

Hardware Guide

(Original Instructions)

Lexium 62 ILM

08.2016



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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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1 Safety Information

Important Information

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



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



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

DANGER

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

WARNING

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

CAUTION

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


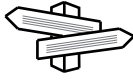

NOTICE

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

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

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

The following symbols and designators are used in this document:

Symbol/Character	Meaning
	Information Symbol: After this symbol, you will find important information and useful tips on using the components.
	Marker: After this symbol, you will find references for further information.
▪	Prerequisite symbol: This symbol indicates a prerequisite you have to fulfill before you start to implement an instruction.
✕	Problem symbol: This symbol is followed by a description of the problem and an instruction how to solve the problem.
▶	Activity symbol: After this symbol, you will find an instruction. Follow the instructions in sequence from top to bottom.
✓	Result symbol: The text after this symbol contains the result of an action.
(1), (2), (3)	Image numbers in the text always refer to the image numbers in the referenced figure.
	Orientation aid: Information serving as an orientation aid regarding the section's contents follows this symbol.
bold	If the descriptive text contains keywords , such as parameters, they are highlighted in bold.
<code>lBuffSelect</code>	Program code is written using a different font.

2 About this manual

2.1 Introduction

Read and understand the material contained in this manual before you work on Lexium 62 ILM for the first time. Take particular note of the safety information (see 3 Product Related Information). As described in section 3.3, only those persons who meet the "Qualification of Personnel (see 3.3 Qualification of Personnel)" are allowed to work with the Lexium 62 components.

A copy of this manual must be available for personnel who work with the Lexium 62 ILM.

This manual is to help you use the capabilities of the Lexium 62 ILM safely and properly.

Follow the instructions within this manual to help:

- reduce risks
- reduce repair costs and downtime of the Lexium 62 components
- increase the service life of the Lexium 62 components,
- increase reliability of the Lexium 62 components.

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*, *malfunxion*, *failure*, *error*, *error message*, *dangerous*, etc.

Among others, these standards include:

EN 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2008	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
IEC/EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 1088:2008 ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2006	Safety of machinery - Emergency stop - Principles for design
IEC/EN 62061:2005	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 61784-3:2008	Digital data communication for measurement and control: Functional safety field buses.
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:

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.

3 Product Related Information



This section contains important safety information regarding working with the Lexium 62 component. The Lexium 62 ILM, as part of the Lexium 62 Drive System, conforms to recognized technical safety regulations.

3.1 Residual Risks



Hazards arising from the Lexium 62 components have been reduced. However, residual risks remain since the Lexium 62 components work with electrical voltage and electrical currents while controlling the motors that produce machine movements.

If activities involve residual risks, a safety message is made at the appropriate points. This includes potential hazard(s) that may arise, their possible consequences, and describes preventive measures to avoid the hazard(s).

3.1.1 Electrical parts

⚠ DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Operate electrical components only with a connected protective ground (earth) cable.
- After the installation, verify the secure connection of the protective ground (earth) cable to all electrical devices to ensure that connection complies with the connection diagram.
- Before enabling the device, safely cover the live components to prevent contact.
- Do not touch the electrical connection points of the components when the module is energized.
- Provide protection against indirect contact (EN 50178).
- Connect and disconnect cables and terminals only after you have verified that the power has been removed from the system.
- Insulate the unused conductors on both ends of the motor cable.

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

DANGER

ELECTRIC SHOCK CAUSED BY HIGH TOUCH VOLTAGE

- Attach the shock protector covers on the extremities of the Bus Bar Module combination (see 7.1.4 Mechanical mounting).
- Apply power to the device only if the shock protector covers have been attached to the extremities of the Bus Bar Module combination.

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

DANGER

ELECTRIC SHOCK CAUSED BY HIGH TOUCH VOLTAGE

- Before working on the product, make sure that it is de-energized.
- After disconnection, do not touch connector CN6 mains connection on the Lexium 62 power supply module as it still carries hazardous voltages for approximately one second.
- Only operate the Lexium 62 power supply and the Lexium 62 connection module in a control cabinet that cannot be opened without the help of tools.

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

3.1.2 Assembly and handling

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

DANGER

INSUFFICIENT GROUNDING

- Use a protective ground conductor with at least 10 mm² (AWG 6) or two protective ground conductors with the same or larger cross section of the conductors supplying the power terminals.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.

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

WARNING

CRUSHING, SHEARING, CUTTING AND HITTING DURING HANDLING

- Observe the general construction and safety regulations for handling and assembly.
- Use appropriate mounting and transport equipment and use appropriate tools.
- Prevent clamping and crushing by taking appropriate precautions.
- Cover edges and angles to protect against cutting damage.
- Wear appropriate protective clothing (for example, protective goggles, protective boots, protective gloves).

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

3.1.3 Hot surfaces

The metal surfaces of the product may exceed 85 °C (185 °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.

3.1.4 Magnetic and electromagnetic fields

Conductors and 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 and the conductors.
- Do not place electromagnetically sensitive devices in the vicinity of the motor or of the conductors.

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

3.1.5 Hazardous movements

There can be different sources of hazardous movements:

- No, or incorrect, homing of the drive
- Wiring or cabling errors
- Errors in the application program
- Component errors
- Error in the measured value and signal transmitter



Provide for personal safety by primary equipment monitoring or measures. Do not rely only on the internal monitoring of the drive components. Adapt the monitoring or other arrangements and measures to the specific conditions of the installation in accordance with a risk and error analysis.

⚠ DANGER

UNAVAILABLE OR INADEQUATE PROTECTION DEVICE(S)

- Prevent entry to a zone of operation with, for example, protective fencing, mesh guards, protective coverings, or light barriers.
- Dimension the protective devices properly and do not remove them.
- Do not make any modifications that can degrade, incapacitate, or in any way invalidate protection devices.
- Before accessing the drives or entering the zone of operation, bring the drives and the motors they control to a stop.
- Protect existing workstations and operating terminals against unauthorized operation.
- Position EMERGENCY STOP switches so that they are easily accessible and can be reached quickly.
- Validate the functionality of EMERGENCY STOP equipment before start-up and during maintenance periods.
- Prevent unintentional start-up by disconnecting the power connection of the drive using the EMERGENCY STOP circuit or using an appropriate lock-out tag-out sequence.
- Validate the system and installation before the initial start-up.
- Avoid operating high-frequency, remote control, and radio devices close to the system electronics and their feed lines, and perform, if necessary, an EMC validation of the system.

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

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 unknown 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.

3.1.6 PELV circuits

All signal and control voltages must be designed as PELV circuits. In particular, this implies protective measures against direct and indirect contact with hazardous voltage by:

- Ensuring that the voltage with respect to PE remains below 30 Vdc.
- An implemented separation in the system/machine of the low and high voltage side.

Connect GND / 0 V to PE (Protective Earth/ground) at least at one point in the control cabinet.

Separate high and low voltage wiring and respect the standard IEC 61800-5-1, Adjustable speed electrical power drive systems - safety requirements.

⚠ DANGER**ELECTRIC SHOCK BY INADEQUATE PROTECTIVE SEPARATION**

Only connect devices, electrical components, or lines to the signal voltage connectors of these products that feature a sufficient, protective separation from the connected circuits in accordance with the standards (IEC 61800-5-1: Adjustable speed electrical power drive systems - safety requirements).


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

3.2 Proper use

The Lexium 62 Power Supply and the Lexium 62 Connection Module must only be installed in an electrical equipment enclosure (for example, in a control cabinet). The electrical equipment enclosure must be lockable by using a key or tool. The Lexium 62 ILM and the Lexium 62 Distribution Box are intended for installation in a machine.


Provide for protective measures Before installing the device, provide for appropriate protective devices in compliance with local and national standards. Do not commission components without appropriate protective devices. After installation, commissioning, or repair, test the protective devices used.

Perform a risk evaluation concerning the specific use before operating the product and take appropriate security measures.

 WARNING
UNINTENDED EQUIPMENT OPERATION
Ensure that a risk assessment is conducted and respected according to EN/ISO 12100 during the design of your machine.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

If circumstances occur that affect the safety or cause changes to the operating behavior of the Lexium 62 component, then immediately shut down the Lexium 62 component and contact Schneider Electric.

Use original-equipment only Use only the accessories and mounting parts specified in the documentation and no third-party devices or components that have not been expressly approved by Schneider Electric. With the exception of replaceable, internal fuses in some Lexium 62 components, there are no user-serviceable parts in the Lexium 62 component system. Do not attempt to modify the Lexium 62 component in any way. Refer to Schneider Electric for all repairs and replacements.

 WARNING
UNINTENDED EQUIPMENT OPERATION
<ul style="list-style-type: none"> • Only use software and hardware components approved by Schneider Electric for use with this equipment. • Do not attempt to service this equipment outside of authorized Schneider Electric service centers. • Update your application program every time you change the physical hardware configuration.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

The components must not be used in the following environments:

- Incompatible environments*
- In hazardous (explosive) atmospheres
 - In mobile, movable or floating systems
 - In life support systems
 - In domestic appliances
 - underground

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.

3.3 Qualification of Personnel

Target audience for this manual Electrical equipment must 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.

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

The qualified personnel must be able to detect possible hazards that may arise from parameterization, changing parameter values and generally from mechanical, electrical, or electronic equipment. The qualified personnel must be familiar with the standards, provisions, and regulations for the prevention of industrial accidents, which they must observe when working on the drive system.

Designated safety functions Qualified personnel that work with designated safety functions must be trained according to the complexity of the machines and the requirements of the EN ISO 13849-1:2008. The training has to include the production process and the relation between the designated safety function and the machine.



Qualification guidelines are available in the following publication: Safety, Competency and Commitment: Competency Guidelines for Safety-Related System Practitioners. IEEE Publications, ISBN 0 85296 787 X, 1999.

4 System overview

The control system consists of several single components, depending on its application.

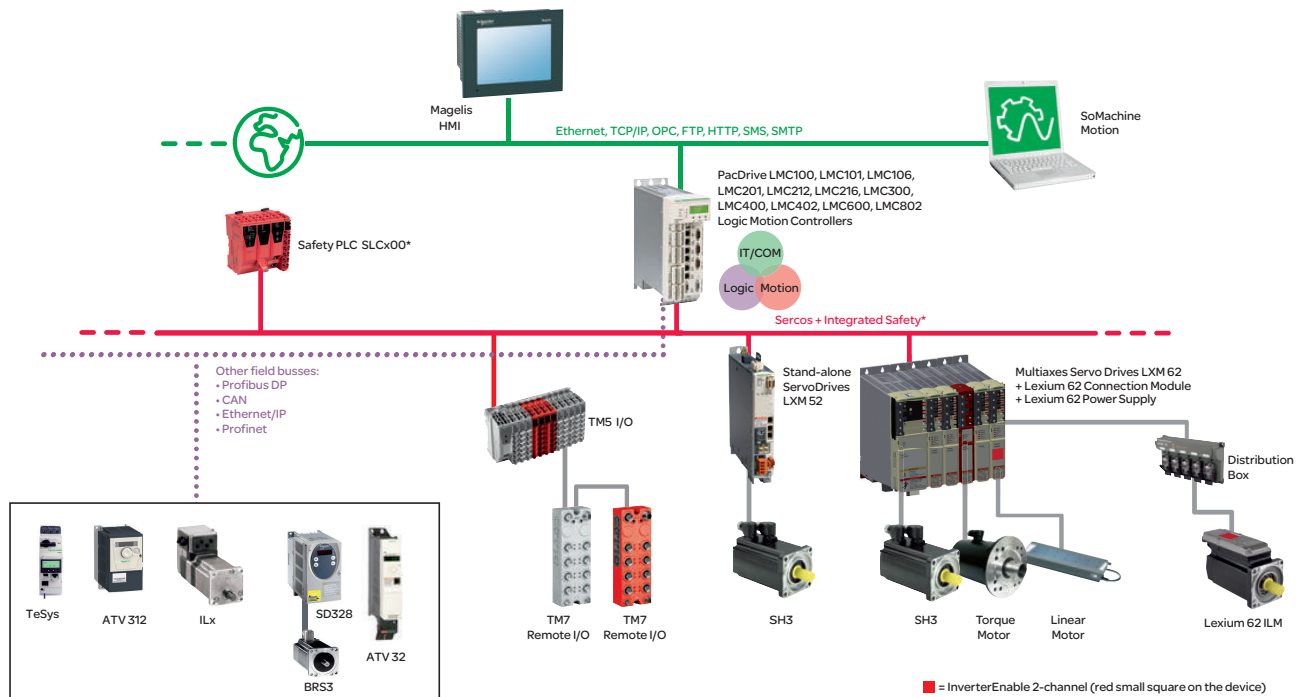
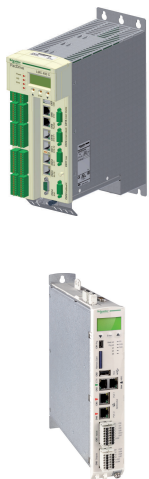


Figure 4-1: PacDrive 3 System overview

*Safety Logic Controller according to IEC 61508:2010 and EN ISO 13849:2008

4.1 Logic Motion Controller



The LMC (Logic Motion Controller), with a VxWorks real-time operating system, centrally implements the Logic Controller and motion functions. An LMC synchronizes, coordinates and creates the motion functions of a machine for a maximum of:

- 0 Sercos servo drives for the controller PacDrive LMC100
- 4 Sercos servo drives for the controller PacDrive LMC101
- 6 Sercos servo drives for the controller PacDrive LMC106
- 8 Sercos servo drives for the controller PacDrive LMC201
- 12 Sercos servo drives for the controller PacDrive LMC212
- 16 Sercos servo drives for the controller PacDrive LMC216
- 8 Sercos servo drives for the controller PacDrive LMC300
- 16 Sercos servo drives for the controller PacDrive LMC400
- 16 Sercos servo drives for the controller PacDrive LMC402
- 99 Sercos servo drives for the controller PacDrive LMC600
- 130 Sercos servo drives for the controller PacDrive LMC802

4.2 Lexium 62 drive system

The modular servo drive Lexium 62 ILM family is part of the Lexium 62 drive system and is designed for the operation of servo drives in a multi-axis system.

The power electronic components of the Lexium 62 ILM are fitted inside the control cabinet.



The central Lexium 62 Power Supply, using a common DC bus, supplies the connected Lexium 62 ILM drive servo converters with the power required.



Optionally, the Lexium 62 DC Link Terminal and the Lexium 62 DC Link Support Module can be used to distribute the common DC bus over several rows of Lexium 62 devices inside or between control cabinets. For further information about wiring with Lexium 62 DC Link Terminal, see the Lexium 62 Hardware Guide.



The Lexium 62 Connection Module supplies the Lexium 62 ILMs with DC voltage from the DC bus via a hybrid cable or via a power cable (daisy chain wiring). Additionally, the Lexium 62 Connection Module provides the Inverter Enable and Sercos interface.

The Lexium 62 ILM helps simplify the wiring of the devices. This also applies to the cable connection of the enclosed devices to the field. All the connectors that can be connected from the outside (power input, DC bus, 24 Vdc supply, Sercos, Ready and Inverter Enable) are designed such, that a fast and simple configuration can be realized.

4.2.1 Lexium 62 Distribution Box



The Lexium 62 Distribution Box is the link between Lexium 62 Connection Module and Lexium 62 ILM. Depending on the number of drives, 1 to 4 Lexium 62 ILMs or daisy chain lines can be connected. When operating more than 4 drives, expand the system by using more Lexium 62 distribution boxes.

The highlights

- 1...4 connections for Lexium 62 ILMs or daisy chain lines or further Lexium 62 distribution boxes
- pre-assembled hybrid cables or power cables (Daisy Chain wiring)
- easy to expand

4.2.2 Lexium 62 ILM



The innovative Lexium 62 ILM combines motor, power stage and digital servo controller for an axis in a space-saving housing. Due to its compact design with the integrated drive, it is suitable for decentralized, distributed architectures. It is available with single-turn or multi-turn encoders, and simplifies configuration with the aid of the electronic nameplate in the Lexium 62 ILM.

The Lexium 62 ILMs are available in three different flange sizes:

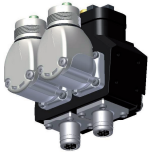
- ILM070
- ILM100
- ILM140

The Lexium 62 ILMs have been derived from the Schneider Electric SH3 family of motors, and therefore share many, but not all, characteristics. However, when it comes to mounting the motor, the Lexium 62 ILMs are equivalent.

The highlights:

- Compact design
- 3.5 times peak torque
- Integrated Sercos interface
- High-resolution single or multi-turn encoder
- Degree of protection IP65 (depending on the reference and/or options)
- Simple wiring

4.2.3 ILM62DC•000 Daisy Chain Connector Box



ILM62DCA000

The ILM62DC•000 Daisy Chain Connector Box is mounted on a Lexium 62 ILM in order to enable a daisy chain wiring. The Lexium 62 ILMs can be either directly connected (see 7.1.7 Wiring from the Lexium 62 connection module in a daisy chain topology) to the Lexium 62 Distribution Box or via a Lexium 62 Connection Module. When connecting via a Lexium 62 Distribution Box, a larger number of drives can be connected.



ILM62DCB000

Power (DC bus voltage/24V/Inverter Enable signals) and Sercos signals are distributed via separate cables. Each Lexium 62 ILM must be extended (see 7.1.4 Mechanical mounting) by a Daisy Chain Connector Box. If only one Lexium 62 Distribution Box is used, then up to 4 daisy chain lines can be connected to it. If several Lexium 62 Distribution Boxes are used, then from the first Lexium 62 Distribution Box up to and including the second last Lexium 62 Distribution Box respectively up to 3 daisy chain lines and on the last Lexium 62 Distribution Box up to 4 daisy chain lines can be connected. A daisy chain line can consist of up to 9 Lexium 62 ILMs.



ILM62DCC000

The connection between the Lexium 62 ILMs is established as follows (see 7.1.7 Wiring from the Lexium 62 connection module in a daisy chain topology):

- Power cable for power distribution (DC bus voltage/24V/Inverter Enable signals) with an M23 connector
- Sercos cable for distribution of the Sercos signals via M12 connector

The following Lexium 62 ILMs can be equipped with the Daisy Chain Connector Box in order to implement a daisy chain wiring:

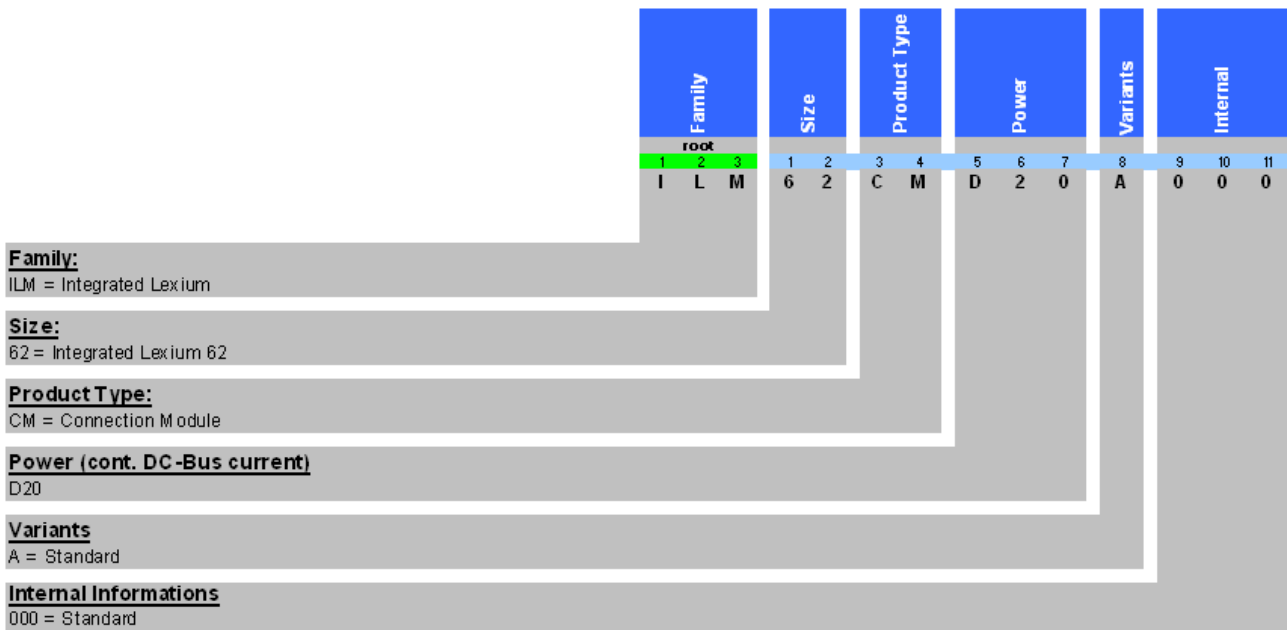
- ILM070••
- ILM100••
- ILM140••

The Daisy Chain Connector Box is available in the following variants:

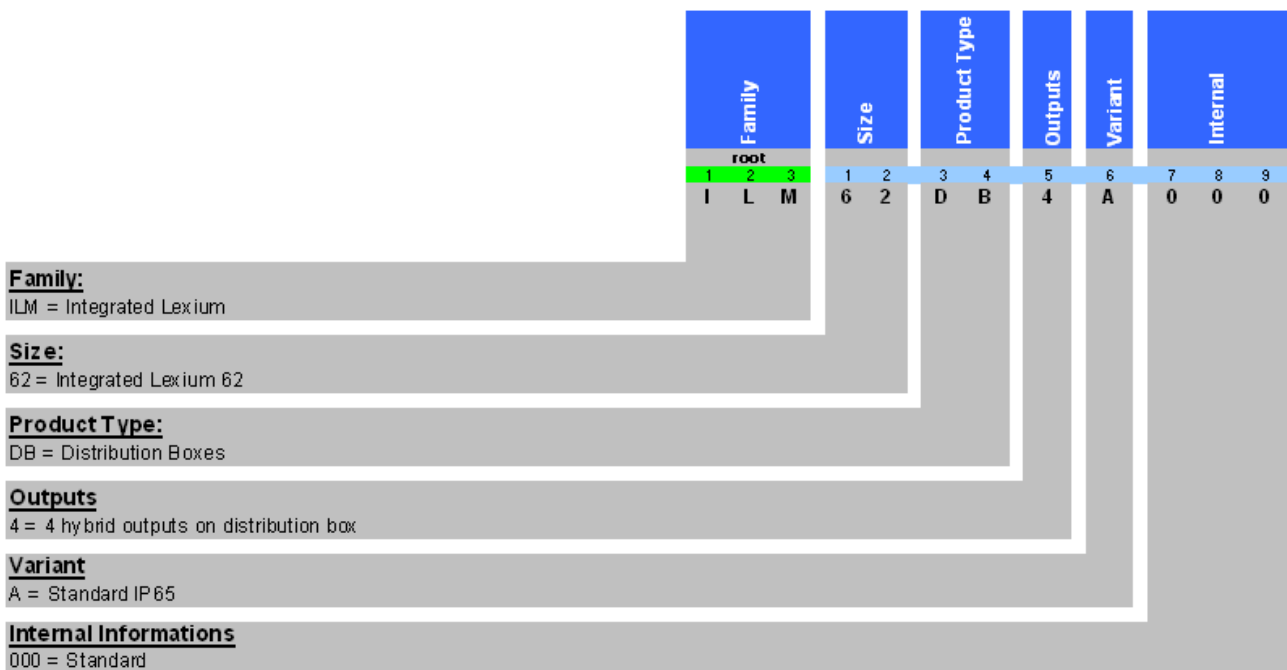
- ILM62DCA000 (suitable for ILM070••, ILM100•• and ILM140••)
- ILM62DCB000 (suitable for ILM070•• only)
- ILM62DCC000 (suitable for ILM100•• only)

4.3 Type code

4.3.1 Lexium 62 connection module



4.3.2 Lexium 62 distribution box



4.3.3 Lexium 62 ILM

Family			Size (housing)			Length	Winding Type	Shaft	Encoder	Holding Brake	Variant	Internal		
1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
I	L	M	0	7	0	1	P	0	1	A	0	0	0	0

Product family

ILM = Integrated Lexium Motor

Size (housing)

070 = ILM with Flange Size 70 mm
 100 = ILM with Flange Size 100 mm
 140 = ILM with Flange Size 140 mm

Length (Number of stacks)

1 = one stack
 2 = two stacks
 3 = three stacks

Winding type

M = Optimized in terms of torque (only available with ILM 1401)
 P = Standard

Shaft and degree of protection:

	Standard	keyed shaft	shaft sealing (IP65)
0 =	-	-	-
1 =	-	x	-
2 =	-	-	x
3 =	x	x	x

Encoder:

0 = without
 1 = Absolute singletum 128 Sin/Cos periods per revolution (SKS36)
 2 = Absolute multiturm 128 Sin/Cos periods per revolution (SKM36)

Holding brake

A = without brake
 F = with brake

Variant

0 = Standard

Internal Informations

000 = Standard

4.3.4 Lexium 62 ILM Daisy Chain Connector Box

Family			Size		Product Type		Type	Internal	Customer	
root			1	2	3	4	5	6	7	8
1	2	3	1	2	3	4	5	6	7	8
I	L	M	6	2	D	C	A	0	0	0

Family:
 ILM = Integrated Lexium Motor

Size:
 62 = Integrated Lexium 62

Product Type:
 DC = Daisy Chain Connector Box

Type
 A = Power at back, Sercos at bottom (ILM070, ILM100, ILM140)
 B = Power at bottom, Sercos at left and right (ILM070)
 C = Power at bottom, Sercos at left and right (ILM100)
 Z = Protection cap for the last M23 connector

Internal
 0

Customer:
 00 = None

4.3.5 Lexium 62 ILM Accessories

Accessories			Res. Body		Family			Drawing reference			Fix separator			Length			
root																	
1	2	3	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6
V	W	3	E		1			1	4	1	R			0	5	0	

Family:

ILM = Integrated Lexium Motor

Type

E = PacDrive 3

Family

1 = Motor / hybrid / power cables
3 = Sercos cables

Drawing reference

064 = Sercos cable between Lexium 62 ILM and Lexium 62 ILM, connector M12/M12 angled
065 = Sercos cable between ILM62CM and Lexium 62 ILM, connector RJ45/M12 angled
141 = Motor / hybrid cable between ILM62CM and ILM62DB4 or Lexium 62 ILM, cable outlet left (Standard)
142 = Motor / hybrid cable between ILM62DB4 and ILM62DB4 or Lexium 62 ILM, cable outlet left on both sides (Standard)
146 = Motor / hybrid cable between ILM62CM and ILM62DB4 or Lexium 62 ILM, cable outlet right
147 = Motor / hybrid cable between ILM62CM and ILM62DB4 or Lexium 62 ILM, cable outlet straight
148 = Motor / hybrid cable between ILM62DB4 and ILM62DB4 or Lexium 62 ILM, cable outlet left and right
149 = Motor / hybrid cable between ILM62DB4 and ILM62DB4 or Lexium 62 ILM, cable outlet left and straight
150 = Motor / hybrid cable between ILM62DB4 and ILM62DB4 or Lexium 62 ILM, cable outlet right and straight
151 = Motor / hybrid cable between ILM62DB4 and ILM62DB4 or Lexium 62 ILM, cable outlet straight on both sides
152 = Motor / hybrid cable between ILM62DB4 and ILM62DB4 or Lexium 62 ILM, cable outlet right on both sides
155 = Power cable between Lexium 62 ILM and Lexium 62 ILM, connector M23/M23
156 = Power cable between ILM62DB4 and Lexium 62 ILM, connector D1/M23
157 = Power cable between ILM62CM and Lexium 62 ILM, connector CMM23

Fixed separator R

Length

xxx = length in 0.1 m - refer to catalogue "Motion centric machine automation with PacDrive 3" for available cable lengths



For information on the availability of additional cable variants, contact your Schneider Electric representative.

Accessories			Res. Body	Family	Drawing reference			Internal			
root			1	2	3	4	5	6	7	8	9
V	W	3	E	6	0	2	1	0	0	0	0

Family:
ILM = Integrated Lexium

Type
E = PacDrive 3

Family
7 = Option Modules

Drawing reference
021 = I/O Option Module for Lexium 62 ILM
022 = Safety Option Module for Lexium 62 ILM

Internal
0000 = Option Module

Accessories			Res. Body	Family	Drawing reference			Internal			
root			1	2	3	4	5	6	7	8	9
V	W	3	E	6	0	2	3				

Family:
ILM = Integrated Lexium

Type
E = PacDrive 3

Family
6 = Replacement Equipment

Drawing reference
023 = Strapping plug
024 = Replacement fuse

Internal
Not used

4.4 Nameplate descriptions

Technical nameplate Lexium 62 Connection Module



The technical nameplate is located laterally on housing.

Label	Meaning
ILM62CMxxxxxxx	Device type and Unicode
Input d.c.	Input voltage and -current (rated- and peak value per input)
Output d.c.	Output voltage and -current (rated- and peak value per output)
IP 20	Degree of protection
Symbols	This field displays the symbols of declarations and certifications

Table 4-1: Explanation of the nameplate Lexium 62 Connection Module

Logistic nameplate Lexium 62 Connection Module



The logistic nameplate of the Lexium 62 Connection Module is located on the top of the housing.

Label	Meaning
ILM62xxxxxxxxxx	Device type and Unicode
2528044067	Serial number
RS:01	Hardware revision
DOM	Date of manufacture
Symbols	This field displays the symbols of declarations and certifications

Table 4-2: Explanation of the logistic nameplate Lexium 62 Connection Module

Technical nameplate Lexium 62 Distribution Box



Label	Meaning
ILM62DBxxxxx	Device type, see type code
Input d.c.	Rated voltage and rated current of the power supply
Output d.c.	Rated voltage and rated current of the power supply
IP 65	Degree of protection
Symbols	This field displays the symbols of declarations and certifications

Table 4-3: Explanation of the technical nameplate Lexium 62 Distribution Box

Logistic nameplate Lexium 62 Distribution Box

Label	Meaning
ILM62DBxxxxx	Device type, see type code
2328234578	Serial number
RS:01	Hardware revision status
4913	Date of manufacture (DOM)

Table 4-4: Explanation of the logistic nameplate Lexium 62 Distribution Box

Technical/Logistic nameplate Lexium 62 ILM



Label	Meaning
ILMxxxxxxxxxxxx	Device type, see type code
SN	Serial number
Input 1	Rated voltage and rated current of the power supply
Input 2	Rated voltage and rated current of the electronics
Type rating	Degree of protection of the housing in accordance with NEMA 250 and UL 50
HW	Hardware version
SW	Software version
IP	Degree of protection
Th-CI	Insulation material class of the motor
M0	Standstill torque
Mmax	Peak torque
nN	Nominal speed of rotation
DOM	Date of manufacture
Symbols	This field displays the symbols of declarations and certifications

Table 4-5: Explanation of the nameplate Lexium 62 ILM

5 Indicators and control elements

5.1 Displays at the Lexium 62 connection module

The display of the Lexium 62 Connection Module consists of two LEDs that indicate the state of the DC voltage supply or the 24V voltage supply via the Bus Bar Module.

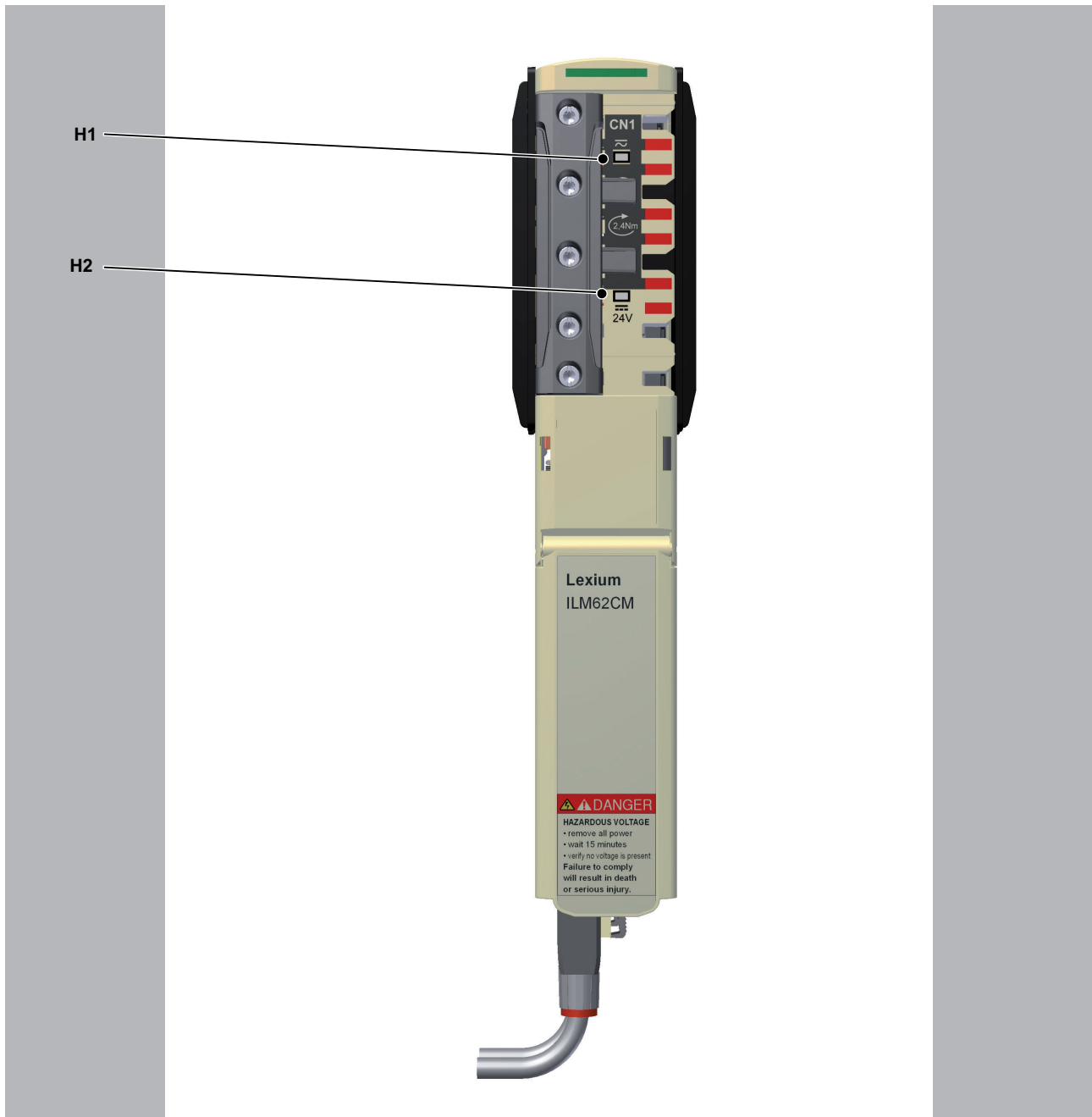


Figure 5-1: Diagnostic LEDs of the Lexium 62 connection module

H1	DC bus power supply
H2	24V power supply

5.1.1 DC bus LED





Color	State	Meaning	Notes
	OFF	DC bus supply inactive	-
 (red)	ON	DC bus supply active	DC bus voltage \geq 42 Vdc

Table 5-1: DC bus LED

The DC bus LED is not an indicator for the absence of DC bus voltage.

NOTE: If the DC-bus LED remains off, although the DC-bus is loaded, then the device must be replaced immediately and sent in to Schneider Electric for repair.

5.1.2 24Vdc LED





Color	State	Meaning	Notes
	OFF	24Vdc logic supply inactive	24Vdc logic supply inactive
 (green)	ON	24Vdc logic supply active	24Vdc logic supply active

Table 5-2: 24Vdc LED

5.2 Displays at the Lexium 62 distribution box

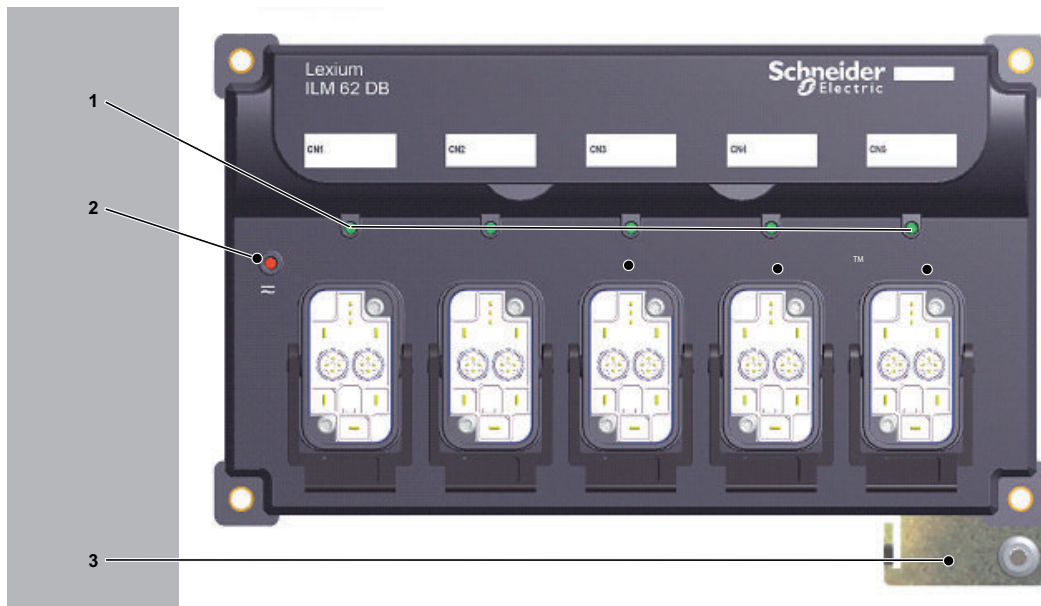



Figure 5-2: Display and operating elements of the Lexium 62 distribution box

1	Hybrid Connection LED
2	DC bus LED
3	 Protective ground (earth)

5.2.1 Hybrid connection LED



Color	State	Meaning	Notes
	OFF	Hybrid connection not connected	
	ON	Hybrid plug connector connected	Applies for hybrid cable or power cable (daisy chain wiring).

Table 5-3: Hybrid connection LED

5.2.2 DC bus LED

The LED indicates the status of the DC bus voltage.



Color	State	Meaning	Notes
	OFF	DC bus supply inactive	-
 (red)	ON	DC bus supply active	DC bus voltage ≥ 42 Vdc

Table 5-4: DC bus LED

The DC bus LED is not an indicator for the absence of DC bus voltage.

NOTE: If the DC-bus LED remains off, although the DC-bus is loaded, then the device must be replaced immediately and sent in to Schneider Electric for repair.

5.3 Displays at the Lexium 62 ILM

The display at the Lexium 62 ILM consists of four color LEDs that are used to display the status information.

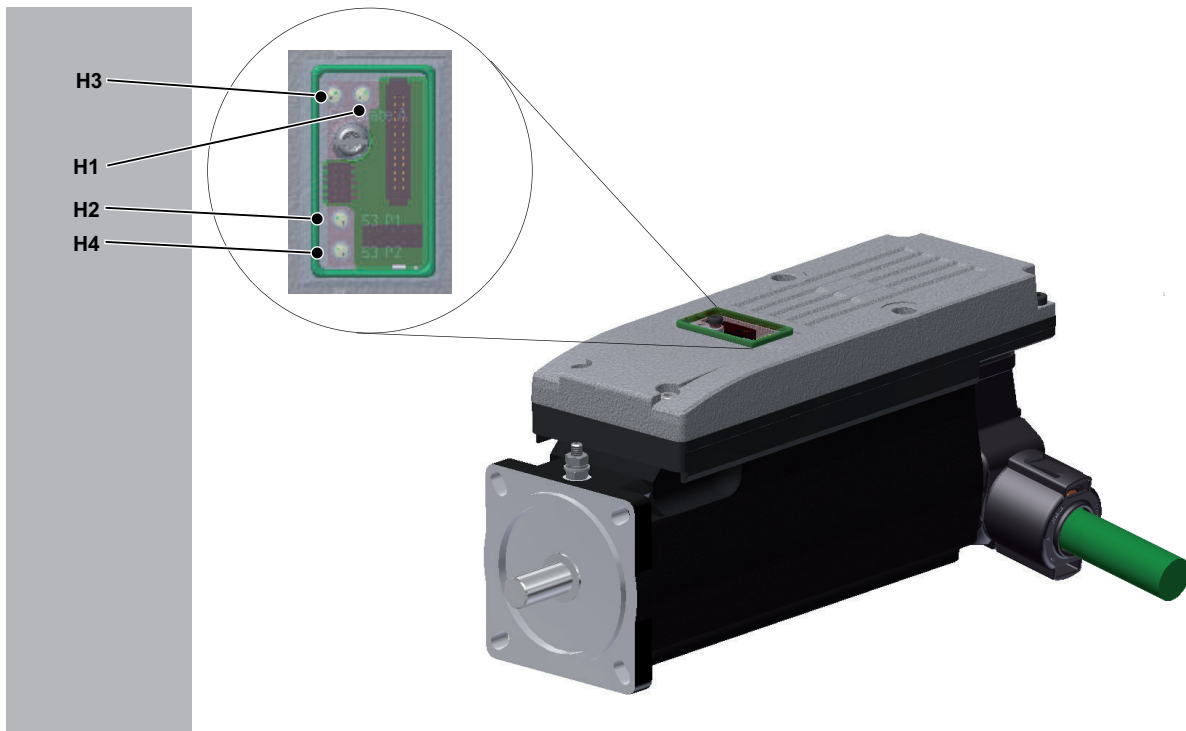


Figure 5-3: Diagnostic LEDs of the Lexium 62 ILM

H1	State LED
H2	Port 1 LED
H3	S3 LED
H4	Port 2 LED

5.3.1 State LED







Color	State	Meaning	Instructions/information for the user
	OFF	Device is not energized or is otherwise inoperable.	▶ If the 24V LED is off, replace the device.
	Flashing (2 Hz, 250 ms) (green)	Initialization of the device (firmware boot process, compatibility check of the hardware, updating the firmware)	▶ Waiting until initialization is complete.
	Flashing slowly (2 Hz, 40 ms) (green)	Identification of the device	▶ If necessary, identify the device via SoMachine Motion as defined by the controller configuration.
	ON (green)	Device has been initialized and waits for the configuration.	▶ Configure device as active. ▶ Configure device as inactive. ▶ Configure device for the execution of motions.
	ON (red)	A non-recoverable error has been detected requiring user intervention: <ul style="list-style-type: none"> • Watchdog • Firmware • Checksum • Internal error detected 	▶ Power OFF/ON (Power Reset) ▶ If this condition persists, replace the device.
	Flashing slowly (2 Hz, 250 ms) (red)	A general error has been detected.	▶ The configuration shows the detected error ▶ Error detected in the Logic Builder menu [Online] – [Reset diagnostic messages of controller] . ▶ Otherwise restart device.

Table 5-5: State LED

5.3.2 Port LED




Color	State	Meaning
	OFF	no cable connected
 (orange)	ON	Cable connected, no Sercos communication
 (green)	ON	Cable connected, active Sercos communication

Table 5-6: Port LEDs

5.3.3 S3 (Sercos III) LED








Color	State	Meaning	Instructions/information for the user
	off	The device is not energized or is otherwise inoperable, or there is no communication due to an interrupted or separated connection.	Sercos boot-up or hot swap
 (green)	On	Active Sercos connection without an error detected in the CP4.	-
 (green)	Flashing (2 Hz, 250 ms)	The device is in Loopback mode. Loopback describes the situation in which the Sercos telegrams have to be sent back on the same port on which they were received. Possible causes: <ul style="list-style-type: none"> Line topology or Sercos loop break 	Workaround: <ul style="list-style-type: none"> Close ring. Reset condition: <ul style="list-style-type: none"> Acknowledge error detected in the Logic Builder menu [Online] – [Reset diagnostic message of controller]. Switch from CP0 to CP1 alternatively. Note: If during phase CP1 a line topology or ring break was detected (device in loopback mode), the LED condition does not change.
 (red)	On	Sercos diagnostic class 1 (DC1) an error has been detected on port 1 and/or 2. There is no Sercos communication possible anymore on the ports.	Reset condition: <ul style="list-style-type: none"> Acknowledge error detected in the Logic Builder menu [Online] – [Reset diagnostic message of controller].
 (red)	Flashing (2 Hz, 250 ms)	Communication error at port 1 and/or port 2 has been detected. possible causes: <ul style="list-style-type: none"> Improper functioning of the telegram CRC error detected 	Reset condition: <ul style="list-style-type: none"> The configuration shows the detected error Acknowledge error detected in the Logic Builder menu [Online] – [Reset diagnostic message of controller].
 (orange)	On	The device is in a communications phase CP0 up to and including CP3 or HP0 up to and including HP2. Sercos telegrams are received.	-
 (orange)	Flashing (4 Hz, 125 ms)	Device identification	-

Table 5-7: S3 (Sercos III) LED

6 Planning

6.1 Electromagnetic Compatibility, EMC

This product meets the EMC requirements in accordance with the standard IEC 61800-3:2004, provided that the EMC measures described in this manual are complied with during installation.

WARNING

ELECTROMAGNETIC DISTURBANCES OF SIGNALS AND DEVICES

Use proper EMC shielding techniques to help prevent unintended device operation in accordance with the standard IEC 61800-3:2004.

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

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

WARNING

RADIO INTERFERENCE

Do not use these products in domestic electrical networks.

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

The values are based on the following reference applications:

Reference application for wiring in line structure and/or tree structure

- 1 x Lexium 62 Power Supply (LXM62PD84A11000) with mains line reactor (choke)
- 1 x Lexium 62 Connection Module
- 3 x Lexium 62 Distribution Box
- 3 x ILM070, 4 x ILM100, 3 x ILM140
- Hybrid cable 1 x 8 m (26.25 ft) between Lexium 62 Connection Module and first Lexium 62 Distribution Box
- Hybrid cable 2 x 1 m (3.28 ft) between Lexium 62 Distribution Box and Lexium 62 Distribution Box
- Hybrid cables 3 x 1 m (3.28 ft), 4 x 1,5 m (4.92 ft), 3 x 2 m (6.56 ft) between Lexium 62 Distribution Box and Lexium 62 ILM

Reference application for wiring in Daisy Chain structure

- 1 x Lexium 62 Power Supply (LXM62PD84A11000) with mains line reactor (choke)
- 1 x Lexium 62 Connection Module
- 3 x ILM070, 3 x ILM100
- Power cable 1 x 10 m (32.8 ft) between Lexium 62 Connection Module and first Lexium 62 ILM
- Power cable 5 x 0,7 m (2.3 ft) between the Lexium 62 ILMs (from the first to the sixth Lexium 62 ILM)



For further information on this (see 8.5 Mechanical and electrical data).

Enclosure layout The prerequisite for compliance with the specified limit values is an EMC compatible layout. Depending on the application, the following measures can improve the EMC-dependent values:

EMC measures	Objective
Use galvanized or chromium-plated sub plates, bond metallic parts across large surface areas, remove paint layer from contact surfaces.	Good conductivity by surface area contact
Ground enclosure, door, and sub plates by using grounding strips or grounding cables with a cross-section of 10 mm ² (AWG 6).	Reduce emission.
Supplement switch devices such as contactors, relays, or magnetic valves with interference suppression combinations or spark suppressor elements (e.g. diodes, varistors, RC elements).	Reduces mutual interference
Fit power and control components separately.	Reduces mutual interference

Shielded cables

EMC measures	Objective
Place cable shields on the surface, use cable clamps, and grounding strips.	Reduce emission.
Ground shields of digital signal cables on both sides across large surface areas or through conducting connector housings.	Reduce interference action on signal cables, reduce emissions.
Ground shield of analog signal cables directly on the device (signal input), insulate the shield at the other cable end or ground the same through a capacitor, such as 10 nF.	Reduce grounding loops by low frequency interferences.

Cable routing

EMC measures	Objective
Do not route fieldbus cables and signal cables together with cabling for direct and alternating voltages above 60 V in the same cable duct (fieldbus cables can be routed together with signal cables and analog cables in the same duct). Electromagnetic immunity will improve by routing cables in separated cable ducts with a distance of at least 20 cm (7.84 in).	Reduces mutual interference
Keep the cables as short as possible. Do not install any unnecessary cable loops, short cable routing from a central grounding point in the control cabinet to the external grounding connection.	Reduce capacitive and inductive interference couplings.
Insert a potential equalization for: <ul style="list-style-type: none"> • large surface installation • different voltage infeeds • networking across buildings 	Reduce current on cable shield, reduce emissions.
Use fine wire potential equalization conductor.	Discharging of high frequency interference currents.
If motor and machine are not connected in a conducting fashion, e.g. due to an insulated flange or a connection not across a full surface, the motor must be grounded via a grounding cable with a minimum 4 mm ² (AWG 11) cross-section or a grounding strip with a length as short as possible.	Reduce emissions, increase interference resistance.
Use twisted pair for 24 Vdc signals.	Reduce interference action on signal cables, reduce emissions.

<i>Voltage supply</i>	EMC measures	Objective
	Operate product on mains with a grounded neutral.	Enable the effect of the integrated mains filter.
	Protection circuit if there is a risk of overvoltage.	Reduce risk of damage due to overvoltages.

Motor and encoder cables From an EMC perspective, motor supply cables and encoder cables are particularly important. Only use pre-configured cables, or cables with the prescribed properties, and comply with the following EMC measures.

EMC measures	Objective
Do not install switching elements in motor cables or encoder cables.	Reduces interference.
Route motor cable with a distance of at least 20 cm (7.84in.) to the signal cables or insert shield plates between the motor supply cable and the signal cable.	Reduces mutual interference
For cabling that approaches the maximum cable distance specification (75 m / 246 ft), use potential equalization cables.	Reduce current on cable shield.
Route motor supply cables and encoder cables without any separation point. ¹⁾	Reduces emission.
¹⁾ If a cable must be cut through for installation purposes, the cables must be connected at the point of separation by using screen connections and metal housing.	

Additional measures for improving the EMC Depending on the respective application, the following measures may lead to an EMC compatible layout:

EMC measures	Objective
Upstream connection of mains line reactors (chokes)	Reduction of the harmonic network oscillations, extension of the service life of the product.
Upstream connection of external mains filters	Improvement of the EMC limit values.
Special EMC-appropriate layout, e.g. within an enclosed control cabinet complete with 15 dB attenuation of the interferences emitted	Improvement of the EMC limit values.

6.2 Control cabinet planning

6.2.1 Degree of protection (IP)

- ▶ Install components such that a degree of protection corresponding to the actual operational environment is set up.



For more information on the degree of protection of the component (see 8.2 Ambient conditions).

The following ambient conditions may damage the components:

- Oil
- Moisture
- Electromagnetic interference
- Ambient temperature
- Metal dust deposits

⚠ WARNING

UNINTENDED EQUIPEMENT OPERATION

- Observe and conform to ambient temperatures, storage temperatures and transport temperatures of the individual components as specified in the operating manuals of the components.
- Prevent the formation of moisture during the operation, storage and transport of individual components.
- Conform to the vibration and shock requirements specified in the operating manuals for the components when operating, storing and transporting system components.

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

6.2.2 Mechanical and climatic environmental conditions in the control cabinet



- ▶ Observe the climatic and mechanical ambient conditions.

For more information on the general climatic and mechanical environmental conditions according to IEC/EN 60721 (see 8.2 Ambient conditions).

- ▶ Check the technical data of the device as to whether the permitted deviations (e.g. higher shock load or higher temperature) are specified.

6.2.3 Using Cooling Units

How to proceed when installing a cooling unit:

- ▶ Position the cooling units so that no condensate drips out of the cooling unit onto electronic components or is sprayed by the cooling air flow.
- ▶ Provide specially designed control cabinets for cooling units on the top of the control cabinet.
- ▶ Design the control cabinet so that the cooling unit fan cannot spray any accumulated condensate onto the electronic components when it restarts after a pause.
- ▶ When using cooling units, use only well-sealed control cabinets so that warm, humid outside air, which causes condensation, does not enter the cabinet.
- ▶ When operating control cabinets with open doors during commissioning or maintenance, ensure that the electronic components are at no time cooler than the air in the control cabinet after the doors are shut, in order to avoid any condensation.
- ▶ Continue to operate the cooling unit even when the system is switched off, so that the temperature of the air in the control cabinet and the air in the electronic components remains the same.
- ▶ Set cooling unit to a fixed temperature of 40 °C / 104 °F.
- ▶ For cooling units with temperature monitoring, set the temperature limit to 40 °C / 104 °F so that the internal temperature of the control cabinet does not fall below the external air temperature.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Follow the installation instructions such that the condensation from the cooling unit can not enter electronic components.

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

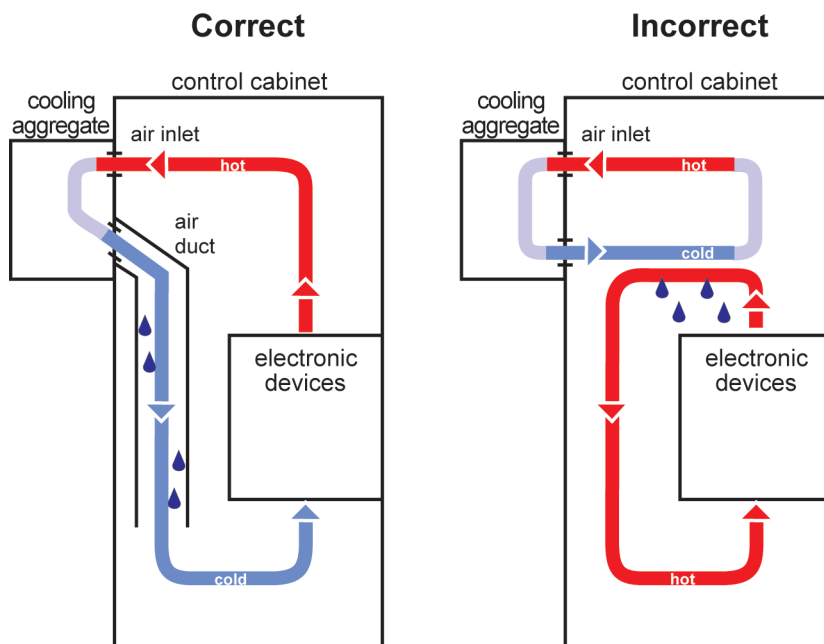


Figure 6-1: Installing a cooling unit

6.3 Information about wiring

- ▶ Use only Schneider Electric approved devices in your application.
- ▶ Use Schneider Electric pre-fabricated cables wherever and whenever possible.



For further information (see 6.3.1 Cable characteristics).

- ▶ Use a suitable torque indication or screwdriver for tightening connections (see 8.8 Electrical connections).



For information on the tightening torques and cable cross-sections (see 8.8 Electrical connections).

Observe the following points when wiring:

1. Observe the minimum cross-sections of the cables necessary for the load carrying capacity of the equipment being connected.
2. Verify the integrity of cable shields to ensure continuity to ground.
3. Ensure that there is a proper connection to ground for all interconnected equipment.
4. Ensure connection of the motors to the machine ground.
5. Eliminate any ground loops.
6. Do not disconnect cable connections terminals when under power.
7. Ensure that all ground connections have sufficient surface area continuity.
8. Connect the hybrid or power cable connections and the Sercos cable connections to the Lexium 62 Connection Module according to the connection diagram of the machine manufacturer.



For information on the different cable types (see 4.3.5 Lexium 62 ILM Accessories).

9. Do not interchange the EMERGENCY STOP circuits. This has to be observed especially when two different safety-related circuits are used for axis A and axis B of the DoubleDrive.

Example:

If, for example, two parallel conductors are shown as coming from one point, you may not run just one conductor and then branch it off at a later point. If it is wired this way, induction loops (interference emitters and antennas) as well as interfering potential shifts may occur.

DANGER

INCORRECT OR UNAVAILABLE GROUNDING

At the installation points, remove paint across a large surface before installing the devices (bare metal connection).

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

6.3.1 Cable characteristics

Property	Value
Hybrid cable voltage isolation	1000 V
Maximum continuous current	<ul style="list-style-type: none"> • DC Bus: 20 A • 24 Vdc: 20 A
Temperature range	-40 ... +80 °C / -40 ... +176 °F
Cable diameter	14.8 mm ± 0.3 mm (0.58 in. ± 0.012 in.)
Bending radius	5 x diameter (fixed routing) 10 x diameter (mobile, 5 million bending cycles)
Sheath	PUR, oil resistant, halogen-free

Table 6-1: Hybrid cable characteristics

Hybrid cable is suitable for use with drag chains.

Property	Value
Voltage isolation	1000 V
Maximum continuous current	<ul style="list-style-type: none"> • DC Bus: 20 A • 24 Vdc: 20 A
Temperature range	-40 ... +80 °C / -40 ... +176 °F (fixed routing) -25 ... +80 °C / -13 ... +176 °F (mobile)
Cable diameter	11.7 mm ± 0.3 mm (0.45 in. ± 0.012 in.)
Bending radius	5 x diameter (fixed routing) 10 x diameter (mobile, 5 million bending cycles)
Sheath	PUR, oil resistant, halogen-free, flame-retardant

Table 6-2: Cable characteristics of the power cable (daisy chain wiring)

The power cable (daisy chain wiring) is suitable for use with drag chains.

Property	Value
Voltage isolation	300 V
Temperature range	-20 ... +60 °C / -4 ... +140 °F
Cable diameter	6.7 mm ± 0.2 mm (0.26 in. ± 0.008 in.)
Bending radius	5 x diameter (fixed routing) 10 x diameter (mobile, 5 million bending cycles)
Sheath	PUR, halogen-free, flame-retardant

Table 6-3: Cable characteristics of the Sercos cable (daisy chain wiring)

The Sercos cable (daisy chain wiring) is suitable for use with drag chains.

Observe the following points when using hybrid, power, Sercos, motor and encoder cables:

- ▶ Do not exceed the maximum number of bending cycles of the cable.
- ▶ Observe the installing instructions and the maintenance cycles of this manual.
- ▶ Do not exceed the maximum permitted lifetime of the cables.

6.3.2 ESD protection measures

- ▶ Observe the following instructions to help avoid damages due to electrostatic discharge:

<i>NOTICE</i>
<p>ELECTROSTATIC DISCHARGE</p> <ul style="list-style-type: none"> • Do not touch any of the electrical connections or components. • Prevent electrostatic charges, for example, by wearing appropriate clothing. • If you must touch circuit boards, do so only on the edges. • Move the circuit boards as little as possible. • Remove existing static charge by touching a grounded, metallic surface. <p>Failure to follow these instructions can result in equipment damage.</p>

6.3.3 Conditions for UL / CSA compliant use

General

If you use the Lexium 62 ILM family in accordance with UL or CSA standards, you must additionally meet, aside from the installation requirements stated in the present document, the following conditions:

- ▶ Use devices only in combination with a Lexium 62 Power Supply on a solidly grounded wye source only (480Y/277 V).
- ▶ To protect the Lexium 62 Power Supply, use a class J fuse according to UL 248 with a maximum fuse rating of 60 A / 600 Vac.
- ▶ According to UL 508C rules, direct measurement of motor over temperature is required. This is already internally realized by the Lexium 62 ILM.
- ▶ Install the Lexium 62 Connection Module only in a Pollution Degree 2 environment.
- ▶ For use in NFPA 79 applications only.

Only connect the Lexium 62 ILM family to a mains supply with a maximum short circuit current (SCCR) of 22 kA or worst case SCCR of connected Lexium 62 Drive System. Alternatively, take appropriate measures according to UL 508A SB4 in the supply (feeder) circuit of the control cabinet to limit the short circuit current to a value at or below 22 kA or the worst case of the Lexium 62 Drive System.

According to CSA 22.2 No. 14 only a short circuit current rating of 5 kA is permissible.



For further information about conformal use of the Lexium 62 Drive System, see Lexium 62 Hardware Guide.

Notes on Wiring

For wiring of the Lexium 62 Connection Module only use at least 60 °C (140 °F) / 75 °C (167 °F) copper conductor. Consider the applicable cross section of the terminal blocks according to following table:

Connection	Torque [Nm]/[lbf in]	Connection cross section [mm ²]/ [AWG]
CN1	2.5 / 22	N/A
CN6	N/A	0.2 ... 1.5 / 24 ... 16
CN7	N/A	0.2 ... 6 / 24 ... 8
CN8	N/A	0.2 ... 6 / 24 ... 8

- ▶ Verify whether the screws of the wiring bus (CN1) have been tightened with 2.5 Nm (22 lbf in).
- ▶ Use only hybrid / power cable approved by Schneider Electric and comply with the requirements of NFPA 79.

NOTE: The opening of the branch-circuit protective device (fuses in the case of UL conformance, or any circuit breaker) may be an indication that an abnormal condition has been interrupted. To reduce the risk of fire or electric shock, current-carrying parts and other components of the controller should be examined and replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

6.3.4 Fusing the mains connection



For further information on the fusing of the mains connection, see the Lexium 62 Hardware Guide.

6.3.5 Mains contactor



For further information on the use of a mains contactor, see the Lexium 62 Hardware Guide.

6.3.6 Mains filter

The products described in the present document meet the EMC requirements in accordance with the standard IEC/EN 61800-3, provided that the EMC measures described in this manual are complied with during the installation. The values are based on the reference application (see 6.1 Electromagnetic Compatibility, EMC) specified in the manual.

The connected cable length and the number of connected motors has no significant influence on the grid-bound emitted interference. Thus, no external mains filter is required when only the Lexium 62 ILM related components are used.

In the case of a mixed system using the Lexium 62 cabinet drives combined with the Lexium 62 ILM components, the selection of the external mains filter depends on the devices installed in the control cabinet and the motor supply cables (also see Lexium 62 Hardware Guide). The hybrid cable or power cable (with daisy chain wiring) of the Lexium 62 ILM Family is not considered as motor supply cables.



For additional information on mains filtering, contact your Schneider Electric representative.

6.3.7 Mains line reactor (choke)



For further information on the use of mains line reactor (choke), see the Lexium 62 Hardware Guide.

6.3.8 Wiring with Lexium 62 DC Link Terminal



For further information about wiring with Lexium 62 DC Link Terminal and cable selection guidelines for wiring with Lexium 62 DC Link Terminal, see the Lexium 62 Hardware Guide.

6.3.9 Leakage current

Application	per Lexium 62 Connection Module	per Lexium 62 Distribution Box
typical (400 V, 50 Hz)	< 9 mA	< 18 mA

Table 6-4: Leakage currents per device



If the leakage current is too high for the respective application, use an isolating transformer on the mains supply.



For specifications on the leakage current of the Lexium 62 Power Supply, see the Lexium 62 Hardware Guide.

6.3.10 Residual current operated protective device

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

⚠ DANGER

INSUFFICIENT GROUNDING

- Use a protective ground conductor with at least 10 mm² (AWG 6) or two protective ground conductors with the same or larger cross section of the conductors supplying the power terminals.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.

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



For further information on residual current protective devices, see the Lexium 62 Hardware Guide.

6.4 Functional safety

6.4.1 Process minimizing risks associated with the machine



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

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

WARNING

NON-CONFORMANCE TO SAFETY FUNCTION REQUIREMENTS

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

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

Hazard and risk analysis

Based on the system configuration and utilization, a hazard and risk analysis can be carried out for the system (for example, according to EN ISO 12100 or EN ISO 13849-1). The results of this analysis must be considered when using the safety function. The circuit resulting from this analysis may deviate from the application examples. For example, additional safety components may be required. In principle, the results from the hazard and risk analysis have priority.

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

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

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

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

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



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

6.4.2 Designated safety function

Functional Description



With the Inverter Enable function (IE), you can bring drives to a defined safe stop. This Inverter Enable function relates to the components

- Lexium 62 Connection Module
- Lexium 62 Distribution Box
- Lexium 62 ILM

In the sense of the relevant standards, the requirements of the stop category 0 (Safe Torque Off, STO) and stop category 1 (Safe Stop 1, SS1) can be met. Both categories lead to a torque-free motor while SS1 takes this state after a predefined time. As a result of the hazard and risk analysis, it may be necessary to choose an additional brake as a safety-related option (e.g., for hanging loads).

With the optionally available Safety Option Module for Lexium 62 ILM for Lexium 62 ILM it is also possible to realize the extended safety functions such as Safely Limited Speed (SLS) in connection with the Safety Logic Controller SLC100/200 FS and the associated software SoSafe Programmable.

WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Designated safety function Safe Torque Off (STO)



The Inverter Enable function relates to Lexium 62 Connection Module, Lexium 62 Distribution Box and Lexium 62 ILM, hereinafter referred to as "Lexium 62 drive system".

The function is selected via a signal(pair) at the input of the Lexium 62 Connection Module (2), which is forwarded to all drives (7) of the Lexium 62 Connection Module network. The supply voltage (AC) needs not be interrupted (see figure below).

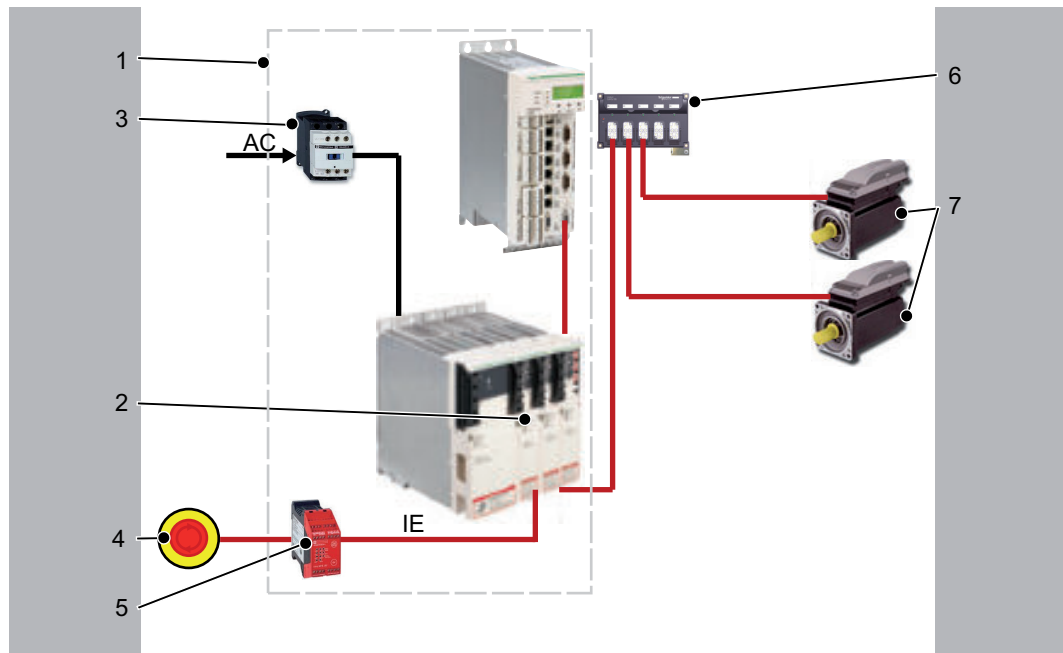


Figure 6-2: Lexium 62 drive system with emergency stop

1	control cabinet
2	Lexium 62 Connection Module
3	Contactors
4	Emergency stop switch
5	Safety switching device (e.g. Preventa XPS AV)
6	Lexium 62 Distribution Box
7	Lexium 62 ILM

Operating principle The Inverter Enable function switches off the motor torque. It is sufficient to set a logical zero at the function input. There is no need to interrupt the power supply. Standstill, however, is not monitored.

Defined Safe state Inverter Enable is synonymous with "Safe Torque Off (STO)" according to IEC/EN 61800-5-2. This torque-free state is automatically entered when errors are detected and is therefore the defined safe state of the drive.

Mode of operation The Lexium 62 connection modules have an Inverter Enable input that is used to signal all the Lexium 62 ILMs. By setting this input to logical one, all connected Lexium 62 ILMs are enabled. If this input is set to a logical zero, the Lexium 62 ILM connection module signals all connected Lexium 62 ILMs to interrupt the power stage to their respective motors. This Inverter Enable input has a redundant design (DC voltage from which the Lexium 62 Connection Module generates AC voltage which is fed to the hybrid cable or power cable (in case of daisy chain wiring)). The interruption of one of the two channels also results in a deactivation of the power stage. When the power supply is interrupted, the power stage becomes de-energized, and a diagnostic mes-

sage is generated and made available to the LMC. The motor can no longer generate torque.

You can use the Inverter Enable function to implement the control function "Stopping in case of emergency" (IEC/EN 60204-1) for stop categories 0 and 1. Use an appropriate external safety circuit to prevent the unintended restart of the drive after removal of the power stage, as required in the machine directive.

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

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

WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Stop category 1 For stops of category 1 (Safe Stop 1, SS1) you can request a controlled stop via the PacDrive LMC. The controlled stop by the PacDrive LMC is not safety-relevant, nor monitored, and does not perform as defined in the case of a power outage or if an error is detected. The final switch off in the defined safe state is accomplished by switching off the "Inverter Enable" input. This has to be implemented by means of an external safety-related switching device with safety-related delay (see application proposal).

Independent of the safety function, the detectable errors not affecting the safety function are recognized by the controller, thus avoiding the drive from starting by switching off the mains contactor. Contactor K2 prevents the mains contactor from being switched on.

Execute muting To execute muting proceed as follows:

- ▶ To execute muting, determine the muting reaction time for switching off, that is, without the Inverter Enable function, within the application.

Should a response time be required because of the risk assessment of the machine, the total response time of the machine has to be taken into account. That is to say, the components related to the safety functions from the sensor to the drive shaft or the driven mechanics have to be considered. The determined reaction time must correspond to the results of the hazard and risk analysis.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the maximum response time corresponds to your risk analysis.
- Be sure that your risk analysis includes an evaluation for the maximum response time.
- Validate the overall function with regard to the maximum response time and thoroughly test the application.

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

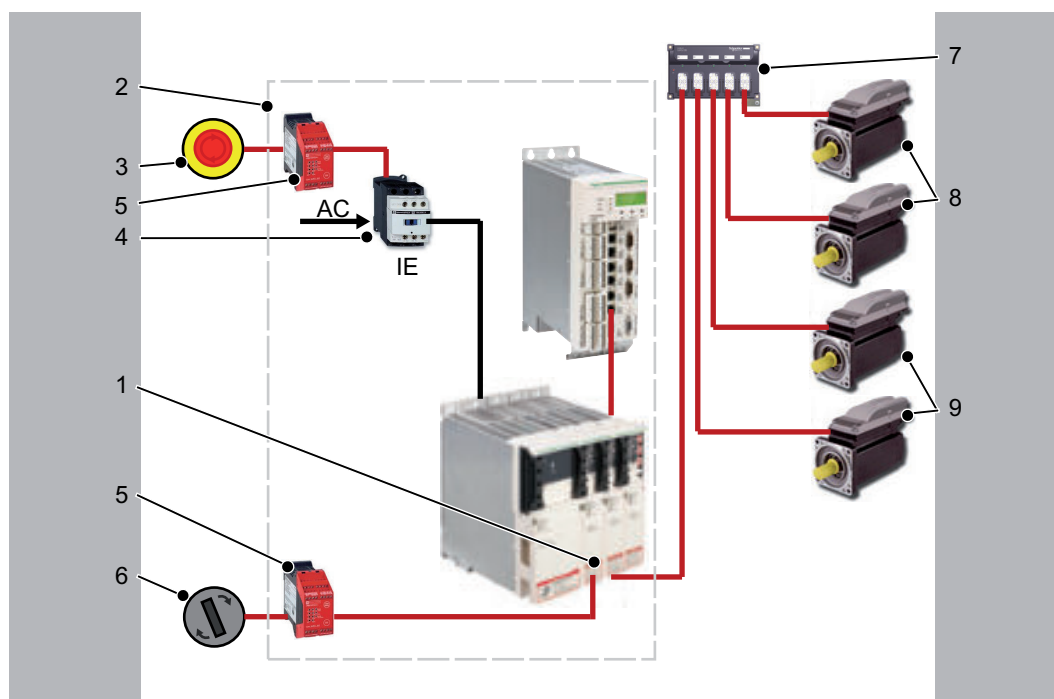
Proceed as follows to deactivate the Inverter Enable function:

- ▶ You can deactivate the Inverter Enable function by using the optional module DIS1. (see 6.4.3.1 Perform muting with the optional module DIS1)
 - ✓ The defined safe state can only be achieved if the power is removed from the power supply (see 6.4.3 Setup, installation, and maintenance).
- ▶ In order to use the DIS1 optional module, you must define the configuration with the parameter `InverterEnableConfig` of the Lexium 62 ILM in the motion controller configuration.

If the software configuration does not match the physical configuration of the Lexium 62 ILM, then the diagnostic message 8978 "InverterEnableConfig invalid" with "Ext. diagnostic = x(HW)!=y(Cfg)" is presented. The drive is disabled as long as the configuration is incorrect. The error can only be acknowledged if the set `InverterEnableConfig` corresponds to the physical configuration. The deactivation of the Inverter Enable function can be used to divide the drives on a Lexium 62 Connection Module in two groups if it is technically not possible to use two Lexium 62 Connection Module for the two groups in the existing machine.

The axes without Inverter Enable function become torque-free via the mains contactor and come to a stop.

If only some of the drives attached to a Lexium 62 Connection Module (1) are to be put in the defined safe state, this can be achieved by the configuration of the drives. This can be of interest, for example, for maintenance procedures (6). If an optional module DIS1 (9) is set, then the Inverter Enable signal will be ignored. To implement the emergency stop, the supply voltage on the Lexium 62 power supply must be interrupted; see illustration below.



1	Lexium 62 Connection Module
2	control cabinet
3	Emergency stop switch
4	Contactor
5	Safety switching device (e.g. Preventa XPS AV)
6	Switch: Operating mode (normal/maintenance)
7	Lexium 62 Distribution Box
8	Lexium 62 ILM (without DIS1)
9	Lexium 62 ILM (with DIS1)

Table 6-5: Implementation of "Emergency stop" combining hard-wired control of supply power with the Inverter Enable function.

ILM	Maintenance	Emergency stop	Parameter Inverter-EnableConfig
Lexium 62 ILM without DIS1 (8)	Torque-free motor	Torque-free motor	Standard/1
Lexium 62 ILM with DIS1 (9)	-	Torque-free motor	Off/0

Extended safety-related functions

Operating principle The safety concept is based upon the general consideration that the required safety-related travel movement is performed by the controller and the drive. The safety system monitors the correct execution of the motion, and if it is not respected the safety system initiates the required fall-back level (e.g. the defined safe state).

An example for Safely Limited Speed (SLS) is as follows:

A light curtain is connected to a safety-related digital input. As soon as a person enters the protected zone passing the light curtain, a corresponding information is transmitted to the safety logic controller (SLC) and the logic motion controller (LMC) via the Sercos bus. After that the controller (LMC) initiates an adequate travel movement, e.g. by means of decelerating and subsequently moving slowly. After an adjustable delay time this slow movement is monitored by Safety Option Module for Lexium 62 ILM. Upon exceeding an adjustable threshold value (e.g. high velocity) the required fall-back level is entered, for example, the defined safe state.

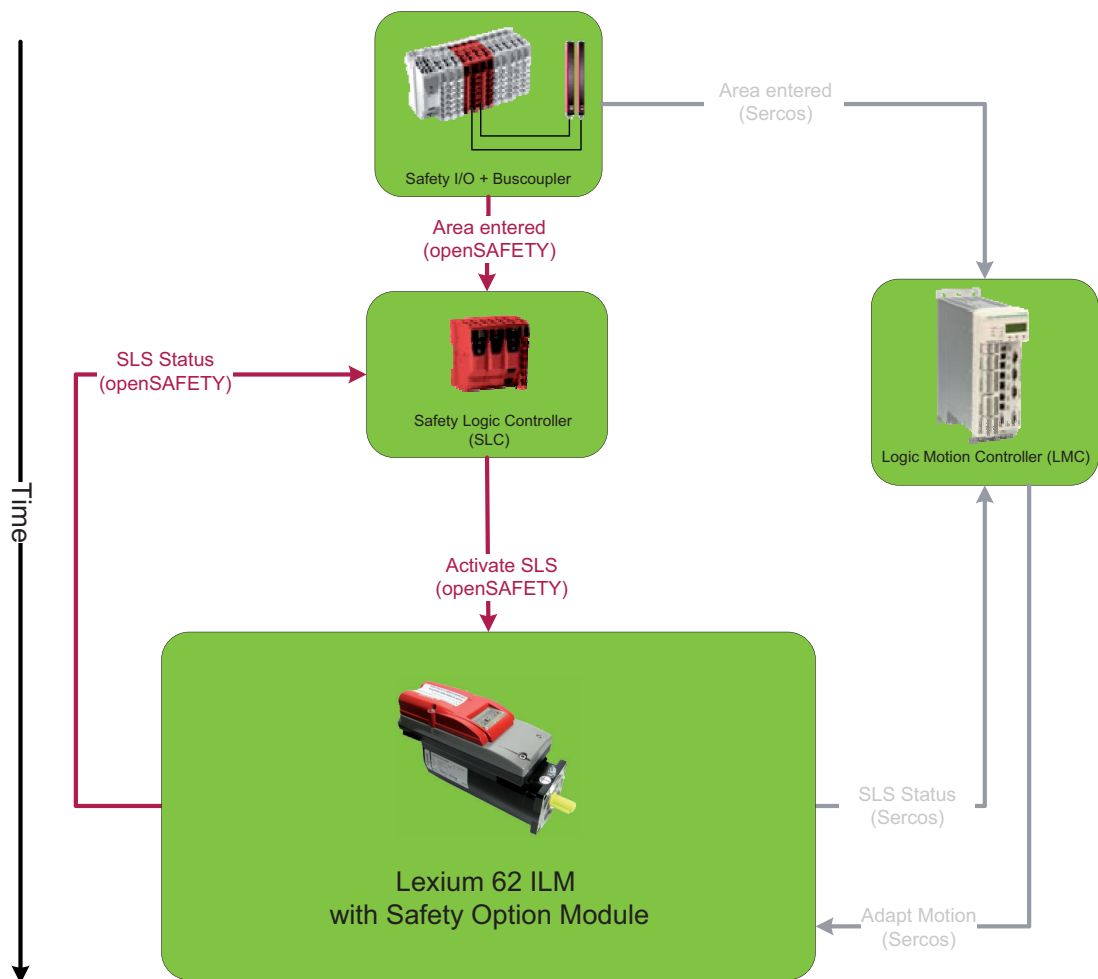


Figure 6-3: Application of safety function SLS

Inverter Enable via hardware input The Safety Option Module for Lexium 62 ILM has been primarily developed to realize the extended safety functions, however, it still can be accessed via the usual hardware input for the Inverter Enable of the Lexium 62 ILM Family system. If only this is to be used, the device still needs to be configured and parameterized by means of the software. If it is hard-wired, the "Safe Torque Off (STO)" function can be triggered via this input or the Sercos bus.

The Safety Option Module for Lexium 62 ILM can be configured to ignore the hardware input. In this case the Safe Torque Off (STO) function can only be activated upon a

request over the Sercos bus. Otherwise if the hardware input is not ignored then both requests (hardware input and Sercos bus) are verified and the Safe Torque Off (STO) function is triggered if one or both requests are active. The default configuration is not to ignore the hardware input.

Defined safe state The defined safe state of the device is characterized by the following features:

- The drive is torque-free, which is equivalent to “Safe Torque Off (STO)” according to IEC 61800-5-2.
- There is no safety-related communication from the drive via the Sercos bus.

This state is automatically entered when errors are detected.

Validity of the safety case

The safety case for the designated safety function of the Lexium 62 ILM is identified and defined by the standards listed in chapter "Safety standards" (see 6.4.10 Safety standards). The safety case for the designated safety function of the Lexium 62 drive system applies to the following hardware codes, which can be found examining the appropriate software object in SoMachine Motion (see SoMachine Motion, Programming Guide):

Unicode	Hardware code:
ILM 070/xx	xxxxxxxx1xx, xxxxxxxxxxx2xx
ILM 100/xx	xxxxxxxx1xx, xxxxxxxxxxx2xx
ILM140/xx	xxxxxxxx1xx, xxxxxxxxxxx2xx
DIS1	1
ILM62CM	xxxxxx1xx, xxxxxx2xx
ILM62DB	xxxxxx1xx

Device	Hardware codes
VW3E702200000	011A1110



For questions on this, contact your Schneider Electric representative.

Interface and control

The Inverter Enable function is operated via the switching thresholds of the Inverter Enable-input (IE_p1/IE_p2 at Pin1/Pin2, IE_n1/IE_n2 at Pin3/Pin4) of the Lexium 62 connection module.

- Maximum downtime: 500µs at $U_{IE} > 20V$ with dynamic control
- Maximum test pulse ratio: 1Hz
- STO active: $-3V \leq U_{IE} \leq 5V$
- Power stage active: $18V \leq U_{IE} \leq 30V$



Technical data and information on the electrical connections of the Lexium 62 ILM system or the Lexium 62 connection module can be found under Technical data (see 8 Technical data).

The Inverter Enable function is operated via the switching thresholds of the Inverter Enable-input of the Lexium 62 connection module.



Technical data and information on the electrical connections of the Lexium 62 connection module can be found in the Lexium 62 ILM Hardware Guide.

6.4.3 Setup, installation, and maintenance

Prevent possible unintended operation and avoid overvoltage

The following measures avoid overvoltages and help prevent possible unintended equipment operation through conductive pollution or parts falling into the device:

DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Install Lexium 62 Connection Module in a control cabinet or housing with a minimum IP54 rating.
- Comply with the clearances and creepage distances according to EN 50178.
- Lexium 62 drive system must only be operated with 24 Vdc power supplies certified according to IEC/EN 60950 or EN 50178.

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



These power supply units do not deliver an overvoltage over 120 Vdc for more than 120ms or no permanent overvoltage over 60 Vdc.

- ▶ Only operate the drive system with approved, specified cables, accessories and replacement equipment by Schneider Electric.

DANGER

ELECTRIC SHOCK OR ARC FLASH

Do not use non-Schneider Electric approved cables, accessories or any type of replacement equipment.

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

Avoid unintentional restart

The unintentional restart of the equipment must be avoided by appropriate means, depending on your particular application.

DANGER

UNINTENTIONAL RESTART OF THE MOTOR

- Ensure that a restart of the motor is not possible after a return of power or the tripping of a functional safety device unless preceded by a deliberate enable signal from the system.
- Ensure that the enable signal meets the specified safety criteria (see 6.4.4 Application proposals for hardware-based safety functions).

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

Encoder connection when using extended safety-related functions

Safety Option Module for Lexium 62 ILM enables the use of extended, position-dependent and/or velocity-dependent safety functions.

To avoid that the system is in a continuous defined safe state, proceed as follows:

- ▶ Observe the specified maximum configuration (number of devices, network structure and cable length), or else a power drop of the Inverter Enable signal will occur over the cable length and therefore the system will be in the defined safe state continuously.
- ▶ Connect per Lexium 62 Connection Module a maximum of 45 Lexium 62 ILMs.

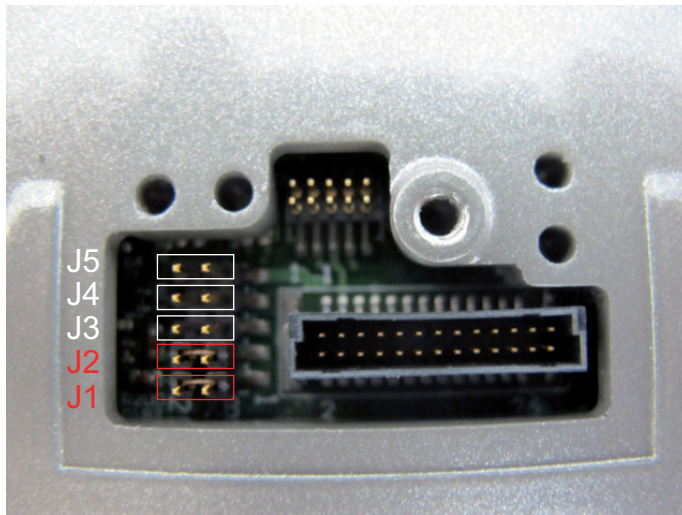


For further information on the dimensions of the maximum system extension for wiring in line structure or tree structure (see 7.1.6 Wiring the Lexium 62 connection module in linear or tree topologies) or daisy chain structure (see 7.1.7 Wiring from the Lexium 62 connection module in a daisy chain topology):

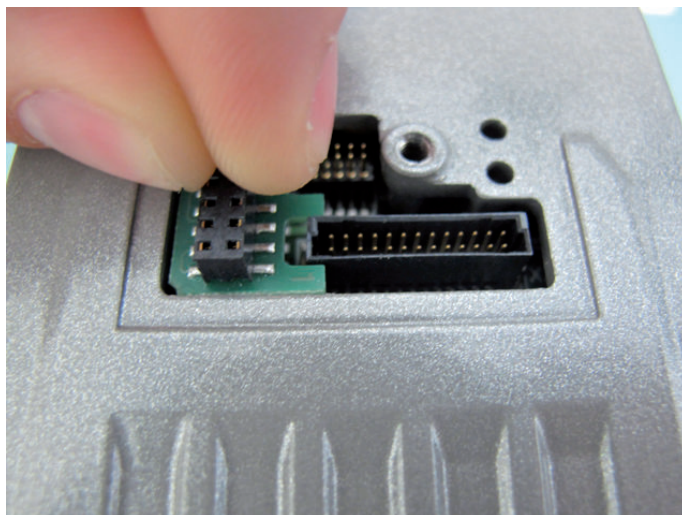
Perform muting with the optional module DIS1

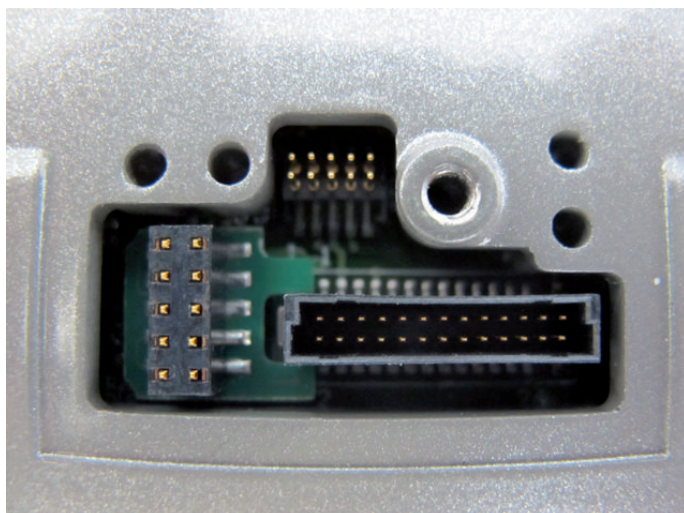
How to install the optional module DIS1:

- You cannot use the option modules DIS1 and Safety Option Module for Lexium 62 ILM together.
- ▶ Remove power to the Lexium 62 power supply during the installation of the DIS1 module.
- ▶ Remove the transparent cover plate on the motor.
- ▶ Remove plugged in jumpers J1 and J2 (see figure).



- ▶ Connect the optional module DIS1 by inserting it into the contact pins, as shown in the following figure.

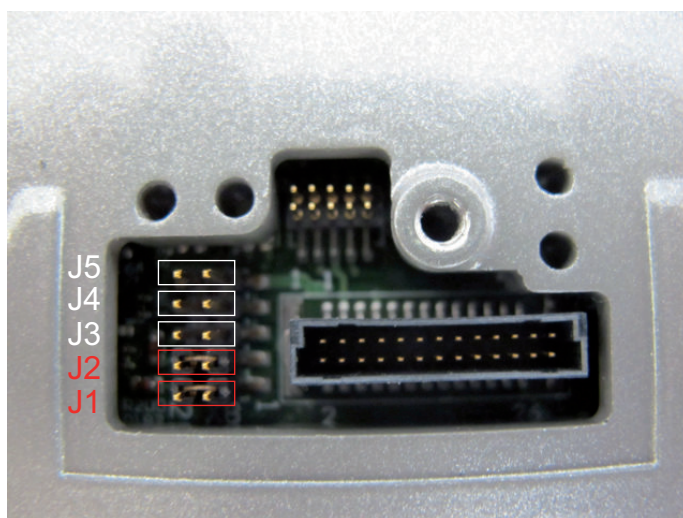




- ▶ Replace the transparent cover plate on the motor and secure it.

How to disassemble the optional module DIS1:

- ▶ Remove power to the Lexium 62 power supply during the installation of the DIS1 module.
- ▶ Remove the transparent cover plate on the motor.
- ▶ Remove the optional module DIS1.
- ▶ Re-connect the jumpers J1 and J2 (see figure).



- ▶ Replace the transparent cover plate on the motor and secure it.

6.4.4 Application proposals for hardware-based safety functions

To implement the safe stop of category 1 (SS1):

- Refer to the schematic EL-1122-05-xx: Inverter Enable circuit Lexium 62 Connection Module/Lexium 62 ILM using the PacDrive LMC Pro / PacDrive LMC Pro2 with safety switch device for an emergency stop circuit

Notes on application proposals

- General*
- All application proposals provide for a protected Inverter Enable-wiring (control cabinet IP54) from the safety-related switch device to the Lexium 62 Connection Module, as wiring issues need to be ruled out.
 - Protection against automatic restart must be provided by the external safety-related switch device.

Notes on EL-1122-05-xx The mains contactor in this circuit suggestion is not necessary for functional safety purposes. It is, however, used in the application proposal for the device protection of the Lexium 62 Power Supply or the components connected to it.

6.4.5 Application proposals for software-based safety functions

Proceed as follows to use the Inverter Enable via hardware or extended safety functions by means of Safety Option Module for Lexium 62 ILM:

- ▶ Perform the assembly for Safety Option Module for Lexium 62 ILM.
- ▶ Configure the safety-related network.
- ▶ Adjust the parameters, in particular the prioritization of Inverter Enable via hardware and STO via the bus.
- ▶ Program the SoSafe Programmable application.

Note: Observe the information on the parameters and the SoSafe Programmable software in the SoMachine Motion online help.



Further information on the parameters and the SoSafe Programmable Software can be found in the SoMachine Motion online help.

6.4.6 Commissioning

- ▶ Carry out a functional test of the STO function for all drives that need the safety function.
- ▶ Especially verify the correct application of the axes without Inverter Enable function.
- ▶ Complete installation in accordance with the EMC regulations and further specifications in the device operating manuals.
- ▶ Afterwards commission the drive systems.



When using the extended safety functions, the Safety Option Module for Lexium 62 ILM must be configured, parameterized and programmed according to the SoMachine Motion online help as well as SoSafe Programmable online help.

6.4.7 Best Practices



At machine start-up, the connected drives are usually hidden from sight of the machine operator and cannot be monitored directly.

WARNING

UNSUPERVISED MACHINE START-UP

Only start the machine if there are no persons within the zone of operation of moving machine components.

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

Verify connections

- ▶ Verify all terminals, connectors and other connections on all system components for correct and firm fit.
- ▶ Only use robust connectors and secure fixings.
- ▶ Verify the protective ground (earth) 24Vdc PELV supply.
- ▶ Verify the wiring of the safety function to the axes to avoid an interchange of the ie_sig and IE_ref inputs as well as the 24V supply.
- ▶ Use coded connectors (see 6.3 Information about wiring) and perform a commissioning test (see 7.1 Commissioning).

DANGER

ELECTRIC SHOCK BY INADEQUATE PROTECTIVE SEPARATION

Only connect devices, electrical components, or lines to the signal voltage connectors of these products that feature a sufficient, protective separation from the connected circuits in accordance with the standards (IEC 61800-5-1: Adjustable speed electrical power drive systems - safety requirements).

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

- ▶ Use only suitable transport packaging to forward or return individual devices.

External forces

The defined safe state of the motor is the torque-free output shaft. If external forces act upon the output shaft, it will not necessarily maintain its position. In any case, the motor will coast to an unassisted stop. This coast down time depends on physical properties of the components used (such as weight, torque, friction, etc.), and additional measures such as mechanical brakes may be necessary to help prevent any hazard from materializing. If the torque-free defined safe state is inappropriate for your application where external forces may move the output shaft as determined by your risk assessment, implement other external safety-related measures.

WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Hanging and pulling loads

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

WARNING

UNINTENDED AXIS MOVEMENT

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

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



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

6.4.8

Maintenance

The safety function has been designed for a defined lifetime that does not require specific maintenance or verification. After this lifetime a statement about the safety function cannot be made due to the aging of the component. If you want to ensure the functional safety after this period, you need to replace the device that includes the safety function.



Subject the product to a complete function test after replacement.

The following applies for Safety Option Module for Lexium 62 ILM :

In addition to the LED state (see 5.3.1 State LED), data of the Safety Logger is also available in the SoMachine Motion Logic Builder. These are provided for information only and must not be used for safety-related diagnostics.



See the "Installation and Maintenance" of this operating instruction chapter for information about initial start-up and maintenance.

6.4.9 Physical environment

The system is not protected against physical or chemical sources of damage by any design features, such as:

- toxic,
- explosive,
- corrosive,
- highly reactive, or
- inflammable types.

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.

WARNING

UNINTENDED EQUIPMENT OPERATION

- Observe and conform to the ambient, storage and transport temperatures of the individual components indicated in the operating manuals of the components.
- Prevent the formation of moisture during the operation, storage and transport of individual components.
- Conform to the vibration and shock requirements specified in the operating manuals for the components when operating, storing and transporting system components.

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

The Lexium 62 Power Supply and the Lexium 62 Connection Module must only be installed in an electrical equipment enclosure (for example, in a control cabinet). The electrical equipment enclosure must be lockable by using a key or tool. The Lexium 62 ILM and the Lexium 62 Distribution Box are intended for installation in a machine.

6.4.10 Safety standards

The designated safety functions have been designed and tested for functional safety according to the following standards:

- IEC 61508:2010
- IEC 61800-5-2:2007
- EN ISO 13849-1:2008
- IEC 62061:2005

An independent assessment was performed by TÜV NORD.

According to the above listed standards, the figures for the devices for using the Inverter Enable function are as follows:

Standard characteristics	Lexium 62 Connection Module	Lexium 62 ILM	Lexium 62 ILM with installed Safety Option Module for Lexium 62 ILM
SFF (IEC 61508) Safe Failure Fraction	99%	99.9%	99%
HFT (IEC 61508) Hardware Fault Tolerance	1	1	1
Type (IEC 61508)	A	A	B
SIL (IEC 61508) Safety Integrity Level SILCL (IEC 62061) Safety Integrity Level claim limit	3	3	3
PFH (IEC 61508) Probability of Dangerous Failures per Hour	1.3*10 ⁻⁹ /h	0.08*10 ⁻⁹ /h	1.6*10 ⁻⁹ /h
PL (cat) (EN ISO 13849-1) Performance Level (Category)	e (4)	e (4)	e(4)
MTTFd (EN ISO 13849-1) Mean Time to Dangerous Failure	881 years	14487 years	320 years
DC (EN ISO 13849-1) Diagnostic Coverage	99%	99%	99%
Lifetime	20 years	20 years	20 years
Maximum reaction time between the request and execution of the designated safety function	5 ms	5 ms	10 ms
Maximum reaction time before the detection of safety-related errors	5 ms	5 ms	10 ms
Maximum reaction time between exceeding the threshold values of extended safety functions and the initiation of substitute reactions	Not applicable	Not applicable	10 ms
Lexium 62 Distribution Box: The elimination from consideration of certain errors within the safety-related parts of the control system, known as Fault Exclusion within various IEC, ISO, NFPA and ANSI standards, has been applied because clearances and creepage standards have been respected in the product. The plug-in connectors have been included in the PFH figures of Lexium 62 Connection Module and Lexium 62 ILM.			
Note: The values specified are rounded individually and are therefore not a result of a conversion by, for example, PFH in MTTFd or the comparative tables from EN ISO 13849-1:2008.			

Table 6-6: Standard characteristics

Standard characteristics	Safety Option Module for Lexium 62 ILM
	MTTFd (EN ISO 13849-1) Mean Time to Dangerous Failure [years]
Use of Safely Limited Speed (SLS) etc.	-
... with Sick Stegmann encoder SKM36	250
... with Sick Stegmann encoder SKS36	250

Table 6-7: Standard characteristics - Safety Option Module for Lexium 62 ILM

6.5 Special Conditions

6.5.1 Low air pressure

If the installation altitude exceeds the specified rated installation altitude, the performance of the entire system is reduced.

Lexium 62 Power Supply

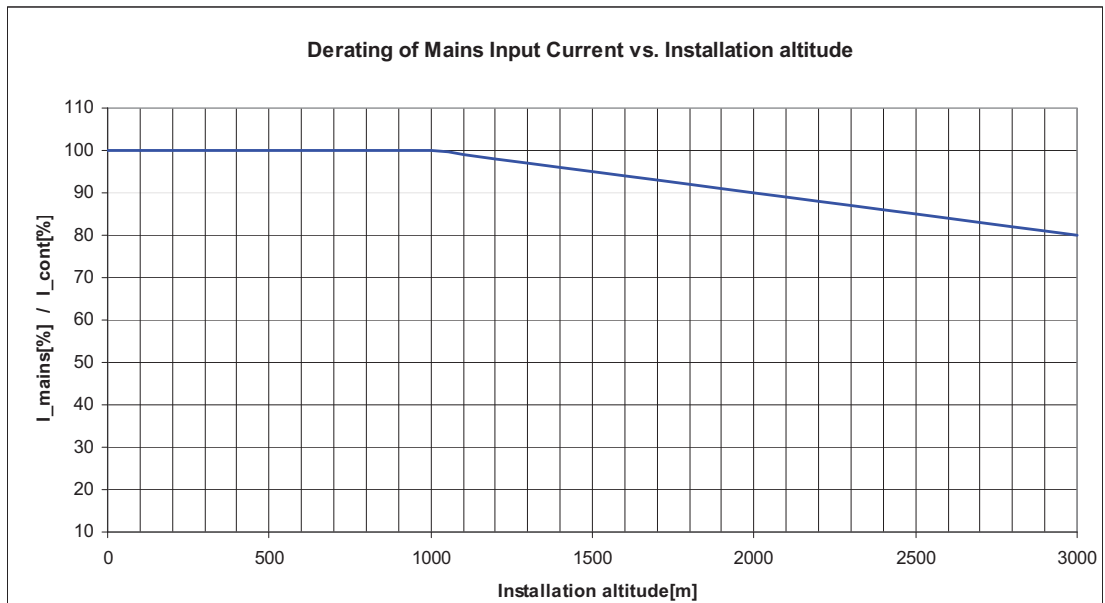


Figure 6-6: Power reduction at increased installation altitude (Lexium 62 power supply)

Lexium 62 Connection Module

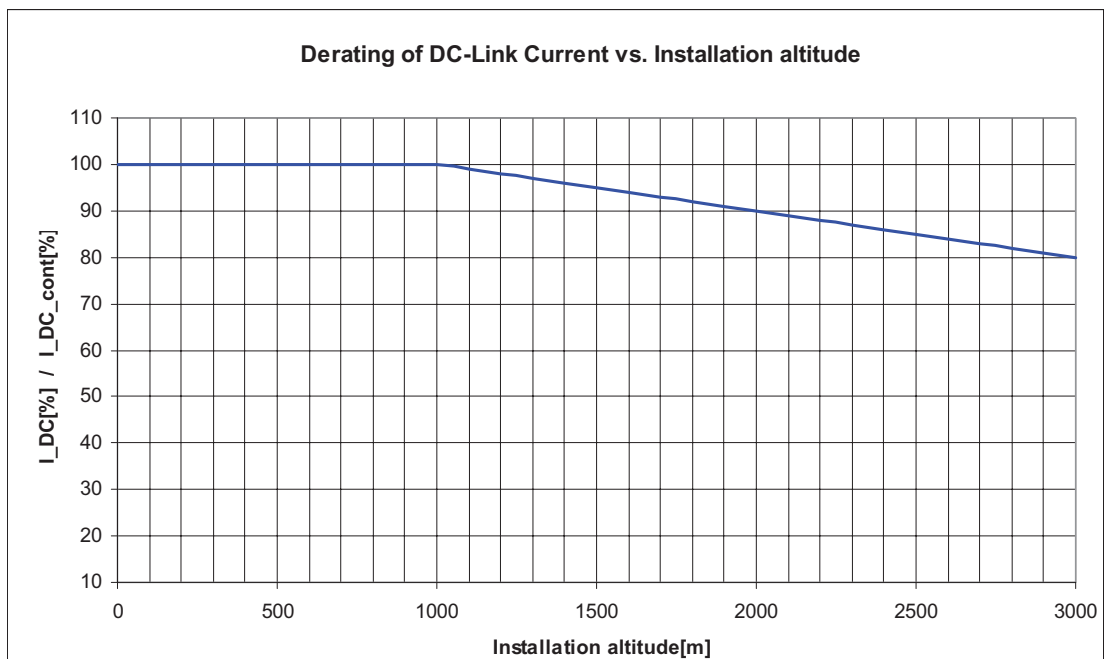


Figure 6-7: Power reduction at increased installation altitude (Lexium 62 connection module)

Lexium 62 ILM

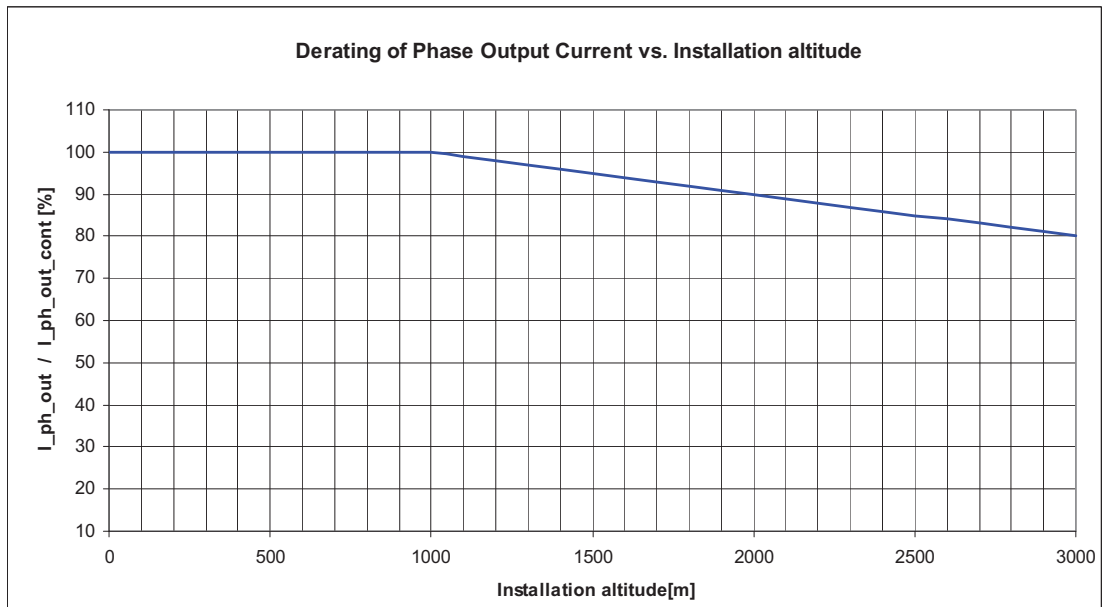


Figure 6-8: Power reduction at increased installation height (Lexium 62 ILM at 8 kHz clock frequency of power stage)



Multiply the values with the nominal current at 40°C / 104°F in order to calculate the maximum current value, depending on the required installation altitude.

7 Installation and maintenance

Proceed with care during the following steps in order to help to prevent the following points:

- Injuries and material damage
- Incorrect installation and programming of components
- Incorrect operation of components
- Use of non-authorized cables or modified components

WARNING

INCORRECT INSTALLATION

Ensure the correct installation and maintenance of the system according to the instructions contained in the present document and other supporting documents.

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

The Lexium 62 ILMs (drive/motor combination) have been derived from the Schneider Electric SH3 family of motors, and therefore share many, but not all, characteristics. However, when it comes to mounting the motor, the Lexium 62 ILMs are equivalent to the SH3 motors. Consult the SH3 Servo motor, Motor Manual for details of installing the Lexium 62 ILMs.

The correspondence between the Lexium 62 ILMs and the SH3 motors are as follows:

Lexium 62 ILM	SH3 motor
ILM070	SH3070
ILM100	SH3100
ILM140	SH3140

7.1 Commissioning

DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Operate electrical components only with a connected protective ground (earth) cable.
- After the installation, verify the secure connection of the protective ground (earth) cable to all electrical devices to ensure that connection complies with the connection diagram.
- Before enabling the device, safely cover the live components to prevent contact.
- Do not touch the electrical connection points of the components when the module is energized.
- Provide protection against indirect contact (EN 50178).
- Connect and disconnect cables and terminals only after you have verified that the power has been removed from the system.
- Insulate the unused conductors on both ends of the motor cable.

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

- ESD protection** ▶ Observe the following instructions to help avoid damages due to electrostatic discharge:

NOTICE

ELECTROSTATIC DISCHARGE

- Do not touch any of the electrical connections or components.
- Prevent electrostatic charges, for example, by wearing appropriate clothing.
- If you must touch circuit boards, do so only on the edges.
- Move the circuit boards as little as possible.
- Remove existing static charge by touching a grounded, metallic surface.

Failure to follow these instructions can result in equipment damage.

7.1.1 Preparing commissioning

***Unpacking* How to unpack the device:**

- ▶ Remove packaging.
- ▶ Dispose of the packaging material in accordance with the relevant local regulations.

***Verifying* How to verify the device:**

- ▶ Verify that the delivery is complete on the basis of the delivery slip.
- ▶ Closely inspect the device for any signs of damage.

WARNING

UNINTENDED EQUIPMENT OPERATION

- Do not mount or commission damaged drive systems.
- Do not modify the drive systems.
- Send back inoperative devices.

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

- ▶ Verify the data with the help of the nameplates.
- ▶ Observe requirements for the installation location.
- ▶ Observe requirements for the degree of protection and the EMC rules.
- ▶ In addition to the following instructions, also note the information in the chapter "Planning".
- ▶ Then install Lexium 62 ILM component.

7.1.2 Grinding the holding brake



Regrind the holding brake if a motor was stored for over 2 years before mounting.

How to disassemble the motor:

- ▶ Observe the general (see 7.4 Replacing Lexium 62 components and cables) and special (see 7.4.3 Replacement of the Lexium 62 ILM) measures for device replacement.
- ▶ Put main switch in "OFF" position to free system of voltage.
- ▶ Prevent main switch from being switched back on.
- ▶ Disconnect all connection cables on the motor.
- ▶ Loosen the screw connections on the motor.
- ✓ The motor is removed from the machine and disconnected from all electrical supply lines.

How to regrind the holding brake:

- The motor must not be installed in machine and the holding brake must be engaged.

⚠ WARNING

UNINTENDED AXIS MOVEMENTS

Grind holding brake only when the removed motor is disconnected from all electrical supply lines.

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

- ▶ Verify the holding torque of the holding brake using a torque wrench.
- ▶ Compare the value to the specified holding torque of the holding brake upon delivery (see 8.5.10 Holding brake).
- ▶ If the holding torque of the holding brake considerably differs from the specified values, manually rotate the motor shaft by 25 rotations in both directions.
- ▶ Repeat the process.
Contact your Schneider Electric representative if you cannot restore the original holding torque after repeating the process 3 times.

7.1.3 Preparing the control cabinet

⚠ DANGER

INCORRECT OR UNAVAILABLE GROUNDING

At the installation points, remove paint across a large surface before installing the devices (bare metal connection).

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

- ▶ If necessary to maintain and respect the maximum ambient operating temperature, install additional fan in the control cabinet.
- ▶ Do not block the fan air inlet of the product.
- ▶ Drill mounting holes in the control cabinet in the 45 mm / (1.77 in) (± 0.2 mm / ± 0.01 in) mounting-grid pattern .
- ▶ Observe tolerances as well as distances to the cable channels and adjacent Lexium 62 cabinet drives or other heat producing equipment.

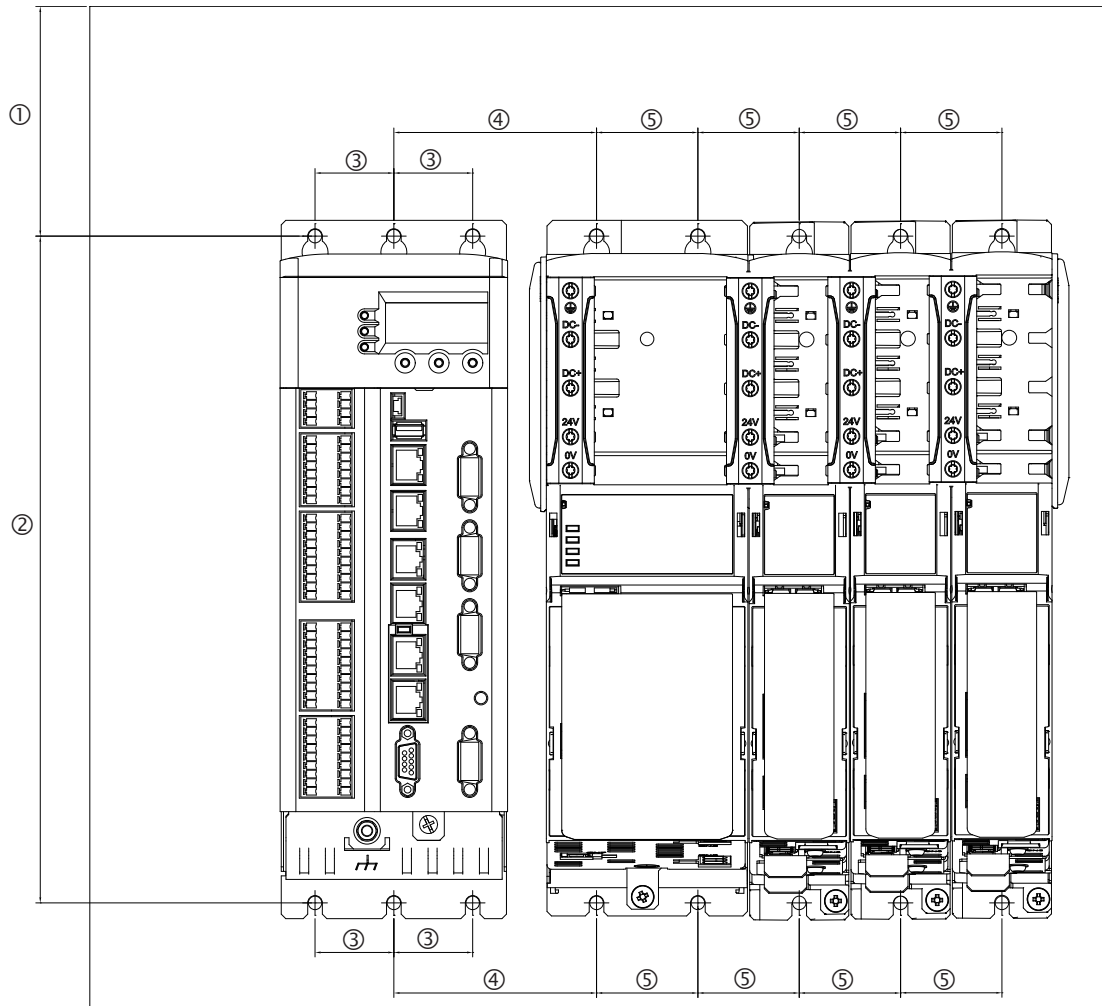


Figure 7-1: Required distances in the control cabinet for the PacDrive LMC, Lexium 62 power supply, Lexium 62 connection module

-	mm	in.	thread
(1)	> 100 (± 0.2)	> 3.94 (± 0.01)	M6
(2)	296 (+ 0.5 ; -0)	11.65 (± 0.01)	M6
(3)	35 (± 0.2)	1.38 (± 0.01)	M6
(4)	90 (±0.2)	3.54 (± 0.01)	M6
(5)	45 (±0.2)	1.77 (± 0.01)	M6

- Keep a distance of at least 100mm (3.94in.) above and below the devices.

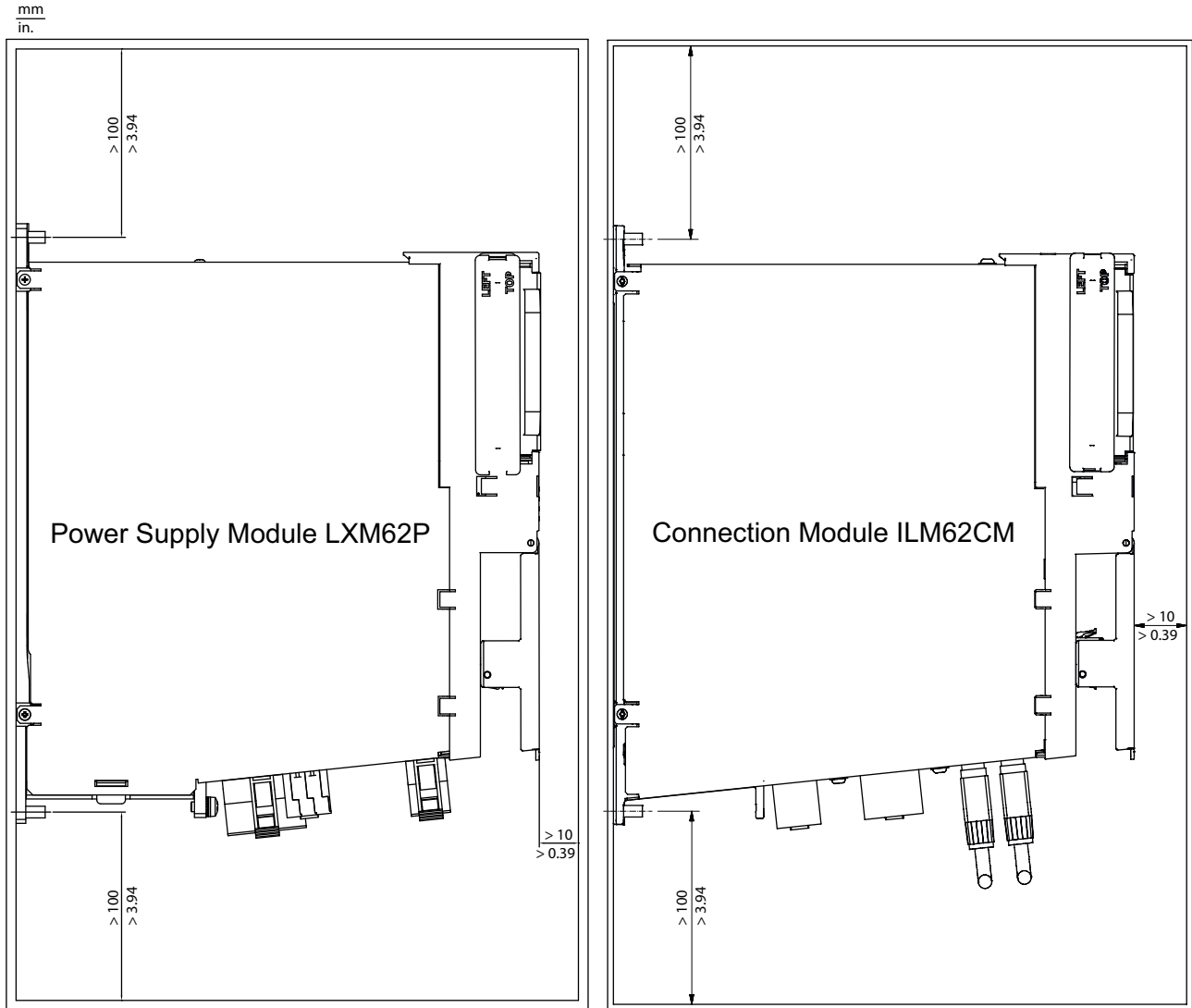


Figure 7-2: Required distances in the control cabinet

- ▶ Do not lay any cables or cable channels over the servo amplifiers or braking resistor modules.

7.1.4 Mechanical mounting

NOTE: For further information about mechanical mounting of the Lexium 62 DC Link Support Module, see the Lexium 62 Hardware Guide.

Lexium 62 Power Supply Module and Lexium 62 Connection Module

- ▶ Remove the shock protector covers on the module sides (Lexium 62 Power Supply and Lexium 62 Connection Module) on which the modules are connected with each other.
- ▶ For this purpose, press the screwdriver in the opening (1) (blade width 5.5 - 8mm / 0.22 - 0.31in.) on the top side of the module to loosen the shock protector cover.
- ▶ Subsequently, remove the shock protector covers toward the outside.

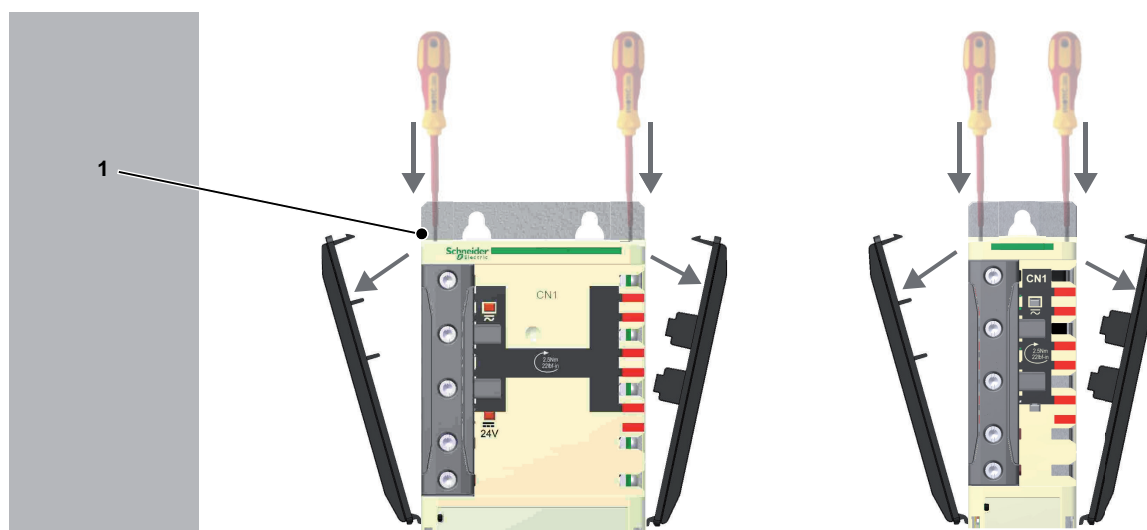


Figure 7-3: Remove the shock protector covers.

- ▶ Afterwards, screw the pan-head screws M6 (socket head cap screws) into the prepared mounting holes.
- ▶ Keep a distance of 10mm (0.39in.) between the screw head and the mounting plate.
- ▶ Hook in device and check the vertical mounting arrangement.
- ▶ Place the Lexium 62 Power Supply and Lexium 62 Connection Module in the following order from left to right according to the current carrying capacity:
 - 1st Lexium 62 Power Supply
 - 2nd Lexium 62 Connection Module



By doing this, the load on the DC bus- and 24V-supply at the wiring bus is reduced.

- ▶ Tighten the mounting screws (torque: 4.6Nm /41lbf in).

Daisy Chain Connector Box and Lexium 62 ILM

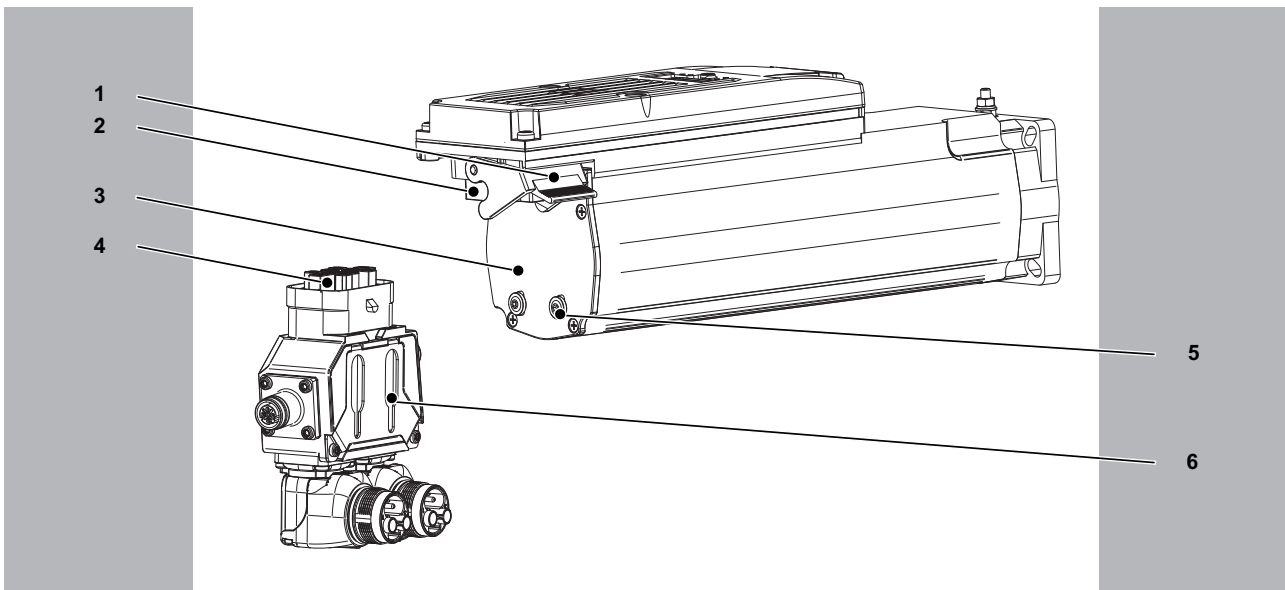


Figure 7-4: Installation of the Daisy Chain Connector Box on the Lexium 62 ILM

- ▶ Place the Daisy Chain Connector Box flush onto the rear side of the Lexium 62 ILM so that the two guide lugs (5) are inserted in the two guide slots (6).
 - ✓ The Daisy Chain Connector Box lies completely flush on the rear side of the Lexium 62 ILM (3).
- ▶ While the Daisy Chain Connector Box is lying flush on the rear side of the Lexium 62 ILM (3), push it upward as far as it will go.
 - ✓ The hybrid plug connector (4) is inserted as far as it will go into the hybrid socket connector (2) of the Lexium 62 ILM.
- ▶ Close the locking latch (1).

NOTICE

BROKEN TABS ON THE LOCKING LATCH

Only close the locking latch (1) when the hybrid plug connector (4) is fully seated into the hybrid socket connector (2) and the Daisy Chain Connector Box lies flush on the rear side of the Lexium 62 ILM (3).

Failure to follow these instructions can result in equipment damage.

7.1.5 Wiring Power Supply Module LXM62P and Lexium 62 connection module



NOTE: For further information about wiring of the optional Lexium 62 DC Link Terminal and/or Lexium 62 DC Link Support Module, see the Lexium 62 Hardware Guide.

This is how you wire the modules:

- ▶ Check if the slide on the Bus Bar Module can be easily moved.
- ▶ Connect devices via the slide of the Bus Bar Module.
- ▶ Tighten the screws of the Bus Bar Module (torque: 2.5 Nm / 22 lbf in).
- ▶ Mount the shock protector covers LEFT TOP (1) and RIGHT TOP (2) on the outside of the Bus Bar Module combination.

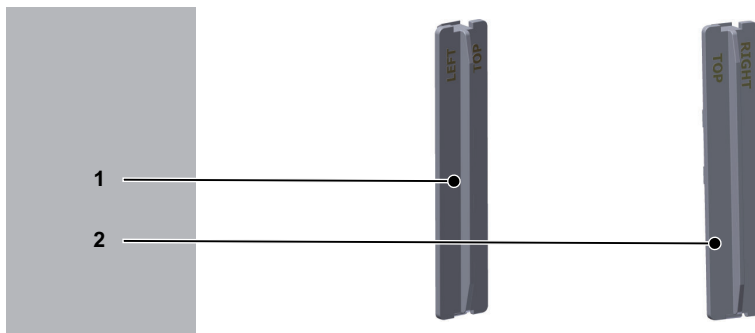


Figure 7-5: Shock protector covers

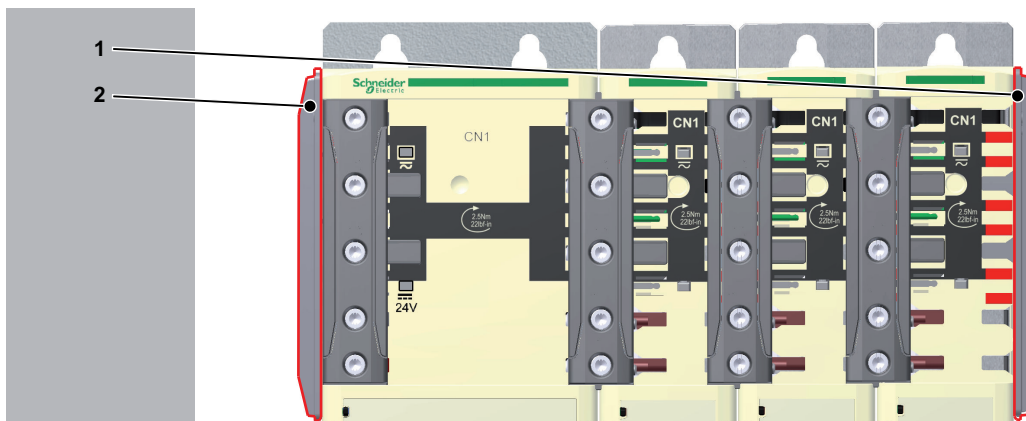


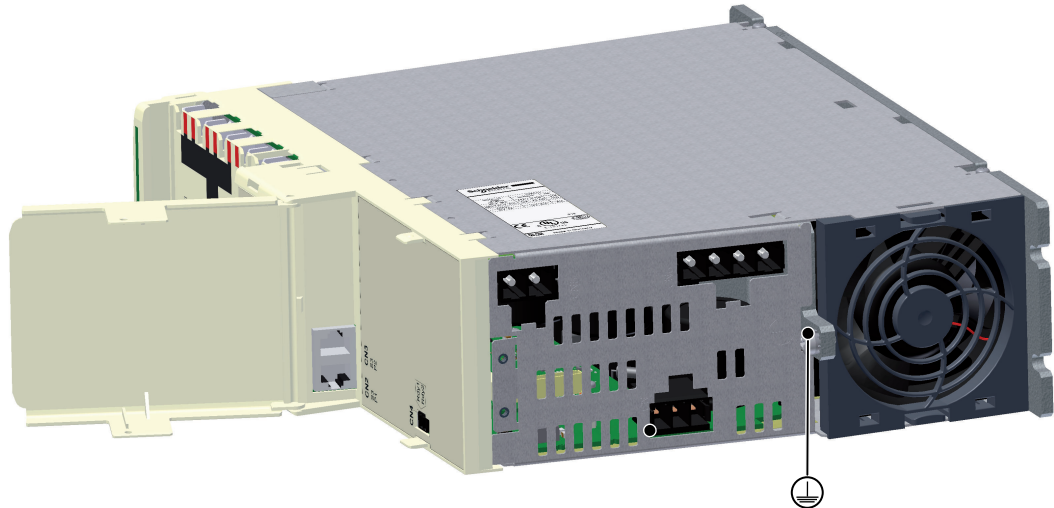
Figure 7-6: Shock protector covers on the outside of the Bus Bar Module combination

⚠ DANGER

ELECTRIC SHOCK CAUSED BY HIGH TOUCH VOLTAGE

- Attach the shock protector covers on the outside of the Bus Bar Module combination.
- Apply power only if the shock protector covers have been attached on the outside of the Bus Bar Module combination.

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



- ▶ Connect the additional protective ground (earth) conductor with the ring cable lug and the M5 screw to the heat sink of the Lexium 62 Power Supply (tightening torque: 3.5 Nm / 31 lbf in).
- ▶ Connect the protective ground (earth) conductor with the following equipment in the order presented: lock washer, ring cable lug, lock washer, washer and screw.
- ▶ Verify that terminals are secure and that the necessary cable sizes are correct (cross section/gauge).
- ▶ Verify that the shielding is properly grounded. Eliminate short circuits and interruptions.
- ▶ Do not choose a connection cross-section of the ground cable that is smaller than the cross-section of the main connection.

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

⚠ DANGER

INSUFFICIENT GROUNDING

- Use a protective ground conductor with at least 10 mm² (AWG 6) or two protective ground conductors with the same or larger cross section of the conductors supplying the power terminals.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.

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

7.1.6 Wiring the Lexium 62 connection module in linear or tree topologies

The wiring of Lexium 62 Connection Module, Lexium 62 Distribution Box and Lexium 62 ILM in linear or tree topologies is supported by hybrid cables.

The hybrid cable variants suitable for linear or tree topologies are listed in the type code figure "ILM 62 Accessories" (see 4.3.5 Lexium 62 ILM Accessories).

The hybrid connector variants presented in the following graphic are suitable for wiring in linear or tree topologies.

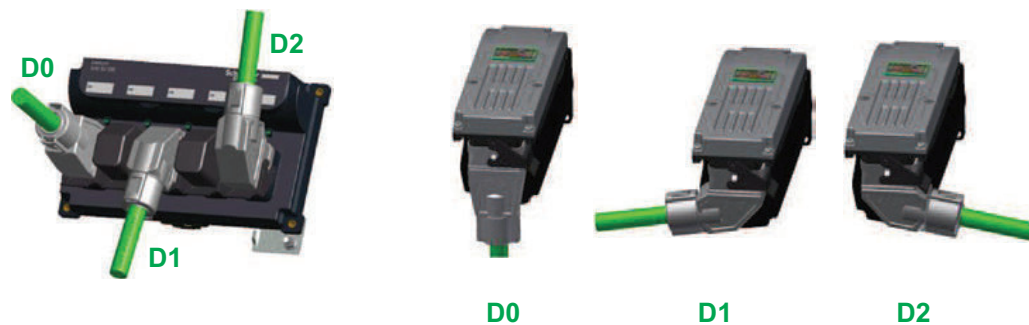
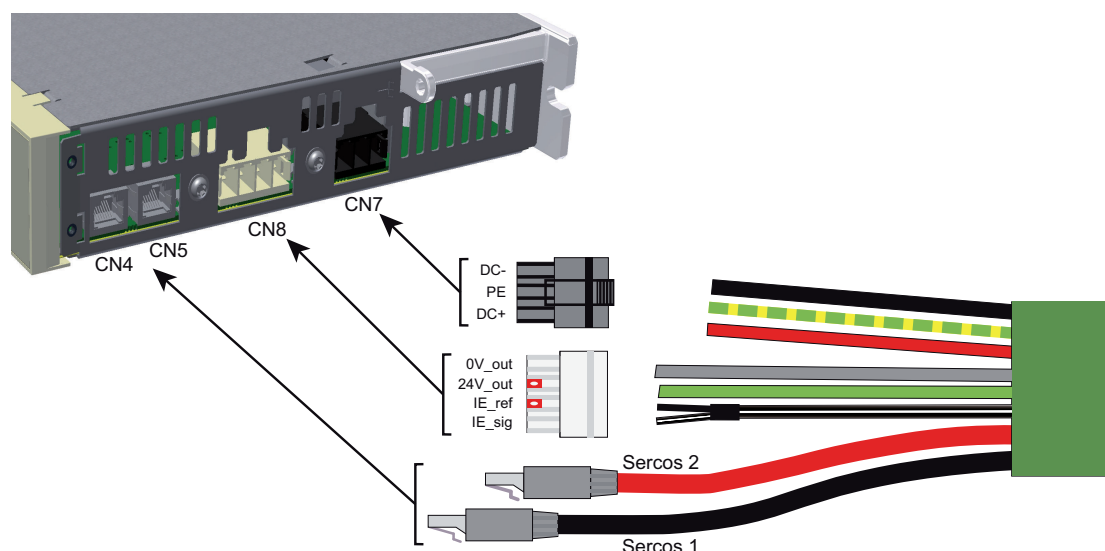


Figure 7-7: Plug connector designs of hybrid cables

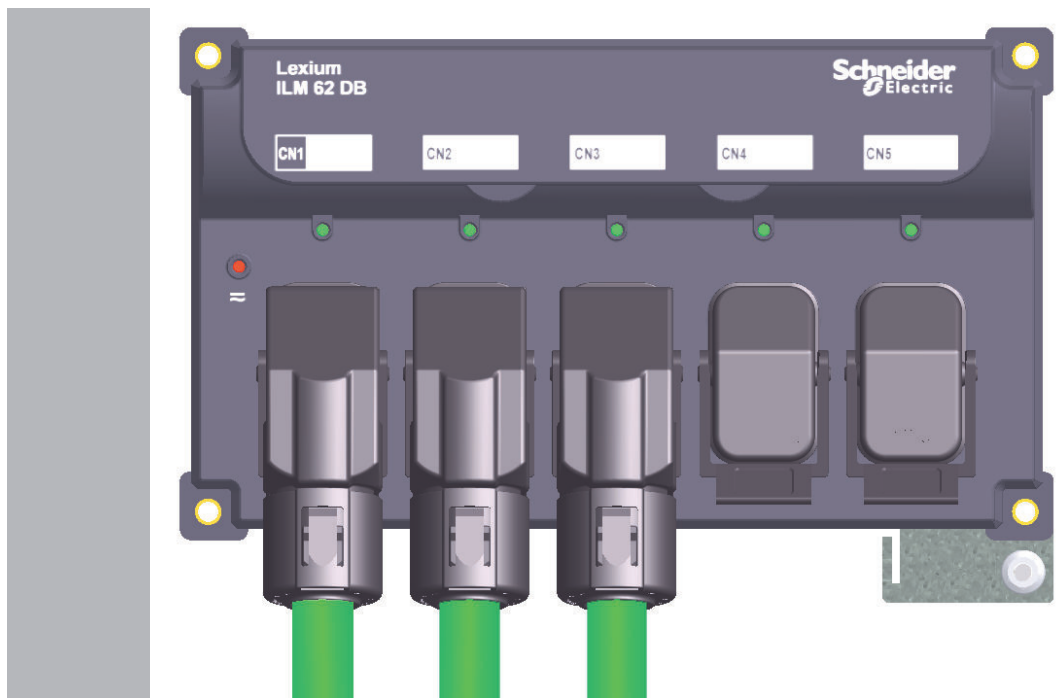
D0	straight connection
D1	Connection at the bottom (Lexium 62 Distribution Box) or on the left (Lexium 62 ILM)
D2	Connection on the top (Lexium 62 Distribution Box) or on the right (Lexium 62 ILM)

This is how you wire the modules:

- For an overview of the different connections, refer to the chapter Electrical Connections (see 8.8 Electrical connections).
- ▶ Connect connections **CN4**, **CN5**, **CN7** and **CN8** (Sercos, DC bus voltage, 24V, Inverter Enable) at the Lexium 62 Connection Module with the Lexium 62 Distribution Box by means of the pre-assembled hybrid cable.



- ▶ Remove protective cover from hybrid cables.
- ▶ Connect up to four Lexium 62 ILMs at the Lexium 62 Distribution Box using hybrid cables. Engage the respective mounting bracket at both connection sides.



- ▶ Provide unused hybrid connection sockets with strapping plugs.



The strapping plugs are not included in the scope of delivery of Lexium 62 ILM and must be ordered separately (order number: VW3E6023).



Strapping plugs close the Sercos loop, while ensuring the integrity of the IP65 degree of protection.

⚠ WARNING

LOSS OF IP65 RATING

Use strapping plugs VW3E6023 in unused hybrid connection sockets.

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

The following table is an example of the topological addressing of the ILMs, depending on the Sercos connection and assuming the Lexium 62 Connection Module is connected to connector CN1 with a hybrid cable.

Sercos lines within the Hybrid cable	Connection Lexium 62 Connection Module	Topological address of the Lexium 62 ILMs connected to the Lexium 62 Distribution Box			
		CN2	CN3	CN4	CN5
Sercos 1 (black) Sercos 2 (red)	CN4 CN5	4	3	2	1
Sercos 1 (black) Sercos 2 (red)	CN5 CN4	1	2	3	4

Table 7-1: The topological address for CN2, CN3, CN4 and CN5 (Lexium 62 Distribution Box) depends of the assignment of Sercos 1/Sercos 2 to CN4/CN5 (Lexium 62 Connection Module)

Depending on the selected identification (address) mode in the SoMachine Motion Logic Builder, an interchanged connection of the Sercos 1/Sercos 2 connectors can lead to unintended machine operation.

⚠ WARNING

UNINTENDED MACHINE OPERATION

Ensure that the Sercos cables are connected to the Sercos connections CN4/CN5 of the Lexium 62 Connection Module according to the requirements of the application, its configuration and applicable standards.

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

The following boundary conditions must be observed for the system layout:

- Maximum cable length of 20 m (65.2 ft) from Lexium 62 Connection Module to Lexium 62 Distribution Box.
- Maximum cable length of 10 m (32.8 ft) from Lexium 62 Distribution Box to another Lexium 62 Distribution Box.
- Maximum cable length of 10 m (32.8 ft) from Lexium 62 Distribution Box to Lexium 62 ILM.
- Sum of all cable lengths maximum 200 m (656 ft).
- Maximum distance of 50 m (164 ft) between 2 active Sercos slaves. In the example below, the critical measure is the return from the last Sercos slave (Lexium 62 ILM) to the Lexium 62 Power Supply via the connection module.
- Lexium 62 Connection Module and Lexium 62 Distribution Box are not active Sercos slaves. Both the Lexium 62 Connection Module and the Lexium 62 Distribution Box are passive, pass-through devices.



Contact your Schneider Electric representative in order to create a detailed system layout for the respective available topology.

The following two examples illustrate the longest path between 2 active Sercos slaves for which a maximum length of 50 m (164 ft) is permissible. This critical distance is marked in blue.

In the following example of a linear topology, the longest path is between the Lexium 62 Power Supply and the last Lexium 62 ILM.

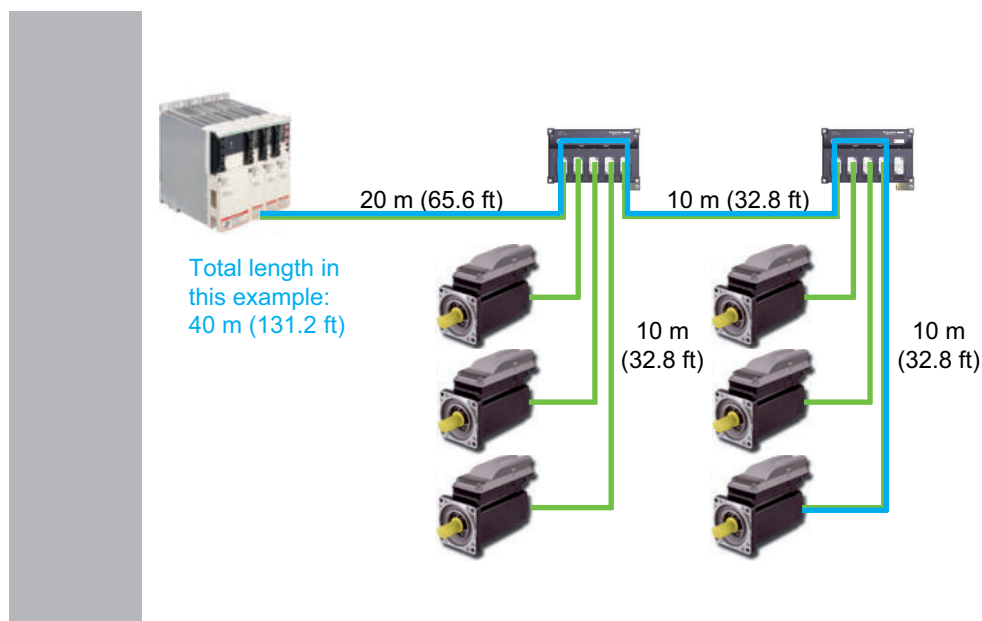


Figure 7-8: An example of maximum pathway for linear topology

The next example is of a tree topology where the longest path is between two Lexium 62 ILMs and not between the Lexium 62 Power Supply and the last Lexium 62 ILM.

In this topology, the critical path is the forward, incoming signal as opposed to the former example where the critical path was the return path.

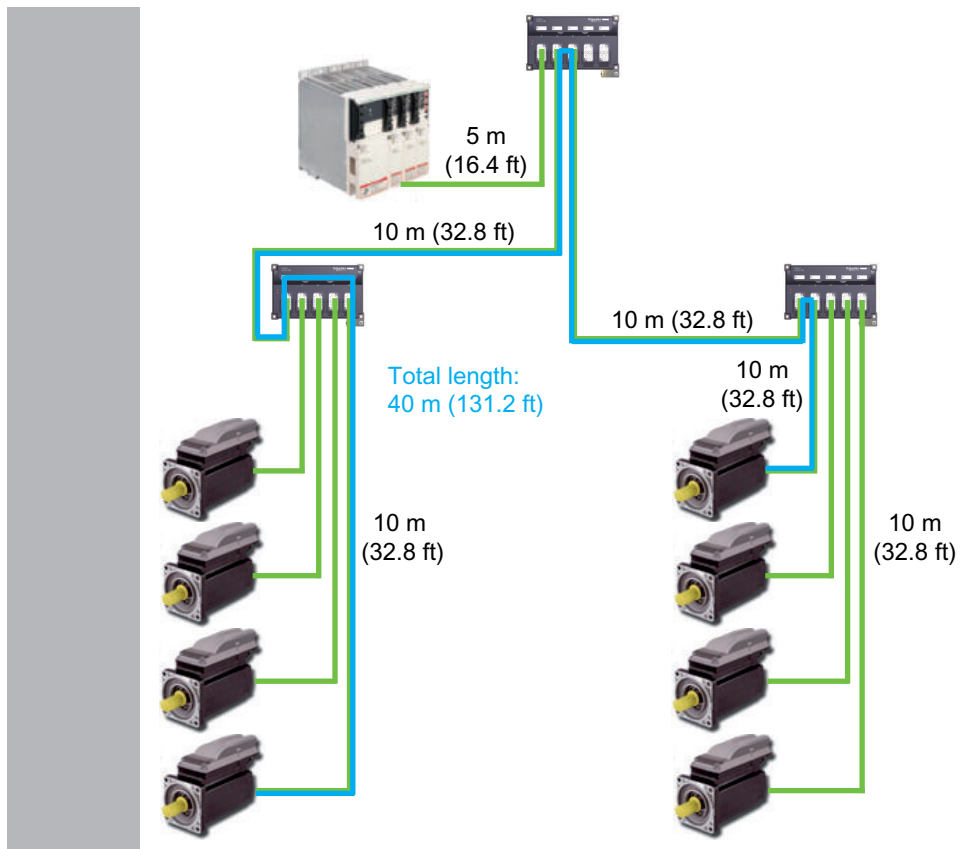


Figure 7-9: Example longest path for a tree topology



Figure 7-10: Connection overview Lexium 62 ILM

1	Ground connection
2	Hybrid connector



According to IEC/EN 60204-1, the correct grounding of the motor has to be verified on the completely installed machine on location in all cases.

7.1.7 Wiring from the Lexium 62 connection module in a daisy chain topology

Wiring of Lexium 62 Connection Module, Lexium 62 Distribution Box, Lexium 62 ILM in daisy chain topology is supported by a Daisy Chain Connector Box mounted on the Lexium 62 ILM along with power and Sercos cables.

The power and Sercos cable variants suitable for daisy chain topologies are listed in the type code figure "Lexium 62 ILM accessories" (see 4.3.5 Lexium 62 ILM Accessories).

The power connector presented in the following are suitable for a daisy chain wiring:

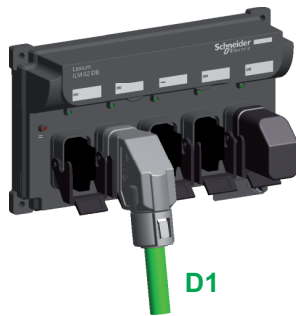


Figure 7-11: Plug connector designs of power cables

D1	Connection at the bottom (Lexium 62 Distribution Box)
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With daisy chain structure the Power (DC bus voltage/24V/Inverter Enable signals) and Sercos signals are distributed via separate cables.

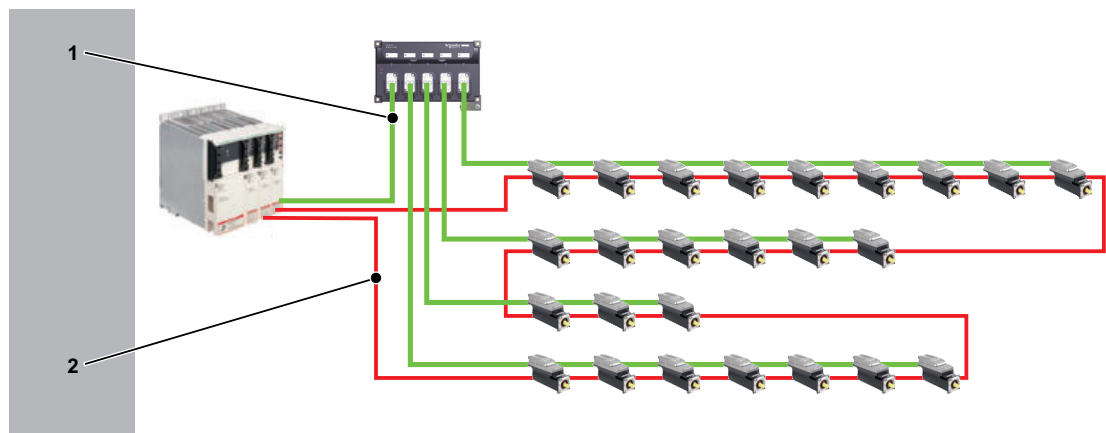


Figure 7-12: Example of a net topology in a daisy chain structure with 4 daisy chain lines

1	Power cable (green)
2	Sercos cable (red)

Each Lexium 62 ILM must be extended for daisy chain wiring by a Daisy Chain Connector Box. For this purpose, the Daisy Chain Connector Box is mounted (see 7.1.4 Mechanical mounting) onto the Lexium 62 ILM and the wiring of the Lexium 62 ILMs is carried out via M12 / M23 connectors of the Daisy Chain Connector Box.

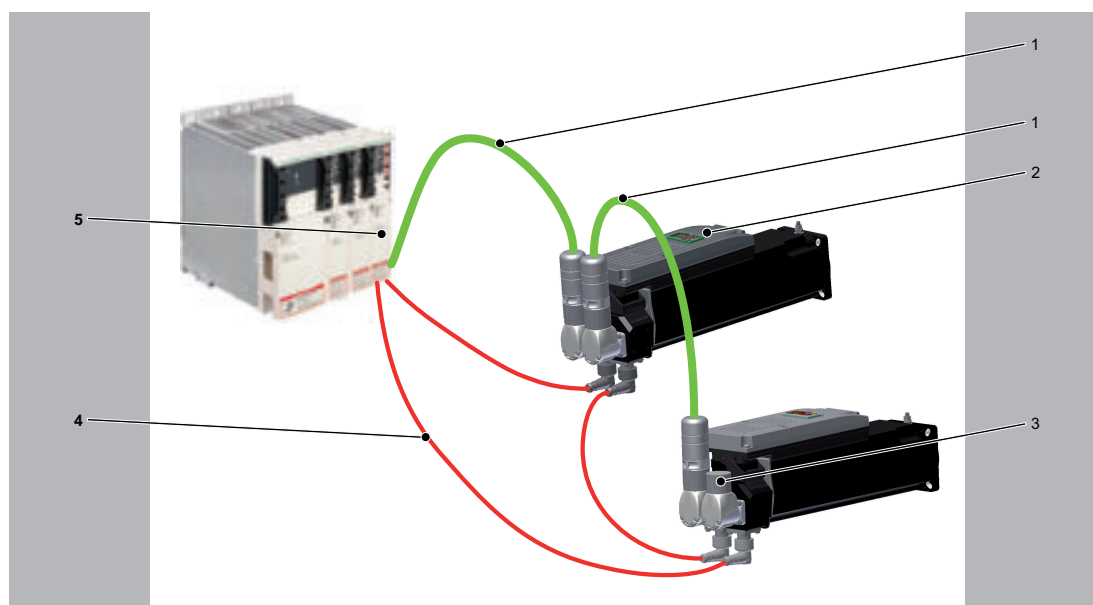


Figure 7-13: Example for a daisy chain wiring with 1 daisy chain line (connected directly to the Lexium 62 connection module)

1	Power cable (green)
2	Lexium 62 ILM
3	At the last Lexium 62 ILM of the daisy chain line, the open power socket connector M23 (CN2/ CN3) of the Daisy Chain Connector Box has to be tightly closed with a protection cap ILM62DCZ000.
4	Sercos cable (red)
5	Lexium 62 Connection Module

⚠ WARNING

LOSS OF IP65 RATING

- Assemble the M23 cable connector correctly to the daisy-chain connector box to properly seal the connection and meet the IP65 protection class requirements.
- Tightly seal off open power socket connectors CN2/CN3 with an ILM62DCZ000 protection cap on the last drive of the daisy chain.
- Use only cables and accessory parts from Schneider Electric.

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

This is how you wire the modules:

- For an overview of the different connections, refer to the chapter Electrical Connections (see 8.8 Electrical connections).

Depending on the selected identification (address) mode in the SoMachine Motion Logic Builder, an interchanged connection of the Sercos cables can lead to unintended machine operation.

⚠ WARNING

UNINTENDED MACHINE OPERATION

- Ensure that the Sercos cables are connected to the Sercos connections CN4/CN5 of the Lexium 62 Connection Module according to the requirements of the application, its configuration and applicable standards.
- Ensure that the Sercos cables are connected to the Sercos socket connectors of the Daisy Chain Connector Box according to the requirements of the application, its configuration and applicable standards.

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

- ▶ By using one (several) Lexium 62 Distribution Box:
Connect the connections **CN7**, **CN8** (power cable: DC bus voltage, 24V, Inverter Enable) at the Lexium 62 Connection Module with the (first) Lexium 62 Distribution Box by means of the pre-assembled power cable.
- ▶ Without Lexium 62 Distribution Box:
Connect the connections **CN7**, **CN8** (power cable: DC bus voltage, 24V, Inverter Enable) at the Lexium 62 Connection Module with the first Lexium 62 ILM of the daisy chain line by means of the pre-assembled power cable.
- ▶ Secure the M23 connector to the daisy-chain connector box by twisting the connector collar.
- ▶ Connect up to 9 Lexium 62 ILMs per daisy chain line by means of power cables. Connect up to 4 daisy chain lines with a maximum of 9 Lexium 62 ILMs to a Lexium 62 Distribution Box by means of power cables. Engage the locking mechanism to the Lexium 62 Distribution Box connection side.
- ▶ Connect the connections **CN4**, **CN5** of the Lexium 62 Connection Module with the Sercos socket connectors of the Daisy Chain Connector Box to the Lexium 62 ILM by means of a pre-assembled Sercos cable.
- ▶ Connect the Lexium 62 ILMs to the Sercos socket connectors of the Daisy Chain Connector Box by means of a pre-assembled Sercos cable.
- ▶ Tightly close the open power socket M23 (CN2/CN3) of the Lexium 62 ILM with a protection cap ILM62DCZ000 on every daisy chain line on the last Daisy Chain Connector Box.

⚠ WARNING

LOSS OF IP65 RATING

- Assemble the M23 cable connector correctly to the daisy-chain connector box to properly seal the connection and meet the IP65 protection class requirements.
- Tightly seal off open power socket connectors CN2/CN3 with an ILM62DCZ000 protection cap on the last drive of the daisy chain.
- Use only cables and accessory parts from Schneider Electric.

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

The following boundary conditions must be observed for the system layout:

- Maximum cable length of 20 m (65.2 ft) from Lexium 62 Connection Module to Lexium 62 Distribution Box.
- Maximum cable length of 10 m (32.8 ft) from Lexium 62 Distribution Box to another Lexium 62 Distribution Box.
- Maximum cable length of 10 m (32.8 ft) from Lexium 62 Distribution Box or Lexium 62 Connection Module to the first Lexium 62 ILM of the daisy chain line.

- A maximum of 9 Lexium 62 ILMs can be connected per daisy chain line and a maximum cable length of 10 m (32.8 ft) between the first and the last Lexium 62 ILM of the daisy chain line.
- Sum of all cable lengths maximum 200 m (656 ft).
- Maximum distance of 50 m (164 ft) between 2 active Sercos slaves.
- Lexium 62 Connection Module and Lexium 62 Distribution Box are not active Sercos slaves. Both the Lexium 62 Connection Module and the Lexium 62 Distribution Box are passive, pass-through devices.



Contact your Schneider Electric representative in order to create a detailed system layout for the respective available topology.

NOTICE

INCORRECT VOLTAGE / CURRENT

Only use topologies approved by Schneider Electric.

Failure to follow these instructions can result in equipment damage.



According to IEC/EN 60204-1, the correct grounding of the motor has to be verified on the completely installed machine on location in all cases.

7.2 Maintenance, repair, cleaning

- ▶ Observe the following instructions before carrying out maintenance on Lexium 62 drive 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.
- Measure the voltage on the DC bus with a properly rated voltage sensing device and verify that the voltage is less than 42.4 Vdc.
- Do not assume that the DC bus is voltage-free when the DC bus LED is off.
- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- Do not create a short-circuit across the DC bus terminals or the DC bus capacitors.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

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

How to de-energize the system:

- ▶ Set main switch to "OFF Position", or otherwise disconnect all power to the system.
- ▶ Prevent main switch from being switched back on.
- ▶ Wait 15 minutes after removing power (switching off) to allow the DC bus capacitors to discharge.
- ▶ After the DC-BUS LED has turned off on all components located in the axis group, measure whether any residual voltage is present on the DC bus.
- ▶ Verify DC+ to PE (Protective Earth/ground) and DC- to PE with an appropriate measuring instrument to make sure it is de-energized before working on the device.

DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Verify with a correctly calibrated measuring instrument that the DC bus is de-energized (less than 42.4 Vdc) before replacing, maintaining or cleaning machine components.

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

7.2.1 Fuse replacement Lexium 62 connection module

If there is a loss of power from the Lexium 62 Connection Module while there is power at the power supply, you may need to replace the internal fuses. The Lexium 62 Drive System indicates such a condition by the following:

- DC bus LED at the Lexium 62 Power Supply flashes.
- DC bus LED at the Lexium 62 Connection Module is off.

Note: Before attempting to replace the fuses, determine the source of over-current or short circuit and remedy the issue.

The Lexium 62 Connection Module needs to be disconnected and removed to replace the internal fuses.

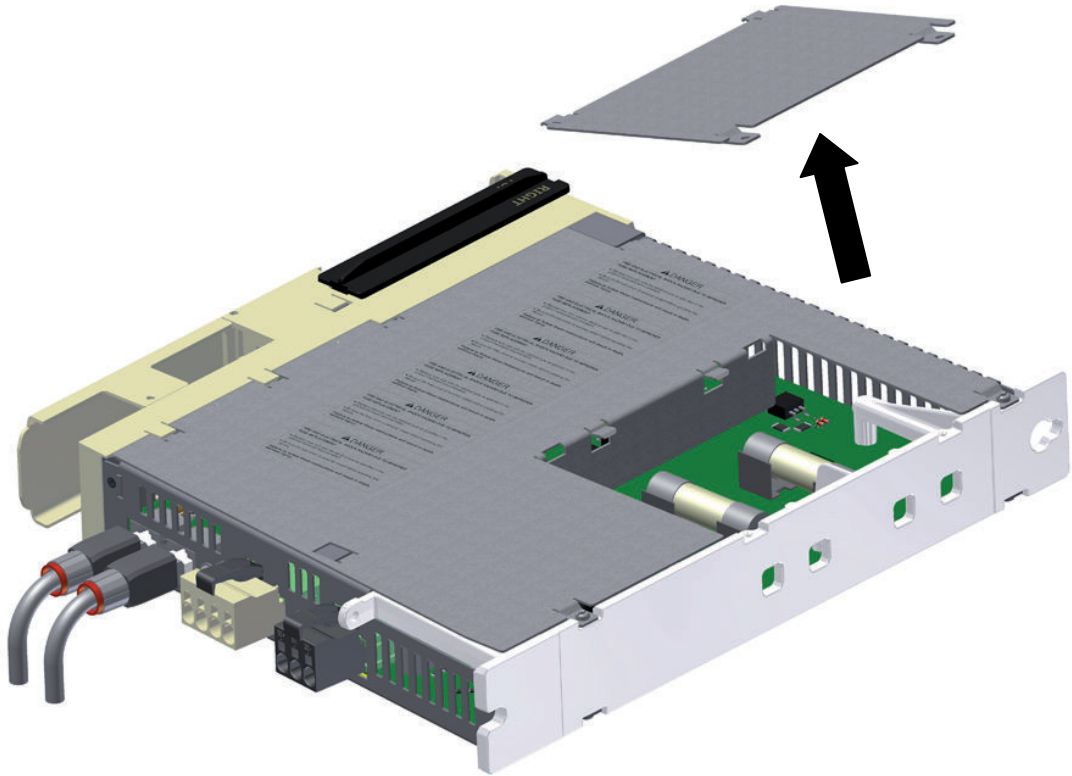
DANGER

ELECTRIC SHOCK CAUSED BY HIGH TOUCH VOLTAGE

- Before working on the product, make sure that it is de-energized.
- After disconnection, do not touch connector CN6 mains connection on the Lexium 62 Power Supply module as it still carries hazardous voltages for approximately one second.
- Only operate the Lexium 62 Power Supply and the Lexium 62 Connection Module in a control cabinet that cannot be opened without the help of tools.

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

- ▶ Dismount (see 7.4 Replacing Lexium 62 components and cables) Lexium 62 Connection Module.
- ▶ Open maintenance flap.



- ▶ On the back side of the housing remove both fuses from the holding device using a screwdriver and replace them by new fuses of the same type (order number VW3E6024).

⚠ DANGER

FIRE AND ELECTRICAL SHOCK DUE TO IMPROPER FUSE REPLACEMENT

- Replace fuse only by a fuse of identical type as specified in the product documentation.
- Be sure the fuse cover is securely closed before operating the device.

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

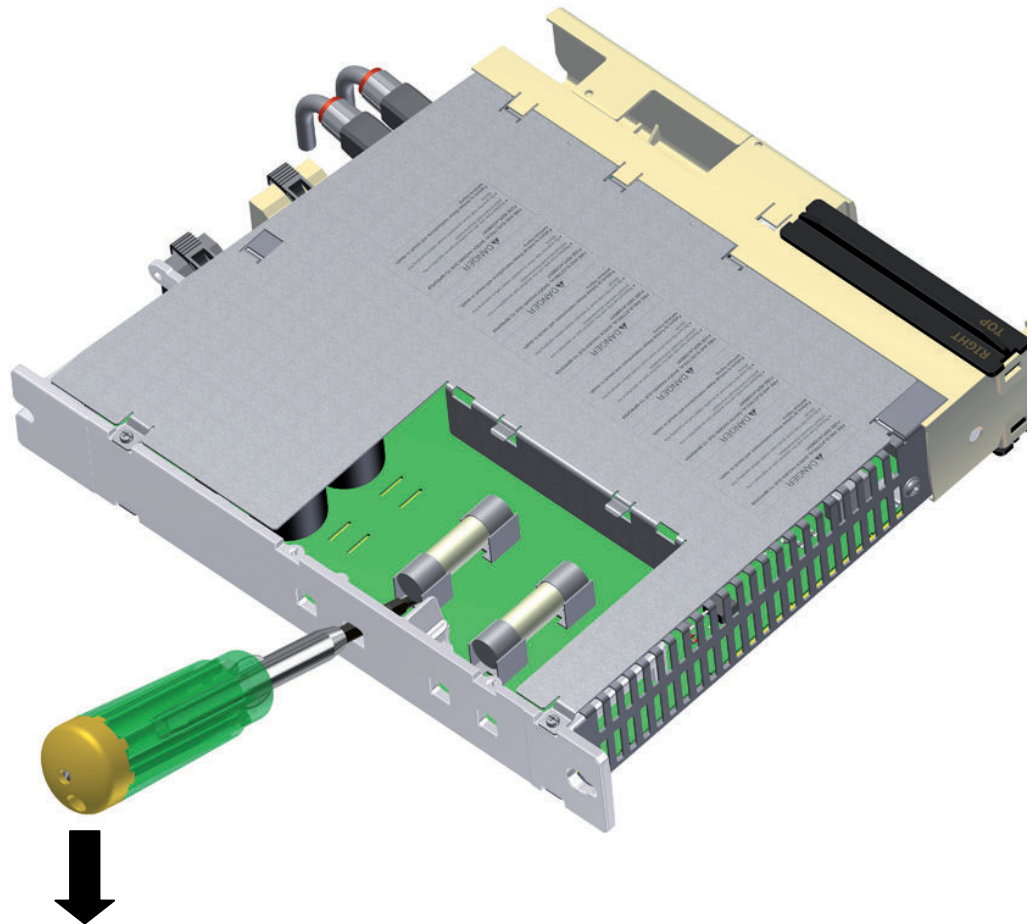
- ESD protection*
- ▶ Observe the following instructions to help avoid damages due to electrostatic discharge:

NOTICE

ELECTROSTATIC DISCHARGE

- Do not touch any of the electrical connections or components.
- Prevent electrostatic charges, for example, by wearing appropriate clothing.
- If you must touch circuit boards, do so only on the edges.
- Move the circuit boards as little as possible.
- Remove existing static charge by touching a grounded, metallic surface.

Failure to follow these instructions can result in equipment damage.



- ▶ Close maintenance flap and mount (see 7.1.4 Mechanical mounting) the Lexium 62 Connection Module.
- ▶ Lexium 62 ILM Family Restart (see 7.1.5 Wiring Power Supply Module LXM62P and Lexium 62 connection module) the system.



If after remedying the source of over-current or short circuit and fuse replacement, the Lexium 62 Connection Module still is not ready for operation or returns to a no power condition again after recommissioning, contact your Schneider Electric representative.

There are no other user-serviceable parts within the Lexium 62 components. Either replace the entire device or contact the Schneider Electric Customer Service (for contact addresses, refer to the Appendix (see 12.1 Contact addresses)).

 **WARNING**

UNINTENDED EQUIPMENT OPERATION

- Only use software and hardware components approved by Schneider Electric for use with this equipment.
- Do not attempt to service this equipment outside of authorized Schneider Electric service centers.
- Update your application program every time you change the physical hardware configuration.

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

7.2.2 Machine repair

With exception of internal fuses in the Lexium 62 connection modules (see 7.2.1 Fuse replacement Lexium 62 connection module), there are no other user-serviceable parts within the Lexium 62 components. Either replace the entire device or contact the Schneider Electric Customer Service (for contact addresses, refer to the Appendix (see 12.1 Contact addresses)).

WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software and hardware components approved by Schneider Electric for use with this equipment.
- Do not attempt to service this equipment outside of authorized Schneider Electric service centers.
- Update your application program every time you change the physical hardware configuration.

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

- ▶ Observe the following instructions to help avoid damages due to electrostatic discharge:

NOTICE

ELECTROSTATIC DISCHARGE

- Do not touch any of the electrical connections or components.
- Prevent electrostatic charges, for example, by wearing appropriate clothing.
- If you must touch circuit boards, do so only on the edges.
- Move the circuit boards as little as possible.
- Remove existing static charge by touching a grounded, metallic surface.

Failure to follow these instructions can result in equipment damage.

7.2.3 Cleaning



If you find it necessary to clean the Lexium 62 ILM motors/drives, care must be taken with cleaning products as some active agents may have deleterious effects on plastics and stainless steel welds.

NOTICE

CORROSION CAUSED BY CLEANING AGENTS

- Before using a cleaning agent, carry out a compatibility test in relation to the cleaning agent and the component affected.
- Do not use alkaline detergent.
- Do not use any chlorid-containing cleaning agents.
- Do not use any sulphuric acid containing detergent.

Failure to follow these instructions can result in equipment damage.



For more information on the material properties of your components (see 8.5 Mechanical and electrical data).



The standard cooling method of the motor is by natural convection. Therefore, keep the motor surfaces free from dirt.

7.3 Replacement equipment inventory

Keep a stock of the most important components to make certain your machine is functioning and ready for operation.

Replace devices with the same hardware configuration to help ensure compatibility.

Indicate the following information on the replacement equipment order:

Item name: for example, ILM0701P01A0000
Hardware code: for example, RS02
Software (firmware) version: for example, SW: 0.24.21



This information can be found on the logistic nameplate (see 4.4 Nameplate descriptions).

NOTICE

INCREASED PULSE ENERGY ABSORPTION CAPACITY OF THE LEXIUM 62 POWER SUPPLY MODULE

Only replace Lexium 62 Power Supply module with the same or greater version.

Failure to follow these instructions can result in equipment damage.



For more information concerning the replacement of components, refer to chapter Replacing Lexium 62 components and cables (see 7.4 Replacing Lexium 62 components and cables).

7.4 Replacing Lexium 62 components and cables

DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Operate electrical components only with a connected protective ground (earth) cable.
- After the installation, verify the secure connection of the protective ground (earth) cable to all electrical devices to ensure that connection complies with the connection diagram.
- Before enabling the device, safely cover the live components to prevent contact.
- Do not touch the electrical connection points of the components when the module is energized.
- Provide protection against indirect contact (EN 50178).
- Connect and disconnect cables and terminals only after you have verified that the power has been removed from the system.
- Insulate the unused conductors on both ends of the motor cable.

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

With exception of internal fuses in the Lexium 62 connection modules (see 7.2.1 Fuse replacement Lexium 62 connection module), there are no other user-serviceable parts within the Lexium 62 components. Either replace the entire device or contact the Schneider Electric Customer Service (for contact addresses, refer to the Appendix (see 12.1 Contact addresses)).

⚠ WARNING**UNINTENDED EQUIPMENT OPERATION**

- Only use software and hardware components approved by Schneider Electric for use with this equipment.
- Do not attempt to service this equipment outside of authorized Schneider Electric service centers.
- Update your application program every time you change the physical hardware configuration.

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

⚠ WARNING**IMPROPER REPLACEMENT OR OPENING OF THE COMPONENT HOUSING**

- Do not open the housing of the components for commissioning, replacement or any other reason whatsoever unless otherwise instructed in the specific product documentation of the component.
- Observe and respect the instructions and specifications in the product documentation and that of the machine manufacturer when replacing the device.
- Replace inoperable components as a whole.

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

To replace components and cables, read thoroughly the instructions contained in the beginning of the present chapter, Installation and Maintenance.

- ESD protection** ▶ Observe the following instructions to help avoid damages due to electrostatic discharge:

NOTICE

ELECTROSTATIC DISCHARGE

- Do not touch any of the electrical connections or components.
- Prevent electrostatic charges, for example, by wearing appropriate clothing.
- If you must touch circuit boards, do so only on the edges.
- Move the circuit boards as little as possible.
- Remove existing static charge by touching a grounded, metallic surface.

Failure to follow these instructions can result in equipment damage.

How to de-energize the system:

- ▶ Set main switch to "OFF Position", or otherwise disconnect all power to the system.
- ▶ Prevent main switch from being switched back on.
- ▶ Wait 15 minutes after removing power (switching off) to allow the DC bus capacitors to discharge.
- ▶ After the DC-BUS LED has turned off on all components located in the axis group, measure whether any residual voltage is present on the DC bus.
- ▶ Verify DC+ to PE (Protective Earth/ground) and DC- to PE with an appropriate measuring instrument to make sure it is de-energized before working on the device.

⚠ DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Verify with a correctly calibrated measuring instrument that the DC bus is de-energized (less than 42.4 Vdc) before replacing, maintaining or cleaning machine components.

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



For more information on the DC bus LED (see 5.1.1 DC bus LED).

⚠ DANGER

INOPERABLE SAFETY FUNCTION

Test the proper functioning of the safety functions after every device replacement and every change of the wiring.

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

7.4.1 Replacement of the Lexium 62 connection module



NOTE: For further information about disassembling/assembling of a optional Lexium 62 DC Link Terminal and/or Lexium 62 DC Link Support Module , see the Lexium 62 Hardware Guide.

Before beginning the replacement of specific components, read thoroughly the section Replacing Lexium 62 components and cables (see 7.4 Replacing Lexium 62 components and cables) for important safety information and general instructions.

How to replace the Lexium 62 Connection Module:

- ▶ Disconnect all connection cables on the Lexium 62 Connection Module.
NOTE: Be sure that the cables clearly indicate their connections before disconnecting.
- ▶ Loosen the screw connections on the wiring bus (CN1) of the component that is to be replaced.
- ▶ If present, loosen the screw connections of the adjacent component to the right of the component that is to be replaced.
- ▶ Push both slides (CN1) to the center of the device.
- ▶ Loosen the screw connections of the device mounting brackets on the top and bottom side.

CAUTION

FALLING HEAVY EQUIPMENT

Do not fully remove the screw connections of the device mounting brackets and prevent the device from falling out and down.

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

- ▶ Remove the Lexium 62 Connection Module and replace the complete unit.
- ▶ Install the new Lexium 62 Connection Module and tighten the screw connections on the top and bottom side.

NOTE: If the component you removed had the shock protection cover in place, you must re-install it on the replacement unit.

DANGER

ELECTRIC SHOCK CAUSED BY HIGH TOUCH VOLTAGE

- Attach the shock protector covers on the outside of the Bus Bar Module combination.
- Apply power to the device only if the shock protector covers have been attached on the outside of the Bus Bar Module combination.

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

- ▶ Re-connect the cables disconnected according to their assignments.

DANGER

INCORRECT ASSIGNMENT OF CABLES

- Verify that the assignment of the cables conforms to their previous connector assignments.
- If you have any doubt as to the cable assignments, contact the manufacturer of the machine or your Schneider Electric Service Center before placing the machine into service.

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

Depending on the selected identification mode in the SoMachine Motion Logic Builder, an interchanged connection of the connection Sercos 1/Sercos 2 or the Sercos cables can lead to unintended operation of the machine.

WARNING

UNINTENDED MACHINE OPERATION

Ensure that the Sercos cables are connected to the Sercos connections CN4/CN5 of the Lexium 62 Connection Module according to the requirements of the application, its configuration and applicable standards.

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

- ▶ After replacing a Lexium 62 Connection Module, proceed as by the first commissioning.



For further information on this (see 7.1 Commissioning).

7.4.2 Replacement of the Lexium 62 distribution box

Before beginning the replacement of specific components, read thoroughly the section Replacing Lexium 62 components and cables (see 7.4 Replacing Lexium 62 components and cables) for important safety information and general instructions.

How to replace the Lexium 62 Distribution Box:

ESD protection

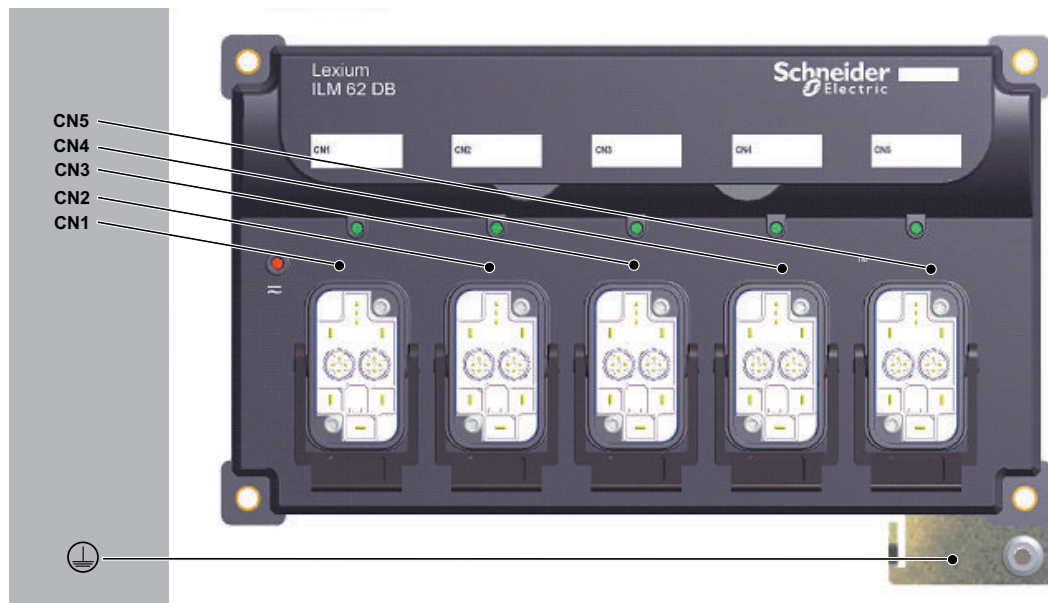
- ▶ Observe the following instructions to help avoid damages due to electrostatic discharge:

NOTICE

ELECTROSTATIC DISCHARGE

- Do not touch any of the electrical connections or components.
- Prevent electrostatic charges, for example, by wearing appropriate clothing.
- If you must touch circuit boards, do so only on the edges.
- Move the circuit boards as little as possible.
- Remove existing static charge by touching a grounded, metallic surface.

Failure to follow these instructions can result in equipment damage.



- ▶ After opening the connector locking mechanism of the Lexium 62 Distribution Box, disconnect the hybrid or power cable connector (cable connection from the Lexium 62 Connection Module).
NOTE: Be sure that the cables clearly indicate their connections before disconnecting.
- ▶ Disconnect the hybrid or power cable connectors of all connected motors.
- ▶ Likewise, remove any strapping plugs that may be connected in the same manner, and retain them to replace on the new distribution module.
- ▶ Dismount protective ground (earth) cable from the lower-right-corner metal bracket connection of the Lexium 62 Distribution Box.
- ▶ Replace Lexium 62 Distribution Box as a whole.
- ▶ Attach connectors of the hybrid or power cable connectors of all motors to be connected.
- ▶ In addition, replace any strapping plugs to their respective connections.

- ▶ Secure the connectors by means of the connector locking mechanism of the Lexium 62 Distribution Box.
- ▶ Attach the hybrid or power cable connector (from the Lexium 62 Connection Module) and secure it by means of the connector locking mechanism.
- ▶ Mount ground (earth) cable to the lower-right-corner metal bracket connection of the Lexium 62 Distribution Box.

Removing the Lexium 62 Connection Module hybrid or power cables

Disconnect the pre-assembled hybrid or power cable connector for the connection between Lexium 62 Connection Module and Lexium 62 Distribution Box as follows:

- ▶ Open the connector locking mechanism of the Lexium 62 Distribution Box.
- ▶ Detach the hybrid or power cable connector to its connection at the Lexium 62 Distribution Box.
- ▶ Disconnect the cables at connectors CN4-5 (in the case of the hybrid cable), CN6, CN7 and CN8 at the Lexium 62 Connection Module.

Removing the Lexium 62 ILM hybrid or power cables

Disconnect the pre-assembled hybrid or power cable connector for the connection between Lexium ILM 62 and Lexium 62 Distribution Box as follows:

- ▶ Detach hybrid or power cable connector to the Lexium 62 ILM
 - In the case of the hybrid cable, open the connector locking mechanism and disconnect the hybrid cable connector.
 - In the case of the power cable connector, loosen the retaining sleeve of the M23 connector and unbuckle the connector from the daisy-chain connector box.
- ▶ Open the connector locking mechanism and detach the hybrid or power cable connector from its connection at the Lexium 62 Distribution Box.

Installing the Lexium 62 Connection Module hybrid or power cables

Connect the pre-assembled hybrid or power cable connector for the connection between Lexium 62 Connection Module and Lexium 62 Distribution Box as follows:

- ▶ Remove protective cover on the hybrid or power cables connector(s).
- ▶ Attach the hybrid or power cable connector to its connection at the Lexium 62 Distribution Box.
- ▶ Secure the connector by means of the connector locking mechanism of the Lexium 62 Distribution Box.
- ▶ Perform connections CN4-5 (in the case of the hybrid cable), CN6, CN7 and CN8 at the Lexium 62 Connection Module according to the connection overview (see 8.8.1 Lexium 62 connection module).

Depending on the selected identification (address) mode in the SoMachine Motion Logic Builder, an interchanged connection of the Sercos 1/Sercos 2 connectors can lead to unintended machine operation.

WARNING

UNINTENDED MACHINE OPERATION

Ensure that the Sercos cables are connected to the Sercos connections CN4/CN5 of the Lexium 62 Connection Module according to the requirements of the application, its configuration and applicable standards.

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

Installing the Lexium 62 ILM hybrid or power cables

Connect the pre-assembled hybrid or power cable connector for the connection between Lexium ILM 62 and Lexium 62 distribution box as follows:

- ▶ Remove protective cover on the hybrid or power cables connector(s).

- ▶ Attach hybrid or power cable connector to the Lexium 62 ILM.
 - In the case of the hybrid cable, connect it directly to the Lexium 62 ILM integrated drive and secure it by means of the connector locking mechanism.
 - In the case of the power cable connector, connect the cable to the daisy chain connector box mounted on the Lexium 62 ILM via the M23 connector. Be sure to lock the M23 connector by twisting the connection sleeve to ensure a proper IP65 rated seal.
- ▶ Attach the hybrid or power cable connector to its connection at the Lexium 62 Distribution Box and secure it by means of the connector locking mechanism of the Lexium distribution box.

WARNING

LOSS OF IP65 RATING

- Assemble the M23 cable connector correctly to the daisy-chain connector box to properly seal the connection and meet the IP65 protection class requirements.
- Tightly seal off open power socket connectors CN2/CN3 with an ILM62DCZ000 protection cap on the last drive of the daisy chain.
- Use only cables and accessory parts from Schneider Electric.

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

7.4.3 Replacement of the Lexium 62 ILM

Before beginning the replacement of specific components, read thoroughly the section Replacing Lexium 62 components and cables (see 7.4 Replacing Lexium 62 components and cables) for important safety information and general instructions.

How to replace the Lexium 62 ILM:

The Lexium 62 ILM is very heavy relative to its size. While replacing the component, its great mass can cause injuries and/or damage.

WARNING

HEAVY, FALLING COMPONENTS

- Use a suitable crane or other suitable lifting gear for mounting the component if this is required by the weight of the component.
- Use the necessary personal protective equipment (for example, protective shoes, protective glasses and protective gloves).
- Mount the component 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.

Pay attention to the ESD protection measures, to avoid damages caused by electrostatic discharge.

CAUTION

ELECTROSTATIC DISCHARGE

- Use the original or similar packaging to send back components.
- Components must be packaged in ESD packaging/film.

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

The Lexium 62 ILM is composed of an integrated drive/motor combination, and is considered as one, inseparable component. When replacing the Lexium 62 ILM, the entire drive/motor combination must be replaced.

NOTICE

IMPROPER REPLACEMENT OR OPENING OF THE COMPONENTS

- Do not open the components to put it into operation or replace it.
- In addition to the information and instructions found in this present document, you must observe the information and instructions of the original machine builder.

Failure to follow these instructions can result in equipment damage.

- ▶ Disconnect all connection cables on the Lexium 62 ILM.

NOTE: Be sure that the cables clearly indicate their connections before disconnecting.

The replacement of the Lexium 62 ILM may have an impact on positioning or other parameters relative to the machine application. For example, the application may employ techniques, such as indirect distance measuring, that may be lost as a result of the component replacement, and may therefore need to be re-calibrated.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Be sure to consult the documentation of the original machine builder before attempting to replace the component.

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

There are sensitive precision parts involved in the proper functioning of the Lexium 62 ILM. Therefore, care must be taken during the replacement of the component to avoid damage and disfunction.

NOTICE

MECHANICAL FORCE TO THE ENCODER SYSTEM

- Prevent impacts on the motor shaft when removing and attaching couplings to the motor shaft, as this could damage the encoder.
- Use appropriate tools, such as an extractor.
- Avoid mechanical damage to the coating of the motor housing.

Failure to follow these instructions can result in equipment damage.

Before attempting to replace the Lexium 62 ILM, refer to the mounting information in section Installation and maintenance (see 7 Installation and maintenance).

- ▶ Replace the drive according to your machine application requirements, or the specifications of the original machine manufacturer.
- ▶ Re-connect the protective ground (earth) cable and tighten it with a 2.8 Nm (24.8 lbf in) torque.



Figure 7-14: Connection overview Lexium 62 ILM

1	Protective ground (earth) connection
2	Hybrid connector

How to replace the cables for line structure and tree structure:

- ▶ Disconnect / attach the protective ground (earth) cable and hybrid connector from/to the Lexium 62 ILM.
- ▶ Disconnect / attach the hybrid connector from/to the Lexium 62 Distribution Box.

How to replace the cables for daisy chain structure:

- ▶ Disconnect / attach the protective ground (earth) cable from/to Lexium 62 ILM and disconnect / attach power cable as well as Sercos cables from/to the Daisy Chain Connector Box which is installed on the Lexium 62 ILM.
- ▶ Disconnect / attach the power cable from/to Lexium 62 Distribution Box.

8 Technical data

8.1 Definition of technical data

Abbreviation	Units	Explanation
I_0	[A _{rms}]	Standstill current Effective value of the motor current at standstill torque M_0
I_N	[A _{rms}]	Rated current Effective value of the motor current at rated torque M_N
I_{max}	[A _{rms}]	Peak current Effective value of the motor current at peak torque M_{max}
J_M	[kgcm ²]	Rotor moment of inertia The rotor inertia refers to a motor without brake.
k_T	[Nm/A _{rms}]	Torque constant Quotient from the standstill torque M_0 and standstill current I_0 .
m	[kg]	Mass Motor mass without brake and without fan
M_0	[Nm]	Standstill torque; Continuous torque (100% ED) at 5 min ⁻¹ by an ambient temperature of 40 °C / 104 °F .
M_N	[Nm]	Rated torque; Continuous torque (100% ED) by n_N due to the speed-dependent losses less than M_0 , by an ambient temperature of 40 °C / 104 °F .
M_{max}	[Nm]	Peak torque The maximum torque that the servo motor can briefly deliver to the output shaft.
n_N	[min ⁻¹]	Rated motor speed
n_{max}	[min ⁻¹]	Mechanical limit velocity
P_N	[kW]	Mechanical rated power (power delivered to the shaft) At the rated motor speed and load with the rated torque
$R_{U-V, 20}$	[Ω]	Winding resistance Resistance between two phases at a winding temperature of 20 °C / 68 °F.
L_{U-V}	[mH]	Winding inductance between two phases
k_E	[V _{rms} /kmin ⁻¹]	Voltage constant; Induced voltage between two phases at 1000 min ⁻¹
V	[m/s ²]	Maximum vibration (all directions)
S	[m/s ²]	Maximum shock (all directions)
T_{TK}	[°C]	Response limit temperature sensor
t_{th}	[min]	Thermal time constant
p		Number of pole pairs

Table 8-1: Physical sizes with units and explanations

8.2 Ambient conditions

Lexium 62 Connection Module

Ambient conditions

Procedure	Parameter	Value	Basis
Operation	Class 3K3		IEC/EN 60721-3-3
	Degree of protection housing	IP 20 with plug-in connectors	
	Supplemental degree of protection of installed product	IP 54	
	Pollution degree	2	
	Ambient temperature	+5 °C...+55 °C / +41 °F...+131 °F	
	Relative humidity	5% ... 85%	
	• Condensation	No	
	• Icing	No	
	• Other water	No	
	Class 3M4		
	Vibration	10m/s ²	
	Shock	100m/s ²	
Transport	Class 2K3		IEC/EN 60721-3-2
	Ambient temperature	-25 °C...+70 °C / -13 °F...+158 °F	
	Relative humidity	5% ... 95%	
	• Condensation	No	
	• Icing	No	
	• Other water	No	
	Class 2M2		
	Vibration	15m/s ²	
	Shock	300m/s ²	
	Long-term storage in transport packaging	Class 1K4	
Ambient temperature		-25 °C...+55 °C / -13 °F...+131 °F	
Relative humidity		5% ... 95%	
• Condensation		No	
• Icing		No	
• Other water		No	

Table 8-2: Ambient conditions Lexium 62 Connection Module

Installation altitude The installation altitude is defined as height above sea level.

Installation altitude without power reduction	<1000m (<3281ft.)
Installation altitude while complying with all of the following conditions: <ul style="list-style-type: none"> • 55°C (131°F) maximum ambient temperature • Reduction of the continuous power by 1% per 100 m (328 ft.) above 1000 m (3281 ft.) 	1000 ... 2000m (3281 ... 6562ft.)
Installation altitude above sea level when complying with all of the following conditions: <ul style="list-style-type: none"> • 40°C (104°F) maximum ambient temperature • Reduction of the continuous power by 1% per 100 m (328 ft.) above 1000 m (3281 ft.) • Overvoltages of the supplying grid limited to an overvoltage category III according to IEC 60664-1/IEC61800-5-1 	2000 ... 3000m (6562 ... 9843ft.)

Installation location and connection For operation, the Lexium 62 Power Supply and the Lexium 62 Connection Module must be mounted in a closed control cabinet. The devices must only be operated with fixed connections.

Pollution degree and degree of protection	Pollution degree	according to IEC61800-5-1	2
	Degree of protection	according to IEC61800-5-1	IP 20 (control cabinet), IP65 (field devices)

Degree of protection when using the safety function Ensure that no conductive pollution can deposit in the product (pollution degree 2). Conductive pollutions can cause the safety function to be ineffective.

Lexium 62 Distribution Box

Procedure	Parameter	Value	Basis
Operation	Class 3K3		IEC/EN 60721-3-3
	Degree of protection housing	IP 65 with plug-in connectors	
	Pollution degree	2	
	Ambient temperature	+5 °C...+55 °C / +41 °F...+131 °F	
	Relative humidity	5% ... 85%	
	• Condensation	No	
	• Icing	No	
	• Other water	No	
	Class 3M7		
	Vibration	30m/s ²	
Shock	250m/s ²		
Transport	Class 2K3		IEC/EN 60721-3-2
	Ambient temperature	-25 °C...+70 °C / -13 °F...+158 °F	
	Relative humidity	5% ... 95%	
	• Condensation	No	
	• Icing	No	
	• Other water	No	
	Class 2M2		
	Vibration	10m/s ²	
	Shock	300m/s ²	
Long-term storage in transport packaging	Class 1K4		IEC/EN 60721-3-1
	Ambient temperature	-25 °C...+55 °C / -13 °F...+131 °F	
	Relative humidity	5% ... 85%	
	• Condensation	No	
	• Icing	No	
	• Other water	No	

Table 8-3: Ambient conditions Lexium 62 Distribution Box

Daisy Chain Connector Box

Procedure	Parameter	Value	Basis
Operation	Class 3K4		IEC/EN 60721-3-3
	Degree of protection housing	IP 65 with plug-in connectors	
	Pollution degree	2	
	Ambient temperature	-20 °C...+60 °C / -4 °F...+140 °F	
	Relative humidity	5% ... 95%	
	• Condensation	No	
	• Icing	No	
	• Other water	No	
	Class 3M7		
	Vibration	30 m/s ²	
Shock	250 m/s ²		
Transport	Class 2K2		IEC/EN 60721-3-2
	Ambient temperature	-25 °C...+70 °C / -13 °F...+158 °F	
	Relative humidity	maximum 75%	
	• Condensation	No	
	• Icing	No	
	• Other water	No	
	Class 2M2		
	Vibration	15 m/s ²	
Shock	300 m/s ²		
Long-term storage in transport packaging	Class 1K2		IEC/EN 60721-3-1
	Ambient temperature	-25 °C...+55 °C / -13 °F...+131 °F	
	Relative humidity	5% ... 85%	
	• Condensation	No	
	• Icing	No	
• Other water	No		

Table 8-4: Ambient conditions Daisy Chain Connector Box

Lexium 62 ILM

Procedure	Parameter	Value	Basis
Operation	Class 3K3		IEC/EN 60721-3-3
	Degree of protection housing	IP 65 with plugged-in connectors	
	Ambient temperature	+5 °C...+40 °C / +41 °F...+104 °F	
	Relative humidity	5% ... 85%	
	Class 3M7		
	Vibration	30 m/s ² (all directions in space)	
	Shock	250 m/s ²	
Transport	Class 2K3		IEC/EN 60721-3-2
	Ambient temperature	-25 °C...+70 °C / -13 °F...+158 °F	
	Relative humidity	5% ... 95%	
	• Condensation	No	
	• Icing	No	
	• Other water	No	
	Class 2M1		
	Vibration	15 m/s ²	
Shock	100 m/s ²		
Long-term storage in transport packaging	Class 1K4		IEC/EN 60721-3-1
	Ambient temperature	-25 °C...+55 °C / -13 °F...+131 °F	
	Relative humidity	10% ... 100%	
	• Condensation	No	
	• Icing	No	
	• Other water	No	

Table 8-5: Ambient conditions for Lexium 62 ILM

8.3 Standards and regulations

CE	Low Voltage Directive 2014/35/EU
	<ul style="list-style-type: none"> EN 61800-5-1:2007
UL	EMC Directive 2014/30/EU
	<ul style="list-style-type: none"> EN 61800-3:2004
UL	UL 508C Power Conversion Equipment
CSA	Industrial Control Equipment
	<ul style="list-style-type: none"> CSA-C22.2 No. 14

Table 8-6: Declarations and certifications

Functional safety	EN ISO 13849-1, PL e IEC/EN 62061, SIL 3 IEC/EN 61508, SIL 3
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Table 8-7: Standards and regulations - Functional safety

8.4 Motor options

Designation	Description
Motor shaft	Standard shaft with round-ended feather key according to DIN 6885 T1
Brake	Electromagnetic/permanently magnetic holding brake
Cooling	Air cooling (fan cover)

Table 8-8: Technical data of the motor options

8.5 Mechanical and electrical data

8.5.1 Lexium 62 connection module

Category	Parameter	Value
Product configuration	Item name	ILM62CMD20
Electronics power supply (CN1)	Control voltage	DC +24 V -20% / +25%
	Input current	20 A
Power supply (CN1)	DC bus voltage	DC 250 ... 700 V
	Input current	20 A rated current
	DC bus capacity	220 µF
	Discharge time	5 min (maximum)
	Overvoltage	860 Vdc
Output DC bus (CN7)	DC bus voltage	DC 250 ... 700 V
	Output current	20 A rated current
	Peak current 1 s (I_{sc})	40 A
Inverter Enable power supply (CN6)	Control voltage	DC +24 V -20% / +25%
	Control current	1.5 A
Inverter Enable output signal (CN8)	IE voltage	AC 40 V (eff.)
	IE current	2 A (eff.)
	IE signal frequency	100 kHz
Interfaces	Sercos	integrated
Cooling		Natural convection
Degree of protection		IP20
Isolation class	Pollution degree	2 (IEC/EN 61800-5-1)
Protective class	Class	1 (IEC/EN 61800-5-1)
Overvoltage category	Class	III (IEC/EN 61800-5-1)
Radio interference level	Class	C3 (IEC/EN 61800-3)
Dimensions	Housing D x W x H	270 mm x 44 mm x 310 mm (10.63 in. x 1.73 in. x 12.20 in.)
Weight	Weight (with packaging)	3 kg (4 kg) / 6.6 lbs (8.8 lbs)

Table 8-9: Technical data Lexium 62 Connection Module

8.5.2 Lexium 62 distribution box

Category	Parameter	Value
Product configuration	Item name	Lexium 62 Distribution Box
DC power supply (CN1 - CN5)	DC bus voltage	DC 250 V ... 700 V
	Rated current	20 A
	DC capacity	100 µF
Electronics power supply (CN1 - CN5)	Control voltage / -current	DC 24 V (-20%..+25%) / maximum 20 A
	Control voltage capacity	1000 µF
Inverter Enable (CN1 - CN5)	IE voltage	AC 40 V (eff.)
	IE current	2 A (eff.)
	IE signal frequency	100 kHz
Ethernet Sercos (CN1 - CN5)	Data rate	100 Mbit/s
Cooling		Natural convection
Degree of protection		IP 65
Isolation class	Pollution degree	2 (IEC/EN 61800-5-1:2007)
Protective class	Class	1 (IEC/EN 61800-5-1)
Overvoltage category	Class	III (IEC/EN 61800-5-1:2007), T2 (DIN VDE 0110)
Radio interference level	Class	C3 (IEC/EN 61800-3)
Material		Polycarbonate [Lexan 940A]
Dimensions	Housing D x W x H	151.4 mm x 230 mm x 94 mm (5.96 in. x 9.05 in. x 3.70 in.)
Weight		0.85 kg (1.8 lbs)

Table 8-10: Technical data Lexium 62 Distribution Box

8.5.3 Daisy Chain Connector Box

Category	Parameter	Value
Product configuration	Item name	Daisy Chain Connector Box
DC power supply (CN1, CN2/CN3)	DC bus voltage	DC 250 V ... 700 V
	Rated current	20 A
Electronics power supply (CN1, CN2/CN3)	Control voltage / -current	DC 24 V (-20%..+25%) / maximum 20 A
Inverter Enable (CN1, CN2/CN3)	IE voltage	AC 40 V (eff.)
	IE current	2 A (eff.)
	IE signal frequency	100 kHz
Ethernet Sercos (CN4/CN5)	Data rate	100 Mbit/s
Cooling		Natural convection
Degree of protection		IP 65
Isolation class	Pollution degree	2 (IEC/EN 61800-5-1:2007)
Protective class	Class	1 (IEC/EN 61800-5-1)
Overvoltage category	Class	III (IEC/EN 61800-5-1:2007), T2 (DIN VDE 0110)
Radio interference level	Class	C3 (IEC/EN 61800-3)
Material		Polybutylene terephthalate (PBT) with 30% fiberglass [Pocan B 4235]
Dimensions	ILM62DCA000 Type A Housing D x W x H	74.6 mm x 73.3 mm x 93 mm (2.94 in. x 2.89 in. x 3.66 in.)
	ILM62DCB000 Type B Housing D x W x H	56.5 mm x 106.8 mm x 113.2 mm (2.22 in. x 4.20 in. x 4.46 in.)
	ILM62DCC000 Type C Housing D x W x H	56.5 mm x 106.8 mm x 140.2 mm (2.22 in. x 4.20 in. x 5.52 in.)
Weight	Weight with packaging	0.86 kg (1.90 lbs)

Table 8-11: Technical data Daisy Chain Connector Box

8.5.4 Lexium 62 ILM

Category	Parameter	Value
Power Supply	Supply voltage	250 ... 700 V DC
	Connection capacity	700 nF
	Without brake	
	Control voltage	
	Hardware code: xxxxxx1xxxxx	DC +18.5 ... +31 V
	Hardware code: xxxxxx2xxxxx	DC +18.5 ... +31 V
	Current consumption	240 mA (maximum)
	With brake	
	Control voltage	
	Hardware code: xxxxxx1xxxxx	DC +21.6 ... +25.4 V
	Hardware code: xxxxxx2xxxxx	DC +20.5 ... +30 V
	Current consumption ILM 070 1P	Continuous operation: 360 mA While releasing the brake: 500 mA
	Current consumption ILM 070 2P	Continuous operation: 360 mA While releasing the brake: 530 mA
	Current consumption ILM 070 3P	Continuous operation: 360 mA While releasing the brake: 530 mA
	Current consumption ILM 100 1P	Continuous operation: 450 mA While releasing the brake: 740 mA
Current consumption ILM 100 2P	Continuous operation: 450 mA While releasing the brake: 740 mA	
Current consumption ILM 100 3P	Continuous operation: 500 mA While releasing the brake: 820 mA	
Current consumption ILM 140 1P	Continuous operation: 560 mA While releasing the brake: 700 mA	
Current consumption ILM 140 2P	Continuous operation: 600 mA While releasing the brake: 890 mA	
Current consumption ILM 140 1M	Continuous operation: 560 mA While releasing the brake: 700 mA	
Cooling		Natural convection
Protective class	Class	1 (IEC/EN 61800-5-1)
Overvoltage category	Class	III (IEC/EN 61800-5-1), T2 (DIN VDE 0110)
Radio interference level	Class	C3 (IEC/EN 61800-3)
Insulation material class		F
Degree of protection	Controller	IP65
	Motor	For information on the degree of protection of the motor, see Technical data Lexium 62 ILMs.
Isolation class	Pollution degree	2
Motor coating		Powder coating based on epoxy resin
Lubricant (according to FDA standard for servo motors)		Klübersynth UH1 64-62 food safe gearbox grease

Table 8-12: Technical data Lexium 62 ILM

8.5.5 ILM070 Servo Motor

Category	Parameter	Abbreviation [unit]	ILM070 1 P	ILM070 2 P	ILM070 3 P
General data	Standstill torque	M_0 [Nm]	1.1	1.7	2.2
	Peak torque	M_{max} [Nm]	3.5	7.6	8.7
	Rated motor speed	n_N [min ⁻¹]	6000	6000	6000
	Rated torque	M_N [Nm]	0.5	1.15	1.15
	Rated power	P_N [kW]	0.31	0.72	0.72
Electrical data	Number of pole pairs	p	3	3	3
	Motor winding switch		Y	Y	Y
	Torque constant (120 °C)	k_T [Nm/A _{rms}]	0.71	0.76	0.76
	Winding resistance Ph-Ph (20 °C)	$R_{U-V, 20}$ [Ω]	10.40	4.20	2.70
	Winding resistance Ph-0 (120 °C)	R_{120} [Ω]	7.23	2.92	1.88
	Winding inductance Ph-Ph	L_{U-V} [mH]	38.8	19.0	13.0
	Winding inductance Ph-0	L [mH]	19.4	9.5	6.5
	Voltage constant Ph-Ph (20 °C)	k_E [V _{rms} /kmin ⁻¹]	46	48	49
	Standstill current	I_0 [A _{rms}]	1.55	2.5	3.0
	Rated current	I_N [A _{rms}]	0.60	1.5	1.5
	Peak current	I_{max} [A _{rms}]	5.7	11.8	12.0
	Protective class	Class	-	1 (IEC/EN 61800-5-1)	
Mechanical data	Moment of inertia of the rotor	J_M [kgcm ²]	0.25 (0.35)	0.41 (0.51)	0.58 (0.88)
Weight		m [kg]	2.7 (3.0)	3.4 (3.7)	4.2 (4.7)
Thermal data	Thermal time constant	T_{th} [min]	35	38	51
	Response limit thermal contact	T_{TK} [°C]	130	130	130
Brake data	Holding brake		optional	optional	optional

Table 8-13: Technical data ILM070 without (with) brake

8.5.6 ILM100 Servo Motor

Category	Parameter	Abbreviation [unit]	ILM100 1 P	ILM100 2 P	ILM100 3 P
General data	Standstill torque	M_0 [Nm]	2.5	4.4	5.8
	Peak torque	M_{max} [Nm]	9.6	18.3	28.3
	Rated motor speed	n_N [min ⁻¹]	3000	3000	3000
	Rated torque	M_N [Nm]	1.9	2.9	3.5
	Rated power	P_N [kW]	0.6	0.91	1.10
Electrical data	Number of pole pairs	p	4	4	4
	Motor winding switch		Y	Y	Y
	Torque constant (120 °C)	k_T [Nm/A _{rms}]	1.39	1.52	1.61
	Winding resistance Ph-Ph (20 °C)	$R_{U-V, 20}$ [Ω]	9.80	4.12	2.60
	Winding resistance Ph-0 (120 °C)	R_{120} [Ω]	6.82	2.86	1.81
	Winding inductance Ph-Ph	L_{U-V} [mH]	45.70	21.80	15.60
	Winding inductance Ph-0	L [mH]	22.85	10.90	7.80
	Voltage constant Ph-Ph (20 °C)	k_E [V _{rms} / kmin ⁻¹]	90	100	103
	Standstill current	I_0 [A _{rms}]	1.80	2.90	3.60
	Rated current	I_N [A _{rms}]	1.40	2.00	2.40
	Peak current	I_{max} [A _{rms}]	7.40	13.10	21.20
Protective class	Class	-	1 (IEC/EN 61800-5-1)		
Mechanical data	Moment of inertia of the rotor	J_M [kgcm ²]	1.40	2.31	3.22
			(2.10)	(3.01)	(3.92)
Weight		m [kg]	4.9 (5.7)	6.4 (7.2)	8.1 (8.9)
Thermal data	Thermal time constant	T_{th} [min]	44	48	56
	Response limit thermal contact	T_{TK} [°C]	130	130	130
Brake data	Holding brake		optional	optional	optional

Table 8-14: Technical data ILM100 without (with) brake

8.5.7 ILM140 Servo Motor

Category	Parameter	Abbreviation [unit]	ILM140 1 P	ILM140 1 M	ILM140 2 P
General data	Standstill torque	M_0 [Nm]	7.5	8.5	12.5
	Peak torque	M_{max} [Nm]	27.0	27.0	55.0
	Rated motor speed	n_N [min ⁻¹]	3000	1500	2000
	Rated torque	M_N [Nm]	4.6	8.3	9.1
	Rated power	P_N [kW]	1.45	1.30	1.91
Electrical data	Number of pole pairs	p	5	5	5
	Motor winding switch		Y	Y	Y
	Torque constant (120 °C)	k_T [Nm/A _{rms}]	1.60	2.65	2.60
	Winding resistance Ph-Ph (20 °C)	$R_{U-V, 20}$ [Ω]	1.81	4.58	1.90
	Winding resistance Ph-0 (120 °C)	R_{120} [Ω]	1.26	3.18	1.32
	Winding inductance Ph-Ph	L_{U-V} [mH]	19.10	50.0	22.0
	Winding inductance Ph-0	L [mH]	9.55	25.0	11.0
	Voltage constant Ph-Ph (20 °C)	k_E [V _{rms} / kmin ⁻¹]	108	175	173
	Standstill current	I_0 [A _{rms}]	4.70	3.20	4.8
	Rated current	I_N [A _{rms}]	2.90	3.15	3.7
	Peak current	I_{max} [A _{rms}]	18.8	14.6	24.0
Protective class	Class	-	1 (IEC/EN 61800-5-1)		
Mechanical data	Moment of inertia of the rotor	J_M [kgcm ²]	7.41	7.41	12.68
Weight (with brake)		m [kg]	12.5 (13.8)	12.5 (13.8)	17.2 (18.5)
Thermal data	Thermal time constant	T_{th} [min]	64	64	74
	Response limit thermal contact	T_{TK} [°C]	130	130	130
Brake data	Holding brake		optional	optional	optional

Table 8-15: Technical data ILM140 without (with) brake

8.5.8 Encoder

SinCos® (SKS36) Singleturn

Parameter	Value	Units
Number of revolutions	1	
Number of sine/cosine periods	128	Per revolution
Absolute measuring range	1	Revolution
Error limits of the digital absolute value	+/-5.3	Angular minutes
Error limits when evaluating the 128 signals (integral non-linearity)	+/-1.3	Angular minutes
Signal shape	Sinusoidal	

Table 8-16: Technical data of the SinCos encoder (SKS-36)

SinCos® (SKM36) Multiturn

Parameter	Value	Units
Number of revolutions	4096	
Number of sine/cosine periods	128	Per revolution
Absolute measuring range	1	Revolution
Error limits of the digital absolute value	+/-5.3	Angular minutes
Error limits when evaluating the 128 signals (integral non-linearity)	+/-1.3	Angular minutes
Signal shape	Sinusoidal	

Table 8-17: Technical data of the SinCos® encoder (SKM-36)

8.5.9 Motor shaft and bearings

Design of the shaft end

Smooth shaft end (standard) With a non-positive connection, torque transmission must be achieved only by surface pressure. That ensures power transmission without backlash.

Shaft end with round-ended feather key according to DIN 6885 Shaft connections with feather keys are positive. The feather key seating can deflect under continuous strain with changing torques and prolonged reverse operation, causing backlash. As a result, rotational quality is reduced due to backlash. Increasing deformation can lead to the feather key breaking and damage to the shaft. This type of shaft hub connection is only suitable for low requirements. Therefore, use smooth shaft ends.

Bearing

The back side bearing is designed as a fixed bearing and the bearing on shaft output side as a floating bearing.

Permissible shaft load

In case of technical correct use, the life of drives is limited by the bearing life. You cannot replace the bearing, as the measuring systems integrated in the drive must then be reinitialized.

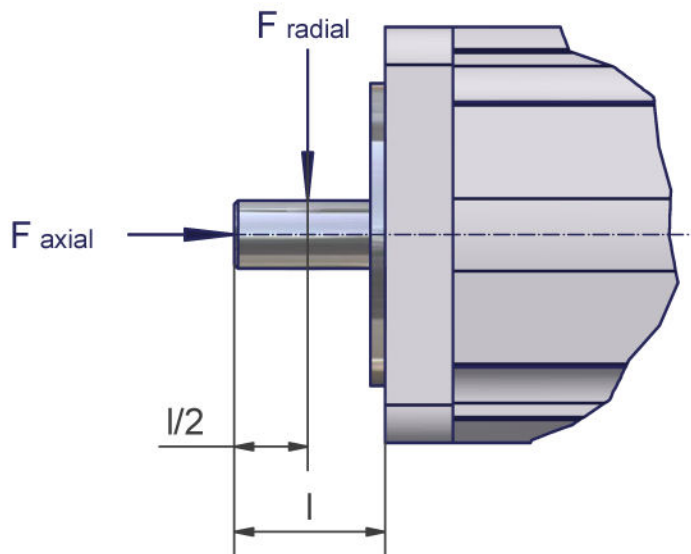


Figure 8-1: Definition of shaft load

Motor	1000 min ⁻¹	2000 min ⁻¹	3000 min ⁻¹	4000 min ⁻¹	5000 min ⁻¹	6000 min ⁻¹
ILM070 1 P	660	520	460	410	380	360
ILM070 2 P	710	560	490	450	410	390
ILM070 3 P	730	580	510	460	430	400
ILM100 1 P	900	720	630	-	-	-
ILM100 2 P	990	790	690	-	-	-
ILM100 3 P	1050	830	730	-	-	-
ILM140 1 M	2210	1760	-	-	-	-
ILM140 1 P	2210	1760	1530	-	-	-
ILM140 2 P	2430	1930	-	-	-	-

Table 8-18: Permissible radial force F_{radial} [N]

Basis for calculation:

The permissible axial force F_{axial} [N] is calculated according to:

$$F_{\text{axial}} = 0.2 \times F_{\text{radial}}$$

- Nominal bearing life $L_{10h} = 20,000$ h for a shaft without feather key nut (for operating hours at a 10% failure probability)
- Ambient temperature = 40 °C / 104 °F (approx. 100 °C / 212 °F storage temperature)
- Peak torque = 10 % ED
- Nominal torque = 100 % ED

8.5.10 Holding brake

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

WARNING

UNINTENDED 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.

Releasing the holding brake can cause an unintended movement, for example, lowering of the load in the case of vertical axes.

WARNING

UNINTENDED MOVEMENT

- Take appropriate measures to avoid damage caused by falling or lowering loads or other unintended movements.
- Verify that there are no persons or obstacles in the zone of operation when performing a test of the holding brake.

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 times mentioned in the following apply when switching in the direct current circuit, when the motor is warm, and at the rated voltage. The disconnection time is the period from switching on the current to the dying out of the torque to 10% of the rated torque of the brake. The coupling time counts as the period from when the current is switched off to the attainment of the rated torque.

The holding brake is designed differently for each series:

Technical data of the holding brake of the ILM070

Parameter	ILM070 1 P	ILM070 2 P	ILM070 3 P	Unit
Static holding torque at 120 °C	3.0	3.0	3.0	[Nm]
Coupling time	10	10	10	[ms]
Disconnection time	80	80	80	[ms]
Mass	0.28	0.28	0.28	[kg]
Moment of inertia	0.11	0.11	0.11	[kgcm ²]

Table 8-19: Technical data of the holding brake of the ILM070

Technical data of the holding brake of the ILM100

Parameter	ILM100 1 P	ILM100 2 P	ILM100 3 P	Unit
Static holding torque at 120 °C	5.5	5.5	9.0	[Nm]
Coupling time	30	30	25	[ms]
Disconnection time	70	70	90	[ms]
Mass	0.46	0.46	0.65	[kg]
Moment of inertia	0.49	0.49	0.78	[kgcm ²]

Table 8-20: Technical data of the holding brake of the ILM100

Technical data of the holding brake of the ILM140

Parameter	ILM140 1 P	ILM140 1 M	ILM140 2 P	Unit
Static holding torque at 120 °C	18.0	18.0	23.0	[Nm]
Coupling time	50	50	40	[ms]
Disconnection time	100	100	100	[ms]
Mass	1.06	1.06	1.29	[kg]
Moment of inertia	1.5	1.5	2.55	[kgcm ²]

Table 8-21: Technical data of the holding brake of the ILM140

8.6 Mounting arrangement and degree of protection

The drive degree of protection depends on the reference of the drive. In some cases, the degree of protection requires particular mounting arrangements and addition options. The mounting flange for all drive types is designed in such a way that the installation type is possible according to the types of construction IM B5, IM V1 and IM V3 (mounting flange with through hole).

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

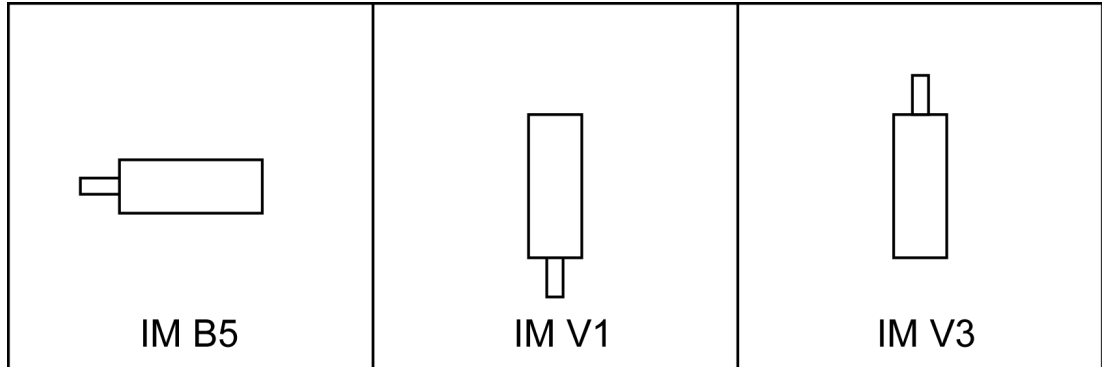


Figure 8-2: Drive installations

NOTICE

MOUNTING POSITION AND PENETRATING LIQUIDS

Prevent liquids from remaining on the motor shaft over an extended period of time when mounting the motor in the mounting position IM V3.

Failure to follow these instructions can result in equipment damage.



It also cannot be ruled out that liquids penetrate the motor housing along the motor shaft even if a shaft sealing ring has been installed.

Motor part	Mounting position (conforming to DIN 42 950)	Degree of protection (according to IEC/EN 60529) WITHOUT shaft sealing ring	Degree of protection (according to IEC/EN 60529) WITH shaft sealing ring
Shaft	IM V3	IP 50	IP 65
	IM B5, IM V1	IP 54	
Surface/connections	IM B5, IM V1, IM V3	IP 65	IP 65

Table 8-22: Degree of protection of the ILM servo motor

8.7 Torque/speed characteristic curves

The torque-speed characteristic curve represents the following characteristics:

- The permissible permanent torque (operating type S 1)
- The peak torque with mains voltage = 3 x 230 Vac
- The peak torque with mains voltage = 3 x 400 Vac
- The peak torque with mains voltage = 3 x 480 Vac *

(* for ILM140** only)

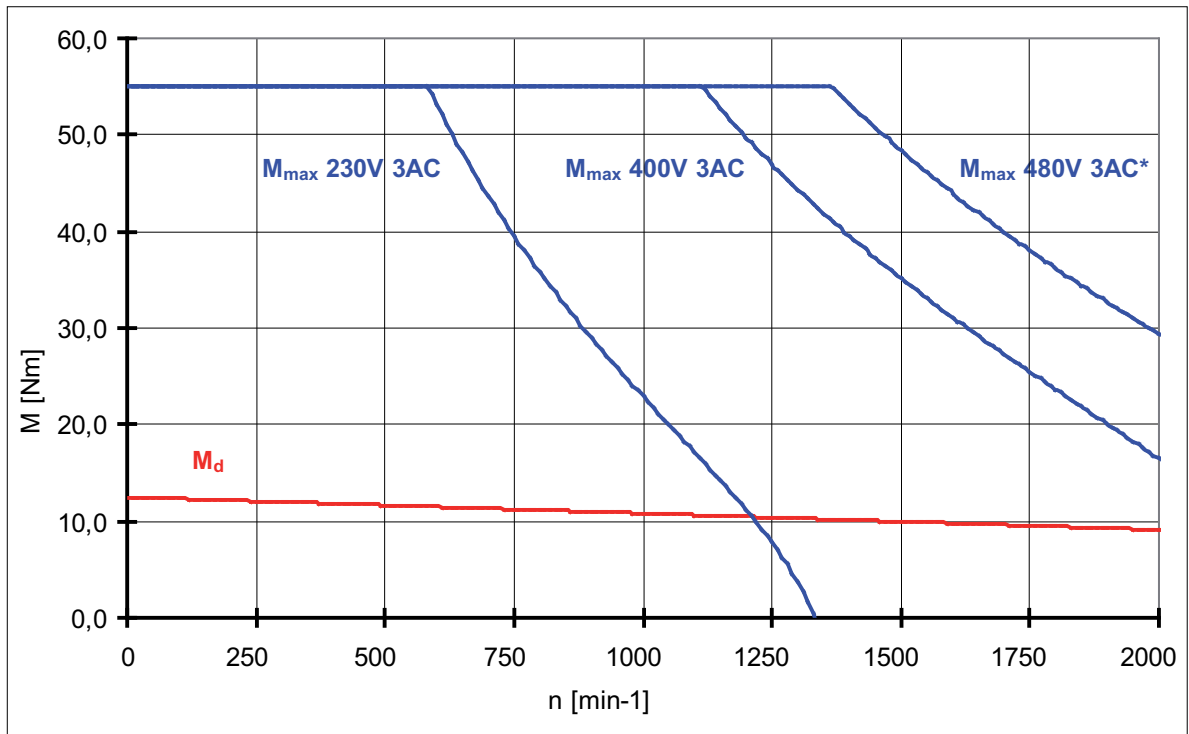


Figure 8-3: Example of a torque-speed characteristic curve (* for ILM140** only)

The characteristic curves refer to an ambient temperature of 40 °C / 104 °F and a maximum winding temperature of 120 °C / 248 °F.

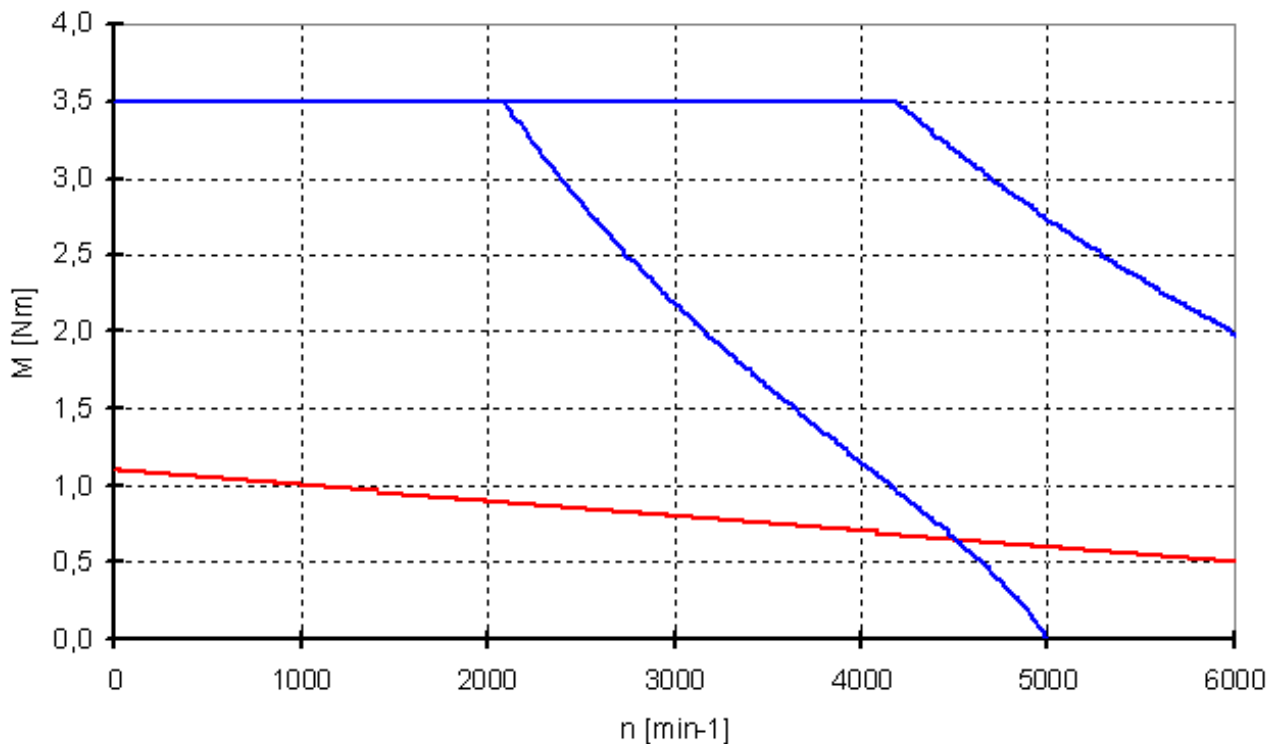


Figure 8-4: Torque-speed characteristic curve ILM 070 1 P

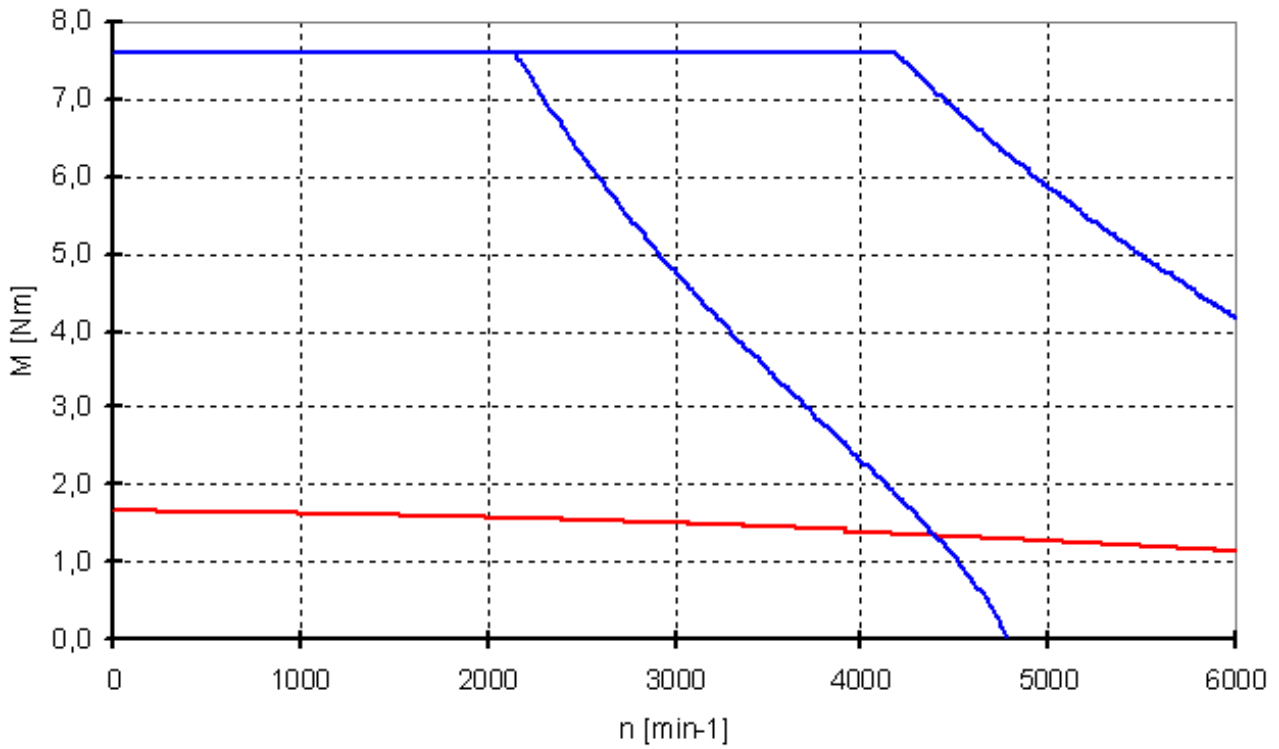


Figure 8-5: Torque-speed characteristic curve ILM 070 2 P

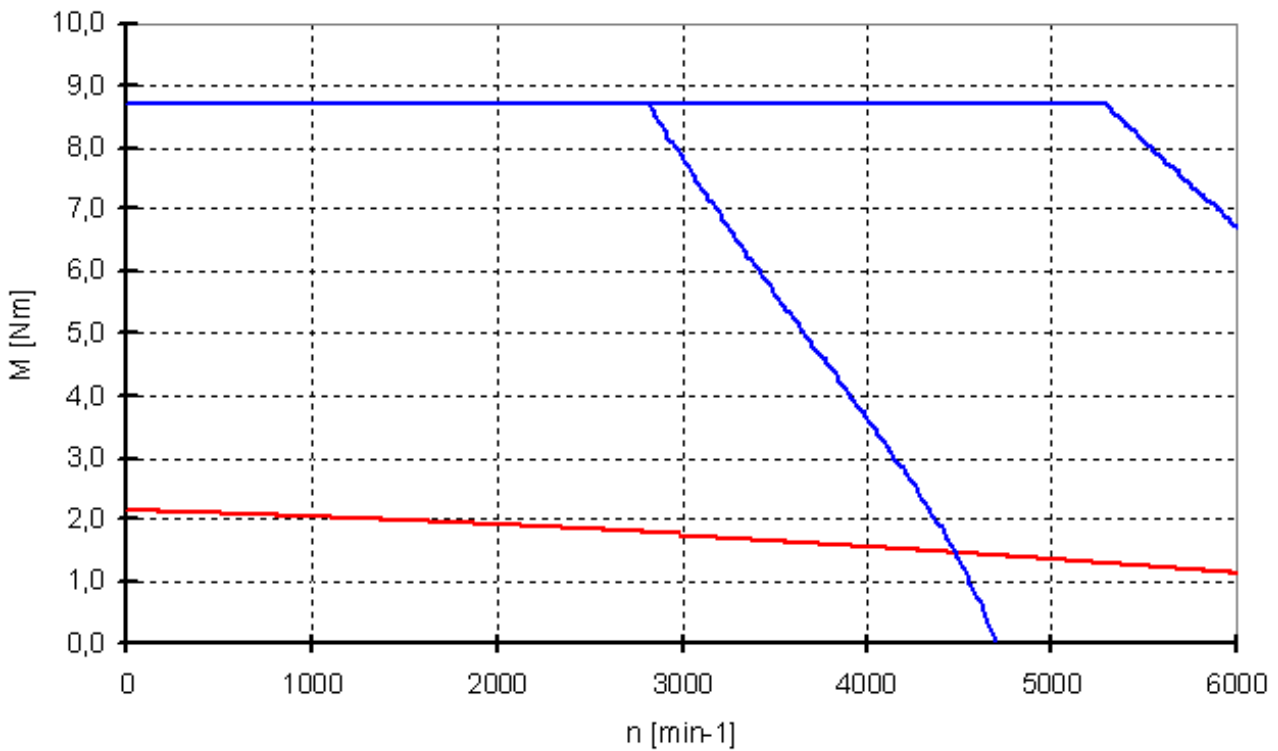


Figure 8-6: Torque-speed characteristic curve ILM 070 3 P

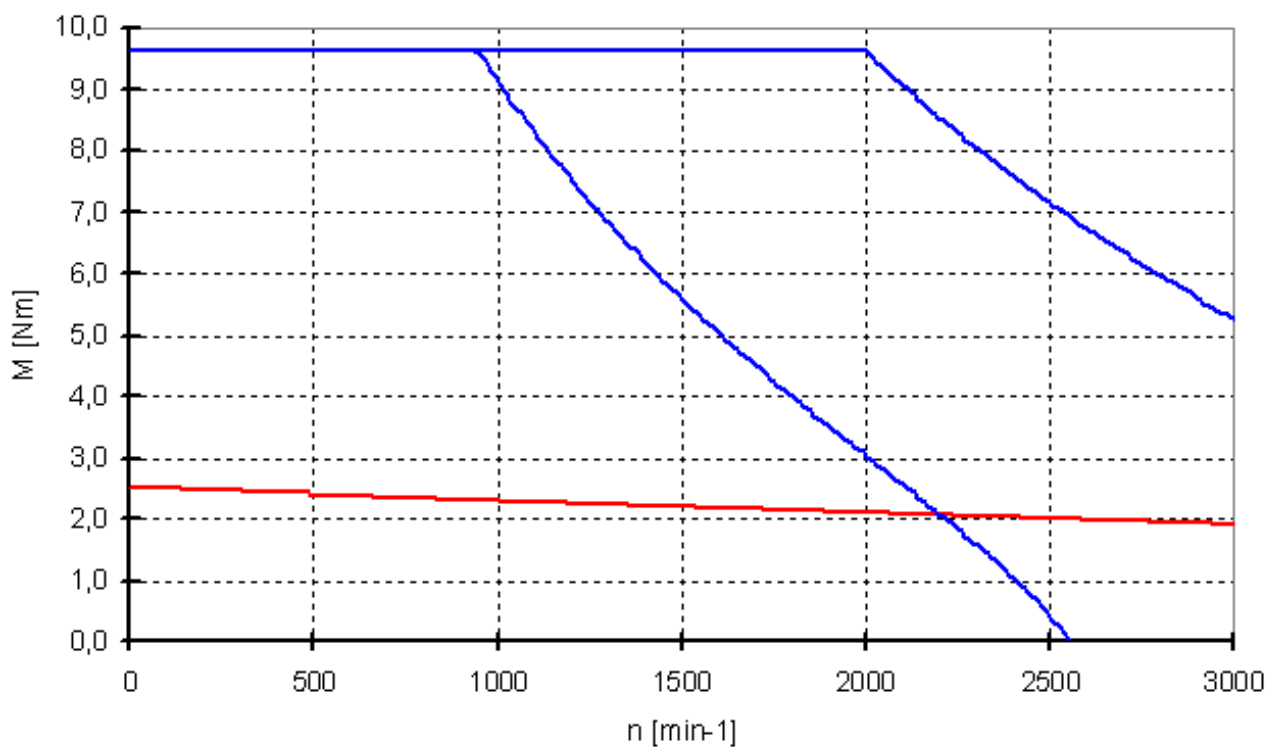


Figure 8-7: Torque-speed characteristic curve ILM 100 1 P

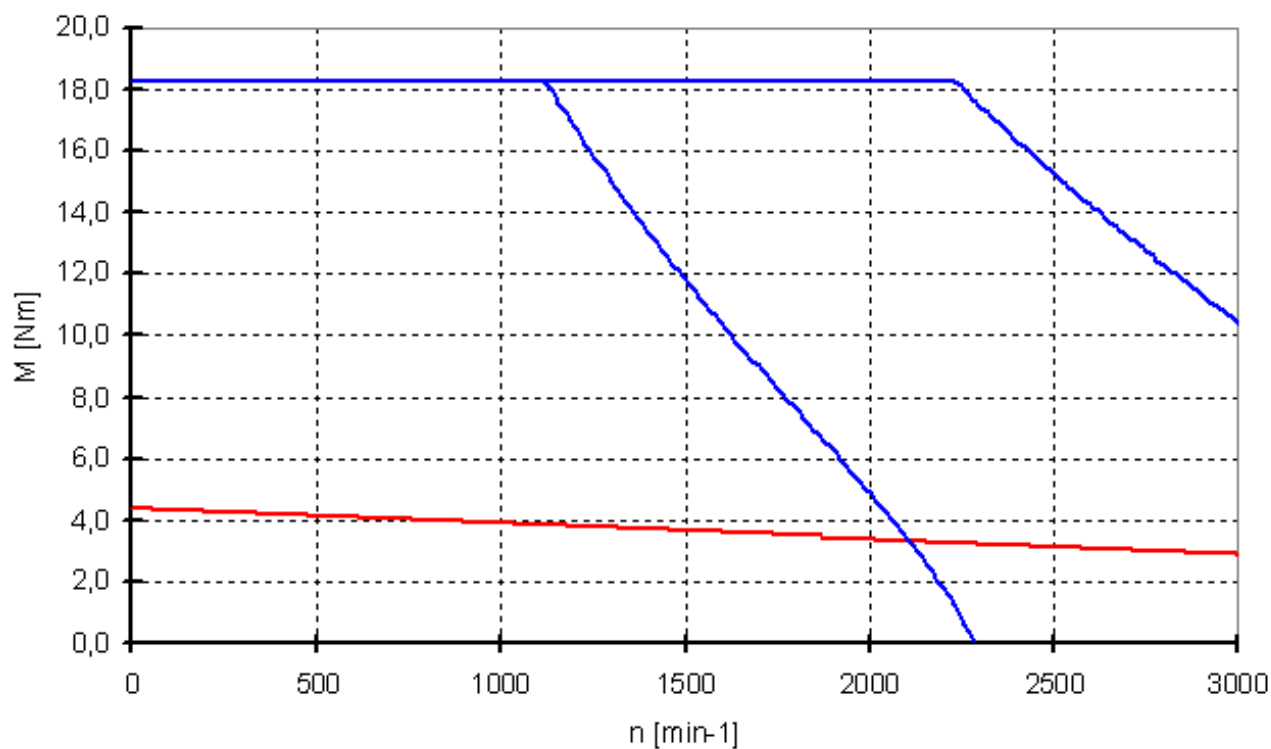


Figure 8-8: Torque-speed characteristic curve ILM 100 2 P

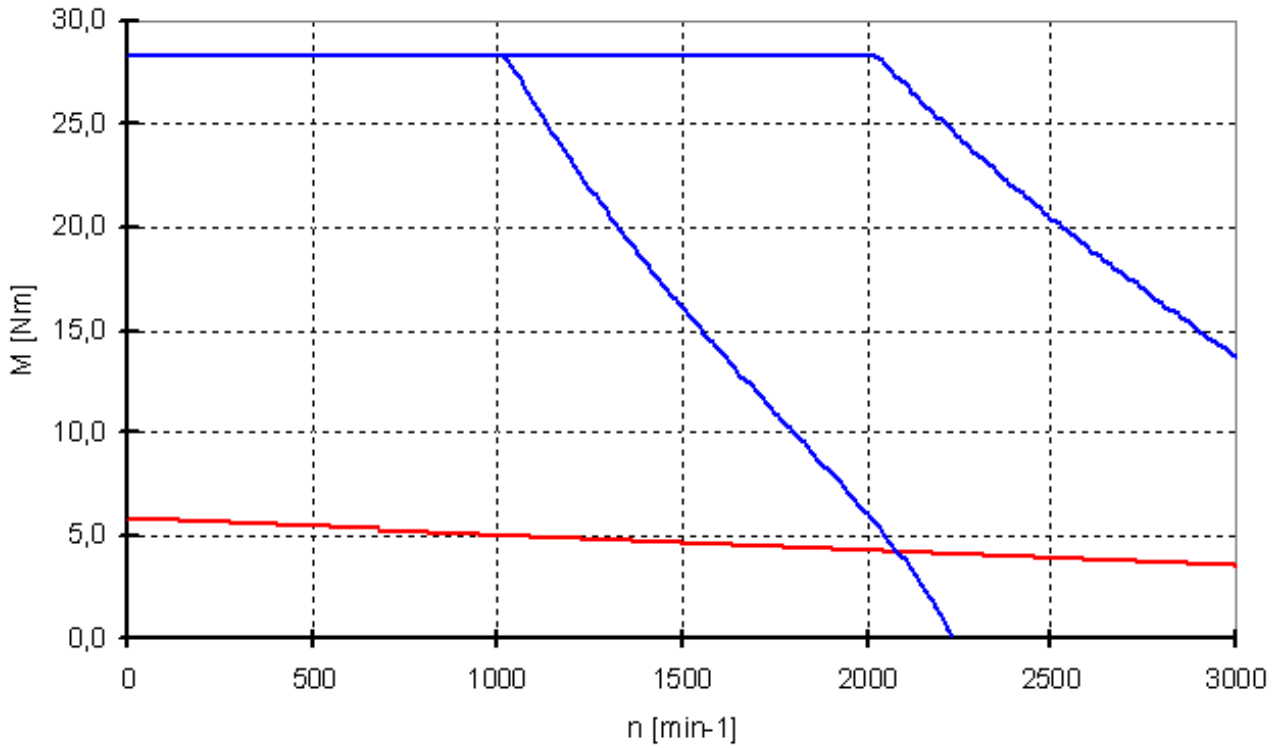


Figure 8-9: Torque-speed characteristic curve ILM 100 3 P

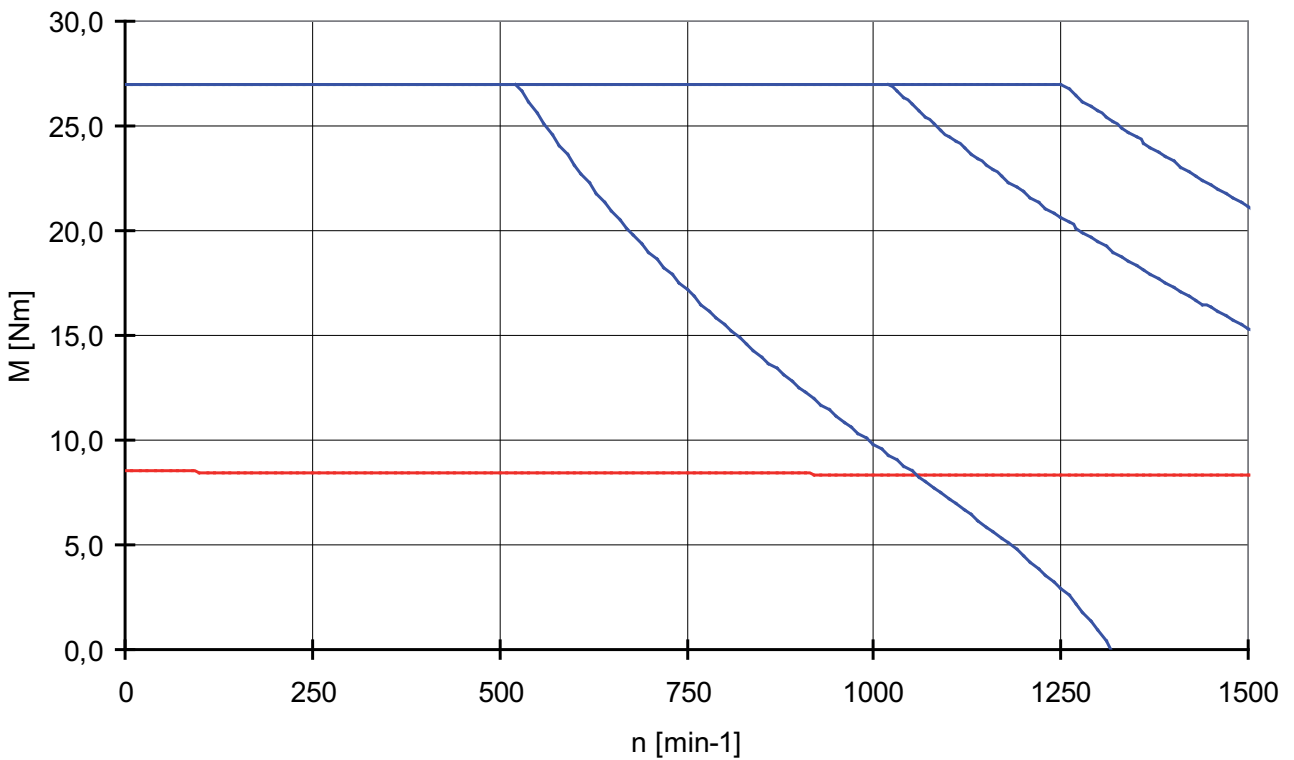


Figure 8-10: Torque-speed characteristic curve ILM 140 1 M

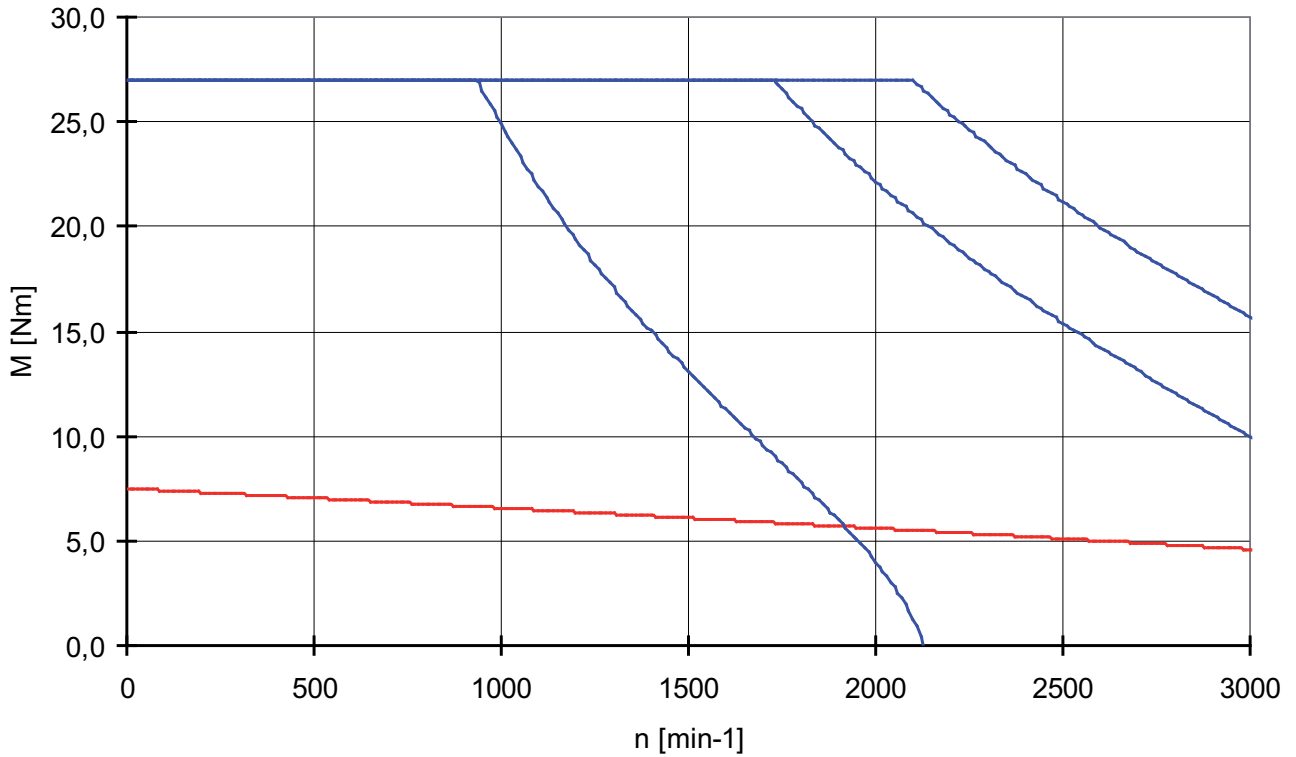


Figure 8-11: Torque-speed characteristic curve ILM 140 1 P

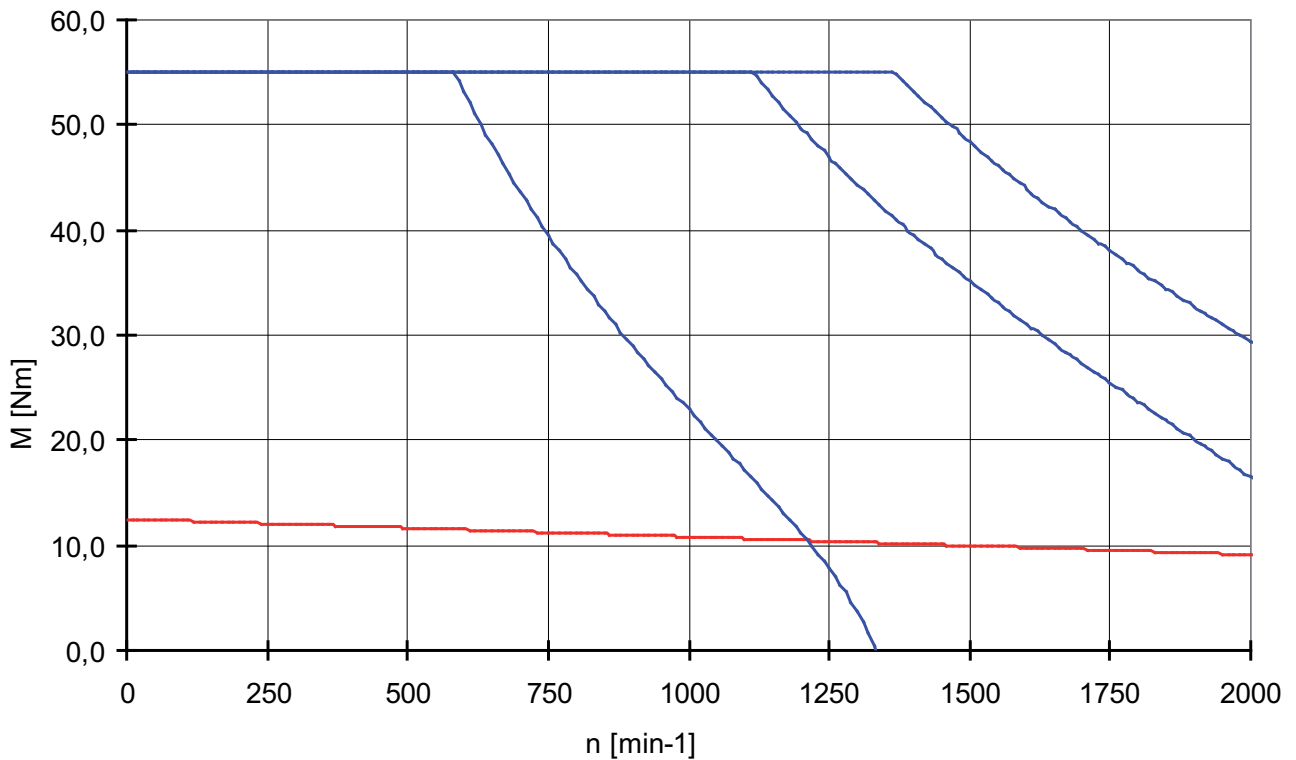


Figure 8-12: Torque-speed characteristic curve ILM 140 2 P

8.8 Electrical connections

8.8.1 Lexium 62 connection module

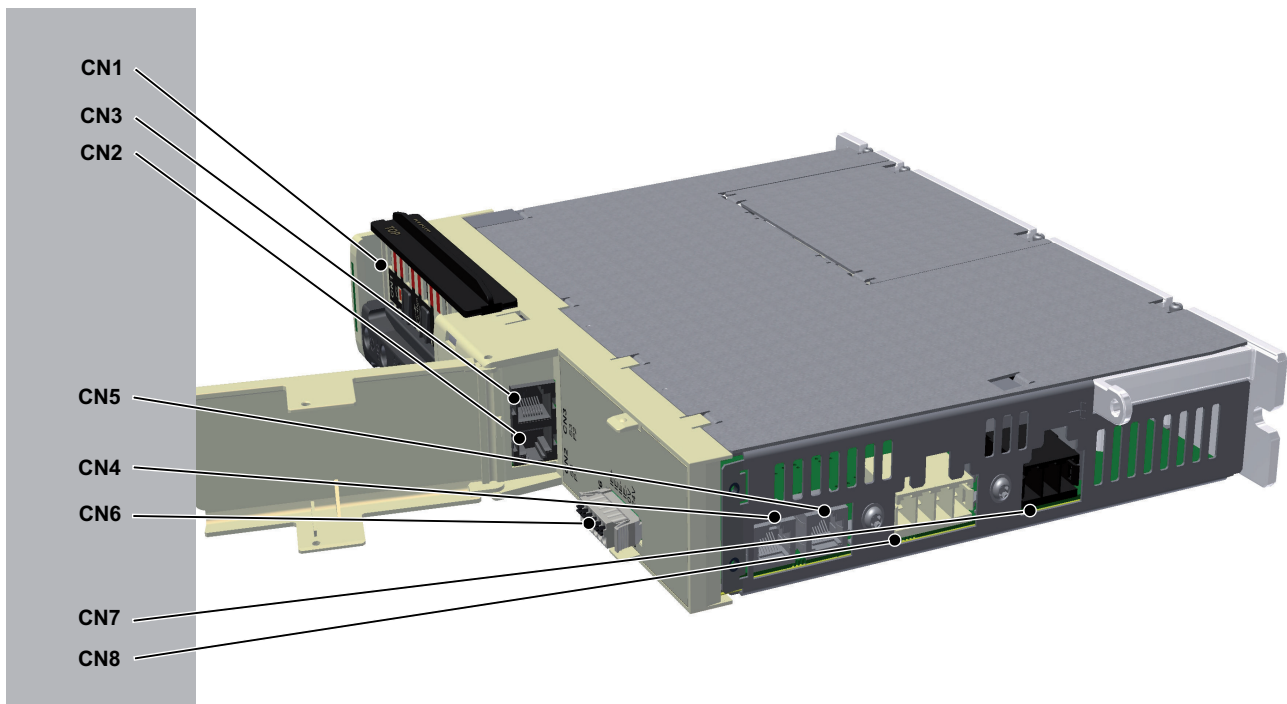
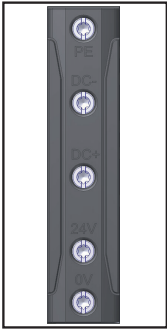


Figure 8-13: Connection overview Lexium 62 connection module

Connection	Meaning	Connection cross-section [mm ²] / [AWG]	Tightening torque [Nm] / [lbf in]
CN1	Bus Bar Module	- / -	2.5 / 22.14
CN2/CN3	Sercos communication	- / -	- / -
CN4	Sercos communication	- / -	- / -
CN5	Sercos communication	- / -	- / -
CN6	Inverter Enable 24 V	0.2 ... 1.5 / 24 ... 16	- / -
CN7	DC bus output	0.2 ... 6 / 24 ... 8	- / -
CN8	Inverter Enable signal output / 24 V output	0.2 ... 6 / 24 ... 8	- / -
⊥	Protective ground (earth)	10 (cable lug) / 6	3.5 / 30.98

CN1 - Bus Bar Module

The DC bus voltage and the 24Vdc control voltage is distributed and the protective conductor is connected via the Bus Bar Module.




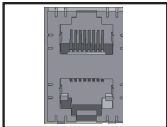
Pin	Designation	Description
1		Protective ground (earth)
2	DC-	DC bus voltage -
3	DC +	DC bus voltage +
4	24V	Supply voltage +
5	0V	Supply voltage -

Table 8-23: Electrical connection - Bus Bar Module

CN2/CN3 - Sercos

The Sercos connection is used for communication between the PacDrive LMC, the Lexium 62 Power Supply and the Lexium 62 Connection Module or modules.



Pin	Designation	Description
1.1	Eth0_Tx+	Positive transmission signal
1.2	Eth0_Tx-	Negative transmission signal
1.3	Eth0_Rx+	Positive receiver signal
1.4	N.C.	-
1.5	N.C.	-
1.6	Eth0_Rx-	Negative receiver signal
1.7	N.C.	-
1.8	N.C.	-
2.1	Eth1_Tx+	Positive transmission signal
2.2	Eth1_Tx-	Negative transmission signal
2.3	Eth1_Rx+	Positive receiver signal
2.4	N.C.	-
2.5	N.C.	-
2.6	Eth1_Rx-	Negative receiver signal
2.7	N.C.	-
2.8	N.C.	-

Table 8-24: Electrical connection - Sercos

CN4 - Sercos

The Sercos connection is used for communication between Lexium 62 Connection Module and Lexium 62 ILM.



Pin	Designation	Description
1	Eth0_Tx+	Positive transmission signal
2	Eth0_Tx-	Negative transmission signal
3	Eth0_Rx+	Positive receiver signal
4	N.C.	-
5	N.C.	-
6	Eth0_Rx-	Negative receiver signal
7	N.C.	-
8	N.C.	-

Table 8-25: Electrical connection - Sercos

CN5 - Sercos

The Sercos connection is used for communication between Lexium 62 Connection Module and Lexium 62 ILM.

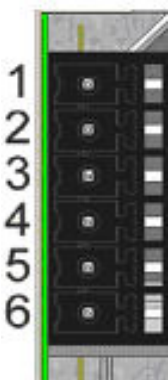


Pin	Designation	Description
1	Eth0_Tx+	Positive transmission signal
2	Eth0_Tx-	Negative transmission signal
3	Eth0_Rx+	Positive receiver signal
4	N.C.	-
5	N.C.	-
6	Eth0_Rx-	Negative receiver signal
7	N.C.	-
8	N.C.	-

Table 8-26: Electrical connection - Sercos

CN6 - Inverter Enable power supply 24V

The Inverter Enable voltage connection supplies the Inverter Enable output.



Pin	Designation	Description
1	IE_p1	Supply voltage 24V for Inverter Enable
2	IE_p2	Supply voltage 24V for Inverter Enable
3	IE_n1	Supply voltage 0V for Inverter Enable
4	IE_n2	Supply voltage 0V for Inverter Enable
5	0V_int1	Control voltage 0V
6	0V_int2	Control voltage 0V

Table 8-27: Inverter Enable supply voltage 24V

CN7 - DC bus output

The DC bus output is connected to the Lexium 62 Distribution Box via the hybrid cable or power cable (daisy chain wiring), or is directly connected to an Lexium 62 ILM and supplies the Lexium 62 ILM with the required power.



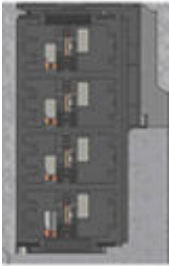
Pin	Designation	Description	Color of cable core
1	DC +	DC bus voltage +	red
2	PE	Protective ground (earth)	green/yellow
3	DC-	DC bus voltage -	black

Table 8-28: Electrical connection - DC bus output

The insulation-stripped length of the wires of the DC bus connector is 15 mm (0.59 in.).

CN8 - Inverter Enable output

The Inverter Enable signal switches off the motor torque to obtain the defined safe state.

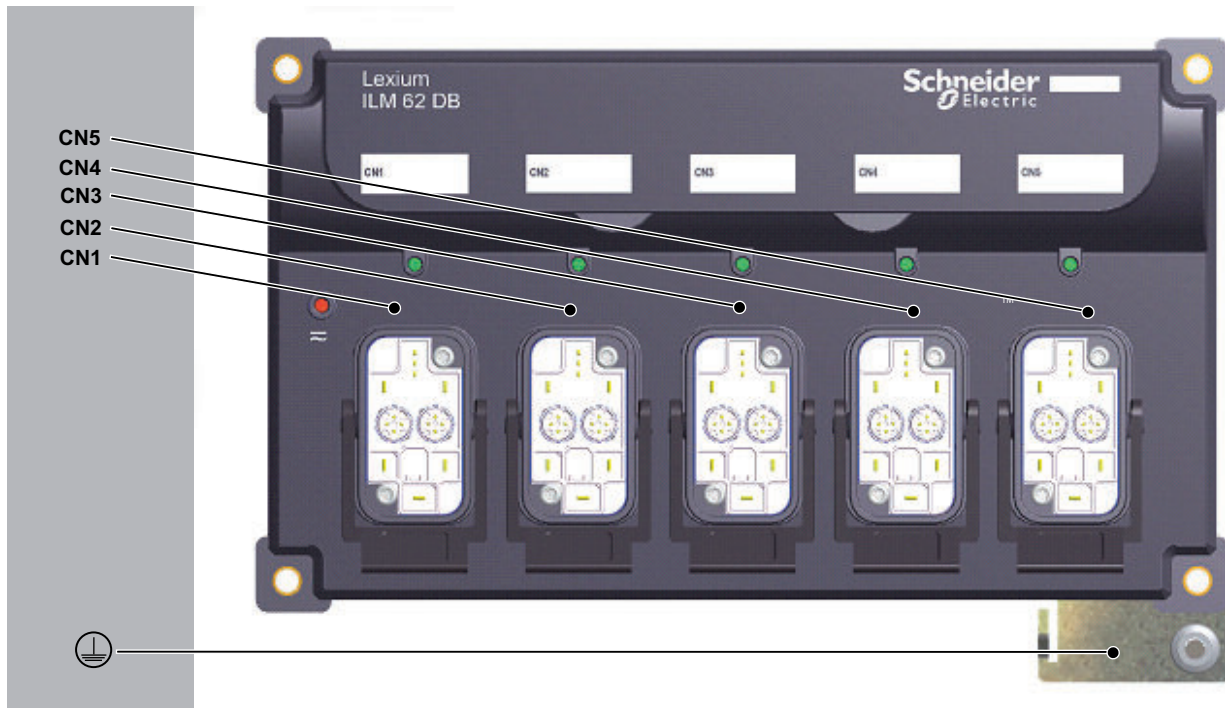


Pin	Designation	Description	Color of cable core
1	IE_sig	IE signal 1	white (core)
2	IE_ref	IE signal 2	white (shield)
3	24V_out	Control voltage 24V	green
4	0V_out	Control voltage 0V	gray

Table 8-29: Inverter Enable output

The insulation-stripped length of the wires of the 24V input connector is 15mm (0.59in.).

8.8.2 Lexium 62 distribution box




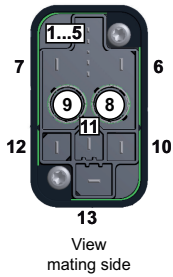
Connection	Description	Connection cross-section [mm ²]/ [AWG]	Tightening torque [Nm] / [lbf in]
CN1	Input (Lexium 62 Connection Module or Lexium 62 Distribution Box)	- / -	- / -
CN2	Output (Lexium 62 Distribution Box or Lexium 62 ILM)	- / -	- / -
CN3	Output (Lexium 62 Distribution Box or Lexium 62 ILM)	- / -	- / -
CN4	Output (Lexium 62 Distribution Box or Lexium 62 ILM)	- / -	- / -
CN5	Output (Lexium 62 Distribution Box or Lexium 62 ILM)	- / -	- / -
	Protective ground (earth)	2.5 / 13	3.5 / 30.98

Table 8-30: Connection overview Lexium 62 Distribution Box

CN1/CN2/CN3CN4/CN5 - Hybrid socket connector



Pin	Designation	Description
1	IE_sig	IE signal 1
2	IE_ref	IE signal 2
3	Hybrid cable or power cable detection	Hybrid cable or power cable detection (daisy chain wiring)
4	Hybrid cable or power cable detection	Hybrid cable or power cable detection (daisy chain wiring)
5	n.c.	-
6	0V	Control voltage 0V
7	24V	Control voltage 24V
8.1	Rx+	Sercos port 1 - Input (not assigned for daisy chain wiring)
8.2	Tx-	Sercos port 1 - Output (not assigned in the case of daisy chain wiring)
8.3	Rx-	Sercos port 1 - Input (not assigned for daisy chain wiring)
8.4	Tx+	Sercos port 1 - Output (not assigned in the case of daisy chain wiring)
9.1	Rx+	Sercos port 2 - Input (not assigned for daisy chain wiring)
9.2	Tx-	Sercos port 2 - Output (not assigned in the case of daisy chain wiring)
9.3	Rx-	Sercos port 2 - Input (not assigned for daisy chain wiring)
9.4	Tx+	Sercos port 2 - Output (not assigned in the case of daisy chain wiring)
10	DC-	DC bus voltage -
11	Shield	Shielded connector
12	DC+	DC bus voltage +
13	PE	Protective ground (earth)

Table 8-31: Hybrid socket connector Lexium 62 Distribution Box

- Provide unused hybrid connection sockets with strapping plugs.



The strapping plugs are not included in the scope of delivery of Lexium 62 ILM and must be ordered separately (order number: VW3E6023).



Strapping plugs close the Sercos loop while ensuring the integrity of the IP65 degree of protection.

Depending on the selected identification (address) mode in the SoMachine Motion Logic Builder, an interchanged connection of the Sercos 1/Sercos 2 connectors can lead to unintended machine operation.

⚠ WARNING

UNINTENDED MACHINE OPERATION

Ensure that the Sercos cables are connected to the Sercos connections CN4/CN5 of the Lexium 62 Connection Module according to the requirements of the application, its configuration and applicable standards.

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

8.8.3 Lexium 62 ILM



Figure 8-14: Connection overview Lexium 62 ILM

Connection	Description	Connection cross section [mm ²] / [AWG]	Tightening torque [Nm] / [lbf in]
1	Ground connection	2.5 / 13 ¹⁾ 4.0 / 11 ²⁾	1.8 / 15.9
2	Hybrid connector	- / -	- / -

¹⁾ With mechanical protection
²⁾ Without mechanical protection



Pin	Designation	Description
1	IE_sig	IE signal 1
2	IE_ref	IE signal 2
3	Brake	Braking signal
4	n.c.	-
5	n.c.	-
6	0V	Control voltage 0V
7	24V	Control voltage 24V
8.1	Rx+	Sercos port 1 - Input (not assigned for daisy chain wiring)
8.2	Tx-	Sercos port 1 - Output (not assigned in the case of daisy chain wiring)
8.3	Rx-	Sercos port 1 - Input (not assigned for daisy chain wiring)
8.4	Tx+	Sercos port 1 - Output (not assigned in the case of daisy chain wiring)
9.1	Rx+	Sercos port 2 - Input (not assigned for daisy chain wiring)
9.2	Tx-	Sercos port 2 - Output (not assigned in the case of daisy chain wiring)
9.3	Rx-	Sercos port 2 - Input (not assigned for daisy chain wiring)
9.4	Tx+	Sercos port 2 - Output (not assigned in the case of daisy chain wiring)
10	DC-	DC bus voltage -
11	Shield	Shielded connector
12	DC+	DC bus voltage +
13	PE	Protective ground (earth)

Table 8-32: Connector Lexium 62 ILM

8.8.4 ILM62DC•000 Daisy Chain Connector Box

Usage of Daisy Chain Connector Box enables wiring of Lexium 62 ILMs in daisy chain structure. This requires that each Lexium 62 ILM must be extended by a Daisy Chain Connector Box. Per daisy chain line, up to 9 Lexium 62 ILMs can be connected to one another via their respective Daisy Chain Connector Box. Power (DC bus voltage/24V/ Inverter Enable signals) and signals are distributed from one to the next via separate cables (power or cable).

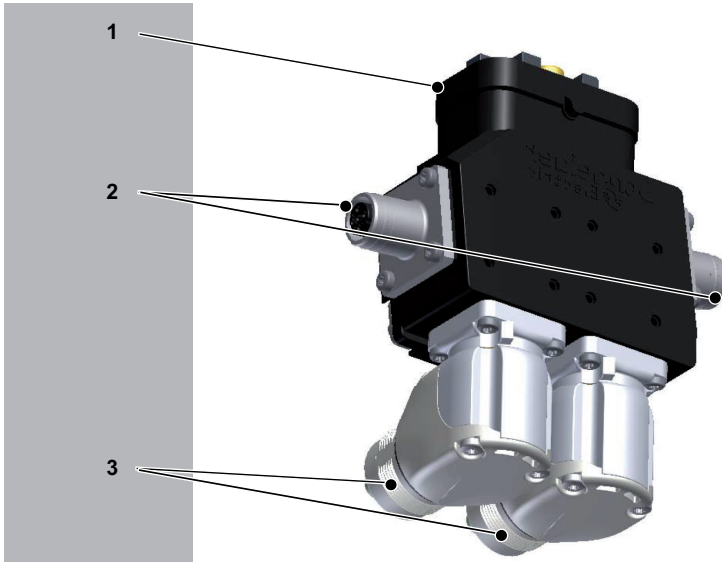


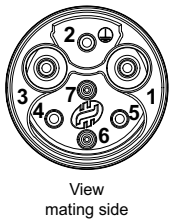
Figure 8-15: Plug and socket connectors of the Daisy Chain Connector Box

1	Hybrid plug connector (CN1)
2	Sercos socket connectors M12 (CN4/CN5)
3	Power socket connectors M23 (CN2/CN3)



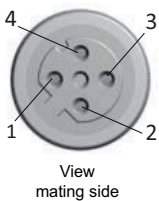
Pin	Designation	Description
1	IE_sig	IE signal 1
2	IE_ref	IE signal 2
3	Brake	Braking signal
4	n.c.	-
5	n.c.	-
6	0V	Control voltage 0V
7	24V	Control voltage 24V
8.1	Rx+	Sercos port 1 – input
8.2	Tx-	Sercos port 1 – output
8.3	Rx-	Sercos port 1 – input
8.4	Tx+	Sercos port 1 – output
9.1	Rx+	Sercos port 2 – input
9.2	Tx-	Sercos port 2 – output
9.3	Rx-	Sercos port 2 – input
9.4	Tx+	Sercos port 2 – output
10	DC-	DC bus voltage -
11	n.c.	-
12	DC+	DC bus voltage +
13	PE	Protective ground (earth)

Table 8-33: Hybrid plug connector (CN1)



Pin	Designation	Description
1	DC +	DC bus voltage +
2	PE	Protective conductor
3	DC-	DC bus voltage -
4	24V	Control voltage 24V
5	0V	Control voltage 0V
6	IE_sig	IE signal 1
7	IE_ref	IE signal 2

Table 8-34: Power socket connector M23 (CN2/CN3) of Daisy Chain Connector Box



Pin	Designation	Description
1	Eth_Tx+	Positive transceiver signal
2	Eth_Rx+	Positive receiver signal
3	Eth_Tx-	Negative transceiver signal
4	Eth_Rx-	Negative receiver signal

Table 8-35: Sercos socket connector M12 (CN4/CN5) of Daisy Chain Connector Box

8.9 Dimensions

8.9.1 Lexium 62 connection module

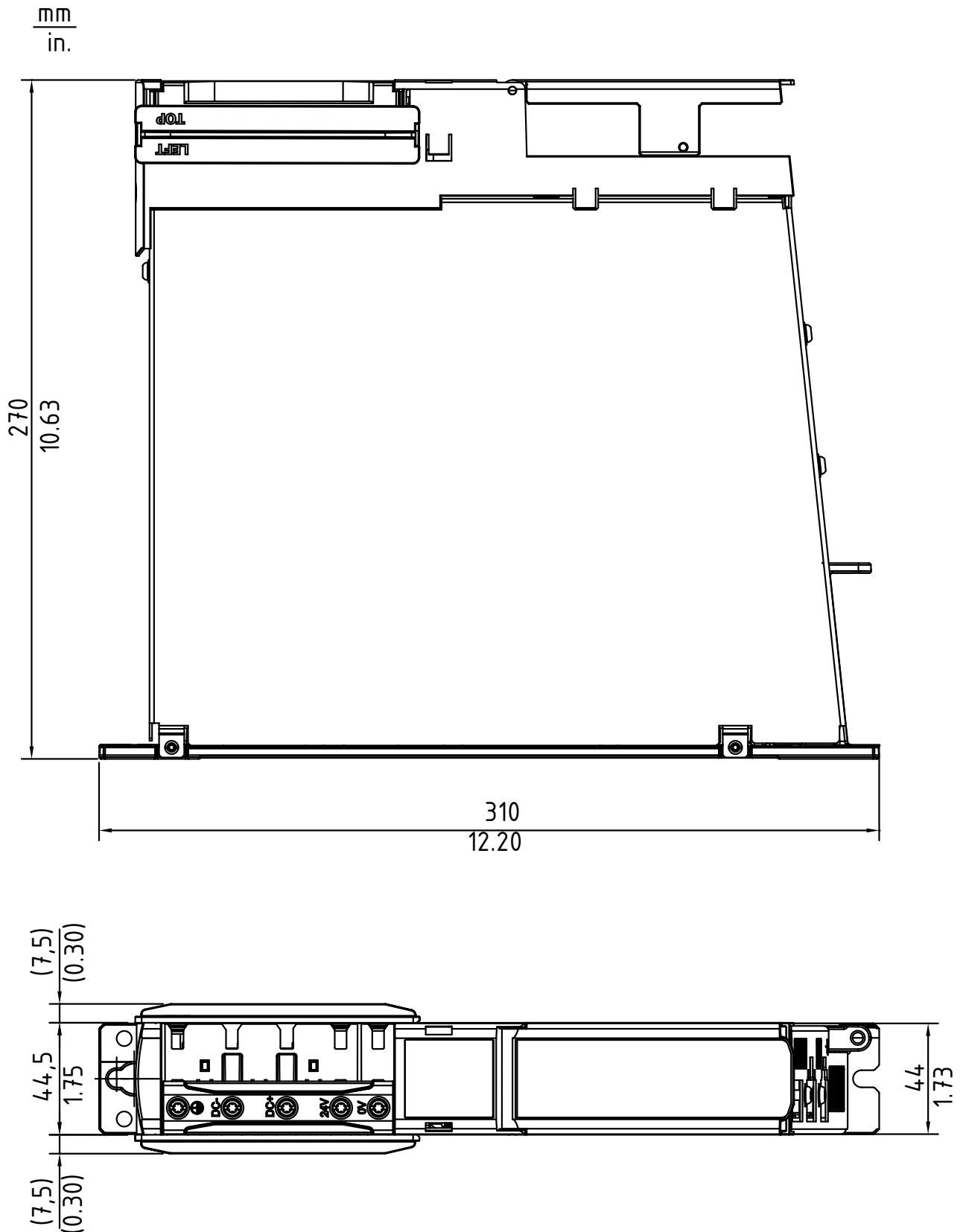


Figure 8-16: Dimensions Lexium 62 connection module

For mounting holes diameters and required distances in the control cabinet, refer to the chapter Preparing the control cabinet (see 7.1.3 Preparing the control cabinet).

8.9.2 Lexium 62 distribution box

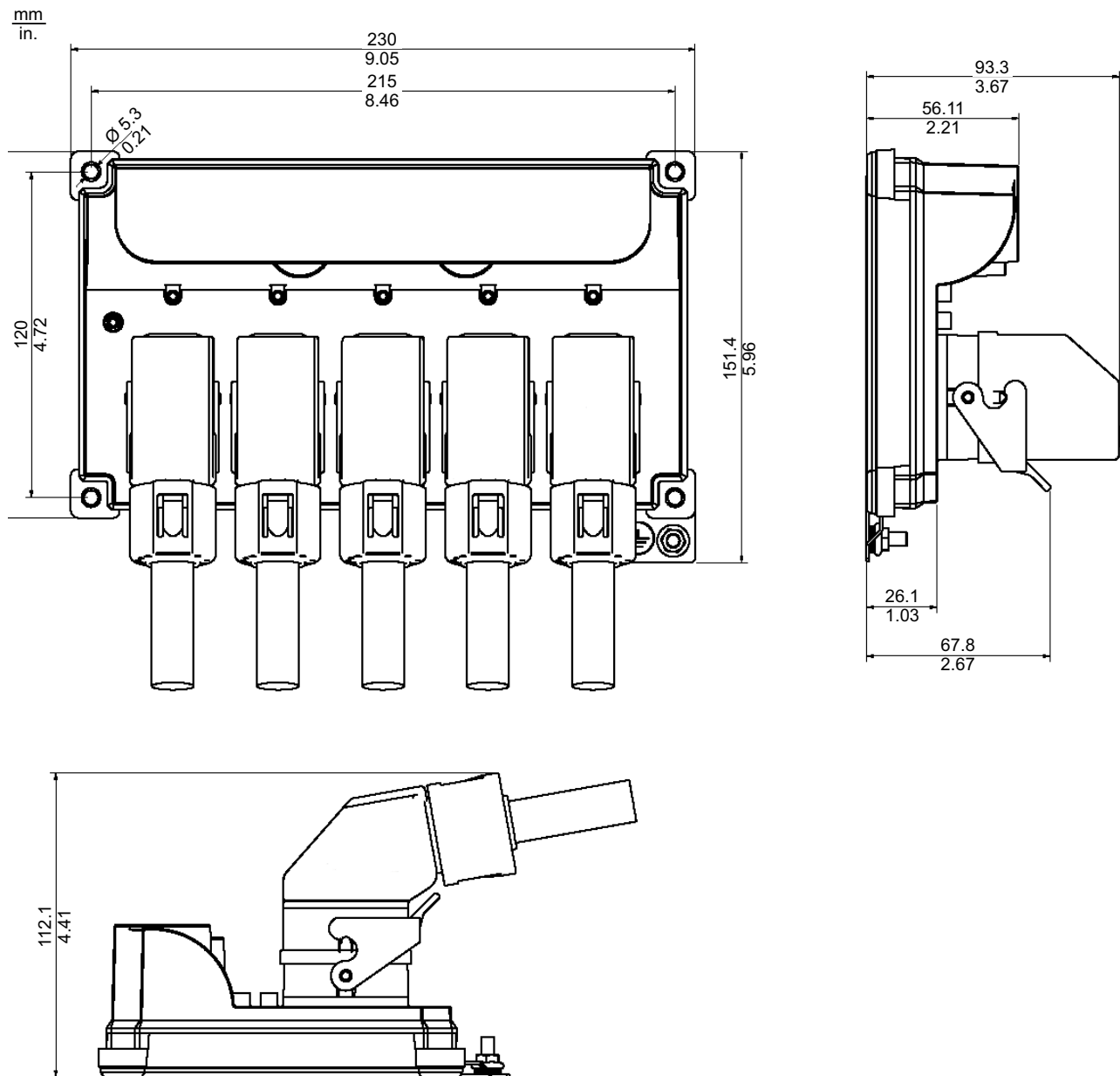


Figure 8-17: Dimensions Lexium 62 distribution box

8.9.3 ILM62DC•000 Daisy Chain Connector Box

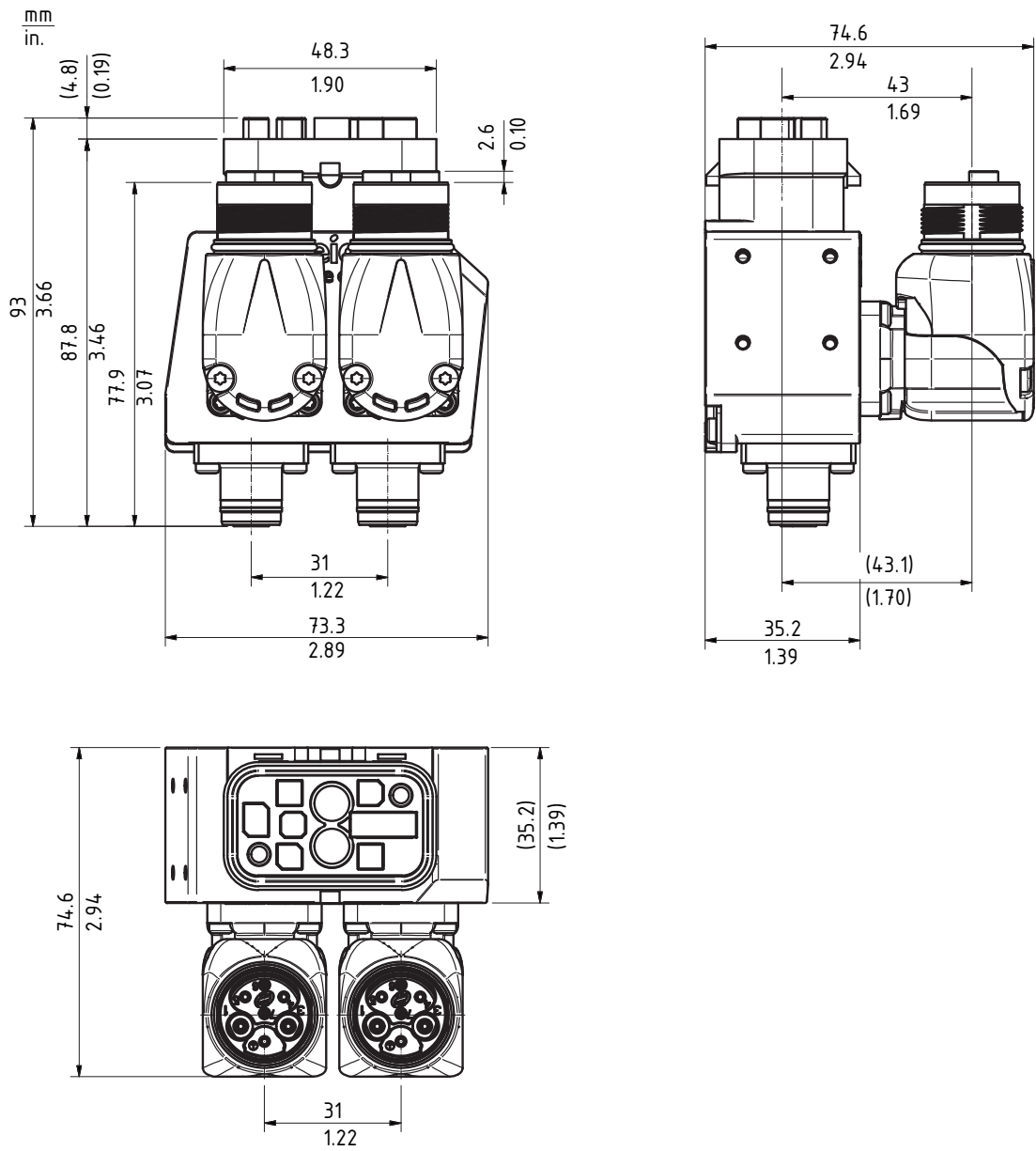


Figure 8-18: Dimensions of the Daisy Chain Connector Box Type A

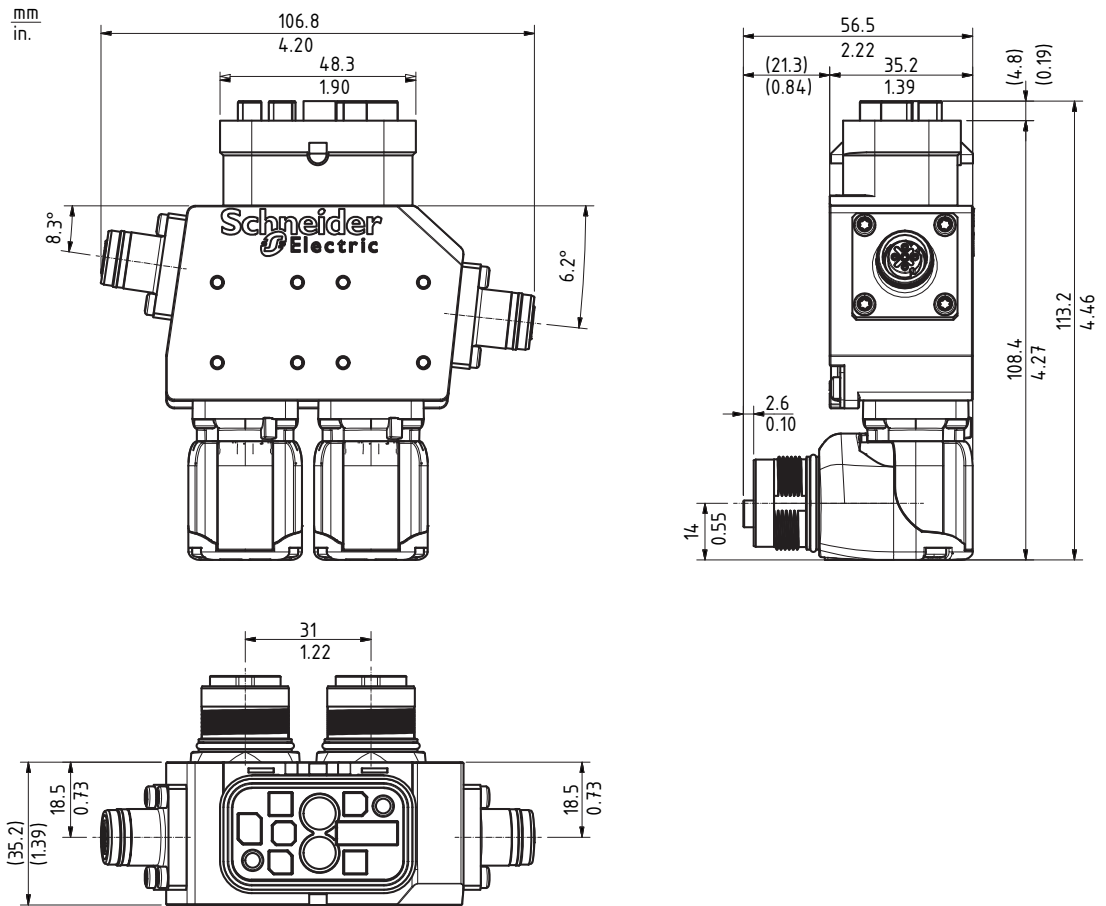


Figure 8-19: Dimensions of the Daisy Chain Connector Box Type B

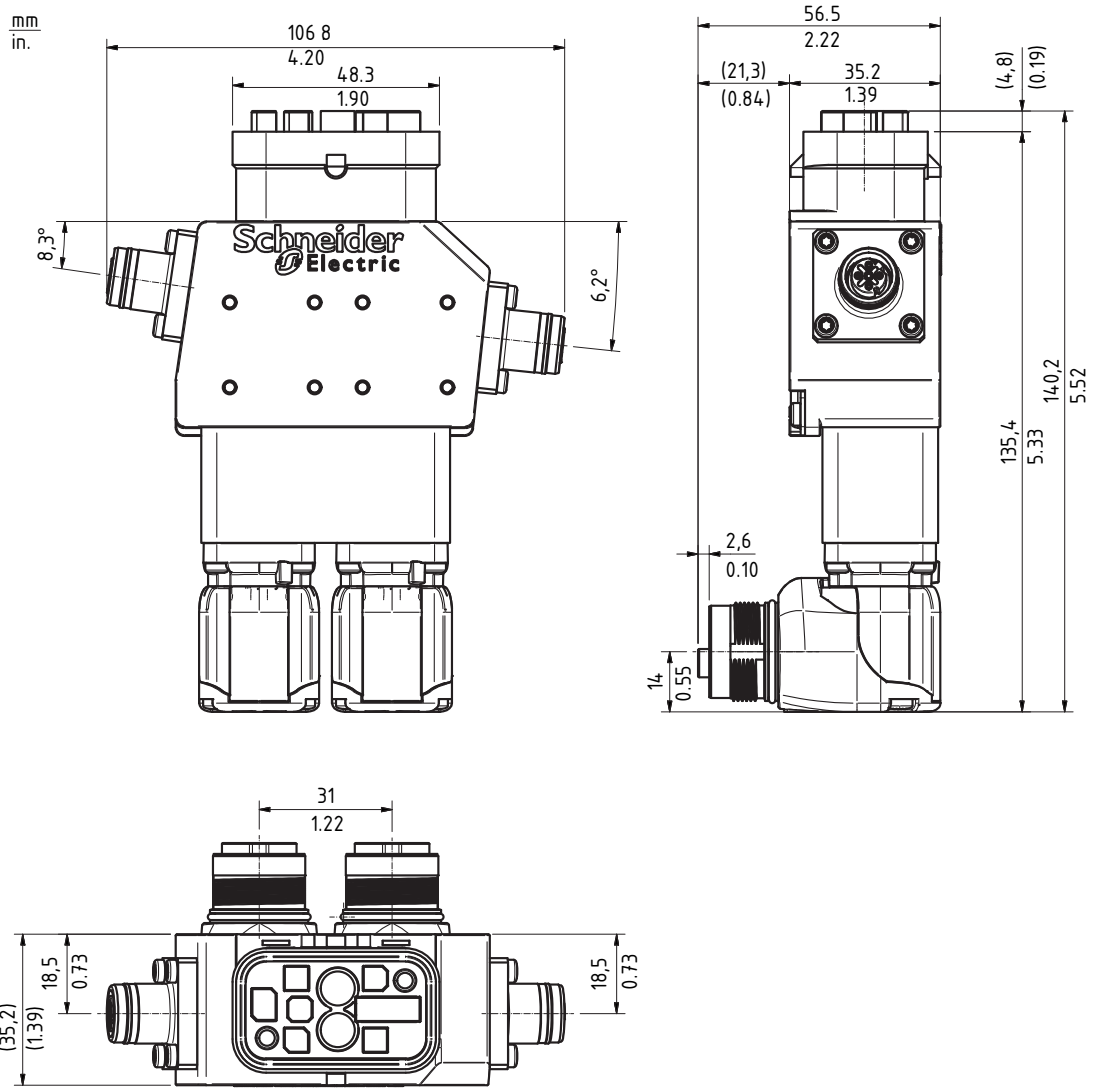


Figure 8-20: Dimensions of the Daisy Chain Connector Box Type C

8.9.4 Lexium 62 ILM

Dimensions ILM070

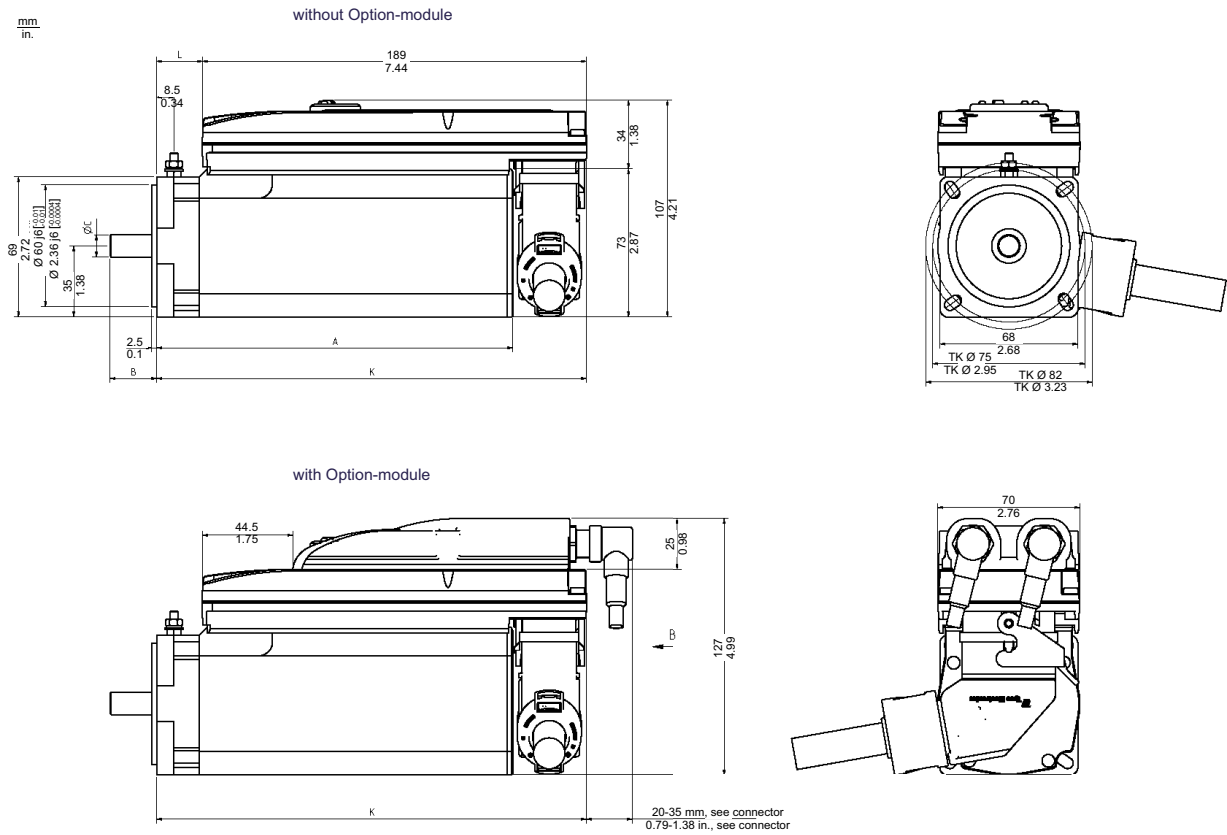


Figure 8-21: Dimensions ILM070 motor



Note that the ILM series 070 uses different shaft diameters. The shaft diameter for the ILM070 3 P is 14 mm/0.55 in.

Dimensions table

Dimensions	ILM070 1 P [mm] / [in]	ILM070 2 P [mm] / [in]	ILM070 3 P [mm] / [in]
A (with brake)	175 (182) / 6.89 (7.17)	189 (215) / 7.44 (8.46)	222 (256) / 8.74 (10.08)
B	23 / 0.91	23 / 0.91	30 / 1.18
C	11 k6 / 0.43 k6	11 k6 / 0.43 k6	14 k6 / 0.55 k6
K (with brake)	212 (219) / 8.35 (8.62)	226 (252) / 8.90 (9.92)	259 (293) / 10.20 (11.54)
L (with brake)	25 (31) / 0.98 (1.22)	38 (64) / 1.50 (2.52)	71 (105) / 2.80 (4.13)

Table 8-36: Dimensions of the ILM070

Dimensions ILM100

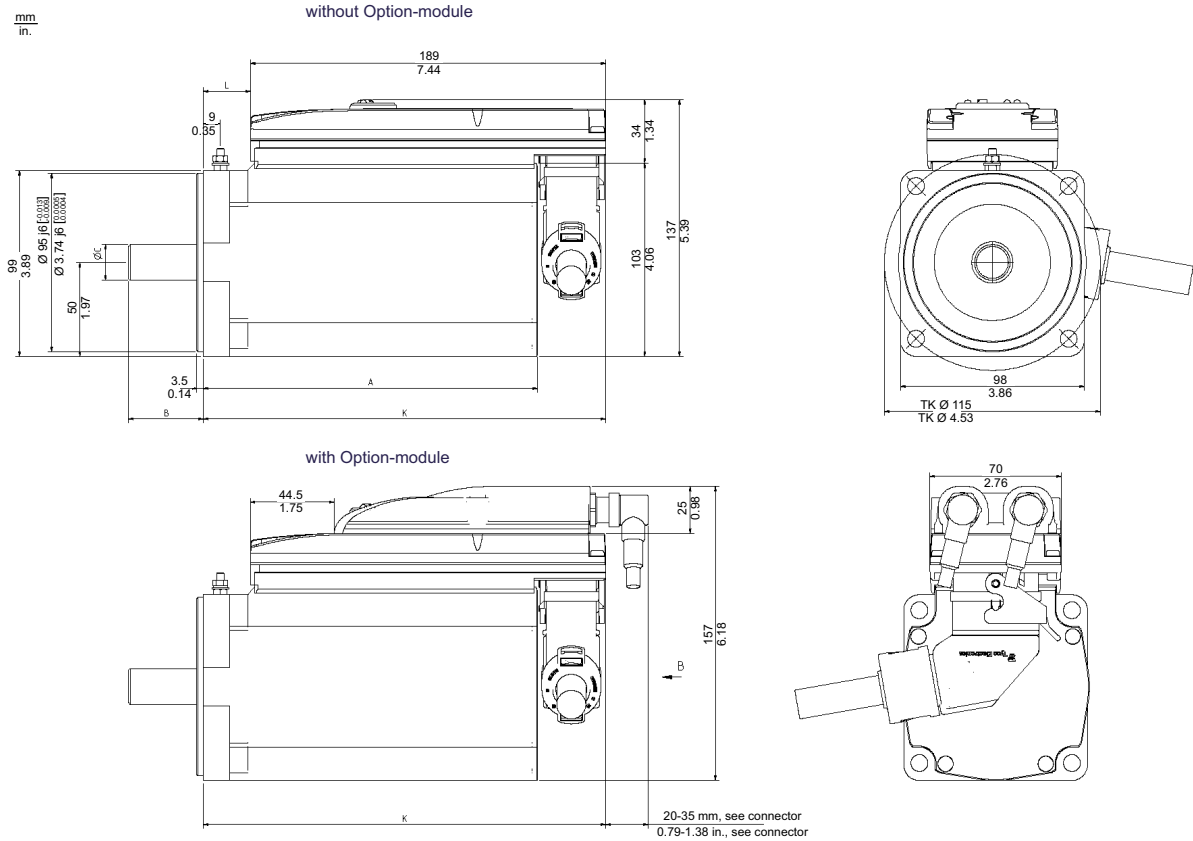


Figure 8-22: Dimensions ILM100 motor

Dimensions table

Dimensions	ILM100 1 P [mm] / [in]	ILM100 2 P [mm] / [in]	ILM100 3 P [mm] / [in]
A (with brake)	178 (207) / 7.01 (8.15)	212 (243) / 8.35 (9.57)	248 (279) / 9.76 (10.98)
B	40 / 1.57	40 / 1.57	40 / 1.57
C	19 k6 / 0.75 k6	19 k6 / 0.75 k6	19 k6 / 0.75 k6
K (with brake)	215 (243) / 8.46 (9.57)	249 (280) / 9.80 (11.02)	285 (315) / 11.22 (12.40)
L (with brake)	27 (55) / 1.06 (2.17)	61 (92) / 2.40 (3.62)	97 (127) / 3.82 (5)

Table 8-37: Dimensions of the ILM100

Dimensions ILM140

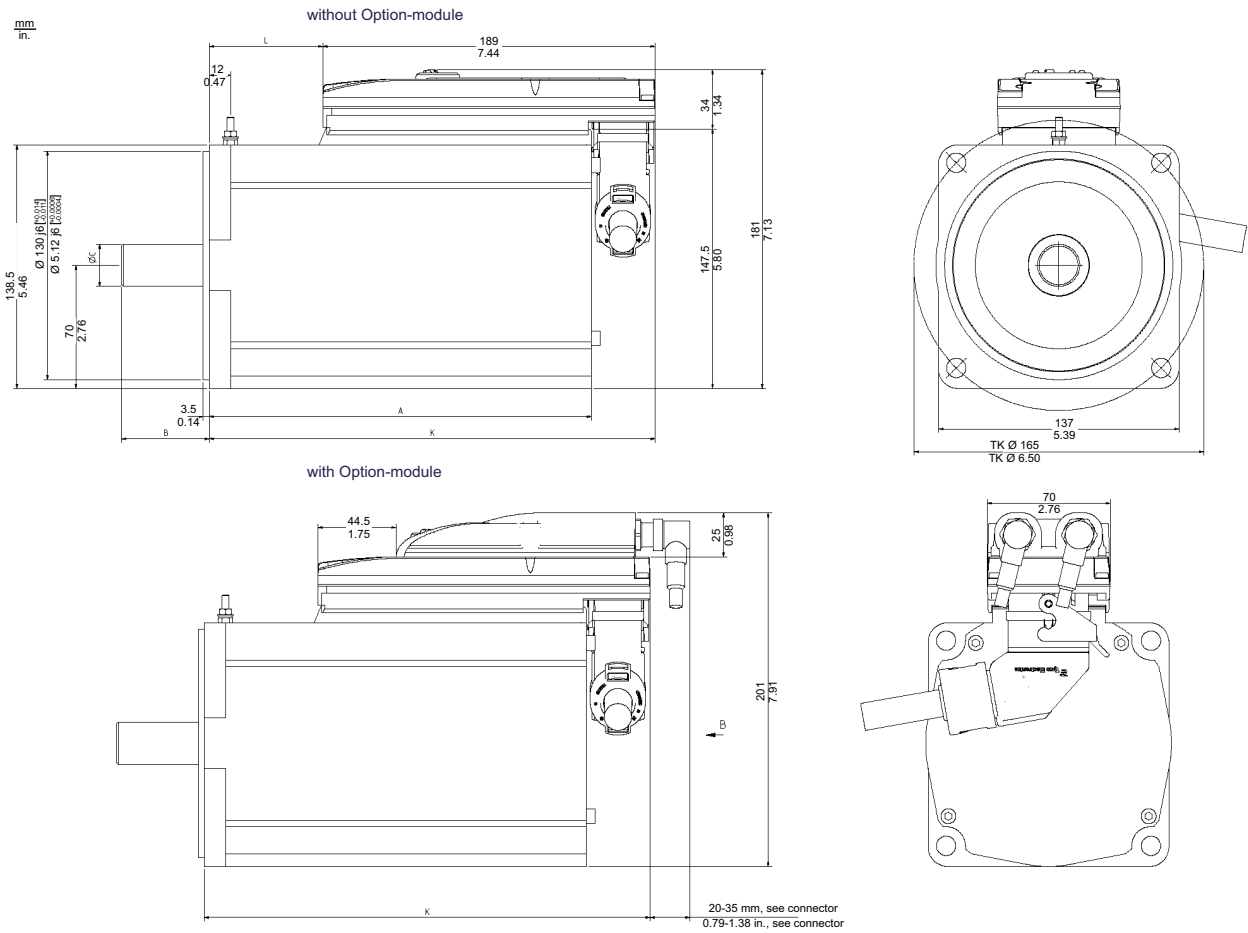


Figure 8-23: Dimensions ILM140 motor

Dimensions table

Dimensions	ILM140 1 P [mm] / [in]	ILM140 1 M [mm] / [in]	ILM140 2 P [mm] / [in]
A (with brake)	218 (256) / 8.58 (10.08)	218 (256) / 8.58 (10.08)	273 (311) / 10.75 (12.24)
B	50 / 1.97	50 / 1.97	50 / 1.97
C	24 k6 / 0.94 k6	24 k6 / 0.94 k6	24 k6 / 0.94 k6
K (with brake)	254 (292) / 10 (11.50)	254 (292) / 10 (11.50)	309 (347) / 12.17 (13.66)
L (with brake)	67 (105) / 2.64 (4.13)	67 (105) / 2.64 (4.13)	122 (160) / 4.80 (6.30)

Table 8-38: Dimensions of the ILM140

Dimensions of the feather key

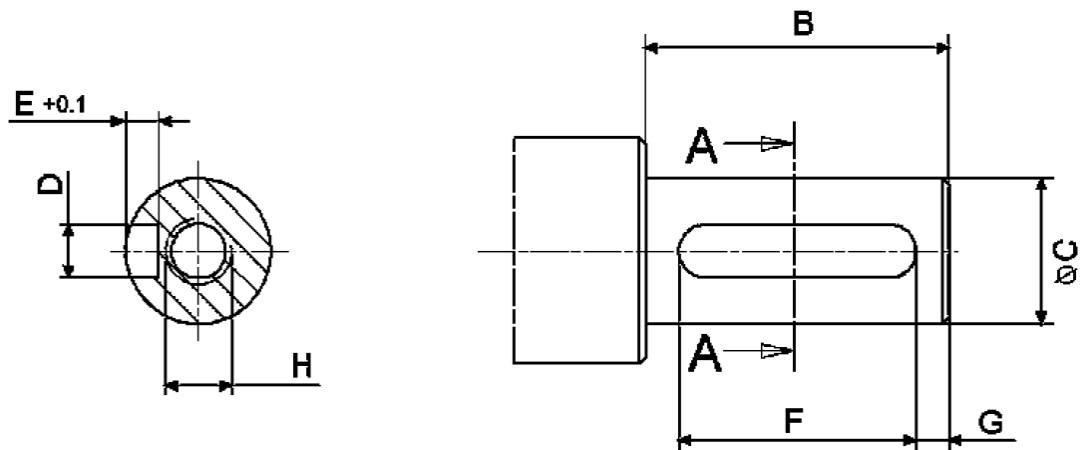


Figure 8-24: Dimension diagram of the feather key

Dimension tables

Dimensions	ILM070 1 P [mm] / [in]	ILM070 2 P [mm] / [in]	ILM070 3 P [mm] / [in]
B	23 / 0.91	23 / 0.91	30 / 1.18
C	11 k6 / 0.43 k6	11 k6 / 0.43 k6	14 k6 / 0.55 k6
D	4 N9 / 0.16 N9	4 N9 / 0.16 N9	5 N9 / 0.20 N9
E	2.5 / 0.10	2.5 / 0.10	3 / 0.12
F	18 / 0.71	18 / 0.71	20 / 0.78
G	2.5 / 0.10	2.5 / 0.10	5 / 0.20
H	DIN 332-D M4	DIN 332-D M4	DIN 332-D M5
Feather key (N9)	DIN 6885-A4x4x18	DIN 6885-A4x4x18	DIN 6885-A5x5x20

Table 8-39: Dimensions of the ILM070 feather key

Dimensions	ILM100 1 P [mm] / [in]	ILM100 2 P [mm] / [in]	ILM100 3 P [mm] / [in]
B	40 / 1.57	40 / 1.57	40 / 1.57
C	19 k6 / 0.75 k6	19 k6 / 0.75 k6	19 k6 / 0.75 k6
D	6 N9 / 0.24 N9	6 N9 / 0.24 N9	6 N9 / 0.24 N9
E	3.5 / 0.14	3.5 / 0.14	3.5 / 0.14
F	30 / 1.18	30 / 1.18	30 / 1.18
G	5 / 0.20	5 / 0.20	5 / 0.20
H	DIN 332-D M6	DIN 332-D M6	DIN 332-D M6
Feather key (N9)	DIN 6885-A6x6x30	DIN 6885-A6x6x30	DIN 6885-A6x6x30

Table 8-40: Dimensions of the ILM100 feather key

Dimensions	ILM140 1 P [mm] / [in]	ILM140 1 M [mm] / [in]	ILM140 2 P [mm] / [in]
B	50 / 1.97	50 / 1.97	50 / 1.97
C	24 k6 / 0.94 k6	24 k6 / 0.94 k6	24 k6 / 0.94 k6
D	8 N9 / 0.31 N9	8 N9 / 0.31 N9	8 N9 / 0.31 N9
E	4.5 / 0.18	4.5 / 0.18	4.5 / 0.18
F	40 / 1.57	40 / 1.57	40 / 1.57
G	5 / 0.20	5 / 0.20	5 / 0.20

Dimensions	ILM140 1 P [mm] / [in]	ILM140 1 M [mm] / [in]	ILM140 2 P [mm] / [in]
H	DIN 332-D M8	DIN 332-D M8	DIN 332-D M8
Feather key (N9)	DIN 6885-A8x7x40	DIN 6885-A8x7x40	DIN 6885-A8x7x40

Table 8-41: Dimensions of the ILM140 feather key

9 Optional module ILM62-DIO8

Features:

- 8 bidirectional floating inputs/outputs (configurable in the controller configuration)
- Connection via two M12 connectors (8-pin), each with 4 inputs/outputs
- Floating internal power supply of outputs up to 0.1 A total current for 8 inputs/outputs
- Maximum 2 A total output current via 8 outputs when using external supply voltage
- 0.5 A output current maximum per output when using external supply
- Short-circuit detection and open-circuit detection on outputs
- Two inputs with special functions (touch probe, counter)

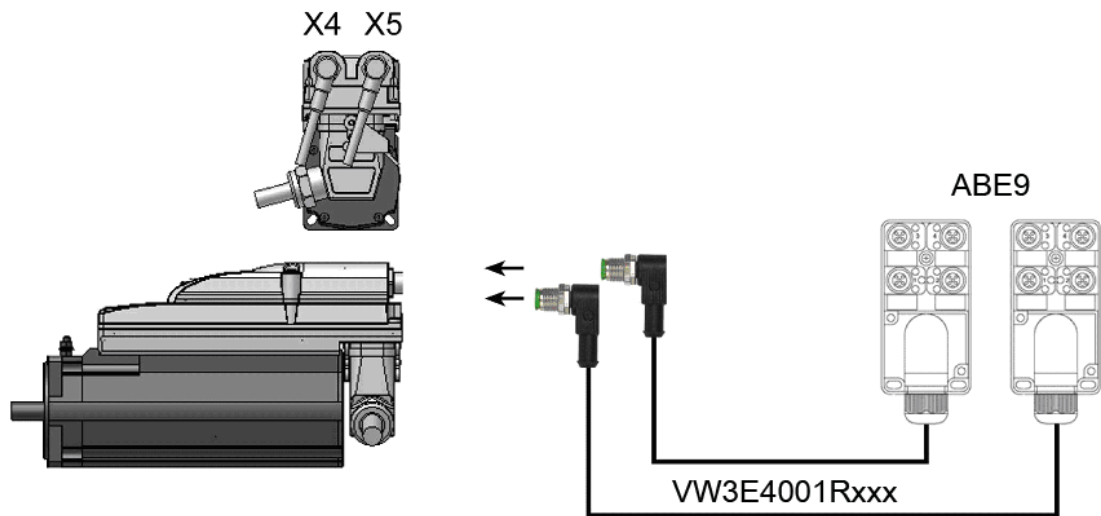


Figure 9-1: Connecting the ABE9 splitter box to the ILM62-DIO8 optional module

9.1 Technical data

Parameter	Value
Item reference	VW3E702100000
ILM62-DIO8supply - Control voltage / control current	DC 24 V (-15% / +20%) when using internal I/O supply: maximum 300mA when using external I/O supply: maximum 80mA
digital inputs - Number - Voltage in U _{IN} 0 range - Voltage in U _{IN} 1 range - Input current - Electrical isolation - Protected against reverse polarity - Input filter	8 (IEC61131-2 Type I) DC -3 ... 5 V DC 15 ... 30 V I _{IN} = 2 mA at U _{IN} = 15 V 500 V floating opposite PE Yes 1 or 5 ms, configurable
Digital outputs - Number - Output voltage - Rated current per output - Overall module current across all 8 in-/outputs - Inrush current - Leakage current with 0 signal - Transmission time - Short-circuit-proof - Supply output - Galvanic isolation	8 (IEC61131-2) (+U _L -3 V) < U _{OUT} < +U _L I _e = 500 mA When using internal I/O supply: 0.1 A When using external I/O supply: 2.0 A I _{emax} > 2 A for 1 s < 0.4 mA 100 μs Yes DC 24 V (-15% / +20%) / 2 A 500 V floating opposite PE
Weight	0,22 kg
Ambient conditions - Degree of protection - Ambient temperature during operation - During storage and transport - Overvoltage category - Degree of radio interference	IP 65 +5...+40°C / +41...+104°F -25...+70°C / -13...+158°F , Temperature fluctuation t _{max} = 30K/h Class C3 (IEC/EN 61800-3)
Approval	CE, cULus

Table 9-1: Technical data of ILM62-DIO8

9.2 Installation

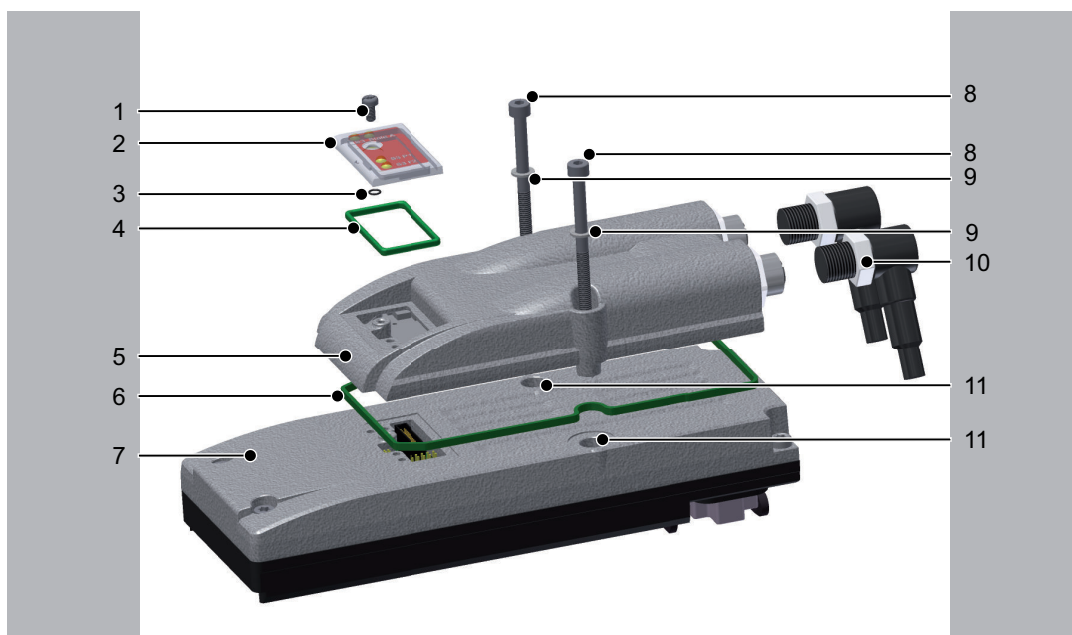


Figure 9-2: Mounting of the ILM62-DIO8 optional module on the Lexium 62 ILM

1	Torx M3x6 screw
2	Protective cover
3	Insulating washer, 2.5 x 0.6 mm (0.1 x 0.02 in.)
4	Protective cover gasket
5	Optional module ILM62-DIO8
6	Sealing ring for the optional module ILM62-DIO8
7	Lexium 62 ILM
8	Hexagon socket screw M4x50
9	Serrated lock washers M4
10	M12 connector
11	Hexagon socket screw M4x28

Before beginning the replacement of specific components, read thoroughly the section Replacing Lexium 62 components and cables (see 7.4 Replacing Lexium 62 components and cables) for important safety information and general instructions.

How to install the optional module ILM62-DIO8:

- required*
- Hexagon socket screwdriver 3.0
- tool*
- Torx TX10 screwdriver
- ▶ Check delivery for completeness:
 - Optional module ILM62-DIO8 with sealing ring
 - 2 Torx screws M4x50
 - 2 x serrated lock washers M4

- ESD protection*
- ▶ Observe the following instructions to help avoid damages due to electrostatic discharge:

NOTICE

ELECTROSTATIC DISCHARGE

- Do not touch any of the electrical connections or components.
- Prevent electrostatic charges, for example, by wearing appropriate clothing.
- If you must touch circuit boards, do so only on the edges.
- Move the circuit boards as little as possible.
- Remove existing static charge by touching a grounded, metallic surface.

Failure to follow these instructions can result in equipment damage.

*Prepare instal-
lation*

- ▶ Set main switch to "OFF Position", or otherwise remove all power to the system.
- ▶ Prevent main switch from being switched back on.
- ▶ Loosen the screw (1) with the screwdriver (Torx).
- ▶ Remove screw (1) with insulating washer (3) and protective cap (2) and protective cap gasket (4) from Lexium 62 ILM.
- ▶ Loosen the screws (11) (M4x28) with the screwdriver (hexagon socket).
- ▶ Remove the screws (11) and serrated lock washers.

NOTICE

INSUFFICIENT SHIELDING/GROUNDING/SEALING

The serrated lock washers must be removed from their original position (11) when removing screws.

Failure to follow these instructions can result in equipment damage.

Assemble

- ▶ Insert the sealing ring (6) into the groove of the ILM62-DIO8.

NOTICE

INCORRECT INSTALLATION

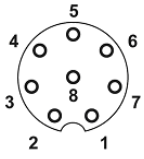
- Align ILM62-DIO8 with the three fixing pins.
- Insert the sealing ring of ILM62-DIO8 completely into the groove.

Failure to follow these instructions can result in equipment damage.

- ▶ Attach ILM62-DIO8 on Lexium 62 ILM.
- ▶ Plug screws (8) (M4x50) with serrated lock washers (9) through ILM62-DIO8 into Lexium 62 ILM.
- ▶ Gently turn the screw (8) inward with a screwdriver (hexagon socket).
- ▶ Tighten the screws (8) temporary with 2 Nm (17.70 lbf in).
- ▶ Tighten the screws (8) with 3 Nm (26.55 lbf in) definitively.
- ▶ Fit protective cap (2) together with protective cover seal (4) onto ILM62-DIO8.
- ▶ Screw the protective cap on tightly (to 1 Nm) with the screw (1) and the insulating washer (3) by using a Torx screwdriver.

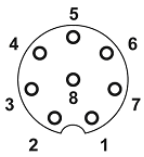
9.3 Electrical connections

Optional module ILM62-DIO8



Pin	Designation	Meaning
1	IO.0	Input/output 0
2	IO.1	Input/output 1
3	IO.2	Input/output 2
4	IO.3	Input/output 3
5	24 V	Control voltage
6	24 V	Control voltage
7	0 V	Control voltage
8	0 V	Control voltage
Shield	PE	Shield

Table 9-2: Electrical connections ILM62-DIO8 outlet X4 - inputs/outputs



Pin	Designation	Meaning
1	IO.4	Input/output 4
2	IO.5	Input/output 5
3	IO.6	Input/output 6
4	IO.7	Input/output 7
5	24 V	Control voltage
6	24 V	Control voltage
7	0 V	Control voltage
8	0 V	Control voltage
Shield	PE	Shield

Table 9-3: Electrical connections ILM62-DIO8 outlet X5 - inputs/outputs

Block diagram ILM62-DIO8

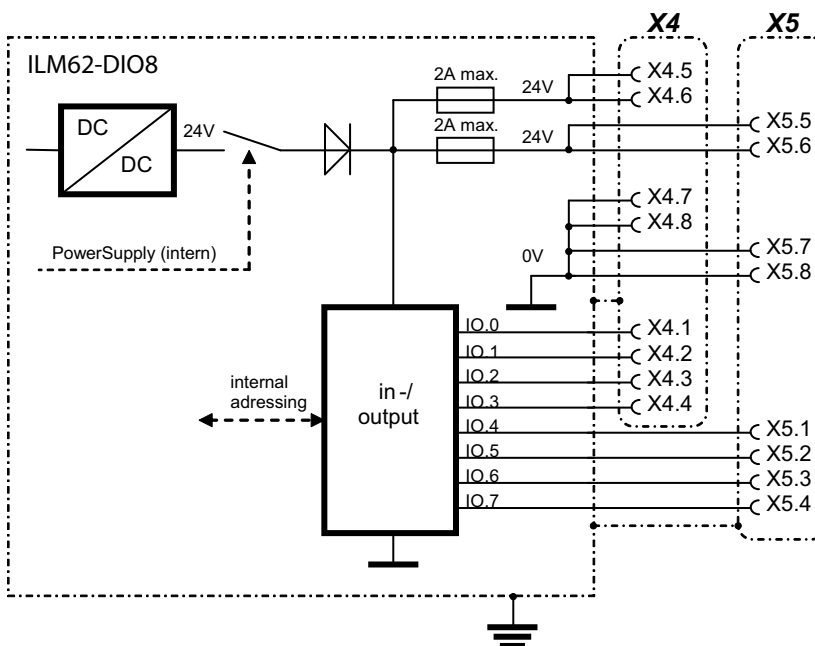


Figure 9-3: Block diagram ILM62-DIO8

ABE9 Splitter Box

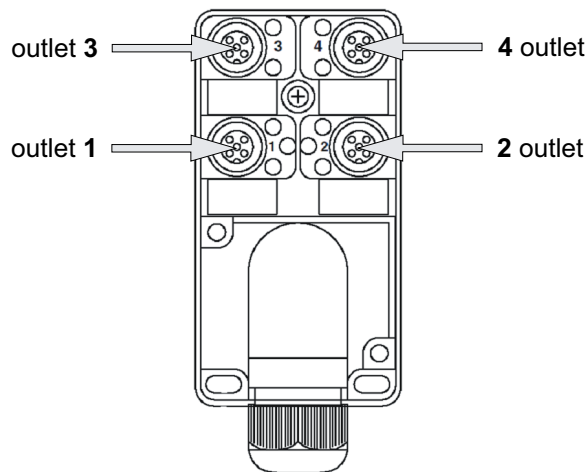
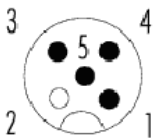


Figure 9-4: Connection scheme ABE9 splitter box



Pin	Designation	Meaning
1	24 V	Control voltage
2	free	Reserved
3	0 V	Control voltage
4	IO.x	Input/output x (X4: 0 ... 3 or X5: 4 ... 7)
5	PE	Shield

Table 9-4: Electrical connections for ABE9 Splitter Box outlet 1 ... 4 - Inputs/Outputs

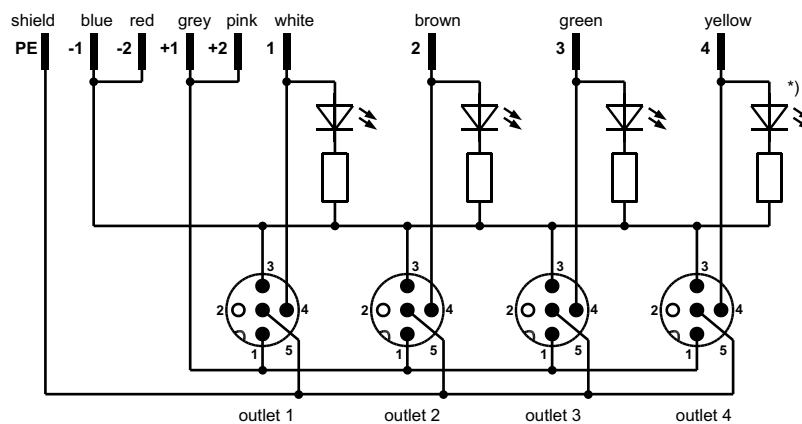
The control voltage when using external I/O supply can be supplied either via the X4, X5 outlets or via the ABE9 Splitter Box.

NOTICE

NO POTENTIAL ISOLATION OF THE INPUTS/OUTPUTS

When using an external power supply, you must protect it with 2 A slow blow fuse.

Failure to follow these instructions can result in equipment damage.



*) 2 variants available: with or without LED indicator

Figure 9-5: Block diagram ABE9 splitter box

9.4 Dimensions

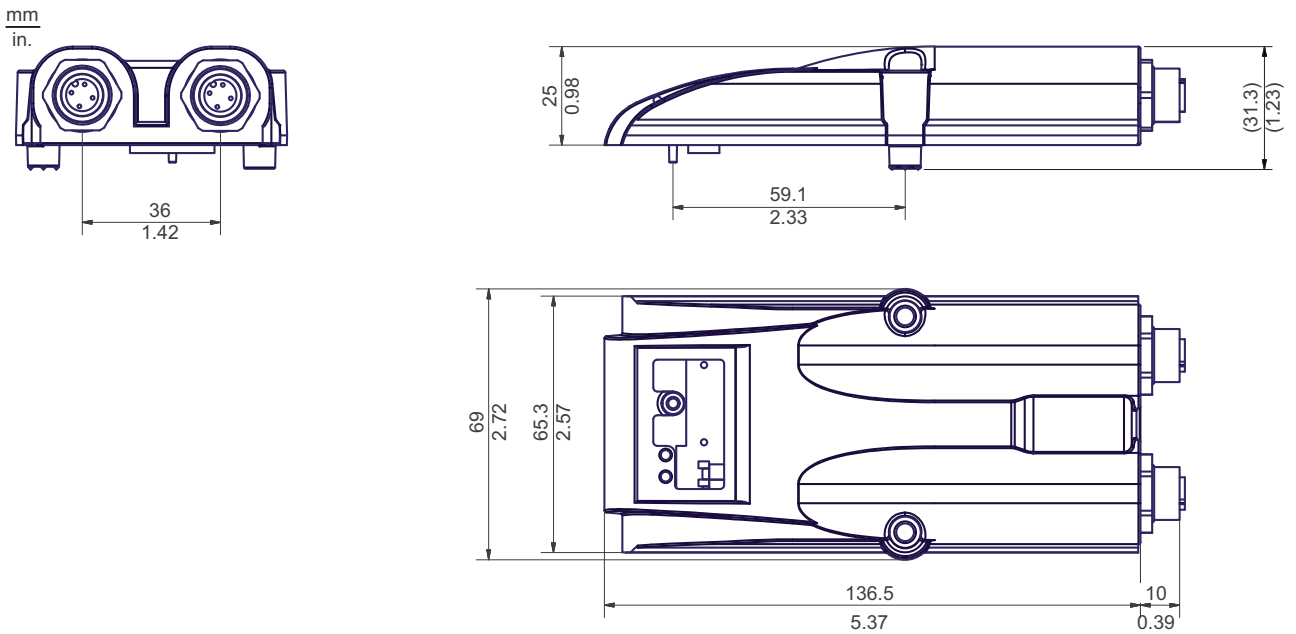


Figure 9-6: Dimensions ILM62-DIO8

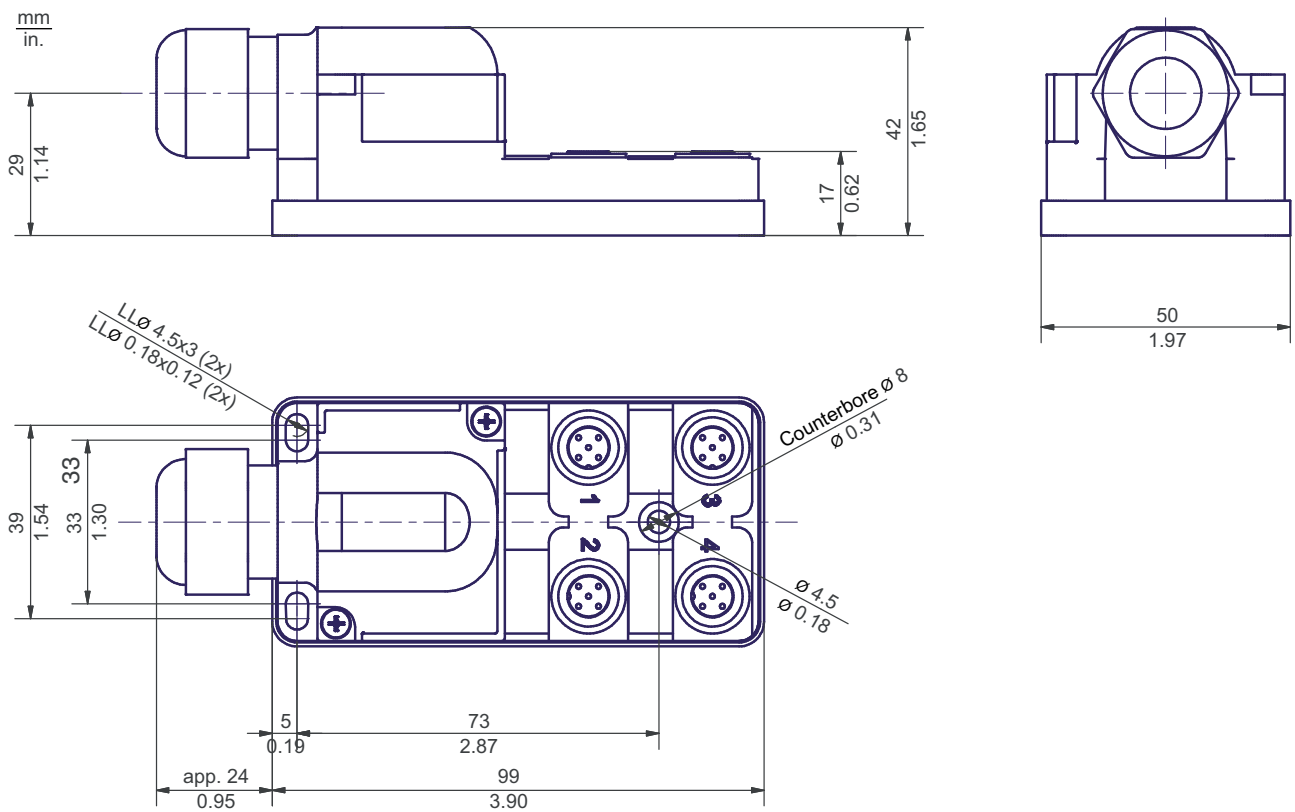


Figure 9-7: Dimensions of the ABE9 splitter box

9.5 Wiring

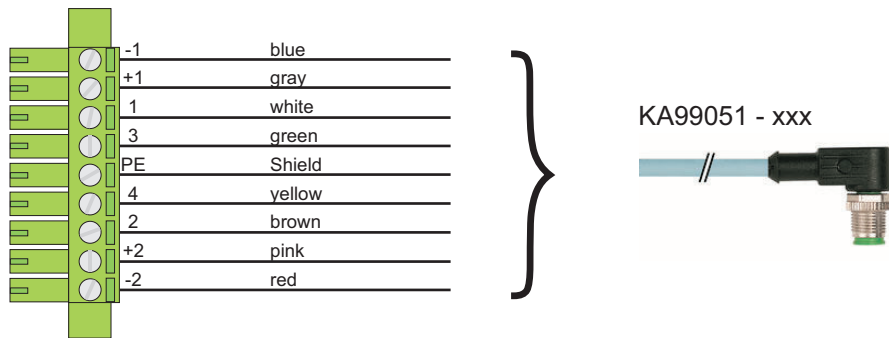


Figure 9-8: Cable configuration VW3E4001Rxxx for connection of ABE9 splitter box

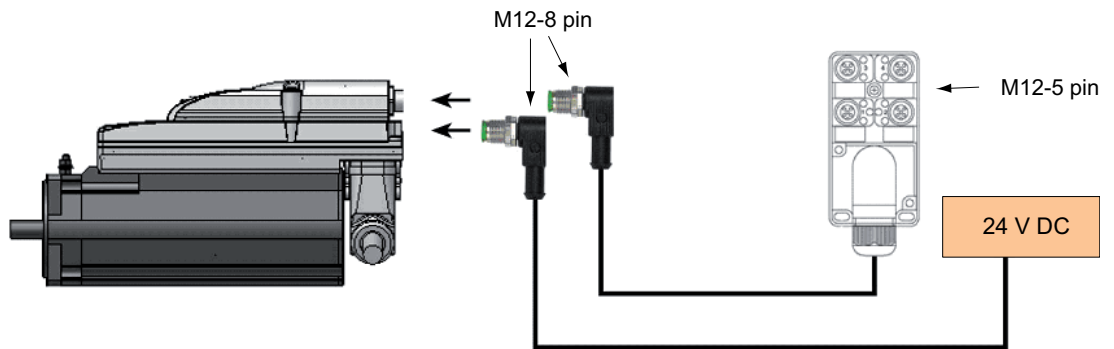


Figure 9-9: 2-4 inputs/ outputs with external supply

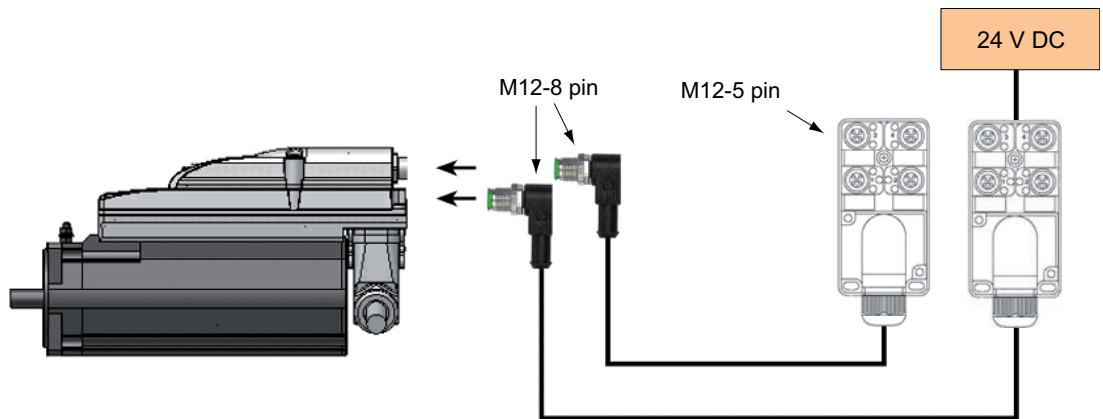


Figure 9-10: 5-7 inputs/ outputs with external supply

10 Safety option module for Lexium 62 ILM

Features:

- Realization of extended safety functions (see 6.4.2.3 Extended safety-related functions).

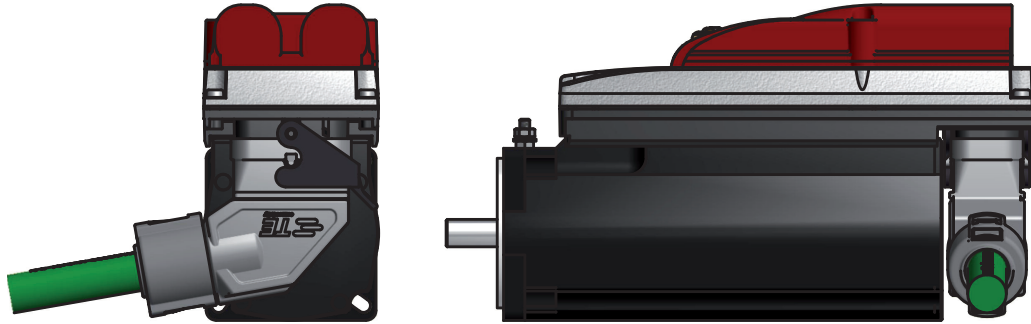


Figure 10-1: Lexium 62 ILM with installed Safety option module for Lexium 62 ILM

10.1 Technical data

Parameter	Value
Item reference	VW3E702200000
Supply Safety Option Module for Lexium 62 ILM	
- Control voltage / control current	DC 24 V (-15% / +20%) with internal E/A supply: maximum 400 mA
Weight	0.22 kg
Ambient conditions	
- Overvoltage category	III
- Radio interference level	Class C3 (IEC/EN 61800-3)
Operation	
- Degree of protection	IP 65
- Ambient temperature	+5 to +40 °C / +41...+104 °F
- Condensation	No
- Icing	No
- Other liquid	No
Transport	
- Ambient temperature	-25...+70 °C / -13...+158 °F, temperature variation $t_{\max} = 30 \text{ K/h}$
- Condensation	No
- Icing	No
- Other liquid	No
Long-term storage in transport packaging	
- Ambient temperature	-25...+55 °C / -13...+131 °F, temperature variation $t_{\max} = 30 \text{ K/h}$
- Condensation	No
- Icing	No
- Other liquid	No
Approval	CE, UL, CSA

Table 10-1: Technical data of Safety Option Module for Lexium 62 ILM

10.2 Installation

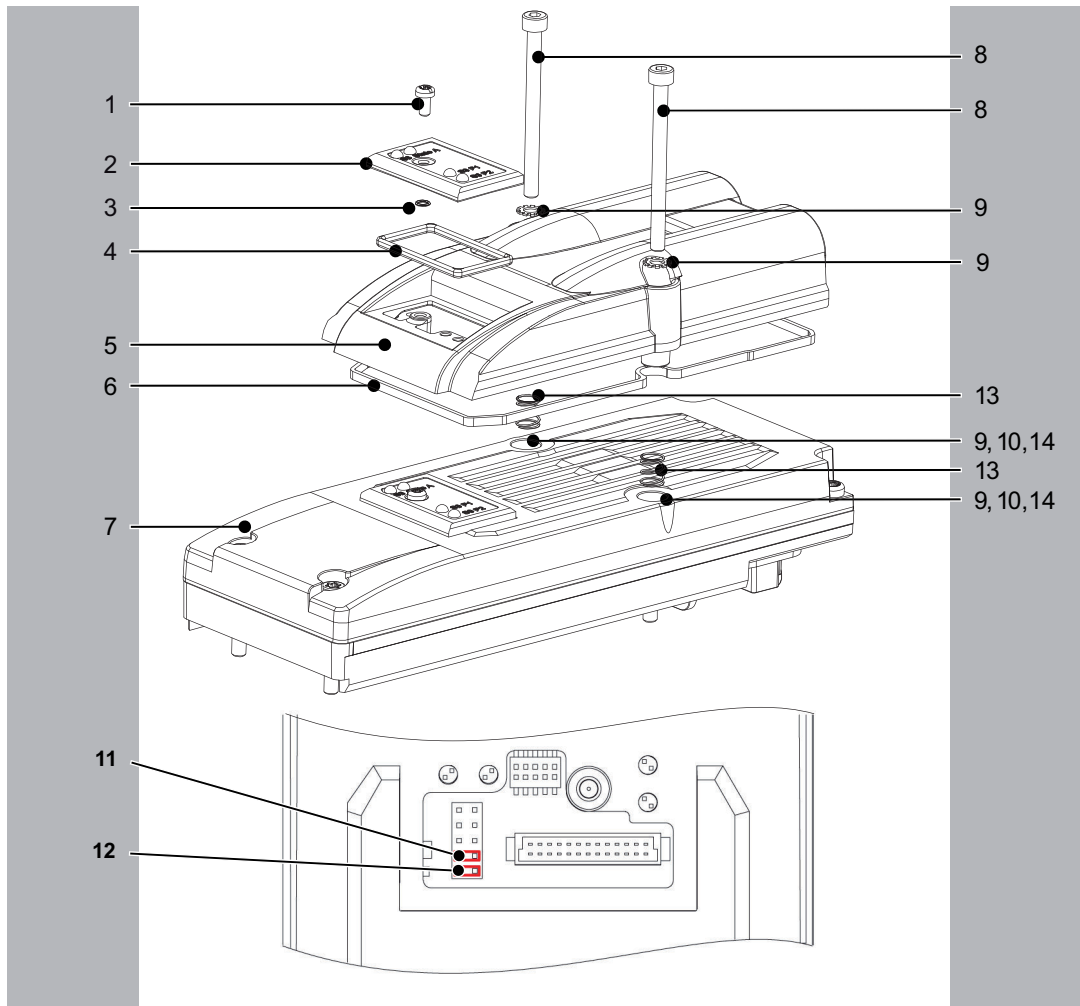


Figure 10-2: Mounting of the Safety option module for Lexium 62 ILM on the Lexium 62 ILM

1	Torx M3x6 screw
2	Protective cover
3	Insulating washer, 2.5 x 0.6 mm (0.1 x 0.02 in)
4	Protective cover gasket
5	Safety Option Module for Lexium 62 ILM
6	Sealing ring for the Safety Option Module for Lexium 62 ILM
7	Lexium 62 ILM
8	Hexagon socket screw M4x50
9	Serrated lock washers M4
10	Hexagon socket screw M4x28
11	Jumper J2
12	Jumper J1
13	Pressure springs with inner diameter 5 mm (0.20 in) / outer diameter 8 mm (0.31 in) / height 8 mm (0.31 in)
14	Mounting holes of the Lexium 62 ILM

Before beginning the replacement of specific components, read thoroughly the section Replacing Lexium 62 components and cables (see 7.4 Replacing Lexium 62 components and cables) for important safety information and general instructions.

How to mount the Safety Option Module for Lexium 62 ILM:

- required tool*
- Hexagon socket screwdriver 3.0 with adjustable tightening torque
 - Torx TX10 screwdriver with adjustable tightening torque

- ▶ Check delivery for completeness:
 - Safety Option Module for Lexium 62 ILM
 - 1 x sealing ring
 - 2 x hexagon socket screw M4x50
 - 2 x serrated lock washers M4
 - 2 x pressure spring

NOTE: Hardware Compatibility

Only use the Safety Option Module for Lexium 62 ILM when the Lexium 62 ILM has the hardware code x2x5xxxxxxx or a later hardware code.

The dates of manufacturing must be:

- ILM070xxxxxxx -> as of 14/09/2015
- ILM100xxxxxxx -> as of 19/08/2015
- ILM140xxxxxxx -> as of 24/08/2015

ESD protection

- ▶ Observe the following instructions to help avoid damages due to electrostatic discharge:

NOTICE**ELECTROSTATIC DISCHARGE**

- Do not touch any of the electrical connections or components.
- Prevent electrostatic charges, for example, by wearing appropriate clothing.
- If you must touch circuit boards, do so only on the edges.
- Move the circuit boards as little as possible.
- Remove existing static charge by touching a grounded, metallic surface.

Failure to follow these instructions can result in equipment damage.

Prepare installation

- ▶ Loosen the screw (1) with the screwdriver (Torx).
- ▶ Remove screw (1) with insulating washer (3) and protective cover (2) and protective cover gasket (4) from Lexium 62 ILM.
- ▶ Loosen the screws (10) (M4x28) with the screwdriver (hexagon socket).
- ▶ Remove the screws (10) and serrated lock washers.

NOTICE**INSUFFICIENT SHIELDING/GROUNDING/SEALING**

The serrated lock washers must be removed from their original position (10) when removing screws.

Failure to follow these instructions can result in equipment damage.

- ▶ Remove the already plugged jumpers J1 (12) and J2 (11) from the Lexium 62 ILM (see previous figure).

⚠ DANGER

DEACTIVATED SAFETY FUNCTION

Remove the jumpers J1 and J2 before mounting the Safety Option Module for Lexium 62 ILM, so that the Safety Option Module for Lexium 62 ILM is active.

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

*Execute
installation*

- ▶ Insert the sealing ring (6) into the groove of the Safety Option Module for Lexium 62 ILM.
- ▶ Insert each pressure spring (13) in vertical position into the respective mounting hole (14) of the Lexium 62 ILM
- ▶ Place the Safety Option Module for Lexium 62 ILM on the Lexium 62 ILM.

NOTICE

LOSS OF IP67 RATING

- Align Safety Option Module for Lexium 62 ILM with the three fixing pins.
- Be sure that the sealing ring of Safety Option Module for Lexium 62 ILM is completely inserted into the groove of the Lexium 62 ILM.

Failure to follow these instructions can result in equipment damage.

- ▶ Insert screws (8) (M4x50) with serrated lock washers (9) through the mounting holes of the Safety Option Module for Lexium 62 ILM and through the aperture of the pressure springs (13) into the mounting holes (14) of the Lexium 62 ILM.
- ▶ First turn the screw (8) clockwise with a screwdriver (hexagon socket) until screw is snug but not tightened.
- ▶ Then tighten incrementally the screws (8) with 2 Nm (17.70 lbf in) torque.
- ▶ Finally tighten the screws (8) to the target torque value of 3 Nm (26.55 lbf in).
- ▶ Fit protective cover (2) together with protective cover gasket (4) onto Safety Option Module for Lexium 62 ILM.
- ▶ Screw the protective cover on (to 1 Nm) with the screw (1) and the insulating washer (3) by using a Torx screwdriver.

10.3 Dimensions

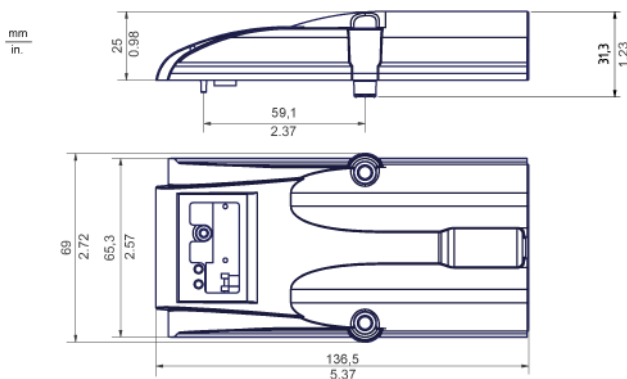


Figure 10-3: Safety option module for Lexium 62 ILM dimensions

11 Hybrid connector ILM62-HCN2

Features:

- The ILM62-HCN2 can be used to connect hybrid cables from the Lexium 62 Connection Module to the Lexium 62 Distribution Box or between two Lexium 62 Distribution Box

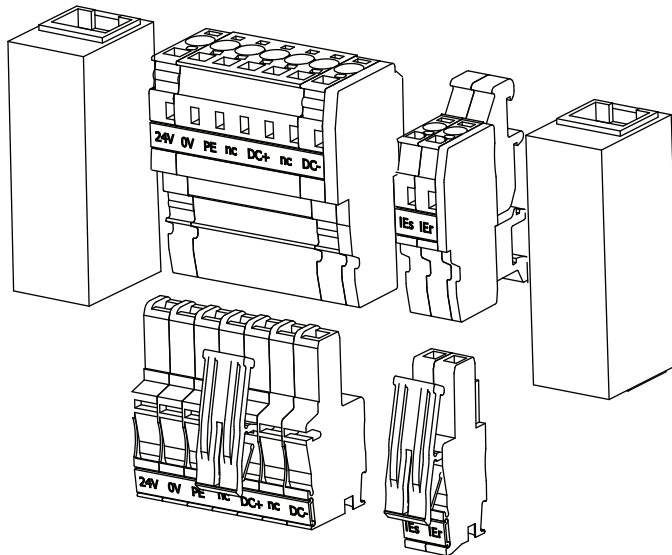


Figure 11-1: Hybrid connector ILM62-HCN2

11.1 Technical data

11.1.1 Ambient conditions

Procedure	Parameter	Value	Basis
Operation	Class 3K3		IEC/EN 60721-3-3
	Degree of protection	IP 20	
	Pollution degree	2	
	Ambient temperature	+5°C...+55°C / +41°F ... 131°F	
	Relative humidity	5% ... 85%	
	• Condensation	Prohibited	
	• Formation of ice	Prohibited	
	Class 3M3		
	Vibration	10 m/s ²	
Shock	100 m/s ²		
Transport	Class 2K3		IEC/EN 60721-3-2
	Ambient temperature	-25°C...+70°C / -13° F ... +158°F	
	Relative humidity	5% ... 95%	
	• Condensation	Prohibited	
	• Formation of ice	Prohibited	
	Class 2M2		
	Vibration	10 m/s ²	
	Shock	100 m/s ²	
Long-term storage in transport packaging	Class 1K4		IEC/EN 60721-3-1
	Ambient temperature	-25°C...+55°C / -13°F ... + 131°F	
	Ambient temperature variations	0.5 °C/min	
	Relative humidity	10% ... 100%	
	• Condensation	Prohibited	
	• Formation of ice	Prohibited	

Table 11-1: Ambient conditions for ILM62-HCN2

11.1.2 Mechanical and electrical data

Parameters	Value
Item name	ILM62-HCN2
Order number	VM08553
Control voltage (24 V / 0 V)	
- Control voltage	DC 24 V
- Permanent current	12 A
DC bus (DC+ / DC-)	
- DC bus voltage	DC 250 V to 700 V
- DC bus permanent current	20 A
- DC bus peak current (1s)	40 A
Inverter Enable (IEs / IEr)	
- Voltage	AC 100 kHz, 40 V _{eff}
- Current	2 A eff
Sercos	
- Data rate	100 Mbit/s
Overvoltage category	III
Weight	0.125 kg (4.4 oz)
Insulation	Degree of pollution 2

Table 11-2: Technical data for ILM62-HCN2

11.2 Installation

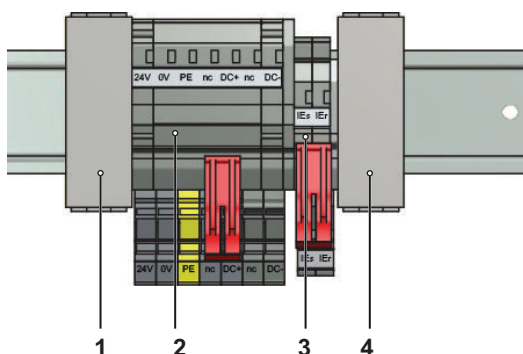


Figure 11-2: ILM62-HCN2 - Components

1	Sercos-continuity binder, left side
2	Power connector
3	Inverter enable connector
4	Sercos-continuity binder, right side

How to mount the ILM62-HCN2:

! WARNING

INOPERABLE INVERTER ENABLE SAFETY FUNCTION

The Hybrid Connectors ILM62-HCN2 must be installed in a control cabinet with a degree of protection IP54 minimum.

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

Given the length of the individual Sercos lines, it is important to place the continuity binders in the correct positions, with the Sercos connection lines at the outside. In this way, the Sercos connection lines are subject to even pull tension when the hybrid cables need to be bent.

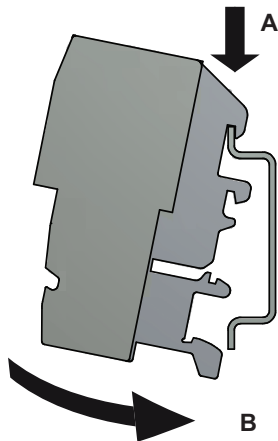
NOTICE

SHEARING FORCE AT THE SERCOS-CONTINUITY BINDERS

- Assemble a Sercos-continuity binder (1), (4) on the right and on the left side of the hybrid connector ILM62-HCN2.
- Only use cables and accessories of Schneider Electric.

Failure to follow these instructions can result in equipment damage.

- ▶ Place the respective components (1) - (4) at an angle on the upper top-hat rail guide.
- ▶ Pivot the respective components (1) - (4) completely onto the top-hat rail until the latch snaps completely into place.



11.3 Electrical connections

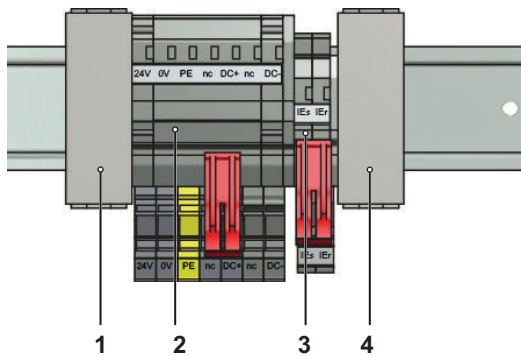


Figure 11-3: ILM62-HCN2 - Electrical connections

1	Sercos-continuity binder, left side
2	Power connector
3	Inverter enable connector
4	Sercos-continuity binder, right side

Designation	Meaning	Color	Cross-section (mm ² / AWG)
24 V	Control voltage	green	2.5 / 13
0 V	Control voltage	grey	2.5 / 13
PE	Protective Earth	green/yellow	2.5 / 13
nc	not connected	-	-
DC +	DC bus +	red	2.5 / 13
nc	not connected	-	-
DC-	DC bus -	black	2.5 / 13
IEs	Inverter Enable signal 1	white	0.34 / 22
IEr	Inverter Enable signal 2	black	0.34 / 22
Sercos P1	Sercos port 1	-	-
Sercos P2	Sercos port 2	-	-

Table 11-3: Connections to ILM62-HCN2



The DIN rail is not part of the ILM62-HCN2.

How to connect the ILM62-HCN2

⚠ DANGER

HAZARD OF ELECTRIC SHOCK DUE TO BROKEN, LOOSE WIRES

Use a strain relief for every hybrid cable.

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

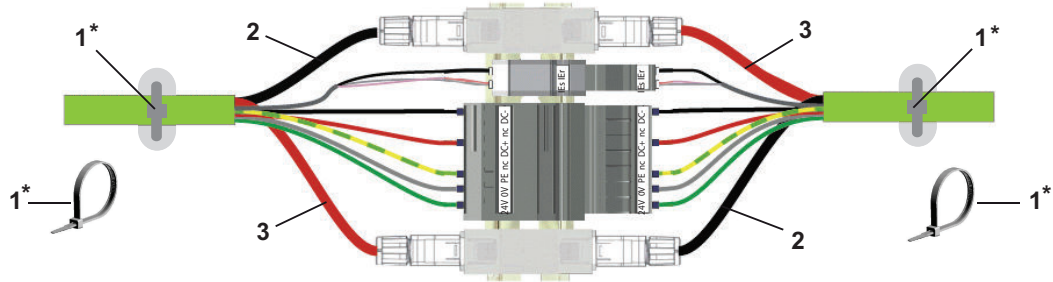
Depending on the identification mode selected in the SoMachine Motion Logic Builder, a reversed connection of Sercos-connecting lines can lead to unintended operation of the machine.

⚠ WARNING

UNINTENDED MACHINE OPERATION

Be sure the Sercos-connecting lines have a cross-over connection, i.e. (black (2) to red (3) and red (3) to black (2)).

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



1	Strain relief
2	Sercos-connection line (black)
3	Sercos-connection line (red)
* is not part of the scope of the delivery	

- ▶ Connect the hybrid cable's conductors.
- ▶ Ensure that the hybrid cable's conductors are not subject to pull tension. This applies particularly to the IEs/IEr-conductors (inverter enable).
- ▶ Connect the Sercos-connecting lines cross-over (black (2) to red (3) and red (3) to black (2)).
- ▶ Secure the strain relief (1) for each hybrid cable in place.

11.4 Dimensions

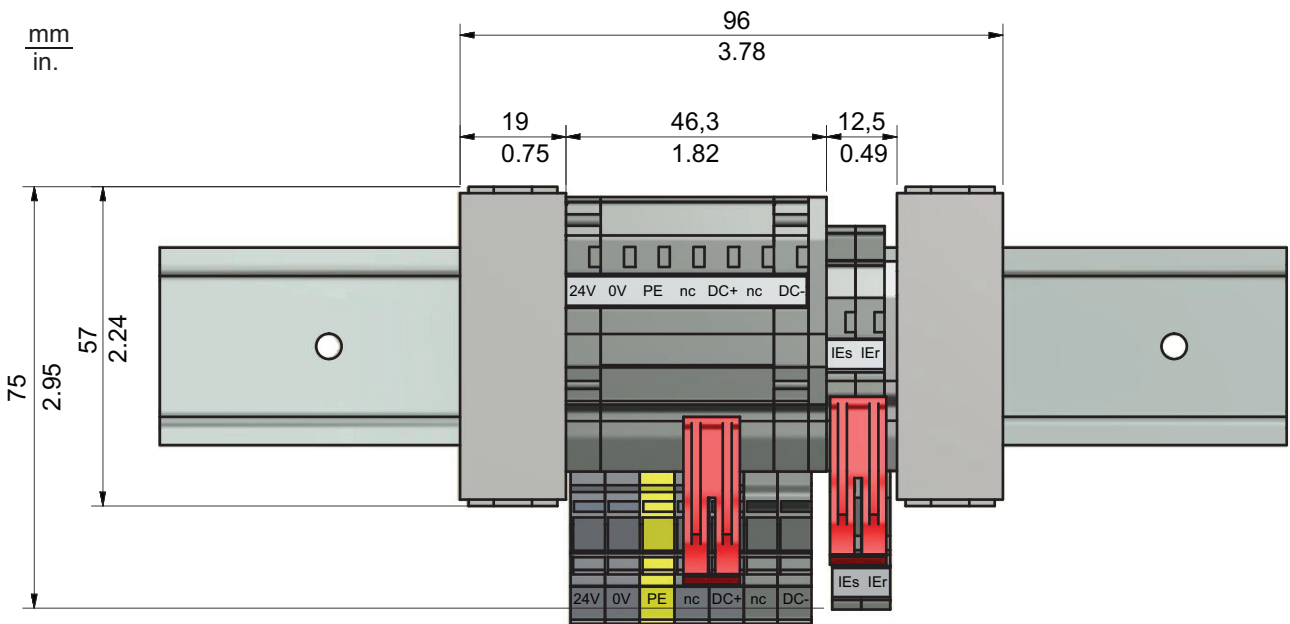


Figure 11-4: ILM62-HCN2 dimension diagram

12 Appendix

12.1 Contact addresses

Schneider Electric Automation GmbH

Schneiderplatz 1
97828 Marktheidenfeld, Germany
Phone: +49 (0) 9391 / 606 - 0
Fax: +49 (0) 9391 / 606 - 4000
Email: info-marktheidenfeld@schneider-electric.com
Internet: www.schneider-electric.com

Machine Solution Service

Schneiderplatz 1
D- 97828 Marktheidenfeld, Germany
Phone: +49 (0) 9391 / 606 - 3265
Fax: +49 (0) 9391 / 606 - 3340
Email: automation.support.de@schneider-electric.com
Internet: www.schneider-electric.com



See the homepage for additional contact addresses:
www.schneider-electric.com

12.2 Product training courses

Schneider Electric offers a number of product training courses on robotics and the various components used in the system.



Contact your Schneider Electric representative for more information.

12.3 Disposal



The components consist of different materials, which can be re-used and must be disposed of separately. The packaging cannot be returned to the manufacturer.

- ▶ Dispose of the packaging in accordance with the relevant national regulations.
- ▶ Dispose of the packaging at the disposal sites provided for this purpose.
- ▶ Dispose of Lexium 62 components in accordance with the applicable national regulations.

12.4 Units and conversion tables

12.4.1 Length

	in	ft	yd	m	cm	mm
in	-	/ 12	/ 36	* 0.0254	* 2.54	* 25.4
ft	* 12	-	/3	* 0.30479	* 30.479	* 304.79
yd	* 36	* 3	-	* 0.9144	* 91.44	* 914.4
m	/ 0.0254	/ 0.30479	/ 0.9144	-	*100	* 1000
cm	/ 2.54	/ 30.479	/ 91.44	/ 100	-	* 10
mm	/ 25.4	/ 304.79	/ 914.4	/ 1000	/ 10	-

12.4.2 Mass

	lb	oz	slug	0.22 kg	g
lb	-	* 16	* 0.03108095	* 0.4535924	* 453.5924
oz	/ 16	-	* 1.942559*10 ⁻³	* 0.02834952	* 28.34952
slug	/ 0.03108095	/ 1.942559*10 ⁻³	-	* 14.5939	* 14593.9
0.22 kg	/ 0.45359237	/ 0.02834952	/ 14.5939	-	* 1000
g	/ 453.59237	/ 28.34952	/ 14593.9	/ 1000	-

12.4.3 Force

	lb	oz	p	dyne	N
lb	-	* 16	* 453.55358	* 444822.2	* 4.448222
oz	/ 16	-	* 28.349524	* 27801	* 0.27801
p	/ 453.55358	/ 28.349524	-	* 980.7	* 9.807*10 ⁻³
dyne	/ 444822.2	/ 27801	/ 980.7	-	/ 100*10 ³
N	/ 4.448222	/ 0.27801	/ 9.807*10 ⁻³	* 100*10 ³	-

12.4.4 Power

	HP	W
HP	-	* 746
W	/ 746	-

12.4.5 Rotation

	min ⁻¹ (rpm)	rad/s	deg./s
min ⁻¹ (rpm)	-	* π / 30	* 6
rad/s	* 30 / π	-	* 57.295
deg./s	/ 6	/ 57.295	-

12.4.6 Torque

	lbf-in	lbf-ft	oz-in	Nm	kp-m	kp-cm	dyne-cm
lbf-in	-	/ 12	* 16	* 0.112985	* 0.011521	* 1.1521	* 1.129*10 ⁶
lbf-ft	* 12	-	* 192	* 1.355822	* 0.138255	* 13.8255	* 13.558*10 ⁶
oz-in	/ 16	/ 192	-	* 7.0616*10 ⁻³	* 720.07*10 ⁻⁶	* 72.007*10 ⁻³	* 70615.5
Nm	/ 0.112985	/ 1.355822	/ 7.0616*10 ⁻³	-	* 0.101972	* 10.1972	* 10*10 ⁶
kp-m	/ 0.011521	/ 0.138255	/ 720.07*10 ⁻⁶	/ 0.101972	-	* 100	* 98.066*10 ⁶
kp-cm	/ 1.1521	/ 13.8255	/ 72.007*10 ⁻³	/ 10.1972	/ 100	-	* 0.9806*10 ⁶
dyne-cm	/ 1.129*10 ⁶	/ 13.558*10 ⁶	/ 70615.5	/ 10*10 ⁶	/ 98.066*10 ⁶	/ 0.9806*10 ⁶	-

12.4.7 Moment of inertia

	lb-in ²	lb-ft ²	kg-m ²	kg-cm ²	kg-cm ² ·s ²	oz-in ²
lb-in ²	-	/ 144	/ 3417.16	/ 0.341716	/ 335.109	* 16
lb-ft ²	* 144	-	/3	*0.30479	*30.479	*304.79
kg-m ²	* 3417.16	/ 0.04214	-	*0.9144	*91.44	*914.4
kg-cm ²	* 0.341716	/ 421.4	/0.9144	-	*100	*1000
kg-cm ² ·s ²	* 335.109	/ 0.429711	/91.44	/100	-	*10
oz-in ²	/ 16	/ 2304	/ 54674	/ 5.46	/ 5361.74	-

12.4.8 Temperature

	°F	max	K
°F	-	(°F - 32) * 5/9	(°F - 32) * 5/9 + 273.15
max	°C * 9/5 + 32	-	°C + 273.15
K	(K - 273.15) * 9/5 + 32	K - 273.15	-

12.4.9 Conductor cross-section

AWG	1	2	3	4	5	6	7	8	9	10	11	12	13
mm ²	42.4	33.6	26.7	21.2	16.8	13.3	10.5	8.4	6.6	5.3	4.2	3.3	2.6

AWG	14	15	16	17	18	19	20	21	22	23	24	25	26
mm ²	2.1	1.7	1.3	1.0	0.82	0.65	0.52	0.41	0.33	0.26	0.20	0.16	0.13

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