LXM28A and BCH2

Servo drive system
Product manual

V2.1, 04.2016

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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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Safety Information

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 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 instructions that follow this symbol to avoid possible injury or death.

Hazard categories

Safety instructions to the user are highlighted by safety alert symbols in the manual. In addition, labels with symbols and/or instructions are attached to the product that alert you to potential hazards.

Four hazard categories exist depending on the criticality and nature of the hazard.

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, serious injury, or equipment damage.

CAUTION

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

NOTICE

NOTICE indicates a hazardous situation, which, if not avoided, **can result** in equipment damage.

Qualification of personnel

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

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

No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Intended use

The products described in the present manual consists of a drive and a three-phase servo motor; they are intended for industrial use in this combination according to this manual.

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

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

Since the products are used as components in an entire system, you must ensure the safety of persons by means of the design of this entire system.

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

Any use other than the use explicitly permitted is prohibited and can result in hazards.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel.

Related Documents

Title of Documentation	Reference Number
LXM28 - Common DC bus - Application note	0198441114085 (eng) 0198441114084 (deu) 0198441114089 (zho)

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

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Product Related Information

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

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

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

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

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

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⚠ ⚠ DANGER

ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Before performing work on the drive system:
  - 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.
  - Lock all power switches in the open (non-energized) position.
  - Wait 15 minutes to allow the DC bus capacitors to discharge.
  - Measure the voltage on the DC bus with a properly rated voltage sensing device as per the instructions in the present document 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.
- Do not touch any connectors, contacts, terminals, unshielded components or printed circuit boards while, or if you suspect that, the equipment is under power.
- Use only electrically insulated tools.
- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- Insulate both ends of unused conductors of the motor cable to help prevent AC voltage from coupling to unused conductors in the motor cable.
- Do not create a short-circuit across the DC bus terminals or the DC bus capacitors.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

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

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

⚠ DANGER

POTENTIAL FOR EXPLOSION

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

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

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

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the holding brake to no longer operate properly and may result in premature wear.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Carefully install the wiring in accordance with the EMC requirements.
- Do not operate the product with unknown settings or data.
- Perform a comprehensive commissioning test.

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

⚠ WARNING

LOSS OF CONTROL

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

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

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

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DC bus voltage measurement

The DC bus voltage can exceed 400 Vdc. The DC bus LED is not an indicator of the absence of DC bus voltage.

DANGER

ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect the voltage supply to all connections.
- Wait 15 minutes to allow the DC bus capacitors to discharge.
- Use a properly rated voltage-sensing device for measuring (greater than 400 Vdc).
- Measure the DC bus voltage between the DC bus terminals (PA/+ and PC/-) to verify that the voltage is less than 42 Vdc.
- Contact your local Schneider Electric representative if the DC bus capacitors do not discharge to less than 42 Vdc within a period of 15 minutes.
- Do not operate the product if the DC bus capacitors do not discharge properly.
- Do not attempt to repair the product if the DC bus capacitors do not discharge properly.
- Do not assume that the DC bus is voltage-free when the DC bus LED is off.

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

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Terminology Derived from Standards

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

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

Among others, these standards include:

Standard	Description
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
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
EN/IEC 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
2004/108/EC	Electromagnetic Compatibility Directive
2006/95/EC	Low Voltage Directive

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

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

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

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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.

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About the book

This manual is valid for LXM28 and BCH2 standard products.

Source manuals

The latest versions of the manuals can be downloaded from the Internet at:

http://www.schneider-electric.com

Source CAD data

For easier engineering, CAD data (drawings or EPLAN macros) are available for download from the Internet at:

http://www.schneider-electric.com

Work steps

If work steps must be performed consecutively, this sequence of steps is represented as follows:

■ Special prerequisites for the following work steps
▶ Step 1
◁ Specific response to this work step
▶ Step 2

If a response to a work step is indicated, this allows you to verify that the work step has been performed correctly.

Unless otherwise stated, the individual steps must be performed in the specified sequence.

Making work easier

Information on making work easier is highlighted by this symbol:

Sections highlighted this way provide supplementary information on making work easier.

SI units

Technical data are specified in SI units. Converted units are shown in parentheses behind the SI unit; they may be rounded.

Example:
Minimum conductor cross section: 1.5 mm^2 (AWG 14)

Glossary

Explanations of special technical terms and abbreviations.

Index

List of keywords with references to the corresponding page numbers.

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1 Introduction

1.1 Device overview

Figure 1: Device overview

LXM28 is an all-purpose AC servo drive. Together with series BCH2 servo motors as well as a comprehensive portfolio of options and accessories, the drives are ideally suited to implement compact, high-performance drive solutions for a wide range of power requirements.

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1.2 Components and interfaces

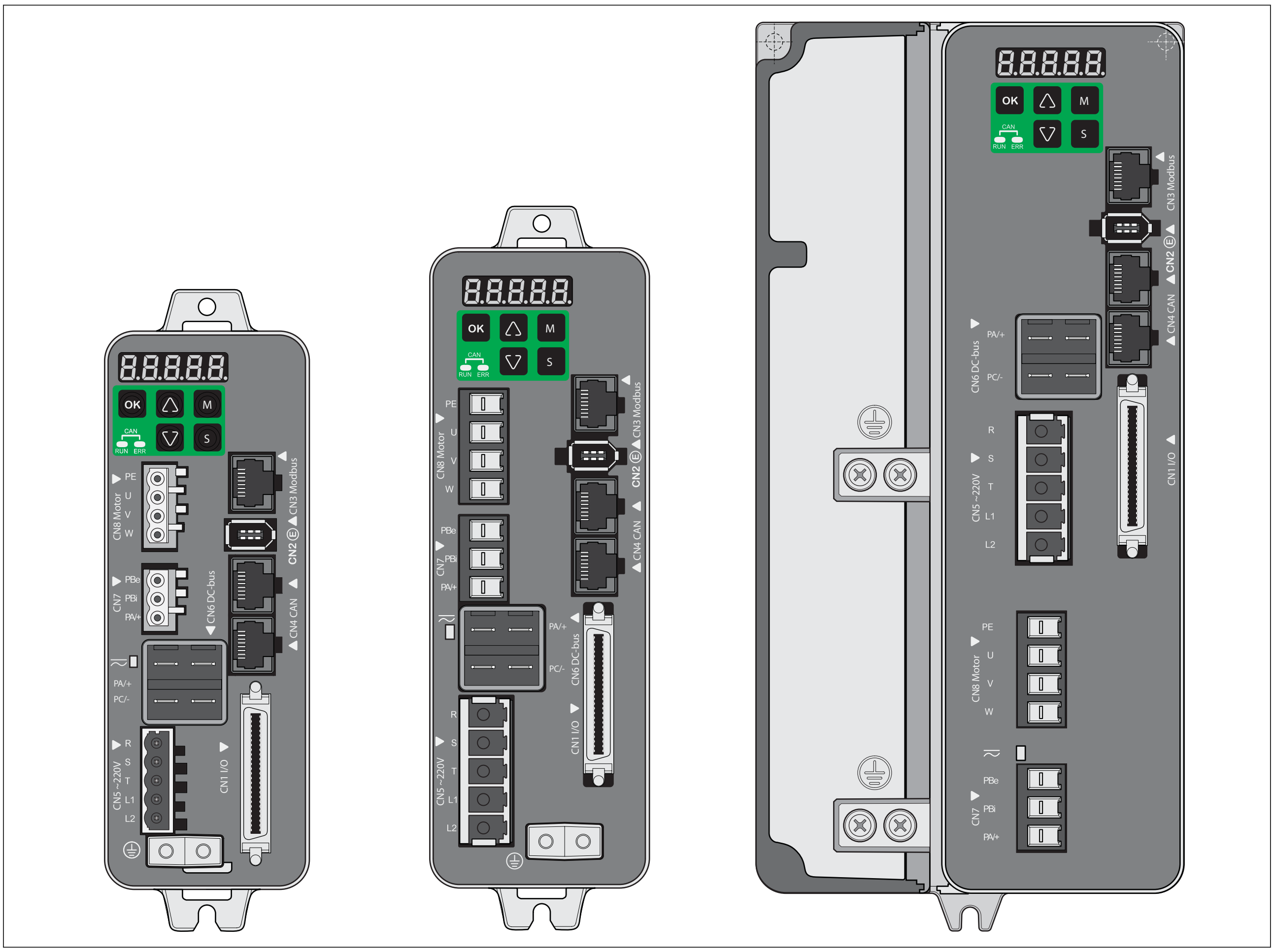

Figure 2: Components and interfaces

(CN1) Signal interface

- 2 analog reference value inputs ±10 V for torque and velocity
- 2 analog outputs ±8 V
- 8 configurable digital inputs
- 6 configurable digital outputs
- 2 inputs for Pulse Train (PT)
- Outputs for ESIM (encoder simulation)
- 12 Vdc power supply for analog inputs
- 24 Vdc power supply for digital signals

(CN2) Connection for motor encoder

(CN3) Modbus (commissioning interface)

(CN4) 2 connections for fieldbus CANopen

(CN5) Mains connection (power stage supply) and controller supply

(CN6) DC bus connection

(CN7) Connection for external braking resistor

(CN8) Motor phases connection

(CN9) Connection for safety function STO

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1.3 Nameplate

Drive The nameplate contains the following data:

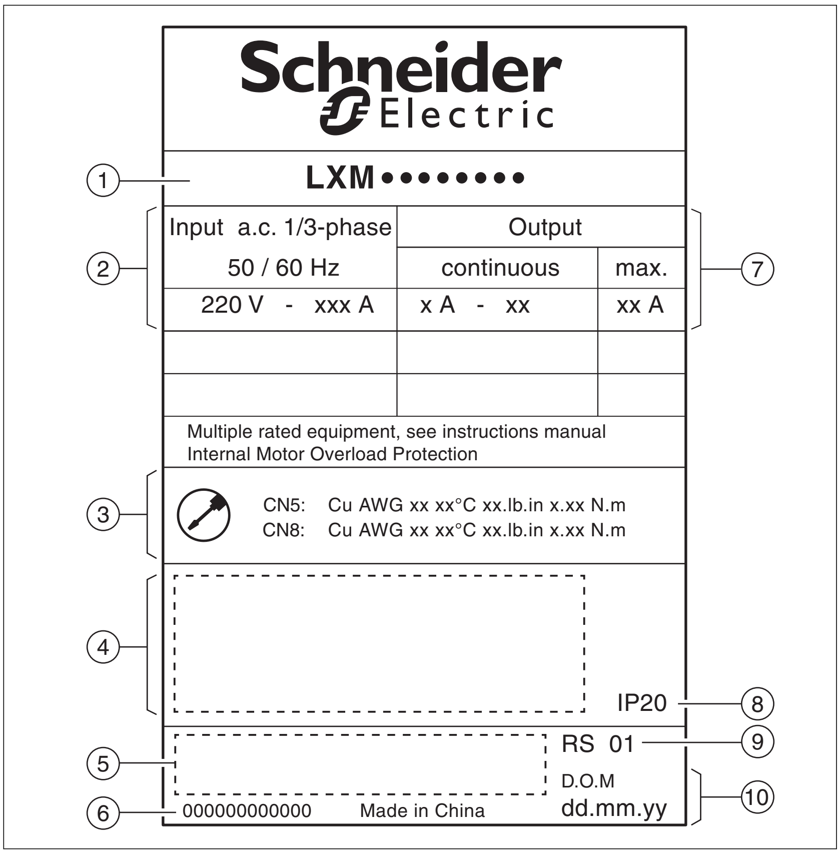

Figure 3: Nameplate

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

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Motor BCH2•B The nameplate shows the following data:

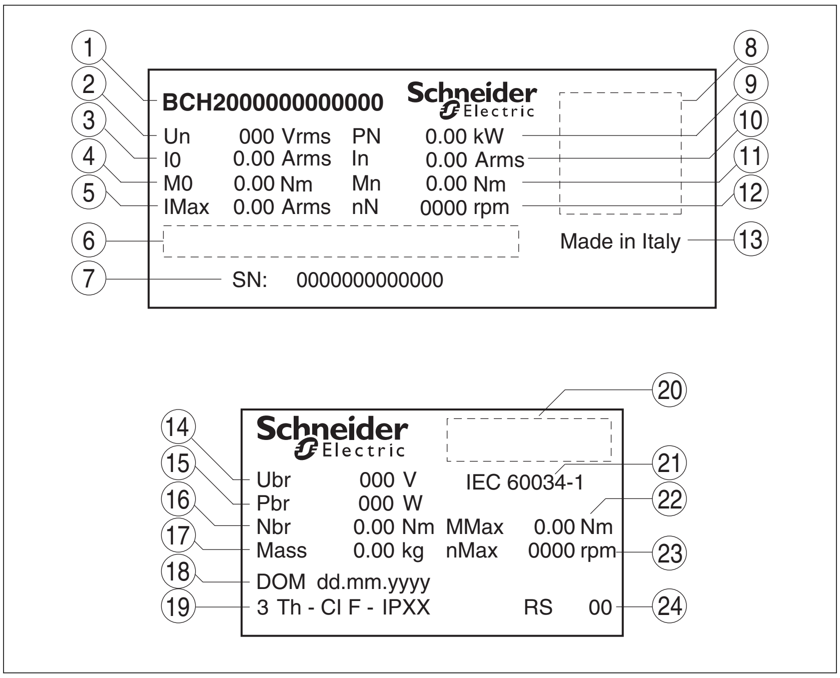

Figure 4: Nameplate BCH2•B

(1)	Motor type, see type code
(2)	Nominal voltage
(3)	Continuous stall current
(4)	Continuous stall torque
(5)	Maximum Current
(6)	Barcode
(7)	Serial number
(8)	QR code
(9)	Nominal power
(10)	Nominal Current
(11)	Nominal torque
(12)	Nominal speed of rotation
(13)	Country of manufacture
(14)	Nominal voltage of the holding brake (optional)
(15)	Nominal power of the holding brake (optional)
(16)	Nominal torque of the holding brake (optional)
(17)	Mass
(18)	Date of manufacture DOM, see page *415*
(19)	Number of motor phases, temperature class, degree of protection
(20)	Certifications
(21)	Applied standard
(22)	Peak torque
(23)	Maximum permissible speed of rotation
(24)	Hardware version

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

The nameplate shows the following data:

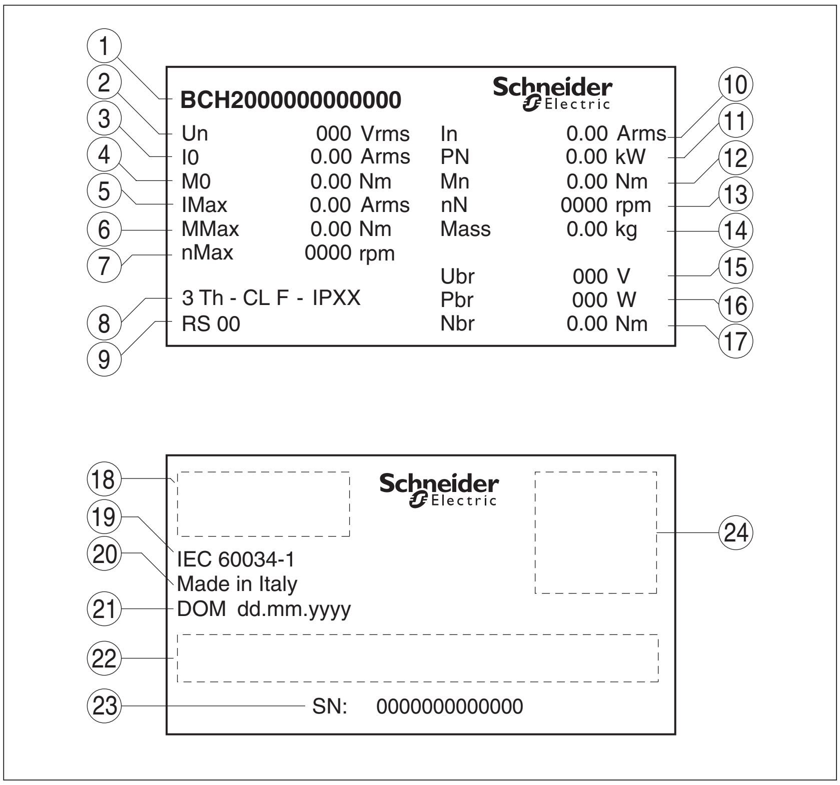

Figure 5: Nameplate BCH2•D, BCH2•F, BCH2•H, BCH2•M, BCH2•R

(1)	Motor type, see type code
(2)	Nominal voltage
(3)	Continuous stall current
(4)	Continuous stall torque
(5)	Maximum Current
(6)	Peak torque
(7)	Maximum permissible speed of rotation
(8)	Number of motor phases, temperature class, degree of protection
(9)	Hardware version
(10)	Nominal Current
(11)	Nominal power
(12)	Nominal torque
(13)	Nominal speed of rotation
(14)	Mass
(15)	Nominal voltage of the holding brake (optional)
(16)	Nominal power of the holding brake (optional)
(17)	Nominal torque of the holding brake (optional)
(18)	Certifications
(19)	Applied standard
(20)	Country of manufacture
(21)	Date of manufacture DOM, see page *415*
(22)	Barcode
(23)	Serial number
(24)	QR code

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1.4 Type code

Drive

LXM	28	A	U07	M3X

Product designation
LXM = Lexium

Product type
28 = AC servo drive for one axis

Interfaces
A = CAN, PTI, I/O interface, commissioning via Modbus RTU

Continuous power
UA5 = 0.05 kW
U01 = 0.1 kW
U02 = 0.2 kW
U04 = 0.4 kW
U07 = 0.75 kW
U10 = 1 kW
U15 = 1.5 kW
U20 = 2 kW
U30 = 3 kW
U45 = 4.5 kW

Power stage supply [V_{ac}]
M3X = 1~/3~, 200/230 Vac

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Motor

	BCH2	M	B	01	3	3	C	A	5	C

Product family
BCH2 = Brushless servo motors - second generation

Moment of inertia
L = Low
M = Medium
H = High

Size (housing)
B = 40 mm flange
D = 60 mm flange
F = 80 mm flange
H = 100 mm flange
M = 130 mm flange
R = 180 mm flange

Nominal power

A5 = 50 W	10 = 1.0 kW
01 = 100 W	13 = 1.3 kW
02 = 200 W	15 = 1.5 kW
03 = 300 W	20 = 2.0 kW
04 = 400 W	30 = 3.0 kW
05 = 500 W	35 = 3.5 kW
06 = 600 W	45 = 4.5 kW
07 = 750 W	55 = 5.5 kW
08 = 850 W	75 = 7.5 kW
09 = 900 W	

Winding
1 = Optimized in terms of torque (1000 min^{-1}/1500 min^{-1})
2 = Optimized in terms of torque and speed of rotation (2000 min^{-1})
3 = Optimized in terms of speed of rotation (3000 min^{-1})

Shaft and degree of protection 1)
0 = Smooth shaft; degree of protection: shaft IP 54, housing IP 65
1 = Parallel key; degree of protection: shaft IP 54, housing IP 65
2 = Smooth shaft; degree of protection: shaft and housing IP 65
3 = Parallel key; degree of protection: shaft and housing IP 65

Encoder system
C = High-resolution encoder

Holding brake
A = Without holding brake
F = With holding brake

Connection version
5 = Flying leads (for BCH2•B, BCH2•D, BCH2•F)
6 = MIL connector (for BCH2•H, BCH2•M, BCH2•R)

Mechanical interface - mounting
C = Asian standard

1) In the case of mounting position IM V3 (drive shaft vertical, shaft end up), the motor only has degree of protection IP 50.

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1.5 Permissible product combinations

Drive	Motor	Available output power	Nominal speed of rotation	Nominal torque	Peak torque	Rotor inertia without holding brake	Moment of inertia
		Watt	min^{-1}	Nm	Nm	$kgcm^2$	
Devices 220 Vac that can be connected via a single phase or three phases							
LXM28•UA5M3X	BCH2MBA53•C•5C	50	3000	0.16	0.48	0.054	Medium
LXM28•U01M3X	BCH2MB013•C•5C	100	3000	0.32	0.96	0.075	Medium
LXM28•U02M3X	BCH2LD023•C•5C	200	3000	0.64	1.92	0.16	Low
LXM28•U04M3X	BCH2LD043•C•5C	400	3000	1.27	3.81	0.27	Low
LXM28•U04M3X	BCH2LF043•C•5C	400	3000	1.27	3.81	0.67	Low
LXM28•U07M3X	BCH2HF073•C•5C	750	3000	2.39	7.16	1.54	High
LXM28•U07M3X	BCH2LF073•C•5C	750	3000	2.39	7.16	1.19	Low
LXM28•U10M3X	BCH2LH103•C•6C	1000	3000	3.18	9.54	2.4	Low
LXM28•U07M3X	BCH2MM052•C•6C	500	2000	2.39	7.16	6.63	Medium
LXM28•U04M3X	BCH2MM031•C•6C	300	1000	2.86	8.59	6.63	Medium
LXM28•U10M3X	BCH2MM102•C•6C	1000	2000	4.77	14.3	6.63	Medium
LXM28•U10M3X	BCH2HM102•C•6C	1000	2000	4.77	14.3	8.41	High
LXM28•U10M3X	BCH2MM081•C•6C	850	1500	5.39	13.8	13.5	Medium
LXM28•U07M3X	BCH2MM061•C•6C	600	1000	5.73	17.19	6.63	Medium
LXM28•U10M3X	BCH2MM091•C•6C	900	1000	8.59	25.77	9.7	Medium
LXM28•U15M3X	BCH2MM152•C•6C	1500	2000	7.16	21.48	9.7	Medium
Devices 220 Vac that can be connected via three phases							
LXM28•U20M3X	BCH2LH203•C•6C	2000	3000	6.37	19.11	4.28	Low
LXM28•U20M3X	BCH2MM202•C•6C	2000	2000	9.55	28.65	13.5	Medium
LXM28•U20M3X	BCH2MR202•C•6C	2000	2000	9.55	28.65	26.5	Medium
LXM28•U20M3X	BCH2HR202•C•6C	2000	2000	9.55	28.65	34.68	High
LXM28•U30M3X	BCH2MR302•C•6C	3000	2000	14.32	42.97	53.56	Medium
LXM28•U30M3X	BCH2MR301•C•6C	3000	1500	19.1	57.29	53.56	Medium
LXM28•U45M3X	BCH2MR352•C•6C	3500	2000	16.7	50.3	53.56	Medium
LXM28•U45M3X	BCH2MR451•C•6C	4500	1500	28.65	71.62	73.32	Medium

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2 Technical Data

This chapter contains information on the ambient conditions and on the mechanical and electrical properties of the product family and the accessories.

2.1 Ambient conditions

2.1.1 Ambient conditions motor

Climatic environmental conditions transportation and storage

The storage time is primarily limited by the service life of the lubricants in the bearings; do not store the product for more than 36 months.

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

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

Climatic environmental conditions operation

The maximum permissible ambient temperature during operation depends on the mounting distances between the devices and on the required power. Observe the pertinent instructions in the chapter *"5 Installation"*.

Ambient temperature [1)] for motors without holding brake (no icing, non-condensing.	°C (°F)	-20 ... 40 (-4 ... 104)
Ambient temperature [1)] for motors with holding brake (no icing, non-condensing)	°C (°F)	0 ... 40 (32 ... 104)
Ambient temperature with current derating of 1% per °C (per 1.8 °F [1)]	°C (°F)	40 ... 60 (104 ... 140)
Relative humidity (non-condensing)	%	5 ... 85
Class as per IEC 60721-3-3		3K3, 3Z12, 3Z2, 3B2, 3C1, 3M6 [2)]
Installation altitude above mean sea level without current derating	m (ft)	<1000 (<3281)
Installation altitude above mean sea level with current derating of 1% per 100 m at altitudes higher than 1000 m [)]	m (ft)	1000 ... 3000 (3281 ... 9843)

1) Limit values with flanged motor, see table on page *28*.
2) Tested as per IEC 60068-2-6 and IEC 60068-2-27

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Flange sizes for temperature limit values

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

Motor	Flange material	Flange size in [mm (in)]
BCH2•B	Aluminum	185 x 185 x 8 (7.28 * 7.28 * 0.31)
BCH2•D	Aluminum	250 x 250 x 12 (9.84 * 9.84 * 0.47)
BCH2•F	Aluminum	250 x 250 x 12 (9.84 * 9.84 * 0.47)
BCH2•H	Steel	300 x 300 x 20 (11.8 * 11.8 * 0.79)
BCH2•M	Steel	400 x 400 x 20 (15.7 * 15.7 * 0.79)
BCH2•R	Steel	550 x 550 x 20 (21.7 * 21.7 * 0.79)

Compatibility with foreign substances

The motor has been tested for compatibility with many known substances and with the latest available knowledge. Nonetheless, you must perform a compatibility test prior to using a foreign substance.

Degree of protection

Motor	Degree of protection
BCH2•••••0 BCH2•••••1	Shaft IP54, housing IP 65
BCH2•••••3 BCH2•••••4	Shaft and housing IP 65

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2.1.2 Ambient conditions drive

Climatic environmental conditions transportation and storage

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

Temperature	°C (°F)	-25 ... 65 (-4 ... 149)

The following relative humidity is permissible during transportation and storage:

Relative humidity (non-condensing)	%	<95

Climatic environmental conditions operation

The maximum permissible ambient temperature during operation depends on the mounting distances between the devices and on the required power. Observe the pertinent instructions in the chapter *"5 Installation"*.

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

The following relative humidity is permissible during operation:

Relative humidity (non-condensing)	%	5 ... 95

Installation altitude above mean sea level without current derating	m (ft)	<2000 (<6561)

Installation site and connection

For operation, the device must be mounted in a closed control cabinet with a degree of protection of at least IP54. The device may only be operated with a permanently installed connection.

⚠ DANGER

ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Install the drive in a control cabinet or housing with a minimum IP 54 rating.

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

Pollution degree and degree of protection

Pollution degree		2
Degree of protection		IP20

Degree of protection when the safety function is used

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

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

Vibration and shock during operation

Class as per IEC 60721-3-3	3M4 3 mm from 9 ... 200 Hz
Maximum shock	98.1 m/s² (10 g) Type I

Vibration and shock during transportation and storage

Class as per IEC 60721-3-2	2M2 3.5 mm (2 ... 9 Hz) 9.81 m/s² (1 g) from 9 ... 200 Hz 14.715 m/s² (1.5 g) from 200 ... 500 Hz 34.335 m/s² (3.5 g) from 2 ... 9 Hz
Maximum shock	294.3 m/s² (30 g) Type II

2.2 Dimensions

2.2.1 Dimensions of drive

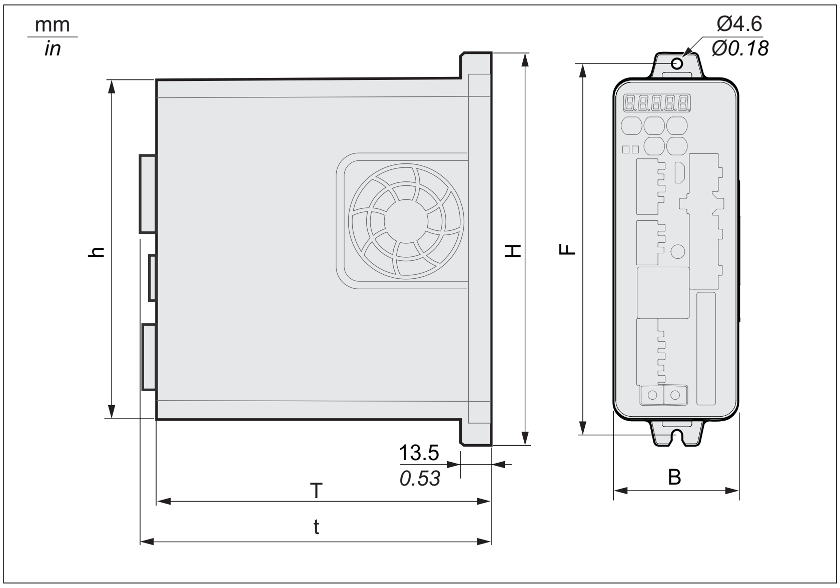

Figure 6: Dimensional drawing sizes 1 to 3

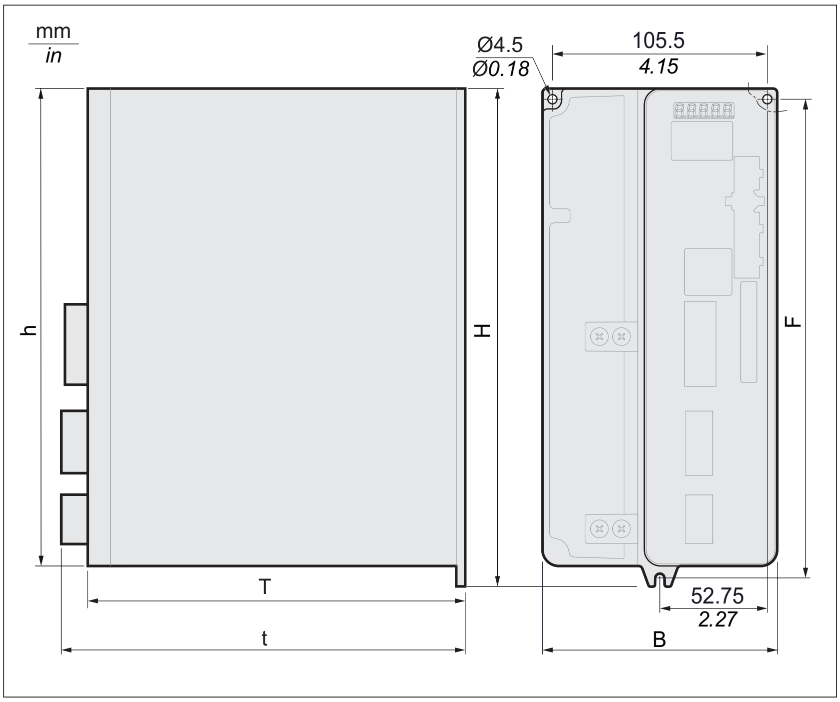

Figure 7: Dimensional drawing size 4

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LXM28•...		UA5, U01, U02, U04, U07	U10, U15	U20	U30, U45
Size		1	2	3	4
B	mm (in)	55 (2.17)	55 (2.17)	62 (2.44)	116 (4.57)
H	mm (in)	173.2 (6.82)	173.5 (6.83)	194.5 (7.66)	245 (9.65)
h	mm (in)	150 (5.91)	150 (5.91)	170 (6.69)	234 (9.21)
F	mm (in)	164 (6.46)	164 (6.46)	185 (7.28)	235 (9.25)
T	mm (in)	146 (5.75)	170 (6.69)	184 (7.24)	186 (7.32)
d	mm (in)	152.7 (6.01)	176.3 (6.94)	197 7.76	199 (7.83)

2.2.2 Dimensions motor

Dimensions BCH2•B

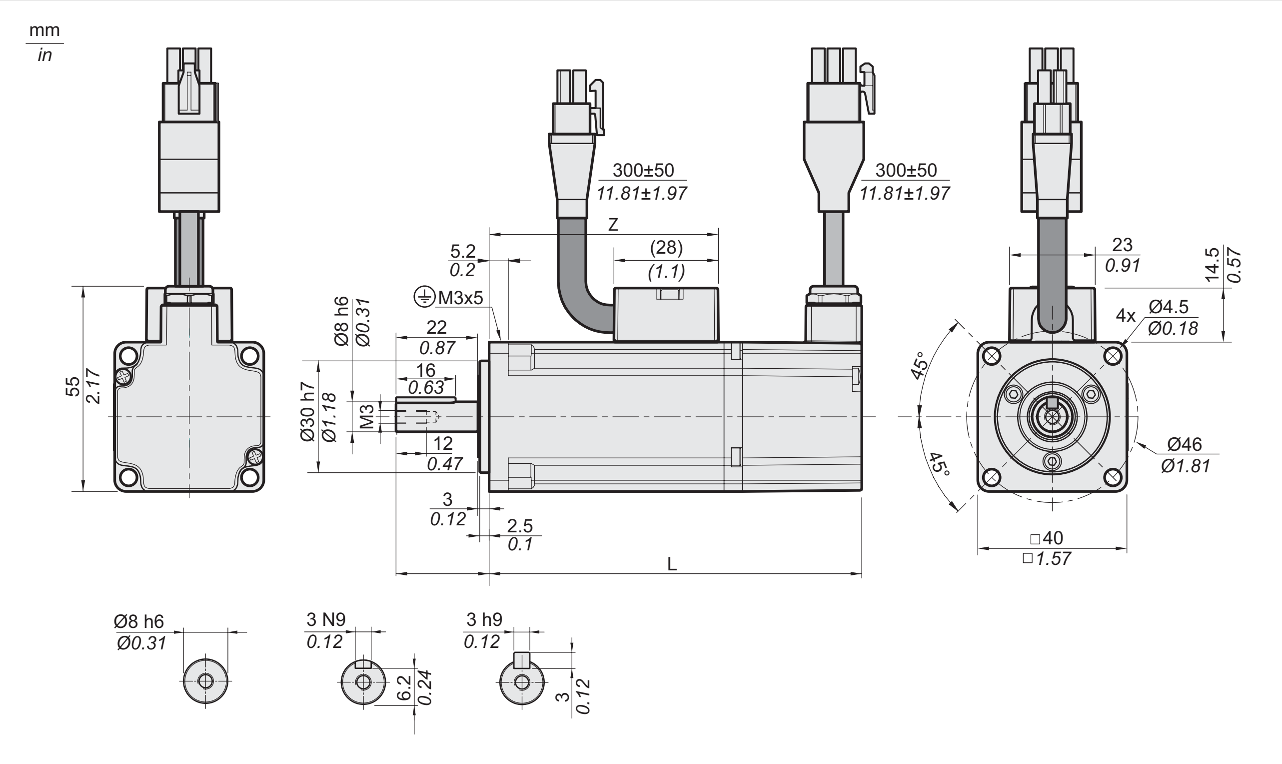

Figure 8: Dimensions BCH2•B

BCH2•B...		A5	01
L (without holding brake)	mm (in)	82 (3.23)	100 (3.94)
L (with holding brake)	mm (in)	112 (4.41)	130 (5.12)
Z	mm (in)	43.5 (1.71)	61.5 (2.42)

Dimensions BCH2•D

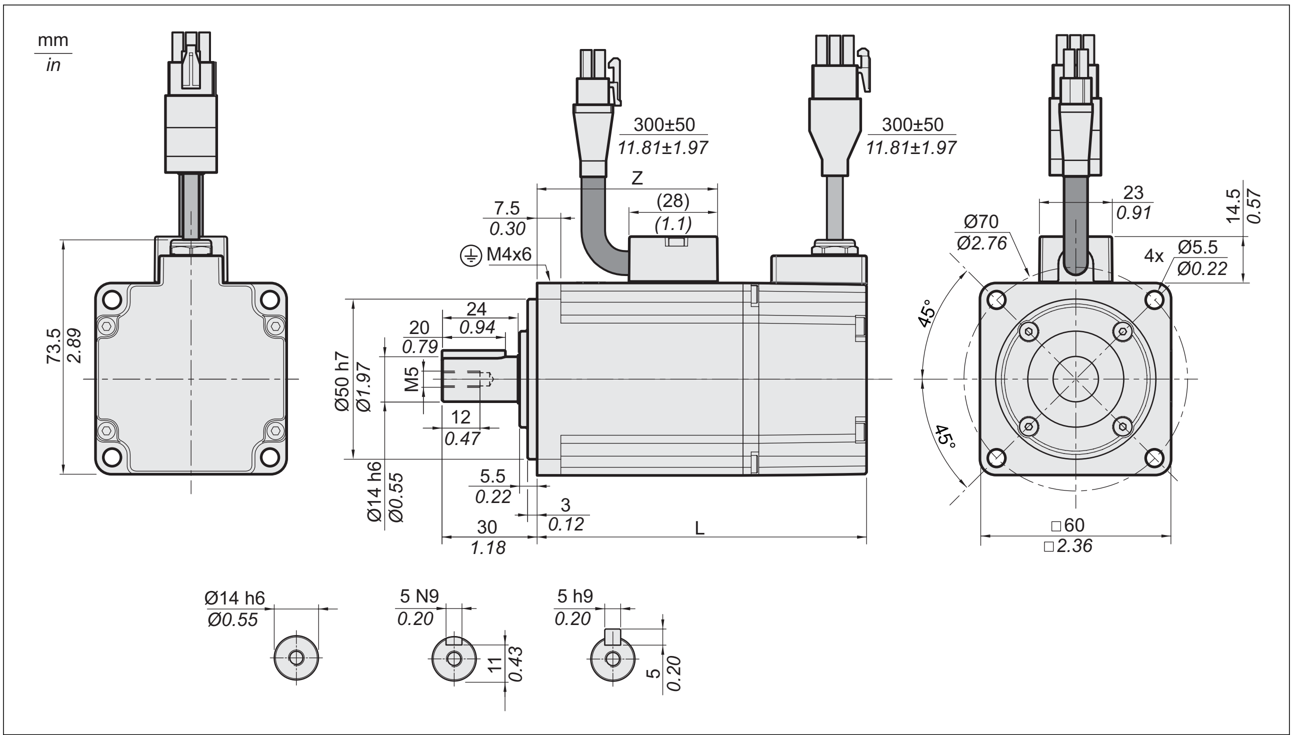

Figure 9: Dimensions BCH2•D

BCH2•D...		**02**	**04**
L (without holding brake)	mm (in)	104 (4.09)	129 (5.08)
L (with holding brake)	mm (in)	140 (5.51)	165 (6.5)
Z	mm (in)	57 (2.24)	82 (3.23)

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Dimensions BCH2•F

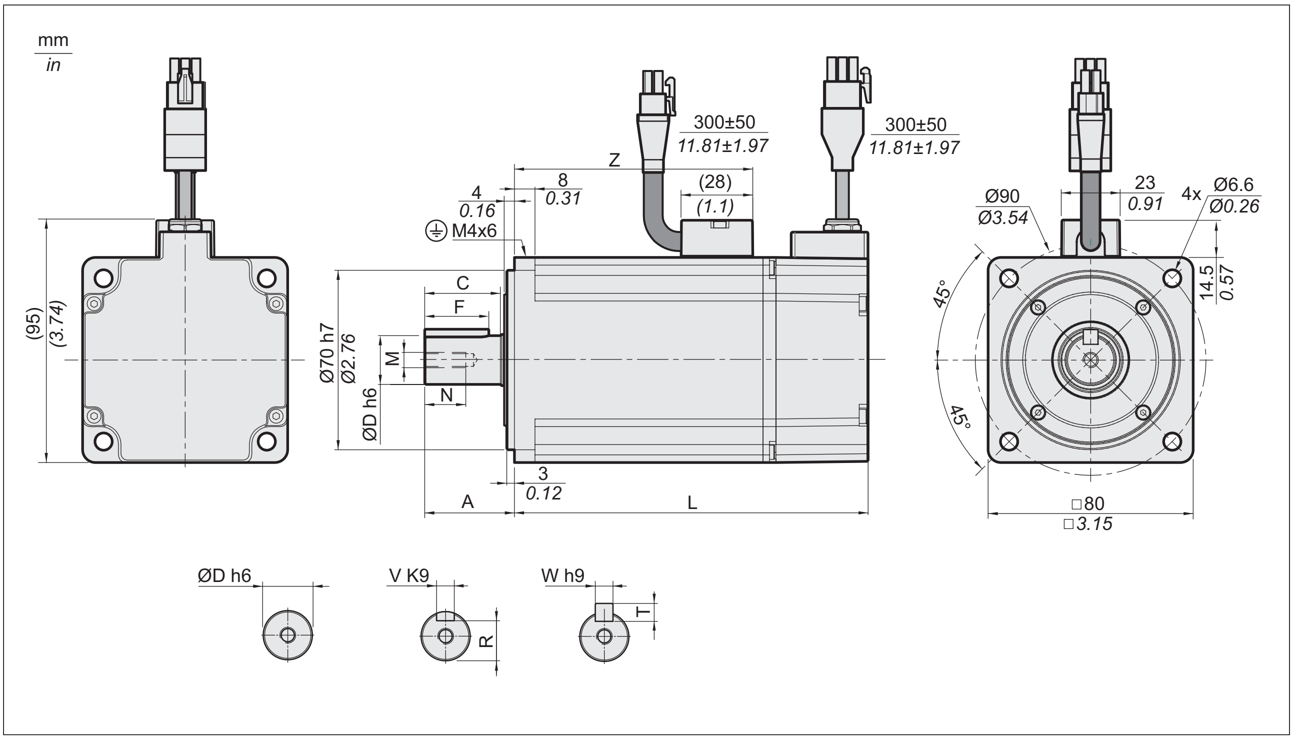

Figure 10: Dimensions BCH2•F

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

Dimensions BCH2•H

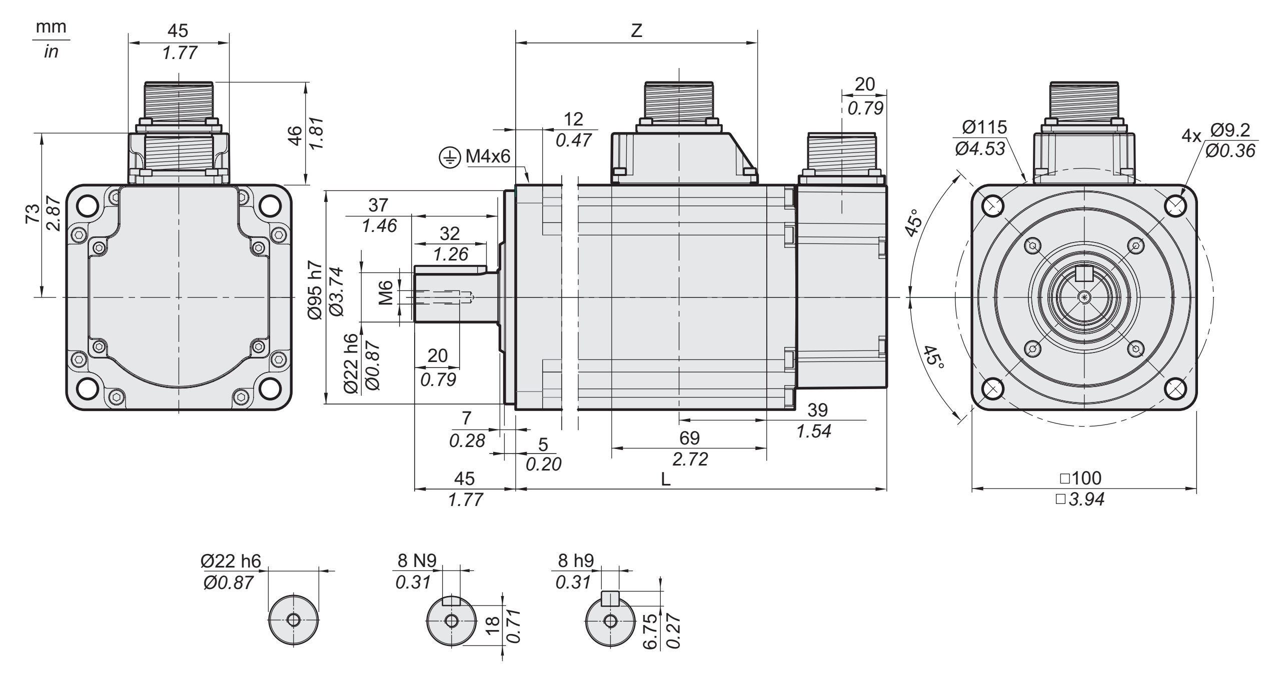

Figure 11: Dimensions BCH2•H

BCH2•H...		**10**	**20**
L (without holding brake)	mm (in)	153.5 (6.04)	198.5 (7.81)
L (with holding brake)	mm (in)	180.5 (7.11)	225.5 (8.88)
Z	mm (in)	96 (3.78)	141 (5.55)

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Dimensions BCH2•M

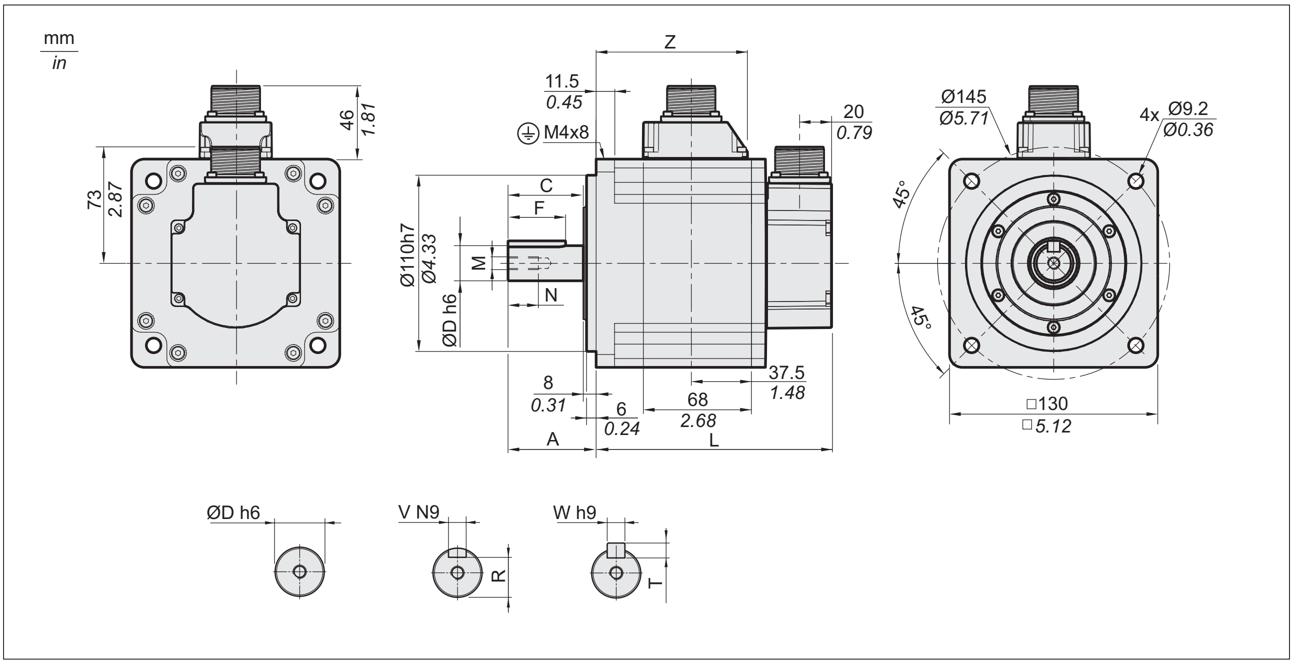

Figure 12: Dimensions BCH2•M

BCH2•M...		08	03, 05, 06, 10	09, 15	20
L (without holding brake)	mm (in)	187 (7.36)	147 (5.79)	163 (6.42)	187 (7.36)
L (with holding brake)	mm (in)	216 (8.5)	183 (7.2)	198 (7.8)	216 (8.5)
A	mm (in)	48 (1.89)	55 (2.17)	55 (2.17)	55 (2.17)
C	mm (in)	40 (1.57)	47 (1.85)	47 (1.85)	47 (1.85)
D	mm (in)	19 (0.75)	22 (0.87)	22 (0.87)	22 (0.87)
F	mm (in)	25 (0.98)	36 (1.42)	36 (1.42)	36 (1.42)
M	-	M6	M8	M8	M8
N	mm (in)	16 (0.63)	19 (0.75)	19 (0.75)	19 (0.75)
R	mm (in)	15.5 (0.61)	18 (0.71)	18 (0.71)	18 (0.71)
T	mm (in)	6 (0.24)	7 (0.28)	7 (0.28)	7 (0.28)
V	mm (in)	6 (0.24)	8 (0.31)	8 (0.31)	8 (0.31)
W	mm (in)	6 (0.24)	8 (0.31)	8 (0.31)	8 (0.31)
Z	mm (in)	134.5 (5.30)	94.5 (3.72)	110.5 (4.35)	134.5 (5.30)

Dimensions BCH2•R

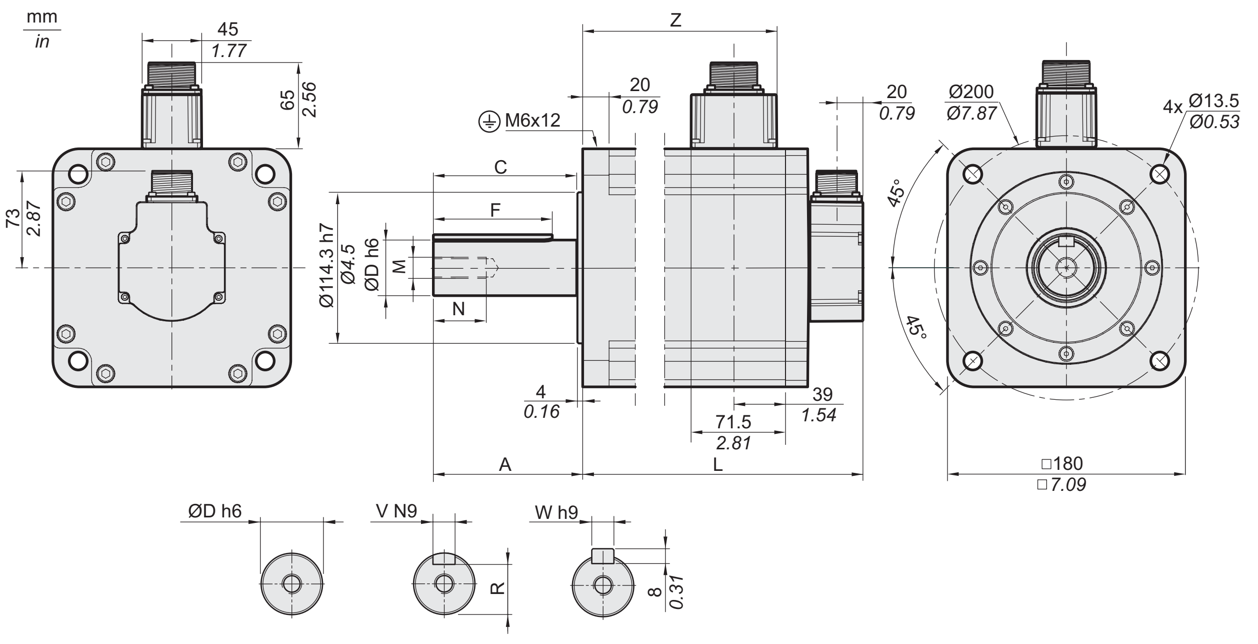

Figure 13: Dimensions BCH2•R

BCH2•R...		**20**	**30**	**35**	**45**
L (without holding brake)	mm (in)	169 (6.65)	202 (7.95)	202 (7.95)	235 (9.25)
L (with holding brake)	mm (in)	203 (7.99)	235 (9.25)	235 (9.25)	279 (10.98)
A	mm (in)	79 (3.11)	79 (3.11)	79 (3.11)	79 (3.11)
C	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)
D	mm (in)	35 (1.38)	35 (1.38)	35 (1.38)	35 (1.38)
F	mm (in)	63 (2.48)	63 (2.48)	63 (2.48)	63 (2.48)
M	-	M12	M12	M12	M12
N	mm (in)	28 (1.10)	28 (1.10)	28 (1.10)	28 (1.10)
R	mm (in)	30 (1.18)	30 (1.18)	30 (1.18)	30 (1.18)
V	mm (in)	10 (0.39)	10 (0.39)	10 (0.39)	10 (0.39)
W	mm (in)	10 (0.39)	10 (0.39)	10 (0.39)	10 (0.39)
Z	mm (in)	103 (4.06)	136 (5.35)	136 (5.35)	169 (6.65)

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2.2.3 Tightening torque and property class of screws

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

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2.3 Electrical Data

2.3.1 Electrical data drive

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

Mains voltage: range and tolerance

220 Vac single-phase/three-phase	Vac	200 -15 % ... 230 +10 %
Frequency	Hz	50 -5 % ... 60 +5 %

Transient overvoltages		Overvoltage category III [1]
Rated voltage to ground	Vac	230

1) Depends on installation altitude, see chapter *"2.1 Ambient conditions"*

Type of grounding

TT system, TN system	Approved
IT system	Not approved
Mains with grounded line conductor	Not approved

Leakage current

Leakage current (as per IEC 60990, figure 3)	mA	<30 [1]

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

Monitoring of the continuous output power

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

PWM frequency power stage

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

LXM28•...		UA5, U01, U02, U04, U07, U10, U15	U20, U30, U45
PWM frequency power stage	kHz	16	8

Permissible product combinations

The following motors can be connected to this device family: BCH2. See chapter *"1.5 Permissible product combinations"* for a list of permissible product combinations.

Inquire for other motors.

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2.3.1.1 Data for devices connected via a single phase

LXM28•...		UA5	U01	U02	U04
Nominal voltage	V	230 (1 ~)	230 (1 ~)	230 (1 ~)	230 (1 ~)
Inrush current limitation	A	8	8	8	8
Maximum fuse to be connected upstream 1)	A	25	25	25	25
Short-circuit current rating (SCCR)	kA	5	5	5	5
Continuous output current	A_{rms}	0.64	0.9	1.5	2.6
Peak output current	A_{rms}	2	2.7	4.5	7.8
Nominal power 2)	W	50	100	200	400
Input current 2) 3)	A_{rms}	0.8	1.2	2.4	3.8
THD (total harmonic distortion) 2) 4)	%	262.8	239.2	226.8	211.6
Power dissipation 5)	W	8	10	14	22
Maximum inrush current 6)	A	175	175	175	175
Time for maximum inrush current	ms	0.5	0.5	0.5	0.5

1) As per IEC 60269; Circuit breakers with C characteristic; See *"2.6 Conditions for UL 508C"* for UL and CSA; Lower ratings are permissible; The fuse must be rated in such a way that the fuse does not trip at the specified input current.
2) At a mains impedance corresponding to the short-circuit current rating (SCCR).
3) At nominal power and nominal voltage
4) with reference to the input current
5) Condition: internal braking resistor not active; value at nominal current, nominal voltage and nominal power; value approximately proportional with output current
6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

LXM28•...		U07	U10	U15
Nominal voltage	V	230 (1 ~)	230 (1 ~)	230 (1 ~)
Inrush current limitation	A	8	8	8
Maximum fuse to be connected upstream 1)	A	25	25	25
Short-circuit current rating (SCCR)	kA	5	5	5
Continuous output current	A_{rms}	4.5	7	7
Peak output current	A_{rms}	13.5	21	21
Nominal power 2)	W	750	1000	1500
Input current 2) 3)	A_{rms}	6	8.5	10
THD (total harmonic distortion) 2) 4)	%	181.8	176.3	166.6
Power dissipation 5)	W	38	36	41
Maximum inrush current 6)	A	175	235	235
Time for maximum inrush current	ms	0.5	0.6	0.6

1) As per IEC 60269; Circuit breakers with C characteristic; See *"2.6 Conditions for UL 508C"* for UL and CSA; Lower ratings are permissible; The fuse must be rated in such a way that the fuse does not trip at the specified input current.
2) At a mains impedance corresponding to a short-circuit current of the supply mains of 1 kA
3) At nominal power and nominal voltage
4) with reference to the input current
5) Condition: internal braking resistor not active; value at nominal current, nominal voltage and nominal power; value approximately proportional with output current
6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

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2.3.1.2 Data for devices connected via three phases

LXM28•...		UA5	U01	U02	U04	U07
Nominal voltage	V	230 (3 ~)	230 (3 ~)	230 (3 ~)	230 (3 ~)	230 (3 ~)
Inrush current limitation	A	8	8	8	8	8
Maximum fuse to be connected upstream [1]	A	25	25	25	25	25
Short-circuit current rating (SCCR)	kA	5	5	5	5	5
Continuous output current	A_{rms}	0.64	0.9	1.5	2.6	4.5
Peak output current	A_{rms}	2	2.7	4.5	7.8	13.5
Nominal power [2]	W	50	100	200	400	750
Input current [2] [3]	A_{rms}	0.42	0.74	1.25	2.2	3.9
THD (total harmonic distortion) [2] [4]	%	227	212.7	200.7	183.7	160.8
Power dissipation [5]	W	8	10	14	22	38
Maximum inrush current [6]	A	175	175	175	175	175
Time for maximum inrush current	ms	0.5	0.5	0.5	0.5	0.5

1) As per IEC 60269; Circuit breakers with C characteristic; See *"2.6 Conditions for UL 508C"* for UL and CSA; Lower ratings are permissible; The fuse must be rated in such a way that the fuse does not trip at the specified input current.
2) At a mains impedance corresponding to a short-circuit current of the supply mains of 1 kA
3) At nominal power and nominal voltage
4) with reference to the input current
5) Condition: internal braking resistor not active; value at nominal current, nominal voltage and nominal power; value approximately proportional with output current
6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

LXM28•...		U10	U15	U20	U30	U45
Nominal voltage	V	230 (3 ~)	230 (3 ~)	230 (3 ~)	230 (3 ~)	230 (3 ~)
Inrush current limitation	A	8	8	19.2	17	17
Maximum fuse to be connected upstream [1]	A	25	25	32	32	32
Short-circuit current rating (SCCR)	kA	5	5	5	22	22
Continuous output current	A_{rms}	7	7	12	19.8	22.87
Peak output current	A_{rms}	21	21	36	60	61
Nominal power [2]	W	1000	1500	2000	3000	4500
Input current [2] [3]	A_{rms}	5	5.9	8.7	12.9	18
THD (total harmonic distortion) [2] [4]	%	155.5	144.8	137.1	155.8	147.1
Power dissipation [5]	W	36	41	41	97	97
Maximum inrush current [6]	A	235	235	295	300	300
Time for maximum inrush current	ms	0.6	0.6	1.0	1.0	1.0

1) As per IEC 60269; Circuit breakers with C characteristic; See *"2.6 Conditions for UL 508C"* for UL and CSA; Lower ratings are permissible; The fuse must be rated in such a way that the fuse does not trip at the specified input current.
2) At a mains impedance corresponding to a short-circuit current of the supply mains of 1 kA
3) At nominal power and nominal voltage
4) with reference to the input current
5) Condition: internal braking resistor not active; value at nominal current, nominal voltage and nominal power; value approximately proportional with output current
6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

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2.3.1.3 DC bus data for drives connected via a single phase

LXM28•...		UA5	U01	U02	U04	U07	U10	U15
Nominal voltage (single-phase)	Vac	230	230	230	230	230	230	230
Nominal voltage DC bus	Vdc	322	322	322	322	322	322	322
Undervoltage limit	Vdc	160	160	160	160	160	160	160
Overvoltage limit	Vdc	420	420	420	420	420	420	420
Maximum continuous power via DC bus	W	50	100	200	400	750	1000	1500
Maximum continuous current via DC bus	A	0.2	0.3	0.6	1.2	2.3	3.1	4.6

2.3.1.4 DC bus data for drives connected via three phases

LXM28•...		UA5	U01	U02	U04	U07
Nominal voltage (three-phase)	Vac	230	230	230	230	230
Nominal voltage DC bus	Vdc	322	322	322	322	322
Undervoltage limit	Vdc	160	160	160	160	160
Overvoltage limit	Vdc	420	420	420	420	420
Maximum continuous power via DC bus	W	50	100	200	400	750
Maximum continuous current via DC bus	A	0.2	0.3	0.6	1.2	2.3

LXM28•...		U10	U15	U20	U30	U45
Nominal voltage (three-phase)	Vac	230	230	230	230	230
Nominal voltage DC bus	Vdc	322	322	322	322	322
Undervoltage limit	Vdc	160	160	160	160	160
Overvoltage limit	Vdc	420	420	420	420	420
Maximum continuous power via DC bus	W	1000	1500	2000	3000	4500
Maximum continuous current via DC bus	A	3.1	4.6	6.2	9.2	13.8

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2.3.1.5 Signals

The outputs are short-circuit protected. The inputs and outputs are galvanically isolated.

The digital inputs and outputs of this product can be wired for logic type 1 or logic type 2.

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

Analog output signals

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

Digital input signals 24 V

When wired as logic type 1, the levels of the opto-isolated inputs `DI1` ... `DI5` and `DI8` comply with IEC 61131-2, type 1.

Level 0 with logic type 1 (U_{low})	Vdc	≤5
Level 1 with logic type 1 (U_{high})	Vdc	≥11
Input current (typical)	mA	6
Debounce time 1)	ms	0 ... 20

1) Adjustable via parameter `P2-09` in increments of 1 ms.

Touch probe input signals 24 V

When wired as "logic type 1", the levels of the opto-isolated inputs `DI6` and `DI7` comply with IEC 61131-2, type 1.

Level 0 with logic type 1 (U_{low})	Vdc	≤5
Level 1 with logic type 1 (U_{high})	Vdc	≥11
Input current (typical)	mA	7
Debounce time 1)	µs	0 ... 100
Jitter Capture	µs	1

1) Adjustable via parameter `P2-24` in increments of 1 µs.

Safety function STO

The signal inputs $\overline{\texttt{STO\_0V}}$ and $\overline{\texttt{STO\_24V}}$ (CN9) are protected against reverse polarity.

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Nominal voltage	Vdc	24
PELV power supply unit		Required
Level 0 with logic type 1 (U_{low}) [1]	Vdc	< 5
Level 1 with logic type 1 (U_{high}) [1]	Vdc	15 ... 30
Input current (typical) LXM28•UA5, U01, U02, U04, U07 LXM28•U10, U15 LXM28•U20 LXM28•U30, U45	mA	 110 120 130 160
Maximum frequency for OSSD (Output Signal Switching Device) test pulses	Hz	475
Debounce time	ms	< 1
Response time of safety function STO	ms	< 40

1) voltage level according to IEC 61131-2 type 2 with the exception of the operation with 15 Vdc instead of 11 Vdc. The condition between 5 Vdc and 15 Vdc is undefined and not permissible.

The 24 V supply `24V_OUT` and `0V_OUT` (CN9) for deactivating the safety function STO are short-circuit protected.

Digital output signals 24 V

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

Switching voltage	Vdc	24
Maximum switching current	mA	100
Voltage drop at 100 mA load	Vdc	< 3

24 Vdc power supply (pin 17)

Output voltage	Vdc	24
Maximum output current	mA	200

CAN bus signals

The CAN bus signals comply with the CAN standard and are short-circuit protected.

ESIM output signals

The ESIM output signals comply with the RS422 interface specification.

Logic level		As per RS422 [1]
Output frequency per signal	kHz	800
Maximum output frequency (quadruple evaluation)	kHz	3200

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

Function A/B signals

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

Signal	Function
Signal `SIGN` before signal `PULSE`	Movement in positive direction
Signal `PULSE` before signal `SIGN`	Movement in negative direction

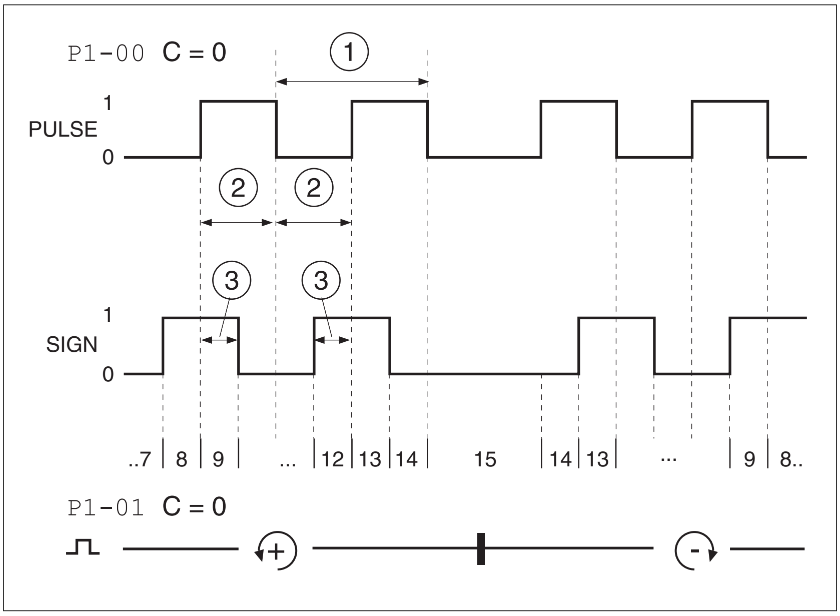

Figure 14: Time chart with A/B signal, counting forwards and backwards

The signal shape shown relates to the factory setting (`P1-00` C=0).

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

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

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Function CW/CCW

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

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

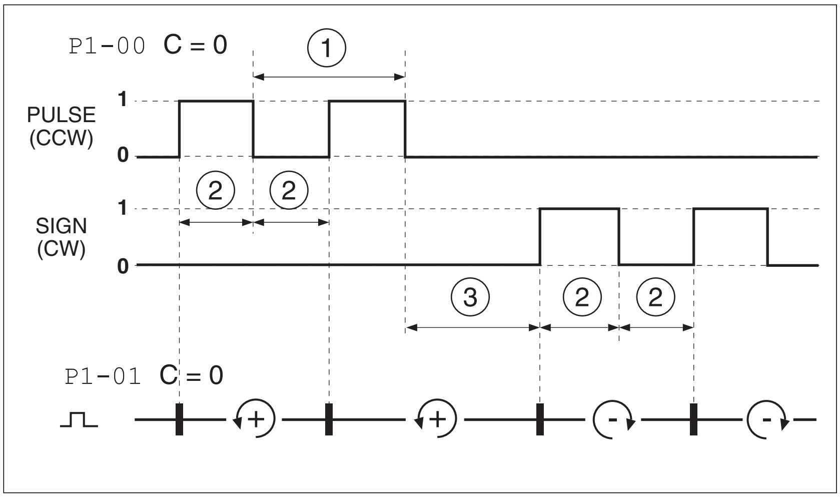

Figure 15: Time chart with "CW/CCW"

The signal shape shown relates to the factory setting (`P1-00` C=0).

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

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

Function P/D

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

Signal	Function
PULSE	Motor movement
SIGN	Direction of movement

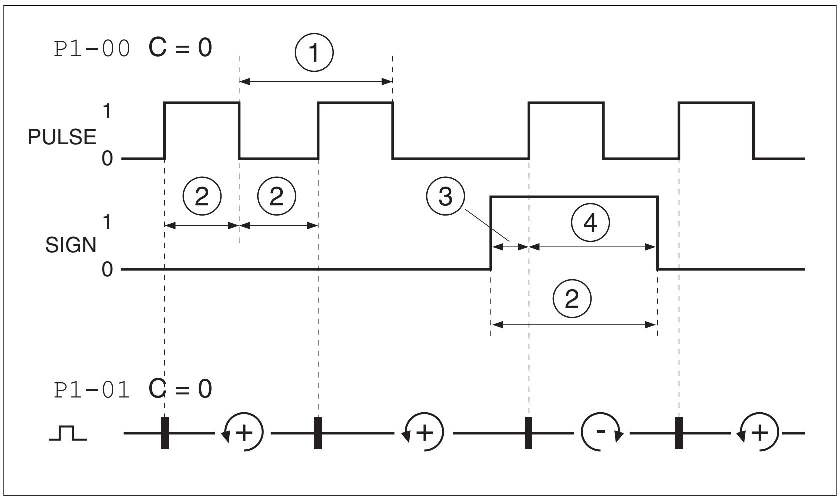

Figure 16: Time chart with pulse/direction signal

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

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

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

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2.3.1.6 Functional safety

Data for maintenance plan and the calculations for the safety function

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

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

Lifetime of the safety function STO (IEC 61508) [1]	Years	20
SFF (IEC 61508) Safe Failure Fraction	%	98.9
Safety integrity level IEC 61508 IEC 62061 IEC 61800-5-2		SIL CL 2
PFH (IEC 61508) Probability of Dangerous Hardware Failure per Hour	1/h	STO_A [2]: $1.7*10^{-9}$ STO_B [3]: $1.5*10^{-9}$
PFD_{avg} (IEC 61508) Probability of Failure on Demand, calculated as one demand per year		STO_A [2]: $1.5*10^{-4}$ STO_B [3]: $1.3*10^{-4}$
PL (ISO 13849-1) Performance Level		d (category 3)
$MTTF_d$ (ISO 13849-1) Mean Time to Dangerous Failure	Years	STO_A [2]: 66757 STO_B [3]: 78457
DC_{avg} (ISO 13849-1) Diagnostic Coverage	%	≥90

1) See chapter *"13.2.1.1 Lifetime safety function STO"*.
2) STO_A: LXM28AUA5, LXM28AU01, LXM28AU02, LXM28AU04, LXM28AU07, LXM28AU10, LXM28AU15, LXM28AU20
3) STO_B: LXM28AU30, LXM28AU45

If two non-adjacent IGBTs have a short circuit, a movement of a maximum of 120 degrees (electrical) can occur even if the safety function STO is active. Include in your risk analysis the probability of IGBT short circuits, and make a determination whether it is acceptable as it relates to your application.

⚠ WARNING

UNINTENTIONAL MOVEMENT DURING STO FUNCTION

Use appropriate safety interlocks (such as a service brake) where personnel and/or equipment hazards exist.

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

The probability of such a condition is $1.5 * 10^{-15}$ per hour (without common cause failure). Include this in your calculations for the safety function.

Contact your local sales office for additional data, if required.

2.3.1.7 Braking resistor

The device has an internal braking resistor. If the internal braking resistor is insufficient for the dynamics of the application, one or more external braking resistors must be used.

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

LXM28•...		**UA5**	**U01**	**U02**	**U04**	**U07**
Resistance value of internal braking resistor	Ω	100	100	100	100	40
Continuous power internal braking resistor P_{PR}	W	60	60	60	60	60
Peak energy E_{CR} 1)	Ws	152	152	152	152	380
External braking resistor minimum	Ω	25	25	25	25	25
External braking resistor maximum 2)	Ω	50	50	50	50	50
Maximum continuous power external braking resistor	W	640	640	640	640	640
Switch-on voltage braking resistor	V	390	390	390	390	390
Capacitance of the internal capacitors	µF	820	820	820	820	820
Energy absorption of internal capacitors E_{var} at nominal voltage 230 V +10%	Ws	8.87	8.87	8.87	8.87	8.87

1) Parameter P1-71 is set to 100 ms.
2) The maximum specified braking resistor can derate the peak power of the device. Depending on the application, it is possible to use a higher ohm resistor.

LXM28•...		**U10**	**U15**	**U20**	**U30**	**U45**
Resistance value of internal braking resistor	Ω	40	40	40	22	22
Continuous power internal braking resistor P_{PR}	W	60	60	60	100	100
Peak energy E_{CR} 1)	Ws	380	380	380	691	691
External braking resistor minimum	Ω	15	15	8	8	8
External braking resistor maximum 2)	Ω	50	50	25	25	25
Maximum continuous power external braking resistor	W	1000	1000	1500	2500	2500
Switch-on voltage braking resistor	V	390	390	390	390	390
Capacitance of the internal capacitors	µF	1640	1640	2110	3280	3280
Energy absorption of internal capacitors E_{var} at nominal voltage 230 V +10%	Ws	17.76	17.76	22.82	35.51	35.51

1) Parameter P1-71 is set to 100 ms.
2) The maximum specified braking resistor can derate the peak power of the device. Depending on the application, it is possible to use a higher ohm resistor.

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2.3.2 Electrical data motor

2.3.2.1 BCH2•B

BCH2... [1]			**MBA53**	**MB013**
Technical data - general				
Continuous stall torque [2]	M_0	Nm	0.16	0.32
Peak torque	M_{max}	Nm	0.32	0.96
With supply voltage U_n = 230 Vac)				
Nominal speed of rotation	n_N	rpm	3000	3000
Nominal torque	M_N	Nm	0.16	0.32
Nominal Current	I_N	A_{rms}	0.59	0.89
Nominal power	P_N	kW	0.05	0.10
Technical data - electrical				
Maximum winding voltage	U_{max}	Vac	255	255
Maximum winding voltage	U_{max}	Vdc	360	360
Maximum voltage to ground		Vac	255	255
Maximum Current	I_{max}	A_{rms}	1.8	2.7
Continuous stall current	I_0	A_{rms}	0.54	0.81
Voltage constant [3]	k_Eu-v	V_{rms}	18	24
Torque constant [4]	k_t	Nm/A	0.30	0.40
Winding resistance	R_{20}u-v	Ω	31.0	23.4
Winding inductance	L_qu-v	mH	26.4	21.5
Winding inductance	L_du-v	mH	24.7	20.6
Technical data - mechanical				
Maximum permissible speed of rotation	n_{max}	rpm	5000	5000
Rotor inertia without brake	J_M	$kgcm^2$	0.054	0.075
Rotor inertia with brake	J_M	$kgcm^2$	0.055	0.076
Mass without brake	m	kg	0.40	0.56
Mass with brake	m	kg	0.60	0.77
Technical data - holding brake				
Holding torque		Nm	0.32	0.32
Nominal voltage		Vdc	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)		W	4.4	4.4

1) Limit values with flanged motor, see table on page *28*.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 rpm the continuous stall torque is reduced to 87%
3) RMS value at 1000 rpm and 20°C (68°F)
4) At n = 20 rpm and 20°C (68°F)

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2.3.2.2 BCH2•D

BCH2... [1]			**LD023**	**LD043**
Technical data - general				
Continuous stall torque [2]	M_0	Nm	0.64	1.27
Peak torque	M_{max}	Nm	1.92	3.81
With supply voltage U_n = 230 Vac				
Nominal speed of rotation	n_N	rpm	3000	3000
Nominal torque	M_N	Nm	0.64	1.27
Nominal Current	I_N	A_{rms}	1.30	2.50
Nominal power	P_N	kW	0.20	0.40
Technical data - electrical				
Maximum winding voltage	U_{max}	Vac	255	255
Maximum winding voltage	U_{max}	Vdc	360	360
Maximum voltage to ground		Vac	255	255
Maximum Current	I_{max}	A_{rms}	4.5	7.8
Continuous stall current	I_0	A_{rms}	1.11	2.19
Voltage constant [3]	k_Eu-v	V_{rms}	35	35
Torque constant [4]	k_t	Nm/A	0.58	0.58
Winding resistance	R_{20}u-v	Ω	12.2	5.2
Winding inductance	L_qu-v	mH	24.8	12.5
Winding inductance	L_du-v	mH	22.7	12.0
Technical data - mechanical				
Maximum permissible speed of rotation	n_{max}	rpm	5000	5000
Rotor inertia without brake	J_M	$kgcm^2$	0.16	0.27
Rotor inertia with brake	J_M	$kgcm^2$	0.17	0.28
Mass without brake	m	kg	1.02	1.45
Mass with brake	m	kg	1.50	2.00
Technical data - holding brake				
Holding torque		Nm	1.3	1.3
Nominal voltage		Vdc	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)		W	11.2	11.2

1) Limit values with flanged motor, see table on page *28*.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 rpm the continuous stall torque is reduced to 87%
3) RMS value at 1000 rpm and 20°C (68°F)
4) At n = 20 rpm and 20°C (68°F)

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2.3.2.3 BCH2•F

BCH2... 1)			LF043	HF073	LF073
Technical data - general					
Continuous stall torque 2)	M_0	Nm	1.27	2.39	2.39
Peak torque	M_{max}	Nm	3.81	7.16	7.16
With supply voltage U_n = 230 Vac					
Nominal speed of rotation	n_N	rpm	3000	3000	3000
Nominal torque	M_N	Nm	1.27	2.39	2.39
Nominal Current	I_N	A_{rms}	2.52	4.29	4.29
Nominal power	P_N	kW	0.40	0.75	0.75
Technical data - electrical					
Maximum winding voltage	U_{max}	Vac	255	255	255
Maximum winding voltage	U_{max}	Vdc	360	360	360
Maximum voltage to ground		Vac	255	255	255
Maximum Current	I_{max}	A_{rms}	7.8	13.5	13.5
Continuous stall current	I_0	A_{rms}	2.29	4.01	4.01
Voltage constant 3)	k_Eu-v	V_{rms}	33.5	36	36
Torque constant 4)	k_t	Nm/A	0.55	0.60	0.60
Winding resistance	R_{20}u-v	Ω	3.20	1.50	1.50
Winding inductance	L_qu-v	mH	12.0	6.6	6.6
Winding inductance	L_du-v	mH	11.3	6.1	6.1
Technical data - mechanical					
Maximum permissible speed of rotation	n_{max}	rpm	5000	5000	5000
Rotor inertia without brake	J_M	$kgcm^2$	0.67	1.54	1.19
Rotor inertia with brake	J_M	$kgcm^2$	0.72	1.59	1.24
Mass without brake	m	kg	2.00	2.90	2.80
Mass with brake	m	kg	2.80	3.70	3.60
Technical data - holding brake					
Holding torque		Nm	2.5	2.5	2.5
Nominal voltage		Vdc	24 +/-10%	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)		W	10.2	10.2	10.2

1) Limit values with flanged motor, see table on page *28*.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 rpm the continuous stall torque is reduced to 87%
3) RMS value at 1000 rpm and 20°C (68°F)
4) At n = 20 rpm and 20°C (68°F)

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2.3.2.4 BCH2•H

BCH2... [1]			LH103	LH203
Technical data - general				
Continuous stall torque [2]	M_0	Nm	3.18	6.37
Peak torque	M_{max}	Nm	9.54	19.11
With supply voltage U_n = 230 Vac				
Nominal speed of rotation	n_N	rpm	3000	3000
Nominal torque	M_N	Nm	3.18	6.37
Nominal Current	I_N	A_{rms}	6.64	10.27
Nominal power	P_N	kW	1.00	2.00
Technical data - electrical				
Maximum winding voltage	U_{max}	Vac	255	255
Maximum winding voltage	U_{max}	Vdc	360	360
Maximum voltage to ground		Vac	255	255
Maximum Current	I_{max}	A_{rms}	20.0	35.0
Continuous stall current	I_0	A_{rms}	5.83	9.87
Voltage constant [3]	$k_Eu\text{-}v$	V_{rms}	33	39
Torque constant [4]	k_t	Nm/A	0.55	0.65
Winding resistance	$R_{20}u\text{-}v$	Ω	0.67	0.36
Winding inductance	$L_qu\text{-}v$	mH	4.3	2.6
Winding inductance	$L_du\text{-}v$	mH	4.20	2.59
Technical data - mechanical				
Maximum permissible speed of rotation	n_{max}	rpm	5000	5000
Rotor inertia without brake	J_M	$kgcm^2$	2.40	4.28
Rotor inertia with brake	J_M	$kgcm^2$	2.45	4.35
Mass without brake	m	kg	4.60	6.70
Mass with brake	m	kg	5.10	7.20
Technical data - holding brake				
Holding torque		Nm	6.5	6.5
Nominal voltage		Vdc	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)		W	10.4	10.4

1) Limit values with flanged motor, see table on page *28*.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 rpm the continuous stall torque is reduced to 87%
3) RMS value at 1000 rpm and 20°C (68°F)
4) At n = 20 rpm and 20°C (68°F)

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2.3.2.5 BCH2•M

BCH2... [1]			MM052	MM031	MM102	HM102	MM081
Technical data - general							
Continuous stall torque [2]	M_0	Nm	2.39	2.86	4.77	4.77	5.39
Peak torque	M_{max}	Nm	7.16	8.59	14.30	14.30	13.80
With supply voltage U_n = 230 Vac							
Nominal speed of rotation	n_N	rpm	2000	1000	2000	2000	1500
Nominal torque	M_N	Nm	2.39	2.86	4.77	4.77	5.39
Nominal Current	I_N	A_{rms}	3.24	2.09	6.29	6.29	6.29
Nominal power	P_N	kW	0.50	0.30	1.00	1.00	0.85
Technical data - electrical							
Maximum winding voltage	U_{max}	Vac	255	255	255	255	255
Maximum winding voltage	U_{max}	Vdc	360	360	360	360	360
Maximum voltage to ground		Vac	255	255	255	255	255
Maximum Current	I_{max}	A_{rms}	9.5	6.0	20.0	20.0	15.0
Continuous stall current	I_0	A_{rms}	2.89	1.88	5.77	5.77	5.62
Voltage constant [3]	k_Eu-v	V_{rms}	50	92	50	50	58
Torque constant [4]	k_t	Nm/A	0.83	1.52	0.83	0.83	0.96
Winding resistance	R_{20}u-v	Ω	0.74	2.08	0.74	0.74	0.42
Winding inductance	L_qu-v	mH	7.84	26.25	7.84	7.84	4.70
Winding inductance	L_du-v	mH	7.14	23.91	7.14	7.14	4.30
Technical data - mechanical							
Maximum permissible speed of rotation	n_{max}	rpm	3000	2000	3000	3000	3000
Rotor inertia without brake	J_M	$kgcm^2$	6.63	6.63	6.63	8.41	13.5
Rotor inertia with brake	J_M	$kgcm^2$	6.91	6.91	6.91	8.54	14.1
Mass without brake	m	kg	7.00	7.00	7.00	7.10	9.60
Mass with brake	m	kg	8.20	8.20	8.20	8.30	10.90
Technical data - holding brake							
Holding torque		Nm	9.6	9.6	9.6	9.6	9.6
Nominal voltage		Vdc	24 +/-10%	24 +/-10%	24 +/-10%	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)		W	19.7	19.7	19.7	19.7	19.7

1) Limit values with flanged motor, see table on page *28*.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 rpm the continuous stall torque is reduced to 87%
3) RMS value at 1000 rpm and 20°C (68°F)
4) At n = 20 rpm and 20°C (68°F)

BCH2... [1]			MM061	MM091	MM152	MM202
Technical data - general						
Continuous stall torque [2]	M_0	Nm	5.73	8.59	7.16	9.55
Peak torque	M_{max}	Nm	17.19	25.77	21.48	28.65
With supply voltage U_n = 230 Vac						
Nominal speed of rotation	n_N	rpm	1000	1000	2000	2000
Nominal torque	M_N	Nm	5.73	8.59	7.16	9.55
Nominal Current	I_N	A_{rms}	4.10	6.15	6.74	11.25
Nominal power	P_N	kW	0.60	0.90	1.50	2.00
Technical data - electrical						
Maximum winding voltage	U_{max}	Vac	255	255	255	255
Maximum winding voltage	U_{max}	Vdc	360	360	360	360
Maximum voltage to ground		Vac	255	255	255	255
Maximum Current	I_{max}	A_{rms}	13.5	20.0	21.0	33.0
Continuous stall current	I_0	A_{rms}	3.77	5.64	6.18	9.95
Voltage constant [3]	k_Eu-v	V_{rms}	92	92	70	58
Torque constant [4]	k_t	Nm/A	1.52	1.52	1.16	0.96
Winding resistance	R_{20}u-v	Ω	2.08	1.22	0.64	0.42
Winding inductance	L_qu-v	mH	26.25	16.40	7.20	4.70
Winding inductance	L_du-v	mH	23.91	14.90	6.40	4.30
Technical data - mechanical						
Maximum permissible speed of rotation	n_{max}	rpm	2000	2000	3000	3000
Rotor inertia without brake	J_M	$kgcm^2$	6.63	9.70	9.70	13.50
Rotor inertia with brake	J_M	$kgcm^2$	6.91	10.00	10.00	14.10
Mass without brake	m	kg	7.00	7.60	7.60	9.70
Mass with brake	m	kg	8.20	8.80	8.80	11.00
Technical data - holding brake						
Holding torque		Nm	9.6	9.6	9.6	9.6
Nominal voltage		Vdc	24 +/-10%	24 +/-10%	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)		W	19.7	19.7	19.7	19.7

1) Limit values with flanged motor, see table on page *28*.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 rpm the continuous stall torque is reduced to 87%
3) RMS value at 1000 rpm and 20°C (68°F)
4) At n = 20 rpm and 20°C (68°F)

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2.3.2.6 BCH2•R

BCH2... [1]			**MR202**	**HR202**	**MR302**	**MR301**	**MR352**	**MR451**
Technical data - general								
Continuous stall torque [2]	M_0	Nm	9.55	9.55	14.32	19.10	16.70	28.65
Peak torque	M_{max}	Nm	28.65	28.65	42.97	57.29	50.30	71.62
With supply voltage U_n = 230 Vac)								
Nominal speed of rotation	n_N	rpm	2000	2000	2000	1500	2000	1500
Nominal torque	M_N	Nm	9.55	9.55	14.32	19.10	16.70	28.65
Nominal Current	I_N	A_{rms}	9.6	9.6	18.8	18.8	19.3	22.8
Nominal power	P_N	kW	2.00	2.00	3.00	3.00	3.50	4.50
Technical data - electrical								
Maximum winding voltage	U_{max}	Vac	255	255	255	255	255	255
Maximum winding voltage	U_{max}	Vdc	360	360	360	360	360	360
Maximum voltage to ground		Vac	255	255	255	255	255	255
Maximum Current	I_{max}	A_{rms}	35.5	35.5	56.0	61.0	61.0	61.0
Continuous stall current	I_0	A_{rms}	8.75	8.75	16.33	16.49	16.83	19.68
Voltage constant [3]	k_Eu-v	V_{rms}	66	66	53	70	60	88
Torque constant [4]	k_t	Nm/A	1.09	1.09	0.88	1.16	0.99	1.46
Winding resistance	R_{20}u-v	Ω	0.572	0.572	0.168	0.234	0.168	0.199
Winding inductance	L_qu-v	mH	6.70	6.70	2.88	3.78	2.80	4.00
Winding inductance	L_du-v	mH	6.10	6.10	2.71	3.45	2.57	3.80
Technical data - mechanical								
Maximum permissible speed of rotation	n_{max}	rpm	3000	3000	3000	3000	3000	3000
Rotor inertia without brake	J_M	$kgcm^2$	26.50	34.68	53.56	53.56	53.56	73.32
Rotor inertia with brake	J_M	$kgcm^2$	27.0	35.13	54.1	54.1	54.1	73.0
Mass without brake	m	kg	13.00	14.30	18.50	18.50	18.50	23.64
Mass with brake	m	kg	18.00	19.30	23.00	23.00	23.00	28.00
Technical data - holding brake								
Holding torque		Nm	48	48	48	48	48	48
Nominal voltage		Vdc	24 +/-10%	24 +/-10%	24 +/-10%	24 +/-10%	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)		W	49.6	49.6	49.6	49.6	49.6	49.6

1) Limit values with flanged motor, see table on page *28*.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 rpm the continuous stall torque is reduced to 87%
3) RMS value at 1000 rpm and 20°C (68°F)
4) At n = 20 rpm and 20°C (68°F)

2.3.3 Electrical data (accessories)

2.3.3.1 External braking resistors

VW3A760...		1Rxx [1)]	2Rxx	3Rxx	4Rxx [1)]	5Rxx	6Rxx	7Rxx [1)]
Resistance	Ω	10	27	27	27	72	72	72
Continuous power	W	400	100	200	400	100	200	400
Maximum time in braking at 115 V / 230 V	s	0.72	0.552	1.08	2.64	1.44	3.72	9.6
Peak power at 115 V / 230 V	kW	18.5	6.8	6.8	6.8	2.6	2.6	2.6
Maximum peak energy at 115 V / 230 V	Ws	13300	3800	7400	18100	3700	9600	24700
Degree of protection		IP65	IP65	IP65	IP65	IP65	IP65	IP65
UL approval (file no.)		-	E233422	E233422	-	E233422	E233422	-

1) Resistors with a continuous power of 400 W are not UL/CSA-approved.

VW3A77...		04	05
Resistance	Ω	15	10
Continuous power	W	1000	1000
Maximum time in braking at 115 V / 230 V	s	3.5	1.98
Peak power at 115 V / 230 V	kW	12.3	18.5
Maximum peak energy at 115 V / 230 V	Ws	43100	36500
Degree of protection		IP20	IP20
UL approval (file no.)		E226619	E226619

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2.3.3.2 External mains filters

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

⚠ WARNING

SIGNAL AND EQUIPMENT INTERFERENCE

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

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

See chapter *"4.1 Electromagnetic compatibility (EMC)"* for additional information on electromagnetic compatibility.

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

LXM28A...	Mains filter for single-phase connection	Mains filter for three-phase connection
UA5 = 0.05 kW U01 = 0.1 kW U02 = 0.2 kW U04 = 0.4 kW U07 = 0.75 kW U10 = 1 kW	VW3A4420	VW3A4422
U15 = 1.5 kW	VW3A4421	VW3A4422
U20 = 2 kW	-	VW3A4423
U30 = 3 kW U45 = 4.5 kW	-	VW3A4424

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

Emission

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

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

LXM28A...	•••
Conducted interference	Category C3
Radiated emission	Category C3

Motor cables with a length exceeding 50 m (164 ft) are not permissible.

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Limit values

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

However, if your entire system composition (products involved, mains filter, additional accessories and measures) does not meet the requirements of category C1, the following information applies as it appears in IEC 61800-3:

⚠ WARNING

RADIO INTERFERENCE

In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.

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

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

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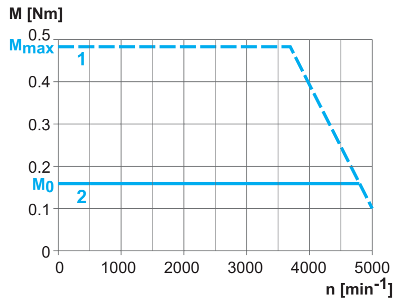
2.4 Characteristic curves

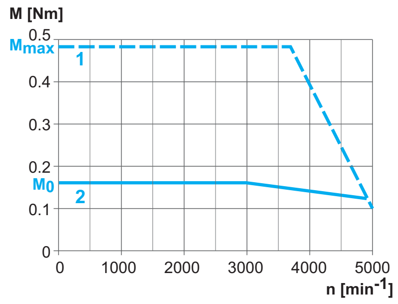
2.4.1 BCH2MB

BCH2MBA53 + LXM28•UA5

Without shaft sealing ring

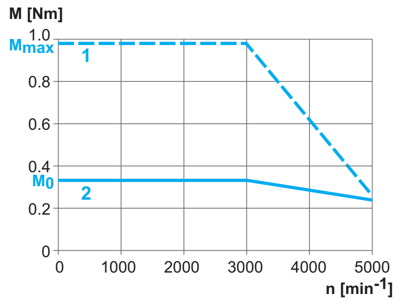


With shaft sealing ring

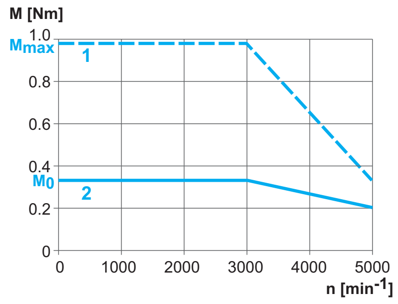


BCH2MB013 + LXM28•U01

Without shaft sealing ring



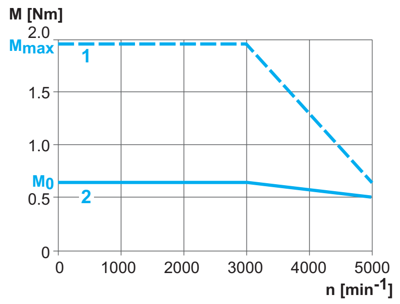
With shaft sealing ring



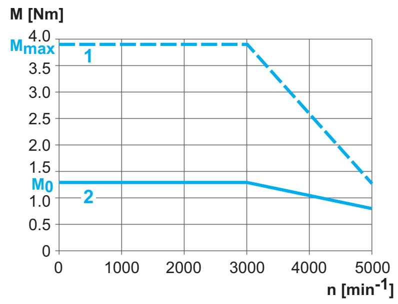
(1) Peak torque
(2) Continuous torque

2.4.2 BCH2LD

BCH2LD023 + LXM28•U02



BCH2LD043 + LXM28•U04



(1) Peak torque
(2) Continuous torque

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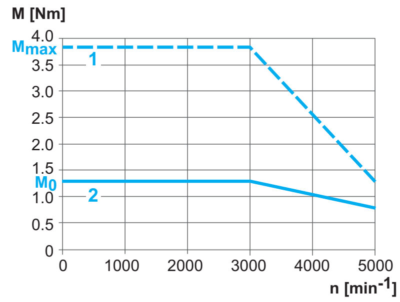
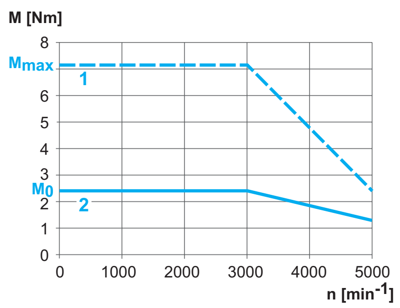
2.4.3 BCH2•F

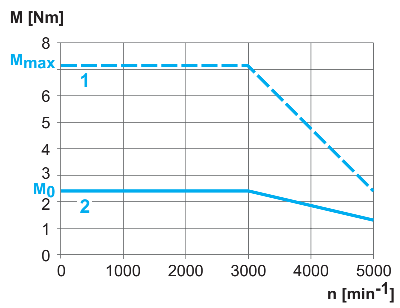
BCH2LF043 + LXM28•U04



BCH2HF073 + LXM28•U07



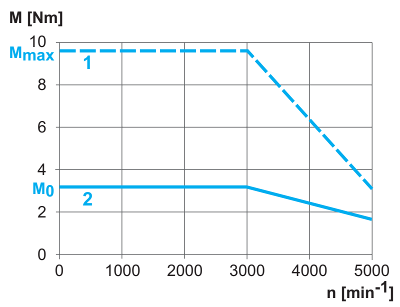
BCH2LF073 + LXM28•U07



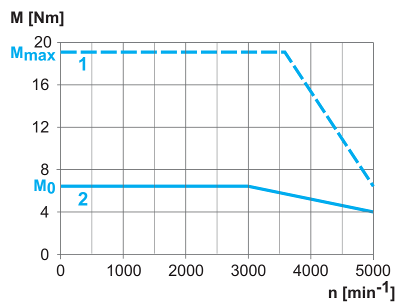
(1) Peak torque
(2) Continuous torque

2.4.4 BCH2LH

BCH2LH103 + LXM28•U10



BCH2LH203 + LXM28•U20



(1) Peak torque
(2) Continuous torque

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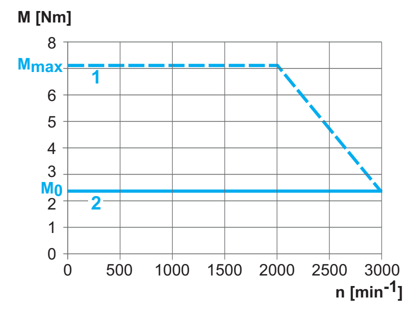
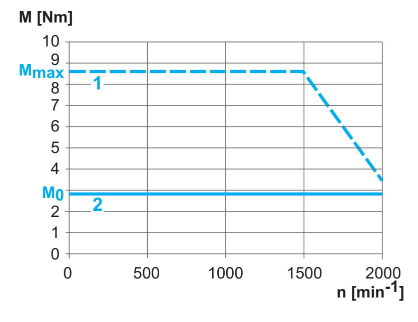
2.4.5 BCH2•M

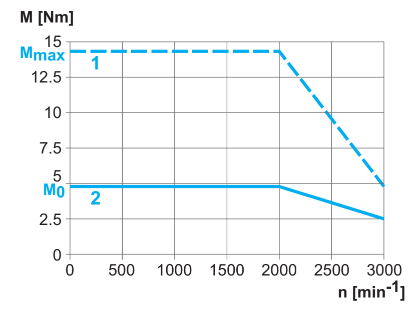
BCH2MM052 + LXM28•U07



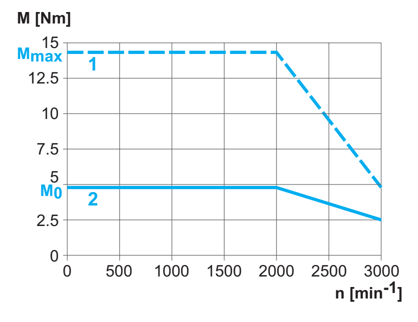
BCH2MM031 + LXM28•U04



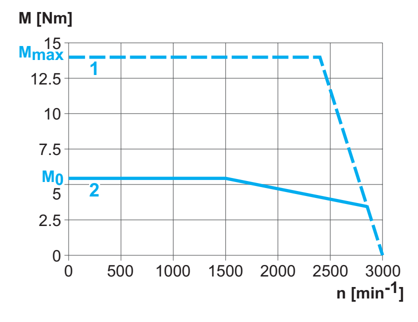
BCH2MM102 + LXM28•U10



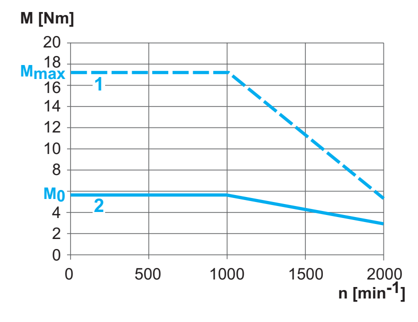
BCH2HM102 + LXM28•U10



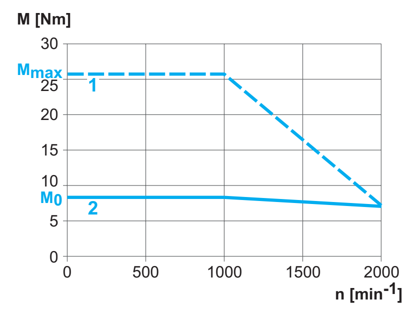
BCH2MM081 + LXM28•U10



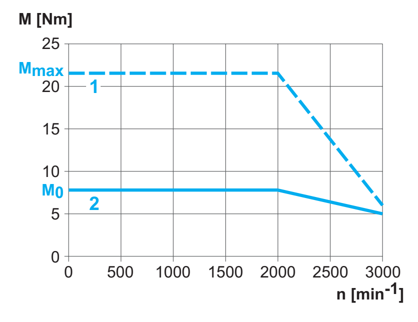
BCH2MM061 + LXM28•U07



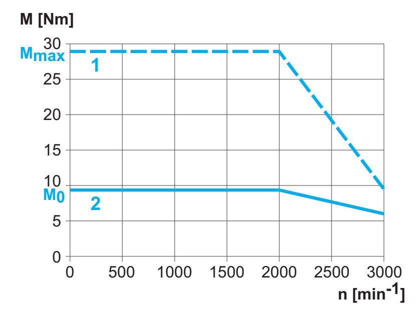
BCH2MM091 + LXM28•U10



BCH2MM152 + LXM28•U15



BCH2MM202 + LXM28•U20



(1) Peak torque

(2) Continuous torque

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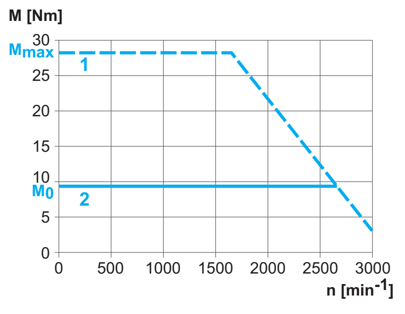
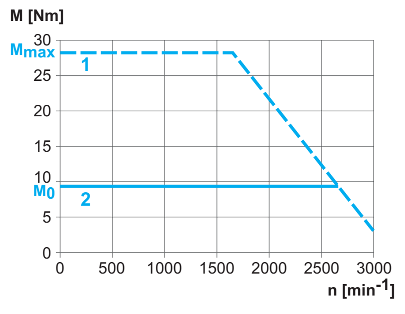
2.4.6 BCH2•R

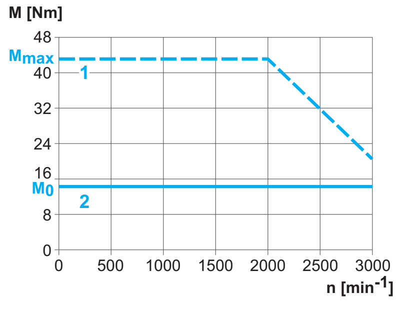
BCH2MR202 + LXM28•U20



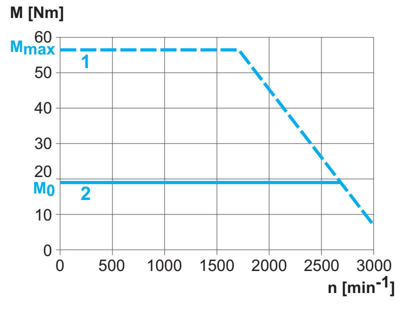
BCH2HR202 + LXM28•U20



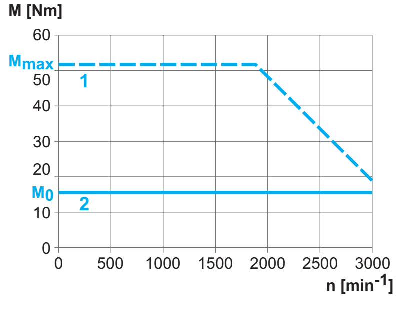
BCH2MR302 + LXM28•U30



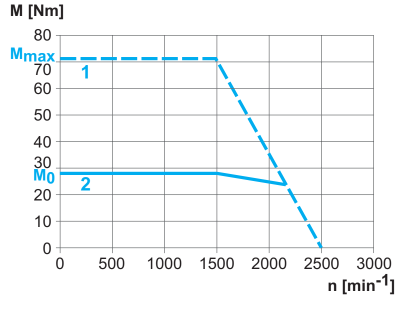
BCH2MR301 + LXM28•U30



BCH2MR352 + LXM28•U45



BCH2MR451 + LXM28•U45



(1) Peak torque
(2) Continuous torque

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2.4.7 Overload characteristics curves

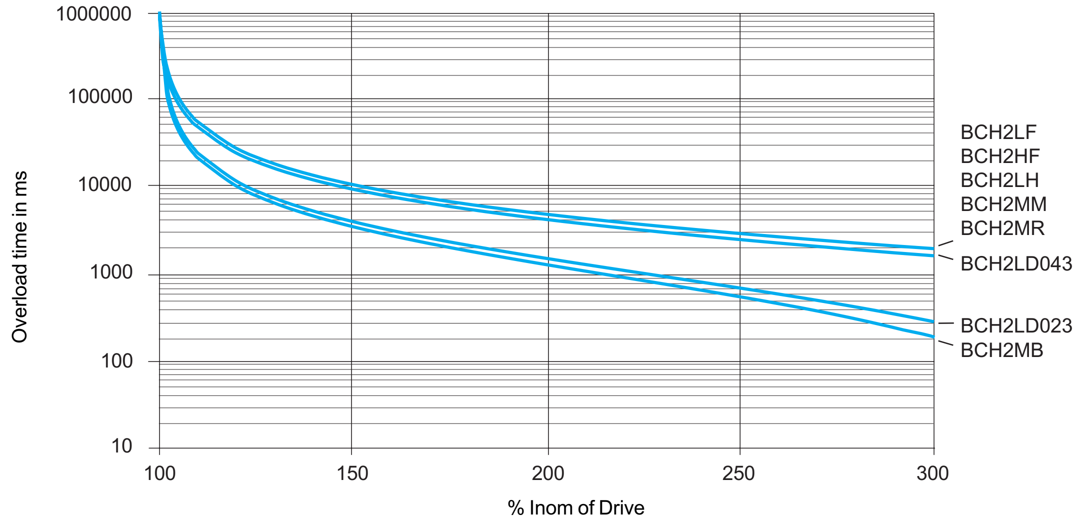

Figure 17: Overload characteristics curves

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2.5 Encoder

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

The signals meet the PELV requirements.

Measuring range absolute	1 revolution
Resolution in increments	Depending on evaluation
Accuracy of position	±0.044°
Supply voltage	4.1 ... 5.25 Vdc
Maximum supply current	100 mA
Maximum permissible speed of rotation	6000 min^{-1}
Maximum angular acceleration	100,000 rad/s^2

2.6 Conditions for UL 508C

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

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

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

LXM28•		**UA5, U01, U02, U04, U07, U10, U15**	**U20, U30, U45**
Maximum fuse rating of fuse to be connected upstream	A	25	32
Class if fuses are used		J	J
Class if circuit breakers are used		D	D

Overvoltage category "Use only in overvoltage category III or where the maximum available Rated Impulse Withstand Voltage Peak is equal or less than 4000 Volts.", or equivalent as defined in UL 840 and its equivalent defined in IEC 60664-1.

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2.7 Certifications

TÜVRheinland®

ZERTIFIKAT
CERTIFICATE

EC Type-Examination Certificate

Reg.-No.: 01/205/5401.00/14

Product tested	Safety function "Safe Torque Off" (STO) within the Power Drive System	**Certificate holder**	Schneider Electric Automation GmbH Schneiderplatz 1 97828 Marktheidenfeld Germany
Type designation	Safety Servo Drive LXM28 (Lexium 28) LXM28AU*, Details see Version Release List		
Codes and standards forming the basis of testing	IEC 61800-5-2:2007 EN ISO 13849-1:2008 + AC:2009 IEC 62061:2012		IEC 61508 Parts 1-7:2010 EN 60204-1:2006 + A1:2009 + AC:2010 (in extracts)
Intended application	The safety function "Safe Torque Off" (STO) complies with the requirements of the relevant standards (Cat. 3 / PL d acc. to EN ISO 13849-1, SIL CL 2 acc. to IEC 61800-5-2 / IEC 62061 / IEC 61508) and can be used in applications up to Cat. 3 / PL d acc. to EN ISO 13849-1 and SIL 2 acc. to IEC 62061 / IEC 61508.		
Specific requirements	The instructions of the associated Installation and Operating Manual shall be considered.		

It is confirmed, that the product under test complies with the requirements for machines defined in Annex I of the EC Directive 2006/42/EC.

This certificate is valid until 2019-07-21.

TÜVRheinland® CERTIFIED
Functional Safety Type Approved
www.tuv.com
ID 0600000000

The issue of this certificate is based upon an examination, whose results are documented in report-no.: 968/FSP 1013.00/14 dated 2014-07-21.

The holder of a valid licence certificate for the product tested is authorized to affix the test mark shown opposite to products, which are identical with the product tested.

TÜV Rheinland Notified Body 0035

Berlin, 2014-07-21

Certification Body for Machinery, NB 0035

Dipl.-Ing. Jelena Stenzel

TÜV Rheinland Industrie Service GmbH, Alboinstr. 56, 12103 Berlin / Germany
Tel.: +49 30 7562-1557, Fax: +49 30 7562-1370, E-Mail: industrie-service@de.tuv.com

Figure 18: TÜV Certificate

2.8 Declaration of conformity

EC – Declaration of Conformity

Document number / Month.Year: NHA3487100.01 / 02.2015

- Original Language -

We: Schneider Electric Automation GmbH
Subsidiary of Schneider Electric (F-92500 Rueil-Malmaison)

Schneiderplatz 1
97828 Markheidenfeld
Germany

Hereby declare that the products:

Trademark:	Schneider Electric
Product, Type, Function:	Servo Drive Module Series LXM28
Models:	See second page
Serial Number:	*aaa*8AA*wwyybbbbb* (*aaa* = Product ID; *ww* = 01…53, *yy* = 14…99, *bbbbb* = 0001…9999)

are in conformity with the requirements of the following directives and conformity was checked in accordance with the following standards:

Directive	Harmonized Standard
DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on machinery, and amending Directive 95/16/EC	**EN 61800-5-2:2007** Adjustable speed electrical power drive systems -- Part 5-2: Safety requirements - Functional **EN ISO 13849-1:2008 + AC:2009** Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design **EN ISO 13849-2:2012** Safety of machinery - Safety-related parts of control systems - Part 2: Validation **EN 62061:2005 + A1:2013** Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems
DIRECTIVE 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC	**EN 61800-3:2004 + A1:2012** Adjustable speed electrical power drive systems -- Part 3: EMC requirements and specific test methods

Additional following standard(s) was/were additional considered:
EN 61800-5-1:2007 Adjustable speed electrical power drive systems -- Part 5-1: Safety requirements - Electrical, thermal and energy

It is important that the component is subject to correct installation, maintenance and use conforming to its intended purpose, to the applicable regulations and standards, to the supplier's instructions, user manual and to the accepted rules of the art.

Name and address of the person authorised to compile the technical file:
Michael Schweizer, Schneider Electric Automation GmbH, Schneiderplatz 1, 97828 Marktheidenfeld - Germany

First year of affixing CE Marking: 2014

Issued at: Marktheidenfeld - Germany, 6th February 2015

M. Schweizer

i.A. Michael Schweizer
Machine Solutions Certification Manager

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0198441114054, V2.1, 04.2016

EC – Declaration of Conformity

Document number / Month.Year: NHA3487100.01 / 02.2015

- Original Language -

List of Models:

Model	Description	Product ID
LXM28AUA5M3X	Lexium 28 230V 50W; PLd Cat.3 / SILcl 2; CAN / PTI	AA5
LXM28AU01M3X	Lexium 28 230V 100W; PLd Cat.3 / SILcl 2; CAN / PTI	A01
LXM28AU02M3X	Lexium 28 230V 200W; PLd Cat.3 / SILcl 2; CAN / PTI	A02
LXM28AU04M3X	Lexium 28 230V 400W; PLd Cat.3 / SILcl 2; CAN / PTI	A04
LXM28AU07M3X	Lexium 28 230V 750W; PLd Cat.3 / SILcl 2; CAN / PTI	A07
LXM28AU10M3X	Lexium 28 230V 1000W; PLd Cat.3 / SILcl 2; CAN / PTI	A10
LXM28AU15M3X	Lexium 28 230V 1500W; PLd Cat.3 / SILcl 2; CAN / PTI	A15
LXM28AU20M3X	Lexium 28 230V 2000W; PLd Cat.3 / SILcl 2; CAN / PTI	A20
LXM28AU30M3X[1]	Lexium 28 230V 3000W; PLd Cat.3 / SILcl 2; CAN / PTI	A30
LXM28AU45M3X[1]	Lexium 28 230V 4500W; PLd Cat.3 / SILcl 2; CAN / PTI	A45

[1] First year of affixing CE mark: 2015

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0198441114054, V2.1, 04.2016

EC – Declaration of Conformity

Document number / Month.Year: NHA3487300.01 / 02.2015

We: Schneider Electric Automation GmbH
Subsidiary of Schneider Electric (F-92500 Rueil-Malmaison)

Schneiderplatz 1
97828 Markheidenfeld
Germany

Hereby declare that the products:

Trademark:	Schneider Electric
Product, Type, Function:	3 phase servo motor
Models:	BCH2 series
Serial Number:	*aaa*8A*cwwyybbbbb* (*aaa* = Product ID; c = location ID (C or I); *ww* = 01…53, *yy* = 14…99, *bbbbb* = 0001…9999)

are in conformity with the requirements of the following directives and conformity was checked in accordance with the following standards:

Directive	Harmonized Standard
DIRECTIVE 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006 on the harmonisation of the laws of Member States relating to Electrical Equipment designed for use within certain voltage limits	**EN 60034-1:2010** Rotating electrical machines - Part 1: Rating and performance **EN 60034-5:2001 + A1:2007** Rotating electrical machines - Part 5: Degrees of protection provided by integral design of rotating electrical machines (IP code) - Classification **EN 61800-5-1:2007** Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy

It is important that the component is subject to correct installation, maintenance and use conforming to its intended purpose, to the applicable regulations and standards, to the supplier's instructions, user manual and to the accepted rules of the art.

First year of affixing CE Marking: 2014

Issued at: Marktheidenfeld - Germany, 6th February 2015

i.A. Michael Schweizer
Machine Solutions Certification Manager

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EC – Declaration of Conformity

Document number / Month.Year: NHA3487300.01 / 02.2015

Schneider Electric

List of Models:

Model	Product ID	Model	Product ID	Model	Product ID
BCH2MBA530CA5C	B01	BCH2MM0812CA6C	M05	BCH2MM0610CA6C	M49
BCH2MBA530CF5C	B02	BCH2MM0812CF6C	M06	BCH2MM0610CF6C	M50
BCH2MBA531CA5C	B03	BCH2MM0813CA6C	M07	BCH2MM0611CA6C	M51
BCH2MBA531CF5C	B04	BCH2MM0813CF6C	M08	BCH2MM0611CF6C	M52
BCH2MBA532CA5C	B05	BCH2LH1030CA6C	H01	BCH2MM0612CA6C	M53
BCH2MBA532CF5C	B06	BCH2LH1030CF6C	H02	BCH2MM0612CF6C	M54
BCH2MBA533CA5C	B07	BCH2LH1031CA6C	H03	BCH2MM0613CA6C	M55
BCH2MBA533CF5C	B08	BCH2LH1031CF6C	H04	BCH2MM0613CF6C	M56
BCH2MB0130CA5C	B09	BCH2LH1032CA6C	H05	BCH2MM0910CA6C	M57
BCH2MB0130CF5C	B10	BCH2LH1032CF6C	H06	BCH2MM0910CF6C	M58
BCH2MB0131CA5C	B11	BCH2LH1033CA6C	H07	BCH2MM0911CA6C	M59
BCH2MB0131CF5C	B12	BCH2LH1033CF6C	H08	BCH2MM0911CF6C	M60
BCH2MB0132CA5C	B13	BCH2LH2030CA6C	H09	BCH2MM0912CA6C	M61
BCH2MB0132CF5C	B14	BCH2LH2030CF6C	H10	BCH2MM0912CF6C	M62
BCH2MB0133CA5C	B15	BCH2LH2031CA6C	H11	BCH2MM0913CA6C	M63
BCH2MB0133CF5C	B16	BCH2LH2031CF6C	H12	BCH2MM0913CF6C	M64
BCH2LD0230CA5C	D01	BCH2LH2032CA6C	H13	BCH2MR2020CA6C	R01
BCH2LD0230CF5C	D02	BCH2LH2032CF6C	H14	BCH2MR2020CF6C	R02
BCH2LD0231CA5C	D03	BCH2LH2033CA6C	H15	BCH2MR2021CA6C	R03
BCH2LD0231CF5C	D04	BCH2LH2033CF6C	H16	BCH2MR2021CF6C	R04
BCH2LD0232CA5C	D05	BCH2MM0520CA6C	M09	BCH2MR2022CA6C	R05
BCH2LD0232CF5C	D06	BCH2MM0520CF6C	M10	BCH2MR2022CF6C	R06
BCH2LD0233CA5C	D07	BCH2MM0521CA6C	M11	BCH2MR2023CA6C	R07
BCH2LD0233CF5C	D08	BCH2MM0521CF6C	M12	BCH2MR2023CF6C	R08
BCH2LD0430CA5C	D09	BCH2MM0522CA6C	M13	BCH2MR3020CA6C	R09
BCH2LD0430CF5C	D10	BCH2MM0522CF6C	M14	BCH2MR3020CF6C	R10
BCH2LD0431CA5C	D11	BCH2MM0523CA6C	M15	BCH2MR3021CA6C	R11
BCH2LD0431CF5C	D12	BCH2MM0523CF6C	M16	BCH2MR3021CF6C	R12
BCH2LD0432CA5C	D13	BCH2MM1020CA6C	M17	BCH2MR3022CA6C	R13
BCH2LD0432CF5C	D14	BCH2MM1020CF6C	M18	BCH2MR3022CF6C	R14
BCH2LD0433CA5C	D15	BCH2MM1021CA6C	M19	BCH2MR3023CA6C	R15
BCH2LD0433CF5C	D16	BCH2MM1021CF6C	M20	BCH2MR3023CF6C	R16
BCH2LF0430CA5C	F01	BCH2MM1022CA6C	M21	BCH2MR3520CA6C	R17
BCH2LF0430CF5C	F02	BCH2MM1022CF6C	M22	BCH2MR3520CF6C	R18
BCH2LF0431CA5C	F03	BCH2MM1023CA6C	M23	BCH2MR3521CA6C	R19
BCH2LF0431CF5C	F04	BCH2MM1023CF6C	M24	BCH2MR3521CF6C	R20
BCH2LF0432CA5C	F05	BCH2MM1520CA6C	M25	BCH2MR3522CA6C	R21
BCH2LF0432CF5C	F06	BCH2MM1520CF6C	M26	BCH2MR3522CF6C	R22
BCH2LF0433CA5C	F07	BCH2MM1521CA6C	M27	BCH2MR3523CA6C	R23
BCH2LF0433CF5C	F08	BCH2MM1521CF6C	M28	BCH2MR3523CF6C	R24
BCH2HF0730CA5C	F09	BCH2MM1522CA6C	M29	BCH2MR3010CA6C	R25
BCH2HF0730CF5C	F10	BCH2MM1522CF6C	M30	BCH2MR3010CF6C	R26
BCH2HF0731CA5C	F11	BCH2MM1523CA6C	M31	BCH2MR3011CA6C	R27
BCH2HF0731CF5C	F12	BCH2MM1523CF6C	M32	BCH2MR3011CF6C	R28
BCH2HF0732CA5C	F13	BCH2MM2020CA6C	M33	BCH2MR3012CA6C	R29
BCH2HF0732CF5C	F14	BCH2MM2020CF6C	M34	BCH2MR3012CF6C	R30
BCH2HF0733CA5C	F15	BCH2MM2021CA6C	M35	BCH2MR3013CA6C	R31
BCH2HF0733CF5C	F16	BCH2MM2021CF6C	M36	BCH2MR3013CF6C	R32
BCH2LF0730CA5C	F17	BCH2MM2022CA6C	M37	BCH2MR4510CA6C	R33
BCH2LF0730CF5C	F18	BCH2MM2022CF6C	M38	BCH2MR4510CF6C	R34
BCH2LF0731CA5C	F19	BCH2MM2023CA6C	M39	BCH2MR4511CA6C	R35
BCH2LF0731CF5C	F20	BCH2MM2023CF6C	M40	BCH2MR4511CF6C	R36
BCH2LF0732CA5C	F21	BCH2MM0310CA6C	M41	BCH2MR4512CA6C	R37
BCH2LF0732CF5C	F22	BCH2MM0310CF6C	M42	BCH2MR4512CF6C	R38
BCH2LF0733CA5C	F23	BCH2MM0311CA6C	M43	BCH2MR4513CA6C	R39
BCH2LF0733CF5C	F24	BCH2MM0311CF6C	M44	BCH2MR4513CF6C	R40
BCH2MM0810CA6C	M01	BCH2MM0312CA6C	M45		
BCH2MM0810CF6C	M02	BCH2MM0312CF6C	M46		
BCH2MM0811CA6C	M03	BCH2MM0313CA6C	M47		
BCH2MM0811CF6C	M04	BCH2MM0313CF6C	M48		

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3 Basics

3.1 Functional safety

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

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

Integrated safety function "Safe Torque Off" STO

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

In stop category 0, 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 to 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 service 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 (such as a service brake) where personnel and/or equipment hazards exist.

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

IEC 61508 and IEC 61800-5-2

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

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

Safety Integrity Level (SIL)

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

Average Frequency of a Dangerous Failure per Hour (PFH)

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

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

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

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

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

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

Fault avoidance measures

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

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4 Engineering

This chapter contains information on the application of the product for the engineering phase.

4.1 Electromagnetic compatibility (EMC)

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

⚠ WARNING

SIGNAL AND EQUIPMENT INTERFERENCE

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

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

Limit values

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

However, if your entire system composition (all the products involved, mains filter, additional accessories and measures) does not meet the requirements of category C1, the following information applies as it appears in IEC 61800-3:

⚠ WARNING

RADIO INTERFERENCE

In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.

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

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

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Measures for EMC improvement

EMC measures	Objective
Use mounting plates with good electrical conductivity, connect large surface areas of metal parts, remove paint from contact areas.	Good conductivity due to large surface contact.
Ground the control cabinet, the control cabinet door and the mounting plate with ground straps or ground wires. The conductor cross section must be at least 10 mm² (AWG 6).	Reduces emissions.
Install switching devices such as power contactors, relays or solenoid valves with interference suppression units or arc suppressors (for example, diodes, varistors, RC circuits).	Reduces mutual interference
Do not install power components and control components adjacent to one another.	Reduces mutual interference

Additional measures for EMC improvement

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

EMC measures	Objective
Use mains reactors	Reduces mains harmonics, prolongs product service life.
Mount in a closed control cabinet with shielded attenuation of radiated interference	Improves the EMC limit values.

Equipotential bonding conductors

Potential differences can result in excessive currents on the cable shields. Use equipotential bonding conductors to reduce currents on the cable shields.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

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

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

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4.2 Cables

Suitability of the cables

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

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

Equipotential bonding conductors

Potential differences can result in excessive currents on the cable shields. Use equipotential bonding conductors to reduce currents on the cable shields.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

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

- 16 mm^2 (AWG 4) for equipotential bonding conductors up to a length of 200 m (656 ft)
- 20 mm^2 (AWG 4) for equipotential bonding conductors with a length of more than 200 m (656 ft)

Cable guides

The device features cable guides at the top and at the bottom. The cable guide must not be used as a strain relief. The cable guide at the bottom of the device can be used as a shield connection.

NOTE: The upper cable guide is not a shield connection.

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Conductor cross sections according to method of installation

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

- Method of installation B2:

  Cables in conduits or cable trunking systems
- Method of installation E:

  Cables on open cable trays

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

1) See chapter *"12 Accessories and spare parts"* for available cables.
2) Values as per IEC 60204-1 for continuous operation, copper conductors and ambient air temperature 40°C (104 °F); see IEC 60204-1 for additional information.

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

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

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

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

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4.3 Residual current device

The drive generates appreciable DC currents. In the case of an insulation degradation or other direct contact of circuits, these currents could be introduced into the grounding system of the product.

⚠ WARNING

DIRECT CURRENT CAN BE INTRODUCED INTO THE PROTECTIVE GROUND CONDUCTOR

- Use a Type A Residual Current Device (RDC / GFCI) for single phase drives.
- Use a Type B Residual Current Device (RDC / GFCI) that has approval for use with frequency inverters and is sensitive to all types of current in cases other than single phase drives.

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

Conditions for use of residual current device

- The product has an increased leakage current at the moment power is applied. Use residual current devices with a response delay so that the residual current device does not trip inadvertently due to the peak current that occurs at the moment the product is energized.
- High-frequency currents must be filtered.

4.4 Common DC bus

Function principle

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

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

This and other important information can be found in the "LXM28 - Common DC bus - Application note". If you wish to take advantage of DC bus sharing, you must first consult the LXM28 - Common DC bus - Application note for important safety-related information.

Requirements for use

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

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4.5 Safety function STO ("Safe Torque Off")

See chapter *"3.1 Functional safety"* for information on using the IEC 61508 standard.

4.5.1 Definitions

Safety function STO (IEC 61800-5-2)
The safety function STO ("Safe Torque Off") removes power to the motor thereby relieving the torque applied by the motor. There is no monitoring for standstill.

Category 0 stop (IEC 60204-1)
Stopping by immediate removal of power to the machine actuators.

Category 1 stop (IEC 60204-1)
Controlled stop with power available to the machine actuators to achieve the stop. Power is not interrupted until the stop is achieved.

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4.5.2 Function

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

The safety function STO switches the supply voltage of the IGBT drivers so that PWM signals cannot switch the IGBTs. The following diagram illustrates the concept:

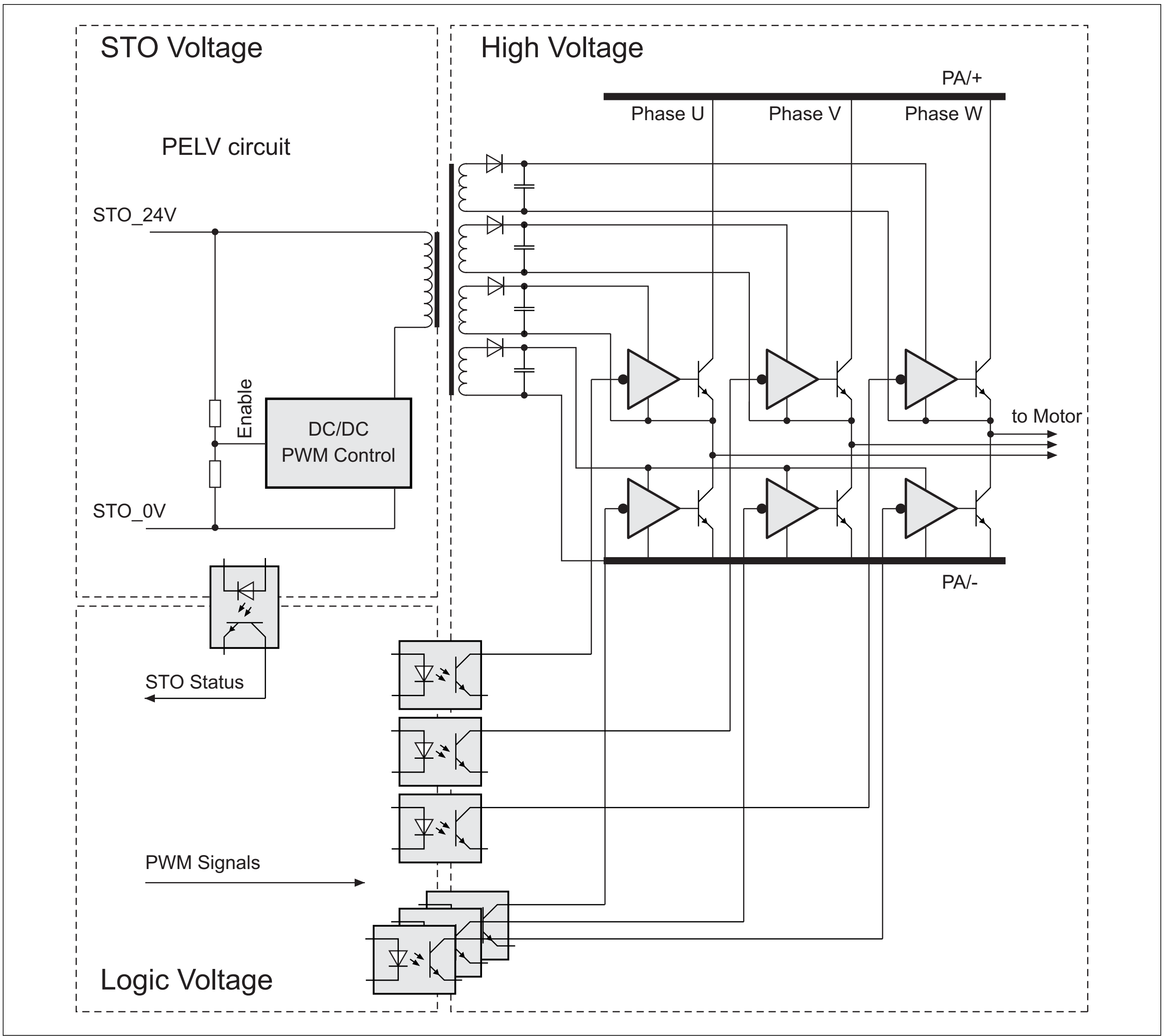

Figure 19: STO concept

4.5.3 Requirements for using the safety function

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

DANGER

ELECTRIC SHOCK

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

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

The safety function STO is factory-deactivated by means of the jumper for CN9. If you want to use the safety function STO you must remove the jumper for CN9. You may only use the safety function STO with an external PELV 24 Vdc power supply unit.

WARNING

UNINTENDED EQUIPMENT OPERATION

- Only remove the jumper for CN9 if you intend to use the safety function STO.
- If you use the safety function STO, you must use an external PELV 24 Vdc power supply unit.

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

See chapter *"5.4.1.12 Connection STO (CN9)"* for additional information on deactivating the safety function STO.

Safety function STO

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

WARNING

FALLING LOAD

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

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

Category 0 stop

During a category 0 stop, the motor coasts down. If access to the machine coasting down involves a hazard (results of the hazard and risk analysis), you must take appropriate measures.

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⚠ 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 (such as a service brake) where personnel and/or equipment hazards exist.

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

Category 1 stop

A controlled stop must be triggered with a category 1 stop. The controlled stop is not monitored by the drive system. In the case of power outage or error, a controlled stop is impossible. The final removal of power to the motor is achieved by triggering the safety function STO. The safety function STO is usually triggered by a standard EMERGENCY STOP safety relay module with a safe time delay.

Unintended restart

To help avoid unintended restart of the motor after restoration of power (for example, after power outage), the parameter P2-68 must be set to "X=0". A controlled restart must be managed externally from the drive, note that the external management itself must not trigger an unintended restart.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Set parameter P2-68 setting X to 0 (zero) if the automatic enabling of the power stage presents hazards in your application.

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

Degree of protection when the safety function is used

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

⚠ WARNING

INOPERABLE SAFETY FUNCTION

Ensure that conductive substances (water, contaminated or impregnated oils, metal shavings, etc.) cannot get into the drive.

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

Protected cable installation

If short circuits or other external faults can be expected in connection with safety-related signals, and if these short circuits or other external faults are not detected by upstream devices, protected cable installation as per ISO 13849-2 is required.

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Data for maintenance plan and the calculations for the safety function

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

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

Lifetime of the safety function STO (IEC 61508) [1]	Years	20
SFF (IEC 61508) Safe Failure Fraction	%	98.9
Safety integrity level IEC 61508 IEC 62061 IEC 61800-5-2		SIL CL 2
PFH (IEC 61508) Probability of Dangerous Hardware Failure per Hour	1/h	STO_A [2]: $1.7*10^{-9}$ STO_B [3]: $1.5*10^{-9}$
PFD_{avg} (IEC 61508) Probability of Failure on Demand, calculated as one demand per year		STO_A [2]: $1.5*10^{-4}$ STO_B [3]: $1.3*10^{-4}$
PL (ISO 13849-1) Performance Level		d (category 3)
$MTTF_d$ (ISO 13849-1) Mean Time to Dangerous Failure	Years	STO_A [2]: 66757 STO_B [3]: 78457
DC_{avg} (ISO 13849-1) Diagnostic Coverage	%	≥90

1) See chapter *"13.2.1.1 Lifetime safety function STO"*.
2) STO_A: LXM28AUA5, LXM28AU01, LXM28AU02, LXM28AU04, LXM28AU07, LXM28AU10, LXM28AU15, LXM28AU20
3) STO_B: LXM28AU30, LXM28AU45

If two non-adjacent IGBTs have a short circuit, a movement of a maximum of 120 degrees (electrical) can occur even if the safety function STO is active. Include in your risk analysis the probability of IGBT short circuits, and make a determination whether it is acceptable as it relates to your application.

⚠ WARNING

UNINTENTIONAL MOVEMENT DURING STO FUNCTION

Use appropriate safety interlocks (such as a service brake) where personnel and/or equipment hazards exist.

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

The probability of such a condition is $1.5 * 10^{-15}$ per hour (without common cause failure). Include this in your calculations for the safety function.

Contact your local sales office for additional data, if required.

Hazard and risk analysis

You must conduct, or ensure that your OEM, system integrator or anyone responsible for the development of the application containing the equipment indicated in the present document conducts a hazard and risk analysis of the entire system. The results of the analysis must be taken into account in the application of the safety function.

The type of circuit resulting from the analysis may differ from any application examples provided in the present document or any supplementary documents concerning this equipment. Additional safety components may be required. The results of the hazard and risk analysis have priority over any other design considerations. Pay particular attention in conforming to any safety information, different electrical requirements, and normative standards that would apply to your system.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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4.5.4 Application examples STO

Example of category 0 stop

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

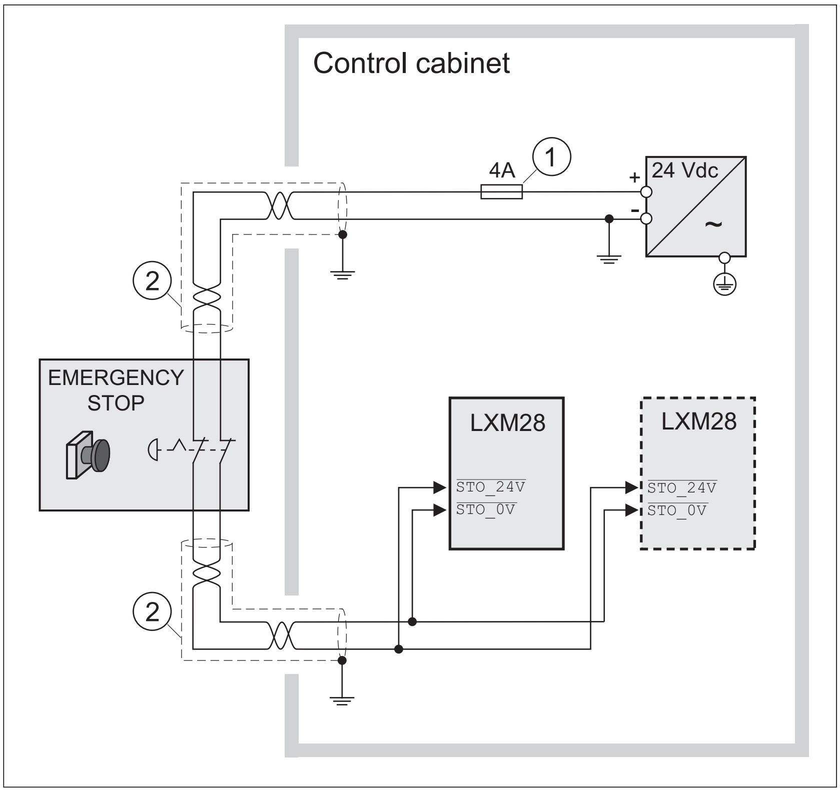

Figure 20: Example of category 0 stop

(1) If the maximum output current of the 24 V power supply exceeds 4 A, a 4 A slow-blow fuse is required. For more information on STO cabling, see chapter *"5.4.1.12 Connection STO (CN9)"*.

(2) Grounded shielded cable for wiring out of the control cabinet.

NOTE: The internal DC power supply of the drive is only to be used to deactivate the safety function STO via the jumper supplied with the drive.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only remove the jumper for CN9 if you intend to use the safety function STO.
- If you use the safety function STO, you must use an external PELV 24 Vdc power supply unit.

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

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

The power stage is immediately disabled via the inputs $\overline{\texttt{STO\_24V}}$ and $\overline{\texttt{STO\_0V}}$ of the safety function STO. Power can no longer be supplied to the motor. If the motor is not already at a standstill when the STO is triggered, it decelerates under the salient physical forces (gravity, friction, etc.) active at the time until presumably coasting to a standstill.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

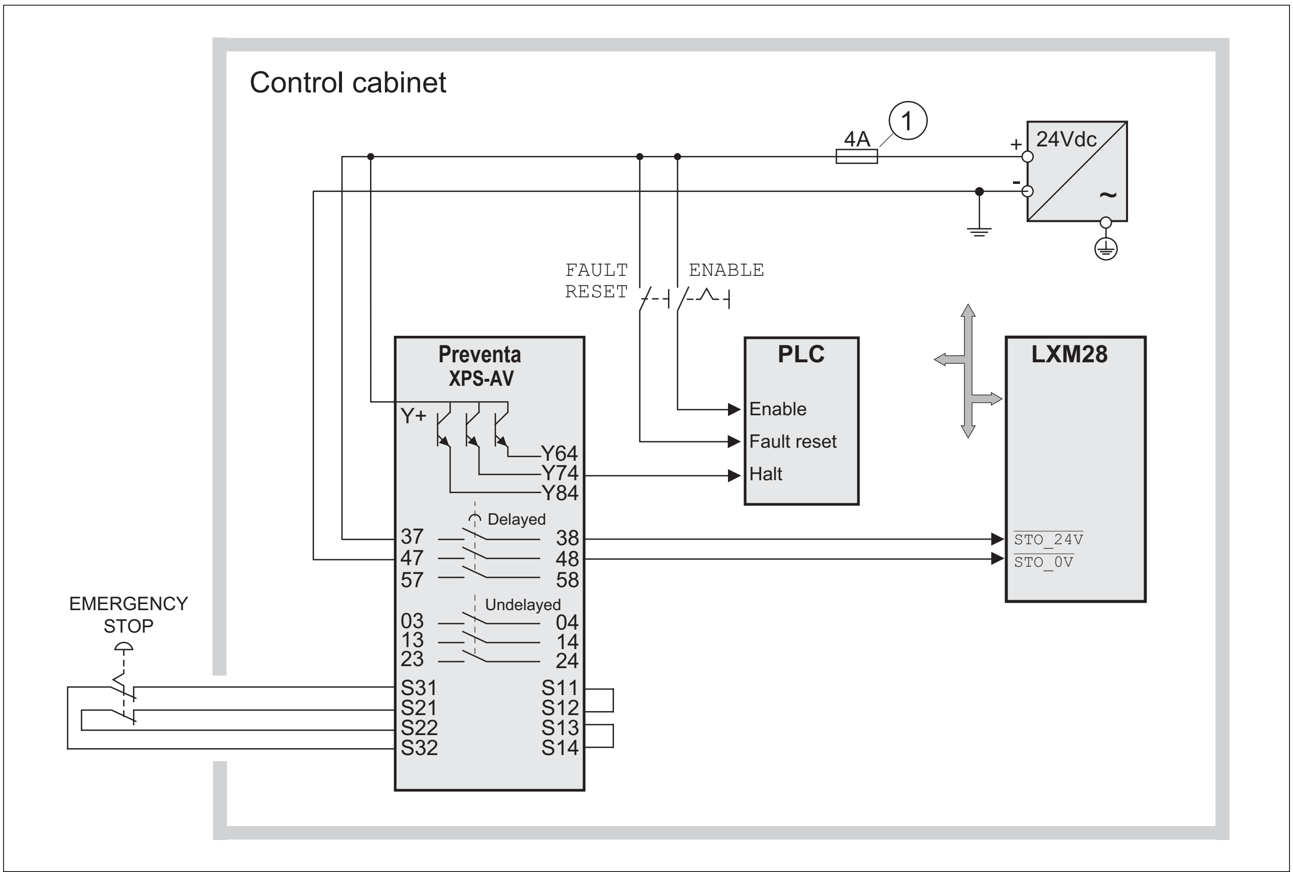

Figure 21: Example of category 1 stop with external Preventa XPS-AV EMERGENCY STOP safety relay module

(1) If the maximum output current of the 24 V power supply exceeds 4 A, a 4 A slow-blow fuse is required. For more information on STO cabling, see chapter *"5.4.1.12 Connection STO (CN9)"*.

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

- The safety relay module requests an immediate stop (undelayed) of the drive via the logic controller (Halt). The logic controller takes the configured or programmed action to instruct the drive to make a decelerated stop.
- The power stage is disabled via the inputs $\overline{\texttt{STO\_24V}}$ and $\overline{\texttt{STO\_0V}}$ of the safety function STO after the delay time set in the EMERGENCY STOP safety relay module has elapsed. Power can no longer be supplied to the motor. If the motor is not already at a standstill when safety function STO is triggered when the delay time has elapsed, it decelerates under the salient physical forces (gravity, friction, etc.) active at the time until presumably coasting to a standstill.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

NOTE: The specified minimum current and the permissible maximum current of the relay outputs of the EMERGENCY STOP safety relay module must be observed.

4.6 Rating the braking resistor

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

If multiple drives are connected via a common DC bus, this affects all motors. See chapter *"4.4 Common DC bus"* for additional information.

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

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

⚠ WARNING

HOT SURFACES

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

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

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

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4.7 Monitoring functions

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

The following monitoring functions are available:

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

4.8 Configurable inputs and outputs

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

⚠ WARNING

LOSS OF CONTROL

- Ensure that limit switches are installed if your application, based on your risk assessment, requires limit switches.
- Verify correct connection of the limit switches.
- Verify that the limit switches are sufficiently distant from the mechanical stop to allow an adequate stopping distance.
- Verify correct parameterization and function of the limit switches.

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

This product has digital inputs and outputs that can be configured. The inputs and outputs have a defined standard assignment depending on the operating mode. This assignment can be adapted to the requirements of the customer's installation. See chapter *"7.4 Setting the digital signal inputs and signal outputs"* for additional information.

5 Installation

An engineering phase is mandatory prior to mechanical and electrical installation. See chapter *"4 Engineering"*, page *77*, for basic information.

DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

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

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

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

DANGER

FIRE CAUSED BY INCORRECT INSTALLATION

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

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

⚠ WARNING

LOSS OF CONTROL

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

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

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

⚠ CAUTION

INOPERABLE EQUIPMENT DUE TO INCORRECT MAINS VOLTAGE CONNECTION

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

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

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5.1 Before mounting

Inspecting the product

- Verify the product version by means of the type code on the name-plate. See chapter *"1.3 Nameplate"* and chapter *"1.4 Type code"*.
- Prior to mounting, inspect the product for visible damage.

Damaged products may cause electric shock or unintended equip-ment operation.

DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

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

Failure to follow these instructions will result in death or seri-ous injury.

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

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5.2 Scope of supply

Drive

- Drive LXM28
- Connector kit with 3 connectors for:
  - Controller supply and power stage supply
  - Braking resistor
    Including jumper between PBi and PBe
  - Motor (available for devices from 50 W to 1.5 kW)
- Plastic tool for opening the spring terminals (available for devices from 50 W to 1.5 kW)
- 4-pin connector for deactivating the safety function STO (CN9)
- Adhesive hazard labels in 5 languages (German, French, Italian, Spanish, Chinese)
- Supplementary instruction sheet for product

Motor

- BCH2 servo motor
- Supplementary instruction sheet for product
- BCH•R: 2 eyebolts

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5.3 Mechanical installation

5.3.1 Mechanical installation drive

⚠ ⚠ DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

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

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

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

⚠ WARNING

LOSS OF SAFETY FUNCTION CAUSED BY FOREIGN OBJECTS

Protect the system against contamination by conductive substances.

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

The metal surfaces of the product may exceed 80 °C (176 °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.

Attaching a hazard label with safety instructions

Included in the packaging of the drive are adhesive hazard labels in 5 languages (German, French, Italian, Spanish and Chinese). The English version is affixed to the drive by the factory. If the country to which your final machine or process is to be delivered is other than English speaking:

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

Control cabinet

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

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

Mounting distances, ventilation

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

- Mount the device in a vertical position (±10°). This is required for cooling the device.
- Adhere to the minimum installation distances for required cooling. Avoid heat accumulations.
- Do not mount the device close to heat sources.
- Do not mount the device on or near flammable materials.
- The heated airflow from other devices and components must not heat up the air used for cooling the device.

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

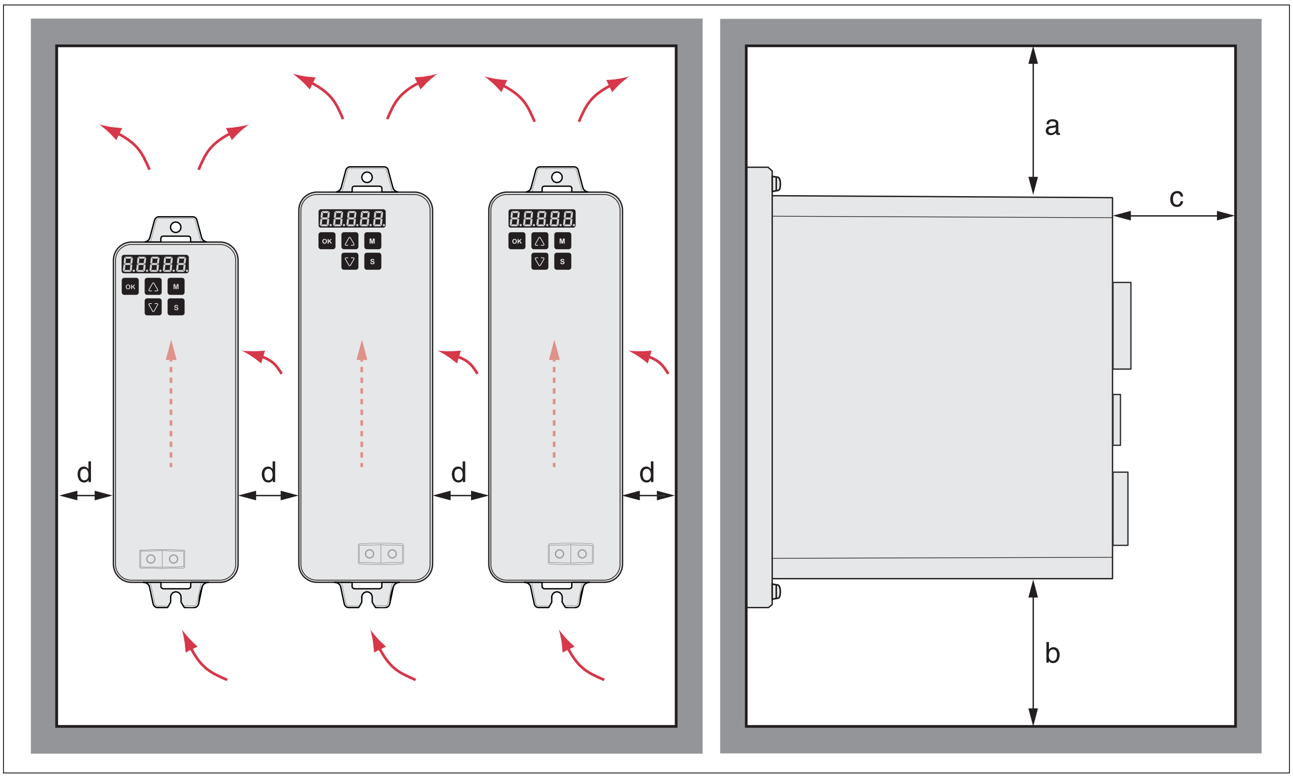

Figure 22: Mounting distances and air circulation

Distance		
Free space a above the device	mm (in)	≥50 (≥1.97)
Free space b below the device	mm (in)	≥50 (≥1.97)
Free space c in front of the device [1]	mm (in)	≥60 (≥2.36)
Free space d between devices	mm (in)	≥15 (≥0.59)

1) The free space is strictly for observing proper ventilation and may not be sufficient for your cabling requirements.

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Mounting the device

See chapter *"2.2 Dimensions"*, page *31* for the dimensions of the mounting holes.

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

- Respect the ambient conditions in chapter *"2 Technical Data"*, page *27*.
- Mount the device in a vertical position (±10°).

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5.3.2 Mechanical installation motor

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

⚠ WARNING

HEAVY AND/OR FALLING PARTS

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

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

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

⚠ WARNING

ELECTROMAGNETIC FIELDS

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

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

The metal surfaces of the product may exceed 100 °C (212 °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.

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⚠ CAUTION

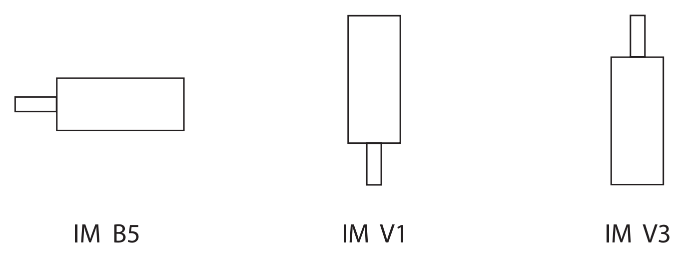
IMPROPER APPLICATION OF FORCES

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

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

Mounting position

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



Mounting

When the motor is mounted to the mounting surface, it must be accurately aligned axially and radially and make even contact with the mounting surface. All mounting screws must be tightened with the specified tightening torque. No uneven mechanical load must be applied when the mounting screws are tightened. See chapter *"2 Technical Data"* for data, dimensions and degrees of protection (IP).

Mounting situation

NOTICE

FORCES APPLIED TO THE REAR SIDE OF THE MOTOR

- Do not place the motor on the rear side.
- Protect the rear side of the motor from impact.
- Do not lift motors via the rear side.
- Only lift motors equipped with eyebolts via the eyebolts.

Failure to follow these instructions can result in equipment damage.

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Special characteristics BCH2•H, BCH2•M, BCH2•R

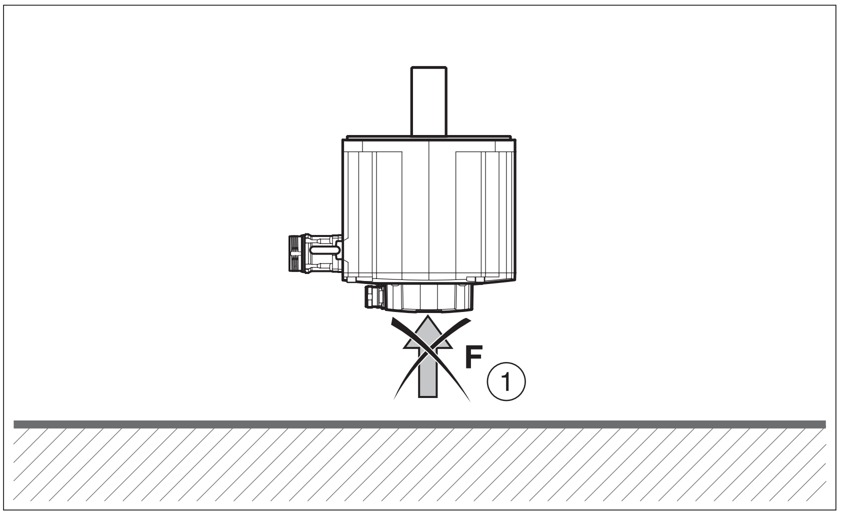
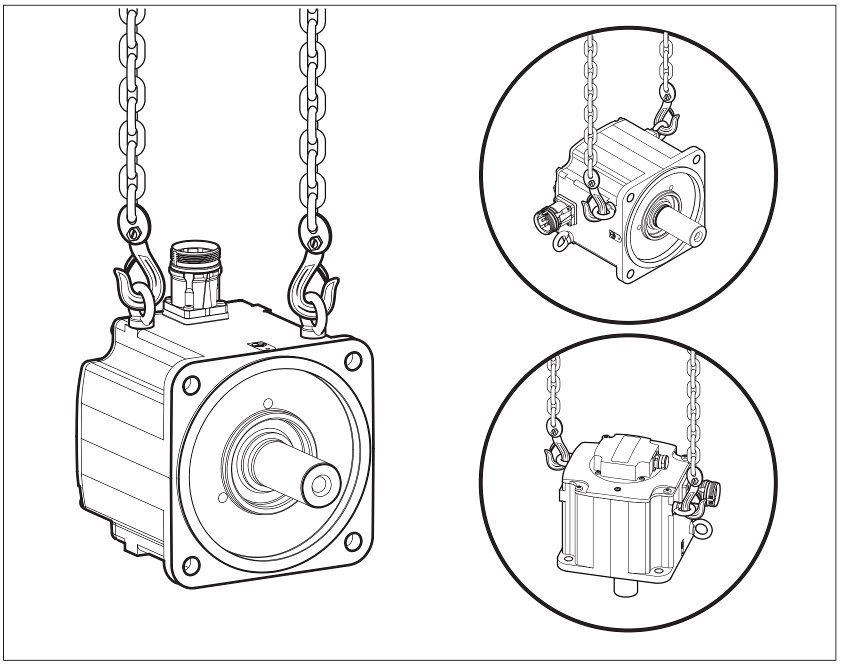


Figure 23: Rear side of motor

(1) Protect the rear side of the motor from application of forces.

Eyebolts BCH2•R

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



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5.4 Electrical installation

DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

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

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

DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

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

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

5.4.1 Electrical installation drive

5.4.1.1 Overview

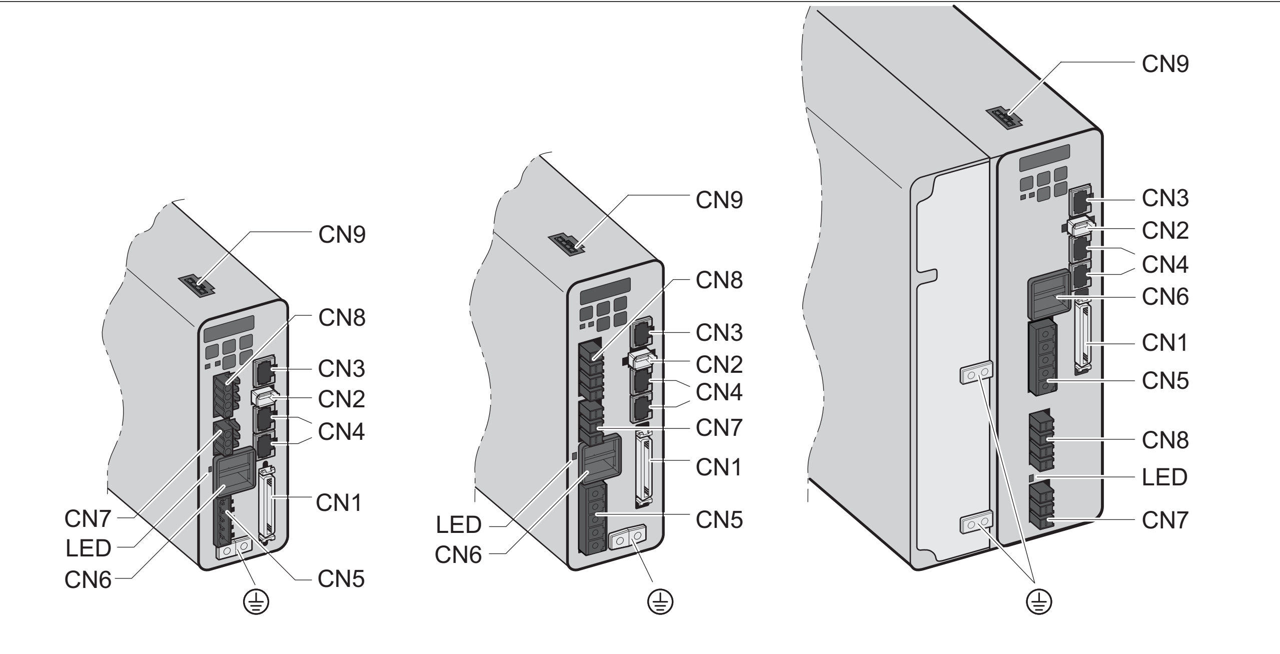

Figure 24: Overview of interfaces

(CN1) Signal interface
For connecting master controller or I/O signals.
Information: page *108*

(CN2) Connection for motor encoder
Information: page *119*

(CN3) Modbus (commissioning interface)
For connecting PC via converter TCSMCNAM3M002P
Information: page *120*

(CN4) 2 connections for fieldbus CANopen
Information: page *122*

(CN5) Controller supply (R,S,T) and power stage supply (L1, L2)
Information: page *126*

(CN6) DC bus connection
Information: page *128*

(LED) DC bus LED
The LED lights when mains voltage or internal charge are present. The DC bus LED is not an indicator of the absence of DC bus voltage.
Information: page *14*

(CN7) Connection for external braking resistor
Information: page *130*

(CN8) Motor phases connection
Information: page *133*

(CN9) Connection for safety function STO
Information: page *138*

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5.4.1.2 Connection grounding screw

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.

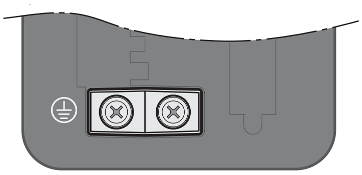
DANGER

INSUFFICIENT GROUNDING

- Use a protective ground conductor at with least 10 mm^2 (AWG 6) or two protective ground conductors with the cross section of the conductors supplying the power terminals.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.

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

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



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

Tightening torque of grounding screw	Nm (lb.in)	1.5 (13.28)
Screw type	-	M4 x 8 socket button head screw

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5.4.1.3 Connection I/O interface (CN1)

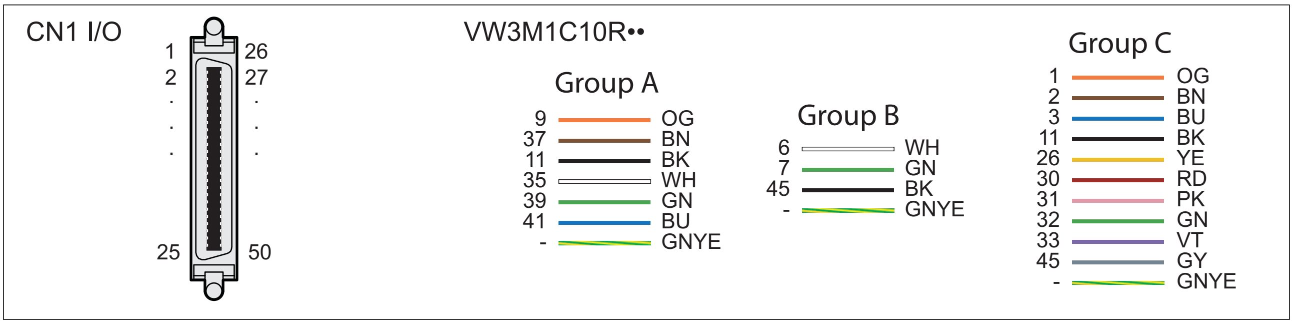

Figure 25: Connection assignment I/O interface (CN1)

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

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

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⚠ WARNING

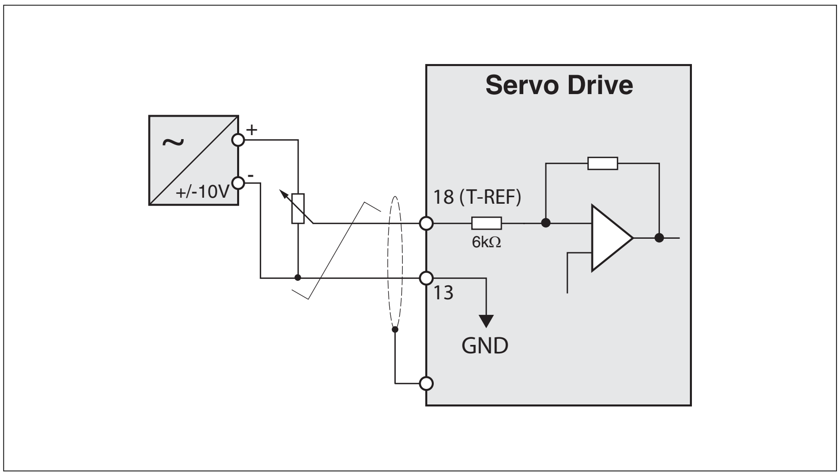
UNINTENDED OPERATION

Wire and configure the system in such a way that unintended movements cannot occur in the case of wire breaks or grounding errors of a signal wire.

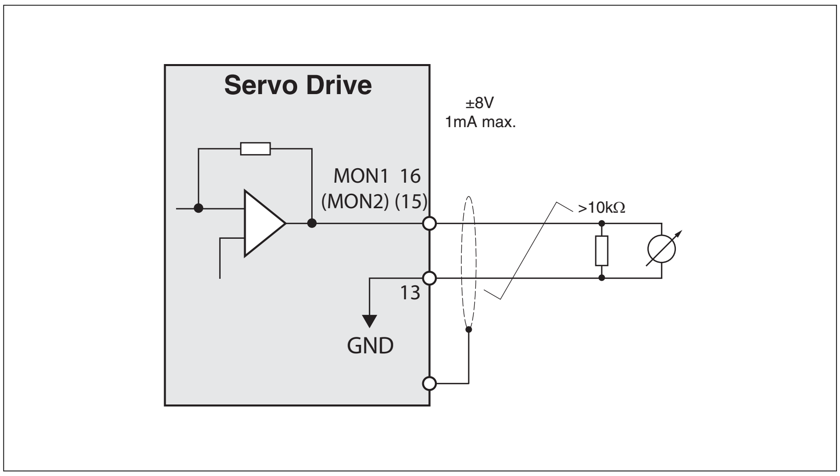
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Analog inputs and outputs

Example of reference value via analog input:



Example of analog output:



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Pulse input (open collector, logic type 2)

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Example of pulse input (open collector) with internal power supply (logic type 2).

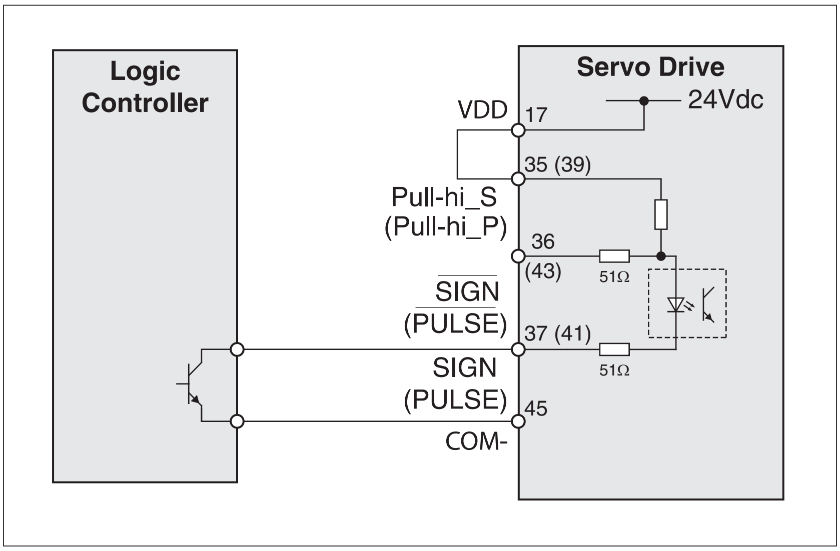

Figure 26: Example of pulse input (open collector) with internal power supply (logic type 2).

Example of pulse input (open collector) with external power supply (logic type 2).

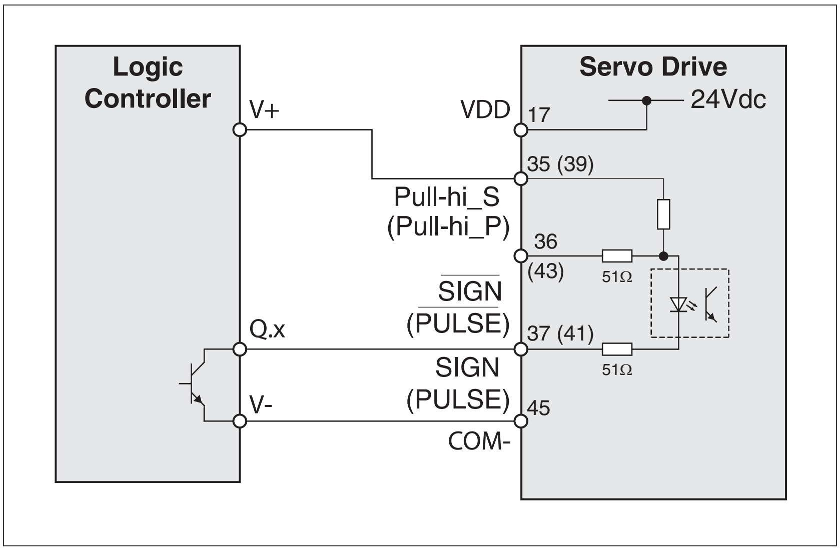

Figure 27: Example of pulse input (open collector) with external power supply (logic type 2).

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Pulse input (open collector, logic type 1)

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Example of pulse input (open collector) with internal power supply (logic type 1).

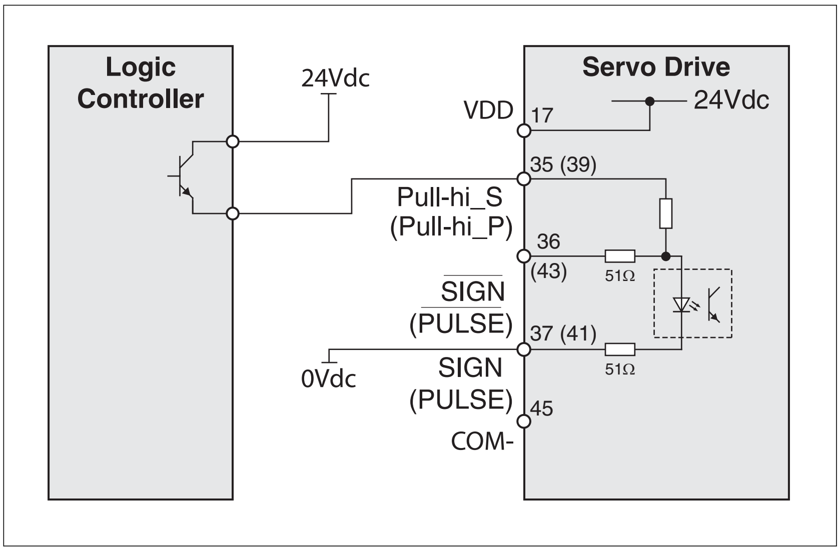

Figure 28: Example of pulse input (open collector) with internal power supply (logic type 1).

Example of pulse input (open collector) with external power supply (logic type 1).

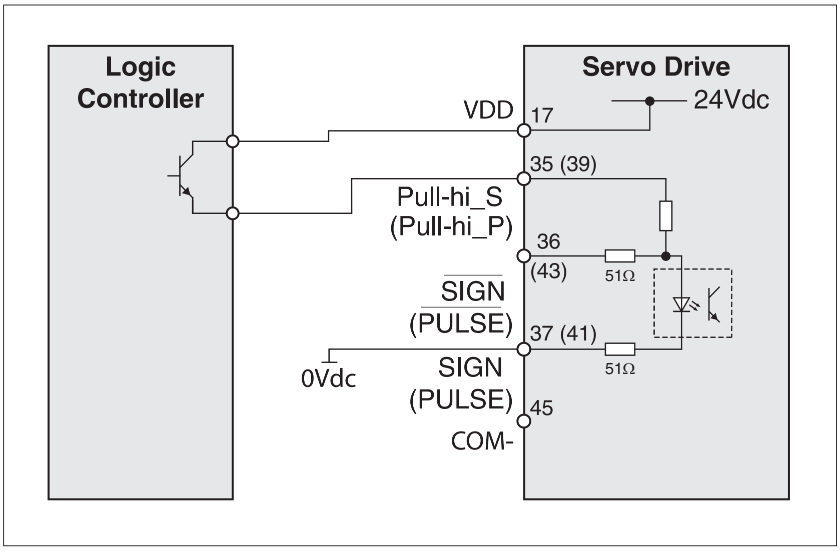

Figure 29: Example of pulse input (open collector) with external power supply (logic type 1).

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Pulse input (line driver)

Example of pulse input (line driver).

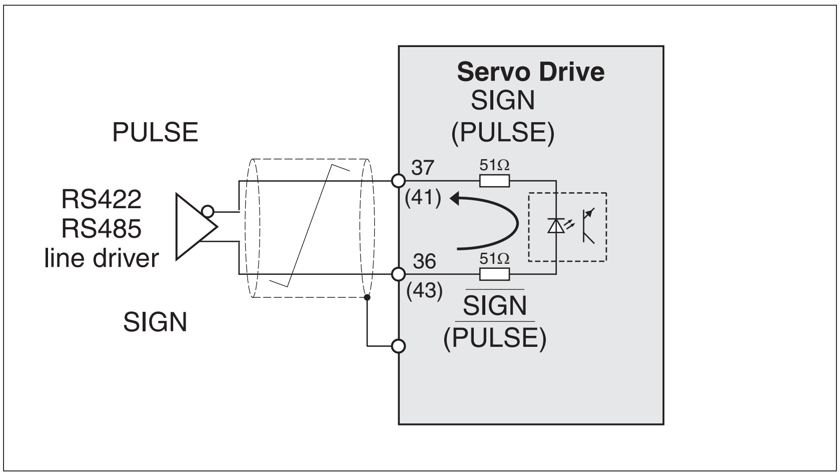

Figure 30: Pulse input (line driver)

Observe the polarity of the input.

High-speed pulses

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

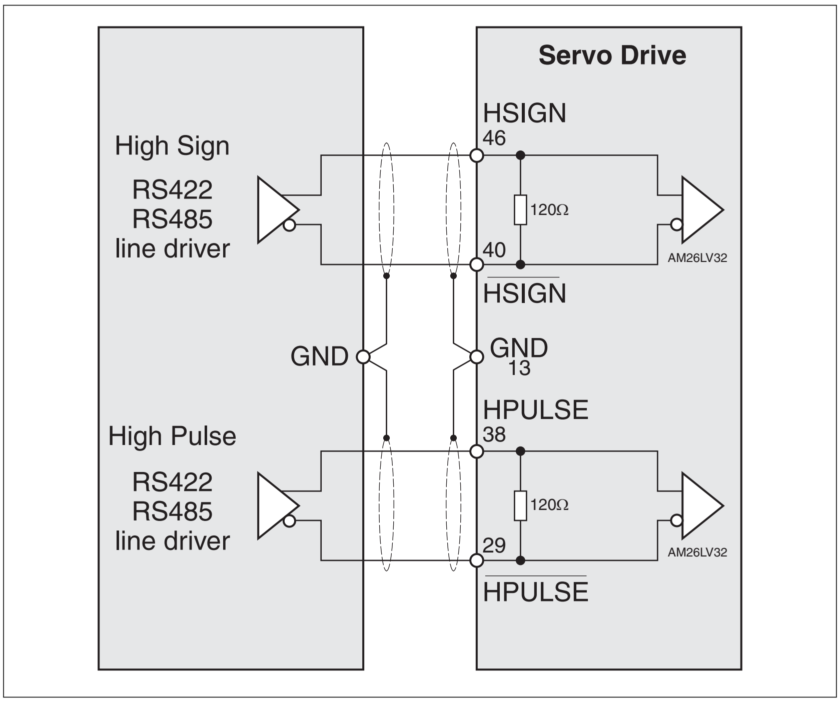

Figure 31: High-speed pulses

Connect the cable shield to the ground connection of the logic controller and to the ground connection of the drive.

NOTE: Ensure that the grounding of the cable is to the equipotential ground plane of your system.

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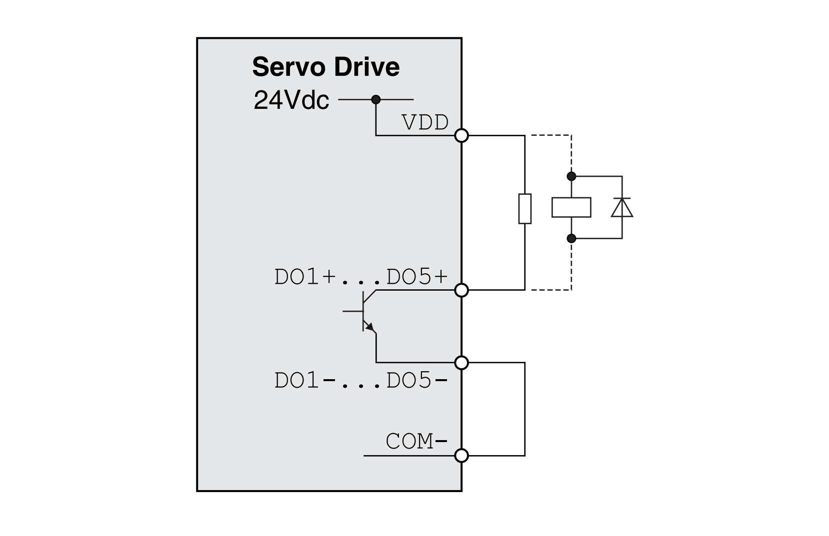
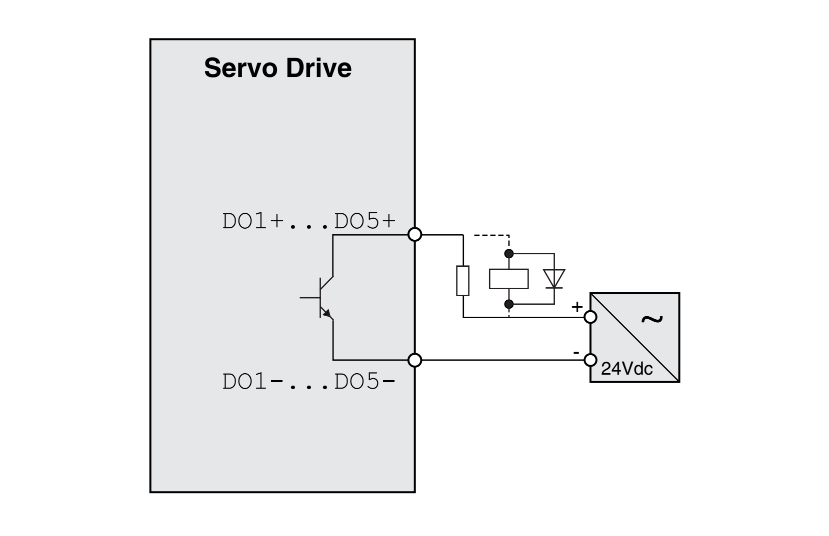
Wiring of the digital outputs (logic type 2)

Example of digital outputs `DO1` ... `DO5` with internal power supply (logic type 2):



Example of digital outputs `DO1` ... `DO5` with external power supply (logic type 2):



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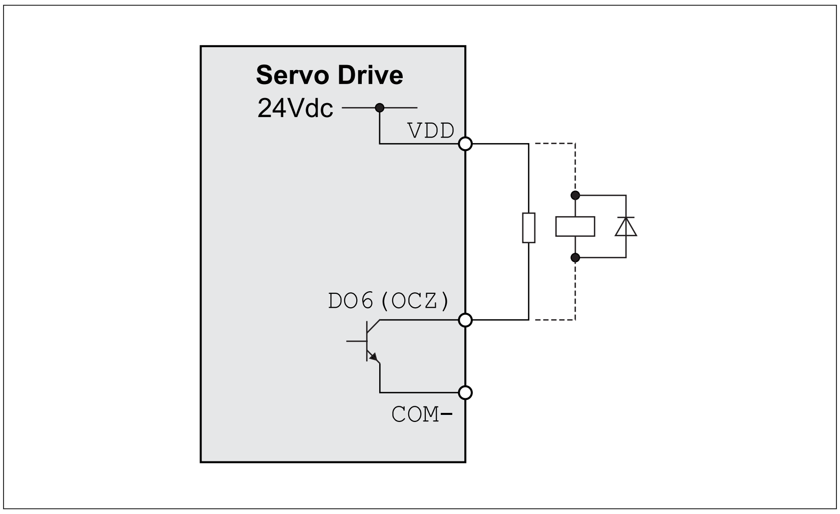
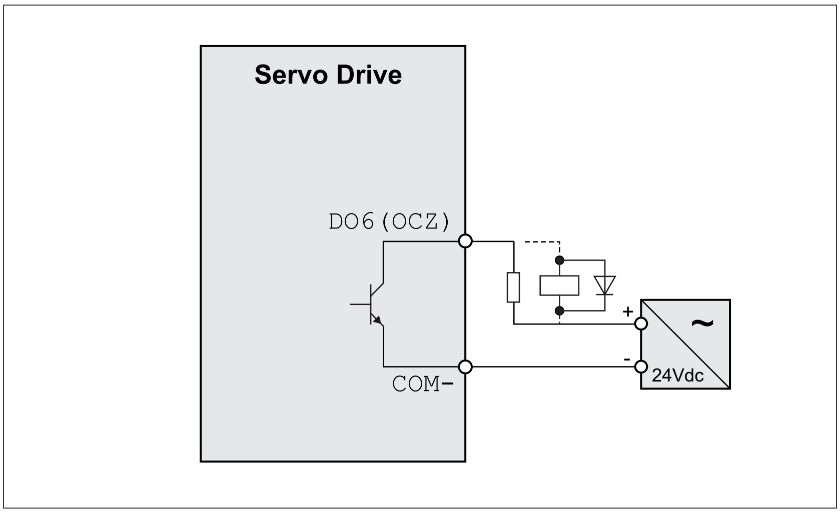
Example of digital output DO6 (OCZ) with internal power supply (logic type 2):



Example of digital output DO6 (OCZ) with external power supply (logic type 2):



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

⚠ CAUTION

OUTPUT CIRCUIT DAMAGE DUE TO INDUCTIVE LOADS

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

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

A diode can be used to protect the signal outputs against inductive loads. Use a diode with the following ratings:
Reverse withstand voltage: Voltage of signal output * 10
Forward current: Higher than the load current

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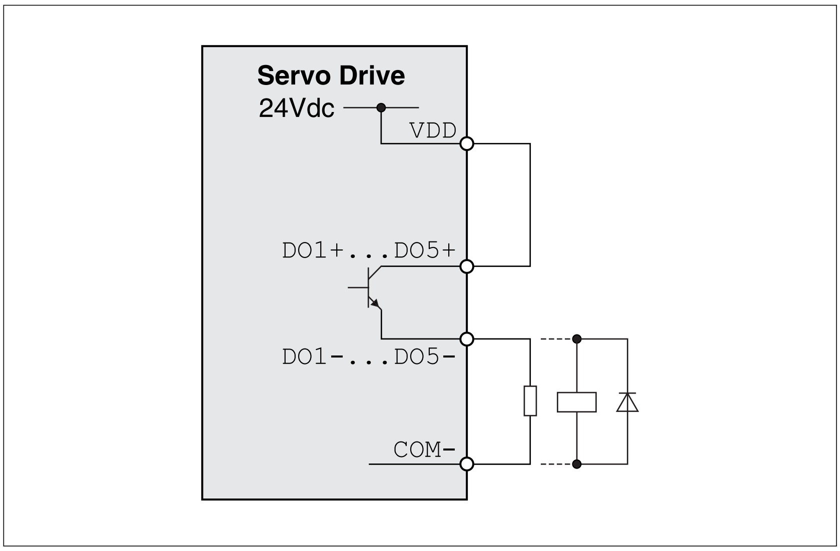
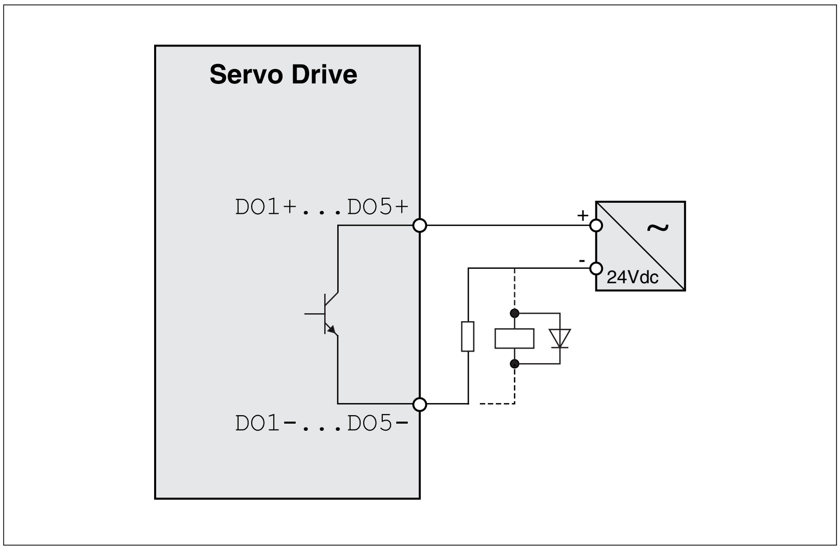
Wiring of the digital outputs (logic type 1)

Example of digital outputs DO1 ... DO5 with internal power supply (logic type 1):



Example of digital outputs DO1 ... DO5 with external power supply (logic type 1):



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

⚠ CAUTION

OUTPUT CIRCUIT DAMAGE DUE TO INDUCTIVE LOADS

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

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

A diode can be used to protect the signal outputs against inductive loads. Use a diode with the following ratings:
Reverse withstand voltage: Voltage of signal output * 10
Forward current: Higher than the load current

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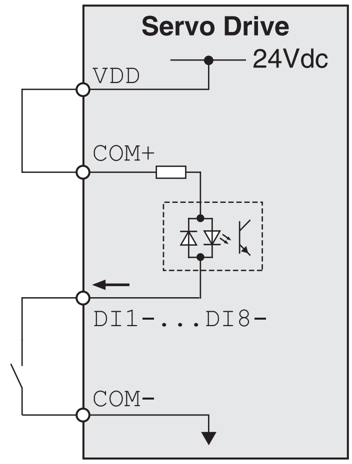
Wiring of the digital inputs (logic type 2)

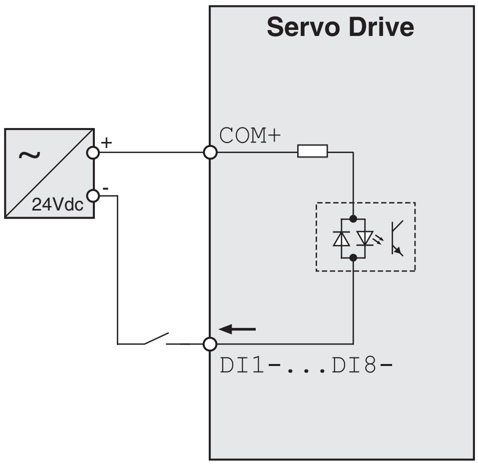
⚠ WARNING
UNINTENDED EQUIPMENT OPERATION
Do not connect an external, 24 Vdc power supply to the VDD connection of the I/O interface (CN1) connector.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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

Example of digital input (logic type 2) with internal power supply:



Example of digital input (logic type 2) with external power supply:



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Wiring of the digital inputs (logic type 1)

⚠ WARNING

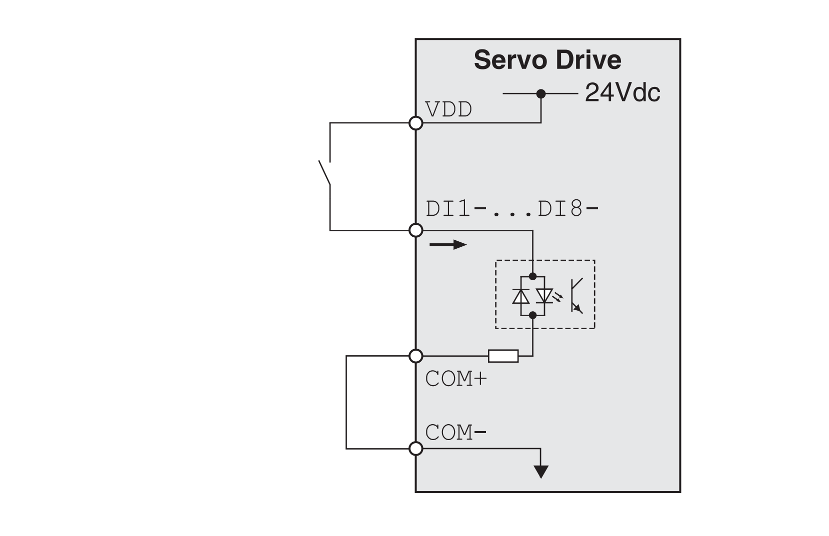
UNINTENDED EQUIPMENT OPERATION

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

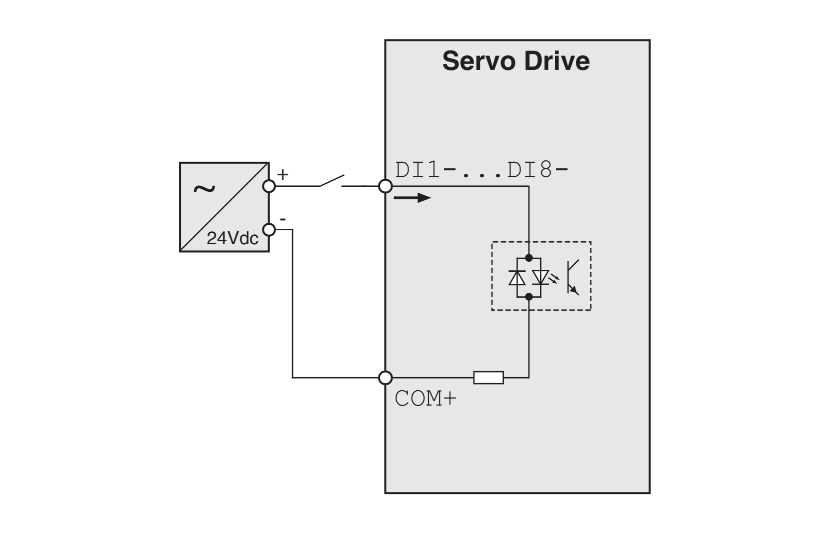
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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

Example of digital input with internal power supply (logic type 1):

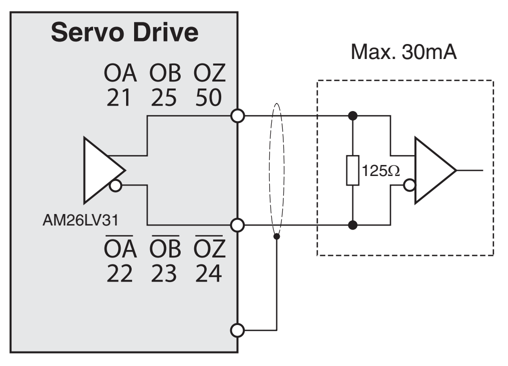


Example of digital input with external power supply (logic type 1):

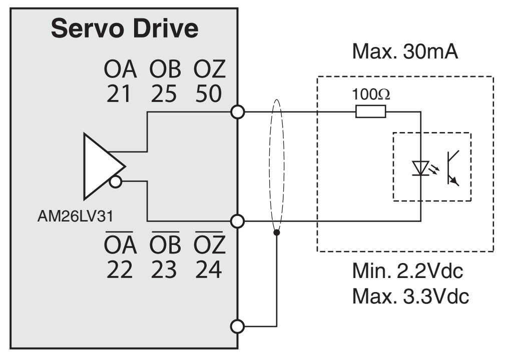


Encoder output signal

Example of encoder output signal Line Driver.



Example of encoder output signal, high-speed optocoupler.



5.4.1.4 Connecting the motor encoder (CN2)

Function and encoder type

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

Note the information on approved motors, see chapter *"2.3 Electrical Data"*.

Cable specifications

See chapter *"4.2 Cables"*, page *79* for information on the cables.

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

- Use pre-assembled cables (page *401*) to reduce the risk of wiring errors.

Wiring diagram

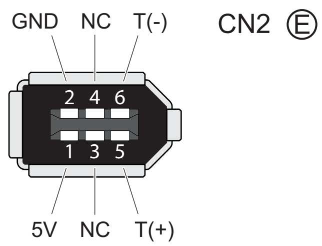


Figure 32: Connection assignment motor encoder (CN2)

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

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

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Connecting the motor encoder

- Verify that wiring, cables and connected interface meet the PELV requirements.
- Note the information on EMC, see chapter *"4.1 Electromagnetic compatibility (EMC)"*. Use equipotential bonding conductors for equipotential bonding.
- Connect the connector to CN2 Encoder.
- Verify that the connector locks snap in properly at the housing.

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

5.4.1.5 Connection PC (CN3)

The commissioning interface (CN3) is an RS485 connection, supported on an RJ45 connector. If the PC used to connect to the commissioning interface has an RS485 port, typically supported on a DB9 connector, you can connect it to this connector (RJ45 / DB9 cable). Otherwise, you can use the USB port of the PC with a USB to RS485 converter.

The commissioning interface may only be used for a point-to-point connection, but not for a point-to-multipoint connection (RS485 network).

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

NOTICE

INOPERABLE EQUIPMENT

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

Failure to follow these instructions can result in equipment damage.

Connecting a PC

A PC with the commissioning software LXM28 DTM Library can be connected for commissioning. The PC is connected via a bidirectional USB/RS485 converter, see chapter Accessories, page *401*.

Cable specifications

See chapter *"4.2 Cables"*, page *79* for information on the cables.

Shield:	Required, both ends grounded
Twisted Pair:	Required
PELV:	Required
Cable composition:	8 * 0.25 mm² (8 * AWG 22)
Maximum cable length:	100 m (328 ft)
Special characteristics:	-

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Wiring diagram

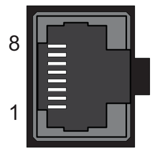

Figure 33: Wiring diagram PC with commissioning software

Pin	Signal	Meaning	I/O
1 ... 3	–	Reserved	-
4	MOD_D1 [1]	Bidirectional transmit/receive signal	RS485 level
5	MOD_D0 [1]	Bidirectional transmit/receive signal, inverted	RS485 level
6 ... 7	–	Reserved	-
8 and connector housing	SHLD	Functional ground / shield - internally connected to ground potential of the drive	-

1) No polarization.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

- Verify that the connector locks snap in properly at the housing.

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5.4.1.6 Connection CAN (CN4)

Function

The device is suitable for connection to CANopen and CANmotion.

A CAN bus connects multiple devices via a bus cable. Each network device can transmit and receive messages. Data between network devices is transmitted serially.

Each network device must be configured before it can be operated on the network. The device is assigned a unique 7 bit node address (node ID) between 1 (01_h) and 127 ($7F_h$). The address is set during commissioning.

The baud rate must be the same for all devices in the fieldbus.

Cable specifications

See chapter *"4.2 Cables"*, page *79* for information on the cables.

Shield:	Required, both ends grounded
Twisted Pair:	Required
PELV:	Required
Cable composition for cables with RJ45 connectors [1]:	8 * 0.14 mm² (AWG 24)
Cable composition with D-SUB connectors:	2 * 0.25 mm², 2 * 0.20 mm² (2 * AWG 22, 2 * AWG 24) Cross section 0.20 mm² (AWG 24) for CAN level, cross section 0.25 mm² (AWG 22) for reference potential.

1) Cables with RJ45 connectors may only be used inside of control cabinets.

- Use equipotential bonding conductors, see page *79*.
- Use pre-assembled cables (page *402*) to reduce the risk of wiring errors.

Connectors D-SUB and RJ45

Usually, a cable with D-Sub connectors is used for CAN fieldbus connection in the field. Inside control cabinets, connections with RJ45 cables have the benefit of easier and faster wiring. In the case of CAN cables with RJ45 connectors, the maximum permissible bus length is reduced by 50%.

Multiple-port taps can be used to connect an RJ45 system inside the control cabinet to a D-Sub system in the field, see the figure below. The trunk line is connected to the multiple-port tap by means of screw terminals; the devices are connected by means of pre-assembled cables. See chapter *"12.6 CANopen connectors, distributors, terminating resistors"*.

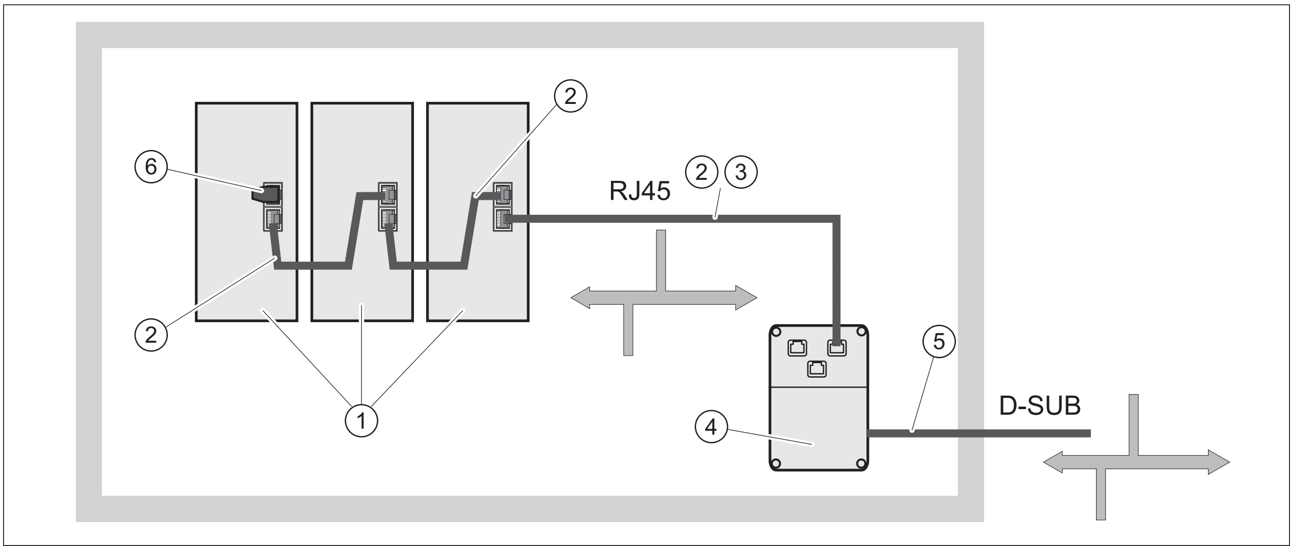

Figure 34: Connection of RJ45 CAN in the control cabinet to the field

(1) Devices with RJ45 CAN connection in the control cabinet

(2) CANopen cables with RJ45 connectors

(3) Connection cables between device and tap, for example TCSCCN4F3M3T for tap TSXCANTDM4

(4) Tap in the control cabinet, for example TSXCANTDM4 as D-SUB four-port tap or VW3CANTAP2 as RJ45 tap

(5) Fieldbus cable (trunk line) to the bus devices outside of the control cabinet, connected to the tap by means of screw terminals.
Cross section 0.20 mm² (AWG 24) for CAN level, cross section 0.25 mm² (AWG 22) for reference potential.

(6) Terminating resistor 120 Ω RJ45 (TCSCAR013M120)

Maximum bus length CAN

The maximum bus length depends on the selected baud rate. The following table shows the maximum overall length of the CAN bus in the case of cables with D-SUB connectors.

Baud rate	Maximum bus length
125 kbit/s	500 m (1640 ft)
250 kbit/s	250 m (820 ft)
500 kbit/s	100 m (328 ft)
1000 kbit/s	20 m (65.6 ft) 1)

1) According to the CANopen specification, the maximum bus length is 40 m. However, in practice, limiting the length to 20 m reduces communication errors caused by external interference.

At a baud rate of 1 Mbit/s, the drop lines are limited to 0.3 m (0.98 ft).

Terminating resistors

Both ends of a CAN bus line must be terminated. A 120 Ω terminating resistor between `CAN_L` and `CAN_H` is used for this purpose.

Connectors with integrated terminating resistors are available as accessories, see chapter *"12.6 CANopen connectors, distributors, terminating resistors"*, page *402*.

Wiring diagram

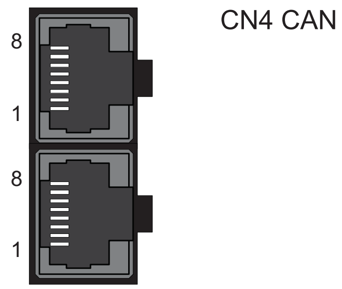

Figure 35: Wiring diagram CN4 CANopen

Pin	Signal	Meaning	I/O
1	`CAN_H`	CAN interface	CAN level
2	`CAN_L`	CAN interface	CAN level
3	`CAN_0V`	Reference potential CAN	-
4 ... 5	-	Reserved	-
6 and connector housing	`SHLD`	Functional ground / shield - internally connected to ground potential of the drive	-
7	`CAN_0V`	Reference potential CAN	-
8	-	Reserved	-

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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Connecting CANopen

- Connect the CANopen cable to CN4 (pins 1, 2 and 3) with an RJ45 connector. Note the information on using cables with RJ45 connectors.
- Verify that the connector locks snap in properly at the housing.

Equipotential bonding conductors

Potential differences can result in excessive currents on the cable shields. Use equipotential bonding conductors to reduce currents on the cable shields.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

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

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

Terminating resistors

Both ends of a CAN bus line must be terminated. A 120 Ω terminating resistor between `CAN_L` and `CAN_H` is used for this purpose.

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5.4.1.7 Connection power stage supply and controller supply (CN5)

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

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

⚠ WARNING

INSUFFICIENT PROTECTION AGAINST OVERCURRENT

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

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

⚠ WARNING

INCORRECT MAINS VOLTAGE

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

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

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

Prior to connecting the device, verify the approved mains types, see chapter *"2.3.1 Electrical data drive"*, page *40*.

Cable specifications

Observe the required cable properties, see page *79*, and the information on electromagnetic compatibility (EMC), see page *77*.

Shield:	-
Twisted Pair:	-
PELV:	-
Cable composition:	The conductors must have a sufficiently large cross section so that the fuse at the mains connection can trip if required.
Maximum cable length:	3 m (9.84 ft)
Special characteristics:	-

Properties of the terminals

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

LXM28•		**UA5, U01, U02, U04, U07, U10, U15**	**U20, U30, U45**
Connection cross section	mm^2 (AWG)	0.75 ... 2.5 (20 ... 14)	0.75 ... 6 (20 ... 10)
Stripping length	mm (in)	8 ... 9	15

Prerequisites for connecting the power stage supply

Note the following information:

- Use upstream mains fuses. See chapter *"2.3.1 Electrical data drive"* for information on fuse types and fuse ratings.
- Observe the EMC requirements. Where required, use surge arresters and mains reactors.
- If the length of the mains cable between the external mains filter and the drive exceeds 200 mm (7.87 in), it must be shielded and grounded at both ends.
- See page *"2.6 Conditions for UL 508C"* for a UL-compliant design.
- Use a protective ground conductor with at least 10 mm^2 (AWG 6) or two protective ground conductors with the cross section of the conductors supplying the power terminals. Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.

DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

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

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

Connection power stage supply

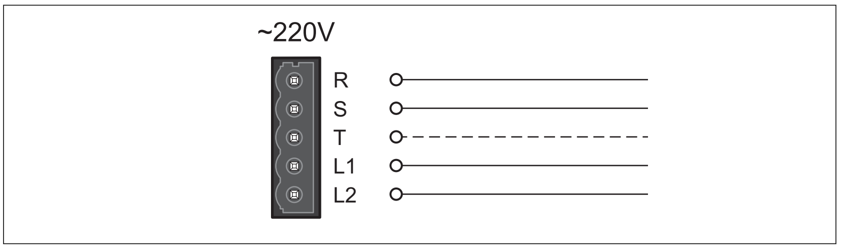

Figure 36: Wiring diagram power stage supply

- Verify the type of mains. See chapter *"2.3.1 Electrical data drive"* for the approved types of mains.
- Connect the mains cable (*Figure 36*).
- Verify that the connector locks snap in properly at the housing.

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

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

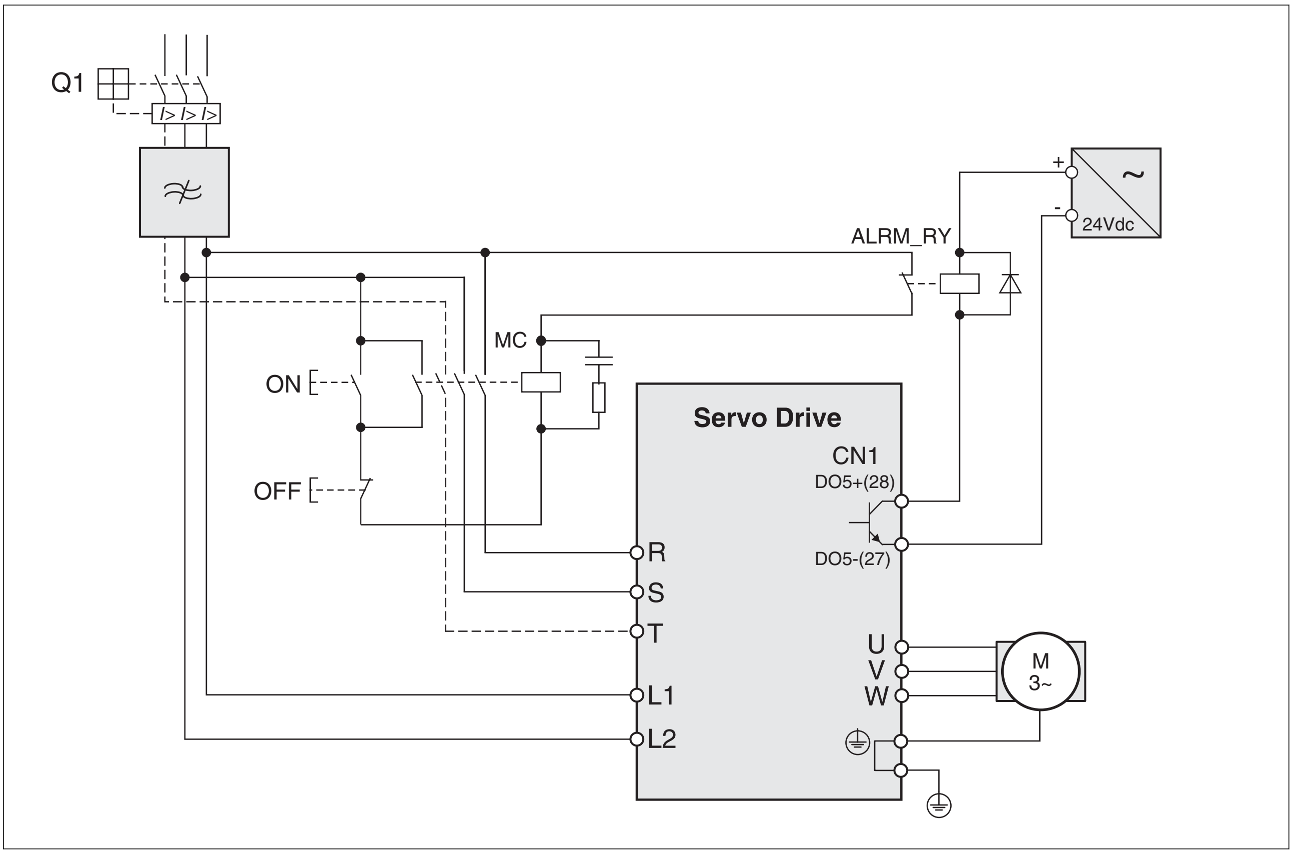

Figure 37: Wiring diagram for devices that can be connected via a single phase or three phases

5.4.1.8 Connection DC bus (CN6)

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

⚠ WARNING

DESTRUCTION OF SYSTEM COMPONENTS AND LOSS OF CONTROL

Verify that all requirements for using the DC bus are met.

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

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This and other important information can be found in the "LXM28 - Common DC bus - Application note". If you wish to take advantage of DC bus sharing, you must first consult the LXM28 - Common DC bus - Application note for important safety-related information.

Requirements for use

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

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5.4.1.9 Connection braking resistor (CN7)

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Further information on the subject	Page
Technical data braking resistor	*49*
Rating the braking resistor	*92*
Order data for external braking resistors (accessory)	*401*

Internal braking resistor

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

External braking resistor

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

Selection and rating of the external braking resistor are described in chapter *"4.6 Rating the braking resistor"*, page *92*. For suitable braking resistors, see chapter *"12 Accessories and spare parts"*, page *406*.

Cable specifications

See chapter *"4.2 Cables"*, page *79* for information on the cables.

Shield:	Required, both ends grounded
Twisted Pair:	-
PELV:	-
Cable composition:	Minimum conductor cross section: Same cross section as power stage supply, see page *126*. The conductors must have a sufficiently large cross section so that the fuse at the mains connection can trip if required.
Maximum cable length:	3 m (9.84 ft)
Special characteristics:	Temperature resistance

The braking resistors listed in chapter *"12 Accessories and spare parts"* have a 3-wire, temperature-resistant cable with a length of 0.75 m (2.46 ft) to 3 m (9.84 ft).

Properties of the terminals CN7

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

LXM28•		UA5, U01, U02, U04, U07, U10, U15	U20, U30, U45
Connection cross section	mm^2 (AWG)	0.75 ... 2.5 (20 ... 14)	0.75 ... 6 (20 ... 10)
Stripping length	mm (in)	8 ... 9	15

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

Wire ferrules: If you use wire ferrules, use only wire ferrules with collars for these terminals.

Wiring diagram

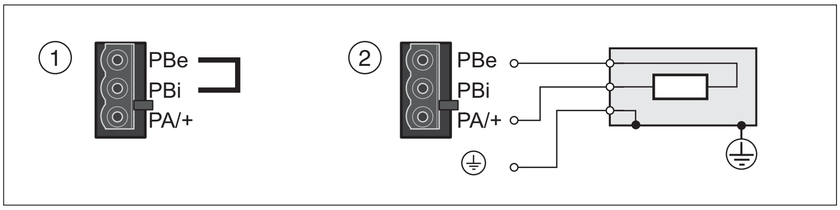

Figure 38: Wiring diagram internal or external braking resistor

(1) Internal braking resistor activated

(2) Connection external braking resistor

Connecting the external braking resistor

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

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⚠ ⚠ DANGER

HAZARD DUE TO ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Before performing work on the drive system:
  - 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.
  - Lock all power switches in the open (non-energized) position.
  - Wait 15 minutes to allow the DC bus capacitors to discharge.
  - Measure the voltage on the DC bus with a properly rated voltage sensing device as per the instructions in the present document 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.
- Do not touch any connectors, contacts, terminals, unshielded components or printed circuit boards while, or if you suspect that, the equipment is under power.
- Use only electrically insulated tools.
- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- Insulate both ends of unused conductors of the motor cable to help prevent AC voltage from coupling to unused conductors in the motor cable.
- 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.

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5.4.1.10 Connecting the motor phases (CN8)

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

DANGER

ELECTRIC SHOCK

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

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

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

DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT WIRING

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

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

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

WARNING

UNINTENDED MOVEMENT

Only use approved combinations of drive and motor.

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

For the list of the combinations see chapter *"1.5 Permissible product combinations"*.

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

Cable specifications

See chapter *"4.2 Cables"*, page *79* for information on the cables.

Shield:	Required, both ends grounded
Twisted Pair:	-
PELV:	The wires for the holding brake must be PELV-compliant.
Cable composition:	3 wires for motor phases The conductors must have a sufficiently large cross section so that the fuse at the mains connection can trip if required.
Maximum cable length:	Depends on the required limit values for conducted interference. Category C3: 50 m (164 ft)
Special characteristics:	Contains wires for the temperature sensor

Note the following information:

- You may only connect the original motor cable.
- If you do not connect the wires at the motor end, you must isolate each wire individually (inductive voltages).
- ▶ Use pre-assembled cables (page *401*) to reduce the risk of wiring errors.

Properties of the terminals CN8

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

LXM28•		**UA5, U01, U02, U04, U07, U10, U15**	**U20, U30, U45**
Connection cross section	mm^2 (AWG)	0.75 ... 2.5 (20 ... 14)	0.75 ... 6 (20 ... 10)
Stripping length	mm (in)	8 ... 9 (0.31 ... 0.35)	15 (0.59)

Monitoring

The drive monitors the motor phases for:

- Short circuit between the motor phases
- Short circuit between the motor phases and ground (applies to drives above size 1)

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

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

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

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Wiring diagram motor

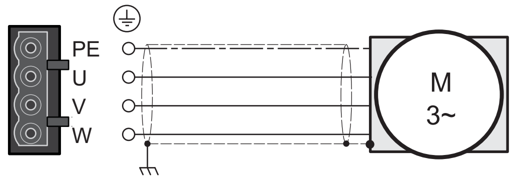

Figure 39: Wiring diagram motor

Connection	**Meaning**	**Color** [1] **(IEC 757)**
U	Motor phase	RD
V	Motor phase	WH
W	Motor phase	BK
PE	Protective ground conductor	GN/YE

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

Connecting the motor cable

- Note the information on EMC, see chapter *"4.1 Electromagnetic compatibility (EMC)"*.
- Connect the motor phases and protective ground conductor to CN8. Verify that the connections U, V, W and PE (ground) match at the motor and the device.
- Verify that the connector locks snap in properly at the housing.

5.4.1.11 Holding brake connection

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

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

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

The factory settings for the signal outputs depend on the operating mode, see chapter *"7.4.3 Default presets of the signal outputs"*. Depending on the operating mode, the signal output function is either assigned to the digital output DO4 or not assigned at all. When you reset the drive to the factory settings with P2-08 = 10, the assignments of the signal output functions are also reset to the factory settings.

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

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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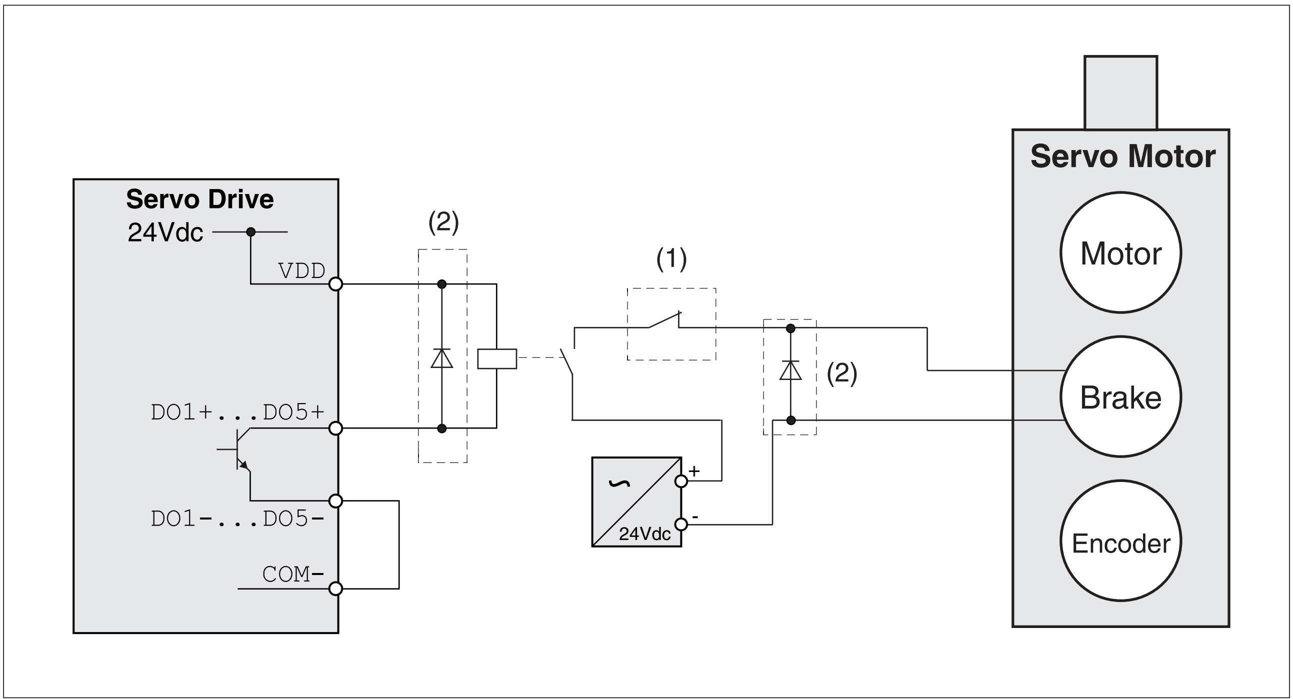

Figure 40: Example (logic type 2) of wiring the holding brake

(1) Triggering an EMERGENCY STOP should apply the holding brake

(2) Flyback diode

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5.4.1.12 Connection STO (CN9)

For important safety information, refer to the chapter *"4.5 Safety function STO ("Safe Torque Off")"* for the requirements for using the safety function STO.

Cable specifications - cables outside of control cabinet

Shield:	Yes
Twisted Pair:	Yes
PELV:	Required
Minimum conductor cross section:	2*0.34 mm^2 (AWG 22)
Maximum cable length:	30 m (98.4 ft)
Fuse:	4 A

Cable specifications - cables inside control cabinet

Shield:	No
Twisted Pair:	No
PELV:	Required
Minimum conductor cross section:	2*0.25 mm^2 (AWG 24)
Maximum cable length:	3 m (9.84 ft)
Fuse:	4 A

Properties of the connection

Connectors Housing Crimp contact	 Molex 436450400 [1)] Molex 430300001 [1)]	
Connection cross section	mm^2 (AWG)	0.25 ... 0.34 (24 ... 22)

1) Or corresponding equivalent.

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Wiring diagram

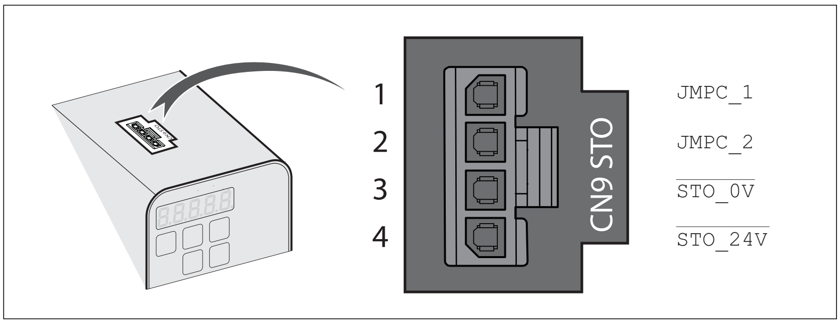

Figure 41: Wiring diagram safety function STO

Pin	Signal	Meaning
1	JMPC_1	Jumper connector 1 to be connected to $\overline{\text{STO\_24V}}$ if the safety function STO is not used in your application
2	JMPC_2	Jumper connector 2 to be connected to $\overline{\text{STO\_0V}}$ if the safety function STO is not used in your application
3	$\overline{\text{STO\_0V}}$	Safety function STO 0 Vdc input 1)
4	$\overline{\text{STO\_24V}}$	Safety function STO 24 Vdc input 1)

1) PELV power supply is required.

Connecting the safety function STO

- Verify that wiring, cables and connected interfaces meet the PELV requirements.
- Connect the safety function STO in accordance with the specifications in chapter *"4.5 Safety function STO ("Safe Torque Off")"*, page *83*.

Deactivating the safety function STO

If the safety function STO is not to be used, it must be deactivated. Plug in the jumper for CN9 to bridge pin 1 and pin 4 as well as pin 2 and pin 3 to deactivate the safety function STO. The jumper for CN9 is factory-fitted.

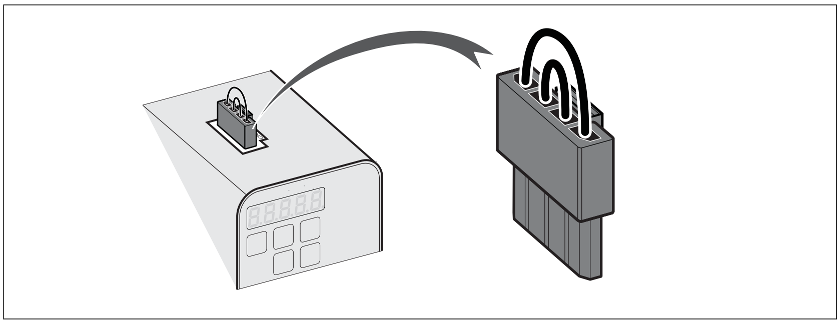

Figure 42: Deactivating the safety function STO

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5.4.2 Electrical installation motor

5.4.2.1 Connections and pin assignments

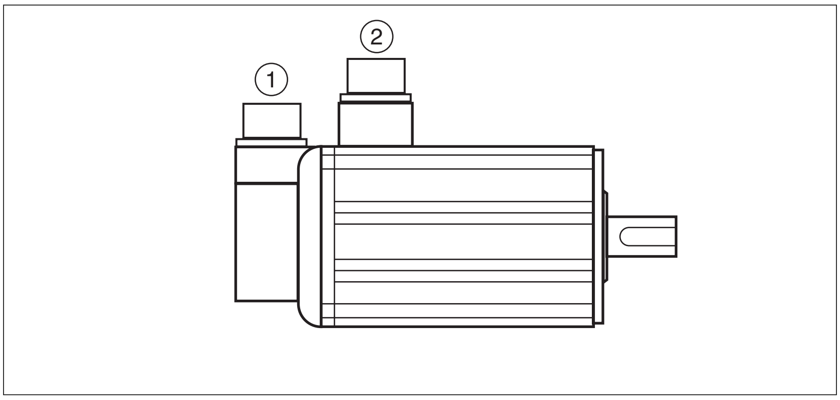

Figure 43: Connection overview

(1) Encoder connection

(2) Motor connection

Pin assignment motor connection Pin assignments of motor phases and holding brake

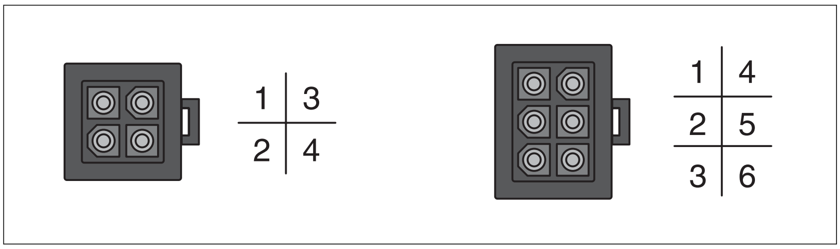

Figure 44: Motor connection plastic connector (type A and type B)

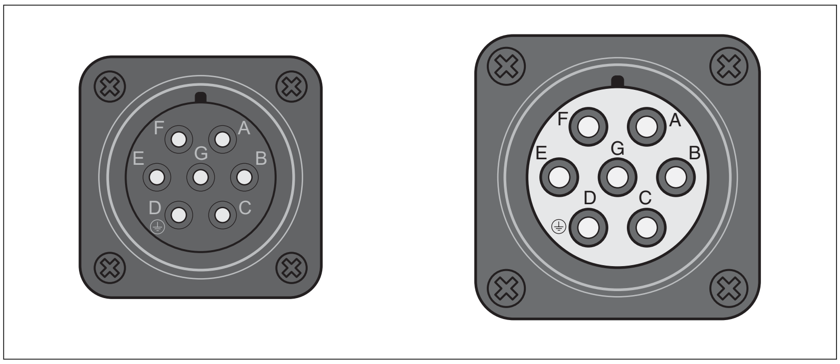

Figure 45: Motor connection MIL connector (type C and type D)

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

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

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Pin assignment encoder connection

Pin assignment of the encoder.

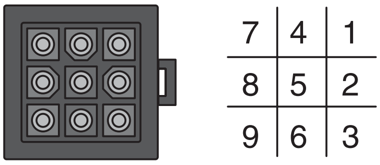

Figure 46: Encoder connection plastic connector (Type A)

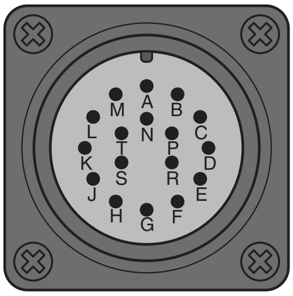

Figure 47: Encoder connection MIL connector (Type B)

Pin Type A	Pin Type B	Signal	Meaning	Color [1] (IEC 757)
1	A	`T+`	DATA	BU
4	B	`T-`	DATA	BU/BK
2	C	-	Reserved	-
3	D	-	Reserved	-
5	F	-	Reserved	-
6	G	-	Reserved	-
7	S	`DC+5V`	Supply voltage	RD/WH
8	R	`GND`	Reference potential	BK/WH
9	L	`Shield`	Shield	BK

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Mating connector

See chapter *"12.2 Connectors and adapters"* for suitable mating connectors.

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5.4.2.2 Connection of motor and encoder

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

⚠ DANGER

FIRE HAZARD DUE TO INCORRECT CONNECTION

Only connect the motor to a matching, approved drive.

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

For the list of the combinations see chapter *"1.5 Permissible product combinations"*.

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

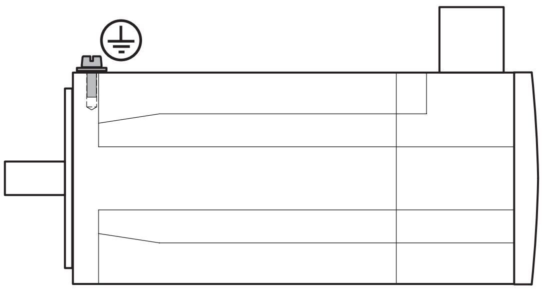
⚠ ⚠ DANGER

ELECTRIC SHOCK

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

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

Protective ground conductor connection



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

Connecting the cables

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

DANGER

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

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

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

▶ Connect the motor cable and the encoder cable to the drive according to the wiring diagram of the drive.

▶ If your motor is equipped with a holding brake, follow the instructions in chapter *"5.4.2.3 Holding brake connection"*.

5.4.2.3 Holding brake connection

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

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

See chapter *"5.4.1.11 Holding brake connection"* for additional information.

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

DANGER

ELECTRICAL SHOCK CAUSED BY DAMAGE TO THE MOTOR CABLE

Use a PELV power supply for the holding brake.

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

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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.

Cable specifications

See chapter *"4.2 Cables"*, page *79* for the cable specifications.

5.5 Verifying installation

Verify proper installation:

- ▶ Verify the mechanical installation of the entire drive system:
- Does the installation meet the specified distance requirements?
- Did you tighten all fastening screws with the specified tightening torque?
- ▶ Verify the electrical connections and the cabling:
- Did you connect all protective ground conductors?
- Do all fuses have the correct rating; are the fuses of the specified type?
- Did you connect all wires of the cables or insulate them?
- Did you properly connect and install all cables and connectors?
- Are the mechanical locks of the connectors correct and effective?
- Did you properly connect the signal wires?
- Are the required shield connections EMC-compliant?
- Did you take all measures for EMC compliance?

- ▶ Verify that all covers and seals of the control cabinet are properly installed to meet the required degree of protection.

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6 Commissioning

This chapter describes how to commission the product.

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

DANGER

ELECTRIC SHOCK

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

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

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

WARNING

UNINTENDED EQUIPMENT OPERATION

- Only start the system if there are no persons or obstructions in the zone of operation.
- Do not operate the drive system with unknown settings or data.
- Never modify a parameter unless you fully understand the parameter and all effects of the modification.
- After modifications to settings, restart the drive and verify the saved data or settings.
- When commissioning the product, carefully run tests for all operating states and potential error situations.
- Verify the functions after replacing the product and also after making modifications to the settings or data.

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

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

The metal surfaces of the product may exceed 80 °C (176 °F) during operation.

⚠ WARNING

HOT SURFACES

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

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

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

⚠ WARNING

MOVING, UNGUARDED EQUIPMENT

Verify that rotating parts cannot cause injuries or equipment damage.

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

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.

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

⚠ WARNING

UNINTENDED MOVEMENT

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

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

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

When the product is operated for the first time, there is a risk of unanticipated movements caused by, for example, incorrect wiring or unsuitable parameter settings.

⚠ WARNING

UNINTENDED MOVEMENT

- Run initial tests without coupled loads.
- Verify that a functioning emergency stop push-button is within reach of all persons involved in running tests.
- Anticipate movements in unintended directions or oscillation of the motor.
- Only operate the system if there are no persons or obstructions in the zone of operation.

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

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The motor may move, tip and fall as a result of incorrect or insufficient mounting.

⚠ WARNING
FALLING PARTS Mount the motor so that it cannot come loose (use of securing screws with appropriate tightening torque), especially in cases of fast acceleration or continuous vibration. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

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6.1 Overview

6.1.1 Commissioning steps

You must also re-commission an already configured device if you want to use it under changed operating conditions.

To be done

"5.5 Verifying installation"
"6.5.1 Verifying the direction of movement"
"6.5.2 Test operation in operating mode Velocity (V)"
"6.5.3 Tuning the control loops"
"6.5.4 Verifying the safety function STO"

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6.1.2 Commissioning tools

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

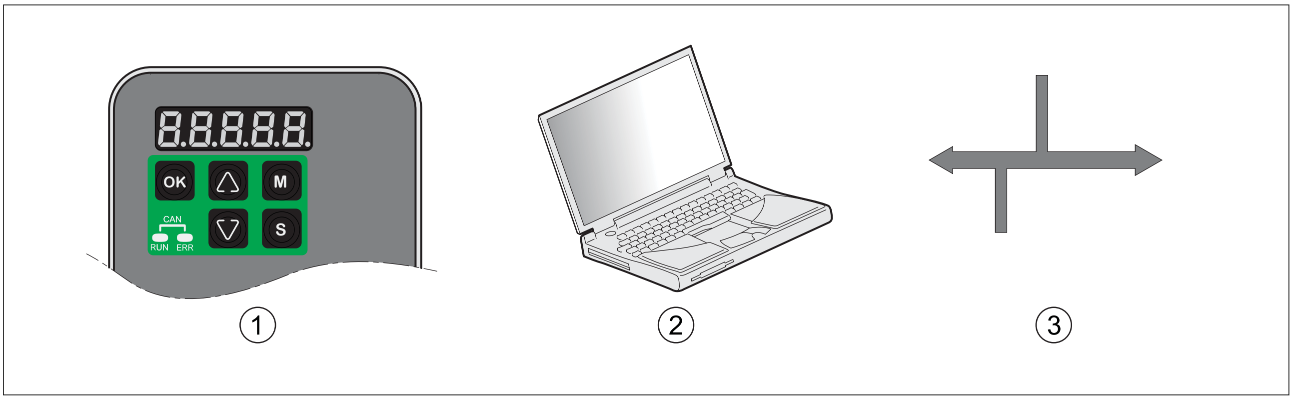

Figure 48: Commissioning tools

(1) Integrated HMI
(2) PC with commissioning software LXM28 DTM Library
(3) Fieldbus

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

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6.2 Integrated HMI

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

Overview

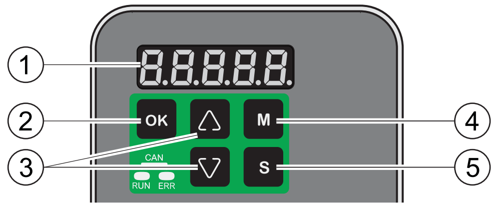

Figure 49: Controls at the integrated HMI

(1) 5-digit 7-segment display
(2) OK key
(3) Arrow keys
(4) M key
(5) S key

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

DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT WIRING

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

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

6.2.1 HMI structure

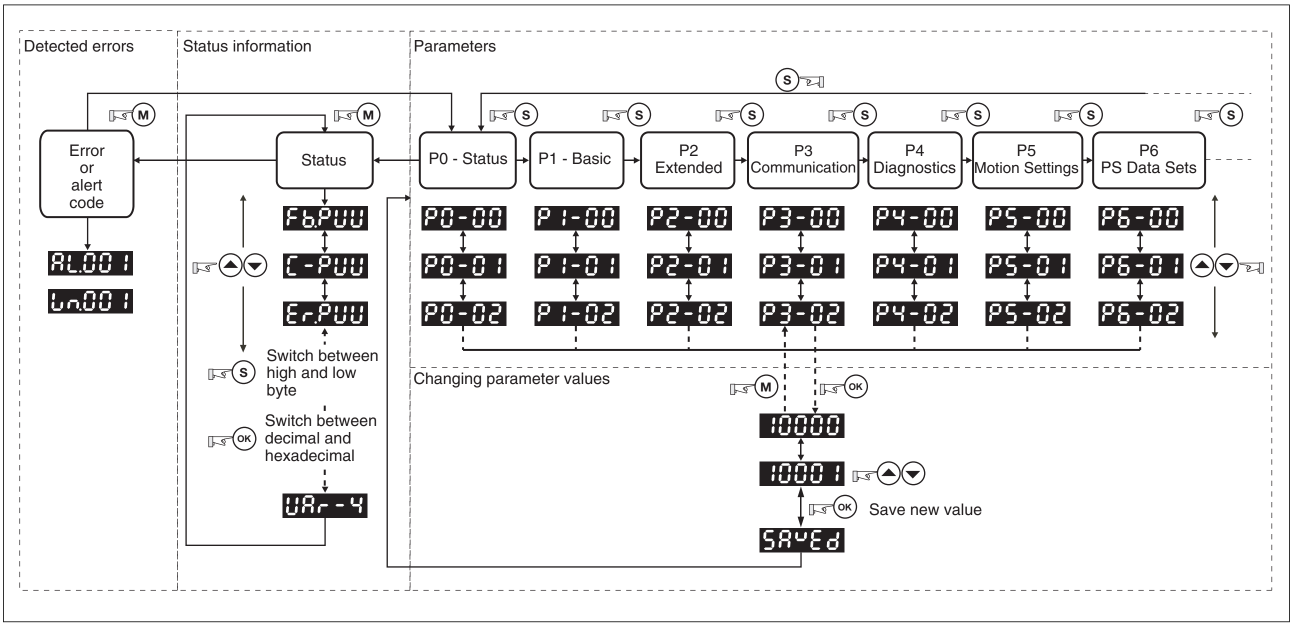

Figure 50: HMI structure

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

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

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6.2.2 7-segment display

Saving settings

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

7-segment display	Description
SAuEd	The new parameter value was successfully saved.
r-oLY	The parameter value is a read-only value and cannot be saved (Read-Only).
Prot	Changing a parameter value requires exclusive access. See See chapter *"7.1 Access channels"*.
out-r	The new parameter value is outside the permissible value range (Out of range).
Sruon	The new parameter value can only be saved when the power stage is disabled (Servo On).
Po-On	The new parameter value becomes active the next time the product is powered on (Power On).
Error	Displayed whenever a value you have entered for a parameter is, for various reasons, rejected by the drive.

Representation of numerical values on the 7-segment display

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

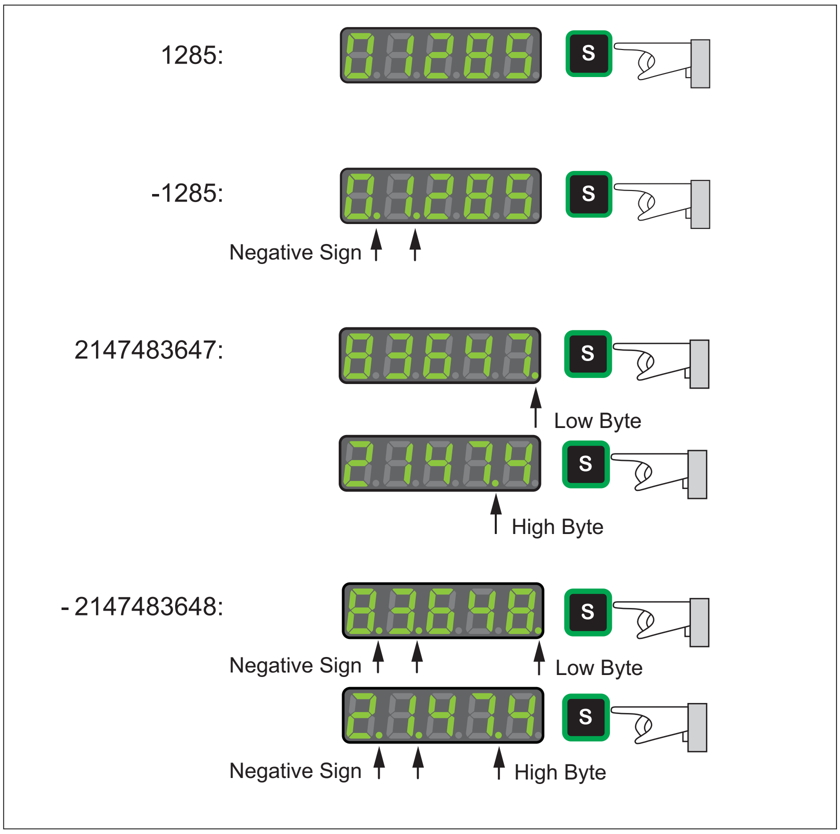

Figure 51: Example of representation of decimal values

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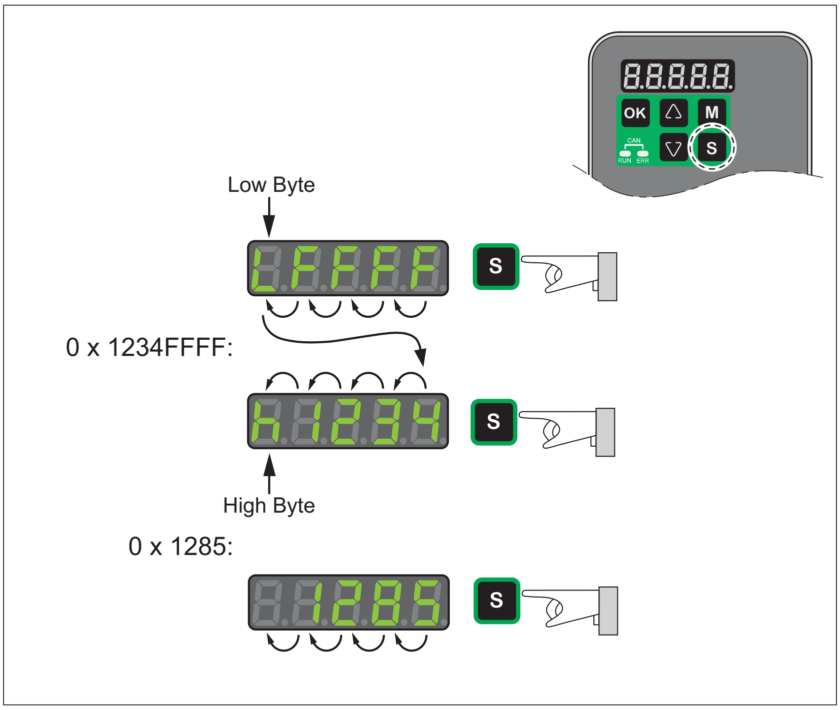

Figure 52: Example of representation of hexadecimal values

Changing the sign on the 7-segment display

7-segment display	Description
24680 2.4.680 H343E HCbC2	You can change the sign of a value by holding down the **S** key for a period of more than 2 seconds. Negative decimal values are represented with 2 dots. Negative hexadecimal values are represented as a two's complement.

Alert messages and error messages on the 7-segment display

7-segment display	Description
Wnnnn	If an alert condition is detected, "Wnnnn" is displayed. "Wn" identifies the code as an alert. The subsequent 3 digits "nnn" represent the number of the alert. See chapter *"9.2 Alert codes"* for a list of alerts.
ALnnn	If an error is detected "ALnnn" is displayed. "AL" identifies the code as a detected error. The subsequent 3 digits "nnn" represent the error number. See chapter *"9.3 Error codes"* for a list of errors.
StoP	The display shows "STOP" if exclusive access is enabled while the power stage is still enabled. See chapter *"7.1 Access channels"* for details on access channels.

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6.2.3 Status information via the HMI

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

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Setting P0-02	Description
0	Actual position (with gear ratio applied) in the unit PUU
1	Target position (with gear ratio applied) in the unit PUU
2	Deviation between actual position and target position (with gear ratio applied) in the unit PUU
3	Actual position in motor increments (1280000 pulses/revolution)
4	Target position in motor increments (1280000 pulses/revolution)
5	Deviation between actual position and target position in motor increments (1280000 pulses/revolution)
6	Reference value in kilopulses per second (kpps)
7	Actual velocity in min^{-1}
8	Voltage for target velocity in V
9	Target velocity in min^{-1}
10	Voltage for target torque in V
11	Target torque in percent of continuous motor current
12	Available current overhead used in percent of continuous motor current
13	Peak current overhead consumed since the last power cycle of the drive in percent of continuous motor current (maximum value of occurring in setting 12 since last power cycle)
14	Mains voltage in V
15	Ratio of load inertia and motor inertia (divided by 10)
16	Power stage temperature in degrees Celsius (°C)
17	Resonance frequency in Hz
18	Absolute pulse number relative to encoder
19	Mapping parameter 1: Content of parameter P0-25 (mapping target is specified via parameter P0-35)
20	Mapping parameter 2: Content of parameter P0-26 (mapping target is specified via parameter P0-36)
21	Mapping parameter 3: Content of parameter P0-27 (mapping target is specified via parameter P0-37)
22	Mapping parameter 4: Content of parameter P0-28 (mapping target is specified via parameter P0-38)
23	Status indication 1: Content of parameter P0-09 (the status information to be displayed is specified by parameter P0-17)
24	Status indication 2: Content of parameter P0-10 (the status information to be displayed is specified by parameter P0-18)
25	Status indication 3: Content of parameter P0-11 (the status information to be displayed is specified by parameter P0-19)
26	Status indication 4: Content of parameter P0-12 (the status information to be displayed is specified by parameter P0-20)

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Setting P0-02	Description
27	Reserved
39	Status of digital inputs (content of P4-07)
40	Status of digital outputs (content of P4-09)
41	Drive status (content of P0-46)
42	Operating mode (content of P1-01)
49	Actual position encoder (content of P5-18)
50	Target velocity in min^{-1}
53	Target torque in 0.1 percent of the nominal torque
54	Actual torque in 0.1 percent of the nominal torque
55	Actual torque in 0.01 A
77	Target velocity in min^{-1} in operating modes PT and PS
96	Firmware version and firmware revision of drive (P0-00 and P5-00)
111	Number of detected error

6.3 Setting the device address, baud rate and connection settings

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

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

Use the parameter `P3-05` to set the CANopen device address.

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

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

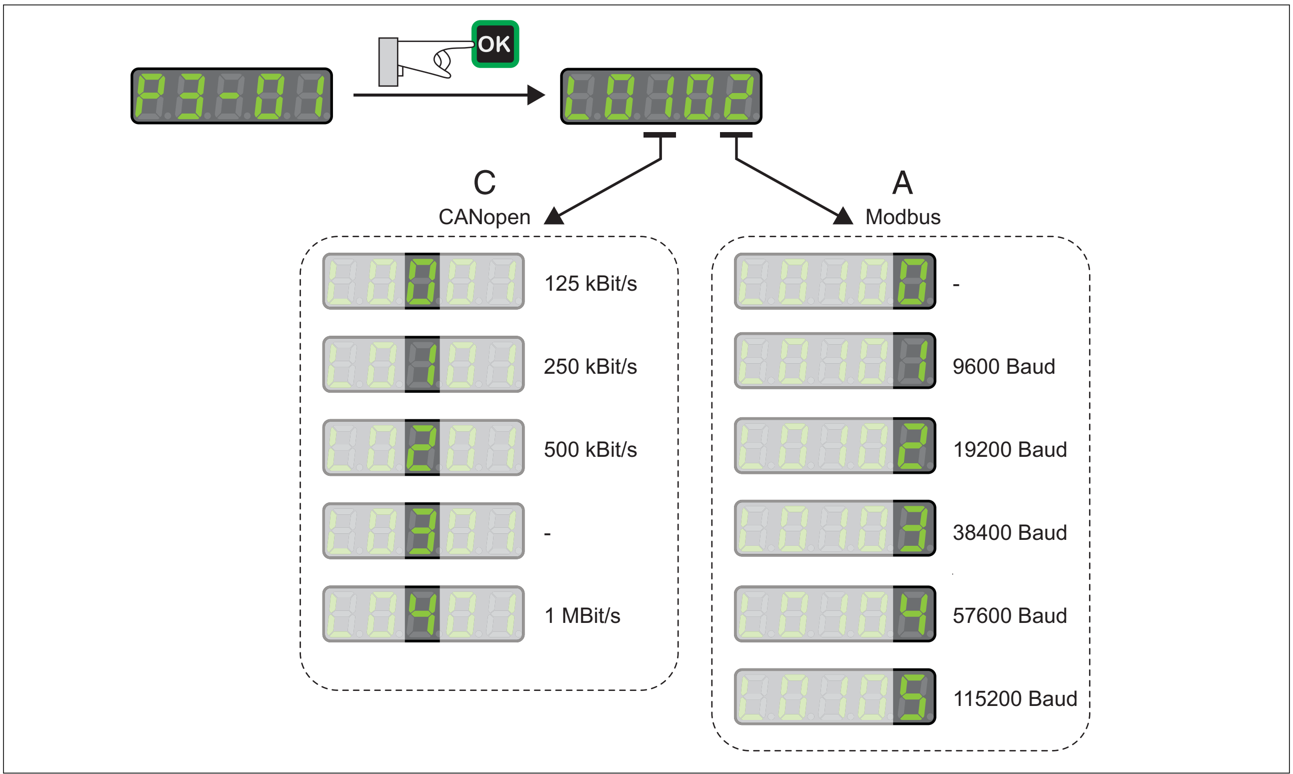

Figure 53: Setting the baud rate

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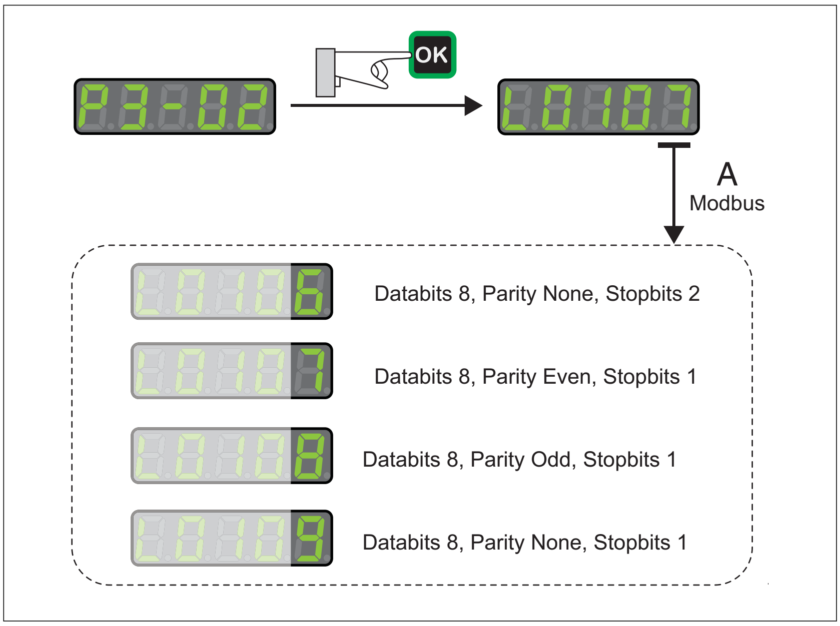

Figure 54: Modbus Connection Settings

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P3-00 ADR	Device Address Modbus Applicable operating mode: PT, PS, V, T The device address must be unique. Changed settings become active the next time the product is powered on.	- 1 127 247 Decimal	u16 RW per.	Modbus 400_h CANopen 4300_h
P3-01 BRT	Transmission Rate Applicable operating mode: PT, PS, V, T This parameter is used to set the data transmission rate. For details see chapter *"6.3 Setting the device address, baud rate and connection settings"*. If this parameter is set via CANopen, only the CANopen transmission rate can be set. Changed settings become active the next time the product is powered on.	- 0_h 102_h 405_h Hexadecimal	u16 RW per.	Modbus 402_h CANopen 4301_h
P3-02 PTL	Modbus Connection Settings Applicable operating mode: PT, PS, V, T This parameter specifies the Modbus connection settings. For details see chapter *"6.3 Setting the device address, baud rate and connection settings"*. Changed settings become active the next time the product is powered on.	- 6_h 7_h 9_h Hexadecimal	u16 RW per.	Modbus 404_h CANopen 4302_h
P3-03 FLT	Detected Modbus Communication Errors - Handling Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive to a detected communication error. Value 0: Detected alert Value 1: Detected error	- 0_h 0_h 1_h Hexadecimal	u16 RW per.	Modbus 406_h CANopen 4303_h
P3-04 CWD	Modbus Connection Monitoring Applicable operating mode: PT, PS, V, T This parameter specifies the maximum permissible duration for communication timeout. When this time has elapsed, the communication timeout is treated as a detected error. Setting this parameter to 0 to disables connection monitoring.	ms 0 0 20000 Decimal	u16 RW per.	Modbus 408_h CANopen 4304_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P3-05 CMM	Device Address CANopen Applicable operating mode: PT, PS, V, T This parameter specifies the CANopen address of the drive in decimal format. The device address must be unique. Changes to this parameter becomes effective only after a restart of the drive. Changed settings become active the next time the product is powered on.	- 0 0 127 Decimal	u16 RW per.	Modbus 40A$_h$ CANopen 4305$_h$
P3-07 CDT	Modbus Response Delay Time Applicable operating mode: PT, PS, V, T This parameter specifies the time delay with which the drive responds to the Modbus master.	0.5ms 0 0 1000 Decimal	u16 RW per.	Modbus 40E$_h$ CANopen 4307$_h$

6.4 Commissioning software

The commissioning software LXM28 DTM Library has a graphic user interface and is used for commissioning, diagnostics and testing settings.

Online help The commissioning software offers help functions, which can be accessed via "? Help Topics" or by pressing the F1 key.

Source of commissioning software The latest version of the commissioning software LXM28 DTM Library is available for download from the Internet.

http://www.schneider-electric.com

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6.5 Commissioning procedure

6.5.1 Verifying the direction of movement

⚠ WARNING

UNINTENDED MOVEMENT CAUSED BY INTERCHANGED MOTOR PHASES

Do not interchange the motor phases.

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

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

Direction of movement

Movements are made in positive or in negative directions.
Definition of the direction of movement: Positive positive direction of movement is when the motor shaft rotates counterclockwise as you look at the end of the protruding motor shaft.

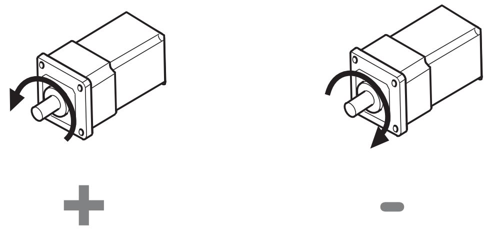

Figure 55: Direction of movement with factory settings

Verifying the direction of movement

- ▶ Start the operating mode Jog. (HMI: P4-05)
- ◁ The HMI displays the velocity in the unit min^{-1} for the operating mode JOG.
- ▶ Set a velocity suitable for your application and conform with the OK key.
- ◁ The HMI displays JOG.

Movement in positive direction:

- ▶ Press the "Up Arrow" key.
- ◁ A movement is made in positive direction.

Movement in negative direction:

- ▶ Press the "Down Arrow" key.
- ◁ A movement is made in negative direction.

Press the M key to terminate the operating mode Jog.

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Changing the direction of movement

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

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

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

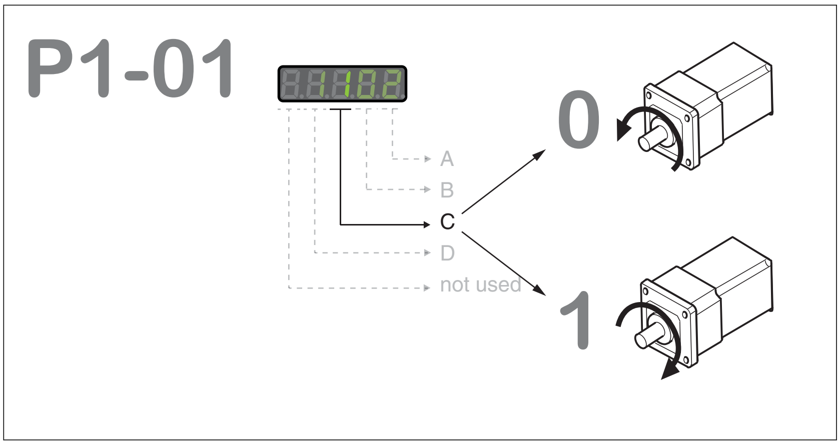

Figure 56: Changing the direction of movement

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6.5.2 Test operation in operating mode Velocity (V)

- Select the operating mode Velocity (V) via the parameter `P1-01`: = 2. See See chapter *"7.3.1 Setting the operating mode"*.

  Set the parameter `P1-01` to D=1. This assigns suitable defaults to the signal input functions for the operating mode Velocity (V) so that you only have to set DI6 to DI8.

  New settings for the parameter `P1-01` do not become active until the drive is powered on the next time.
- Restart the drive.
- Select the following signal input functions via the parameters P2-10 to P2-17:

Digital input	Parameter	Setting	Signal	Function	PIN at CN1
DI1	`P2-10`	101	SON	Enable power stage	9
DI2	`P2-11`	109	TRQLM	Activate Torque Limitation	10
DI3	`P2-12`	114	SPD0	Velocity Reference Value Bit 0	34
DI4	`P2-13`	115	SPD1	Velocity Reference Value Bit 1	8
DI5	`P2-14`	102	FAULT_RESET	Fault Reset	33
DI6	`P2-15`	0	-	-	-
DI7	`P2-16`	0	-	-	-
DI8	`P2-17`	0	-	-	-

See chapter *"7.4.2 Parameterization of the signal input functions"* for additional information on the settings.

Error messages HMI

Message	Cause	Remedy
AL013	Parameter `P2-17` not set to 0 (deactivated).	Set the parameter `P2-17` to 0.
AL014	Parameter `P2-15` not set to 0 (deactivated).	Set the parameter `P2-15` to 0.
AL015	Parameter `P2-16` not set to 0 (deactivated).	Set the parameter `P2-16` to 0.

See chapter *"9 Diagnostics and troubleshooting"* for additional information on error messages.

Target velocity

The target velocity is selected via the signal input functions SPD0 (LSB) and SPD1 (MSB) (bit-coded):

-	Signal state of the digital signal inputs		Target velocity via:		Range
	SPD1	SPD0			
S1	0	0	External analog signal	Voltage between V_REF (pin 42) and GND (pin 44)	-10V ... 10V
S2	0	1	Internal parameters	`P1-09`	-60000 ... 60000 *0.1 min^{-1}
S3	1	0		`P1-10`	
S4	1	1		`P1-11`	

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- ▶ Enable the power stage via DI1 (SON).
- ◁ If DI3 (SPD0) and DI4 (SPD1) are deactivated, the target velocity is supplied via the analog input V_REF.
- ▶ Activate DI3(SPD0).
- ◁ The target velocity is supplied via the parameter `P1-09`. The factory setting for the target velocity is 1000 min^{-1}.

6.5.3 Tuning the control loops

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

⚠ WARNING

UNINTENDED MOVEMENT

- Only start the system if there are no persons or obstructions in the zone of operation.
- Verify that the values for the parameters `P9-26` and `P9-27` do not exceed the available movement range.
- Verify that the parameterized movement ranges are available.
- In determining the available movement range, consider the additional distance for the deceleration ramp in the case of an EMERGENCY STOP.
- Verify that the parameter settings for a Quick Stop are correct.
- Verify correct operation of the limit switches.
- Verify that a functioning emergency stop push-button is within reach of all persons involved in the operation.

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

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

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

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

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6.5.3.1 Easy Tuning

Easy Tuning is started via the HMI or the commissioning software LXM28 DTM Library.

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

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

Performing Easy Tuning

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

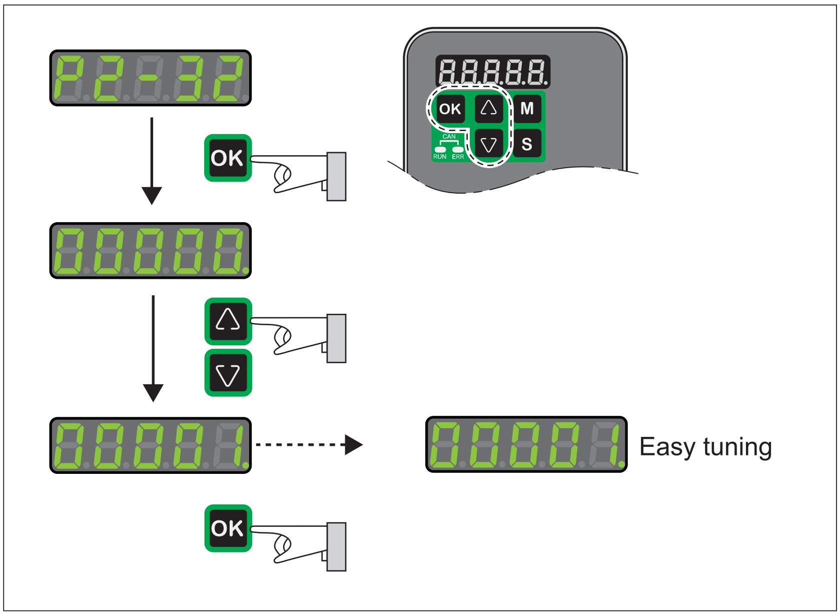

Figure 57: Performing Easy Tuning

After you have started Easy Tuning via P2-32, the display of the HMI shows the progress as a percentage from tn000 to tn 100.

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

If autotuning completes successfully, the display of the HMI shows the message donE.
Press the **OK** key of the HMI to save the control loop parameters. The display of the HMI briefly shows the message SAVEd.
Press the **M** key of the HMI to discard the autotuning results.

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

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

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6.5.3.2 Comfort Tuning

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

Optimization criteria for Comfort Tuning

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

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

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

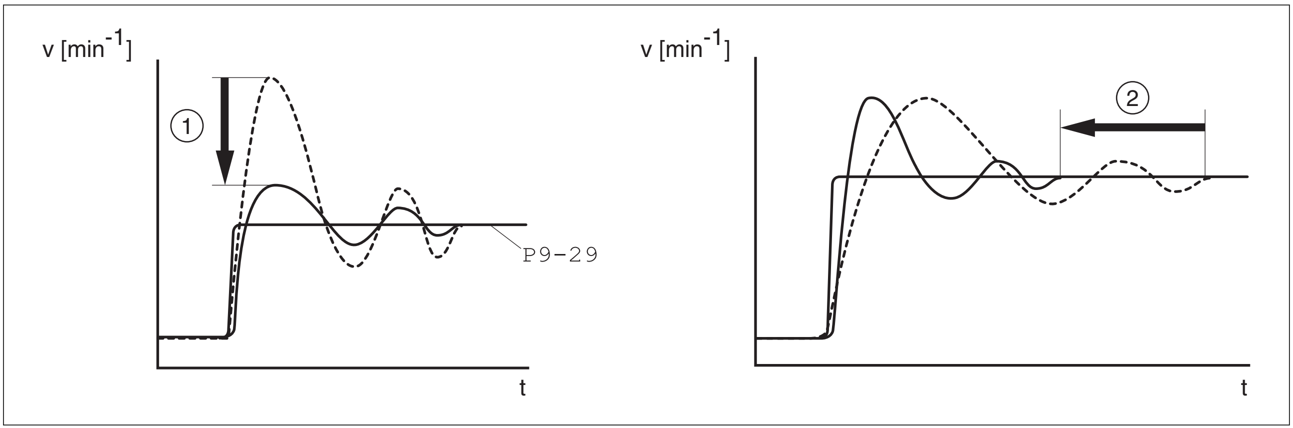

Figure 58: Optimization in terms of overshoot or settling time

(1) Optimization for minimum overshoot
(2) Optimization for minimum settling time

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

Parameters for the movement for Comfort Tuning

The following settings must be made for Comfort Tuning:

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

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

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P9-20 LTNCYCLE	Autotuning - Direction of Movement Applicable operating mode: PT, PS, V This parameter sets the direction of movement for autotuning. Value 0: Both directions of movement Value 2: One direction of movement	- 0 0 3 Decimal	s16 RW -	Modbus $A28_h$ CANopen 4914_h

Setting the velocity Set the velocity via the parameter P9-29.

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P9-29 LTNVCRUISE	Autotuning - Velocity Applicable operating mode: PT, PS, V Bits 0 ... 15: Velocity for positive direction of movement Bits 16 ... 31: Velocity for negative direction of movement	0.1rpm|0.1rpm - - - Decimal	u32 RW -	Modbus $A3A_h$ CANopen $491D_h$

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

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

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

J_M = Moment of inertia of the motor in kg cm^2
J_{load} = Moment of inertia of the load in kg cm^2
M_{max} = Peak torque in Nm
M_N = Nominal torque in Nm

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P9-31 PTACCDEC	Autotuning - Acceleration and Deceleration Applicable operating mode: PT, PS, V Bits 0 ... 15: Acceleration for Autotuning Bits 16 ... 31: Deceleration for Autotuning	ms|ms 6| 6 6000| 6000 65500| 65500 Decimal	u32 RW -	Modbus $A3E_h$ CANopen $491F_h$

Setting the movement range

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

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P9-26` PTPOS	Autotuning - Movement Range in Direction 1 Applicable operating mode: PS This parameter specifies the movement range for autotuning in direction of movement 1. The sign of the value determines the direction of movement: Positive value: Positive direction of movement as set via parameter P1-01 Negative value: Negative direction of movement as set via parameter P1-01 See parameter P9-20 to select one direction of movement or both directions of movement for Comfort Tuning.	PUU -2147483647 0 2147483647 Decimal	s32 RW -	Modbus $A34_h$ CANopen $491A_h$
`P9-27` PTNEG	Autotuning - Movement Range in Direction 2 Applicable operating mode: PS This parameter specifies the movement range for autotuning in direction of movement 2. The sign of the value determines the direction of movement: Positive value: Positive direction of movement as set via parameter P1-01 Negative value: Negative direction of movement as set via parameter P1-01 See parameter P9-20 for Comfort Tuning in a single or in both directions of movement. See parameter P9-20 to select one direction of movement or both directions of movement for Comfort Tuning.	PUU -2147483647 0 2147483647 Decimal	s32 RW -	Modbus $A36_h$ CANopen $491B_h$

Setting smoothing

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

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

The following options are available for manual smoothing:

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

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P9-23` LTNSTIFF	Defines which values will be used for the position command filters. Applicable operating mode: PT, PS, V Value 0: Automatic smoothing via S-curve optimization of the value Value 1: Manual smoothing	- 0 0 1 Decimal	u16 RW -	Modbus $A2E_h$ CANopen 4917_h
`P8-34` MOVESMOOTH-MODE	Smoothing Filter for Operating modes PT and PS - Type Applicable operating mode: PT, PS Value 0: No smoothing Value 1: LPF smoothing Value 2: S-curve smoothing Setting can only be changed if power stage is disabled.	- 0 2 2 Decimal	u16 RW per.	Modbus 944_h CANopen 4822_h

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

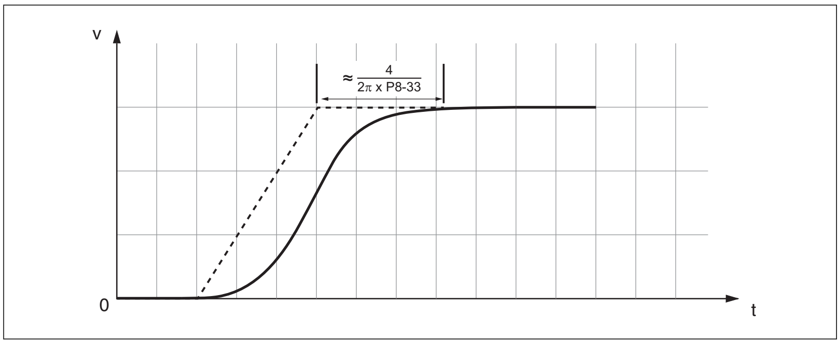

Figure 59: Comfort Tuning with smoothing via low-pass filter

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P8-33` MOVE-SMOOTHLPFHZ	Low Pass Filter Setting Applicable operating mode: PT, PS	Hz 1 5000 5000 Decimal	u16 RW per.	Modbus 942_h CANopen 4821_h

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

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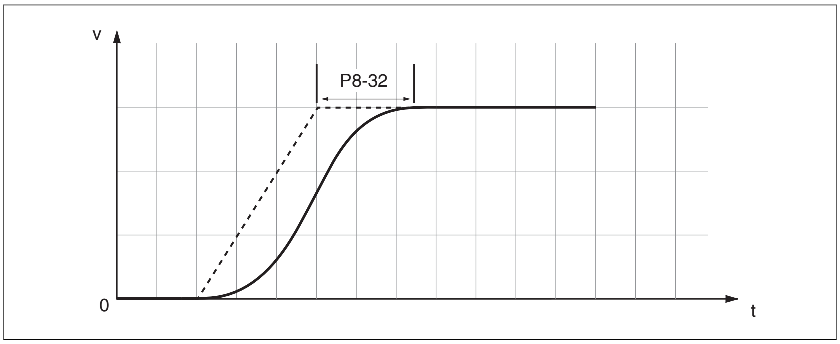

Figure 60: Comfort Tuning with smoothing via S-curve

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P8-32` MOVESMOO-THAVG	S-Curve Setting Applicable operating mode: PT, PS Setting can only be changed if power stage is disabled.	0.01ms 25 1500 25600 Decimal	u32 RW per.	Modbus 940h CANopen 4820h

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Performing Comfort Tuning

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P2-32 ATMODE	Autotuning Applicable operating mode: PT, PS, V This parameter is used to start autotuning with the selected autotuning method. Value 0: Stop Autotuning Value 1: Easy Tuning Value 2: Comfort Tuning [minimum settling time, vibration suppression] Value 3: Comfort Tuning [minimum overshoot, vibration suppression] Value 52: Comfort Tuning [minimum settling time, no vibration suppression] Value 53: Comfort Tuning [minimum overshoot, no vibration suppression]	- 0 0 56 Decimal	u16 RW -	Modbus 340_h CANopen 4220_h

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

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

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

After you have started the required Comfort Tuning method via P2-32, the display of the HMI shows the progress as a percentage from tn000 to tn 100.

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

If autotuning completes successfully, the display of the HMI shows the message donE.
Press the **OK** key of the HMI to save the control loop parameters. The display of the HMI briefly shows the message SAVEd.
Press the **M** key of the HMI to discard the autotuning results.

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

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

6.5.3.3 Manual tuning

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

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

Procedure for manual tuning

The control loop parameters are tuned in the following sequence:

(1) Derivative gain, parameter `P8-00` (KNLD)

(2) Low-pass filter, parameters `P8-14` (NLFILTDAMPING) and `P8-15` (NLFILTT1)

(3) Re-tuning of the derivative gain, parameter `P8-00` (KNLD)

(4) Proportional gain, parameter `P8-03` (KNLP)

(5) Derivative-integral gain, parameter `P8-02` (KNLIV)

(6) Integral gain, parameter `P8-01` (KNLI)

(7) Compensation of the flexibility of the mechanical system, parameters `P8-05` (NLAFFLPFHZ) and `P8-20` (NLPEAFF)

Depending on the requirements concerning the control performance, steps 2 and 3 can be omitted. Perform a movement in both directions after each of the steps below to check the recorded parameter values on the Scope tab of the commissioning software LXM28 DTM Library.

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Step 1: Setting the derivative gain

The objective of tuning the derivative gain is to achieve a current ripple that is as low as possible. The optimum value primarily depends on the load. Criteria for a well-tuned derivative gain include:

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

The derivative gain is set via parameter `P8-00` (KNLD). Procedure:

- Set the value of parameter `P8-03` (KNLP) to 150 (corresponds to 15 Hz).
- Set the value of parameter `P8-01` (KNLI) to 0.
- Set the value of parameter `P8-02` (KNLIV) to 0.

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- Progressively increase the value of parameter `P8-00` (KNLD) until the oscilloscope shows oscillation of the reference current, `P11-11` (TCMD).

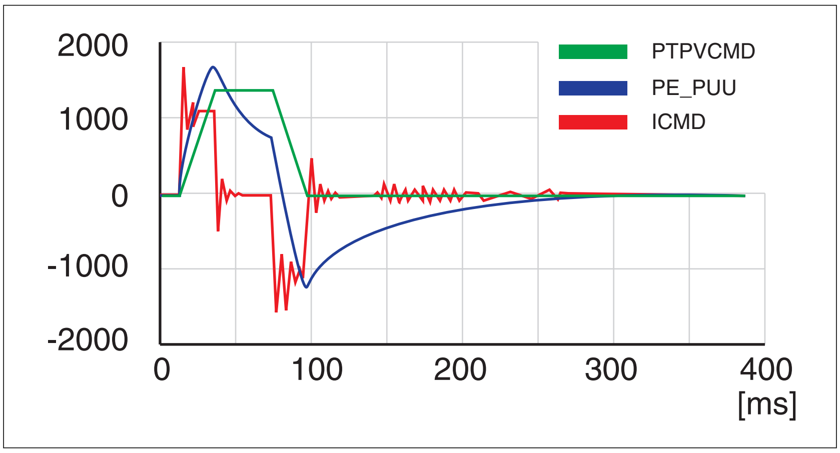

Figure 61: Example `P8-00` (KNLD) set to 1340 (134 Hz)

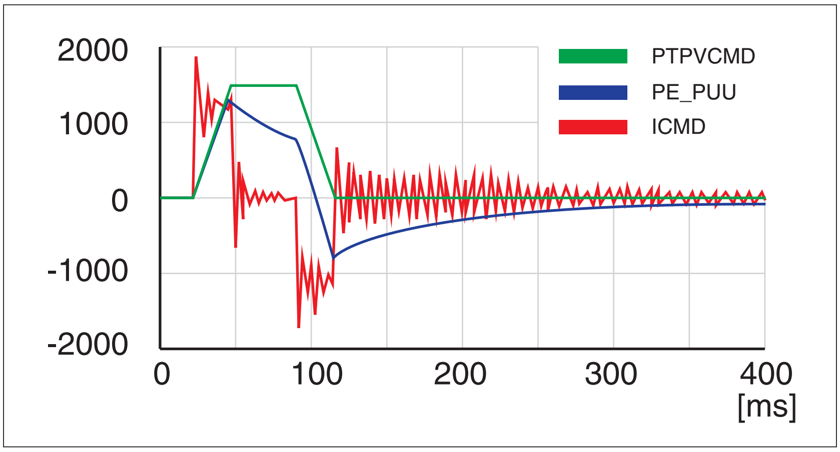

Figure 62: Example `P8-00` (KNLD) set too high at 2000 (200 Hz)

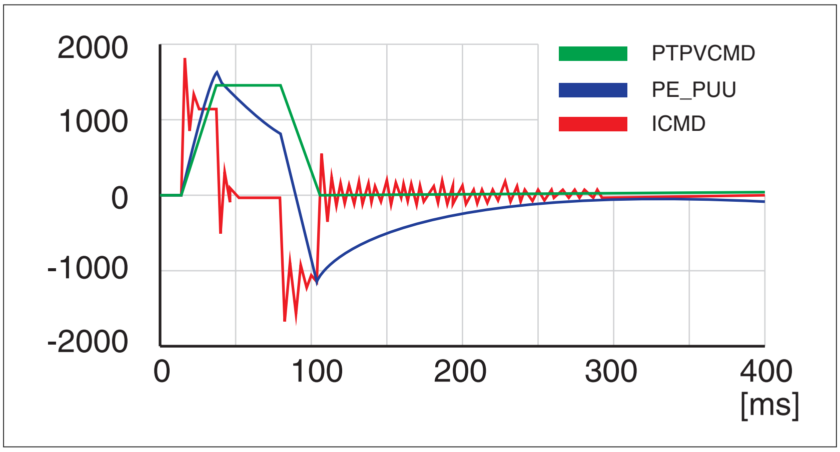

Figure 63: Example `P8-00` (KNLD) OK at 1500 (150 Hz)

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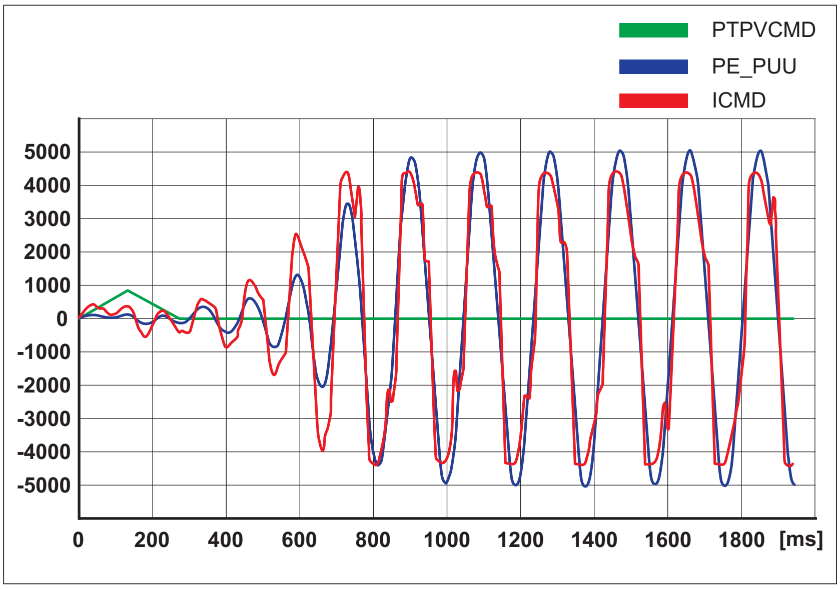

Figure 64: Example `P8-00` (KNLD) set too low at 100 (10 Hz)

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

Step 2: Setting the low-pass filter

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

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

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

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

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

- Progressively increase the value of parameter `P8-14` (NLFILTDAMPING) until the oscilloscope shows noise and/or oscillation of the reference current, `P11-11` (TCMD).
- Progressively decrease the value of parameter `P8-15` (NLFILTT1) until the oscilloscope shows noise and/or oscillation of the reference current `P11-11` (TCMD).

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- Increase the value of parameter `P8-15` (NLFILTT1) by 20 %, however, by at least 0.05 ms.

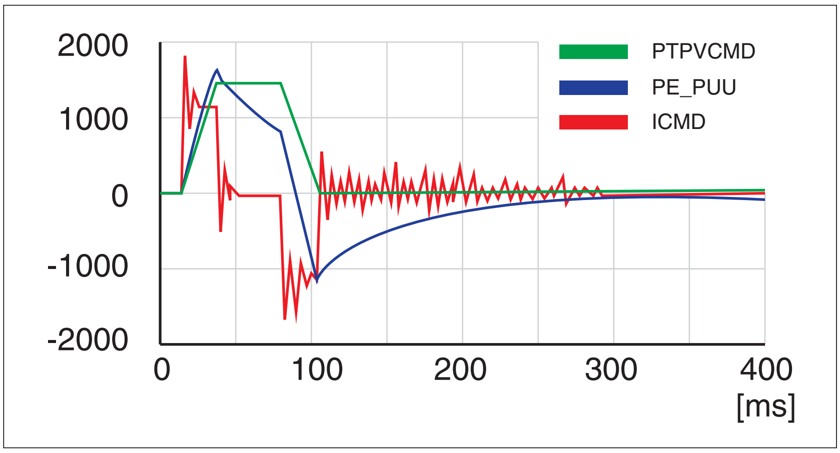

Figure 65: Example `P8-14` (NLFILTDAMPING) OK (75 %)

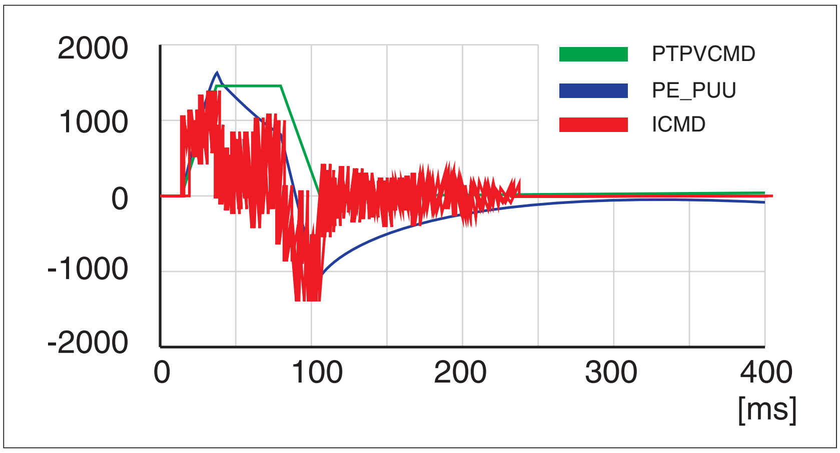

Figure 66: Example `P8-15` (NLFILTT1) too low (0.5 ms)

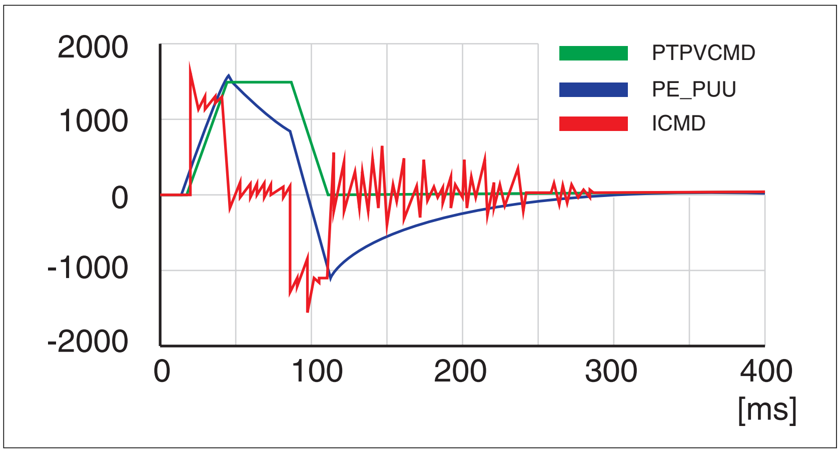

Figure 67: Example `P8-15` (NLFILTT1) OK (1.2 ms)

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Step 3: Re-tuning of the derivative gain

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

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

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

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Step 4: Setting the proportional gain

The proportional gain is set via parameter `P8-03` (KNLP). Procedure:

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

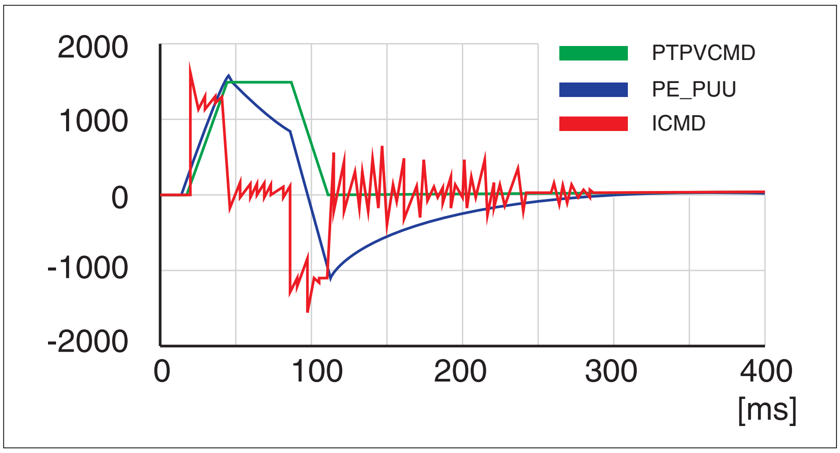

Figure 68: Example `P8-03` (KNLP) starting value (13 Hz)

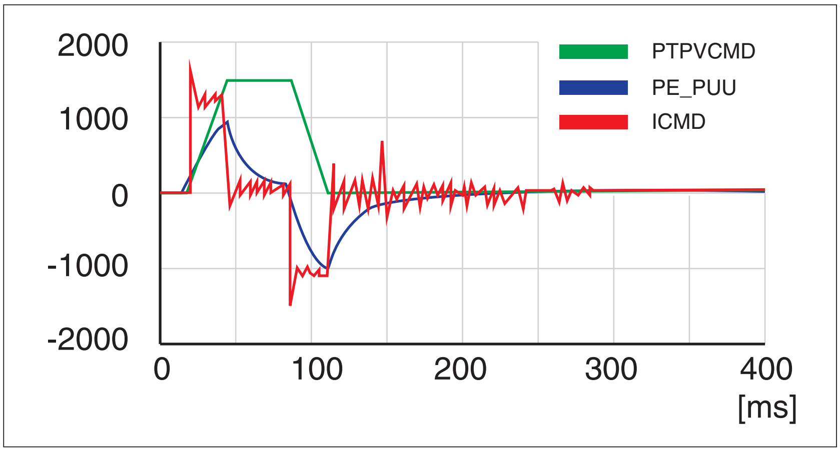

Figure 69: Example `P8-03` (KNLP) position deviation decreased (25 Hz)

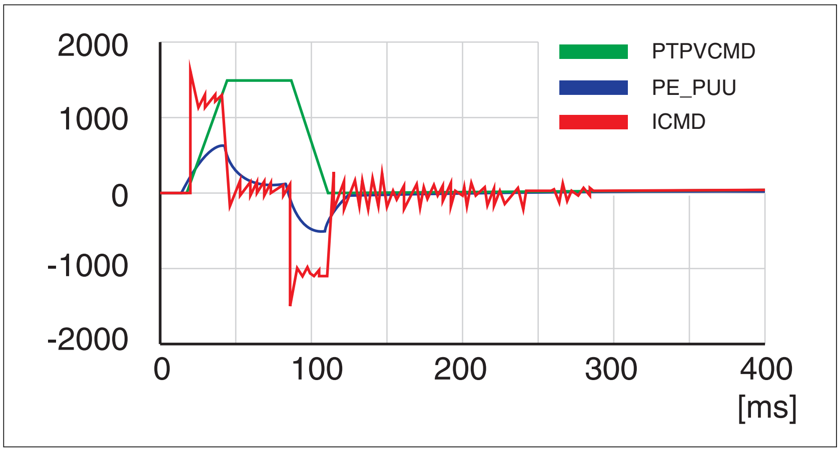

Figure 70: Example `P8-03` (KNLP) position deviation further decreased (35 Hz)

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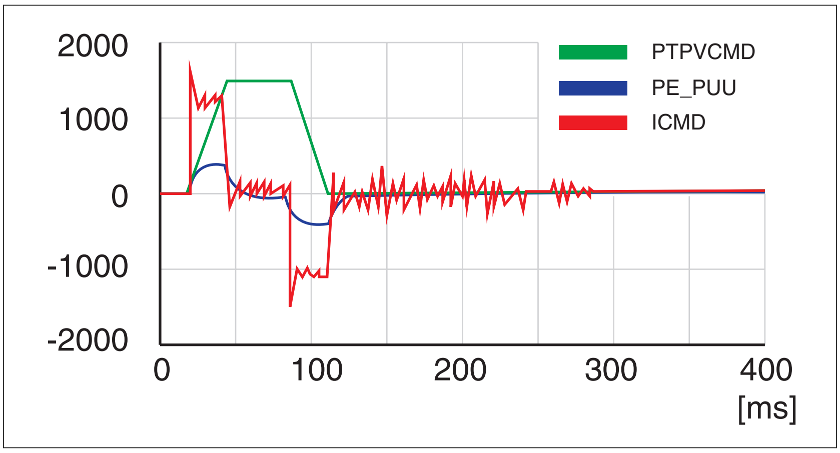

Figure 71: Example `P8-03` (KNLP) position deviation further decreased (45 Hz)

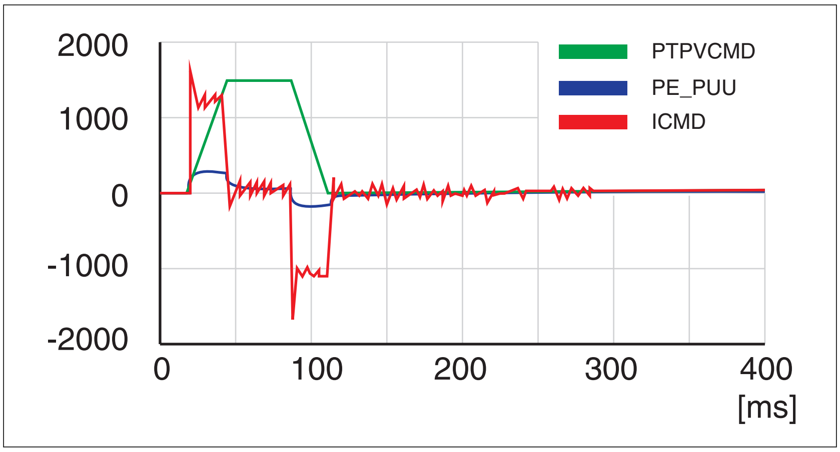

Figure 72: Example `P8-03` (KNLP) value too high - oscillation at standstill (65 Hz)

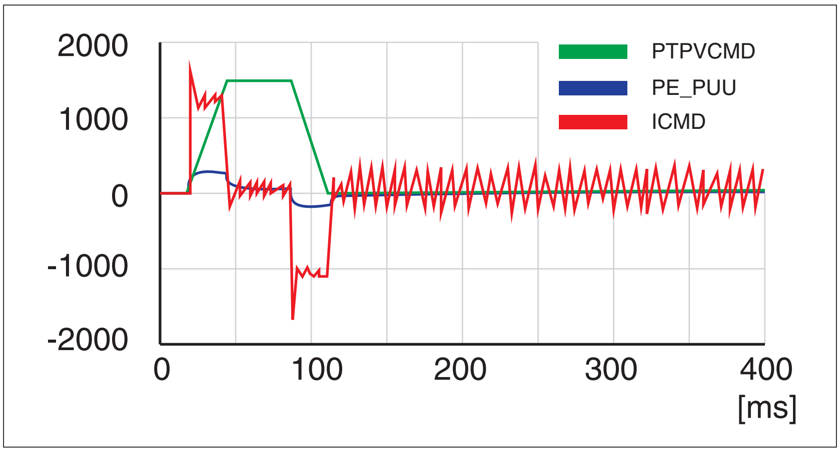

Figure 73: Example `P8-03` (KNLP) value too high - oscillation at standstill (75 Hz)

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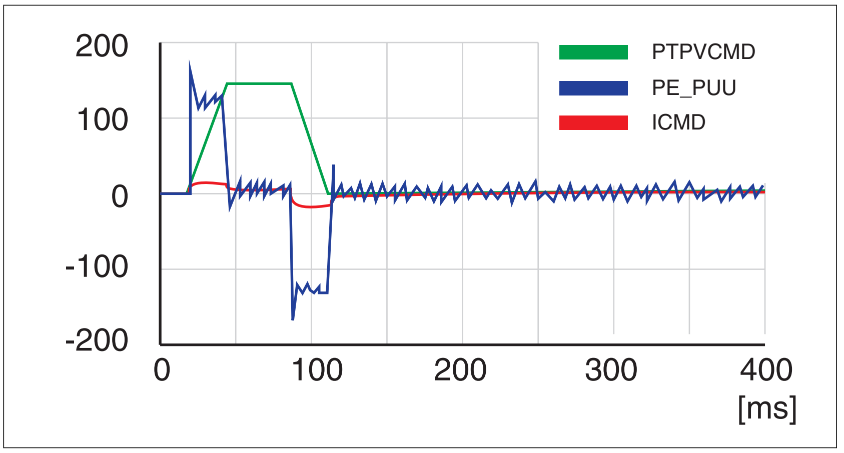

Figure 74: Example `P8-03` (KNLP) value too high - oscillation at standstill, overshoot of position deviation (100 Hz)

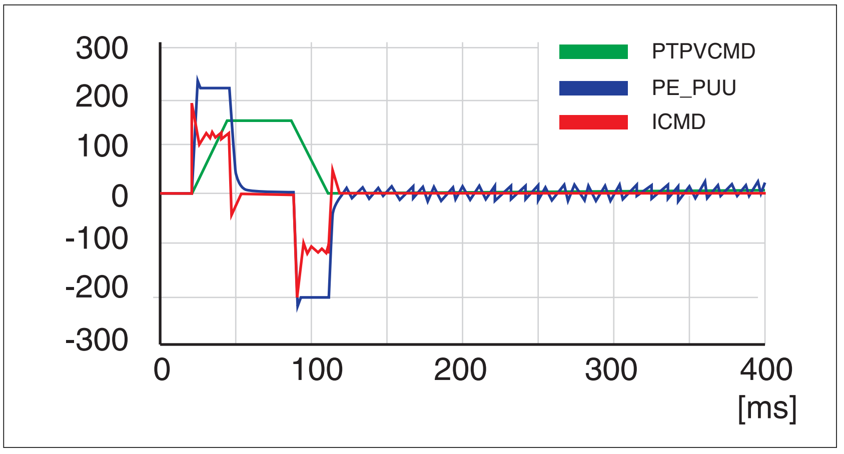

Figure 75: Example `P8-03` (KNLP) OK (65 Hz)

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Step 5: Setting the derivative-integral gain

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

`P8-03` (KNLP) / 2 < `P8-02` (KNLIV) < 2 x `P8-03` (KNLP)

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

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

- Position deviation decreases rapidly after each transition of the movement phases (jerk)
- No or minimum overshoot of position deviation
- No or minimum oscillations during transitions between the movement phases

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- Oscillations at standstill as low as possible (+/- 1 encoder increment)

The derivative-integral gain is set via parameter `P8-02` (KNLIV). Procedure:

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

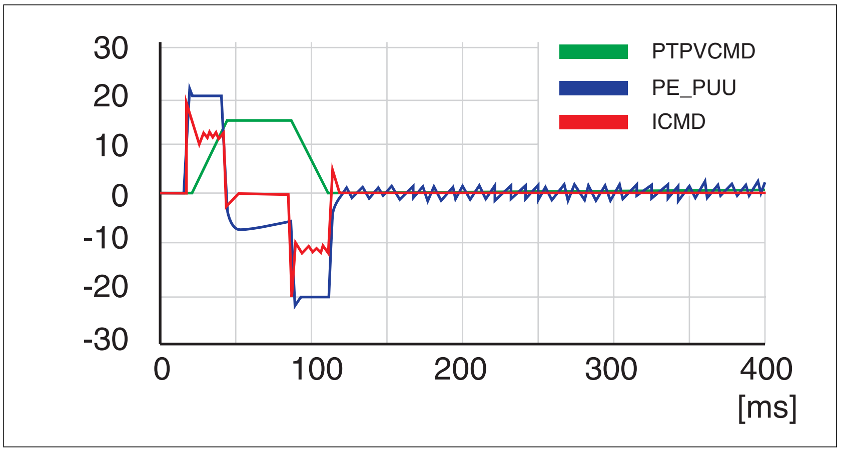

Figure 76: Example `P8-02` (KNLIV) starting value (30 Hz)

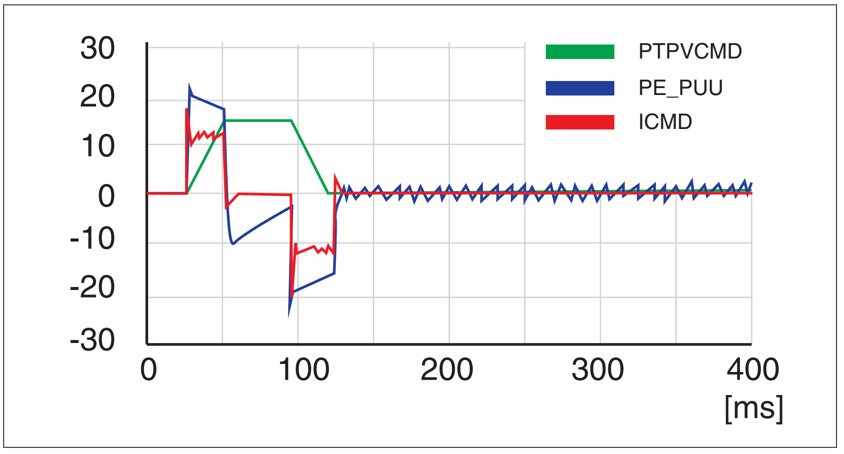

Figure 77: Example `P8-02` (KNLIV) position deviation decreased (60 Hz)

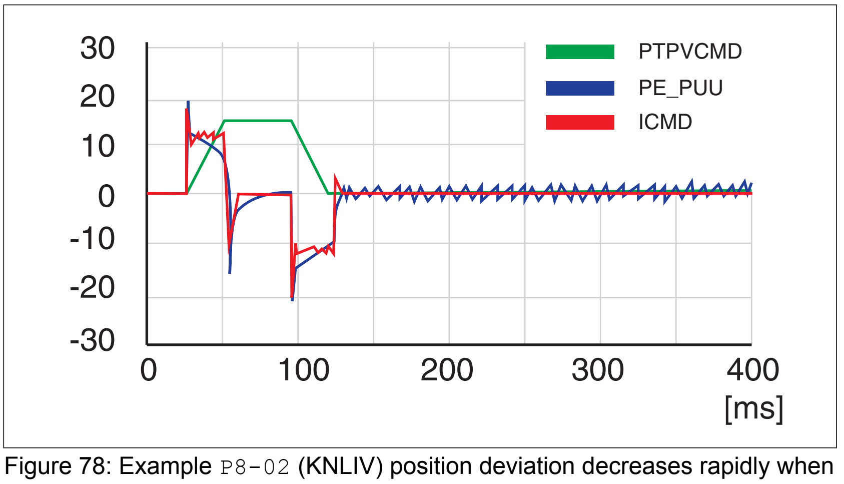

Figure 78: Example `P8-02` (KNLIV) position deviation decreases rapidly when target velocity is reached (90 Hz)

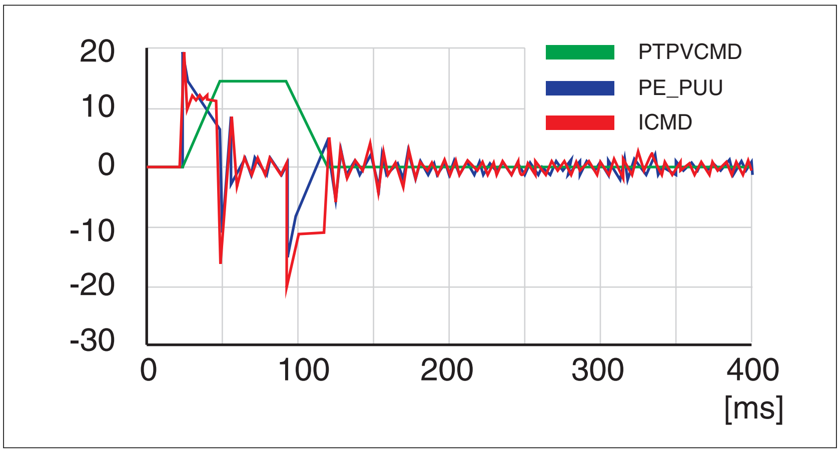

Figure 79: Example P8-02 (KNLIV) value too high - oscillation at standstill, overshoot of position deviation (120 Hz)

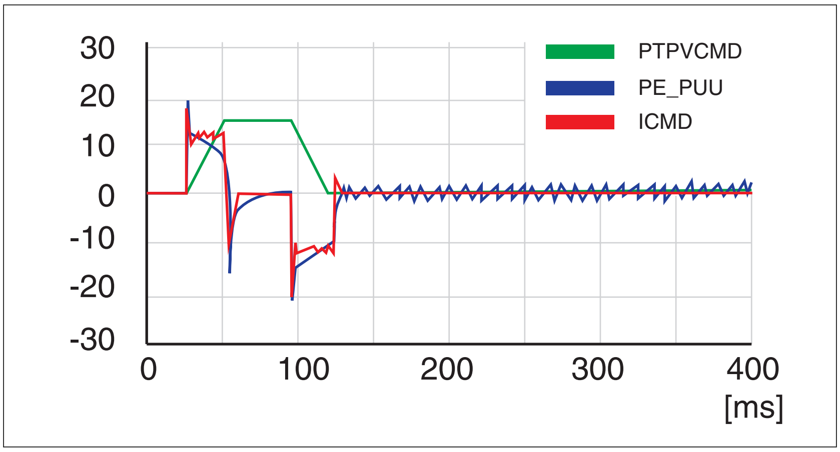

Figure 80: Example P8-02 (KNLIV) OK (90 Hz)

Step 6: Setting the integral gain

The objective of tuning the integral gain is to reduce the position deviation during movements and at standstill. Criteria for a well-tuned integral gain include:

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

The integral gain is set via parameter P8-01 (KNLI). Procedure:

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

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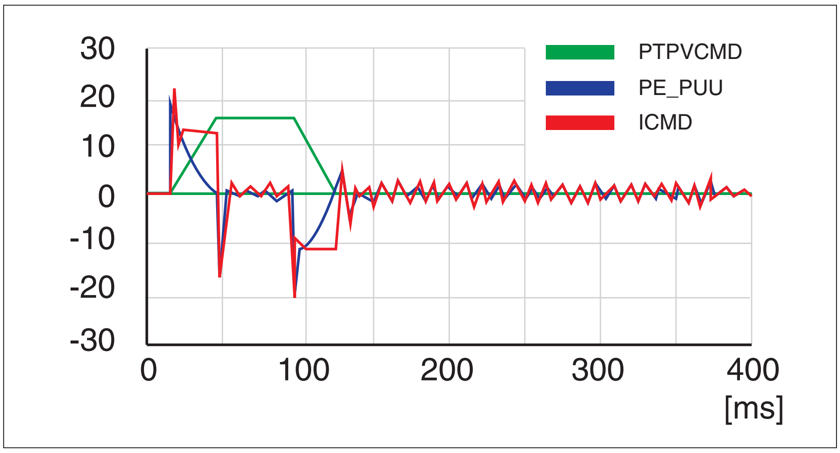

Figure 81: Example P8-01 (KNLI) value too high - oscillation at standstill, overshoot of position deviation (50 Hz)

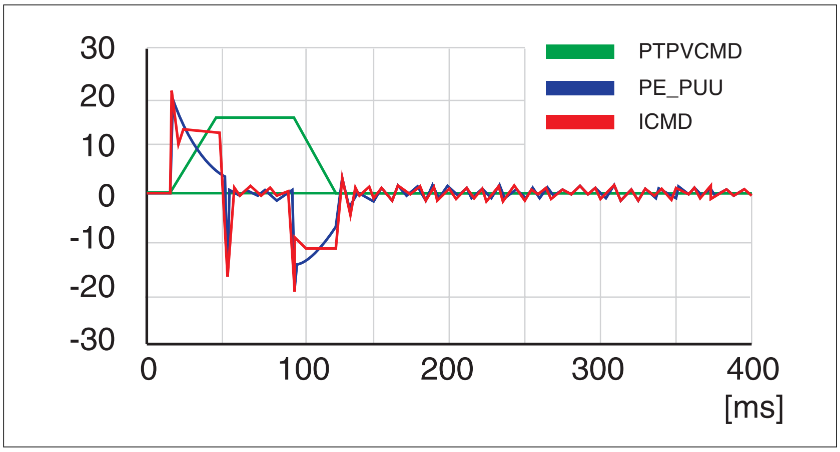

Figure 82: Example P8-01 (KNLI) OK (25 Hz)

Step 7: Compensation of the flexibility of the mechanical system

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

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

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

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

- Set the value of parameter `P8-05` (NLAFFLPFHZ) to a value three times as high as that of parameter `P8-20` (NLPEAFF). With this value, the bandwidth of this low-pass filter is sufficiently higher than the response time of the system.
- Progressively decrease the value of parameter `P8-20` (NLPEAFF) to find the optimum value. The optimum value depends on your optimization criterion: either short settling time or low position deviation.

  Start with a high frequency of 400 Hz. Decrease the value and compare the amplitudes for the position deviation and the settling time. Select the most suitable value according to your optimization criterion. The figures below show examples of the plot as the value approaches the optimum value.

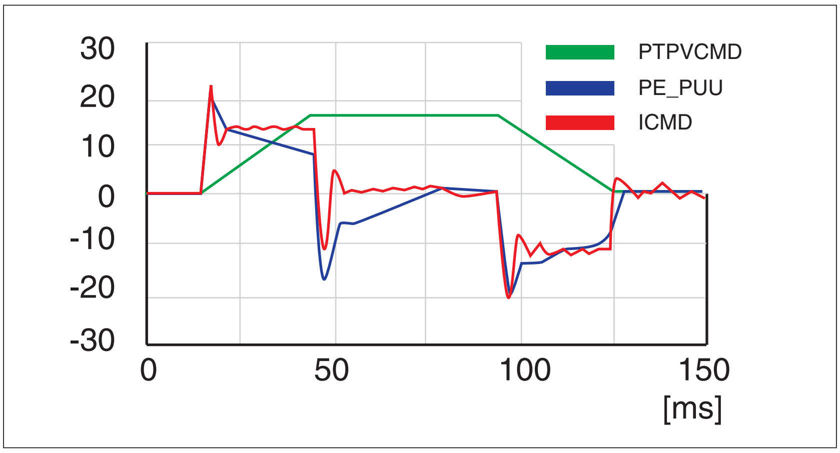

Figure 83: Example `P8-20` (NLPEAFF) without compensation of the flexibility (5000 Hz)

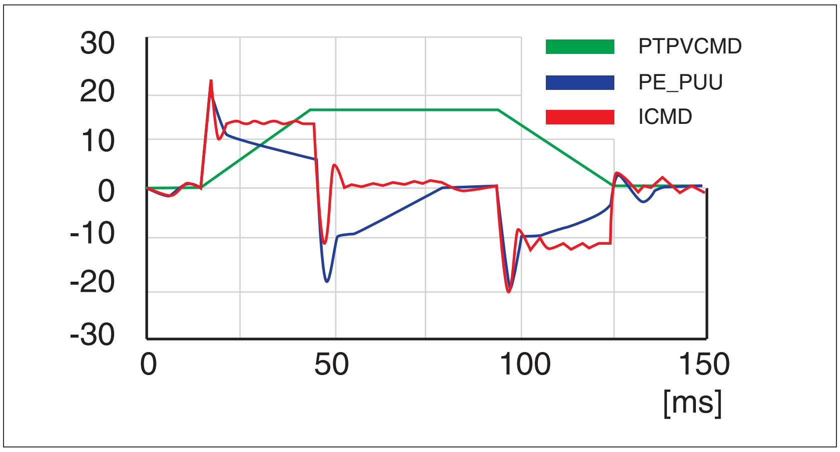

Figure 84: Example `P8-20` (NLPEAFF) maximum position deviation decreased (300 Hz)

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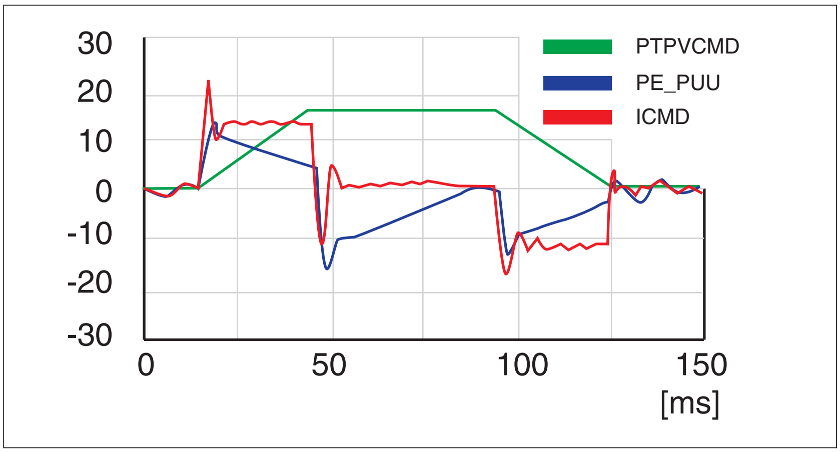

Figure 85: Example `P8-20` (NLPEAFF) maximum position deviation further decreased (220 Hz)

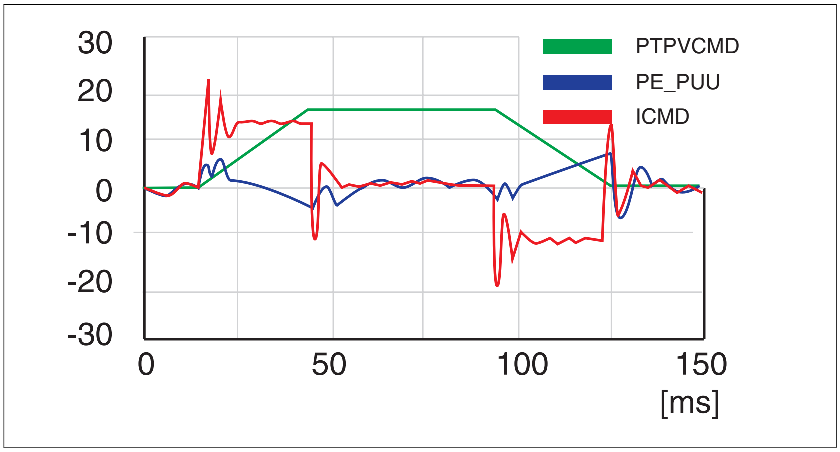

Figure 86: Example `P8-20` (NLPEAFF) minimum position deviation, short settling time, oscillation at standstill (120 Hz)

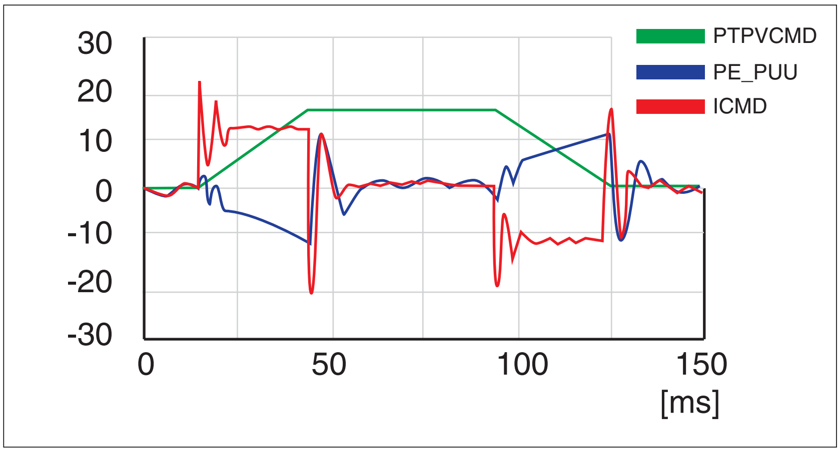

Figure 87: Example `P8-20` (NLPEAFF) negative position deviation during acceleration phase (100 Hz)

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6.5.4 Verifying the safety function STO

The safety function STO must be tested at least once per year. Procedure:

- ▶ Operate the system with the nominal voltage at the STO inputs (see chapter *"2.3.1.5 Signals"*).
- ▶ Enable the power stage (operating state **6** Operation Enabled).
- ▶ Trigger the safety function STO by switching off the voltage (for example, via an EMERGENCY STOP pushbutton).
- ◁ The power stage is disabled and the error message AL501 is displayed.
- ▶ Verify that drive is in the operating state Fault.
- ▶ Check whether the drive can be set to the operating state Operation Enabled.
- ◁ The drive remains in the operating state Fault.
- ▶ Restore the STO voltage at the signal inputs of the safety function STO and trigger a Fault Reset.
- ▶ Verify that the drive can be set to the operating state Operation Enabled.
- ◁ The drive is set to the operating state Operation Enabled. Movements are possible again.

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7 Operation

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only start the system if there are no persons or obstructions in the zone of operation.
- Do not operate the drive system with unknown settings or data.
- Never modify a parameter unless you fully understand the parameter and all effects of the modification.
- After modifications to settings, restart the drive and verify the saved data or settings.
- When commissioning the product, carefully run tests for all operating states and potential error situations.
- Verify the functions after replacing the product and also after making modifications to the settings or data.

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

7.1 Access channels

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

⚠ **WARNING**

UNINTENDED EQUIPMENT OPERATION

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

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

The product can be addressed via different access channels. Access channels are:

- Integrated HMI
- Fieldbus
- Commissioning software LXM28 DTM Library
- Digital and analog Input signals

If several access channels are active at the same time, this may lead to unintended equipment operation.

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

Only one access channel can have exclusive access to the product. An exclusive access can be provided via different access channels:

- Via the integrated HMI:

  The operating mode Jog or Autotuning can be started via the HMI.
- Via a fieldbus:

  Exclusive access is provided to a fieldbus by blocking the other access channels with the parameter `AccessLock`.
- Via the commissioning software LXM28 DTM Library:

  The commissioning software receives exclusive access via the switch "Exclusive access" in position "On".

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

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

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

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7.2 Operating states

7.2.1 State diagram

When the product is powered on and when an operating mode is started, the product goes through a number of operating states.

The state diagram (state machine) shows the relationships between the operating states and the state transitions.

The operating states are internally monitored and influenced by monitoring functions.

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State diagram

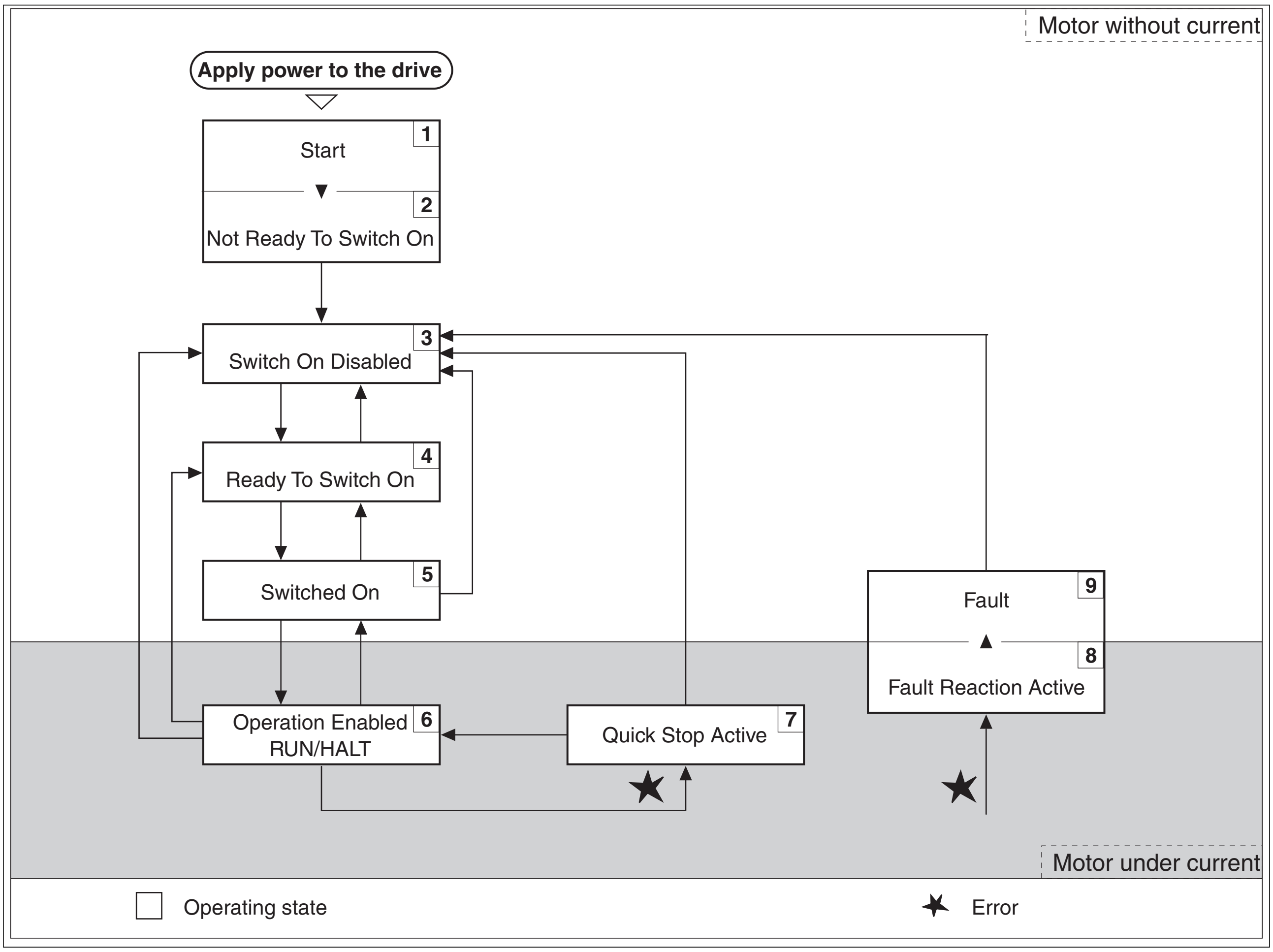

Figure 88: State diagram

Operating states

Operating state	Description
1 Start	Electronics are initialized
2 Not Ready To Switch On	The power stage is not ready to switch on
3 Switch On Disabled	Impossible to enable the power stage
4 Ready To Switch On	The power stage is ready to switch on.
5 Switched On	Power stage is switched on
6 Operation Enabled	Power stage is enabled Selected operating mode is active
7 Quick Stop Active	"Quick Stop" is being executed
8 Fault Reaction Active	Error response is active
9 Fault	Error response terminated Power stage is disabled

Resetting an error message

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

- With a rising edge of the signal input function "FAULT_RESET"
- With a rising edge of the signal input function "SON"
- By setting parameter P0-01 to the value 0

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7.3 Operating modes

7.3.1 Setting the operating mode

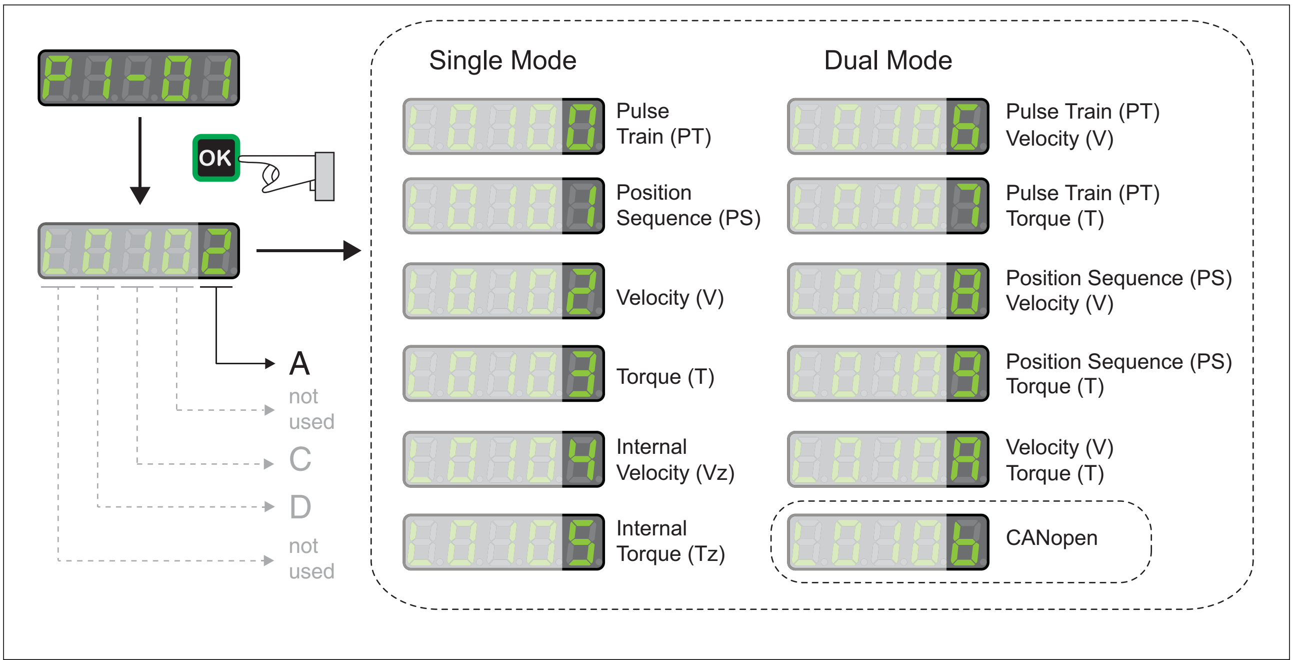

Figure 89: Setting the operating mode

There are 3 types of operating modes.

- `Single Mode` operating modes
  - The drive operates in a single operating mode.
- `Dual Mode` operating modes
  - The drive operates using 2 operating modes alternately. The signal input functions are used to switch between the operating modes. See *"7.4.2 Parameterization of the signal input functions"*.
- `CANopen Mode` operating mode
  - The drive operates in the operating mode CANopen.

The operating modes Torque (T) and Torque (Tz) and the dual operating modes with Torque (T) and Torque (Tz) do not provide deceleration functionality in response to a power stage disable request. In these operating modes, the motor coasts down to a standstill in response to a power stage disable request. You must install additional

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equipment such as a dedicated service brake if your application requires faster deceleration of the load.

⚠ WARNING
UNINTENDED EQUIPMENT OPERATION • Verify that all loads come to a secure standstill when the power stage is disabled in the operating modes Torque (T) and Torque (Tz) and in all dual-mode operating modes with Torque (T) and Torque (Tz) by performing comprehensive commissioning tests under maximum load conditions. • During commissioning, trigger all signals and simulate all conditions that cause a power stage disable request in order to verify that all loads come to a secure standstill when the power stage is disabled in the operating modes Torque (T) and Torque (Tz) and in all dual-mode operating modes with Torque (T) and Torque (Tz) under maximum load conditions. • Install a dedicated service brake if coasting does not meet the deceleration requirements of your application. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

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7.3.2 Jog operation

Description

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

The parameter `P4-05` is used to set the velocity for the movement in the unit min^{-1}.

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

See chapter *"7.4.2 Parameterization of the signal input functions"* for additional information on the parameterizable signal input functions.

Jog via HMI

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

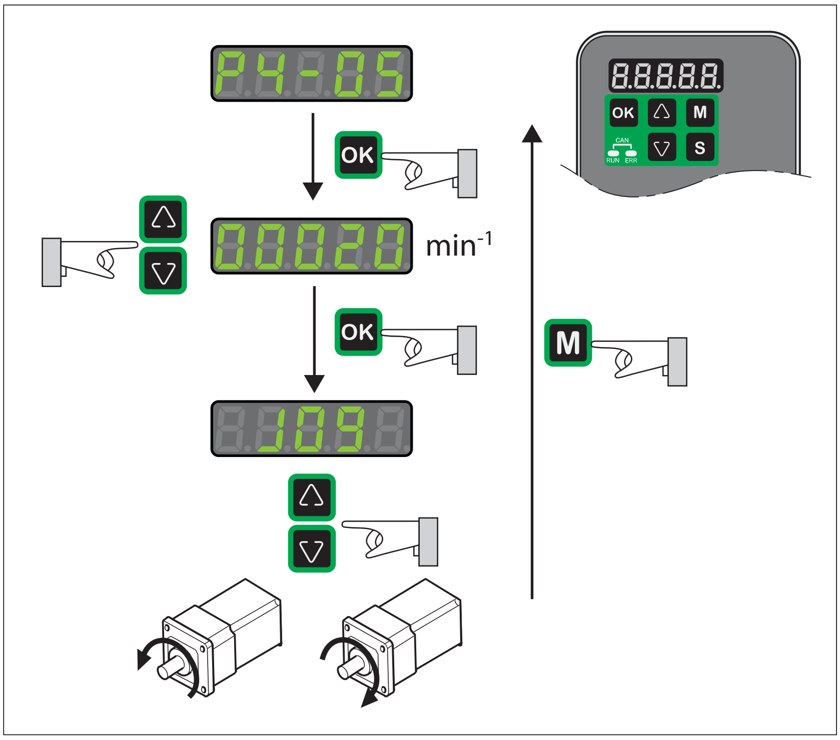

Figure 90: Starting a movement in the operating mode Jog

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7.3.3 Operating mode Pulse Train (PT)

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

Method A movement can be made using one of 3 methods:

- Position synchronization without compensation movement

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

  In the case of position synchronization with compensation movement, the movement is made synchronously (position synchronicity) with the supplied reference value signals. Reference value signals supplied during an interruption are taken into account and compensated for.
- Velocity synchronization

  In the case of velocity synchronization, the movement is made synchronously (velocity synchronicity) with the supplied reference value signals.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
`P8-31` GEARING_MODE	Method for Operating Mode Pulse Train (PT) Applicable operating mode: PT Value 0: Synchronization deactivated Value 1: Position synchronization without compensation movement Value 2: Position synchronization with compensation movement Value 3: Velocity synchronization The parameters for acceleration (P1-34), deceleration (P1-35) and velocity (P1-55) act as limitations for the sychonization.	- 0 1 3 Decimal	u16 RW per.	Modbus $93E_h$ CANopen $481F_h$

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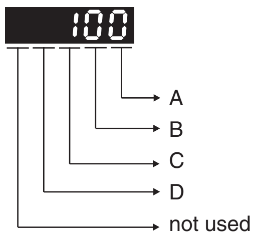
7.3.3.1 Pulse Settings

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
`P1-00` PTT	Reference Value Signal - Pulse Settings Applicable operating mode: PT  This parameter is used to configure the reference value signals for the operating mode PT. A: Type of reference value signals B: Signal frequency C: Input polarity D: Source of reference value signals Setting can only be changed if power stage is disabled.	- 0_h 2_h 1132_h Hexadecimal	u16 RW per.	Modbus 200_h CANopen 4100_h

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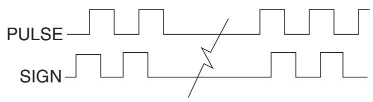
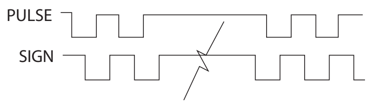
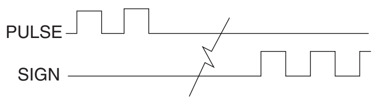
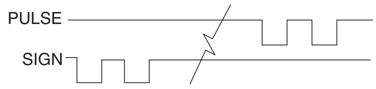
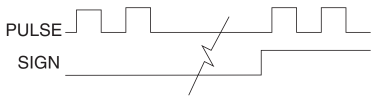
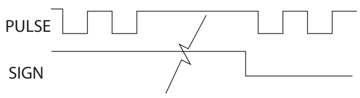
Settings A and C Type of reference value signals and input polarity

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

Setting B Maximum signal frequency

	Low-speed pulses PULSE, SIGN	**High-speed pulses HPULSE, HSIGN**
B = 0	500 Kpps [1)]	4 Mpps
B = 1	200 Kpps	2 Mpps
B = 2	100 Kpps	1 Mpps
B = 3	50 Kpps	500 Kpps

1) Only possible with RS422.

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

Setting D Source of the pulses

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

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

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7.3.3.2 Gear ratio

The gear ratio is the ratio of the number of motor increments and the number of reference increments.

The reference increments are supplied as reference value signals via the signal inputs.

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

Figure 91: Gear ratio

With the factory setting for the gear ratio, 100000 reference increments correspond to one revolution.

There are 1280000 motor increments per revolution.

Parameterization

You can set up 4 gear ratios. It is possible to switch between these gear ratios via the signal inputs.

The gear ratios are set via parameters P1-44, P1-45, P2-60, P2-61, and P2-62.

You can switch between the gear ratios with the signal input functions GNUM0 and GNUM1.

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

Figure 92: Gear ratio

In order to switch between the gear ratios via the signal inputs, you must first parameterize the signal input functions GNUM0 and GNUM1, see chapter *"7.4.2 Parameterization of the signal input functions"*.

Example 1

Calculation of number of motor revolutions corresponding to 30000 PUU:

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

Figure 93: Calculation example 1

Example 2

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

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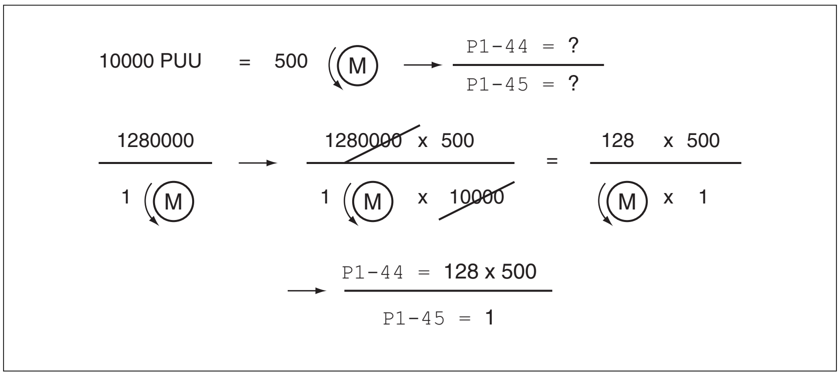

Figure 94: Calculation example 2

Example 3 A machine encoder with 1024 lines per revolution is to effect one revolution of the motor shaft with one revolution.

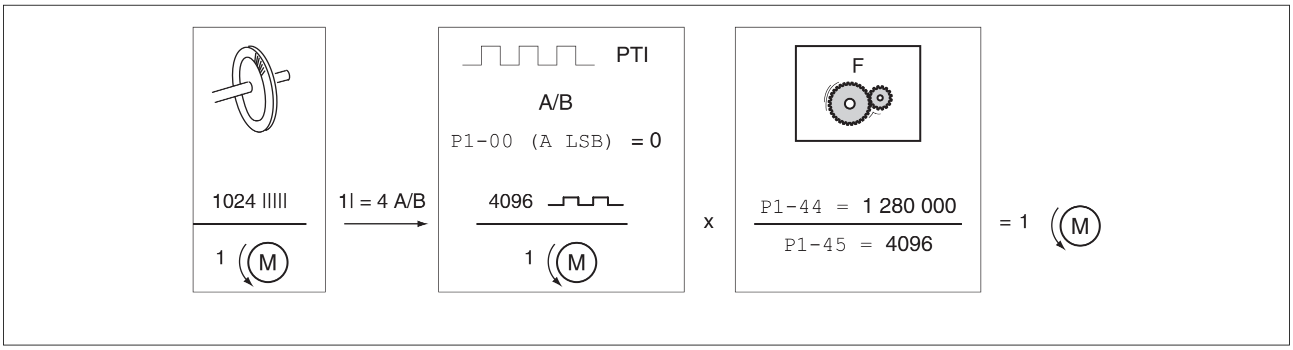

Figure 95: Calculation example 3

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7.3.3.3 Acceleration and deceleration limitation

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

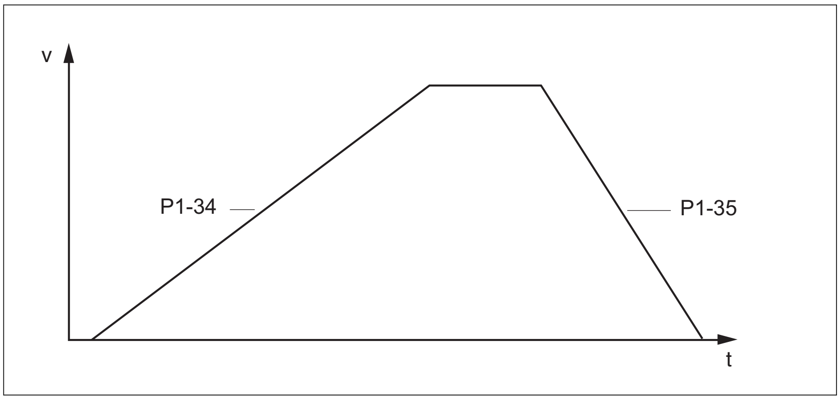

Figure 96: Acceleration and deceleration limitation

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
`P1-34` TACC	Acceleration Period Applicable operating mode: PT, V The acceleration period is the time in milliseconds required to accelerate from motor standstill to 6000 min^{-1}. For operating mode V, this parameter specifies the acceleration. If the target velocity is supplied as an analog signal, the maximum value of this parameter is automatically limited to 20000. For operating mode PT, this parameter specifies an acceleration limitation for the pulses at the PTI interface.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 244$_h$ CANopen 4122$_h$
`P1-35` TDEC	Deceleration Period Applicable operating mode: PT, V The deceleration period is the time in milliseconds required to decelerate from 6000 min^{-1} to motor standstill. For operating mode V, this parameter specifies the deceleration. If the target velocity is supplied as an analog signal, the maximum value of this parameter is automatically limited to 20000. For operating mode PT, this parameter specifies a deceleration limitation for the pulses at the PTI interface.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 246$_h$ CANopen 4123$_h$

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7.3.4 Operating mode Position Sequence (PS)

Description

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

The following values can be set for each data set:

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

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

Configuration

The data sets are configured by means of the commissioning software LXM28 DTM Library.

Starting movements

The data sets are selected via the signal input functions POS0 ... POS4. The table below shows the bit pattern used to select the data sets.

Data set	POS4	POS3	POS2	POS1	POS0
1	0	0	0	0	0
2	0	0	0	0	1
3	0	0	0	1	0
4	0	0	0	1	1
5	0	0	1	0	0
...	...	...	...	...	...
31	1	1	1	1	0
32	1	1	1	1	1

The selected data set is executed and the movement started via the signal input function CTRG, rising edge, or via the parameter P5-07.

See chapter *"7.4 Setting the digital signal inputs and signal outputs"* for additional information on parameterizing the signal input functions.

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Example The illustration below shows how the data sets are started and terminated via the signal input functions and the signal output functions CMD_OK, TPOS and MC_OK:

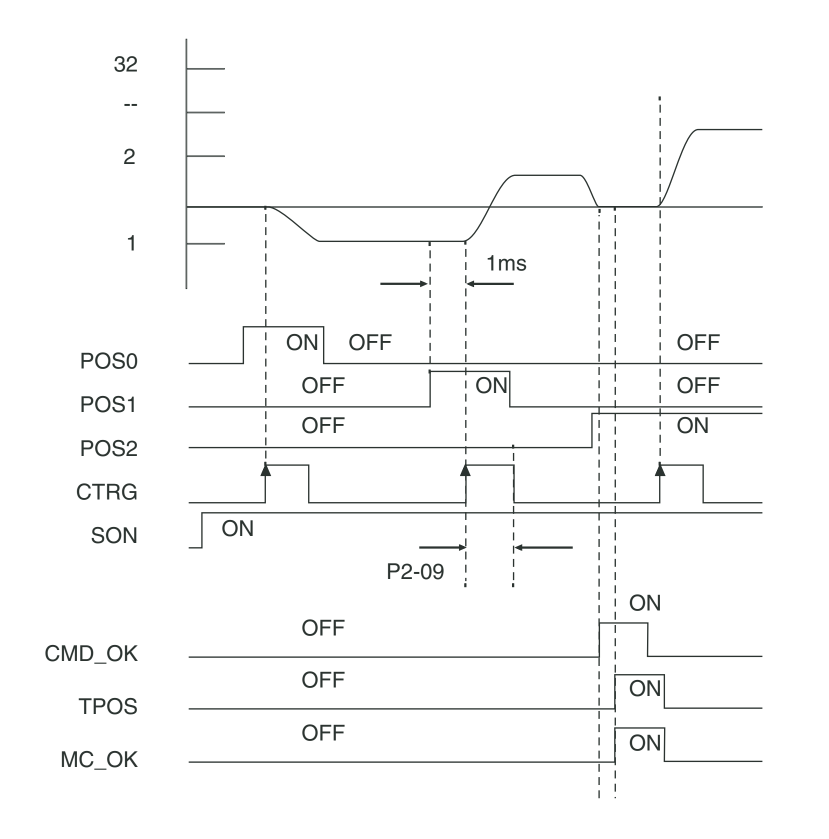

Figure 97: Operating mode Position Sequence (PS)

See chapter *"7.4 Setting the digital signal inputs and signal outputs"* for additional information.

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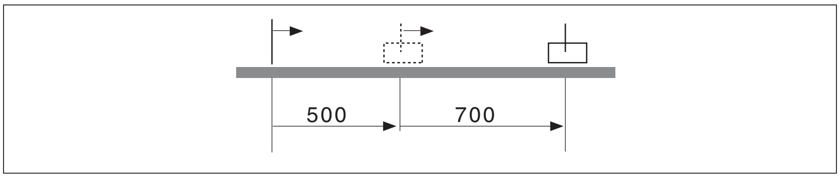
7.3.4.1 Structure of a data set

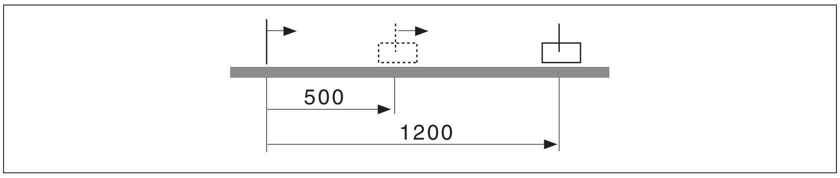
Target position The target position is set in the user-defined unit. With the factory scaling, the resolution is 100000 user-defined units per revolution.

See chapter *"7.3.4.2 Scaling"* for additional information on scaling.

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



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



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

Transition between data sets There are two types of transitions:

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

Acceleration Period The acceleration period is the time in milliseconds required to accelerate from motor standstill to 6000 min^{-1}. It is used to set the acceleration ramp.

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

Deceleration Period The deceleration period is the time in milliseconds required to decelerate from 6000 min^{-1} to motor standstill. It is used to set the deceleration ramp.

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

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Parameters for the data sets

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

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

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7.3.4.2 Scaling

Scaling is the ratio of the number of user-defined units and the number of internal units.

The user-defined units are supplied as parameter values in the unit PUU.

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

Figure 98: Scaling factor

With the factory setting for the scaling factor, 100000 user-defined units correspond to one revolution.

The internal units are 1280000 increments per revolution.

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

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

Figure 99: Scaling factor

Example 1 Calculation of number of motor revolutions corresponding to 30000 PUU:

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

Figure 100: Calculation example 1

Example 2 Calculation of the scaling factor if 10000 PUU are to effect 500 revolutions of the motor shaft:

$$10000\ \text{PUU} = 500\ \text{M} \longrightarrow \frac{\texttt{P1-44} = ?}{\texttt{P1-45} = ?}$$

$$\frac{1280000}{1\ \text{M}} \longrightarrow \frac{\cancel{1280000} \times 500}{1\ \text{M} \times \cancel{10000}} = \frac{128 \times 500}{\text{M} \times 1}$$

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

Figure 101: Calculation example 2

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7.3.4.3 Homing data set for absolute movements

The Homing data set is used to establish a reference between a mechanical position and the actual position of the motor.

A reference between a mechanical position and the actual position of the motor is generated by means of a reference movement or by means of position setting.

A successful reference movement, or position setting, homes the motor.

Homing establishes the zero point for absolute movements.

Methods

The following methods are available:

- Reference movement to a limit switch

  In the case of a reference movement to a limit switch, a movement to the negative limit switch or the positive limit switch is performed. When the limit switch is reached, the motor is stopped and a movement is made back to the switching point of the limit switch.
  From the switching point of the limit switch, an additional movement can be made to the next index pulse of the motor.
  The switching point of the limit switch or the position of the index pulse point is the reference point.
- Reference movement to the reference switch

  In the case of a reference movement to the reference switch, a movement to the reference switch is performed.
  When the reference switch is reached, the motor is stopped and a movement is made back to the switching point of the reference switch.
  From the switching point of the reference switch, an additional movement can be made to the next index pulse of the motor.
  The switching point of the reference switch or the position of the index pulse point is the reference point.
- Reference movement to the index pulse

  In the case of a reference movement to the index pulse, a movement is made from the actual position to the next index pulse. The position of the index pulse is the reference point.
- Position setting

  In the case of position setting, the current motor position is set to a desired position value.

A reference movement must be terminated without interruption for the new zero point to be valid. If the reference movement is interrupted, it must be started again.

Starting the Homing data set

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

- Automatic start when the power stage is enabled for the first time
  The automatic start can be set with the parameter P6-01.
- Start via the signal input function GOTOHOME
  The signal input function must have been parameterized, see chapter *"7.4 Setting the digital signal inputs and signal outputs"*.

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Setting automatic start and the subsequent data set

The parameter P6-01 is used to set the automatic start and select a data set to be executed after completion of the Homing data set.
The parameter P7-01 is used to set a waiting time for the subsequent data set. The subsequent data set is started after the waiting time has elapsed.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P6-01 ODEF	Subsequent Data Set and Auto-start of Homing Data Set Applicable operating mode: PS Bit 0: 0 = Do not start Homing after first power stage enable 1 = Start Homing after first power stage enable Bits 1 ... 7: Reserved Bits 8 ... 15: Subsequent data set	- 0_h 0_h 2001_h Hexadecimal	u32 RW per.	Modbus 702_h CANopen 4601_h
P7-01 HOME_DLY	Waiting Time of Homing Data Set Applicable operating mode: PS Bits 0 ... 15: Waiting time until next dataset is started Bits 16 ... 31: Reserved	ms 0 0 32767 Decimal	u32 RW per.	Modbus 802_h CANopen 4701_h

Setting acceleration and deceleration

The acceleration and deceleration for the Homing data set are set via the parameter P7-00.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P7-00 HOME_ACC_DEC	Deceleration and Acceleration of Homing Data Set Applicable operating mode: PS Bits 0 ... 15: Deceleration Bits 16 ... 31: Acceleration	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 800_h CANopen 4700_h

Setting velocities The parameters P5-05 and P5-06 are used to set the velocities for searching the switch and for moving away from the switch.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P5-05 HOMESPEED1	Homing - Fast Velocity for Reference Movement Applicable operating mode: PS	0.1rpm 10 1000 60000 Decimal	u32 RW per.	Modbus $60A_h$ CANopen 4505_h
P5-06 HOMESPEED2	Homing - Slow Velocity for Reference Movement Applicable operating mode: PS	0.1rpm 10 200 60000 Decimal	u32 RW per.	Modbus $60C_h$ CANopen 4506_h

Defining the zero point The parameter P6-00 is used to specify a position value, which is set at the reference point after a successful reference movement or after position setting. This position value defines the zero point.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P6-00 ODAT	Position of Homing Data Set Applicable operating mode: PS After a successful reference movement, this position is automatically set at the reference point. Bits 0 ... 31: Position	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 700_h CANopen 4600_h

Selecting the Homing method

The parameter P5-04 is used to set the Homing method.

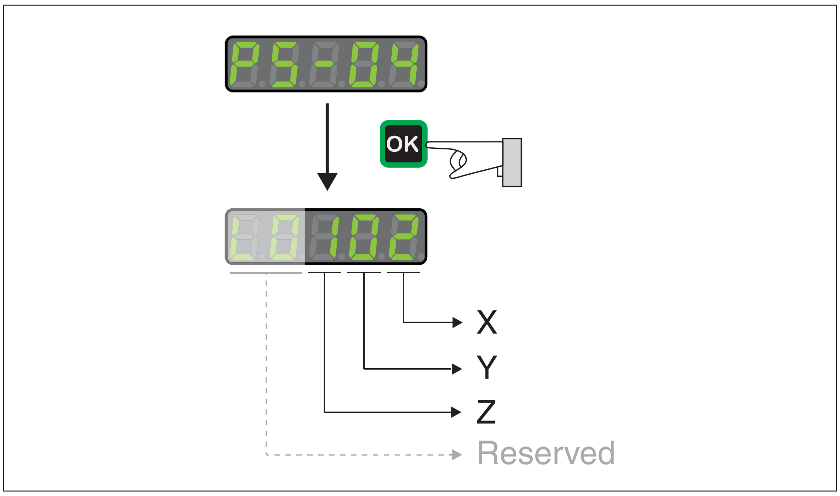

Figure 102: Settings for the Homing method

Setting Z - limit switch	Setting Y - index pulse	Settings X - Homing method	
-	Y=0: Movement back to the last index pulse	0	Movement in positive direction to the positive limit switch
-	Y=2: No movement to the index pulse	1	Movement in negative direction to the negative limit switch
Z=0: Stop after limit switch is reached and trigger alert AL014 or AL015 Z=1: Move in opposite direction after having reached the limit switch, no alert	Y=0: Movement back to the last index pulse Y=1: Movement to the next index pulse Y=2: No movement to the index pulse	2	Movement in positive direction to the rising edge of the reference switch
		3	Movement in negative direction to the rising edge of the reference switch
	-	4	Movement in positive direction to the next index pulse
	-	5	Movement in negative direction to the next index pulse
	Y=0: Movement back to the last index pulse Y=1: Movement to the next index pulse Y=2: No movement to the index pulse	6	Movement in positive direction to the falling edge of the reference switch
		7	Movement in negative direction to the falling edge of the reference switch
-	-	8	Position setting

The illustrations below show the Homing methods.

Reference movement to the positive limit switch

The following illustrations show reference movements to the positive limit switch from different starting positions.

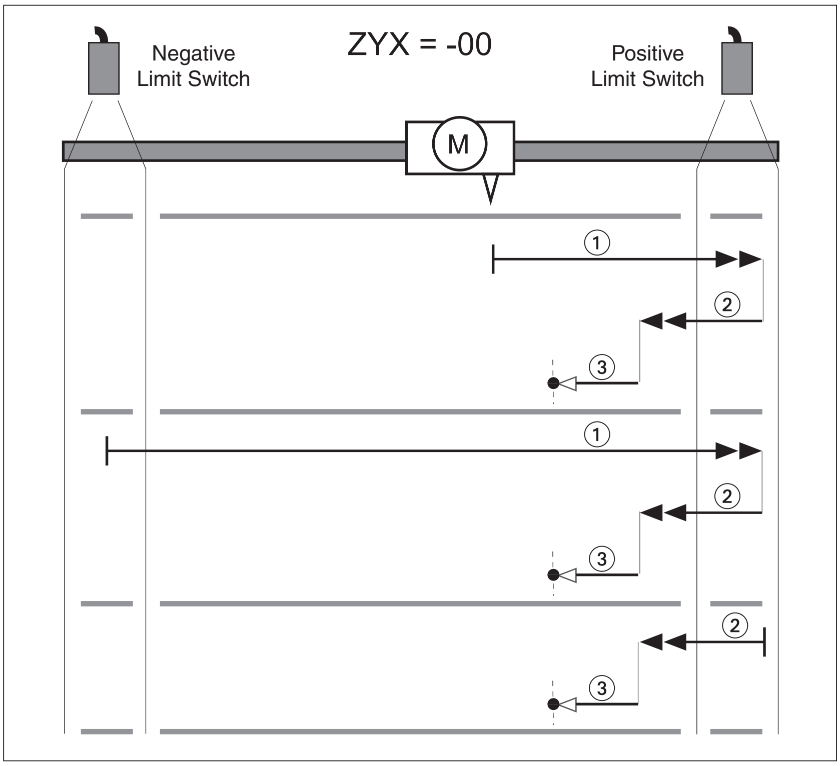

Figure 103: Reference movement (ZYX = -00)

(1) Movement to rising edge at velocity P5-05
(2) Movement to falling edge at velocity P5-05
(3) Movement to the index pulse at velocity P5-06

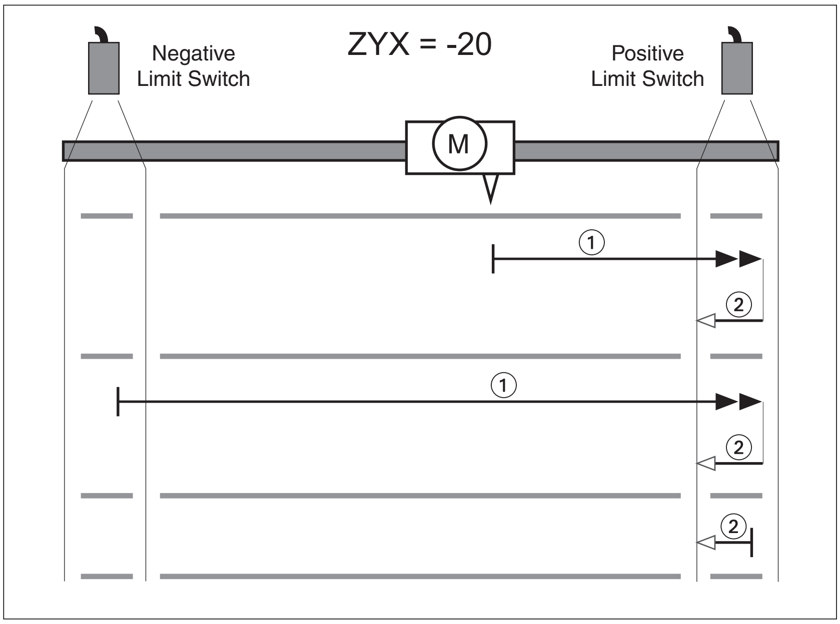

Figure 104: Reference movement (ZYX = -20)

(1) Movement to rising edge at velocity P5-05
(2) Movement to falling edge at velocity P5-06

Reference movement to the negative limit switch

The following illustrations show reference movements to the negative limit switch from different starting positions.

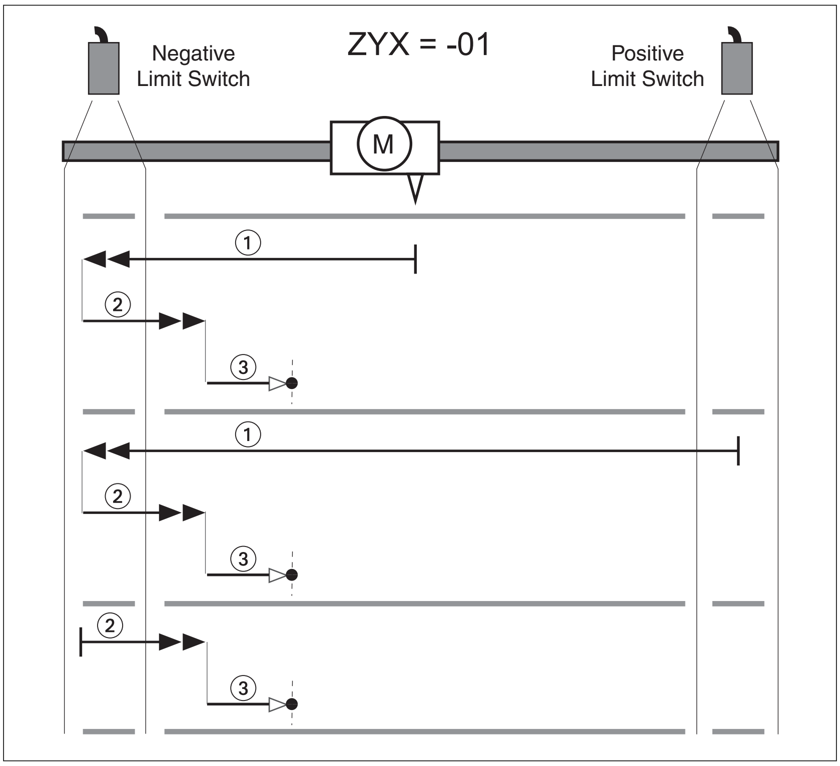

Figure 105: Reference movement (ZYX = -01)

(1) Movement to rising edge at velocity P5-05
(2) Movement to falling edge at velocity P5-05
(3) Movement to the index pulse at velocity P5-06

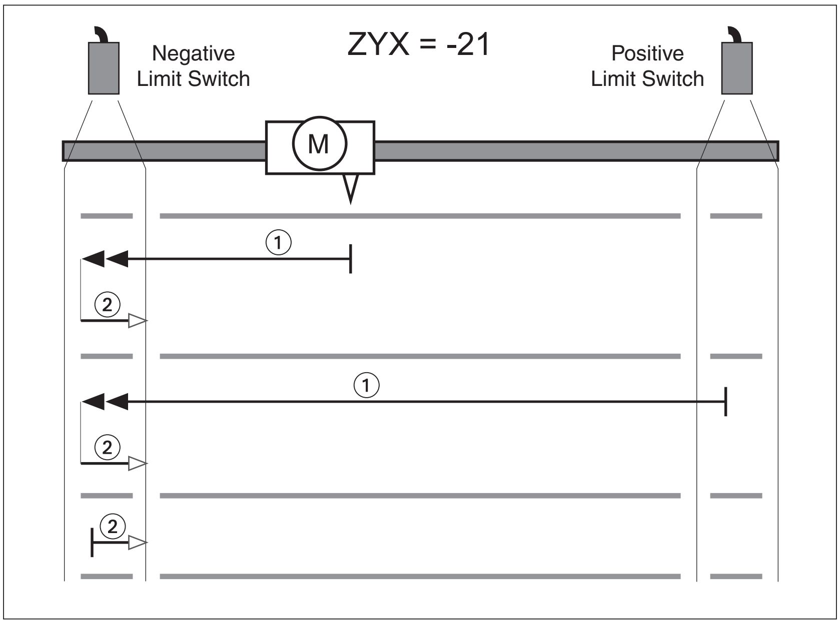

Figure 106: Reference movement (ZYX = -21)

(1) Movement to rising edge at velocity P5-05
(2) Movement to falling edge at velocity P5-06

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Reference movement in positive direction to the rising edge of the reference switch

The following illustrations show reference movements to the rising edge of the reference switch in positive direction from different starting positions.

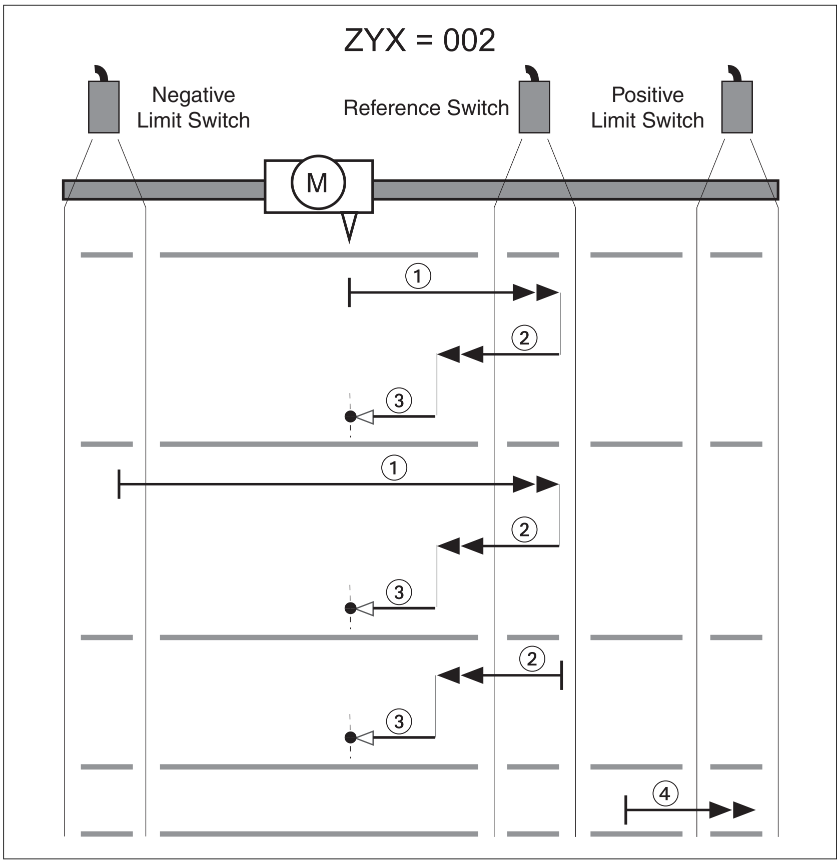

Figure 107: Reference movement (ZYX = 002)

(1) Movement to rising edge at velocity P5-05
(2) Movement to falling edge at velocity P5-05
(3) Movement to the index pulse at velocity P5-06
(4) Movement to the limit switch at velocity P5-05

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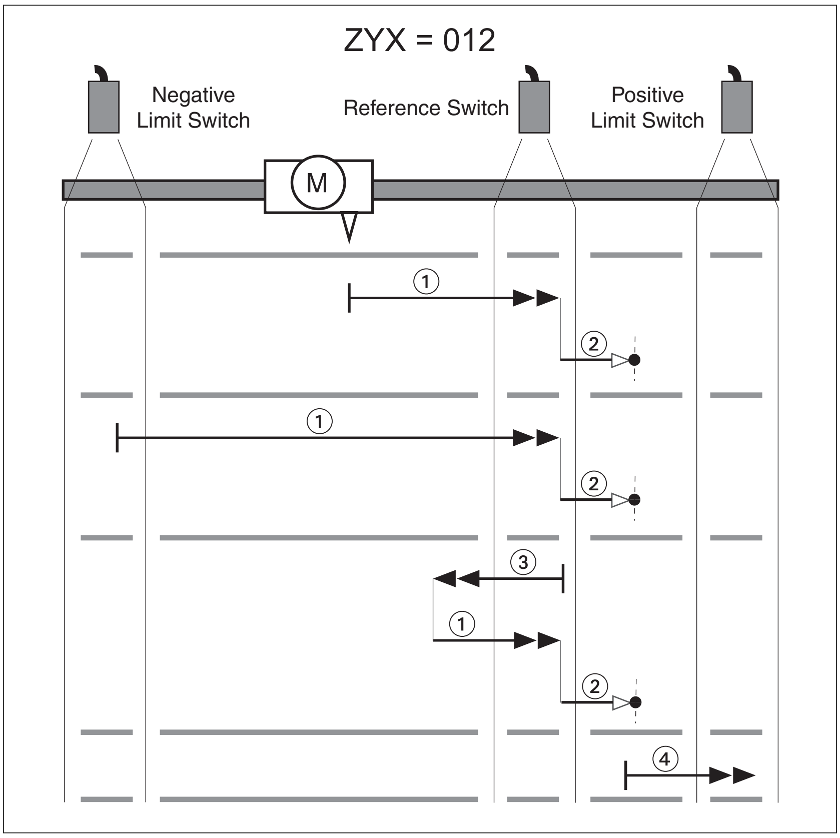

Figure 108: Reference movement (ZYX = 012)

(1) Movement to rising edge at velocity P5-05

(2) Movement to the index pulse at velocity P5-06

(3) Movement to falling edge at velocity P5-05

(4) Movement to the limit switch at velocity P5-05

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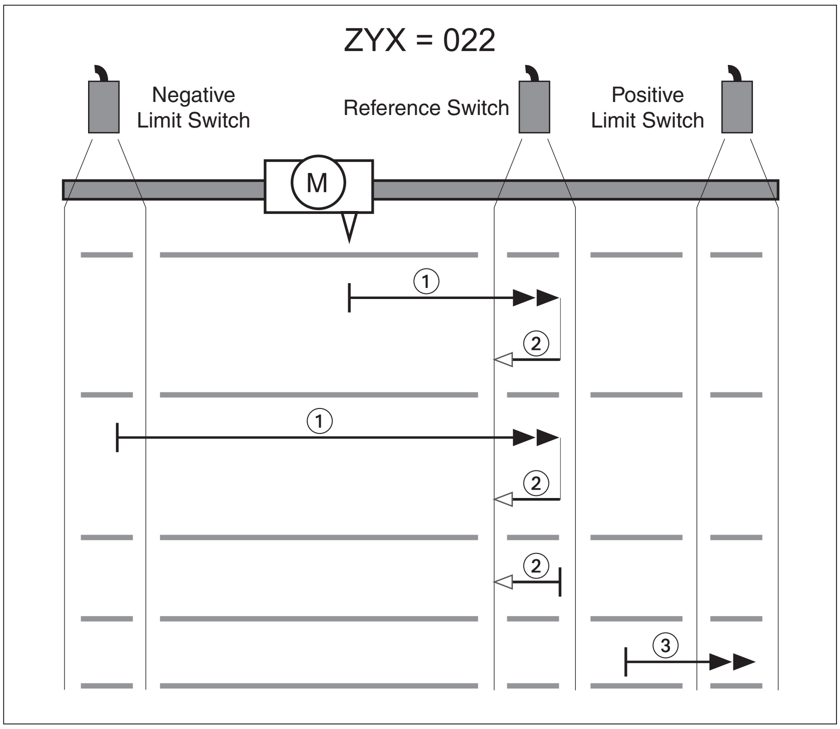

Figure 109: Reference movement (ZYX = 022)

(1) Movement to rising edge at velocity P5-05

(2) Movement to falling edge at velocity P5-06

(3) Movement to the limit switch at velocity P5-05

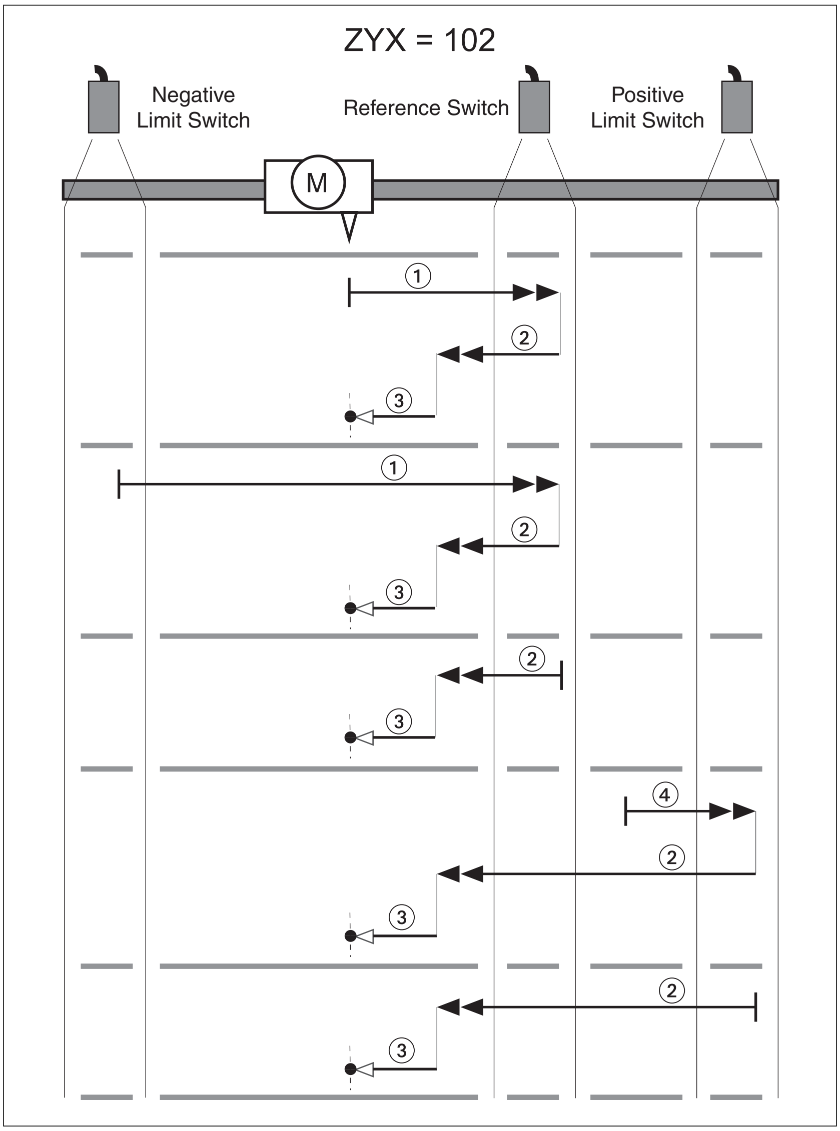

Figure 110: Reference movement (ZYX = 102)

(1) Movement to rising edge at velocity P5-05

(2) Movement to falling edge at velocity P5-05

(3) Movement to the index pulse at velocity P5-06

(4) Movement to the limit switch at velocity P5-05

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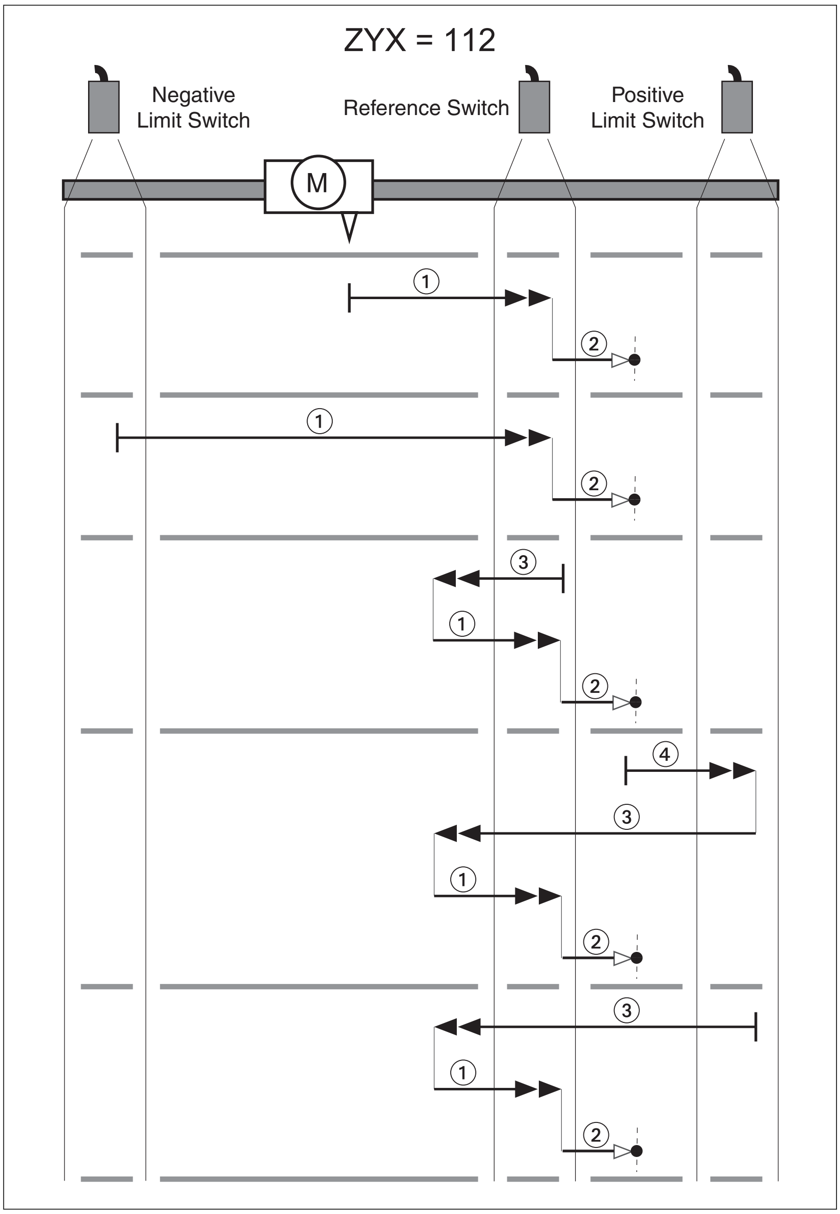

Figure 111: Reference movement (ZYX = 112)

(1) Movement to rising edge at velocity P5-05

(2) Movement to the index pulse at velocity P5-06

(3) Movement to falling edge at velocity P5-05

(4) Movement to the limit switch at velocity P5-05

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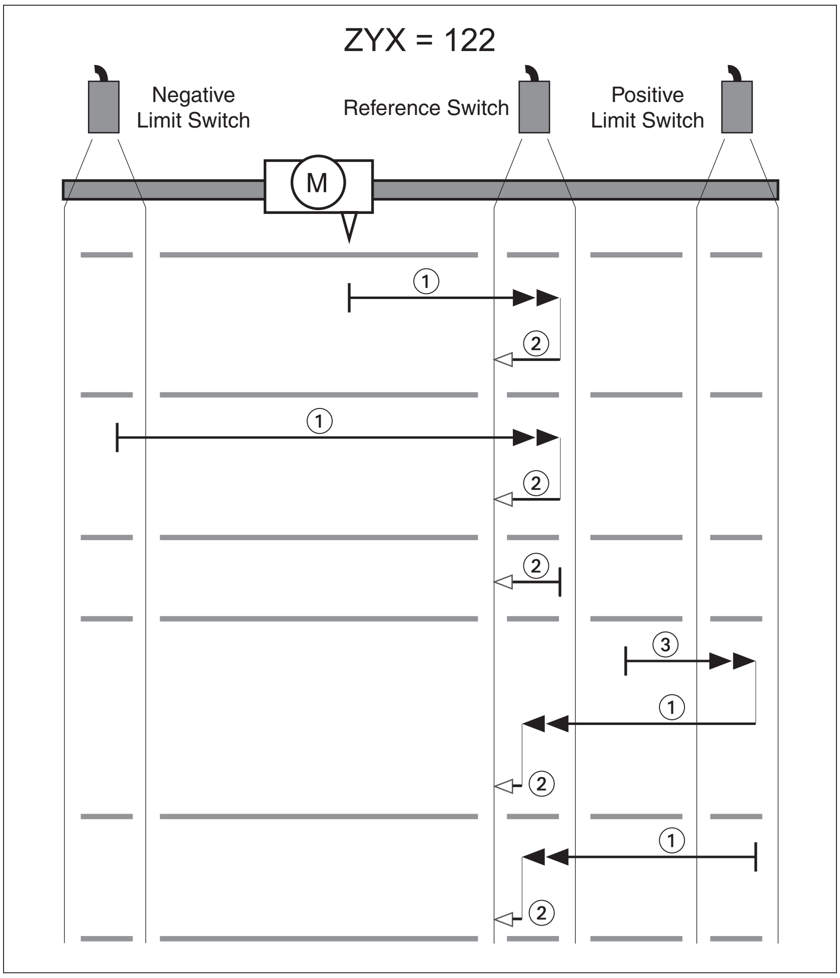

Figure 112: Reference movement (ZYX = 122)

(1) Movement to rising edge at velocity P5-05
(2) Movement to falling edge at velocity P5-06
(3) Movement to the limit switch at velocity P5-05

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Reference movement in negative direction to the rising edge of the reference switch

The following illustrations show reference movements to the rising edge of the reference switch in negative direction from different starting positions.

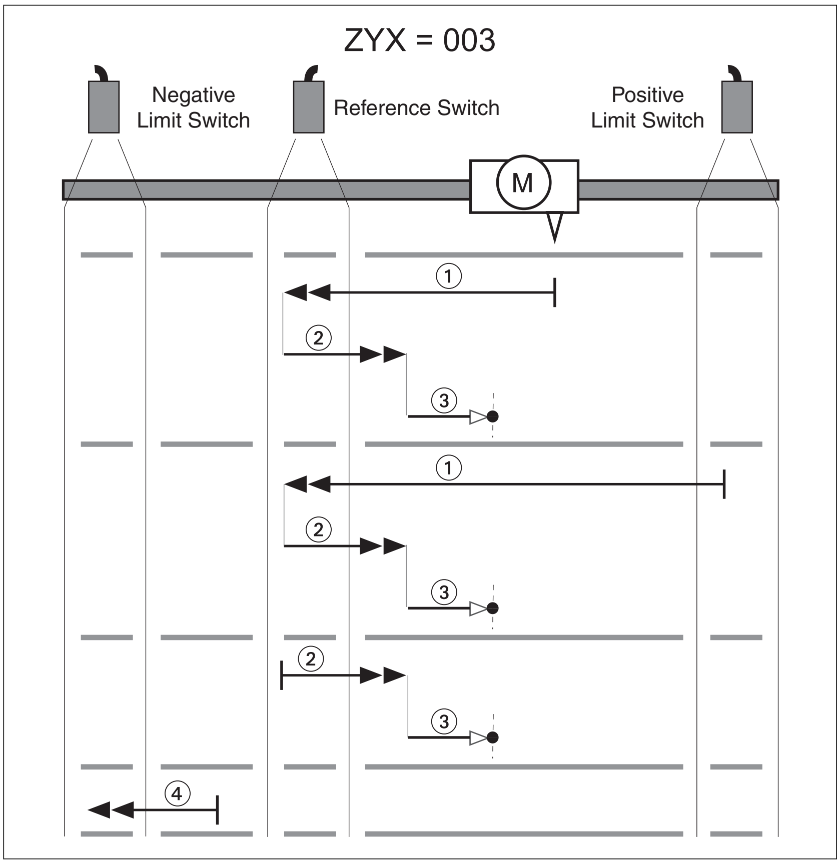

Figure 113: Reference movement (ZYX = 003)

(1) Movement to rising edge at velocity P5-05

(2) Movement to falling edge at velocity P5-05

(3) Movement to the index pulse at velocity P5-06

(4) Movement to the limit switch at velocity P5-05

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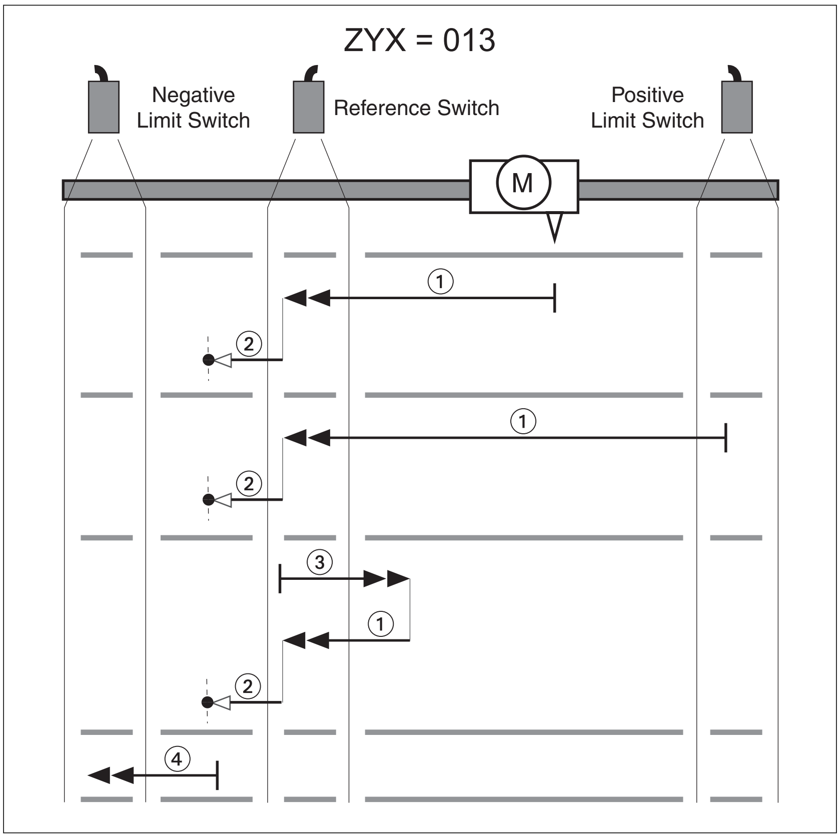

Figure 114: Reference movement (ZYX = 013)

(1) Movement to rising edge at velocity P5-05
(2) Movement to the index pulse at velocity P5-06
(3) Movement to falling edge at velocity P5-05
(4) Movement to the limit switch at velocity P5-05

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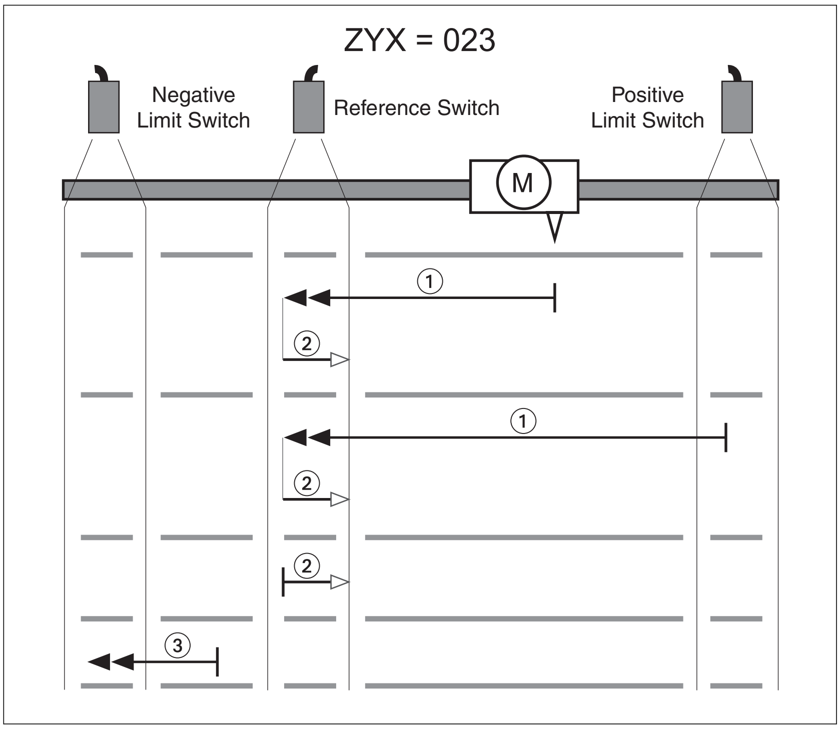

Figure 115: Reference movement (ZYX = 023)

(1) Movement to rising edge at velocity P5-05

(2) Movement to falling edge at velocity P5-06

(3) Movement to the limit switch at velocity P5-05

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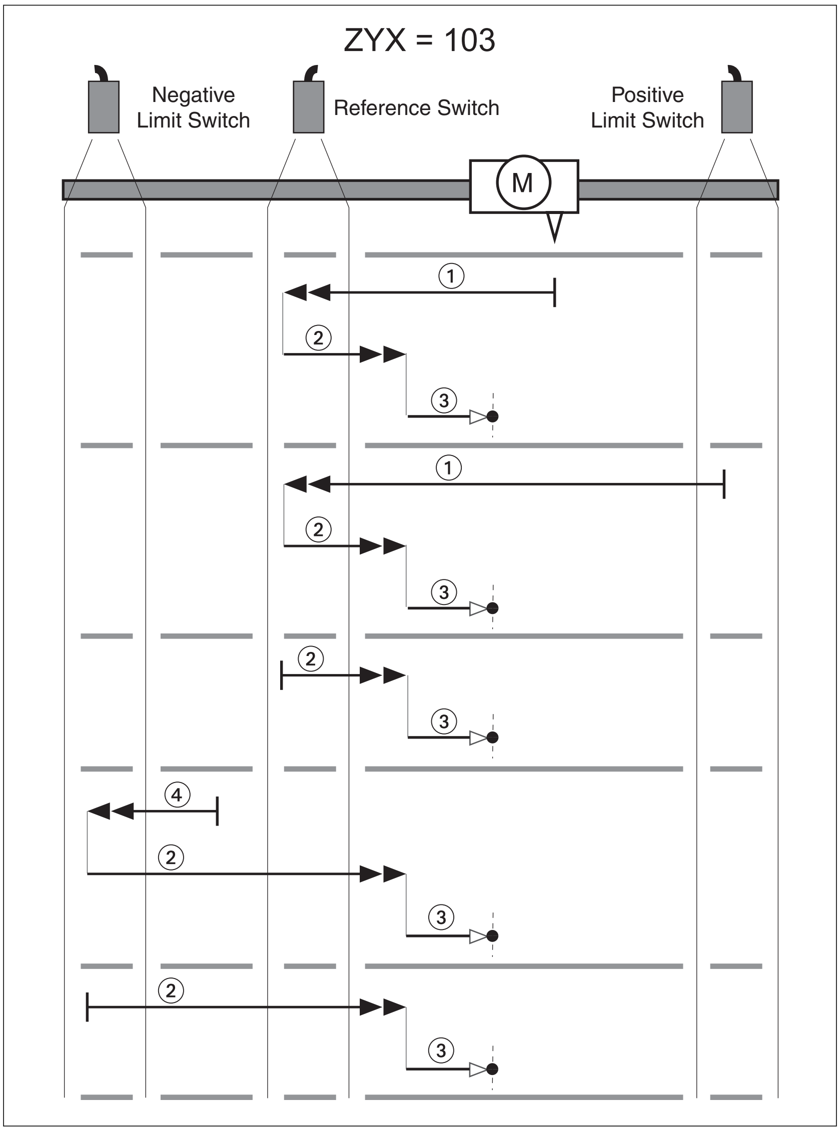

Figure 116: Reference movement (ZYX = 103)

(1) Movement to rising edge at velocity P5-05

(2) Movement to falling edge at velocity P5-05

(3) Movement to the index pulse at velocity P5-06

(4) Movement to the limit switch at velocity P5-05

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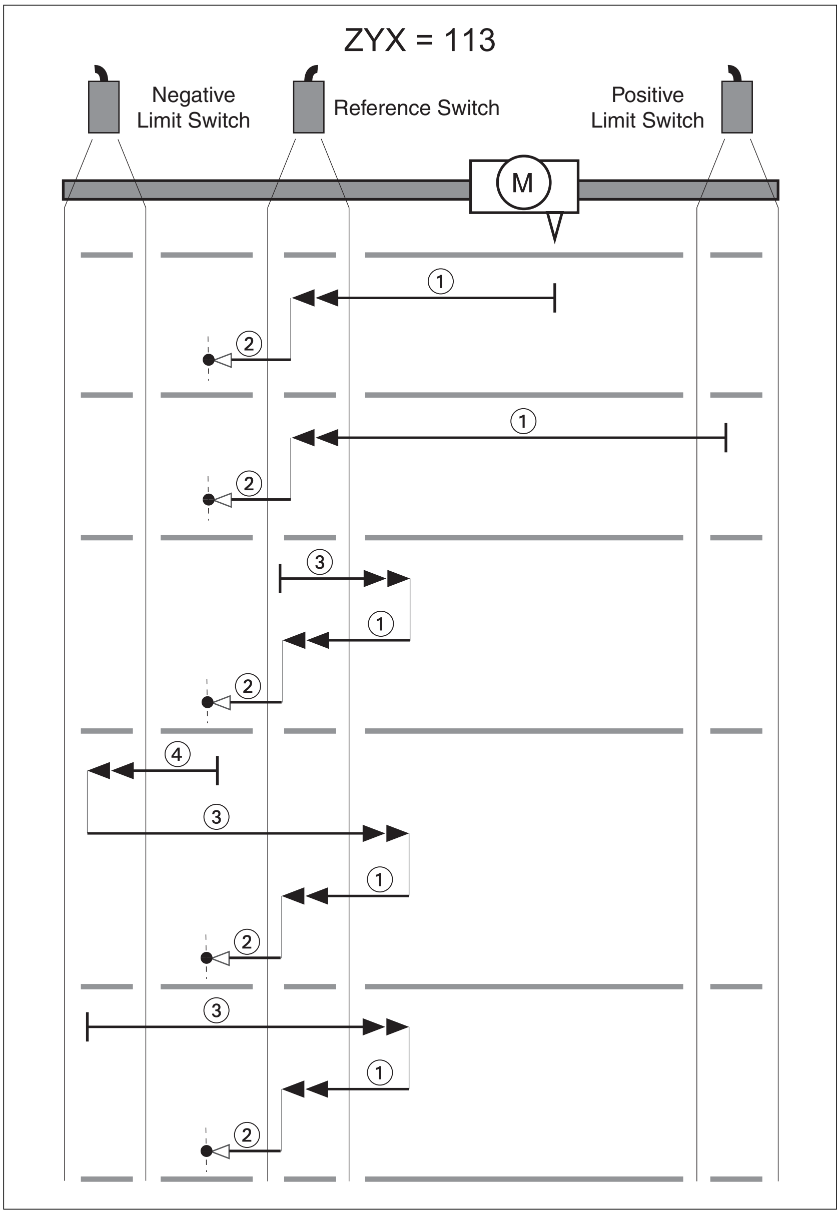

Figure 117: Reference movement (ZYX = 113)

(1) Movement to rising edge at velocity P5-05
(2) Movement to the index pulse at velocity P5-06
(3) Movement to falling edge at velocity P5-05
(4) Movement to the limit switch at velocity P5-05

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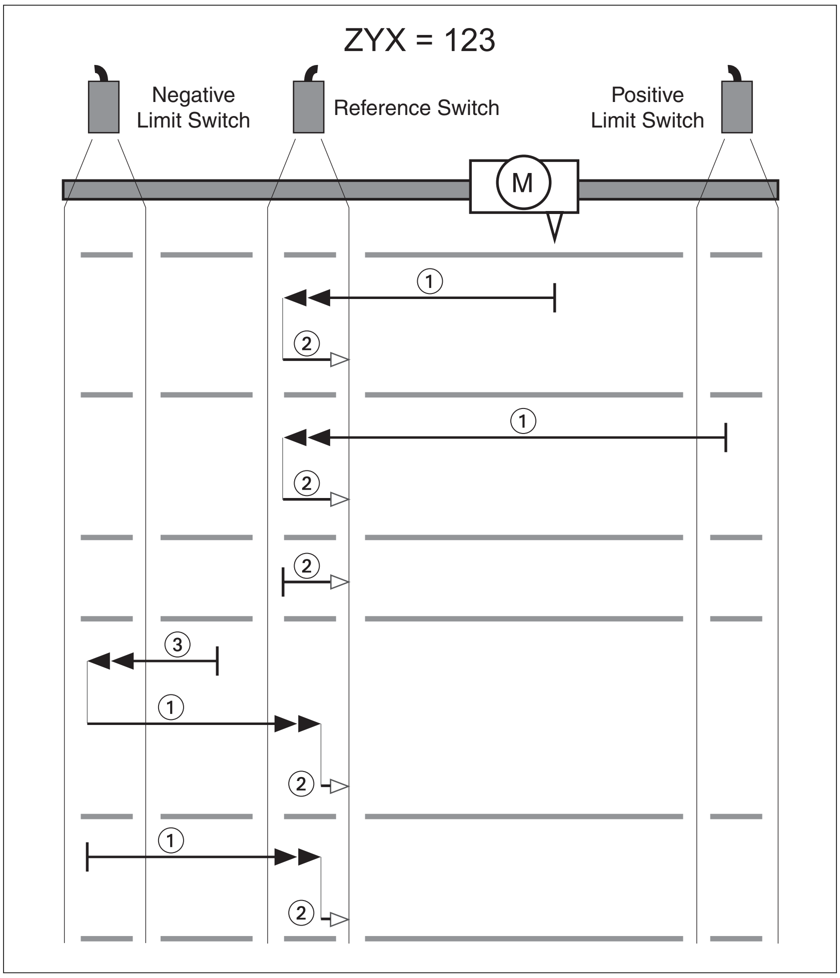

Figure 118: Reference movement (ZYX = 123)

(1) Movement to rising edge at velocity P5-05
(2) Movement to falling edge at velocity P5-06
(3) Movement to the limit switch at velocity P5-05

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Reference movement to the index pulse in positive direction

The following illustrations show reference movements to the index pulse in positive direction from different starting positions.

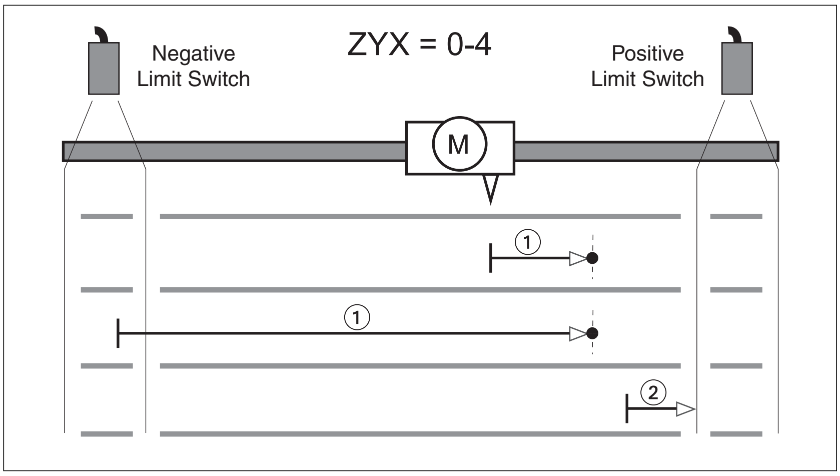

Figure 119: Reference movement (ZYX = 0-4)

(1) Movement to the next index pulse at velocity P5-06

(2) Movement to the limit switch at velocity P5-06

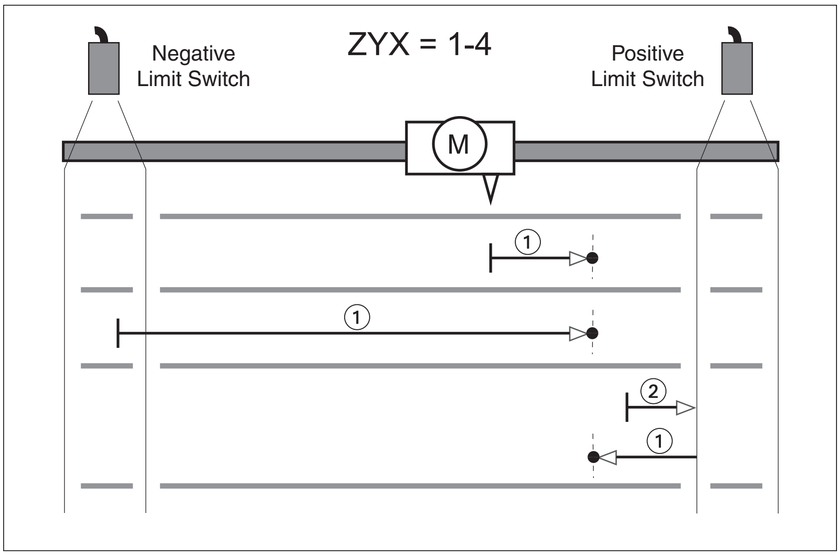

Figure 120: Reference movement (ZYX = 1-4)

(1) Movement to the next index pulse at velocity P5-06

(2) Movement to the limit switch at velocity P5-06

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Reference movement to the index pulse in negative direction

The following illustrations show reference movements to the index pulse in negative direction from different starting positions.

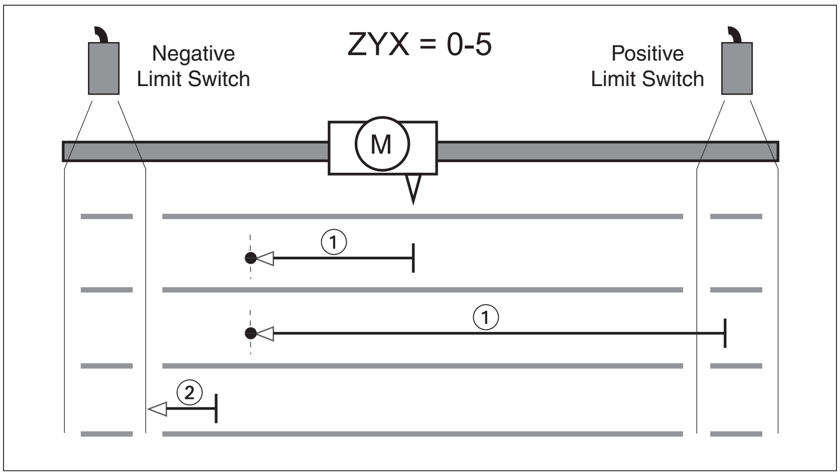

Figure 121: Reference movement (ZYX = 0-5)

(1) Movement to the next index pulse at velocity P5-06
(2) Movement to the limit switch at velocity P5-06

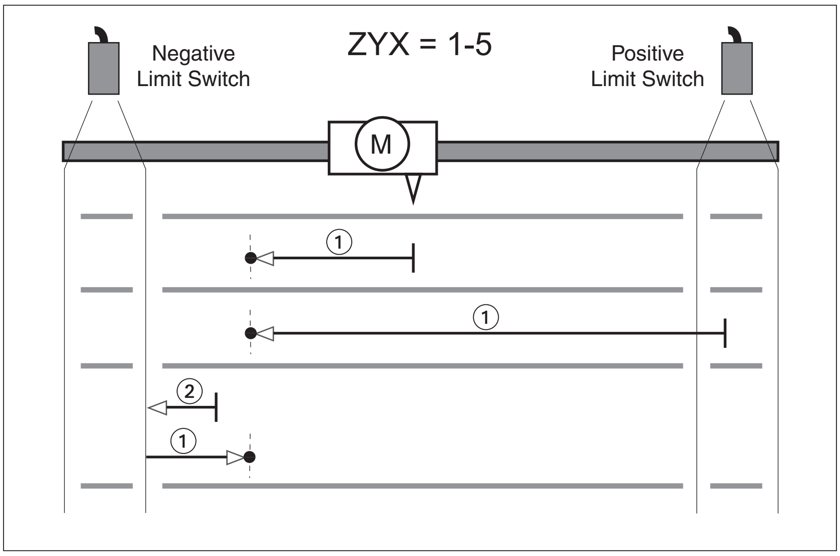

Figure 122: Reference movement (ZYX = 1-5)

(1) Movement to the next index pulse at velocity P5-06
(2) Movement to the limit switch at velocity P5-06

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Reference movement in positive direction to the falling edge of the reference switch

The following illustrations show reference movements to the falling edge of the reference switch in positive direction from different starting positions.

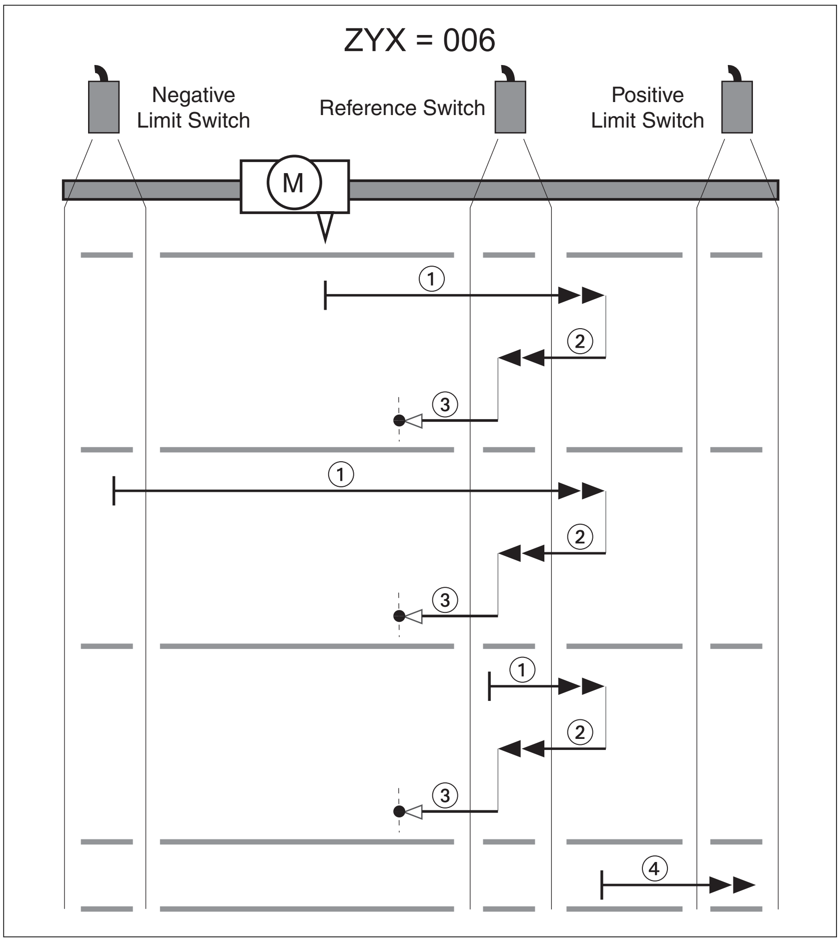

Figure 123: Reference movement (ZYX = 006)

(1) Movement to falling edge at velocity P5-05

(2) Movement to rising edge at velocity P5-05

(3) Movement to the index pulse at velocity P5-06

(4) Movement to the limit switch at velocity P5-05

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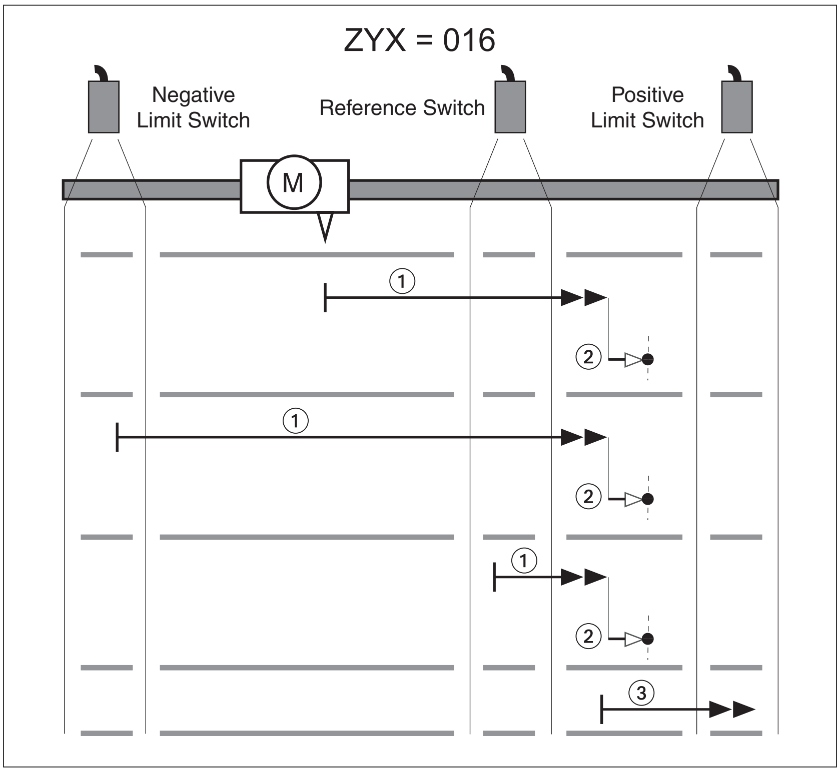

Figure 124: Reference movement (ZYX = 016)

(1) Movement to falling edge at velocity P5-05
(2) Movement to the index pulse at velocity P5-06
(3) Movement to the limit switch at velocity P5-05

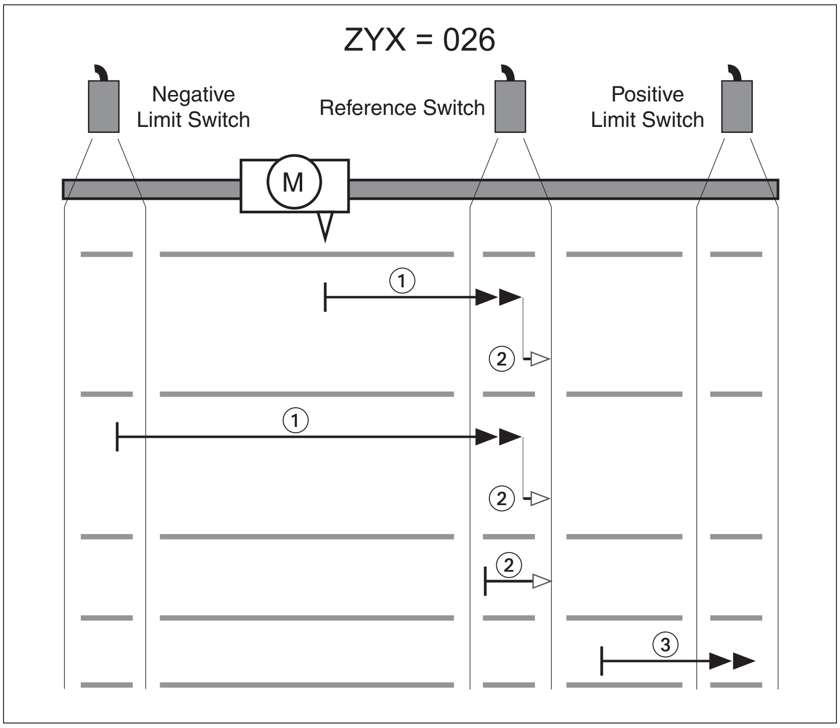

Figure 125: Reference movement (ZYX = 026)

(1) Movement to rising edge at velocity P5-05
(2) Movement to falling edge at velocity P5-06
(3) Movement to the limit switch at velocity P5-05

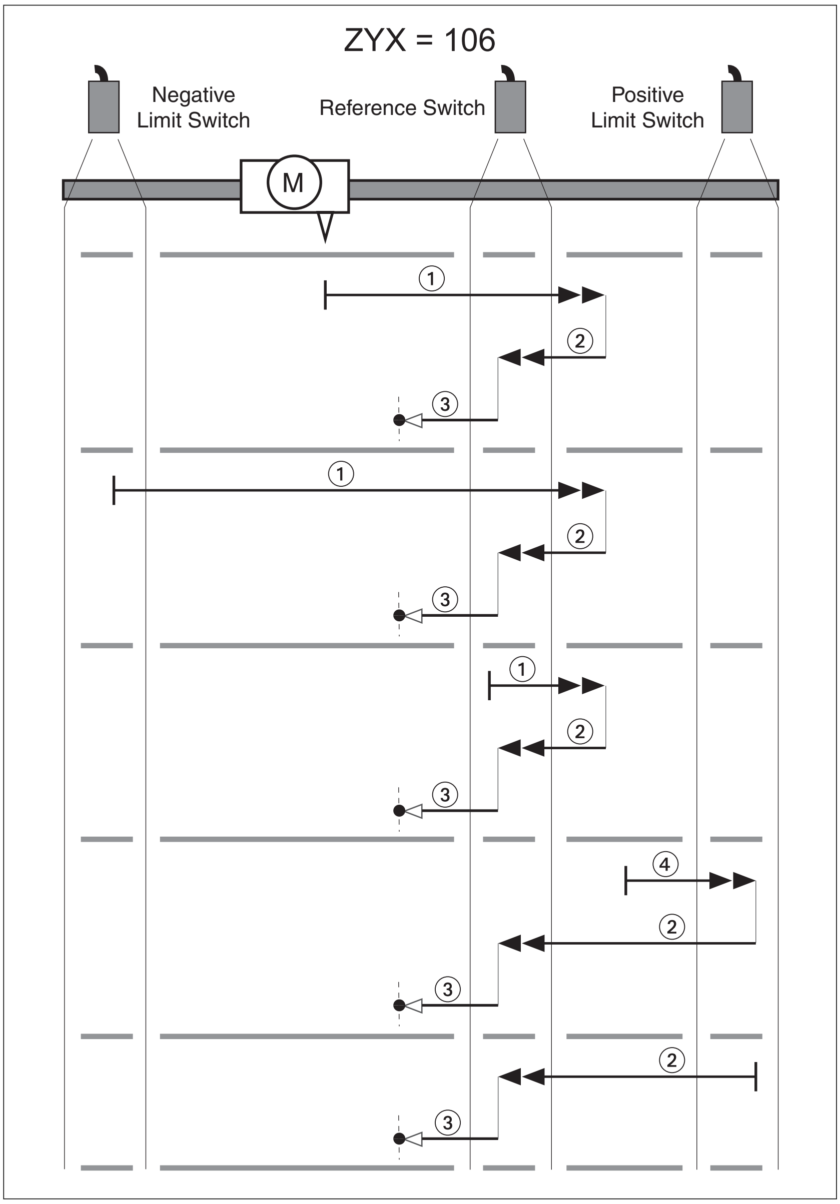

Figure 126: Reference movement (ZYX = 106)

(1) Movement to falling edge at velocity P5-05
(2) Movement to rising edge at velocity P5-05
(3) Movement to the index pulse at velocity P5-06
(4) Movement to the limit switch at velocity P5-05

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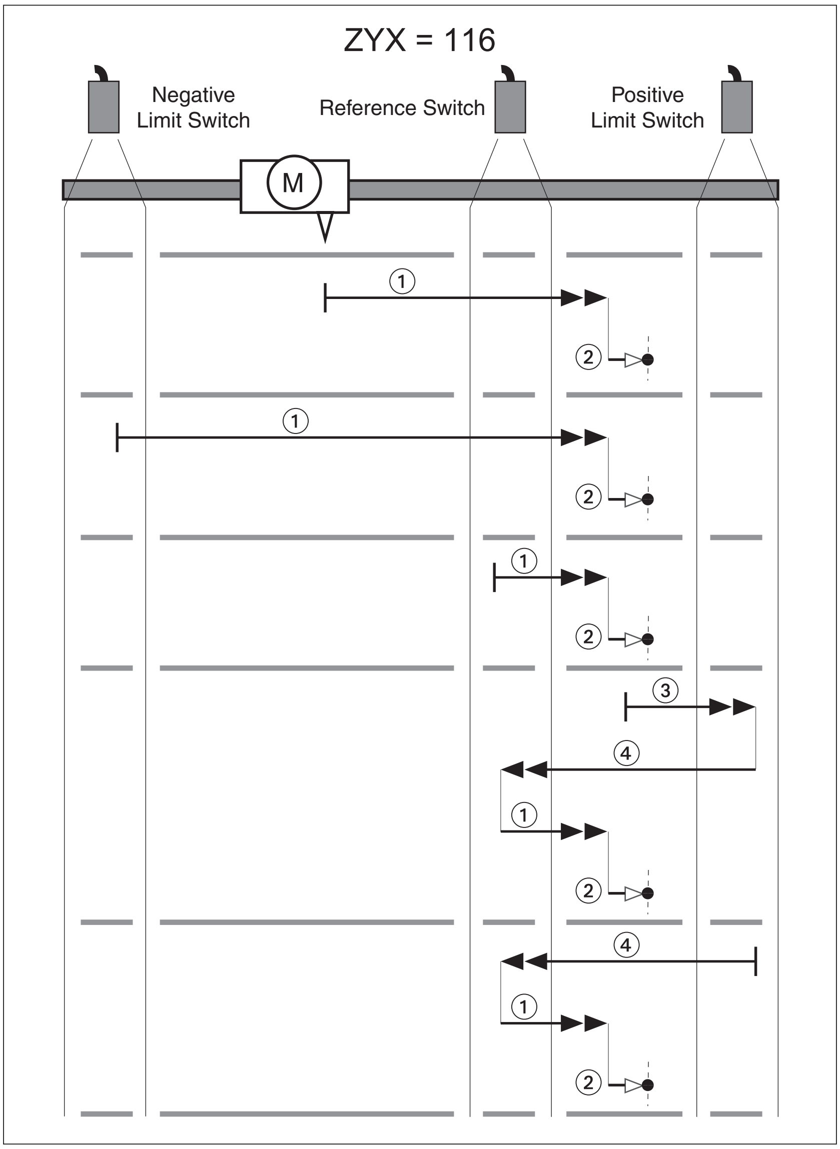

Figure 127: Reference movement (ZYX = 116)

(1) Movement to falling edge at velocity P5-05

(2) Movement to the index pulse at velocity P5-06

(3) Movement to the limit switch at velocity P5-05

(4) Movement to rising edge at velocity P5-05

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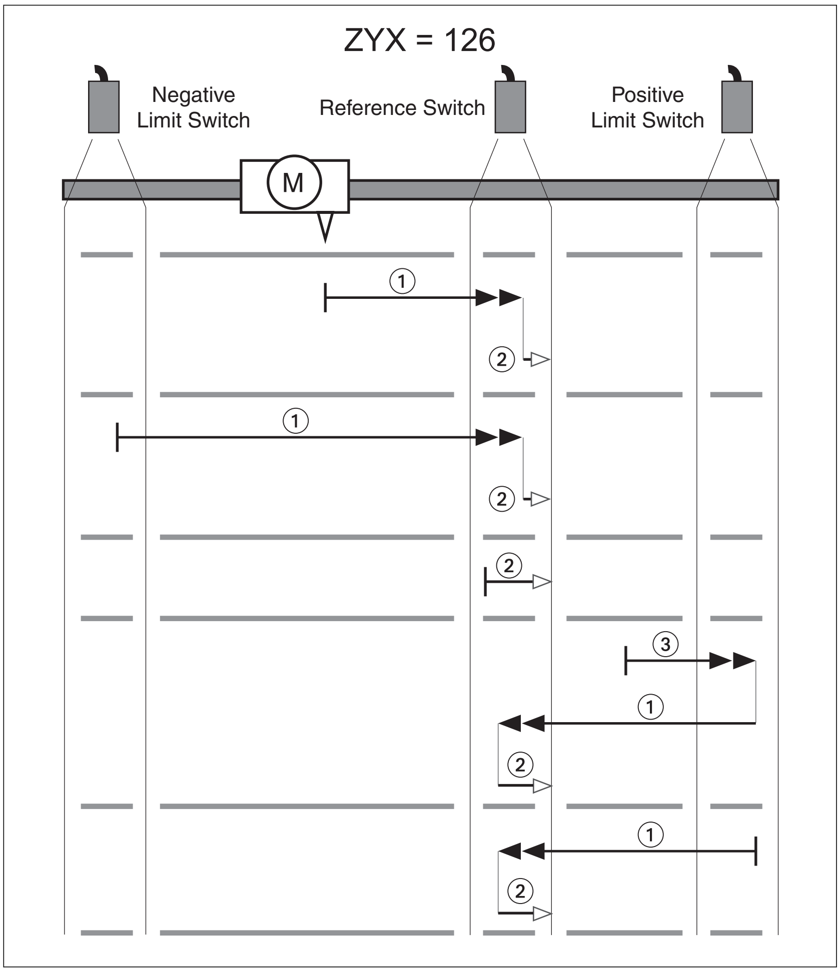

Figure 128: Reference movement (ZYX = 126)

(1) Movement to rising edge at velocity P5-05

(2) Movement to falling edge at velocity P5-06

(3) Movement to the limit switch at velocity P5-05

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Reference movement in negative direction to the falling edge of the reference switch

The following illustrations show reference movements to the falling edge of the reference switch in negative direction from different starting positions.

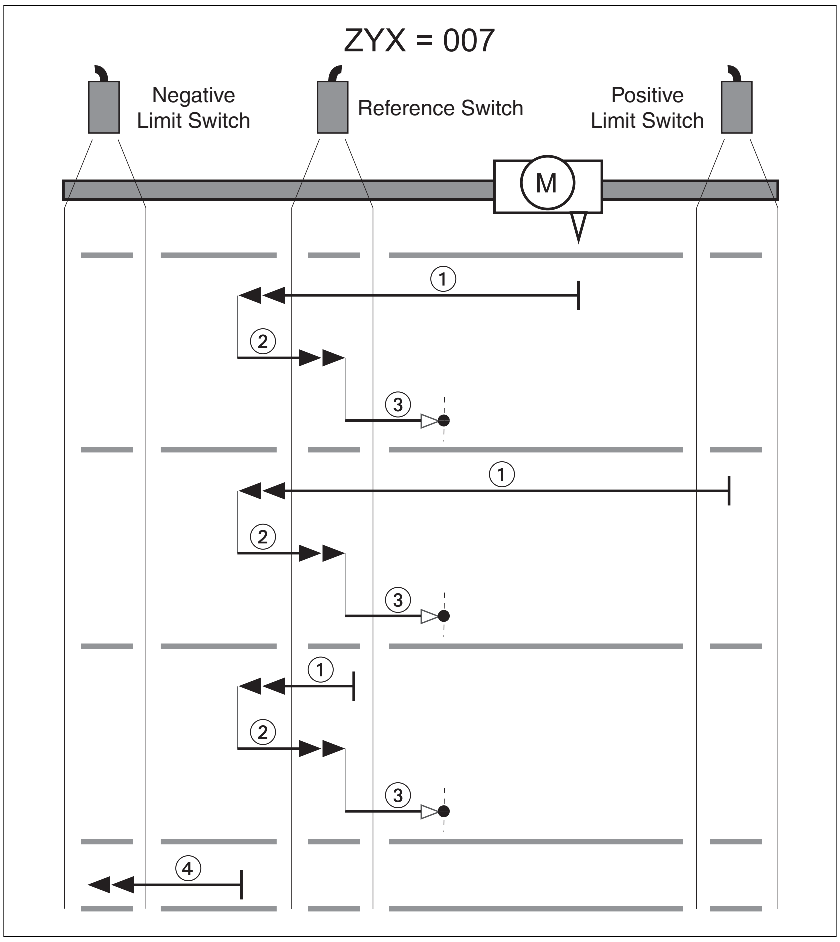

Figure 129: Reference movement (ZYX = 007)

(1) Movement to falling edge at velocity P5-05
(2) Movement to rising edge at velocity P5-05
(3) Movement to the index pulse at velocity P5-06
(4) Movement to the limit switch at velocity P5-05

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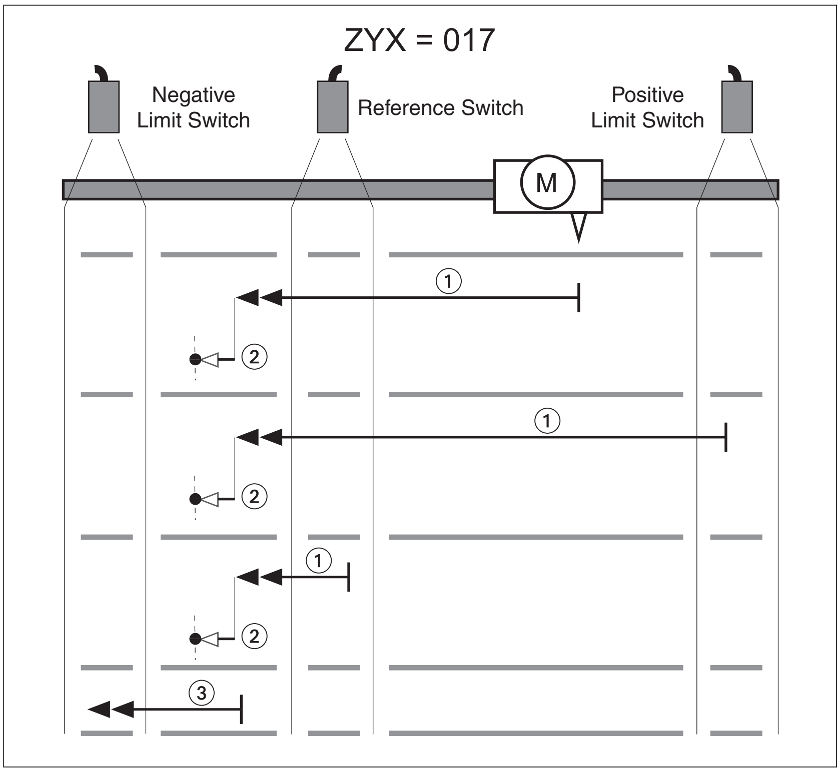

Figure 130: Reference movement (ZYX = 017)

(1) Movement to falling edge at velocity P5-05
(2) Movement to the index pulse at velocity P5-06
(3) Movement to the limit switch at velocity P5-05

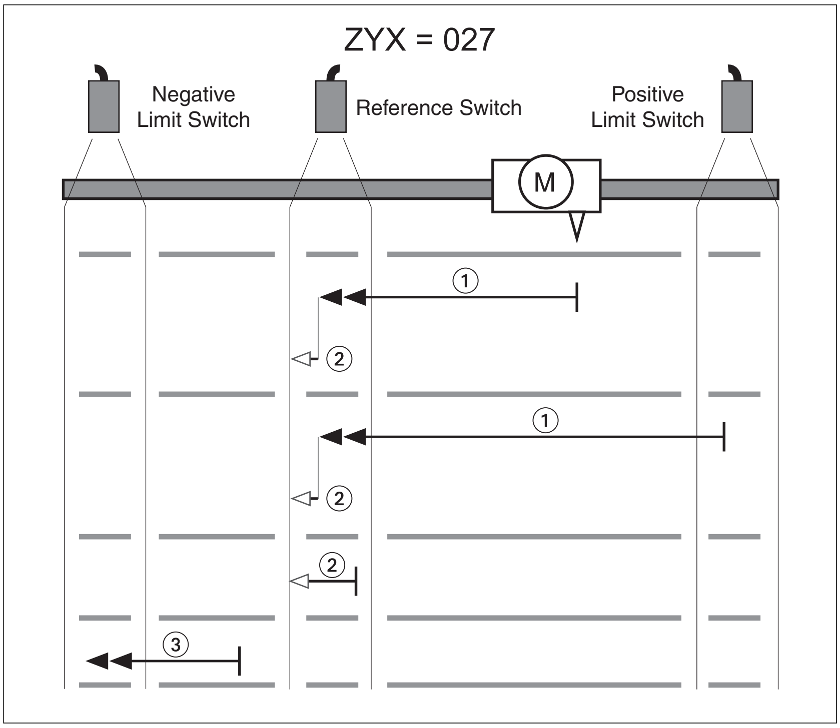

Figure 131: Reference movement (ZYX = 027)

(1) Movement to rising edge at velocity P5-05
(2) Movement to falling edge at velocity P5-06
(3) Movement to the limit switch at velocity P5-05

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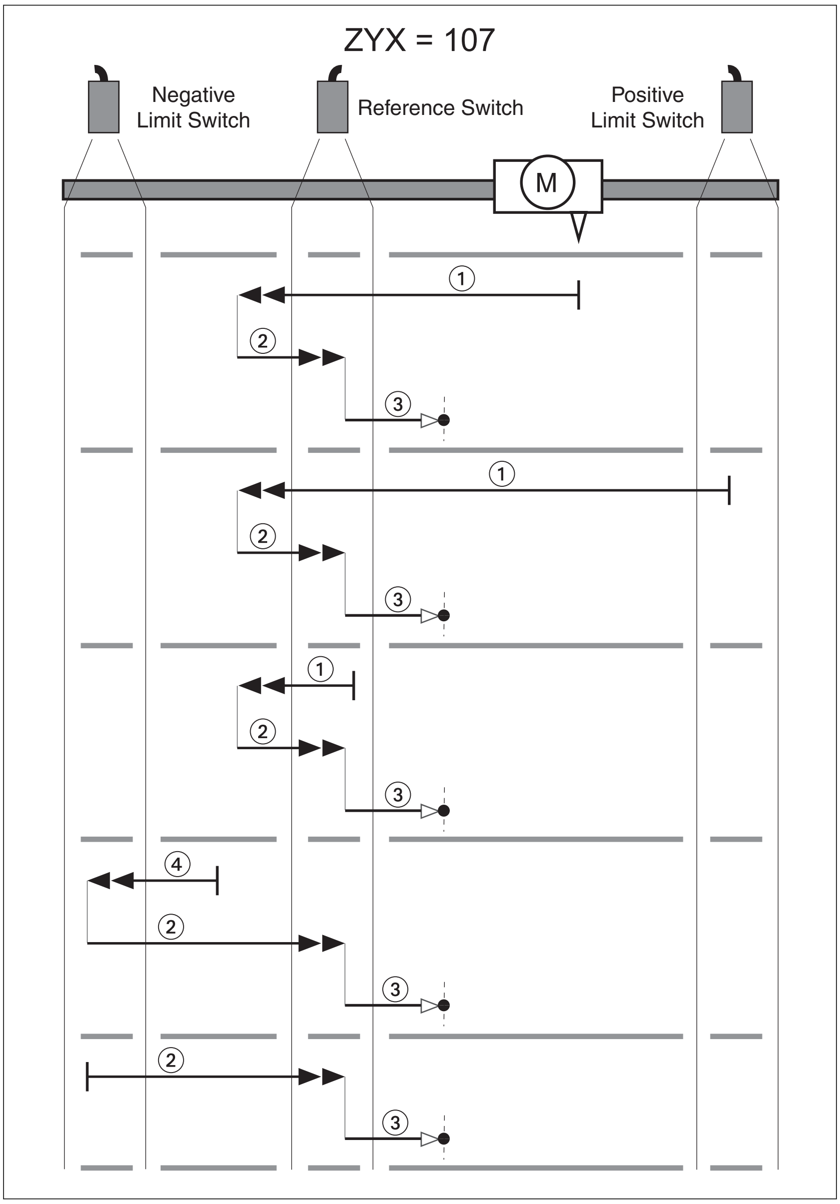

Figure 132: Reference movement (ZYX = 107)

(1) Movement to falling edge at velocity P5-05

(2) Movement to rising edge at velocity P5-05

(3) Movement to the index pulse at velocity P5-06

(4) Movement to the limit switch at velocity P5-05

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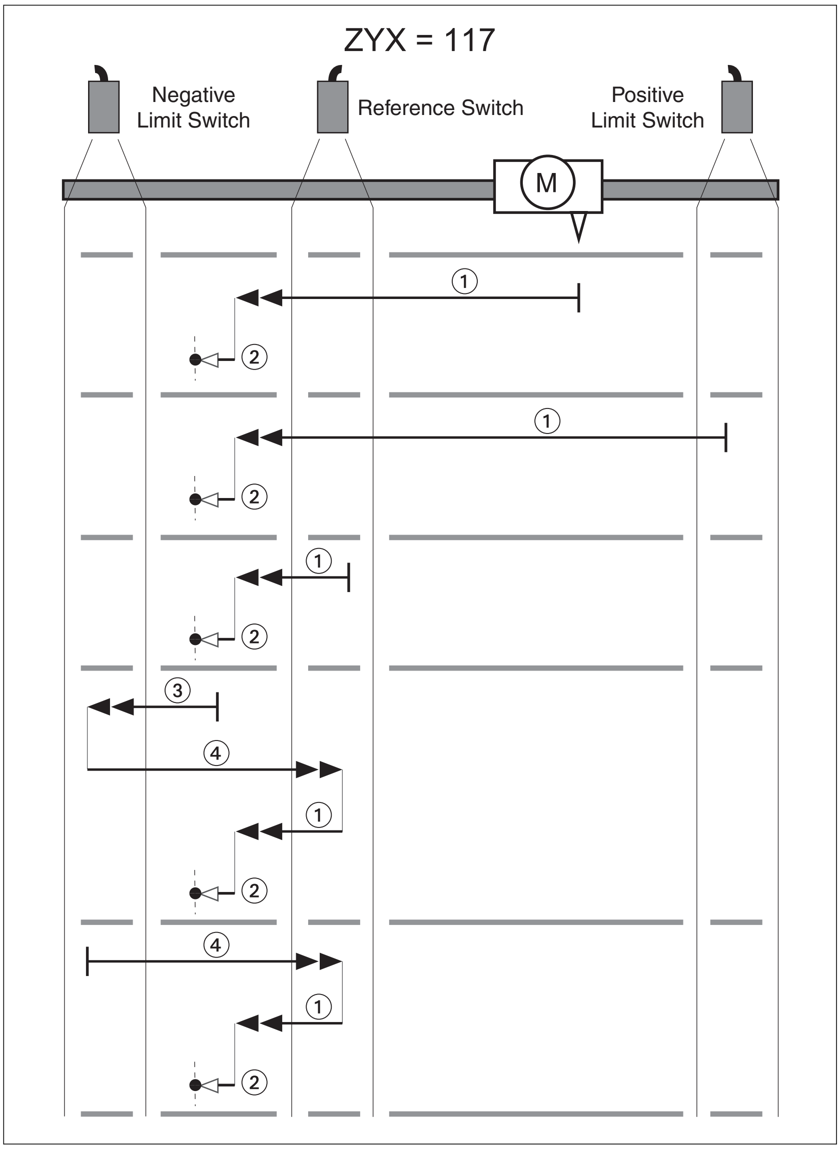

Figure 133: Reference movement (ZYX = 117)

(1) Movement to falling edge at velocity P5-05
(2) Movement to the index pulse at velocity P5-06
(3) Movement to the limit switch at velocity P5-05
(4) Movement to rising edge at velocity P5-05

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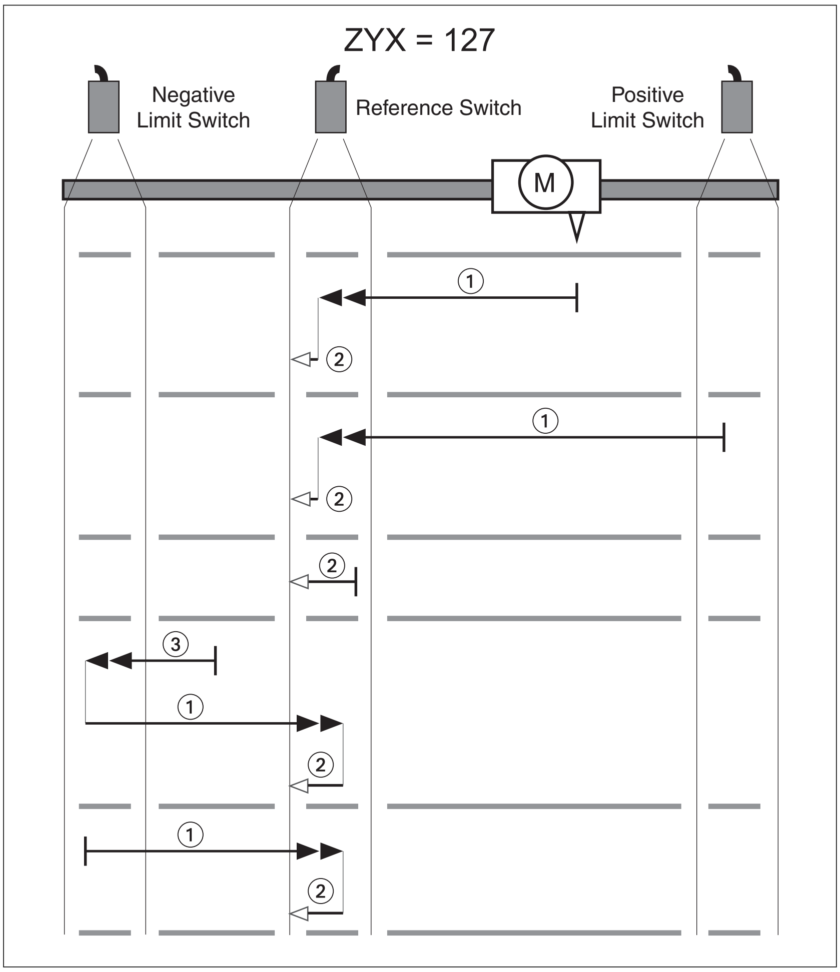

Figure 134: Reference movement (ZYX = 127)

(1) Movement to rising edge at velocity P5-05

(2) Movement to falling edge at velocity P5-06

(3) Movement to the limit switch at velocity P5-05

Position setting

By means of position setting, the current motor position is set to the position value in parameter P6-00. This also defines the zero point.

Position setting is only possible when the motor is at a standstill. Any active position deviation remains active and can still be compensated for by the position controller after position setting.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P6-00` ODAT	Position of Homing Data Set Applicable operating mode: PS After a successful reference movement, this position is automatically set at the reference point. Bits 0 ... 31: Position	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 700_h CANopen 4600_h

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7.3.5 Operating modes Velocity (V) and Velocity Zero (Vz)

Description

In the operating mode Velocity (V), a movement is made with a specified target velocity.

Source of reference value signals

In the operating mode Velocity (V), the source of the reference value signals is either the analog input `V_REF` or one of the three values set via the parameters `P1-09` to `P1-11`.

In the operating mode Velocity Zero (Vz), the source of the reference value signals is either one of the three values set via the parameters `P1-09` to `P1-11` or the fixed target velocity 0.

The values of the parameters `P1-09` to `P1-11` can be selected via the signal input functions SPD0 and SPD1.

The signal input functions SPD0 and SPD1 take priority over the reference value signal at the analog input `V_REF`.

The target velocity is selected via the signal input functions SPD0 (LSB) and SPD1 (MSB) (bit-coded):

See chapter *"7.4.2 Parameterization of the signal input functions"* for additional information on the parameterizable signal input functions.

-	**Signal state of the digital signal inputs**		**Target velocity via:**		**Range**
	SPD1	**SPD0**			
S1	0	0	Operating mode Velocity (V)	Voltage between V_REF (pin 42) and GND (pin 44)	-10V ... 10V
			Operating mode Velocity Zero (Vz)	0 min^{-1}	
S2	0	1	Internal parameters	`P1-09`	-60000 ... 60000 *0.1 min^{-1}
S3	1	0		`P1-10`	
S4	1	1		`P1-11`	

Scaling of the analog input V_REF

The parameter `P1-40` lets you set the velocity corresponding to 10 V. This results in a linear scaling for the analog input V_REF.

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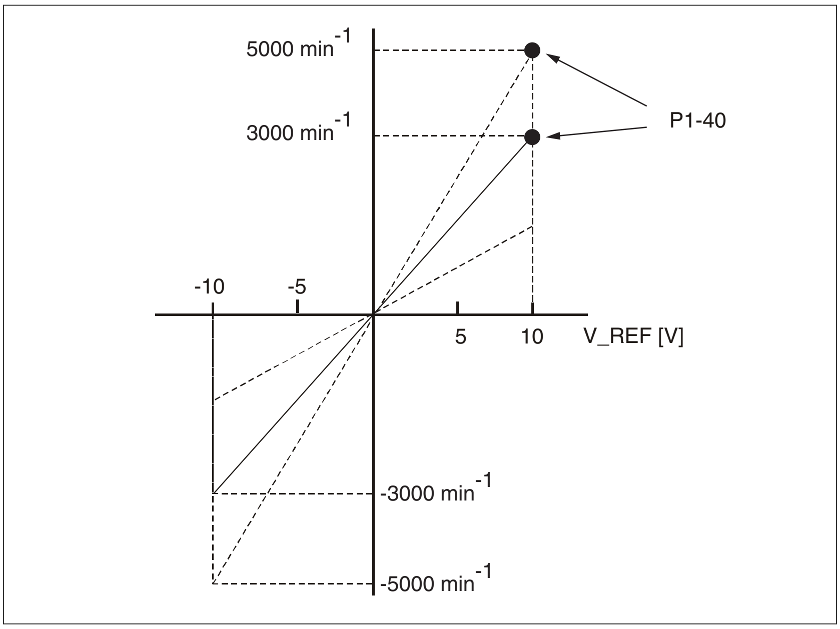

Figure 135: Scaling of the analog input V_REF via `P1-40`

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P1-40` VCM	Velocity Target Value and Velocity Limitation 10 V Applicable operating mode: PT, PS, V, T In the operating mode V, this parameter specifies the target velocity that corresponds to the maximum input voltage of 10 V. In the operating mode T, this parameter specifies the velocity limitation that corresponds to the maximum input voltage of 10 V. Example: If the value of this parameter is 3000 in the operating mode V and if the input voltage is 10 V, the target velocity is 3000 min^{-1}.	rpm 0 - 10001 Decimal	s32 RW per.	Modbus 250_h CANopen 4128_h

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Example The illustration below shows how the target velocities are switched by means of the signal input functions SPD0,SPD1 and SON.

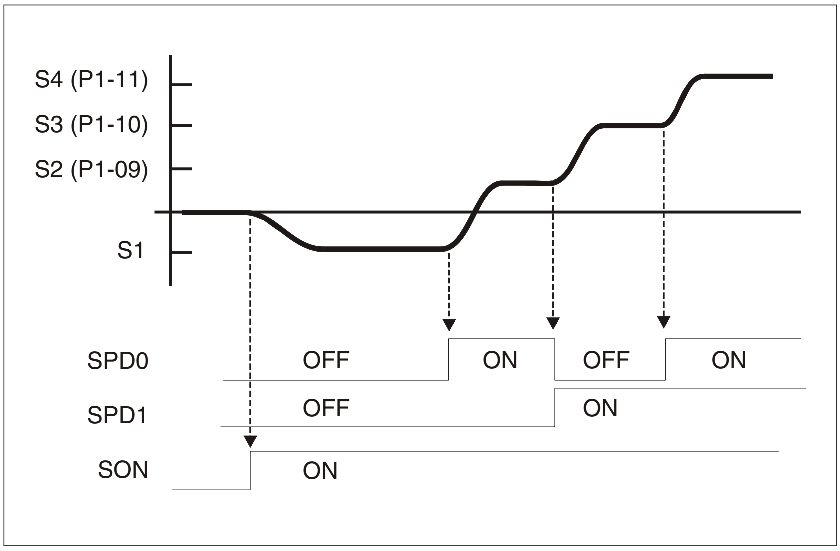

Figure 136: Operating modes Velocity (V) and Velocity Zero (Vz)

See chapter *"7.4 Setting the digital signal inputs and signal outputs"* for additional information.

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7.3.5.1 Acceleration and deceleration

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

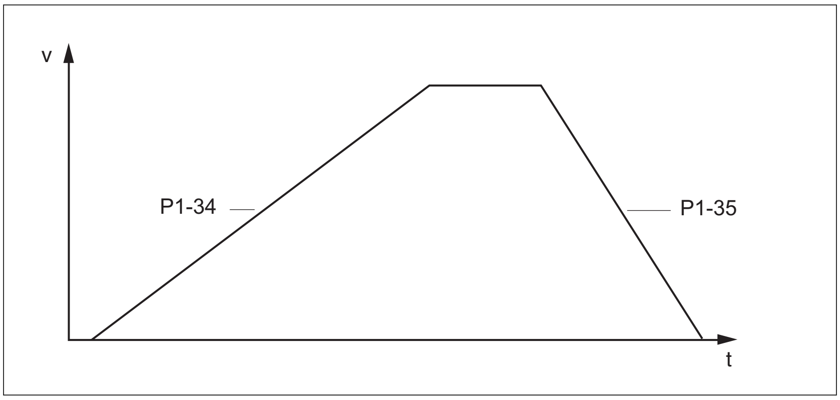

Figure 137: Acceleration and deceleration

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P1-34` TACC	Acceleration Period Applicable operating mode: PT, V The acceleration period is the time in milli-seconds required to accelerate from motor standstill to 6000 min^{-1}. For operating mode V, this parameter speci-fies the acceleration. If the target velocity is supplied as an analog signal, the maximum value of this parameter is automatically limi-ted to 20000. For operating mode PT, this parameter specifies an acceleration limitation for the pulses at the PTI interface.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 244_h CANopen 4122_h
`P1-35` TDEC	Deceleration Period Applicable operating mode: PT, V The deceleration period is the time in milli-seconds required to decelerate from 6000 min^{-1} to motor standstill. For operating mode V, this parameter speci-fies the deceleration. If the target velocity is supplied as an analog signal, the maximum value of this parameter is automatically limi-ted to 20000. For operating mode PT, this parameter specifies a deceleration limitation for the pulses at the PTI interface.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 246_h CANopen 4123_h

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7.3.6 Operating modes Torque (T) and Torque Zero (Tz)

Description

In the operating mode Torque (T), a movement is made with a specified target torque. The target torque is specified in percent of the nominal torque of the motor.

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that all loads come to a secure standstill when the power stage is disabled in the operating modes Torque (T) and Torque (Tz) and in all dual-mode operating modes with Torque (T) and Torque (Tz) by performing comprehensive commissioning tests under maximum load conditions.
- During commissioning, trigger all signals and simulate all conditions that cause a power stage disable request in order to verify that all loads come to a secure standstill when the power stage is disabled in the operating modes Torque (T) and Torque (Tz) and in all dual-mode operating modes with Torque (T) and Torque (Tz) under maximum load conditions.
- Install a dedicated service brake if coasting does not meet the deceleration requirements of your application.

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

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Source of reference value signals

In the operating mode Torque (T), the source of the reference value signals is either the analog input `T_REF` or one of the three values set via the parameters `P1-12` to `P1-14`.

In the operating mode Torque Zero (Tz), the source of the reference value signals is either one of the three values set via the parameters `P1-12` to `P1-14` or the fixed target torque 0 %.

The values of the parameters `P1-12` to `P1-14` can be selected via the signal input functions TCM0 and TCM1.

The signal input functions TCM0 and TCM1 take priority over the reference value signal of the analog input `T_REF`.

The target torque is selected via the signal input functions TCM0 (LSB) and TCM1 (MSB) (bit-coded):

See chapter *"7.4.2 Parameterization of the signal input functions"* for additional information on the parameterizable signal input functions.

-	**Signal state of the digital signal inputs**		**Target torque is provided via:**		**Range**
	TCM1	**TCM0**			
T1	0	0	Operating mode Torque (T)	Voltage between T_REF (pin 18) and GND (pin 19)	-10V ... 10V
			Operating mode Torque Zero (Tz)	0 %	
T2	0	1	Internal parameters	`P1-12`	-300 ... 300%
T3	1	0		`P1-13`	
T4	1	1		`P1-14`	

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Scaling of the analog input T_REF

The parameter `P1-41` lets you set the torque corresponding to 10 V. This results in a linear scaling for the analog input T_REF.

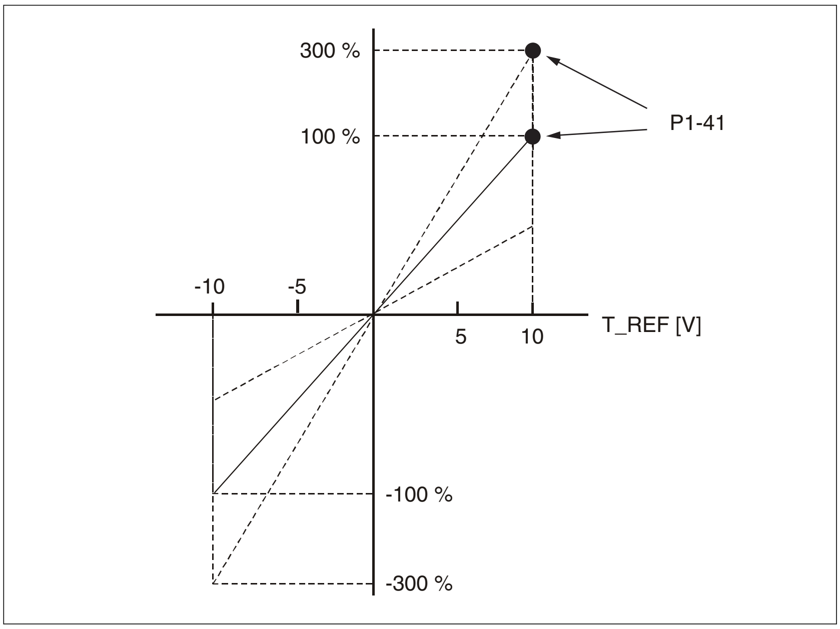

Figure 138: Scaling of the analog input T_REF via `P1-41`

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P1-41` TCM	Torque Target Value and Torque Limitation 10 V Applicable operating mode: PT, PS, V, T In the operating mode T, this parameter specifies the target torque that corresponds to the maximum input voltage of 10 V. In the operating modes PT, PS and V, this parameter specifies the torque limitation that corresponds to the maximum input voltage of 10 V. Example: If the value of this parameter is 100 in the operating mode T and if the input voltage is 10 V, the target torque is 100 % of the nominal torque. Setting can only be changed if power stage is disabled.	% 0 100 1000 Decimal	u16 RW per.	Modbus 252_h CANopen 4129_h

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Example The illustration below shows how the target torque is switched by means of the signal input functions TCM0,TCM1 and SON.

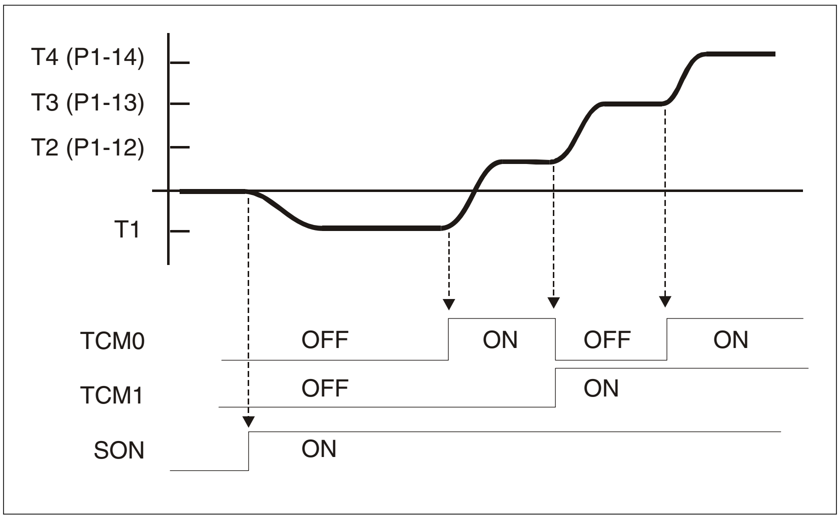

Figure 139: Operating modes Torque (T) and Torque Zero (Tz)

See chapter *"7.4 Setting the digital signal inputs and signal outputs"* for additional information.

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7.4 Setting the digital signal inputs and signal outputs

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the wiring is appropriate for the settings.
- Only start the system if there are no persons or obstructions in the zone of operation.
- When commissioning, carefully run tests for all operating states and potential error situations.

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

Signal function

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

Depending on the selected operating mode, different functions are assigned to the digital signal inputs and digital signal outputs.

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7.4.1 Default presets of the signal inputs

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

Setting A for P2-10 ... P2-17	Short name	Name	PT	PS	V	T	Vz	Tz	PT V	PT T	PS V	PS T	V T	CANopen
01_h	SON	Servo ON	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	-
02_h	FAULT_RESET	Fault Reset	DI5	DI5	DI5	DI5	DI5	DI5	-	-	-	-	-	-
03_h	GAINUP	Increase Gain	-	-	-	-	-	-	-	-	-	-	-	-
04_h	CLRPOSDEV	Clear Position Deviation	DI2	-	-	-	-	-	DI2	DI2	-	-	-	-
05_h	ZCLAMP	Zero Clamp	-	-	-	-	-	-	-	-	-	-	-	-
06_h	INVDIR-ROT	Inverse Direction Of Rotation	-	-	-	-	-	-	-	-	-	-	-	-
07_h	HALT	Halt	-	-	-	-	-	-	-	-	-	-	-	-
08_h	CTRG	Start Data Set	-	DI2	-	-	-	-	-	-	DI2	DI2		-
09_h	TRQLM	Activate Torque Limit	-	-	DI2	-	DI2	-	-	-	-	-	-	-
10_h	SPDLM	Activate Speed Limit	-	-	-	DI2	-	DI2	-	-	-	-	-	-
11_h	POS0	Data Set Bit 0	-	DI3	-	-	-	-	-	-	DI3	DI3	-	-
12_h	POS1	Data Set Bit 1	-	DI4	-	-	-	-	-	-	DI4	DI4	-	-
13_h	POS2	Data Set Bit 2	-	-	-	-	-	-	-	-	-	-	-	-
14_h	SPD0	Speed Reference Value Bit 0	-	-	DI3	-	DI3	-	DI3	-	DI5	-	DI3	-
15_h	SPD1	Speed Reference Value Bit 1	-	-	DI4	-	DI4	-	DI4	-	DI6	-	DI4	-
16_h	TCM0	Torque Reference Value Bit 0	DI3	-	-	DI3	-	DI3	-	DI3	-	DI5	DI5	-
17_h	TCM1	Torque Reference Value Bit 1	DI4	-	-	DI4	-	DI4	-	DI4	-	DI6	DI6	-
18_h	V-Px	Velocity - Position	-	-	-	-	-	-	DI7	-	DI7	-	-	-
19_h	V-T	Velocity - Torque	-	-	-	-	-	-	-	-	-	-	DI7	-
$1A_h$	POS3	Data Set Bit 3	-	-	-	-	-	-	-	-	-	-	-	-
$1B_h$	POS4	Data Set Bit 4	-	-	-	-	-	-	-	-	-	-	-	-
$1C_h$	TPROB1	Touch Probe 1	-	-	-	-	-	-	-	-	-	-	-	-
20_h	T-Px	Torque - Position	-	-	-	-	-	-	-	DI7	-	DI7	-	-
21_h	OPST	Stop and Disable Power Stage	DI8	DI8	DI8	DI8	DI8	DI8	DI8	DI8	DI8	DI8	DI8	DI8
22_h	CWL(NL)	Negative Limit Switch (NL/LIMN)	DI6	DI6	DI6	DI6	DI6	DI6	-	-	-	-	-	DI6
23_h	CCWL(PL)	Positive Limit Switch (PL/LIMP)	DI7	DI7	DI7	DI7	DI7	DI7	-	-	-	-	-	DI7
24_h	ORGP	Reference Switch	-	-	-	-	-	-	-	-	-	-	-	DI5

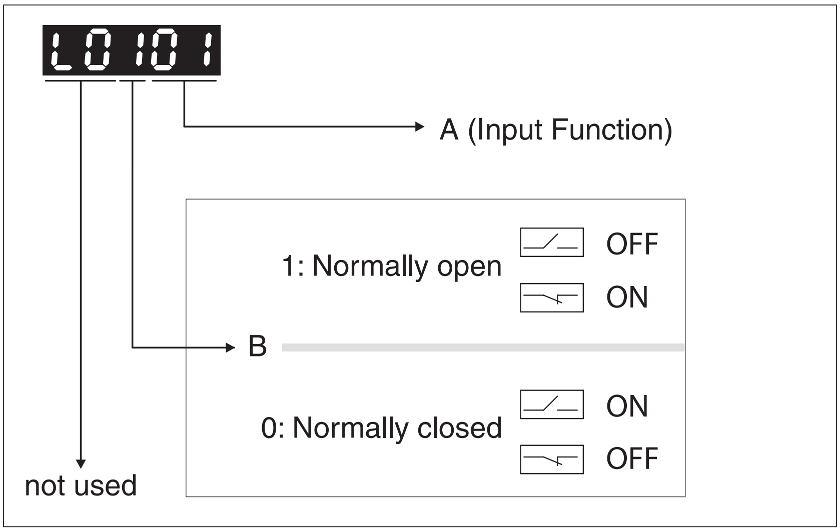
Setting A for P2-10 … P2-17	Short name	Name	PT	PS	V	T	Vz	Tz	PT V	PT T	PS V	PS T	V T	CANopen
27_h	GOTO-HOME	Move To Home Position	-	-	-	-	-	-	-	-	-	-	-	-
$2C_h$	PTCMS	Type of pulses for operating mode Pulse Train (PT) (OFF: Low-speed pulses, ON: High-Speed pulses)	-	-	-	-	-	-	-	-	-	-	-	-
37_h	JOGP	Jog Positive	-	-	-	-	-	-	-	-	-	-	-	-
38_h	JOGN	Jog Negative	-	-	-	-	-	-	-	-	-	-	-	-
39_h	STEPU	Next Data Set	-	-	-	-	-	-	-	-	-	-	-	-
40_h	STEPD	Previous Data Set	-	-	-	-	-	-	-	-	-	-	-	-
41_h	STEPB	First Data Set	-	-	-	-	-	-	-	-	-	-	-	-
42_h	AUTOR	Automatic Position Sequence: Start with first data set, repeat sequence	-	-	-	-	-	-	-	-	-	-	-	-
43_h	GNUM0	Numerator Bit 0 Electronic Gear Ratio	-	-	-	-	-	-	-	-	-	-	-	-
44_h	GNUM1	Numerator Bit 1 Electronic Gear Ratio	-	-	-	-	-	-	-	-	-	-	-	-
45_h	INHP	Pulse Inhibit	-	-	-	-	-	-	-	-	-	-	-	-
46_h	STOP	Stop Motor (operating mode PS only)	-	-	-	-	-	-	-	-	-	-	-	-

7.4.2 Parameterization of the signal input functions

Parameterization

The signal input functions for the inputs `DI1` ... `DI8` are configured via the parameters `P2-10` ... `P2-17`.

A signal input function can only be assigned to one of the signal inputs.



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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that all loads come to a secure standstill when the power stage is disabled in the operating modes Torque (T) and Torque (Tz) and in all dual-mode operating modes with Torque (T) and Torque (Tz) by performing comprehensive commissioning tests under maximum load conditions.
- During commissioning, trigger all signals and simulate all conditions that cause a power stage disable request in order to verify that all loads come to a secure standstill when the power stage is disabled in the operating modes Torque (T) and Torque (Tz) and in all dual-mode operating modes with Torque (T) and Torque (Tz) under maximum load conditions.
- Install a dedicated service brake if coasting does not meet the deceleration requirements of your application.

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

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

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Setting A for P2-10 ... P2-17	Short name	Name	Description
01_h	SON	Servo ON	The signal input function SON enables the power stage (operating state Operation Enabled). The signal input function SON is only available if no detected errors are present.
02_h	FAULT_RESET	Fault Reset	The signal input function FAULT_RESET performs a Fault Reset. The cause of the error must have been removed before a Fault Reset is performed.
03_h	GAINUP	Increase Gain	The signal input function GAINUP increases the control gain according to the values and conditions set via parameter P2-27.
04_h	CLRPOSDEV	Clear Position Deviation	The signal input function CLRPOSDEV resets the position deviation to zero as set via parameter P2-50.
05_h	ZCLAMP	Zero Clamp	The signal input function ZCLAMP stops the motor. The velocity of the motor must be below the velocity value set via parameter P1-38.
06_h	INVDIRROT	Inverse Direction Of Rotation	The signal input function INVDIRROT inverts the direction of rotation of the motor. The signal input function INVDIRROT is available in the operating modes Velocity (V) and Torque (T).
07_h	HALT	Halt	The signal input function HALT interrupts the movement with the deceleration ramp set via the parameter P1-68. The movement is resumed when the signal input function is no longer active.
08_h	CTRG	Start Data Set	The signal input function CTRG starts the selected data set in the operating mode Position Sequence (PS). See chapter *"7.3.4 Operating mode Position Sequence (PS)"* for additional information.
09_h	TRQLM	Activate Torque Limit	The signal input function TRQLM activates the torque limitations set via parameters P1-12 ... P1-14. You can also use the parameter P1-02 to activate the torque limitations set via parameters P1-12 ... P1-14.
10_h	SPDLM	Activate Speed Limit	The signal input function SPDLM activates the velocity limitations set via parameters P1-09 ... P1-11. You can also use the parameter P1-02 to activate the velocity limitations set via parameters P1-09 ... P1-11.
11_h	POS0	Data Set Bit 0	The signal input functions POS0 ... POS4 represent bits 0 ... 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). See chapter *"7.3.4 Operating mode Position Sequence (PS)"* for additional information.
12_h	POS1	Data Set Bit 1	The signal input functions POS0 ... POS4 represent bits 0 ... 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). See chapter *"7.3.4 Operating mode Position Sequence (PS)"* for additional information.
13_h	POS2	Data Set Bit 2	The signal input functions POS0 ... POS4 represent bits 0 ... 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). See chapter *"7.3.4 Operating mode Position Sequence (PS)"* for additional information.
14_h	SPD0	Speed Reference Value Bit 0	The signal input functions SPD0 and SPD1 represent bits 0 and 1 to select one of the three velocity reference values available in the operating mode Velocity (V). See chapter *"7.3.5 Operating modes Velocity (V) and Velocity Zero (Vz)"* for additional information.
15_h	SPD1	Speed Reference Value Bit 1	The signal input functions SPD0 and SPD1 represent bits 0 and 1 to select one of the three velocity reference values available in the operating mode Velocity (V). See chapter *"7.3.5 Operating modes Velocity (V) and Velocity Zero (Vz)"* for additional information.

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Setting A for P2-10 ... P2-17	Short name	Name	Description
16_h	TCM0	Torque Reference Value Bit 0	The signal input functions TCM0 and TCM1 represent bits 0 and 1 to select one of the three torque reference values available in the operating mode Torque (T). See chapter *"7.3.6 Operating modes Torque (T) and Torque Zero (Tz)"* for additional information.
17_h	TCM1	Torque Reference Value Bit 1	The signal input functions TCM0 and TCM1 represent bits 0 and 1 to select one of the three torque reference values available in the operating mode Torque (T). See chapter *"7.3.6 Operating modes Torque (T) and Torque Zero (Tz)"* for additional information.
18_h	V-Px	Velocity - Position	Operating mode switching between Velocity (V) and Pulse Train (PT) or between Velocity (V) and Position Sequence (PS) , see chapter *"7.3.1 Setting the operating mode"*. (OFF: Velocity (V), ON: Pulse Train (PT) or Position Sequence (PS), depending on P1-01)
19_h	V-T	Velocity - Torque	Operating mode switching between Velocity (V) and Torque (T), see chapter *"7.3.1 Setting the operating mode"*. (OFF: Velocity (V), ON: Pulse Torque (T))
$1A_h$	POS3	Data Set Bit 3	The signal input functions POS0 ... POS4 represent bits 0 ... 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). See chapter *"7.3.4 Operating mode Position Sequence (PS)"* for additional information.
$1B_h$	POS4	Data Set Bit 4	The signal input functions POS0 ... POS4 represent bits 0 ... 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). See chapter *"7.3.4 Operating mode Position Sequence (PS)"* for additional information.
$1C_h$	TPROB1	Touch Probe 1	The signal input function TPROB1 is used to trigger the Position Capture function. See the sections on the parameters P5-37 ... P5-39 for additional information.
$1D_h$	TPROB2	Touch Probe 2	The signal input function TPROB2 is used to trigger the Position Capture function. See the sections on the parameters P5-37 ... P5-39 for additional information.
20_h	T-Px	Torque - Position	Operating mode switching between Torque (T) and Pulse Train (PT) or between Torque (T) and Position Sequence (PS) , see chapter *"7.3.1 Setting the operating mode"*. (OFF: Torque (T), ON: Pulse Train (PT) or Position Sequence (PS), depending on P1-01)
21_h	OPST	Stop and Disable Power Stage	The signal input function OPST stops the motor with the deceleration ramp set via the parameter P1-68 and then disables the power stage.
22_h	CWL(NL)	Negative Limit Switch (NL/LIMN)	Negative limit switch (NL/LIMN). When the signal input is activated, an alert is triggered. The deceleration ramp is specified via parameter P5-25.
23_h	CCWL(PL)	Positive Limit Switch (PL/LIMP)	Positive limit switch (PL/LIMP). When the signal input is activated, an alert is triggered. The deceleration ramp is specified via parameter P5-26.
24_h	ORGP	Reference Switch	The signal input function ORGP is used for the reference switch. See chapter *"7.3.4 Operating mode Position Sequence (PS)"* for additional information.
27_h	GOTO-HOME	Move To Home Position	The signal input function GOTOHOME triggers a movement to the Home position set via the parameter P5-04.

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Setting A for P2-10 ... P2-17	Short name	Name	Description
$2C_h$	PTCMS	Type of pulses for operating mode Pulse Train (PT) (OFF: Low-speed pulses, ON: High-Speed pulses)	The signal input function PTCMS selects the type of pulses for the operating mode Pulse Train PT (OFF: Low-speed pulses, ON: High-speed pulses). You can also use the parameter P1-00 to select the type of pulses.
37_h	JOGP	Jog Positive	The signal input function JOGP triggers a Jog movement in positive direction if the value determining the direction of movement in the parameter P1-01 is set to the default value.
38_h	JOGN	Jog Negative	The signal input function JOGN triggers a Jog movement in negative direction if the value determining the direction of movement in the parameter P1-01 is set to the default value.
39_h	STEPU	Next Data Set	The signal input function STEPU starts the next data set in the operating mode Position Sequence (PS).
40_h	STEPD	Previous Data Set	The signal input function STEPD starts the previous data set in the operating mode Position Sequence (PS).
41_h	STEPB	First Data Set	The signal input function STEPB starts the first data set in the operating mode Position Sequence (PS).
42_h	AUTOR	Automatic Position Sequence: Start with first data set, repeat sequence	The signal input function AUTOR starts a sequence of data sets from the first data set in the operating mode Position Sequence (PS). The sequence is repeated as long a the signal input function AUTOR is active.
43_h	GNUM0	Numerator Bit 0 Electronic Gear Ratio	The signal input functions GNUM0 and GNUM1 represent bits 0 and 1 to select one of the four numerators set via the parameters P1-44, P2-60 ... P2-62. The denominator is set via the parameter P1-45 . The ratios are used as gear factors in the operating mode Pulse Train (PT) and as scaling factors. See chapters *"7.3.3.2 Gear ratio"* and *"7.3.4.2 Scaling"* for additional information.
44_h	GNUM1	Numerator Bit 1 Electronic Gear Ratio	The signal input functions GNUM0 and GNUM1 represent bits 0 and 1 to select one of the four numerators set via the parameters P1-44, P2-60 ... P2-62. The denominator is set via the parameter P1-45. The ratios are used as gear factors in the operating mode Pulse Train (PT) and as scaling factors. See chapters *"7.3.3.2 Gear ratio"* and *"7.3.4.2 Scaling"* for additional information.
45_h	INHP	Pulse Inhibit	The signal input function INHP is used in the operating mode Pulse Train (PT) to block pulses received as reference signals. If the signal input function is active, the pulses are no longer evaluated and the motor coasts down.
46_h	STOP	Stop Motor (operating mode PS only)	The signal input function STOP stops the motor with the deceleration ramp set via the parameter P5-20. The power stage remains enabled. The signal input function STOP is available in the operating mode Position Sequence (PS).

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7.4.3 Default presets of the signal outputs

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

Setting A for `P2-18 ... P2-22`	Short name	Name	PT	PS	V	T	Vz	Tz	PT V	PT T	PS V	PS T	V T	CANopen
01_h	SRDY	Servo Ready	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1
02_h	SON	Servo On	-	-	-	-	-	-	-	-	-	-	-	-
03_h	ZSPD	Zero Speed	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	-
04_h	TSPD	Speed Reached	-	-	DO3	DO3	DO3	DO3	DO3	DO3	DO3	DO3	DO3	-
05_h	TPOS	Movement Completed	DO4	DO4	-	-	-	-	DO4	DO4	DO4	DO4		-
06_h	TQL	Torque Limit Reached	-	-	-	-	-	-	-	-	-	-	-	-
07_h	ERROR	Error Detected	DO5	DO5	DO5	DO5	DO5	DO5	DO5	DO5	DO5	DO5	DO5	DO5
08_h	BRKR	Holding Brake Control	-	-	DO4	DO4	DO4	DO4	-	-	-	-	-	-
09_h	HOMED_OK	Homing Completed	DO3	DO3	-	-	-	-	-	-	-	-	-	-
10_h	OLW	Motor Overload Alert	-	-	-	-	-	-	-	-	-	-	-	-
11_h	WARN	Alert Signal activated	-	-	-	-	-	-	-	-	-	-	-	-
12_h	OVF	Position command overflow	-	-	-	-	-	-	-	-	-	-	-	-
13_h	SCWL(SNL)	Negative Software Limit Switch Reached	-	-	-	-	-	-	-	-	-	-	-	-
14_h	SCCWL(SPL)	Positive Software Limit Switch Reached	-	-	-	-	-	-	-	-	-	-	-	-
15_h	CMD_OK	Data set completed	-	-	-	-	-	-	-	-	-	-	-	-
16_h	CAP_OK	Capture completed	-	-	-	-	-	-	-	-	-	-	-	-
17_h	MC_OK	Motion control completed output	-	-	-	-	-	-	-	-	-	-	-	-
19_h	SP_OK	Speed reached output	-	-	-	-	-	-	-	-	-	-	-	-

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Setting A for `P2-18 … P2-22`	Short name	Name	PT	PS	V	T	Vz	Tz	PT V	PT T	PS V	PS T	V T	CANopen
30_h	SDO_0	Output the status of bit 0 of P4-06.	-	-	-	-	-	-	-	-	-	-	-	-
31_h	SDO_1	Output the status of bit 1 of P4-06.	-	-	-	-	-	-	-	-	-	-	-	-
32_h	SDO_2	Output the status of bit 2 of P4-06.	-	-	-	-	-	-	-	-	-	-	-	-
33_h	SDO_3	Output the status of bit 3 of P4-06.	-	-	-	-	-	-	-	-	-	-	-	-
34_h	SDO_4	Output the status of bit 4 of P4-06.	-	-	-	-	-	-	-	-	-	-	-	-
35_h	SDO_5	Output the status of bit 5 of P4-06.	-	-	-	-	-	-	-	-	-	-	-	-
36_h	SDO_6	Output the status of bit 6 of P4-06.	-	-	-	-	-	-	-	-	-	-	-	-
37_h	SDO_7	Output the status of bit 7 of P4-06.	-	-	-	-	-	-	-	-	-	-	-	-
38_h … $3F_h$	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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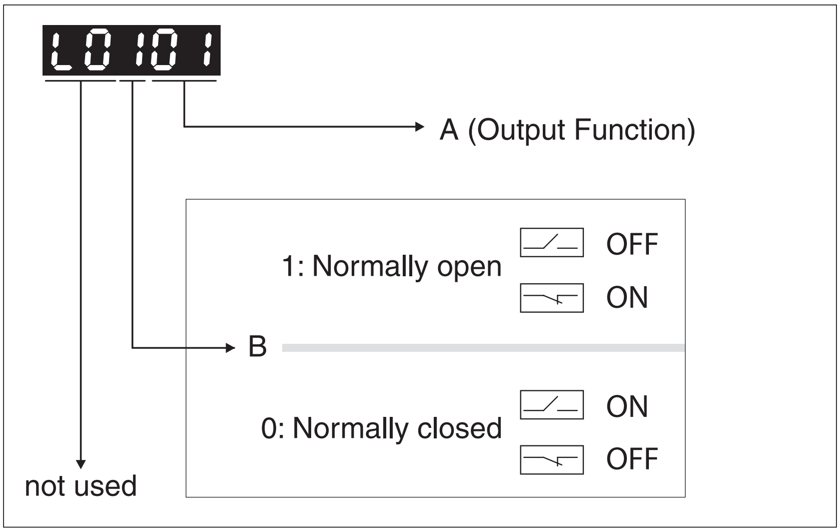
7.4.4 Parameterization of the signal output functions

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



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

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

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Setting A for P2-18 ... P2-22	Short name	Name	Description
06_h	TQL	Torque Limit Reached	The signal output function TQL indicates that the torque of the motor has reached the value set via parameters P1-12 ... P1-14 or an analog input.
07_h	ERROR	Error Detected	The signal output function ERROR indicates that an error has been detected and that the drive has switched to the operating state Fault. See *"9 Diagnostics and troubleshooting"* for details.
08_h	BRKR	Holding Brake Control	The signal output function BRKR is used to control the holding brake with the settings made via parameters P1-42 and P1-19. The holding brake must be must be connected to the output to which the signal output function BRKR is assigned. See chapter *"5.4.1.11 Holding brake connection"* for additional information.
09_h	HOMED_OK	Homing Completed	The signal output function HOMED_OK indicates that the homing procedure has been successfully completed. The settings for Homing are specified via parameters P5-04 ... P5-06. See chapter *"7.3.4 Operating mode Position Sequence (PS)"* for additional information.
10_h	OLW	Motor Overload Alert	The signal output function OLW indicates a motor overload condition. A threshold for the signal output function OLW can be set via parameter P1-28.
11_h	WARN	Alert Signal activated	The signal output function indicates that one of the following conditions has been detected: Hardware limit switch triggered, undervoltage, Nodeguard alert, Operational Stop (OPST). See chapter *"9 Diagnostics and troubleshooting"* for additional information.
12_h	-	-	Reserved
13_h	SCWL(SNL)	Negative Software Limit Switch Reached	The signal output function SCWL(SNL) indicates that the negative software limit switch set via parameter P5-09 has been reached. When the software limit switch is reached, an alert is triggered. The deceleration ramp is specified via parameter P5-23.
14_h	SCCWL(SPL)	Positive Software Limit Switch Reached	The signal output function SCCWL(SPL) indicates that the positive software limit switch set via parameter P5-08 has been reached. When the software limit switch is reached, an alert is triggered. The deceleration ramp is specified via parameter P5-24.
15_h	CMD_OK	Data set completed	The signal output function CMD_OK indicates that the data set including the waiting time has been successfully completed.
16_h	CAP_OK	Capture completed	The signal output function CAP_OK indicates that a position capture (Touch Probe) has been successfully completed. The settings for position capture (Touch Probe) are specified via parameters P5-37 ... P5-39.
17_h	MC_OK	Motion control completed output	The signal output function MC_OK indicates that both the signal output functions CMD_OK and TPOS have been activated.
19_h	SP_OK	Speed reached output	The signal output function SP_OK indicates that the target velocity has been reached. The velocity range for activating this signal output function is set via parameter P1-47.
30_h	SDO_0	Output the status of bit 0 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
31_h	SDO_1	Output the status of bit 1 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
32_h	SDO_2	Output the status of bit 2 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.

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Setting A for P2-18 ... P2-22	Short name	Name	Description
33_h	SDO_3	Output the status of bit 3 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
34_h	SDO_4	Output the status of bit 4 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
35_h	SDO_5	Output the status of bit 5 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
36_h	SDO_6	Output the status of bit 6 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
37_h	SDO_7	Output the status of bit 7 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
38_h ... $3F_h$	-	-	Reserved

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7.5 Functions for target value processing

7.5.1 Interrupting a movement with HALT

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

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

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

In order to interrupt a movement via a signal input, you must first parameterize the signal input function HALT, see chapter *"7.4.2 Parameterization of the signal input functions"*.

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

⚠ WARNING
UNEXPECTED MOVEMENT OF MACHINERY
Prior to deactivating the HALT function, determine whether subsequent movement will present a hazard within the zone of operation.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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

7.5.2 Stopping a movement with OPST

With the signal input function OPST, the ongoing movement is stopped.

In order to stop a movement via a signal input, you must first parameterize the signal input function OPST, see chapter *"7.4.2 Parameterization of the signal input functions"*.

Depending on the operating mode, the movement is interrupted either via a deceleration ramp, or, as in the case of one of the torque modes, allowed to coast to a standstill. After that, the power stage is disabled once the drive has determined that the motor is at standstill (defined as either a standstill or, as for operating mode Torque, after a 5 second timeout), and that the delay for applying the holding brake has expired.

An error, AL013, is detected and presented.

The deceleration ramp is specified via parameter `P1-68`.

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

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7.6 Setting a signal output via parameter

The digital signal outputs can be set via a parameter.

In order to set a digital signal output via the parameter, you must first parameterize of of the signal output functions "SDO_0" ... "SDO_7", see chapter *"7.4.4 Parameterization of the signal output functions"*.

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P4-06` FOT	Setting a signal output via parameter Applicable operating mode: PT, PS, V, T This parameter lets you set those signal outputs whose signal output functions have been set to SDO_0 ... SDO_5. Bit 0 = 1 sets those signal outputs whose signal output function has been set to SDO_0. Bit 1 = 1 sets those signal outputs whose signal output function has been set to SDO_1. Bit 2 = 1 sets those signal outputs whose signal output function has been set to SDO_2. Bit 3 = 1 sets those signal outputs whose signal output function has been set to SDO_3. Bit 4 = 1 sets those signal outputs whose signal output function has been set to SDO_4. Bit 5 = 1 sets those signal outputs whose signal output function has been set to SDO_5. Bit 6 = 1 sets those signal outputs whose signal output function has been set to SDO_6. Bit 7 = 1 sets those signal outputs whose signal output function has been set to SDO_7. See P2-18 ... P2-22 for assigning the functions to the digital outputs.	- 0_h 0_h FF_h Hexadecimal	u16 RW -	Modbus $50C_h$ CANopen 4406_h

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7.7 Forcing the digital signal inputs and signal outputs

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION CAUSED BY FORCING

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

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

Forcing the digital inputs

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

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P3-06 SDI	Digital Inputs - Forcing Settings Applicable operating mode: PT, PS, V, T This parameter determines whether or not a digital input can be forced. Bits 0 ... 7: Digital input DI1 ... digital input DI8 Bit settings: Value 0: Digital input cannot be forced Value 1: Digital input can be forced To actually start forcing, you must write P4-07. See P2-10 ... P2-17 for the assignment of signal input functions to the digital inputs.	- 0_h 0_h $7FF_h$ Hexadecimal	u16 RW -	Modbus $40C_h$ CANopen 4306_h

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P4-07 ITST	State of Digital Inputs / Activate Forcing Applicable operating mode: PT, PS, V, T A read access to this parameter indicates the state of the digital inputs in the form of a bit pattern. Example: Read value 0x0011: Digital inputs 1 and 5 are activated By writing this parameter, you can change the state of the inputs provided that the setting for the corresponding input in P3-06 allows for forcing (value 1 for the bit corresponding to the input). Example: Write value 0x0011: Digital inputs 1 and 5 are activated Read value 0x0011: Digital inputs 1 and 5 are activated See P3-06 for permitting forcing of individual digital inputs. See P2-10 ... P2-17 for the assignment of signal input functions to the digital inputs.	- 0_h 0_h FF_h Hexadecimal	u16 RW -	Modbus $50E_h$ CANopen 4407_h

Forcing the digital outputs

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

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P4-27 DO_FORCE_MASK	Digital Outputs - Forcing Settings Applicable operating mode: PT, PS, V, T This parameter determines whether or not a digital output can be forced. Bits 0 ... 4: Digital output DO1 ... digital output DO5 Bit settings: Value 0: Digital output cannot be forced Value 1: Digital output can be forced To actually start forcing, you must write P4-28. See P2-18 ... P2-22 for the assignment of signal output functions to the digital outputs.	- 0_h 0_h $1F_h$ Hexadecimal	u16 RW -	Modbus 536_h CANopen $441B_h$

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P4-28 DO_FORCE_VALUE	State of Digital Outputs / Activate Forcing Applicable operating mode: PT, PS, V, T A read access to this parameter indicates the state of the digital outputs in the form of a bit pattern. Example: Read value 0x0011: Digital outputs 1 and 5 are activated By writing this parameter, you can change the state of the outputs provided that the setting for the corresponding output in P4-27 allows for forcing (value 1 for the bit corresponding to the output). Example: Write value 0x0011: Digital outputs 1 and 5 are activated Read value 0x0011: Digital outputs 1 and 5 are activated See P4-27 for permitting forcing of individual digital outputs. See P2-18 ... P2-22 for the assignment of signal output functions to the digital outputs.	- 0_h 0_h $1F_h$ Hexadecimal	u16 RW -	Modbus 538_h CANopen $441C_h$

8 Examples

8.1 Wiring examples

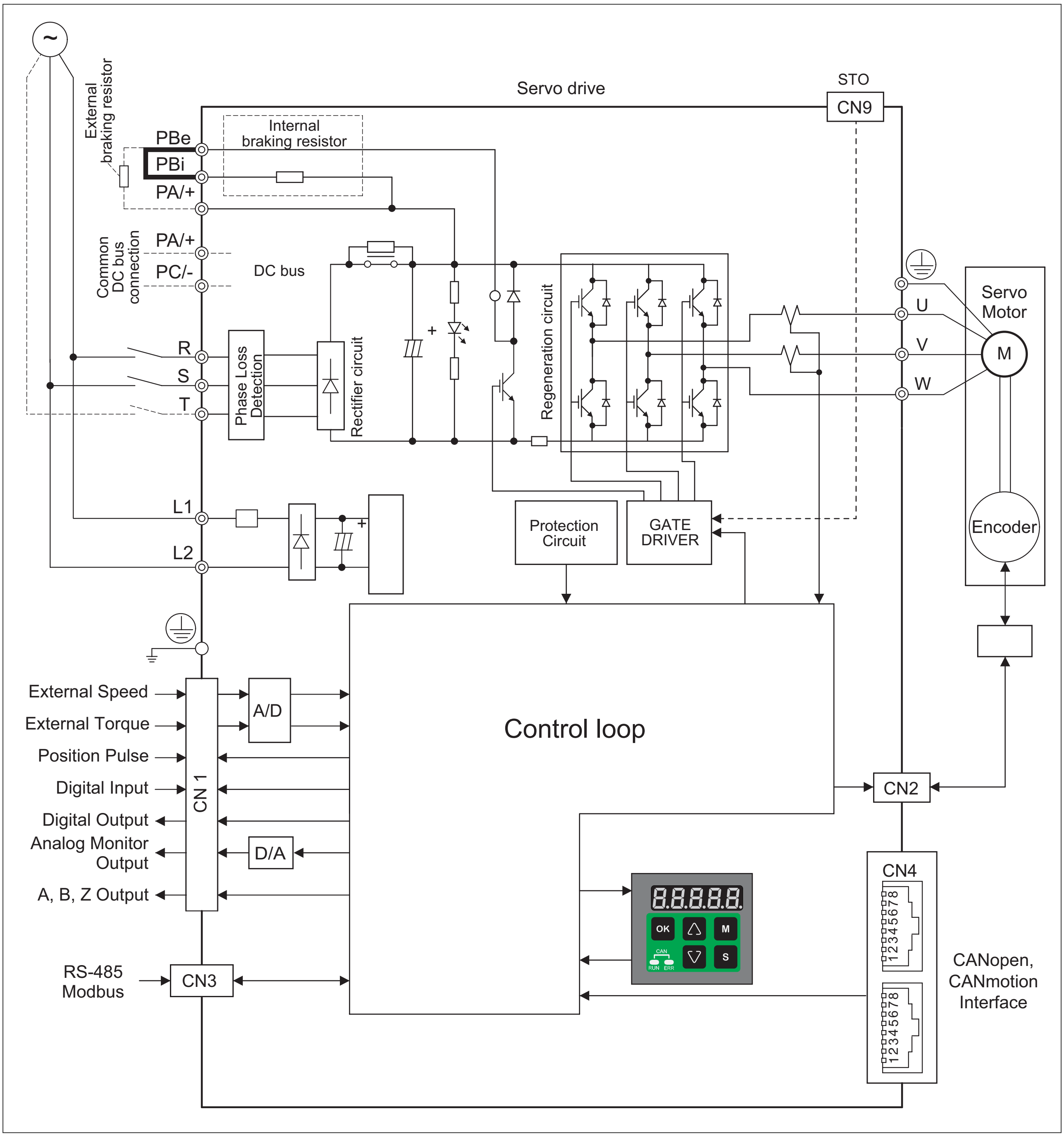

Figure 140: Wiring example

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8.2 Wiring example with Modicon M221 Logic Controller

Logic type 1 Wiring example with Modicon M221 Logic Controller (logic type 1).

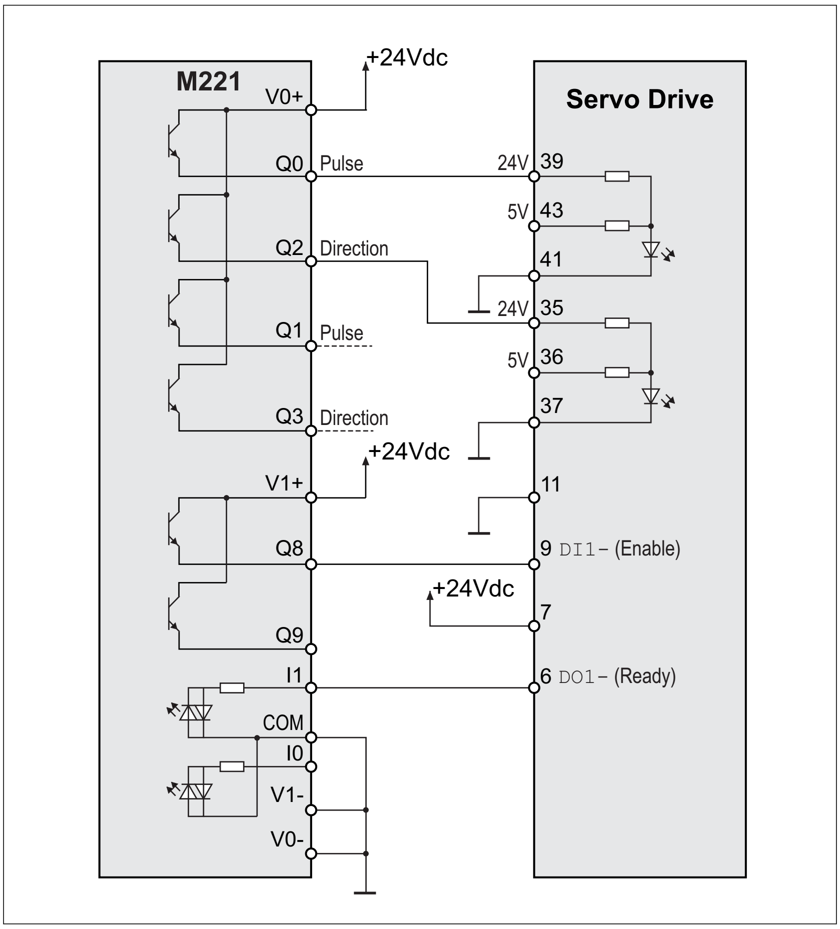

Figure 141: Wiring example with Modicon M221 and logic type 1

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Logic type 2 Wiring example with Modicon M221 Logic Controller (logic type 2).

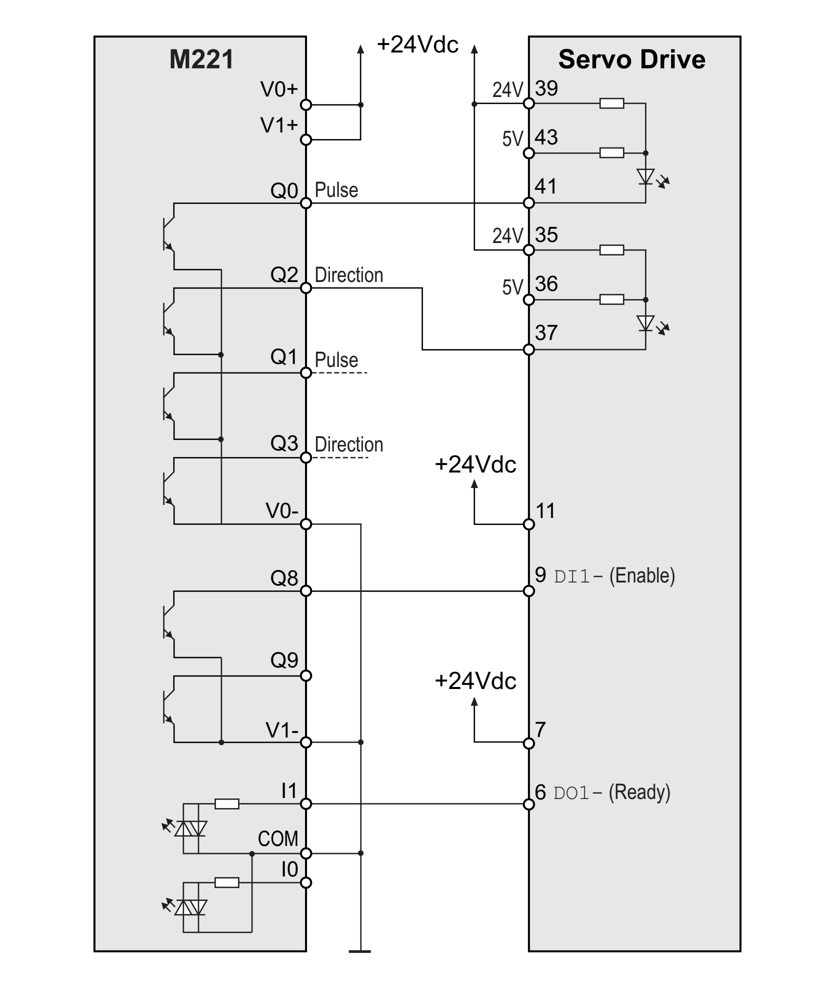

Figure 142: Wiring example with Modicon M221 and logic type 2

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9 Diagnostics and troubleshooting

9.1 Status request/status indication

Information on the product status is provided by:

- Integrated HMI
- Commissioning software LXM28 DTM Library
- Fieldbus

The error memory also contains a history of the last 5 detected errors.

Meaning of an error An error is a discrepancy between a computed, measured or signaled value or condition and the specified or theoretically correct value or condition detected by a monitoring function. An error triggers a transition of the operating state.

Meaning of an alert An alert indicates a potential issue that was detected by a monitoring function. An alert does not trigger a transition of the operating state.

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9.1.1 Fieldbus status LEDs

The fieldbus status LEDs visualize the status of the fieldbus.

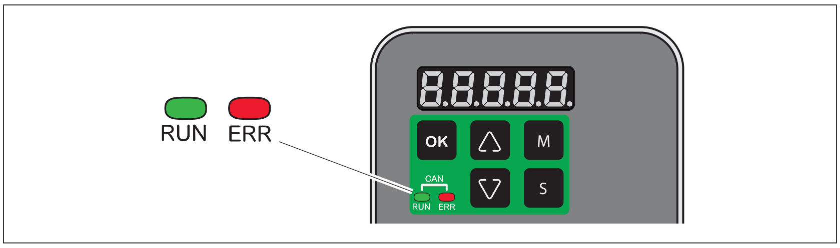

Figure 143: Fieldbus status LEDs

The illustration below shows the fieldbus communication states.

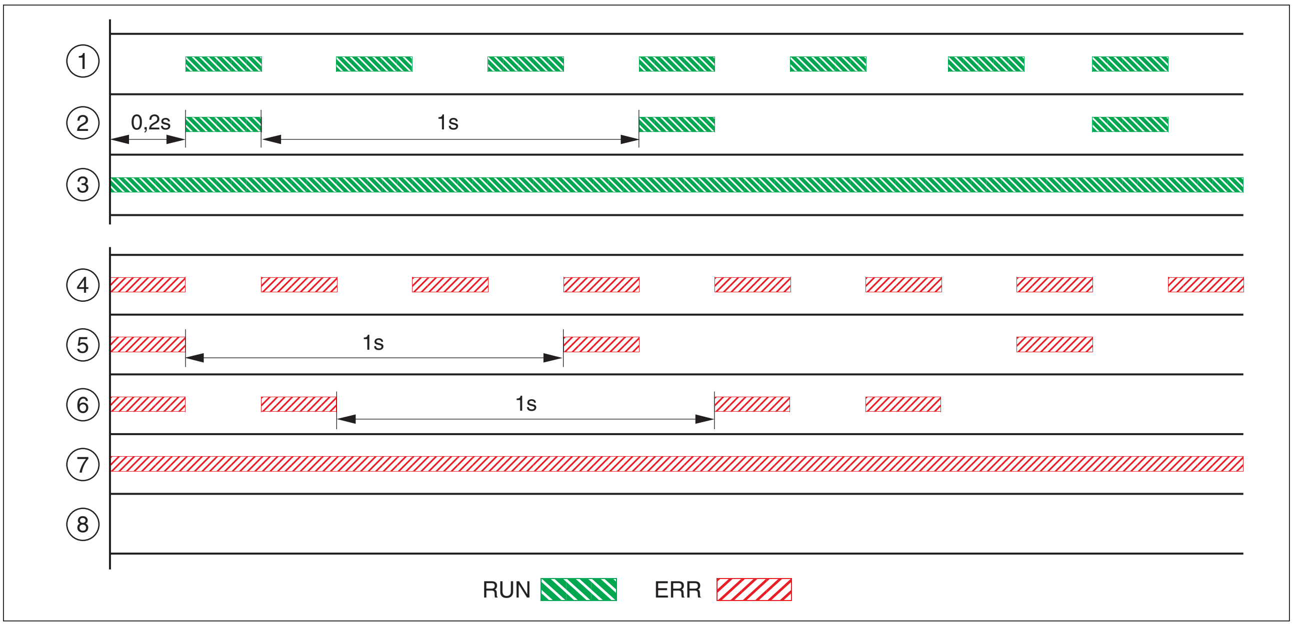

Figure 144: Signals of the CAN bus status LEDs (Run=GN; Err=RD)

(1)	NMT state PRE-OPERATIONAL
(2)	NMT state STOPPED
(3)	NMT state OPERATIONAL
(4)	Incorrect settings, for example, invalid node address
(5)	Alert limit reached, for example after 16 incorrect transmission attempts
(6)	Node Guarding
(7)	CAN is BUS-OFF, for example after 32 incorrect transmission attempts.
(8)	Fieldbus communication without error message

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9.1.2 Error diagnostics via integrated HMI

The parameters `P4-00` to `P4-04` allow you to read the error memory.

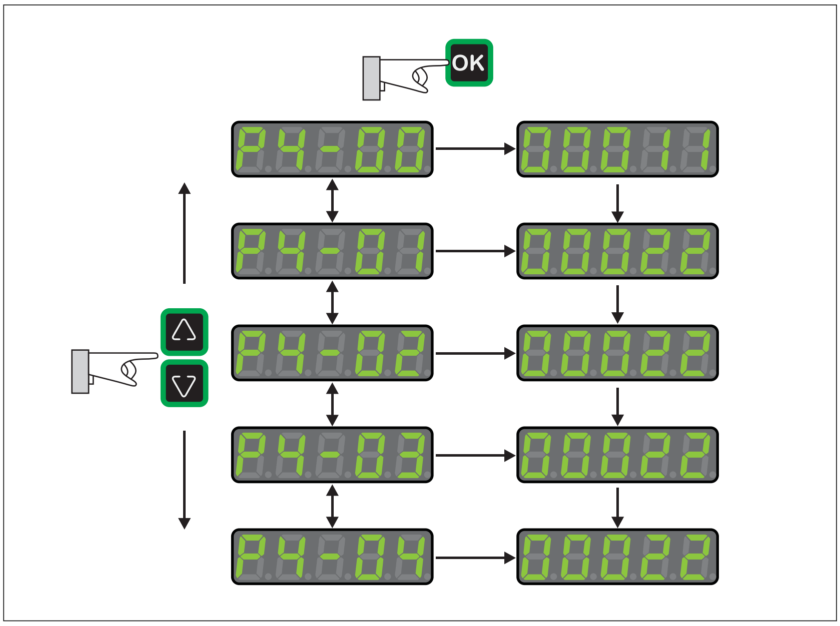

Figure 145: Reading the error memory via the HMI

P4-00	Error number of the most recently detected error
...	...
P4-04	Error number of the oldest detected error

The parameter `P0-47` allows you to read the last detected alert.

9.1.3 Diagnostics via the commissioning software

See the information provided with the commissioning software for details on how to display the device state via the commissioning software LXM28 DTM Library.

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9.1.4 Diagnostics via signal outputs

The signal outputs allow you to indicate, among other things, operating states and detected errors. The list below is an excerpt of the parameterizable signal output functions. See chapter *"7.4.4 Parameterization of the signal output functions"* for additional signal output functions.

Setting A for `P2-18` ... `P2-22`	**Short name**	**Name of the output function**	**Description**
1	SRDY	Servo Ready	The signal output function SRDY indicates that no errors are presently detected, i.e. the drive is not in the operating state Fault.
2	SON	Servo On	The signal output function SON indicates that the drive is in the operating state Operation Enabled.
7	ERROR	Error Detected	The signal output function ERROR indicates that an error has been detected and that the drive has switched to the operating state Fault. See *"9 Diagnostics and troubleshooting"* for details.
11	WARN	Alert Signal activated	The signal output function indicates that one of the following conditions has been detected: Hardware limit switch triggered, undervoltage, Nodeguard alert, Operational Stop (OPST).

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9.2 Alert codes

Number	Description	Cause	Remedy
AL014	Negative hardware limit switch triggered	-	-
AL015	Positive hardware limit switch triggered	-	-
AL283	Positive software limit switch triggered	-	-
AL285	Negative software limit switch triggered	-	-
Wn023	Alert threshold reached: Motor overload (foldback)	The foldback current of the motor has dropped below the alert threshold specified via the parameter P1-28.	Verify correct settings of the parameter P1-28 for the foldback current of the motor.
Wn123	PDO packet too short	-	Verify correct PDO mapping.
Wn124	Data in PDO out of range	-	Verify that the minimum and maximum limit values are not exceeded.
Wn127	R_PDO data cannot be written while the power stage is enabled	-	-
Wn185	CANopen: A communication error was detected.		
Wn283	Target value will cause movement to positive software limit switch	-	Verify correct target positions.
Wn285	Target value will cause movement to negative software limit switch	-	Verify correct target positions.
Wn380	Position deviation via signal output function MC_OK	After a movement has been successfully completed, MC_OK was active. Then TPOS became inactive which caused MC_OK to become inactive as well.	If you want this condition to cause a detected error instead of an alert, set the parameter P1-48 accordingly.
Wn700	Safety function Safe Torque Off (STO) triggered while the power stage was disabled	The safety function STO has been triggered or the signal for the safety function STO is not properly connected. If this condition is detected while the power stage is enabled, the drive detects an error. If this condition is detected while the power stage is disabled, the drive detects an alert.	Check whether the safety function STO was triggered intentionally. If not, verify correct connection of the signal of the safety function STO.
Wn701	Alert threshold reached: Drive overload (foldback)	The foldback current of the drive has dropped below the alert threshold specified via the parameter P1-24.	Verify correct settings of the parameter P1-24 for the foldback current of the drive.
Wn702	The DC bus voltage has dropped below the alert threshold.	Power supply loss, poor power supply.	Verify correct mains supply. Verify that the undervoltage limit is set correctly via the parameter P4-24.
Wn703	Alert threshold reached: Power stage overtemperature	Ambient temperature is too high, fan is inoperative, dust.	Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive.

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Number	Description	Cause	Remedy
Wn704	Alert threshold reached: Motor overtemperature	The motor temperature is excessively high.	Verify correct settings of the parameters for temperature monitoring. Verify proper ventilation and heat dissipation of the motor. Clean off pollutants such as dust. Verify that the motor is evenly mounted to the flange plate. Increase the size of the flange plate to which the motor is mounted to improve heat dissipation. Verify that the motor is properly sized for the application.
Wn707	Alert threshold reached: Drive overtemperature (controller)	Ambient temperature is too high, fan is inoperative, dust.	Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive.
Wn709	PLL not synchronized	-	-
Wn713	Positive hardware limit switch and negative hardware limit triggered	-	-
Wn716	Positive software limit switch and negative software limit triggered	-	-
Wn728	Alert: Missing mains supply, undervoltage mains supply	At least one mains phase is missing. Mains voltage is out of range. Mains frequency is out of range.	Verify correct connection of mains supply. Verify that the values of the mains power supply network comply with the technical data.
Wn729	Modbus: Node Guarding error detected	Incorrect Modbus connection, incorrect data from Modbus master.	Verify correct Modbus connection. Verify correct operation of Modbus master.
Wn730	Alert threshold reached: Braking resistor overload	The permissible braking resistor power has been exceeded.	Verify correct rating of the braking resistor used. Verify your application.
Wn731	Encoder error detected	-	-
Wn732	Alert threshold reached: Processing time too long	-	-
Wn734	Alert threshold reached: Drive overtemperature (IPM)	Ambient temperature is too high, fan is inoperative, dust.	Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive.
Wn736	PDO packet too long	-	Verify correct PDO mapping.
Wn737	The parameters have been reset to the factory settings, but not yet been saved to the non volatile memory.	-	Use parameter P2-08 = 11 to save the parameters reset to the factory settings to the non volatile memory and restart the drive.
Wn738	No target values received via the fieldbus	No target values have been received via the fieldbus three times in succession.	Verify that target values are transmitted via the fieldbus. Verify that the fieldbus has exclusive access.
Wn739	Temperature value for monitoring function not available	-	-
Wn742	Motor type has changed.	The type of motor connected is different from the previously connected type of motor.	Reset the drive to the factory settings.

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9.3 Error codes

Error number	Short description	Cause	Remedy
AL001	Power stage overcurrent	An overcurrent has been detected at the power stage which may be caused by a short circuit or by incorrect settings of the current loop parameters. This condition may occur up to three times in succession. After the third time, a time delay of one minute must pass before the power stage can be enabled again.	Verify correct connection of the motor. Verify correct settings of the parameters for the current loop.
AL002	DC bus overvoltage	The DC bus voltage exceeded the maximum value.	Verify your application. Reduce the external load, the motor velocity or the deceleration. Use an appropriately rated braking resistor, if necessary.
AL003	DC bus undervoltage	Power supply loss, poor power supply.	Verify correct mains supply. Verify that the undervoltage limitation is set correctly via the parameter P4-24.
AL005	Braking resistor overload	The braking resistor has been on for such a long period of time that its overload capability has been exceeded.	Verify your application. Reduce the external load, the motor velocity or the deceleration. Use a braking resistor with a higher rating, if necessary.
AL006	Motor overload (foldback)	The foldback current of the motor has dropped below the value specified via the parameter P1-27.	Verify correct settings for the parameter P1-27.
AL007	Actual motor velocity too high.	The actual motor velocity exceeded the velocity limitation by more than 20% (P1-55). The analog input signal is not stable.	Verify that the velocity limitation set via the parameter P1-55 matches the requirements of the application. Verify that the values for the tuning parameters are suitable. Verify that the frequency of the analog input signal is stable using a signal detector. Use a filter function.
AL008	Frequency of reference value signal is too high	The frequency of the pulse signal (A/B, Pulse/Direction, CW/CCW) exceeds the specified range. Received pulses may be lost.	Adapt the output pulse frequency of the external source to fit the input specification of the drive. Adapt the gear ratios to the application requirements (parameters P1-44, P1-45, P2-60, P2-61 and P2-62).
AL009	Position deviation too high (following error)	The position deviation has exceeded the maximum permissible position deviation specified via the parameter P2-35 and the drive has detected a following error.	Verify your application. Reduce the external load. Increase the permissible position deviation via the parameter P2-35. Reduce the motor velocity via the parameters P1-09 ? P1-11 or the analog input V_REF. Increase the torque limitation via the parameters P1-12 ? P1-14 or the analog input T_REF.
AL013	The input to which the signal input function OPST is assigned has been activated.	-	Identify the cause which has triggered the signal input function OPST. Remove the cause. If your application does not require the signal input function OPST, disable this signal input function.

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Error number	Short description	Cause	Remedy
AL016	Power stage overtemperature	Ambient temperature is too high, fan is inoperative, dust.	Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive.
AL017	Error detected in non-volatile memory	The drive was reset to the factory settings via parameter P2-08.	Use parameter P2-08 = 11 to save the parameters reset to the factory settings to the non volatile memory and restart the drive. Contact technical support.
AL018	Encoder simulation frequency exceeded 4 MHz	The computed equivalent encoder output frequency exceeds the maximum limit of 4 MHz for this signal.	Reduce the resolution of the encoder simulation via the parameter P1-46 or reduce the maximum velocity.
AL020	Modbus: Node Guarding error detected	Incorrect Modbus connection, incorrect data from Modbus master.	Verify correct Modbus connection. Verify correct operation of Modbus master.
AL022	Missing mains supply, undervoltage mains supply	At least one mains phase is missing. Mains voltage is out of range. Mains frequency is out of range.	Verify correct connection of mains supply. Verify that the values of the mains power supply network comply with the technical data.
AL025	Not possible to read data of electronic motor nameplate	Incorrect or missing motor data. Motor without electronic motor nameplate has been connected.	Verify that the drive and the connected motor are a permissible product combination. Verify correct connection of the encoder. Contact Technical Support or replace the motor.
AL026	Error detected in communication with motor encoder	Communication with the encoder was not initialized correctly.	Verify correct connection of the encoder. Contact Technical Support or replace the motor.
AL030	Motor torque too high for an excessive period of time	The motor torque has exceeded the value specified via the parameter P1-57 for a period of time exceeding the value specified via the parameter P1-58.	Verify your application. Verify that no movements are made up to a mechanical stop (for example, use limit switches). Verify that the values for the parameters P1-57 and P1-58 are suitable.
AL180	CANopen: Heartbeat error detected	The bus cycle time of the CANopen master is higher than the programmed heartbeat or node guard time. The connection between the CANopen master and the drive is lost.	Verify correct CANopen connection. Check the CANopen master. Verify correct CANopen configuration, increase the Heartbeat or Node Guarding time.
AL3E1	Drive is not synchronous with master cycle	Operating mode has been activated but drive is not synchronized to external synchronization signal.	Verify correct CANopen connection. After having started the synchronization mechanism, wait for 120 cycles before activating the operating mode.
AL401	Fieldbus: Communication error detected	While the power stage was enabled, a command was received requesting a different communication state.	Verify that the master does not try to change the communication state while the power stage of the drive is enabled.

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Error number	Short description	Cause	Remedy
AL501	Safety function Safe Torque Off (STO) triggered	The safety function STO has been triggered or the signal for the safety function STO is not properly connected. If this condition is detected while the power stage is enabled, the drive detects an error. If this condition is detected while the power stage is disabled, the drive detects an alert.	Check whether the safety function STO was triggered intentionally. If not, verify correct connection of the signal of the safety function STO.
AL502	System error detected (FPGA)	-	Contact technical support.
AL503	System error detected (non volatile memory)	-	Contact technical support.
AL504	System error detected (non volatile memory)	-	Contact technical support.
AL505	DC bus voltage measurement	An error was detected in the circuit that measures the DC bus voltage.	Perform a Fault Reset. Restart the drive. If the error persists, contact Technical Support.
AL507	System error detected (NV access)	-	Contact technical support.
AL508	Drive overload (foldback)	The foldback current of the drive has dropped below the value specified via the parameter P1-23.	Verify correct settings for the parameter P1-23.
AL514	Motor overtemperature	The motor temperature is excessively high.	Verify correct settings of the parameters P8-59 and P8-60 for temperature monitoring. Verify proper ventilation and heat dissipation of the motor. Clean off pollutants such as dust. Verify that the motor is evenly mounted to the flange plate. Increase the size of the flange plate to which the motor is mounted to improve heat dissipation. Verify that the motor is properly sized for the application.
AL517	Encoder overvoltage or overcurrent	The current supplied by the drive for the 5 V encoder supply has exceeded the limit. This condition may occur up to three times in succession. After the third time, a time delay of one second must pass before the power stage can be enabled again.	Verify correct connection of the encoder (short circuits). Verify the current consumption of the encoder.
AL520	Target position rejected	A target position was rejected because it would have caused the motor to exceed the maximum velocity.	Verify that target positions do not lead to excessive motor velocities.
AL522	System error detected (CAN power supply)	The internal supply voltage for the CAN bus is not correct.	Contact technical support.
AL523	System error detected (self test)	The self test has detected an error.	Contact technical support.
AL525	Reserved	Reserved	Reserved
AL526	Reserved	Reserved	Reserved
AL527	System error detected (Watchdog)	The Watchdog function has detected a system error.	Restart the drive. If the error persists, contact Technical Support.

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Error number	Short description	Cause	Remedy
AL528	Drive overtemperature (IPM)	Ambient temperature is too high, fan is inoperative, dust.	Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive.
AL529	Drive overtemperature (controller)	Ambient temperature is too high, fan is inoperative, dust.	Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive.
AL532	Calculated offsets for current sensors out of range	The calculated offsets for the current sensors are out of range.	Perform a Fault Reset. Restart the drive. If the error persists, contact Technical Support.
AL533	Reserved	Reserved	Reserved
AL534	Pulse signal missing	One of the pulse signals is not connected.	Verify correct connection of the pulse inputs.
AL535	System error detected (FPGA does not match firmware)	The firmware version is not suitable for the drive.	Update the firmware of the drive. Contact technical support.
AL539	Motor phase missing	One of the motor phases is not connected.	Verify correct connection of the motor phases. Contact technical support.
AL547	Motor blocked	The motor was blocked mechanically, for example, by a mechanical stop or by the load.	Remove condition causing the mechanical blocking. Verify your application.
AL553	No connection between master and drive	-	Connect master and drive.
AL554	Target position rejected	A target position was rejected because it would have caused the motor to exceed the maximum acceleration/deceleration.	Verify that target positions do not lead to excessive acceleration/ deceleration.
AL555	Velocity deviation too high	The deviation between actual velocity and reference velocity has exceeded the maximum velocity deviation specified via the parameter P2-34.	Verify your application. Verify that the values for the tuning parameters are suitable. Increase the value for the maximum velocity deviation in the parameter P2-34.
AL557	No target values received via the fieldbus	No target values have been received via the fieldbus three times in succession.	Perform a Fault Reset. Verify that target values are transmitted via the fieldbus.
AL558	System error detected	-	Contact technical support.
AL560	Controller supply off	-	Power on the controller supply.
AL561	Temperature sensor inoperative	-	Restart the drive. If the error persists, contact Technical Support.
AL563	Commutation error detected	Motor phases have been interchanged.	Verify correct connection of the motor phases.
AL564	Position deviation via signal output function MC_OK	After a movement has been successfully completed, MC_OK was active. Then TPOS became inactive which caused MC_OK to become inactive as well.	Use the signal input function FAULT_RESET to perform a Fault Reset and set the parameter P0-01 to 0. If you want this condition to cause an alert instead of a detected error, set the parameter P1-48 accordingly.
AL567	System error detected (encoder)	-	Contact technical support.

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Error number	Short description	Cause	Remedy
AL568	Braking resistor overload	The permissible braking resistor power has been exceeded.	Verify correct rating of the braking resistor used. Verify your application.
AL569	Configuration not correctly transferred via Modbus	-	Verify correct connection. Verify that configuration file and drive are compatible.
AL570	Overcurrent detected at one of the digital outputs	-	Verify correct wiring of the digital outputs. Verify there are no short circuits.
AL572	Position deviation too high (following error)	The position deviation has exceeded the maximum permissible position deviation specified via the parameter P2-35 and the drive has detected a following error.	Verify your application. Reduce the external load. Increase the permissible position deviation via the parameter P2-35. Reduce the motor velocity via the parameters P1-09 ? P1-11 or the analog input V_REF. Increase the torque limitation via the parameters P1-12 ? P1-14 or the analog input T_REF.
AL585	CANopen device in state bus-off	Too many error frames have been detected. CANopen devices have different baud rates.	Verify correct baud rates. Verify CANopen bus installation.
AL588	Reserved	Reserved	Reserved
AL595	Impermissible combination of drive and motor	-	Use an approved drive/motor combination.

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10 Parameters

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

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only start the system if there are no persons or obstructions in the zone of operation.
- Do not operate the drive system with unknown settings or data.
- Never modify a parameter unless you fully understand the parameter and all effects of the modification.
- After modifications to settings, restart the drive and verify the saved data or settings.
- When commissioning the product, carefully run tests for all operating states and potential error situations.
- Verify the functions after replacing the product and also after making modifications to the settings or data.

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

10.1 Representation of the parameters

Parameter name The parameter name uniquely identifies a parameter.

Unit The unit of the value.

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10.2 List of parameters

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P0-00` VER	Firmware Version Applicable operating mode: PT, PS, V, T	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus 100_h CANopen 4000_h
`P0-01` ALE	Error code of detected error Applicable operating mode: PT, PS, V, T This parameter contains the error number of the most recently detected error. See chapter *"9.3 Error codes"* for a list of the detected errors.	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RW -	Modbus 102_h CANopen 4001_h
`P0-02` STS	Drive Status Displayed by HMI Applicable operating mode: PT, PS, V, T This parameter selects the type of status information to be displayed on the HMI. Example: If the setting is 7, the HMI displays the speed of rotation of the motor. For details see chapter *"6.2.3 Status information via the HMI"*.	- 0 0 123 Decimal	u16 RW per.	Modbus 104_h CANopen 4002_h

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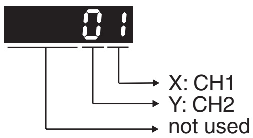
Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P0-03` MON	Function of Analog Outputs Applicable operating mode: PT, PS, V, T This parameter specifies the functions of the analog outputs.  XY: (X: MON1; Y: MON2) 0: Actual velocity (+/-8 V correspond to maximum velocity) 1: Actual torque (+/-8 V correspond to maximum torque) 2: Reference value in kilopulses per second (+8 V correspond to 4.5 Mpps) 3: Target velocity (+/-8 V correspond to maximum target velocity) 4: Target torque (+/-8 V correspond to maximum target torque) 5: DC bus voltage (+/-8 V correspond to 450 V) 6: Reserved 7: Reserved See P1-04 and P1-05 for setting a voltage percentage (scaling). Example: P0-03 = 01: Voltage value at analog output indicates the actual velocity. Velocity = (maximum velocity x V1 / 8) x P1-04 / 100 if the output voltage value of MON2 is V1.	- 0_h 0_h 77_h Hexadecimal	u16 RW per.	Modbus 106_h CANopen 4003_h
`P0-08` TSON	Operating Hour Meter in Seconds Applicable operating mode: PT, PS, V, T	s 0 - 4294967295 Decimal	u32 RO -	Modbus 110_h CANopen 4008_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P0-09 CM1	Status Value 1 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-17. Examples: If the status of the drive is read via the HMI and if P0-02 is set to 23, VAR-1 is displayed for approximately two seconds by the HMI, followed by the value of this parameter. If the setting of P0-17 is 3, reading this parameter displays the actual position in pulses. For reading the status via Modbus, read two 16-bit data stored in the addresses of 0012H and 0013H to generate 32-bit data. (0013H : 0012H) = (high byte : low byte)	- -2147483647 - 2147483647 Decimal	s32 RO -	Modbus 112_h CANopen 4009_h
P0-10 CM2	Status Value 2 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-18. See P0-09 for details.	- -2147483647 - 2147483647 Decimal	s32 RO -	Modbus 114_h CANopen $400A_h$
P0-11 CM3	Status Value 3 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-19. See P0-09 for details.	- -2147483647 - 2147483647 Decimal	s32 RO -	Modbus 116_h CANopen $400B_h$
P0-12 CM4	Status Value 4 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-20. See P0-09 for details.	- -2147483647 - 2147483647 Decimal	s32 RO -	Modbus 118_h CANopen $400C_h$
P0-13 CM5	Status Value 5 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-21. See P0-09 for details.	- -2147483647 - 2147483647 Decimal	s32 RO -	Modbus $11A_h$ CANopen $400D_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P0-17 CMA1	Indicate status value 1 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-09. Example: If the setting of P0-17 is 7, reading P0-09 returns the speed of rotation of the motor in min-1.	- 0 0 123 Decimal	u16 RW per.	Modbus 122_h CANopen 4011_h
P0-18 CMA2	Indicate status value 2 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-10. See P0-17 for details.	- 0 0 123 Decimal	u16 RW per.	Modbus 124_h CANopen 4012_h
P0-19 CMA3	Indicate status value 3 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-11. See P0-17 for details.	- 0 0 123 Decimal	u16 RW per.	Modbus 126_h CANopen 4013_h
P0-20 CMA4	Indicate status value 4 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-12. See P0-17 for details.	- 0 0 123 Decimal	u16 RW per.	Modbus 128_h CANopen 4014_h
P0-21 CMA5	Indicate status value 5 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-13. See P0-17 for details.	- 0 0 123 Decimal	u16 RW per.	Modbus $12A_h$ CANopen 4015_h
P0-25 MAP1	Parameter Mapping 1 Applicable operating mode: PT, PS, V, T The parameters from P0-25 ... P0-32 are used to read and write the values of parameters with non-consecutive communication addresses. You can set P0-35 ... P0-42 as the required read and write mapping parameter numbers. When P0-25 ... P0-32 are read, the read or write values are equivalent to the values of the parameters specified via P0-35 ... P0-42, and vice versa. See P0-35 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus 132_h CANopen 4019_h
P0-26 MAP2	Parameter Mapping 2 Applicable operating mode: PT, PS, V, T See P0-25 and P0-36 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus 134_h CANopen $401A_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P0-27 MAP3	Parameter Mapping 3 Applicable operating mode: PT, PS, V, T See P0-25 and P0-37 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus 136_h CANopen $401B_h$
P0-28 MAP4	Parameter Mapping 4 Applicable operating mode: PT, PS, V, T See P0-25 and P0-38 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus 138_h CANopen $401C_h$
P0-29 MAP5	Parameter Mapping 5 Applicable operating mode: PT, PS, V, T See P0-25 and P0-39 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus $13A_h$ CANopen $401D_h$
P0-30 MAP6	Parameter Mapping 6 Applicable operating mode: PT, PS, V, T See P0-25 and P0-40 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus $13C_h$ CANopen $401E_h$
P0-31 MAP7	Parameter Mapping 7 Applicable operating mode: PT, PS, V, T See P0-25 and P0-41 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus $13E_h$ CANopen $401F_h$
P0-32 MAP8	Parameter Mapping 8 Applicable operating mode: PT, PS, V, T See P0-25 and P0-42 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus 140_h CANopen 4020_h

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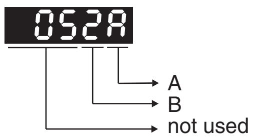
Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P0-35 MAPA1	Block Data Read/Write P0-35…P0-42 1 Applicable operating mode: PT, PS, V, T The parameters P0-35 ... P0-42 specify the required read and write parameter numbers for P0-25 ... P0-32. They read and write the values of the parameters whose communication addresses are not consecutive. The read / write parameter can be a single 32-bit parameter or two 16-bit parameters.  A: Parameter group code in hexadecimal format B: Parameter number in hexadecimal format Example: If you want to read and write the value of P1-44 (32-bit parameter) via P0-25, set P0-35 to 012C012C$_h$. If you want to read and write the values of P2-02 (16-bit parameter) and P2-04 (16-bit parameter) via P0-25, set P0-35 to 02040202$_h$.	- 0_h 0_h FFFFFFFF$_h$ Hexadecimal	u32 RW per.	Modbus 146$_h$ CANopen 4023$_h$
P0-36 MAPA2	Block Data Read/Write P0-35…P0-42 2 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0_h 0_h FFFFFFFF$_h$ Hexadecimal	u32 RW per.	Modbus 148$_h$ CANopen 4024$_h$
P0-37 MAPA3	Block Data Read/Write P0-35…P0-42 3 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0_h 0_h FFFFFFFF$_h$ Hexadecimal	u32 RW per.	Modbus 14A$_h$ CANopen 4025$_h$
P0-38 MAPA4	Block Data Read/Write P0-35…P0-42 4 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0_h 0_h FFFFFFFF$_h$ Hexadecimal	u32 RW per.	Modbus 14C$_h$ CANopen 4026$_h$
P0-39 MAPA5	Block Data Read/Write P0-35…P0-42 5 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0_h 0_h FFFFFFFF$_h$ Hexadecimal	u32 RW per.	Modbus 14E$_h$ CANopen 4027$_h$
P0-40 MAPA6	Block Data Read/Write P0-35…P0-42 6 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0_h 0_h FFFFFFFF$_h$ Hexadecimal	u32 RW per.	Modbus 150$_h$ CANopen 4028$_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P0-41 MAPA7	Block Data Read/Write P0-35…P0-42 7 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW per.	Modbus 152_h CANopen 4029_h
P0-42 MAPA8	Block Data Read/Write P0-35…P0-42 8 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW per.	Modbus 154_h CANopen $402A_h$
P0-46 SVSTS	State of Signal Output Functions Applicable operating mode: PT, PS, V, T This parameter is used to indicate the state of the signal output function of the drive in hexadecimal format. If the function is assigned to a digital output, it would represent the state of the output given no forcing on the output. Bit 0: SRDY (Servo ready) Bit 1: SON (Servo On) Bit 2: ZSPD (Zero speed) Bit 3: TSPD (Speed reached) Bit 4: TPOS (Movement completed) Bit 5: TQL (Torque Limit Reached) Bit 6: ERR (Error Detected) Bit 7: BRKR (Holding brake control) Bit 8: HOMED_OK (Homing completed) Bit 9: OLW (Motor Overload Alert) Bit 10: WARN (indicates that one of the following conditions has been detected: Hardware limit switch triggered, undervoltage, Nodeguard alert, Operational Stop (OPST)) Bits 11 ... 15: Reserved The parameter can also be read via the fieldbus.	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus $15C_h$ CANopen $402E_h$
P0-47 LAST_WRN	Number of Last Alert Applicable operating mode: PT, PS, V, T This parameter contains the number of the last detected alert. After a Fault Reset, the number is cleared.	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus $15E_h$ CANopen $402F_h$

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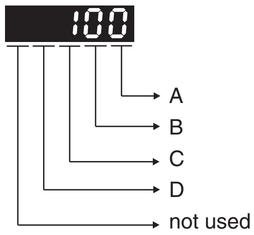
Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P1-00 PTT	Reference Value Signal - Pulse Settings Applicable operating mode: PT  This parameter is used to configure the reference value signals for the operating mode PT. A: Type of reference value signals B: Signal frequency C: Input polarity D: Source of reference value signals Setting can only be changed if power stage is disabled.	- 0_h 2_h 1132_h Hexadecimal	u16 RW per.	Modbus 200_h CANopen 4100_h

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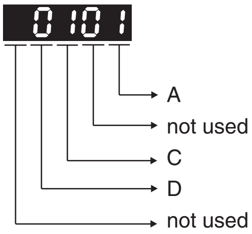
Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P1-01` CTL	Operating Mode and Direction of Rotation Applicable operating mode: PT, PS, V, T  A: Operating mode See chapter *"7.3.1 Setting the operating mode"*. C: Direction of movement See chapter *"6.5.1 Verifying the direction of movement"*. D: Signal input functions and signal output functions after operating mode switching Value 0: The assignments of the signal input functions and the signal output functions (P2-10 ... P2-22) remain identical for the new operating mode. Value 1: The assignments of the signal input functions and the signal output functions (P2-10 ... P2-22) are set to the default presets of the new operating mode. See chapters *"7.4.1 Default presets of the signal inputs"* and *"7.4.3 Default presets of the signal outputs"*. Changed settings become active the next time the product is powered on.	- 0_h B_h $110B_h$ Hexadecimal	u16 RW per.	Modbus 202_h CANopen 4101_h

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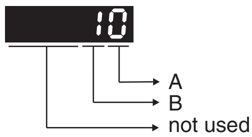
<table>
<tr><th>Parameter name</th><th>Description</th><th>Unit
Minimum value
Factory setting
Maximum value
HMI Format</th><th>Data type
R/W
Persistent</th><th>Parameter address via field-bus</th></tr>
<tr><td>P1-02

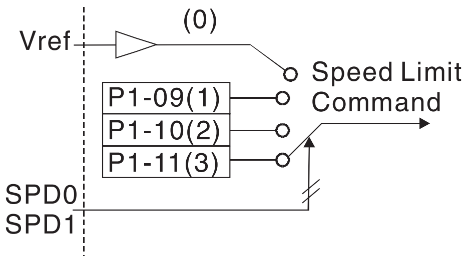
PSTL</td><td>Velocity and Torque Limitations Activation/ Deactivation

Applicable operating mode: PT, PS, V, T

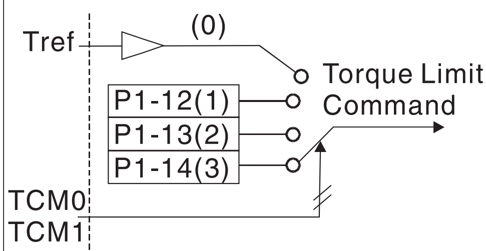
This parameter activates/deactivates velocity limitation and torque limitation.
Velocity limitation and torque limitation can also be activated via the signal input functions SPDLM and TRQLM.
The signal input functions SPD0 and SPD1 are used to select velocity values set via P1-09 to P1-11. The signal input functions TCM0 and TCM1 are used to select torque values set via P1-12 to P1-14.



A: Velocity limitation
0: Deactivate
1: Activate (in operating mode T)



B: Torque limitation
0: Deactivate
1: Activate (operating modes PT, PS and V)


</td><td>-
0_h
0_h
11_h
Hexadecimal</td><td>u16
RW
per.</td><td>Modbus 204_h
CANopen 4102_h</td></tr>
</table>

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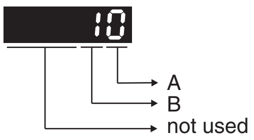
Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P1-03` AOUT	Polarity of Analog Outputs / Polarity of Pulse Outputs Applicable operating mode: PT, PS, V, T  This parameter is used to specify the polarity of analog outputs MON1 and MON2 and the polarity of pulse outputs. A: Polarity of analog outputs MON1 and MON2 0: MON1(+), MON2(+) 1: MON1(+), MON2(-) 2: MON1(-), MON2(+) 3: MON1(-), MON2(-) B: Polarity of pulse outputs 0: Not inverted 1: Inverted	- 0_h 0_h 13_h Hexadecimal	u16 RW per.	Modbus 206_h CANopen 4103_h
`P1-04` MON1	Scaling Factor Analog Output 1 Applicable operating mode: PT, PS, V, T	% 1 100 100 Decimal	u16 RW per.	Modbus 208_h CANopen 4104_h
`P1-05` MON2	Scaling Factor Analog Output 2 Applicable operating mode: PT, PS, V, T	% 1 100 100 Decimal	u16 RW per.	Modbus $20A_h$ CANopen 4105_h
`P1-09` SP1	Target Velocity/Velocity Limitation 1 Applicable operating mode: V, T Target velocity 1 In the operating mode V, this parameter specifies the first target velocity. Velocity limitation 1 In the operating mode T, this parameter specifies the first velocity limitation.	0.1rpm -60000 10000 60000 Decimal	s32 RW per.	Modbus 212_h CANopen 4109_h
`P1-10` SP2	Target Velocity/Velocity Limitation 2 Applicable operating mode: V, T Target velocity 2 In the operating mode V, this parameter specifies the second target velocity. Velocity limitation 2 In the operating mode T, this parameter specifies the second velocity limitation.	0.1rpm -60000 20000 60000 Decimal	s32 RW per.	Modbus 214_h CANopen $410A_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P1-11` SP3	Target Velocity/Velocity Limitation 3 Applicable operating mode: V, T Target velocity 3 In the operating mode V, this parameter specifies the third target velocity. Velocity limitation 3 In the operating mode T, this parameter specifies the third velocity limitation.	0.1rpm -60000 30000 60000 Decimal	s32 RW per.	Modbus 216_h CANopen $410B_h$
`P1-12` TQ1	Target Torque/Torque Limitation 1 Applicable operating mode: PT, PS, V, T Target torque 1 in percent of nominal current In the operating mode T, this parameter specifies the first target torque. Torque limitation 1 in percent of nominal current In the operating modes PT, PS and V, this parameter specifies the first torque limitation. The signal output function TQL is activated if the torque reaches the torque limitations set via the parameters P1-12 ... P1-14 or via an analog input.	% -300 100 300 Decimal	s16 RW per.	Modbus 218_h CANopen $410C_h$
`P1-13` TQ2	Target Torque/Torque Limitation 2 Applicable operating mode: PT, PS, V, T Target torque 2 in percent of nominal current In the operating mode T, this parameter specifies the second target torque. Torque limitation 2 in percent of nominal current In the operating modes PT, PS and V, this parameter specifies the second torque limitation. The signal output function TQL is activated if the torque reaches the torque limitations set via the parameters P1-12 ... P1-14 or via an analog input.	% -300 100 300 Decimal	s16 RW per.	Modbus $21A_h$ CANopen $410D_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P1-14 TQ3	Target Torque/Torque Limitation 3 Applicable operating mode: PT, PS, V, T Target torque 3 in percent of nominal current In the operating mode T, this parameter specifies the third target torque. Torque limitation 3 in percent of nominal current In the operating modes PT, PS and V, this parameter specifies the third torque limitation. The signal output function TQL is activated if the torque reaches the torque limitations set via the parameters P1-12 ... P1-14 or via an analog input.	% -300 100 300 Decimal	s16 RW per.	Modbus $21C_h$ CANopen $410E_h$
P1-15 LINELOSSMODE	Mains Phase Monitoring - Response to Missing Mains Phase Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive if the mains phase monitoring function detects an error. Value 0: Detected error if power stage is enabled or disabled Value 1: Detected error if power stage is enabled, alert if power stage is disabled Value 2: Alert if power stage is enabled or disabled	- 0 0 2 Decimal	u16 RW per.	Modbus $21E_h$ CANopen $410F_h$
P1-16 LINELOSSRE-COVER	Mains Phase Monitoring - Fault Reset Applicable operating mode: PT, PS, V, T This parameter specifies the type of Fault Reset after a detected mains phase error has been removed. Value 0: No automatic Fault Reset Value 1: Automatic Fault Reset	- 0 0 1 Decimal	u16 RW per.	Modbus 220_h CANopen 4110_h
P1-17 LINELOSSTYPE	Mains Phase Monitoring - Type Applicable operating mode: PT, PS, V, T This parameter specifies the type of mains phase monitoring Value 0: No mains phase monitoring Value 1: Mains phase monitoring single-phase connection Value 2: Mains phase monitoring three-phase connection	- 0 0 2 Decimal	u16 RW per.	Modbus 222_h CANopen 4111_h
P1-18	Reserved			
P1-19 DISTIME	Active Disable - Delay Time Power Stage Applicable operating mode: PT, PS, V, T This parameter specifies the delay time between standstill of the motor and disabling the power stage.	ms 0 0 6500 Decimal	u16 RW per.	Modbus 226_h CANopen 4113_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P1-20 ESTOPILIM	Current Limit During Quick Stop Applicable operating mode: PT, PS, V This parameter specifies the maximum current during a Quick Stop (expressed as factor of P1-78).	0.001 1 1000 1000 Decimal	s16 RW per.	Modbus 228h CANopen 4114h
P1-21 FOLD	Status of Foldback Current Drive Applicable operating mode: PT, PS, V, T This parameter indicates whether the foldback current limit is greater than or less than the maximum current of the drive (see P1-78). Value 0: Foldback current limit greater than P1-78 Value 1: Foldback current limit is less than P1-78	- 0 - 1 Decimal	u16 RO -	Modbus 22Ah CANopen 4115h
P1-22 IFOLD	Foldback Current Limit - Drive Applicable operating mode: PT, PS, V, T Drive foldback current limit	0.01A 0 - 30000 Decimal	u32 RO -	Modbus 22Ch CANopen 4116h
P1-23 IFOLDFTHRESH	Current Monitoring Drive - Detected Error Threshold Foldback Current Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the drive current monitoring function to detect a drive foldback current error.	0.01A 0 - 30000 Decimal	u32 RW per.	Modbus 22Eh CANopen 4117h
P1-24 IFOLDWTHRESH	Current Monitoring Drive - Alert Threshold Foldback Current Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the drive current monitoring function to trigger a drive foldback current alert.	0.01A 0 - 30000 Decimal	u32 RW per.	Modbus 230h CANopen 4118h
P1-25	Reserved			
P1-26 MIFOLD	Foldback Current Limit - Motor Applicable operating mode: PT, PS, V, T Motor foldback current limit	0.01A 0 - 30000 Decimal	u32 RO -	Modbus 234h CANopen 411Ah
P1-27 MIFOLDFTHRESH	Motor Current Monitoring - Detected Error Threshold Foldback Current Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the motor current monitoring function to detect a motor foldback current error.	0.01A 0 - 30000 Decimal	u32 RW per.	Modbus 236h CANopen 411Bh
P1-28 MIFOLDWTHRESH	Motor Current Monitoring - Alert Threshold Foldback Current Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the motor current monitoring function to trigger a motor foldback current alert.	0.01A 0 - 30000 Decimal	u32 RW per.	Modbus 238h CANopen 411Ch

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P1-29 OVTHRESH	DC Bus Overvoltage Monitoring - Threshold Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the DC bus overvoltage monitoring function.	V - - - Decimal	u16 RO -	Modbus $23A_h$ CANopen $411D_h$
P1-30 RAMAXERRCNT	Commutation Monitoring - Maximum Counter Value Applicable operating mode: PT, PS, V, T	ms 0 0 0 Decimal	u16 RW -	Modbus $23C_h$ CANopen $411E_h$
P1-32 LSTP	Stop Method Applicable operating mode: PT, PS, V This parameter specifies how the motor is stopped if the power stage is to be disabled (includes signal input function OPST) or if an error is detected. Value 0_h: Deceleration ramp Value 10_h: Coast to stop Value 20_h: Deceleration ramp to velocity P1-38, then coast to stop (actual velocity must be less than the value of P1-38 for 50 ms before coasting to stop starts) In the operating mode Torque (T), the deceleration ramp is not used. Instead, the current is set to zero. Depending on the event that triggered the stop, the following deceleration ramps are used: - Signal input function STOP: P5-20 - Transmission error detected: P5-21 - Position overflow: P5-22 - Triggering of negative software limit switch: P5-23 - Triggering of positive software limit switch: P5-24 - Triggering of negative hardware limit switch: P5-25 - Triggering of positive hardware limit switch: P5-26 - Any other event: P1-68 The delay time between standstill of the motor and disabling the power stage is set via P1-19.	- 0_h 0_h 20_h Hexadecimal	u16 RW per.	Modbus 240_h CANopen 4120_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P1-34 TACC	Acceleration Period Applicable operating mode: PT, V The acceleration period is the time in milli-seconds required to accelerate from motor standstill to 6000 min^{-1}. For operating mode V, this parameter specifies the acceleration. If the target velocity is supplied as an analog signal, the maximum value of this parameter is automatically limited to 20000. For operating mode PT, this parameter specifies an acceleration limitation for the pulses at the PTI interface.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 244_h CANopen 4122_h
P1-35 TDEC	Deceleration Period Applicable operating mode: PT, V The deceleration period is the time in milli-seconds required to decelerate from 6000 min^{-1} to motor standstill. For operating mode V, this parameter specifies the deceleration. If the target velocity is supplied as an analog signal, the maximum value of this parameter is automatically limited to 20000. For operating mode PT, this parameter specifies a deceleration limitation for the pulses at the PTI interface.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 246_h CANopen 4123_h
P1-37 LMJR	Ratio of Load Inertia to Motor Inertia Applicable operating mode: PT, PS, V, T This parameter specifies the ratio of load inertia to motor inertia (J_load / J_motor). J_load: Total moment of inertia of external mechanical load J_motor: Moment of inertia of motor	0.1 0 10 20000 Decimal	u32 RW per.	Modbus $24A_h$ CANopen 4125_h
P1-38 ZSPD	Signal Output Function ZSPD / Signal Input Function ZCLAMP - Velocity Applicable operating mode: PT, PS, V, T This parameter specifies the velocity for the signal output function ZSPD. The signal output function ZSPD indicates that the velocity of the motor is less than the velocity value set via this parameter. This parameter specifies the velocity for the signal input function ZCLAMP. The signal input function ZCLAMP stops the motor. The velocity of the motor must be below the velocity value set via this parameter.	0.1rpm 0 100 2000 Decimal	s32 RW per.	Modbus $24C_h$ CANopen 4126_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P1-39 SSPD	Signal Output Function TSPD - Velocity Applicable operating mode: PT, PS, V, T This parameter specifies the velocity for the signal output function TSPD. The signal output function TSPD indicates that the velocity of the motor is greater than the velocity value set via this parameter.	rpm 0 3000 5000 Decimal	u32 RW per.	Modbus $24E_h$ CANopen 4127_h
P1-40 VCM	Velocity Target Value and Velocity Limitation 10 V Applicable operating mode: PT, PS, V, T In the operating mode V, this parameter specifies the target velocity that corresponds to the maximum input voltage of 10 V. In the operating mode T, this parameter specifies the velocity limitation that corresponds to the maximum input voltage of 10 V. Example: If the value of this parameter is 3000 in the operating mode V and if the input voltage is 10 V, the target velocity is 3000 min^{-1}.	rpm 0 - 10001 Decimal	s32 RW per.	Modbus 250_h CANopen 4128_h
P1-41 TCM	Torque Target Value and Torque Limitation 10 V Applicable operating mode: PT, PS, V, T In the operating mode T, this parameter specifies the target torque that corresponds to the maximum input voltage of 10 V. In the operating modes PT, PS and V, this parameter specifies the torque limitation that corresponds to the maximum input voltage of 10 V. Example: If the value of this parameter is 100 in the operating mode T and if the input voltage is 10 V, the target torque is 100 % of the nominal torque. Setting can only be changed if power stage is disabled.	% 0 100 1000 Decimal	u16 RW per.	Modbus 252_h CANopen 4129_h
P1-42 MBT1	ON Delay Time of Holding Brake Applicable operating mode: PT, PS, V, T This parameter specifies the time between enabling the power stage and activation of the signal output function BRKR.	ms 0 0 1000 Decimal	u16 RW per.	Modbus 254_h CANopen $412A_h$
P1-44 GR1	Electronic Gear Ratio - Numerator 1 Applicable operating mode: PT, PS This parameter is used to set the numerator of the gear ratio. The denominator of the gear ratio is set via P1-45. In the operating mode PS, the value of this parameter can only be changed when the power stage is disabled.	- 1 128 536870911 Decimal	u32 RW per.	Modbus 258_h CANopen $412C_h$

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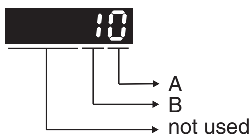
Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P1-45` GR2	Electronic Gear Ratio - Denominator Applicable operating mode: PT, PS This parameter is used to set the denominator of the gear ratio. The numerator of the gear ratio is set via P1-44. Setting can only be changed if power stage is disabled.	- 1 10 2147483647 Decimal	u32 RW per.	Modbus $25A_h$ CANopen $412D_h$
`P1-46` ENCOUTRES	Encoder Simulation Resolution Applicable operating mode: PT, PS, V, T This parameter is used to set the resolution of the encoder simulation via the digital output DO6 (OCZ). Setting can only be changed if power stage is disabled.	LPR - 2048 - Decimal	s32 RW per.	Modbus $25C_h$ CANopen $412E_h$
`P1-47` SPOK	Signal Output Function SP_OK - Velocity Applicable operating mode: V This parameter specifies the velocity deviation window for the signal output function SP_OK. The signal output function SP_OK indicates that actual velocity is within the velocity deviation window.	rpm 0 10 300 Decimal	u32 RW per.	Modbus $25E_h$ CANopen $412F_h$
`P1-48` MCOK	Signal Output Function MC_OK - Settings Applicable operating mode: PS This parameter specifies the behavior of the signal output function MC_OK after it has been activated. The signal output function MC_OK indicates that both the signal output functions CMD_OK and TPOS have been activated. In addition, you can specify whether a detected position deviation is to trigger a detected error.  A: Behavior of MC_OK after deactivation of TPOS Value 0: When TPOS is deactivated, MC_OK is deactivated. Value 1: When TPOS is deactivated, MC_OK remains activated. B: Response to detected position deviation via TPOS if A is set to 0 Value 0: No response Value 1: Detected alert Value 2: Detected error	- 0_h 0_h 21_h Hexadecimal	u16 RW per.	Modbus 260_h CANopen 4130_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P1-52 REGENRES	Braking Resistor - Resistance Applicable operating mode: PT, PS, V, T This parameter is used to set the resistance of the braking resistor. Value -1: No braking resistor	Ohm -1 - 32767 Decimal	s16 RW per.	Modbus 268_h CANopen 4134_h
P1-53 REGENPOW	Braking Resistor - Power Applicable operating mode: PT, PS, V, T This parameter is used to set the power of the braking resistor. Value -1: No braking resistor	W -1 - 32767 Decimal	s16 RW per.	Modbus $26A_h$ CANopen 4135_h
P1-54 PER	Signal Output Function TPOS - Trigger Value Applicable operating mode: PT, PS This parameter specifies the position deviation value used to activate the signal output function TPOS. Operating mode PT: The signal output function TPOS indicates that the position deviation is within the tolerance set via this parameter. Operating mode PS: The signal output function TPOS indicates that the position deviation at the target position is within the tolerance set via this parameter.	PUU 0 12800 1280000 Decimal	u32 RW per.	Modbus $26C_h$ CANopen 4136_h
P1-55 VLIM	Maximum Velocity - User-Defined Applicable operating mode: PT, PS, V, T This parameter specifies the maximum velocity. Default setting: nominal velocity. Setting can only be changed if power stage is disabled.	rpm 10 - 6000 Decimal	u32 RW per.	Modbus $26E_h$ CANopen 4137_h
P1-57 CRSHA	Torque Monitoring - Torque Value Applicable operating mode: PT, PS, V, T This parameter is used to configure the torque monitoring function. The torque monitoring function detects an error (AL030) if the torque value set via this parameter is exceeded for a period of time set via P1-58.	% 0 0 300 Decimal	u16 RW per.	Modbus 272_h CANopen 4139_h
P1-58 CRSHT	Torque Monitoring - Time Value Applicable operating mode: PT, PS, V, T This parameter is used to configure the torque monitoring function. The torque monitoring function detects an error (AL030) if the torque value set via P1-57 is exceeded for a period of time set via this parameter.	ms 1 1 1000 Decimal	u16 RW per.	Modbus 274_h CANopen $413A_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P1-59 MFLT	S Curve Filter for Operating Mode Velocity Applicable operating mode: V This parameter specifies the moving average time in [us] for the S curve filter in the operating mode Velocity. The value of this parameter must be a multiple of 125. This filter changes a linear acceleration into an S curve. Setting can only be changed if power stage is disabled.	us 0 0 255875 Decimal	u32 RW per.	Modbus 276_h CANopen $413B_h$
P1-60 RUNAWAYT-THRESH	Commutation Monitoring - Time Threshold Applicable operating mode: PT, PS, V, T	ms 0 0 3000 Decimal	u16 RW per.	Modbus 278_h CANopen $413C_h$
P1-61 RUNAWAYV-THRESH	Commutation Monitoring - Velocity Threshold Applicable operating mode: PT, PS, V, T	0.1rpm 0 600 60000 Decimal	u32 RW per.	Modbus $27A_h$ CANopen $413D_h$
P1-62 THERMODE	Motor Overtemperature Monitoring - Response Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive if the temperature monitoring function detects motor overtemperature. Value 0: Disable power stage immediately Value 3: Ignore overtemperature Value 4: Alert Value 5: Alert first, then detected error if condition persists after P1-63	- 0 0 5 Decimal	u16 RW per.	Modbus $27C_h$ CANopen $413E_h$
P1-63 THERMTIME	Motor Overtemperature Monitoring - Delay Time Applicable operating mode: PT, PS, V, T This parameter specifies the delay time between the detection of motor overtemperature and the transition to the operating state Fault (see P1-62).	s 0 30 300 Decimal	u16 RW per.	Modbus $27E_h$ CANopen $413F_h$
P1-64 UVMODE	Undervoltage Monitoring - Response Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive if the undervoltage monitoring function detects undervoltage. Value 0: Detected error Value 1: Alert (if power stage is enabled) Value 2: Alert first, then detected error if condition persists after P1-67 (if power stage is enabled) Value 3: Detected error (if power stage is enabled)	- 0 0 3 Decimal	u16 RW per.	Modbus 280_h CANopen 4140_h
P1-65	Reserved			

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P1-66 MFOLD	Status of Foldback Current Motor Applicable operating mode: PT, PS, V, T This parameter indicates whether the fold-back current limit is greater than or less than the maximum current of the motor (see P1-78). Value 0: Foldback current limit greater than P1-78 Value 1: Foldback current limit is less than P1-78	- 0 - 1 Decimal	u16 RO -	Modbus 284h CANopen 4142h
P1-67 UVTIME	Undervoltage Monitoring - Delay Time Applicable operating mode: PT, PS, V, T This parameter specifies the delay time between the detection of an undervoltage condition (displayed as "u")and the response of the drive to this condition as specified in P1-64.	s 0 30 300 Decimal	u16 RW per.	Modbus 286h CANopen 4143h
P1-68 DECSTOP	Active Disable - Deceleration Ramp Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a power stage Disable request, see P1-32.	ms 6 200 65500 Decimal	u16 RW per.	Modbus 288h CANopen 4144h
P1-69 DECSTOPTIME	Disable - Deceleration Time Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a power stage Disable request, see P1-32. If the value of this parameter is not 0, this parameter overrides P1-68. Setting can only be changed if power stage is disabled.	ms 0 0 6500 Decimal	u16 RW per.	Modbus 28Ah CANopen 4145h
P1-70 IMAXHALT	Signal Input Function HALT - Maximum Current Applicable operating mode: T This parameter specifies the maximum current for the signal input function Halt. The maximum value for this parameter is the value of P1-79.	0.01A - 0 - Decimal	u32 RW per.	Modbus 28Ch CANopen 4146h
P1-71 REGENMAXON-TIME	Braking Resistor - Maximum Time in Braking Applicable operating mode: PT, PS, V, T This parameter specifies the maximum time in braking for the braking resistor. The maximum time in braking is the maximum period of time during which the braking resistor may be activated.	ms 10 40 100 Decimal	u16 RW per.	Modbus 28Eh CANopen 4147h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P1-72 REGENFLTMODE	Braking Resistor Overload Monitoring - Response Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive if the braking resistor overload monitoring function detects braking resistor overload. Value 0: Alert Value 1: Detected error	- 0 0 1 Decimal	u16 RW per.	Modbus 290h CANopen 4148h
P1-78 ILIM	User-Defined Maximum Current Applicable operating mode: PT, PS, V, T This parameter is specifies a user-defined maximum current for the drive. The maximum value of this parameter is the value of P1-79.	0.01A - - - Decimal	u32 RW per.	Modbus 29Ch CANopen 414Eh
P1-79 IMAX	Maximum Current Applicable operating mode: PT, PS, V, T This parameter indicates the maximum current for a drive / motor combination.	0.01A - - - Decimal	u32 RO -	Modbus 29Eh CANopen 414Fh
P1-80 DIPEAK	Maximum Peak Current Applicable operating mode: PT, PS, V, T This parameter indicates the maximum peak current of the drive.	0.01A - - - Decimal	u32 RO -	Modbus 2A0h CANopen 4150h
P1-81 DICONT	Nominal Current Applicable operating mode: PT, PS, V, T This parameter indicates the nominal current of the drive.	0.01A - - - Decimal	u32 RO -	Modbus 2A2h CANopen 4151h
P1-82 CAN-OPEN_VEL_LIMIT	Velocity limitation for CANopen operating mode Profile Torque Applicable operating mode: Fieldbus mode Value 0: Limitation via analog input Value 1: Limitation via P1-09 Value 2: Limitation via P1-10 Value 3: Limitation via P1-11	- 0 0 3 Decimal	u16 RW per.	Modbus 2A4h CANopen 4152h
P1-83 OPMODE_CHANGE_MODE	Change of operating mode during movement Applicable operating mode: PT, PS, V, T Value 0: With motor standstill Value 1: Without motor standstill	- 0 0 1 Decimal	u16 RW per.	Modbus 2A6h CANopen 4153h
P1-84 CFG_MOTOR	Configured motor type Applicable operating mode: PT, PS, V, T	- 0 - 2147483647 Decimal	u32 RO per.	Modbus 2A8h CANopen 4154h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P2-01 PPR	Gain Switching - Rate for Position Loop Applicable operating mode: PT, PS This parameter specifies the gain switching rate for the position loop. The gain switching function is configured via this parameter and parameters P2-05, P2-27 and P2-29.	% 10 100 500 Decimal	u16 RW per.	Modbus 302_h CANopen 4201_h
P2-05 SPR	Gain Switching - Rate for Velocity Loop Applicable operating mode: PT, PS, V, T This parameter specifies the gain switching rate for the velocity loop. The gain switching function is configured via this parameter and parameters P2-01, P2-27 and P2-29.	% 10 100 500 Decimal	u16 RW per.	Modbus $30A_h$ CANopen 4205_h
P2-08 PCTL	Factory Reset / Save Parameters Applicable operating mode: PT, PS, V, T This parameter provides the following functions: - Reset the parameters to the factory settings - Save the current parameter values Changes to this parameter are only possible when the power stage is disabled. The factory settings do not become effective until after you have powered the drive off and on again. Value 10: Reset the parameter values to the factory settings Value 11: Save the parameter values	- 0 0 406 Decimal	u16 RW -	Modbus 310_h CANopen 4208_h
P2-09 DRT	Debounce Time - Inputs Applicable operating mode: PT, PS, V, T This parameter specifies the debounce time for the digital inputs DI1 ... DI5 and DI8. See P2-24 for the debounce time for the fast digital inputs DI6 and DI7.	ms 0 2 20 Decimal	u16 RW per.	Modbus 312_h CANopen 4209_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P2-10 DITF1	Signal Input Function for DI1 Applicable operating mode: PT, PS, V, T The parameters P2-10 ... P2-17 are used to assign signal input functions to the digital inputs DI1 ... DI8 and to configure the type of digital input (normally closed, normally open). A: Signal input functions: For the values see chapter *"7.4 Setting the digital signal inputs and signal outputs"*. B: Type: 0: Normally closed (contact b) 1: Normally open (contact a) Example: If the setting of P2-10 is 101, the signal input function assigned to digital input 1 is SON (0x01) and the type of contact is a normally open contact. The drive must be restarted after the parameters have been changed. Forcing of digital inputs is configured via P3-06 and activated via P4-07. Setting can only be changed if power stage is disabled.	- 0_h 100_h 146_h Hexadecimal	u16 RW per.	Modbus 314_h CANopen $420A_h$
P2-11 DITF2	Signal Input Function for DI2 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be changed if power stage is disabled.	- 0_h 100_h 146_h Hexadecimal	u16 RW per.	Modbus 316_h CANopen $420B_h$
P2-12 DITF3	Signal Input Function for DI3 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be changed if power stage is disabled.	- 0_h 100_h 146_h Hexadecimal	u16 RW per.	Modbus 318_h CANopen $420C_h$
P2-13 DITF4	Signal Input Function for DI4 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be changed if power stage is disabled.	- 0_h 100_h 146_h Hexadecimal	u16 RW per.	Modbus $31A_h$ CANopen $420D_h$
P2-14 DITF5	Signal Input Function for DI5 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be changed if power stage is disabled.	- 0_h 24_h 146_h Hexadecimal	u16 RW per.	Modbus $31C_h$ CANopen $420E_h$

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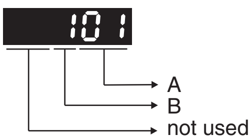
Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P2-15` DITF6	Signal Input Function for DI6 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be changed if power stage is disabled.	- 0_h 22_h 146_h Hexadecimal	u16 RW per.	Modbus $31E_h$ CANopen $420F_h$
`P2-16` DITF7	Signal Input Function for DI7 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be changed if power stage is disabled.	- 0_h 23_h 146_h Hexadecimal	u16 RW per.	Modbus 320_h CANopen 4210_h
`P2-17` DITF8	Signal Input Function for DI8 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be changed if power stage is disabled.	- 0_h 21_h 146_h Hexadecimal	u16 RW per.	Modbus 322_h CANopen 4211_h
`P2-18` DOTF1	Signal Output Function for DO1 Applicable operating mode: PT, PS, V, T The parameters P2-18 ... P2-22 are used to assign signal output functions to the digital outputs DO1 ... DO5 and to configure the type of digital output (normally closed, normally open).  A: Signal output functions: For the values see chapter *"7.4 Setting the digital signal inputs and signal outputs"*. B: Type: 0: Normally closed (contact b) 1: Normally open (contact a) Example: If the setting of P2-18 is 101, the signal output function assigned to digital output 1 is SRDY (0x01) and the type of contact is a normally open contact.	- 0_h 101_h $13F_h$ Hexadecimal	u16 RW per.	Modbus 324_h CANopen 4212_h
`P2-19` DOTF2	Signal Output Function for DO2 Applicable operating mode: PT, PS, V, T See P2-18 for details.	- 0_h 100_h $13F_h$ Hexadecimal	u16 RW per.	Modbus 326_h CANopen 4213_h
`P2-20` DOTF3	Signal Output Function for DO3 Applicable operating mode: PT, PS, V, T See P2-18 for details.	- 0_h 100_h $13F_h$ Hexadecimal	u16 RW per.	Modbus 328_h CANopen 4214_h

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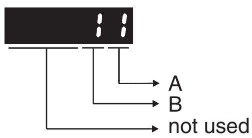
Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P2-21 DOTF4	Signal Output Function for DO4 Applicable operating mode: PT, PS, V, T See P2-18 for details.	- 0_h 100_h $13F_h$ Hexadecimal	u16 RW per.	Modbus $32A_h$ CANopen 4215_h
P2-22 DOTF5	Signal Output Function for DO5 Applicable operating mode: PT, PS, V, T See P2-18 for details.	- 0_h 7_h $13F_h$ Hexadecimal	u16 RW per.	Modbus $32C_h$ CANopen 4216_h
P2-23 DOTF6	Signal Output Function for DO6(OCZ) Applicable operating mode: PT, PS, V, T Only the signal output function ESIM can be assigned to the digital output DO6 (OCZ). Use P2-18 ... P22 for assigning other signal output functions to the other digital outputs DO1 ... DO5. See P2-18 for details.	- 0_h 40_h $13F_h$ Hexadecimal	u16 RW per.	Modbus $32E_h$ CANopen 4217_h
P2-24 FDRT	Debounce Time - Fast Inputs Applicable operating mode: PT, PS, V, T This parameter specifies the debounce time for the digital inputs DI6 and DI7. See P2-09 for the debounce time for the digital inputs DI1 ... DI5 and DI8.	us 0 50 100 Decimal	u16 RW per.	Modbus 330_h CANopen 4218_h
P2-27 GCC	Gain Switching - Conditions and Type Applicable operating mode: PT, PS, V, T This parameter specifies the conditions for and the type of gain switching. The gain switching function is configured via this parameter and parameters P2-01, P2-05 and P2-29.  A: Conditions for gain switching: 0: Disabled 1: Signal input function GAINUP is active 2: In operating modes PT and PS, the position deviation is greater than the value of P2-29 3: Pulse frequency is greater than the value of P2-29 4: Velocity is greater than the value of P2-29 5: Signal input function GAINUP is not active 6: In operating modes PT and PS, the position deviation is less than the value of P2-29 7: Pulse frequency is less than the value of P2-29 8: Velocity is less than the value of P2-29	- 0_h 0_h 18_h Hexadecimal	u16 RW per.	Modbus 336_h CANopen $421B_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P2-29 GPE	Gain Switching - Comparison Value Applicable operating mode: PT, PS, V, T This parameter specifies the comparison value used for the conditions for gain switching. Depending on the selected condition, the value entered represents the number of pulses (position deviation), the pulse frequency or the velocity. The gain switching function is configured via this parameter and parameters P2-01, P2-05 and P2-27.	- 0_h 138800_h $3A9800_h$ Hexadecimal	u32 RW per.	Modbus $33A_h$ CANopen $421D_h$
P2-30 INH	Auxiliary Functions Applicable operating mode: PT, PS, V, T Value 0: Disabled Value 1: Enable the power stage	- -8 0 8 Decimal	s16 RW -	Modbus $33C_h$ CANopen $421E_h$
P2-31 LTNEFFORT	Autotuning Optimization Value Threshold Applicable operating mode: PT, PS, V	0.1% 0 1000 10000 Decimal	u32 RW -	Modbus $33E_h$ CANopen $421F_h$
P2-32 ATMODE	Autotuning Applicable operating mode: PT, PS, V This parameter is used to start autotuning with the selected autotuning method. Value 0: Stop Autotuning Value 1: Easy Tuning Value 2: Comfort Tuning [minimum settling time, vibration suppression] Value 3: Comfort Tuning [minimum overshoot, vibration suppression] Value 52: Comfort Tuning [minimum settling time, no vibration suppression] Value 53: Comfort Tuning [minimum overshoot, no vibration suppression]	- 0 0 56 Decimal	u16 RW -	Modbus 340_h CANopen 4220_h
P2-34 VEMAX	Velocity Monitoring - Threshold Value Applicable operating mode: V This parameter specifies the velocity threshold for the velocity monitoring function. If this value is exceeded, error AL555 is detected.	0.1rpm 0 50000 60000 Decimal	u32 RW per.	Modbus 344_h CANopen 4222_h
P2-35 PDEV	Position Deviation Monitoring - Threshold Value Applicable operating mode: PT, PS This parameter specifies the position deviation threshold for the position deviation monitoring function. If this value is exceeded, error AL009 is detected.	PUU 1 100000 128000000 Decimal	u32 RW per.	Modbus 346_h CANopen 4223_h
P2-36 PT_PULSE_FLTR	PTI Interface Debounce Time - Pulse Applicable operating mode: PT, PS, V, T This parameter specifies the debounce time of the pulse input of the PTI interface.	16.6666*ns 0 30 511 Decimal	u16 RO -	Modbus 348_h CANopen 4224_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P2-37 PT_DIRECT_FLTR	PTI Interface Debounce Time - Direction Applicable operating mode: PT, PS, V, T This parameter specifies the debounce time of the direction input of the PTI interface.	16.6666*ns 0 30 511 Decimal	u16 RO -	Modbus 34Ah CANopen 4225h
P2-50 DCLR	Signal Input Function CLRPOS - Trigger Applicable operating mode: PT, PS This parameter specifies how the signal input function CLRPOSDEV is triggered. The signal input function CLRPOSDEV resets the position deviation to zero. Value 0: Rising edge Value 1: Level	- 0h 0h 1h Hexadecimal	u16 RW per.	Modbus 364h CANopen 4232h
P2-60 GR2	Electronic Gear Ratio - Numerator 2 Applicable operating mode: PT, PS This parameter can be used to set an additional gear ratio. The additional gear ratio can be selected via the signal input functions GNUM0 and GNUM1. See P1-44 for details.	- 1 128 536870911 Decimal	u32 RW per.	Modbus 378h CANopen 423Ch
P2-61 GR3	Electronic Gear Ratio - Numerator 3 Applicable operating mode: PT, PS See P2-60 for details.	- 1 128 536870911 Decimal	u32 RW per.	Modbus 37Ah CANopen 423Dh
P2-62 GR4	Electronic Gear Ratio - Numerator 4 Applicable operating mode: PT, PS See P2-60 for details.	- 1 128 536870911 Decimal	u32 RW per.	Modbus 37Ch CANopen 423Eh

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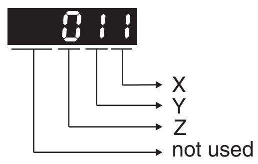
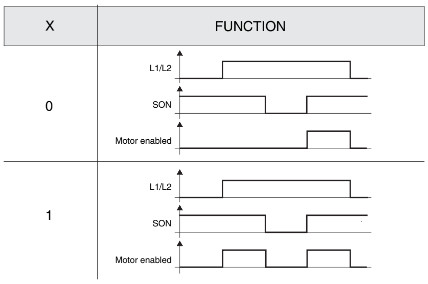
Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P2-65 GBIT	Special Function 1 Applicable operating mode: PT, PS, V Bits 0 ... 5: Reserved (must be set to 0). Bit 6: Reference pulse monitoring 0: Activate reference pulse monitoring 1: Deactivate reference pulse monitoring Bits 7 ... 8: Reserved (Must be set to 0). Bit 9: Motor phase monitoring 0: Deactivate motor phase monitoring 1: Activate motor phase monitoring Bit 10: Reserved (must be set to 0). Bit 11: NL(CWL)/PL(CCWL) pulse input inhibit function Value 0: Activate NL(CWL)/PL(CCWL) pulse input inhibit function Value 1: Deactivate NL(CWL)/PL(CCWL) pulse input inhibit function If P8-31 is set to 1 or 3 and if a hardware limit switch is triggered, a Fault Reset clears the missing master pulses. Therefore, only use the pulse inhibit function with settings 1 or 3 of P8-31 if you do not need a Fault Reset after a detected hardware limit switch error. To achieve this, set the Automatic Fault Reset function of P2-68 to 1. Bit 12: Mains phase monitoring Value 0: Activate mains phase monitoring (AL022) Value 1: Deactivate mains phase monitoring Bit 13: Encoder simulation output monitoring Value 0: Activate encoder simulation output monitoring (AL018) Value 1: Deactivate encoder simulation output monitoring Bits 14 ... 15: Reserved (must be set to 0).	- 0_h 200_h $3E40_h$ Hexadecimal	u16 RW per.	Modbus 382_h CANopen 4241_h
P2-66 GBIT2	Special Function 2 Applicable operating mode: PT, PS, V, T Bits 0 ... 1: Reserved (must be set to 0). Bit 2: This bit specifies the type of Fault Reset after a detected undervoltage error has been removed. 0: No automatic Fault Reset 1: Automatic Fault Reset Bits 3 ... 7: Reserved (must be set to 0).	- 0 0 4 Decimal	u16 RW per.	Modbus 384_h CANopen 4242_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P2-68` AEAL	Auto-Enable and Automatic Hardware Limit Switch Fault Reset Applicable operating mode: PT, PS, V, T  X: Automatic power stage enabling 0: Trigger SON to enable power stage 1: Enable power stage automatically if SON is active after drive has been powered on  Y: Automatic Fault Reset for limit switches 0: Detected hardware limit switch error (AL014 and AL015) requires Fault Reset 1: Detected hardware limit switch error (AL014 and AL015) can be reset without Fault Reset Z: Repeated attempt to overtravel limit switch (CANopen only) 0: No detected error 1: Detected error, Fault Reset required Changed settings become active the next time the product is powered on.	- 0_h 0_h 111_h Hexadecimal	u16 RW per.	Modbus 388_h CANopen 4244_h
`P3-00` ADR	Device Address Modbus Applicable operating mode: PT, PS, V, T The device address must be unique. Changed settings become active the next time the product is powered on.	- 1 127 247 Decimal	u16 RW per.	Modbus 400_h CANopen 4300_h
`P3-01` BRT	Transmission Rate Applicable operating mode: PT, PS, V, T This parameter is used to set the data transmission rate. For details see chapter *"6.3 Setting the device address, baud rate and connection settings"*. If this parameter is set via CANopen, only the CANopen transmission rate can be set. Changed settings become active the next time the product is powered on.	- 0_h 102_h 405_h Hexadecimal	u16 RW per.	Modbus 402_h CANopen 4301_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
`P3-02` PTL	Modbus Connection Settings Applicable operating mode: PT, PS, V, T This parameter specifies the Modbus connection settings. For details see chapter *"6.3 Setting the device address, baud rate and connection settings"*. Changed settings become active the next time the product is powered on.	- 6_h 7_h 9_h Hexadecimal	u16 RW per.	Modbus 404_h CANopen 4302_h
`P3-03` FLT	Detected Modbus Communication Errors - Handling Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive to a detected communication error. Value 0: Detected alert Value 1: Detected error	- 0_h 0_h 1_h Hexadecimal	u16 RW per.	Modbus 406_h CANopen 4303_h
`P3-04` CWD	Modbus Connection Monitoring Applicable operating mode: PT, PS, V, T This parameter specifies the maximum permissible duration for communication timeout. When this time has elapsed, the communication timeout is treated as a detected error. Setting this parameter to 0 to disables connection monitoring.	ms 0 0 20000 Decimal	u16 RW per.	Modbus 408_h CANopen 4304_h
`P3-05` CMM	Device Address CANopen Applicable operating mode: PT, PS, V, T This parameter specifies the CANopen address of the drive in decimal format. The device address must be unique. Changes to this parameter becomes effective only after a restart of the drive. Changed settings become active the next time the product is powered on.	- 0 0 127 Decimal	u16 RW per.	Modbus $40A_h$ CANopen 4305_h
`P3-06` SDI	Digital Inputs - Forcing Settings Applicable operating mode: PT, PS, V, T This parameter determines whether or not a digital input can be forced. Bits 0 ... 7: Digital input DI1 ... digital input DI8 Bit settings: Value 0: Digital input cannot be forced Value 1: Digital input can be forced To actually start forcing, you must write P4-07. See P2-10 ... P2-17 for the assignment of signal input functions to the digital inputs.	- 0_h 0_h $7FF_h$ Hexadecimal	u16 RW -	Modbus $40C_h$ CANopen 4306_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P3-07 CDT	Modbus Response Delay Time Applicable operating mode: PT, PS, V, T This parameter specifies the time delay with which the drive responds to the Modbus master.	0.5ms 0 0 1000 Decimal	u16 RW per.	Modbus $40E_h$ CANopen 4307_h
P3-09 SYC	CANopen Master/Slave Synchronization Applicable operating mode: Fieldbus mode This parameter specifies synchronization settings of the CANopen slave and the CANopen master via the synchronization signal. Setting can only be changed if power stage is disabled.	- 1001_h 5055_h $9FFF_h$ Hexadecimal	u16 RW per.	Modbus 412_h CANopen 4309_h
P3-10 LXM_PLC_EN	Drive Profile Lexium - Activation Applicable operating mode: Fieldbus mode 0: Deactivate Drive Profile Lexium 1: Activate Drive Profile Lexium	- 0_h 0_h 1_h Hexadecimal	u16 RW per.	Modbus 414_h CANopen $430A_h$
P3-11 DRIVE_INPUT	Drive Profile Lexium - State of Digital Inputs Applicable operating mode: Fieldbus mode	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus 416_h CANopen $430B_h$
P3-12 DRIVE_MODE_CTRL	Drive Profile Lexium - Control Word Applicable operating mode: Fieldbus mode	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RW -	Modbus 418_h CANopen $430C_h$
P3-13 REFA16	Drive Profile Lexium - RefA 16 Bit Parameter Applicable operating mode: Fieldbus mode	- 8000_h 0_h $7FFF_h$ Hexadecimal	s16 RW -	Modbus $41A_h$ CANopen $430D_h$
P3-14 REFB32	Drive Profile Lexium - RefB 32 Bit Parameter Applicable operating mode: Fieldbus mode	- 80000000_h 0_h $7FFFFFFF_h$ Hexadecimal	s32 RW -	Modbus $41C_h$ CANopen $430E_h$
P3-15 DRIVE_STAT	Drive Profile Lexium - Drive Status Applicable operating mode: Fieldbus mode	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus $41E_h$ CANopen $430F_h$
P3-16 MF_STAT	Drive Profile Lexium - Operating Mode Status Applicable operating mode: Fieldbus mode	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus 420_h CANopen 4310_h
P3-17 MOTION_STAT	Drive Profile Lexium - Motion Status Applicable operating mode: Fieldbus mode	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus 422_h CANopen 4311_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P3-18 PEVM1	PDO Event Mask 1 Applicable operating mode: Fieldbus mode Changes of values in the object trigger an event: Bit 0: First PDO object Bit 1: Second PDO object Bit 2: Third PDO object Bit 3: Fourth PDO object	- 0_h 1_h F_h Hexadecimal	u16 RW per.	Modbus 424_h CANopen 4312_h
P3-19 PEVM2	PDO Event Mask 2 Applicable operating mode: Fieldbus mode See P3-18 for details.	- 0_h 1_h F_h Hexadecimal	u16 RW per.	Modbus 426_h CANopen 4313_h
P3-20 PEVM3	PDO Event Mask 3 Applicable operating mode: Fieldbus mode See P3-18 for details.	- 0_h 1_h F_h Hexadecimal	u16 RW per.	Modbus 428_h CANopen 4314_h
P3-21 PEVM4	PDO Event Mask 4 Applicable operating mode: Fieldbus mode See P3-18 for details.	- 0_h F_h F_h Hexadecimal	u16 RW per.	Modbus $42A_h$ CANopen 4315_h
P3-30 INTRN_LIM_SRC	Internal Limit for Bit 11 DriveCom Status Word 6041 Applicable operating mode: PT, PS, V, T This parameter assigns a limit to bit 11 (Internal Limit Active) of the DriveCom status word 6041. Value 0: None: Not used (reserved) Value 1: Current Below Threshold: Current threshold value Value 2: Velocity Below Threshold: Velocity threshold value Value 3: In Position Deviation Window: Position deviation window Value 4: In Velocity Deviation Window: Velocity deviation window Value 9: Hardware Limit Switch: Hardware limit switch Value 11: Position Window: Position window	- 0 0 11 Decimal	u16 RW per.	Modbus $43C_h$ CANopen $431E_h$
P3-31 QSOC	Settings for NMT operating state Quick Stop Applicable operating mode: PT, PS, V Value 6: Decelerate with Quick Stop deceleration ramp and remain in operating state Quick Stop Active Value 7: Decelerate with maximum current and remain in operating state Quick Stop Active	- 6_h 6_h 7_h Hexadecimal	u16 RW per.	Modbus $43E_h$ CANopen $431F_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P3-32 SOD2RTSO	Automatic operating state transition from Switch On Disabled to Ready To Switch On Applicable operating mode: PT, PS, V, T Value 0: Transition according to value of CANopen control word Value 1: Automatic transition	- 0_h 0_h 1_h Hexadecimal	u16 RW per.	Modbus 440_h CANopen 4320_h
P4-00 ASH1	Error History - Error Code of Most Recent Detected Error n Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the most recent detected error. Writing 0 to this parameter clears the error history.	- 0_h 0_h 0_h Hexadecimal	u16 RW -	Modbus 500_h CANopen 4400_h
P4-01 ASH2	Error History - Error Code of Most Recent Detected Error n - 1 Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the detected error n-1, n being the most recent detected error.	- 0_h 0_h 0_h Hexadecimal	u16 RO -	Modbus 502_h CANopen 4401_h
P4-02 ASH3	Error History - Error Code of Most Recent Detected Error n - 2 Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the detected error n-2, n being the most recent detected error.	- 0_h 0_h 0_h Hexadecimal	u16 RO -	Modbus 504_h CANopen 4402_h
P4-03 ASH4	Error History - Error Code of Most Recent Detected Error n - 3 Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the detected error n-3, n being the most recent detected error.	- 0_h 0_h 0_h Hexadecimal	u16 RO -	Modbus 506_h CANopen 4403_h
P4-04 ASH5	Error History - Error Code of Most Recent Detected Error n - 4 Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the detected error n-4, n being the most recent detected error.	- 0_h 0_h 0_h Hexadecimal	u16 RO -	Modbus 508_h CANopen 4404_h
P4-05 JOG	Jog Velocity Applicable operating mode: PT, PS, V, T See chapter *"7.3.2 Jog operation"* for details.	rpm 0 20 5000 Decimal	u32 RW per.	Modbus $50A_h$ CANopen 4405_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P4-06 FOT	Setting a signal output via parameter Applicable operating mode: PT, PS, V, T This parameter lets you set those signal outputs whose signal output functions have been set to SDO_0 ... SDO_5. Bit 0 = 1 sets those signal outputs whose signal output function has been set to SDO_0. Bit 1 = 1 sets those signal outputs whose signal output function has been set to SDO_1. Bit 2 = 1 sets those signal outputs whose signal output function has been set to SDO_2. Bit 3 = 1 sets those signal outputs whose signal output function has been set to SDO_3. Bit 4 = 1 sets those signal outputs whose signal output function has been set to SDO_4. Bit 5 = 1 sets those signal outputs whose signal output function has been set to SDO_5. Bit 6 = 1 sets those signal outputs whose signal output function has been set to SDO_6. Bit 7 = 1 sets those signal outputs whose signal output function has been set to SDO_7. See P2-18 ... P2-22 for assigning the functions to the digital outputs.	- 0_h 0_h FF_h Hexadecimal	u16 RW -	Modbus $50C_h$ CANopen 4406_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P4-07 ITST	State of Digital Inputs / Activate Forcing Applicable operating mode: PT, PS, V, T A read access to this parameter indicates the state of the digital inputs in the form of a bit pattern. Example: Read value 0x0011: Digital inputs 1 and 5 are logical 1 By writing this parameter, you can change the state of the inputs provided that the setting for the corresponding input in P3-06 allows for forcing (value 1 for the bit corresponding to the input). Example: Write value 0x0011: Digital inputs 1 and 5 are set to logical 1, regardless of the previous state See P3-06 for permitting forcing of individual digital inputs. See P2-10 ... P2-17 for the assignment of signal input functions to the digital inputs.	- 0_h 0_h FF_h Hexadecimal	u16 RW -	Modbus $50E_h$ CANopen 4407_h
P4-08 PKEY	Status of HMI Keypad Applicable operating mode: PT, PS, V, T This parameter is used to verify proper operation of the keys on the HMI keypad of the drive: **ENT**, **UP**, **DOWN**, **M** and **S**.	- 0_h 0_h FF_h Hexadecimal	u16 RO -	Modbus 510_h CANopen 4408_h
P4-09 MOT	State of Digital Outputs Applicable operating mode: PT, PS, V, T This parameter indicates the state of the digital outputs DO1 ... DO6. Bit 0 = 1: DO1 is activated Bit 1 = 1: DO2 is activated Bit 2 = 1: DO3 is activated Bit 3 = 1: DO4 is activated Bit 4 = 1: DO5 is activated Bit 5 = 1: DO6 is activated	- 0_h 0_h $3F_h$ Hexadecimal	u16 RO -	Modbus 512_h CANopen 4409_h
P4-10 FLTHISTCLR	Clear Error History Applicable operating mode: PT, PS, V, T Writing 0 to this parameter clears the error history.	- 0 0 0 Decimal	u16 RW -	Modbus 514_h CANopen $440A_h$
P4-22 ANIN1OFFSET	Analog Input 1 Offset Applicable operating mode: V This parameter specifies an offset for the analog input used in operating mode V.	mV -10000 0 10000 Decimal	s16 RW per.	Modbus $52C_h$ CANopen 4416_h
P4-23 ANIN2OFFSET	Analog Input 2 Offset Applicable operating mode: T This parameter specifies an offset for the analog input used in operating mode T.	mV -10000 0 10000 Decimal	s16 RW per.	Modbus $52E_h$ CANopen 4417_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P4-24 LVL	Undervoltage Monitoring - Threshold Value Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value for DC bus undervoltage monitoring. If the DC Bus voltage is less than the value of P4-24 x 2, the error AL003 is detected.	V 140 160 190 Decimal	u16 RW per.	Modbus 530_h CANopen 4418_h
P4-25 STO	Safety Function STO - Status Applicable operating mode: PT, PS, V, T This parameter indicates the status of the safety function STO. Bit 0 = 0: Safety function STO triggered Bit 0 = 1: Safety function STO not triggered or deactivated via jumper at CN9	- 0 - 1 Decimal	u16 RO -	Modbus 532_h CANopen 4419_h
P4-26 DO_FORCEABLE	Digital Outputs - Forcing Information Applicable operating mode: PT, PS, V, T This parameter shows whether or not a digital output can be forced. Bits 0 ... 4: Digital output DO1 ... digital output DO5 Bit settings: Value 0: Digital output cannot be forced Value 1: Digital output can be forced	- $1F_h$ $1F_h$ $1F_h$ Hexadecimal	u16 RO -	Modbus 534_h CANopen $441A_h$
P4-27 DO_FORCE_MASK	Digital Outputs - Forcing Settings Applicable operating mode: PT, PS, V, T This parameter determines whether or not a digital output can be forced. Bits 0 ... 4: Digital output DO1 ... digital output DO5 Bit settings: Value 0: Digital output cannot be forced Value 1: Digital output can be forced To actually start forcing, you must write P4-28. See P2-18 ... P2-22 for the assignment of signal output functions to the digital outputs.	- 0_h 0_h $1F_h$ Hexadecimal	u16 RW -	Modbus 536_h CANopen $441B_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P4-28 DO_FORCE_VALUE	State of Digital Outputs / Activate Forcing Applicable operating mode: PT, PS, V, T A read access to this parameter indicates the state of the digital outputs in the form of a bit pattern. Example: Read value 0x0011: Digital outputs 1 and 5 are logical 1 By writing this parameter, you can change the state of the outputs provided that the setting for the corresponding output in P4-27 allows for forcing (value 1 for the bit corresponding to the output). Example: Write value 0x0011: Digital outputs 1 and 5 are set to logical 1, regardless of the previous state See P4-27 for permitting forcing of individual digital outputs. See P2-18 ... P2-22 for the assignment of signal output functions to the digital outputs.	- 0_h 0_h $1F_h$ Hexadecimal	u16 RW -	Modbus 538_h CANopen $441C_h$
P5-00 REV	Firmware Revision Applicable operating mode: PT, PS, V, T This parameter contains the revision number of the firmware.	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus 600_h CANopen 4500_h
P5-04 HMOV	Homing - Homing Method Selection Applicable operating mode: PS This parameter is used to select the homing method and configure the behavior of the index pulse and the limit switches. See chapter *"7.3.4 Operating mode Position Sequence (PS)"* for details. Setting can only be changed if power stage is disabled.	- 0_h 0_h 128_h Hexadecimal	u16 RW per.	Modbus 608_h CANopen 4504_h
P5-05 HOMESPEED1	Homing - Fast Velocity for Reference Movement Applicable operating mode: PS	0.1rpm 10 1000 60000 Decimal	u32 RW per.	Modbus $60A_h$ CANopen 4505_h
P5-06 HOMESPEED2	Homing - Slow Velocity for Reference Movement Applicable operating mode: PS	0.1rpm 10 200 60000 Decimal	u32 RW per.	Modbus $60C_h$ CANopen 4506_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P5-07 PRCM	Operating Mode PS via Parameter Applicable operating mode: PS The operating mode Position Sequence (PS) provides 32 data sets that can be executed via the signal input functions POS0 ... POS4 and CTRG or via of this parameter. 0: Start operating mode Homing (Homing data set) 1 ... 32: Trigger data set (equivalent to the signal input functions CTRG and POSn). 33 ... 9999: Not permitted 1000: Stop movement (equivalent to the signal input function STOP) Values displayed via this parameter: If a data set is active, but not yet completed, the value displayed is the value of this parameter plus 10000. If a data set has been completed, the value displayed is the value of this parameter plus 20000. Example: Displayed value 10003: Data set 3 has been started, but is not yet completed. Displayed value 20003: Data set 3 has been completed. See chapter *"7.3.4 Operating mode Position Sequence (PS)"*.	- 0 0 1000 Decimal	u16 RW -	Modbus 60E$_h$ CANopen 4507$_h$
P5-08 POSLIMPOS	Positive Software Limit Switch - Position Applicable operating mode: PS Setting can only be changed if power stage is disabled.	PUU -2147483647 134217727 2147483647 Decimal	s32 RW per.	Modbus 610$_h$ CANopen 4508$_h$
P5-09 POSLIMNEG	Negative Software Limit Switch - Position Applicable operating mode: PS Setting can only be changed if power stage is disabled.	PUU -2147483647 -134217727 2147483647 Decimal	s32 RW per.	Modbus 612$_h$ CANopen 4509$_h$
P5-10 GEARACC-THRESH	Operating mode Pulse Train - Maximum Acceleration Applicable operating mode: PT	ms 6 6 65500 Decimal	u16 RW per.	Modbus 614$_h$ CANopen 450A$_h$
P5-11 POSLIMHYST	Software Limit Switches - Hysteresis Value Applicable operating mode: PT, PS, V, T This parameter specifies a hysteresis value for the software limit switches. Setting can only be changed if power stage is disabled.	PULSE 0 3556 35555 Decimal	u16 RW per.	Modbus 616$_h$ CANopen 450B$_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P5-12 PROBE_1_LVL_PRD	Touch Probe Input 1 - Stable Level Duration Applicable operating mode: PT, PS This parameter specifies the period of time for which the level at Touch Probe input 1 must be stable.	- 2 5 32 Decimal	u16 RW per.	Modbus 618_h CANopen $450C_h$
P5-13 POSLIMMODE	Software Limit Switches - Activation Applicable operating mode: PT, PS, ?, ? This parameter activates/deactivates the software limit switches configured via P5-08 and P5-09. Value 0: Deactivate software limit switches Value 1: Activate software limit switches	- 0 0 1 Decimal	u16 RW per.	Modbus $61A_h$ CANopen $450D_h$
P5-14 ICMDSLOPE	Motion Profile for Torque - Slope Applicable operating mode: T This parameter specifies the slope of the motion profile for torque.	mA/s 1 100000 30000000 Decimal	u32 RW per.	Modbus $61C_h$ CANopen $450E_h$
P5-15 ICMDSLOPEEN	Motion Profile for Torque - Activation Applicable operating mode: T This parameter activates the motion profile for torque. Value 0: Activate Value 1: Deactivate Setting can only be changed if power stage is disabled.	- 0 0 1 Decimal	u16 RW per.	Modbus $61E_h$ CANopen $450F_h$
P5-16 AXEN	Encoder Increments in PUU Applicable operating mode: PT, PS, V, T Setting can only be changed if power stage is disabled.	PUU -2147483647 0 2147483647 Decimal	s32 RW -	Modbus 620_h CANopen 4510_h
P5-18 AXPC	External Encoder (Pulses) Applicable operating mode: PT, PS, V, T	- -2147483648 - 2147483647 Decimal	s32 RO -	Modbus 624_h CANopen 4512_h
P5-20 STP	Deceleration Ramp - Signal Input Function STOP Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered via the signal input function STOP. The deceleration period is the time in milliseconds required to decelerate from 6000 min^{-1} to motor standstill. It is used to set the deceleration ramp.	ms 6 50 65500 Decimal	u16 RW per.	Modbus 628_h CANopen 4514_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P5-21 CTO	Deceleration Ramp - Detected Transmission Error Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if a transmission error is detected. The deceleration period is the time in milliseconds required to decelerate from 6000 min^{-1} to motor standstill. It is used to set the deceleration ramp.	ms 6 50 65500 Decimal	u16 RW per.	Modbus $62A_h$ CANopen 4515_h
P5-22 OVF	Deceleration Ramp - Position Overflow Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if a position overflow is detected. The deceleration period is the time in milliseconds required to decelerate from 6000 min^{-1} to motor standstill. It is used to set the deceleration ramp.	ms 6 30 65500 Decimal	u16 RW per.	Modbus $62C_h$ CANopen 4516_h
P5-23 SNL	Deceleration Ramp - Triggering of Negative Software Limit Switch Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if the negative software limit switch is activated. The deceleration period is the time in milliseconds required to decelerate from 6000 min^{-1} to motor standstill. It is used to set the deceleration ramp.	ms 6 50 65500 Decimal	u16 RW per.	Modbus $62E_h$ CANopen 4517_h
P5-24 SPL	Deceleration Ramp - Triggering of Positive Software Limit Switch Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if the positive software limit switch is activated. The deceleration period is the time in milliseconds required to decelerate from 6000 min^{-1} to motor standstill. It is used to set the deceleration ramp.	ms 6 50 65500 Decimal	u16 RW per.	Modbus 630_h CANopen 4518_h
P5-25 NL	Deceleration Ramp - Triggering of Negative Hardware Limit Switch Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if the negative hardware limit switch is activated. The deceleration period is the time in milliseconds required to decelerate from 6000 min^{-1} to motor standstill. It is used to set the deceleration ramp.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 632_h CANopen 4519_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P5-26 PL	Deceleration Ramp - Triggering of Positive Hardware Limit Switch Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if the positive hardware limit switch is activated. The deceleration period is the time in milliseconds required to decelerate from 6000 min^{-1} to motor standstill. It is used to set the deceleration ramp.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 634_h CANopen $451A_h$
P5-37 CAAX	Touch Probe Input 1 - Captured Position Applicable operating mode: PT, PS, V, T This parameter contains the position captured at Touch Probe input 1.	PUU -2147483647 0 2147483647 Decimal	s32 RO -	Modbus $64A_h$ CANopen 4525_h
P5-38 PROBE1_CNTR	Touch Probe Input 1 - Event Counter Applicable operating mode: PT, PS, V, T The value is increased by 1 each time a position has been captured at Touch Probe input 1.	- 0 0 65535 Decimal	u16 RO -	Modbus $64C_h$ CANopen 4526_h
P5-39 CACT	Touch Probe Input 1 - Configuration Applicable operating mode: PT, PS, V, T X: Activate/deactivate position capture 0: Deactivate 1: Activate (is reset to 0 when the counter in P5-38 is incremented) Y: Reserved Z: Polarity of Touch Probe input 0: Normally open 1: Normally closed U: Reserved	- 0_h 0_h 101_h Hexadecimal	u16 RW -	Modbus $64E_h$ CANopen 4527_h
P5-57 CAAX2	Touch Probe Input 2 - Captured Position Applicable operating mode: PT, PS, V, T This parameter contains the position captured at Touch Probe input 2.	PUU -2147483647 0 2147483647 Decimal	s32 RO -	Modbus 672_h CANopen 4539_h
P5-58 PROBE2_CNTR	Touch Probe Input 2 - Event Counter Applicable operating mode: PT, PS, V, T The value is increased by 1 each time a position has been captured at Touch Probe input 2.	- 0 0 65535 Decimal	u16 RO -	Modbus 674_h CANopen $453A_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P5-59 CACT2	Touch Probe Input 2 - Configuration Applicable operating mode: PT, PS, V, T X: Activate/deactivate position capture 0: Deactivate 1: Activate (is reset to 0 when the counter in P5-58 is incremented) Y: Reserved Z: Polarity of Touch Probe input 0: Normally open 1: Normally closed U: Reserved	- 0_h 0_h 101_h Hexadecimal	u16 RW -	Modbus 676_h CANopen $453B_h$
P5-77 PROBE_2_LVL_PRD	Touch Probe Input 2 - Stable Level Duration Applicable operating mode: PT, PS This parameter specifies the period of time for which the level at Touch Probe input 2 must be stable.	- 2 5 32 Decimal	u16 RW per.	Modbus $69A_h$ CANopen $454D_h$
P6-00 ODAT	Position of Homing Data Set Applicable operating mode: PS After a successful reference movement, this position is automatically set at the reference point. Bits 0 ... 31: Position	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 700_h CANopen 4600_h
P6-01 ODEF	Subsequent Data Set and Auto-start of Homing Data Set Applicable operating mode: PS Bit 0: 0 = Do not start Homing after first power stage enable 1 = Start Homing after first power stage enable Bits 1 ... 7: Reserved Bits 8 ... 15: Subsequent data set	- 0_h 0_h 2001_h Hexadecimal	u32 RW per.	Modbus 702_h CANopen 4601_h
P6-02 PATHPOS1	Target Position of Data Set 1 Applicable operating mode: PS Bits 0 ... 31: Target position	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 704_h CANopen 4602_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P6-03 PATHCTRL1	Configuration of Data Set 1 Applicable operating mode: PS Bits 0 ... 3: Reserved Bit 4: 0 = Wait for preceding data set to complete, then start this data set 1 = Start this data set immediately Bits 5 ... 6: Reserved Bit 7: 0 = Absolute position 1 = Relative (incremental) position Bits 8 ... 15: Reserved	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 706_h CANopen 4603_h
P6-04 PATHPOS2	Target Position of Data Set 2 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 708_h CANopen 4604_h
P6-05 PATHCTRL2	Configuration of Data Set 2 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $70A_h$ CANopen 4605_h
P6-06 PATHPOS3	Target Position of Data Set 3 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $70C_h$ CANopen 4606_h
P6-07 PATHCTRL3	Configuration of Data Set 3 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $70E_h$ CANopen 4607_h
P6-08 PATHPOS4	Target Position of Data Set 4 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 710_h CANopen 4608_h
P6-09 PATHCTRL4	Configuration of Data Set 4 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 712_h CANopen 4609_h
P6-10 PATHPOS5	Target Position of Data Set 5 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 714_h CANopen $460A_h$
P6-11 PATHCTRL5	Configuration of Data Set 5 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 716_h CANopen $460B_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P6-12 PATHPOS6	Target Position of Data Set 6 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 718_h CANopen $460C_h$
P6-13 PATHCTRL6	Configuration of Data Set 6 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $71A_h$ CANopen $460D_h$
P6-14 PATHPOS7	Target Position of Data Set 7 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $71C_h$ CANopen $460E_h$
P6-15 PATHCTRL7	Configuration of Data Set 7 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $71E_h$ CANopen $460F_h$
P6-16 PATHPOS8	Target Position of Data Set 8 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 720_h CANopen 4610_h
P6-17 PATHCTRL8	Configuration of Data Set 8 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 722_h CANopen 4611_h
P6-18 PATHPOS9	Target Position of Data Set 9 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 724_h CANopen 4612_h
P6-19 PATHCTRL9	Configuration of Data Set 9 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 726_h CANopen 4613_h
P6-20 PATHPOS10	Target Position of Data Set 10 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 728_h CANopen 4614_h
P6-21 PATHCTRL10	Configuration of Data Set 10 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $72A_h$ CANopen 4615_h
P6-22 PATHPOS11	Target Position of Data Set 11 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $72C_h$ CANopen 4616_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P6-23 PATHCTRL11	Configuration of Data Set 11 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $72E_h$ CANopen 4617_h
P6-24 PATHPOS12	Target Position of Data Set 12 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 730_h CANopen 4618_h
P6-25 PATHCTRL12	Configuration of Data Set 12 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 732_h CANopen 4619_h
P6-26 PATHPOS13	Target Position of Data Set 13 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 734_h CANopen $461A_h$
P6-27 PATHCTRL13	Configuration of Data Set 13 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 736_h CANopen $461B_h$
P6-28 PATHPOS14	Target Position of Data Set 14 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 738_h CANopen $461C_h$
P6-29 PATHCTRL14	Configuration of Data Set 14 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $73A_h$ CANopen $461D_h$
P6-30 PATHPOS15	Target Position of Data Set 15 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $73C_h$ CANopen $461E_h$
P6-31 PATHCTRL15	Configuration of Data Set 15 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $73E_h$ CANopen $461F_h$
P6-32 PATHPOS16	Target Position of Data Set 16 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 740_h CANopen 4620_h
P6-33 PATHCTRL16	Configuration of Data Set 16 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 742_h CANopen 4621_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P6-34 PATHPOS17	Target Position of Data Set 17 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 744h CANopen 4622h
P6-35 PATHCTRL17	Configuration of Data Set 17 Applicable operating mode: PS See P6-03 for details.	- 0h 0h 90h Hexadecimal	u16 RW per.	Modbus 746h CANopen 4623h
P6-36 PATHPOS18	Target Position of Data Set 18 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 748h CANopen 4624h
P6-37 PATHCTRL18	Configuration of Data Set 18 Applicable operating mode: PS See P6-03 for details.	- 0h 0h 90h Hexadecimal	u16 RW per.	Modbus 74Ah CANopen 4625h
P6-38 PATHPOS19	Target Position of Data Set 19 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 74Ch CANopen 4626h
P6-39 PATHCTRL19	Configuration of Data Set 19 Applicable operating mode: PS See P6-03 for details.	- 0h 0h 90h Hexadecimal	u16 RW per.	Modbus 74Eh CANopen 4627h
P6-40 PATHPOS20	Target Position of Data Set 20 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 750h CANopen 4628h
P6-41 PATHCTRL20	Configuration of Data Set 20 Applicable operating mode: PS See P6-03 for details.	- 0h 0h 90h Hexadecimal	u16 RW per.	Modbus 752h CANopen 4629h
P6-42 PATHPOS21	Target Position of Data Set 21 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 754h CANopen 462Ah
P6-43 PATHCTRL21	Configuration of Data Set 21 Applicable operating mode: PS See P6-03 for details.	- 0h 0h 90h Hexadecimal	u16 RW per.	Modbus 756h CANopen 462Bh
P6-44 PATHPOS22	Target Position of Data Set 22 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 758h CANopen 462Ch

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P6-45 PATHCTRL22	Configuration of Data Set 22 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $75A_h$ CANopen $462D_h$
P6-46 PATHPOS23	Target Position of Data Set 23 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $75C_h$ CANopen $462E_h$
P6-47 PATHCTRL23	Configuration of Data Set 23 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $75E_h$ CANopen $462F_h$
P6-48 PATHPOS24	Target Position of Data Set 24 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 760_h CANopen 4630_h
P6-49 PATHCTRL24	Configuration of Data Set 24 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 762_h CANopen 4631_h
P6-50 PATHPOS25	Target Position of Data Set 25 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 764_h CANopen 4632_h
P6-51 PATHCTRL25	Configuration of Data Set 25 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 766_h CANopen 4633_h
P6-52 PATHPOS26	Target Position of Data Set 26 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 768_h CANopen 4634_h
P6-53 PATHCTRL26	Configuration of Data Set 26 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $76A_h$ CANopen 4635_h
P6-54 PATHPOS27	Target Position of Data Set 27 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $76C_h$ CANopen 4636_h
P6-55 PATHCTRL27	Configuration of Data Set 27 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $76E_h$ CANopen 4637_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P6-56 PATHPOS28	Target Position of Data Set 28 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 770_h CANopen 4638_h
P6-57 PATHCTRL28	Configuration of Data Set 28 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 772_h CANopen 4639_h
P6-58 PATHPOS29	Target Position of Data Set 29 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 774_h CANopen $463A_h$
P6-59 PATHCTRL29	Configuration of Data Set 29 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 776_h CANopen $463B_h$
P6-60 PATHPOS30	Target Position of Data Set 30 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 778_h CANopen $463C_h$
P6-61 PATHCTRL30	Configuration of Data Set 30 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $77A_h$ CANopen $463D_h$
P6-62 PATHPOS31	Target Position of Data Set 31 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $77C_h$ CANopen $463E_h$
P6-63 PATHCTRL31	Configuration of Data Set 31 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus $77E_h$ CANopen $463F_h$
P6-64 PATHPOS32	Target Position of Data Set 32 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 780_h CANopen 4640_h
P6-65 PATHCTRL32	Configuration of Data Set 32 Applicable operating mode: PS See P6-03 for details.	- 0_h 0_h 90_h Hexadecimal	u16 RW per.	Modbus 782_h CANopen 4641_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P7-00 HOME_ACC_DEC	Deceleration and Acceleration of Homing Data Set Applicable operating mode: PS Bits 0 ... 15: Deceleration Bits 16 ... 31: Acceleration	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 800_h CANopen 4700_h
P7-01 HOME_DLY	Waiting Time of Homing Data Set Applicable operating mode: PS Bits 0 ... 15: Waiting time until next dataset is started Bits 16 ... 31: Reserved	ms 0 0 32767 Decimal	u32 RW per.	Modbus 802_h CANopen 4701_h
P7-02 ACC_DEC1	Deceleration and Acceleration of Data Set 1 Applicable operating mode: PS Bits 0 ... 15: Deceleration Bits 16 ... 31: Acceleration	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 804_h CANopen 4702_h
P7-03 SPD_DLY1	Waiting Time and Target Velocity of Data Set 1 Applicable operating mode: PS Bits 0 ... 15: Waiting time until next dataset is started (in ms) Bits 16 ... 31: Target velocity (in min^{-1})	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 806_h CANopen 4703_h
P7-04 ACC_DEC2	Deceleration and Acceleration of Data Set 2 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 808_h CANopen 4704_h
P7-05 SPD_DLY2	Waiting Time and Target Velocity of Data Set 2 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus $80A_h$ CANopen 4705_h
P7-06 ACC_DEC3	Deceleration and Acceleration of Data Set 3 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus $80C_h$ CANopen 4706_h
P7-07 SPD_DLY3	Waiting Time and Target Velocity of Data Set 3 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus $80E_h$ CANopen 4707_h
P7-08 ACC_DEC4	Deceleration and Acceleration of Data Set 4 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 810_h CANopen 4708_h
P7-09 SPD_DLY4	Waiting Time and Target Velocity of Data Set 4 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 812_h CANopen 4709_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P7-10 ACC_DEC5	Deceleration and Acceleration of Data Set 5 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 814h CANopen 470Ah
P7-11 SPD_DLY5	Waiting Time and Target Velocity of Data Set 5 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 816h CANopen 470Bh
P7-12 ACC_DEC6	Deceleration and Acceleration of Data Set 6 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 818h CANopen 470Ch
P7-13 SPD_DLY6	Waiting Time and Target Velocity of Data Set 6 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 81Ah CANopen 470Dh
P7-14 ACC_DEC7	Deceleration and Acceleration of Data Set 7 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 81Ch CANopen 470Eh
P7-15 SPD_DLY7	Waiting Time and Target Velocity of Data Set 7 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 81Eh CANopen 470Fh
P7-16 ACC_DEC8	Deceleration and Acceleration of Data Set 8 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 820h CANopen 4710h
P7-17 SPD_DLY8	Waiting Time and Target Velocity of Data Set 8 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 822h CANopen 4711h
P7-18 ACC_DEC9	Deceleration and Acceleration of Data Set 9 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 824h CANopen 4712h
P7-19 SPD_DLY9	Waiting Time and Target Velocity of Data Set 9 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 826h CANopen 4713h
P7-20 ACC_DEC10	Deceleration and Acceleration of Data Set 10 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 828h CANopen 4714h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P7-21 SPD_DLY10	Waiting Time and Target Velocity of Data Set 10 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus $82A_h$ CANopen 4715_h
P7-22 ACC_DEC11	Deceleration and Acceleration of Data Set 11 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus $82C_h$ CANopen 4716_h
P7-23 SPD_DLY11	Waiting Time and Target Velocity of Data Set 11 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus $82E_h$ CANopen 4717_h
P7-24 ACC_DEC12	Deceleration and Acceleration of Data Set 12 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 830_h CANopen 4718_h
P7-25 SPD_DLY12	Waiting Time and Target Velocity of Data Set 12 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 832_h CANopen 4719_h
P7-26 ACC_DEC13	Deceleration and Acceleration of Data Set 13 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 834_h CANopen $471A_h$
P7-27 SPD_DLY13	Waiting Time and Target Velocity of Data Set 13 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 836_h CANopen $471B_h$
P7-28 ACC_DEC14	Deceleration and Acceleration of Data Set 14 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 838_h CANopen $471C_h$
P7-29 SPD_DLY14	Waiting Time and Target Velocity of Data Set 14 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus $83A_h$ CANopen $471D_h$
P7-30 ACC_DEC15	Deceleration and Acceleration of Data Set 15 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus $83C_h$ CANopen $471E_h$
P7-31 SPD_DLY15	Waiting Time and Target Velocity of Data Set 15 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus $83E_h$ CANopen $471F_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P7-32 ACC_DEC16	Deceleration and Acceleration of Data Set 16 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 840h CANopen 4720h
P7-33 SPD_DLY16	Waiting Time and Target Velocity of Data Set 16 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 842h CANopen 4721h
P7-34 ACC_DEC17	Deceleration and Acceleration of Data Set 17 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 844h CANopen 4722h
P7-35 SPD_DLY17	Waiting Time and Target Velocity of Data Set 17 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 846h CANopen 4723h
P7-36 ACC_DEC18	Deceleration and Acceleration of Data Set 18 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 848h CANopen 4724h
P7-37 SPD_DLY18	Waiting Time and Target Velocity of Data Set 18 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 84Ah CANopen 4725h
P7-38 ACC_DEC19	Deceleration and Acceleration of Data Set 19 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 84Ch CANopen 4726h
P7-39 SPD_DLY19	Waiting Time and Target Velocity of Data Set 19 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 84Eh CANopen 4727h
P7-40 ACC_DEC20	Deceleration and Acceleration of Data Set 20 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 850h CANopen 4728h
P7-41 SPD_DLY20	Waiting Time and Target Velocity of Data Set 20 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 852h CANopen 4729h
P7-42 ACC_DEC21	Deceleration and Acceleration of Data Set 21 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 854h CANopen 472Ah

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P7-43 SPD_DLY21	Waiting Time and Target Velocity of Data Set 21 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 856_h CANopen $472B_h$
P7-44 ACC_DEC22	Deceleration and Acceleration of Data Set 22 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 858_h CANopen $472C_h$
P7-45 SPD_DLY22	Waiting Time and Target Velocity of Data Set 22 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus $85A_h$ CANopen $472D_h$
P7-46 ACC_DEC23	Deceleration and Acceleration of Data Set 23 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus $85C_h$ CANopen $472E_h$
P7-47 SPD_DLY23	Waiting Time and Target Velocity of Data Set 23 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus $85E_h$ CANopen $472F_h$
P7-48 ACC_DEC24	Deceleration and Acceleration of Data Set 24 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 860_h CANopen 4730_h
P7-49 SPD_DLY24	Waiting Time and Target Velocity of Data Set 24 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 862_h CANopen 4731_h
P7-50 ACC_DEC25	Deceleration and Acceleration of Data Set 25 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 864_h CANopen 4732_h
P7-51 SPD_DLY25	Waiting Time and Target Velocity of Data Set 25 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 866_h CANopen 4733_h
P7-52 ACC_DEC26	Deceleration and Acceleration of Data Set 26 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 868_h CANopen 4734_h
P7-53 SPD_DLY26	Waiting Time and Target Velocity of Data Set 26 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus $86A_h$ CANopen 4735_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P7-54 ACC_DEC27	Deceleration and Acceleration of Data Set 27 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 86Ch CANopen 4736h
P7-55 SPD_DLY27	Waiting Time and Target Velocity of Data Set 27 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 86Eh CANopen 4737h
P7-56 ACC_DEC28	Deceleration and Acceleration of Data Set 28 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 870h CANopen 4738h
P7-57 SPD_DLY28	Waiting Time and Target Velocity of Data Set 28 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 872h CANopen 4739h
P7-58 ACC_DEC29	Deceleration and Acceleration of Data Set 29 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 874h CANopen 473Ah
P7-59 SPD_DLY29	Waiting Time and Target Velocity of Data Set 29 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 876h CANopen 473Bh
P7-60 ACC_DEC30	Deceleration and Acceleration of Data Set 30 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 878h CANopen 473Ch
P7-61 SPD_DLY30	Waiting Time and Target Velocity of Data Set 30 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 87Ah CANopen 473Dh
P7-62 ACC_DEC31	Deceleration and Acceleration of Data Set 31 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 87Ch CANopen 473Eh
P7-63 SPD_DLY31	Waiting Time and Target Velocity of Data Set 31 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 87Eh CANopen 473Fh
P7-64 ACC_DEC32	Deceleration and Acceleration of Data Set 32 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 880h CANopen 4740h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P7-65 SPD_DLY32	Waiting Time and Target Velocity of Data Set 32 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 882_h CANopen 4741_h
P8-00 KNLD	Derivative Gain Applicable operating mode: PT, PS, V This parameter is used to adjust the derivative gain. See chapter *"6.5.3.3 Manual tuning"*.	0.1Hz 0 800 20000 Decimal	u32 RW per.	Modbus 900_h CANopen 4800_h
P8-01 KNLI	Integral Gain Applicable operating mode: PT, PS, V This parameter is used to adjust the integral gain. See chapter *"6.5.3.3 Manual tuning"*.	0.1Hz 0 100 2000 Decimal	u32 RW per.	Modbus 902_h CANopen 4801_h
P8-02 KNLIV	Derivative-Integral Gain Applicable operating mode: PT, PS, V This parameter is used to adjust the derivative-integral gain. See chapter *"6.5.3.3 Manual tuning"*.	0.1Hz 0 400 4000 Decimal	u32 RW per.	Modbus 904_h CANopen 4802_h
P8-03 KNLP	Proportional Gain Applicable operating mode: PT, PS, V This parameter is used to adjust the proportional gain. See chapter *"6.5.3.3 Manual tuning"*.	0.1Hz 0 300 4000 Decimal	u32 RW per.	Modbus 906_h CANopen 4803_h
P8-04 KNLUSERGAIN	Global Gain Applicable operating mode: PT, PS, V	0.001 100 500 3000 Decimal	u32 RW per.	Modbus 908_h CANopen 4804_h
P8-05 NLAFFLPFHZ	HD Spring Filter Applicable operating mode: PT, PS, V This parameter is used to set a low-pass filter for the acceleration profile during tuning. See chapter *"6.5.3.3 Manual tuning"*.	Hz 10 7000 7000 Decimal	u16 RW per.	Modbus $90A_h$ CANopen 4805_h
P8-06 NLANTIVIBGAIN	Anti-Vibration Gain Applicable operating mode: PT, PS, V	Rad*10-3/N 0 0 10000 Decimal	u32 RW per.	Modbus $90C_h$ CANopen 4806_h
P8-07 NLANTIVIBGAIN2	Pe filter Applicable operating mode: PT, PS, V	0.001 0 0 99000 Decimal	u32 RW per.	Modbus $90E_h$ CANopen 4807_h
P8-08 NLANTIVIBHZ	Anti-Vibration Filter Applicable operating mode: PT, PS, V	0.1Hz 50 4000 4000 Decimal	u32 RW per.	Modbus 910_h CANopen 4808_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P8-09 NLANTIVIBHZ2	Pe filter Applicable operating mode: PT, PS, V	0.1Hz 50 4000 4000 Decimal	u32 RW per.	Modbus 912h CANopen 4809h
P8-10 NLANTIVIBLMJR	Ratio of Load Inertia to Motor Inertia for Anti-Vibration Applicable operating mode: PT, PS, V	0.1 0 0 6000 Decimal	u32 RW per.	Modbus 914h CANopen 480Ah
P8-11 NLANTIVIBN	NL Anti Resonance Filter Divider Applicable operating mode: PT, PS, V	0.01 1 200 10000 Decimal	u32 RW per.	Modbus 916h CANopen 480Bh
P8-12 NLANTIVIBSHARP	Anti-Resonance Sharpness Applicable operating mode: PT, PS, V	0.001 10 500 10000 Decimal	u16 RW per.	Modbus 918h CANopen 480Ch
P8-13 NLANTIVIB-SHARP2	Pe Sharpness Applicable operating mode: PT, PS, V	0.001 10 500 10000 Decimal	u16 RW per.	Modbus 91Ah CANopen 480Dh
P8-14 NLFILTDAMPING	Current Filter Damping Applicable operating mode: PT, PS, V	% 0 0 100 Decimal	u16 RW per.	Modbus 91Ch CANopen 480Eh
P8-15 NLFILTT1	Current Filter Low Pass Filter Rise Time Applicable operating mode: PT, PS, V	0.01ms 0 300 3000 Decimal	u16 RW per.	Modbus 91Eh CANopen 480Fh
P8-16 NLNOTCH2BW	Current Filter - Second Notch Filter Band-width Applicable operating mode: PT, PS, V	Hz 0 0 500 Decimal	u16 RW per.	Modbus 920h CANopen 4810h
P8-17 NLNOTCH2CEN-TER	Current Filter - Second Notch Filter Center Applicable operating mode: PT, PS, V	Hz 100 100 10000 Decimal	u16 RW per.	Modbus 922h CANopen 4811h
P8-18 NLNOTCHBW	Current Filter - Notch Filter Bandwidth Applicable operating mode: PT, PS, V	Hz 0 0 500 Decimal	u16 RW per.	Modbus 924h CANopen 4812h
P8-19 NLNOTCHCENTER	Current Filter - Notch Filter Center Applicable operating mode: PT, PS, V	Hz 100 100 10000 Decimal	u16 RW per.	Modbus 926h CANopen 4813h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P8-20 NLPEAFF	Elasticity Compensation Applicable operating mode: PT, PS, V	0.1Hz 0 50000 50000 Decimal	u32 RW per.	Modbus 928h CANopen 4814h
P8-21 NLPEDFFRATIO	Spring Deceleration Ratio Applicable operating mode: PT, PS, V	0.001 0 1000 2000 Decimal	u16 RW per.	Modbus 92Ah CANopen 4815h
P8-22 NLVELLIM	Analog NCT standstill Applicable operating mode: PT, PS, V	mV -3815 0 3815 Decimal	s16 RW per.	Modbus 92Ch CANopen 4816h
P8-24 ANIN2LPFHZ	Analog Input 2 - Filter Applicable operating mode: PT, PS, V, T This parameter specifies the cut-off frequency for the first order low-pass filter of analog input 2.	Hz 10 1000 10000 Decimal	u16 RW per.	Modbus 930h CANopen 4818h
P8-25 GEARFILTAFF	Electronic Gear Filter - Acceleration Feedforward Applicable operating mode: PT This parameter specifies the acceleration feed-forward for the electronic gear filter. Setting can only be changed if power stage is disabled.	0.001 -2000 0 2000 Decimal	s16 RW per.	Modbus 932h CANopen 4819h
P8-26 GEARFILTMODE	Electronic Gear Filter - Activation Applicable operating mode: PT This parameter activates/deactivates the electronic gear filter. Value 0: Deactivate electronic gear filter Value 1: Activate electronic gear filter Setting can only be changed if power stage is disabled.	- 0 0 1 Decimal	u16 RW per.	Modbus 934h CANopen 481Ah
P8-27 GEARFILTT1	Electronic Gear Filter - Depth Applicable operating mode: PT	0.01ms 75 200 10000 Decimal	u32 RW per.	Modbus 936h CANopen 481Bh
P8-28 GEARFILTT2	Electronic Gear Filter - Velocity and Acceleration Depth Applicable operating mode: PT	0.01ms 0 400 6000 Decimal	u16 RW per.	Modbus 938h CANopen 481Ch
P8-29 GEARFILTVELFF	Electronic Gear Filter - Velocity Feedforward Applicable operating mode: PT This parameter specifies the velocity feed-forward for the electronic gear filter. Setting can only be changed if power stage is disabled.	0.01ms -20000 0 20000 Decimal	s32 RW per.	Modbus 93Ah CANopen 481Dh

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P8-30 GEARINMODE	Interpolation of Input Signal for Electronic Gear - Activation Applicable operating mode: PT This parameter allows for interpolation of the input signal for electronic gear and increases the resolution by a factor of 16. Value 0: Deactivate interpolation of input signal for electronic gear Value 1: Activate interpolation of input signal for electronic gear Setting can only be changed if power stage is disabled.	- 0 1 1 Decimal	u16 RW per.	Modbus $93C_h$ CANopen $481E_h$
P8-31 GEARING_MODE	Method for Operating Mode Pulse Train (PT) Applicable operating mode: PT Value 0: Synchronization deactivated Value 1: Position synchronization without compensation movement Value 2: Position synchronization with compensation movement Value 3: Velocity synchronization The parameters for acceleration (P1-34), deceleration (P1-35) and velocity (P1-55) act as limitations for the sychonization.	- 0 1 3 Decimal	u16 RW per.	Modbus $93E_h$ CANopen $481F_h$
P8-32 MOVESMOOTHAVG	S-Curve Setting Applicable operating mode: PT, PS Setting can only be changed if power stage is disabled.	0.01ms 25 1500 25600 Decimal	u32 RW per.	Modbus 940_h CANopen 4820_h
P8-33 MOVESMOOTHLPFHZ	Low Pass Filter Setting Applicable operating mode: PT, PS	Hz 1 5000 5000 Decimal	u16 RW per.	Modbus 942_h CANopen 4821_h
P8-34 MOVESMOOTHMODE	Smoothing Filter for Operating modes PT and PS - Type Applicable operating mode: PT, PS Value 0: No smoothing Value 1: LPF smoothing Value 2: S-curve smoothing Setting can only be changed if power stage is disabled.	- 0 2 2 Decimal	u16 RW per.	Modbus 944_h CANopen 4822_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P8-35 VELCONTROL-MODE	Type of Velocity Control Applicable operating mode: V This parameter specifies the type of velocity control. Value 5: Velocity control with integral gain (P8-01, P8-02) Value 6: Velocity control without integral gain Value 7: Velocity control with P8-00 = P8-01, P8-02 = 0, P8-03 = 0 Setting can only be changed if power stage is disabled.	- 5 7 7 Decimal	u16 RW per.	Modbus 946_h CANopen 4823_h
P8-36 NLANTIVIBGAIN3	Pe filter 3 Applicable operating mode: PT, PS, V	0.001 0 0 1000000 Decimal	u32 RW per.	Modbus 948_h CANopen 4824_h
P8-37 NLANTIVIBHZ3	Pe filter 3 Applicable operating mode: PT, PS, V	0.1Hz 50 4000 4000 Decimal	u32 RW per.	Modbus $94A_h$ CANopen 4825_h
P8-38 NLANTIVIBQ3	Pe filter 3 Applicable operating mode: PT, PS, V	0.001 0 1000 1000000 Decimal	u32 RW per.	Modbus $94C_h$ CANopen 4826_h
P8-39 IGRAV	Gravity Compensation Applicable operating mode: PT, PS, V, T	0.01A - 0 - Decimal	s16 RW per.	Modbus $94E_h$ CANopen 4827_h
P8-40 KNLAFRC	HD AFF Applicable operating mode: PT, PS, V	- 0 0 200 Decimal	u16 RW per.	Modbus 950_h CANopen 4828_h
P8-41 NLANTIVIB-SHARP3	Pe Sharpness Applicable operating mode: PT, PS, V	- 10 200 10000 Decimal	u16 RW per.	Modbus 952_h CANopen 4829_h
P8-99 KNLUSERVCMDG-AIN	Adaptive Velocity Reference Value Gain Applicable operating mode: PT, PS	0.001 0 1000 3000 Decimal	u32 RW per.	Modbus $9C6_h$ CANopen 4863_h
P9-00 PRGNR	Lexium program number Applicable operating mode: PT, PS, V, T Reads the program number	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RO -	Modbus $A00_h$ CANopen 4900_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P9-01 DATE	Firmware Version Date Applicable operating mode: PT, PS, V, T This parameter contains the date of the firmware version.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RO -	Modbus $A02_h$ CANopen 4901_h
P9-06 UNAME1	User-Defined Application Name 1 Applicable operating mode: PT, PS, V, T This parameter is provided for a user-defined application name.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW per.	Modbus $A0C_h$ CANopen 4906_h
P9-07 UNAME2	User-Defined Application Name 2 Applicable operating mode: PT, PS, V, T This parameter is provided for a user-defined application name.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW per.	Modbus $A0E_h$ CANopen 4907_h
P9-08 UNAME3	User-Defined Application Name 3 Applicable operating mode: PT, PS, V, T This parameter is provided for a user-defined application name.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW per.	Modbus $A10_h$ CANopen 4908_h
P9-09 UNAME4	User-Defined Application Name 4 Applicable operating mode: PT, PS, V, T This parameter is provided for a user-defined application name.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW per.	Modbus $A12_h$ CANopen 4909_h
P9-10 MBWORD	Modbus Word Order Applicable operating mode: PT, PS, V, T This parameter sets the word order for Modbus. Value 0: Order of the bytes: 0 1 2 3 Value 1: Order of the bytes: 2 3 0 1	- 0 0 1 Decimal	u16 RW per.	Modbus $A14_h$ CANopen $490A_h$
P9-11 SERNUM1	Serial Number Part 1 Applicable operating mode: PT, PS, V, T	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RO -	Modbus $A16_h$ CANopen $490B_h$
P9-12 SERNUM2	Serial Number Part 2 Applicable operating mode: PT, PS, V, T	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RO -	Modbus $A18_h$ CANopen $490C_h$
P9-13 SERNUM3	Serial Number Part 3 Applicable operating mode: PT, PS, V, T	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RO -	Modbus $A1A_h$ CANopen $490D_h$
P9-14 SERNUM4	Serial Number Part 4 Applicable operating mode: PT, PS, V, T	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RO -	Modbus $A1C_h$ CANopen $490E_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P9-15 LTN	Autotuning Method Applicable operating mode: PT, PS, V, T	- 0 0 6 Decimal	u16 RW -	Modbus $A1E_h$ CANopen $490F_h$
P9-16 LTNREFERENCE	Autotuning Motion Profile - Type Applicable operating mode: PT, PS, V	- 0 0 2 Decimal	u16 RW -	Modbus $A20_h$ CANopen 4910_h
P9-17 LTNAVMODE	Anti-vibration tuning mode. Applicable operating mode: PT, PS, V	- 0 2 6 Decimal	u16 RW -	Modbus $A22_h$ CANopen 4911_h
P9-18 LTNSAVEMODE	Autotuning Results - Save/Discard Applicable operating mode: PT, PS, V	- 0 0 3 Decimal	u16 RW -	Modbus $A24_h$ CANopen 4912_h
P9-19 LTNNLPEAFF	Autotuning - Elasticity Compensation Filters Applicable operating mode: PT, PS, V	- 0 1 1 Decimal	s16 RW -	Modbus $A26_h$ CANopen 4913_h
P9-20 LTNCYCLE	Autotuning - Direction of Movement Applicable operating mode: PT, PS, V This parameter sets the direction of movement for autotuning. Value 0: Both directions of movement Value 2: One direction of movement	- 0 0 3 Decimal	s16 RW -	Modbus $A28_h$ CANopen 4914_h
P9-21 LTNDWELLTIME	Minimum Dwell Time for Detection of Movement Cycle Applicable operating mode: PT, PS, V	- 100 200 1000 Decimal	u16 RW -	Modbus $A2A_h$ CANopen 4915_h
P9-22 LTNLMJR	Autotuning - Automatic Estimation of Ratio of Load Inertia and Motor Inertia Applicable operating mode: PT, PS, V	- 0 0 1 Decimal	u16 RW -	Modbus $A2C_h$ CANopen 4916_h
P9-23 LTNSTIFF	Defines which values will be used for the position command filters. Applicable operating mode: PT, PS, V Value 0: Automatic smoothing via S-curve optimization of the value Value 1: Manual smoothing	- 0 0 1 Decimal	u16 RW -	Modbus $A2E_h$ CANopen 4917_h
P9-24 LTNNLFILT	Torque filter tuning mode. Applicable operating mode: PT, PS, V	- 0 0 2 Decimal	s16 RW -	Modbus $A30_h$ CANopen 4918_h

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P9-25 LTNREFEN	Autotuning Motion Profile - Activation Applicable operating mode: PT, PS, V	- 0 0 1 Decimal	u16 RW -	Modbus $A32_h$ CANopen 4919_h
P9-26 PTPOS	Autotuning - Movement Range in Direction 1 Applicable operating mode: PS This parameter specifies the movement range for autotuning in direction of movement 1. The sign of the value determines the direction of movement: Positive value: Positive direction of movement as set via parameter P1-01 Negative value: Negative direction of movement as set via parameter P1-01 See parameter P9-20 to select one direction of movement or both directions of movement for Comfort Tuning.	PUU -2147483647 0 2147483647 Decimal	s32 RW -	Modbus $A34_h$ CANopen $491A_h$
P9-27 PTNEG	Autotuning - Movement Range in Direction 2 Applicable operating mode: PS This parameter specifies the movement range for autotuning in direction of movement 2. The sign of the value determines the direction of movement: Positive value: Positive direction of movement as set via parameter P1-01 Negative value: Negative direction of movement as set via parameter P1-01 See parameter P9-20 for Comfort Tuning in a single or in both directions of movement. See parameter P9-20 to select one direction of movement or both directions of movement for Comfort Tuning.	PUU -2147483647 0 2147483647 Decimal	s32 RW -	Modbus $A36_h$ CANopen $491B_h$
P9-28 LTNACTIVE	Autotuning Active Applicable operating mode: PT, PS, V This parameter indicates whether autotuning is active. Value 0: Autotuning inactive Value 1: Autotuning active	- 0 - 1 Decimal	s16 RO -	Modbus $A38_h$ CANopen $491C_h$
P9-29 LTNVCRUISE	Autotuning - Velocity Applicable operating mode: PT, PS, V Bits 0 ... 15: Velocity for positive direction of movement Bits 16 ... 31: Velocity for negative direction of movement	0.1rpm|0.1rpm - - - Decimal	u32 RW -	Modbus $A3A_h$ CANopen $491D_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
P9-30 LTNST	Autotuning - Status Applicable operating mode: PT, PS, V Value 0: Inactive Value 1: Active Value 2: Successfully completed Values 3 ... 9: Reserved Value 10: Impossible to set P9-15 Value 11: Impossible to set P9-16 Value 12: Impossible to set P9-17 Value 13: Impossible to set P9-18 Value 14: Impossible to set P9-19 Value 15: Impossible to set P9-21 Value 16: Impossible to set P9-22 Value 17: Impossible to set P9-23 Value 18: Impossible to set P9-24 Value 19: Impossible to set P9-25 Value 20: Impossible to set P9-32 Value 21: Impossible to enable the power stage Value 22: Hold is active Value 23: Unknown motor Value 24: Cancelled - message 24 Value 25: Cancelled - message 25 Value 26: Cancelled - message 26 Value 27: Impossible to activate autotuning Value 28: Autotuning did not run successfully Value 29: Cancelled - message 29 Value 30: Low Effort Value 31: AVG Zero Init Value Value 32: Cost factor error detected Value 33: Pos tune user gain modified Value 34: Motor Was Not Recognized Value 35: KNLP Step Updated Value 36: Movement too small Value 37: KNLIV verify Value 38: ICMD Sat Value 39: Insufficient velocity (less than 10 % of nominal velocity) Value 40: Insufficient acceleration/deceleration (less than 33 % of nominal acc/dec) Value 41: Excessive acceleration/deceleration (more than 90 % of nominal acc/dec) Value 42: Need gravity compensation Value 43: Cancelled - message 43 Value 44: Cancelled - message 44 Value 45: Cancelled - message 45 Value 46: Cancelled - message 46 Value 47: Cancelled - message 47 Value 48: Cancelled - message 48 Value 49: Cancelled - message 49 Value 50: P9-15 set to 0 Value 51: Power stage disabled during autotuning Value 52: Current saturation Value 53: Reserved Value 54: Insufficient excitation for autotuning (poor motion profile: short distance, low acceleration/deceleration, etc) Value 55: Insufficient tuning effort	- 0 - 65535 Decimal	u32 RO -	Modbus A3C$_h$ CANopen 491E$_h$

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Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via field-bus
	Value 56: Halt during autotuning Value 57: Unknown motor Value 58: Motion profile exceeds limits Value 59: Invalid gains during autotuning Value 60: Insufficient movement Value 61: Cancelled - message 61 Value 62: Cancelled - message 62 Value 63: Cancelled - message 63 Value 64: Cancelled - message 64 Value 65: Cancelled - message 65 Value 66: Cancelled - message 66 Value 67: Cancelled - message 67 Value 68: Cancelled - message 68 Value 69: Cancelled - message 69			
`P9-31` PTACCDEC	Autotuning - Acceleration and Deceleration Applicable operating mode: PT, PS, V Bits 0 ... 15: Acceleration for Autotuning Bits 16 ... 31: Deceleration for Autotuning	ms|ms 6| 6 6000| 6000 65500| 65500 Decimal	u32 RW -	Modbus $A3E_h$ CANopen $491F_h$
`P9-32` LTNADVMODE	Autotune advance mode. Applicable operating mode: PT, PS, V	- 0 0 2 Decimal	u16 RW -	Modbus $A40_h$ CANopen 4920_h
`P9-33` LTNEFFORTMAX	Maximum Autotuning Optimization Value Applicable operating mode: PT, PS, V Setting can only be changed if power stage is disabled.	0.001 0 - 1000 Decimal	u32 RO -	Modbus $A42_h$ CANopen 4921_h
`P9-34` LTNBAR	Autotuning Progress Bar Applicable operating mode: PT, PS, V	- 0 0 100 Decimal	u16 RO -	Modbus $A44_h$ CANopen 4922_h
`P9-35` LTNIGRAV	Autotuning - Gravity Estimation Applicable operating mode: PT, PS, V	- 0 0 1 Decimal	u16 RW -	Modbus $A46_h$ CANopen 4923_h
`P9-36` LTNNLAFRC	Set KNLAFRC in Autotune Applicable operating mode: PT, PS, V	- 0 0 1 Decimal	s16 RW -	Modbus $A48_h$ CANopen 4924_h
`P9-37` LTNWARNING	Autotuning - Last Stored Event Applicable operating mode: PT, PS, V	- 0 0 65535 Decimal	u32 RO -	Modbus $A4A_h$ CANopen 4925_h

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11 Object dictionary

11.1 Specifications for the objects

Index The index specifies the position of the object in the object dictionary. The index value is specified as a hexadecimal value.

Object code The object code specifies the data structure of the object.

Object code	Meaning	Coding
VAR	A simple value, for example of the type Integer8, Unsigned32 or Visible String8.	7
ARR (ARRAY)	A data field in which the entries have the same data type.	8
REC (RECORD)	A data field that contains entries that are a combination of simple data types.	9

Data type	Value range	Data length	DS301 coding
Boolean	0 = false, 1 = true	1 byte	0001
Integer8	-128 ... +127	1 byte	0002
Integer16	-32768 ... +32767	2 byte	0003
Integer32	-2147483648 ... 2147483647	4 byte	0004
Unsigned8	0 ... 255	1 byte	0005
Unsigned16	0 ... 65535	2 byte	0006
Unsigned32	0 ... 4294967295	4 byte	0007
Visible String8	ASCII characters	8 byte	0009
Visible String16	ASCII characters	16 byte	0010

RO/RW Indicates read and/or write values
RO: values can only be read
RW: values can be read and written.

PDO R_PDO: Mapping for R_PDO possible
T_PDO: Mapping for T_PDO possible
No specification: PDO mapping not possible with the object

Minimum value The minimum value which can be entered.

Factory settings Settings when the product is shipped.

Maximum value The maximum value which can be entered.

Persistent "per." indicates whether the value of the parameter is persistent, i.e. whether it remains in the memory after the device is powered off .

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11.2 Overview of object group 1000_h

Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
1000_h	Device Type	VAR UINT32 ro	No	- 4325778 -
1001_h	Error Register	VAR UINT8 ro	No	- - -
1002_h	Manufacturer Status Register	VAR UINT32 ro	No	- - -
1003_h	Pre-defined Error Field	ARRAY - -	No	- - -
$1003{:}0_h$	Number of Errors	VAR UINT8 rw	No	- 0 -
$1003{:}1_h$	Standard Error Field	VAR UINT32 ro	No	- - -
$1003{:}2_h$	Standard Error Field	VAR UINT32 ro	No	- - -
$1003{:}3_h$	Standard Error Field	VAR UINT32 ro	No	- - -
$1003{:}4_h$	Standard Error Field	VAR UINT32 ro	No	- - -
$1003{:}5_h$	Standard Error Field	VAR UINT32 ro	No	- - -
$1003{:}6_h$	Standard Error Field	VAR UINT32 ro	No	- - -
$1003{:}7_h$	Standard Error Field	VAR UINT32 ro	No	- - -
$1003{:}8_h$	Standard Error Field	VAR UINT32 ro	No	- - -
$1003{:}9_h$	Standard Error Field	VAR UINT32 ro	No	- - -
$1003{:}A_h$	Standard Error Field	VAR UINT32 ro	No	- - -
1005_h	COB-ID SYNC	VAR UINT32 rw	No	- 128 -
1006_h	Communication Cycle Period	VAR UINT32 rw	No	- 0 -

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Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
1007$_h$	Synchronous Window Length	VAR UINT32 rw	No	- 0 -
1008$_h$	Manufacturer Device Name	VAR VISIBLE_STRING const	No	- - -
1009$_h$	Manufacturer Hardware Version	VAR VISIBLE_STRING const	No	- - -
100A$_h$	Manufacturer Software Version	VAR VISIBLE_STRING const	No	- - -
100C$_h$	Guard Time	VAR UINT16 rw	No	- 0 -
100D$_h$	Life Time Factor	VAR UINT8 rw	No	- 0 -
1010$_h$	Store Parameter Field	ARRAY - -	No	- - -
1010:0$_h$	Number of Entries	VAR UINT8 ro	No	- 3 -
1010:1$_h$	Save all Parameters	VAR UINT32 rw	No	- - -
1010:2$_h$	Save Communication Parameters	VAR UINT32 rw	No	- - -
1010:3$_h$	Save Application Parameters	VAR UINT32 rw	No	- - -
1011$_h$	Restore Default Parameters	ARRAY - -	No	- - -
1011:0$_h$	Number of Entries	VAR UINT8 ro	No	- 3 -
1011:1$_h$	Restore all Default Parameters	VAR UINT32 rw	No	- - -
1011:2$_h$	Restore Communication Default Parameters	VAR UINT32 rw	No	- - -
1011:3$_h$	Restore Application Default Parameters	VAR UINT32 rw	No	- - -
1014$_h$	COB-ID EMCY	VAR UINT32 rw	No	- $NODEID+0x80 -
1015$_h$	Inhibit Time Emergency	VAR UINT16 rw	No	- 0 -

Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
1016_h	Heartbeat Consumer Entries	ARRAY - -	No	- - -
$1016:0_h$	Number of Entries	VAR UINT8 ro	No	- 3 -
$1016:1_h$	Consumer Heartbeat Time 1	VAR UINT32 rw	No	0 0 8388607
$1016:2_h$	Consumer Heartbeat Time 2	VAR UINT32 rw	No	0 0 8388607
$1016:3_h$	Consumer Heartbeat Time 3	VAR UINT32 rw	No	0 0 8388607
1017_h	Producer Heartbeat Time	VAR UINT16 rw	No	- 0 -
1018_h	Identity Object	RECORD - -	No	- - -
$1018:0_h$	number of entries	VAR UINT8 ro	No	1 4 4
$1018:1_h$	Vendor Id	VAR UINT32 ro	No	- 134217818 -
$1018:2_h$	Product Code	VAR UINT32 ro	No	- 614416 -
$1018:3_h$	Revision number	VAR UINT32 ro	No	- - -
$1018:4_h$	Serial number	VAR UINT32 ro	No	- - -
1019_h	Synchronous counter overflow value	VAR UINT8 rw	No	- 0 -
1029_h	Error Behaviour	ARRAY - -	No	- - -
$1029:0_h$	Number of Entries	VAR UINT8 ro	No	1 1 254
$1029:1_h$	Communication Error	VAR UINT8 rw	No	0 0 -
1200_h	Server SDO Parameter 1	RECORD - -	No	- - -
$1200:0_h$	Number of Entries	VAR UINT8 ro	No	2 2 2

Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
1200:1h	COB-ID Client -> Server	VAR UINT32 ro	No	$NODEID+0x600 $NODEID+0x600 $NODEID +0xBFFFFFFF
1200:2h	COB-ID Server -> Client	VAR UINT32 ro	No	$NODEID+0x580 $NODEID+0x580 $NODEID +0xBFFFFFFF
1201h	Server SDO Parameter 2	RECORD - -	No	- - -
1201:0h	Number of Entries	VAR UINT8 ro	No	2 3 3
1201:1h	COB-ID Client -> Server	VAR UINT32 rw	No	- - 4294967295
1201:2h	COB-ID Server -> Client	VAR UINT32 rw	No	- - 4294967295
1201:3h	Node ID of the SDO Client	VAR UINT8 rw	No	- - 127
1400h	Receive PDO Communication Parameter 1	RECORD - -	No	- - -
1400:0h	Number of Entries	VAR UINT8 ro	No	2 3 5
1400:1h	COB-ID	VAR UINT32 rw	No	- $NODEID+0x200 $NODEID +0xFFFFFFFF
1400:2h	Transmission Type	VAR UINT8 rw	No	0 255 255
1400:3h	Inhibit Time	VAR UINT16 rw	No	0 0 65535
1401h	Receive PDO Communication Parameter 2	RECORD - -	No	- - -
1401:0h	Number of Entries	VAR UINT8 ro	No	2 3 5
1401:1h	COB-ID	VAR UINT32 rw	No	- $NODEID +0x80000300 $NODEID +0xFFFFFFFF
1401:2h	Transmission Type	VAR UINT8 rw	No	0 255 255

Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
1401:3h	Inhibit Time	VAR UINT16 rw	No	0 0 65535
1402h	Receive PDO Communication Parameter 3	RECORD - -	No	- - -
1402:0h	Number of Entries	VAR UINT8 ro	No	2 3 5
1402:1h	COB-ID	VAR UINT32 rw	No	- $NODEID +0x80000400 $NODEID +0xFFFFFFFF
1402:2h	Transmission Type	VAR UINT8 rw	No	0 255 255
1402:3h	Inhibit Time	VAR UINT16 rw	No	0 0 65535
1403h	Receive PDO Communication Parameter 4	RECORD - -	No	- - -
1403:0h	Number of Entries	VAR UINT8 ro	No	2 3 5
1403:1h	COB-ID	VAR UINT32 rw	No	- $NODEID +0x80000500 $NODEID +0xFFFFFFFF
1403:2h	Transmission Type	VAR UINT8 rw	No	0 255 255
1403:3h	Inhibit Time	VAR UINT16 rw	No	0 0 65535
1600h	Receive PDO Mapping Parameter 1	RECORD - -	No	- - -
1600:0h	Number of Entries	VAR UINT8 rw	No	0 1 64
1600:1h	Mapping Entry 1	VAR UINT32 rw	No	0 1614807056 4294967295
1600:2h	Mapping Entry 2	VAR UINT32 rw	No	0 0 4294967295
1600:3h	Mapping Entry 3	VAR UINT32 rw	No	0 0 4294967295

Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
1600:4h	Mapping Entry 4	VAR UINT32 rw	No	0 0 4294967295
1601h	Receive PDO Mapping Parameter 2	RECORD - -	No	- - -
1601:0h	Number of Entries	VAR UINT8 rw	No	0 2 64
1601:1h	Mapping Entry 1	VAR UINT32 rw	No	0 1614807056 4294967295
1601:2h	Mapping Entry 2	VAR UINT32 rw	No	0 1618608160 4294967295
1601:3h	Mapping Entry 3	VAR UINT32 rw	No	0 0 4294967295
1601:4h	Mapping Entry 4	VAR UINT32 rw	No	0 0 4294967295
1602h	Receive PDO Mapping Parameter 3	RECORD - -	No	- - -
1602:0h	Number of Entries	VAR UINT8 rw	No	0 2 64
1602:1h	Mapping Entry 1	VAR UINT32 rw	No	0 1614807056 4294967295
1602:2h	Mapping Entry 2	VAR UINT32 rw	No	0 1627324448 4294967295
1602:3h	Mapping Entry 3	VAR UINT32 rw	No	0 0 4294967295
1602:4h	Mapping Entry 4	VAR UINT32 rw	No	0 0 4294967295
1603h	Receive PDO Mapping Parameter 4	RECORD - -	No	- - -
1603:0h	Number of Entries	VAR UINT8 rw	No	0 0 64
1603:1h	Mapping Entry 1	VAR UINT32 rw	No	0 0 4294967295
1603:2h	Mapping Entry 2	VAR UINT32 rw	No	0 0 4294967295
1603:3h	Mapping Entry 3	VAR UINT32 rw	No	0 0 4294967295

Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
$1603:4_h$	Mapping Entry 4	VAR UINT32 rw	No	0 0 4294967295
1800_h	Transmit PDO Communication Parameter 1	RECORD - -	No	- - -
$1800:0_h$	Number of Entries	VAR UINT8 ro	No	2 5 6
$1800:1_h$	COB-ID	VAR UINT32 rw	No	- $NODEID +0x40000180 $NODEID +0xFFFFFFFF
$1800:2_h$	Transmission Type	VAR UINT8 rw	No	0 255 255
$1800:3_h$	Inhibit Time	VAR UINT16 rw	No	0 0 65535
$1800:4_h$	Compatibility Entry	VAR UINT8 rw	No	0 0 255
$1800:5_h$	Event Timer	VAR UINT16 rw	No	0 0 65535
1801_h	Transmit PDO Communication Parameter 2	RECORD - -	No	- - -
$1801:0_h$	Number of Entries	VAR UINT8 ro	No	2 5 6
$1801:1_h$	COB-ID	VAR UINT32 rw	No	- $NODEID +0xC0000280 $NODEID +0xFFFFFFFF
$1801:2_h$	Transmission Type	VAR UINT8 rw	No	0 255 255
$1801:3_h$	Inhibit Time	VAR UINT16 rw	No	0 0 65535
$1801:4_h$	Compatibility Entry	VAR UINT8 rw	No	0 0 255
$1801:5_h$	Event Timer	VAR UINT16 rw	No	0 100 65535
1802_h	Transmit PDO Communication Parameter 3	RECORD - -	No	- - -

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Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
1802:0$_h$	Number of Entries	VAR UINT8 ro	No	2 5 6
1802:1$_h$	COB-ID	VAR UINT32 rw	No	- $NODEID +0xC0000380 $NODEID +0xFFFFFFFF
1802:2$_h$	Transmission Type	VAR UINT8 rw	No	0 255 255
1802:3$_h$	Inhibit Time	VAR UINT16 rw	No	0 0 65535
1802:4$_h$	Compatibility Entry	VAR UINT8 rw	No	0 0 255
1802:5$_h$	Event Timer	VAR UINT16 rw	No	0 100 65535
1803$_h$	Transmit PDO Communication Parameter 4	RECORD - -	No	- - -
1803:0$_h$	Number of Entries	VAR UINT8 ro	No	2 5 6
1803:1$_h$	COB-ID	VAR UINT32 rw	No	- $NODEID +0xC0000480 $NODEID +0xFFFFFFFF
1803:2$_h$	Transmission Type	VAR UINT8 rw	No	0 254 255
1803:3$_h$	Inhibit Time	VAR UINT16 rw	No	0 0 65535
1803:4$_h$	Compatibility Entry	VAR UINT8 rw	No	0 0 255
1803:5$_h$	Event Timer	VAR UINT16 rw	No	0 0 65535
1A00$_h$	Transmit PDO Mapping Parameter 1	RECORD - -	No	- - -
1A00:0$_h$	Number of Entries	VAR UINT8 rw	No	0 1 255
1A00:1$_h$	Mapping Entry 1	VAR UINT32 rw	No	0 1614872592 4294967295

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Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
1A00:2h	Mapping Entry 2	VAR UINT32 rw	No	0 0 4294967295
1A00:3h	Mapping Entry 3	VAR UINT32 rw	No	0 0 4294967295
1A00:4h	Mapping Entry 4	VAR UINT32 rw	No	0 0 4294967295
1A01h	Transmit PDO Mapping Parameter 2	RECORD - -	No	- - -
1A01:0h	Number of Entries	VAR UINT8 rw	No	0 2 255
1A01:1h	Mapping Entry 1	VAR UINT32 rw	No	0 1614872592 4294967295
1A01:2h	Mapping Entry 2	VAR UINT32 rw	No	0 1617166368 4294967295
1A01:3h	Mapping Entry 3	VAR UINT32 rw	No	0 0 4294967295
1A01:4h	Mapping Entry 4	VAR UINT32 rw	No	0 0 4294967295
1A02h	Transmit PDO Mapping Parameter 3	RECORD - -	No	- - -
1A02:0h	Number of Entries	VAR UINT8 rw	No	0 2 255
1A02:1h	Mapping Entry 1	VAR UINT32 rw	No	0 1614872592 4294967295
1A02:2h	Mapping Entry 2	VAR UINT32 rw	No	0 1617690656 4294967295
1A02:3h	Mapping Entry 3	VAR UINT32 rw	No	0 0 4294967295
1A02:4h	Mapping Entry 4	VAR UINT32 rw	No	0 0 4294967295
1A03h	Transmit PDO Mapping Parameter 4	RECORD - -	No	- - -
1A03:0h	Number of Entries	VAR UINT8 rw	No	0 0 255
1A03:1h	Mapping Entry 1	VAR UINT32 rw	No	0 0 4294967295

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Index	**Name**	**Object type** **Data type** **Access**	**PDO mapping object**	**Minimum value** **Factory settings** **Maximum value**
$1A03:2_h$	Mapping Entry 2	VAR UINT32 rw	No	0 0 4294967295
$1A03:3_h$	Mapping Entry 3	VAR UINT32 rw	No	0 0 4294967295
$1A03:4_h$	Mapping Entry 4	VAR UINT32 rw	No	0 0 4294967295

11.3 Overview of the vendor-specific object group 4000_h

Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
4000_h	Firmware Version	P0-00	VAR UINT16 ro	No	0 - 65535
4001_h	Error code of detected error	P0-01	VAR UINT16 rw	No	0 - 65535
4002_h	Drive Status Displayed by HMI	P0-02	VAR UINT16 rw	No	0 0 123
4003_h	Function of Analog Outputs	P0-03	VAR UINT16 rw	No	0 0 119
4008_h	Operating Hour Meter in Seconds	P0-08	VAR UINT32 ro	No	0 - 4294967295
4009_h	Status Value 1	P0-09	VAR INT32 ro	No	-2147483647 - 2147483647
$400A_h$	Status Value 2	P0-10	VAR INT32 ro	No	-2147483647 - 2147483647
$400B_h$	Status Value 3	P0-11	VAR INT32 ro	No	-2147483647 - 2147483647
$400C_h$	Status Value 4	P0-12	VAR INT32 ro	No	-2147483647 - 2147483647
$400D_h$	Status Value 5	P0-13	VAR INT32 ro	No	-2147483647 - 2147483647
4011_h	Indicate status value 1	P0-17	VAR UINT16 rw	No	0 0 123
4012_h	Indicate status value 2	P0-18	VAR UINT16 rw	No	0 0 123
4013_h	Indicate status value 3	P0-19	VAR UINT16 rw	No	0 0 123
4014_h	Indicate status value 4	P0-20	VAR UINT16 rw	No	0 0 123
4015_h	Indicate status value 5	P0-21	VAR UINT16 rw	No	0 0 123
4019_h	Parameter Mapping 1	P0-25	VAR UINT32 rw	No	0 - 4294967295
$401A_h$	Parameter Mapping 2	P0-26	VAR UINT32 rw	No	0 - 4294967295

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Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
401B$_h$	Parameter Mapping 3	P0-27	VAR UINT32 rw	No	0 - 4294967295
401C$_h$	Parameter Mapping 4	P0-28	VAR UINT32 rw	No	0 - 4294967295
401D$_h$	Parameter Mapping 5	P0-29	VAR UINT32 rw	No	0 - 4294967295
401E$_h$	Parameter Mapping 6	P0-30	VAR UINT32 rw	No	0 - 4294967295
401F$_h$	Parameter Mapping 7	P0-31	VAR UINT32 rw	No	0 - 4294967295
4020$_h$	Parameter Mapping 8	P0-32	VAR UINT32 rw	No	0 - 4294967295
4023$_h$	Block Data Read/Write P0-35…P0-42 1	P0-35	VAR UINT32 rw	No	0 0 4294967295
4024$_h$	Block Data Read/Write P0-35…P0-42 2	P0-36	VAR UINT32 rw	No	0 0 4294967295
4025$_h$	Block Data Read/Write P0-35…P0-42 3	P0-37	VAR UINT32 rw	No	0 0 4294967295
4026$_h$	Block Data Read/Write P0-35…P0-42 4	P0-38	VAR UINT32 rw	No	0 0 4294967295
4027$_h$	Block Data Read/Write P0-35…P0-42 5	P0-39	VAR UINT32 rw	No	0 0 4294967295
4028$_h$	Block Data Read/Write P0-35…P0-42 6	P0-40	VAR UINT32 rw	No	0 0 4294967295
4029$_h$	Block Data Read/Write P0-35…P0-42 7	P0-41	VAR UINT32 rw	No	0 0 4294967295
402A$_h$	Block Data Read/Write P0-35…P0-42 8	P0-42	VAR UINT32 rw	No	0 0 4294967295
402E$_h$	State of Digital Outputs	P0-46	VAR UINT16 ro	No	0 - 65535
402F$_h$	Number of Last Alert	P0-47	VAR UINT16 ro	No	0 - 65535
4100$_h$	Reference Value Signal - Pulse Settings	P1-00	VAR UINT16 rw	No	0 2 4402
4101$_h$	Operating Mode and Direction of Rotation	P1-01	VAR UINT16 rw	No	0 11 4363

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Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
4102_h	Velocity and Torque Limitations Activation/Deactivation	P1-02	VAR UINT16 rw	No	0 0 17
4103_h	Polarity of Analog Outputs / Polarity of Pulse Outputs	P1-03	VAR UINT16 rw	No	0 0 19
4104_h	Scaling Factor Analog Output 1	P1-04	VAR UINT16 rw	No	1 100 100
4105_h	Scaling Factor Analog Output 2	P1-05	VAR UINT16 rw	No	1 100 100
4109_h	Target Velocity/Velocity Limitation 1	P1-09	VAR INT32 rw	No	-60000 10000 60000
$410A_h$	Target Velocity/Velocity Limitation 2	P1-10	VAR INT32 rw	No	-60000 20000 60000
$410B_h$	Target Velocity/Velocity Limitation 3	P1-11	VAR INT32 rw	No	-60000 30000 60000
$410C_h$	Target Torque/Torque Limitation 1	P1-12	VAR INT16 rw	No	-300 100 300
$410D_h$	Target Torque/Torque Limitation 2	P1-13	VAR INT16 rw	No	-300 100 300
$410E_h$	Target Torque/Torque Limitation 3	P1-14	VAR INT16 rw	No	-300 100 300
$410F_h$	Mains Phase Monitoring - Response to Missing Mains Phase	P1-15	VAR UINT16 rw	No	0 0 2
4110_h	Mains Phase Monitoring - Fault Reset	P1-16	VAR UINT16 rw	No	0 0 1
4111_h	Mains Phase Monitoring - Type	P1-17	VAR UINT16 rw	No	0 0 2
4112_h	Reserved	P1-18	VAR UINT16 rw	No	0 3 5
4113_h	Active Disable - Delay Time Power Stage	P1-19	VAR UINT16 rw	No	0 0 6500
4114_h	Current Limit During Quick Stop	P1-20	VAR INT16 rw	No	1 1000 1000
4115_h	Status of Foldback Current Drive	P1-21	VAR UINT16 ro	No	0 - 1
4116_h	Foldback Current Limit - Drive	P1-22	VAR UINT32 ro	No	0 - 30000

Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
4117_h	Current Monitoring Drive - Detected Error Threshold Foldback Current	P1-23	VAR UINT32 rw	No	0 - 30000
4118_h	Current Monitoring Drive - Alert Threshold Foldback Current	P1-24	VAR UINT32 rw	No	0 - 30000
4119_h	Current for Dynamic Braking	P1-25	VAR UINT32 rw	No	- - -
$411A_h$	Foldback Current Limit - Motor	P1-26	VAR UINT32 ro	No	0 - 30000
$411B_h$	Motor Current Monitoring - Detected Error Threshold Foldback Current	P1-27	VAR UINT32 rw	No	0 - 30000
$411C_h$	Motor Current Monitoring - Alert Threshold Foldback Current	P1-28	VAR UINT32 rw	No	0 - 30000
$411D_h$	DC Bus Overvoltage Monitoring - Threshold	P1-29	VAR UINT16 ro	No	- - -
$411E_h$	Commutation Monitoring - Maximum Counter Value	P1-30	VAR UINT16 rw	No	0 0 0
4120_h	Stop Method	P1-32	VAR UINT16 rw	No	0 0 32
4122_h	Acceleration Period	P1-34	VAR UINT16 rw	No	6 30 65500
4123_h	Deceleration Period	P1-35	VAR UINT16 rw	No	6 30 65500
4125_h	Ratio of Load Inertia to Motor Inertia	P1-37	VAR UINT32 rw	No	0 10 20000
4126_h	Signal Output Function ZSPD / Signal Input Function ZCLAMP - Velocity	P1-38	VAR INT32 rw	No	0 100 2000
4127_h	Signal Output Function TSPD - Velocity	P1-39	VAR UINT32 rw	No	0 3000 5000
4128_h	Velocity Target Value and Velocity Limitation 10 V	P1-40	VAR INT32 rw	No	0 - 10001
4129_h	Torque Target Value and Torque Limitation 10 V	P1-41	VAR UINT16 rw	No	0 100 1000
$412A_h$	ON Delay Time of Holding Brake	P1-42	VAR UINT16 rw	No	0 0 1000
$412C_h$	Electronic Gear Ratio - Numerator 1	P1-44	VAR UINT32 rw	No	1 128 536870911

Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
$412D_h$	Electronic Gear Ratio - Denominator	P1-45	VAR UINT32 rw	No	1 10 2147483647
$412E_h$	Encoder Simulation Resolution	P1-46	VAR INT32 rw	No	- 2048 -
$412F_h$	Signal Output Function SP_OK - Velocity	P1-47	VAR UINT32 rw	No	0 10 300
4130_h	Signal Output Function MC_OK - Settings	P1-48	VAR UINT16 rw	No	0 0 33
4134_h	Braking Resistor - Resistance	P1-52	VAR INT16 rw	No	-1 - 32767
4135_h	Braking Resistor - Power	P1-53	VAR INT16 rw	No	-1 - 32767
4136_h	Signal Output Function TPOS - Trigger Value	P1-54	VAR UINT32 rw	No	0 12800 1280000
4137_h	Maximum Velocity - User-Defined	P1-55	VAR UINT32 rw	No	10 - 6000
4139_h	Torque Monitoring - Torque Value	P1-57	VAR UINT16 rw	No	0 0 300
$413A_h$	Torque Monitoring - Time Value	P1-58	VAR UINT16 rw	No	1 1 1000
$413B_h$	S Curve Filter for Operating Mode Velocity	P1-59	VAR UINT32 rw	No	0 0 255875
$413C_h$	Commutation Monitoring - Time Threshold	P1-60	VAR UINT16 rw	No	0 0 3000
$413D_h$	Commutation Monitoring - Velocity Threshold	P1-61	VAR UINT32 rw	No	0 600 60000
$413E_h$	Motor Overtemperature Monitoring - Response	P1-62	VAR UINT16 rw	No	0 0 5
$413F_h$	Motor Overtemperature Monitoring - Delay Time	P1-63	VAR UINT16 rw	No	0 30 300
4140_h	Undervoltage Monitoring - Response	P1-64	VAR UINT16 rw	No	0 0 3
4141_h	Reserved	P1-65	VAR UINT16 rw	No	0 0 1
4142_h	Status of Foldback Current Motor	P1-66	VAR UINT16 ro	No	0 - 1

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Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
4143h	Undervoltage Monitoring - Delay Time	P1-67	VAR UINT16 rw	No	0 30 300
4144h	Active Disable - Deceleration Ramp	P1-68	VAR UINT16 rw	No	6 200 65500
4145h	Disable - Deceleration Time	P1-69	VAR UINT16 rw	No	0 0 6500
4146h	Signal Input Function HALT - Maximum Current	P1-70	VAR UINT32 rw	No	- 0 -
4147h	Braking Resistor - Maximum Time in Braking	P1-71	VAR UINT16 rw	No	10 40 100
4148h	Braking Resistor Overload Monitoring - Response	P1-72	VAR UINT16 rw	No	0 0 1
414Eh	User-Defined Maximum Current	P1-78	VAR UINT32 rw	No	- - -
414Fh	Maximum Current	P1-79	VAR UINT32 ro	No	- - -
4150h	Maximum Peak Current	P1-80	VAR UINT32 ro	No	- - -
4151h	Nominal Current	P1-81	VAR UINT32 ro	No	- - -
4152h	Velocity limitation for CANopen operating mode Profile Torque	P1-82	VAR UINT16 rw	No	0 0 3
4153h	Change of operating mode during movement	P1-83	VAR UINT16 rw	No	0 0 1
4154h	Configured motor type	P1-84	VAR UINT32 ro	No	- - -
4201h	Gain Switching - Rate for Position Loop	P2-01	VAR UINT16 rw	No	10 100 500
4205h	Gain Switching - Rate for Velocity Loop	P2-05	VAR UINT16 rw	No	10 100 500
4208h	Factory Reset / Save Parameters / Activation of Forcing of Outputs	P2-08	VAR UINT16 rw	No	0 0 406
4209h	Debounce Time - Inputs	P2-09	VAR UINT16 rw	No	0 2 20
420Ah	Signal Input Function for DI1	P2-10	VAR UINT16 rw	No	0 256 326

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$420B_h$	Signal Input Function for DI2	P2-11	VAR UINT16 rw	No	0 256 326
$420C_h$	Signal Input Function for DI3	P2-12	VAR UINT16 rw	No	0 256 326
$420D_h$	Signal Input Function for DI4	P2-13	VAR UINT16 rw	No	0 256 326
$420E_h$	Signal Input Function for DI5	P2-14	VAR UINT16 rw	No	0 36 326
$420F_h$	Signal Input Function for DI6	P2-15	VAR UINT16 rw	No	0 34 326
4210_h	Signal Input Function for DI7	P2-16	VAR UINT16 rw	No	0 35 326
4211_h	Signal Input Function for DI8	P2-17	VAR UINT16 rw	No	0 33 326
4212_h	Signal Output Function for DO1	P2-18	VAR UINT16 rw	No	0 257 319
4213_h	Signal Output Function for DO2	P2-19	VAR UINT16 rw	No	0 256 319
4214_h	Signal Output Function for DO3	P2-20	VAR UINT16 rw	No	0 256 319
4215_h	Signal Output Function for DO4	P2-21	VAR UINT16 rw	No	0 256 319
4216_h	Signal Output Function for DO5	P2-22	VAR UINT16 rw	No	0 7 319
4217_h	Signal Output Function for DO6(OCZ)	P2-23	VAR UINT16 rw	No	0 64 319
4218_h	Debounce Time - Fast Inputs	P2-24	VAR UINT16 rw	No	0 50 100
$421B_h$	Gain Switching - Conditions and Type	P2-27	VAR UINT16 rw	No	0 0 24
$421D_h$	Gain Switching - Comparison Value	P2-29	VAR UINT32 rw	No	0 1280000 3840000
$421E_h$	Auxiliary Functions	P2-30	VAR INT16 rw	No	-8 0 8
$421F_h$	Autotuning Optimization Value Threshold	P2-31	VAR UINT32 rw	No	0 1000 10000

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Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
4220_h	Autotuning	P2-32	VAR UINT16 rw	No	0 0 56
4222_h	Velocity Monitoring - Threshold Value	P2-34	VAR UINT32 rw	No	0 50000 60000
4223_h	Position Deviation Monitoring - Threshold Value	P2-35	VAR UINT32 rw	No	1 100000 128000000
4224_h	PTI Interface Debounce Time - Pulse	P2-36	VAR UINT16 ro	No	0 30 511
4225_h	PTI Interface Debounce Time - Direction	P2-37	VAR UINT16 ro	No	0 30 511
4232_h	Signal Input Function CLRPOS - Trigger	P2-50	VAR UINT16 rw	No	0 0 1
$423C_h$	Electronic Gear Ratio - Numerator 2	P2-60	VAR UINT32 rw	No	1 128 536870911
$423D_h$	Electronic Gear Ratio - Numerator 3	P2-61	VAR UINT32 rw	No	1 128 536870911
$423E_h$	Electronic Gear Ratio - Numerator 4	P2-62	VAR UINT32 rw	No	1 128 536870911
4241_h	Special Function 1	P2-65	VAR UINT16 rw	No	0 512 15936
4242_h	Special Function 2	P2-66	VAR UINT16 rw	No	0 0 4
4244_h	Auto-Enable and Automatic Hardware Limit Switch Fault Reset	P2-68	VAR UINT16 rw	No	0 0 273
4300_h	Device Address Modbus	P3-00	VAR UINT16 rw	No	1 127 247
4301_h	Transmission Rate for CANopen and Modbus	P3-01	VAR UINT16 rw	No	0 258 1029
4302_h	Modbus Connection Settings	P3-02	VAR UINT16 rw	No	6 7 9
4303_h	Detected Modbus Communication Errors - Handling	P3-03	VAR UINT16 rw	No	0 0 1
4304_h	Modbus Connection Monitoring	P3-04	VAR UINT16 rw	No	0 0 20000
4305_h	Device Address CANopen	P3-05	VAR UINT16 rw	No	0 0 127

Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
4306_h	Digital Inputs - Forcing Settings	P3-06	VAR UINT16 rw	No	0 0 2047
4307_h	Modbus Response Delay Time	P3-07	VAR UINT16 rw	No	0 0 1000
4309_h	CANopen Master/Slave Synchronization	P3-09	VAR UINT16 rw	No	4097 20565 40959
$430A_h$	Drive Profile Lexium - Activation	P3-10	VAR UINT16 rw	No	0 0 1
$430B_h$	Drive Profile Lexium - State of Digital Inputs	P3-11	VAR UINT16 ro	Yes	0 - 65535
$430C_h$	Drive Profile Lexium - Control Word	P3-12	VAR UINT16 rww	Yes	0 0 65535
$430D_h$	Drive Profile Lexium - RefA 16 Bit Parameter	P3-13	VAR INT16 rww	Yes	-32768 0 32767
$430E_h$	Drive Profile Lexium - RefB 32 Bit Parameter	P3-14	VAR INT32 rww	Yes	-2147483648 0 2147483647
$430F_h$	Drive Profile Lexium - Drive Status	P3-15	VAR UINT16 ro	Yes	0 - 65535
4310_h	Drive Profile Lexium - Operating Mode Status	P3-16	VAR UINT16 ro	Yes	0 - 65535
4311_h	Drive Profile Lexium - Motion Status	P3-17	VAR UINT16 ro	Yes	0 - 65535
4312_h	PDO Event Mask 1	P3-18	VAR UINT16 rw	No	0 1 15
4313_h	PDO Event Mask 2	P3-19	VAR UINT16 rw	No	0 1 15
4314_h	PDO Event Mask 3	P3-20	VAR UINT16 rw	No	0 1 15
4315_h	PDO Event Mask 4	P3-21	VAR UINT16 rw	No	0 15 15
$431E_h$	Internal Limit for Bit 11 DriveCom Status Word 6041	P3-30	VAR UINT16 rw	No	0 0 11
$431F_h$	Settings for NMT operating state Quick Stop	P3-31	VAR UINT16 rw	No	6 6 7
4320_h	Automatic operating state transition from Switch On Disabled to Ready To Switch On	P3-32	VAR UINT16 rw	No	0 0 1

Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
4328_h	Velocity Window	-	VAR UINT32 rw	No	0 2100000 4294967295
4329_h	Velocity Threshold	-	VAR UINT32 rw	No	0 2100000 4294967295
4400_h	Error History - Number of Most Recent Detected Error n	P4-00	VAR UINT16 rw	No	0 - 0
4401_h	Error History - Number of Most Recent Detected Error n - 1	P4-01	VAR UINT16 ro	No	0 - 0
4402_h	Error History - Number of Most Recent Detected Error n - 2	P4-02	VAR UINT16 ro	No	0 - 0
4403_h	Error History - Number of Most Recent Detected Error n - 3	P4-03	VAR UINT16 ro	No	0 - 0
4404_h	Error History - Number of Most Recent Detected Error n - 4	P4-04	VAR UINT16 ro	No	0 - 0
4405_h	Jog Velocity	P4-05	VAR UINT32 rw	No	0 20 5000
4406_h	Setting a signal output via parameter	P4-06	VAR UINT16 rw	No	0 0 255
4407_h	State of Digital Inputs / Activate Forcing	P4-07	VAR UINT16 rw	No	0 - 255
4408_h	Status of HMI Keypad	P4-08	VAR UINT16 ro	No	0 0 255
4409_h	State of Digital Outputs	P4-09	VAR UINT16 ro	No	0 - 63
$440A_h$	Clear Error History	P4-10	VAR UINT16 rw	No	0 0 0
4416_h	Analog Input 1 Offset	P4-22	VAR INT16 rw	No	-10000 0 10000
4417_h	Analog Input 2 Offset	P4-23	VAR INT16 rw	No	-10000 0 10000
4418_h	Undervoltage Monitoring - Threshold Value	P4-24	VAR UINT16 rw	No	140 160 190
4419_h	Safety Function STO - Status	P4-25	VAR UINT16 ro	No	0 - 1
$441A_h$	Digital Outputs - Forcing Information	P4-26	VAR UINT16 ro	No	0 - 31

Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
$441B_h$	Digital Outputs - Forcing Settings	P4-27	VAR UINT16 rw	No	0 0 31
$441C_h$	State of Digital Outputs / Activate Forcing	P4-28	VAR UINT16 rw	No	0 0 31
4450_h	Jog Speed Fast	-	VAR UINT32 rw	No	0 426674 4294967295
4451_h	Jog Time	-	VAR UINT32 rw	No	0 0 4294967295
4452_h	Jog Step	-	VAR UINT32 rw	No	0 0 2147483647
4453_h	Jog Method	-	VAR UINT16 rw	No	0 0 1
4454_h	Jog Speed Slow	-	VAR UINT32 rw	No	0 426674 4294967295
4500_h	Firmware Revision	P5-00	VAR UINT16 ro	No	0 - 65535
4504_h	Homing - Homing Method Selection	P5-04	VAR UINT16 rw	No	0 0 296
4505_h	Homing - Fast Velocity for Reference Movement	P5-05	VAR UINT32 rw	No	10 1000 60000
4506_h	Homing - Slow Velocity for Reference Movement	P5-06	VAR UINT32 rw	No	10 200 60000
4507_h	Operating Mode PS via Parameter	P5-07	VAR UINT16 rw	No	0 0 1000
4508_h	Positive Software Limit Switch - Position	P5-08	VAR INT32 rw	No	-2147483647 134217727 2147483647
4509_h	Negative Software Limit Switch - Position	P5-09	VAR INT32 rw	No	-2147483647 -134217727 2147483647
$450A_h$	Operating mode Pulse Train - Maximum Acceleration	P5-10	VAR UINT16 rw	No	6 6 65500
$450B_h$	Software Limit Switches - Hysteresis Value	P5-11	VAR UINT16 rw	No	0 3556 35555
$450C_h$	Touch Probe Input 1 - Stable Level Duration	P5-12	VAR UINT16 rw	No	2 5 32
$450D_h$	Software Limit Switches - Activation	P5-13	VAR UINT16 rw	No	0 0 1

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Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
$450E_h$	Motion Profile for Torque - Slope	P5-14	VAR UINT32 rw	No	1 100000 30000000
$450F_h$	Motion Profile for Torque - Activation	P5-15	VAR UINT16 rw	No	0 0 1
4510_h	Encoder Increments in PUU	P5-16	VAR INT32 rw	No	-2147483647 0 2147483647
4512_h	External Encoder (Pulses)	P5-18	VAR INT32 ro	No	-2147483648 - 2147483647
4514_h	Deceleration Ramp - Signal Input Function STOP	P5-20	VAR UINT16 rw	No	6 50 65500
4515_h	Deceleration Ramp - Detected Transmission Error	P5-21	VAR UINT16 rw	No	6 50 65500
4516_h	Deceleration Ramp - Position Overflow	P5-22	VAR UINT16 rw	No	6 30 65500
4517_h	Deceleration Ramp - Triggering of Negative Software Limit Switch	P5-23	VAR UINT16 rw	No	6 50 65500
4518_h	Deceleration Ramp - Triggering of Positive Software Limit Switch	P5-24	VAR UINT16 rw	No	6 50 65500
4519_h	Deceleration Ramp - Triggering of Negative Hardware Limit Switch	P5-25	VAR UINT16 rw	No	6 30 65500
$451A_h$	Deceleration Ramp - Triggering of Positive Hardware Limit Switch	P5-26	VAR UINT16 rw	No	6 30 65500
4525_h	Touch Probe Input 1 - Captured Position	P5-37	VAR INT32 ro	No	-2147483647 0 2147483647
4526_h	Touch Probe Input 1 - Event Counter	P5-38	VAR UINT16 ro	No	0 0 65535
4527_h	Touch Probe Input 1 - Configuration	P5-39	VAR UINT16 rw	No	0 0 257
4539_h	Touch Probe Input 2 - Captured Position	P5-57	VAR INT32 ro	No	-2147483647 0 2147483647
$453A_h$	Touch Probe Input 2 - Event Counter	P5-58	VAR UINT16 ro	No	0 0 65535
$453B_h$	Touch Probe Input 2 - Configuration	P5-59	VAR UINT16 rw	No	0 0 257
$454D_h$	Touch Probe Input 2 - Stable Level Duration	P5-77	VAR UINT16 rw	No	2 5 32

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4600_h	Position of Homing Data Set	P6-00	VAR INT32 rw	No	-2147483647 0 2147483647
4601_h	Subsequent Data Set and Auto-start of Homing Data Set	P6-01	VAR UINT32 rw	No	0 0 8193
4602_h	Target Position of Data Set 1	P6-02	VAR INT32 rw	No	-2147483647 0 2147483647
4603_h	Configuration of Data Set 1	P6-03	VAR UINT16 rw	No	0 0 144
4604_h	Target Position of Data Set 2	P6-04	VAR INT32 rw	No	-2147483647 0 2147483647
4605_h	Configuration of Data Set 2	P6-05	VAR UINT16 rw	No	0 0 144
4606_h	Target Position of Data Set 3	P6-06	VAR INT32 rw	No	-2147483647 0 2147483647
4607_h	Configuration of Data Set 3	P6-07	VAR UINT16 rw	No	0 0 144
4608_h	Target Position of Data Set 4	P6-08	VAR INT32 rw	No	-2147483647 0 2147483647
4609_h	Configuration of Data Set 4	P6-09	VAR UINT16 rw	No	0 0 144
$460A_h$	Target Position of Data Set 5	P6-10	VAR INT32 rw	No	-2147483647 0 2147483647
$460B_h$	Configuration of Data Set 5	P6-11	VAR UINT16 rw	No	0 0 144
$460C_h$	Target Position of Data Set 6	P6-12	VAR INT32 rw	No	-2147483647 0 2147483647
$460D_h$	Configuration of Data Set 6	P6-13	VAR UINT16 rw	No	0 0 144
$460E_h$	Target Position of Data Set 7	P6-14	VAR INT32 rw	No	-2147483647 0 2147483647
$460F_h$	Configuration of Data Set 7	P6-15	VAR UINT16 rw	No	0 0 144
4610_h	Target Position of Data Set 8	P6-16	VAR INT32 rw	No	-2147483647 0 2147483647
4611_h	Configuration of Data Set 8	P6-17	VAR UINT16 rw	No	0 0 144

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4612_h	Target Position of Data Set 9	P6-18	VAR INT32 rw	No	-2147483647 0 2147483647
4613_h	Configuration of Data Set 9	P6-19	VAR UINT16 rw	No	0 0 144
4614_h	Target Position of Data Set 10	P6-20	VAR INT32 rw	No	-2147483647 0 2147483647
4615_h	Configuration of Data Set 10	P6-21	VAR UINT16 rw	No	0 0 144
4616_h	Target Position of Data Set 11	P6-22	VAR INT32 rw	No	-2147483647 0 2147483647
4617_h	Configuration of Data Set 11	P6-23	VAR UINT16 rw	No	0 0 144
4618_h	Target Position of Data Set 12	P6-24	VAR INT32 rw	No	-2147483647 0 2147483647
4619_h	Configuration of Data Set 12	P6-25	VAR UINT16 rw	No	0 0 144
$461A_h$	Target Position of Data Set 13	P6-26	VAR INT32 rw	No	-2147483647 0 2147483647
$461B_h$	Configuration of Data Set 13	P6-27	VAR UINT16 rw	No	0 0 144
$461C_h$	Target Position of Data Set 14	P6-28	VAR INT32 rw	No	-2147483647 0 2147483647
$461D_h$	Configuration of Data Set 14	P6-29	VAR UINT16 rw	No	0 0 144
$461E_h$	Target Position of Data Set 15	P6-30	VAR INT32 rw	No	-2147483647 0 2147483647
$461F_h$	Configuration of Data Set 15	P6-31	VAR UINT16 rw	No	0 0 144
4620_h	Target Position of Data Set 16	P6-32	VAR INT32 rw	No	-2147483647 0 2147483647
4621_h	Configuration of Data Set 16	P6-33	VAR UINT16 rw	No	0 0 144
4622_h	Target Position of Data Set 17	P6-34	VAR INT32 rw	No	-2147483647 0 2147483647
4623_h	Configuration of Data Set 17	P6-35	VAR UINT16 rw	No	0 0 144

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Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
4624_h	Target Position of Data Set 18	P6-36	VAR INT32 rw	No	-2147483647 0 2147483647
4625_h	Configuration of Data Set 18	P6-37	VAR UINT16 rw	No	0 0 144
4626_h	Target Position of Data Set 19	P6-38	VAR INT32 rw	No	-2147483647 0 2147483647
4627_h	Configuration of Data Set 19	P6-39	VAR UINT16 rw	No	0 0 144
4628_h	Target Position of Data Set 20	P6-40	VAR INT32 rw	No	-2147483647 0 2147483647
4629_h	Configuration of Data Set 20	P6-41	VAR UINT16 rw	No	0 0 144
$462A_h$	Target Position of Data Set 21	P6-42	VAR INT32 rw	No	-2147483647 0 2147483647
$462B_h$	Configuration of Data Set 21	P6-43	VAR UINT16 rw	No	0 0 144
$462C_h$	Target Position of Data Set 22	P6-44	VAR INT32 rw	No	-2147483647 0 2147483647
$462D_h$	Configuration of Data Set 22	P6-45	VAR UINT16 rw	No	0 0 144
$462E_h$	Target Position of Data Set 23	P6-46	VAR INT32 rw	No	-2147483647 0 2147483647
$462F_h$	Configuration of Data Set 23	P6-47	VAR UINT16 rw	No	0 0 144
4630_h	Target Position of Data Set 24	P6-48	VAR INT32 rw	No	-2147483647 0 2147483647
4631_h	Configuration of Data Set 24	P6-49	VAR UINT16 rw	No	0 0 144
4632_h	Target Position of Data Set 25	P6-50	VAR INT32 rw	No	-2147483647 0 2147483647
4633_h	Configuration of Data Set 25	P6-51	VAR UINT16 rw	No	0 0 144
4634_h	Target Position of Data Set 26	P6-52	VAR INT32 rw	No	-2147483647 0 2147483647
4635_h	Configuration of Data Set 26	P6-53	VAR UINT16 rw	No	0 0 144

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4636h	Target Position of Data Set 27	P6-54	VAR INT32 rw	No	-2147483647 0 2147483647
4637h	Configuration of Data Set 27	P6-55	VAR UINT16 rw	No	0 0 144
4638h	Target Position of Data Set 28	P6-56	VAR INT32 rw	No	-2147483647 0 2147483647
4639h	Configuration of Data Set 28	P6-57	VAR UINT16 rw	No	0 0 144
463Ah	Target Position of Data Set 29	P6-58	VAR INT32 rw	No	-2147483647 0 2147483647
463Bh	Configuration of Data Set 29	P6-59	VAR UINT16 rw	No	0 0 144
463Ch	Target Position of Data Set 30	P6-60	VAR INT32 rw	No	-2147483647 0 2147483647
463Dh	Configuration of Data Set 30	P6-61	VAR UINT16 rw	No	0 0 144
463Eh	Target Position of Data Set 31	P6-62	VAR INT32 rw	No	-2147483647 0 2147483647
463Fh	Configuration of Data Set 31	P6-63	VAR UINT16 rw	No	0 0 144
4640h	Target Position of Data Set 32	P6-64	VAR INT32 rw	No	-2147483647 0 2147483647
4641h	Configuration of Data Set 32	P6-65	VAR UINT16 rw	No	0 0 144
4700h	Deceleration and Acceleration of Homing Data Set	P7-00	VAR UINT32 rw	No	393222 13107400 4292673500
4701h	Waiting Time of Homing Data Set	P7-01	VAR UINT32 rw	No	0 0 32767
4702h	Deceleration and Acceleration of Data Set 1	P7-02	VAR UINT32 rw	No	393222 13107400 4292673500
4703h	Waiting Time and Target Velocity of Data Set 1	P7-03	VAR UINT32 rw	No	0 13107200 3932192767
4704h	Deceleration and Acceleration of Data Set 2	P7-04	VAR UINT32 rw	No	393222 13107400 4292673500
4705h	Waiting Time and Target Velocity of Data Set 2	P7-05	VAR UINT32 rw	No	0 13107200 3932192767

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4706_h	Deceleration and Acceleration of Data Set 3	P7-06	VAR UINT32 rw	No	393222 13107400 4292673500
4707_h	Waiting Time and Target Velocity of Data Set 3	P7-07	VAR UINT32 rw	No	0 13107200 3932192767
4708_h	Deceleration and Acceleration of Data Set 4	P7-08	VAR UINT32 rw	No	393222 13107400 4292673500
4709_h	Waiting Time and Target Velocity of Data Set 4	P7-09	VAR UINT32 rw	No	0 13107200 3932192767
$470A_h$	Deceleration and Acceleration of Data Set 5	P7-10	VAR UINT32 rw	No	393222 13107400 4292673500
$470B_h$	Waiting Time and Target Velocity of Data Set 5	P7-11	VAR UINT32 rw	No	0 13107200 3932192767
$470C_h$	Deceleration and Acceleration of Data Set 6	P7-12	VAR UINT32 rw	No	393222 13107400 4292673500
$470D_h$	Waiting Time and Target Velocity of Data Set 6	P7-13	VAR UINT32 rw	No	0 13107200 3932192767
$470E_h$	Deceleration and Acceleration of Data Set 7	P7-14	VAR UINT32 rw	No	393222 13107400 4292673500
$470F_h$	Waiting Time and Target Velocity of Data Set 7	P7-15	VAR UINT32 rw	No	0 13107200 3932192767
4710_h	Deceleration and Acceleration of Data Set 8	P7-16	VAR UINT32 rw	No	393222 13107400 4292673500
4711_h	Waiting Time and Target Velocity of Data Set 8	P7-17	VAR UINT32 rw	No	0 13107200 3932192767
4712_h	Deceleration and Acceleration of Data Set 9	P7-18	VAR UINT32 rw	No	393222 13107400 4292673500
4713_h	Waiting Time and Target Velocity of Data Set 9	P7-19	VAR UINT32 rw	No	0 13107200 3932192767
4714_h	Deceleration and Acceleration of Data Set 10	P7-20	VAR UINT32 rw	No	393222 13107400 4292673500
4715_h	Waiting Time and Target Velocity of Data Set 10	P7-21	VAR UINT32 rw	No	0 13107200 3932192767
4716_h	Deceleration and Acceleration of Data Set 11	P7-22	VAR UINT32 rw	No	393222 13107400 4292673500
4717_h	Waiting Time and Target Velocity of Data Set 11	P7-23	VAR UINT32 rw	No	0 13107200 3932192767

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4718_h	Deceleration and Acceleration of Data Set 12	P7-24	VAR UINT32 rw	No	393222 13107400 4292673500
4719_h	Waiting Time and Target Velocity of Data Set 12	P7-25	VAR UINT32 rw	No	0 13107200 3932192767
$471A_h$	Deceleration and Acceleration of Data Set 13	P7-26	VAR UINT32 rw	No	393222 13107400 4292673500
$471B_h$	Waiting Time and Target Velocity of Data Set 13	P7-27	VAR UINT32 rw	No	0 13107200 3932192767
$471C_h$	Deceleration and Acceleration of Data Set 14	P7-28	VAR UINT32 rw	No	393222 13107400 4292673500
$471D_h$	Waiting Time and Target Velocity of Data Set 14	P7-29	VAR UINT32 rw	No	0 13107200 3932192767
$471E_h$	Deceleration and Acceleration of Data Set 15	P7-30	VAR UINT32 rw	No	393222 13107400 4292673500
$471F_h$	Waiting Time and Target Velocity of Data Set 15	P7-31	VAR UINT32 rw	No	0 13107200 3932192767
4720_h	Deceleration and Acceleration of Data Set 16	P7-32	VAR UINT32 rw	No	393222 13107400 4292673500
4721_h	Waiting Time and Target Velocity of Data Set 16	P7-33	VAR UINT32 rw	No	0 13107200 3932192767
4722_h	Deceleration and Acceleration of Data Set 17	P7-34	VAR UINT32 rw	No	393222 13107400 4292673500
4723_h	Waiting Time and Target Velocity of Data Set 17	P7-35	VAR UINT32 rw	No	0 13107200 3932192767
4724_h	Deceleration and Acceleration of Data Set 18	P7-36	VAR UINT32 rw	No	393222 13107400 4292673500
4725_h	Waiting Time and Target Velocity of Data Set 18	P7-37	VAR UINT32 rw	No	0 13107200 3932192767
4726_h	Deceleration and Acceleration of Data Set 19	P7-38	VAR UINT32 rw	No	393222 13107400 4292673500
4727_h	Waiting Time and Target Velocity of Data Set 19	P7-39	VAR UINT32 rw	No	0 13107200 3932192767
4728_h	Deceleration and Acceleration of Data Set 20	P7-40	VAR UINT32 rw	No	393222 13107400 4292673500
4729_h	Waiting Time and Target Velocity of Data Set 20	P7-41	VAR UINT32 rw	No	0 13107200 3932192767

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$472A_h$	Deceleration and Acceleration of Data Set 21	P7-42	VAR UINT32 rw	No	393222 13107400 4292673500
$472B_h$	Waiting Time and Target Velocity of Data Set 21	P7-43	VAR UINT32 rw	No	0 13107200 3932192767
$472C_h$	Deceleration and Acceleration of Data Set 22	P7-44	VAR UINT32 rw	No	393222 13107400 4292673500
$472D_h$	Waiting Time and Target Velocity of Data Set 22	P7-45	VAR UINT32 rw	No	0 13107200 3932192767
$472E_h$	Deceleration and Acceleration of Data Set 23	P7-46	VAR UINT32 rw	No	393222 13107400 4292673500
$472F_h$	Waiting Time and Target Velocity of Data Set 23	P7-47	VAR UINT32 rw	No	0 13107200 3932192767
4730_h	Deceleration and Acceleration of Data Set 24	P7-48	VAR UINT32 rw	No	393222 13107400 4292673500
4731_h	Waiting Time and Target Velocity of Data Set 24	P7-49	VAR UINT32 rw	No	0 13107200 3932192767
4732_h	Deceleration and Acceleration of Data Set 25	P7-50	VAR UINT32 rw	No	393222 13107400 4292673500
4733_h	Waiting Time and Target Velocity of Data Set 25	P7-51	VAR UINT32 rw	No	0 13107200 3932192767
4734_h	Deceleration and Acceleration of Data Set 26	P7-52	VAR UINT32 rw	No	393222 13107400 4292673500
4735_h	Waiting Time and Target Velocity of Data Set 26	P7-53	VAR UINT32 rw	No	0 13107200 3932192767
4736_h	Deceleration and Acceleration of Data Set 27	P7-54	VAR UINT32 rw	No	393222 13107400 4292673500
4737_h	Waiting Time and Target Velocity of Data Set 27	P7-55	VAR UINT32 rw	No	0 13107200 3932192767
4738_h	Deceleration and Acceleration of Data Set 28	P7-56	VAR UINT32 rw	No	393222 13107400 4292673500
4739_h	Waiting Time and Target Velocity of Data Set 28	P7-57	VAR UINT32 rw	No	0 13107200 3932192767
$473A_h$	Deceleration and Acceleration of Data Set 29	P7-58	VAR UINT32 rw	No	393222 13107400 4292673500
$473B_h$	Waiting Time and Target Velocity of Data Set 29	P7-59	VAR UINT32 rw	No	0 13107200 3932192767

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$473C_h$	Deceleration and Acceleration of Data Set 30	P7-60	VAR UINT32 rw	No	393222 13107400 4292673500
$473D_h$	Waiting Time and Target Velocity of Data Set 30	P7-61	VAR UINT32 rw	No	0 13107200 3932192767
$473E_h$	Deceleration and Acceleration of Data Set 31	P7-62	VAR UINT32 rw	No	393222 13107400 4292673500
$473F_h$	Waiting Time and Target Velocity of Data Set 31	P7-63	VAR UINT32 rw	No	0 13107200 3932192767
4740_h	Deceleration and Acceleration of Data Set 32	P7-64	VAR UINT32 rw	No	393222 13107400 4292673500
4741_h	Waiting Time and Target Velocity of Data Set 32	P7-65	VAR UINT32 rw	No	0 13107200 3932192767
4800_h	Derivative Gain	P8-00	VAR UINT32 rw	No	0 800 20000
4801_h	Integral Gain	P8-01	VAR UINT32 rw	No	0 100 2000
4802_h	Derivative-Integral Gain	P8-02	VAR UINT32 rw	No	0 400 4000
4803_h	Proportional Gain	P8-03	VAR UINT32 rw	No	0 300 4000
4804_h	Global Gain	P8-04	VAR UINT32 rw	No	100 500 3000
4805_h	HD Spring Filter	P8-05	VAR UINT16 rw	No	10 7000 7000
4806_h	Anti-Vibration Gain	P8-06	VAR UINT32 rw	No	0 0 10000
4807_h	Pe filter	P8-07	VAR UINT32 rw	No	0 0 99000
4808_h	Anti-Vibration Filter	P8-08	VAR UINT32 rw	No	50 4000 4000
4809_h	Pe filter	P8-09	VAR UINT32 rw	No	50 4000 4000
$480A_h$	Ratio of Load Inertia to Motor Inertia for Anti-Vibration	P8-10	VAR UINT32 rw	No	0 0 6000
$480B_h$	NL Anti Resonance Filter Divider	P8-11	VAR UINT32 rw	No	1 200 10000

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$480C_h$	Anti-Resonance Sharpness	P8-12	VAR UINT16 rw	No	10 500 10000
$480D_h$	Pe Sharpness	P8-13	VAR UINT16 rw	No	10 500 10000
$480E_h$	Current Filter Damping	P8-14	VAR UINT16 rw	No	0 0 100
$480F_h$	Current Filter Low Pass Filter Rise Time	P8-15	VAR UINT16 rw	No	0 300 3000
4810_h	Current Filter - Second Notch Filter Bandwidth	P8-16	VAR UINT16 rw	No	0 0 500
4811_h	Current Filter - Second Notch Filter Center	P8-17	VAR UINT16 rw	No	100 100 10000
4812_h	Current Filter - Notch Filter Bandwidth	P8-18	VAR UINT16 rw	No	0 0 500
4813_h	Current Filter - Notch Filter Center	P8-19	VAR UINT16 rw	No	100 100 10000
4814_h	Elasticity Compensation	P8-20	VAR UINT32 rw	No	0 50000 50000
4815_h	Spring Deceleration Ratio	P8-21	VAR UINT16 rw	No	0 1000 2000
4816_h	Analog NCT standstill	P8-22	VAR INT16 rw	No	-3815 0 3815
4817_h	Analog Input 1 Filter	P8-23	VAR UINT16 rw	No	10 1000 10000
4818_h	Analog Input 2 - Filter	P8-24	VAR UINT16 rw	No	10 1000 10000
4819_h	Electronic Gear Filter - Acceleration Feedforward	P8-25	VAR INT16 rw	No	-2000 0 2000
$481A_h$	Electronic Gear Filter - Activation	P8-26	VAR UINT16 rw	No	0 0 1
$481B_h$	Electronic Gear Filter - Depth	P8-27	VAR UINT32 rw	No	75 200 10000
$481C_h$	Electronic Gear Filter - Velocity and Acceleration Depth	P8-28	VAR UINT16 rw	No	0 400 6000
$481D_h$	Electronic Gear Filter - Velocity Feedforward	P8-29	VAR INT32 rw	No	-20000 0 20000

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$481E_h$	Interpolation of Input Signal for Electronic Gear - Activation	P8-30	VAR UINT16 rw	No	0 1 1
$481F_h$	Method for Operating Mode Pulse Train (PT)	P8-31	VAR UINT16 rw	No	0 1 3
4820_h	Position Command move averaging number	P8-32	VAR UINT32 rw	No	25 1500 25600
4821_h	Position Command Move Low Pass Filter Via P Parameter	P8-33	VAR UINT16 rw	No	1 5000 5000
4822_h	Smoothing Filter for Operating modes PT and PS - Type	P8-34	VAR UINT16 rw	No	0 2 2
4823_h	Type of Velocity Control	P8-35	VAR UINT16 rw	No	5 7 7
4824_h	Pe filter 3	P8-36	VAR UINT32 rw	No	0 0 1000000
4825_h	Pe filter 3	P8-37	VAR UINT32 rw	No	50 4000 4000
4826_h	Pe filter 3	P8-38	VAR UINT32 rw	No	0 1000 1000000
4827_h	Gravity Compensation	P8-39	VAR INT16 rw	No	- 0 -
4828_h	HD AFF	P8-40	VAR UINT16 rw	No	0 0 200
4829_h	Pe Sharpness	P8-41	VAR UINT16 rw	No	10 200 10000
4863_h	Adaptive Velocity Reference Value Gain	P8-99	VAR UINT32 rw	No	0 1000 3000
4900_h	Lexium program number	P9-00	VAR UINT32 ro	No	0 - 4294967295
4901_h	Firmware Version Date	P9-01	VAR UINT32 ro	No	0 - 4294967295
4906_h	User-Defined Application Name 1	P9-06	VAR UINT32 rw	No	0 0 4294967295
4907_h	User-Defined Application Name 2	P9-07	VAR UINT32 rw	No	0 0 4294967295
4908_h	User-Defined Application Name 3	P9-08	VAR UINT32 rw	No	0 0 4294967295

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4909_h	User-Defined Application Name 4	P9-09	VAR UINT32 rw	No	0 0 4294967295
$490A_h$	Modbus Word Order	P9-10	VAR UINT16 rw	No	0 0 1
$490B_h$	Serial Number Part 1	P9-11	VAR UINT32 ro	No	0 - 4294967295
$490C_h$	Serial Number Part 2	P9-12	VAR UINT32 ro	No	0 - 4294967295
$490D_h$	Serial Number Part 3	P9-13	VAR UINT32 ro	No	0 - 4294967295
$490E_h$	Serial Number Part 4	P9-14	VAR UINT32 ro	No	0 - 4294967295
$490F_h$	Autotuning Method	P9-15	VAR UINT16 rw	No	0 0 6
4910_h	Autotuning Motion Profile - Type	P9-16	VAR UINT16 rw	No	0 0 2
4911_h	Anti-vibration tuning mode.	P9-17	VAR UINT16 rw	No	0 2 6
4912_h	Autotuning Results - Save/ Discard	P9-18	VAR UINT16 rw	No	0 0 3
4913_h	Autotuning - Elasticity Compensation Filters	P9-19	VAR INT16 rw	No	0 1 1
4914_h	Autotuning - Direction of Movement	P9-20	VAR INT16 rw	No	0 0 3
4915_h	Minimum Dwell Time for Detection of Movement Cycle	P9-21	VAR UINT16 rw	No	100 200 1000
4916_h	Autotuning - Automatic Estimation of Ratio of Load Inertia and Motor Inertia	P9-22	VAR UINT16 rw	No	0 0 1
4917_h	Defines which values will be used for the position command filters.	P9-23	VAR UINT16 rw	No	0 0 1
4918_h	Torque filter tuning mode.	P9-24	VAR INT16 rw	No	0 0 2
4919_h	Autotuning Motion Profile - Activation	P9-25	VAR UINT16 rw	No	0 0 1
$491A_h$	Autotuning - Permissible Movement Range in Positive Direction	P9-26	VAR INT32 rw	No	-2147483647 0 2147483647

Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
$491B_h$	Autotuning - Permissible Movement Range in Negative Direction	P9-27	VAR INT32 rw	No	-2147483647 0 2147483647
$491C_h$	Autotuning Active	P9-28	VAR INT16 ro	No	0 - 1
$491D_h$	Autotuning - Velocity	P9-29	VAR UINT32 rw	No	- - -
$491E_h$	Autotuning - Status	P9-30	VAR UINT32 ro	No	0 - 65535
$491F_h$	Autotuning - Acceleration and Deceleration	P9-31	VAR UINT32 rw	No	393222 393222000 4292673500
4920_h	Autotune advance mode.	P9-32	VAR UINT16 rw	No	0 0 2
4921_h	Maximum Autotuning Optimization Value	P9-33	VAR UINT32 ro	No	0 - 1000
4922_h	Autotuning Progress Bar	P9-34	VAR UINT16 ro	No	0 0 100
4923_h	Autotuning - Gravity Estimation	P9-35	VAR UINT16 rw	No	0 0 1
4924_h	Set KNLAFRC in Autotune	P9-36	VAR INT16 rw	No	0 0 1
4925_h	Autotuning - Last Stored Event	P9-37	VAR UINT32 ro	No	0 0 65535
$4A00_h$	Login for Commissioning	-	VAR UINT16 rw	No	0 0 3
$4A01_h$	Content of HMI 1 - 4	-	VAR UINT32 ro	No	0 - 4294967295
$4A02_h$	Content of HMI 5	-	VAR UINT32 ro	No	0 - 255
$4A03_h$	Detected Modbus Communication Error During Login	-	VAR UINT16 rw	No	0 0 20000
$4A06_h$	Lock for Configuration	-	VAR UINT16 rw	No	0 0 4
$4A08_h$	Save Parameters	-	VAR UINT16 rw	No	0 0 1
$4A09_h$	Reset to Factory Settings	-	VAR UINT16 rw	No	0 0 1

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$4A0A_h$	Modbus - Most Recent Invalid Parameter	-	VAR UINT16 ro	No	0 0 65535
$4A0B_h$	Scope Command	-	VAR UINT16 rw	No	0 0 1
$4A0C_h$	Scope - Number of Variables to Record	-	VAR UINT16 rw	No	0 0 4
$4A0D_h$	Scope - Version	-	VAR UINT16 ro	No	1 1 65535
$4A0E_h$	Scope - Time Interval	-	VAR UINT32 rw	No	31 1000 2147483644
$4A0F_h$	Scope - Status	-	VAR UINT16 ro	No	0 - 3
$4A10_h$	Scope - Number of Points to Record	-	VAR UINT16 rw	No	0 0 2000
$4A11_h$	Scope - Trigger Type	-	VAR UINT16 rw	No	0 0 2
$4A12_h$	Scope - Pre-Trigger Points	-	VAR UINT16 rw	No	0 0 65500
$4A13_h$	Scope - Trigger Value	-	VAR INT32 rw	No	-2147483647 0 2147483647
$4A14_h$	Scope - Variables to Record 1	-	VAR UINT16 rw	No	0 0 65535
$4A15_h$	Scope - Variables to Record 2	-	VAR UINT16 rw	No	0 0 65535
$4A16_h$	Scope - Variables to Record 3	-	VAR UINT16 rw	No	0 0 65535
$4A17_h$	Scope - Variables to Record 4	-	VAR UINT16 rw	No	0 0 65535
$4A18_h$	Scope - Trigger Variable	-	VAR UINT16 rw	No	0 0 65535
$4A19_h$	Jog via Modbus	-	VAR UINT16 rw	No	0 0 2
$4A1A_h$	Number of Parameters in Status Block	-	VAR UINT16 ro	No	20 20 20
$4A1B_h$	Values of Parameters in Status Block	-	VAR UINT16 ro	No	- - -

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$4A1C_h$	Number of Parameters in Data Block	-	VAR UINT16 ro	No	27 27 27
$4A1D_h$	Values of Parameters in Data Block	-	VAR UINT16 ro	No	- - -
$4A1E_h$	Access Rights - User Level	-	VAR UINT32 rw	No	0 1 4294967295
$4A1F_h$	Access Rights - User Level Status	-	VAR UINT16 ro	No	256 1024 1024
$4A20_h$	Exclusive Access	-	VAR UINT16 rw	No	0 0 1
$4A21_h$	Internal Motion Profile - Incremental Movement Distance	-	VAR INT32 rw	No	-2147483647 0 2147483647
$4A22_h$	Internal Motion Profile - Velocity	-	VAR UINT16 rw	No	0 10000 60000
$4A23_h$	Internal Motion Profile - Acceleration/Deceleration	-	VAR UINT32 rw	No	393222 393222000 4292673500
$4A24_h$	Internal Motion Profile - Trigger and Repetitions	-	VAR INT16 rw	No	-1 0 32767
$4A25_h$	Access Lock	-	VAR UINT16 rw	No	0 0 1
$4B00_h$	Position	-	VAR INT32 ro	No	- - -
$4B01_h$	Target Position in PUU	-	VAR INT32 ro	No	- - -
$4B02_h$	Position Deviation in PUU	-	VAR INT32 ro	No	- - -
$4B03_h$	Actual Position in Pulses	-	VAR INT32 ro	No	- - -
$4B04_h$	Target Position in Pulses	-	VAR INT32 ro	No	- - -
$4B05_h$	Position Deviation in Pulses	-	VAR INT32 ro	No	- - -
$4B06_h$	Input Frequency	-	VAR INT32 ro	No	- - -
$4B07_h$	Actual Velocity in min-1	-	VAR INT32 ro	No	- - -

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$4B08_h$	Target Velocity in V	-	VAR INT32 ro	No	- - -
$4B09_h$	Target Velocity in min-1	-	VAR INT32 ro	No	- - -
$4B0A_h$	Target Torque in V	-	VAR INT32 ro	No	- - -
$4B0B_h$	Target Torque in Percent of Nominal Current	-	VAR INT32 ro	No	- - -
$4B0E_h$	DC Bus Voltage	-	VAR INT32 ro	No	- - -
$4B0F_h$	Ratio of Load Inertia and Motor Inertia	-	VAR INT32 ro	No	- - -
$4B10_h$	Drive Temperature - Power Stage	-	VAR INT32 ro	No	- - -
$4B13_h$	Map P0-25	-	VAR INT32 ro	No	- - -
$4B14_h$	Map P0-26	-	VAR INT32 ro	No	- - -
$4B15_h$	Map P0-27	-	VAR INT32 ro	No	- - -
$4B16_h$	Map P0-28	-	VAR INT32 ro	No	- - -
$4B17_h$	Indicate P0-09	-	VAR INT32 ro	No	- - -
$4B18_h$	Indicate P0-10	-	VAR INT32 ro	No	- - -
$4B19_h$	Indicate P0-11	-	VAR INT32 ro	No	- - -
$4B1A_h$	Indicate P0-12	-	VAR INT32 ro	No	- - -
$4B1B_h$	Drive Temperature - Controller	-	VAR INT32 ro	No	- - -
$4B27_h$	Digital Inputs	-	VAR INT32 ro	No	- - -
$4B28_h$	Digital Outputs	-	VAR INT32 ro	No	- - -

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Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
$4B29_h$	Drive Status	-	VAR INT32 ro	No	- - -
$4B2A_h$	Operating Mode	-	VAR INT32 ro	No	- - -
$4B31_h$	External Encoder	-	VAR INT32 ro	No	- - -
$4B32_h$	Target Velocity in min-1	-	VAR INT32 ro	No	- - -
$4B35_h$	Target Torque	-	VAR INT32 ro	No	- - -
$4B36_h$	Actual Torque in Percent	-	VAR INT32 ro	No	- - -
$4B37_h$	Actual Torque in A	-	VAR INT32 ro	No	- - -
$4B4D_h$	Target Velocity in Operating Modes PT / PS	-	VAR INT32 ro	No	- - -
$4FA0_h$	Drive Profile Lexium Control	-	RECORD - -	No	- - -
$4FA0{:}0_h$	NumOfEntries	-	VAR UINT8 ro	No	0 9 9
$4FA0{:}1_h$	ShiftRefA	-	VAR UINT16 ro	No	0 0 65535
$4FA0{:}2_h$	ModeError	-	VAR UINT16 ro	No	0 0 65535
$4FA0{:}3_h$	ModeErrorInfo	-	VAR UINT16 ro	No	0 0 65535
$4FA0{:}4_h$	Dpl_int_Lim	-	VAR UINT16 rw	No	0 0 65535
$4FA0{:}5_h$	Ds402intLim	-	VAR UINT16 rw	No	0 0 65535
$4FA0{:}6_h$	MON_V_Threshold	-	VAR UINT32 rw	No	0 0 4294967295
$4FA0{:}7_h$	MON_I_Threshold	-	VAR UINT16 rw	No	- - -
$4FA0{:}8_h$	DataError	-	VAR UINT16 ro	No	- - -

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Index	Name	Parameter	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
4FA0:9$_h$	DataErrorInfo	-	VAR UINT16 ro	No	- - -
4FA3$_h$	Save/Load Status	-	VAR UINT8 ro	No	0 0 255
4FA4$_h$	Commanded velocity	-	VAR INT32 ro	No	-2147483648 0 2147483647
4FA5$_h$	Electronic Gear Ratio	-	ARRAY - -	No	- - -
4FA5:0$_h$	Number of Entries	-	VAR UINT8 ro	No	2 2 2
4FA5:1$_h$	Electronic Gear Ratio (Numerator)	-	VAR INT32 rww	Yes	1 128 536870911
4FA5:2$_h$	Electronic Gear Ratio (Denominator)	-	VAR INT32 rww	Yes	1 10 2147483647
4FA6$_h$	CANopen Manufacturer Specific SDO Abort Code	-	VAR UINT32 ro	No	0 - 4294967295

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Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
603Fh	Error Code	VAR UINT16 ro	Yes	0 - 65535
6040h	Controlword	VAR UINT16 rww	Yes	0 - 65535
6041h	Statusword	VAR UINT16 ro	Yes	0 - 65535
605Dh	Halt Option Code	VAR INT16 rw	No	1 1 3
6060h	Modes of Operation	VAR INT8 rww	Yes	-128 0 8
6061h	Modes of Operation Display	VAR INT8 ro	Yes	-128 - 8
6062h	Position Demand Value Unit: User-defined position unit	VAR INT32 ro	No	-2147483648 - 2147483647
6063h	Position Actual Internal Value Unit: Increments	VAR INT32 ro	Yes	-2147483648 - 2147483647
6064h	Position Actual Value Unit: User-defined position unit	VAR INT32 ro	Yes	-2147483648 - 2147483647
6065h	Following Error Window Unit: User-defined position unit	VAR UINT32 rww	Yes	0 1280000 4294967295
6066h	Following Error Time Out Unit: ms	VAR UINT16 rw	No	0 0 65535
6067h	Position Window Unit: User-defined position unit	VAR UINT32 rww	Yes	0 163840 4294967295
6068h	Position Window Time Unit: ms	VAR UINT16 rw	No	0 1 65535
606Bh	Velocity Demand Value Unit: User-defined position unit/s	VAR INT32 ro	No	-2147483648 - 2147483647
606Ch	Velocity Actual Value Unit: User-defined position unit/s	VAR INT32 ro	Yes	-2147483648 - 2147483647
606Eh	Velocity Window Time Unit: ms	VAR UINT16 rw	No	0 0 65535
6070h	Velocity Threshold Time Unit: ms	VAR UINT16 rw	No	0 0 65535

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Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
6071h	Target Torque Unit: 1/1000 of nominal torque	VAR INT16 rww	Yes	-32768 0 32767
6073h	Max Current Unit: 1/1000 of nominal current	VAR UINT16 rww	Yes	0 - 65535
6074h	Torque Demand Value Unit: 1/1000 of nominal torque	VAR INT16 ro	Yes	-32768 - 32767
6075h	Motor Rated Current Unit: mA	VAR UINT32 ro	No	0 - 150
6076h	Motor Rated Torque Unit: mNm	VAR UINT32 rw	No	0 0 4294967295
6077h	Torque Actual Value Unit: 1/1000 of nominal torque	VAR INT16 ro	Yes	-32768 - 32767
6078h	Current Actual Value Unit: 1/1000 of nominal current	VAR INT16 ro	Yes	-32768 - 32767
6079h	DC Link Circuit Voltage Unit: mV	VAR UINT32 ro	No	0 - 4294967295
607Ah	Target Position Unit: User-defined position unit	VAR INT32 rww	Yes	-2147483648 0 2147483647
607Ch	Home Offset Unit: User-defined position unit	VAR INT32 rw	No	-2147483648 0 2147483647
607Dh	Software Position Limit	ARRAY - -	No	- - -
607D:0h	Highest sub-index supported	VAR UINT8 ro	No	2 2 2
607D:1h	Min Software Position Limit Unit: User-defined position unit	VAR INT32 rw	No	-2147483648 -1717986906 2147483647
607D:2h	Max Software Position Limit Unit: User-defined position unit	VAR INT32 rw	No	-2147483648 1717986906 2147483647
607Eh	Polarity	VAR UINT8 rw	No	0 0 192
607Fh	Max Profile Velocity Unit: User-defined position unit/s	VAR UINT32 rw	No	1 - 4294967295
6080h	Max Motor Speed Unit: User-defined position unit/s	VAR UINT32 ro	No	0 - 4294967295
6081h	Profile Velocity in profile position mode Unit: User-defined position unit/s	VAR UINT32 rww	Yes	0 0 4294967295

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Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
6083_h	Profile Acceleration Unit: User-defined position unit/s^2	VAR UINT32 rww	Yes	1 4266666667 4294967295
6084_h	Profile Deceleration Unit: User-defined position unit/s^2	VAR UINT32 rww	Yes	1 4266666667 4294967295
6085_h	Quick Stop Deceleration Unit: User-defined position unit/s^2	VAR UINT32 rw	No	1 4266666667 4294967295
6087_h	Torque Slope Unit: 1/1000 of nominal torque/s	VAR UINT32 rww	Yes	1 - 30000000
$608F_h$	Position Encoder Resolution	ARRAY - -	No	- - -
$608F:0_h$	Highest sub-index supported	VAR UINT8 ro	No	2 2 2
$608F:1_h$	Encoder Increments Unit: Increments	VAR UINT32 ro	No	16 1048576 10000000
$608F:2_h$	Motor Revolutions Unit: Revolutions	VAR UINT32 ro	No	1 1 1
6091_h	Gear Ratio	ARRAY - -	No	- - -
$6091:0_h$	Highest sub-index supported	VAR UINT8 ro	No	2 2 2
$6091:1_h$	Motor Revolutions	VAR UINT32 rw	No	1 1 4294967295
$6091:2_h$	Shaft Revolutions	VAR UINT32 rw	No	1 1 4294967295
6092_h	Feed Constant User-defined position unit	ARRAY - -	No	- - -
$6092:0_h$	Highest sub-index supported	VAR UINT8 ro	No	2 2 2
$6092:1_h$	Feed	VAR UINT32 rw	No	1 1280000 4294967295
$6092:2_h$	Shaft Revolutions	VAR UINT32 rw	No	1 1 4294967295
6098_h	Homing Method	VAR INT8 rw	No	1 2 35
6099_h	Homing Speeds	ARRAY - -	No	- - -

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Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
6099:0h	Highest sub-index supported	VAR UINT8 ro	No	2 2 2
6099:1h	Fast Homing Speed Unit: User-defined position unit/s	VAR UINT32 rw	No	1 2133333 4294967295
6099:2h	Slow Homing Speed Unit: User-defined position unit/s	VAR UINT32 rw	No	1 426667 4294967295
609Ah	Homing Acceleration Unit: User-defined position unit/s^2	VAR UINT32 rw	No	1 640000000 4294967295
60B0h	Position Offset Unit: User-defined position unit	VAR INT32 rw	No	-2147483648 0 2147483647
60B1h	Velocity Offset Unit: User-defined position unit/s	VAR INT32 rww	Yes	-2147483648 0 2147483647
60B2h	Torque Offset Unit: 1/1000 of nominal torque	VAR INT16 rww	Yes	-32768 0 32767
60B8h	Touch Probe Function	VAR UINT16 rww	Yes	0 - 65535
60B9h	Touch Probe Status	VAR UINT16 ro	Yes	0 0 65535
60BAh	Touch Probe 1 Position Positive Value Unit: User-defined position unit	VAR INT32 ro	Yes	-2147483648 0 2147483647
60BBh	Touch Probe 1 Position Negative Value Unit: User-defined position unit	VAR INT32 ro	Yes	-2147483648 0 2147483647
60BCh	Touch Probe 2 Position Positive Value Unit: User-defined position unit	VAR INT32 ro	Yes	-2147483648 - 2147483647
60BDh	Touch Probe 2 Position Negative Value Unit: User-defined position unit	VAR INT32 ro	Yes	-2147483648 - 2147483647
60C1h	Interpolation Data Record	ARRAY - -	No	- - -
60C1:0h	Highest sub-index supported	VAR UINT8 ro	No	1 4 254
60C1:1h	Data Record 1	VAR INT32 rww	Yes	-2147483648 0 2147483647
60C1:2h	Data Record 2	VAR INT32 rww	Yes	-2147483648 0 2147483647
60C1:3h	Data Record 3	VAR INT32 rww	Yes	-2147483648 0 2147483647

Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
60C1:4h	Data Record 4	VAR INT32 rww	Yes	-2147483648 0 2147483647
60C2h	Interpolation Time Period	RECORD - -	No	- - -
60C2:0h	Highest sub-index supported	VAR UINT8 ro	No	2 2 2
60C2:1h	Interpolation time period value Unit: 10(interpolation time index) seconds	VAR UINT8 rw	No	1 2 255
60C2:2h	Interpolation time index	VAR INT8 rw	No	-128 -3 63
60C4h	Interpolation Data Configuration	RECORD - -	No	- - -
60C4:0h	Highest sub-index supported	VAR UINT8 ro	No	6 6 6
60C4:1h	Maximum buffer size Unit: Number of data records	VAR UINT32 ro	No	1 1 1
60C4:2h	Actual buffer size Unit: Number of data records	VAR UINT32 rw	No	1 - 1
60C4:3h	Buffer organization	VAR UINT8 rw	No	0 0 1
60C4:4h	Buffer position	VAR UINT16 rw	No	0 - 0
60C4:5h	Size of data record Unit: Bytes	VAR UINT8 wo	No	4 - 4
60C4:6h	Buffer clear	VAR UINT8 wo	No	0 - 1
60C5h	Max Acceleration Unit: User-defined position unit/s^2	VAR UINT32 rw	No	1 4153464149 4294967295
60C6h	Max Deceleration Unit: User-defined position unit/s^2	VAR UINT32 rw	No	1 4153464149 4294967295
60D5h	Touch probe 1 positive edge counter	VAR UINT16 ro	Yes	0 0 65535
60D6h	Touch probe 1 negative edge counter	VAR UINT16 ro	Yes	0 0 65535
60D7h	Touch probe 2 positive edge counter	VAR UINT16 ro	Yes	0 0 65535

Index	Name	Object type Data type Access	PDO mapping object	Minimum value Factory settings Maximum value
$60D8_h$	Touch probe 2 negative edge counter	VAR UINT16 ro	Yes	0 0 65535
$60F2_h$	Position option code	VAR UINT16 rw	No	0 0 65535
$60F4_h$	Following Error Actual Value Unit: User-defined position unit	VAR INT32 ro	Yes	-2147483648 - 2147483647
$60FC_h$	Position Demand Internal Value Unit: Increments	VAR INT32 ro	No	-2147483648 - 2147483647
$60FD_h$	Digital Inputs	VAR UINT32 ro	Yes	0 - 4294967295
$60FE_h$	Digital Outputs	ARRAY - -	No	- - -
$60FE:0_h$	Higheat sub-index supported	VAR UINT8 ro	No	2 2 2
$60FE:1_h$	Physical Outputs	VAR UINT32 rww	Yes	0 - 4294967295
$60FE:2_h$	Output Mask	VAR UINT32 rw	No	0 0 4294967295
$60FF_h$	Target Velocity Unit: User-defined position unit/s	VAR INT32 rww	Yes	-2147483648 0 2147483647
6502_h	Supported Drive Modes	VAR UINT32 ro	No	237 - 237

11.5 PDO mapping

Up to 8 bytes of data from different areas of the object dictionary can be transmitted with a PDO message. Mapping of data to a PDO message is referred to as PDO mapping.

Chapter *"11 Object dictionary"* contains a list of vendor-specific objects that are available for PDO mapping.

The picture below shows the data exchange between PDOs and object dictionary on the basis of two examples of objects in T_PDO4 and R_PDO4 of the PDOs.

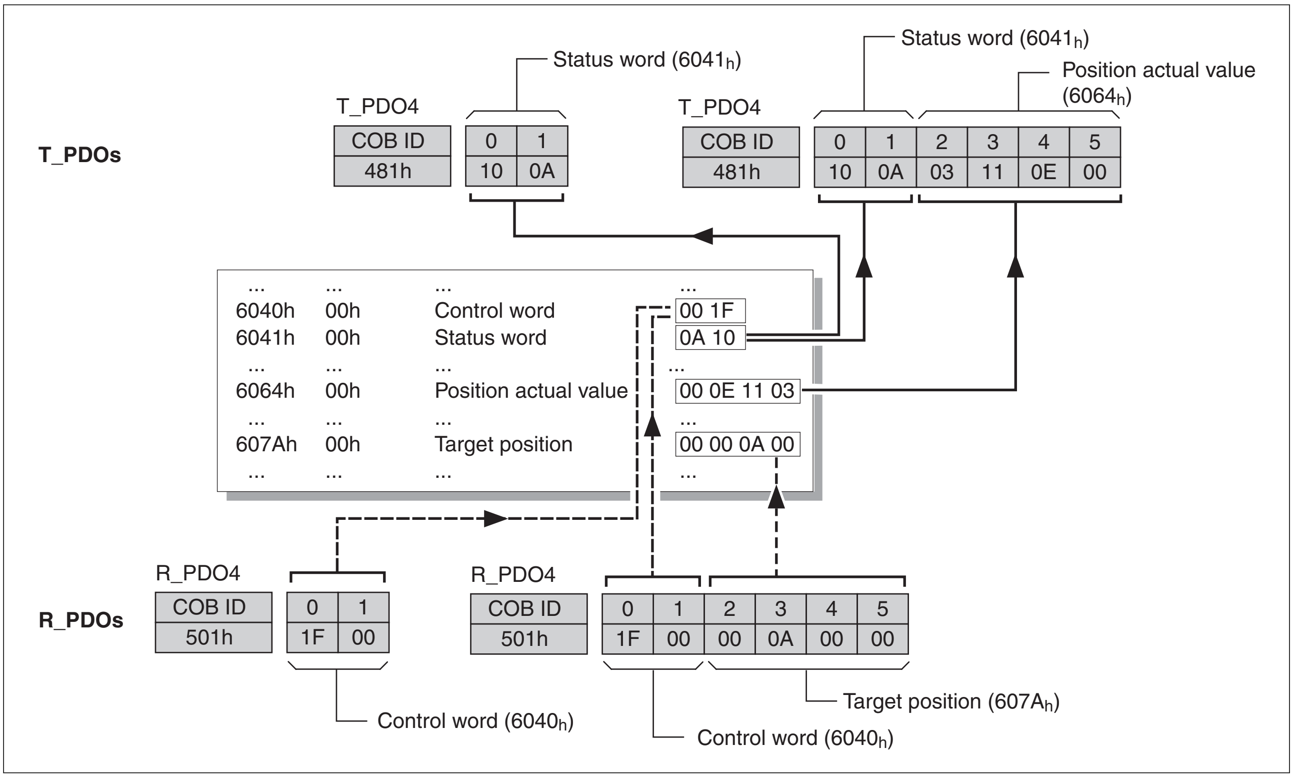

Figure 146: PDO mapping, in this case for a device with node address 1

Dynamic PDO mapping

The device uses dynamic PDO mapping. Dynamic PDO mapping means that objects can be mapped to the corresponding PDO using adjustable settings.

The settings for PDO mapping are defined in an assigned communication object for each PDO.

Object	PDO mapping for	Type
1st receive PDO mapping (1600_h)	R_PDO1	Dynamic
2nd receive PDO mapping (1601_h)	R_PDO2	Dynamic
3rd receive PDO mapping (1602_h)	R_PDO3	Dynamic
4th receive PDO mapping (1603_h)	R_PDO4	Dynamic
1st transmit PDO mapping ($1A00_h$)	T_PDO1	Dynamic
2nd transmit PDO mapping ($1A01_h$)	T_PDO2	Dynamic
3rd transmit PDO mapping ($1A02_h$)	T_PDO3	Dynamic
4th transmit PDO mapping ($1A03_h$)	T_PDO4	Dynamic

Structure of the entries

Up to 8 bytes of 8 different objects can be mapped in a PDO. Each communication object for setting the PDO mapping provides 4 subindex entries. A subindex entry contains 3 pieces of information on the object: the index, the subindex and the number of bits that the object uses in the PDO.

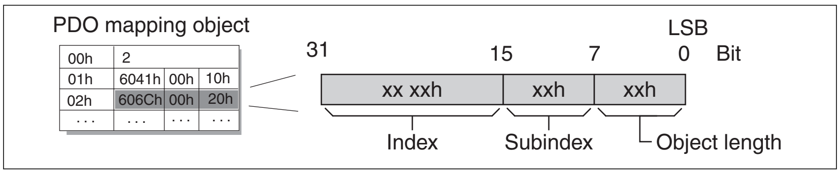

Figure 147: Structure of entries for PDO mapping

Subindex 00_h of the communication object contains the number of valid subindex entries.

Object length	Bit value
08_h	8 bits
10_h	16 bits
20_h	32 bits

PDO mapping objects

The table below provides a list of parameters that can be used for PDO mapping.

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Index	Name	Parameter	Object type Data type Access	Minimum value Factory settings Maximum value
430B$_h$	driveInput	P3-11	VAR UINT16 ro	0 - 65535
430C$_h$	driveModeCtrl	P3-12	VAR UINT16 rww	0 0 65535
430D$_h$	refA16	P3-13	VAR INT16 rww	-32768 0 32767
430E$_h$	refB32	P3-14	VAR INT32 rww	-2147483648 0 2147483647
430F$_h$	driveStat	P3-15	VAR UINT16 ro	0 - 65535
4310$_h$	mfStat	P3-16	VAR UINT16 ro	0 - 65535
4311$_h$	motionStat	P3-17	VAR UINT16 ro	0 - 65535
4FA5:1$_h$	Electronic Gear Ratio (Numerator)	-	VAR INT32 rww	1 128 536870911
4FA5:2$_h$	Electronic Gear Ratio (Denominator)	-	VAR INT32 rww	1 10 2147483647
603F$_h$	Error Code	-	VAR UINT16 ro	0 - 65535
6040$_h$	Controlword	-	VAR UINT16 rww	0 - 65535
6041$_h$	Statusword	-	VAR UINT16 ro	0 - 65535
6060$_h$	Modes of Operation	-	VAR INT8 rww	-128 0 8
6061$_h$	Modes of Operation Display	-	VAR INT8 ro	-128 - 8
6063$_h$	Position Actual Internal Value	-	VAR INT32 ro	-2147483648 - 2147483647
6064$_h$	Position Actual Value	-	VAR INT32 ro	-2147483648 - 2147483647
6065$_h$	Following Error Window	-	VAR UINT32 rww	0 1280000 4294967295
6067$_h$	Position Window	-	VAR UINT32 rww	0 163840 4294967295

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Index	Name	Parameter	Object type Data type Access	Minimum value Factory settings Maximum value
606C$_h$	Velocity Actual Value	-	VAR INT32 ro	-2147483648 - 2147483647
6071$_h$	Target Torque	-	VAR INT16 rww	-32768 0 32767
6073$_h$	Max Current	-	VAR UINT16 rww	0 - 65535
6074$_h$	Torque Demand Value	-	VAR INT16 ro	-32768 - 32767
6077$_h$	Torque Actual Value	-	VAR INT16 ro	-32768 - 32767
6078$_h$	Current Actual Value	-	VAR INT16 ro	-32768 - 32767
607A$_h$	Target Position	-	VAR INT32 rww	-2147483648 0 2147483647
6081$_h$	Profile Velocity in profile position mode	-	VAR UINT32 rww	0 0 4294967295
6083$_h$	Profile Acceleration	-	VAR UINT32 rww	1 640000000 4294967295
6084$_h$	Profile Deceleration	-	VAR UINT32 rww	1 640000000 4294967295
6087$_h$	Torque Slope	-	VAR UINT32 rww	1 - 30000000
60B1$_h$	Velocity Offset	-	VAR INT32 rww	-2147483648 0 2147483647
60B2$_h$	Torque Offset	-	VAR INT16 rww	-32768 0 32767
60B8$_h$	Touch Probe Function	-	VAR UINT16 rww	0 0 65535
60B9$_h$	Touch Probe Status	-	VAR UINT16 ro	0 0 65535
60BA$_h$	Touch Probe 1 Position Positive Value	-	VAR INT32 ro	-2147483648 0 2147483647
60BB$_h$	Touch Probe 1 Position Negative Value	-	VAR INT32 ro	-2147483648 0 2147483647
60BC$_h$	Touch Probe 2 Position Positive Value	-	VAR INT32 ro	-2147483648 - 2147483647

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Index	Name	Parameter	Object type Data type Access	Minimum value Factory settings Maximum value
60BD$_h$	Touch Probe 2 Position Negative Value	-	VAR INT32 ro	-2147483648 - 2147483647
60C1:1$_h$	Data Record 1	-	VAR INT32 rww	-2147483648 0 2147483647
60C1:2$_h$	Data Record 2	-	VAR INT32 rww	-2147483648 0 2147483647
60C1:3$_h$	Data Record 3	-	VAR INT32 rww	-2147483648 0 2147483647
60C1:4$_h$	Data Record 4	-	VAR INT32 rww	-2147483648 0 2147483647
60D5$_h$	Touch probe 1 positive edge counter	-	VAR UINT16 ro	0 0 65535
60D6$_h$	Touch probe 1 negative edge counter	-	VAR UINT16 ro	0 0 65535
60D7$_h$	Touch probe 2 positive edge counter	-	VAR UINT16 ro	0 0 65535
60D8$_h$	Touch probe 2 negative edge counter	-	VAR UINT16 ro	0 0 65535
60F4$_h$	Following Error Actual Value	-	VAR INT32 ro	-2147483648 - 2147483647
60FD$_h$	Digital Inputs	-	VAR UINT32 ro	0 - 4294967295
60FE:1$_h$	Physical Outputs	-	VAR UINT32 rww	0 - 4294967295
60FF$_h$	Target Velocity	-	VAR INT32 rww	-2147483648 0 2147483647

12 Accessories and spare parts

12.1 Commissioning tools

Description	Reference
Commissioning software LXM28 DTM Library, can be downloaded at: www.schneider-electric.com	-
PC connection kit, serial connection between drive and PC, USB-A to RJ45	TCSMCNAM3M002P
Multi-Loader, device for copying the parameter settings to a PC or to another drive	VW3A8121
Connection cable for Multi-Loader	VW3A8126
Modbus cable, 1 m (3.28 ft), 2 x RJ45	VW3A8306R10
Holding brake controller HBC with automatic voltage reduction; 24 V - 1.6 A	VW3M3103

12.2 Connectors and adapters

Description	Reference
Connector kit for controller supply and power stage supply (CN5), braking resistor (CN7) and motor (CN8); suitable for LXM28•UA5, U01, U02, U04, U07, U10 and U15	VW3M4C21
Connector kit for controller supply and power stage supply (CN5), braking resistor (CN7) and motor (CN8); suitable for LXM28•U2219U20, U30 and U45	VW3M4C22
Interface connector for CN1, 50-pin, 3 pieces	VW3M1C12
Interface adapter for CN1, connector with 0.5 m (1.64 ft) cable and connection module with screw terminals for DIN rail mounting	VW3M1C13
Connector kit for motor; motor end plastic connector without holding brake	VW3M5D1A
Connector kit for motor; motor end plastic connector with holding brake	VW3M5D1F
Connector kit for motor; motor end MIL connector with holding brake, size 100 ... 130	VW3M5D2A
Connector kit for motor; motor end MIL connector with holding brake, size 180	VW3M5D2B
Connector kit for encoder; motor end flying leads; device end IEEE1394 connector	VW3M8D1A
Connector kit for encoder; motor end MIL connector; device end IEEE1394 connector	VW3M8D2A

12.3 External mains filters

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

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12.4 DC bus accessories

Description	Reference
DC bus connection cable, 2 * 6 mm^2 (2 * AWG 10), pre-assembled, 0.1 m (0.33 ft), 5 pieces	VW3M7101R01
DC bus connection cable, 2 * 6 mm^2 (2 * AWG 10), Twisted Pair, shielded, 15 m (49.2 ft)	VW3M7102R150
DC bus connector kit, connector housing and crimp contacts for 3 ... 6 mm^2 (AWG 12 ... 10), 10 pieces	VW3M2207

A crimping tool is required for the crimp contacts of the connector kit. Manufacturer:
Tyco Electronics, Heavy Head Hand Tool, Tool Pt. No 180250

12.5 Application nameplate

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

12.6 CANopen connectors, distributors, terminating resistors

Description	Reference
CANopen terminating resistor, 120 Ohm, integrated in RJ45 connector	TCSCAR013M120
CANopen cable, 0.3 m (0.98 ft), 2 x RJ45	VW3CANCARR03
CANopen cable, 1 m (3.28 ft), 2 x RJ45	VW3CANCARR1
CANopen cable, 1 m (3.28 ft), D9-SUB (female) with integrated terminating resistor to RJ45	VW3M3805R010
CANopen cable, 3 m (9.84 ft), D9-SUB (female) with integrated terminating resistor to RJ45	VW3M3805R030

12.7 CANopen cables with open cable ends

Cables with open cable ends are suitable for connection of D-SUB connectors. Observe the cable cross section and the connection cross section of the required connector.

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Description	Reference
CANopen cable, 50 m (164 ft), [(2 x AWG 22) + (2 x AWG 24)], LSZH standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1), both cable ends open	TSXCANCA50
CANopen cable, 100 m (328 ft), [(2 x AWG 22) + (2 x AWG 24)], LSZH standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1), both cable ends open	TSXCANCA100
CANopen cable, 300 m (984 ft), [(2 x AWG 22) + (2 x AWG 24)], LSZH standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1), both cable ends open	TSXCANCA300
CANopen cable, 50 m (164 ft), [(2 x AWG 22) + (2 x AWG 24)], flame-retardant, tested as per IEC 60332-2, UL certification, both cable ends open	TSXCANCB50
CANopen cable, 100 m (328 ft), [(2 x AWG 22) + (2 x AWG 24)], flame-retardant, tested as per IEC 60332-2, UL certification, both cable ends open	TSXCANCB100
CANopen cable, 300 m (984 ft), [(2 x AWG 22) + (2 x AWG 24)], flame-retardant, tested as per IEC 60332-2, UL certification, both cable ends open	TSXCANCB300
CANopen cable, 50 m (164 ft), [(2 x AWG 22) + (2 x AWG 24)], flexible LSZH HD standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1), for heavy-duty or flexible installation, oil-resistant, both cable ends open	TSXCANCD50
CANopen cable, 100 m (328 ft), [(2 x AWG 22) + (2 x AWG 24)], flexible LSZH HD standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1), for heavy-duty or flexible installation, oil-resistant, both cable ends open	TSXCANCD100
CANopen cable, 300 m (984 ft), [(2 x AWG 22) + (2 x AWG 24)], flexible LSZH HD standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1), for heavy-duty or flexible installation, oil-resistant, both cable ends open	TSXCANCD300

12.8 Motor cables

Description	Reference
Motor cable without holding brake 1.5 m (4.92 ft), 4 x 0.82 mm^2 (AWG 18) shielded; motor end plastic connector, other cable end flying leads	VW3M5D1AR15
Motor cable without holding brake 3 m (9.84 ft), 4 x 0.82 mm^2 (AWG 18) shielded; motor end plastic connector, other cable end flying leads	VW3M5D1AR30
Motor cable without holding brake 5 m (16.4 ft), 4 x 0.82 mm^2 (AWG 18) shielded; motor end plastic connector, other cable end flying leads	VW3M5D1AR50
Motor cable with holding brake 3 m (9.84 ft), 6 x 0.82 mm^2 (AWG 18) shielded; motor end plastic connector, other cable end flying leads	VW3M5D1FR30
Motor cable with holding brake 5 m (16.4 ft), 6 x 0.82 mm^2 (AWG 18) shielded; motor end plastic connector, other cable end flying leads	VW3M5D1FR50
Motor cable without holding brake 3 m (9.84 ft), 4 x 1.3 mm^2 (AWG 16) shielded; motor end MIL connector, other cable end flying leads	VW3M5D2AR30
Motor cable without holding brake 5 m (16.4 ft), 4 x 1.3 mm^2 (AWG 16) shielded; motor end MIL connector, other cable end flying leads	VW3M5D2AR50
Motor cable with holding brake 3 m (9.84 ft), 6 x 1.3 mm^2 (AWG 16) shielded; motor end MIL connector, other cable end flying leads	VW3M5D2FR30
Motor cable with holding brake 5 m (16.4 ft), 6 x 1.3 mm^2 (AWG 16) shielded; motor end MIL connector, other cable end flying leads	VW3M5D2FR50
Motor cable without holding brake 3 m (9.84 ft), 4 x 3.3 mm^2 (AWG 12) shielded; motor end MIL connector, other cable end flying leads	VW3M5D4AR30
Motor cable without holding brake 5 m (16.4 ft), 4 x 3.3 mm^2 (AWG 12) shielded; motor end MIL connector, other cable end flying leads	VW3M5D4AR50
Motor cable with holding brake 3 m (9.84 ft), 6 x 3.3 mm^2 (AWG 12) shielded; motor end MIL connector, other cable end flying leads	VW3M5D4FR30
Motor cable with holding brake 5 m (16.4 ft), 6 x 3.3 mm^2 (AWG 12) shielded; motor end MIL connector, other cable end flying leads	VW3M5D4FR50
Motor cable without holding brake 3 m (9.84 ft), 4 x 6 mm^2 (AWG 10) shielded; motor end MIL connector, other cable end flying leads	VW3M5D6AR30
Motor cable without holding brake 5 m (16.4 ft), 4 x 6 mm^2 (AWG 10) shielded; motor end MIL connector, other cable end flying leads	VW3M5D6AR50
Motor cable with holding brake 3 m (9.84 ft), 6 x 6 mm^2 (AWG 10) shielded; motor end MIL connector, other cable end flying leads	VW3M5D6FR30
Motor cable with holding brake 5 m (16.4 ft), 6 x 6 mm^2 (AWG 10) shielded; motor end MIL connector, other cable end flying leads	VW3M5D6FR50

12.9 Encoder cables

Description	Reference
Encoder cable 1.5 m (4.92 ft), 10 x 0.13 mm^2 (AWG 26) shielded; motor end and device end plastic connector	VW3M8D1AR15
Encoder cable 3 m (9.84 ft), 10 x 0.13 mm^2 (AWG 26) shielded; motor end and device end plastic connector	VW3M8D1AR30
Encoder cable 5 m (16.4 ft), 10 x 0.13 mm^2 (AWG 26) shielded; motor end and device end plastic connector	VW3M8D1AR50
Encoder cable 3 m (9.84 ft), 10 x 0.13 mm^2 (AWG 26) shielded; motor end MIL connector, other cable end plastic connector	VW3M8D2AR30
Encoder cable 5 m (16.4 ft), 10 x 0.13 mm^2 (AWG 26) shielded; motor end MIL connector, other cable end plastic connector	VW3M8D2AR50

12.10 Signal cables

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

12.11 Signal cable for safety function STO

Description	Reference
Signal cable 1 m (3.28 ft) for safety function STO CN9	VW3M1C20R10
Signal cable 2 m (6.56 ft) for safety function STO CN9	VW3M1C20R20
Signal cable 3 m (9.84 ft) for safety function STO CN9	VW3M1C20R30

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12.12 External braking resistors

Description	Reference
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7601R07
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7601R20
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7601R30
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7602R07
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7602R20
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7602R30
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7603R07
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7603R20
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7603R30
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7604R07
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7604R20
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7604R30
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7606R07
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7606R20
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7606R30
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 0.75 m (2.46 ft) connection cable	VW3A7607R07
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 2 m (6.56 ft) connection cable	VW3A7607R20
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 3 m (9.84 ft) connection cable	VW3A7607R30
Braking resistor IP20; 15 Ω; maximum continuous power 1000 W; M6 terminals, UL	VW3A7704
Braking resistor IP20; 10 Ω; maximum continuous power 1000 W; M6 terminals, UL	VW3A7705

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12.13 Circuit breakers

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

12.14 Motor protection switches and power contactors

Drive	Nominal power	Order no. motor protection switch	Rated continuous current motor protection switch	Order no. power contactor
LXM28AUA5	50	GV2L10	6.3	LC1K0610••
LXM28AU01	100	GV2L10	6.3	LC1K0610••
LXM28AU02	200	GV2L14	10	LC1D09••
LXM28AU04	400	GV2L14	10	LC1D09••
LXM28AU07	750	GV2L16	14	LC1D12••
LXM28AU15	1500	GV2L22	25	LC1D18••
LXM28AU20	2000	GV2L32	30	LC1D32••
LXM28AU30	3000	GV2L32	30	LC1D32••

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

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

13 Service, maintenance and disposal

The product may only be repaired by a Schneider Electric customer service center.

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

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

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

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

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

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DANGER

HAZARD DUE TO ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only qualified personnel may install, adjust, repair and maintain this equipment.
- Do not touch any connectors, contacts, terminals, unshielded components or printed circuit boards while the equipment is under power.
- Use only electrically insulated tools.
- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- Insulate both ends of unused conductors of the motor cable to help prevent AC voltage from coupling to unused conductors in the motor cable.
- Do not short across the DC bus terminals or the DC bus capacitors.
- Before performing work on the drive system:
  - Disconnect all power, including external control power that may be present.
  - Place a "Do Not Turn On" label on all power switches.
  - Lock all power switches in the open position.
  - Wait 15 minutes to allow the DC bus capacitors to discharge.
  - Measure the voltage on the DC bus as per chapter "DC bus voltage measurement" and verify the voltage is less than 42 Vdc.
  - Do not assume that the DC bus is voltage-free when the DC bus LED is off.
- Refit/replace and secure all covers, accessories, hardware, cables, and wires and verify that a proper ground connection exists before applying power to the unit.

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

13.1 Service address

If you cannot resolve an error yourself please contact your sales office. Have the following details available:

- Nameplate (type, identification number, serial number, DOM, ...)
- Type of error (with LED flash code or error code)
- Previous and concomitant circumstances
- Your own assumptions concerning the cause of the error

Also include this information if you return the product for inspection or repair.

If you have any questions please contact your sales office. Your sales office staff will be happy to give you the name of a customer service office in your area.

http://www.schneider-electric.com

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13.2 Maintenance

Prior to any type of work on the drive system, consult the chapters on Installation and Commissioning for information on the precautions and processes to be observed.

Repairs cannot be made with the device installed.

13.2.1 Maintenance of drive

Include the following points in the maintenance plan of your machine.

Connections and fastening

- Check all connection cables and connectors regularly for damage. Replace damaged cables immediately.
- Tighten all mechanical and electrical threaded connections to the specified torque.

Cleaning

Clean dust and dirt off the product at regular intervals. Insufficient heat dissipation to the ambient air may excessively increase the temperature.

13.2.1.1 Lifetime safety function STO

The STO safety function is designed for a lifetime of 20 years. After this period, the data of the safety function are no longer valid. The expiry date is determined by adding 20 years to the DOM shown on the nameplate of the product.

- This date must be included in the maintenance plan of the system.

  Do not use the safety function after this date.

Example

The DOM on the nameplate of the product is shown in the format DD.MM.YY, for example 31.12.08. (31 December 2008). This means: Do not use the safety function after December 31, 2028.

13.2.2 Maintenance of motor

Include the following points in the maintenance plan of your machine.

Connections and fastening

- Inspect all connection cables and connectors regularly for damage. Replace damaged cables immediately.
- Verify that all output elements are firmly seated.
- Tighten all mechanical and electrical threaded connections to the specified torque.

Lubricating the shaft sealing ring

In the case of motors with shaft sealing ring, lubricant must be applied to the space between the sealing lip of the shaft sealing ring and the shaft with a suitable non-metallic tool. If the shaft sealing rings are allowed to run dry, the service life of the shaft sealing rings will be significantly reduced.

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Cleaning

If the permissible ambient conditions are not respected, external substances from the environment may penetrate the product and cause unintended movement or equipment damage.

⚠ WARNING

UNINTENDED MOVEMENT

- Verify that the ambient conditions are respected.
- Do not allow seals to run dry.
- Keep liquids from getting to the shaft bushing (for example, in mounting position IM V3).
- Do not expose the shaft sealing rings and cable entries of the motor to the direct spray of a pressure washer.

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

Clean dust and dirt off the product at regular intervals. Insufficient heat dissipation to the ambient air may excessively increase the temperature.

Motors are not suitable for cleaning with a pressure washer. The high pressure may force water into the motor.

When using solvents or cleaning agents, verify that the cables, cable entry seals, O-rings and motor paint are not damaged.

Replacing the rolling bearing

When the rolling bearing is replaced, the motor is partially demagnetized and loses power.

NOTICE

INOPERABLE EQUIPMENT

Do not replace the rolling bearing.

Failure to follow these instructions can result in equipment damage.

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13.3 Replacement of drive

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only start the system if there are no persons or obstructions in the zone of operation.
- Do not operate the drive system with unknown settings or data.
- Never modify a parameter unless you fully understand the parameter and all effects of the modification.
- After modifications to settings, restart the drive and verify the saved data or settings.
- When commissioning the product, carefully run tests for all operating states and potential error situations.
- Verify the functions after replacing the product and also after making modifications to the settings or data.

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

Prepare a list with the parameters required for the functions used.

Observe the following procedure when replacing devices.

- Save all parameter settings. Save the data to your PC using the commissioning software, see chapter *"6.4 Commissioning software"*.
- Power off all supply voltages. Verify that no voltages are present (safety instructions).
- Label all connections and remove all connection cables (unlock connector locks).
- Uninstall the product.
- Note the identification number and the serial number shown on the product nameplate for later identification.
- Install the new product as per chapter *"5 Installation"*.
- If the product to be installed has previously been used in a different system or application, you must restore the factory settings before commissioning the product.
- Commission the product as per chapter *"6 Commissioning"*.

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13.4 Changing the motor

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

⚠ WARNING

UNINTENDED MOVEMENT

Only use approved combinations of drive and motor.

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

For the list of the combinations see chapter *"1.5 Permissible product combinations"*.

- Switch off all supply voltages. Verify that no voltages are present (safety instructions).
- Label all connections and uninstall the product.
- Note the identification number and the serial number shown on the product nameplate for later identification.
- Install the new product as per chapter *"5 Installation"*.
- Commission the product as per chapter *"6 Commissioning"*.

If the connected motor is replaced by another approved motor, the new motor is automatically recognized by the drive.

13.5 Shipping, storage, disposal

Respect the ambient conditions in chapter *"2.1 Ambient conditions"*.

Shipping The product must be protected against shocks during transportation. If possible, use the original packaging for shipping.

Storage The product may only be stored in spaces where the specified permissible ambient conditions are met.
Protect the product from dust and dirt.

Disposal The product consists of various materials that can be recycled. Dispose of the product in accordance with local regulations.

Visit http://www.schneider-electric.com/green-premium for information and documents on environmental protection as per ISO 14025 such as:

- EoLi (Product End-of-Life Instructions)
- PEP (Product Environmental Profile)

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Glossary

Terms and Abbreviations

See chapter *" Terminology Derived from Standards"* for information on the pertinent standards on which many terms are based. Some terms and abbreviations may have specific meanings with regard to the standards.

Actual value In control engineering, the actual value is the value of the controlled variable at a given instant (for example, actual velocity, actual torque, actual position). The actual value is an input value (measured value) used by the control loops to reach the reference value.

Degree of protection The degree of protection is a standardized specification for electrical equipment that describes the protection against the ingress of foreign objects and water (for example: IP 20).

DOM **D**ate **o**f **m**anufacturing: The nameplate of the product shows the date of manufacture in the format DD.MM.YY or in the format DD.MM.YYYY. For example:
31.12.11 corresponds to December 31, 2011
31.12.2011 corresponds to December 31, 2011

Electronic gear Calculation of a new output velocity for the motor movement based on the input velocity and the values of an adjustable gear ratio; calculated by the drive system.

EMC Electromagnetic compatibility

Encoder Sensor that converts a measured distance or angle into an electrical signal. This signal is evaluated by the drive to determine the actual position of a shaft (rotor) or a driving unit.

Error Discrepancy between a detected (computed, measured or signaled) value or condition and the specified or theoretically correct value or condition.

Fault Fault is an operating state. If the monitoring functions detect an error, a transition to this operating state is triggered, depending on the error class. A "Fault Reset" or a power cycle are required to exit this operating state. Prior to this, the cause of the detected error must be removed. Further information can be found in the pertinent standards such as IEC 61800-7, ODVA Common Industrial Protocol (CIP).

Fault Reset Function used to exit the operating state Fault. Before the function is used, the cause of the detected error must be removed.

Internal units Resolution of the power stage at which the motor can be positioned. Internal units are specified in increments.

IT mains Mains in which all active components are isolated from ground or are grounded by a high impedance. IT: isolé terre (French), isolated ground.
Opposite: Grounded mains, see TT/TN mains

Limit switch Switches that signal overtravel of the permissible range of travel.

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Monitoring function Monitoring functions acquire a value continuously or cyclically (for example, by measuring) in order to check whether it is within permissible limits. Monitoring functions are used for error detection. Monitoring functions are not safety functions.

PELV Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41

Position deviation The position deviation is the difference between reference position and actual position. The current position deviation consists of the load-dependent position deviation and the dynamic position deviation.

Power stage The power stage controls the motor. The power stage generates current for controlling the motor on the basis of the motion signals from the controller.

rms "Root Mean Square" value of a voltage (V_{rms}) or a current (A_{rms})

Safety function Safety functions are defined in the standard IEC 61800-5-2 (for example, Safe Torque Off (STO), Safe Operating Stop (SOS) or Safe Stop 1 (SS1)). If the safety functions are wired properly, they meet the requirements specified in IEC 61800-5-2.

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