Lexium 32S

Servo Drive
User Guide

Original instructions

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www.schneider-electric.com

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER
DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING
WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION
CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

QUALIFICATION OF PERSONNEL

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product. These persons must have sufficient technical training, knowledge and experience and be able to foresee and detect potential hazards that may be caused by using the product, by modifying the settings and by the mechanical, electrical and electronic equipment of the entire system in which the product is used.

The qualified person must be able to detect possible hazards that may arise from parameterization, modifying parameter values and generally from mechanical, electrical, or electronic equipment.

The qualified person must be familiar with the standards, provisions, and regulations for the prevention of industrial accidents, which they must observe when designing and implementing the system.

INTENDED USE

The products described or affected by this document are, along with software, accessories and options, servo-drive systems for three-phase servo motors. The products are intended for industrial use according to the instructions, directions, examples and safety information contained in the present user guide and other supporting documentation.

The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements and the technical data.

Prior to using the products, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety-related measures must be implemented.

Since the products are used as components in an overall machine or process, you must ensure the safety of persons by means of the design of this overall machine or process.

Operate the products only with the specified cables and accessories. Use only genuine accessories and spare parts.

Any use other than the use explicitly permitted as described herein is prohibited and may result in unanticipated hazards.

About the Book

At a Glance

Document Scope

This manual describes technical characteristics, installation, commissioning, operation and maintenance of the servo drive Lexium 32S (LXM32S).

Validity Note

This manual is valid for the standard products listed in the type code, see chapter Type Code *(see page 19)*.

For product compliance and environmental information (RoHS, REACH, PEP, EOLI, etc.), go to *www.schneider-electric.com/green-premium*.

The technical characteristics of the devices described in the present document also appear online. To access the information online:

Step	Action
1	Go to the Schneider Electric home page *www.schneider-electric.com*.
2	In the **Search** box type the reference of a product or the name of a product range. ● Do not include blank spaces in the reference or product range. ● To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the **Product Datasheets** search results and click on the reference that interests you. If you entered the name of a product range, go to the **Product Ranges** search results and click on the product range that interests you.
4	If more than one reference appears in the **Products** search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the datasheet.
6	To save or print a datasheet as a .pdf file, click **Download XXX product datasheet**.

The characteristics that are presented in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

Related Documents

Title of documentation	Reference number
LXM32S - AC servo drive - Product manual (this manual)	*0198441114060 (eng)* *0198441114061 (fre)* *0198441114059 (ger)* *0198441114063 (spa)* *0198441114062 (ita)* *0198441114064 (chi)* *0198441114065 (tur)*
LXM32 - Common DC bus - Application note	*MNA01M001EN (eng)* *MNA01M001DE (ger)*

You can download these technical publications and other technical information from our website at *www.schneider-electric.com/en/download*.

Product Related Information

The use and application of the information contained herein require expertise in the design and programming of automated control systems.

Only you, the user, machine builder or integrator, can be aware of all the conditions and factors present during installation and setup, operation, repair and maintenance of the machine or process.

You must also consider any applicable standards and/or regulations with respect to grounding of all equipment. Verify compliance with any safety information, different electrical requirements, and normative standards that apply to your machine or process in the use of this equipment.

Many components of the equipment, including the printed circuit board, operate with mains voltage, or present transformed high currents, and/or high voltages.

The motor itself generates voltage when the motor shaft is rotated.

⚠ DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires.
- Place a "Do Not Turn On" or equivalent hazard label on all power switches and lock them in the non-energized position.
- Wait 15 minutes to allow the residual energy of the DC bus capacitors to discharge.
- Measure the voltage on the DC bus with a properly rated voltage sensing device and verify that the voltage is less than 42.4 Vdc.
- Do not assume that the DC bus is voltage-free when the DC bus LED is off.
- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- Do not create a short-circuit across the DC bus terminals or the DC bus capacitors.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

This equipment has been designed to operate outside of any hazardous location. Only install this equipment in zones known to be free of a hazardous atmosphere.

⚠ DANGER

POTENTIAL FOR EXPLOSION

Install and use this equipment in non-hazardous locations only.

Failure to follow these instructions will result in death or serious injury.

If the power stage is disabled unintentionally, for example as a result of power outage, errors or functions, the motor is no longer decelerated in a controlled way. Overload, errors or incorrect use may cause the holding brake to no longer operate properly and may result in premature wear.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that movements without braking effect cannot cause injuries or equipment damage.
- Verify the function of the holding brake at regular intervals.
- Do not use the holding brake as a service brake.
- Do not use the holding brake for safety-related purposes.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Drive systems may perform unanticipated movements because of incorrect wiring, incorrect settings, incorrect data or other errors.

⚠ WARNING

UNINTENDED MOVEMENT OR MACHINE OPERATION

- Carefully install the wiring in accordance with the EMC requirements.
- Do not operate the product with undetermined settings and data.
- Perform comprehensive commissioning tests that include verification of configuration settings and data that determine position and movement.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control” and to NEMA ICS 7.1 (latest edition), “Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems” or their equivalent governing your particular location.

Machines, controllers, and related equipment are usually integrated into networks. Unauthorized persons and malware may gain access to the machine as well as to other devices on the network/fieldbus of the machine and connected networks via insufficiently secure access to software and networks.

⚠ WARNING

UNAUTHORIZED ACCESS TO THE MACHINE VIA SOFTWARE AND NETWORKS

- In your hazard and risk analysis, take into account all hazards that result from access to and operation on the network/fieldbus and develop an appropriate cyber security conceptual framework.
- Verify that the hardware infrastructure and the software infrastructure into which the machine is integrated, as well as all organizational measures and rules covering access to this infrastructure, take into account the results of the hazard and risk analysis.
- Implement your cyber security framework according to the best practices and standards of IT security and cyber security, such as ISO/IEC 27000 series, Common Criteria for Information Technology Security Evaluation, ISO/IEC 15408, IEC 62351, ISA/IEC 62443, NIST Cybersecurity Framework, Information Security Forum - Standard of Good Practice for Information Security.
- Verify the effectiveness of your IT security and cyber security systems using appropriate, proven methods.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in this manual, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as *safety*, *safety function*, *safe state*, *fault*, *fault reset*, *malfunction*, *failure*, *error*, *error message*, *dangerous*, etc.

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2015	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
IEC 62061:2015	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2016	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 60034 series	Rotating electrical machines
IEC 61800 series	Adjustable speed electrical power drive systems
IEC 61158 series	Digital data communications for measurement and control – Fieldbus for use in industrial control systems

Finally, the term *zone of operation* may be used in conjunction with the description of specific hazards, and is defined as it is for a *hazard zone* or *danger zone* in the *Machinery Directive* (*2006/42/EC*) and *ISO 12100:2010*.

NOTE: The aforementioned standards may or may not apply to the specific products cited in the present documentation. For more information concerning the individual standards applicable to the products described herein, see the characteristics tables for those product references.

Chapter 1
Introduction

What Is in This Chapter?

This chapter contains the following topics:

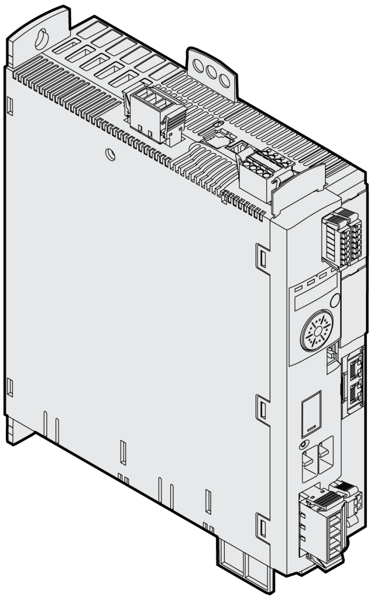
Device Overview

General

The Lexium 32 product family consists of various servo drive models that cover different application areas. Together with Lexium BMH servo motors or Lexium BSH servo motors as well as a comprehensive portfolio of options and accessories, the drives are ideally suited to implement compact, high-performance drive solutions for a wide range of power requirements.

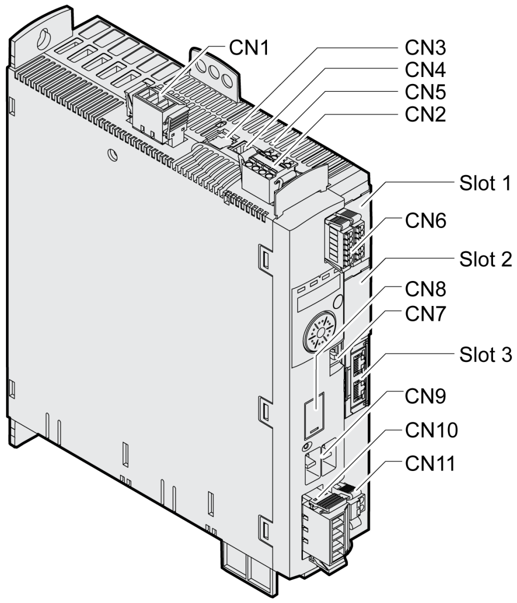
Lexium Servo Drive LXM32S

This product manual describes the LXM32S servo drive.



Overview of some of the features of the servo drive:
- Communication interface for SERCOS III.
- An optional encoder module allows you to add a second encoder interface for digital encoders, analog encoders or resolvers.
- The product is commissioned via the integrated HMI or a PC with commissioning software.
- The safety function "Safe Torque Off" (STO) as per IEC 61800-5-2 is integrated into the drive. The optional safety module eSM offers additional safety functions.
- A memory card slot is provided for backup and copying of parameters and fast device replacement.

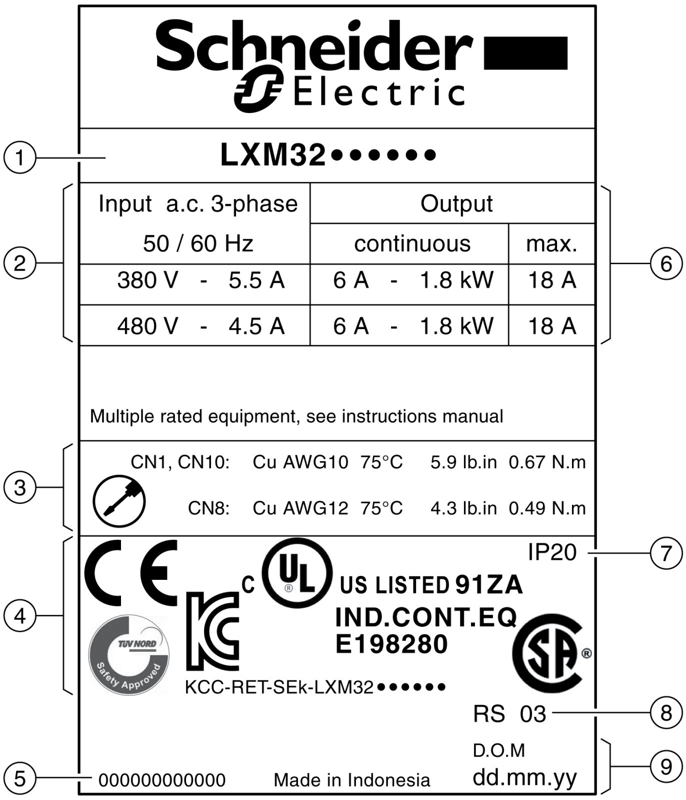
Components and Interfaces



CN1 Power stage supply
CN2 24 Vdc control supply and safety function STO
CN3 Motor encoder (Encoder 1)
CN4 PTO (Pulse Train Out) - ESIM (encoder simulation)
CN5 PTI (Pulse Train In) - P/D, A/B or CW/CCW signals
CN6 6 digital inputs and 3 digital outputs
CN7 Modbus (commissioning interface)
CN8 External braking resistor
CN9 DC bus
CN10 Motor phases
CN11 Motor holding brake
Slot 1 Slot for safety module
Slot 2 Slot for encoder module (Encoder 2)
Slot 3 Fieldbus SERCOS III

Nameplate

The nameplate contains the following data:



1 Product type, see type code
2 Power stage supply
3 Cable specifications and tightening torque
4 Certifications
5 Serial number
6 Output power
7 Degree of protection
8 Hardware version
9 Date of manufacture

Type Code

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Type code (example)	L	X	M	3	2	S	D	1	8	M	2	•	•	•	•

Item	Meaning
1 ... 3	**Product family** LXM = Lexium
4 ... 5	**Product type** 32 = AC servo drive for one axis
6	**Fieldbus interface** S = Modular Drive with fieldbus SERCOS III
7 ... 9	**Peak current** U45 = 4.5 A_{rms} U60 = 6 A_{rms} U90 = 9 A_{rms} D12 = 12 A_{rms} D18 = 18 A_{rms} D30 = 30 A_{rms} D72 = 72 A_{rms}
10 ... 11	**Power stage supply** M2 = Single-phase, 115/200/240 Vac N4 = Three-phase, 208/400/480 Vac
12 ... 15	**Customized version** S = Customized version

If you have questions concerning the type code, contact your Schneider Electric representative.

Designation Customized Version

In the case of a customized version, position 12 of the type code is an "S". The subsequent number defines the customized version. Example: LXM32••••••S123

Contact your local Schneider Electric service representative if you have questions concerning customized versions.

Chapter 2
Technical Data

What Is in This Chapter?

This chapter contains the following topics:

Environmental Conditions

Conditions for Operation

The maximum permissible ambient temperature during operation depends on the clearances between the devices and on the power consumption. Observe the pertinent instructions in the chapter Installation *(see page 89)*.

Characteristic	Unit	Value
Ambient temperature (no icing, non-condensing)	°C (°F)	0 ... 50 (32 ... 122)

The following relative humidity is permissible during operation:

Characteristic	Unit	Value
Relative humidity (non-condensing)	%	5 ... 95

The installation altitude is defined in terms of altitude above mean sea level.

Characteristic	Unit	Value
Installation altitude above mean sea level without derating.	m (ft)	<1000 (<3281)
Altitude above mean sea level when all of the following conditions are met: ● Maximum ambient temperature 45 °C (113 °F) ● Reduction of the continuous power by 1% per 100 m (328 ft) above 1000 m (3281 ft)	m (ft)	1000 ... 2000 (3281 ... 6562)
Altitude above mean sea level when all of the following conditions are met: ● Maximum ambient temperature 40 °C (104 °F) ● Reduction of the continuous power by 1% per 100 m (328 ft) above 1000 m (3281 ft) ● Overvoltages of the supply mains limited to overvoltage category II as per IEC 60664-1 ● No IT grounding system	m (ft)	2000 ... 3000 (6562 ... 9843)

Conditions for Transportation and Storage

The environment during transportation and storage must be dry and free from dust.

Characteristic	Unit	Value
Temperature	°C (°F)	-25 ... 70 (-13 ... 158)

The following relative humidity is permissible during transportation and storage:

Characteristic	Unit	Value
Relative humidity (non-condensing)	%	<95

Installation Site and Connection

For operation, the device must be mounted in a closed control cabinet. The device may only be operated with a permanently installed connection.

Pollution Degree and Degree of Protection

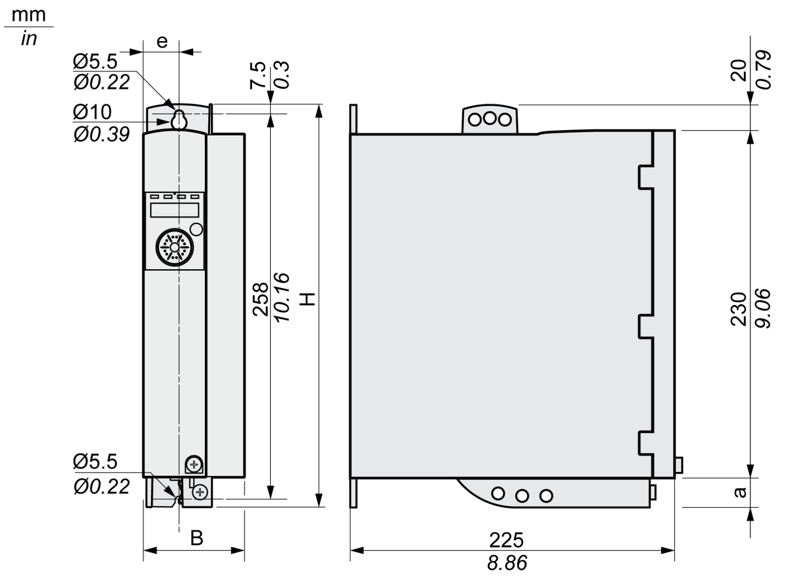
Characteristic	Value
Pollution degree	2
Degree of protection	IP20

Vibration and Shock

Characteristic	Value
Vibration, sinusoidal	Tested as per IEC 60068-2-6 3.5 mm (2 ... 8.4 Hz) 10 m/s^2 (8.4 ... 200 Hz)
Shock, semi-sinusoidal	Tested as per IEC 60068-2-27 150 m/s^2 (for 11 ms)

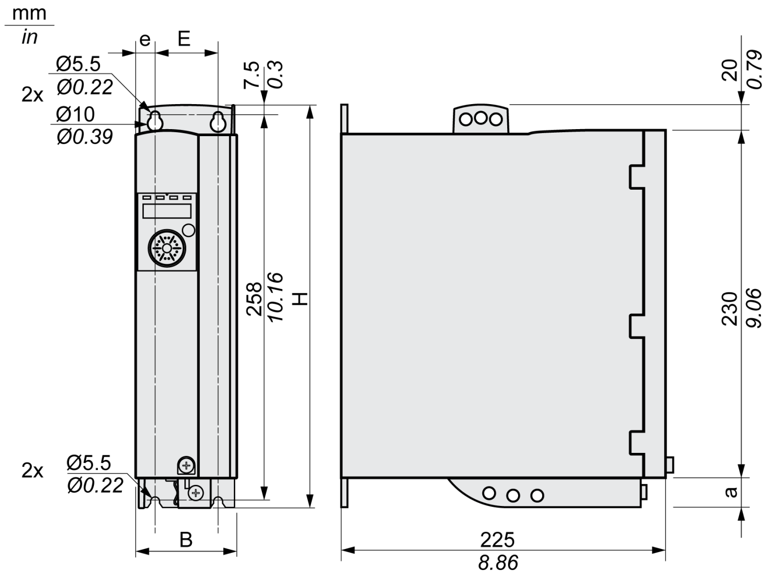
Dimensions

Dimensions LXM32•U45, LXM32•U60, LXM32•U90, LXM32•D12, LXM32•D18 and LXM32•D30M2



Characteristic	Unit	Value	
		LXM32•U45, LXM32•U60, LXM32•U90	LXM32•D12, LXM32•D18, LXM32•D30M2
B	mm (in)	68 ±1 (2.68 ±0.04)	68 ±1 (2.68 ±0.04)
H	mm (in)	270 (10.63)	270 (10.63)
e	mm (in)	24 (0.94)	24 (0.94)
E	mm (in)	-	-
a	mm (in)	20 (0.79)	20 (0.79)
Type of cooling		Convection(1)	Fan 40 mm (1.57 in)
(1) Greater than 1 m/s			

Dimensions LXM32•D30N4 and LXM32•D72



Characteristic	Unit	Value	
		LXM32•D30N4	LXM32•D72
B	mm (in)	68 ±1 (2.68 ±0.04)	108 ±1 (4.25 ±0.04)
H	mm (in)	270 (10.63)	274 (10.79)
e	mm (in)	13 (0.51)	13 (0.51)
E	mm (in)	42 (1.65)	82 (3.23)
a	mm (in)	20 (0.79)	24 (0.94)
Type of cooling		Fan 60 mm	Fan 80 mm (3.15 in)
(1) Greater than 1 m/s			

Mass

Characteristic	Unit	Value					
		LXM32•U45	LXM32•U60, LXM32•U90	LXM32•D12, LXM32•D18M2	LXM32•D18N4, LXM32•D30M2	LXM32•D30N4	LXM32•D72
Mass	kg (lb)	1.6 (3.53)	1.7 (3.75)	1.8 (3.97)	2.0 (4.41)	2.6 (5.73)	4.7 (10.36)

Power Stage Data - General

Mains Voltage: Range and Tolerance

Characteristic	Unit	Value
115/230 Vac single-phase	Vac	100 -15% ... 120 +10% 200 -15% ... 240 +10%
208/400/480 Vac three-phase	Vac	200 -15% ... 240 +10% 380 -15% ... 480 +10%
Frequency	Hz	50 -5% ... 60 +5%

Characteristic	Unit	Value
Transient overvoltages		Overvoltage category III(1)
Rated voltage to ground	Vac	300
(1) Depends on installation altitude, see chapter Environmental Conditions *(see page 22)*		

Type of Grounding

Characteristic	Value
TT grounding system, TN grounding system	Approved
IT grounding system	Depends on hardware version ≥RS 02: Approved(1) <RS02: Not approved
Mains with corner grounded system	Not approved
(1) Depending on installation altitude, see chapter Environmental Conditions *(see page 22)*	

Leakage Current

Characteristic	Unit	Value
Leakage current (as per IEC 60990, figure 3)	mA	<30(1)
(1) Measured on mains with grounded neutral point and without external mains filter. Take into account that a 30 mA RCD can already trigger at 15 mA. In addition, there is a high-frequency leakage current which is not considered in the measurement. The response to this depends on the type of residual current device.		

Harmonic Currents and Impedance

The harmonic currents depend on the impedance of the supply mains. This is expressed in terms of the short-circuit current of the supply mains. If the supply mains has a higher short-circuit current than indicated in the Technical Data for the device, use upstream mains reactors. See chapter Accessories and Spare Parts *(see page 455)* for suitable mains reactors.

Monitoring the Continuous Output Current

The continuous output current is monitored by the device. If the continuous output current is permanently exceeded, the device reduces the output current.

PWM Frequency Power Stage

The PWM frequency of the power stage is set to a fixed value.

Characteristic	Unit	Value
PWM frequency power stage	kHz	8

Approved Motors

The following motor families can be connected: BMH, BSH.

When selecting, consider the type and amount of the mains voltage and the motor inductance.

If an encoder module is installed, additional motors can be used. The conditions can be found in the corresponding manual for the module.

For other motor possibilities, contact your local Schneider Electric representative.

Inductance of Motor

The permissible minimum inductance of the motor to be connected depends on the device type and the nominal mains voltage. See chapter Power Stage Data - Drive-Specific *(see page 28)*.

The specified minimum inductance value limits the current ripple of the peak output current. If the inductance value of the connected motor is less than the specified minimum inductance value, this may adversely affect current control and trigger motor phase current monitoring.

Power Stage Data - Drive-Specific

Data for Single-Phase Devices at 115 Vac

Characteristic	Unit	Value			
		LXM32•U45M2	LXM32•U90M2	LXM32•D18M2	LXM32•D30M2
Nominal voltage (single-phase)	Vac	115	115	115	115
Inrush current limitation	A	1.7	3.5	8	16
Maximum fuse to be connected upstream(1)	A	25	25	25	25
Continuous output current	A_{rms}	1.5	3	6	10
Peak output current	A_{rms}	3	6	10	15
Minimum inductance motor (phase/phase)	mH	5.5	3	1.4	0.8
Values without mains reactor(2)					
Nominal power	kW	0.15	0.3	0.5	0.8
Input current(3)	A_{rms}	2.9	5.4	8.5	12.9
THD (total harmonic distortion)(4)	%	173	159	147	135
Power dissipation(5)	W	7	15	28	33
Maximum inrush current(6)	A	111	161	203	231
Time for maximum inrush current	ms	0.8	1.0	1.2	1.4
Values with mains reactor					
Mains reactor	mH	5	2	2	2
Nominal power	kW	0.2	0.4	0.8	0.8
Input current(3)	A_{rms}	2.6	5.2	9.9	9.9
THD (total harmonic distortion)(4)	%	85	90	74	72
Power dissipation(5)	W	8	16	32	33
Maximum inrush current(6)	A	22	48	56	61
Time for maximum inrush current	ms	3.3	3.1	3.5	3.7

(1) As per IEC 60269. Circuit breakers with B or C characteristic. See chapter Conditions for UL 508C and CSA *(see page 51)* for UL and CSA. Lower ratings are permissible. The fuse must be rated in such a way that the fuse does not trip at the specified input current.
(2) At a mains impedance corresponding to a short-circuit current of the supply mains of 1 kA
(3) At nominal power and nominal voltage
(4) With reference to the input current
(5) Condition: internal braking resistor not active. Value at nominal current, nominal voltage and nominal power. Value approximately proportional with output current.
(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

Data for Single-Phase Devices at 230 Vac

Characteristic	Unit	Value			
		LXM32•U45M2	LXM32•U90M2	LXM32•D18M2	LXM32•D30M2
Nominal voltage (single-phase)	Vac	230	230	230	230
Inrush current limitation	A	3.5	6.9	16	33
Maximum fuse to be connected upstream(1)	A	25	25	25	25
Continuous output current	A_{rms}	1.5	3	6	10
Peak output current	A_{rms}	4.5	9	18	30
Minimum inductance motor (phase/phase)	mH	5.5	3	1.4	0.8
Values without mains reactor(2)					
Nominal power	kW	0.3	0.5	1.0	1.6
Input current(3)	A_{rms}	2.9	4.5	8.4	12.7
THD (total harmonic distortion)(4)	%	181	166	148	135
Power dissipation(5)	W	10	18	34	38
Maximum inrush current(6)	A	142	197	240	270
Time for maximum inrush current	ms	1.1	1.5	1.8	2.1
Values with mains reactor					
Mains reactor	mH	5	2	2	2
Nominal power	kW	0.5	0.9	1.6	2.2
Input current(3)	A_{rms}	3.4	6.3	10.6	14.1
THD (total harmonic distortion)(4)	%	100	107	93	86
Power dissipation(5)	W	11	20	38	42
Maximum inrush current(6)	A	42	90	106	116
Time for maximum inrush current	ms	3.5	3.2	3.6	4.0

(1) As per IEC 60269. Circuit breakers with B or C characteristic. See chapter Conditions for UL 508C and CSA *(see page 51)* for UL and CSA. Lower ratings are permissible. The fuse must be rated in such a way that the fuse does not trip at the specified input current.
(2) At a mains impedance corresponding to a short-circuit current of the supply mains of 1 kA
(3) At nominal power and nominal voltage
(4) With reference to the input current
(5) Condition: internal braking resistor not active. Value at nominal current, nominal voltage and nominal power. Value approximately proportional with output current.
(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

Data for Three-Phase Devices at 208 Vac

Characteristic	Unit	Value				
		LXM32•U60N4	LXM32•D12N4	LXM32•D18N4	LXM32•D30N4	LXM32•D72N4
Nominal voltage (three-phase)	Vac	208	208	208	208	208
Inrush current limitation	A	2.2	4.9	10	10	29
Maximum fuse to be connected upstream(1)	A	32	32	32	32	32
Continuous output current	A_{rms}	1.5	3	6	10	24
Peak output current	A_{rms}	6	12	18	30	72
Minimum inductance motor (phase/phase)	mH	8.5	4.5	3	1.7	0.7
Values without mains reactor(2)						
Nominal power	kW	0.35	0.7	1.2	2.0	5
Input current(3)	A_{rms}	1.8	3.6	6.2	9.8	21.9
THD (total harmonic distortion)(4)	%	132	136	140	128	106
Power dissipation(5)	W	13	26	48	81	204
Maximum inrush current(6)	A	60	180	276	341	500
Time for maximum inrush current	ms	0.5	0.7	0.9	1.1	1.5
Values with mains reactor						
Mains reactor	mH	2	2	1	1	1
Nominal power	kW	0.4	0.8	1.5	2.6	6.5
Input current(3)	A_{rms}	1.7	3.1	6.0	9.2	21.1
THD (total harmonic distortion)(4)	%	97	79	78	59	34
Power dissipation(5)	W	13	27	51	86	218
Maximum inrush current(6)	A	19	55	104	126	155
Time for maximum inrush current	ms	1.9	2.6	2.6	3.0	3.6

(1) As per IEC 60269. Circuit breakers with B or C characteristic. See chapter Conditions for UL 508C and CSA *(see page 51)* for UL and CSA. Lower ratings are permissible. The fuse must be rated in such a way that the fuse does not trip at the specified input current.
(2) At a mains impedance corresponding to a short-circuit current of the supply mains of 5 kA
(3) At nominal power and nominal voltage
(4) With reference to the input current
(5) Condition: internal braking resistor not active. Value at nominal current, nominal voltage and nominal power. Value approximately proportional with output current.
(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

Data for Three-Phase Devices at 400 Vac

Characteristic	Unit	Value				
		LXM32•U60N4	LXM32•D12N4	LXM32•D18N4	LXM32•D30N4	LXM32•D72N4
Nominal voltage (three-phase)	Vac	400	400	400	400	400
Inrush current limitation	A	4.3	9.4	19	19	57
Maximum fuse to be connected upstream(1)	A	32	32	32	32	32
Continuous output current	A_{rms}	1.5	3	6	10	24
Peak output current	A_{rms}	6	12	18	30	72
Minimum inductance motor (phase/phase)	mH	8.5	4.5	3	1.7	0.7
Values without mains reactor(2)						
Nominal power	kW	0.4	0.9	1.8	3.0	7
Input current(3)	A_{rms}	1.4	2.9	5.2	8.3	17.3
THD (total harmonic distortion)(4)	%	191	177	161	148	126
Power dissipation(5)	W	17	37	68	115	283
Maximum inrush current(6)	A	90	131	201	248	359
Time for maximum inrush current	ms	0.5	0.7	0.9	1.1	1.4
Values with mains reactor						
Mains reactor	mH	2	2	1	1	1
Nominal power	kW	0.8	1.6	3.3	5.6	13
Input current(3)	A_{rms}	1.8	3.4	6.9	11.1	22.5
THD (total harmonic distortion)(4)	%	108	90	90	77	45
Power dissipation(5)	W	19	40	74	125	308
Maximum inrush current(6)	A	28	36	75	87	112
Time for maximum inrush current	ms	1.9	2.3	2.3	2.6	3.0

(1) As per IEC 60269. Circuit breakers with B or C characteristic. See chapter Conditions for UL 508C and CSA *(see page 51)* for UL and CSA. Lower ratings are permissible. The fuse must be rated in such a way that the fuse does not trip at the specified input current.
(2) At a mains impedance corresponding to a short-circuit current of the supply mains of 5 kA
(3) At nominal power and nominal voltage
(4) With reference to the input current
(5) Condition: internal braking resistor not active. Value at nominal current, nominal voltage and nominal power. Value approximately proportional with output current.
(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

Data for Three-Phase Devices at 480 Vac

Characteristic	Unit	Value				
		LXM32•U60N4	LXM32•D12N4	LXM32•D18N4	LXM32•D30N4	LXM32•D72N4
Nominal voltage (three-phase)	Vac	480	480	480	480	480
Inrush current limitation	A	5.1	11.3	23	23	68
Maximum fuse to be connected upstream(1)	A	32	32	32	32	32
Continuous output current	A_{rms}	1.5	3	6	10	24
Peak output current	A_{rms}	6	12	18	30	72
Minimum inductance motor (phase/phase)	mH	8.5	4.5	3	1.7	0.7
Values without mains reactor(2)						
Nominal power	kW	0.4	0.9	1.8	3.0	7
Input current(3)	A_{rms}	1.2	2.4	4.5	7.0	14.6
THD (total harmonic distortion)(4)	%	201	182	165	152	129
Power dissipation(5)	W	20	42	76	129	315
Maximum inrush current(6)	A	129	188	286	350	504
Time for maximum inrush current	ms	0.6	0.7	1.0	1.2	1.6
Values with mains reactor						
Mains reactor	mH	2	2	1	1	1
Nominal power	kW	0.8	1.6	3.3	5.6	13
Input current(3)	A_{rms}	1.6	2.9	6.0	9.6	19.5
THD (total harmonic distortion)(4)	%	116	98	98	85	55
Power dissipation(5)	W	21	44	82	137	341
Maximum inrush current(6)	A	43	57	116	137	177
Time for maximum inrush current	ms	1.9	2.4	2.4	2.7	3.2

(1) As per IEC 60269. Circuit breakers with B or C characteristic. See chapter Conditions for UL 508C and CSA *(see page 51)* for UL and CSA. Lower ratings are permissible. The fuse must be rated in such a way that the fuse does not trip at the specified input current.
(2) At a mains impedance corresponding to a short-circuit current of the supply mains of 5 kA
(3) At nominal power and nominal voltage
(4) With reference to the input current
(5) Condition: internal braking resistor not active. Value at nominal current, nominal voltage and nominal power. Value approximately proportional with output current.
(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

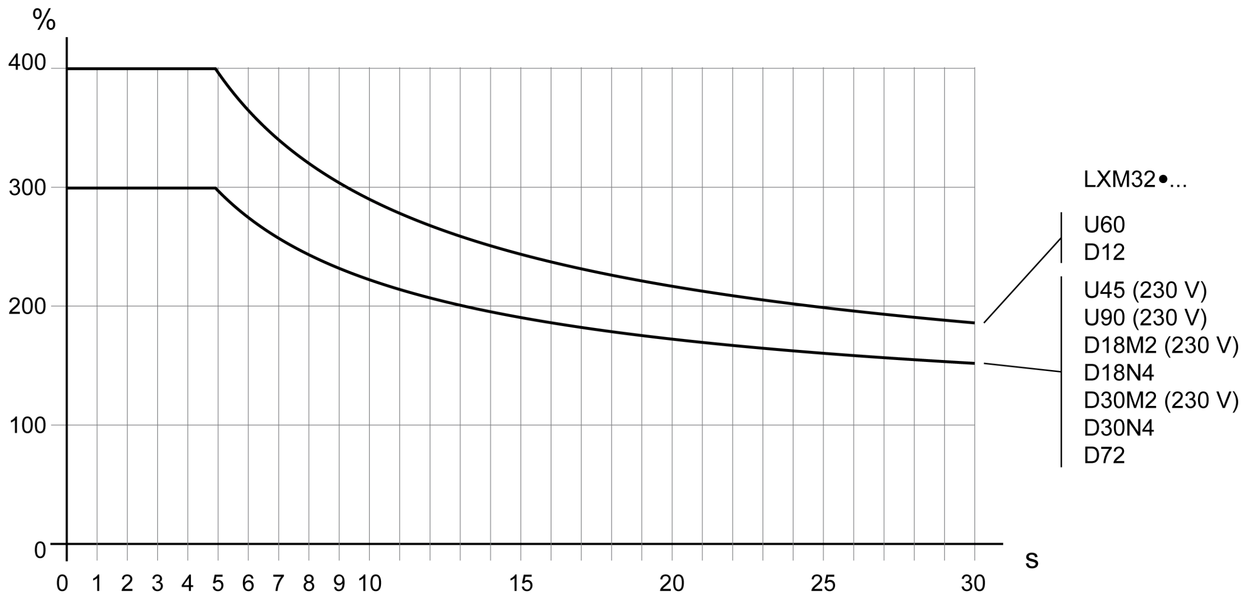
Peak Output Currents

Description

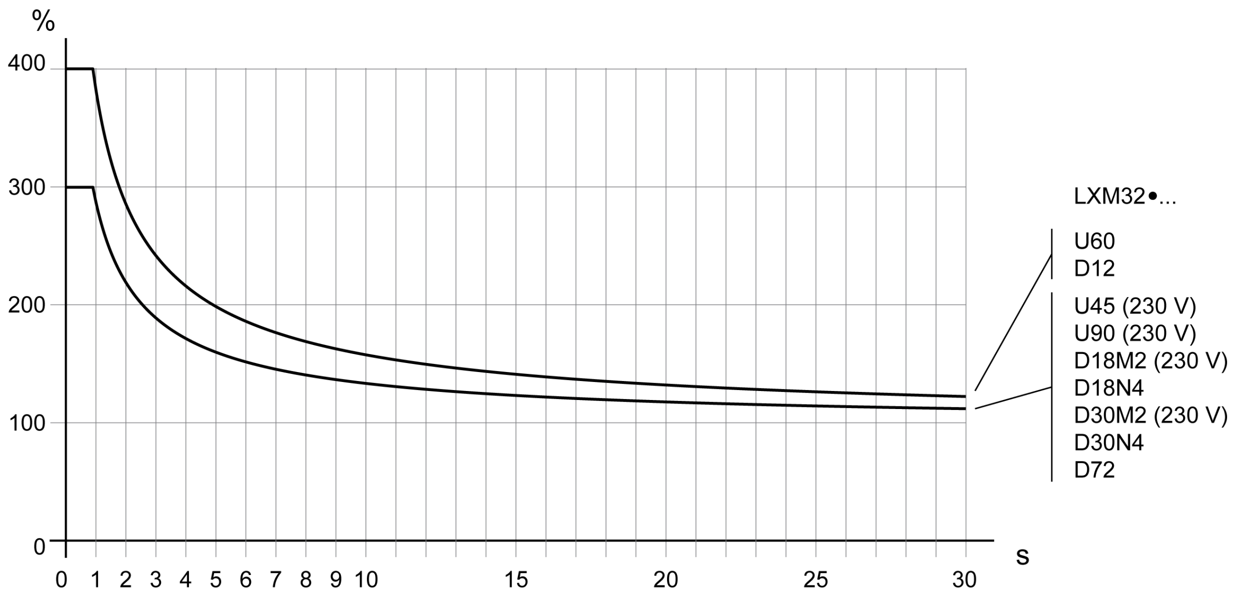
The device can provide the peak output current for a limited period of time. If the peak output current flows when the motor is at a standstill, the higher load on a single semiconductor switch causes the current limitation to become active earlier than when the motor moves.

The period of time for which the peak output current can be provided depends on the hardware version.

Peak output current with hardware version ≥RS03: 5 seconds



Peak output current with hardware version <RS03: 1 second



DC Bus Data

DC Bus Data for Single-Phase Devices

Characteristic	Unit	Value							
		LXM32•U45M2		LXM32•U90M2		LXM32•D18M2		LXM32•D30M2	
Nominal voltage	V	115	230	115	230	115	230	115	230
Nominal voltage DC bus	V	163	325	163	325	163	325	163	325
Undervoltage limit	V	55	130	55	130	55	130	55	130
Voltage limit: activation of Quick Stop	V	60	140	60	140	60	140	60	140
Overvoltage limit	V	260(1) / 450	450	260(1) / 450	450	260(1) / 450	450	260(1) / 450	450
Maximum continuous power via DC bus	kW	0.2	0.5	0.4	0.9	0.8	1.6	0.8	2.2
Maximum continuous current via DC bus	A	1.5	1.5	3.2	3.2	6.0	6.0	10.0	10.0
(1) Can be set via parameter `MON_DCbusVdcThresh`.									

DC Bus Data for Three-Phase Devices

Characteristic	Unit	Value								
		LXM32•U60N4			LXM32•D12N4			LXM32•D18N4		
Nominal voltage	V	208	400	480	208	400	480	208	400	480
Nominal voltage DC bus	V	294	566	679	294	566	679	294	566	679
Undervoltage limit	V	150	350	350	150	350	350	150	350	350
Voltage limit: activation of Quick Stop	V	160	360	360	160	360	360	160	360	360
Overvoltage limit	V	450(1) / 820	820	820	450(1) / 820	820	820	450(1) / 820	820	820
Maximum continuous power via DC bus	kW	0.4	0.8	0.8	0.8	1.6	1.6	1.7	3.3	3.3
Maximum continuous current via DC bus	A	1.5	1.5	1.5	3.2	3.2	3.2	6.0	6.0	6.0
(1) Can be set via parameter `MON_DCbusVdcThresh`.										

Characteristic	Unit	Value					
		LXM32•D30N4			LXM32•D72N4		
Nominal voltage	V	208	400	480	208	400	480
Nominal voltage DC bus	V	294	566	679	294	566	679
Undervoltage limit	V	150	350	350	150	350	350
Voltage limit: activation of Quick Stop	V	160	360	360	160	360	360
Overvoltage limit	V	450(1) / 820	820	820	450(1) / 820	820	820
Maximum continuous power via DC bus	kW	2.8	5.6	5.6	6.5	13.0	13.0
Maximum continuous current via DC bus	A	10.0	10.0	10.0	22.0	22.0	22.0
(1) Can be set via parameter `MON_DCbusVdcThresh`.							

24 Vdc Control Supply

Description

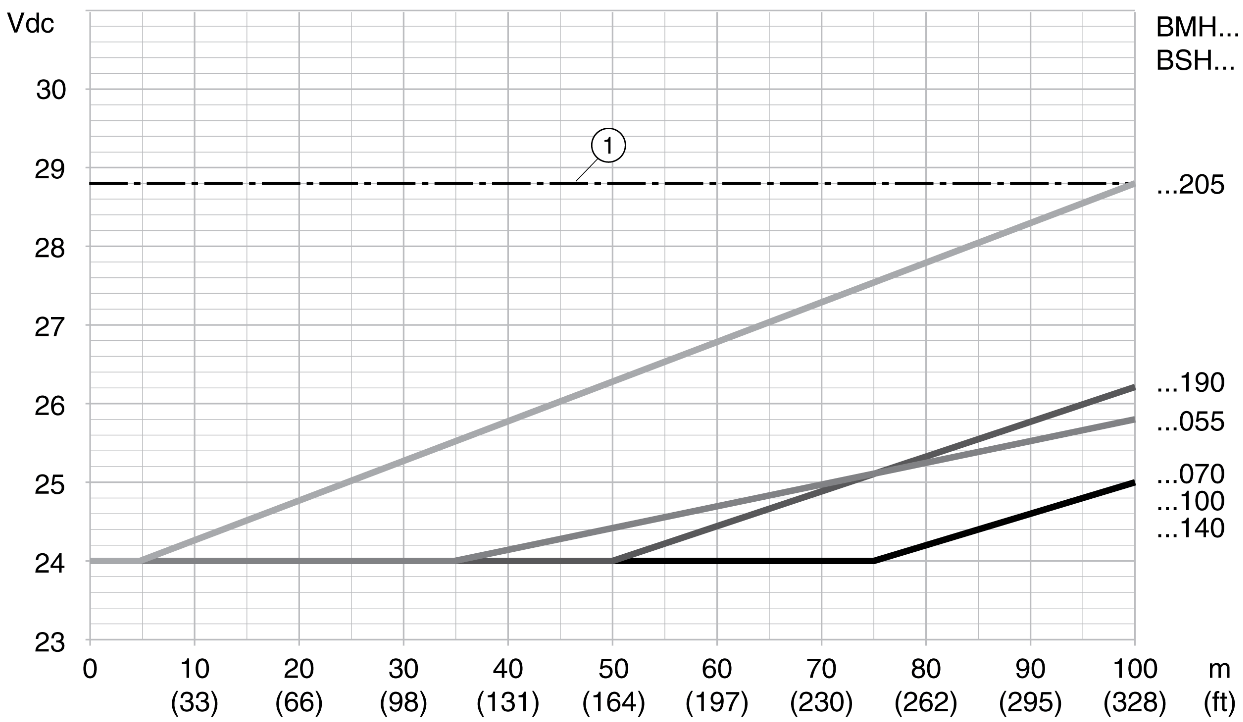
The 24 Vdc control supply must meet the requirements of IEC 61131-2 (PELV standard power supply unit):

Characteristic	Unit	Value
Input voltage	Vdc	24 (-15/+20 %)(1)
Input current (without load)	A	≤1(2)
Residual ripple	%	<5
Inrush current		Charging current for capacitor C= 1.8 mF
(1) For connection of motors without holding brake. See figure below for motors with holding brake (2) Input current: holding brake not considered.		

24 Vdc Control Supply in the Case of Motor with Holding Brake

If a motor with holding brake is connected, the 24 Vdc control supply must be adjusted according to the connected motor type, the motor cable length and the cross section of the wires for the holding brake. The following diagram applies to the motor cables available as accessories, see chapter Accessories and Spare Parts *(see page 455)*. See the diagram for the voltage that must be available at CN2 for releasing the holding brake. The voltage tolerance is ±5 %.

24 Vdc control supply in the case of motor with holding brake: the voltage depends on the motor type, the motor cable length and the conductor cross section.

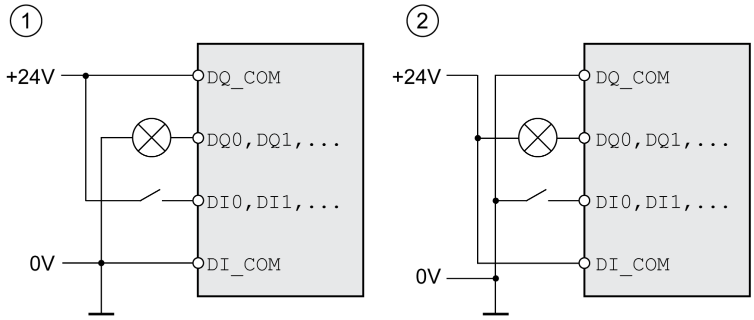


1 Maximum voltage of the 24 Vdc control supply

Signals

Logic Type

The digital inputs and outputs of this product can be wired for positive logic or negative logic.



Logic type	Active state
(1) Positive logic	Output supplies current (source output) Current flows to the input (sink input)
(2) Negative logic	Output draws current (sink output) Current flows from the input (source input)

Signal inputs are protected against reverse polarity, outputs are short-circuit protected. The inputs and outputs are functionally isolated.

Digital Input Signals 24 V

When wired as positive logic, the levels of the digital inputs comply with IEC 61131-2, type 1. The electrical characteristics are also valid when wired as negative logic unless otherwise indicated.

Characteristic	Unit	Value
Input voltage - positive logic Level 0 Level 1	 Vdc Vdc	 -3 ... 5 15 ... 30
Input voltage - negative logic (at 24 Vdc) Level 0 Level 1	 Vdc Vdc	 >19 <9
Input current (at 24 Vdc)	mA	5
Debounce time (software)[(1)(2)]	ms	1.5 (default value)
Hardware switching time Rising edge (level 0 -> 1) Falling edge (level 1 -> 0)	 µs µs	 15 150
Jitter (capture inputs)	µs	<2
(1) Adjustable via parameter (sampling period 250µs) (2) If the capture inputs are used for capture then the debounce time is not applied.		

Digital Output Signals 24 V

When wired as positive logic, the levels of the digital outputs comply with IEC 61131-2. The electrical characteristics are also valid when wired as negative logic unless otherwise indicated.

Characteristic	Unit	Value
Nominal supply voltage	Vdc	24
Voltage range for supply voltage	Vdc	19.2 ... 30
Nominal output voltage - positive logic	Vdc	24
Nominal output voltage - negative logic	Vdc	0
Voltage drop at 100 mA load	Vdc	≤3
Maximum current per output	mA	100

Input Signals Safety Function STO

The inputs for the safety function STO (inputs STO_A and STO_B) can only be wired for positive logic. Observe the information provided in chapter Safety function STO ("Safe Torque Off") (see page 79).

Characteristic	Unit	Value
Input voltage - positive logic Level 0 Level 1	 Vdc Vdc	 -3 ... 5 15 ... 30
Input current (at 24 Vdc)	mA	5
Debounce time STO_A and STO_B	ms	>1
Detection of signal differences between STO_A and STO_B	s	>1
Response time of safety function STO	ms	≤10

Holding Brake Output CN11

The 24 Vdc holding brake of the BMH motor or the BSH motor can be connected to the output CN11. Data of output CN11:

Characteristic	Unit	Value
Output voltage(1)	V	Voltage at 24 Vdc control supply CN2 minus 0.8 V
Maximum switching current	A	1.7
Energy inductive load(2)	Ws	1.5
(1) See chapter 24 Vdc Control Supply (see page 35) (2) Time between switch off procedures: > 1 s		

Encoder Signals

The encoder signals comply with the Stegmann Hiperface specification.

Characteristic	Unit	Value
Output voltage for encoder	V	10
Output current for encoder	mA	100
SIN/COS input signal voltage range		1 V_{pp} with 2.5 V offset, 0.5 V_{pp} at 100 kHz
Input resistance	Ω	120

The output voltage is short-circuit protected and overload protected. Transmission via RS485, asynchronous, half-duplex

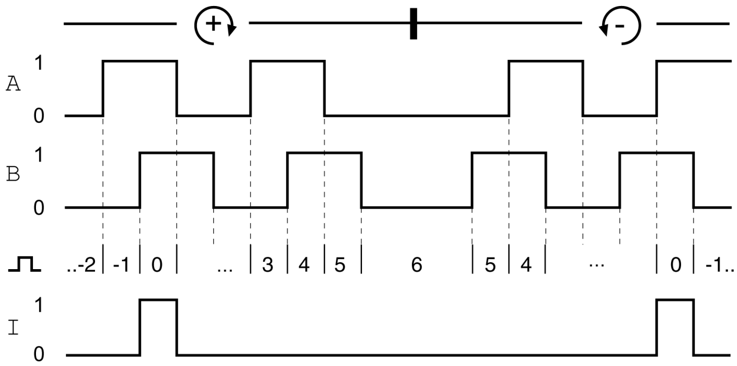
Output PTO (CN4)

5 V signals are available at the PTO (Pulse Train Out, CN4) output. Depending on parameter `PTO_mode`, these signals are ESIM signals (encoder simulation) or directly transmitted PTI input signals (P/D signals, A/B signals, CW/CCW signals). The PTO output signals can be used as PTI input signals for another device. The PTO output signals have 5 V, even if the PTI input signal is a 24 V signal.

The signal level corresponds to RS422. Due to the input current of the optocoupler in the input circuit, a parallel connection of a driver output to several devices is not permitted.

The basic resolution of the encoder simulation at quadruple resolution is 4096 increments per revolution in the case of rotary motors.

Time chart with A, B and index pulse signal, counting forwards and backwards



Output Signal PTO

The PTO output signals comply with the RS422 interface specification.

Characteristic	Unit	Value
Logic level		As per RS422[1]
Output frequency per signal	kHz	≤500
Motor increments per second	Inc/s	≤1.6 * 10^6
(1) Due to the input current of the optocoupler in the input circuit, a parallel connection of a driver output to several devices is not permitted.		

The device connected to the PTO output must be able to process the specified motor increments per second. Even at low velocities, (medium PTO frequency in the kHz range), edges may change at up to 1.6 MHz.

Input PTI (CN5)

5 V signals or 24 V signals can be connected to the PTI (Pulse Train In) input.

The following signals can be connected:

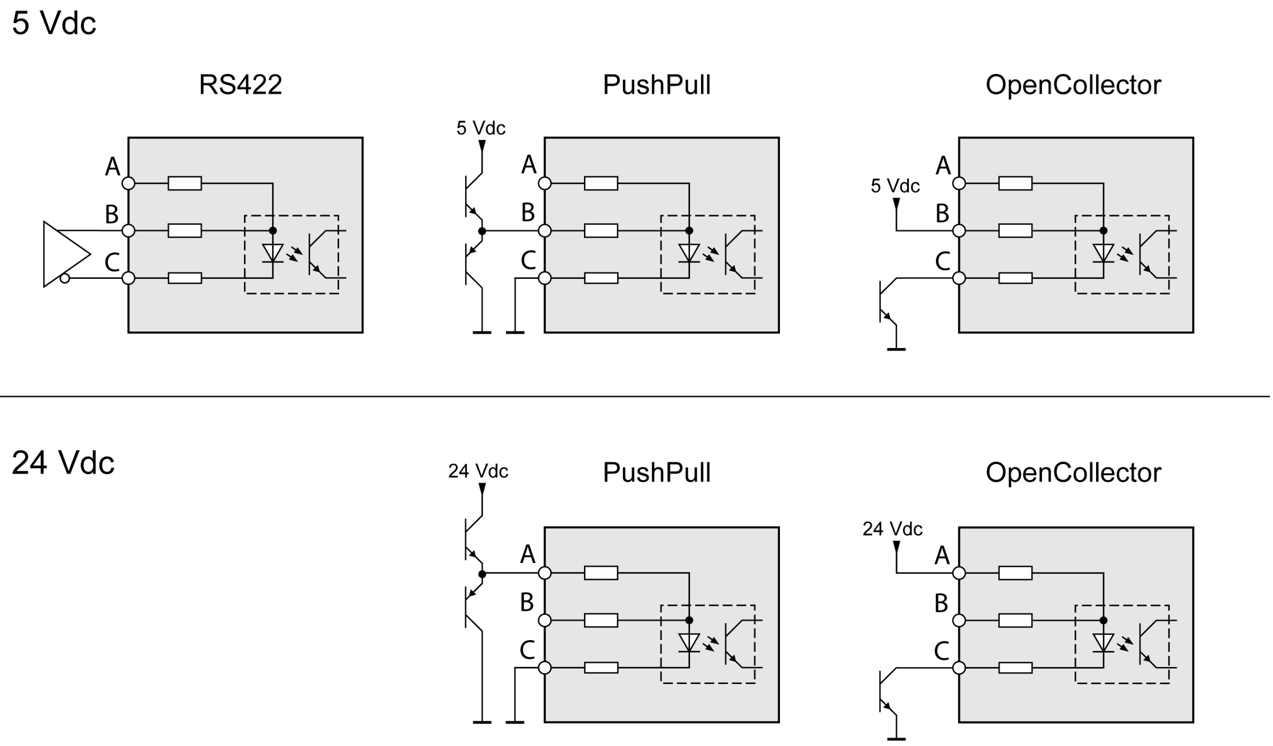
- A/B signals (`ENC_A`/`ENC_B`)
- P/D signals (`PULSE`/`DIR`)
- CW/CCW signals (`CW`/`CCW`)

Input Circuit and Selection of Method

The input circuit and the selected method affect the maximum permissible input frequency and the maximum permissible line length:

Input circuit		RS422	Push pull	Open collector
Minimum input frequency with method position synchronization	Hz	0	0	0
Minimum input frequency with method velocity synchronization	Hz	100	100	100
Maximum input frequency	MHz	1	0.2	0.01
Maximum line length	m (ft)	100 (328)	10 (32.8)	1 (3.28)

Signal input circuits: RS422, Push Pull and Open Collector



Input	Pin[1]	RS422[2]	5V	24V
A	Pin 7	Reserved	Reserved	PULSE(24) ENC_A(24) CW(24)
	Pin 8	Reserved	Reserved	DIR(24) ENC_B(24) CCW(24
B	Pin 1	PULSE(5) ENC_A(5) CW(5)	PULSE(5) ENC_A(5) CW(5)	Reserved
	Pin4	DIR(5) ENC_B(5) CCW(5)	DIR(5) ENC_B(5) CCW(5)	Reserved
C	Pin 2	PULSE ENC_A CW	PULSE ENC_A CW	PULSE ENC_A CW
	Pin 5	DIR ENC_B CCW	DIR ENC_B CCW	DIR ENC_B CCW

(1) Observe the different pairing in the case of twisted pair:
Pin 1 / pin 2 and pin 4 / pin 5 for RS422 and 5V;
pin 7 / pin 2 and pin 8 / pin 5 for 24V

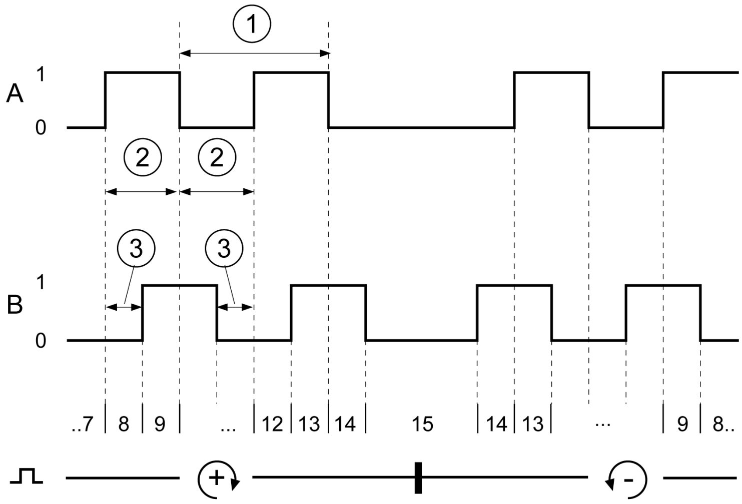
(2) Due to the input current of the optocoupler in the input circuit, a parallel connection of a driver output to several devices is not permitted.

Function A/B Signals

External A/B signals can be counted at the PTI input.

Signal	Value	Function
Signal A before signal B	0 -> 1	Count in positive direction
Signal B before signal A	0 -> 1	Count in negative direction

Time chart with A/B signal, counting forwards and backwards



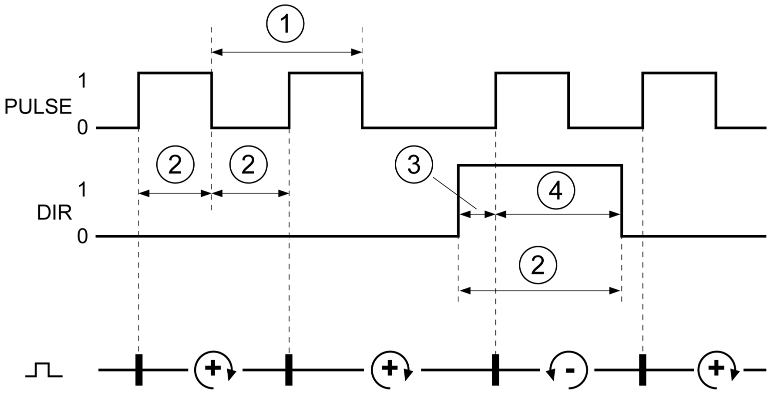
Times for pulse/direction	Minimum value
(1) Cycle duration A, B	1 µs
(2) Pulse duration	0.4 µs
(3) Lead time (A, B)	200 ns

Function P/D Signals

External P/D signals can be counted at the PTI input.

Signal	Value	Function
PULSE DIR	0 -> 1 0 / open	Count in positive direction
PULSE DIR	0 -> 1 1	Count in negative direction

Time chart with pulse/direction signal



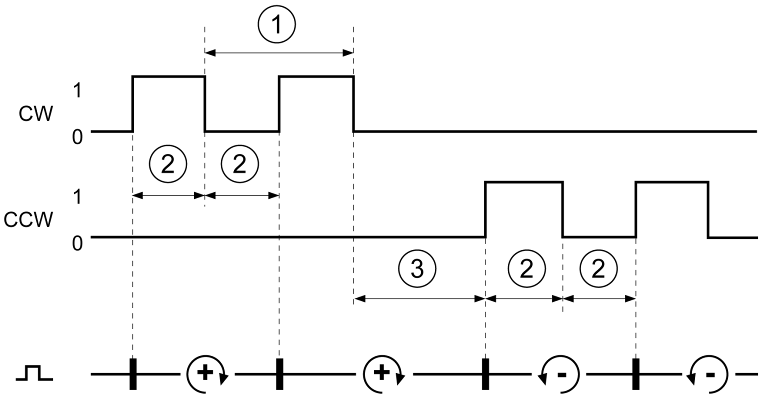
Times for pulse/direction	Minimum value
(1) Cycle duration (pulse)	1 µs
(2) Pulse duration (pulse)	0.4 µs
(3) Lead time (Dir-Pulse)	0 µs
(4) Hold time (Pulse-Dir)	0.4 µs

Function CW/CCW Signals

External CW/CCW signals can be counted at the PTI input.

Signal	Value	Function
`CW`	0 -> 1	Count in positive direction
`CCW`	0 -> 1	Count in negative direction

Time chart with "CW/CCW"



Times for pulse/direction	Minimum value
(1) Cycle duration CW, CCW	1 μs
(2) Pulse duration	0.4 μs
(3) Lead time (CW-CCW, CCW-CW)	0 μs

Capacitor and Braking Resistor

Description

The drive has an internal capacitor and an internal braking resistor. If the internal capacitor and the internal braking resistor are insufficient for the dynamics of the application, one or more external braking resistors must be used.

The resistance values for external braking resistors must not be below the specified minimum resistance. If an external braking resistor is activated by means of the appropriate parameter, the internal braking resistor is deactivated.

Data of Internal Capacitor

Characteristic	Unit	Value			
		LXM32•U45M2	LXM32•U90M2	LXM32•D18M2	LXM32•D30M2
Capacitance of internal capacitor	µF	390	780	1170	1560
Parameter `DCbus_compat` **= 0** (default value)					
Energy absorption of internal capacitors E_{var} at nominal voltage 115 V +10%	Ws	5	9	14	18
Energy absorption of internal capacitors E_{var} at nominal voltage 200 V +10%	Ws	17	34	52	69
Energy absorption of internal capacitors E_{var} at nominal voltage 230 V +10%	Ws	11	22	33	44
Parameter `DCbus_compat` **= 1** (reduced switch-on voltage)					
Energy absorption of internal capacitors E_{var} at nominal voltage 115 V +10%	Ws	24	48	73	97
Energy absorption of internal capacitors E_{var} at nominal voltage 200 V +10%	Ws	12	23	35	46
Energy absorption of internal capacitors E_{var} at nominal voltage 230 V +10%	Ws	5	11	16	22

Characteristic	Unit	Value				
		LXM32•U60N4	LXM32•D12N4	LXM32•D18N4	LXM32•D30N4	LXM32•D72N4
Capacitance of internal capacitor	µF	110	195	390	560	1120
Parameter `DCbus_compat`(1)						
Energy absorption of internal capacitors E_{var} at nominal voltage 208 V +10%	Ws	4	8	16	22	45
Energy absorption of internal capacitors E_{var} at nominal voltage 380 V +10%	Ws	14	25	50	73	145
Energy absorption of internal capacitors E_{var} at nominal voltage 400 V +10%	Ws	12	22	43	62	124
Energy absorption of internal capacitors E_{var} at nominal voltage 480 V +10%	Ws	3	5	10	14	28
(1) Parameter `DCbus_compat` has no effect in the case of three-phase devices						

Data of Internal Braking Resistor

Characteristic	Unit	Value			
		LXM32•U45M2	LXM32•U90M2	LXM32•D18M2	LXM32•D30M2
Resistance value of internal braking resistor	Ω	94	47	20	10
Continuous power internal braking resistor P_{PR}	W	10	20	40	60
Peak energy E_{CR}	Ws	82	166	330	550
Parameter `DCbus_compat` **= 0** (default value)					
Switch-on voltage of braking resistor at nominal voltage 115 V	V	236	236	236	236
Switch-on voltage of braking resistor at nominal voltage 200 V and 230 V	V	430	430	430	430
Parameter `DCbus_compat` **= 1** (reduced switch-on voltage)					
Switch-on voltage of braking resistor	V	395	395	395	395

Characteristic	Unit	Value				
		LXM32•U60N4	LXM32•D12N4	LXM32•D18N4	LXM32•D30N4	LXM32•D72N4
Resistance value of internal braking resistor	Ω	132	60	30	30	10
Continuous power internal braking resistor P_{PR}	W	20	40	60	100	150
Peak energy E_{CR}	Ws	200	400	600	1000	2400
Parameter `DCbus_compat`(2)						
Switch-on voltage of braking resistor at nominal voltage 208 V	V	430	430	430	430	430
Switch-on voltage of braking resistor at nominal voltage 380 V, 400 V and 480 V	V	780	780	780	780	780

(1) The maximum specified braking resistor can derate the peak power of the device. Depending on the application, it is possible to use a higher ohm resistor.
(2) Parameter `DCbus_compat` has no effect in the case of three-phase devices

Data for External Braking Resistor

Characteristic	Unit	Value			
		LXM32•U45M2	LXM32•U90M2	LXM32•D18M2	LXM32•D30M2
Minimum resistance value of external braking resistor	Ω	68	36	20	10
Maximum resistance value of external braking resistor(1)	Ω	110	55	27	16
Maximum continuous power of external braking resistor	W	200	400	600	800
Parameter `DCbus_compat` **= 0** (default value)					
Switch-on voltage of braking resistor at nominal voltage 115 V	V	236	236	236	236
Switch-on voltage of braking resistor at nominal voltage 200 V and 230 V	V	430	430	430	430
Parameter `DCbus_compat` **= 1** (reduced switch-on voltage)					
Switch-on voltage of braking resistor	V	395	395	395	395
(1) The maximum specified braking resistor can derate the peak power of the device. Depending on the application, it is possible to use a higher ohm resistor.					

Characteristic	Unit	Value				
		LXM32•U60N4	LXM32•D12N4	LXM32•D18N4	LXM32•D30N4	LXM32•D72N4
Minimum resistance value of external braking resistor	Ω	70	47	25	15	8
Maximum resistance value of external braking resistor(1)	Ω	145	73	50	30	12
Maximum continuous power of external braking resistor	W	200	500	800	1500	3000
Parameter `DCbus_compat`(2)						
Switch-on voltage of braking resistor at nominal voltage 208 V	V	430	430	430	430	430
Switch-on voltage of braking resistor at nominal voltage 380 V, 400 V and 480 V	V	780	780	780	780	780
(1) The maximum specified braking resistor can derate the peak power of the device. Depending on the application, it is possible to use a higher ohm resistor. (2) Parameter `DCbus_compat` has no effect in the case of three-phase devices						

Data of External Braking Resistors (Accessories)

Characteristic	Unit	Value							
		VW3A76 01Rxx	VW3A76 02Rxx	VW3A76 03Rxx	VW3A76 04Rxx	VW3A76 05Rxx	VW3A76 06Rxx	VW3A76 07Rxx	VW3A76 08Rxx
Resistance	Ω	10	27	27	27	72	72	72	100
Continuous power	W	400	100	200	400	100	200	400	100
Maximum time in braking at 115 V	s	3	1.8	4.2	10.8	6.36	16.8	42	10.8
Peak power at 115 V	kW	5.6	2.1	2.1	2.1	0.8	0.8	0.8	0.6
Maximum peak energy at 115 V	kWs	16.7	3.7	8.7	22.3	4.9	13	32.5	6
Maximum time in braking at 230 V	s	0.72	0.55	1.08	2.64	1.44	3.72	9.6	2.4
Peak power at 230 V	kW	18.5	6.8	6.8	6.8	2.6	2.6	2.6	1.8
Maximum peak energy at 230 V	kWs	13.3	3.8	7.4	18.1	3.7	9.6	24.7	4.4
Maximum time in braking at 400 V and 480 V	s	0.12	0.084	0.216	0.504	0.3	0.78	1.92	0.48
Peak power at 400 V and 480 V	kW	60.8	22.5	22.5	22.5	8.5	8.5	8.5	6.1
Maximum peak energy at 400 V and 480 V	kWs	7.3	1.9	4.9	11.4	2.5	6.6	16.2	2.9
Degree of protection		IP65	IP65	IP65	IP65	IP65	IP65	IP65	IP65
UL approval (file no.)		-	E233422	E233422	-	E233422	E233422	-	E233422

Characteristic	Unit	Value	
		VW3A7733	VW3A7734
Resistance	Ω	16	10
Continuous power	W	960	960
Maximum time in braking at 115 V	s	20	10
Peak power at 115 V	kW	3.5	5.6
Maximum peak energy at 115 V	kWs	70	59
Maximum time in braking at 230 V	s	3.8	1.98
Peak power at 230 V	kW	11.6	18.5
Maximum peak energy at 230 V	kWs	44	36.5
Maximum time in braking at 400 V and 480 V	s	0.7	0.37
Peak power at 400 V and 480 V	kW	38	60.8
Maximum peak energy at 400 V and 480 V	kWs	26.6	22.5
Degree of protection		IP20	IP20
UL approval (file no.)		E226619	E226619

Electromagnetic Emission

Overview

The products described in the present manual meet the EMC requirements as per IEC 61800-3 if the EMC measures described in the present manual are implemented.

⚠ WARNING
ELECTROMAGNETIC DISTURBANCES OF SIGNALS AND DEVICES
Use proper EMC shielding techniques to help prevent unintended device operation in accordance with the standard IEC 61800-3.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

These types of devices are not intended to be used on a low-voltage public network which supplies domestic premises. Radio frequency interference is expected if used in such a network.

⚠ WARNING
RADIO INTERFERENCE
Do not operate this equipment in a first environment as defined in IEC 61800-3.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

EMC Categories

The following categories for emission as per IEC 61800-3 are reached if the EMC measures described in the present manual are implemented.

Emission type	Category LXM32••••M2	Category LXM32••••N4
Conducted emission Motor cable length ≤10 m (≤32.81 ft) Motor cable length 10 ... ≤20 m (32.81 ... ≤65.62 ft)	 Category C2 Category C3	 Category C3 Category C3
Radiated emission Motor cable length ≤20 m (65.62 ft)	 Category C3	 Category C3

EMC Categories With External Mains Filter

The following categories for emission as per IEC 61800-3 are reached if the EMC measures described in the present manual are implemented and if the external mains filters offered as accessories are used.

Emission type	Category LXM32••••M2	Category LXM32••••N4
Conducted emission Motor cable length ≤20 m (65.62 ft) Motor cable length >20 ... ≤50 m (>65.62 ... ≤164.00 ft) Motor cable length >50 ... ≤100 m (>164.00 ... ≤328.01 ft	 Category C1 Category C2 Category C3	 Category C1 Category C2 Category C3
Radiated emission Motor cable length ≤100 m (328.01 ft)	 Category C3	 Category C3

Assignment of External Mains Filters

Single-phase drives	Mains filter reference
LXM32•U45M2 (230 V, 1,5 A)	VW3A4420 (9 A)
LXM32•U90M2 (230 V, 3 A)	VW3A4420 (9 A)
LXM32•D18M2 (230 V, 6 A)	VW3A4421 (16 A)
LXM32•D30M2 (230 V, 10 A)	VW3A4421 (16 A)

Three-phase drives	Mains filter reference
LXM32•U60N4 (480 V, 1,5 A)	VW3A4422 (15 A)
LXM32•D12N4 (480 V, 3 A)	VW3A4422 (15 A)
LXM32•D18N4 (480 V, 6 A)	VW3A4422 (15 A)
LXM32•D30N4 (480 V, 10 A)	VW3A4422 (15 A)
LXM32•D72N4 (480 V, 24 A)	VW3A4423 (25 A)

Several devices can be connected to a common external mains filter.

Prerequisites:
- Single-phase devices may only be connected to single-phase mains filters; three-phase devices may only be connected to three-phase devices.
- The total input current of the connected devices must be smaller than or equal to the permissible nominal current of the mains filter.

Nonvolatile Memory and Memory Card

Nonvolatile Memory

The following table shows characteristics for the nonvolatile memory:

Characteristic	Value
Minimum number of writing cycles	100000
Type	EEPROM

Memory Card

The following table shows characteristics for the memory card:

Characteristic	Value
Minimum number of writing cycles	100000
Minimum number of plug-in cycles	1000

Memory Card Holder

The following table shows characteristics for the memory card holder:

Characteristic	Value
Minimum number of plug-in cycles	5000

Conditions for UL 508C and CSA

If the product is used to comply with UL 508C or CSA, the following conditions must also be met:

Ambient Temperature During Operation

Characteristic	Unit	Value
Surrounding air temperature	°C (°F)	0 ... 50 (32 ... 122)

Fuses

Use fuses as per UL 248.

Characteristic	Unit	Value	
		LXM32••••M2	LXM32••••N4
Maximum fuse rating of fuse to be connected upstream	A	25	30
Class of fuse		CC or J	CC or J
Short-circuit current rating (SCCR)	kA	12	12

Circuit Breaker

Characteristic	Unit	Value				
		LXM32•U45M2, LXM32•U90M2	LXM32•D18M2, LXM32•D30M2	LXM32•U60N4, LXM32•D12N4, LXM32•D18N4		LXM32•D30N4, LXM32•D72N4
Catalog number of type E combination motor controller		GV2P14 or GV3P25	GV3P25	GV2P14 or GV3P25	GV2P22	GV2P22
Short-circuit current rating (SCCR)	kA	12	12	12	10	10

Wiring

Use at least 75 °C (167 °F) copper conductors.

400/480 V Three-Phase Devices

400/480 V three-phase devices may only be operated via mains up to 480Y/277Vac.

Overvoltage Category

Use only in overvoltage category III or where the maximum available Rated Impulse Withstand Voltage Peak is equal or less than 4000 Volts.

Motor Overload Protection

This equipment provides Solid State Motor Overload Protection at 200 % of maximum FLA (Full Load Ampacity).

Certifications

Product certifications:

Certified by	Assigned number
TÜV Nord	SAS-192/2008TB-1
UL	E116875
CSA	2320425

Chapter 3
Engineering

What Is in This Chapter?

This chapter contains the following sections:

Section 3.1
Electromagnetic Compatibility (EMC)

What Is in This Section?

This section contains the following topics:

General

EMC-Compliant Wiring

This product meets the EMC requirements according to the standard IEC 61800-3 if the measures described in this manual are implemented during installation.

Signal interference can cause unexpected responses of the drive system and of other equipment in the vicinity of the drive system.

⚠ WARNING

SIGNAL AND EQUIPMENT INTERFERENCE

- Install the wiring in accordance with the EMC requirements described in the present document.
- Verify compliance with the EMC requirements described in the present document.
- Verify compliance with all EMC regulations and requirements applicable in the country in which the product is to be operated and with all EMC regulations and requirements applicable at the installation site.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ WARNING

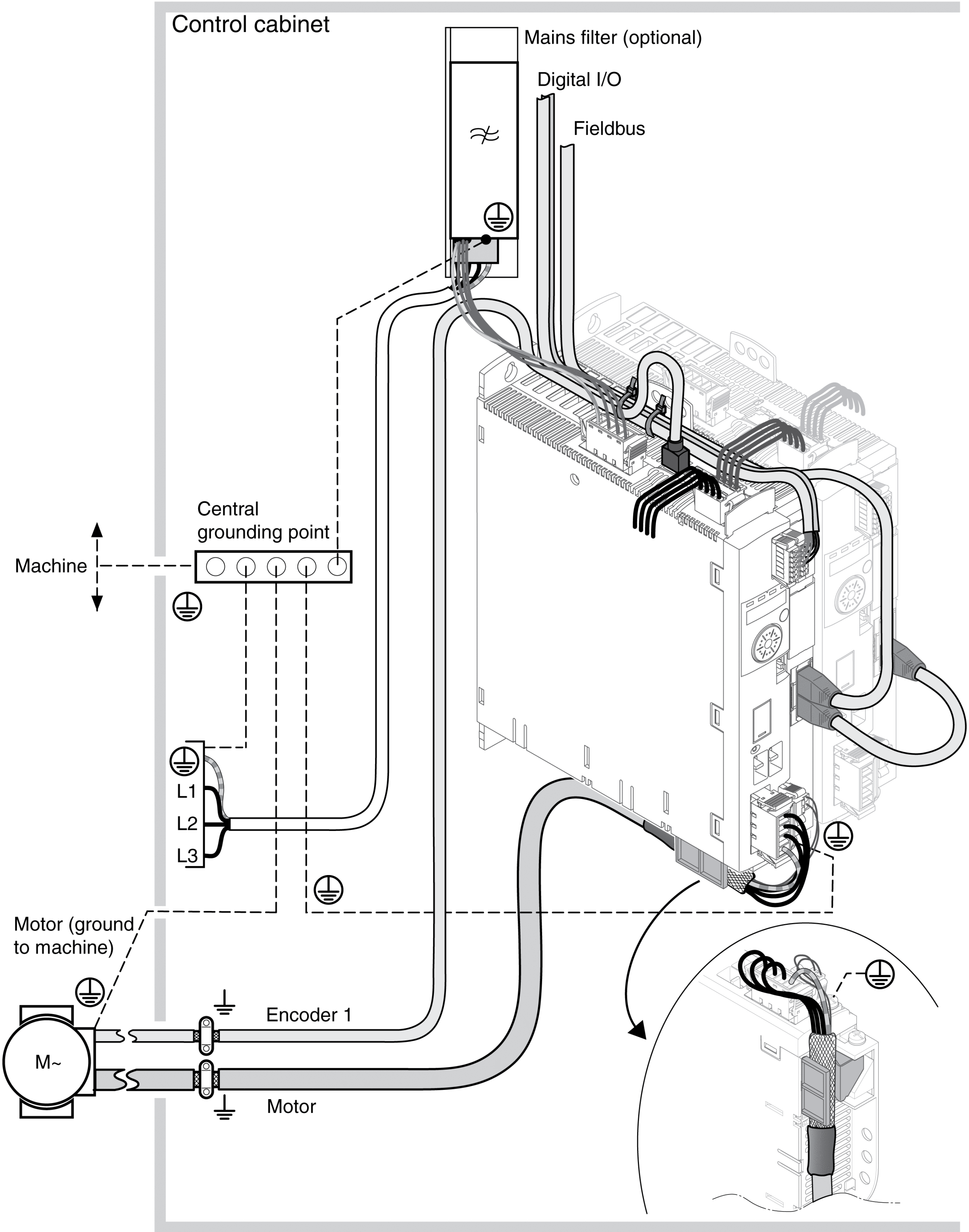
ELECTROMAGNETIC DISTURBANCES OF SIGNALS AND DEVICES

Use proper EMC shielding techniques to help prevent unintended device operation in accordance with the standard IEC 61800-3.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

See chapter Electromagnetic Emission *(see page 48)* for the EMC categories.

Overview of wiring with EMC details



EMC Requirements for the Control Cabinet

EMC measures	Objective
Use mounting plates with good electrical conductivity, connect large surface areas of metal parts, remove paint from contact areas.	Good conductivity due to large surface contact.
Ground the control cabinet, the control cabinet door and the mounting plate with ground straps or ground wires. The conductor cross section must be at least 10 mm^2 (AWG 6).	Reduces emissions.
Install switching devices such as power contactors, relays or solenoid valves with interference suppression units or arc suppressors (for example, diodes, varistors, RC circuits).	Reduces mutual interference
Do not install power components and control components adjacent to one another.	Reduces mutual interference

Shielded Cables

EMC measures	Objective
Connect large surface areas of cable shields, use cable clamps and ground straps.	Reduces emissions.
Use cable clamps to connect a large surface area of the shields of all shielded cables to the mounting plate at the control cabinet entry.	Reduces emissions.
Ground shields of digital signal wires at both ends by connecting them to a large surface area or via conductive connector housings.	Reduces interference affecting the signal wires, reduces emissions
Ground the shields of analog signal wires directly at the device (signal input); insulate the shield at the other cable end or ground it via a capacitor (for example, 10 nF).	Reduces ground loops due to low-frequency interference.
Use only shielded motor cables with copper braid and a coverage of at least 85%, ground a large surface area of the shield at both ends.	Diverts interference currents in a controlled way, reduces emissions.

Cable Installation

EMC measures	Objective
Do not route fieldbus cables and signal wires in a single cable duct together with lines with DC and AC voltages of more than 60 V. (Fieldbus cables, signal lines and analog lines may be in the same cable duct) Use separate cable ducts at least 20 cm (7.87 in) apart.	Reduces mutual interference
Keep cables as short as possible. Do not install unnecessary cable loops, use short cables from the central grounding point in the control cabinet to the external ground connection.	Reduces capacitive and inductive interference.
Use equipotential bonding conductors in the following cases: wide-area installations, different voltage supplies and installation across several buildings.	Reduces current in the cable shield, reduces emissions.
Use fine stranded equipotential bonding conductors.	Diverts high-frequency interference currents.
If motor and machine are not conductively connected, for example by an insulated flange or a connection without surface contact, you must ground the motor with a ground strap or a ground wire. The conductor cross section must be at least 10 mm^2 (AWG 6).	Reduces emissions, increases immunity.
Use twisted pair for the DC supply.	Reduces interference affecting the signal cables, reduces emissions.

Power Supply

EMC measures	Objective
Operate product on mains with grounded neutral point.	Enables effectiveness of mains filter.
Surge arrester if there is a risk of overvoltage.	Reduces the risk of damage caused by overvoltage.

Motor and Encoder Cables

Motor and encoder cables require particular attention in terms of EMC. Use only pre-assembled cables (see chapter Accessories and Spare Parts *(see page 455)*) or cables that comply with the specifications (see chapter Cables and Signals *(see page 60)*) and implement the EMC measures described below.

EMC measures	Objective
Do not install switching elements in motor cables or encoder cables.	Reduces interference.
Route the motor cable at a distance of at least 20 cm (7.87 in) from the signal cable or use shielding plates between the motor cable and signal cable.	Reduces mutual interference
For long lines, use equipotential bonding conductors.	Reduces current in the cable shield.
Route the motor cable and encoder cable without cutting them.(1)	Reduces emission.
(1) If a cable has to be cut for the installation, it has to be connected with shield connections and a metal housing at the point of the cut.	

Additional Measures for EMC Improvement

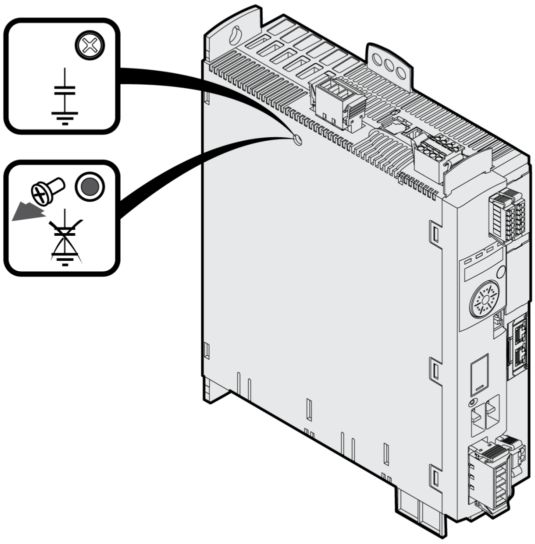
Depending on the application, the following measures can improve the EMC-dependent values:

EMC measures	Objective
Use mains reactors	Reduces mains harmonics, prolongs product service life.
Use external mains filters	Improves the EMC limit values.
Install in a closed control cabinet with increased shielding.	Improves the EMC limit values.

Deactivating the Y Capacitors

Description

The ground connections of the internal Y capacitors can be disconnected (deactivation). Usually, it is not required to deactivate the ground connection of the Y capacitors.



To deactivate the Y capacitors, remove the screw. Keep this screw so you can re-activate the Y capacitors, if required.

The drive no longer complies with the EMC limit values specified if the Y capacitors are deactivated.

Section 3.2
Cables and Signals

What Is in This Section?

This section contains the following topics:

Cables - General

Suitability of the Cables

Cables must not be twisted, stretched, crushed or bent. Use only cables that comply with the cable specification. Consider the following in determining suitability of the cables:

- Suitable for drag chain applications
- Temperature range
- Chemical resistance
- Outdoor installation
- Underground installation

Connecting Shields

Shield connection possibilities:

- Motor cable: The motor cable shield is fastened in the shield clamp at the bottom of the device.
- Other cables: The shields are connected to the shield connection at the bottom of the device.
- Alternative: Connect the shield via shield clamps and rail, for example.

Equipotential Bonding Conductors

Potential differences can result in excessive currents on the cable shields. Use equipotential bonding conductors to reduce currents on the cable shields. The equipotential bonding conductor must be rated for the maximum current.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Ground cable shields for all fast I/O, analog I/O, and communication signals at a single point. [1)]
- Route communications and I/O cables separately from power cables.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1)] Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

Conductor Cross Sections According to Method of Installation

The following sections describe the conductor cross sections for two methods of installation:

- Method of installation B2:
  Cables in conduits or cable trunking systems
- Method of installation E:
  Cables on open cable trays

Cross section in mm^2 (AWG)	Current-carrying capacity with method of installation B2 in A[1]	Current carrying capacity with method of installation E in A[1]
0.75 (18)	8.5	10.4
1 (16)	10.1	12.4
1.5 (14)	13.1	16.1
2.5 (12)	17.4	22
4 (10)	23	30
6 (8)	30	37
10 (6)	40	52
16 (4)	54	70
25 (2)	70	88

(1) Values as per IEC 60204-1 for continuous operation, copper conductors and ambient air temperature 40 °C (104 °F). See IEC 60204-1 for additional information. The table is an excerpt from this standard and also shows cable cross-sections that are not applicable with regard to the product.

Note the derating factors for grouping of cables and correction factors for other ambient conditions (IEC 60204-1).

The conductors must have a sufficiently large cross section so that the upstream fuse can trip.

In the case of longer cables, it may be necessary to use a greater conductor cross section to reduce the energy losses.

Overview of the Required Cables

The properties of the required cables are listed in the table below. Use pre-assembled cables to reduce the risk of wiring errors. Pre-assembled cables can be found in chapter Accessories and Spare Parts *(see page 455)*. If the product is used to comply with the requirements as per UL 508C, the conditions specified in chapter Conditions for UL 508C and CSA *(see page 51)* must be met.

	Maximum length:	Minimum cross section	Shielded, both ends grounded	Twisted pair	PELV
24 Vdc control supply	–	0.75 mm^2 (AWG 18)			Required
Safety function STO(1)	–	0.75 mm^2 (AWG 18)	(1)		Required
Power stage supply	–	–(2)			
Motor phases	–(3)	–(4)	Required		
External braking resistor	3 m (9.84 ft)	As power stage supply	Required		
Motor encoder	100 m (328.01 ft)	6 * 0.14 mm^2 and 2 * 0.34 mm^2 (6 * AWG 24 and 2 * AWG 20)	Required	Required	Required
A/B signals	100 m (328.08 ft)	0.25 mm^2 (AWG 22)	Required	Required	Required
PULSE / DIR signals	100 m (328.08 ft)	0.14 mm^2 (AWG 24)	Required	Required	Required
CW/CCW signals	100 m (328.08 ft)	0.14 mm^2 (AWG 24)	Required	Required	Required
ESIM	100 m (328.08 ft)	0.14 mm^2 (AWG 24)	Required	Required	Required
Fieldbus SERCOS III	100 m (328.08 ft)	0.14 mm^2 (AWG 24)	Required	Required	Required
Digital inputs / outputs	30 m (98.43 ft)	0.14 mm^2 (AWG 24)			Required
PC, commissioning interface	20 m (65.62 ft)	0.14 mm^2 (AWG 24)	Required	Required	Required

(1) Note the installation requirements (protected cable installation), see chapter Safety function STO ("Safe Torque Off") *(see page 79)*.
(2) See Connection Power Stage Supply (CN1) *(see page 108)*
(3) Length depends on the required limit values for conducted interference.
(4) See Connection Motor Phases and Holding Brake (CN10 and CN11) *(see page 101)*

Cable Specifications

Using pre-assembled cables helps to reduce the possibility of wiring errors. See chapter Accessories and Spare Parts *(see page 455)*.

The genuine accessories have the following properties:

Motor Cable With Connector

VW3...		M5100R•••	M5101R•••	M5102R•••	M5103R•••	M5105R•••	M5104R•••
Cable jacket, insulation		PUR orange (RAL 2003), TPM	PUR orange (RAL 2003), polypropylene (PP)				
Capacitance power wires Wire/wire Wire/shield	 pF/m pF/m	 80 145	 80 135	 80 150	 90 150	 85 150	 100 160
Number of contacts (shielded)		(4 x 1 mm^2 + 2 x (2 x 0.75 mm^2))	(4 x 1.5 mm^2 + (2 x 1 mm^2))	(4 x 2.5 mm^2 + (2 x 1 mm^2))	(4 x 4 mm^2 + (2 x 1 mm^2))	(4 x 6 mm^2 + (2 x 1 mm^2))	(4 x 10 mm^2 + (2 x 1 mm^2))
Connector motor side		8-pin circular Y-TEC	8-pin circular M23		8-pin circular M40		
Connector drive side		Open					
Cable diameter	mm (in)	11 ± 0.3 (0.43 ± 0.01)	12 ± 0.2 (0.47 ± 0.01)	14.3 ± 0.3 (0.55 ± 0.01)	16.3 ± 0.3 (0.64 ± 0.01)	18.8 ± 0.4 (0.74 ± 0.02)	23.5 ± 0.6 (0.93 ± 0.02)
Minimum bend radius with fixed installation		10 times the cable diameter	5 times the cable diameter				
Minimum bend radius with moving installation		10 times the cable diameter	7.5 times the cable diameter			10 times the cable diameter	
Nominal voltage Motor phases Holding brake	 V V	 1000 1000	 600 300				
Maximum orderable length	m (ft)	25 (82)	75 (246)				
Permissible temperature range during operation with fixed installation	°C (°F)	-40 ... 80 (-40 ... 176)					
Permissible temperature range during operation with moving installation	°C (°F)	-20 ... 60 (-4 ... 140)	-20 ... 80 (-4 ... 176)				
Certifications / declaration of conformity		CE, DESINA					

Motor Cable Without Connector

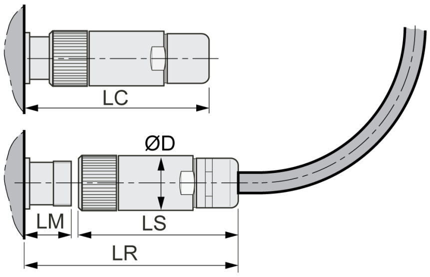
VW3...		M5300R•••	M5301R•••	M5302R•••	M5303R•••	M5305R•••	M5304R•••
Cable jacket, insulation		PUR orange (RAL 2003), TPM	PUR orange (RAL 2003), polypropylene (PP)				
Capacitance power wires Wire/wire Wire/shield	 pF/m pF/m	 80 145	 80 135	 80 150	 90 150	 85 150	 100 160
Number of contacts (shielded)		(4 x 1 mm^2 + 2 x (2 x 0.75 mm^2))	(4 x 1.5 mm^2 + (2 x 1 mm^2))	(4 x 2.5 mm^2 + (2 x 1 mm^2))	(4 x 4 mm^2 + (2 x 1 mm^2))	(4 x 6 mm^2 + (2 x 1 mm^2))	(4 x 10 mm^2 + (2 x 1 mm^2))
Connector motor side		Open					
Connector drive side		Open					
Cable diameter	mm (in)	11 ± 0.3 (0.43 ± 0.01)	12 ± 0.2 (0.47 ± 0.01)	14.3 ± 0.3 (0.55 ± 0.01)	16.3 ± 0.3 (0.64 ± 0.01)	18.8 ± 0.4 (0.74 ± 0.02)	23.5 ± 0.6 (0.93 ± 0.02)
Minimum bend radius with fixed installation		10 times the cable diameter	5 times the cable diameter				
Minimum bend radius with moving installation		10 times the cable diameter	7.5 times the cable diameter			10 times the cable diameter	
Nominal voltage Motor phases Holding brake	V	 1000 1000	 600 300				
Maximum orderable length	m (ft)	100 (328)					
Permissible temperature range during operation with fixed installation	°C (°F)	-40 ... 80 (-40 ... 176)					
Permissible temperature range during operation with moving installation	°C (°F)	-20 ... 60 (-4 ... 140)	-20 ... 80 (-4 ... 176)				
Certifications / declaration of conformity		CE, c-UR-us, DESINA					

Encoder Cable With and Without Connectors

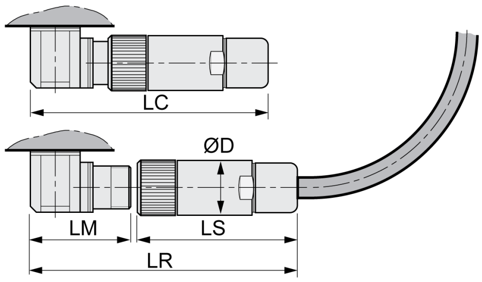
VW3...		M8100R•••	M8102R•••	M8222R•••
Cable jacket, insulation		PUR green (RAL 6018), polypropylene (PP)		
Capacitance	pF/m	Approx. 135 (wire/wire)		
Number of contacts (shielded)		(3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2)		
Connector motor side		12-pin circular Y-TEC	12-pin circular M23	Open
Connector drive side		10-pin RJ45	10-pin RJ45	Open
Cable diameter	mm (in)	6.8 ± 0.2 (0.27 ± 0.1)		
Minimum bend radius	mm (in)	68 (2.68)		
Nominal voltage	V	300		
Maximum orderable length	m (ft)	25 (82)	75 (246)	100 (328)
Permissible temperature range during operation with fixed installation	°C (°F)	-40 ... 80 (-40 ... 176)		
Permissible temperature range during operation with moving installation	°C (°F)	-20 ... 80 (-4 ... 176)		
Certifications / declaration of conformity		DESINA		c-UR-us, DESINA

Clearance For Connectors

Straight connectors



Angular connectors



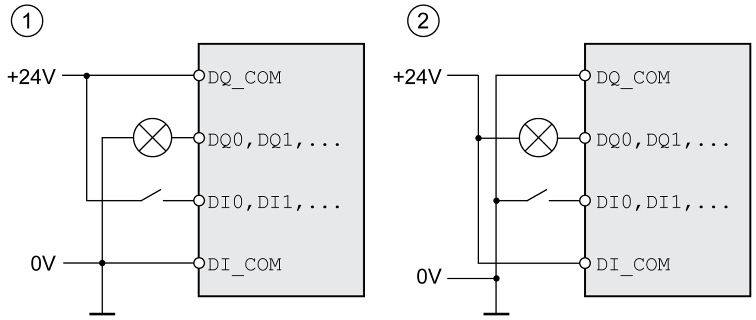
Dimensions		Motor connectors straight		Encoder connector straight
		M23	M40	M23
D	mm (in)	28 (1.1)	46 (1.81)	26 (1.02)
LS	mm (in)	76 (2.99)	100 (3.94)	51 (2.01)
LR	mm (in)	117 (4.61)	155 (6.1)	76 (2.99)
LC	mm (in)	100 (3.94)	145 (5.71)	60 (2.36)
LM	mm (in)	40 (1.57)	54 (2.13)	23 (0.91)

Dimensions		Motor connectors angular			Encoder connector angular	
		Y-TEC	M23	M40	Y-TEC	M23
D	mm (in)	18.7 (0.74)	28 (1.1)	46 (1.81)	18.7 (0.74)	26 (1.02)
LS	mm (in)	42 (1.65)	76 (2.99)	100 (3.94)	42 (1.65)	51 (2.01)
LR	mm (in)	100 (3.94)	132 (5.2)	191 (7.52)	100 (3.94)	105 (4.13)
LC	mm (in)	89 (3.50)	114 (4.49)	170 (6.69)	89 (3.50)	89 (3.5)
LM	mm (in)	58 (2.28)	55 (2.17)	91 (3.58)	58 (2.28)	52 (2.05)

Logic Type

Overview

The digital inputs and outputs of this product can be wired for positive logic or negative logic.



Logic type	Active state
(1) Positive logic	Output supplies current (source output) Current flows to the input (sink input)
(2) Negative logic	Output draws current (sink output) Current flows from the input (source input)

Signal inputs are protected against reverse polarity, outputs are short-circuit protected. The inputs and outputs are functionally isolated.

If negative logic is used, a ground fault of a signal is detected as an On state.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Verify that a short-circuit of a signal cannot cause unintended equipment operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Selection of the Logic Type

The logic type is determined by the wiring of `DI_COM` and `DQ_COM`. The logic type affects wiring and control of the sensors; therefore, you must determine the required value in the engineering phase in view of the application.

Special Case: Safety Function STO

The inputs for the safety function STO (inputs `STO_A` and `STO_B`) can only be wired for positive logic.

Configurable Inputs and Outputs

This product has digital inputs and outputs that can be configured for specific functional assignments. The inputs and outputs have a defined standard assignment depending on the operating mode. This assignment can be adapted to the requirements of the customer's installation. See chapter Digital Inputs and Outputs *(see page 192)* for additional information.

Section 3.3
Mains Supply

What Is in This Section?

This section contains the following topics:

Residual Current Device

Direct current can be introduced in the protective ground conductor of this drive. If a residual current device (RCD / GFCI) or a residual current monitor (RCM) is used for protection against direct or indirect contact, the following specific types must be used:

⚠ WARNING

DIRECT CURRENT CAN BE INTRODUCED INTO THE PROTECTIVE GROUND CONDUCTOR

- Use a Type A Residual Current Device (RCD / GFCI) or a Residual Current Monitor (RCM) for single-phase drives connected to a phase and to the neutral conductor.
- Use a Type B Residual Current Device (RCD / GFCI) or a Residual Current Monitor (RCM) that has approval for use with frequency inverters and is sensitive to all types of current for three-phase devices and for single-phase devices not connected to a phase and the neutral conductor.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Further conditions for use of a residual current device:

- The drive has an increased leakage current at the moment power is applied. Use a residual current device (RCD / GFCI) or a residual current monitor (RCM) with a response delay.
- High-frequency currents must be filtered.

Common DC Bus

Function Principle

The DC buses of several devices can be connected so that energy can be used efficiently. If on device decelerates, a different device connected to the common DC bus can use the generated braking energy. Without a common DC bus, the braking energy would be converted to heat by the braking resistor while the other device would have to be supplied with energy from mains.

Another advantage of having a common DC bus is that several devices can share one external braking resistor. The number of the individual external braking resistors can be reduced to a single braking resistor if the braking resistor is properly rated.

This and other important information can be found in the Common DC bus Application Note for the drive. If you wish to take advantage of DC bus sharing, you must first consult the Common DC bus Application Note for important safety-related information.

Requirements for Use

The requirements and limit values for parallel connection of multiple devices via the DC bus are described in the Common DC bus Application Note for the drive that can be found on *http://www.schneider-electric.com*. If there are any issues or questions related to obtaining the Common DC bus Application Note, consult your local Schneider-Electric representative.

Mains Reactor

A mains reactor must be used under the following conditions:

- Operation via supply mains with low impedance (short-circuit current of supply mains greater than specified in chapter Technical Data *(see page 21)*.
- If the nominal power of the drive is insufficient without mains reactor.
- In the case of operation with supply mains with reactive power compensation systems.
- For improvement of the power factor at the mains input and for reduction of mains harmonics.

A single mains reactor can be used for multiple devices. Use a mains reactor with a properly rated current.

Low-impedance supply mains cause high harmonic currents at the mains input. High harmonic currents result in considerable load on the DC bus capacitors. The load on the DC bus capacitors has a decisive impact on the service life of the devices.

Section 3.4
Rating the Braking Resistor

What Is in This Section?

This section contains the following topics:

Internal Braking Resistor

The drive is equipped with a internal braking resistor to absorb braking energy.

Braking resistors are required for dynamic applications. During deceleration, the kinetic energy is transformed into electrical energy in the motor. The electrical energy increases the DC bus voltage. The braking resistor is activated when the defined threshold value is exceeded. The braking resistor transforms electrical energy into heat. If highly dynamic deceleration is required, the braking resistor must be well adapted to the system.

An insufficiently rated braking resistor can cause overvoltage on the DC bus. Overvoltage on the DC bus causes the power stage to be disabled. The motor is no longer actively decelerated.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the braking resistor has a sufficient rating by performing a test run under maximum load conditions.
- Verify that the parameter settings for the braking resistor are correct.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

External Braking Resistor

An external braking resistor is required for applications in which the motor must be decelerated quickly and the internal braking resistor cannot absorb the excess braking energy.

The temperature of the braking resistor may exceed 250 °C (482 °F) during operation.

⚠ WARNING

HOT SURFACES

- Ensure that it is not possible to make any contact with a hot braking resistor.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of the braking resistor.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Monitoring

The device monitors the power of the braking resistor. The load on the braking resistor can be read out.

The output for the external braking resistor is short-circuit protected. The drive does not monitor for ground faults of the braking resistor.

Selection of the External Braking Resistor

The rating of an external braking resistor depends on the required peak power and continuous power.

The resistance R is derived from the required peak power and the DC bus voltage.

$$R = \frac{U^2}{P_{max}}$$

R = Resistance in Ω

U = Switching threshold for braking resistor V

P_{max} = Required peak power in W

If 2 or more braking resistors are connected to one drive, note the following criteria:

- The total resistance of all connected regenerative resistors must comply with the approved resistance.
- The braking resistors can be connected in parallel or in series. Only connect braking resistors with identical resistance in parallel in order to evenly distribute the load to the braking resistors.
- The total continuous power of all connected braking resistors result must be greater than or equal to the required continuous power.

Use only resistors that are specified as braking resistors. For suitable braking resistors, see chapter Accessories and Spare Parts *(see page 455)*.

Mounting and Commissioning of an External Braking Resistor

A parameter is used to switch between the internal braking resistor and an external braking resistor.

The external braking resistors listed in the Accessories chapter are shipped with an information sheet that provides details on installation.

Rating Information

Description

To rate the braking resistor, calculate the proportion contributing to absorbing braking energy.

An external braking resistor is required if the kinetic energy that must be absorbed exceeds the possible total internal energy absorption.

Internal Energy Absorption

Braking energy is absorbed internally by:

- DC bus capacitor E_{var}
- Internal braking resistor E_I
- Electrical losses of the drive E_{el}
- Mechanical losses of the drive E_{mech}

Values for the energy absorption E_{var} can be found in chapter Braking Resistor *(see page 44)*.

Internal Braking Resistor

Two characteristic values determine the energy absorption of the internal braking resistor.

- The continuous power P_{PR} is the amount of energy that can be continuously absorbed without overloading the braking resistor.
- The maximum energy E_{CR} limits the maximum short-term power that can be absorbed.

If the continuous power was exceeded for a specific time, the braking resistor must remain without load for a corresponding period.

The characteristic values P_{PR} and E_{CR} of the internal braking resistor can be found in chapter Braking Resistor *(see page 44)*.

Electrical Losses E_{el}

The electrical losses E_{el} of the drive system can be estimated on the basis of the peak power of the drive. The maximum power dissipation is approximately 10% of the peak power at a typical efficiency of 90%. If the current during deceleration is lower, the power dissipation is reduced accordingly.

Mechanical Losses E_{mech}

The mechanical losses result from friction during operation of the system. Mechanical losses are negligible if the time required by the system to coast to a stop without a driving force is considerably longer than the time required to decelerate the system. The mechanical losses can be calculated from the load torque and the velocity from which the motor is to stop.

Example

Deceleration of a rotary motor with the following data:

- Initial speed of rotation: n = 4000 RPM
- Rotor inertia: J_R = 4 $kgcm^2$
- Load inertia: J_L = 6 $kgcm^2$
- Drive: E_{var} = 23 Ws, E_{CR} = 80 Ws, P_{PR} = 10 W

Calculation of the energy to be absorbed:

$$E_B = \frac{1}{2} J \cdot \left[\frac{2\pi n}{60}\right]^2$$

to E_B = 88 Ws. Electrical and mechanical losses are ignored.

In this example, the DC bus capacitors absorb E_{var} = 23 Ws (the value depends on the device type).

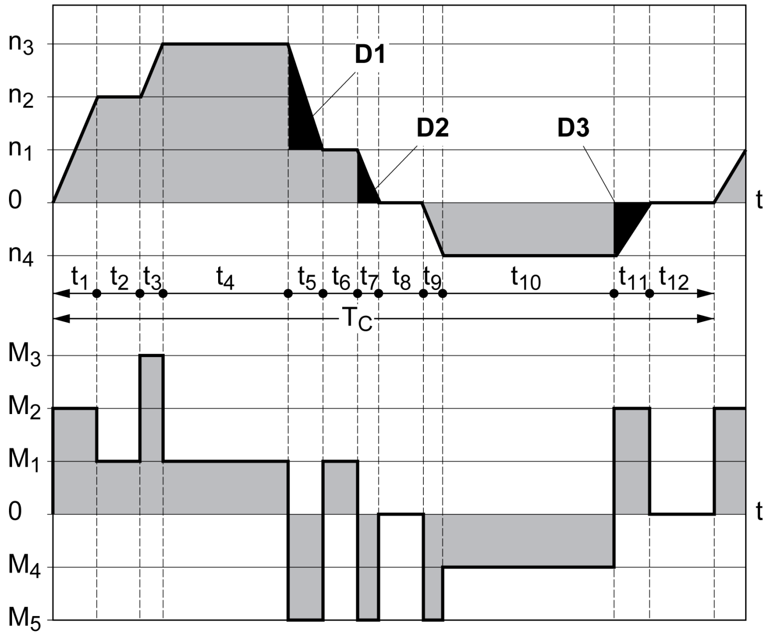
The internal braking resistor must absorb the remaining 65 Ws. It can absorb a pulse of E_{CR} = 80 Ws. If the load is decelerated once, the internal braking resistor is sufficient.

If the deceleration is repeated cyclically, the continuous power must be taken into account. If the cycle time is longer than the ratio of the energy to be absorbed E_B and the continuous power P_{PR}, the internal braking resistor is sufficient. If the system decelerates more frequently, the internal braking resistor is not sufficient.

In this example, the ratio of E_B/P_{PR} is 8.8 s. An external braking resistor is required if the cycle time is shorter.

Rating the External Braking Resistor

Characteristic curves for rating the braking resistor



These two characteristics are also used for the rating the motor. The segments of the characteristic curves to be considered are designated by D_i (D_1 ... D_3).

The total inertia J_t must be known for the calculation of the energy at constant deceleration..

$J_t = J_m + J_c$

J_m: Motor inertia (with holding brake)

J_c: Load inertia

The energy for each deceleration segment is calculated as follows:

$$E_i = \frac{1}{2} J_t \cdot \omega_i^2 = \frac{1}{2} J_t \cdot \left[\frac{2\pi n_i}{60}\right]^2$$

Calculation for the segments (D_1) … (D_3):

$$E_1 = \frac{1}{2} J_t \cdot \left[\frac{2\pi}{60}\right]^2 \cdot \left[n_3^2 - n_1^2\right]$$

$$E_2 = \frac{1}{2} J_t \cdot \left[\frac{2\pi n_1}{60}\right]^2$$

$$E_3 = \frac{1}{2} J_t \cdot \left[\frac{2\pi n_4}{60}\right]^2$$

Units: E_i in Ws (wattseconds), J_t in kgm^2, ω in rad and n_i in RPM.

See the technical data for the energy absorption E_{var} of the devices (without consideration of a braking resistor).

In the next calculation steps, only consider those segments D_i, whose energy E_i exceeds the energy absorption of the device. These excess energies E_{Di} must be diverted by means of the braking resistor.

E_{Di} is calculated using the following formula:

$E_{Di} = E_i - E_{var}$ (in Ws)

The continuous power P_c is calculated for each machine cycle:

$$P_c = \frac{\sum E_{Di}}{\text{Cycletime}}$$

Units: P_c in W, E_{Di} in Ws and cycle time T in s

The selection is made in two steps:

- If the following conditions are met, the internal braking resistor is sufficient.
  - The maximum energy during deceleration must be less than the peak energy that the braking resistor can absorb: $(E_{Di})<(E_{Cr})$.
  - The continuous power of the internal braking resistor must not be exceeded: $(P_C)<(P_{Pr})$.
- If the conditions are not met, you must use an external braking resistor that meets the conditions.

For order data for the external braking resistors, see chapter Accessories and Spare Parts (see page 455).

Section 3.5
Functional Safety

What Is in This Section?

This section contains the following topics:

Basics

Functional Safety

Automation and safety engineering are closely related. Engineering, installation and operation of complex automation solutions are greatly simplified by integrated safety-related functions and modules.

Usually, the safety engineering requirements depend on the application. The level of the requirements results from, among other things, the risk and the hazard potential arising from the specific application and from the applicable standards and regulations.

The goal of designing machines safely is to protect people. The risk associated with machines with electrically controlled drives comes chiefly from moving machine parts and electricity itself.

Only you, the user, machine builder, or system integrator can be aware of all the conditions and factors realized in the design of your application for the machine. Therefore, only you can determine the automation equipment and the related safeties and interlocks which can be properly used, and validate such usage.

⚠ WARNING

NON-CONFORMANCE TO SAFETY FUNCTION REQUIREMENTS

- Specify the requirements and/or measures to be implemented in the risk analysis you perform.
- Verify that your safety-related application complies to applicable safety regulations and standards.
- Make certain that appropriate procedures and measures (according to applicable sector standards) have been established to help avoid hazardous situations when operating the machine.
- Use appropriate safety interlocks where personnel and/or equipment hazards exist.
- Validate the overall safety-related function and thoroughly test the application.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Hazard and Risk Analysis

The standard IEC 61508 "Functional safety of electrical/electronic/programmable electronic safety-related systems" defines the safety-related aspects of systems. Instead of a single functional unit of a safety-related system, the standard treats all elements of a function chain as a unit. These elements must meet the requirements of the specific safety integrity level as a whole.

The standard IEC 61800-5-2 "Adjustable speed electrical power drive systems – Safety requirements – Functional" is a product standard that defines the safety-related requirements regarding drives. Among other things, this standard defines the safety-related functions for drives.

Based on the system configuration and utilization, a hazard and risk analysis must be carried out for the system (for example, according to EN ISO 12100 or EN ISO 13849-1). The results of this analysis must be considered when designing the machine, and subsequently applying safety-related equipment and safety-related functions. The results of your analysis may deviate from any application examples contained in the present or related documentation. For example, additional safety components may be required. In principle, the results from the hazard and risk analysis have priority.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Perform a hazard and risk analysis to determine the appropriate safety integrity level, and any other safety requirements, for your specific application based on all the applicable standards.
- Ensure that the hazard and risk analysis is conducted and respected according to EN/ISO 12100 during the design of your machine.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The EN ISO 13849-1 Safety of machinery - Safety-related parts of control systems - Part 1: General Principles for Design describes an iterative process for the selection and design of safety-related parts of controllers to reduce the risk to the machine to a reasonable degree.

To perform risk assessment and risk minimization according to EN ISO 12100, proceed as follows:

1. Defining the boundary of the machine.
2. Identifying risks associated with the machine.
3. Assessing risks.
4. Evaluating risks.
5. Minimizing risks by:
   - Intrinsically safe design
   - Protective devices
   - User information (see EN ISO 12100)
6. Designing safety-related controller parts (SRP/CS, Safety-Related Parts of the Control System) in an interactive process.

To design the safety-related controller parts in an interactive process, proceed as follows:

Step	Action
1	Identify necessary safety functions that are executed via SRP/CS (Safety-Related Parts of the Control System).
2	Determine required properties for each safety function.
3	Determine the required performance level PL_r.
4	Identify safety-related parts executing the safety function.
5	Determine the performance level PL of the afore-mentioned safety-related parts.
6	Verify the performance level PL for the safety function ($PL \geq PL_r$).
7	Verify if all requirements have been met (validation).

Additional information is available on *www.schneider-electric.com*.

Safety Integrity Level (SIL)

The standard IEC 61508 defines 4 safety integrity levels (Safety Integrity Level (SIL)). Safety integrity level SIL1 is the lowest level, safety integrity level SIL4 is the highest level. The safety integrity level required for a given application is determined on the basis of the hazard potential resulting from the hazard and risk analysis. This is used to decide whether the relevant function chain is to be considered as a safety-related function chain and which hazard potential it must cover.

Average Frequency of a Dangerous Failure per Hour (PFH)

To maintain the function of the safety-related system, the IEC 61508 standard requires various levels of measures for avoiding and controlling faults, depending on the required safety integrity level (Safety Integrity Level (SIL)). All components must be subjected to a probability assessment to evaluate the effectiveness of the measures implemented for controlling faults. This assessment determines the probability of a dangerous failure per hour PFH (Average Frequency of a Dangerous Failure per Hour (PFH)) for a safety-related system. This is the frequency per hour with which a safety-related system fails in a hazardous manner so that it can no longer perform its function correctly. Depending on the SIL, the average frequency of a dangerous failure per hour must not exceed certain values for the entire safety-related system. The individual PFH values of a function chain are added. The result must not exceed the maximum value specified in the standard.

SIL	PFH at high demand or continuous demand
4	$\geq 10^{-9}$ ... $<10^{-8}$
3	$\geq 10^{-8}$ ... $<10^{-7}$
2	$\geq 10^{-7}$ ... $<10^{-6}$
1	$\geq 10^{-6}$ ... $<10^{-5}$

Hardware Fault Tolerance (HFT) and Safe Failure Fraction (SFF)

Depending on the safety integrity level (Safety Integrity Level (SIL)) for the safety-related system, the IEC 61508 standard requires a specific hardware fault tolerance (Hardware Fault Tolerance (HFT)) in connection with a specific safe failure fraction (Safe Failure Fraction (SFF)). The hardware fault tolerance is the ability of a safety-related system to execute the required function even if one or more hardware faults are present. The safe failure fraction of a safety-related system is defined as the ratio of the rate of safe failures to the total failure rate of the safety-related system. As per IEC 61508, the maximum achievable safety integrity level of a safety-related system is partly determined by the hardware fault tolerance and the safe failure fraction of the safety-related system.

IEC 61800-5-2 distinguishes two types of subsystems (type A subsystem, type B subsystem). These types are specified on the basis of criteria which the standard defines for the safety-related components.

SFF	HFT type A subsystem			HFT type B subsystem		
	0	1	2	0	1	2
<60 %	SIL1	SIL2	SIL3	---	SIL1	SIL2
60 ... <90 %	SIL2	SIL3	SIL4	SIL1	SIL2	SIL3
90 ... <99 %	SIL3	SIL4	SIL4	SIL2	SIL3	SIL4
≥99 %	SIL3	SIL4	SIL4	SIL3	SIL4	SIL4

Fault Avoidance Measures

Systematic errors in the specifications, in the hardware and the software, incorrect usage and maintenance of the safety-related system must be avoided to the maximum degree possible. To meet these requirements, IEC 61508 specifies a number of measures for fault avoidance that must be implemented depending on the required safety integrity level (Safety Integrity Level (SIL)). These measures for fault avoidance must cover the entire life cycle of the safety-related system, i.e. from design to decommissioning of the system.

Data for Maintenance Plan and the Calculations for Functional Safety

The safety function must be tested at regular intervals. The interval depends on the hazard and risk analysis of the total system. The minimum interval is 1 year (high demand mode as per IEC 61508).

Use the following data of the safety function STO for your maintenance plan and for the calculations for functional safety:

Lifetime of the safety function STO (IEC 61508)(1)	Years	20
SFF (IEC 61508) Safe Failure Fraction	%	90
HFT (IEC 61508) Hardware Fault Tolerance Type A subsystem		1
Safety integrity level IEC 61508 IEC 62061		 SIL3 SILCL3
PFH (IEC 61508) Probability of Dangerous Hardware Failure per Hour	1/h (FIT)	$1*10^{-9}$ (1)
PL (ISO 13849-1) Performance Level		e (category 3)
$MTTF_d$ (ISO 13849-1) Mean Time to Dangerous Failure	Years	>100
DC (ISO 13849-1) Diagnostic Coverage	%	90
(1) See chapter Lifetime Safety Function STO *(see page 475)*.		

Contact your local Schneider Electric representative for additional data, if required.

The data for the safety module eSM can be found in the product manual for the safety module.

Definitions

Integrated Safety Function "Safe Torque Off" STO

The integrated safety function STO (IEC 61800-5-2) allows for a category 0 stop as per IEC 60204-1 without external power contactors. It is not necessary to interrupt the supply voltage for a category 0 stop. This reduces the system costs and the response times.

Category 0 Stop (IEC 60204-1)

In stop category 0 (Safe Torque Off, STO), the drive coasts to a stop (provided there are no external forces operating to the contrary). The STO safety-related function is intended to help prevent an unintended start-up, not stop a motor, and therefore corresponds to an unassisted stop in accordance with IEC 60204-1.

In circumstances where external influences are present, the coast down time depends on physical properties of the components used (such as weight, torque, friction, etc.), and additional measures such as mechanical brakes may be necessary to help prevent any hazard from materializing. That is to say, if this means a hazard to your personnel or equipment, you must take appropriate measures.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Make certain that no hazards can arise for persons or material during the coast down period of the axis/machine.
- Do not enter the zone of operation during the coast down period.
- Ensure that no other persons can access the zone of operation during the coast down period.
- Use appropriate safety interlocks where personnel and/or equipment hazards exist.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Category 1 Stop (IEC 60204-1)

For stops of category 1 (Safe Stop 1, SS1), you can initiate a controlled stop via the control system, or through the use of specific functional safety-related devices. A Category 1 Stop is a controlled stop with power available to the machine actuators to achieve the stop.

The controlled stop by the control/safety-related system is not safety-relevant, nor monitored, and does not perform as defined in the case of a power outage or if an error is detected. This has to be implemented by means of an external safety-related switching device with safety-related delay.

Function

The safety function STO integrated into the product can be used to implement an "EMERGENCY STOP" (IEC 60204-1) for category 0 stops. With an additional, approved EMERGENCY STOP safety relay module, it is also possible to implement category 1 stops.

Function Principle

The safety function STO is triggered via two redundant signal inputs. The wiring of the two signal inputs must be separate.

The safety function STO is triggered if the level at one of the two signal inputs is 0. The power stage is disabled. The motor can no longer generate torque and coasts down without braking. An error of error class 3 is detected.

If, within one second, the level of the other output also becomes 0, the error class remains 3. If, within one second, the level of the other output does not become 0, the error class changes to 4.

Requirements for Using the Safety Function

General

The safety function STO (Safe Torque Off) does not remove power from the DC bus. The safety function STO only removes power to the motor. The DC bus voltage and the mains voltage to the drive are still present.

DANGER

ELECTRIC SHOCK

- Do not use the safety function STO for any other purposes than its intended function.
- Use an appropriate switch, that is not part of the circuit of the safety function STO, to disconnect the drive from the mains power.

Failure to follow these instructions will result in death or serious injury.

After the safety function STO is triggered, the motor can no longer generate torque and coasts down without braking.

WARNING

UNINTENDED EQUIPMENT OPERATION

Install a dedicated service brake if coasting does not meet the deceleration requirements of your application.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Logic Type

The inputs for the safety function STO (inputs `STO_A` and `STO_B`) can only be wired for positive logic.

Holding Brake and Safety Function STO

When the safety function STO is triggered, the power stage is immediately disabled. Applying the holding brake requires a certain amount of time. In the case of vertical axes or external forces acting on the load, you may have to take additional measures to bring the load to a standstill and to keep it at a standstill when the safety function STO is used, for example, by using a service brake.

WARNING

FALLING LOAD

Ensure that all loads come to a secure standstill when the safety function STO is used.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

If the suspension of hanging / pulling loads is a safety objective for the machine, then you can only achieve this objective by using an appropriate external brake as a safety-related measure.

WARNING

UNINTENDED AXIS MOVEMENT

- Do not use the internal holding brake as a safety-related measure.
- Only use certified external brakes as safety-related measures.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: The drive does not provide its own safety-related output to connect an external brake to use as a safety-related measure.

Unintended Restart

⚠ WARNING
UNINTENDED EQUIPMENT OPERATION
● Verify that your risk assessment covers all potential effects of automatic or unintended enabling of the power stage, for example, after power outage. ● Implement all measures such as control functions, guards, or other safety-related functions, required to reliably protect against all hazards that may result from automatic or unintended enabling of the power stage. ● Verify that a master controller cannot enable the power stage in an unintended way.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Degree of Protection when the Safety Function is Used

You must ensure that conductive substances cannot get into the product (pollution degree 2). Moreover, conductive substances may cause the safety function to become inoperative.

⚠ WARNING
INOPERABLE SAFETY FUNCTION
Ensure that conductive substances (water, contaminated or impregnated oils, metal shavings, etc.) cannot get into the drive.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Protected Cable Installation

If short circuits and other wiring errors such as a cross fault between the signals of the safety function STO can be expected in connection with safety-related signals, and if these short circuits and cross faults are not detected by upstream devices, protected cable installation as per ISO 13849-2 is required.

In the case of an unprotected cable installation, the two signals (both channels) of a safety function may be connected to external voltage if a cable is damaged. If the two channels are connected to external voltage, the safety function is no longer operative.

ISO 13849-2 describes protected cable installation for cables for safety-related signals. The cables for the safety function STO must be protected against external voltage. A shield with ground connection helps to keep external voltage away from the cables for the signals of the safety function STO.

Ground loops can cause problems in machines. A shield connected at one end only is sufficient for grounding and does not create a ground loop.

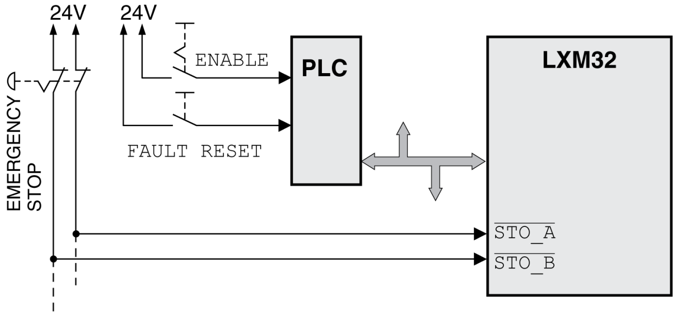
- Use shielded cables for the signals of the safety function STO.
- Do not use the cable for the signals of the safety function STO for other signals.
- Connect one end of the shield.

Application Examples STO

Example of Category 0 stop

Use without EMERGENCY STOP safety relay module, category 0 stop.

Example of category 0 stop



In this example, when an EMERGENCY STOP is activated, it leads to a category 0 stop.

The safety function STO is triggered via a simultaneous 0-level at both inputs (time offset of less than 1 s). The power stage is disabled and an error of error class 3 is detected. The motor can no longer generate torque.

If the motor is not already at a standstill when the STO is triggered, it decelerates under the salient physical forces (gravity, friction, etc.) active at the time until presumably coasting to a standstill.

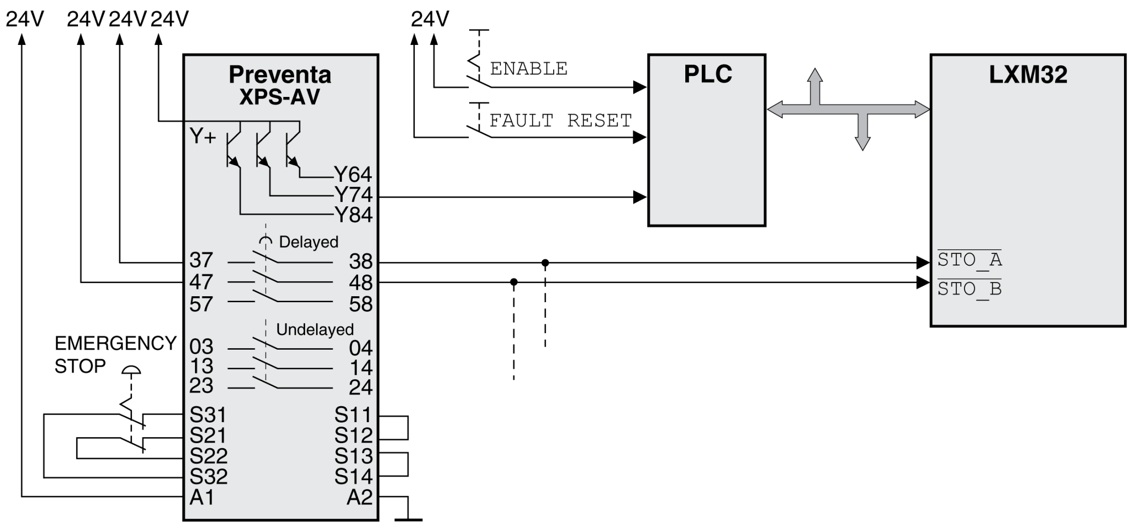
⚠ WARNING
UNINTENDED EQUIPMENT OPERATION Install a dedicated service brake if coasting does not meet the deceleration requirements of your application. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

If the coasting of the motor and its potential load is unsatisfactory as determined by your risk and hazard analysis, an external brake may also be required. See Holding Brake and Safety Function STO *(see page 85)*.

Example of Category 1 stop

Use with EMERGENCY STOP safety relay module, category 1 stop.

Example of category 1 stop with external Preventa XPS-AV EMERGENCY STOP safety relay module



In this example, when an EMERGENCY STOP is activated, it leads to a category 1 stop.

The EMERGENCY STOP safety relay module requests an immediate stop (undelayed) of the drive, for example by means of the function "Halt". After the time delay set in the EMERGENCY STOP safety relay module has elapsed, the EMERGENCY STOP safety relay triggers the safety function STO.

The safety function STO is triggered via a simultaneous 0-level at both inputs (time offset of less than 1 s). The power stage is disabled and an error of error class 3 is detected. The motor can no longer generate torque.

If the coasting of the motor and its potential load is unsatisfactory as determined by your risk and hazard analysis, an external brake may also be required. See Holding Brake and Safety Function STO *(see page 85)*.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Install a dedicated service brake if coasting does not meet the deceleration requirements of your application.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Chapter 4
Installation

What Is in This Chapter?

This chapter contains the following sections:

Section 4.1
Mechanical Installation

What Is in This Section?

This section contains the following topics:

Before Mounting

An engineering phase is mandatory prior to mechanical and electrical installation. See chapter Engineering *(see page 53)* for basic information.

DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire drive system.
- Ground the drive system before applying voltage.
- Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.
- The cross section of the protective ground conductor must comply with the applicable standards.
- Do not consider cable shields to be protective ground conductors.

Failure to follow these instructions will result in death or serious injury.

DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

- Keep foreign objects from getting into the product.
- Verify the correct seating of seals and cable entries in order to avoid contamination such as deposits and humidity.

Failure to follow these instructions will result in death or serious injury.

WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control” and to NEMA ICS 7.1 (latest edition), “Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems” or their equivalent governing your particular location.

Conductive foreign objects, dust or liquids may cause safety functions to become inoperative.

WARNING

LOSS OF SAFETY FUNCTION CAUSED BY FOREIGN OBJECTS

Protect the system against contamination by conductive substances.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The metal surfaces of the product may exceed 70 °C (158 °F) during operation.

⚠ CAUTION

HOT SURFACES

- Avoid unprotected contact with hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

Failure to follow these instructions can result in injury or equipment damage.

⚠ CAUTION

INOPERABLE EQUIPMENT DUE TO INCORRECT MAINS VOLTAGE CONNECTION

- Verify that you use the correct mains voltage; install a transformer, if necessary.
- Do not connect mains voltage to the output terminals (U, V, W).

Failure to follow these instructions can result in injury or equipment damage.

Inspecting the Product

- Verify the product version by means of the Type Code *(see page 19)* on the Nameplate *(see page 18)*.
- Prior to mounting, inspect the product for visible damage.

Damaged products may cause electric shock or unintended equipment operation.

⚠ ⚠ DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

- Do not use damaged products.
- Keep foreign objects (such as chips, screws or wire clippings) from getting into the product.

Failure to follow these instructions will result in death or serious injury.

Contact your local Schneider Electric representative if you detect any damage whatsoever to the products.

For information concerning the mounting of the motor, see the individual user guide for your particular motor.

Installing and removing modules

Overview

Many components of the equipment, including the printed circuit board, operate with mains voltage, or present transformed high currents, and/or high voltages.

The motor itself generates voltage when the motor shaft is rotated.

⚠ DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires.
- Place a "Do Not Turn On" or equivalent hazard label on all power switches and lock them in the non-energized position.
- Wait 15 minutes to allow the residual energy of the DC bus capacitors to discharge.
- Measure the voltage on the DC bus with a properly rated voltage sensing device and verify that the voltage is less than 42.4 Vdc.
- Do not assume that the DC bus is voltage-free when the DC bus LED is off.
- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- Do not create a short-circuit across the DC bus terminals or the DC bus capacitors.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

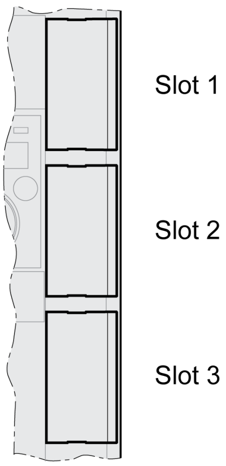
Electrostatic discharge (ESD) may permanently damage the module either immediately or over time.

NOTICE

EQUIPMENT DAMAGE DUE TO ESD

- Use suitable ESD measures (for example, ESD gloves) when handling the module.
- Do not touch internal components.

Failure to follow these instructions can result in equipment damage.



The drive has 3 module slots. The module slots are designed for the following modules:

Slot	Module
Slot 1	Safety module eSM
Slot 2	Encoder module RSR (resolver interface) Encoder module DIG (digital interface) Encoder module ANA (analog interface)
Slot 3	Fieldbus module Sercos III

Plugging a Module Into a Slot

Disconnect all power (power stage supply and 24 Vdc control supply) before plugging in or removing a module. Verify that no voltage is present.

Procedure for plugging in a module:

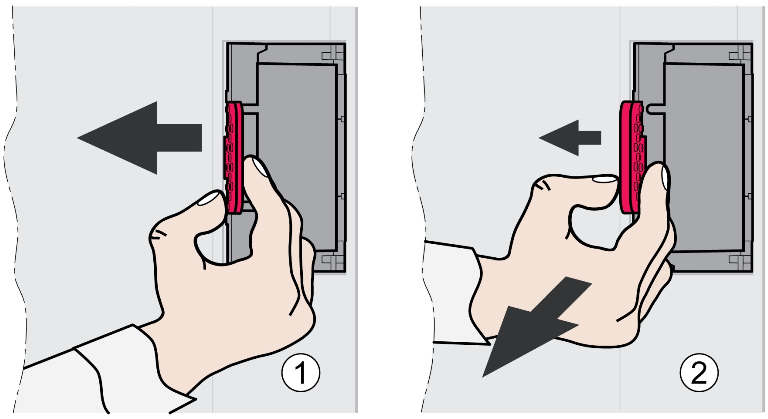
Step	Action
1	Fully read and understand the product manual as well as the manual for the module prior to installing the module.
2	Verify that the order number on the nameplate of the module corresponds to the specification in the manual for the module.
3	Note and record the serial number, revision and DOM shown on the nameplate of the module and the nameplate of the device.
4	Remove the cover from the module slot and keep the cover.
5	Inspect the module for visible damage. Do not install damaged modules.
6	Push the module into the appropriate slot until the snap-in lock snaps in.

Information on wiring can be found in the chapter "Installation" of the manual for the module.

- Fasten the connection cable to the cable guide of the device.

Various settings must be made the next time the device is powered on. See the chapter Commissioning of the manual for the module for details on these settings.

Removing a Module From a Slot



Disconnect all power (power stage supply and 24 Vdc control supply) before plugging in or removing a module. Verify that no voltage is present.

Procedure for removing a module from a slot of the device:

- Label the connection cables. Remove the wiring of the module.
- Push the snap-in lock of the module to the left (1) and pull out the module at the snap-in lock (2) while holding it to the left.
- Close the module slot with the cover.

The next time the device is powered on, it will signal a different hardware. See chapter Acknowledging a Module Replacement *(see page 311)* for additional information.

Mounting the Drive

Attaching a Hazard Label with Safety Instructions

Included in the packaging of the drive are adhesive hazard labels in German, French, Italian, Spanish and Chinese. The English version is affixed to the front of the drive by the factory. If the country to which your final machine or process is to be delivered is other than English speaking:

- Select the label suitable for the target country.
  Observe the safety regulations in the target country.
- Attach the label to the front of the drive so that it is clearly visible.

Control Cabinet

The control cabinet (enclosure) must have a sufficient size so that all devices and components can be permanently installed and wired in compliance with the EMC requirements.

The ventilation of the control cabinet must be sufficient to comply with the specified ambient conditions for the devices and components operated in the control cabinet.

Install and operate this equipment in a control cabinet rated for its intended environment and secured by a keyed or tooled locking mechanism.

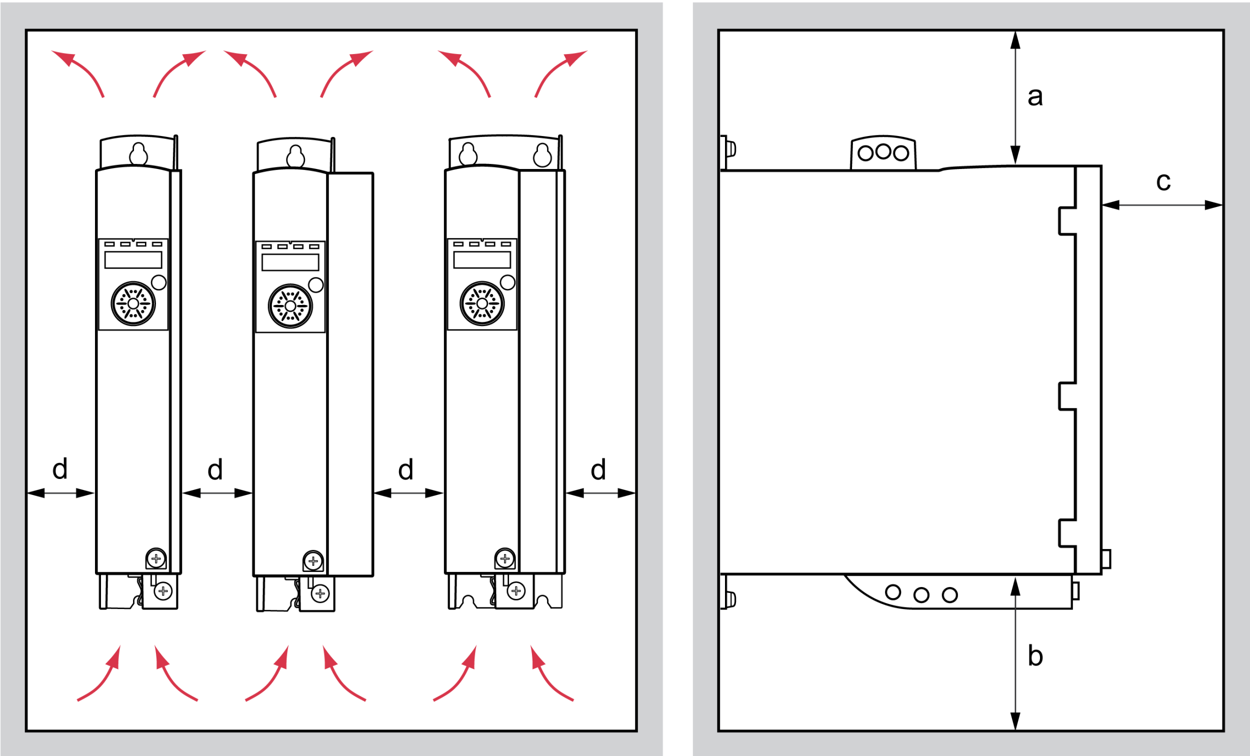
Mounting Distances, Ventilation

When selecting the position of the device in the control cabinet, note the following:

- Mount the device in a vertical position (±10°). This is required for cooling the device.
- Adhere to the minimum installation distances for required cooling. Avoid heat accumulations.
- Do not mount the device close to heat sources.
- Do not mount the device on or near flammable materials.
- The heated airflow from other devices and components must not heat up the air used for cooling the device.
- If the thermal limits are exceeded during operation, the power stage of the drive is disabled (overtemperature).

The connection cables of the devices are routed to the top and to the bottom. The minimum distances must be adhered to for air circulation and cable installation.

Mounting distances and air circulation



Free space a	mm (in)	≥100 (≥3.94)
Free space b	mm (in)	≥100 (≥3.94)
Free space c	mm (in)	≥60 (≥2.36)
Free space d	mm (in)	≥0 (≥0)

Mounting the Device

See chapter Dimensions *(see page 24)* for the dimensions of the mounting holes.

Painted surfaces may create electrical resistance or isolation. Before mounting the device to a painted mounting plate, remove all paint across a large area of the mounting points.

Section 4.2
Electrical Installation

What Is in This Section?

This section contains the following topics:

Overview of Procedure

⚠ ⚠ DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

- Keep foreign objects from getting into the product.
- Verify the correct seating of seals and cable entries in order to avoid contamination such as deposits and humidity.

Failure to follow these instructions will result in death or serious injury.

⚠ ⚠ DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire drive system.
- Ground the drive system before applying voltage.
- Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.
- The cross section of the protective ground conductor must comply with the applicable standards.
- Do not consider cable shields to be protective ground conductors.

Failure to follow these instructions will result in death or serious injury.

Direct current can be introduced in the protective ground conductor of this drive. If a residual current device (RCD / GFCI) or a residual current monitor (RCM) is used for protection against direct or indirect contact, the following specific types must be used:

⚠ WARNING

DIRECT CURRENT CAN BE INTRODUCED INTO THE PROTECTIVE GROUND CONDUCTOR

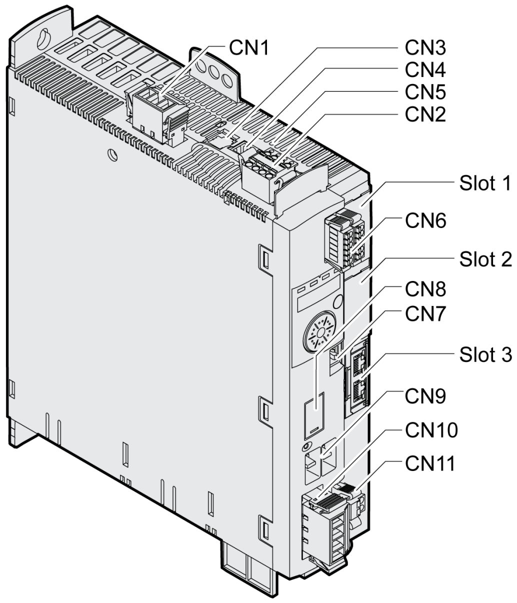
- Use a Type A Residual Current Device (RCD / GFCI) or a Residual Current Monitor (RCM) for single-phase drives connected to a phase and to the neutral conductor.
- Use a Type B Residual Current Device (RCD / GFCI) or a Residual Current Monitor (RCM) that has approval for use with frequency inverters and is sensitive to all types of current for three-phase devices and for single-phase devices not connected to a phase and the neutral conductor.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The entire installation procedure must be performed without voltage present.

Connection Overview

Description



Connection	Assignment
CN1	Power stage supply
CN2	24 Vdc control supply and safety function STO
CN3	Motor encoder (encoder 1)
CN4	PTO (encoder simulation ESIM)
CN5	PTI (A/B signals, P/D signals, CW/CCW signals)
CN6	Digital inputs/outputs
CN7	Modbus (commissioning interface)
CN8	External braking resistor
CN9	DC bus connection for parallel operation
CN10	Motor phases
CN11	Holding brake
Slot 1	Safety module
Slot 2	Encoder module (encoder 2)
Slot 3	Fieldbus SERCOS III

Connection Grounding Screw

Description

This product has a leakage current greater than 3.5 mA. If the protective ground connection is interrupted, a hazardous touch current may flow if the housing is touched.

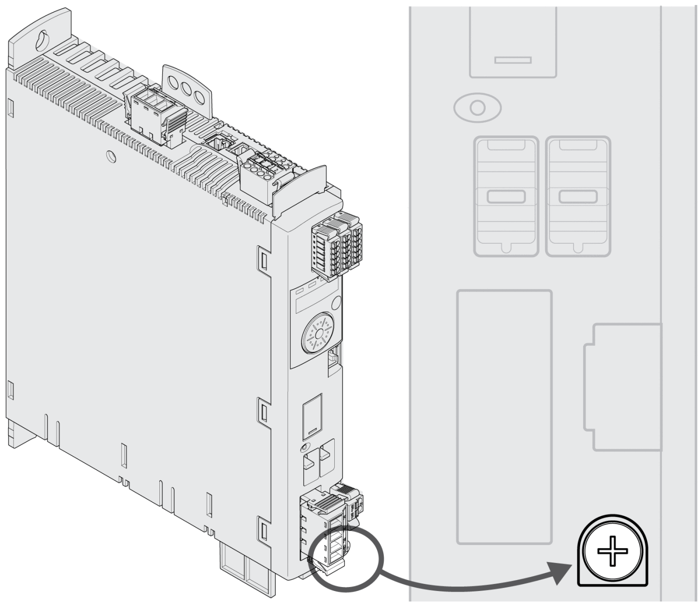
DANGER

INSUFFICIENT GROUNDING

- Use a protective ground conductor with at least 10 mm^2 (AWG 6) or two protective ground conductors with the cross section of the conductors supplying the power terminals.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Ground the drive system before applying voltage.
- Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.
- Do not use cable shields as protective ground conductors.

Failure to follow these instructions will result in death or serious injury.

The central grounding screw of the product is located at the bottom of the front side.



- Connect the ground connection of the device to the central grounding point of the system.

Characteristic	Unit	Value
Tightening torque of grounding screw	Nm (lb.in)	3.5 (31)

Connection Motor Phases and Holding Brake (CN10 and CN11)

General

The motor is designed for operation via a drive. Connecting the motor directly to AC voltage will damage the motor and can cause fires and initiate an explosion.

⚠ DANGER

POTENTIAL FOR EXPLOSION

Only connect the motor to a matching, approved drive in the way described in the present documentation.

Failure to follow these instructions will result in death or serious injury.

High voltages may be present at the motor connection. The motor itself generates voltage when the motor shaft is rotated. AC voltage can couple voltage to unused conductors in the motor cable.

⚠ ⚠ DANGER

ELECTRIC SHOCK

- Verify that no voltage is present prior to performing any type of work on the drive system.
- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- Insulate both ends of unused conductors of the motor cable.
- Supplement the motor cable grounding conductor with an additional protective ground conductor to the motor housing if the protective ground conductor of the motor cable is insufficient.
- Only touch the motor shaft or the mounted output components if all power has been disconnected.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.

Failure to follow these instructions will result in death or serious injury.

If third-party motors are used, insufficient isolation may allow hazardous voltages to enter the PELV circuit.

⚠ ⚠ DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT ISOLATION

- Verify protective separation between the temperature sensor and the motor phases.
- Verify that the signals at the encoder connection meet the PELV requirements.
- Verify protective separation between the brake voltage in the motor and the motor cable, and the motor phases.

Failure to follow these instructions will result in death or serious injury.

Drive systems may perform unintended movements if unapproved combinations of drive and motor are used. Though the connectors for motor connection and encoder connection may match mechanically, this does not imply that the motor is approved for use.

⚠ WARNING

UNINTENDED MOVEMENT

Only use approved combinations of drive and motor.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

See chapter Approved Motors *(see page 27)* for additional information.

Route the cables from the motor and the encoder to the device (starting from the motor). Due to the pre-assembled connectors, this direction is often faster and easier.

Cable Specifications

Shield:	Required, both ends grounded
Twisted Pair:	-
PELV:	The wires for the holding brake must be PELV-compliant.
Cable composition:	3 wires for motor phases 2 wires for holding brake The conductors must have a sufficiently large cross section so that the fuse at the mains connection can trip if required.
Maximum cable length:	Depends on the required limit values for conducted interference, see chapter Electromagnetic Emission *(see page 48)*.

Note the following information:

- You may only connect the original motor cable (with two wires for the holding brake).
- The wires for the holding brake must also be connected to the device at connection CN11 in the case of motors without holding brakes. At the motor end, connect the wires to the appropriate pins for the holding brake; the cable can then be used for motors with or without holding brake. If you do not connect the wires at the motor end, you must isolate each wire individually (inductive voltages).
- Observe the polarity of the holding brake voltage.
- The voltage for the holding brake depends on the 24 Vdc control supply (PELV). Observe the tolerance for the 24 Vdc control supply and the specified voltage for the holding brake, see chapter 24 Vdc Control Supply *(see page 35)*.
- Use pre-assembled cables to reduce the risk of wiring errors, see chapter Accessories and Spare Parts *(see page 455)*.

The optional holding brake of a motor is connected to connection CN11. The integrated holding brake controller releases the holding brake when the power stage is enabled. When the power stage is disabled, the holding brake is re-applied.

Properties of the Connection Terminals CN10

The terminals are approved for stranded conductors and solid conductors. Use wire cable ends (ferrules), if possible.

Characteristic	Unit	Value	
		LXM32•U45, LXM32•U60, LXM32•U90, LXM32•D12, LXM32•D18, LXM32•D30	LXM32•D72
Connection cross section	mm^2 (AWG)	0.75 ... 5.3 (18 ... 10)	0.75 ... 10 (18 ... 8)
Tightening torque for terminal screws	Nm (lb.in)	0.68 (6.0)	1.81 (16.0)
Stripping length	mm (in)	6 ... 7 (0.24 ... 0.28)	8 ... 9 (0.31 ... 0.35)

Properties of the Connection Terminals CN11

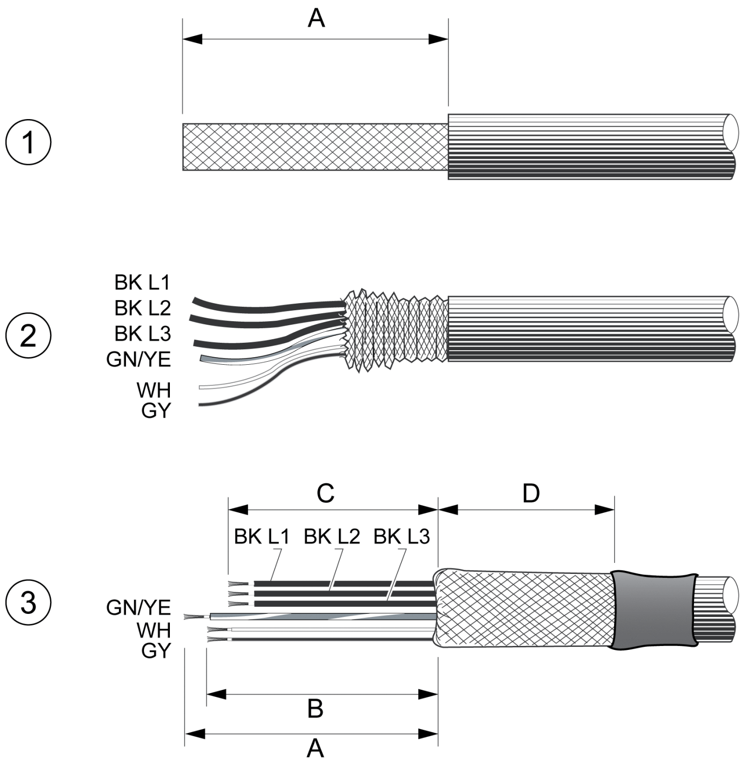
The terminals are approved for stranded conductors and solid conductors. Use wire cable ends (ferrules), if possible.

Characteristic	Unit	Value
Maximum terminal current	A	1.7
Connection cross section	mm^2 (AWG)	0.75 ... 2.5 (18 ... 14)
Stripping length	mm (in)	12 ... 13 (0.47 ... 0.51)

Assembling Cables

Note the dimensions specified when assembling cables.

Steps for assembling the motor cable



1 Strip the cable jacket, length A.
2 Slide the shielding braid back over the cable jacket.
3 Secure the shielding braid with a heat shrink tube. The shield must have at least length D. Verify that a large surface area of the shielding braid is connected to the EMC shield clamp. Shorten the wires for the holding brake to length B and the three wires for the motor phases to length C. The protective ground conductor has length A. Connect the wires for the holding brake to the device even in the case of motors without a holding brake (inductive voltage).

Characteristic	Unit	Value
A	mm (in)	140 (5.51)
B	mm (in)	135 (5.32)
C	mm (in)	130 (5.12)
D	mm (in)	50 (1.97)

Observe the maximum permissible connection cross section. Take into account the fact that wire cable ends (ferrules) increase the conductor cross section.

Monitoring

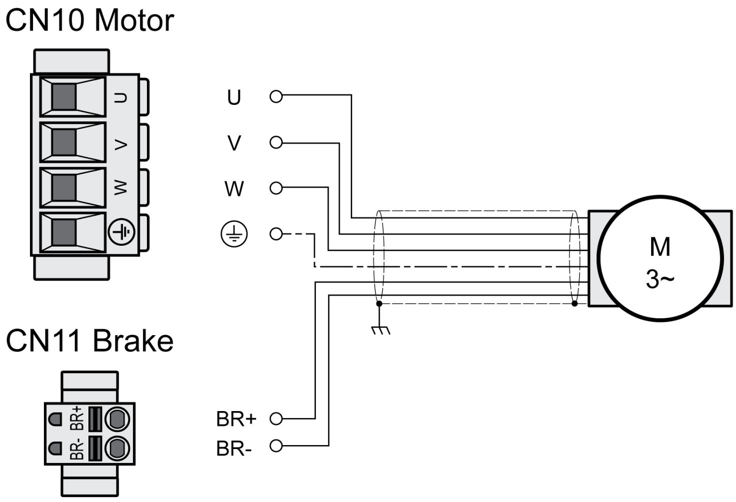
The device monitors the motor phases for:

- Short circuit between the motor phases
- Short circuit between the motor phases and ground

Short circuits between the motor phases and the DC bus, the braking resistor or the holding brake wires are not detected.

Wiring Diagram Motor and Holding Brake

Wiring diagram motor with holding brake

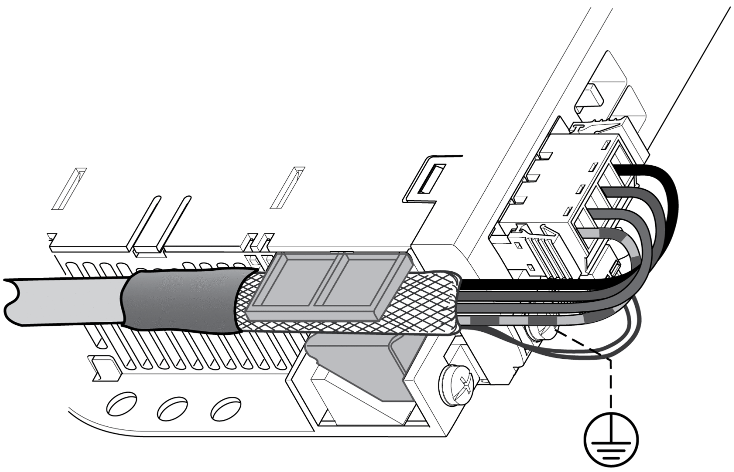


Connection	Meaning	Color
U	Motor phase	Black L1 (BK)
V	Motor phase	Black L2 (BK)
W	Motor phase	Black L3 (BK)
PE	Protective ground conductor	Green/yellow (GN/YE)
BR+	Holding brake +	White (WH) or black 5 (BK)
BR-	Holding brake -	Gray (GR) or black 6 (BK)

Connecting the Motor Cable

- Connect the motor phases and protective ground conductor to CN10. Verify that the connections U, V, W and PE (ground) match at the motor and the device.
- Note the tightening torque specified for the terminal screws.
- Connect the white wire or the black wire with the label 5 to connection BR+ of CN11.
  Connect the gray wire or the black wire with the label 6 to connection BR- of CN11.
- Verify that the connector locks snap in properly.
- Connect the cable shield to the shield clamp (large surface area contact).

Shield clamp motor cable



Connection DC Bus (CN9, DC Bus)

Incorrect use of the DC bus may permanently damage the drives either immediately or over time.

⚠ WARNING
INOPERABLE SYSTEM COMPONENTS AND LOSS OF CONTROL
Verify that all requirements for using the DC bus are met.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

This and other important information can be found in the "LXM32 - Common DC bus - Application note". If you wish to take advantage of DC bus sharing, you must first read the "LXM32 - Common DC bus - Application note".

Requirements for Use

The requirements and limit values for parallel connection via the DC bus can be found on *http://www.schneider-electric.com* in the form of an application note. If there are any issues or questions related to obtaining the Common DC bus Application Note, consult your local Schneider-Electric representative.

Connection Braking Resistor (CN8, Braking Resistor)

General

An insufficiently rated braking resistor can cause overvoltage on the DC bus. Overvoltage on the DC bus causes the power stage to be disabled. The motor is no longer actively decelerated.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the braking resistor has a sufficient rating by performing a test run under maximum load conditions.
- Verify that the parameter settings for the braking resistor are correct.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Internal Braking Resistor

A braking resistor is integrated in the device to absorb braking energy. The device is shipped with the internal braking resistor active.

External Braking Resistor

An external braking resistor is required for applications in which the motor must be decelerated quickly and the internal braking resistor cannot absorb the excess braking energy.

Selection and rating of the external braking resistor are described in chapter Rating the Braking Resistor *(see page 73)*. For suitable braking resistors, see chapter Accessories and Spare Parts *(see page 455)*.

Cable Specifications

Shield:	Required, both ends grounded
Twisted Pair:	-
PELV:	-
Cable composition:	Minimum conductor cross section: Same cross section as power stage supply, see chapter Connection Power Stage Supply (CN1) *(see page 108)*. The conductors must have a sufficiently large cross section so that the fuse at the mains connection can trip if required.
Maximum cable length:	3 m (9.84 ft)

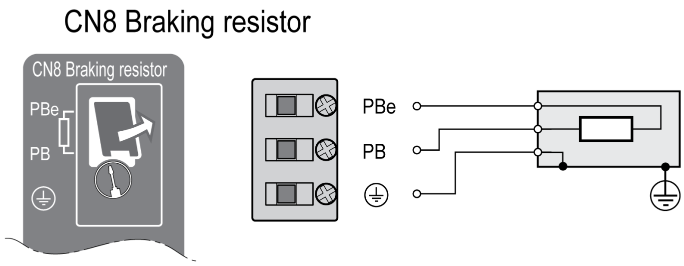
Properties of the Connection Terminals CN8

Characteristic	Unit	Value	
		LXM32•U45, LXM32•U60, LXM32•U90, LXM32•D12, LXM32•D18, LXM32•D30, LXM32•D72	LXM32•D85, LXM32•C10
Connection cross section	mm^2 (AWG)	0.75 ... 3.3 (18 ... 12)	1.5 ... 25 (14 ... 4)
Tightening torque for terminal screws	Nm (lb.in)	0.51 (4.5)	3.8 (33.6)
Stripping length	mm (in)	10 ... 11 (0.39 ... 0.43)	18 (0.71)

The terminals are approved for fine-stranded conductors and solid conductors. Observe the maximum permissible connection cross section. Take into account the fact that wire cable ends (ferrules) increase the conductor cross section.

If you use wire cable ends (ferrules), use only wire cable ends (ferrules) with collars for these terminals.

Wiring Diagram



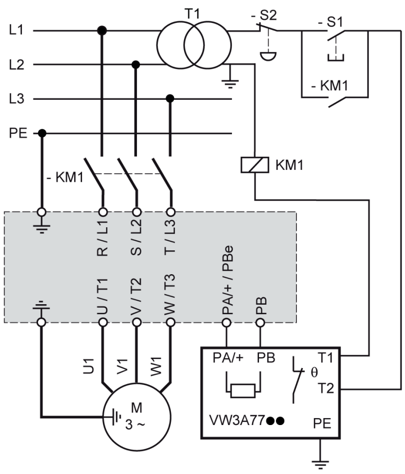
Connecting the External Braking Resistor

- Verify that no voltages are present.
- Remove the cover from the connection.
- Ground the ground connection (PE) of the braking resistor.
- Connect the external braking resistor to the device. Note the tightening torque specified for the terminal screws.
- Connect the cable shield to the shield connection at the bottom of the device (large surface area contact).

The parameter `RESint_ext` is used to switch between the internal and an external braking resistor. See chapter Setting the Braking Resistor Parameters *(see page 159)* for the parameter settings for the braking resistor. Verify correct operation of the braking resistor during commissioning.

Wiring Example

The following graphic shows a functional principle:



Connection Power Stage Supply (CN1)

General

This product has a leakage current greater than 3.5 mA. If the protective ground connection is interrupted, a hazardous touch current may flow if the housing is touched.

DANGER

INSUFFICIENT GROUNDING

- Use a protective ground conductor with at least 10 mm^2 (AWG 6) or two protective ground conductors with the cross section of the conductors supplying the power terminals.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Ground the drive system before applying voltage.
- Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.
- Do not use cable shields as protective ground conductors.

Failure to follow these instructions will result in death or serious injury.

WARNING

INSUFFICIENT PROTECTION AGAINST OVERCURRENT

- Use the external fuses specified in "Technical data".
- Do not connect the product to a supply mains whose short-circuit current rating (SCCR) exceeds the value specified in the chapter "Technical Data".

Failure to follow these instructions can result in death, serious injury, or equipment damage.

WARNING

INCORRECT MAINS VOLTAGE

Verify that the product is approved for the mains voltage before applying power and configuring the product.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The products are intended for industrial use and may only be operated with a permanently installed connection.

Prior to connecting the device, verify the approved mains types, see chapter Power Stage Data - General *(see page 26)*.

Cable Specifications

Shield:	-
Twisted Pair:	-
PELV:	-
Cable composition:	The conductors must have a sufficiently large cross section so that the fuse at the mains connection can trip if required.
Maximum cable length:	-

Properties of Connection Terminals CN1

Characteristic	Unit	Value	
		LXM32•U45, LXM32•U60, LXM32•U90, LXM32•D12, LXM32•D18, LXM32•D30	LXM32•D72
Connection cross section	mm^2 (AWG)	0.75 ... 5.3 (18 ... 10)	0.75 ... 10 (18 ... 8)
Tightening torque for terminal screws	Nm (lb.in)	0.68 (6.0)	1.81 (16.0)
Stripping length	mm (in)	6 ... 7 (0.24 ... 0.28)	8 ... 9 (0.31 ... 0.35)

The terminals are approved for stranded conductors and solid conductors. Use wire cable ends (ferrules), if possible.

Prerequisites for Connecting the Power Stage Supply

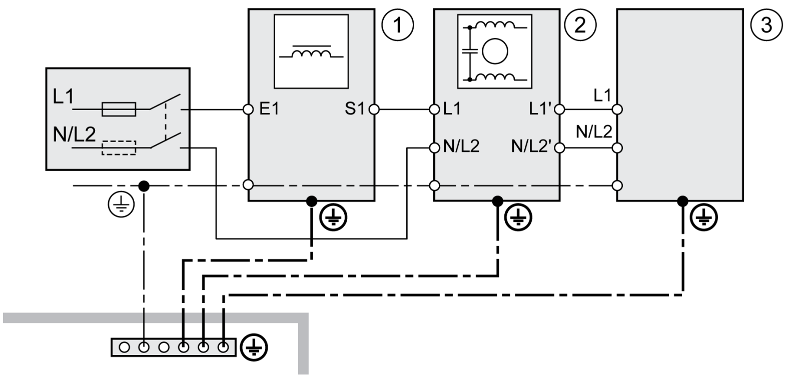
Note the following information:

- Three-phase devices may only be connected and operated via three phases.
- Use upstream mains fuses.
- If you use an external mains filter, the mains cable must be shielded and grounded at both ends if the length between the external mains filter and the device exceeds 200 mm (7.87 in).
- See page Conditions for UL 508C and CSA *(see page 51)* for a UL-compliant design.

Power Stage Supply Single-Phase Device

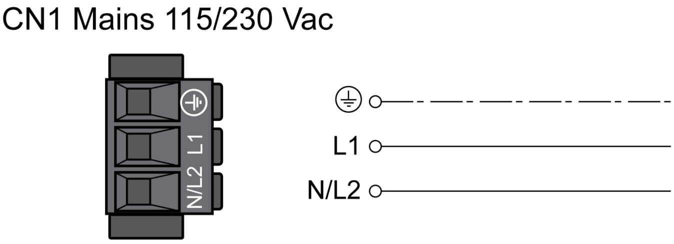
The illustration shows an overview for wiring the power stage supply for a single-phase device. The illustration also shows an external mains filter and a mains reactor which are available as accessories.

Overview power stage supply for single-phase device



1 Mains reactor (accessory)
2 External mains filter (accessory)
3 Drive

Wiring diagram power stage supply for single-phase device.

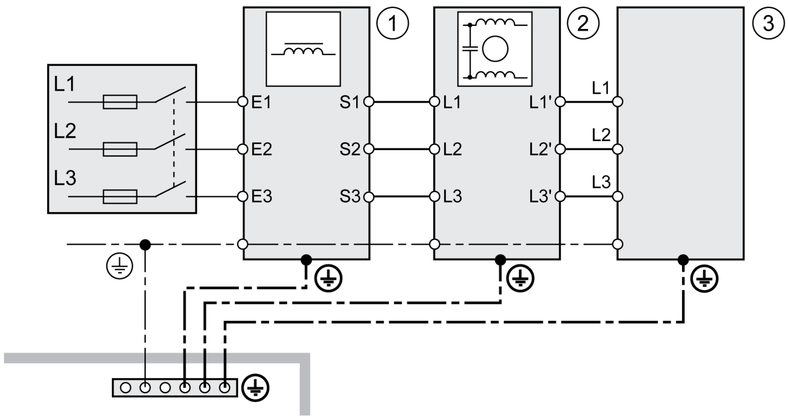


- Verify the type of mains. See chapter Power Stage Data - General *(see page 26)* for the approved types of mains.
- Connect the mains cable. Note the tightening torque specified for the terminal screws.
- Verify that the connector locks snap in properly.

Power Stage Supply Three-Phase Device

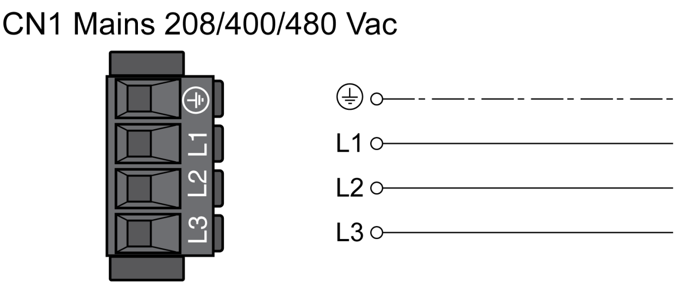
The illustration shows an overview for wiring the power stage supply for a three-phase device. The illustration also shows an external mains filter and a mains reactor which are available as accessories.

Wiring diagram, power stage supply for three-phase device.



1 Mains reactor (accessory)
2 External mains filter (accessory)
3 Drive

Wiring diagram power stage supply for three-phase device.



- Verify the type of mains. See chapter Power Stage Data - General *(see page 26)* for the approved types of mains.
- Connect the mains cable. Note the tightening torque specified for the terminal screws.
- Verify that the connector locks snap in properly.

Connection Motor Encoder (CN3)

Function and Encoder Type

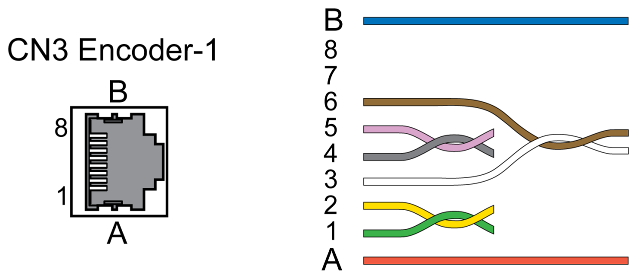
The motor encoder is a Hiperface encoder integrated in the motor. It provides the device with information on the motor position (analog and digital).

Cable Specifications

Shield:	Required, both ends grounded
Twisted Pair:	Required
PELV:	Required
Cable composition:	6 * 0.14 mm^2 + 2 * 0.34 mm^2 (6 * AWG 24 + 2 * AWG 20)
Maximum cable length:	100 m (328.08 ft)

Use pre-assembled cables to reduce the risk of wiring errors, see chapter Accessories and Spare Parts *(see page 455)*.

Wiring Diagram



Pin	Signal	Motor, pin	Pair	Meaning	I/O
1	COS+	9	2	Cosine signal	I
2	REFCOS	5	2	Reference for cosine signal	I
3	SIN+	8	3	Sine signal	I
6	REFSIN	4	3	Reference for sine signal	I
4	Data	6	1	Receive data, transmit data	I/O
5	Data	7	1	Receive data and transmit data, inverted	I/O
7 ... 8	-		4	Reserved	
A	ENC+10V_OUT	10	5	Encoder supply	O
B	ENC_0V	11	5	Reference potential for encoder supply	
	SHLD			Shield	

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect any wiring to reserved, unused connections, or to connections designated as No Connection (N.C.).

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Connecting the Motor Encoder

- Verify that wiring, cables and connected interfaces meet the PELV requirements.
- Connect the connector to CN3 Encoder-1.
- Verify that the connector locks snap in properly.

Route the cables from the motor and the encoder to the device (starting from the motor). Due to the pre-assembled connectors, this direction is often faster and easier.

Connection PTO (CN4, Pulse Train Out)

5 V signals are available at the PTO (Pulse Train Out, CN4) output. Depending on parameter `PTO_mode`, these signals are ESIM signals (encoder simulation) or logically fed through PTI input signals (P/D signals, A/B signals, CW/CCW signals). The PTO output signals can be used as PTI input signals for another device. The signal level corresponds to RS422, see chapter Output PTO (CN4) *(see page 38)*. The PTO output supplies 5 V signals, even if the PTI input signal is a 24 V signal.

Availability

Available with firmware version ≥V01.04.

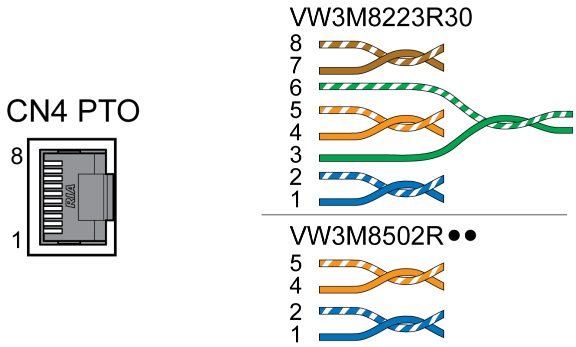
Cable Specifications

Shield:	Required, both ends grounded
Twisted Pair:	Required
PELV:	Required
Cable composition:	8 * 0.14 mm^2 (8 * AWG 24)
Maximum cable length:	100 m (328 ft)

Use pre-assembled cables to reduce the risk of wiring errors, see chapter Accessories and Spare Parts *(see page 455)*.

Wiring Diagram

Wiring diagram Pulse Train Out (PTO)



Pin	Signal	Pair	Meaning
1	ESIM_A	2	ESIM channel A
2	ESIM_A	2	ESIM channel A, inverted
4	ESIM_B	1	ESIM channel B
5	ESIM_B	1	ESIM channel B, inverted
3	ESIM_I	3	ESIM index pulse
6	ESIM_I	3	ESIM index pulse, inverted
7		4	Reference potential
8		4	Reference potential

PTO: Logically Fed Through PTI Signals

At the PTO output, the PTI input signals can be made available again to control a subsequent device (daisy chain). Depending on the input signal, the output signal can be of type P/D signal, A/B signal or CW/CCW signal. The PTO output supplies 5 V signals.

Connecting PTO

- Connect the connector to CN4. Verify correct pin assignment.
- Verify that the connector locks snap in properly.

Connection PTI (CN5, Pulse Train In)

P/D (pulse/direction), A/B signals or CW/CCW signals can be connected to the PTI connection (Pulse Train In, CN5).

It is possible to connect 5 V signals or 24 V signals, see chapter Input PTI (CN5) *(see page 39)*. Pin assignments and cables are different.

Incorrect or interfered signals as reference values can cause unintended movements.

⚠ WARNING

UNINTENDED MOVEMENT

- Use shielded twisted-pair cables.
- Do not use signals without push-pull in environments subject to interference.
- Use signals with push-pull in the case of cable lengths of more than 3 m (9.84 ft) and limit the frequency to 50 kHz.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Availability

Available with firmware version ≥V01.04.

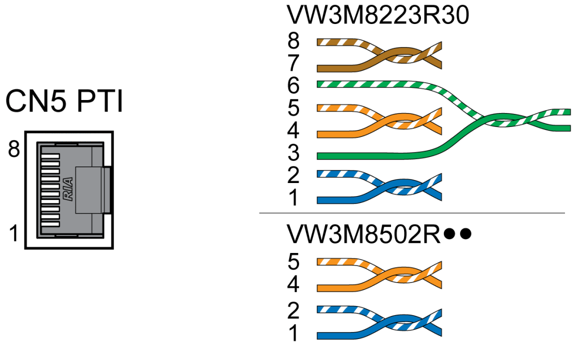
Cable Specifications PTI

Shield:	Required, both ends grounded
Twisted Pair:	Required
PELV:	Required
Minimum conductor cross section:	0.14 mm^2 (AWG 24)
Maximum cable length:	100 m (328 ft) with RS422 10 m (32.8 ft) with push-pull 1 m (3.28 ft) with open collector

Use pre-assembled cables to reduce the risk of wiring errors, see chapter Accessories and Spare Parts *(see page 455)*.

Connection Assignment PTI 5 V

Wiring diagram Pulse Train In (PTI) 5 V



P/D signals 5 V

Pin	Signal	Pair	Meaning
1	`PULSE(5)`	2	Pulse 5V
2	`PULSE`	2	Pulse, inverted
4	`DIR(5)`	1	Direction 5V
5	`DIR`	1	Direction, inverted

A/B signals 5 V

Pin	Signal	Pair	Meaning
1	`ENC_A(5)`	2	Encoder channel A 5V
2	`ENC_A`	2	Encoder channel A, inverted
4	`ENC_B(5)`	1	Encoder channel B 5V
5	`ENC_B`	1	Encoder channel B, inverted

CW/CCW signals 5 V

Pin	Signal	Pair	Meaning
1	`CW(5)`	2	Pulse positive 5V
2	`CW`	2	Pulse positive, inverted
4	`CCW(5)`	1	Pulse negative 5V
5	`CCW`	1	Pulse negative, inverted

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect any wiring to reserved, unused connections, or to connections designated as No Connection (N.C.).

Failure to follow these instructions can result in death, serious injury, or equipment damage.

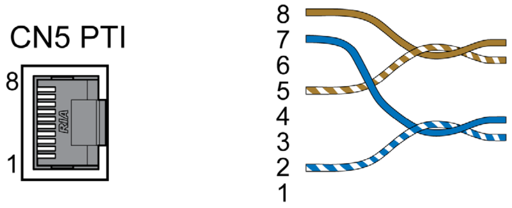
Connecting Pulse Train IN (PTI) 5 V

- Connect the connector to CN5. Verify correct pin assignment.
- Verify that the connector locks snap in properly.

Connection Assignment PTI 24 V

Note that the wire pairs for 24 V signals require assignments different from those for 5 V signals. Use a cable that complies with the cable specification. Assemble the cable as shown in the illustration below.

Wiring diagram Pulse Train In (PTI) 24 V.



P/D signals 24 V

Pin	Signal	Pair	Meaning
7	PULSE(24)	A	Pulse 24V
2	PULSE	A	Pulse, inverted
8	DIR(24)	B	Direction 24V
5	DIR	B	Direction, inverted

A/B signals 24 V

Pin	Signal	Pair	Meaning
7	ENC_A(24)	A	Encoder channel A 24V
2	ENC_A	A	Encoder channel A, inverted
8	ENC_B(24)	B	Encoder channel B 24V
5	ENC_B	B	Encoder channel B, inverted

CW/CCW signals 24 V

Pin	Signal	Pair	Meaning
7	CW(24)	A	Pulse positive 24V
2	CW	A	Pulse positive, inverted
8	CCW(24)	B	Pulse negative 24V
5	CCW	B	Pulse negative, inverted

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect any wiring to reserved, unused connections, or to connections designated as No Connection (N.C.).

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Connecting Pulse Train In (PTI) 24 V

- Connect the connector to CN5. Verify correct pin assignment.
- Verify that the connector locks snap in properly.

Connection 24 Vdc Control Supply and STO (CN2, DC Supply and STO)

The +24VDC supply voltage is connected with many exposed signal connections in the drive system.

DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT POWER SUPPLY UNIT

- Use a power supply unit that meets the PELV (Protective Extra Low Voltage) requirements.
- Connect the negative output of the power supply unit to PE (ground).

Failure to follow these instructions will result in death or serious injury.

The connection for the 24 Vdc control supply at the product does not have an inrush current limitation. If the voltage is applied by means of switching of contacts, damage to the contacts or contact welding may result.

NOTICE

PERMANENT DAMAGE TO CONTACTS

- Switch the power input of the power supply unit.
- Do not switch the output voltage.

Failure to follow these instructions can result in equipment damage.

Safety Function STO

Information on the signals of the safety function STO can be found in chapter Safety function STO ("Safe Torque Off") *(see page 79)*. If the safety function is not required, the inputs STO_A and STO_B must be connected to +24VDC.

Cable Specifications CN2

Shield:	-(1)
Twisted Pair:	-
PELV:	Required
Minimum conductor cross section:	0.75 mm^2 (AWG 18)
Maximum cable length:	100 m (328 ft)
(1) See chapter Safety function STO ("Safe Torque Off") *(see page 79)*	

Properties of Connection Terminals CN2

Characteristic	Unit	Value
Maximum terminal current	A	16(1)
Connection cross section	mm^2 (AWG)	0.5 ... 2.5 (20 ... 14)
Stripping length	mm (in)	12 ... 13 (0.47 ... 0.51)
(1) Note the maximum permissible terminal current when connecting several devices.		

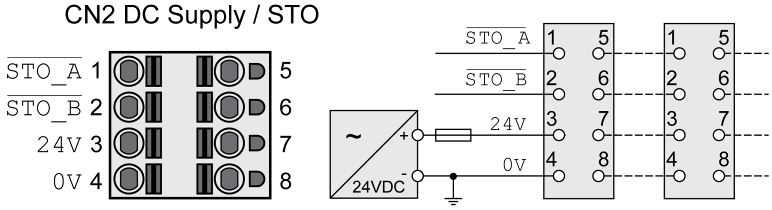
The terminals are approved for stranded conductors and solid conductors. Use wire cable ends (ferrules), if possible.

Permissible Terminal Current of 24 Vdc Control Supply

- Connection CN2, pins 3 and 7 as well as pins 4 and 8 can be used as 24V/0V connections for additional consumers.
  In the connector, the following pins are connected: pin 1 to pin 5, pin 2 to pin 6, pin 3 to pin 7 and pin 4 to pin 8.
- The voltage at the holding brake output depends on the 24 Vdc control supply. Note that the current of the holding brake also flows via this terminal.

Wiring Diagram

CN2 DC Supply / STO



Pin	Signal	Meaning
1, 5	STO_A	Safety function STO: Dual-channel connection, connection A
2, 6	STO_B	Safety function STO: Dual-channel connection, connection B
3, 7	+24 VDC	24 Vdc control supply
4, 8	0VDC	Reference potential for 24 Vdc control supply and reference potential for STO

Connecting the Safety Function STO

- Verify that wiring, cables and connected interfaces meet the PELV requirements.
- Connect the safety function in accordance with the specifications in chapter Safety function STO ("Safe Torque Off") *(see page 79)*.

Connecting the 24 Vdc Control Supply

- Verify that wiring, cables and connected interfaces meet the PELV requirements.
- Route the 24 Vdc control supply from a power supply unit (PELV) to the device.
- Ground the negative output at the power supply unit.
- Note the maximum permissible terminal current when connecting several devices.
- Verify that the connector locks snap in properly at the housing.

Connection Digital Inputs and Outputs (CN6)

The device has configurable inputs and configurable outputs. The standard assignment and the configurable assignment depend on the selected operating mode. For more information, see chapter Digital Inputs and Outputs *(see page 192)*.

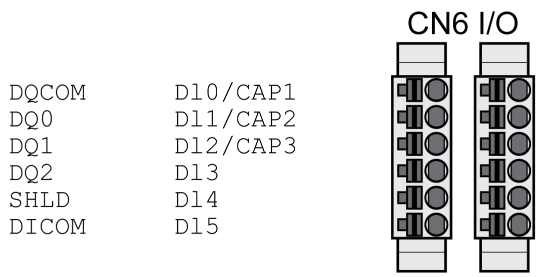
Cable Specifications

Shield:	-
Twisted Pair:	-
PELV:	Required
Cable composition:	0.25 mm^2, (AWG 22)
Maximum cable length:	30 m (98.4 ft)

Properties of Connection Terminals CN6

Characteristic	Unit	Value
Connection cross section	mm^2 (AWG)	0.2 ... 1.0 (24 ... 16)
Stripping length	mm (in)	10 (0.39)

Wiring Diagram



Signal	Meaning
DQ_COM	Reference potential to DQ0 ... DQ4
DQ0	Digital output 0
DQ1	Digital output 1
DQ2	Digital output 2
SHLD	Shield connection
DI_COM	Reference potential to DI0 ... DI5
DI0/CAP1	Digital input 0 / Capture input 1
DI1/CAP2	Digital input 1 / Capture input 2
DI2/CAP3(1)	Digital input 2 / Capture input 3(1)
DI3	Digital input 3
DI4	Digital input 4
DI5	Digital input 5
(1) Available with hardware version ≥RS03	

The connectors are coded. Verify correct assignment when connecting them.

The configuration and the standard assignment of the inputs and outputs are described in chapter Digital Inputs and Outputs *(see page 192)*.

Connecting the Digital Inputs/Outputs

- Wire the digital connections to CN6.
- Ground the shield to `SHLD`.
- Verify that the connector locks snap in properly.

Connection PC with Commissioning Software (CN7)

A PC with the commissioning software Lexium DTM Library can be connected for commissioning. The PC is connected via a bidirectional USB/RS485 converter, see chapter Accessories and Spare Parts *(see page 455)*.

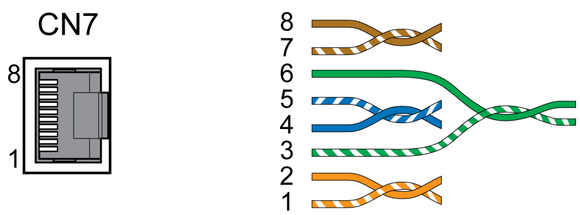
If the commissioning interface at the product is directly connected to an Ethernet interface at the PC, the PC interface may be damaged and rendered inoperable.

NOTICE
DAMAGE TO PC
Do not directly connect an Ethernet interface to the commissioning interface of this product.
Failure to follow these instructions can result in equipment damage.

Cable Specifications

Shield:	Required, both ends grounded
Twisted Pair:	Required
PELV:	Required
Cable composition:	8 * 0.25 mm^2 (8 * AWG 22)
Maximum cable length:	100 m (328 ft)

Wiring Diagram



Pin	Signal	Meaning
1 ... 3	–	Reserved
4	MOD_D1	RS485, Bidirectional transmit/receive signal
5	MOD_D0	RS485, Bidirectional transmit/receive signal, inverted
6	–	Reserved
7	MOD+10V_OUT	10 V supply, maximum 100 mA
8	MOD_0V	Reference potential to MOD+10V_OUT

⚠ WARNING
UNINTENDED EQUIPMENT OPERATION
Do not connect any wiring to reserved, unused connections, or to connections designated as No Connection (N.C.).
Failure to follow these instructions can result in death, serious injury, or equipment damage.

- Verify that the connector locks snap in properly.

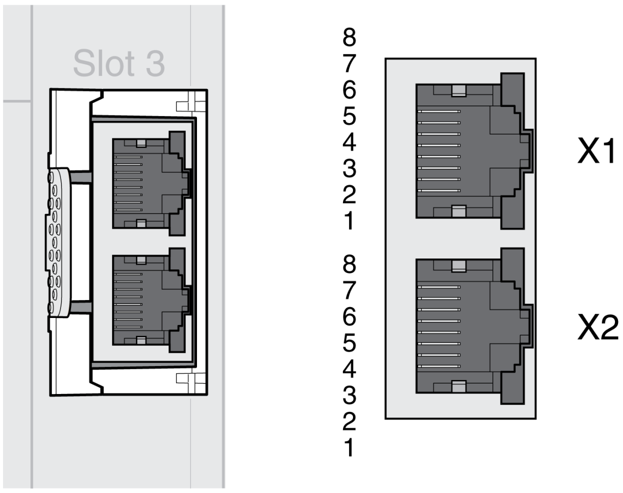
Connection SERCOS III

Cable Specifications

Shield:	Required, both ends grounded
Twisted Pair:	Required
PELV:	Required
Cable composition:	4 * 0.14 mm^2 (AWG 24)

Use pre-assembled cables to reduce the risk of wiring errors, see chapter Accessories and Spare Parts *(see page 455)*.

Wiring Diagram



Pin	Signal	Meaning
1	`Tx+`	Ethernet transmit signal +
2	`Tx-`	Ethernet transmit signal -
3	`Rx+`	Ethernet receive signal +
4 ... 5	-	Reserved
6	`Rx-`	Ethernet receive signal -
7 ... 8	-	Reserved

⚠ WARNING
UNINTENDED EQUIPMENT OPERATION
Do not connect any wiring to reserved, unused connections, or to connections designated as No Connection (N.C.).
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Connecting the Fieldbus

- Connect the fieldbus.
- Verify that the connector locks snap in properly.

Section 4.3
Verifying Installation

Verifying Installation

Verify proper installation:

- Verify the mechanical installation of the entire drive system:
- Does the installation meet the specified distance requirements?
- Did you tighten all fastening screws with the specified tightening torque?
- Verify the electrical connections and the cabling:
- Did you connect all protective ground conductors?
- Do all fuses have the correct rating; are the fuses of the specified type?
- Did you connect all wires of the cables or insulate them?
- Did you properly connect and install all cables and connectors?
- Are the mechanical locks of the connectors correct and effective?
- Did you properly connect the signal wires?
- Are the required shield connections EMC-compliant?
- Did you take all measures for EMC compliance?
- Does the drive installation conform to all local, regional, and national electrical safety codes for the eventual placement of the equipment?
- Verify that all covers and seals have been properly installed to achieve the required degree of protection.

Chapter 5
Commissioning

What Is in This Chapter?

This chapter contains the following sections:

Section 5.1
Overview

What Is in This Section?

This section contains the following topics:

General

The safety function STO (Safe Torque Off) does not remove power from the DC bus. The safety function STO only removes power to the motor. The DC bus voltage and the mains voltage to the drive are still present.

DANGER

ELECTRIC SHOCK

- Do not use the safety function STO for any other purposes than its intended function.
- Use an appropriate switch, that is not part of the circuit of the safety function STO, to disconnect the drive from the mains power.

Failure to follow these instructions will result in death or serious injury.

External driving forces acting on the motor can cause high currents to be regenerated and supplied back to the drive.

DANGER

FIRE DUE TO EXTERNAL DRIVING FORCES ACTING ON MOTOR

Verify that no external forces can act on the motor in the case of errors of error classes 3 or 4.

Failure to follow these instructions will result in death or serious injury.

Unsuitable parameter values or unsuitable data may trigger unintended movements, trigger signals, damage parts and disable monitoring functions. Some parameter values or data do not become active until after a restart.

WARNING

UNINTENDED EQUIPMENT OPERATION

- Only start the system if there are no persons or obstructions in the zone of operation.
- Do not operate the drive system with undetermined parameter values or data.
- Never modify a parameter value unless you fully understand the parameter and all effects of the modification.
- Restart the drive and verify the saved operational data and/or parameter values after modifications.
- Carefully run tests for all operating states and potential error situations when commissioning, upgrading or otherwise modifying the operation of the drive.
- Verify the functions after replacing the product and also after making modifications to the parameter values and/or other operational data.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

If the power stage is disabled unintentionally, for example as a result of power outage, errors or functions, the motor is no longer decelerated in a controlled way.

WARNING

UNINTENDED EQUIPMENT OPERATION

Verify that movements without braking effect cannot cause injuries or equipment damage.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Applying the holding brake while the motor is running will cause excessive wear and degradation of the braking torque.

⚠ WARNING

LOSS OF BRAKING FORCE DUE TO WEAR OR HIGH TEMPERATURE

- Do not use the holding brake as a service brake.
- Do not exceed the maximum number of brake applications and the kinetic energy during braking of moving loads.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

When the product is operated for the first time, there is a risk of unanticipated movements caused by, for example, incorrect wiring or unsuitable parameter settings. Releasing the holding brake can cause an unintended movement, like for example, a falling load in the case of vertical axes.

⚠ WARNING

UNINTENDED MOVEMENT

- Verify that there are no persons or obstructions in the zone of operation when operating the system.
- Take appropriate measures to avoid hazards caused by falling or lowering loads or other unintended movements.
- Run initial tests without coupled loads.
- Verify that a functioning emergency stop push-button is within reach of all persons involved in running tests.
- Anticipate movements in unintended directions or oscillations of the motor.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The metal surfaces of the product may exceed 70 °C (158 °F) during operation.

⚠ CAUTION

HOT SURFACES

- Avoid unprotected contact with hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

Failure to follow these instructions can result in injury or equipment damage.

The product can be accessed via different types of access channels. Simultaneous access via multiple access channels or the use of exclusive access may cause unintended equipment operation.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that simultaneous access via multiple access channels cannot cause unintended triggering or blocking of commands.
- Verify that the use of exclusive access cannot cause unintended triggering or blocking of commands.
- Verify that the required access channels are available.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

If the drive was not connected to mains for an extended period of time, the capacitors must be restored to their full performance before the motor is started.

NOTICE
REDUCED CAPACITOR PERFORMANCE ● If the drive has not been connected to mains for a period of more than 24 months, apply mains voltage to the drive for at least one hour before enabling the power stage for the first time. ● If the drive is commissioned for the first time, verify the date of manufacture and run the procedure specified above if the date of manufacture is more than 24 months in the past. **Failure to follow these instructions can result in equipment damage.**

Preparation

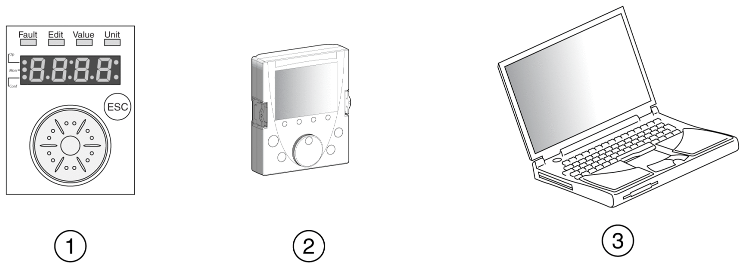
Required Components

The following is required for commissioning:

- Commissioning software “Lexium DTM Library”
  http://www.schneider-electric.com/en/download/document/Lexium_DTM_Library/
- Fieldbus converter for the commissioning software for connection via the commissioning interface

Interfaces

The following interfaces can be used for commissioning, parameterization and diagnostics:



1 Integrated HMI
2 External graphic display terminal
3 PC with commissioning software “Lexium DTM Library”

Device settings can be duplicated. Stored device settings can be transferred to a device of the same type. Duplicating the device settings can be used if multiple devices are to have the same settings, for example, when devices are replaced.

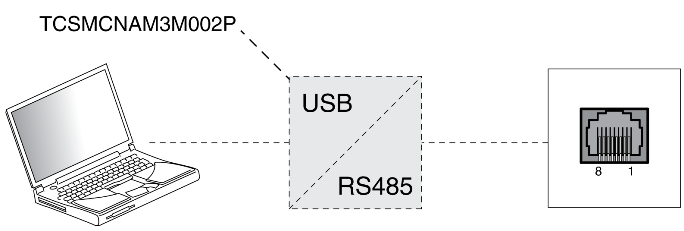
Commissioning Software

The commissioning software “Lexium DTM Library” has a graphic user interface and is used for commissioning, diagnostics and testing settings.

- Tuning of the control loop parameters via a graphical user interface
- Comprehensive set of diagnostics tools for optimization and maintenance
- Long-term trace for evaluation of the performance
- Testing the input and output signals
- Tracking signals on the screen
- Archiving of device settings and recordings with export function for further processing in other applications

Connecting a PC

A PC with commissioning software can be connected for commissioning. The PC is connected to a bidirectional USB/RS485 converter, see chapter Accessories and Spare Parts *(see page 455)*.



Section 5.2
Integrated HMI

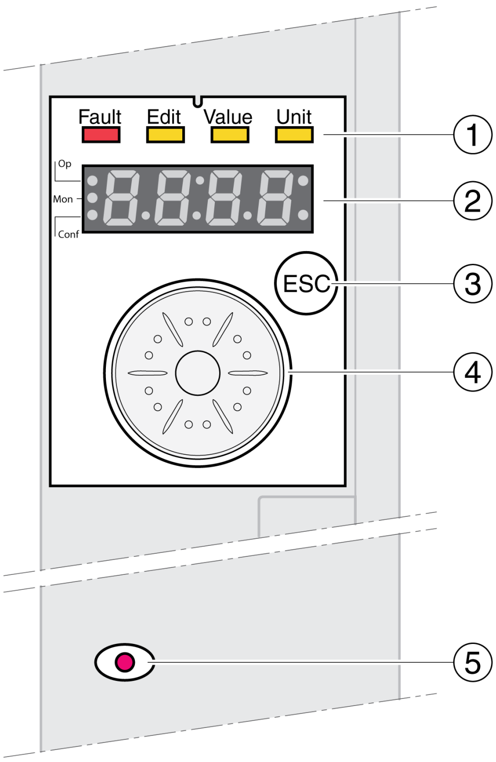
What Is in This Section?

This section contains the following topics:

Overview of Integrated HMI

Overview

The device allows you to edit parameters, start the operating mode Jog or perform autotuning via the integrated Human-Machine Interface (HMI). Diagnostics information (such as parameter values or error codes) can also be displayed. The individual sections on commissioning and operation include information on whether a function can be carried out via the integrated HMI or whether the commissioning software must be used.



1 Status LEDs
2 7-segment display
3 ESC key
4 Navigation button
5 Red LED on: Voltage present at DC bus

Status LEDs and a 4-digit 7-segment display indicate the device status, menu designation, parameter codes, status codes and error codes. By turning the navigation button, you can select menu levels and parameters and increment or decrement values. To confirm a selection, press the navigation button.

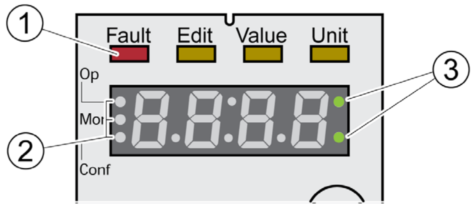
The ESC (Escape) button allows you to exit parameters and menus. If values are displayed, the ESC button lets you return to the last saved value.

Character Set on the HMI

The following table shows the assignment of the characters to the symbols displayed by the 4-digit 7-segment display.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
A	b	c C	d	E	F	G	H	i	J	K	L	Π	n	o	P	q	r
S	T	U	V	W	X	Y	Z	1	2	3	4	5	6	7	8	9	0
S	t	u	V	W	X	y	Z	1	2	3	4	5	6	7	8	9	0

Indication of the Device Status



1 Four status LEDs
2 Three status LEDS for identification of the menu levels
3 Flashing dots indicate an error of error class 0

1: Four status LEDs are located above the 7-segment display:

Fault	Edit	Value	Unit	Meaning
Lights red				Operating state Fault
	Lights yellow	Lights yellow		Parameter value can be edited
		Lights yellow		Value of the parameter
			Lights yellow	Unit of the selected parameter

2: Three status LEDS for identification of the menu levels:

LED	Meaning
Op	Operation
Mon	Status information
Conf	Configuration

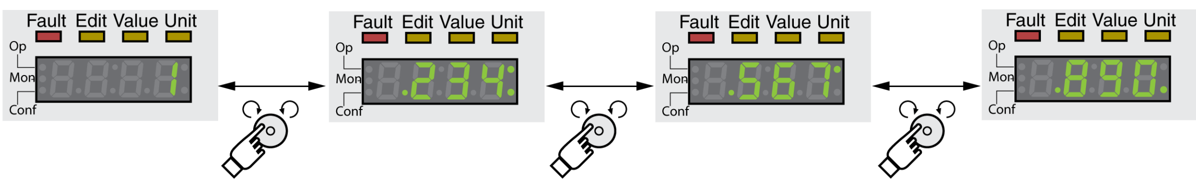
3: Flashing dots indicate an error of error class 0, for example, if a limit value has been exceeded.

Display of Values

The HMI can directly display values up to 999.

Values greater than 999 are displayed in ranges of 1000. Turn the navigation button to select one of the ranges.

Example: Value 1234567890



Navigation Button

The navigation button can be turned and pressed. There are two types of pressing: brief pressing (≤1 s) and long pressing (≥3 s).

Turn the navigation button to do the following:

- Go to the next or previous menu
- Go to the next or previous parameter
- Increment or decrement values
- Switch between ranges in the case of values greater than 999

Briefly **press** the navigation button to do the following:

- Call the selected menu
- Call the selected parameter
- Save the value to the nonvolatile memory

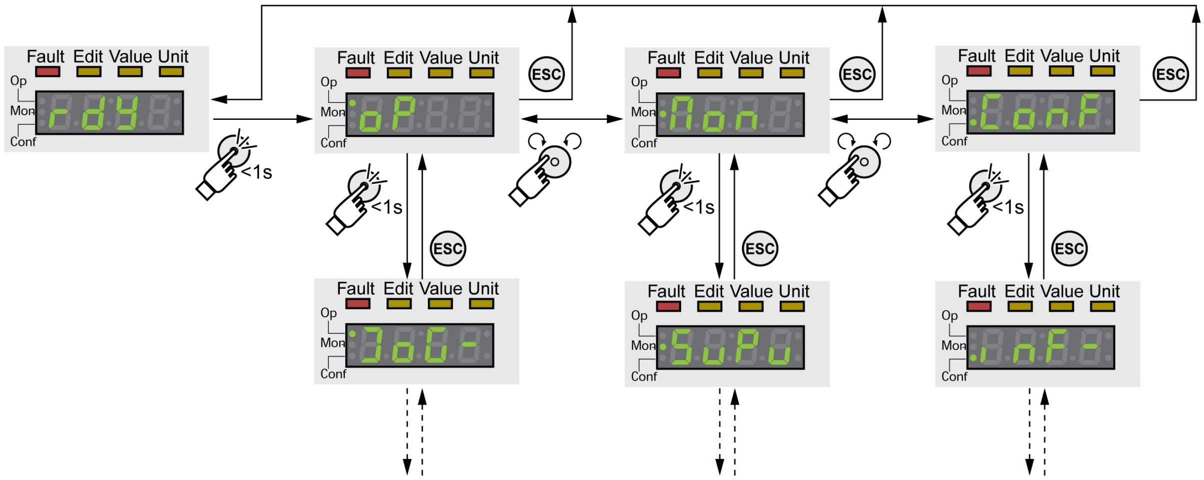
Hold down the navigation button to do the following:

- Display a description of the selected parameter
- Display the unit of the selected parameter

Menu Structure

Overview

The integrated HMI is menu-driven. The following illustration shows the top level of the menu structure.

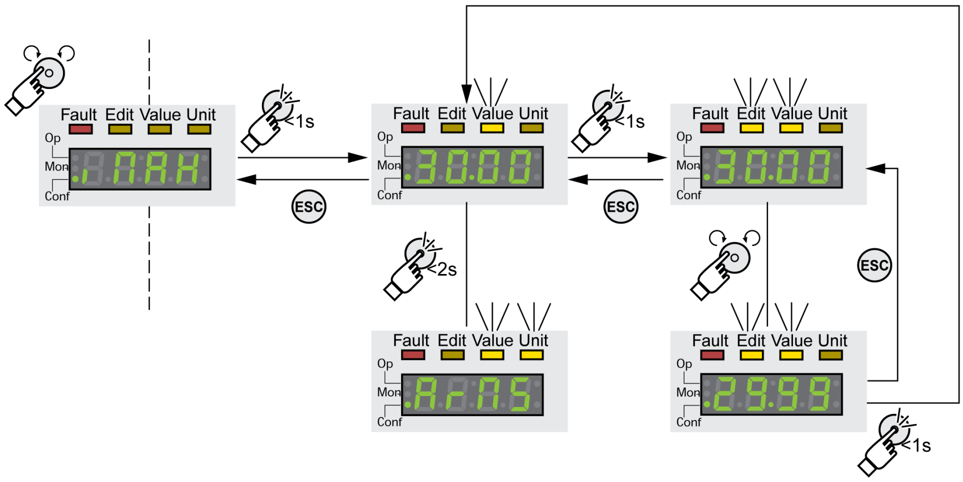


The level below the top level contains the parameters belonging to the respective menu items. To facilitate access, the parameter tables also specify the menu path, for example oP→JoG-.

Making Settings

Displaying and Setting Parameters

The figure below shows an example of displaying a parameter (second level) and entering or selecting a parameter value (third level).



- Go to the parameter iMAX (iMax).
- Press the navigation button for a longer period of time to display a parameter description.
  The parameter description is displayed in the form of horizontally scrolling text.
- Briefly press the navigation button to display the value of the selected parameter.
  The LED Value lights up and the parameter value is displayed.
- Press the navigation button for a longer period of time to display the unit of the parameter value.
  As long as the navigation button is held down, the status LEDs Value and Unit light. The unit of the parameter value is displayed. Once you release the navigation button, the parameter value is displayed again.
- Press the navigation button to modify the value of the parameter.
  The status LEDs Edit and Value light and the parameter value is displayed.
- Turn the navigation button to modify the value of the parameter. The increments and the limit value for each parameter are pre-defined.
- Briefly press the navigation button to save the modified parameter value.
  If you do not want to save the modified parameter value, press the ESC button to cancel. The display returns to the original value of the parameter.
  The displayed modified value of parameter value flashes once and is written to the nonvolatile memory.
- Press ESC to return to the menu

Setting the 7-segment Display

By default, the operating state is displayed by the 4-digit 7-segment display,

You can set the following via the menu item drc- / SuPV:

- StAt displays the operating state, default
- VAct displays the actual velocity of the motor, default
- iAct displays the actual torque of the motor, default

A change only becomes active when the power stage is disabled.

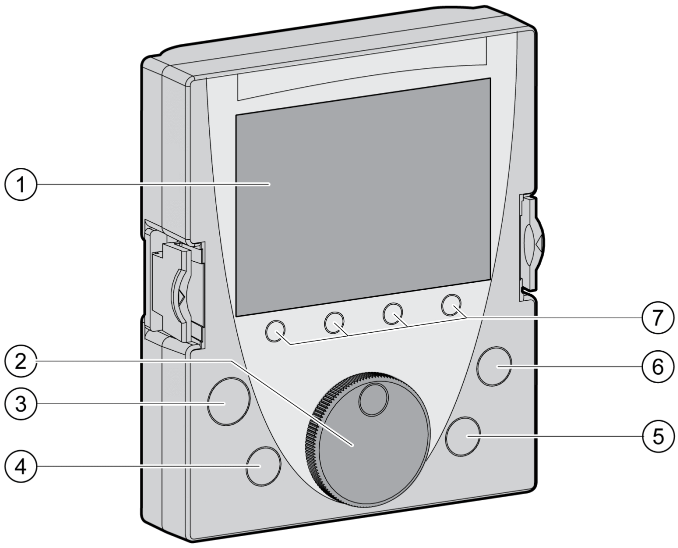
Section 5.3
External graphic display terminal

What Is in This Section?

This section contains the following topics:

Display and Controls

The external graphic display terminal is only designed for commissioning drives.



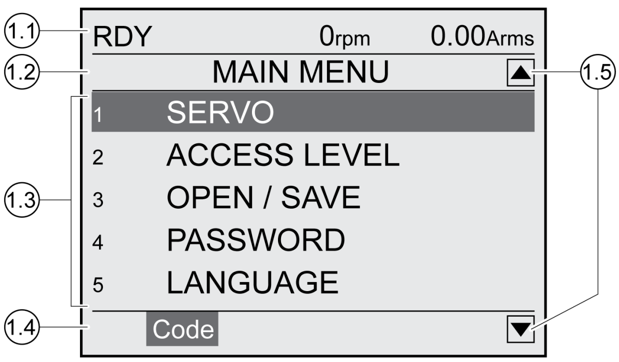
1 Display field
2 Navigation button
3 STOP/RESET key
4 RUN key
5 FWD/REV key
6 ESC key
7 Function keys F1 ... F4

Depending on the firmware version of the external graphic display terminal, the information may be represented differently. Use the most up to date firmware version.

Display Field (1)

The display is subdivided into 5 areas.

Display of the graphic display terminal (example shows English language)



1.1 Status information of the drive
1.2 Menu bar
1.3 Data field
1.4 Function bar
1.5 Navigation

Status Information of the Drive (1.1)

This line displays the operating state, the actual velocity and the actual current of the motor. If an error has been detected, the error code is displayed.

Menu Bar (1.2)

The menu bar displays the name of the menu.

Data Field (1.3)

The following information can be displayed and values entered in the data field:

- Submenus
- Operating Mode
- Parameters and parameter values
- State of movement
- Error messages

Function Bar (1.4)

The function bar displays the name of the function that is triggered when you press the corresponding function key. Example: Pressing the F1 function key displays the "Code". If you press F1, the HMI name of the displayed parameter is shown.

Navigation (1.5)

Arrows indicate that additional information is available that can be displayed by scrolling.

Navigation Button (2)

By turning the navigation button, you can select menu levels and parameters and increment or decrement values. To confirm a selection, press the navigation button.

Key STOP/RESET (3)

The key STOP/RESET terminates a movement by means of a Quick Stop.

Key RUN (4)

The key RUN allows you to start a movement.

Key FWD/REV (5)

The key FWD/REV allows you to reverse the direction of movement.

Key ESC (6)

The ESC (Escape) button allows you to exit parameters and menus or cancel a movement. If values are displayed, the ESC key lets you return to the last saved value.

Function Keys F1 ... F4 (7)

The function bar displays the name of the function triggered when the corresponding function key is pressed.

Connecting the external graphic display terminal to LXM32

The external graphic display terminal is an accessory for the drive, see chapter Accessories and Spare Parts *(see page 455)*. The external graphic display terminal is connected to CN7 (commissioning interface). Only use the cable shipped with the external graphic display terminal to connect it. If the external graphic display terminal is connected to LXM32, the integrated HMI is deactivated. The integrated HMI shows *d i S P* (Display).

Using the external graphic display terminal

The following example shows how to use the external graphic display terminal.

Example 'Setting the Language'

In this example, you set the desired language for the external graphic display terminal. The installation of the drive must have been completed and the 24 Vdc control supply voltage must be on.

- Go to the main menu.
- Rotate the navigation button until item 5 (LANGUAGE) is highlighted.
- Press the navigation button to confirm the selection.
  The menu bar shows the selected function 5 (LANGUAGE). The data field displays the selected value, in this case the selected language.
- Press the navigation button to change the value.
  The menu bar displays the selected function "Language". The supported languages are shown in the data field.
- Turn the navigation button to select the desired language.
  The currently active language is highlighted by a check.
- Press the navigation button to confirm the selected value.
  The menu bar displays the selected function "Language". The selected language is shown in the data field.
- Press ESC to return to the main menu.
  The main menu is displayed in the selected language.

Section 5.4
Commissioning Procedure

What Is in This Section?

This section contains the following topics:

Powering on the Device for the First Time

Performing a "First Setup"

A "First Setup" is required when the 24 Vdc control supply of the drive is powered on for the first time or after the factory settings have been restored.

Automatic Reading of the Motor Data Record

When the device is powered on and if an encoder is connected to CN3, the device automatically reads the electronic nameplate from the Hiperface encoder. The data record is verified and written to the nonvolatile memory.

The data record contains technical information on the motor such as nominal torque and peak torque, nominal current, nominal velocity and number of pole pairs. The data record cannot be modified by the user.

Manual Adjustment of the Motor Parameters

If the motor encoder is not connected to CN3, the motor parameters must be adjusted manually. Note the information in the manual for the encoder modules.

Preparation

If the device is not to be commissioned exclusively via the HMI, a PC with the commissioning software must be connected.

Powering On the Device

- Verify that the power stage supply and the 24 Vdc control supply are powered off.
- Disconnect the product from the fieldbus during commissioning in order to help avoid conflicts by simultaneous access.
- Power on the 24 Vdc control supply.
  The device goes through an initialization routine. The segments of the 7-segment display and the status LEDs light up.

If a memory card is in the slot of the device, the message *CArd* is displayed by the 7-segment display for a short period of time. This indicates that a memory card has been detected. If the message *CArd* is permanently displayed by the 7-segment display, there are differences between the content of the memory card and the parameter values stored in the device. See chapter Memory Card *(see page 177)* for additional information.

Fieldbus Interface

After the initialization, the fieldbus interface must be configured. You must assign a unique network address to each device.

- Enter the network address. The network address is stored in the parameter `SercosAddress`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`SercosAddress` *ConF → CoM -* *Addr*	Sercos device address. This parameter assigns a Sercos address to the drive. Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 0 255	UINT16 R/W per. -	-

If modules are plugged in, you must make additional settings depending on the module. Make these settings as described in the appropriate manuals for the modules.

Restarting the Drive

Depending on the settings of the parameters, a restart of the drive may be required for the modifications to become effective.

- If the HMI shows rdY the drive is ready for operation.
- If the HMI shows nrdY a restart of the drive is required. After the restart, the drive is ready for operation.

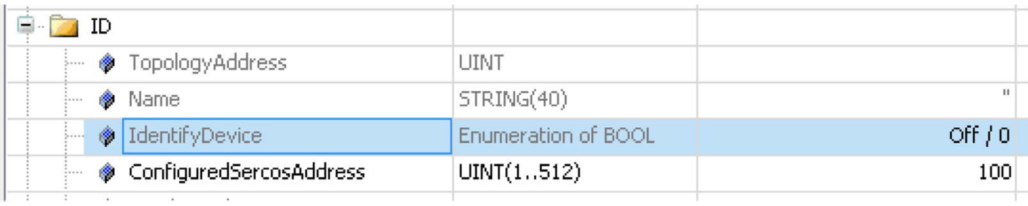
Identifying the Drive

The SERCOS function "IdentifyDevice" allows for easy identification of a slave in the control cabinet.

The function "IdentifyDevice" causes the LED SIII to flash. See chapter Fieldbus Status LEDs *(see page 308)* for more information on the LEDs.

The function "IdentifyDevice" presupposes that communication (CP2 ... CP4) has been established.

The example below shows how the function "IdentifyDevice" is used in the software "SoMachine", "Configuration":



IdentifyDevice = Off / 0: Function "IdentifyDevice" is not active

IdentifyDevice = On / 1: Function "IdentifyDevice" is active

Further Steps

- Attach a label to the device that contains information for servicing the device such as fieldbus type and device address.
- Make the settings described below for commissioning.

NOTE: For more information on the presentation of parameters and a list of all operational parameters of the drive, see chapter Parameters *(see page 357)*.

Setting Limit Values

Setting Limit Values

Suitable limit values must be determined and calculated on the basis of the system and motor data. As long as the motor is operated without loads, the default settings do not need to be changed.

Current Limitation

The maximum motor current can be set with the parameter `CTRL_I_max`.

The maximum current for the "Quick Stop" function can be limited with the parameter `LIM_I_maxQSTP` and for the "Halt" function with the parameter `LIM_I_maxHalt`.

- Use the parameter `CTRL_I_max` to set the maximum motor current.
- Use the parameter `LIM_I_maxQSTP` to set the maximum motor current for the "Quick Stop" function.
- Use the parameter `LIM_I_maxHalt` to set the maximum motor current for the "Halt" function.

The motor can be decelerated via a deceleration ramp or the maximum current for the functions "Quick Stop" and "Halt".

The device limits the maximum permissible current on the basis of the motor data and the device data. Even if the value entered for the maximum current in the parameter `CTRL_I_max` is too high, the value is limited.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`CTRL_I_max` ConF → drC- iMAX	Current limitation. During operation, the actual current limit is one of the following values (whichever is lowest): - CTRL_I_max - _M_I_max - _PS_I_max Limitations caused by I2t monitoring are also taken into account. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} 0.00 - 463.00	UINT16 R/W per. -	Modbus 4376 IDN P-0-3017.0.12
`LIM_I_maxQSTP` ConF → FLt- qcur	Current for Quick Stop. This value is only limited by the minimum/maximum value range (no limitation of this value by motor/power stage). In the case of a Quick Stop, the current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxQSTP - _M_I_max - _PS_I_max Further current limitations caused by I2t monitoring are also taken into account during a Quick Stop. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} - - -	UINT16 R/W per. -	Modbus 4378 IDN P-0-3017.0.13

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`LIM_I_maxHalt` ConF → ACG - hcur	Current for Halt. This value is only limited by the minimum/maximum value range (no limitation of this value by motor/power stage). In the case of a Halt, the current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxHalt - _M_I_max - _PS_I_max Further current limitations caused by I2t monitoring are also taken into account during a Halt. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} - - -	UINT16 R/W per. -	Modbus 4380 IDN P-0-3017.0.14

Velocity Limitation

The parameter `CTRL_v_max` can be used to limit the maximum velocity.

- Use the parameter `CTRL_v_max` to set the maximum velocity of the motor.

NOTE:
Values for positions, velocities, acceleration and deceleration are specified in the following user-defined unit:
- usr_p for positions
- usr_v for velocities
- usr_a for acceleration and deceleration

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`CTRL_v_max` ConF → drC - nMAX	Velocity limitation. During operation, the velocity limit is one of the following values (whichever is lowest): - CTRL_v_max - M_n_max Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 1 13200 2147483647	UINT32 R/W per. -	Modbus 4384 IDN P-0-3017.0.16

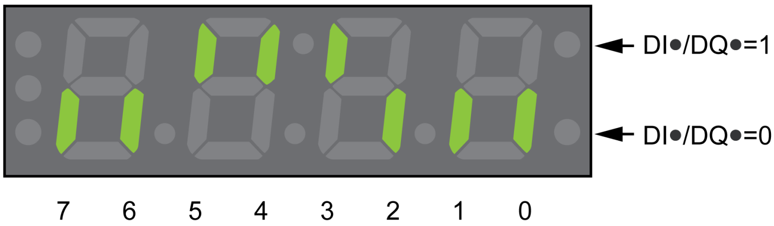
Digital Inputs and Outputs

The device has configurable inputs and configurable outputs. See chapter Digital Inputs and Outputs *(see page 192)* for additional information.

The signal states of the digital inputs and digital outputs can be displayed on the HMI and via the fieldbus.

Integrated HMI

The signal states can be displayed on the integrated HMI, but they cannot be modified.



Inputs (parameter `_IO_DI_act`):

- Open the menu item -Mon → diMo.
  The digital inputs are displayed in a bit-coded way.

Bit	Signal
0	DI0
1	DI1
2	DI2
3	DI3
4	DI4
5	DI5
6 ... 7	-

The parameter `_IO_DI_act` does not display the states of the inputs of the safety function STO. Use the parameter `_IO_STO_act` to visualize the states of the inputs of the safety function STO.

Outputs (parameter `_IO_DQ_act`):

- Open the menu item -Mon → doMo.
  The digital outputs are displayed in a bit-coded way.

Bit	Signal
0	DQ0
1	DQ1
2	DQ2
3 ... 7	-

Fieldbus

The signal states are contained in the parameter `_IO_act` in a bit-coded way. The values "1" and "0" correspond to the signal state of the input or output.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_IO_act`	Physical status of the digital inputs and outputs. Low byte: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3 Bit 4: DI4 Bit 5: DI5 High byte: Bit 8: DQ0 Bit 9: DQ1 Bit 10: DQ2 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2050 IDN P-0-3008.0.1
`_IO_DI_act` Mon diMo	Status of digital inputs. Bit assignments: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3 Bit 4: DI4 Bit 5: DI5 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2078 IDN P-0-3008.0.15
`_IO_DQ_act` Mon doMo	Status of digital outputs. Bit assignments: Bit 0: DQ0 Bit 1: DQ1 Bit 2: DQ2 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2080 IDN P-0-3008.0.16
`_IO_STO_act` Mon Sto	Status of the inputs for the safety-related function STO. Bit 0: STO_A Bit 1: STO_B If no safety module eSM is plugged in, this parameter indicates the status of the signal inputs STO_A and STO_B. If a safety module eSM is plugged in, the safety function STO can be triggered via the signal inputs or via the safety module eSM. This parameter indicates whether or not the safety function STO was triggered (regardless of whether it was triggered via the signal inputs or via the safety module eSM). Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2124 IDN P-0-3008.0.38

Verifying the Signals of the Limit Switches

The use of limit switches can help protect against some hazards (for example, collision with mechanical stop caused by incorrect reference values).

⚠ WARNING

LOSS OF CONTROL

- Ensure that limit switches are installed as determined by your risk assessment.
- Verify correct connection of the limit switches.
- Verify that the limit switches are sufficiently distant from the mechanical end to allow an adequate stopping distance.
- Verify correct parameterization and function of the limit switches.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

- Set up the limit switches in such a way as to keep the motor from overtraveling the limit switches.
- Trigger the limit switches manually.
  If an error message is indicated, the limit switches were triggered.

Parameters can be used to release the limit switches and to set them up as normally closed contacts or normally open contacts, see chapter Limit Switches *(see page 279)*.

Verifying the Safety Function STO

Operation with Safety Function STO

If you want to use the safety function STO, carry out the following steps:

Power off the power stage supply and the 24 Vdc control supply:

- Verify that the signal wires at the inputs (`STO_A`) and (`STO_B`) are isolated from each other. The two signal wires must not be electrically connected.

Power on the power stage supply and the 24 Vdc control supply:

- Enable the power stage without starting a motor movement.
- Trigger the safety function STO.
  If the power stage is now disabled and the error message 1300 is indicated, the safety function STO was triggered.
  If a different error message is indicated, the safety function STO was not triggered.
- Document all tests of the safety function in your acceptance protocol.

Operation without Safety Function STO

If you do not want to use the safety function STO:

- Verify that the inputs `STO_A` and `STO_B` are connected to `+24VDC`.

Holding Brake (Option)

Holding Brake

The holding brake in the motor has the task of holding the motor position when the power stage is disabled. The holding brake is not a safety function and not a service brake.

⚠ WARNING
UNINTENDED AXIS MOVEMENT ● Do not use the internal holding brake as a safety-related measure. ● Only use certified external brakes as safety-related measures. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Releasing the Holding Brake

When the power stage is enabled, current is applied to the motor. When current is applied to the motor, the holding brake is automatically released.

Releasing the holding brake requires a certain amount of time. This time is contained in the electronic nameplate of the motor. Transition to the operating state **6 Operation Enabled** is only possible after this time delay has elapsed.

An additional time delay can be set via parameters, see chapter Additional Time Delay for Releasing the Holding Brake *(see page 150)*.

Applying the Holding Brake

When the power stage is disabled, the holding brake is automatically applied.

However, applying the holding brake requires a certain amount of time. This time is contained in the electronic nameplate of the motor. Current remains to be applied to the motor during this time delay.

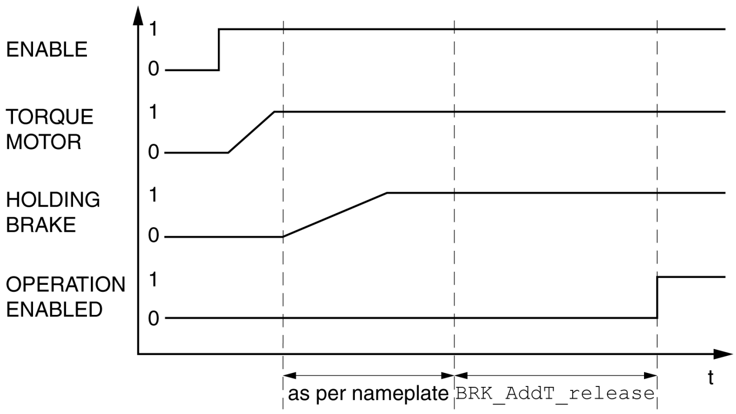
See chapter Safety function STO ("Safe Torque Off") *(see page 79)* for additional information on the behavior of the holding brake when the safety function STO is triggered.

An additional time delay can be set via parameters, see chapter Additional Time Delay for Applying the Holding Brake *(see page 151)*.

Additional Time Delay for Releasing the Holding Brake

An additional time delay can be set via the parameter `BRK_AddT_release`.

Transition to the operating state **6** Operation Enabled is only possible after the entire time delay has elapsed.

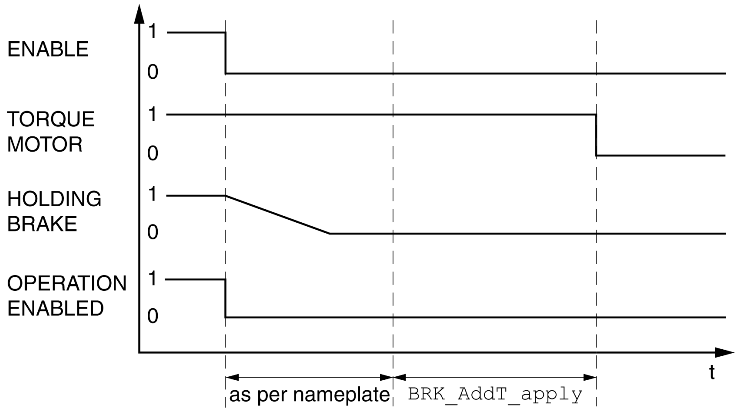


Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`BRK_AddT_release`	Additional time delay for releasing the holding brake. The overall time delay for releasing the holding brake is the time delay from the electronic nameplate of the motor and the additional time delay in this parameter. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	ms 0 0 400	INT16 R/W per. -	Modbus 1294 IDN P-0-3005.0.7

Additional Time Delay for Applying the Holding Brake

An additional time delay can be set via the parameter `BRK_AddT_apply`.

Current continues to be applied to the motor until the entire time delay has passed.



Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`BRK_AddT_apply`	Additional time delay for applying the holding brake. The overall time delay for applying the holding brake is the time delay from the electronic nameplate of the motor and the additional time delay in this parameter. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	ms 0 0 1000	INT16 R/W per. -	Modbus 1296 IDN P-0-3005.0.8

Verifying the Function of the Holding Brake

The device is in the operating state "Ready to switch on".

Step	Action
1	Start the operating mode Jog (HMI: oP→JoG→JGSt). The power stage is enabled and the holding brake released. The HMI displays JG -.
2	If the holding brake has been released, hold down the navigation button. Then press ESC. As long as the navigation button is held down, the motor moves. When you press ESC, the holding brake is applied again and the power stage is disabled.
3	If the holding brake is not released, press ESC. When you press ESC, the power stage is disabled.
4	Verify the wiring if the behavior of the holding brake is not correct.

Releasing the Holding Brake Manually

Mechanical adjustments may require you to manually rotate the motor shaft.

Manual release of the holding brake is only possible in the operating states **3 Switch On Disabled**, **4 Ready To Switch On** or **9 Fault**.

When the product is operated for the first time, there is a risk of unanticipated movements caused by, for example, incorrect wiring or unsuitable parameter settings. Releasing the holding brake can cause an unintended movement, like for example, a falling load in the case of vertical axes.

⚠ WARNING

UNINTENDED MOVEMENT

- Verify that there are no persons or obstructions in the zone of operation when operating the system.
- Take appropriate measures to avoid hazards caused by falling or lowering loads or other unintended movements.
- Run initial tests without coupled loads.
- Verify that a functioning emergency stop push-button is within reach of all persons involved in running tests.
- Anticipate movements in unintended directions or oscillations of the motor.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Applying the Holding Brake Manually

For testing the holding brake, you may want to manually apply the holding brake.

You can only apply the holding brake manually when the motor is at a standstill.

If you enable the power stage after the holding brake has been applied manually, the holding brake remains applied.

Manual application of the holding brake has priority over automatic and manual release of the holding brake.

If a movement is started after the holding brake has been applied manually, this can cause wear.

NOTICE

BRAKE WEAR AND LOSS OF BRAKING TORQUE

- Verify that the generated motor torque is not greater than the holding torque of the holding brake if you have applied the holding brake manually.
- Only apply the holding brake manually for the purpose of testing the holding brake.

Failure to follow these instructions can result in equipment damage.

As of firmware version ≥V01.04, you can manually apply the holding brake.

Releasing the Holding Brake Manually via a Signal Input

In order to release the holding brake via a signal input, you must first parameterize the signal input function "Release Holding Brake", see chapter Digital Inputs and Outputs *(see page 192)*.

Releasing or Applying the Holding Brake Manually via the Fieldbus

The parameter `BRK_release` can be used to release the holding brake via the fieldbus.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`BRK_release`	Manual operation of the holding brake. **0 / Automatic**: Automatic processing **1 / Manual Release**: Manual release of holding brake **2 / Manual Application**: Manual applying of holding brake You can apply or release the holding brake manually. The holding brake can only be manually released in the operating states 'Switch On Disabled', 'Ready To Switch On' or 'Fault'. If you have applied the holding brake manually and then want to release it manually, you must first set this parameter to Automatic and then to Manual Release. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 2	UINT16 R/W - -	Modbus 2068 IDN P-0-3008.0.10

Verifying the Direction of Movement

Definition of Direction of Movement

In the case of a rotary motors, direction of movement is defined in accordance with IEC 61800-7-204: Positive direction is when the motor shaft rotates clockwise as you look at the end of the protruding motor shaft.

It is important to maintain the IEC 61800-7-204 directional standard within your application because many motion-related function blocks, programming conventions, and, safety-related and conventional devices expect this underlying assumption within their logic and operational methodologies.

⚠ WARNING
UNINTENDED MOVEMENT CAUSED BY INTERCHANGED MOTOR PHASES
Do not interchange the motor phases.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

If your application requires an inversion of the direction of movement, you can parameterize the direction of movement.

The direction of movement can be verified by starting a movement.

Verifying the Direction of Movement

Power supply has been powered on.

- Start the operating mode Jog. (HMI: oP → JoG → JGSt)
  The HMI displays JG-.

Movement in positive direction:

- Press the navigation button and hold it down.
  A movement is made in positive direction.

Movement in negative direction:

- Turn the navigation button until the HMI displays -JG.
- Press the navigation button and hold it down.
  A movement is made in negative direction.

Changing the Direction of Movement

You can invert the direction of movement.

- Inversion of direction of movement is off:
  Movements are made in positive direction with positive target values.
- Inversion of direction of movement is on:
  Movements are made in positive direction with negative target values.

The parameter `InvertDirOfMove` allows you to invert the direction of movement.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`InvertDirOfMove` ConF → ACG - inMo	Inversion of direction of movement. **0 / Inversion Off /** oFF: Inversion of direction of movement is off **1 / Inversion On /** on: Inversion of direction of movement is on The limit switch which is reached with a movement in positive direction must be connected to the positive limit switch input and vice versa. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- 0 0 1	UINT16 R/W per. -	Modbus 1560 IDN P-0-3006.0.12

Setting Parameters for Encoder

When starting up, the device reads the absolute position of the motor from the encoder. The absolute position can be read with the parameter _p_absENC.

NOTE:
Values for positions, velocities, acceleration and deceleration are specified in the following user-defined unit:

- usr_p for positions
- usr_v for velocities
- usr_a for acceleration and deceleration

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_p_absENC Mon PAMu	Absolute position with reference to the encoder range. This value corresponds to the modulo position of the absolute encoder range. The value is no longer valid if the gear ratio of machine encoder and motor encoder is changed. A restart is required in such a case. Type: Unsigned decimal - 4 bytes	usr_p - - -	UINT32 R/- - -	Modbus 7710 IDN P-0-3030.0.15

Working Range of the Encoder

The working range of the singleturn encoder is 131072 increments per turn.

The working range of the multiturn encoder is 4096 turns with 131072 increments per turn.

Underrun of Absolute Position

If a rotary motor performs a movement from 0 into negative direction, there is an underrun of the absolute position of the encoder. However, the actual position keeps counting forward and delivers a negative position value. After a power cycle, the actual position no longer corresponds to the negative position value, but to the absolute position of the encoder.

The following options are available to adjust the absolute position of the encoder:

- Adjustment of the absolute position
- Shifting the working range

Adjustment of the Absolute Position

When the motor is at a standstill, the new absolute position of the motor can be set to the current mechanical motor position the with the parameter ENC1_adjustment.

Adjusting the absolute position also shifts the position of the index pulse.

The absolute position of an encoder at encoder 2 (module) can be adjusted via the parameter ENC2_adjustment.

- Set the absolute position at the negative mechanical limit to a position value greater than 0. This way, the movements remain within the continuous range of the encoder.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ENC1_adjustment	Adjustment of absolute position of encoder 1. The value range depends on the encoder type. Singleturn encoder: 0 ... x-1 Multiturn encoder: 0 ... (4096*x)-1 Singleturn encoder (shifted with parameter ShiftEncWorkRang): -(x/2) ... (x/2)-1 Multiturn encoder (shifted with parameter ShiftEncWorkRang): -(2048*x) ... (2048*x)-1 Definition of 'x': Maximum position for one encoder turn in user-defined units. This value is 16384 with the default scaling. If processing is to be performed with inversion of the direction of movement, this must be set before the encoder position is adjusted. After the write access, a wait time of at least 1 second is required before the drive can be powered off. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective after the next power cycle.	usr_p - - -	INT32 R/W - -	Modbus 1324 IDN P-0-3005.0.22

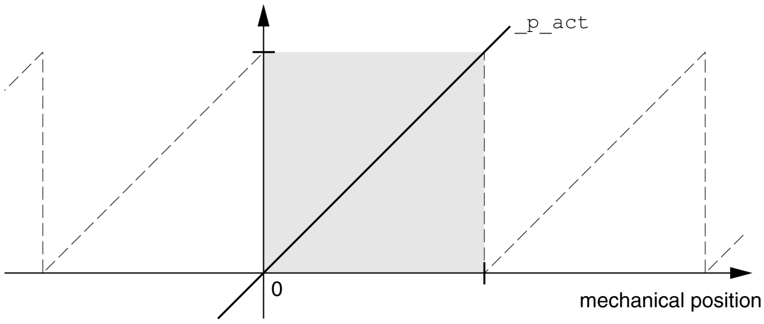
Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ENC2_adjustment	Adjustment of absolute position of encoder 2. The value range depends on the encoder type at the physical port ENC2. This parameter can only be changed if the parameter ENC_abs_source is set to 'Encoder 2'. Singleturn encoder: 0 ... x-1 Multiturn encoder: 0 ... (y*x)-1 Singleturn encoder (shifted with parameter ShiftEncWorkRang): -(x/2) ... (x/2)-1 Multiturn encoder (shifted with parameter ShiftEncWorkRang): -(y/2)*x ... ((y/2)*x)-1 Definition of 'x': Maximum position for one encoder turn in user-defined units. This value is 16384 with the default scaling. Definition of 'y': Revolutions of the multiturn encoder. If processing is to be performed with inversion of the direction of movement, this must be set before the encoder position is adjusted. After the write access, the parameter values have to be saved to the nonvolatile memory and the drive has to be power cycled, before the change becomes effective. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective after the next power cycle.	usr_p - - -	INT32 R/W - -	Modbus 1352 IDN P-0-3005.0.36

Shifting the Working Range

The parameter `ShiftEncWorkRang` lets you shift the working range.

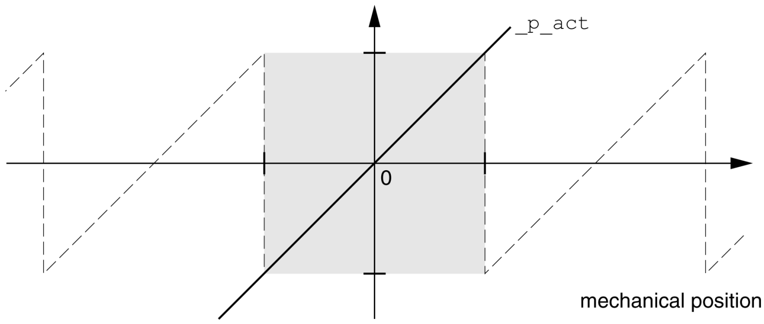
The working range without shift comprises:

Singleturn encoder	0 ... 131071 increments
Multiturn encoder	0 ... 4095 revolutions



The working range with shift comprises:

Singleturn encoder	-65536 ... 65535 increments
Multiturn encoder	-2048 ... 2047 revolutions



Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ShiftEncWorkRang`	Shifting of the encoder working range. **0 / Off**: Shifting off **1 / On**: Shifting on After activating the shifting function, the position range of a multiturn encoder is shifted by one half of the range. Example for the position range of a multiturn encoder with 4096 revolutions: Value 0: Position values are between 0 … 4096 revolutions. Value 1: Position values are between -2048 … 2048 revolutions. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective after the next power cycle.	- 0 0 1	UINT16 R/W per. -	Modbus 1346 IDN P-0-3005.0.33

Setting the Braking Resistor Parameters

Description

An insufficiently rated braking resistor can cause overvoltage on the DC bus. Overvoltage on the DC bus causes the power stage to be disabled. The motor is no longer actively decelerated.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the braking resistor has a sufficient rating by performing a test run under maximum load conditions.
- Verify that the parameter settings for the braking resistor are correct.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The temperature of the braking resistor may exceed 250 °C (482 °F) during operation.

⚠ WARNING

HOT SURFACES

- Ensure that it is not possible to make any contact with a hot braking resistor.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of the braking resistor.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

If you use an external braking resistor, perform the following steps:

- Set the parameter `RESint_ext` to "External Braking Resistor".
- Set the parameters `RESext_P`, `RESext_R` and `RESext_ton`.

The maximum value of `RESext_P` and the minimum value of `RESext_R` depend on the power stage, see chapter External Braking Resistor *(see page 46)*.

See chapter Rating the Braking Resistor *(see page 73)* for additional information.

If the regenerated power becomes greater than the power that can be absorbed by the braking resistor, an error message is generated and the power stage is disabled.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`RESint_ext` CONF → ACG - EIbr	Selection of type of braking resistor. **0 / Internal Braking Resistor / Int**: Internal braking resistor **1 / External Braking Resistor / EHt**: External braking resistor **2 / Reserved / rSVd**: Reserved Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 0 2	UINT16 R/W per. -	Modbus 1298 IDN P-0-3005.0.9
`RESext_P` CONF → ACG - Pobr	Nominal power of external braking resistor. The maximum value depends on the power stage. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	W 1 10 -	UINT16 R/W per. -	Modbus 1316 IDN P-0-3005.0.18

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RESext_R ConF → ACG - rbr	Resistance value of external braking resistor. The minimum value depends on the power stage. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 Ω. Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	Ω - 100.00 327.67	UINT16 R/W per. -	Modbus 1318 IDN P-0-3005.0.19
RESext_ton ConF → ACG - tbr	Maximum permissible switch-on time of external braking resistor. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	ms 1 1 30000	UINT16 R/W per. -	Modbus 1314 IDN P-0-3005.0.17

Autotuning

Autotuning

Autotuning moves the motor in order to tune the control loops. Incorrect parameters may cause unintended movements or the loss of monitoring functions.

⚠ WARNING

UNINTENDED MOVEMENT

- Only start the system if there are no persons or obstructions in the zone of operation.
- Verify that the values for the parameters `AT_dir` and `AT_dis_usr` (`AT_dis`) do not exceed the available movement range.
- Verify that the parameterized movement ranges are available, free and clear for the mechanical movement defined by your application logic.
- Include in your calculations when determining the available movement range, the additional distance for the deceleration ramp in the case of an emergency stop.
- Verify that the parameter settings for a Quick Stop are correct.
- Verify correct operation of the limit switches.
- Verify that a functioning emergency stop push-button is within reach of all persons involved in all phases of machine operation and maintenance involving this equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Autotuning determines the friction torque as a constantly acting load torque and considers it in the calculation of the moment of inertia of the entire system.

External factors such as a load at the motor are considered. Autotuning optimizes the settings of the control loop parameters; see chapter Controller Optimization with Step Response *(see page 165)*.

Autotuning also supports vertical axes.

Methods

There are three ways of tuning the drive control loops:

- Easy Tuning: Automatic - autotuning without user intervention. For most applications, autotuning yields good, highly dynamic results.
- Comfort Tuning: Semi-automatic - autotuning with user intervention. Parameters for direction and parameters for damping can be set by the user.
- Manual Tuning: The user can set and tune the control loop parameters manually. Manual Tuning is available in the Expert Mode of the commissioning software.

Function

During autotuning, the motor is activated and small movements are made. Noise development and mechanical oscillations of the system are normal.

If you want to perform Easy Tuning, no additional parameters need to be adjusted. To perform Comfort Tuning, the parameters `AT_dir`, `AT_dis_usr` and `AT_mechanics` are available to be adjusted to meet the requirements of your application.

The parameter `AT_Start` is used to start Easy Tuning or Comfort Tuning.

- Start autotuning via the commissioning software.
  It is also possible to start autotuning via the HMI.
  HMI: oP → tun → tuSt
- Save the new settings to the nonvolatile memory via the commissioning software.
  If you have started autotuning via the HMI, press the navigation button to save the new values to the nonvolatile memory.
  The product features 2 control loop parameter sets that can be parameterized separately. The values for the control loop parameters determined during autotuning are stored in control loop parameter set 1.

If autotuning cancels with an error message, the default values are used. Change the mechanical position and restart autotuning. If you want to verify the plausibility of the calculated values, you can have them displayed; see chapter Enhanced Settings for Autotuning (see page 163).

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`AT_dir` oP → tun- StiM	Direction of movement for Autotuning. **1 / Positive Negative Home** / Pnh: Positive direction first, then negative direction with return to initial position **2 / Negative Positive Home** / nPh: Negative direction first, then positive direction with return to initial position **3 / Positive Home** / P-h: Positive direction only with return to initial position **4 / Positive** / P--: Positive direction only without return to initial position **5 / Negative Home** / n-h: Negative direction only with return to initial position **6 / Negative** / n--: Negative direction only without return to initial position Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	- 1 1 6	UINT16 R/W - -	Modbus 12040 IDN P-0-3047.0.4
`AT_dis_usr`	Movement range for Autotuning. Movement range within which the control parameters are automatically optimized. The movement range is entered with reference to the actual position. In the case of "Movement in one direction only" (Parameter AT_dir), the specified range is used for each optimization step. The movement typically corresponds to 20 times the value, but it is not limited. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p 1 262144 2147483647	INT32 R/W - -	Modbus 12068 IDN P-0-3047.0.18
`AT_mechanical`	Type of coupling of the system. **1 / Direct Coupling**: Direct coupling **2 / Belt Axis**: Belt axis **3 / Spindle Axis**: Spindle axis Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	- 1 2 3	UINT16 R/W - -	Modbus 12060 IDN P-0-3047.0.14
`AT_start`	Autotuning start. Value 0: Terminate Value 1: Activate EasyTuning Value 2: Activate ComfortTuning Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 - 2	UINT16 R/W - -	Modbus 12034 IDN P-0-3047.0.1

Enhanced Settings for Autotuning

Description

The following parameters allow you to monitor and influence autotuning.

The parameters `AT_state` and `AT_progress` allow you to monitor the progress and status of autotuning.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_AT_state`	Autotuning status. Bit assignments: Bits 0 ... 10: Last processing step Bit 13: auto_tune_process Bit 14: auto_tune_end Bit 15: auto_tune_err Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 12036 IDN P-0-3047.0.2
`_AT_progress`	Progress of Autotuning. Type: Unsigned decimal - 2 bytes	% 0 0 100	UINT16 R/- - -	Modbus 12054 IDN P-0-3047.0.11

If, in a test run, you want to determine the effects of harder or softer settings of the control loop parameters on your system, you can write the parameter `CTRL_GlobGain` to modify the settings determined during autotuning. The parameter `_AT_J` allows you to read the moment of inertia of the entire system calculated during autotuning.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`CTRL_GlobGain` oP → tun- GAin	Global gain factor (affects control loop parameter set 1). The global gain factor affects the following parameters of control loop parameter set 1: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref The global gain factor is set to 100% - if the control loop parameters are set to default - at the end of the Autotuning process - if control loop parameter set 2 is copied to set 1 via the parameter CTRL_ParSetCopy If a full configuration is transmitted via the fieldbus, the value for CTRL_GlobGain must be transmitted prior to the values of the control loop parameters CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref. If CTRL_GlobGain is changed during a configuration transmission, CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref must also be part of the configuration. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 5.0 100.0 1000.0	UINT16 R/W per. -	Modbus 4394 IDN P-0-3017.0.21
`_AT_M_friction`	Friction torque of the system. Is determined during Autotuning. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 12046 IDN P-0-3047.0.7

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_AT_M_load`	Constant load torque. Is determined during Autotuning. Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 12048 IDN P-0-3047.0.8
`_AT_J`	Moment of inertia of the system. Is automatically calculated during Autotuning. Type: Unsigned decimal - 2 bytes In increments of 0.1 kg cm^2.	kg cm^2 0.1 0.1 6553.5	UINT16 R/- per. -	Modbus 12056 IDN P-0-3047.0.12

The parameter `AT_wait` lets you set a waiting time between the individual autotuning steps. Setting a waiting time is only useful in the case of a low-rigidity coupling, in particular so if the next autotuning step (changing the hardness) is already performed while the system is still settling.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`AT_wait`	Waiting time between Autotuning steps. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	ms 300 500 10000	UINT16 R/W - -	Modbus 12050 IDN P-0-3047.0.9

Section 5.5
Controller Optimization with Step Response

What Is in This Section?

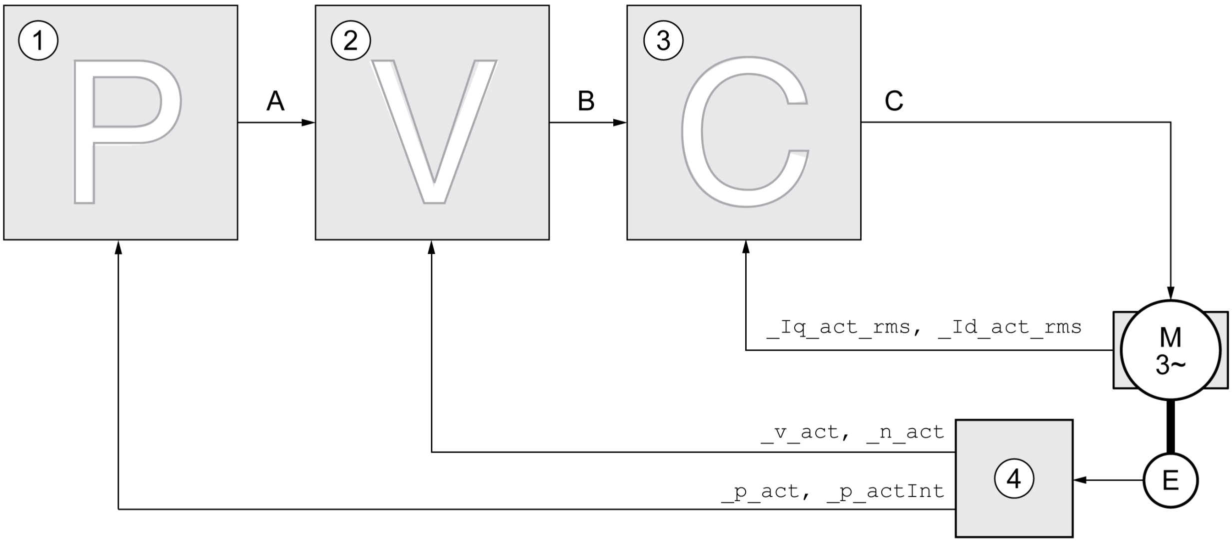
This section contains the following topics:

Controller Structure

Overview

The controller structure corresponds to the classical cascaded closed loop with current controller, velocity controller and position controller. In addition, the reference value of the velocity controller can be smoothed via a filter.

The controllers are tuned one after the other from the "inside" to the "outside" in the following sequence: current control, velocity control, position control.



1 Position controller
2 Velocity controller
3 Current controller
4 Encoder evaluation

See chapter Overview of the Controller Structure *(see page 208)* for a detailed description of the controller structure.

Current Controller

The current controller determines the torque of the motor. The current controller is automatically optimally tuned with the stored motor data.

Velocity Controller

The velocity controller controls the motor velocity by varying the motor current depending on the load situation. The velocity controller has a decisive influence on the dynamic response of the drive. The dynamics of the velocity controller depend on:

- Moment of inertia of the drive and the controlled system
- Power of the motor
- Stiffness and elasticity of the elements in the flow of forces
- Backlash of the drive elements
- Friction

Position Controller

The position controller reduces the difference between the reference position and the actual position of the motor (position deviation) to a minimum. When the motor is at a standstill, the position deviation is close to zero in the case of a well-tuned position controller.

An optimized velocity control loop is a prerequisite for good amplification of the position controller.

Control Loop Parameters

This device allows you to use two control loop parameter sets. It is possible to switch form one set of control loop parameter sets to the other during operation. The active control loop parameter set is selected with the parameter `CTRL_SelParSet`.

The corresponding parameters are `CTRL1_xx` for the first control loop parameter set and `CTRL2_xx` for the second control loop parameter set. The following descriptions use the notation `CTRL1_xx` (`CTRL2_xx`) if there are no functional differences between the two control loop parameter sets.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`CTRL_SelParSet`	Selection of control loop parameter set (non-persistent). Coding see parameter: CTRL_PwrUpParSet Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 1 2	UINT16 R/W - -	Modbus 4402 IDN P-0-3017.0.25
`_CTRL_ActParSet`	Active control loop parameter set. Value 1: Control loop parameter set 1 is active Value 2: Control loop parameter set 2 is active A control loop parameter set is active after the time for the parameter switching (CTRL_ParChgTime) has elapsed. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 4398 IDN P-0-3017.0.23
`CTRL_ParChgTime`	Period of time for control loop parameter set switching. In the case of control loop parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp Such a switching can be caused by - change of the active control loop parameter set - change of the global gain - change of any of the parameters listed above - deactivating the integral term of the velocity controller Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	ms 0 0 2000	UINT16 R/W per. -	Modbus 4392 IDN P-0-3017.0.20

Optimization

The drive optimization function matches the device to the application conditions. The following options are available:

- Selecting control loops. Upstream control loops are automatically deactivated.
- Defining reference value signals: signal type, amplitude, frequency and starting point
- Testing control performance with the signal generator.
- Recording the control performance on screen and evaluating it with the commissioning software.

Setting Reference Value Signals

Start controller optimization with the commissioning software.

Set the following values for the reference value signal:

- Signal type: Step "positive"
- Amplitude: 100 RPM
- Cycle duration: 100 ms
- Number of repetitions: 1

- Start the trace.

Only the signal types "Step" and "Square" allow you to determine the entire dynamic behavior of a control loop. The manual shows signal paths for the signal type "Step".

Entering Values for Optimization

The optimization steps described on the following pages require you to enter control loop parameters and test their effect by triggering a step function.

A step function is triggered as soon as you start a trace in the commissioning software.

Control Loop Parameters

This device allows you to use two control loop parameter sets. It is possible to switch form one set of control loop parameter sets to the other during operation. The active control loop parameter set is selected with the parameter `CTRL_SelParSet`.

The corresponding parameters are `CTRL1_xx` for the first control loop parameter set and `CTRL2_xx` for the second control loop parameter set. The following descriptions use the notation `CTRL1_xx` (`CTRL2_xx`) if there are no functional differences between the two control loop parameter sets.

For details see chapter Switching Between Control Loop Parameter Sets *(see page 207)*.

Optimizing the Velocity Controller

Optimizing complex mechanical control systems require hands-on experience with controller tuning. This includes the ability to calculate control loop parameters and to apply identification procedures.

Less complex mechanical systems can often be optimized by means of experimental adjustment using the aperiodic limit method. The following parameters are used for this:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_KPn ConF → drC - Pn1	Velocity controller P gain. The default value is calculated on the basis of the motor parameters. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.0001 A/RPM. Modified settings become effective immediately.	A/RPM 0.0001 - 2.5400	UINT16 R/W per. -	Modbus 4610 IDN P-0-3018.0.1
CTRL2_KPn ConF → drC - Pn2	Velocity controller P gain. The default value is calculated on the basis of the motor parameters. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.0001 A/RPM. Modified settings become effective immediately.	A/RPM 0.0001 - 2.5400	UINT16 R/W per. -	Modbus 4866 IDN P-0-3019.0.1
CTRL1_TNn ConF → drC - tin1	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4612 IDN P-0-3018.0.2
CTRL2_TNn ConF → drC - tin2	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4868 IDN P-0-3019.0.2

Verify and optimize the calculated values in a second step, see chapter Verifying and Optimizing the P Gain *(see page 173)*.

Reference Value Filter of the Velocity Controller

The reference value filter of the velocity controller allows you to improve the transient response at optimized velocity control. The reference value filter must be deactivated for the first setup of the velocity controller.

- Deactivate the reference value filter of the velocity controller. Set the parameter `CTRL1_TAUnref` (`CTRL2_TAUnref`) to the lower limit value "0".

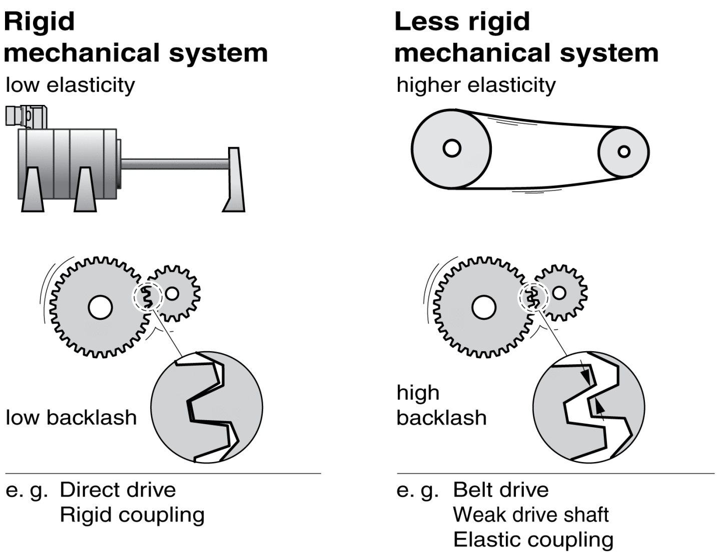
Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`CTRL1_TAUnref` ConF → drC- tAu1	Filter time constant of the reference velocity value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	Modbus 4616 IDN P-0-3018.0.4
`CTRL2_TAUnref` ConF → drC- tAu2	Filter time constant of the reference velocity value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	Modbus 4872 IDN P-0-3019.0.4

Determining the Type of Mechanical System

To assess and optimize the transient response behavior of your system, group its mechanical system into one of the following two categories.

- System with rigid mechanical system
- System with a less rigid mechanical system

Rigid and less rigid mechanical systems



Determining Values for Rigid Mechanical Systems

In the case of a rigid mechanical system, adjusting the control performance on the basis of the table is possible if:

- the moment of inertia of the load and of the motor are known and
- the moment of inertia of the load and of the motor are constant

The P gain `CTRL_KPn` and the integral action time `CTRL_TNn` depend on:

- J_L: Moment of inertia of the load
- J_M: Moment of inertia of the motor

- Determine the values on the basis of the following table:

	$J_L = J_M$		$J_L = 5 * J_M$		$J_L = 10 * J_M$	
J_L	KPn	TNn	KPn	TNn	KPn	TNn
1 $kgcm^2$	0.0125	8	0.008	12	0.007	16
2 $kgcm^2$	0.0250	8	0.015	12	0.014	16
5 $kgcm^2$	0.0625	8	0.038	12	0.034	16
10 $kgcm^2$	0.125	8	0.075	12	0.069	16
20 $kgcm^2$	0.250	8	0.150	12	0.138	16

Determining Values for Less Rigid Mechanical Systems

For optimization purposes, determine the P gain of the velocity controller at which the controller adjusts velocity `_v_act` as quickly as possible without overshooting.

- Set the integral action time `CTRL1_TNn` (`CTRL2_TNn`) to infinite (= 327.67 ms).

If a load torque acts on the motor when the motor is at a standstill, the integral action time must not exceed a value that causes unwanted changes of the motor position.

If the motor is subject to loads when it is at a standstill, setting the integral action time to "infinite" may cause position deviations (for example, in the case of vertical axes). Reduce the integral action time if the position deviation is unacceptable in your application. However, reducing the integral action time can adversely affect optimization results.

⚠ WARNING

UNINTENDED MOVEMENT

- Only start the system if there are no persons or obstructions in the zone of operation.
- Verify that the values for the velocity and the time do not exceed the available movement range.
- Verify that a functioning emergency stop push-button is within reach of all persons involved in the operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

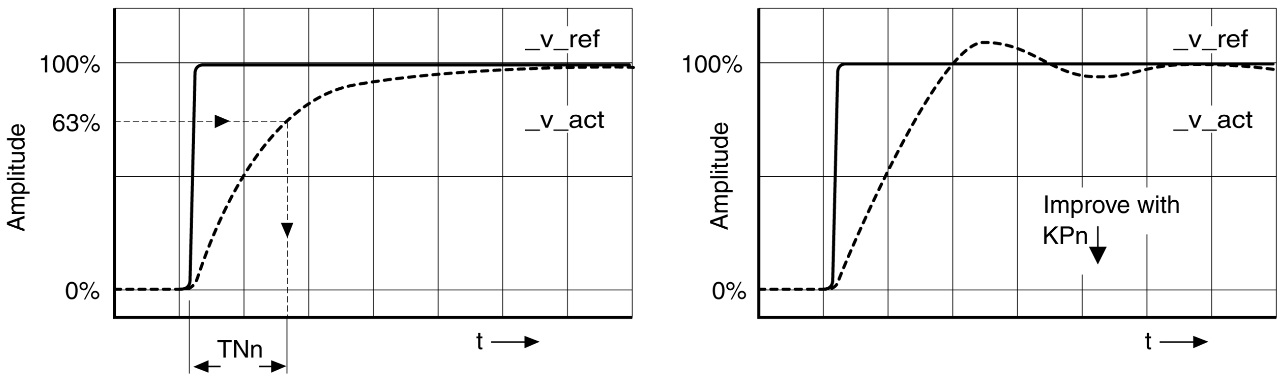
- Trigger a step function.
- After the first test, verify the maximum amplitude for the reference value for the current `_Iq_ref`.

Set the amplitude of the reference value just high enough so the reference value for the current `_Iq_ref` remains below the maximum value `CTRL_I_max`. On the other hand, the value selected should not be too low, otherwise friction effects of the mechanical system will determine the performance of the control loop.

- Trigger another step function if you had to modify `_v_ref` and verify the amplitude of `_Iq_ref`.
- Increase or decrease the P gain in small increments until `_v_act` is obtained as fast as possible. The following diagram shows the required transient response on the left. Overshooting - as shown on the right - is reduced by reducing `CTRL1_KPn` (`CTRL2_KPn`).

Differences between `_v_ref` and `_v_act` result from setting `CTRL1_TNn` (`CTRL2_TNn`) to "Infinite".

Determining "TNn" for the aperiodic limit



In the case of drive systems in which oscillations occur before the aperiodic limit is reached, the P gain "KPn" must be reduced until oscillations can no longer be detected. This occurs frequently in the case of linear axes with a toothed belt drive.

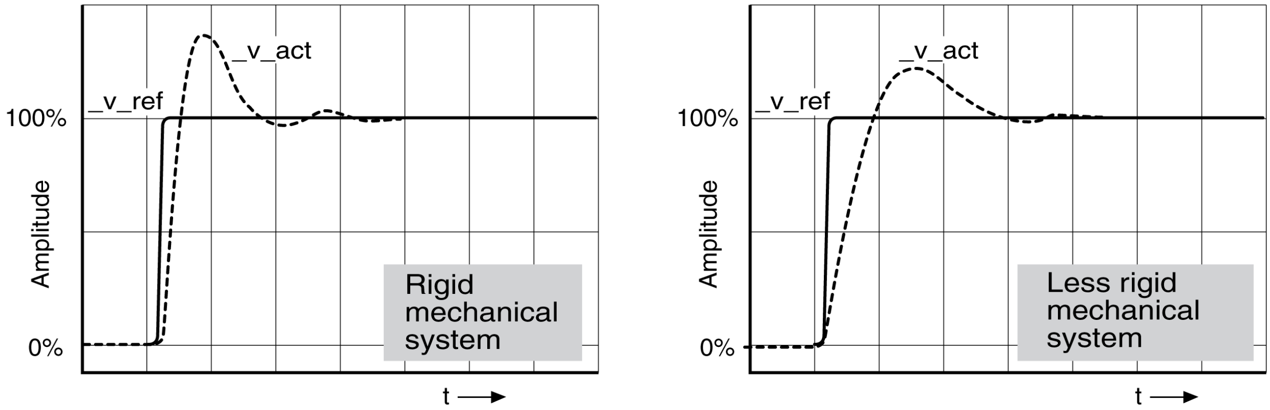
Graphic Determination of the 63% Value

Graphically determine the point at which the actual velocity `_v_act` reaches 63% of the final value. The integral action time `CTRL1_TNn` (`CTRL2_TNn`) then results as a value on the time axis. The commissioning software supports you with the evaluation:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`CTRL1_TNn` ConF → drC - tin1	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4612 IDN P-0-3018.0.2
`CTRL2_TNn` ConF → drC - tin2	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4868 IDN P-0-3019.0.2

Verifying and Optimizing the P Gain

Step responses with good control performance



The controller is properly set when the step response is approximately identical to the signal shown. Good control performance is characterized by

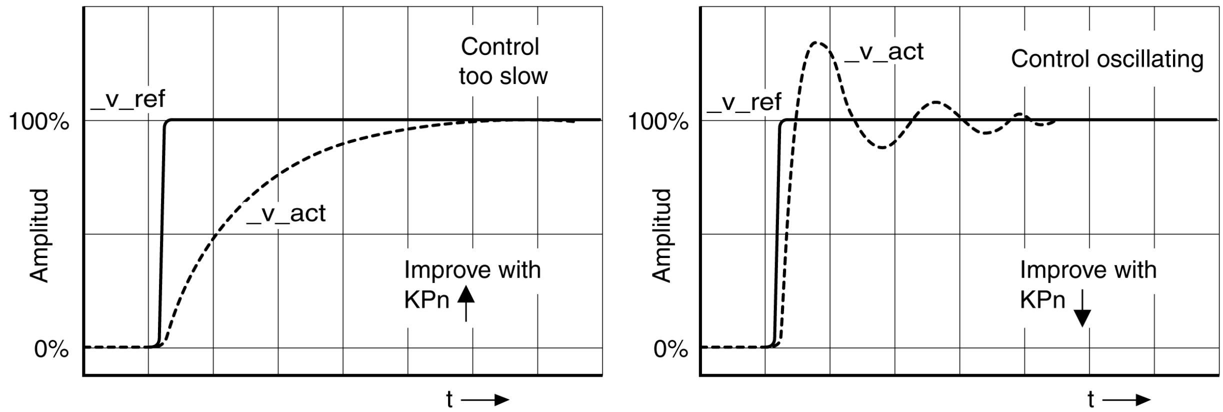
- Fast transient response
- Overshooting up to a maximum of 40%, 20%.

If the control performance does not correspond to the curve shown, change `CTRL_KPn` in increments of about 10% and then trigger another step function:

- If the control is too slow: Use a higher `CTRL1_KPn` (`CTRL2_KPn`) value.
- If the control tends to oscillate: Use a lower `CTRL1_KPn` (`CTRL2_KPn`) value.

Oscillation ringing is characterized by continuous acceleration and deceleration of the motor.

Optimizing insufficient velocity controller settings



Optimizing the Position Controller

General

An optimized velocity controller is a prerequisite for optimization of the position controller.

When tuning the position controller, you must optimize the P gain CTRL1_KPp (CTRL2_KPp):

- CTRL1_KPp (CTRL2_KPp) too high: Overshooting, instability
- CTRL1_KPp (CTRL2_KPp) too low: High position deviation

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_KPp ConF → drC - PP1	Position controller P gain. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 1/s. Modified settings become effective immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	Modbus 4614 IDN P-0-3018.0.3
CTRL2_KPp ConF → drC - PP2	Position controller P gain. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 1/s. Modified settings become effective immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	Modbus 4870 IDN P-0-3019.0.3

The step function moves the motor at constant velocity until the specified time has expired.

⚠ WARNING

UNINTENDED MOVEMENT

- Only start the system if there are no persons or obstructions in the zone of operation.
- Verify that the values for the velocity and the time do not exceed the available movement range.
- Verify that a functioning emergency stop push-button is within reach of all persons involved in the operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Setting the Reference Value Signal

- Select Position Controller as the reference value in the commissioning software.
- Set the reference value signal:
- Signal type: "Step"
- Set the amplitude to approx. 1/10 motor revolution.

The amplitude is entered in user-defined units. With the default scaling, the resolution is 16384 user-defined units per motor revolution.

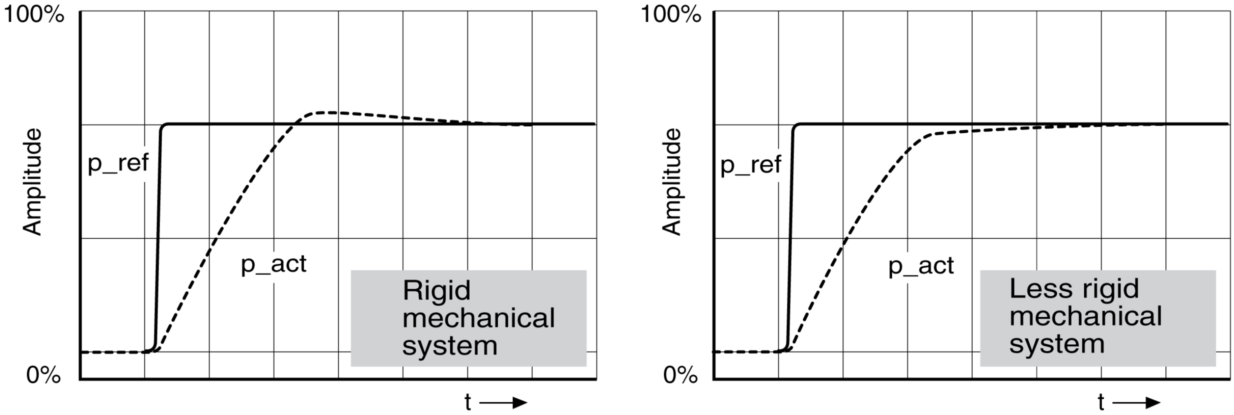
Selecting the Trace Signals

- Select the values in the box General Trace Parameters:
- Reference position of position controller _p_refusr (_p_ref)
- Actual position of position controller _p_actusr (_p_act)
- Actual velocity _v_act
- Reference value current _Iq_ref

Optimizing the Position Controller Value

- Trigger a step function with the default controller values.
- After the first test, verify the values achieved for `_v_act` and `_Iq_ref` for current control and velocity control. The values must not reach the current and velocity limitation range.

Step responses of a position controller with good control performance

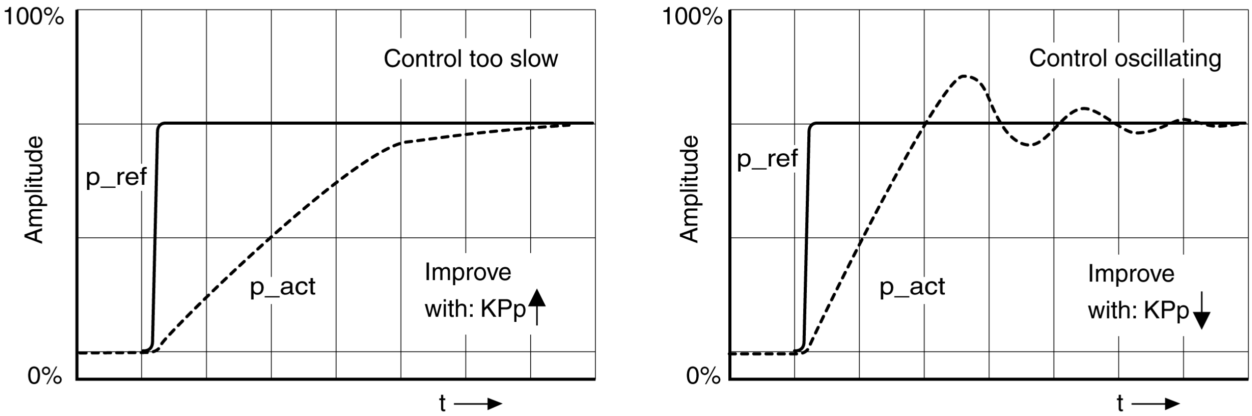


The p gain setting `CTRL1_KPp` (`CTRL2_KPp`) is optimal if the reference value is reached rapidly and with little or no overshooting.

If the control performance does not correspond to the curve shown, change the P gain `CTRL1_KPp` (`CTRL2_KPp`) in increments of approximately 10% and trigger another step function.

- If the control tends to oscillate: Use a lower KPp value.
- If the actual value is too slow reaching the reference value: Use a higher KPp value.

Optimizing inadequate position controller settings



Section 5.6
Parameter Management

What Is in This Section?

This section contains the following topics:

Memory Card

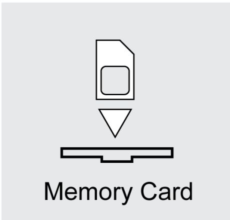
Description

The devices features a card holder for a memory card. The parameters stored on the memory card can be transferred to other devices. If a device is replaced, a new device of the same type can be operated with identical parameters.

The contents of the memory card is compared to the parameters stored in the device when the device is powered on.

When the parameters are written to the nonvolatile memory, they are also saved to the memory card.

The parameters of the safety module require special treatment. See the module manual of the safety module for additional information.



Note the following:

- Use only genuine accessory memory cards.
- Do not touch the gold contacts.
- The insert/remove cycles of the memory card are limited.
- The memory card can remain in the device.
- The memory card can only be removed from the device by pulling (not by pushing).

NOTICE
ELECTROSTATIC DISCHARGE OR INTERMITTENT CONTACT AND LOSS OF DATA
Do not touch the contacts of the memory card.
Failure to follow these instructions can result in equipment damage.

Inserting a Memory Card

- 24 Vdc control supply has been powered off.
- Insert the memory card into the device with the gold contacts face down; the slanted corner must be face to the mounting plate.
- Power on the 24 Vdc control supply.
- Observe the 7-segment display during the initialization of the device.

CArd is Displayed for a Short Period of Time

The device has detected a memory card. User intervention is not required.

The parameter values stored in the device and the contents of the memory card are identical. The data on the memory card originates from the device into which the memory card is plugged in.

CArd is Displayed Permanently

The device has detected a memory card. User intervention is required.

Cause	Options
The memory card is new.	The device data can be transferred to the memory card.
The data on the memory card does not match the device (different device type, different motor type, different firmware version).	The device data can be transferred to the memory card.
The data on the memory card matches the device, but the parameter values are different.	The device data can be transferred to the memory card. The data on the memory card can be transferred to the device. If the memory card is to remain in the device, the device data must be transferred to the memory card.

CArd is Not Displayed

The device has not detected a memory card. Power off the 24 Vdc control supply. Verify that the memory card has been properly inserted (contacts, slanted corner).

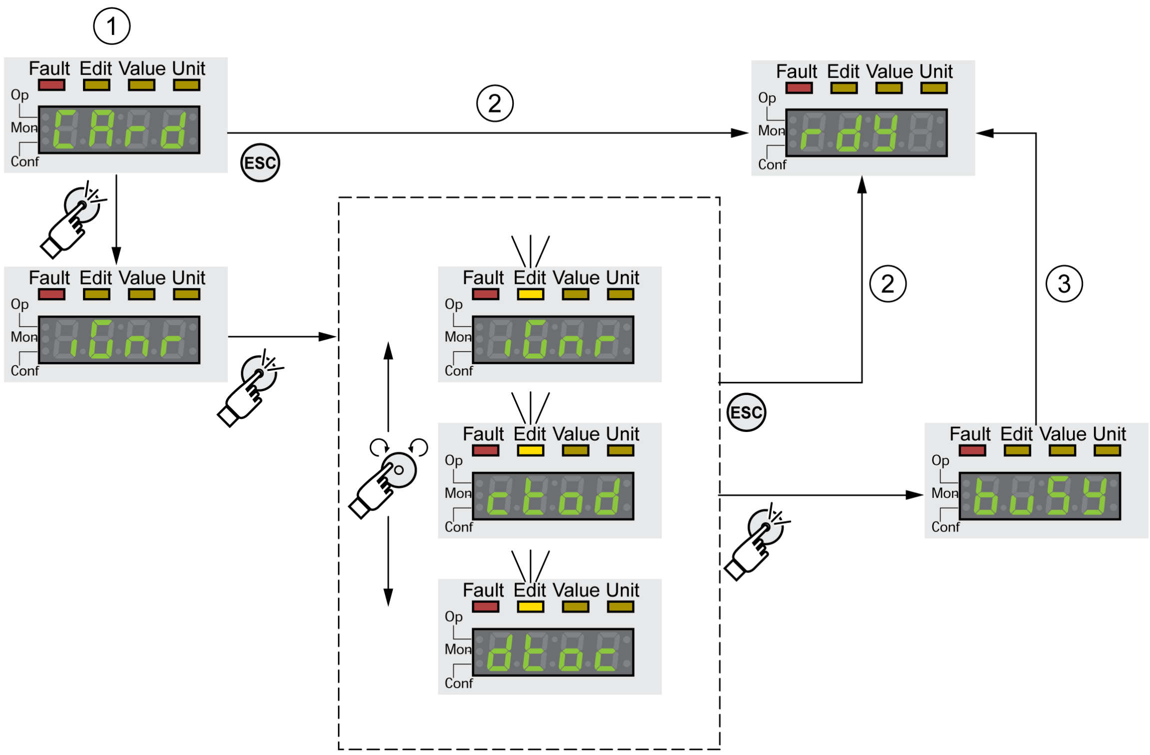
Data Exchange with the Memory Card

If there are differences between the parameters on the memory card and the parameters stored in the device, the device stops after initialization and displays CArd.

Copying Data or Ignoring the Memory Card (CArd iGnr, ctod, dtoc)

If the 7-segment display shows CArd:

- Press the navigation button.
  The 7-segment display shows the last setting, for example iGnr.
- Briefly press the navigation button to activate the Edit mode.
  The 7-segment display continues to display the last setting, the Edit LED lights.
- Select with the navigation button:
  iGnr ignores the memory card.
  ctod transfers the data from the memory card to the device.
  dtoc transfers the data from the device to the memory card.
  The device switches to operating state **4** Ready To Switch On.



1 Data on the memory card and in the device are different: The device displays cArd and waits for user intervention.
2 Transition to operating state **4** Ready To Switch On (memory card is ignored).
3 Transfer of data (ctod = card to device, dtoc = device to card) and transition to operating state **4** Ready To Switch On.

Memory Card has Been Removed (CArdMISS)

If you removed the memory card, the device displays CArd after initialization. If you confirm this, the display shows MISS. If you confirm again, the product transitions to the operating state .**4** Ready To Switch On.

Write Protection for Memory Card (CArd, EnPr, dIPr, Prot)

It is possible to write-protect the memory card for LXM 32 (Prot). For example, you may want to write-protect memory cards used for regular duplication of device data.

To write-protect the memory card, select ConF - ACG - CArd on the HMI.

Selection	Meaning
EnPr	Write protection on (Prot)
dIPr	Write protection off

Memory cards can also be write-protected via the commissioning software.

Duplicating Existing Parameter Values

Application

Multiple devices are to have the same settings, for example, when devices are replaced.

Prerequisites

- Device type, motor type and firmware version must be identical.
- Tools for duplication:
  - Memory card
  - Commissioning software
- The 24 Vdc control supply must be powered on.

Duplication Using a Memory Card

Device settings can be stored on a memory card (accessories).

The stored device settings can be copied to a device of the same type. Note that the fieldbus address and the settings for the monitoring functions are copied along with this information.

Duplication Using the Commissioning Software

The commissioning software can save the settings of a device in the form of a configuration file. The stored device settings can be copied to a device of the same type. Note that the fieldbus address and the settings for the monitoring functions are copied along with this information.

See the manual for the commissioning software for additional information.

Resetting the User Parameters

Description

The user parameters are reset by means of the parameter PARuserReset.

- Disconnect the drive from the fieldbus.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PARuserReset ConF → FCS - rESu	Reset user parameters. **0 / No / no**: No **65535 / Yes / YES**: Yes Bit 0: Reset persistent user parameters and control loop parameters to default values Bits 1 … 15: For future use The parameters are reset with the exception of: - Communication parameters - Inversion of direction of movement - Type of reference value signal for PTI interface - Settings of encoder simulation - Functions of digital inputs and outputs - Safety module eSM The new settings are not saved to the nonvolatile memory. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 - 65535	UINT16 R/W - -	Modbus 1040 IDN P-0-3004.0.8

Resetting via the HMI

Use the menu items ConF -> FCS - -> rESu of the HMI to reset the user parameters. Confirm the selection with YES.

The new settings are not saved to the nonvolatile memory.

If the drive transitions to the operating state "**2** Not Ready To Switch On" after the user parameters are reset, the new settings only become active after the 24 Vdc control supply of the drive is power cycled.

Resetting via the Commissioning Software

Use the menu items "Device -> User Functions -> Reset User Parameters" in the commissioning software to reset the user parameters.

If the drive transitions to the operating state "**2** Not Ready To Switch On" after the user parameters are reset, the new settings only become active after the 24 Vdc control supply of the drive is power cycled.

Restoring Factory Settings

Description

The parameter values, both active and those saved in nonvolatile memory, are lost in this process.

NOTICE
LOSS OF DATA
Perform a backup of the drive parameters prior to restoring factory settings (factory established parameter values).
Failure to follow these instructions can result in equipment damage.

The commissioning software allows you to save the parameter values set for a drive as a configuration file. For information on saving the existing parameters in the drive, see chapter Parameter Management *(see page 176)*.

The factory settings can be restored via the HMI or the commissioning software.

Disconnect the drive from the fieldbus before you restore the factory settings.

Factory Settings via HMI

Use the menu items ConF → FCS- → rStF of the HMI to restore the factory settings. Confirm the selection with YES.

The new settings only become active until after the 24 Vdc control supply of the drive is power cycled.

Factory Settings via Commissioning Software

Use the menu items **Device** → **User Functions** → **Restore Factory Settings** in the commissioning software to restore the factory settings.

The new settings only become active until after the 24 Vdc control supply of the drive is power cycled.

Chapter 6
Operation

What Is in This Chapter?

This chapter contains the following sections:

Section 6.1
Access Channels

Access Channels

Description

The product can be accessed via different types of access channels. Simultaneous access via multiple access channels or the use of exclusive access may cause unintended equipment operation.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that simultaneous access via multiple access channels cannot cause unintended triggering or blocking of commands.
- Verify that the use of exclusive access cannot cause unintended triggering or blocking of commands.
- Verify that the required access channels are available.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The product can be addressed via different access channels. Access channels are:

- Integrated HMI
- External graphic display terminal
- Fieldbus
- Commissioning software

Only one access channel can have exclusive access to the product. An exclusive access can be provided via different access channels:

- Via the integrated HMI:
  The operating mode Jog or Autotuning can be started via the HMI.
- Via a fieldbus:
  Exclusive access is provided to a fieldbus by blocking the other access channels with the parameter `AccessLock`.
- Via the commissioning software:
  The commissioning software receives exclusive access via the switch "Exclusive access" in position "On".

When the drive is powered on, there is no exclusive access via an access channel.

The signal input functions "Positive Limit Switch (LIMP)", "Negative Limit Switch (LIMN)" and "Reference Switch (REF)" as well as the signals of the safety function STO (`STO_A` and `STO_B`) are available during exclusive access.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`AccessLock`	Locking other access channels. Value 0: Allow control via other access channels Value 1: Lock control via other access channels Example: The access channel is used by the fieldbus. In this case, control via the commissioning software, for example, is not possible. The access channel can only be locked after the currently active operating mode has terminated. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W - -	Modbus 284 IDN P-0-3001.0.14

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
HMIlocked	Lock HMI. **0 / Not Locked /** nLoc: HMI not locked **1 / Locked /** Loc: HMI locked The following functions can no longer be started when the HMI is locked: - Parameter change - Jog - Autotuning - Fault Reset Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 14850 IDN P-0-3058.0.1

Section 6.2
Movement Range

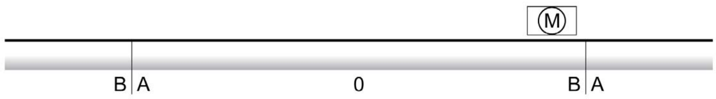
Size of the Movement Range

Description

The movement range is the maximum possible range within which a movement can be made to any position.

The actual position of the motor is the position in the movement range.

The figure below shows the movement range in user-defined units with the factory scaling.



A -2147483648 user-defined units (usr_p)
B 2147483647 user-defined units (usr_p)

Availability

The movement range is relevant in the following operating modes:
- Jog
- Homing
- Cyclic Synchronous Position

Zero Point of the Movement Range

The zero point of the movement range is the point of reference for absolute movements.

Valid Zero Point

The zero point of the movement range is set by means of a reference movement or by position setting.

A reference movement and position setting can be performed in the operating mode Homing.

In the case of a movement beyond the movement range (for example, a relative movement), the zero point becomes invalid.

Section 6.3
Scaling

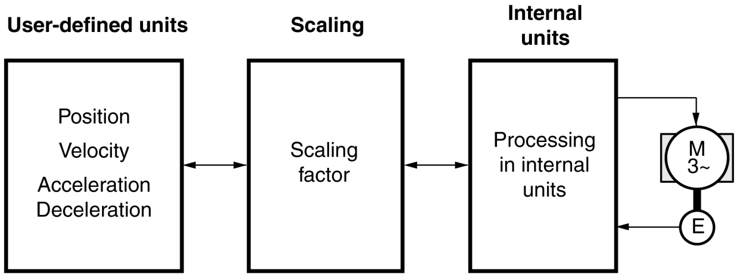
What Is in This Section?

This section contains the following topics:

General

Overview

Scaling converts user-defined units into internal units of the device, and vice versa.



User-Defined Units

Values for positions, velocities, acceleration and deceleration are specified in the following user-defined unit:

- usr_p for positions
- usr_v for velocities
- usr_a for acceleration and deceleration

Modifying the scaling modifies the ratio between user-defined units and internal units. After a modification to the scaling, one and the same value of a parameter specified in a user-defined unit causes a different movement than before the modification. A modification of the scaling affects all parameters whose values are specified in user-defined units.

WARNING

UNINTENDED MOVEMENT

- Verify all parameters with user-defined units before modifying the scaling factor.
- Verify that a modification of the scaling factor cannot cause unintended movements.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Scaling Factor

The scaling factor is the relationship between the motor movement and the required user-defined units.

Configuration of Position Scaling

Description

Position scaling is the relationship between the number of motor revolutions and the required user-defined units (usr_p).

Scaling Factor

Position scaling is specified by means of scaling factor:

In the case of a rotary motor, the scaling factor is calculated as shown below:

$$\frac{\text{Number of revolutions of the motor}}{\text{Number of user-defined units [usr\_p]}}$$

The scaling factor is set to 1 / 131072 by the logic/motion controller.

Configuration of Velocity Scaling

Description

Velocity scaling is the relationship between the number of motor revolutions per minute and the required user-defined units (usr_v).

Scaling Factor

Velocity scaling is specified by means of scaling factor:

In the case of a rotary motor, the scaling factor is calculated as shown below:

$$\frac{\text{Number of revolutions of the motor per minute}}{\text{Number of user-defined units [usr\_v]}}$$

Factory Setting

The following factory settings are used:

- 1 motor revolution per minute corresponds to 1 user-defined unit

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ScaleVELnum`	Velocity scaling: Numerator. Specification of the scaling factor: Speed of rotation of motor [RPM] -- User-defined units [usr_v] A new scaling is activated when the numerator value is supplied. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	RPM 1 1 2147483647	INT32 R/W per. -	Modbus 1604 IDN P-0-3006.0.34
`ScaleVELdenom`	Velocity scaling: Denominator. See numerator (ScaleVELnum) for a description. A new scaling is activated when the numerator value is supplied. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	usr_v 1 1 2147483647	INT32 R/W per. -	Modbus 1602 IDN P-0-3006.0.33

Configuration of Ramp Scaling

Description

Ramp scaling is the relationship between the change in velocity and the required user-defined units (usr_a).

Scaling Factor

Ramp scaling is specified by means of scaling factor:

$$\frac{\text{Velocity change per second}}{\text{Number of user-defined units [usr\_a]}}$$

Factory Setting

The following factory settings are used:

- A change of 1 motor revolution per minute per second corresponds to 1 user-defined unit.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ScaleRAMPnum`	Ramp scaling: Numerator. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	RPM/s 1 1 2147483647	INT32 R/W per. -	Modbus 1634 IDN P-0-3006.0.49
`ScaleRAMPdenom`	Ramp scaling: Denominator. See numerator (ScaleRAMPnum) for a description. A new scaling is activated when the numerator value is supplied. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	usr_a 1 1 2147483647	INT32 R/W per. -	Modbus 1632 IDN P-0-3006.0.48

Section 6.4
Digital Inputs and Outputs

What Is in This Section?

This section contains the following topics:

Parameterization of the Signal Input Functions

Signal Input Function

Various signal input functions can be assigned to the digital signal inputs.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the wiring is appropriate for the factory settings and any subsequent parameterizations.
- Only start the system if there are no persons or obstructions in the zone of operation.
- Carefully run tests for all operating states and potential error situations when commissioning, upgrading or otherwise modifying the operation of the drive.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Factory Settings

The table below shows the factory settings of the digital signal inputs:

Signal	Signal input function
`DI0`	Freely Available
`DI1`	Reference Switch (REF)
`DI2`	Positive Limit Switch (LIMP)
`DI3`	Negative Limit Switch (LIMN)
`DI4`	Freely Available
`DI5`	Freely Available

Parameterization

The table below provides an overview of the possible signal input functions:

Signal input function	Description in chapter
Freely Available	Setting a Signal Output via Parameter *(see page 270)*
Reference Switch (REF)	Reference Switch *(see page 280)*
Positive Limit Switch (LIMP)	Limit Switches *(see page 279)*
Negative Limit Switch (LIMN)	Limit Switches *(see page 279)*
Switch Controller Parameter Set	Switching Between Control Loop Parameter Sets *(see page 207)*
Velocity Controller Integral Off	Switching Between Control Loop Parameter Sets *(see page 207)*
Release Holding Brake	Releasing the Holding Brake Manually *(see page 152)*

The following parameters can be used to parameterize the digital signal inputs:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DI0 ConF → i-o- di0	Function Input DI0. **1 / Freely Available** / nonE: Available as required **21 / Reference Switch (REF)** / rEF: Reference switch **22 / Positive Limit Switch (LIMP)** / LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN)** / LiMn: Negative limit switch **24 / Switch Controller Parameter Set** / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off** / tnoF: Switches off velocity controller integral term **40 / Release Holding Brake** / rEhb: Releases the holding brake Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1794 IDN P-0-3007.0.1
IOfunct_DI1 ConF → i-o- di1	Function Input DI1. **1 / Freely Available** / nonE: Available as required **21 / Reference Switch (REF)** / rEF: Reference switch **22 / Positive Limit Switch (LIMP)** / LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN)** / LiMn: Negative limit switch **24 / Switch Controller Parameter Set** / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off** / tnoF: Switches off velocity controller integral term **40 / Release Holding Brake** / rEhb: Releases the holding brake Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1796 IDN P-0-3007.0.2
IOfunct_DI2 ConF → i-o- di2	Function Input DI2. **1 / Freely Available** / nonE: Available as required **21 / Reference Switch (REF)** / rEF: Reference switch **22 / Positive Limit Switch (LIMP)** / LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN)** / LiMn: Negative limit switch **24 / Switch Controller Parameter Set** / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off** / tnoF: Switches off velocity controller integral term **40 / Release Holding Brake** / rEhb: Releases the holding brake Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1798 IDN P-0-3007.0.3

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DI3 ConF → i-o- di3	Function Input DI3. **1 / Freely Available** / nonE: Available as required **21 / Reference Switch (REF)** / rEF: Reference switch **22 / Positive Limit Switch (LIMP)** / LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN)** / LiMn: Negative limit switch **24 / Switch Controller Parameter Set** / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off** / tnoF: Switches off velocity controller integral term **40 / Release Holding Brake** / rEhb: Releases the holding brake Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1800 IDN P-0-3007.0.4
IOfunct_DI4 ConF → i-o- di4	Function Input DI4. **1 / Freely Available** / nonE: Available as required **21 / Reference Switch (REF)** / rEF: Reference switch **22 / Positive Limit Switch (LIMP)** / LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN)** / LiMn: Negative limit switch **24 / Switch Controller Parameter Set** / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off** / tnoF: Switches off velocity controller integral term **40 / Release Holding Brake** / rEhb: Releases the holding brake Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1802 IDN P-0-3007.0.5
IOfunct_DI5 ConF → i-o- di5	Function Input DI5. **1 / Freely Available** / nonE: Available as required **21 / Reference Switch (REF)** / rEF: Reference switch **22 / Positive Limit Switch (LIMP)** / LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN)** / LiMn: Negative limit switch **24 / Switch Controller Parameter Set** / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off** / tnoF: Switches off velocity controller integral term **40 / Release Holding Brake** / rEhb: Releases the holding brake Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1804 IDN P-0-3007.0.6

Parameterization of the Signal Output Functions

Signal Output Function

Various signal output functions can be assigned to the digital signal outputs.

In the case of a detected error the state of the signal outputs remains active according to assigned signal output function.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the wiring is appropriate for the factory settings and any subsequent parameterizations.
- Only start the system if there are no persons or obstructions in the zone of operation.
- Carefully run tests for all operating states and potential error situations when commissioning, upgrading or otherwise modifying the operation of the drive.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Factory Settings

The table below shows the factory settings of the digital signal outputs:

Signal	Signal output function
`DQ0`	No Fault
`DQ1`	Active
`DQ2`	Freely Available

Parameterization

The table below provides an overview of the possible signal output functions:

Signal output function	Description in chapter
Freely Available	Setting a Signal Output via Parameter *(see page 270)*
No Fault	Indication of the Operating State via Signal Inputs *(see page 229)*
Active	Indication of the Operating State via Signal Inputs *(see page 229)*
In Position Deviation Window	Position Deviation Window *(see page 288)*
In Velocity Deviation Window	Velocity Deviation Window *(see page 290)*
Velocity Below Threshold	Velocity Threshold Value *(see page 292)*
Current Below Threshold	Current Threshold Value *(see page 293)*
Halt Acknowledge	Stop Movement with Halt *(see page 266)*
Motor Standstill	Motor Standstill and Direction of Movement *(see page 287)*
Selected Error	Indicating Error Messages *(see page 316)*
Drive Referenced (ref_ok)	Operating Mode Homing *(see page 245)*
Selected Warning	Indicating Error Messages *(see page 316)*
Motor Moves Positive	Motor Standstill and Direction of Movement *(see page 287)*
Motor Moves Negative	Motor Standstill and Direction of Movement *(see page 287)*

The following parameters can be used to parameterize the digital signal outputs:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`IOfunct_DQ0` ConF → i-o- do0	Function Output DQ0. **1 / Freely Available** / nonE: Available as required **2 / No Fault** / nFLt: Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active** / Acti: Signals operating state Operation Enabled **5 / In Position Deviation Window** / in-P: Position deviation is within window **6 / In Velocity Deviation Window** / in-V: Velocity deviation is within window **7 / Velocity Below Threshold** / Vthr: Motor velocity below threshold **8 / Current Below Threshold** / ithr: Motor current below threshold **9 / Halt Acknowledge** / hALt: Halt acknowledgement **13 / Motor Standstill** / MStd: Motor at a standstill **14 / Selected Error** / SErr: One of the specified errors of error classes 1 … 4 is active **15 / Valid Reference (ref_ok)** / rEFo: Zero point is valid (ref_ok) **16 / Selected Warning** / SWrn: One of the specified errors of error class 0 is active **22 / Motor Moves Positive** / MPoS: Motor moves in positive direction **23 / Motor Moves Negative** / MnEG: Motor moves in negative direction Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1810 IDN P-0-3007.0.9

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DQ1 ConF → i-o- do1	Function Output DQ1. **1 / Freely Available** / nonE: Available as required **2 / No Fault** / nFLt: Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active** / Acti: Signals operating state Operation Enabled **5 / In Position Deviation Window** / in-P: Position deviation is within window **6 / In Velocity Deviation Window** / in-V: Velocity deviation is within window **7 / Velocity Below Threshold** / Vthr: Motor velocity below threshold **8 / Current Below Threshold** / ithr: Motor current below threshold **9 / Halt Acknowledge** / hALt: Halt acknowledgement **13 / Motor Standstill** / MStd: Motor at a standstill **14 / Selected Error** / SErr: One of the specified errors of error classes 1 … 4 is active **15 / Valid Reference (ref_ok)** / rEFo: Zero point is valid (ref_ok) **16 / Selected Warning** / SWrn: One of the specified errors of error class 0 is active **22 / Motor Moves Positive** / MPoS: Motor moves in positive direction **23 / Motor Moves Negative** / MnEG: Motor moves in negative direction Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1812 IDN P-0-3007.0.10

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DQ2 ConF → i-o- do2	Function Output DQ2. **1 / Freely Available** / nonE: Available as required **2 / No Fault** / nFLt: Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active** / Acti: Signals operating state Operation Enabled **5 / In Position Deviation Window** / in-P: Position deviation is within window **6 / In Velocity Deviation Window** / in-V: Velocity deviation is within window **7 / Velocity Below Threshold** / Vthr: Motor velocity below threshold **8 / Current Below Threshold** / ithr: Motor current below threshold **9 / Halt Acknowledge** / hALt: Halt acknowledgement **13 / Motor Standstill** / MStd: Motor at a standstill **14 / Selected Error** / SErr: One of the specified errors of error classes 1 … 4 is active **15 / Valid Reference (ref_ok)** / rEFo: Zero point is valid (ref_ok) **16 / Selected Warning** / SWrn: One of the specified errors of error class 0 is active **22 / Motor Moves Positive** / MPoS: Motor moves in positive direction **23 / Motor Moves Negative** / MnEG: Motor moves in negative direction Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1814 IDN P-0-3007.0.11

Parameterization of Software Debouncing

Debounce Time

Signal input debouncing comprises hardware debouncing and software debouncing.

Hardware debounce time is permanently set, see chapter Signals, Hardware switching time *(see page 36)*.

When a set signal function is changed and when the product is power cycled, software debouncing is reset to the factory setting.

The software debounce time can be set via the following parameters.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`DI_0_Debounce`	Debounce time of DI0. 0 / No 1 / 0.25 ms 2 / 0.50 ms 3 / 0.75 ms 4 / 1.00 ms 5 / 1.25 ms 6 / 1.50 ms Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2112 IDN P-0-3008.0.32
`DI_1_Debounce`	Debounce time of DI1. 0 / No 1 / 0.25 ms 2 / 0.50 ms 3 / 0.75 ms 4 / 1.00 ms 5 / 1.25 ms 6 / 1.50 ms Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2114 IDN P-0-3008.0.33
`DI_2_Debounce`	Debounce time of DI2. 0 / No 1 / 0.25 ms 2 / 0.50 ms 3 / 0.75 ms 4 / 1.00 ms 5 / 1.25 ms 6 / 1.50 ms Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2116 IDN P-0-3008.0.34
`DI_3_Debounce`	Debounce time of DI3. 0 / No 1 / 0.25 ms 2 / 0.50 ms 3 / 0.75 ms 4 / 1.00 ms 5 / 1.25 ms 6 / 1.50 ms Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2118 IDN P-0-3008.0.35

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`DI_4_Debounce`	Debounce time of DI4. 0 / No 1 / 0.25 ms 2 / 0.50 ms 3 / 0.75 ms 4 / 1.00 ms 5 / 1.25 ms 6 / 1.50 ms Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2120 IDN P-0-3008.0.36
`DI_5_Debounce`	Debounce time of DI5. 0 / No 1 / 0.25 ms 2 / 0.50 ms 3 / 0.75 ms 4 / 1.00 ms 5 / 1.25 ms 6 / 1.50 ms Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2122 IDN P-0-3008.0.37

Section 6.5
PTI and PTO Interface

What Is in This Section?

This section contains the following topics:

Setting the PTI Interface

Availability

Available with firmware version ≥V01.04.

Type of Reference Value Signal

A/B signals, P/D signals or CW/CCW signals can be connected to the PTI interface.

- Set the type of reference value signal for the PTI interface with the parameter `PTI_signal_type`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`PTI_signal_type` ConF → i-o- ioPi	Type of reference value signal for PTI interface. **0 / A/B Signals** / **Ab**: Signals ENC_A and ENC_B (quadruple evaluation) **1 / P/D Signals** / **Pd**: Signals PULSE and DIR **2 / CW/CCW Signals** / **cWcc**: Signals clockwise and counterclockwise Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- 0 0 2	UINT16 R/W per. -	Modbus 1284 IDN P-0-3005.0.2

Inverting the Reference Value Signals

The direction of counting of the reference value signals at the PTI interface can be inverted by means of the parameter `InvertDirOfCount`.

- Activate or deactivate inversion of the direction of counting by means of the parameter `InvertDirOfCount`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`InvertDirOfCount`	Inversion of direction of counting at PTI interface. **0 / Inversion Off**: Inversion of direction of counting is off **1 / Inversion On**: Inversion of direction of counting is on Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 2062 IDN P-0-3008.0.7

Setting the Position Value

The position value at the PTI interface can be set manually by means of the parameter `p_PTI_act_set`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`p_PTI_act_set`	Position value at PTI interface. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Available with firmware version ≥V01.06.	Inc -2147483648 - 2147483647	INT32 R/W - -	Modbus 2130 IDN P-0-3008.0.41

Setting the PTO Interface

Availability

Available with firmware version ≥V01.04.

Type of Usage of PTO Interface

The PTO interface allows you to make reference value signals from the device externally available.

The PTO interface can be used in several ways:

- Encoder simulation based on a position value
- Encoder simulation based on reference current
- PTI signal

The parameter `PTO_mode` lets you set the way the PTO interface is used.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`PTO_mode` ConF → ACG - PtoM	Type of usage of PTO interface. **0 / Off /** oFF: PTO interface disabled **1 / Esim pAct Enc 1 /** PEn1: Encoder simulation based on actual position of encoder 1 **2 / Esim pRef /** PrEF: Encoder simulation based on reference position (_p_ref) **3 / PTI Signal /** Pti: Directly the signal from PTI interface **4 / Esim pAct Enc 2 /** PEn2: Encoder simulation based on actual position of encoder 2 (module) **5 / Esim iqRef /** irEF: Encoder simulation based on reference current **6 / Esim pActRaw Enc2 /** Enc2: Encoder simulation based on raw position value of encoder 2 (module) Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled. Available with firmware version ≥V01.04.	- 0 0 6	UINT16 R/W per. -	Modbus 1342 IDN P-0-3005.0.31

Encoder Simulation Based on a Position Value

The following types of encoder simulation based on a position value are possible:

- Encoder simulation based on actual position of encoder 1
- Encoder simulation based on the reference position values (_p_ref)

The resolution for the encoder simulation is set with the parameter `ESIM_scale`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ESIM_scale` ConF → i-o- ESSC	Resolution of encoder simulation. Resolution defines the number of increments per revolution (AB signal with quadruple evaluation). The index pulse is created once per revolution at an interval where signal A and signal B are high. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle. Available with firmware version ≥V01.04.	EncInc 8 4096 65535	UINT16 R/W per. -	Modbus 1322 IDN P-0-3005.0.21

The parameter `ESIM_HighResolution` lets you set the resolution with decimal places.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ESIM_HighResolution`	Encoder simulation: High resolution. Specifies the number of increments per revolution with 12 bit decimal places. If the parameter is set to a multiple of 4096, the index pulse will be generated exactly at the same position within one revolution. The setting of parameter ESIM_scale is only used if parameter ESIM_HighResolution is set to 0. Otherwise, the setting of ESIM_HighResolution is used. Example: 1417.322835 encoder simulation pulses per revolution are required. Set the parameter to 1417.322835 * 4096 = 5805354. In this example, the index pulse will be generated exactly after every 1417 pulses. This means that the index pulse shifts with each revolution. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle. Available with firmware version ≥V01.04.	EncInc 0 0 268431360	UINT32 R/W per. expert	Modbus 1380 IDN P-0-3005.0.50

The phase shift of the encoder simulation is set with the parameter `ESIM_PhaseShift`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ESIM_PhaseShift`	Encoder simulation: Phase shift for pulse output. The generated encoder simulation pulses can be shifted in units of 1/4096 encoder pulses. The shift results in a position offset at PTO. The index pulse is shifted as well. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately. Available with firmware version ≥V01.04.	- -32768 0 32767	INT16 R/W - expert	Modbus 1382 IDN P-0-3005.0.51

Encoder Simulation Based on Reference Current

In the case of encoder simulation based on the reference current, A/B signals are output. The maximum frequency of the A/B signals is $1.6 * 10^{-6}$ increments per second and corresponds to the maximum reference current (value in parameter `CTRL_I_max`).

With firmware version ≥V01.06, you can set encoder simulation based on the reference current.

PTI Signal

If the PTI signal is selected by means of parameter `PTO_mode`, the signal from the PTI interface is directly made available at the PTO interface.

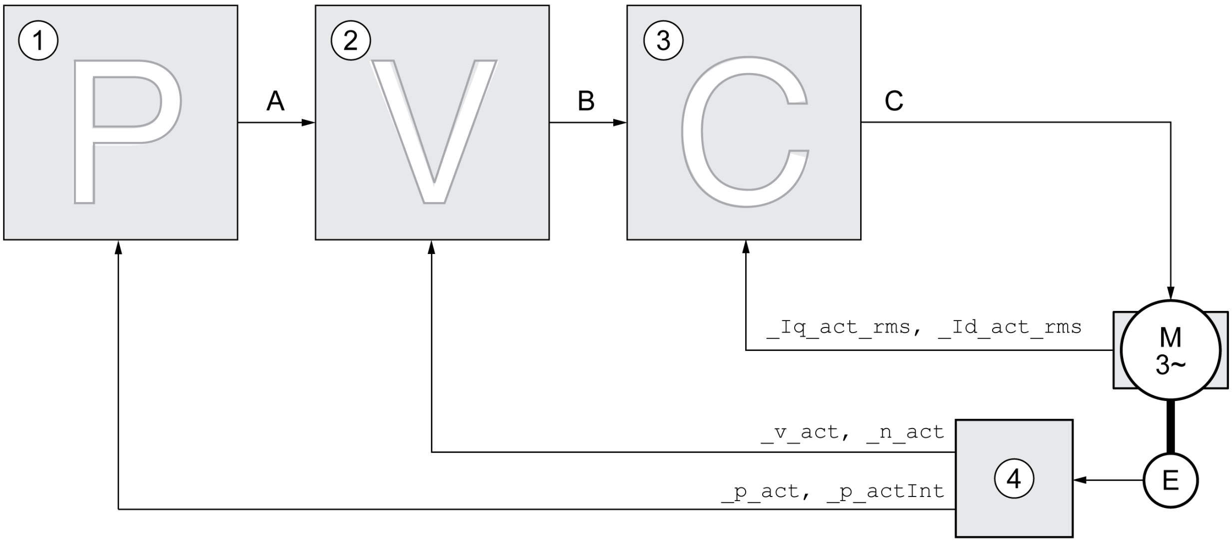
Section 6.6
Switching Between Control Loop Parameter Sets

What Is in This Section?

This section contains the following topics:

Overview of the Controller Structure

The illustration below provides an overview of the controller structure.



1 Position controller
2 Velocity controller
3 Current controller
4 Encoder evaluation

Position Controller

The position controller reduces the difference between the reference position and the actual position of the motor (position deviation) to a minimum. When the motor is at a standstill, the position deviation is close to zero in the case of a well-tuned position controller.

An optimized velocity control loop is a prerequisite for good amplification of the position controller.

Velocity Controller

The velocity controller controls the motor velocity by varying the motor current depending on the load situation. The velocity controller has a decisive influence on the dynamic response of the drive. The dynamics of the velocity controller depend on:

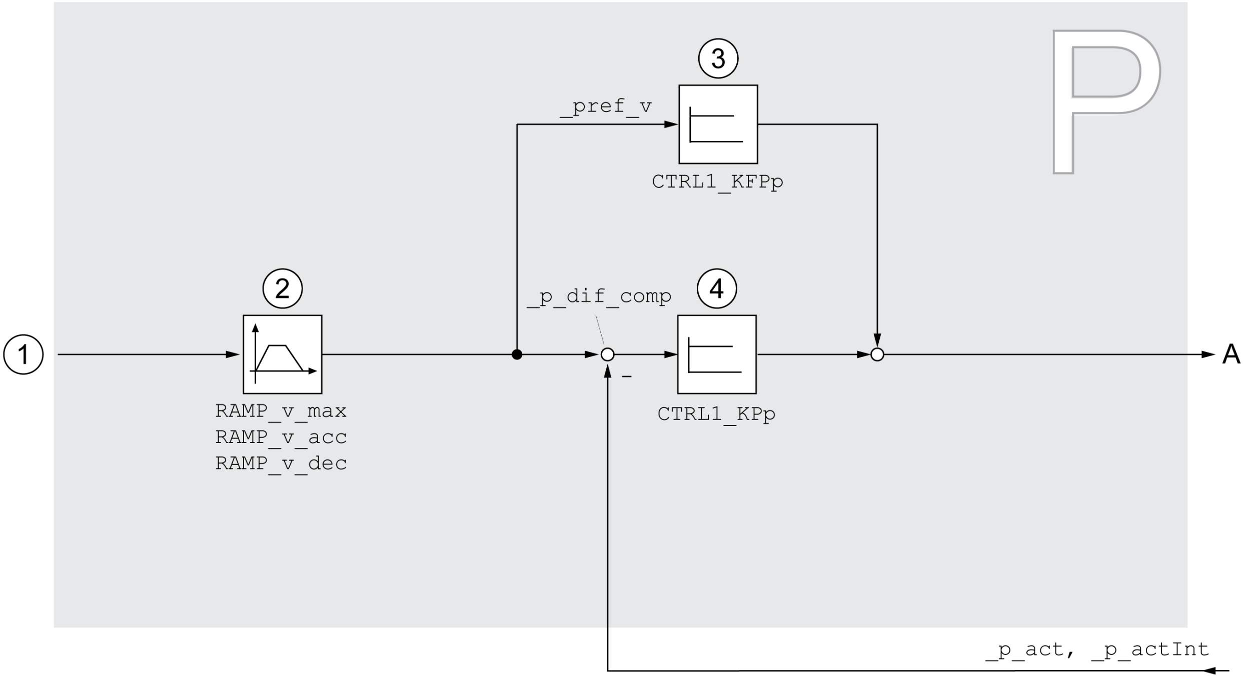
- Moment of inertia of the drive and the controlled system
- Power of the motor
- Stiffness and elasticity of the elements in the flow of forces
- Backlash of the drive elements
- Friction

Current Controller

The current controller determines the torque of the motor. The current controller is automatically optimally tuned with the stored motor data.

Overview of Position Controller

The illustration below provides an overview of the position controller.



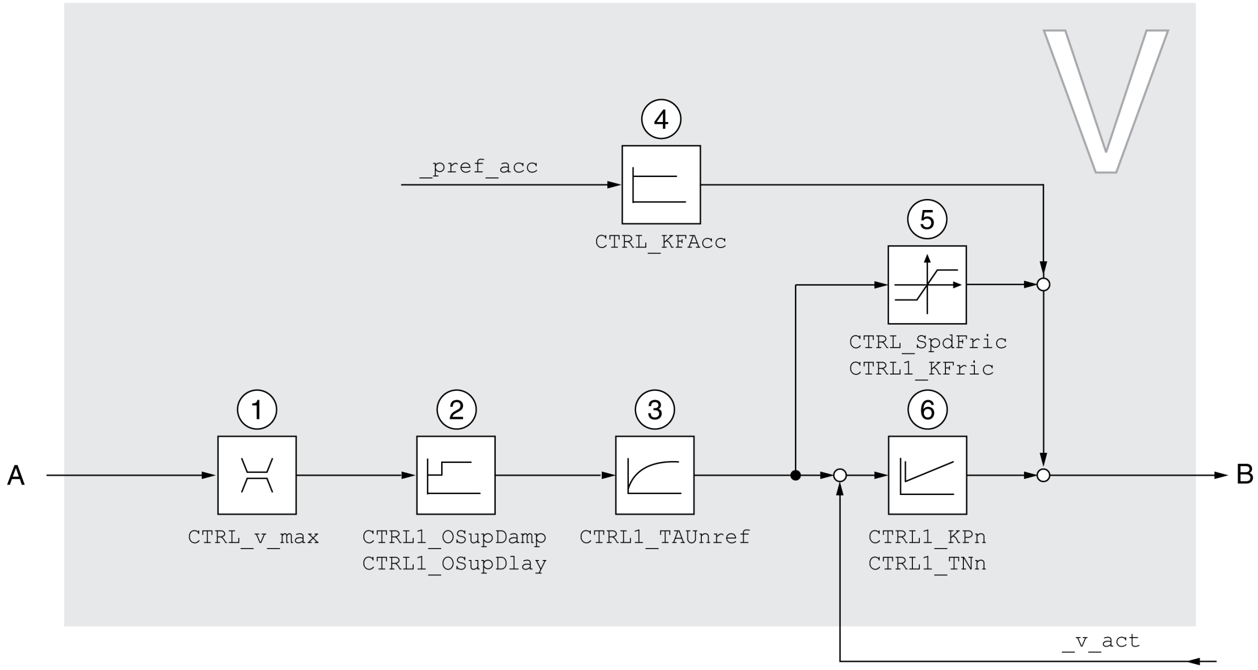
1 Target values for the operating modes Jog and Homing
2 Motion profile for the velocity
3 Velocity feed-forward control
4 Position controller

Sampling Period

The sampling period of the position controller is 250 μs.

Overview of Velocity Controller

The illustration below provides an overview of the velocity controller.



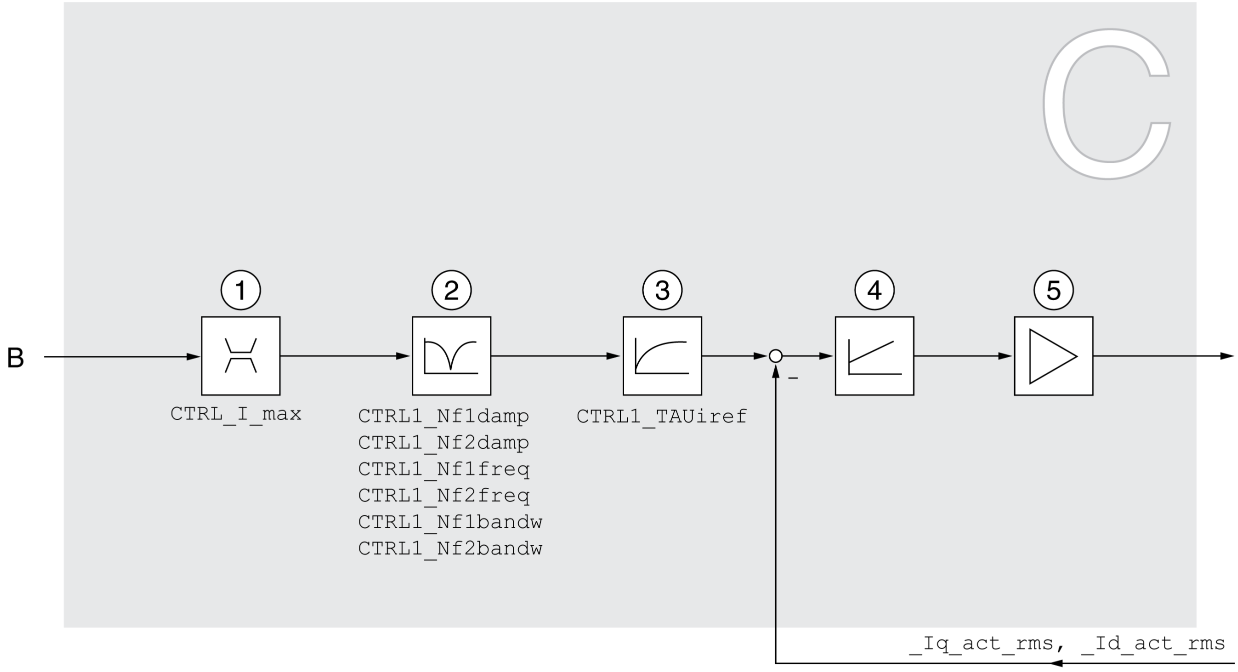
1 Velocity limitation
2 Overshoot suppression filter (parameter accessible in Expert mode)
3 Filter time constant of the reference velocity value filter
4 Acceleration feed forward control (parameter accessible in Expert mode)
5 Friction compensation (parameter accessible in Expert mode)
6 Velocity Loop Controller

Sampling Period

The sampling period of the velocity controller is 62.5 μs.

Overview of Current Controller

The illustration below provides an overview of the current controller.



1 Current limitation
2 Notch filter (parameter accessible in Expert mode)
3 Filter time constant of the reference current value filter
4 Current controller
5 Power stage

Sampling Period

The sampling period of the current controller is 62.5 μs.

Parameterizable Control Loop Parameters

Control Loop Parameter Set

The product features 2 control loop parameter sets that can be parameterized separately. The values for the control loop parameters determined during autotuning are stored in control loop parameter set 1.

A control loop parameter set consists of freely accessible parameters and parameters which are only accessible in Expert mode.

Control loop parameter set 1	Control loop parameter set 2

Freely accessible parameters:
`CTRL1_KPn`
`CTRL1_TNn`
`CTRL1_KPp`
`CTRL1_TAUiref`
`CTRL1_TAUnref`
`CTRL1_KFPp`
Parameters only accessible in expert mode:
`CTRL1_Nf1damp`
`CTRL1_Nf1freq`
`CTRL1_Nf1bandw`
`CTRL1_Nf2damp`
`CTRL1_Nf2freq`
`CTRL1_Nf2bandw`
`CTRL1_Osupdamp`
`CTRL1_Osupdelay`
`CTRL1_Kfric`
	Freely accessible parameters:
	`CTRL2_KPn`
	`CTRL2_TNn`
	`CTRL2_KPp`
	`CTRL2_TAUiref`
	`CTRL2_TAUnref`
	`CTRL2_KFPp`
	Parameters only accessible in expert mode:
	`CTRL2_Nf1damp`
	`CTRL2_Nf1freq`
	`CTRL2_Nf1bandw`
	`CTRL2_Nf2damp`
	`CTRL2_Nf2freq`
	`CTRL2_Nf2bandw`
	`CTRL2_Osupdamp`
	`CTRL2_Osupdelay`
	`CTRL2_Kfric`

See chapters Control Loop Parameter Set 1 *(see page 219)* and Control Loop Parameter Set 2 *(see page 221)*.

Parameterization

- Selecting a control loop parameter set
  Select a control loop parameter set after switching on.
  See chapter Selecting a Control Loop Parameter Set *(see page 213)*.
- Automatically switching between control loop parameter sets
  It is possible to switch between the two control loop parameter sets.
  See chapter Automatically Switching Between Control Loop Parameter Sets *(see page 214)*.
- Copying a control loop parameter set
  The values of control loop parameter set 1 can be copied to control loop parameter set 2.
  See chapter Copying a Control Loop Parameter Set *(see page 217)*.
- Deactivating the integral term
  The integral term and, by implication, the integral action time, can be deactivated via a digital signal input.
  See chapter Deactivating the Integral Term *(see page 218)*.

Selecting a Control Loop Parameter Set

Description

The active control loop parameter set is indicated via the parameter `_CTRL_ActParSet`.

The parameter `CTRL_PwrUpParSet` allows you to set the control loop parameter set to be activated after powering on. Alternatively, you can set whether or not the product is to switch automatically between the two control loop parameter sets.

The parameter `CTRL_SelParSet` allows you to switch between the two control loop parameter sets during operation.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_CTRL_ActParSet`	Active control loop parameter set. Value 1: Control loop parameter set 1 is active Value 2: Control loop parameter set 2 is active A control loop parameter set is active after the time for the parameter switching (CTRL_ParChgTime) has elapsed. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 4398 IDN P-0-3017.0.23
`CTRL_PwrUpParSet`	Selection of control loop parameter set at power up. **0 / Switching Condition**: The switching condition is used for control loop parameter set switching **1 / Parameter Set 1**: Control loop parameter set 1 is used **2 / Parameter Set 2**: Control loop parameter set 2 is used The selected value is also written to CTRL_SelParSet (non-persistent). Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 1 2	UINT16 R/W per. -	Modbus 4400 IDN P-0-3017.0.24
`CTRL_SelParSet`	Selection of control loop parameter set (non-persistent). Coding see parameter: CTRL_PwrUpParSet Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 1 2	UINT16 R/W - -	Modbus 4402 IDN P-0-3017.0.25

Automatically Switching Between Control Loop Parameter Sets

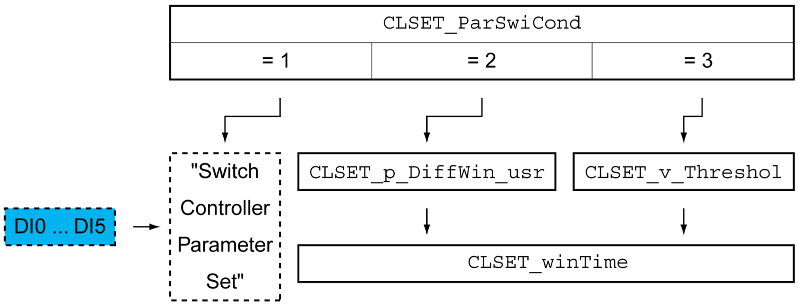
Description

It is possible to automatically switch between the two control loop parameter sets.

The following criteria can be set for switching between the control loop parameter sets:
- Digital signal input
- Position deviation window
- Target velocity below parameterizable value
- Actual velocity below parameterizable value

Settings

The illustration below provides an overview of switching between the parameter sets.



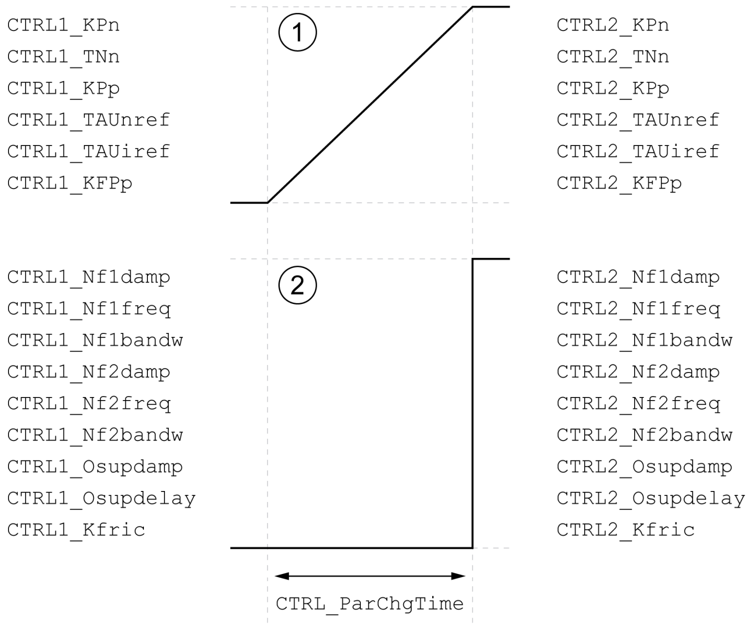
Time Chart

The freely accessible parameters are changed linearly. This linear change of the values of control loop parameter set 1 to the values of control loop parameter set 2 takes place during the parameterizable time CTRL_ParChgTime.

The parameters only accessible in Expert mode are directly changed to the values of the other control loop parameter set after the parameterizable time CTRL_ParChgTime has passed.

The figure below shows the time chart for switching the control loop parameters.

Time chart for switching the control loop parameter sets



1 Freely accessible parameters are changed linearly over time
2 Parameters which are only accessible in Expert mode are switched over directly

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`CLSET_ParSwiCond`	Condition for parameter set switching. **0 / None Or Digital Input**: None or digital input function selected **1 / Inside Position Deviation**: Inside position deviation (value definition in parameter CLSET_p_DiffWin) **2 / Below Reference Velocity**: Below reference velocity (value definition in parameter CLSET_v_Threshol) **3 / Below Actual Velocity**: Below actual velocity (value definition in parameter CLSET_v_Threshol) **4 / Reserved**: Reserved In the case of parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp The following parameters are changed immediately after the time for parameter set switching (CTRL_ParChgTime): - CTRL_Nf1damp - CTRL_Nf1freq - CTRL_Nf1bandw - CTRL_Nf2damp - CTRL_Nf2freq - CTRL_Nf2bandw - CTRL_Osupdamp - CTRL_Osupdelay - CTRL_Kfric Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 4	UINT16 R/W per. -	Modbus 4404 IDN P-0-3017.0.26
`CLSET_p_DiffWin_usr`	Position deviation for control loop parameter set switching. If the position deviation of the position controller is less than the value of this parameter, control loop parameter set 2 is used. Otherwise, control loop parameter set 1 is used. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_p 0 1311 2147483647	INT32 R/W per. -	Modbus 4426 IDN P-0-3017.0.37
`CLSET_v_Threshol`	Velocity threshold for control loop parameter set switching. If the reference velocity or the actual velocity are less than the value of this parameter, control loop parameter set 2 is used. Otherwise, control loop parameter set 1 is used. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 0 50 2147483647	UINT32 R/W per. -	Modbus 4410 IDN P-0-3017.0.29
`CLSET_winTime`	Time window for parameter set switching. Value 0: Window monitoring deactivated. Value >0: Window time for the parameters CLSET_v_Threshol and CLSET_p_DiffWin. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	ms 0 0 1000	UINT16 R/W per. -	Modbus 4406 IDN P-0-3017.0.27

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`CTRL_ParChgTime`	Period of time for control loop parameter set switching. In the case of control loop parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp Such a switching can be caused by - change of the active control loop parameter set - change of the global gain - change of any of the parameters listed above - deactivating the integral term of the velocity controller Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	ms 0 0 2000	UINT16 R/W per. -	Modbus 4392 IDN P-0-3017.0.20

Copying a Control Loop Parameter Set

Description

The parameter CTRL_ParSetCopy allows you to copy the values of control loop parameter set 1 to control loop parameter set 2 or the values of control loop parameter set 2 to control loop parameter set 1.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL_ParSetCopy	Control loop parameter set copying. Value 1: Copy control loop parameter set 1 to set 2 Value 2: Copy control loop parameter set 2 to set 1 If control loop parameter set 2 is copied to control loop parameter set 1, the parameter CTRL_GlobGain is set to 100%. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0.0 - 0.2	UINT16 R/W - -	Modbus 4396 IDN P-0-3017.0.22

Deactivating the Integral Term

The integral term of the velocity controller can be deactivated via the signal input function "Velocity Controller Integral Off". If the integral term is deactivated, the integral action time of the velocity controller (`CTRL1_TNn` and `CTRL2_TNn`) is implicitly and gradually reduced to zero. The time it takes to reduce the value to zero depends on the parameter `CTRL_ParChgTime`. In the case of vertical axes, the integral term is needed to reduce position deviations during standstill.

Control Loop Parameter Set 1

Overview

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_KPn ConF → drC - Pn1	Velocity controller P gain. The default value is calculated on the basis of the motor parameters. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.0001 A/RPM. Modified settings become effective immediately.	A/RPM 0.0001 - 2.5400	UINT16 R/W per. -	Modbus 4610 IDN P-0-3018.0.1
CTRL1_TNn ConF → drC - tin1	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4612 IDN P-0-3018.0.2
CTRL1_KPp ConF → drC - PP1	Position controller P gain. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 1/s. Modified settings become effective immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	Modbus 4614 IDN P-0-3018.0.3
CTRL1_TAUiref	Filter time constant of the reference current value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	Modbus 4618 IDN P-0-3018.0.5
CTRL1_TAUnref ConF → drC - tAu1	Filter time constant of the reference velocity value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	Modbus 4616 IDN P-0-3018.0.4

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_KFPp ConF → drC - FPP1	Velocity feed-forward control. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 0.0 100.0 200.0	UINT16 R/W per. -	Modbus 4620 IDN P-0-3018.0.6
CTRL1_Nf1damp	Notch filter 1: Damping. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4624 IDN P-0-3018.0.8
CTRL1_Nf1freq	Notch filter 1: Frequency. The filter is deactivated at a value of 15000. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 Hz. Modified settings become effective immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4626 IDN P-0-3018.0.9
CTRL1_Nf1bandw	Notch filter 1: Bandwidth. Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4628 IDN P-0-3018.0.10
CTRL1_Nf2damp	Notch filter 2: Damping. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4630 IDN P-0-3018.0.11
CTRL1_Nf2freq	Notch filter 2: Frequency. The filter is deactivated at a value of 15000. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 Hz. Modified settings become effective immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4632 IDN P-0-3018.0.12
CTRL1_Nf2bandw	Notch filter 2: Bandwidth. Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4634 IDN P-0-3018.0.13
CTRL1_Osupdamp	Overshoot suppression filter: Damping. The filter is deactivated at a value of 0. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 0.0 0.0 50.0	UINT16 R/W per. expert	Modbus 4636 IDN P-0-3018.0.14
CTRL1_Osupdelay	Overshoot suppression filter: Time delay. The filter is deactivated at a value of 0. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 0.00 75.00	UINT16 R/W per. expert	Modbus 4638 IDN P-0-3018.0.15
CTRL1_Kfric	Friction compensation: Gain. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} 0.00 0.00 10.00	UINT16 R/W per. expert	Modbus 4640 IDN P-0-3018.0.16

Control Loop Parameter Set 2

Overview

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL2_KPn ConF → drC - Pn2	Velocity controller P gain. The default value is calculated on the basis of the motor parameters. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.0001 A/RPM. Modified settings become effective immediately.	A/RPM 0.0001 - 2.5400	UINT16 R/W per. -	Modbus 4866 IDN P-0-3019.0.1
CTRL2_TNn ConF → drC - tin2	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4868 IDN P-0-3019.0.2
CTRL2_KPp ConF → drC - PP2	Position controller P gain. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 1/s. Modified settings become effective immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	Modbus 4870 IDN P-0-3019.0.3
CTRL2_TAUiref	Filter time constant of the reference current value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	Modbus 4874 IDN P-0-3019.0.5
CTRL2_TAUnref ConF → drC - tAu2	Filter time constant of the reference velocity value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	Modbus 4872 IDN P-0-3019.0.4

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL2_KFPp ConF → drC - FPP2	Velocity feed-forward control. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 0.0 100.0 200.0	UINT16 R/W per. -	Modbus 4876 IDN P-0-3019.0.6
CTRL2_Nf1damp	Notch filter 1: Damping. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4880 IDN P-0-3019.0.8
CTRL2_Nf1freq	Notch filter 1: Frequency. The filter is deactivated at a value of 15000. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 Hz. Modified settings become effective immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4882 IDN P-0-3019.0.9
CTRL2_Nf1bandw	Notch filter 1: Bandwidth. Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4884 IDN P-0-3019.0.10
CTRL2_Nf2damp	Notch filter 2: Damping. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4886 IDN P-0-3019.0.11
CTRL2_Nf2freq	Notch filter 2: Frequency. The filter is deactivated at a value of 15000. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 Hz. Modified settings become effective immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4888 IDN P-0-3019.0.12
CTRL2_Nf2bandw	Notch filter 2: Bandwidth. Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4890 IDN P-0-3019.0.13
CTRL2_Osupdamp	Overshoot suppression filter: Damping. The filter is deactivated at a value of 0. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 0.0 0.0 50.0	UINT16 R/W per. expert	Modbus 4892 IDN P-0-3019.0.14
CTRL2_Osupdelay	Overshoot suppression filter: Time delay. The filter is deactivated at a value of 0. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 0.00 75.00	UINT16 R/W per. expert	Modbus 4894 IDN P-0-3019.0.15
CTRL2_Kfric	Friction compensation: Gain. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} 0.00 0.00 10.00	UINT16 R/W per. expert	Modbus 4896 IDN P-0-3019.0.16

Chapter 7
Operating States and Operating Modes

What Is in This Chapter?

This chapter contains the following sections:

Section 7.1
Operating States

What Is in This Section?

This section contains the following topics:

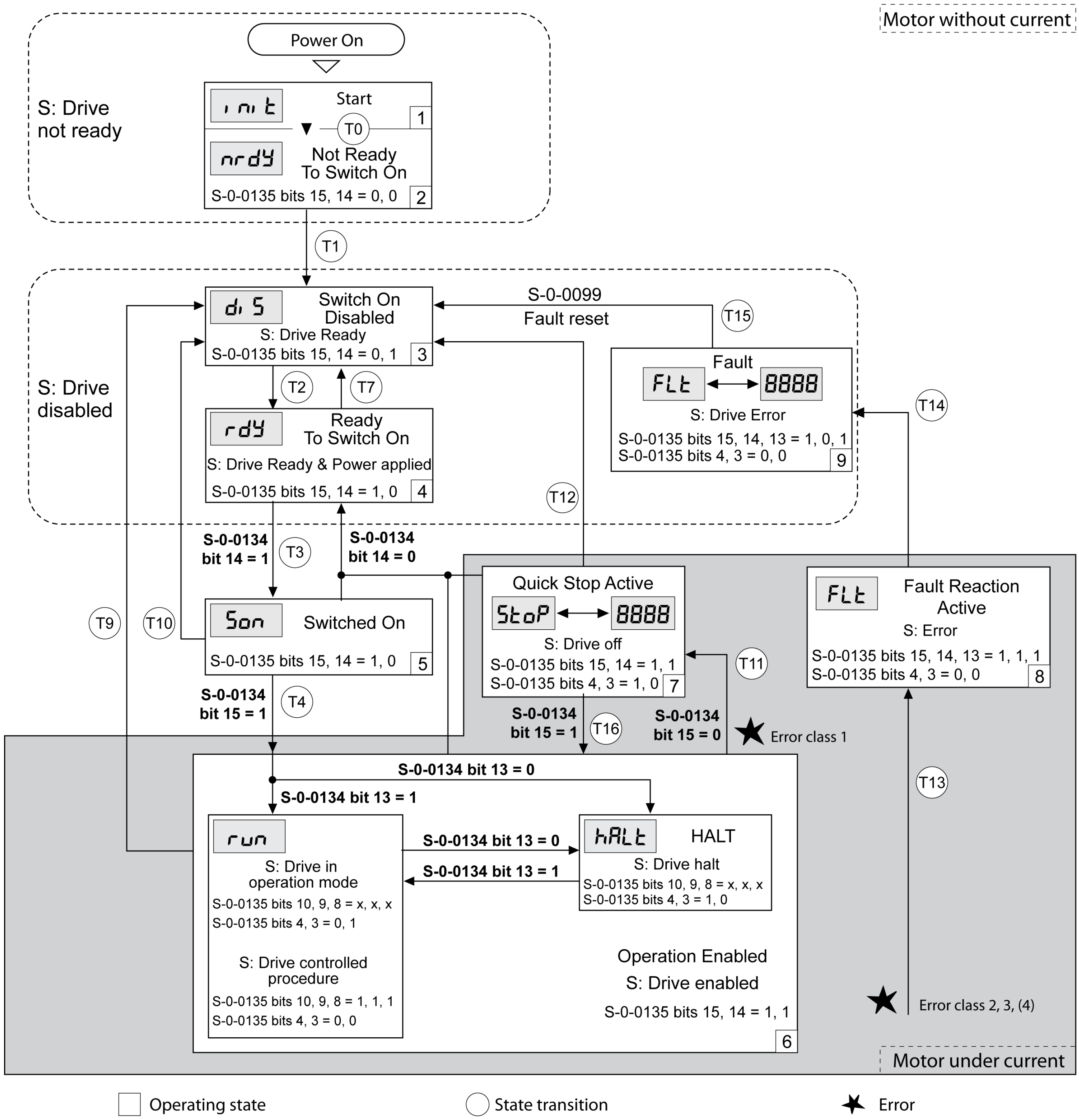
State Diagram and State Transitions

State Diagram

When the product is powered on and when an operating mode is started, the product goes through a number of operating states.

The state diagram (state machine) shows the relationships between the operating states and the state transitions.

The operating states are internally monitored and influenced by monitoring functions.



Operating States

Operating state	Description
1 Start	Electronics are initialized
2 Not Ready To Switch On	The power stage is not ready to switch on
3 Switch On Disabled	Impossible to enable the power stage
4 Ready To Switch On	The power stage is ready to switch on.
5 Switched On	Power stage is switched on
6 Operation Enabled	Power stage is enabled Selected operating mode is active
7 Quick Stop Active	"Quick Stop" is being executed
8 Fault Reaction Active	Error response is active
9 Fault	Error response terminated Power stage is disabled

Error Class

The errors are classified according to the following error classes:

Error class	State transition	Error response	Resetting an error message
0	-	No interruption of the movement	Function "Fault Reset"
1	T11	Stop movement with "Quick Stop"	Function "Fault Reset"
2	T13, T14	Stop movement with "Quick Stop" and disable the power stage when the motor has come to a standstill	Function "Fault Reset"
3	T13, T14	Disable the power stage immediately without stopping the movement first	Function "Fault Reset"
4	T13, T14	Disable the power stage immediately without stopping the movement first	Power cycle

Error Response

The state transition T13 (error class 2, 3 or 4) initiates an error response as soon as an internal occurrence signals an error to which the device must react.

Error class	Response
2	Movement is stopped with "Quick Stop" Holding brake is applied Power stage is disabled
3, 4 or Safety function STO	Power stage is immediately disabled

An error can be triggered by a temperature sensor, for example. The drive cancels the movement and triggers an error response. Subsequently, the operating state changes to **9** Fault.

Resetting an Error Message

A "Fault Reset" resets an error message.

In the event of a "Quick Stop" triggered by a detected error of class 1 (operating state **7** Quick Stop Active), a "Fault Reset" causes a direct transition to operating state **6** Operation Enabled.

State Transitions

State transitions are triggered by an input signal, a fieldbus command or as a response to a monitoring function.

State transition	Operating state	Condition / event(1)	Response
T0	1-> 2	• Device electronics successfully initialized	
T1	2-> 3	• Parameter successfully initialized	
T2	3 -> 4	• No undervoltage and Encoder successfully checked and Actual velocity: <1000 RPM and STO signals = +24V	
T3	4 -> 5	• Request for enabling the power stage	
T4	5 -> 6	• Request for 'Drive ON'	Power stage is enabled. User parameters are checked. Holding brake is released (if available).
T7	4 -> 3	• Undervoltage • STO signals = 0V • Actual velocity: >1000 RPM (for example by external driving force)	-
T9	6 -> 3	• Request for disabling the power stage	
T10	5 -> 3	• Request for disabling the power stage	
T11	6 -> 7	• Error of error class 1	Movement is canceled with "Quick Stop".
T12	7 -> 3	• Request for disabling the power stage	Power stage is disabled immediately, even if "Quick Stop" is still active.
T13	x -> 8	• Error of error classes 2, 3 or 4	Error response is carried out, see "Error Response".
T14	8 -> 9	• Error response terminated (error class 2) • Error of error classes 3 or 4	
T15	9 -> 3	• Function: "Fault Reset"	Error is reset (cause of error must have been corrected).
T16	7 -> 6	• Function: "Fault Reset"	In the event of a "Quick Stop" triggered by a detected error of class 1, a "Fault Reset" causes a direct transition to the operating state **6** Operation Enabled.
(1) In order to trigger a state transition it is sufficient if one condition is met			

Indication of the Operating State via HMI

The operating state is displayed by the HMI. The table below provides an overview:

Operating state	HMI
1 Start	init
2 Not Ready To Switch On	nrdY
3 Switch On Disabled	diS
4 Ready To Switch On	rdY
5 Switched On	Son
6 Operation Enabled	run
7 Quick Stop Active	StoP
8 Fault Reaction Active	FLt
9 Fault	FLt

Indication of the Operating State via Signal Outputs

Information on the operating state is available via the signal outputs. The table below provides an overview:

Operating state	Signal output function "No fault"(1)	Signal output function "Active"(2)
1 Start	0	0
2 Not Ready To Switch On	0	0
3 Switch On Disabled	0	0
4 Ready To Switch On	1	0
5 Switched On	1	0
6 Operation Enabled	1	1
7 Quick Stop Active	0	0
8 Fault Reaction Active	0	0
9 Fault	0	0
(1) The signal output function is factory setting for `DQ0` **(2)** The signal output function is the factory setting for `DQ1`		

Indication of the Operating State via Fieldbus

Description

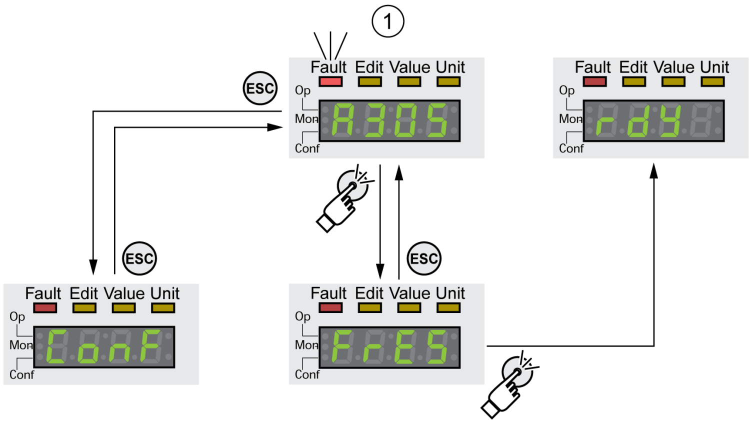
With the parameter S-0-0135 you can read the status information of the drive.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`S-0-0135`	Drive Status. This parameter contains the status word of the AT. It can be used for diagnostics purposes. Type: Hexadecimal - 2 bytes Write access via Sercos: Read only	- 0 - 65535	R/- - -	IDN S-0-0135

Bits	Meaning
0 ... 2	Reserved
3	Value 0: Drive ignores the command values. Value 1: Drive follows the command values.
4	Value 0: Drive Halt is not active. Value 1: Drive Halt is active.
5 ... 7	Reserved
8 ... 10	Value 0: Primary operating mode is set. Value 1: Secondary operating mode 1 is set. Value 2: Secondary operating mode 2 is set. Value >2: Reserved.
11	Reserved
12	Value 0: No detected error with the error class 0. Value 1: Detected error with the error class 0.
13	Value 0: No detected error with the error class 1, 2, 3, or 4. Value 1: Detected error with the error class 1, 2, 3, or 4.
14 ... 15	Value 0: Drive not ready. Value 1: Drive ready for main power on. Value 2: Drive ready and main power applied. Value 3: Drive enabled.

Changing the Operating State via HMI

An error message can be reset via the HMI.



In the case of a detected error of error class 1, resetting the error message causes a transition from operating state **7** Quick Stop Active back to operating state **6** Operation Enabled.

In the case of a detected error of error classes 2 or 3, resetting the error message causes a transition from operating state **9** Fault back to operating state **3** Switch On Disable.

Changing the Operating State via Fieldbus

Description

With the parameter S-0-0134 you can change the operating state of the drive and select the operating mode.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`S-0-0134`	Drive Control. This parameter contains the control word. Type: Hexadecimal - 2 bytes Write access via Sercos: CP2, CP3, CP4	- 0 - 65535	R/W - -	IDN S-0-0134

Bits	Meaning
0 ... 7	Reserved
8 ... 10	Value 0: Primary operating mode. Value 1: Secondary operating mode 1. Value 2: Secondary operating mode 2. Value >2: Reserved.
11 ... 12	Reserved
13	Value 0: Drive halt Value 1: Drive restart (after Halt)
14	Value 0: Drive disable Value 1: Drive enable
15	Value 0: Drive OFF Value 1: Drive ON

With the parameter S-0-0099 you can reset detected errors (state transition T15).

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`S-0-0099`	Reset class 1 diagnostic. If this procedure command is received by the drive via the service channel, the detected errors, the error bits and the shut-down mechanism are cleared. Type: Binary - 2 bytes Write access via Sercos: CP2, CP3, CP4 Class name: GDP_Basic	- 0 0 7	R/W - -	IDN S-0-0099

Section 7.2
Operating Modes

Starting and Changing an Operating Mode

Starting the Operating Mode

The desired operating mode is set via the Sercos controller. Refer to the user guide of your Sercos controller for more details.

Changing the Operating Mode

The operating mode can be changed after the active operating mode has been terminated.

In addition, it is also possible to change the operating mode during a running movement; however, this is only possible in certain operating modes.

Changing the Operating Mode During a Movement

You can switch between the following operating modes during a running movement.

- Jog
- Profile Torque
- Cyclic Synchronous Torque
- Cyclic Synchronous Velocity
- Cyclic Synchronous Position

The operating mode can be changed while the motor is at a standstill or while the motor is not at a standstill, depending on the new operating mode.

Operating mode to be changed to	Motor standstill
Jog	With motor standstill
Profile Torque	Without motor standstill
Cyclic Synchronous Torque	If you change from Jog or Profile Torque: With motor standstill If you change from Cyclic Synchronous Velocity or Cyclic Synchronous Position: Without motor standstill
Cyclic Synchronous Velocity	If you change from Jog or Profile Torque: With motor standstill If you change from Cyclic Synchronous Torque or Cyclic Synchronous Position: Without motor standstill
Cyclic Synchronous Position	If you change from Jog or Profile Torque: With motor standstill If you change from Cyclic Synchronous Torque or Cyclic Synchronous Velocity: Without motor standstill

The motor is decelerated to a standstill via the ramp set in the parameter `LIM_HaltReaction`, see chapter Stop Movement with Halt *(see page 266)*.

NOTE: The change of the operating mode during a movement depends also on the functionality of the Sercos controller. Refer to the user guide of your Sercos controller for more details.

Section 7.3
Operating Mode Jog

What Is in This Section?

This section contains the following topics:

Overview

Description

In the operating mode Jog, a movement is made from the actual motor position in the specified direction.

A movement can be made using one of two methods:

- Continuous movement
- Step movement

In addition, the product features two parameterizable velocities.

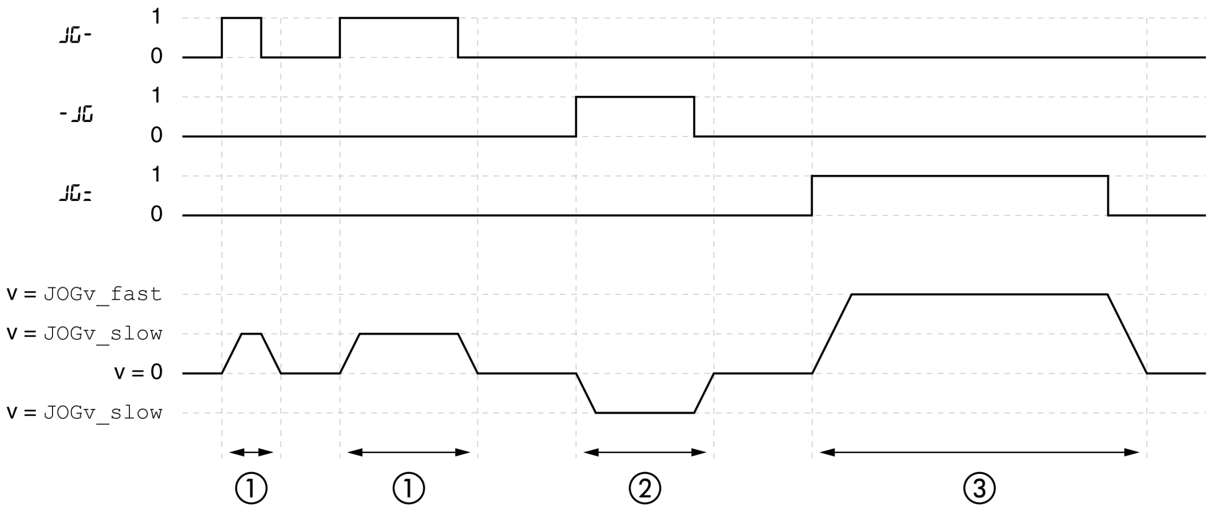
Further, the movement can be made either in a positive or negative direction for both methods:

- JG- : slow movement in positive direction
- JG= : fast movement in positive direction
- -JG : slow movement in negative direction
- =JG : fast movement in negative direction

Continuous Movement

As long as the signal for the direction is available, a continuous movement is made in the desired direction.

The illustration below provides an example of continuous movement:



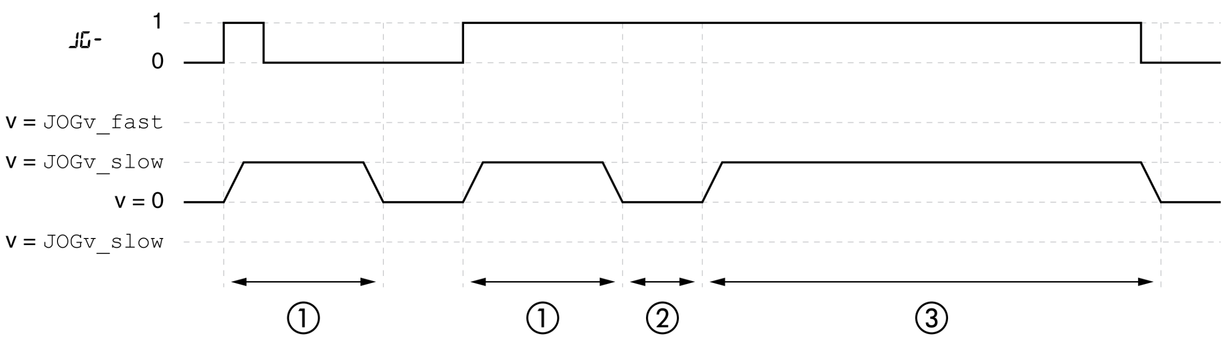
1 Slow movement in positive direction
2 Slow movement in negative direction
3 Fast movement in positive direction

Step Movement

If the signal for the direction is available for a short period of time, a movement with a parameterizable number of user-defined units is made in the desired direction.

If the signal for the direction is available continuously, a movement with a parameterizable number of user-defined units is made in the desired direction. After this movement, the motor stops for a defined period of time. Then a continuous movement is made in the desired direction.

The illustration provides an example of step movement:



1 Slow movement in positive direction with a parameterizable number of user-defined units `JOGstep`
2 Waiting time `JOGtime`
3 Slow continuous movement in positive direction

Integrated HMI

It is also possible to start the operating mode via the HMI. Calling →oP→JoG-→JGSt enables the power stage and starts the operating mode.

The method Continuous Movement is controlled via the HMI.

Turn the navigation button to select one of 4 types of movement:

- JG- : slow movement in positive direction
- JG= : fast movement in positive direction
- -JG : slow movement in negative direction
- =JG : fast movement in negative direction

Press the navigation button to start the movement.

Status Messages

Information on the operating state and the ongoing movement is available via signal outputs.

The table below provides an overview of the signal outputs:

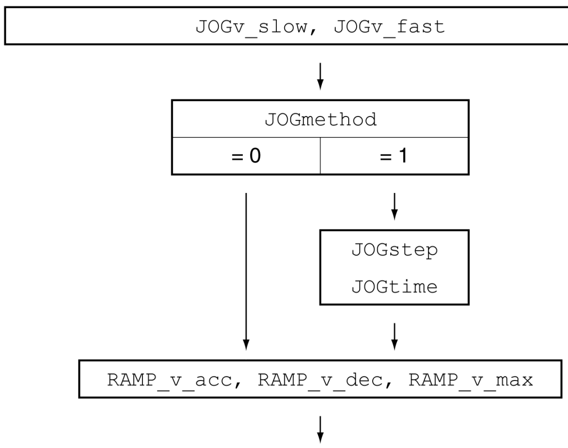
Signal output	Signal output function
`DQ0`	"No Fault" Signals the operating states **4** Ready To Switch On, **5** Switched On and **6** Operation Enabled
`DQ1`	"Active" Signals the operating state **6** Operation Enabled
`DQ2`	"Freely Available" See chapter Setting a Signal Output via Parameter *(see page 270)*

It is possible to change the factory settings of the signal outputs, see chapter Digital Inputs and Outputs *(see page 192)*.

Parameterization

Overview

The illustration below provides an overview of the adjustable parameters.



Velocities

Two parameterizable velocities are available.

- Set the desired values with the parameters `JOGv_slow` and `JOGv_fast`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`JOGv_slow` oP → JoG - JGLo	Velocity for slow movement. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 1 60 2147483647	UINT32 R/W per. -	Modbus 10504 IDN P-0-3041.0.4
`JOGv_fast` oP → JoG - JGhi	Velocity for fast movement. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 1 180 2147483647	UINT32 R/W per. -	Modbus 10506 IDN P-0-3041.0.5

Selection of the Method

The parameter `JOGmethod` lets you set the method.

- Set the desired method with the parameter `JOGmethod`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`JOGmethod`	Selection of jog method. **0 / Continuous Movement /** conO: Jog with continuous movement **1 / Step Movement /** StMo: Jog with step movement Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 1 1	UINT16 R/W - -	Modbus 10502 IDN P-0-3041.0.3

Setting the Step Movement

The parameters `JOGstep` and `JOGtime` are used to set the parameterizable number of user-defined units and the time for which the motor is stopped.

- Set the desired values with the parameters `JOGstep` and `JOGtime`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`JOGstep`	Distance for step movement. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p 1 20 2147483647	INT32 R/W per. -	Modbus 10510 IDN P-0-3041.0.7
`JOGtime`	Wait time for step movement. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	ms 1 500 32767	UINT16 R/W per. -	Modbus 10512 IDN P-0-3041.0.8

Changing the Motion Profile for the Velocity

It is possible to change the parameterization of the Motion Profile for the Velocity *(see page 263)*.

Additional Settings

The following functions can be used for target value processing:

- Chapter Jerk Limitation *(see page 265)*
- Chapter Stop Movement with Halt *(see page 266)*
- Chapter Stop Movement with Quick Stop *(see page 268)*
- Chapter Setting a Signal Output via Parameter *(see page 270)*
- Chapter Position Capture via Signal Input (Vendor-Specific Profile) *(see page 271)*

The following functions can be used for monitoring the movement:

- Chapter Limit Switches *(see page 279)*
- Chapter Software Limit Switches *(see page 281)*
- Chapter Load-Dependent Position Deviation (Following Error) *(see page 283)*
- Chapter Motor Standstill and Direction of Movement *(see page 287)*
- Chapter Position Deviation Window *(see page 288)*
- Chapter Velocity Deviation Window *(see page 290)*
- Chapter Velocity Threshold Value *(see page 292)*
- Chapter Current Threshold Value *(see page 293)*

Section 7.4
Operating Mode Profile Torque

What Is in This Section?

This section contains the following topics:

Overview

Description

In the operating mode Profile Torque, a movement is made with a specified target torque.

The target torque can be set via a reference current via the PTI interface.

Without a proper limit value, the motor can reach an unintentionally high velocity in this operating mode.

⚠ WARNING
UNINTENTIONALLY HIGH VELOCITY
Verify that the parameterized velocity limitation is appropriate for the motor.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Starting the Operating Mode

The operating mode is started via the Sercos controller. Refer to the user guide of your Sercos controller for more details.

Status Messages

Information on the operating state and the ongoing movement is available via the fieldbus and the signal outputs.

The table below provides an overview of the signal outputs:

Signal output	Signal output function
`DQ0`	"No Fault" Signals the operating states **4** Ready To Switch On, **5** Switched On and **6** Operation Enabled
`DQ1`	"Active" Signals the operating state **6** Operation Enabled
`DQ2`	"Freely Available" See chapter Setting a Signal Output via Parameter *(see page 270)*

It is possible to change the factory settings of the signal outputs, see chapter Digital Inputs and Outputs *(see page 192)*.

Terminating the Operating Mode

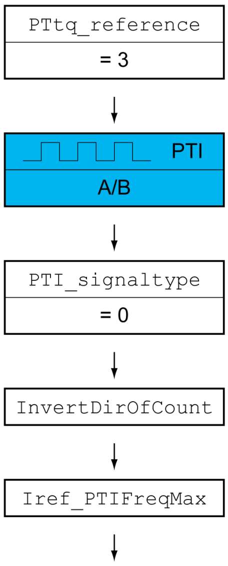
The operating mode is terminated when the motor is at a standstill and one of the following conditions is met:

- Stop caused by “Halt” or “Quick Stop”
- Stop caused by a detected error

Parameterization

Overview

The illustration below provides an overview of the adjustable parameters.



Setting the Source of the Reference Value

The parameter `PTtq_reference` is used to set the source of the reference value.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`PTtq_reference`	Reference value source for operating mode Profile Torque. **0 / None**: None **1 / Parameter 'PTtq_target'**: Reference value via parameter PTtq_target **3 / PTI Interface**: Reference value via PTI interface Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately. Available with firmware version ≥V01.08.	- 0 1 3	UINT16 R/W - -	Modbus 7024 IDN P-0-3027.0.56

Type of Reference Value Signal and Inversion of the Reference Value Signals (for PTI Interface Only)

The PTI interface can be set:

- Type of reference value signal (must be set to A/B signals)
- Inverting the reference value signals

See chapter Setting the PTI Interface *(see page 203)* for information on setting the PTI interface.

Setting the Reference Current (for PTI Interface Only)

The parameter Iref_PTIFreqMax is used to set the reference current.

- Set the desired reference current with the parameter Iref_PTIFreqMax.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
Iref_PTIFreqMax	Reference current for operating mode Profile Torque via PTI interface. Reference current corresponding to 1.6 million increments per second at the PTI interface for operating mode Profile Torque. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately. Available with firmware version ≥V01.06.	A_{rms} 0.00 - 463.00	UINT16 R/W per. -	Modbus 8200 IDN P-0-3032.0.4

Additional Settings

The following functions can be used for target value processing:

- Chapter Stop Movement with Halt *(see page 266)*
- Chapter Stop Movement with Quick Stop *(see page 268)*
- Chapter Position Capture via Signal Input (Vendor-Specific Profile) *(see page 271)*

The following functions can be used for monitoring the movement:

- Chapter Limit Switches *(see page 279)*
- Chapter Software Limit Switches *(see page 281)*
- Chapter Motor Standstill and Direction of Movement *(see page 287)*
- Chapter Velocity Threshold Value *(see page 292)*
- Chapter Current Threshold Value *(see page 293)*

Section 7.5
Operating Mode Homing

What Is in This Section?

This section contains the following topics:

Overview

Description

In the operating mode Homing, a reference is generated between a mechanical position and the actual position of the motor.

A reference between a mechanical position and the actual position of the motor is generated by means of a reference movement or by means of position setting.

A successful reference movement or position setting homes the motor and the zero point becomes valid.

The zero point of the movement range is the point of reference for absolute movements.

Methods

A movement can be made using different methods:

- Reference movement to a limit switch
  In the case of a reference movement to a limit switch, a movement to the negative limit switch or the positive limit switch is performed.
  When the limit switch is reached, the motor is stopped and a movement is made back to the switching point of the limit switch.
  From the switching point of the limit switch, a movement is made to the next index pulse of the motor or to a parameterizable distance from the switching point.
  The position of the index pulse or the position of the parameterizable distance from the switching point is the reference point.
- Reference movement to the reference switch
  In the case of a reference movement to the reference switch, a movement to the reference switch is performed.
  When the reference switch is reached, the motor is stopped and a movement is made back to the switching point of the reference switch.
  From the switching point of the reference switch, a movement is made to the next index pulse of the motor or to a parameterizable distance from the switching point.
  The position of the index pulse or the position of the parameterizable distance from the switching point is the reference point.
- Reference movement to the index pulse
  In the case of a reference movement to the index pulse, a movement is made from the actual position to the next index pulse. The position of the index pulse is the reference point.
- Position setting
  In the case of position setting, the actual position of the motor is set to a desired position value.

A reference movement must be terminated without interruption for the new zero point to be valid. If the reference movement is interrupted, it must be started again.

Motors with multiturn encoder deliver a valid zero point after they are powered on.

Starting the Operating Mode

The parameter `S-0-0148` is used to start the operating mode Homing.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`S-0-0148`	Drive controlled homing procedure command. This parameter starts homing with the homing method settings made in the drive objects. See the product manual for details on homing. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4	- 0 - 3	R/W - -	IDN S-0-0148

Status Messages

Information on the operating state and the ongoing movement is available via the fieldbus and the signal outputs.

The table below provides an overview of the signal outputs:

Signal output	Signal output function
`DQ0`	"No Fault" Signals the operating states **4** Ready To Switch On, **5** Switched On and **6** Operation Enabled
`DQ1`	"Active" Signals the operating state **6** Operation Enabled
`DQ2`	"Freely Available" See chapter Setting a Signal Output via Parameter *(see page 270)*

It is possible to change the factory settings of the signal outputs, see chapter Digital Inputs and Outputs *(see page 192)*.

Terminating the Operating Mode

The operating mode is terminated when the motor is at a standstill and one of the following conditions is met:

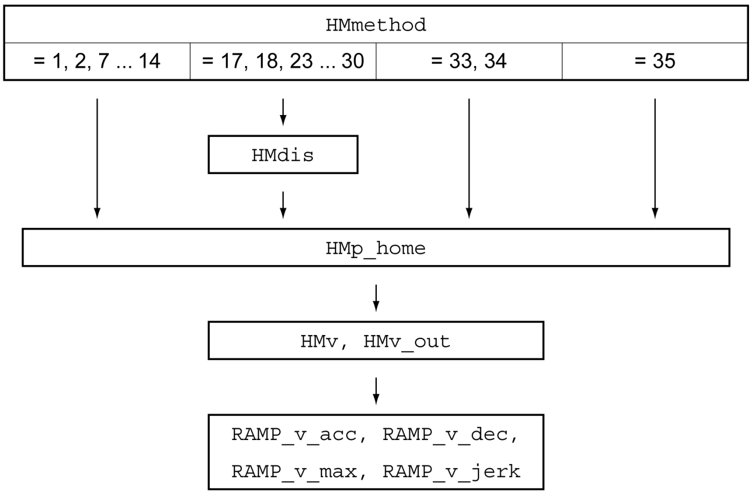
- Homing successful
- Stop caused by “Halt” or “Quick Stop”
- Stop caused by a detected error

Parameterization

Overview

The illustration below provides an overview of the adjustable parameters.

Overview of adjustable parameters



Setting Limit Switches and Reference Switches

The limit switches and reference switches must be set to meet the requirements, see chapter Limit Switches *(see page 279)* and chapter Reference Switch *(see page 280)*.

Selection of the Method

The operating mode Homing establishes an absolute position reference between the motor position and a defined axis position. There are various Homing methods which can be selected via the parameter `HMmethod`.

The `HMprefmethod` parameter is used to save the preferred method to the nonvolatile memory (persistent). When the preferred method has been set in this parameter, the method is performed during homing even after the device is powered off and on. The value to be entered corresponds to the value in the `HMmethod` parameter.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`HMmethod`	Homing method. 1: LIMN with index pulse 2: LIMP with index pulse 7: REF+ with index pulse, inv., outside 8: REF+ with index pulse, inv., inside 9: REF+ with index pulse, not inv., inside 10: REF+ with index pulse, not inv., outside 11: REF- with index pulse, inv., outside 12: REF- with index pulse, inv., inside 13: REF- with index pulse, not inv., inside 14: REF- with index pulse, not inv., outside 17: LIMN 18: LIMP 23: REF+, inv., outside 24: REF+, inv., inside 25: REF+, not inv., inside 26: REF+, not inv., outside 27: REF-, inv., outside 28: REF-, inv., inside 29: REF-, not inv., inside 30: REF-, not inv., outside 33: Index pulse neg. direction 34: Index pulse pos. direction 35: Position setting Abbreviations: REF+: Search movement in pos. direction REF-: Search movement in neg. direction inv.: Invert direction in switch not inv.: Direction not inverted in switch outside: Index pulse / distance outside switch inside: Index pulse / distance inside switch Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 1 18 35	INT16 R/W - -	Modbus 6936 IDN P-0-3027.0.12
`HMprefmethod` oP → hoП- ПEth	Preferred homing method. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 1 18 35	INT16 R/W per. -	Modbus 10260 IDN P-0-3040.0.10

Setting the Distance From the Switching Point

A distance to the switching point of the limit switch or the reference switch must be parameterized for a reference movement with index pulse. The parameter `HMdis` lets you set the distance to the switching limit switch or the reference switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`HMdis`	Distance from switching point. The distance from the switching point is defined as the reference point. The parameter is only effective during a reference movement without index pulse. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p 1 200 2147483647	INT32 R/W per. -	Modbus 10254 IDN P-0-3040.0.7

Defining the Zero Point

The parameter `HMp_home` is used to specify a desired position value, which is set at the reference point after a successful reference movement. The desired position value at the reference point defines the zero point.

If the value 0 is used, the zero point corresponds to the reference point.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`HMp_home`	Position at reference point. After a successful reference movement, this position is automatically set at the reference point. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p -2147483648 0 2147483647	INT32 R/W per. -	Modbus 10262 IDN P-0-3040.0.11

Setting Monitoring

The parameters HMoutdis and HMsrchdis allow you to activate monitoring of the limit switches and the reference switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
HMoutdis	Maximum distance for search for switching point. 0: Monitoring of distance inactive >0: Maximum distance After detection of the switch, the drive starts to search for the defined switching point. If the defined switching point is not found within the distance defined here, the reference movement is canceled and an error is detected. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p 0 0 2147483647	INT32 R/W per. -	Modbus 10252 IDN P-0-3040.0.6
HMsrchdis	Maximum search distance after overtravel of switch. 0: Search distance monitoring disabled >0: Search distance The switch must be activated again within this search distance, otherwise the reference movement is canceled. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p 0 0 2147483647	INT32 R/W per. -	Modbus 10266 IDN P-0-3040.0.13

Reading out the Position Distance

The position distance between the switching point and index pulse can be read out with the following parameter.

The distance between the switching point and the index pulse must be >0.05 revolutions for reproducible reference movements with index pulse.

If the index pulse is too close to the switching point, the limit switch or reference switch can be moved mechanically.

Otherwise the position of the index pulse can be moved with the parameter ENC_pabsusr, see Chapter Setting Parameters for Encoder *(see page 155)*.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_HMdisREFtoIDX_usr	Distance from switching point to index pulse. Allows you to verify the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. Type: Signed decimal - 4 bytes	usr_p -2147483648 - 2147483647	INT32 R/- - -	Modbus 10270 IDN P-0-3040.0.15

Setting Velocities

The parameters HMv and HMv_out are used to set the velocities for searching the switch and for moving away from the switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
HMv oP → hoM - hMn	Target velocity for searching the switch. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_v - 60 -	UINT32 R/W per. -	Modbus 10248 IDN P-0-3040.0.4
HMv_out	Target velocity for moving away from switch. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_v 1 6 2147483647	UINT32 R/W per. -	Modbus 10250 IDN P-0-3040.0.5

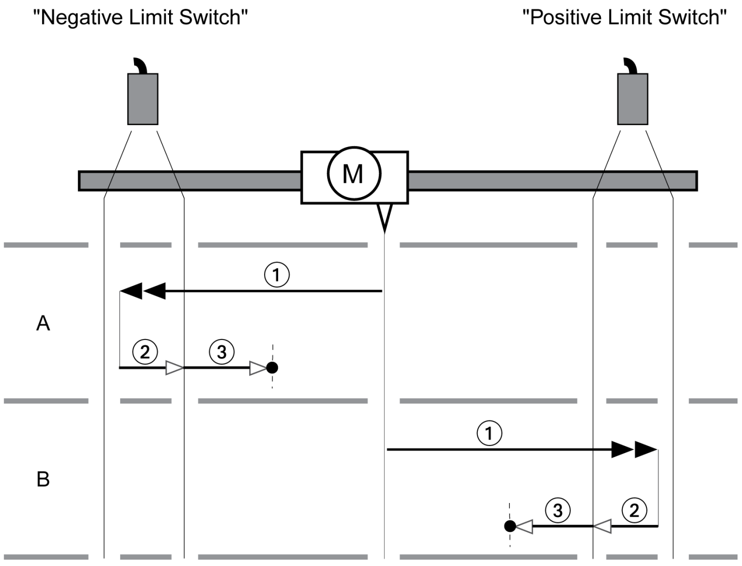
Changing the Motion Profile for the Velocity

It is possible to change the parameterization of the Motion Profile for the Velocity *(see page 263)*.

Reference Movement to a Limit Switch

The illustration below shows a reference movement to a limit switch

Reference movement to a limit switch



1 Movement to limit switch at velocity `HMv`
2 Movement to the switching point of the limit switch at velocity `HMv_out`
3 Movement to index pulse or movement to a distance from the switching point at velocity `HMv_out`

Type A

Method 1: Movement to the index pulse.

Method 17: Movement to distance from switching point.

Type B

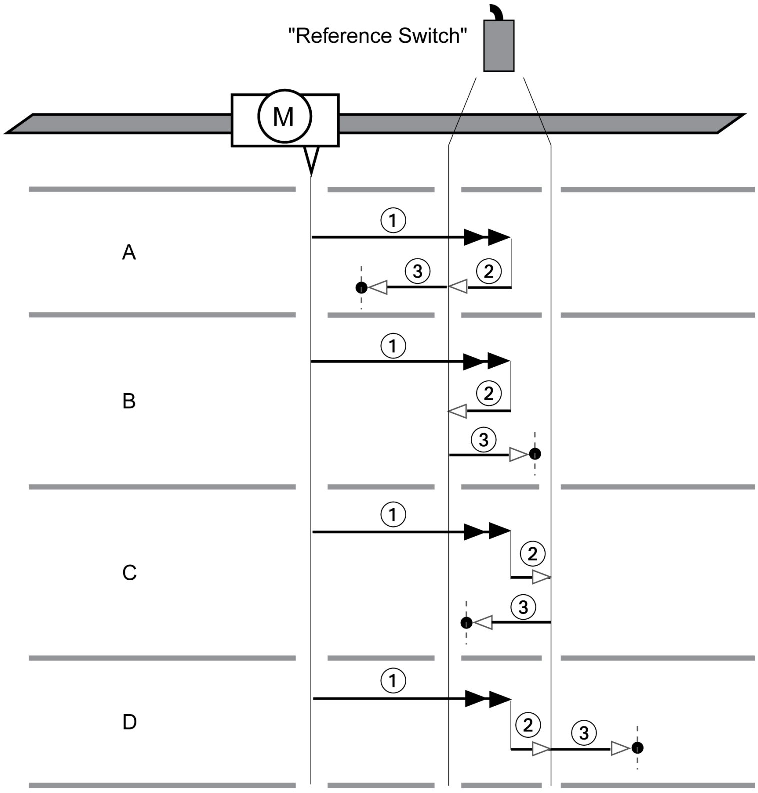
Method 2: Movement to the index pulse.

Method 18: Movement to distance from switching point.

Reference Movement to the Reference Switch in Positive Direction

The illustration below shows a reference movement to the reference switch in positive direction

Reference movement to the reference switch in positive direction



1 Movement to reference switch at velocity `HMv`
2 Movement to the switching point of the reference switch at velocity `HMv_out`
3 Movement to index pulse or movement to a distance from the switching point at velocity `HMv_out`

Type A

Method 7: Movement to the index pulse.

Method 23: Movement to distance from switching point.

Type B

Method 8: Movement to the index pulse.

Method 24: Movement to distance from switching point.

Type C

Method 9: Movement to the index pulse.

Method 25: Movement to distance from switching point.

Type D

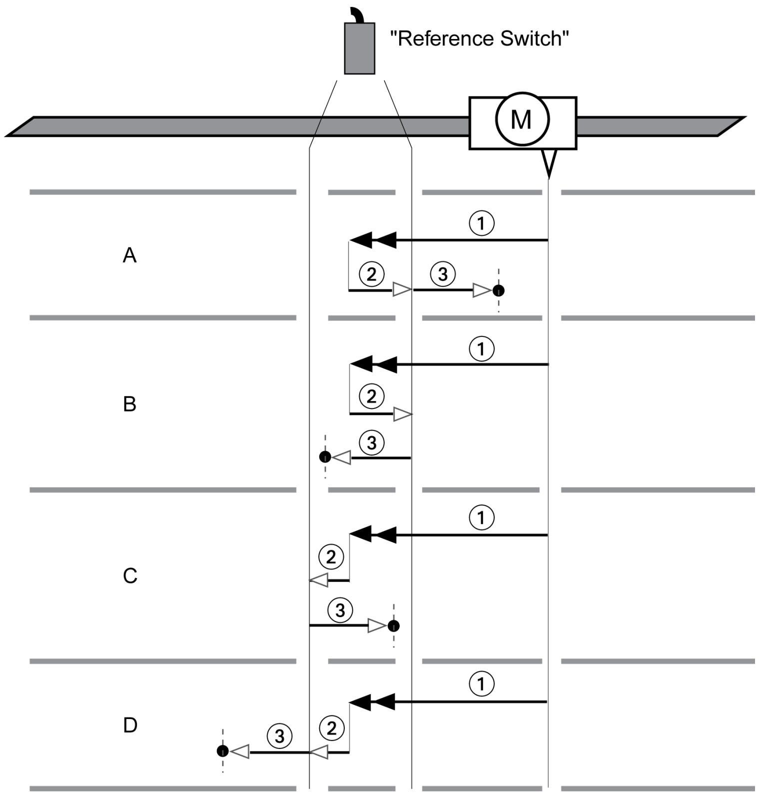
Method 10: Movement to the index pulse.

Method 26: Movement to distance from switching point.

Reference Movement to the Reference Switch in Negative Direction

The illustration below shows a reference movement to the reference switch in negative direction

Reference movement to the reference switch in negative direction



1 Movement to reference switch at velocity `HMv`
2 Movement to the switching point of the reference switch at velocity `HMv_out`
3 Movement to index pulse or movement to a distance from the switching point at velocity `HMv_out`

Type A

Method 11: Movement to the index pulse.

Method 27: Movement to distance from switching point.

Type B

Method 12: Movement to the index pulse.

Method 28: Movement to distance from switching point.

Type C

Method 13: Movement to the index pulse.

Method 29: Movement to distance from switching point.

Type D

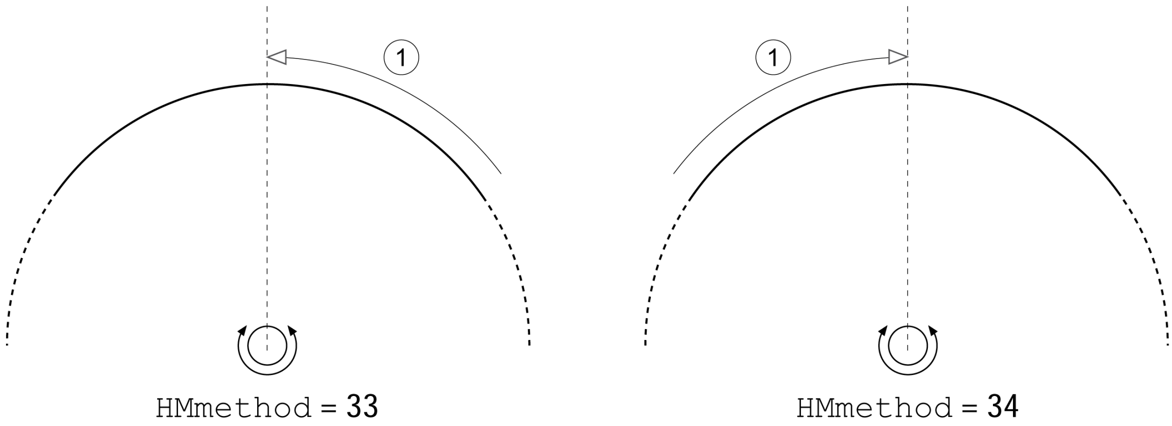
Method 14: Movement to the index pulse.

Method 30: Movement to distance from switching point.

Reference Movement to the Index Pulse

The illustration below shows a reference movement to the index pulse

Reference movement to the index pulse



1 Movement to index pulse at velocity `HMv_out`

Position Setting

Description

By means of position setting, the actual position of the motor is set to the position value in parameter HMp_home. This also defines the zero point.

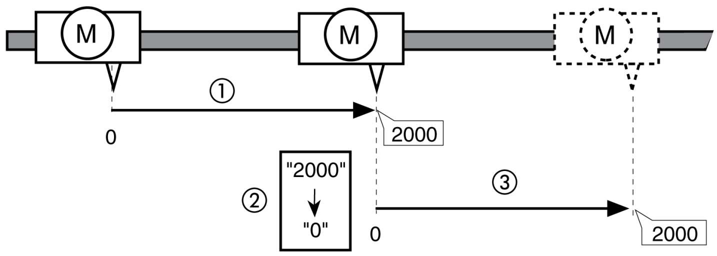
Position setting is only possible when the motor is at a standstill. Any active position deviation remains active and can still be compensated for by the position controller after position setting.

Setting the Position for Position Setting

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
HMp_home	Position at reference point. After a successful reference movement, this position is automatically set at the reference point. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p -2147483648 0 2147483647	INT32 R/W per. -	Modbus 10262 IDN P-0-3040.0.11

Example

Movement by 4000 user-defined units with position setting



1 The motor is positioned by 2000 user-defined units.
2 By means of position setting to 0, the actual position of the motor is set to position value 0 which, at the same time, defines a new zero point.
3 When a new movement by 2000 user-defined units is triggered, the new target position is 2000 user-defined units.

Additional Settings

The following functions can be used for target value processing:

- Chapter Jerk Limitation *(see page 265)*
- Chapter Stop Movement with Halt *(see page 266)*
- Chapter Limitation of the Current via Signal Inputs
- Chapter Setting a Signal Output via Parameter *(see page 270)*
- Chapter Position Capture via Signal Input (Vendor-Specific Profile) *(see page 271)*

The following functions can be used for monitoring the movement:

- Chapter Limit Switches *(see page 279)*
- Chapter Reference Switch *(see page 280)*
- Chapter Software Limit Switches *(see page 281)*
- Chapter Load-Dependent Position Deviation (Following Error) *(see page 283)*
- Chapter Motor Standstill and Direction of Movement *(see page 287)*
- Chapter Position Deviation Window *(see page 288)*
- Chapter Velocity Deviation Window *(see page 290)*
- Chapter Velocity Threshold Value *(see page 292)*
- Chapter Current Threshold Value *(see page 293)*

Section 7.6
Cyclic Synchronous Operating Modes

Overview

Description

The following Cyclic Synchronous operating modes are supported:

- Cyclic Synchronous Position
- Cyclic Synchronous Velocity
- Cyclic Synchronous Torque

The motor synchronously follows the target values transmitted on a cyclic basis. The transmitted values are linearly interpolated (internally).

The possible applications for these operating mode are described in the manual of the master controller.

The operating modes are fixed set in the corresponding SERCOS parameters:

- Parameter `S-0-0032 Primary Operation Mode` for Cyclic Synchronous Position
- Parameter `S-0-0033 Secondary Operation Mode 1` for Cyclic Synchronous Velocity
- Parameter `S-0-0034 Secondary Operation Mode 2` for Cyclic Synchronous Torque

Chapter 8
Functions for Operation

What Is in This Chapter?

This chapter contains the following sections:

Section 8.1
Functions for Target Value Processing

What Is in This Section?

This section contains the following topics:

Motion Profile for the Velocity

Description

Target position and target velocity are input values specified by the user. A motion profile for the velocity is calculated on the basis of these input values.

The motion profile for the velocity consists of an acceleration, a deceleration and a maximum velocity.

A linear ramp for both directions of movement is available.

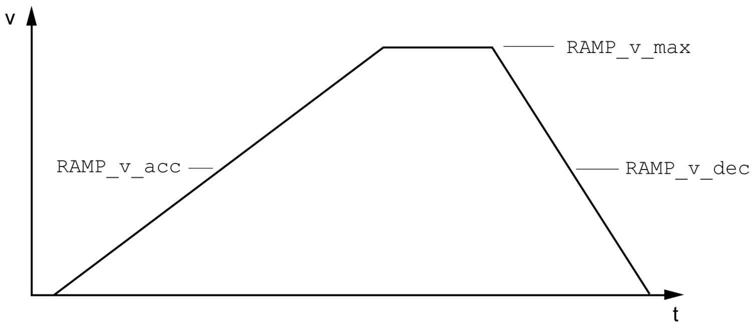
Availability

The availability of the motion profile for the velocity depends on the operating mode.

In the following operating modes, the motion profile for the velocity is permanently active:
- Jog
- Homing

Ramp Slope

The ramp slope determines the velocity changes of the motor per time unit. The ramp slope can be set for acceleration and deceleration.



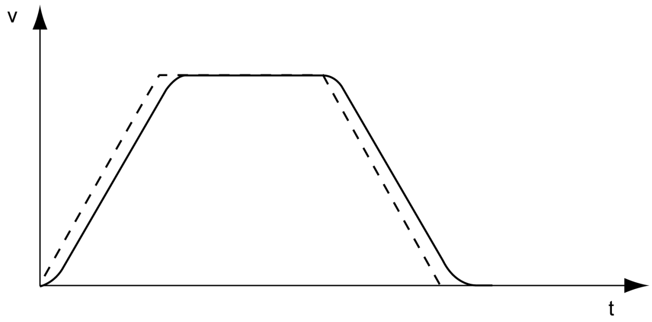
Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RAMP_v_enable	Activation of the motion profile for velocity. **0 / Profile Off**: Profile off **1 / Profile On**: Profile on Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 1 1	UINT16 R/W per. -	Modbus 1622 IDN P-0-3006.0.43
RAMP_v_max ConF → ACG - nrMP	Maximum velocity of the motion profile for velocity. If a greater reference velocity is set in one of these operating modes, it is automatically limited to RAMP_v_max. This way, commissioning at limited velocity is easier to perform. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the motor moves.	usr_v 1 13200 2147483647	UINT32 R/W per. -	Modbus 1554 IDN P-0-3006.0.9
RAMP_v_acc	Acceleration of the motion profile for velocity. Writing the value 0 has no effect on the parameter. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_a 1 600 2147483647	UINT32 R/W per. -	Modbus 1556 IDN P-0-3006.0.10

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`RAMP_v_dec`	Deceleration of the motion profile for velocity. The minimum value depends on the operating mode: Operating modes with minimum value 120: Jog Homing Writing the value 0 has no effect on the parameter. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_a 1 600 2147483647	UINT32 R/W per. -	Modbus 1558 IDN P-0-3006.0.11

Jerk Limitation

Description

Jerk limitation smoothes sudden acceleration changes to allow for smooth transitions with almost no jerking.



Availability

Jerk limitation is available in the following operating modes.

- Jog
- Homing

Settings

Jerk limitation is activated and set via the parameter `RAMP_v_jerk`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`RAMP_v_jerk` ConF → drC - JEr	Jerk limitation of the motion profile for velocity. **0 / Off /** oFF: Off **1 / 1 /** 1: 1 ms **2 / 2 /** 2: 2 ms **4 / 4 /** 4: 4 ms **8 / 8 /** 8: 8 ms **16 / 16 /** 16: 16 ms **32 / 32 /** 32: 32 ms **64 / 64 /** 64: 64 ms **128 / 128 /** 128: 128 ms Adjustments can only be made if the operating mode is inactive (x_end=1). Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	ms 0 0 128	UINT16 R/W per. -	Modbus 1562 IDN P-0-3006.0.13

Stop Movement with Halt

With a Halt, the ongoing movement is interrupted; it can be resumed.

A Halt can be triggered via a digital signal input or a fieldbus command.

In order to interrupt a movement via a signal input, you must first parameterize the signal input function “Halt”, see chapter Digital Inputs and Outputs *(see page 192)*.

The movement can be interrupted with 2 different deceleration types.

- Deceleration via deceleration ramp
- Deceleration via torque ramp

Setting the Type of Deceleration

The parameter `LIM_HaltReaction` lets you set the type of deceleration.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`LIM_HaltReaction` ConF → ACG - htyP	Halt option code. **1 / Deceleration Ramp / dEcE** **3 / Torque Ramp / torq** Set the deceleration ramp with parameter RAMP_v_dec. Set the torque ramp with parameter LIM_I_maxHalt. If a deceleration ramp is already active, the parameter cannot be written. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 1 3 3	INT16 R/W per. -	Modbus 1582 IDN P-0-3006.0.23

Setting the Deceleration Ramp

The deceleration ramp is set with the parameter `Ramp_v_dec` via the Motion Profile for the Velocity *(see page 263)*.

Setting the Torque Ramp

The parameter `LIM_I_maxHalt` lets you set the torque ramp.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
LIM_I_maxHalt ConF → ACG - hcur	Current for Halt. This value is only limited by the minimum/maximum value range (no limitation of this value by motor/power stage). In the case of a Halt, the current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxHalt - _M_I_max - _PS_I_max Further current limitations caused by I2t monitoring are also taken into account during a Halt. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} - - -	UINT16 R/W per. -	Modbus 4380 IDN P-0-3017.0.14

Stop Movement with Quick Stop

With a Quick Stop, the ongoing movement is stopped.

A Quick Stop can be triggered by a detected error of error classes 1 or 2 or via a fieldbus command.

The movement can be stopped with 2 different deceleration types.

- Deceleration via deceleration ramp
- Deceleration via torque ramp

In addition, you can set the operating state to switch to after the deceleration.

- Transition to operating state **9** Fault
- Transition to operating state **7** Quick Stop Active

Setting the Type of Deceleration

The parameter `LIM_QStopReact` lets you set the type of deceleration.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`LIM_QStopReact`	Quick Stop option code. **-2 / Torque ramp (Fault)**: Use torque ramp and transit to operating state 9 Fault **-1 / Deceleration Ramp (Fault)**: Use deceleration ramp and transit to operating state 9 Fault **6 / Deceleration ramp (Quick Stop)**: Use deceleration ramp and remain in operating state 7 Quick Stop **7 / Torque ramp (Quick Stop)**: Use torque ramp and remain in operating state 7 Quick Stop Type of deceleration for Quick Stop. Setting of deceleration ramp with parameter RAMPquickstop. Setting of torque ramp with parameter LIM_I_maxQSTP. If a deceleration ramp is already active, the parameter cannot be written. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- -2 6 7	INT16 R/W per. -	Modbus 1584 IDN P-0-3006.0.24

Setting the Deceleration Ramp

The parameter `RAMPquickstop` lets you set the deceleration ramp.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`RAMPquickstop`	Deceleration ramp for Quick Stop. Deceleration ramp for a software stop or an error with error class 1 or 2. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_a 1 6000 2147483647	UINT32 R/W per. -	Modbus 1572 IDN P-0-3006.0.18

Setting the Torque Ramp

The parameter LIM_I_maxQSTP lets you set the torque ramp.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
LIM_I_maxQSTP ConF → FLt - qcur	Current for Quick Stop. This value is only limited by the minimum/maximum value range (no limitation of this value by motor/power stage). In the case of a Quick Stop, the current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxQSTP - _M_I_max - _PS_I_max Further current limitations caused by I2t monitoring are also taken into account during a Quick Stop. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} - - -	UINT16 R/W per. -	Modbus 4378 IDN P-0-3017.0.13

Setting a Signal Output via Parameter

Description

The digital signal outputs can be set as required via the fieldbus.

In order to set the digital signal outputs via the parameter, you must first parameterize the signal output function “Freely Available”, see chapter Parameterization of the Signal Output Functions *(see page 196)*.

If one or more of the outputs are not set to "Freely Available", the write to that or those outputs is ignored.

The parameter `IO_DQ_set` lets you set the digital signal outputs.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`IO_DQ_set`	Setting the digital outputs directly. Digital outputs can only be set directly if the signal output function has been set to 'Freely Available'. Bit assignments: Bit 0: DQ0 Bit 1: DQ1 Bit 2: DQ2 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4	- - - -	UINT16 R/W - -	Modbus 2082 IDN P-0-3008.0.17

Position Capture via Signal Input (Vendor-Specific Profile)

Description

The motor position can be captured when a signal is detected at a Capture input.

Number of Capture Inputs

3 Capture inputs are available.

- Capture input: `DI0/CAP1`
- Capture input: `DI1/CAP2`
- Capture input: `DI2/CAP3`

Selection of the Method

The motor position can be captured in 2 different ways:

- One-time position capture
  One-time capture means that the position is captured at the first edge.
- Continuous motor position capture
  Continuous capture means that the motor position is captured anew at every edge. The previously captured value is lost.

The motor position can be captured when the edge at the Capture input rises or falls.

Accuracy

A jitter of 2 µs results in an inaccuracy of the captured position of approximately 13.2 user-defined units at a velocity of 3000 RPM.

(3000 RPM = $(3000*131072)/(60*10^6)$ = 6.6 usr_p/µs)

If the factory settings for scaling are used, 13.2 user-defined units correspond to 0.036 °.

The captured motor position is less accurate during the acceleration phase and the deceleration phase.

Overview of the Parameters

The following table shows an overview of the parameters for one-time capture:

Step	Input **CAP1**	Input **CAP2**	Input **CAP3**
Capture input encoder source	Cap1Source	Cap2Source	Cap3Source
Capture input configuration	Cap1Config	Cap2Config	Cap2Config
Capture input capture input start/stop	SPDSercos3Control(1)		Cap3Activate
Capture input captured position	Cap1Pos(1)	Cap2Pos(1)	Cap3Pos(1)
Capture input status	_SPDSercos3Status(1)		_CapStatus(1)
(1) Parameter is mappable			

The following table shows an overview of the parameters for continuous capture:

Step	Input **CAP1**	Input **CAP2**	Input **CAP3**
Capture input encoder source	Cap1Source	Cap2Source	Cap3Source
Capture input configuration	Cap1Config	Cap2Config	Cap2Config
Capture input start/stop	Cap1Activate	Cap2Activate	Cap3Activate
Capture input event counter(1)	Cap1CountCons(2)	Cap2CountCons(2)	Cap3CountCons(2)
Capture input captured position	Cap1PosCons(2)	Cap2PosCons(2)	Cap3PosCons(2)
Capture input status	_CapStatus(2)		
(1) By reading this parameter, the corresponding parameter for the position is updated and locked so it cannot be changed. Both parameter values remain consistent. (2) Parameter is mappable			

Setting the Source

The following parameters let you set the source for position capture.

- Set the source for position capture with the parameters `Cap1Source`, `Cap2Source` and `Cap3Source`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`Cap1Source`	Capture input 1 encoder source. **0 / Pact Encoder 1**: Source for capture input 1 is Pact of encoder 1 **1 / Pact Encoder 2**: Source for capture input 1 is Pact of encoder 2 (module) Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2580 IDN P-0-3010.0.10
`Cap2Source`	Capture input 2 encoder source. **0 / Pact Encoder 1**: Source for capture input 2 is Pact of encoder 1 **1 / Pact Encoder 2**: Source for capture input 2 is Pact of encoder 2 (module) Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2582 IDN P-0-3010.0.11
`Cap3Source`	Capture input 3 encoder source. **0 / Pact Encoder 1**: Source for capture input 3 is Pact of encoder 1 **1 / Pact Encoder 2**: Source for capture input 3 is Pact of encoder 2 (module) Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2602 IDN P-0-3010.0.21

Setting the Edge

The following parameters let you set the edge for position capture.

- Set the desired edge with the parameters `Cap1Config`, `Cap2Config` and `Cap3Config`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`Cap1Config`	Capture input 1 configuration. **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge **2 / Both Edges**: Position capture at both edges Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 2	UINT16 R/W - -	Modbus 2564 IDN P-0-3010.0.2
`Cap2Config`	Capture input 2 configuration. **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge **2 / Both Edges**: Position capture at both edges Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 2	UINT16 R/W - -	Modbus 2566 IDN P-0-3010.0.3
`Cap3Config`	Capture input 3 configuration. **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2594 IDN P-0-3010.0.17

Starting Position Capture

The following parameters let you start position capture.

Real-time channel:

- Set the desired method with the parameter `SPDSercos3Control`.

Acyclical channel:

- Set the desired method with the parameters `Cap1Activate` and `Cap2Activate` and `Cap3Activate`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`SPDSercos3Control`	SPD Sercos control (CAP1 and CAP2). Bit 0 = 0: Cancel capture function Bit 0 = 1: Start one-time capture via input CAP1 Bit 1 = 0: Cancel capture function Bit 1 = 1: Start one-time capture via input CAP2 Bits 2 … 15: Reserved Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- - - -	UINT16 R/W - -	Modbus 6560 IDN P-0-3025.0.80
`Cap1Activate`	Capture input 1 start/stop. **0 / Capture Stop**: Cancel capture function **1 / Capture Once**: Start one-time capture **2 / Capture Continuous**: Start continuous capture **3 / Reserved**: Reserved **4 / Reserved**: Reserved In the case of one-time capture, the function is terminated when the first value is captured. In the case of continuous capture, the function continues to run. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 - 4	UINT16 R/W - -	Modbus 2568 IDN P-0-3010.0.4
`Cap2Activate`	Capture input 2 start/stop. **0 / Capture Stop**: Cancel capture function **1 / Capture Once**: Start one-time capture **2 / Capture Continuous**: Start continuous capture **3 / Reserved**: Reserved **4 / Reserved**: Reserved In the case of one-time capture, the function is terminated when the first value is captured. In the case of continuous capture, the function continues to run. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 - 4	UINT16 R/W - -	Modbus 2570 IDN P-0-3010.0.5
`Cap3Activate`	Capture input 3 start/stop. **0 / Capture Stop**: Cancel capture function **1 / Capture Once**: Start one-time capture **2 / Capture Continuous**: Start continuous capture In the case of one-time capture, the function is terminated when the first value is captured. In the case of continuous capture, the function continues to run. Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 - 2	UINT16 R/W - -	Modbus 2596 IDN P-0-3010.0.18

Status Messages

Real-time channel:
- The parameter `SPDSercos3Status` indicates the capture status.

Acyclical channel:
- The parameter `_CapStatus` indicates the capture status.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_SPDSercos3Status`	SPD Sercos status (CAP1 and CAP2). Bit 0 = 0: No position captured via input CAP1 Bit 0 = 1: Position captured via input CAP1 Bit 1 = 0: No position captured via input CAP2 Bit 1 = 1: Position captured via input CAP2 Bit 2 = 0: Positive limit switch not active Bit 2 = 1: Positive limit switch active Bit 3 = 0: Negative limit switch not active Bit 3 = 1: Negative limit switch active Bit 4 = 0: Quick Stop: Standstill not yet reached Bit 4 = 1: Quick Stop: Standstill reached Type: Unsigned decimal - 2 bytes Modified settings become effective immediately.	- - - -	UINT16 R/- - -	Modbus 6562 IDN P-0-3025.0.81
`_CapStatus`	Status of the capture inputs. Read access: Bit 0: Position captured via input CAP1 Bit 1: Position captured via input CAP2 Bit 2: Position captured via input CAP3 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2562 IDN P-0-3010.0.1

Captured Position

The captured positions for one-time capture can be read via the following parameters:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_Cap1Pos`	Capture input 1 captured position (one-time). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2572 IDN P-0-3010.0.6
`_Cap2Pos`	Capture input 2 captured position (one-time). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2574 IDN P-0-3010.0.7
`_Cap3Pos`	Capture input 3 captured position (one-time). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". Available with hardware version ≥RS03. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2598 IDN P-0-3010.0.19

The captured positions for continuous capture can be read via the following parameters:

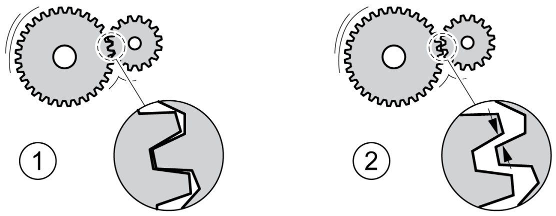
Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_Cap1CountCons`	Capture input 1 event counter (continuous). Counts the capture events. The event counter is reset when capture input 1 is activated. By reading this parameter, the parameter "_Cap1PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2606 IDN P-0-3010.0.23
`_Cap1PosCons`	Capture input 1 captured position (continuous). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap1CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2608 IDN P-0-3010.0.24
`_Cap2CountCons`	Capture input 2 event counter (continuous). Counts the capture events. The event counter is reset when capture input 2 is activated. By reading this parameter, the parameter "_Cap2PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2610 IDN P-0-3010.0.25
`_Cap2PosCons`	Capture input 2 captured position (continuous). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap2CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2612 IDN P-0-3010.0.26
`_Cap3CountCons`	Capture input 3 event counter (continuous). Counts the capture events. The event counter is reset when capture input 3 is activated. By reading this parameter, the parameter "_Cap3PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2614 IDN P-0-3010.0.27
`_Cap3PosCons`	Capture input 3 captured position (continuous). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap3CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2616 IDN P-0-3010.0.28

Backlash Compensation

Description

By setting backlash compensation, you can compensate for mechanical backlash.

Example of mechanical backlash



1 Example of low mechanical backlash
2 Example of high mechanical backlash

When backlash compensation is activated, the drive automatically compensates for the mechanical backlash during each movement.

Availability

Backlash compensation is possible in the following operating modes:

- Jog
- Homing
- Cyclic Synchronous Position

Parameterization

To use backlash compensation, you must set the amount of backlash.

The parameter `BLSH_Position` lets you set the amount of backlash in user-defined units.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`BLSH_Position`	Position value for backlash compensation. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	usr_p 0 0 2147483647	INT32 R/W per. -	Modbus 1668 IDN P-0-3006.0.66

In addition, you can set a processing time. The processing time specifies the period of time during which the mechanical backlash is to be compensated for.

The parameter `BLSH_Time` lets you set the processing time in ms.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`BLSH_Time`	Processing time for backlash compensation. Value 0: Immediate backlash compensation Value >0: Processing time for backlash compensation Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	ms 0 0 16383	UINT16 R/W per. -	Modbus 1672 IDN P-0-3006.0.68

Activating Backlash Compensation

Before you can activate backlash compensation, there must be a movement in positive or negative direction. Backlash compensation is activated with the parameter BLSH_Mode.

- Start a movement in positive direction or in negative direction. This movement must last as long as it takes to move the mechanical system connected to the motor.
- If the movement was in positive direction (positive target values), activate backlash compensation with the value "OnAfterPositiveMovement".
- If the movement was in negative direction (negative target values), activate backlash compensation with the value "OnAfterNegativeMovement".

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
BLSH_Mode	Processing mode of backlash compensation. **0 / Off**: Backlash compensation is off **1 / OnAfterPositiveMovement**: Backlash compensation is on, last movement was in positive direction **2 / OnAfterNegativeMovement**: Backlash compensation is on, last movement was in negative direction Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 2	UINT16 R/W per. -	Modbus 1666 IDN P-0-3006.0.65

Section 8.2
Functions for Monitoring Movements

What Is in This Section?

This section contains the following topics:

Limit Switches

Description

The use of limit switches can help protect against some hazards (for example, collision with mechanical stop caused by incorrect reference values).

⚠ WARNING
LOSS OF CONTROL ● Ensure that limit switches are installed as determined by your risk assessment. ● Verify correct connection of the limit switches. ● Verify that the limit switches are sufficiently distant from the mechanical end to allow an adequate stopping distance. ● Verify correct parameterization and function of the limit switches. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Movements can be monitored using limit switches. A positive limit switch and a negative limit switch can be used for monitoring.

If the positive or negative limit switch are tripped, the movement stops. An error message is generated and the operating state switches to **7** Quick Stop Active.

The error message can be reset by means of a “Fault Reset”. The operating state switches back to **6** Operation Enabled.

The movement can continue, however, only in the opposite direction. For example, if the positive limit switch was triggered, further movement is only possible in negative direction. In the case of further movement in positive direction, a new error message is generated and the operating state switches back to **7** Quick Stop Active.

The parameters `IOsigLIMP` and `IOsigLIMN` are used to set the type of limit switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`IOsigLIMP`	Signal evaluation for positive limit switch. **0 / Inactive**: Inactive **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	Modbus 1568 IDN P-0-3006.0.16
`IOsigLIMN`	Signal evaluation for negative limit switch. **0 / Inactive**: Inactive **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	Modbus 1566 IDN P-0-3006.0.15

The signal input functions “Positive Limit Switch (LIMP)” and “Negative Limit Switch (LIMN)” must have been parameterized, see chapter Digital Inputs and Outputs *(see page 192)*.

Reference Switch

Description

The reference switch is only active in the operating mode Homing.

The parameter `IOsigREF` lets you set the type of reference switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`IOsigREF`	Signal evaluation for reference switch. **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO The reference switch is only active while a reference movement to the reference switch is processed. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 1 1 2	UINT16 R/W per. -	Modbus 1564 IDN P-0-3006.0.14

The signal input function “Reference Switch (REF)” must have been parameterized, see chapter Digital Inputs and Outputs *(see page 192)*.

Software Limit Switches

Description

Movements can be monitored using software limit switches. A positive position limit and a negative position limit can be set for monitoring.

If the positive or negative position limit switch are reached, the movement stops. An error message is generated and the operating state switches to **7** Quick Stop Active.

The error message can be reset by means of a “Fault Reset”. The operating state switches back to **6** Operation Enabled.

The movement can continue, however, only in the opposite direction of the position limit. For example, if the positive position limit was reached, further movement is only possible in negative direction. In the case of further movement in positive direction, a new error message is generated and the operating state switches back to **7** Quick Stop Active.

Prerequisite

Software limit switch monitoring only works with a valid zero point, see chapter Size of the Movement Range *(see page 186)*.

Behavior in Operating Modes with Target Positions

In the case of operating modes with target positions, the movement is started normally, even if the target position is greater than the positive position limit or less than the negative position limit. When the position limit is approached, a Quick Stop is executed by the drive such that the motor reaches standstill at the limit.

In the following operating modes, the target position is verified prior to the start of a movement such that the position limit is not traversed regardless of the target position.

- Jog (step movement)

Behavior in Operating Modes Without Target Positions

In operating modes without target position, by default a Quick Stop is triggered at the position limit.

The parameter `MON_SWLimMode` allows you to set the behavior when a position limit is approached.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_SWLimMode`	Behavior when position limit is reached. **0 / Standstill Behind Position Limit**: Quick Stop is triggered at position limit and standstill is reached behind position limit **1 / Standstill At Position Limit**: Quick Stop is triggered in front of position limit and standstill is reached at position limit Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 1678 IDN P-0-3006.0.71

Standstill at the position limit in operating modes without target position requires the parameter `LIM_QStopReact` to be set to "Deceleration ramp (Quick Stop)", see chapter Stop Movement with Quick Stop *(see page 268)*. If the parameter `LIM_QStopReact` is set to "Torque ramp (Quick Stop)", the movement may come to a standstill in front of or behind the position limit due to different loads.

Activation

The software limit switches are activated via the parameter `MON_SW_Limits`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_SW_Limits`	Activation of software limit switches. **0 / None**: Deactivated **1 / SWLIMP**: Activation of software limit switches positive direction **2 / SWLIMN**: Activation of software limit switches negative direction **3 / SWLIMP+SWLIMN**: Activation of software limit switches both directions Software limit switches can only be activated if the zero point is valid. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 3	UINT16 R/W per. -	Modbus 1542 IDN P-0-3006.0.3

Setting Position Limits

The software limit switches are set via the parameters `MON_swLimP` and `MON_swLimN`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_swLimP`	Positive position limit for software limit switch. If a user-defined value entered is outside of the permissible range, the limit switch limits are automatically set to the maximum user-defined value. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	usr_p - 2147483647 -	INT32 R/W per. -	Modbus 1544 IDN P-0-3006.0.4
`MON_swLimN`	Negative position limit for software limit switch. See description 'MON_swLimP'. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	usr_p - -2147483648 -	INT32 R/W per. -	Modbus 1546 IDN P-0-3006.0.5

Load-Dependent Position Deviation (Following Error)

Description

The load-dependent position deviation is the difference between the reference position and the actual position caused by the load inertia.

Parameters are available to read the load-dependent position deviation during operation and the maximum position deviation reached so far.

The maximum permissible load-dependent position deviation can be parameterized. In addition, you can set the error class.

Availability

Monitoring of the load-dependent position deviation is available in the following operating modes:

- Jog
- Homing
- Cyclic Synchronous Position

Reading the Position Deviation

The following parameters let you read the load-dependent position deviation in user-defined units or revolutions.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_p_dif_load_usr`	Load-dependent position deviation between reference and actual positions. The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. This value is used for following error monitoring. Type: Signed decimal - 4 bytes	usr_p -2147483648 - 2147483647	INT32 R/- - -	Modbus 7724 IDN P-0-3030.0.22

The following parameters let you read the maximum value of the load-dependent position deviation reached so far in user-defined units or revolutions.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_p_dif_load_peak_usr`	Maximum value of the load-dependent position deviation. This parameter contains the maximum load-dependent position deviation reached so far. A write access resets this value. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_p 0 - 2147483647	INT32 R/W - -	Modbus 7722 IDN P-0-3030.0.21

Setting the Position Deviation

The following parameter lets you set the threshold for the maximum load-dependent position deviation that is to trigger an error of error class 0.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_p_dif_warn`	Advisory limit of the load-dependent position deviation (error class 0). 100.0 % correspond to the maximum position deviation (following error) as specified by means of parameter MON_p_dif_load. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	% 0 75 100	UINT16 R/W per. -	Modbus 1618 IDN P-0-3006.0.41

The following parameters let you set the maximum load-dependent position deviation at which a movement is canceled with an error of error classes 1, 2, or 3.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_p_dif_load_usr`	Maximum load-dependent position deviation. The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_p 1 131072 2147483647	INT32 R/W per. -	Modbus 1660 IDN P-0-3006.0.62

Setting the Error Class

The following parameter lets you set the error class for an excessively high load-dependent position deviation.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ErrorResp_p_dif`	Error response to excessively high load-dependent position deviation. **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 1 3 3	UINT16 R/W per. -	Modbus 1302 IDN P-0-3005.0.11

Load-Dependent Velocity Deviation

Description

The load-dependent velocity deviation is the difference between the reference velocity and the actual velocity caused by the load.

The maximum permissible load-dependent velocity deviation can be parameterized. In addition, you can set the error class.

Availability

Monitoring of the load-dependent velocity deviation is available in the following operating modes:

- Profile Velocity
- Cyclic Synchronous Velocity

Reading the Velocity Deviation

The following parameters let you read the load-dependent velocity deviation in user-defined units.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_v_dif_usr`	Load-dependent velocity deviation. The load-dependent velocity deviation is the difference between reference velocity and actual velocity. Type: Signed decimal - 4 bytes Available with firmware version ≥V01.06.	usr_v -2147483648 - 2147483647	INT32 R/- - -	Modbus 7768 IDN P-0-3030.0.44

Setting the Velocity Deviation

The following parameters let you specify the size of the window for the maximum load-dependent velocity deviation at which a movement is canceled.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_VelDiff`	Maximum load-dependent velocity deviation. Value 0: Monitoring deactivated. Value >0: Maximum value Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately. Available with firmware version ≥V01.06.	usr_v 0 0 2147483647	UINT32 R/W per. -	Modbus 1686 IDN P-0-3006.0.75
`MON_VelDiff_Time`	Time window for maximum load-dependent velocity deviation. Value 0: Monitoring deactivated. Value >0: Time window for maximum value Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately. Available with firmware version ≥V01.06.	ms 0 10 -	UINT16 R/W per. -	Modbus 1688 IDN P-0-3006.0.76

Setting the Error Class

The following parameter lets you set the error class for an excessively high load-dependent velocity deviation.

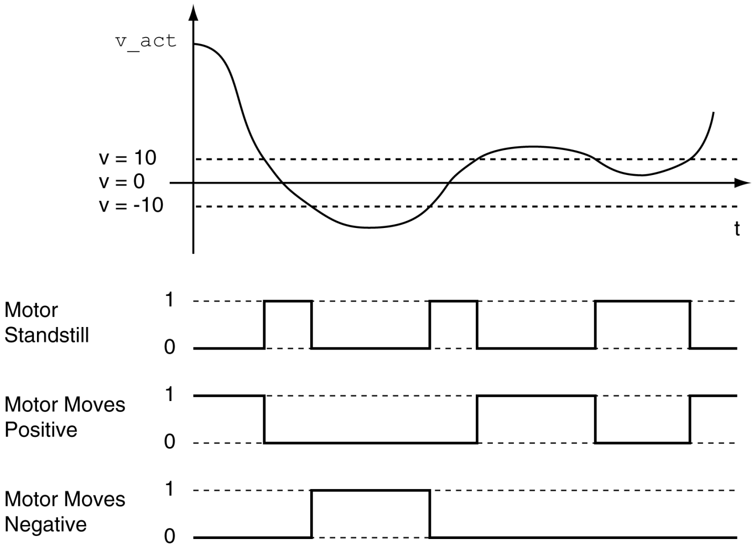
Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ErrorResp_v_dif`	Error response to excessively high load-dependent velocity deviation. **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 1 3 3	UINT16 R/W per. -	Modbus 1400 IDN P-0-3005.0.60

Motor Standstill and Direction of Movement

Description

The status of a movement can be monitored. You can determine whether the motor is at a standstill or whether it moves in a specific direction.

A velocity of <10 RPM is interpreted as standstill.



The status is available via signal outputs. In order to read the status, you must first parameterize the signal output functions “Motor Standstill”, “Motor Moves Positive” or “Motor Moves Negative”, see chapter Digital Inputs and Outputs *(see page 192)*.

Position Deviation Window

Description

The position deviation window allows you to monitor whether the motor is within a parameterizable position deviation.

The position deviation is the difference between reference position and actual position.

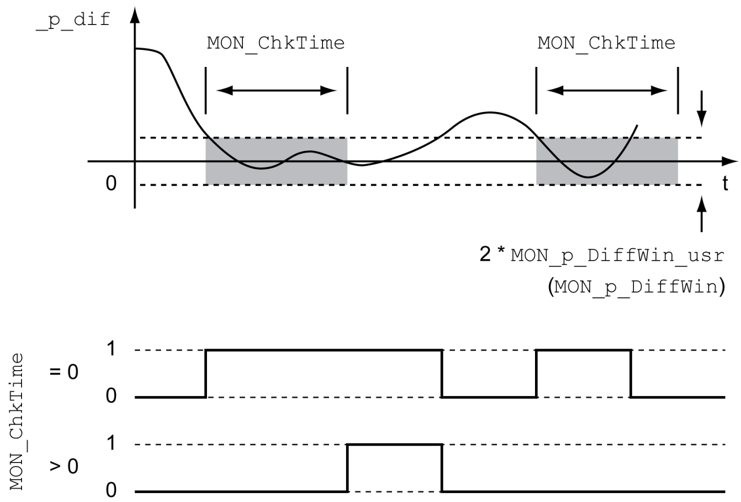
The position deviation window comprises position deviation and monitoring time.

Availability

The position deviation window is available in the following operating modes.

- Jog
- Homing
- Cyclic Synchronous Position

Settings



The parameters MON_p_DiffWin_usr and MON_ChkTime specify the size of the window.

Status Indication

The status is available via a signal output.

In order to read the status via a signal output, you must first parameterize the signal output function “In Position Deviation Window”, see chapter Digital Inputs and Outputs *(see page 192)*.

The parameter `MON_ChkTime` acts on the parameters `MON_p_DiffWin_usr` (`MON_p_DiffWin`), `MON_v_DiffWin`, `MON_v_Threshold` and `MON_I_Threshold`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_p_DiffWin_usr`	Monitoring of position deviation. The system verifies whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_p 0 131 2147483647	INT32 R/W per. -	Modbus 1662 IDN P-0-3006.0.63
`MON_ChkTime` ConF → i-o- tthr	Monitoring of time window. Adjustment of a time for monitoring of position deviation, velocity deviation, velocity value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	ms 0 0 9999	UINT16 R/W per. -	Modbus 1594 IDN P-0-3006.0.29

Velocity Deviation Window

Description

The velocity deviation window allows you to monitor whether the motor is within a parameterizable velocity deviation.

The velocity deviation is the difference between the reference velocity and the actual velocity.

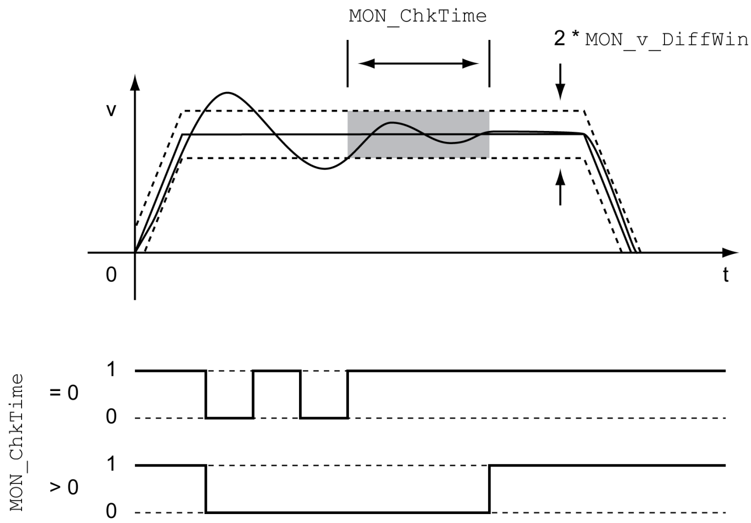
The velocity deviation window comprises velocity deviation and monitoring time.

Availability

The velocity deviation window is available in the following operating modes.

- Jog
- Homing
- Cyclic Synchronous Velocity
- Cyclic Synchronous Position

Settings



The parameters `MON_v_DiffWin` and `MON_ChkTime` specify the size of the window.

Status Indication

The status is available via a signal output.

In order to read the status via a signal output, you must first parameterize the signal output function "In Velocity Deviation Window", see chapter Digital Inputs and Outputs *(see page 192)*.

The parameter `MON_ChkTime` acts on the parameters `MON_p_DiffWin_usr`, `MON_v_DiffWin`, `MON_v_Threshold` and `MON_I_Threshold`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_v_DiffWin`	Monitoring of velocity deviation. The system monitors whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 1 10 2147483647	UINT32 R/W per. -	Modbus 1588 IDN P-0-3006.0.26
`MON_ChkTime` ConF → i-o- tthr	Monitoring of time window. Adjustment of a time for monitoring of position deviation, velocity deviation, velocity value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	ms 0 0 9999	UINT16 R/W per. -	Modbus 1594 IDN P-0-3006.0.29

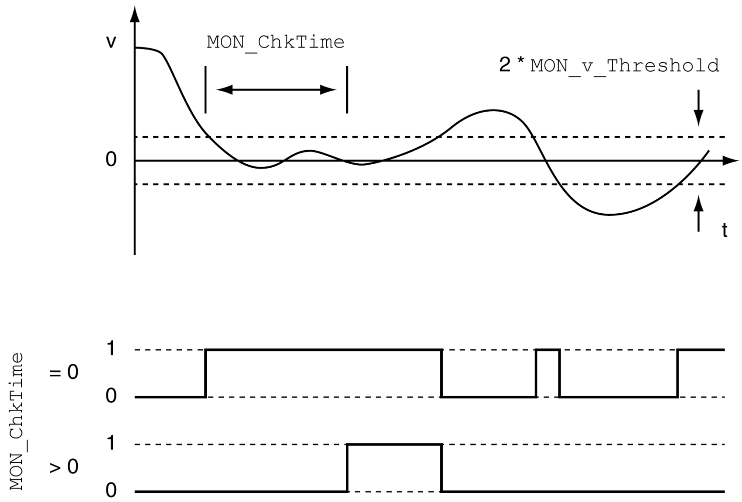
Velocity Threshold Value

Description

The velocity threshold value allows you to monitor whether the actual velocity is below a parameterizable velocity value.

The velocity threshold value comprises the velocity and the monitoring time.

Settings



The parameters `MON_v_Threshold` and `MON_ChkTime` specify the size of the window.

Status Indication

The status is available via a signal output.

In order to read the status via a signal output, you must first parameterize the signal output function "Velocity Below Threshold", see chapter Digital Inputs and Outputs *(see page 192)*.

The parameter `MON_ChkTime` acts on the parameters `MON_p_DiffWin_usr`, `MON_v_DiffWin`, `MON_v_Threshold` and `MON_I_Threshold`.

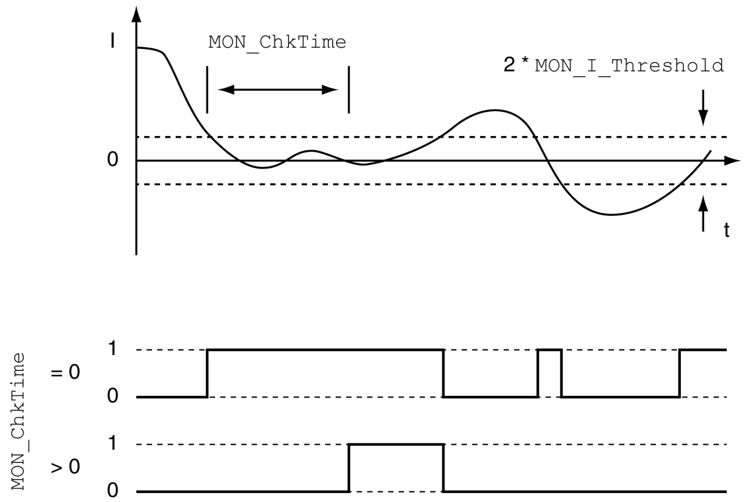
Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_v_Threshold`	Monitoring of velocity threshold. The system monitors whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 1 10 2147483647	UINT32 R/W per. -	Modbus 1590 IDN P-0-3006.0.27
`MON_ChkTime` ConF → i-o- tthr	Monitoring of time window. Adjustment of a time for monitoring of position deviation, velocity deviation, velocity value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	ms 0 0 9999	UINT16 R/W per. -	Modbus 1594 IDN P-0-3006.0.29

Current Threshold Value

The current threshold value allows you to monitor whether the actual current is below a parameterizable current value.

The current threshold value comprises the current value and the monitoring time.

Settings



The parameters MON_I_Threshold and MON_ChkTime specify the size of the window.

Status Indication

The status is available via a signal output.

In order to read the status via a signal output, you must first parameterize the signal output function "Current Below Threshold", see chapter Digital Inputs and Outputs *(see page 192)*.

The parameter `MON_ChkTime` acts on the parameters `MON_p_DiffWin_usr`, `MON_v_DiffWin`, `MON_v_Threshold` and `MON_I_Threshold`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_I_Threshold ConF → i-o- ithr	Monitoring of current threshold. The system monitors whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter _Iq_act_rms is used as comparison value. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} 0.00 0.20 300.00	UINT16 R/W per. -	Modbus 1592 IDN P-0-3006.0.28
MON_ChkTime ConF → i-o- tthr	Monitoring of time window. Adjustment of a time for monitoring of position deviation, velocity deviation, velocity value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	ms 0 0 9999	UINT16 R/W per. -	Modbus 1594 IDN P-0-3006.0.29

Section 8.3
Functions for Monitoring Internal Device Signals

What Is in This Section?

This section contains the following topics:

Temperature Monitoring

Temperature of Power Stage

The parameter _PS_T_current indicates the temperature of the power stage.

The parameter _PS_T_warn contains the threshold value for an error of error class 0. The parameter _PS_T_max indicates the maximum power stage temperature.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_PS_T_current Mon tPS	Temperature of power stage. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 7200 IDN P-0-3028.0.16
_PS_T_warn	Advisory temperature limit of power stage (error class 0). Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- per. -	Modbus 4108 IDN P-0-3016.0.6
_PS_T_max	Maximum temperature of power stage. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- per. -	Modbus 4110 IDN P-0-3016.0.7

Temperature of Motor

The parameter _M_T_current indicates the motor temperature.

The parameter _M_T_max indicates the maximum motor temperature.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_M_T_current Mon tMot	Temperature of motor. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 7202 IDN P-0-3028.0.17
_M_T_max	Maximum temperature of motor. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 3360 IDN P-0-3013.0.16

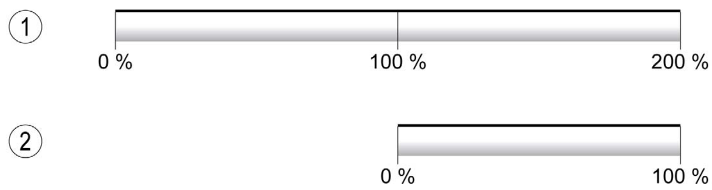
Monitoring Load and Overload (I^2T Monitoring)

Description

The load is the thermal load on the power stage, the motor and the braking resistor.

Load and overload on the individual components are monitored internally; the values can be read by means of parameters.

Overload starts at a load value of 100 %.



1 Load
2 Overload

Load Monitoring

The load can be read using the following parameters:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_PS_load` Mon LdFP	Load of power stage. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7214 IDN P-0-3028.0.23
`_M_load` Mon LdFM	Load of motor. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7220 IDN P-0-3028.0.26
`_RES_load` Mon LdFb	Load of braking resistor. The braking resistor set via parameter RESint_ext is monitored. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7208 IDN P-0-3028.0.20

Overload Monitoring

In the case of 100 % overload of the power stage or the motor, the current is limited internally. In the case of 100 % overload of the braking resistor, the braking resistor is deactivated.

The overload and the peak value can be read using the following parameters:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_PS_overload`	Overload of power stage. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7240 IDN P-0-3028.0.36
`_PS_maxoverload`	Maximum value of overload of power stage. Maximum overload of power stage during the last 10 seconds. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7216 IDN P-0-3028.0.24
`_M_overload`	Overload of motor (I2t). Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7218 IDN P-0-3028.0.25
`_M_maxoverload`	Maximum value of overload of motor. Maximum overload of motor during the last 10 seconds. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7222 IDN P-0-3028.0.27
`_RES_overload`	Overload of braking resistor (I2t). The braking resistor set via parameter RESint_ext is monitored. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7206 IDN P-0-3028.0.19
`_RES_maxoverload`	Maximum value of overload of braking resistor. Maximum overload of braking resistor during the last 10 seconds. The braking resistor set via parameter RESint_ext is monitored. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7210 IDN P-0-3028.0.21

Commutation Monitoring

Description

Commutation monitoring verifies the plausibility of acceleration and effective motor torque.

If the motor accelerates though the drive control decelerates the motor with the maximum current, an error is detected.

Deactivating commutation monitoring can cause unintended movements.

⚠ WARNING
UNINTENDED MOVEMENT
● Only deactivate commutation monitoring during commissioning and only for test purposes. ● Verify that the commutation monitoring is active prior to putting the equipment into service.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

The parameter `MON_commutat` lets you deactivate commutation monitoring.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_commutat`	Commutation monitoring. **0 / Off**: Commutation monitoring off **1 / On**: Commutation monitoring on in operating states 6, 7 and 8 **2 / On (OpState6+7)**: Commutation monitoring on in operating states 6 and 7 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	Modbus 1290 IDN P-0-3005.0.5

Monitoring of Mains Phases

Description

If a three-phase drive is missing a mains phase and mains phase monitoring is not correctly set, this can cause overload of the product.

NOTICE
INOPERABLE EQUIPMENT DUE TO MISSING MAINS PHASE ● Verify that mains phase monitoring is set to "Automatic Mains Detection" or to "Mains ..." with the correct voltage value if the drive is supplied via the mains phases. ● Verify that mains phase monitoring is set to "DC bus only ..." with the correct voltage value if the drive is supplied via the DC bus. **Failure to follow these instructions can result in equipment damage.**

The parameter `ErrorResp_Flt_AC` lets you set the error response to a missing mains phase for three-phase devices.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ErrorResp_Flt_AC`	Error response to missing mains phase. **0 / Error Class 0**: Error class 0 **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 2 3	UINT16 R/W per. -	Modbus 1300 IDN P-0-3005.0.10

If the product is supplied via the DC bus, mains phase monitoring must be set to "DC bus only ..." with the correct voltage value.

Mains phase monitoring is set by means of the parameter `MON_MainsVolt`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_MainsVolt`	Detection and monitoring of mains phases. **0 / Automatic Mains Detection**: Automatic detection and monitoring of mains voltage **1 / DC-Bus Only (Mains 1~230 V / 3~480 V)**: DC bus supply only, corresponding to mains voltage 230 V (single-phase) or 480 V (three phases) **2 / DC-Bus Only (Mains 1~115 V / 3~208 V)**: DC bus supply only, corresponding to mains voltage 115 V (single-phase) or 208 V (three phases) **3 / Mains 1~230 V / 3~480 V**: Mains voltage 230 V (single-phase) or 480 V (three phases) **4 / Mains 1~115 V / 3~208 V**: Mains voltage 115 V (single-phase) or 208 V (three phases) **5 / Reserved**: Reserved Value 0: As soon as mains voltage detected, the device automatically verifies whether the mains voltage is 115 V or 230 V in the case of single-phase devices or 208 V or 400/480 V in the case of three-phase devices. Values 1 … 2: If the device is supplied only via the DC bus, the parameter has to be set to the voltage value corresponding to the mains voltage of the supplying device. There is no mains voltage monitoring. Values 3 … 4: If the mains voltage is not detected properly during start-up, the mains voltage to be used can be selected manually. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 0 5	UINT16 R/W per. expert	Modbus 1310 IDN P-0-3005.0.15

Ground Monitoring

Description

When the power stage is enabled, the device monitors the motor phases for ground errors. A ground error occurs when one or more motor phases are short-circuited to the ground (earth) of the application.

A ground error of one or more motor phases is detected. A ground error of the DC bus or the braking resistor is not monitored.

If the ground error monitoring is deactivated, the drive may be rendered inoperable by a ground error.

NOTICE

INOPERABLE EQUIPMENT DUE TO GROUND ERROR

- Only deactivate ground monitoring during commissioning and only for test purposes.
- Verify that the ground monitoring is active prior to putting the equipment into service.

Failure to follow these instructions can result in equipment damage.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_GroundFault	Ground monitoring. **0 / Off**: Ground monitoring off **1 / On**: Ground monitoring on Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective after the next power cycle.	- 0 1 1	UINT16 R/W per. expert	Modbus 1312 IDN P-0-3005.0.16

Chapter 9
Examples

Examples

General Information

The examples show some typical applications of the product. The examples are intended to provide an overview; they are not exhaustive wiring plans.

The examples described here are intended for learning purposes only. In general, they are intended to help you understand how to develop, test, commission, and integrate application logic and/or the device wiring of the equipment associated with your own design in your control systems. The examples are not intended to be used directly on products that are part of a machine or process.

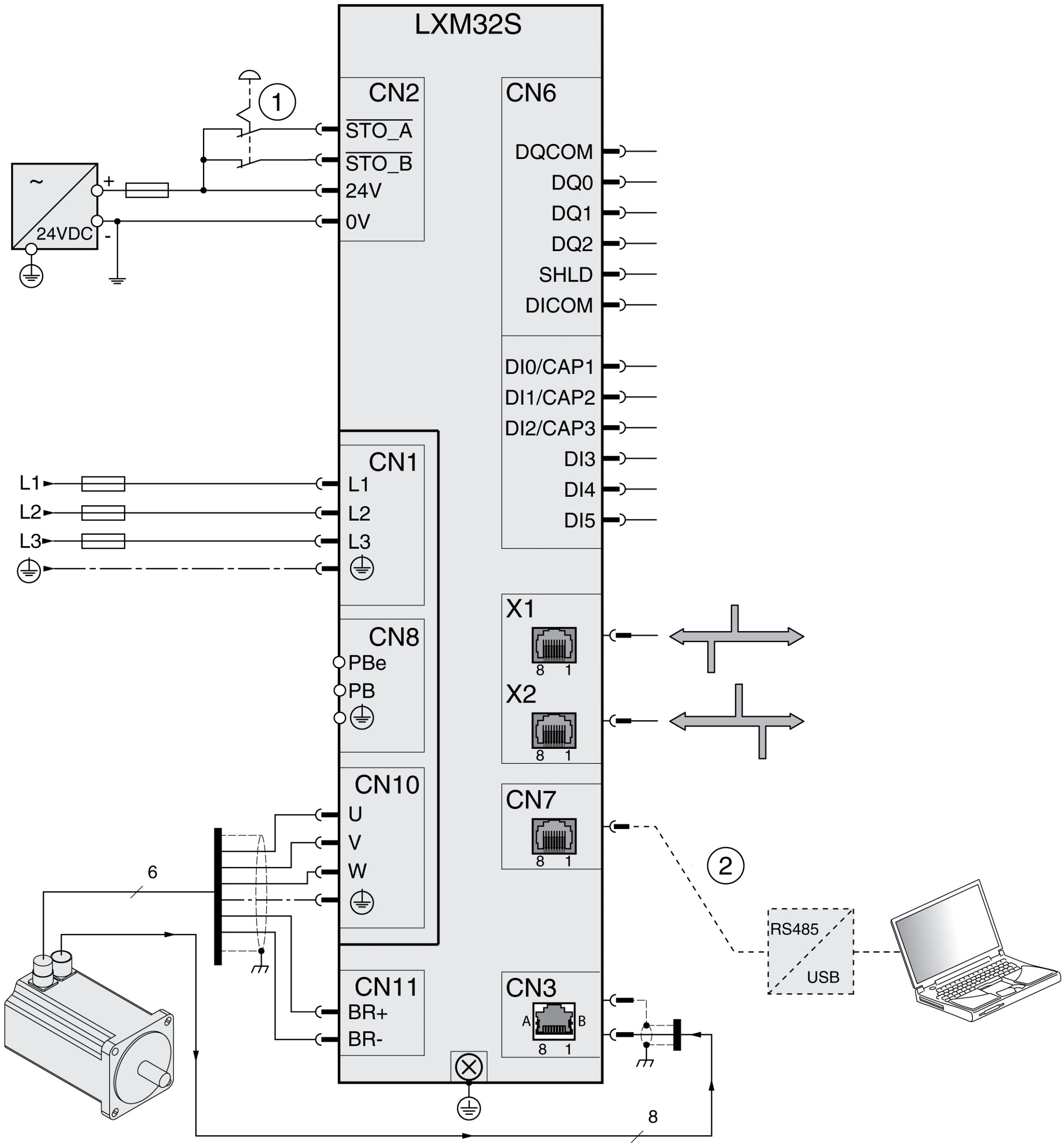
⚠ WARNING
UNINTENDED EQUIPMENT OPERATION Do not include any wiring information, programming or configuration logic, or parameterization values from the Examples in your machine or process without thoroughly testing your entire application. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Using the safety function STO integrated in this product requires careful planning. See chapter Safety function STO ("Safe Torque Off") *(see page 79)* for additional information.

Example of Operation via Fieldbus

The product is controlled via SERCOS 3.

Wiring example



1 EMERGENCY STOP
2 Commissioning accessories

Chapter 10
Diagnostics and Troubleshooting

What Is in This Chapter?

This chapter contains the following sections:

Section 10.1
Diagnostics via HMI

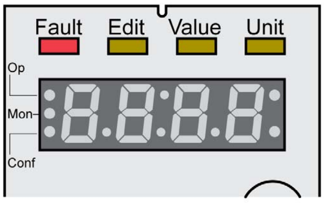
What Is in This Section?

This section contains the following topics:

Diagnostics via the Integrated HMI

Overview

The 7-segment display provides the user with information.



With the factory setting, the 7-segment display shows the operating states. The operating states are described in chapter Operating States *(see page 224)*.

Message	Description
init	Operating state **1** Start
nrdY	Operating state **2** Not Ready To Switch On
dis	Operating state **3** Switch On Disabled
rdY	Operating state **4** Ready To Switch On
Son	Operating state **5** Switched On
run and hALt	Operating state **6** Operation Enabled
StoP	Operating state **7** Quick Stop Active
FLt	Operating state **8** Fault Reaction Active and **9** Fault

Additional Messages

The table below provides an overview of the messages that can additionally be displayed on the integrated HMI.

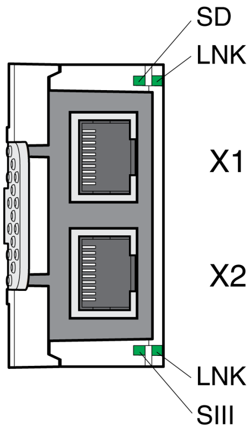
Message	Description
CArd	Data on the memory card differs from data in the product. See chapter Memory Card *(see page 177)* for information on how to proceed.
diSP	An external HMI is connected. The integrated HMI has no function.
FSu	Perform a First Setup. See chapter Powering on the Device for the First Time *(see page 141)*.
Mot	A new motor was detected. See chapter Acknowledging a Motor Change *(see page 310)* for replacing a motor.
Prot	Parts of the integrated HMI were locked with the parameter `HMIlocked`.
SLt1 ... SLt2	The device has detected a different equipment with modules. See chapter Acknowledging a Module Replacement *(see page 311)* for replacing modules.
uLoW	24 Vdc control supply during initialization not high enough.
WdoG	Undeterminable system error. Contact your Schneider Electric service representative.
8888	Undervoltage 24 Vdc control supply.

Fieldbus Status LEDs

General

The fieldbus status LEDs indicate the status of the fieldbus.

Overview of the LEDs



LED LNK

Status	Meaning
	No link
	Link, 10 MBit, no activity
	Link, 10 MBit, activity
	Link, 100 MBit, no activity
	Link, 100 MBit, activity

LED SIII

Status	Meaning
	No communication
	Communication phase 0 active
	Communication phase 1 active
	Communication phase 2 active
	Communication phase 3 active
	Communication phase 4 active
	Real-time state is "loopback"
	Application error
	MST transmission error ≥S-0-1003/2
	Communication error
	Identification ("IdentifyDevice")

LED SD

Status	Meaning
	Sub-device is not active
	Sub-device is in state "parametrization level (PL)"
	Sub-device is in state "operating level (OL)"
	Sub-device is in state "application error (C1D)"

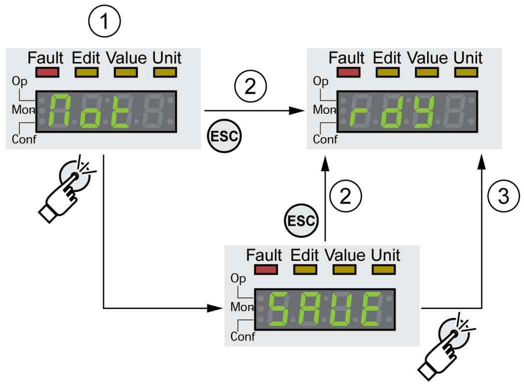
Acknowledging a Motor Change

Procedure for confirming a motor change via the integrated HMI.

If the 7-segment display shows Mot:

- Press the navigation button.
  The 7-segment display shows SAVE.
- Press the navigation button to save the new motor parameters to the nonvolatile memory.
  The product switches to operating state **4** Ready To Switch On.

Confirming a motor change via the integrated HMI



1 HMI displays that a replacement of a motor has been detected.
2 Canceling the saving process
3 Saving switching to operating state **4** Ready To Switch On.

Acknowledging a Module Replacement

General

Note the information in the manuals for the respective modules.

Slot 1

Refer to the manual for the safety module for information on replacing a module in slot 1.

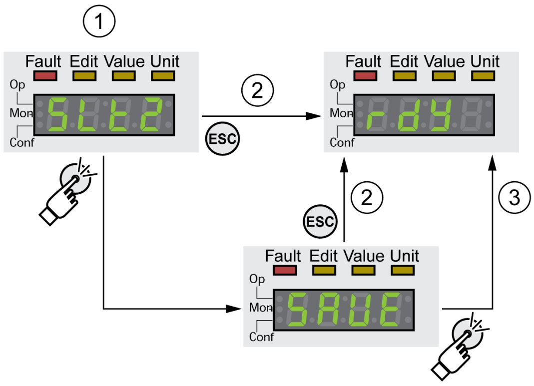
Slot 2

The replacement of a module is confirmed via the integrated HMI.

The 7-segment display shows SLt2.

- Press the navigation button.
  The 7-segment display shows SAVE.
- Press the navigation button.
  The product switches to operating state **4** Ready To Switch On.

Confirming a module change via the integrated HMI



1 HMI displays that a replacement of a module has been detected.
2 Canceling the saving process
3 Saving switching to operating state **4** Ready To Switch On.

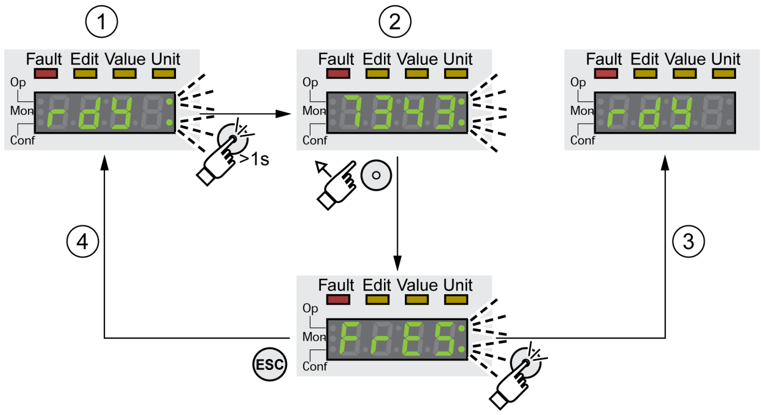
Displaying error messages via the HMI

Resetting Errors of Error Class 0

If there are errors of error class 0, the two dots to the right of the 7-segment display (2) flash. The error code is not directly displayed on the 7-segment display, but must be explicitly queried by the user.

Procedure for displaying and resetting:

- Remedy the cause.
- Press the navigation button and hold it down.
  The 7-segment display shows the error code.
- Release the navigation button.
  The 7-segment display shows FrES.
- Press the navigation button to reset the error message.
  The 7-segment display returns to the initial state.



1 HMI shows an error of error class 0
2 Indication of error code
3 Resetting an error message
4 Canceling (the error code remains in the memory)

See chapter Error Messages *(see page 325)* for the meaning of the error codes.

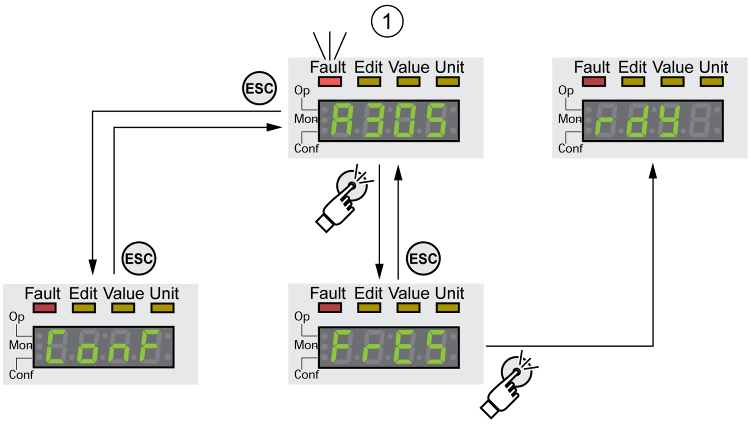
Reading and Acknowledging Errors of Error Classes 1 ...4

In the case of a detected error of error class 1, the error code and *StoP* are alternately shown on the 7 segment display.

In the case of a detected error of error class 2 ... 4, the error code and *FLt* are alternately shown on the 7 segment display.

Procedure for displaying and resetting:

- Remedy the cause.
- Press the navigation button.
  The 7-segment display shows *FrES*.
- Press the navigation button to reset the error message.
  The product switches to operating state **4** Ready To Switch On.



1 HMI shows and error message with an error code

See chapter Error Messages *(see page 325)* for the meaning of the error codes.

Section 10.2
Diagnostics via Signal Outputs

What Is in This Section?

This section contains the following topics:

Indicating the Operating State

Information on the operating state is available via the signal outputs.

The table below provides an overview.

	Signal output function	
Operating state	“No fault”(1)	“Active”(2)
1 Start	0	0
2 Not Ready To Switch On	0	0
3 Switch On Disabled	0	0
4 Ready To Switch On	1	0
5 Switched On	1	0
6 Operation Enabled	1	1
7 Quick Stop Active	0	0
8 Fault Reaction Active	0	0
9 Fault	0	0

(1) The signal output function is factory setting for signal output DQ0
(2) The signal output function is the factory setting for signal output DQ1

Indicating Error Messages

Description

Selected error messages can be output via the signal outputs.

In order to output an error message via a signal output, you must first parameterizes the signal output functions “Selected Warning” or “Selected Error”, see chapter Digital Inputs and Outputs *(see page 192)*.

The parameters `MON_IO_SelWar1` and `MON_IO_SelWar2` are used to specify error codes with the error class 0.

The parameters `MON_IO_SelErr1` and `MON_IO_SelErr2` are used to specify error codes with the error classes 1 ... 4.

If an error specified in one of these parameters is detected, the corresponding signal output is to be set.

The list of the error messages sorted by error code can be found in the chapter Error Messages *(see page 325)*.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_IO_SelWar1`	Signal output function Selected Warning (error class 0): First error code. This parameter specifies the error code of an error of error class 0 which is to activate the signal output function. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15120 IDN P-0-3059.0.8
`MON_IO_SelWar2`	Signal output function Selected Warning (error class 0): Second error code. This parameter specifies the error code of an error of error class 0 which is to activate the signal output function. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15122 IDN P-0-3059.0.9
`MON_IO_SelErr1`	Signal output function Selected Error (error classes 1 to 4): First error code. This parameter specifies the error code of an error of error classes 1 ... 4 which is to activate the signal output function. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15116 IDN P-0-3059.0.6
`MON_IO_SelErr2`	Signal output function Selected Error (error classes 1 to 4): Second error code. This parameter specifies the error code of an error of error classes 1 ... 4 which is to activate the signal output function. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15118 IDN P-0-3059.0.7

Section 10.3
Diagnostics via the Fieldbus

What Is in This Section?

This section contains the following topics:

Fieldbus Communication Error Diagnostics

Checking Connections

A properly operating fieldbus is essential for evaluating status and error messages.

If the product cannot be addressed via the fieldbus, first verify the connections.

Verify the following connections:
- System power supply
- Supply connections
- Fieldbus cables and wiring
- Fieldbus connection

Fieldbus Function Test

If the connections are correct, verify that you can address the product on the fieldbus.

Status Information on Detected Errors

Description

Status information on detected errors are provided via the parameter `S-0-0135`, bits 12 and 13. The status information shows the error class of a detected error.

The parameter `S-0-0390` allows you to read the error code of the detected error.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`S-0-0390`	Diagnostic number. The operation data of this parameter contains detailed information on the diagnostics event with the highest priority which is currently active in the drive. Type: Hexadecimal - 4 bytes Write access via Sercos: Read only Class name: GDP_Basic	- 0 0 4294967295	R/- - -	IDN S-0-0390

Bits	Meaning
0 ... 15	Value 0: No error detected. Value >0: Error code of the detected error.
16 ... 19	Value 14: Detected error with the error class 0. Value 15: Detected error with the error class 1, 2, 3, or 4.
20 ... 23	Reserved
24 ... 29	Value 1: Sercos FSP IO
30 ... 31	Value 1: Fully manufacture specific.

The parameters `S-0-0011` and `S-0-0012` also provide information on detected errors.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`S-0-0011`	Class 1 diagnostic (C1D). This parameter provides information on detected errors. A class 1 diagnostics error leads to a Quick Stop (with transition to operating state Fault). Type: Hexadecimal - 2 bytes Write access via Sercos: Read only	- 0 0 65535	R/- - -	IDN S-0-0011
`S-0-0012`	Class 2 diagnostic (C2D). This parameter provides information on warnings. Type: Hexadecimal - 2 bytes Write access via Sercos: Read only	- 0 0 65535	R/- - -	IDN S-0-0012

Most Recent Detected Error - Status Bits

Error Bits

The parameters _WarnLatched and _SigLatched contain information on errors of error class 0 and errors of error classes 1 ... 4.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_WarnLatched Mon WrnS	Saved errors of error class 0, bit-coded. The bits are set to 0 in the case of a Fault Reset. Bits 10 and 13 are set to 0 automatically. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General Bit 1: Reserved Bit 2: Out of range (software limit switches, tuning) Bit 3: Reserved Bit 4: Active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following error Bit 9: Reserved Bit 10: Inputs STO_A and/or STO_B Bits 11 ... 12: Reserved Bit 13: Low voltage DC bus or mains phase missing Bits 14 ... 15: Reserved Bit 16: Integrated encoder interface Bit 17: Temperature of motor high Bit 18: Temperature of power stage high Bit 19: Reserved Bit 20: Memory card Bit 21: Fieldbus module Bit 22: Encoder module Bit 23: Safety module eSM Bits 24 … 27: Reserved Bit 28: Transistor for braking resistor overload (I^2t) Bit 29: Braking resistor overload (I^2t) Bit 30: Power stage overload (I^2t) Bit 31: Motor overload (I^2t) Monitoring functions are product-dependent. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 7192 IDN P-0-3028.0.12

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_SigLatched Mon SiGS	Saved status of monitoring signals. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General error Bit 1: Hardware limit switches (LIMP/LIMN/REF) Bit 2: Out of range (software limit switches, tuning) Bit 3: Quick Stop via fieldbus Bit 4: Error in active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following error Bit 9: Reserved Bit 10: Inputs STO are 0 Bit 11: Inputs STO different Bit 12: Reserved Bit 13: DC bus voltage low Bit 14: DC bus voltage high Bit 15: Mains phase missing Bit 16: Integrated encoder interface Bit 17: Overtemperature motor Bit 18: Overtemperature power stage Bit 19: Reserved Bit 20: Memory card Bit 21: Fieldbus module Bit 22: Encoder module Bit 23: Safety module eSM Bit 24: Reserved Bit 25: Reserved Bit 26: Motor connection Bit 27: Motor overcurrent/short circuit Bit 28: Frequency of reference signal too high Bit 29: Nonvolatile memory error detected Bit 30: System start-up (hardware or parameter) Bit 31: System error detected (for example, watchdog, internal hardware interface) Monitoring functions are product-dependent. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 7184 IDN P-0-3028.0.8

Most Recent Detected Error - Error Code

Description

If the master controller receives information concerning a detected error via the process data communication, the following parameters can be used to read the error code.

The list of the error messages sorted by error code can be found in the chapter Error Messages *(see page 325)*.

Most Recent Detected Error with Error Class 0

The parameter `_LastWarning` allows you to read the error number of the last detected error with error class 0.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_LastWarning` Mon LWrn	Code of most recent error of error class 0. If the error is no longer active, the code is stored until the next Fault Reset. Value 0: No error of error class 0 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 7186 IDN P-0-3028.0.9

Most Recent Detected Error with Error Class 1 ... 4

The parameter `_LastError` allows you to read the error number of the last detected error with error class 1 ... 4.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_LastError` Mon LFLt	Detected error causing a stop (error classes 1 to 4). Error code of the most recent detected error. Consecutive detected errors do not overwrite this error code. Example: If an error response to a detected limit switch error causes overvoltage, this parameter contains the code of the detected limit switch error. Exception: Detected errors of error class 4 overwrite existing entries. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 7178 IDN P-0-3028.0.5

Error Memory

General

The error memory is an error history of the last 10 error messages. It is not cleared even if the product is powered off. The error memory allows you to read and evaluate past events.

The following information on the events is stored:

- Error class
- Error code
- Motor current
- Number of power on cycles
- Additional error information (for example, parameter numbers)
- Product temperature
- Power stage temperature
- Time the error was detected (with reference to operating hours counter)
- DC Bus Voltage
- Velocity
- Number of Enable cycles after powering on
- Time from Enable until detection of the error

The stored information relates to the situation at the point in time the error was detected.

The list of the error messages sorted by error code can be found in the chapter Error Messages *(see page 325)*.

Reading the Error Memory

The error memory can only be read sequentially. The parameter `ERR_reset` must be used to reset the read pointer. Then the first error entry can be read. The read pointer is automatically set to the next entry. A new read access delivers the next error entry. If the error code 0 is returned, there is no additional error entry.

Position of the entry	Meaning
1	First error message (oldest message).
2	Second error message (later message).
...	...
10	Tenth error message. In the case of ten error messages, the most recent error message is contained here.

An error entry consists of several pieces of information which can be read using different parameters. When you read an error entry, the error code must be read first with the parameter `_ERR_number`.

The following parameters allow you to manage the error memory:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_ERR_class`	Error class. Value 0: Error class 0 Value 1: Error class 1 Value 2: Error class 2 Value 3: Error class 3 Value 4: Error class 4 Type: Unsigned decimal - 2 bytes	- 0 - 4	UINT16 R/- - -	Modbus 15364 IDN P-0-3060.0.2
`_ERR_number`	Error code. Reading this parameter copies the entire entry for the detected error (error class, time of detection of error, …) to an intermediate memory from which the elements of the detected error can then be read. In addition, the read pointer of the error memory is automatically set to the next error entry. Type: Unsigned decimal - 2 bytes	- 0 - 65535	UINT16 R/- - -	Modbus 15362 IDN P-0-3060.0.1

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_ERR_motor_I	Motor current at the time the error was detected. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 15378 IDN P-0-3060.0.9
_ERR_powerOn Mon PoWo	Number of power on cycles. Type: Unsigned decimal - 4 bytes	- 0 - 4294967295	UINT32 R/- - -	Modbus 15108 IDN P-0-3059.0.2
_ERR_qual	Additional information on detected error. This entry contains additional information on the detected error, depending on the error number. Example: a parameter address Type: Unsigned decimal - 2 bytes	- 0 - 65535	UINT16 R/- - -	Modbus 15368 IDN P-0-3060.0.4
_ERR_temp_dev	Temperature of device at the time the error was detected. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 15382 IDN P-0-3060.0.11
_ERR_temp_ps	Temperature of power stage at the time the error was detected. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 15380 IDN P-0-3060.0.10
_ERR_time	Time of detection of error. With reference to operating hours counter Type: Unsigned decimal - 4 bytes	s 0 - 536870911	UINT32 R/- - -	Modbus 15366 IDN P-0-3060.0.3
_ERR_DCbus	DC bus voltage at the time the error was detected. Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- - -	Modbus 15374 IDN P-0-3060.0.7
_ERR_motor_v	Motor velocity at the time the error was detected. Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 15376 IDN P-0-3060.0.8
_ERR_enable_cycl	Number of cycles of enabling the power stage at error time. Number of cycles of enabling the power stage from the time the control voltage was applied to the time the error was detected. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 15370 IDN P-0-3060.0.5
_ERR_enable_time	Time between enabling of power stage and detection of the error. Type: Unsigned decimal - 2 bytes	s - - -	UINT16 R/- - -	Modbus 15372 IDN P-0-3060.0.6
ERR_reset	Reset error memory read pointer. Value 1: Set error memory read pointer to oldest error entry. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 - 1	UINT16 R/W - -	Modbus 15114 IDN P-0-3059.0.5
ERR_clear	Clear error memory. Value 1: Delete entries in the error memory The clearing process is completed if a 0 is returned after a read access. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 - 1	UINT16 R/W - -	Modbus 15112 IDN P-0-3059.0.4

Section 10.4
Error Messages

What Is in This Section?

This section contains the following topics:

Description of Error Messages

Description

If monitoring functions of the drive detect an error, the drive generates an error message. Each error message is identified by an error code.

The following information is available for each error message:

- Error code
- Error class
- Description of error
- Possible causes
- Possible remedies

Range of Error Messages

The table below summarizes the error codes classified by range.

Error code	Range
E 1xxx	General
E 2xxx	Overcurrent
E 3xxx	Voltage
E 4xxx	Temperature
E 5xxx	Hardware
E 6xxx	Software
E 7xxx	Interface, wiring
E 8xxx	Fieldbus
E Axxx	Motor movement
E Bxxx	Communication

Error Class of Error Messages

The error messages are classified according to the following error classes:

Error class	State transition[1)]	Error response	Resetting the error message
0	-	No interruption of the movement	Function “Fault Reset”
1	T11	Stop movement with “Quick Stop”	Function “Fault Reset”
2	T13, T14	Stop movement with “Quick Stop” and disable the power stage when the motor has come to a standstill	Function “Fault Reset”
3	T13, T14	Disable the power stage immediately without stopping the movement first	Function “Fault Reset”
4	T13, T14	Disable the power stage immediately without stopping the movement first	Power cycle
(1) See chapter Operating State *(see page 224)*			

Table of Error Messages

List of the Error Messages Sorted by Error Code

Error code	Error class	Description	Cause	Correctives
E 1100	0	Parameter out of permissible value range	The value entered was outside of the permissible value range for this parameter.	The entered value must be within the permissible value range.
E 1101	0	Parameter does not exist	Error detected by parameter management: Parameter (index) does not exist.	Select a different parameter (index).
E 1102	0	Parameter does not exist	Error detected by parameter management: Parameter (subindex) does not exist.	Select a different parameter (subindex).
E 1103	0	Parameter write not permissible (READ only)	Write access to read only parameter.	Write only to parameters that are not read-only.
E 1104	0	Write access denied (no access authorization)	Parameter only accessible at expert level.	The write access level expert is required.
E 1105	0	Block Upload/Download not initialized	-	-
E 1106	0	Command not permissible while power stage is active	Command not permissible while the power stage is enabled (operating state Operation Enabled or Quick Stop Active).	Disable the power stage and repeat the command.
E 1107	0	Access via other interface blocked	Access occupied by another channel (for example: Commissioning software is active and fieldbus access was tried at the same time).	Verify the channel that blocks access.
E 1108	0	File cannot be uploaded: Incorrect file ID	-	-
E 1109	1	Data stored after a power outage is invalid	-	-
E 110A	0	System error detected: No bootloader available	-	-
E 110B	3	Configuration error detected (additional info=Modbus register address) Parameter `_SigLatched` Bit 30	Error detected during parameter check (for example, reference velocity value for operating mode Profile Position is greater than maximum permissible velocity of drive).	Value in additional error information shows the Modbus register address of the parameter where the initialization error was detected.
E 110D	1	Basic configuration of drive required after factory setting	The "First Setup" (FSU) was not run at all or not completed.	Perform a First Setup.
E 110E	0	Parameter changed that requires a restart of the drive	Only displayed by the commissioning software. A parameter modification requires the drive to be powered off and on.	Restart the drive to activate the parameter functionality. See the chapter Parameters for the parameter that requires a restart of the drive.
E 110F	0	Function not available in this type of device	The specific type of device does not support this function or this parameter value.	Verify that you have the correct device type, in particular type of motor, type of encoder, holding brake.
E 1110	0	Incorrect file ID for upload or download	The specific type of device does not support this kind of file.	Verify that you have the correct device type or the correct configuration file.
E 1111	0	File transfer not correctly initialized	A previous file transfer has been aborted.	-
E 1112	0	Locking of configuration denied	An external tool has tried to lock the configuration of the drive for upload or download. This may not work because another tool had already locked the configuration of the drive or the drive is in an operating state that does not allow locking.	-
E 1113	0	System not locked for configuration transfer	An external tool has tried to transfer the configuration without locking the drive.	-

Error code	Error class	Description	Cause	Correctives
E 1114	4	Configuration download aborted Parameter `_SigLatched` Bit 5	During a configuration download, a communication error or an error in the external tool was detected. The configuration was only partially transferred to the drive and might be inconsistent now.	Power the drive off/on and retry to download the configuration or restore the factory settings.
E 1115	0	Incorrect configuration file format Parameter `_WarnLatched` Bit 5	An external tool has downloaded a configuration which has an incorrect format.	-
E 1116	0	Request is processed asynchronously	-	-
E 1117	0	Asynchronous request blocked	Request to a module is blocked because the module is currently processing another request.	-
E 1118	0	Configuration data incompatible with device	The configuration data contains data from a different device.	Verify device type including type of power stage.
E 1119	0	Incorrect data length, too many bytes	-	-
E 111A	0	Incorrect data length, insufficient number of bytes	-	-
E 111B	4	Configuration download error detected (additional info=Modbus register address)	During a configuration download, one or more configuration values were not accepted by the drive.	Verify that the configuration file is valid and matches the type and version of the drive. The value in the additional error info shows the Modbus register address of the parameter where the initialization error was detected.
E 111C	1	Not possible to initialize recalculation for scaling	A parameter could not be initialized.	The address of the parameter that caused the detected error can be read via the parameter _PAR_ScalingError.
E 111D	3	Original state of a parameter cannot be restored after an error was detected during recalculation of parameters with user-defined units.	The drive contained an invalid configuration before the recalculation was started. An error was detected during the recalculation.	Power the drive off and on again. This may help you to identify the affected parameter(s). Change the parameters as required. Verify that the parameter configuration is valid before starting the recalculation procedure.
E 111E	1	Not possible to recalculate data set	A data set of the operating mode Motion Sequence could not be recalculated.	The address of the parameter and the number of the data set that caused this condition can be read via the parameter _PAR_ScalingError.
E 111F	1	Recalculation not possible.	Invalid scaling factor.	Verify that you really want the selected scaling factor. Try a different scaling factor. Before triggering scaling, reset the parameters with user-defined units.
E 1120	1	Recalculation for scaling not possible	A parameter could not be recalculated.	The address of the parameter that caused this condition can be read via the parameter _PAR_ScalingError.
E 1121	0	Incorrect sequence of steps for scaling (fieldbus)	The recalculation has been started prior to the initialization.	The recalculation must be started after the initialization.
E 1122	0	Recalculation for scaling not possible	Recalculation for scaling is already running.	Wait for the running recalculation for scaling to finish.
E 1123	0	Parameter cannot be changed	Recalculation for scaling is running.	Wait for the running recalculation for scaling to finish.
E 1124	1	Timeout during recalculation for scaling	The time between the initialization of the recalculation and the start of the recalculation has been exceeded (30 seconds).	Recalculation must be started within 30 seconds after initialization.
E 1125	1	Scaling not possible	The scaling factors for position, velocity or acceleration/deceleration are beyond internal calculation limits.	Retry with different scaling factors.
E 1126	0	Configuration is blocked by another access channel	-	Close other access channel (for example, other instance of commissioning software).
E 1127	0	Invalid key received	-	-

Error code	Error class	Description	Cause	Correctives
E 1128	0	Special login is required for Manufacturing Test Firmware	-	-
E 1129	0	Test step not yet started	-	-
E 112A	0	Not possible to enable the capture input	Position capturing has not yet been activated	Activate position capturing via procedure command "Probing cycle" (IDN170).
E 112B	0	Not possible to configure difference value capturing	Capture input 1 has not been set to both edges (IDN169).	Set capture input 1 to both edges.
E 112C	0	Not possible to configure difference value capturing	Capture input 2 has not been set to both edges (IDN169).	Set capture input 2 to both edges.
E 112E	0	Configuration of edges cannot be changed	The configuration of edges cannot be changed because difference value capture is active.	Deactivate difference value capture.
E 1130	0	Incorrect parameter setting	The parameter ENC_ModeOfMaEnc is set to "Velocity And Position". The parameter ErrorResp_PDiffEncM is set to "Error Class 1" or "Error Class 2". The combination of these settings is invalid.	Set parameter ErrorResp_PDiffEncM to "Error Class 3".
E 1300	3	Safety function STO activated (STO_A, STO_B) Parameter `_SigLatched` Bit 10	The safety function STO was activated in the operating state Operation Enabled.	Verify correct wiring of the inputs of the safety function STO and perform a Fault Reset.
E 1301	4	STO_A and STO_B different level Parameter `_SigLatched` Bit 11	The levels of the inputs STO_A and STO_B were different for more than 1 second.	Verify correct wiring of the inputs of the safety function STO.
E 1302	0	Safety function STO activated (STO_A, STO_B) Parameter `_WarnLatched` Bit 10	Safety function STO was activated while the power stage was disabled.	Verify correct wiring of the inputs of the safety function STO.
E 1310	2	Frequency of the external reference value signal too high Parameter `_SigLatched` Bit 28	The frequency of the external reference value signals (A/B signals, P/D signals or CW/CCW signals) is higher than the permissible value.	Verify the frequency of the external reference values. Verify the gear ratio in the operating mode Electronic Gear.
E 1311	0	The selected signal input function or signal output function cannot be configured	The selected signal input function or signal output function cannot be used in the selected operating mode.	Select another function or change the operating mode.
E 1312	0	Limit switch or reference switch signal not defined for signal input function	Reference movements require limit switches. These limit switches are not assigned to inputs.	Assign the signal input functions Positive Limit Switch, Negative Limit Switch and Reference Switch.
E 1313	0	Configured debounce time not possible for this signal input function	The signal input function does not support the selected debounce time.	Set the debounce time to a valid value.
E 1314	4	At least two inputs have the same signal input function.	The same signal input function has been assigned to at least two inputs.	Reconfigure the inputs.
E 1315	0	Frequency of reference value signal is too high. Parameter `_WarnLatched` Bit 28	The frequency of the pulse signal (A/B, Pulse/Direction, CW/CCW) exceeds the specified range. Received pulses may be lost.	Adapt the frequency of the reference value signal to match the input specification of the drive. Also adapt the gear ratio in the operating mode Electronic Gear to the application requirements (position accuracy and velocity).
E 1316	1	Position capture via signal input currently not possible Parameter `_SigLatched` Bit 28	Position capture is already being used.	-
E 1317	0	Interference at PTI input Parameter `_WarnLatched` Bit 28	Interfering pulses or impermissible edge transitions (A and B signal simultaneously) have been detected.	Verify cable specifications, shield connection and EMC.
E 1318	0	The selected type of usage of the analog inputs is not possible.	At least two analog inputs are configured with the same type of usage.	Reconfigure the analog inputs.
E 1501	4	System error detected: DriveCom state machine indeterminable state	-	-

Error code	Error class	Description	Cause	Correctives
E 1502	4	System error detected: HWL low-level state machine indeterminable state	-	-
E 1503	1	Quick Stop triggered via fieldbus	A Quick Stop has been triggered via the fieldbus. The Quick Stop option code has been set to -1 or -2 which causes the drive to transition to the operating state 9 Fault instead of the operating state 7 Quick Stop Active.	-
E 1504	2	Power stage cannot be enabled Parameter `_SigLatched` Bit 4	The signal input function "Servo On" has been assigned to an input. However, there is a 0 level the signal input.	There must be a 1 level at the signal input.
E 1600	0	Oscilloscope: No additional data available	-	-
E 1601	0	Oscilloscope: Parameterization incomplete	-	-
E 1602	0	Oscilloscope: Trigger variable not defined	-	-
E 1606	0	Logging still active	-	-
E 1607	0	Logging: No trigger defined	-	-
E 1608	0	Logging: Invalid trigger option	-	-
E 1609	0	Logging: No channel selected	-	-
E 160A	0	Logging: No data available	-	-
E 160B	0	Parameter cannot be logged	-	-
E 160C	1	Autotuning: Moment of inertia outside permissible range	The load inertia is too high.	Verify that the system can easily be moved. Verify the load. Use a differently rated drive.
E 160E	1	Autotuning: Test movement could not be started	-	-
E 160F	1	Autotuning: Power stage cannot be enabled	Autotuning was not started in the operating state Ready To Switch On.	Start Autotuning when the drive is in the operating state Ready To Switch On.
E 1610	1	Autotuning: Processing stopped	Autotuning stopped by user command or by detected error (see additional error message in error memory, for example, DC bus undervoltage, limit switches triggered)	Remove the cause of the stop and restart Autotuning.
E 1611	1	System error detected: Parameter could not be written during Autotuning (additional info=Modbus register address)	-	-
E 1612	1	System error detected: Parameter could not be read during Autotuning	-	-
E 1613	1	Autotuning: Maximum permissible movement range exceeded Parameter `_SigLatched` Bit 2	The movement exceeded the adjusted movement range during Autotuning.	Increase the movement range value or disable movement range monitoring by setting AT_DIS = 0.
E 1614	0	Autotuning: Already active	Autotuning has been started twice simultaneously or an Autotuning parameter is modified during Autotuning (parameter AT_dis and AT_dir).	Wait for Autotuning to finish before restarting Autotuning.
E 1615	0	Autotuning: This parameter cannot be changed while Autotuning is active	Parameter AT_gain or AT_J are written during Autotuning.	Wait for Autotuning to finish before changing the parameter.
E 1617	1	Autotuning: Friction torque or load torque too great	The current limit has been reached (parameter CTRL_I_max).	Verify that the system can easily be moved. Verify the load. Use a differently rated drive.

Error code	Error class	Description	Cause	Correctives
E 1618	1	Autotuning: Optimization aborted	The internal Autotuning sequence has not been finished, there may have been a following error.	See the additional information provided in the error memory.
E 1619	0	Autotuning: Velocity jump in parameter AT_n_ref is not sufficient	Parameter AT_n_ref < 2 * AT_n_tolerance. The drive only checks this for the first velocity jump.	Modify the parameter AT_n_ref or AT_n_tolerance to meet the required condition.
E 1620	1	Autotuning: Load torque too high	Product rating is not suitable for the machine load. Detected machine inertia is too high compared to the inertia of the motor.	Reduce load, verify rating.
E 1621	1	System error detected: Calculation error	-	-
E 1622	0	Autotuning: Not possible to perform Autotuning	Autotuning can only be performed if no operating mode is active.	Terminate the active operating mode or disable the power stage.
E 1623	1	Autotuning: HALT request has stopped the autotuning process	Autotuning can only be performed if no operating mode is active.	Terminate the active operating mode or disable the power stage.
E 1A00	0	System error detected: FIFO memory overflow	-	-
E 1A01	3	Motor has been changed (different type of motor) Parameter `_SigLatched` Bit 16	Detected motor type is different from previously detected motor.	Confirm the change.
E 1A03	4	System error detected: Hardware and firmware do not match	-	-
E 1B00	3	System error detected: Incorrect parameters for motor and power stage Parameter `_SigLatched` Bit 30	Incorrect manufacturer parameter value (data) non-volatile memory of device.	Replace device.
E 1B02	3	Target value too high. Parameter `_SigLatched` Bit 30	-	-
E 1B04	2	Product of encoder simulation resolution and the maximum velocity is too high Parameter `_SigLatched` Bit 30	Value in parameter CTRL_v_max or resolution or the encoder simulation ESIM_scale are too high.	Reduce the resolution of the encoder simulation or the maximum velocity in parameter CTRL_v_max.
E 1B05	2	Error detected during parameter switching Parameter `_SigLatched` Bit 30	-	-
E 1B06	3	Wake & shake cannot be started. Parameter `_SigLatched` Bit 30	Motor velocity is too high at the beginning of the wake and shake procedure.	Verify that the motor is at a standstill at the beginning wake and shake procedure.
E 1B08	3	Position difference during the wake and shake procedure is too high.	Incorrect motor data entered by user (especially motor resistance, motor inertia (in case of rotary motors) or motor mass (in case of linear motors)). Incorrect setting for parameter WakeAndShakeGain.	Verify motor data. Verify setting of parameter WakeAndShakeGain.
E 1B0B	1	The operating state at the beginning of the commutation offset identification must be Ready To Switch On.	-	Set the operating state to Ready To Switch On and restart commutation offset identification.
E 1B0C	3	Motor velocity too high.	-	-
E 1B0D	3	Velocity value determined by velocity observer is incorrect	Incorrect system inertia for velocity observer calculations. Incorrect velocity observer dynamics. System inertia changes during operation. In this case, operation with velocity observer is not possible and the velocity observer must be deactivated.	Change the velocity observer dynamics via the parameter CTRL_SpdObsDyn. Change the system inertia used for velocity observer calculations via the parameter CTRL_SpdObsInert. If the detected error persists, deactivate the velocity observer.

Error code	Error class	Description	Cause	Correctives
E 1B0E	3	Not possible to determine the commutation angle at the end of the wake and shake procedure	Incorrect motor data, for example motor resistance, motor inertia (in case of rotary motors) or motor mass (in case of linear motors). Incorrect setting for parameter WakeAndShakeGain. Holding brake (if available) not properly wired.	Verify correct motor data. Verify setting of parameter WakesAndShakeGain. Verify correct wiring of holding brake.
E 1B0F	3	Velocity deviation too high	-	-
E 2300	3	Power stage overcurrent Parameter `_SigLatched` Bit 27	Motor short circuit and disabling of the power stage. Motor phases are inverted.	Verify the motor power connection.
E 2301	3	Braking resistor overcurrent Parameter `_SigLatched` Bit 27	Braking resistor short circuit.	If you use the internal braking resistor, contact your Schneider Electric service representative. If you use an external braking resistor, verify correct wiring and rating of the braking resistor.
E 3100	par.	Missing mains supply, undervoltage mains supply or overvoltage mains supply Parameter `_SigLatched` Bit 15	Missing phase(s) for more than 50 ms. Mains voltage is out of range. Mains frequency is out of range.	Verify that the values of the mains power supply network comply with the technical data.
E 3200	3	DC bus overvoltage Parameter `_SigLatched` Bit 14	Excessive regeneration during deceleration.	Verify correct deceleration ramp, rating of drive and braking resistor.
E 3201	3	DC bus undervoltage (shutdown threshold) Parameter `_SigLatched` Bit 13	Power supply outage, insufficient power supply.	Verify mains supply.
E 3202	2	DC bus undervoltage (Quick Stop threshold) Parameter `_SigLatched` Bit 13	Power supply outage, insufficient power supply.	Verify mains supply.
E 3206	0	Undervoltage DC bus, missing mains supply, undervoltage mains supply or overvoltage mains supply Parameter `_WarnLatched` Bit 13	Missing phase(s) for more than 50 ms. Mains voltage is out of range. Mains frequency is out of range. Mains voltage and setting of parameter MON_MainsVolt do not match (for example, mains voltage is 230 V and MON_MainsVolt is set to 115 V).	Verify that the values of the mains power supply network comply with the technical data. Verify the settings of the parameter for reduced mains voltage.
E 3300	0	The winding voltage of the motor is lower than the nominal supply voltage of the drive	If the winding voltage of the motor is lower than the nominal supply voltage of the drive, this may result in motor overtemperature due to high current ripple.	Verify the motor temperature. In the case of overtemperature, use a motor with a higher winding voltage or use a drive with a lower nominal supply voltage.
E 4100	3	Power stage overtemperature Parameter `_SigLatched` Bit 18	Excessively high ambient temperature due to, for example, dust.	Improve heat dissipation. If a fan is installed, verify correct operation of the fan.
E 4101	0	Power stage overtemperature Parameter `_WarnLatched` Bit 18	Excessively high ambient temperature due to, for example, dust.	Improve heat dissipation. If a fan is installed, verify correct operation of the fan.
E 4102	0	Power stage overload (I2t) Parameter `_WarnLatched` Bit 30	The current has exceeded the nominal value for an extended period of time.	Verify rating, reduce cycle time.
E 4200	3	Device overtemperature Parameter `_SigLatched` Bit 18	Excessively high ambient temperature due to, for example, dust.	Improve heat dissipation. If a fan is installed, verify correct operation of the fan.
E 4300	2	Motor overtemperature Parameter `_SigLatched` Bit 17	Ambient temperature is too high. Duty cycle is too high. Motor not properly mounted (thermal isolation). Motor overload.	Verify motor installation: The heat must be dissipated via the mounting surface. Reduce ambient temperature. Provide ventilation.

Error code	Error class	Description	Cause	Correctives
E 4301	0	Motor overtemperature Parameter _WarnLatched Bit 17	Ambient temperature is too high. Duty cycle is too high. Motor not properly mounted (thermal isolation). Motor overload.	Verify motor installation: The heat must be dissipated via the mounting surface. Reduce ambient temperature. Provide ventilation.
E 4302	0	Motor overload (I2t) Parameter _WarnLatched Bit 31	The current has exceeded the nominal value for an extended period of time.	Verify that the system can easily be moved. Verify the load. Use a differently sized motor, if necessary.
E 4303	0	No motor temperature monitoring	The temperature parameters (in electronic nameplate of motor, non-volatile memory of encoder) are unavailable or invalid; parameter A12 is equal to 0.	Contact your Schneider Electric service representative. Replace motor.
E 4304	0	The encoder does not support motor temperature monitoring.	-	-
E 4402	0	Braking resistor overload (I2t > 75%) Parameter _WarnLatched Bit 29	Regeneration energy too high. External loads too high. Motor velocity too high. Deceleration too fast. Insufficient braking resistor.	Reduce load, velocity, deceleration. Verify correct braking resistor rating.
E 4403	par.	Braking resistor overload (I2t > 100%)	Regeneration energy too high. External loads too high. Motor velocity too high. Deceleration too fast. Insufficient braking resistor.	Reduce load, velocity, deceleration. Verify correct braking resistor rating.
E 4404	0	Overload of transistor for braking resistor Parameter _WarnLatched Bit 28	Regeneration energy too high. External loads too high. Deceleration too fast.	Reduce load and/or deceleration.
E 5101	0	Modbus power supply missing	-	-
E 5102	4	Motor encoder supply voltage Parameter _SigLatched Bit 16	Encoder power supply is not within permissible range of 8 V to 12 V.	Replace the device. Contact your Schneider Electric service representative.
E 5200	4	Error detected at connection to motor encoder Parameter _SigLatched Bit 16	Encoder not properly connected, EMC	-
E 5201	4	Error detected in motor encoder communication Parameter _SigLatched Bit 16	Encoder not properly connected, EMC	-
E 5202	4	Motor encoder is not supported Parameter _SigLatched Bit 16	Incompatible encoder connected.	-
E 5203	4	Error detected in connection motor encoder Parameter _SigLatched Bit 16	Encoder not properly connected	-
E 5204	3	Connection to motor encoder lost Parameter _SigLatched Bit 16	Encoder not properly connected	-
E 5206	0	Communication error detected in encoder Parameter _WarnLatched Bit 16	Communication channel to encoder is subject to interference.	Verify EMC measures.
E 5207	1	Function is not supported	The hardware revision does not support the function.	-
E 5302	4	The motor requires a PWM frequency (16kHz) which the power stage does not support.	The motor only works with a PWM frequency of 16 kHz (motor nameplate entry). However, the power stage does not support this PWM frequency.	Use a motor that works with a PWM frequency of 8 kHz. Contact your Schneider Electric service representative.
E 5430	4	System error detected: Nonvolatile memory read error Parameter _SigLatched Bit 29	-	-

Error code	Error class	Description	Cause	Correctives
E 5431	3	System error: Nonvolatile memory write error Parameter _SigLatched Bit 29	-	-
E 5432	3	System error: Nonvolatile memory state machine Parameter _SigLatched Bit 29	-	-
E 5433	3	System error: Nonvolatile memory address error Parameter _SigLatched Bit 29	-	-
E 5434	3	System error: Nonvolatile memory incorrect data length Parameter _SigLatched Bit 29	-	-
E 5435	4	System error: Nonvolatile memory not formatted Parameter _SigLatched Bit 29	-	-
E 5436	4	System error: Nonvolatile memory incompatible structure Parameter _SigLatched Bit 29	-	-
E 5437	4	System error detected: Nonvolatile memory checksum error (manufacturer data) Parameter _SigLatched Bit 29	-	-
E 5438	3	System error detected: Nonvolatile memory checksum error (user parameters) Parameter _SigLatched Bit 29	-	-
E 5439	3	System error detected: Nonvolatile memory checksum error (fieldbus parameters) Parameter _SigLatched Bit 29	-	-
E 543B	4	System error detected: No valid manufacturer data Parameter _SigLatched Bit 29	-	-
E 543E	3	System error detected: Nonvolatile memory checksum error (NoInit parameter) Parameter _SigLatched Bit 29	-	-
E 543F	3	System error detected: Nonvolatile memory checksum error (motor parameters) Parameter _SigLatched Bit 29	-	-
E 5441	4	System error detected: Nonvolatile memory checksum error (global control loop parameter set) Parameter _SigLatched Bit 29	-	-
E 5442	4	System error detected: Nonvolatile memory checksum error (control loop parameter set 1) Parameter _SigLatched Bit 29	-	-
E 5443	4	System error detected: Nonvolatile memory checksum error (control loop parameter set 2) Parameter _SigLatched Bit 29	-	-
E 5444	4	System error detected: Nonvolatile memory checksum error (NoReset parameter) Parameter _SigLatched Bit 29	-	-

Error code	Error class	Description	Cause	Correctives
E 5445	4	System error detected: Nonvolatile memory checksum error (hardware information) Parameter `_SigLatched` Bit 29	-	-
E 5446	4	System error detected: Nonvolatile memory checksum error (for power outage data) Parameter `_SigLatched` Bit 29	Internal nonvolatile memory not operative.	Restart the drive. If the detected error persists, contact your Schneider Electric service representative.
E 5448	2	System error detected: Communication with memory card Parameter `_SigLatched` Bit 20	-	-
E 5449	2	System error detected: Memory card bus is busy Parameter `_SigLatched` Bit 20	-	-
E 544A	4	System error detected: Nonvolatile memory checksum error (administration data) Parameter `_SigLatched` Bit 29	-	-
E 544C	4	System error detected: Nonvolatile memory is write-protected Parameter `_SigLatched` Bit 29	-	-
E 544D	2	System error detected: Memory card Parameter `_SigLatched` Bit 20	The last saving procedure may not have been successful; the memory card may be inoperative.	Retry saving the data. Replace the memory card.
E 544E	2	System error detected: Memory card Parameter `_SigLatched` Bit 20	The last saving procedure may not have been successful; the memory card may be inoperative.	Retry saving the data. Replace the memory card.
E 544F	2	System error detected: Memory card Parameter `_SigLatched` Bit 20	The last saving procedure may not have been successful; the memory card may be inoperative.	Retry saving the data. Replace the memory card.
E 5451	0	System error detected: No memory card available Parameter `_WarnLatched` Bit 20	-	-
E 5452	2	System error detected: Data on memory card and device do not match Parameter `_SigLatched` Bit 20	Different type of device. Different type of power stage. Data on memory card does not match firmware version of device.	-
E 5453	2	System error detected: Incompatible data on the memory card Parameter `_SigLatched` Bit 20	-	-
E 5454	2	System error detected: Capacity of detected memory card insufficient Parameter `_SigLatched` Bit 20	-	-
E 5455	2	System error detected: Memory card not formatted Parameter `_SigLatched` Bit 20	-	Update memory card (drive to card).
E 5456	1	System error detected: Memory card is write-protected Parameter `_SigLatched` Bit 20	The memory card has been write-protected.	Remove memory card or disable write protection.
E 5457	2	System error detected: Incompatible memory card Parameter `_SigLatched` Bit 20	Memory card capacity is insufficient.	Replace memory card
E 5462	0	Memory card implicitly written by the device Parameter `_WarnLatched` Bit 20	The content of the memory card and the content of the nonvolatile memory are not identical.	-
E 546C	0	Nonvolatile memory file not available	-	-
E 5600	3	Motor connection phase error detected Parameter `_SigLatched` Bit 26	Missing motor phase.	-

Error code	Error class	Description	Cause	Correctives
E 5603	3	Commutation error detected (additional info=Internal_DeltaQuep) Parameter `_SigLatched` Bit 26	Incorrect wiring of motor cable. Encoder signals are lost or subject to interference. The load torque is greater than the motor torque. The encoder nonvolatile memory contains incorrect data (encoder phase offset is incorrect). Motor is not adjusted.	Verify motor phases, verify encoder wiring. Improve EMC, verify grounding and shield connection. Use a differently sized motor that can withstand the load torque. Verify the motor data. Contact your Schneider Electric service representative.
E 6102	4	System error detected: Internal software error Parameter `_SigLatched` Bit 30	-	-
E 6103	4	System error detected: System stack overflow Parameter `_SigLatched` Bit 31	-	-
E 6104	0	System error detected: Division by zero (internal)	-	-
E 6105	0	System error detected: Overflow during 32 bit calculation (internal)	-	-
E 6106	4	System error detected: Size of data interface does not match Parameter `_SigLatched` Bit 30	-	-
E 6107	0	Parameter outside of value range (calculation error detected)	-	-
E 6108	0	Function not available	-	-
E 6109	0	System error detected: Internal range exceeded	-	-
E 610A	2	System error detected: Calculated value cannot be represented as a 32 bit value	-	-
E 610D	0	Error detected in selection parameter	Incorrect parameter value selected.	Verify the value to be written.
E 610E	4	System error detected: 24 VDC below undervoltage threshold for shutdown	-	-
E 610F	4	System error detected: Internal timer basis missing (Timer0) Parameter `_SigLatched` Bit 30	-	-
E 6111	2	System error detected: Memory area locked Parameter `_SigLatched` Bit 30	-	-
E 6112	2	System error detected: Out of memory Parameter `_SigLatched` Bit 30	-	-
E 6113	1	System error detected: Calculated value cannot be represented as a 16 bit value	-	-
E 6114	4	System error detected: Impermissible function call from interrupt service routine	Incorrect programming	-
E 6117	0	Holding brake cannot be released manually.	The holding brake cannot be released manually because it is still applied manually.	First, switch from applying the holding brake manually to Automatic, then to releasing the holding brake manually.
E 7100	4	System error detected: Invalid power stage data Parameter `_SigLatched` Bit 30	Error detected in power stage data stored in device (incorrect CRC), error detected in internal memory data.	Contact your Schneider Electric service representative or replace the device.
E 7110	2	System error detected: Internal braking resistor	Internal braking resistor is inoperative or not connected.	Contact your Schneider Electric service representative.
E 7111	0	Parameter cannot be changed because the external braking resistor is active.	An attempt is made to change one of the parameters RESext_ton, RESext_P or RESext_R even though the external braking resistor is active.	Verify that the external braking resistor is not active if one of the parameters RESext_ton, RESext_P or RESext_R has to be changed.

Error code	Error class	Description	Cause	Correctives
E 7112	2	No external braking resistor connected	External braking resistor activated (Parameter RESint_ext), but no external resistor is detected.	Verify wiring of the external braking resistor. Verify correct resistance.
E 7120	4	Invalid motor data Parameter _SigLatched Bit 16	Motor data is incorrect (incorrect CRC).	Contact your Schneider Electric service representative or replace the motor.
E 7121	2	System error detected: Error in motor encoder communication Parameter _SigLatched Bit 16	EMC, detailed information can be found in the error memory that contains the error code of the encoder.	Contact your Schneider Electric service representative.
E 7122	4	Invalid motor data Parameter _SigLatched Bit 30	Error detected in motor data stored in motor encoder, error detected in internal memory data.	Contact your Schneider Electric service representative or replace the motor.
E 7124	4	System error detected: Motor encoder inoperative Parameter _SigLatched Bit 16	-	Contact your Schneider Electric service representative or replace the motor.
E 7125	4	System error detected: Length specification for user data too great Parameter _SigLatched Bit 16	-	-
E 7129	0	System error detected: Motor encoder Parameter _WarnLatched Bit 16	-	-
E 712C	0	System error detected: Communication with encoder not possible Parameter _WarnLatched Bit 16	-	-
E 712D	4	Electronic motor nameplate not found Parameter _SigLatched Bit 16	Incorrect motor data (incorrect CRC). Motor without electronic motor nameplate (for example, SER motor)	Contact your Schneider Electric service representative or replace the motor.
E 712F	0	No data segment of the electronic motor nameplate	-	-
E 7132	0	System error detected: Motor configuration cannot be written	-	-
E 7133	0	Not possible to write motor configuration	-	-
E 7134	4	Incomplete motor configuration Parameter _SigLatched Bit 16	-	-
E 7135	4	Format is not supported Parameter _SigLatched Bit 16	-	-
E 7136	4	Incorrect encoder type selected with parameter MotEnctype Parameter _SigLatched Bit 16	-	-
E 7137	4	Error detected during the internal conversion of the motor configuration Parameter _SigLatched Bit 16	-	-
E 7138	4	Parameter of the motor configuration out of permissible range Parameter _SigLatched Bit 16	-	-
E 7139	0	Encoder offset: Data segment in encoder is incorrect.	-	-
E 713A	3	Adjustment value of the encoder of the third party motor has not yet been determined. Parameter _SigLatched Bit 16	-	-
E 7200	4	System error detected: Calibration analog/digital converter during manufacturing / incorrect BLE file Parameter _SigLatched Bit 30	-	-

Error code	Error class	Description	Cause	Correctives
E 7320	4	System error detected: Invalid encoder parameter Parameter `_SigLatched` Bit 16	Communication channel (Hiperface) to encoder is subject to interference, motor encoder has not been factory-parameterized.	Contact your Schneider Electric service representative.
E 7321	3	Timeout reading the absolute position from the encoder Parameter `_SigLatched` Bit 16	Communication channel (Hiperface) to encoder is subject to interference or motor encoder is inoperative.	Verify EMC measures.
E 7327	0	Error bit set in Hiperface answer Parameter `_WarnLatched` Bit 16	Insufficient EMC.	Verify wiring (shield).
E 7328	4	Motor encoder: Position evaluation error detected Parameter `_SigLatched` Bit 16	Encoder has detected incorrect position evaluation.	Contact your Schneider Electric service representative or replace the motor.
E 7329	0	Motor encoder Warn signal Parameter `_WarnLatched` Bit 16	EMC.	Contact your Schneider Electric service representative or replace the motor.
E 7330	4	System error detected: Motor encoder (Hiperface) Parameter `_SigLatched` Bit 16	-	Verify EMC measures. Contact your Schneider Electric service representative.
E 7331	4	System error detected: Motor encoder initialization Parameter `_SigLatched` Bit 30	-	Verify EMC measures. Contact your Schneider Electric service representative.
E 7335	0	Communication with motor encoder active Parameter `_WarnLatched` Bit 16	Command is being processed or communication may be disturbed (EMC).	Verify EMC measures. Contact your Schneider Electric service representative.
E 733F	4	Amplitude of encoder analog signals too low Parameter `_SigLatched` Bit 16	Incorrect encoder wiring. Encoder not connected. Encoder signals subject to EMC interference (shield connection, cabling, etc.).	Verify EMC measures. Contact your Schneider Electric service representative.
E 7340	3	Reading of absolute position aborted Parameter `_SigLatched` Bit 16	Communication channel (Hiperface) to encoder is subject to interference. Encoder (in motor) is inoperative.	Verify EMC measures. Contact your Schneider Electric service representative.
E 7341	0	Encoder overtemperature Parameter `_WarnLatched` Bit 16	The maximum permissible duty cycle is exceeded. The motor was not mounted properly, for example, it is thermally isolated. The motor is blocked so that more current is used than under normal conditions. The ambient temperature is too high.	Reduce the duty cycle, for example, reduce acceleration. Supply additional cooling, for example, use a fan. Mount the motor in such a way as to increase thermal conductivity. Use a differently rated drive or motor. Replace the motor.
E 7342	2	Encoder overtemperature Parameter `_SigLatched` Bit 16	The maximum permissible duty cycle is exceeded. The motor was not mounted properly, for example, it is thermally isolated. The motor is blocked so that more current is used than under normal conditions. The ambient temperature is too high.	Reduce the duty cycle, for example, reduce acceleration. Supply additional cooling, for example, use a fan. Mount the motor in such a way as to increase thermal conductivity. Use a differently rated drive or motor. Replace the motor.
E 7343	0	Absolute position is different from incremental position Parameter `_WarnLatched` Bit 16	Encoder is subject to EMC interference. Motor encoder is inoperative.	Verify EMC measures. Contact your Schneider Electric service representative.
E 7344	3	Absolute position is different from incremental position Parameter `_SigLatched` Bit 16	Encoder is subject to EMC interference. Motor encoder is inoperative.	Verify EMC measures. Contact your Schneider Electric service representative.
E 7345	0	Amplitude of analog signals too high, limit of AD conversion exceeded	Encoder signals subject to EMC interference (shield connection, wiring, etc.). Encoder inoperative.	Verify EMC measures. Contact your Schneider Electric service representative.
E 7346	4	System error detected: Encoder not ready Parameter `_SigLatched` Bit 16	-	Verify EMC measures. Contact your Schneider Electric service representative.

Error code	Error class	Description	Cause	Correctives
E 7347	0	System error detected: Position initialization not possible	Analog and digital encoder signals subject to massive interference.	Verify EMC measures. Contact your Schneider Electric service representative.
E 7348	3	Timeout reading encoder temperature Parameter `_SigLatched` Bit 16	Encoder without temperature sensor, incorrect encoder connection.	Verify EMC measures. Contact your Schneider Electric service representative.
E 7349	0	Discrepancy between absolute and analog encoder phases	Analog encoder signals are subject to interference. Encoder inoperative.	Verify EMC measures. Contact your Schneider Electric service representative.
E 734A	3	Amplitude of analog signals from encoder too high, signals are clipped Parameter `_SigLatched` Bit 16	Incorrect encoder wiring. Encoder hardware interface inoperative.	-
E 734B	0	Signal position evaluation of analog encoder inoperative Parameter `_WarnLatched` Bit 16	Incorrect encoder wiring. Encoder hardware interface inoperative.	-
E 734C	par.	Error detected with quasi absolute position Parameter `_SigLatched` Bit 16	The motor shaft may have been moved while the drive was powered down. A quasi absolute position has been detected that is not within the permissible motor shaft deviation range.	If the quasi absolute function is active, only power down the drive if the motor is at a standstill and do not move the motor shaft when the drive is off.
E 734D	0	Index pulse is not available for the encoder Parameter `_WarnLatched` Bit 16	-	-
E 734E	4	Error in analog signals from encoder detected (additional info=Internal_DeltaQuep) Parameter `_SigLatched` Bit 16	Encoder cable not properly connected. Encoder signals subject to EMC interference (shield connection, wiring, etc.). Mechanical issue.	Verify EMC measures. Contact your Schneider Electric service representative.
E 7500	0	RS485/Modbus: Overrun error detected Parameter `_WarnLatched` Bit 5	EMC; incorrect cabling.	Verify cables.
E 7501	0	RS485/Modbus: Framing error detected Parameter `_WarnLatched` Bit 5	EMC; incorrect cabling.	Verify cables.
E 7502	0	RS485/Modbus: Parity error detected Parameter `_WarnLatched` Bit 5	EMC; incorrect cabling.	Verify cables.
E 7503	0	RS485/Modbus: Receive error detected Parameter `_WarnLatched` Bit 5	EMC; incorrect cabling.	Verify cables.
E 7601	4	System error detected: Indeterminable type of encoder Parameter `_SigLatched` Bit 22	-	-
E 7602	4	Configuration error detected: Encoder module and selected machine encoder type do not match Parameter `_SigLatched` Bit 22	-	-
E 7603	4	Configuration error detected: Encoder module and selected motor encoder type do not match Parameter `_SigLatched` Bit 22	-	-
E 7604	4	Configuration error detected: Encoder module parameterized, but no module detected Parameter `_SigLatched` Bit 22	-	-
E 7605	4	Configuration error detected: No motor encoder type selected for encoder module Parameter `_SigLatched` Bit 22	-	-

Error code	Error class	Description	Cause	Correctives
E 7606	4	Configuration error detected: No machine encoder type selected for encoder module Parameter `_SigLatched` Bit 22	-	-
E 7607	4	Encoder module cannot be identified Parameter `_SigLatched` Bit 22	The encoder module is indeterminable.	Use correct encoder module.
E 7608	4	Encoder module power supply overcurrent Parameter `_SigLatched` Bit 22	- Short circuit at connector or encoder cable. - Incorrect or inoperative encoder.	-
E 7609	4	Encoder not connected to encoder module Parameter `_SigLatched` Bit 22	Connector not connected to module or not connected to motor/encoder. Incorrect or inoperative encoder cable.	-
E 760A	3	Encoder module in slot 2 missing. Parameter `_SigLatched` Bit 22	Module has been removed or module is inoperative.	-
E 760C	2	Maximum encoder frequency exceeded Parameter `_SigLatched` Bit 22	Velocity too high for the encoder.	-
E 760D	4	Configuration error detected: Incorrect use of encoder module Parameter `_SigLatched` Bit 22	Incorrect value in parameter ENC2_usage.	-
E 760E	2	Position evaluation error detected (signal tracking error detected) Parameter `_SigLatched` Bit 22	Encoder signals subject to EMC interference	Verify wiring and cable shield.
E 760F	0	Incorrect position evaluation (interference detected) Parameter `_WarnLatched` Bit 22	Encoder signals subject to EMC interference	Verify wiring, cable shield.
E 7610	0	Resolver: Loss of position tracking, position is inaccurate Parameter `_WarnLatched` Bit 22	- Motor velocity is too high. - Motor acceleration is too fast.	- Reduce velocity. - Reduce acceleration. - Reduce resolver resolution. - Adapt resolver excitation frequency.
E 7611	2	Resolver: Signal degradation, position is inaccurate Parameter `_SigLatched` Bit 22	Resolver is inoperative. Resolver signals are subject to interference. Resolver cable is too long.	Replace resolver. Verify resolver cable: wiring and shield connection. Additional info bits: D5: Sine/cosine inputs exceed DOS out of range threshold. D4: Sine/cosine inputs exceed DOS mismatch threshold.
E 7612	3	Resolver: Loss of signal, position unreliable Parameter `_SigLatched` Bit 22	Resolver is inoperative. Resolver wiring is incorrect. Resolver signals are subject to excessive interference. Resolver is unsuitable for drive. Incorrect parameter transformation ratio.	Verify resolver cable: wiring and shield connection. Replace resolver. Additional info bits: D7: Sine/cosine inputs clipped. D6: Sine/cosine inputs below LOS threshold.
E 7613	3	Resolver: Signal communication subject to interference Parameter `_SigLatched` Bit 22	Resolver signals are subject to interference.	Verify resolver cable: wiring and shield connection.
E 7614	3	Error detected at resolver power supply. Parameter `_SigLatched` Bit 22	Resolver is not properly connected.	Verify resolver cable.
E 7615	3	System error detected: Encoder module RES is not ready for position evaluation Parameter `_SigLatched` Bit 22	EMC.	Verify resolver cable.
E 7616	3	System error detected: Resolver timeout Parameter `_SigLatched` Bit 22	-	Replace encoder module.
E 7617	1	Resolver velocity is too high Parameter `_SigLatched` Bit 22	Motor velocity is too high.	Reduce motor velocity.

Error code	Error class	Description	Cause	Correctives
E 7618	4	Encoder 2 Hall sensor error detected Parameter _SigLatched Bit 22	Incorrect wiring or inoperative cable for Hall signals of encoder 2.	Verify encoder cable.
E 7619	4	Incorrect communication between module and encoder Parameter _SigLatched Bit 22	Incorrect encoder wiring/adjustment or incorrect encoder parameter settings (example: parameter ENCDigSSICoding is set for SSI encoder).	Verify encoder cable: wiring and shield connection.. Verify encoder parameter settings. Verify encoder adjustment.
E 761A	0	Incorrect communication between module and encoder Parameter _WarnLatched Bit 22	Incorrect encoder wiring.	Verify encoder cable: wiring and shield connection.
E 761B	4	Connected type of EnDat encoder is not supported Parameter _SigLatched Bit 22	-	Use a supported EnDat encoder.
E 761C	4	Configuration error detected: Invalid SSI encoder parameter setting Parameter _SigLatched Bit 22	Incorrect values in parameter ENCDigSSIResSgl or ENCDigSSIResMult.	-
E 761D	2	Maximum velocity of the encoder is exceeded Parameter _SigLatched Bit 22	Velocity too high for the encoder. In the case of SSI or EnDat2.2, the reason may also be a detected encoder communication error.	-
E 761E	2	Encoder module overtemperature Parameter _SigLatched Bit 22	The ambient temperature is too high.	Improve the heat dissipation in the control cabinet.
E 761F	2	Position evaluation error detected (AB encoder signals) Parameter _SigLatched Bit 22	No sync signal available.	-
E 7620	4	Checksum error detected in EnDat encoder data Parameter _SigLatched Bit 22	-	-
E 7621	1	Runtime compensation was not successful Parameter _SigLatched Bit 22	-	Verify encoder cable: wiring and shield connection.
E 7622	0	Resolver timeout Parameter _WarnLatched Bit 22	System error detected.	Replace encoder module
E 7623	0	Absolute encoder signal is not available Parameter _WarnLatched Bit 22	There is no encoder available at the input specified via the parameter ENC_abs_source.	Verify wiring, verify encoder. Change the value of the parameter ENC_abs_source.
E 7624	0	Absolute position for encoder 2 cannot be set Parameter _WarnLatched Bit 22	No encoder connected or encoder does not support setting of absolute positions.	Use an encoder that supports direct setting of the absolute position via ENC2_setpabs.
E 7625	0	Not possible to set the absolute position for encoder 1. Parameter _WarnLatched Bit 22	There is no encoder connected to the input for encoder 1.	Connect an encoder to the input for encoder 1 before trying to set the absolute position directly via ENC1_abs_pos.
E 7626	4	Overflow error detected during encoder scaling Parameter _SigLatched Bit 22	The multiturn resolution of the machine encoder with reference to the motor shaft exceeds the system limits, for example, due to the mechanical gear ratio between machine encoder and motor encoder.	Reduce the number of bits of the multitun resolution that are used for position evaluation via the parameter ENCDigResMulUsed.
E 7627	4	Configuration error detected: Invalid BISS encoder parameter setting Parameter _SigLatched Bit 22	Incorrect values in parameters ENCDigBISSResSgl or ENCDigBISSResMult.	-
E 7628	0	BISS encoder bits 'War' or 'Err' are set Parameter _WarnLatched Bit 22	The bits are used for diverse types of monitoring such as: - Encoder temperature is too high. - Service life of LED inside encoder exceeded. - Position is not reliable.	Replace encoder.
E 7629	3	BISS initialization error detected Parameter _SigLatched Bit 22	-	-

Error code	Error class	Description	Cause	Correctives
E 7701	4	System error detected: Timeout during connection to power stage Parameter _SigLatched Bit 31	-	Contact your Schneider Electric service representative.
E 7702	4	System error detected: Invalid data received from power stage Parameter _SigLatched Bit 31	-	Contact your Schneider Electric service representative.
E 7703	4	System error detected: Data exchange with power stage lost Parameter _SigLatched Bit 31	-	Contact your Schneider Electric service representative.
E 7704	4	System error detected: Exchange of identification data from power stage not successful Parameter _SigLatched Bit 31	-	Contact your Schneider Electric service representative.
E 7705	4	System error detected: Checksum identification data from power stage incorrect Parameter _SigLatched Bit 31	-	Contact your Schneider Electric service representative.
E 7706	4	System error detected: No identification frame received from power stage Parameter _SigLatched Bit 31	-	Contact your Schneider Electric service representative.
E 7707	4	System error detected: Type of power stage and manufacture data do not match	-	Contact your Schneider Electric service representative.
E 7708	4	PIC voltage supply too low Parameter _SigLatched Bit 31	-	Contact your Schneider Electric service representative.
E 7709	4	System error detected: Invalid numbers of data received Parameter _SigLatched Bit 31	-	Contact your Schneider Electric service representative.
E 770A	2	PIC received data with incorrect parity Parameter _SigLatched Bit 31	-	Contact your Schneider Electric service representative.
E 7800	1	eSM module: System error detected: Error of class 1 forced Parameter _SigLatched Bit 23	-	-
E 7801	2	eSM module: System error detected: Error of class 2 forced Parameter _SigLatched Bit 23	-	-
E 7802	3	eSM module: System error detected: Error of class 3 forced Parameter _SigLatched Bit 23	-	-
E 7803	4	eSM module: System error detected: Error of class 4 forced Parameter _SigLatched Bit 23	-	-
E 7804	3	eSM module: Insufficient deceleration for Quick Stop Parameter _SigLatched Bit 23	Quick Stop ramp of drive lower than Quick Stop ramp configured for eSM.	Change ramp in eSM or drive.
E 7805	1	eSM module: Error detected during Safe Operating Stop (SOS) Parameter _SigLatched Bit 23	Motor movement during Safe Operating Stop (SOS).	Keep motor from moving while Safe Operating Stop is active (external forces, loads).
E 7806	1	eSM module: Safely Limited Speed (SLS) exceeded in machine operating mode Setup Mode Parameter _SigLatched Bit 23	Delay for reaching Safely Limited Speed (SLS) too low or eSM deceleration ramp too high.	Increase delay for eSM control of Safely Limited Speed (SLS) or decrease eSM deceleration ramp for reaching Safely Limited Speed (SLS).
E 780A	2	eSM module: /ESTOP signal for EMERGENCY STOP triggered Parameter _SigLatched Bit 23	EMERGENCY STOP is active.	Reset EMERGENCY STOP.
E 780B	0	eSM module: Not ready for Fault Reset Parameter _WarnLatched Bit 23	eSM is in state Quick Stop Active or Fault Reaction Active or Fault.	Wait until eSM is no longer in state Quick Stop Active or Fault Reaction Active or Fault or reboot the drive.

Error code	Error class	Description	Cause	Correctives
E 780C	0	eSM module: Not ready for eSM Disable Parameter `_WarnLatched` Bit 23	Safety module eSM is not in operating state Operation Enabled.	eSM Disable requires the safety module eSM to be in operating state Operation Enabled.
E 780F	0	eSM module: Parameter cannot be written in this operating state Parameter `_WarnLatched` Bit 23	Parameter cannot be written in this eSM state.	Change eSM state to write this parameter.
E 7810	0	eSM module: Incorrect password Parameter `_WarnLatched` Bit 23	The password that was sent by the configuration tool is not identical to the password stored in the device.	Send the stored password.
E 7811	0	eSM module: Timeout during parameter download (default values loaded) Parameter `_WarnLatched` Bit 23	Incorrect connection or EMC.	Verify wiring (shield).
E 7813	0	eSM module: Parameter checksum cannot be written in this operating state Parameter `_WarnLatched` Bit 23	eSM is not ready to be configured.	Use correct password. Reconfigure safety module eSM. Contact your Schneider Electric service representative.
E 7814	0	eSM module: Parameter checksum incorrect (default values loaded) Parameter `_WarnLatched` Bit 23	EMC. The commissioning software is outdated and not compatible with the safety module eSM.	Verify wiring (shield). Install latest commissioning software version.
E 7815	0	eSM module: Undertemperature Parameter `_WarnLatched` Bit 23	Temperature too low.	-
E 7816	0	eSM module: Overtemperature Parameter `_WarnLatched` Bit 23	Temperature too high.	Verify the ambient conditions. Verify that the flow of air is sufficient (pollution, objects).
E 7818	2	eSM module: System error detected: ESM5VDC undervoltage Parameter `_SigLatched` Bit 23	Error detected in eSM 5V supply.	-
E 7819	2	eSM module: Overload outputs channel A Parameter `_SigLatched` Bit 23	Short circuit or overload.	Verify wiring and connected devices.
E 781A	4	eSM module: System error detected: 5V overvoltage Parameter `_SigLatched` Bit 23	eSM internal power supply error detected	-
E 781B	4	eSM module: System error detected: 5V undervoltage Parameter `_SigLatched` Bit 23	eSM internal power supply error detected	-
E 781D	2	eSM module: ESMSTART: Maximum permissible pulse duration exceeded Parameter `_SigLatched` Bit 23	Pulse duration longer than 4 seconds.	Pulse duration must be less than 4 seconds.
E 781E	4	eSM module: System error detected: RAM Parameter `_SigLatched` Bit 23	eSM RAM error detected	-
E 781F	4	eSM module: System error detected: Stack overflow Parameter `_SigLatched` Bit 23	-	-
E 7820	4	eSM module: System error detected: Program sequence control (communication) Parameter `_SigLatched` Bit 23	Software watchdog eSM (CPU_B)	-
E 7821	4	eSM module: System error detected: Program sequence control (Idle task) Parameter `_SigLatched` Bit 23	-	-
E 7825	4	eSM module: System error detected: Firmware checksum Parameter `_SigLatched` Bit 23	-	-
E 7826	0	eSM module: Parameter outside of permissible value range Parameter `_WarnLatched` Bit 23	Parameter outside of permissible value range.	Verify parameter value.

Error code	Error class	Description	Cause	Correctives
E 7827	2	eSM module: Parameter checksum error detected Parameter `_SigLatched` Bit 23	Saved parameter values are invalid.	Reconfigure the eSM. Contact your Schneider Electric service representative.
E 7828	2	eSM module: System error detected: SPI framing error detected Parameter `_SigLatched` Bit 23	-	-
E 7829	4	eSM module: Input states channel A and channel B are not identical Parameter `_SigLatched` Bit 23	Wire break or connected devices are inoperable.	Verify wiring and connected devices.
E 782A	2	eSM module: Output states channel A and channel B are not identical Parameter `_SigLatched` Bit 23	Short circuit to 24V DC. System error detected.	Verify wiring and connected devices. Verify connection of STO_A and STO_B. Contact your Schneider Electric service representative.
E 782B	3	eSM module: System error detected: Position evaluation error detected (values not identical) Parameter `_SigLatched` Bit 23	CPU_A and CPU_B have different position values. This condition may have been caused by the encoder.	-
E 782C	3	eSM module: System error detected: Velocity evaluation error detected (values not identical) Parameter `_SigLatched` Bit 23	CPU_A and CPU_B have different velocity values. This condition may have been caused by the encoder.	-
E 782F	2	eSM module: System error detected: Error detected during dynamization of STO signal Parameter `_SigLatched` Bit 23	-	-
E 7833	0	eSM module: System error detected: Nonvolatile memory incorrect checksum (default values loaded) Parameter `_WarnLatched` Bit 23	Nonvolatile memory inoperative.	-
E 7834	0	eSM module: Safety module replaced (default values loaded) Parameter `_WarnLatched` Bit 23	This safety module has not been configured with this drive. The parameters have been reset to the default values.	Reconfigure the safety module.
E 7835	4	eSM module: Commutation position Parameter `_SigLatched` Bit 23	Encoder error or error in internal communication with the drive detected (for example, EMC).	Verify EMC. Verify encoder connection. Contact your Schneider Electric service representative.
E 7836	4	eSM module: Parameter checksums not identical Parameter `_SigLatched` Bit 23	Parameter of CPU_A is not identical to parameter of CPU_B. Not possible to load parameters into safety module eSM.	Retry loading the parameters into the safety module eSM. If the condition persists, contact your Schneider Electric service representative.
E 7837	0	eSM module: System error detected: Boot program: Invalid address Parameter `_WarnLatched` Bit 23	Invalid write access of bootloader to flash memory range.	-
E 7838	1	eSM module: Safely Limited Speed (SLS) exceeded in machine operating mode Automatic Mode Parameter `_SigLatched` Bit 23	Drive velocity greater than configured eSM speed limit.	Reduce velocity of the drive or verify eSM speed limit for machine operating mode Automatic Mode.
E 7839	2	eSM module: Input ESMSTART low instead of high (automatic start) Parameter `_SigLatched` Bit 23	ESMSTART is configured for automatic start and must be high at start.	Verify parameter configuration of ESMSTART. Verify wiring of ESMSTART.
E 783A	2	eSM module: Input ESMSTART high instead of low (manual start) Parameter `_SigLatched` Bit 23	ESMSTART is configured for manual start and must be low at start.	Verify parameter configuration of ESMSTART. Verify wiring of ESMSTART.
E 783B	2	eSM module: Guard door acknowledgment: The acknowledgement signal is available for too long a time. Parameter `_SigLatched` Bit 23	The acknowledgement signal is available for more than 6 seconds.	The acknowledgement signal must be available for less than 6 seconds.

Error code	Error class	Description	Cause	Correctives
E 783C	4	eSM module: System error detected: States of eSM state machines not identical Parameter `_SigLatched` Bit 23	-	-
E 783F	2	eSM module: Output AUXOUT1 (cross fault to another output detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Verify wiring and connected devices.
E 7840	2	eSM module: Output /INTERLOCK_OUT (cross fault to another output detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Verify wiring and connected devices.
E 7841	2	eSM module: Output RELAY_OUT_A (cross fault to another output detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Verify wiring and connected devices.
E 7842	2	eSM module: Output CCM24V_OUT_A (cross fault to another output detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Verify wiring and connected devices.
E 7843	2	eSM module: Output AUXOUT1 (cross fault to 24 V detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to 24 V.	Verify wiring and connected devices.
E 7844	2	eSM module: Output /INTERLOCK_OUT (cross fault to 24 V detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to 24 V.	Verify wiring and connected devices.
E 7845	2	eSM module: Output RELAY_OUT_A (cross fault to 24 V detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to 24 V.	Verify wiring and connected devices.
E 7846	2	eSM module: Output CCM24V_OUT_A (cross fault to 24 V detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to 24 V.	-
E 7848	2	eSM module: System error detected: Input ESMSTART_A Parameter `_SigLatched` Bit 23	-	-
E 7849	2	eSM module: System error detected: Input SETUPENABLE_A Parameter `_SigLatched` Bit 23	-	-
E 784A	2	eSM module: System error detected: Input SETUPMODE_A Parameter `_SigLatched` Bit 23	-	-
E 784B	2	eSM module: System error detected: Input GUARD_A Parameter `_SigLatched` Bit 23	-	-
E 784C	2	eSM module: System error detected: Input GUARD_ACK Parameter `_SigLatched` Bit 23	-	-
E 784D	2	eSM module: System error detected: Input /INTERLOCK_IN_A Parameter `_SigLatched` Bit 23	-	-
E 784E	2	eSM module: System error detected: Input /ESTOP_A Parameter `_SigLatched` Bit 23	-	-
E 784F	2	eSM module: System error detected: Input NOTUSED_A Parameter `_SigLatched` Bit 23	-	-
E 7850	2	eSM module: Overload outputs channel B Parameter `_SigLatched` Bit 23	Short circuit or overload.	Verify wiring and connected devices.

Error code	Error class	Description	Cause	Correctives
E 7851	4	eSM module: System error detected: UART overrun/framing error Parameter `_SigLatched` Bit 23	-	-
E 7852	2	eSM module: System error detected: ResEnc (encoder resolution) is set to 0 Parameter `_SigLatched` Bit 23	-	-
E 7853	4	eSM module: System error detected: CPU synchronization Parameter `_SigLatched` Bit 23	-	-
E 7854	2	eSM module: No motor movement for 36 hours Parameter `_SigLatched` Bit 23	There has not been a minimum motor movement for the last 36 hours.	There must be a minimum motor movement at least once every 36 hours.
E 7855	2	eSM module: System error detected: Timeout high-priority tests (5 sec) Parameter `_SigLatched` Bit 23	-	-
E 7856	2	eSM module: System error detected: Timeout low-priority tests Parameter `_SigLatched` Bit 23	-	-
E 7857	2	eSM module: Parameter dec_Qstop (minimum deceleration) is set to 0 Parameter `_SigLatched` Bit 23	Module is not configured.	Download a configuration.
E 7858	2	eSM module: Output AUXOUT2 (cross fault to another output detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Verify wiring and connected devices.
E 7859	2	eSM module: Output /INTERLOCK_OUT (cross fault to another output detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Verify wiring and connected devices.
E 785A	2	eSM module: Output RELAY_OUT_B (cross fault to another output detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Verify wiring and connected devices.
E 785B	2	eSM module: Output CCM24V_OUT_B (cross fault to another output detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Verify wiring and connected devices.
E 785C	2	eSM module: Output AUXOUT2 (cross fault to 24 V detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to 24 V.	Verify wiring and connected devices.
E 785D	2	eSM module: Output /INTERLOCK_OUT (cross fault to 24 V detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to 24 V.	Verify wiring and connected devices.
E 785E	2	eSM module: Output RELAY_OUT_B (cross fault to 24 V detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to 24 V.	Verify wiring and connected devices.
E 785F	2	eSM module: Output CCM24V_OUT_B (cross fault to 24 V detected) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to 24 V.	Verify wiring and connected devices.
E 7861	2	eSM module: System error detected: Input ESMSTART_B Parameter `_SigLatched` Bit 23	-	-
E 7862	2	eSM module: System error detected: Input SETUPENABLE_B Parameter `_SigLatched` Bit 23	-	-
E 7863	2	eSM module: System error detected: Input SETUPMODE_B Parameter `_SigLatched` Bit 23	-	-

Error code	Error class	Description	Cause	Correctives
E 7864	2	eSM module: System error detected: Input GUARD_B Parameter `_SigLatched` Bit 23	-	-
E 7865	2	eSM module: System error detected: Input GUARD_ACK Parameter `_SigLatched` Bit 23	-	-
E 7866	2	eSM module: System error detected: Input /INTERLOCK_IN_B Parameter `_SigLatched` Bit 23	-	-
E 7867	2	eSM module: System error detected: Input /ESTOP_B Parameter `_SigLatched` Bit 23	-	-
E 786A	4	eSM module: Undertemperature Parameter `_SigLatched` Bit 23	Temperature of the eSM too low.	Verify ambient conditions.
E 786C	2	eSM module: Overvoltage ESM24VDC Parameter `_SigLatched` Bit 23	Voltage too high at the ESM24VDC.	Verify power supply.
E 786D	4	eSM module: Overtemperature Parameter `_SigLatched` Bit 23	Temperature too high.	Verify the ambient conditions. Verify that the flow of air is sufficient (pollution, objects).
E 786E	4	eSM module: System error detected: Operating states not identical Parameter `_SigLatched` Bit 23	-	-
E 7870	4	eSM module: System error detected: Software versions not identical Parameter `_SigLatched` Bit 23	-	-
E 7871	3	eSM module: Error detected during Safe Operating Stop (SOS) after detected error Parameter `_SigLatched` Bit 23	Motor movement during Safe Operating Stop (SOS).	-
E 7872	4	eSM module: System error detected: Software incompatible with hardware Parameter `_SigLatched` Bit 23	-	-
E 7873	1	eSM module: Error detected during deceleration to Safely Limited Speed (SLS) Parameter `_SigLatched` Bit 23	Velocity of drive greater than speed limit configured for eSM Safely Limited Speed (SLS).	Verify speed limit and delay time for eSM Safely Limited Speed (SLS). Adapt the drive values for ramp and velocity, if necessary.
E 7874	2	eSM module: Repeated error detected during Safe Operating Stop (SOS) Parameter `_SigLatched` Bit 23	-	-
E 7875	4	eSM module: Repeated error detected during deceleration for Quick Stop Parameter `_SigLatched` Bit 23	-	-
E 7876	3	eSM module: /INTERLOCK_IN not high (timeout if t_Relay = 2) Parameter `_SigLatched` Bit 23	-	-
E 7877	2	eSM module: Input /INTERLOCK_IN is high even though Ignore has been configured Parameter `_SigLatched` Bit 23	-	-
E 7878	2	eSM module: Speed limit for machine operating mode Setup Mode (eSM_v_maxSetup) higher than speed limit for machine operating mode Automatic Mode (eSM_v_maxAuto) Parameter `_SigLatched` Bit 23	Speed limit for machine operating mode Setup Mode must not be greater than speed limit for machine operating mode Automatic Mode.	Verify the speed limits for machine operating modes Automatic Mode and Setup Mode and change them as required.
E 7879	4	eSM module: System error detected: Indeterminable state of eSM state machine Parameter `_SigLatched` Bit 23	-	-

Error code	Error class	Description	Cause	Correctives
E 787A	2	eSM module: ESM24VDC undervoltage Parameter `_SigLatched` Bit 23	Voltage at the ESM24VDC connector to low.	Verify power supply.
E 787D	4	eSM module: System error detected: Asynchronous communication (UART/SPI) Parameter `_SigLatched` Bit 23	-	-
E 787E	4	eSM module: System error detected: RAM (bit) Parameter `_SigLatched` Bit 23	-	-
E 787F	4	eSM module: Encoder signal error detected Parameter `_SigLatched` Bit 23	Encoder or encoder cable inoperative. Incorrect signal evaluation in drive.	-
E 7880	2	eSM module: Indeterminable service Parameter `_SigLatched` Bit 23	-	-
E 7881	2	eSM module: Parameter does not exist Parameter `_SigLatched` Bit 23	Parameter does not exist.	Verify the parameter number.
E 7882	4	eSM module: System error detected: 3_3V overvoltage Parameter `_SigLatched` Bit 23	Overvoltage in internal eSM power supply.	-
E 7883	4	eSM module: System error detected: 3_3V undervoltage Parameter `_SigLatched` Bit 23	Undervoltage in internal eSM power supply.	-
E 7884	4	eSM module: System error detected: Temperature sensor Parameter `_SigLatched` Bit 23	Temperature sensor for CPU_A or CPU_B does not work properly.	-
E 7886	2	eSM module: No speed limit for negative direction set for direction-dependent SLS Parameter `_SigLatched` Bit 23	Direction-dependent SLS is active, but no speed limit greater than 0 RPM has been specified in the parameter eSM_v_maxSetup or in parameter eSM_SLSnegDirS.	Set a speed limit for direction-dependent SLS greater than 0 RPM in the parameter _eSM_v_maxSetup or in the parameter eSM_SLSnegDirS or deactivate direction-dependent SLS via the parameter eSM_FuncSwitches.
E 7887	2	eSM module: Speed limit for SLS in negative direction has been specified, but direction-dependant SLS has not been activated Parameter `_SigLatched` Bit 23	Direction-dependent SLS is not active, but a speed limit for direction-dependent SLS in negative direction has been specified.	Set the speed limit for direction-dependent SLS in negative direction in parameter eSM_SLSnegDirS to 0 RPM or activate direction-dependent SLS via the parameter eSM_FuncSwitches.
E 7889	2	eSM module: Order of speed limits for multiple SLS in positive direction is incorrect Parameter `_SigLatched` Bit 23	The values for the speed limits for multiple SLS are not in ascending order.	Set correct speed limits for multiple SLS.
E 788A	2	eSM module: Order of speed limits for multiple SLS in negative direction is incorrect Parameter `_SigLatched` Bit 23	The values for the speed limits for multiple SLS are not in ascending order.	Set correct speed limits for multiple SLS.
E 788B	2	eSM module: Invalid speed limit for multiple SLS in positive direction Parameter `_SigLatched` Bit 23	Speed limit for multiple SLS in positive direction has a value of zero.	Set a speed limit not equal to zero for multiple SLS.
E 788C	2	eSM module: Invalid speed limit for multiple SLS in negative direction has a value of zero Parameter `_SigLatched` Bit 23	Speed limit for multiple SLS in negative direction has a value of zero.	Set a speed limit not equal to zero for multiple SLS.
E 788D	2	eSM module: Two types of multiple SLS selected at the same time Parameter `_SigLatched` Bit 23	eSM module: Two types of multiple SLS selected at the same time.	Select a single type of multiple SLS.
E 7900	4	Module in fieldbus slot not correctly detected Parameter `_SigLatched` Bit 21	Fieldbus module not correctly mounted in the slot. Unsupported fieldbus module inserted. Fieldbus module inoperative. EMC.	Replace fieldbus module. Improve EMC.

Error code	Error class	Description	Cause	Correctives
E 7901	4	Indeterminable type of fieldbus module detected in fieldbus slot Parameter `_SigLatched` Bit 21	The type of module detected in fieldbus slot is not supported by the drive.	Use supported type of fieldbus module. Refer to manual or catalog.
E 7903	3	Fieldbus module in slot 3 missing Parameter `_SigLatched` Bit 21	Fieldbus module has been removed or fieldbus module is inoperative.	Confirm or cancel HMI dialog box for fieldbus module replacement. Install a new fieldbus module.
E 7904	0	Parameter access error detected in fieldbus module	Fieldbus module parameter does not exist or cannot be written.	-
E 7905	3	Fieldbus module in slot 3 has been changed Parameter `_SigLatched` Bit 21	The fieldbus module has been replaced by another type of fieldbus module.	Confirm the new fieldbus module via the HMI dialog.
E 7906	0	Internal timeout in communication with fieldbus module	Internal communication with fieldbus module not correct. Fieldbus module inoperative. EMC.	Replace fieldbus module. Improve EMC.
E A060	2	Calculated velocity too high for operating mode Electronic Gear Parameter `_SigLatched` Bit 4	Gear ratio or reference velocity value too high	Reduce the gear ratio or reference velocity.
E A061	2	Position change in reference value for operating mode Electronic Gear too high Parameter `_SigLatched` Bit 4	Position reference change is too high. Error detected at signal input for reference value.	Reduce the resolution of the master. Verify signal input for reference value signal.
E A065	0	Parameters cannot be written Parameter `_WarnLatched` Bit 4	A data set is still active.	Wait until the currently active data set has been terminated.
E A067	1	Invalid value in data set (additional info = data set number (low byte) and entry (high byte)) Parameter `_SigLatched` Bit 4	Value not possible in data set.	See also parameters _MSM_error_num and _MSM_error_entry for additional information.
E A068	0	Offset positioning not possible Parameter `_WarnLatched` Bit 4	Operating mode Electronic Gear inactive or no gear method selected.	Start operating mode Electronic Gear and/or select a gear method.
E A069	0	Setting the offset position is not possible Parameter `_WarnLatched` Bit 4	If offset positioning is active, it is not possible to set the position offset.	Wait until ongoing offset positioning has finished.
E A06B	2	Position deviation in operating mode Electronic Gear too high Parameter `_SigLatched` Bit 4	The position deviation has become excessively high due to a velocity limitation or the release of direction.	Verify the velocity of the external reference values and the velocity limitation. Verify release of direction.
E A300	0	Deceleration after HALT request still running	HALT was removed too soon. New command was sent before motor standstill was reached after a HALT request.	Wait for complete stop before removing HALT signal. Wait until motor has come to a complete standstill.
E A301	0	Drive in operating state Quick Stop Active	Error with error class 1 detected. Drive stopped with Quick Stop.	-
E A302	1	Stop by positive limit switch Parameter `_SigLatched` Bit 1	The positive limit switch was activated because movement range was exceeded, incorrect operation of limit switch or signal disturbance.	Verify application. Verify limit switch function and connection.
E A303	1	Stop by negative limit switch Parameter `_SigLatched` Bit 1	The negative limit switch was activated because movement range was exceeded, incorrect operation of limit switch or signal disturbance.	Verify application. Verify limit switch function and connection.
E A304	1	Stop by reference switch Parameter `_SigLatched` Bit 1	-	-
E A305	0	Power stage cannot be enabled in the operating state Not Ready To Switch On	Fieldbus: An attempt was made to enable the power stage in the operating state Not Ready To Switch On.	Refer to the state diagram.

Error code	Error class	Description	Cause	Correctives
E A306	1	Stop by user-initiated software stop Parameter `_SigLatched` Bit 3	Drive is in operating state Quick Stop Active due to a software stop request. The activation of a new operating mode is not possible, the error code is sent as the response to the activation command.	Clear break condition with command Fault Reset.
E A307	0	Interruption by internal software stop	In the operating modes Homing and Jog, the movement is internally interrupted by an internal software stop. The activation of a new operating mode is not possible, the error code is sent as the response to the activation command.	Perform a Fault Reset.
E A308	0	Drive is in operating state Fault or Fault Reaction Active	Error with error class 2 or higher detected.	Verify the error code, remove the cause and perform a Fault Reset.
E A309	0	Drive not in operating state Operation Enabled	A command was sent that requires the drive to be in the operating state Operation Enabled (for example, a command to change the operating mode).	Set drive to operating state Operation Enabled and repeat the command.
E A310	0	Power stage not enabled	Command cannot be used because the power stage is not enabled (operating state Operation Enabled or Quick Stop Active).	Set drive to an operating state in which the power stage is enabled, see state diagram.
E A311	0	Operating mode change active	A start request for an operating mode has been received while a change of the operating mode was active.	Wait until the operating mode change has terminated before triggering a start request for another operating mode.
E A312	0	Profile generation interrupted	-	-
E A313	0	Position overflow, zero point is therefore no longer valid (ref_ok=0)	The movement range limits were exceeded and the zero point is no longer valid. An absolute movement requires a valid zero point.	Define a valid zero point by means of the operating mode Homing.
E A314	0	No valid zero point	Command needs a valid zero point (ref_ok=1).	Define a valid zero point by means of the operating mode Homing.
E A315	0	Homing active	Command cannot be used while the operating mode Homing is active.	Wait until reference movement is finished.
E A316	0	Overflow during calculation of acceleration	-	-
E A317	0	Motor is not at a standstill	Command sent which is not permissible when the motor is not at a standstill. For example: - Change of software limit switches - Change of handling of monitoring signals - Setting of reference point - Teach in of data set	Wait until the motor has come to a standstill (x_end = 1).
E A318	0	Operating mode active (x_end=0)	Activation of a new operating mode is not possible while another operating mode is still active.	Wait until the command in the operating mode has finished (x_end=1) or terminate active operating mode with HALT command.
E A319	1	Manual tuning/Autotuning: Movement out of range Parameter `_SigLatched` Bit 2	The movement exceeds the parameterized maximum movement range.	Verify permissible movement range value and time interval.
E A31A	0	Manual tuning/Autotuning: Amplitude/offset too high	Amplitude plus offset for tuning exceed internal velocity or current limitation.	Choose lower amplitude and offset values.
E A31B	0	Halt requested	Command not permissible while Halt is requested.	Clear Halt request and repeat command.
E A31C	0	Invalid position setting with software limit switch	Value for negative (positive) software limit switch is greater (less) than value for positive (negative) software limit switch.	Set correct position values.

Error code	Error class	Description	Cause	Correctives
E A31D	0	Velocity range exceeded (parameter CTRL_v_max, M_n_max)	The velocity was set to a value greater than the maximum permissible velocity in parameter CTRL_v_max or M_n_max, whichever is lower.	If the value of parameter M_n_max is greater than the value of parameter CTRL_v_max, increase the value of parameter CTRL_v_max or reduce the velocity value.
E A31E	1	Stop by positive software limit switch Parameter `_SigLatched` Bit 2	Not possible to execute command because positive software limit switch was triggered.	Return to the permissible movement range.
E A31F	1	Stop by negative software limit switch Parameter `_SigLatched` Bit 2	Not possible to execute command because negative software limit switch was triggered.	Return to the permissible movement range.
E A320	par.	Permissible position deviation exceeded Parameter `_SigLatched` Bit 8	External load or acceleration are too high.	Reduce external load or acceleration. Use a differently rated drive, if necessary. Error response can be adjusted via parameter ErrorResp_p_dif.
E A321	0	Invalid setting for RS422 position interface	-	-
E A322	0	Error detected in ramp calculation	-	-
E A323	3	System error detected: Processing error detected during generation of profile	-	-
E A324	1	Error detected during homing (additional info = detailed error code) Parameter `_SigLatched` Bit 4	Homing movement was stopped in response to a detected error, the detailed reason is indicated by the additional info in the error memory.	Possible sub-error codes: E A325, E A326, E A327, E A328 or E A329.
E A325	1	Limit switch to be approached not enabled Parameter `_SigLatched` Bit 4	Homing to positive limit switch or negative limit switch is disabled.	Enable limit switch via 'IOsigLimP' or 'IOsigLimN'.
E A326	1	Reference switch not found between positive limit switch and negative limit switch Parameter `_SigLatched` Bit 4	Reference switch inoperative or not correctly connected.	Verify the function and wiring of the reference switch.
E A329	1	More than one signal positive limit switch/negative limit switch/reference switch active Parameter `_SigLatched` Bit 4	Reference switch or limit switch not connected correctly or supply voltage for switches too low.	Verify the wiring and 24 VDC supply voltage.
E A32A	1	Positive limit switch triggered with negative direction of movement Parameter `_SigLatched` Bit 4	Start reference movement with negative direction (for example, reference movement to negative limit switch) and activate the positive limit switch (switch in opposite direction of movement).	Verify correct connection and function of limit switch. Activate a jog movement with negative direction of movement (target limit switch must be connected to the negative limit switch).
E A32B	1	Negative limit switch triggered with positive direction of movement Parameter `_SigLatched` Bit 4	Start reference movement with positive direction (for example, reference movement to positive limit switch) and activate the negative limit switch (switch in opposite direction of movement).	Verify correct connection and function of limit switch. Activate a jog movement with positive direction of movement (target limit switch must be connected to the positive limit switch).
E A32C	1	Reference switch error detected (switch signal briefly enabled or switch overtraveled) Parameter `_SigLatched` Bit 4	Switch signal disturbance. Motor subjected to vibration or shock when stopped after activation of the switch signal.	Verify supply voltage, cabling and function of switch. Verify motor response after stopping and optimize control loop settings.
E A32D	1	Positive limit switch error detected (switch signal briefly enabled or switch overtraveled) Parameter `_SigLatched` Bit 4	Switch signal disturbance. Motor subjected to vibration or shock when stopped after activation of the switch signal.	Verify supply voltage, cabling and function of switch. Verify motor response after stopping and optimize control loop settings.
E A32E	1	Negative limit switch error detected (switch signal briefly enabled or switch overtraveled) Parameter `_SigLatched` Bit 4	Switch signal disturbance. Motor subjected to vibration or shock when stopped after activation of the switch signal.	Verify supply voltage, cabling and function of switch. Verify motor response after stopping and optimize control loop settings.

Error code	Error class	Description	Cause	Correctives
E A32F	1	Index pulse not found Parameter `_SigLatched` Bit 4	Index pulse signal not connected or not working properly.	Verify index pulse signal and connection.
E A330	0	Reference movement to index pulse cannot be reproduced. Index pulse is too close to the switch Parameter `_WarnLatched` Bit 4	The position difference between the index pulse and the switching point is insufficient.	Increase the distance between the index pulse and the switching point. If possible, the distance between the index pulse and the switching point should be a half motor revolution.
E A332	1	Jog error detected (additional info = detailed error code) Parameter `_SigLatched` Bit 4	Jog movement was stopped in response to a detected error.	For additional info, verify the detailed error code in the error memory.
E A333	3	System error detected: Invalid internal selection	-	-
E A334	2	Timeout Standstill Window monitoring	Position deviation after movement greater than standstill window. This may have been caused by an external load.	Verify load. Verify settings for standstill window (parameter MON_p_win, MON_p_winTime and MON_p_winTout). Optimize control loop settings.
E A336	1	System error detected: Jerk limitation with position offset after end of movement (additional info = offset in Inc.)	-	-
E A337	0	Operating mode cannot be continued Parameter `_WarnLatched` Bit 4	Continuation of interrupted movement in operating mode Profile Position is not possible because another operating mode had been active in the meantime. In the operating mode Motion Sequence, continuation is not possible if a motion blend was interrupted.	Restart the operating mode.
E A338	0	Operating mode unavailable Parameter `_WarnLatched` Bit 4	The selected operating mode is not available.	-
E A33A	0	No valid zero point (ref_ok=0) Parameter `_WarnLatched` Bit 4	No zero point defined by means of operating mode Homing. Zero point no longer valid due to movement beyond permissible movement range. Motor does not have an absolute encoder.	Use operating mode Homing to define a valid zero point. Use a motor with an absolute encoder.
E A33C	0	Function not available in this operating mode Parameter `_WarnLatched` Bit 4	Activation of a function which is not available in the active operating mode. Example: Start of backlash compensation while autotuning/manual tuning is active.	-
E A33D	0	Motion blend is already active Parameter `_WarnLatched` Bit 4	Change of motion blend during the ongoing motion blend (end position of motion blend not yet reached)	Wait for the motion blend to complete before setting the next position.
E A33E	0	No movement activated Parameter `_WarnLatched` Bit 4	Activation of a motion blend without movement.	Start a movement before the motion blend is activated.
E A33F	0	Position of motion blend movement not in the range of the ongoing movement Parameter `_WarnLatched` Bit 4	The position of the motion blend is outside of the movement range.	Verify the position of the motion blend and the movement range.
E A340	1	Error detected in operating mode Motion Sequence (additional info = detailed error code) Parameter `_SigLatched` Bit 4	The operating mode Motion Sequence was stopped in response to a detected error. Verify the error memory for details on the detected error.	See the additional error information.
E A341	0	Position of motion blend has already been passed Parameter `_WarnLatched` Bit 4	The movement has passed beyond the position of the motion blend.	-
E A342	1	Target velocity was not reached at motion blend position. Parameter `_SigLatched` Bit 4	The position of the motion blend was overtraveled, the target velocity was not reached.	Reduce the ramp velocity so that the target velocity is reached at the position of the motion blend.

Error code	Error class	Description	Cause	Correctives
E A343	0	Processing only possible with linear ramp Parameter _WarnLatched Bit 4	Motion blend position was set with a non-linear ramp.	Set a linear ramp.
E A344	par.	Maximum position deviation between motor encoder and machine encoder exceeded Parameter _SigLatched Bit 8	Incorrect or inoperative encoder cable. Machine encoder not connected or not supplied correctly. Different counting directions of motor encoder and machine encoder. Incorrect setting of resolution factors (numerator or denominator) of machine encoder.	Verify encoder connection. Verify parameterization of machine encoder.
E A347	0	Permissible position deviation exceeded Parameter _WarnLatched Bit 8	External load or acceleration are too high.	Reduce external load or acceleration. Threshold value can be adjusted via the parameter MON_p_dif_warn.
E A348	1	No analog reference value source selected Parameter _SigLatched Bit 4	No analog reference value selected	Select an analog reference value source.
E A349	0	Position setting exceeds system limits	Position scaling of POSscaleDenom and POSscaleNum results in a scaling factor that is too small.	Change POSscaleDenom and POSscaleNum in such a way as to increase the resulting scaling factor.
E A34A	0	Velocity setting exceeds system limits	The velocity scaling of 'VELscaleDenom' and 'VELscaleNum' results in a scaling factor that is too small. The velocity has been set to a value greater than the maximum possible velocity (the maximum velocity is 13200 RPM).	Change 'VELscaleDenom' and 'VELscaleNum' in such a way as to increase the resulting scaling factor.
E A34B	0	Ramp setting exceeds system limits	The ramp scaling of 'RAMPscaleDenom' and 'RAMPscaleNum' results in a scaling factor that is too small.	Change of 'RAMPscaleDenom' and 'RAMPscaleNum' in such a way as to increase the resulting scaling factor.
E A34C	0	Resolution of scaling too high (range exceeded)	-	-
E A350	1	Change for jerk filter input position too great Parameter _SigLatched Bit 4	Operating mode Electronic Gear with processing method 'Position synchronization with compensation movement' has been activated which resulted in a position change greater than 0.25 revolutions.	Deactivate jerk filter processing for Electronic Gear or use processing method 'Position synchronization without compensation movement'.
E A351	1	Function cannot be executed with this position scaling factor Parameter _SigLatched Bit 4	The positions scaling factor is set to a value less than 1rev/131072usr_p, which is less than the internal resolution. In the operating mode Cyclic Synchronous Position, the resolution is not set to 1rev/131072usr_p.	Use a different position scaling factor or deactivate the selected function.
E A355	1	Error detected during relative movement after capture (additional info = detailed error code) Parameter _SigLatched Bit 4	Movement was stopped by error.	Verify the error memory.
E A356	0	Function Relative Movement After Capture not assigned to a digital input	-	Assign the function Relative Movement After Capture to a digital input.
E A357	0	Deceleration still running	Command is not permissible during deceleration.	Wait until motor has come to a complete standstill.
E A358	1	Target position overtraveled with function Relative Movement After Capture Parameter _SigLatched Bit 4	Stopping distance too small or velocity too high at the point in time of the capture event.	Reduce the velocity.
E A359	0	Request cannot be processed since the relative movement after capture is still active	-	-

Error code	Error class	Description	Cause	Correctives
E A35A	1	Selected data set cannot be started Parameter `_SigLatched` Bit 4	The data set with the selected number is not available.	Verify the number of the data set.
E A35C	1	Movement to new reference position is not possible after a limit switch has been triggered and a Fault Reset has been performed	The difference between the actual position and the reference position is too great.	-
E A35D	par.	Permissible velocity deviation exceeded Parameter `_SigLatched` Bit 8	Load or acceleration too high.	Reduce load or acceleration.
E B100	0	RS485/Modbus: Indeterminable service Parameter `_WarnLatched` Bit 5	Unsupported Modbus service was received.	Verify application on the Modbus master.
E B101	1	Incorrect I/O data configuration (additional info = Modbus register address) Parameter `_SigLatched` Bit 21	The I/O data configuration or the Modbus I/O scanning configuration contains an invalid parameter.	Verify the configuration of the I/O data.
E B102	0	Fieldbus module: General error detected Parameter `_WarnLatched` Bit 21	-	-
E B103	2	Fieldbus module: Controlling communication channel has been closed Parameter `_SigLatched` Bit 21	-	-
E B104	2	Fieldbus module: Internal communication error detected Parameter `_SigLatched` Bit 21	-	-
E B105	2	Fieldbus module: I/O data timeout Parameter `_SigLatched` Bit 21	-	-
E B106	2	Fieldbus module: I/O data mapping error detected Parameter `_SigLatched` Bit 21	-	-
E B107	4	Fieldbus module: Nonvolatile memory error detected in module Parameter `_SigLatched` Bit 21	-	-
E B108	1	Fieldbus module: Active IOC physical layer does not match the IOC physical layer of the detected fieldbus module. Parameter `_SigLatched` Bit 21	The manufacturer data has been stored with a physical layer different from the physical layer normally used by the module.	Contact your Schneider Electric service representative.
E B109	4	Fieldbus module: Synchronization heartbeat lost between module and drive Parameter `_SigLatched` Bit 21	-	-
E B120	2	Cyclic communication: Incorrect cycle time Parameter `_SigLatched` Bit 21	The drive does not support the configured cycle time or the difference between the measured cycle time and the configured cycle time is too great.	Change the cycle time in the master controller to a cycle time supported by the drive or verify synchronization requirements.
E B121	2	Cyclic communication: Synchronization signal missing Parameter `_SigLatched` Bit 21	Two cycles have passed without a synchronization signal having been received.	Analyze the communication.
E B122	2	Cyclic communication: Incorrect synchronization Parameter `_SigLatched` Bit 21	One signal was missing and the expected second signal was received at an incorrect point in time. The master controller may be unable to provide the required synchronization signals at the set cycle time, for example, due to insufficient computing power.	Analyze the communication or increase the cycle time.
E B123	2	Cyclic communication: The selected cycle time tolerance is too high Parameter `_SigLatched` Bit 21	The cycle time tolerance may not exceed one quarter of the set cycle time.	Enter a correct value.

Error code	Error class	Description	Cause	Correctives
E B124	0	Cyclic Communication: Drive is not synchronous with master cycle Parameter `_WarnLatched` Bit 21	Operating mode has been activated but drive is not synchronized to external synchronization signal.	After having started the synchronization mechanism, wait for 120 cycles before activating the operating mode.
E B200	0	RS485/Modbus: Protocol error detected Parameter `_WarnLatched` Bit 5	Logical protocol error detected: Incorrect length or unsupported subfunction.	Verify application on the Modbus master.
E B201	2	RS485/Modbus: Interruption of the connection Parameter `_SigLatched` Bit 5	Connection monitoring has detected an interruption of the connection.	Verify all connections and cables used for data exchange. Verify that the device is on.
E B202	0	RS485/Modbus: Interruption of the connection Parameter `_WarnLatched` Bit 5	Connection monitoring has detected an interruption of the connection.	Verify all connections and cables used for data exchange. Verify that the device is on.
E B203	0	RS485/Modbus: Incorrect number of monitor objects Parameter `_WarnLatched` Bit 5	-	-
E B700	0	Drive Profile Lexium: On activation of the profile, no dmControl, refA or refB has been mapped.	dmControl, refA or refB have not been mapped.	Map dmControl, refA or refB.
E B702	1	Insufficient velocity resolution due to velocity scaling	Due to the configured velocity scaling, the velocity resolution in REFA16 is insufficient.	Change the velocity scaling.
E B703	0	Drive Profile Lexium: Write request with incorrect data type.	-	-

Chapter 11
Parameters

What Is in This Chapter?

This chapter contains the following topics:

Representation of the Parameters

Description

This chapter provides an overview of the parameters which can be used for operating the product.

Unsuitable parameter values or unsuitable data may trigger unintended movements, trigger signals, damage parts and disable monitoring functions. Some parameter values or data do not become active until after a restart.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only start the system if there are no persons or obstructions in the zone of operation.
- Do not operate the drive system with undetermined parameter values or data.
- Never modify a parameter value unless you fully understand the parameter and all effects of the modification.
- Restart the drive and verify the saved operational data and/or parameter values after modifications.
- Carefully run tests for all operating states and potential error situations when commissioning, upgrading or otherwise modifying the operation of the drive.
- Verify the functions after replacing the product and also after making modifications to the parameter values and/or other operational data.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Overview

The way parameters are shown provides information required for unique identification, the default values and the properties of a parameter.

Structure of the parameter representation:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ABCDE ConF → inF - Prn	Short description Selection values **1** / **Abc1** / AbC 1: Explanation 1 **2** / **Abc2** / AbC 2: Explanation 2 Description and details	A_{pk} 0.00 3.00 300.00	UINT32 R/W per. -	Fieldbus 1234

Field “Parameter Name”

The parameter name uniquely identifies a parameter.

Field “HMI menu” and “HMI name”

HMI menu shows the sequence of menus and commands to access the parameter via the HMI.

Field “Description”

Short description:

The short description contains information on the parameter and a cross reference to the page that describes the use of the parameter.

Selection values:

In the case of parameters which offer a selection of settings, the value to be entered via the fieldbus, the designation of the value for entry via the commissioning software and the designation of the value for entry via the are specified.

1 = Value for input via fieldbus

Abc1 = Designation for entry via the commissioning software

Abc 1 = Designation for entry via the HMI

Description and details:

Provides further information on the parameter.

Field “Unit”

The unit of the value.

Field “Minimum Value”

The minimum value which can be entered.

Field “Factory Settings”

Settings when the product is shipped.

Field “Maximum Value”

The maximum value which can be entered.

Field “Data Type”

If the minimum and the maximum values are not explicitly indicated, the valid range of values is determined by the data type.

Data type	Minumum value	Maximum value
INT8	-128	127
UINT8	0	255
INT16	-32768	32767
UINT16	0	65535
INT32	-2147483648	2147483647
UINT32	0	4294967295

Field “R/W”

Indicates read and/or write values

"R/" values can only be read

"R/W" values can be read and written.

Field “Persistent”

“per.” indicates whether the value of the parameter is persistent, i.e. whether it remains in the memory after the device is powered off.

When a value of a persistent parameter is modified via the HMI, the drive stores the value automatically in the persistent memory.

When a value of a persistent parameter is modified via the commissioning software or the fieldbus, the user must explicitly store the modified value in the persistent memory.

Parameters for the safety module eSM are modified using the commissioning software. The parameter values are saved persistently after transfer. Explicit saving to the persistent memory is not required in the case of the eSM module.

Field “Parameter Address”

Each parameter has a unique parameter address. The parameter address is used to access the parameter via the fieldbus.

Decimal Numbers Entered via the Fieldbus

Please note that parameter values are entered via the fieldbus without a decimal point. All decimal places must be entered.

Input examples:

Value	Commissioning software	Fieldbus
20	20	20
5.0	5.0	50
23.57	23.57	2357
1.000	1.000	1000

List of Parameters

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
S-0-0011	Class 1 diagnostic (C1D). This parameter provides information on detected errors. A class 1 diagnostics error leads to a Quick Stop (with transition to operating state Fault). Type: Hexadecimal - 2 bytes Write access via Sercos: Read only	- 0 0 65535	R/- - -	IDN S-0-0011
S-0-0012	Class 2 diagnostic (C2D). This parameter provides information on warnings. Type: Hexadecimal - 2 bytes Write access via Sercos: Read only	- 0 0 65535	R/- - -	IDN S-0-0012
S-0-0014	Interface Status. This parameter contains the status of the SERCOS interface. Type: Binary - 2 bytes Write access via Sercos: Read only Class name: SCP_VarCFG	- 0 0 16383	R/- - -	IDN S-0-0014
S-0-0017	IDN-list of all operation data. This parameter contains all procedure commands and parameters supported by the drive. Type: IDN - 4 bytes (variable length) Write access via Sercos: Read only Class name: GDP_Basic	- - - -	R/- - -	IDN S-0-0017
S-0-0021	IDN list of invalid operation data for CP2. This parameter contains an IDN list with IDNs which are considered invalid by the drive when it performs the CP3 transition check (S-0-0127). Type: IDN - 4 bytes (variable length) Write access via Sercos: Read only Class name: SCP_VarCFG, SCP_Diag	- - - -	R/- - -	IDN S-0-0021
S-0-0022	IDN list of invalid operation data for CP3. This parameter contains an IDN list with IDNs which are considered invalid by the drive when it performs the CP4 transition check (S-0-0128). Type: IDN - 4 bytes (variable length) Write access via Sercos: Read only Class name: SCP_VarCFG, SCP_Diag	- - - -	R/- - -	IDN S-0-0022
S-0-0032	Primary Operation Mode. This parameter sets the primary operating mode of the drive. The operating mode is started via bits 8, 9 and 10 in the parameter Drive Control (S-0-0134). The active operating mode is indicated by bits 8, 9 and 10 in the status word (S-0-0135). Type: Hexadecimal - 2 bytes Write access via Sercos: CP2, CP3	- 3 3 3	R/W - -	IDN S-0-0032
S-0-0033	Secondary Operation Mode 1. This parameter sets the secondary operating mode 1 of the drive. The operating mode is started via bits 8, 9 and 10 in the parameter Drive Control (S-0-0134). The active operating mode is indicated by bits 8, 9 and 10 in the status word (S-0-0135). Type: Hexadecimal - 2 bytes Write access via Sercos: CP2, CP3	- 2 2 2	R/W - -	IDN S-0-0033

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
S-0-0034	Secondary Operation Mode 2. This parameter sets the secondary operating mode 2 of the drive. The operating mode is started via bits 8, 9 and 10 in the parameter Drive Control (S-0-0134). The active operating mode is indicated by bits 8, 9 and 10 in the status word (S-0-0135). Type: Hexadecimal - 2 bytes Write access via Sercos: CP2, CP3	- 1 1 1	R/W - -	IDN S-0-0034
S-0-0047	Position Command Value. This parameter contains the target values for operating modes with position target values. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4	- -2147483648 - 2147483647	R/W - -	IDN S-0-0047
S-0-0051	Position Feedback Value 1 (motor feedback.) This parameter contains the position data of the motor encoder. Type: Signed decimal - 4 bytes Write access via Sercos: Read only	- -2147483648 - 2147483647	R/- - -	IDN S-0-0051
S-0-0099	Reset class 1 diagnostic. If this procedure command is received by the drive via the service channel, the detected errors, the error bits and the shut-down mechanism are cleared. Type: Binary - 2 bytes Write access via Sercos: CP2, CP3, CP4 Class name: GDP_Basic	- 0 0 7	R/W - -	IDN S-0-0099
S-0-0127	CP3 transition check. This procedure command instructs the drive to verify that all parameters necessary for CP3 have been transferred. If an error is detected, parameter S-0-0021 contains the appropriate IDNs. After correct termination of the command by the master, the master can activate CP3. Type: Binary - 2 bytes Write access via Sercos: CP2, CP3, CP4 Class name: SCP_VarCFG	- 0 - 3	R/W - -	IDN S-0-0127
S-0-0128	CP4 transition check. This procedure command instructs the drive to verify that all parameters necessary for CP4 have been transferred. If an error is detected, parameter S-0-0022 contains the appropriate IDNs. After correct termination of the command by the master, the master can activate CP4. Type: Binary - 2 bytes Write access via Sercos: CP2, CP3, CP4 Class name: SCP_VarCFG	- 0 - 3	R/W - -	IDN S-0-0128
S-0-0134	Drive Control. This parameter contains the control word. Type: Hexadecimal - 2 bytes Write access via Sercos: CP2, CP3, CP4	- 0 - 65535	R/W - -	IDN S-0-0134
S-0-0135	Drive Status. This parameter contains the status word of the AT. It can be used for diagnostics purposes. Type: Hexadecimal - 2 bytes Write access via Sercos: Read only	- 0 - 65535	R/- - -	IDN S-0-0135
S-0-0148	Drive controlled homing procedure command. This parameter starts homing with the homing method settings made in the drive objects. See the product manual for details on homing. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4	- 0 - 3	R/W - -	IDN S-0-0148

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
S-0-0187	IDN list of configurable data as producer. This parameter contains a list of all IDNs with operation data (feedback values) which can be cyclically processed by the drive. Type: IDN - 4 bytes (variable length) Write access via Sercos: Read only Class name: SCP_VarCFG	- - - -	R/- - -	IDN S-0-0187
S-0-0188	IDN list of configurable data as consumer. This parameter contains a list of all IDNs with operation data command values) which can be cyclically processed by the drive. Type: IDN - 4 bytes (variable length) Write access via Sercos: Read only Class name: SCP_VarCFG	- - - -	R/- - -	IDN S-0-0188
S-0-0390	Diagnostic number. The operation data of this parameter contains detailed information on the diagnostics event with the highest priority which is currently active in the drive. Type: Hexadecimal - 4 bytes Write access via Sercos: Read only Class name: GDP_Basic	- 0 0 4294967295	R/- - -	IDN S-0-0390
S-0-1000.0.0	SCP Type & Version. This parameter contains a list of the SERCOS communication capabilities/communication classes and the appropriate version supported by the drive. Type: Hexadecimal - 2 bytes (variable length) Write access via Sercos: Read only Class name: SCP_VarCFG	- - - -	R/- - -	IDN S-0-1000.0.0
S-0-1002	Communication Cycle time (tScyc). This parameter specifies the intervals at which the cyclic real-time data is transmitted. Possible values are 1000 µs, 2000 µs and 4000 µs. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2 Class name: SCP_VarCFG In increments of 0.001 µs.	µs 1000.000 1000.000 4000.000	R/W - -	IDN S-0-1002
S-0-1003	Allowed MST losses in CP3/CP4. This parameter specifies the maximum number of successive communication cycles during which a drive is permitted to not receive the MST in CP3 and CP4. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2 Class name: SCP_VarCFG	- 0 2 65535	R/W - -	IDN S-0-1003
S-0-1005	Minimum feedback processing time (t5). This parameter specifies the time required by the drive for receiving and processing actual values (such as encoder or touch probe data) and providing them in ATs. Type: Unsigned decimal - 4 bytes Write access via Sercos: Read only Class name: SCP_Sync In increments of 0.001 µs.	µs - - -	R/- - -	IDN S-0-1005
S-0-1006	AT0 transmission starting time (t1). This parameter specifies the nominal time interval between the end of MST and the beginning of AT0. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2 Class name: SCP_Sync In increments of 0.001 µs.	µs - - -	R/W - -	IDN S-0-1006

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
S-0-1007	Synchronisation Time (tSync). This parameter specifies the point in time at which all producer cycle times (producing and consuming connections) in a drive are synchronized. This value is set by the master. It must be less than the value for the synchronization cycle time. The synchronization cycle time is the least common multiple of all producer cycle times (tPcyc) to be synchronized in the network. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2 Class name: SCP_Sync In increments of 0.001 µs.	µs 0 - 4294967.295	R/W - -	IDN S-0-1007
S-0-1008	MDT Command value valid time (t3). This parameter determines the point in time at which the drive is permitted to access the new reference values, related to the synchronization time. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2 Class name: SCP_Sync In increments of 0.001 µs.	µs 0 - 4000.000	R/W - -	IDN S-0-1008
S-0-1009	Device Control Offset in MDT. This parameter specifies the MDT number and the position within the specified MDT for device control. This parameter is transferred by the master to each drive during CP2 and becomes effective in the master and drive in CP3. Type: Hexadecimal - 2 bytes Write access via Sercos: CP2 Class name: SCP_VarCFG	- 0 - 1492	R/W - -	IDN S-0-1009
S-0-1010	Lengths of MDTs. This parameter contains the lengths of the four possible MDTs in octets. These values are required for the initialization of the SERCOS hardware. Type: Unsigned decimal - 2 bytes (variable length) Write access via Sercos: CP2 Class name: SCP_VarCFG	- 0 - 1494	R/W - -	IDN S-0-1010
S-0-1011	Device Status Offset in AT. This parameter specifies the position of the status field of the drive in the AT in octets. This parameter is transferred by the master to each drive during CP2 and becomes effective in the master and drive in CP3. Type: Hexadecimal - 2 bytes Write access via Sercos: CP2 Class name: SCP_VarCFG	- 0 - 1492	R/W - -	IDN S-0-1011
S-0-1012	Length of Ats. This parameter contains the lengths of the four possible ATs in octets. These values are required for the initialization of the SERCOS hardware. Type: Unsigned decimal - 2 bytes (variable length) Write access via Sercos: CP2 Class name: SCP_VarCFG	- 0 - 1494	R/W - -	IDN S-0-1012
S-0-1013	SVC offset in MDT. This parameter specifies the position of the service channel in the MDT for the drive. This parameter is transferred by the master to each drive during CP2 and becomes effective in CP3. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2 Class name: SCP_VarCFG	- 0 - 1484	R/W - -	IDN S-0-1013

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`S-0-1014`	SVC offset in AT. This parameter specifies the position of the service channel in the AT for the drive. This parameter is transferred by the master to each drive during CP2 and becomes effective in CP3. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2 Class name: SCP_VarCFG	- 0 - 1484	R/W - -	IDN S-0-1014
`S-0-1015`	Ring delay. This parameter contains the entire ring delay determined by the master. The master assigns this value to the drives. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Class name: SCP_Sync In increments of 0.001 µs.	µs 0 - 1048.575	R/W - -	IDN S-0-1015
`S-0-1016`	Slave delay (P/S). This parameter contains the slave delay. After the master has assigned the ring delay (S-0-1015) to the slaves, the slaves measure their own delay (SYNCCNT-P/SYNCCNT-S) when the procedure command S-0-1024 is executed. Type: Unsigned decimal - 4 bytes (variable length) Write access via Sercos: Read only Class name: SCP_Sync In increments of 0.001 µs.	µs 0 - 4294967.296	R/- - -	IDN S-0-1016
`S-0-1017`	NRT transmission time. This parameter contains the NRT transmission time. Type: Hexadecimal - 1 byte (variable length) Write access via Sercos: Read only Class name: SCP_VarCFG	µs 0 650000 4000000	R/- - -	IDN S-0-1017
`S-0-1019`	MAC Address. The drive writes its MAC address to this parameter. Type: Unsigned decimal - 1 byte (variable length) Write access via Sercos: CP2, CP3, CP4 Class name: SCP_NRT	- - - -	R/W - -	IDN S-0-1019
`S-0-1020`	Current IP address. This parameter contains the IP address of the SERCOS III interface of the drive. The master can change the IP address by writing this parameter. Type: Unsigned decimal - 1 byte (variable length) Write access via Sercos: CP2, CP3, CP4 Class name: SCP_NRT	- - - -	R/W - -	IDN S-0-1020
`S-0-1021`	Subnet Mask. This parameter contains the subnet mask. The master can change the subnet mask for IP communication via the NRT channel. Type: Unsigned decimal - 1 byte (variable length) Write access via Sercos: CP2, CP3, CP4 Class name: SCP_NRT	- - - -	R/W - -	IDN S-0-1021
`S-0-1022`	Gateway address. This parameter contains the gateway address. The master can change the gateway address for IP communication via the NRT channel. Type: Unsigned decimal - 1 byte (variable length) Write access via Sercos: CP2, CP3, CP4 Class name: SCP_NRT	- - - -	R/W - -	IDN S-0-1022

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
S-0-1023	SYNC jitter. This parameter contains the maximum synchronization jitter. The synchronization jitter is used by the drive to calculate the MST window (2 x synchronization jitter). This parameter is transmitted to all drives supporting SCP_Sync. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2 Class name: SPC_Sync In increments of 0.001 µs.	µs - - -	R/W - -	IDN S-0-1023
S-0-1024	SYNC delay measuring procedure command. This procedure command causes the drive to determine its slave delay (S-0-1016) depending on the ring delay (S-0-1015). Type: Binary - 2 bytes Write access via Sercos: CP2, CP3, CP4 Class name: SCP_Sync	- 0 0 3	R/W - -	IDN S-0-1024
S-0-1026	Version of communication hardware. This parameter contains the SERCOS III-specific communication hardware identification. Type: Text - 1 byte (variable length) Write access via Sercos: Read only Class name: SCP_VarCFG	- - - -	R/- - -	IDN S-0-1026
S-0-1027.0.1	Requested MTU. The requested MTU specifies the maximum number of octets that can be sent via the NRT channel by higher layers. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2 Class name: SCP_NRT	- 46 - 1500	R/W - -	IDN S-0-1027.0.1
S-0-1027.0.2	Effective MTU. This parameter contains the current MTU. The current MTU is calculated using the parameters S-0-1017 and S-0-1027.0. Type: Unsigned decimal - 2 bytes Write access via Sercos: Read only Class name: SCP_NRT	- 46 - 1500	R/- - -	IDN S-0-1027.0.2
S-0-1028	Error counter MST P/S. This parameter is an error counter which is incremented if no valid MST is received at port 1 or port 2 during CP 3 and CP4. Type: Unsigned decimal - 2 bytes Write access via Sercos: Read only Class name: SCP_Diag	- 0 0 65535	R/- - -	IDN S-0-1028
S-0-1031	Test pin assignment Port 1 & Port 2. This parameter is used to assign communication-related hardware signals to the test pins TS1 and TS2. Type: Binary - 2 bytes Write access via Sercos: CP2, CP3, CP4 Class name: SCP_Diag	- 0 0 3855	R/W - -	IDN S-0-1031
S-0-1035	Error counter Port1 and Port2. This parameter is an error counter which counts the detected Ethernet errors. Type: Hexadecimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Class name: SCP_VarCFG	- 0 0 65535	R/W - -	IDN S-0-1035
S-0-1040	SERCOS address. This parameter contains the SERCOS device address assigned to the drive. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Class name: SCP_VarCFG	- 0 0 511	R/W - -	IDN S-0-1040

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`S-0-1040.0.128`	Topology address. This parameter contains the topology address of the drive (physical position in the network). This address is independent of the SERCOS address. This parameter is a manufacturer-specific extension of the standard parameter. Type: IDN - 2 bytes Write access via Sercos: Read only	- 0 0 511	R/- - -	IDN S-0-1040.0.128
`S-0-1041`	AT Command value valid time (t9). This parameter determines the point in time at which the drive is permitted to access the new reference values from the AT. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2 Class name: SCP_Sync In increments of 0.001 µs.	µs 0 - 4000.000	R/W - -	IDN S-0-1041
`S-0-1044`	Device Control. This parameter contains the control information (for example, topology control, fast-forward, loopback, physical topology, ring, etc.) set by the master and evaluated by the drive. Type: Hexadecimal - 2 bytes Write access via Sercos: Read only Class name: SCP_Diag	- - - -	R/- - -	IDN S-0-1044
`S-0-1045`	Device Status. This parameter contains the status information (for example, topology status, fast-forward, loopback, physical topology, ring, etc.) set by the drive and evaluated by the master. Type: Hexadecimal - 2 bytes Write access via Sercos: Read only Class name: SCP_Diag	- - - -	R/- - -	IDN S-0-1045
`S-0-1046`	List of SERCOS addresses in device. If a device comprises multiple SERCOS slaves, this parameter contains the SERCOS addresses of the slaves that participate in the communication. Type: Unsigned decimal - 2 bytes (variable length) Write access via Sercos: Read only Class name: SCP_VarCFG	- 1 1 1	R/- - -	IDN S-0-1046
`S-0-1050.x.01`	Connection setup. This parameter is used to configure connections. Type: Hexadecimal - 2 bytes Write access via Sercos: CP2 Class name: SCP_VarCFG, SCP_Sync, SCP_WDCon	- 0 8218 65535	R/W - -	IDN S-0-1050.x.01
`S-0-1050.x.02`	Connection Number. The connection number is used to identify a connection. The producer and all consumers of the same connection have the same connection number. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2 Class name: SCP_VarCFG	- 0 0 65535	R/W - -	IDN S-0-1050.x.02
`S-0-1050.x.03`	Telegram Assignment. This parameter contains the telegram type (MDT or AT), the telegram number and the telegram offset of connection control for this connection. Type: Hexadecimal - 2 bytes Write access via Sercos: CP2 Class name: SCP_VarCFG	- 0 0 15828	R/W - -	IDN S-0-1050.x.03

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`S-0-1050.x.04`	Max. Length Of Connection. This parameter specifies the maximum length of this connection. Type: Unsigned decimal - 2 bytes Write access via Sercos: Read only Class name: SCP_VarCFG	- 2 2 200	R/- - -	IDN S-0-1050.x.04
`S-0-1050.x.05`	Current length of connection. This parameter specifies the current length of this connection. Type: Unsigned decimal - 2 bytes Write access via Sercos: Read only Class name: SCP_VarCFG	- 2 2 200	R/- - -	IDN S-0-1050.x.05
`S-0-1050.x.06`	Configuration List. If the connection data is configured via IDNs (type of connection, bit 5-4 = 00, in S-0-1050.x.01), this parameter contains the list of IDNs within this connection. Type: IDN - 4 bytes (variable length) Write access via Sercos: CP2 Class name: SCP_VarCFG	- - - -	R/W - -	IDN S-0-1050.x.06
`S-0-1050.x.08`	Connection Control (C-Con). This parameter contains the image of the control word C-Con of this connection. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2 Class name: SCP_Diag In increments of 0.001 .	- - - -	R/W - -	IDN S-0-1050.x.08
`S-0-1050.x.10`	Producer Cycle Time. This parameter contains the producer cycle time. The producer cycle time should be an integer multiple of the communication cycle time. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2 Class name: SCP_Sync, SCP_WDCon	μs 31250 1000000 4294967296	R/W - -	IDN S-0-1050.x.10
`S-0-1050.x.11`	Allowed Data Losses. This parameter specifies the maximum amount of consecutive producer data that may be lost before a connection is closed. Type: Unsigned decimal - 2 bytes Write access via Sercos: Read only Class name: SCP_Sync, SCP_WDCon	- 1 1 65535	R/- - -	IDN S-0-1050.x.11
`S-0-1050.x.12`	Error Counter Data Losses. This parameter is a counter which counts the amount of producer data lost. Type: Hexadecimal - 2 bytes (variable length) Write access via Sercos: Read only Class name: SCP_Sync, SCP_Diag	- 0 0 65535	R/- - -	IDN S-0-1050.x.12
`S-0-1051.0.0`	Image of connection setups. This parameter contains the actual state of all the connections of the drive, corresponding to the parameter S-0-1050.x.1. Type: Unsigned decimal - 4 bytes (variable length) Write access via Sercos: CP2 Class name: SCP_VarCFG In increments of 0.001 .	- - - -	R/W - -	IDN S-0-1051.0.0
`S-0-1300.0.02`	Vendor Name. This parameter contains the vendor-specific name of the device. Type: Text - 1 byte (variable length) Write access via Sercos: Read only Class name: GDP_Id	- - - -	R/- - -	IDN S-0-1300.0.02

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`S-0-1300.0.03`	Vendor Code. This parameter contains the vendor code. The vendor code is a unique number assigned to each vendor and helps to identify a SERCOS device. Type: Unsigned decimal - 2 bytes Write access via Sercos: Read only Class name: GDP_Basic	- 1 1 1	R/- - -	IDN S-0-1300.0.03
`S-0-1300.0.04`	Device Name. This parameter contains the device name published in vendor's price list. Type: Text - 1 byte (variable length) Write access via Sercos: Read only Class name: GDP_Id	- 0 - 255	R/- - -	IDN S-0-1300.0.04
`S-0-1300.0.05`	Vendor Device ID. The parameter contains the vendor device ID. The vendor device ID is a unique device ID managed by the vendor; it identifies the component number. Type: Text - 1 byte (variable length) Write access via Sercos: Read only Class name: GDP_Basic	- 0 - 255	R/- - -	IDN S-0-1300.0.05
`S-0-1300.0.08`	Hardware Revision. This parameter contains the hardware revision of the device. Type: Text - 1 byte (variable length) Write access via Sercos: Read only	- 0 - 255	R/- - -	IDN S-0-1300.0.08
`S-0-1300.0.09`	Software Revision. This parameter contains the firmware version of the drive. Type: Text - 1 byte (variable length) Write access via Sercos: Read only	- 0 - 255	R/- - -	IDN S-0-1300.0.09
`S-0-1300.0.11`	Order Number. This parameter contains the order number of the drive. Type: Text - 1 byte (variable length) Write access via Sercos: Read only	- - - -	R/- - -	IDN S-0-1300.0.11
`S-0-1300.0.12`	Serial Number. This parameter contains the serial number of the drive. Type: Text - 1 byte (variable length) Write access via Sercos: Read only Class name: GDP_Id	- 0 - 255	R/- - -	IDN S-0-1300.0.12
`S-0-1300.1.09`	Software Revision. This parameter contains the software version of the SERCOS III Communication Option. Type: Text - 1 byte (variable length) Write access via Sercos: Read only	- 0 - 255	R/- - -	IDN S-0-1300.1.09
`S-0-1300.1.10`	Firmware Loader Revision. This parameter contains the revision of the firmware loader or bootloader implemented in the drive. Type: Text - 1 byte (variable length) Write access via Sercos: Read only	- 0 - 255	R/- - -	IDN S-0-1300.1.10
`S-0-1300.2.09`	Software Revision. This parameter contains the software version of the FPGA of the SERCOS communication option. Type: Text - 1 byte (variable length) Write access via Sercos: Read only	- 0 - 255	R/- - -	IDN S-0-1300.2.09
`S-0-1301`	List of GDP classes & Version. This parameter contains a list of the generic profile capabilities and the versions supported by the drive. Type: Hexadecimal - 2 bytes (variable length) Write access via Sercos: Read only Class name: GDP_Basic	- 257 - 5889	R/- - -	IDN S-0-1301

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
S-0-1302.0.01	FSP Type & Version. This parameter contains the function-specific type and the function-dependent version of the resource. Type: Hexadecimal - 4 bytes Write access via Sercos: Read only Class name: GDP_Basic	- 0 - 4294967295	R/- - -	IDN S-0-1302.0.01
S-0-1302.0.02	Function groups. The operation data of this parameter contains a list of all instanced function groups. Type: IDN - 4 bytes (variable length) Write access via Sercos: Read only Class name: GDP_Basic	- 0 - 4294967295	R/- - -	IDN S-0-1302.0.02
S-0-1302.0.03	Application Type. The operation data of this parameter contains the type of the sub-device application (for example, main spindle drive, round axis, X axis, etc.). Type: Text - 1 byte (variable length) Write access via Sercos: CP2, CP3, CP4 Class name: GDP_Id	- 0 - 255	R/W - -	IDN S-0-1302.0.03

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_AccessInfo	Access channel information. Low byte: Exclusive access Value 0: No Value 1: Yes High byte: Access channel Value 0: Reserved Value 1: I/O Value 2: HMI Value 3: Modbus RS485 Value 4: Fieldbus main channel Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 280 IDN P-0-3001.0.12
_actionStatus	Action word. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: Error class 0 Bit 1: Error class 1 Bit 2: Error class 2 Bit 3: Error class 3 Bit 4: Error class 4 Bit 5: Reserved Bit 6: Motor is at a standstill (_n_act < 9 RPM) Bit 7: Motor movement in positive direction Bit 8: Motor movement in negative direction Bit 9: Assignment can be set via parameter DPL_intLim Bit 10: Assignment can be set via parameter DS402intLim Bit 11: Profile generator idle (reference velocity is 0) Bit 12: Profile generator decelerates Bit 13: Profile generator accelerates Bit 14: Profile generator moves at constant speed Bit 15: Reserved Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 7176 IDN P-0-3028.0.4

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_AT_J`	Moment of inertia of the system. Is automatically calculated during Autotuning. Type: Unsigned decimal - 2 bytes In increments of 0.1 kg cm^2.	kg cm^2 0.1 0.1 6553.5	UINT16 R/- per. -	Modbus 12056 IDN P-0-3047.0.12
`_AT_M_friction`	Friction torque of the system. Is determined during Autotuning. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 12046 IDN P-0-3047.0.7
`_AT_M_load`	Constant load torque. Is determined during Autotuning. Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 12048 IDN P-0-3047.0.8
`_AT_progress`	Progress of Autotuning. Type: Unsigned decimal - 2 bytes	% 0 0 100	UINT16 R/- - -	Modbus 12054 IDN P-0-3047.0.11
`_AT_state`	Autotuning status. Bit assignments: Bits 0 ... 10: Last processing step Bit 13: auto_tune_process Bit 14: auto_tune_end Bit 15: auto_tune_err Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 12036 IDN P-0-3047.0.2
`_Cap1CountCons`	Capture input 1 event counter (continuous). Counts the capture events. The event counter is reset when capture input 1 is activated. By reading this parameter, the parameter "_Cap1PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2606 IDN P-0-3010.0.23
`_Cap1Pos`	Capture input 1 captured position (one-time). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2572 IDN P-0-3010.0.6
`_Cap1PosCons`	Capture input 1 captured position (continuous). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap1CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2608 IDN P-0-3010.0.24
`_Cap2CountCons`	Capture input 2 event counter (continuous). Counts the capture events. The event counter is reset when capture input 2 is activated. By reading this parameter, the parameter "_Cap2PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2610 IDN P-0-3010.0.25
`_Cap2Pos`	Capture input 2 captured position (one-time). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2574 IDN P-0-3010.0.7

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_Cap2PosCons`	Capture input 2 captured position (continuous). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap2CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2612 IDN P-0-3010.0.26
`_Cap3CountCons`	Capture input 3 event counter (continuous). Counts the capture events. The event counter is reset when capture input 3 is activated. By reading this parameter, the parameter "_Cap3PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2614 IDN P-0-3010.0.27
`_Cap3Pos`	Capture input 3 captured position (one-time). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". Available with hardware version ≥RS03. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2598 IDN P-0-3010.0.19
`_Cap3PosCons`	Capture input 3 captured position (continuous). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap3CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2616 IDN P-0-3010.0.28
`_CapStatus`	Status of the capture inputs. Read access: Bit 0: Position captured via input CAP1 Bit 1: Position captured via input CAP2 Bit 2: Position captured via input CAP3 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2562 IDN P-0-3010.0.1
`_CommutCntAct`	Actual value of commutation monitoring counter. Type: Signed decimal - 2 bytes Available with firmware version ≥V01.06.	- - - -	INT16 R/- - -	Modbus 16324 IDN P-0-3063.0.98
`_Cond_State4`	Conditions for transition to operating state Ready To Switch On. Signal state: 0: Condition not met 1: Condition met Bit 0: DC bus or mains voltage Bit 1: Inputs for safety function Bit 2: No configuration download ongoing Bit 3: Velocity greater than limit value Bit 4: Absolute position has been set Bit 5: Holding brake not manually released Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 7244 IDN P-0-3028.0.38

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_CTRL_ActParSet`	Active control loop parameter set. Value 1: Control loop parameter set 1 is active Value 2: Control loop parameter set 2 is active A control loop parameter set is active after the time for the parameter switching (CTRL_ParChgTime) has elapsed. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 4398 IDN P-0-3017.0.23
`_CTRL_KPid`	Current controller d component P gain. This value is calculated on the basis of the motor parameters. Type: Unsigned decimal - 2 bytes In increments of 0.1 V/A. Modified settings become effective immediately.	V/A 0.5 - 1270.0	UINT16 R/- per. -	Modbus 4354 IDN P-0-3017.0.1
`_CTRL_KPiq`	Current controller q component P gain. This value is calculated on the basis of the motor parameters. Type: Unsigned decimal - 2 bytes In increments of 0.1 V/A. Modified settings become effective immediately.	V/A 0.5 - 1270.0	UINT16 R/- per. -	Modbus 4358 IDN P-0-3017.0.3
`_CTRL_TNid`	Current controller d component integral action time. This value is calculated on the basis of the motor parameters. Type: Unsigned decimal - 2 bytes In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.13 - 327.67	UINT16 R/- per. -	Modbus 4356 IDN P-0-3017.0.2
`_CTRL_TNiq`	Current controller q component integral action time. This value is calculated on the basis of the motor parameters. Type: Unsigned decimal - 2 bytes In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.13 - 327.67	UINT16 R/- per. -	Modbus 4360 IDN P-0-3017.0.4
`_DCOMopmd_act`	Active operating mode. **-6 / Manual Tuning / Autotuning**: Manual Tuning / Autotuning **-1 / Jog**: Jog **0 / Reserved**: Reserved **4 / Profile Torque**: Profile Torque **6 / Homing**: Homing **8 / Cyclic Synchronous Position**: Cyclic Synchronous Position **9 / Cyclic Synchronous Velocity**: Cyclic Synchronous Velocity **10 / Cyclic Synchronous Torque**: Cyclic Synchronous Torque Type: Signed decimal - 2 bytes	- -6 0 10	INT16 R/- - -	Modbus 6920 IDN P-0-3027.0.4

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_DCOMstatus	DriveCom status word. Bit assignments: Bit 0: Operating state Ready To Switch On Bit 1: Operating state Switched On Bit 2: Operating state Operation Enabled Bit 3: Operating state Fault Bit 4: Voltage Enabled Bit 5: Operating state Quick Stop Bit 6: Operating state Switch On Disabled Bit 7: Error of error class 0 Bit 8: HALT request active Bit 9: Remote Bit 10: Target Reached Bit 11: Internal Limit Active Bit 12: Operating mode-specific Bit 13: x_err Bit 14: x_end Bit 15: ref_ok Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 6916 IDN P-0-3027.0.2
_DEV_T_current Mon tdEV	Temperature of device. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 7204 IDN P-0-3028.0.18
_ENC_AmplMax	Maximum value of the SinCos amplitude. This value is only available if monitoring of the SinCos amplitude has been activated. Type: Unsigned decimal - 2 bytes Available with firmware version ≥V01.06.	mV - - -	UINT16 R/- - -	Modbus 16320 IDN P-0-3063.0.96
_ENC_AmplMean	Mean value of the SinCos amplitude. This value is only available if monitoring of the SinCos amplitude has been activated. Type: Unsigned decimal - 2 bytes Available with firmware version ≥V01.06.	mV - - -	UINT16 R/- - -	Modbus 16316 IDN P-0-3063.0.94
_ENC_AmplMin	Minimum value of the SinCos amplitude. This value is only available if monitoring of the SinCos amplitude has been activated. Type: Unsigned decimal - 2 bytes Available with firmware version ≥V01.06.	mV - - -	UINT16 R/- - -	Modbus 16318 IDN P-0-3063.0.95
_ENC_AmplVal	Value of the SinCos amplitude. This value is only available if monitoring of the SinCos amplitude has been activated. Type: Unsigned decimal - 2 bytes Available with firmware version ≥V01.06.	mV - - -	UINT16 R/- - -	Modbus 16314 IDN P-0-3063.0.93
_Enc2Cos	Cosine signal of encoder 2. Type: Signed decimal - 2 bytes In increments of 0.001 V. Available with firmware version ≥V01.06.	V - - -	INT16 R/- - -	Modbus 20746 IDN P-0-3081.0.5
_Enc2Sin	Sine signal of encoder 2. Type: Signed decimal - 2 bytes In increments of 0.001 V. Available with firmware version ≥V01.06.	V - - -	INT16 R/- - -	Modbus 20748 IDN P-0-3081.0.6
_ENCAnaHallStatu	Sequence of Hall effect sensor signals of analog encoder. This parameter can be used to read the sequence of the Hall effect sensor signals of an analog encoder with the interface "SinCos 1Vpp (with Hall)". Type: Unsigned decimal - 2 bytes	- 0 - 7	UINT16 R/- - -	Modbus 20742 IDN P-0-3081.0.3

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_ERR_class`	Error class. Value 0: Error class 0 Value 1: Error class 1 Value 2: Error class 2 Value 3: Error class 3 Value 4: Error class 4 Type: Unsigned decimal - 2 bytes	- 0 - 4	UINT16 R/- - -	Modbus 15364 IDN P-0-3060.0.2
`_ERR_DCbus`	DC bus voltage at the time the error was detected. Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- - -	Modbus 15374 IDN P-0-3060.0.7
`_ERR_enable_cycl`	Number of cycles of enabling the power stage at error time. Number of cycles of enabling the power stage from the time the control voltage was applied to the time the error was detected. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 15370 IDN P-0-3060.0.5
`_ERR_enable_time`	Time between enabling of power stage and detection of the error. Type: Unsigned decimal - 2 bytes	s - - -	UINT16 R/- - -	Modbus 15372 IDN P-0-3060.0.6
`_ERR_motor_I`	Motor current at the time the error was detected. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 15378 IDN P-0-3060.0.9
`_ERR_motor_v`	Motor velocity at the time the error was detected. Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 15376 IDN P-0-3060.0.8
`_ERR_number`	Error code. Reading this parameter copies the entire entry for the detected error (error class, time of detection of error, …) to an intermediate memory from which the elements of the detected error can then be read. In addition, the read pointer of the error memory is automatically set to the next error entry. Type: Unsigned decimal - 2 bytes	- 0 - 65535	UINT16 R/- - -	Modbus 15362 IDN P-0-3060.0.1
`_ERR_powerOn` Mon PoWo	Number of power on cycles. Type: Unsigned decimal - 4 bytes	- 0 - 4294967295	UINT32 R/- - -	Modbus 15108 IDN P-0-3059.0.2
`_ERR_qual`	Additional information on detected error. This entry contains additional information on the detected error, depending on the error number. Example: a parameter address Type: Unsigned decimal - 2 bytes	- 0 - 65535	UINT16 R/- - -	Modbus 15368 IDN P-0-3060.0.4
`_ERR_temp_dev`	Temperature of device at the time the error was detected. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 15382 IDN P-0-3060.0.11
`_ERR_temp_ps`	Temperature of power stage at the time the error was detected. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 15380 IDN P-0-3060.0.10
`_ERR_time`	Time of detection of error. With reference to operating hours counter Type: Unsigned decimal - 4 bytes	s 0 - 536870911	UINT32 R/- - -	Modbus 15366 IDN P-0-3060.0.3

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_ErrNumFbParSvc	Last error code of fieldbus parameter services. Some fieldbusses only provide general error codes if a request for a parameter service is not successful. This parameter returns the vendor-specific error code of the last unsuccessful service. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 16518 IDN P-0-3064.0.67
_eSM_funct Mon SMoP	eSM function. Active eSM function Value 0: Safe Torque Off (STO) Value 1: No function active Value 2: Safe Operating Stop (SOS) Value 3: Safely Limited Speed (SLS) Value 4: Reserved Value 5: Safe Stop 1 (SS1) Value 6: Safe Stop 2 (SS2) Value 7: Safe Operating Stop (SOS) after error Value 8: Safely Limited Speed (SLS) in machine operating mode Automatic Mode If bit 15 of the value is set: GUARD_ACK was triggered Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 19502 IDN P-0-3076.0.23
_eSM_LI_act	eSM digital inputs channel B. Signal state: 0: 0 level 1: 1 level Bit assignments: Bit 0: /ESTOP_B Bit 1: GUARD_B Bit 3: SETUPMODE_B Bit 4: SETUPENABLE_B Bit 6: GUARD_ACK Bit 8: ESMSTART Bit 9: /INTERLOCK_IN Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 19492 IDN P-0-3076.0.18
_eSM_LI_mask	eSM digital inputs channel B mask. Mask of active digital inputs 0: Digital input is not active 1: Digital input is active Bit assignments: See digital inputs channel. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 19494 IDN P-0-3076.0.19
_eSM_LO_act	eSM digital outputs channel B. Signal state: 0: 0 level 1: 1 level Bit assignments: Bit 0: CCM24V_OUT_B Bit 1: Drive operating state 6 Operation Enabled (B) Bit 2: RELAY_OUT_B Bit 3: AUXOUT2 Bit 4: /INTERLOCK_OUT Bits 5 ... 15: Reserved Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 19496 IDN P-0-3076.0.20

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_eSM_state` Mon SMSt	eSM operating state. **0 / eSM module missing /** MISS: eSM module missing **1 / Start /** Strt: Start **2 / Not Ready To Switch On /** nrdY: Not Ready To Switch On **3 / Switch On Disabled /** dIS: Switch On Disabled **4 / Ready To Switch On /** rdY: Ready To Switch On **6 / Operation Enabled /** run: Operation Enabled **7 / Quick Stop /** qStP: Quick Stop **8 / Fault Reaction Active /** FLt: Fault Reaction Active **9 / Fault /** FLt: Fault Status word of eSM state machine Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 19500 IDN P-0-3076.0.22
`_eSMVer`	eSM revision of firmware. Revision of firmware: Bits 0 ... 7: Firmware evolution (dec) Bits 8 ... 15: Firmware minor revision (dec) Bits 16 ... 23: Firmware major revision (dec) Bits 24 ... 31: Reserved Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 19486 IDN P-0-3076.0.15
`_fwNoSlot1`	Firmware number of slot 1. Example: PR0912.00 The value is provided as a decimal value: 91200. If no module is installed, the value 0 is returned. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 558 IDN P-0-3002.0.23
`_fwNoSlot2`	Firmware number of slot 2. Example: PR0912.00 The value is provided as a decimal value: 91200. If no module is installed, the value 0 is returned. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 568 IDN P-0-3002.0.28
`_fwNoSlot3`	Firmware number of slot 3. Example: PR0912.00 The value is provided as a decimal value: 91200. If no module is installed, the value 0 is returned. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 578 IDN P-0-3002.0.33
`_fwNoSlot3Boot`	Firmware number of slot 3 (Bootloader). Example: PR0912.00 The value is provided as a decimal value: 91200. If no module is installed, the value 0 is returned. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 590 IDN P-0-3002.0.39
`_fwNoSlot3FPGA`	Firmware number of slot 3 (FPGA). Example: PR0912.00 The value is provided as a decimal value: 91200. If no module is installed, the value 0 is returned. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 584 IDN P-0-3002.0.36
`_fwNoSlot3PRU`	Firmware number of slot 3 (PRU). Example: PR0912.00 The value is provided as a decimal value: 91200. If no module is installed, the value 0 is returned. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 596 IDN P-0-3002.0.42

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_fwRevSlot1	Firmware revision of slot 1. The version format is XX.YY.ZZ. Part XX.YY is contained in parameter _fwVerSlot1. Part ZZ is used for quality evolution and contained in this parameter. If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 45 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 562 IDN P-0-3002.0.25
_fwRevSlot2	Firmware revision of slot 2. The version format is XX.YY.ZZ. Part XX.YY is contained in parameter _fwVersSlot2. Part ZZ is used for quality evolution and contained in this parameter. If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 45 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 572 IDN P-0-3002.0.30
_fwRevSlot3 ConF → inF - ArEV	Firmware revision of slot 3. The version format is XX.YY.ZZ. Part XX.YY is contained in parameter _fwVerSlot3. Part ZZ is used for quality evolution and contained in this parameter. If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 45 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 582 IDN P-0-3002.0.35
_fwRevSlot3Boot ConF → inF - brEV	Firmware revision of slot 3 (Bootloader). The version format is XX.YY.ZZ.BB. Part XX.YY is contained in parameter _fwVerSlot3Boot. Part ZZ.BB is used for quality evolution and contained in this parameter. If no module is installed, the value 0 is returned. Example: V01.23.45.67 The value is provided as a decimal value: 4567 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 594 IDN P-0-3002.0.41
_fwRevSlot3FPGA ConF → inF - FrEV	Firmware revision of slot 3 (FPGA). The version format is XX.YY.ZZ. Part XX.YY is contained in parameter _fwVerSlot3FPGA. Part ZZ is used for quality evolution and contained in this parameter. If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 45 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 588 IDN P-0-3002.0.38
_fwRevSlot3PRU ConF → inF - PrEV	Firmware revision of slot 3 (PRU). The version format is XX.YY.ZZ.B. Part XX.YY is contained in parameter _fwVerSlot3PRU. Part ZZ.B is used for quality evolution and contained in this parameter. If no module is installed, the value 0 is returned. Example: V01.23.45.6 The value is provided as a decimal value: 456 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 600 IDN P-0-3002.0.44

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_fwVersSlot1	Firmware version of slot 1. The version format is XX.YY.ZZ. Part XX.YY is contained in this parameter. Part ZZ is contained in parameter _fwRevSlot1. If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 560 IDN P-0-3002.0.24
_fwVersSlot2	Firmware version of slot 2. The version format is XX.YY.ZZ. Part XX.YY is contained in this parameter. Part ZZ is contained in parameter _fwRevSlot2. If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 570 IDN P-0-3002.0.29
_fwVersSlot3 ConF → inF - AVEr	Firmware version of slot 3. The version format is XX.YY.ZZ. Part XX.YY is contained in this parameter. Part ZZ is contained in parameter _fwRevSlot3. If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 580 IDN P-0-3002.0.34
_fwVersSlot3Boot ConF → inF - bVEr	Firmware version of slot 3 (Bootloader). The version format is XX.YY.ZZ.BB. Part XX.YY is contained in this parameter. Part ZZ.BB is contained in parameter _fwRevSlot3Boot. If no module is installed, the value 0 is returned. Example: V01.23.45.67 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 592 IDN P-0-3002.0.40
_fwVersSlot3FPGA ConF → inF - FVEr	Firmware version of slot 3 (FPGA). The version format is XX.YY.ZZ. Part XX.YY is contained in this parameter. Part ZZ is contained in parameter _fwRevSlot3FPGA. If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 586 IDN P-0-3002.0.37
_fwVersSlot3PRU ConF → inF - PVEr	Firmware version of slot 3 (PRU). The version format is XX.YY.ZZ.B. Part XX.YY is contained in this parameter. Part ZZ.B is contained in parameter _fwRevSlot3PRU. If no module is installed, the value 0 is returned. Example: V01.23.45.6 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 598 IDN P-0-3002.0.43

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_HMdisREFtoIDX	Distance from switching point to index pulse. Allows you to verify the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. The parameter _HMdisREFtoIDX_usr allows you to enter the value in user-defined units. Type: Signed decimal - 4 bytes In increments of 0.0001 revolution.	revolution - - -	INT32 R/- - -	Modbus 10264 IDN P-0-3040.0.12
_HMdisREFtoIDX_usr	Distance from switching point to index pulse. Allows you to verify the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. Type: Signed decimal - 4 bytes	usr_p -2147483648 - 2147483647	INT32 R/- - -	Modbus 10270 IDN P-0-3040.0.15
_hwVersCPU	Hardware version of control board. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 548 IDN P-0-3002.0.18
_hwVersPS	Hardware version of power stage. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 552 IDN P-0-3002.0.20
_hwVersSlot1	Hardware version of module in slot 1. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 556 IDN P-0-3002.0.22
_hwVersSlot2	Hardware version of module in slot 2. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 566 IDN P-0-3002.0.27
_hwVersSlot3	Hardware version of module in slot 3. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 576 IDN P-0-3002.0.32
_I_act Mon iAct	Total motor current. Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 7686 IDN P-0-3030.0.3
_Id_act_rms	Actual motor current (d component, field weakening). Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 7684 IDN P-0-3030.0.2
_Id_ref_rms	Reference motor current (d component, field weakening). Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 7714 IDN P-0-3030.0.17
_Imax_act	Currently effective current limitation. Value of the currently effective current limitation. This is one of the following values (whichever is lowest): - CTRL_I_max (only during normal operation) - LIM_I_maxQSTP (only during Quick Stop) - LIM_I_maxHalt (only during Halt) - Current limitation via digital input - _M_I_max (only if motor is connected) - _PS_I_max Limitations caused by I2t monitoring are also taken into account. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 7248 IDN P-0-3028.0.40

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_Imax_system`	Current limitation of the system. This parameter specifies the maximum system current. This is the lower value of the maximum motor current and the maximum power stage current. If no motor is connected, only the maximum power stage current is taken into account in this parameter. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 7246 IDN P-0-3028.0.39
`_Inc_ENC2Raw`	Raw increment value of encoder 2. This parameter is only needed for commissioning of encoder 2 in case of an unknown machine encoder resolution. Type: Signed decimal - 4 bytes	EncInc - - -	INT32 R/- - -	Modbus 7754 IDN P-0-3030.0.37
`_InvalidParam`	Modbus address of parameter with invalid value. If a configuration error is detected, the Modbus address of the parameter with an invalid value is indicated here. Type: Unsigned decimal - 2 bytes	- - 0 -	UINT16 R/- - -	Modbus 7180 IDN P-0-3028.0.6
`_IO_act`	Physical status of the digital inputs and outputs. Low byte: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3 Bit 4: DI4 Bit 5: DI5 High byte: Bit 8: DQ0 Bit 9: DQ1 Bit 10: DQ2 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2050 IDN P-0-3008.0.1
`_IO_DI_act` Mon diMo	Status of digital inputs. Bit assignments: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3 Bit 4: DI4 Bit 5: DI5 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2078 IDN P-0-3008.0.15
`_IO_DQ_act` Mon doMo	Status of digital outputs. Bit assignments: Bit 0: DQ0 Bit 1: DQ1 Bit 2: DQ2 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2080 IDN P-0-3008.0.16
`_IO_STO_act` Mon Sto	Status of the inputs for the safety-related function STO. Bit 0: STO_A Bit 1: STO_B If no safety module eSM is plugged in, this parameter indicates the status of the signal inputs STO_A and STO_B. If a safety module eSM is plugged in, the safety function STO can be triggered via the signal inputs or via the safety module eSM. This parameter indicates whether or not the safety function STO was triggered (regardless of whether it was triggered via the signal inputs or via the safety module eSM). Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2124 IDN P-0-3008.0.38

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_IOdataMtoS01	I/O parameter data Master to Slave - parameter 01. Data of the cyclic communication between the master and slave. This parameter contains the data of the first parameter mapped from the master to the slave. The parameters _IOdataMtoS02 to _IOdataMtoS16 contain the data of the remaining mapped parameters. Type: Unsigned decimal - 4 bytes	- 0 FFFFFFFF hex 4294967295	UINT32 R/- - -	Modbus 16386 IDN P-0-3064.0.1
_IOdataStoM01	I/O parameter data Slave to Master - parameter 01. Data of the cyclic communication between the master and slave. This parameter contains the data of the first parameter mapped from the slave to the master. The parameters _IOdataStoM02 to _IOdataStoM16 contain the data of the remaining mapped parameters. Type: Unsigned decimal - 4 bytes	- 0 FFFFFFFF hex 4294967295	UINT32 R/- - -	Modbus 16450 IDN P-0-3064.0.33
_IOmappingMtoS01	I/O parameter mapping Master to Slave - parameter 01. Mapping of the cyclic communication between the master and slave. This parameter contains the mapping of the first parameter mapped from the master to the slave. The parameters _IOmappingMtoS02 to _IOmappingMtoS16 contain the mapping of the remaining mapped parameters. Type: Unsigned decimal - 2 bytes	- 0 FFFF hex 65535	UINT16 R/- - -	Modbus 16418 IDN P-0-3064.0.17
_IOmappingStoM01	I/O parameter mapping Slave to Master - parameter 01. Mapping of the cyclic communication between the master and slave. This parameter contains the mapping of the first parameter mapped from the slave to the master. The parameters _IOmappingStoM02 to _IOmappingStoM16 contain the mapping of the remaining mapped parameters. Type: Unsigned decimal - 2 bytes	- 0 FFFF hex 65535	UINT16 R/- - -	Modbus 16482 IDN P-0-3064.0.49
_Iq_act_rms Mon qAct	Actual motor current (q component, generating torque). Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 7682 IDN P-0-3030.0.1
_Iq_ref_rms Mon qrEF	Reference motor current (q component, generating torque). Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 7712 IDN P-0-3030.0.16
_LastError Mon LFLt	Detected error causing a stop (error classes 1 to 4). Error code of the most recent detected error. Consecutive detected errors do not overwrite this error code. Example: If an error response to a detected limit switch error causes overvoltage, this parameter contains the code of the detected limit switch error. Exception: Detected errors of error class 4 overwrite existing entries. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 7178 IDN P-0-3028.0.5
_LastError_Qual	Additional info on most recent error. This parameter contains additional information on the most recent detected error, depending on the error code. For example: a parameter address. Type: Unsigned decimal - 2 bytes	- - 0 -	UINT16 R/- - -	Modbus 7230 IDN P-0-3028.0.31

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_LastWarning Mon LWrn	Code of most recent error of error class 0. If the error is no longer active, the code is stored until the next Fault Reset. Value 0: No error of error class 0 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 7186 IDN P-0-3028.0.9
_M_BRK_T_apply	Holding brake application time. Type: Unsigned decimal - 2 bytes	ms - - -	UINT16 R/- - -	Modbus 3394 IDN P-0-3013.0.33
_M_BRK_T_release	Holding brake release time. Type: Unsigned decimal - 2 bytes	ms - - -	UINT16 R/- - -	Modbus 3396 IDN P-0-3013.0.34
_M_Enc_Cosine	Voltage of cosine signal of encoder. Type: Signed decimal - 2 bytes In increments of 0.001 V. Available with firmware version ≥V01.06.	V - - -	INT16 R/- - -	Modbus 7254 IDN P-0-3028.0.43
_M_Enc_Sine	Voltage of sine signal of encoder. Type: Signed decimal - 2 bytes In increments of 0.001 V. Available with firmware version ≥V01.06.	V - - -	INT16 R/- - -	Modbus 7256 IDN P-0-3028.0.44
_M_Encoder ConF → inF - SEnS	Type of motor encoder. **1 / SinCos With HiFa** / SWhi: SinCos with Hiperface **2 / SinCos Without HiFa** / SWoh: SinCos without Hiperface **3 / SinCos With Hall** / SWhA: SinCos with Hall **4 / SinCos With EnDat** / SWEn: SinCos with EnDat **5 / EnDat Without SinCos** / EndA: EnDat without SinCos **6 / Resolver** / rESo: Resolver **7 / Hall** / hALL: Hall (not supported yet) **8 / BISS** / biSS: BISS High byte: Value 0: Rotary encoder Value 1: Linear encoder Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 3334 IDN P-0-3013.0.3
_M_HoldingBrake	Holding brake identification. Value 0: Motor without holding brake Value 1: Motor with holding brake Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 3392 IDN P-0-3013.0.32
_M_I_0	Continuous stall current of motor. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 3366 IDN P-0-3013.0.19
_M_I_max ConF → inF - MiMA	Maximum current of motor. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 3340 IDN P-0-3013.0.6
_M_I_nom ConF → inF - Mino	Nominal current of motor. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 3342 IDN P-0-3013.0.7
_M_I2t	Maximum permissible time for maximum current of motor. Type: Unsigned decimal - 2 bytes	ms - - -	UINT16 R/- - -	Modbus 3362 IDN P-0-3013.0.17

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_M_Jrot	Moment of inertia of motor. Units: Rotary motors: $kgcm^2$ Linear motors: kg Type: Unsigned decimal - 4 bytes In increments of 0.001 motor_f.	motor_f - - -	UINT32 R/- - -	Modbus 3352 IDN P-0-3013.0.12
_M_kE	Voltage constant kE of motor. Voltage constant in Vrms at 1000 RPM. Units: Rotary motors: Vrms/RPM Linear motors: Vrms/(m/s) Type: Unsigned decimal - 4 bytes In increments of 0.1 motor_u.	motor_u - - -	UINT32 R/- - -	Modbus 3350 IDN P-0-3013.0.11
_M_L_d	Inductance d component of motor. Type: Unsigned decimal - 2 bytes In increments of 0.01 mH.	mH - - -	UINT16 R/- - -	Modbus 3358 IDN P-0-3013.0.15
_M_L_q	Inductance q component of motor. Type: Unsigned decimal - 2 bytes In increments of 0.01 mH.	mH - - -	UINT16 R/- - -	Modbus 3356 IDN P-0-3013.0.14
_M_load Mon LdFM	Load of motor. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7220 IDN P-0-3028.0.26
_M_M_0	Continuous stall torque of motor. A value of 100 % in operating mode Profile Torque corresponds to this parameter. Units: Rotary motors: Ncm Linear motors: N Type: Unsigned decimal - 2 bytes	motor_m - - -	UINT16 R/- - -	Modbus 3372 IDN P-0-3013.0.22
_M_M_max	Maximum torque of motor. Type: Unsigned decimal - 2 bytes In increments of 0.1 Nm.	Nm - - -	UINT16 R/- - -	Modbus 3346 IDN P-0-3013.0.9
_M_M_nom	Nominal torque/force of motor. Units: Rotary motors: Ncm Linear motors: N Type: Unsigned decimal - 2 bytes	motor_m - - -	UINT16 R/- - -	Modbus 3344 IDN P-0-3013.0.8
_M_maxoverload	Maximum value of overload of motor. Maximum overload of motor during the last 10 seconds. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7222 IDN P-0-3028.0.27
_M_n_max ConF → inF- MnMA	Maximum permissible speed of rotation/velocity of motor. Units: Rotary motors: RPM Linear motors: mm/s Type: Unsigned decimal - 2 bytes	motor_v - - -	UINT16 R/- - -	Modbus 3336 IDN P-0-3013.0.4
_M_n_nom	Nominal speed of rotation/velocity of motor. Units: Rotary motors: RPM Linear motors: mm/s Type: Unsigned decimal - 2 bytes	motor_v - - -	UINT16 R/- - -	Modbus 3338 IDN P-0-3013.0.5
_M_overload	Overload of motor (I2t). Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7218 IDN P-0-3028.0.25

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_M_Polepair	Number of pole pairs of motor. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 3368 IDN P-0-3013.0.20
_M_PolePairPitch	Pole pair pitch of motor. Type: Unsigned decimal - 2 bytes In increments of 0.01 mm.	mm - - -	UINT16 R/- - -	Modbus 3398 IDN P-0-3013.0.35
_M_R_UV	Winding resistance of motor. Type: Unsigned decimal - 2 bytes In increments of 0.01 Ω.	Ω - - -	UINT16 R/- - -	Modbus 3354 IDN P-0-3013.0.13
_M_T_current Mon tMot	Temperature of motor. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 7202 IDN P-0-3028.0.17
_M_T_max	Maximum temperature of motor. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 3360 IDN P-0-3013.0.16
_M_Type ConF → inF- MtyP	Motor type. Value 0: No motor selected Value >0: Connected motor type Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 3332 IDN P-0-3013.0.2
_M_U_max	Maximum voltage of motor. Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- - -	Modbus 3378 IDN P-0-3013.0.25
_M_U_nom	Nominal voltage of motor. Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- - -	Modbus 3348 IDN P-0-3013.0.10
_ModuleSlot1	Module in slot 1. **0 / None**: No module **1025 / eSM**: Safety module eSM Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 554 IDN P-0-3002.0.21
_ModuleSlot2	Module in slot 2. **0 / None**: No module **769 / Encoder ANA**: Encoder module ANA **770 / Encoder DIG**: Encoder module DIG **771 / Encoder RSR**: Encoder module RSR Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 564 IDN P-0-3002.0.26
_ModuleSlot3	Module in slot 3. **0 / None**: No module **513 / CANopen (D-SUB)**: Fieldbus CANopen (D-SUB) **514 / CANopen (RJ45)**: Fieldbus CANopen (RJ45) **515 / DeviceNet (Open-Style)**: Fieldbus DeviceNet (Open-Style) **517 / CANopen (Open-Style)**: Fieldbus CANopen (Open-Style) **528 / ProfibusDP**: Fieldbus Profibus DP **529 / EtherNetIP**: Fieldbus EtherNetIP **530 / EtherCAT**: Fieldbus EtherCAT **531 / SercosII**: Fieldbus Sercos II **533 / SercosIII**: Fieldbus Sercos III Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 574 IDN P-0-3002.0.31
_n_act Mon nAct	Actual speed of rotation. Type: Signed decimal - 2 bytes	RPM - - -	INT16 R/- - -	Modbus 7696 IDN P-0-3030.0.8

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_n_act_ENC1	Actual speed of rotation of encoder 1. Type: Signed decimal - 2 bytes	RPM - - -	INT16 R/- - -	Modbus 7760 IDN P-0-3030.0.40
_n_act_ENC2	Actual speed of rotation of encoder 2 (module). Type: Signed decimal - 2 bytes	RPM - - -	INT16 R/- - -	Modbus 7740 IDN P-0-3030.0.30
_n_ref Mon nrEF	Reference speed of rotation. Type: Signed decimal - 2 bytes	RPM - - -	INT16 R/- - -	Modbus 7694 IDN P-0-3030.0.7
_OpHours Mon oPh	Operating hours counter. Type: Unsigned decimal - 4 bytes	s - - -	UINT32 R/- - -	Modbus 7188 IDN P-0-3028.0.10
_p_absENC Mon PAMu	Absolute position with reference to the encoder range. This value corresponds to the modulo position of the absolute encoder range. The value is no longer valid if the gear ratio of machine encoder and motor encoder is changed. A restart is required in such a case. Type: Unsigned decimal - 4 bytes	usr_p - - -	UINT32 R/- - -	Modbus 7710 IDN P-0-3030.0.15
_p_absmodulo	Absolute position with reference to internal resolution in internal units. This value is based on encoder raw position with reference to internal resolution (131072 Inc). Type: Unsigned decimal - 4 bytes	Inc - - -	UINT32 R/- - -	Modbus 7708 IDN P-0-3030.0.14
_p_act	Actual position. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7706 IDN P-0-3030.0.13
_p_act_ENC1	Position of encoder 1. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7758 IDN P-0-3030.0.39
_p_act_ENC1_int	Actual position of encoder 1 in internal units. Type: Signed decimal - 4 bytes	Inc - - -	INT32 R/- - -	Modbus 7756 IDN P-0-3030.0.38
_p_act_ENC2	Position of encoder 2 (module). Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7732 IDN P-0-3030.0.26
_p_act_ENC2_int	Actual position of encoder 2 (module) in internal units. Type: Signed decimal - 4 bytes	Inc - - -	INT32 R/- - -	Modbus 7730 IDN P-0-3030.0.25
_p_act_int	Actual position in internal units. Type: Signed decimal - 4 bytes	Inc - - -	INT32 R/- - -	Modbus 7700 IDN P-0-3030.0.10

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_p_dif`	Position deviation including dynamic position deviation. Position deviation is the difference between reference position and actual position. The position deviation consists of the load-dependent position deviation and the dynamic position deviation. The parameter _p_dif_usr allows you to enter the value in user-defined units. Type: Signed decimal - 4 bytes In increments of 0.0001 revolution.	revolution -214748.3648 - 214748.3647	INT32 R/- - -	Modbus 7716 IDN P-0-3030.0.18
`_p_dif_load`	Load-dependent position deviation between reference and actual positions. The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. This value is used for following error monitoring. The parameter _p_dif_load_usr allows you to enter the value in user-defined units. Type: Signed decimal - 4 bytes In increments of 0.0001 revolution.	revolution -214748.3648 - 214748.3647	INT32 R/- - -	Modbus 7736 IDN P-0-3030.0.28
`_p_dif_load_peak`	Maximum value of the load-dependent position deviation. This parameter contains the maximum load-dependent position deviation reached so far. A write access resets this value. The parameter _p_dif_load_peak_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.0001 revolution. Modified settings become effective immediately.	revolution 0.0000 - 429496.7295	UINT32 R/W - -	Modbus 7734 IDN P-0-3030.0.27
`_p_dif_load_peak_usr`	Maximum value of the load-dependent position deviation. This parameter contains the maximum load-dependent position deviation reached so far. A write access resets this value. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_p 0 - 2147483647	INT32 R/W - -	Modbus 7722 IDN P-0-3030.0.21
`_p_dif_load_usr`	Load-dependent position deviation between reference and actual positions. The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. This value is used for following error monitoring. Type: Signed decimal - 4 bytes	usr_p -2147483648 - 2147483647	INT32 R/- - -	Modbus 7724 IDN P-0-3030.0.22
`_p_dif_usr`	Position deviation including dynamic position deviation. Position deviation is the difference between reference position and actual position. The position deviation consists of the load-dependent position deviation and the dynamic position deviation. Type: Signed decimal - 4 bytes	usr_p -2147483648 - 2147483647	INT32 R/- - -	Modbus 7720 IDN P-0-3030.0.20
`_p_DifENC1toENC2`	Deviation of encoder positions. Type: Signed decimal - 4 bytes	Inc - - -	INT32 R/- - -	Modbus 7728 IDN P-0-3030.0.24
`_p_PTI_act`	Actual position at PTI interface. Counted position increments at PTI interface. Type: Signed decimal - 4 bytes Available with firmware version ≥V01.04.	Inc -2147483648 - 2147483647	INT32 R/- - -	Modbus 2058 IDN P-0-3008.0.5

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_p_ref`	Reference position. Value corresponds to the reference position of the position controller. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7704 IDN P-0-3030.0.12
`_p_ref_int`	Reference position in internal units. Value corresponds to the reference position of the position controller. Type: Signed decimal - 4 bytes	Inc - - -	INT32 R/- - -	Modbus 7698 IDN P-0-3030.0.9
`_PAR_ScalingError`	Additional information on error detected during recalculation. Coding: Bits 0 ... 15: Address of the parameter that caused the error Bits 16 ... 31: Number of the data set in the operating mode Motion Sequence that caused the error Type: Unsigned decimal - 4 bytes Modified settings become effective immediately.	- - - -	UINT32 R/- - -	Modbus 1068 IDN P-0-3004.0.22
`_PAR_ScalingState`	Status of recalculation of the parameters with user-defined units. **0 / Recalculation Active**: Recalculation active **1 / Reserved (1)**: Reserved **2 / Recalculation Finished - No Error**: Recalculation finished, no error **3 / Error During Recalculation**: Error during recalculation **4 / Initialization Successful**: Initialization successful **5 / Reserved (5)**: Reserved **6 / Reserved (6)**: Reserved **7 / Reserved (7)**: Reserved Status of recalculation of the parameters with user-defined units which are recalculated with a changed scaling factor. Type: Unsigned decimal - 2 bytes Modified settings become effective immediately.	- 0 2 7	UINT16 R/- - -	Modbus 1066 IDN P-0-3004.0.21
`_Power_act`	Output power. Type: Signed decimal - 4 bytes	W - - -	INT32 R/- - -	Modbus 7194 IDN P-0-3028.0.13
`_Power_mean`	Mean output power. Type: Unsigned decimal - 2 bytes	W - - -	UINT16 R/- - -	Modbus 7196 IDN P-0-3028.0.14
`_pref_acc`	Acceleration of reference value for acceleration feed-forward control. Sign according to the changed velocity value: Increased velocity: Positive sign Reduced velocity: Negative sign Type: Signed decimal - 4 bytes	usr_a - - -	INT32 R/- - -	Modbus 7954 IDN P-0-3031.0.9
`_pref_v`	Velocity of reference value for velocity feed-forward control. Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7950 IDN P-0-3031.0.7
`_prgNoDEV` ConF → inF- Prn	Firmware number of device. Example: PR0912.00 The value is provided as a decimal value: 91200 Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 258 IDN P-0-3001.0.1

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_prgRevDEV ConF → inF- Prr	Firmware revision of device. The version format is XX.YY.ZZ. Part XX.YY is contained in parameter _prgVerDEV. Part ZZ is used for quality evolution and contained in this parameter. Example: V01.23.45 The value is provided as a decimal value: 45 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 264 IDN P-0-3001.0.4
_prgVerDEV ConF → inF- PrV	Firmware version of device. The version format is XX.YY.ZZ. Part XX.YY is contained in this parameter. Part ZZ is contained in parameter _prgRevDEV. Example: V01.23.45 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 260 IDN P-0-3001.0.2
_PS_I_max ConF → inF- PiMA	Maximum current of power stage. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- per. -	Modbus 4100 IDN P-0-3016.0.2
_PS_I_nom ConF → inF- Pino	Nominal current of power stage. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- per. -	Modbus 4098 IDN P-0-3016.0.1
_PS_load Mon LdFP	Load of power stage. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7214 IDN P-0-3028.0.23
_PS_maxoverload	Maximum value of overload of power stage. Maximum overload of power stage during the last 10 seconds. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7216 IDN P-0-3028.0.24
_PS_overload	Overload of power stage. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7240 IDN P-0-3028.0.36
_PS_overload_cte	Overload of power stage (chip temperature). Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7236 IDN P-0-3028.0.34
_PS_overload_I2t	Overload of power stage (I2t). Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7212 IDN P-0-3028.0.22
_PS_overload_psq	Overload of power stage (power squared). Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7238 IDN P-0-3028.0.35
_PS_T_current Mon tPS	Temperature of power stage. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 7200 IDN P-0-3028.0.16
_PS_T_max	Maximum temperature of power stage. Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- per. -	Modbus 4110 IDN P-0-3016.0.7
_PS_T_warn	Advisory temperature limit of power stage (error class 0). Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- per. -	Modbus 4108 IDN P-0-3016.0.6

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_PS_U_maxDC	Maximum permissible DC bus voltage. Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- per. -	Modbus 4102 IDN P-0-3016.0.3
_PS_U_minDC	Minimum permissible DC bus voltage. Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- per. -	Modbus 4104 IDN P-0-3016.0.4
_PS_U_minStopDC	DC bus voltage low threshold for Quick Stop. If the threshold is reached, the drive performs a Quick Stop. Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- per. -	Modbus 4116 IDN P-0-3016.0.10
_PT_max_val	Maximum possible value for operating mode Profile Torque. 100.0 % correspond to the continuous stall torque _M_M_0. Type: Signed decimal - 2 bytes In increments of 0.1 %.	% - - -	INT16 R/- - -	Modbus 7228 IDN P-0-3028.0.30
_RAMP_p_act	Actual position of profile generator. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7940 IDN P-0-3031.0.2
_RAMP_p_target	Target position of profile generator. Absolute position value of the profile generator, calculated on the basis of the relative and absolute position values received. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7938 IDN P-0-3031.0.1
_RAMP_v_act	Actual velocity of profile generator. Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7948 IDN P-0-3031.0.6
_RAMP_v_target	Target velocity of profile generator. Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7946 IDN P-0-3031.0.5
_RES_load MOn LdFb	Load of braking resistor. The braking resistor set via parameter RESint_ext is monitored. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7208 IDN P-0-3028.0.20
_RES_maxoverload	Maximum value of overload of braking resistor. Maximum overload of braking resistor during the last 10 seconds. The braking resistor set via parameter RESint_ext is monitored. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7210 IDN P-0-3028.0.21
_RES_overload	Overload of braking resistor (I2t). The braking resistor set via parameter RESint_ext is monitored. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7206 IDN P-0-3028.0.19
_RESint_P	Nominal power of internal braking resistor. Type: Unsigned decimal - 2 bytes	W - - -	UINT16 R/- per. -	Modbus 4114 IDN P-0-3016.0.9
_RESint_R	Resistance value of internal braking resistor. Type: Unsigned decimal - 2 bytes In increments of 0.01 Ω.	Ω - - -	UINT16 R/- per. -	Modbus 4112 IDN P-0-3016.0.8

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_ScalePOSmax	Maximum user-defined value for positions. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7956 IDN P-0-3031.0.10
_ScaleRAMPmax	Maximum user-defined value for acceleration and deceleration. This value depends on ScaleRAMPdenom and ScaleRAMPnum. Type: Signed decimal - 4 bytes	usr_a - - -	INT32 R/- - -	Modbus 7960 IDN P-0-3031.0.12
_ScaleVELmax	Maximum user-defined value for velocity. This value depends on ScaleVELdenom and ScaleVELnum. Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7958 IDN P-0-3031.0.11
_SigActive	Status of monitoring signals. See _SigLatched for more details on the bit codes. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 7182 IDN P-0-3028.0.7
_SigLatched Mon SiGS	Saved status of monitoring signals. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General error Bit 1: Hardware limit switches (LIMP/LIMN/REF) Bit 2: Out of range (software limit switches, tuning) Bit 3: Quick Stop via fieldbus Bit 4: Error in active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following error Bit 9: Reserved Bit 10: Inputs STO are 0 Bit 11: Inputs STO different Bit 12: Reserved Bit 13: DC bus voltage low Bit 14: DC bus voltage high Bit 15: Mains phase missing Bit 16: Integrated encoder interface Bit 17: Overtemperature motor Bit 18: Overtemperature power stage Bit 19: Reserved Bit 20: Memory card Bit 21: Fieldbus module Bit 22: Encoder module Bit 23: Safety module eSM Bit 24: Reserved Bit 25: Reserved Bit 26: Motor connection Bit 27: Motor overcurrent/short circuit Bit 28: Frequency of reference signal too high Bit 29: Nonvolatile memory error detected Bit 30: System start-up (hardware or parameter) Bit 31: System error detected (for example, watchdog, internal hardware interface) Monitoring functions are product-dependent. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 7184 IDN P-0-3028.0.8

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_SPDSercos3Status`	SPD Sercos status (CAP1 and CAP2). Bit 0 = 0: No position captured via input CAP1 Bit 0 = 1: Position captured via input CAP1 Bit 1 = 0: No position captured via input CAP2 Bit 1 = 1: Position captured via input CAP2 Bit 2 = 0: Positive limit switch not active Bit 2 = 1: Positive limit switch active Bit 3 = 0: Negative limit switch not active Bit 3 = 1: Negative limit switch active Bit 4 = 0: Quick Stop: Standstill not yet reached Bit 4 = 1: Quick Stop: Standstill reached Type: Unsigned decimal - 2 bytes Modified settings become effective immediately.	- - - -	UINT16 R/- - -	Modbus 6562 IDN P-0-3025.0.81
`_SuppDriveModes`	Supported operating modes as per DSP402. Bit 5: Homing Bit 7: Cyclic Synchronous Position Bit 8: Cyclic Synchronous Velocity Bit 9: Cyclic Synchronous Torque Bit 16: Jog Bit 21: Manual Tuning Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 6952 IDN P-0-3027.0.20
`_tq_act`	Actual torque. Positive value: Actual torque in positive direction of movement Negative value: Actual torque in negative direction of movement 100.0 % correspond to the continuous stall torque _M_M_0. Type: Signed decimal - 2 bytes In increments of 0.1 %.	% - - -	INT16 R/- - -	Modbus 7752 IDN P-0-3030.0.36
`_Ud_ref`	Reference motor voltage d component. Type: Signed decimal - 2 bytes In increments of 0.1 V.	V - - -	INT16 R/- - -	Modbus 7690 IDN P-0-3030.0.5
`_UDC_act` Mon udcA	Voltage at DC bus. Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- - -	Modbus 7198 IDN P-0-3028.0.15
`_Udq_ref`	Total motor voltage (vector sum d components and q components). Square root of (_Uq_ref^2 + _Ud_ref^2) Type: Signed decimal - 2 bytes In increments of 0.1 V.	V - - -	INT16 R/- - -	Modbus 7692 IDN P-0-3030.0.6
`_Uq_ref`	Reference motor voltage q component. Type: Signed decimal - 2 bytes In increments of 0.1 V.	V - - -	INT16 R/- - -	Modbus 7688 IDN P-0-3030.0.4
`_v_act` Mon VAct	Actual velocity. Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7744 IDN P-0-3030.0.32
`_v_act_ENC1`	Actual velocity of encoder 1. Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7762 IDN P-0-3030.0.41
`_v_act_ENC2`	Actual velocity of encoder 2 (module). Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7750 IDN P-0-3030.0.35

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_v_dif_usr`	Load-dependent velocity deviation. The load-dependent velocity deviation is the difference between reference velocity and actual velocity. Type: Signed decimal - 4 bytes Available with firmware version ≥V01.06.	usr_v -2147483648 - 2147483647	INT32 R/- - -	Modbus 7768 IDN P-0-3030.0.44
`_v_PTI_act`	Actual velocity at PTI interface. Determined pulse frequency at position interface PTI. Type: Signed decimal - 4 bytes	Inc/s -2147483648 - 2147483647	INT32 R/- - -	Modbus 2060 IDN P-0-3008.0.6
`_v_ref` Mon VrEF	Reference velocity. Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7742 IDN P-0-3030.0.31
`_Vmax_act`	Currently effective velocity limitation. Value of the currently effective velocity limitation. This is one of the following values (whichever is lowest): - CTRL_v_max - M_n_max (only if motor is connected) - Velocity limitation via digital input Type: Unsigned decimal - 4 bytes	usr_v - - -	UINT32 R/- - -	Modbus 7250 IDN P-0-3028.0.41
`_VoltUtil` Mon udcr	Degree of utilization of DC bus voltage. With a value of 100%, the drive operates at the voltage limit. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7718 IDN P-0-3030.0.19
`_WarnActive`	Active errors of error class 0, bit-coded. See parameter _WarnLatched for more details on the bits. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 7190 IDN P-0-3028.0.11

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_WarnLatched Mon WrnS	Saved errors of error class 0, bit-coded. The bits are set to 0 in the case of a Fault Reset. Bits 10 and 13 are set to 0 automatically. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General Bit 1: Reserved Bit 2: Out of range (software limit switches, tuning) Bit 3: Reserved Bit 4: Active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following error Bit 9: Reserved Bit 10: Inputs STO_A and/or STO_B Bits 11 ... 12: Reserved Bit 13: Low voltage DC bus or mains phase missing Bits 14 ... 15: Reserved Bit 16: Integrated encoder interface Bit 17: Temperature of motor high Bit 18: Temperature of power stage high Bit 19: Reserved Bit 20: Memory card Bit 21: Fieldbus module Bit 22: Encoder module Bit 23: Safety module eSM Bits 24 … 27: Reserved Bit 28: Transistor for braking resistor overload (I^2t) Bit 29: Braking resistor overload (I^2t) Bit 30: Power stage overload (I^2t) Bit 31: Motor overload (I^2t) Monitoring functions are product-dependent. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 7192 IDN P-0-3028.0.12
AbsHomeRequest	Absolute positioning only after homing. **0 / No**: No **1 / Yes**: Yes This parameter has no function if the parameter 'PP_ModeRangeLim' is set to '1' which allows overtraveling of the movement range (ref_ok is set to 0 when the range is overtraveled). Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 1 1	UINT16 R/W per. -	Modbus 1580 IDN P-0-3006.0.22
AccessLock	Locking other access channels. Value 0: Allow control via other access channels Value 1: Lock control via other access channels Example: The access channel is used by the fieldbus. In this case, control via the commissioning software, for example, is not possible. The access channel can only be locked after the currently active operating mode has terminated. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W - -	Modbus 284 IDN P-0-3001.0.14

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
AT_dir oP → tun- StiM	Direction of movement for Autotuning. **1 / Positive Negative Home** / Pnh: Positive direction first, then negative direction with return to initial position **2 / Negative Positive Home** / nPh: Negative direction first, then positive direction with return to initial position **3 / Positive Home** / P-h: Positive direction only with return to initial position **4 / Positive** / P--: Positive direction only without return to initial position **5 / Negative Home** / n-h: Negative direction only with return to initial position **6 / Negative** / n--: Negative direction only without return to initial position Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	- 1 1 6	UINT16 R/W - -	Modbus 12040 IDN P-0-3047.0.4
AT_dis	Movement range for Autotuning. Movement range within which the control parameters are automatically optimized. The movement range is entered with reference to the actual position. In the case of "Movement in one direction only" (Parameter AT_dir), the specified movement range is used for each optimization step. The movement typically corresponds to 20 times the value, but it is not limited. The parameter AT_dis_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 revolution. Modified settings become effective the next time the motor moves.	revolution 1.0 2.0 999.9	UINT32 R/W - -	Modbus 12038 IDN P-0-3047.0.3
AT_dis_usr	Movement range for Autotuning. Movement range within which the control parameters are automatically optimized. The movement range is entered with reference to the actual position. In the case of "Movement in one direction only" (Parameter AT_dir), the specified range is used for each optimization step. The movement typically corresponds to 20 times the value, but it is not limited. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p 1 262144 2147483647	INT32 R/W - -	Modbus 12068 IDN P-0-3047.0.18
AT_mechanical	Type of coupling of the system. **1 / Direct Coupling**: Direct coupling **2 / Belt Axis**: Belt axis **3 / Spindle Axis**: Spindle axis Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	- 1 2 3	UINT16 R/W - -	Modbus 12060 IDN P-0-3047.0.14

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`AT_n_ref`	Velocity jump for Autotuning. The parameter AT_v_ref allows you to enter the value in user-defined units. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	RPM 10 100 1000	UINT32 R/W - -	Modbus 12044 IDN P-0-3047.0.6
`AT_start`	Autotuning start. Value 0: Terminate Value 1: Activate EasyTuning Value 2: Activate ComfortTuning Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 - 2	UINT16 R/W - -	Modbus 12034 IDN P-0-3047.0.1
`AT_v_ref`	Velocity jump for Autotuning. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_v 1 100 2147483647	INT32 R/W - -	Modbus 12070 IDN P-0-3047.0.19
`AT_wait`	Waiting time between Autotuning steps. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	ms 300 500 10000	UINT16 R/W - -	Modbus 12050 IDN P-0-3047.0.9
`BLSH_Mode`	Processing mode of backlash compensation. **0 / Off**: Backlash compensation is off **1 / OnAfterPositiveMovement**: Backlash compensation is on, last movement was in positive direction **2 / OnAfterNegativeMovement**: Backlash compensation is on, last movement was in negative direction Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 2	UINT16 R/W per. -	Modbus 1666 IDN P-0-3006.0.65
`BLSH_Position`	Position value for backlash compensation. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	usr_p 0 0 2147483647	INT32 R/W per. -	Modbus 1668 IDN P-0-3006.0.66
`BLSH_Time`	Processing time for backlash compensation. Value 0: Immediate backlash compensation Value >0: Processing time for backlash compensation Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	ms 0 0 16383	UINT16 R/W per. -	Modbus 1672 IDN P-0-3006.0.68

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`BRK_AddT_apply`	Additional time delay for applying the holding brake. The overall time delay for applying the holding brake is the time delay from the electronic nameplate of the motor and the additional time delay in this parameter. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	ms 0 0 1000	INT16 R/W per. -	Modbus 1296 IDN P-0-3005.0.8
`BRK_AddT_release`	Additional time delay for releasing the holding brake. The overall time delay for releasing the holding brake is the time delay from the electronic nameplate of the motor and the additional time delay in this parameter. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	ms 0 0 400	INT16 R/W per. -	Modbus 1294 IDN P-0-3005.0.7
`BRK_release`	Manual operation of the holding brake. **0 / Automatic**: Automatic processing **1 / Manual Release**: Manual release of holding brake **2 / Manual Application**: Manual applying of holding brake You can apply or release the holding brake manually. The holding brake can only be manually released in the operating states 'Switch On Disabled', 'Ready To Switch On' or 'Fault'. If you have applied the holding brake manually and then want to release it manually, you must first set this parameter to Automatic and then to Manual Release. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 2	UINT16 R/W - -	Modbus 2068 IDN P-0-3008.0.10
`Cap1Activate`	Capture input 1 start/stop. **0 / Capture Stop**: Cancel capture function **1 / Capture Once**: Start one-time capture **2 / Capture Continuous**: Start continuous capture **3 / Reserved**: Reserved **4 / Reserved**: Reserved In the case of one-time capture, the function is terminated when the first value is captured. In the case of continuous capture, the function continues to run. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 - 4	UINT16 R/W - -	Modbus 2568 IDN P-0-3010.0.4
`Cap1Config`	Capture input 1 configuration. **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge **2 / Both Edges**: Position capture at both edges Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 2	UINT16 R/W - -	Modbus 2564 IDN P-0-3010.0.2

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`Cap1Source`	Capture input 1 encoder source. **0 / Pact Encoder 1**: Source for capture input 1 is Pact of encoder 1 **1 / Pact Encoder 2**: Source for capture input 1 is Pact of encoder 2 (module) Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2580 IDN P-0-3010.0.10
`Cap2Activate`	Capture input 2 start/stop. **0 / Capture Stop**: Cancel capture function **1 / Capture Once**: Start one-time capture **2 / Capture Continuous**: Start continuous capture **3 / Reserved**: Reserved **4 / Reserved**: Reserved In the case of one-time capture, the function is terminated when the first value is captured. In the case of continuous capture, the function continues to run. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 - 4	UINT16 R/W - -	Modbus 2570 IDN P-0-3010.0.5
`Cap2Config`	Capture input 2 configuration. **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge **2 / Both Edges**: Position capture at both edges Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 2	UINT16 R/W - -	Modbus 2566 IDN P-0-3010.0.3
`Cap2Source`	Capture input 2 encoder source. **0 / Pact Encoder 1**: Source for capture input 2 is Pact of encoder 1 **1 / Pact Encoder 2**: Source for capture input 2 is Pact of encoder 2 (module) Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2582 IDN P-0-3010.0.11
`Cap3Activate`	Capture input 3 start/stop. **0 / Capture Stop**: Cancel capture function **1 / Capture Once**: Start one-time capture **2 / Capture Continuous**: Start continuous capture In the case of one-time capture, the function is terminated when the first value is captured. In the case of continuous capture, the function continues to run. Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 - 2	UINT16 R/W - -	Modbus 2596 IDN P-0-3010.0.18
`Cap3Config`	Capture input 3 configuration. **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2594 IDN P-0-3010.0.17

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`Cap3Source`	Capture input 3 encoder source. **0 / Pact Encoder 1**: Source for capture input 3 is Pact of encoder 1 **1 / Pact Encoder 2**: Source for capture input 3 is Pact of encoder 2 (module) Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2602 IDN P-0-3010.0.21
`CLSET_p_DiffWin`	Position deviation for control loop parameter set switching. If the position deviation of the position controller is less than the value of this parameter, control loop parameter set 2 is used. Otherwise, control loop parameter set 1 is used. The parameter CLSET_p_DiffWin_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.0001 revolution. Modified settings become effective immediately.	revolution 0.0000 0.0100 2.0000	UINT16 R/W per. -	Modbus 4408 IDN P-0-3017.0.28
`CLSET_p_DiffWin_usr`	Position deviation for control loop parameter set switching. If the position deviation of the position controller is less than the value of this parameter, control loop parameter set 2 is used. Otherwise, control loop parameter set 1 is used. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_p 0 1311 2147483647	INT32 R/W per. -	Modbus 4426 IDN P-0-3017.0.37

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CLSET_ParSwiCond	Condition for parameter set switching. **0 / None Or Digital Input**: None or digital input function selected **1 / Inside Position Deviation**: Inside position deviation (value definition in parameter CLSET_p_DiffWin) **2 / Below Reference Velocity**: Below reference velocity (value definition in parameter CLSET_v_Threshol) **3 / Below Actual Velocity**: Below actual velocity (value definition in parameter CLSET_v_Threshol) **4 / Reserved**: Reserved In the case of parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp The following parameters are changed immediately after the time for parameter set switching (CTRL_ParChgTime): - CTRL_Nf1damp - CTRL_Nf1freq - CTRL_Nf1bandw - CTRL_Nf2damp - CTRL_Nf2freq - CTRL_Nf2bandw - CTRL_Osupdamp - CTRL_Osupdelay - CTRL_Kfric Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 4	UINT16 R/W per. -	Modbus 4404 IDN P-0-3017.0.26
CLSET_v_Threshol	Velocity threshold for control loop parameter set switching. If the reference velocity or the actual velocity are less than the value of this parameter, control loop parameter set 2 is used. Otherwise, control loop parameter set 1 is used. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 0 50 2147483647	UINT32 R/W per. -	Modbus 4410 IDN P-0-3017.0.29
CLSET_winTime	Time window for parameter set switching. Value 0: Window monitoring deactivated. Value >0: Window time for the parameters CLSET_v_Threshol and CLSET_p_DiffWin. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	ms 0 0 1000	UINT16 R/W per. -	Modbus 4406 IDN P-0-3017.0.27
CommutCntCred	Value for increased threshold for commutation monitoring. This parameter contains the value which is added to the threshold value for commutation monitoring. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately. Available with firmware version ≥V01.06.	- 0 0 1000	INT16 R/W per. expert	Modbus 1404 IDN P-0-3005.0.62

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CommutCntMax	Maximum value the commutation monitoring counter has reached. This parameter contains the maximum value the commutation monitoring counter has reached since power on or reset. The maximum value can be reset by writing the value 0. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Available with firmware version ≥V01.06.	- - - -	INT16 R/W - expert	Modbus 16326 IDN P-0-3063.0.99
CTRL_GlobGain oP → tun - GAin	Global gain factor (affects control loop parameter set 1). The global gain factor affects the following parameters of control loop parameter set 1: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref The global gain factor is set to 100% - if the control loop parameters are set to default - at the end of the Autotuning process - if control loop parameter set 2 is copied to set 1 via the parameter CTRL_ParSetCopy If a full configuration is transmitted via the fieldbus, the value for CTRL_GlobGain must be transmitted prior to the values of the control loop parameters CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref. If CTRL_GlobGain is changed during a configuration transmission, CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref must also be part of the configuration. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 5.0 100.0 1000.0	UINT16 R/W per. -	Modbus 4394 IDN P-0-3017.0.21
CTRL_I_max ConF → drC - iMAX	Current limitation. During operation, the actual current limit is one of the following values (whichever is lowest): - CTRL_I_max - _M_I_max - _PS_I_max Limitations caused by I2t monitoring are also taken into account. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} 0.00 - 463.00	UINT16 R/W per. -	Modbus 4376 IDN P-0-3017.0.12

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL_I_max_fw	Maximum current for field weakening (d component). This value is only limited by the minimum/maximum parameter range (no limitation of this value by motor/power stage). The actually effective field weakening current is the minimum of CTRL_I_max_fw and one half of the lower value of the nominal current of the power stage and the motor. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	A_{rms} 0.00 0.00 300.00	UINT16 R/W per. expert	Modbus 4382 IDN P-0-3017.0.15
CTRL_KFAcc	Acceleration feed-forward control. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 0.0 0.0 3000.0	UINT16 R/W per. expert	Modbus 4372 IDN P-0-3017.0.10
CTRL_ParChgTime	Period of time for control loop parameter set switching. In the case of control loop parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp Such a switching can be caused by - change of the active control loop parameter set - change of the global gain - change of any of the parameters listed above - deactivating the integral term of the velocity controller Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	ms 0 0 2000	UINT16 R/W per. -	Modbus 4392 IDN P-0-3017.0.20
CTRL_ParSetCopy	Control loop parameter set copying. Value 1: Copy control loop parameter set 1 to set 2 Value 2: Copy control loop parameter set 2 to set 1 If control loop parameter set 2 is copied to control loop parameter set 1, the parameter CTRL_GlobGain is set to 100%. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0.0 - 0.2	UINT16 R/W - -	Modbus 4396 IDN P-0-3017.0.22
CTRL_PwrUpParSet	Selection of control loop parameter set at power up. **0 / Switching Condition**: The switching condition is used for control loop parameter set switching **1 / Parameter Set 1**: Control loop parameter set 1 is used **2 / Parameter Set 2**: Control loop parameter set 2 is used The selected value is also written to CTRL_SelParSet (non-persistent). Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 1 2	UINT16 R/W per. -	Modbus 4400 IDN P-0-3017.0.24

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL_SelParSet	Selection of control loop parameter set (non-persistent). Coding see parameter: CTRL_PwrUpParSet Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 1 2	UINT16 R/W - -	Modbus 4402 IDN P-0-3017.0.25
CTRL_SmoothCurr	Smoothing factor for current controller. This parameter decreases the dynamics of the current control loop. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately. Available with firmware version ≥V01.06.	% 50 100 100	UINT16 R/W per. -	Modbus 4428 IDN P-0-3017.0.38
CTRL_SpdFric	Speed of rotation up to which the friction compensation is linear. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	RPM 0 5 20	UINT32 R/W per. expert	Modbus 4370 IDN P-0-3017.0.9
CTRL_TAUnact	Filter time constant to smooth velocity of motor. The default value is calculated on the basis of the motor data. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 - 30.00	UINT16 R/W per. expert	Modbus 4368 IDN P-0-3017.0.8
CTRL_v_max ConF → drC- nMAX	Velocity limitation. During operation, the velocity limit is one of the following values (whichever is lowest): - CTRL_v_max - M_n_max Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 1 13200 2147483647	UINT32 R/W per. -	Modbus 4384 IDN P-0-3017.0.16
CTRL_VelObsActiv	Activation of velocity observer. **0 / Velocity Observer Off**: Velocity observer is off **1 / Velocity Observer Passive**: Velocity observer is on, but not used for motor control **2 / Velocity Observer Active**: Velocity observer is on and used for motor control Velocity observer control reduces velocity ripple and enhances controller bandwidth. Set the correct dynamics and inertia values before activation. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 0 2	UINT16 R/W per. expert	Modbus 4420 IDN P-0-3017.0.34
CTRL_VelObsDyn	Dynamics of velocity observer. The value of this parameter must be less than (for example, between 5 % and 20 %) the integral action time of the velocity controller (parameter CTRL1_TNn und CTRL2_TNn). Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	ms 0.03 0.25 200.00	UINT16 R/W per. expert	Modbus 4422 IDN P-0-3017.0.35

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL_VelObsInert	Inertia value for velocity observer. System inertia that is used for velocity observer calculations. The default value is the inertia of the mounted motor. In the case of autotuning, the value of this parameter can be set equal to that of _AT_J. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	g cm^2 1 - 2147483648	UINT32 R/W per. expert	Modbus 4424 IDN P-0-3017.0.36
CTRL_vPIDDPart	PID velocity controller: D gain. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 0.0 0.0 400.0	UINT16 R/W per. expert	Modbus 4364 IDN P-0-3017.0.6
CTRL_vPIDDTime	PID velocity controller: Time constant of D term smoothing filter. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.01 0.25 10.00	UINT16 R/W per. expert	Modbus 4362 IDN P-0-3017.0.5
CTRL1_KFPp ConF → drC- FPP1	Velocity feed-forward control. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 0.0 100.0 200.0	UINT16 R/W per. -	Modbus 4620 IDN P-0-3018.0.6
CTRL1_Kfric	Friction compensation: Gain. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} 0.00 0.00 10.00	UINT16 R/W per. expert	Modbus 4640 IDN P-0-3018.0.16
CTRL1_KPn ConF → drC- Pn1	Velocity controller P gain. The default value is calculated on the basis of the motor parameters. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.0001 A/RPM. Modified settings become effective immediately.	A/RPM 0.0001 - 2.5400	UINT16 R/W per. -	Modbus 4610 IDN P-0-3018.0.1
CTRL1_KPp ConF → drC- PP1	Position controller P gain. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 1/s. Modified settings become effective immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	Modbus 4614 IDN P-0-3018.0.3

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_Nf1bandw	Notch filter 1: Bandwidth. Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4628 IDN P-0-3018.0.10
CTRL1_Nf1damp	Notch filter 1: Damping. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4624 IDN P-0-3018.0.8
CTRL1_Nf1freq	Notch filter 1: Frequency. The filter is deactivated at a value of 15000. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 Hz. Modified settings become effective immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4626 IDN P-0-3018.0.9
CTRL1_Nf2bandw	Notch filter 2: Bandwidth. Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4634 IDN P-0-3018.0.13
CTRL1_Nf2damp	Notch filter 2: Damping. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4630 IDN P-0-3018.0.11
CTRL1_Nf2freq	Notch filter 2: Frequency. The filter is deactivated at a value of 15000. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 Hz. Modified settings become effective immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4632 IDN P-0-3018.0.12
CTRL1_Osupdamp	Overshoot suppression filter: Damping. The filter is deactivated at a value of 0. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 0.0 0.0 50.0	UINT16 R/W per. expert	Modbus 4636 IDN P-0-3018.0.14
CTRL1_Osupdelay	Overshoot suppression filter: Time delay. The filter is deactivated at a value of 0. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 0.00 75.00	UINT16 R/W per. expert	Modbus 4638 IDN P-0-3018.0.15
CTRL1_TAUiref	Filter time constant of the reference current value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	Modbus 4618 IDN P-0-3018.0.5

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_TAUnref ConF → drC - tAu1	Filter time constant of the reference velocity value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	Modbus 4616 IDN P-0-3018.0.4
CTRL1_TNn ConF → drC - tin1	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4612 IDN P-0-3018.0.2
CTRL2_KFPp ConF → drC - FPP2	Velocity feed-forward control. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 0.0 100.0 200.0	UINT16 R/W per. -	Modbus 4876 IDN P-0-3019.0.6
CTRL2_Kfric	Friction compensation: Gain. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} 0.00 0.00 10.00	UINT16 R/W per. expert	Modbus 4896 IDN P-0-3019.0.16
CTRL2_KPn ConF → drC - Pn2	Velocity controller P gain. The default value is calculated on the basis of the motor parameters. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.0001 A/RPM. Modified settings become effective immediately.	A/RPM 0.0001 - 2.5400	UINT16 R/W per. -	Modbus 4866 IDN P-0-3019.0.1
CTRL2_KPp ConF → drC - PP2	Position controller P gain. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 1/s. Modified settings become effective immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	Modbus 4870 IDN P-0-3019.0.3
CTRL2_Nf1bandw	Notch filter 1: Bandwidth. Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4884 IDN P-0-3019.0.10

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL2_Nf1damp	Notch filter 1: Damping. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4880 IDN P-0-3019.0.8
CTRL2_Nf1freq	Notch filter 1: Frequency. The filter is deactivated at a value of 15000. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 Hz. Modified settings become effective immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4882 IDN P-0-3019.0.9
CTRL2_Nf2bandw	Notch filter 2: Bandwidth. Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4890 IDN P-0-3019.0.13
CTRL2_Nf2damp	Notch filter 2: Damping. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4886 IDN P-0-3019.0.11
CTRL2_Nf2freq	Notch filter 2: Frequency. The filter is deactivated at a value of 15000. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 Hz. Modified settings become effective immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4888 IDN P-0-3019.0.12
CTRL2_Osupdamp	Overshoot suppression filter: Damping. The filter is deactivated at a value of 0. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% 0.0 0.0 50.0	UINT16 R/W per. expert	Modbus 4892 IDN P-0-3019.0.14
CTRL2_Osupdelay	Overshoot suppression filter: Time delay. The filter is deactivated at a value of 0. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 0.00 75.00	UINT16 R/W per. expert	Modbus 4894 IDN P-0-3019.0.15
CTRL2_TAUiref	Filter time constant of the reference current value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	Modbus 4874 IDN P-0-3019.0.5
CTRL2_TAUnref ConF → drC- tAu2	Filter time constant of the reference velocity value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	Modbus 4872 IDN P-0-3019.0.4

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL2_TNn ConF → drC- tin2	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 ms. Modified settings become effective immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4868 IDN P-0-3019.0.2
DCbus_compat	DC bus compatibility LXM32 and ATV32. **0 / No DC bus or LXM32 only**: DC bus not used or only LXM32 connected via the DC bus **1 / DC bus with LXM32 and ATV32**: LXM32 and ATV32 connected via the DC bus Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- 0 0 1	UINT16 R/W per. -	Modbus 1356 IDN P-0-3005.0.38
DCOMopmode	Operating mode. **-6 / Manual Tuning / Autotuning**: Manual Tuning or Autotuning **-1 / Jog**: Jog **0 / Reserved**: Reserved **4 / Profile Torque**: Profile Torque **6 / Homing**: Homing **8 / Cyclic Synchronous Position**: Cyclic Synchronous Position **9 / Cyclic Synchronous Velocity**: Cyclic Synchronous Velocity **10 / Cyclic Synchronous Torque**: Cyclic Synchronous Torque Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- -6 - 10	INT16 R/W - -	Modbus 6918 IDN P-0-3027.0.3
DEVcmdinterf ConF → ACG- nonE dEVC	Control mode. **2 / Fieldbus Control Mode / FbuS**: Fieldbus control mode Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1282 IDN P-0-3005.0.1
DI_0_Debounce	Debounce time of DI0. **0 / No** **1 / 0.25 ms** **2 / 0.50 ms** **3 / 0.75 ms** **4 / 1.00 ms** **5 / 1.25 ms** **6 / 1.50 ms** Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2112 IDN P-0-3008.0.32

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
DI_1_Debounce	Debounce time of DI1. **0 / No** **1 / 0.25 ms** **2 / 0.50 ms** **3 / 0.75 ms** **4 / 1.00 ms** **5 / 1.25 ms** **6 / 1.50 ms** Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2114 IDN P-0-3008.0.33
DI_2_Debounce	Debounce time of DI2. **0 / No** **1 / 0.25 ms** **2 / 0.50 ms** **3 / 0.75 ms** **4 / 1.00 ms** **5 / 1.25 ms** **6 / 1.50 ms** Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2116 IDN P-0-3008.0.34
DI_3_Debounce	Debounce time of DI3. **0 / No** **1 / 0.25 ms** **2 / 0.50 ms** **3 / 0.75 ms** **4 / 1.00 ms** **5 / 1.25 ms** **6 / 1.50 ms** Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2118 IDN P-0-3008.0.35
DI_4_Debounce	Debounce time of DI4. **0 / No** **1 / 0.25 ms** **2 / 0.50 ms** **3 / 0.75 ms** **4 / 1.00 ms** **5 / 1.25 ms** **6 / 1.50 ms** Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2120 IDN P-0-3008.0.36
DI_5_Debounce	Debounce time of DI5. **0 / No** **1 / 0.25 ms** **2 / 0.50 ms** **3 / 0.75 ms** **4 / 1.00 ms** **5 / 1.25 ms** **6 / 1.50 ms** Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2122 IDN P-0-3008.0.37

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`DPL_intLim`	Setting for bit 9 of _DPL_motionStat and _actionStatus. **0 / None**: Not used (reserved) **1 / Current Below Threshold**: Current threshold value **2 / Velocity Below Threshold**: Velocity threshold value **3 / In Position Deviation Window**: Position deviation window **4 / In Velocity Deviation Window**: Velocity deviation window **5 / Position Register Channel 1**: Position register channel 1 **6 / Position Register Channel 2**: Position register channel 2 **7 / Position Register Channel 3**: Position register channel 3 **8 / Position Register Channel 4**: Position register channel 4 **9 / Hardware Limit Switch**: Hardware limit switch **10 / RMAC active or finished**: Relative movement after capture is active or finished **11 / Position Window**: Position window Setting for: Bit 9 of the parameter _actionStatus Bit 9 of the parameter _DPL_motionStat Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 11 11	UINT16 R/W per. -	Modbus 7018 IDN P-0-3027.0.53
`DS402intLim`	DS402 status word: Setting for bit 11 (internal limit). **0 / None**: Not used (reserved) **1 / Current Below Threshold**: Current threshold value **2 / Velocity Below Threshold**: Velocity threshold value **3 / In Position Deviation Window**: Position deviation window **4 / In Velocity Deviation Window**: Velocity deviation window **5 / Position Register Channel 1**: Position register channel 1 **6 / Position Register Channel 2**: Position register channel 2 **7 / Position Register Channel 3**: Position register channel 3 **8 / Position Register Channel 4**: Position register channel 4 **9 / Hardware Limit Switch**: Hardware limit switch **10 / RMAC active or finished**: Relative movement after capture is active or finished **11 / Position Window**: Position window Setting for: Bit 11 of the parameter _DCOMstatus Bit 10 of the parameter _actionStatus Bit 10 of the parameter _DPL_motionStat Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 11	UINT16 R/W per. -	Modbus 6972 IDN P-0-3027.0.30

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ENC_abs_source`	Source for setting absolute encoder position. **0 / Encoder 1**: Absolute position determined from encoder 1 **1 / Encoder 2 (module)**: Absolute position determined from encoder 2 (module) This parameter defines the encoder source which is used to determine the base absolute position after power cycling. If this is set to Encoder 1, the absolute position from encoder 1 is read and copied to the system values of encoder 2. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective after the next power cycle.	- 0 0 1	UINT16 R/W per. -	Modbus 1354 IDN P-0-3005.0.37
`ENC_ModeOfMaEnc`	Selection of mode of machine encoder. **0 / None**: Machine encoder is not used for motor control **1 / Position Control**: Machine encoder is used for position control **2 / Velocity And Position Control**: Machine encoder is used for velocity and position control It is not possible to use the machine encoder for velocity control and the motor encoder for position control. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	Modbus 20484 IDN P-0-3080.0.2
`ENC1_adjustment`	Adjustment of absolute position of encoder 1. The value range depends on the encoder type. Singleturn encoder: 0 ... x-1 Multiturn encoder: 0 ... (4096*x)-1 Singleturn encoder (shifted with parameter ShiftEncWorkRang): -(x/2) ... (x/2)-1 Multiturn encoder (shifted with parameter ShiftEncWorkRang): -(2048*x) ... (2048*x)-1 Definition of 'x': Maximum position for one encoder turn in user-defined units. This value is 16384 with the default scaling. If processing is to be performed with inversion of the direction of movement, this must be set before the encoder position is adjusted. After the write access, a wait time of at least 1 second is required before the drive can be powered off. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective after the next power cycle.	usr_p - - -	INT32 R/W - -	Modbus 1324 IDN P-0-3005.0.22

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ENC2_adjustment	Adjustment of absolute position of encoder 2. The value range depends on the encoder type at the physical port ENC2. This parameter can only be changed if the parameter ENC_abs_source is set to 'Encoder 2'. Singleturn encoder: 0 ... x-1 Multiturn encoder: 0 ... (y*x)-1 Singleturn encoder (shifted with parameter ShiftEncWorkRang): -(x/2) ... (x/2)-1 Multiturn encoder (shifted with parameter ShiftEncWorkRang): -(y/2)*x ... ((y/2)*x)-1 Definition of 'x': Maximum position for one encoder turn in user-defined units. This value is 16384 with the default scaling. Definition of 'y': Revolutions of the multiturn encoder. If processing is to be performed with inversion of the direction of movement, this must be set before the encoder position is adjusted. After the write access, the parameter values have to be saved to the nonvolatile memory and the drive has to be power cycled, before the change becomes effective. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective after the next power cycle.	usr_p - - -	INT32 R/W - -	Modbus 1352 IDN P-0-3005.0.36
ENC2_pos_offset	Offset for actual position value 2. This offset is used in the calculation of the value of IDN53. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- - - -	INT32 R/W per. -	Modbus 1386 IDN P-0-3005.0.53

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ENC2_type`	Type of encoder at encoder 2 (module). **0 / None**: Undefined **1 / SinCos Hiperface (rotary)**: SinCos Hiperface (rotary) **2 / SinCos 1Vpp (rotary)**: SinCos 1Vpp (rotary) **3 / Sincos 1Vpp Hall (rotary)**: SinCos 1Vpp Hall (rotary) **5 / EnDat 2.2 (rotary)**: EnDat 2.2 (rotary) **6 / Resolver**: Resolver **8 / BISS**: BISS **9 / A/B/I (rotary)**: A/B/I (rotary) **10 / SSI (rotary)**: SSI (rotary) **257 / SinCos Hiperface (linear)**: SinCos Hiperface (linear) **258 / SinCos 1Vpp (linear)**: SinCos 1Vpp (linear) **259 / SinCos 1Vpp Hall (linear)**: SinCos 1Vpp Hall (linear) **261 / EnDat 2.2 (linear)**: EnDat 2.2 (linear) **265 / A/B/I (linear)**: A/B/I (linear) **266 / SSI (linear)**: SSI (linear) Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- 0 0 266	UINT16 R/W per. -	Modbus 20486 IDN P-0-3080.0.3
`ENC2_usage`	Type of usage of encoder 2 (module). **0 / None**: Undefined **1 / Motor**: Configured as motor encoder **2 / Machine**: Configured as machine encoder If the parameter is set to "Motor", encoder 1 has no functionality. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- 0 0 2	UINT16 R/W per. -	Modbus 20482 IDN P-0-3080.0.1
`ENCAnaPowSupply`	Power supply encoder module ANA (analog interface). **5 / 5V**: 5 V supply voltage **12 / 12V**: 12 V supply voltage Power supply of the analog encoder only if the encoder is used as a machine encoder supplying 1Vpp encoder signals. This parameter is not used for Hiperface encoders. Hiperface encoders are supplied with 12 V. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- 5 5 12	UINT16 R/W per. -	Modbus 20740 IDN P-0-3081.0.2

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ENCDigABIMaxFreq`	ABI maximum frequency. The maximum possible ABI frequency is encoder-specific (specified by the encoder manufacturer). The encoder module DIG supports a maximum ABI frequency of 1 MHz (this is the default and maximum value of ENCDigABIMaxFreq). An ABI frequency of 1 MHz means that there are 4000000 encoder increments in 1 second. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	kHz 1 1000 1000	UINT16 R/W per. -	Modbus 21004 IDN P-0-3082.0.6
`ENCDigABImaxIx`	ABI maximum distance for index pulse search. In the case of a reference movement to the index pulse, ENCDigABImaxIx contains the maximum distance within which the index pulse must be found. If no physical index pulse is found over this range, an error message is generated. Example: A rotary ABI encoder with one index pulse per revolution is connected. The resolution of the encoder is 8000 encoder increments per revolution (this value can be determined using parameter _Inc_Enc2Raw. _Inc_Enc2Raw and ENCDigABImaxIx have the same scaling). The maximum distance necessary for a reference movement to the index pulse is one revolution. This means that ENCDigABImaxIx should be set to 8000. Internally, a tolerance of 10% is added. This means that during a reference movement to the index pulse, an index pulse must be found within 8800 encoder increments. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	EncInc 1 10000 2147483647	INT32 R/W per. -	Modbus 21006 IDN P-0-3082.0.7
`ENCDigBISSCoding`	Position coding of BISS encoder. **0 / binary**: Binary coding **1 / gray**: Gray coding This parameter defines the type of position coding of the BISS encoder. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- 0 0 1	UINT16 R/W per. -	Modbus 21012 IDN P-0-3082.0.10

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ENCDigBISSResMul	BISS multiturn resolution. This parameter is only relevant for BISS encoders (singleturn and multiturn). If a singleturn BISS encoder is used, ENCDigBISSResMult must be set to 0. Example: If ENCDigBISSResMult is set to 12, the number of turns of the encoder used must be 2^12 = 4096. The sum of ENCDigBISSResMult + ENCDigBISSResSgl must be less than or equal to 46 bits. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	bit 0 0 24	UINT16 R/W per. -	Modbus 21010 IDN P-0-3082.0.9
ENCDigBISSResSgl	BISS singleturn resolution. This parameter is only relevant for BISS encoders (singleturn and multiturn). Example: If ENCDigBISSResSgl is set to 13, an BISS encoder with a singleturn resolution of 2^13 = 8192 increments must be used. If a multiturn encoder is used, the sum of ENCDigBISSResMult + ENCDigBISSResSgl must be less than or equal to 46 bits. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	bit 8 13 25	UINT16 R/W per. -	Modbus 21008 IDN P-0-3082.0.8
ENCDigLinBitsUsed	Linear encoder: Number of bits of the position resolution used. Specifies the number of bits of the position resolution used for position evaluation. If ENCDigLinBitsUsed = 0, all position bits of the position resolution of the encoder are used. Example: If ENCDigLinBitsUsed = 22, only 22 bits of the position resolution of the encoder are used. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle. Available with firmware version ≥V01.06.	bit 0 0 31	UINT16 R/W per. -	Modbus 21020 IDN P-0-3082.0.14
ENCDigPowSupply	Power supply encoder module DIG (digital interface). **5 / 5V**: 5 V supply voltage **12 / 12V**: 12 V supply voltage Power supply of the digital encoder. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- 5 5 12	UINT16 R/W per. -	Modbus 21000 IDN P-0-3082.0.4

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ENCDigResMulUsed	Number of bits of the multiturn resolution used from the encoder. Specifies the number of bits of the multiturn resolution used for position evaluation. If ENCDigResMulUsed = 0, all bits of the multiturn resolution of the encoder are used. Example: If ENCDigResMulUsed = 11, only 11 bits of the multiturn resolution of the encoder are used. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	bit 0 0 24	UINT16 R/W per. -	Modbus 21014 IDN P-0-3082.0.11
ENCDigSSICoding	Position coding of SSI encoder. **0 / binary**: Binary coding **1 / gray**: Gray coding This parameter defines the type of position coding of the SSI encoder. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- 0 0 1	UINT16 R/W per. -	Modbus 20998 IDN P-0-3082.0.3
ENCDigSSILinAdd	SSI encoder additional bits (linear). This parameter is used to set the number of resolution bits of a linear SSI encoder. The total number of resolution bits (ENCDigSSILinRes) and additional bits (ENCDigSSILinAdd) is limited to 32. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle. Available with firmware version ≥V01.06.	bit 0 0 3	UINT16 R/W per. -	Modbus 21018 IDN P-0-3082.0.13
ENCDigSSILinRes	SSI encoder resolution bits (linear). This parameter is used to set the number of resolution bits of a linear SSI encoder. The total number of resolution bits (ENCDigSSILinRes) and additional bits (ENCDigSSILinAdd) is limited to 32. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle. Available with firmware version ≥V01.06.	bit 8 24 32	UINT16 R/W per. -	Modbus 21016 IDN P-0-3082.0.12

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ENCDigSSIMaxFreq	SSI maximum transfer frequency. This parameter is used to set the SSI transfer frequency for SSI encoders (singleturn and multiturn). The SSI transfer frequency depends on the encoder (maximum frequency specified by the encoder manufacturer) and on the length of the encoder cable. The encoder module supports SSI transfer frequencies of 200 kHz and 1000 kHz. If your SSI encoder supports a maximum frequency of 1000 kHz, set the value of this parameter to 1000. If the length of the encoder cable in your system exceeds 50 m, set the value of this parameter to 200, regardless of the maximum possible frequency specified by the encoder manufacturer. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	kHz 200 200 1000	UINT16 R/W per. -	Modbus 21002 IDN P-0-3082.0.5
ENCDigSSIResMult	SSI multiturn resolution (rotary). This parameter is only relevant for SSI encoders (singleturn and multiturn). If a singleturn SSI encoder is used, ENCDigSSIResMult must be set to 0. Example: If ENCDigSSIResMult is set to 12, the number of turns of the encoder used must be 2^12 = 4096. The sum of ENCDigSSIResMult + ENCDigSSIResSgl must be less than or equal to 32 bits. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	bit 0 0 24	UINT16 R/W per. -	Modbus 20996 IDN P-0-3082.0.2
ENCDigSSIResSgl	SSI singleturn resolution (rotary). This parameter is only relevant for SSI encoders (singleturn and multiturn). Example: If ENCDigSSIResSgl is set to 13, an SSI encoder with a singleturn resolution of 2^13 = 8192 increments must be used. If a multiturn encoder is used, the sum of ENCDigSSIResMult + ENCDigSSIResSgl must be less than or equal to 32 bits. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	bit 8 13 25	UINT16 R/W per. -	Modbus 20994 IDN P-0-3082.0.1

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ENCSinCosMaxIx`	Maximum distance for search for index pulse for SinCos encoder. The parameter specifies the maximum number of periods during which the index pulse must be found (search range). A tolerance of 10 % is added to this value. If no index pulse is found within this range (including the 10% tolerance), an error message is generated. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately. Available with firmware version ≥V01.06.	- 1 1024 2147483647	INT32 R/W per. -	Modbus 20744 IDN P-0-3081.0.4
`ERR_clear`	Clear error memory. Value 1: Delete entries in the error memory The clearing process is completed if a 0 is returned after a read access. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 - 1	UINT16 R/W - -	Modbus 15112 IDN P-0-3059.0.4
`ERR_reset`	Reset error memory read pointer. Value 1: Set error memory read pointer to oldest error entry. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 - 1	UINT16 R/W - -	Modbus 15114 IDN P-0-3059.0.5
`ErrorResp_Flt_AC`	Error response to missing mains phase. **0 / Error Class 0**: Error class 0 **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 2 3	UINT16 R/W per. -	Modbus 1300 IDN P-0-3005.0.10
`ErrorResp_I2tRES`	Error response to 100% I2t braking resistor. **0 / Error Class 0**: Error class 0 **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 0 2	UINT16 R/W per. -	Modbus 1348 IDN P-0-3005.0.34
`ErrorResp_p_dif`	Error response to excessively high load-dependent position deviation. **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 1 3 3	UINT16 R/W per. -	Modbus 1302 IDN P-0-3005.0.11

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ErrorResp_PDiffEncM`	Error response to position deviation motor encoder and machine encoder exceeded. **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 0 3 3	UINT16 R/W per. -	Modbus 1398 IDN P-0-3005.0.59
`ErrorResp_QuasiAbs`	Error response to detected error with quasi absolute position. **3 / Error Class 3**: Error class 3 **4 / Error Class 4**: Error class 4 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 3 3 4	UINT16 R/W per. -	Modbus 1396 IDN P-0-3005.0.58
`ErrorResp_v_dif`	Error response to excessively high load-dependent velocity deviation. **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 1 3 3	UINT16 R/W per. -	Modbus 1400 IDN P-0-3005.0.60
`ESIM_HighResolution`	Encoder simulation: High resolution. Specifies the number of increments per revolution with 12 bit decimal places. If the parameter is set to a multiple of 4096, the index pulse will be generated exactly at the same position within one revolution. The setting of parameter ESIM_scale is only used if parameter ESIM_HighResolution is set to 0. Otherwise, the setting of ESIM_HighResolution is used. Example: 1417.322835 encoder simulation pulses per revolution are required. Set the parameter to 1417.322835 * 4096 = 5805354. In this example, the index pulse will be generated exactly after every 1417 pulses. This means that the index pulse shifts with each revolution. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle. Available with firmware version ≥V01.04.	EncInc 0 0 268431360	UINT32 R/W per. expert	Modbus 1380 IDN P-0-3005.0.50

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ESIM_PhaseShift	Encoder simulation: Phase shift for pulse output. The generated encoder simulation pulses can be shifted in units of 1/4096 encoder pulses. The shift results in a position offset at PTO. The index pulse is shifted as well. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately. Available with firmware version ≥V01.04.	- -32768 0 32767	INT16 R/W - expert	Modbus 1382 IDN P-0-3005.0.51
ESIM_scale ConF → i-o- ESSC	Resolution of encoder simulation. Resolution defines the number of increments per revolution (AB signal with quadruple evaluation). The index pulse is created once per revolution at an interval where signal A and signal B are high. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle. Available with firmware version ≥V01.04.	EncInc 8 4096 65535	UINT16 R/W per. -	Modbus 1322 IDN P-0-3005.0.21
eSM_BaseSetting	eSM basic settings. **None**: No function **Auto Start**: Automatic start (ESMSTART) **Ignore GUARD_ACK**: GUARD_ACK inactive **Ignore INTERLOCK_IN**: INTERLOCK chain inactive Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	- - - -	UINT16 R/W per. -	-
eSM_dec_NC	eSM deceleration ramp. Deceleration ramp for monitored deceleration Value 0: Disabled, no monitoring of deceleration ramp Value >0: Deceleration ramp in RPM/s Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	RPM/s 0 0 32786009	UINT32 R/W per. -	-
eSM_dec_Qstop	eSM deceleration ramp for Quick Stop. Deceleration ramp for monitored Quick Stop. This value must be greater than 0. Value 0: eSM module is not configured Value >0: Deceleration ramp in RPM/s Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	RPM/s 0 0 32786009	UINT32 R/W per. -	-
eSM_disable	eSM disable. Value 0: No action Value 1: Force a change of eSM state 6 to eSM state 3 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4	- - - -	UINT16 R/W - -	Modbus 19508 IDN P-0-3076.0.26

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
eSM_FuncAUXOUT1	eSM function of status output AUXOUT1. **None**: No function **/ESTOP**: Signal state /ESTOP **GUARD**: Signal state GUARD **SETUPMODE**: Signal state SETUPMODE **SETUPENABLE**: Signal state SETUPENABLE **GUARD_ACK**: Signal state GUARD_ACK **/INTERLOCK_IN**: Signal state /INTERLOCK_IN **STO by eSM**: Signal state of internal STO **RELAY**: Signal state RELAY **/INTERLOCK_OUT**: Signal state /INTERLOCK_OUT **Standstill**: Standstill (v = 0) **SLS**: SLS **Error class 4**: Error of error class 4 detected **Error class 1 ... 4**: Error of error classes 1 … 4 detected **/ESTOP inv.**: Signal state /ESTOP, inverted **GUARD inv.**: Signal state GUARD, inverted **SETUPMODE inv.**: Signal state SETUPMODE, inverted **SETUPENABLE inv.**: Signal state SETUPENABLE, inverted **GUARD_ACK inv.**: Signal state GUARD_ACK, inverted **/INTERLOCK_IN inv.**: Signal state /INTERLOCK_IN, inverted **STO by eSM inv.**: Signal state of internal STO, inverted **RELAY inv.**: Signal state RELAY, inverted **/INTERLOCK_OUT inv.**: Signal state /INTERLOCK_OUT, inverted **Standstill inv.**: Standstill, inverted **SLS inv.**: SLS, inverted **Error class 4 inv.**: Error of error class 4 detected (inverted) **Error class 1 ... 4 inv.**: Error of error classes 1 … 4 detected (inverted) Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	- - - -	UINT32 R/W per. -	-

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`eSM_FuncAUXOUT2`	eSM function of status output AUXOUT2. **None**: No function **/ESTOP**: Signal state /ESTOP **GUARD**: Signal state GUARD **SETUPMODE**: Signal state SETUPMODE **SETUPENABLE**: Signal state SETUPENABLE **GUARD_ACK**: Signal state GUARD_ACK **/INTERLOCK_IN**: Signal state /INTERLOCK_IN **STO by eSM**: Signal state of internal STO **RELAY**: Signal state RELAY **/INTERLOCK_OUT**: Signal state /INTERLOCK_OUT **Standstill**: Standstill (v = 0) **SLS**: SLS **Error class 4**: Error of error class 4 detected **Error class 1 ... 4**: Error of error classes 1 … 4 occurred **/ESTOP inv.**: Signal state /ESTOP, inverted **GUARD inv.**: Signal state GUARD, inverted **SETUPMODE inv.**: Signal state SETUPMODE, inverted **SETUPENABLE inv.**: Signal state SETUPENABLE, inverted **GUARD_ACK inv.**: Signal state GUARD_ACK, inverted **/INTERLOCK_IN inv.**: Signal state /INTERLOCK_IN, inverted **STO by eSM inv.**: Signal state of internal STO, inverted **RELAY inv.**: Signal state RELAY, inverted **/INTERLOCK_OUT inv.**: Signal state /INTERLOCK_OUT, inverted **Standstill inv.**: Standstill, inverted **SLS inv.**: SLS, inverted **Error class 4 inv.**: Error of error class 4 detected (inverted) **Error class 1 ... 4 inv.**: Error of error classes 1 … 4 detected (inverted) Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	- - - -	UINT32 R/W per. -	-
`eSM_FuncSwitches`	eSM switches for functions. **None**: No function **DirectionDependentSLS**: SLS dependent on direction of movement **Reserved (Bit 1)**: Reserved (bit 1) **Reserved (Bit 2)**: Reserved (bit 2) **Reserved (Bit 3)**: Reserved (bit 3) **Reserved (Bit 4)**: Reserved (bit 4) **Reserved (Bit 5)**: Reserved (bit 5) Available as of firmware version safety module eSM ≥V01.01. Bit 0 = 0: SLS independent of direction of movement Bit 0 = 1: SLS dependent on direction of movement Bits 1 … 15: Reserved (must be set to 0) Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	- 0 0 63	UINT16 R/W per. -	-

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`eSM_LO_mask`	eSM digital outputs channel B mask. Mask of active digital outputs 0: Digital output is not active 1: Digital output is active Bit assignments: See digital outputs channel. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4	- - - -	UINT16 R/W - -	Modbus 19498 IDN P-0-3076.0.21
`eSM_SLSnegDirS`	eSM speed limit negative direction machine operating mode Setup Mode. Firmware version safety module eSM ≥V01.01. Parameter eSM_FuncSwitches Bit 0 = 1: Value = Monitored speed limit for negative direction of movement. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	RPM 0 0 8000	UINT16 R/W per. -	-
`eSM_t_NCDel`	eSM time delay until start of monitored deceleration. This time can be adjusted to meet the requirements of a PLC. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	ms 0 0 10000	UINT16 R/W per. -	-
`eSM_t_Relay`	eSM deactivation of output RELAY. Deactivation of the digital output RELAY: Value 0: Immediate, no time delay Value 1: At motor standstill (v = 0) Value 2: At motor standstill (v = 0) and INTERLOCK_OUT = 1 Value >2: Time delay in ms, deactivation of output after this time has passed Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	ms 0 0 10000	UINT16 R/W per. -	-
`eSM_v_maxAuto`	eSM speed limit for machine operating mode Automatic Mode. This value sets the speed limit for monitoring in machine operating mode Automatic Mode. Value 0: The speed limit is not monitored Value >0: Monitored speed limit Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	RPM 0 0 8000	UINT16 R/W per. -	-

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
eSM_v_maxSetup	eSM speed limit for machine operating mode Setup Mode. This value sets the speed limit for monitoring in machine operating mode Setup Mode. Firmware version safety module eSM ≥V01.01: Parameter eSM_FuncSwitches Bit 0 = 0: Value = Monitored speed limit for positive and negative directions of movement. Parameter eSM_FuncSwitches Bit 0 = 1: Value = Monitored speed limit for positive direction of movement. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	RPM 0 0 8000	UINT16 R/W per. -	-
HMdis	Distance from switching point. The distance from the switching point is defined as the reference point. The parameter is only effective during a reference movement without index pulse. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p 1 200 2147483647	INT32 R/W per. -	Modbus 10254 IDN P-0-3040.0.7
HMIDispPara Mon SuPV	HMI display when motor moves. **0 / OperatingState /** StAt: Operating state **1 / v_act /** VAct: Actual motor velocity **2 / I_act /** iAct: Actual motor current Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 2	UINT16 R/W per. -	Modbus 14852 IDN P-0-3058.0.2
HMIlocked	Lock HMI. **0 / Not Locked /** nLoc: HMI not locked **1 / Locked /** Loc: HMI locked The following functions can no longer be started when the HMI is locked: - Parameter change - Jog - Autotuning - Fault Reset Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 14850 IDN P-0-3058.0.1

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
HMmethod	Homing method. 1: LIMN with index pulse 2: LIMP with index pulse 7: REF+ with index pulse, inv., outside 8: REF+ with index pulse, inv., inside 9: REF+ with index pulse, not inv., inside 10: REF+ with index pulse, not inv., outside 11: REF- with index pulse, inv., outside 12: REF- with index pulse, inv., inside 13: REF- with index pulse, not inv., inside 14: REF- with index pulse, not inv., outside 17: LIMN 18: LIMP 23: REF+, inv., outside 24: REF+, inv., inside 25: REF+, not inv., inside 26: REF+, not inv., outside 27: REF-, inv., outside 28: REF-, inv., inside 29: REF-, not inv., inside 30: REF-, not inv., outside 33: Index pulse neg. direction 34: Index pulse pos. direction 35: Position setting Abbreviations: REF+: Search movement in pos. direction REF-: Search movement in neg. direction inv.: Invert direction in switch not inv.: Direction not inverted in switch outside: Index pulse / distance outside switch inside: Index pulse / distance inside switch Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 1 18 35	INT16 R/W - -	Modbus 6936 IDN P-0-3027.0.12
HMoutdis	Maximum distance for search for switching point. 0: Monitoring of distance inactive >0: Maximum distance After detection of the switch, the drive starts to search for the defined switching point. If the defined switching point is not found within the distance defined here, the reference movement is canceled and an error is detected. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p 0 0 2147483647	INT32 R/W per. -	Modbus 10252 IDN P-0-3040.0.6
HMp_home	Position at reference point. After a successful reference movement, this position is automatically set at the reference point. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p -2147483648 0 2147483647	INT32 R/W per. -	Modbus 10262 IDN P-0-3040.0.11
HMprefmethod oP → hoM- MEth	Preferred homing method. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 1 18 35	INT16 R/W per. -	Modbus 10260 IDN P-0-3040.0.10

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
HMsrchdis	Maximum search distance after overtravel of switch. 0: Search distance monitoring disabled >0: Search distance The switch must be activated again within this search distance, otherwise the reference movement is canceled. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p 0 0 2147483647	INT32 R/W per. -	Modbus 10266 IDN P-0-3040.0.13
HMv oP → hoM- hMn	Target velocity for searching the switch. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_v - 60 -	UINT32 R/W per. -	Modbus 10248 IDN P-0-3040.0.4
HMv_out	Target velocity for moving away from switch. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_v 1 6 2147483647	UINT32 R/W per. -	Modbus 10250 IDN P-0-3040.0.5
InvertDirOfCount	Inversion of direction of counting at PTI interface. **0 / Inversion Off**: Inversion of direction of counting is off **1 / Inversion On**: Inversion of direction of counting is on Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 2062 IDN P-0-3008.0.7
InvertDirOfMaEnc	Inversion of direction of machine encoder. **0 / Inversion Off**: Inversion of direction is off **1 / Inversion On**: Inversion of direction is on Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 20496 IDN P-0-3080.0.8
InvertDirOfMove ConF → ACG- inMo	Inversion of direction of movement. **0 / Inversion Off /** oFF: Inversion of direction of movement is off **1 / Inversion On /** on: Inversion of direction of movement is on The limit switch which is reached with a movement in positive direction must be connected to the positive limit switch input and vice versa. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- 0 0 1	UINT16 R/W per. -	Modbus 1560 IDN P-0-3006.0.12

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IO_DQ_set	Setting the digital outputs directly. Digital outputs can only be set directly if the signal output function has been set to 'Freely Available'. Bit assignments: Bit 0: DQ0 Bit 1: DQ1 Bit 2: DQ2 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4	- - - -	UINT16 R/W - -	Modbus 2082 IDN P-0-3008.0.17
IO_I_limit ConF → i-o- iLiM	Current limitation via input. A current limit can be activated via a digital input. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} 0.00 0.20 300.00	UINT16 R/W per. -	Modbus 1614 IDN P-0-3006.0.39
IO_v_limit	Velocity limitation via input. A velocity limitation can be activated via a digital input. In operating mode Profile Torque, the minimum velocity is internally limited to 100 RPM. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 0 10 2147483647	UINT32 R/W per. -	Modbus 1596 IDN P-0-3006.0.30
IOfunct_DI0 ConF → i-o- di0	Function Input DI0. **1 / Freely Available** / nonE: Available as required **21 / Reference Switch (REF)** / rEF: Reference switch **22 / Positive Limit Switch (LIMP)** / LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN)** / LiMn: Negative limit switch **24 / Switch Controller Parameter Set** / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off** / tnoF: Switches off velocity controller integral term **40 / Release Holding Brake** / rEhb: Releases the holding brake Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1794 IDN P-0-3007.0.1

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DI1 ConF → i-o- di1	Function Input DI1. **1 / Freely Available** / nonE: Available as required **21 / Reference Switch (REF)** / rEF: Reference switch **22 / Positive Limit Switch (LIMP)** / LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN)** / LiMn: Negative limit switch **24 / Switch Controller Parameter Set** / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off** / tnoF: Switches off velocity controller integral term **40 / Release Holding Brake** / rEhb: Releases the holding brake Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1796 IDN P-0-3007.0.2
IOfunct_DI2 ConF → i-o- di2	Function Input DI2. **1 / Freely Available** / nonE: Available as required **21 / Reference Switch (REF)** / rEF: Reference switch **22 / Positive Limit Switch (LIMP)** / LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN)** / LiMn: Negative limit switch **24 / Switch Controller Parameter Set** / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off** / tnoF: Switches off velocity controller integral term **40 / Release Holding Brake** / rEhb: Releases the holding brake Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1798 IDN P-0-3007.0.3
IOfunct_DI3 ConF → i-o- di3	Function Input DI3. **1 / Freely Available** / nonE: Available as required **21 / Reference Switch (REF)** / rEF: Reference switch **22 / Positive Limit Switch (LIMP)** / LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN)** / LiMn: Negative limit switch **24 / Switch Controller Parameter Set** / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off** / tnoF: Switches off velocity controller integral term **40 / Release Holding Brake** / rEhb: Releases the holding brake Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1800 IDN P-0-3007.0.4

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DI4 ConF → i-o- di4	Function Input DI4. **1 / Freely Available** / nonE: Available as required **21 / Reference Switch (REF)** / rEF: Reference switch **22 / Positive Limit Switch (LIMP)** / LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN)** / LiMn: Negative limit switch **24 / Switch Controller Parameter Set** / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off** / tnoF: Switches off velocity controller integral term **40 / Release Holding Brake** / rEhb: Releases the holding brake Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1802 IDN P-0-3007.0.5
IOfunct_DI5 ConF → i-o- di5	Function Input DI5. **1 / Freely Available** / nonE: Available as required **21 / Reference Switch (REF)** / rEF: Reference switch **22 / Positive Limit Switch (LIMP)** / LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN)** / LiMn: Negative limit switch **24 / Switch Controller Parameter Set** / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off** / tnoF: Switches off velocity controller integral term **40 / Release Holding Brake** / rEhb: Releases the holding brake Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1804 IDN P-0-3007.0.6

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DQ0 ConF → i-o- do0	Function Output DQ0. **1 / Freely Available** / nonE: Available as required **2 / No Fault** / nFLt: Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active** / Acti: Signals operating state Operation Enabled **5 / In Position Deviation Window** / in-P: Position deviation is within window **6 / In Velocity Deviation Window** / in-V: Velocity deviation is within window **7 / Velocity Below Threshold** / Vthr: Motor velocity below threshold **8 / Current Below Threshold** / ithr: Motor current below threshold **9 / Halt Acknowledge** / hALt: Halt acknowledgement **13 / Motor Standstill** / MStd: Motor at a standstill **14 / Selected Error** / SErr: One of the specified errors of error classes 1 … 4 is active **15 / Valid Reference (ref_ok)** / rEFo: Zero point is valid (ref_ok) **16 / Selected Warning** / SWrn: One of the specified errors of error class 0 is active **22 / Motor Moves Positive** / MPoS: Motor moves in positive direction **23 / Motor Moves Negative** / MnEG: Motor moves in negative direction Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1810 IDN P-0-3007.0.9

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DQ1 ConF → i-o- do1	Function Output DQ1. **1 / Freely Available** / nonE: Available as required **2 / No Fault** / nFLt: Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active** / Acti: Signals operating state Operation Enabled **5 / In Position Deviation Window** / in-P: Position deviation is within window **6 / In Velocity Deviation Window** / in-V: Velocity deviation is within window **7 / Velocity Below Threshold** / Vthr: Motor velocity below threshold **8 / Current Below Threshold** / ithr: Motor current below threshold **9 / Halt Acknowledge** / hALt: Halt acknowledgement **13 / Motor Standstill** / MStd: Motor at a standstill **14 / Selected Error** / SErr: One of the specified errors of error classes 1 … 4 is active **15 / Valid Reference (ref_ok)** / rEFo: Zero point is valid (ref_ok) **16 / Selected Warning** / SWrn: One of the specified errors of error class 0 is active **22 / Motor Moves Positive** / MPoS: Motor moves in positive direction **23 / Motor Moves Negative** / MnEG: Motor moves in negative direction Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1812 IDN P-0-3007.0.10

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DQ2 ConF → i-o- do2	Function Output DQ2. **1 / Freely Available** / nonE: Available as required **2 / No Fault** / nFLt: Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active** / Acti: Signals operating state Operation Enabled **5 / In Position Deviation Window** / in-P: Position deviation is within window **6 / In Velocity Deviation Window** / in-V: Velocity deviation is within window **7 / Velocity Below Threshold** / Vthr: Motor velocity below threshold **8 / Current Below Threshold** / ithr: Motor current below threshold **9 / Halt Acknowledge** / hALt: Halt acknowledgement **13 / Motor Standstill** / MStd: Motor at a standstill **14 / Selected Error** / SErr: One of the specified errors of error classes 1 … 4 is active **15 / Valid Reference (ref_ok)** / rEFo: Zero point is valid (ref_ok) **16 / Selected Warning** / SWrn: One of the specified errors of error class 0 is active **22 / Motor Moves Positive** / MPoS: Motor moves in positive direction **23 / Motor Moves Negative** / MnEG: Motor moves in negative direction Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- - - -	UINT16 R/W per. -	Modbus 1814 IDN P-0-3007.0.11
IOsigLIMN	Signal evaluation for negative limit switch. **0 / Inactive**: Inactive **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	Modbus 1566 IDN P-0-3006.0.15
IOsigLIMP	Signal evaluation for positive limit switch. **0 / Inactive**: Inactive **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	Modbus 1568 IDN P-0-3006.0.16

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOsigREF	Signal evaluation for reference switch. **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO The reference switch is only active while a reference movement to the reference switch is processed. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 1 1 2	UINT16 R/W per. -	Modbus 1564 IDN P-0-3006.0.14
IOsigRespOfPS	Response to active limit switch during enabling of power stage. **0 / Error**: Active limit switch triggers an error. **1 / No Error**: Active limit switch does not trigger an error. Defines the response when the power stage is enabled while a hardware limit switch is active. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 1548 IDN P-0-3006.0.6
IP_IntTimInd	Interpolation time index. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4	- -128 -3 63	INT16 R/W - -	Modbus 7002 IDN P-0-3027.0.45
IP_IntTimPerVal	Interpolation time period value. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4	s 0 1 255	UINT16 R/W - -	Modbus 7000 IDN P-0-3027.0.44
Iref_PTIFreqMax	Reference current for operating mode Profile Torque via PTI interface. Reference current corresponding to 1.6 million increments per second at the PTI interface for operating mode Profile Torque. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately. Available with firmware version ≥V01.06.	A_{rms} 0.00 - 463.00	UINT16 R/W per. -	Modbus 8200 IDN P-0-3032.0.4
JOGactivate	Activation of operating mode Jog. Bit 0: Positive direction of movement Bit 1: Negative direction of movement Bit 2: 0=slow 1=fast Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 7	UINT16 R/W - -	Modbus 6930 IDN P-0-3027.0.9
JOGmethod	Selection of jog method. **0 / Continuous Movement / coMo**: Jog with continuous movement **1 / Step Movement / StMo**: Jog with step movement Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 1 1	UINT16 R/W - -	Modbus 10502 IDN P-0-3041.0.3
JOGstep	Distance for step movement. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p 1 20 2147483647	INT32 R/W per. -	Modbus 10510 IDN P-0-3041.0.7

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
JOGtime	Wait time for step movement. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	ms 1 500 32767	UINT16 R/W per. -	Modbus 10512 IDN P-0-3041.0.8
JOGv_fast oP → JoG- JGhi	Velocity for fast movement. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 1 180 2147483647	UINT32 R/W per. -	Modbus 10506 IDN P-0-3041.0.5
JOGv_slow oP → JoG- JGLo	Velocity for slow movement. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 1 60 2147483647	UINT32 R/W per. -	Modbus 10504 IDN P-0-3041.0.4
LIM_HaltReaction ConF → ACG- htYP	Halt option code. **1 / Deceleration Ramp / dEcE** **3 / Torque Ramp / torq** Set the deceleration ramp with parameter RAMP_v_dec. Set the torque ramp with parameter LIM_I_maxHalt. If a deceleration ramp is already active, the parameter cannot be written. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 1 3 3	INT16 R/W per. -	Modbus 1582 IDN P-0-3006.0.23
LIM_I_maxHalt ConF → ACG- hcur	Current for Halt. This value is only limited by the minimum/maximum value range (no limitation of this value by motor/power stage). In the case of a Halt, the current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxHalt - _M_I_max - _PS_I_max Further current limitations caused by I2t monitoring are also taken into account during a Halt. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} - - -	UINT16 R/W per. -	Modbus 4380 IDN P-0-3017.0.14

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
LIM_I_maxQSTP ConF → FLt - qcur	Current for Quick Stop. This value is only limited by the minimum/maximum value range (no limitation of this value by motor/power stage). In the case of a Quick Stop, the current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxQSTP - _M_I_max - _PS_I_max Further current limitations caused by I2t monitoring are also taken into account during a Quick Stop. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} - - -	UINT16 R/W per. -	Modbus 4378 IDN P-0-3017.0.13
LIM_QStopReact	Quick Stop option code. **-2 / Torque ramp (Fault)**: Use torque ramp and transit to operating state 9 Fault **-1 / Deceleration Ramp (Fault)**: Use deceleration ramp and transit to operating state 9 Fault **6 / Deceleration ramp (Quick Stop)**: Use deceleration ramp and remain in operating state 7 Quick Stop **7 / Torque ramp (Quick Stop)**: Use torque ramp and remain in operating state 7 Quick Stop Type of deceleration for Quick Stop. Setting of deceleration ramp with parameter RAMPquickstop. Setting of torque ramp with parameter LIM_I_maxQSTP. If a deceleration ramp is already active, the parameter cannot be written. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- -2 6 7	INT16 R/W per. -	Modbus 1584 IDN P-0-3006.0.24
Mains_reactor	Mains reactor. **0 / No**: No **1 / Yes**: Yes Value 0: No mains reactor connected. The nominal power of the power stage is reduced. Value 1: A mains reactor is connected. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 1344 IDN P-0-3005.0.32
MBaddress ConF → CoM - MbAd	Modbus address. Valid addresses: 1 to 247 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective after the next power cycle.	- 1 1 247	UINT16 R/W per. -	Modbus 5640 IDN P-0-3022.0.4

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MBbaud ConF → CoM- Mbbd	Modbus baud rate. **9600 / 9600 Baud** / 9.6: 9600 Baud **19200 / 19200 Baud** / 19.2: 19200 Baud **38400 / 38400 Baud** / 38.4: 38400 Baud Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective after the next power cycle.	- 9600 19200 38400	UINT32 R/W per. -	Modbus 5638 IDN P-0-3022.0.3
MON_ChkTime ConF → i-o- tthr	Monitoring of time window. Adjustment of a time for monitoring of position deviation, velocity deviation, velocity value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	ms 0 0 9999	UINT16 R/W per. -	Modbus 1594 IDN P-0-3006.0.29
MON_commutat	Commutation monitoring. **0 / Off**: Commutation monitoring off **1 / On**: Commutation monitoring on in operating states 6, 7 and 8 **2 / On (OpState6+7)**: Commutation monitoring on in operating states 6 and 7 Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	Modbus 1290 IDN P-0-3005.0.5
MON_ConfModification	Configuration modification monitoring. Value 0: Modification detected for each write access. Value 1: Modification detected for each write access which modifies a value. Value 2: Identical to value 0 if commissioning software is not connected. Identical to value 1 if commissioning software is connected. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately. Available with firmware version ≥V01.06.	- 0 2 2	UINT16 R/W per. -	Modbus 1082 IDN P-0-3004.0.29

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_DCbusVdcThresh	DC bus overvoltage monitoring threshold. **0 / Reduction Off**: Reduction is off **1 / Reduction On**: Reduction is on This parameter is used to reduce the threshold for DC bus overvoltage monitoring. The parameter only affects single-phase devices supplied with 115 V and three-phase devices supplied with 208 V. Value 0: Single-phase: 450 Vdc Three-phase: 820 Vdc Value 1: Single-phase: 260 Vdc Three-phase: 450 Vdc Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 0 0 1	UINT16 R/W per. -	Modbus 1402 IDN P-0-3005.0.61
MON_ENC_Ampl	Activation of monitoring of SinCos amplitude. Value 0: Deactivate monitoring Value 1: Activate monitoring Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately. Available with firmware version ≥V01.06.	- 0 0 1	UINT16 R/W - -	Modbus 16322 IDN P-0-3063.0.97
MON_GroundFault	Ground monitoring. **0 / Off**: Ground monitoring off **1 / On**: Ground monitoring on Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective after the next power cycle.	- 0 1 1	UINT16 R/W per. expert	Modbus 1312 IDN P-0-3005.0.16
MON_HW_Limits	Temporary deactivation of hardware limit switches. **0 / None**: No limit switch deactivated **1 / Positive Limit Switch**: Deactivate positive limit switch **2 / Negative Limit Switch**: Deactivate negative limit switch **3 / Both Limit Switches**: Deactivate both limit switches With this parameter, a PLC can temporarily deactivate hardware limit switches. This is useful if a homing procedure controlled by a PLC is to use a limit switch as a reference switch without an error response of the drive. The parameter is only available with the EtherCAT module. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 3	UINT16 R/W - -	Modbus 1570 IDN P-0-3006.0.17

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_I_Threshold ConF → i-o- ithr	Monitoring of current threshold. The system monitors whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter _Iq_act_rms is used as comparison value. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Modified settings become effective immediately.	A_{rms} 0.00 0.20 300.00	UINT16 R/W per. -	Modbus 1592 IDN P-0-3006.0.28
MON_IO_SelErr1	Signal output function Selected Error (error classes 1 to 4): First error code. This parameter specifies the error code of an error of error classes 1 ... 4 which is to activate the signal output function. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15116 IDN P-0-3059.0.6
MON_IO_SelErr2	Signal output function Selected Error (error classes 1 to 4): Second error code. This parameter specifies the error code of an error of error classes 1 ... 4 which is to activate the signal output function. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15118 IDN P-0-3059.0.7
MON_IO_SelWar1	Signal output function Selected Warning (error class 0): First error code. This parameter specifies the error code of an error of error class 0 which is to activate the signal output function. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15120 IDN P-0-3059.0.8
MON_IO_SelWar2	Signal output function Selected Warning (error class 0): Second error code. This parameter specifies the error code of an error of error class 0 which is to activate the signal output function. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15122 IDN P-0-3059.0.9

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_MainsVolt	Detection and monitoring of mains phases. **0 / Automatic Mains Detection**: Automatic detection and monitoring of mains voltage **1 / DC-Bus Only (Mains 1~230 V / 3~480 V)**: DC bus supply only, corresponding to mains voltage 230 V (single-phase) or 480 V (three phases) **2 / DC-Bus Only (Mains 1~115 V / 3~208 V)**: DC bus supply only, corresponding to mains voltage 115 V (single-phase) or 208 V (three phases) **3 / Mains 1~230 V / 3~480 V**: Mains voltage 230 V (single-phase) or 480 V (three phases) **4 / Mains 1~115 V / 3~208 V**: Mains voltage 115 V (single-phase) or 208 V (three phases) **5 / Reserved**: Reserved Value 0: As soon as mains voltage detected, the device automatically verifies whether the mains voltage is 115 V or 230 V in the case of single-phase devices or 208 V or 400/480 V in the case of three-phase devices. Values 1 … 2: If the device is supplied only via the DC bus, the parameter has to be set to the voltage value corresponding to the mains voltage of the supplying device. There is no mains voltage monitoring. Values 3 … 4: If the mains voltage is not detected properly during start-up, the mains voltage to be used can be selected manually. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 0 5	UINT16 R/W per. expert	Modbus 1310 IDN P-0-3005.0.15
MON_p_dif_load	Maximum load-dependent position deviation. The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. The parameter MON_p_dif_load_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.0001 revolution. Modified settings become effective immediately.	revolution 0.0001 1.0000 200.0000	UINT32 R/W per. -	Modbus 1606 IDN P-0-3006.0.35
MON_p_dif_load_usr	Maximum load-dependent position deviation. The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_p 1 131072 2147483647	INT32 R/W per. -	Modbus 1660 IDN P-0-3006.0.62
MON_p_dif_warn	Advisory limit of the load-dependent position deviation (error class 0). 100.0 % correspond to the maximum position deviation (following error) as specified by means of parameter MON_p_dif_load. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	% 0 75 100	UINT16 R/W per. -	Modbus 1618 IDN P-0-3006.0.41

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_p_DiffWin`	Monitoring of position deviation. The system verifies whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter MON_p_DiffWin_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.0001 revolution. Modified settings become effective immediately.	revolution 0.0000 0.0010 0.9999	UINT16 R/W per. -	Modbus 1586 IDN P-0-3006.0.25
`MON_p_DiffWin_usr`	Monitoring of position deviation. The system verifies whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_p 0 131 2147483647	INT32 R/W per. -	Modbus 1662 IDN P-0-3006.0.63
`MON_SW_Limits`	Activation of software limit switches. **0 / None**: Deactivated **1 / SWLIMP**: Activation of software limit switches positive direction **2 / SWLIMN**: Activation of software limit switches negative direction **3 / SWLIMP+SWLIMN**: Activation of software limit switches both directions Software limit switches can only be activated if the zero point is valid. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 3	UINT16 R/W per. -	Modbus 1542 IDN P-0-3006.0.3
`MON_SWLimMode`	Behavior when position limit is reached. **0 / Standstill Behind Position Limit**: Quick Stop is triggered at position limit and standstill is reached behind position limit **1 / Standstill At Position Limit**: Quick Stop is triggered in front of position limit and standstill is reached at position limit Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 1678 IDN P-0-3006.0.71
`MON_swLimN`	Negative position limit for software limit switch. See description 'MON_swLimP'. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	usr_p - -2147483648 -	INT32 R/W per. -	Modbus 1546 IDN P-0-3006.0.5

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_swLimP`	Positive position limit for software limit switch. If a user-defined value entered is outside of the permissible range, the limit switch limits are automatically set to the maximum user-defined value. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	usr_p - 2147483647 -	INT32 R/W per. -	Modbus 1544 IDN P-0-3006.0.4
`MON_v_DiffWin`	Monitoring of velocity deviation. The system monitors whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 1 10 2147483647	UINT32 R/W per. -	Modbus 1588 IDN P-0-3006.0.26
`MON_v_Threshold`	Monitoring of velocity threshold. The system monitors whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 1 10 2147483647	UINT32 R/W per. -	Modbus 1590 IDN P-0-3006.0.27
`MON_v_zeroclamp`	Velocity limit for Zero Clamp. A Zero Clamp operation is only possible if the reference velocity is below the Zero Clamp velocity limit. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v 0 10 2147483647	UINT32 R/W per. -	Modbus 1616 IDN P-0-3006.0.40
`MON_VelDiff`	Maximum load-dependent velocity deviation. Value 0: Monitoring deactivated. Value >0: Maximum value Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately. Available with firmware version ≥V01.06.	usr_v 0 0 2147483647	UINT32 R/W per. -	Modbus 1686 IDN P-0-3006.0.75
`MON_VelDiff_Time`	Time window for maximum load-dependent velocity deviation. Value 0: Monitoring deactivated. Value >0: Time window for maximum value Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately. Available with firmware version ≥V01.06.	ms 0 10 -	UINT16 R/W per. -	Modbus 1688 IDN P-0-3006.0.76

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_VelDiffOpSt578	Maximum load-dependent velocity deviation for operating states 5, 7 and 8. Maximum load-dependent velocity deviation for operating states 5 Switch On, 7 Quick Stop Active and 8 Fault Reaction Active. Value 0: Monitoring deactivated. Value >0: Maximum value. Monitoring is active if parameter LIM_QStopReact is set to "Deceleration Ramp (Fault)" or to "Deceleration ramp (Quick Stop)". Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	usr_v 0 0 2147483647	UINT32 R/W per. -	Modbus 1680 IDN P-0-3006.0.72
MT_dismax	Maximum permissible distance. If the reference value is active and the maximum permissible distance is exceeded, an error of error class 1 is detected. The value 0 switches off monitoring. The parameter MT_dismax_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 revolution. Modified settings become effective the next time the motor moves.	revolution 0.0 1.0 999.9	UINT16 R/W - -	Modbus 11782 IDN P-0-3046.0.3
MT_dismax_usr	Maximum permissible distance. If the reference value is active and the maximum permissible distance is exceeded, an error of error class 1 is detected. The value 0 switches off monitoring. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_p 0 131072 2147483647	INT32 R/W - -	Modbus 11796 IDN P-0-3046.0.10
p_MaxDifToENC2	Maximum permissible deviation of encoder positions. The maximum permissible position deviation between the encoder positions is cyclically monitored. If the limit is exceeded, an error is detected. The position deviation is available via the parameter '_p_DifEnc1ToEnc2'. The default value corresponds to 1/2 motor revolution. The maximum value corresponds to 100 motor revolutions. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	Inc 1 65536 13107200	INT32 R/W per. -	Modbus 20494 IDN P-0-3080.0.7

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
p_PTI_act_set	Position value at PTI interface. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Available with firmware version ≥V01.06.	Inc -2147483648 - 2147483647	INT32 R/W - -	Modbus 2130 IDN P-0-3008.0.41
PAR_CTRLreset ConF → FCS- rESC	Reset control loop parameters. **0 / No /** no: No **1 / Yes /** YES: Yes Reset of the control loop parameters. The control loop parameters are recalculated on the basis of the motor data of the connected motor. Current and velocity limitations are not reset. Therefore, a user parameter reset is required. The new settings are not saved to the nonvolatile memory. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 0 1	UINT16 R/W - -	Modbus 1038 IDN P-0-3004.0.7
PAR_ScalingStart	Recalculation of parameters with user-defined units. The parameters with user-defined units can be recalculated with a changed scaling factor. Value 0: Inactive Value 1: Initialize recalculation Value 2: Start recalculation Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 0 2	UINT16 R/W - -	Modbus 1064 IDN P-0-3004.0.20
PAReeprSave	Save parameter values to the nonvolatile memory. Value 1: Save persistent parameters The currently set parameters are saved to the nonvolatile memory. The saving process is complete when the parameter is read and 0 is returned. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- - - -	UINT16 R/W - -	Modbus 1026 IDN P-0-3004.0.1

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PARuserReset ConF → FCS- rESu	Reset user parameters. **0 / No / no**: No **65535 / Yes / YES**: Yes Bit 0: Reset persistent user parameters and control loop parameters to default values Bits 1 … 15: For future use The parameters are reset with the exception of: - Communication parameters - Inversion of direction of movement - Type of reference value signal for PTI interface - Settings of encoder simulation - Functions of digital inputs and outputs - Safety module eSM The new settings are not saved to the nonvolatile memory. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 - 65535	UINT16 R/W - -	Modbus 1040 IDN P-0-3004.0.8
PDOmask	Deactivate receive PDO. Value 0: Activate receive PDO Value 1: Deactivate receive PDO Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W - -	Modbus 16516 IDN P-0-3064.0.66
PP_ModeRangeLim	Absolute movement beyond movement range. **0 / NoAbsMoveAllowed**: Absolute movement beyond movement range is not possible **1 / AbsMoveAllowed**: Absolute movement beyond movement range is possible Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 0 1	UINT16 R/W per. -	Modbus 8974 IDN P-0-3035.0.7
PPoption	Options for operating mode Profile Position. Determines the reference position for relative positioning: 0: Relative with reference to the previous target position of the profile generator 1: Not supported 2: Relative with reference to the actual position of the motor Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	- 0 0 2	UINT16 R/W - -	Modbus 6960 IDN P-0-3027.0.24
PPp_target	Target position for operating mode Profile Position. Minimum/maximum values depend on: - Scaling factor - Software limit switches (if they are activated) Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_p - - -	INT32 R/W - -	Modbus 6940 IDN P-0-3027.0.14

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PPv_target	Target velocity for operating mode Profile Position. The target velocity is limited to the setting in CTRL_v_max and RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_v 1 60 4294967295	UINT32 R/W - -	Modbus 6942 IDN P-0-3027.0.15
PTI_pulse_filter	Filter time for input signals at the PTI interface. A signal at the PTI interface is only evaluated if it is available for a time that is longer than the set filter time. For example, if an interference pulse is available for a period shorter than the set filter time, the interference pulse is not evaluated. The interval between 2 signals must also be greater than the set filter time. Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 µs. Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	µs 0.00 0.25 13.00	UINT16 R/W per. expert	Modbus 1374 IDN P-0-3005.0.47
PTI_signal_type ConF → i-o- ioPi	Type of reference value signal for PTI interface. **0 / A/B Signals** / Ab: Signals ENC_A and ENC_B (quadruple evaluation) **1 / P/D Signals** / Pd: Signals PULSE and DIR **2 / CW/CCW Signals** / cWcc: Signals clockwise and counterclockwise Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective after the next power cycle.	- 0 0 2	UINT16 R/W per. -	Modbus 1284 IDN P-0-3005.0.2
PTO_mode ConF → ACG- PtoM	Type of usage of PTO interface. **0 / Off** / oFF: PTO interface disabled **1 / Esim pAct Enc 1** / PEn1: Encoder simulation based on actual position of encoder 1 **2 / Esim pRef** / PrEF: Encoder simulation based on reference position (_p_ref) **3 / PTI Signal** / Pti: Directly the signal from PTI interface **4 / Esim pAct Enc 2** / PEn2: Encoder simulation based on actual position of encoder 2 (module) **5 / Esim iqRef** / irEF: Encoder simulation based on reference current **6 / Esim pActRaw Enc2** / Enc2: Encoder simulation based on raw position value of encoder 2 (module) Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled. Available with firmware version ≥V01.04.	- 0 0 6	UINT16 R/W per. -	Modbus 1342 IDN P-0-3005.0.31

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`PTtq_reference`	Reference value source for operating mode Profile Torque. **0 / None**: None **1 / Parameter 'PTtq_target'**: Reference value via parameter PTtq_target **3 / PTI Interface**: Reference value via PTI interface Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately. Available with firmware version ≥V01.08.	- 0 1 3	UINT16 R/W - -	Modbus 7024 IDN P-0-3027.0.56
`PTtq_target`	Target torque. 100.0 % correspond to the continuous stall torque _M_M_0. Type: Signed decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Modified settings become effective immediately.	% -3000.0 0.0 3000.0	INT16 R/W - -	Modbus 6944 IDN P-0-3027.0.16
`PVv_reference`	Reference value source for operating mode Profile Velocity. **0 / None**: None **1 / Parameter 'PVv_target'**: Reference value via parameter PVv_target **2 / Analog Input**: Reference value via analog input Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 1 2	UINT16 R/W - -	Modbus 7026 IDN P-0-3027.0.57
`PVv_target`	Target velocity. The target velocity is limited to the setting in CTRL_v_max and RAMP_v_max. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	usr_v - 0 -	INT32 R/W - -	Modbus 6938 IDN P-0-3027.0.13
`PWM_fChop`	PWM frequency of power stage. **4 / 4 kHz**: 4 kHz **8 / 8 kHz**: 8 kHz **16 / 16 kHz**: 16 kHz Factory setting: Peak output current ≤72 Arms: 8 kHz Peak output current >72 Arms: 4 kHz Changing this setting is only possible in the case of devices with a peak output current >72 Arms. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 4 - 16	UINT16 R/W per. expert	Modbus 1308 IDN P-0-3005.0.14
`RAMP_tq_enable`	Activation of the motion profile for torque. **0 / Profile Off**: Profile off **1 / Profile On**: Profile on In the operating mode Profile Torque, the motion profile for torque can be activated or deactivated. In the other operating modes, the motion profile for torque is inactive. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 1 1	UINT16 R/W per. -	Modbus 1624 IDN P-0-3006.0.44

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RAMP_tq_slope	Slope setting of the motion profile for torque. 100.00 % of the torque setting correspond to the continuous stall torque _M_M_0. Example: A ramp setting of 10000.00 %/s results in a torque change of 100.0% of _M_M_0 in 0.01s. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %/s. Modified settings become effective immediately.	%/s 0.1 10000.0 3000000.0	UINT32 R/W per. -	Modbus 1620 IDN P-0-3006.0.42
RAMP_v_acc	Acceleration of the motion profile for velocity. Writing the value 0 has no effect on the parameter. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_a 1 600 2147483647	UINT32 R/W per. -	Modbus 1556 IDN P-0-3006.0.10
RAMP_v_dec	Deceleration of the motion profile for velocity. The minimum value depends on the operating mode: Operating modes with minimum value 120: Jog Homing Writing the value 0 has no effect on the parameter. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_a 1 600 2147483647	UINT32 R/W per. -	Modbus 1558 IDN P-0-3006.0.11
RAMP_v_enable	Activation of the motion profile for velocity. **0 / Profile Off**: Profile off **1 / Profile On**: Profile on Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 1 1	UINT16 R/W per. -	Modbus 1622 IDN P-0-3006.0.43
RAMP_v_jerk ConF → drC - JEr	Jerk limitation of the motion profile for velocity. **0 / Off / oFF**: Off **1 / 1 / 1**: 1 ms **2 / 2 / 2**: 2 ms **4 / 4 / 4**: 4 ms **8 / 8 / 8**: 8 ms **16 / 16 / 16**: 16 ms **32 / 32 / 32**: 32 ms **64 / 64 / 64**: 64 ms **128 / 128 / 128**: 128 ms Adjustments can only be made if the operating mode is inactive (x_end=1). Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	ms 0 0 128	UINT16 R/W per. -	Modbus 1562 IDN P-0-3006.0.13

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RAMP_v_max ConF → ACG - nrMP	Maximum velocity of the motion profile for velocity. If a greater reference velocity is set in one of these operating modes, it is automatically limited to RAMP_v_max. This way, commissioning at limited velocity is easier to perform. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the motor moves.	usr_v 1 13200 2147483647	UINT32 R/W per. -	Modbus 1554 IDN P-0-3006.0.9
RAMP_v_sym	Acceleration and deceleration of the motion profile for velocity. The values are internally multiplied by 10 (example: 1 = 10 RPM/s). Write access changes the values of RAMP_v_acc and RAMP_v_dec. The limit values are verified on the basis of the values indicated for these parameters. Read access returns the greater value from RAMP_v_acc/RAMP_v_dec. If the value cannot be represented as a 16 bit value, the value is set to 65535 (maximum UINT16 value) Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	- - - -	UINT16 R/W - -	Modbus 1538 IDN P-0-3006.0.1
RAMPaccdec	Acceleration and deceleration for the Drive Profile Lexium. High word: Acceleration Low word: Deceleration The values are internally multiplied by 10 (example: 1 = 10 RPM/s). Write access changes the values of RAMP_v_acc and RAMP_v_dec. The limit values are verified on the basis of the values indicated for these parameters. If the value cannot be represented as a 16 bit value, the value is set to 65535 (maximum UINT16 value). Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	- - - -	UINT32 R/W - -	Modbus 1540 IDN P-0-3006.0.2
RAMPquickstop	Deceleration ramp for Quick Stop. Deceleration ramp for a software stop or an error with error class 1 or 2. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective the next time the motor moves.	usr_a 1 6000 2147483647	UINT32 R/W per. -	Modbus 1572 IDN P-0-3006.0.18
RESext_P ConF → ACG - Pobr	Nominal power of external braking resistor. The maximum value depends on the power stage. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	W 1 10 -	UINT16 R/W per. -	Modbus 1316 IDN P-0-3005.0.18

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RESext_R ConF → ACG - rbr	Resistance value of external braking resistor. The minimum value depends on the power stage. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.01 Ω. Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	Ω - 100.00 327.67	UINT16 R/W per. -	Modbus 1318 IDN P-0-3005.0.19
RESext_ton ConF → ACG - tbr	Maximum permissible switch-on time of external braking resistor. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	ms 1 1 30000	UINT16 R/W per. -	Modbus 1314 IDN P-0-3005.0.17
RESint_ext ConF → ACG - Eibr	Selection of type of braking resistor. **0 / Internal Braking Resistor /** int: Internal braking resistor **1 / External Braking Resistor /** Eht: External braking resistor **2 / Reserved /** rSVd: Reserved Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	- 0 0 2	UINT16 R/W per. -	Modbus 1298 IDN P-0-3005.0.9
ResolENC2	Raw resolution of encoder 2. Digital encoders: Number of encoder increments per encoder revolution. Analog encoders: Number of analog periods per encoder revolution. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled. Available with firmware version ≥V01.06.	EncInc 1 10000 2147483647	UINT32 R/W per. -	Modbus 20510 IDN P-0-3080.0.15
ResolENC2Denom	Resolution of encoder 2, denominator. See numerator (ResolEnc2Num) for a description. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	revolution 1 1 16383	INT32 R/W per. -	Modbus 20490 IDN P-0-3080.0.5

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ResolENC2Num`	Resolution of encoder 2, numerator. Digital encoders: Specification of the encoder increments the external encoder returns for one or several revolutions of the motor shaft. The value is indicated with a numerator and a denominator so that it is possible, for example, to take into account the gear ratio of a mechanical gearing. The value must not be set to 0. The resolution factor is not applied until this numerator value is specified. Example: One motor revolution causes 1/3 encoder revolution at an encoder resolution of 16384 EncInc/revolution. ResolENC2Num = 16384 EncInc ResolENC2Denom = 3 revolutions Analog encoders: Num/Denom must be set equivalent to the number of analog periods per 1 motor revolution. Example: One motor revolution causes 1/3 encoder revolution at an encoder resolution of 16 analog periods per revolution. ResolENC2Num = 16 periods ResolENC2Denom = 3 revolutions Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective the next time the power stage is enabled.	EncInc 1 10000 2147483647	INT32 R/W per. -	Modbus 20492 IDN P-0-3080.0.6
`ScaleRAMPdenom`	Ramp scaling: Denominator. See numerator (ScaleRAMPnum) for a description. A new scaling is activated when the numerator value is supplied. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	usr_a 1 1 2147483647	INT32 R/W per. -	Modbus 1632 IDN P-0-3006.0.48
`ScaleRAMPnum`	Ramp scaling: Numerator. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	RPM/s 1 1 2147483647	INT32 R/W per. -	Modbus 1634 IDN P-0-3006.0.49
`ScaleVELdenom`	Velocity scaling: Denominator. See numerator (ScaleVELnum) for a description. A new scaling is activated when the numerator value is supplied. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled.	usr_v 1 1 2147483647	INT32 R/W per. -	Modbus 1602 IDN P-0-3006.0.33

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ScaleVELnum	Velocity scaling: Numerator. Specification of the scaling factor: Speed of rotation of motor [RPM] -- User-defined units [usr_v] A new scaling is activated when the numerator value is supplied. Type: Signed decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	RPM 1 1 2147483647	INT32 R/W per. -	Modbus 1604 IDN P-0-3006.0.34
SercosAddress ConF → CoM- Addr	Sercos device address. This parameter assigns a Sercos address to the drive. Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	- 0 0 255	UINT16 R/W per. -	-
SercosPhaseStatus Mon S3cP	Sercos communication phase. This parameter contains the current Sercos communication phase. Type: Signed decimal - 2 bytes Modified settings become effective immediately.	- -1 0 7	INT16 R/- - -	Modbus 18180 IDN P-0-3071.0.2
ShiftEncWorkRang	Shifting of the encoder working range. **0 / Off**: Shifting off **1 / On**: Shifting on After activating the shifting function, the position range of a multiturn encoder is shifted by one half of the range. Example for the position range of a multiturn encoder with 4096 revolutions: Value 0: Position values are between 0 … 4096 revolutions. Value 1: Position values are between -2048 … 2048 revolutions. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective after the next power cycle.	- 0 0 1	UINT16 R/W per. -	Modbus 1346 IDN P-0-3005.0.33

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
SimAbsolutePos ConF → ACG - qAbS	Simulation of absolute position at power cycling. **0 / Simulation Off / oFF**: Do not use the last mechanical position after power cycling **1 / Simulation On / on**: Use last mechanical position after power cycling This parameter specifies the way position values are handled over a power cycle and allows for the simulation of an absolute position encoder using singleturn encoders. If this function is activated, the drive saves the pertinent position data prior to a power removal so that the drive can restore the mechanical position the next time it is powered on. In the case of singleturn encoders, the position can be restored if the motor shaft has not been moved by more than 0.25 revolutions while the drive was powered off. In the case of multiturn encoders, the permissible shaft movement while the drive is off can be much greater, depending on the type of multiturn encoder. For this function to work, the drive may only be powered off while the motor is at a standstill and the motor shaft must not be moved outside of the permissible range (for example, use a holding brake). Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 1350 IDN P-0-3005.0.35
SPDSercos3Control	SPD Sercos control (CAP1 and CAP2). Bit 0 = 0: Cancel capture function Bit 0 = 1: Start one-time capture via input CAP1 Bit 1 = 0: Cancel capture function Bit 1 = 1: Start one-time capture via input CAP2 Bits 2 … 15: Reserved Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- - - -	UINT16 R/W - -	Modbus 6560 IDN P-0-3025.0.80
SyncMechStart	Activation of synchronization mechanism. Value 0: Deactivate synchronization mechanism Value 1: Activate synchronization mechanism (CANmotion). Value 2: Activate synchronization mechanism, standard CANopen mechanism. The cycle time of the synchronization signal is derived from the parameters intTimPerVal and intTimInd. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 0 0 2	UINT16 R/W - -	Modbus 8714 IDN P-0-3034.0.5
SyncMechStatus	Status of synchronization mechanism. Status of synchronization mechanism: Value 1: Synchronization mechanism of drive is inactive. Value 32: Drive is synchronizing with external sync signal. Value 64: Drive is synchronized with external sync signal. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 8716 IDN P-0-3034.0.6

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`SyncMechTol`	Synchronization tolerance. The value is applied when the synchronization mechanism is activated via the parameter SyncMechStart. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- 1 1 20	UINT16 R/W - -	Modbus 8712 IDN P-0-3034.0.4
`UsrAppDataMem1`	User-specific data 1. This parameter can be used to store user-specific data. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- - - -	UINT32 R/W per. -	Modbus 390 IDN P-0-3001.0.67
`UsrAppDataMem2`	User-specific data 2. This parameter can be used to store user-specific data. Type: Unsigned decimal - 4 bytes Write access via Sercos: CP2, CP3, CP4 Modified settings become effective immediately.	- - 0 -	UINT32 R/W per. -	Modbus 392 IDN P-0-3001.0.68
`WakesAndShakeGain`	Gain for wake and shake. If wake and shake did not work properly, this parameter can be used to adapt the dynamics of the wake and shake procedure. Value >100 %: Increased dynamics which leads to less motor movement. Value <100 %: Reduced dynamics which leads to more motor movement. Type: Unsigned decimal - 2 bytes Write access via Sercos: CP2, CP3, CP4 In increments of 0.1 %. Setting can only be modified if power stage is disabled. Modified settings become effective immediately.	% 1.0 100.0 400.0	UINT16 R/W per. -	Modbus 20508 IDN P-0-3080.0.14

List of Mappable Parameters

Overview

Parameter name	Description	Data type	Parameter address
S-0-0047.0.0	Position Command Value	INT32	S-0-0047.0.0
S-0-0051.0.0	Position Feedback Value	INT32	S-0-0051.0.0
S-0-0134.0.0	Drive Control Word	UINT16	S-0-0134.0.0
S-0-0135.0.0	Drive Status Word	UINT16	S-0-0135.0.0
S-0-0390.0.0	Diagnostic Number	UINT32	S-0-0390.0.0
S-0-1045.0.0	Device Status	UINT16	S-0-1045.0.0
S-0-1050.0.8	Connection Control	UINT16	S-0-1050.0.8
S-0-1050.1.8	Connection Control	UINT16	S-0-1050.1.8
S-0-1050.2.8	Connection Control	UINT16	S-0-1050.2.8
S-0-1050.3.8	Connection Control	UINT16	S-0-1050.3.8
_actionStatus	Action word	UINT16	P-0- 3028.0. 4
_Cap1Count	Capture input 1 event counter (one-time)	UINT16	P-0- 3010.0. 8
_Cap1CountCons	Capture input 1 event counter (continuous)	UINT16	P-0- 3010.0. 23
_Cap1Pos	Capture input 1 captured position (one-time)	INT32	P-0- 3010.0. 6
_Cap1PosCons	Capture input 1 captured position (continuous)	INT32	P-0- 3010.0. 24
_Cap2Count	Capture input 2 event counter (one-time)	UINT16	P-0- 3010.0. 9
_Cap2CountCons	Capture input 2 event counter (continuous)	UINT16	P-0- 3010.0. 25
_Cap2Pos	Capture input 2 captured position (one-time)	INT32	P-0- 3010.0. 7
_Cap2PosCons	Capture input 2 captured position (continuous)	INT32	P-0- 3010.0. 26
_Cap3Count	Capture input 3 event counter (one-time)	UINT16	P-0- 3010.0. 20
_Cap3CountCons	Capture input 3 event counter (continuous)	UINT16	P-0- 3010.0. 27
_Cap3Pos	Capture input 3 captured position (one-time)	INT32	P-0- 3010.0. 19
_Cap3PosCons	Capture input 3 captured position (continuous)	INT32	P-0- 3010.0. 28
_CapStatus	Status of the capture inputs	UINT16	P-0- 3010.0. 1
_DCOMopmd_act	Active operating mode	INT16	P-0- 3027.0. 4
_DCOMstatus	DriveCom status word	UINT16	P-0- 3027.0. 2
_eSM_funct	eSM function	UINT16	P-0- 3076.0. 23
_eSM_LI_act	eSM digital inputs channel B	UINT16	P-0- 3076.0. 18
_eSM_LO_act	eSM digital outputs channel B	UINT16	P-0- 3076.0. 20
_eSM_state	eSM operating state	UINT16	P-0- 3076.0. 22
_I_act	Total motor current	INT16	P-0- 3030.0. 3
_IO_act	Physical status of the digital inputs and outputs	UINT16	P-0- 3008.0. 1
_IO_DI_act	Status of digital inputs	UINT16	P-0- 3008.0. 15
_IO_DQ_act	Status of digital outputs	UINT16	P-0- 3008.0. 16
_LastError	Detected error causing a stop (error classes 1 to 4)	UINT16	P-0- 3028.0. 5
_LastWarning	Code of most recent error of error class 0	UINT16	P-0- 3028.0. 9
_p_act_ENC1	Actual position of encoder 1	INT32	P-0- 3030.0. 39
_p_act_ENC1_int	Actual position of encoder 1 in internal units	INT32	P-0- 3030.0. 38
_p_act_ENC2	Actual position of encoder 2 (module)	INT32	P-0- 3030.0. 26
_p_act_ENC2_int	Actual position of encoder 2 (module) in internal units	INT32	P-0- 3030.0. 25
_p_act_pure_ENC2	Actual position of encoder 2 without internal offset	INT32	P-0- 3030.0. 29
_p_dif	Position deviation including dynamic position deviation	INT32	P-0- 3030.0. 18
_p_dif_load_usr	Load-dependent position deviation between reference and actual positions	INT32	P-0- 3030.0. 22
_p_PTI_act	Actual position at PTI interface	INT32	P-0- 3008.0. 5

Parameter name	Description	Data type	Parameter address
_SPDSercos3Status	SPD Sercos status (CAP1 and CAP2)	UINT16	P-0- 3025.0. 81
_tq_act	Actual torque	INT16	P-0- 3030.0. 36
_v_act	Actual velocity	INT32	P-0- 3030.0. 32
_v_PTI_act	Actual velocity at PTI interface	INT32	P-0- 3008.0. 6
CTRL_I_max	Current limitation	UINT16	P-0- 3017.0. 12
CTRL_v_max	Velocity limitation	UINT32	P-0- 3017.0. 16
HMp_home	Position at reference point	INT32	P-0- 3040.0. 11
IO_DQ_set	Setting the digital outputs directly	UINT16	P-0- 3008.0. 17
MON_I_Threshold	Monitoring of current threshold	UINT16	P-0- 3006.0. 28
MON_p_dif_load	Maximum load-dependent position deviation	UINT32	P-0- 3006.0. 35
MON_v_Threshold	Monitoring of velocity threshold	UINT32	P-0- 3006.0. 27
PTtq_target	Target torque	INT16	P-0- 3027.0. 16
PVv_target	Target velocity	INT32	P-0- 3027.0. 13
SPDSercos3Control	SPD Sercos control (CAP1 and CAP2)	UINT16	P-0- 3025.0. 80

Chapter 12
Accessories and Spare Parts

What Is in This Chapter?

This chapter contains the following topics:

Commissioning Tools

Description	Reference
PC connection kit, serial connection between drive and PC, USB-A to RJ45	TCSMCNAM3M002P
Multi-Loader, device for copying the parameter settings to a PC or to another drive	VW3A8121
Modbus cable, 1 m (3.28 ft), 2 x RJ45	VW3A8306R10
Modbus-Bluetooth adapter	VW3A8114
External graphic display terminal	VW3A1101

Memory Cards

Description	Reference
Memory card for copying parameter settings	VW3M8705
25 memory cards for copying parameter settings	VW3M8704

Additional Modules

Description	Reference
Encoder module RSR (resolver interface) with DE9 D-SUB connection (female)	VW3M3401
Encoder module DIG (digital interface) with HD15 D-SUB connection (female)	VW3M3402
Encoder module ANA (analog interface) with HD15 D-SUB connection (female)	VW3M3403

Safety Module eSM

Description	Reference
Safety module eSM with safety functions SOS, SLS, SS1, SS2 as per IEC/EN 61800-5-2	VW3M3501
Cable for safety module eSM, 3 m (9.84 ft); 24-pin connector, other cable end open	VW3M8801R30
Cable for safety module eSM, 1.5 m (4.92 ft); 2 x 24-pin connector	VW3M8802R15
Cable for safety module eSM, 3 m (9.84 ft); 2 x 24-pin connector	VW3M8802R30
Connection terminal adapter for eSM safety module, for easy wiring of several safety modules in the control cabinet	VW3M8810
Connector with wire jumper (for INTERLOCK signal) for eSM terminal adapter; 4 pieces	VW3M8820

Application Nameplate

Description	Reference
Application nameplate to be clipped onto the top of the drive, size 38.5 x 13 mm (1.51 x 0.51 in), 50 pieces	VW3M2501

SERCOS III Cables with Connectors

Description	Reference
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 0.5 m (1.64 ft)	VW3E5001R005
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 1 m (3.28 ft)	VW3E5001R010
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 1.5 m (4.92 ft)	VW3E5001R015
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 2 m (6.56 ft)	VW3E5001R020
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 3 m (9.84 ft)	VW3E5001R030
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 5 m (16.4 ft)	VW3E5001R050
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 10 m (32.8 ft)	VW3E5001R100
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 15 m (49.2 ft)	VW3E5001R150
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 20 m (65.6 ft)	VW3E5001R200
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 25 m (82 ft)	VW3E5001R250
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 30 m (98.4 ft)	VW3E5001R300
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 40 m (131 ft)	VW3E5001R400
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 50 m (164 ft)	VW3E5001R500

Cables for PTO and PTI

Description	Reference
Signal cable 2 x RJ45, PTO to PTI, 0.3 m (0.98 ft)	VW3M8502R03
Signal cable 2 x RJ45, PTO to PTI, 1.5 m (4.92 ft)	VW3M8502R15
Signal cable 1 x RJ45, other cable end open, for connecting PTI in the control cabinet, 3 m (9.84 ft)	VW3M8223R30

Motor Cables

Motor cables 1.0 mm^2

Description	Reference
Motor cable 3 m (9.84 ft), (4 x 1.0 mm^2 + 2 x (2 x 0.75 mm^2)) shielded; motor end 8-pin circular connector Y-TEC, other cable end open	VW3M5100R30
Motor cable 5 m (16.4 ft), (4 x 1.0 mm^2 + 2 x (2 x 0.75 mm^2)) shielded; motor end 8-pin circular connector Y-TEC, other cable end open	VW3M5100R50
Motor cable 10 m (32.8 ft), (4 x 1.0 mm^2 + 2 x (2 x 0.75 mm^2)) shielded; motor end 8-pin circular connector Y-TEC, other cable end open	VW3M5100R100
Motor cable 15 m (49.2 ft), (4 x 1.0 mm^2 + 2 x (2 x 0.75 mm^2)) shielded; motor end 8-pin circular connector Y-TEC, other cable end open	VW3M5100R150
Motor cable 25 m (82 ft), (4 x 1.0 mm^2 + 2 x (2 x 0.75 mm^2)) shielded; motor end 8-pin circular connector Y-TEC, other cable end open	VW3M5100R250
Motor cable 100 m (328 ft), (4 x 1.0 mm^2 + 2 x (2 x 0.75 mm^2)) shielded; both cable ends open	VW3M5300R1000

Motor cables 1.5 mm^2

Description	Reference
Motor cable 1.5 m (4.92 ft), (4 x 1.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R15
Motor cable 3 m (9.84 ft), (4 x 1.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R30
Motor cable 5 m (16.4 ft), (4 x 1.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R50
Motor cable 10 m (32.8 ft), (4 x 1.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R100
Motor cable 15 m (49.2 ft), (4 x 1.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R150
Motor cable 20 m (65.6 ft), (4 x 1.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R200
Motor cable 25 m (82 ft), (4 x 1.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R250
Motor cable 50 m (164 ft), (4 x 1.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R500
Motor cable 75 m (246 ft), (4 x 1.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R750
Motor cable 25 m (82 ft), (4 x 1.5 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5301R250
Motor cable 50 m (164 ft), (4 x 1.5 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5301R500
Motor cable 100 m (328 ft), (4 x 1.5 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5301R1000

Motor cables 2.5 mm^2

Description	Reference
Motor cable 3 m (9.84 ft), (4 x 2.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R30
Motor cable 5 m (16.4 ft), (4 x 2.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R50
Motor cable 10 m (32.8 ft), (4 x 2.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R100
Motor cable 15 m (49.2 ft), (4 x 2.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R150
Motor cable 20 m (65.6 ft), (4 x 2.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R200
Motor cable 25 m (82 ft), (4 x 2.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R250
Motor cable 50 m (164 ft), (4 x 2.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R500
Motor cable 75 m (246 ft), (4 x 2.5 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R750
Motor cable 25 m (82 ft), (4 x 2.5 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5302R250
Motor cable 50 m (164 ft), (4 x 2.5 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5302R500
Motor cable 100 m (328 ft), (4 x 2.5 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5302R1000

Motor cables 4 mm^2

Description	Reference
Motor cable 3 m (9.84 ft), (4 x 4 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R30
Motor cable 5 m (16.4 ft), (4 x 4 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R50
Motor cable 10 m (32.8 ft), (4 x 4 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R100
Motor cable 15 m (49.2 ft), (4 x 4 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R150
Motor cable 20 m (65.6 ft), (4 x 4 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R200
Motor cable 25 m (82 ft), (4 x 4 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R250
Motor cable 50 m (164 ft), (4 x 4 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R500
Motor cable 75 m (246 ft), (4 x 4 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R750
Motor cable 25 m (82 ft), (4 x 4 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5303R250
Motor cable 50 m (164 ft), (4 x 4 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5303R500
Motor cable 100 m (328 ft), (4 x 4 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5303R1000

Motor cables 6 mm^2

Description	Reference
Motor cable 3 m (9.84 ft), (4 x 6 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R30
Motor cable 5 m (16.4 ft), (4 x 6 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R50
Motor cable 10 m (32.8 ft), (4 x 6 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R100
Motor cable 15 m (49.2 ft), (4 x 6 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R150
Motor cable 20 m (65.6 ft), (4 x 6 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R200
Motor cable 25 m (82 ft), (4 x 6 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R250
Motor cable 50 m (164 ft), (4 x 6 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R500
Motor cable 75 m (246 ft), (4 x 6 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R750
Motor cable 25 m (82 ft), (4 x 6 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5305R250
Motor cable 50 m (164 ft), (4 x 6 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5305R500
Motor cable 100 m (328 ft), (4 x 6 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5305R1000

Motor cables 10 mm^2

Description	Reference
Motor cable 3 m (9.84 ft), (4 x 10 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R30
Motor cable 5 m (16.4 ft), (4 x 10 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R50
Motor cable 10 m (32.8 ft), (4 x 10 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R100
Motor cable 15 m (49.2 ft), (4 x 10 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R150
Motor cable 20 m (65.6 ft), (4 x 10 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R200
Motor cable 25 m (82 ft), (4 x 10 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R250
Motor cable 50 m (164 ft), (4 x 10 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R500
Motor cable 75 m (246 ft), (4 x 10 mm^2 + (2 x 1 mm^2)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R750
Motor cable 25 m (82 ft), (4 x 10 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5304R250
Motor cable 50 m (164 ft), (4 x 10 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5304R500
Motor cable 100 m (328 ft), (4 x 10 mm^2 + (2 x 1 mm^2)) shielded; both cable ends open	VW3M5304R1000

Encoder Cables

Description	Reference
Encoder cable 3 m (9.84 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector Y-TEC, device end 10-pin connector RJ45	VW3M8100R30
Encoder cable 5 m (16.4 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector Y-TEC, device end 10-pin connector RJ45	VW3M8100R50
Encoder cable 10 m (32.8 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector Y-TEC, device end 10-pin connector RJ45	VW3M8100R100
Encoder cable 15 m (49.2 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector Y-TEC, device end 10-pin connector RJ45	VW3M8100R150
Encoder cable 25 m (82 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector Y-TEC, device end 10-pin connector RJ45	VW3M8100R250
Encoder cable 1.5 m (4.92 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R15
Encoder cable 3 m (9.84 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R30
Encoder cable 5 m (16.4 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R50
Encoder cable 10 m (32.8 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R100
Encoder cable 15 m (49.2 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R150
Encoder cable 20 m (65.6 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R200
Encoder cable 25 m (82 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R250
Encoder cable 50 m (164 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R500
Encoder cable 75 m (246 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R750
Encoder cable 25 m (82 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; both cable ends open	VW3M8222R250
Encoder cable 50 m (164 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; both cable ends open	VW3M8222R500
Encoder cable 100 m (328 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; both cable ends open	VW3M8222R1000
Encoder cable 100 m (328 ft), (5 x 2 x 0.25 mm^2 + 2 x 0.5 mm^2) shielded; both cable ends open	VW3M8221R1000
Encoder cable 1 m (3.28 ft), shielded; HD15 D-SUB (male); other cable end open	VW3M4701

Connectors

Description	Reference
Connector for motor cable, motor end Y-TEC, 1 mm^2, 5 pieces	VW3M8219
Connector for motor cable, motor end M23, 1.5 ... 2.5 mm^2, 5 pieces	VW3M8215
Connector for motor cable, motor end M40, 4 mm^2, 5 pieces	VW3M8217
Connector for motor cable, motor end M40, 6...10 mm^2, 5 pieces	VW3M8218
Connector for encoder cable, motor end Y-TEC, 5 pieces	VW3M8220
Connector for encoder cable, motor end M23, 5 pieces	VW3M8214
Connector for encoder cable, drive end RJ45 (10 pins), 5 pieces	VW3M2208

The tools required for cable assembly can be ordered directly from the manufacturer.

- Crimping tool for power connector Y-TEC:
  Intercontec C0.201.00 or C0.235.00
  www.intercontec.com
- Crimping tool for power connector M23/M40:
  Coninvers SF-Z0025, SF-Z0026
  www.coninvers.com
- Crimping tool for encoder connector Y-TEC:
  Intercontec C0.201.00 or C0.235.00
  www.intercontec.com
- Crimping tool for encoder connector M23:
  Coninvers RC-Z2514
  www.coninvers.com
- Crimping tools for encoder connector RJ45 10 pins:
  Yamaichi Y-ConTool-11, Y-ConTool-20, Y-ConTool-30
  www.yamaichi.com

External Braking Resistors

Description	Reference
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 0.75 m (2.46 ft) connection cable, 2.1 mm^2 (AWG 14)	VW3A7601R07
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 2 m (6.56 ft) connection cable, 2.1 mm^2 (AWG 14)	VW3A7601R20
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 3 m (9.84 ft) connection cable, 2.1 mm^2 (AWG 14)	VW3A7601R30
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 0.75 m (2.46 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7602R07
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 2 m (6.56 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7602R20
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 3 m (9.84 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7602R30
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 0.75 m (2.46 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7603R07
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 2 m (6.56 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7603R20
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 3 m (9.84 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7603R30
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 0.75 m (2.46 ft) connection cable, 2.1 mm^2 (AWG 14)	VW3A7604R07
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 2 m (6.56 ft) connection cable, 2.1 mm^2 (AWG 14)	VW3A7604R20
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 3 m (9.84 ft) connection cable, 2.1 mm^2 (AWG 14)	VW3A7604R30
Braking resistor IP65; 72 Ω; maximum continuous power 100 W; 0.75 m (2.46 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7605R07
Braking resistor IP65; 72 Ω; maximum continuous power 100 W; 2 m (6.56 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7605R20
Braking resistor IP65; 72 Ω; maximum continuous power 100 W; 3 m (9.84 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7605R30
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 0.75 m (2.46 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7606R07
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 2 m (6.56 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7606R20
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 3 m (9.84 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7606R30
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 0.75 m (2.46 ft) connection cable, 2.1 mm^2 (AWG 14)	VW3A7607R07
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 2 m (6.56 ft) connection cable, 2.1 mm^2 (AWG 14)	VW3A7607R20
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 3 m (9.84 ft) connection cable, 2.1 mm^2 (AWG 14)	VW3A7607R30
Braking resistor IP65; 100 Ω; maximum continuous power 100 W; 0.75 m (2.46 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7608R07
Braking resistor IP65; 100 Ω; maximum continuous power 100 W; 2 m (6.56 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7608R20
Braking resistor IP65; 100 Ω; maximum continuous power 100 W; 3 m (9.84 ft) connection cable, 2.1 mm^2 (AWG 14), UL	VW3A7608R30
Braking resistor IP20; 16 Ω; maximum continuous power 960 W; M6 terminals, UL	VW3A7704
Braking resistor IP20; 10 Ω; maximum continuous power 960 W; M6 terminals, UL	VW3A7705

DC Bus Accessories

Description	Reference
DC bus connection cable, 0.1 m (0.33 ft), 2 * 6 mm^2 (2 * AWG 10), pre-assembled, 5 pieces	VW3M7101R01
DC bus connection cable, 15 m (49.2 ft), 2 * 6 mm^2 (2 * AWG 10), Twisted Pair, shielded	VW3M7102R150
DC bus connector kit, connector housing and crimp contacts for 3 ... 6 mm^2 (AWG 12 ... 10), 10 pieces	VW3M2207

A crimping tool is required for the crimp contacts of the connector kit. Manufacturer:

Tyco Electronics, Heavy Head Hand Tool, Tool Pt. No 180250

Mains Reactors

Description	Reference
Mains reactor single-phase; 50-60 Hz; 7 A; 5 mH; IP00	VZ1L007UM50
Mains reactor single-phase; 50-60 Hz; 18 A; 2 mH; IP00	VZ1L018UM20
Mains reactor three-phase; 50-60 Hz; 16 A; 2 mH; IP00	VW3A4553
Mains reactor three-phase; 50-60 Hz; 30 A; 1 mH; IP00	VW3A4554
Mains reactor three-phase; 50-60 Hz; 60 A; 0.5 mH; IP00	VW3A4555

External Mains Filters

Description	Reference
Mains filter single-phase; 9 A; 115/230 Vac	VW3A4420
Mains filter single-phase; 16 A; 115/230 Vac	VW3A4421
Mains filter three-phase; 15 A; 208/400/480 Vac	VW3A4422
Mains filter three-phase; 25 A; 208/400/480 Vac	VW3A4423
Mains filter three-phase; 47 A; 208/400/480 Vac	VW3A4424

Spare Parts Connectors, Fans, Cover Plates

Description	Reference
Connector kit LXM32M: 3 x AC power stage supply (230/400 Vac), 1 x control supply, 2 x digital inputs/outputs (6-pin), 2 x motor (10 A / 24 A), 1 x holding brake	VW3M2203
Cover plate for module slot, spare part to replace damaged/lost cover plates, 10 pieces	VW3M2405
Cooling fan kit 40 x 40 mm (1.57 x 1.57 in), plastic housing, with connection cable	VW3M2401
Cooling fan kit 60 x 60 mm (2.36 x 2.36 in), plastic housing, with connection cable	VW3M2402
Cooling fan kit 80 x 80 mm (3.15 x 3.15 in), plastic housing, with connection cable	VW3M2403

Chapter 13
Service, Maintenance, and Disposal

What Is in This Chapter?

This chapter contains the following topics:

Service Addresses

Schneider Electric Automation GmbH

Schneiderplatz 1

97828 Marktheidenfeld, Germany

Phone: +49 (0) 9391 / 606 - 0

Fax: +49 (0) 9391 / 606 - 4000

Email: info-marktheidenfeld@schneider-electric.com

Internet: *http://www.schneider-electric.com*

Additional Contact Addresses

See the homepage for additional contact addresses:

http://www.schneider-electric.com

Maintenance

Maintenance Plan

Inspect the product for pollution or damage at regular intervals.

Repairs may only be made by the manufacturer. No warranty or liability is accepted for repairs made by unauthorized persons.

Prior to any type of work on the drive system, consult the chapters on Installation and Commissioning for information on the precautions and processes to be observed.

Include the following points in the maintenance plan of your machine.

Connections and Fastening

- Inspect all connection cables and connectors regularly for damage. Replace damaged cables immediately.
- Verify that all output elements are firmly seated.
- Tighten all mechanical and electrical threaded connections to the specified torque.

Lifetime Safety Function STO

The STO safety function is designed for a lifetime of 20 years. After this period, the data of the safety function are no longer valid. The expiry date is determined by adding 20 years to the DOM shown on the nameplate of the product.

- This date must be included in the maintenance plan of the system.
  Do not use the safety function after this date.

Example:

The DOM on the nameplate of the product is shown in the format DD.MM.YY, for example 31.12.16. (31 December 2016). This means: Do not use the safety function after December 31, 2036.

Replacing the Product

Unsuitable parameter values or unsuitable data may trigger unintended movements, trigger signals, damage parts and disable monitoring functions. Some parameter values or data do not become active until after a restart.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only start the system if there are no persons or obstructions in the zone of operation.
- Do not operate the drive system with undetermined parameter values or data.
- Never modify a parameter value unless you fully understand the parameter and all effects of the modification.
- Restart the drive and verify the saved operational data and/or parameter values after modifications.
- Carefully run tests for all operating states and potential error situations when commissioning, upgrading or otherwise modifying the operation of the drive.
- Verify the functions after replacing the product and also after making modifications to the parameter values and/or other operational data.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Follow the procedure below for replacing devices.

- Save all parameter settings. To do so, use a memory card or save the data to a PC using the commissioning software, see chapter Parameter Management *(see page 176)*.
- Power off all supply voltages. Verify that no voltages are present (safety instructions).
- Label all connections and remove all connection cables (unlock connector locks).
- Uninstall the product.
- Note the identification number and the serial number shown on the product nameplate for later identification.
- Install the new product as per chapter Installation *(see page 89)*.
- If the product to be installed has previously been used in a different system or application, you must restore the factory settings before commissioning the product.
- Commission the product as per chapter Commissioning *(see page 123)*.

Replacement of the Motor

Drive systems may perform unintended movements if unapproved combinations of drive and motor are used. Though the connectors for motor connection and encoder connection may match mechanically, this does not imply that the motor is approved for use.

⚠ WARNING
UNINTENDED MOVEMENT
Only use approved combinations of drive and motor.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

- Power off all supply voltages. Verify that no voltages are present (safety instructions).
- Label all connections and uninstall the product.
- Note the identification number and the serial number shown on the product nameplate for later identification.
- Install the new product as per chapter Installation *(see page 89)*.

If the connected motor is replaced by another motor, the motor data set is read again. If the device detects a different motor type, the control loop parameters are recalculated and the HMI displays Mot. See chapter Acknowledging a Motor Change *(see page 310)* for additional information.

If the motor is replaced, the encoder parameters must also be re-adjusted, see chapter Setting Parameters for Encoder *(see page 155)*.

If a motor encoder is connected via encoder 2 (module), a motor replacement is not detected. Observe the information provided in the encoder manual.

Changing the Motor Type Temporarily

If you want to operate the new motor type only temporarily via the device, press ESC at the HMI.

The newly calculated control loop parameters are not saved to the nonvolatile memory. This way, you can resume operation with the original motor using the saved control loop parameters.

Changing the Motor Type Permanently

If you want to operate the new motor type permanently via this device, press the navigation button at the HMI.

The newly calculated control loop parameters are saved to the nonvolatile memory.

See also chapter Acknowledging a Motor Change *(see page 310)*.

Shipping, Storage, Disposal

Shipping

The product must be protected against shocks during transportation. If possible, use the original packaging for shipping.

Storage

The product may only be stored in spaces where the specified permissible ambient conditions are met.

Protect the product from dust and dirt.

Disposal

The product consists of various materials that can be recycled. Dispose of the product in accordance with local regulations.

Visit *http://www.schneider-electric.com/green-premium* for information and documents on environmental protection as per ISO 14025 such as:

- EoLi (Product End-of-Life Instructions)
- PEP (Product Environmental Profile)

Glossary

A

Actual value

In control engineering, the actual value is the value of the controlled variable at a given instant (for example, actual velocity, actual torque, actual position). The actual value is an input value (measured value) used by the control loops to reach the reference value.

C

CCW

Counter Clockwise.

CW

Clockwise.

D

DC bus

Circuit that supplies the power stage with energy (direct voltage).

Degree of protection

The degree of protection is a standardized specification for electrical equipment that describes the protection against the ingress of foreign objects and water (for example: IP 20).

Direction of movement

In the case of a rotary motors, direction of movement is defined in accordance with IEC 61800-7-204: Positive direction is when the motor shaft rotates clockwise as you look at the end of the protruding motor shaft.

DOM

Date of manufacturing: The nameplate of the product shows the date of manufacture in the format DD.MM.YY or in the format DD.MM.YYYY. For example:

31.12.11 corresponds to December 31, 2011

31.12.2011 corresponds to December 31, 2011

Drive system

System consisting of controller, drive and motor.

E

EMC

Electromagnetic compatibility

Encoder

Sensor that converts a measured distance or angle into an electrical signal. This signal is evaluated by the drive to determine the actual position of a shaft (rotor) or a driving unit.

Error

Discrepancy between a detected (computed, measured or signaled) value or condition and the specified or theoretically correct value or condition.

Error class

Classification of errors into groups. The different error classes allow for specific responses to errors, for example by severity.

F

Factory settings

Settings when the product is shipped.

Fault

Fault is an operating state. If the monitoring functions detect an error, a transition to this operating state is triggered, depending on the error class. A "Fault Reset" or a power cycle are required to exit this operating state. Prior to this, the cause of the detected error must be removed. Further information can be found in the pertinent standards such as IEC 61800-7, ODVA Common Industrial Protocol (CIP).

Fault Reset

Function used to exit the operating state Fault. Before the function is used, the cause of the detected error must be removed.

I

I/O

Inputs/outputs

I2t monitoring

Anticipatory temperature monitoring. The expected temperature rise of components is calculated in advance on the basis of the motor current. If a limit value is exceeded, the drive reduces the motor current.

Inc

Increments

Index pulse

Signal of an encoder to reference the rotor position in the motor. The encoder returns one index pulse per revolution.

Internal units

Resolution of the power stage at which the motor can be positioned. Internal units are specified in increments.

L

Limit switch

Switches that signal overtravel of the permissible range of travel.

M

Monitoring function

Monitoring functions acquire a value continuously or cyclically (for example, by measuring) in order to check whether it is within permissible limits. Monitoring functions are used for error detection. Monitoring functions are not safety functions.

P

Parameter

Device data and values that can be read and set (to a certain extent) by the user.

PELV

Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41

Persistent

Indicates whether the value of the parameter remains in the memory after the device is switched off.

Power stage

The power stage controls the motor. The power stage generates current for controlling the motor on the basis of the motion signals from the controller.

Pulse/direction signals

Digital signals with variable pulse frequencies which signal changes in position and direction of movement via separate signal wires.

Q

Quick Stop

The function can be used for fast deceleration of a movement as a response to a detected error or via a command.

R

RCD

RCD residual current device.

rms

"Root Mean Square" value of a voltage (V_{rms}) or a current (A_{rms})

RS485

Fieldbus interface as per EIA-485 which enables serial data transmission with multiple devices.

S

Safety function

Safety functions are defined in the standard IEC 61800-5-2 (for example, Safe Torque Off (STO), Safe Operating Stop (SOS) or Safe Stop 1 (SS1)). If the safety functions are wired properly, they meet the requirements specified in IEC 61800-5-2.

Scaling factor

This factor is the ratio between an internal unit and a user-defined unit.

U

User-defined unit

Unit whose reference to motor movement can be determined by the user via parameters.

Index

Q

R

S

T

U