

Lexium 26D and BCH2 Servo Drive System User Guide

Original instructions

09/2019



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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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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.

All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

INTENDED USE

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

The products 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 entire system, you must ensure the safety of persons by means of the design of this entire system.

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 is prohibited and can result in hazards.

About the Book



At a Glance

Document Scope

This document describes the functions of the Servo Drive LXM26D and the BCH2 motor.

Validity Note

This document has been updated with the firmware release of the Lexium 26D V1.75.

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. <ul style="list-style-type: none">• 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.

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

Related Documents

Use your tablet or your PC to quickly access detailed and comprehensive information on all our products on www.schneider-electric.com.

The internet site provides the information you need for products and solutions:

- The whole catalog for detailed characteristics and selection guides,
- The CAD files to help design your installation,
- All software and firmware to maintain your installation up to date,
- And finally all the User Guides related to your drive, listed below:

| Title of documentation | Reference number |
|---|---|
| Lexium 26D and BCH2 Servo Drive System - User Guide (This document) | EIO0000002299 (English) |
| Lexium 26D DTM Commissioning software - User Guide | EIO0000002311 (English) |
| HBC Holding Brake Controller -Product Manual | 0198441113316 (English) |
| Multi-loader - User Manual | BBV48778 (English) BBV48777 (French) |

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.
- 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.

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.

Part I

Servo Drive System Planning

What Is in This Part?

This part contains the following chapters:

| Chapter | Chapter Name | Page |
|---------|--------------------|------|
| 1 | General Overview | 15 |
| 2 | Document Navigator | 21 |

Chapter 1

General Overview

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|-----------------------------|------|
| Servo Drive Device Overview | 16 |
| Drive / Motor References | 18 |

Servo Drive Device Overview

Presentation

The servo drive system includes:

- the drive (*see page 29*) and the motor (*see page 49*):



- the accessories and spare parts (*see page 87*):



| Item | Description |
|------|--|
| 1 | Commissioning tools (<i>see page 88</i>) |
| 2 | Connectors and adapters (<i>see page 88</i>) |
| 3 | External mains filters (<i>see page 88</i>) |
| 4 | Not used |
| 5 | Application nameplate (<i>see page 89</i>) |
| 6 | Not used |
| 7 | Motor cables (<i>see page 90</i>) |
| 8 | Encoder cables (<i>see page 90</i>) |
| 9 | Signal cables (<i>see page 90</i>) |
| 10 | Not used |
| 11 | External braking resistors (<i>see page 91</i>) |
| 12 | Circuit breakers (<i>see page 91</i>) |
| 13 | Motor protection switches and power contractors (<i>see page 92</i>) |

Drive / Motor References

Introduction

The present user guide provides information about the following Drives and Motors reference tables.

The Lexium 26D range is defined by AC-servo drives Lexium 26D for combination with AC-servo motors BCH2.

- The combinations of servo motors with servo drives are based on the power class: both servo motor and servo drive must have the same power class.
- The bundle of a servo drive with its related servo motor is designed to cover a nominal power from:
 - 0.05 kW up to 4.5 kW (0.067 up to 6.03 hp) with 200...240 V mains supply voltage.

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table (*see page 20*).

Lexium 26D Drive References List

| Drive references | Nominal power | Supply mains |
|------------------|---------------|----------------------------------|
| LXM26DUA5M3X | 50 W | single phase or 3-phase, 230 Vac |
| LXM26DU01M3X | 100 W | single phase or 3-phase, 230 Vac |
| LXM26DU02M3X | 200 W | single phase or 3-phase, 230 Vac |
| LXM26DU04M3X | 400 W | single phase or 3-phase, 230 Vac |
| LXM26DU07M3X | 750 W | single phase or 3-phase, 230 Vac |
| LXM26DU10M3X | 1000 W | single phase or 3-phase, 230 Vac |
| LXM26DU15M3X | 1500 W | single phase or 3-phase, 230 Vac |
| LXM26DU20M3X | 2000 W | 3-phase, 230 Vac |
| LXM26DU30M3X | 3000 W | 3-phase, 230 Vac |
| LXM26DU45M3X | 4500 W | 3-phase, 230 Vac |

For further information, refer to the servo drive general overview (*see page 30*).

BCH2 Motor References List

| Motor references | Nominal power |
|------------------|---------------|
| BCH2MBA53...5C | 50 W |
| BCH2MB013...5C | 100 W |
| BCH2LD023...5C | 200 W |
| BCH2MM031...6C | 300 W |
| BCH2LD043...5C | 400 W |
| BCH2LF043...5C | 400 W |
| BCH2MM052...6C | 500 W |
| BCH2MM061...6C | 600 W |
| BCH2HF073...5C | 750 W |
| BCH2LF073...5C | 750 W |
| BCH2MM081...6C | 850 W |
| BCH2MM091...6C | 900 W |
| BCH2MM102...6C | 1000 W |
| BCH2HM102...6C | 1000 W |
| BCH2LH103...6C | 1000 W |
| BCH2MM152...6C | 1500 W |
| BCH2MM202...6C | 2000 W |
| BCH2HM202...6C | 2000 W |
| BCH2MR202...6C | 2000 W |
| BCH2HR202...6C | 2000 W |
| BCH2LH203...6C | 2000 W |
| BCH2MR301...6C | 3000 W |
| BCH2MR302...6C | 3000 W |
| BCH2MR352...6C | 3500 W |
| BCH2MR451...6C | 4500 W |

For further information, refer to Servo Motor Type Code (*see page 54*).

Drive / Motor Combinations

The permissible Drive / Motor Combinations are detailed in the following table:

| Drive | Motor | Nominal power | Nominal speed of rotation | Nominal torque | Peak torque | Rotor inertia without holding brake | Moment of inertia |
|--|----------------|---------------|---------------------------|----------------|-------------|-------------------------------------|-------------------|
| | | W | rpm | Nm | Nm | kg.cm ² | - |
| Devices 220 Vac that can be connected via a single phase or three phases | | | | | | | |
| LXM26DUA5M3X | BCH2MBA53...5C | 50 | 3000 | 0.16 | 0.48 | 0.054 | Medium |
| LXM26DU01M3X | BCH2MB013...5C | 100 | 3000 | 0.32 | 0.96 | 0.075 | Medium |
| LXM26DU02M3X | BCH2LD023...5C | 200 | 3000 | 0.64 | 1.92 | 0.16 | Low |
| LXM26DU04M3X | BCH2MM031...6C | 300 | 1000 | 2.86 | 8.59 | 6.63 | Medium |
| | BCH2LD043...5C | 400 | 3000 | 1.27 | 3.81 | 0.27 | Low |
| | BCH2LF043...5C | 400 | 3000 | 1.27 | 3.81 | 0.67 | Low |
| LXM26DU07M3X | BCH2MM052...6C | 500 | 2000 | 2.39 | 7.16 | 6.63 | Medium |
| | BCH2MM061...6C | 600 | 1000 | 5.73 | 17.19 | 6.63 | Medium |
| | BCH2LF073...5C | 750 | 3000 | 2.39 | 7.16 | 1.19 | Low |
| | BCH2HF073...5C | 750 | 3000 | 2.39 | 7.16 | 1.54 | High |
| LXM26DU10M3X | BCH2MM081...6C | 850 | 1500 | 5.39 | 13.8 | 13.5 | Medium |
| | BCH2MM091...6C | 900 | 1000 | 8.59 | 25.77 | 9.7 | Medium |
| | BCH2LH103...6C | 1000 | 3000 | 3.18 | 9.54 | 2.4 | Low |
| | BCH2MM102...6C | 1000 | 2000 | 4.77 | 14.3 | 6.63 | Medium |
| | BCH2HM102...6C | 1000 | 2000 | 4.77 | 14.3 | 8.41 | High |
| LXM26DU15M3X | BCH2MM152...6C | 1500 | 2000 | 7.16 | 21.48 | 9.7 | Medium |
| Devices 220 Vac that can be connected via three phases | | | | | | | |
| LXM26DU20M3X | BCH2LH203...6C | 2000 | 3000 | 6.37 | 19.11 | 4.28 | Low |
| | BCH2MM202...6C | 2000 | 2000 | 9.55 | 28.65 | 13.5 | Medium |
| | BCH2MR202...6C | 2000 | 2000 | 9.55 | 28.65 | 26.5 | Medium |
| | BCH2HR202...6C | 2000 | 2000 | 9.55 | 28.65 | 34.68 | High |
| LXM26DU30M3X | BCH2MR301...6C | 3000 | 1500 | 19.1 | 57.29 | 53.56 | Medium |
| | BCH2MR302...6C | 3000 | 2000 | 14.32 | 42.97 | 53.56 | Medium |
| LXM26DU45M3X | BCH2MR352...6C | 3500 | 2000 | 16.7 | 50.3 | 53.56 | Medium |
| | BCH2MR451...6C | 4500 | 1500 | 28.65 | 71.62 | 73.32 | Medium |

Chapter 2

Document Navigator

Document Navigator

Document Content

This user guide contains following data:

- Technical data (*see page 23*)
 - Conditions for UL 508C and CSA (*see page 25*)
 - Drive (*see page 29*)
 - Motor (*see page 49*)
 - Accessories and spare parts (*see page 87*)
- Engineering (*see page 93*)
- Installation (*see page 113*)
 - Before mounting (*see page 115*)
 - Drive installation (*see page 119*)
 - Motor installation (*see page 151*)
 - Verifying installation (*see page 163*)
- Commissioning (*see page 165*)
 - Overview (*see page 167*)
 - Integrated HMI (*see page 171*)
 - Commissioning procedure (*see page 179*)
 - Tuning the control loop (*see page 187*)
- Parameters (*see page 209*)
- Operation (*see page 279*)
 - Operation (*see page 281*)
 - Operating modes (*see page 299*)
- Diagnostics and troubleshooting (*see page 357*)
- Service, maintenance and disposal (*see page 369*)

Part II

Servo Drive System Technical Data

What Is in This Part?

This part contains the following chapters:

| Chapter | Chapter Name | Page |
|---------|-----------------------------|------|
| 3 | Certifications | 25 |
| 4 | Drive | 29 |
| 5 | Motor | 49 |
| 6 | Accessories and Spare Parts | 87 |

Chapter 3

Certifications

Download links

| Item | Link |
|------------------------------------|---|
| EC Declaration of conformity | <i>LXM26 EC CERTIFICATE</i> |
| KC certificate - Reference group 1 | <i>KC_1333-B797-B43E-FC6C</i> |
| KC certificate - Reference group 2 | <i>KC_8812-6AC0-ECBC-1757</i> |
| KC certificate - Reference group 3 | <i>KC_AE96-6B40-C214-7A18</i> |
| KC certificate - Reference group 4 | <i>KC_A1BB-480B-E156-0EF1</i> |

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|------------------------|------|
| Conditions for UL 508C | 26 |
| Conditions for CSA | 27 |

Conditions for UL 508C

Introduction

The UL certification status can be downloaded on the [Schneider Electric](#) website.
If the product is used to comply with UL 508C, the following conditions must also be met.

Wiring

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

Fuses

Use fuses as per UL 248 or circuit breaker as per UL 489.

| LXM26D | UA5, U01, U02, U04, U07, U10, U15 | U20, U30, U45 |
|--|-----------------------------------|---------------|
| Maximum fuse rating of fuse to be connected upstream | 25 A | 32 A |
| Class if fuses are used | J | J |
| Class if circuit breakers are used | D | D |

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, or equivalent as defined in UL 840 and its equivalent defined in IEC 60664-1.

Conditions for CSA

The CSA certificate can be downloaded on the [Schneider Electric](#) website.

If the product is used to comply with CSA, the following conditions must also be met.

Integral solid-state short circuit protection in these drives does not provide branch circuit protection.

DANGER

ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Provide branch circuit protection in accordance with the manual instructions, National Electrical Code and any additional local codes of the type and size specified in the present document.

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

For reference groups 1, 2, 3, and 4 (see Fuse Types table), this product is suitable for use on a circuit capable of delivering not more than 200 kA RMS symmetrical amperes and 230 Vac (LXM26D•••M3X) maximum, when protected by Listed Class J, CC or RK5 fuses as indicated in this instruction manual and the Fuse Types table. Instead of fuses, protection may be provided by circuit breakers of type C60 by Schneider Electric with the maximum current ratings specified in the Fuse Types table.

For reference group 1 only, this product is suitable for motor group installation on a circuit capable of delivering not more than 5 kA RMS symmetrical amperes and 230 Vac (LXM26D•••M3X) maximum, when protected by Listed Class J or CC fuses as indicated in the instruction manual and the Fuse Types table. Instead of fuses, protection may be provided by circuit breakers of type C60 by Schneider Electric with the maximum current ratings specified in the Fuse Types table.

The opening of the branch-circuit protective device may be an indication that an electrical interruption has been detected.

DANGER

ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Examine all current carrying parts and other components of the drive controller for damage and replace if necessary before replacing fuses or engaging circuit breakers.
- Completely replace overload relays if burnout of the current element occurs.

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

Capacitive voltages above 40 V may remain for up to 15 minutes after power is removed from the drive.

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.
- 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.

These drives are provided with load and speed adjustable motor overload and short circuit protection. Adjust the parameter P1-78 'User-Defined maximal current' in the drive which protects the motor by limiting the maximum current according to the required degree of protection of the motors as indicated on the name plate.

Other Characteristics

Maximum surrounding Air Temperature: 40...55 °C (104...131 °F) with current derating of 1% per °C (per 1.8 °F).

Tightening torque for the connectors labelled ~ **220V**, **Resistor** and **Motor** for drive reference group:

- 3 and 4: 0.7 ... 0.8 Nm (6.2 ... 7 lb.in)

Fuse Types

| Reference Group | Reference | Class | Maximum Current |
|-----------------|--------------|----------------|-----------------|
| 1 | LXM26DUA5M3X | CC or J | 25 A |
| | LXM26DU01M3X | | |
| | LXM26DU02M3X | | |
| | LXM26DU04M3X | | |
| | LXM26DU07M3X | | |
| 2 | LXM26DU10M3X | RK5 or CC or J | 25 A |
| | LXM26DU15M3X | | |
| 3 | LXM26DU20M3X | RK5 or J | 45 A |
| 4 | LXM26DU30M3X | RK5 or J | 50 A |
| | LXM26DU45M3X | | |

Chapter 4

Drive

What Is in This Chapter?

This chapter contains the following sections:

| Section | Topic | Page |
|---------|----------------------|------|
| 4.1 | General Overview | 30 |
| 4.2 | Drive Technical Data | 34 |

Section 4.1

General Overview

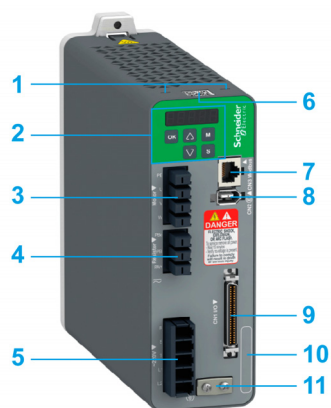
What Is in This Section?

This section contains the following topics:

| Topic | Page |
|-------------------------|------|
| Servo Drive Description | 31 |
| Servo Drive Nameplate | 32 |
| Servo Drive Type Code | 33 |

Servo Drive Description

Presentation



| Item | Description | Connector |
|------|---|----------------------------|
| 1 | Slot for application name plate (VW3M2501) | - |
| 2 | HMI: 7-segment display, 5 buttons, and 2 status LED | - |
| 3 | Terminal for motor connection | Motor (see page 145) |
| 4 | Terminal for braking resistor connection | Resistor (see page 143) |
| 5 | Terminal for connecting the power supply | ~ 220 V (see page 140) |
| 6 | QR code for access to technical data | - |
| 7 | RJ45 connector for Modbus serial link | CN3 (see page 138) |
| 8 | Connector for the encoder of the motor | CN2 (see page 136) |
| 9 | Input/output connector | CN1 (see page 125) |
| 10 | Device Reference | - |
| 11 | Screw terminal for protective ground (protective earth) | - |

Parameters Access

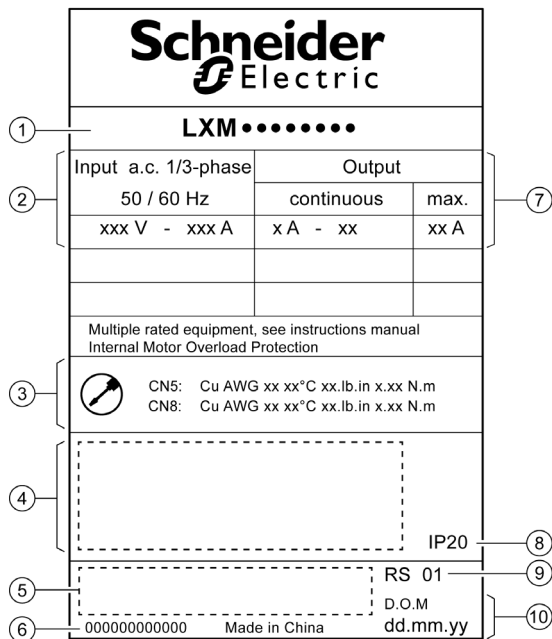
Servo drive parameters (see page 211) may be accessed using:

- The integrated HMI
- The Device Type Manager (DTM)

Servo Drive Nameplate

Presentation

The nameplate contains the following data:



| Item | Description |
|------|--|
| 1 | Drive reference (<i>see page 33</i>) |
| 2 | Logic supply |
| 3 | Cable specifications |
| 4 | Certifications |
| 5 | Barcode |
| 6 | Serial number |
| 7 | Output power |
| 8 | Degree of protection |
| 9 | Hardware version |
| 10 | Date of manufacture |

Servo Drive Type Code

Servo Drive Type Code

| Item | 1 | 2 | 3 | 4 | 5 |
|---------------------|-----|----|---|-----|-----|
| Type code (example) | LXM | 26 | D | U07 | M3X |

| Item | Meaning |
|------|---|
| 1 | Product designation LXM = Lexium |
| 2 | Product type 26 = AC servo drive for one axis |
| 3 | Interfaces D = Modbus RTU, PTI, I/O interface, commissioning via Modbus RTU |
| 4 | Continuous power UA5 = 0.05 kW U01 = 0.1 kW U02 = 0.2 kW U04 = 0.4 kW U07 = 0.75 kW U10 = 1 kW U15 = 1.5 kW U20 = 2 kW U30 = 3 kW U45 = 4.5 kW |
| 5 | Power stage supply [Vac] M3X = single phase or 3-phase, 200/230 Vac |

Section 4.2

Drive Technical Data

What Is in This Section?

This section contains the following topics:

| Topic | Page |
|----------------------------------|------|
| Environmental Conditions | 35 |
| Dimensions | 37 |
| Electrical Data | 39 |
| Single-Phase Connection | 40 |
| Three-Phase Connection | 41 |
| Inputs / Outputs Characteristics | 43 |

Environmental Conditions

Ambient Conditions During Operation

The maximum permissible ambient temperature during operation depends on the mounting distances between the devices and on the required power. Observe the instructions in the chapter Installation (*see page 120*).

| Description | Unit | Value |
|---|---------|---------------------|
| Ambient temperature without current derating (no icing, non-condensing) | °C (°F) | 0...40 (32...104) |
| Ambient temperature with current derating of 1% per 1 °C (1.8 °F) | °C (°F) | 40...55 (104...131) |

The following relative humidity is permissible during operation:

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

| Description | Unit | Value |
|---|--------|---------------|
| Installation altitude above mean sea level without current derating | m (ft) | <2000 (<6561) |

Ambient Conditions During Transportation and Storage

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


| Description | Unit | Value |
|-------------|---------|---------------------|
| Temperature | °C (°F) | -25...65 (-4...149) |

The following relative humidity is permissible during transportation and storage:

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

Installation Site and Connection

For operation, the device must be mounted in a closed control cabinet with a degree of protection of at least IP 54. The device may only be operated with a permanently installed connection.

|  DANGER | |
|---|--|
| ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH | |
| Install the drive in a control cabinet or housing with a minimum IP 54 rating. | |
| Failure to follow these instructions will result in death or serious injury. | |

Pollution Degree and Degree of Protection

| Description | Value |
|----------------------|-------|
| Pollution degree | 2 |
| Degree of protection | IP20 |

Degree of Protection When the Safety Function Is Used

You must ensure that conductive substances cannot get into the product (pollution degree 2). 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.

Vibration and Shock During Operation

| Description | Value |
|----------------------------|-------------------------------------|
| Class as per IEC 60721-3-3 | 3M4 3 mm from 9...200 Hz |
| Maximum shock | 98.1 m/s ² (10 g) Type I |

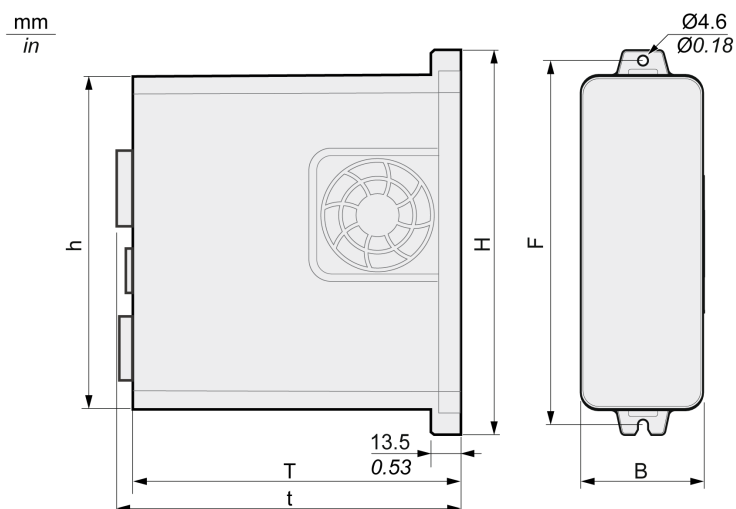
Vibration and Shock During Transportation and Storage

| Description | Value |
|----------------------------|---|
| Class as per IEC 60721-3-2 | 2M2 3.5 mm (2...9 Hz) 9.81 m/s ² (1 g) from 9...200 Hz 14.715 m/s ² (1.5 g) from 200...500 Hz 34.335 m/s ² (3.5 g) from 2...9 Hz |
| Maximum shock | 294.3 m/s ² (30 g) Type II |

Dimensions

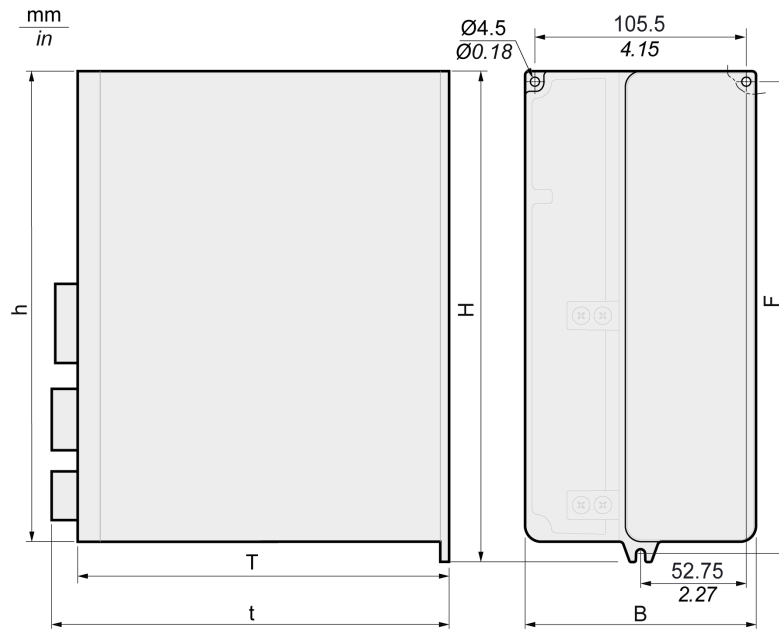
Lexium 26D Dimensions

LXM26DUA5, LXM26DU01, LXM26DU02, LXM26DU04, LXM26DU07, LXM26DU10, LXM26DU15, LXM26DU20



| LXM26D | Unit | UA5M3X, U01M3X, U02M3X, U04M3X, U07M3X | U10M3X, U15M3X | U20M3X |
|--------|---------|--|----------------|--------------|
| B | mm (in) | 55 (2.17) | 55 (2.17) | 62 (2.44) |
| H | mm (in) | 173.2 (6.82) | 173.5 (6.83) | 194.5 (7.66) |
| h | mm (in) | 150 (5.91) | 150 (5.91) | 170 (6.69) |
| F | mm (in) | 164 (6.46) | 164 (6.46) | 185 (7.28) |
| T | mm (in) | 146 (5.75) | 170 (6.69) | 184 (7.24) |
| t | mm (in) | 152.7 (6.01) | 176.3 (6.94) | 197 (7.76) |

LXM26DU30, LXM26DU45



| LXM26D | Unit | U30M3X, U45M3X |
|--------|---------|----------------|
| B | mm (in) | 116 (4.57) |
| H | mm (in) | 245 (9.65) |
| h | mm (in) | 234 (9.21) |
| F | mm (in) | 235 (9.25) |
| T | mm (in) | 186 (7.32) |
| t | mm (in) | 199 (7.83) |

Electrical Data

Introduction

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

220 Vac Mains Voltage: Range and Tolerance

LXM26D•••M3X

| Description | Unit | Value |
|--|------|---|
| 220 Vac single-phase/three-phase (LXM26D•••M3X) | Vac | 200 -15 % ... 230 +10 % |
| Frequency | Hz | 50 -5 % ... 60 +5 % |
| Transient overvoltages | – | Overvoltage category III ⁽¹⁾ |
| Rated voltage to ground | Vac | 230 |
| (1) Depends on installation altitude, see Environmental Conditions (<i>see page 35</i>) | | |

Type of Grounding

| Description | Value |
|--|--------------|
| TT grounding system, TN grounding system | Approved |
| IT mains | Not approved |
| Mains with grounded line conductor | Not approved |

Leakage Current

| Description | 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. | | |

Monitoring of the Continuous Output Power

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

PWM Frequency Power Stage

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

| LXM26D | UA5, U01, U02, U04, U07, U10, U15 | U20, U30, U45 |
|---------------------------|-----------------------------------|---------------|
| PWM frequency power stage | 16 kHz | 8 kHz |

Type of Cooling

| LXM26D | UA5, U01, U02 | U04, U07, U10, U15, U20, U30, U45 |
|-----------------|---------------|-----------------------------------|
| Type of cooling | Convection | Fan |

Permissible Drive / Motor Combinations

The BCH2 motors can be connected to the Lexium 26D drive range.

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table (*see page 20*).

Single-Phase Connection

Electrical Data for LXM26D•••M3X Drive Connected Via a Single-Phase 220 Vac

| LXM26D•••M3X | Unit | UA5 | U01 | U02 | U04 | U07 | U10 | U15 |
|---|------------------|--------------------|-------|-------|-------|-------|-------|-------|
| Nominal voltage | V | 230 (single-phase) | | | | | | |
| Inrush current limitation | A | 8 | | | | | | |
| Maximum fuse to be connected upstream ⁽¹⁾ | A | 25 | | | | | | |
| Short-circuit current rating (SCCR) | kA | 5 | | | | | | |
| Continuous output current | A _{rms} | 0.64 | 0.9 | 1.5 | 2.6 | 4.5 | 7 | 7 |
| Peak output current | A _{rms} | 2 | 2.7 | 4.5 | 7.8 | 13.5 | 21 | 21 |
| Nominal power ⁽²⁾ | W | 50 | 100 | 200 | 400 | 750 | 1000 | 1500 |
| Input current ⁽²⁾⁽³⁾ | A _{rms} | 0.8 | 1.2 | 2.4 | 3.8 | 6 | 8.5 | 10 |
| THD (total harmonic distortion) ⁽²⁾⁽⁴⁾ | % | 262.8 | 239.2 | 226.8 | 211.6 | 181.8 | 176.3 | 166.6 |
| Power dissipation ⁽⁵⁾ | W | 8 | 10 | 14 | 22 | 38 | 36 | 41 |
| Maximum inrush current ⁽⁶⁾ | A | 175 | | | | | | 235 |
| Time for maximum inrush current | ms | 0.5 | | | | | | 0.6 |
| <p>(1) As per IEC 60269; Circuit breakers with C characteristic; See Conditions for UL 508C (<i>see page 25</i>) 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.</p> <p>(2) At a mains impedance corresponding to the short-circuit current rating (SCCR)</p> <p>(3) At nominal power and nominal voltage</p> <p>(4) With reference to the input current</p> <p>(5) Condition: internal braking resistor not active; value at nominal current, nominal voltage, and nominal power; value approximately proportional with output current</p> <p>(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time</p> | | | | | | | | |

DC bus data for drives connected via a single-phase 220 Vac

| LXM26D•••M3X | Unit | UA5 | U01 | U02 | U04 | U07 | U10 | U15 |
|-------------------------------------|------|-----|-----|-----|-----|-----|------|------|
| Nominal voltage (single-phase) | Vac | 230 | | | | | | |
| Nominal voltage DC bus | Vdc | 322 | | | | | | |
| Undervoltage limit | Vdc | 160 | | | | | | |
| Overvoltage limit | Vdc | 420 | | | | | | |
| Maximum continuous power via DC bus | W | 50 | 100 | 200 | 400 | 750 | 1000 | 1500 |
| Maximum continuous power via DC bus | A | 0.2 | 0.3 | 0.6 | 1.2 | 2.3 | 3.1 | 4.6 |

Three-Phase Connection

Electrical Data for LXM26D•••M3X Drive Connected Via Three-Phase 220 Vac

| LXM26D•••M3X | Unit | UA5 | U01 | U02 | U04 | U07 | U10 | |
|---|------------------|---------------|-------|-------|-------|-------|-------|-----|
| Nominal voltage | V | 230 (3-phase) | | | | | | |
| Inrush current limitation | A | 8 | | | | | | |
| Maximum fuse to be connected upstream ⁽¹⁾ | A | 25 | | | | | | |
| Short-circuit current rating (SCCR) | kA | 5 | | | | | | |
| Continuous output current | A _{rms} | 0.64 | 0.9 | 1.5 | 2.6 | 4.5 | 7 | |
| Peak output current | A _{rms} | 2 | 2.7 | 4.5 | 7.8 | 13.5 | 21 | |
| Nominal power ⁽²⁾ | W | 50 | 100 | 200 | 400 | 750 | 1000 | |
| Input current ⁽²⁾⁽³⁾ | A _{rms} | 0.42 | 0.74 | 1.25 | 2.2 | 3.9 | 5 | |
| THD (total harmonic distortion) ⁽²⁾⁽⁴⁾ | % | 227.8 | 212.7 | 200.7 | 183.7 | 160.8 | 155.5 | |
| Power dissipation ⁽⁵⁾ | W | 8 | 10 | 14 | 22 | 38 | 36 | |
| Maximum inrush current ⁽⁶⁾ | A | 175 | | | | | | 235 |
| Time for maximum inrush current | ms | 0.5 | | | | | | 0.6 |
| <p>(1) As per IEC 60269; Circuit breakers with C characteristic; See Conditions for UL 508C (<i>see page 25</i>) 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.</p> <p>(2) At a mains impedance corresponding to the short-circuit current rating (SCCR)</p> <p>(3) At nominal power and nominal voltage</p> <p>(4) With reference to the input current</p> <p>(5) Condition: internal braking resistor not active; value at nominal current, nominal voltage, and nominal power; value approximately proportional with output current</p> <p>(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time</p> | | | | | | | | |

| LXM26D•••M3X | Unit | U15 | U20 | U30 | U45 |
|---|------------------|---------------|-------|-------|-------|
| Nominal voltage | V | 230 (3-phase) | | | |
| Inrush current limitation | A | 8 | 19.2 | 17 | |
| Maximum fuse to be connected upstream ⁽¹⁾ | A | 25 | 32 | | |
| Short-circuit current rating (SCCR) | kA | 5 | | 22 | |
| Continuous output current | A _{rms} | 7 | 12 | 19.8 | 22.8 |
| Peak output current | A _{rms} | 21 | 36 | 60 | 61 |
| Nominal power ⁽²⁾ | W | 1500 | 2000 | 3000 | 4500 |
| Input current ⁽²⁾⁽³⁾ | A _{rms} | 5.9 | 8.7 | 12.9 | 18 |
| THD (total harmonic distortion) ⁽²⁾⁽⁴⁾ | % | 144.8 | 137.1 | 155.8 | 147.1 |
| Power dissipation ⁽⁵⁾ | W | 41 | | 97 | |
| Maximum inrush current ⁽⁶⁾ | A | 235 | 295 | 300 | |
| Time for maximum inrush current | ms | 0.6 | 1.0 | | |
| <p>(1) As per IEC 60269; Circuit breakers with C characteristic; See Conditions for UL 508C (<i>see page 25</i>) 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.</p> <p>(2) At a mains impedance corresponding to the short-circuit current rating (SCCR)</p> <p>(3) At nominal power and nominal voltage</p> <p>(4) With reference to the input current</p> <p>(5) Condition: internal braking resistor not active; value at nominal current, nominal voltage, and nominal power; value approximately proportional with output current</p> <p>(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time</p> | | | | | |

DC bus data for drives connected via three-phase 220 Vac

| LXM26D***M3X | Unit | UA5 | U01 | U02 | U04 | U07 | U10 |
|-------------------------------------|-------------|------------|------------|------------|------------|------------|------------|
| Nominal voltage (three phases) | Vac | 230 | | | | | |
| Nominal voltage DC bus | Vdc | 322 | | | | | |
| Undervoltage limit | Vdc | 160 | | | | | |
| Overvoltage limit | Vdc | 420 | | | | | |
| Maximum continuous power via DC bus | W | 50 | 100 | 200 | 400 | 750 | 1000 |
| Maximum continuous power via DC bus | A | 0.2 | 0.3 | 0.6 | 1.2 | 2.3 | 3.1 |

| LXM26D***M3X | Unit | U15 | U20 | U30 | U45 |
|-------------------------------------|-------------|------------|------------|------------|------------|
| Nominal voltage (three phases) | Vac | 230 | | | |
| Nominal voltage DC bus | Vdc | 322 | | | |
| Undervoltage limit | Vdc | 160 | | | |
| Overvoltage limit | Vdc | 420 | | | |
| Maximum continuous power via DC bus | W | 1500 | 2000 | 3000 | 4500 |
| Maximum continuous power via DC bus | A | 4.6 | 6.2 | 9.2 | 13.8 |

Inputs / Outputs Characteristics

Logic Type

The outputs are short-circuit protected. The inputs and outputs are galvanically isolated.
The digital inputs and outputs of this product can be wired for positive or negative logic.

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

Digital Input Signals 24 V

When wired as positive logic, the levels of the opto-isolated inputs DI1...DI5 and DI8 comply with IEC 61131-2, type 1. The electrical characteristics are also valid when wired as negative logic.

| Description | Unit | Value |
|--|------|--------|
| "0" signal voltage | Vdc | ≤5 |
| "1" signal voltage | Vdc | ≥11 |
| Input current (typical) | mA | 6 |
| Debounce time ⁽¹⁾ | ms | 0...20 |
| (1) Adjustable via parameter P2-09 in increments of 1 ms. | | |

Digital Output Signals 24 V

The levels of the digital 24 V output signals DO• comply with IEC 61131-2.

| Description | Unit | Value |
|-----------------------------|------|-------|
| Switching voltage | Vdc | 24 |
| Maximum switching current | mA | 100 |
| Voltage drop at 100 mA load | Vdc | < 3 |

Analog Input Signals

| Description | Unit | Value |
|---------------------------|------|----------|
| Voltage range | Vdc | -10...10 |
| Input resistance, typical | kΩ | 10 |
| Resolution | Bit | 12 |
| Sampling period | μs | 32.25 |

Analog Output Signals

| Description | Unit | Value |
|--|------|--------|
| Voltage range | Vdc | -8...8 |
| Output current | mA | 10 |
| Minimum load resistance (voltage source) | kΩ | 1 |
| Resolution | Bit | 12 |
| Sampling period | ms | 1 |
| Time constant | μs | 10 |

Touch Probe Input Signals 24 V

When wired as positive logic, the levels of the opto-isolated inputs DI6 and DI7 comply with IEC 61131-2, type 1. The electrical characteristics are also valid when wired as negative logic.

| Description | Unit | Value |
|--|------|---------|
| "0" signal voltage | Vdc | ≤5 |
| "1" signal voltage | Vdc | ≥11 |
| Input current (typical) | mA | 7 |
| Debounce time ⁽¹⁾ | μs | 0...100 |
| Jitter Capture | μs | 1 |
| (1) Adjustable via parameter P2-24 in increments of 1 μs. | | |

24 Vdc Power Supply (Pin 17):

24 Vdc power supply (pin 17):

| Description | Unit | Value |
|------------------------|------|-------|
| Output voltage | Vdc | 24 |
| Maximum output current | mA | 200 |

ESIM Output Signals

The ESIM output signals comply with the RS422 interface specification.

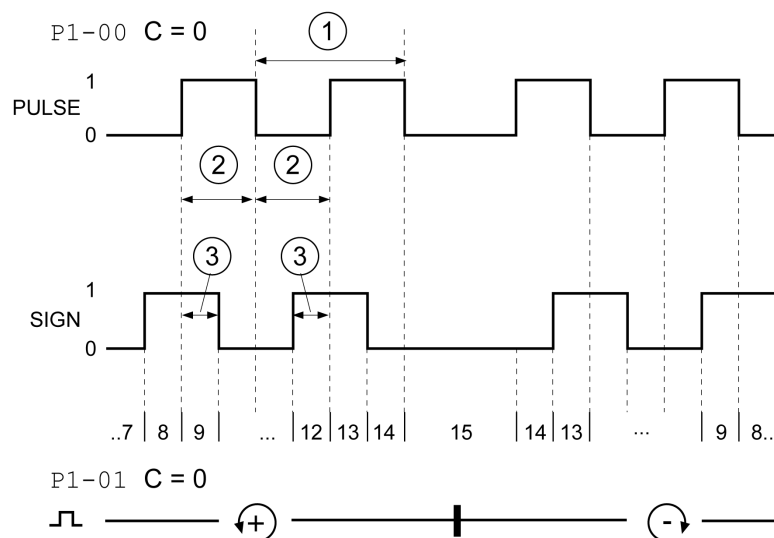
| Description | Unit | Value |
|--|------|-----------------------------|
| Logic level | – | As per RS422 ⁽¹⁾ |
| Output frequency per signal | kHz | 800 |
| Maximum output frequency (quadruple evaluation) | kHz | 3200 |
| (1) Due to the input current of the optocoupler in the input circuit, a parallel connection of a driver output to several devices is not permitted. | | |

Function A/B Signals

External A/B signals can be supplied via the PTI input as reference values in operating mode Pulse Train (Pt).

| Signal | Function |
|---------------------------------|--------------------------------|
| Signal SIGN before signal PULSE | Movement in positive direction |
| Signal PULSE before signal SIGN | Movement in negative direction |

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



The signal shape shown relates to the factory setting (P1-00 C=0). The direction of movement shown relates to the factory setting (P1-01 C=0).

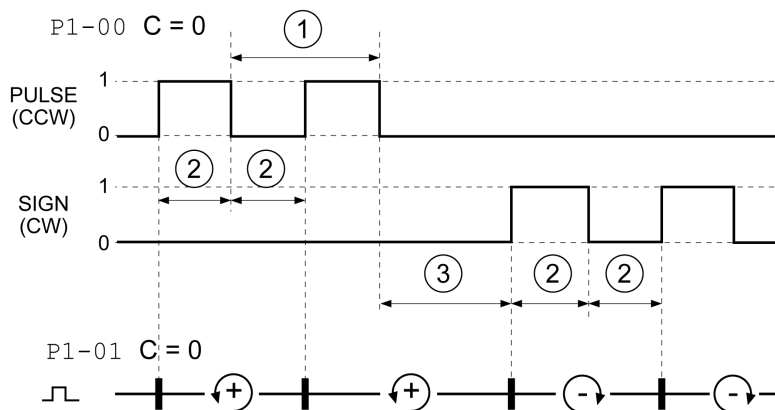
| Intervals (minimum) | HPULSE / HSIGN with RS422 | PULSE / SIGN with RS422 | PULSE / SIGN with Open Collector |
|---------------------|---------------------------|-------------------------|----------------------------------|
| 1 | 4 MHz | 500 kHz | 200 kHz |
| 2 | 0.125 μ s | 0.1 μ s | 2.5 μ s |
| 3 | 0.0625 μ s | 0.5 μ s | 1.25 μ s |

Function CW/CCW

External CW/CCW signals can be supplied via the PTI input as reference values.

| Signal | Function |
|--------------------|--------------------------------|
| Signal PULSE (CCW) | Movement in positive direction |
| Signal SIGN (CW) | Movement in negative direction |

Time chart with "CW/CCW"



The signal shape shown relates to the factory setting (P1-00 C=0). The direction of movement shown relates to the factory setting (P1-01 C=0).

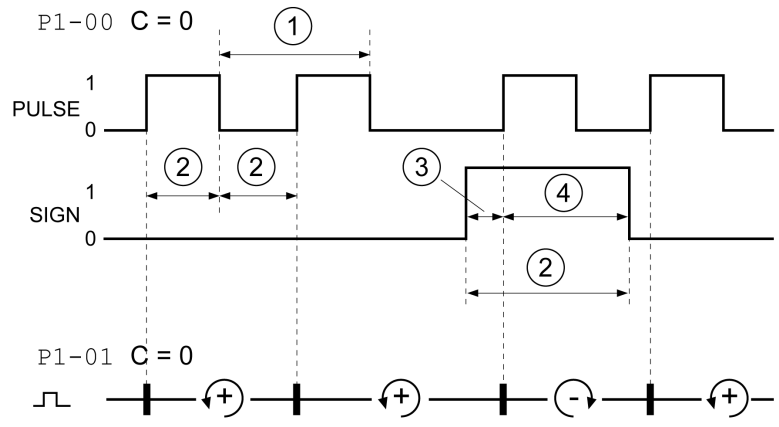
| Intervals (minimum) | HPULSE / HSIGN with RS422 | PULSE / SIGN with RS422 | PULSE / SIGN with Open Collector |
|---------------------|---------------------------|-------------------------|----------------------------------|
| 1 | 4 MHz | 500 kHz | 200 kHz |
| 2 | 0.125 μ s | 0.1 μ s | 2.5 μ s |
| 3 | 0.0625 μ s | 0.5 μ s | 1.25 μ s |

Function P/D

External P/D signals can be supplied via the PTI input as reference values.

| Signal | Function |
|--------------|-----------------------|
| Signal PULSE | Motor movement |
| Signal SIGN | Direction of movement |

Time chart with pulse/direction signal



The signal shape shown relates to the factory setting (P1-00 C=0). The direction of movement shown relates to the factory setting (P1-01 C=0).

| Intervals (minimum) | HPULSE / HSIGN with RS422 | PULSE / SIGN with RS422 | PULSE / SIGN with Open Collector |
|---------------------|---------------------------|-------------------------|----------------------------------|
| 1 | 4 MHz | 500 kHz | 200 kHz |
| 2 | 0.125 μs | 0.1 μs | 2.5 μs |
| 3 | 0.0625 μs | 0.5 μs | 1.25 μs |
| 4 | 0.0625 μs | 0.5 μs | 1.25 μs |

Chapter 5

Motor

What Is in This Chapter?

This chapter contains the following sections:

| Section | Topic | Page |
|---------|----------------------|------|
| 5.1 | General Overview | 50 |
| 5.2 | Motor Technical Data | 55 |
| 5.3 | BCH2MB Motor | 59 |
| 5.4 | BCH2LD Motor | 63 |
| 5.5 | BCH2•F Motor | 67 |
| 5.6 | BCH2LH Motor | 71 |
| 5.7 | BCH2•M Motor | 75 |
| 5.8 | BCH2•R Motor | 81 |

Section 5.1

General Overview

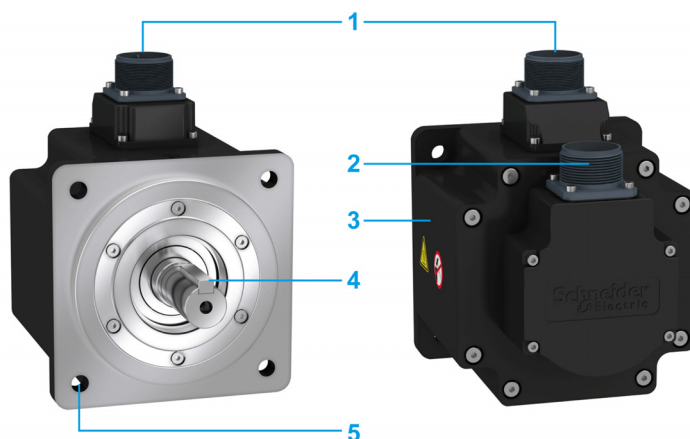
What Is in This Section?

This section contains the following topics:

| Topic | Page |
|---------------------------|------|
| Components and Interfaces | 51 |
| Servo Motor Nameplate | 52 |
| Servo Motor Type Code | 54 |

Components and Interfaces

Presentation



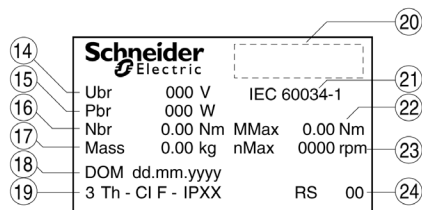
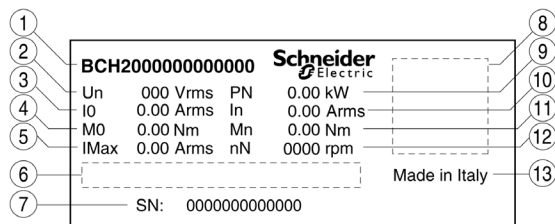
BCH2 servo motors, with a 3-phase stator and rotor with rare earth-based permanent magnets, consist of:

| Item | Description |
|------|---|
| 1 | Connector of the motor cable (<i>see page 90</i>) |
| 2 | Connector of the encoder cable (<i>see page 90</i>) |
| 3 | Housing |
| 4 | Smooth or keyed shaft end, depending on the motor reference |
| 5 | 4-point axial mounting flange |

Servo Motor Nameplate

BCH2•B

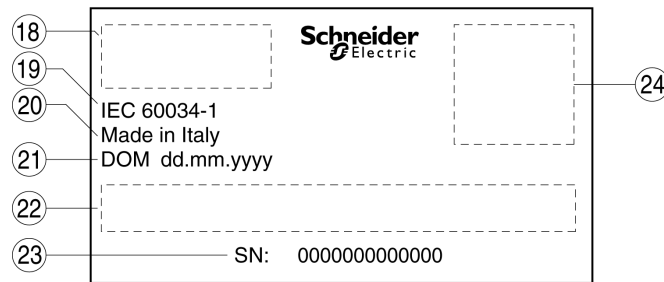
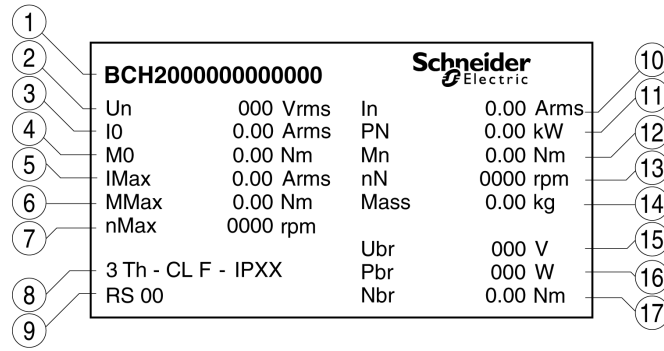
The nameplate contains the following data:



| Item | Description | Item | Description |
|------|--|------|---|
| 1 | Motor reference (<i>see page 54</i>) | 13 | Country of manufacture |
| 2 | Nominal voltage | 14 | Nominal voltage of the holding brake (optional) |
| 3 | Continuous stall current | 15 | Nominal power of the holding brake (optional) |
| 4 | Continuous stall torque | 16 | Nominal torque of the holding brake (optional) |
| 5 | Maximum current | 17 | Mass |
| 6 | Barcode | 18 | Date of manufacture DOM |
| 7 | Serial number | 19 | Number of motor phases, temperature class, degree of protection |
| 8 | QR code | 20 | Certifications |
| 9 | Nominal power | 21 | Applied standard |
| 10 | Nominal current | 22 | Peak torque |
| 11 | Nominal torque | 23 | Maximum permissible speed of rotation |
| 12 | Nominal speed of rotation | 24 | Hardware version |

BCH2•D, BCH2•F, BCH2•H, BCH2•M, and BCH2•R

The nameplate contains the following data:



| Item | Description | Item | Description |
|------|---|------|---|
| 1 | Motor reference (<i>see page 54</i>) | 13 | Nominal speed of rotation |
| 2 | Nominal voltage | 14 | Mass |
| 3 | Continuous stall current | 15 | Nominal voltage of the holding brake (optional) |
| 4 | Continuous stall torque | 16 | Nominal power of the holding brake (optional) |
| 5 | Maximum current | 17 | Nominal torque of the holding brake (optional) |
| 6 | Peak torque | 18 | Certifications |
| 7 | Maximum permissible speed of rotation | 19 | Applied standard |
| 8 | Number of motor phases, temperature class, degree of protection | 20 | Country of manufacture |
| 9 | Hardware version | 21 | Date of manufacture DOM |
| 10 | Nominal current | 22 | Barcode |
| 11 | Nominal power | 23 | Serial number |
| 12 | Nominal torque | 24 | QR code |

Servo Motor Type Code

Servo Motor Type Code

| Item | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---------------------|------|---|---|----|---|---|---|---|---|----|
| Type code (example) | BCH2 | M | B | 01 | 3 | 3 | C | A | 5 | C |

| Item | Meaning |
|---|--|
| 1 | Product family BCH2 = Brushless servo motors - second generation |
| 2 | Moment of inertia L = Low M = Medium H = High |
| 3 | Size (housing) B = 40 mm flange D = 60 mm flange F = 80 mm flange H = 100 mm flange M = 130 mm flange R = 180 mm flange |
| 4 | Nominal power A5 = 50 W 01 = 100 W 02 = 200 W 03 = 300 W 04 = 400 W 05 = 500 W 06 = 600 W 07 = 750 W 08 = 850 W 09 = 900 W 10 = 1.0 kW 13 = 1.3 kW 15 = 1.5 kW 20 = 2.0 kW 30 = 3.0 kW 35 = 3.5 kW 45 = 4.5 kW |
| 5 | Winding 1 = Optimized in terms of torque (1000 rpm/1500 rpm) 2 = Optimized in terms of torque and speed of rotation (2000 rpm) 3 = Optimized in terms of speed of rotation (3000 rpm) |
| 6 | Shaft and degree of protection⁽¹⁾ 3 = Parallel key; degree of protection: shaft and housing IP 65 |
| 7 | Encoder system C = High-resolution encoder single turn M = High-resolution encoder multi turn ⁽³⁾ |
| 8 | Holding brake A = Without holding brake F = With holding brake |
| 9 | Connection version 5 = Flying leads (for BCH2•B, BCH2•D, BCH2•F) 6 = MIL connector (for BCH2•H, BCH2•M, BCH2•R) |
| 10 | Mechanical interface - mounting C = Asian style |
| <p>(1) In the case of mounting position IM V3 (drive shaft vertical, shaft end up), the motor has degree of protection IP 50.</p> <p>(2) Only available with single turn encoder, up to 4.5 kW.</p> <p>(3) Planned marketing end of November 2018.</p> | |

Section 5.2

Motor Technical Data

What Is in This Section?

This section contains the following topics:

| Topic | Page |
|--|------|
| Environmental Conditions | 56 |
| Tightening Torque and Property Class of Screws | 57 |
| Overload Characteristics Curves | 57 |
| Encoder Technical Data | 58 |

Environmental Conditions

Ambient Conditions During Operation

The maximum permissible ambient temperature during operation depends on the mounting distances between the devices and on the required power. Observe the instructions in the chapter Installation (*see page 152*).

| Description | Unit | Value |
|--|---------|--|
| Ambient temperature ⁽¹⁾ for motors without holding brake (no icing, non-condensing). | °C (°F) | -20...40 (-4...104) |
| Ambient temperature for motors with holding brake (no icing, non-condensing). | °C (°F) | 0...40 (32...104) |
| Ambient temperature with current derating of 1% per °C (per 1.8 °F) | °C (°F) | 40...60 (104...140) |
| Relative humidity (non-condensing) | % | 5...85 |
| Class as per IEC 60721-3-3 | - | 3K3, 3Z12, 3Z2, 3B2, 3C1, 3M6 ⁽²⁾ |
| Installation altitude above mean sea level without current derating | m (ft) | <1000 (<3281) |
| Installation altitude above mean sea level with current derating of 1% per 100 m at altitudes higher than 1000 m | m (ft) | 1000...3000 (3281...9843) |
| (1) Limit values with flanged motor, see Flange Sizes for Limit Values (<i>see page 56</i>) | | |
| (2) Tested as per IEC 60068-2-6 and IEC 60068-2-27 | | |

Ambient Conditions During Transportation and Storage

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

| Description | Unit | Value |
|--|---------|----------------------|
| Temperature | °C (°F) | -40...70 (-40...158) |
| Relative humidity (non-condensing) | % | ≤75 |
| Set of class combinations as per IEC 60721-3-2 | - | IE 21 |

Flange Sizes for Limit Values

Limit values referring to this table relate to flanged motors with the following flange sizes:

| Motor | Flange material | Flange size in [mm (in)] |
|--------|-----------------|-------------------------------------|
| BCH2MB | Aluminum | 185 x 185 x 8 (7.28 x 7.28 x 0.31) |
| BCH2LD | Aluminum | 250 x 250 x 12 (9.84 x 9.84 x 0.47) |
| BCH2•F | Aluminum | 250 x 250 x 12 (9.84 x 9.84 x 0.47) |
| BCH2LH | Steel | 300 x 300 x 20 (11.8 x 11.8 x 0.79) |
| BCH2•M | Steel | 400 x 400 x 20 (15.7 x 15.7 x 0.79) |
| BCH2•R | Steel | 550 x 550 x 20 (21.7 x 21.7 x 0.79) |

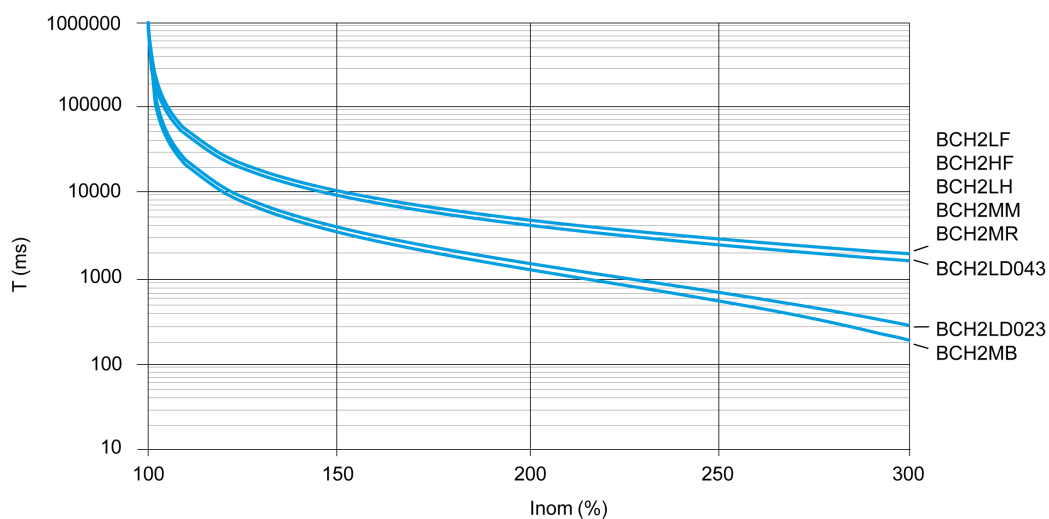
Compatibility with Foreign Substances

The motor has been tested for compatibility with many known substances and with the latest available knowledge at the moment of the design. Nonetheless, you must perform a compatibility test before using a foreign substance.

Tightening Torque and Property Class of Screws

| Housing screws | Unit | Tightening torque |
|------------------------------|------------|-------------------|
| M3 x 0.50 | Nm (lb.in) | 1 (8.85) |
| M4 x 0.70 | Nm (lb.in) | 2.9 (25.67) |
| M5 x 0.80 | Nm (lb.in) | 5.9 (52.22) |
| M6 x 1.00 | Nm (lb.in) | 9.9 (87.62) |
| M7 x 1.25 | Nm (lb.in) | 24 (212.40) |
| M8 x 1.50 | Nm (lb.in) | 49 (433.65) |
| Property class of the screws | H | 8.8 |

Overload Characteristics Curves



Encoder Technical Data

Overview

The drive can access the electronic nameplate via the electronic interface of the encoder for easy commissioning.

The signals meet the PELV requirements.

Depending on the motor reference, the motor are delivered with a single turn encoder or a multi turn encoder.

Single Turn Encoder

Technical data

| Description | Value |
|---------------------------------------|----------------------------|
| Measuring range absolute | 1 revolution |
| Resolution in increments | Depending on evaluation |
| Accuracy of position | $\pm 0.044^\circ$ |
| Supply voltage | 4.1...5.25 Vdc |
| Maximum supply current | 100 mA |
| Maximum permissible speed of rotation | 6000 rpm |
| Maximum angular acceleration | 100,000 rad/s ² |

Multi Turn Encoder

Technical data

| Description | Value |
|---|--|
| Measuring range absolute | 1 revolution |
| Resolution in increments | Depending on evaluation |
| Accuracy of position | $\pm 0.044^\circ$ |
| Supply voltage | 4.1...5.25 Vdc |
| Maximum supply current | 40 μ A |
| Maximum permissible speed of rotation | 6000 rpm |
| Maximum angular acceleration | 100,000 rad/s ² |
| Battery nominal voltage | 3.6 Vdc |
| Battery nominal current consumption while the encoder is not powered by the drive | 20 μ A at standstill 40 μ A with rotating shaft |
| Battery life time (at 25 °C) | 7 years |

The multi turn counting is preserved through power down by an external battery.

- For further information on the battery compartment connection, refer to the motor encoder connection ([see page 137](#)).
- For further information on the battery replacement, refer to the maintenance of the motor ([see page 377](#)).

Section 5.3

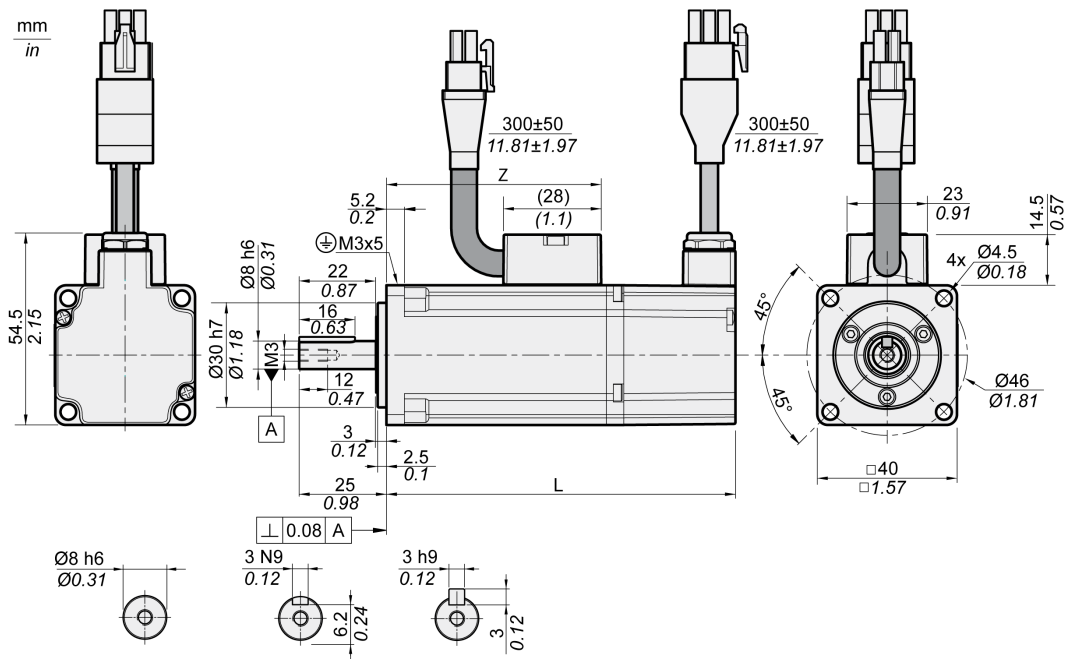
BCH2MB Motor

What Is in This Section?

This section contains the following topics:

| Topic | Page |
|------------------------------|------|
| BCH2MB Dimensions | 60 |
| BCH2MB Characteristics Table | 61 |
| BCH2MB Curves | 62 |

BCH2MB Dimensions

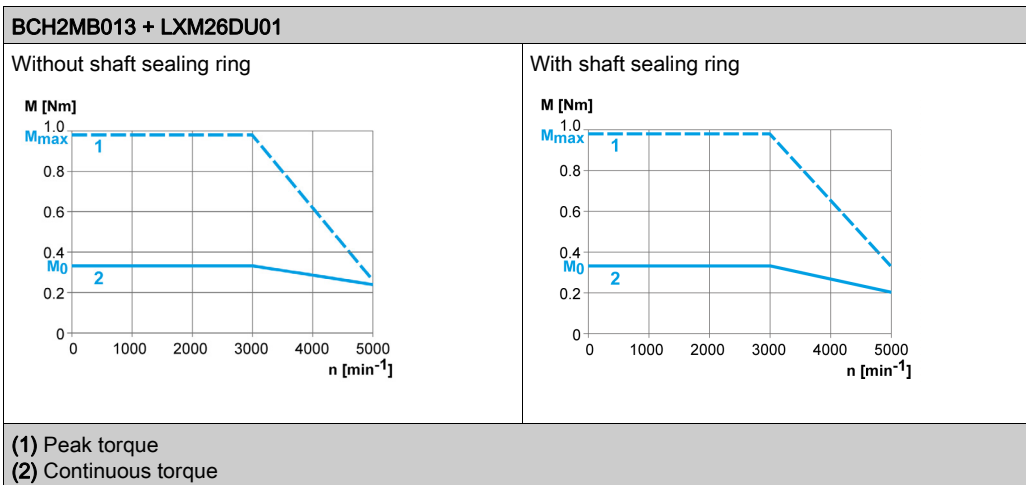
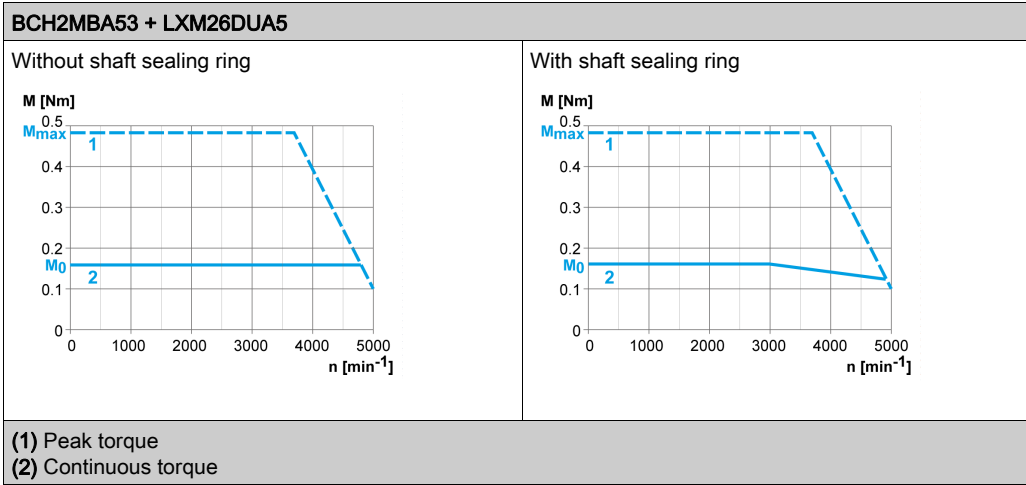


| BCH2MB | Unit | A5 | 01 |
|---------------------------|---------|-------------|-------------|
| L (without holding brake) | mm (in) | 82 (3.23) | 100 (3.94) |
| L (with holding brake) | mm (in) | 112 (4.41) | 130 (5.12) |
| Z | mm (in) | 43.5 (1.71) | 61.5 (2.42) |

BCH2MB Characteristics Table

| BCH2MB ⁽¹⁾ | | | A53 | 013 |
|--|--------------------------------|-----------|-------------------|-----------|
| Technical data - general | | | | |
| Continuous stall torque ⁽²⁾ | M_0 | Nm | 0.16 | 0.32 |
| Peak torque | M_{max} | Nm | 0.48 | 0.96 |
| With supply voltage $U_n = 230$ Vac | | | | |
| Nominal speed of rotation | n_N | rpm | 3000 | 3000 |
| Nominal torque | M_N | Nm | 0.16 | 0.32 |
| Nominal Current | I_N | A_{rms} | 0.59 | 0.89 |
| Nominal power | P_N | kW | 0.05 | 0.10 |
| Technical data - electrical | | | | |
| Maximum winding voltage | U_{max} | Vac | 255 | 255 |
| Maximum winding voltage | U_{max} | Vdc | 360 | 360 |
| Maximum voltage to ground | – | Vac | 255 | 255 |
| Maximum Current | I_{max} | A_{rms} | 1.8 | 2.7 |
| Continuous stall current | I_0 | A_{rms} | 0.54 | 0.81 |
| Voltage constant ⁽³⁾ | $k_{E\text{U-V}}$ | V_{rms} | 18 | 24 |
| Torque constant ⁽⁴⁾ | k_t | Nm/A | 0.30 | 0.40 |
| Winding resistance | $R_{20\text{U-V}}$ | Ω | 31.0 | 23.4 |
| Winding inductance | $L_{q\text{U-V}}$ | mH | 26.4 | 21.5 |
| Winding inductance | $L_{d\text{U-V}}$ | mH | 24.7 | 20.6 |
| Technical data - mechanical | | | | |
| Maximum permissible speed of rotation | n_{max} | rpm | 5000 | 5000 |
| Rotor inertia without brake | Hardware version RS 01 or RS 2 | J_M | kgcm ² | 0.054 |
| | Hardware version RS 03 | | | 0.065 |
| Rotor inertia with brake | Hardware version RS 01 or RS 2 | J_M | kgcm ² | 0.055 |
| | Hardware version RS 03 | | | 0.066 |
| Mass without brake | m | kg | 0.40 | 0.56 |
| Mass with brake | m | kg | 0.60 | 0.77 |
| Degree of protection of the shaft | – | – | IP 65 | IP 65 |
| Degree of protection of the housing | – | – | IP 65 | IP 65 |
| Technical data - holding brake | | | | |
| Holding torque | – | Nm | 0.32 | 0.32 |
| Nominal voltage | – | Vdc | 24 +/-10% | 24 +/-10% |
| Nominal power (electrical pull-in power) | – | W | 4.4 | 4.4 |
| <p>(1) Limit values with flanged motor:</p> <ul style="list-style-type: none"> ○ Flange material: Aluminum ○ Flange size in mm (in): 185 x 185 x 8 (7.28 x 7.28 x 0.31) <p>(2) M_0 = Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %.</p> <p>(3) RMS value at 1000 rpm and 20 °C (68 °F).</p> <p>(4) At $n = 20$ rpm and 20 °C (68 °F).</p> | | | | |

BCH2MB Curves



Section 5.4

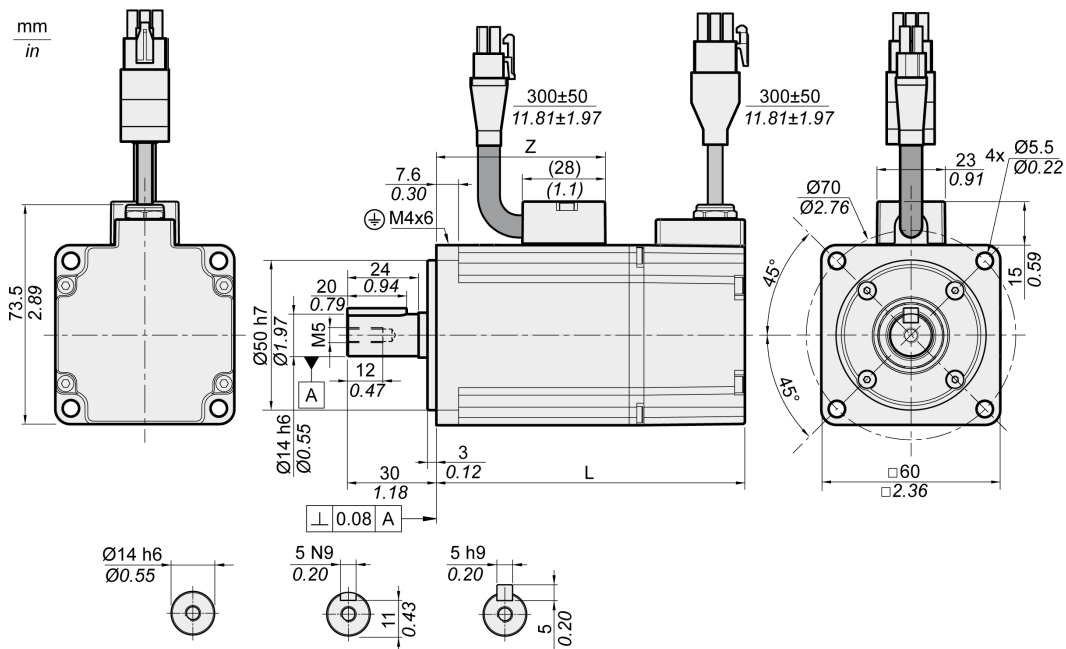
BCH2LD Motor

What Is in This Section?

This section contains the following topics:

| Topic | Page |
|------------------------------|------|
| BCH2LD Dimensions | 64 |
| BCH2LD Characteristics Table | 65 |
| BCH2LD Curves | 66 |

BCH2LD Dimensions

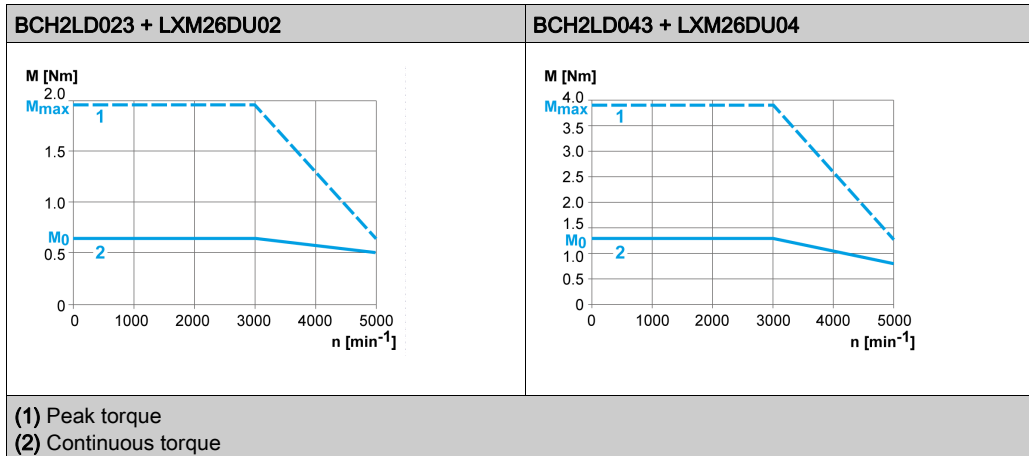


| BCH2LD | Unit | 02 | 04 |
|---------------------------|---------|------------|------------|
| L (without holding brake) | mm (in) | 104 (4.09) | 129 (5.08) |
| L (with holding brake) | mm (in) | 140 (5.51) | 165 (6.5) |
| Z | mm (in) | 57 (2.24) | 82 (3.23) |

BCH2LD Characteristics Table

| BCH2LD ⁽¹⁾ | | | 023 | 043 |
|--|--------------------|-------------------|-----------|-----------|
| Technical data - general | | | | |
| Continuous stall torque ⁽²⁾ | M_0 | Nm | 0.64 | 1.27 |
| Peak torque | M_{max} | Nm | 1.92 | 3.81 |
| With supply voltage $U_n = 230$ Vac | | | | |
| Nominal speed of rotation | n_N | rpm | 3000 | 3000 |
| Nominal torque | M_N | Nm | 0.64 | 1.27 |
| Nominal Current | I_N | A_{rms} | 1.30 | 2.50 |
| Nominal power | P_N | kW | 0.20 | 0.40 |
| Technical data - electrical | | | | |
| Maximum winding voltage | U_{max} | Vac | 255 | 255 |
| Maximum winding voltage | U_{max} | Vdc | 360 | 360 |
| Maximum voltage to ground | – | Vac | 255 | 255 |
| Maximum Current | I_{max} | A_{rms} | 4.5 | 7.8 |
| Continuous stall current | I_0 | A_{rms} | 1.11 | 2.19 |
| Voltage constant ⁽³⁾ | $k_{E\text{U-V}}$ | V_{rms} | 35 | 35 |
| Torque constant ⁽⁴⁾ | k_t | Nm/A | 0.58 | 0.58 |
| Winding resistance | $R_{20\text{U-V}}$ | Ω | 12.2 | 5.2 |
| Winding inductance | $L_{q\text{U-V}}$ | mH | 24.8 | 12.5 |
| Winding inductance | $L_{d\text{U-V}}$ | mH | 22.7 | 12.0 |
| Technical data - mechanical | | | | |
| Maximum permissible speed of rotation | n_{max} | rpm | 5000 | 5000 |
| Rotor inertia without brake | J_M | kgcm ² | 0.15 | 0.26 |
| Rotor inertia with brake | J_M | kgcm ² | 0.16 | 0.27 |
| Mass without brake | m | kg | 1.02 | 1.45 |
| Mass with brake | m | kg | 1.50 | 2.00 |
| Degree of protection of the shaft | – | – | IP 65 | IP 65 |
| Degree of protection of the housing | – | – | IP 65 | IP 65 |
| Technical data - holding brake | | | | |
| Holding torque | – | Nm | 1.3 | 1.3 |
| Nominal voltage | – | Vdc | 24 +/-10% | 24 +/-10% |
| Nominal power (electrical pull-in power) | – | W | 11.2 | 11.2 |
| <p>(1) Limit values with flanged motor:</p> <ul style="list-style-type: none"> ○ Flange material: Aluminum ○ Flange size in mm (in): 250 x 250 x 12 (9.84 x 9.84 x 0.47) <p>(2) M_0=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %</p> <p>(3) RMS value at 1000 rpm and 20 °C (68 °F).</p> <p>(4) At $n = 20$ rpm and 20 °C (68 °F).</p> | | | | |

BCH2LD Curves



Section 5.5

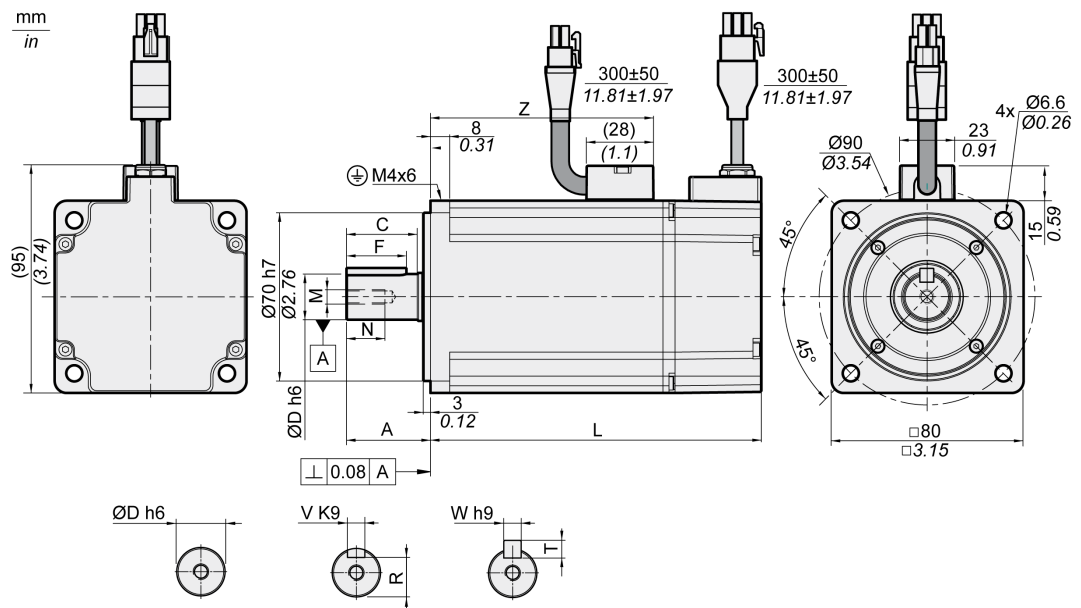
BCH2•F Motor

What Is in This Section?

This section contains the following topics:

| Topic | Page |
|------------------------------|------|
| BCH2•F Dimensions | 68 |
| BCH2•F Characteristics Table | 69 |
| BCH2•F Curves | 70 |

BCH2•F Dimensions

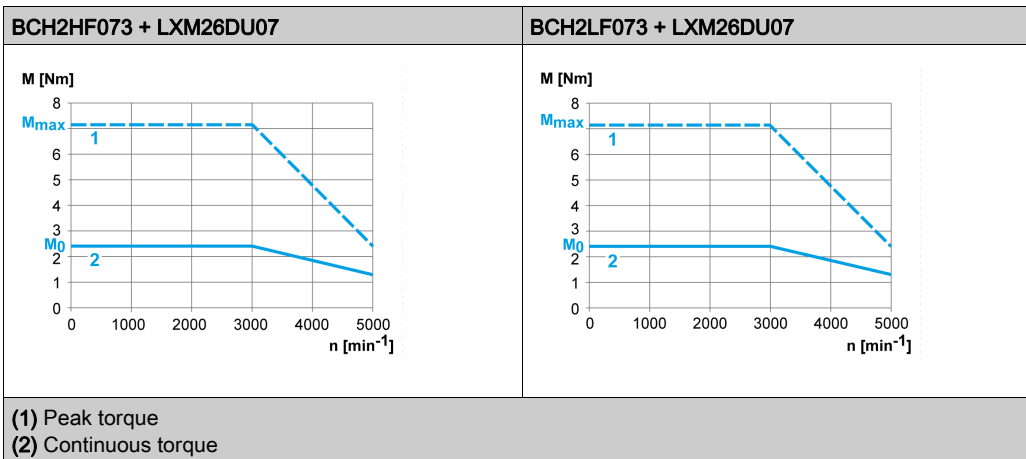
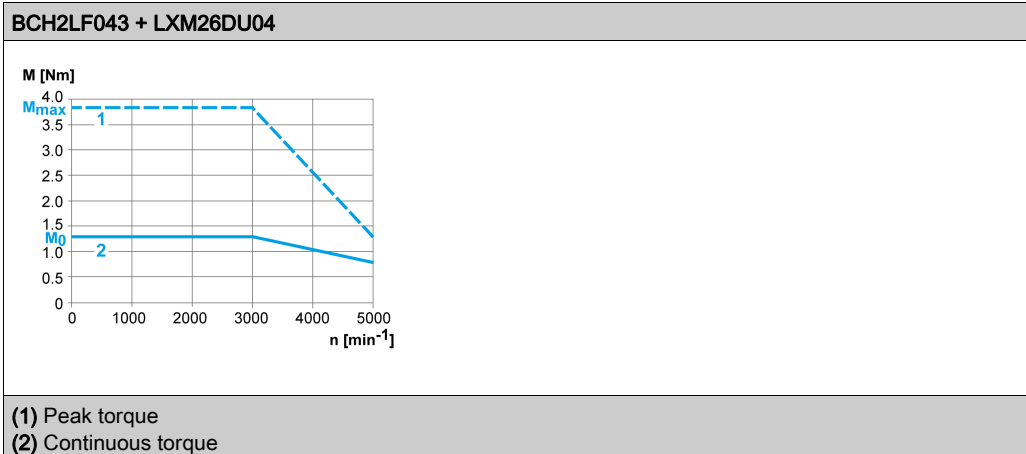


| BCH2 | Unit | LF04 | HF07 | LF07 |
|---------------------------|---------|-------------|-------------|-------------|
| L (without holding brake) | mm (in) | 112 (4.41) | 138 (5.43) | 138 (5.43) |
| L (with holding brake) | mm (in) | 152 (5.98) | 178 (7.01) | 178 (7.01) |
| A | mm (in) | 30 (1.18) | 35 (1.38) | 35 (1.38) |
| C | mm (in) | 24.5 (0.96) | 29.5 (1.16) | 29.5 (1.16) |
| D | mm (in) | 14 (0.55) | 19 (0.75) | 19 (0.75) |
| F | mm (in) | 20 (0.79) | 25 (0.98) | 25 (0.98) |
| M | - | M5 | M6 | M6 |
| N | mm (in) | 12 (0.47) | 16 (0.63) | 16 (0.63) |
| R | mm (in) | 11 (0.43) | 15.5 (0.61) | 15.5 (0.61) |
| T | mm (in) | 5 (0.2) | 6 (0.24) | 6 (0.24) |
| V | mm (in) | 5 (0.2) | 6 (0.24) | 6 (0.24) |
| W | mm (in) | 5 (0.2) | 6 (0.24) | 6 (0.24) |
| Z | mm (in) | 68 (2.68) | 93 (3.66) | 93 (3.66) |

BCH2•F Characteristics Table

| BCH2 ⁽¹⁾ | | | LF043 | HF073 | LF073 |
|--|-------------|-------------------|-----------|-----------|-----------|
| Technical data - general | | | | | |
| Continuous stall torque ⁽²⁾ | M_0 | Nm | 1.27 | 2.39 | 2.39 |
| Peak torque | M_{max} | Nm | 3.81 | 7.16 | 7.16 |
| With supply voltage $U_n = 230$ Vac | | | | | |
| Nominal speed of rotation | n_N | rpm | 3000 | 3000 | 3000 |
| Nominal torque | M_N | Nm | 1.27 | 2.39 | 2.39 |
| Nominal Current | I_N | A_{rms} | 2.52 | 4.29 | 4.29 |
| Nominal power | P_N | kW | 0.40 | 0.75 | 0.75 |
| Technical data - electrical | | | | | |
| Maximum winding voltage | U_{max} | Vac | 255 | 255 | 255 |
| Maximum winding voltage | U_{max} | Vdc | 360 | 360 | 360 |
| Maximum voltage to ground | – | Vac | 255 | 255 | 255 |
| Maximum Current | I_{max} | A_{rms} | 7.8 | 13.5 | 13.5 |
| Continuous stall current | I_0 | A_{rms} | 2.29 | 4.01 | 4.01 |
| Voltage constant ⁽³⁾ | $k_E U-v$ | V_{rms} | 33.5 | 36 | 36 |
| Torque constant ⁽⁴⁾ | k_t | Nm/A | 0.55 | 0.60 | 0.60 |
| Winding resistance | R_{20U-v} | Ω | 3.20 | 1.50 | 1.50 |
| Winding inductance | $L_q U-v$ | mH | 12.0 | 6.6 | 6.6 |
| Winding inductance | $L_d U-v$ | mH | 11.3 | 6.1 | 6.1 |
| Technical data - mechanical | | | | | |
| Maximum permissible speed of rotation | n_{max} | rpm | 5000 | 5000 | 5000 |
| Rotor inertia without brake | J_M | kgcm ² | 0.66 | 1.53 | 1.18 |
| Rotor inertia with brake | J_M | kgcm ² | 0.71 | 1.58 | 1.23 |
| Mass without brake | m | kg | 2.00 | 2.90 | 2.80 |
| Mass with brake | m | kg | 2.80 | 3.70 | 3.60 |
| Degree of protection of the shaft | – | – | IP 65 | IP 65 | IP 65 |
| Degree of protection of the housing | – | – | IP 65 | IP 65 | IP 65 |
| Technical data - holding brake | | | | | |
| Holding torque | – | Nm | 2.5 | 2.5 | 2.5 |
| Nominal voltage | – | Vdc | 24 +/-10% | 24 +/-10% | 24 +/-10% |
| Nominal power (electrical pull-in power) | – | W | 10.2 | 10.2 | 10.2 |
| <p>(1) Limit values with flanged motor:</p> <ul style="list-style-type: none"> ○ Flange material: Aluminum ○ Flange size in mm (in): 250 x 250 x 12 (9.84 x 9.84 x 0.47) <p>(2) M_0=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %</p> <p>(3) RMS value at 1000 rpm and 20 °C (68 °F).</p> <p>(4) At $n = 20$ rpm and 20 °C (68 °F).</p> | | | | | |

BCH2•F Curves



Section 5.6

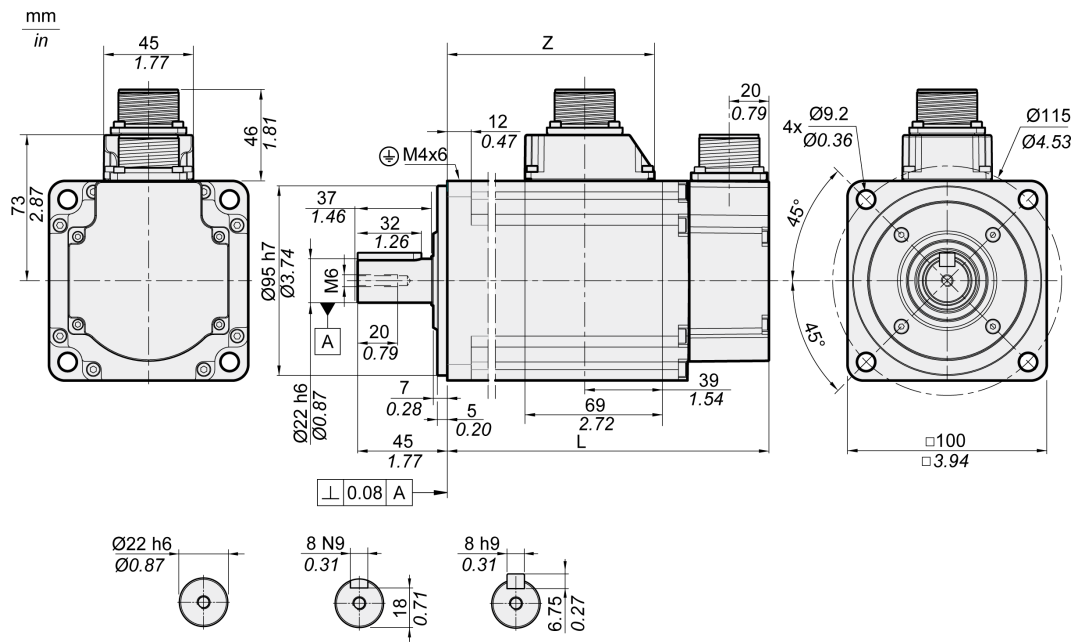
BCH2LH Motor

What Is in This Section?

This section contains the following topics:

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| BCH2LH Dimensions | 72 |
| BCH2LH Characteristics Table | 73 |
| BCH2LH Curves | 74 |

BCH2LH Dimensions

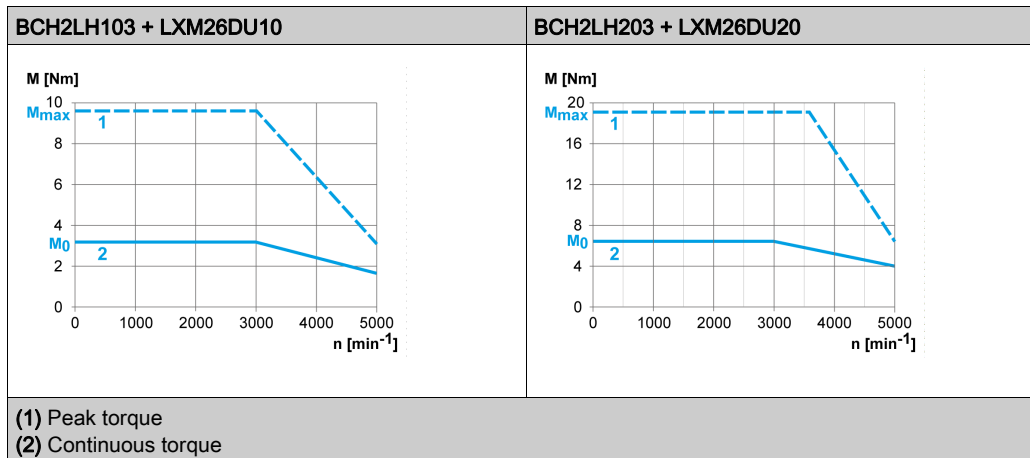


| BCH2LH | Unit | 103 | 203 |
|---------------------------|---------|--------------|--------------|
| L (without holding brake) | mm (in) | 153.5 (6.04) | 198.5 (7.81) |
| L (with holding brake) | mm (in) | 180.5 (7.11) | 225.5 (8.88) |
| Z | mm (in) | 96 (3.78) | 141 (5.55) |

BCH2LH Characteristics Table

| BCH2LH ⁽¹⁾ | | | 103 | 203 |
|---|--------------------|-------------------|-----------|-----------|
| Technical data - general | | | | |
| Continuous stall torque ⁽²⁾ | M_0 | Nm | 3.18 | 6.37 |
| Peak torque | M_{max} | Nm | 9.54 | 19.11 |
| With supply voltage $U_n = 230$ Vac | | | | |
| Nominal speed of rotation | n_N | rpm | 3000 | 3000 |
| Nominal torque | M_N | Nm | 3.18 | 6.37 |
| Nominal Current | I_N | A_{rms} | 6.64 | 10.27 |
| Nominal power | P_N | kW | 1.00 | 2.00 |
| Technical data - electrical | | | | |
| Maximum winding voltage | U_{max} | Vac | 255 | 255 |
| Maximum winding voltage | U_{max} | Vdc | 360 | 360 |
| Maximum voltage to ground | – | Vac | 255 | 255 |
| Maximum Current | I_{max} | A_{rms} | 20.0 | 35.0 |
| Continuous stall current | I_0 | A_{rms} | 5.83 | 9.87 |
| Voltage constant ⁽³⁾ | $k_{E\text{U-V}}$ | V_{rms} | 33 | 39 |
| Torque constant ⁽⁴⁾ | k_t | Nm/A | 0.55 | 0.65 |
| Winding resistance | $R_{20\text{U-V}}$ | Ω | 0.67 | 0.36 |
| Winding inductance | $L_{q\text{U-V}}$ | mH | 4.3 | 2.6 |
| Winding inductance | $L_{d\text{U-V}}$ | mH | 4.20 | 2.59 |
| Technical data - mechanical | | | | |
| Maximum permissible speed of rotation | n_{max} | rpm | 5000 | 5000 |
| Rotor inertia without brake | J_M | kgcm ² | 2.39 | 4.27 |
| Rotor inertia with brake | J_M | kgcm ² | 2.44 | 4.34 |
| Mass without brake | m | kg | 4.60 | 6.70 |
| Mass with brake | m | kg | 5.10 | 7.20 |
| Degree of protection of the shaft | – | – | IP 65 | IP 65 |
| Degree of protection of the housing | – | – | IP 65 | IP 65 |
| Technical data - holding brake | | | | |
| Holding torque | – | Nm | 6.5 | 6.5 |
| Nominal voltage | – | Vdc | 24 +/-10% | 24 +/-10% |
| Nominal power (electrical pull-in power) | – | W | 10.4 | 10.4 |
| <p>(1) Limit values with flanged motor:</p> <ul style="list-style-type: none"> ○ Flange material: Steel ○ Flange size in mm (in): 300 x 300 x 20 (11.8 x 11.8 x 0.79) <p>(2) M_0=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %</p> <p>(3) RMS value at 1000 rpm and 20 °C (68 °F).</p> <p>(4) At $n = 20$ rpm and 20 °C (68 °F).</p> | | | | |

BCH2LH Curves



Section 5.7

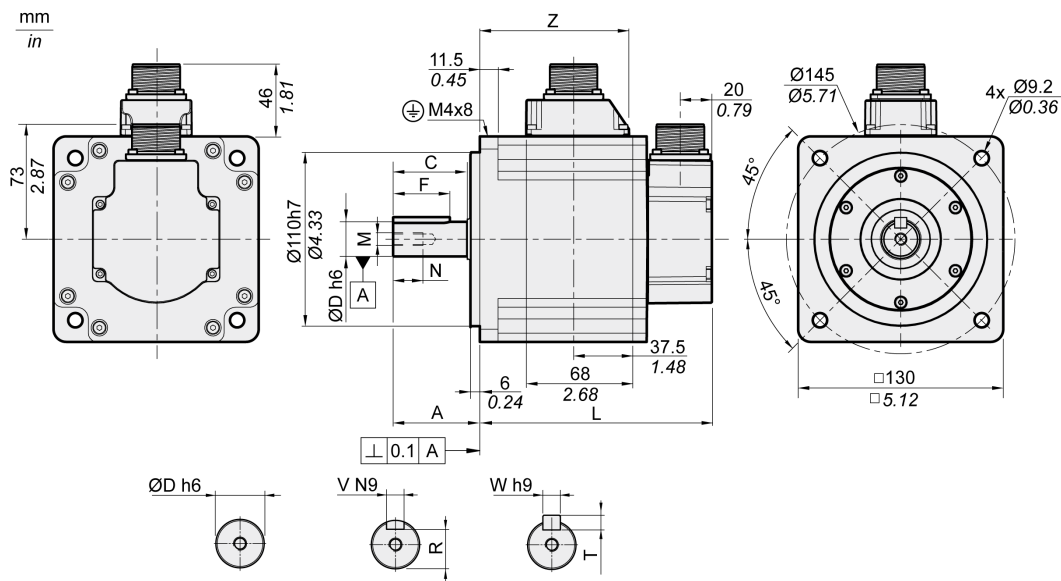
BCH2•M Motor

What Is in This Section?

This section contains the following topics:

| Topic | Page |
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| BCH2•M Dimensions | 76 |
| BCH2•M Characteristics Table | 77 |
| BCH2•M Curves | 79 |

BCH2•M Dimensions



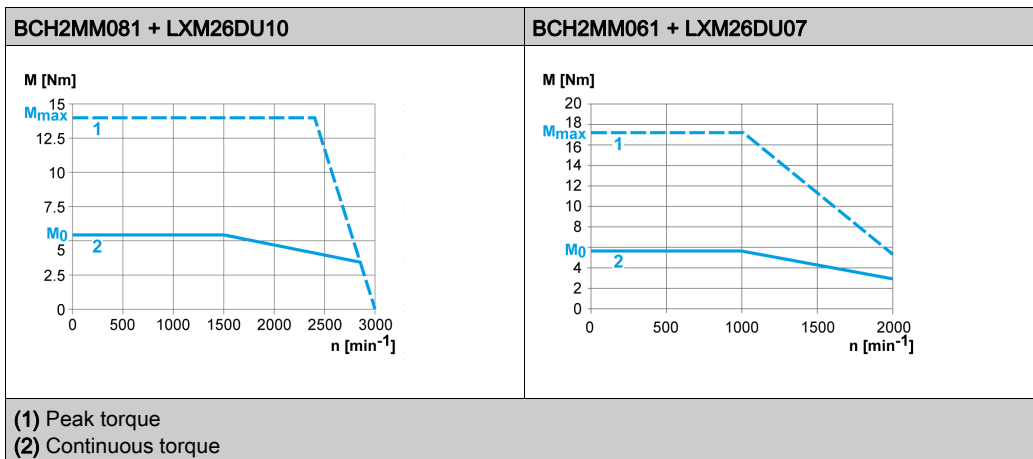
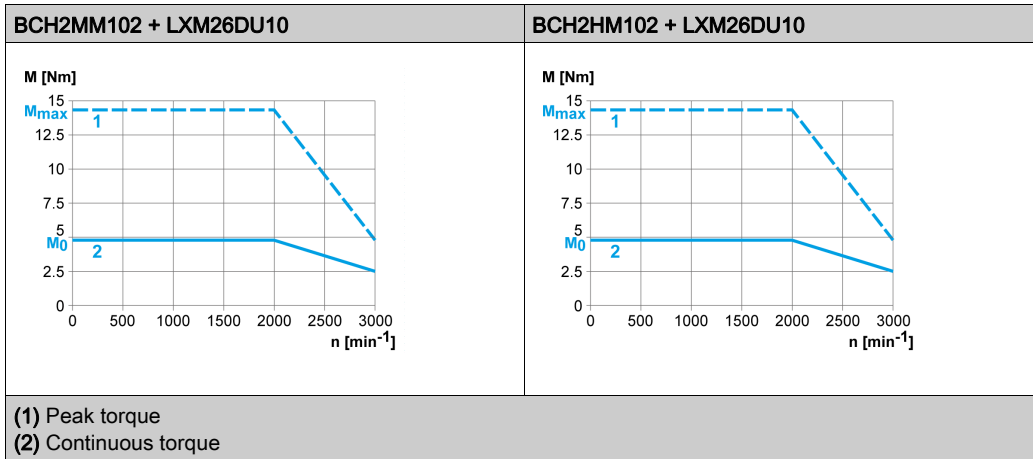
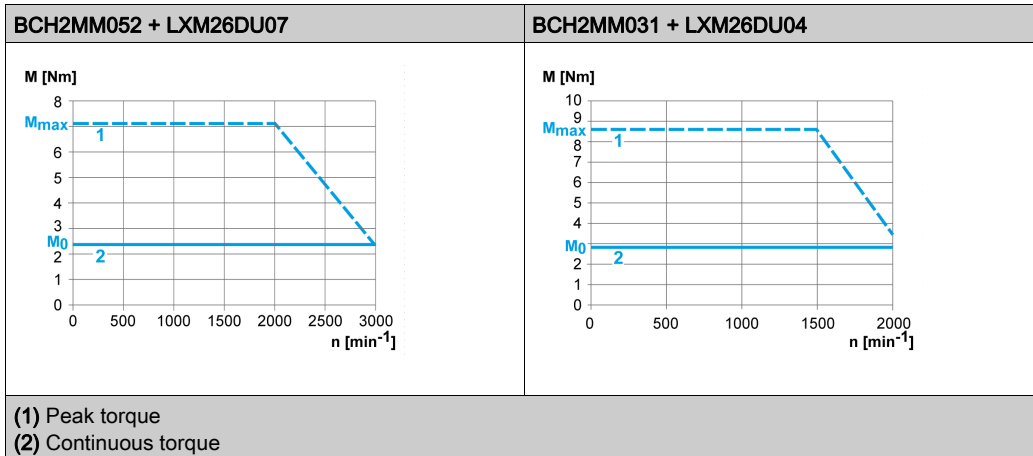
| BCH2•M | Unit | 08 | 03, 05, 06, 10 | 09, 15 | 20 |
|---------------------------|---------|--------------|----------------|--------------|--------------|
| L (without holding brake) | mm (in) | 187 (7.36) | 147 (5.79) | 163 (6.42) | 187 (7.36) |
| L (with holding brake) | mm (in) | 216 (8.5) | 176 (6.93) | 192 (7.56) | 216 (8.5) |
| A | mm (in) | 48 (1.89) | 55 (2.17) | 55 (2.17) | 55 (2.17) |
| C | mm (in) | 40 (1.57) | 47 (1.85) | 47 (1.85) | 47 (1.85) |
| D | mm (in) | 19 (0.75) | 22 (0.87) | 22 (0.87) | 22 (0.87) |
| F | mm (in) | 25 (0.98) | 36 (1.42) | 36 (1.42) | 36 (1.42) |
| M | - | M6 | M8 | M8 | M8 |
| N | mm (in) | 16 (0.63) | 19 (0.75) | 19 (0.75) | 19 (0.75) |
| R | mm (in) | 15.5 (0.61) | 18 (0.71) | 18 (0.71) | 18 (0.71) |
| T | mm (in) | 6 (0.24) | 7 (0.28) | 7 (0.28) | 7 (0.28) |
| V | mm (in) | 6 (0.24) | 8 (0.31) | 8 (0.31) | 8 (0.31) |
| W | mm (in) | 6 (0.24) | 8 (0.31) | 8 (0.31) | 8 (0.31) |
| Z | mm (in) | 134.5 (5.30) | 94.5 (3.72) | 110.5 (4.35) | 134.5 (5.30) |

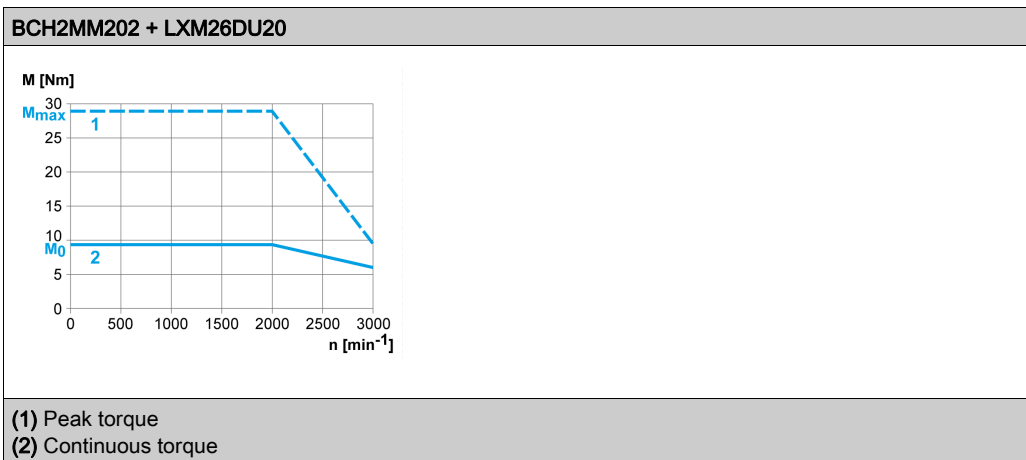
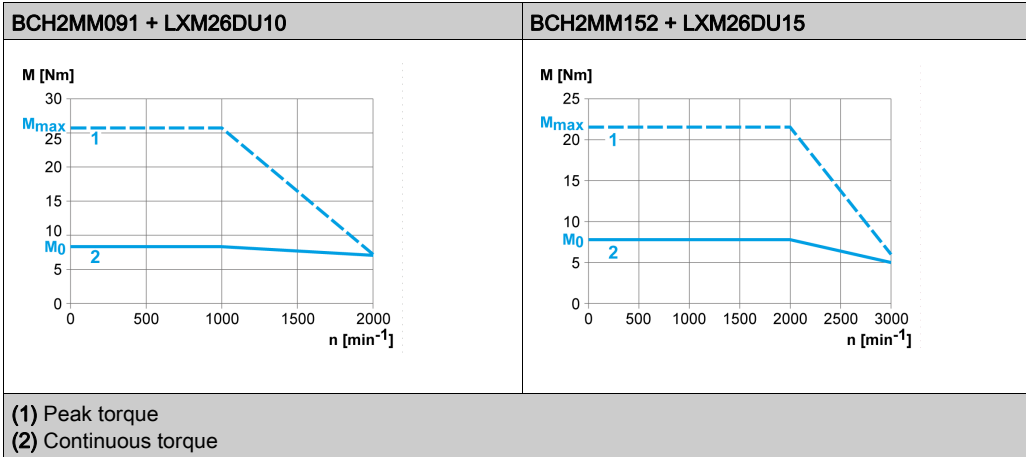
BCH2•M Characteristics Table

| BCH2 ⁽¹⁾ | | | MM052 | MM031 | MM102 | HM102 | MM081 |
|---|--------------------|-------------------|-----------|-----------|-----------|-----------|-----------|
| Technical data - general | | | | | | | |
| Continuous stall torque ⁽²⁾ | M_0 | Nm | 2.39 | 2.86 | 4.77 | 4.77 | 5.39 |
| Peak torque | M_{max} | Nm | 7.16 | 8.59 | 14.30 | 14.30 | 13.80 |
| With supply voltage $U_n = 230$ Vac | | | | | | | |
| Nominal speed of rotation | n_N | rpm | 2000 | 1000 | 2000 | 2000 | 1500 |
| Nominal torque | M_N | Nm | 2.39 | 2.86 | 4.77 | 4.77 | 5.39 |
| Nominal Current | I_N | A_{rms} | 3.24 | 2.09 | 6.29 | 6.29 | 6.29 |
| Nominal power | P_N | kW | 0.50 | 0.30 | 1.00 | 1.00 | 0.85 |
| Technical data - electrical | | | | | | | |
| Maximum winding voltage | U_{max} | Vac | 255 | 255 | 255 | 255 | 255 |
| Maximum winding voltage | U_{max} | Vdc | 360 | 360 | 360 | 360 | 360 |
| Maximum voltage to ground | – | Vac | 255 | 255 | 255 | 255 | 255 |
| Maximum Current | I_{max} | A_{rms} | 9.5 | 6.0 | 20.0 | 20.0 | 15.0 |
| Continuous stall current | I_0 | A_{rms} | 2.89 | 1.88 | 5.77 | 5.77 | 5.62 |
| Voltage constant ⁽³⁾ | $k_{E\text{U-V}}$ | V_{rms} | 50 | 92 | 50 | 50 | 58 |
| Torque constant ⁽⁴⁾ | k_t | Nm/A | 0.83 | 1.52 | 0.83 | 0.83 | 0.96 |
| Winding resistance | $R_{20\text{U-V}}$ | Ω | 0.74 | 2.08 | 0.74 | 0.74 | 0.42 |
| Winding inductance | $L_{q\text{U-V}}$ | mH | 7.84 | 26.25 | 7.84 | 7.84 | 4.70 |
| Winding inductance | $L_{d\text{U-V}}$ | mH | 7.14 | 23.91 | 7.14 | 7.14 | 4.30 |
| Technical data - mechanical | | | | | | | |
| Maximum permissible speed of rotation | n_{max} | rpm | 3000 | 2000 | 3000 | 3000 | 3000 |
| Rotor inertia without brake | J_M | kgcm ² | 6.62 | 6.62 | 6.62 | 8.40 | 13.49 |
| Rotor inertia with brake | J_M | kgcm ² | 6.90 | 6.90 | 6.90 | 8.79 | 14.09 |
| Mass without brake | m | kg | 7.00 | 7.00 | 7.00 | 7.10 | 9.60 |
| Mass with brake | m | kg | 8.20 | 8.20 | 8.20 | 8.30 | 10.90 |
| Degree of protection of the shaft | – | – | IP 65 | IP 54 | IP 65 | IP 65 | IP 54 |
| Degree of protection of the housing | – | – | IP 65 | IP 65 | IP 65 | IP 65 | IP 65 |
| Technical data - holding brake | | | | | | | |
| Holding torque | – | Nm | 9.6 | 9.6 | 9.6 | 9.6 | 9.6 |
| Nominal voltage | – | Vdc | 24 +/-10% | 24 +/-10% | 24 +/-10% | 24 +/-10% | 24 +/-10% |
| Nominal power (electrical pull-in power) | – | W | 19.7 | 19.7 | 19.7 | 19.7 | 19.7 |
| <p>(1) Limit values with flanged motor: ○ Flange material: Steel ○ Flange size in mm (in): 400 x 400 x 20 (15.7 x 15.7 x 0.79)</p> <p>(2) M_0=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %</p> <p>(3) RMS value at 1000 rpm and 20 °C (68 °F).</p> <p>(4) At n = 20 rpm and 20 °C (68 °F).</p> | | | | | | | |

| BCH2 ⁽¹⁾ | | | MM061 | MM091 | MM152 | MM202 |
|--|--------------------|-------------------|-----------|-----------|-----------|-----------|
| Technical data - general | | | | | | |
| Continuous stall torque ⁽²⁾ | M ₀ | Nm | 5.73 | 8.59 | 7.16 | 9.55 |
| Peak torque | M _{max} | Nm | 17.19 | 25.77 | 21.48 | 28.65 |
| With supply voltage U _n = 230 Vac | | | | | | |
| Nominal speed of rotation | n _N | rpm | 1000 | 1000 | 2000 | 2000 |
| Nominal torque | M _N | Nm | 5.73 | 8.59 | 7.16 | 9.55 |
| Nominal Current | I _N | A _{rms} | 4.10 | 6.15 | 6.74 | 11.25 |
| Nominal power | P _N | kW | 0.60 | 0.90 | 1.50 | 2.00 |
| Technical data - electrical | | | | | | |
| Maximum winding voltage | U _{max} | Vac | 255 | 255 | 255 | 255 |
| Maximum winding voltage | U _{max} | Vdc | 360 | 360 | 360 | 360 |
| Maximum voltage to ground | - | Vac | 255 | 255 | 255 | 255 |
| Maximum Current | I _{max} | A _{rms} | 13.5 | 20.0 | 21.0 | 33.0 |
| Continuous stall current | I ₀ | A _{rms} | 3.77 | 5.64 | 6.18 | 9.95 |
| Voltage constant ⁽³⁾ | k _E U-V | V _{rms} | 92 | 92 | 70 | 58 |
| Torque constant ⁽⁴⁾ | k _t | Nm/A | 1.52 | 1.52 | 1.16 | 0.96 |
| Winding resistance | R _{20U-V} | Ω | 2.08 | 1.22 | 0.64 | 0.42 |
| Winding inductance | L _{qU-V} | mH | 26.25 | 16.40 | 7.20 | 4.70 |
| Winding inductance | L _{dU-V} | mH | 23.91 | 14.90 | 6.40 | 4.30 |
| Technical data - mechanical | | | | | | |
| Maximum permissible speed of rotation | n _{max} | rpm | 2000 | 2000 | 3000 | 3000 |
| Rotor inertia without brake | J _M | kgcm ² | 6.62 | 9.69 | 9.69 | 13.49 |
| Rotor inertia with brake | J _M | kgcm ² | 6.90 | 9.99 | 9.99 | 14.09 |
| Mass without brake | m | kg | 7.00 | 7.60 | 7.60 | 9.70 |
| Mass with brake | m | kg | 8.20 | 8.80 | 8.80 | 11.00 |
| Technical data - holding brake | | | | | | |
| Holding torque | - | Nm | 9.6 | 9.6 | 9.6 | 9.6 |
| Nominal voltage | - | Vdc | 24 +/-10% | 24 +/-10% | 24 +/-10% | 24 +/-10% |
| Nominal power (electrical pull-in power) | - | W | 19.7 | 19.7 | 19.7 | 19.7 |
| <p>(1) Limit values with flanged motor: ○ Flange material: Steel ○ Flange size in mm (in): 400 x 400 x 20 (15.7 x 15.7 x 0.79)</p> <p>(2) M₀=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %</p> <p>(3) RMS value at 1000 rpm and 20 °C (68 °F).</p> <p>(4) At n = 20 rpm and 20 °C (68 °F).</p> | | | | | | |

BCH2•M Curves





Section 5.8

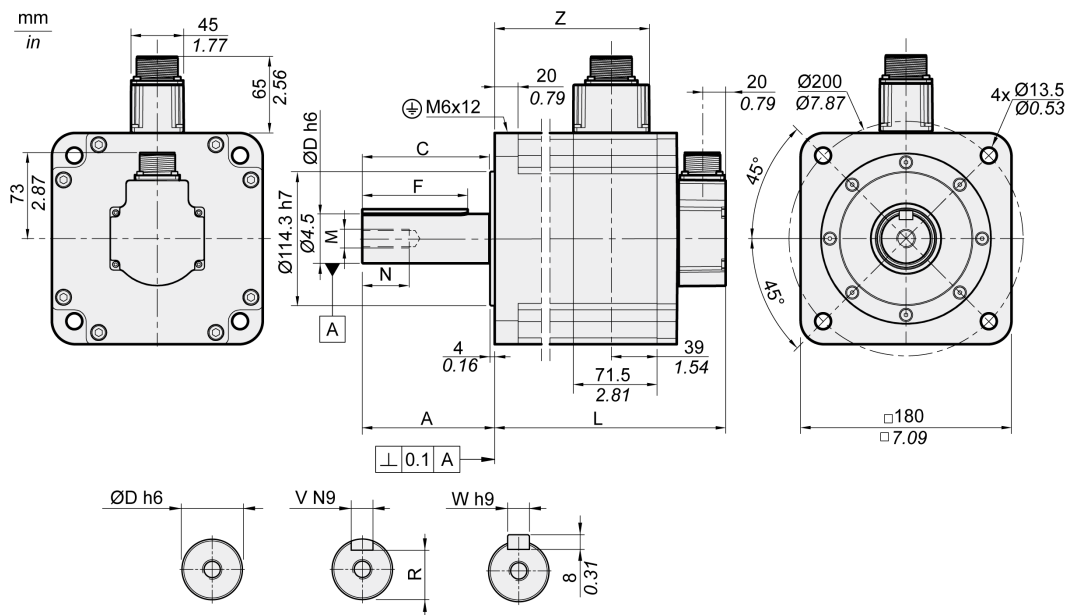
BCH2•R Motor

What Is in This Section?

This section contains the following topics:

| Topic | Page |
|------------------------------|------|
| BCH2•R Dimensions | 82 |
| BCH2•R Characteristics Table | 83 |
| BCH2•R Curves | 85 |

BCH2•R Dimensions



| BCH2•R | Unit | 20 | 30, 35 | 45 |
|---------------------------|---------|------------|------------|-------------|
| L (without holding brake) | mm (in) | 168 (6.61) | 201 (7.91) | 234 (9.21) |
| L (with holding brake) | mm (in) | 203 (7.99) | 236 (9.29) | 269 (10.59) |
| A | mm (in) | 79 (3.11) | | |
| C | mm (in) | 73 (2.87) | | |
| D | mm (in) | 35 (1.38) | | |
| F | mm (in) | 63 (2.48) | | |
| M | - | M12 | | |
| N | mm (in) | 28 (1.10) | | |
| R | mm (in) | 30 (1.18) | | |
| V | mm (in) | 10 (0.39) | | |
| W | mm (in) | 10 (0.39) | | |
| Z | mm (in) | 103 (4.06) | 136 (5.35) | 169 (6.65) |

BCH2•R Characteristics Table

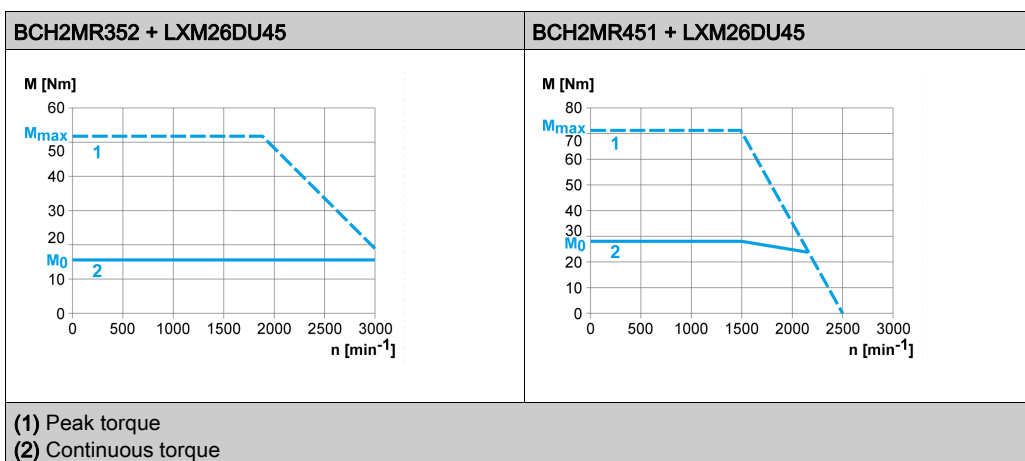
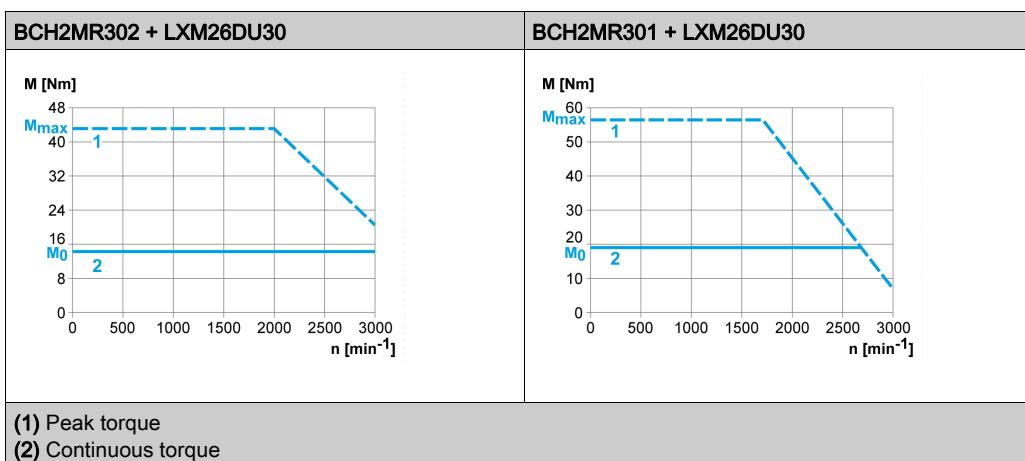
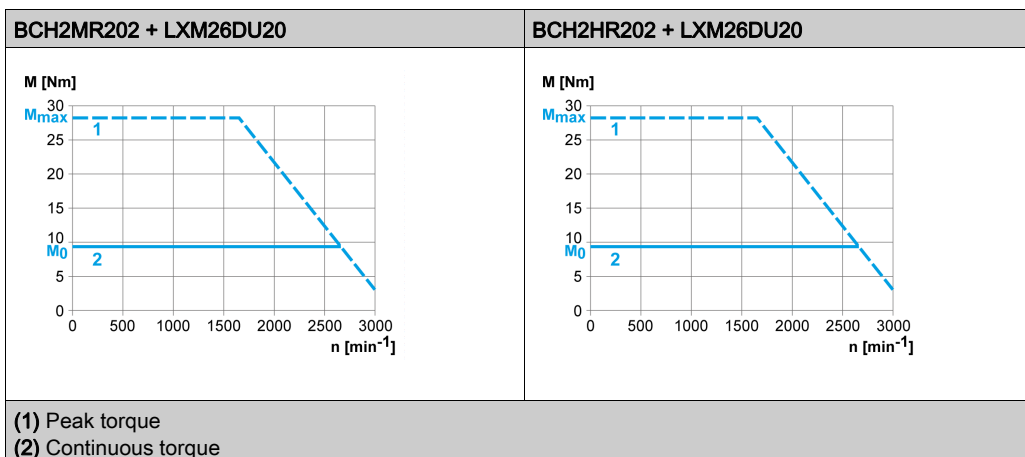
BCH2MR202/301/302, BCH2HR202 technical data

| BCH2 ⁽¹⁾ | | | MR202 | HR202 | MR302 | MR301 |
|--|--------------------|-------------------|-----------|-----------|-----------|-----------|
| Technical data - general | | | | | | |
| Continuous stall torque ⁽²⁾ | M ₀ | Nm | 9.55 | 9.55 | 14.32 | 19.10 |
| Peak torque | M _{max} | Nm | 28.65 | 28.65 | 42.97 | 57.29 |
| With supply voltage U _n = 230 Vac | | | | | | |
| Nominal speed of rotation | n _N | rpm | 2000 | 2000 | 2000 | 1500 |
| Nominal torque | M _N | Nm | 9.55 | 9.55 | 14.32 | 19.10 |
| Nominal Current | I _N | A _{rms} | 9.6 | 9.6 | 18.8 | 18.8 |
| Nominal power | P _N | kW | 2.00 | 2.00 | 3.00 | 3.00 |
| Technical data - electrical | | | | | | |
| Maximum winding voltage | U _{max} | Vac | 255 | 255 | 255 | 255 |
| Maximum winding voltage | U _{max} | Vdc | 360 | 360 | 360 | 360 |
| Maximum voltage to ground | – | Vac | 255 | 255 | 255 | 255 |
| Maximum Current | I _{max} | A _{rms} | 35.5 | 35.5 | 56.0 | 61.0 |
| Continuous stall current | I ₀ | A _{rms} | 8.75 | 8.75 | 16.33 | 16.49 |
| Voltage constant ⁽³⁾ | k _{EU-V} | V _{rms} | 66 | 66 | 53 | 70 |
| Torque constant ⁽⁴⁾ | k _t | Nm/A | 1.09 | 1.09 | 0.88 | 1.16 |
| Winding resistance | R _{20U-V} | Ω | 0.572 | 0.572 | 0.168 | 0.234 |
| Winding inductance | L _{qU-V} | mH | 6.70 | 6.70 | 2.88 | 3.78 |
| Winding inductance | L _{dU-V} | mH | 6.10 | 6.10 | 2.71 | 3.45 |
| Technical data - mechanical | | | | | | |
| Maximum permissible speed of rotation | n _{max} | rpm | 3000 | 3000 | 3000 | 3000 |
| Rotor inertia without brake | J _M | kgcm ² | 26.49 | 34.67 | 53.55 | 53.55 |
| Rotor inertia with brake | J _M | kgcm ² | 26.99 | 36.17 | 54.09 | 54.09 |
| Mass without brake | m | kg | 13.00 | 14.30 | 18.50 | 18.50 |
| Mass with brake | m | kg | 18.00 | 19.30 | 23.00 | 23.00 |
| Degree of protection of the shaft | – | – | IP 65 | IP 65 | IP 65 | IP 54 |
| Degree of protection of the housing | – | – | IP 65 | IP 65 | IP 65 | IP 65 |
| Technical data - holding brake | | | | | | |
| Holding torque | – | Nm | 48 | 48 | 48 | 48 |
| Nominal voltage | – | Vdc | 24 +/-10% | 24 +/-10% | 24 +/-10% | 24 +/-10% |
| Nominal power (electrical pull-in power) | – | W | 49.6 | 49.6 | 49.6 | 49.6 |
| <p>(1) Limit values with flanged motor: ○ Flange material: Steel ○ Flange size in mm (in): 550 x 550 x 20 (21.7 x 21.7 x 0.79)</p> <p>(2) M₀=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %</p> <p>(3) RMS value at 1000 rpm and 20 °C (68 °F).</p> <p>(4) At n = 20 rpm and 20 °C (68 °F).</p> | | | | | | |

BCH2MR352/451 technical data

| BCH2 ⁽¹⁾ | | MR352 | MR451 | |
|---|--------------------|-----------------|-----------|-----------|
| Technical data - general | | | | |
| Continuous stall torque ⁽²⁾ | M_0 | Nm | 16.70 | 28.65 |
| Peak torque | M_{max} | Nm | 50.30 | 71.62 |
| With supply voltage $U_n = 230$ Vac | | | | |
| Nominal speed of rotation | n_N | rpm | 2000 | 1500 |
| Nominal torque | M_N | Nm | 16.70 | 28.65 |
| Nominal Current | I_N | A_{rms} | 19.3 | 22.8 |
| Nominal power | P_N | kW | 3.50 | 4.50 |
| Technical data - electrical | | | | |
| Maximum winding voltage | U_{max} | Vac | 255 | 255 |
| Maximum winding voltage | U_{max} | Vdc | 360 | 360 |
| Maximum voltage to ground | – | Vac | 255 | 255 |
| Maximum Current | I_{max} | A_{rms} | 61.0 | 61.0 |
| Continuous stall current | I_0 | A_{rms} | 16.83 | 19.68 |
| Voltage constant ⁽³⁾ | $k_{E\text{U-V}}$ | V_{rms} | 60 | 88 |
| Torque constant ⁽⁴⁾ | k_t | Nm/A | 0.99 | 1.46 |
| Winding resistance | $R_{20\text{U-V}}$ | Ω | 0.168 | 0.199 |
| Winding inductance | $L_{q\text{U-V}}$ | mH | 2.80 | 4.00 |
| Winding inductance | $L_{d\text{U-V}}$ | mH | 2.57 | 3.80 |
| Technical data - mechanical | | | | |
| Maximum permissible speed of rotation | n_{max} | rpm | 3000 | 3000 |
| Rotor inertia without brake | J_M | kgcm^2 | 53.55 | 73.31 |
| Rotor inertia with brake | J_M | kgcm^2 | 54.09 | 72.99 |
| Mass without brake | m | kg | 18.50 | 23.64 |
| Mass with brake | m | kg | 23.00 | 28.00 |
| Technical data - holding brake | | | | |
| Holding torque | – | Nm | 48 | 48 |
| Nominal voltage | – | Vdc | 24 +/-10% | 24 +/-10% |
| Nominal power (electrical pull-in power) | – | W | 49.6 | 49.6 |
| <p>(1) Limit values with flanged motor:</p> <ul style="list-style-type: none"> ○ Flange material: Steel ○ Flange size in mm (in): 550 x 550 x 20 (21.7 x 21.7 x 0.79) <p>(2) M_0=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %</p> <p>(3) RMS value at 1000 rpm and 20 °C (68 °F).</p> <p>(4) At $n = 20$ rpm and 20 °C (68 °F).</p> | | | | |

BCH2•R Curves



Chapter 6

Accessories and Spare Parts

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|---|------|
| Commissioning Tools | 88 |
| Connectors and Adapters | 88 |
| External Mains Filters | 88 |
| Application Nameplate | 89 |
| Motor Cables | 90 |
| Encoder Cables and Accessories | 90 |
| Signal Cables | 90 |
| External Braking Resistors and Holding Brake Controller | 91 |
| Circuit Breakers | 91 |
| Motor Protection Switches and Power Contactors | 92 |

Commissioning Tools

| Description | Reference |
|--|----------------|
| Commissioning software LXM26 DTM Library, can be downloaded at: www.schneider-electric.com | - |
| 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 |
| Connection cable for Multi-Loader | VW3A8126 |
| Modbus cable, 1 m (3.28 ft), 2 x RJ45 | VW3A8306R10 |

Connectors and Adapters

| Description | | Reference | |
|---|---|--|----------|
| Connector kit for logic supply and power stage supply ($\sim 220V$), braking resistor (Resistor), and motor (Motor) | LXM26DUA5, LXM26DU01, LXM26DU02, LXM26DU04, LXM26DU07, LXM26DU10, LXM26DU15 | VW3M4C21 | |
| | LXM26DU20 | VW3M4C23 | |
| | LXM26DU30, LXM26DU45 | VW3M4C24 | |
| Interface connector for CN1, 50-pin, 3 pieces | | VW3M1C12 | |
| Interface adapter for CN1, connector with 0.5 m (1.64 ft) cable and connection module with screw terminals for DIN rail mounting | | VW3M1C13 | |
| Connector kit for motor | Motor end plastic connector | Without holding brake | VW3M5D1A |
| | | With holding brake | VW3M5D1F |
| | Motor end MIL connector | With holding brake, size 100 ... 130 | VW3M5D2A |
| | | With holding brake, size 180 | VW3M5D2B |
| | | For 8 mm ² (AWG8) up to 16 mm ² (AWG16) with holding brake, size 180 | VW3M5D2C |
| | Device end IEEE1394 connector | VW3M8D2A | |
| Motor end flying leads | Device end IEEE1394 connector | VW3M8D1A | |

External Mains Filters

| Description | | Reference |
|---|------|-----------|
| Mains filter single-phase; 115/230 Vac | 9 A | VW3A4420 |
| | 16 A | VW3A4421 |
| | 23 A | VW3A4426 |
| Mains filter three-phase; 208/400/480 Vac | 15 A | VW3A4422 |
| | 25 A | VW3A4423 |
| | 47 A | VW3A4424 |

Application Nameplate

| Description | Reference |
|--|-----------|
| Application nameplate to be clipped onto the top of the drive, size 38.5 mm (1.52 in) x 13 mm (0.51 in), 50 pieces | VW3M2501 |

Motor Cables

| Description | | | Reference | | |
|--|---|---|-----------------------------------|---------------|--|
| Shielded motor cable without holding brake | Motor end plastic connector, other cable end flying leads | 4 x 0.82 mm ² (AWG 18) | 1.5 m (4.92 ft) | VW3M5D1AR15 | |
| | | | 3 m (9.84 ft) | VW3M5D1AR30 | |
| | | | 5 m (16.4 ft) | VW3M5D1AR50 | |
| | Motor end MIL connector, other cable end flying leads | 4 x 1.3 mm ² (AWG 16) | 3 m (9.84 ft) | VW3M5D2AR30 | |
| | | | 5 m (16.4 ft) | VW3M5D2AR50 | |
| | | 4 x 3.3 mm ² (AWG 12) | 3 m (9.84 ft) | VW3M5D4AR30 | |
| | | | 5 m (16.4 ft) | VW3M5D4AR50 | |
| | | 4 x 6 mm ² (AWG 10) | 3 m (9.84 ft) | VW3M5D6AR30 | |
| | | | 5 m (16.4 ft) | VW3M5D6AR50 | |
| | Shielded motor cable with holding brake | Motor end plastic connector, other cable end flying leads | 6 x 0.82 mm ² (AWG 18) | 3 m (9.84 ft) | |
| | | | | 5 m (16.4 ft) | |
| | | Motor end MIL connector, other cable end flying leads | 6 x 1.3 mm ² (AWG 16) | 3 m (9.84 ft) | |
| 5 m (16.4 ft) | | | | | |
| 6 x 3.3 mm ² (AWG 12) | | | 3 m (9.84 ft) | VW3M5D4FR30 | |
| | | | 5 m (16.4 ft) | VW3M5D4FR50 | |
| 6 x 6 mm ² (AWG 10) | 3 m (9.84 ft) | VW3M5D6FR30 | | | |
| | 5 m (16.4 ft) | VW3M5D6FR50 | | | |

Encoder Cables and Accessories

| Description | | | Reference |
|--|--|-----------------|-------------|
| Encoder cable, 10 x 0.13 mm ² (AWG 26) shielded | Motor end and device end plastic connector | 1.5 m (4.92 ft) | VW3M8D1AR15 |
| | | 3 m (9.84 ft) | VW3M8D1AR30 |
| | | 5 m (16.4 ft) | VW3M8D1AR50 |
| | Motor end MIL connector, other cable end plastic connector | 3 m (9.84 ft) | VW3M8D2AR30 |
| | | 5 m (16.4 ft) | VW3M8D2AR50 |
| Battery compartment for multi turn encoder, cable 0.45 m (1.47 ft) | | | VW3M8BATC |
| Battery 3.6 Vdc for multi turn encoder | | | VW3M9BATT |

NOTE: The battery compartment and the battery are not provided with motor equipped with a multi turn encoder and must be ordered separately.

Signal Cables

| Description | Reference | |
|--|---------------|-------------|
| Signal cable for signal interface CN1, device end 50-pin connector, other cable end flying leads | 1 m (3.28 ft) | VW3M1C10R10 |
| | 2 m (6.56 ft) | VW3M1C10R20 |
| | 3 m (9.84 ft) | VW3M1C10R30 |

External Braking Resistors and Holding Brake Controller

| Description | | | Reference | |
|---|-----------------------------------|-----------------------------------|------------------|-------------|
| Holding brake controller HBC with automatic voltage reduction; 24 V - 1.6 A | | | VW3M3103 | |
| Braking resistor IP 65 connection cable 2.1 mm ² (AWG 14) | 10 Ω | Maximum continuous power 400 W | 0.75 m (2.46 ft) | VW3A7601R07 |
| | | | 2 m (6.56 ft) | VW3A7601R20 |
| | | | 3 m (9.84 ft) | VW3A7601R30 |
| Braking resistor IP 65, UL connection cable 2.1 mm ² (AWG 14) | 27 Ω | Maximum continuous power 100 W | 0.75 m (2.46 ft) | VW3A7602R07 |
| | | | 2 m (6.56 ft) | VW3A7602R20 |
| | | | 3 m (9.84 ft) | VW3A7602R30 |
| | | Maximum continuous power 200 W | 0.75 m (2.46 ft) | VW3A7603R07 |
| | | | 2 m (6.56 ft) | VW3A7603R20 |
| | | | 3 m (9.84 ft) | VW3A7603R30 |
| | Maximum continuous power 400 W | 0.75 m (2.46 ft) | VW3A7604R07 | |
| | | 2 m (6.56 ft) | VW3A7604R20 | |
| | | 3 m (9.84 ft) | VW3A7604R30 | |
| | 72 Ω | Maximum continuous power 200 W | 0.75 m (2.46 ft) | VW3A7606R07 |
| | | | 2 m (6.56 ft) | VW3A7606R20 |
| | | | 3 m (9.84 ft) | VW3A7606R30 |
| Maximum continuous power 400 W | | 0.75 m (2.46 ft) | VW3A7607R07 | |
| | | 2 m (6.56 ft) | VW3A7607R20 | |
| | | 3 m (9.84 ft) | VW3A7607R30 | |
| Braking resistor IP20, UL screw terminals M6 | 16 Ω | Maximum continuous power 956 W | - | VW3A7733 |
| | 10 Ω | | - | VW3A7734 |

Circuit Breakers

| Description | Reference | |
|---|-------------|--------|
| Circuit breaker - thermal magnetic -screw terminals | 4 ... 6.3 A | GV2P10 |
| | 6 ... 10 A | GV2P14 |
| | 9 ... 14 A | GV2P16 |
| | 13 ... 18 A | GV2P20 |
| | 17 ... 23 A | GV2P21 |
| | 20 ... 25 A | GV2P22 |
| | 24 ... 32 A | GV2P32 |

Motor Protection Switches and Power Contactors

| Drive | Nominal power | Order no. motor protection switch | Rated continuous current motor protection switch | Order no. power contactor |
|-----------|---------------|-----------------------------------|--|---------------------------|
| LXM26DUA5 | 50 W | GV2L10 | 6.3 A | LC1K0610•• |
| LXM26DU01 | 100 W | GV2L10 | 6.3 A | LC1K0610•• |
| LXM26DU02 | 200 W | GV2L14 | 10 A | LC1D09•• |
| LXM26DU04 | 400 W | GV2L14 | 10 A | LC1D09•• |
| LXM26DU07 | 750 W | GV2L16 | 14 A | LC1D12•• |
| LXM26DU15 | 1500 W | GV2L22 | 25 A | LC1D18•• |
| LXM26DU20 | 2000 W | GV2L32 | 30 A | LC1D32•• |
| LXM26DU30 | 3000 W | GV2L32 | 30 A | LC1D32•• |

| Control voltage power contactor | | 24 V | 48 V | 110 V | 220 V | 230 V | 240 V |
|---------------------------------|----------|------|------|-------|-------|-------|-------|
| LC1K•••• | 50/60 Hz | B7 | E7 | F7 | M7 | P7 | U7 |

| Control voltage power contactor | | 24 V | 48 V | 110 V | 220/230 V | 230 | 230/240 V |
|---------------------------------|----------|------|------|-------|-----------|-----|-----------|
| LC1D•••• | 50 Hz | B5 | E5 | F5 | M5 | P5 | U5 |
| | 60 Hz | B6 | E& | F6 | M6 | - | U6 |
| | 50/60 Hz | B7 | E7 | F7 | M7 | P7 | U7 |

Part III

Engineering

Chapter 7

Engineering

This chapter contains information on the application of the Servo Drive system for the engineering phase.

What Is in This Chapter?

This chapter contains the following sections:

| Section | Topic | Page |
|---------|-------------------------------------|------|
| 7.1 | Electromagnetic Compatibility (EMC) | 96 |
| 7.2 | Cables | 100 |
| 7.3 | Residual Current Device | 102 |
| 7.4 | Rating the Braking Resistor | 103 |
| 7.5 | Monitoring Functions | 107 |
| 7.6 | Configurable Inputs and Outputs | 108 |
| 7.7 | Wiring | 109 |

Section 7.1

Electromagnetic Compatibility (EMC)


What Is in This Section?

This section contains the following topics:

| Topic | Page |
|-------------------------------------|------|
| Electromagnetic Compatibility (EMC) | 97 |
| External Mains Filters | 99 |


Electromagnetic Compatibility (EMC)

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


|  WARNING |
|--|
| SIGNAL AND EQUIPMENT INTERFERENCE <ul style="list-style-type: none">• Only operate the drive with the specified external mains filter.• 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. |

Limit Values

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

|  WARNING |
|--|
| ELECTROMAGNETIC DISTURBANCES OF SIGNALS AND DEVICES <p>Use proper EMC shielding techniques to help prevent unintended device operation in accordance with the standard IEC 61800-3.</p> 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 <p>Do not use these products in domestic electrical networks.</p> Failure to follow these instructions can result in death, serious injury, or equipment damage. |

As a system provider, you may have to include this information in the documentation to your customer.

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.

| |
|--|
|  WARNING |
| <p>UNINTENDED EQUIPMENT OPERATION</p> <ul style="list-style-type: none"> ● 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. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p> |

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.

The equipotential bonding conductors must be rated for the maximum current. The following conductors cross sections can be used:

- 16 mm² (AWG 4) for equipotential bonding conductors up to a length of 200 m (656 ft)
- 20 mm² (AWG 4) for equipotential bonding conductors with a length of more than 200 m (656 ft)

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 |

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. |
| Mount in a closed control cabinet with shielded attenuation of radiated interference | Improves the EMC limit values. |

External Mains Filters

Filter/Drive Combinations

You can obtain EMC conformance by following the wiring standards and practices in the present document and installing, for each drive, the following filter/drive combination:

For further information, refer to Electromagnetic compatibility (EMC) (*see page 96*).

| LXM26D | Mains filter for single-phase connection | Mains filter for three-phase connection |
|--|--|---|
| UA5 = 0.05 kW U01 = 0.1 kW U02 = 0.2 kW U04 = 0.4 kW U07 = 0.75 kW U10 = 1 kW | VW3A4420 | VW3A4422 |
| U15 = 1.5 kW | VW3A4421 | VW3A4422 |
| U20 = 2 kW | - | VW3A4423 |
| U30 = 3 kW U45 = 4.5 kW | - | VW3A4424 |

If you use mains filters of other manufacturers, these mains filters must have the same technical data as specified mains filters.

Emission

The specified limit values are complied with if the external mains filters available as accessories are used.

The following limit values for emission are complied with if the installation is EMC-compliant and if the cables offered as accessories are used.

| Lexium 26D | Category |
|------------------------|----------|
| Conducted interference | C3 |
| Radiated emission | C3 |

Section 7.2

Cables

Cables

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

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

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.

The equipotential bonding conductor must be rated for the maximum current. The following conductor cross sections can be used:

- 16 mm² (AWG 4) for equipotential bonding conductors up to a length of 200 m (656 ft)
- 20 mm² (AWG 4) for equipotential bonding conductors with a length of more than 200 m (656 ft)

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) ⁽¹⁾ | Current-carrying capacity with method of installation B2 in A ⁽²⁾ | Current carrying capacity with method of installation E in A ⁽²⁾ |
|---|--|---|
| 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 |
| <p>(1) See chapter "Accessories and spare parts" (<i>see page 87</i>) for available cables. (2) 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.</p> | | |

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.

For conformance to UL requirements, use 75 °C (167 °F) copper conductors.

Section 7.3

Residual Current Device

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 drives and for single-phase drives not connected to a phase and the neutral conductor.

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

Conditions for Use of Residual Current Device

- The drive has an increased leakage current at the moment power is applied. Use residual current devices with a response delay.
- High-frequency currents must be filtered.

Section 7.4

Rating the Braking Resistor

What Is in This Section?

This section contains the following topics:

| Topic | Page |
|-----------------------------|------|
| Rating the Braking Resistor | 104 |
| Internal Braking Resistor | 105 |
| External Braking Resistors | 106 |

Rating the Braking Resistor

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. 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 that will exceed the capacity of the braking resistor.

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

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.

An external braking resistor ([see page 91](#)) is required for applications in which the motor must be decelerated quickly and the internal braking resistor cannot absorb the excess braking energy.

Internal Braking Resistor

Introduction

The drive has an internal braking resistor. If the internal braking resistor is 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 using the appropriate parameter, the internal braking resistor is deactivated.

| LXM26D...M3X | Unit | UA5, U01, U02, U04 | U07 | U10, U15 | U20 | U30, U45 |
|--|---------------|-----------------------|-----|----------|-------|----------|
| Resistance value of internal braking resistor | Ω | 100 | | 40 | | 22 |
| Continuous power internal braking resistor P_{PR} | W | 60 | | 60 | | 100 |
| Peak energy $E_{CR}^{(1)}$ | Ws | 152 | | 380 | | 691 |
| External braking resistor minimum | Ω | 25 | | 15 | | 8 |
| External braking resistor maximum ⁽²⁾ | Ω | 50 | | | | 25 |
| Maximum continuous power external braking resistor | W | 640 | | 1000 | 1500 | 2500 |
| Switch-on voltage braking resistor | V | 390 | | | | |
| Capacitance of the internal capacitors | μF | 820 | | 1640 | 2110 | 3280 |
| Energy absorption of internal capacitors E_{var} at nominal voltage 230 V +10% | Ws | 8.87 | | 17.76 | 22.82 | 35.51 |
| (1) Parameter P1-71 is set to 100 ms. | | | | | | |
| (2) The maximum specified braking resistor can derate the peak power of the device. Depending on the application, it is possible to use a greater ohm resistor. | | | | | | |

External Braking Resistors

Introduction

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 | | | | | | | | |
| <ul style="list-style-type: none"> ● 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. | | | | | | | | |

| VW3A760• | Unit | 1R•• (1) | 2R•• | 3R•• | 4R•• (1) | 5R•• | 6R•• | 7R•• (1) |
|--|------|----------|-------|------|----------|------|------|----------|
| Resistance | Ω | 10 | 27 | | | 72 | | |
| Continuous power | W | 400 | 100 | 200 | 400 | 100 | 200 | 400 |
| Maximum time in braking at 115 V / 230 V | s | 0.72 | 0.552 | 1.08 | 2.64 | 1.44 | 3.72 | 9.6 |
| Peak power at 115 V / 230 V | kW | 18.5 | 6.8 | | | 2.6 | | |
| Maximum peak energy at 115 V / 230 V | Ws | 13300 | 3800 | 7400 | 18100 | 3700 | 9600 | 24700 |
| Degree of protection | - | IP 65 | | | | | | |
| (1) Resistors with a continuous power of 400 W are not UL/CSA-approved. | | | | | | | | |

| VW3A77• | Unit | 04 | 05 |
|--|------|-------|-------|
| Resistance | Ω | 15 | 10 |
| Continuous power | W | 1000 | |
| Maximum time in braking at 115 V / 230 V | s | 3.5 | 1.98 |
| Peak power at 115 V / 230 V | kW | 12.3 | 18.5 |
| Maximum peak energy at 115 V / 230 V | Ws | 43100 | 36500 |
| Degree of protection | - | IP20 | |

Section 7.5

Monitoring Functions

Monitoring Functions

Overview

The monitoring functions of the drive can be used to monitor movements and to monitor internal signals. These monitoring functions are not safety-related functions.

The following monitoring functions are available:

| Monitoring function | Task |
|-------------------------------|--|
| Data connection | Monitors data connection for interruption |
| Limit switch signals | Monitors for permissible movement range |
| Position deviation | Monitors for difference between actual position and reference position |
| Motor overload | Monitors for excessively high current in the motor phases |
| Overvoltage and undervoltage | Monitors for overvoltage and undervoltage of the power stage supply and the DC bus |
| Overtemperature | Monitors the drive for overtemperature |
| Encoder overtemperature | Monitors the encoder for overtemperature |
| Overvoltage and undervoltage | Monitors the logic supply and power stage supply for permissible voltage range |
| Overvoltage at digital inputs | Monitors the digital inputs for overvoltage |
| Wire break HPULSE inputs | Monitors the HPULSE inputs for wire break |
| Power supply encoder | Monitors the encoder supply for short circuit and permissible voltage range |
| Current limitation (Foldback) | Power limitation in the case of overloads for the motor, the output current, the output power, and the braking resistor. |

Section 7.6

Configurable Inputs and Outputs

Configurable Inputs and Outputs

Presentation

This drive has digital inputs and outputs that can be configured. The inputs and outputs have a defined default assignment depending on the operating mode. This assignment can be adapted to the requirements of the customer's installation.

For further details, refer to chapter Operation (*see page 281*).

Section 7.7

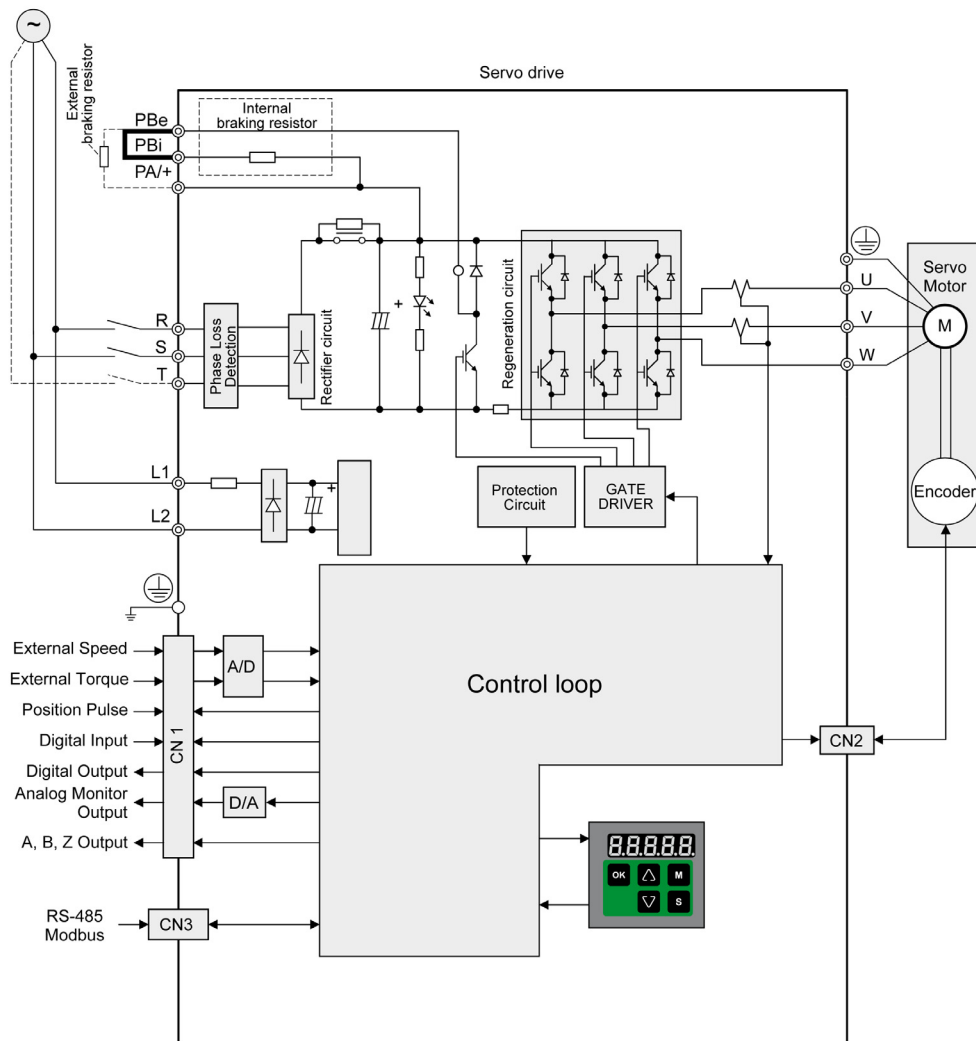
Wiring

What Is in This Section?

This section contains the following topics:

| Topic | Page |
|---|------|
| General Wiring | 110 |
| I/O Wiring Example With Modicon M221 Logic Controller | 111 |

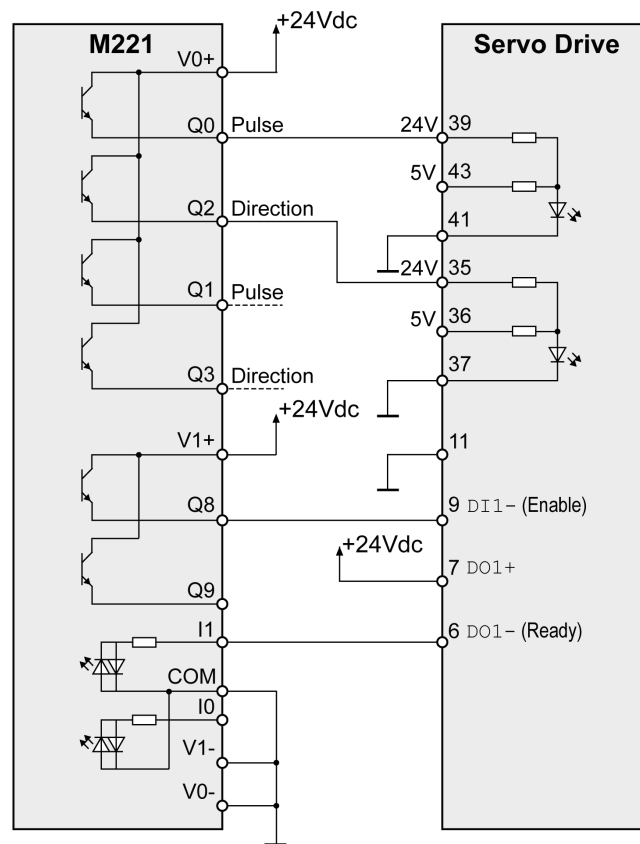
General Wiring



I/O Wiring Example With Modicon M221 Logic Controller

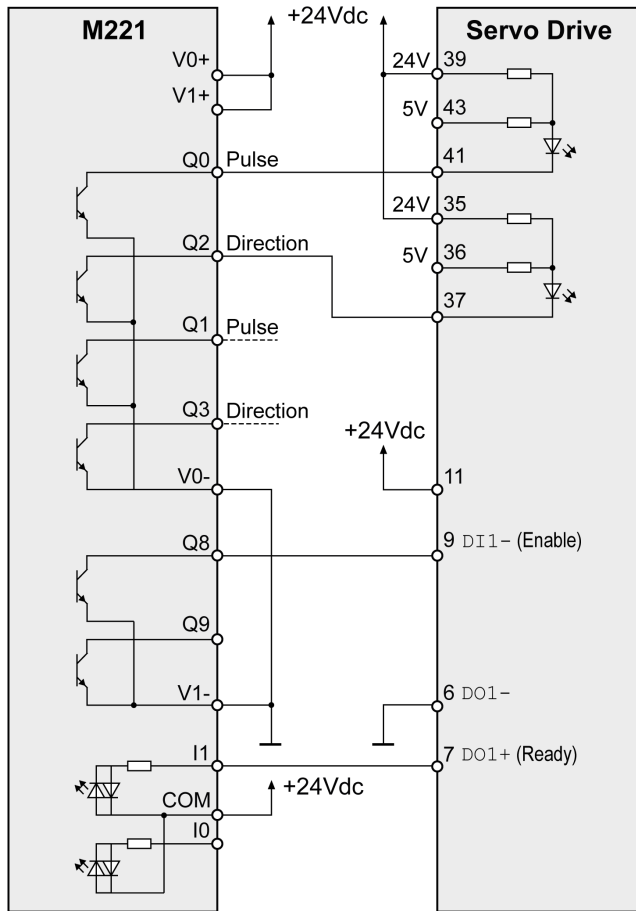
Positive Logic

Wiring example with Modicon M221 Logic Controller (positive logic).



Negative Logic

Wiring example with Modicon M221 Logic Controller (negative logic).



Part IV

Installation

Introduction

An engineering phase is mandatory prior to mechanical and electrical installation. For basic information, refer to Engineering (*see page 95*).

DANGER

INSUFFICIENT GROUNDING

- Use a protective ground conductor with at least 10 mm² (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 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.
- Do not use cable shields as protective ground conductors.
- 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.

In the case of a ground error, the maximum permissible current in the motor phases may be exceeded.

DANGER

FIRE CAUSED BY INCORRECT INSTALLATION

Use upstream, external ground error detection equipment (Residual Current Device / Ground Fault Circuit Interrupter).

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 65 °C (149 °F) (for bare metal) during operation.

| |
|---|
| ⚠ WARNING |
| HOT SURFACES |
| <ul style="list-style-type: none"> ● 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 death, serious injury, or equipment damage. |

| |
|--|
| ⚠ CAUTION |
| INOPERABLE EQUIPMENT DUE TO INCORRECT MAINS VOLTAGE CONNECTION |
| <ul style="list-style-type: none"> ● 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. |

What Is in This Part?

This part contains the following chapters:

| Chapter | Chapter Name | Page |
|---------|------------------------|------|
| 8 | Before Mounting | 115 |
| 9 | Drive Installation | 119 |
| 10 | Motor Installation | 151 |
| 11 | Verifying Installation | 163 |

Chapter 8

Before Mounting

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|------------------------|------|
| Inspecting the Product | 116 |
| Scope of Supply | 117 |

Inspecting the Product

Inspecting the Product

- Verify the product version by means of the type code on the nameplate. Refer to chapter Nameplate (*see page 32*) and chapter Type Code (*see page 33*).
- 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.

Scope of Supply

Drive

- Drive Lexium 26D
- Connector kit with 3 connectors for:
 - Power stage supply and logic supply
 - Braking resistor
 - Including jumper between **PBi** and **PBe**
 - Motor
- Plastic tool for opening the spring terminals (available for devices from 50 W to 1.5 kW)
- Adhesive hazard label (Chinese)
- Instruction sheet for the product

Motor

- BCH2 servo motor
- BCH2•R: 2 eyebolts
- Information sheet for the product

Chapter 9


Drive Installation

What Is in This Chapter?


This chapter contains the following topics:

| Topic | Page |
|--|------|
| Mechanical Installation Drive | 120 |
| Electrical Installation Drive | 122 |
| Connection Grounding Screw | 124 |
| Connection I/O Interface (CN1) | 125 |
| Connecting the Motor Encoder (CN2) | 136 |
| Connection PC (CN3) | 138 |
| Connection Logic Supply and Power Stage Supply (~220V) | 140 |
| Connection Braking Resistor (Resistor) | 143 |
| Connecting the Motor Phases (Motor) | 145 |
| Holding Brake Connection | 148 |


Mechanical Installation Drive

|  DANGER |
|--|
| ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION <ul style="list-style-type: none">• 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. |

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

|  WARNING |
|--|
| LOSS OF SAFETY FUNCTION CAUSED BY FOREIGN OBJECTS <p>Protect the system against contamination by conductive substances.</p> 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.

|  WARNING |
|---|
| HOT SURFACES <ul style="list-style-type: none">• 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 death, serious injury, or equipment damage. |

Attaching a Hazard Label with Safety Instructions

Included in the packaging of the drive are adhesive hazard labels in Chinese language. The English version is affixed to 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 hazard label suitable for the target country.
Respect the safety regulations in the target country.
- Attach the hazard label to the front of the device 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 tooling locking mechanism.

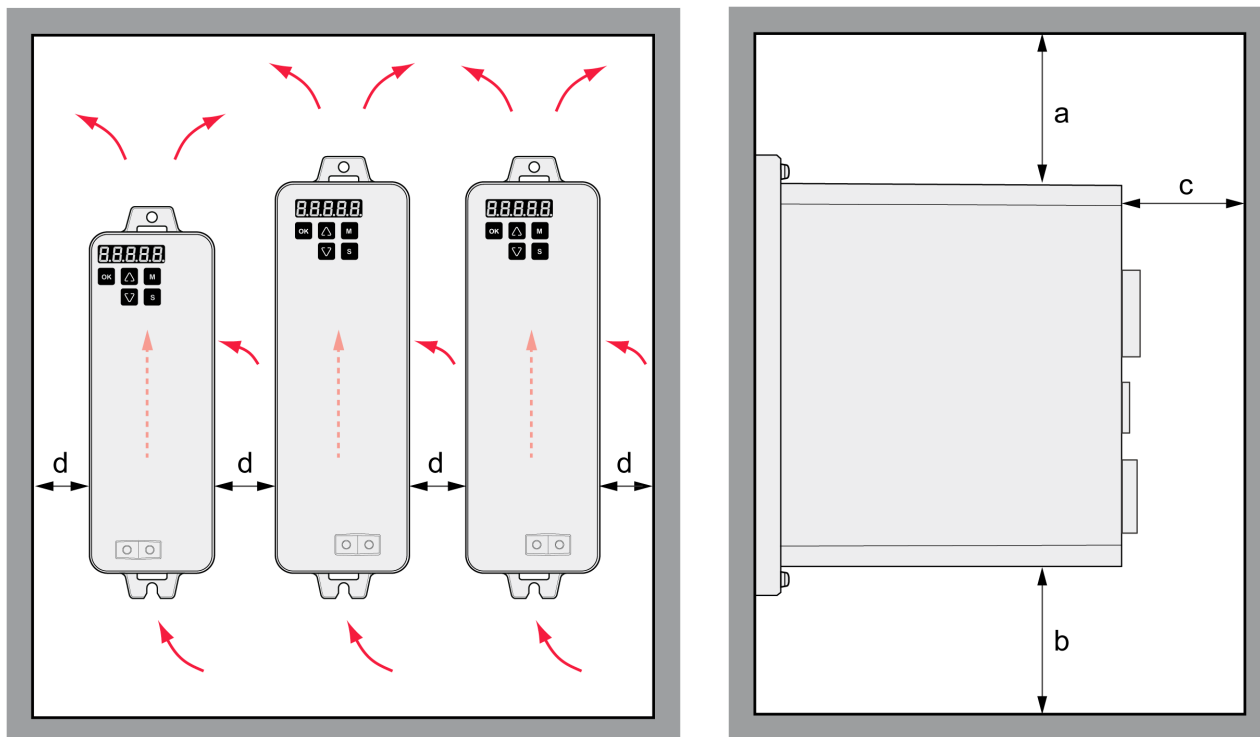
Mounting Distances, Ventilation

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

- Mount the device in a vertical position ($\pm 10^\circ$). 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.

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



LXM26DUA5, U01, U02, U04, U07, U10, U15, U20, U30, U45

| Distance | Unit | Value |
|--|------------|----------------|
| Free space a above the device | mm (in) | ≥50 (≥1.97) |
| Free space b below the device | mm (in) | ≥50 (≥1.97) |
| Free space c in front of the device ⁽¹⁾ | mm (in) | ≥60 (≥2.36) |
| Free space d between devices | mm (in) | ≥15 (≥0.59) |
| (1) The free space is strictly for observing proper ventilation and may not be sufficient for your wiring requirements. | | |

Mounting the Drive

For further information on the dimensions of the mounting holes, refer to chapter Dimensions ([see page 37](#)).

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.

- Respect the ambient conditions in chapter Environmental Conditions ([see page 35](#)).
- Mount the device in a vertical position ($\pm 10^\circ$).

Electrical Installation Drive

Introduction

DANGER

INSUFFICIENT GROUNDING

- Use a protective ground conductor with at least 10 mm² (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 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.
- Do not use cable shields as protective ground conductors.
- 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.

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:

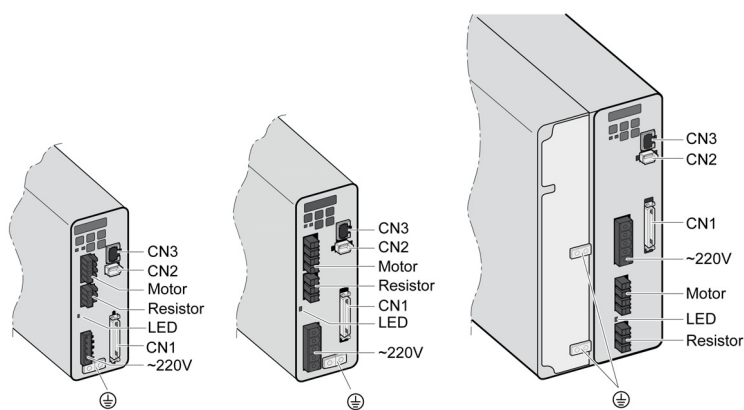
WARNING

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 drives and for single-phase drives 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.



LXM26DUA5 ... U15

LXM26DU20

LXM26DU30, U45

| Item | Description | Refer to |
|----------|--|--|
| CN1 | Signal interface For connecting master controller or I/O signals. | Connection I/O Interface (CN1) <i>(see page 125)</i> |
| CN2 | Connection for motor encoder | Connecting the Motor Encoder (CN2) <i>(see page 136)</i> |
| CN3 | Modbus (commissioning interface) For connecting PC via converter TCSMCNAM3M002P | Connection PC (CN3) <i>(see page 138)</i> |
| ~220V | Power stage supply (R,S,T) and logic supply (L1, L2) | Connection Logic Supply and Power Stage Supply (~220V) <i>(see page 140)</i> |
| LED | DC bus LED The LED is illuminated when mains voltage or internal charge are present. The DC bus LED is not an indicator of the absence of DC bus voltage. | - |
| Resistor | Connection for external braking resistor | Connection braking resistor (Resistor) <i>(see page 143)</i> |
| Motor | Motor phases connection (U, V, W, PE) | Connecting the motor phases (Motor) <i>(see page 145)</i> |

Connection Grounding Screw

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

⚠ ⚠ **DANGER**

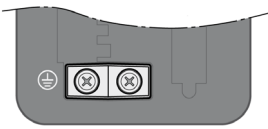
INSUFFICIENT GROUNDING

- Use a protective ground conductor with at least 10 mm² (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 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.
- Do not use cable shields as protective ground conductors.
- 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.

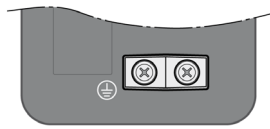
Failure to follow these instructions will result in death or serious injury.

The central grounding screws of the product are located at the front side.

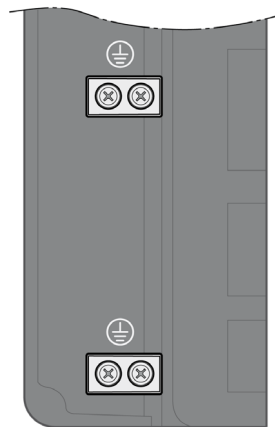
LXM26DUA5...U15



LXM26DU20



LXM26DU30, U45



- Use ring-type cable lugs or fork-type cable lugs.
- Connect the ground connection of the device to the equipotential ground plane of your system.

| LXM26D | Unit | UA5, U01, U02, U04, U07, U10, U15, U20, U30, U45 |
|--------------------------------------|---------------|--|
| Tightening torque of grounding screw | Nm (lb.in) | 1.3 (11.5) |
| Screw type | - | M4 x 8 socket button head screw |

Connection I/O Interface (CN1)

The I/O Interface (CN1) is a D-Sub 50-pin female connector. The following table describes the contacts of the connector:

| Pin | Signal | Meaning | Pin | Signal | Meaning |
|-----|-------------------|---|-----|----------|--|
| 1 | DO4+ | Digital output 4 | 2 | DO3- | Digital output 3 |
| 3 | DO3+ | Digital output 3 | 4 | DO2- | Digital output 2 |
| 5 | DO2+ | Digital output 2 | 6 | DO1- | Digital output 1 |
| 7 | DO1+ | Digital output 1 | 8 | DI4- | Digital input 4 |
| 9 | DI1- | Digital input 1 | 10 | DI2- | Digital input 2 |
| 11 | COM | Reference potential to DI1 ... DI8 | 12 | GND | Reference potential analog input |
| 13 | GND | Reference potential for analog input | 14 | - | Reserved |
| 15 | MON2 | Analog output 2 | 16 | MON1 | Analog output 1 |
| 17 | VDD | 24 Vdc power supply (for external I/O) | 18 | T_REF | Analog input for reference torque |
| 19 | GND | Analog input signal ground | 20 | VCC | Output power supply 12 Vdc (for analog reference values) |
| 21 | OA | ESIM channel A | 22 | /OA | ESIM channel A, inverted |
| 23 | /OB | ESIM channel B, inverted | 24 | /OZ | ESIM index pulse, inverted |
| 25 | OB | ESIM channel B | 26 | DO4- | Digital output 4 |
| 27 | DO5- | Digital output 5 | 28 | DO5+ | Digital output 5 |
| 29 | /HPULSE | High-speed pulses, inverted | 30 | DI8- | Digital input 8 |
| 31 | DI7- | Digital input 7 | 32 | DI6- | Digital input 6 |
| 33 | DI5- | Digital input 5 | 34 | DI3- | Digital input 3 |
| 35 | PULL HI_S (SIGN) | Pulse applied Power (SIGN) | 36 | /SIGN | Direction signal, inverted |
| 37 | SIGN | Direction signal | 38 | HPULSE | High-speed pulses |
| 39 | PULL HI_P (PULSE) | Pulse applied Power (PULSE) | 40 | /HSIGN | Direction signal for high-speed pulses, inverted |
| 41 | PULSE | Pulse input | 42 | V_REF | Analog input for reference velocity |
| 43 | /PULSE | Pulse input | 44 | GND | Analog input signal ground |
| 45 | COM- | Reference potential to VDD and DO6(OCZ) | 46 | HSIGN | Direction signal for high-speed pulses |
| 47 | COM- | Reference potential to VDD and DO6(OCZ) | 48 | DO6(OCZ) | ESIM index pulse Open collector output |
| 49 | COM- | Reference potential to VDD and DO6(OCZ) | 50 | OZ | ESIM index pulse Line driver output |

WARNING

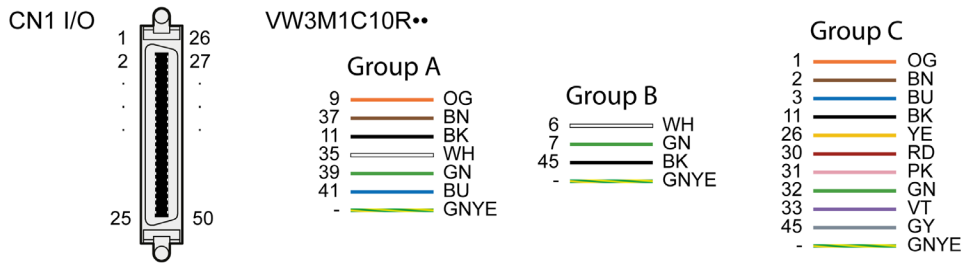
UNINTENDED EQUIPMENT OPERATION

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.

Prefabricated Cable VW3M1C10R••

Color assignments of the prefabricated cable connected to the I/O interface (CN1):



VW3M1C10R•• Pinout

| Group A | | | Group B | | | Group C | | |
|---------|--------|-------|---------|--------|-------|---------|--------|-------|
| Pin | Signal | Color | Pin | Signal | Color | Pin | Signal | Color |
| 9 | DI1- | OG | 6 | DO1- | WH | 1 | DO4+ | OG |
| 37 | | BN | 7 | DO1+ | GN | 2 | DO3- | BN |
| 11 | COM | BK | 45 | COM- | BK | 3 | DO3+ | BU |
| 35 | | WH | - | | | 11 | COM | BK |
| 39 | | GN | | 26 | DO4- | YE | | |
| 41 | | BU | | 30 | DI8- | RD | | |
| | | | | 31 | DI7- | PK | | |
| | | | | 32 | DI6- | GN | | |
| | | | | 33 | DI5- | VT | | |
| | | | | 45 | COM- | BY | | |

NOTE: For the CN1 mating connector, use a clip-on (latching) type, such as Schneider Electric reference VW3M1C12 CN1 Connector Kit.

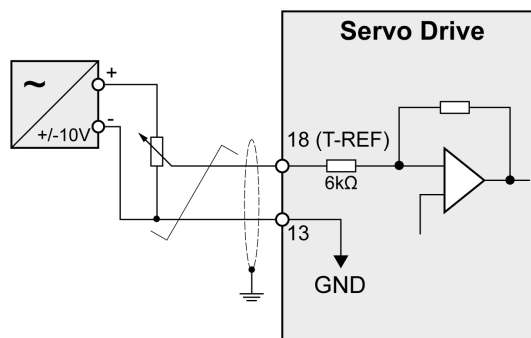
Inputs and Outputs Signals

The following inputs and outputs signals are available:

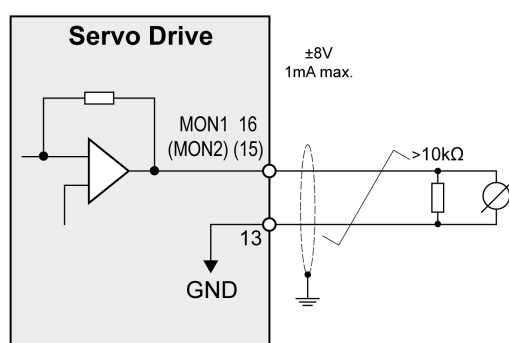
- Analog inputs and outputs (*see page 127*)
- Pulse input (open collector, negative logic) (*see page 127*)
- Pulse input (open collector, positive logic) (*see page 128*)
- Pulse input (line driver) (*see page 129*)
- High-speed pulse input (line driver) (*see page 130*)
- Digital outputs (negative logic) (*see page 130*)
- Digital outputs (positive logic) (*see page 132*)
- Digital inputs (negative logic) (*see page 133*)
- Digital inputs (positive logic) (*see page 134*)
- Encoder output signal) (*see page 135*)

Analog Inputs and Outputs

Example of reference value via analog input:



Example of analog output:



Pulse Input (Open Collector, Negative Logic)

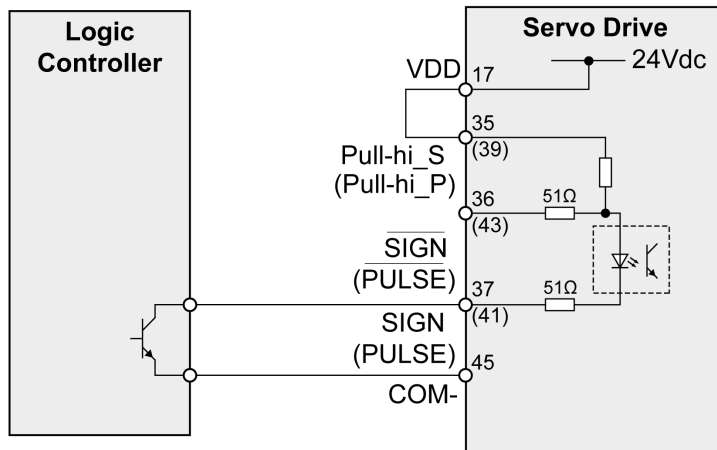
⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

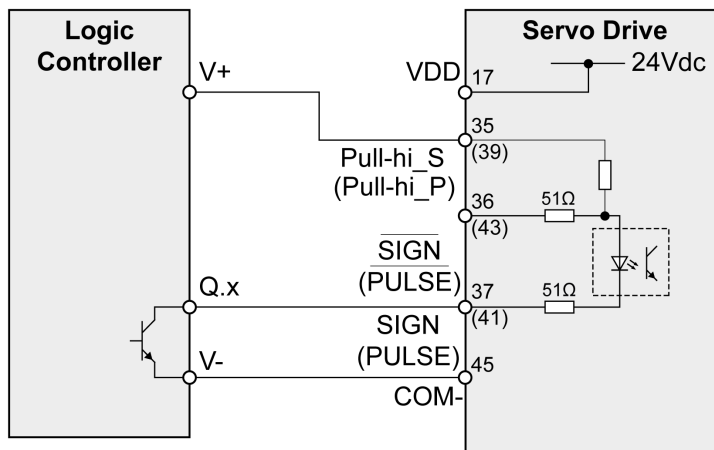
Do not connect an external, 24 Vdc power supply to the VDD connection of the I/O interface (CN1) connector.

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

Example of pulse input (open collector) with internal power supply (negative logic).



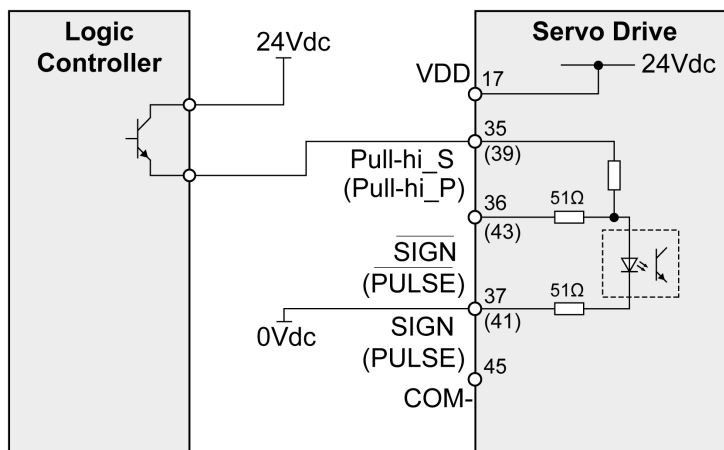
Example of pulse input (open collector) with external power supply (negative logic).



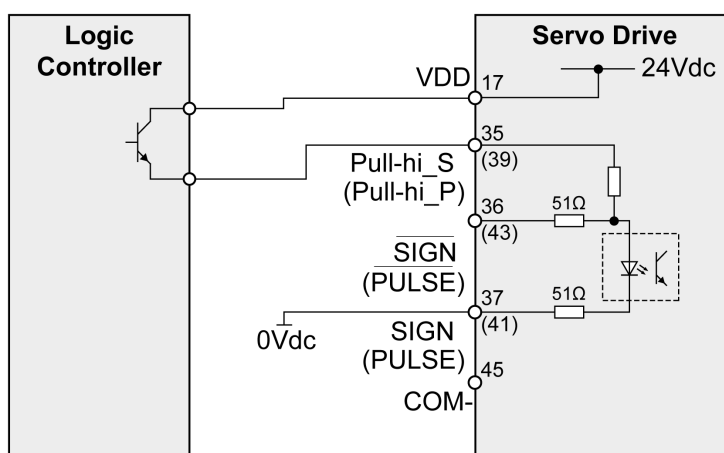
Pulse Input (Open Collector, Positive Logic)

| |
|--|
| WARNING |
| <p>UNINTENDED EQUIPMENT OPERATION</p> <p>Do not connect an external, 24 Vdc power supply to the VDD connection of the I/O interface (CN1) connector.</p> <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p> |

Example of pulse input (open collector) with internal power supply (positive logic).

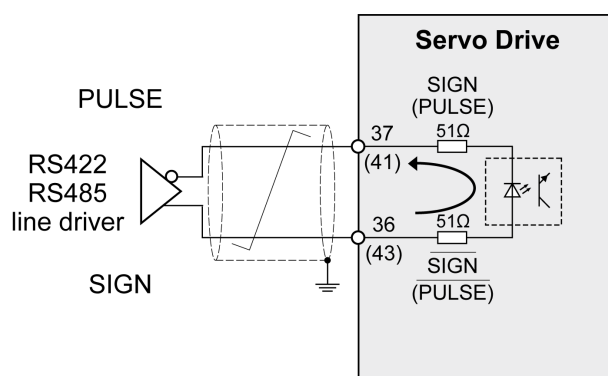


Example of pulse input (open collector) with external power supply (positive logic).



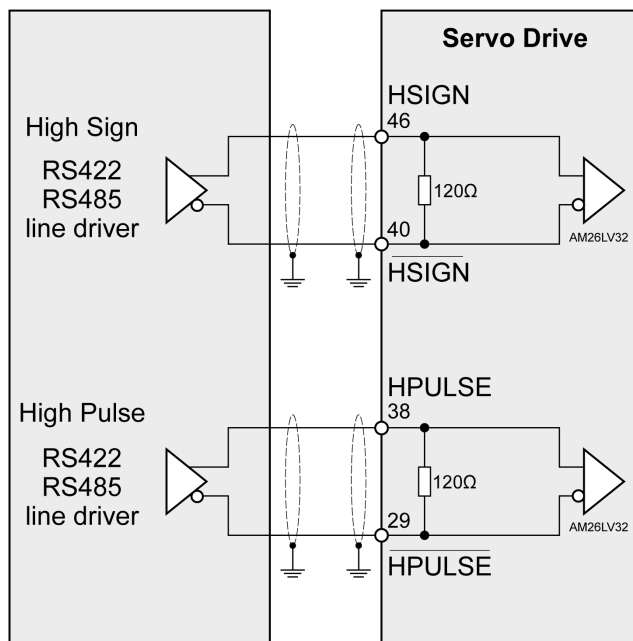
Pulse Input (Line Driver)

Example of pulse input (line driver).



High-Speed Pulses

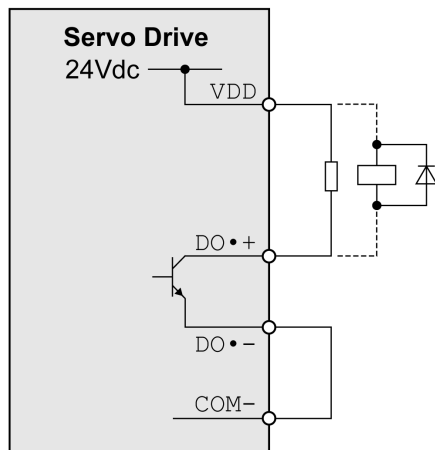
Example of high-speed pulse input (line driver).



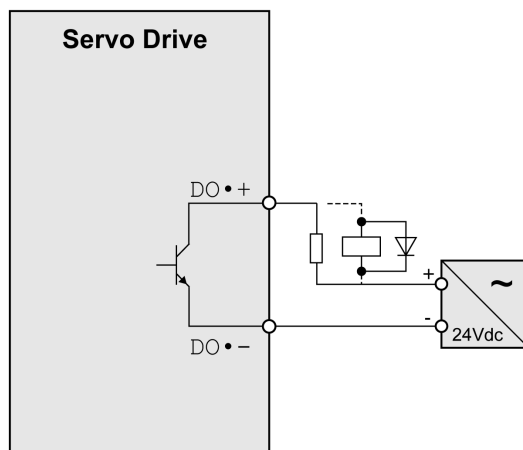
Connect the cable shield to the equipotential ground of your controller/drive electrical system.

Wiring of the Digital Outputs (Negative Logic)

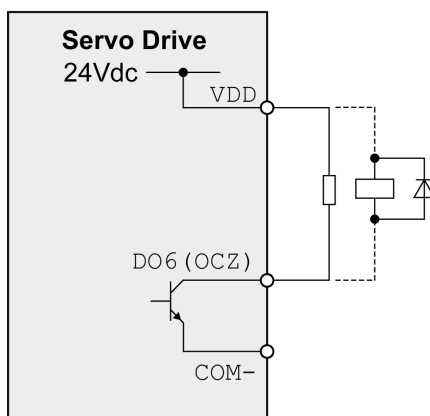
Example of digital outputs DO1 ... DO5 with internal power supply (negative logic):



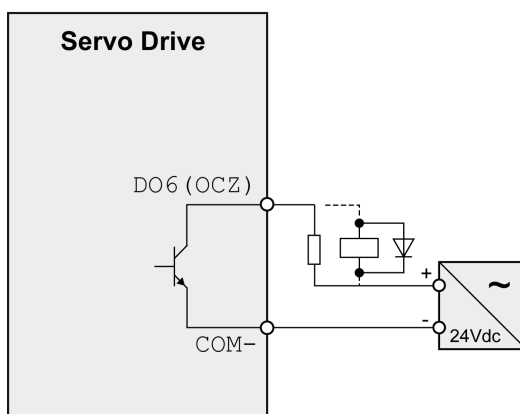
Example of digital outputs DO1 ... DO5 with external power supply (negative logic):



Example of digital output DO6 (OCZ) with internal power supply (negative logic):



Example of digital output DO6 (OCZ) with external power supply (negative logic):



Inductive loads using DC voltages may damage the signal outputs. A protection circuit is required to protect the signal outputs against inductive loads.

⚠ CAUTION

OUTPUT CIRCUIT DAMAGE DUE TO INDUCTIVE LOADS

Use an appropriate external protective circuit or device to reduce the inductive direct current load damage.

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

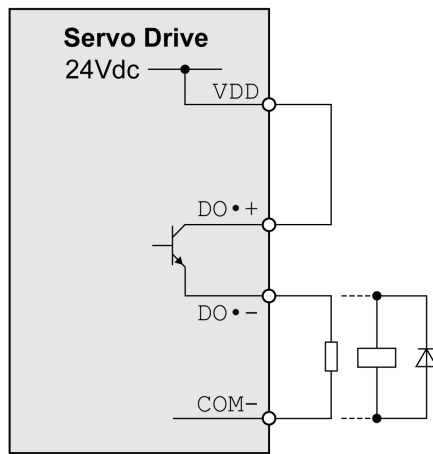
A diode can be used to protect the signal outputs against inductive loads.

Use a diode with the following ratings:

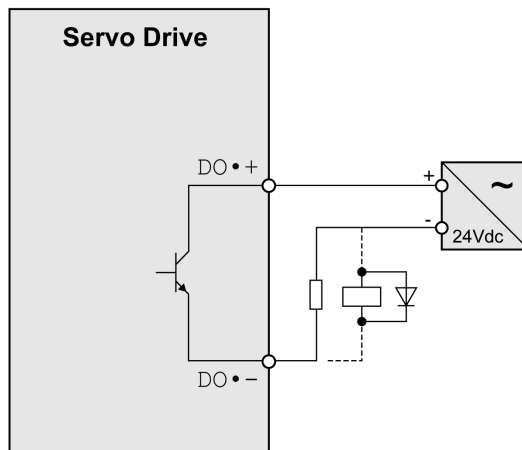
- Reverse withstand voltage: voltage of signal output times 10
- Forward current: greater than the load current

Wiring of the Digital Outputs (Positive Logic)

Example of digital outputs DO1 ... DO5 with internal power supply (positive logic):



Example of digital outputs DO1 ... DO5 with external power supply (positive logic):



Inductive loads using DC voltages may damage the signal outputs. A protection circuit is required to protect the signal outputs against inductive loads.

⚠ CAUTION

OUTPUT CIRCUIT DAMAGE DUE TO INDUCTIVE LOADS

Use an appropriate external protective circuit or device to reduce the inductive direct current load damage.

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

A diode can be used to protect the signal outputs against inductive loads. Use a diode with the following ratings:

Reverse withstand voltage: voltage of signal output times 10

Forward current: greater than the load current

Wiring of the Digital Inputs (Negative Logic)

⚠ WARNING

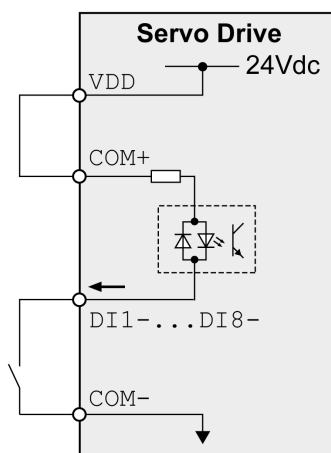
UNINTENDED EQUIPMENT OPERATION

Do not connect an external, 24 Vdc power supply to the VDD connection of the I/O interface (CN1) connector.

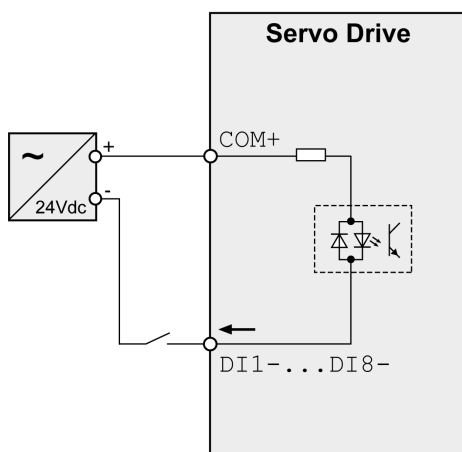
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Use a relay or an open collector output (NPN transistor) for the input signal.

Example of digital input (negative logic) with internal power supply:



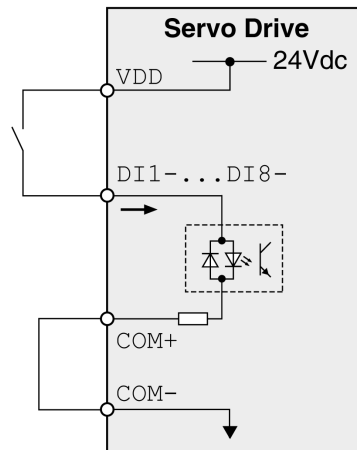
Example of digital input (negative logic) with external power supply:



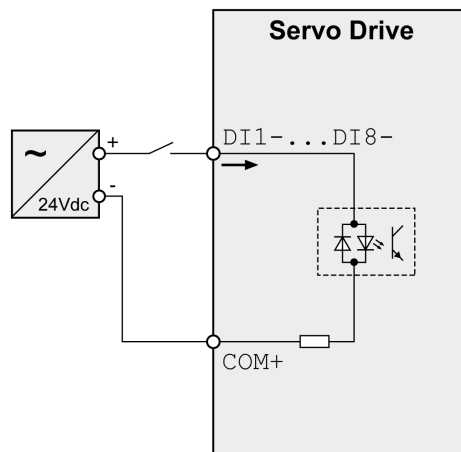
Wiring of the Digital Inputs (Positive Logic)

| |
|--|
| WARNING |
| <p>UNINTENDED EQUIPMENT OPERATION</p> <p>Do not connect an external, 24 Vdc power supply to the VDD connection of the I/O interface (CN1) connector.</p> <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p> |

Use a relay or an open collector output (PNP transistor) for the input signal.
 Example of digital input with internal power supply (positive logic):

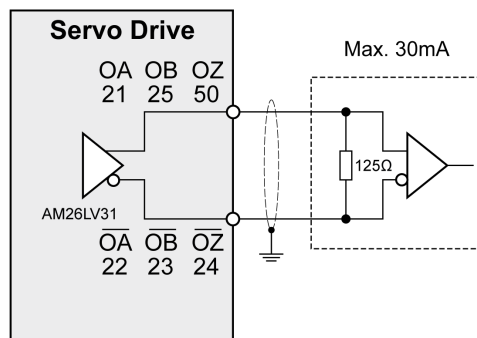


Example of digital input with external power supply (positive logic):

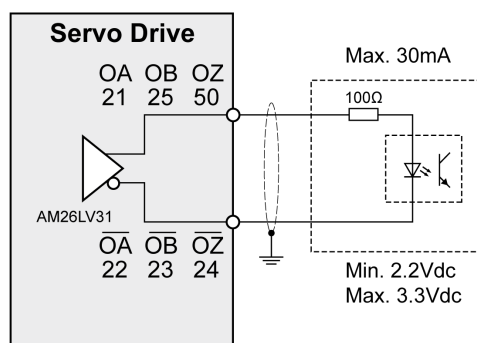


Encoder Output Signal

Example of encoder output signal Line Driver.



Example of encoder output signal, high-speed optocoupler.



Connecting the Motor Encoder (CN2)

Function and Encoder Type

The motor encoder is an integrated, high-resolution absolute encoder. It provides the device with information on the motor position (analog and digital).

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table (*see page 20*).

Cable Specifications

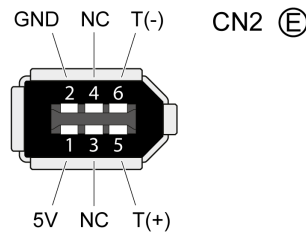
For further information, refer to chapter Cables (*see page 100*).

| | |
|--------------------------|---|
| Shield: | Required, both ends grounded |
| Twisted Pair: | Required |
| PELV: | Required |
| Cable composition: | 10 x 0.13 mm ² (10 x AWG 24) |
| Maximum cable length: | 20 m (65.6 ft) |
| Special characteristics: | Fieldbus cables are not suitable for connecting encoders. |

NOTE: Use pre-assembled cables to reduce the risk of wiring errors.

Wiring Diagram

Connection assignment motor encoder (CN2)



The motor encoder interface (CN2) is a 6-pin connector. The following table describes the contacts of the connector:

| Pin | Signal | Color ⁽¹⁾ | Meaning | Motor military connector | Motor plastic connector | I/O |
|------|--------|--------------------------------|--|--------------------------|-------------------------|-----|
| 5 | T+ | Blue (BU) | Serial communication | A | 1 | I/O |
| 6 | T- | Blue/Black (BU/BK) | | B | 4 | |
| 1 | +5 V | Red, red/white (RD, RD/WH) | 5 V encoder supply | S | 7 | I |
| 2 | GND | Black, black/white (BK, BK/WH) | Reference potential for encoder supply | R | 8 | O |
| 3, 4 | N.C. | Reserved | - | - | - | - |

(1) Color information relates to the cables available as accessories.

⚠ 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 interface meet the PELV requirements.
- Note the information on EMC, see chapter Electromagnetic Compatibility (EMC) (*see page 96*). Use equipotential bonding conductors for equipotential bonding.
- Connect the connector to
 - CN2 Encoder if using a motor equipped with a single turn encoder.
 - the battery compartment if using a motor equipped with a multi turn encoder.
- Verify that the connector locks snap in properly at the housing.

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.

Connecting the Battery Compartment When Using a Motor Equipped With a Multi Turn Encoder

The battery compartment is connected to CN2 Encoder, between the drive and the motor encoder cable.

NOTE: The multi turn counting is preserved through power down by the external battery located into the battery compartment.

For further information on the battery replacement, refer to the maintenance of the motor (*see page 377*).

For LXM26D•••UA5 ...U45, the battery compartment should be installed on a baseplate near the drive

Connection PC (CN3)

Function

The commissioning interface (CN3) is an RS-485 connection, supported on an RJ45 connector. If the PC used to connect to the commissioning interface has an RS-485 port, typically supported on a DB9 connector, you can connect it to this connector (RJ45 / DB9 cable). Otherwise, you can use the USB port of the PC with a USB to RS-485 converter.

The commissioning interface may only be used for a point-to-point connection, but not for a point-to-multipoint connection (RS-485 network).

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

INOPERABLE EQUIPMENT

Do not directly connect an Ethernet interface to the commissioning interface of this product.

Failure to follow these instructions can result in equipment damage.

Connecting a PC

A PC with the commissioning software LXM26 DTM Library can be connected for commissioning. The PC is connected via a bidirectional USB/RS485 converter, refer to Accessories and Spare Parts (*see page 88*).

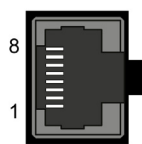
Cable Specifications

For further information, refer to chapter Cables (*see page 100*).

| | |
|--------------------------|---------------------------------------|
| Shield: | Required, both ends grounded |
| Twisted Pair: | Required |
| PELV: | Required |
| Cable composition: | 8 x 0.25 mm ² (8 x AWG 22) |
| Maximum cable length: | 100 m (328 ft) |
| Special characteristics: | - |

Wiring Diagram

Wiring diagram PC with commissioning software



CN3 Modbus

The commissioning interface (CN3) is an RJ45 connector. The following table describes the contacts of the connector:

| Pin | Signal | Meaning | I/O |
|-------------------------|-----------------------|--|--------------|
| 1 ... 3 | - | Reserved | - |
| 4 | MOD_D1 ⁽¹⁾ | Bidirectional transmit/receive signal | RS-485 level |
| 5 | MOD_D0 ⁽¹⁾ | Bidirectional transmit/receive signal, inverted | |
| 6 ... 7 | - | Reserved | - |
| 8 and connector housing | SHLD | Functional ground / shield - internally connected to ground potential of the drive | - |

(1) No polarization.

⚠ 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.


NOTE: Verify that the connector locks snap in properly at the housing.

Connection Logic Supply and Power Stage Supply (~220V)

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

|  DANGER |
|---|
| <p>INSUFFICIENT GROUNDING</p> <ul style="list-style-type: none"> • Use a protective ground conductor with at least 10 mm² (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 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. • Do not use cable shields as protective ground conductors. • 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. <p>Failure to follow these instructions will result in death or serious injury.</p> |

|  WARNING |
|---|
| <p>INSUFFICIENT PROTECTION AGAINST OVERCURRENT</p> <ul style="list-style-type: none"> • Use the external fuses specified in chapter “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”. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p> |

|  WARNING |
|--|
| <p>INCORRECT MAINS VOLTAGE</p> <p>Verify that the product is approved for the mains voltage before applying power and configuring the product.</p> <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p> |

The equipment, drives and motors, are intended for industrial use and may only be operated with a permanently installed connection.

Prior to connecting the equipment, verify the approved mains types, see chapter Electrical Data Drive ([see page 39](#)).

Cable Specifications

Respect the required cable properties in chapter Cables ([see page 100](#)) and in chapter Electromagnetic Compatibility (EMC) ([see page 96](#)).

| | |
|--------------------------|--|
| 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: | 3 m (9.84 ft) |
| Special characteristics: | - |

Properties of the Terminals

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

| LXM26D | Unit | UA5, U01, U02, U04, U07, U10, U15 | U20, U30, U45 |
|--------------------------|--------------------------|---|---------------------------|
| Connection cross section | mm ² (AWG) | 0.75 ... 2.5 (20 ... 14) | 0.75 ... 6 (20 ... 10) |
| Stripping length | mm (in) | 8 ... 9 (0.31 ... 0.35) | 15 (0.59) |

Prerequisites for Connecting the Logic Supply

Note the following information:

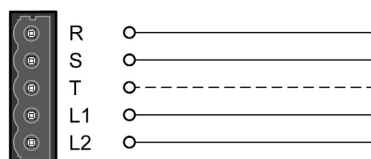
- Use upstream mains fuses. For further information about fuse types and fuse ratings, refer to chapter Electrical Data Drive ([see page 39](#)).
- Note the EMC requirements. Where required, use surge arresters and mains reactors.
- If the length of the mains cable between the external mains filter and the drive exceeds 200 mm (7.87 in), it must be shielded and grounded at both ends.
- For a UL-compliant design, refer to chapter Conditions for UL 508C ([see page 25](#)).

Connection Logic Supply

Wiring diagram logic supply LXM26D•••M3X

UA5, U01, U02, U04, U07, U10, U15, U20, U30, U45

~220V



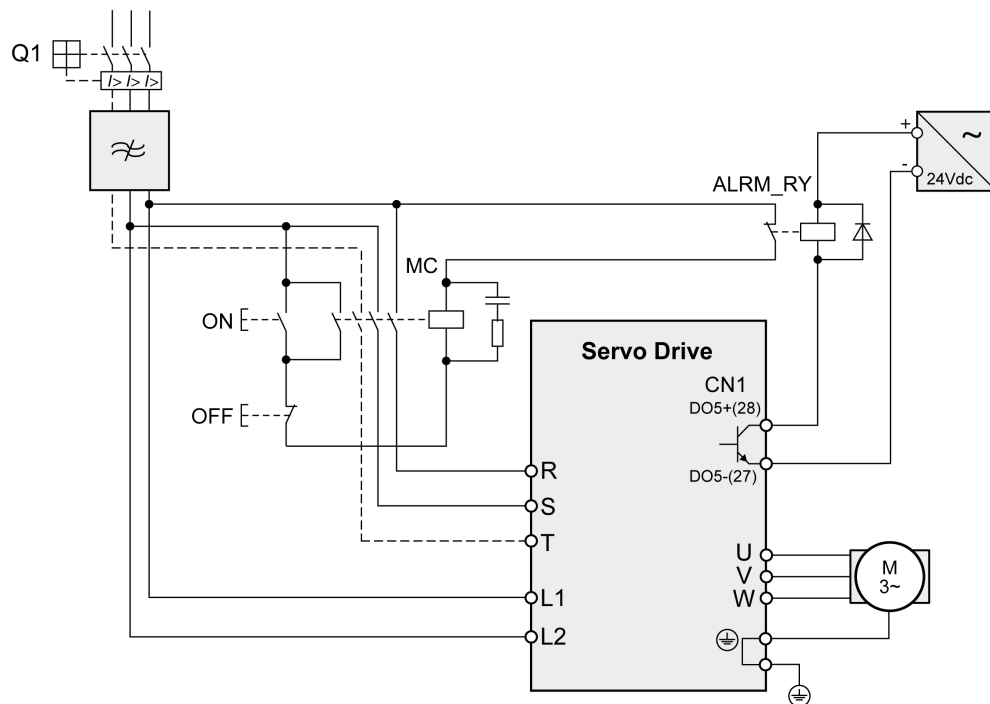
| Connection | Meaning |
|------------|--------------------|
| R, S, (T) | Power stage supply |
| L1, L2 | Logic supply |

- Verify the type of mains. For the approved types of mains, refer to chapter Electrical Data Drive ([see page 39](#)).
- Connect the mains cable.
- Verify that the connector locks snap in properly at the housing.

Wiring Diagram for Devices That Can Be Connected Via a Single-Phase or Three Phases


Drives with a continuous power from 50 W to 1500 W can be connected via a single-phase or via three phases. Drives with a continuous power of more than 1500 W must be connected via three phases.

Wiring diagram for devices that can be connected via a single-phase or three-phases



Connection Braking Resistor (Resistor)

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 |
| <ul style="list-style-type: none"> • 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 drive 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 103*). For suitable braking resistors, refer to chapter Accessories and Spare Parts (*see page 91*).

Cable Specifications

For further information, refer to chapter Cables (*see page 100*).

| | |
|--------------------------|--|
| Shield: | Required, both ends grounded |
| Twisted Pair: | - |
| PELV: | - |
| Cable composition: | Minimum conductor cross section: Same cross section as logic supply. 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) |
| Special characteristics: | Temperature resistance |

The braking resistors listed in chapter Accessories and Spare Parts (*see page 91*) have a 3-wire, temperature-resistant cable with a length of 0.75 m (2.46 ft) to 3 m (9.84 ft).

Properties of the Terminals (Resistor) LXM26DUA5, U01, U02, U04, U07, U10, U15, U20, U30, U45

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

| LXM26D | Unit | UA5, U01, U02, U04, U07, U10, U15 | U20, U30, U45 |
|--------------------------|--------------------------|--------------------------------------|---------------------------|
| Connection cross section | mm ² (AWG) | 0.75 ... 2.5 (20 ... 14) | 0.75 ... 6 (20 ... 10) |
| Stripping length | mm (in) | 8 ... 9 (0.31 ... 0.35) | 15 (0.59) |

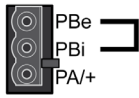
The removable terminals are approved for fine-stranded conductors and solid conductors. Respect the maximum permissible connection cross section. Take into account the fact that cable ends (ferrules) increase the conductor cross section.

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

Wiring Diagram

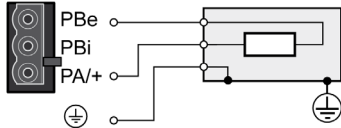
Wiring diagram internal braking resistor activated

LXM26DUA5...U45



Wiring diagram external braking resistor

LXM26DUA5...U45



Connecting the External Braking Resistor

- Remove power from all supply voltages. Respect the safety instructions concerning electrical installation.
- Verify that no voltages are present.
- Ground the ground connection (PE) of the braking resistor.
- Connect the external braking resistor to the device.
- Connect a large surface area of the cable shield to the central grounding point of your system.

⚠ 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.
- 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.

Connecting the Motor Phases (Motor)

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.
- 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.

Incorrect wiring of the motor connection may cause live wires to be exposed outside of the motor connector below the HMI.

DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT WIRING

- Verify that the protective ground connection (PE) of the device is connected to ground.
- Do not remove the cable end (ferrule) from the protective ground terminal (PE) of the motor connector until you are prepared to wire the protective ground conductor of the motor to the protective ground terminal (PE) of the motor connector.
- Verify that no bare metal of the wires is exposed outside of the motor connector housing when wiring the motor connector.
- Regularly, as part of a maintenance plan, assure that the motor wires are secured in the terminals of the motor connector due to vibration or other influences.

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. Even if motors are similar, different adjustment of the encoder system may be a source of hazards. Even if the connectors for motor connection and encoder connection 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.

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table ([see page 20](#)). 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

For further information, refer to chapter Cables (*see page 100*).

| | |
|--------------------------|--|
| 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 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. Category C3: 20 m (65.6 ft) |
| Special characteristics: | Contains wires for the temperature sensor |

Note the following information:

- You may only connect the original motor cable.
- If you do not connect the wires at the motor end, you must isolate each wire individually (inductive voltages).
- Use pre-assembled cables to reduce the risk of wiring errors.

Properties of the Terminals (Motor)

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

| LXM26D | Unit | UA5, U01, U02, U04, U07, U10, U15 | U20, U30, U45 |
|--------------------------|--------------------------|-----------------------------------|---------------------------|
| Connection cross section | mm ² (AWG) | 0.75 ... 2.5 (20 ... 14) | 0.75 ... 6 (20 ... 10) |
| Stripping length | mm (in) | 8 ... 9 (0.31 ... 0.35) | 15 (0.59) |

Monitoring

The drive monitors the motor phases for:

- Short circuit between the motor phases
- Short circuit between the motor phases and ground (Not applicable for LXM26DUA5 ... U07 M3X.)

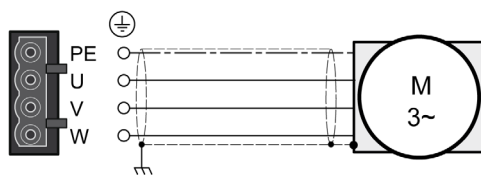
Short circuits between the motor phases and the DC bus, the braking resistor, or the holding brake wires are not detected.

When a short-circuit is detected, power is removed by disabling the power stage. The firmware reports error AL001. Once you have resolved the issue of the over-current, you can re-enable the power stage of the drive.

NOTE: After three successive unsuccessful retries of resetting the power stage, the reset will be blocked for a minimum of one minute.

Wiring Diagram Motor

LXM26DUA5...U45



| Connection | Meaning | Color ⁽¹⁾ (IEC 757) |
|--|-----------------------------|-----------------------------------|
| U | Motor phase | GY |
| V | | BK |
| W | | BN |
| PE | Protective ground conductor | GN/YE |
| (1) Color information relates to the cables available as accessories. | | |

Connecting the Motor Cable

- Note the information on EMC, refer to chapter Electromagnetic Compatibility (EMC) ([see page 96](#)).
- Connect the motor phases and protective ground conductor to the connector labelled **Motor**. Verify that the connections U, V, W, and PE (ground) match at the motor and the device.
- If the product is equipped with removable connectors, Verify that the connector locks snap in properly at the housing.

Holding Brake Connection

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.

A motor with a holding brake requires a suitable holding brake controller which releases the brake when the power stage is enabled and locks the motor shaft when the power stage is disabled.

The holding brake is connected to one of the digital outputs **DO1...DO5**. The signal output function **BRKR** must be assigned to the digital output to which the holding brake is connected. The signal output function **BRKR** releases the holding brake when the power stage is enabled. When the power stage is disabled, the holding brake is reapplied.

The factory settings for the signal outputs depend on the operating mode, see chapter Setting the Digital Signal Outputs (*see page 290*). Depending on the operating mode, the signal output function is either assigned to the digital output **DO4** or not assigned at all. When you reset the drive to the factory settings with **P2-08 = 10**, the assignments of the signal output functions are also reset to the factory settings.

When you switch the operating mode using the parameter **P1-01** or the signal input functions **V-Px** and **V-T**, the signal output functions may also be reset to the factory settings for the new operating mode. If you use the setting **D = 0** of parameter **P1-01**, the assignment of the signal output functions remains the same in the new operating mode.

Resetting the drive to the factory settings or switching the operating mode can modify the assignment of the signal output functions in such a way that the holding brake is released unintentionally.

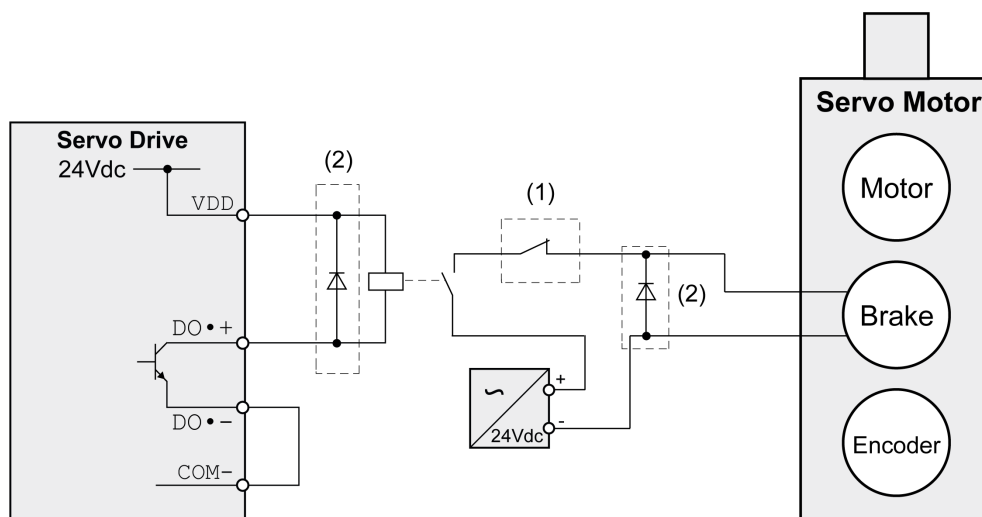
WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the digital output to which you have assigned the signal output function **BRKR** has been properly wired and configured.
- Before switching to a different operating mode, verify that the signal output function **BRKR** for the holding brake will not be assigned to an incorrect digital output in the new operating mode.
- Before resetting the drive to the factory settings, verify that the signal output function **BRKR** for the holding brake will be assigned to the correct digital output or reassign the signal output function **BRKR** after the factory reset according to the requirements of your application prior to starting the system.
- In all cases, take all necessary measures to prevent unintended movements of the load caused by a release of the holding brake.

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

Example (negative logic) of wiring the holding brake



| Item | Description |
|------|---|
| 1 | Triggering an EMERGENCY STOP should apply the holding brake |
| 2 | Flyback diode |

Chapter 10

Motor Installation

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|---------------------------------|------|
| Mechanical Installation Motor | 152 |
| Connections and Pin Assignments | 155 |
| Connection of Motor and Encoder | 159 |
| Holding Brake Connection | 161 |

Mechanical Installation Motor

Motors are very heavy relative to their size. The mass of the motor can cause injuries and damage.

WARNING

HEAVY AND/OR FALLING PARTS

- Use a suitable crane or other suitable lifting gear for mounting the motor if this is required by the weight of the motor.
- Use the necessary personal protective equipment (for example, protective shoes, protective glasses and protective gloves).
- Mount the motor so that it cannot come loose (use of securing screws with appropriate tightening torque), especially in cases of fast acceleration or continuous vibration.

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

Motors can generate strong local electrical and magnetic fields. This can cause interference in sensitive devices.

WARNING

ELECTROMAGNETIC FIELDS

- Keep persons with electronic medical implants, such as pacemakers, away from the motor.
- Do not place electromagnetically sensitive devices in the vicinity 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.

WARNING

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 death, serious injury, or equipment damage.

CAUTION

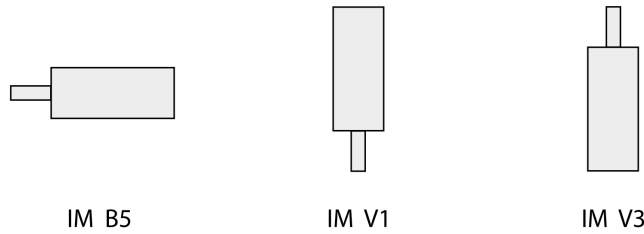
IMPROPER APPLICATION OF FORCES

- Do not use the motor as a step to climb into or onto the machine.
- Do not use the motor as a load-bearing part.
- Use hazard labels and guards on your machine to help prevent the improper application of forces on the motor.

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

Mounting Position

The following mounting positions are defined and permissible as per IEC 60034-7:



Mounting

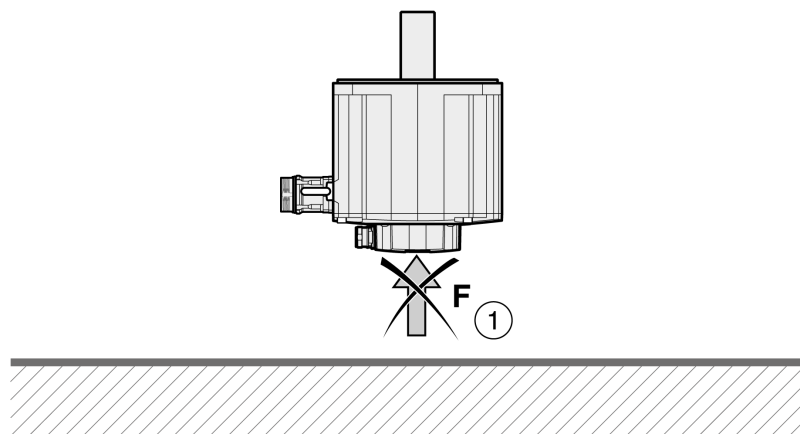
When the motor is mounted to the mounting surface, it must be accurately aligned axially and radially and make even contact with the mounting surface. All mounting screws must be tightened with the specified tightening torque. No uneven mechanical load may be applied while the mounting screws are tightened. For data, dimensions, and degrees of protection (IP), refer to chapter Motor (*see page 49*).

Mounting Situation

| |
|---|
| <i>NOTICE</i> |
| <p>FORCES APPLIED TO THE REAR SIDE OF THE MOTOR</p> <ul style="list-style-type: none"> • Do not place the motor on the rear side. • Protect the rear side of the motor from impact. • Do not lift motors via the rear side. • Only lift motors equipped with eyebolts via the eyebolts. <p>Failure to follow these instructions can result in equipment damage.</p> |

Special Characteristics BCH2•H, BCH2•M, BCH2•R

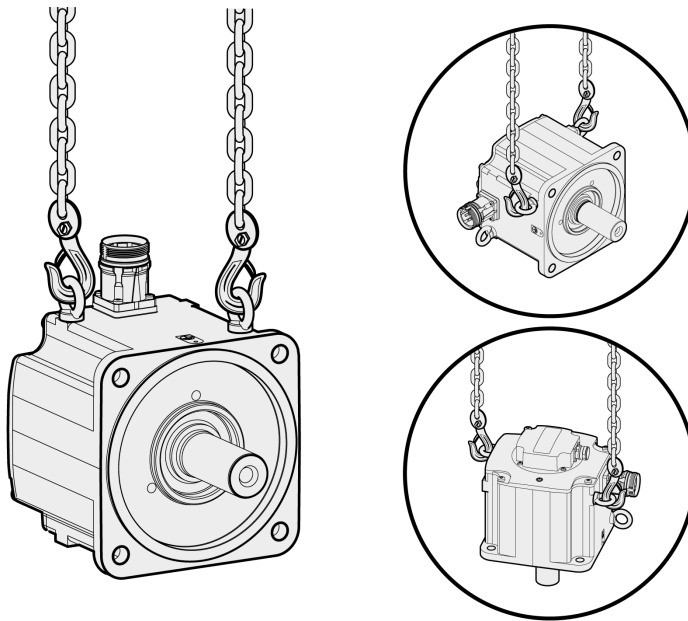
Rear side of motor



| Item | Description |
|------|--|
| 1 | Protect the rear side of the motor from application of forces. |

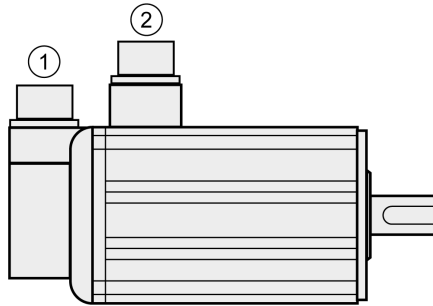
Eyebolts BCH2•R

Consider the mass of the product when mounting the motor. It may be necessary to use suitable lifting gear.



Connections and Pin Assignments

Connection overview

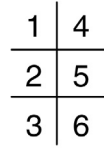
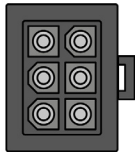
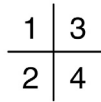
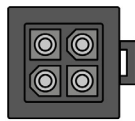


| Item | Description |
|------|--------------------|
| 1 | Encoder connection |
| 2 | Motor connection |

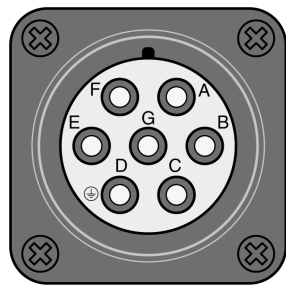
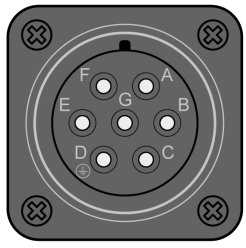
Pin Assignment Motor Connection

Pin assignments of motor phases and holding brake

Motor connection plastic connector (type A and type B), drive side:



Motor connection MIL connector (type C and type D), motor side:



| Pin Type A | Pin Type B | Pin Type C and D | Signal | Meaning | Color ⁽¹⁾ (IEC 757) |
|------------|------------|------------------|-----------|---|--------------------------------|
| 1 | 1 | E | U | Motor phase U | RD |
| 2 | 2 | G | V | Motor phase V | WH |
| 3 | 4 | B | W | Motor phase W | BK |
| 4 | 5 | D | PE | Protective ground (protective earth) | GN/YE |
| - | 3 | F | BRAKE_24V | Supply voltage holding brake 24 Vdc | BU |
| - | 6 | A | BRAKE_0V | Reference potential holding brake 0 Vdc | BN |
| - | - | C | - | Reserved | - |

(1) Color information relates to the cables available as accessories.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

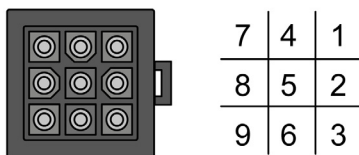
Do not connect any wiring to reserved, unused connections, or to connections designated as No Connection (N.C.).

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

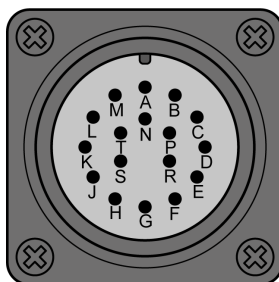
Pin Assignment Encoder Connection

Pin assignment of the encoder.

Encoder connection plastic connector (Type A), drive side:



Encoder connection MIL connector (Type B), motor side:



| Pin Type A | Pin Type B | Signal | Meaning | Color ⁽¹⁾ (IEC 757) |
|------------|------------|-----------|--------------------------|--------------------------------|
| 1 | A | T+ | Data | BU |
| 2 | C | - | Reserved | - |
| 3 | D | - | Reserved | - |
| 4 | B | T- | Data | BU/BK |
| 5 | F | Battery + | Battery + ⁽²⁾ | RD |
| 6 | G | Battery - | Battery - ⁽²⁾ | BK |
| 7 | S | DC+5 V | Supply voltage | RD/WH |
| 8 | R | GND | Reference potential | BK/WH |
| 9 | L | Shield | Shield | BK |
| - | E | - | Reserved | - |
| - | H | - | Reserved | - |
| - | J | - | Reserved | - |
| - | K | - | Reserved | - |
| - | M | - | Reserved | - |
| - | N | - | Reserved | - |
| - | P | - | Reserved | - |
| - | T | - | Reserved | - |

(1) Color information relates to the cables available as accessories.
 (2) Used with multi turn encoders.

⚠ 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.

Mating Connector

For suitable mating connectors, refer to chapter Connectors and Adapters (*see page 88*).

Connection of Motor and Encoder

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

⚠ DANGER

FIRE HAZARD DUE TO INCORRECT CONNECTION

Only connect the motor to a matching, approved drive.

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

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table (*see page 20*).

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.
- 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.

Drive systems may perform unintended movements if unapproved combinations of drive and motor are used. Even if motors are similar, different adjustment of the encoder system may be a source of hazards. Even if the connectors for motor connection and encoder connection match mechanically, this does not imply that the motor is approved for use.

⚠ WARNING

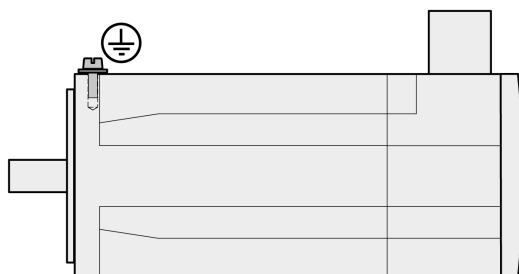
UNINTENDED MOVEMENT

Only use approved combinations of drive and motor.

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

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table (*see page 20*).

Protective Ground Conductor Connection



- Ground the motor via a grounding screw if grounding via the flange and the protective ground conductor of the motor cable is not sufficient.
- Use parts with suitable corrosion protection.

Connecting the Cables

Incorrect installation of the cable may destroy the insulation. Broken conductors in the cable or improperly connected connectors may be melted by arcs.

DANGER

ELECTRIC SHOCK, ARC FLASH AND FIRE CAUSED BY INCORRECT INSTALLATION OF THE CABLE

- Disconnect all power before plugging in or unplugging the connectors.
- Verify correct pin assignment of the connectors according to the specifications in this chapter before connecting the cables.
- Verify that the connectors are properly inserted and locked before applying power.
- Avoid forces or movements of the cable at the cable entries.

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

- Connect the motor cable and the encoder cable to the drive according to the wiring diagram of the drive.
- If your motor is equipped with a holding brake, follow the instructions in chapter Holding Brake Connection ([see page 161](#)).

Holding Brake Connection

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.

A motor with a holding brake requires a suitable holding brake controller which releases the brake when the power stage is enabled and locks the motor shaft when the power stage is disabled.

See chapter Holding Brake Connection (*see page 148*) for additional information.

As a result of damage to the insulation of the motor cable, mains voltage may get to the wires for the holding brake.

DANGER

ELECTRICAL SHOCK CAUSED BY DAMAGE TO THE MOTOR CABLE

- Use a PELV power supply for the holding brake.
- Insulate both ends of unused conductors of the motor cable.

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

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, for example, lowering of the load in the case of vertical axes.

WARNING

UNINTENDED MOVEMENT

- Verify that there are no persons or obstacles in the zone of operation when performing a test of the holding brake.
- Take appropriate measures to avoid damage 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.

Cable Specifications

For further information on cable specifications, refer to chapter Cables (*see page 100*).

Chapter 11

Verifying Installation

Verifying 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 wiring:

- 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 of the control cabinet are properly installed to meet the required degree of protection.

Part V

Commissioning

What Is in This Part?

This part contains the following chapters:

| Chapter | Chapter Name | Page |
|---------|--------------------------|------|
| 12 | Overview | 167 |
| 13 | Integrated HMI | 171 |
| 14 | Commissioning Procedure | 179 |
| 15 | Tuning the Control Loops | 187 |

Chapter 12

Overview

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|---------------------|------|
| General | 168 |
| Commissioning Tools | 170 |

General

You must recommission an already configured device if you want to use it under different operating conditions.

Unsuitable settings or unsuitable data may trigger unintended movements, trigger signals, damage parts and disable monitoring functions. Some parameters and other operational 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.
- 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 modification.
- 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 a 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 loss of the braking force.

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.

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

WARNING

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 death, serious injury, or equipment damage.

Rotating parts may cause injuries and may catch clothing or hair. Loose parts or parts that are out of balance may be ejected.

WARNING

MOVING, UNGUARDED EQUIPMENT

Verify that rotating parts cannot cause injuries or equipment damage.

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, for example, lowering of the load in the case of vertical axes.

WARNING

UNINTENDED MOVEMENT

- Verify that there are no persons or obstacles in the zone of operation when performing a test of the holding brake.
- Take appropriate measures to avoid damage 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 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

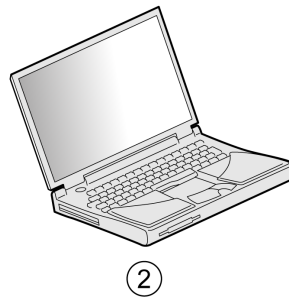
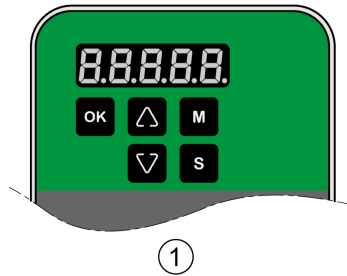
- Verify that simultaneous access via multiple access channels cannot cause unintended triggering or blocking of commands.
- Verify that the use of exclusive access cannot cause unintended triggering or blocking of commands.
- Verify that the required access channels are available.

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

Commissioning Tools

Overview

The following tools (*see page 88*) can be used for commissioning, parameterization, and diagnostics:



| Item | Description |
|------|--|
| 1 | Integrated HMI |
| 2 | PC with commissioning software LXM26 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.

Chapter 13

Integrated HMI

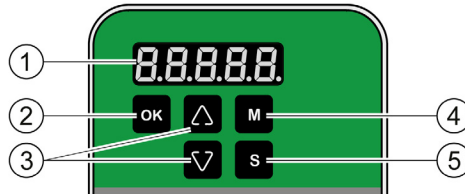
What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------------|------|
| Overview | 172 |
| Integrated HMI Structure | 173 |
| 7-Segment Display | 174 |
| Status Information Via the HMI | 177 |

Overview

The integrated HMI 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.



| Item | Description |
|------|---------------------------|
| 1 | 5-digit 7-segment display |
| 2 | OK key |
| 3 | Arrow keys |
| 4 | M key |
| 5 | S key |

Incorrect wiring of the motor connection may cause live wires to be exposed outside of the motor connector below the HMI.

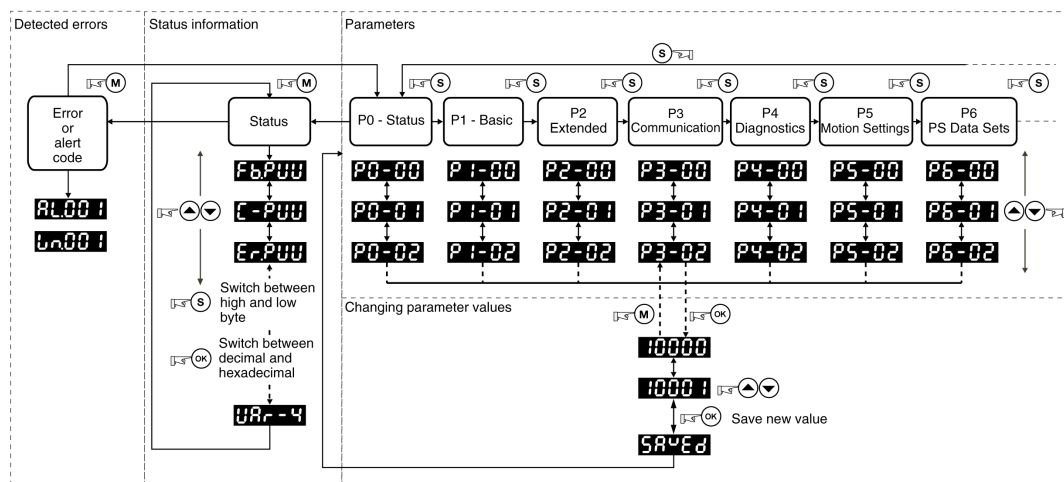
⚡ ⚠ DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT WIRING

- Verify that the protective ground connection (PE) of the device is connected to ground.
- Do not remove the cable end (ferrule) from the protective ground terminal (PE) of the motor connector until you are prepared to wire the protective ground conductor of the motor to the protective ground terminal (PE) of the motor connector.
- Verify that no bare metal of the wires is exposed outside of the motor connector housing when wiring the motor connector.
- Regularly, as part of a maintenance plan, assure that the motor wires are secured in the terminals of the motor connector due to vibration or other influences.

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

Integrated HMI Structure



When the drive is powered on, the display shows the name of the selected status information function for approximately one second; after that, it displays the corresponding actual value or status value.

| Element | Function |
|-------------|---|
| HMI display | The 5-digit 7-segment display shows actual values, parameter settings, status information, and error codes. |
| M key | The M key lets you switch between the type of information displayed: status information/actual values, error codes, and parameters. If an error is detected, the display shows the error code. If you press the M while the error is active, you can display other information; however, after approximately 20 seconds without interaction, the error code is displayed again. |
| S key | The S lets you scroll through the parameter groups. After you have selected a parameter and its value is displayed, you can use the S key to move the cursor to the left. The digit at the current cursor position flashes. The arrow keys let you change the value at the current cursor position. |
| Arrow keys | The arrow keys let you scroll through the actual values/status information and the parameters within a parameter group. Use the arrow keys to increase or decrease values. |
| OK key | After you have selected a parameter, press the OK key to display the current parameter value. The arrow keys let you change the displayed value. Pressing the OK key again saves the value. |

7-Segment Display

Saving Settings

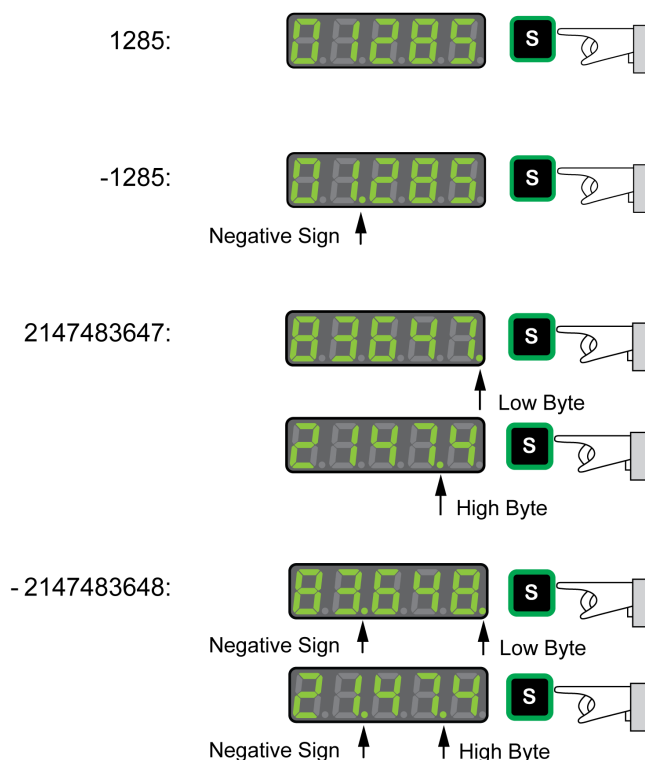
If you set a new parameter value and press the **OK** key, a message is displayed for approximately one second to provide feedback.

| 7-segment display | Description |
|-------------------|---|
| <i>S R U E d</i> | The new parameter value was successfully saved. |
| <i>r - o L Y</i> | The parameter value is a read-only value and cannot be saved (Read-Only). |
| <i>P r o t</i> | Changing a parameter value requires exclusive access. See chapter Access Channels (<i>see page 282</i>). |
| <i>o u t - r</i> | The new parameter value is outside the permissible value range (Out of range). |
| <i>S r u o n</i> | The new parameter value can only be saved when the power stage is disabled (Servo On). |
| <i>P o - O n</i> | The new parameter value becomes active the next time the product is powered on (Power On). |
| <i>E r r o r</i> | Displayed whenever a value you have entered for a parameter is, for various reasons, rejected by the drive. |

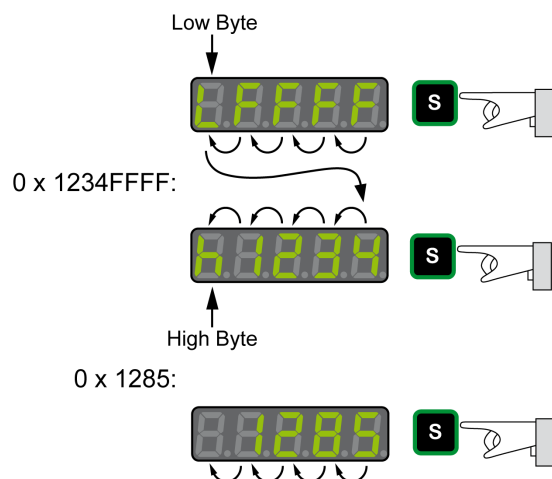
Representation of Numerical Values on the 7-Segment Display

The illustration below shows the decimal representation of a 16-bit value and a 32-bit value as a positive value and as a negative value each.

Example of representation of decimal values



Example of representation of hexadecimal values



Changing the Sign Via the 7-Segment Display

| 7-segment display | Description |
|--------------------|---|
| <i>2 4 6 8 0</i> | You can change the sign of a value by holding down the S key for a period of more than 2 seconds. Negative decimal values are represented with a dot between the second and the third position. Negative hexadecimal values are represented as a two's complement. |
| <i>2 4 . 6 8 0</i> | |
| <i>X 3 4 3 E</i> | |
| <i>X C b C 2</i> | |

Alert Messages and Error Messages on the 7-Segment Display

| 7-segment display | Description |
|-------------------|---|
| W n n n n | If an alert condition is detected, Wnnnn is displayed. Win identifies the code as an alert. The subsequent 3 digit nnn represent the number of the alert. For a list of alert codes, refer to Alert Codes and Error Codes (<i>see page 362</i>). |
| AL n n n | If an error is detected ALnnn is displayed. AL identifies the code as a detected error. The subsequent 3 digit nnn represent the error number. For a list of error codes, refer to Alert Codes and Error Codes (<i>see page 362</i>). |
| S t o p | The display shows STOP if exclusive access is enabled while the power stage is still enabled. For further information on access channels, refer to Access Channels (<i>see page 282</i>). |

Status Information Via the HMI

After you have powered on the drive, status information is displayed via the HMI. Use the parameter P0-02 to select the type of status information to be displayed. For example, if you set the parameter P0-02 to the value 7, the speed of rotation of the motor after is displayed after you have powered on the drive.

| Setting P0-02 | Description |
|---------------|---|
| 0 | Actual position (with gear ratio applied) in the unit PUU |
| 1 | Target position (with gear ratio applied) in the unit PUU |
| 2 | Deviation between actual position and target position (with gear ratio applied) in the unit PUU |
| 3 | Actual position in motor increments (1280000 pulses/revolution) |
| 4 | Target position in motor increments (1280000 pulses/revolution) |
| 5 | Deviation between actual position and target position in motor increments (1280000 pulses/revolution) |
| 6 | Reference value in kilopulses per second (kpps) |
| 7 | Actual velocity in rpm |
| 8 | Voltage for target velocity in V |
| 9 | Target velocity in rpm |
| 10 | Voltage for target torque in V |
| 11 | Target torque in percent of continuous motor current |
| 12 | Average load of the motor in percent of continuous motor current (The sampling window duration is specified via parameter P4-29) |
| 13 | Peak load of the motor since the last power cycle of the drive in percent of continuous motor current (maximum value of occurring in setting 12 since last power cycle) |
| 14 | Mains voltage in V |
| 15 | Ratio of load inertia and motor inertia (divided by 10) |
| 16 | Power stage temperature in degrees Celsius (°C) |
| 17 | Resonance frequency in Hz |
| 18 | Absolute pulse number relative to encoder |
| 19 | Mapping parameter 1: Content of parameter P0-25 (mapping target is specified via parameter P0-35) |
| 20 | Mapping parameter 2: Content of parameter P0-26 (mapping target is specified via parameter P0-36) |
| 21 | Mapping parameter 3: Content of parameter P0-27 (mapping target is specified via parameter P0-37) |
| 22 | Mapping parameter 4: Content of parameter P0-28 (mapping target is specified via parameter P0-38) |
| 23 | Status indication 1: Content of parameter P0-09 (the status information to be displayed is specified by parameter P0-17) |
| 24 | Status indication 2: Content of parameter P0-10 (the status information to be displayed is specified by parameter P0-18) |
| 25 | Status indication 3: Content of parameter P0-11 (the status information to be displayed is specified by parameter P0-19) |
| 26 | Status indication 4: Content of parameter P0-12 (the status information to be displayed is specified by parameter P0-20) |
| 27 | Reserved |
| 39 | Status of digital inputs (content of P4-07) |
| 40 | Status of digital outputs (content of P4-09) |
| 41 | Drive status (content of P0-46) |
| 42 | Operating mode (content of P1-01) |
| 49 | Actual position encoder (content of P5-18) |
| 50 | Target velocity in rpm |
| 53 | Target torque in 0.1 percent of the nominal torque |
| 54 | Actual torque in 0.1 percent of the nominal torque |
| 55 | Actual torque in 0.01 A |
| 77 | Target velocity in rpm in operating modes PT and PS |
| 96 | Firmware version and firmware revision of drive (P0-00 and P5-00) |
| 111 | Number of detected errors |

Chapter 14

Commissioning Procedure

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|---|------|
| Commissioning Software | 180 |
| Setting the Device Address, Baud Rate and Connection Settings | 181 |
| Verifying the Direction of Movement | 183 |
| Test Operation in Operating Mode Velocity (V) | 185 |

Commissioning Software

The commissioning software LXM26 DTM Library has a graphic user interface and is used for commissioning, diagnostics, and testing settings.

Online Help

The commissioning software offers help functions, which can be accessed via help menu or by pressing the F1 key.

Source of Commissioning Software

The latest version of the commissioning software LXM26 DTM Library is available for download from the Internet.

<https://www.schneider-electric.com>

Setting the Device Address, Baud Rate and Connection Settings

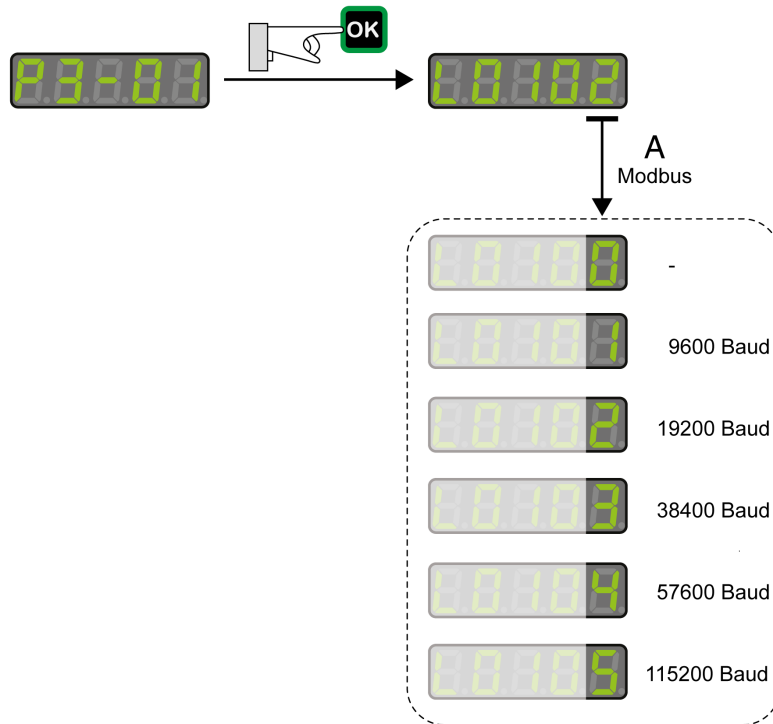
Each device is identified by a unique address. Each device must have its own unique node address, which may only be assigned once in the network. The transmission rate (baud rate) must be the same for all devices in the network.

Use the parameter P3-00 to set the Modbus device address.

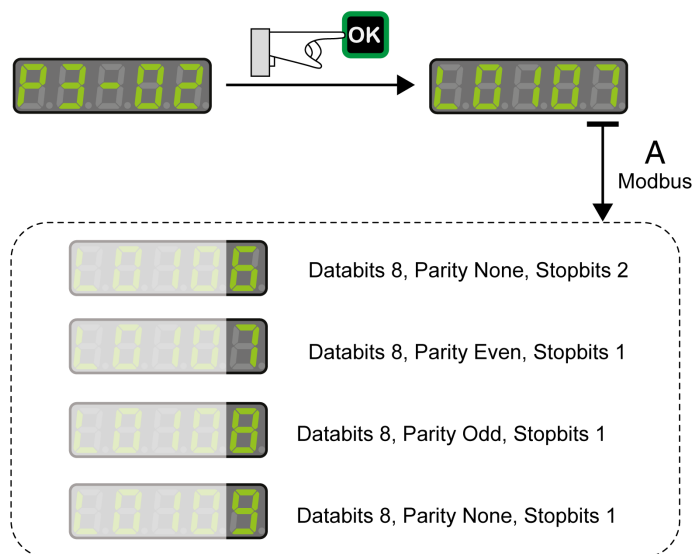
Use the parameter P3-01 to set the baud rate.

Use the parameter P3-02 to set the connection settings.

Setting the baud rate:



Modbus Connection Settings



⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that there is only one master controller configured on the network or remote link.
- Verify that all devices have unique addresses.
- Confirm that the device address is unique before placing the system into service.

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

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|--|--------------------------------|--------------------------------|
| P3-00 ADR | Device Address Modbus Applicable operating mode: PT, PS, V, T The device address must be unique. Modified settings become active the next time the product is powered on. | - 1 127 247 Decimal | u16 RW per. | Modbus 400 _h |
| P3-01 BRT | Transmission Rate Applicable operating mode: PT, PS, V, T This parameter is used to set the data transmission rate. Modified settings become active the next time the product is powered on. | - 0 _h 102 _h 405 _h Hexadecimal | u16 RW per. | Modbus 402 _h |
| P3-02 PTL | Modbus Connection Settings Applicable operating mode: PT, PS, V, T This parameter specifies the Modbus connection settings. Modified settings become active the next time the product is powered on. | - 6 _h 7 _h 9 _h Hexadecimal | u16 RW per. | Modbus 404 _h |
| P3-03 FLT | Detected Modbus Communication Errors - Handling Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive to a detected communication error. Value 0: Detected alert Value 1: Detected error | - 0 _h 0 _h 1 _h Hexadecimal | u16 RW per. | Modbus 406 _h |
| P3-04 CWD | Modbus Connection Monitoring Applicable operating mode: PT, PS, V, T This parameter specifies the maximum permissible duration for communication timeout. When this time has elapsed, the communication timeout is treated as a detected error. Setting this parameter to 0 to disables connection monitoring. | ms 0 0 20000 Decimal | u16 RW per. | Modbus 408 _h |
| P3-07 CDT | Modbus Response Delay Time Applicable operating mode: PT, PS, V, T This parameter specifies the time delay with which the drive responds to the Modbus master. | 0.5 ms 0 0 1000 Decimal | u16 RW per. | Modbus 40E _h |

Verifying the Direction of Movement

Direction of Movement

⚠ WARNING

UNINTENDED MOVEMENT CAUSED BY INTERCHANGED MOTOR PHASES

Do not interchange the motor phases.

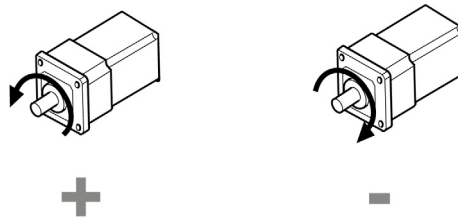
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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

Movements are made in positive or in negative directions.

Definition of the direction of movement: Positive direction of movement is when the motor shaft rotates counterclockwise as you look at the end of the protruding motor shaft.

Direction of movement with factory settings



Verifying the Direction of Movement

- Start the operating mode Jog. (HMI: *P 4 - 0 5*)
The HMI displays the velocity in the unit rpm for the operating mode JOG.
- Set a velocity suitable for your application and conform with the OK key.
The HMI displays *J O G*.

Movement in positive direction:

- Press the **Up Arrow** key.
A movement is made in positive direction.

Movement in negative direction:

- Press the **Down Arrow** key.
A movement is made in negative direction.

Press the M key to terminate the operating mode Jog.

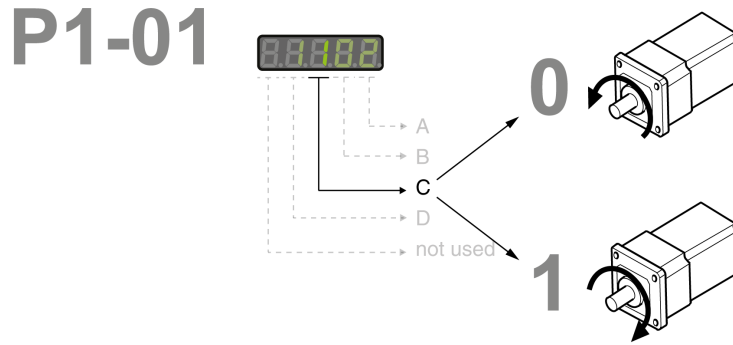
Changing the Direction of Movement

If the expected direction of movement and the actual direction of movement are not identical, you can invert the direction of movement.

- Inversion of direction of movement is not activated:
Movements are made in positive direction with positive target values.
- Inversion of direction of movement is activated:
Movements are made in positive direction with negative target values.

The parameter P1-01 C = 1 allows you to invert the direction of movement.

Changing the direction of movement



Test Operation in Operating Mode Velocity (V)

- Select the operating mode Velocity (V) via the parameter P1-01: = 2. Refer to Setting the Operating Mode (*see page 300*).
- Set the parameter P1-01 to D=1. This assigns defaults to the signal input functions for the operating mode Velocity (V), DI6...DI8 presets must be modified for this test.
New settings for the parameter P1-01 do not become active until the drive is powered on the next time.
- Restart the drive.
- Select the following signal input functions via the parameters P2-10 to P2-17:

| Digital input | Parameter | Setting | Signal | Function | Pin at CN1 |
|---------------|-----------|-------------------|-------------|--------------------------------|------------|
| DI1 | P2-10 | 0101 _h | SON | Enable power stage | 9 |
| DI2 | P2-11 | 0109 _h | TRQLM | Activate Torque Limitation | 10 |
| DI3 | P2-12 | 0114 _h | SPD0 | Velocity Reference Value Bit 0 | 34 |
| DI4 | P2-13 | 0115 _h | SPD1 | Velocity Reference Value Bit 1 | 8 |
| DI5 | P2-14 | 0102 _h | FAULT_RESET | Fault Reset | 33 |
| DI6 | P2-15 | 0 _h | - | - | 32 |
| DI7 | P2-16 | 0 _h | - | - | 31 |
| DI8 | P2-17 | 0 _h | - | - | 30 |

For further information on the settings, refer to Setting the Digital Signal Inputs (*see page 284*).

Error Messages HMI

If the default presets of the signal inputs OPST, CWL(NL), and CCWL(PL/LIMP) are still present, the following error codes can be displayed:

- AL013: Parameter P2-17 not set to 0 (deactivated).
- AL014: Parameter P2-15 not set to 0 (deactivated).
- AL015: Parameter P2-16 not set to 0 (deactivated).

For further information on error messages, refer to Diagnostics and Troubleshooting (*see page 362*).

Target Velocity

The target velocity is selected via the signal input functions SPD0 (least significant bit) and SPD (most significant bit):

| - | Signal state of the digital signal inputs | | Target velocity via: | | Range |
|----|---|------|------------------------|---|----------------------------|
| | SPD1 | SPD0 | | | |
| S1 | 0 | 0 | External analog signal | Voltage between V_REF (pin 42) and GND (pin 44) | -10 ... 10 Vdc |
| S2 | 0 | 1 | Internal parameters | P1-09 | -60000 ... 60000 x 0.1 rpm |
| S3 | 1 | 0 | | P1-10 | |
| S4 | 1 | 1 | | P1-11 | |

- Enable the power stage via DI1 (SON).
If DI3 (SPD0) and DI4 (SPD1) are deactivated, the target velocity is supplied via the analog input V_REF.
- Activate DI3 (SPD0).
The target velocity is supplied via the parameter P1-09. The factory setting for the target velocity is 1000 rpm.

Chapter 15

Tuning the Control Loops

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Tuning the Control Loops | 188 |
| Easy Tuning | 189 |
| Comfort Tuning | 190 |
| Manual Tuning | 196 |

Tuning the Control Loops

Autotuning and manual tuning move 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 P9-26 and P9-27 do not exceed the available movement range.
- Verify that the parameterized movement ranges are available.
- In determining the available movement range, consider 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 the operation.

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

Autotuning adapts the control performance of the drive to the mechanical system used and optimizes the control loop settings appropriately. External factors such as a load at the motor are considered. The control loop settings can also be optimized by using manual tuning.

Two autotuning methods and manual tuning are provided for control loop optimization:

- Easy Tuning: This type of autotuning is performed without user intervention. For most applications, Easy Tuning yields good, highly dynamic results.
- Comfort Tuning: This type of autotuning is performed with user intervention. You can select optimization criteria and set parameters for movement, direction, and velocity.
- Manual Tuning: This type of tuning allows you to perform test movements and optimize the control loop settings using the Scope function.

Easy Tuning

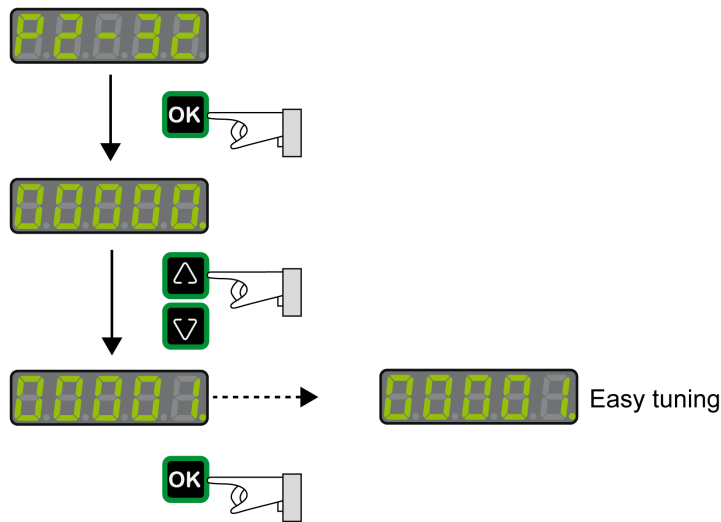
Easy Tuning is started via the HMI or the commissioning software LXM26 DTM Library.

Easy Tuning requires an available movement range of 5 revolutions. During Easy Tuning, movements of 2.5 revolutions are performed in positive direction of movement and 2.5 revolutions in negative direction of movement. If this movement range is not available, you must use Comfort Tuning.

Easy Tuning can be used for a ratio of motor inertia to load inertia of up to 1:50.

Performing Easy Tuning

Set the parameter P2-32 to 1 to perform Easy Tuning.



After you have started Easy Tuning via P2-32, the display of the HMI shows the progress as a percentage from `tn000` to `tn100`.

Press the **M** button of the HMI to cancel autotuning.

If autotuning completes successfully, the display of the HMI shows the message `done`.

Press the **OK** key of the HMI to save the control loop parameters. The display of the HMI briefly shows the message `saved`.

Press the **M** key of the HMI to discard the autotuning results.

If autotuning does not complete successfully, the display of the HMI shows the message `ERROR`. The cause can be read with the parameter P9-30.

The parameter P9-37 provides additional information on the last event that occurred during autotuning.

Comfort Tuning

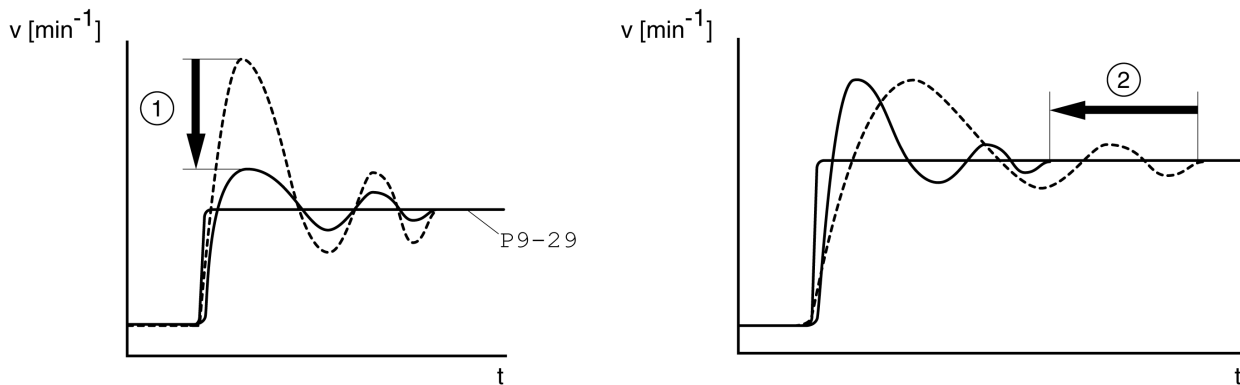
Comfort Tuning allows you to select optimization criteria and set values for the movement.

Optimization Criteria for Comfort Tuning

Comfort Tuning allows you to select an optimization criterion for autotuning. The following optimization criteria are available:

- Optimization of the control loop parameters for minimum settling time with vibration suppression
- Optimization of the control loop parameters for minimum overshoot with vibration suppression
- Optimization of the control loop parameters for minimum settling time without vibration suppression
- Optimization of the control loop parameters for minimum overshoot without vibration suppression

The illustration below shows optimization for minimum overshoot and optimization for minimum settling time.



| Item | Description |
|------|--|
| 1 | Optimization for minimum overshoot |
| 2 | Optimization for minimum settling time |

Vibration suppression compensates resonance frequencies of the mechanical system. The option Vibration Suppression is available for both optimization criteria.

Parameters for the Movement for Comfort Tuning

The following settings must be made for Comfort Tuning:

- Direction of movement
- Velocity
- Acceleration and deceleration
- Movement range
- Smoothing

These values must be as close as possible to the values used in the actual application. If you enter implausible values, Comfort Tuning is canceled.

Setting the Direction of Movement

Set the direction of movement via the parameter P9-20.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-------------------|---|---|--------------------------------|--------------------------------|
| P9-20 LTNCYCLE | Autotuning - Direction of Movement Applicable operating mode: PT, PS, V This parameter sets the direction of movement for autotuning. Value 0: Both directions of movement Value 2: One direction of movement | - 0 0 3 Decimal | s16 RW - | Modbus A28 _n |

Setting the Velocity

Set the velocity via the parameter P9-29.

The velocity must be between 10 ... 100 % of the nominal velocity n_N .

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|---------------------|--|---|--------------------------------|--------------------------------|
| P9-29 LTNVCRUISE | Autotuning - Velocity Applicable operating mode: PT, PS, V Bits 0 ... 15: Velocity for positive direction of movement Bits 16 ... 31: Velocity for negative direction of movement | 0.1rpm 0.1rpm - - - Decimal | u32 RW - | Modbus A3A _n |

Setting Acceleration and Deceleration

Set the acceleration and the deceleration with the P9-31 parameter.

The value for the acceleration and the value for the deceleration must be between t_{\min} and t_{\max} :

$$t_{\min} = \frac{100}{90} 20\pi \frac{J_M + J_{\text{load}}}{M_{\max}} \quad t_{\max} = \frac{100}{33} 20\pi \frac{J_M + J_{\text{load}}}{M_N}$$

J_M = Moment of inertia of the motor in kg cm²

J_{load} = Moment of inertia of the load in kg cm²

M_{\max} = Peak torque in Nm

M_N = Nominal torque in Nm

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-------------------|---|---|--------------------------------|--------------------------------|
| P9-31 PTACCDEC | Autotuning - Acceleration and Deceleration Applicable operating mode: PT, PS, V Bits 0 ... 15: Acceleration for Autotuning Bits 16 ... 31: Deceleration for Autotuning | ms ms 6 6 6000 6000 65500 65500 Decimal | u32 RW - | Modbus A3E _n |

Setting the Movement Range

Set the movement range via parameters P9-26 and P9-27.

The movement range must be sufficiently large to allow for a constant movement at the set speed in addition to the acceleration phase and the deceleration phase.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P9-26 PTPOS | Autotuning - Movement Range in Direction 1 Applicable operating mode: PS This parameter specifies the movement range for autotuning in direction of movement 1. The sign of the value determines the direction of movement: Positive value: Positive direction of movement as set via parameter P1-01 Negative value: Negative direction of movement as set via parameter P1-01 See parameter P9-20 to select one direction of movement or both directions of movement for Comfort Tuning. | PUU -2147483647 0 2147483647 Decimal | s32 RW - | Modbus A34 _n |
| P9-27 PTNEG | Autotuning - Movement Range in Direction 2 Applicable operating mode: PS This parameter specifies the movement range for autotuning in direction of movement 2. The sign of the value determines the direction of movement: Positive value: Positive direction of movement as set via parameter P1-01 Negative value: Negative direction of movement as set via parameter P1-01 See parameter P9-20 for Comfort Tuning in a single or in both directions of movement. See parameter P9-20 to select one direction of movement or both directions of movement for Comfort Tuning. | PUU -2147483647 0 2147483647 Decimal | s32 RW - | Modbus A36 _n |

Setting Smoothing

Comfort Tuning uses S-curve smoothing by default. The value for smoothing via the S-curve is optimized during Comfort Tunings.

The parameter P9-23 allows you to change from automatic smoothing to manual smoothing.

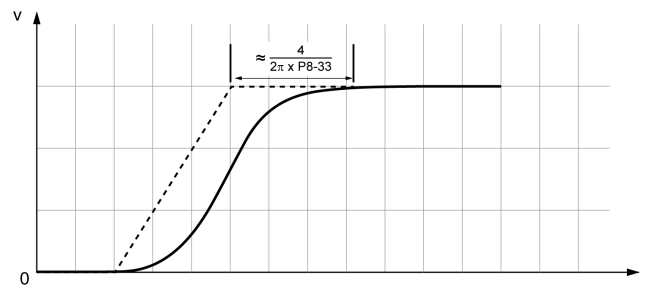
The following options are available for manual smoothing:

- No smoothing
- Smoothing via low-pass filter with a fixed value
- Smoothing via S-curve with a fixed value

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-----------------------------|---|---|--------------------------------|--------------------------------|
| P9-23 LTNSTIFF | Defines which values are used for the position command filters. Applicable operating mode: PT, PS, V Value 0: Automatic smoothing via S-curve optimization of the value Value 1: Manual smoothing | - 0 0 1 Decimal | u16 RW - | Modbus A2E _n |
| P8-34 MOVESMOOTHM ODE | Smoothing Filter for Operating modes PT and PS - Type Applicable operating mode: PT, PS Value 0: No smoothing Value 1: LPF smoothing Value 2: S-curve smoothing Setting can only be modified if power stage is disabled. | - 0 2 2 Decimal | u16 RW per. | Modbus 944 _n |

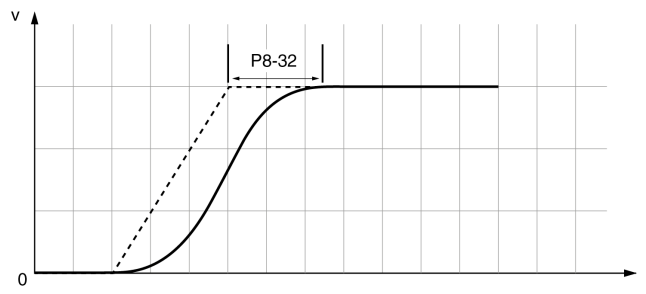
The illustration below shows the movement during Comfort Tuning if smoothing via the low-pass filter is used:

Comfort Tuning with smoothing via low-pass filter



| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|------------------------------|--|---|--------------------------------|--------------------------------|
| P8-33 MOVESMOOTHL PFHZ | Low Pass Filter Setting Applicable operating mode: PT, PS | Hz 1 5000 500000 Decimal | u32 RW per. | Modbus 942 _n |

The illustration below shows the movement during Comfort Tuning if smoothing via an S-curve is used:
 Comfort Tuning with smoothing via S-curve



| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------------------|---|---|--------------------------------|--------------------------------|
| P8-32 MOVESMOOTHA VG | S-Curve Setting Applicable operating mode: PT, PS Setting can only be modified if power stage is disabled. The maximum value is reduced to 12800 if P8-35 CONTROLMODE (high byte) is set to 5. | 0.01 ms 25 400 25600 Decimal | u32 RW per. | Modbus 940 _h |

Performing Comfort Tuning

Start Comfort Tuning by selecting the required method via the parameter P2-32.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-----------------|---|---|--------------------------------|--------------------------------|
| P2-32 ATMODE | Autotuning Applicable operating mode: PT, PS, V This parameter is used to start autotuning with the selected autotuning method. Value 0: Stop Autotuning Value 1: Easy Tuning Value 2: Comfort Tuning [minimum settling time, vibration suppression] Value 3: Comfort Tuning [minimum overshoot, vibration suppression] Value 52: Comfort Tuning [minimum settling time, no vibration suppression] Value 53: Comfort Tuning [minimum overshoot, no vibration suppression] | - 0 0 56 Decimal | u16 RW - | Modbus 340 _n |

If you want Comfort Tuning in both directions, set parameter P9-20 to 0. Then set the parameters P9-26 and P9-27 to the same values, but with different signs (for example, P9-26 = -20000 and P9-27 = +20000). The value determines the movement range in both directions.

If you want Comfort Tuning in a single direction, set parameter P9-20 to 2. Then set the parameters P9-26 and P9-27 to the same values. The sign of the value determines the direction for Comfort Tuning. For example, if you set P9-26 = -20000 and P9-27 = -20000, Comfort Tuning is performed in negative direction of movement with a movement range of 20000 PUU.

NOTE: If you do not enter consistent values for parameters P9-26 and P9-27, the autotuning is unsuccessful. Parameter P9-30 contains the information on the unsuccessful autotuning attempt.

After you have started the required Comfort Tuning method via P2-32, the display of the HMI shows the progress as a percentage from *EN 000* to *EN 100*.

Press the **M** button of the HMI to cancel autotuning.

If autotuning completes successfully, the display of the HMI shows the message *done*.

Press the **OK** key of the HMI to save the control loop parameters. The display of the HMI briefly shows the message *SAVE d*.

Press the **M** key of the HMI to discard the autotuning results.

If autotuning does not complete successfully, the display of the HMI shows the message *Error*. The cause can be read with the parameter P9-30.

The parameter P9-37 provides additional information on the last event that occurred during autotuning.

Manual Tuning

Manual tuning is performed in the operating mode Internal Profile. Manual tuning allows you to perform test movements and optimize the control loop settings using the Scope function.

NOTE: Manual tuning should only be attempted by trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation. These persons must have sufficient technical training, knowledge, and experience and be able to foresee and detect potential hazards and issues that may be caused by manual tuning, by changing the settings and by the mechanical, electrical, and electronic equipment of the entire system in which the product is used. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of manual tuning.

In addition to the low-pass filter, electronic gear filter function can be used in the following cases:

- Pulse and direction command has a low resolution
- Low rigidity of the coupling between motor and load
- Movement is too short
- Motor is noisy after tuning
- Current is unstable during tuning
- Motor temperature is unusually high

Procedure for Manual Tuning

The control loop parameters are tuned in the following sequence:

| Step | Item | Parameters |
|------|--|---|
| 1 | Derivative gain <i>(see page 196)</i> | P8-00 (LTND) |
| 2 | Low-pass filter <i>(see page 199)</i> | P8-14 (NLFILTDAMPING) P8-15 (NLFILTT1) |
| 3 | Retuning of the derivative gain <i>(see page 201)</i> | P8-00 (LTND) |
| 4 | Proportional gain <i>(see page 201)</i> | P8-03 (LTNP) |
| 5 | Derivative-integral gain <i>(see page 204)</i> | P8-02 (LTNIV) |
| 6 | Integral gain <i>(see page 206)</i> | P8-01 (LTNI) |
| 7 | Compensation of the flexibility of the mechanical system <i>(see page 207)</i> | P8-05 (NLAFFLPFHZ) P8-20 (NLPEAFF) |

Depending on the requirements concerning the control performance, steps 2 and 3 can be omitted. Perform a movement in both directions after each of the steps below to check the recorded parameter values on the Scope tab of the commissioning software LXM26 DTM Library.

Step 1: Setting the Derivative Gain

The objective of tuning the derivative gain is to achieve a current ripple that is as low as possible. The optimum value primarily depends on the load.

Criteria for a well-tuned derivative gain include:

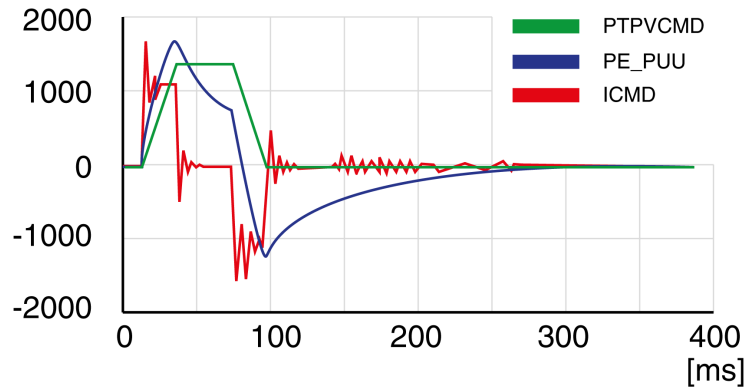
- For loads less than twice the rotor inertia: 5 % of the nominal current may be acceptable
- For greater loads: 10 % of the nominal current may be acceptable

The derivative gain is set via parameter P8-00 (LTND).

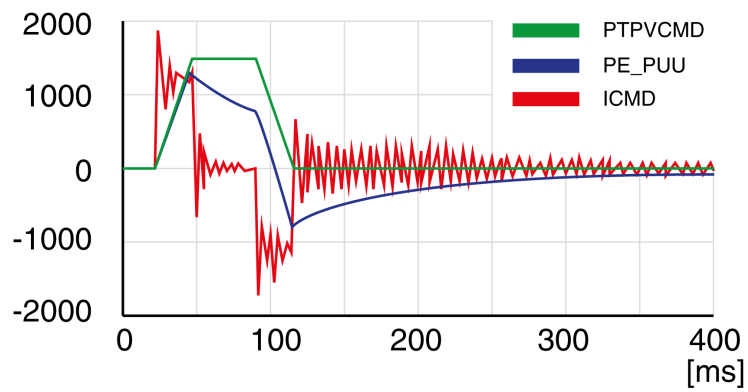
Procedure:

- Set the value of parameter P8-03 (LTNP) to 150 (corresponds to 15 Hz).
- Set the value of parameter P8-01 (LTNI) to 0.
- Set the value of parameter P8-02 (LTNIV) to 0.
- Progressively increase the value of parameter P8-00 (LTND) until the oscilloscope shows oscillation of the reference current, P11-11 (TCMD).

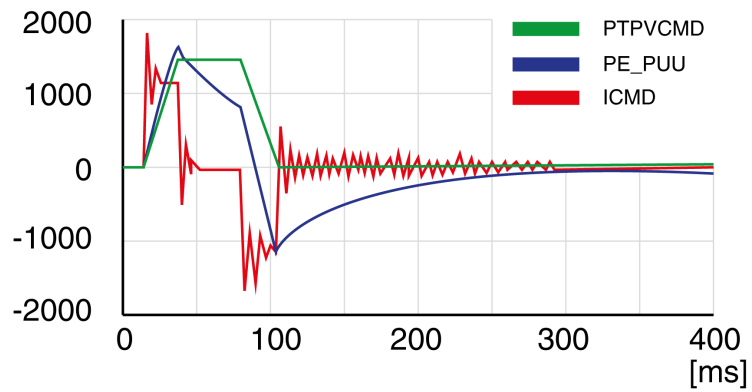
Example P8-00 (LTND) set to 1340 (134 Hz)



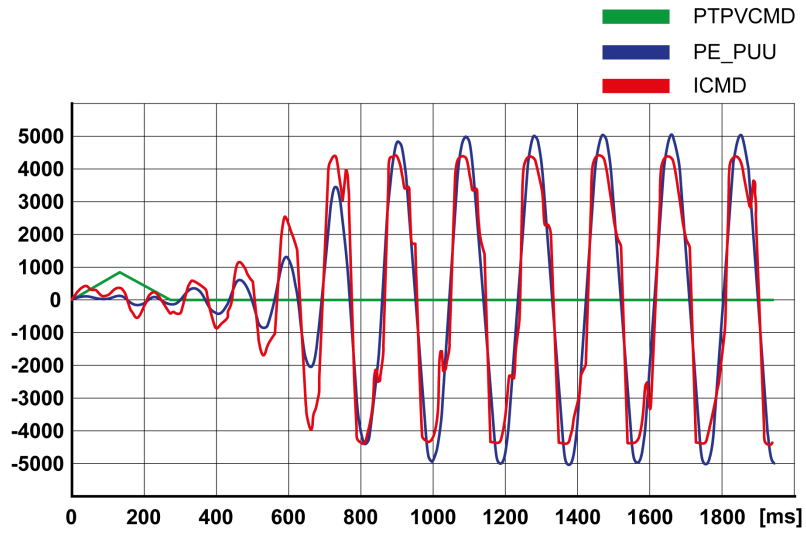
Example P8-00 (LTND) set too high at 2000 (200 Hz)



Example P8-00 (LTND) OK at 1500 (150 Hz)



Example P8-00 (LTND) set too low at 100 (10 Hz)



NOTE: The process of tuning requires trials of successive approximations. Values that are too high or too low relative to the other relevant values might cause instability. If it is necessary to have a low or high value of the parameter in the preceding example, you may need to adjust the values of the other relevant parameters to compensate and achieve a stable system.

Step 2: Setting the Low-Pass Filter

Setting the low-pass filter is an optional step in manual tuning of the control loop parameters. The low-pass filter parameters are optimized after you have tuned the derivative gain. The objective of tuning the low-pass filter parameters is to suppress high-frequency resonance and reduce the response time of the control loops to a minimum.

The low-pass filter is set via parameters P8-14 (NLFILTDAMPING) and P8-15 (NLFILTT1).

The parameter P8-14 (NLFILTDAMPING) maintains the bandwidth of the low-pass filter up to the cutoff frequency. The parameter value is expressed as a percentage. The parameter P8-15 (NLFILTT1) sets the inverse frequency of the cutoff frequency. The parameter P8-14 (NLFILTDAMPING) can also be used independently to allow for a certain degree of compensation of system-related bandwidth limits.

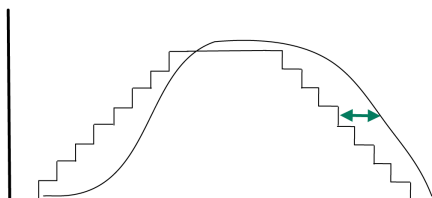
Criteria for a well-tuned low-pass filter include:

- The value of parameter P8-14 (NLFILTDAMPING) is as high as possible.
- The value of parameter P8-15 (NLFILTT1) is as low as possible.

When P8-35 (CONTROLMODE) (high byte) is set to 5, the following table presents the values for 10 % overshoot. Set the filter parameter values P8-14 (NLFILTDAMPING) and P8-15 (NLFILTT1) accordingly:

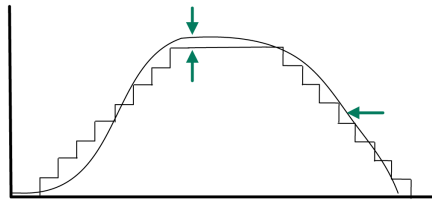
| Frequency (Hz) | P8-14 (NLFILTDAMPING) (%) | P8-15 (NLFILTT1) (ms) |
|----------------|---------------------------|-----------------------|
| 100 | 98.27 | 122.86 |
| 200 | 29.3 | 96.5 |
| 300 | 14.3 | 95 |
| 400 | 7.9 | 93.32 |
| 500 | 5.05 | 91.677 |
| 600 | 3.5 | 90.03 |
| 700 | 2.566 | 88.4 |
| 800 | 2 | 86.934 |
| 900 | 1.6056 | 85.457 |
| 1000 | 1.31 | 83.98 |
| 1100 | 1.09 | 82.45 |
| 1200 | 0.928694 | 81.1 |
| 1300 | 0.815 | 79.9 |
| 1400 | 0.7 | 78.4 |
| 1500 | 0.62 | 77 |
| 1600 | 0.555 | 75.97 |
| 1700 | 0.496 | 74.6 |
| 1800 | 0.439 | 73 |
| 1900 | 0.406 | 72.19 |
| 2000 | 0.365 | 70.5 |

Electronic gear filter example 1:



Increasing P8-27 (GEARFILTT1) smooths the input command, but adds a delay.

Electronic gear filter example 2:



Increasing P8-28 (GEARFILTT2) and P8-29 (GEARFILTVELFF) compensate the delay, but adds overshoots.

If P8-29 (GEARFILTVELFF) has the same value as P8-28 (GEARFILTT2), there is no delay.

Usual values:

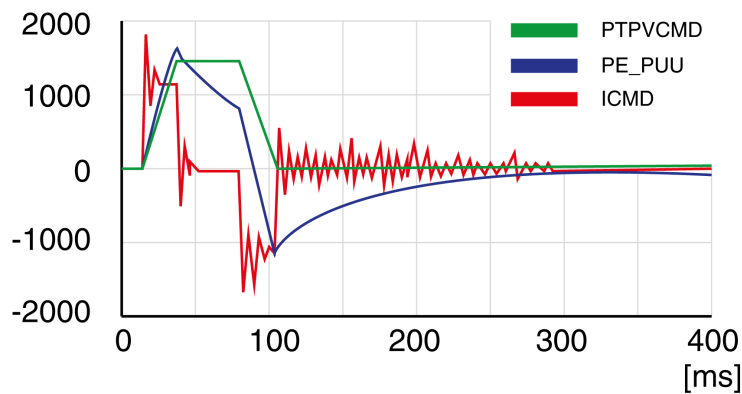
- P8-27 (GEARFILTT1) is usually around 2 times the input step width
- P8-28 (GEARFILTT2) is usually 2 times P8-27 (GEARFILTT1)

NOTE: When a system has multiple axes, gear filter values must be the same for all axes.

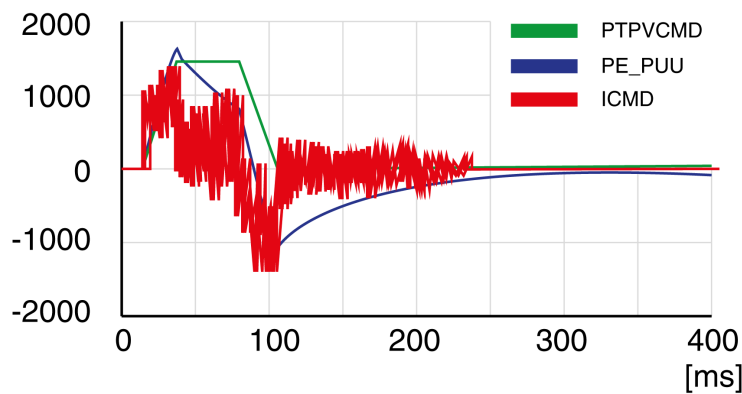
Procedure:

- Progressively increase the value of parameter P8-14 (NLFILTDAMPING) until the oscilloscope shows noise and/or oscillation of the reference current, P11-11 (TCMD).
- Progressively decrease the value of parameter P8-15 (NLFILTT1) until the oscilloscope shows noise and/or oscillation of the reference current P11-11 (TCMD).
- Increase the value of parameter P8-15 (NLFILTT1) by 20 %, however, by at least 0.05 ms.

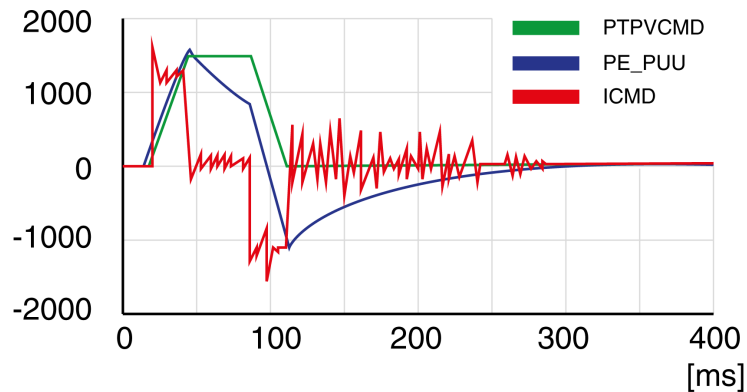
Example P8-14 (NLFILTDAMPING) OK (75 %)



Example P8-15 (NLFILTT1) too low (0.5 ms)



Example P8-15 (NLFILTT1) OK (1.2 ms)



Step 3: Re-Tuning of the Derivative Gain

If you have modified the low-pass filter values in parameters P8-14 (NLFILTDAMPING) and P8-15 (NLFILTT1), the derivative gain can be set to a greater value via parameter P8-00 (LTND). Follow the procedure described in step 1.

The objective of tuning the proportional gain is to get a constant and low position deviation in the acceleration phase, the constant velocity phase, and the deceleration phase and to have no oscillations during the transitions between these phases. In the oscilloscope, this is indicated by a shape that is as square and as flat as possible.

Criteria for a well-tuned proportional gain include:

- No or minimum overshoot of position deviation
- No or minimum current ripple
- No or minimum oscillations at standstill

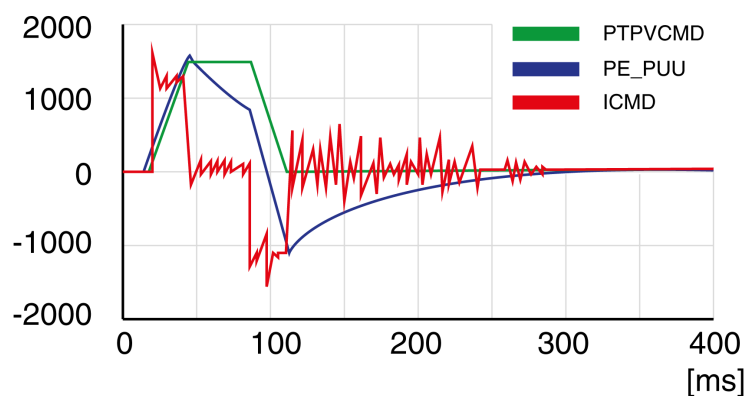
Step 4: Setting the Proportional Gain

The proportional gain is set via parameter P8-03 (LTNP).

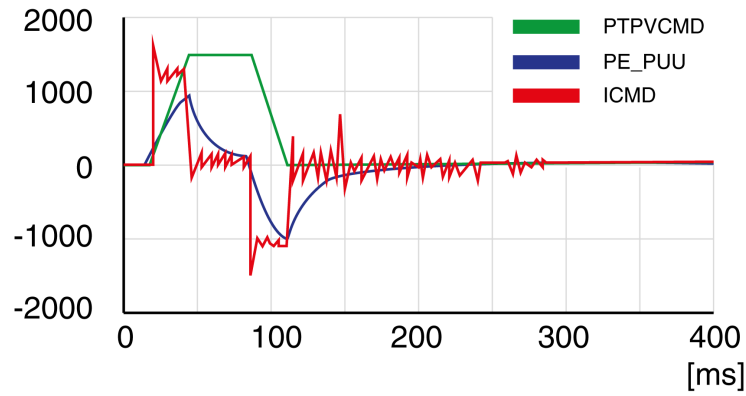
Procedure:

- Progressively increase the value of parameter P8-03 (LTNP) to find the optimum value. The figures below show examples of the plot as the value approaches the optimum value.

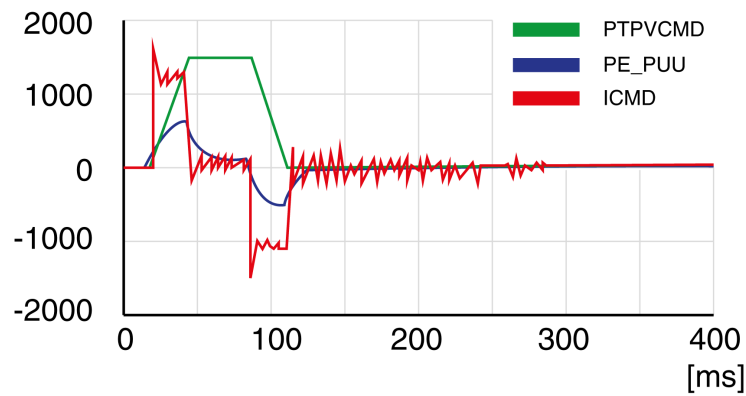
Example P8-03 (LTNP) starting value (13 Hz)



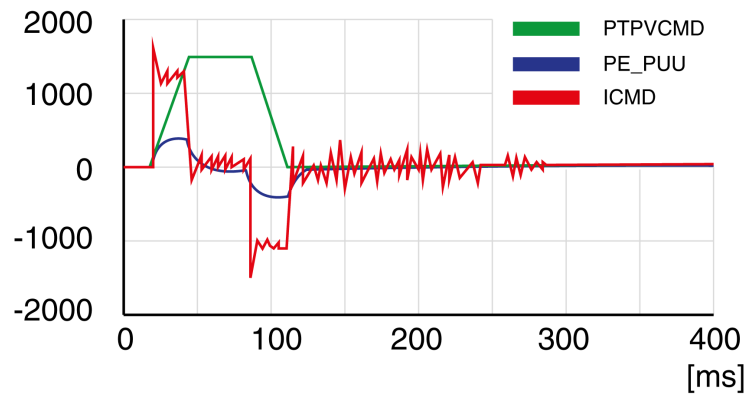
Example P8-03 (LTNP) position deviation decreased (25 Hz)



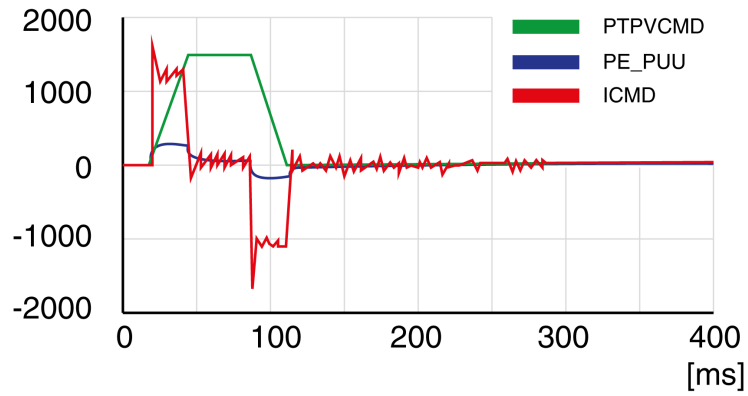
Example P8-03 (LTNP) position deviation further decreased (35 Hz)



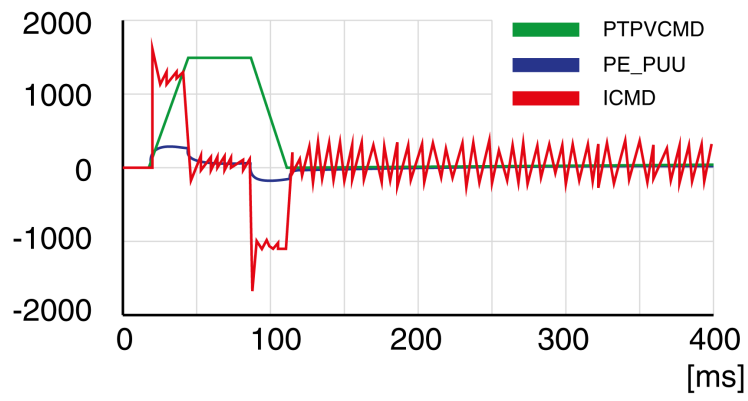
Example P8-03 (LTNP) position deviation further decreased (45 Hz)



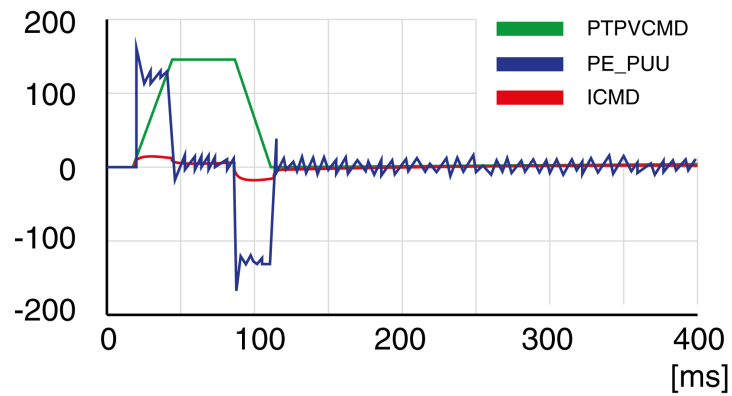
Example P8-03 (LTNP) value too high - oscillation at standstill (65 Hz)



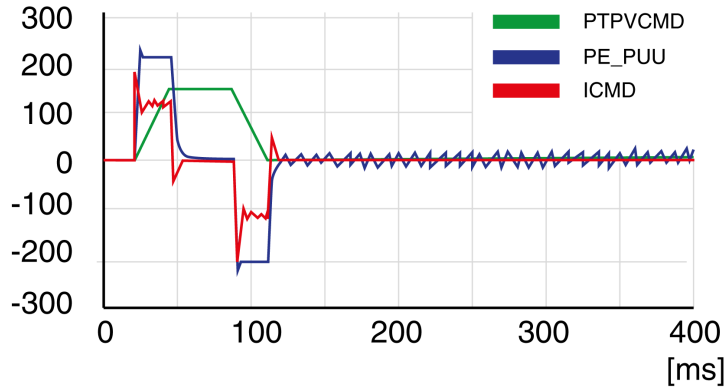
Example P8-03 (LTNP) value too high - oscillation at standstill (75 Hz)



Example P8-03 (LTNP) value too high - oscillation at standstill, overshoot of position deviation (100 Hz)



Example P8-03 (LTNP) OK (65 Hz)



Step 5: Setting the Derivative-Integral Gain

The objective of tuning the derivative-integral gain is to reduce the position deviation. As a general rule, the value for the derivative-integral gain (P8-02LTNIV) is within the following range:

$$P8-03 (LTNP) / 2 < P8-02 (LTNIV) < 2 \times P8-03 (LTNP)$$

Progressively increasing the value of the derivative-integral gain progressively decreases the position deviation during the acceleration phase, the constant velocity phase, and the deceleration phase.

Criteria for a well-tuned derivative-integral gain include:

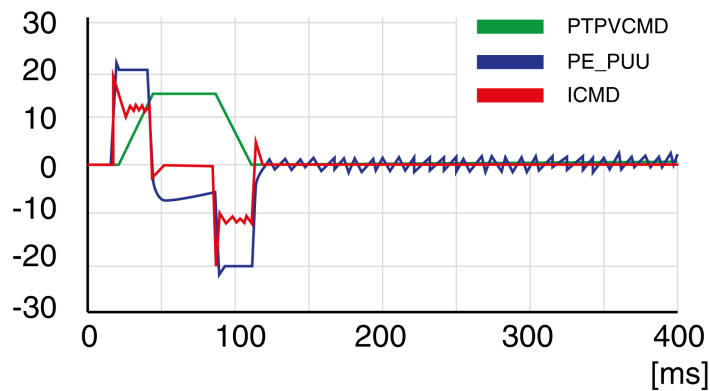
- Position deviation decreases rapidly after each transition of the movement phases (jerk)
- No or minimum overshoot of position deviation
- No or minimum oscillations during transitions between the movement phases
- Oscillations at standstill as low as possible (+/- 1 encoder increment)

The derivative-integral gain is set via parameter P8-02 (LTNIV).

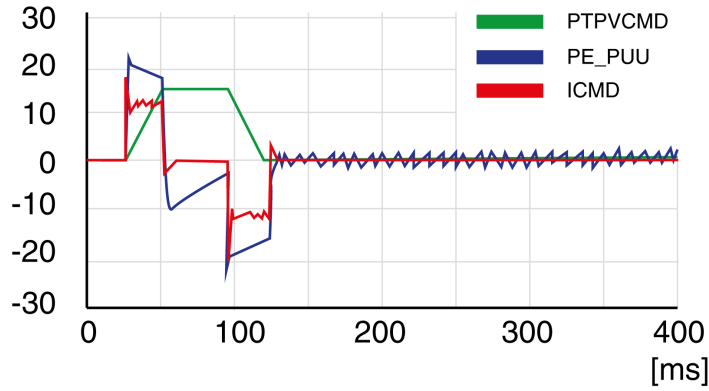
Procedure:

- Progressively increase the value of parameter P8-02 (LTNIV) to find the optimum value. The figures below show examples of the plot as the value approaches the optimum value.

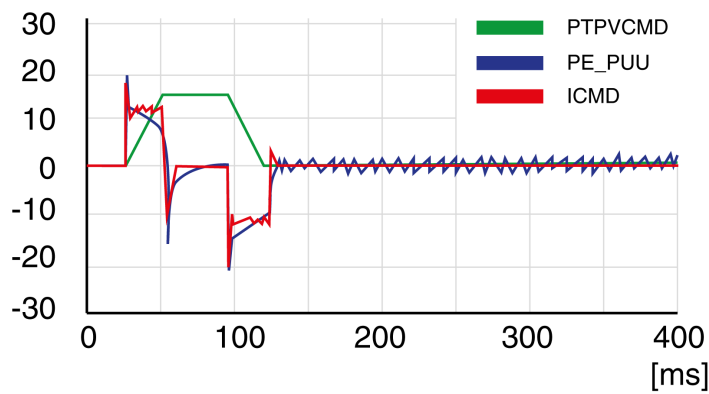
Example P8-02 (LTNIV) starting value (30 Hz)



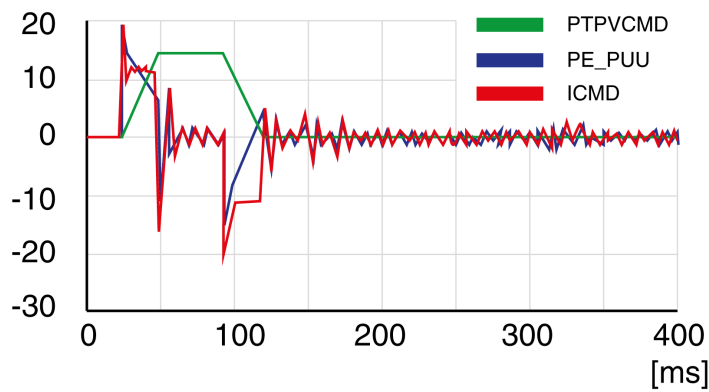
Example P8-02 (LTNIV) position deviation decreased (60 Hz)



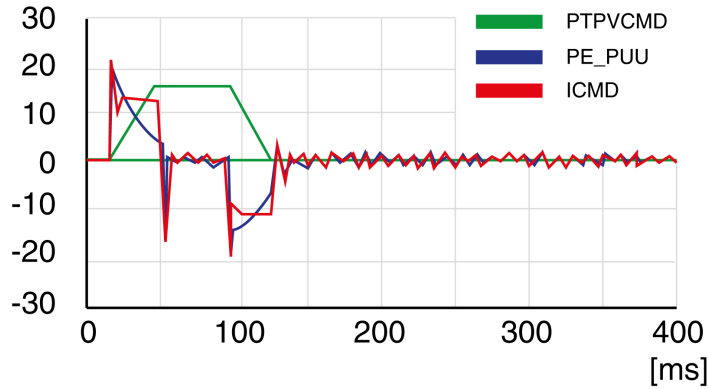
Example P8-02 (LTNIV) position deviation decreases rapidly when target velocity is reached (90 Hz)



Example P8-02 (LTNIV) value too high - oscillation at standstill, overshoot of position deviation (120 Hz)



Example P8-02 (LTNIV) OK (90 Hz)



Step 6: Setting the Integral Gain

The objective of tuning the integral gain is to reduce the position deviation during movements and at standstill.

Criteria for a well-tuned integral gain include:

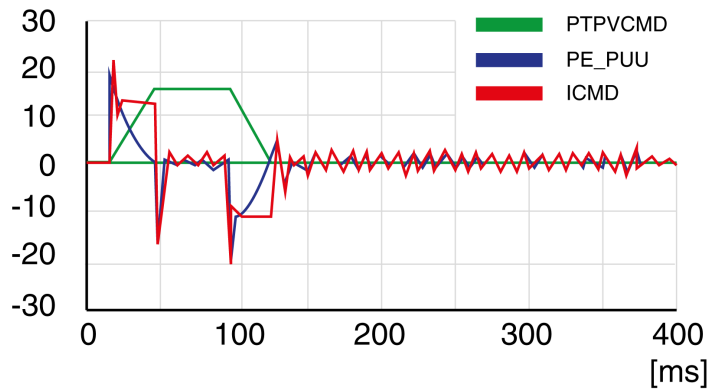
- Position deviation further reduced
- No or minimum overshoot of position deviation at the end of the deceleration phase
- Oscillations at standstill as low as possible (+/- 1 encoder increment)

The integral gain is set via parameter P8-01 (LTNI).

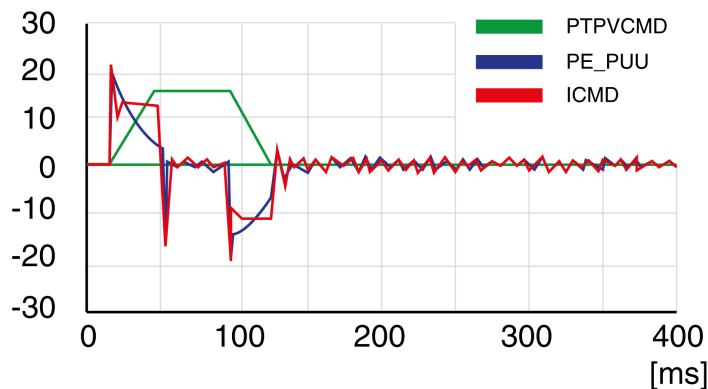
Procedure:

- Progressively increase the value of parameter P8-01 (LTNI) until the oscilloscope shows overshoot or oscillations. The figures below show examples of the plot as the value approaches the optimum value.

Example P8-01 (LTNI) value too high - oscillation at standstill, overshoot of position deviation (50 Hz)



Example P8-01 (LTNI) OK (25 Hz)



Step 7: Compensation of the Flexibility of the Mechanical System

The parameters for compensation of the system flexibility reduce the vibrations caused by abrupt changes in the acceleration (jerk). The parameters can also be used to further minimize overshoot or settling time.

The value of parameter $P8-20$ (NLPEAFF) reflects the oscillation frequency of the mechanical system, i.e. the coupling between the motor and the load. The coupling can be very rigid (for example, a direct drive or a low-backlash coupling) and less rigid (for example, a belt drive or an elastic coupling). Systems with a high rigidity require a high value. Systems with high load inertia and less rigid couplings require lower values. The less rigid the coupling, the lower this frequency. Depending on the application, the typical value range is 400 ... 30 Hz.

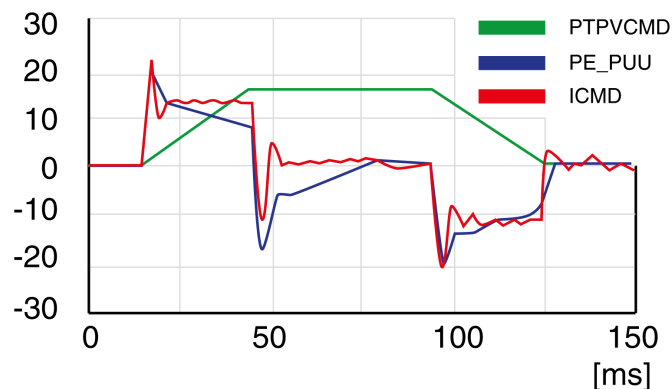
The parameter $P8-05$ (NLAFFLPFHZ) sets a low-pass filter for the acceleration profile. If the target value has a relatively low resolution as, for example, in the case of a pulse train input, the calculated acceleration may be subject to noise. The low-pass filter set via this parameter can be used to smooth the acceleration profile. The parameter can be used if the flexibility compensation set via parameter $P8-20$ (NLPEAFF) results in noise.

The compensation of the flexibility of the mechanical system is set via parameters $P8-05$ (NLAFFLPFHZ) and $P8-20$ (NLPEAFF).

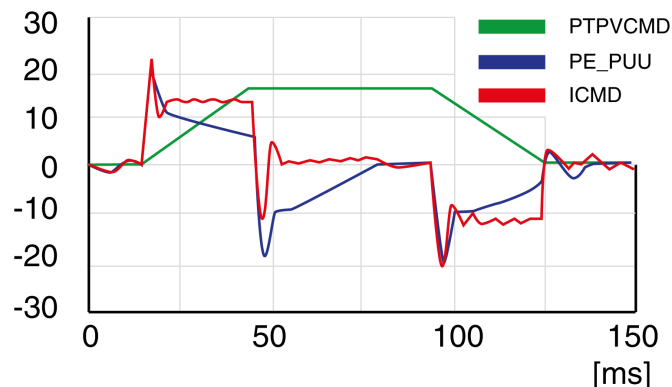
Procedure:

- Set the value of parameter $P8-05$ (NLAFFLPFHZ) to a value three times as high as that of parameter $P8-20$ (NLPEAFF). With this value, the bandwidth of this low-pass filter is sufficiently higher than the response time of the system.
- Progressively decrease the value of parameter $P8-20$ (NLPEAFF) to find the optimum value. The optimum value depends on your optimization criterion: either short settling time or low position deviation. Start with a high frequency of 400 Hz. Decrease the value and compare the amplitudes for the position deviation and the settling time. Select the most suitable value according to your optimization criterion. The figures below show examples of the plot as the value approaches the optimum value.

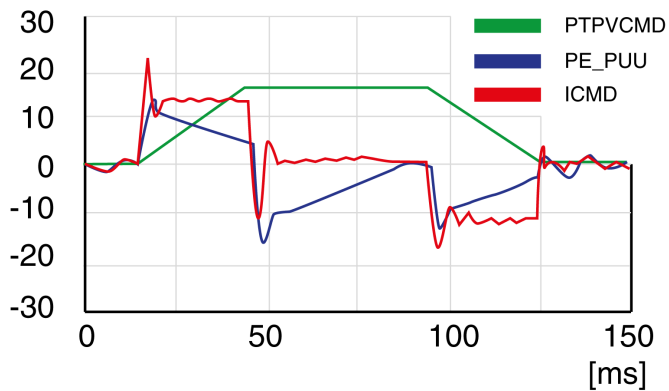
Example $P8-20$ (NLPEAFF) without compensation of the flexibility (5000 Hz)



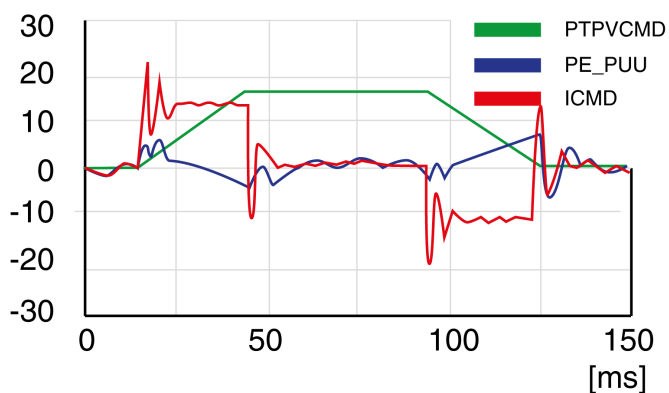
Example $P8-20$ (NLPEAFF) maximum position deviation decreased (300 Hz)



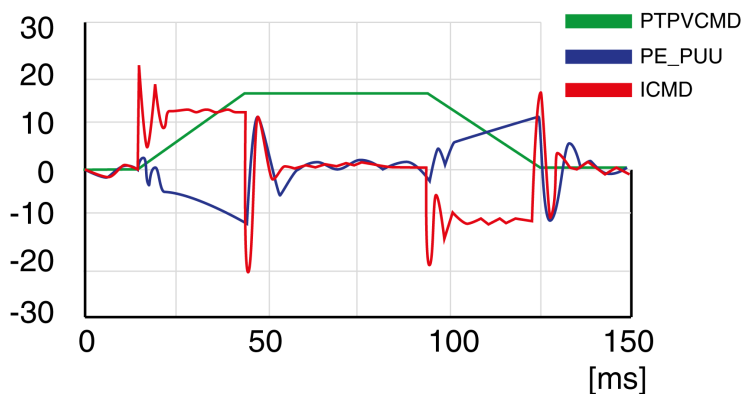
Example P8-20 (NLPEAFF) maximum position deviation further decreased (220 Hz)



Example P8-20 (NLPEAFF) minimum position deviation, short settling time, oscillation at standstill (120 Hz)



Example P8-20 (NLPEAFF) negative position deviation during acceleration phase (100 Hz)



Part VI

Parameters

Chapter 16

Parameters

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--|------|
| Representation of the Parameters | 212 |
| P0 - Status Parameters | 213 |
| P1 - Basic Parameters | 218 |
| P2 - Extended Parameters | 230 |
| P3 - Communication Parameters | 238 |
| P4 - Diagnostics Parameters | 239 |
| P5 - Motion Settings | 243 |
| P6 - Position Sequence Data Sets Group 1 | 248 |
| P7 - Position Sequence Data Sets Group 2 | 255 |
| P8 - Control Loops | 261 |
| P9 - DTM Data | 272 |

Representation of the Parameters

This chapter provides an overview of the parameters which can be used for operating the product.

Unsuitable settings or unsuitable data may trigger unintended movements, trigger signals, damage parts and disable monitoring functions. Some parameters and other operational 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.
- 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 modification.
- 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.

NOTE: Possible values of a parameter that are not described are considered as reserved and must not be used.

Parameter Name

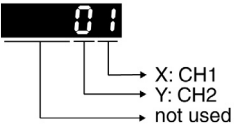
The parameter name uniquely identifies a parameter.

Unit

The unit of the value.

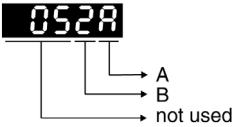
P0 - Status Parameters

P0 - Status Parameters

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P0-00 VER | Firmware Version Applicable operating mode: PT, PS, V, T | - 0 _h 0 _h FFFF _h Hexadecimal | u16 RO - | Modbus 100 _h |
| P0-01 ALE | Error code of detected error Applicable operating mode: PT, PS, V, T This parameter contains the error number of the most recently detected error. For a list of the detected error codes, refer to Error Codes (<i>see page 362</i>). | - 0 _h 0 _h FFFF _h Hexadecimal | u16 RW - | Modbus 102 _h |
| P0-02 STS | Drive Status Displayed by HMI Applicable operating mode: PT, PS, V, T This parameter selects the type of status information to be displayed on the HMI. Example: If the setting is 7, the HMI displays the speed of rotation of the motor. For further information, refer to chapter Status Information via the HMI (<i>see page 177</i>). | - 0 0 123 Decimal | u16 RW per. | Modbus 104 _h |
| P0-03 MON | Function of Analog Outputs Applicable operating mode: PT, PS, V, T This parameter specifies the functions of the analog outputs.  XY: (X: MON1; Y: MON2) 0: Actual velocity (+/-8 V correspond to maximum velocity) 1: Actual torque (+/-8 V correspond to maximum torque) 2: Reference value in kilopulses per second (+8 V correspond to 4.5 Mpps) 3: Target velocity (+/-8 V correspond to maximum target velocity) 4: Target torque (+/-8 V correspond to maximum target torque) 5: DC bus voltage (+/-8 V correspond to 450 V) 6: Reserved 7: Reserved See P1-04 and P1-05 for setting a voltage percentage (scaling). Example: P0-03 = 01: Voltage value at analog output indicates the actual velocity. Velocity = (maximum velocity x V1 / 8) x P1-04 / 100 if the output voltage value of MON2 is V1. | - 0 _h 0 _h 77 _h Hexadecimal | u16 RW per. | Modbus 106 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|------------------|--|---|--------------------------------|--------------------------------|
| P0-04 FPGAVER | FPGA Version Applicable operating mode: PT, PS, V, T | - 0 _h - h 0000FFFF _h Hexadecimal | u16 RO - | Modbus 108 _h |
| P0-08 TSON | Operating Hour Meter in Seconds Applicable operating mode: PT, PS, V, T | s 0 - 4294967295 Decimal | u32 RO - | Modbus 110 _h |
| P0-09 CM1 | Status Value 1 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-17. Examples: If the status of the drive is read via the HMI and if P0-02 is set to 23, VAR-1 is displayed for approximately two seconds by the HMI, followed by the value of this parameter. If the setting of P0-17 is 3, reading this parameter displays the actual position in pulses. For reading the status via Modbus, read two 16-bit data stored in the addresses of 0012H and 0013H to generate 32-bit data. (0013H : 0012H) = (high byte : low byte) | - -2147483647 - 2147483647 Decimal | s32 RO - | Modbus 112 _h |
| P0-10 CM2 | Status Value 2 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-18. See P0-09 for details. | - -2147483647 - 2147483647 Decimal | s32 RO - | Modbus 114 _h |
| P0-11 CM3 | Status Value 3 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-19. See P0-09 for details. | - -2147483647 - 2147483647 Decimal | s32 RO - | Modbus 116 _h |
| P0-12 CM4 | Status Value 4 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-20. See P0-09 for details. | - -2147483647 - 2147483647 Decimal | s32 RO - | Modbus 118 _h |
| P0-13 CM5 | Status Value 5 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-21. See P0-09 for details. | - -2147483647 - 2147483647 Decimal | s32 RO - | Modbus 11A _h |

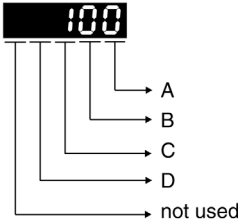
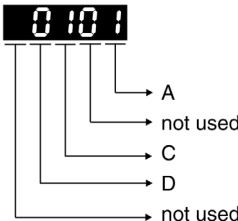
| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|--|---|--------------------------------|--------------------------------|
| P0-17 CMA1 | Indicate status value 1 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-09. Example: If the setting of P0-17 is 7, reading P0-09 returns the speed of rotation of the motor in rpm. | - 0 0 123 Decimal | u16 RW per. | Modbus 122 _h |
| P0-18 CMA2 | Indicate status value 2 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-10. See P0-17 for details. | - 0 0 123 Decimal | u16 RW per. | Modbus 124 _h |
| P0-19 CMA3 | Indicate status value 3 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-11. See P0-17 for details. | - 0 0 123 Decimal | u16 RW per. | Modbus 126 _h |
| P0-20 CMA4 | Indicate status value 4 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-12. See P0-17 for details. | - 0 0 123 Decimal | u16 RW per. | Modbus 128 _h |
| P0-21 CMA5 | Indicate status value 5 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-13. See P0-17 for details. | - 0 0 123 Decimal | u16 RW per. | Modbus 12A _h |
| P0-25 MAP1 | Parameter Mapping 1 Applicable operating mode: PT, PS, V, T The parameters from P0-25 ... P0-32 are used to read and write the values of parameters with non-consecutive communication addresses. You can set P0-35 ... P0-42 as the required read and write mapping parameter numbers. When P0-25 ... P0-32 are read, the read or write values are equivalent to the values of the parameters specified via P0-35 ... P0-42, and vice versa. See P0-35 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW - | Modbus 132 _h |
| P0-26 MAP2 | Parameter Mapping 2 Applicable operating mode: PT, PS, V, T See P0-25 and P0-36 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW - | Modbus 134 _h |
| P0-27 MAP3 | Parameter Mapping 3 Applicable operating mode: PT, PS, V, T See P0-25 and P0-37 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW - | Modbus 136 _h |
| P0-28 MAP4 | Parameter Mapping 4 Applicable operating mode: PT, PS, V, T See P0-25 and P0-38 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW - | Modbus 138 _h |

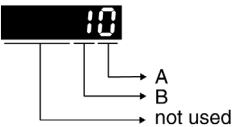
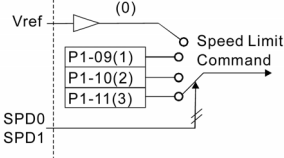
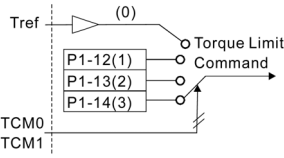
| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P0-29 MAP5 | Parameter Mapping 5 Applicable operating mode: PT, PS, V, T See P0-25 and P0-39 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW - | Modbus 13A _h |
| P0-30 MAP6 | Parameter Mapping 6 Applicable operating mode: PT, PS, V, T See P0-25 and P0-40 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW - | Modbus 13C _h |
| P0-31 MAP7 | Parameter Mapping 7 Applicable operating mode: PT, PS, V, T See P0-25 and P0-41 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW - | Modbus 13E _h |
| P0-32 MAP8 | Parameter Mapping 8 Applicable operating mode: PT, PS, V, T See P0-25 and P0-42 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW - | Modbus 140 _h |
| P0-35 MAPA1 | Block Data Read/Write P0-35...P0-42 1 Applicable operating mode: PT, PS, V, T The parameters P0-35 ... P0-42 specify the required read and write parameter numbers for P0-25 ... P0-32. They read and write the values of the parameters whose communication addresses are not consecutive. The read/write parameter can be a single 32-bit parameter or two 16-bit parameters.  A: Parameter group code in hexadecimal format B: Parameter number in hexadecimal format Example: If you want to read and write the value of P1-44 (32-bit parameter) via P0-25, set P0-35 to 012C012C _h . If you want to read and write the values of P2-02 (16-bit parameter) and P2-04 (16-bit parameter) via P0-25, set P0-35 to 02040202 _h . | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW per. | Modbus 146 _h |
| P0-36 MAPA2 | Block Data Read/Write P0-35...P0-42 2 Applicable operating mode: PT, PS, V, T See P0-35 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW per. | Modbus 148 _h |
| P0-37 MAPA3 | Block Data Read/Write P0-35...P0-42 3 Applicable operating mode: PT, PS, V, T See P0-35 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW per. | Modbus 14A _h |

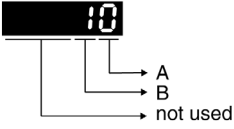
| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-------------------|---|---|--------------------------------|--------------------------------|
| P0-38 MAPA4 | Block Data Read/Write P0-35...P0-42 4 Applicable operating mode: PT, PS, V, T See P0-35 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW per. | Modbus 14C _h |
| P0-39 MAPA5 | Block Data Read/Write P0-35...P0-42 5 Applicable operating mode: PT, PS, V, T See P0-35 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW per. | Modbus 14E _h |
| P0-40 MAPA6 | Block Data Read/Write P0-35...P0-42 6 Applicable operating mode: PT, PS, V, T See P0-35 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW per. | Modbus 150 _h |
| P0-41 MAPA7 | Block Data Read/Write P0-35...P0-42 7 Applicable operating mode: PT, PS, V, T See P0-35 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW per. | Modbus 152 _h |
| P0-42 MAPA8 | Block Data Read/Write P0-35...P0-42 8 Applicable operating mode: PT, PS, V, T See P0-35 for details. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW per. | Modbus 154 _h |
| P0-46 SVSTS | State of Signal Output Functions Applicable operating mode: PT, PS, V, T This parameter is used to indicate the state of the signal output function of the drive in hexadecimal format. If the function is assigned to a digital output, it would represent the state of the output given no forcing on the output. Bit 0: SRDY (Servo ready) Bit 1: SON (Servo On) Bit 2: ZSPD (Zero speed) Bit 3: TSPD (Speed reached) Bit 4: TPOS (Movement completed) Bit 5: TQL (Torque Limit Reached) Bit 6: ERR (Error Detected) Bit 7: BRKR (Holding brake control) Bit 8: HOMED_OK (Homing completed) Bit 9: OLW (Motor Overload Alert) Bit 10: WARN (indicates that one of the following conditions has been detected: Hardware limit switch triggered, undervoltage, Nodeguard alert, Operational Stop (OPST)) Bits 11 ... 15: Reserved The parameter can also be read via the fieldbus. | - 0 _h 0 _h FFFF _h Hexadecimal | u16 RO - | Modbus 15C _h |
| P0-47 LAST_WRN | Number of Last Alert Applicable operating mode: PT, PS, V, T This parameter contains the number of the last detected alert. After a Fault Reset, the number is cleared. | - 0 _h 0 _h FFFF _h Hexadecimal | u16 RO - | Modbus 15E _h |

P1 - Basic Parameters

P1 - Basic Parameters

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P1-00 PTT | <p>Reference Value Signal - Pulse Settings Applicable operating mode: PT</p>  <p>This parameter is used to configure the reference value signals for the operating mode PT. A: Type of reference value signals B: Signal frequency C: Input polarity D: Source of reference value signals Setting can only be modified if power stage is disabled.</p> | - 0 _h 2 _h 1132 _h Hexadecimal | u16 RW per. | Modbus 200 _h |
| P1-01 CTL | <p>Operating Mode and Direction of Rotation Applicable operating mode: PT, PS, V, T</p>  <p>A: Operating mode Refer to chapter Setting the Operating Mode (see page 300). C: Direction of movement Refer to chapter Verifying the Direction of Movement (see page 183). D: Signal input functions and signal output functions after operating mode switching Value 0: The assignments of the signal input functions and the signal output functions (P2-10 ... P2-22) remain identical for the new operating mode. Value 1: The assignments of the signal input functions and the signal output functions (P2-10 ... P2-22) are set to the default presets of the new operating mode. Refer to chapters Default Presets of the Signal Inputs (see page 284) and Default Presets of the Signal Outputs (see page 290). Modified settings become active the next time the product is powered on.</p> | - 0 _h 0 _h 110A _h Hexadecimal | u16 RW per. | Modbus 202 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P1-02 PSTL | <p>Velocity and Torque Limitations Activation/Deactivation Applicable operating mode: PT, PS, V, T This parameter activates/deactivates velocity limitation and torque limitation. It can also be activated via the signal input functions SPDLM and TRQLM. The signal input functions SPD0 and SPD1 are used to select velocity values set via P1-09 to P1-11. The signal input functions TCM0 and TCM1 are used to select torque values set via P1-12 to P1-14.</p>  <p>A: Velocity limitation 0: Deactivate 1: Activate (in operating mode T))</p>  <p>B: Torque limitation 0: Deactivate 1: Activate (operating modes PT, PS, and V)</p>  | - | u16 RW per. | Modbus 204 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|---------------------|---|---|--------------------------------|--------------------------------|
| P1-03 AOUT | Polarity of Analog Outputs / Polarity of Pulse Outputs Applicable operating mode: PT, PS, V, T  <p>This parameter is used to specify the polarity of analog outputs MON1 and MON2 and the polarity of pulse outputs. A: Polarity of analog outputs MON1 and MON2 0: MON1(+), MON2(+) 1: MON1(+), MON2(-) 2: MON1(-), MON2(+) 3: MON1(-), MON2(-) B: Polarity of pulse outputs 0: Not inverted 1: Inverted</p> | - 0 _h 0 _h 13 _h Hexadecimal | u16 RW per. | Modbus 206 _h |
| P1-04 MON1 | Scaling Factor Analog Output 1 Applicable operating mode: PT, PS, V, T | % 1 100 100 Decimal | u16 RW per. | Modbus 208 _h |
| P1-05 MON2 | Scaling Factor Analog Output 2 Applicable operating mode: PT, PS, V, T | % 1 100 100 Decimal | u16 RW per. | Modbus 20A _h |
| P1-07 ReactLimSw | Limit Switch Fault Reaction Applicable operating mode: PT, PS, V, T Fault Reaction selection after a limit switch is at active state while the power stage is disabled (Servo On) 1: The drive does not trigger an error 0: The drive triggers an error | - 0 0 1 Decimal | u16 RW per. | Modbus 20E _h |
| P1-09 SP1 | Target Velocity/Velocity Limitation 1 Applicable operating mode: V, T Target velocity 1 In the operating mode V, this parameter specifies the first target velocity. Velocity limitation 1 In the operating mode T, this parameter specifies the first velocity limitation. | 0.1rpm -60000 10000 60000 Decimal | s32 RW per. | Modbus 212 _h |
| P1-10 SP2 | Target Velocity/Velocity Limitation 2 Applicable operating mode: V, T Target velocity 2 In the operating mode V, this parameter specifies the second target velocity. Velocity limitation 2 In the operating mode T, this parameter specifies the second velocity limitation. | 0.1rpm -60000 20000 60000 Decimal | s32 RW per. | Modbus 214 _h |

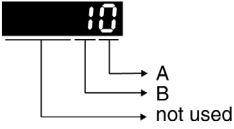
| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P1-11 SP3 | Target Velocity/Velocity Limitation 3 Applicable operating mode: V, T Target velocity 3 In the operating mode V, this parameter specifies the third target velocity. Velocity limitation 3 In the operating mode T, this parameter specifies the third velocity limitation. | 0.1rpm -60000 30000 60000 Decimal | s32 RW per. | Modbus 216 _h |
| P1-12 TQ1 | Target Torque/Torque Limitation 1 Applicable operating mode: PT, PS, V, T Target torque 1 in percent of nominal current In the operating mode T, this parameter specifies the first target torque. Torque limitation 1 in percent of nominal current In the operating modes PT, PS and V, this parameter specifies the first torque limitation. The signal output function TQL is activated if the torque reaches the torque limitations set via the parameters P1-12 ... P1-14 or via an analog input. | % -300 100 300 Decimal | s16 RW per. | Modbus 218 _h |
| P1-13 TQ2 | Target Torque/Torque Limitation 2 Applicable operating mode: PT, PS, V, T Target torque 2 in percent of nominal current In the operating mode T, this parameter specifies the second target torque. Torque limitation 2 in percent of nominal current In the operating modes PT, PS and V, this parameter specifies the second torque limitation. The signal output function TQL is activated if the torque reaches the torque limitations set via the parameters P1-12 ... P1-14 or via an analog input. | % -300 100 300 Decimal | s16 RW per. | Modbus 21A _h |
| P1-14 TQ3 | Target Torque/Torque Limitation 3 Applicable operating mode: PT, PS, V, T Target torque 3 in percent of nominal current In the operating mode T, this parameter specifies the third target torque. Torque limitation 3 in percent of nominal current In the operating modes PT, PS and V, this parameter specifies the third torque limitation. The signal output function TQL is activated if the torque reaches the torque limitations set via the parameters P1-12 ... P1-14 or via an analog input. | % -300 100 300 Decimal | s16 RW per. | Modbus 21C _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|--------------------------|--|---|--------------------------------|--------------------------------|
| P1-15 LINELOSSMODE | Mains Phase Monitoring - Response to Missing Mains Phase Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive if the mains phase monitoring function detects an error. Value 0: Detected error if power stage is enabled or disabled Value 1: Detected error if power stage is enabled, alert if power stage is disabled Value 2: Alert if power stage is enabled or disabled | - 0 0 2 Decimal | u16 RW per. | Modbus 21E _h |
| P1-16 LINELOSSRECOVER | Mains Phase Monitoring - Fault Reset Applicable operating mode: PT, PS, V, T This parameter specifies the type of Fault Reset after a detected mains phase error has been removed. Value 0: No automatic Fault Reset Value 1: Automatic Fault Reset | - 0 0 1 Decimal | u16 RW per. | Modbus 220 _h |
| P1-17 LINELOSSTYPE | Mains Phase Monitoring - Type Applicable operating mode: PT, PS, V, T This parameter specifies the type of mains phase monitoring Value 0: No mains phase monitoring Value 1: Mains phase monitoring single-phase connection Value 2: Mains phase monitoring three-phase connection | - 0 0 2 Decimal | u16 RW per. | Modbus 222 _h |
| P1-18 | Reserved | - | - | - |
| P1-19 DISTIME | Active Disable - Delay Time Power Stage Applicable operating mode: PT, PS, V, T This parameter specifies the delay time between standstill of the motor and disabling the power stage. | ms 0 0 6500 Decimal | u16 RW per. | Modbus 226 _h |
| P1-20 ESTOPI LIM | Current Limit During Quick Stop Applicable operating mode: PT, PS, V This parameter specifies the maximum current during a Quick Stop (expressed as factor of P1-78). | 0.001 1 1000 1000 Decimal | s16 RW per. | Modbus 228 _h |
| P1-21 FOLD | Status of Foldback Current Drive Applicable operating mode: PT, PS, V, T This parameter indicates whether the foldback current limit is greater than or less than the maximum current of the drive (see P1-78). Value 0: Foldback current limit greater than P1-78 Value 1: Foldback current limit is less than P1-78 | - 0 - 1 Decimal | u16 RO - | Modbus 22A _h |
| P1-22 IFOLD | Foldback Current Limit - Drive Applicable operating mode: PT, PS, V, T Drive foldback current limit | 0.01A 0 - 30000 Decimal | u32 RO - | Modbus 22C _h |
| P1-23 IFOLDFTHRESH | Current Monitoring Drive - Detected Error Threshold Foldback Current Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the drive current monitoring function to detect a drive foldback current error. | 0.01A 0 - 30000 Decimal | u32 RW per. | Modbus 22E _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|------------------------|---|---|--------------------------------|--------------------------------|
| P1-24 IFOLDWTHRESH | Current Monitoring Drive - Alert Threshold Foldback Current Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the drive current monitoring function to trigger a drive foldback current alert. | 0.01A 0 - 30000 Decimal | u32 RW per. | Modbus 230 _h |
| P1-25 | Reserved | - | - | - |
| P1-26 MIFOLD | Foldback Current Limit - Motor Applicable operating mode: PT, PS, V, T Motor foldback current limit | 0.01A 0 - 30000 Decimal | u32 RO - | Modbus 234 _h |
| P1-27 MIFOLDFTRESH | Motor Current Monitoring - Detected Error Threshold Foldback Current Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the motor current monitoring function to detect a motor foldback current error. | 0.01A 0 - 30000 Decimal | u32 RW per. | Modbus 236 _h |
| P1-28 MIFOLDWTHRESH | Motor Current Monitoring - Alert Threshold Foldback Current Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the motor current monitoring function to trigger a motor foldback current alert. | 0.01A 0 - 30000 Decimal | u32 RW per. | Modbus 238 _h |
| P1-29 OVTHRESH | DC Bus Overvoltage Monitoring - Threshold Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the DC bus overvoltage monitoring function. | V - - - Decimal | u16 RO - | Modbus 23A _h |
| P1-30 COMMERRMAXCNT | Commutation Monitoring - Maximum Counter Value Applicable operating mode: PT, PS, V, T | ms 0 0 0 Decimal | u16 RW - | Modbus 23C _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P1-32 LSTP | <p>Stop Method</p> <p>Applicable operating mode: PT, PS, V</p> <p>This parameter specifies how the motor is stopped if the power stage is to be disabled (includes signal input function OPST) or if an error is detected.</p> <p>Value 0_h: Deceleration ramp</p> <p>Value 10_h: Coast to stop</p> <p>Value 20_h: Deceleration ramp to velocity P1-38, then coast to stop (actual velocity must be less than the value of P1-38 for 50 ms before coasting to stop starts)</p> <p>In the operating mode Torque (T), the deceleration ramp is not used. Instead, the current is set to zero.</p> <p>Depending on the event that triggered the stop, the following deceleration ramps are used:</p> <ul style="list-style-type: none"> - Signal input function STOP: P5-20 - Transmission error detected: P5-21 - Position overflow: P5-22 - Triggering of negative software limit switch: P5-23 - Triggering of positive software limit switch: P5-24 - Triggering of negative hardware limit switch: P5-25 - Triggering of positive hardware limit switch: P5-26 - Any other event: P1-68 <p>The delay time between standstill of the motor and disabling the power stage is set via P1-19.</p> | - 0 _h 0 _h 20 _h Hexadecimal | u16 RW per. | Modbus 240 _h |
| P1-34 TACC | <p>Acceleration Period</p> <p>Applicable operating mode: PT, V</p> <p>The acceleration period is the time in milliseconds required to accelerate from motor standstill to 6000 rpm.</p> <p>For operating mode V, this parameter specifies the acceleration.</p> <p>For operating mode PT, this parameter specifies an acceleration limitation for the pulses at the PTI interface.</p> | ms 6 30 65500 Decimal | u16 RW per. | Modbus 244 _h |
| P1-35 TDEC | <p>Deceleration Period</p> <p>Applicable operating mode: PT, V</p> <p>The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill.</p> <p>For operating mode V, this parameter specifies the deceleration.</p> <p>For operating mode PT, this parameter specifies a deceleration limitation for the pulses at the PTI interface.</p> | ms 6 30 65500 Decimal | u16 RW per. | Modbus 246 _h |
| P1-37 LMJR | <p>Ratio of Load Inertia to Motor Inertia</p> <p>Applicable operating mode: PT, PS, V, T</p> <p>This parameter specifies the ratio of load inertia to motor inertia (J_{load} / J_{motor}).</p> <p>J_{load}: Total moment of inertia of external mechanical load</p> <p>J_{motor}: Moment of inertia of motor</p> | 0.1 0 10 20000 Decimal | u32 RW per. | Modbus 24A _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P1-38 ZSPD | Signal Output Function ZSPD / Signal Input Function ZCLAMP - Velocity Applicable operating mode: PT, PS, V, T This parameter specifies the velocity for the signal output function ZSPD. The signal output function ZSPD indicates that the velocity of the motor is less than the velocity value set via this parameter. This parameter specifies the velocity for the signal input function ZCLAMP. The signal input function ZCLAMP stops the motor. The velocity of the motor must be below the velocity value set via this parameter. | 0.1rpm 0 100 2000 Decimal | s32 RW per. | Modbus 24C _h |
| P1-39 SSPD | Signal Output Function TSPD - Velocity Applicable operating mode: PT, PS, V, T This parameter specifies the velocity for the signal output function TSPD. The signal output function TSPD indicates that the velocity of the motor is greater than the velocity value set via this parameter. | rpm 0 3000 5000 Decimal | u32 RW per. | Modbus 24E _h |
| P1-40 VCM | Velocity Target Value and Velocity Limitation 10 V Applicable operating mode: PT, PS, V, T In the operating mode V, this parameter specifies the target velocity that corresponds to the maximum input voltage of 10 V. In the operating mode T, this parameter specifies the velocity limitation that corresponds to the maximum input voltage of 10 V. Example: If the value of this parameter is 3000 in the operating mode V and if the input voltage is 10 V, the target velocity is 3000 rpm. | rpm 0 - 10001 Decimal | s32 RW per. | Modbus 250 _h |
| P1-41 TCM | Torque Target Value and Torque Limitation 10 V Applicable operating mode: PT, PS, V, T In the operating mode T, this parameter specifies the target torque that corresponds to the maximum input voltage of 10 V. In the operating modes PT, PS and V, this parameter specifies the torque limitation that corresponds to the maximum input voltage of 10 V. Example: If the value of this parameter is 100 in the operating mode T and if the input voltage is 10 V, the target torque is 100 % of the nominal torque. Setting can only be modified if power stage is disabled. | % 0 100 1000 Decimal | u16 RW per. | Modbus 252 _h |
| P1-42 MBT1 | ON Delay Time of Holding Brake Applicable operating mode: PT, PS, V, T This parameter specifies the time between enabling the power stage and starting a movement (opening time for the holding brake). | ms 0 0 1000 Decimal | u16 RW per. | Modbus 254 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|--------------------|--|---|--------------------------------|--------------------------------|
| P1-44 GR1 | Electronic Gear Ratio - Numerator 1 Applicable operating mode: PT, PS This parameter is used to set the numerator of the gear ratio. The denominator of the gear ratio is set via P1-45. In the operating mode PS, the value of this parameter can only be modified when the power stage is disabled. | - 1 128 536870911 Decimal | u32 RW per. | Modbus 258 _h |
| P1-45 GR2 | Electronic Gear Ratio - Denominator Applicable operating mode: PT, PS This parameter is used to set the denominator of the gear ratio. The numerator of the gear ratio is set via P1-44. Setting can only be modified if power stage is disabled. | - 1 10 2147483647 Decimal | u32 RW per. | Modbus 25A _h |
| P1-46 ENCOUTRES | Number of encoder simulation increments (AB signal) per revolution Applicable operating mode: PT, PS, V, T The calculation of the range of this parameter depends on the value of P1-55. Setting can only be modified if power stage is disabled. | LPR - 2048 - Decimal | s32 RW per. | Modbus 25C _h |
| P1-47 SPOK | Signal Output Function SP_OK - Velocity Applicable operating mode: V This parameter specifies the velocity deviation window for the signal output function SP_OK. The signal output function SP_OK indicates that actual velocity is within the velocity deviation window. | rpm 0 10 300 Decimal | u32 RW per. | Modbus 25E _h |
| P1-48 MCOK | Signal Output Function MC_OK - Settings Applicable operating mode: PS This parameter specifies the behavior of the signal output function MC_OK after it has been activated. The signal output function MC_OK indicates that both the signal output functions CMD_OK and TPOS have been activated. In addition, you can specify whether a detected position deviation is to trigger a detected error.  A: Behavior of MC_OK after deactivation of TPOS Value 0: When TPOS is deactivated, MC_OK is deactivated. Value 1: When TPOS is deactivated, MC_OK remains activated. B: Response to detected position deviation via TPOS if A is set to 0 Value 0: No response Value 1: Detected alert Value 2: Detected error | - 0 _h 0 _h 21 _h Hexadecimal | u16 RW per. | Modbus 260 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-----------------------------|--|---|--------------------------------|--------------------------------|
| P1-52 REGENRES | Braking Resistor - Resistance Applicable operating mode: PT, PS, V, T This parameter is used to set the resistance of the braking resistor. Value -1: No braking resistor | Ohm -1 - 32767 Decimal | s16 RW per. | Modbus 268 _h |
| P1-53 REGENPOW | Braking Resistor - Power Applicable operating mode: PT, PS, V, T This parameter is used to set the power of the braking resistor. Value -1: No braking resistor | W -1 - 32767 Decimal | s16 RW per. | Modbus 26A _h |
| P1-54 PER | Signal Output Function TPOS - Trigger Value Applicable operating mode: PT, PS This parameter specifies the position deviation value used to activate the signal output function TPOS. Operating mode PT: The signal output function TPOS indicates that the position deviation is within the tolerance set via this parameter. Operating mode PS: The signal output function TPOS indicates that the position deviation at the target position is within the tolerance set via this parameter. | PUU 0 1311 1280000 Decimal | u32 RW per. | Modbus 26C _h |
| P1-55 VLIM | Maximum Velocity - User-Defined Applicable operating mode: PT, PS, V, T This parameter specifies the maximum velocity. Factory setting: maximum motor speed. Setting can only be modified if power stage is disabled. | rpm 10 - 6000 Decimal | u32 RW per. | Modbus 26E _h |
| P1-57 CRSHA | Torque Monitoring - Torque Value Applicable operating mode: PT, PS, V, T This parameter is used to configure the torque monitoring function. The torque monitoring function detects an error (AL030) if the torque value set via this parameter is exceeded for a period of time set via P1-58. | % 0 0 300 Decimal | u16 RW per. | Modbus 272 _h |
| P1-58 CRSHT | Torque Monitoring - Time Value Applicable operating mode: PT, PS, V, T This parameter is used to configure the torque monitoring function. The torque monitoring function detects an error (AL030) if the torque value set via P1-57 is exceeded for a period of time set via this parameter. | ms 1 1 1000 Decimal | u16 RW per. | Modbus 274 _h |
| P1-59 VELCMDMOVEA VG | S Curve Filter for Operating Mode Velocity Applicable operating mode: V This parameter specifies the moving average time in [us] for the S curve filter in the operating mode Velocity. The value of this parameter must be a multiple of 125. This filter changes a linear acceleration into an S curve. Setting can only be modified if power stage is disabled. | us 0 0 255875 Decimal | u32 RW per. | Modbus 276 _h |
| P1-60 COMMERRTTHR ESH | Commutation Monitoring - Time Threshold Applicable operating mode: PT, PS, V, T | ms 0 0 3000 Decimal | u16 RW per. | Modbus 278 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-------------------------|--|---|--------------------------------|--------------------------------|
| P1-61 COMMERRVTHRESH | Commutation Monitoring - Velocity Threshold Applicable operating mode: PT, PS, V, T | 0.1rpm 0 600 60000 Decimal | u32 RW per. | Modbus 27A _h |
| P1-62 THERMODE | Motor Overtemperature Monitoring - Response Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive if the temperature monitoring function detects motor overtemperature. Value 0: Disable power stage immediately Value 3: Ignore overtemperature Value 4: Alert Value 5: Alert first, then detected error if condition persists after P1-63 | - 0 0 5 Decimal | u16 RW per. | Modbus 27C _h |
| P1-63 THERMTIME | Motor Overtemperature Monitoring - Delay Time Applicable operating mode: PT, PS, V, T This parameter specifies the delay time between the detection of motor overtemperature and the transition to the operating state Fault (see P1-62). | s 0 30 300 Decimal | u16 RW per. | Modbus 27E _h |
| P1-64 UVMODE | Undervoltage Monitoring - Response Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive if the undervoltage monitoring function detects undervoltage. Value 0: Detected error Value 1: Alert (if power stage is enabled) Value 2: Alert first, then detected error if condition persists after P1-67 (if power stage is enabled) Value 3: Detected error (if power stage is enabled) | - 0 0 3 Decimal | u16 RW per. | Modbus 280 _h |
| P1-65 | Reserved | - | - | - |
| P1-66 MFOLD | Status of Foldback Current Motor Applicable operating mode: PT, PS, V, T This parameter indicates whether the foldback current limit is greater than or less than the maximum current of the motor (see P1-78). Value 0: Foldback current limit greater than P1-78 Value 1: Foldback current limit is less than P1-78 | - 0 - 1 Decimal | u16 RO - | Modbus 284 _h |
| P1-67 UVTIME | Undervoltage Monitoring - Delay Time Applicable operating mode: PT, PS, V, T This parameter specifies the delay time between the detection of an undervoltage condition (displayed as "u") and the response of the drive to this condition as specified in P1-64. | s 0 30 300 Decimal | u16 RW per. | Modbus 286 _h |
| P1-68 DECSTOP | Active Disable - Deceleration Ramp Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a power stage Disable request, see P1-32. | ms 6 30 65500 Decimal | u16 RW per. | Modbus 288 _h |

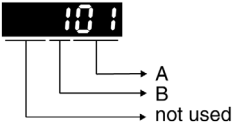
| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-------------------------|---|---|--------------------------------|--------------------------------|
| P1-69 DECSTOPTIME | Disable - Deceleration Time Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a power stage Disable request, see P1-32. If the value of this parameter is not 0, this parameter overrides P1-68. Setting can only be modified if power stage is disabled. | ms 0 0 6500 Decimal | u16 RW per. | Modbus 28A _h |
| P1-70 IMAXHALT | Signal Input Function HALT - Maximum Current Applicable operating mode: T This parameter specifies the maximum current for the signal input function Halt. The maximum value for this parameter is the value of P1-79. | 0.01A - 0 - Decimal | u32 RW per. | Modbus 28C _h |
| P1-71 REGENMAXONTIME | Braking Resistor - Maximum Time in Braking Applicable operating mode: PT, PS, V, T This parameter specifies the maximum time in braking for the braking resistor. The maximum time in braking is the maximum period of time during which the braking resistor may be activated. | ms 10 40 100 Decimal | u16 RW per. | Modbus 28E _h |
| P1-72 REGENFLTMODE | Braking Resistor Overload Monitoring - Response Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive if the braking resistor overload monitoring function detects braking resistor overload. Value 0: Alert Value 1: Detected error | - 0 0 1 Decimal | u16 RW per. | Modbus 290 _h |
| P1-78 ILIM | User-Defined Maximum Current Applicable operating mode: PT, PS, V, T This parameter is specifies a user-defined maximum current for the drive. The maximum value of this parameter is the value of P1-79. | 0.01A - - - Decimal | u32 RW per. | Modbus 29C _h |
| P1-79 IMAX | Maximum Current Applicable operating mode: PT, PS, V, T This parameter indicates the maximum current for a drive / motor combination. | 0.01A - - - Decimal | u32 RO - | Modbus 29E _h |
| P1-80 DIPEAK | Maximum Peak Current Applicable operating mode: PT, PS, V, T This parameter indicates the maximum peak current of the drive. | 0.01A - - - Decimal | u32 RO - | Modbus 2A0 _h |
| P1-81 DICONT | Nominal Current Applicable operating mode: PT, PS, V, T This parameter indicates the nominal current of the drive. | 0.01A - - - Decimal | u32 RO - | Modbus 2A2 _h |
| P1-84 CFG_MOTOR | Configured motor type Applicable operating mode: PT, PS, V, T | - 0 - 2147483647 Decimal | u32 RW per. | Modbus 2A8 _h |

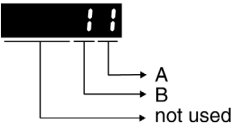
P2 - Extended Parameters

P2 - Extended Parameters

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P2-01 PPR | Gain Switching - Rate for Position Loop Applicable operating mode: PT, PS This parameter specifies the gain switching rate for the position loop. The gain switching function is configured via this parameter and parameters P2-05, P2-27 and P2-29. | % 10 100 500 Decimal | u16 RW per. | Modbus 302 _h |
| P2-05 SPR | Gain Switching - Rate for Velocity Loop Applicable operating mode: PT, PS, V, T This parameter specifies the gain switching rate for the velocity loop. The gain switching function is configured via this parameter and parameters P2-01, P2-27 and P2-29. | % 10 100 500 Decimal | u16 RW per. | Modbus 30A _h |
| P2-08 PCTL | Factory Reset / Save Parameters Applicable operating mode: PT, PS, V, T This parameter provides the following functions: - Reset the parameters to the factory settings - Save the current parameter values The factory settings do not become effective until after you have powered the drive off and on again. Value 10: Reset the parameter values to the factory settings Value 11: Save the parameter values Value 400: Normal digital output control operation mode Value 406: Force output control operation mode NOTE: Value 999 is displayed when the parameter values are successfully saved. Setting can only be modified if power stage is disabled. | - 0 0 406 Decimal | u16 RW - | Modbus 310 _h |
| P2-09 DRT | Debounce Time - Inputs Applicable operating mode: PT, PS, V, T This parameter specifies the debounce time for the digital inputs DI1 ... DI5 and DI8. See P2-24 for the debounce time for the fast digital inputs DI6 and DI7. | ms 0 2 20 Decimal | u16 RW per. | Modbus 312 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|--|--|--------------------------------|--------------------------------|
| P2-10 DITF1 | Signal Input Function for DI1 Applicable operating mode: PT, PS, V, T The parameters P2-10 ... P2-17 are used to assign signal input functions to the digital inputs DI1 ... DI8 and to configure the type of digital input (normally closed, normally open). A: Signal input functions: For the values, refer to chapter Setting the Digital Signal Inputs (<i>see page 284</i>). B: Type: 0: Normally closed (contact b) 1: Normally open (contact a) Example: If the setting of P2-10 is 101, the signal input function assigned to digital input 1 is SON (0x01) and the type of contact is a normally open contact. The drive must be restarted after the parameters have been modified. Forcing of digital inputs is configured via P3-06 and activated via P4-07. Setting can only be modified if power stage is disabled. | - 0 _h 101 _h 146 _h Hexadecimal | u16 RW per. | Modbus 314 _h |
| P2-11 DITF2 | Signal Input Function for DI2 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled. | - 0 _h 104 _h 146 _h Hexadecimal | u16 RW per. | Modbus 316 _h |
| P2-12 DITF3 | Signal Input Function for DI3 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled. | - 0 _h 116 _h 146 _h Hexadecimal | u16 RW per. | Modbus 318 _h |
| P2-13 DITF4 | Signal Input Function for DI4 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled. | - 0 _h 117 _h 146 _h Hexadecimal | u16 RW per. | Modbus 31A _h |
| P2-14 DITF5 | Signal Input Function for DI5 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled. | - 0 _h 102 _h 146 _h Hexadecimal | u16 RW per. | Modbus 31C _h |
| P2-15 DITF6 | Signal Input Function for DI6 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled. | - 0 _h 22 _h 146 _h Hexadecimal | u16 RW per. | Modbus 31E _h |
| P2-16 DITF7 | Signal Input Function for DI7 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled. | - 0 _h 23 _h 146 _h Hexadecimal | u16 RW per. | Modbus 320 _h |
| P2-17 DITF8 | Signal Input Function for DI8 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled. | - 0 _h 21 _h 146 _h Hexadecimal | u16 RW per. | Modbus 322 _h |

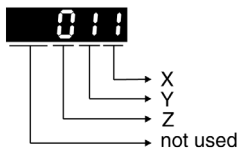
| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|--|--------------------------------|--------------------------------|
| P2-18 DOTF1 | <p>Signal Output Function for DO1 Applicable operating mode: PT, PS, V, T The parameters P2-18 ... P2-22 are used to assign signal output functions to the digital outputs DO1 ... DO5 and to configure the type of digital output (normally closed, normally open).</p>  <p>A: Signal output functions: For the values, refer to chapter Setting the Digital Signal Outputs (<i>see page 290</i>). B: Type: 0: Normally closed (contact b) 1: Normally open (contact a) Example: If the setting of P2-18 is 101, the signal output function assigned to digital output 1 is SRDY (0x01) and the type of contact is a normally open contact.</p> | - 0 _h 101 _h 137 _h Hexadecimal | u16 RW per. | Modbus 324 _h |
| P2-19 DOTF2 | Signal Output Function for DO2 Applicable operating mode: PT, PS, V, T See P2-18 for details. | - 0 _h 103 _h 137 _h Hexadecimal | u16 RW per. | Modbus 326 _h |
| P2-20 DOTF3 | Signal Output Function for DO3 Applicable operating mode: PT, PS, V, T See P2-18 for details. | - 0 _h 109 _h 137 _h Hexadecimal | u16 RW per. | Modbus 328 _h |
| P2-21 DOTF4 | Signal Output Function for DO4 Applicable operating mode: PT, PS, V, T See P2-18 for details. | - 0 _h 105 _h 137 _h Hexadecimal | u16 RW per. | Modbus 32A _h |
| P2-22 DOTF5 | Signal Output Function for DO5 Applicable operating mode: PT, PS, V, T See P2-18 for details. | - 0 _h 7 _h 137 _h Hexadecimal | u16 RW per. | Modbus 32C _h |
| P2-23 DOTF6 | Signal Output Function for DO6(OCZ) Applicable operating mode: PT, PS, V, T Only the signal output function ESIM can be assigned to the digital output DO6(OCZ). Value 0: Encoder simulation function disabled Value 40 _(h) : Encoder simulation function enabled Use P2-18 ... P2-22 for assigning other signal output functions to the other digital outputs DO1 ... DO5. See P2-18 for details. | - 0 _h 40 _h 137 _h Hexadecimal | u16 RW per. | Modbus 32E _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|--------------------|---|--|--------------------------------|--------------------------------|
| P2-24 FDRT | Debounce Time - Fast Inputs Applicable operating mode: PT, PS, V, T This parameter specifies the debounce time for the digital inputs DI6 and DI7. See P2-09 for the debounce time for the digital inputs DI1 ... DI5 and DI8. | us 0 50 100 Decimal | u16 RW per. | Modbus 330 _h |
| P2-27 GCC | Gain Switching - Conditions and Type Applicable operating mode: PT, PS, V, T This parameter specifies the conditions for and the type of gain switching. The gain switching function is configured via this parameter and parameters P2-01, P2-05 and P2-29.  <p>A: Conditions for gain switching: 0: Disabled 1: Signal input function GAINUP is active 2: In operating modes PT and PS, the position deviation is greater than the value of P2-29 3: Pulse frequency is greater than the value of P2-29 4: Velocity is greater than the value of P2-29 5: Signal input function GAINUP is not active 6: In operating modes PT and PS, the position deviation is less than the value of P2-29 7: Pulse frequency is less than the value of P2-29 8: Velocity is less than the value of P2-29</p> | - 0 _h 0 _h 18 _h Hexadecimal | u16 RW per. | Modbus 336 _h |
| P2-29 GPE | Gain Switching - Comparison Value Applicable operating mode: PT, PS, V, T This parameter specifies the comparison value used for the conditions for gain switching. Depending on the selected condition, the value entered represents the number of pulses (position deviation), the pulse frequency or the velocity. The gain switching function is configured via this parameter and parameters P2-01, P2-05 and P2-27. | - 0 _h 138800 _h 3A9800 _h Hexadecimal | u32 RW per. | Modbus 33A _h |
| P2-30 INH | Auxiliary Functions Applicable operating mode: PT, PS, V, T Value 0: Disabled Value 1: Enable the power stage | - -8 0 8 Decimal | s16 RW - | Modbus 33C _h |
| P2-31 LTNEFFORT | Autotuning Optimization Value Threshold Applicable operating mode: PT, PS, V This parameter is used to modify the gain. | 0.001 100 1000 10000 Decimal | u32 RW - | Modbus 33E _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-------------------------|--|---|--------------------------------|--------------------------------|
| P2-32 ATMODE | Autotuning Applicable operating mode: PT, PS, V This parameter is used to start autotuning with the selected autotuning method. Value 0: Stop Autotuning Value 1: Easy Tuning Value 2: Comfort Tuning [minimum settling time, vibration suppression] Value 3: Comfort Tuning [minimum overshoot, vibration suppression] Value 52: Comfort Tuning [minimum settling time, no vibration suppression] Value 53: Comfort Tuning [minimum overshoot, no vibration suppression] | - 0 0 56 Decimal | u16 RW - | Modbus 340 _h |
| P2-34 VEMAX | Velocity Monitoring - Threshold Value Applicable operating mode: V This parameter specifies the velocity threshold for the velocity monitoring function. If this value is exceeded, error AL555 is detected. | 0.1rpm 0 50000 60000 Decimal | u32 RW per. | Modbus 344 _h |
| P2-35 PDEV | Position Deviation Monitoring - Threshold Value Applicable operating mode: PT, PS This parameter specifies the position deviation threshold for the position deviation monitoring function. If this value is exceeded, error AL009 is detected. | 10*pulse 1 384000 12800000 Decimal | u32 RW per. | Modbus 346 _h |
| P2-36 PT_PULSE_FLTR | PTI Interface Debounce Time - Pulse Applicable operating mode: PT, PS, V, T This parameter specifies the debounce time of the pulse input of the PTI interface. | 16.6666*ns 0 30 511 Decimal | u16 RO - | Modbus 348 _h |
| P2-37 PT_DIRECT_FLTR | PTI Interface Debounce Time - Direction Applicable operating mode: PT, PS, V, T This parameter specifies the debounce time of the direction input of the PTI interface. | 16.6666*ns 0 30 511 Decimal | u16 RO - | Modbus 34A _h |
| P2-44 AUTOR_DOMS | Set the AUTOR feature digital out mode Applicable operating mode: PS This parameter provides information on the status of the sequence of data sets processed with the signal input functions. Value 0: General output mode. The functions assigned to the digital outputs DO1 ... DO6 via the parameters P2-18 ... P2-23 are active. Value 1: Combination output mode. The digital outputs provide information on the status of the sequence of data sets. When this parameter is reset to 0, the previous assignments and configurations of the digital outputs as set via the parameters P2-18 ... P2-23 are restored. See Status of Data Set Sequences for details. | - 0 _h 0 _h 1 _h Hexadecimal | u16 RW per. | Modbus 358 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P2-50 DCLR | Signal Input Function CLRPOS - Trigger Applicable operating mode: PT This function is only supported in linear control mode (P8-35=0x4001) This parameter specifies how the signal input function CLRPOSDEV is triggered. The signal input function CLRPOSDEV resets the position deviation to zero. Value 0: Rising edge Value 1: Level | - 0 _h 0 _h 1 _h Hexadecimal | u16 RW per. | Modbus 364 _h |
| P2-60 GR2 | Electronic Gear Ratio - Numerator 2 Applicable operating mode: PT, PS This parameter can be used to set an additional gear ratio. The additional gear ratio can be selected via the signal input functions GNUM0 and GNUM1. See P1-44 for details. | - 1 128 536870911 Decimal | u32 RW per. | Modbus 378 _h |
| P2-61 GR3 | Electronic Gear Ratio - Numerator 3 Applicable operating mode: PT, PS See P2-60 for details. | - 1 128 536870911 Decimal | u32 RW per. | Modbus 37A _h |
| P2-62 GR4 | Electronic Gear Ratio - Numerator 4 Applicable operating mode: PT, PS See P2-60 for details. | - 1 128 536870911 Decimal | u32 RW per. | Modbus 37C _h |
| P2-65 GBIT | Special Function 1 Applicable operating mode: PT, PS, V Bits 0 ... 5: Reserved (must be set to 0). Bit 6: Reference pulse monitoring <ul style="list-style-type: none"> ● 0: Function activated ● 1: Function deactivated Bit 7: Pulse signal monitoring <ul style="list-style-type: none"> ● 0: Function activated (AL534) ● 1: Function deactivated Bit 8: Motor overload monitoring <ul style="list-style-type: none"> ● 0: Function activated (AL006) ● 1: Function deactivated Bit 9: Motor phase monitoring <ul style="list-style-type: none"> ● 0: Function deactivated ● 1: Function activated Bit 10: Acceleration and deceleration for ZCLAMP: <ul style="list-style-type: none"> ● 0: Immediate stop. Motor is locked at the position where it was when ZCLAMP became active. ● 1: Motor is decelerated with deceleration ramp setting. Motor is locked at the position where standstill is reached. | - 0 _h 200 _h FFC0 _h Hexadecimal | u16 RW per. | Modbus 382 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|------------------|---|---|--------------------------------|--------------------------------|
| P2-65(continued) | <p>Bit 11: NL(CWL)/PL(CCWL) pulse input inhibit function</p> <ul style="list-style-type: none"> ● 0: Function activated ● 1: Function deactivated <p>If P8-31 is set to 1 or 3 and if a hardware limit switch is triggered, a Fault Reset clears the missing master pulses. Only use the pulse inhibit function with settings 1 or 3 of P8-31 if you do not need a Fault Reset after a detected hardware limit switch error. To achieve this, set the Automatic Fault Reset function of P2-68 to 1.</p> <p>Bit 12: Mains phase monitoring</p> <ul style="list-style-type: none"> ● 0: Function activated (AL022) ● 1: Function deactivated <p>Bit 13: Encoder simulation output monitoring</p> <ul style="list-style-type: none"> ● 0: Function activated (AL018) ● 1: Function deactivated <p>Bit 14: Unit of P8-33</p> <ul style="list-style-type: none"> ● 0: P8-33 is in Hz ● 1: P8-33 is in 0.01Hz <p>Bit 15: Reserved (must be set to 0).</p> | | | |
| P2-66 GBIT2 | <p>Special Function 2</p> <p>Applicable operating mode: PT, PS, V, T</p> <p>Bits 0 ... 1: Reserved (must be set to 0).</p> <p>Bit 2: This bit specifies the type of Fault Reset after a detected undervoltage error has been removed.</p> <p>0: No automatic Fault Reset</p> <p>1: Automatic Fault Reset</p> <p>Bits 3 ... 7: Reserved (must be set to 0).</p> | - 0 0 4 Decimal | u16 RW per. | Modbus 384 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus | | | | | | |
|----------------|--|---|--------------------------------|--------------------------------|--|---|--|--|-------------------|-------------------------|
| P2-68 AEAL | <p>Auto-Enable and Automatic Hardware Limit Switch Fault Reset Applicable operating mode: PT, PS, V, T</p>  <p>X: Automatic power stage enabling 0: Trigger SON to enable power stage 1: Enable power stage automatically if SON is active after drive has been powered on</p> <table border="1" data-bbox="566 743 949 996"> <thead> <tr> <th>X</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>0</td> <td> </td> </tr> <tr> <td>1</td> <td> </td> </tr> </tbody> </table> <p>Y: Automatic Fault Reset for limit switches 0: Detected hardware limit switch error (AL014 and AL015) requires Fault Reset 1: Detected hardware limit switch error (AL014 and AL015) can be reset without Fault Reset Z: Reserved 0: No detected error 1: Detected error, Fault Reset required Modified settings become active the next time the product is powered on.</p> | X | FUNCTION | 0 | | 1 | | - 0 _h 0 _h 111 _h Hexadecimal | u16 RW per. | Modbus 388 _h |
| X | FUNCTION | | | | | | | | | |
| 0 | | | | | | | | | | |
| 1 | | | | | | | | | | |
| P2-69 ANIN1 | <p>Analog Input 1 Value Applicable operating mode: PT, PS, V, T This parameter Indicates the value of analog input 1.</p> | mV -12500 - 12500 Decimal | s16 RO per. | Modbus 38A _h | | | | | | |
| P2-70 ANIN2 | <p>Analog Input 2 Value Applicable operating mode: PT, PS, V, T This parameter Indicates the value of analog input 2.</p> | mV -12500 - 12500 Decimal | s16 RO per. | Modbus 38C _h | | | | | | |

P3 - Communication Parameters

P3 - Communication Parameters

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|--|--------------------------------|--------------------------------|
| P3-00 ADR | Device Address Modbus Applicable operating mode: PT, PS, V, T The device address must be unique. Modified settings become active the next time the product is powered on. | - 1 127 247 Decimal | u16 RW per. | Modbus 400 _h |
| P3-01 BRT | Transmission Rate Applicable operating mode: PT, PS, V, T This parameter is used to set the data transmission rate. For further information, refer to chapter Setting the Device Address, Baud Rate and Connection Settings (<i>see page 181</i>). Modified settings become active the next time the product is powered on. | - 0 _h 102 _h 405 _h Hexadecimal | u16 RW per. | Modbus 402 _h |
| P3-02 PTL | Modbus Connection Settings Applicable operating mode: PT, PS, V, T This parameter specifies the Modbus connection settings. For further information, refer to chapter Setting the Device Address, Baud Rate and Connection Settings (<i>see page 181</i>). Modified settings become active the next time the product is powered on. | - 6 _h 7 _h 9 _h Hexadecimal | u16 RW per. | Modbus 404 _h |
| P3-03 FLT | Detected Modbus Communication Errors - Handling Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive to a detected communication error. Value 0: Detected alert Value 1: Detected error | - 0 _h 0 _h 1 _h Hexadecimal | u16 RW per. | Modbus 406 _h |
| P3-04 CWD | Modbus Connection Monitoring Applicable operating mode: PT, PS, V, T This parameter specifies the maximum permissible duration for communication timeout. When this time has elapsed, the communication timeout is treated as a detected error. Setting this parameter to 0 to disables connection monitoring. | ms 0 0 20000 Decimal | u16 RW per. | Modbus 408 _h |
| P3-06 SDI | Digital Inputs - Forcing Settings Applicable operating mode: PT, PS, V, T This parameter determines whether or not a digital input can be forced. Bits 0 ... 7: Digital input DI1 ... digital input DI8 Bit settings: Value 0: Digital input cannot be forced Value 1: Digital input can be forced To actually start forcing, you must write P4-07. See P2-10 ... P2-17 for the assignment of signal input functions to the digital inputs. | - 0 _h 0 _h 7FF _h Hexadecimal | u16 RW - | Modbus 40C _h |
| P3-07 CDT | Modbus Response Delay Time Applicable operating mode: PT, PS, V, T This parameter specifies the time delay with which the drive responds to the Modbus master. | 0.5ms 0 0 1000 Decimal | u16 RW per. | Modbus 40E _h |

P4 - Diagnostics Parameters

P4 - Diagnostics Parameters

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|--|---|--------------------------------|--------------------------------|
| P4-00 ASH1 | Error History - Error Code of Most Recent Detected Error n Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the most recent detected error. Writing 0 to this parameter clears the error history. | - 0 _h 0 _h FFFF _h Hexadecimal | u16 RW - | Modbus 500 _h |
| P4-01 ASH2 | Error History - Error Code of Most Recent Detected Error n - 1 Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the detected error n-1, n being the most recent detected error. | - 0 _h 0 _h FFFF _h Hexadecimal | u16 RO - | Modbus 502 _h |
| P4-02 ASH3 | Error History - Error Code of Most Recent Detected Error n - 2 Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the detected error n-2, n being the most recent detected error. | - 0 _h 0 _h FFFF _h Hexadecimal | u16 RO - | Modbus 504 _h |
| P4-03 ASH4 | Error History - Error Code of Most Recent Detected Error n - 3 Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the detected error n-3, n being the most recent detected error. | - 0 _h 0 _h FFFF _h Hexadecimal | u16 RO - | Modbus 506 _h |
| P4-04 ASH5 | Error History - Error Code of Most Recent Detected Error n - 4 Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the detected error n-4, n being the most recent detected error. | - 0 _h 0 _h FFFF _h Hexadecimal | u16 RO - | Modbus 508 _h |
| P4-05 JOG | Jog Velocity Applicable operating mode: PT, PS, V, T For further information, refer to chapter Jog Operation (see page 302). | rpm 0 20 5000 Decimal | u32 RW per. | Modbus 50A _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P4-06 FOT | <p>Forcing Matrix of Digital Outputs Applicable operating mode: PT, PS, V, T This parameter lets you set those signal outputs whose signal output functions have been set to SDO_0 ... SDO_5. Bit 0 = 1 sets those signal outputs whose signal output function has been set to SDO_0. Bit 1 = 1 sets those signal outputs whose signal output function has been set to SDO_1. Bit 2 = 1 sets those signal outputs whose signal output function has been set to SDO_2. Bit 3 = 1 sets those signal outputs whose signal output function has been set to SDO_3. Bit 4 = 1 sets those signal outputs whose signal output function has been set to SDO_4. Bit 5 = 1 sets those signal outputs whose signal output function has been set to SDO_5. Bit 6 = 1 sets those signal outputs whose signal output function has been set to SDO_6. Bit 7 = 1 sets those signal outputs whose signal output function has been set to SDO_7. See P2-18 ... P2-22 for assigning the functions to the digital outputs.</p> | - 0 _h 0 _h FF _h Hexadecimal | u16 RW - | Modbus 50C _h |
| P4-07 ITST | <p>State of Digital Inputs / Activate Forcing Applicable operating mode: PT, PS, V, T A read access to this parameter indicates the state of the digital inputs in the form of a bit pattern. Example: Read value 0x0011: Digital inputs 1 and 5 are logical 1 By writing this parameter, you can modify the state of the inputs provided that the setting for the corresponding input in P3-06 allows for forcing (value 1 for the bit corresponding to the input). Example: Write value 0x0011: Digital inputs 1 and 5 are set to logical 1, regardless of the previous state See P3-06 for permitting forcing of individual digital inputs. See P2-10 ... P2-17 for the assignment of signal input functions to the digital inputs.</p> | - 0 _h 0 _h FF _h Hexadecimal | u16 RW - | Modbus 50E _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------------|--|---|--------------------------------|--------------------------------|
| P4-08 PKEY | Status of HMI Keypad Applicable operating mode: PT, PS, V, T This parameter is used to verify proper operation of the keys on the HMI keypad of the drive As a bitwise: <ul style="list-style-type: none"> • "1" - key is pressed, • "0" - key is released. When: <ul style="list-style-type: none"> • S key is indicated by bit0 • M key is indicated by bit1 • UP key is indicated by bit2 • DOWN key is indicated by bit3 • ENT key is indicated by bit4 | - 0 _h 0 _h FF _h Hexadecimal | u16 RO - | Modbus 510 _h |
| P4-09 MOT | State of Digital Outputs Applicable operating mode: PT, PS, V, T This parameter indicates the state of the digital outputs DO1...DO6. Bit 0 = 1: DO1 is activated Bit 1 = 1: DO2 is activated Bit 2 = 1: DO3 is activated Bit 3 = 1: DO4 is activated Bit 4 = 1: DO5 is activated Bit 5 = 1: DO6 is activated | - 0 _h 0 _h 3F _h Hexadecimal | u16 RO - | Modbus 512 _h |
| P4-10 FLTHISTCLR | Clear Error History Applicable operating mode: PT, PS, V, T Writing 0 to this parameter clears the error history. | - 0 0 0 Decimal | u16 RW - | Modbus 514 _h |
| P4-20 ANIN1DB | Analog Input 1 Dead Band Applicable operating mode: PT, PS, V, T This parameter gets/sets the dead band of analog input 1. If the absolute value of the analog input signal is less than this value, no analog command signal is generated. This function helps to prevent the drive from responding to voltage noise near the zero point of the analog input. | mV 0 0 10000 Decimal | s16 RW per. | Modbus 528 _h |
| P4-21 ANIN2DB | Analog Input 2 Dead Band Applicable operating mode: PT, PS, V, T This parameter gets/sets the dead band of analog input 2. If the absolute value of the analog input signal is less than this value, no analog command signal is generated. This function helps to prevent the drive from responding to voltage noise near the zero point of the analog input. | mV 0 0 10000 Decimal | s16 RW per. | Modbus 52A _h |
| P4-22 ANIN1OFFSET | Analog Input 1 Offset Applicable operating mode: V This parameter specifies an offset for the analog input used in operating mode V. | mV -10000 0 10000 Decimal | s16 RW per. | Modbus 52C _h |
| P4-23 ANIN2OFFSET | Analog Input 2 Offset Applicable operating mode: T This parameter specifies an offset for the analog input used in operating mode T. | mV -10000 0 10000 Decimal | s16 RW per. | Modbus 52E _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|---------------------------|---|---|--------------------------------|--------------------------------|
| P4-24 LVL | Undervoltage Monitoring - Threshold Value Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value for DC bus undervoltage monitoring. If the DC Bus voltage is less than the value of P4-24 x $\sqrt{2}$, the error AL003 is detected. | V 140 160 190 Decimal | u16 RW per. | Modbus 530 _h |
| P4-26 DO_FORCEABLE | Forceable digital outputs Applicable operating mode: PT, PS, V, T This parameter shows whether or not a digital output can be forced. Bits 0 ... 4: Digital output DO1 ... digital output DO5 Bit settings: Value 0: Digital output cannot be forced Value 1: Digital output can be forced | - Hexadecimal | u16 RO - | Modbus 534 _h |
| P4-27 DO_FORCE_MASK | Digital output force mask Applicable operating mode: PT, PS, V, T This parameter contains a mask that determines whether or not a digital output can be forced. Bits 0 ... 4: Digital output DO1 ... digital output DO5 Bit settings: Value 0: Digital output cannot be forced Value 1: Digital output can be forced To actually start forcing, you must write P4-28. See P2-18 ... P2-22 for the assignment of signal output functions to the digital outputs. | - 0 _h 0 _h Hexadecimal | u16 RW - | Modbus 536 _h |
| P4-28 DO_FORCE_VALUE | Digital output force value Applicable operating mode: PT, PS, V, T A read access to this parameter indicates the state of the digital outputs in the form of a bit pattern. Example: Read value 0x0011: Digital outputs 1 and 5 are logical 1 By writing this parameter, you can modify the state of the outputs provided that the setting for the corresponding output in P4-27 allows for forcing (value 1 for the bit corresponding to the output). Example: Write value 0x0011: Digital outputs 1 and 5 are set to logical 1, regardless of the previous state See P4-27 for permitting forcing of individual digital outputs. See P2-18 ... P2-22 for the assignment of signal output functions to the digital outputs. | - 0 _h 0 _h Hexadecimal | u16 RW - | Modbus 538 _h |
| P4-29 LOAD_PERIOD_TIME | Motor Load Period Time Applicable operating mode: PT, PS, V, T This parameter specifies the time period in which the average load will be calculated. Modified settings become active the next time the product is powered on. | ms 1 5000 100000 Decimal | u32 RW per. | Modbus 53A _h |

P5 - Motion Settings

P5- Motion Settings

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|---------------------|---|---|--------------------------------|--------------------------------|
| P5-00 REV | Firmware Revision Applicable operating mode: PT, PS, V, T This parameter contains the revision number of the firmware. | - 0 _h 0 _h FFFF _h Hexadecimal | u16 RO - | Modbus 600 _h |
| P5-04 HMOV | Homing - Homing Method Selection Applicable operating mode: PS This parameter is used to select the homing method and configure the behavior of the index pulse and the limit switches. For further information, refer to chapter Operating Mode Position Sequence (PS) (<i>see page 310</i>). Setting can only be modified if power stage is disabled. | - 0 _h 0 _h 128 _h Hexadecimal | u16 RW per. | Modbus 608 _h |
| P5-05 HOMESPEED1 | Homing - Fast Velocity for Reference Movement Applicable operating mode: PS | 0.1rpm 10 1000 60000 Decimal | u32 RW per. | Modbus 60A _h |
| P5-06 HOMESPEED2 | Homing - Slow Velocity for Reference Movement Applicable operating mode: PS | 0.1rpm 10 200 60000 Decimal | u32 RW per. | Modbus 60C _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|------------------------------|---|---|--------------------------------|--------------------------------|
| P5-07 PRCM | <p>Operating Mode PS via Parameter</p> <p>Applicable operating mode: PS</p> <p>The power stage must be enabled by using the parameter P2-30 prior to use this function.</p> <p>The power stage must be disabled by using the parameter P2-30 after using this function.</p> <p>The operating mode Position Sequence (PS) provides 32 data sets that can be executed via the signal input functions POS0 ... POS4 and CTRG or via of this parameter.</p> <p>0: Start operating mode Homing (Homing data set)</p> <p>1 ... 32: Trigger data set (equivalent to the signal input functions CTRG and POSn).</p> <p>33 ... 9999: Not permitted</p> <p>10000: Stop movement (equivalent to the signal input function STOP)</p> <p>Values displayed via this parameter:</p> <p>If a data set is active, but not yet completed, the value displayed is the value of this parameter plus 10000.</p> <p>If a data set has been completed, the value displayed is the value of this parameter plus 20000.</p> <p>Example:</p> <p>Displayed value 10003: Data set 3 has been started, but is not yet completed.</p> <p>Displayed value 20003: Data set 3 has been completed.</p> <p>Refer to chapter Operating Mode Position Sequence (PS) (<i>see page 310</i>).</p> | - 0 0 20032 Decimal | u16 RW - | Modbus 60E _h |
| P5-08 POSLIMPOS | <p>Positive Software Limit Switch - Position</p> <p>Applicable operating mode: PS</p> <p>Prerequisite: Software limit switches only work with a valid zero point.</p> <p>Setting can only be modified if power stage is disabled.</p> | PUU -2147483647 134217727 2147483647 Decimal | s32 RW per. | Modbus 610 _h |
| P5-09 POSLIMNEG | <p>Negative Software Limit Switch - Position</p> <p>Applicable operating mode: PS</p> <p>Prerequisite: Software limit switches only work with a valid zero point.</p> <p>Setting can only be modified if power stage is disabled.</p> | PUU -2147483647 -134217727 2147483647 Decimal | s32 RW per. | Modbus 612 _h |
| P5-10 GEARACCTHRESH | <p>Operating mode Pulse Train - Maximum Acceleration</p> <p>Applicable operating mode: PT</p> <p>This parameter is used to reduce the acceleration noise.</p> | ms 6 6 65500 Decimal | u16 RW per. | Modbus 614 _h |
| P5-11 POSLIMHYST | <p>Software Limit Switches - Hysteresis Value</p> <p>Applicable operating mode: PS</p> <p>This parameter specifies a hysteresis value for the software limit switches.</p> <p>Setting can only be modified if power stage is disabled.</p> | PULSE 0 3556 35555 Decimal | u16 RW per. | Modbus 616 _h |
| P5-12 PROBE_1_LVL_P RD | <p>Touch Probe Input 1 - Stable Level Duration</p> <p>Applicable operating mode: PT, PS</p> <p>This parameter specifies the period of time for which the level at Touch Probe input 1 must be stable.</p> | 31.25 μ s 2 5 32 Decimal | u16 RW per. | Modbus 618 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------------|---|---|--------------------------------|--------------------------------|
| P5-13 POSLIMMODE | Position Limiting Mode Applicable operating mode: PS This parameter activates/deactivates the software limit switches and the homing transient limits. Value 0: <ul style="list-style-type: none"> Deactivate software limit switches. Activate homing transient limits. Value 1: <ul style="list-style-type: none"> Activate software limit switches. Activate homing transient limits. Value 2: <ul style="list-style-type: none"> Deactivate software limit switches. Deactivate homing transient limits. Value 3: <ul style="list-style-type: none"> Activate software limit switches. Deactivate homing transient limits. NOTE: Software limit switches only work with a valid zero point. | - 0 0 3 Decimal | u16 RW per. | Modbus 61A _h |
| P5-14 ICMDSLOPE | Motion Profile for Torque - Slope Applicable operating mode: T This parameter specifies the slope of the motion profile for torque. | mA/s 1 100000 30000000 Decimal | u32 RW per. | Modbus 61C _h |
| P5-15 ICMDSLOPEEN | Motion Profile for Torque - Activation Applicable operating mode: T This parameter activates the motion profile for torque. Value 0: Deactivate Value 1: Activate Setting can only be modified if power stage is disabled. | - 0 0 1 Decimal | u16 RW per. | Modbus 61E _h |
| P5-16 AXEN | Encoder Increments in PUU Applicable operating mode: PT, PS, V, T Setting can only be modified if power stage is disabled. This parameter specifies an offset to the encoder position. | PUU -2147483647 0 2147483647 Decimal | s32 RW - | Modbus 620 _h |
| P5-18 AXPC | External Encoder (Pulses) Applicable operating mode: PT, PS, V, T This parameter contains the cumulated pluses counted at the PTI input multiplied by 16 since the drive has been switched on. | - -2147483648 - 2147483647 Decimal | s32 RO - | Modbus 624 _h |
| P5-20 STP | Deceleration Ramp - Signal Input Function STOP Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered via the signal input function STOP. The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp. | ms 6 50 65500 Decimal | u16 RW per. | Modbus 628 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P5-21 CTO | Deceleration Ramp - Detected Transmission Error Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if a transmission error is detected. The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp. | ms 6 50 65500 Decimal | u16 RW per. | Modbus 62A _h |
| P5-22 OVF | Deceleration Ramp - Position Overflow Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if a position overflow is detected. The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp. | ms 6 30 65500 Decimal | u16 RW per. | Modbus 62C _h |
| P5-23 SNL | Deceleration Ramp - Triggering of Negative Software Limit Switch Applicable operating mode: PS This parameter specifies the deceleration ramp for a stop triggered if the negative software limit switch is activated. The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp. | ms 6 50 65500 Decimal | u16 RW per. | Modbus 62E _h |
| P5-24 SPL | Deceleration Ramp - Triggering of Positive Software Limit Switch Applicable operating mode: PS This parameter specifies the deceleration ramp for a stop triggered if the positive software limit switch is activated. The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp. | ms 6 50 65500 Decimal | u16 RW per. | Modbus 630 _h |
| P5-25 NL | Deceleration Ramp - Triggering of Negative Hardware Limit Switch Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if the negative hardware limit switch is activated. The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp. | ms 6 30 65500 Decimal | u16 RW per. | Modbus 632 _h |
| P5-26 PL | Deceleration Ramp - Triggering of Positive Hardware Limit Switch Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if the positive hardware limit switch is activated. The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp. | ms 6 30 65500 Decimal | u16 RW per. | Modbus 634 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|------------------------------|--|--|--------------------------------|--------------------------------|
| P5-35 PROBES_POLARITY | Touch Probes Polarity Applicable operating mode: PT, PS, V, T This parameter specifies the touch probes polarity. | - 0 - 3 Decimal | u16 RO per. | Modbus 646 _h |
| P5-37 CAAX | Touch Probe Input 1 - Captured Position Applicable operating mode: PT, PS, V, T This parameter contains the position captured at Touch Probe input 1. | PUU -2147483647 0 2147483647 Decimal | s32 RO - | Modbus 64A _h |
| P5-38 PROBE1_CNTR | Touch Probe Input 1 - Event Counter Applicable operating mode: PT, PS, V, T The value is increased by 1 each time a position has been captured at Touch Probe input 1. | - 0 0 65535 Decimal | u16 RO - | Modbus 64C _h |
| P5-39 CACT | Touch Probe Input 1 - Configuration Applicable operating mode: PT, PS, V, T X: Activate/deactivate position capture 0: Deactivate 1: Activate (is reset to 0 when the counter in P5-38 is incremented) Y: Reserved U: Reserved Z: Polarity of Touch Probe input 0: Normally open 1: Normally closed Where X is the least significant half-byte and U is the most significant half-byte of the X/Y/U/Z Integer. | - 0 _h 0 _h 101 _h Hexadecimal | u16 RW - | Modbus 64E _h |
| P5-57 CAAX2 | Touch Probe Input 2 - Captured Position Applicable operating mode: PT, PS, V, T This parameter contains the position captured at Touch Probe input 2. | PUU -2147483647 0 2147483647 Decimal | s32 RO - | Modbus 672 _h |
| P5-58 PROBE2_CNTR | Touch Probe Input 2 - Event Counter Applicable operating mode: PT, PS, V, T The value is increased by 1 each time a position has been captured at Touch Probe input 2. | - 0 0 65535 Decimal | u16 RO - | Modbus 674 _h |
| P5-59 CACT2 | Touch Probe Input 2 - Configuration Applicable operating mode: PT, PS, V, T X: Activate/deactivate position capture 0: Deactivate 1: Activate (is reset to 0 when the counter in P5-58 is incremented) Y: Reserved Z: Polarity of Touch Probe input 0: Normally open 1: Normally closed U: Reserved | - 0 _h 0 _h 101 _h Hexadecimal | u16 RW - | Modbus 676 _h |
| P5-76 HOME_OFFSET_MOVE | Move Home Offset When Homing Applicable operating mode: Fieldbus mode This parameter activate/deactivate a movement to a configured home offset position when the homing position is reached. | - 0 0 1 Decimal | u16 RW per. | Modbus 698 _h |
| P5-77 PROBE_2_LVL_P RD | Touch Probe Input 2 - Stable Level Duration Applicable operating mode: PT, PS This parameter specifies the period of time for which the level at Touch Probe input 2 must be stable. | 31.25 μ s 2 5 32 Decimal | u16 RW per. | Modbus 69A _h |

P6 - Position Sequence Data Sets Group 1

P6 - PS Data Sets Group 1

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|--------------------|---|---|--------------------------------|--------------------------------|
| P6-00 ODAT | Position of Homing Data Set Applicable operating mode: PS After a successful reference movement, this position is automatically set at the reference point. Bits 0...31: Position | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 700 _h |
| P6-01 ODEF | Subsequent Data Set and Auto-start of Homing Data Set Applicable operating mode: PS Bit 0: 0 = Do not start Homing after first power stage enable 1 = Start Homing after first power stage enable Bits 1...7: Reserved Bits 8...15: Number of the subsequent data set | - 0 _h 0 _h 2001 _h Hexadecimal | u32 RW per. | Modbus 702 _h |
| P6-02 PATHPOS1 | Target Position of Data Set 1 Applicable operating mode: PS Bits 0...31: Target position | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 704 _h |
| P6-03 PATHCTRL1 | Configuration of Data Set 1 Applicable operating mode: PS Bits 0...3: Reserved Bit 4: 0 = Wait for preceding data set to complete, then start this data set 1 = Start this data set immediately Bits 5...6: Reserved Bit 7: 0 = Absolute position 1 = Relative (incremental) position Bits 8...15: Reserved | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 706 _h |
| P6-04 PATHPOS2 | Target Position of Data Set 2 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 708 _h |
| P6-05 PATHCTRL2 | Configuration of Data Set 2 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 70A _h |
| P6-06 PATHPOS3 | Target Position of Data Set 3 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 70C _h |
| P6-07 PATHCTRL3 | Configuration of Data Set 3 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 70E _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|--------------------|--|---|--------------------------------|--------------------------------|
| P6-08 PATHPOS4 | Target Position of Data Set 4 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 710 _h |
| P6-09 PATHCTRL4 | Configuration of Data Set 4 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 712 _h |
| P6-10 PATHPOS5 | Target Position of Data Set 5 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 714 _h |
| P6-11 PATHCTRL5 | Configuration of Data Set 5 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 716 _h |
| P6-12 PATHPOS6 | Target Position of Data Set 6 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 718 _h |
| P6-13 PATHCTRL6 | Configuration of Data Set 6 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 71A _h |
| P6-14 PATHPOS7 | Target Position of Data Set 7 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 71C _h |
| P6-15 PATHCTRL7 | Configuration of Data Set 7 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 71E _h |
| P6-16 PATHPOS8 | Target Position of Data Set 8 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 720 _h |
| P6-17 PATHCTRL8 | Configuration of Data Set 8 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 722 _h |
| P6-18 PATHPOS9 | Target Position of Data Set 9 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 724 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|---------------------|---|---|--------------------------------|--------------------------------|
| P6-19 PATHCTRL9 | Configuration of Data Set 9 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 726 _h |
| P6-20 PATHPOS10 | Target Position of Data Set 10 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 728 _h |
| P6-21 PATHCTRL10 | Configuration of Data Set 10 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 72A _h |
| P6-22 PATHPOS11 | Target Position of Data Set 11 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 72C _h |
| P6-23 PATHCTRL11 | Configuration of Data Set 11 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 72E _h |
| P6-24 PATHPOS12 | Target Position of Data Set 12 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 730 _h |
| P6-25 PATHCTRL12 | Configuration of Data Set 12 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 732 _h |
| P6-26 PATHPOS13 | Target Position of Data Set 13 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 734 _h |
| P6-27 PATHCTRL13 | Configuration of Data Set 13 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 736 _h |
| P6-28 PATHPOS14 | Target Position of Data Set 14 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 738 _h |
| P6-29 PATHCTRL14 | Configuration of Data Set 14 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 73A _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|---------------------|---|---|--------------------------------|--------------------------------|
| P6-30 PATHPOS15 | Target Position of Data Set 15 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 73C _h |
| P6-31 PATHCTRL15 | Configuration of Data Set 15 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 73E _h |
| P6-32 PATHPOS16 | Target Position of Data Set 16 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 740 _h |
| P6-33 PATHCTRL16 | Configuration of Data Set 16 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 742 _h |
| P6-34 PATHPOS17 | Target Position of Data Set 17 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 744 _h |
| P6-35 PATHCTRL17 | Configuration of Data Set 17 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 746 _h |
| P6-36 PATHPOS18 | Target Position of Data Set 18 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 748 _h |
| P6-37 PATHCTRL18 | Configuration of Data Set 18 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 74A _h |
| P6-38 PATHPOS19 | Target Position of Data Set 19 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 74C _h |
| P6-39 PATHCTRL19 | Configuration of Data Set 19 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 74E _h |
| P6-40 PATHPOS20 | Target Position of Data Set 20 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 750 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|---------------------|---|---|--------------------------------|--------------------------------|
| P6-41 PATHCTRL20 | Configuration of Data Set 20 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 752 _h |
| P6-42 PATHPOS21 | Target Position of Data Set 21 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 754 _h |
| P6-43 PATHCTRL21 | Configuration of Data Set 21 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 756 _h |
| P6-44 PATHPOS22 | Target Position of Data Set 22 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 758 _h |
| P6-45 PATHCTRL22 | Configuration of Data Set 22 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 75A _h |
| P6-46 PATHPOS23 | Target Position of Data Set 23 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 75C _h |
| P6-47 PATHCTRL23 | Configuration of Data Set 23 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 75E _h |
| P6-48 PATHPOS24 | Target Position of Data Set 24 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 760 _h |
| P6-49 PATHCTRL24 | Configuration of Data Set 24 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 762 _h |
| P6-50 PATHPOS25 | Target Position of Data Set 25 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 764 _h |
| P6-51 PATHCTRL25 | Configuration of Data Set 25 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 766 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|---------------------|---|---|--------------------------------|--------------------------------|
| P6-52 PATHPOS26 | Target Position of Data Set 26 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 768 _h |
| P6-53 PATHCTRL26 | Configuration of Data Set 26 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 76A _h |
| P6-54 PATHPOS27 | Target Position of Data Set 27 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 76C _h |
| P6-55 PATHCTRL27 | Configuration of Data Set 27 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 76E _h |
| P6-56 PATHPOS28 | Target Position of Data Set 28 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 770 _h |
| P6-57 PATHCTRL28 | Configuration of Data Set 28 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 772 _h |
| P6-58 PATHPOS29 | Target Position of Data Set 29 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 774 _h |
| P6-59 PATHCTRL29 | Configuration of Data Set 29 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 776 _h |
| P6-60 PATHPOS30 | Target Position of Data Set 30 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 778 _h |
| P6-61 PATHCTRL30 | Configuration of Data Set 30 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 77A _h |
| P6-62 PATHPOS31 | Target Position of Data Set 31 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 77C _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|---------------------|---|---|--------------------------------|--------------------------------|
| P6-63 PATHCTRL31 | Configuration of Data Set 31 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 77E _h |
| P6-64 PATHPOS32 | Target Position of Data Set 32 Applicable operating mode: PS See P6-02 for details. | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 780 _h |
| P6-65 PATHCTRL32 | Configuration of Data Set 32 Applicable operating mode: PS See P6-03 for details. | - 0 _h 0 _h D0 _h Hexadecimal | u16 RW per. | Modbus 782 _h |

P7 - Position Sequence Data Sets Group 2

P7 - PS Data Sets Group 2

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-----------------------|--|---|--------------------------------|--------------------------------|
| P7-00 HOME_ACC_DEC | Deceleration and Acceleration of Homing Data Set Applicable operating mode: PS Bits 0 ... 15: Deceleration Bits 16 ... 31: Acceleration | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 800 _h |
| P7-01 HOME_DLY | Waiting Time of Homing Data Set Applicable operating mode: PS Bits 0 ... 15: Waiting time until next dataset is started Bits 16 ... 31: Reserved | ms 0 0 32767 Decimal | u32 RW per. | Modbus 802 _h |
| P7-02 ACC_DEC1 | Deceleration and Acceleration of Data Set 1 Applicable operating mode: PS Bits 0 ... 15: Deceleration Bits 16 ... 31: Acceleration | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 804 _h |
| P7-03 SPD_DLY1 | Waiting Time and Target Velocity of Data Set 1 Applicable operating mode: PS Bits 0 ... 15: Waiting time until next dataset is started (in ms) Bits 16 ... 31: Target velocity (in rpm) | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 806 _h |
| P7-04 ACC_DEC2 | Deceleration and Acceleration of Data Set 2 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 808 _h |
| P7-05 SPD_DLY2 | Waiting Time and Target Velocity of Data Set 2 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 80A _h |
| P7-06 ACC_DEC3 | Deceleration and Acceleration of Data Set 3 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 80C _h |
| P7-07 SPD_DLY3 | Waiting Time and Target Velocity of Data Set 3 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 80E _h |
| P7-08 ACC_DEC4 | Deceleration and Acceleration of Data Set 4 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 810 _h |
| P7-09 SPD_DLY4 | Waiting Time and Target Velocity of Data Set 4 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 812 _h |
| P7-10 ACC_DEC5 | Deceleration and Acceleration of Data Set 5 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 814 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|--------------------|--|---|--------------------------------|--------------------------------|
| P7-11 SPD_DLY5 | Waiting Time and Target Velocity of Data Set 5 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 816 _h |
| P7-12 ACC_DEC6 | Deceleration and Acceleration of Data Set 6 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 818 _h |
| P7-13 SPD_DLY6 | Waiting Time and Target Velocity of Data Set 6 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 81A _h |
| P7-14 ACC_DEC7 | Deceleration and Acceleration of Data Set 7 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 81C _h |
| P7-15 SPD_DLY7 | Waiting Time and Target Velocity of Data Set 7 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 81E _h |
| P7-16 ACC_DEC8 | Deceleration and Acceleration of Data Set 8 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 820 _h |
| P7-17 SPD_DLY8 | Waiting Time and Target Velocity of Data Set 8 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 822 _h |
| P7-18 ACC_DEC9 | Deceleration and Acceleration of Data Set 9 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 824 _h |
| P7-19 SPD_DLY9 | Waiting Time and Target Velocity of Data Set 9 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 826 _h |
| P7-20 ACC_DEC10 | Deceleration and Acceleration of Data Set 10 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 828 _h |
| P7-21 SPD_DLY10 | Waiting Time and Target Velocity of Data Set 10 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 82A _h |
| P7-22 ACC_DEC11 | Deceleration and Acceleration of Data Set 11 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 82C _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|--------------------|--|---|--------------------------------|--------------------------------|
| P7-23 SPD_DLY11 | Waiting Time and Target Velocity of Data Set 11 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 82E _h |
| P7-24 ACC_DEC12 | Deceleration and Acceleration of Data Set 12 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 830 _h |
| P7-25 SPD_DLY12 | Waiting Time and Target Velocity of Data Set 12 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 832 _h |
| P7-26 ACC_DEC13 | Deceleration and Acceleration of Data Set 13 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 834 _h |
| P7-27 SPD_DLY13 | Waiting Time and Target Velocity of Data Set 13 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 836 _h |
| P7-28 ACC_DEC14 | Deceleration and Acceleration of Data Set 14 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 838 _h |
| P7-29 SPD_DLY14 | Waiting Time and Target Velocity of Data Set 14 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 83A _h |
| P7-30 ACC_DEC15 | Deceleration and Acceleration of Data Set 15 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 83C _h |
| P7-31 SPD_DLY15 | Waiting Time and Target Velocity of Data Set 15 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 83E _h |
| P7-32 ACC_DEC16 | Deceleration and Acceleration of Data Set 16 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 840 _h |
| P7-33 SPD_DLY16 | Waiting Time and Target Velocity of Data Set 16 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 842 _h |
| P7-34 ACC_DEC17 | Deceleration and Acceleration of Data Set 17 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 844 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|--------------------|--|---|--------------------------------|--------------------------------|
| P7-35 SPD_DLY17 | Waiting Time and Target Velocity of Data Set 17 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 846 _h |
| P7-36 ACC_DEC18 | Deceleration and Acceleration of Data Set 18 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 848 _h |
| P7-37 SPD_DLY18 | Waiting Time and Target Velocity of Data Set 18 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 84A _h |
| P7-38 ACC_DEC19 | Deceleration and Acceleration of Data Set 19 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 84C _h |
| P7-39 SPD_DLY19 | Waiting Time and Target Velocity of Data Set 19 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 84E _h |
| P7-40 ACC_DEC20 | Deceleration and Acceleration of Data Set 20 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 850 _h |
| P7-41 SPD_DLY20 | Waiting Time and Target Velocity of Data Set 20 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 852 _h |
| P7-42 ACC_DEC21 | Deceleration and Acceleration of Data Set 21 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 854 _h |
| P7-43 SPD_DLY21 | Waiting Time and Target Velocity of Data Set 21 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 856 _h |
| P7-44 ACC_DEC22 | Deceleration and Acceleration of Data Set 22 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 858 _h |
| P7-45 SPD_DLY22 | Waiting Time and Target Velocity of Data Set 22 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 85A _h |
| P7-46 ACC_DEC23 | Deceleration and Acceleration of Data Set 23 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 85C _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|--------------------|--|---|--------------------------------|--------------------------------|
| P7-47 SPD_DLY23 | Waiting Time and Target Velocity of Data Set 23 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 85E _h |
| P7-48 ACC_DEC24 | Deceleration and Acceleration of Data Set 24 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 860 _h |
| P7-49 SPD_DLY24 | Waiting Time and Target Velocity of Data Set 24 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 862 _h |
| P7-50 ACC_DEC25 | Deceleration and Acceleration of Data Set 25 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 864 _h |
| P7-51 SPD_DLY25 | Waiting Time and Target Velocity of Data Set 25 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 866 _h |
| P7-52 ACC_DEC26 | Deceleration and Acceleration of Data Set 26 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 868 _h |
| P7-53 SPD_DLY26 | Waiting Time and Target Velocity of Data Set 26 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 86A _h |
| P7-54 ACC_DEC27 | Deceleration and Acceleration of Data Set 27 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 86C _h |
| P7-55 SPD_DLY27 | Waiting Time and Target Velocity of Data Set 27 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 86E _h |
| P7-56 ACC_DEC28 | Deceleration and Acceleration of Data Set 28 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 870 _h |
| P7-57 SPD_DLY28 | Waiting Time and Target Velocity of Data Set 28 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 872 _h |
| P7-58 ACC_DEC29 | Deceleration and Acceleration of Data Set 29 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 874 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|--------------------|--|---|--------------------------------|--------------------------------|
| P7-59 SPD_DLY29 | Waiting Time and Target Velocity of Data Set 29 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 876 _h |
| P7-60 ACC_DEC30 | Deceleration and Acceleration of Data Set 30 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 878 _h |
| P7-61 SPD_DLY30 | Waiting Time and Target Velocity of Data Set 30 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 87A _h |
| P7-62 ACC_DEC31 | Deceleration and Acceleration of Data Set 31 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 87C _h |
| P7-63 SPD_DLY31 | Waiting Time and Target Velocity of Data Set 31 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 87E _h |
| P7-64 ACC_DEC32 | Deceleration and Acceleration of Data Set 32 Applicable operating mode: PS See P7-02 for details. | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 880 _h |
| P7-65 SPD_DLY32 | Waiting Time and Target Velocity of Data Set 32 Applicable operating mode: PS See P7-03 for details. | 0.1rpm ms 0 0 200 0 60000 32767 Decimal | u32 RW per. | Modbus 882 _h |

P8 - Control Loops

P8 - Control Loops

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-------------------------|--|---|--------------------------------|--------------------------------|
| P8-00 LTND | Derivative Gain Applicable operating mode: PT, PS, V This parameter is used to adjust the derivative gain. Refer to chapter Manual Tuning (<i>see page 196</i>). | 0.1Hz 0 800 20000 Decimal | u32 RW per. | Modbus 900 _h |
| P8-01 LTNI | Integral Gain Applicable operating mode: PT, PS, V This parameter is used to adjust the integral gain. Refer to chapter Manual Tuning (<i>see page 196</i>). | 0.1Hz 0 100 2000 Decimal | u32 RW per. | Modbus 902 _h |
| P8-02 LTNIV | Derivative-Integral Gain Applicable operating mode: PT, PS, V This parameter is used to adjust the derivative-integral gain. Refer to chapter Manual Tuning (<i>see page 196</i>). | 0.1Hz 0 400 4000 Decimal | u32 RW per. | Modbus 904 _h |
| P8-03 LTNP | Proportional Gain Applicable operating mode: PT, PS, V This parameter is used to adjust the proportional gain. Refer to chapter Manual Tuning (<i>see page 196</i>). | 0.1Hz 0 300 4000 Decimal | u32 RW per. | Modbus 906 _h |
| P8-04 LTNUSERGAIN | Global Gain Applicable operating mode: PT, PS, V | 0.001 100 500 3000 Decimal | u32 RW per. | Modbus 908 _h |
| P8-05 NLAFFLPPHZ | LTN Spring Filter Applicable operating mode: PT, PS, V This parameter is used to set a low-pass filter for the acceleration profile during tuning. Refer to chapter Manual Tuning (<i>see page 196</i>). | Hz 10 7000 7000 Decimal | u16 RW per. | Modbus 90A _h |
| P8-06 NLANTIVIBGAIN | Anti-Vibration Gain Applicable operating mode: PT, PS, V | Rad*10-3/N 0 0 10000 Decimal | u32 RW per. | Modbus 90C _h |
| P8-07 NLANTIVIBGAIN2 | Pe filter Applicable operating mode: PT, PS, V This parameter is used to set the gain of the Pe filter. | 0.001 0 0 99000 Decimal | u32 RW per. | Modbus 90E _h |
| P8-08 NLANTIVIBHZ | Anti-Vibration Filter Applicable operating mode: PT, PS, V This parameter is used to set the frequency to remove while using the anti-vibration filter. | 0.1Hz 50 4000 4000 Decimal | u32 RW per. | Modbus 910 _h |
| P8-09 NLANTIVIBHZ2 | Pe filter Applicable operating mode: PT, PS, V This parameter is used to set the frequency to remove with the Pe filter. | 0.1Hz 50 4000 8000 Decimal | u32 RW per. | Modbus 912 _h |
| P8-10 NLANTIVIBLMJR | Ratio of Load Inertia to Motor Inertia for Anti-Vibration Applicable operating mode: PT, PS, V Expert parameter for the internal control loop. | 0.1 0 0 6000 Decimal | u32 RW per. | Modbus 914 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|--------------------------|--|---|--------------------------------|--------------------------------|
| P8-11 NLANTIVIBN | NL Anti-Resonance Filter Divider Applicable operating mode: PT, PS, V Expert parameter for the internal control loop. | 0.01 1 200 10000 Decimal | u32 RW per. | Modbus 916 _h |
| P8-12 NLANTIVIBSHARP | Anti-Resonance Sharpness Applicable operating mode: PT, PS, V Expert parameter for the internal control loop. | 0.001 10 500 10000 Decimal | u16 RW per. | Modbus 918 _h |
| P8-13 NLANTIVIBSHARP2 | Pe Sharpness Applicable operating mode: PT, PS, V This parameter is used to optimize the Pe filter action. | 0.001 10 500 10000 Decimal | u16 RW per. | Modbus 91A _h |
| P8-14 NLFILTDAMPING | Current Filter Damping Applicable operating mode: PT, PS, V For further details, refer to Manual Tuning (see page 196). | % 0 0 100 Decimal | u16 RW per. | Modbus 91C _h |
| P8-15 NLFILTT1 | Current Filter Low Pass Filter Rise Time Applicable operating mode: PT, PS, V For further details, refer to Manual Tuning (see page 196). | 0.01ms 0 300 3000 Decimal | u16 RW per. | Modbus 91E _h |
| P8-16 NLNOTCH2BW | Current Filter - Second Notch Filter Bandwidth Applicable operating mode: PT, PS, V | Hz 0 0 500 Decimal | u16 RW per. | Modbus 920 _h |
| P8-17 NLNOTCH2CENTER | Current Filter - Second Notch Filter Center Applicable operating mode: PT, PS, V | Hz 5 100 1800 Decimal | u16 RW per. | Modbus 922 _h |
| P8-18 NLNOTCHBW | Current Filter - Notch Filter Bandwidth Applicable operating mode: PT, PS, V | Hz 0 0 500 Decimal | u16 RW per. | Modbus 924 _h |
| P8-19 NLNOTCHCENTER | Current Filter - Notch Filter Center Applicable operating mode: PT, PS, V For further details, refer to Manual Tuning (see page 196). | Hz 5 100 1800 Decimal | u16 RW per. | Modbus 926 _h |
| P8-20 NLPEAFF | Elasticity Compensation Applicable operating mode: PT, PS, V This parameter is used in the compensation of the elasticity of the mechanical system. For further details, refer to Manual Tuning (see page 196). | 0.1Hz 0 50000 50000 Decimal | u32 RW per. | Modbus 928 _h |
| P8-21 NLPEDFFRATIO | Spring Deceleration Ratio Applicable operating mode: PT, PS, V This parameter is used in the compensation of the elasticity of the mechanical system. For further details, refer to Manual Tuning (see page 196). | 0.001 0 1000 2000 Decimal | u16 RW per. | Modbus 92A _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|------------------------|--|---|--------------------------------|--------------------------------|
| P8-22 NLVELLIM | Analog NCT standstill Applicable operating mode: PT, PS, V If the target value is supplied as an analog voltage signal, this parameter can be used to improve the standstill stability. If the voltage drops below the value specified via this parameter, the integral gain set via parameter P8-01 and the derivative-integral gain set via parameter P8-02 are reduced by one half. | mV -3815 0 3815 Decimal | s16 RW per. | Modbus 92C _h |
| P8-23 ANIN1LPFHZ | Analog Input 1 - Filter Applicable operating mode: PT, PS, V, T This parameter specifies the cut-off frequency for the first order low-pass filter of analog input 1. | Hz 10 1000 10000 Decimal | u16 RW per. | Modbus 92E _h |
| P8-24 ANIN2LPFHZ | Analog Input 2 - Filter Applicable operating mode: PT, PS, V, T This parameter specifies the cut-off frequency for the first order low-pass filter of analog input 2. | Hz 10 1000 10000 Decimal | u16 RW per. | Modbus 930 _h |
| P8-25 GEARFILTAFF | Electronic Gear Filter - Acceleration Feedforward Applicable operating mode: PT This parameter specifies the acceleration feed-forward for the electronic gear filter. Setting can only be modified if power stage is disabled. | 0.001 -2000 0 2000 Decimal | s16 RW per. | Modbus 932 _h |
| P8-26 GEARFILTMODE | Electronic Gear Filter - Activation Applicable operating mode: PT This parameter activates/deactivates the electronic gear filter. Value 0: Deactivate electronic gear filter Value 1: Activate electronic gear filter Value 2: Activate enhanced electronic gear filter Setting can only be modified if power stage is disabled. | - 0 0 2 Decimal | u16 RW per. | Modbus 934 _h |
| P8-27 GEARFILTT1 | Electronic Gear Filter - Depth Applicable operating mode: PT | 0.01ms 75 200 3200 Decimal | u32 RW per. | Modbus 936 _h |
| P8-28 GEARFILTT2 | Electronic Gear Filter - Velocity and Acceleration Depth Applicable operating mode: PT | 0.01ms 0 400 6000 Decimal | u16 RW per. | Modbus 938 _h |
| P8-29 GEARFILTVELFF | Electronic Gear Filter - Velocity Feedforward Applicable operating mode: PT This parameter specifies the velocity feed-forward for the electronic gear filter. Setting can only be modified if power stage is disabled. | 0.01ms -20000 0 20000 Decimal | s32 RW per. | Modbus 93A _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|------------------------------|--|---|--------------------------------|--------------------------------|
| P8-30 GEARINMODE | Interpolation of Input Signal for Electronic Gear - Activation Applicable operating mode: PT This parameter allows for interpolation of the input signal for electronic gear and increases the resolution by a factor of 16. Value 0: Deactivate interpolation of input signal for electronic gear Value 1: Activate interpolation of input signal for electronic gear Setting can only be modified if power stage is disabled. | - 0 1 1 Decimal | u16 RW per. | Modbus 93C _h |
| P8-31 GEARING_MODE | Method for Operating Mode Pulse Train (PT) Applicable operating mode: PT Value 0: Synchronization deactivated Value 1: Position synchronization without compensation movement Value 2: Position synchronization with compensation movement Value 3: Velocity synchronization The parameters for acceleration (P1-34), deceleration (P1-35) and velocity (P1-55) act as limitations for the synchronization. | - 0 1 3 Decimal | u16 RW per. | Modbus 93E _h |
| P8-32 MOVESMOOTHA VG | S-Curve Setting Applicable operating mode: PT, PS Setting can only be modified if power stage is disabled. The maximum value is reduced to 12800 if P8-35 CONTROLMODE (high byte) is set to 5. | 0.01ms 25 400 25600 Decimal | u32 RW per. | Modbus 940 _h |
| P8-33 MOVESMOOTHL PFHZ | Low Pass Filter Setting Applicable operating mode: PT, PS The unit is modified to 0.01Hz if P2-65 GBIT Bit 14 is set to 1. | Hz 1 5000 500000 Decimal | u32 RW per. | Modbus 942 _h |
| P8-34 MOVESMOOTHM ODE | Smoothing Filter for Operating modes PT and PS - Type Applicable operating mode: PT, PS Value 0: No smoothing Value 1: LPF smoothing Value 2: S-curve smoothing Setting can only be modified if power stage is disabled. | - 0 2 2 Decimal | u16 RW per. | Modbus 944 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|---------------------------|---|---|--------------------------------|--------------------------------|
| P8-35 CONTROLMODE | Type of Velocity Control Type of Position Control Applicable operating mode: PT, PS, V This parameter specifies: <ul style="list-style-type: none"> the position control mode (high byte) <ul style="list-style-type: none"> value 2: Position control mode 2 (Sample rate 4 kHz) value 5: Position control mode 5 (Sample rate 8 kHz) value 40: Linear position control the type of velocity (low byte) <ul style="list-style-type: none"> value 1: Linear velocity control value 5: Velocity control with integral gain (P8-01, P8-02) value 6: Velocity control without integral gain value 7: Velocity control with P8-00 = P8-01, P8-02 = 0, P8-03 = 0 Setting can only be modified if power stage is disabled. | - 5 _h 207 _h 4001 _h Hexadecimal | u16 RW per. | Modbus 946 _h |
| P8-36 NLANTIVIBGAIN3 | Pe filter 3 Applicable operating mode: PT, PS, V This parameter is used to set the gain of the Pe filter 3 | 0.001 0 0 6000 Decimal | u32 RW per. | Modbus 948 _h |
| P8-37 NLANTIVIBHZ3 | Pe filter 3 Applicable operating mode: PT, PS, V This parameter is used to set the frequency to remove with the Pe filter 3. | 0.1Hz 50 4000 8000 Decimal | u32 RW per. | Modbus 94A _h |
| P8-38 NLANTIVIBQ3 | Pe filter 3 Applicable operating mode: PT, PS, V This parameter is used to set the zero-pole alignment with the Pe filter 3. | 0.001 200 1000 10000 Decimal | u32 RW per. | Modbus 94C _h |
| P8-39 IGRAV | Gravity Compensation Applicable operating mode: PT, PS, V, T This parameter is used to set the gravity compensation current for unbalanced systems. | 0.01A - 0 - Decimal | s16 RW per. | Modbus 94E _h |
| P8-40 LTNAFRC | LTN AFF Applicable operating mode: PT, PS, V This parameter is used to set the feed-forward term for the current command. | - 0 0 200 Decimal | u16 RW per. | Modbus 950 _h |
| P8-41 NLANTIVIBSHARP3 | Pe Sharpness Applicable operating mode: PT, PS, V This parameter is used to optimize the Pe filter 3 action. | - 10 200 10000 Decimal | u16 RW per. | Modbus 952 _h |
| P8-42 HOME_FAILURE_IND | Homing Error Information Applicable operating mode: PT, PS, V, T This parameter provides information in case of the homing is not successful. | - 0 - FFFFFFFF _h Hexadecimal | u32 RO - | Modbus 954 _h |
| P8-43 ZSPDLPFHZ | ZSPD Low Pass Filter Value Applicable operating mode: PT, PS, V, T This parameter sets the low pass filter value for ZSPD output in order to reduce jitters when the motor speed is around the Zero speed Threshold (P1-38) value. | Hz 10 1000 1000 Decimal | u16 RW per. | Modbus 956 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-----------------------------|---|---|--------------------------------|--------------------------------|
| P8-44 MT_COMMANDS | Send commands to multi turn encoder Applicable operating mode: PT, PS, V, T Value 0: No command to send. Value 1: Clear the battery detected error on the encoder. Value 2: Reset the number of accumulated revolutions of the encoder to zero. | - 0 - 2 Decimal | u16 RW - | Modbus 958 _h |
| P8-45 FEEDBACKTYPE | Feedback type Applicable operating mode: PT, PS, V, T Value 0: No feedback connected or undetermined feedback connected. Value 1: Single turn encoder. Value 2: Multi turn encoder. | - 0 - 2 Decimal | u16 RO - | Modbus 95A _h |
| P8-46 SRVSNS_TEMPERATURE | Encoder temperature Applicable operating mode: PT, PS, V, T | Deg. - - - Decimal | s16 RO - | Modbus 95C _h |
| P8-47 SRVSNS_VER | Encoder firmware and hardware versions Applicable operating mode: PT, PS, V, T The format is: ZZaabbcc ● aa.bb.cc: firmware version. ● ZZ: hardware version. | - - - 4294967295 Decimal | u32 RO - | Modbus 95E _h |
| P8-48 SRVSNS_FLTS | Encoder errors Applicable operating mode: PT, PS, V, T ● Bit 0: The returned position values are no longer considered as reliable. ● Bit 1: The device temperature is too high. ● Bit 2: The device temperature is too low. ● Bit 3: The device is not calibrated or the calibration data is corrupted. The device is not able to decode the position. ● Bit 4: The device supply voltage has dropped under operational value. ● Bit 5: The multi turn encoder battery voltage has dropped under 3 Vdc. ● Bit 6: The multi turn encoder requires an explicit configuration command. ● Bit 7: Internal position synchronization error detected between the multi turn and the single turn modules. ● Bit 8: Generic error code of the multi turn module is detected. ● Bit 16...23: Internal Error detected. ● Bit 24: The encoder firmware cannot operate on the provided hardware. ● Bit 25...31: Reserved. | - - - 4294967295 Hexadecimal | u32 RO - | Modbus 960 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|------------------------|---|---|--------------------------------|--------------------------------|
| P8-49 SRVSNS_WRNS | Encoder alerts Applicable operating mode: PT, PS, V, T <ul style="list-style-type: none"> ● Bit 0: The device temperature is too high. ● Bit 1: The device temperature is too low. ● Bit 2: Over speed. ● Bit 3: Over acceleration. ● Bit 4: Invalid checksum value detected on non-volatile memory initialization. ● Bit 5: non-volatile memory is empty. ● Bit 6: Internal Parameters area detected as invalid, default values are used. ● Bit 7: Invalid decoding sequence detected. ● Bit 8: Encoder internal flash error detected. ● Bit 9: The device has detected unusual high shaft displacement. Position error might be greater than usual. ● Bit 10: The multi turn encoder battery voltage is in the range 3000 ... 3150 mVdc. ● Bit 11: Reserved. ● Bit 12: The multi turn encoder counter exceeded the range of signed 16 bit value (-32767 ... 32768). The warning remains active until MT_COMMANDS (P8-44) is set to 2. The multi turn encoder counter continues to count in the range 0 ... 65535. ● Bit 13...31: Reserved. | - - 4294967295 Hexadecimal | u32 RO - | Modbus 962 _h |
| P8-51 SPDOBSRVRMODE | Speed Observer Mode Applicable operating mode: PT, PS, V, T Value 0: Speed feedback value is computed by the drive. Value 3: Speed feedback value is measured by the encoder. | - 0 0 3 Decimal | u16 RW per. | Modbus 966 _h |
| P8-52 GEARFILDEPTH | Electronic Gear Filter - Depth Applicable operating mode: PT This parameter sets the value of the depth for the enhanced electronic gear filter (P8-26 set to the value 2). | 0.01 ms 75 200 3200 Decimal | u32 RW per. | Modbus 968 _h |
| P8-53 KPP | Position Linear Controller Proportional Gain Applicable operating mode: PT, PS This parameter sets the value of the proportional gain for the linear position controller. NOTE: After motor connection, the drive automatically sets the optimized value (<i>see page 271</i>). | 0.1 rps/rev 0 300 12000 Decimal | u16 RW per. | Modbus 96A _h |
| P8-54 KPVFR | Position Velocity Feedforward This parameter sets the value of the position velocity feedforward to velocity command gain for the linear position controller. This is used to reduce the position following error at constant speed. NOTE: Value of 1000 is the nominal design for zero position following error. | 0.001 -2000 500 2000 Decimal | s32 RW per. | Modbus 96C _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-------------------|---|---|--------------------------------|--------------------------------|
| P8-55 KPAFVRV | Position Acceleration Feedforward This parameter sets the value of the position acceleration feedforward to velocity command gain for the linear position controller. This is used to reduce the position following error at constant acceleration. NOTE: Value of 1000 is the nominal design for zero position following error. | 0.001 -20000 0 20000 Decimal | s32 RW per. | Modbus 96E _h |
| P8-56 KPAFRC | Position Acceleration Feedforward to Current Loop This parameter sets the value of the position acceleration feedforward to current command gain for the linear position controller. This is used to reduce the position following error at constant acceleration. NOTE: Value of 100 is the nominal design for zero position following error. P1-37 value must be correctly set. | 0.001 -20000 0 20000 Decimal | s32 RW per. | Modbus 970 _h |
| P8-57 KVP | Velocity Proportional Gain This parameter sets the value of the proportional gain for the linear velocity controller. NOTE: After motor connection, the drive automatically sets the optimized value (see page 271). | 0.001 0 100 1000000000 Decimal | u32 RW per. | Modbus 972 _h |
| P8-58 KVI | Velocity Integral Gain This parameter sets the value of the integral gain for the linear velocity controller. NOTE: After motor connection, the drive automatically sets the optimized value (see page 271). | 0.001 0 30000 200000000 Decimal | u32 RW per. | Modbus 974 _h |
| P8-59 KVFR | Velocity Feedforward Ratio This parameter sets the value of the feedforward ratio for the linear velocity controller. NOTE: Value of 1000 makes the control close to a PI control. Higher values reduces the following error but introduces an overshoot. | 0.001 0 900 1000 Decimal | u16 RW per. | Modbus 976 _h |
| P8-60 FILTMODE | Velocity Loop Output Filter Mode This parameter sets the value of the velocity loop output filter for the linear velocity controller. Value 0: No filtering. Value 1: First order low pass filter; sets P8-61 as corner frequency. Value 2: Double first order low pass filter (sets P8-61 and P8-62 as corner frequencies). Value 3: Notch filter (sets P8-62 as notch center frequency and P8-61 as notch frequency width). NOTE: After motor connection, the drive automatically sets the optimized value (see page 271). | - 0 2 3 Decimal | u16 RW per. | Modbus 978 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-------------------------|--|---|--------------------------------|--------------------------------|
| P8-61 FILTHZ1 | Velocity Loop Output Filter Parameter 1 The function of this parameter depends on the velocity loop output filter mode (see P8-60). NOTE: After motor connection, the drive automatically sets the optimized value (see page 271). | - 1 500 10000 Decimal | u16 RW per. | Modbus 97A _h |
| P8-62 FILTHZ2 | Velocity Loop Output Filter Parameter 2 The function of this parameter depends on the velocity loop output filter mode (see P8-60). NOTE: After motor connection, the drive automatically sets the optimized value (see page 271). | - 1 500 10000 Decimal | u16 RW per. | Modbus 97C _h |
| P8-63 VELFILTMODE | Velocity Filter Mode This parameter sets the value of the type of filter that is used for extraction of a velocity signal from the position feedback. Value 0: No filtering. Use derivative of feedback position. Value 1: First order low pass filter; sets P8-64 as corner frequency. Value 2: Use of the velocity feedback provided by the encoder. Setting can only be modified if power stage is disabled. | - 0 1 2 Decimal | u32 RW per. | Modbus 97E _h |
| P8-64 VELFILTRFQ | Velocity Filter Pole Frequency This parameter sets the value of the first order filter, which is applied to the velocity feedback signal before applying the velocity controller. NOTE: This parameter value is used only if P8-63 is set to 1. Setting can only be modified if power stage is disabled. | - 20 440 2000 Decimal | u16 RW per. | Modbus 980 _h |
| P8-65 IFFLPHZ | Current Feedforward Low Pass Filter Applicable operating mode: PT, PS This parameter sets the value of the first order filter of the linear controller which is applied to the current feedforward before it is added to current command. | - 10 1000 1000 Decimal | u16 RW per. | Modbus 982 _h |
| P8-66 NLTFDESIGNMODE | LTN Torque Filter Mode Applicable operating mode: PT, PS, V This parameter sets the value of the torque filter mode used in the LTN control loop. Value 0: Manual set of P8-15 and P8-14 values. Value 1: P8-15 and P8-14 values are computed based on P8-67 value. | - 0 0 1 Decimal | u16 RW per. | Modbus 984 _h |
| P8-67 NLTFBW | LTN Torque Filter Bandwidth Applicable operating mode: PT, PS, V This parameter sets the value of the filter bandwidth used in LTN control loop to define P8-15 and P8-14 values with 10% overshoot. | Hz 50 1000 2000 Decimal | u16 RW per. | Modbus 986 _h |
| P8-68 NLNOTCHMODE | Current Filter - Notch Filter Mode Applicable operating mode: PT, PS, V This parameter sets the value of the notch filter mode used in the LTN control loop. Value 0: Original notch filter. Value 1: Advanced notch filter. | - 0 0 1 Decimal | u16 RW per. | Modbus 988 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-------------------------|---|---|--------------------------------|--------------------------------|
| P8-69 STANDSTILLMODE | <p>Standstill Mode</p> <p>Applicable operating mode: PT, PS, V</p> <p>This parameter sets the value of the standstill mode used for variable gain. The drive latches the variable gain when the motor is at standstill.</p> <p>Value 0: The drive revert to the original gain when the motor is not at standstill.</p> <p>Value 1: The drive revert to the original gain when a new motion command is applied.</p> <p>NOTE:</p> <p>The motor is at standstill when:</p> <ul style="list-style-type: none"> the velocity command is less than the velocity value set via the parameter P1-38 and the position deviation is within the tolerance sets via the parameter P1-54. | - 0 0 1 Decimal | u16 RW per. | Modbus 98A _n |
| P8-70 STANDSTILLGAIN | <p>Standstill Gain</p> <p>Applicable operating mode: PT, PS, V</p> <p>This parameter sets the value of the variable gain used for the linear position controller.</p> <p>When the motor is at standstill, the velocity proportional gain (P8-57 KVP) and the position proportional gain (P8-53 KPP) are multiplied by (P8-70/1024). When the motor is not at standstill, the velocity proportional gain and the position proportional gain revert to their original values.</p> | - 128 1024 1024 Decimal | u16 RW per. | Modbus 98C _n |
| P8-71 SFILTMODE | <p>Encoder Filter Mode</p> <p>Applicable operating mode: PT, PS, V</p> <p>This parameter activates/deactivates the encoder filter.</p> <p>Value 0: Deactivate the encoder filter.</p> <p>Value 1: Activate the encoder filter.</p> <p>The encoder filter helps to reduce the feedback jitter.</p> | - 0 1 1 Decimal | s16 RW per. | Modbus 98E _n |
| P8-99 LTNUSERVCMGAIN | <p>Adaptive Velocity Reference Value Gain</p> <p>Applicable operating mode: PT, PS</p> | 0.001 0 1000 3000 Decimal | u32 RW per. | Modbus 9C6 _n |

Linear Default Gains Values

The following table displays the optimized values set according to the connected motor:

| Motor references | P8-53 KPP | P8-57 KVP | P8-58 KVI | P8-60 FILTMODE | P8-61 FILTHZ1 | P8-62 FILTHZ2 |
|------------------|--------------|--------------|--------------|-------------------|------------------|------------------|
| BCH2MBA53...5C | 55 | 0.4 | 50 | 0 | 0 | 0 |
| BCH2MB013...5C | 25 | 0.25 | 50 | 1 | 500 | 0 |
| BCH2LD023...5C | 35 | 0.5 | 30 | 1 | 800 | 0 |
| BCH2MM031...6C | 19 | 4.5 | 20 | 2 | 400 | 500 |
| BCH2LD043...5C | 30 | 1.1 | 25 | 1 | 1000 | 0 |
| BCH2LF043...5C | 35 | 2 | 50 | 1 | 700 | 0 |
| BCH2MM052...6C | 18 | 8 | 30 | 2 | 500 | 500 |
| BCH2MM061...6C | 20 | 5 | 30 | 1 | 400 | 0 |
| BCH2HF073...5C | 25 | 4 | 30 | 1 | 400 | 0 |
| BCH2LF073...5C | 30 | 3 | 50 | 1 | 500 | 0 |
| BCH2MM081...6C | 23 | 12 | 35 | 2 | 400 | 400 |
| BCH2MM091...6C | 25 | 7 | 35 | 1 | 300 | 0 |
| BCH2MM102...6C | 16 | 8.5 | 50 | 1 | 200 | 0 |
| BCH2HM102...6C | 16 | 8.5 | 50 | 1 | 200 | 0 |
| BCH2LH103...6C | 23 | 7 | 40 | 1 | 700 | 0 |
| BCH2MM152...6C | 25 | 8 | 50 | 2 | 500 | 500 |
| BCH2MM202...6C | 17 | 11 | 15 | 2 | 400 | 400 |
| BCH2HM202...6C | 17 | 11 | 15 | 2 | 400 | 400 |
| BCH2MR202...6C | 13 | 21 | 25 | 1 | 200 | 0 |
| BCH2HR202...6C | 13 | 21 | 25 | 1 | 200 | 0 |
| BCH2LH203...6C | 21 | 9 | 40 | 1 | 700 | 0 |
| BCH2MR301...6C | 20 | 30 | 25 | 2 | 400 | 400 |
| BCH2MR302...6C | 15 | 33 | 30 | 2 | 300 | 300 |
| BCH2MR352...6C | 22 | 50 | 30 | 1 | 300 | 0 |
| BCH2MR451...6C | 22 | 35 | 30 | 2 | 300 | 400 |

P9 - DTM Data

P9 - DTM Data

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|------------------|--|---|--------------------------------|--------------------------------|
| P9-00 PRGNR | Lexium program number Applicable operating mode: PT, PS, V, T Reads the program number | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RO - | Modbus A00 _h |
| P9-01 DATE | Firmware Version Date Applicable operating mode: PT, PS, V, T This parameter contains the date of the firmware version. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RO - | Modbus A02 _h |
| P9-02 MTP_ID | MTP Identification Code Applicable operating mode: PT, PS, V, T | - 0 _h - FFFFFFFF _h Hexadecimal | u16 RO - | Modbus A04 _h |
| P9-06 UNAME1 | User-Defined Application Name 1 Applicable operating mode: PT, PS, V, T This parameter is provided for a user-defined application name. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW per. | Modbus A0C _h |
| P9-07 UNAME2 | User-Defined Application Name 2 Applicable operating mode: PT, PS, V, T This parameter is provided for a user-defined application name. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW per. | Modbus A0E _h |
| P9-08 UNAME3 | User-Defined Application Name 3 Applicable operating mode: PT, PS, V, T This parameter is provided for a user-defined application name. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW per. | Modbus A10 _h |
| P9-09 UNAME4 | User-Defined Application Name 4 Applicable operating mode: PT, PS, V, T This parameter is provided for a user-defined application name. | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RW per. | Modbus A12 _h |
| P9-10 MBWORD | Modbus Word Order Applicable operating mode: PT, PS, V, T This parameter sets the word order for Modbus. Value 0: Order of the bytes: 0 1 2 3 Value 1: Order of the bytes: 2 3 0 1 | - 0 0 1 Decimal | u16 RW per. | Modbus A14 _h |
| P9-11 SERNUM1 | Serial Number Part 1 Applicable operating mode: PT, PS, V, T | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RO - | Modbus A16 _h |
| P9-12 SERNUM2 | Serial Number Part 2 Applicable operating mode: PT, PS, V, T | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RO - | Modbus A18 _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-----------------------|---|---|--------------------------------|--------------------------------|
| P9-13 SERNUM3 | Serial Number Part 3 Applicable operating mode: PT, PS, V, T | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RO - | Modbus A1A _h |
| P9-14 SERNUM4 | Serial Number Part 4 Applicable operating mode: PT, PS, V, T | - 0 _h 0 _h FFFFFFFF _h Hexadecimal | u32 RO - | Modbus A1C _h |
| P9-15 LTN | Autotuning Method Applicable operating mode: PT, PS, V, T | - 0 0 6 Decimal | u16 RW - | Modbus A1E _h |
| P9-16 LTNREFERENCE | Autotuning Motion Profile - Type Applicable operating mode: PT, PS, V | - 0 0 2 Decimal | u16 RW - | Modbus A20 _h |
| P9-17 LTNAVMODE | Anti-vibration tuning mode. Applicable operating mode: PT, PS, V | - 0 0 6 Decimal | u16 RW - | Modbus A22 _h |
| P9-18 LTNSAEMODE | Autotuning Results - Save/Discard Applicable operating mode: PT, PS, V | - 0 0 3 Decimal | u16 RW - | Modbus A24 _h |
| P9-19 LTNNLPEAFF | Autotuning - Elasticity Compensation Filters Applicable operating mode: PT, PS, V | - 0 1 1 Decimal | s16 RW - | Modbus A26 _h |
| P9-20 LTNCYCLE | Autotuning - Direction of Movement Applicable operating mode: PT, PS, V This parameter sets the direction of movement for autotuning. Value 0: Both directions of movement Value 2: One direction of movement | - 0 0 3 Decimal | s16 RW - | Modbus A28 _h |
| P9-21 LTNDWELLTIME | Minimum Dwell Time for Detection of Movement Cycle Applicable operating mode: PT, PS, V | - 100 200 1000 Decimal | u16 RW - | Modbus A2A _h |
| P9-22 LTNLMJR | Autotuning - Automatic Estimation of Ratio of Load Inertia and Motor Inertia Applicable operating mode: PT, PS, V | - 0 0 1 Decimal | u16 RW - | Modbus A2C _h |
| P9-23 LTNSTIFF | Defines which values will be used for the position command filters. Applicable operating mode: PT, PS, V Value 0: Automatic smoothing via S-curve optimization of the value Value 1: Manual smoothing | - 0 0 1 Decimal | u16 RW - | Modbus A2E _h |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|---------------------|--|---|--------------------------------|--------------------------------|
| P9-25 LTNREFEN | Autotuning Motion Profile - Activation Applicable operating mode: PT, PS, V | - 0 0 1 Decimal | u16 RW - | Modbus A32 _n |
| P9-26 PTPOS | Autotuning - Movement Range in Direction 1 Applicable operating mode: PS This parameter specifies the movement range for autotuning in direction of movement 1. The sign of the value determines the direction of movement: Positive value: Positive direction of movement as set via parameter P1-01 Negative value: Negative direction of movement as set via parameter P1-01 See parameter P9-20 to select one direction of movement or both directions of movement for Comfort Tuning. | PUU -2147483647 0 2147483647 Decimal | s32 RW - | Modbus A34 _n |
| P9-27 PTNEG | Autotuning - Movement Range in Direction 2 Applicable operating mode: PS This parameter specifies the movement range for autotuning in direction of movement 2. The sign of the value determines the direction of movement: Positive value: Positive direction of movement as set via parameter P1-01 Negative value: Negative direction of movement as set via parameter P1-01 See parameter P9-20 to select one direction of movement or both directions of movement for Comfort Tuning. | PUU -2147483647 0 2147483647 Decimal | s32 RW - | Modbus A36 _n |
| P9-28 LTNACTIVE | Autotuning Active Applicable operating mode: PT, PS, V This parameter indicates whether autotuning is active. Value 0: Autotuning inactive Value 1: Autotuning active | - 0 - 1 Decimal | s16 RO - | Modbus A38 _n |
| P9-29 LTNVCRUISE | Autotuning - Velocity Applicable operating mode: PT, PS, V Bits 0 ... 15: Velocity for positive direction of movement Bits 16 ... 31: Velocity for negative direction of movement | 0.1rpm 0.1rpm - - - Decimal | u32 RW - | Modbus A3A _n |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P9-30 LTNST | <p>Autotuning - Status</p> <p>Applicable operating mode: PT, PS, V</p> <p>Value 0: Inactive</p> <p>Value 1: Active</p> <p>Value 2: Successfully completed</p> <p>Values 3 ... 9: Reserved</p> <p>Value 10: Impossible to set P9-15</p> <p>Value 11: Impossible to set P9-16</p> <p>Value 12: Impossible to set P9-17</p> <p>Value 13: Impossible to set P9-18</p> <p>Value 14: Impossible to set P9-19</p> <p>Value 15: Impossible to set P9-21</p> <p>Value 16: Impossible to set P9-22</p> <p>Value 17: Impossible to set P9-23</p> <p>Value 18: Impossible to set P9-24</p> <p>Value 19: Impossible to set P9-25</p> <p>Value 20: Impossible to set P9-32</p> <p>Value 21: Impossible to enable the power stage</p> <p>Value 22: Hold is active</p> <p>Value 23: Undetermined motor</p> <p>Values 24 ... 26: Reserved</p> <p>Value 27: Impossible to activate autotuning</p> <p>Value 28: Autotuning did not run successfully</p> <p>Value 29: Reserved</p> <p>Value 30: Low Effort</p> <p>Value 31: AVG Zero Init Value</p> <p>Value 32: Cost factor error detected</p> <p>Value 33: Pos tune user gain modified</p> <p>Value 34: Motor Was Not Recognized</p> <p>Value 35: LTNP Step Updated</p> <p>Value 36: Movement too small</p> <p>Value 37: ICMD Sat.</p> <p>Value 38: Insufficient load estimation time.</p> <p>Value 39: Insufficient acceleration/deceleration (less than 33 % of nominal acc/dec)</p> <p>Value 40: Excessive acceleration/deceleration (more than 90 % of nominal acc/dec)</p> | - 0 - 65535 Decimal | u32 RO - | Modbus A3C _n |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-----------------------|--|---|--------------------------------|--------------------------------|
| P9-30 Continued | Value 41: Need for gravity compensation (see P9-35) Value 42: Insufficient velocity (less than 10 % of nominal velocity) Value 43: Insufficient deceleration (less than deceleration ramp DECSTOP) Value 44: Autotuning timeout Value 45: Invalid default values Values 46 ... 49: Reserved Value 50: P9-15 set to 0 Value 51: Power stage disabled during autotuning Value 52: Current saturation Value 53: Reserved Value 54: Insufficient excitation for autotuning (poor motion profile: short distance, low acceleration/deceleration, etc.) Value 55: Insufficient tuning effort Value 56: Halt during autotuning Value 57: Undetermined motor Value 58: Motion profile exceeds limits Value 59: Invalid gains during autotuning Value 60: Insufficient movement Value 61: Current limitation during autotuning Value 62: Detected alert during autotuning Values 63 ... 69: Reserved Value 70: Positive distance and negative distance are not equal Value 71: Velocity is too low Value 72: Motion profile is not trapezoidal Value 73: Same sign used for positive and negative movement in bidirectional mode Value 74: Different signs used for positive and negative movement in unidirectional mode Values 75 ... 89: Reserved | | | |
| P9-31 PTACCDEC | Autotuning - Acceleration and Deceleration Applicable operating mode: PT, PS, V Bits 0 ... 15: Acceleration for Autotuning Bits 16 ... 31: Deceleration for Autotuning | ms ms 6 6 6000 6000 65500 65500 Decimal | u32 RW - | Modbus A3E _n |
| P9-32 LTNADVMODE | Autotune advance mode. Applicable operating mode: PT, PS, V | - 0 1 2 Decimal | u16 RW - | Modbus A40 _n |
| P9-33 LTNEFFORTMAX | Maximum Autotuning Optimization Value Applicable operating mode: PT, PS, V Setting can only be modified if power stage is disabled. | 0.001 0 - 1000 Decimal | u32 RO - | Modbus A42 _n |
| P9-34 LTNBAR | Autotuning Progress Bar Applicable operating mode: PT, PS, V | - 0 0 100 Decimal | u16 RO - | Modbus A44 _n |
| P9-35 LTNIGRAV | Autotuning - Gravity Estimation Applicable operating mode: PT, PS, V | - 0 0 1 Decimal | u16 RW - | Modbus A46 _n |

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-------------------------|--|---|--------------------------------|--------------------------------|
| P9-36 LTNLAFC | Set LTNAFRC in Autotune Applicable operating mode: PT, PS, V | - 0 0 2 Decimal | s16 RW - | Modbus A48 _h |
| P9-37 LTNWARNING | Autotuning - Last Stored Event Applicable operating mode: PT, PS, V | - 0 0 65535 Decimal | u32 RO - | Modbus A4A _h |
| P9-38 LTNIMPROVEMENT | Mode 2 AT improvement Applicable operating mode: PT, PS, V, T | - 0 0 100 Decimal | u16 RO - | Modbus A4C _h |
| P9-39 LTNCYCLEIDENT | Cycle Identification status Applicable operating mode: PT, PS, V, T | - 0 0 9 Decimal | u16 RO - | Modbus A4E _h |
| P9-40 LTNDEFAULTS | LTN Autotuning Using Defaults Applicable operating mode: PT, PS, V | - 0 0 1 Decimal | u16 RW - | Modbus A50 _h |

Part VII

Operation

What Is in This Part?

This part contains the following chapters:

| Chapter | Chapter Name | Page |
|---------|-----------------|------|
| 17 | Operation | 281 |
| 18 | Operating Modes | 299 |

Chapter 17

Operation

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--|------|
| Access Channels | 282 |
| Operating States | 283 |
| Setting the Digital Signal Inputs | 284 |
| Setting the Digital Signal Outputs | 290 |
| Functions for Target Value Processing | 294 |
| Setting a Signal Output Via Parameter | 295 |
| Forcing the Digital Signal Inputs and Signal Outputs | 296 |

Access Channels

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
- Digital and analog input signals
- Commissioning software LXM26 DTM Library

The product allows you to work with exclusive access which limits access to the product via a single access channel.

Only one access channel can have exclusive access to the product.

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 the commissioning software LXM26 DTM Library:
The commissioning software receives exclusive access via the switch *Exclusive access* in position *On*.

When the product is powered on, there is no exclusive access via an access channel.

The reference values are effective at the analog inputs and at the pulse inputs when the product is powered on. If exclusive access has been assigned to an access channel, signal at the pulse inputs are ignored.

The signal input functions **HALT**, **FAULT_RESET**, **SON** (falling edge), **CWL(NL)** and **CCWL(PL)** are always effective during exclusive access.

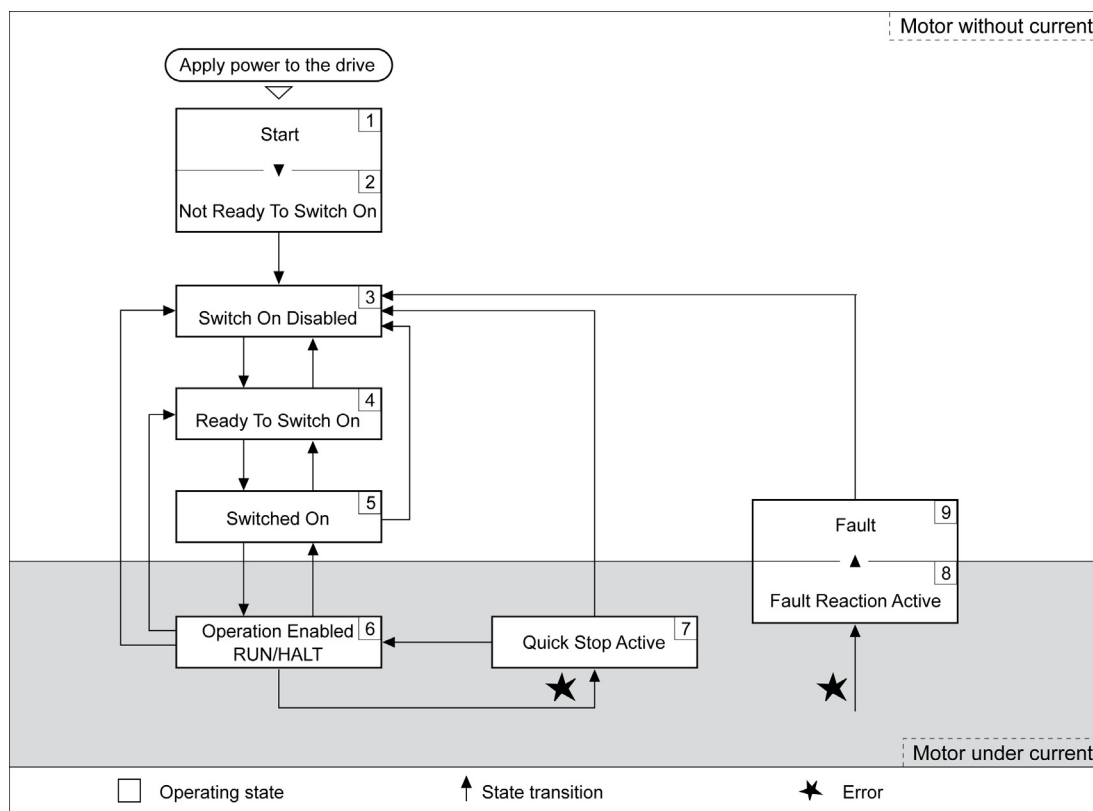
Operating States

State Diagram

When the product is powered on and when an operating mode is started (*see page 299*), 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 |

Resetting an Error Message

After you have removed the cause of the error, you can reset the error message in one of the following ways:

- With a rising edge of the signal input function **FAULT_RESET**
- With a rising edge of the signal input function **SON**
- By using the **Fault Reset** button in the SoMove commissioning software.

Setting the Digital Signal Inputs

Various signal functions can be assigned to the digital signal inputs.

The functions of the inputs and outputs depend on the selected operating mode and the settings of the corresponding parameters.

| ⚠ WARNING | |
|--|--|
| UNINTENDED EQUIPMENT OPERATION | |
| <ul style="list-style-type: none"> Only start the system if there are no persons or obstructions in the zone of operation. Verify that the wiring is appropriate for the settings. 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. | |

Default Presets of the Signal Inputs

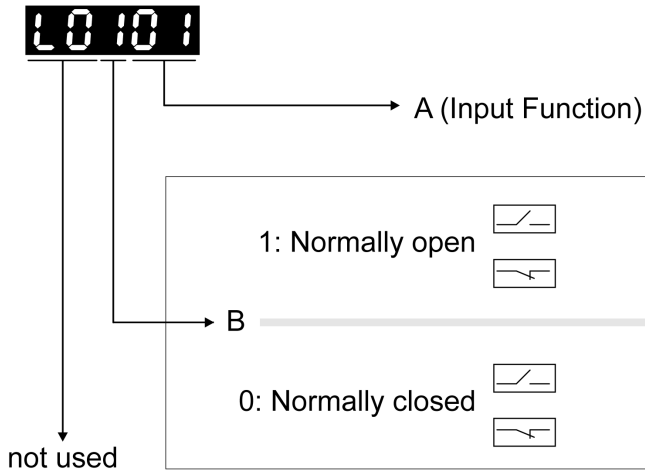
The following table shows the default presets of the digital signal inputs depending on the selected operating mode:

| Setting A for P2- 10 ... P2- 17 | Short name | Name | PT | PS | V | T | Vz | Tz | PT | PT | PS | PS | V | |
|--|---------------|-------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | | | V | T | V | T | V | T | V | T | | | | |
| 01 _h | SON | Servo ON | DI1 | | | | | | | | | | | |
| 02 _h | FAULT_ RESET | Fault Reset | DI5 | | | | | | - | | | | | |
| 03 _h | GAINUP | Increase Gain | - | | | | | | | | | | | |
| 04 _h | CLRPO SDEV | Clear Position Deviation | DI2 | - | | | | DI2 | | - | | | | |
| 05 _h | ZCLAMP | Zero Clamp | - | | | | | | | | | | | |
| 06 _h | INVDIR ROT | Inverse Direction Of Rotation | - | | | | | | | | | | | |
| 07 _h | HALT | Halt | - | | | | | | | | | | | |
| 08 _h | CTRG | Start Data Set | - | DI2 | - | | | | DI2 | | - | | | |
| 09 _h | TRQLM | Activate Torque Limit | - | DI2 | - | DI2 | - | | | | | | | |
| 10 _h | SPDLM | Activate Speed Limit | - | | DI2 | - | DI2 | - | | | | | | |
| 11 _h | POS0 | Data Set Bit 0 | - | DI3 | - | | | | DI3 | | - | | | |
| 12 _h | POS1 | Data Set Bit 1 | - | DI4 | - | | | | DI4 | | - | | | |
| 13 _h | POS2 | Data Set Bit 2 | - | | | | | | | | | | | |
| 14 _h | SPD0 | Speed Reference Value Bit 0 | - | DI3 | - | DI3 | - | DI3 | - | DI5 | - | DI3 | | |
| 15 _h | SPD1 | Speed Reference Value Bit 1 | - | DI4 | - | DI4 | - | DI4 | - | DI6 | - | DI4 | | |
| 16 _h | TCM0 | Torque Reference Value Bit 0 | DI3 | - | | DI3 | - | DI3 | - | DI3 | - | | DI5 | |
| 17 _h | TCM1 | Torque Reference Value Bit 1 | DI4 | - | | DI4 | - | DI4 | - | DI4 | - | | DI6 | |
| 18 _h | V-Px | Velocity - Position | - | | | | | | DI7 | - | DI7 | - | | |
| 19 _h | V-T | Velocity - Torque | - | | | | | | | | | | DI7 | |
| 1A _h | POS3 | Data Set Bit 3 | - | | | | | | | | | | | |
| 1B _h | POS4 | Data Set Bit 4 | - | | | | | | | | | | | |
| 1C _h | TPROB 1 | Touch Probe 1 | - | | | | | | | | | | | |

| Setting A for P2- 10 ... P2- 17 | Short name | Name | PT | PS | V | T | Vz | Tz | PT V | PT T | PS V | PS T | V T |
|--|---------------|--|----|----|---|---|----|-----|---------|---------|---------|---------|--------|
| 20 _h | T-Px | Torque - Position | | | | | | | | DI7 | - | DI7 | - |
| 21 _h | OPST | Stop and Disable Power Stage | | | | | | | | DI8 | | | |
| 22 _h | CWL(NL) | Negative Limit Switch (NL/LIMN) | | | | | | DI6 | | | - | | |
| 23 _h | CCWL(PL) | Positive Limit Switch (PL/LIMP) | | | | | | DI7 | | | - | | |
| 24 _h | ORGP | Reference Switch | | | | | | - | | | | | |
| 27 _h | GOTOH OME | Move To Home Position | | | | | | - | | | | | |
| 2C _h | PTCMS | Type of pulses for operating mode Pulse Train (PT) (OFF: Low- speed pulses, ON: High-Speed pulses) | | | | | | - | | | | | |
| 37 _h | JOGP | Jog Positive | | | | | | - | | | | | |
| 38 _h | JOGN | Jog Negative | | | | | | - | | | | | |
| 39 _h | STEPU | Next Data Set | | | | | | - | | | | | |
| 40 _h | STEPD | Previous Data Set | | | | | | - | | | | | |
| 41 _h | STEPB | First Data Set | | | | | | - | | | | | |
| 42 _h | AUTOR | Automatic Position Sequence: Start with first data set, repeat sequence | | | | | | - | | | | | |
| 43 _h | GNUM0 | Numerator Bit 0 Electronic Gear Ratio | | | | | | - | | | | | |
| 44 _h | GNUM1 | Numerator Bit 1 Electronic Gear Ratio | | | | | | - | | | | | |
| 45 _h | INHP | Pulse Inhibit | | | | | | - | | | | | |
| 46 _h | STOP | Stop Motor (operating mode PS only) | | | | | | - | | | | | |

Parameterization of the Signal Input Functions

The signal input functions for the inputs DI1 ... DI8 are configured via the parameters P2-10 ... P2-17. A signal input function can only be assigned to one of the signal inputs.



The operating modes Torque (T) and Torque (Tz) and the dual operating modes with Torque (T) and Torque (Tz) do not provide deceleration functionality in response to a power stage disable request. In these operating modes, the motor coasts down to a standstill in response to a power stage disable request. You must install additional equipment such as a dedicated service brake if your application requires faster deceleration of the load.

| |
|--|
| ⚠ WARNING |
| UNINTENDED EQUIPMENT OPERATION |
| <ul style="list-style-type: none"> During commissioning, trigger all signals and simulate all conditions that cause a power stage disable request in order to verify that all loads come to a secure standstill when the power stage is disabled under maximum load conditions. Install a dedicated service brake if removal of power to the motor does not meet the requirements of your application. |
| Failure to follow these instructions can result in death, serious injury, or equipment damage. |

The following table provides an overview of the possible signal input functions:

| Setting A for P2- 10 ... P2- 17 | Short name | Name | Description | Signal inputs |
|--|-----------------|-----------------------------|--|------------------|
| 01 _h | SON | Servo ON | The signal input function SON enables the power stage (operating state Operation Enabled). The signal input function SON is only available if no detected errors are present. | DI1 ... DI 8 |
| 02 _h | FAULT_RE SET | Fault Reset | The signal input function FAULT_RESET performs a Fault Reset. The cause of the error must have been removed before a Fault Reset is performed. | DI1 ... DI 8 |
| 03 _h | GAINUP | Increase Gain | The signal input function GAINUP increases the control gain according to the values and conditions set via parameter P2-27. | DI1 ... DI 8 |
| 04 _h | CLRPOSD EV | Clear Position Deviation | The signal input function CLRPOSDEV resets the position deviation to zero as set via parameter P2-50. This function is only supported in linear control mode (P8-35=4001 _h) | DI1 ... DI 8 |
| 05 _h | ZCLAMP | Zero Clamp | In the operating mode V, the signal input function ZCLAMP can be used to stop the motor if the velocity of the motor is below the velocity value set via the parameter P1-38. The behavior of the signal input function ZCLAMP is set via the parameter P2-65, bit 10. | DI1 ... DI 8 |

| Setting A for P2-10 ... P2-17 | Short name | Name | Description | Signal inputs |
|-------------------------------|------------|-------------------------------|---|---------------|
| 06 _h | INVDIRROT | Inverse Direction Of Rotation | The signal input function INVDIRROT inverts the direction of rotation of the motor. The signal input function INVDIRROT is available in the operating modes Velocity (V) and Torque (T). | DI1 ... DI8 |
| 07 _h | HALT | Halt | The signal input function HALT interrupts the movement with the deceleration ramp set via the parameter P1-68. The movement is resumed when the signal input function is no longer active. | DI1 ... DI8 |
| 08 _h | CTRG | Start Data Set | The signal input function CTRG starts the selected data set in the operating mode Position Sequence (PS). For further information, refer to Operating Mode Position Sequence (PS) (<i>see page 310</i>). | DI1 ... DI8 |
| 09 _h | TRQLM | Activate Torque Limit | The signal input function TRQLM activates the torque limitations set via parameters P1-12 ... P1-14. You can also use the parameter P1-02 to activate the torque limitations set via parameters P1-12 ... P1-14. | DI1 ... DI8 |
| 10 _h | SPDLM | Activate Speed Limit | The signal input function SPDLM activates the velocity limitations set via parameters P1-09 ... P1-11. You can also use the parameter P1-02 to activate the velocity limitations set via parameters P1-09 ... P1-11. | DI1 ... DI8 |
| 11 _h | POS0 | Data Set Bit 0 | The signal input functions POS0 ... POS4 represent bits 0 ... 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). For further information, refer to Operating Mode Position Sequence (PS) (<i>see page 310</i>). | DI1 ... DI8 |
| 12 _h | POS1 | Data Set Bit 1 | The signal input functions POS0 ... POS4 represent bits 0 ... 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). For further information, refer to Operating Mode Position Sequence (PS) (<i>see page 310</i>). | DI1 ... DI8 |
| 13 _h | POS2 | Data Set Bit 2 | The signal input functions POS0 ... POS4 represent bits 0 ... 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). For further information, refer to Operating Mode Position Sequence (PS) (<i>see page 310</i>). | DI1 ... DI8 |
| 14 _h | SPD0 | Speed Reference Value Bit 0 | The signal input functions SPD0 and SPD1 represent bits 0 and 1 to select one of the three velocity reference values available in the operating mode Velocity (V). For further information, refer to Operating Modes Velocity (V) and Velocity Zero (Vz) (<i>see page 348</i>). | DI1 ... DI8 |
| 15 _h | SPD1 | Speed Reference Value Bit 1 | The signal input functions SPD0 and SPD1 represent bits 0 and 1 to select one of the three velocity reference values available in the operating mode Velocity (V). For further information, refer to Operating Modes Velocity (V) and Velocity Zero (Vz) (<i>see page 348</i>). | DI1 ... DI8 |
| 16 _h | TCM0 | Torque Reference Value Bit 0 | The signal input functions TCM0 and TCM1 represent bits 0 and 1 to select one of the three torque reference values available in the operating mode Torque (T). For further information, refer to Operating Modes Torque (T) and Torque Zero (Tz) (<i>see page 353</i>). | DI1 ... DI8 |
| 17 _h | TCM1 | Torque Reference Value Bit 1 | The signal input functions TCM0 and TCM1 represent bits 0 and 1 to select one of the three torque reference values available in the operating mode Torque (T). For further information, refer to Operating Modes Torque (T) and Torque Zero (Tz) (<i>see page 353</i>). | DI1 ... DI8 |
| 18 _h | V-Px | Velocity - Position | Operating mode switching between Velocity (V) and Pulse Train (PT) or between Velocity (V) and Position Sequence (PS). For further information, refer to Setting the Operating Mode (<i>see page 300</i>). (OFF: Velocity (V), ON: Pulse Train (PT) or Position Sequence (PS), depending on P1-01) | DI1 ... DI8 |

| Setting A for P2-10 ... P2-17 | Short name | Name | Description | Signal inputs |
|-------------------------------|------------|--|---|---------------|
| 19 _h | V-T | Velocity - Torque | Operating mode switching between Velocity (V) and Torque (T). For further information, refer to Setting the Operating Mode (<i>see page 300</i>). (OFF: Velocity (V), ON: Pulse Torque (T)) | DI1 ... DI8 |
| 1A _h | POS3 | Data Set Bit 3 | The signal input functions POS0 ... POS4 represent bits 0 ... 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). For further information, refer to Operating Mode Position Sequence (PS) (<i>see page 310</i>). | DI1 ... DI8 |
| 1B _h | POS4 | Data Set Bit 4 | The signal input functions POS0 ... POS4 represent bits 0 ... 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). For further information, refer to Operating Mode Position Sequence (PS) (<i>see page 310</i>). | DI1 ... DI8 |
| 1C _h | TPROB1 | Touch Probe 1 | The signal input function TPROB1 is used to trigger the Position Capture function. See the sections on the parameters P5-37 ... P5-39 for additional information. | DI7 |
| 1D _h | TPROB2 | Touch Probe 2 | The signal input function TPROB2 is used to trigger the Position Capture function. See the sections on the parameters P5-57 ... P5-59 for additional information. | DI6 |
| 20 _h | T-Px | Torque - Position | Operating mode switching between Torque (T) and Pulse Train (PT) or between Torque (T) and Position Sequence (PS). For further information, refer to Setting the Operating Mode (<i>see page 300</i>). (OFF: Torque (T), ON: Pulse Train (PT) or Position Sequence (PS), depending on P1-01) | DI1 ... DI8 |
| 21 _h | OPST | Stop and Disable Power Stage | The signal input function OPST stops the motor with the deceleration ramp set via the parameter P1-68 and then disables the power stage. | DI1 ... DI8 |
| 22 _h | CWL(NL) | Negative Limit Switch (NL/LIMN) | Negative limit switch (NL/LIMN). When the signal input is activated, an alert is triggered. The deceleration ramp is specified via parameter P5-25. | DI1 ... DI8 |
| 23 _h | CCWL(PL) | Positive Limit Switch (PL/LIMP) | Positive limit switch (PL/LIMP). When the signal input is activated, an alert is triggered. The deceleration ramp is specified via parameter P5-26. | DI1 ... DI8 |
| 24 _h | ORGP | Reference Switch | The signal input function ORGP is used for the reference switch. For further information, refer to Operating Mode Position Sequence (PS) (<i>see page 310</i>). | DI1 ... DI8 |
| 27 _h | GOTOHOME | Move To Home Position | The signal input function GOTOHOME triggers a movement to the Home position set via the parameter P5-04. | DI1 ... DI8 |
| 2C _h | PTCMS | Type of pulses for operating mode Pulse Train (PT) (OFF: Low-speed pulses, ON: High-Speed pulses) | The signal input function PTCMS selects the type of pulses for the operating mode Pulse Train PT (OFF: Low-speed pulses, ON: High-speed pulses). You can also use the parameter P1-00 to select the type of pulses. | DI1 ... DI8 |
| 37 _h | JOGP | Jog Positive | The signal input function JOGP triggers a Jog movement in positive direction if the value determining the direction of movement in the parameter P1-01 is set to the default value. | DI1 ... DI8 |
| 38 _h | JOGN | Jog Negative | The signal input function JOGN triggers a Jog movement in negative direction if the value determining the direction of movement in the parameter P1-01 is set to the default value. | DI1 ... DI8 |
| 39 _h | STEPU | Next Data Set | The signal input function STEPUP starts the next data set in the operating mode Position Sequence (PS). | DI1 ... DI8 |
| 40 _h | STEPD | Previous Data Set | The signal input function STEPDP starts the previous data set in the operating mode Position Sequence (PS). | DI1 ... DI8 |

| Setting A for P2- 10 ... P2- 17 | Short name | Name | Description | Signal inputs |
|--|------------|--|--|------------------|
| 41 _h | STEPB | First Data Set | The signal input function STEPB starts the first data set in the operating mode Position Sequence (PS). | DI1 ... DI 8 |
| 42 _h | AUTOR | Automatic Position Sequence: Start with first data set, repeat sequence | The signal input function AUTOR starts a sequence of data sets from the first data set in the operating mode Position Sequence (PS). The sequence is repeated as long as the signal input function AUTOR is active. | DI1 ... DI 8 |
| 43 _h | GNUM0 | Numerator Bit 0 Electronic Gear Ratio | The signal input functions GNUM0 and GNUM1 represent bits 0 and 1 to select one of the four numerators set via the parameters P1-44, P2-60 ... P2-62. The denominator is set via the parameter P1-45. The ratios are used as gear factors in the operating mode Pulse Train (PT) and as scaling factors. For further information, refer to Gear Ratio (see page 307) and Scaling (see page 314). | DI1 ... DI 8 |
| 44 _h | GNUM1 | Numerator Bit 1 Electronic Gear Ratio | The signal input functions GNUM0 and GNUM1 represent bits 0 and 1 to select one of the four numerators set via the parameters P1-44, P2-60 ... P2-62. The denominator is set via the parameter P1-45. The ratios are used as gear factors in the operating mode Pulse Train (PT) and as scaling factors. For further information, refer to Gear Ratio (see page 307) and Scaling (see page 314). | DI1 ... DI 8 |
| 45 _h | INHP | Pulse Inhibit | The signal input function INHP is used in the operating mode Pulse Train (PT) to block pulses received as reference signals. If the signal input function is active, the pulses are no longer evaluated and the motor coasts down. | DI1 ... DI 8 |
| 46 _h | STOP | Stop Motor (operating mode PS only) | The signal input function STOP stops the motor with the deceleration ramp set via the parameter P5-20. The power stage remains enabled. The signal input function STOP is available in the operating mode Position Sequence (PS). | DI1 ... DI 8 |

Setting the Digital Signal Outputs

Various signal functions can be assigned to the digital signal outputs.

The functions of the inputs and outputs depend on the selected operating mode and the settings of the corresponding parameters.

| ⚠ WARNING | |
|--|--|
| UNINTENDED EQUIPMENT OPERATION | |
| <ul style="list-style-type: none"> ● Only start the system if there are no persons or obstructions in the zone of operation. ● Verify that the wiring is appropriate for the settings. ● 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. | |

Default Presets of the Signal Outputs

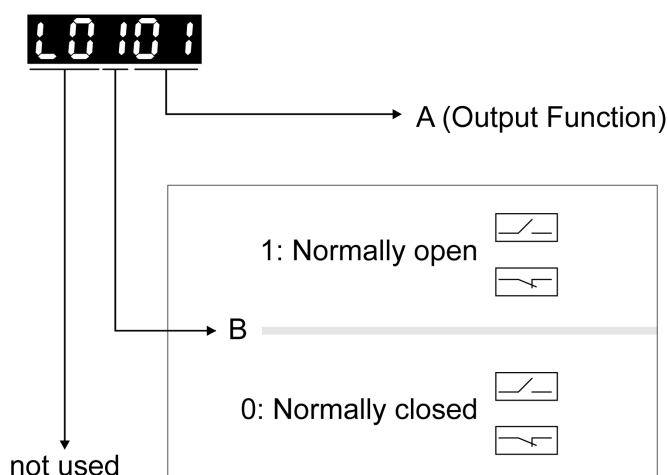
The following table shows the default presets of the digital signal outputs depending on the selected operating mode:

| Setting A for P2- 18 ... P2- 22 | Short name | Name | PT | PS | V | T | Vz | Tz | PT | PT | PS | PS | V | |
|--|----------------|---|-----|-----|-----|---|----|----|----|----|----|----|---|--|
| | | | V | T | V | T | V | T | V | T | | | | |
| 01 _h | SRDY | Servo Ready | DO1 | | | | | | | | | | | |
| 02 _h | SON | Servo On | - | | | | | | | | | | | |
| 03 _h | ZSPD | Zero Speed | DO2 | | | | | | | | | | | |
| 04 _h | TSPD | Speed Reached | - | DO3 | | | | | | | | | | |
| 05 _h | TPOS | Movement Completed | DO4 | - | DO4 | | - | | | | | | | |
| 06 _h | TQL | Torque Limit Reached | - | | | | | | | | | | | |
| 07 _h | ERROR | Error Detected | DO5 | | | | | | | | | | | |
| 08 _h | BRKR | Holding Brake Control | - | DO4 | | - | | | | | | | | |
| 09 _h | HOMED _OK | Homing Completed | DO3 | - | | | | | | | | | | |
| 10 _h | OLW | Motor Overload Alert | - | | | | | | | | | | | |
| 11 _h | WARN | Alert Signal activated | - | | | | | | | | | | | |
| 12 _h | OVF | Position command overflow | - | | | | | | | | | | | |
| 13 _h | SCWL(SNL) | Negative Software Limit Switch Reached | - | | | | | | | | | | | |
| 14 _h | SCCWL (SPL) | Positive Software Limit Switch Reached | - | | | | | | | | | | | |
| 15 _h | CMD_O K | Data set completed | - | | | | | | | | | | | |
| 16 _h | CAP1_ OK | Capture 1 completed | - | | | | | | | | | | | |
| 17 _h | MC_OK | Motion control completed output | - | | | | | | | | | | | |
| 18 _h | - | - | - | | | | | | | | | | | |
| 19 _h | SP_OK | Speed reached output | - | | | | | | | | | | | |
| 1A _h ...2F _h | - | - | - | | | | | | | | | | | |
| 30 _h | SDO_0 | Output the status of bit 0 of P4-06. | - | | | | | | | | | | | |
| 31 _h | SDO_1 | Output the status of bit 1 of P4-06. | - | | | | | | | | | | | |

| Setting A for P2-18 ... P2-22 | Short name | Name | PT | PS | V | T | Vz | Tz | PT V | PT T | PS V | PS T | V T |
|-------------------------------------|------------|--------------------------------------|----|----|---|---|----|----|------|------|------|------|-----|
| 32 _h | SDO_2 | Output the status of bit 2 of P4-06. | | | | | | | | | | | |
| 33 _h | SDO_3 | Output the status of bit 3 of P4-06. | | | | | | | | | | | |
| 34 _h | SDO_4 | Output the status of bit 4 of P4-06. | | | | | | | | | | | |
| 35 _h | SDO_5 | Output the status of bit 5 of P4-06. | | | | | | | | | | | |
| 36 _h | SDO_6 | Output the status of bit 6 of P4-06. | | | | | | | | | | | |
| 37 _h | SDO_7 | Output the status of bit 7 of P4-06. | | | | | | | | | | | |
| 38 _h ... 3F _h | - | - | | | | | | | | | | | |

Parameterization of the Signal Output Functions

The signal output functions for the outputs DO1 ... DO5 are configured via the parameters P2-18 ... P2-22.



The following table provides an overview of the possible signal output functions:

| Setting A for P2-18 ... P2-22 | Short name | Name | Description |
|-------------------------------|------------|--------------------|--|
| 01 _h | SRDY | Servo Ready | The signal output function SRDY indicates that no errors are detected, i.e., the drive is not in the operating state Fault. |
| 02 _h | SON | Servo On | The signal output function SON indicates that the drive is in the operating state Operation Enabled . |
| 03 _h | ZSPD | Zero Speed | The signal output function ZSPD indicates that the velocity of the motor is less than the velocity value set via parameter P1-38 . |
| 04 _h | TSPD | Speed Reached | The signal output function TSPD indicates that the velocity of the motor is greater than the velocity value set via parameter P1-39 . |
| 05 _h | TPOS | Movement Completed | Operating mode Pulse Train (PT): The signal output function TPOS indicates that the position deviation is within the tolerance set via the parameter P1-54 and the motor has come to a standstill. Operating mode Position Sequence (PS): The signal output function TPOS indicates that the position deviation at the target position is within the tolerance set via the parameter P1-54 and the reference velocity is below the value set via the parameter P1-38. |

| Setting A for P2-18 ... P2-22 | Short name | Name | Description |
|------------------------------------|------------|--|---|
| 06 _h | TQL | Torque Limit Reached | The signal output function TQL indicates that the torque of the motor has reached the value set via parameters P1-12 ... P1-14 or an analog input. |
| 07 _h | ERROR | Error Detected | The signal output function ERROR indicates that an error has been detected and that the drive has switched to the operating state Fault. For further information, refer to Diagnostics and Troubleshooting (<i>see page 359</i>). |
| 08 _h | BRKR | Holding Brake Control | The signal output function BRKR is used to control the holding brake with the settings made via parameters P1-42 and P1-19. The holding brake must be connected to the output to which the signal output function BRKR is assigned. For further information, refer to Holding Brake Connection (<i>see page 148</i>). |
| 09 _h | HOMED_OK | Homing Completed | The signal output function HOMED_OK indicates that the homing procedure has been successfully completed. The settings for Homing are specified via parameters P5-04 ... P5-06. For further information, refer to Operating Mode Position Sequence (PS) (<i>see page 310</i>). |
| 10 _h | OLW | Motor Overload Alert | The signal output function OLW indicates a motor overload condition. A threshold for the signal output function OLW can be set via parameter P1-28. |
| 11 _h | WARN | Alert Signal activated | The signal output function indicates that one of the following conditions has been detected: Hardware limit switch triggered, undervoltage, Nodeguard alert, Operational Stop (OPST). For further information, refer to Diagnostics and Troubleshooting (<i>see page 359</i>). |
| 12 _h | - | - | Reserved |
| 13 _h | SCWL(SNL) | Negative Software Limit Switch Reached | The signal output function SCWL(SNL) indicates that the negative software limit switch set via parameter P5-09 has been reached. When the software limit switch is reached, an alert is triggered. The deceleration ramp is specified via parameter P5-23. |
| 14 _h | SCCWL(SPL) | Positive Software Limit Switch Reached | The signal output function SCCWL(SPL) indicates that the positive software limit switch set via parameter P5-08 has been reached. When the software limit switch is reached, an alert is triggered. The deceleration ramp is specified via parameter P5-24. |
| 15 _h | CMD_OK | Data set completed | The signal output function CMD_OK indicates that the data set including the waiting time has been successfully completed. |
| 16 _h | CAP1_OK | Capture 1 completed | The signal output function CAP1_OK indicates that a position capture (Touch Probe) has been successfully completed. The settings for position capture (Touch Probe) are specified via parameters P5-37 ... P5-39. |
| 17 _h | MC_OK | Motion control completed output | The signal output function MC_OK indicates that both the signal output functions CMD_OK and TPOS have been activated. |
| 18 _h | - | - | Reserved |
| 19 _h | SP_OK | Speed reached output | The signal output function SP_OK indicates that the target velocity has been reached. The velocity range for activating this signal output function is set via parameter P1-47. |
| 1A _h ...2F _h | - | - | Reserved |
| 30 _h | SDO_0 | Output the status of bit 0 of P4-06. | The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06. |
| 31 _h | SDO_1 | Output the status of bit 1 of P4-06. | The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06. |
| 32 _h | SDO_2 | Output the status of bit 2 of P4-06. | The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06. |
| 33 _h | SDO_3 | Output the status of bit 3 of P4-06. | The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06. |

| Setting A for P2-18 ... P2- 22 | Short name | Name | Description |
|--------------------------------------|------------|--------------------------------------|--|
| 34 _h | SDO_4 | Output the status of bit 4 of P4-06. | The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06. |
| 35 _h | SDO_5 | Output the status of bit 5 of P4-06. | The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06. |
| 36 _h | SDO_6 | Output the status of bit 6 of P4-06. | The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06. |
| 37 _h | SDO_7 | Output the status of bit 7 of P4-06. | The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06. |
| 38 _h ...3F _h | - | - | Reserved |

Functions for Target Value Processing

Interrupting a Movement with HALT

The HALT signal input function is available in the operating mode PT only.

With the signal input function HALT, the ongoing movement is interrupted. When the signal input function HALT is no longer active, the movement is resumed from the point where it was interrupted.

The movement is interrupted via a deceleration ramp. The deceleration ramp is specified via parameter P1-68.

In order to interrupt a movement via a signal input, you must first parameterize the signal input function HALT, refer to Setting the Digital Signal Inputs (*see page 284*).

NOTE: The pulses received while the HALT function is active are ignored. When the HALT is no longer active, the drive accepts any on-going pulse stream and start movement according to that stream.

WARNING

UNINTENDED EQUIPMENT OPERATION

- Do not deactivate the HALT function prior to the deceleration of the motor.
- If the deactivation of the HALT function prior to the deceleration of the motor is unavoidable, be sure to include these circumstances in your hazard and risk analysis of your application.

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

If there is uncertainty of the effect of the movement generated by an ongoing pulse stream at the time of HALT deactivation, you must rehome the application.

Stopping a Movement with OPST

With the signal input function OPST (Operational Stop), the ongoing movement is stopped.

In order to stop a movement via a signal input, you must first parameterize the signal input function OPST, refer to Setting the Digital Signal Inputs (*see page 284*).

The movement is interrupted via a deceleration ramp to the point of the defined standstill. After that, the power stage is disabled once the drive has determined that the motor is at standstill, and if so configured, the holding brake is applied.

WARNING

UNINTENDED EQUIPMENT OPERATION

- During commissioning, trigger all signals and simulate all conditions that cause a power stage disable request in order to verify that all loads come to a secure standstill when the power stage is disabled under maximum load conditions.
- Install a dedicated service brake if removal of power to the motor does not meet the requirements of your application.

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

An error, AL013, is detected and presented.

The deceleration ramp is specified via parameter P1-68.

After the OPST function is enabled, you must disable it and re-enable the power stage for continued operation.

Setting a Signal Output Via Parameter

The digital signal outputs can be set via a parameter.

In order to set a digital signal output via the parameter, you must first parameterize the signal output functions SDO_0 ... SDO_7, refer to Setting the Digital Signal Outputs ([see page 290](#)).

The parameter P4-06 lets you set the digital signal outputs.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|--|---|--------------------------------|--------------------------------|
| P4-06 FOT | <p>Setting a signal output via parameter</p> <p>Applicable operating mode: PT, PS, V, T</p> <p>This parameter lets you set those signal outputs whose signal output functions have been defined by SDO_0 ... SDO_7.</p> <p>Bit 0 = 1 sets those signal outputs whose signal output function has been set to SDO_0.</p> <p>Bit 1 = 1 sets those signal outputs whose signal output function has been set to SDO_1.</p> <p>Bit 2 = 1 sets those signal outputs whose signal output function has been set to SDO_2.</p> <p>Bit 3 = 1 sets those signal outputs whose signal output function has been set to SDO_3.</p> <p>Bit 4 = 1 sets those signal outputs whose signal output function has been set to SDO_4.</p> <p>Bit 5 = 1 sets those signal outputs whose signal output function has been set to SDO_5.</p> <p>Bit 6 = 1 sets those signal outputs whose signal output function has been set to SDO_6.</p> <p>Bit 7 = 1 sets those signal outputs whose signal output function has been set to SDO_7.</p> <p>See P2-18 ... P2-22 for assigning the functions to the digital outputs.</p> | - 0 _h 0 _h FF _h Hexadecimal | u16 RW - | Modbus 50C _h |

Forcing the Digital Signal Inputs and Signal Outputs

Forcing of signals means that the digital inputs and outputs are set manually. Forcing input and output values can have serious consequences on the operation of a machine or process.

WARNING

UNINTENDED EQUIPMENT OPERATION CAUSED BY FORCING

- Only force I/O if there are no persons or obstructions in the zone of operation.
- Only force I/O if you are fully familiar with the effects of the signals.
- Only force I/O for test purposes, maintenance or other short-term tasks.
- Do not use forcing for regular, long-term or in-service operation.
- Always remove forcing when the task (testing, maintenance or other short-term operation) is completed.

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

Forcing the Digital Inputs

Forcing of the digital inputs is set via the parameters P3-06 and P4-07.

The parameter P3-06 lets you specify which digital signal inputs are allowed to be forced.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|--|--------------------------------|--------------------------------|
| P3-06 SDI | Digital Inputs - Forcing Settings Applicable operating mode: PT, PS, V, T This parameter determines whether a digital input can be forced. Bits 0 ... 7: Digital input DI1 ... Digital input DI8 Bit settings: Value 0: Digital input cannot be forced Value 1: Digital input can be forced To start forcing, you must write P4-07. See P2-10 ... P2-17 for the assignment of signal input functions to the digital inputs. | - 0 _h 0 _h 7FF _h Hexadecimal | u16 RW - | Modbus 40C _h |

Use parameter P4-07 to activate forcing of the digital signal inputs.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|--|---|--------------------------------|--------------------------------|
| P4-07 ITST | State of Digital Inputs / Activate Forcing Applicable operating mode: PT, PS, V, T A read access to this parameter indicates the state of the digital inputs in the form of a bit pattern. Example: Read value 0x0011: Digital inputs 1 and 5 are activated By writing this parameter, you can change the state of the inputs provided that the setting for the corresponding input in P3-06 allows for forcing (value 1 for the bit corresponding to the input). Example: Write value 0x0011: Digital inputs 1 and 5 are activated Read value 0x0011: Digital inputs 1 and 5 are activated See P3-06 for permitting forcing of individual digital inputs. See P2-10 ... P2-17 for the assignment of signal input functions to the digital inputs. | - 0 _h 0 _h FF _h Hexadecimal | u16 RW - | Modbus 50E _h |

Forcing the Digital Outputs

Forcing of the digital outputs is set via the parameters P4-27 and P4-28.

The parameter P4-27 lets you specify which digital signal outputs are allowed to be forced.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------------------|---|---|--------------------------------|--------------------------------|
| P4-27 DO_FORCE_MAS K | Digital Outputs - Forcing Settings Applicable operating mode: PT, PS, V, T This parameter determines whether a digital output can be forced. Bits 0 ... 4: Digital output DO1 ... Digital output DO5 Bit settings: Value 0: Digital output cannot be forced Value 1: Digital output can be forced To start forcing, you must write P4-28. See P2-18 ... P2-22 for the assignment of signal output functions to the digital outputs. | - 0 _h 0 _h 1F _h Hexadecimal | u16 RW - | Modbus 536 _h |

Use parameter P4-28 to activate forcing of the digital signal outputs.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-----------------------------|---|---|--------------------------------|--------------------------------|
| P4-28 DO_FORCE_VAL UE | State of Digital Outputs / Activate Forcing Applicable operating mode: PT, PS, V, T A read access to this parameter indicates the state of the digital outputs in the form of a bit pattern. Example: Read value 0x0011: Digital outputs 1 and 5 are activated By writing this parameter, you can change the state of the outputs provided that the setting for the corresponding output in P4-27 allows for forcing (value 1 for the bit corresponding to the output). Example: Write value 0x0011: Digital outputs 1 and 5 are activated Read value 0x0011: Digital outputs 1 and 5 are activated See P4-27 for permitting forcing of individual digital outputs. See P2-18 ... P2-22 for the assignment of signal output functions to the digital outputs. | - 0 _h 0 _h 1F _h Hexadecimal | u16 RW - | Modbus 538 _h |

Chapter 18

Operating Modes

What Is in This Chapter?

This chapter contains the following sections:

| Section | Topic | Page |
|---------|---|------|
| 18.1 | Setting the Operating Mode | 300 |
| 18.2 | Jog Operation | 302 |
| 18.3 | Operating Mode Pulse Train (PT) | 303 |
| 18.4 | Operating Mode Position Sequence (PS) | 310 |
| 18.5 | Operating Modes Velocity (V) and Velocity Zero (Vz) | 348 |
| 18.6 | Operating Modes Torque (T) and Torque Zero (Tz) | 353 |

Section 18.1

Setting the Operating Mode

Setting the Operating Mode

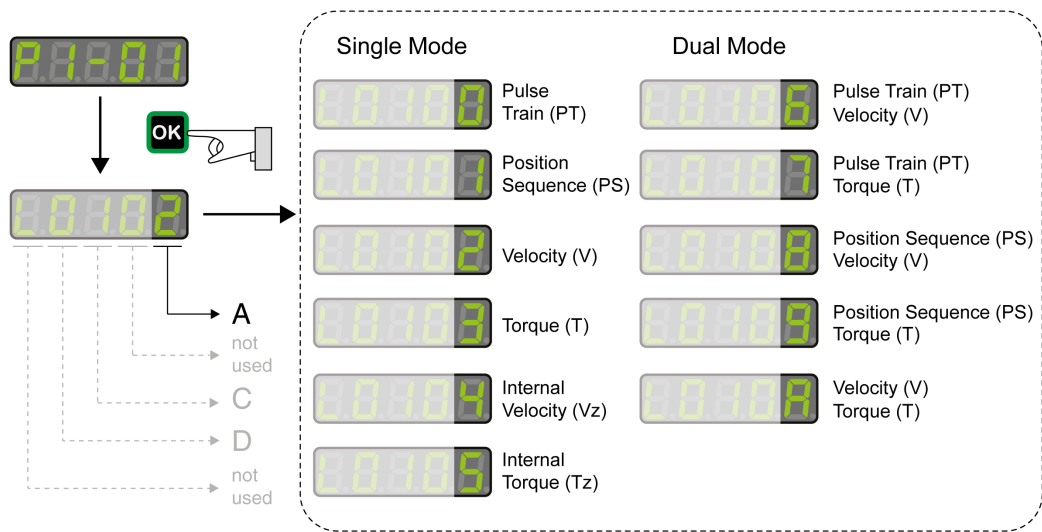
Unsuitable settings or unsuitable data may trigger unintended movements, trigger signals, damage parts and disable monitoring functions. Some parameters and other operational data do not become active until after a restart.

⚠ 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.
- 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 modification.
- 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.



The drive has the following types of operating modes:

- **Single Mode operating modes**
 - The drive operates in a single operating mode.
- **Dual Mode operating modes**
 - The drive operates using 2 operating modes alternately. The signal input functions are used to switch between the operating modes.

The operating modes Torque (T) and Torque (Tz) and the dual operating modes with Torque (T) and Torque (Tz) do not provide deceleration functionality in response to a power stage disable request. In these operating modes, the motor coasts down to a standstill in response to a power stage disable request. You must install additional equipment such as a dedicated service brake if your application requires faster deceleration of the load.

WARNING

UNINTENDED EQUIPMENT OPERATION

- During commissioning, trigger all signals and simulate all conditions that cause a power stage disable request in order to verify that all loads come to a secure standstill when the power stage is disabled under maximum load conditions.
- Install a dedicated service brake if removal of power to the motor does not meet the requirements of your application.

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

Section 18.2 Jog Operation

Jog Operation

Description

In the Jog operation, a movement is made from the actual motor position in the specified direction.

The parameter P4-05 is used to set the velocity for the movement in the unit rpm.

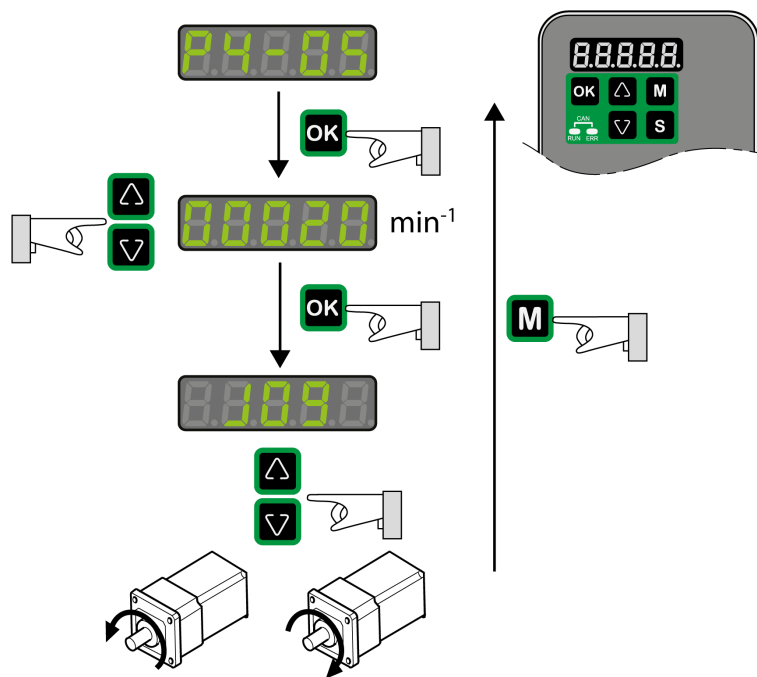
The movement can be performed via the arrow keys at the HMI or via the signal input functions JOGP and JOGN.

For further information on the parameterizable signal input functions, refer to Setting the Digital Signal Inputs (see page 284).

Jog Via HMI

If the HMI is used, the movements are performed via the arrow keys. The operating mode is terminated via the M key.

If the HMI is used, the movements are performed via the arrow keys. The operating mode is terminated via the M key.



Section 18.3

Operating Mode Pulse Train (PT)

What Is in This Section?

This section contains the following topics:

| Topic | Page |
|--|------|
| Operating mode Pulse Train (PT) | 304 |
| Pulse Settings | 305 |
| Gear Ratio | 307 |
| Acceleration and Deceleration Limitation | 309 |

Operating mode Pulse Train (PT)

Description

In the operating mode Pulse Train (PT), movements are carried out according to externally supplied reference value signals. A position reference value is calculated on the basis of these external reference values plus an adjustable gear ratio. The reference value signals can be A/B signals, P/D signals or CW/CCW signals.

Method

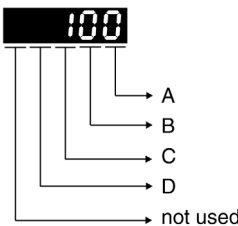
A movement can be made using one of 3 methods:

- Position synchronization without compensation movement
In the case of position synchronization without compensation movement, the movement is made synchronously (position synchronicity) with the supplied reference value signals. Reference value signals supplied during an interruption are not taken into account.
- Position synchronization with compensation movement
In the case of position synchronization with compensation movement, the movement is made synchronously (position synchronicity) with the supplied reference value signals. Reference value signals supplied during an interruption are taken into account and compensated for.
- Velocity synchronization
In the case of velocity synchronization, the movement is made synchronously (velocity synchronicity) with the supplied reference value signals.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-----------------------|---|---|--------------------------------|--------------------------------|
| P8-31 GEARING_MODE | Method for Operating Mode Pulse Train (PT) Applicable operating mode: PT Value 0: Synchronization deactivated Value 1: Position synchronization without compensation movement Value 2: Position synchronization with compensation movement Value 3: Velocity synchronization The parameters for acceleration (P1-34), deceleration (P1-35) and velocity (P1-55) act as limitations for the synchronization. | - 0 1 3 Decimal | u16 RW per. | Modbus 93E _n |

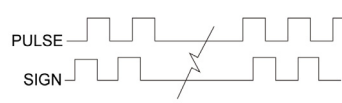

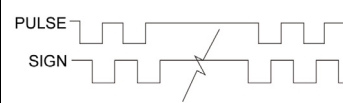

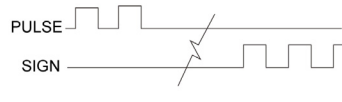

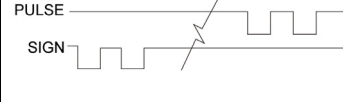

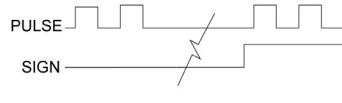

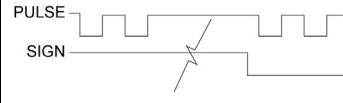

Pulse Settings

The parameter P1-00 lets you specify the type of reference value signals, the input polarity, the maximum signal frequency and the source of the pulses.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|--|---|--------------------------------|--------------------------------|
| P1-00 PTT | <p>Reference Value Signal - Pulse Settings Applicable operating mode: PT</p>  <p>This parameter is used to configure the reference value signals for the operating mode PT. A: Type of reference value signals B: Signal frequency C: Input polarity D: Source of reference value signals Setting can only be modified if power stage is disabled.</p> | - 0 _h 2 _h 1132 _h Hexadecimal | u16 RW per. | Modbus 200 _h |

Settings A and C

Type of reference value signals and input polarity

| - | C = 0 Positive input polarity | | C = 1 Negative input polarity | |
|--------------------------------|---|---|--|--|
| | Positive direction of movement | Negative direction of movement | Positive direction of movement | Negative direction of movement |
| A = 0 A/B signals |  |  |  |  |
| A = 1 CW/CCW signals |  |  |  |  |
| A = 2 P/D signals |  |  |  |  |

Setting B

Maximum signal frequency:

| | Low-speed pulses PULSE, SIGN | High-speed pulses HPULSE, HSIGN |
|--------------------------------------|---------------------------------|------------------------------------|
| B = 0 | 500 Kpps ⁽¹⁾ | 4 Mpps |
| B = 1 | 200 Kpps | 2 Mpps |
| B = 2 | 100 Kpps | 1 Mpps |
| B = 3 | 50 Kpps | 500 Kpps |
| (1) Only possible with RS422. | | |

Parameter P2-65 bit 6 allows you to set an error response for frequencies exceeding the maximum signal frequency by more than 10 %.

Setting D

Source of the pulses:

| | | |
|--------------|-------------------|-----------------------------|
| D = 0 | Low-speed pulses | CN1 Terminal: PULSE, SIGN |
| D = 1 | High-speed pulses | CN1 Terminal: HPULSE, HSIGN |

The source of the pulses can also be set via the signal input function PTCMS. The settings of the signal input function take priority over the settings of the parameter P1-00.

Gear Ratio

The gear ratio is the ratio of the number of motor increments and the number of reference increments. The reference increments are supplied as reference value signals via the signal inputs.

$$\text{Gear factor} = \frac{\text{Motor increments}}{\text{Reference increments}} = \frac{\text{Gear factor numerator}}{\text{Gear factor denominator}}$$

With the factory setting for the gear ratio, 100000 reference increments correspond to one revolution. There are 1280000 motor increments per revolution.

Parameterization

You can set up 4 gear ratios. It is possible to switch between these gear ratios via the signal inputs. The gear ratios are set via parameters P1-44, P1-45, P2-60, P2-61, and P2-62. You can switch between the gear ratios with the signal input functions GNUM0 and GNUM1.

| GNUM1 | GNUM0 | = |
|-------|-------|-----------------------|
| 0 | 0 | $\frac{P1-44}{P1-45}$ |
| 0 | 1 | $\frac{P2-60}{P1-45}$ |
| 1 | 0 | $\frac{P2-61}{P1-45}$ |
| 1 | 1 | $\frac{P2-62}{P1-45}$ |

In order to switch between the gear ratios via the signal inputs, you must first parameterize the signal input functions GNUM0 and GNUM1, refer to Setting the Digital Signal Inputs (*see page 284*).

Example 1

Calculation of number of motor revolutions corresponding to 30000 PUU:

$$30000 \text{ PUU} \times \frac{P1-44 = 128}{P1-45 = 10} = 384000 \rightarrow \frac{384000}{1280000} = 0,3 \text{ (M)}$$

Example 2

Calculation of gear ratio if 10000 PUU are to effect 500 revolutions of the motor shaft:

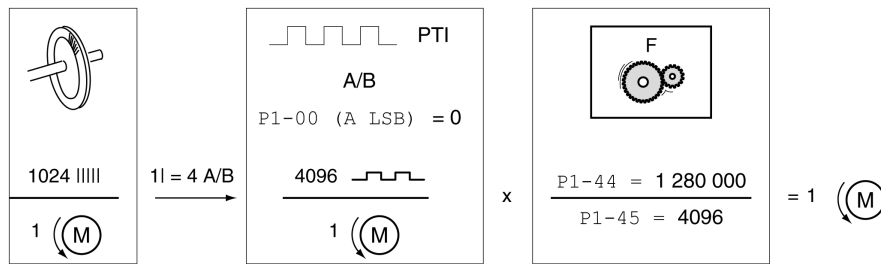
$$10000 \text{ PUU} = 500 \text{ (M)} \rightarrow \frac{P1-44 = ?}{P1-45 = ?}$$

$$\frac{1280000}{1 \text{ (M)}} \rightarrow \frac{1280000 \cancel{x 500}}{1 \text{ (M)} \times 10000} = \frac{128 \cancel{x 500}}{\text{(M)} \times 1}$$

$$\rightarrow \frac{P1-44 = 128 \times 500}{P1-45 = 1}$$

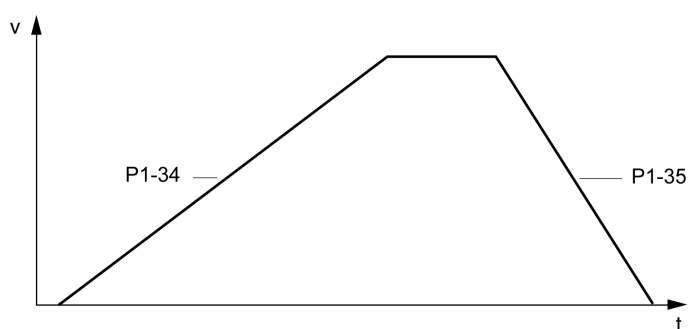
Example 3

A machine encoder with 1024 lines per revolution is to effect one revolution of the motor shaft with one revolution.



Acceleration and Deceleration Limitation

The parameters P1-34 and P1-35 allow you to set a limitation for the acceleration and deceleration.



| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P1-34 TACC | Acceleration Period Applicable operating mode: PT, V The acceleration period is the time in milliseconds required to accelerate from motor standstill to 6000 rpm. For operating mode V, this parameter specifies the acceleration. For operating mode PT, this parameter specifies an acceleration limitation for the pulses at the PTI interface. | ms 6 30 65500 Decimal | u16 RW per. | Modbus 244 _h |
| P1-35 TDEC | Deceleration Period Applicable operating mode: PT, V The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. For operating mode V, this parameter specifies the deceleration. For operating mode PT, this parameter specifies a deceleration limitation for the pulses at the PTI interface. | ms 6 30 65500 Decimal | u16 RW per. | Modbus 246 _h |

Section 18.4

Operating Mode Position Sequence (PS)

What Is in This Section?

This section contains the following topics:

| Topic | Page |
|--|------|
| Operating mode Position Sequence (PS) | 311 |
| Structure of a Data Set | 312 |
| Scaling | 314 |
| Homing Data Set for Absolute Movements | 315 |

Operating mode Position Sequence (PS)

Description

The operating mode Position Sequence (PS) allows you to set and execute 32 motion profiles in any sequence. The motion profiles are defined via 32 data sets.

The following values can be set for each data set:

- Target position
- Type of movement: Absolute or relative
- Type of transition between data sets
- Acceleration
- Target velocity
- Deceleration
- Waiting time after completion of the data set

In addition, a Homing data set is provided. This Homing data set is used to set a reference point for absolute movements.

Configuration

The data sets are configured by means of the commissioning software LXM26 DTM Library.

Structure of a Data Set

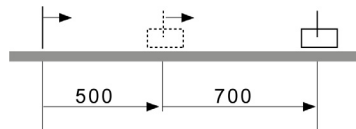
Target Position

The target position is set in the user-defined unit. With the factory scaling, the resolution is 100000 user-defined units per revolution.

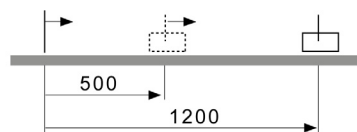
For further information on scaling, refer to chapter Scaling (*see page 314*).

Type of Movement

In the case of a relative movement, the movement is relative with reference to the previous target position or the current motor position.



In the case of an absolute movement, the movement is absolute with reference to the zero point.



Homing or position setting is required before the first absolute movement can be performed.

Transition Between Data Sets

There are two types of transitions:

- The subsequent data set is only started after the preceding data set has been completed.
- The subsequent data set is started as soon as it is triggered via the signal input function CTRG or the parameter P5-07.

Acceleration Period

The acceleration period is the time in milliseconds required to accelerate from motor standstill to 6000 rpm. It is used to set the acceleration ramp.

Target Velocity

The target velocity is reached after the time required for acceleration has passed.

Deceleration Period

The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp.

Waiting Time

The waiting time is the period of time that must pass after the target position has been reached for the data set to be considered completed.

Parameters for the Data Sets

The data set are configured via parameters P6-02 ... P6-65 and P7-02 ... P7-65. The following table provides an overview:

| Data set | Target position | Type / transition | Acceleration / deceleration | Waiting time / target velocity |
|----------|-----------------|-------------------|-----------------------------|--------------------------------|
| 1 | P6-02 | P6-03 | P7-02 | P7-03 |
| 2 | P6-04 | P6-05 | P7-04 | P7-05 |
| 3 | P6-06 | P6-07 | P7-06 | P7-07 |
| 4 | P6-08 | P6-09 | P7-08 | P7-09 |
| 5 | P6-10 | P6-11 | P7-10 | P7-11 |
| 6 | P6-12 | P6-13 | P7-12 | P7-13 |
| 7 | P6-14 | P6-15 | P7-14 | P7-15 |
| 8 | P6-16 | P6-17 | P7-16 | P7-17 |
| 9 | P6-18 | P6-19 | P7-18 | P7-19 |
| 10 | P6-20 | P6-21 | P7-20 | P7-21 |
| 11 | P6-22 | P6-23 | P7-22 | P7-23 |
| 12 | P6-24 | P6-25 | P7-24 | P7-25 |
| 13 | P6-26 | P6-27 | P7-26 | P7-27 |
| 14 | P6-28 | P6-29 | P7-28 | P7-29 |
| 15 | P6-30 | P6-31 | P7-30 | P7-31 |
| 16 | P6-32 | P6-33 | P7-32 | P7-33 |
| 17 | P6-34 | P6-35 | P7-34 | P7-35 |
| 18 | P6-36 | P6-37 | P7-36 | P7-37 |
| 19 | P6-38 | P6-39 | P7-38 | P7-39 |
| 20 | P6-40 | P6-41 | P7-40 | P7-41 |
| 21 | P6-42 | P6-43 | P7-42 | P7-43 |
| 22 | P6-44 | P6-45 | P7-44 | P7-45 |
| 23 | P6-46 | P6-47 | P7-46 | P7-47 |
| 24 | P6-48 | P6-49 | P7-48 | P7-49 |
| 25 | P6-50 | P6-51 | P7-50 | P7-51 |
| 26 | P6-52 | P6-53 | P7-52 | P7-53 |
| 27 | P6-54 | P6-55 | P7-54 | P7-55 |
| 28 | P6-56 | P6-57 | P7-56 | P7-57 |
| 29 | P6-58 | P6-59 | P7-58 | P7-59 |
| 30 | P6-60 | P6-61 | P7-60 | P7-61 |
| 31 | P6-62 | P6-63 | P7-62 | P7-63 |
| 32 | P6-64 | P6-65 | P7-64 | P7-65 |

Scaling

Scaling is the ratio of the number of user-defined units and the number of internal units.
 The user-defined units are supplied as parameter values in the unit PUU.

$$\text{Scaling factor} = \frac{\text{Internal units}}{\text{User-defined units}} = \frac{\text{Gear factor numerator}}{\text{Gear factor denominator}}$$

With the factory setting for the scaling factor, 100000 user-defined units correspond to one revolution.
 The internal units are 1280000 increments per revolution.

Parameterization

The scaling factor is set using the parameters P1-44 and P1-45.

$$\frac{P1-44}{P1-45}$$

Example 1

Calculation of number of motor revolutions corresponding to 30000 PUU:

$$30000 \text{ PUU} \times \frac{P1-44 = 128}{P1-45 = 10} = 384000 \rightarrow \frac{384000}{1280000} = 0,3 \text{ (M)}$$

Example 2

Calculation of the scaling factor if 10000 PUU are to effect 500 revolutions of the motor shaft:

$$10000 \text{ PUU} = 500 \text{ (M)} \rightarrow \frac{P1-44 = ?}{P1-45 = ?}$$

$$\frac{1280000}{1 \text{ (M)}} \rightarrow \frac{\cancel{1280000} \times 500}{1 \text{ (M)} \times \cancel{10000}} = \frac{128 \times 500}{\text{(M)} \times 1}$$

$$\rightarrow \frac{P1-44 = 128 \times 500}{P1-45 = 1}$$

Homing Data Set for Absolute Movements

The Homing data set is used to establish a reference 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.

Homing establishes the zero point for absolute movements.

Methods

The following methods are available:

- 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, an additional movement can be made to the next index pulse of the motor.
The switching point of the limit switch or the position of the index pulse 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, an additional movement can be made to the next index pulse of the motor.
The switching point of the reference switch or the position of the index pulse 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 current motor position 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.

Starting the Homing Data Set

The Homing data set can be started in the following ways:

- Automatic start when the power stage is enabled for the first time
The automatic start can be set with the parameter P6-01.
- Start via the signal input function GOTOHOME
The signal input function must have been parameterized, refer to Setting the Digital Signal Inputs (*see page 284*).

Setting Automatic Start and the Subsequent Data Set

The parameter P6-01 is used to set the automatic start and select a data set to be executed after completion of the Homing data set.

The parameter P7-01 is used to set a waiting time for the subsequent data set. The subsequent data set is started after the waiting time has elapsed.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-------------------|---|---|--------------------------------|--------------------------------|
| P6-01 ODEF | Subsequent Data Set and Auto-start of Homing Data Set Applicable operating mode: PS Bit 0: 0 = Do not start Homing after first power stage enable 1 = Start Homing after first power stage enable Bits 1 ... 7: Reserved Bits 8 ... 15: Subsequent data set | - 0 _h 0 _h 2001 _h Hexadecimal | u32 RW per. | Modbus 702 _h |
| P7-01 HOME_DLY | Waiting Time of Homing Data Set Applicable operating mode: PS Bits 0 ... 15: Waiting time until next dataset is started Bits 16 ... 31: Reserved | ms 0 0 32767 Decimal | u32 RW per. | Modbus 802 _h |

Setting Acceleration and Deceleration

The acceleration and deceleration for the Homing data set are set via the parameter P7-00.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|-----------------------|--|---|--------------------------------|--------------------------------|
| P7-00 HOME_ACC_DEC | Deceleration and Acceleration of Homing Data Set Applicable operating mode: PS Bits 0 ... 15: Deceleration Bits 16 ... 31: Acceleration | ms ms 6 6 200 200 65500 65500 Decimal | u32 RW per. | Modbus 800 _h |

Setting Velocities

The parameters P5-05 and P5-06 are used to set the velocities for searching the switch and for moving away from the switch.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|---------------------|--|---|--------------------------------|--------------------------------|
| P5-05 HOMESPEED1 | Homing - Fast Velocity for Reference Movement Applicable operating mode: PS | 0.1rpm 10 1000 60000 Decimal | u32 RW per. | Modbus 60A _h |
| P5-06 HOMESPEED2 | Homing - Slow Velocity for Reference Movement Applicable operating mode: PS | 0.1rpm 10 200 60000 Decimal | u32 RW per. | Modbus 60C _h |

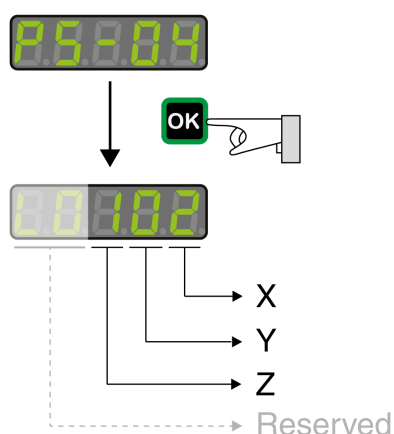
Defining the Zero Point

The parameter P6-00 is used to specify a position value, which is set at the reference point after a successful reference movement or after position setting. This position value defines the zero point.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|--|---|--------------------------------|--------------------------------|
| P6-00 ODAT | Position of Homing Data Set Applicable operating mode: PS After a successful reference movement, this position is automatically set at the reference point. Bits 0 ... 31: Position | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 700 _h |

Selecting the Homing Method

The parameter P5-04 is used to set the Homing method.



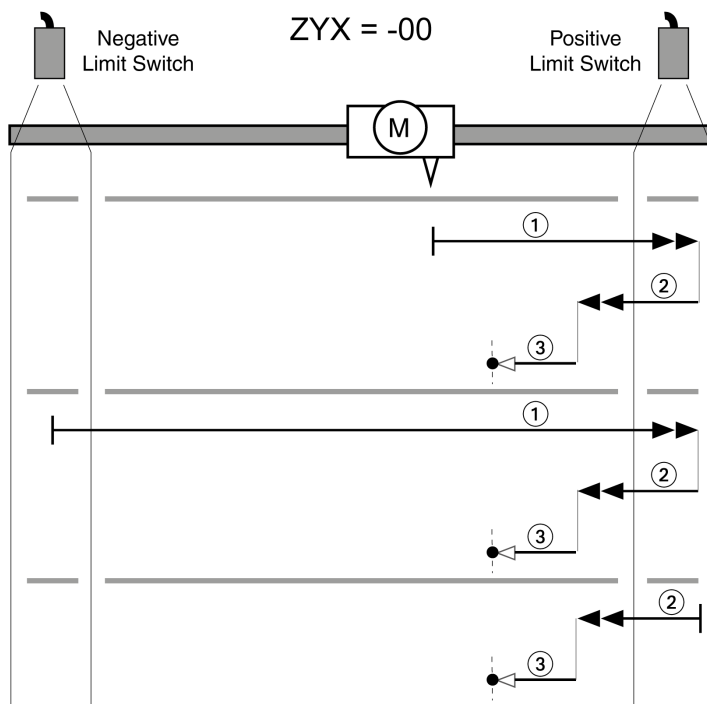
| Setting Z - limit switch | Setting Y - index pulse | Settings X - Homing method | |
|---|--|--|--|
| - | Y=0: Movement back to the last index pulse | 0 | Movement in positive direction to the positive limit switch |
| - | Y=2: No movement to the index pulse | 1 | Movement in negative direction to the negative limit switch |
| Z=0: Stop after limit switch is reached and trigger alert AL014 or AL015 Z=1: Move in opposite direction after having reached the limit switch, no alert | Y=0: Movement back to the last index pulse | 2 | Movement in positive direction to the rising edge of the reference switch |
| | Y=1: Movement to the next index pulse | 3 | Movement in negative direction to the rising edge of the reference switch |
| | Y=2: No movement to the index pulse | 4 | Movement in positive direction to the next index pulse |
| | - | 5 | Movement in negative direction to the next index pulse |
| | Y=0: Movement back to the last index pulse | 6 | Movement in positive direction to the falling edge of the reference switch |
| Y=1: Movement to the next index pulse | 7 | Movement in negative direction to the falling edge of the reference switch | |
| Y=2: No movement to the index pulse | - | 8 | Position setting |

The illustrations below show the Homing methods.

Reference Movement to the Positive Limit Switch

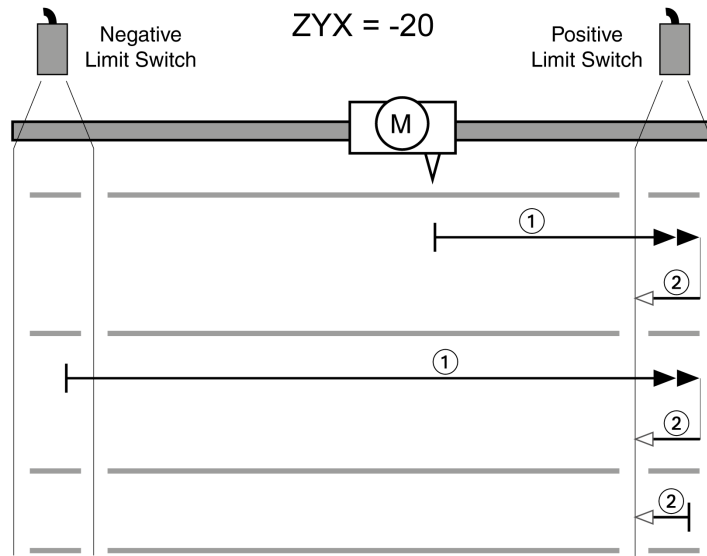
The following illustrations show reference movements to the positive limit switch from different starting positions.

Reference movement (ZYX = -00)



| Item | Description |
|------|---|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-05 |
| 3 | Movement to the index pulse at velocity P5-06 |

Reference movement (ZYX = -20)

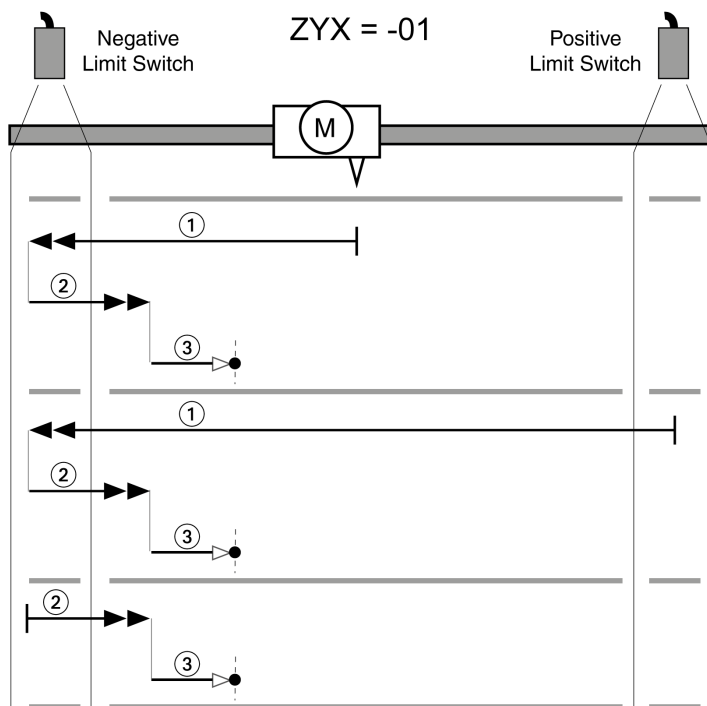


| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-06 |

Reference Movement to the Negative Limit Switch

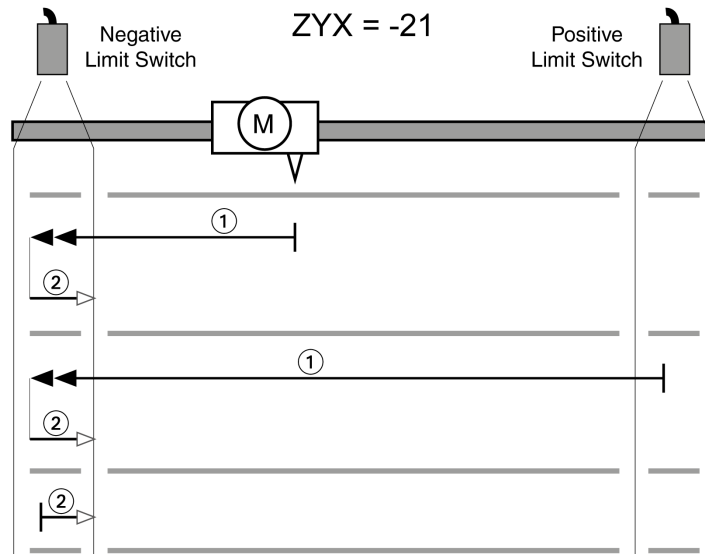
The following illustrations show reference movements to the negative limit switch from different starting positions.

Reference movement (ZYX = -01)



| Item | Description |
|------|---|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-05 |
| 3 | Movement to the index pulse at velocity P5-06 |

Reference movement (ZYX = -21)

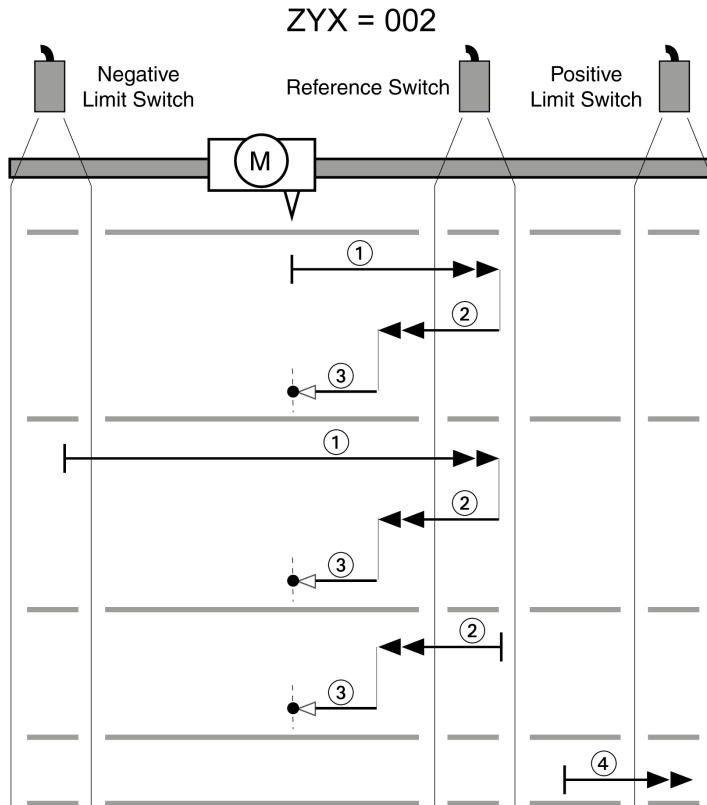


| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-06 |

Reference Movement in Positive Direction to the Rising Edge of the Reference Switch

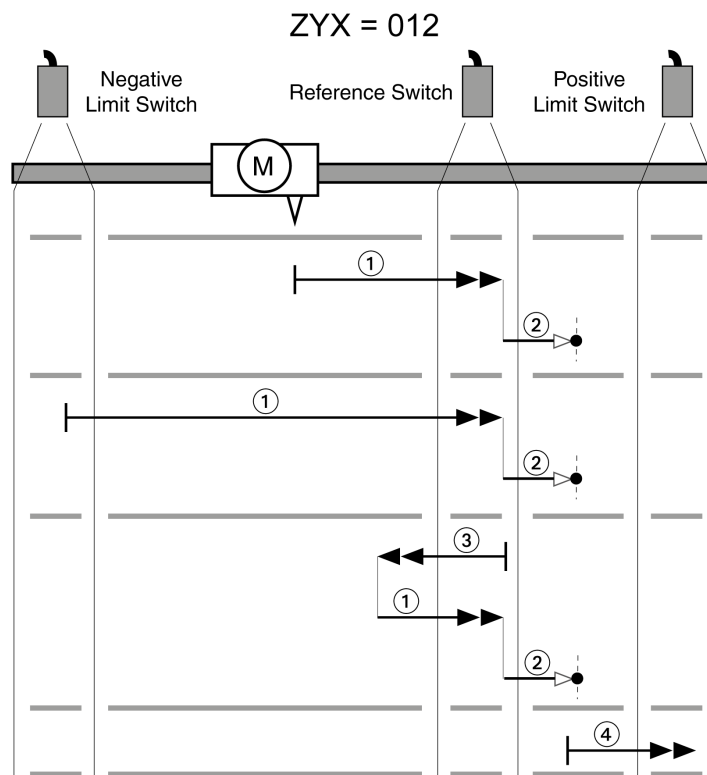
The following illustrations show reference movements to the rising edge of the reference switch in positive direction from different starting positions.

Reference movement (ZYX = 002)



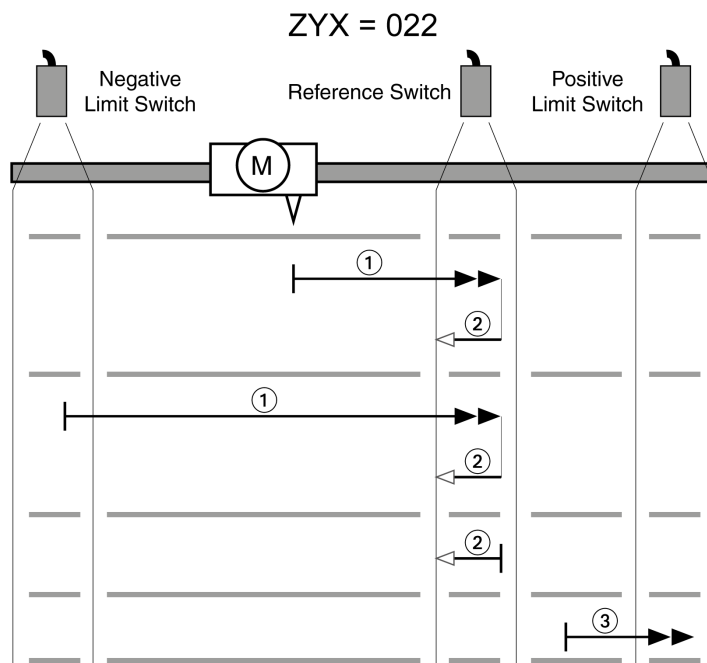
| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-05 |
| 3 | Movement to the index pulse at velocity P5-06 |
| 4 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 012)



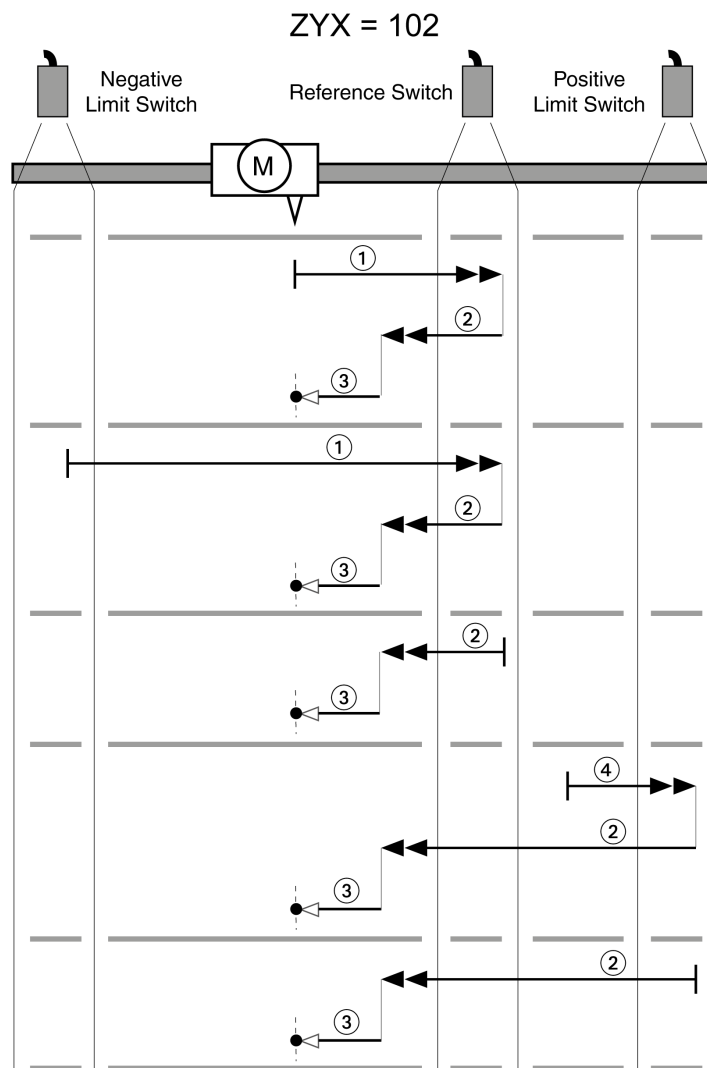
| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to the index pulse at velocity P5-06 |
| 3 | Movement to falling edge at velocity P5-05 |
| 4 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 022)



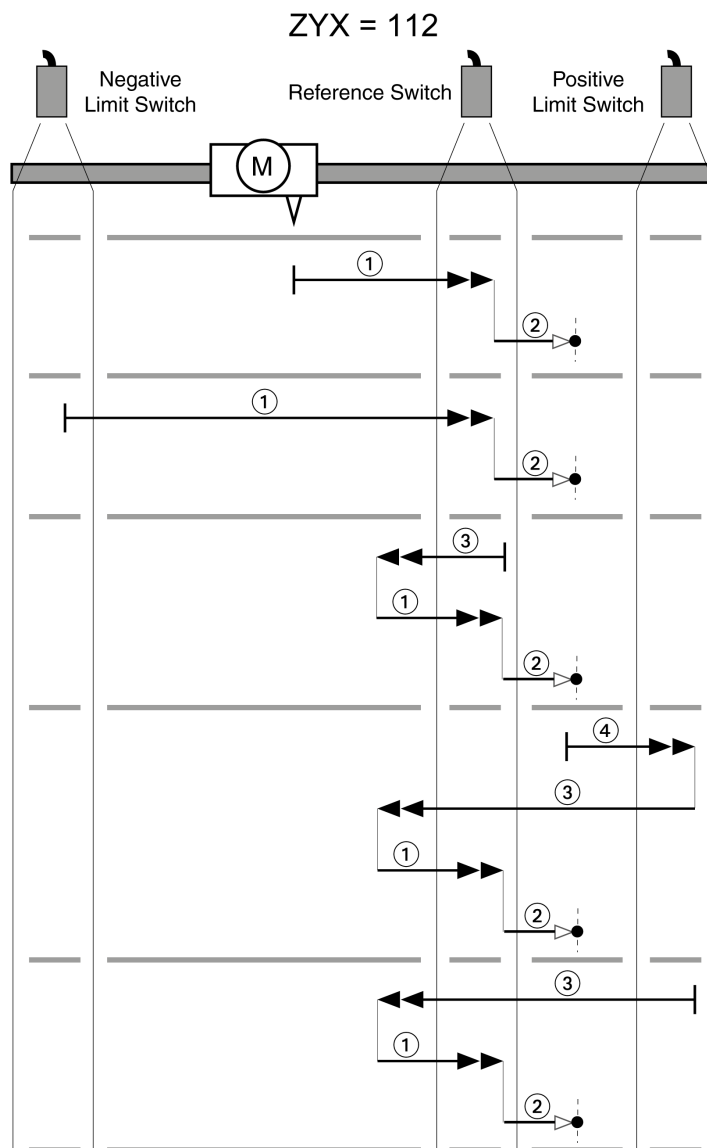
| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-06 |
| 3 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 102)



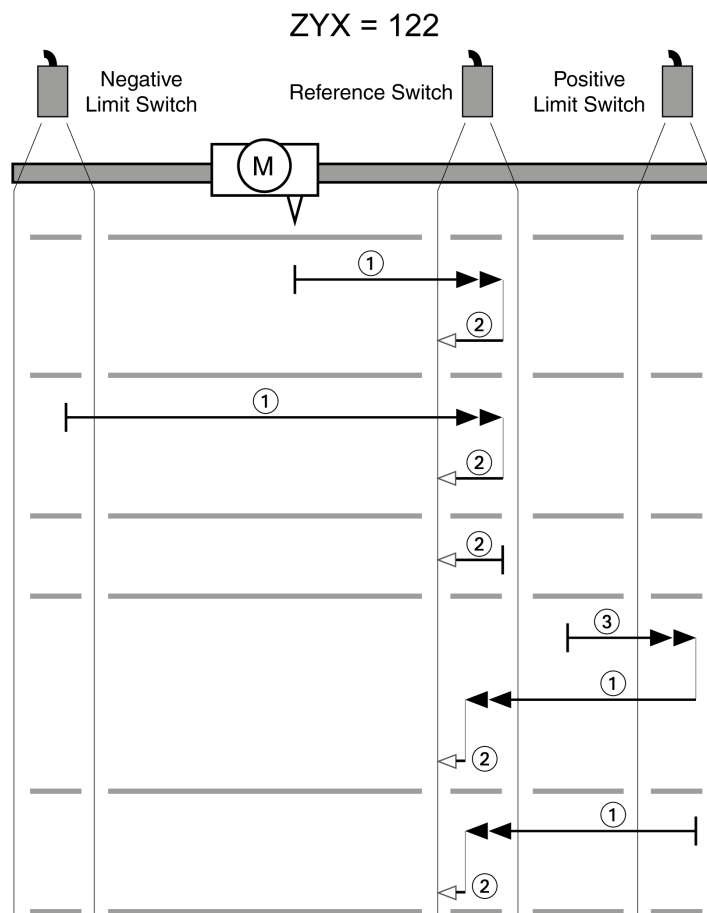
| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-05 |
| 3 | Movement to the index pulse at velocity P5-06 |
| 4 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 112)



| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to the index pulse at velocity P5-06 |
| 3 | Movement to falling edge at velocity P5-05 |
| 4 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 122)

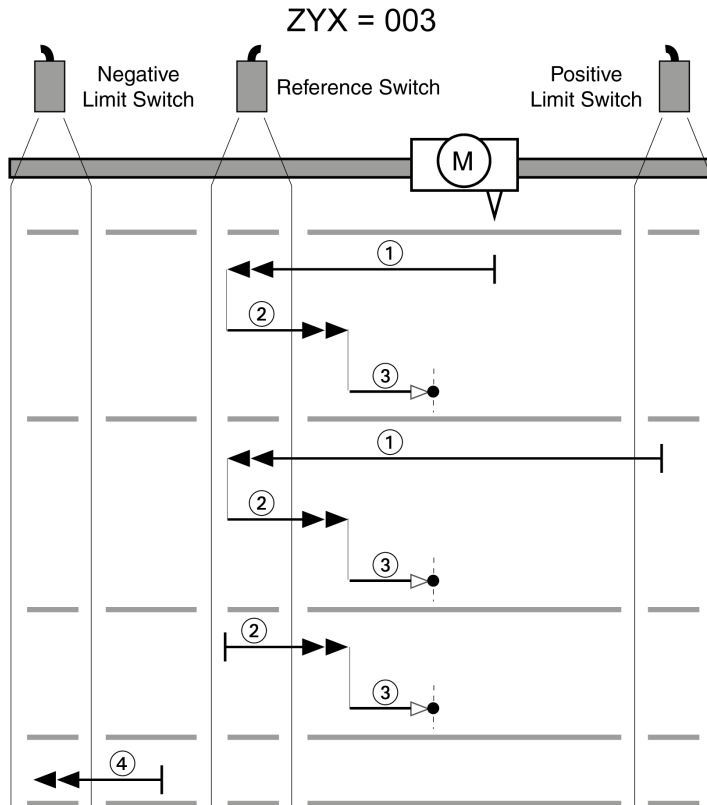


| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-06 |
| 3 | Movement to the limit switch at velocity P5-05 |

Reference Movement in Negative Direction to the Rising Edge of the Reference Switch

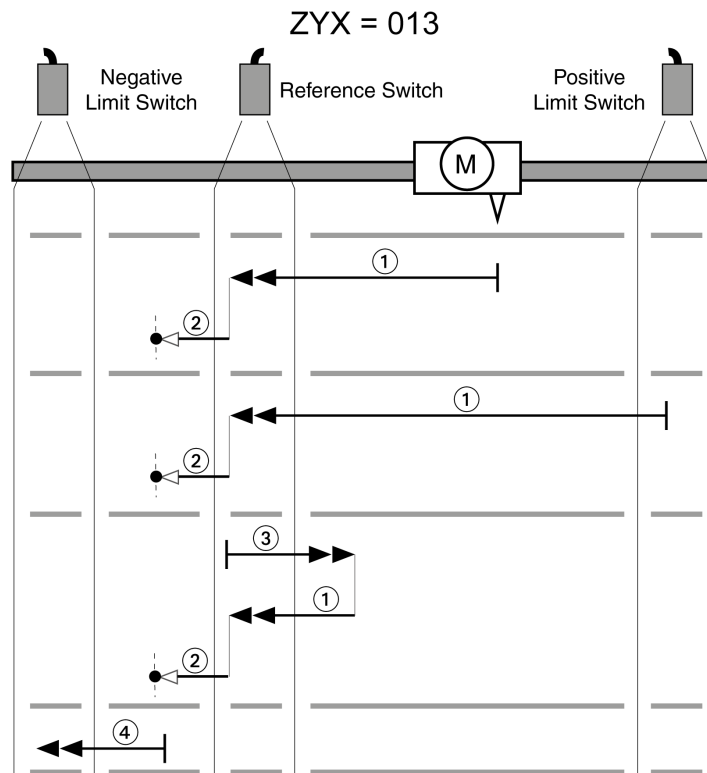
The following illustrations show reference movements to the rising edge of the reference switch in negative direction from different starting positions.

Reference movement (ZYX = 003)



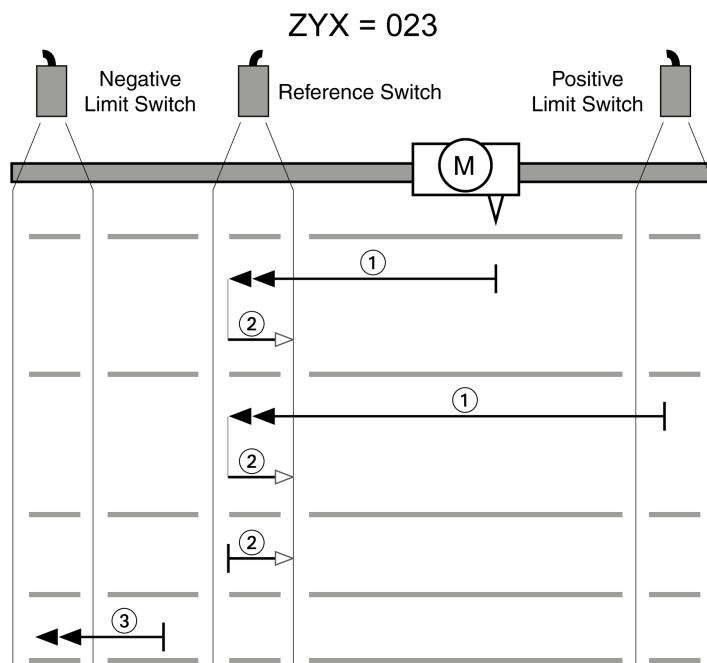
| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-05 |
| 3 | Movement to the index pulse at velocity P5-06 |
| 4 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 013)



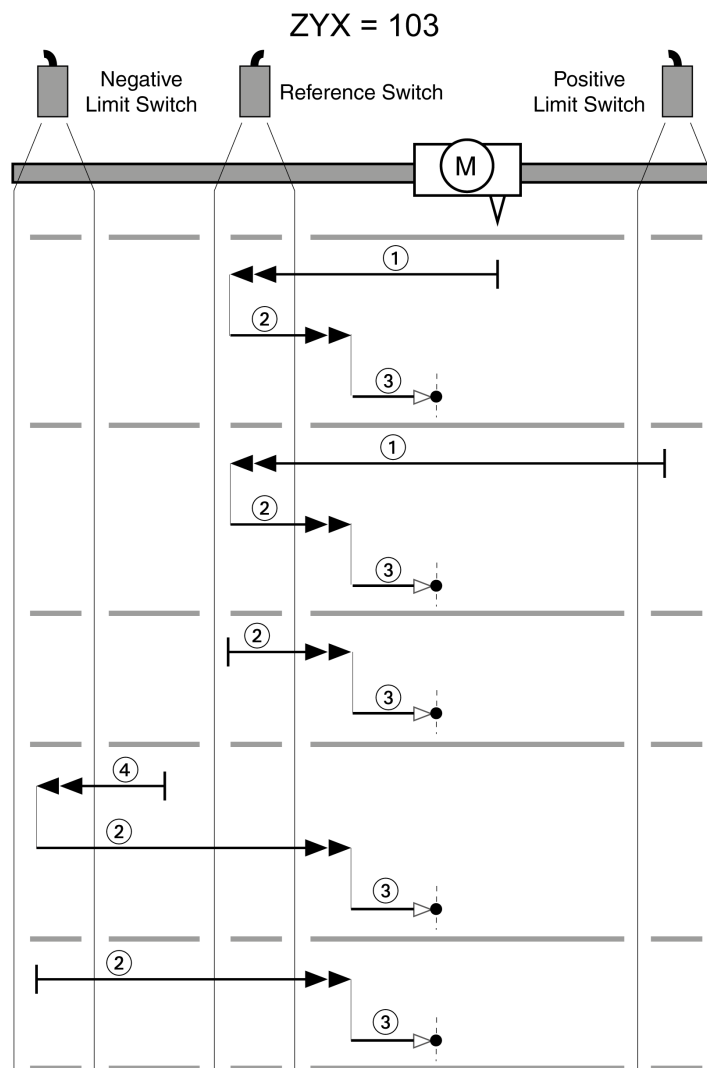
| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to the index pulse at velocity P5-06 |
| 3 | Movement to falling edge at velocity P5-05 |
| 4 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 023)



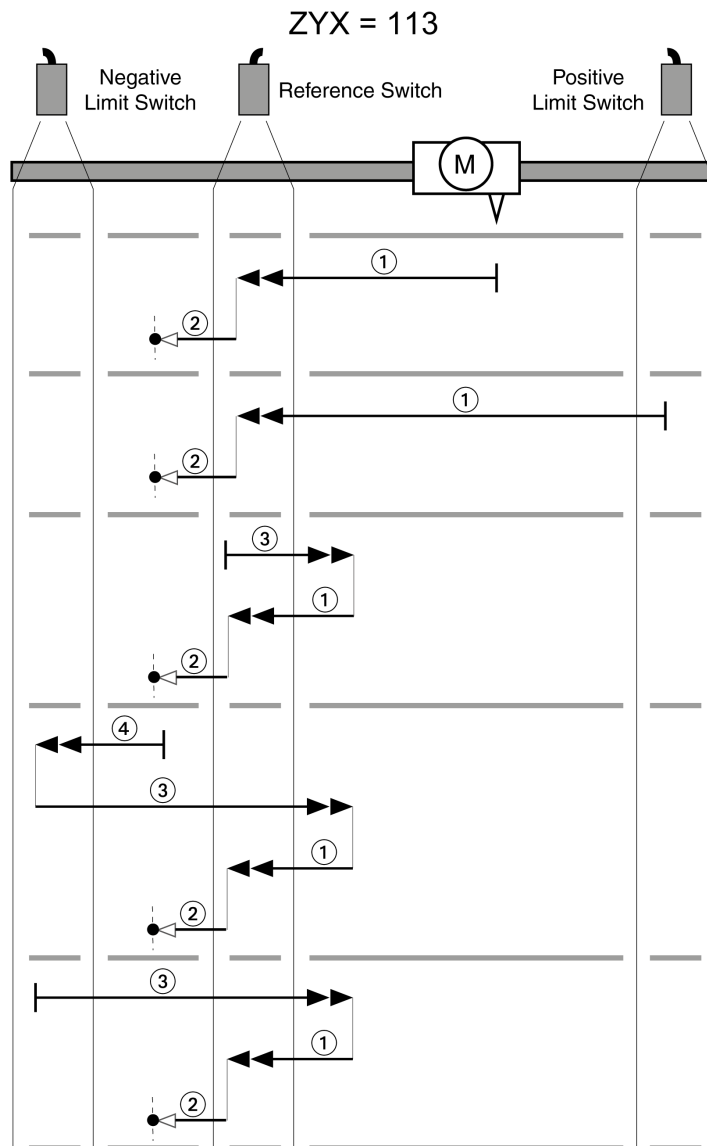
| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-06 |
| 3 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 103)



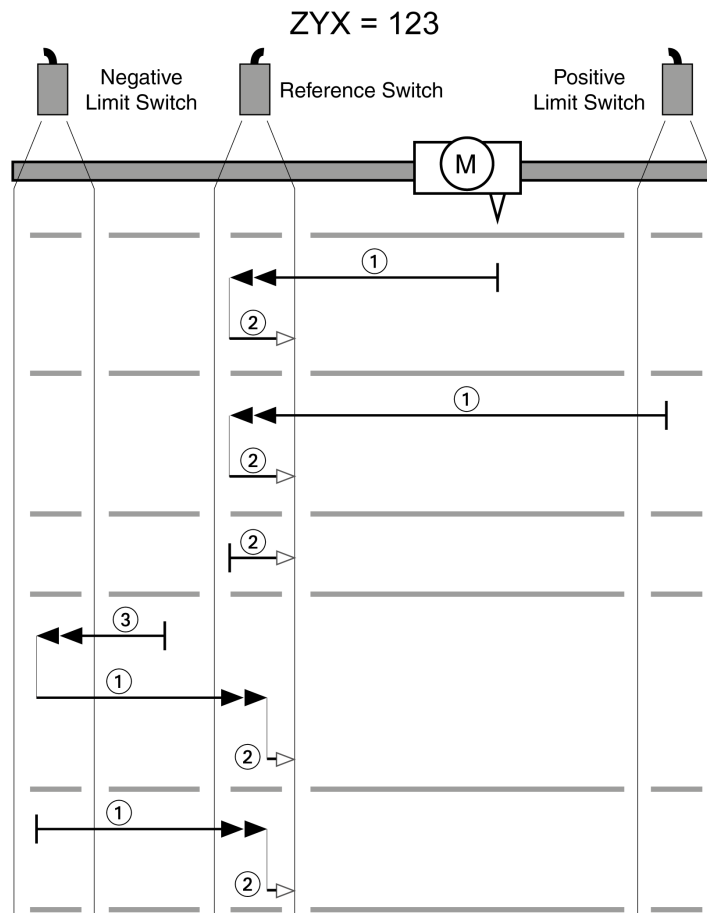
| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-05 |
| 3 | Movement to the index pulse at velocity P5-06 |
| 4 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 113)



| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to the index pulse at velocity P5-06 |
| 3 | Movement to falling edge at velocity P5-05 |
| 4 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 123)

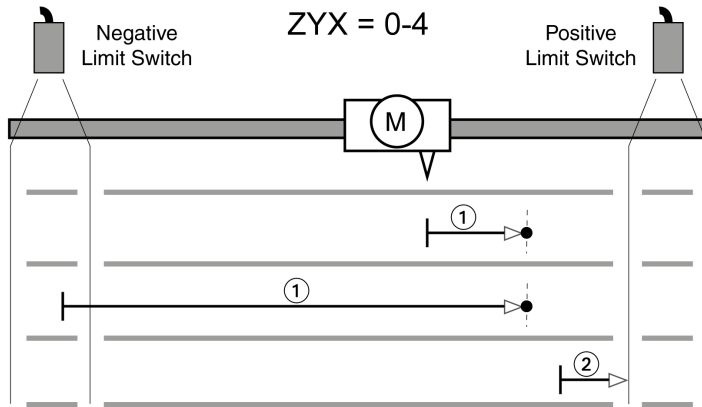


| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-06 |
| 3 | Movement to the limit switch at velocity P5-05 |

Reference Movement to the Index Pulse in Positive Direction

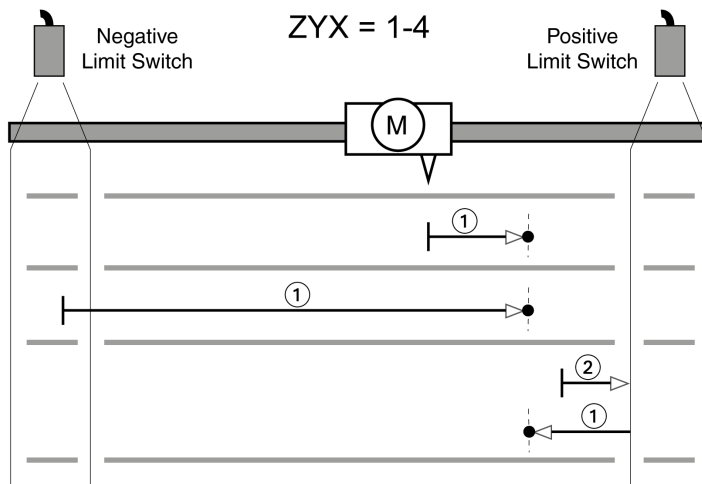
The following illustrations show reference movements to the index pulse in positive direction from different starting positions.

Reference movement (ZYX = 0-4)



| Item | Description |
|------|--|
| 1 | Movement to the next index pulse at velocity P5-06 |
| 2 | Movement to the limit switch at velocity P5-06 |

Reference movement (ZYX = 1-4)

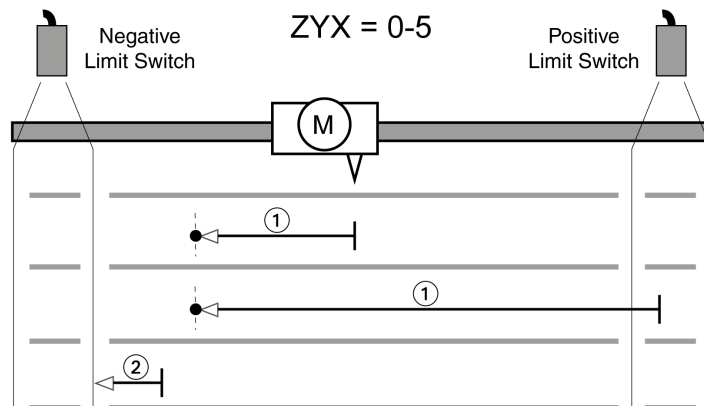


| Item | Description |
|------|--|
| 1 | Movement to the next index pulse at velocity P5-06 |
| 2 | Movement to the limit switch at velocity P5-06 |

Reference Movement to the Index Pulse in Negative Direction

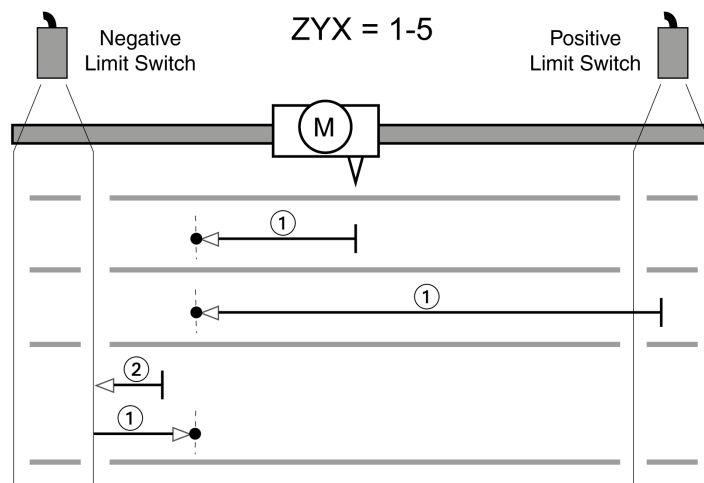
The following illustrations show reference movements to the index pulse in negative direction from different starting positions.

Reference movement (ZYX = 0-5)



| Item | Description |
|------|--|
| 1 | Movement to the next index pulse at velocity P5-06 |
| 2 | Movement to the limit switch at velocity P5-06 |

Reference movement (ZYX = 1-5)

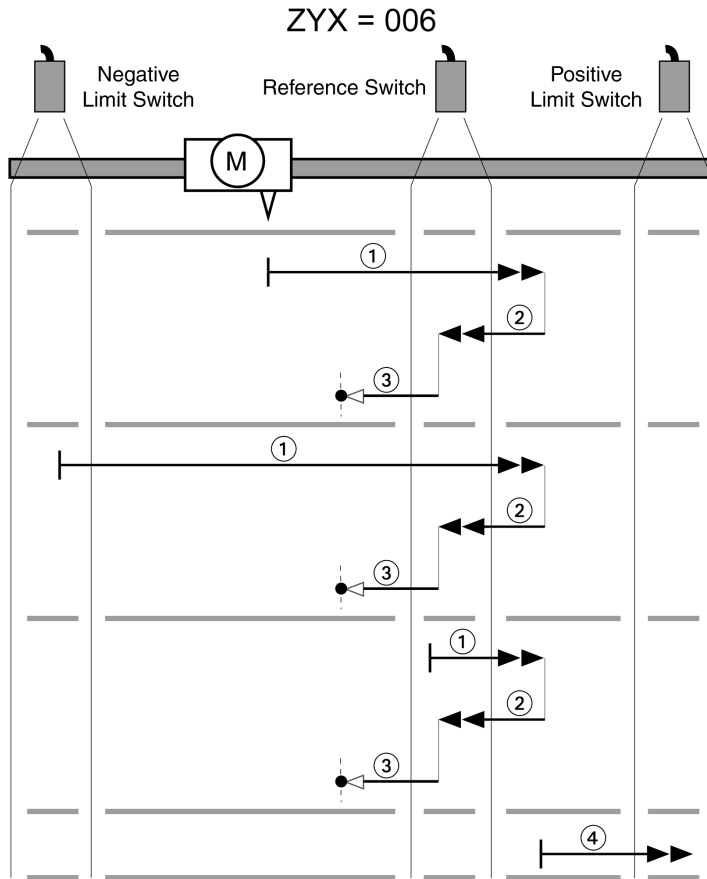


| Item | Description |
|------|--|
| 1 | Movement to the next index pulse at velocity P5-06 |
| 2 | Movement to the limit switch at velocity P5-06 |

Reference Movement in Positive Direction to the Falling Edge of the Reference Switch

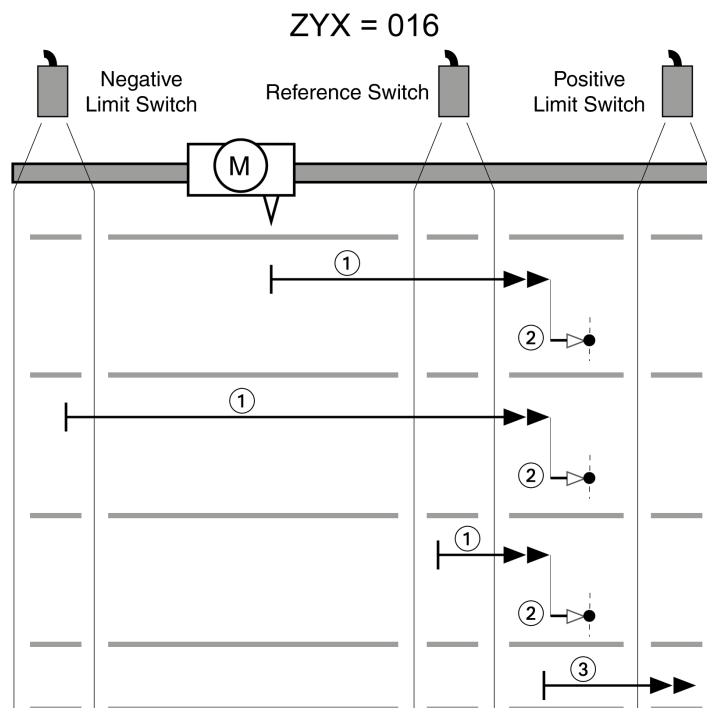
The following illustrations show reference movements to the falling edge of the reference switch in positive direction from different starting positions.

Reference movement (ZYX = 006)



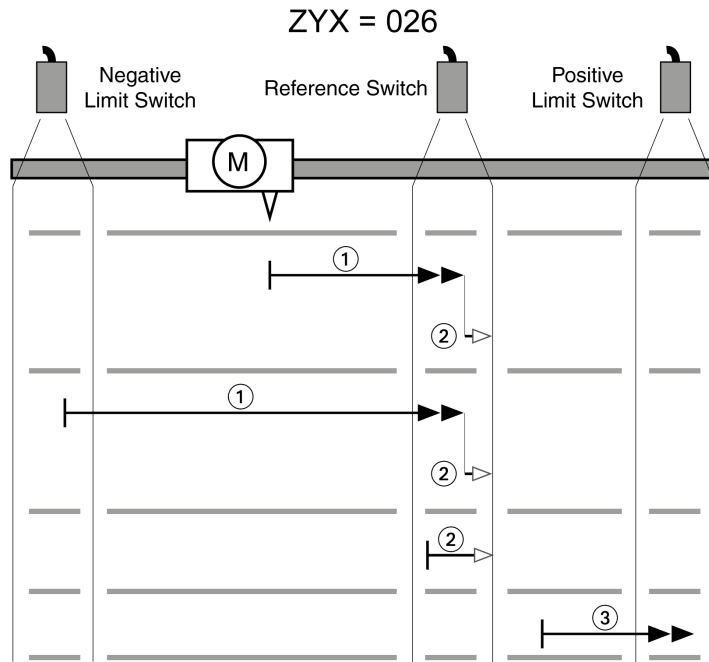
| Item | Description |
|------|--|
| 1 | Movement to falling edge at velocity P5-05 |
| 2 | Movement to rising edge at velocity P5-05 |
| 3 | Movement to the index pulse at velocity P5-06 |
| 4 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 016)



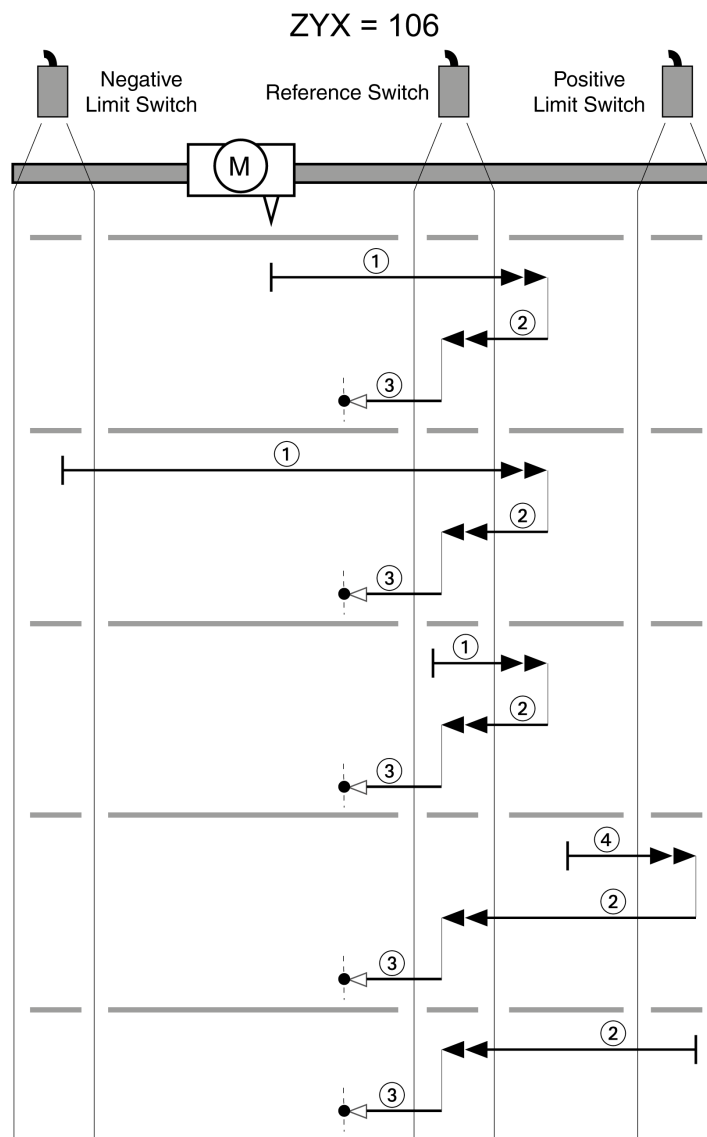
| Item | Description |
|------|--|
| 1 | Movement to falling edge at velocity P5-05 |
| 2 | Movement to the index pulse at velocity P5-06 |
| 3 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 026)



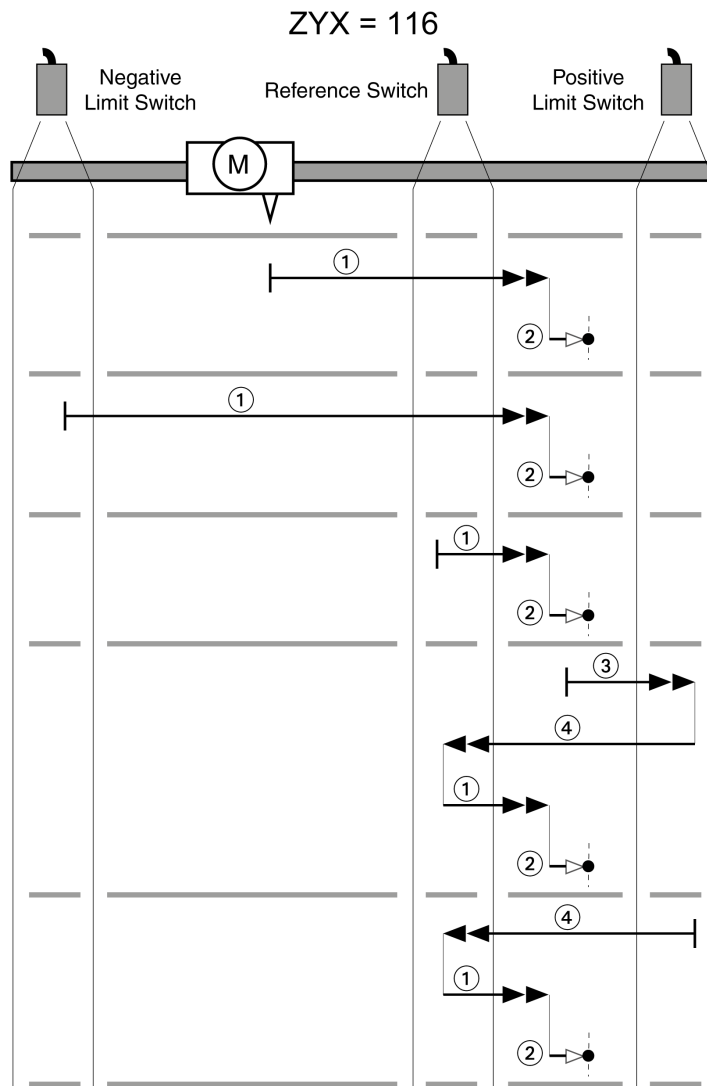
| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-06 |
| 3 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 106)



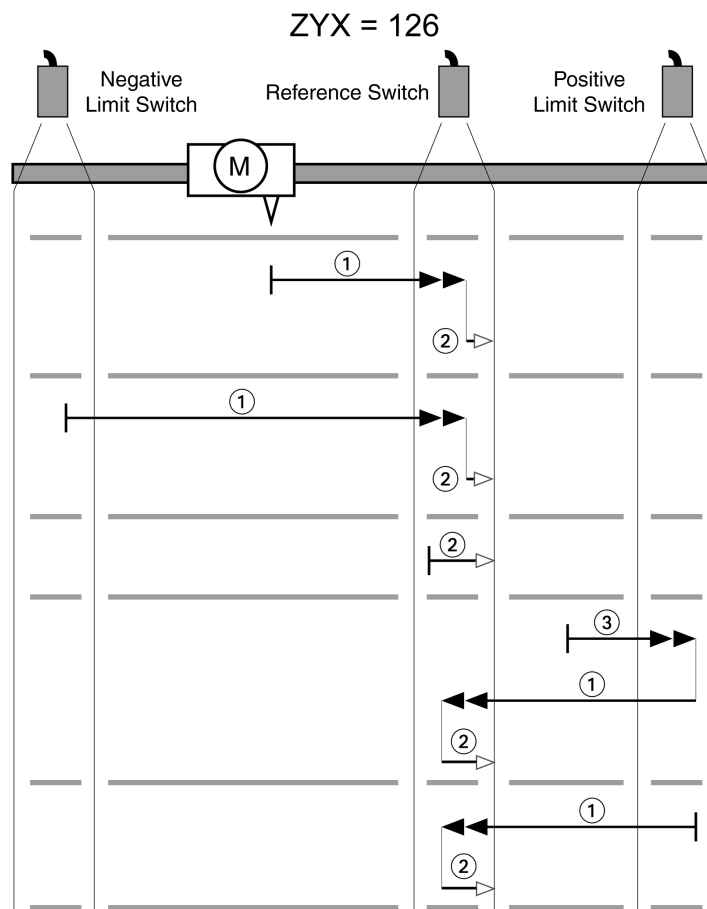
| Item | Description |
|------|--|
| 1 | Movement to falling edge at velocity P5-05 |
| 2 | Movement to rising edge at velocity P5-05 |
| 3 | Movement to the index pulse at velocity P5-06 |
| 4 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 116)



| Item | Description |
|------|--|
| 1 | Movement to falling edge at velocity P5-05 |
| 2 | Movement to the index pulse at velocity P5-06 |
| 3 | Movement to the limit switch at velocity P5-05 |
| 4 | Movement to rising edge at velocity P5-05 |

Reference movement (ZYX = 126)

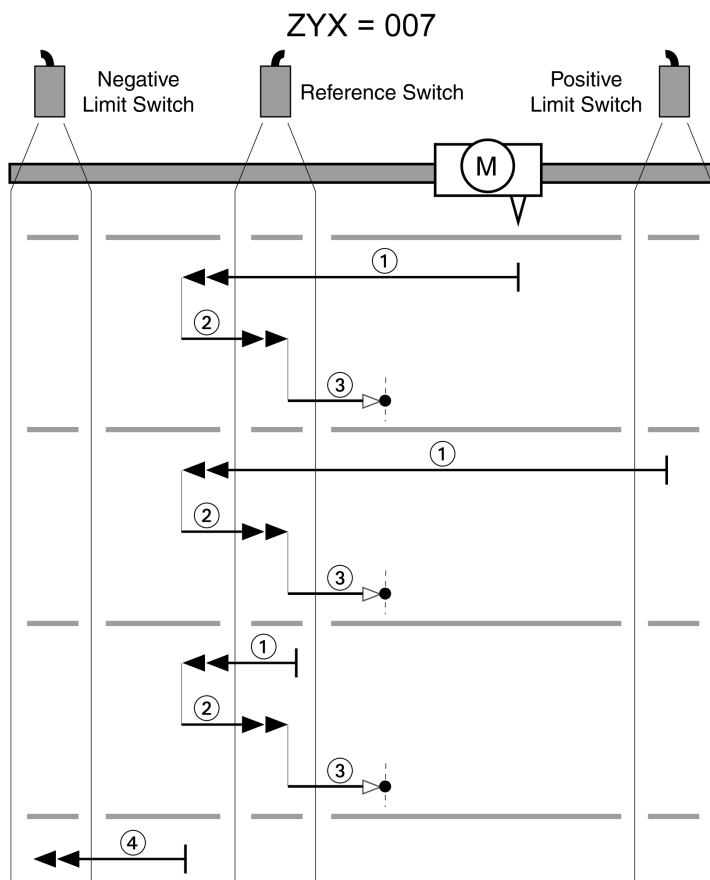


| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-06 |
| 3 | Movement to the limit switch at velocity P5-05 |

Reference Movement in Negative Direction to the Falling Edge of the Reference Switch

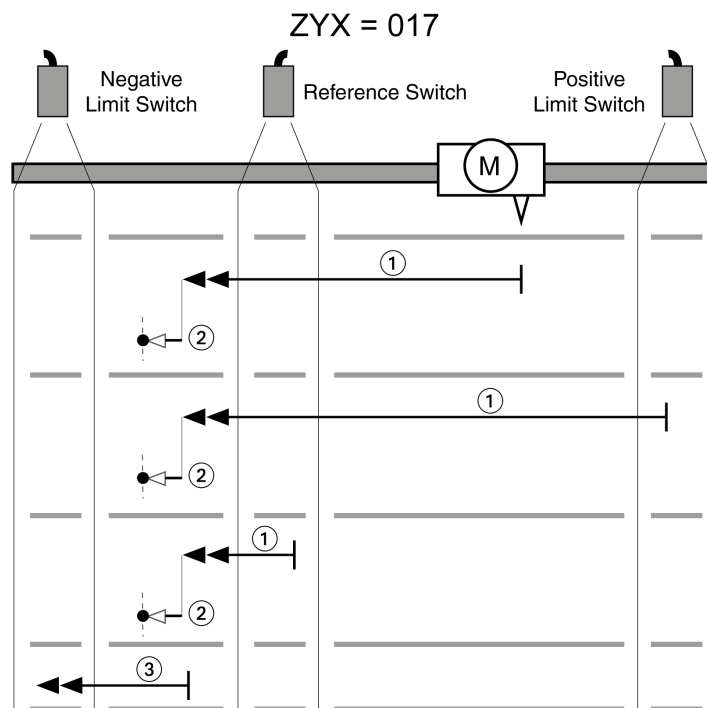
The following illustrations show reference movements to the falling edge of the reference switch in negative direction from different starting positions.

Reference movement (ZYX = 007)



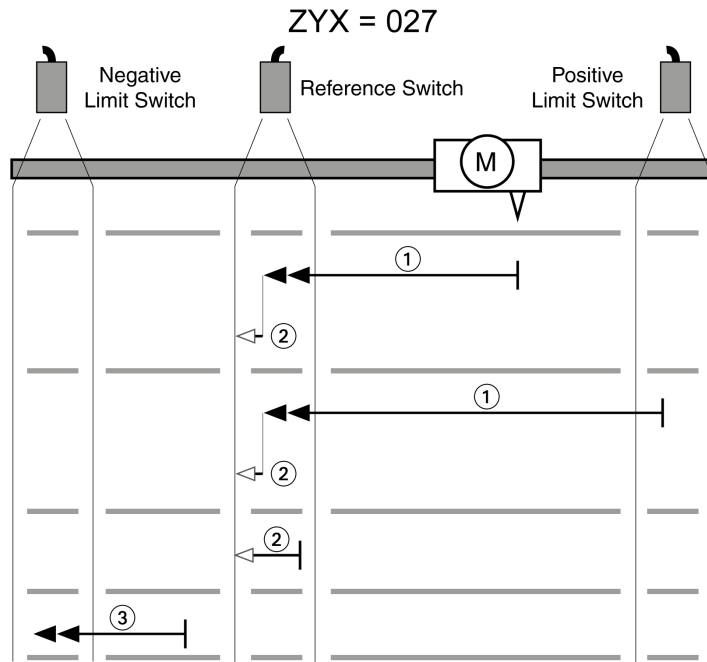
| Item | Description |
|------|--|
| 1 | Movement to falling edge at velocity P5-05 |
| 2 | Movement to rising edge at velocity P5-05 |
| 3 | Movement to the index pulse at velocity P5-06 |
| 4 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 017)



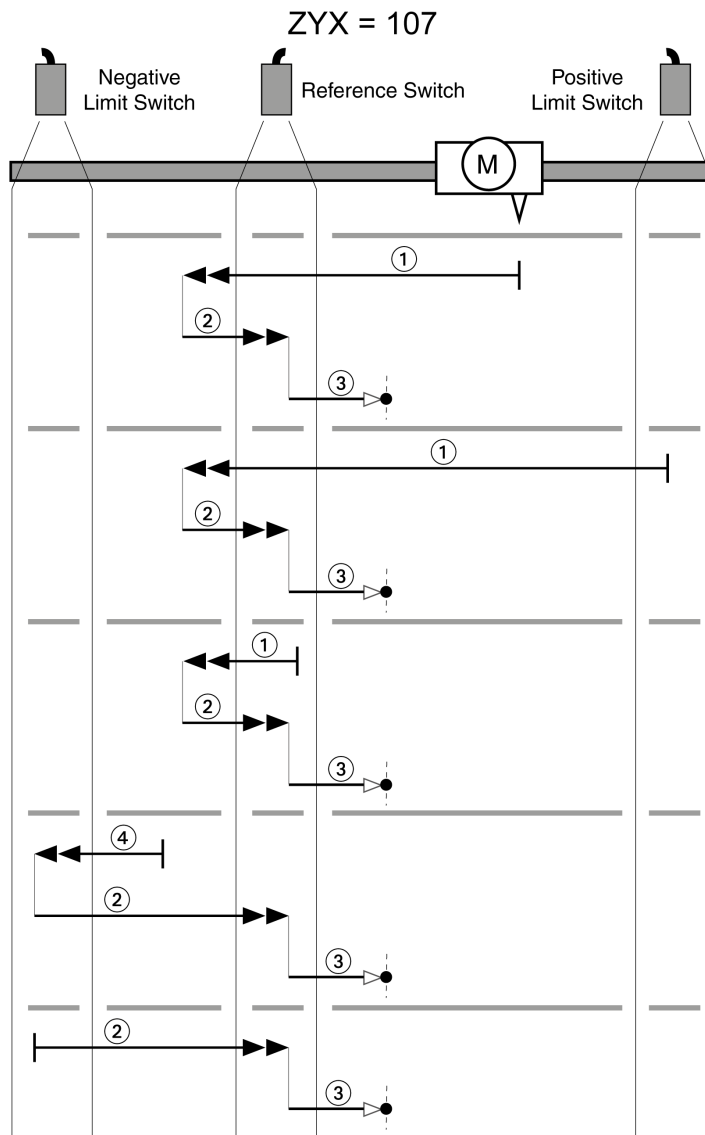
| Item | Description |
|------|--|
| 1 | Movement to falling edge at velocity P5-05 |
| 2 | Movement to the index pulse at velocity P5-06 |
| 3 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 027)



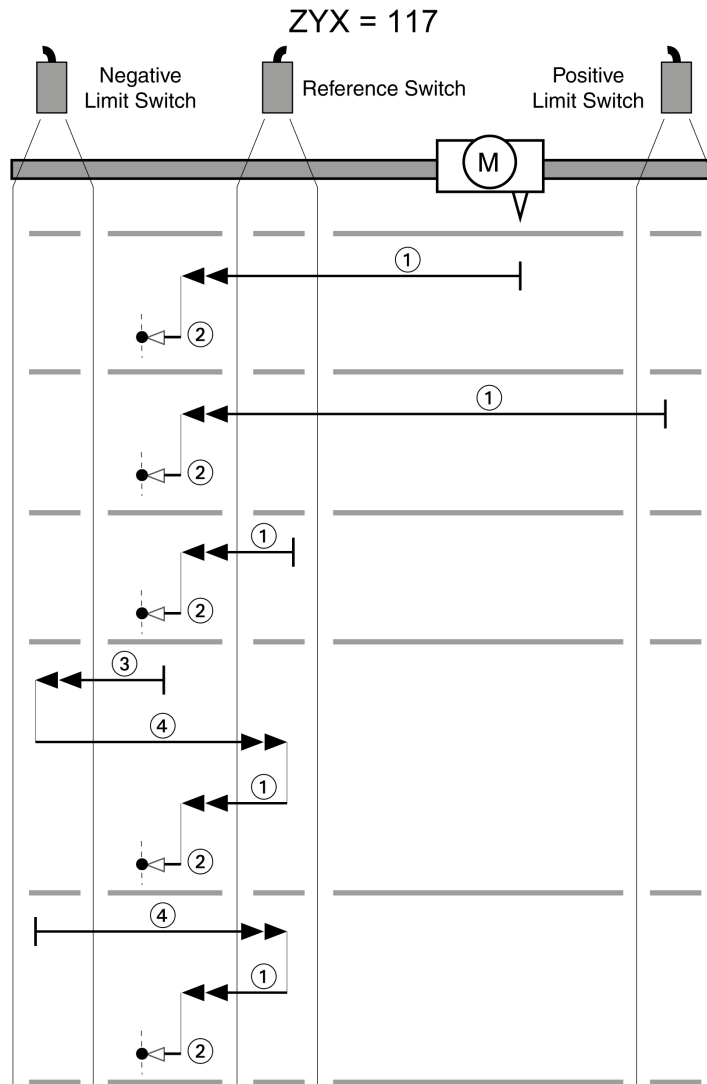
| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-06 |
| 3 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 107)



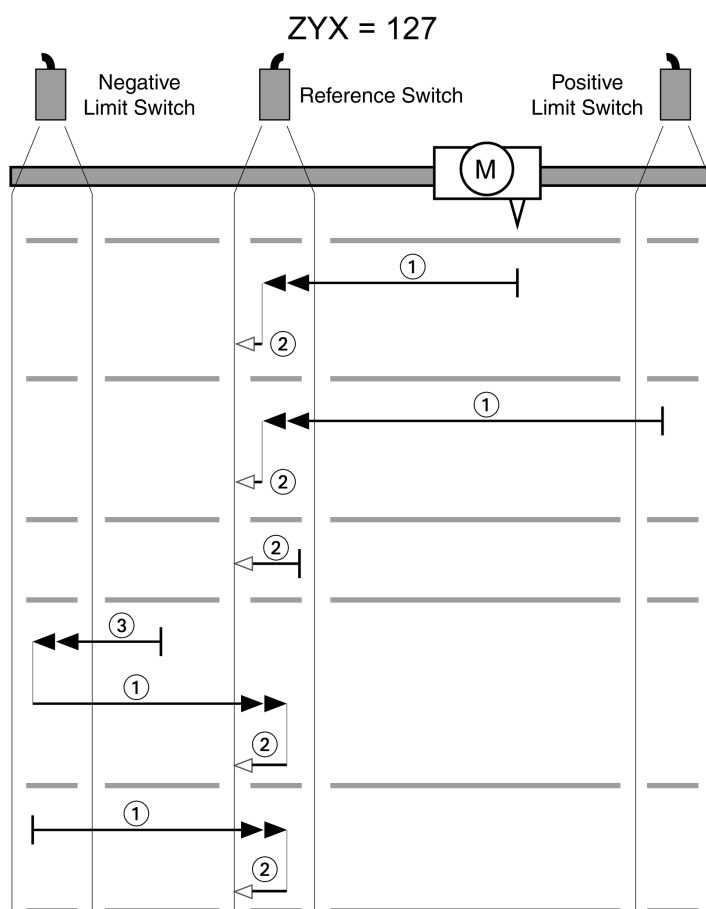
| Item | Description |
|------|--|
| 1 | Movement to falling edge at velocity P5-05 |
| 2 | Movement to rising edge at velocity P5-05 |
| 3 | Movement to the index pulse at velocity P5-06 |
| 4 | Movement to the limit switch at velocity P5-05 |

Reference movement (ZYX = 117)



| Item | Description |
|------|--|
| 1 | Movement to falling edge at velocity P5-05 |
| 2 | Movement to the index pulse at velocity P5-06 |
| 3 | Movement to the limit switch at velocity P5-05 |
| 4 | Movement to rising edge at velocity P5-05 |

Reference movement (ZYX = 127)



| Item | Description |
|------|--|
| 1 | Movement to rising edge at velocity P5-05 |
| 2 | Movement to falling edge at velocity P5-06 |
| 3 | Movement to the limit switch at velocity P5-05 |

Position Setting

By means of position setting, the current motor position is set to the position value in parameter P6-00. 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.

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|--|---|--------------------------------|--------------------------------|
| P6-00 ODAT | Position of Homing Data Set Applicable operating mode: PS After a successful reference movement, this position is automatically set at the reference point. Bits 0 ... 31: Position | PUU -2147483647 0 2147483647 Decimal | s32 RW per. | Modbus 700 _h |

Section 18.5

Operating Modes Velocity (V) and Velocity Zero (Vz)

What Is in This Section?

This section contains the following topics:

| Topic | Page |
|---|------|
| Operating Modes Velocity (V) and Velocity Zero (Vz) | 349 |
| Acceleration and Deceleration | 352 |

Operating Modes Velocity (V) and Velocity Zero (Vz)

Description

In the operating mode Velocity (V), a movement is made with a specified target velocity.

Source of Reference Value Signals

In the operating mode Velocity (V), the source of the reference value signals is one of the three values set via the parameters P1-09 to P1-11.

In the operating mode Velocity Zero (Vz), the source of the reference value signals is either one of the three values set via the parameters P1-09 to P1-11 or the fixed target velocity 0.

The values of the parameters P1-09 to P1-11 can be selected via the signal input functions SPD0 and SPD1.

The signal input functions SPD0 and SPD1 take priority over the reference value signal at the analog input V_REF.

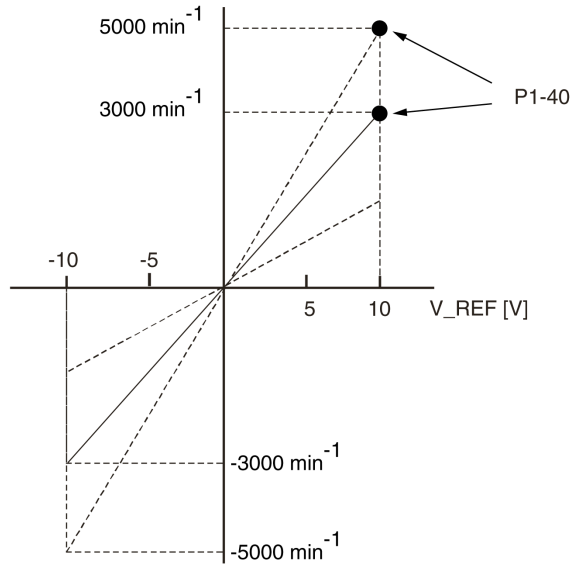
The target velocity is selected via the signal input functions SPD0 (LSB) and SPD1 (MSB) (bit-coded):

For additional information on the parameterizable signal input functions, refer to Setting the Digital Signal Inputs ([see page 284](#)).

| - | Signal state of the digital signal inputs | | Target velocity via: | | Range |
|----|---|------|-----------------------------------|--|--------------|
| | SPD1 | SPD0 | | | |
| S1 | 0 | 0 | Operating mode Velocity (Vz) | Voltage between V_REF (Pin42) and GND (pin 44) | -10V ... 10V |
| | | | Operating mode Velocity Zero (Vz) | 0 rpm | |
| S2 | 0 | 1 | Internal parameters | P1-09 | - |
| S3 | 1 | 0 | | P1-10 | |
| S4 | 1 | 1 | | P1-11 | |

Scaling of the Analog Input V_REF

The parameter P1-40 lets you set the velocity corresponding to 10 V. This results in a linear scaling for the analog input V_REF.

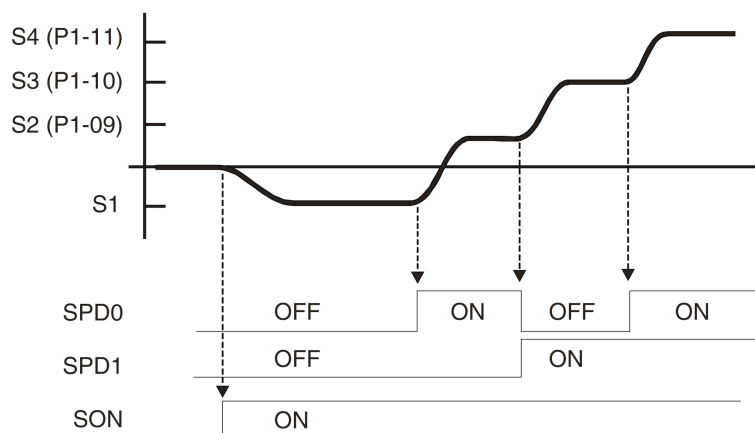


| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P1-40 VCM | Velocity Target Value and Velocity Limitation 10 V Applicable operating mode: PT, PS, V, T In the operating mode V, this parameter specifies the target velocity that corresponds to the maximum input voltage of 10 V. In the operating mode T, this parameter specifies the velocity limitation that corresponds to the maximum input voltage of 10 V. Example: If the value of this parameter is 3000 in the operating mode V and if the input voltage is 10 V, the target velocity is 3000 rpm. | rpm 0 - 10001 Decimal | s32 RW per. | Modbus 250 _h |

Example

The illustration below shows how the target velocities are switched by means of the signal input functions SPD0, SPD1 and SON.

Operating modes Velocity (V) and Velocity Zero (Vz)



For further information, refer to Setting the Digital Signal Inputs ([see page 284](#)).

Stopping the Movement via Signal Input Function ZCLAMP

The movement can be stopped via the digital signal input function ZCLAMP.

Conditions for stopping the movement:

- The reference velocity must be below the velocity value defined in parameter P1-38.
- The signal input function ZCLAMP must be assigned and the signal input must be triggered.

For assigning the signal input function, refer to Setting the Digital Signal Inputs ([see page 284](#)).

| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|--|---|--------------------------------|--------------------------------|
| P1-38 ZSPD | Signal Output Function ZSPD / Signal Input Function ZCLAMP - Velocity Applicable operating mode: PT, PS, V, T This parameter specifies the velocity for the signal output function ZSPD. The signal output function ZSPD indicates that the velocity of the motor is less than the velocity value set via this parameter. This parameter specifies the velocity for the signal input function ZCLAMP. The signal input function ZCLAMP stops the motor. The velocity of the motor must be below the velocity value set via this parameter. | 0.1rpm 0 100 2000 Decimal | s32 RW per. | Modbus 24C _n |

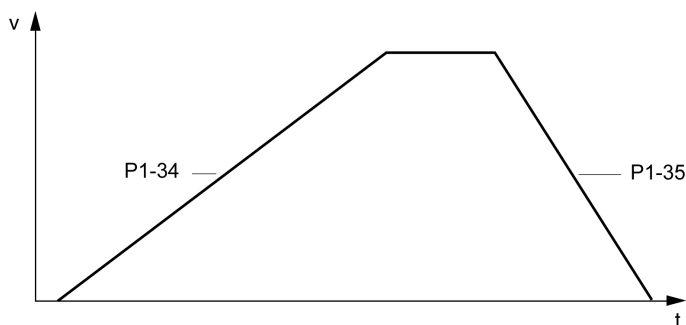
Additionally the behavior for ZCLAMP can be set via parameter P2-65 bit 10.

Setting of parameter P2-65 bit 10:

- Bit 10 = 0: Immediate stop. Motor is locked at the position where it was when ZCLAMP became active.
- Bit 10 = 1: Motor is decelerated with deceleration ramp setting. Motor is locked at the position where standstill is reached.

Acceleration and Deceleration

The parameters P1-34 and P1-35 allow you to set the acceleration and deceleration.



| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|---|---|--------------------------------|--------------------------------|
| P1-34 TACC | Acceleration Period Applicable operating mode: PT, V The acceleration period is the time in milliseconds required to accelerate from motor standstill to 6000 rpm. For operating mode V, this parameter specifies the acceleration. For operating mode PT, this parameter specifies an acceleration limitation for the pulses at the PTI interface. | ms 6 30 65500 Decimal | u16 RW per. | Modbus 244 _h |
| P1-35 TDEC | Deceleration Period Applicable operating mode: PT, V The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. For operating mode V, this parameter specifies the deceleration. For operating mode PT, this parameter specifies a deceleration limitation for the pulses at the PTI interface. | ms 6 30 65500 Decimal | u16 RW per. | Modbus 246 _h |

Section 18.6

Operating Modes Torque (T) and Torque Zero (Tz)

Operating Modes Torque (T) and Torque Zero (Tz)

Description

In the operating mode Torque (T), a movement is made with a specified target torque. The target torque is specified in percent of the nominal torque of the motor.

The operating modes Torque (T) and Torque (Tz) and the dual operating modes with Torque (T) and Torque (Tz) do not provide deceleration functionality in response to a power stage disable request. In these operating modes, the motor coasts down to a standstill in response to a power stage disable request. You must install additional equipment such as a dedicated service brake if your application requires faster deceleration of the load.

WARNING

UNINTENDED EQUIPMENT OPERATION

- During commissioning, trigger all signals and simulate all conditions that cause a power stage disable request in order to verify that all loads come to a secure standstill when the power stage is disabled under maximum load conditions.
- Install a dedicated service brake if removal of power to the motor does not meet the requirements of your application.

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

Source of Reference Value Signals

In the operating mode Torque (T), the source of the reference value signals is either the analog input T_REF or one of the three values set via the parameters P1-12 to P1-14.

In the operating mode Torque Zero (Tz), the source of the reference value signals is either one of the three values set via the parameters P1-12 to P1-14 or the fixed target torque 0 %.

The values of the parameters P1-12 to P1-14 can be selected via the signal input functions TCM0 and TCM1.

The signal input functions TCM0 and TCM1 take priority over the reference value signal of the analog input T_REF.

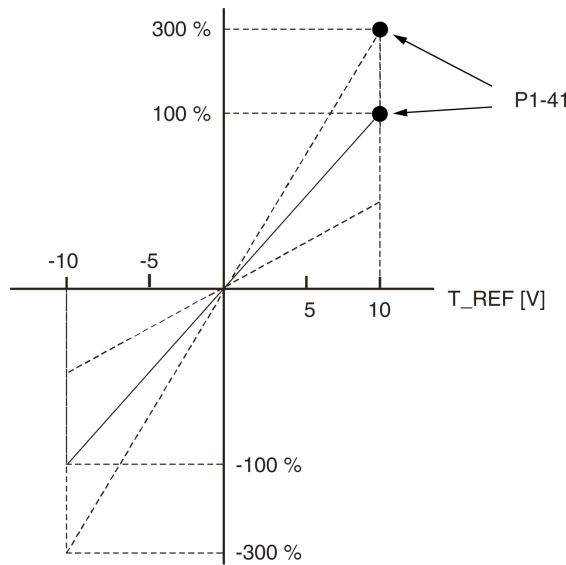
The target torque is selected via the signal input functions TCM0 (LSB) and TCM1 (MSB) (bit-coded):

For further information on the parameterizable signal input functions, refer to Setting the Digital Signal Inputs ([see page 284](#)).

| - | Signal state of the digital signal inputs | | Target torque is provided via: | | Range |
|----|---|------|---------------------------------|---|---------------|
| | TCM1 | TCM0 | | | |
| T1 | 0 | 0 | Operating mode Torque (T) | Voltage between T_REF (pin 18) and GND (pin 19) | -10V ... 10V |
| | | | Operating mode Torque Zero (Tz) | 0 % | - |
| T2 | 0 | 1 | Internal parameters | P1-12 | -300 ... 300% |
| T3 | 1 | 0 | | P1-13 | |
| T4 | 1 | 1 | | P1-14 | |

Scaling of the Analog Input T_REF

The parameter P1-41 lets you set the torque corresponding to 10 V. This results in a linear scaling for the analog input T_REF.

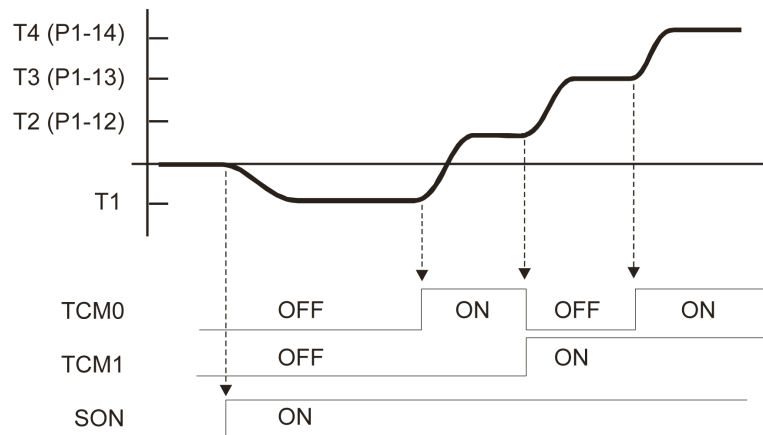


| Parameter name | Description | Unit Minimum value Factory setting Maximum value HMI Format | Data type R/W Persistent | Parameter address via fieldbus |
|----------------|--|---|--------------------------------|--------------------------------|
| P1-41 TCM | <p>Torque Target Value and Torque Limitation 10 V</p> <p>Applicable operating mode: PT, PS, V, T</p> <p>In the operating mode T, this parameter specifies the target torque that corresponds to the maximum input voltage of 10 V.</p> <p>In the operating modes PT, PS and V, this parameter specifies the torque limitation that corresponds to the maximum input voltage of 10 V.</p> <p>Example: If the value of this parameter is 100 in the operating mode T and if the input voltage is 10 V, the target torque is 100 % of the nominal torque.</p> <p>Setting can only be modified if power stage is disabled.</p> | % 0 100 1000 Decimal | u16 RW per. | Modbus 252 _h |

Example

The illustration below shows how the target torque is switched by means of the signal input functions TCM0, TCM1 and SON.

Operating modes Torque (T) and Torque Zero (Tz)



For further information, refer to Setting the Digital Signal Inputs ([see page 284](#)).

Part VIII

Diagnostics and Troubleshooting

Chapter 19

Diagnostics and Troubleshooting

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--|------|
| Diagnostics Via the Integrated HMI | 360 |
| Diagnostics Via the Signal Outputs | 361 |
| Diagnostics Via the Commissioning Software | 361 |
| Alert Codes and Error Codes | 362 |

Diagnostics Via the Integrated HMI

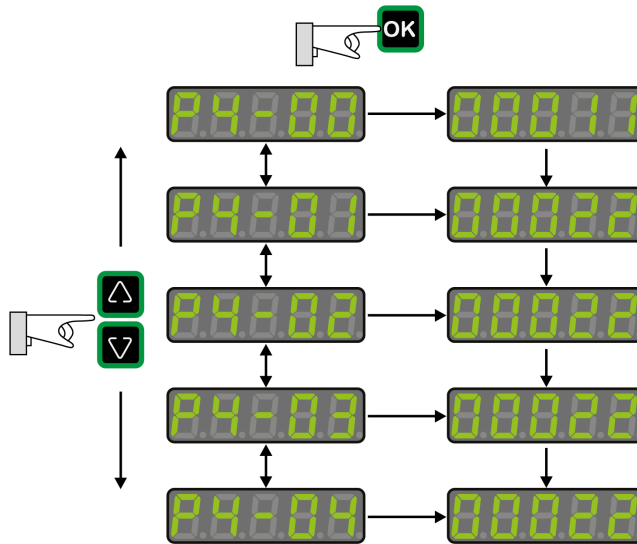
Modbus Activity

The left most decimal point in the integrated HMI indicates Modbus activity by flashing.

Error Memory

Parameters P4-00 to P4-04 allow you to read the error memory.

The error memory also contains a history of the last 5 detected errors.



| Parameter | Description |
|-----------|--|
| P4-00 | Error number of the most recently detected error |
| ... | ... |
| P4-04 | Error number of the oldest detected error |

The parameter P0-47 allows you to read the last detected alert.

Diagnostics Via the Signal Outputs

The signal outputs allow you to indicate, among other things, operating states and detected errors. The following list is an excerpt of the parameterizable signal output functions. For additional signal output functions, refer to Setting the Digital Signal Outputs (*see page 290*).

| Setting A for P2-18 ... P2-22 | Short name | Name of the output function | Description |
|-------------------------------|------------|------------------------------------|---|
| 1 | SRDY | Servo Ready | The signal output function SRDY indicates that no errors are presently detected, i.e. the drive is not in the operating state Fault. |
| 2 | SON | Servo On | The signal output function SON indicates that the drive is in the operating state Operation Enabled. |
| 7 | ERROR | Error Detected | The signal output function ERROR indicates that an error has been detected and that the drive has switched to the operating state Fault. For further information, refer to Diagnostics and Troubleshooting (<i>see page 359</i>). |
| 11 | WARN | Advisory or Alert Signal activated | The signal output function indicates that one of the following conditions has been detected: Hardware limit switch triggered, undervoltage, Nodeguard alert, Operational Stop (OPST). |

Diagnostics Via the Commissioning Software

See the information provided with the commissioning software for details on how to display the device state via the commissioning software LXM26 DTM Library.

Alert Codes and Error Codes

Meaning of an Alert

An alert indicates a potential issue that was detected by a monitoring function. An alert does not trigger a transition of the operating state.

| Number | Description | Cause | Remedy |
|--------|--|--|--|
| AL014 | Negative hardware limit switch triggered | - | - |
| AL015 | Positive hardware limit switch triggered | - | - |
| AL283 | Positive software limit switch triggered | - | - |
| AL285 | Negative software limit switch triggered | - | - |
| Wn023 | Alert threshold reached: Motor overload (foldback) | The foldback current of the motor has dropped below the alert threshold specified via the parameter P1-28. | Verify correct settings of the parameter P1-28 for the foldback current of the motor. |
| Wn701 | Alert threshold reached: Drive overload (foldback) | The foldback current of the drive has dropped below the alert threshold specified via the parameter P1-24. | Verify correct settings of the parameter P1-24 for the foldback current of the drive. |
| Wn702 | The DC bus voltage has dropped below the alert threshold. | Power supply loss, poor power supply. | Verify correct mains supply. Verify that the undervoltage limit is set correctly via the parameter P4-24. |
| Wn703 | Alert threshold reached: Power stage overtemperature | Ambient temperature is too high, fan is inoperative, dust. | Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive. |
| Wn704 | Alert threshold reached: Motor overtemperature | The motor temperature is excessively high. | Verify correct settings of the parameters for temperature monitoring. Verify proper ventilation and heat dissipation of the motor. Clean off pollutants such as dust. Verify that the motor is evenly mounted to the flange plate. Increase the size of the flange plate to which the motor is mounted to improve heat dissipation. Verify that the motor is properly sized for the application. |
| Wn707 | Alert threshold reached: Drive overtemperature (controller) | Ambient temperature is too high, fan is inoperative, dust. | Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive. |
| Wn713 | Positive hardware limit switch and negative hardware limit triggered | - | - |
| Wn716 | Positive software limit switch and negative software limit triggered | - | - |
| Wn728 | Alert: Missing mains supply, undervoltage mains supply | At least one mains phase is missing. Mains voltage is out of range. Mains frequency is out of range. | Verify correct connection of mains supply. Verify that the values of the mains power supply network comply with the technical data. |
| Wn729 | Modbus: Node Guarding error detected | Incorrect Modbus connection, incorrect data from Modbus master. | Verify correct Modbus connection. Verify correct operation of Modbus master. |
| Wn730 | Alert threshold reached: Braking resistor overload | The permissible braking resistor power has been exceeded. | Verify correct rating of the braking resistor used. Verify your application. |

| Number | Description | Cause | Remedy |
|--------|---|---|--|
| Wn731 | Encoder error detected | Refer to parameter P8-49 for details. | - |
| Wn732 | Alert threshold reached: Processing time too long | - | - |
| Wn734 | Alert threshold reached: Drive overttemperature (IPM) | Ambient temperature is too high, fan is inoperative, dust. | Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive. |
| Wn737 | Parameters have been reset to the factory settings, but are not yet saved to the non- volatile memory. | - | Use parameter P2-08 = 11 to save parameters reset to the factory settings to the non-volatile memory and restart the drive. |
| Wn739 | Temperature value for monitoring function not available | - | - |
| Wn742 | Motor type has changed | The type of motor connected is different from the previously connected type of motor. | Reset the drive to the factory settings. |
| Wn743 | Fan circuit warning | The fan circuit is either overloaded or disconnected. | Check for fan short circuit or disconnection. |
| Wn744 | Excessive electronic noise | - | Check proper grounding and shielding. Use line filter. |
| Wn745 | Configured feedbacktype and actual connected encoder mismatch | The connected encoder does not correspond to configured feedback type. | Check that configured feedback type and connected encoder match. |
| Wn746 | Encoder overtemperature | - | - |
| Wn747 | Encoder internal flash memory error detected | - | - |
| Wn748 | Encoderfeedback error detected | The device has detected unusually high shaft displacement. The device can still operate correctly; but position error might be higher than usual. | - |

Meaning of an Error

An error is a discrepancy between a computed, measured, or signaled value or condition and the specified or theoretically correct value or condition detected by a monitoring function. An error triggers a transition of the operating state.

| Number | Short description | Cause | Remedy |
|--------|---|---|--|
| AL001 | Power stage overcurrent | An overcurrent has been detected at the power stage which may be caused by a short circuit or by incorrect settings of the current loop parameters. This condition may occur up to three times in succession. After the third time, a time delay of one minute must pass before the power stage can be enabled again. | Verify correct connection of the motor. Verify correct settings of the parameters for the current loop. |
| AL002 | DC bus overvoltage | The DC bus voltage exceeded the maximum value. | Verify your application. Reduce the external load, the motor velocity, or the deceleration. Use an appropriately rated braking resistor, if necessary. |
| AL003 | DC bus undervoltage | Power supply loss, poor power supply. | Verify correct mains supply. Verify that the undervoltage limitation is set correctly via the parameter P4-24. |
| AL005 | Braking resistor overload | The braking resistor has been on for such a long period of time that its overload capability has been exceeded. | Verify your application. Reduce the external load, the motor velocity, or the deceleration. Use a braking resistor with a greater rating, if necessary. |
| AL006 | Motor overload (foldback) | The foldback current of the motor has dropped below the value specified via the parameter P1-27. | Verify correct settings for the parameter P1-27. |
| AL007 | Actual motor velocity too high. | The actual motor velocity exceeded the velocity limitation by more than 20% (P1-55). The analog input signal is not stable. | Verify that the velocity limitation set via the parameter P1-55 matches the requirements of the application. Verify that the values for the tuning parameters are suitable. Verify that the frequency of the analog input signal is stable using a signal detector. Use a filter function. |
| AL008 | Frequency of reference value signal is too high | The frequency of the pulse signal (A/B, Pulse/Direction, CW/CCW) exceeds the specified range. Received pulses may be lost. | Adapt the output pulse frequency of the external source to fit the input specification of the drive. Adapt the gear ratios to the application requirements (parameters P1-44, P1-45, P2-60, P2-61 and P2-62). |
| AL009 | Position deviation too high (following error) | The position deviation has exceeded the maximum permissible position deviation specified via the parameter P2-35 and the drive has detected a following error. | Verify your application. Reduce the external load. Increase the permissible position deviation via the parameter P2-35. Reduce the motor velocity via the parameters P1-09 ... P1-11 or the analog input V_REF. Increase the torque limitation via the parameters P1-12 ... P1-14 or the analog input T_REF. |
| AL013 | The input to which the signal input function OPST is assigned has been activated. | - | Identify the cause which has triggered the signal input function OPST. Remove the cause. If your application does not require the signal input function OPST, disable this signal input function. |

| Number | Short description | Cause | Remedy |
|--------|---|---|--|
| AL016 | Power stage overtemperature | Ambient temperature is too high, fan is inoperative, dust. | Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive. |
| AL017 | Error detected in non-volatile memory | The drive was reset to the factory settings via parameter P2-08. | Use parameter P2-08 = 11 to save parameters reset to the factory settings to the non-volatile memory and restart the drive. Contact technical support. |
| AL018 | Encoder simulation frequency exceeded 4 MHz | The computed equivalent encoder output frequency exceeds the maximum limit of 4 MHz for this signal. | Reduce the resolution of the encoder simulation via the parameter P1-46 or reduce the maximum velocity. |
| AL020 | Modbus: Node Guarding error detected | Incorrect Modbus connection, incorrect data from Modbus master. | Verify correct Modbus connection. Verify correct operation of Modbus master. |
| AL022 | Missing mains supply, undervoltage mains supply | At least one mains phase is missing. Mains voltage is out of range. Mains frequency is out of range. | Verify correct connection of mains supply. Verify that the values of the mains power supply network comply with the technical data. |
| AL025 | Not possible to read data of electronic motor nameplate | Incorrect or missing motor data. Motor without electronic motor nameplate has been connected. | Verify that the drive and the connected motor are a permissible product combination. Verify correct connection of the encoder. Contact Technical Support or replace the motor. |
| AL026 | Error detected in communication with motor encoder | Communication with the encoder was not initialized correctly. | Verify correct connection of the encoder. Contact Technical Support or replace the motor. |
| AL030 | Motor torque too high for an excessive period of time | The motor torque has exceeded the value specified via the parameter P1-57 for a period of time exceeding the value specified via the parameter P1-58. | Verify your application. Verify that no movements are made up to a mechanical stop (for example, use limit switches). Verify that the values for the parameters P1-57 and P1-58 are suitable. |
| AL502 | System error detected (FPGA) | - | Contact technical support. |
| AL503 | System error detected (non-volatile memory) | - | Contact technical support. |
| AL504 | System error detected (non-volatile memory) | - | Contact technical support. |
| AL505 | DC bus voltage measurement | An error was detected in the circuit that measures the DC bus voltage. | Perform a Fault Reset. Restart the drive. If the error persists, contact Technical Support. |
| AL507 | System error detected (NV access) | - | Contact technical support. |
| AL508 | Drive overload (foldback) | The foldback current of the drive has dropped below the value specified via the parameter P1-23. | Verify correct settings for the parameter P1-23. |
| AL514 | Motor overtemperature | The motor temperature is excessively high. | Verify correct settings of the parameters P1-62 and P1-63 for temperature monitoring. Verify proper ventilation and heat dissipation of the motor. Clean off pollutants such as dust. Verify that the motor is evenly mounted to the flange plate. Increase the size of the flange plate to which the motor is mounted to improve heat dissipation. Verify that the motor is properly sized for the application. |

| Number | Short description | Cause | Remedy |
|--------|--|--|--|
| AL517 | Encoder overvoltage or overcurrent | The current supplied by the drive for the 5 V encoder supply has exceeded the limit. This condition may occur up to three times in succession. After the third time, a time delay of one second must pass before the power stage can be enabled again. | Verify correct connection of the encoder (short circuits). Verify the current consumption of the encoder. |
| AL523 | System error detected (self-test) | The self-test has detected an error. | Contact technical support. |
| AL525 | Reserved | – | – |
| AL526 | Reserved | – | – |
| AL527 | System error detected (Watchdog) | The Watchdog function has detected a system error. | Restart the drive. If the error persists, contact Technical Support. |
| AL528 | Drive overtemperature (IPM) | Ambient temperature is too high, fan is inoperative, dust. | Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive. |
| AL529 | Drive overtemperature (controller) | Ambient temperature is too high, fan is inoperative, dust. | Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive. |
| AL532 | Calculated offsets for current sensors out of range | The calculated offsets for the current sensors are out of range. | Perform a Fault Reset. Restart the drive. If the error persists, contact Technical Support. |
| AL533 | Reserved | – | – |
| AL534 | Pulse signal missing | One of the pulse signals is not connected. | Verify correct connection of the pulse inputs. |
| AL535 | System error detected (FPGA does not match firmware) | The firmware version is not suitable for the drive. | Update the firmware of the drive. Contact technical support. |
| AL539 | Motor phase missing | One of the motor phases is not connected. | Verify correct connection of the motor phases. Contact technical support. |
| AL547 | Motor blocked | The motor was blocked mechanically, for example, by a mechanical stop or by the load. | Remove condition causing the mechanical blocking. Verify your application. |
| AL555 | Velocity deviation too high | The deviation between actual velocity and reference velocity has exceeded the maximum velocity deviation specified via the parameter P2-34. | Verify your application. Verify that the values for the tuning parameters are suitable. Increase the value for the maximum velocity deviation in the parameter P2-34. |
| AL558 | System error detected | - | Contact technical support. |
| AL560 | Power stage supply off | - | Power on the power stage supply. |
| AL561 | Temperature sensor inoperative | - | Restart the drive. If the error persists, contact Technical Support. |
| AL563 | Commutation error detected | Motor phases have been interchanged. | Verify correct connection of the motor phases. |
| AL567 | System error detected (encoder) | Refer to parameter P8-48 for details. | Contact technical support. |
| AL568 | Braking resistor overload | The permissible braking resistor power has been exceeded. | Verify correct rating of the braking resistor used. Verify your application. |
| AL569 | Configuration not correctly transferred via Modbus | - | Verify correct connection. Verify that configuration file and drive are compatible. |
| AL570 | Overcurrent detected at one of the digital outputs | - | Verify correct wiring of the digital outputs. Verify that there are no short circuits. |

| Number | Short description | Cause | Remedy |
|--------|---|--|--|
| AL572 | Position deviation too high (following error) | The position deviation has exceeded the maximum permissible position deviation specified via the parameter P2-35 and the drive has detected a following error. | Verify your application. Reduce the external load. Increase the permissible position deviation via the parameter P2-35. Reduce the motor velocity via the parameters P1-09 ... P1-11 or the analog input V_REF. Increase the torque limitation via the parameters P1-12 ... P1-14 or the analog input T_REF. |
| AL573 | The returned position values are no longer considered valid | – | – |
| AL574 | The encoder temperature is too high | – | – |
| AL575 | The encoder supply voltage has dropped under operational value | – | – |
| AL576 | The multi turn encoder battery voltage has dropped under 3 Vdc | – | – |
| AL577 | The multi turn encoder requires an explicit configuration command | – | – |
| AL578 | Internal position synchronization error detected between the multi turn and the single turn modules | – | – |
| AL579 | Generic error code of the multi turn module is detected | – | – |
| AL580 | The encoder firmware cannot operate on the provided hardware | – | – |
| AL581 | The drive firmware cannot operate with the provided encoder version | – | – |
| AL582 | The drive firmware cannot operate on the provided hardware | – | – |
| AL588 | Reserved | – | – |
| AL595 | Impermissible combination of drive and motor | – | Use an approved drive/motor combination. |
| AL596 | Unstable current loop | Excessive overshoot in current loop. | Verify correct settings of the parameters for the current loop. |

Part IX

Service, Maintenance and Disposal

Chapter 20

Service, Maintenance, and Disposal

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|-----------------------------|------|
| General | 372 |
| Service Address | 373 |
| Maintenance of the Drive | 374 |
| Replacement of Drive | 375 |
| Maintenance of the Motor | 376 |
| Changing the Motor | 378 |
| Shipping, Storage, Disposal | 379 |

General

The product may only be repaired by a Schneider Electric customer service center.

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.
- 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.

Service Address

If you cannot resolve an error yourself, contact your sales office.

Have the following data available:

- Nameplate (type, identification number, serial number, DOM, ...)
- Type of error (with LED flash code or error code)
- Previous and concomitant circumstances
- Your own assumptions concerning the cause of the error

Also include this information if you return the product for inspection or repair.

If you have any questions, contact your sales office. Your sales office staff will provide you the name of a customer service office in your area.

<http://www.schneider-electric.com>

Maintenance of the Drive

Prior to any type of work on the drive system, consult the chapters on Installation and Commissioning for information to be observed.

Repairs cannot be made with the device installed.

Include the following points in the maintenance plan of your machine.

Connections and Fastening

- Check all connection cables and connectors regularly for damage. Replace damaged cables immediately.
- Tighten all mechanical and electrical threaded connections to the specified torque.

Cleaning

Clean dust and dirt off the product at regular intervals. Insufficient heat dissipation to the ambient air may excessively increase the temperature.

Replacement of Drive

Unsuitable settings or unsuitable data may trigger unintended movements, trigger signals, damage parts and disable monitoring functions. Some parameters and other operational 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.
- 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 modification.
- 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.

Prepare a list with the parameters required for the functions used.

Observe the following procedure when replacing devices:

| Step | Action |
|------|---|
| 1 | Save all parameter settings. Save the data to your PC using the commissioning software, refer to chapter Commissioning Software (<i>see page 180</i>). |
| 2 | Power off all supply voltages. Verify that no voltages are present. |
| 3 | Label all connections and remove all connection cables (unlock connector locks). |
| 4 | Uninstall the product. |
| 5 | Note the identification number and the serial number shown on the product nameplate for later identification. |
| 6 | Install the new product as per chapter Installation (<i>see page 119</i>). |
| 7 | 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. |
| 8 | Commission the product as per chapter Commissioning (<i>see page 165</i>). |

Maintenance of the Motor

Prior to any type of work on the drive system, consult the chapters on Installation and Commissioning for information to be observed.

Repairs cannot be made with the device installed.

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.

Lubricating the Shaft Sealing Ring

In the case of motors with shaft sealing ring, lubricant must be applied to the space between the sealing lip of the shaft sealing ring and the shaft with a suitable non-metallic tool. If the shaft sealing rings are allowed to run dry, the service life of the shaft sealing rings will be significantly reduced.

Cleaning

If the permissible ambient conditions are not respected, external substances from the environment may penetrate the product and cause unintended movement or equipment damage.

| |
|---|
| ⚠ WARNING |
| UNINTENDED MOVEMENT |
| <ul style="list-style-type: none">• Verify that the ambient conditions are respected.• Do not allow seals to run dry.• Keep liquids from getting to the shaft bushing (for example, in mounting position IM V3).• Do not expose the shaft sealing rings and cable entries of the motor to the direct spray of a pressure washer. |
| Failure to follow these instructions can result in death, serious injury, or equipment damage. |

Clean dust and dirt off the product at regular intervals. Insufficient heat dissipation to the ambient air may excessively increase the temperature.

Motors are not suitable for cleaning with a pressure washer. The high pressure may force water into the motor.

When using solvents or cleaning agents, verify that the cables, cable entry seals, O-rings, and motor paint are not damaged.

Replacing the Rolling Bearing

When the rolling bearing is replaced, the motor is partially demagnetized and loses power.

| |
|---|
| <i>NOTICE</i> |
| INOPERABLE EQUIPMENT |
| Do not replace the rolling bearing. |
| Failure to follow these instructions can result in equipment damage. |

Replacing the Battery for the Multi Turn Encoder

The multi turn counting is preserved through power down by the external battery located into the battery compartment.

- Do not disconnect the encoder cable from the battery compartment or the multi turn information is lost.
- Replace the battery while the encoder is powered by the drive or the multi turn information is lost.

The battery has its manufacturing date printing on it in MMY format. The expiration date for the battery is 3 years after the manufacturing date.

On the following example, the manufacturing date of the battery is June 2016 (0616). The expiration date is June 2019.



The battery voltage is monitored by the encoder at each power on of the drive.

- An alert Wn731 related to P8-49 Bit 10 is triggered when the measured voltage is in the range 3 ... 3.15 Vdc.
- An error AL567 related to P8-48 Bit 5 is triggered when the measured voltage is under 3 Vdc.
NOTE: After replacing the battery, the detected error is cleared the next time the drive is powered on (next battery voltage measurement), or when an explicit command is sent to the encoder by setting P8-44 to the value 1.

Changing the Motor

Drive systems may perform unintended movements if unapproved combinations of drive and motor are used. Even if motors are similar, different adjustment of the encoder system may be a source of hazards. Even if the connectors for motor connection and encoder connection 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.

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table ([see page 20](#)).

Observe the following procedure when changing motors:

| Step | Action |
|------|---|
| 1 | Switch off all supply voltages. Verify that no voltages are present. |
| 2 | Label all connections and uninstall the product. |
| 3 | Note the identification number and the serial number shown on the product nameplate for later identification. |
| 4 | Install the new product as per chapter Installation (see page 151). |
| 5 | Commission the product as per chapter Commissioning (see page 165). |

If the connected motor is replaced by another approved motor, the new motor is automatically recognized by the drive.

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)



A

absolute movement

A movement to a position defined from a reference point.

analog input

Converts received voltage or current levels into numerical values. You can store and process these values within the logic controller.

analog output

Converts numerical values within the logic controller and sends out proportional voltage or current levels.

AWG

(*American wire gauge*) The standard that specifies wire section sizes in North America.

C

CCW

Counter ClockWise

CSA

(*Canadian standards association*) The Canadian standard for industrial electronic equipment in hazardous environments.

CW

ClockWise

D

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).

DIN

(*Deutsches Institut für Normung*) A German institution that sets engineering and dimensional standards.

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

DTM

(*device type manager*) Classified into 2 categories:

- Device DTMs connect to the field device configuration components.
- CommDTMs connect to the software communication components.

The DTM provides a unified structure for accessing device parameters and configuring, operating, and diagnosing the devices. DTMs can range from a simple graphical user interface for setting device parameters to a highly sophisticated application capable of performing complex real-time calculations for diagnosis and maintenance purposes.

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.

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.

firmware

Represents the BIOS, data parameters, and programming instructions that constitute the operating system on a controller. The firmware is stored in non-volatile memory within the controller.

flash memory

A non-volatile memory that can be overwritten. It is stored on a special EEPROM that can be erased and reprogrammed.

H**HMI**

(human machine interface) An operator interface (usually graphical) for human control over industrial equipment.

homing

The method used to establish the reference point for absolute movement.

I**I/O**

(input/output)

IEC

(international electrotechnical commission) A non-profit and non-governmental international standards organization that prepares and publishes international standards for electrical, electronic, and related technologies.

Internal Units

Resolution of the power stage at which the motor can be positioned. Internal units are specified in increments.

IT Mains

Mains in which all active components are isolated from ground or are grounded by a high impedance. IT: isol e terre (French), isolated ground. Opposite: Grounded mains, see TT/TN mains

L**LED**

(light emitting diode) An indicator that illuminates under a low-level electrical charge.

Limit Switch

Switches that signal overtravel of the permissible range of travel.

LSB

(least significant bit/byte) The part of a number, address, or field that is written as the right-most single value in conventional hexadecimal or binary notation.

M**Modbus**

The protocol that allows communications between many devices connected to the same network.

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.

MSB

(*most significant bit/byte*) The part of a number, address, or field that is written as the left-most single value in conventional hexadecimal or binary notation.

N**network**

A system of interconnected devices that share a common data path and protocol for communications.

node

An addressable device on a communication network.

non-volatile memory

A memory that can be overwritten. It is stored on a special EEPROM that can be erased and reprogrammed.

P**Parameter**

Device data and values that can be read and set (to a certain extent) by the user.

PE

(*Protective Earth*) A common grounding connection to help avoid the hazard of electric shock by keeping any exposed conductive surface of a device at earth potential. To avoid possible voltage drop, no current is allowed to flow in this conductor (also referred to as *protective ground* in North America or as an equipment grounding conductor in the US national electrical code).

PELV

Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41

Position Deviation

The position deviation is the difference between reference position and actual position. The current position deviation consists of the load-dependent position deviation and the dynamic position deviation.

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.

PWM

(*pulse width modulation*) A fast output that oscillates between off and on in an adjustable duty cycle, producing a rectangular wave form (though you can adjust it to produce a square wave). The PTO is well adapted to simulate or approximate an analog output in that it regulates the voltage of the output over its period making it useful in light dimming or speed control applications, among others.

Q**Quick Stop**

The quick Stop function can be used for fast deceleration of a movement as a response to a detected error or via a command.

R**relative movement**

Movement by a specified distance from the current position.

RJ45

A standard type of 8-pin connector for network cables defined for Ethernet.

rms

"Root Mean Square" value of a voltage (V_{rms}) or a current (I_{rms})

RPM

(revolutions per minute)

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.

T**TN Mains**

Grounded mains, differ in terms of the ground connection (PE conductor connection). Opposite: Ungrounded mains, see IT mains.

TP

(touch probe) A position capture that is triggered by a fast input signal (quick sensor). On the rising edge of the touch probe input, the position of an encoder is captured.

For example, this is used for packaging machines to capture the position of a printmark on a film to cut on the same position.

TT Mains

Grounded mains, differ in terms of the ground connection (PE conductor connection). Opposite: Ungrounded mains, see IT mains.

U**UL**

(underwriters laboratories) A US organization for product testing and safety certification.



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