LXM32S

AC servo drive
Product manual

V2.0, 03.2016

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Green Premium™ Product

Schneider Electric

www.schneider-electric.com

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, 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 messages 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.

Depending on the seriousness of the hazard, the safety instructions are divided into 4 hazard categories.

⚠ DANGER

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

⚠ WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

⚠ CAUTION

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

NOTICE

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

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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 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.

Intended use

This product is a drive for three-phase servo motors and intended for industrial use according to this manual.

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

Prior to using the product, 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 product is used as a component in an entire system, you must ensure the safety of persons by means of the design of this entire system (for example, machine design).

Operate the product 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.

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Basic information

⚠ ⚠ DANGER

HAZARD DUE TO ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation and who have received safety training to recognize and avoid hazards involved are authorized to work on and with this drive system. Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- The system integrator is responsible for compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Many components of the product, including the printed circuit board, operate with mains voltage. Do not touch. Use only electrically insulated tools.
- Do not touch unshielded components or terminals with voltage present.
- The motor itself generates voltage when the motor shaft is rotated. Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- AC voltage can couple voltage to unused conductors in the motor cable. Insulate both ends of unused conductors of 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 <42 Vdc. The DC bus LED is not an indicator of the absence of DC bus voltage.
- Install and close all covers before applying voltage.

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

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

⚠ WARNING

UNEXPECTED MOVEMENT

- 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 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 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 USA: 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”.

The product is not approved for use in hazardous areas (explosive atmospheres).

⚠ WARNING

EXPLOSION HAZARD

Only use this device outside of hazardous areas (explosive atmospheres).

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

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

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machine and connected networks via insufficiently secure access to software and networks.

⚠ WARNING

UNAUTHORIZED ACCESS TO THE MACHINE VIA SOFTWARE AND NETWORKS

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

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

DC bus voltage measurement

The DC bus voltage can exceed 800 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 (>800 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.

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

Functional safety

Using the safety functions integrated in this product requires careful planning. See chapter *"4.9 Safety function STO ("Safe Torque Off")"*, page *75* for additional information.

An pluggable safety module is available as an accessory; this module provides additional safety functions for the device. See the manual for the module for information on the extended safety functions.

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Standards and terminology

Technical terms, terminology and the corresponding descriptions in this manual are intended to use the terms or definitions of the pertinent standards.

In the area of drive systems, this includes, but is not limited to, terms such as "safety function", "safe state", "fault", "fault reset", "failure", "error", "error message", "warning", etc.

Among others, these standards include:

- 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"
- IEC 61784 series: "Industrial communication networks – Profiles"
- IEC 61508 series: "Functional safety of electrical/electronic/programmable electronic safety-related systems"

Also see the glossary at the end of this manual.

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About the book

This manual is valid for LXM32S standard products. Chapter *"1 Introduction"* lists the type code for this product. The type code allows you to identify whether your product is a standard product or a customized version.

The following manuals belong to this product:

- **Product manual**, describes the technical data, installation, commissioning and the operating modes and functions.
- **Motor manual**, describes the technical characteristics of the motors, including correct installation and commissioning.
- **Module manuals**, descriptions required for using modules.

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)

Inverted signals Inverted signals are represented by an overline, for example $\overline{\texttt{STO\_A}}$ or $\overline{\texttt{STO\_B}}$.

Logic types The product supports logic type 1 and logic type 2 for digital signals. Note that most of the wiring examples show the logic type 1. The STO safety function must be wired using the logic type 1.

Glossary Explanations of special technical terms and abbreviations.

Index List of keywords with references to the corresponding page numbers.

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Further reading

Recommended literature for further reading:

- Ellis, George: Control System Design Guide. Academic Press
- Kuo, Benjamin; Golnaraghi, Farid: Automatic Control Systems. John Wiley & Sons

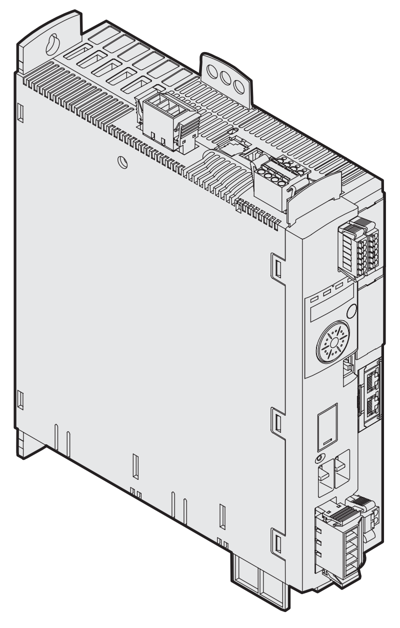
1 Introduction

1.1 Device overview

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

Lexium servo drive LXM32S

This product manual describes the LXM32S servo drive.



Overview of some of the features of the servo drive:

- Communication interface for SERCOS III; the reference values for numerous operating modes are supplied via this interface.
- An encoder module allows you to add a second encoder interface for digital encoders, analog encoders or resolvers.
- The product is commissioned via the integrated HMI or a PC with commissioning software.
- The safety function "Safe Torque Off" (STO) as per IEC 61800-5-2 is implemented on board. The optional safety module eSM offers additional safety functions.
- A memory card slot is provided for backup and copying of parameters and fast device replacement.

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1.2 Components and interfaces

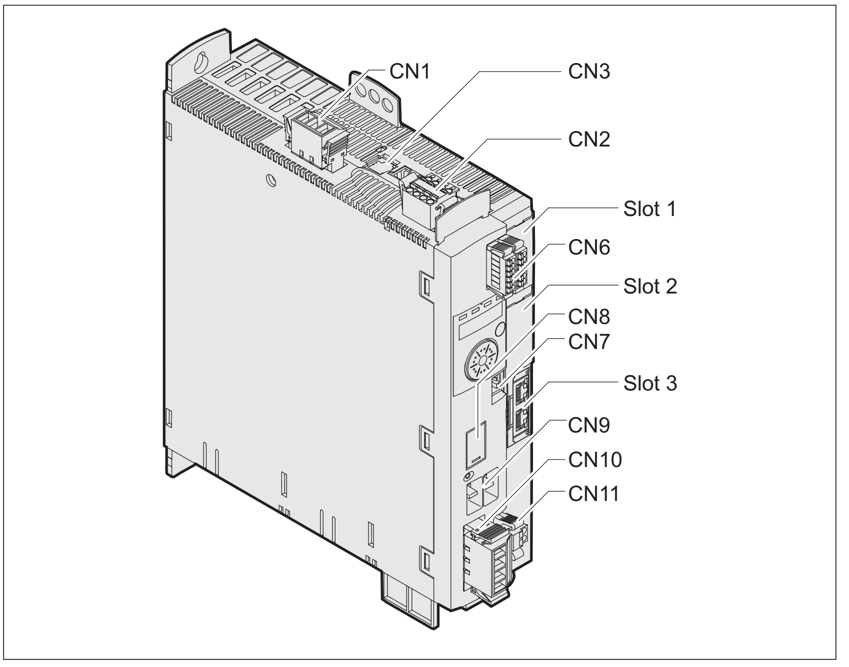

Figure 1: Overview of connections

(CN1) Mains connection (power stage supply)

(CN2) Connection for

- 24V controller supply
- Safety function STO

(CN3) Motor encoder connection (encoder 1)

(CN6) Inputs and outputs

- 6 configurable digital inputs
- 3 configurable digital outputs

(CN7) Modbus (commissioning interface)

(CN8) Connection for external braking resistor

(CN9) DC bus connection

(CN10) Motor phases connection

(CN11) Motor holding brake connection

(Slot 1) Slot for safety module

(Slot 2) Slot for encoder module (encoder 2)

(Slot 3) Fieldbus SERCOS III

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1.3 Nameplate

The nameplate contains the following data:

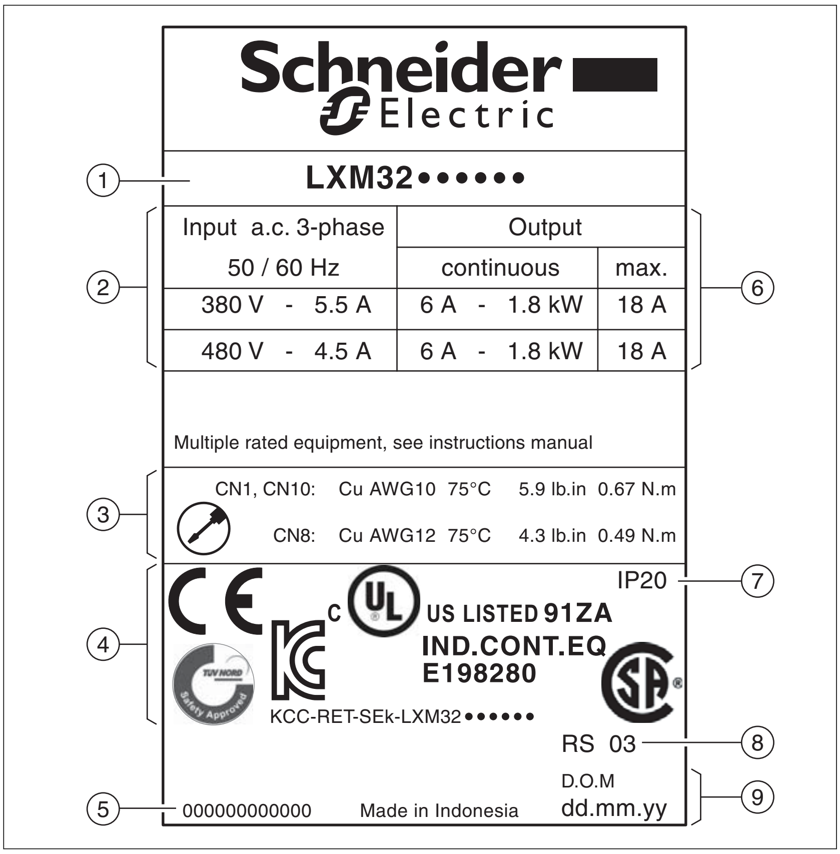

Figure 2: Nameplate

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

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1.4 Type code

LXM	32	S	D18	M2	••••

Product designation
LXM = Lexium

Product type
32 = AC servo drive for one axis

Interfaces
S = Modular Drive with fieldbus SERCOS III

Peak current
U45 = 4.5 A_{rms}
U60 = 6 A_{rms}
U90 = 9 A_{rms}
D12 = 12 A_{rms}
D18 = 18 A_{rms}
D30 = 30 A_{rms}
D72 = 72 A_{rms}

Power stage supply
M2 = 1~, 115/200/240 Vac
N4 = 3~, 208/400/480 Vac

Further options

If you have questions concerning the type code, contact your Schneider Electric sales office. Contact your machine vendor if you have questions concerning customized versions.

Customized version: Position 12 of the type code is an "S". The subsequent number defines the customized version. Example: LXM32S••••• **S123**

The device designation is shown on the nameplate.

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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

Climatic environmental conditions transportation and storage

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

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

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 (no icing, non-condensing)	°C (°F)	0 ... 50 (32 ... 122)

The following relative humidity is permissible during operation:

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

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

Installation site and connection

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

Pollution degree and degree of protection

Pollution degree		2
Degree of protection		IP 20

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.

Vibration and shock

Vibration, sinusoidal		Tested as per IEC 60068-2-6 3.5 mm (2 ... 8.4 Hz) 10 m/s² (8.4 ... 200 Hz)
Shock, semi-sinusoidal		Tested as per IEC 60068-2-27 150 m/s² (for 11 ms)

2.2 Mechanical data

2.2.1 Dimensional drawings

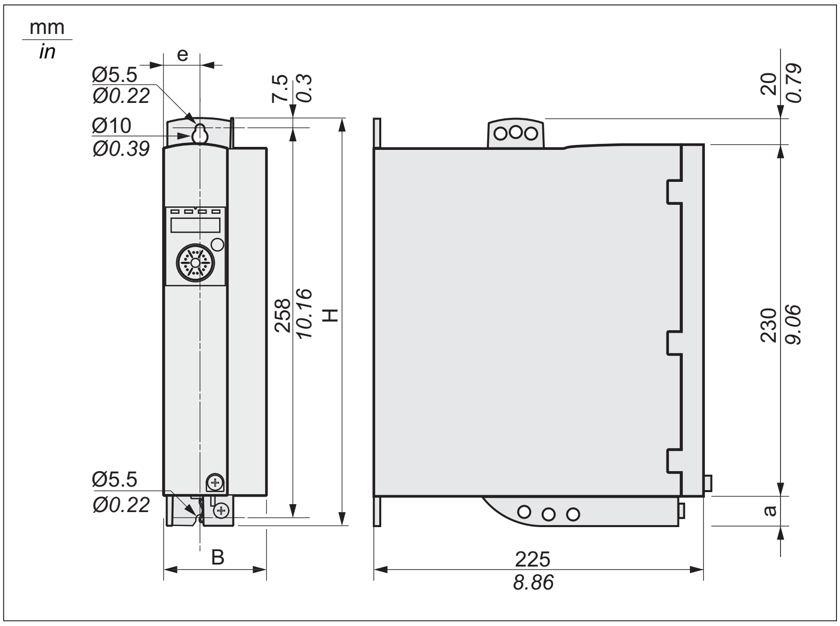

Figure 3: Dimensional drawing

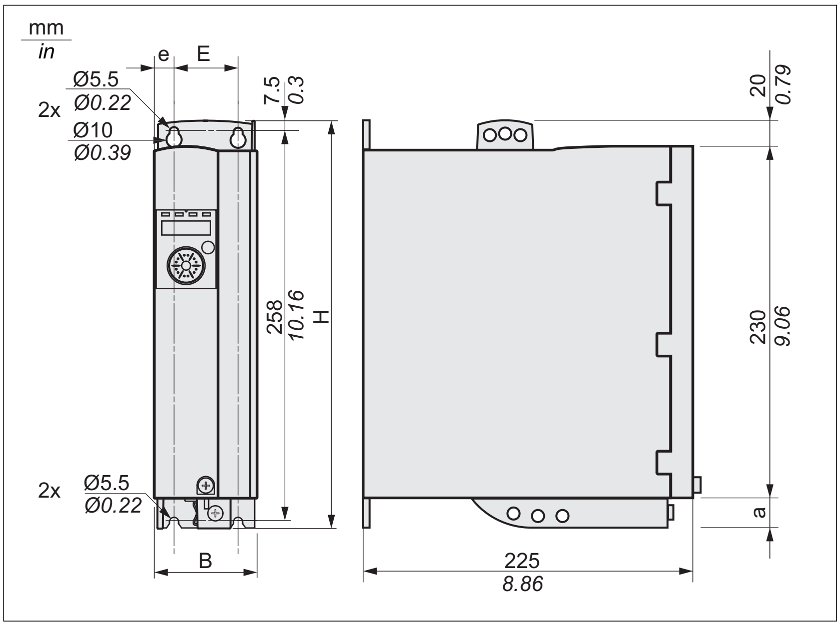

Figure 4: Dimensional drawing

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LXM32•...		U45 U60 U90	D12 D18 D30M2	D30N4	D72
Figure		*Figure 3*	*Figure 3*	*Figure 4*	*Figure 4*
B	mm (in)	48 ±1 (1.99)	48 ±1 (1.99)	68 ±1 (2.68)	108 ±1 (4.25)
H	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	274 (10.79)
e	mm (in)	24 (0.94)	24 (0.94)	13 (0.51)	13 (0.51)
E	mm (in)	-	-	42 (1.65)	82 (3.23)
a	mm (in)	20 (0.79)	20 (0.79)	20 (0.79)	24 (0.94)
Type of cooling		Convection [1)]	Fan 40 mm	Fan 60 mm	Fan 80 mm

1) >1 m/s

The connection cables of the devices are routed to the top and to the bottom. The following distances are required in order to enable sufficient air circulation and cable installation without bends:

- At least 100 mm (3.94 in) of free space is required above the device.
- At least 100 mm (3.94 in) of free space is required below the device.
- At least 60 mm (2.36 in) of free space is required in front of the device. The controls must be accessible.

Mass

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

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2.3 Electrical Data

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

2.3.1 Power stage

Mains voltage: range and tolerance

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

Transient overvoltages		Overvoltage category III [1]
Rated voltage to ground	Vac	300

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

Type of mains (type of grounding)

TT grounding system, TN grounding system	approved
IT mains	Depends on hardware version ≥RS 02: Approved [1] <RS02: not approved
Mains with grounded line conductor	Not approved

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

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. If you use an RCD, take into account that a 30 mA RCD can already trigger at 15 mA. In addition, there is a high-frequency leakage current which is not considered in the measurement. The response to this depends on the type of residual current device.

Harmonic currents and impedance

The harmonic currents depend on the impedance of the supply mains. This is expressed in terms of the short-circuit current of the supply mains. If the supply mains has a higher short-circuit current than indicated in the Technical Data for the device, use upstream mains reactors. See chapter *"11.12 Mains reactors"* for suitable mains reactors.

Monitoring the continuous output current

The continuous output current is monitored by the device. If the continuous output current is permanently exceeded, the device reduces the output current. The continuous output current can flow if the ambient temperature is below 50°C (122 °F) and if the internal braking resistor does not generate heat.

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.

PWM frequency power stage	kHz	8

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Approved motors

The following motors can be connected to this device family: BMH, BSH.
When selecting, consider the type and amount of the mains voltage and the motor inductance.

Further conditions must be met if you use the safety module eSM.

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

Inquire for other motors.

Inductance of motor

The permissible minimum inductance of the motor to be connected depends on the device type and the nominal mains voltage. See the tables on pages *31* to *35* for the values.

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

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2.3.1.1 Data for single-phase devices at 115 Vac

LXM32•...		U45M2	U90M2	D18M2	D30M2
Nominal voltage (single-phase)	Vac	115	115	115	115
Inrush current limitation	A	1.7	3.5	8	16
Maximum fuse to be connected upstream [1]	A	25	25	25	25
Short-circuit current rating (SCCR)	kA	12	12	12	12
Continuous output current	A_{rms}	1.5	3	6	10
Peak output current	A_{rms}	3	6	10	15
Minimum inductance motor (phase/ phase)	mH	5.5	3	1.4	0.8
Values without mains reactor					
Nominal power [2]	kW	0.15	0.3	0.5	0.8
Input current [2] [3]	A_{rms}	2.9	5.4	8.5	12.9
THD (total harmonic distortion) [2] [4]	%	173	159	147	135
Power dissipation [5]	W	7	15	28	33
Maximum inrush current [6]	A	111	161	203	231
Time for maximum inrush current	ms	0.8	1.0	1.2	1.4
Values with mains reactor					
Mains reactor	mH	5	2	2	2
Nominal power	kW	0.2	0.4	0.8	0.8
Input current [3]	A_{rms}	2.6	5.2	9.9	9.9
THD (total harmonic distortion) [4]	%	85	90	74	72
Power dissipation [5]	W	8	16	32	33
Maximum inrush current [6]	A	22	48	56	61
Time for maximum inrush current	ms	3.3	3.1	3.5	3.7

1) As per IEC 60269; Circuit breakers with B or C characteristic; See *"2.4 Conditions for UL 508C and CSA"* 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 single-phase devices at 230 Vac

LXM32•...		U45M2	U90M2	D18M2	D30M2
Nominal voltage (single-phase)	Vac	230	230	230	230
Inrush current limitation	A	3.5	6.9	16	33
Maximum fuse to be connected upstream [1]	A	25	25	25	25
Short-circuit current rating (SCCR)	kA	12	12	12	12
Continuous output current	A_{rms}	1.5	3	6	10
Peak output current	A_{rms}	4.5	9	18	30
Minimum inductance motor (phase/ phase)	mH	5.5	3	1.4	0.8
Values without mains reactor					
Nominal power [2]	kW	0.3	0.5	1.0	1.6
Input current [2] [3]	A_{rms}	2.9	4.5	8.4	12.7
THD (total harmonic distortion) [2] [4]	%	181	166	148	135
Power dissipation [5]	W	10	18	34	38
Maximum inrush current [6]	A	142	197	240	270
Time for maximum inrush current	ms	1.1	1.5	1.8	2.1
Values with mains reactor					
Mains reactor	mH	5	2	2	2
Nominal power	kW	0.5	0.9	1.6	2.2
Input current [3]	A_{rms}	3.4	6.3	10.6	14.1
THD (total harmonic distortion) [4]	%	100	107	93	86
Power dissipation [5]	W	11	20	38	42
Maximum inrush current [6]	A	42	90	106	116
Time for maximum inrush current	ms	3.5	3.2	3.6	4.0

1) As per IEC 60269; Circuit breakers with B or C characteristic; See *"2.4 Conditions for UL 508C and CSA"* 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 Data for three-phase devices at 208 Vac

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

1) As per IEC 60269; Circuit breakers with B or C characteristic; See *"2.4 Conditions for UL 508C and CSA"* 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 nominal power and nominal voltage
3) with reference to the input current
4) Condition: internal braking resistor not active; value at nominal current, nominal voltage and nominal power; value approximately proportional with output current
5) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

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2.3.1.4 Data for three-phase devices at 400 Vac

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

1) As per IEC 60269; Circuit breakers with B or C characteristic; See *"2.4 Conditions for UL 508C and CSA"* 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 nominal power and nominal voltage
3) with reference to the input current
4) Condition: internal braking resistor not active; value at nominal current, nominal voltage and nominal power; value approximately proportional with output current
5) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

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2.3.1.5 Data for three-phase devices at 480 Vac

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

1) As per IEC 60269; Circuit breakers with B or C characteristic; See *"2.4 Conditions for UL 508C and CSA"* 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 nominal power and nominal voltage
3) with reference to the input current
4) Condition: internal braking resistor not active; value at nominal current, nominal voltage and nominal power; value approximately proportional with output current
5) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

2.3.1.6 Peak output currents

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

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

With hardware version ≥RS03: 5 seconds

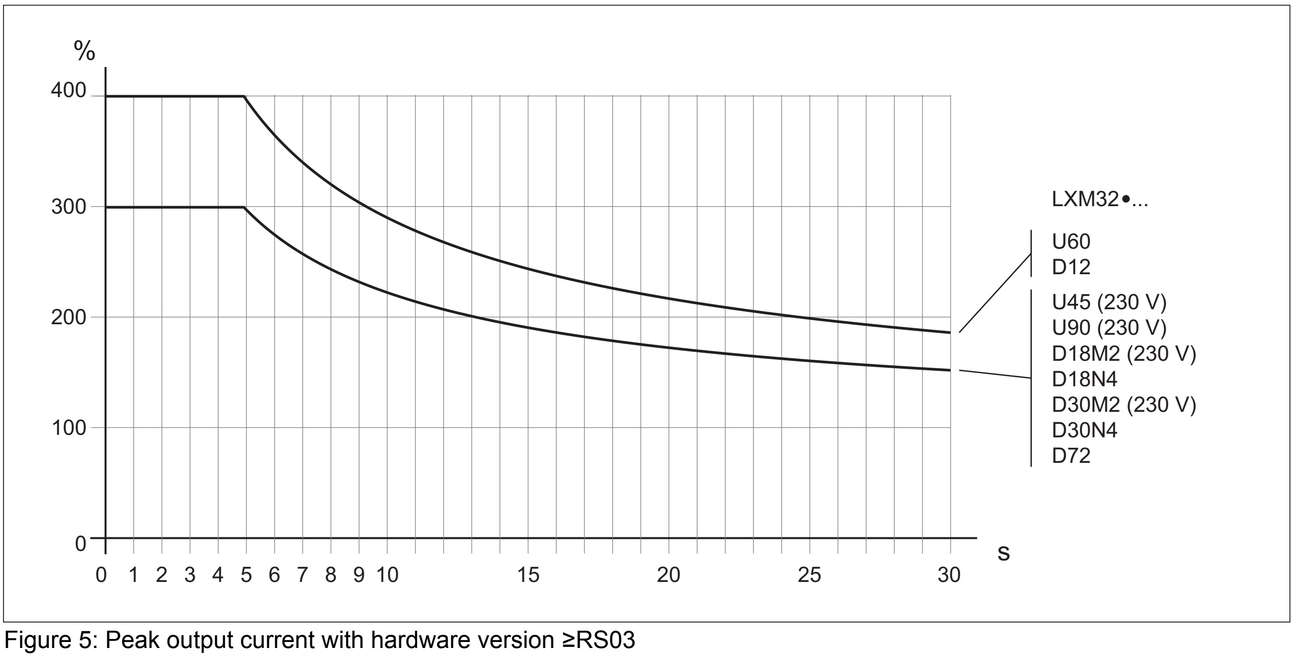

Figure 5: Peak output current with hardware version ≥RS03

With hardware version <RS03: 1 second

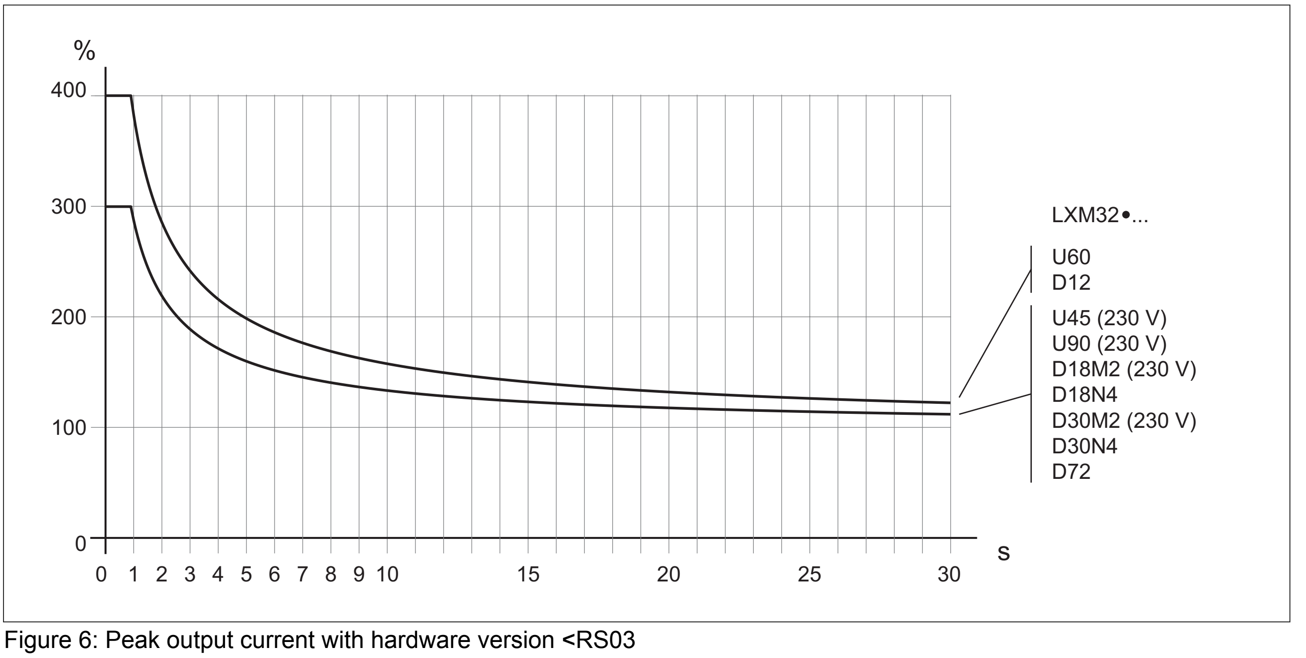

Figure 6: Peak output current with hardware version <RS03

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2.3.1.7 DC bus data for single-phase devices

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

2.3.1.8 DC bus data for three-phase devices

LXM32•...		U60N4	D12N4	D18N4	D30N4	D72N4
Nominal voltage (3 ~)	V	208	208	208	208	208
Nominal voltage DC bus	V	294	294	294	294	294
Undervoltage limit	V	150	150	150	150	150
Voltage limit: activation of Quick Stop	V	160	160	160	160	160
Overvoltage limit	V	820	820	820	820	820
Maximum continuous power via DC bus	kW	0.4	0.8	1.7	2.8	6.5
Maximum continuous current via DC bus	A	1.5	3.2	6.0	10.0	22.0

LXM32•...		U60N4	D12N4	D18N4	D30N4	D72N4
Nominal voltage (3 ~)	V	400	400	400	400	400
Nominal voltage DC bus	V	566	566	566	566	566
Undervoltage limit	V	350	350	350	350	350
Voltage limit: activation of Quick Stop	V	360	360	360	360	360
Overvoltage limit	V	820	820	820	820	820
Maximum continuous power via DC bus	kW	0.8	1.6	3.3	5.6	13.0
Maximum continuous current via DC bus	A	1.5	3.2	6.0	10.0	22.0

LXM32•...		U60N4	D12N4	D18N4	D30N4	D72N4
Nominal voltage (3 ~)	V	480	480	480	480	480
Nominal voltage DC bus	V	679	679	679	679	679
Undervoltage limit	V	350	350	350	350	350
Voltage limit: activation of Quick Stop	V	360	360	360	360	360
Overvoltage limit	V	820	820	820	820	820
Maximum continuous power via DC bus	kW	0.8	1.6	3.3	5.6	13.0
Maximum continuous current via DC bus	A	1.5	3.2	6.0	10.0	22.0

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2.3.2 Controller supply voltage 24V

24V supply

The `+24VDC` controller supply must meet the requirements of IEC 61131-2 (PELV standard power supply unit):

Input voltage	Vdc	24 (-15/+20 %) 1)
Input current (without load)	A	≤1 2)
Residual ripple	%	<5
Inrush current		Charging current for capacitor C= 1.8 mF

1) For connection of motors without holding brake; see figure below for motors with holding brake
2) Input current: holding brake not considered.

Controller supply in the case of motor with holding brake

If a motor with holding brake is connected, the 24 Vdc controller supply must be adjusted according to the connected motor type, the motor cable length and the cross section of the wires for the holding brake. The following diagram applies to the motor cables available as accessories, see chapter *"11.7 Motor cables"*. Refer to the diagram for the voltage that must be available at CN2 for releasing the holding brake. The voltage tolerance is ±5 %.

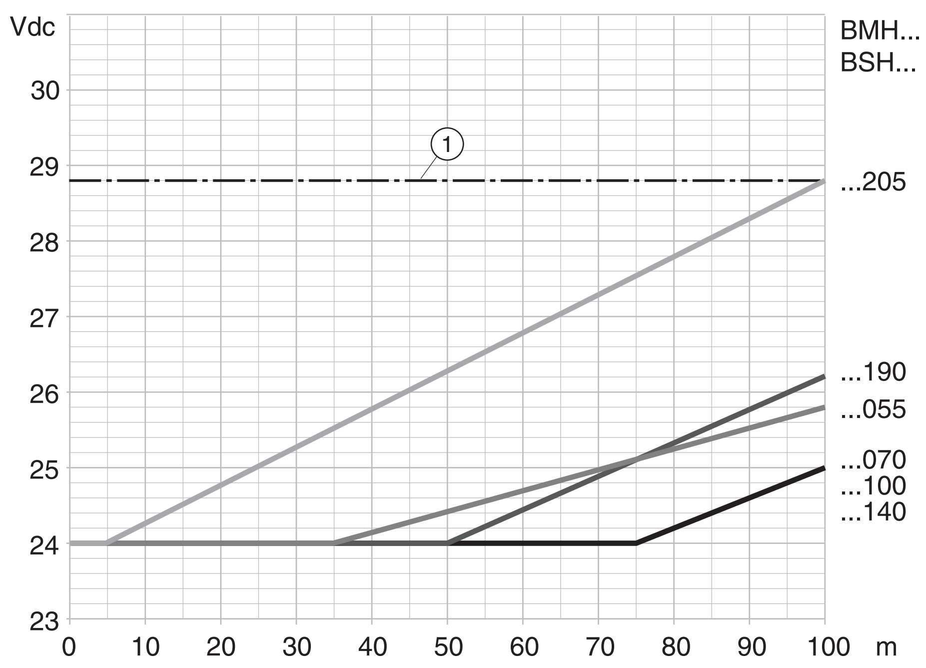

Figure 7: Controller supply in the case of motor with holding brake: the voltage depends on the motor type, the motor cable length and the conductor cross section.

(1) Maximum voltage of controller supply

2.3.3 Signals

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

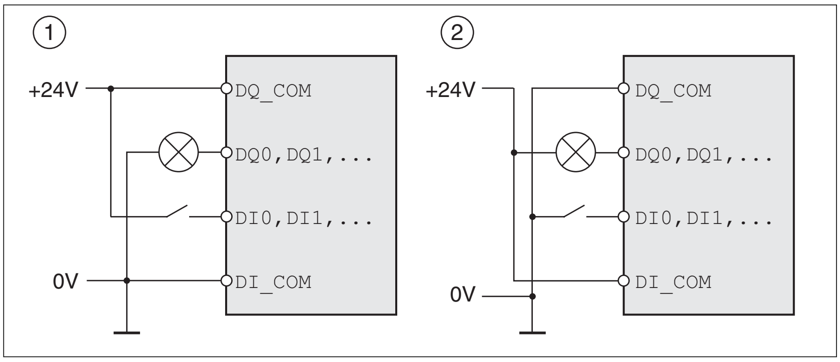

Figure 8: Logic type

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

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

Digital input signals 24 V

When wired as logic type 1, the levels of the opto-isolated inputs DI• comply with IEC 61131-2, type 1.

Level 0 with logic type 1 (U_{low})	Vdc	-3 ... 5
Level 1 with logic type 1 (U_{high})	Vdc	15 ... 30
Input current (typical)	mA	5
Debounce time [1)]	ms	1.5

1) Adjustable via parameter (sampling period 250µs)

Capture input signals 24 V

When wired as "logic type 1", the levels of the opto-isolated inputs Cap• comply with IEC 61131-2, type 1.

Level 0 with logic type 1 (U_{low})	Vdc	-3 ... 5
Level 1 with logic type 1 (U_{high})	Vdc	15 ... 30
Input current (typical)	mA	5
Debounce time Capture `CAP •`	µs	2
Jitter Capture `CAP •`	µs	<2

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Input signals safety function STO

Level 0 with logic type 1 (U_{low})	Vdc	-3 ... 5
Level 1 with logic type 1 (U_{high})	Vdc	15 ... 30
Input current (typical)	mA	5
Debounce time $\overline{\text{STO\_A}}$ and $\overline{\text{STO\_B}}$	ms	>1
Detection of signal differences between $\overline{\text{STO\_A}}$ and $\overline{\text{STO\_B}}$	s	>1
Response time of safety function STO	ms	≤10

24 V output signals

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

Output voltage	V	≤30
Maximum switching current	mA	≤100
Voltage drop at 100 mA load	V	≤3

Holding brake output CN11

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

Output voltage 1)	V	Voltage at controller supply CN2 minus 0.8 V
Maximum switching current	A	1.7
Energy inductive load 2)	Ws	1.5

1) See *"2.3.2 Controller supply voltage 24V"*
2) Time between switch off procedures: > 1 s

Encoder signals

The encoder signals comply with the Stegmann Hiperface specification.

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

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

2.3.4 Functional safety

Data for maintenance plan and safety calculations

The safety function must be requested and 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 safety calculations:

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

1) See chapter *"12.2.1 Lifetime safety function STO"*.

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

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

2.3.5 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.

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.

LXM32•...		**U45M2**	**U90M2**	**D18M2**	**D30M2**
Resistance value of internal braking resistor	Ω	94	47	20	10
Continuous power internal braking resistor P_{PR}	W	10	20	40	60
Peak energy E_{CR}	Ws	82	166	330	550
External braking resistor minimum	Ω	68	36	20	10
External braking resistor maximum [1)]	Ω	110	55	27	16
Maximum continuous power external braking resistor	W	200	400	600	800
Capacitance of internal capacitor	µF	390	780	1170	1560
Parameter `DCbus_compat` **= 0** (default value)					
Switch-on voltage braking resistor	V	430	430	430	430
Energy absorption of internal capacitors E_{var} at nominal voltage 115 V +10%	Ws	30	60	89	119
Energy absorption of internal capacitors E_{var} at nominal voltage 200 V +10%	Ws	17	34	52	69
Energy absorption of internal capacitors E_{var} at nominal voltage 230 V +10%	Ws	11	22	33	44
Parameter `DCbus_compat` **= 1** (reduced switch-on voltage)					
Switch-on voltage braking resistor	V	395	395	395	395
Energy absorption of internal capacitors E_{var} at nominal voltage 115 V +10%	Ws	24	48	73	97
Energy absorption of internal capacitors E_{var} at nominal voltage 200 V +10%	Ws	12	23	35	46
Energy absorption of internal capacitors E_{var} at nominal voltage 230 V +10%	Ws	5	11	16	22

1) The maximum specified braking resistor can derate the peak power of the device. Depending on the application, it is possible to use a higher ohm resistor.

See chapter *"2.3.1.7 DC bus data for single-phase devices"*, page *37* for the DC bus data.

LXM32•...		U60N4	D12N4	D18N4	D30N4	D72N4
Resistance value of internal braking resistor	Ω	132	60	30	30	10
Continuous power internal braking resistor P_{PR}	W	20	40	60	100	150
Peak energy E_{CR}	Ws	200	400	600	1000	2400
External braking resistor minimum	Ω	70	47	25	15	8
External braking resistor maximum [1)]	Ω	145	73	50	30	12
Maximum continuous power external braking resistor	W	200	500	800	1500	3000
Capacitance of internal capacitor	μF	110	195	390	560	1120
Parameter DCbus_compat [2)]						
Switch-on voltage	V	780	780	780	780	780
Energy absorption of internal capacitors E_{var} at nominal voltage 208 V +10%	Ws	28	49	98	141	282
Energy absorption of internal capacitors E_{var} at nominal voltage 380 V +10%	Ws	14	25	50	73	145
Energy absorption of internal capacitors E_{var} at nominal voltage 400 V +10%	Ws	12	22	43	62	124
Energy absorption of internal capacitors E_{var} at nominal voltage 480 V +10%	Ws	3	5	10	14	28

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

See chapter *"2.3.1.8 DC bus data for three-phase devices"*, page *37* for the DC bus data.

Further information on the subject	Page
Rating the external braking resistor	*68*
Mounting the external braking resistor (accessory)	*90*
Electrical installation of the braking resistor (accessory)	*68*
Setting the braking resistor parameters	*160*
Order data for external braking resistors (accessory)	*481*

2.3.5.1 External braking resistors (accessories)

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
Maximum time in braking at 400 V / 480 V	s	0.12	0.084	0.216	0.504	0.3	0.78	1.92
Peak power at 400 V / 480 V	kW	60.8	22.5	22.5	22.5	8.5	8.5	8.5
Maximum peak energy at 400 V / 480 V	Ws	7300	1900	4900	11400	2500	6600	16200
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
Maximum time in braking at 400 V / 480 V	s	0.65	0.37
Peak power at 400 V / 480 V	kW	40.6	60.8
Maximum peak energy at 400 V / 480 V	Ws	26500	22500
Degree of protection		IP20	IP20
UL approval (file no.)		E221095	E221095

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2.3.6 Internal mains filter

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.

If the selected composition (product itself, mains filter, other accessories and measures) does not meet the requirements of category C1, the following information applies as per 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.

Emission

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

LXM32•	**•••M2**	**•••N4**
Conducted interference Motor cable length ≤10 m Motor cable length 10 ... ≤20 m	 Category C2 Category C3	 Category C3 Category C3
Radiated emission Motor cable length ≤20 m	 Category C3	 Category C3

External mains filters must be used if longer motor cables are used. See page *46* for the technical data of the external mains filters available as accessories.

Further information on the subject	**Page**
Engineering information external mains filters (accessory)	*66*
Mounting the external mains filter (accessory)	*90*
Electrical installation of external mains filters (accessory)	*105*
Order data external mains filters (accessory)	*487*

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2.3.7 External mains filters (accessories)

If external mains filters are used, the system integrator and/or machine owner/operator is responsible for complying with the EMC directives.

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.

LXM32•	**•••M2**	**•••N4**
Conducted interference Motor cable length ≤20 m Motor cable length >20 ... ≤50 m Motor cable length >50 ... ≤100 m	 Category C1 Category C2 Category C3	 Category C1 Category C2 Category C3
Radiated emission Motor cable length ≤100 m	 Category C3	 Category C3

Motor cables with a length exceeding 100 m are not permissible.

Common external mains filter

Several device can be connected to a common external mains filter. Prerequisites:

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

Assignment of external mains filters to device type

Device type 1 ~	**Order number mains filter**
LXM32•U45M2 (230 V, 1,5 A, 1 ~)	VW3A4420 (9 A, 1 ~)
LXM32•U90M2 (230 V, 3 A, 1 ~)	VW3A4420 (9 A, 1 ~)
LXM32•D18M2 (230 V, 6 A, 1 ~)	VW3A4421 (16 A, 1 ~)
LXM32•D30M2 (230 V, 10 A, 1 ~)	VW3A4421 (16 A, 1 ~)

Device type 3 ~	**Order number mains filter**
LXM32•U60N4 (480 V, 1,5 A, 3 ~)	VW3A4422 (15 A, 3 ~)
LXM32•D12N4 (480 V, 3 A, 3 ~)	VW3A4422 (15 A, 3 ~)
LXM32•D18N4 (480 V, 6 A, 3 ~)	VW3A4422 (15 A, 3 ~)
LXM32•D30N4 (480 V, 10 A, 3 ~)	VW3A4422 (15 A, 3 ~)
LXM32•D72N4 (480 V, 24 A, 3 ~)	VW3A4423 (25 A, 3 ~)

Further information on the subject	**Page**
Engineering information external mains filters (accessory)	*66*
Mounting the external mains filter (accessory)	*90*
Electrical installation of external mains filters (accessory)	*105*
Order data external mains filters (accessory)	*487*

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2.3.8 Mains reactor (accessory)

Mains reactor

Mains reactors must be connected upstream if the supply mains does not meet the requirements in terms of mains impedance. High current harmonics result in considerable load on the DC bus capacitors. Mains reactors reduce harmonics in the mains supply. The load on the DC bus capacitors has a decisive impact on the service life of the devices.

A higher continuous power of the device is an additional benefit of using an upstream mains reactor.

Further information on the subject	Page
Engineering information mains reactor (accessory)	*65*
Mounting the mains reactor (accessory)	*90*
Electrical installation of the mains reactor (accessory)	*105*
Order data mains reactor (accessory)	*487*

2.4 Conditions for UL 508C and CSA

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

Ambient temperature during operation

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

Fuses

Use fuses as per UL 248.

LXM32•...		**•••M2**	**•••N4**
Maximum fuse rating of fuse to be connected upstream	A	25	30
Class		CC or J	CC or J

Wiring

Use at least 60/75 °C copper conductors.

400/480 V three-phase devices

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

Overvoltage category

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

Motor Overload Protection

This equipment provides Solid State Motor Overload Protection at 110% of maximum FLA (Full Load Ampacity).

2.5 Certifications

Product certifications:

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

2.6 Declaration of conformity

Schneider Electric

EC DECLARATION OF CONFORMITY

We : **Schneider Electric Industry SA**
35 rue Joseph Monier
Rueil Malmaison 92506 – France

Hereby declare under our own responsibility that the products:

Trademark	Schneider Electric
Product	AC Servo drives including modules LXM32Axxxxx, LXM32Cxxxxx, LXM32Mxxxxx, LXM32Sxxxxx & options VW3 dedicated to LXM32
List of reference and options	See next page (s)

Serial number: ZZYYXXXXXXXX (ZZ: two last digit of the Year + 10; YY: supplier code; continuous number)

Are in conformity with the requirements of the following directives and conformity was checked in accordance with the following standards.

Directive	Harmonized standard / Notified body reference
Directive 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE CONCIL of 12 December 2006 on the harmonization of the laws of the member states relating to electrical equipment designed for use within certain voltage limits	EN 61800-5-1: 2007 Adjustable speed electrical power drive systems – Part 5-1: Safety requirements – Electrical, thermal and energy. (IEC 61800-5-1:2007)
Directive 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE CONCIL 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 Adjustable speed electrical power drive systems – part 3: EMC requirements and specific test methods. (IEC 61800-3:2004)
Directive 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE CONCIL of 17 May2006 on machinery, and amending Directive 95/16/EC (recast) Applying article 12(3)a, third alternative.	EN ISO 13849-1/2:2008 PL “e” Safety of machinery – Safety-related parts of control systems.
	EN61800-5-2:2007 SIL 3 Adjustable speed electrical power drive systems – Part 5-2: Safety requirements – Fonctional. (IEC 61800-5-2:2007)
	EN 62061:2005 SIL CL3 Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems.
	A volontary certification has been carried out by TÜV NORD Augsburg. Certificate n° SEBS-A.144502/13, V1.0

And also the standards:
UL508C: 2011, CSA 22.2N14: 2013
IEC 61508: 2002 (parts 1 & 2), SIL 3

Subject to correct installation, maintenance and use conforming to its intended purpose, to the applicable regulations and standards, to the supplier's instructions and to accepted rules of the art.
This declaration becomes invalid in the case of any modification to the products not authorized by us.

Compliance with the Machinery & EMC Directives will require the application of the Safety guide and EMC guide giving requirements, details and advices for installation of products used.
The guides are available on http://www.schneider-electric.com

The undersigned also agrees to transmit relevant information in response to a reasoned request from any adequate way by a national authority.
Person in charge of documentation:
Frédéric Roussel, Schneider Toshiba Inverter Europe, rue André Blanchet, 27120 Pacy/Eure – France.

First year of affixing the CE marking: 2010

Issued at Pacy sur Eure - FRANCE: 25/06/2014

Authorised Signatories

Name: Frederic Roussel
Title: Drives Certification Manager
Signature:

Name: Jean-Marie Amann
Title: Drives Products Line of Business VP
Signature:

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Schneider Electric

EC DECLARATION OF CONFORMITY

List of references LXM32:

Single phase 115Vac / 230Vac

Reference (1)	Range
LXM 32CU45M2	0,15 kW
LXM 32AU45M2	
LXM 32MU45M2	
LXM 32SU45M2	
LXM 32CU90M2	0,3 kW
LXM 32AU90M2	
LXM 32MU90M2	
LXM 32SU90M2	
LXM 32CD18M2	0,5 kW
LXM 32AD18M2	
LXM 32MD18M2	
LXM 32SD18M2	
LXM 32CD30M2	0,8 kW
LXM 32AD30M2	
LXM 32MD30M2	
LXM 32SD30M2	

Three phase 208V to 230Vac / 380V to 480Vac

Reference (1)	Range
LXM 32CU60N4	0,4 kW
LXM 32AU60N4	
LXM 32MU60N4	
LXM 32SU60N4	
LXM 32CD12N4	0,9 kW
LXM 32AD12N4	
LXM 32MD12N4	
LXM 32SD12N4	
LXM 32CD18N4	1,8 kW
LXM 32AD18N4	
LXM 32MD18N4	
LXM 32SD18N4	
LXM 32CD30N4	3 kW
LXM 32AD30N4	
LXM 32MD30N4	
LXM 32SD30N4	
LXM 32CD72N4	7 kW
LXM 32AD72N4	
LXM 32MD72N4	
LXM 32SD72N4	
LXM 32MD85N4	9KW
LXM 32MC10N4	11KW

(1) may be followed by S and by 1 to 3 character for customer specification

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Options considered with LXM 32:

Reference	Description
VW3A3601	EtherCAT RJ45
VW3A3607	PROFIBUS DP V1 SUB-D
VW3A3608	CANopen/CAN motion RJ45
VW3A3616	EtherNet/IP & Modbus-TCP RJ45
VW3A3618	CANopen/CAN motion SUB-D
VW3A3628	CANopen/CAN motion open style connector
VW3M3301	DeviceNet open style connector
VW3M3302	I/O module
VW3M3401	Encoder module RSR
VW3M3402	Encoder module DIG
VW3M3403	Encoder module ANA
VW3M3501	Safety module eSM
VW3M3609	Sercos II
VW3M3619	Sercos III

CE Declaration LXM32 & Options 2014.doc

2.7 TÜV certificate for functional safety

TÜV NORD

Certificate

No. SEBS-A.144502/13, V1.0

TÜV NORD Systems GmbH & Co. KG
certifies

Schneider Electric Automation GmbH
Breslauer Straße 7
77933 Lahr,

that the safety function “Safe Torque Off“ (STO) of the drive system

Lexium 32

within the variants LXM32XU45M2; LXM32XU90M2; LXM32XD18M2; LXM32XD30M2, LXM32XU60N4, LXM32XD12N4, LXM32XD18N4, LXM32XD30N4; LXM32XD72N4; LXM32XD85N4; LXM32XC10N4
is capable for safety applications up to SIL 3, PL e category 3.
The requirements of the following standards are fulfilled.

- **IEC 61508 Part 1:2010; Part 2:2010**
- **IEC 62061:2005**
- **IEC 61800-5-2:2007**
- **ISO 13849 Part 1:2006; Part 2:2012**

The certification is based on the report SEBS-A.144502TB1 in the valid version. This certificate entitles the holder to use the pictured safety approved mark.

Expire date: 2019-04-01
Reference No.: 8110398211

Augsburg, 2014-04-01

Gerhard M. Rieger

Voluntary Certification

TÜV NORD
TÜV NORD Systems GmbH & Co. KG
Safety Approved
LXM32
(STO)
IEC 61508 SIL 3
IEC 61800-5-2 SIL 3
IEC 62061 SIL_{CL} 3
ISO 13849 PL e (Cat.3)
SEBS-A.144502/13

TÜV NORD Systems GmbH & Co. KG, Branch South, Halderstr. 27, 86150 Augsburg, Germany

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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.

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 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.

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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 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 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 that is vital in the engineering phase.

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4.1 Electromagnetic compatibility (EMC)

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

> ⚠ **WARNING**
>
> **SIGNAL AND DEVICE INTERFERENCE**
>
> - Install the wiring in accordance with the EMC requirements described.
> - Verify compliance with the EMC requirements described.
> - 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 are implemented during installation.

If the selected composition (product itself, mains filter, other accessories and measures) does not meet the requirements of category C1, the following information applies as per 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.**

The specified limit values require EMC measures to be taken for mounting and wiring. Note the following requirements.

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Overview: EMC-compliant wiring

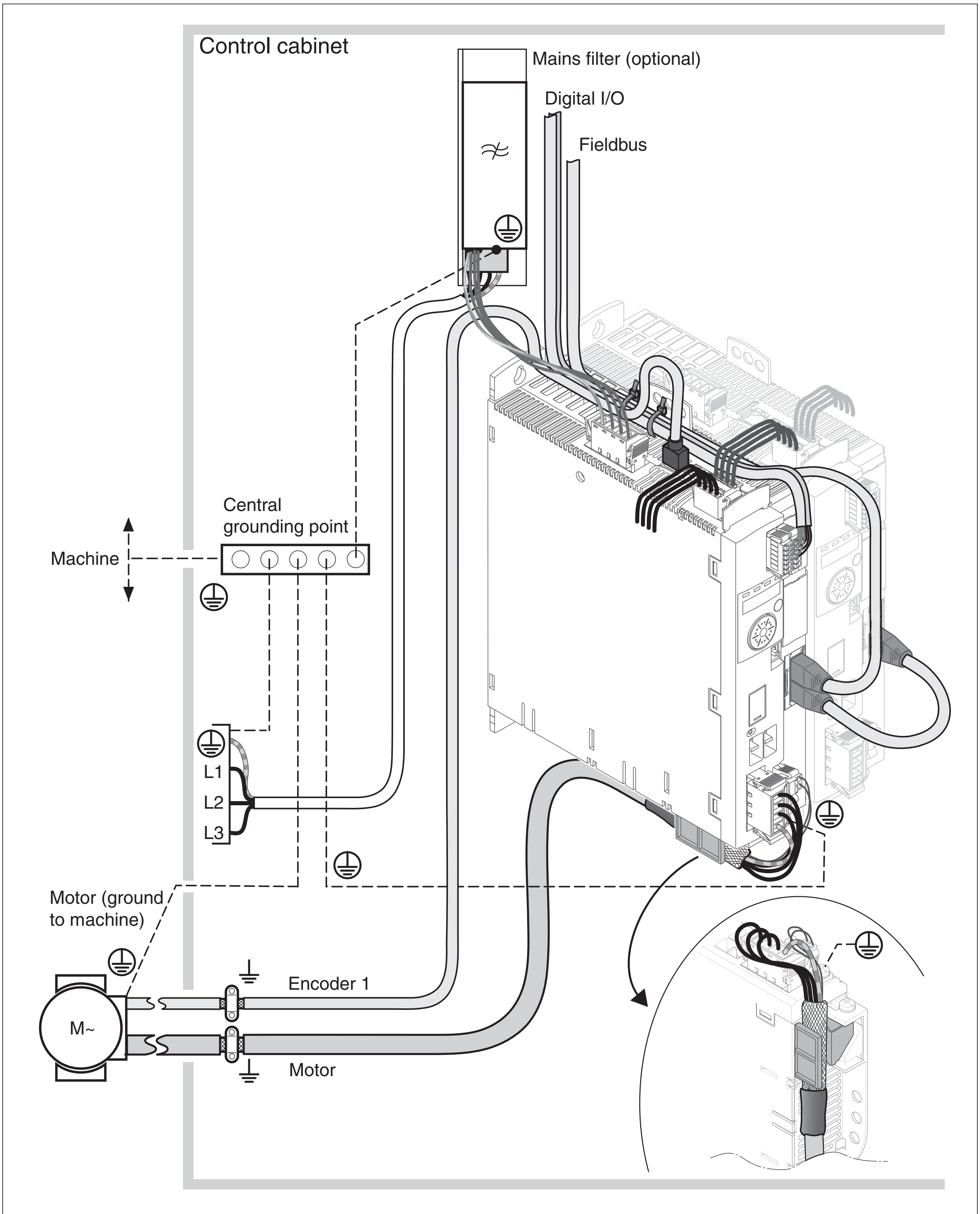

Figure 9: Overview of wiring under EMC considerations

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EMC requirements for the control cabinet

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

Shielded cables

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

Cable installation

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

Power supply

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

Motor and encoder cables

Motor and encoder cables are especially critical in terms of EMC. Use only pre-assembled cables (see chapter *"11 Accessories and spare parts"*) or cables that comply with the specifications (see chapter *"4.2 Cables"*, page *61*) and implement the EMC measures described below.

EMC measures	Objective
Do not install switching elements in motor cables or encoder cables.	Reduces interference.
Route the motor cable at a distance of at least 20 cm from the signal cable or use shielding plates between the motor cable and signal cable.	Reduces mutual interference
For long lines, use equipotential bonding conductors.	Reduces current in the cable shield.
Route the motor cable and encoder cable without cutting them. [1]	Reduces emission.

1) If a cable has to be cut for the installation, it has to be connected with shield connections and a metal housing at the point of the cut.

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Additional measures for EMC improvement

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

EMC measures	Objective
Use mains reactors	Reduces mains harmonics, prolongs product service life.
Use external mains filters	Improves the EMC limit values.
Additional EMC measures, for example mounting in a closed control cabinet with 15 dB shielding attenuation of radiated interference	Improves the EMC limit values.

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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

Connecting shields

Shield connection possibilities:

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

Equipotential bonding conductors

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

The equipotential bonding conductor must be rated for the maximum current flowing. Practical experience has shown that 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 for fixing the cables. The cable guide at the bottom of the device can also be used as a shield connection.

The cable guides must not be used as a strain relief.

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4.2.1 Overview of the required cables

The properties of the required cables are listed in the table below. Use pre-assembled cables to reduce the risk of wiring errors. Pre-assembled cables can be found in chapter *"11 Accessories and spare parts"*, page *481*. If the product is used to comply with the requirements as per UL 508C, the conditions specified in chapter *"2.4 Conditions for UL 508C and CSA"*, page *48*, must be met.

	Maximum length:	**Minimum cross section**	**Shielded, both ends grounded**	**Twisted pair**	**PELV**
Controller supply	–	0.75 mm^2 (AWG 18)			Required
Safety function STO 1)	–	0.75 mm^2 (AWG 18)	1)		Required
Power stage supply	–	– 2)			
Motor phases	– 3)	– 4)	Required		
External braking resistor	3 m	As power stage supply	Required		
Motor encoder	100 m	6 * 0.14 mm^2 and 2 * 0.34 mm^2 (6 * AWG 24 and 2 * AWG 20)	Required	Required	Required
Fieldbus SERCOS III	100 m	0.14 mm^2 (AWG 24)	Required	Required	Required
Digital inputs / outputs	30 m	0.14 mm^2 (AWG 24)			Required
PC, commissioning interface	20 m	0.14 mm^2 (AWG 24)	Required	Required	Required

1) Note the installation requirements (protected cable installation), see page *76*.
2) See *"5.3.7 Connection of power stage supply voltage (CN1)"*
3) Length depends on the required limit values for conducted interference.
4) See *"5.3.4 Connection motor phases and holding brake (CN10 and CN11)"*

Motor cable and encoder cable

Motor cables		Style 20234
Motor cable outside diameter	mm	VW3M5•01: 12 ±0.2 VW3M5•02: 14 ±0.3 VW3M5•03: 16.3 ±0.3 VW3M5•05: 19 ±0.3 VW3M5•04: 23.5 ±0.3
Permissible voltage motor cable	Vac	600 (UL and CSA)
Encoder cables		Style 20233
Encoder cable outside diameter	mm	VW3M8••2: 6.8 ±0.2
Temperature range	°C	-40 ... 90 (fixed) -20 ... 80 (moving)
Permissible bend radius		4 x diameter (fixed) 7.5 x diameter (moving)
Cable jacket		Oil-resistant PUR
Shielding		Shield braiding
Shield braiding coverage	%	≥85

The motor cables and encoder cables are suitable for drag chain applications; they are available in various lengths. See page *481* for the versions available as accessories.

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4.3 Residual current device

⚠ WARNING

THIS PRODUCT MAY CAUSE DIRECT CURRENT IN THE PROTECTIVE GROUND CONDUCTOR

If a residual current device (RCD) is used, conditions must be observed.

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

Conditions for use of residual current device

If a residual current device (RCD / GFCI) or a residual current monitor (RCM) is used for protection against direct or indirect contact, the following conditions must be met:

- A residual current device "type A", series s.i. (super-immunized, Schneider Electric) can be used for single-phase drives.
- In all other cases, you must use a residual current device "type B", with sensitivity to all currents and with approval for frequency inverters.

Additional conditions:

- The product has an increased leakage current when it is switched on. 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 when the product is switched on.
- High-frequency currents must be filtered.
- When using residual current devices, consider the leakage currents of connected consumers.

4.4 Operation in an IT grounding system

See chapter *"2.3.1 Power stage"*, page *29* for the approved types of mains.

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4.5 Common DC bus

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.

Function principle

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

With a common DC bus, 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.

Requirements for use

The requirements and limit values for parallel connection of multiple LXM32 via the DC bus can be found on the Internet in the form of Application Note MNA01M001.

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4.6 Mains reactor

A mains reactor must be used under the following conditions:

- Operation via supply mains with low impedance (short-circuit current of supply mains greater than specified in chapter *"2 Technical Data"*, page *29*).
- If the nominal power of the drive is insufficient without mains reactor.
- In the case of high demands concerning the service life of the drive.
- In the case of operation with supply mains with reactive current compensation systems.
- For improvement of the power factor at the mains input and for reduction of mains harmonics.

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

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

Further information on the subject	**Page**
Technical data mains reactor (accessory)	*47*
Mounting the mains reactor (accessory)	*90*
Electrical installation of the mains reactor (accessory)	*105*
Order data mains reactor (accessory)	*487*

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4.7 Mains filter

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.

If the selected composition (product itself, mains filter, other accessories and measures) does not meet the requirements of category C1, the following information applies as per 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.

See chapter Technical Data, page *45*, for the category the device complies with.

Better values can be achieved depending on the application, mounting and installation, for example, in the case of installation in an enclosed control cabinet with at least 15db shielding attenuation.

The drives have an integrated mains filter.

An additional external mains filter is required in the case of long motor cables. When using external mains filters, verify compliance with all applicable EMC directives.

If the external mains filters offered in chapter *"11.13 External mains filters"* are used, the limit values specified in chapter *"2.3.7 External mains filters (accessories)"*, page *46*, are met.

Further information on the subject	Page
Technical data external mains filters (accessory)	*46*
Mounting the external mains filter (accessory)	*90*
Electrical installation of external mains filters (accessory)	*105*
Order data external mains filters (accessory)	*487*

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4.7.1 Deactivating the Y capacitors

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

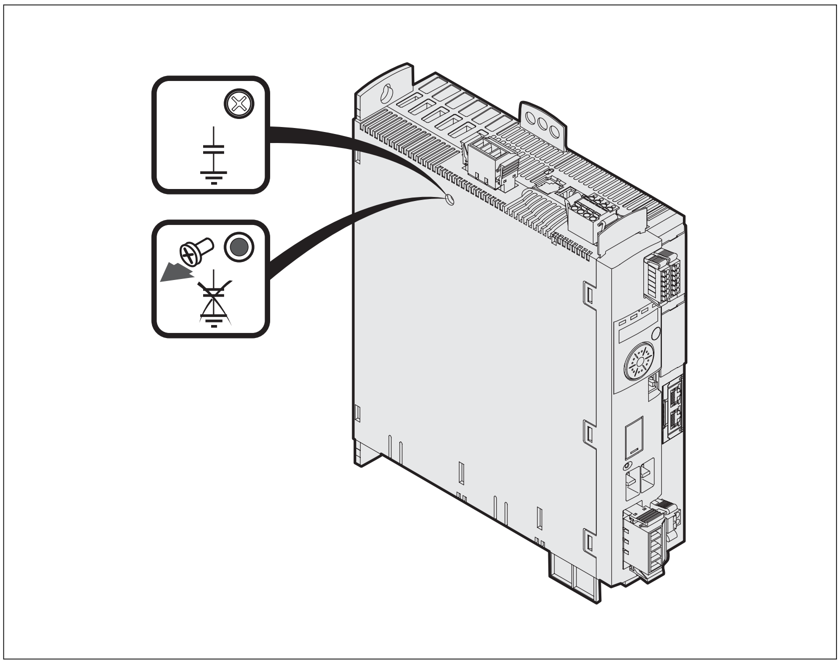

Figure 10: Deactivating/activating the internal Y capacitors

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

NOTE: The EMC limit values specified no longer apply if the Y capacitors are deactivated.

4.8 Rating the braking resistor

If external driving forces acting on the motor cause excessively high currents to be regenerated and supplied back to the drive, this may cause overheating and fire of the drive.

⚠ DANGER

FIRE HAZARD CAUSED BY EXTERNAL DRIVING FORCES ACTING ON MOTOR

Verify that no energy is supplied to the driving motor after an error of error classes 3 or 4.

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

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

⚠ WARNING

MOTOR WITHOUT BRAKING EFFECT

- Verify that the braking resistor has a sufficient rating.
- Verify that the parameter settings for the braking resistor are correct.
- Verify that the I^2t value for temperature monitoring does not exceed 100% by performing a test run under maximum load conditions.
- Verify that the calculations and the test run take into account the fact that the DC bus capacitors can absorb less braking energy at higher mains voltages.

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

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

⚠ WARNING

HOT SURFACES

- Ensure that any contact with a hot braking resistor is avoided.
- 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.

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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.

Further information on the subject	**Page**
Technical data *"2.3.5 Braking resistor"*	*42*
Mounting the *"External braking resistor"* (accessory)	*90*
Electrical installation: *"4.8 Rating the braking resistor"* (accessory)	*68*
Setting the braking resistor parameters	*160*
"4.5 Common DC bus"	*64*
Order data for external braking resistors (accessory)	*481*

4.8.1 Internal braking resistor

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

4.8.2 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.

Monitoring

The device monitors the power of the braking resistor. The load on the braking resistor can be read out.
The output for the external braking resistor is short-circuit protected. There is no protection in the case of a ground fault.

Selection of the external braking resistor

The rating of an external braking resistor depends on the required peak power and continuous power with which the braking resistor can be operated.

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

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

R = Resistance value in Ω
U = Switch-on voltage braking resistor in V
P_{max} = Required peak power in W

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

- The braking resistors must be connected in parallel or in series so the required resistance is reached. Only connect resistors with identical resistance in parallel in order to evenly distribute the load to all braking resistors.
- The total resistance of all external braking resistors connected to one drive must not fall below a lower limit.
- The continuous power of the network of connected braking resistors must be calculated. The result must be greater than or equal to the actually required continuous power.

See chapter *"2.3.5 Braking resistor"* for the permissible resistance for the drives. Use only resistors that are specified as braking resistors. For suitable braking resistors, see Accessories, page *486*.

Mounting and commissioning of an external braking resistor

A parameter is used to switch between the internal and an external braking resistor. Test the function of the braking resistor under realistic conditions during commissioning, see page *138*.

Braking resistors with degree of protection IP65 may be installed outside the control cabinet in an appropriate environment in order to decrease the temperature in the control cabinet.
The external braking resistors listed in the Accessories chapter are shipped with an information sheet that provides details on installation.

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

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4.8.3 Rating information

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

An external braking resistor is required if the kinetic energy that must be absorbed exceeds the total of the internal proportions, including the internal braking resistor.

Internal energy absorption

Braking energy is absorbed internally by the following mechanisms:

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

Values for the energy absorption E_{var} can be found in chapter *"2.3.5 Braking resistor"*.

Internal braking resistor

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

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

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

The characteristic values P_{PR} and E_{CR} of the internal braking resistor can be found in chapter *"2.3.5 Braking resistor"*.

Electrical losses E_{el}

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

Mechanical losses E_{mech}

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

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Example

Deceleration of a rotary motor with the following data:

- Initial speed of rotation: $n = 4000\ min^{-1}$
- Rotor inertia: $J_R = 4\ kgcm^2$
- Load inertia: $J_L = 6\ kgcm^2$
- Drive: $E_{var} = 23$ Ws, $E_{CR} = 80$ Ws, $P_{PR} = 10$ W

Calculation of the energy to be absorbed:

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

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

In this example, the DC bus capacitors absorb $E_{var} = 23$ Ws (the value depends on the device type, see chapter *"2 Technical Data"*).

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

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

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

Rating the external braking resistor

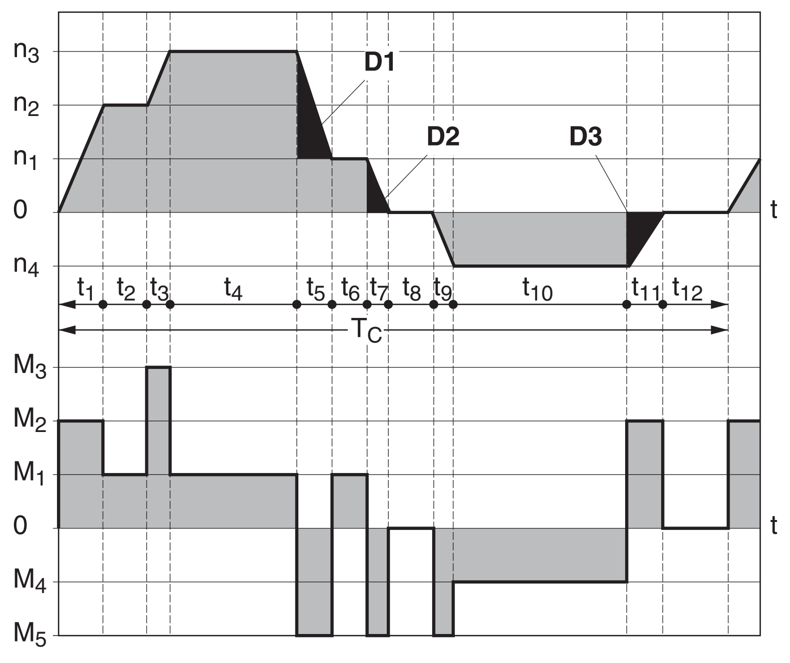

Figure 11: Characteristic curves for rating the braking resistor

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

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

$J_t = J_m + J_c$

J_m: Motor inertia (with holding brake)
J_c: Load inertia

The energy for each deceleration segment is calculated as follows:

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

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

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

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

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

Units: E_i in Ws (wattseconds), J_t in kgm^2, ω in rad and n_i in min^{-1}.

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

In the next calculation steps, only consider those segments D_i, whose energy E_i exceeds the energy absorption of the device (see chapter *"2.3 Electrical Data"*). These excess energies E_{Di} must be diverted by means of the braking resistor (internal or external).

E_{Di} is calculated using the following formula:

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

The continuous power P_c is calculated for each machine cycle:

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

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

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The selection is made in two steps:

- The maximum energy during deceleration must be less than the peak energy that the braking resistor can absorb: $(E_{Di})<(E_{Cr})$. In addition, the continuous power of the internal braking resistor must not be exceeded: $(P_C)<(P_{Pr})$. If these conditions are met, then the internal braking resistor is sufficient.
- If one of the conditions is not met, you must use an external braking resistor. The braking resistor must be rated in such a way that the conditions are met. The resistance of the braking resistor must be between the specified minimum and maximum values, since otherwise the load can no longer be decelerated or the product might be destroyed.

For order data for the external braking resistors, see chapter Accessories, page *487*.

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4.9 Safety function STO ("Safe Torque Off")

See chapter *41* for information on using the IEC 61508 standard.

4.9.1 Definitions

Safety function STO (IEC 61800-5-2)

The safety function STO ("Safe Torque Off") shuts off the motor torque safely. It is not necessary to interrupt the supply voltage. There is no monitoring for standstill.

Category 0 stop (IEC 60204-1)

Stopping by immediate removal of power to the machine actuators (i.e. an uncontrolled stop).

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.

4.9.2 Function

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

Function principle

The STO safety function is triggered via 2 redundant inputs. The circuits of the two inputs must be separate so that there are two channels.

The switching process must be simultaneous for both inputs (offset <1s). The power stage is disabled and an error message is generated. The motor can no longer generate torque and coasts down without braking. A restart is possible after resetting the error message with a "Fault Reset".

The power stage is disabled and an error message is generated if only one of the two inputs is switched off or if the time offset is too great. This error message can only be reset by switching off the product.

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4.9.3 Requirements for using the safety function

The safety function STO (Safe Torque Off) does not cause electric isolation. The DC bus voltage is still present.

DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT USE

Turn off the mains voltage using an appropriate switch to achieve a voltage-free condition.

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

Incorrect usage may cause a hazard due to the loss of the safety function.

WARNING

LOSS OF SAFETY FUNCTION

Observe the requirements for using the safety function.

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

The inputs for the safety function STO (inputs $\overline{\text{STO\_A}}$ and $\overline{\text{STO\_B}}$) are permanently set to logic type 1.

Category 0 stop

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

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 an error, a controlled stop is impossible. Final shutoff of the motor is achieved by switching off the two inputs of the STO safety function. The shutoff is usually controlled by a standard EMERGENCY STOP safety relay module with a safe time delay.

Behavior of holding brake

Triggering the STO safety function means that the delay time for motors with holding brake is not effective. The motor cannot generate holding torque to bridge the time to application of the holding brake. Check whether additional measures have to be taken; for example, this may cause the load of vertical axes to lower.

Vertical axes, external forces

If external forces act on the motor (vertical axis) and an unwanted movement, for example caused by gravity, could cause a hazard, the motor must not be operated without additional measures for fall protection.

Unintended restart

Verify that a master controller cannot trigger an unintended restart of the motor after restoration of power, for example, after a power outage.

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.

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Protected cable installation

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

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

Data for maintenance plan and safety calculations

The safety function must be requested and 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 safety calculations:

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

1) See chapter *"12.2.1 Lifetime safety function STO"*.

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

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

Hazard and risk analysis

As a system integrator you must conduct a hazard and risk analysis of the entire system. The results must be taken into account in the application of the safety function.

The type of circuit resulting from the analysis may differ from the following application examples. Additional safety components may be required. The results of the hazard and risk analysis have priority.

4.9.4 Application examples STO

Example of category 0 stop

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

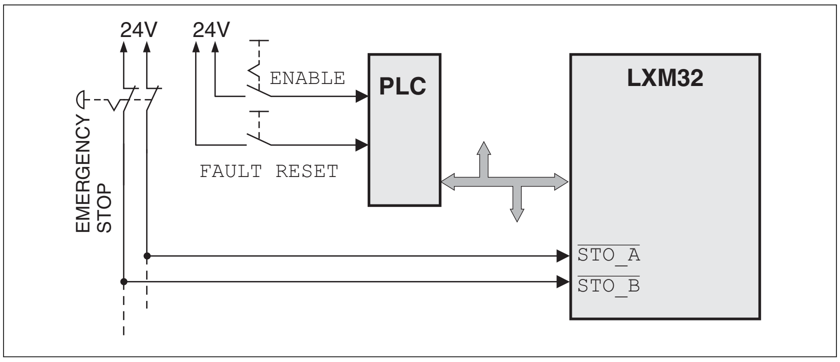

Figure 12: Example of category 0 stop

An EMERGENCY STOP is requested. This request leads to a category 0 stop

- The power stage is immediately disabled via the inputs STO_A and STO_B of the safety function STO. Power can no longer be supplied to the motor. If the motor has not yet stopped at this point in time, it coasts down in an uncontrolled way (uncontrolled stop).

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

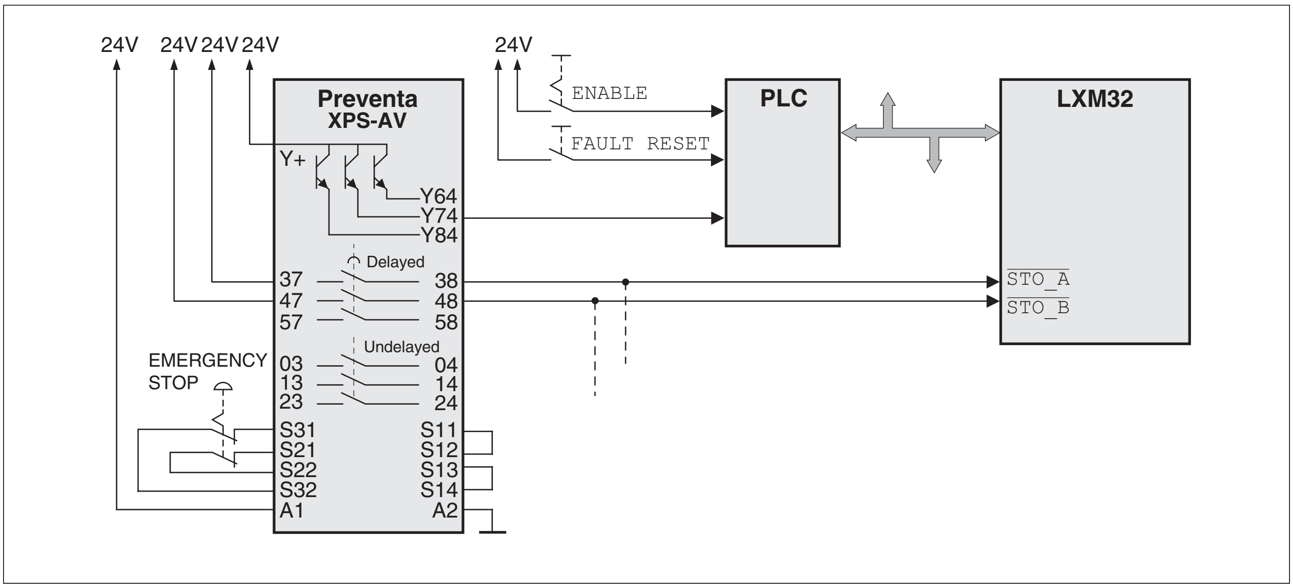

Figure 13: Example of category 1 stop with external Preventa XPS-AV EMERGENCY STOP safety relay module

An EMERGENCY STOP is requested. This request leads to a category 1 stop

- The function "Halt" is immediately started (undelayed) via the fieldbus (single-channel, not monitored). Any active movement is decelerated via the adjusted ramp.
- The power stage is disabled via the inputs $\overline{\text{STO\_A}}$ and $\overline{\text{STO\_B}}$ of the safety STO function 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 has not yet stopped when the delay time has elapsed, it coasts down in an uncontrolled way (uncontrolled stop).

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

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4.10 Logic type

If logic type 2 (sink outputs) is used, a ground fault of a signal is detected as an On state.

⚠ WARNING
UNINTENDED OPERATION
Use great care in wiring to exclude the possibility of ground faults.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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

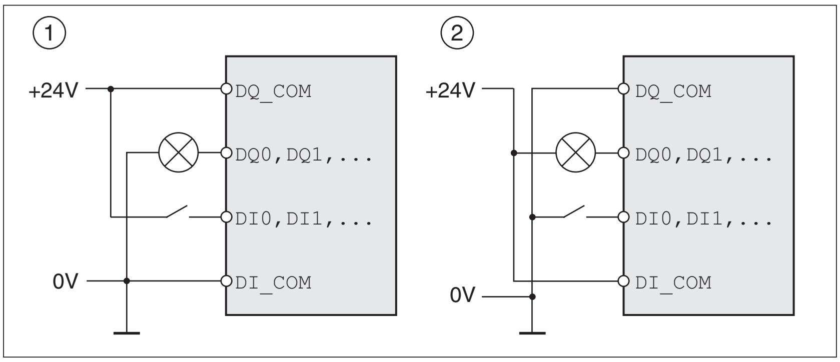

Figure 14: Logic type

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

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

The logic type is determined by the wiring of `DI_COM` and `DQ_COM`, see *Figure 8*. The logic type affects wiring and control of the sensors; therefore, you must determine the required value in the engineering phase in view of the application.

Special case: Safety function STO

The inputs for the safety function STO (inputs $\overline{\texttt{STO\_A}}$ and $\overline{\texttt{STO\_B}}$) are permanently set to logic type 1.

4.11 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 device for overtemperature
I^2t limitation	Power limitation in the case of overloads for the motor, the output current, the output power and the braking resistor.
Commutation	Plausibility check of motor acceleration and effective torque
Mains phases	Monitoring for missing mains phases
Short circuit / ground fault	Monitors for short circuit between motor phase and motor phase and between motor phase and ground

See chapters *"7.7 Functions for monitoring movements"* and *"7.8 Functions for monitoring internal device signals"* for descriptions of the monitoring functions.

4.12 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

- Check whether your application allows for the use of limit switches. If yes, use limit switches.
- Verify correct connection of the limit switches.
- Verify that the limit switches are mounted in a position far enough away from the mechanical stop to allow for 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 *"7.5.2 Setting the digital signal inputs and signal outputs"* for additional information.

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5 Installation

An engineering phase is mandatory prior to mechanical and electrical installation. See chapter *"4 Engineering"*, page *55*, for basic information.

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical 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 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 USA: 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”.

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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 equipment operation.

⚠ ⚠ DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

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

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

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

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5.2 Mechanical installation

⚠ ⚠ DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

- Keep foreign objects from getting into the product.
- Verify correct seat of seals and cable entries in order to avoid 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

Do not use a safety function unless you have protected 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 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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5.2.1 Installing and removing modules

Electrostatic discharge (ESD) can cause immediate or later destruction of the module or the device.

NOTICE

DESTRUCTION DUE TO ESD

- Use suitable ESD measures (IEC 61340-5-2) when handling the module.
- Do not touch any internal components.

Failure to follow these instructions can result in equipment damage.

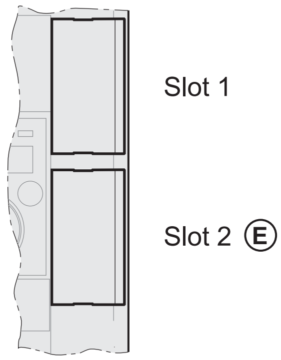

Figure 15: Module slots

The device has 2 module slots. The module slots are designed for the following modules. See also chapter *"11 Accessories and spare parts"*.

Slot 1	Safety module eSM
Slot 2	Encoder module RSR (resolver interface) Encoder module DIG (digital interface) Encoder module ANA (analog interface)

Do not install the safety module eSM until you have commissioned the drive.

Plugging a modul into a slot

Procedure for plugging in a module:

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- Disconnect all power (power stage supply voltage and controller supply voltage) before plugging in or removing a module. Verify that no voltage is present (safety instructions).
- Fully read an understand the product manual as well as the manual for the module prior to installing the module.
- Verify that the order number on the nameplate of the module corresponds to the specification in the manual for the module.
- Note and record the serial number, revision and DOM shown on the nameplate of the module and the nameplate of the device.
- Remove the cover from the module slot and keep the cover.
- Check the module for visible damage. Do not install damaged modules.
- Plug the module into the appropriate slot until the snap-in lock snaps in.

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

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

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

Removing a module from a slot

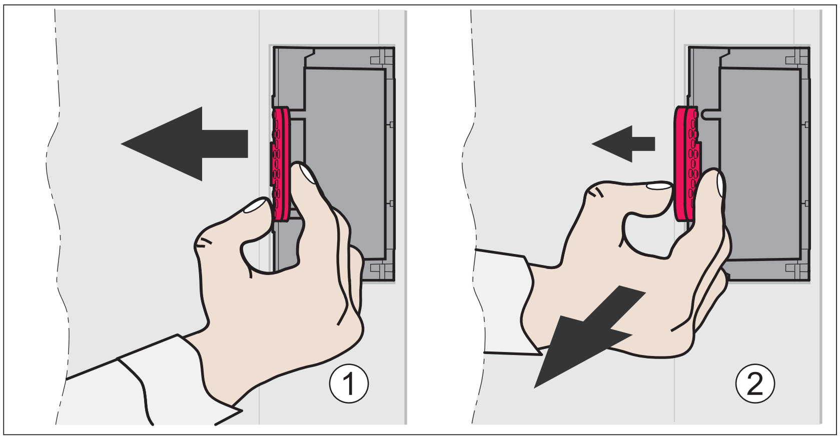

Figure 16: Removing a module from a slot

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

- Disconnect all power (power stage supply and controller supply) before plugging in or removing a module. Verify that no voltage is present (safety instructions).
- Label the connection cables. Remove the wiring of the module.
- Push the snap-in lock of the module to the left (1) and pull out the module at the snap-in lock (2) while holding it to the left.
- Close the module slot with the cover.

The next time the device is switched on, it signal a different hardware. See chapter *"9.3.3 Acknowledging a module replacement"*, page *318* for additional information.

5.2.2 Mounting the device

Attaching a label with safety instructions

- ▸ Select the label suitable for the target country.
  Observe the safety regulations in the target country.
- ▸ Attach the 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.

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 flammable materials.
- The heated airflow from other devices and components must not heat up the air used for cooling the device.

- If the thermal limits are exceeded during operation, the drive switches off (overtemperature).
- Comply with the specifications in chapter *"5.2.3 Mounting mains filter, mains reactor and braking resistor"*, page *90*, for mounting additional components (external mains filters, mains reactor, external braking resistor).

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.

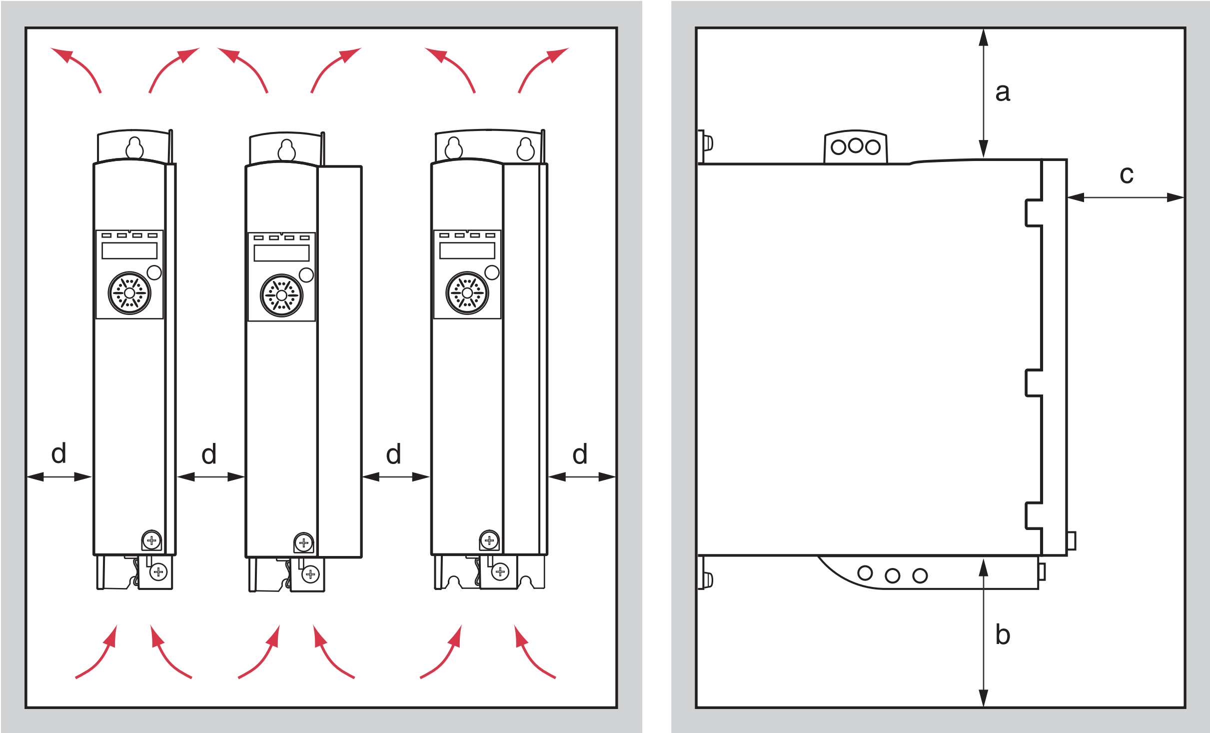

Figure 17: Mounting distances and air circulation

Free space a above the device	mm (in)	≥100 (≥3.94)
Free space b below the device	mm (in)	≥100 (≥3.94)
Free space c in front of the device	mm (in)	≥60 (≥2.36)
Free space d between devices for ambient temperature during operation: 0 ... 50 °C (32 ... 122 °F)	mm (in)	≥0 (≥0)

Mounting the device

See chapter *"2.2.1 Dimensional drawings"*, page *27* for the dimensions of the mounting holes.

NOTE: Painted surfaces have an insulating effect. Before mounting the device to a painted mounting plate, remove all paint across a large area of the mounting points until the metal is completely bare.

- Note the ambient conditions in chapter *"2 Technical Data"*, page *25*.
- Mount the device in a vertical position (±10°).

5.2.3 Mounting mains filter, mains reactor and braking resistor

External mains filter

The drives have an integrated mains filter.

An additional external mains filter is required in the case of long motor cables. When using external mains filters, verify compliance with all applicable EMC directives.

Further information on the subject	Page
Technical data external mains filters (accessory)	*46*
Engineering information external mains filters (accessory)	*66*
Electrical installation of external mains filters (accessory)	*105*
Order data external mains filters (accessory)	*487*

Mains reactor

A mains reactor must be used under specific conditions as outlined in chapter *"4.6 Mains reactor"*, page *65*. The mains reactor is shipped with an information sheet that provides details on mounting. Information on the electrical installation can be found in chapter *"5.3.7 Connection of power stage supply voltage (CN1)"*, page *105*.

If you install a mains reactor, the power provided by the device is increased, see chapter *"2.3.1 Power stage"*, page *29*. Increased power is only available if the corresponding parameter is set during commissioning.

Further information on the subject	Page
Technical data mains reactor (accessory)	*47*
Engineering information mains reactor (accessory)	*65*
Electrical installation of the mains reactor (accessory)	*105*
Order data mains reactor (accessory)	*487*

External braking resistor

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

⚠ WARNING

HOT SURFACES

- Ensure that any contact with a hot braking resistor is avoided.
- 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.

Braking resistors with degree of protection IP65 may be installed outside the control cabinet in an appropriate environment in order to decrease the temperature in the control cabinet.
The external braking resistors listed in the Accessories chapter are shipped with an information sheet that provides details on installation.

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Further information on the subject	Page
Technical data braking resistor	*42*
Mounting the external braking resistor (accessory)	*90*
Electrical installation of the braking resistor (accessory)	*68*
Setting the braking resistor parameters	*160*
Order data for external braking resistors (accessory)	*481*

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5.3 Electrical installation

DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

- Keep foreign objects from getting into the product.
- Verify correct seat of seals and cable entries in order to avoid 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.

WARNING

THIS PRODUCT MAY CAUSE DIRECT CURRENT IN THE PROTECTIVE GROUND CONDUCTOR

If a residual current device (RCD) is used, conditions must be observed.

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

See chapter *"4.3 Residual current device"*, page *63* for conditions for using a residual current device.

Logic types

The product supports logic type 1 and logic type 2 for digital signals. Note that most of the wiring examples show the logic type 1. The STO safety function must be wired using the logic type 1.

5.3.1 Overview of procedure

- Take into account the information provided in chapter *"4 Engineering"*. The selected settings affect the entire installation.
- The entire installation procedure must be performed without voltage present.

Sequence of installation steps:

Connection	Connection to	Page
Ground connection	Grounding screw	*95*
Motor phases	CN10, CN11	*96*
DC bus connection	CN9	*64*
External braking resistor	CN8	*68*
Power stage supply	CN1	*105*
Motor encoder (encoder 1)	CN3	*109*
Safety function STO	CN2	*111*
24 V controller supply	CN2	*111*
Digital inputs / outputs	CN6	*114*
Commissioning interface (PC)	CN7	*116*
Fieldbus SERCOS III	X1, X2	*117*

Finally, verify proper installation.

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5.3.2 Connection overview

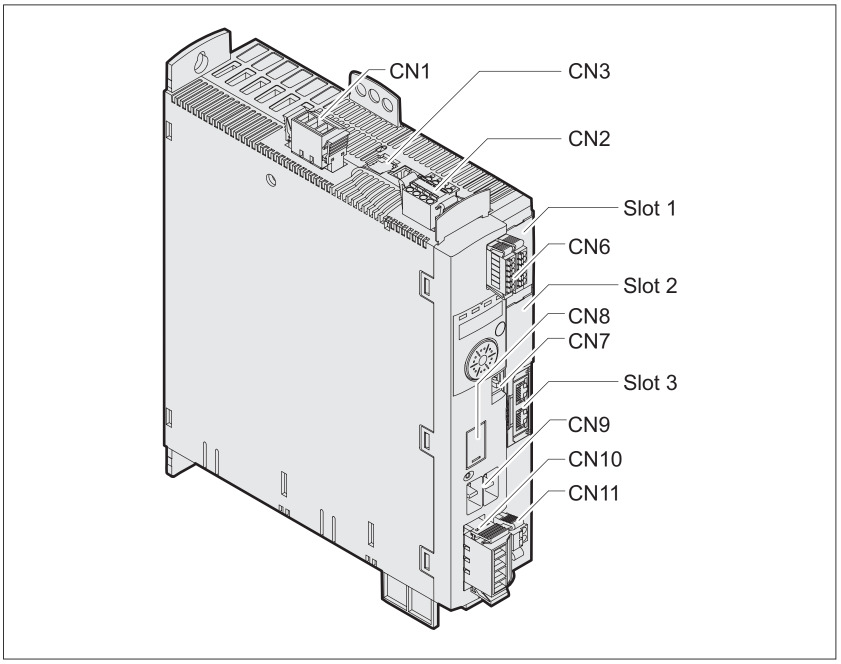


Figure 18: Overview of the signal connections

Connection	Assignment
CN1	Power stage supply
CN2	24 controller supply and safety function STO
CN3	Motor encoder (encoder 1)
CN7	Modbus (commissioning interface)
CN8	External braking resistor
CN9	DC bus connection for parallel operation
CN10	Motor phases
CN11	Holding brake
Slot 1	Safety module
Slot 2	Encoder module (encoder 2)
Slot 3	Fieldbus SERCOS III

5.3.3 Connection grounding screw

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

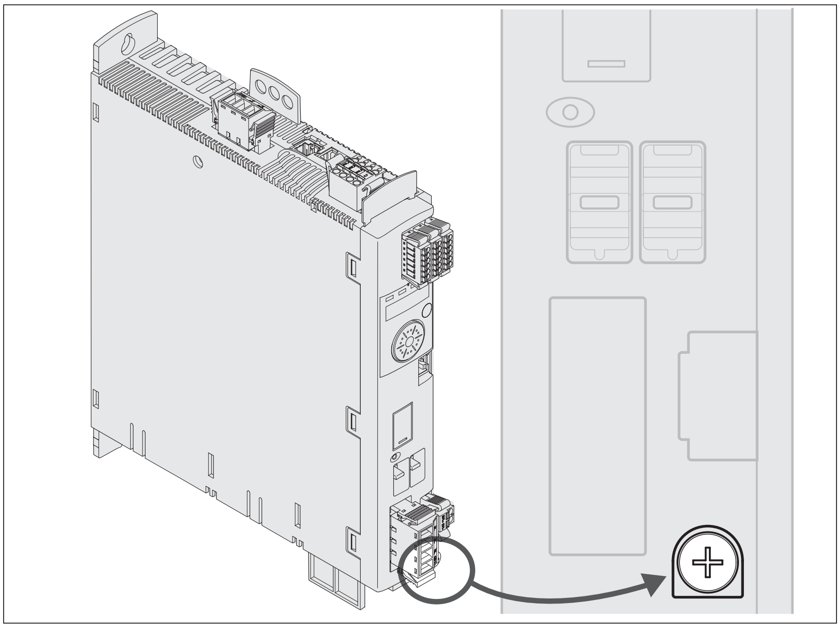
⚠ ⚠ DANGER

ELECTRIC SHOCK CAUSED BY 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.

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



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

LXM32•...		U45, U60, U90, D12, D18, D30, D72
Tightening torque of grounding screw	Nm (lb.in)	3.5 (31)

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5.3.4 Connection motor phases and holding brake (CN10 and CN11)

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

- Disconnect all power 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.

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

DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT ISOLATION

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

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

Drive systems may perform unexpected movements because of incorrect connection or other errors.

WARNING

UNEXPECTED MOVEMENT

- Operate the device with approved motors only. 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 they may be used.

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

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

Cable specifications

See chapter *"4.2 Cables"*, page *61* 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 2 wires for holding brake The conductors must have a sufficiently large cross section so that the fuse at the mains connection can trip if required.
Maximum cable length:	Depends on the required limit values for conducted interference, see chapter *"2.3.6 Internal mains filter"*, page *45*, and chapter *"2.3.7 External mains filters (accessories)"*, page *46*.
Special characteristics:	Contains wires for the holding brake

Note the following information:

- You may only connect the original motor cable (with two wires for the holding brake).
- The wires for the holding brake must also be connected to the device at connection CN11 in the case of motors without holding brakes. At the motor end, connect the wires to the appropriate pins for the holding brake; the cable can then be used for motors with or without holding brake. If you do not connect the wires at the motor end, you must isolate each wire individually (inductive voltages).
- Observe the polarity of the holding brake voltage.
- The voltage for the holding brake depends on the controller supply (PELV). Observe the tolerance for the controller supply and the specified voltage for the holding brake, see chapter *"2.3.2 Controller supply voltage 24V"*, page *38*.

▶ Use pre-assembled cables (page *482*) to reduce the risk of wiring errors.

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

Properties of the connection terminals CN10

The terminals are approved for wires and rigid conductors. Observe the maximum permissible connection cross section. Take into account the fact that wire ferrules increase the connection cross section.

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

Properties of the connection terminals CN11

The terminals are approved for wires and rigid conductors. Observe the maximum permissible connection cross section. Take into account the fact that wire ferrules increase the connection cross section.

LXM32•...		**U45, U60, U90, D12, D18, D30, D72**
Maximum terminal current	A	1.7
Connection cross section	mm^2 (AWG)	0.75 ... 2.5 (18 ... 14)
Stripping length	mm (in)	12 ... 13 (0.47 ... 0.51)

Assembling cables Note the dimensions specified when assembling cables.

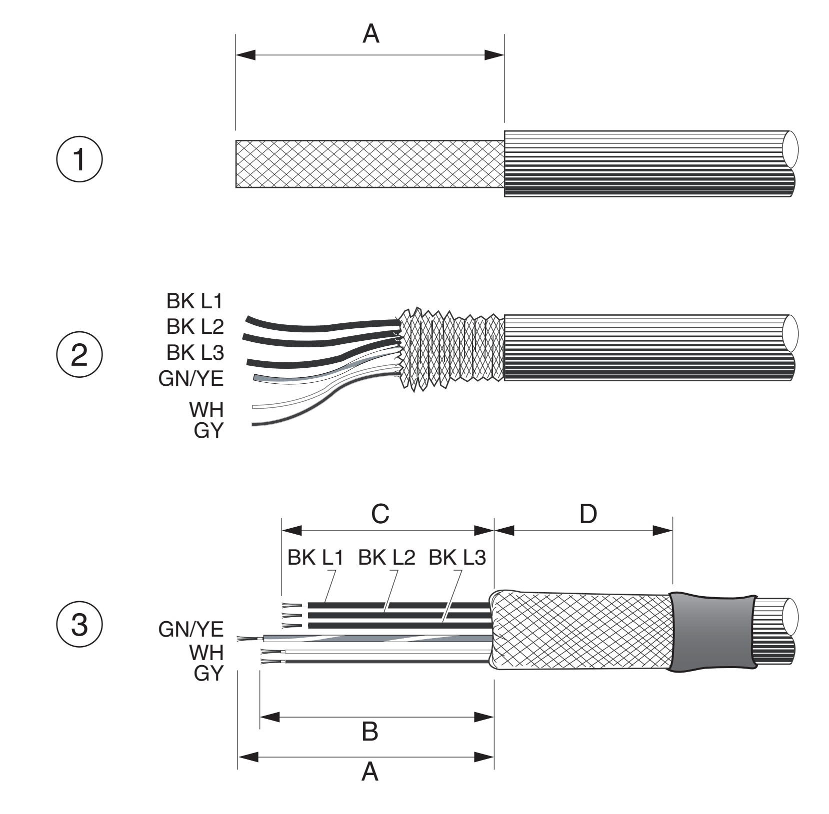

Figure 19: Steps for assembling the motor cable

(1) Strip the cable jacket, length A.

(2) Slide the shield braiding back over the cable jacket.

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

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

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

Monitoring

The device monitor the motor phases for:

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

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

Wiring diagram motor and holding brake

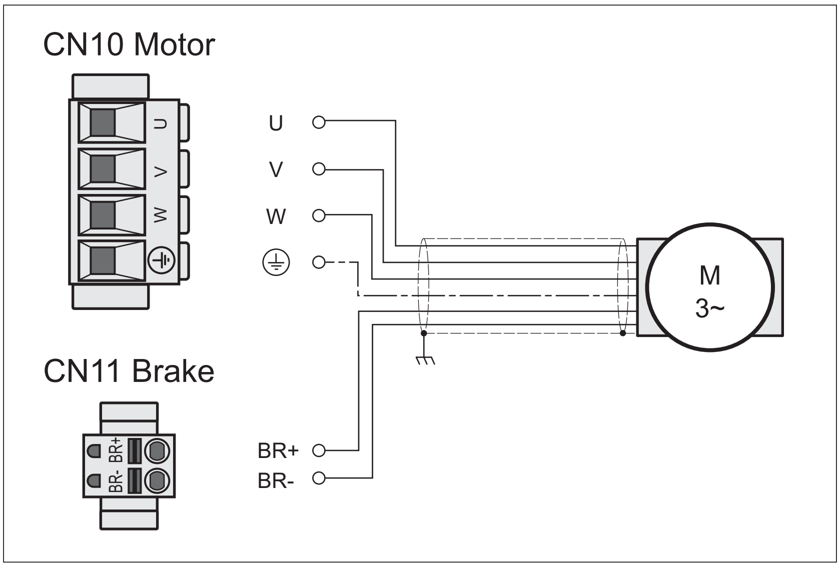

Figure 20: Wiring diagram motor with holding brake

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

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Connecting the motor cable

- Note the EMC requirements for the motor cables, see page *56*.
- Connect the motor phases and protective ground conductor to CN10. Verify that the connections U, V, W and PE (ground) match at the motor and the device.
- Note the tightening torque specified for the terminal screws.
- Connect the white wire or the black wire with the label 5 to connection BR+ of CN11.
  Connect the gray wire or the black wire with the label 6 to connection BR- of CN11.
- Verify that the connector locks snap in properly at the housing.
- Connect the cable shield to the shield clamp (large surface area contact).

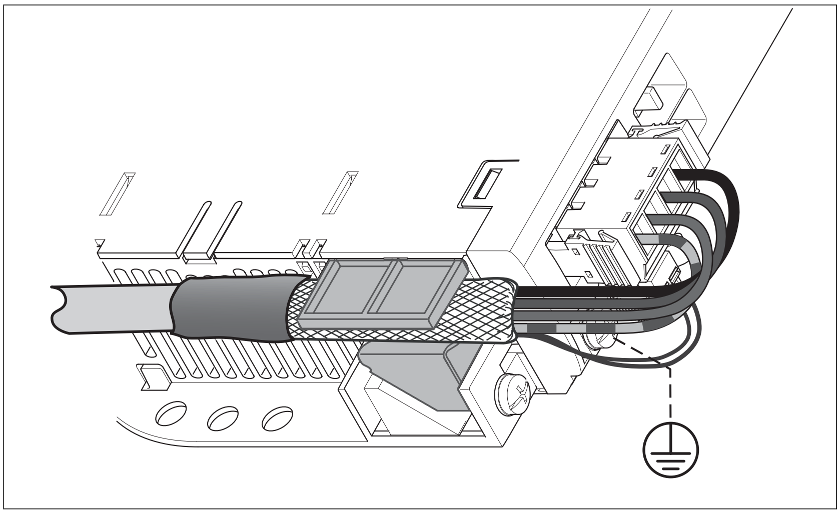

Figure 21: Shield clamp motor cable

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5.3.5 Connecting the DC bus (CN9, DC bus)

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.

Requirements for use

The requirements and limit values for parallel connection of multiple LXM32 via the DC bus can be found on the Internet in the form of Application Note MNA01M001.

5.3.6 Braking resistor connection (CN8, 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

MOTOR WITHOUT BRAKING EFFECT

- Verify that the braking resistor has a sufficient rating.
- Verify that the parameter settings for the braking resistor are correct.
- Verify that the I^2t value for temperature monitoring does not exceed 100% by performing a test run under maximum load conditions.
- Verify that the calculations and the test run take into account the fact that the DC bus capacitors can absorb less braking energy at higher mains voltages.

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

Further information on the subject	Page
Technical data braking resistor	*42*
Rating the braking resistor	*68*
Mounting the external braking resistor (accessory)	*90*
Setting the braking resistor parameters	*160*
Order data for external braking resistors (accessory)	*481*

5.3.6.1 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.

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5.3.6.2 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 *"4.8 Rating the braking resistor"*, page *68*. For suitable braking resistors, see chapter *"11 Accessories and spare parts"*, page *486*.

Cable specifications

See chapter *"4.2 Cables"*, page *61* 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 *105*. 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
Special characteristics:	Temperature resistance

The braking resistors recommended in chapter *"11 Accessories and spare parts"* have a 3-wire, temperature-resistant cable with a length of 0.75 m to 3 m.

Properties of the connection terminals CN8

LXM32•...		**U45, U60, U90, D12, D18, D30, D72**
Connection cross section	mm^2 (AWG)	0.75 ... 3.3 (18 ... 12)
Tightening torque for terminal screws	Nm (lb.in)	0.51 (4.5)
Stripping length	mm (in)	10 ... 11 (0.39 ... 0.43)

The terminals are approved for fine wire conductors and rigid 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

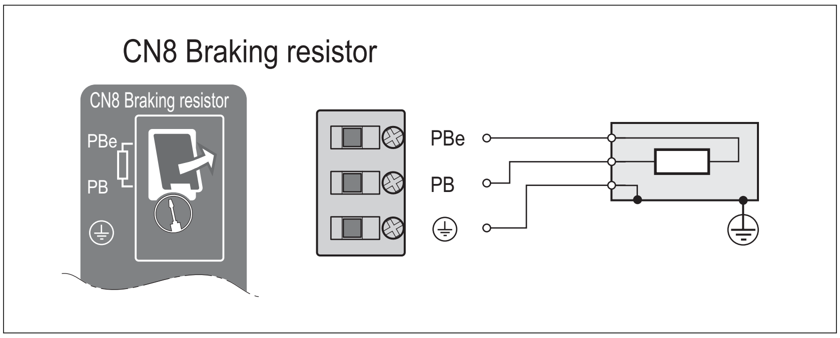

Figure 22: Wiring diagram external braking resistor

Connecting the external braking resistor

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

The parameter `RESint_ext` is used to switch between the internal and an external braking resistor. The parameter settings for the braking resistor can be found in chapter *"6.5.10 Setting the braking resistor parameters"*, page*160*. Verify that the selected external braking resistor is really connected. Test the function of the braking resistor under realistic conditions during commissioning, see chapter *"6.5.10 Setting the braking resistor parameters"*, page *160*.

5.3.7 Connection of power stage supply voltage (CN1)

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

DANGER

ELECTRIC SHOCK CAUSED BY 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.

WARNING

INSUFFICIENT PROTECTION AGAINST OVERCURRENTS

- 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 permissible value specified in the chapter "Technical Data".

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

NOTICE

DESTRUCTION DUE TO INCORRECT MAINS VOLTAGE

Before switching on and configuring the product, verify that it is approved for the mains voltage.

Failure to follow these instructions can result in equipment damage.

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

Prior to connecting the device, check the approved mains types, see chapter *"2.3.1 Power stage"*, page *29*.

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Cable specifications

Observe the required cable properties, see page *61*, and the information on electromagnetic compatibility (EMC), see page *56*.

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:	-
Special characteristics:	-

Properties of connection terminals CN1

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

The terminals are approved for wires and rigid conductors. Observe the maximum permissible connection cross section. Take into account the fact that wire ferrules increase the connection cross section.

Prerequisites for connecting the power stage supply

Note the following information:

- Three-phase devices may only be connected and operated via three phases.
- Use upstream mains fuses. See chapter *"2.3.1 Power stage"*, page *29* for information on fuse types and fuse ratings.
- Observe the EMC requirements. If necessary, use surge arresters, mains filters and mains reactors.
- If you use an external mains filter, the mains cable must be shielded and grounded at both ends if the length between the external mains filter and the device exceeds 200 mm.
- See page *25* for a UL-compliant design.
- Due to high leakage currents, 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.

Accessories: Mains reactor and external mains filter

Note the information on the following accessories: mains reactor and external mains filter.

Further information on the subject	Page
Technical data mains reactor (accessory)	*47*
Engineering information mains reactor (accessory)	*65*
Mounting the mains reactor (accessory)	*90*
Order data mains reactor (accessory)	*487*

Further information on the subject	Page
Technical data external mains filters (accessory)	*46*
Engineering information external mains filters (accessory)	*66*
Mounting the external mains filter (accessory)	*90*
Order data external mains filters (accessory)	*487*

Power stage supply single-phase device

Figure 23 shows an overview for wiring the power stage supply for a single-phase device. The illustration also shows an external mains filter and a mains reactor which are available as accessories.

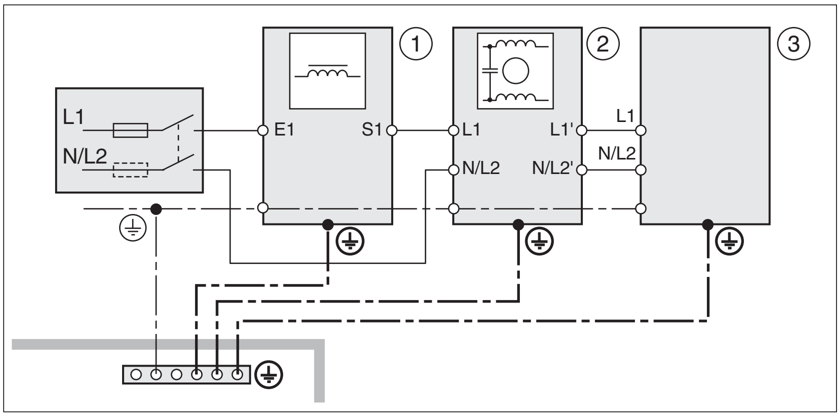

Figure 23: Overview power stage supply for single-phase device

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

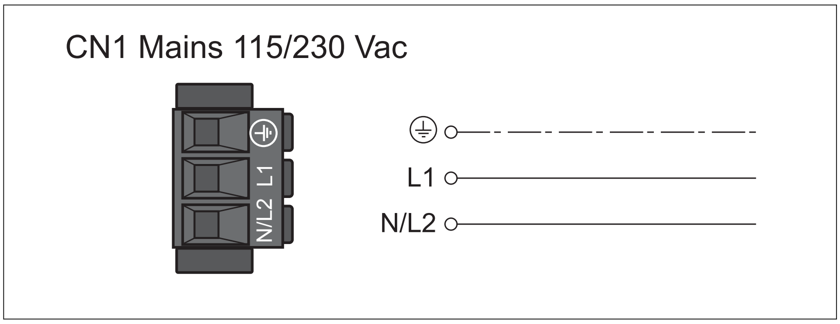

Figure 24: Wiring diagram power stage supply for single-phase device.

- Verify the type of mains. See chapter *"2.3.1 Power stage"*, page *29* for the approved types of mains.
- Connect the mains cable (*Figure 24*). Note the tightening torque specified for the terminal screws.
- Verify that the connector locks snap in properly at the housing.

Power stage supply three-phase device

Figure 25 shows an overview for wiring the power stage supply for a three-phase device. The illustration also shows an external mains filter and a mains reactor which are available as accessories.

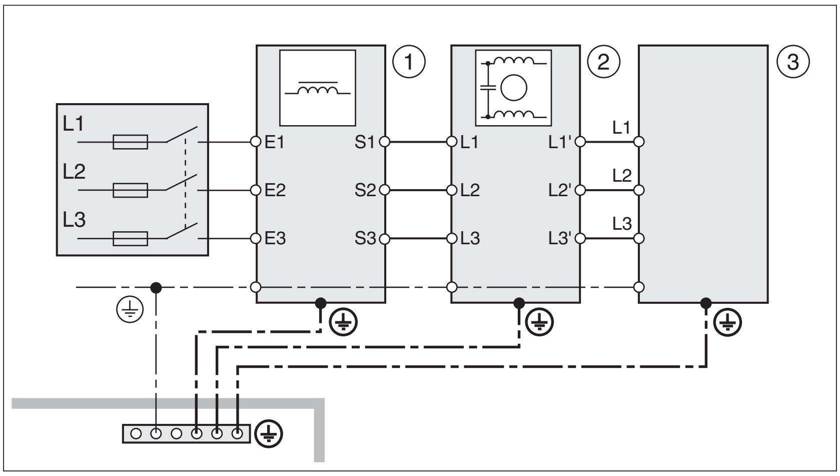

Figure 25: Wiring diagram, power stage supply for three-phase device.

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

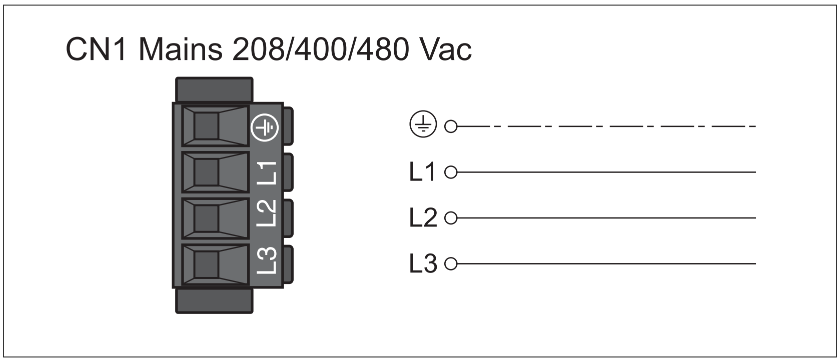

Figure 26: Wiring diagram power stage supply for three-phase device.

- Verify the type of mains. See chapter *"2.3.1 Power stage"*, page *29* for the approved types of mains.
- Connect the mains cable. Note the tightening torque specified for the terminal screws.
- Verify that the connector locks snap in properly at the housing.

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5.3.8 Motor encoder connection (CN3)

Function and encoder type

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

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

Cable specifications

See chapter *"4.2 Cables"*, page *61* for information on the cables.

Shield:	Required, both ends grounded
Twisted Pair:	Required
PELV:	Required
Cable composition:	6 * 0.14 mm² + 2 * 0.34 mm² (6 * AWG 24 + 2 * AWG 20)
Maximum cable length:	100 m
Special characteristics:	Fieldbus cables are not suitable for connecting encoders.

- Use pre-assembled cables (page *485*) to reduce the risk of wiring errors.

Wiring diagram

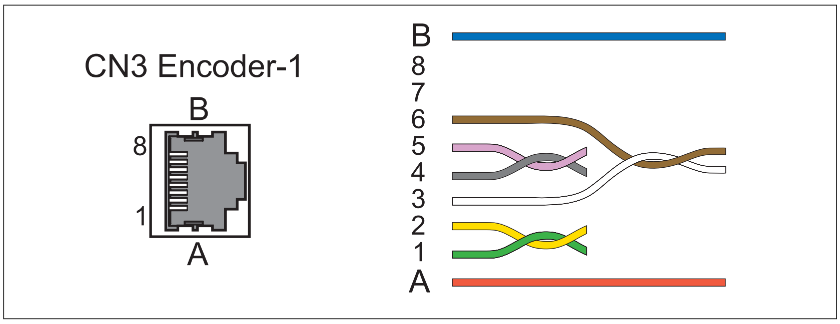

Figure 27: Wiring diagram motor encoder

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

Connecting the motor encoder

- Verify that wiring, cables and connected interface meet the PELV requirements.
- Note the EMC requirements for encoder cables, page *56*. Use equipotential bonding conductors for equipotential bonding.
- Connect the connector to CN3 Encoder-1.
- Verify that the connector locks snap in properly at the housing.

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

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5.3.9 Connection controller supply and STO (CN2, DC Supply and STO)

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

DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT POWER SUPPLY UNIT

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

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

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

NOTICE

DESTRUCTION OF CONTACTS

Switch the power input of the power supply unit instead of the output voltage.

Failure to follow these instructions can result in equipment damage.

Safety function STO

Incorrect usage may cause a hazard due to the loss of the safety function.

WARNING

LOSS OF SAFETY FUNCTION

Observe the requirements for using the safety function.

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

Information on the signals of the safety function STO can be found in chapter *"4.9 Safety function STO ("Safe Torque Off")"*. If the safety function is NOT required, the inputs $\overline{\text{STO\_A}}$ and $\overline{\text{STO\_B}}$ must be connected to +24VDC.

Cable specifications CN2

See chapter *"4.2 Cables"*, page *61* for information on the cables.

Shield:	- 1)
Twisted Pair:	-
PELV:	Required
Minimum conductor cross section:	0.75 mm² (AWG 18)
Maximum cable length:	100 m
Special characteristics:	-

1) See *"4.9.3 Requirements for using the safety function"*

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Properties of connection terminals CN2

LXM32•...		
Maximum terminal current	A	16 [1)]
Connection cross section	mm² (AWG)	0.5 ... 2.5 (20 ... 14)
Stripping length	mm (in)	12 ... 13 (0.47 ... 0.51)

1) Note the maximum permissible terminal current when connecting several devices.

The terminals are approved for wires and rigid conductors. Observe the maximum permissible connection cross section. Take into account the fact that wire ferrules increase the connection cross section.

Permissible terminal current of controller supply

- Connection CN2, pins 3 and 7 as well as CN2, pins 4 and 8 (see *Figure 28*) can be used as 24V/0V connections for additional consumers. [1] Note the maximum permissible terminal current (*"Properties of connection terminals CN2"*).
- The voltage at the holding brake output depends on the controller supply. Note that the current of the holding brake also flows via this terminal.
- As long as the controller supply is switched on, the position of the motor will remain the same, even if the power stage supply is switched off.

Wiring diagram

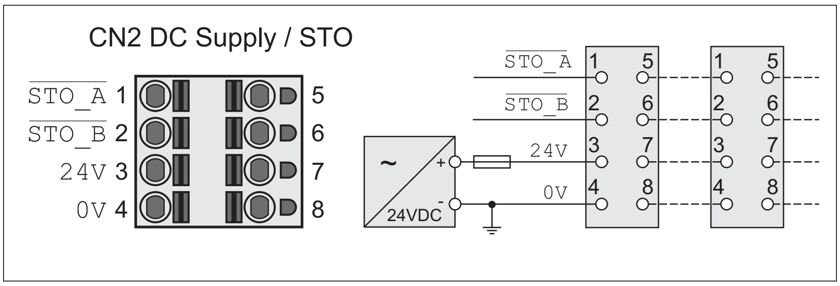

Figure 28: Wiring diagram controller supply

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

Connecting the safety function STO

- ▶ Verify that wiring, cables and connected interfaces meet the PELV requirements.
- ▶ Connect the safety function in accordance with the specifications in chapter *"4.9 Safety function STO ("Safe Torque Off")"*, page *75*.

1. In the connector, the following pins are connected: pin 1 to pin 5, pin 2 to pin 6, pin 3 to pin 7 and pin 4 to pin 8.

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Connecting the controller supply voltage

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

5.3.10 Connecting the digital inputs/outputs (CN6)

The device has configurable inputs and configurable outputs. The standard assignment and the configurable assignment depends on the selected operating mode. For more information, see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

Cable specifications

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

Shield:	-
Twisted Pair:	-
PELV:	Required
Cable composition:	0.25 mm², (AWG 22)
Maximum cable length:	30 m
Special characteristics:	

Properties of connection terminals CN6

LXM32•...		
Connection cross section	mm² (AWG)	0.2 ... 1.0 (24 ... 16)
Stripping length	mm (in)	10 (0.39)

Wiring diagram

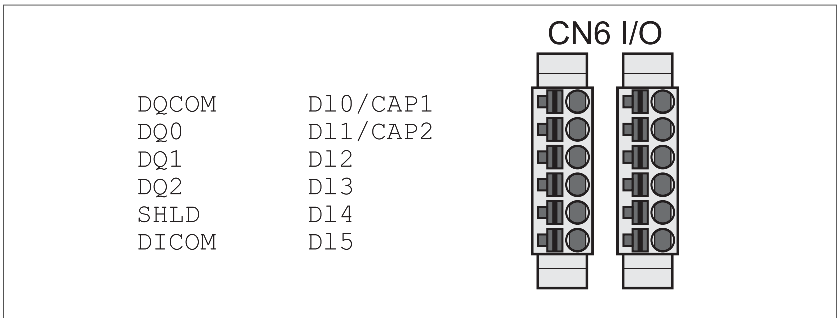

Figure 29: Wiring diagram, digital inputs/outputs

Signal	Meaning	I/O
DQ_COM	Reference potential to DQ0 ... DQ4	
DQ0	Digital output 0	O (24 V)
DQ1	Digital output 1	O (24 V)
DQ2	Digital output 2	O (24 V)
SHLD	Shield connection	
DI_COM	Reference potential to DI0 ... DI5	
DI0/CAP1	Digital input 0 / Capture input 1	I (24 V)
DI1/CAP2	Digital input 1 / Capture input 2	I (24 V)
DI2/CAP3 [1]	Digital input 2 / Capture input 3 [1]	I (24 V)
DI3	Digital input 3	I (24 V)
DI4	Digital input 4	I (24 V)
DI5	Digital input 5	I (24 V)

1) Available with hardware version ≥RS03

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

The configuration and the standard assignment of the inputs and outputs are described in chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

Connecting the digital inputs/outputs

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

5.3.11 Connection of PC with commissioning software CN7)

If this commissioning interface at the product is directly connected to a Gigabit Ethernet interface at the PC, the PC interface may be destroyed.

NOTICE

DAMAGE TO PC

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

Failure to follow these instructions can result in equipment damage.

Cable specifications

See chapter *"4.2 Cables"*, page *61* 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
Special characteristics:	-

Connecting a PC

A PC with commissioning software can be connected for commissioning. The PC is connected via a bidirectional USB/RS485 converter, see chapter Accessories, page *481*.

Wiring diagram

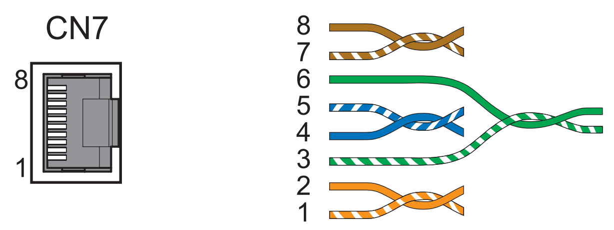

Figure 30: Wiring diagram PC with commissioning software

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

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

5.3.12 Connection SERCOS III

Cable specifications

Shield:	Required, both ends grounded
Twisted Pair:	Required
PELV:	Required
Cable composition:	4 * 0.14 mm² (AWG 24)

- Use equipotential bonding conductors, see page *61*.
- Use pre-assembled cables (page *485*) to reduce the risk of wiring errors.

Wiring diagram

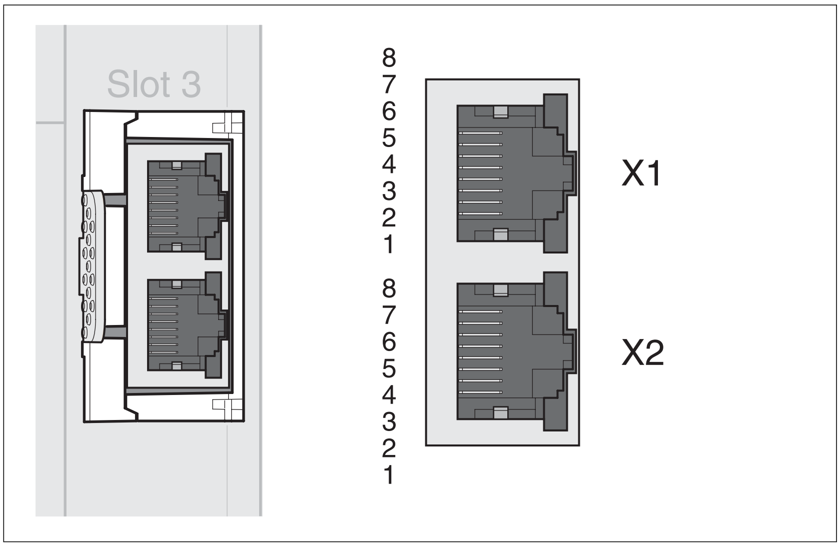

Figure 31: Pin assignment

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

Connecting the fieldbus

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

5.3.13 Modules

The mechanical installation of modules is described in chapter *"5.2.1 Installing and removing modules"* on page *86*.

The electrical installation of the module is described in the corresponding manual for the module.

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5.4 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.

An alphabetically sorted overview of the parameters can be found in the chapter "Parameters". The use and the function of some parameters are explained in more detail in this chapter.

The safety function STO (Safe Torque Off) does not cause electric isolation. The DC bus voltage is still present.

DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT USE

Turn off the mains voltage using an appropriate switch to achieve a voltage-free condition.

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

- 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 changes to the settings or data.
- Only start the system if there are no persons or obstructions in the danger zone.

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

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

WARNING

MOVEMENT WITHOUT BRAKING EFFECT

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.

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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 danger zone.

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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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

"5.4 Verifying installation"
"6.5 Commissioning procedure"
"6.5.1 "First Setup""
"6.5.2 Operating state (state diagram)"
"6.5.3 Setting basic parameters and limit values"
"6.5.4 Digital inputs / outputs"
"6.5.6 Testing the safety function STO"
"6.5.7 Holding brake"
"6.5.8 Checking the direction of movement"
"6.5.9 Setting parameters for encoder"
"6.5.10 Setting the braking resistor parameters"
"6.5.11 Autotuning the device"
"6.5.12 Enhanced settings for autotuning"

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6.1.2 Commissioning tools

Overview

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

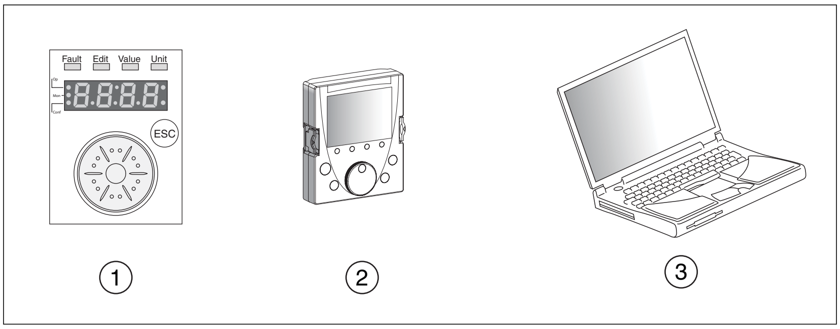

Figure 32: Commissioning tools

(1) Integrated HMI

(2) External graphic display terminal

(3) PC with commissioning software

Access to all parameters is only possible with the commissioning software or via the 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 numbers) 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

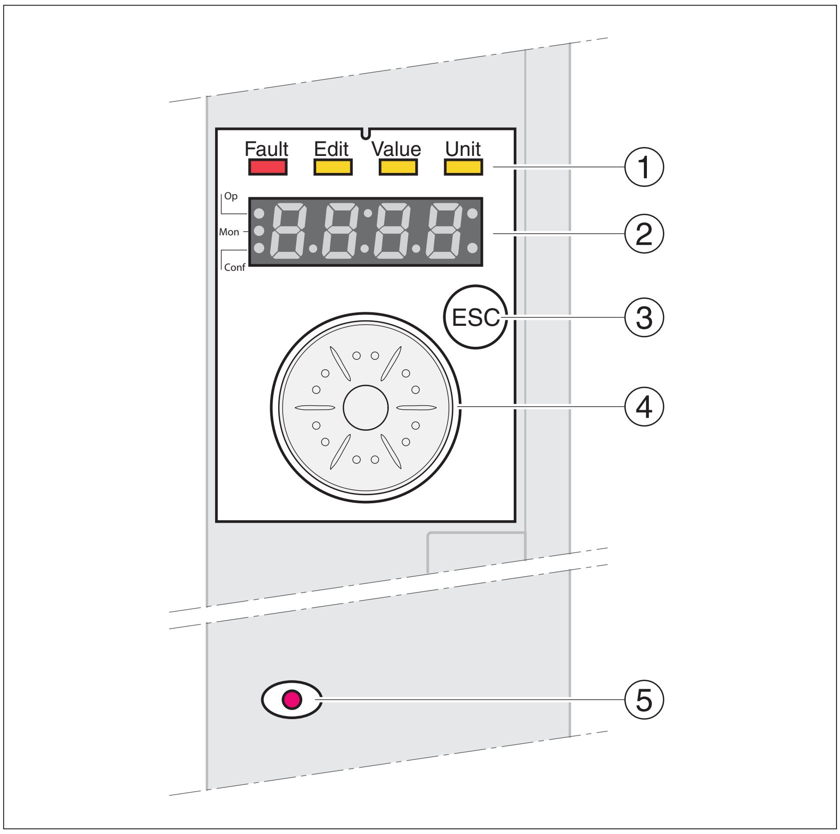

Figure 33: Controls at the integrated HMI

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

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6.2.1 Indication and operation

Overview

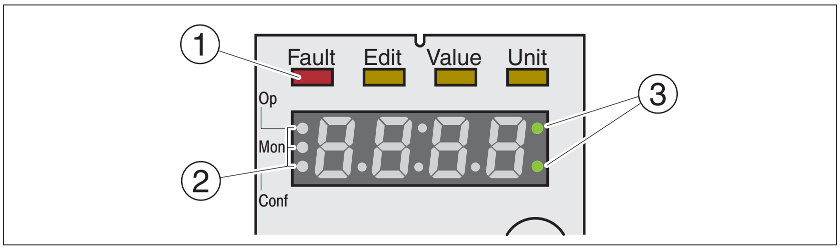
Status LEDs and a 4-digit 7-segment display indicate the device status, menu designation, parameter codes, status codes and error numbers. By turning the navigation button, you can select menu levels and parameters and increment or decrement values. To confirm a selection, press the navigation button.
The ESC (Escape) button allows you to exit parameters and menus. If values are displayed, the ESC button lets you return to the last saved value.

Character set on the HMI

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

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
A	b	c C	d	E	F	G	h	ı	J	H	L	M	n	o	P	q	r
S	T	U	V	W	X	Y	Z	1	2	3	4	5	6	7	8	9	0
5	t	u	U	W	H	y	2	1	2	3	4	5	6	7	8	9	0
!	?	%	(	)	+	-	_	<	=	>	"	'	^	/	\	°	μ
!	?	%	C	)	+	-	_	c	=	ɔ	"	'	^	/	\	°	μ

Indication of the device status



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

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

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

LED	Meaning
Op	Operation
Mon	Monitoring
Conf	Configuration

(3) Flashing dots indicate a warning, for example, if a limit value has been exceeded.

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Display of values

The HMI can directly display values up to 999.

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

Example:: Value 1234567890

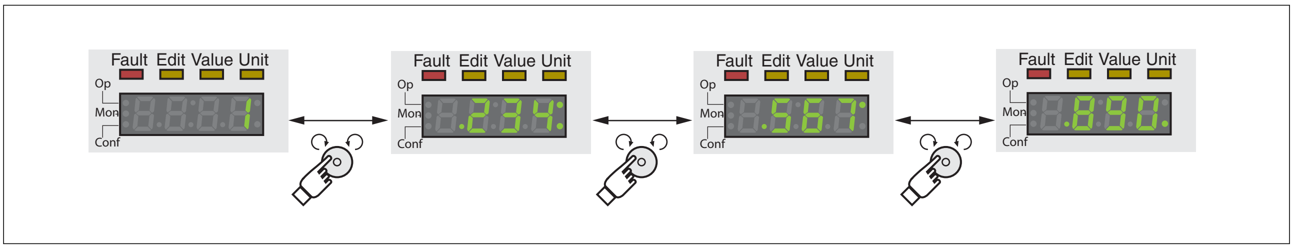

Figure 34: HMI display of values

Navigation button

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

Turn the navigation button to do the following:

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

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

- Call the selected menu
- Call the selected parameter
- Save the current value to the EEPROM

Hold down the navigation button to do the following:

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

Access channels

The product can be addressed via different access channels. See chapter *"7.1 Access channels"* for additional information.

6.2.2 Menu structure

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

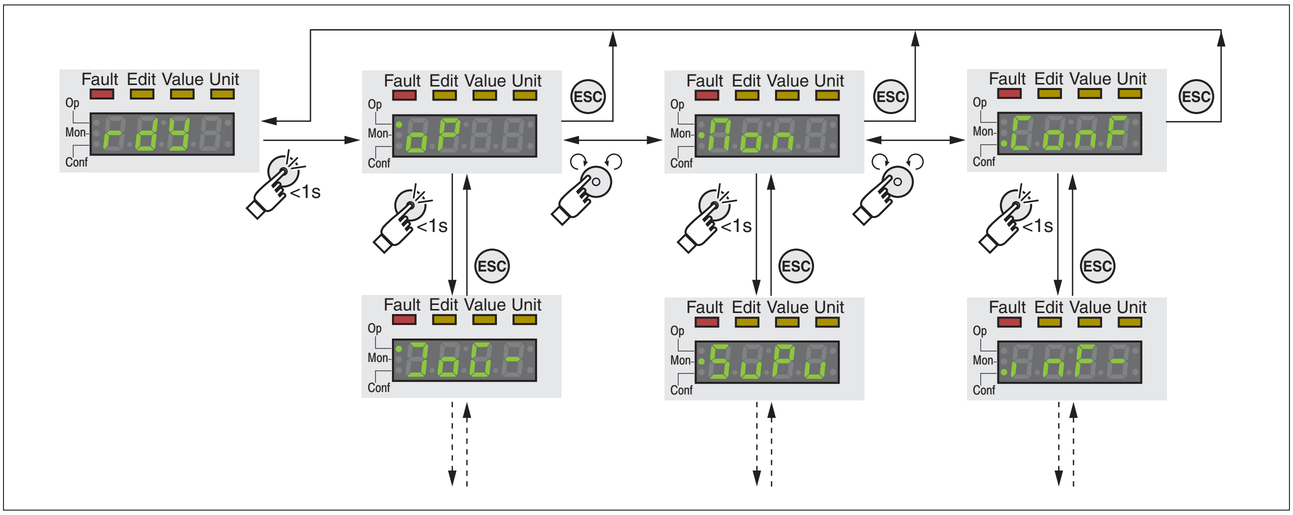

Figure 35: HMI menu structure

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

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6.2.3 Making settings

Displaying and setting parameters

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

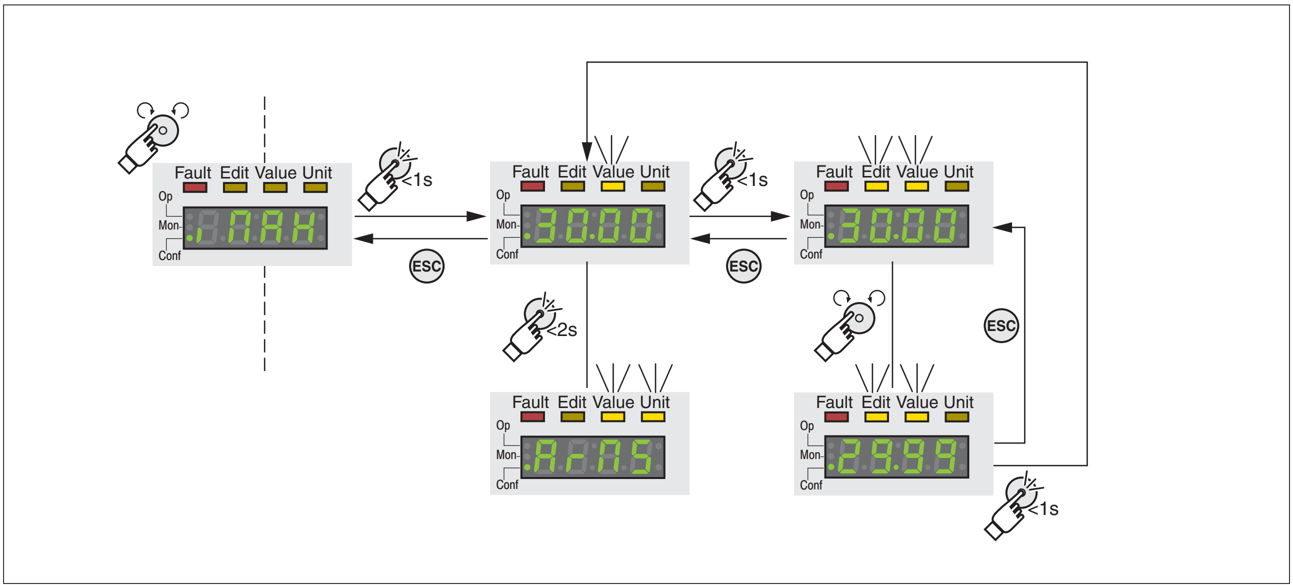

Figure 36: Integrated HMI, example of setting a parameter

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- The parameter iMAX (iMax) is shown on the 7-segment display, see *Figure 36*.
- ▶ Press the navigation button for a longer period of time to display a parameter description.
- ◁ The parameter description is displayed in the form of horizontally scrolling text.
- ▶ Briefly press the navigation button to display the current value of the selected parameter.
- ◁ The Value status LED lights up and the current parameter value is displayed.
- ▶ Press the navigation button for a longer period of time to display the unit of the current parameter value.
- ◁ As long as the navigation button is held down, the status LEDs Value and Unit light. The unit of the current parameter value is displayed. Once you release the navigation button, the current parameter value is displayed again and the status LED Value lights.
- ▶ Briefly press the navigation button to activate the Edit mode which allows you to modify parameter values.
- ◁ The Edit and Value status LEDs light up and the current parameter value is displayed.
- ▶ Turn the navigation button to change the value. The increments and the limit value for each parameter are pre-defined.
- ◁ The Edit and Value status LEDs light and the selected parameter value is displayed.
- ▶ Briefly press the navigation button to save the changed parameter value.

  If you do not want to save the changed parameter value, press the ESC button to cancel. The display returns to the original value.
- ◁ The displayed parameter value flashes once; the changed parameter value is written to the EEPROM.
- ▶ Press ESC to return to the menu

Setting the 7-segment display

By default, the current operating state is displayed by the 4-digit 7-segment display, see page *193*. You can set the following via the menu item drC- / SUPV:

- StAt displays the current operating state
- VAct displays the current velocity of the motor
- iAct displays the current motor current

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

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6.3 External graphic display terminal

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

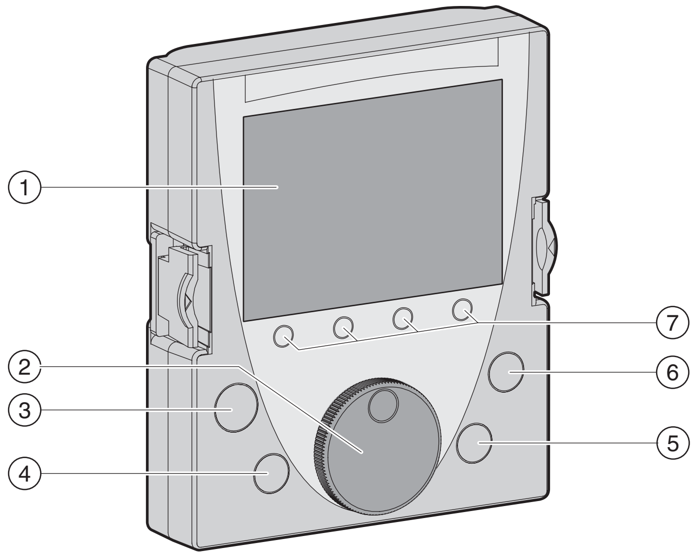

Figure 37: External graphic display terminal

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

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

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

6.3.1 Display and controls

Display field (1)

The display is subdivided into 5 areas.

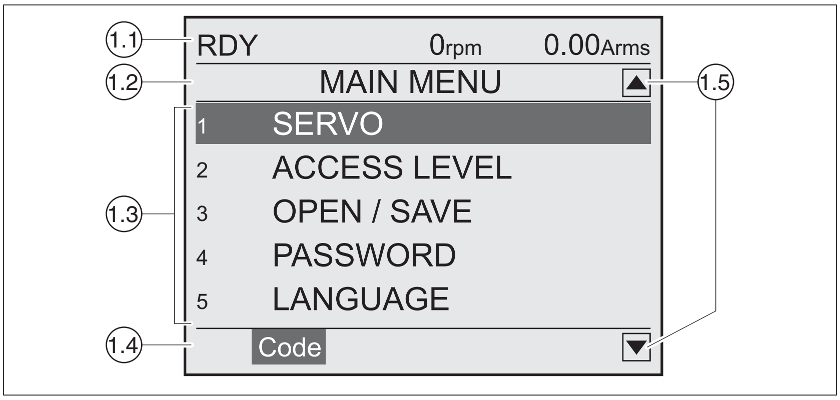

Figure 38: Display of the graphic display terminal (example shows English language)

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

Status information of the drive (1.1)

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

Menu bar (1.2)

The menu bar displays the name of the current menu.

Data field (1.3)

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

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

Function bar (1.4)

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

Navigation (1.5)

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

Navigation button (2)

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

Key STOP/RESET (3)

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

Key RUN (4)

The key RUN allows you to start a movement.

Key FWD/REV (5)

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

Key ESC (6)

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

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Function keys F1 ... F4 (7)

The assignment of the function keys F1 .... F4 depends on the context. The function bar displays the name of the function triggered when the corresponding function key is pressed.

6.3.2 Connecting the external graphic display terminal to LXM32

The external graphic display terminal is an accessory for the drive, see chapter *"11.1 Commissioning tools"*, page *481*. The external graphic display terminal is connected to CN7 (commissioning interface). Only use the cable shipped with the external graphic display terminal to connect it. If the external graphic display terminal is connected to LXM32, the integrated HMI is deactivated. The integrated HMI shows di SP (Display).

6.3.3 Using the external graphic display terminal

The following 2 examples show you how to use the external graphic display terminal.

Example 'Setting the Language'

In this example, you set the desired language for the external graphic display terminal. The drive must have been fully installed and the supply voltage must be on.

- ■ The external graphic display terminal has been connected to CN7 and the main menu is displayed.
- ▶ Rotate the navigation button until item 5 (LANGUAGE) is highlighted.
- ▶ Press the navigation button to confirm the selection.
- ◁ The menu bar shows the selected function ($_5$ LANGUAGE). The data field displays the selected value, in this case the selected language.
- ▶ Press the navigation button to change the value.
- ◁ The menu bar displays the selected function "Language". The supported languages are shown in the data field.
- ▶ Turn the navigation button to select the desired language.
- ◁ The currently active language is highlighted by a check.
- ▶ Press the navigation button to confirm the selected value.
- ◁ The menu bar displays the selected function "Language". The selected language is shown in the data field.
- ▶ Press ESC to return to the main menu.
- ◁ The main menu is displayed in the selected language.

Example 'Using Operating Mode Jog'

This example starts a movement in the operating mode Jog. The drive must have been fully installed. Commission the drive as per chapter *"6.5 Commissioning procedure"*. The following procedure corresponds to chapter .*"6.5.8 Checking the direction of movement"*.

- ■ The external graphic display terminal has been connected to CN7 and the main menu is displayed. The desired language has been set.
- ▶ Rotate the navigation button until item 1 (SERVO) is highlighted.
- ▶ Press the navigation button to confirm the selection.
- ◁ The menu bar shows the selected function ($_{1}$ SERVO). The data field displays the submenu of the selected function ($_{1}$ SERVO).
- ▶ Rotate the navigation button until item 1.4 (OPERATION) is highlighted and press the navigation button to confirm the selection.
- ◁ The menu bar shows the selected function ($_{1.4}$ OPERATION). The data field displays the supported operating modes in a submenu.
- ▶ Rotate the navigation button until item 1.4.1 (JOG) is highlighted and press the navigation button to confirm the selection.
- ◁ The menu bar shows the selected function ($_{1.4.1}$ JOG). The data field displays "Op. mode Jog" and the parameters and parameter values for the operating mode
- ▶ Rotate the navigation button until the item "Op. mode Jog" is highlighted and press the navigation button to confirm the selection.
- ◁ The data field displays "JOG → " (Jog, slow movement in positive direction).
- ▶ Rotate the navigation button to change the (slow: → , ← fast: →→ , ←←) and the direction of movement (positive direction of movement: → , →→ , negative direction of movement: ← , ←←). You can also use the FWD/REV key to change the direction of movement.
- ▶ Press the navigation button or the RUN key to enable the power stage.
- ▶ Press the navigation button or the RUN key to start a movement.
- ◁ The movement continues as long as you hold down the navigation button / the RUN key or until you press the STOP/RESET key. You can neither change the velocity nor the direction of movement during the movement.
- ▶ To stop the movement, press the STOP/RESET key or release the navigation button / the RUN key.
- ▶ Press the ESC key to disable the power stage.
- ◁ Power stage is disabled.
- ▶ Press ESC 3 times to return to the main menu.
- ◁ Each time you press ESC you go back by one menu level.

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6.4 Commissioning software

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

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

See page *116* for details on connecting a PC to the device.

Online help

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

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6.5 Commissioning procedure

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

- 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 changes to the settings or data.
- Only start the system if there are no persons or obstructions in the danger zone.

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

Improper use of access control may cause commands to be triggered or blocked.

⚠ WARNING

UNINTENDED BEHAVIOR CAUSED BY ACCESS CONTROL

- Verify that no unintended behavior is caused as a result of enabling or disabling exclusive access.
- Verify that impermissible access is blocked.
- Verify that required access is available.

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

6.5.1 "First Setup"

A "First Setup" is required when the controller supply is switched on for the first time or after the factory settings have been restored.

Duplicating device settings

A memory card or the commissioning software allows you duplicate device settings. See chapter *"6.8 Duplicating existing device settings"*, page *186* for additional information.

Automatic reading of the motor data record

When the device is switched on and if an encoder is connected to CN3, the device automatically reads the electronic nameplate from the Hiperface encoder. The record is checked and written to the EEPROM.

The record contains technical information on the motor such as nominal torque and peak torque, nominal current, nominal velocity and number of pole pairs. The record cannot be changed by the user. Without this information, the device is not ready for operation.

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Manual adjustment of the motor parameters

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

Preparation

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

Switching on the device

■ The power stage supply is switched off.

▸ Disconnect the product from the the fieldbus during commissioning in order to avoid conflicts by simultaneous access.

▸ Switch on the controller supply.

◁ The device goes through an initialization routine, all LEDs are tested, all segments of the 7-segment display and the status LEDs light up.

If a memory card is in the the slot of the device, the message CArd is displayed by the 7-segment display for a short period of time. This indicates that a memory card has been detected. If the message CArd is permanently displayed by the 7-segment display, there are differences between the content of the memory card and the parameter values stored in the device. See chapter *"6.7 Memory Card"*, page *182* for additional information.

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

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

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
`SercosAddress` ConF → CoM- ConF → FSu- Addr	Sercos device address This parameter assigns a Sercos address to the drive. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 0 255	UINT16 R/W per. -	Modbus 18178 IDN P-0-3071.0.1

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

Restarting the device

A restart of the device is required for the changes to become effective. After the restart, the device is ready for operation.

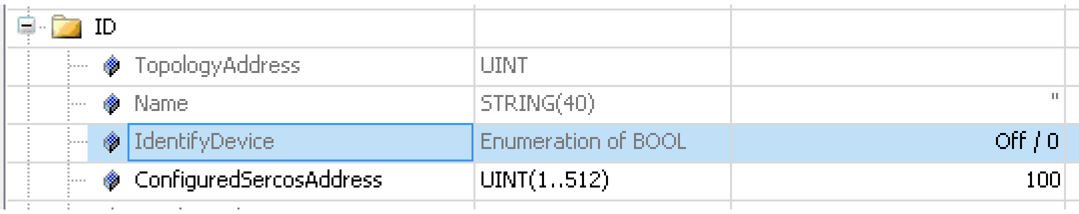
Identifying the device

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

The function "IdentifyDevice" causes the LED SIII to flash. See chapter *"9.1.5 Fieldbus status LEDs"* for more information on the LEDs.

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

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



IdentifyDevice = Off / 0: Function "IdentifyDevice" is not active
IdentifyDevice = On / 1: Function "IdentifyDevice" is active

Further steps

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

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6.5.2 Operating state (state diagram)

After switching 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.

Graphical representation The state diagram is represented as a flow chart.

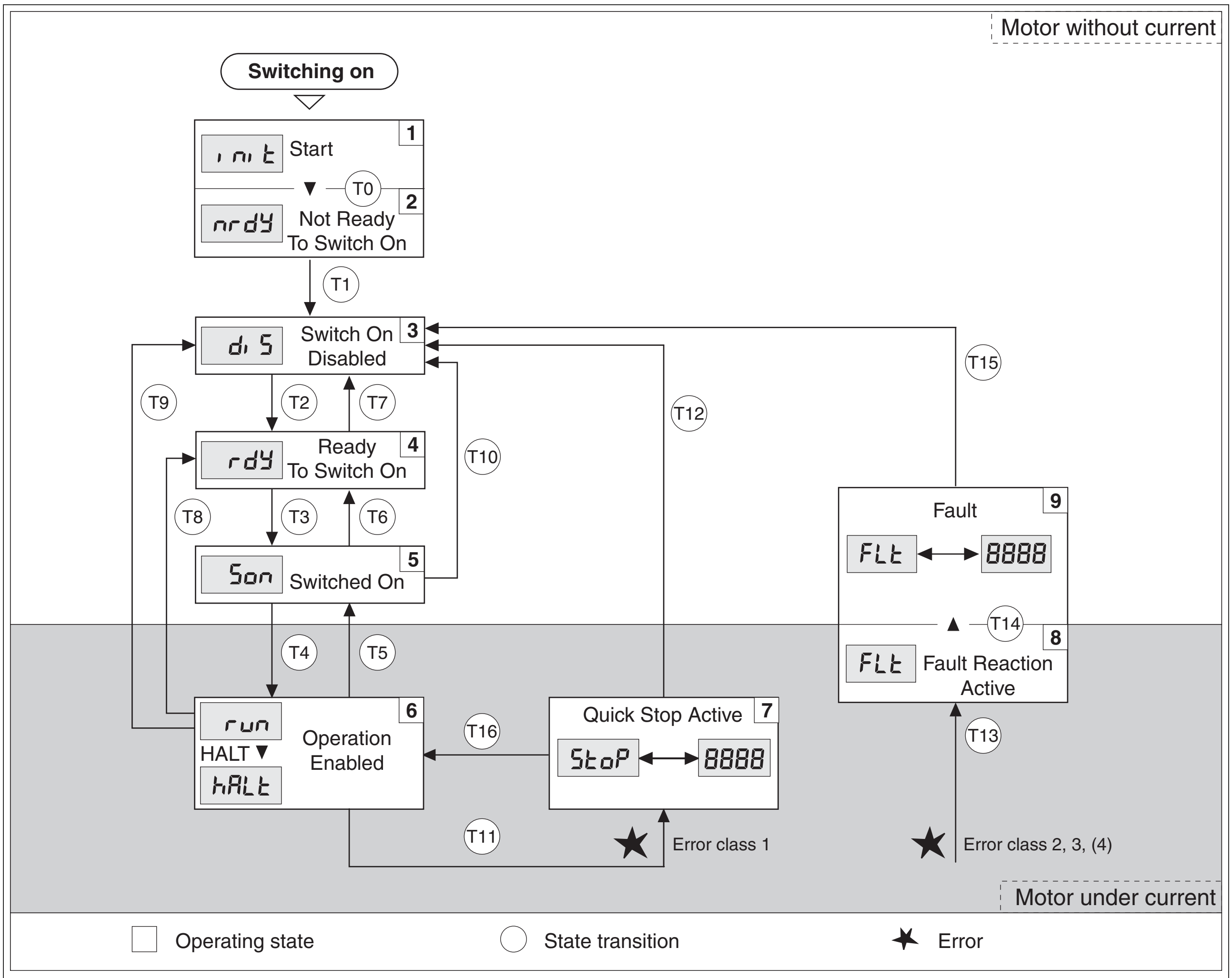

Figure 39: State diagram

Operating states and state transitions See page *193* for detailed information on operating states and state transitions.

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6.5.3 Setting basic parameters and limit values

Prepare a list with the parameters required for the functions used.

Controller parameter sets

This device allows you to use two controller parameter sets. It is possible to switch form one set of controller parameters to the other during operation. The active controller parameter set is selected with the parameter `CTRL_SelParSet`.

The corresponding parameters are `CTRL1_xx` for the first controller parameter set and `CTRL2_xx` for the second controller parameter set. The following descriptions use the notation `CTRL1_xx` (`CTRL2_xx`) if there are no functional differences between the two controller parameter sets.

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL_SelParSet	Selection of controller parameter set (non-persistent) Coding see parameter: CTRL_PwrUpParSet Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 1 2	UINT16 R/W - -	Modbus 4402 IDN P-0-3017.0.25
_CTRL_ActParSet	Active controller parameter set Value 1: Controller parameter set 1 is active Value 2: Controller parameter set 2 is active A controller parameter set is active after the time for the parameter switching (CTRL_ParChgTime) has elapsed. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 4398 IDN P-0-3017.0.23
CTRL_ParChgTime	Period of time for parameter switching In the case of parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp Such a parameter switching can be caused by - change of the active controller parameter set - change of the global gain - change of any of the parameters listed above - switching off the integral term of the velocity controller Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	ms 0 0 2000	UINT16 R/W per. -	Modbus 4392 IDN P-0-3017.0.20

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

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

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

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

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

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL_I_max ConF → drC- iMAX	Current limitation During operation, the actual current limit is one of the following values (whichever is lowest): - CTRL_I_max - _M_I_max - _PS_I_max - Current limitation via analog input (module IOM1) - Current limitation via digital input Limitations caused by I2t monitoring are also taken into account. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 - 463.00	UINT16 R/W per. -	Modbus 4376 IDN P-0-3017.0.12
LIM_I_maxQSTP ConF → FLt- qcur	Current value for Quick Stop This value is only limited by the minimum/maximum value range (no limitation of this value by motor/power stage). In the case of a Quick Stop, the actual current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxQSTP - _M_I_max - _PS_I_max Further current reductions caused by I2t monitoring are also taken into account during a Quick Stop. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} - - -	UINT16 R/W per. -	Modbus 4378 IDN P-0-3017.0.13

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

Velocity limitation

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

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL_v_max ConF → drC- nMAX	Velocity limitation During operation, the actual velocity limit is one of the following values (whichever is lowest): - CTRL_v_max - M_n_max - Velocity limitation via analog input (module IOM1) - Velocity limitation via digital input Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 1 13200 2147483647	UINT32 R/W per. -	Modbus 4384 IDN P-0-3017.0.16

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6.5.4 Digital inputs / outputs

The device has configurable inputs and configurable outputs. The standard assignment and the configurable assignment depends on the selected operating mode. For more information, see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

The signal states of the digital inputs and outputs can be displayed on the HMI and displayed and modified using the commissioning software.

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

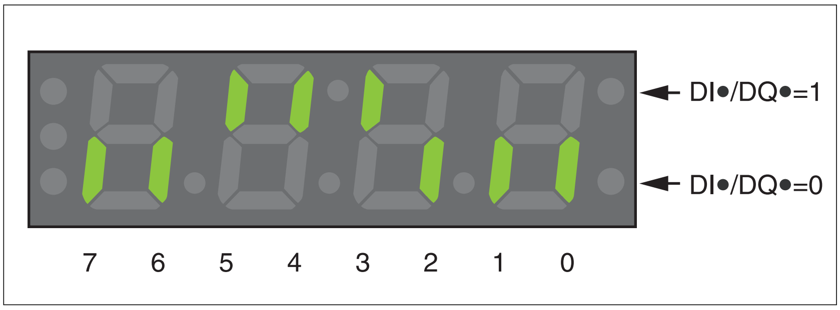

Figure 40: Integrated HMI, displaying the signal state of the digital inputs (DI•) and outputs (DQ•)

Inputs (parameter `_IO_DI_act`):

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

bit	Signal	I/O
0	DI0	I
1	DI1	I
2	DI2	I
3	DI3	I
4	DI4	I
5	DI5	I
6 ... 7	-	-

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

Outputs (parameter `_IO_DQ_act`):

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

bit	Signal	I/O
0	DQ0	O
1	DQ1	O
2	DQ2	O
3 ... 7	-	-

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

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

6.5.5 Testing the signals of the limit switches

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 • Check whether your application allows for the use of limit switches. If yes, use limit switches. • Verify correct connection of the limit switches. • Verify that the limit switches are mounted in a position far enough away from the mechanical stop to allow for an adequate stopping distance. • Verify correct parameterization and function of the limit switches. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

▸ Set up the limit switches in such a way as to keep the motor from overtraveling the limit switches.
▸ Trigger the limit switches manually.
◃ The HMI displays an error message.

Parameters can be used to release the limit switches and to set the evaluation to active 0 or active 1, see page *276*.

If possible, use normally closed contacts so that a wire break can be signaled as an error.

6.5.6 Testing the safety function STO

Operation with STO

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

- Power stage supply is switched off.
  Controller supply is switched off.
- ▶ Verify that the signal wires at the inputs ($\overline{\text{STO\_A}}$) and ($\overline{\text{STO\_B}}$) are isolated from each other. The two signal wires must not be electrically connected.
- Power stage supply is switched on.
  Controller supply is switched on.
- ▶ Start the operating mode Jog (without motor movement) (see page *198*).
- ▶ Trigger the safety function. $\overline{\text{STO\_A}}$ and $\overline{\text{STO\_B}}$ must be switched off simultaneously.
- ◁ The power stage is disabled and error message 1300 is generated. (NOTE: Error message 1301 indicates a wiring error.)
- ▶ Check the behavior of the drive when errors are detected.
- ▶ Document all tests of the safety function in your acceptance protocol.

Operation without STO

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

- ▶ Verify that the inputs $\overline{\text{STO\_A}}$ and $\overline{\text{STO\_B}}$ are connected to +24VDC.

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6.5.7 Holding brake

Holding brake

The holding brake in the motor has the task of holding the current motor position when the power stage is disabled, even if external forces act (for example, in the case of a vertical axis). The holding brake is not a safety function and not a service brake.

The signals of the holding brake meet the PELV requirements.

Releasing the holding brake

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

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

An additional time delay can be set via parameters, see chapter *"6.5.7.2 Adjustable parameters"*.

Applying the holding brake

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

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

An additional time delay can be set via parameters, see chapter *"6.5.7.2 Adjustable parameters"*.

NOTE: Triggering the STO safety function means that the time delay for motors with holding brake is not effective. The motor cannot generate holding torque to bridge the time to application of the holding brake. Check whether additional measures have to be taken; for example, this may cause the load of vertical axes to lower.

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6.5.7.1 Releasing the holding brake manually

Releasing the holding brake may cause an unintended movement in the system, for example, if vertical axes are used.

⚠ WARNING

UNINTENDED MOVEMENT

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

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

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

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

Releasing the holding brake via a signal input

In order to release the holding brake via a signal input, you must first parameterize the signal input function "Release Holding Brake", see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

Releasing the holding brake via the fieldbus

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

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via field-bus**
`BRK_release`	Processing of holding brake **0 / Automatic**: Automatic processing **1 / Manual Release**: Manual release of holding brake The holding brake output can only be activated in the operating states 'Switch On Disabled', 'Ready To Switch On' or 'Fault'. If the power stage is active, the value is automatically set to 0. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2068 IDN P-0-3008.0.10

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6.5.7.2 Adjustable parameters

The time delay for releasing and applying the holding brake stored in the electronic nameplate depends on the motor type.

An additional time delay can be set via parameters.

- `BRK_AddT_release`: Additional time delay for releasing the holding brake
- `BRK_AddT_apply`: Additional time delay for applying the holding brake

Time delay for releasing the holding brake

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

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

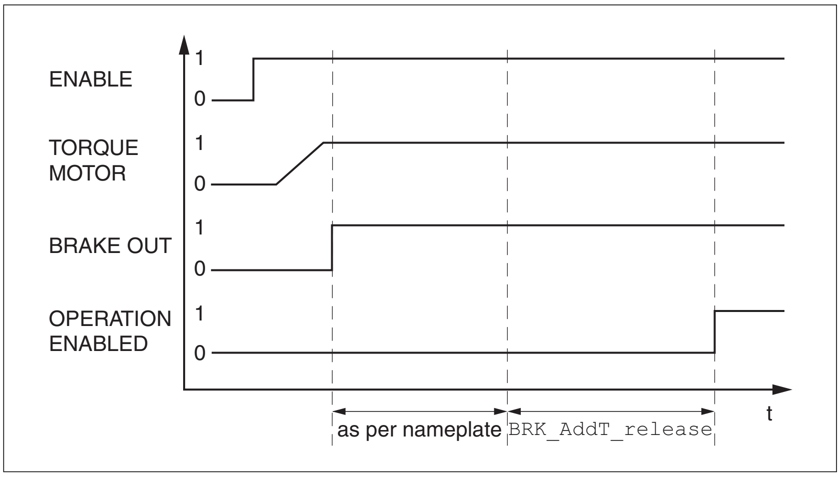

Figure 41: Releasing the holding brake

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

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Time delay for applying the holding brake

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

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

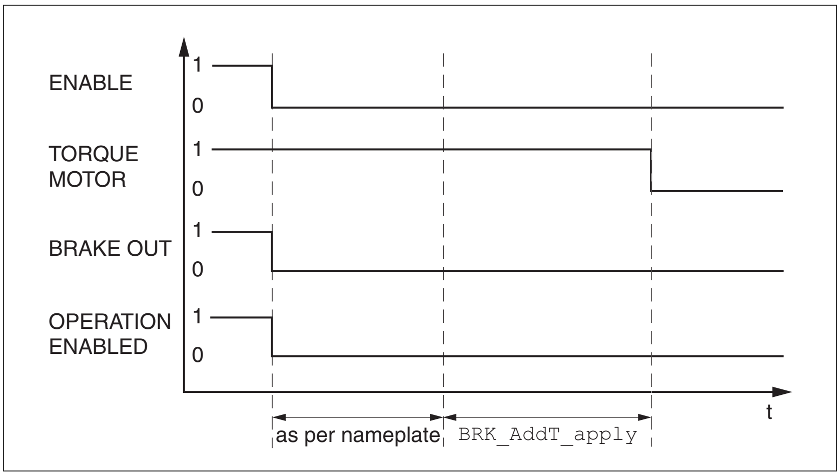

Figure 42: Applying the holding brake

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

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6.5.7.3 Checking the holding brake

Releasing the holding brake may cause an unintended movement in the system, for example, if vertical axes are used.

⚠ WARNING

UNINTENDED MOVEMENT

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

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

Checking the holding brake

■ The device is in operating state "Ready to switch on" and the parameters for the holding brake must have been set.

▶ Start the operating mode Jog (HMI: oP → JoG → JGSt).

◁ The power stage is enabled and the holding brake released. The HMI displays JG-.

▶ Press the navigation button and hold it down.

◁ As long as the navigation button is held down, the motor moves.

▶ Press ESC.

◁ The holding brake is applied. The power stage is disabled.

NOTE: Depending on the motor current set, the driving torque may be greater than the holding torque of the holding brake.

6.5.8 Checking the direction of movement

⚠ WARNING

UNEXPECTED MOVEMENT CAUSED BY INTERCHANGED MOTOR PHASES

- Do not interchange the motor phases.
- If necessary, parameterize a reversal of the direction of movement.

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

Direction of movement

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

Checking the direction of movement

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

Movement in positive direction:

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

Movement in negative direction:

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

Changing the direction of movement

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

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

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

6.5.9 Setting parameters for encoder

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

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

If you have replaced the device, you must check the absolute position of the motor. If there is a deviation or if you replace the motor, you must set the absolute position once again.

Working range of the encoder

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

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

Underrun of absolute position

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

In the case of applications with a multiturn encoder, an underrun of the absolute position may result in an unexpected actual position during switching on.

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

- Adjustment of the absolute position
- Shifting the working range

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6.5.9.1 Adjustment of the absolute position

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

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

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

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

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

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

6.5.9.2 Shifting the working range

The parameter ShiftEncWorkRang lets you shift the working range.

Working range without shift

The working range without shift comprises:

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

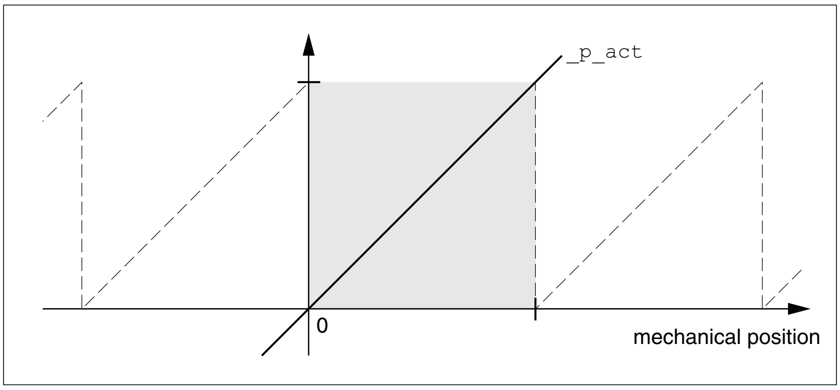

Figure 43: Working range without shift

Working range with shift

The working range with shift comprises:

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

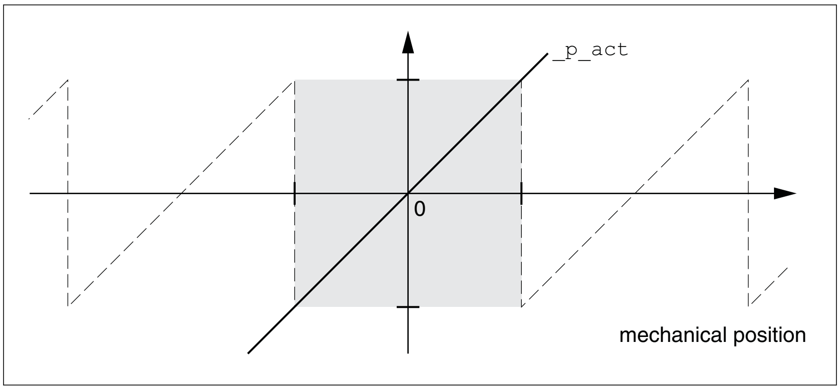

Figure 44: Working range with shift

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

6.5.10 Setting the braking resistor parameters

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

MOTOR WITHOUT BRAKING EFFECT

- Verify that the braking resistor has a sufficient rating.
- Verify that the parameter settings for the braking resistor are correct.
- Verify that the I^2t value for temperature monitoring does not exceed 100% by performing a test run under maximum load conditions.
- Verify that the calculations and the test run take into account the fact that the DC bus capacitors can absorb less braking energy at higher mains voltages.

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

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

⚠ WARNING

HOT SURFACES

- Ensure that any contact with a hot braking resistor is avoided.
- 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.

Further information on braking resistors	Page
Technical data braking resistor	*42*
Rating the braking resistor	*68*
Mounting the external braking resistor	*90*
Electrical installation of the braking resistor	*68*
Order data for external braking resistors	*481*

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- Check the parameter RESint_ext. If you have connected an external braking resistor, you must set the parameter to "external".
- If you have connected an external braking resistor, (value of the parameter RESint_ext is set to "external"), you must assign the appropriate values to the parameters RESext_P, RESext_R and RESext_ton. Verify that the selected external braking resistor is really connected.
- Test the function of the braking resistor under realistic, worst case conditions.

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RESint_ext ConF → ACG- Eibr	Selection of type of braking resistor **0 / Internal Braking Resistor / int** : Internal braking resistor **1 / External Braking Resistor / Eht** : External braking resistor **2 / Reserved / rSUd** : Reserved Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 0 2	UINT16 R/W per. -	Modbus 1298 IDN P-0-3005.0.9
RESext_P ConF → ACG- Pobr	Nominal power of external braking resistor Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	W 1 10 32767	UINT16 R/W per. -	Modbus 1316 IDN P-0-3005.0.18
RESext_R ConF → ACG- rbr	Resistance value of external braking resistor The minimum value depends on the power stage. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 Ω. Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	Ω 0.00 100.00 327.67	UINT16 R/W per. -	Modbus 1318 IDN P-0-3005.0.19
RESext_ton ConF → ACG- tbr	Maximum permissible switch-on time of external braking resistor Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	ms 1 1 30000	UINT16 R/W per. -	Modbus 1314 IDN P-0-3005.0.17

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6.5.11 Autotuning the device

There are three ways of tuning the drive control loops:

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

Autotuning

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

External factors such as a load at the motor are considered. Autotuning optimizes the settings of the control loop parameters; see chapter *"6.6 Controller optimization with step response"*.

Autotuning also supports typical vertical axes.

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

⚠ WARNING

UNEXPECTED MOVEMENT

- Check the parameters `AT_dir` and `AT_dis_usr` (`AT_dis`). The distance required for the deceleration ramp must also be taken into account.
- Verify that the parameter `LIM_I_maxQSTP` for Quick Stop is correctly set.
- If possible, use the limit switches.
- Verify that a functioning button for emergency stop is within reach.
- Only start the system if there are no persons or obstructions in the hazardous area.

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

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

If you want to perform Easy Tuning, no additional parameters need to be set. If you want to perform Comfort Tuning, set the parameters `AT_dir`, `AT_dis_usr` (`AT_dis`) and `AT_mechanics` to meet the requirements of your system.

The parameter `AT_Start` is used to selected between Easy Tuning and Comfort Tuning. When the value is written, autotuning also starts.

▸ Start autotuning via the commissioning software.

It is also possible to start autotuning via the HMI.
HMI: oP → tun → tuSt

- Save the new settings to the EEPROM via the commissioning software.

  The product features 2 controller parameter sets that can be parameterized separately. The values for the controller parameters determined during autotuning are stored in controller parameter set 1.

  If you have started autotuning via the HMI, press the navigation button to save the new values to the EEPROM.

If autotuning cancels with an error message, the default values are used. Change the mechanical position and restart autotuning. If you want to verify the plausibility of the calculated values, you can have them displayed; see chapter
"6.5.12 Enhanced settings for autotuning", page *167*.

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`AT_dis`	Movement range for Autotuning Range within which the control parameters are automatically optimized. The range is entered with reference to the current position. NOTE: In the case of "Movement in one direction only" (Parameter AT_dir), the specified range is used for each optimization step. The actual movement typically corresponds to 20 times the value, but it is not limited. The parameter AT_dis_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 In increments of 0.1 revolution. Changed settings become active the next time the motor moves.	revolution 1.0 2.0 999.9	UINT32 R/W - -	Modbus 12038 IDN P-0-3047.0.3
`AT_mechanical`	Type of coupling of the system **1 / Direct Coupling**: Direct coupling **2 / Belt Axis**: Belt axis **3 / Spindle Axis**: Spindle axis Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	- 1 2 3	UINT16 R/W - -	Modbus 12060 IDN P-0-3047.0.14
`AT_start`	Autotuning start Value 0: Terminate Value 1: Activate EasyTuning Value 2: Activate ComfortTuning Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 - 2	UINT16 R/W - -	Modbus 12034 IDN P-0-3047.0.1

6.5.12 Enhanced settings for autotuning

The following parameters allow you to monitor and influence autotuning.

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

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

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL_GlobGain oP → tun- GAin	Global gain factor (affects parameter set 1) The global gain factor affects the following parameters of controller parameter set 1: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref The global gain factor is set to 100% - if the controller parameters are set to default - at the end of the Autotuning process - if the controller parameter set 2 is copied to set 1 via the parameter CTRL_ParSet-Copy NOTE: If a full configuration is transmitted via the fieldbus, the value for CTRL_Glob-Gain must be transmitted prior to the values of the controller parameters CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUn-ref. If CTRL_GlobGain is changed during a configuration transmission, CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref must also be part of the configuration. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immedi-ately.	% 5.0 100.0 1000.0	UINT16 R/W per. -	Modbus 4394 IDN P-0-3017.0.21
_AT_M_friction	Friction torque of the system Is determined during Autotuning. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 12046 IDN P-0-3047.0.7
_AT_M_load	Constant load torque Is determined during Autotuning. Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 12048 IDN P-0-3047.0.8
_AT_J	Moment of inertia of the entire system Is automatically calculated during Autotun-ing. Type: Unsigned decimal - 2 bytes In increments of 0.1 kg cm^2.	kg cm^2 0.1 0.1 6553.5	UINT16 R/- per. -	Modbus 12056 IDN P-0-3047.0.12

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

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

6.6 Controller optimization with step response

6.6.1 Controller structure

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

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

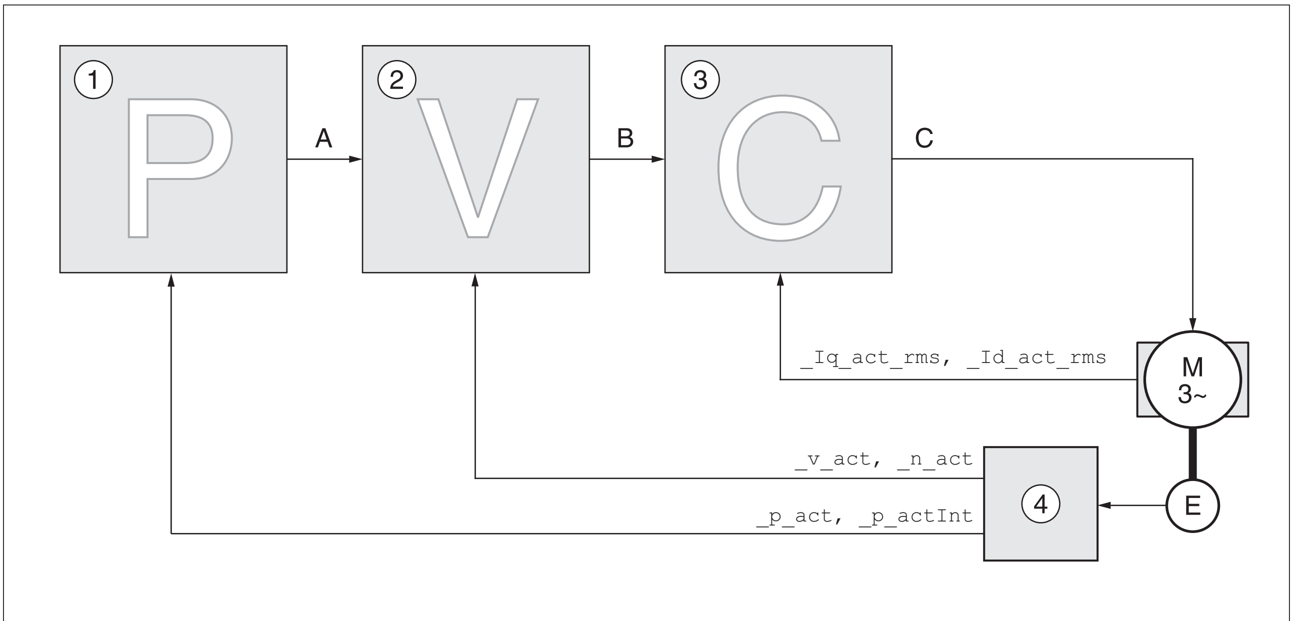

Figure 45: Controller structure

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

See chapter *"7.5.5 Setting the controller parameters"* for a detailed description of the controller structure.

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

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

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

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

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

6.6.2 Optimization

The drive optimization function matches the device to the application conditions. The following options are available:

- Selecting control loops. Superimposed control loops are automatically deactivated.
- Defining reference value signals: signal type, amplitude, frequency and starting point
- Testing control performance with the signal generator.
- Recording the control performance on screen and evaluating it with the commissioning software.

Setting reference value signals

- ▶ Start controller optimization with the commissioning software.
- ▶ Set the following values for the reference value signal:
- Signal type: Step "positive"
- Amplitude: 100 min^{-1}
- Cycle duration: 100 ms
- Number of repetitions: 1
- ▶ Start the trace.

Only the signal types "Step" and "Square" allow you to determine the entire dynamic behavior of a control loop. The manual shows signal paths for the signal type "Step".

Entering controller values

The optimization steps described on the following pages require you to enter control loop parameters and test their effect by triggering a step function.

A step function is triggered as soon as you start recording in the commissioning software.

You can enter controller values for optimization in the parameters window in the "Control" group.

Controller parameter sets

This device allows you to use two controller parameter sets. It is possible to switch form one set of controller parameters to the other during operation. The active controller parameter set is selected with the parameter `CTRL_SelParSet`.

The corresponding parameters are `CTRL1_xx` for the first controller parameter set and `CTRL2_xx` for the second controller parameter set. The following descriptions use the notation `CTRL1_xx` (`CTRL2_xx`) if there are no functional differences between the two controller parameter sets.

6.6.3 Optimizing the velocity controller

Optimum settings of complex mechanical control systems require hands-on experience with controller tuning . This includes the ability to calculate control loop parameters and to apply identification procedures.

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Less complex mechanical systems can often be successfully optimized by means of experimental adjustment using the aperiodic limit method. The following parameters are used for this:

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL1_KPn ConF → drC- Pn1	Velocity controller P gain The default value is calculated on the basis of the motor parameters. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 A/min^{-1}. Changed settings become active immediately.	A/min^{-1} 0.0001 - 2.5400	UINT16 R/W per. -	Modbus 4610 IDN P-0-3018.0.1
CTRL2_KPn ConF → drC- Pn2	Velocity controller P gain The default value is calculated on the basis of the motor parameters. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 A/min^{-1}. Changed settings become active immediately.	A/min^{-1} 0.0001 - 2.5400	UINT16 R/W per. -	Modbus 4866 IDN P-0-3019.0.1
CTRL1_TNn ConF → drC- tin1	Velocity controller integral action time The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4612 IDN P-0-3018.0.2
CTRL2_TNn ConF → drC- tin2	Velocity controller integral action time The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4868 IDN P-0-3019.0.2

Check and optimize the calculated values in a second step, as described on page *178*.

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Determining the mechanical system of the system

To assess and optimize the transient response behavior of your system, group its mechanical system into one of the following two categories.

- System with rigid mechanical system
- System with a less rigid mechanical system

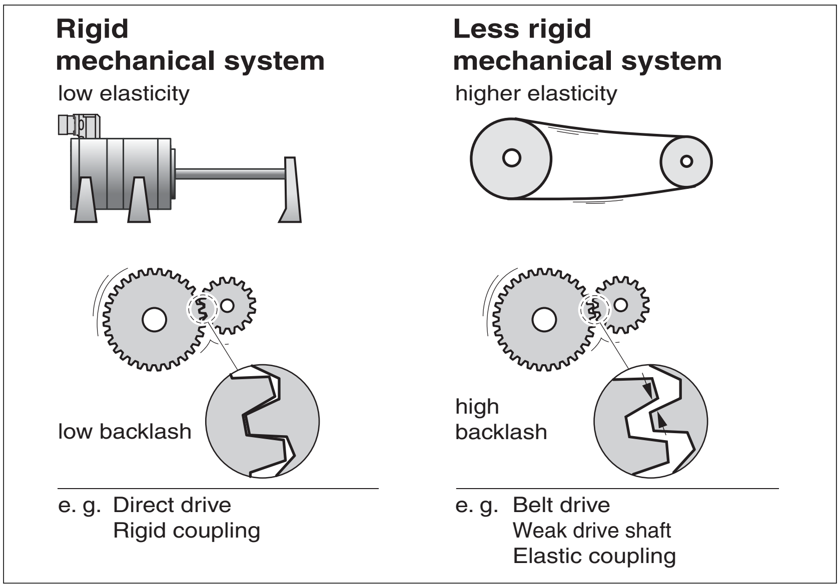

Figure 46: Rigid and less rigid mechanical systems

▸ Couple the motor and the mechanical system

▸ If you use limit switches: verify the function of the limit switches after installation of the motor.

Switching off the reference value filter of the velocity controller

The reference value filter of the velocity controller allows you to improve the transient response at optimized velocity control. The reference value filter must be switched off for the first setup of the velocity controller.

▸ Deactivate the reference value filter of the velocity controller. Set the parameter `CTRL1_TAUnref` (`CTRL2_TAUnref`) to the lower limit value "0".

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL1_TAUnref ConF → drC- tAu1	Filter time constant of the reference velocity value filter In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immedi-ately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	Modbus 4616 IDN P-0-3018.0.4
CTRL2_TAUnref ConF → drC- tAu2	Filter time constant of the reference velocity value filter In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immedi-ately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	Modbus 4872 IDN P-0-3019.0.4

NOTE: The procedure for optimization of the settings is only a suggestion. It is the responsibility of the user to decide whether the method is suitable for the actual application.

Determining controller parameter values for rigid mechanical systems

In the case of a rigid mechanical system, adjusting the control performance on the basis of the table is possible if:

- the moment of inertia of the load and of the motor are known and
- the moment of inertia of the load and of the motor are constant

The P gain `CTRL_KPn` and the integral action time `CTRL_TNn` depend on:

- J_L: Moment of inertia of the load
- J_M: Moment of inertia of the motor
- ▶ Determine the controller parameter values on the basis of the following table:

	$J_L = J_M$		$J_L = 5 * J_M$		$J_L = 10 * J_M$	
J_L	KPn	TNn	KPn	TNn	KPn	TNn
1 $kgcm^2$	0.0125	8	0.008	12	0.007	16
2 $kgcm^2$	0.0250	8	0.015	12	0.014	16
5 $kgcm^2$	0.0625	8	0.038	12	0.034	16
10 $kgcm^2$	0.125	8	0.075	12	0.069	16
20 $kgcm^2$	0.25	8	0.15	12	0.138	16

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Determining controller parameter values for rigid mechanical systems

For optimization purposes, determine the P gain of the velocity controller at which the controller adjusts velocity `_v_act` as quickly as possible without overshooting.

▸ Set the integral action time `CTRL1_TNn` (`CTRL2_TNn`) to infinite (= 327.67 ms).

If a load torque acts on the motor when the motor is at a standstill, the integral action time must not exceed a value that causes uncontrolled change of the motor position.

If the motor is subject to loads when it is at a standstill, setting the integral action time to "infinite" may cause position deviations. Reduce the integral action time if the deviation is unacceptable in your application. However, reducing the integral action time can adversely affect optimization results.

The step function moves the motor at constant velocity until the specified time has expired.

⚠ WARNING
UNEXPECTED MOVEMENT • Verify that the selected values for velocity and time do not exceed the available distance. • If possible, use limit switches. • Verify that a functioning button for emergency stop is within reach. • Verify that the system is free and ready for the movement before starting the function. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

▸ Initiate a step function.

▸ After the first test, check the maximum amplitude for the reference value for the current `_Iq_ref`.

Set the amplitude of the reference value just high enough so the reference value for the current `_Iq_ref` remains below the maximum value `CTRL_I_max`. On the other hand, the value selected should not be too low, otherwise friction effects of the mechanical system will determine the performance of the control loop.

▸ Trigger another step function if you had to modify `_v_ref` and check the amplitude of `_Iq_ref`.

▸ Increase or decrease the P gain in small increments until `_v_act` is obtained as fast as possible. The following diagram shows the required transient response on the left. Overshooting - as shown on the right - is reduced by reducing `CTRL1_KPn` (`CTRL2_KPn`).

Differences between `_v_ref` and `_v_act` result from setting `CTRL1_TNn` (`CTRL2_TNn`) to "Infinite".

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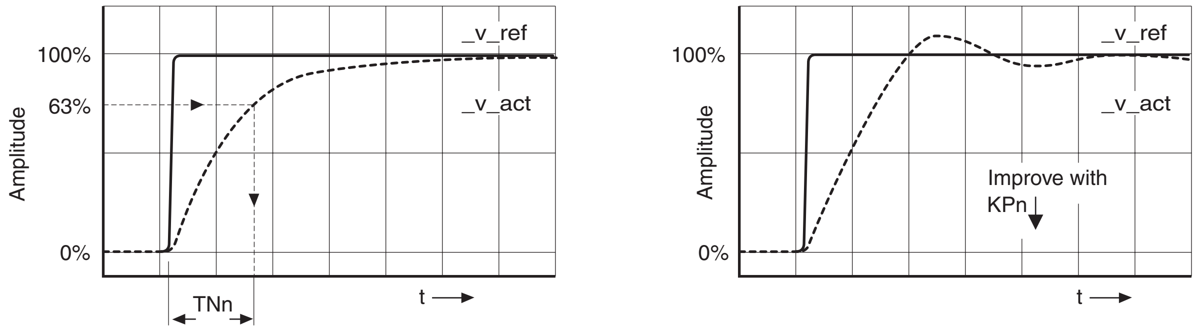

Figure 47: Determining "TNn" for the aperiodic limit

In the case of drive systems in which oscillations occur before the aperiodic limit is reached, the P gain "KPn" must be reduced until oscillations can no longer be detected. This occurs frequently in the case of linear axes with a toothed belt drive.

Graphic determination of the 63% value

Graphically determine the point at which the actual velocity `_v_act` reaches 63% of the final value. The integral action time `CTRL1_TNn` (`CTRL2_TNn`) then results as a value on the time axis. The commissioning software supports you with the evaluation:

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
`CTRL1_TAUiref`	Filter time constant of the reference current value filter In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	Modbus 4618 IDN P-0-3018.0.5
`CTRL2_TAUiref`	Filter time constant of the reference current value filter In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	Modbus 4874 IDN P-0-3019.0.5

6.6.4 Checking and optimizing default settings

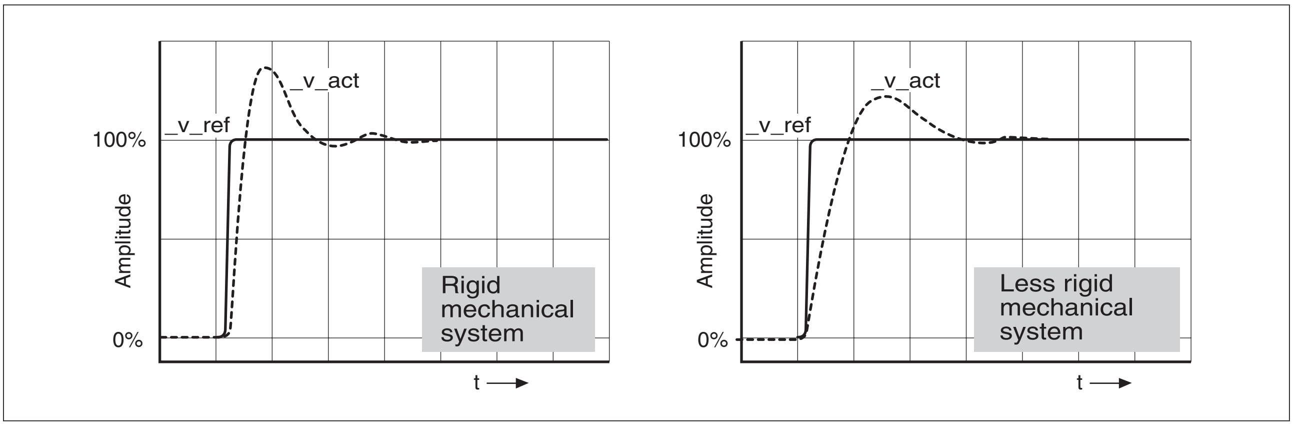

Figure 48: Step responses with good control performance

The controller is properly set when the step response is approximately identical to the signal shown. Good control performance is characterized by

- Fast transient response
- Overshooting up to a maximum of 40%, 20% is recommended.

If the control performance does not correspond to the curve shown, change `CTRL_KPn` in increments of about 10% and then trigger another step function:

- If the control is too slow: Use a higher `CTRL1_KPn` (`CTRL2_KPn`) value.
- If the control tends to oscillate: Use a lower `CTRL1_KPn` (`CTRL2_KPn`) value.

Oscillation ringing is characterized by continuous acceleration and deceleration of the motor.

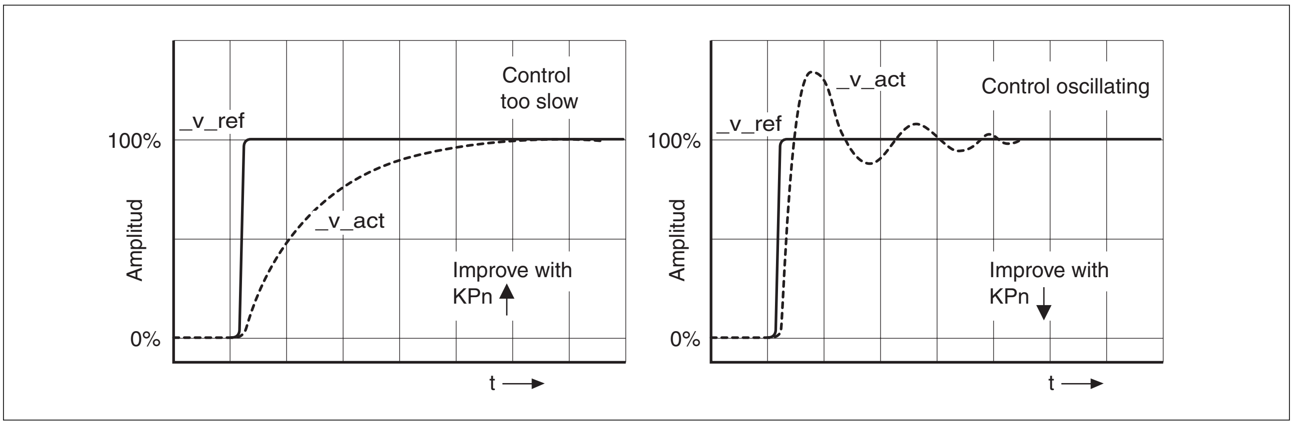

Figure 49: Optimizing insufficient velocity controller settings

If the controller performance remains unsatisfactory in spite of optimization, contact your local sales representative.

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6.6.5 Optimizing the position controller

An optimized subordinate velocity controller is a prerequisite for optimization of the position controller.

When tuning the position controller, you must optimize the P gain CTRL1_KPp (CTRL2_KPp) in two limits:

- CTRL1_KPp (CTRL2_KPp) too high: Overshooting of the mechanical system, instability of the closed-loop control
- CTRL1_KPp (CTRL2_KPp) too low: High position deviation

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_KPp ConF → drC- PP1	Position controller P gain The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 1/s. Changed settings become active immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	Modbus 4614 IDN P-0-3018.0.3
CTRL2_KPp ConF → drC- PP2	Position controller P gain The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 1/s. Changed settings become active immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	Modbus 4870 IDN P-0-3019.0.3

The step function moves the motor at constant velocity until the specified time has expired.

⚠ WARNING

UNEXPECTED MOVEMENT

- Verify that the selected values for velocity and time do not exceed the available distance.
- If possible, use limit switches.
- Verify that a functioning button for emergency stop is within reach.
- Verify that the system is free and ready for the movement before starting the function.

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

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Setting the reference value signal

- ▶ Select Position Controller as the reference value in the commissioning software.
- ▶ Set the reference signal:
- Signal type: "Step"
- For rotary motors: Set the amplitude to approx. 1/10 motor revolution.

The amplitude is entered in user-defined units. With the default scaling, the resolution is 16384 user-defined units per motor revolution.

Selecting the trace signals

- ▶ Select the values in the box General Trace Parameters:
- Reference position of position controller `_p_refusr` (`_p_ref`)
- Actual position of position controller `_p_actusr` (`_p_act`)
- Actual velocity `_v_act`
- Reference value current `_Iq_ref`

Optimizing the position controller value

- ▶ Trigger a step function with the default controller values.
- ▶ After the first test, check the values achieved for `_v_act` and `_Iq_ref` for current and velocity control. The values must not reach the current and velocity limitation range.

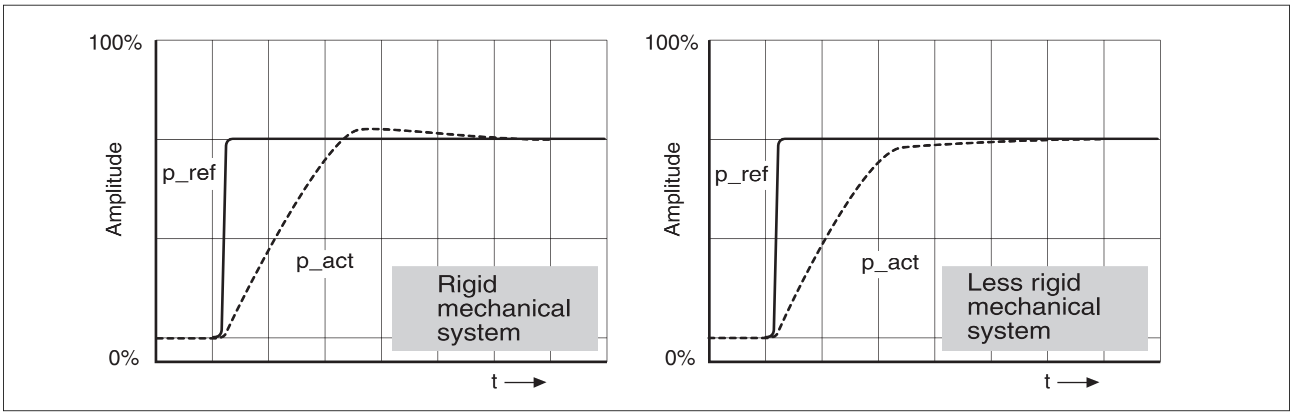

Figure 50: Step responses of a position controller with good control performance

The p gain setting `CTRL1_KPp` (`CTRL2_KPp`) is optimal if the reference value is reached rapidly and with little or no overshooting.

If the control performance does not correspond to the curve shown, change the P gain `CTRL1_KPp` (`CTRL2_KPp`) in increments of approximately 10% and trigger another step function.

- If the control tends to oscillate: Use a lower KPp value.
- If the actual value is too slow reaching the reference value: Use a higher KPp value.

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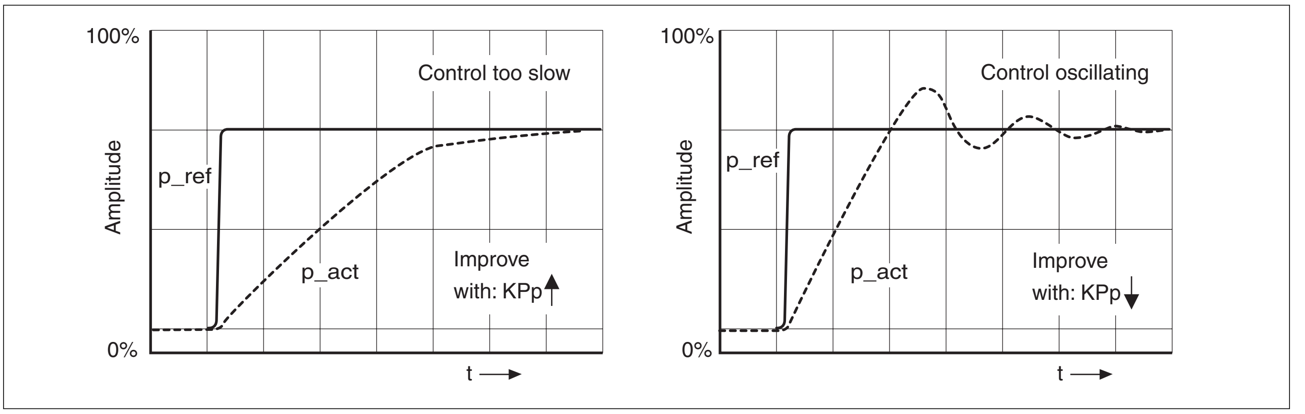

Figure 51: Optimizing inadequate position controller settings

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6.7 Memory Card

The devices features a cad holder for a memory card. The parameters stored on the memory card can be transferred to other devices. If a device is replaced, a new device of the same type can be operated with identical parameters.

The contents of the memory card is compared to the parameters stored in the device when the device is switched on.

When the parameters are written to the EEPROM, they are also saved to the memory card.

The parameters of the safety module require special treatment. See the module manual of the safety module for additional information.

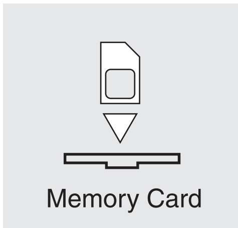

Figure 52: Memory card

Note the following:

- Use only genuine accessory memory cards.
- Do not touch the gold contacts.
- The insert/remove cycles of the memory card are limited.
- The memory card can remain in the device.
- The memory card can only be removed from the device by pulling (not by pushing).

Inserting a memory card

■ The controller supply is switched off.

▶ Insert the memory card into the device with the gold contacts face down; the slanted corner must be face to the mounting plate.

▶ Switch on the controller supply.

▶ Observe the 7-segment display during the initialization of the device.

CArd is displayed for a short period of time

The device has detected a memory card. User intervention is not required.

The parameter values stored in the device and the contents of the memory card are identical. The data on the memory card originates from the device into which the memory card is plugged in.

CArd is displayed permanently

The device has detected a memory card. User intervention is required.

Cause	Options
The memory card is new.	The device data can be transferred to the memory card.
The data on the memory card does not match the device (different device type, different motor type, different firmware version).	The device data can be transferred to the memory card.
The data on the memory card matches the device, but the parameter values are different.	The device data can be transferred to the memory card. The data on the memory card can be transferred to the device. If the memory card is to remain in the device, the device data must be transferred to the memory card.

CArd is not displayed

The device has not detected a memory card. Switch off the controller supply. Verify that the memory card has been properly inserted (contacts, slanted corner).

6.7.1 Data exchange with the memory card

If there are differences between the parameters on the memory card and the parameters stored in the device, the device stops after initialization and displays CArd.

Copying data or ignoring the memory card (CArd, iGnr, ctod, dtoc)

- The 7-segment display shows CArd.
- ► Press the navigation button.
- ◁ The 7-segment display shows the last setting, for example iGnr.
- ► Briefly press the navigation button to activate the Edit mode.
- ◁ The 7-segment display continues to display the last setting, the Edit LED lights.
- ► Select one of the following using the navigation button [2] :
  - iGnr ignores the memory card.
  - ctod transfers the data from the memory card to the device.
  - dtoc transfers the data from the device to the memory card.
- ◁ The device switches to operating state **4** Ready To Switch On.

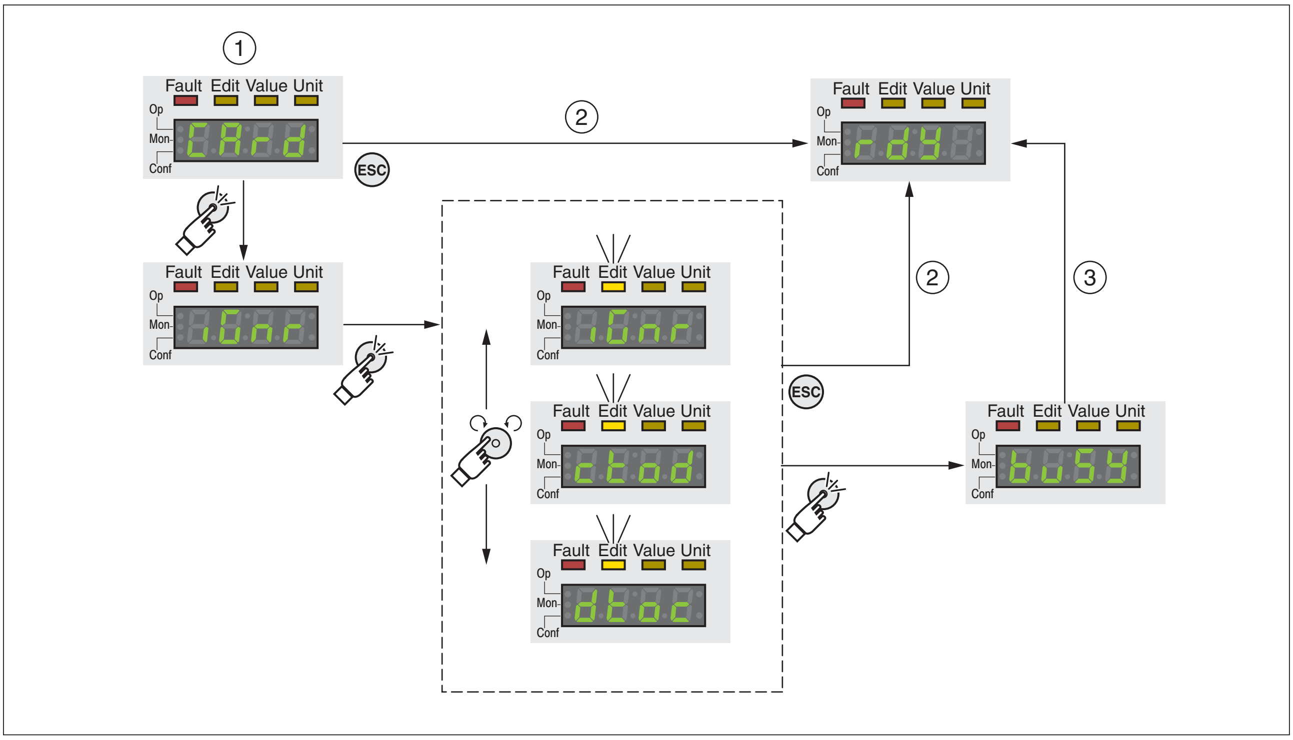

Figure 53: Memory card via integrated HMI

(1) Data on the memory card and in the device are different: The device displays cArd and waits for user intervention.

(2) Transition to operating state **4** Ready To Switch On (memory card is ignored).

(3) Transfer of data (ctod = card to device, dtoc = device to card) and transition to operating state **4** Ready To Switch On.

Memory card has been removed (CArd MISS)

If you removed the memory card, the device displays CArd after initialization. If you confirm this, the display shows MISS. After you have

2. Options may be limited

confirmed this warning, the product switches to the operating state **4** Ready To Switch On..

Write protection for memory card (CArd, EnPr, di Pr, Prot)

It is possible to write-protect the memory card for LXM 32 (Prot). For example, you may want to write-protect memory cards used for regular duplication of device data.

To write-protect the memory card, select ConF - ACG- CArd on the HMI.

Selection	Meaning
EnPr	Write protection on (Prot)
di Pr	Write protection off

Memory cards can also be write-protected via the commissioning software.

6.8 Duplicating existing device settings

Application and advantage

Multiple devices are to have the same settings, for example, when devices are replaced.

Prerequisites

Device type, motor type and firmware version must be identical.

Tools for duplication:

- Memory card (Memory Card)
- Commissioning software (for Windows)

The controller supply must be switched on at the device.

Duplication using a memory card

Device settings can be stored on a memory card (accessories).

The stored device settings can be copied to a device of the same type. Note that the fieldbus address and the settings for the monitoring functions are copied along with this information. If the memory card is to remain in the new device, the device data must be transferred to the memory card, see chapter *"6.7 Memory Card"*.

Duplication using the commissioning software

The commissioning software installed on a PC can save the settings of a device in the form of a configuration file. The stored device settings can be copied to a device of the same type. Note that the fieldbus address and the settings for the monitoring functions are copied along with this information.

See the manual for the commissioning software for additional information.

6.9 Resetting the user parameters

The user parameters are reset by means of the parameter `PARuserReset`.

- Disconnect the product from the the fieldbus in order to avoid conflicts by simultaneous access.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
`PARuserReset` ConF → FCS- rESu	Reset user parameters **0 / No / no** : No **65535 / Yes / YES** : Yes Bit 0: Reset persistent user parameters and controller parameters to default values Bit 1: Reset Motion Sequence parameters to default values Bits 2 ... 15: Reserved The parameters are reset with the exception of: - Communication parameters - Inversion of direction of movement - Type of reference value signal for PTI interface - Settings of encoder simulation - Functions of digital inputs and outputs - Safety module eSM NOTE: The new settings are not saved to the EEPROM. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 - 65535	UINT16 R/W - -	Modbus 1040 IDN P-0-3004.0.8

Resetting via the HMI

Use the menu items ConF -> FCS- -> rESu of the HMI to rest the user parameters. Confirm the selection with YES.

NOTE: The new settings are not saved to the EEPROM.

If the device transitions to the operating state
2 Not Ready To Switch On after the user parameters are reset, the new settings only become active until after the device is switched off and on again.

Resetting via the commissioning software

Use the menu items "Device -> User Functions -> Reset User Parameters" in the commissioning software to reset the user parameters.

If the device transitions to the operating state
2 Not Ready To Switch On after the user parameters are reset, the new settings only become active until after the device is switched off and on again.

6.10 Restoring factory settings

The parameter values set by the user are lost in this process.
The commissioning software allows you to save the parameter values set for a device as a configuration file.

The factory settings are restored by means of the parameter `PARfactorySet`.

▶ Disconnect the product from the the fieldbus in order to avoid conflicts by simultaneous access.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`PARfactorySet` ConF → FCS- rStF	Restore factory settings (default values) **No / no** : No **Yes / YES** : Yes The parameters are reset to the factory settings and subsequently saved to the EEPROM. The factory settings can be restored via the HMI or the commissioning software. The saving process is complete when the parameter is read and 0 is returned. Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 - 1	 R/W - -	

Factory settings via HMI

Use the menu items ConF -> FCS- -> rStF of the HMI to restore the factory settings. Confirm the selection with YES.

The new settings only become active until after the device is switched off and on again.

Factory settings via commissioning software

Use the menu items "Device -> User Functions -> Restore factory Settings" in the commissioning software to restore the factory settings.

The new settings only become active until after the device is switched off and on again.

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7 Operation

The chapter *"7 Operation"* describes the basic operating states, operating modes and functions of the device.

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

- 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 changes to the settings or data.
- Only start the system if there are no persons or obstructions in the danger zone.

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

Access channels

"7.1 Access channels"

Operating states

"7.2 Operating states"
"7.2.1 State diagram"
"7.2.2 State transitions"
"7.2.3 Indication of the operating state"
"7.2.4 Changing the operating state"

Operating modes

"7.3 Operating modes"
"7.3.1 Operating mode Jog"
"7.3.2 Operating mode Homing"

Movement range

"7.4 Movement range"
"7.4.1 Zero point of the movement range"

Extended settings

"7.5 Extended settings"
"7.5.1 Scaling"
"7.5.2 Setting the digital signal inputs and signal outputs"
"7.5.3 Setting backlash compensation"
"7.5.4 Setting the motion profile for the velocity"
"7.5.5 Setting the controller parameters"

Functions for target value processing

"7.6 Functions for target value processing"
"7.6.1 Stop movement with Halt"
"7.6.2 Stopping a movement with Quick Stop"
"7.6.3 Jerk limitation"
"7.6.4 Setting a signal output via parameter"
"7.6.5 Position capture via signal input"

Functions for monitoring movements

"7.7 Functions for monitoring movements"
"7.7.1 Limit switches"
"7.7.2 Reference switch"
"7.7.3 Software limit switches"
"7.7.4 Load-dependent position deviation (following error)"
"7.7.5 Motor standstill and direction of movement"
"7.7.6 Position deviation window"
"7.7.7 Velocity deviation window"
"7.7.8 Velocity threshold value"
"7.7.9 Current threshold value"

Functions for monitoring internal device signals

"7.8 Functions for monitoring internal device signals"
"7.8.1 Temperature monitoring"
"7.8.2 Monitoring load and overload (I^2t monitoring)"
"7.8.3 Commutation monitoring"
"7.8.4 Monitoring of mains phases"
"7.8.5 Ground fault monitoring"

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7.1 Access channels

Improper use of access control may cause commands to be triggered or blocked.

⚠ WARNING

UNINTENDED BEHAVIOR CAUSED BY ACCESS CONTROL

- Verify that no unintended behavior is caused as a result of enabling or disabling exclusive access.
- Verify that impermissible access is blocked.
- Verify that required access is 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 or external graphic display terminal
- Digital 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:

  The commissioning software receives exclusive access via the switch "Exclusive access" in position "On".

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

The signal input functions "Positive Limit Switch (LIMP)", "Negative Limit Switch (LIMN)" and "Reference Switch (REF)" as well as the signals of the safety function STO ($\overline{\text{STO\_A}}$ and $\overline{\text{STO\_B}}$) are effective during exclusive access.

Access to the product via the HMI (writing parameters) can be revoked by means of the parameter `HMIlocked`.

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`AccessLock`	Locking other access channels Value 0: Allow control via other access channels Value 1: Lock control via other access channels Example: The access channel is used by the fieldbus. In this case, control via the commissioning software or the HMI is not possible. The access channel can only be locked after the current operating mode has terminated. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 284 IDN P-0-3001.0.14
`HMIlocked`	Lock HMI **0 / Not Locked / nLoc** : HMI not locked **1 / Locked / Loc** : HMI locked The following functions can no longer be started when the HMI is locked: - Parameter change - Jog - Autotuning - Fault Reset Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 14850 IDN P-0-3058.0.1

7.2 Operating states

7.2.1 State diagram

After switching 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.

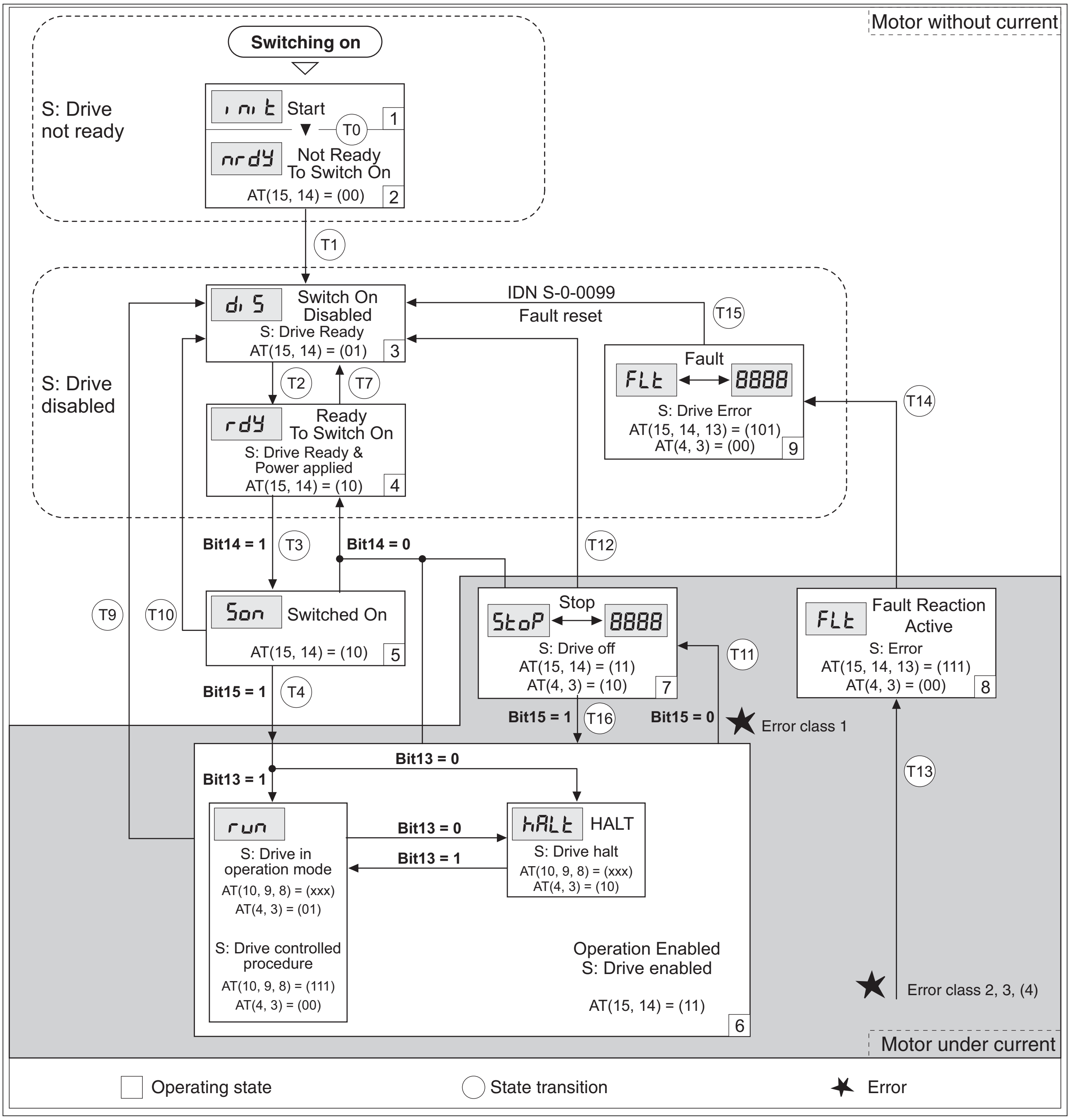

Figure 54: State diagram

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

Error class

The product triggers an error response if an error occurs. Depending upon the severity of the error, the device responds in accordance with one of the following error classes:

Error class	Response
1	Movement is canceled with "Quick Stop".
2	Movement is canceled with "Quick Stop". The power stage is disabled after standstill has been reached.
3	The power stage is immediately disabled without stopping the motor first.
4	The power stage is immediately disabled without stopping the motor first. The error can only be reset by switching off the product.

Error response

The state transition T13 (error class 2, 3 or 4) initiates an error response as soon as an internal occurrence signals an error to which the device must react.

Error class	Response
2	Movement is stopped with "Quick Stop" Holding brake is applied Power stage is disabled
3, 4 or Safety function STO	Power stage is immediately disabled

An error can be triggered by a temperature sensor, for example. The product cancels the current movement and triggers an error response. Subsequently, the operating state changes to **9** Fault.

Resetting an error message

A "Fault Reset" resets an error message.

*In the event of a "Quick Stop" triggered by a detected error of class 1 (operating state **7** Quick Stop Active), a "Fault Reset" causes a direct transition to operating state **6** Operation Enabled.*

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7.2.2 State transitions

State transitions are triggered by an input signal, a fieldbus command or as a response to a monitoring function.

State transition	Operating state	Condition / event 1)	Response
T0	**1**-> **2**	• Device electronics successfully initialized	
T1	**2**-> **3**	• Parameter successfully initialized	
T2	**3** -> **4**	• No undervoltage Encoder successfully checked Actual velocity: <1000 min^{-1} STO signals = +24V	
T3	**4** -> **5**	• Request for enabling the power stage	
T4	**5** -> **6**	• Automatic transition	Power stage is enabled. User-defined parameters are checked. Holding brake is released (if available).
T7	**4** -> **3**	• Undervoltage • STO signals = 0V • Actual velocity: >1000 min^{-1} (for example by external driving force)	-
T9	**6** -> **3**	• Request for disabling the power stage	Power stage is immediately disabled.
T10	**5** -> **3**	• Request for disabling the power stage	
T11	**6** -> **7**	• Error of error class 1	Movement is canceled with "Quick Stop".
T12	**7** -> **3**	• Request for disabling the power stage	Power stage is disabled immediately, even if "Quick Stop" is still active.
T13	**x** -> **8**	• Error of error classes 2, 3 or 4	Error response is carried out, see "Error Response".
T14	**8** -> **9**	• Error response terminated (error class 2) • Error of error classes 3 or 4	
T15	**9** -> **3**	• Function: "Fault Reset"	Error is reset (cause of error must have been corrected).
T16	**7** -> **6**	• Function: "Fault Reset"	

1) In order to trigger a state transition it is sufficient if one condition is met

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7.2.3 Indication of the operating state

7.2.3.1 HMI

The operating state is displayed by the HMI. The table below provides an overview:

Operating state	HMI
1 Start	init
2 Not Ready To Switch On	nrdY
3 Switch On Disabled	dis
4 Ready To Switch On	rdY
5 Switched On	Son
6 Operation Enabled	run
7 Quick Stop Active	StoP
8 Fault Reaction Active	FLt
9 Fault	FLt

7.2.3.2 Signal outputs

Information on the operating state is available via the the signal outputs. The table below provides an overview:

Operating state	"No fault" 1)	"Active" 2)
1 Start	0	0
2 Not Ready To Switch On	0	0
3 Switch On Disabled	0	0
4 Ready To Switch On	1	0
5 Switched On	1	0
6 Operation Enabled	1	1
7 Quick Stop Active	0	0
8 Fault Reaction Active	0	0
9 Fault	0	0

1) The signal output function is factory setting for `DQ0`
2) The signal output function is the factory setting for `DQ1`

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7.2.4 Changing the operating state

7.2.4.1 HMI

An error message can be reset via the HMI.

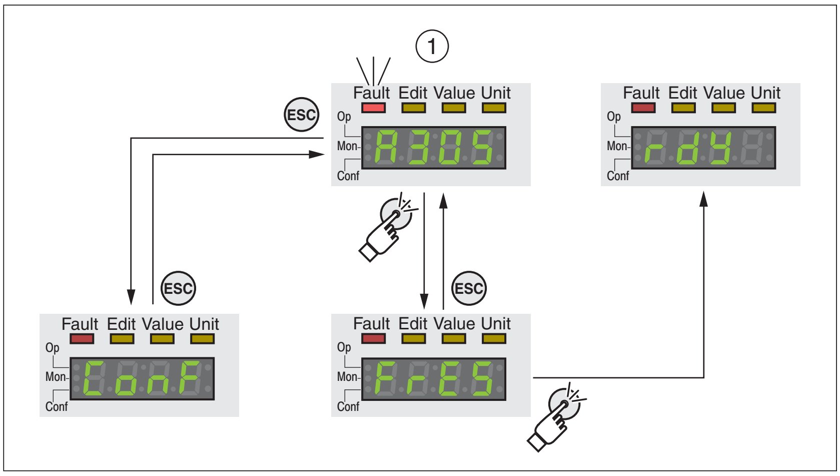

Figure 55: Resetting an error message

In the case of a detected error of error class 1, resetting the error message causes a transition from operating state **7** Quick Stop Active back to operating state **6** Operation Enabled.

In the case of a detected error of error classes 2 or 3, resetting the error message causes a transition from operating state **9** Fault back to operating state **3** Switch On Disable.

7.2.4.2 Fieldbus

The parameter `S-0-0099` is used to reset an error message and a warning message.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`S-0-0099`	Reset class 1 diagnostic If this procedure command is received by the drive via the service channel, the detected errors, the error bits and the shut-down mechanism are cleared. Type: Binary - 2 bytes Write access: CP2, CP3, CP4 Class name: GDP_Basic	- 0 0 7	R/W - -	S-0-0099

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7.3 Operating modes

7.3.1 Operating mode Jog

Description

In the operating mode Jog, a movement is made from the actual motor position in the desired direction.

A movement can be made using one of 2 methods:

- Continuous movement
- Step movement

In addition, the product features 2 parameterizable velocities.

Integrated HMI

It is also possible to start the operating mode via the HMI. Calling → oP → JoG- → JGSt enables the power stage and starts the operating mode.

The method Continuous Movement is controlled via the HMI.

Turn the navigation button to select one of 4 types of movement:

- JG- : slow movement in positive direction
- JG= : fast movement in positive direction
- -JG : slow movement in negative direction
- =JG : fast movement in negative direction

Press the navigation button to start the movement.

Status messages

Information on the operating state and the current movement is available via signal outputs.

The table below provides an overview of the signal outputs:

Signal output	Signal output function
DQ0	"No Fault" Signals the operating states **4** Ready To Switch On, **5** Switched On and **6** Operation Enabled
DQ1	"Active" Signals the operating state **6** Operation Enabled
DQ2	"Freely Available" See chapter *"7.6.4 Setting a signal output via parameter"*

It is possible to change the factory settings of the signal outputs, see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

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7.3.1.1 Continuous movement

As long as the signal for the direction is available, a continuous movement is made in the desired direction.

The illustration below provides an overview of continuous movement:

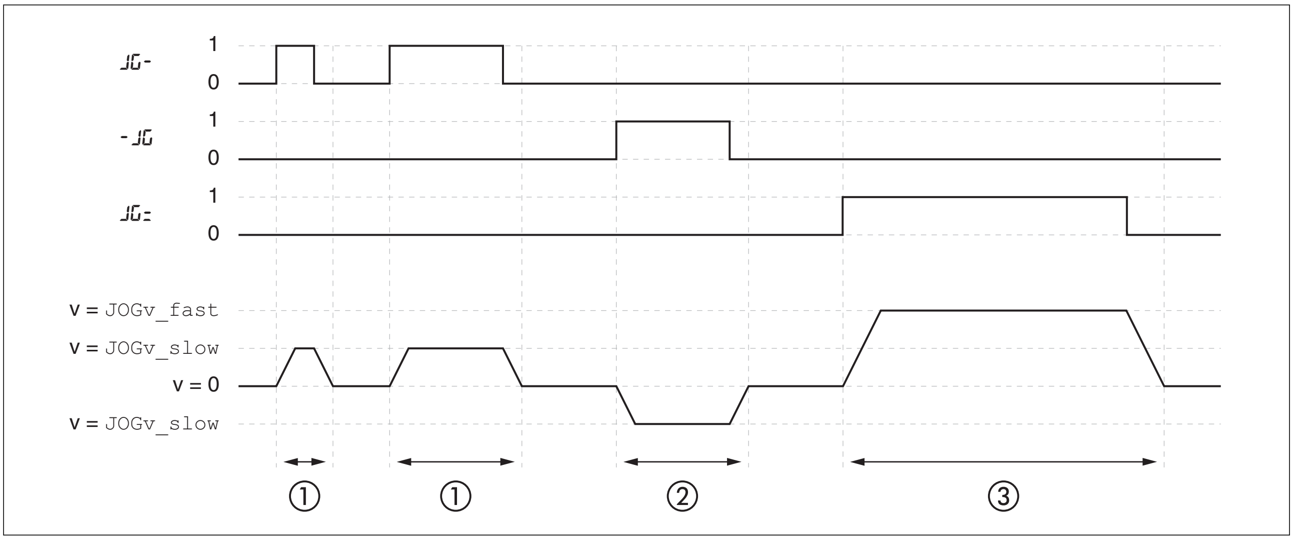

Figure 56: Continuous movement

(1)	Slow movement in positive direction
(2)	Slow movement in negative direction
(3)	Fast movement in positive direction

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7.3.1.2 Step movement

If the signal for the direction is available for a short period of time, a movement with a parameterizable number of user-defined units is made in the desired direction.

If the signal for the direction is available continuously, a movement with a parameterizable number of user-defined units is made in the desired direction. After this movement, the motor stops for a defined period of time. Then a continuous movement is made in the desired direction.

The illustration provides an overview of step movement:

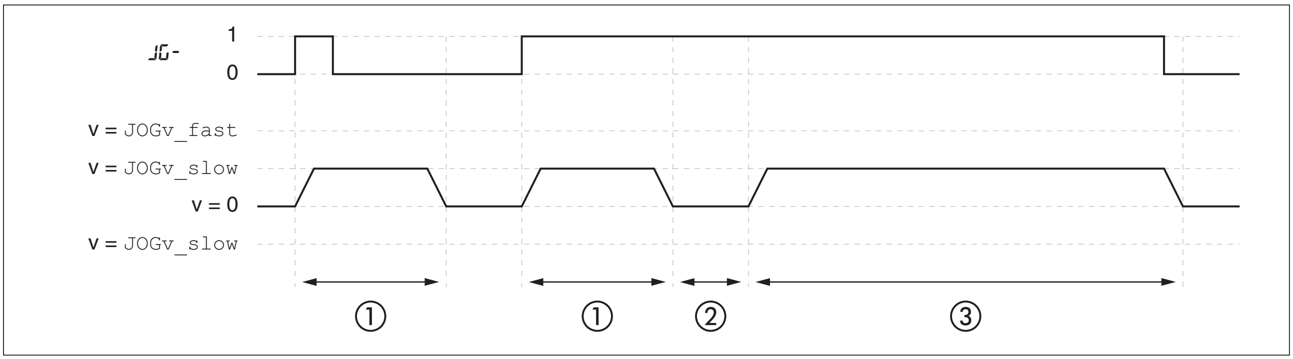

Figure 57: Step movement

(1) Slow movement in positive direction with a parameterizable number of user-defined units JOGstep

(2) Waiting time JOGtime

(3) Slow continuous movement in positive direction

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7.3.1.3 Parameterization

Overview The illustration below provides an overview of the adjustable parameters.

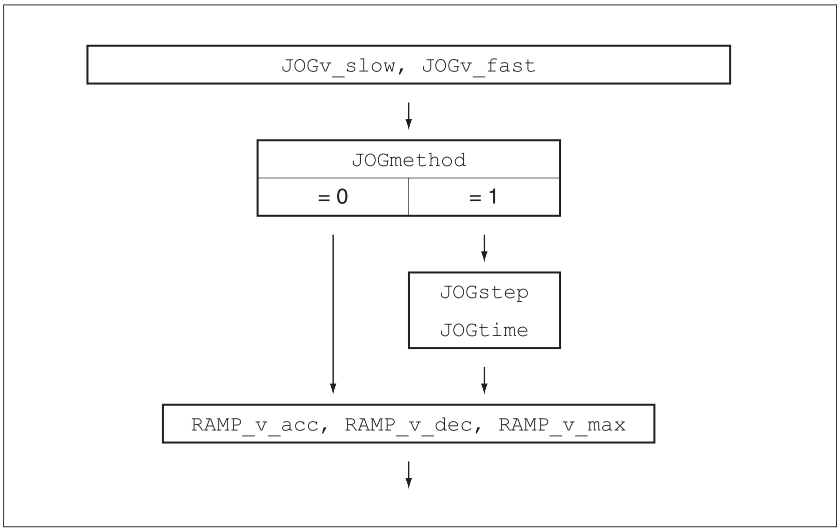

Figure 58: Overview of adjustable parameters

Velocities Two parameterizable velocities are available.

▶ Set the desired values with the parameters `JOGv_slow` and `JOGv_fast`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
JOGv_slow oP → JoG- JGLo	Velocity for slow movement The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 1 60 2147483647	UINT32 R/W per. -	Modbus 10504 IDN P-0-3041.0.4
JOGv_fast oP → JoG- JGhi	Velocity for fast movement The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 1 180 2147483647	UINT32 R/W per. -	Modbus 10506 IDN P-0-3041.0.5

Selection of the method The parameter `JOGmethod` lets you set the method.

▶ Set the desired method with the parameter `JOGmethod`.

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
JOGmethod	Selection of jog method **0 / Continuous Movement / coMo** : Jog with continuous movement **1 / Step Movement / StMo** : Jog with step movement Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 1 1	UINT16 R/W - -	Modbus 10502 IDN P-0-3041.0.3

Setting the step movement

The parameters JOGstep and JOGtime are used to set the parameterizable number of user-defined units and the time for which the motor is stopped.

▶ Set the desired values with the parameters JOGstep and JOGtime.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
JOGstep	Distance for step movement Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_p 1 20 2147483647	INT32 R/W per. -	Modbus 10510 IDN P-0-3041.0.7
JOGtime	Wait time for step movement Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	ms 1 500 32767	UINT16 R/W per. -	Modbus 10512 IDN P-0-3041.0.8

Changing the motion profile for the velocity

It is possible to change the parameterization of the motion profile for the velocity, see chapter *"7.5.4 Setting the motion profile for the velocity"*.

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7.3.1.4 Additional settings

The following functions can be used for target value processing:

- Chapter *"7.6.1 Stop movement with Halt"*
- Chapter *"7.6.2 Stopping a movement with Quick Stop"*
- Chapter *"7.6.3 Jerk limitation"*
- Chapter *"7.6.4 Setting a signal output via parameter"*
- Chapter *"7.6.5 Position capture via signal input"*

The following functions can be used for monitoring the movement:

- Chapter *"7.7.1 Limit switches"*
- Chapter *"7.7.3 Software limit switches"*
- Chapter *"7.7.4 Load-dependent position deviation (following error)"*
- Chapter *"7.7.5 Motor standstill and direction of movement"*
- Chapter *"7.7.6 Position deviation window"*
- Chapter *"7.7.7 Velocity deviation window"*
- Chapter *"7.7.8 Velocity threshold value"*
- Chapter *"7.7.9 Current threshold value"*

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7.3.2 Operating mode Homing

Description

In the operating mode Homing, a reference is generated between a mechanical position and the actual position of the motor.

A reference between a mechanical position and the actual position of the motor is generated by means of a reference movement or by means of position setting.

A successful reference movement or position setting home the motor and the zero point becomes valid.

Methods

A movement can be made using different methods:

- Reference movement to a limit switch

  In the case of a reference movement to a limit switch, a movement to the negative limit switch or the positive limit switch is performed. When the limit switch is reached, the motor is stopped and a movement is made back to the switching point of the limit switch.
  From the switching point of the limit switch, a movement is made to the next index pulse of the motor or to a parameterizable distance from the switching point.
  The position of the index pulse or the position of the parameterizable distance from the switching point is the reference point.
- Reference movement to the reference switch

  In the case of a reference movement to the reference switch, a movement to the reference switch is performed.
  When the reference switch is reached, the motor is stopped and a movement is made back to the switching point of the reference switch.
  From the switching point of the reference switch, a movement is made to the next index pulse of the motor or to a parameterizable distance from the switching point.
  The position of the index pulse or the position of the parameterizable distance from the switching point is the reference point.
- Reference movement to the index pulse

  In the case of a reference movement to the index pulse, a movement is made from the actual position to the next index pulse. The position of the index pulse is the reference point.
- Position setting

  In the case of position setting, the 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.

Motors with multiturn encoder deliver a valid zero point after they are switched on.

Starting the operating mode

The parameter `S-0-0148` is used to start the operating mode Homing.

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-0148	Drive controlled homing procedure command This parameter starts homing with the homing method settings made in the drive objects. See the product manual for details on homing. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4	- 0 - 3	R/W - -	S-0-0148

Status messages

Information on the operating state and the current movement is available via the fieldbus and the signal outputs.

The table below provides an overview of the signal outputs:

Signal output	Signal output function
DQ0	"No Fault" Signals the operating states **4** Ready To Switch On, **5** Switched On and **6** Operation Enabled
DQ1	"Active" Signals the operating state **6** Operation Enabled
DQ2	"Freely Available" See chapter *"7.6.4 Setting a signal output via parameter"*

It is possible to change the factory settings of the signal outputs, see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

7.3.2.1 Parameterization

Overview

The illustration below provides an overview of the adjustable parameters.

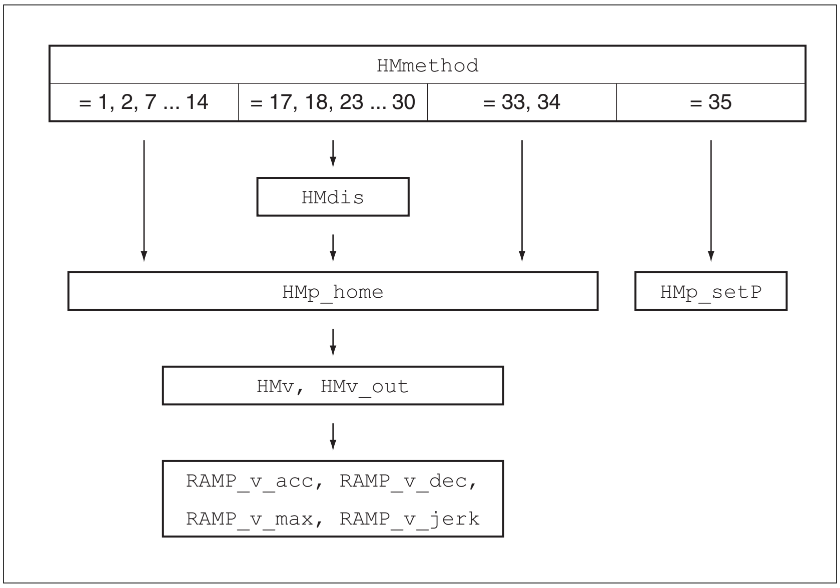

Figure 59: Overview of adjustable parameters

Setting limit switches and reference switches

The limit switches and reference switches must be set to meet the requirements, see chapter *"7.7.1 Limit switches"* and chapter *"7.7.2 Reference switch"*.

Selection of the method

The operating mode Homing establishes an absolute position reference between the motor position and a defined axis position. There are various Homing methods which can be selected via the parameter `HMmethod`.

The `HMprefmethod` parameter is used to save the preferred method to the EEPROM (persistent). When the preferred method has been set in this parameter, the method is performed during homing even after the device is switched off and on. The value to be entered corresponds to the value in the `HMmethod` parameter.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
HMmethod	Homing method 1: LIMN with index pulse 2: LIMP with index pulse 7: REF+ with index pulse, inv., outside 8: REF+ with index pulse, inv., inside 9: REF+ with index pulse, not inv., inside 10: REF+ with index pulse, not inv., outside 11: REF- with index pulse, inv., outside 12: REF- with index pulse, inv., inside 13: REF- with index pulse, not inv., inside 14: REF- with index pulse, not inv., outside 17: LIMN 18: LIMP 23: REF+, inv., outside 24: REF+, inv., inside 25: REF+, not inv., inside 26: REF+, not inv., outside 27: REF-, inv., outside 28: REF-, inv., inside 29: REF-, not inv., inside 30: REF-, not inv., outside 33: Index pulse neg. direction 34: Index pulse pos. direction 35: Position setting Abbreviations: REF+: Search movement in pos. direction REF-: Search movement in neg. direction inv.: Invert direction in switch not inv.: Direction not inverted in switch outside: Index pulse / distance outside switch inside: Index pulse / distance inside switch Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 1 18 35	INT16 R/W - -	Modbus 6936 IDN P-0-3027.0.12
HMprefmethod oP → hoN- NEth	Preferred homing method Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 1 18 35	INT16 R/W per. -	Modbus 10260 IDN P-0-3040.0.10

Setting the distance from the switching point

A distance to the switching point of the limit switch or the reference switch must be parameterized for a reference movement with index pulse. The parameter HMdis lets you set the distance to the switching limit switch or the reference switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
HMdis	Distance from switching point The distance from the switching point is defined as the reference point. The parameter is only effective during a reference movement without index pulse. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_p 1 200 2147483647	INT32 R/W per. -	Modbus 10254 IDN P-0-3040.0.7

Defining the zero point

The parameter HMp_home is used to specify a desired position value, which is set at the reference point after a successful reference movement. The desired position value at the reference point defines the zero point.

NOTE: If the value 0 is used, the zero point corresponds to the reference point.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
HMp_home	Position at reference point After a successful reference movement, this position is automatically set at the reference point. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_p -2147483648 0 2147483647	INT32 R/W per. -	Modbus 10262 IDN P-0-3040.0.11

Setting monitoring

The parameters HMoutdis and HMsrchdis allow you to activate monitoring of the limit switchs and the reference switch.

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`HMoutdis`	Maximum distance for search for switching point 0: Monitoring of distance inactive >0: Maximum distance After detection of the switch, the drive starts to search for the defined switching point. If the defined switching point is not found within the distance defined here, the reference movement is canceled with an error. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_p 0 0 2147483647	INT32 R/W per. -	Modbus 10252 IDN P-0-3040.0.6
`HMsrchdis`	Maximum search distance after overtravel of switch 0: Search distance monitoring disabled >0: Search distance The switch must be activated again within this search distance, otherwise the reference movement is canceled. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_p 0 0 2147483647	INT32 R/W per. -	Modbus 10266 IDN P-0-3040.0.13

Reading out the position distance

The position distance between the switching point and index pulse can be read out with the following parameters.

The distance between the switching point and the index pulse must be >0.05 revolutions for reproducible reference movements with index pulse.

If the index pulse is too close to the switching point, the limit switch or reference switch can be moved mechanically.

Otherwise the position of the index pulse can be moved with the parameter `ENC_pabsusr`, see Chapter *"6.5.9 Setting parameters for encoder"*.

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_HMdisREFtoIDX_usr	Distance from switching point to index pulse It allows to check the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. Type: Signed decimal - 4 bytes	usr_p -2147483648 - 2147483647	INT32 R/- - -	Modbus 10270 IDN P-0-3040.0.15
_HMdisREFtoIDX	Distance from switching point to index pulse It allows to check the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. The parameter _HMdisREFtoIDX_usr allows you to enter the value in user-defined units. Type: Signed decimal - 4 bytes In increments of 0.0001 revolution.	revolution - - -	INT32 R/- - -	Modbus 10264 IDN P-0-3040.0.12

Setting velocities The parameters HMv and HMv_out are used to set the velocities for searching the switch and for moving away from the switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
HMv oP → hoM- hMn	Target velocity for searching the switch The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_v 1 60 2147483647	UINT32 R/W per. -	Modbus 10248 IDN P-0-3040.0.4
HMv_out	Target velocity for moving away from switch The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_v 1 6 2147483647	UINT32 R/W per. -	Modbus 10250 IDN P-0-3040.0.5

Changing the motion profile for the velocity It is possible to change the parameterization of the motion profile for the velocity, see chapter *"7.5.4 Setting the motion profile for the velocity"*.

7.3.2.2 Reference movement to a limit switch

The illustration below shows a reference movement to a limit switch

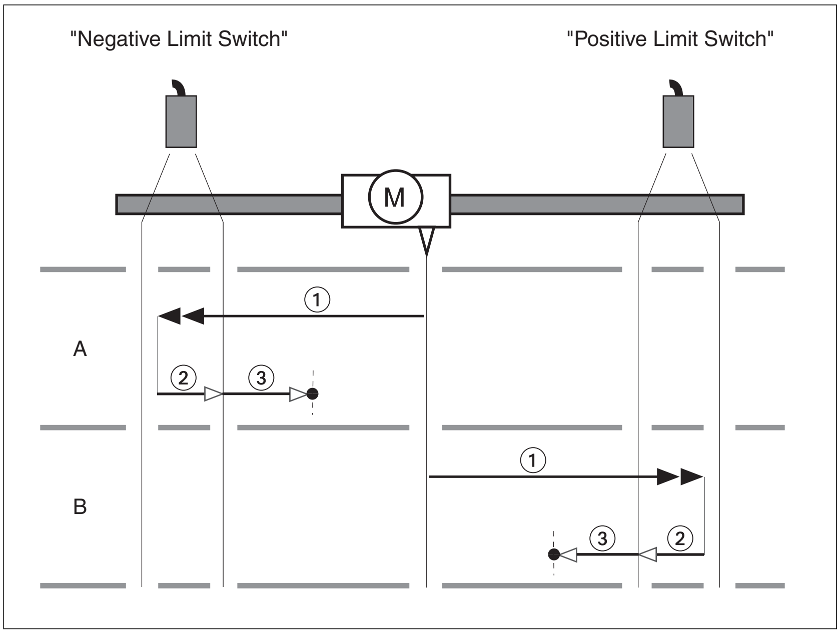

Figure 60: Reference movement to a limit switch

(1) Movement to limit switch at velocity `HMv`

(2) Movement to the switching point of the limit switch at velocity `HMv_out`

(3) Movement to index pulse or movement to a distance from the switching point at velocity `HMv_out`

Type A Method 1: Movement to the index pulse.

Method 17: Movement to distance from switching point.

Type B Method 2: Movement to the index pulse.

Method 18: Movement to distance from switching point.

7.3.2.3 Reference movement to the reference switch in positive direction

The illustration below shows a reference movement to the reference switch in positive direction

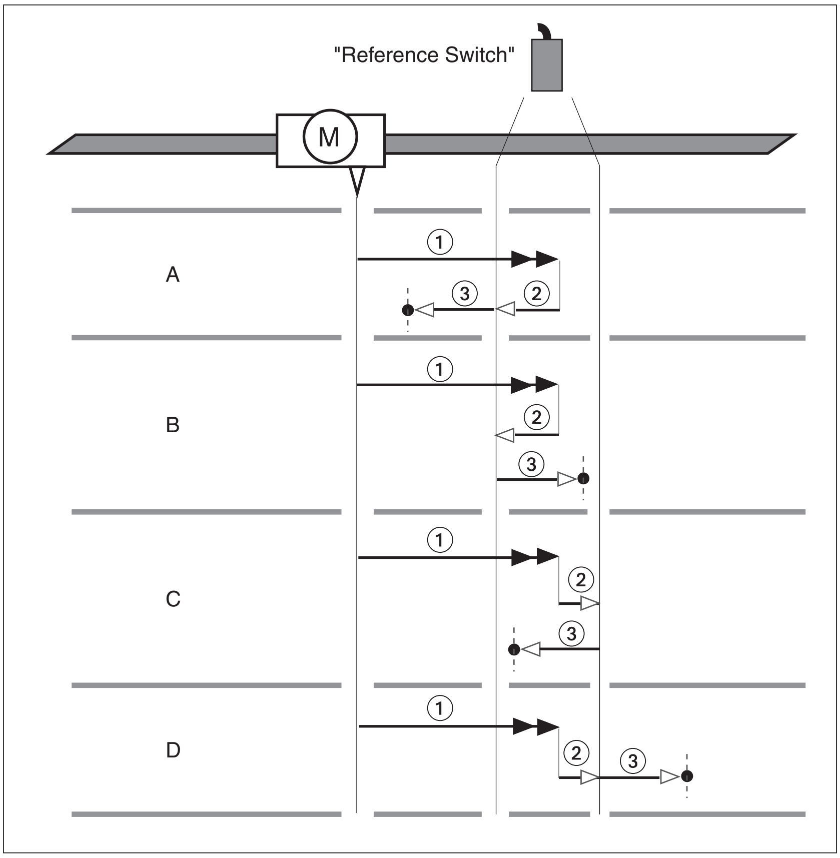

Figure 61: Reference movement to the reference switch in positive direction

(1) Movement to reference switch at velocity `HMv`

(2) Movement to the switching point of the reference switch at velocity `HMv_out`

(3) Movement to index pulse or movement to a distance from the switching point at velocity `HMv_out`

Type A Method 7: Movement to the index pulse.

Method 23: Movement to distance from switching point.

Type B Method 8: Movement to the index pulse.

Method 24: Movement to distance from switching point.

Type C Method 9: Movement to the index pulse.

Method 25: Movement to distance from switching point.

Type D Method 10: Movement to the index pulse.

Method 26: Movement to distance from switching point.

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7.3.2.4 Reference movement to the reference switch in negative direction

The illustration below shows a reference movement to the reference switch in negative direction

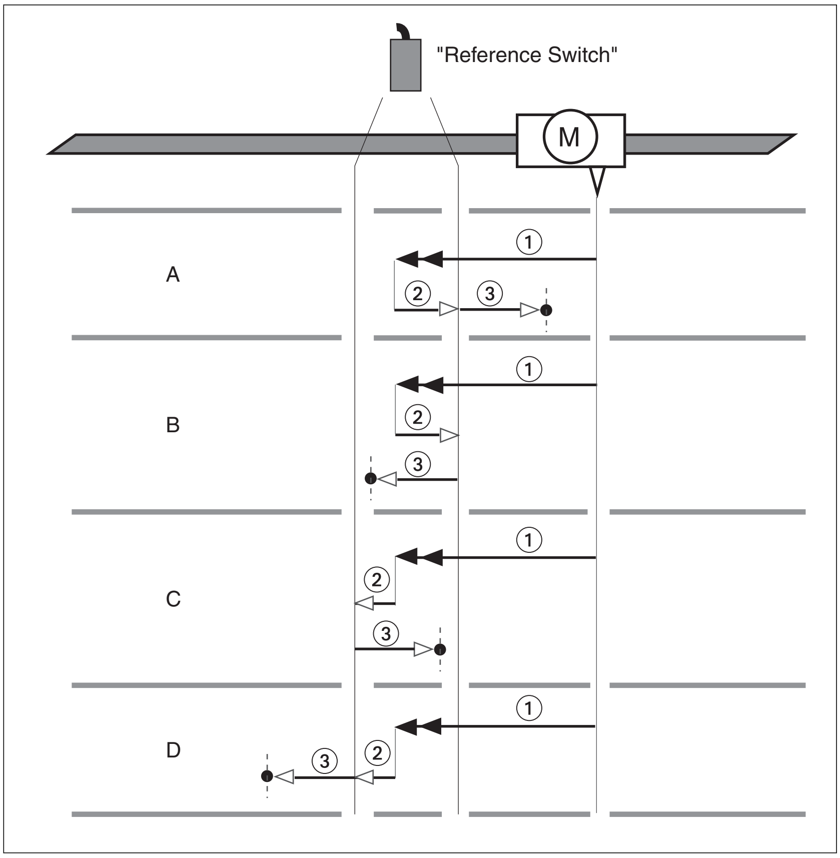

Figure 62: Reference movement to the reference switch in negative direction

(1) Movement to reference switch at velocity `HMv`

(2) Movement to the switching point of the reference switch at velocity `HMv_out`

(3) Movement to index pulse or movement to a distance from the switching point at velocity `HMv_out`

Type A Method 11: Movement to the index pulse.

Method 27: Movement to distance from switching point.

Type B Method 12: Movement to the index pulse.

Method 28: Movement to distance from switching point.

Type C Method 13: Movement to the index pulse.

Method 29: Movement to distance from switching point.

Type D Method 14: Movement to the index pulse.

Method 30: Movement to distance from switching point.

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7.3.2.5 Reference movement to the index pulse

The illustration below shows a reference movement to the index pulse

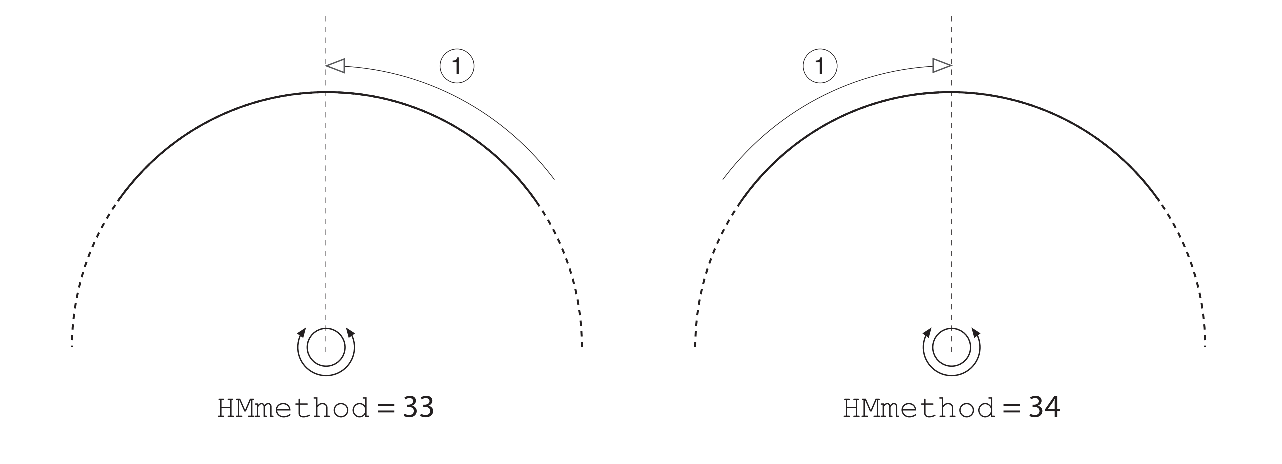

Figure 63: Reference movement to the index pulse

(1) Movement to index pulse at velocity HMv_out

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7.3.2.6 Position setting

Description

By means of position setting, the current motor position is set to the position value in parameter `HMp_setP`. This also defines the zero point.

Position setting is only possible when the motor is at a standstill. Any active position deviation remains active and can still be compensated for by the position controller after position setting.

Setting the position for position setting

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`HMp_setP`	Position for Position Setting Position for operating mode Homing, method 35. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immedi-ately.	usr_p - 0 -	INT32 R/W - -	Modbus 6956 IDN P-0-3027.0.22

Example

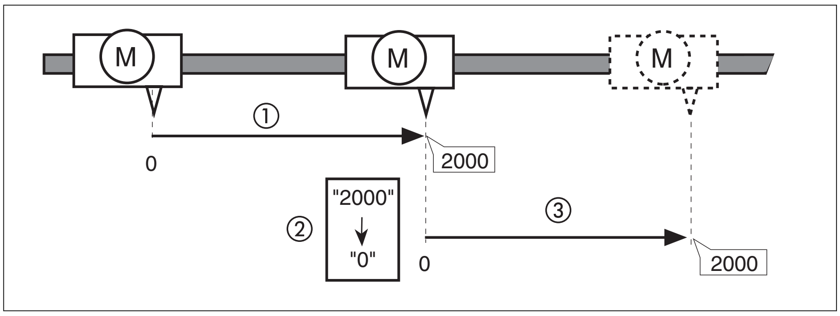

Figure 64: Movement by 4000 user-defined units with position setting

(1) The motor is positioned by 2000 user-defined units.

(2) By means of position setting to 0, the current motor position is set to position value 0 which, at the same time, defines a new zero point.

(3) When a new movement by 2000 user-defined units is triggered, the new target position is 2000 user-defined units.

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7.3.2.7 Additional settings

The following functions can be used for target value processing:

- Chapter *"7.6.1 Stop movement with Halt"*
- Chapter *"7.6.2 Stopping a movement with Quick Stop"*
- Chapter *"7.6.3 Jerk limitation"*
- Chapter *"7.6.4 Setting a signal output via parameter"*
- Chapter *"7.6.5 Position capture via signal input"*

The following functions can be used for monitoring the movement:

- Chapter *"7.7.1 Limit switches"*
- Chapter *"7.7.2 Reference switch"*
- Chapter *"7.7.3 Software limit switches"*
- Chapter *"7.7.4 Load-dependent position deviation (following error)"*
- Chapter *"7.7.5 Motor standstill and direction of movement"*
- Chapter *"7.7.6 Position deviation window"*
- Chapter *"7.7.7 Velocity deviation window"*
- Chapter *"7.7.8 Velocity threshold value"*
- Chapter *"7.7.9 Current threshold value"*

Aktuell noch ausgeblendet, bis klar ist, ob diese Betriebsarten offiziell beschrieben werden sollen. Siehe auch Feldbushandbuch.

Aktuell eingeblendet für LXM32S.

7.3.3 Operating mode Cyclic Synchronous Position

Description The motor synchronously follows the target position values transmitted on a cyclic basis. The transmitted values are linearly interpolated (internally).

The possible applications for this operating mode are described in the manual of the master controller.

This operating mode corresponds to the following in the case of SERCOS:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
S-0-0032	Primary Operation Mode This parameter sets the primary operating mode of the drive. The operating mode is started via bits 8, 9 and 10 in the parameter Drive Control (S-0-0134). The active operating mode is indicated by bits 8, 9 and 10 in the status word (S-0-0135). Type: Hexadecimal - 2 bytes Write access: CP2, CP3	- 3 3 3	R/W - -	S-0-0032

7.3.4 Operating mode Cyclic Synchronous Velocity

Description The motor synchronously follows the target velocity values transmitted on a cyclic basis. The transmitted values are linearly interpolated (internally).

The possible applications for this operating mode are described in the manual of the master controller.

This operating mode corresponds to the following in the case of SERCOS:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
S-0-0033	Secondary Operation Mode 1 This parameter sets the secondary operating mode 1 of the drive. The operating mode is started via bits 8, 9 and 10 in the parameter Drive Control (S-0-0134). The active operating mode is indicated by bits 8, 9 and 10 in the status word (S-0-0135). Type: Hexadecimal - 2 bytes Write access: CP2, CP3	- 2 2 2	R/W - -	S-0-0033

0198441114060, V2.0, 03.2016

7.3.5 Operating mode Cyclic Synchronous Torque

Description The motor synchronously follows the target torque values transmitted on a cyclic basis. The transmitted values are linearly interpolated (internally).

The possible applications for this operating mode are described in the manual of the master controller.

This operating mode corresponds to the following in the case of SERCOS:

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via field-bus**
S-0-0034	Secondary Operation Mode 2 This parameter sets the secondary operating mode 2 of the drive. The operating mode is started via bits 8, 9 and 10 in the parameter Drive Control (S-0-0134). The active operating mode is indicated by bits 8, 9 and 10 in the status word (S-0-0135). Type: Hexadecimal - 2 bytes Write access: CP2, CP3	- 1 1 1	R/W - -	S-0-0034

7.4 Movement range

The movement range is the maximum possible range within which a movement can be made to any position.

The actual position of the motor is the position in the movement range.

The figure below shows the movement range in user-defined units with the factory scaling.

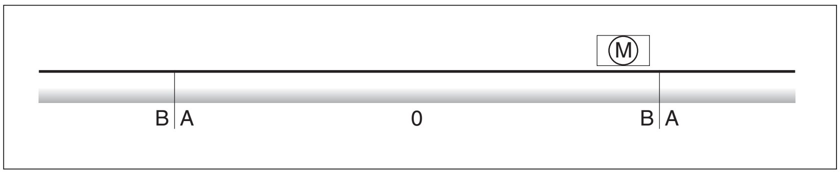

Figure 65: Movement range

(A) -2147483648 user-defined units (usr_p)
(B) 2147483647 user-defined units (usr_p)

7.4.1 Zero point of the movement range

The zero point of the movement range is the point of reference for absolute movements.

Valid zero point

The zero point of the movement range is set by means of a reference movement or by position setting.

A reference movement and position setting can be performed in the operating mode Homing.

In the case of a movement beyond the movement range (for example, a relative movement), the zero point becomes invalid.

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7.5 Extended settings

7.5.1 Scaling

Changing the scaling changes the effect of the values in user-defined units. The same user-defined units cause different movements when the scaling is changed.

⚠ WARNING
UNEXPECTED MOVEMENT CAUSED BY CHANGED SCALING • Note that scaling affects all relationships between the user-defined units and the movements. • Check the parameters with user-defined units. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Scaling converts user-defined units into internal units of the device, and vice versa.

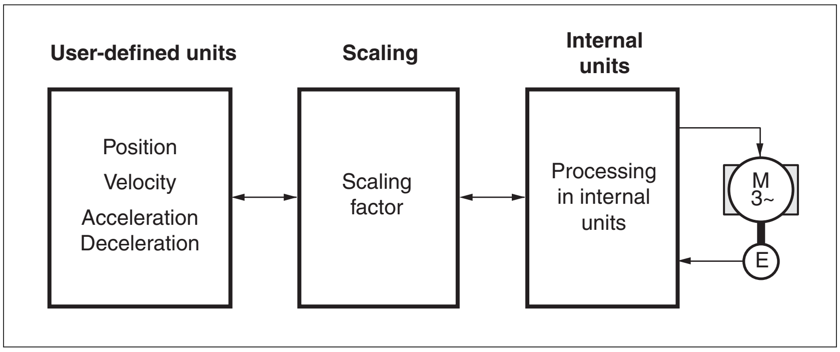

Figure 66: Scaling

User-defined units User-defined units are values for positions, velocities, acceleration and deceleration; they have the following units:

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

Scaling factor The scaling factor is the relationship between the motor movement and the required user-defined units. When specifying the scaling factor, note that numerator and denominator can only be integer values.

7.5.1.1 Configuration of position scaling

Position scaling is the relationship between the number of motor revolutions and the required user-defined units (usr_p).

Scaling factor

Position scaling is specified by means of scaling factor:

In the case of a rotary motor, the scaling factor is calculated as shown below:

$$\frac{\text{Number of revolutions of the motor}}{\text{Number of user-defined units [usr\_p]}}$$

Figure 67: Scaling factor of position scaling

The scaling factor is set to 1 / 131072.

0198441114060, V2.0, 03.2016

7.5.1.2 Configuration of velocity scaling

Velocity scaling is the relationship between the number of motor revolutions per minute and the required user-defined units (usr_v).

Scaling factor Velocity scaling is specified by means of scaling factor:

In the case of a rotary motor, the scaling factor is calculated as shown below:

$$\frac{\text{Number of revolutions of the motor per minute}}{\text{Number of user-defined units [usr\_v]}}$$

Figure 68: Scaling factor of velocity scaling

Factory setting The following factory settings are used:

- 1 motor revolution per minute corresponds to 1 user-defined unit

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
`ScaleVELnum`	Velocity scaling: Numerator Specification of the scaling factor: Speed of rotation of motor [min^{-1}] -- User-defined units [usr_v] A new scaling is activated when the numerator value is supplied. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	min^{-1} 1 1 2147483647	INT32 R/W per. -	Modbus 1604 IDN P-0-3006.0.34
`ScaleVELdenom`	Velocity scaling: Denominator Refer to numerator (ScaleVELnum) for a description. A new scaling is activated when the numerator value is supplied. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled.	usr_v 1 1 2147483647	INT32 R/W per. -	Modbus 1602 IDN P-0-3006.0.33

0198441114060, V2.0, 03.2016

7.5.1.3 Configuration of ramp scaling

Ramp scaling is the relationship between the change in velocity and the required user-defined units (usr_a).

Scaling factor

Ramp scaling is specified by means of scaling factor:

$$\frac{\text{Velocity change per second}}{\text{Number of user-defined units [usr\_a]}}$$

Figure 69: Scaling factor of ramp scaling

Factory setting

The following factory settings are used:

- A change of 1 motor revolution per minute per second corresponds to 1 user-defined unit.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`ScaleRAMPnum`	Ramp scaling: Numerator Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	min^{-1}/s 1 1 2147483647	INT32 R/W per. -	Modbus 1634 IDN P-0-3006.0.49
`ScaleRAMPdenom`	Ramp scaling: Denominator Refer to numerator (ScaleRAMPnum) for a description. A new scaling is activated when the numerator value is supplied. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled.	usr_a 1 1 2147483647	INT32 R/W per. -	Modbus 1632 IDN P-0-3006.0.48

7.5.2 Setting the digital signal inputs and signal outputs

Signal function Different signal functions can be assigned to the digital signal inputs and digital signal outputs.

Debounce time Signal input debouncing comprises hardware debouncing and software debouncing.

Hardware debounce time is permanently set, see *"2.3.3 Signals"*. Software debouncing can be adapted via parameters, see chapter *"7.5.2.3 Parameterization of software debouncing"*.

When a set signal function is changed and when the product is switched off and on again, software debouncing is reset to the factory setting.

7.5.2.1 Parameterization of the signal input functions

Factory settings

The table below shows the factory settings of the digital signal inputs:

Signal	Signal input function
DI0	Freely Available
DI1	Reference Switch (REF)
DI2	Positive Limit Switch (LIMP)
DI3	Negative Limit Switch (LIMN)
DI4	Freely Available
DI5	Freely Available

Parameterization

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

Signal input function	Description in chapter
Freely Available	No function
Reference Switch (REF)	*"7.7.2 Reference switch"*
Positive Limit Switch (LIMP)	*"7.7.1 Limit switches"*
Negative Limit Switch (LIMN)	*"7.7.1 Limit switches"*
Switch Controller Parameter Set	*"7.5.5.5 Parameterizable controller parameters"*
Velocity Controller Integral Off	*"7.5.5.9 Deactivating the integral term"*
Release Holding Brake	*"6.5.7.1 Releasing the holding brake manually"*

The following parameters can be used to parameterize the digital signal inputs:

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DI0 ConF → i -o- di 0	Function Input DI0 **1 / Freely Available / nonE** : Available as required **21 / Reference Switch (REF) / rEF** : Reference switch **22 / Positive Limit Switch (LIMP) / LiMP** : Positive limit switch **23 / Negative Limit Switch (LIMN) / LiMn** : Negative limit switch **24 / Switch Controller Parameter Set / CPAr** : Switches controller parameter set **28 / Velocity Controller Integral Off / tnoF** : Switches off velocity controller integral term **40 / Release Holding Brake / rEhb** : Releases the holding brake Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1794 IDN P-0-3007.0.1
IOfunct_DI1 ConF → i -o- di 1	Function Input DI1 **1 / Freely Available / nonE** : Available as required **21 / Reference Switch (REF) / rEF** : Reference switch **22 / Positive Limit Switch (LIMP) / LiMP** : Positive limit switch **23 / Negative Limit Switch (LIMN) / LiMn** : Negative limit switch **24 / Switch Controller Parameter Set / CPAr** : Switches controller parameter set **28 / Velocity Controller Integral Off / tnoF** : Switches off velocity controller integral term **40 / Release Holding Brake / rEhb** : Releases the holding brake Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1796 IDN P-0-3007.0.2

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DI2 ConF → i-o- di2	Function Input DI2 **1 / Freely Available / nonE** : Available as required **21 / Reference Switch (REF) / rEF** : Reference switch **22 / Positive Limit Switch (LIMP) / LinP** : Positive limit switch **23 / Negative Limit Switch (LIMN) / Linn** : Negative limit switch **24 / Switch Controller Parameter Set / CPAr** : Switches controller parameter set **28 / Velocity Controller Integral Off / tnoF** : Switches off velocity controller integral term **40 / Release Holding Brake / rEhb** : Releases the holding brake Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1798 IDN P-0-3007.0.3
IOfunct_DI3 ConF → i-o- di3	Function Input DI3 **1 / Freely Available / nonE** : Available as required **21 / Reference Switch (REF) / rEF** : Reference switch **22 / Positive Limit Switch (LIMP) / LinP** : Positive limit switch **23 / Negative Limit Switch (LIMN) / Linn** : Negative limit switch **24 / Switch Controller Parameter Set / CPAr** : Switches controller parameter set **28 / Velocity Controller Integral Off / tnoF** : Switches off velocity controller integral term **40 / Release Holding Brake / rEhb** : Releases the holding brake Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1800 IDN P-0-3007.0.4

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DI4 ConF → i-o- di4	Function Input DI4 **1 / Freely Available / nonE** : Available as required **21 / Reference Switch (REF) / rEF** : Reference switch **22 / Positive Limit Switch (LIMP) / LiMP** : Positive limit switch **23 / Negative Limit Switch (LIMN) / LiMn** : Negative limit switch **24 / Switch Controller Parameter Set / CPAr** : Switches controller parameter set **28 / Velocity Controller Integral Off / tnoF** : Switches off velocity controller integral term **40 / Release Holding Brake / rEhb** : Releases the holding brake Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1802 IDN P-0-3007.0.5
IOfunct_DI5 ConF → i-o- di5	Function Input DI5 **1 / Freely Available / nonE** : Available as required **21 / Reference Switch (REF) / rEF** : Reference switch **22 / Positive Limit Switch (LIMP) / LiMP** : Positive limit switch **23 / Negative Limit Switch (LIMN) / LiMn** : Negative limit switch **24 / Switch Controller Parameter Set / CPAr** : Switches controller parameter set **28 / Velocity Controller Integral Off / tnoF** : Switches off velocity controller integral term **40 / Release Holding Brake / rEhb** : Releases the holding brake Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1804 IDN P-0-3007.0.6

7.5.2.2 Parameterization of the signal output functions

Factory settings

The table below shows the factory settings of the digital signal outputs:

Signal	Signal output function
DQ0	No Fault
DQ1	Active
DQ2	Freely Available

Parameterization

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

Signal output function	Description in chapter
Freely Available	*"7.6.4 Setting a signal output via parameter"*
No Fault	*"7.2.3 Indication of the operating state"*
Active	*"7.2.3 Indication of the operating state"*
In Position Deviation Window	*"7.7.6 Position deviation window"*
In Velocity Deviation Window	*"7.7.7 Velocity deviation window"*
Velocity Below Threshold	*"7.7.8 Velocity threshold value"*
Current Below Threshold	*"7.7.9 Current threshold value"*
Halt Acknowledge	*"7.6.1 Stop movement with Halt"*
Motor Standstill	*"7.7.5 Motor standstill and direction of movement"*
Selected Error	*"9.1.3 Diagnostics via signal outputs"*
Drive Referenced (ref_ok)	*"7.3.2 Operating mode Homing"*
Selected Warning	*"9.1.3 Diagnostics via signal outputs"*
Motor Moves Positive	*"7.7.5 Motor standstill and direction of movement"*
Motor Moves Negative	*"7.7.5 Motor standstill and direction of movement"*

The following parameters can be used to parameterize the digital signal outputs:

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DQ0 ConF → i-o- do0	Function Output DQ0 **1 / Freely Available / nonE** : Available as required **2 / No Fault / nFLt** : Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active / Acti** : Signals operating state Operation Enabled **5 / In Position Deviation Window / in-P** : Position deviation is within window **6 / In Velocity Deviation Window / in-V** : Velocity deviation is within window **7 / Velocity Below Threshold / Vthr** : Motor velocity below threshold **8 / Current Below Threshold / ithr** : Motor current below threshold **9 / Halt Acknowledge / hALt** : Halt acknowledgement **13 / Motor Standstill / MStd** : Motor at a standstill **14 / Selected Error / SErr** : One of the selected errors is active **15 / Valid Reference (ref_ok) / rEFo** : Drive has a valid reference (ref_ok) **16 / Selected Warning / SWrn** : One of the selected warnings is active **22 / Motor Moves Positive / MPoS** : Motor moves in positive direction **23 / Motor Moves Negative / MnEG** : Motor moves in negative direction Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1810 IDN P-0-3007.0.9

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DQ1 ConF → i-o- do1	Function Output DQ1 **1 / Freely Available / nonE** : Available as required **2 / No Fault / nFLt** : Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active / Acti** : Signals operating state Operation Enabled **5 / In Position Deviation Window / in-P** : Position deviation is within window **6 / In Velocity Deviation Window / in-V** : Velocity deviation is within window **7 / Velocity Below Threshold / Vthr** : Motor velocity below threshold **8 / Current Below Threshold / ithr** : Motor current below threshold **9 / Halt Acknowledge / hALt** : Halt acknowledgement **13 / Motor Standstill / MStd** : Motor at a standstill **14 / Selected Error / SErr** : One of the selected errors is active **15 / Valid Reference (ref_ok) / rEFo** : Drive has a valid reference (ref_ok) **16 / Selected Warning / SWrn** : One of the selected warnings is active **22 / Motor Moves Positive / MPoS** : Motor moves in positive direction **23 / Motor Moves Negative / MnEG** : Motor moves in negative direction Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1812 IDN P-0-3007.0.10

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DQ2 ConF → i-o- do2	Function Output DQ2 **1 / Freely Available / nonE** : Available as required **2 / No Fault / nFLt** : Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active / Acti** : Signals operating state Operation Enabled **5 / In Position Deviation Window / in-P** : Position deviation is within window **6 / In Velocity Deviation Window / in-V** : Velocity deviation is within window **7 / Velocity Below Threshold / Vthr** : Motor velocity below threshold **8 / Current Below Threshold / ithr** : Motor current below threshold **9 / Halt Acknowledge / hALt** : Halt acknowledgement **13 / Motor Standstill / MStd** : Motor at a standstill **14 / Selected Error / SErr** : One of the selected errors is active **15 / Valid Reference (ref_ok) / rEFo** : Drive has a valid reference (ref_ok) **16 / Selected Warning / SWrn** : One of the selected warnings is active **22 / Motor Moves Positive / MPoS** : Motor moves in positive direction **23 / Motor Moves Negative / MnEG** : Motor moves in negative direction Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1814 IDN P-0-3007.0.11

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7.5.2.3 Parameterization of software debouncing

The debounce time can be set via the following parameters.

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`DI_0_Debounce`	Debounce time of DI0 **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **2 / 0.50 ms**: 0.50 ms **3 / 0.75 ms**: 0.75 ms **4 / 1.00 ms**: 1.00 ms **5 / 1.25 ms**: 1.25 ms **6 / 1.50 ms**: 1.50 ms Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2112 IDN P-0-3008.0.32
`DI_1_Debounce`	Debounce time of DI1 **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **2 / 0.50 ms**: 0.50 ms **3 / 0.75 ms**: 0.75 ms **4 / 1.00 ms**: 1.00 ms **5 / 1.25 ms**: 1.25 ms **6 / 1.50 ms**: 1.50 ms Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2114 IDN P-0-3008.0.33
`DI_2_Debounce`	Debounce time of DI2 **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **2 / 0.50 ms**: 0.50 ms **3 / 0.75 ms**: 0.75 ms **4 / 1.00 ms**: 1.00 ms **5 / 1.25 ms**: 1.25 ms **6 / 1.50 ms**: 1.50 ms Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2116 IDN P-0-3008.0.34

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
DI_3_Debounce	Debounce time of DI3 **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **2 / 0.50 ms**: 0.50 ms **3 / 0.75 ms**: 0.75 ms **4 / 1.00 ms**: 1.00 ms **5 / 1.25 ms**: 1.25 ms **6 / 1.50 ms**: 1.50 ms Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2118 IDN P-0-3008.0.35
DI_4_Debounce	Debounce time of DI4 **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **2 / 0.50 ms**: 0.50 ms **3 / 0.75 ms**: 0.75 ms **4 / 1.00 ms**: 1.00 ms **5 / 1.25 ms**: 1.25 ms **6 / 1.50 ms**: 1.50 ms Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2120 IDN P-0-3008.0.36
DI_5_Debounce	Debounce time of DI5 **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **2 / 0.50 ms**: 0.50 ms **3 / 0.75 ms**: 0.75 ms **4 / 1.00 ms**: 1.00 ms **5 / 1.25 ms**: 1.25 ms **6 / 1.50 ms**: 1.50 ms Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2122 IDN P-0-3008.0.37

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7.5.3 Setting backlash compensation

By setting backlash compensation, you can compensate for mechanical backlash.

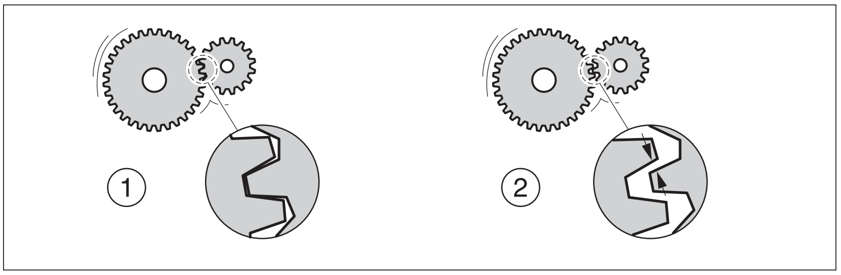

Figure 70: Example of mechanical backlash

(1) Example of low mechanical backlash
(2) Example of high mechanical backlash

When backlash compensation is activated, the drive automatically compensates for the mechanical backlash during each movement.

Availability Backlash compensation is possible in the following operating modes:

- Jog
- Homing

Parameterization To use backlash compensation, you must set the amount of backlash.

The parameter `BLSH_Position` lets you set the amount of backlash in user-defined units.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
BLSH_Position	Position value for backlash compensation Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	usr_p 0 0 2147483647	INT32 R/W per. -	Modbus 1668 IDN P-0-3006.0.66

In addition, you can set a processing time. The processing time specifies the period of time during which the mechanical backlash is to be compensated for.

The parameter `BLSH_Time` lets you set the processing time in ms.

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
BLSH_Time	Processing time for backlash compensation Value 0: Immediate backlash compensation Value >0: Processing time for backlash compensation Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	ms 0 0 16383	UINT16 R/W per. -	Modbus 1672 IDN P-0-3006.0.68

Activating backlash compensation

Before you can activate backlash compensation, there must be a movement in positive or negative direction. Backlash compensation is activated with the parameter BLSH_Mode.

- Start a movement in positive direction or in negative direction. This movement must last as long as it takes to move the mechanical system connected to the motor.
- If the movement was in positive direction (positive target values), activate backlash compensation with the value "OnAfterPositive-Movement".
- If the movement was in negative direction (negative target values), activate backlash compensation with the value "OnAfterNegative-Movement".

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
BLSH_Mode	Processing mode of backlash compensation **0 / Off**: Backlash compensation is off **1 / OnAfterPositiveMovement**: Backlash compensation is on, last movement was in positive direction **2 / OnAfterNegativeMovement**: Backlash compensation is on, last movement was in negative direction Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 2	UINT16 R/W per. -	Modbus 1666 IDN P-0-3006.0.65

7.5.4 Setting the motion profile for the velocity

Target position and target velocity are input values specified by the user. A motion profile for the velocity is calculated on the basis of these input values.

The motion profile for the velocity consists of an acceleration, a deceleration and a maximum velocity.

A linear ramp for both directions of movement is available.

Availability

The availability of the motion profile for the velocity depends on the operating mode.

In the following operating modes, the motion profile for the velocity is permanently active:

- Jog
- Homing

Ramp slope

The ramp slope determines the velocity changes of the motor per time unit. The ramp slope can be set for acceleration and deceleration.

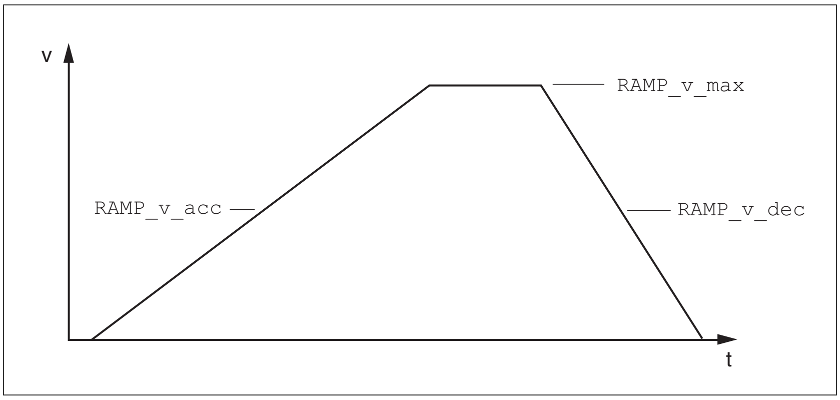

Figure 71: Ramp slope

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
RAMP_v_enable	Activation of the motion profile for velocity **0 / Profile Off**: Profile off **1 / Profile On**: Profile on Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 1 1	UINT16 R/W per. -	Modbus 1622 IDN P-0-3006.0.43
RAMP_v_max ConF → ACG- nrMP	Maximum velocity of the motion profile for velocity If a greater reference speed is set in one of these operating modes, it is automatically limited to RAMP_v_max. This way, commissioning at limited speed is easier to perform. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the motor moves.	usr_v 1 13200 2147483647	UINT32 R/W per. -	Modbus 1554 IDN P-0-3006.0.9
RAMP_v_acc	Acceleration of the motion profile for velocity Writing the value 0 has no effect on the parameter. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_a 1 600 2147483647	UINT32 R/W per. -	Modbus 1556 IDN P-0-3006.0.10
RAMP_v_dec	Deceleration of the motion profile for velocity The minimum value depends on the operating mode: Operating modes with minimum value 1: Electronic Gear (velocity synchronization) Profile Velocity Motion Sequence (Move Velocity) Operating modes with minimum value 120: Jog Profile Position Homing Motion Sequence (Move Absolute, Move Additive, Move Relative and Reference Movement) Writing the value 0 has no effect on the parameter. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_a 1 600 2147483647	UINT32 R/W per. -	Modbus 1558 IDN P-0-3006.0.11

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7.5.5 Setting the controller parameters

7.5.5.1 Overview of the controller structure

The illustration below provides an overview of the controller structure.

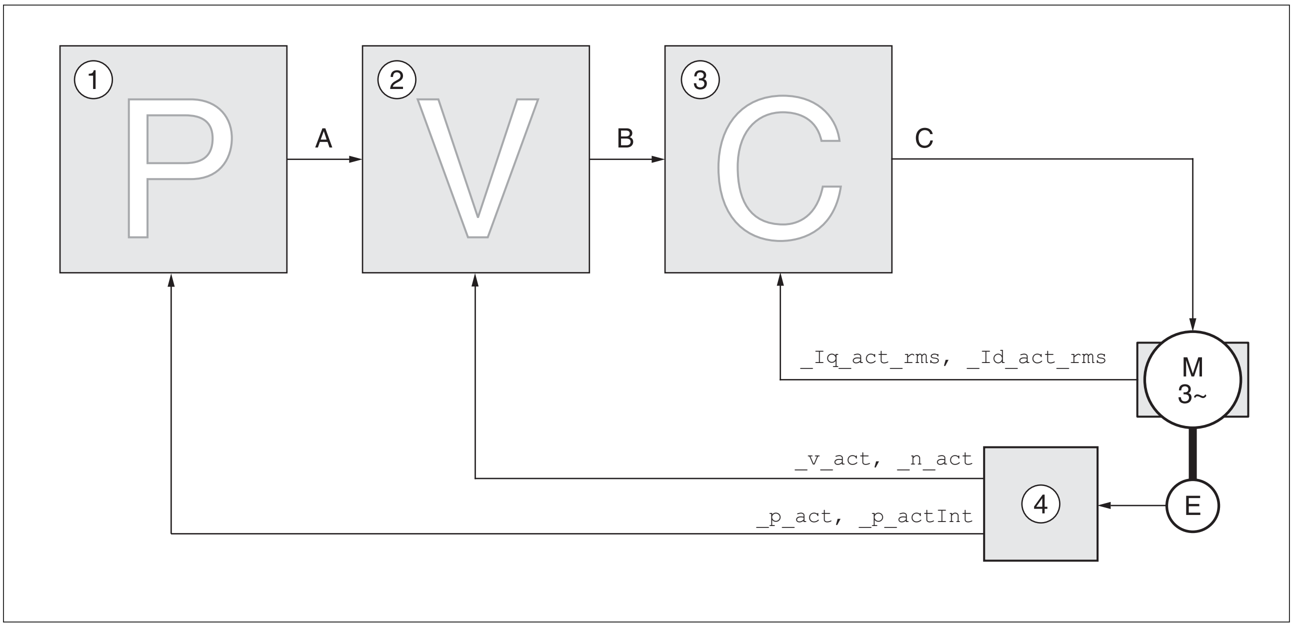

Figure 72: Controller structure, overview

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

Position controller

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

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

Velocity controller

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

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

Current controller

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

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7.5.5.2 Overview of position controller

The illustration below provides an overview of the position controller.

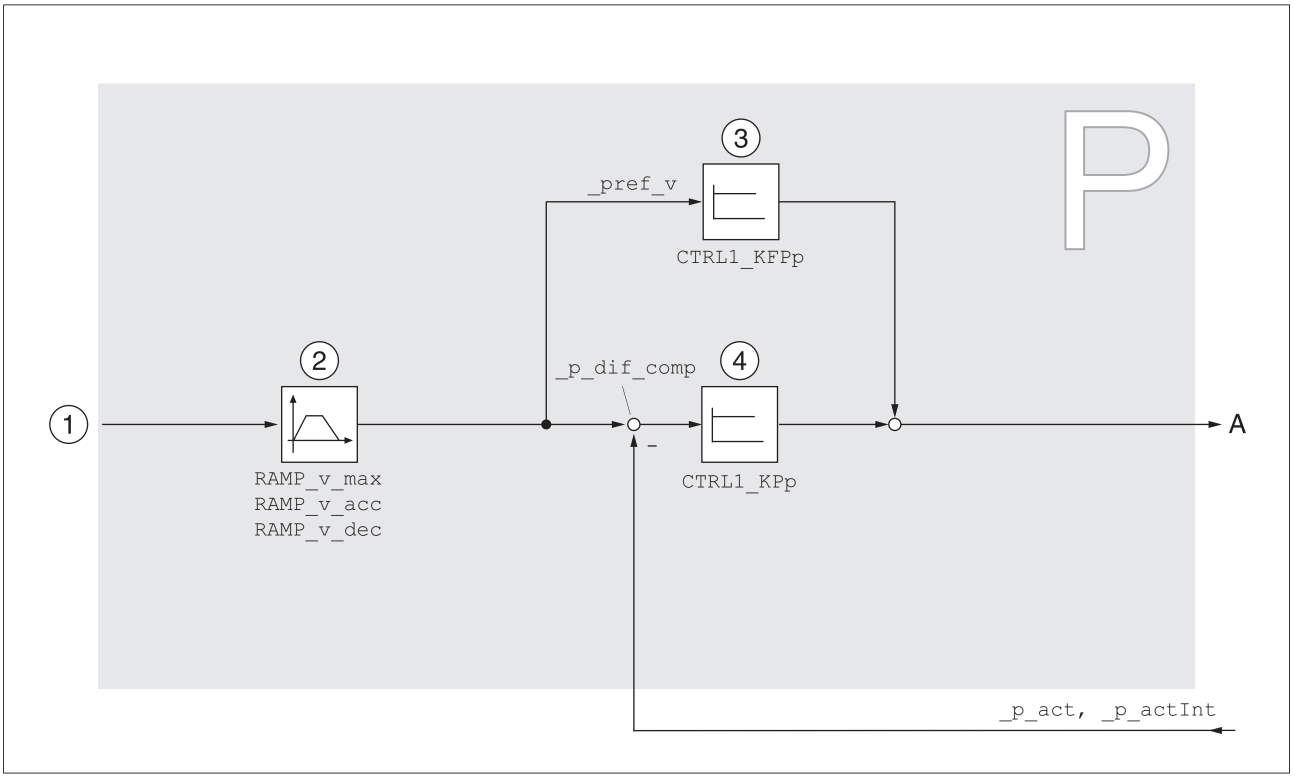

Figure 73: Position controller

(1)	Target values for the operating modes Jog and Homing
(2)	Motion profile for the velocity
(3)	Velocity feed-forward control
(4)	Position controller

Sampling period The sampling period of the position controller is 250 μs.

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7.5.5.3 Overview of velocity controller

The illustration below provides an overview of the velocity controller.

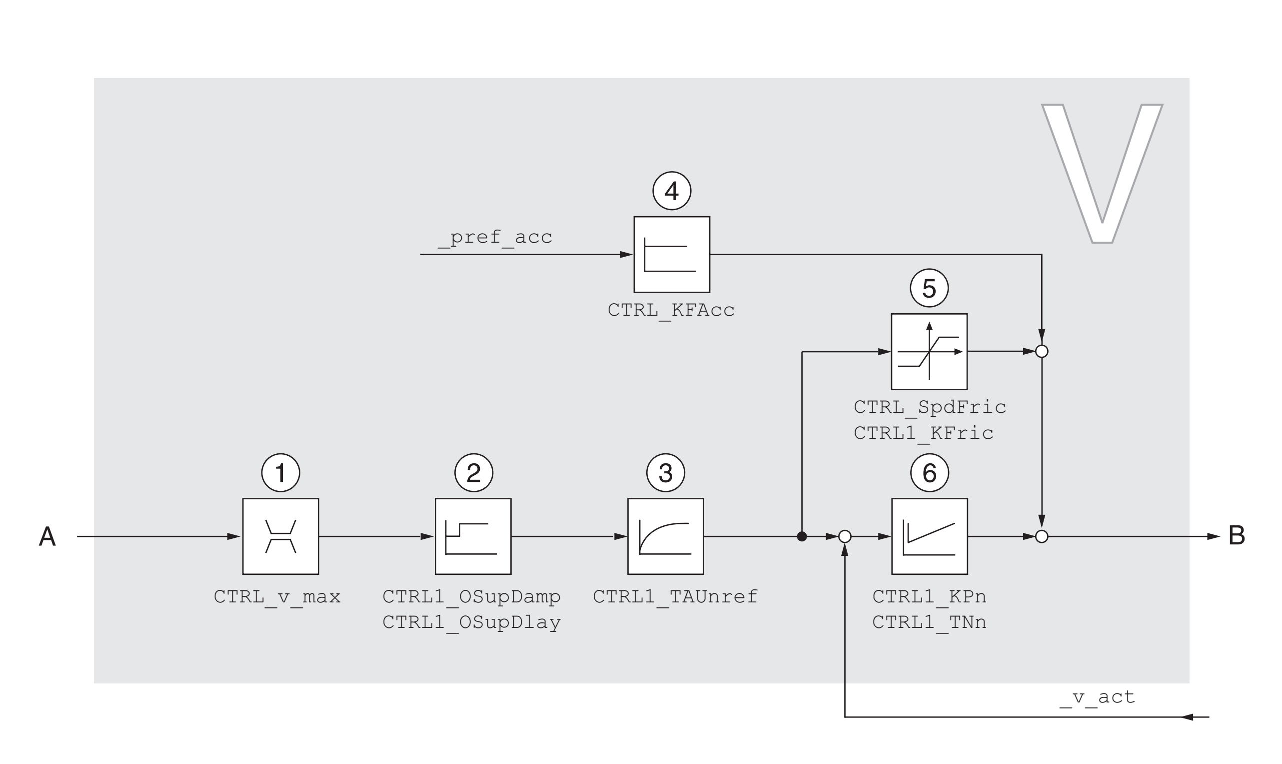

Figure 74: Velocity controller

(1) Velocity limitation
(2) Overshoot suppression filter (parameter accessible in Expert mode)
(3) Filter time constant of the reference velocity value filter
(4) Acceleration feed forward control (parameter accessible in Expert mode)
(5) Friction compensation (parameter accessible in Expert mode)
(6) Velocity controller

Sampling period The sampling period of the velocity controller is 62.5 µs.

0198441114060, V2.0, 03.2016

7.5.5.4 Overview of current controller

The illustration below provides an overview of the current controller.

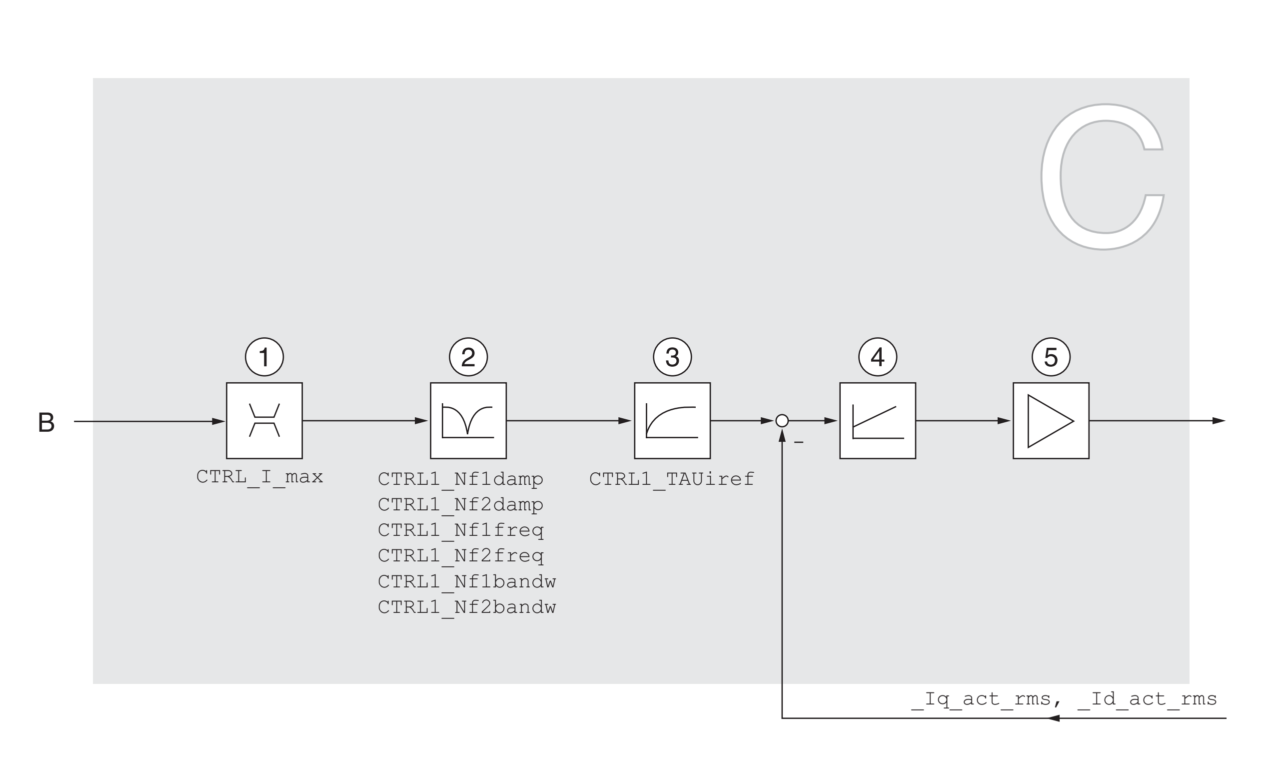

Figure 75: Current controller

(1) Current limitation
(2) Notch filter (parameter accessible in Expert mode)
(3) Filter time constant of the reference current value filter
(4) Current controller
(5) Power stage

Sampling period The sampling period of the current controller is 62.5 µs.

7.5.5.5 Parameterizable controller parameters

The product features 2 controller parameter sets that can be parameterized separately. The values for the controller parameters determined during autotuning are stored in controller parameter set 1.

Controller parameter set

A controller parameter set consists of freely accessible parameters and parameters which are only accessible in Expert mode.

Controller parameter set 1	Controller parameter set 2
Freely accessible parameters:	Freely accessible parameters:
CTRL1_KPn CTRL1_TNn CTRL1_KPp CTRL1_TAUiref CTRL1_TAUnref CTRL1_KFPp	CTRL2_KPn CTRL2_TNn CTRL2_KPp CTRL2_TAUiref CTRL2_TAUnref CTRL2_KFPp
Parameters only accessible in expert mode:	Parameters only accessible in expert mode:
CTRL1_Nf1damp CTRL1_Nf1freq CTRL1_Nf1bandw CTRL1_Nf2damp CTRL1_Nf2freq CTRL1_Nf2bandw CTRL1_Osupdamp CTRL1_Osupdelay CTRL1_Kfric	CTRL2_Nf1damp CTRL2_Nf1freq CTRL2_Nf1bandw CTRL2_Nf2damp CTRL2_Nf2freq CTRL2_Nf2bandw CTRL2_Osupdamp CTRL2_Osupdelay CTRL2_Kfric

See chapters *"7.5.5.10 Controller parameter set 1"* and *"7.5.5.11 Controller parameter set 2"*.

Parameterization

- Selecting a controller parameter set

  Select a controller parameter set after switching on.

  See chapter *"7.5.5.6 Selecting a controller parameter set"*.
- Automatically switching between control parameter sets

  It is possible to switch between the two controller parameter sets.

  See chapter *"7.5.5.7 Automatically switching between control parameter sets"*.
- Copying a controller parameter set

  The values of controller parameter set 1 can be copied to controller parameter set 2.

  See chapter *"7.5.5.8 Copying a controller parameter set"*.
- Deactivating the integral term

  The integral term and, by implication, the integral action time, can be switched off via a digital signal input.

  See chapter *"7.5.5.9 Deactivating the integral term"*.

7.5.5.6 Selecting a controller parameter set

The currently active controller parameter set is indicated via the parameter _CTRL_ActParSet.

The parameter CTRL_PwrUpParSet allows you to set the controller parameter set to be activated after switching on. Alternatively, you can set whether or not the product is to switch automatically between the two controller parameter sets.

The parameter CTRL_SelParSet allows you to switch between the two controller parameter sets during operation.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_CTRL_ActParSet	Active controller parameter set Value 1: Controller parameter set 1 is active Value 2: Controller parameter set 2 is active A controller parameter set is active after the time for the parameter switching (CTRL_ParChgTime) has elapsed. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 4398 IDN P-0-3017.0.23
CTRL_PwrUpParSet	Selection of controller parameter set at power up **0 / Switching Condition**: The switching condition is used for parameter set switching **1 / Parameter Set 1**: Parameter set 1 is used **2 / Parameter Set 2**: Parameter set 2 is used The selected value is also written to CTRL_ParSetSel (non-persistent). Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 1 2	UINT16 R/W per. -	Modbus 4400 IDN P-0-3017.0.24
CTRL_SelParSet	Selection of controller parameter set (non-persistent) Coding see parameter: CTRL_PwrUpParSet Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 1 2	UINT16 R/W - -	Modbus 4402 IDN P-0-3017.0.25

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7.5.5.7 Automatically switching between control parameter sets

It is possible to automatically switch between the two controller parameter sets.

The following criteria can be set for switching between the controller parameter sets:

- Digital signal input
- Position deviation window
- Target velocity below parameterizable value
- Actual velocity below parameterizable value

Settings The illustration below provides an overview of switching between the controller parameter sets.

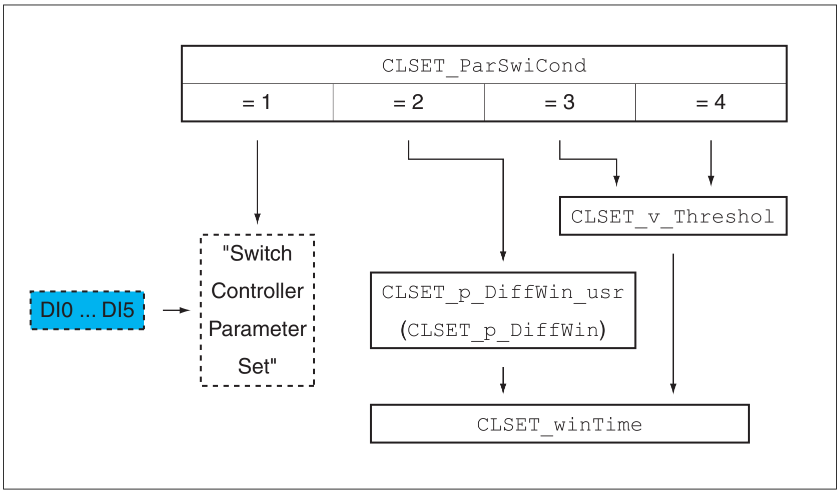

Figure 76: Parameters for switching the controller parameter sets

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Time chart

The freely accessible parameters are changed linearly. This linear change of the values of controller parameter set 1 to the values of controller parameter set 2 takes place during the parameterizable time `CTRL_ParChgTime`.

The parameters only accessible in Expert mode are directly changed to the values of the other controller parameter set after the parameterizable time `CTRL_ParChgTime` has passed.

The figure below shows the time chart for switching the controller parameters.

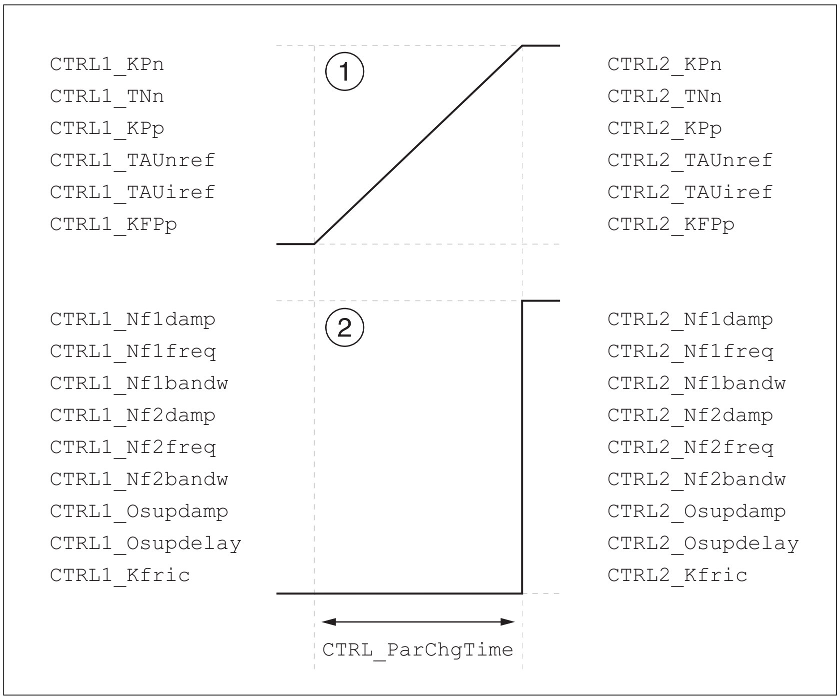

Figure 77: Time chart for switching the controller parameter sets

(1) Freely accessible parameters are changed linearly over time

(2) Parameters which are only accessible in Expert mode are switched over directly

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CLSET_ParSwiCond	Condition for parameter set switching **0 / None Or Digital Input**: None or digital input function selected **1 / Inside Position Deviation**: Inside position deviation (value definition in parameter CLSET_p_DiffWin) **2 / Below Reference Velocity**: Below reference velocity (value definition in parameter CLSET_v_Threshol) **3 / Below Actual Velocity**: Below actual velocity (value definition in parameter CLSET_v_Threshol) **4 / Reserved**: Reserved In the case of parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp The following parameters are changed immediately after the time for parameter set switching (CTRL_ParChgTime): - CTRL_Nf1damp - CTRL_Nf1freq - CTRL_Nf1bandw - CTRL_Nf2damp - CTRL_Nf2freq - CTRL_Nf2bandw - CTRL_Osupdamp - CTRL_Osupdelay - CTRL_Kfric Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 4	UINT16 R/W per. -	Modbus 4404 IDN P-0-3017.0.26
CLSET_p_DiffWin_usr	Position deviation for parameter set switching If the position deviation of the position controller is less than the value of this parameter, the controller parameter set 2 is used. Otherwise, controller parameter set 1 is used. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_p 0 1312 2147483647	INT32 R/W per. -	Modbus 4426 IDN P-0-3017.0.37

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CLSET_p_DiffWin	Position deviation for parameter set switching If the position deviation of the position controller is less than the value of this parameter, the controller parameter set 2 is used. Otherwise, controller parameter set 1 is used. The parameter CLSET_p_DiffWin_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 revolution. Changed settings become active immediately.	revolution 0.0000 0.0100 2.0000	UINT16 R/W per. -	Modbus 4408 IDN P-0-3017.0.28
CLSET_v_Threshol	Velocity threshold for parameter set switching If the reference velocity or the actual velocity are less than the value of this parameter, the controller parameter set 2 is used. Otherwise, controller parameter set 1 is used. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 0 50 2147483647	UINT32 R/W per. -	Modbus 4410 IDN P-0-3017.0.29
CLSET_winTime	Time window for parameter set switching Value 0: Window monitoring deactivated. Value >0: Window time for the parameters CLSET_v_Threshol and CLSET_p_DiffWin. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	ms 0 0 1000	UINT16 R/W per. -	Modbus 4406 IDN P-0-3017.0.27

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL_ParChgTime	Period of time for parameter switching In the case of parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp Such a parameter switching can be caused by - change of the active controller parameter set - change of the global gain - change of any of the parameters listed above - switching off the integral term of the velocity controller Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	ms 0 0 2000	UINT16 R/W per. -	Modbus 4392 IDN P-0-3017.0.20

7.5.5.8 Copying a controller parameter set

The parameter CTRL_ParSetCopy allows you to copy the values of controller parameter set 1 to controller parameter set 2 or the values of controller parameter set 2 to controller parameter set 1.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL_ParSetCopy	Controller parameter set copying Value 1: Copy controller parameter set 1 to set 2 Value 2: Copy controller parameter set 2 to set 1 If parameter set 2 copied to parameter set 1, the parameter CTRL_GlobGain is set to 100%. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0.0 - 0.2	UINT16 R/W - -	Modbus 4396 IDN P-0-3017.0.22

7.5.5.9 Deactivating the integral term

The integral term of the velocity controller can be deactivated via the signal input function "Velocity Controller Integral Off". If the integral term is deactivated, the integral action time of the velocity controller (CTRL1_TNn and CTRL2_TNn) is implicitly and gradually reduced to zero. The time it takes to reduce the value to zero depends on the parameter CTRL_ParChgTime. In the case of vertical axes, the integral term is needed to reduce position deviations during standstill.

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7.5.5.10 Controller parameter set 1

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_KPn ConF → drC- Pn1	Velocity controller P gain The default value is calculated on the basis of the motor parameters. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 A/min^{-1}. Changed settings become active immediately.	A/min^{-1} 0.0001 - 2.5400	UINT16 R/W per. -	Modbus 4610 IDN P-0-3018.0.1
CTRL1_TNn ConF → drC- tin1	Velocity controller integral action time The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4612 IDN P-0-3018.0.2
CTRL1_KPp ConF → drC- PP1	Position controller P gain The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 1/s. Changed settings become active immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	Modbus 4614 IDN P-0-3018.0.3
CTRL1_TAUiref	Filter time constant of the reference current value filter In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	Modbus 4618 IDN P-0-3018.0.5

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_TAUnref ConF → drC- tAu1	Filter time constant of the reference velocity value filter In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	Modbus 4616 IDN P-0-3018.0.4
CTRL1_KFPp ConF → drC- FPP1	Velocity feed-forward control In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 0.0 100.0 200.0	UINT16 R/W per. -	Modbus 4620 IDN P-0-3018.0.6
CTRL1_Nf1damp	Notch filter 1: Damping Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4624 IDN P-0-3018.0.8
CTRL1_Nf1freq	Notch filter 1: Frequency The filter is switched off at a value of 15000. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4626 IDN P-0-3018.0.9
CTRL1_Nf1bandw	Notch filter 1: Bandwidth Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4628 IDN P-0-3018.0.10
CTRL1_Nf2damp	Notch filter 2: Damping Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4630 IDN P-0-3018.0.11

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL1_Nf2freq	Notch filter 2: Frequency The filter is switched off at a value of 15000. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4632 IDN P-0-3018.0.12
CTRL1_Nf2bandw	Notch filter 2: Bandwidth Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4634 IDN P-0-3018.0.13
CTRL1_Osupdamp	Overshoot suppression filter: Damping The filter is switched off at a value of 0. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 50.0	UINT16 R/W per. expert	Modbus 4636 IDN P-0-3018.0.14
CTRL1_Osupdelay	Overshoot suppression filter: Time delay The filter is switched off at a value of 0. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.00 75.00	UINT16 R/W per. expert	Modbus 4638 IDN P-0-3018.0.15
CTRL1_Kfric	Friction compensation: Gain Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.00 10.00	UINT16 R/W per. expert	Modbus 4640 IDN P-0-3018.0.16

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7.5.5.11 Controller parameter set 2

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL2_KFPp ConF → drC- FPP2	Velocity feed-forward control In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 0.0 100.0 200.0	UINT16 R/W per. -	Modbus 4876 IDN P-0-3019.0.6
CTRL2_Kfric	Friction compensation: Gain Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.00 10.00	UINT16 R/W per. expert	Modbus 4896 IDN P-0-3019.0.16
CTRL2_KPn ConF → drC- Pn2	Velocity controller P gain The default value is calculated on the basis of the motor parameters. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 A/min^{-1}. Changed settings become active immediately.	A/min^{-1} 0.0001 - 2.5400	UINT16 R/W per. -	Modbus 4866 IDN P-0-3019.0.1
CTRL2_KPp ConF → drC- PP2	Position controller P gain The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 1/s. Changed settings become active immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	Modbus 4870 IDN P-0-3019.0.3
CTRL2_Nf1bandw	Notch filter 1: Bandwidth Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4884 IDN P-0-3019.0.10

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL2_Nf1damp	Notch filter 1: Damping Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4880 IDN P-0-3019.0.8
CTRL2_Nf1freq	Notch filter 1: Frequency The filter is switched off at a value of 15000. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4882 IDN P-0-3019.0.9
CTRL2_Nf2bandw	Notch filter 2: Bandwidth Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4890 IDN P-0-3019.0.13
CTRL2_Nf2damp	Notch filter 2: Damping Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4886 IDN P-0-3019.0.11
CTRL2_Nf2freq	Notch filter 2: Frequency The filter is switched off at a value of 15000. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4888 IDN P-0-3019.0.12
CTRL2_Osupdamp	Overshoot suppression filter: Damping The filter is switched off at a value of 0. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 50.0	UINT16 R/W per. expert	Modbus 4892 IDN P-0-3019.0.14

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL2_Osupdelay	Overshoot suppression filter: Time delay The filter is switched off at a value of 0. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.00 75.00	UINT16 R/W per. expert	Modbus 4894 IDN P-0-3019.0.15
CTRL2_TAUiref	Filter time constant of the reference current value filter In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	Modbus 4874 IDN P-0-3019.0.5
CTRL2_TAUnref ConF → drC- tAu2	Filter time constant of the reference velocity value filter In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	Modbus 4872 IDN P-0-3019.0.4
CTRL2_TNn ConF → drC- tin2	Velocity controller integral action time The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4868 IDN P-0-3019.0.2

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7.6 Functions for target value processing

7.6.1 Stop movement with Halt

With a Halt, the current movement is interrupted; it can be resumed.

A Halt can be triggered via a fieldbus command.

The movement can be interrupted with 2 different deceleration types.

- Deceleration via deceleration ramp
- Deceleration via torque ramp

Setting the type of deceleration

The parameter `LIM_HaltReaction` lets you set the type of deceleration.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
LIM_HaltReaction ConF → ACG- htyP	Halt option code **1 / Deceleration Ramp / dEcE** : Deceleration ramp **3 / Torque Ramp / torq** : Torque ramp Type of deceleration for Halt. Setting of deceleration ramp with parameter RAMP_v_dec. Setting of torque ramp with parameter LIM_I_maxHalt. If a deceleration ramp is already active, the parameter cannot be written. Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 1 3 3	INT16 R/W per. -	Modbus 1582 IDN P-0-3006.0.23

Setting the deceleration ramp

The deceleration ramp is set with the parameter `Ramp_v_dec` via the motion profile for the velocity, see chapter *"7.5.4 Setting the motion profile for the velocity"*.

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Setting the torque ramp The parameter `LIM_I_maxHalt` lets you set the torque ramp.

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

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7.6.2 Stopping a movement with Quick Stop

With a Quick Stop, the current movement is stopped.

A Quick Stop can be triggered by a detected error of error classes 1 or 2 or via a fieldbus command.

The movement can be stopped with 2 different deceleration types.

- Deceleration via deceleration ramp
- Deceleration via torque ramp

In addition, you can set the operating state to switch to after the deceleration.

- Transition to operating state **9** Fault
- Transition to operating state **7** Quick Stop Active

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Setting the type of deceleration The parameter LIM_QStopReact lets you set the type of deceleration.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
LIM_QStopReact	Quick Stop option code **-2 / Torque ramp (Fault)**: Use torque ramp and transit to operating state 9 Fault **-1 / Deceleration Ramp (Fault)**: Use deceleration ramp and transit to operating state 9 Fault **6 / Deceleration ramp (Quick Stop)**: Use deceleration ramp and remain in operating state 7 Quick Stop **7 / Torque ramp (Quick Stop)**: Use torque ramp and remain in operating state 7 Quick Stop Type of deceleration for Quick Stop. Setting of deceleration ramp with parameter RAMPquickstop. Setting of torque ramp with parameter LIM_I_maxQSTP. If a deceleration ramp is already active, the parameter cannot be written. Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- -2 6 7	INT16 R/W per. -	Modbus 1584 IDN P-0-3006.0.24

Setting the deceleration ramp The parameter RAMPquickstop lets you set the deceleration ramp.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RAMPquickstop	Deceleration ramp for Quick Stop Deceleration ramp for a software stop or an error with error class 1 or 2. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_a 1 6000 2147483647	UINT32 R/W per. -	Modbus 1572 IDN P-0-3006.0.18

Setting the torque ramp The parameter LIM_I_maxQSTP lets you set the torque ramp.

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

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7.6.3 Jerk limitation

Jerk limitation smoothes sudden acceleration changes to allow for smooth transitions with almost no jerking.

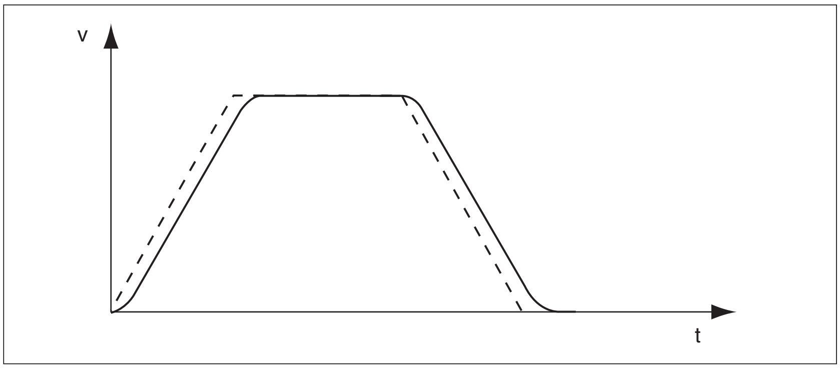

Figure 78: Jerk limitation

Availability Jerk limitation is available in the following operating modes.

- Jog
- Homing

Jerk limitation is activated and set via the parameter `RAMP_v_jerk`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`RAMP_v_jerk` ConF → drC- JEr	Jerk limitation of the motion profile for velocity **0 / Off / oFF** : Off **1 / 1 / 1** : 1 ms **2 / 2 / 2** : 2 ms **4 / 4 / 4** : 4 ms **8 / 8 / 8** : 8 ms **16 / 16 / 16** : 16 ms **32 / 32 / 32** : 32 ms **64 / 64 / 64** : 64 ms **128 / 128 / 128** : 128 ms Adjustments can only be made if the operating mode is inactive (x_end=1). Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	ms 0 0 128	UINT16 R/W per. -	Modbus 1562 IDN P-0-3006.0.13

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7.6.4 Setting a signal output via parameter

The digital signal outputs can be set as required via the fieldbus.

In order to set a digital signal output via the parameter, you must first parameterize the signal input function "Freely Available", see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

The parameter `IO_DQ_set` lets you set the digital signal outputs.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via field-bus**
`IO_DQ_set`	Setting the digital outputs directly Write access to output bits is only active if the signal pin is available as an output and if the function of the output was set to 'Available as required'. Coding of the individual signals: Bit 0: DQ0 Bit 1: DQ1 Bit 2: DQ2 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4	- - - -	UINT16 R/W - -	Modbus 2082 IDN P-0-3008.0.17

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7.6.5 Position capture via signal input

The motor position can be captured when a signal is detected at a Capture input.

Number of Capture inputs

3 Capture inputs are available.

- Capture input: `DI0/CAP1`
- Capture input: `DI1/CAP2`
- Capture input: `DI2/CAP3`

Selection of the method

The motor position can be captured in 2 different ways:

- One-time position capture

  One-time capture means that the position is captured at the first edge.
- Continuous motor position capture

  Continuous capture means that the motor position is captured anew at every edge. The previously captured value is lost.

The motor position can be captured when the edge at the Capture input rises or falls.

Accuracy

A jitter of 2 µs results in an inaccuracy of the captured position of approximately 13.2 user-defined units at a velocity of 3000 min^{-1}. (3000 min^{-1} = $(3000*131072)/(60*10^6)$ = 6.6 usr_p/µs)

If the factory settings for scaling are used, 13.2 user-defined units correspond to 0.036 °.

The captured motor position is less accurate during the acceleration phase and the deceleration phase.

Real-time capability

The motor position can be captured via the real-time channel. The functionalities of the real-time channel and the acyclical channel differ. The table below provides an overview:

Function	Real-time channel	Acyclical channel
Starting position capture `DI0/CAP1`	Yes	Yes
Starting position capture `DI1/CAP2`	Yes	Yes
Starting position capture `DI2/CAP3`	No	Yes
Status of captured position `DI0/CAP1`	Yes	Yes
Status of captured position `DI1/CAP2`	Yes	Yes
Status of captured position `DI2/CAP3`	No	Yes
One-time position capture	Yes	Yes
Continuous motor position capture	No	Yes

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7.6.5.1 Position capture via vendor-specific profile

Setting the source

The following parameters let you set the source for position capture.

▸ Set the source for position capture with the parameters `Cap1Source`, `Cap2Source` and `Cap3Source`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`Cap1Source`	Capture input 1 encoder source **0 / Pact Encoder 1**: Source for capture input 1 is Pact of encoder 1 **1 / Pact Encoder 2**: Source for capture input 1 is Pact of encoder 2 (module) Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2580 IDN P-0-3010.0.10
`Cap2Source`	Capture input 2 encoder source **0 / Pact Encoder 1**: Source for capture input 2 is Pact of encoder 1 **1 / Pact Encoder 2**: Source for capture input 2 is Pact of encoder 2 (module) Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2582 IDN P-0-3010.0.11
`Cap3Source`	Capture input 3 encoder source **0 / Pact Encoder 1**: Source for capture input 3 is Pact of encoder 1 **1 / Pact Encoder 2**: Source for capture input 3 is Pact of encoder 2 (module) Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2602 IDN P-0-3010.0.21

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Setting the edge The following parameters let you set the edge for position capture.

▸ Set the desired edge with the parameters `Cap1Config`, `Cap2Config` and `Cap3Config`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`Cap1Config`	Capture input 1 configuration **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge **2 / Both Edges**: Position capture at both edges Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 2	UINT16 R/W - -	Modbus 2564 IDN P-0-3010.0.2
`Cap2Config`	Capture input 2 configuration **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge **2 / Both Edges**: Position capture at both edges Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 2	UINT16 R/W - -	Modbus 2566 IDN P-0-3010.0.3
`Cap3Config`	Capture input 3 configuration **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2594 IDN P-0-3010.0.17

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Starting position capture

The following parameters let you start position capture.

Real-time channel:

▶ Set the desired method with the parameter `SPDSercos3Control`.

Acyclical channel:

▶ Set the desired method with the parameters `Cap1Activate` and `Cap2Activate` and `Cap3Activate`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`SPDSercos3Control`	SPD Sercos control Bit 0 = 0: Cancel capture function Bit 0 = 1: Start one-time capture via input CAP1 Bit 1 = 0: Cancel capture function Bit 1 = 1: Start one-time capture via input CAP2 Bits 2 … 15: Reserved Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- - - -	UINT16 R/W - -	Modbus 6560 IDN P-0-3025.0.80
`Cap1Activate`	Capture input 1 start/stop **0 / Capture Stop**: Cancel capture function **1 / Capture Once**: Start one-time capture **2 / Capture Continuous**: Start continuous capture **3 / Reserved**: Reserved **4 / Reserved**: Reserved In the case of one-time capture, the function is terminated when the first value is captured. In the case of continuous capture, the function continues to run. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 - 4	UINT16 R/W - -	Modbus 2568 IDN P-0-3010.0.4
`Cap2Activate`	Capture input 2 start/stop **0 / Capture Stop**: Cancel capture function **1 / Capture Once**: Start one-time capture **2 / Capture Continuous**: Start continuous capture **3 / Reserved**: Reserved **4 / Reserved**: Reserved In the case of one-time capture, the function is terminated when the first value is captured. In the case of continuous capture, the function continues to run. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 - 4	UINT16 R/W - -	Modbus 2570 IDN P-0-3010.0.5
`Cap3Activate`	Capture input 3 start/stop **0 / Capture Stop**: Cancel capture function **1 / Capture Once**: Start one-time capture **2 / Capture Continuous**: Start continuous capture In the case of one-time capture, the function is terminated when the first value is captured. In the case of continuous capture, the function continues to run.	- 0 - 2	UINT16 R/W - -	Modbus 2596 IDN P-0-3010.0.18

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
	Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immedi-ately.			

Status messages Real-time channel:

The parameter `SPDSercos3Status` indicates the capture status.

Acyclical channel:

The parameter `_CapStatus` indicates the capture status.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`SPDSercos3Status`	SPD Sercos status Bit 0 = 0: No position captured via input CAP1 Bit 0 = 1: Position captured via input CAP1 Bit 1 = 0: No position captured via input CAP2 Bit 1 = 1: Position captured via input CAP2 Bit 2 = 0: Positive limit switch not active Bit 2 = 1: Positive limit switch active Bit 3 = 0: Negative limit switch not active Bit 3 = 1: Negative limit switch active Bit 4 = 0: Quick Stop: Standstill not yet reached Bit 4 = 1: Quick Stop: Standstill reached Type: Unsigned decimal - 2 bytes Changed settings become active immedi-ately.	- - - -	UINT16 R/- - -	Modbus 6562 IDN P-0-3025.0.81
`_CapStatus`	Status of the capture inputs Read access: Bit 0: Position captured via input CAP1 Bit 1: Position captured via input CAP2 Bit 2: Position captured via input CAP3 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2562 IDN P-0-3010.0.1

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Captured position The captured position can be read via the following parameters:

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_Cap1PosCons	Capture input 1 captured position (consistent) Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap1CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2608 IDN P-0-3010.0.24
_Cap1CountCons	Capture input 1 event counter (consistent) Counts the capture events. The event counter is reset when capture input 1 is activated. By reading this parameter, the parameter "_Cap1PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2606 IDN P-0-3010.0.23
_Cap2PosCons	Capture input 2 captured position (consistent) Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap2CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2612 IDN P-0-3010.0.26
_Cap2CountCons	Capture input 2 event counter (consistent) Counts the capture events. The event counter is reset when capture input 2 is activated. By reading this parameter, the parameter "_Cap2PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2610 IDN P-0-3010.0.25
_Cap3PosCons	Capture input 3 captured position (consistent) Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap3CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2616 IDN P-0-3010.0.28

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Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via field-bus**
`_Cap3CountCons`	Capture input 3 event counter (consistent) Counts the capture events. The event counter is reset when capture input 3 is activated. By reading this parameter, the parameter "_Cap3PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2614 IDN P-0-3010.0.27

7.7 Functions for monitoring movements

7.7.1 Limit switches

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

- Check whether your application allows for the use of limit switches. If yes, use limit switches.
- Verify correct connection of the limit switches.
- Verify that the limit switches are mounted in a position far enough away from the mechanical stop to allow for 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.

Limit switches

Movements can be monitored using limit switches. A positive limit switch and a negative limit switch can be used for monitoring.

If the positive or negative limit switch are tripped, the movement stops. An error message is generated and the operating state switches to **7** Quick Stop Active.

The error message can be reset by means of a "Fault Reset". The operating state switches back to **6** Operation Enabled.

The movement can continue, however, only in the opposite direction. For example, if the positive limit switch was triggered, further movement is only possible in negative direction. In the case of further movement in positive direction, a new error message is generated and the operating state switches back to **7** Quick Stop Active.

The parameters `IOsigLIMP` and `IOsigLIMN` are used to set the the type of limit switch.

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`IOsigLIMP`	Signal evaluation for positive limit switch **0 / Inactive**: Inactive **1 / Normally closed**: Normally closed NC **2 / Normally open**: Normally open NO Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	Modbus 1568 IDN P-0-3006.0.16
`IOsigLIMN`	Signal evaluation for negative limit switch **0 / Inactive**: Inactive **1 / Normally closed**: Normally closed NC **2 / Normally open**: Normally open NO Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	Modbus 1566 IDN P-0-3006.0.15

The signal input functions "Positive Limit Switch (LIMP)" and "Negative Limit Switch (LIMN)" must have been parameterized, see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

If possible, use normally closed contacts so that a wire break can be signaled as an error.

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7.7.2 Reference switch

The reference switch is only active in the operating mode Homing.

The parameter `IOsigREF` lets you set the type of reference switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`IOsigREF`	Signal evaluation for reference switch **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO The reference switch is only active while a reference movement to the reference switch is processed. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 1 1 2	UINT16 R/W per. -	Modbus 1564 IDN P-0-3006.0.14

The signal input function "Reference Switch (REF)" must have been parameterized, see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

If possible, use normally closed contacts so that a wire break can be signaled as an error.

7.7.3 Software limit switches

Movements can be monitored using software limit switches. A positive position limit and a negative position limit can be set for monitoring.

If the positive or negative position limit switch are reached, the movement stops. An error message is generated and the operating state switches to **7** Quick Stop Active.

The error message can be reset by means of a "Fault Reset". The operating state switches back to **6** Operation Enabled.

The movement can continue, however, only in the opposite direction of the position limit. For example, if the positive position limit was reached, further movement is only possible in negative direction. In the case of further movement in positive direction, a new error message is generated and the operating state switches back to **7** Quick Stop Active.

Prerequisite

Software limit switch monitoring only works with a valid zero point, see chapter *"7.4.1 Zero point of the movement range"*.

Behavior in operating modes with target positions

In the case of operating modes with target positions, the target position is compared to the position limits before the movement is started. The movement is started normally, even if the target position is greater than the positive position limit or less than the negative position limit. However, the movement is stopped before the position limit is exceeded.

In the following operating modes, the target position is checked prior to the start of a movement.

- Jog (step movement)

Behavior in operating modes without target positions

In operating modes without target position, a Quick Stop is triggered at the position limit.

In the following operating modes, a Quick Stop is triggered at the position limit.

- Jog (continuous movement)

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The parameter MON_SWLimMode allows you to set the behavior when a position limit is reached.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_SWLimMode	Behavior when position limit is reached **0 / Standstill Behind Position Limit**: Quick Stop is triggered at position limit and standstill is reached behind position limit **1 / Standstill At Position Limit**: Quick Stop is triggered in front of position limit and standstill is reached at position limit Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 1678 IDN P-0-3006.0.71

Standstill at the position limit in operating modes without target position requires the parameter LIM_QStopReact to be set to "Deceleration ramp (Quick Stop)", see *"7.6.2 Stopping a movement with Quick Stop"*. If the parameter LIM_QStopReact is set to "Torque ramp (Quick Stop)", the movement may come to a standstill in front of or behind the position limit due to different loads.

Activation The software limit switches are activated via the parameter MON_SW_Limits.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_SW_Limits	Activation of software limit switches **0 / None**: Deactivated **1 / SWLIMP**: Activation of software limit switches positive direction **2 / SWLIMN**: Activation of software limit switches negative direction **3 / SWLIMP+SWLIMN**: Activation of software limit switches both directions Software limit switches can only be activated if the zero point is valid. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 3	UINT16 R/W per. -	Modbus 1542 IDN P-0-3006.0.3

Setting position limits The software limit switches are set via the parameters MON_swLimP and MON_swLimN.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_swLimP	Positive position limit for software limit switch If a user-defined value entered is outside of the permissible range, the limit switch limits are automatically set to the maximum user-defined value. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	usr_p - 2147483647 -	INT32 R/W per. -	Modbus 1544 IDN P-0-3006.0.4
MON_swLimN	Negative position limit for software limit switch Refer to description 'MON_swLimP' Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	usr_p - -2147483648 -	INT32 R/W per. -	Modbus 1546 IDN P-0-3006.0.5

7.7.4 Load-dependent position deviation (following error)

The load-dependent position deviation is the difference between the reference position and the actual position caused by the load.

Parameters are available to read the load-dependent position deviation during operation and the maximum position deviation reached so far.

The maximum permissible load-dependent position deviation can be parameterized. In addition, you can set the error class for a following error.

Availability Monitoring of the load-dependent position deviation is available in the following operating modes:

- Jog
- Homing

Reading the position deviation The following parameters let you read the current load-dependent position deviation in user-defined units or revolutions.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
`_p_dif_load_usr`	Current load-dependent position deviation between reference and actual position The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. This value is used for following error monitoring. Type: Signed decimal - 4 bytes	usr_p -2147483648 - 2147483647	INT32 R/- - -	Modbus 7724 IDN P-0-3030.0.22
`_p_dif_load`	Current load-dependent position deviation between reference and actual position The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. This value is used for following error monitoring. The parameter _p_dif_load_usr allows you to enter the value in user-defined units. Type: Signed decimal - 4 bytes In increments of 0.0001 revolution.	revolution -214748.3648 - 214748.3647	INT32 R/- - -	Modbus 7736 IDN P-0-3030.0.28

The following parameters let you read the maximum value of the load-dependent position deviation reached so far in user-defined units or revolutions.

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_p_dif_load_peak_usr	Maximum value of the load-dependent position deviation This parameter contains the maximum load-dependent position deviation reached so far. A write access resets this value. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_p 0 - 2147483647	INT32 R/W - -	Modbus 7722 IDN P-0-3030.0.21
_p_dif_load_peak	Maximum value of the load-dependent position deviation This parameter contains the maximum load-dependent position deviation reached so far. A write access resets this value. The parameter _p_dif_load_peak_usr allows you to enter the value in user-defined units.. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 revolution. Changed settings become active immediately.	revolution 0.0000 - 429496.7295	UINT32 R/W - -	Modbus 7734 IDN P-0-3030.0.27

Setting the position deviation

The following parameter lets you set the warning threshold for the maximum load-dependent position deviation.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_p_dif_warn	Maximum load-dependent position deviation (warning) 100.0 % correspond to the maximum position deviation (following error) as specified by means of parameter MON_p_dif_load. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	% 0 75 100	UINT16 R/W per. -	Modbus 1618 IDN P-0-3006.0.41

The following parameters let you set the following error threshold in user-defined units or revolutions for the maximum load-dependent position deviation.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`MON_p_dif_load_usr`	Maximum load-dependent position deviation (following error) The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_p 1 131072 2147483647	INT32 R/W per. -	Modbus 1660 IDN P-0-3006.0.62
`MON_p_dif_load`	Maximum load-dependent position deviation (following error) The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. The parameter MON_p_dif_load_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 revolution. Changed settings become active immediately.	revolution 0.0001 1.0000 200.0000	UINT32 R/W per. -	Modbus 1606 IDN P-0-3006.0.35

Setting the error class

The following parameter lets you set the error response to an excessively high load-dependent position deviation (following error).

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`ErrorResp_p_dif`	Error response to following error **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 1 3 3	UINT16 R/W per. -	Modbus 1302 IDN P-0-3005.0.11

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7.7.5 Motor standstill and direction of movement

The status of a movement can be monitored. You can read out whether the motor is at a standstill or whether it moves in a specific direction.

Monitoring

A velocity of <10 min^{-1} is interpreted as standstill.

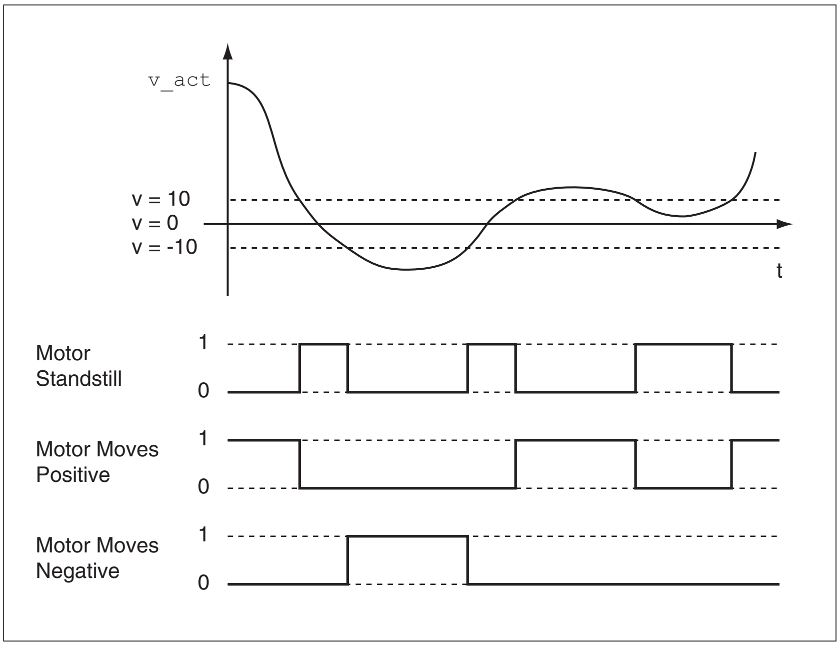

Figure 79: Motor standstill and direction of movement

The status is available via signal outputs. In order to read the status, you must first parameterize the signal output functions "Motor Standstill", "Motor Moves Positive" or "Motor Moves Negative", see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

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7.7.6 Position deviation window

The position deviation window allows you to monitor whether the motor is within a parameterizable position deviation.

The position deviation is the difference between reference position and actual position.

The position deviation window comprises position deviation and monitoring time.

Availability

The position deviation window is available in the following operating modes.

- Jog
- Homing

Monitoring

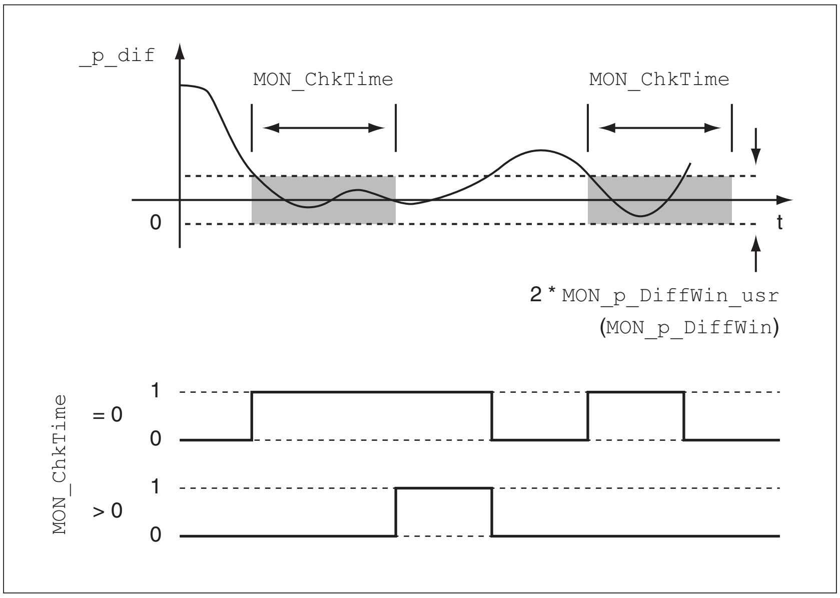

Figure 80: Position deviation window

The parameters MON_p_DiffWin_usr (MON_p_DiffWin) and MON_ChkTime specify the size of the window.

Status indication

The status is available via a signal output.

In order to read the status via a signal output, you must first parameterize the signal output function "In Position Deviation Window", see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

The parameter MON_ChkTime acts on the parameters MON_p_DiffWin_usr (MON_p_DiffWin), MON_v_DiffWin, MON_v_Threshold and *MON_I_Threshold.*

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_p_DiffWin_usr	Monitoring of position deviation The system checks whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_p 0 128 2147483647	INT32 R/W per. -	Modbus 1662 IDN P-0-3006.0.63
MON_p_DiffWin	Monitoring of position deviation The system checks whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter MON_p_DiffWin_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 revolution. Changed settings become active immediately.	revolution 0.0000 0.0010 0.9999	UINT16 R/W per. -	Modbus 1586 IDN P-0-3006.0.25
MON_ChkTime ConF → i-o- tthr	Monitoring of time window Adjustment of a time for monitoring of position deviation, speed deviation, speed value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	ms 0 0 9999	UINT16 R/W per. -	Modbus 1594 IDN P-0-3006.0.29

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7.7.7 Velocity deviation window

The velocity deviation window allows you to monitor whether the motor is within a parameterizable velocity deviation.

The velocity deviation is the difference between the reference velocity and the actual velocity.

The velocity deviation window comprises velocity deviation and monitoring time.

Availability

The velocity deviation window is available in the following operating modes.

- Jog
- Homing

Monitoring

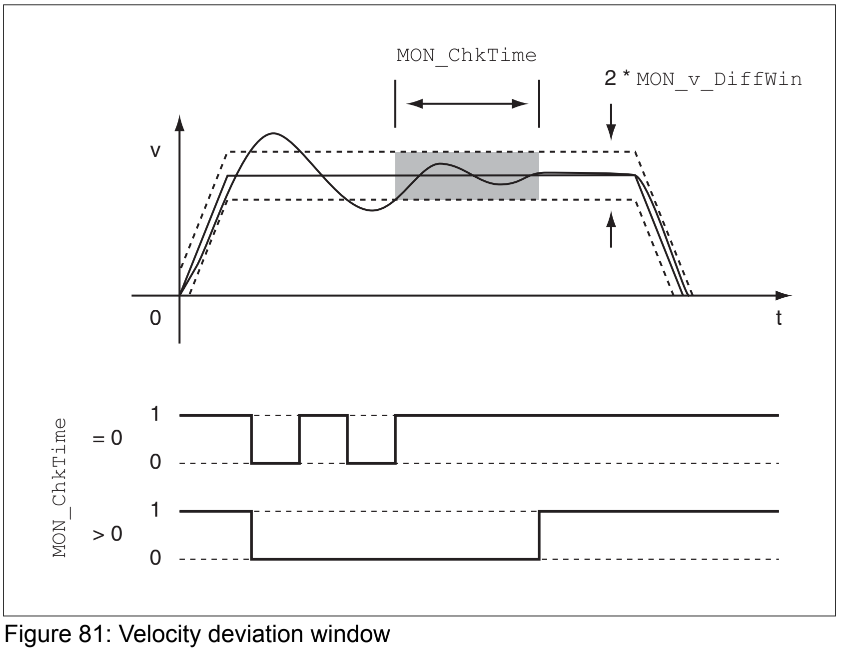

Figure 81: Velocity deviation window

The parameters `MON_v_DiffWin` and `MON_ChkTime` specify the size of the window.

Status indication

The status is available via a signal output.

In order to read the status via a signal output, you must first parameterize the signal output function "In Velocity Deviation Window", see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

The parameter `MON_ChkTime` acts on the parameters `MON_p_DiffWin_usr` (`MON_p_DiffWin`), `MON_v_DiffWin`, `MON_v_Threshold` and `MON_I_Threshold`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_v_DiffWin	Monitoring of velocity deviation The system checks whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 1 10 2147483647	UINT32 R/W per. -	Modbus 1588 IDN P-0-3006.0.26
MON_ChkTime ConF → i-o- tthr	Monitoring of time window Adjustment of a time for monitoring of position deviation, speed deviation, speed value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	ms 0 0 9999	UINT16 R/W per. -	Modbus 1594 IDN P-0-3006.0.29

7.7.8 Velocity threshold value

The velocity threshold value allows you to monitor whether the actual velocity is below a parameterizable velocity value.

The velocity threshold value comprises the velocity and the monitoring time.

Monitoring

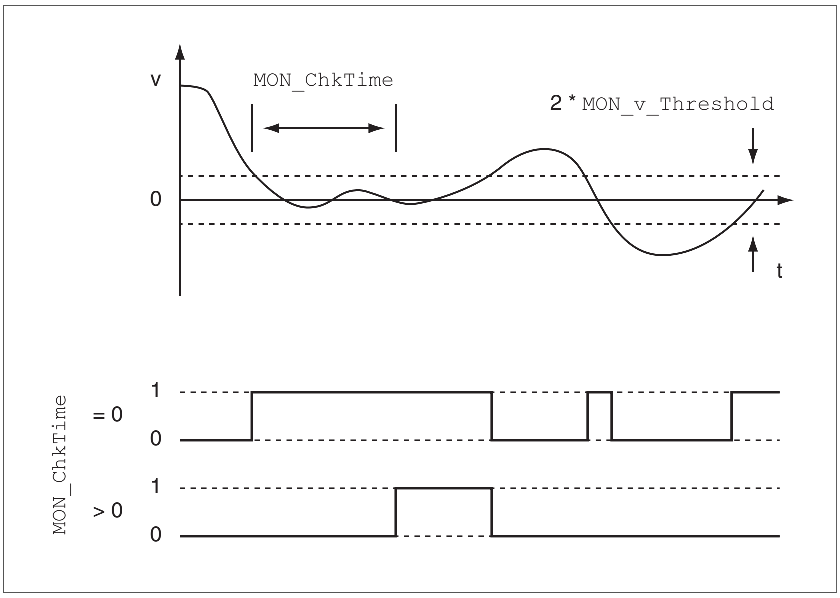

Figure 82: Velocity threshold value

The parameters MON_v_Threshold and MON_ChkTime specify the size of the window.

Status indication

The status is available via a signal output.

In order to read the status via a signal output, you must first parameterize the signal output function "Velocity Below Threshold", see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

The parameter MON_ChkTime acts on the parameters MON_p_DiffWin_usr (MON_p_DiffWin), MON_v_DiffWin, MON_v_Threshold and MON_I_Threshold.

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_v_Threshold	Monitoring of velocity threshold The system checks whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 1 10 2147483647	UINT32 R/W per. -	Modbus 1590 IDN P-0-3006.0.27
MON_ChkTime ConF → i-o- tthr	Monitoring of time window Adjustment of a time for monitoring of position deviation, speed deviation, speed value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	ms 0 0 9999	UINT16 R/W per. -	Modbus 1594 IDN P-0-3006.0.29

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7.7.9 Current threshold value

The current threshold value allows you to monitor whether the current motor current is below a parameterizable current value.

The current threshold value comprises the current value and the monitoring time.

Monitoring

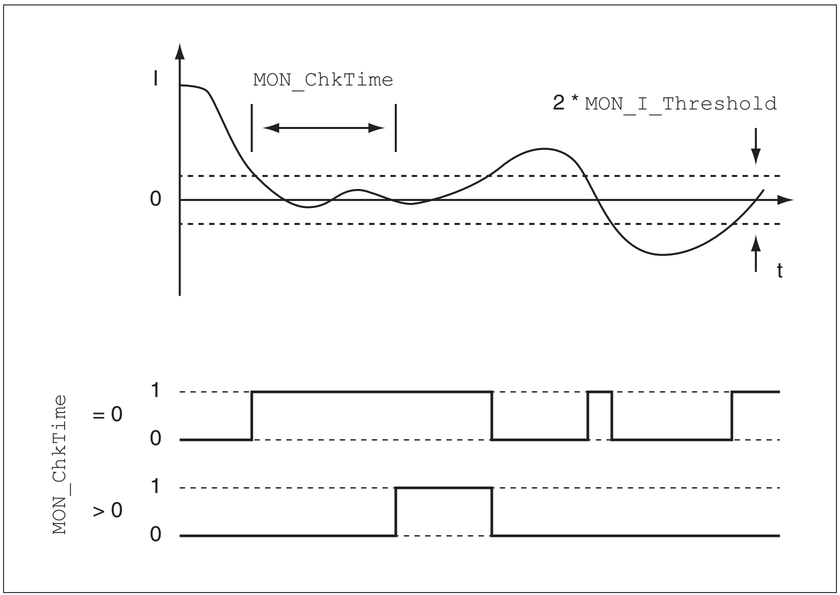

Figure 83: Current threshold value

The parameters MON_I_Threshold and MON_ChkTime specify the size of the window.

Status indication The status is available via a signal output.

In order to read the status via a signal output, you must first parameterize the signal output function "Current Below Threshold", see chapter *"7.5.2 Setting the digital signal inputs and signal outputs"*.

The parameter MON_ChkTime acts on the parameters MON_p_DiffWin_usr (MON_p_DiffWin), MON_v_DiffWin, MON_v_Threshold and *MON_I_Threshold.*

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_I_Threshold ConF → i-o- ithr	Monitoring of current threshold The system checks whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter _Iq_act_rms is used as comparison value. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.20 300.00	UINT16 R/W per. -	Modbus 1592 IDN P-0-3006.0.28
MON_ChkTime ConF → i-o- tthr	Monitoring of time window Adjustment of a time for monitoring of position deviation, speed deviation, speed value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	ms 0 0 9999	UINT16 R/W per. -	Modbus 1594 IDN P-0-3006.0.29

7.8 Functions for monitoring internal device signals

7.8.1 Temperature monitoring

The power stage temperature and the motor temperature are monitored internally.

Power stage temperature

The parameters `_PS_T_current` and `_PS_T_max` can be used to read the current temperature and the maximum temperature of the power stage.

The parameter `_PS_T_warn` contains as threshold value for a warning.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_PS_T_current` Mon tPS	Current power stage temperature Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 7200 IDN P-0-3028.0.16
`_PS_T_warn`	Temperature warning threshold of power stage Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- per. -	Modbus 4108 IDN P-0-3016.0.6
`_PS_T_max`	Maximum power stage temperature Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- per. -	Modbus 4110 IDN P-0-3016.0.7

Motor temperature

The parameters `_M_T_current` and `_M_T_max` can be used to read the current temperature and the maximum temperature of the motor.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_M_T_current`	Current motor temperature Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 7202 IDN P-0-3028.0.17
`_M_T_max`	Maximum temperature of motor Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 3360 IDN P-0-3013.0.16

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7.8.2 Monitoring load and overload (I^2t monitoring)

The load is the thermal load on the power stage, the motor and the braking resistor.

Load and overload on the individual components are monitored internally; the values can be read by means of parameters.

Overload starts at a load value of 100 %.

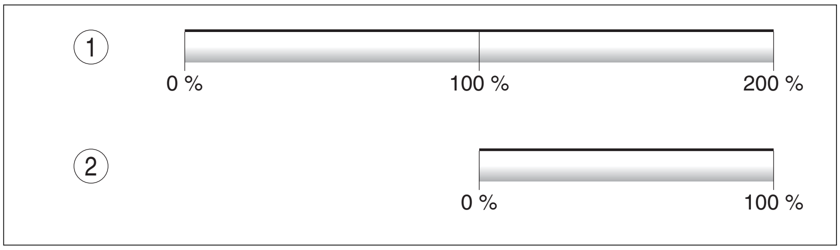

Figure 84: Load and overload

(1) Load
(2) Overload

Load monitoring The current load can be read using the following parameters:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_PS_load MON LDFP	Current load of power stage Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7214 IDN P-0-3028.0.23
_M_load MON LDFM	Current load of motor Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7220 IDN P-0-3028.0.26
_RES_load MON LDFB	Current load of braking resistor The braking resistor set via parameter RESint_ext is monitored. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7208 IDN P-0-3028.0.20

Overload monitoring

In the case of 100 % overload of the power stage or the motor), the current is limited internally. In the case of 100 % overload of the braking resistor, the braking resistor is switched off.

The current overload and the peak value can be read using the following parameters:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_PS_overload`	Current overload of power stage Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7240 IDN P-0-3028.0.36
`_PS_maxoverload`	Maximum value of overload of power stage Maximum overload of power stage during the last 10 seconds. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7216 IDN P-0-3028.0.24
`_M_overload`	Current overload of motor (I2t) Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7218 IDN P-0-3028.0.25
`_M_maxoverload`	Maximum value of overload of motor Maximum overload of motor during the last 10 seconds. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7222 IDN P-0-3028.0.27
`_RES_overload`	Current overload of braking resistor (I2t) The braking resistor set via parameter RESint_ext is monitored. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7206 IDN P-0-3028.0.19
`_RES_maxoverload`	Maximum value of overload of braking resistor Maximum overload of braking resistor during the last 10 seconds. The braking resistor set via parameter RESint_ext is monitored. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7210 IDN P-0-3028.0.21

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7.8.3 Commutation monitoring

The risk of unexpected movements increases if monitoring functions are deactivated.

⚠ WARNING

UNEXPECTED MOVEMENT

Use the monitoring functions.

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

The device checks the plausibility of motor acceleration and effective motor torque in order to recognize uncontrolled movements and to suppress them if required. The monitoring function is referred to as commutation monitoring.

If the motor accelerates for a period of more than 5 to 10 ms even though the drive control decelerates the motor with the maximum current set, commutation monitoring signals an uncontrolled motor movement.

The parameter `MON_commutat` lets you deactivate commutation monitoring.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_commutat`	Commutation monitoring **0 / Off**: Commutation monitoring off **1 / On**: Commutation monitoring on Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 1	UINT16 R/W per. -	Modbus 1290 IDN P-0-3005.0.5

7.8.4 Monitoring of mains phases

If a mains phase for a three-phase product misses and the monitoring function is deactivated, this can cause overload and destruction of the product.

NOTICE

DESTRUCTION CAUSED BY MISSING MAINS PHASE

- Use the monitoring functions.
- Do not operate the product if a mains phase misses.

Failure to follow these instructions can result in equipment damage.

The mains phases are monitored internally.

The parameter ErrorResp_Flt_AC lets you set the error response to a missing mains phase for three-phase devices.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ErrorResp_Flt_AC	Error response to missing mains phase **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 1 2 3	UINT16 R/W per. -	Modbus 1300 IDN P-0-3005.0.10

If the product is supplied via the DC bus, mains phase monitoring must be set to the mains voltage used.

The type of main phase monitoring is set by means of the parameter MON_MainsVolt.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_MainsVolt	Detection and monitoring of mains phases **0 / Automatic Mains Detection**: Automatic detection and monitoring of mains voltage **1 / DC-Bus Only (Mains 1~230 V / 3~480 V)**: DC bus supply only, corresponding to mains voltage 230 V (single-phase) or 480 V (three phases) **2 / DC-Bus Only (Mains 1~115 V / 3~208 V)**: DC bus supply only, corresponding to mains voltage 115 V (single-phase) or 208 V (three phases) **3 / Mains 1~230 V / 3~480 V**: Mains voltage 230 V (single-phase) or 480 V (three phases) **4 / Mains 1~115 V / 3~208 V**: Mains voltage 115 V (single-phase) or 208 V (three phases) Value 0: As soon as a mains voltage detected, the device automatically checks whether the mains voltage is 115 V or 230 V in the case of single-phase devices or 208 V or 400/480 V in the case of three-phase devices. Values 1 ... 2: If the device is supplied only via the DC bus, the parameter has to be set to the voltage value corresponding to the mains voltage of the supplying device. There is no mains voltage monitoring. Values 3 ... 4: If the mains voltage is not detected properly during start-up, the mains voltage to be used can be selected manually. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 0 4	UINT16 R/W per. expert	Modbus 1310 IDN P-0-3005.0.15

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7.8.5 Ground fault monitoring

If the monitoring function is deactivated, the product may be destroyed by a ground fault.

NOTICE

DESTRUCTION CAUSED BY GROUND FAULTS

- Use the monitoring functions.
- Avoid ground faults by wiring the product properly.

Failure to follow these instructions can result in equipment damage.

When the power stage is enabled, the device monitors the motor phases for ground faults.

A ground fault of one or more motor phases is detected. A ground fault of the DC bus or the braking resistor is not detected.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_GroundFault`	Ground fault monitoring **0 / Off**: Ground fault monitoring off **1 / On**: Ground fault monitoring on In exceptional cases, deactivation may be necessary, for example: - Long motor cables Deactivate ground fault monitoring if it responds in an unwanted way. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the product is switched on.	- 0 1 1	UINT16 R/W per. expert	Modbus 1312 IDN P-0-3005.0.16

8 Examples

8.1 General information

The examples show some typical applications of the product. The examples are intended to provide an overview; they are not exhaustive wiring plans.

Using the safety functions integrated in this product requires careful planning. See chapter *"4.9 Safety function STO ("Safe Torque Off")"*, page *75* for additional information.

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8.2 Example of operation via fieldbus

The product is controlled via SERCOS 3.

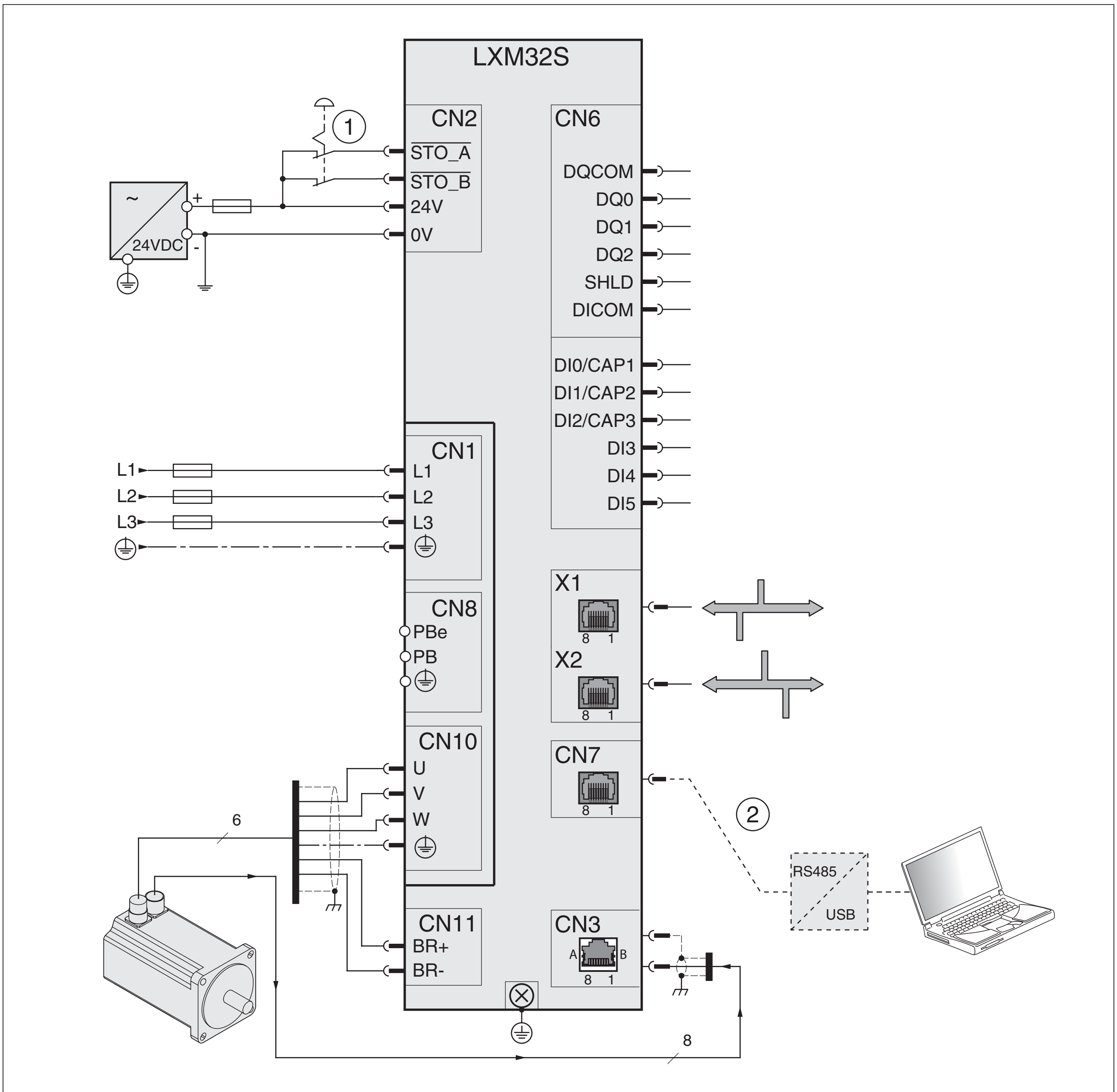

Figure 85: Wiring example

(1)	EMERGENCY STOP
(2)	Commissioning accessories

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9 Diagnostics and troubleshooting

This chapter describes the various types of diagnostics and provides troubleshooting assistance.

9.1 Status request/status indication

Information on the product status is provided by:

- Integrated HMI
- Commissioning software
- Fieldbus
- Fieldbus status LEDs

The error memory also contains a history of the last 10 detected errors.

Meaning of a warning

A warning alerts to a problem that was detected by a monitoring function. A warning belongs to error class 0 and does not cause a transition of the operating state.

Meaning of an error

An error is a deviation from the required value or state. Errors are subdivided into different error classes.

Error class

The product triggers an error response if an error occurs. Depending upon the severity of the error, the device responds in accordance with one of the following error classes:

Error class	Response
1	Movement is canceled with "Quick Stop".
2	Movement is canceled with "Quick Stop". The power stage is disabled after standstill has been reached.
3	The power stage is immediately disabled without stopping the motor first.
4	The power stage is immediately disabled without stopping the motor first. The error can only be reset by switching off the product.

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9.1.1 Error diagnostics via integrated HMI

The following illustration shows the status LEDs and the 7-segment display of the integrated HMI

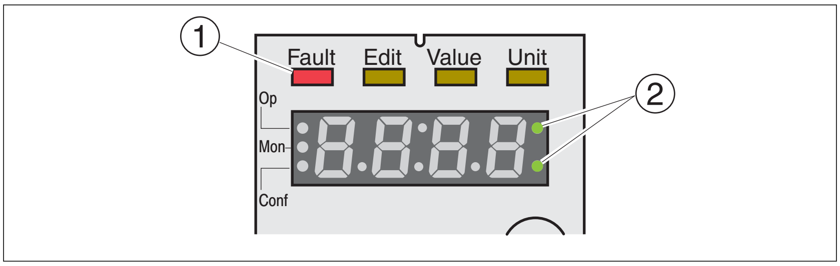

Figure 86: Status indication via the integrated HMI

Status LED "Fault"

If the drive is in the operating state Fault, the "Fault" (1) status LED lights.

Indication of a warning

If there are detected warnings (error class 0), the two dots to the right of the 7-segment display (2) flash. Warnings are not directly displayed on the 7-segment display in the form of an error number, bust must be explicitly queried by the user.

See chapter *"9.3.1 Reading and acknowledging warnings"* for additional information.

Indication of a detected error

In the case of a detected error of error class 1, the error number and StoP are alternately shown on the 7 segment display.

In the case of a detected error of error class 2 ... 4, the error number and FLt are alternately shown on the 7 segment display.

See chapter *"9.3.2 Reading and acknowledging detected errors"* for information on acknowledging detected errors via the integrated HMI.

The meanings of the error numbers can be found in chapter *"9.4 Table of warnings and errors by range"*.

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7-segment display

The 7-segment display provides the user with information.

With the factory setting, the 7-segment display shows the operating states. The operating states are described in chapter *"7.2 Operating states"*.

Message	Description
init	Operating state **1** Start
nrdY	Operating state **2** Not Ready To Switch On
diS	Operating state **3** Switch On Disabled
rdY	Operating state **4** Ready To Switch On
Son	Operating state **5** Switched On
run and hALt	Operating state **6** Operation Enabled
StoP	Operating state **7** Quick Stop Active
FLt	Operating state **8** Fault Reaction Active and **9** Fault

The table below provides an overview of the messages that can additionally be displayed on the integrated HMI.

Message	Description
CArd	Data on the memory card differs from data in the product. See chapter *"6.7.1 Data exchange with the memory card"* for information on how to proceed.
diSP	An external HMI is connected. The integrated HMI has no function.
FSu	Perform a First Setup. See chapter *"6.5 Commissioning procedure"*.
Mot	A new motor was detected. See chapter *"9.3.4 Acknowledging a motor change"* for replacing a motor.
Prot	Parts of the integrated HMI were locked with the parameter `HMIlocked`.
uLoW	Controller supply during initialization not high enough.
WdoG	Unknown system error. Contact technical Support.
8888	Undervoltage controller supply.

9.1.2 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.

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9.1.3 Diagnostics via signal outputs

Information on the operating state is available via the the signal outputs. The table below provides an overview.

Operating state	**"No fault"** 1)	**"Active"** 2)
1 Start	0	0
2 Not Ready To Switch On	0	0
3 Switch On Disabled	0	0
4 Ready To Switch On	1	0
5 Switched On	1	0
6 Operation Enabled	1	1
7 Quick Stop Active	0	0
8 Fault Reaction Active	0	0
9 Fault	0	0

1) The signal output function is factory setting for `DQ0`
2) The signal output function is the factory setting for `DQ1`

Indicating warnings and errors

Selected warnings or errors can be output via the signal outputs.

In order to output a warning or an error via a signal outputs, you must first parameterizes the signal output functions "Selected Warning" or "Selected Error", see chapter
"7.5.2 Setting the digital signal inputs and signal outputs".

The parameters `MON_IO_SelWar1`, `MON_IO_SelWar2`, `MON_IO_SelErr1` and `MON_IO_SelErr2` are used to specify the error or warning numbers; if these errors or warnings occur, a signal output is to be set.

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`MON_IO_SelWar1`	First number for the signal output function Selected Warning Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15120 IDN P-0-3059.0.8
`MON_IO_SelWar2`	Second number for the signal output function Selected Warning Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15122 IDN P-0-3059.0.9
`MON_IO_SelErr1`	First number for the signal output function Selected Error Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15116 IDN P-0-3059.0.6
`MON_IO_SelErr2`	Second number for the signal output function Selected Error Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15118 IDN P-0-3059.0.7

9.1.4 Diagnostics via the fieldbus

Asynchronous and synchronous errors

Asynchronous errors are signaled by the product without a request. Example of an asynchronous error: Power stage overtemperature.

Synchronous errors are errors that are detected in response to an incorrect request.
Example of a synchronous error: An invalid parameter value is transmitted to the product. In response, the product signals an error.

If the master controller receives information concerning a warning or a detected error via the process data communication, the following parameters can be used to read the error number.

Last warning

The parameter `_LastWarning` allows you to read the error number of the last detected warning. As long as no warning threshold has been exceeded, the value of this parameter is 0.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_LastWarning` Mon LWrn	Number of last warning (error class 0) Number of the most recent warning. If the warning becomes inactive again, the number is memorized until the next fault reset. Value 0: No warning occurred Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 7186 IDN P-0-3028.0.9

Last detected error

The parameter `_LastError` allows you to read the error number of the last detected error. As long as no error is detected, the value of the parameter is 0. If an error is detected, the error is written to the error memory along with other status information.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_LastError` Mon LFLt	Error causing a stop (error classes 1 to 4) Number of the current error. Any consequtive errors do not overwrite this error number. Example: If a limit switch error reaction caused an overvoltage error, this parameter would contain the number of the limit switch error. Exception: Errors of error class 4 overwrite existing entries. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 7178 IDN P-0-3028.0.5

Status information

Status information is provided via the parameter `S-0-1045`, bits 6 and 7, and the parameter `S-0-0135`, bits 12 and 13. The status information shows whether a warning or an error have been detected.

The parameter `S-0-0390` allows you to read the number of the detected warning or the number of the detected error.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`S-0-0390`	Diagnostic number The operation data of this parameter contains detailed information on the diagnostics event with the highest priority which is currently active in the drive. Type: Hexadecimal - 4 bytes Write access: Read only Class name: GDP_Basic	- 0 0 4294967295	R/- - -	S-0-0390

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bit	Meaning
0 ... 15	The value corresponds to the number of the detected warning or the detected error.
16 ... 19	Value 14: Number is a detected warning Value 15: Number is a detected error
20 ... 31	Reserved

The parameters `S-0-0011` and `S-0-0012` also provide information on detected warnings and errors.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`S-0-0011`	Class 1 diagnostic (C1D) This parameter provides information on detected errors. A class 1 diagnostics error leads to a Quick Stop (with transition to operating state Fault). Type: Hexadecimal - 2 bytes Write access: Read only	- 0 0 65535	R/- - -	S-0-0011
`S-0-0012`	Class 2 diagnostic (C2D) This parameter provides information on warnings. Type: Hexadecimal - 2 bytes Write access: Read only	- 0 0 65535	R/- - -	S-0-0012

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9.1.5 Fieldbus status LEDs

General The fieldbus status LEDs visualize the status of the fieldbus.

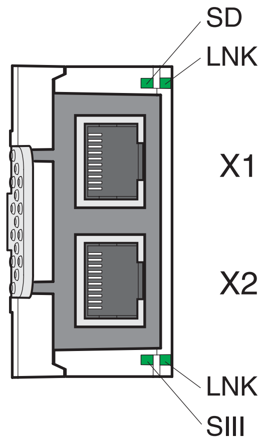

Figure 87: Overview of the LEDs

LED LNK

Status	Meaning
	No link
	Link, 10 MBit, no activity
	Link, 10 MBit, activity
	Link, 100 MBit, no activity
	Link, 100 MBit, activity

LED SIII

Status	Meaning
	No communication
	Communication phase 0 active
	Communication phase 1 active
	Communication phase 2 active
	Communication phase 3 active
	Communication phase 4 active
	Real-time state is "loopback"
	Application error
	MST transmission error ≥S-0-1003/2
	Communication error
	Identification ("IdentifyDevice")

0198441114060, V2.0, 03.2016

LED SD

Status	Meaning
	Sub-device is not active
	Sub-device is in state "parametrization level (PL)"
	Sub-device is in state "operating level (OL)"
	Sub-device is in state "application error (C1D)"

0198441114060, V2.0, 03.2016

9.2 Error memory

General

The error memory is an error history of the last 10 detected errors; it is not cleared even if the product is switched off. The error memory allows you to read and evaluate past events.

The following information on the events is stored:

- Error class
- Error number
- Motor current
- Number of switch-on cycles
- Additional error information (for example, parameter numbers)
- Product temperature
- Power stage temperature
- Time the error was detected (with reference to operating hours counter)
- DC bus voltage
- Velocity
- Number of Enable cycles after switch-on
- Time from Enable until detection of the error

The stored information relates to the situation at the point in time the error was detected.

9.2.1 Reading the error memory via the fieldbus

The following parameters allow you to manage the error memory:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`ERR_clear`	Clear error memory Value 1: Delete entries in the error memory The clearing process is completed if a 0 is returned after a read access. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 - 1	UINT16 R/W - -	Modbus 15112 IDN P-0-3059.0.4
`ERR_reset`	Reset error memory read pointer Value 1: Set error memory read pointer to oldest error entry. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 - 1	UINT16 R/W - -	Modbus 15114 IDN P-0-3059.0.5

0198441114060, V2.0, 03.2016

The error memory can only be read sequentially. The parameter ERR_reset must be used to reset the read pointer. Then the first error entry can be read. The read pointer is automatically set to the next entry. A new read access delivers the next error entry. If the error number 0 is returned, there is no additional error entry.

Position of the entry	Meaning
1	First error entry (oldest message).
2	Second error entry (later message).
...	...
10	Tenth error entry. In the case of ten error entries, the most recent message is contained here.

An error entry consists of several pieces of information which can be read using different parameters. When you read an error entry, the error number must be read first with the parameter _ERR_number.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_ERR_class	Error class Value 0: Warning (no response) Value 1: Error class 1 Value 2: Error class 2 Value 3: Error class 3 Value 4: Error class 4 Type: Unsigned decimal - 2 bytes	- 0 - 4	UINT16 R/- - -	Modbus 15364 IDN P-0-3060.0.2
_ERR_number	Error number Reading this parameter copies the entire error entry (error class, time of occurrence of error, ...) to an intermediate memory from which the elements of the error can then be read. In addition, the read pointer of the error memory is automatically set to the next error entry. Type: Unsigned decimal - 2 bytes	- 0 - 65535	UINT16 R/- - -	Modbus 15362 IDN P-0-3060.0.1
_ERR_motor_I	Motor current at error time Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 15378 IDN P-0-3060.0.9
_ERR_powerOn Mon Powo	Number of power on cycles Type: Unsigned decimal - 4 bytes	- 0 - 4294967295	UINT32 R/- - -	Modbus 15108 IDN P-0-3059.0.2
_ERR_qual	Error additional information This entry contains additional information on the error, depending on the error number. Example: a parameter address Type: Unsigned decimal - 2 bytes	- 0 - 65535	UINT16 R/- - -	Modbus 15368 IDN P-0-3060.0.4
_ERR_temp_dev	Temperature of device at error time Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 15382 IDN P-0-3060.0.11
_ERR_temp_ps	Temperature of power stage at error time Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 15380 IDN P-0-3060.0.10
_ERR_time	Error time With reference to operating hours counter Type: Unsigned decimal - 4 bytes	s 0 - 536870911	UINT32 R/- - -	Modbus 15366 IDN P-0-3060.0.3
_ERR_DCbus	DC bus voltage at error time Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- - -	Modbus 15374 IDN P-0-3060.0.7
_ERR_motor_v	Motor velocity at error time Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 15376 IDN P-0-3060.0.8

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_ERR_enable_cycl	Number of cycles of enabling the power stage at error time Number of cycles of enabling the power stage from the time the power supply (control voltage) was switched on to the time the error occurred. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 15370 IDN P-0-3060.0.5
_ERR_enable_time	Time between enabling of power stage and occurrence of the error Type: Unsigned decimal - 2 bytes	s - - -	UINT16 R/- - -	Modbus 15372 IDN P-0-3060.0.6

Error bits

The parameters _WarnLatched and _SigLatched contain information on warnings and errors.

The error bits of the warnings can be read using the parameter _WarnLatched.

The error bits of the errors can be read using the parameter _SigLatched.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_WarnLatched Mon WrnS	Saved warnings, bit-coded Saved warning bits are deleted in the case of a Fault Reset. Bits 10, 13 are deleted automatically. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General warning Bit 1: Reserved Bit 2: Out of range (SW limit switches, tuning) Bit 3: Reserved Bit 4: Active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following warning limit reached Bit 9: Reserved Bit 10: Inputs STO_A and/or STO_B Bit 11: Reserved Bit 12: Reserved Bit 13: Low voltage DC bus or mains phase missing Bit 14: Reserved Bit 15: Reserved Bit 16: Integrated encoder interface Bit 17: Temperature of motor high Bit 18: Temperature of power stage high Bit 19: Reserved Bit 20: Memory card Bit 21: Optional fieldbus module Bit 22: Optional encoder module Bit 23: Optional safety module eSM or module IOM1 Bit 24: Reserved Bit 25: Reserved Bit 26: Reserved Bit 27: Reserved Bit 28: Reserved Bit 29: Braking resistor overload (I^2t) Bit 30: Power stage overload (I^2t) Bit 31: Motor overload (I^2t) Monitoring functions are product-dependent. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 7192 IDN P-0-3028.0.12

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_SigLatched MON SIGS	Saved status of monitoring signals Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General error Bit 1: Hardware limit switches (LIMP/LIMN/REF) Bit 2: Out of range (software limit switches, tuning) Bit 3: Quick Stop via fieldbus Bit 4: Error in active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following error Bit 9: Reserved Bit 10: Inputs STO are 0 Bit 11: Inputs STO different Bit 12: Reserved Bit 13: DC bus voltage low Bit 14: DC bus voltage high Bit 15: Mains phase missing Bit 16: Integrated encoder interface Bit 17: Overtemperature motor Bit 18: Overtemperature power stage Bit 19: Reserved Bit 20: Memory card Bit 21: Optional fieldbus module Bit 22: Optional encoder module Bit 23: Optional safety module eSM or module IOM1 Bit 24: Reserved Bit 25: Reserved Bit 26: Motor connection Bit 27: Motor overcurrent/short circuit Bit 28: Frequency of reference signal too high Bit 29: EEPROM error Bit 30: System start-up (hardware or parameter) Bit 31: System error (for example, watchdog, internal hardware interface) Monitoring functions are product-dependent. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 7184 IDN P-0-3028.0.8

9.2.2 Reading the error memory via the commissioning software

See the information provided with the commissioning software for details on how to read the error memory using the commissioning software.

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9.3 Special menus at the integrated HMI

The following functions depend on the situation. They are only available in specific contexts.

9.3.1 Reading and acknowledging warnings

Procedure for reading and acknowledging warnings via the integrated HMI:

■ A warning is active. The two dots to the right of the 7-segment display flash.

▸ Remedy the cause of the warning.

▸ Press the navigation button and hold it down.

◃ The 7-segment display shows the error number of the warning.

▸ Release the navigation button.

◃ The 7-segment display shows FrES.

▸ Press the navigation button to acknowledge the warning.

◃ The 7-segment display returns to the initial state.

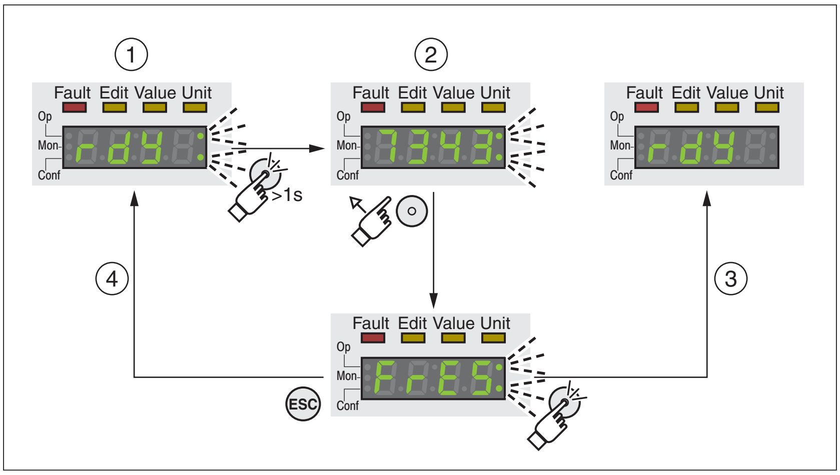

Figure 88: Acknowledging warnings via the integrated HMI

(1) HMI displays a warning
(2) Number of detected error is displayed
(3) Resetting the warning
(4) Canceling, the warning remains in the memory

See chapter *"9.4 Table of warnings and errors by range"*, page *320*, for detailed information on the warnings.

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9.3.2 Reading and acknowledging detected errors

Procedure for reading and acknowledging detected errors via the integrated HMI:

■ The LED "Fault" is on. The 7-segment display alternately shows FLt and an error number. An error of error classes 2 to 4 has been detected.

▸ Remedy the cause of the detected error.

▸ Press the navigation button.

◃ The 7-segment display shows FrES.

▸ Press the navigation button to acknowledge the detected error.

◃ The product switches to operating state **4** Ready To Switch On.

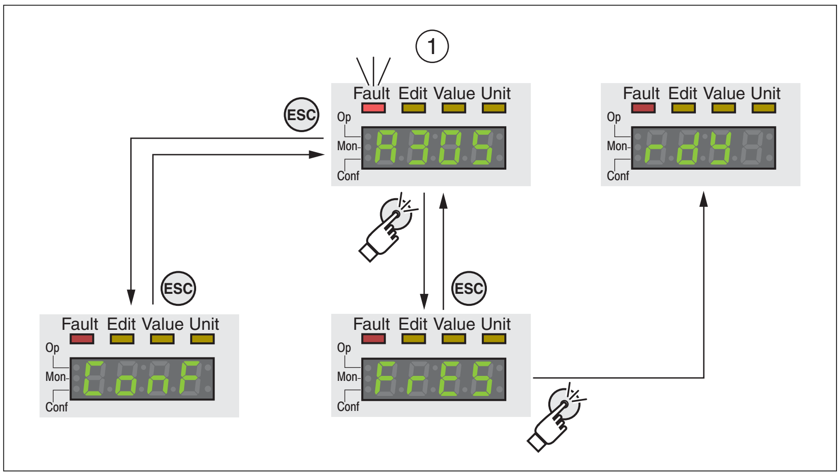

Figure 89: Acknowledging detected errors via the integrated HMI

(1) HMI displays a detected error with error number

The meanings of the error numbers can be determined using the table in chapter *"9.4 Table of warnings and errors by range"*, page *320*.

9.3.3 Acknowledging a module replacement

General Note the information in the manuals for the respective modules.

Slot 1 Refer to the manual for the safety module for information on replacing a module in slot 1.

Slot 2 The replacement of a module is confirmed via the integrated HMI.

- ■ The 7-segment display shows SLt2.
- ▶ Press the navigation button.
- ◁ The 7-segment display shows SAVE.
- ▶ Press the navigation button to acknowledge. The information on the current module equipment is saved to the EEPROM.
- ◁ The product switches to operating state **4** Ready To Switch On.

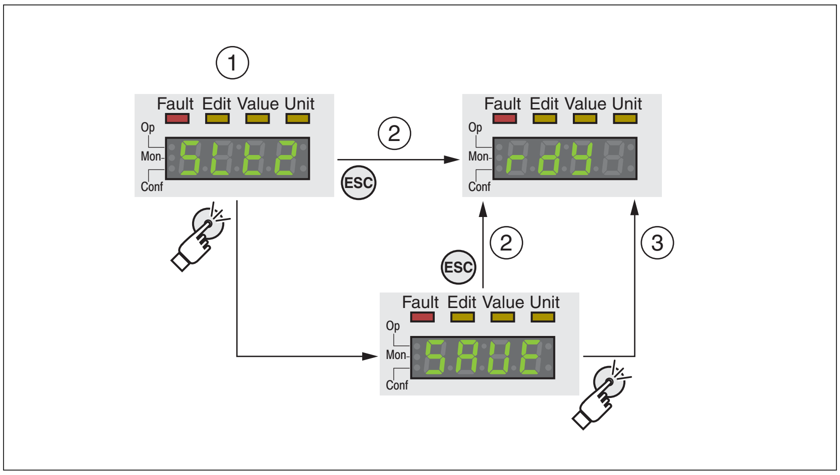

Figure 90: Acknowledging a module change via the integrated HMI

(1)	HMI displays that a replacement of a module has been detected.
(2)	Canceling the saving process
(3)	Saving the new equipment with modules and switching to operating state **4** Ready To Switch On.

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9.3.4 Acknowledging a motor change

Procedure for acknowledging a motor change via the integrated HMI:

■ The 7-segment display shows nOt .

▸ Press the navigation button.

◃ The 7-segment display shows SAVE.

▸ Press the navigation button to save the new motor parameters to the EEPROM.

◃ The product switches to operating state **4** Ready To Switch On.

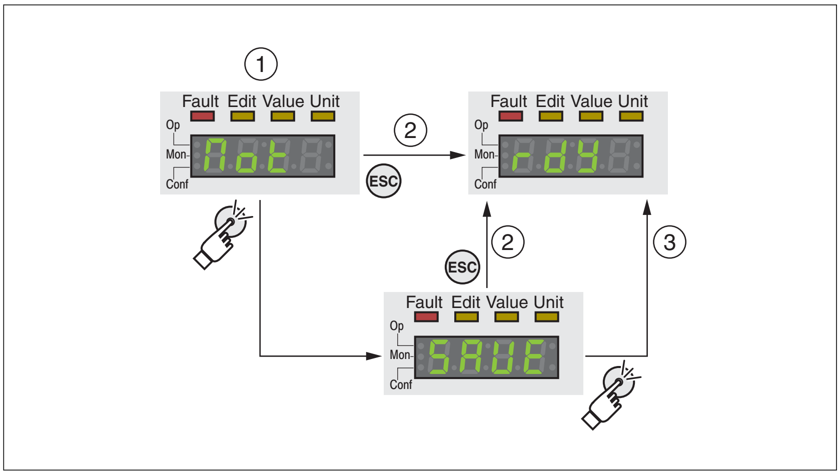

Figure 91: Acknowledging a motor change via the integrated HMI

(1) HMI displays that a replacement of a motor has been detected.

(2) Canceling the saving process

(3) Saving the new motor data and switching to operating state **4** Ready To Switch On.

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9.4 Table of warnings and errors by range

The table below summarizes the error numbers classified by range.

Error number	Range
E 1xxx	General
E 2xxx	Overcurrent
E 3xxx	Voltage
E 4xxx	Temperature
E 5xxx	Hardware
E 6xxx	Software
E 7xxx	Interface, wiring
E 8xxx	Fieldbus
E Axxx	Motor movement
E Bxxx	Communication

Error number not listed

If the error number is not listed in the table below, the firmware version may be newer than the version of the manual or there may be a system error.

- ▶ Verify that you use the correct manual (*" About the book"*)
- ▶ Verify that the wiring is EMC-compliant (*"4.1 Electromagnetic compatibility (EMC)"*)
- ▶ Contact technical support (*"12.1 Service address"*)

List of error numbers

The table below provides an overview of the error numbers.

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Error number	Error class	Description	Cause	Correctives
E 1100	-	Parameter out of permissible value range	The value entered was outside of the permissible value range for this parameter.	The entered value must be within the permissible value range.
E 1101	-	Parameter does not exist	Error signaled by parameter management: Parameter (index) does not exist.	Select a different parameter (index).
E 1102	-	Parameter does not exist	Error signaled by parameter management: Parameter (subindex) does not exist.	Select a different parameter (subindex).
E 1103	-	Parameter write not permissible (READ only)	Write access to read only parameter.	Write only to parameters that are not read-only.
E 1104	-	Write access denied (no access authorization)	Parameter only accessible at expert level.	The write access level expert is required.
E 1105	-	Block Upload/Download not initialized		
E 1106	-	Command not permissible while power stage is active	Command not permissible while the power stage is enabled (operating state Operation Enabled or Quick Stop Active).	Disable the power stage and repeat the command.
E 1107	-	Access via other interface blocked	Access occupied by another channel (for example: Commissioning software is active and fieldbus access was tried at the same time).	Check the channel that blocks the access.
E 1108	-	File cannot be uploaded: Unknown file ID		
E 1109	1	Data stored after a power outage is invalid		
E 110A	-	System error: No bootloader available		
E 110B	3	Configuration error (additional info=Modbus register address) Parameter `_SigLatched` Bit 30	Error detected during parameter check (for example, reference velocity value for operating mode Profile Position is greater than maximum permissible velocity of drive).	Value in additional error information shows the Modbus register address of the parameter where the initialization error was detected.
E 110D	1	Basic configuration of drive required after factory setting	The "First Setup" (FSU) was not run at all or not completed.	Perform a First Setup.
E 110E	-	Parameter changed that requires a restart of the drive	Only displayed by the commissioning software. A parameter modification requires the drive to be switched off and on.	Restart the drive to activate the parameter functionality. See the chapter Parameters for the parameter that requires a restart of the drive.
E 110F	-	Function not available in this type of device	The specific type of device does not support this function or this parameter value.	Check if you have the correct device type, in particular type of motor, type of encoder, holding brake.
E 1110	-	Unknown file ID for upload or download	The specific type of device does not support this kind of file.	Verify that you have the correct device type or the correct configuration file.
E 1111	-	File transfer not correctly initialized	A previous file transfer has been aborted.	

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Error number	Error class	Description	Cause	Correctives
E 1112	-	Locking of configuration denied	An external tool has tried to lock the configuration of the drive for upload or download. This may not work because another tool had already locked the configuration of the drive or the drive is in an operating state that does not allow locking.	
E 1113	-	System not locked for configuration transfer	An external tool has tried to transfer the configuration without locking the drive.	
E 1114	4	Configuration download aborted Parameter `_SigLatched` Bit 5	During a configuration download, a communication error or an error in the external tool occurred. The configuration was only partially transferred to the drive and might be inconsistent now.	Switch the drive off/on and retry to download the configuration or restore the factory settings.
E 1115	0	Incorrect configuration file format Parameter `_WarnLatched` Bit 5	An external tool has downloaded a configuration which has an invalid or unknown format.	
E 1116	-	Request is processed asynchronously		
E 1117	-	Asynchronous request blocked	Request to a module is blocked because the module is currently processing another request.	
E 1118	-	Configuration data incompatible with device	The configuration data contains data from a different device.	Check device type including type of power stage.
E 1119	-	Incorrect data length, too many bytes		
E 111A	-	Incorrect data length, insufficient number of bytes		
E 111B	4	Configuration download error (additional info=Modbus register address)	During a configuration download, one or more configuration values have not been accepted by the drive.	Check whether the configuration file is valid and matches the type and version of the drive. The value in the additional error info shows the Modbus register address of the parameter where the initialization error was detected.
E 111C	1	Not possible to initialize recalculation for scaling	A parameter could not be initialized.	The address of the parameter that caused the error can be read via the parameter _PAR_ScalingError.
E 111D	3	Original state of a parameter after error during recalculation of parameters with user-defined units cannot be restored.	The drive contained an invalid configuration before the recalculation was started. An error occurred during the recalculation.	Switch the drive off and on again. This may help you to identify the affected parameter(s). Change the parameters as required. Verify that the parameter configuration is valid before starting the recalculation procedure.

Error number	Error class	Description	Cause	Correctives
E 111E	1	Not possible to recalculate data record	A data set of the operating mode Motion Sequence could not be recalculated.	The address of the parameter and the number of the data set that caused the error can be read via the parameter _PAR_ScalingError.
E 111F	1	Recalculation not possible.	Invalid scaling factor.	Check whether you really want the selected scaling factor. Try a different scaling factor. Before triggering scaling, reset the parameters with user-defined units.
E 1120	1	Recalculation for scaling not possible	A parameter could not be recalculated.	The address of the parameter that caused the error can be read via the parameter _PAR_ScalingError.
E 1121	-	Incorrect sequence of steps for scaling (fieldbus)	The recalculation has been started prior to the initialization.	The recalculation must be started after the initialization.
E 1122	-	Recalculation for scaling not possible	Recalculation for scaling is already running.	Wait for the running recalculation for scaling to finish.
E 1123	-	Parameter cannot be changed	Recalculation for scaling is running.	Wait for the running recalculation for scaling to finish.
E 1124	1	Timeout during recalculation for scaling	The time between the initialization of the recalculation and the start of the recalculation has been exceeded (30 seconds).	Recalculation must be started within 30 seconds after initialization.
E 1125	1	Scaling not possible	The scaling factors for position, velocity or acceleration/ deceleration are beyond internal calculation limits.	Retry with different scaling factors.
E 1126	-	Configuration is blocked by another access channel		Close other access channel (for example, other instance of commissioning software).
E 1127	-	Invalid key received		
E 1128	-	Special login is required for Manufacturing Test Firmware		
E 1129	-	Test step not yet started		
E 112A	-	Not possible to enable the capture input	Position capturing has not yet been activated	Activate position capturing via procedure command "Probing cycle" (IDN170).
E 112B	-	Not possible to configure difference value capturing	Capture input 1 has not been set to both edges (IDN169).	Set capture input 1 to both edges.
E 112C	-	Not possible to configure difference value capturing	Capture input 2 has not been set to both edges (IDN169).	Set capture input 2 to both edges.
E 112E	-	Current configuration of edges cannot be changed	The current configuration of edges cannot be changed because difference value capture is active.	Deactivate difference value capture.
E 1300	3	Safety function STO activated (STO_A, STO_B) Parameter `_SigLatched` Bit 10	The safety function STO was activated in the operating state Operation Enabled.	Check the wiring of the inputs of the safety function STO and reset the error.

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Error number	Error class	Description	Cause	Correctives
E 1301	4	STO_A and STO_B different level Parameter _SigLatched Bit 11	The levels of the inputs STO_A and STO_B were different for more than 1 second.	The drive has to be switched off and the reason fixed (for example, check whether EMERGENCY STOP is active) before it is switched on.
E 1302	0	Safety function STO activated (STO_A, STO_B) Parameter _WarnLatched Bit 10	Safety function STO was activated while the power stage was disabled.	The warning is automatically reset once the safety function STO is deactivated.
E 1310	2	Frequency of the external reference value signal too high Parameter _SigLatched Bit 28	The frequency of the external reference value signals (A/B signals, P/D signals or CW/CCW signals) is higher than the permissible value.	Check the frequency of the external reference values. Check the gear ratio in the operating mode Electronic Gear.
E 1311	-	The selected signal input function or signal output function cannot be configured	The selected signal input function or signal output function cannot be used in the selected operating mode.	Select another function or change the operating mode.
E 1312	-	Limit switch or reference switch signal not defined for signal input function	Reference movements require limit switches. These limit switches are not assigned to inputs.	Assign the signal input functions Positive Limit Switch, Negative Limit Switch and Reference Switch.
E 1313	-	Configured debounce time not possible for this signal input function	The signal input function does not support the selected debounce time.	Set the debounce time to a valid value.
E 1314	4	At least two inputs have the same signal input function.	At least two inputs are configured with the same signal input function.	Reconfigure the inputs.
E 1315	0	Frequency of reference value signal is too high (warning). Parameter _WarnLatched Bit 28	The frequency of the pulse signal (A/B, Pulse/Direction, CW/CCW) exceeds the specified working range. Received pulses may be lost.	Adapt the output pulse frequency of the controller to fit the input specification of the drive. Also adapt the gear ratio in the operating mode Electronic Gear to the application requirements (position accuracy and velocity).
E 1316	1	Position capture via signal input currently not possible Parameter _SigLatched Bit 28	Position capture is already being used.	
E 1317	0	Interference at PTI input Parameter _WarnLatched Bit 28	Interfering pulses or impermissible edge transitions (A and B signal simultaneously) have been detected.	Check cable specifications, shield connection and EMC.
E 1318	-	The selected type of usage of the analog inputs is not possible.	At least two analog inputs are configured with the same type of usage.	Reconfigure the analog inputs.
E 1501	4	System error: DriveCom state machine unknown state		
E 1502	4	System error: HWL low-level state machine unknown state		

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Error number	Error class	Description	Cause	Correctives
E 1503	1	Quick Stop triggered via fieldbus	A Quick Stop has been triggered via the fieldbus. The Quick Stop option code has been set to -1 or -2 which causes the drive to transition to the operating state 9 Fault instead of the operating state 7 Quick Stop Active.	
E 1504	2	Power stage cannot be enabled Parameter `_SigLatched` Bit 4	The signal input function "Servo On" has been assigned to an input. However, there is a 0 level the signal input.	There must be a 1 level at the signal input.
E 1600	-	Oscilloscope: No additional data available		
E 1601	-	Oscilloscope: Parameterization incomplete		
E 1602	-	Oscilloscope: Trigger variable not defined		
E 1606	-	Logging still active		
E 1607	-	Logging: No trigger defined		
E 1608	-	Logging: Invalid trigger option		
E 1609	-	Logging: No channel selected		
E 160A	-	Logging: No data available		
E 160B	-	Parameter cannot be logged		
E 160C	1	Autotuning: Moment of inertia outside permissible range	The load inertia is too high.	Verify that the system can easily be moved. Check the load. Use a differently rated drive.
E 160E	1	Autotuning: Test movement could not be started		
E 160F	1	Autotuning: Power stage cannot be enabled	Autotuning was not started in the operating state Ready To Switch On.	Start Autotuning when the drive is in the operating state Ready To Switch On.
E 1610	1	Autotuning: Processing stopped	Autotuning process stopped by user command or by drive error (see additional error message in error memory, for example, DC bus undervoltage, limit switches triggered)	Fix the cause of the stop and restart Autotuning.
E 1611	1	System error: Autotuning internal write access	HALT is active and an Autotuning parameter is written. Occurs when Autotuning is started.	
E 1612	1	System error: Autotuning internal read access		
E 1613	1	Autotuning: Maximum permissible movement range exceeded Parameter `_SigLatched` Bit 2	The motor exceeded the adjusted movement range during Autotuning.	Increase the movement range value or disable range monitoring by setting AT_DIS = 0.
E 1614	-	Autotuning: Already active	Autotuning has been started twice simultaneously or an Autotuning parameter is modified during Autotuning (parameter AT_dis and AT_dir).	Wait for Autotuning to finish before restarting Autotuning.

Error number	Error class	Description	Cause	Correctives
E 1615	-	Autotuning: This parameter cannot be changed while Autotuning is active	Parameter AT_gain or AT_J are written during Autotuning.	Wait for Autotuning to finish before changing the parameter.
E 1617	1	Autotuning: Friction torque or load torque too great	The current limit has been reached (parameter CTRL_I_max).	Verify that the system can easily be moved. Check the load. Use a differently rated drive.
E 1618	1	Autotuning: Optimization aborted	The internal Autotuning sequence has not been finished (following error?).	Note the additional information provided in the error memory.
E 1619	-	Autotuning: The velocity jump height in parameter AT_n_ref is too small	Parameter AT_n_ref < 2 * AT_n_tolerance. Checked only once at the first velocity jump.	Modify the parameter AT_n_ref or AT_n_tolerance to meet the desired condition.
E 1620	1	Autotuning: Load torque too high	Product rating is not suitable for the machine load. Detected machine inertia is too high compared to the inertia of the motor.	Reduce load, check rating.
E 1621	1	System error: Calculation error		
E 1622	-	Autotuning: Not possible to perform Autotuning	Autotuning can only be performed if no operating mode is active.	Terminate the active operating mode or disable the power stage.
E 1623	1	Autotuning: HALT request has stopped the autotuning process	Autotuning can only be performed if no operating mode is active.	Terminate the active operating mode or disable the power stage.
E 1A00	-	System error: FIFO memory overflow		
E 1A01	3	Motor has been changed (different type of motor) Parameter `_SigLatched` Bit 16	Detected motor type is different from previously detected motor.	Confirm the change.
E 1A03	4	System error: Hardware and firmware do not match		
E 1B00	3	System error: Incorrect parameters for motor and power stage Parameter `_SigLatched` Bit 30	Incorrect manufacturer parameter value (data) non-volatile memory of device.	Replace device.
E 1B02	3	Target value too high. Parameter `_SigLatched` Bit 30		
E 1B04	2	Product of encoder simulation resolution and the maximum velocity is too high Parameter `_SigLatched` Bit 30	Value in parameter CTRL_v_max or resolution or the encoder simulation ESIM_scale are too high.	Reduce the resolution of the encoder simulation or the maximum velocity in parameter CTRL_v_max.
E 1B05	2	Error during parameter switching Parameter `_SigLatched` Bit 30		
E 1B06	3	Wake & shake cannot be started. Parameter `_SigLatched` Bit 30	Motor velocity is too high at the beginning of the wake and shake procedure.	Verify that the motor is at a standstill at the beginning wake and shake procedure.

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Error number	Error class	Description	Cause	Correctives
E 1B08	3	Position difference during the wake and shake procedure is too high.	Incorrect motor data entered by user (especially motor resistance, motor inertia (in case of rotary motors) or motor mass (in case of linear motors)). Incorrect setting for parameter WakeAndShakeGain.	Check motor data. Check setting of parameter WakeAndShakeGain.
E 1B0B	1	The power stage must be in operating state Ready To Switch On at the beginning of the commutation offset identification.		Set the operating state of the power stage to Ready To Switch On and restart commutation offset identification.
E 1B0C	3	Actual motor velocity too high.		
E 1B0D	3	Velocity value determined by velocity observer is incorrect	Incorrect system inertia for velocity observer calculations. Incorrect velocity observer dynamics. System inertia changes during operation. In this case, operation with velocity observer is not possible and the velocity observer has to be switched off.	Change the velocity observer dynamics via the parameter CTRL_SpdObsDyn. Change the system inertia used for velocity observer calculations via the parameter CTRL_SpdObsInert. If error persists, deactivate velocity observer.
E 1B0E	3	Not possible to determine the commutation angle at the end of the wake and shake procedure	Incorrect motor data entered by user (especially motor resistance, motor inertia (in case of rotary motors) or motor mass (in case of linear motors)). Incorrect setting for parameter WakeAndShakeGain. Motor brake (if available) not properly wired.	Check motor data. Check setting of parameter WakesAndShakeGain. Check wiring of motor brake.
E 2300	3	Power stage overcurrent Parameter `_SigLatched` Bit 27	Motor short circuit and disabling of the power stage. Motor phases are inverted.	Check the motor power connection.
E 2301	3	Braking resistor overcurrent Parameter `_SigLatched` Bit 27	Braking resistor short circuit.	If you use the internal braking resistor, please contact Technical Support. If you use an external braking resistor, check the wiring and the rating of the braking resistor.
E 3100	par.	Missing mains supply, undervoltage mains supply or overvoltage mains supply Parameter `_SigLatched` Bit 15	Missing phase(s) for more than 50 ms. Mains voltage is out of range. Mains frequency is out of range.	Verify that the values of the mains power supply network comply with the technical data.
E 3200	3	DC bus overvoltage Parameter `_SigLatched` Bit 14	Excessive regeneration during braking.	Check deceleration ramp, check rating of drive and braking resistor.
E 3201	3	DC bus undervoltage (shutdown threshold) Parameter `_SigLatched` Bit 13	Power supply loss, poor power supply.	Check mains supply.
E 3202	2	DC bus undervoltage (Quick Stop threshold) Parameter `_SigLatched` Bit 13	Power supply loss, poor power supply.	Check mains supply.

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Error number	Error class	Description	Cause	Correctives
E 3206	0	Undervoltage DC bus, missing mains supply, undervoltage mains supply or overvoltage mains supply Parameter _WarnLatched Bit 13	Missing phase(s) for more than 50 ms. Mains voltage is out of range. Mains frequency is out of range. Mains voltage and parameter setting of MON_MainsVolt do not match (for example, mains voltage is 230 V and MON_MainsVolt is set to 115 V).	Verify that the values of the mains power supply network comply with the technical data. Check the settings of the parameter for reduced mains voltage.
E 3300	0	Maximum motor voltage is too low for the power stage used	The maximum motor voltage M_U_max is too low. The power stage supply voltage and the maximum motor voltage do not match.	Use a motor with a higher maximum voltage M_U_max. If this warning is ignored, the motor may be damaged.
E 4100	3	Power stage overtemperature Parameter _SigLatched Bit 18	Transistors overtemperature: Ambient temperature is too high, fan is inoperative, dust.	Check the fan, improve the heat dissipation in the cabinet.
E 4101	0	Warning power stage overtemperature Parameter _WarnLatched Bit 18	Transistors overtemperature: Ambient temperature is too high, fan is inoperative, dust.	Check the fan, improve the heat dissipation in the cabinet.
E 4102	0	Power stage overload (I2t) Parameter _WarnLatched Bit 30	The current has exceeded the nominal value for an extended period of time.	Check rating, reduce cycle time.
E 4200	3	Device overtemperature Parameter _SigLatched Bit 18	Board overtemperature: Ambient temperature is too high.	Check fan, improve the heat dissipation in the cabinet.
E 4300	2	Motor overtemperature Parameter _SigLatched Bit 17	Ambient temperature is too high. Duty cycle is too high. Motor not properly mounted (thermal isolation). Motor overload (power losses too high).	Check motor installation: The heat must be dissipated via the mounting surface. Reduce ambient temperature. Provide ventilation.
E 4301	0	Warning motor overtemperature Parameter _WarnLatched Bit 17	Resistance of thermal sensor is too high; overload, ambient temp (see I2t).	Check motor installation: The heat must be dissipated via the mounting surface.
E 4302	0	Motor overload (I2t) Parameter _WarnLatched Bit 31	The current has exceeded the nominal value for an extended period of time.	Verify that the system can easily be moved. Check the load. Use a differently sized motor, if necessary.
E 4303	0	No motor temperature monitoring	The temperature parameters (in electronic nameplate of motor, non-volatile memory of encoder) are unavailable or invalid; parameter A12 is equal to 0.	Contact Technical Support. Replace motor.
E 4304	0	The encoder type does not support motor temperature monitoring.		
E 4402	0	Warning: Braking resistor overload (I2t > 75%) Parameter _WarnLatched Bit 29	The braking resistor has been switched on for such a long period of time that 75% of its overload capability have been exceeded.	The regeneration energy is too high. Possible causes: The external loads are too high, the motor velocity is too high, the deceleration is too fast.

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Error number	Error class	Description	Cause	Correctives
E 4403	par.	Braking resistor overload (I2t > 100%)	The braking resistor is switched on for an excessively long period of time.	The regeneration energy is too high. Possible causes: The external loads are too high, the motor velocity is too high, the deceleration is too fast.
E 5101	0	Modbus power supply missing		
E 5102	4	Motor encoder supply voltage Parameter _SigLatched Bit 16	Encoder power supply is not within permissible range of 8V to 12V; there may be a hardware problem.	Replace the device. Contact Technical Support.
E 5200	4	Error at connection to motor encoder Parameter _SigLatched Bit 16	Incorrect encoder cable or cable not connected, EMC.	Check the cable connection and the shield.
E 5201	4	Errors in motor encoder communication Parameter _SigLatched Bit 16	Encoder error message: Communication error detected by the encoder itself.	Check the cable connection and the shield.
E 5202	4	Motor encoder is not supported Parameter _SigLatched Bit 16	Incompatible encoder type is connected.	Use genuine accessories.
E 5203	4	Connection error motor encoder Parameter _SigLatched Bit 16		
E 5204	3	Connection to motor encoder lost Parameter _SigLatched Bit 16	Encoder cable problems (communication has been interrupted).	Check the cable connection.
E 5206	0	Communication error in encoder Parameter _WarnLatched Bit 16	Communication disturbed, EMC.	Check cable specifications, shield connection and EMC.
E 5207	1	Function is not supported	The current hardware revision does not support the function.	
E 5302	4	The motor requires a PWM frequency (16kHz) which the power stage does not support.	The connected motor only works with a PWM frequency of 16 kHz (motor nameplate entry). However, the power stage does not support this PWM frequency.	Use a motor that works with a PWM frequency of 8 kHz.
E 5430	4	System error: EEPROM read error Parameter _SigLatched Bit 29		
E 5431	3	System error: EEPROM write error Parameter _SigLatched Bit 29		
E 5432	3	System error: EEPROM state machine Parameter _SigLatched Bit 29		
E 5433	3	System error: EEPROM address error Parameter _SigLatched Bit 29		
E 5434	3	System error: EEPROM incorrect data length Parameter _SigLatched Bit 29		

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Error number	Error class	Description	Cause	Correctives
E 5435	4	System error: EEPROM not formatted Parameter _SigLatched Bit 29		
E 5436	4	System error: EEPROM incompatible structure Parameter _SigLatched Bit 29		
E 5437	4	System error: EEPROM checksum error (manufacturer data) Parameter _SigLatched Bit 29		
E 5438	3	System error: EEPROM checksum error (user parameters) Parameter _SigLatched Bit 29		
E 5439	3	System error: EEPROM checksum error (fieldbus parameters) Parameter _SigLatched Bit 29		
E 543B	4	System error: No valid manufacturer data Parameter _SigLatched Bit 29		
E 543E	3	System error: EEPROM checksum error (NoInit parameter) Parameter _SigLatched Bit 29		
E 543F	3	System error: EEPROM checksum error (motor parameters) Parameter _SigLatched Bit 29		
E 5441	4	System error: EEPROM checksum error (global controller parameter set) Parameter _SigLatched Bit 29		
E 5442	4	System error: EEPROM checksum error (controller parameter set 1) Parameter _SigLatched Bit 29		
E 5443	4	System error: EEPROM checksum error (controller parameter set 2) Parameter _SigLatched Bit 29		
E 5444	4	System error: EEPROM checksum error (NoReset parameter) Parameter _SigLatched Bit 29		
E 5445	4	System error: EEPROM checksum error (hardware information) Parameter _SigLatched Bit 29		
E 5446	4	System error: EEPROM checksum error (for power outage data) Parameter _SigLatched Bit 29	Problem with internal EEPROM detected.	Restart the drive. If the error persists, contact Technical Support.

Error number	Error class	Description	Cause	Correctives
E 5447	3	System error: EEPROM checksum error (data sets operating mode Motion Sequence) Parameter `_SigLatched` Bit 29		
E 5448	2	System error: Communication error to memory card Parameter `_SigLatched` Bit 20		
E 5449	2	System error: Memory card bus is busy Parameter `_SigLatched` Bit 20		
E 544A	4	System error: EEPROM checksum error (administration data) Parameter `_SigLatched` Bit 29		
E 544B	4	System error: EEPROM checksum error (DeviceNet data) Parameter `_SigLatched` Bit 29		
E 544C	4	System error: EEPROM is write-protected Parameter `_SigLatched` Bit 29		
E 544D	2	System error: Memory card error Parameter `_SigLatched` Bit 20	An error may have occurred during the last saving procedure or the memory card may be inoperative.	Retry saving the data. Replace the memory card.
E 544E	2	System error: Memory card error Parameter `_SigLatched` Bit 20	An error may have occurred during the last saving procedure or the memory card may be inoperative.	Retry saving the data. Replace the memory card.
E 544F	2	System error: Memory card error Parameter `_SigLatched` Bit 20	An error may have occurred during the last saving procedure or the memory card may be inoperative.	Retry saving the data. Replace the memory card.
E 5451	0	System error: No memory card available Parameter `_WarnLatched` Bit 20		
E 5452	2	System error: Data on memory card and device do not match Parameter `_SigLatched` Bit 20	Different type of device. Different type of power stage. Data on memory card does not match firmware version of device.	
E 5453	2	System error: Incompatible data on the memory card Parameter `_SigLatched` Bit 20		
E 5454	2	System error: Capacity of detected memory card to small Parameter `_SigLatched` Bit 20		
E 5455	2	System error: Memory card not formatted Parameter `_SigLatched` Bit 20		Update memory card via HMI command "dtoc" (drive-to-card).

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Error number	Error class	Description	Cause	Correctives
E 5456	1	System error: Memory card is write-protected Parameter _SigLatched Bit 20	The memory card has been write-protected.	Remove memory card or disable write protection via HMI.
E 5457	2	System error: Incompatible memory card Parameter _SigLatched Bit 20	Memory card capacity is insufficient.	Replace memory card
E 5462	0	Memory card implicitly written by the device Parameter _WarnLatched Bit 20	The content of the memory card and the content of the EEPROM are not equal.	
E 5600	3	Motor connection phase error Parameter _SigLatched Bit 26	Missing motor phase.	Check connection of motor phases.
E 5603	3	Commutation error Parameter _SigLatched Bit 26	Wiring error of motor cable. Encoder signals are lost or subject to interference. The load torque is greater than the motor torque. The encoder EEPROM contains incorrect data (encoder phase offset is incorrect). Motor is not adjusted.	Check motor phases, check encoder wiring. Check and improve EMC situation, check grounding and shield connection. Resize the motor so it can withstand the load torque. Check the motor data. Contact Technical Support.
E 6102	4	System error: Internal software error Parameter _SigLatched Bit 30		
E 6103	4	System error: System stack overflow Parameter _SigLatched Bit 31		
E 6104	-	System error: Division by zero (internal)		
E 6105	-	System error: Overflow during 32 bit calculation (internal)		
E 6106	4	System error: Size of data interface does not match Parameter _SigLatched Bit 30		
E 6107	-	Parameter outside of value range (calculation error)		
E 6108	-	Function not available		
E 6109	-	System error: Internal range exceeded		
E 610A	2	System error: Calculated value cannot be represented as 32 bit value		
E 610D	-	Error in selection parameter	Wrong parameter value selected.	Check the value to be written.
E 610E	4	System error: 24 VDC below undervoltage threshold for shutdown		
E 610F	4	System error: Internal timer basis error (Timer0) Parameter _SigLatched Bit 30		

Error number	Error class	Description	Cause	Correctives
E 6111	2	System error: Memory area locked Parameter `_SigLatched` Bit 30		
E 6112	2	System error: Out of memory Parameter `_SigLatched` Bit 30		
E 6113	1	System error: Calculated value cannot be represented as a 16 bit value		
E 6114	4	System error: Impermissible function call from interrupt service routine	Programming error	
E 7100	4	System error: Invalid power stage data Parameter `_SigLatched` Bit 30	Power stage data stored in device is corrupt (wrong CRC), error in internal memory data.	Contact Technical Support or replace the device.
E 7110	2	System error: Error internal braking resistor	Internal braking resistor is inoperative or not connected.	Contact Technical Support.
E 7111	-	Parameter cannot be changed because the external braking resistor is active.	An attempt is made to change one of the parameters RESext_ton, RESext_P or RESext_R even though the external braking resistor is active.	Verify that the external braking resistor is not active if one of the parameters RESext_ton, RESext_P or RESext_R has to be changed.
E 7112	2	No external braking resistor connected	External braking resistor activated (Parameter RESint_ext), but no external resistor is detected.	Check wiring of the external braking resistor. Verify correct resistance.
E 7120	4	Invalid motor data Parameter `_SigLatched` Bit 16	Motor data is corrupt (wrong CRC).	Contact Technical Support or replace the motor.
E 7121	2	System error: Errors in motor encoder communication Parameter `_SigLatched` Bit 16	EMC, detailed information is included in the error memory that contains the error code of the encoder.	Contact Technical Support.
E 7122	4	Invalid motor data Parameter `_SigLatched` Bit 30	Motor data stored in motor encoder is corrupt, error in internal memory data.	Contact Technical Support or replace the motor.
E 7124	4	System error: Motor encoder inoperative Parameter `_SigLatched` Bit 16	Encoder signals internal error.	Contact Technical Support or replace the motor.
E 7125	4	System error: Length specification for user data too great Parameter `_SigLatched` Bit 16		
E 7129	0	System error: Error in motor encoder Parameter `_WarnLatched` Bit 16		
E 712C	0	System error: Communication with encoder not possible Parameter `_WarnLatched` Bit 16		

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Error number	Error class	Description	Cause	Correctives
E 712D	4	Electronic motor nameplate not found Parameter `_SigLatched` Bit 16	Motor data is corrupt (wrong CRC). Motor without electronic motor nameplate (for example, SER motor)	Contact Technical Support or replace the motor.
E 712F	0	No data segment of the electronic motor nameplate		
E 7132	0	System error: Motor configuration cannot be written		
E 7133	0	Not possible to write motor configuration		
E 7134	4	Incomplete motor configuration Parameter `_SigLatched` Bit 16		
E 7135	4	Format is not supported Parameter `_SigLatched` Bit 16		
E 7136	4	Incorrect encoder type selected with parameter MotEnctype Parameter `_SigLatched` Bit 16		
E 7137	4	Error during the internal conversion of the motor configuration Parameter `_SigLatched` Bit 16		
E 7138	4	Parameter of the motor configuration out of permissible range Parameter `_SigLatched` Bit 16		
E 7139	0	Encoder offset: Data segment in encoder is corrupt.		
E 713A	3	Adjustment value of the encoder of the third party motor has not yet been determined. Parameter `_SigLatched` Bit 16		
E 7200	4	System error: Calibration analog/ digital converter during manufacturing / incorrect BLE file Parameter `_SigLatched` Bit 30		
E 7320	4	System error: Invalid encoder parameter Parameter `_SigLatched` Bit 16	Communication channel (Hiperface) to encoder is subject to interference, motor encoder has not been factory-parameterized.	Contact Technical Support.
E 7321	3	Timeout reading the absolute position from the encoder Parameter `_SigLatched` Bit 16	Communication channel (Hiperface) to encoder is subject to interference or motor encoder is inoperative.	Check wiring and shield connection of encoder cable or replace motor.
E 7327	0	Error bit set in Hiperface answer Parameter `_WarnLatched` Bit 16	EMC problems.	Check wiring (shield).
E 7328	4	Motor encoder: Position evaluation error Parameter `_SigLatched` Bit 16	Position evaluation problem detected by encoder.	Contact Technical Support or replace the motor.
E 7329	0	Motor encoder: Warning Parameter `_WarnLatched` Bit 16	EMC, encoder signals internal warning.	Contact Technical Support or replace the motor.

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Error number	Error class	Description	Cause	Correctives
E 7330	4	System error: Motor encoder (Hiperface) Parameter `_SigLatched` Bit 16		Check wiring and shield connection of encoder cable. Contact Technical Support.
E 7331	4	System error: Motor encoder initialization Parameter `_SigLatched` Bit 30		Check wiring and shield connection of encoder cable. Contact Technical Support.
E 7335	0	Communication with motor encoder active Parameter `_WarnLatched` Bit 16	Command is being processed or communication may be disturbed by EMC problems.	Check shield connection of encoder cable. Contact Technical Support.
E 733F	3	Amplitude of encoder analog signals too low Parameter `_SigLatched` Bit 16	Incorrect encoder wiring. Encoder not connected. Encoder signals subject to EMC interference (shield connection, cabling, etc.).	
E 7340	3	Reading of absolute position aborted, number of unsuccessful consecutive attempts too great Parameter `_SigLatched` Bit 16	Communication channel (Hiperface) to encoder is subject to interference. Encoder (in motor) is inoperative.	Check wiring and shield connection of encoder cable, replace motor.
E 7341	0	Encoder temperature warning level reached Parameter `_WarnLatched` Bit 16	The maximum permissible duty cycle is exceeded. The motor was not mounted properly, for example, it is thermally isolated. The motor is blocked or damaged so that more current is used than under normal conditions. The ambient temperature is too high.	Reduce the duty cycle, for example, reduce acceleration. Supply additional cooling, for example, use a fan. Mount the motor in such a way as to increase thermal conductivity. Use a differently rated drive or motor. Replace the motor if it is damaged.
E 7342	2	Encoder temperature limit reached Parameter `_SigLatched` Bit 16	The maximum permissible duty cycle is exceeded. The motor was not mounted properly, for example, it is thermally isolated. The motor is blocked or damaged so that more current is used than under normal conditions. The ambient temperature is too high.	Reduce the duty cycle, for example, reduce acceleration. Supply additional cooling, for example, use a fan. Mount the motor in such a way as to increase thermal conductivity. Use a differently rated drive or motor. Replace the motor if it is damaged.
E 7343	0	Warning: Absolute position is different from incremental position Parameter `_WarnLatched` Bit 16	- Encoder is subject to EMC interference. - Motor encoder is inoperative.	Check wiring and shield connection of encoder cable, replace motor.
E 7344	3	Absolute position is different from incremental position Parameter `_SigLatched` Bit 16	- Encoder is subject to EMC interference. - Motor encoder is inoperative.	Check wiring and shield connection of encoder cable, replace motor.
E 7345	0	Amplitude of analog signals too high, limit of AD conversion exceeded	Encoder signals subject to EMC interference (shield connection, cabling, etc.). Encoder inoperative.	Check cabling and shield connection. Replace encoder.
E 7346	4	System error: Encoder not ready Parameter `_SigLatched` Bit 16		Check wiring and shield connection of encoder cable. Contact Technical Support.

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Error number	Error class	Description	Cause	Correctives
E 7347	0	System error: Position initialization not possible	Analog and digital encoder signals subject to massive interference.	Reduce encoder signal interference, check shield connection, etc. Contact Technical Support.
E 7348	3	Timeout reading encoder temperature Parameter `_SigLatched` Bit 16	Encoder without temperature sensor	Check wiring and shield connection of encoder cable. Contact Technical Support.
E 7349	0	Discrepancy between absolute and analog encoder phases	Analog encoder signals are subject to interference. Encoder inoperative.	Check wiring and shield connection of encoder cable. Replace motor. Contact Technical Support.
E 734A	3	Amplitude of analog signals from encoder too high, signals are clipped Parameter `_SigLatched` Bit 16	Incorrect encoder wiring. Encoder hardware interface inoperative.	
E 734B	0	Signal position evaluation of analog encoder inoperative Parameter `_WarnLatched` Bit 16	Incorrect encoder wiring. Encoder hardware interface inoperative.	
E 734C	3	Error with quasi absolute position Parameter `_SigLatched` Bit 16	The motor shaft may have been moved while the drive was shut down. A quasi absolute position has been detected that is not within the permissible motor shaft deviation range.	If the quasi absolute function is active, only shut down the drive if the motor is at a standstill and do not move the motor shaft when the drive is off.
E 734D	0	Index pulse is not available for the encoder Parameter `_WarnLatched` Bit 16		
E 7500	0	RS485/Modbus: Overrun error Parameter `_WarnLatched` Bit 5	EMC; cabling problem.	Check cables.
E 7501	0	RS485/Modbus: Framing error Parameter `_WarnLatched` Bit 5	EMC; cabling problem.	Check cables.
E 7502	0	RS485/Modbus: Parity error Parameter `_WarnLatched` Bit 5	EMC; cabling problem.	Check cables.
E 7503	0	RS485/Modbus: Receive error Parameter `_WarnLatched` Bit 5	EMC; cabling problem.	Check cables.
E 7601	4	System error: Unknown type of encoder Parameter `_SigLatched` Bit 22		
E 7602	4	Configuration error: Encoder module and selected machine encoder type do not match Parameter `_SigLatched` Bit 22		
E 7603	4	Configuration error: Encoder module and selected motor encoder type do not match Parameter `_SigLatched` Bit 22		

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Error number	Error class	Description	Cause	Correctives
E 7604	4	Configuration error: Encoder module parameterized, but no module detected Parameter `_SigLatched` Bit 22		
E 7605	4	Configuration error: No motor encoder type selected for encoder module Parameter `_SigLatched` Bit 22		
E 7606	4	Configuration error: No machine encoder type selected for encoder module Parameter `_SigLatched` Bit 22		
E 7607	4	Encoder module cannot be identified Parameter `_SigLatched` Bit 22	The encoder module is unknown.	Exchange encoder module.
E 7608	4	Encoder module power supply overcurrent Parameter `_SigLatched` Bit 22	- Short circuit at connector or encoder cable. - Incorrect or inoperative encoder.	
E 7609	4	Encoder not connected to encoder module Parameter `_SigLatched` Bit 22	Connector not connected to module or connected to motor/ encoder. Incorrect or damaged encoder cable.	
E 760A	3	Encoder module in slot 2 missing. Parameter `_SigLatched` Bit 22	Module has been removed or module is inoperative.	
E 760C	2	Encoder signals that maximum frequency is exceeded Parameter `_SigLatched` Bit 22	Velocity too high for the encoder.	
E 760D	4	Configuration error: Incorrect use of encoder module Parameter `_SigLatched` Bit 22	Incorrect value in parameter ENC2_usage.	
E 760E	2	Position evaluation error (signal tracking error detected) Parameter `_SigLatched` Bit 22	Encoder signals subject to EMC interference	Check wiring, cable shield.
E 760F	0	Position evaluation problem (interference detected) Parameter `_WarnLatched` Bit 22	Encoder signals subject to EMC interference	Check wiring, cable shield.
E 7610	0	Resolver: Loss of position tracking, position is inaccurate Parameter `_WarnLatched` Bit 22	- Motor moves too fast. - Motor acceleration is too fast.	- Reduce speed. - Reduce acceleration. - Reduce resolver resolution. - Adapt resolver excitation frequency.
E 7611	2	Resolver: Signal degradation error, position is inaccurate Parameter `_SigLatched` Bit 22	Resolver is inoperative. Resolver signals are subject to interference. Resolver cable is too long.	Replace resolver. Check resolver cable, especially cable shield. Additional info bits: D5: Sine/cosine inputs exceed DOS out of range threshold. D4: Sine/cosine inputs exceed DOS mismatch threshold.

Error number	Error class	Description	Cause	Correctives
E 7612	3	Resolver: Error due to loss of signal, position unreliable Parameter `_SigLatched` Bit 22	Resolver is inoperative. Resolver wiring is incorrect. Resolver signals are subject to excessive interference. Resolver is unsuitable for drive. Incorrect parameter transformation ratio.	Check resolver cable, especially wiring and shield connection. Replace resolver. Additional info bits: D7: Sine/cosine inputs clipped. D6: Sine/cosine inputs below LOS threshold.
E 7613	3	Resolver: Signal communication subject to interference Parameter `_SigLatched` Bit 22	Resolver signals are subject to interference.	Check resolver cable, especially wiring and shield connection.
E 7614	3	Error at resolver power supply. Parameter `_SigLatched` Bit 22	Resolver is not connected properly.	Check resolver cable.
E 7615	3	System error: Encoder module RES is not ready for position evaluation Parameter `_SigLatched` Bit 22	EMC problem.	Check resolver cable.
E 7616	3	System error: Resolver timeout Parameter `_SigLatched` Bit 22	System error	Replace encoder module.
E 7617	1	Resolver velocity is too high Parameter `_SigLatched` Bit 22	Motor velocity is too high.	Reduce motor velocity.
E 7618	4	Encoder 2 Hall sensor error Parameter `_SigLatched` Bit 22	Incorrect wiring or damaged cable for Hall signals of encoder 2.	Check encoder cabling.
E 7619	4	Error during module - encoder communication Parameter `_SigLatched` Bit 22	Incorrect encoder wiring/ adjustment or incorrect encoder parameter settings (example: parameter ENCDigSSICoding is set for SSI encoder).	Check encoder cable, especially wiring and shield. Check encoder parameter settings. Check encoder adjustment.
E 761A	0	Warning during module - encoder communication Parameter `_WarnLatched` Bit 22	Incorrect encoder wiring.	Check encoder cable, especially wiring and shield.
E 761B	4	Connected type of EnDat encoder is not supported Parameter `_SigLatched` Bit 22	Operation of the EnDat encoder not possible with the entries detected in the encoder nameplate.	Use a supported EnDat encoder.
E 761C	4	Configuration error: Invalid SSI encoder parameter setting Parameter `_SigLatched` Bit 22	Incorrect values in parameter ENCDigSSIResSgl or ENCDigSSIResMult.	
E 761D	2	Maximum velocity of the encoder is exceeded Parameter `_SigLatched` Bit 22	Velocity too high for the encoder. In the case of SSI or EnDat2.2, the reason may also be an encoder communication error.	
E 761E	2	Encoder module overtemperature Parameter `_SigLatched` Bit 22	The ambient temperature is too high.	Improve the heat dissipation in the cabinet.
E 761F	2	Position evaluation error (AB encoder signals) Parameter `_SigLatched` Bit 22	No sync signal available.	

Error number	Error class	Description	Cause	Correctives
E 7620	4	Checksum error in EnDat encoder data Parameter _SigLatched Bit 22		
E 7621	1	Runtime compensation was not successful Parameter _SigLatched Bit 22		Check encoder cable, especially wiring and shield.
E 7622	0	Warning: Resolver timeout Parameter _WarnLatched Bit 22	System error.	Replace encoder module
E 7623	0	Absolute encoder signal is not available Parameter _WarnLatched Bit 22	There is no encoder available at the input specified via the parameter ENC_abs_source.	Check wiring, check encoder. Change the value of the parameter ENC_abs_source.
E 7624	0	Not possible to set the absolute position for encoder 2. Parameter _WarnLatched Bit 22	Setting the absolute position via ENC2_setpabs for the encoder at the input for encoder 2 is not possible. If no encoder is connected to the input for encoder 2 input and if ENC2_setpabs is executed, this warning is also generated.	Use an encoder that supports direct setting of the absolute position via ENC2_setpabs.
E 7625	0	Not possible to set the absolute position for encoder 1. Parameter _WarnLatched Bit 22	There is no encoder connected to the input for encoder 1.	Connect an encoder to the input for encoder 1 before trying to set the absolute position directly via ENC1_abs_pos.
E 7626	4	Overflow error during encoder scaling Parameter _SigLatched Bit 22	The multiturn resolution of the machine encoder with reference to the motor shaft exceeds the system limits, for example, due to the mechanical gear ratio between machine encoder and motor encoder.	Reduce the number of bits of the multitun resolution that are used for position evaluation via the parameter ENCDigResMulUsed.
E 7627	4	Configuration error: Invalid BISS encoder parameter setting Parameter _SigLatched Bit 22	Incorrect values in parameters ENCDigBISSResSgl or ENCDigBISSResMult.	
E 7628	0	BISS encoder bits 'War' or 'Err' are set Parameter _WarnLatched Bit 22	The bits are used for diverse types of monitoring such as: - Encoder temperature is too high. - Service life of LED inside encoder exceeded. - Position is not reliable.	Replace encoder.
E 7629	3	BISS initialization error Parameter _SigLatched Bit 22		
E 7701	4	System error: Timeout during connection to power stage Parameter _SigLatched Bit 31		Contact Technical Support.
E 7702	4	System error: Invalid data received from power stage Parameter _SigLatched Bit 31		Contact Technical Support.
E 7703	4	System error: Data exchange with power stage lost Parameter _SigLatched Bit 31		Contact Technical Support.

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Error number	Error class	Description	Cause	Correctives
E 7704	4	System error: Exchange of identification data from power stage not successful Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 7705	4	System error: Checksum identification data from power stage incorrect Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 7706	4	System error: No identification frame received from power stage Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 7707	4	System error: Type of power stage and manufacture data do not match		Contact Technical Support.
E 7708	4	PIC voltage supply too low Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 7709	4	System error: Invalid numbers of data received Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 770A	2	PIC received data with incorrect parity Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 7800	1	eSM module: System error: Error of class 1 forced Parameter `_SigLatched` Bit 23		
E 7801	2	eSM module: System error: Error of class 2 forced Parameter `_SigLatched` Bit 23		
E 7802	3	eSM module: System error: Error of class 3 forced Parameter `_SigLatched` Bit 23		
E 7803	4	eSM module: System error: Error of class 4 forced Parameter `_SigLatched` Bit 23		
E 7804	3	eSM module: Insufficient deceleration for Quick Stop Parameter `_SigLatched` Bit 23	Quick Stop ramp of drive lower than Quick Stop ramp configured for eSM.	Change ramp in eSM or drive.
E 7805	1	eSM module: Error during Safe Operating Stop (SOS) Parameter `_SigLatched` Bit 23	Motor movement during Safe Operating Stop (SOS).	Keep motor from moving while Safe Operating Stop is active (external forces, loads).
E 7806	1	eSM module: Safely Limited Speed (SLS) exceeded in machine operating mode Setup Mode Parameter `_SigLatched` Bit 23	Delay for reaching Safely Limited Speed (SLS) too low or eSM deceleration ramp too high.	Increase delay for eSM control of Safely Limited Speed (SLS) or decrease eSM deceleration ramp for reaching Safely Limited Speed (SLS).
E 780A	2	eSM module: /ESTOP signal for EMERGENCY STOP triggered Parameter `_SigLatched` Bit 23	EMERGENCY STOP is active.	Reset EMERGENCY STOP.

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Error number	Error class	Description	Cause	Correctives
E 780B	0	eSM module: Not ready for Fault Reset Parameter _WarnLatched Bit 23	eSM is in state Quick Stop Active or Fault Reaction Active or Fault.	Wait until eSM is no longer in state Quick Stop Active or Fault Reaction Active or Fault or reboot the drive.
E 780C	0	eSM module: Not ready for eSM Disable Parameter _WarnLatched Bit 23	Safety module eSM is not in operating state Operation Enabled.	eSM Disable requires the safety module eSM to be in operating state Operation Enabled.
E 780F	0	eSM module: Parameter cannot be written in this operating state Parameter _WarnLatched Bit 23	Parameter cannot be written in this eSM state.	Change eSM state to write this parameter.
E 7810	0	eSM module: Incorrect password Parameter _WarnLatched Bit 23	The password that was sent by the configuration tool is not identical to the password stored in the device.	Send the stored password.
E 7811	0	eSM module: Timeout during parameter download (default values loaded) Parameter _WarnLatched Bit 23	Connection problems or EMC.	Check wiring (shield).
E 7813	0	eSM module: Parameter checksum cannot be written in this operating state Parameter _WarnLatched Bit 23	eSM is not ready to be configured.	Use correct password. Reconfigure safety module eSM. Contact Technical Support.
E 7814	0	eSM module: Parameter checksum incorrect (default values loaded) Parameter _WarnLatched Bit 23	EMC problems. The commissioning software is outdated and not compatible with the safety module eSM.	Check wiring (shield). Install latest commissioning software version.
E 7815	0	eSM module: Warning: Undertemperature Parameter _WarnLatched Bit 23	Temperature too low.	
E 7816	0	eSM module: Warning: Overtemperature Parameter _WarnLatched Bit 23	Temperature too high.	Check the ambient conditions. Verify that the flow of air is sufficient (pollution, objects).
E 7818	2	eSM module: System error: ESM5VDC undervoltage Parameter _SigLatched Bit 23	Error in eSM 5V supply.	
E 7819	2	eSM module: Overload outputs channel A Parameter _SigLatched Bit 23	Short circuit or overload.	Check wiring and connected devices.
E 781A	4	eSM module: System error: 5V overvoltage Parameter _SigLatched Bit 23	eSM internal power supply error	
E 781B	4	eSM module: System error: 5V undervoltage Parameter _SigLatched Bit 23	eSM internal power supply error	
E 781D	2	eSM module: ESMSTART: Maximum permissible pulse duration exceeded Parameter _SigLatched Bit 23	Pulse duration longer than 4 seconds.	Pulse duration must be less than 4 seconds.

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Error number	Error class	Description	Cause	Correctives
E 781E	4	eSM module: System error: RAM Parameter `_SigLatched` Bit 23	eSM RAM error	
E 781F	4	eSM module: System error: Stack overflow Parameter `_SigLatched` Bit 23		
E 7820	4	eSM module: System error: Program sequence control (communication) Parameter `_SigLatched` Bit 23	Software watchdog eSM (CPU_B)	
E 7821	4	eSM module: System error: Program sequence control (Idle task) Parameter `_SigLatched` Bit 23		
E 7825	4	eSM module: System error: Firmware checksum error Parameter `_SigLatched` Bit 23		
E 7826	0	eSM module: Parameter outside of permissible value range Parameter `_WarnLatched` Bit 23	Parameter outside of permissible value range.	Check the parameter value.
E 7827	2	eSM module: Parameter checksum error Parameter `_SigLatched` Bit 23	Saved parameter values are invalid.	Reconfigure the eSM. Contact Technical Support.
E 7828	2	eSM module: System error: SPI framing error Parameter `_SigLatched` Bit 23		
E 7829	4	eSM module: Input states channel A and channel B are not identical Parameter `_SigLatched` Bit 23	Wire break or connected devices are inoperable.	Check wiring and connected devices.
E 782A	2	eSM module: Output states channel A and channel B are not identical Parameter `_SigLatched` Bit 23	Short circuit to 24V DC. System error.	Check wiring and connected devices. Check connection of STO_A and STO_B. Contact Technical Support.
E 782B	3	eSM module: System error: Position evaluation error (values not identical) Parameter `_SigLatched` Bit 23	CPU_A and CPU_B have different position values. Possible encoder problem.	
E 782C	3	eSM module: System error: Velocity evaluation error (values not identical) Parameter `_SigLatched` Bit 23	CPU_A and CPU_B have different velocity values. Possible encoder problem.	
E 782F	2	eSM module: System error: Error during dynamization of STO signal Parameter `_SigLatched` Bit 23		
E 7833	0	eSM module: System error: EEPROM incorrect checksum (default values loaded) Parameter `_WarnLatched` Bit 23	EEPROM error.	

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Error number	Error class	Description	Cause	Correctives
E 7834	0	eSM module: Safety module replaced (default values loaded) Parameter `_WarnLatched` Bit 23	This safety module has not been configured with this drive. The parameters have been reset to the default values.	Reconfigure the safety module.
E 7835	4	eSM module: Commutation position Parameter `_SigLatched` Bit 23	Encoder error or error in internal communication with the drive (for example, EMC).	Check EMC. Check encoder connection. Contact Technical Support.
E 7836	4	eSM module: Parameter checksums not identical Parameter `_SigLatched` Bit 23	Parameter of CPU_A is not identical to parameter of CPU_B. Problem during loading of parameters into eSM module.	Retry loading the parameters into the eSM module. If the problem persists, contact Technical Support.
E 7837	0	eSM module: System error: Boot program: Invalid address Parameter `_WarnLatched` Bit 23	Invalid write access of bootloader to flash memory range.	
E 7838	1	eSM module: Safely Limited Speed (SLS) exceeded in machine operating mode Automatic Mode Parameter `_SigLatched` Bit 23	Drive velocity greater than configured eSM speed limit.	Reduce velocity of the drive or check eSM speed limit for machine operating mode Automatic Mode.
E 7839	2	eSM module: Input ESMSTART low instead of high (automatic start) Parameter `_SigLatched` Bit 23	ESMSTART is configured for automatic start and must be high at start.	Check parameter configuration of ESMSTART. Check wiring of ESMSTART.
E 783A	2	eSM module: Input ESMSTART high instead of low (manual start) Parameter `_SigLatched` Bit 23	ESMSTART is configured for manual start and must be low at start.	Check parameter configuration of ESMSTART. Check wiring of ESMSTART.
E 783B	2	eSM module: Guard door acknowledgment: The acknowledgement signal is available for too long a time. Parameter `_SigLatched` Bit 23	The acknowledgement signal is available for more than 6 seconds.	The acknowledgement signal must be available for less than 6 seconds.
E 783C	4	eSM module: System error: State of eSM state machines not identical Parameter `_SigLatched` Bit 23		
E 783F	2	eSM module: Output AUXOUT1 (cross fault to another output) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Check wiring and connected devices.
E 7840	2	eSM module: Output /INTERLOCK_OUT (cross fault to another output) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Check wiring and connected devices.
E 7841	2	eSM module: Output RELAY_OUT_A (cross fault to another output) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Check wiring and connected devices.

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Error number	Error class	Description	Cause	Correctives
E 7842	2	eSM module: Output CCM24V_OUT_A (cross fault to another output) Parameter _SigLatched Bit 23	Cross fault detection detected a cross fault to another output.	Check wiring and connected devices.
E 7843	2	eSM module: Output AUXOUT1 (cross fault to 24V) Parameter _SigLatched Bit 23	Cross fault detection detected a cross fault to 24V.	Check wiring and connected devices.
E 7844	2	eSM module: Output /INTER-LOCK_OUT (cross fault to 24V) Parameter _SigLatched Bit 23	Cross fault detection detected a cross fault to 24V.	Check wiring and connected devices.
E 7845	2	eSM module: Output RELAY_OUT_A (cross fault to 24V) Parameter _SigLatched Bit 23	Cross fault detection detected a cross fault to 24V.	Check wiring and connected devices.
E 7846	2	eSM module: Output CCM24V_OUT_A (cross fault to 24V) Parameter _SigLatched Bit 23	Cross fault detection detected a cross fault to 24V.	
E 7848	2	eSM module: System error: Input ESMSTART_A Parameter _SigLatched Bit 23		
E 7849	2	eSM module: System error: Input SETUPENABLE_A Parameter _SigLatched Bit 23		
E 784A	2	eSM module: System error: Input SETUPMODE_A Parameter _SigLatched Bit 23		
E 784B	2	eSM module: System error: Input GUARD_A Parameter _SigLatched Bit 23		
E 784C	2	eSM module: System error: Input GUARD_ACK Parameter _SigLatched Bit 23		
E 784D	2	eSM module: System error: Input /INTERLOCK_IN_A Parameter _SigLatched Bit 23		
E 784E	2	eSM module: System error: Input /ESTOP_A Parameter _SigLatched Bit 23		
E 784F	2	eSM module: System error: Input NOTUSED_A Parameter _SigLatched Bit 23		
E 7850	2	eSM module: Overload outputs channel B Parameter _SigLatched Bit 23	Short circuit or overload.	Check wiring and connected devices.
E 7851	4	eSM module: System error: UART overrun/framing error Parameter _SigLatched Bit 23		

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Error number	Error class	Description	Cause	Correctives
E 7852	2	eSM module: System error: ResEnc (encoder resolution) is set to 0 Parameter `_SigLatched` Bit 23		
E 7853	4	eSM module: System error: CPU synchronization Parameter `_SigLatched` Bit 23		
E 7854	2	eSM module: No motor movement for 36 hours Parameter `_SigLatched` Bit 23	There has not been a minimum motor movement for the last 36 hours.	There should be a minimum motor movement at least once every 36 hours.
E 7855	2	eSM module: System error: Timeout high-priority tests (5 sec) Parameter `_SigLatched` Bit 23		
E 7856	2	eSM module: System error: Timeout low-priority tests Parameter `_SigLatched` Bit 23		
E 7857	2	eSM module: Parameter dec_Qstop (minimum deceleration) is set to 0 Parameter `_SigLatched` Bit 23	Module is not configured.	Download a configuration.
E 7858	2	eSM module: Output AUXOUT2 (cross fault to another output) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Check wiring and connected devices.
E 7859	2	eSM module: Output /INTERLOCK_OUT (cross fault to another output) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Check wiring and connected devices.
E 785A	2	eSM module: Output RELAY_OUT_B (cross fault to another output) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Check wiring and connected devices.
E 785B	2	eSM module: Output CCM24V_OUT_B (cross fault to another output) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to another output.	Check wiring and connected devices.
E 785C	2	eSM module: Output AUXOUT2 (cross fault to 24V) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to 24V.	Check wiring and connected devices.
E 785D	2	eSM module: Output /INTERLOCK_OUT (cross fault to 24V) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to 24V.	Check wiring and connected devices.
E 785E	2	eSM module: Output RELAY_OUT_B (cross fault to 24V) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to 24V.	Check wiring and connected devices.
E 785F	2	eSM module: Output CCM24V_OUT_B (cross fault to 24V) Parameter `_SigLatched` Bit 23	Cross fault detection detected a cross fault to 24V.	Check wiring and connected devices.

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Error number	Error class	Description	Cause	Correctives
E 7861	2	eSM module: System error: Input ESMSTART_B Parameter _SigLatched Bit 23		
E 7862	2	eSM module: System error: Input SETUPENABLE_B Parameter _SigLatched Bit 23		
E 7863	2	eSM module: System error: Input SETUPMODE_B Parameter _SigLatched Bit 23		
E 7864	2	eSM module: System error: Input GUARD_B Parameter _SigLatched Bit 23		
E 7865	2	eSM module: System error: Input GUARD_ACK Parameter _SigLatched Bit 23		
E 7866	2	eSM module: System error: Input /INTERLOCK_IN_B Parameter _SigLatched Bit 23		
E 7867	2	eSM module: System error: Input /ESTOP_B Parameter _SigLatched Bit 23		
E 786A	4	eSM module: Undertemperature Parameter _SigLatched Bit 23	Temperature of the eSM too low.	Check ambient conditions.
E 786C	2	eSM module: Overvoltage ESM24VDC Parameter _SigLatched Bit 23	Voltage too high at the ESM24VDC.	Check power supply.
E 786D	4	eSM module: Parameter _SigLatched Bit 23	Temperature too high.	Check the ambient conditions. Verify that the flow of air is sufficient (pollution, objects).
E 786E	4	eSM module: System error: Operating states not identical Parameter _SigLatched Bit 23		
E 7870	4	eSM module: System error: Software versions not identical Parameter _SigLatched Bit 23		
E 7871	3	eSM module: Error during Safe Operating Stop (SOS) after error Parameter _SigLatched Bit 23	Motor movement during Safe Operating Stop (SOS).	
E 7872	4	eSM module: System error: Software incompatible with hardware Parameter _SigLatched Bit 23		
E 7873	1	eSM module: Error during deceleration to Safely Limited Speed (SLS) Parameter _SigLatched Bit 23	Velocity of drive greater than speed limit configured for eSM Safely Limited Speed (SLS).	Check speed limit and delay time for eSM Safely Limited Speed (SLS). Adapt the drive values for ramp and velocity, if necessary.

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Error number	Error class	Description	Cause	Correctives
E 7874	2	eSM module: Repeated error during Safe Operating Stop (SOS) Parameter `_SigLatched` Bit 23		
E 7875	4	eSM module: Repeated error during deceleration for Quick Stop Parameter `_SigLatched` Bit 23		
E 7876	3	eSM module: /INTERLOCK_IN not high (timeout if t_Relay = 2) Parameter `_SigLatched` Bit 23		
E 7877	2	eSM module: Input /INTERLOCK_IN is high even though Ignore has been configured Parameter `_SigLatched` Bit 23		
E 7878	2	eSM module: Speed limit for machine operating mode Setup Mode (eSM_v_maxSetup) higher than speed limit for machine operating mode Automatic Mode (eSM_v_maxAuto) Parameter `_SigLatched` Bit 23	Speed limit for machine operating mode Setup Mode must not be greater than speed limit for machine operating mode Automatic Mode.	Check the speed limits for machine operating modes Automatic Mode and Setup Mode and change them as required.
E 7879	4	eSM module: System error: Unknown state of eSM state machine Parameter `_SigLatched` Bit 23		
E 787A	2	eSM module: ESM24VDC undervoltage Parameter `_SigLatched` Bit 23	Voltage at the ESM24VDC connector to low.	Check power supply.
E 787D	4	eSM module: System error: Asynchronous communication (UART/SPI) Parameter `_SigLatched` Bit 23		
E 787E	4	eSM module: System error: RAM (bit) Parameter `_SigLatched` Bit 23		
E 787F	4	eSM module: Encoder signal error Parameter `_SigLatched` Bit 23	Encoder error or encoder cable error. Signal evaluation error in drive.	
E 7880	2	eSM module: Unknown service Parameter `_SigLatched` Bit 23		
E 7881	2	eSM module: Parameter does not exist Parameter `_SigLatched` Bit 23	Parameter does not exist.	Check the parameter number.
E 7882	4	eSM module: System error: 3_3V overvoltage Parameter `_SigLatched` Bit 23	Error in internal eSM power supply.	
E 7883	4	eSM module: System error: 3_3V undervoltage Parameter `_SigLatched` Bit 23	Error in internal eSM power supply.	

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Error number	Error class	Description	Cause	Correctives
E 7884	4	eSM module: System error: Temperature sensor Parameter _SigLatched Bit 23	Temperature sensor for CPU_A or CPU_B does not work properly.	
E 7886	2	eSM module: No speed limit for negative direction set for direction-dependent SLS Parameter _SigLatched Bit 23	Direction-dependent SLS is active, but no speed limit greater than 0 min^{-1} has been specified in the parameter eSM_v_maxSetup or in parameter eSM_SLSnegDirS.	Set a speed limit for direction-dependent SLS greater than 0 min^{-1} in the parameter _eSM_v_maxSetup or in the parameter eSM_SLSnegDirS or deactivate direction-dependent SLS via the parameter eSM_FuncSwitches.
E 7887	2	eSM module: Speed limit for SLS in negative direction has been specified, but direction-dependant SLS has not been activated Parameter _SigLatched Bit 23	Direction-dependent SLS is not active, but a speed limit for direction-dependent SLS in negative direction has been specified.	Set the speed limit for direction-dependent SLS in negative direction in parameter eSM_SLSnegDirS to 0 min^{-1} or activate direction-dependent SLS via the parameter eSM_FuncSwitches.
E 7900	4	Error detecting module in fieldbus slot Parameter _SigLatched Bit 21	Fieldbus module not correctly mounted in the slot. Unsupported fieldbus module inserted. Fieldbus module inoperative. EMC problems.	Replace fieldbus module. Improve EMC.
E 7901	4	Unknown type of fieldbus module detected in fieldbus slot Parameter _SigLatched Bit 21	The type of module detected in fieldbus slot is not supported by the drive.	Use supported type of fieldbus module. Refer to manual or catalog.
E 7903	3	Fieldbus module in slot 3 missing Parameter _SigLatched Bit 21	Fieldbus module has been removed or fieldbus module is inoperative.	Confirm or cancel HMI dialog box for fieldbus module replacement. Install a new fieldbus module.
E 7904	0	Parameter access error in fieldbus module	Fieldbus module parameter does not exist or cannot be written.	
E 7905	3	Fieldbus module in slot 3 has been changed. Parameter _SigLatched Bit 21	The fieldbus module has been replaced by another type of fieldbus module.	Confirm the new fieldbus module via the HMI dialog.
E 7906	0	Internal timeout in communication with fieldbus module	Problem in internal communication with fieldbus module. Fieldbus module inoperative. EMC problems.	Replace fieldbus module. Improve EMC.
E A060	2	Calculated velocity too high for operating mode Electronic Gear Parameter _SigLatched Bit 4	Gear ratio or reference velocity value too high	Reduce the gear ratio or reference velocity.
E A061	2	Position change in reference value for operating mode Electronic Gear too high Parameter _SigLatched Bit 4	Position reference change is too high. Error at signal input for reference value.	Reduce the resolution of the master. Check signal input for reference signal.
E A065	0	Parameters cannot be written Parameter _WarnLatched Bit 4	A data set is still active.	Wait until the currently active data set is terminated.

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Error number	Error class	Description	Cause	Correctives
E A067	1	Invalid value in data set (additional info = data set number (low byte) and entry (high byte)) Parameter `_SigLatched` Bit 4	Value not possible in data set.	See also parameter _MSM_error_num and _MSM_error_entry for additional information.
E A068	0	Offset positioning not possible Parameter `_WarnLatched` Bit 4	Operating mode Electronic Gear inactive or no gear mode selected.	Start operating mode Electronic Gear and/or select a gear mode.
E A069	0	Setting the offset position is not possible Parameter `_WarnLatched` Bit 4	If offset positioning is active, it is not possible to set the position offset.	Wait until current offset positioning has finished.
E A06B	2	Position deviation in operating mode Electronic Gear too high Parameter `_SigLatched` Bit 4	The position deviation has become excessively high due to a velocity limitation or the release of direction.	Check the velocity of the external reference values and the velocity limitation. Check the release of direction.
E A300	-	Braking procedure after HALT request still active	HALT was removed too soon. New command was sent before motor standstill was reached after a HALT request.	Wait for complete stop before removing HALT signal. Wait until motor has come to a complete standstill.
E A301	-	Drive in operating state Quick Stop Active	Error with error class 1 occurred. Drive stopped with Quick Stop.	
E A302	1	Stop by positive limit switch Parameter `_SigLatched` Bit 1	The positive limit switch was activated because movement range was exceeded, misoperation of limit switch or signal disturbance.	Check application. Check limit switch function and connection.
E A303	1	Stop by negative limit switch Parameter `_SigLatched` Bit 1	The negative limit switch was activated because movement range was exceeded, misoperation of limit switch or signal disturbance.	Check application. Check limit switch function and connection.
E A304	1	Stop by reference switch Parameter `_SigLatched` Bit 1		
E A305	-	Power stage cannot be enabled in the current operating state	Fieldbus: An attempt was made to enable the power stage in the operating state Not Ready To Switch On.	Refer to the state diagram.
E A306	1	Stop by user-initiated software stop Parameter `_SigLatched` Bit 3	Drive is in operating state Quick Stop Active due to a software stop request. The activation of a new operating mode is not possible, the error code is sent as the response to the activation command.	Clear break condition with command Fault Reset.
E A307	-	Interruption by internal software stop	In the operating mode Homing and Jog, the movement is internally interrupted by an internal software stop. The activation of a new operating mode is not possible, the error code is sent as the response to the activation command.	Clear break condition with command Fault Reset.

Error number	Error class	Description	Cause	Correctives
E A308	-	Drive is in operating state Fault or Fault Reaction Active	Error with error class 2 or higher occurred.	Check error code (HMI or commissioning software), remove error condition and clear error with command Fault Reset.
E A309	-	Drive not in operating state Operation Enabled	A command was sent that requires the drive to be in the operating state Operation Enabled was sent (for example, a command to change the operating mode).	Set drive to operating state Operation Enabled and repeat the command.
E A310	-	Power stage not enabled	Command cannot be used because the power stage is not enabled (operating state Operation Enabled or Quick Stop Active).	Set drive to an operating state in which the power stage is enabled, refer to the state diagram.
E A311	-	Operating mode change active	A start request for an operating mode has been received while a change of the operating mode was active.	Wait until the operating mode change has terminated before triggering a start request for another operating mode.
E A312	-	Profile generation interrupted		
E A313	-	Position overtraveled, reference point is therefore no longer defined (ref_ok=0)	The movement range limits were exceeded which resulted in a loss of the reference point. An absolute movement cannot be made before a new reference point is defined.	Define a new reference point by means of the operating mode Homing.
E A314	-	No reference point	Command needs a defined reference point (ref_ok=1).	Define a new reference point by means of the operating mode Homing.
E A315	-	Homing active	Command cannot be used while the operating mode Homing is active.	Wait until reference movement is finished.
E A316	-	Overflow during calculation of acceleration		
E A317	-	Motor is not at a standstill	Command sent which is not permissible when the motor is not at a standstill. For example: - Change of software limit switches - Change of handling of monitoring signals - Setting of reference point - Teach in of data set	Wait until the motor has come to a standstill (x_end = 1).
E A318	-	Operating mode active (x_end=0)	Activation of a new operating mode is not possible while the current operating mode is still active.	Wait until the command in the operating mode has finished (x_end=1) or terminate current operating mode with HALT command.
E A319	1	Manual tuning/Autotuning: Movement out of permissible range Parameter `_SigLatched` Bit 2	The movement exceeds the parameterized maximum permissible movement range.	Check permissible movement range value and time interval.
E A31A	-	Manual tuning/Autotuning: Amplitude/offset too high	Amplitude plus offset for tuning exceed internal velocity or current limitation.	Choose lower amplitude and offset values.

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Error number	Error class	Description	Cause	Correctives
E A31B	-	Halt requested	Command not permissible while Halt is requested.	Clear Halt request and repeat command.
E A31C	-	Invalid position setting with software limit switch	Value for negative (positive) software limit switch is greater (less) than value for positive (negative) software limit switch.	Set correct position values.
E A31D	-	Velocity range exceeded (parameter CTRL_v_max, M_n_max)	The velocity was set to a value greater than the maximum permissible velocity in parameter CTRL_v_max or M_n_max, whichever is lower.	If the value of parameter M_n_max is greater than the value of parameter CTRL_v_max, increase the value of parameter CTRL_v_max or reduce the velocity value.
E A31E	1	Stop by positive software limit switch Parameter `_SigLatched` Bit 2	Not possible to execute command because positive software limit switch was overtraveled.	Return to the permissible range.
E A31F	1	Stop by negative software limit switch Parameter `_SigLatched` Bit 2	Not possible to execute command because negative software limit switch was overtraveled.	Return to the permissible range.
E A320	par.	Following error Parameter `_SigLatched` Bit 8	External load or acceleration are too high.	Reduce external load or acceleration. Use a differently rated drive, if necessary. Error response can be adjusted via parameter ErrorResp_p_dif.
E A321	-	Invalid setting for RS422 position interface		
E A322	-	Error in ramp calculation		
E A323	3	System error: Processing error during generation of profile (see additional info for details)		
E A324	1	Error during homing (additional info = detailed error number) Parameter `_SigLatched` Bit 4	Homing movement was stopped by an error, the detailed reason is indicated by the additional info in the error buffer.	Possible sub error codes: E A325, E A326, E A327, E A328 or E A329.
E A325	1	Limit switch to be approached not enabled Parameter `_SigLatched` Bit 4	Homing to positive limit switch or negative limit switch is disabled.	Enable limit switch via 'IOsigLimP' or 'IOsigLimN'.
E A326	1	Reference switch not found between positive limit switch and negative limit switch Parameter `_SigLatched` Bit 4	Reference switch inoperative or not correctly connected.	Check the function and wiring of the reference switch.
E A329	1	More than one signal positive limit switch/negative limit switch/reference switch signal active Parameter `_SigLatched` Bit 4	Reference switch or limit switch not connected correctly or supply voltage for switches too low.	Check the wiring and 24VDC supply voltage.

Error number	Error class	Description	Cause	Correctives
E A32A	1	Positive limit switch triggered with negative direction of movement Parameter _SigLatched Bit 4	Start reference movement with negative direction (for example reference movement to negative limit switch) and activate the positive limit switch (switch in opposite direction of movement).	Check correct connection and function of limit switch. Activate a jog movement with negative movement (target limit switch must be connected to the negative limit switch).
E A32B	1	Negative limit switch triggered with positive direction of movement Parameter _SigLatched Bit 4	Start reference movement with positive direction (for example reference movement to positive limit switch) and activate the negative limit switch (switch in opposite direction of movement).	Check correct connection and function of limit switch. Activate a jog movement with positive movement (target limit switch must be connected to the positive limit switch).
E A32C	1	Reference switch error (switch signal briefly enabled or switch overtraveled) Parameter _SigLatched Bit 4	Switch signal disturbance. Motor subjected to vibration or shock when stopped after activation of the switch signal.	Check supply voltage, cabling and function of switch. Check motor reaction after stopping and optimize controller settings.
E A32D	1	Positive limit switch error (switch signal briefly enabled or switch overtraveled) Parameter _SigLatched Bit 4	Switch signal disturbance. Motor subjected to vibration or shock when stopped after activation of the switch signal.	Check supply voltage, cabling and function of switch. Check motor reaction after stopping and optimize controller settings.
E A32E	1	Negative limit switch error (switch signal briefly enabled or switch overtraveled) Parameter _SigLatched Bit 4	Switch signal disturbance. Motor subjected to vibration or shock when stopped after activation of the switch signal.	Check supply voltage, cabling and function of switch. Check motor reaction after stopping and optimize controller settings.
E A32F	1	Index pulse not found Parameter _SigLatched Bit 4	Index pulse signal not connected or not working properly.	Check index pulse signal and connection.
E A330	0	Reference movement to index pulse cannot be reproduced. Index pulse is too close to the switch Parameter _WarnLatched Bit 4	The position difference between the index pulse and the switching point is insufficient.	Increase the distance between the index pulse and the switching point. If possible, the distance between the index pulse and the switching point should be a half motor revolution.
E A332	1	Jog error (additional info = detailed error number) Parameter _SigLatched Bit 4	Jog movement was stopped by error.	For additional info, check the detailed error number in the error buffer.
E A333	3	System error: Invalid internal selection		
E A334	2	Timeout Standstill Window monitoring	Position deviation after movement greater than standstill window. This may have been caused by an external load.	Check load. Check settings for standstill window (parameter MON_p_win, MON_p_winTime and MON_p_winTout). Optimize controller settings.
E A336	1	System error: Jerk limitation with position offset after end of movement (additional info = offset in Inc.)		

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Error number	Error class	Description	Cause	Correctives
E A337	0	Operating mode cannot be continued Parameter _WarnLatched Bit 4	Continuation of interrupted movement in operating mode Profile Position is not possible because another operating mode had been active in the meantime. In the operating mode Motion Sequence, continuation is not possible if a motion blend was interrupted.	Restart the operating mode.
E A338	0	Operating mode unavailable Parameter _WarnLatched Bit 4	The selected operating mode is not available.	
E A33A	0	Reference point is not defined (ref_ok=0) Parameter _WarnLatched Bit 4	No reference point defined by means of operating mode Homing. Reference position lost because the movement range has been left. Motor does not have an absolute encoder.	Use operating mode Homing to define a reference point. Use a motor with an absolute encoder.
E A33C	0	Function not available in current operating mode Parameter _WarnLatched Bit 4	Activation of a function which is not available in the current operating mode. Example: Start of backlash compensation while autotuning/manual tuning is active.	
E A33D	0	Motion blend is already active Parameter _WarnLatched Bit 4	Change of motion blend during the current motion blend (end position of motion blend not yet reached)	Wait for the motion blend to complete before setting the next position.
E A33E	0	No movement activated Parameter _WarnLatched Bit 4	Activation of a motion blend without movement.	Start a movement before the motion blend is activated.
E A33F	0	Position of motion blend movement not in the range of the active movement Parameter _WarnLatched Bit 4	The position of the motion blend is outside of the current movement range.	Check the position of the motion blend and the current movement range.
E A340	1	Error in operating mode Motion Sequence (additional info = detailed error number) Parameter _SigLatched Bit 4	The operating mode Motion Sequence was stopped by an error. Check the error memory for details on the error.	Verify the error by checking the additional error information.
E A341	0	Position of motion blend has already been passed Parameter _WarnLatched Bit 4	The current movement has passed beyond the position of the motion blend.	
E A342	1	Target velocity was not reached at motion blend position. Parameter _SigLatched Bit 4	The position of the motion blend was overtraveled, the target velocity was not reached.	Reduce the ramp velocity so that the target velocity is reached at the position of the motion blend.
E A343	0	Processing only possible with linear ramp Parameter _WarnLatched Bit 4	Motion blend position was set with a non-linear ramp.	Set a linear ramp type.

Error number	Error class	Description	Cause	Correctives
E A344	3	Maximum position deviation between motor encoder and machine encoder exceeded Parameter `_SigLatched` Bit 8	Incorrect or damaged encoder cable. Machine encoder not connected or not supplied correctly. Different counting directions of motor encoder and machine encoder. Wrong setting of resolution factors (numerator or denominator) of machine encoder.	Check encoder connection. Check parameterization of machine encoder.
E A347	0	Threshold for position deviation warning reached Parameter `_WarnLatched` Bit 8	External load or acceleration are too high.	Reduce external load or acceleration. Threshold can be adjusted via the parameter MON_p_dif_warn.
E A348	1	No analog reference value source selected Parameter `_SigLatched` Bit 4	No analog reference value selected	Select an analog reference value source.
E A349	-	Position setting exceeds system limits	Position scaling of POSscaleDenom and POSscaleNum results in a scaling factor that is too small.	Change POSscaleDenom and POSscaleNum in such a way as to increase the resulting scaling factor.
E A34A	-	Velocity setting exceeds system limits	The velocity scaling of 'VELscaleDenom' and 'VELscaleNum' results in a scaling factor that is too small. The velocity has been set to a value greater than the maximum possible velocity (the maximum velocity is 13200 rpm).	Change 'VELscaleDenom' and 'VELscaleNum' in such a way as to increase the resulting scaling factor.
E A34B	-	Ramp setting exceeds system limits	The ramp scaling of 'RAMPscaleDenom' and 'RAMPscaleNum' results in a scaling factor that is too small.	Change of 'RAMPscaleDenom' and 'RAMPscaleNum' in such a way as to increase the resulting scaling factor.
E A34C	-	Resolution of scaling too high (range exceeded)		
E A34D	-	The function is not possible when Modulo is active.	The function cannot be executed when Modulo is active.	Deactivate Modulo to use the function.
E A34E	-	Target value for absolute movement not possible with defined modulo range and modulo handling.	If parameter 'MOD_Absolute' is set to: Shortest Distance: Target value is not in defined modulo range. Positive Direction: Target value is less than parameter 'MOD_Min'. Negative Direction: Target value is greater than parameter 'MOD_Max'.	Set a correct target value for absolute movement.
E A34F	-	Target position outside of modulo range. Corresponding movement within range performed instead.	The current setting of parameter 'MOD_AbsMultiRng' only allows for a movement within the modulo range.	Change the parameter 'MOD_AbsMultiRng' to allow for movements beyond the modulo range.

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Error number	Error class	Description	Cause	Correctives
E A350	1	Change for jerk filter input position too great Parameter `_SigLatched` Bit 4	Operating mode Electronic Gear with processing method 'Position synchronization with compensation movement' has been activated which resulted in a position change greater than 0.25 revolutions.	Deactivate jerk filter processing for Electronic Gear or use processing method 'Position synchronization without compensation movement'.
E A351	1	Function cannot be executed with the current position scaling factor Parameter `_SigLatched` Bit 4	The positions scaling factor is set to a value less than 1rev/ 131072usr_p, which is less than the internal resolution. In the operating mode Cyclic Synchronous Position, the resolution is not set to 1rev/ 131072usr_p.	Use a different position scaling factor or deactivate the selected function.
E A355	1	Error during relative movement after capture (additional info = detailed error number) Parameter `_SigLatched` Bit 4	Movement was stopped by error.	Check the error memory or the parameter _LastError_Qual for additional information.
E A356	0	Function Relative Movement After Capture not assigned to a digital input.		Assign the function Relative Movement After Capture to a digital input.
E A357	-	Braking procedure still active	Command is not permissible when a braking procedure is active.	Wait until motor has come to a complete standstill.
E A358	1	Target position overtraveled with function Relative Movement After Capture Parameter `_SigLatched` Bit 4	Stopping distance too small or velocity too high at the point in time of the capture event.	Reduce the velocity.
E A359	0	Request cannot be processed since the relative movement after capture is still active		
E A35A	1	Selected data set cannot be started Parameter `_SigLatched` Bit 4	The data set with the selected number is not available.	Check the number of available data sets.
E A35B	0	Modulo cannot be activated Parameter `_WarnLatched` Bit 4	The set operating mode does not support Modulo.	
E A35C	1	Movement to new reference position is not possible after a limit switch has been triggered and a Fault Reset has been performed.	The difference between the actual position and the reference position is too great.	
E B100	0	RS485/Modbus: Unknown service Parameter `_WarnLatched` Bit 5	Unsupported Modbus service was received.	Check application on the Modbus master.
E B101	1	Incorrect I/O data configuration (additional info=Modbus register address) Parameter `_SigLatched` Bit 21	The I/O data configuration or the Modbus I/O scanning configuration contains an invalid parameter.	Check the configuration of the I/O data.
E B102	1	Fieldbus module: General error Parameter `_SigLatched` Bit 21		

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Error number	Error class	Description	Cause	Correctives
E B103	2	Fieldbus module: Controlling communication channel has been closed Parameter _SigLatched Bit 21		
E B104	2	Fieldbus module: Internal communication error Parameter _SigLatched Bit 21		
E B105	2	Fieldbus module: I/O data timeout Parameter _SigLatched Bit 21		
E B106	2	Fieldbus module: I/O data mapping error Parameter _SigLatched Bit 21		
E B107	4	Fieldbus module: EEPROM error in module Parameter _SigLatched Bit 21		
E B108	1	Fieldbus module: Active IOC physical layer does not match the IOC physical layer of the detected fieldbus module. Parameter _SigLatched Bit 21	The manufacturer data has been stored with a physical layer different from the physical layer normally used by the module.	Contact Technical Support.
E B109	4	Fieldbus module: Synchronization heartbeat lost between module and drive Parameter _SigLatched Bit 21		
E B120	2	Cyclic communication: Incorrect cycle time Parameter _SigLatched Bit 21	The drive does not support the configured cycle time or the difference between the measured cycle time and the configured cycle time is too great.	Change the cycle time in the master controller to a cycle time supported by the drive or check synchronization requirements.
E B121	2	Cyclic communication: Synchronization signal missing Parameter _SigLatched Bit 21	Two cycles have passed without a synchronization signal having been received.	Analyze the communication.
E B122	2	Cyclic communication: Incorrect synchronization Parameter _SigLatched Bit 21	One signal was missing and expected second signal was received at an incorrect point in time. The master controller may be unable to provide the required synchronization signals at the current cycle time, for example, due to insufficient computing power.	Analyze the communication or increase the cycle time.
E B123	2	Cyclic communication: The selected cycle time tolerance is too high. Parameter _SigLatched Bit 21	The cycle time tolerance may not exceed one quarter of the set cycle time.	Enter a correct value.
E B124	0	Cyclic Communication: Drive is not synchronous with master cycle. Parameter _WarnLatched Bit 21	Operating mode has been activated but drive is not synchronized to external synchronization signal.	After having started the synchronization mechanism, wait for 120 cycles before activating the operating mode.
E B200	0	RS485/Modbus: Protocol error Parameter _WarnLatched Bit 5	Logical protocol error: Wrong length or unsupported subfunction.	Check application on the Modbus master.

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Error number	Error class	Description	Cause	Correctives
E B201	2	RS485/Modbus: Connection monitoring error Parameter `_SigLatched` Bit 5	Connection monitoring has detected an interruption of the connection.	Check all connections and cables used for data exchange. Verify that the device is on.
E B202	0	RS485/Modbus: Connection monitoring warning Parameter `_WarnLatched` Bit 5	Connection monitoring has detected an interruption of the connection.	Check all connections and cables used for data exchange. Verify that the device is on.
E B203	0	RS485/Modbus: Incorrect number of monitor objects Parameter `_WarnLatched` Bit 5		
E B700	0	Drive Profile Lexium: On activation of the profile, no dmControl, refA or refB has been mapped.	dmControl, refA or refB have not been mapped.	dmControl, refA or refB must be mapped.
E B702	1	Insufficient velocity resolution due to velocity scaling	Due to the configured velocity scaling, the velocity resolution in REFA16 is insufficient.	Change the velocity scaling.

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10 Parameters

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

Unsuitable parameter values may trigger unintended movements or signals, damage parts and disable monitoring functions.

⚠ WARNING

UNINTENDED BEHAVIOR CAUSED BY PARAMETERS

- Never change a parameter unless you understand its meaning.
- Only start the system if there are no persons or obstructions in the hazardous area.
- 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.

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10.1 Representation of the parameters

The way parameters are shown provides information required for unique identification, the default values and the properties of a parameter.

Structure of the parameter representation:

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
ABCDE ConF → InF - Prn	Short description (cross reference) Selection values **1 / Abc1 / AbC1** : Explanation 1 **2 / Abc2 / AbC2** : Explanation 2 Description and details	A_{pk} 0.00 3.00 300.00	UINT32 R/W per. -	Fieldbus 1234:5_h

Parameter name The parameter name uniquely identifies a parameter.

HMI menu HMI menu shows the sequence of menus and commands to access the parameter via the HMI.

Description

Short description (cross reference)
The short description contains information on the parameter and a cross reference to the page that describes the use of the parameter.

Selection values:
In the case of parameters which offer a selection of settings, the value to be entered via the fieldbus and the designation of the value for entry via the commissioning software and the HMI are specified.
1 = Value for input via fieldbus
Abc1 = Designation for entry via the commissioning software
AbC1 = Designation for entry via the HMI

Further description and details
Provides further information on the parameter.

Unit The unit of the value.

Minimum value The minimum value which can be entered.

Factory setting Factory settings when the product is shipped

Maximum value The maximum value which can be entered.

Data type If the minimum and the maximum values are not explicitly indicated, the valid range of values is determined by the data type.

Data type	Byte	Minumum value	Maximum value
INT8	1 Byte / 8 Bit	-128	127
UINT8	1 Byte / 8 Bit	0	255
INT16	2 Byte / 16 Bit	-32768	32767
UINT16	2 Byte / 16 Bit	0	65535
INT32	4 Byte / 32 Bit	-2147483648	2147483647
UINT32	4 Byte / 32 Bit	0	4294967295

R/W Indicates read and/or write values

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"R/" values can only be read
"R/W" values can be read and written.

Persistent

"per." indicates whether the value of the parameter is persistent, i.e. whether it remains in the memory after the device is switched off .

When a value is entered via the HMI, the device stores the value of the parameter automatically each time it is changed.

When changing a value via commissioning software or fieldbus, the user must explicitly store the changed value in the persistent memory.

NOTE: Parameters for the safety module eSM are modified using the commissioning software. The parameter values are saved persistently after transfer. Explicit saving to the persistent memory is not required in the case of the eSM module.

10.1.1 Decimal numbers for fieldbus

Entering values

Please note that parameter values are entered via the fieldbus without a decimal point. All decimal places must be entered.

Input examples:

Value	Commissioning software	Fieldbus
20	20	20
5.0	5.0	50
23.57	23.57	2357
1.000	1.000	1000

10.2 List of parameters

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-0011	Class 1 diagnostic (C1D) This parameter provides information on detected errors. A class 1 diagnostics error leads to a Quick Stop (with transition to operating state Fault). Type: Hexadecimal - 2 bytes Write access: Read only	- 0 0 65535	R/- - -	S-0-0011
S-0-0012	Class 2 diagnostic (C2D) This parameter provides information on warnings. Type: Hexadecimal - 2 bytes Write access: Read only	- 0 0 65535	R/- - -	S-0-0012
S-0-0014	Interface Status This parameter contains the status of the SERCOS interface. Type: Binary - 2 bytes Write access: Read only Class name: SCP_VarCFG	- 0 0 16383	R/- - -	S-0-0014
S-0-0017	IDN-list of all operation data This parameter contains all procedure commands and parameters supported by the drive. Type: IDN - 4 bytes (variable length) Write access: Read only Class name: GDP_Basic	- - - -	R/- - -	S-0-0017
S-0-0021	IDN list of invalid operation data for CP2 This parameter contains an IDN list with IDNs which are considered invalid by the drive when it performs the CP3 transition check (S-0-0127). Type: IDN - 4 bytes (variable length) Write access: Read only Class name: SCP_VarCFG, SCP_Diag	- - - -	R/- - -	S-0-0021
S-0-0022	IDN list of invalid operation data for CP3 This parameter contains an IDN list with IDNs which are considered invalid by the drive when it performs the CP4 transition check (S-0-0128). Type: IDN - 4 bytes (variable length) Write access: Read only Class name: SCP_VarCFG, SCP_Diag	- - - -	R/- - -	S-0-0022

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-0032	Primary Operation Mode This parameter sets the primary operating mode of the drive. The operating mode is started via bits 8, 9 and 10 in the parameter Drive Control (S-0-0134). The active operating mode is indicated by bits 8, 9 and 10 in the status word (S-0-0135). Type: Hexadecimal - 2 bytes Write access: CP2, CP3	- 3 3 3	R/W - -	S-0-0032
S-0-0033	Secondary Operation Mode 1 This parameter sets the secondary operating mode 1 of the drive. The operating mode is started via bits 8, 9 and 10 in the parameter Drive Control (S-0-0134). The active operating mode is indicated by bits 8, 9 and 10 in the status word (S-0-0135). Type: Hexadecimal - 2 bytes Write access: CP2, CP3	- 2 2 2	R/W - -	S-0-0033
S-0-0034	Secondary Operation Mode 2 This parameter sets the secondary operating mode 2 of the drive. The operating mode is started via bits 8, 9 and 10 in the parameter Drive Control (S-0-0134). The active operating mode is indicated by bits 8, 9 and 10 in the status word (S-0-0135). Type: Hexadecimal - 2 bytes Write access: CP2, CP3	- 1 1 1	R/W - -	S-0-0034
S-0-0047	Position Command Value This parameter contains the target values for operating modes with position target values. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4	- -2147483648 - 2147483647	R/W - -	S-0-0047
S-0-0051	Position Feedback Value 1 (motor feedback) This parameter contains the position data of the motor encoder. Type: Signed decimal - 4 bytes Write access: Read only	- -2147483648 - 2147483647	R/- - -	S-0-0051
S-0-0099	Reset class 1 diagnostic If this procedure command is received by the drive via the service channel, the detected errors, the error bits and the shut-down mechanism are cleared. Type: Binary - 2 bytes Write access: CP2, CP3, CP4 Class name: GDP_Basic	- 0 0 7	R/W - -	S-0-0099

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`S-0-0127`	CP3 transition check This procedure command instructs the drive to verify that all parameters necessary for CP3 have been transferred. If an error is detected, parameter S-0-0021 contains the appropriate IDNs. After correct termination of the command by the master, the master can activate CP3. Type: Binary - 2 bytes Write access: CP2, CP3, CP4 Class name: SCP_VarCFG	- 0 - 3	R/W - -	S-0-0127
`S-0-0128`	CP4 transition check This procedure command instructs the drive to verify that all parameters necessary for CP4 have been transferred. If an error is detected, parameter S-0-0022 contains the appropriate IDNs. After correct termination of the command by the master, the master can activate CP4. Type: Binary - 2 bytes Write access: CP2, CP3, CP4 Class name: SCP_VarCFG	- 0 - 3	R/W - -	S-0-0128
`S-0-0134`	Drive Control This parameter contains the control word. Type: Hexadecimal - 2 bytes Write access: CP2, CP3, CP4	- 0 - 65535	R/W - -	S-0-0134
`S-0-0135`	Drive Status This parameter contains the status word of the AT. It can be used for diagnostics purpo-ses. Type: Hexadecimal - 2 bytes Write access: Read only	- 0 - 65535	R/- - -	S-0-0135
`S-0-0148`	Drive controlled homing procedure com-mand This parameter starts homing with the hom-ing method settings made in the drive objects. See the product manual for details on homing. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4	- 0 - 3	R/W - -	S-0-0148
`S-0-0187`	IDN list of configurable data as producer This parameter contains a list of all IDNs with operation data (feedback values) which can be cyclically processed by the drive. Type: IDN - 4 bytes (variable length) Write access: Read only Class name: SCP_VarCFG	- - - -	R/- - -	S-0-0187

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-0188	IDN list of configurable data as consumer This parameter contains a list of all IDNs with operation data command values) which can be cyclically processed by the drive. Type: IDN - 4 bytes (variable length) Write access: Read only Class name: SCP_VarCFG	- - - -	R/- - -	S-0-0188
S-0-0390	Diagnostic number The operation data of this parameter contains detailed information on the diagnostics event with the highest priority which is currently active in the drive. Type: Hexadecimal - 4 bytes Write access: Read only Class name: GDP_Basic	- 0 0 4294967295	R/- - -	S-0-0390
S-0-1000.0.0	SCP Type & Version This parameter contains a list of the SERCOS communication capabilities/communication classes and the appropriate version supported by the drive. Type: Hexadecimal - 2 bytes (variable length) Write access: Read only Class name: SCP_VarCFG	- - - -	R/- - -	S-0-1000.0.0
S-0-1002	Communication Cycle time (tScyc) This parameter specifies the intervals at which the cyclic real-time data is transmitted. Possible values are 1000 μs, 2000 μs and 4000 μs. Type: Unsigned decimal - 4 bytes Write access: CP2 Class name: SCP_VarCFG In increments of 0.001 μs.	μs 1000.000 1000.000 4000.000	R/W - -	S-0-1002
S-0-1003	Allowed MST losses in CP3/CP4 This parameter specifies the maximum number of successive communication cycles during which a drive is permitted to not receive the MST in CP3 and CP4. Type: Unsigned decimal - 4 bytes Write access: CP2 Class name: SCP_VarCFG	- 0 2 65535	R/W - -	S-0-1003

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-1005	Minimum feedback processing time (t5) This parameter specifies the time required by the drive for receiving and processing actual values (such as encoder or touch probe data) and providing them in ATs. Type: Unsigned decimal - 4 bytes Write access: Read only Class name: SCP_Sync In increments of 0.001 µs.	µs - - -	R/- - -	S-0-1005
S-0-1006	AT0 transmission starting time (t1) This parameter specifies the nominal time interval between the end of MST and the beginning of AT0. Type: Unsigned decimal - 4 bytes Write access: CP2 Class name: SCP_Sync In increments of 0.001 µs.	µs - - -	R/W - -	S-0-1006
S-0-1007	Synchronisation Time (tSync) This parameter specifies the point in time at which all producer cycle times (producing and consuming connections) in a drive are synchronized. This value is set by the master. It must be less than the value for the synchronization cycle time. The synchronization cycle time is the least common multiple of all producer cycle times (tPcyc) to be synchronized in the network. Type: Unsigned decimal - 4 bytes Write access: CP2 Class name: SCP_Sync In increments of 0.001 µs.	µs 0 - 4294967.295	R/W - -	S-0-1007
S-0-1008	MDT Command value valid time (t3) This parameter determines the point in time at which the drive is permitted to access the new reference values, related to the synchronization time. Type: Unsigned decimal - 4 bytes Write access: CP2 Class name: SCP_Sync In increments of 0.001 µs.	µs 0 - 4000.000	R/W - -	S-0-1008
S-0-1009	Device Control Offset in MDT This parameter specifies the MDT number and the position within the specified MDT for device control. This parameter is transferred by the master to each drive during CP2 and becomes effective in the master and drive in CP3. Type: Hexadecimal - 2 bytes Write access: CP2 Class name: SCP_VarCFG	- 0 - 1492	R/W - -	S-0-1009

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-1010	Lengths of MDTs This parameter contains the lengths of the four possible MDTs in octets. These values are required for the initialization of the SER-COS hardware. Type: Unsigned decimal - 2 bytes (variable length) Write access: CP2 Class name: SCP_VarCFG	- 0 - 1494	R/W - -	S-0-1010
S-0-1011	Device Status Offset in AT This parameter specifies the position of the status field of the drive in the AT in octets. This parameter is transferred by the master to each drive during CP2 and becomes effective in the master and drive in CP3. Type: Hexadecimal - 2 bytes Write access: CP2 Class name: SCP_VarCFG	- 0 - 1492	R/W - -	S-0-1011
S-0-1012	Length of Ats This parameter contains the lengths of the four possible ATs in octets. These values are required for the initialization of the SER-COS hardware. Type: Unsigned decimal - 2 bytes (variable length) Write access: CP2 Class name: SCP_VarCFG	- 0 - 1494	R/W - -	S-0-1012
S-0-1013	SVC offset in MDT This parameter specifies the position of the service channel in the MDT for the drive. This parameter is transferred by the master to each drive during CP2 and becomes effective in CP3. Type: Unsigned decimal - 2 bytes Write access: CP2 Class name: SCP_VarCFG	- 0 - 1484	R/W - -	S-0-1013
S-0-1014	SVC offset in AT This parameter specifies the position of the service channel in the AT for the drive. This parameter is transferred by the master to each drive during CP2 and becomes effective in CP3. Type: Unsigned decimal - 2 bytes Write access: CP2 Class name: SCP_VarCFG	- 0 - 1484	R/W - -	S-0-1014

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`S-0-1015`	Ring delay This parameter contains the entire ring delay determined by the master. The master assigns this value to the drives. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Class name: SCP_Sync In increments of 0.001 µs.	µs 0 - 1048.575	R/W - -	S-0-1015
`S-0-1016`	Slave delay (P/S) This parameter contains the slave delay. After the master has assigned the ring delay (S-0-1015) to the slaves, the slaves measure their own delay (SYNCCNT-P/SYNCCNT-S) when the procedure command S-0-1024 is executed. Type: Unsigned decimal - 4 bytes (variable length) Write access: Read only Class name: SCP_Sync In increments of 0.001 µs.	µs 0 - 4294967.296	R/- - -	S-0-1016
`S-0-1017`	NRT transmission time This parameter contains the NRT transmission time. Type: Hexadecimal - 1 byte (variable length) Write access: Read only Class name: SCP_VarCFG	µs 0 650000 4000000	R/- - -	S-0-1017
`S-0-1019`	MAC Address The drive writes its MAC address to this parameter. Type: Unsigned decimal - 1 byte (variable length) Write access: CP2, CP3, CP4 Class name: SCP_NRT	- - - -	R/W - -	S-0-1019
`S-0-1020`	Current IP address This parameter contains the IP address of the SERCOS III interface of the drive. The master can change the IP address by writing this parameter. Type: Unsigned decimal - 1 byte (variable length) Write access: CP2, CP3, CP4 Class name: SCP_NRT	- - - -	R/W - -	S-0-1020

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-1021	Subnet Mask This parameter contains the subnet mask. The master can change the subnet mask for IP communication via the NRT channel. Type: Unsigned decimal - 1 byte (variable length) Write access: CP2, CP3, CP4 Class name: SCP_NRT	- - - -	R/W - -	S-0-1021
S-0-1022	Gateway address This parameter contains the gateway address. The master can change the gate-way address for IP communication via the NRT channel. Type: Unsigned decimal - 1 byte (variable length) Write access: CP2, CP3, CP4 Class name: SCP_NRT	- - - -	R/W - -	S-0-1022
S-0-1023	SYNC jitter This parameter contains the maximum syn-chronization jitter. The synchronization jitter is used by the drive to calculate the MST window (2 x synchronization jitter). This parameter is transmitted to all drives sup-porting SCP_Sync. Type: Unsigned decimal - 4 bytes Write access: CP2 Class name: SPC_Sync In increments of 0.001 μs.	μs - - -	R/W - -	S-0-1023
S-0-1024	SYNC delay measuring procedure com-mand This procedure command causes the drive to determine its slave delay (S-0-1016) depending on the ring delay (S-0-1015). Type: Binary - 2 bytes Write access: CP2, CP3, CP4 Class name: SCP_Sync	- 0 0 3	R/W - -	S-0-1024
S-0-1026	Version of communication hardware This parameter contains the SERCOS III-specific communication hardware identifica-tion. Type: Text - 1 byte (variable length) Write access: Read only Class name: SCP_VarCFG	- - - -	R/- - -	S-0-1026
S-0-1027.0.1	Requested MTU The requested MTU specifies the maximum number of octets that can be sent via the NRT channel by higher layers. Type: Unsigned decimal - 2 bytes Write access: CP2 Class name: SCP_NRT	- 46 - 1500	R/W - -	S-0-1027.0.1

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-1027.0.2	Effective MTU This parameter contains the current MTU. The current MTU is calculated using the parameters S-0-1017 and S-0-1027.0. Type: Unsigned decimal - 2 bytes Write access: Read only Class name: SCP_NRT	- 46 - 1500	R/- - -	S-0-1027.0.2
S-0-1028	Error counter MST P/S This parameter is an error counter which is incremented if no valid MST is received at port 1 or port 2 during CP 3 and CP4. Type: Unsigned decimal - 2 bytes Write access: Read only Class name: SCP_Diag	- 0 0 65535	R/- - -	S-0-1028
S-0-1031	Test pin assignment Port 1 & Port 2 This parameter is used to assign communication-related hardware signals to the test pins TS1 and TS2. Type: Binary - 2 bytes Write access: CP2, CP3, CP4 Class name: SCP_Diag	- 0 0 3855	R/W - -	S-0-1031
S-0-1035	Error counter Port1 and Port2 This parameter is an error counter which counts the detected Ethernet errors. Type: Hexadecimal - 4 bytes Write access: CP2, CP3, CP4 Class name: SCP_VarCFG	- 0 0 65535	R/W - -	S-0-1035
S-0-1040	SERCOS address This parameter contains the SERCOS device address assigned to the drive. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Class name: SCP_VarCFG	- 0 0 511	R/W - -	S-0-1040
S-0-1040.0.128	Topology address This parameter contains the topology address of the drive (physical position in the network). This address is independent of the SERCOS address. This parameter is a manufacturer-specific extension of the standard parameter. Type: IDN - 2 bytes Write access: Read only	- 0 0 511	R/- - -	S-0-1040.0.128

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-1041	AT Command value valid time (t9) This parameter determines the point in time at which the drive is permitted to access the new reference values from the AT. Type: Unsigned decimal - 4 bytes Write access: CP2 Class name: SCP_Sync In increments of 0.001 µs.	µs 0 - 4000.000	R/W - -	S-0-1041
S-0-1044	Device Control This parameter contains the control information (for example, topology control, fast-forward, loopback, physical topology, ring, etc.) set by the master and evaluated by the drive. Type: Hexadecimal - 2 bytes Write access: Read only Class name: SCP_Diag	- - - -	R/- - -	S-0-1044
S-0-1045	Device Status This parameter contains the status information (for example, topology status, fast-forward, loopback, physical topology, ring, etc.) set by the drive and evaluated by the master. Type: Hexadecimal - 2 bytes Write access: Read only Class name: SCP_Diag	- - - -	R/- - -	S-0-1045
S-0-1046	List of SERCOS addresses in device If a device comprises multiple SERCOS slaves, this parameter contains the SERCOS addresses of the slaves that participate in the communication. Type: Unsigned decimal - 2 bytes (variable length) Write access: Read only Class name: SCP_VarCFG	- 1 1 1	R/- - -	S-0-1046
S-0-1050.x.01	Connection setup This parameter is used to configure connections. Type: Hexadecimal - 2 bytes Write access: CP2 Class name: SCP_VarCFG, SCP_Sync, SCP_WDCon	- 0 8218 65535	R/W - -	S-0-1050.x.01
S-0-1050.x.02	Connection Number The connection number is used to identify a connection. The producer and all consumers of the same connection have the same connection number. Type: Unsigned decimal - 2 bytes Write access: CP2 Class name: SCP_VarCFG	- 0 0 65535	R/W - -	S-0-1050.x.02

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-1050.x.03	Telegram Assignment This parameter contains the telegram type (MDT or AT), the telegram number and the telegram offset of connection control for this connection. Type: Hexadecimal - 2 bytes Write access: CP2 Class name: SCP_VarCFG	- 0 0 15828	R/W - -	S-0-1050.x.03
S-0-1050.x.04	Max. Length Of Connection This parameter specifies the maximum length of this connection. Type: Unsigned decimal - 2 bytes Write access: Read only Class name: SCP_VarCFG	- 2 2 200	R/- - -	S-0-1050.x.04
S-0-1050.x.05	Current length of connection This parameter specifies the current length of this connection. Type: Unsigned decimal - 2 bytes Write access: Read only Class name: SCP_VarCFG	- 2 2 200	R/- - -	S-0-1050.x.05
S-0-1050.x.06	Configuration List If the connection data is configured via IDNs (type of connection, bit 5-4 = 00, in S-0-1050.x.01), this parameter contains the list of IDNs within this connection. Type: IDN - 4 bytes (variable length) Write access: CP2 Class name: SCP_VarCFG	- - - -	R/W - -	S-0-1050.x.06
S-0-1050.x.08	Connection Control (C-Con) This parameter contains the image of the control word C-Con of this connection. Type: Unsigned decimal - 4 bytes Write access: CP2 Class name: SCP_Diag In increments of 0.001 .	- - - -	R/W - -	S-0-1050.x.08
S-0-1050.x.10	Producer Cycle Time This parameter contains the producer cycle time. The producer cycle time should be an integer multiple of the communication cycle time. Type: Unsigned decimal - 2 bytes Write access: CP2 Class name: SCP_Sync, SCP_WDCon	µs 31250 1000000 4294967296	R/W - -	S-0-1050.x.10

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-1050.x.11	Allowed Data Losses This parameter specifies the maximum amount of consecutive producer data that may be lost before a connection is closed. Type: Unsigned decimal - 2 bytes Write access: Read only Class name: SCP_Sync, SCP_WDCon	- 1 1 65535	R/- - -	S-0-1050.x.11
S-0-1050.x.12	Error Counter Data Losses This parameter is a counter which counts the amount of producer data lost. Type: Hexadecimal - 2 bytes (variable length) Write access: Read only Class name: SCP_Sync, SCP_Diag	- 0 0 65535	R/- - -	S-0-1050.x.12
S-0-1051.0.0	Image of connection setups This parameter contains the actual state of all the connections of the drive, corresponding to the parameter S-0-1050.x.1. Type: Unsigned decimal - 4 bytes (variable length) Write access: CP2 Class name: SCP_VarCFG In increments of 0.001 .	- - - -	R/W - -	S-0-1051.0.0
S-0-1300.0.02	Vendor Name This parameter contains the vendor-specific name of the device. Type: Text - 1 byte (variable length) Write access: Read only Class name: GDP_Id	- - - -	R/- - -	S-0-1300.0.02
S-0-1300.0.03	Vendor Code This parameter contains the vendor code. The vendor code is a unique number assigned to each vendor and helps to identify a SERCOS device. Type: Unsigned decimal - 2 bytes Write access: Read only Class name: GDP_Basic	- 1 1 1	R/- - -	S-0-1300.0.03
S-0-1300.0.04	Device Name This parameter contains the device name published in vendor's price list. Type: Text - 1 byte (variable length) Write access: Read only Class name: GDP_Id	- 0 - 255	R/- - -	S-0-1300.0.04

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-1300.0.05	Vendor Device ID The parameter contains the vendor device ID. The vendor device ID is a unique device ID managed by the vendor; it identifies the component number. Type: Text - 1 byte (variable length) Write access: Read only Class name: GDP_Basic	- 0 - 255	R/- - -	S-0-1300.0.05
S-0-1300.0.08	Hardware Revision This parameter contains the hardware revision of the device. Type: Text - 1 byte (variable length) Write access: Read only	- 0 - 255	R/- - -	S-0-1300.0.08
S-0-1300.0.09	Software Revision This parameter contains the firmware version of the drive. Type: Text - 1 byte (variable length) Write access: Read only	- 0 - 255	R/- - -	S-0-1300.0.09
S-0-1300.0.11	Order Number This parameter contains the order number of the drive. Type: Text - 1 byte (variable length) Write access: Read only	- - - -	R/- - -	S-0-1300.0.11
S-0-1300.0.12	Serial Number This parameter contains the serial number of the drive. Type: Text - 1 byte (variable length) Write access: Read only Class name: GDP_Id	- 0 - 255	R/- - -	S-0-1300.0.12
S-0-1300.1.09	Software Revision This parameter contains the software version of the SERCOS III Communication Option. Type: Text - 1 byte (variable length) Write access: Read only	- 0 - 255	R/- - -	S-0-1300.1.09
S-0-1300.1.10	Firmware Loader Revision This parameter contains the revision of the firmware loader or bootloader implemented in the drive. Type: Text - 1 byte (variable length) Write access: Read only	- 0 - 255	R/- - -	S-0-1300.1.10
S-0-1300.2.09	Software Revision This parameter contains the software version of the FPGA of the SERCOS communication option. Type: Text - 1 byte (variable length) Write access: Read only	- 0 - 255	R/- - -	S-0-1300.2.09

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
S-0-1301	List of GDP classes & Version This parameter contains a list of the generic profile capabilities and the versions supported by the drive. Type: Hexadecimal - 2 bytes (variable length) Write access: Read only Class name: GDP_Basic	- 257 - 5889	R/- - -	S-0-1301
S-0-1302.0.01	FSP Type & Version This parameter contains the function-specific type and the function-dependent version of the resource. Type: Hexadecimal - 4 bytes Write access: Read only Class name: GDP_Basic	- 0 - 4294967295	R/- - -	S-0-1302.0.01
S-0-1302.0.02	Function groups The operation data of this parameter contains a list of all instanced function groups. Type: IDN - 4 bytes (variable length) Write access: Read only Class name: GDP_Basic	- 0 - 4294967295	R/- - -	S-0-1302.0.02
S-0-1302.0.03	Application Type The operation data of this parameter contains the type of the sub-device application (for example, main spindle drive, round axis, X axis, etc.). Type: Text - 1 byte (variable length) Write access: CP2, CP3, CP4 Class name: GDP_Id	- 0 - 255	R/W - -	S-0-1302.0.03

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_AccessInfo	Current access channel Low byte: Value 0: Used by channel in high byte Value 1: Exclusively used by channel in high byte High byte: Current assignment of access channel Value 0: Reserved Value 1: I/O Value 2: HMI Value 3: Modbus RS485 Value 4: Fieldbus main channel Values 5 ... 12: Modbus TCP, CANopen second SDO or Profibus master class 2 Values 13 ... 28: Ethenet/IP explicit channels Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 280 IDN P-0-3001.0.12
_actionStatus	Action word Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: Warning (error class 0) Bit 1: Error class 1 Bit 2: Error class 2 Bit 3: Error class 3 Bit 4: Error class 4 Bit 5: Reserved Bit 6: Motor is at a standstill (_n_act < 9) Bit 7: Motor movement in positive direction Bit 8: Motor movement in negative direction Bit 9: Assignment can be set via parameter DPL_intLim Bit 10: Assignment can be set via parameter DS402intLim Bit 11: Profile generator idle (reference velocity is 0) Bit 12: Profile generator decelerates Bit 13: Profile generator accelerates Bit 14: Profile generator moves at constant speed Bit 15: Reserved Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 7176 IDN P-0-3028.0.4
_AT_J	Moment of inertia of the entire system *(168)* Is automatically calculated during Autotuning. Type: Unsigned decimal - 2 bytes In increments of 0.1 kg cm^2.	kg cm^2 0.1 0.1 6553.5	UINT16 R/- per. -	Modbus 12056 IDN P-0-3047.0.12
_AT_M_friction	Friction torque of the system *(168)* Is determined during Autotuning. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 12046 IDN P-0-3047.0.7

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_AT_M_load`	Constant load torque *(168)* Is determined during Autotuning. Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 12048 IDN P-0-3047.0.8
`_AT_progress`	Progress of Autotuning *(167)* Type: Unsigned decimal - 2 bytes	% 0 0 100	UINT16 R/- - -	Modbus 12054 IDN P-0-3047.0.11
`_AT_state`	Autotuning status *(167)* Bit assignments: Bits 0 ... 10: Last processing step Bit 13: auto_tune_process Bit 14: auto_tune_end Bit 15: auto_tune_err Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 12036 IDN P-0-3047.0.2
`_Cap1CntFall`	Capture input 1 event counter at falling edges Counts the capture events at falling edges. The event counter is reset when capture input 1 is activated. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2648 IDN P-0-3010.0.44
`_Cap1CntRise`	Capture input 1 event counter at rising edges Counts the capture events at rising edges. The event counter is reset when capture input 1 is activated. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2646 IDN P-0-3010.0.43
`_Cap1Count`	Capture input 1 event counter Counts the capture events. The event counter is reset when capture input 1 is activated. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2576 IDN P-0-3010.0.8
`_Cap1CountCons`	Capture input 1 event counter (consistent) *(272)* Counts the capture events. The event counter is reset when capture input 1 is activated. By reading this parameter, the parameter "_Cap1PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2606 IDN P-0-3010.0.23
`_Cap1DiffValue`	Capture input 1 captured difference value This parameter contains the difference value of the last two captured values. Settings for capturing are made via IDNP39290. Type: Signed decimal - 4 bytes Changed settings become active immediately.	- - - -	INT32 R/- - -	Modbus 2630 IDN P-0-3010.0.35

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_Cap1Pos	Capture input 1 captured position Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2572 IDN P-0-3010.0.6
_Cap1PosCons	Capture input 1 captured position (consis-tent) *(272)* Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap1Count-Cons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2608 IDN P-0-3010.0.24
_Cap1PosFallEdge	Capture input 1 captured position at falling edge This parameter contains the position cap-tured at the point in time a falling edge was detected. The captured position is recalculated after "Position Setting" or "Reference Movement". Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2636 IDN P-0-3010.0.38
_Cap1PosRisEdge	Capture input 1 captured position at rising edge This parameter contains the position cap-tured at the point in time a rising edge was detected. The captured position is recalculated after "Position Setting" or "Reference Movement". Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2634 IDN P-0-3010.0.37
_Cap2CntFall	Capture input 2 event counter at falling edges Counts the capture events at falling edges. The event counter is reset when capture input 2 is activated. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2652 IDN P-0-3010.0.46
_Cap2CntRise	Capture input 2 event counter at rising edges Counts the capture events at rising edges. The event counter is reset when capture input 2 is activated. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2650 IDN P-0-3010.0.45
_Cap2Count	Capture input 2 event counter Counts the capture events. The event counter is reset when capture input 2 is activated. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2578 IDN P-0-3010.0.9

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_Cap2CountCons	Capture input 2 event counter (consis-tent) *(272)* Counts the capture events. The event counter is reset when capture input 2 is activated. By reading this parameter, the parameter "_Cap2PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2610 IDN P-0-3010.0.25
_Cap2DiffValue	Capture input 2 captured difference value This parameter contains the difference value of the last two captured values. Settings for capturing are made via IDNP39290. Type: Signed decimal - 4 bytes Changed settings become active immedi-ately.	- - - -	INT32 R/- - -	Modbus 2632 IDN P-0-3010.0.36
_Cap2Pos	Capture input 2 captured position Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2574 IDN P-0-3010.0.7
_Cap2PosCons	Capture input 2 captured position (consis-tent) *(272)* Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap2Count-Cons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2612 IDN P-0-3010.0.26
_Cap2PosFallEdge	Capture input 2 captured position at falling edge This parameter contains the position captured at the point in time a falling edge was detected. The captured position is recalculated after "Position Setting" or "Reference Movement". Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2640 IDN P-0-3010.0.40
_Cap2PosRisEdge	Capture input 2 captured position at rising edge This parameter contains the position captured at the point in time a rising edge was detected. The captured position is recalculated after "Position Setting" or "Reference Movement". Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2638 IDN P-0-3010.0.39

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_Cap3Count`	Capture input 3 event counter Counts the capture events. The event counter is reset when capture input 3 is activated. Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2600 IDN P-0-3010.0.20
`_Cap3CountCons`	Capture input 3 event counter (consistent) *(273)* Counts the capture events. The event counter is reset when capture input 3 is activated. By reading this parameter, the parameter "_Cap3PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2614 IDN P-0-3010.0.27
`_Cap3Pos`	Capture input 3 captured position Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". Available with hardware version ≥RS03. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2598 IDN P-0-3010.0.19
`_Cap3PosCons`	Capture input 3 captured position (consistent) *(272)* Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap3CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 2616 IDN P-0-3010.0.28
`_CapEdgeStatus`	Capture status This parameter indicates whether a position has been captured. The information provided by this parameter summarizes the information in IDNs 409 to 412. Bit 0: Capture input 1 rising edge detected Bit 1: Capture input 1 falling edge detected Bit 2: Capture input 2 rising edge detected Bit 3: Capture input 2 falling edge detected Type: Unsigned decimal - 2 bytes Changed settings become active immediately.	- - - -	UINT16 R/- - -	Modbus 2622 IDN P-0-3010.0.31

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_CapEventCounters	Capture inputs 1 and 2 summary of event counters This parameter contains the counted capture events. Bits 0 ... 3: _Cap1CntRise (lowest 4 bits) Bits 4 ... 7: _Cap1CntFall (lowest 4 bits) Bits 8 ... 11: _Cap2CntRise (lowest 4 bits) Bits 12 ... 15: _Cap2CntFall (lowest 4 bits) Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2654 IDN P-0-3010.0.47
_CapStatus	Status of the capture inputs *(270)* Read access: Bit 0: Position captured via input CAP1 Bit 1: Position captured via input CAP2 Bit 2: Position captured via input CAP3 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2562 IDN P-0-3010.0.1
_Cond_State4	Conditions for transition to operating state Ready To Switch On Signal state: 0: Condition not met 1: Condition met Bit 0: DC bus or mains voltage Bit 1: Inputs for safety function Bit 2: No configuration download ongoing Bit 3: Velocity greater than limit value Bit 4: Absolut position has been set Bit 5: Holding brake not manually released Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 7244 IDN P-0-3028.0.38
_CTRL_ActParSet	Active controller parameter set *(139)* Value 1: Controller parameter set 1 is active Value 2: Controller parameter set 2 is active A controller parameter set is active after the time for the parameter switching (CTRL_ParChgTime) has elapsed. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 4398 IDN P-0-3017.0.23
_CTRL_KPid	Current controller d component P gain This value is calculated on the basis of the motor parameters. Type: Unsigned decimal - 2 bytes In increments of 0.1 V/A. Changed settings become active immediately.	V/A 0.5 - 1270.0	UINT16 R/- per. -	Modbus 4354 IDN P-0-3017.0.1
_CTRL_KPiq	Current controller q component P gain This value is calculated on the basis of the motor parameters. Type: Unsigned decimal - 2 bytes In increments of 0.1 V/A. Changed settings become active immediately.	V/A 0.5 - 1270.0	UINT16 R/- per. -	Modbus 4358 IDN P-0-3017.0.3

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_CTRL_TNid	Current controller d component integral action time This value is calculated on the basis of the motor parameters. Type: Unsigned decimal - 2 bytes In increments of 0.01 ms. Changed settings become active immediately.	ms 0.13 - 327.67	UINT16 R/- per. -	Modbus 4356 IDN P-0-3017.0.2
_CTRL_TNiq	Current controller q component integral action time This value is calculated on the basis of the motor parameters. Type: Unsigned decimal - 2 bytes In increments of 0.01 ms. Changed settings become active immediately.	ms 0.13 - 327.67	UINT16 R/- per. -	Modbus 4360 IDN P-0-3017.0.4
_DCOMopmd_act	Active operating mode **-6 / Manual Tuning / Autotuning**: Manual Tuning / Autotuning **-3 / Motion Sequence**: Motion Sequence **-2 / Electronic Gear**: Electronic Gear **-1 / Jog**: Jog **0 / Reserved**: Reserved **1 / Profile Position**: Profile Position **3 / Profile Velocity**: Profile Velocity **4 / Profile Torque**: Profile Torque **6 / Homing**: Homing **7 / Interpolated Position**: Interpolated Position **8 / Cyclic Synchronous Position**: Cyclic Synchronous Position **9 / Cyclic Synchronous Velocity**: Cyclic Synchronous Velocity **10 / Cyclic Synchronous Torque**: Cyclic Synchronous Torque Type: Signed decimal - 2 bytes	- -6 - 10	INT16 R/- - -	Modbus 6920 IDN P-0-3027.0.4
_DEV_T_current Mon tdEV	Current device temperature Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 7204 IDN P-0-3028.0.18
_ERR_class	Error class *(312)* Value 0: Warning (no response) Value 1: Error class 1 Value 2: Error class 2 Value 3: Error class 3 Value 4: Error class 4 Type: Unsigned decimal - 2 bytes	- 0 - 4	UINT16 R/- - -	Modbus 15364 IDN P-0-3060.0.2
_ERR_DCbus	DC bus voltage at error time *(312)* Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- - -	Modbus 15374 IDN P-0-3060.0.7

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_ERR_enable_cycl	Number of cycles of enabling the power stage at error time *(313)* Number of cycles of enabling the power stage from the time the power supply (control voltage) was switched on to the time the error occurred. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 15370 IDN P-0-3060.0.5
_ERR_enable_time	Time between enabling of power stage and occurrence of the error *(313)* Type: Unsigned decimal - 2 bytes	s - - -	UINT16 R/- - -	Modbus 15372 IDN P-0-3060.0.6
_ERR_motor_I	Motor current at error time *(312)* Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 15378 IDN P-0-3060.0.9
_ERR_motor_v	Motor velocity at error time *(312)* Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 15376 IDN P-0-3060.0.8
_ERR_number	Error number *(312)* Reading this parameter copies the entire error entry (error class, time of occurrence of error, ...) to an intermediate memory from which the elements of the error can then be read. In addition, the read pointer of the error memory is automatically set to the next error entry. Type: Unsigned decimal - 2 bytes	- 0 - 65535	UINT16 R/- - -	Modbus 15362 IDN P-0-3060.0.1
_ERR_powerOn Mon PoWo	Number of power on cycles *(312)* Type: Unsigned decimal - 4 bytes	- 0 - 4294967295	UINT32 R/- - -	Modbus 15108 IDN P-0-3059.0.2
_ERR_qual	Error additional information *(312)* This entry contains additional information on the error, depending on the error number. Example: a parameter address Type: Unsigned decimal - 2 bytes	- 0 - 65535	UINT16 R/- - -	Modbus 15368 IDN P-0-3060.0.4
_ERR_temp_dev	Temperature of device at error time *(312)* Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 15382 IDN P-0-3060.0.11
_ERR_temp_ps	Temperature of power stage at error time *(312)* Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 15380 IDN P-0-3060.0.10
_ERR_time	Error time *(312)* With reference to operating hours counter Type: Unsigned decimal - 4 bytes	s 0 - 536870911	UINT32 R/- - -	Modbus 15366 IDN P-0-3060.0.3

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_ErrNumFbParSvc	Last error number of fieldbus parameter services Some fieldbus types only provide general error codes if a request for a parameter service is not successful. This parameter returns the vendor-specific error number of the last unsuccessful service. CANopen: SDO service EtherCAT: CoE SDO service EtherNet/IP: CIP explicit message service DeviceNet: CIP explicit message service Modbus TCP: FC3, FC16 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 16518 IDN P-0-3064.0.67
_eSM_funct Mon SMoP	eSM function Active eSM function Value 0: Safe Torque Off (STO) Value 1: No motion monitoring active Value 2: Safe Operating Stop (SOS) Value 3: Safely Limited Speed (SLS) Value 4: Reserved Value 5: Safe Stop 1 (SS1) Value 6: Safe Stop 2 (SS2) Value 7: Safe Operating Stop (SOS) after error Value 8: Safely Limited Speed (SLS) in machine operating mode Automatic Mode If bit 15 of the value is set: GUARD_ACK was triggered Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 19502 IDN P-0-3076.0.23
_eSM_LI_act	eSM digital inputs channel B Signal state: 0: 0 level 1: 1 level Bit assignments: Bit 0: /ESTOP_B Bit 1: GUARD_B Bit 3: SETUPMODE_B Bit 4: SETUPENABLE_B Bit 6: GUARD_ACK Bit 8: ESMSTART Bit 9: /INTERLOCK_IN Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 19492 IDN P-0-3076.0.18
_eSM_LI_mask	eSM digital inputs channel B mask Mask of active digital inputs 0: Digital input is not active 1: Digital input is active Bit assignments: See digital inputs channel. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 19494 IDN P-0-3076.0.19

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_eSM_LO_act	eSM digital outputs channel B Signal state: 0: 0 level 1: 1 level Bit assignments: Bit 0: CCM24V_OUT_B Bit 1: Drive operating state 6 Operation Enabled (B) Bit 2: RELAY_OUT_B Bit 3: AUXOUT2 Bit 4: /INTERLOCK_OUT Bits 5 ... 15: Reserved Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 19496 IDN P-0-3076.0.20
_eSM_state Mon SMSt	eSM state **0 / eSM module missing / MiSS** : eSM module missing **1 / Start / Strt** : Start **2 / Not Ready To Switch On / nrdY** : Not Ready To Switch On **3 / Switch On Disabled / diS** : Switch On Disabled **4 / Ready To Switch On / rdY** : Ready To Switch On **6 / Operation Enabled / run** : Operation Enabled **7 / Quick Stop / qStP** : Quick Stop **8 / Fault Reaction Active / FLt** : Fault Reaction Active **9 / Fault / FLt** : Fault Status word of eSM state machine Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 19500 IDN P-0-3076.0.22
_eSMVer	eSM revision of firmware Revision of firmware: Bits 0 ... 7: Firmware evolution (dec) Bits 8 ... 15: Firmware minor revision (dec) Bits 16 ... 23: Firmware major revision (dec) Bits 24 ... 31: Reserved Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 19486 IDN P-0-3076.0.15
_fwNoSlot1	Firmware number of slot 1 Example: PR0912.00 The value is provided as a decimal value: 91200. NOTE: If no module is installed, the value 0 is returned. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 558 IDN P-0-3002.0.23

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_fwNoSlot2	Firmware number of slot 2 Example: PR0912.00 The value is provided as a decimal value: 91200. NOTE: If no module is installed, the value 0 is returned. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 568 IDN P-0-3002.0.28
_fwNoSlot3	Firmware number of slot 3 Example: PR0912.00 The value is provided as a decimal value: 91200. NOTE: If no module is installed, the value 0 is returned. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 578 IDN P-0-3002.0.33
_fwNoSlot3Boot	Firmware number of slot 3 (Bootloader) Example: PR0912.00 The value is provided as a decimal value: 91200. NOTE: If no module is installed, the value 0 is returned. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 590 IDN P-0-3002.0.39
_fwNoSlot3FPGA	Firmware number of slot 3 (FPGA) Example: PR0912.00 The value is provided as a decimal value: 91200. NOTE: If no module is installed, the value 0 is returned. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 584 IDN P-0-3002.0.36
_fwNoSlot3PRU	Firmware number of slot 3 (PRU) Example: PR0912.00 The value is provided as a decimal value: 91200. NOTE: If no module is installed, the value 0 is returned. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 596 IDN P-0-3002.0.42
_fwRevSlot1	Firmware revision of slot 1 The version format is XX.YY.ZZ. Part XX.YY is contained in parameter _fwVerSlot1. Part ZZ is used for quality evolution and contained in this parameter. NOTE: If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 45 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 562 IDN P-0-3002.0.25

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_fwRevSlot2	Firmware revision of slot 2 The version format is XX.YY.ZZ. Part XX.YY is contained in parameter _fwVersSlot2. Part ZZ is used for quality evolution and contained in this parameter. NOTE: If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 45 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 572 IDN P-0-3002.0.30
_fwRevSlot3 ConF → inF- ArEU	Firmware revision of slot 3 The version format is XX.YY.ZZ. Part XX.YY is contained in parameter _fwVerSlot3. Part ZZ is used for quality evolution and contained in this parameter. NOTE: If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 45 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 582 IDN P-0-3002.0.35
_fwRevSlot3Boot ConF → inF- brEU	Firmware revision of slot 3 (Bootloader) The version format is XX.YY.ZZ.BB. Part XX.YY is contained in parameter _fwVerSlot3Boot. Part ZZ.BB is used for quality evolution and contained in this parameter. NOTE: If no module is installed, the value 0 is returned. Example: V01.23.45.67 The value is provided as a decimal value: 4567 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 594 IDN P-0-3002.0.41
_fwRevSlot3FPGA ConF → inF- FrEU	Firmware revision of slot 3 (FPGA) The version format is XX.YY.ZZ. Part XX.YY is contained in parameter _fwVerSlot3FPGA. Part ZZ is used for quality evolution and contained in this parameter. NOTE: If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 45 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 588 IDN P-0-3002.0.38

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_fwRevSlot3PRU ConF → inF- PrEU	Firmware revision of slot 3 (PRU) The version format is XX.YY.ZZ.B. Part XX.YY is contained in parameter _fwVerSlot3PRU. Part ZZ.B is used for quality evolution and contained in this parameter. NOTE: If no module is installed, the value 0 is returned. Example: V01.23.45.6 The value is provided as a decimal value: 456 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 600 IDN P-0-3002.0.44
_fwVersSlot1	Firmware version of slot 1 The version format is XX.YY.ZZ. Part XX.YY is contained in this parameter. Part ZZ is contained in parameter _fwRev-Slot1. NOTE: If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 560 IDN P-0-3002.0.24
_fwVersSlot2	Firmware version of slot 2 The version format is XX.YY.ZZ. Part XX.YY is contained in this parameter. Part ZZ is contained in parameter _fwRev-Slot2. NOTE: If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 570 IDN P-0-3002.0.29
_fwVersSlot3 ConF → inF- AUEr	Firmware version of slot 3 The version format is XX.YY.ZZ. Part XX.YY is contained in this parameter. Part ZZ is contained in parameter _fwRev-Slot3. NOTE: If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 580 IDN P-0-3002.0.34

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_fwVersSlot3Boot ConF → inF- bUEr	Firmware version of slot 3 (Bootloader) The version format is XX.YY.ZZ.BB. Part XX.YY is contained in this parameter. Part ZZ.BB is contained in parameter _fwRevSlot3Boot. NOTE: If no module is installed, the value 0 is returned. Example: V01.23.45.67 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 592 IDN P-0-3002.0.40
_fwVersSlot3FPGA ConF → inF- FUEr	Firmware version of slot 3 (FPGA) The version format is XX.YY.ZZ. Part XX.YY is contained in this parameter. Part ZZ is contained in parameter _fwRev-Slot3FPGA. NOTE: If no module is installed, the value 0 is returned. Example: V01.23.45 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 586 IDN P-0-3002.0.37
_fwVersSlot3PRU ConF → inF- PUEr	Firmware version of slot 3 (PRU) The version format is XX.YY.ZZ.B. Part XX.YY is contained in this parameter. Part ZZ.B is contained in parameter _fwRevSlot3PRU. NOTE: If no module is installed, the value 0 is returned. Example: V01.23.45.6 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 598 IDN P-0-3002.0.43
_HMdisREFtoIDX	Distance from switching point to index pulse *(210)* It allows to check the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. The parameter _HMdisREFtoIDX_usr allows you to enter the value in user-defined units. Type: Signed decimal - 4 bytes In increments of 0.0001 revolution.	revolution - - -	INT32 R/- - -	Modbus 10264 IDN P-0-3040.0.12

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_HMdisREFtoIDX _usr	Distance from switching point to index pulse *(210)* It allows to check the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. Type: Signed decimal - 4 bytes	usr_p -2147483648 - 2147483647	INT32 R/- - -	Modbus 10270 IDN P-0-3040.0.15
_I_act Mon iAct	Total motor current Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 7686 IDN P-0-3030.0.3
_Id_act_rms	Actual motor current (d component, field weakening) Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 7684 IDN P-0-3030.0.2
_Id_ref_rms	Reference motor current (d component, field weakening) Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 7714 IDN P-0-3030.0.17
_Imax_act	Currently effective current limitation Value of the currently effective current limitation. This is one of the following values (whichever is lowest): - CTRL_I_max (only during normal operation) - LIM_I_maxQSTP (only during Quick Stop) - LIM_I_maxHalt (only during Halt) - Current limitation via digital input - _M_I_max (only if motor is connected) - _PS_I_max Limitations caused by I2t monitoring are also taken into account. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 7248 IDN P-0-3028.0.40
_Imax_system	Current limitation of the system This parameter specifies the maximum system current. This is the lower value of the maximum motor current and the maximum power stage current. If no motor is connected, only the maximum power stage current is considered in this parameter. Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 7246 IDN P-0-3028.0.39
_Inc_ENC2Raw	Actual raw increment value of encoder 2 This parameter is only needed for commissioning of encoder 2 in case of an unknown machine encoder resolution. Type: Signed decimal - 4 bytes	EncInc - - -	INT32 R/- - -	Modbus 7754 IDN P-0-3030.0.37

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_InvalidParam`	Modbus address of parameter with invalid value In case of a configuration error, the Modbus address of the parameter with an invalid value is indicated here. Type: Unsigned decimal - 2 bytes	- - 0 -	UINT16 R/- - -	Modbus 7180 IDN P-0-3028.0.6
`_IO_act`	Physical status of the digital inputs and outputs *(144)* Low byte: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3 Bit 4: DI4 Bit 5: DI5 High byte: Bit 8: DQ0 Bit 9: DQ1 Bit 10: DQ2 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2050 IDN P-0-3008.0.1
`_IO_DI_act` Mon diMo	Status of digital inputs *(144)* Bit assignments: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3 Bit 4: DI4 Bit 5: DI5 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2078 IDN P-0-3008.0.15
`_IO_DQ_act` Mon doMo	Status of digital outputs *(144)* Bit assignments: Bit 0: DQ0 Bit 1: DQ1 Bit 2: DQ2 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2080 IDN P-0-3008.0.16
`_IO_STO_act` Mon Sto	Status of the inputs for the safety function STO *(144)* Bit 0: STO_A Bit 1: STO_B If no safety module eSM is plugged in, this parameter indicates the status of the signal inputs STO_A and STO_B. If a safety module eSM is plugged in, the safety function STO can be triggered via the signal inputs or via the safety module eSM. This parameter indicates whether or not the safety function STO was triggered (regardless of whether it was triggered via the signal inputs or via the safety module eSM). Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 2124 IDN P-0-3008.0.38

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_IOdataMtoS01	I/O parameter data Master to Slave - parameter 01 Actual data of the cyclic communication between the master and slave. This parameter contains the data of the first parameter mapped from the master to the slave. The parameters _IOdataMtoS02 to _IOdataMtoS16 contain the data of the remaining mapped parameters. Type: Unsigned decimal - 4 bytes	- 0 FFFFFFFFh 4294967295	UINT32 R/- - -	Modbus 16386 IDN P-0-3064.0.1
_IOdataStoM01	I/O parameter data Slave to Master - parameter 01 Actual data of the cyclic communication between the master and slave. This parameter contains the data of the first parameter mapped from the slave to the master. The parameters _IOdataStoM02 to _IOdataStoM16 contain the data of the remaining mapped parameters. Type: Unsigned decimal - 4 bytes	- 0 FFFFFFFFh 4294967295	UINT32 R/- - -	Modbus 16450 IDN P-0-3064.0.33
_IOmappingMtoS01	I/O parameter mapping Master to Slave - parameter 01 Actual mapping of the cyclic communication between the master and slave. This parameter contains the mapping of the first parameter mapped from the master to the slave. The parameters _IOmappingMtoS02 to _IOmappingMtoS16 contain the mapping of the remaining mapped parameters. Type: Unsigned decimal - 2 bytes	- 0 FFFFh 65535	UINT16 R/- - -	Modbus 16418 IDN P-0-3064.0.17
_IOmappingStoM01	I/O parameter mapping Slave to Master - parameter 01 Actual mapping of the cyclic communication between the master and slave. This parameter contains the mapping of the first parameter mapped from the slave to the master. The parameters _IOmappingStoM02 to _IOmappingStoM16 contain the mapping of the remaining mapped parameters. Type: Unsigned decimal - 2 bytes	- 0 FFFFh 65535	UINT16 R/- - -	Modbus 16482 IDN P-0-3064.0.49
_Iq_act_rms Mon qAct	Actual motor current (q component, generating torque) Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 7682 IDN P-0-3030.0.1
_Iq_ref_rms Mon qrEF	Reference motor current (q component, generating torque) Type: Signed decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	Modbus 7712 IDN P-0-3030.0.16

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_LastError` Mon LFLt	Error causing a stop (error classes 1 to 4) *(306)* Number of the current error. Any consequ-tive errors do not overwrite this error num-ber. Example: If a limit switch error reaction caused an overvoltage error, this parameter would contain the number of the limit switch error. Exception: Errors of error class 4 overwrite existing entries. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 7178 IDN P-0-3028.0.5
`_LastError_Qual`	Additional info of last error This parameter contains additional informa-tion on the last error, depending on the error number. For example: a parameter address. Type: Unsigned decimal - 2 bytes	- - 0 -	UINT16 R/- - -	Modbus 7230 IDN P-0-3028.0.31
`_LastWarning` Mon LWrn	Number of last warning (error class 0) *(306)* Number of the most recent warning. If the warning becomes inactive again, the number is memorized until the next fault reset. Value 0: No warning occurred Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 7186 IDN P-0-3028.0.9
`_M_BRK_T_apply`	Holding brake application time Type: Unsigned decimal - 2 bytes	ms - - -	UINT16 R/- - -	Modbus 3394 IDN P-0-3013.0.33
`_M_BRK_T_release`	Holding brake release time Type: Unsigned decimal - 2 bytes	ms - - -	UINT16 R/- - -	Modbus 3396 IDN P-0-3013.0.34
`_M_Encoder` ConF → inF- SEnS	Encoder type of motor **1 / SinCos With HiFa / SWhi** : SinCos with Hiperface **2 / SinCos Without HiFa / SWoh** : SinCos without Hiperface **3 / SinCos With Hall / SWhA** : SinCos with Hall **4 / SinCos With EnDat / SWEn** : SinCos with EnDat **5 / EnDat Without SinCos / EndA** : EnDat without SinCos **6 / Resolver / rESo** : Resolver **7 / Hall / hALL** : Hall (not supported yet) **8 / BISS / biSS** : BISS High byte: Value 0: Rotary encoder Value 1: Linear encoder Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 3334 IDN P-0-3013.0.3

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_M_HoldingBrake	Holding brake identification Value 0: Motor without holding brake Value 1: Motor with holding brake Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 3392 IDN P-0-3013.0.32
_M_I_0	Continuous stall current of motor Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 3366 IDN P-0-3013.0.19
_M_I_max ConF → inF- MiMA	Maximum current of motor Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 3340 IDN P-0-3013.0.6
_M_I_nom ConF → inF- Mino	Nominal current of motor Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	Modbus 3342 IDN P-0-3013.0.7
_M_I2t	Maximum permissible time for maximum current of motor Type: Unsigned decimal - 2 bytes	ms - - -	UINT16 R/- - -	Modbus 3362 IDN P-0-3013.0.17
_M_Jrot	Moment of inertia of motor Units: Rotary motors: $kgcm^2$ Linear motors: kg Type: Unsigned decimal - 4 bytes In increments of 0.001 motor_f.	motor_f - - -	UINT32 R/- - -	Modbus 3352 IDN P-0-3013.0.12
_M_kE	Voltage constant kE of motor Voltage constant in Vrms at 1000 min^{-1}. Units: Rotary motors: Vrms/min^{-1} Linear motors: Vrms/(m/s) Type: Unsigned decimal - 4 bytes In increments of 0.1 motor_u.	motor_u - - -	UINT32 R/- - -	Modbus 3350 IDN P-0-3013.0.11
_M_L_d	Inductance d component of motor Type: Unsigned decimal - 2 bytes In increments of 0.01 mH.	mH - - -	UINT16 R/- - -	Modbus 3358 IDN P-0-3013.0.15
_M_L_q	Inductance q component of motor Type: Unsigned decimal - 2 bytes In increments of 0.01 mH.	mH - - -	UINT16 R/- - -	Modbus 3356 IDN P-0-3013.0.14
_M_load Mon LdFM	Current load of motor *(293)* Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7220 IDN P-0-3028.0.26

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_M_M_0	Continuous stall torque of motor A value of 100 % in operating mode Profile Torque corresponds to this parameter. Units: Rotary motors: Ncm Linear motors: N Type: Unsigned decimal - 2 bytes	motor_m - - -	UINT16 R/- - -	Modbus 3372 IDN P-0-3013.0.22
_M_M_max	Maximum torque of motor Type: Unsigned decimal - 2 bytes In increments of 0.1 Nm.	Nm - - -	UINT16 R/- - -	Modbus 3346 IDN P-0-3013.0.9
_M_M_nom	Nominal torque/force of motor Units: Rotary motors: Ncm Linear motors: N Type: Unsigned decimal - 2 bytes	motor_m - - -	UINT16 R/- - -	Modbus 3344 IDN P-0-3013.0.8
_M_maxoverload	Maximum value of overload of motor *(294)* Maximum overload of motor during the last 10 seconds. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7222 IDN P-0-3028.0.27
_M_n_max ConF → inF- MnMA	Maximum permissible speed of rotation/ velocity of motor Units: Rotary motors: min^{-1} Linear motors: mm/s Type: Unsigned decimal - 2 bytes	motor_v - - -	UINT16 R/- - -	Modbus 3336 IDN P-0-3013.0.4
_M_n_nom	Nominal speed of rotation/velocity of motor Units: Rotary motors: min^{-1} Linear motors: mm/s Type: Unsigned decimal - 2 bytes	motor_v - - -	UINT16 R/- - -	Modbus 3338 IDN P-0-3013.0.5
_M_overload	Current overload of motor (I2t) *(294)* Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7218 IDN P-0-3028.0.25
_M_Polepair	Number of pole pairs of motor Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 3368 IDN P-0-3013.0.20
_M_PolePairPitch	Pole pair pitch of motor Type: Unsigned decimal - 2 bytes In increments of 0.01 mm.	mm - - -	UINT16 R/- - -	Modbus 3398 IDN P-0-3013.0.35
_M_R_UV	Winding resistance of motor Type: Unsigned decimal - 2 bytes In increments of 0.01 Ω.	Ω - - -	UINT16 R/- - -	Modbus 3354 IDN P-0-3013.0.13

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_M_T_current`	Current motor temperature *(292)* Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 7202 IDN P-0-3028.0.17
`_M_T_max`	Maximum temperature of motor *(292)* Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 3360 IDN P-0-3013.0.16
`_M_Type` ConF → inF- MtYP	Motor type Value 0: No motor selected Value >0: Connected motor type Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 3332 IDN P-0-3013.0.2
`_M_U_max`	Maximum voltage of motor Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- - -	Modbus 3378 IDN P-0-3013.0.25
`_M_U_nom`	Nominal voltage of motor Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- - -	Modbus 3348 IDN P-0-3013.0.10
`_n_act` Mon nAct	Actual speed of rotation Type: Signed decimal - 2 bytes	min^{-1} - - -	INT16 R/- - -	Modbus 7696 IDN P-0-3030.0.8
`_n_act_ENC1`	Actual speed of rotation of encoder 1 Type: Signed decimal - 2 bytes	min^{-1} - - -	INT16 R/- - -	Modbus 7760 IDN P-0-3030.0.40
`_n_act_ENC2`	Actual speed of rotation of encoder 2 (module) Type: Signed decimal - 2 bytes	min^{-1} - - -	INT16 R/- - -	Modbus 7740 IDN P-0-3030.0.30
`_n_ref` Mon nrEF	Reference speed of rotation Type: Signed decimal - 2 bytes	min^{-1} - - -	INT16 R/- - -	Modbus 7694 IDN P-0-3030.0.7
`_OpHours` Mon oPh	Operating hours counter Type: Unsigned decimal - 4 bytes	s - - -	UINT32 R/- - -	Modbus 7188 IDN P-0-3028.0.10
`_p_absENC` Mon PAMu	Absolute position with reference to the encoder range *(154)* This value corresponds to the modulo position of the absolute encoder range. The value is no longer valid if the gear ratio of machine encoder and motor encoder is changed. A restart is required in such a case. Type: Unsigned decimal - 4 bytes	usr_p - - -	UINT32 R/- - -	Modbus 7710 IDN P-0-3030.0.15

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_p_absmodulo	Absolute position with reference to internal resolution in internal units This value is based on encoder raw position with reference to internal resolution (131072 Inc). Type: Unsigned decimal - 4 bytes	Inc - - -	UINT32 R/- - -	Modbus 7708 IDN P-0-3030.0.14
_p_act	Actual position Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7706 IDN P-0-3030.0.13
_p_act_ENC1	Actual position of encoder 1 Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7758 IDN P-0-3030.0.39
_p_act_ENC1_in t	Actual position of encoder 1 in internal units Type: Signed decimal - 4 bytes	Inc - - -	INT32 R/- - -	Modbus 7756 IDN P-0-3030.0.38
_p_act_ENC2	Actual position of encoder 2 (module) Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7732 IDN P-0-3030.0.26
_p_act_ENC2_in t	Actual position of encoder 2 (module) in internal units Type: Signed decimal - 4 bytes	Inc - - -	INT32 R/- - -	Modbus 7730 IDN P-0-3030.0.25
_p_act_int	Actual position in internal units Type: Signed decimal - 4 bytes	Inc - - -	INT32 R/- - -	Modbus 7700 IDN P-0-3030.0.10
_p_act_pure_EN C2	Actual position of encoder 2 without internal offset Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7738 IDN P-0-3030.0.29
_p_dif	Current position deviation including dynamic position deviation 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. The parameter _p_dif_usr allows you to enter the value in user-defined units. Type: Signed decimal - 4 bytes In increments of 0.0001 revolution.	revolution -214748.3648 - 214748.3647	INT32 R/- - -	Modbus 7716 IDN P-0-3030.0.18

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_p_dif_load	Current load-dependent position deviation between reference and actual position *(280)* The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. This value is used for following error monitoring. The parameter _p_dif_load_usr allows you to enter the value in user-defined units. Type: Signed decimal - 4 bytes In increments of 0.0001 revolution.	revolution -214748.3648 - 214748.3647	INT32 R/- - -	Modbus 7736 IDN P-0-3030.0.28
_p_dif_load_usr	Current load-dependent position deviation between reference and actual position *(280)* The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. This value is used for following error monitoring. Type: Signed decimal - 4 bytes	usr_p -2147483648 - 2147483647	INT32 R/- - -	Modbus 7724 IDN P-0-3030.0.22
_p_dif_load_peak	Maximum value of the load-dependent position deviation *(281)* This parameter contains the maximum load-dependent position deviation reached so far. A write access resets this value. The parameter _p_dif_load_peak_usr allows you to enter the value in user-defined units.. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 revolution. Changed settings become active immediately.	revolution 0.0000 - 429496.7295	UINT32 R/W - -	Modbus 7734 IDN P-0-3030.0.27
_p_dif_load_peak_usr	Maximum value of the load-dependent position deviation *(281)* This parameter contains the maximum load-dependent position deviation reached so far. A write access resets this value. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_p 0 - 2147483647	INT32 R/W - -	Modbus 7722 IDN P-0-3030.0.21
_p_dif_usr	Current position deviation including dynamic position deviation 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. Type: Signed decimal - 4 bytes	usr_p -2147483648 - 2147483647	INT32 R/- - -	Modbus 7720 IDN P-0-3030.0.20

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_p_DifENC1toENC2	Current deviation of encoder positions Type: Signed decimal - 4 bytes	Inc - - -	INT32 R/- - -	Modbus 7728 IDN P-0-3030.0.24
_p_ref	Reference position Value corresponds to the reference position of the position controller. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7704 IDN P-0-3030.0.12
_p_ref_int	Reference position in internal units Value corresponds to the reference position of the position controller. Type: Signed decimal - 4 bytes	Inc - - -	INT32 R/- - -	Modbus 7698 IDN P-0-3030.0.9
_PAR_ScalingError	Additional information on error during recalculation Coding: Bits 0 ... 15: Address of the parameter that caused the error Bits 16 ... 31: Number of the data set in the operating mode Motion Sequence that caused the error Type: Unsigned decimal - 4 bytes Changed settings become active immediately.	- - - -	UINT32 R/- - -	Modbus 1068 IDN P-0-3004.0.22
_PAR_ScalingState	Status of recalculation of the parameters with user-defined units **0 / Recalculation active**: Recalculation active **1 / reserved (1)**: reserved (1) **2 / Recalculation finished - no error**: Recalculation finished, no error **3 / Error during recalculation**: Error during recalculation **4 / Initialization successful**: Initialization successful **5 / reserved (5)**: reserved (5) **6 / reserved (6)**: reserved (6) **7 / reserved (7)**: reserved (7) Status of recalculation of the parameters with user-defined units which are recalculated with a changed scaling factor. Type: Unsigned decimal - 2 bytes Changed settings become active immediately.	- 0 2 7	UINT16 R/- - -	Modbus 1066 IDN P-0-3004.0.21
_Power_act	Current output power Type: Signed decimal - 4 bytes	W - - -	INT32 R/- - -	Modbus 7194 IDN P-0-3028.0.13
_Power_mean	Mean output power Type: Unsigned decimal - 2 bytes	W - - -	UINT16 R/- - -	Modbus 7196 IDN P-0-3028.0.14

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_pref_acc	Acceleration of reference value for acceleration feed-forward control Sign according to the changed speed value: Increased speed: Positive sign Reduced speed: Negative sign Type: Signed decimal - 4 bytes	usr_a - - -	INT32 R/- - -	Modbus 7954 IDN P-0-3031.0.9
_pref_v	Velocity of reference value for velocity feed-forward control Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7950 IDN P-0-3031.0.7
_prgNoDEV ConF → inF- Prn	Firmware number of device Example: PR0912.00 The value is provided as a decimal value: 91200 Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 258 IDN P-0-3001.0.1
_prgRevDEV ConF → inF- Prr	Firmware revision of device The version format is XX.YY.ZZ. Part XX.YY is contained in parameter _prgVerDEV. Part ZZ is used for quality evolution and contained in this parameter. Example: V01.23.45 The value is provided as a decimal value: 45 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 264 IDN P-0-3001.0.4
_prgVerDEV ConF → inF- PrU	Firmware version of device The version format is XX.YY.ZZ. Part XX.YY is contained in this parameter. Part ZZ is contained in parameter _prgRevDEV. Example: V01.23.45 The value is provided as a decimal value: 123 Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 260 IDN P-0-3001.0.2
_PS_I_max ConF → inF- PiMA	Maximum current of power stage Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- per. -	Modbus 4100 IDN P-0-3016.0.2
_PS_I_nom ConF → inF- Pino	Nominal current of power stage Type: Unsigned decimal - 2 bytes In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- per. -	Modbus 4098 IDN P-0-3016.0.1
_PS_load Mon LdFP	Current load of power stage *(293)* Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7214 IDN P-0-3028.0.23

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_PS_maxoverload	Maximum value of overload of power stage *(294)* Maximum overload of power stage during the last 10 seconds. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7216 IDN P-0-3028.0.24
_PS_overload	Current overload of power stage *(294)* Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7240 IDN P-0-3028.0.36
_PS_overload_cte	Current overload of power stage (chip temperature) Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7236 IDN P-0-3028.0.34
_PS_overload_I2t	Current overload of power stage (I2t) Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7212 IDN P-0-3028.0.22
_PS_overload_psq	Current overload of power stage (power squared) Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7238 IDN P-0-3028.0.35
_PS_T_current Mon tPS	Current power stage temperature *(292)* Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- - -	Modbus 7200 IDN P-0-3028.0.16
_PS_T_max	Maximum power stage temperature *(292)* Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- per. -	Modbus 4110 IDN P-0-3016.0.7
_PS_T_warn	Temperature warning threshold of power stage *(292)* Type: Signed decimal - 2 bytes	°C - - -	INT16 R/- per. -	Modbus 4108 IDN P-0-3016.0.6
_PS_U_maxDC	Maximum permissible DC bus voltage Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- per. -	Modbus 4102 IDN P-0-3016.0.3
_PS_U_minDC	Minimum permissible DC bus voltage Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- per. -	Modbus 4104 IDN P-0-3016.0.4
_PS_U_minStopDC	DC bus voltage low threshold for Quick Stop If the threshold is reached, the drive performs a Quick Stop. Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- per. -	Modbus 4116 IDN P-0-3016.0.10
_PT_max_val	Maximum possible value for operating mode Profile Torque 100.0 % correspond to the continuous stall torque _M_M_0. Type: Signed decimal - 2 bytes In increments of 0.1 %.	% - - -	INT16 R/- - -	Modbus 7228 IDN P-0-3028.0.30

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_RAMP_p_act	Actual position of profile generator Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7940 IDN P-0-3031.0.2
_RAMP_p_target	Target position of profile generator Absolute position value of the profile generator, calculated on the basis of the relative and absolute position values received. Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7938 IDN P-0-3031.0.1
_RAMP_v_act	Actual velocity of profile generator Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7948 IDN P-0-3031.0.6
_RAMP_v_target	Target velocity of profile generator Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7946 IDN P-0-3031.0.5
_RES_load Mon LdFb	Current load of braking resistor *(293)* The braking resistor set via parameter RESint_ext is monitored. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7208 IDN P-0-3028.0.20
_RES_maxoverload	Maximum value of overload of braking resistor *(294)* Maximum overload of braking resistor during the last 10 seconds. The braking resistor set via parameter RESint_ext is monitored. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7210 IDN P-0-3028.0.21
_RES_overload	Current overload of braking resistor (I2t) *(294)* The braking resistor set via parameter RESint_ext is monitored. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7206 IDN P-0-3028.0.19
_RESint_P	Nominal power of internal braking resistor Type: Unsigned decimal - 2 bytes	W - - -	UINT16 R/- per. -	Modbus 4114 IDN P-0-3016.0.9
_RESint_R	Resistance value of internal braking resistor Type: Unsigned decimal - 2 bytes In increments of 0.01 Ω.	Ω - - -	UINT16 R/- per. -	Modbus 4112 IDN P-0-3016.0.8
_ScalePOSmax	Maximum user-defined value for positions Type: Signed decimal - 4 bytes	usr_p - - -	INT32 R/- - -	Modbus 7956 IDN P-0-3031.0.10
_ScaleRAMPmax	Maximum user-defined value for accelerations and decelerations This value depends on ScaleRAMPdenom and ScaleRAMPnum. Type: Signed decimal - 4 bytes	usr_a - - -	INT32 R/- - -	Modbus 7960 IDN P-0-3031.0.12

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_ScaleVELmax`	Maximum user-defined value for velocities This value depends on ScaleVELdenom and ScaleVELnum. Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7958 IDN P-0-3031.0.11
`_SigActive`	Current status of monitoring signals See _SigLatched for more details on the bit codes. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 7182 IDN P-0-3028.0.7
`_SigLatched` MOn SiGS	Saved status of monitoring signals *(315)* Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General error Bit 1: Hardware limit switches (LIMP/LIMN/REF) Bit 2: Out of range (software limit switches, tuning) Bit 3: Quick Stop via fieldbus Bit 4: Error in active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following error Bit 9: Reserved Bit 10: Inputs STO are 0 Bit 11: Inputs STO different Bit 12: Reserved Bit 13: DC bus voltage low Bit 14: DC bus voltage high Bit 15: Mains phase missing Bit 16: Integrated encoder interface Bit 17: Overtemperature motor Bit 18: Overtemperature power stage Bit 19: Reserved Bit 20: Memory card Bit 21: Optional fieldbus module Bit 22: Optional encoder module Bit 23: Optional safety module eSM or module IOM1 Bit 24: Reserved Bit 25: Reserved Bit 26: Motor connection Bit 27: Motor overcurrent/short circuit Bit 28: Frequency of reference signal too high Bit 29: EEPROM error Bit 30: System start-up (hardware or parameter) Bit 31: System error (for example, watchdog, internal hardware interface) Monitoring functions are product-dependent. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 7184 IDN P-0-3028.0.8

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_SuppDriveModes`	Supported operating modes as per DSP402 Bit 0: Profile Position Bit 2: Profile Velocity Bit 3: Profile Torque Bit 5: Homing Bit 16: Jog Bit 17: Electronic Gear Bit 21: Manual Tuning Bit 23: Motion Sequence The availability of the individual bits is product-dependent. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 6952 IDN P-0-3027.0.20
`_tq_act`	Actual torque value Positive value: Actual torque in positive direction of movement Negative value: Actual torque in negative direction of movement 100.0 % correspond to the continuous stall torque _M_M_0. Type: Signed decimal - 2 bytes In increments of 0.1 %.	% - - -	INT16 R/- - -	Modbus 7752 IDN P-0-3030.0.36
`_Ud_ref`	Reference motor voltage d component Type: Signed decimal - 2 bytes In increments of 0.1 V.	V - - -	INT16 R/- - -	Modbus 7690 IDN P-0-3030.0.5
`_UDC_act` Mon udcA	Voltage at DC bus Type: Unsigned decimal - 2 bytes In increments of 0.1 V.	V - - -	UINT16 R/- - -	Modbus 7198 IDN P-0-3028.0.15
`_Udq_ref`	Total motor voltage (vector sum d components and q components) Square root of ($\_Uq\_ref^2$ + $\_Ud\_ref^2$) Type: Signed decimal - 2 bytes In increments of 0.1 V.	V - - -	INT16 R/- - -	Modbus 7692 IDN P-0-3030.0.6
`_Uq_ref`	Reference motor voltage q component Type: Signed decimal - 2 bytes In increments of 0.1 V.	V - - -	INT16 R/- - -	Modbus 7688 IDN P-0-3030.0.4
`_v_act` Mon VAct	Actual velocity Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7744 IDN P-0-3030.0.32
`_v_act_ENC1`	Actual velocity of encoder 1 Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7762 IDN P-0-3030.0.41
`_v_act_ENC2`	Actual velocity of encoder 2 (module) Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7750 IDN P-0-3030.0.35

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_v_ref MON VREF	Reference velocity Type: Signed decimal - 4 bytes	usr_v - - -	INT32 R/- - -	Modbus 7742 IDN P-0-3030.0.31
_Vmax_act	Currently effective velocity limitation Value of the currently effective velocity limitation. This is one of the following values (whichever is lowest): - CTRL_v_max - M_n_max (only if motor is connected) - Velocity limitation via digital input Type: Unsigned decimal - 4 bytes	usr_v - - -	UINT32 R/- - -	Modbus 7250 IDN P-0-3028.0.41
_VoltUtil MON UDCR	Degree of utilization of DC bus voltage With a value of 100%, the drive operates at the voltage limit. Type: Signed decimal - 2 bytes	% - - -	INT16 R/- - -	Modbus 7718 IDN P-0-3030.0.19
_WarnActive	Active warnings, bit-coded See _WarnLatched for more details on the bit codes. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 7190 IDN P-0-3028.0.11

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_WarnLatched Mon WrnS	Saved warnings, bit-coded *(314)* Saved warning bits are deleted in the case of a Fault Reset. Bits 10, 13 are deleted automatically. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General warning Bit 1: Reserved Bit 2: Out of range (SW limit switches, tuning) Bit 3: Reserved Bit 4: Active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following warning limit reached Bit 9: Reserved Bit 10: Inputs STO_A and/or STO_B Bit 11: Reserved Bit 12: Reserved Bit 13: Low voltage DC bus or mains phase missing Bit 14: Reserved Bit 15: Reserved Bit 16: Integrated encoder interface Bit 17: Temperature of motor high Bit 18: Temperature of power stage high Bit 19: Reserved Bit 20: Memory card Bit 21: Optional fieldbus module Bit 22: Optional encoder module Bit 23: Optional safety module eSM or module IOM1 Bit 24: Reserved Bit 25: Reserved Bit 26: Reserved Bit 27: Reserved Bit 28: Reserved Bit 29: Braking resistor overload (I^2t) Bit 30: Power stage overload (I^2t) Bit 31: Motor overload (I^2t) Monitoring functions are product-dependent. Type: Unsigned decimal - 4 bytes	- - - -	UINT32 R/- - -	Modbus 7192 IDN P-0-3028.0.12

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
AbsHomeRequest	Absolute positioning only after homing **0 / No**: No **1 / Yes**: Yes This parameter has no function if the parameter 'PP_ModeRangeLim' is set to '1' which allows overtraveling of the movement range (ref_ok is set to 0 when the range is overtraveled). Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 1 1	UINT16 R/W per. -	Modbus 1580 IDN P-0-3006.0.22
AccessLock	Locking other access channels *(192)* Value 0: Allow control via other access channels Value 1: Lock control via other access channels Example: The access channel is used by the fieldbus. In this case, control via the commissioning software or the HMI is not possible. The access channel can only be locked after the current operating mode has terminated. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 284 IDN P-0-3001.0.14
AT_dir oP → tun- StiM	Direction of movement for Autotuning *(165)* **1 / Positive Negative Home / Pnh** : Positive direction first, then negative direction with return to initial position **2 / Negative Positive Home / nPh** : Negative direction first, then positive direction with return to initial position **3 / Positive Home / P-h** : Positive direction only with return to initial position **4 / Positive / P--** : Positive direction only without return to initial position **5 / Negative Home / n-h** : Negative direction only with return to initial position **6 / Negative / n--** : Negative direction only without return to initial position Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	- 1 1 6	UINT16 R/W - -	Modbus 12040 IDN P-0-3047.0.4

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
AT_dis	Movement range for Autotuning *(166)* Range within which the control parameters are automatically optimized. The range is entered with reference to the current position. NOTE: In the case of "Movement in one direction only" (Parameter AT_dir), the specified range is used for each optimization step. The actual movement typically corresponds to 20 times the value, but it is not limited. The parameter AT_dis_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 In increments of 0.1 revolution. Changed settings become active the next time the motor moves.	revolution 1.0 2.0 999.9	UINT32 R/W - -	Modbus 12038 IDN P-0-3047.0.3
AT_dis_usr	Movement range for Autotuning *(165)* Range within which the control parameters are automatically optimized. The range is entered with reference to the current position. NOTE: In the case of "Movement in one direction only" (Parameter AT_dir), the specified range is used for each optimization step. The actual movement typically corresponds to 20 times the value, but it is not limited. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_p 1 262144 2147483647	INT32 R/W - -	Modbus 12068 IDN P-0-3047.0.18
AT_mechanical	Type of coupling of the system *(166)* **1 / Direct Coupling**: Direct coupling **2 / Belt Axis**: Belt axis **3 / Spindle Axis**: Spindle axis Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	- 1 2 3	UINT16 R/W - -	Modbus 12060 IDN P-0-3047.0.14
AT_n_ref	Jump of speed of rotation for Autotuning The parameter AT_v_ref allows you to enter the value in user-defined units. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	min^{-1} 10 100 1000	UINT32 R/W - -	Modbus 12044 IDN P-0-3047.0.6

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
AT_start	Autotuning start *(166)* Value 0: Terminate Value 1: Activate EasyTuning Value 2: Activate ComfortTuning Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 - 2	UINT16 R/W - -	Modbus 12034 IDN P-0-3047.0.1
AT_v_ref	Jump of velocity for Autotuning The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_v 1 100 2147483647	INT32 R/W - -	Modbus 12070 IDN P-0-3047.0.19
AT_wait	Waiting time between Autotuning steps *(169)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	ms 300 500 10000	UINT16 R/W - -	Modbus 12050 IDN P-0-3047.0.9
BLSH_Mode	Processing mode of backlash compensation *(237)* **0 / Off**: Backlash compensation is off **1 / OnAfterPositiveMovement**: Backlash compensation is on, last movement was in positive direction **2 / OnAfterNegativeMovement**: Backlash compensation is on, last movement was in negative direction Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 2	UINT16 R/W per. -	Modbus 1666 IDN P-0-3006.0.65
BLSH_Position	Position value for backlash compensation *(236)* Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	usr_p 0 0 2147483647	INT32 R/W per. -	Modbus 1668 IDN P-0-3006.0.66

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`BLSH_Time`	Processing time for backlash compensation *(237)* Value 0: Immediate backlash compensation Value >0: Processing time for backlash compensation Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	ms 0 0 16383	UINT16 R/W per. -	Modbus 1672 IDN P-0-3006.0.68
`BRK_AddT_apply`	Additional time delay for applying the holding brake *(150)* The overall time delay for applying the holding brake is the time delay from the electronic nameplate of the motor and the additional time delay in this parameter. Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	ms 0 0 1000	INT16 R/W per. -	Modbus 1296 IDN P-0-3005.0.8
`BRK_AddT_release`	Additional time delay for releasing the holding brake *(149)* The overall time delay for releasing the holding brake is the time delay from the electronic nameplate of the motor and the additional time delay in this parameter. Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	ms 0 0 400	INT16 R/W per. -	Modbus 1294 IDN P-0-3005.0.7
`BRK_release`	Processing of holding brake *(148)* **0 / Automatic**: Automatic processing **1 / Manual Release**: Manual release of holding brake The holding brake output can only be activated in the operating states 'Switch On Disabled', 'Ready To Switch On' or 'Fault'. If the power stage is active, the value is automatically set to 0. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2068 IDN P-0-3008.0.10

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`Cap1Activate`	Capture input 1 start/stop *(269)* **0 / Capture Stop**: Cancel capture function **1 / Capture Once**: Start one-time capture **2 / Capture Continuous**: Start continuous capture **3 / Reserved**: Reserved **4 / Reserved**: Reserved In the case of one-time capture, the function is terminated when the first value is captured. In the case of continuous capture, the function continues to run. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 - 4	UINT16 R/W - -	Modbus 2568 IDN P-0-3010.0.4
`Cap1Config`	Capture input 1 configuration *(267)* **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge **2 / Both Edges**: Position capture at both edges Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 2	UINT16 R/W - -	Modbus 2564 IDN P-0-3010.0.2
`Cap1Source`	Capture input 1 encoder source *(266)* **0 / Pact Encoder 1**: Source for capture input 1 is Pact of encoder 1 **1 / Pact Encoder 2**: Source for capture input 1 is Pact of encoder 2 (module) Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2580 IDN P-0-3010.0.10
`Cap2Activate`	Capture input 2 start/stop *(269)* **0 / Capture Stop**: Cancel capture function **1 / Capture Once**: Start one-time capture **2 / Capture Continuous**: Start continuous capture **3 / Reserved**: Reserved **4 / Reserved**: Reserved In the case of one-time capture, the function is terminated when the first value is captured. In the case of continuous capture, the function continues to run. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 - 4	UINT16 R/W - -	Modbus 2570 IDN P-0-3010.0.5

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`Cap2Config`	Capture input 2 configuration *(267)* **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge **2 / Both Edges**: Position capture at both edges Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 2	UINT16 R/W - -	Modbus 2566 IDN P-0-3010.0.3
`Cap2Source`	Capture input 2 encoder source *(266)* **0 / Pact Encoder 1**: Source for capture input 2 is Pact of encoder 1 **1 / Pact Encoder 2**: Source for capture input 2 is Pact of encoder 2 (module) Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2582 IDN P-0-3010.0.11
`Cap3Activate`	Capture input 3 start/stop *(269)* **0 / Capture Stop**: Cancel capture function **1 / Capture Once**: Start one-time capture **2 / Capture Continuous**: Start continuous capture In the case of one-time capture, the function is terminated when the first value is captured. In the case of continuous capture, the function continues to run. Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 - 2	UINT16 R/W - -	Modbus 2596 IDN P-0-3010.0.18
`Cap3Config`	Capture input 3 configuration *(267)* **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2594 IDN P-0-3010.0.17

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
Cap3Source	Capture input 3 encoder source *(266)* **0 / Pact Encoder 1**: Source for capture input 3 is Pact of encoder 1 **1 / Pact Encoder 2**: Source for capture input 3 is Pact of encoder 2 (module) Available with hardware version ≥RS03. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 2602 IDN P-0-3010.0.21
CLSET_p_DiffWin	Position deviation for parameter set switching *(249)* If the position deviation of the position controller is less than the value of this parameter, the controller parameter set 2 is used. Otherwise, controller parameter set 1 is used. The parameter CLSET_p_DiffWin_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 revolution. Changed settings become active immediately.	revolution 0.0000 0.0100 2.0000	UINT16 R/W per. -	Modbus 4408 IDN P-0-3017.0.28
CLSET_p_DiffWin_usr	Position deviation for parameter set switching *(248)* If the position deviation of the position controller is less than the value of this parameter, the controller parameter set 2 is used. Otherwise, controller parameter set 1 is used. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_p 0 1312 2147483647	INT32 R/W per. -	Modbus 4426 IDN P-0-3017.0.37

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CLSET_ParSwiCond	Condition for parameter set switching *(248)* **0 / None Or Digital Input**: None or digital input function selected **1 / Inside Position Deviation**: Inside position deviation (value definition in parameter CLSET_p_DiffWin) **2 / Below Reference Velocity**: Below reference velocity (value definition in parameter CLSET_v_Threshol) **3 / Below Actual Velocity**: Below actual velocity (value definition in parameter CLSET_v_Threshol) **4 / Reserved**: Reserved In the case of parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp The following parameters are changed immediately after the time for parameter set switching (CTRL_ParChgTime): - CTRL_Nf1damp - CTRL_Nf1freq - CTRL_Nf1bandw - CTRL_Nf2damp - CTRL_Nf2freq - CTRL_Nf2bandw - CTRL_Osupdamp - CTRL_Osupdelay - CTRL_Kfric Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 4	UINT16 R/W per. -	Modbus 4404 IDN P-0-3017.0.26
CLSET_v_Threshol	Velocity threshold for parameter set switching *(249)* If the reference velocity or the actual velocity are less than the value of this parameter, the controller parameter set 2 is used. Otherwise, controller parameter set 1 is used. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 0 50 2147483647	UINT32 R/W per. -	Modbus 4410 IDN P-0-3017.0.29

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CLSET_winTime	Time window for parameter set switching *(249)* Value 0: Window monitoring deactivated. Value >0: Window time for the parameters CLSET_v_Threshol and CLSET_p_DiffWin. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	ms 0 0 1000	UINT16 R/W per. -	Modbus 4406 IDN P-0-3017.0.27
CTRL_GlobGain oP → tun- GAin	Global gain factor (affects parameter set 1) *(168)* The global gain factor affects the following parameters of controller parameter set 1: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref The global gain factor is set to 100% - if the controller parameters are set to default - at the end of the Autotuning process - if the controller parameter set 2 is copied to set 1 via the parameter CTRL_ParSetCopy NOTE: If a full configuration is transmitted via the fieldbus, the value for CTRL_GlobGain must be transmitted prior to the values of the controller parameters CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref. If CTRL_GlobGain is changed during a configuration transmission, CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref must also be part of the configuration. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 5.0 100.0 1000.0	UINT16 R/W per. -	Modbus 4394 IDN P-0-3017.0.21

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL_I_max_fw	Maximum current for field weakening (d component) This value is only limited by the minimum/ maximum parameter range (no limitation of this value by motor/power stage). The actual field weakening current is the minimum of CTRL_I_max_fw and one half of the lower value of the nominal current of the power stage and the motor. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	A_{rms} 0.00 0.00 300.00	UINT16 R/W per. expert	Modbus 4382 IDN P-0-3017.0.15
CTRL_I_max ConF → drC- iMAX	Current limitation *(141)* During operation, the actual current limit is one of the following values (whichever is lowest): - CTRL_I_max - _M_I_max - _PS_I_max - Current limitation via analog input (module IOM1) - Current limitation via digital input Limitations caused by I2t monitoring are also taken into account. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 - 463.00	UINT16 R/W per. -	Modbus 4376 IDN P-0-3017.0.12
CTRL_KFAcc	Acceleration feed-forward control Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 3000.0	UINT16 R/W per. expert	Modbus 4372 IDN P-0-3017.0.10

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL_ParChgTime	Period of time for parameter switching *(139)* In the case of parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp Such a parameter switching can be caused by - change of the active controller parameter set - change of the global gain - change of any of the parameters listed above - switching off the integral term of the velocity controller Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	ms 0 0 2000	UINT16 R/W per. -	Modbus 4392 IDN P-0-3017.0.20
CTRL_ParSetCopy	Controller parameter set copying *(251)* Value 1: Copy controller parameter set 1 to set 2 Value 2: Copy controller parameter set 2 to set 1 If parameter set 2 copied to parameter set 1, the parameter CTRL_GlobGain is set to 100%. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0.0 - 0.2	UINT16 R/W - -	Modbus 4396 IDN P-0-3017.0.22
CTRL_PwrUpParSet	Selection of controller parameter set at power up *(245)* **0 / Switching Condition**: The switching condition is used for parameter set switching **1 / Parameter Set 1**: Parameter set 1 is used **2 / Parameter Set 2**: Parameter set 2 is used The selected value is also written to CTRL_ParSetSel (non-persistent). Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 1 2	UINT16 R/W per. -	Modbus 4400 IDN P-0-3017.0.24

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`CTRL_SelParSet`	Selection of controller parameter set (non-persistent) *(139)* Coding see parameter: CTRL_PwrUpParSet Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 1 2	UINT16 R/W - -	Modbus 4402 IDN P-0-3017.0.25
`CTRL_SpdFric`	Speed of rotation up to which the friction compensation is linear Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	min^{-1} 0 5 20	UINT32 R/W per. expert	Modbus 4370 IDN P-0-3017.0.9
`CTRL_TAUnact`	Filter time constant to smooth velocity of motor The default value is calculated on the basis of the motor data. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 30.00	UINT16 R/W per. expert	Modbus 4368 IDN P-0-3017.0.8
`CTRL_v_max` ConF → drC- nMAX	Velocity limitation *(142)* During operation, the actual velocity limit is one of the following values (whichever is lowest): - CTRL_v_max - M_n_max - Velocity limitation via analog input (module IOM1) - Velocity limitation via digital input Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 1 13200 2147483647	UINT32 R/W per. -	Modbus 4384 IDN P-0-3017.0.16

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL_VelObsActiv	Activation of velocity observer **0 / Velocity Observer Off**: Velocity observer is off **1 / Velocity Observer Passive**: Velocity observer is on, but not used for motor control **2 / Velocity Observer Active**: Velocity observer is on and used for motor control Velocity observer control reduces velocity ripple and enhances controller bandwith. NOTE: Set the correct dynamics and inertia values before activation. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 0 2	UINT16 R/W per. expert	Modbus 4420 IDN P-0-3017.0.34
CTRL_VelObsDyn	Dynamics of velocity observer Dynamics of the velocity observer. This time constant should be much smaller than that of the velocity controller. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Setting can only be changed if power stage is disabled. Changed settings become active immediately.	ms 0.03 0.25 200.00	UINT16 R/W per. expert	Modbus 4422 IDN P-0-3017.0.35
CTRL_VelObsInert	Inertia value for velocity observer System inertia that is used for velocity observer calculations. The default value is the inertia of the mounted motor. In the case of autotuning, the value of this parameter can be set equal to that of _AT_J. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	g cm^2 1 - 2147483648	UINT32 R/W per. expert	Modbus 4424 IDN P-0-3017.0.36
CTRL_vPIDDPart	PID velocity controller: D gain Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 400.0	UINT16 R/W per. expert	Modbus 4364 IDN P-0-3017.0.6

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL_vPIDDTime	PID velocity controller: Time constant of D term smoothing filter Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.01 0.25 10.00	UINT16 R/W per. expert	Modbus 4362 IDN P-0-3017.0.5
CTRL1_KFPp ConF → drC- FPP1	Velocity feed-forward control *(253)* In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 0.0 100.0 200.0	UINT16 R/W per. -	Modbus 4620 IDN P-0-3018.0.6
CTRL1_Kfric	Friction compensation: Gain *(254)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.00 10.00	UINT16 R/W per. expert	Modbus 4640 IDN P-0-3018.0.16
CTRL1_KPn ConF → drC- Pn1	Velocity controller P gain *(173)* The default value is calculated on the basis of the motor parameters. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 A/min^{-1}. Changed settings become active immediately.	A/min^{-1} 0.0001 - 2.5400	UINT16 R/W per. -	Modbus 4610 IDN P-0-3018.0.1
CTRL1_KPp ConF → drC- PP1	Position controller P gain *(179)* The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 1/s. Changed settings become active immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	Modbus 4614 IDN P-0-3018.0.3

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`CTRL1_Nf1bandw`	Notch filter 1: Bandwidth *(253)* Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4628 IDN P-0-3018.0.10
`CTRL1_Nf1damp`	Notch filter 1: Damping *(253)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4624 IDN P-0-3018.0.8
`CTRL1_Nf1freq`	Notch filter 1: Frequency *(253)* The filter is switched off at a value of 15000. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4626 IDN P-0-3018.0.9
`CTRL1_Nf2bandw`	Notch filter 2: Bandwidth *(254)* Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4634 IDN P-0-3018.0.13
`CTRL1_Nf2damp`	Notch filter 2: Damping *(253)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4630 IDN P-0-3018.0.11
`CTRL1_Nf2freq`	Notch filter 2: Frequency *(254)* The filter is switched off at a value of 15000. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4632 IDN P-0-3018.0.12

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL1_Osupdamp	Overshoot suppression filter: Damping *(254)* The filter is switched off at a value of 0. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 50.0	UINT16 R/W per. expert	Modbus 4636 IDN P-0-3018.0.14
CTRL1_Osupdelay	Overshoot suppression filter: Time delay *(254)* The filter is switched off at a value of 0. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.00 75.00	UINT16 R/W per. expert	Modbus 4638 IDN P-0-3018.0.15
CTRL1_TAUiref	Filter time constant of the reference current value filter *(177)* In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	Modbus 4618 IDN P-0-3018.0.5
CTRL1_TAUnref ConF → drC- tAu1	Filter time constant of the reference velocity value filter *(175)* In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	Modbus 4616 IDN P-0-3018.0.4
CTRL1_TNn ConF → drC- tin1	Velocity controller integral action time *(173)* The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4612 IDN P-0-3018.0.2

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL2_KFPp ConF → drC- FPP2	Velocity feed-forward control *(255)* In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 0.0 100.0 200.0	UINT16 R/W per. -	Modbus 4876 IDN P-0-3019.0.6
CTRL2_Kfric	Friction compensation: Gain *(255)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.00 10.00	UINT16 R/W per. expert	Modbus 4896 IDN P-0-3019.0.16
CTRL2_KPn ConF → drC- Pn2	Velocity controller P gain *(173)* The default value is calculated on the basis of the motor parameters. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 A/min^{-1}. Changed settings become active immediately.	A/min^{-1} 0.0001 - 2.5400	UINT16 R/W per. -	Modbus 4866 IDN P-0-3019.0.1
CTRL2_KPp ConF → drC- PP2	Position controller P gain *(179)* The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 1/s. Changed settings become active immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	Modbus 4870 IDN P-0-3019.0.3
CTRL2_Nf1bandw	Notch filter 1: Bandwidth *(255)* Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4884 IDN P-0-3019.0.10

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL2_Nf1damp	Notch filter 1: Damping *(256)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4880 IDN P-0-3019.0.8
CTRL2_Nf1freq	Notch filter 1: Frequency *(256)* The filter is switched off at a value of 15000. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4882 IDN P-0-3019.0.9
CTRL2_Nf2bandw	Notch filter 2: Bandwidth *(256)* Definition of bandwidth: 1 - Fb/F0 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	Modbus 4890 IDN P-0-3019.0.13
CTRL2_Nf2damp	Notch filter 2: Damping *(256)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	Modbus 4886 IDN P-0-3019.0.11
CTRL2_Nf2freq	Notch filter 2: Frequency *(256)* The filter is switched off at a value of 15000. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	Modbus 4888 IDN P-0-3019.0.12
CTRL2_Osupdamp	Overshoot suppression filter: Damping *(256)* The filter is switched off at a value of 0. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 50.0	UINT16 R/W per. expert	Modbus 4892 IDN P-0-3019.0.14

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`CTRL2_Osupdelay`	Overshoot suppression filter: Time delay *(257)* The filter is switched off at a value of 0. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.00 75.00	UINT16 R/W per. expert	Modbus 4894 IDN P-0-3019.0.15
`CTRL2_TAUiref`	Filter time constant of the reference current value filter *(177)* In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	Modbus 4874 IDN P-0-3019.0.5
`CTRL2_TAUnref` ConF → drC- tAu2	Filter time constant of the reference velocity value filter *(175)* In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	Modbus 4872 IDN P-0-3019.0.4
`CTRL2_TNn` ConF → drC- tin2	Velocity controller integral action time *(173)* The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	Modbus 4868 IDN P-0-3019.0.2

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`DCbus_compat`	DC bus compatibility LXM32 and ATV32 **0 / No DC bus or LXM32 only**: DC bus not used or only LXM32 connected via the DC bus **1 / DC bus with LXM32 and ATV32**: LXM32 and ATV32 connected via the DC bus NOTE: Connecting LXM32 drives and ATV32 drives via the DC bus may change the technical data. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 0 1	UINT16 R/W per. -	Modbus 1356 IDN P-0-3005.0.38
`DCOMopmode`	Operating mode **-6 / Manual Tuning / Autotuning**: Manual Tuning or Autotuning **-1 / Jog**: Jog **0 / Reserved**: Reserved **6 / Homing**: Homing **8 / Cyclic Synchronous Position**: Cyclic Synchronous Position **9 / Cyclic Synchronous Velocity**: Cyclic Synchronous Velocity **10 / Cyclic Synchronous Torque**: Cyclic Synchronous Torque Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- -6 - 10	INT16 R/W - -	Modbus 6918 IDN P-0-3027.0.3
`DEVcmdinterf` ConF → ACG- nonE dEUC	Specification of the control mode **2 / Fieldbus Control Mode / FbuS** : Fieldbus control mode Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1282 IDN P-0-3005.0.1

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
DI_0_Debounce	Debounce time of DI0 *(234)* **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **2 / 0.50 ms**: 0.50 ms **3 / 0.75 ms**: 0.75 ms **4 / 1.00 ms**: 1.00 ms **5 / 1.25 ms**: 1.25 ms **6 / 1.50 ms**: 1.50 ms Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2112 IDN P-0-3008.0.32
DI_1_Debounce	Debounce time of DI1 *(234)* **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **2 / 0.50 ms**: 0.50 ms **3 / 0.75 ms**: 0.75 ms **4 / 1.00 ms**: 1.00 ms **5 / 1.25 ms**: 1.25 ms **6 / 1.50 ms**: 1.50 ms Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2114 IDN P-0-3008.0.33
DI_2_Debounce	Debounce time of DI2 *(234)* **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **2 / 0.50 ms**: 0.50 ms **3 / 0.75 ms**: 0.75 ms **4 / 1.00 ms**: 1.00 ms **5 / 1.25 ms**: 1.25 ms **6 / 1.50 ms**: 1.50 ms Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2116 IDN P-0-3008.0.34

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
DI_3_Debounce	Debounce time of DI3 *(235)* **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **2 / 0.50 ms**: 0.50 ms **3 / 0.75 ms**: 0.75 ms **4 / 1.00 ms**: 1.00 ms **5 / 1.25 ms**: 1.25 ms **6 / 1.50 ms**: 1.50 ms Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2118 IDN P-0-3008.0.35
DI_4_Debounce	Debounce time of DI4 *(235)* **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **2 / 0.50 ms**: 0.50 ms **3 / 0.75 ms**: 0.75 ms **4 / 1.00 ms**: 1.00 ms **5 / 1.25 ms**: 1.25 ms **6 / 1.50 ms**: 1.50 ms Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2120 IDN P-0-3008.0.36
DI_5_Debounce	Debounce time of DI5 *(235)* **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **2 / 0.50 ms**: 0.50 ms **3 / 0.75 ms**: 0.75 ms **4 / 1.00 ms**: 1.00 ms **5 / 1.25 ms**: 1.25 ms **6 / 1.50 ms**: 1.50 ms Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 R/W per. -	Modbus 2122 IDN P-0-3008.0.37

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
DPL_intLim	Setting for bit 9 of _DPL_motionStat and _actionStatus **0 / None**: Not used (reserved) **1 / Current Below Threshold**: Current threshold value **2 / Velocity Below Threshold**: Velocity threshold value **3 / In Position Deviation Window**: Position deviation window **4 / In Velocity Deviation Window**: Velocity deviation window **5 / Position Register Channel 1**: Position register channel 1 **6 / Position Register Channel 2**: Position register channel 2 **7 / Position Register Channel 3**: Position register channel 3 **8 / Position Register Channel 4**: Position register channel 4 **9 / Hardware Limit Switch**: Hardware limit switch **10 / RMAC active or finished**: Relative movement after capture is active or finished **11 / Position Window**: Position window Setting for: Bit 9 of the parameter _actionStatus Bit 9 of the parameter _DPL_motionStat Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 11 11	UINT16 R/W per. -	Modbus 7018 IDN P-0-3027.0.53

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
DS402intLim	DS402 status word: Setting for bit 11 (internal limit) **0 / None**: Not used (reserved) **1 / Current Below Threshold**: Current threshold value **2 / Velocity Below Threshold**: Velocity threshold value **3 / In Position Deviation Window**: Position deviation window **4 / In Velocity Deviation Window**: Velocity deviation window **5 / Position Register Channel 1**: Position register channel 1 **6 / Position Register Channel 2**: Position register channel 2 **7 / Position Register Channel 3**: Position register channel 3 **8 / Position Register Channel 4**: Position register channel 4 **9 / Hardware Limit Switch**: Hardware limit switch **10 / RMAC active or finished**: Relative movement after capture is active or finished **11 / Position Window**: Position window Setting for: Bit 11 of the parameter _DCOMstatus Bit 10 of the parameter _actionStatus Bit 10 of the parameter _DPL_motionStat Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 11	UINT16 R/W per. -	Modbus 6972 IDN P-0-3027.0.30
ENC_abs_source	Source for setting absolute encoder position **0 / Encoder 1**: Absolute position determined from encoder 1 **1 / Encoder 2 (module)**: Absolute position determined from encoder 2 (module) This parameter defines the encoder source which is used to determine the base absolute position after power cycling. If this is set to Encoder 1, the absolute position from encoder 1 is read and copied to the system values of encoder 2. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the product is switched on.	- 0 0 1	UINT16 R/W per. -	Modbus 1354 IDN P-0-3005.0.37

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ENC_ModeOfMaEnc	Selection of mode of machine encoder **0 / None**: Machine encoder is not used for motor control **1 / Position Control**: Machine encoder is used for position control **2 / Velocity And Position Control**: Machine encoder is used for velocity and position control NOTE: It is not possible to use the machine encoder for speed control and the motor encoder for position control. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	Modbus 20484 IDN P-0-3080.0.2
ENC1_adjustment	Adjustment of absolute position of encoder 1 *(156)* The value range depends on the encoder type. Singleturn encoder: 0 ... x-1 Multiturn encoder: 0 ... (4096*x)-1 Singleturn encoder (shifted with parameter ShiftEncWorkRang): -(x/2) ... (x/2)-1 Multiturn encoder (shifted with parameter ShiftEncWorkRang): -(2048*x) ... (2048*x)-1 Definition of 'x': Maximum position for one encoder turn in user-defined units. This value is 16384 with the default scaling. NOTE: * If processing is to be performed with inversion of the direction of movement, this must be set before the encoder position is adjusted. * After the write access, a wait time of at least 1 second is required before the drive is switched off. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the product is switched on.	usr_p - - -	INT32 R/W - -	Modbus 1324 IDN P-0-3005.0.22

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ENC2_adjustment`	Adjustment of absolute position of encoder 2 *(157)* The value range depends on the encoder type at the physical port ENC2. This parameter can only be changed if the parameter ENC_abs_source is set to 'Encoder 2'. Singleturn encoder: 0 ... x-1 Multiturn encoder: 0 ... (y*x)-1 Singleturn encoder (shifted with parameter ShiftEncWorkRang): -(x/2) ... (x/2)-1 Multiturn encoder (shifted with parameter ShiftEncWorkRang): -(y/2)*x ... ((y/2)*x)-1 Definition of 'x': Maximum position for one encoder turn in user-defined units. This value is 16384 with the default scaling. Definition of 'y': Revolutions of the multiturn encoder. NOTE: * If processing is to be performed with inversion of the direction of movement, this must be set before the encoder position is adjusted. * After the write access, the parameter values has to be saved to the EEPROM and the drive has to be switched off, before the change becomes active. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the product is switched on.	usr_p - - -	INT32 R/W - -	Modbus 1352 IDN P-0-3005.0.36
`ENC2_pos_offset`	Offset for actual position value 2 This offset is used in the calculation of the value of IDN53. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- - - -	INT32 R/W per. -	Modbus 1386 IDN P-0-3005.0.53

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ENC2_type	Type of encoder at encoder 2 (module) **0 / none**: Undefined **1 / SinCos Hiperface (rotary)**: SinCos Hiperface (rotary) **2 / SinCos 1Vpp (wake & shake - rotary)**: SinCos 1Vpp (wake & shake, rotary) **3 / Sincos 1Vpp Hall (no wake & shake - rotary)**: SinCos 1Vpp Hall (no wake & shake, rotary) **5 / EnDat 2.2 (rotary)**: EnDat 2.2 (rotary) **6 / Resolver**: Resolver **8 / BISS**: BISS **9 / A/B/I (rot)**: A/B/I (rotary) **10 / SSI (rot)**: SSI (rotary) **257 / SinCos Hiperface (linear)**: SinCos Hiperface (linear) **258 / SinCos 1Vpp (wake & shake - linear)**: SinCos 1Vpp (wake & shake, linear) **259 / SinCos 1Vpp Hall (no wake & shake - linear)**: SinCos 1Vpp Hall (no wake & shake, linear) **261 / EnDat 2.2 (linear)**: EnDat 2.2 (linear) **265 / A/B/I (linear)**: A/B/I (linear) Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 0 265	UINT16 R/W per. -	Modbus 20486 IDN P-0-3080.0.3
ENC2_usage	Type of usage of encoder 2 (module) **0 / None**: Undefined **1 / Motor**: Configured as motor encoder **2 / Machine**: Configured as machine encoder NOTE: If the parameter is set to "Motor", encoder 1 has no functionality. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 0 2	UINT16 R/W per. -	Modbus 20482 IDN P-0-3080.0.1

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ENCAnaPowSupply	Power supply encoder module ANA (analog interface) **5 / 5V**: 5 V supply voltage **12 / 12V**: 12 V supply voltage Power supply of the analog encoder only if the encoder is used as a machine encoder supplying 1Vpp encoder signals. This parameter is not used for Hiperface encoders. Hiperface encoders are supplied with 12 V. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 5 5 12	UINT16 R/W per. -	Modbus 20740 IDN P-0-3081.0.2
ENCDigABIMaxFreq	ABI maximum frequency The maximum possible ABI frequency is encoder-specific (specified by the encoder manufacturer). The encoder module DIG supports a maximum ABI frequency of 1 MHz (this is the default and maximum value of ENCDigABIMaxFreq). An ABI frequency of 1 MHz means that there are 4000000 encoder increments in 1 second. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	kHz 1 1000 1000	UINT16 R/W per. -	Modbus 21004 IDN P-0-3082.0.6

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ENCDigABImaxIx	ABI maximum distance for index pulse search In the case of a reference movement to the index pulse, ENCDigABImaxIx contains the maximum distance within which the index pulse must be found. If no physical index pulse is found over this range, an error message is generated. Example: A rotary ABI encoder with one index pulse per revolution is connected. The resolution of the encoder is 8000 encoder increments per revolution (this value can be determined using parameter _Inc_Enc2Raw. _Inc_Enc2Raw and ENCDigABImaxIx have the same scaling). The maximum distance necessary for a reference movement to the index pulse is one revolution. This means that ENCDigABImaxIx should be set to 8000. Internally, a tolerance of 10% is added. This means that during a reference movement to the index pulse, an index pulse must be found within 8800 encoder increments. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	EncInc 1 10000 2147483647	INT32 R/W per. -	Modbus 21006 IDN P-0-3082.0.7
ENCDigBISSCoding	Position coding of BISS encoder **0 / binary**: Binary coding **1 / gray**: Gray coding This parameter defines the type of position coding of the BISS encoder. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 0 1	UINT16 R/W per. -	Modbus 21012 IDN P-0-3082.0.10

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ENCDigBISSResMul	BISS multiturn resolution This parameter is only relevant for BISS encoders (singleturn and multiturn). If a singleturn BISS encoder is used, ENCDigBISSResMult must be set to 0. Example: If ENCDigBISSResMult is set to 12, the number of turns of the encoder used must be 2^12 = 4096. The sum of ENCDigBISSResMult + ENCDigBISSResSgl must be less than or equal to 46 bits. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	bit 0 0 24	UINT16 R/W per. -	Modbus 21010 IDN P-0-3082.0.9
ENCDigBISSResSgl	BISS singleturn resolution This parameter is only relevant for BISS encoders (singleturn and multiturn). Example: If ENCDigBISSResSgl is set to 13, an BISS encoder with a singleturn resolution of 2^13 = 8192 increments must be used. If a multiturn encoder is used, the sum of ENCDigBISSResMult + ENCDigBISSResSgl must be less than or equal to 46 bits. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	bit 8 13 25	UINT16 R/W per. -	Modbus 21008 IDN P-0-3082.0.8
ENCDigPowSupply	Power supply encoder module DIG (digital interface) **5 / 5V**: 5 V supply voltage **12 / 12V**: 12 V supply voltage Power supply of the digital encoder. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 5 5 12	UINT16 R/W per. -	Modbus 21000 IDN P-0-3082.0.4

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ENCDigResMulUsed	Number of bits of the multiturn resolution used of the encoder Specifies the number of bits of the multiturn resolution used for position evaluation. If ENCDigResMulUsed = 0, all bits of the multiturn resolution of the encoder are used. Example: If ENCDigResMulUsed = 11, only 11 bits of the multiturn resolution of the encoder are used. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	bit 0 0 24	UINT16 R/W per. -	Modbus 21014 IDN P-0-3082.0.11
ENCDigSSICoding	Position coding of SSI encoder **0 / binary**: Binary coding **1 / gray**: Gray coding This parameter defines the type of position coding of the SSI encoder. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 0 1	UINT16 R/W per. -	Modbus 20998 IDN P-0-3082.0.3
ENCDigSSIMaxFreq	SSI maximum transfer frequency This parameter is only relevant for SSI encoders (singleturn and multiturn). The maximum possible SSI transfer frequency is encoder-specific (specified by encoder manufacturer). The value of ENCDigSSIMaxFreq and the possible SSI transfer frequencies of the encoder module are used to configure an optimum SSI transfer frequency (the encoder module supports 0.2 MHz and 1 MHz transfer frequencies). Example: The encoder has a maximum transfer frequency of 400 kHz. ENCDigSSIMaxFreq is set to 400. Internally, the transfer frequency is set to 200 kHz. If the encoder cable is very long, ENCDigSSIMaxFreq may have to be reduced. In this case, the response time of the drive is slightly reduced. The higher the transfer frequency, the lower the lag time in the control loop. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	kHz 200 200 1000	UINT16 R/W per. -	Modbus 21002 IDN P-0-3082.0.5

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ENCDigSSIResMult	SSI multiturn resolution This parameter is only relevant for SSI encoders (singleturn and multiturn). If a singleturn SSI encoder is used, ENCDigSSIResMult must be set to 0. Example: If ENCDigSSIResMult is set to 12, the number of turns of the encoder used must be 2^12 = 4096. The sum of ENCDigSSIResMult + ENCDigSSIResSgl must be less than or equal to 32 bits. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	bit 0 0 24	UINT16 R/W per. -	Modbus 20996 IDN P-0-3082.0.2
ENCDigSSIResSgl	SSI singleturn resolution This parameter is only relevant for SSI encoders (singleturn and multiturn). Example: If ENCDigSSIResSgl is set to 13, an SSI encoder with a singleturn resolution of 2^13 = 8192 increments must be used. If a multiturn encoder is used, the sum of ENCDigSSIResMult + ENCDigSSIResSgl must be less than or equal to 32 bits. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	bit 8 13 25	UINT16 R/W per. -	Modbus 20994 IDN P-0-3082.0.1
ENCSinCosMaxIx	Maximum distance for search for index pulse for SinCos encoder The parameter specifies the maximum number of periods during which the index pulse must be found (search range). A tolerance of 10 % is added to this value. If no index pulse is found within this range (including the 10% tolerance), an error message is generated. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 1 1024 2147483647	INT32 R/W per. -	Modbus 20744 IDN P-0-3081.0.4

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ERR_clear	Clear error memory *(310)* Value 1: Delete entries in the error memory The clearing process is completed if a 0 is returned after a read access. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 - 1	UINT16 R/W - -	Modbus 15112 IDN P-0-3059.0.4
ERR_reset	Reset error memory read pointer *(310)* Value 1: Set error memory read pointer to oldest error entry. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 - 1	UINT16 R/W - -	Modbus 15114 IDN P-0-3059.0.5
ErrorResp_Flt_AC	Error response to missing mains phase *(296)* **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 1 2 3	UINT16 R/W per. -	Modbus 1300 IDN P-0-3005.0.10
ErrorResp_I2tRES	Error response to 100% I2t braking resistor **0 / Warning**: Warning (error class 0) **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 0 2	UINT16 R/W per. -	Modbus 1348 IDN P-0-3005.0.34
ErrorResp_p_dif	Error response to following error *(282)* **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 1 3 3	UINT16 R/W per. -	Modbus 1302 IDN P-0-3005.0.11

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`eSM_BaseSetting`	eSM basic settings **None**: No function **Auto Start**: Automatic start (ESMSTART) **Ignore GUARD_ACK**: GUARD_ACK inactive **Ignore INTERLOCK_IN**: INTERLOCK chain inactive Setting can only be changed if power stage is disabled.	- - - -	 R/W per. -	
`eSM_dec_NC`	eSM deceleration ramp Deceleration ramp for monitored deceleration Value 0: Disabled, no monitoring of deceleration ramp Value >0: Deceleration ramp in min^{-1}/s Setting can only be changed if power stage is disabled.	min^{-1}/s 0 0 32786009	 R/W per. -	
`eSM_dec_Qstop`	eSM deceleration ramp for Quick Stop Deceleration ramp for monitored Quick Stop. This value must be greater than 0. Value 0: eSM module is not configured Value >0: Deceleration ramp in min^{-1}/s Setting can only be changed if power stage is disabled.	min^{-1}/s 0 0 32786009	 R/W per. -	
`eSM_disable`	eSM disable Value 0: No action Value 1: Force a change of eSM state 6 to eSM state 3 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4	- - - -	UINT16 R/W - -	Modbus 19508 IDN P-0-3076.0.26

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
eSM_FuncAUXOUT1	eSM function of status output AUXOUT1 **None**: No function **/ESTOP**: Signal state /ESTOP **GUARD**: Signal state GUARD **SETUPMODE**: Signal state SETUPMODE **SETUPENABLE**: Signal state SETUPENABLE **GUARD_ACK**: Signal state GUARD_ACK **/INTERLOCK_IN**: Signal state /INTERLOCK_IN **STO by eSM**: Signal state of internal STO **RELAY**: Signal state RELAY **/INTERLOCK_OUT**: Signal state /INTERLOCK_OUT **Standstill**: Standstill (v = 0) **SLS**: SLS **Error class 4**: Error of error class 4 occurred **Error class 1 ... 4**: Error of error classes 1 … 4 occurred **/ESTOP inv.**: Signal state /ESTOP, inverted **GUARD inv.**: Signal state GUARD, inverted **SETUPMODE inv.**: Signal state SETUPMODE, inverted **SETUPENABLE inv.**: Signal state SETUPENABLE, inverted **GUARD_ACK inv.**: Signal state GUARD_ACK, inverted **/INTERLOCK_IN inv.**: Signal state /INTERLOCK_IN, inverted **STO by eSM inv.**: Signal state of internal STO, inverted **RELAY inv.**: Signal state RELAY, inverted **/INTERLOCK_OUT inv.**: Signal state /INTERLOCK_OUT, inverted **Standstill inv.**: Standstill, inverted **SLS inv.**: SLS, inverted **Error class 4 inv.**: Error of error class 4 occurred, inverted **Error class 1 ... 4 inv.**: Error of error classes 1 … 4 occurred, inverted Setting can only be changed if power stage is disabled.	- - - -	 R/W per. -	

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
eSM_FuncAUXOUT2	eSM function of status output AUXOUT2 **None**: No function **/ESTOP**: Signal state /ESTOP **GUARD**: Signal state GUARD **SETUPMODE**: Signal state SETUPMODE **SETUPENABLE**: Signal state SETUPENABLE **GUARD_ACK**: Signal state GUARD_ACK **/INTERLOCK_IN**: Signal state /INTERLOCK_IN **STO by eSM**: Signal state of internal STO **RELAY**: Signal state RELAY **/INTERLOCK_OUT**: Signal state /INTERLOCK_OUT **Standstill**: Standstill (v = 0) **SLS**: SLS **Error class 4**: Error of error class 4 occurred **Error class 1 ... 4**: Error of error classes 1 … 4 occurred **/ESTOP inv.**: Signal state /ESTOP, inverted **GUARD inv.**: Signal state GUARD, inverted **SETUPMODE inv.**: Signal state SETUPMODE, inverted **SETUPENABLE inv.**: Signal state SETUPENABLE, inverted **GUARD_ACK inv.**: Signal state GUARD_ACK, inverted **/INTERLOCK_IN inv.**: Signal state /INTERLOCK_IN, inverted **STO by eSM inv.**: Signal state of internal STO, inverted **RELAY inv.**: Signal state RELAY, inverted **/INTERLOCK_OUT inv.**: Signal state /INTERLOCK_OUT, inverted **Standstill inv.**: Standstill, inverted **SLS inv.**: SLS, inverted **Error class 4 inv.**: Error of error class 4 occurred, inverted **Error class 1 ... 4 inv.**: Error of error classes 1 … 4 occurred, inverted Setting can only be changed if power stage is disabled.	- - - -	 R/W per. -	

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
eSM_FuncSwitches	eSM switches for functions **None**: No function **DirectionDependentSLS**: SLS dependent on direction of movement Available as of firmware version safety module eSM ≥V01.01. Bit 0 = 0: SLS independent of direction of movement Bit 0 = 1: SLS dependent on direction of movement Available as of firmware version safety module eSM ≥V01.02. Bit 1 = 0: Activate error response to fifth detected error during monitored deceleration Bit 1 = 1: Deactivate error response to fifth detected error during monitored deceleration Bit 2 = 0: After an eSM Disable, the transition from operating state 3 to 4 takes place when the transition condition is met. Bit 2 = 1: After an eSM Disable, the transition from operating state 3 to 4 takes place when the transition condition is met and if the eSM Disable is no longer set. Setting can only be changed if power stage is disabled.	- 0 0 7	 R/W per. -	
eSM_LO_mask	eSM digital outputs channel B mask Mask of active digital outputs 0: Digital output is not active 1: Digital output is active Bit assignments: See digital outputs channel. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4	- - - -	UINT16 R/W - -	Modbus 19498 IDN P-0-3076.0.21
eSM_SLSnegDirS	eSM speed limit negative direction machine operating mode Setup Mode Firmware version safety module eSM ≥V01.01. Parameter eSM_FuncSwitches Bit 0 = 1: Value = Monitored speed limit for negative direction of movement. Setting can only be changed if power stage is disabled.	min^{-1} 0 0 8000	 R/W per. -	
eSM_t_NCDel	eSM delay time until start of monitored deceleration Delay time until monitoring of the deceleration ramp starts. This time can be adjusted to meet the requirements of a PLC. Setting can only be changed if power stage is disabled.	ms 0 0 10000	 R/W per. -	

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
eSM_t_Relay	eSM deactivation of output RELAY Deactivation of the digital output RELAY: Value 0: Immediate, no delay time Value 1: At motor standstill (v = 0) Value 2: At motor standstill (v = 0) and INTERLOCK_OUT = 1 Value >2: Delay time in ms, deactivation of output after this time has passed Setting can only be changed if power stage is disabled.	ms 0 0 10000	 R/W per. -	
eSM_v_maxAuto	eSM speed limit for machine operating mode Automatic Mode This value sets the speed limit for monitoring in machine operating mode Automatic Mode. Value 0: The speed limit is not monitored Value >0: Monitored speed limit Setting can only be changed if power stage is disabled.	min^{-1} 0 0 8000	 R/W per. -	
eSM_v_maxSetup	eSM speed limit for machine operating mode Setup Mode This value sets the speed limit for monitoring in machine operating mode Setup Mode. Firmware version safety module eSM ≥V01.01: Parameter eSM_FuncSwitches Bit 0 = 0: Value = Monitored speed limit for positive and negative directions of movement. Parameter eSM_FuncSwitches Bit 0 = 1: Value = Monitored speed limit for positive direction of movement. Setting can only be changed if power stage is disabled.	min^{-1} 0 0 8000	 R/W per. -	
HMdis	Distance from switching point *(208)* The distance from the switching point is defined as the reference point. The parameter is only effective during a reference movement without index pulse. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_p 1 200 2147483647	INT32 R/W per. -	Modbus 10254 IDN P-0-3040.0.7

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
HMIDispPara Mon SuPV	HMI display when motor moves **0 / OperatingState / StAt** : Operating state **1 / v_act / VAct** : Actual motor velocity **2 / I_act / iAct** : Actual motor current Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immedi-ately.	- 0 0 2	UINT16 R/W per. -	Modbus 14852 IDN P-0-3058.0.2
HMIlocked	Lock HMI *(192)* **0 / Not Locked / nLoc** : HMI not locked **1 / Locked / Loc** : HMI locked The following functions can no longer be started when the HMI is locked: - Parameter change - Jog - Autotuning - Fault Reset Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immedi-ately.	- 0 0 1	UINT16 R/W per. -	Modbus 14850 IDN P-0-3058.0.1

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
HMmethod	Homing method *(207)* 1: LIMN with index pulse 2: LIMP with index pulse 7: REF+ with index pulse, inv., outside 8: REF+ with index pulse, inv., inside 9: REF+ with index pulse, not inv., inside 10: REF+ with index pulse, not inv., outside 11: REF- with index pulse, inv., outside 12: REF- with index pulse, inv., inside 13: REF- with index pulse, not inv., inside 14: REF- with index pulse, not inv., outside 17: LIMN 18: LIMP 23: REF+, inv., outside 24: REF+, inv., inside 25: REF+, not inv., inside 26: REF+, not inv., outside 27: REF-, inv., outside 28: REF-, inv., inside 29: REF-, not inv., inside 30: REF-, not inv., outside 33: Index pulse neg. direction 34: Index pulse pos. direction 35: Position setting Abbreviations: REF+: Search movement in pos. direction REF-: Search movement in neg. direction inv.: Invert direction in switch not inv.: Direction not inverted in switch outside: Index pulse / distance outside switch inside: Index pulse / distance inside switch Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 1 18 35	INT16 R/W - -	Modbus 6936 IDN P-0-3027.0.12
HMoutdis	Maximum distance for search for switching point *(209)* 0: Monitoring of distance inactive >0: Maximum distance After detection of the switch, the drive starts to search for the defined switching point. If the defined switching point is not found within the distance defined here, the reference movement is canceled with an error. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_p 0 0 2147483647	INT32 R/W per. -	Modbus 10252 IDN P-0-3040.0.6

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
HMp_home	Position at reference point *(208)* After a successful reference movement, this position is automatically set at the reference point. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_p -2147483648 0 2147483647	INT32 R/W per. -	Modbus 10262 IDN P-0-3040.0.11
HMp_setP	Position for Position Setting *(215)* Position for operating mode Homing, method 35. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immedi-ately.	usr_p - 0 -	INT32 R/W - -	Modbus 6956 IDN P-0-3027.0.22
HMprefmethod oP → hoM- MEth	Preferred homing method *(207)* Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immedi-ately.	- 1 18 35	INT16 R/W per. -	Modbus 10260 IDN P-0-3040.0.10
HMsrchdis	Maximum search distance after overtravel of switch *(209)* 0: Search distance monitoring disabled >0: Search distance The switch must be activated again within this search distance, otherwise the refer-ence movement is canceled. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_p 0 0 2147483647	INT32 R/W per. -	Modbus 10266 IDN P-0-3040.0.13
HMv oP → hoM- hMn	Target velocity for searching the switch *(210)* The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_v 1 60 2147483647	UINT32 R/W per. -	Modbus 10248 IDN P-0-3040.0.4
HMv_out	Target velocity for moving away from switch *(210)* The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_v 1 6 2147483647	UINT32 R/W per. -	Modbus 10250 IDN P-0-3040.0.5

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`InvertDirOfMaEnc`	Inversion of direction of machine encoder **0 / Inversion Off**: Inversion of direction is off **1 / Inversion On**: Inversion of direction is on Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 20496 IDN P-0-3080.0.8
`InvertDirOfMove` ConF → ACG- inMo	Inversion of direction of movement *(153)* **0 / Inversion Off / oFF** : Inversion of direction of movement is off **1 / Inversion On / on** : Inversion of direction of movement is on The limit switch which is reached with a movement in positive direction must be connected to the positive limit switch input and vice versa. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 0 1	UINT16 R/W per. -	Modbus 1560 IDN P-0-3006.0.12
`IO_DQ_set`	Setting the digital outputs directly *(264)* Write access to output bits is only active if the signal pin is available as an output and if the function of the output was set to 'Available as required'. Coding of the individual signals: Bit 0: DQ0 Bit 1: DQ1 Bit 2: DQ2 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4	- - - -	UINT16 R/W - -	Modbus 2082 IDN P-0-3008.0.17
`IO_I_limit` ConF → i-o- iLiM	Current limitation via input A current limit can be activated via a digital input. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.20 300.00	UINT16 R/W per. -	Modbus 1614 IDN P-0-3006.0.39

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IO_v_limit	Velocity limitation via input A velocity limitation can be activated via a digital input. NOTE: In operating mode Profile Torque, the minimum velocity is internally limited to 100 min^{-1}. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 0 10 2147483647	UINT32 R/W per. -	Modbus 1596 IDN P-0-3006.0.30
IOfunct_DI0 ConF → i-o- di0	Function Input DI0 *(226)* **1 / Freely Available / nonE** : Available as required **21 / Reference Switch (REF) / rEF** : Reference switch **22 / Positive Limit Switch (LIMP) / LiMP** : Positive limit switch **23 / Negative Limit Switch (LIMN) / LiMn** : Negative limit switch **24 / Switch Controller Parameter Set / CPAr** : Switches controller parameter set **28 / Velocity Controller Integral Off / tnoF** : Switches off velocity controller integral term **40 / Release Holding Brake / rEhb** : Releases the holding brake Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1794 IDN P-0-3007.0.1

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DI1 ConF → i-o- di1	Function Input DI1 *(226)* **1 / Freely Available / nonE** : Available as required **21 / Reference Switch (REF) / rEF** : Reference switch **22 / Positive Limit Switch (LIMP) / LiMP** : Positive limit switch **23 / Negative Limit Switch (LIMN) / LiMn** : Negative limit switch **24 / Switch Controller Parameter Set / CPAr** : Switches controller parameter set **28 / Velocity Controller Integral Off / tnoF** : Switches off velocity controller integral term **40 / Release Holding Brake / rEhb** : Releases the holding brake Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1796 IDN P-0-3007.0.2
IOfunct_DI2 ConF → i-o- di2	Function Input DI2 *(227)* **1 / Freely Available / nonE** : Available as required **21 / Reference Switch (REF) / rEF** : Reference switch **22 / Positive Limit Switch (LIMP) / LiMP** : Positive limit switch **23 / Negative Limit Switch (LIMN) / LiMn** : Negative limit switch **24 / Switch Controller Parameter Set / CPAr** : Switches controller parameter set **28 / Velocity Controller Integral Off / tnoF** : Switches off velocity controller integral term **40 / Release Holding Brake / rEhb** : Releases the holding brake Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1798 IDN P-0-3007.0.3

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`IOfunct_DI3` ConF → i-o- di3	Function Input DI3 *(227)* **1 / Freely Available / nonE** : Available as required **21 / Reference Switch (REF) / rEF** : Reference switch **22 / Positive Limit Switch (LIMP) / LiMP** : Positive limit switch **23 / Negative Limit Switch (LIMN) / LiMn** : Negative limit switch **24 / Switch Controller Parameter Set / CPAr** : Switches controller parameter set **28 / Velocity Controller Integral Off / tnoF** : Switches off velocity controller integral term **40 / Release Holding Brake / rEhb** : Releases the holding brake Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1800 IDN P-0-3007.0.4
`IOfunct_DI4` ConF → i-o- di4	Function Input DI4 *(228)* **1 / Freely Available / nonE** : Available as required **21 / Reference Switch (REF) / rEF** : Reference switch **22 / Positive Limit Switch (LIMP) / LiMP** : Positive limit switch **23 / Negative Limit Switch (LIMN) / LiMn** : Negative limit switch **24 / Switch Controller Parameter Set / CPAr** : Switches controller parameter set **28 / Velocity Controller Integral Off / tnoF** : Switches off velocity controller integral term **40 / Release Holding Brake / rEhb** : Releases the holding brake Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1802 IDN P-0-3007.0.5

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DI5 ConF → i-o- di5	Function Input DI5 *(228)* **1 / Freely Available / nonE** : Available as required **21 / Reference Switch (REF) / rEF** : Reference switch **22 / Positive Limit Switch (LIMP) / LiMP** : Positive limit switch **23 / Negative Limit Switch (LIMN) / LiMn** : Negative limit switch **24 / Switch Controller Parameter Set / CPAr** : Switches controller parameter set **28 / Velocity Controller Integral Off / tnoF** : Switches off velocity controller integral term **40 / Release Holding Brake / rEhb** : Releases the holding brake Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1804 IDN P-0-3007.0.6

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`IOfunct_DQ0` ConF → i-o- do0	Function Output DQ0 *(230)* **1 / Freely Available / nonE** : Available as required **2 / No Fault / nFLt** : Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active / Acti** : Signals operating state Operation Enabled **5 / In Position Deviation Window / in-P** : Position deviation is within window **6 / In Velocity Deviation Window / in-V** : Velocity deviation is within window **7 / Velocity Below Threshold / Vthr** : Motor velocity below threshold **8 / Current Below Threshold / ithr** : Motor current below threshold **9 / Halt Acknowledge / hALt** : Halt acknowledgement **13 / Motor Standstill / MStd** : Motor at a standstill **14 / Selected Error / SErr** : One of the selected errors is active **15 / Valid Reference (ref_ok) / rEFo** : Drive has a valid reference (ref_ok) **16 / Selected Warning / SWrn** : One of the selected warnings is active **22 / Motor Moves Positive / MPoS** : Motor moves in positive direction **23 / Motor Moves Negative / MnEG** : Motor moves in negative direction Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1810 IDN P-0-3007.0.9

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DQ1 ConF → i-o- do1	Function Output DQ1 *(231)* **1 / Freely Available / nonE** : Available as required **2 / No Fault / nFLt** : Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active / Acti** : Signals operating state Operation Enabled **5 / In Position Deviation Window / in-P** : Position deviation is within window **6 / In Velocity Deviation Window / in-V** : Velocity deviation is within window **7 / Velocity Below Threshold / Vthr** : Motor velocity below threshold **8 / Current Below Threshold / ithr** : Motor current below threshold **9 / Halt Acknowledge / hALt** : Halt acknowledgement **13 / Motor Standstill / MStd** : Motor at a standstill **14 / Selected Error / SErr** : One of the selected errors is active **15 / Valid Reference (ref_ok) / rEFo** : Drive has a valid reference (ref_ok) **16 / Selected Warning / SWrn** : One of the selected warnings is active **22 / Motor Moves Positive / MPoS** : Motor moves in positive direction **23 / Motor Moves Negative / MnEG** : Motor moves in negative direction Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1812 IDN P-0-3007.0.10

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DQ2 ConF → i-o- do2	Function Output DQ2 *(232)* **1 / Freely Available / nonE** : Available as required **2 / No Fault / nFLt** : Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active / Acti** : Signals operating state Operation Enabled **5 / In Position Deviation Window / in-P** : Position deviation is within window **6 / In Velocity Deviation Window / in-V** : Velocity deviation is within window **7 / Velocity Below Threshold / Vthr** : Motor velocity below threshold **8 / Current Below Threshold / ithr** : Motor current below threshold **9 / Halt Acknowledge / hALt** : Halt acknowledgement **13 / Motor Standstill / MStd** : Motor at a standstill **14 / Selected Error / SErr** : One of the selected errors is active **15 / Valid Reference (ref_ok) / rEFo** : Drive has a valid reference (ref_ok) **16 / Selected Warning / SWrn** : One of the selected warnings is active **22 / Motor Moves Positive / MPoS** : Motor moves in positive direction **23 / Motor Moves Negative / MnEG** : Motor moves in negative direction Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W per. -	Modbus 1814 IDN P-0-3007.0.11
IOsigLIMN	Signal evaluation for negative limit switch *(275)* **0 / Inactive**: Inactive **1 / Normally closed**: Normally closed NC **2 / Normally open**: Normally open NO Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	Modbus 1566 IDN P-0-3006.0.15

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOsigLIMP	Signal evaluation for positive limit switch *(275)* **0 / Inactive**: Inactive **1 / Normally closed**: Normally closed NC **2 / Normally open**: Normally open NO Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	Modbus 1568 IDN P-0-3006.0.16
IOsigREF	Signal evaluation for reference switch *(276)* **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO The reference switch is only active while a reference movement to the reference switch is processed. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 1 1 2	UINT16 R/W per. -	Modbus 1564 IDN P-0-3006.0.14
IOsigRespOfPS	Response to active limit switch during enabling of power stage **0 / Error**: Active limit switch triggers an error. **1 / No Error**: Active limit switch does not trigger an error. Defines the response when the power stage is enabled while a hardware limit switch is active. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 1548 IDN P-0-3006.0.6
IP_IntTimInd	Interpolation time index Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4	- -128 -3 63	INT16 R/W - -	Modbus 7002 IDN P-0-3027.0.45
IP_IntTimPerVal	Interpolation time period value Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4	s 0 1 255	UINT16 R/W - -	Modbus 7000 IDN P-0-3027.0.44

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
JOGactivate	Activation of operating mode Jog Bit 0: Positive direction of movement Bit 1: Negative direction of movement Bit 2: 0=slow 1=fast Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 7	UINT16 R/W - -	Modbus 6930 IDN P-0-3027.0.9
JOGmethod	Selection of jog method *(202)* **0 / Continuous Movement / coMo** : Jog with continuous movement **1 / Step Movement / StMo** : Jog with step movement Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 1 1	UINT16 R/W - -	Modbus 10502 IDN P-0-3041.0.3
JOGstep	Distance for step movement *(202)* Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_p 1 20 2147483647	INT32 R/W per. -	Modbus 10510 IDN P-0-3041.0.7
JOGtime	Wait time for step movement *(202)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	ms 1 500 32767	UINT16 R/W per. -	Modbus 10512 IDN P-0-3041.0.8
JOGv_fast oP → JoG- JGhi	Velocity for fast movement *(201)* The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 1 180 2147483647	UINT32 R/W per. -	Modbus 10506 IDN P-0-3041.0.5
JOGv_slow oP → JoG- JGLo	Velocity for slow movement *(201)* The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 1 60 2147483647	UINT32 R/W per. -	Modbus 10504 IDN P-0-3041.0.4

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
LIM_HaltReaction ConF → ACG- htYP	Halt option code *(258)* **1 / Deceleration Ramp / dEcE** : Deceleration ramp **3 / Torque Ramp / torq** : Torque ramp Type of deceleration for Halt. Setting of deceleration ramp with parameter RAMP_v_dec. Setting of torque ramp with parameter LIM_I_maxHalt. If a deceleration ramp is already active, the parameter cannot be written. Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 1 3 3	INT16 R/W per. -	Modbus 1582 IDN P-0-3006.0.23
LIM_I_maxHalt ConF → ACG- hcur	Current value for Halt *(142)* This value is only limited by the minimum/maximum value range (no limitation of this value by motor/power stage). In the case of a Halt, the actual current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxHalt - _M_I_max - _PS_I_max Further current reductions caused by I2t monitoring are also taken into account during a Halt. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} - - -	UINT16 R/W per. -	Modbus 4380 IDN P-0-3017.0.14

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
LIM_I_maxQSTP ConF → FLt- qcur	Current value for Quick Stop *(141)* This value is only limited by the minimum/maximum value range (no limitation of this value by motor/power stage). In the case of a Quick Stop, the actual current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxQSTP - _M_I_max - _PS_I_max Further current reductions caused by I2t monitoring are also taken into account during a Quick Stop. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} - - -	UINT16 R/W per. -	Modbus 4378 IDN P-0-3017.0.13
LIM_QStopReact	Quick Stop option code *(261)* **-2 / Torque ramp (Fault)**: Use torque ramp and transit to operating state 9 Fault **-1 / Deceleration Ramp (Fault)**: Use deceleration ramp and transit to operating state 9 Fault **6 / Deceleration ramp (Quick Stop)**: Use deceleration ramp and remain in operating state 7 Quick Stop **7 / Torque ramp (Quick Stop)**: Use torque ramp and remain in operating state 7 Quick Stop Type of deceleration for Quick Stop. Setting of deceleration ramp with parameter RAMPquickstop. Setting of torque ramp with parameter LIM_I_maxQSTP. If a deceleration ramp is already active, the parameter cannot be written. Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- -2 6 7	INT16 R/W per. -	Modbus 1584 IDN P-0-3006.0.24

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
M_I_max	Maximum motor current Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	A_{rms} 0.01 - 300.00	UINT16 R/W - -	Modbus 23814 IDN P-0-3093.0.3
Mains_reactor	Mains reactor **0 / No**: No **1 / Yes**: Yes Value 0: No mains reactor connected. The nominal power of the power stage is reduced. Value 1: A mains reactor is connected. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 1344 IDN P-0-3005.0.32
MBaddress ConF → CoM- MbAd	Modbus address Valid addresses: 1 to 247 Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the product is switched on.	- 1 1 247	UINT16 R/W per. -	Modbus 5640 IDN P-0-3022.0.4
MBbaud ConF → CoM- Mbbd	Modbus baud rate **9600 / 9600 Baud / 9.6** : 9600 Baud **19200 / 19200 Baud / 19.2** : 19200 Baud **38400 / 38400 Baud / 38.4** : 38400 Baud Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the product is switched on.	- 9600 19200 38400	UINT32 R/W per. -	Modbus 5638 IDN P-0-3022.0.3
Mfb_lines_rot	Periods per revolution Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 R/W - -	Modbus 23578 IDN P-0-3092.0.13

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`Mfb_ResRatio`	Transformation ratio Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0.3 - 1.0	UINT16 R/W - -	Modbus 23598 IDN P-0-3092.0.23
`MON_ChkTime` ConF → i-o- tthr	Monitoring of time window *(285)* Adjustment of a time for monitoring of position deviation, speed deviation, speed value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	ms 0 0 9999	UINT16 R/W per. -	Modbus 1594 IDN P-0-3006.0.29
`MON_commutat`	Commutation monitoring *(295)* **0 / Off**: Commutation monitoring off **1 / On**: Commutation monitoring on Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 1	UINT16 R/W per. -	Modbus 1290 IDN P-0-3005.0.5
`MON_GroundFault`	Ground fault monitoring *(298)* **0 / Off**: Ground fault monitoring off **1 / On**: Ground fault monitoring on In exceptional cases, deactivation may be necessary, for example: - Long motor cables Deactivate ground fault monitoring if it responds in an unwanted way. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the product is switched on.	- 0 1 1	UINT16 R/W per. expert	Modbus 1312 IDN P-0-3005.0.16

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_HW_Limits	Temporary deactivation of hardware limit switches **0**: No limit switch deactivated **1**: Deactivate positive limit switch **2**: Deactivate negative limit switch **3**: Deactivate both limit switches With this parameter, a PLC can temporarily deactivate hardware limit switches. This is useful if a homing procedure controlled by a PLC is to use a limit switch as a reference switch without an error response of the drive. The parameter is only available with the EtherCAT module. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 3	UINT16 R/W - -	Modbus 1570 IDN P-0-3006.0.17
MON_I_Threshold ConF → i-o- ithr	Monitoring of current threshold *(291)* The system checks whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter _Iq_act_rms is used as comparison value. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.20 300.00	UINT16 R/W per. -	Modbus 1592 IDN P-0-3006.0.28
MON_IO_SelErr1	First number for the signal output function Selected Error *(305)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15116 IDN P-0-3059.0.6
MON_IO_SelErr2	Second number for the signal output function Selected Error *(305)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15118 IDN P-0-3059.0.7
MON_IO_SelWar1	First number for the signal output function Selected Warning *(305)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15120 IDN P-0-3059.0.8

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via field-bus**
`MON_IO_SelWar2`	Second number for the signal output function Selected Warning *(305)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	Modbus 15122 IDN P-0-3059.0.9
`MON_MainsVolt`	Detection and monitoring of mains phases *(297)* **0 / Automatic Mains Detection**: Automatic detection and monitoring of mains voltage **1 / DC-Bus Only (Mains 1~230 V / 3~480 V)**: DC bus supply only, corresponding to mains voltage 230 V (single-phase) or 480 V (three phases) **2 / DC-Bus Only (Mains 1~115 V / 3~208 V)**: DC bus supply only, corresponding to mains voltage 115 V (single-phase) or 208 V (three phases) **3 / Mains 1~230 V / 3~480 V**: Mains voltage 230 V (single-phase) or 480 V (three phases) **4 / Mains 1~115 V / 3~208 V**: Mains voltage 115 V (single-phase) or 208 V (three phases) Value 0: As soon as a mains voltage detected, the device automatically checks whether the mains voltage is 115 V or 230 V in the case of single-phase devices or 208 V or 400/480 V in the case of three-phase devices. Values 1 ... 2: If the device is supplied only via the DC bus, the parameter has to be set to the voltage value corresponding to the mains voltage of the supplying device. There is no mains voltage monitoring. Values 3 ... 4: If the mains voltage is not detected properly during start-up, the mains voltage to be used can be selected manually. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 0 4	UINT16 R/W per. expert	Modbus 1310 IDN P-0-3005.0.15

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_p_dif_load	Maximum load-dependent position deviation (following error) *(282)* The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. The parameter MON_p_dif_load_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 revolution. Changed settings become active immediately.	revolution 0.0001 1.0000 200.0000	UINT32 R/W per. -	Modbus 1606 IDN P-0-3006.0.35
MON_p_dif_load_usr	Maximum load-dependent position deviation (following error) *(282)* The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_p 1 131072 2147483647	INT32 R/W per. -	Modbus 1660 IDN P-0-3006.0.62
MON_p_dif_warn	Maximum load-dependent position deviation (warning) *(281)* 100.0 % correspond to the maximum position deviation (following error) as specified by means of parameter MON_p_dif_load. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	% 0 75 100	UINT16 R/W per. -	Modbus 1618 IDN P-0-3006.0.41
MON_p_DiffWin	Monitoring of position deviation *(285)* The system checks whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter MON_p_DiffWin_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.0001 revolution. Changed settings become active immediately.	revolution 0.0000 0.0010 0.9999	UINT16 R/W per. -	Modbus 1586 IDN P-0-3006.0.25

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_p_DiffWin_usr	Monitoring of position deviation *(285)* The system checks whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_p 0 128 2147483647	INT32 R/W per. -	Modbus 1662 IDN P-0-3006.0.63
MON_SW_Limits	Activation of software limit switches *(278)* **0 / None**: Deactivated **1 / SWLIMP**: Activation of software limit switches positive direction **2 / SWLIMN**: Activation of software limit switches negative direction **3 / SWLIMP+SWLIMN**: Activation of software limit switches both directions Software limit switches can only be activated if the zero point is valid. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 3	UINT16 R/W per. -	Modbus 1542 IDN P-0-3006.0.3
MON_SWLimMode	Behavior when position limit is reached *(278)* **0 / Standstill Behind Position Limit**: Quick Stop is triggered at position limit and standstill is reached behind position limit **1 / Standstill At Position Limit**: Quick Stop is triggered in front of position limit and standstill is reached at position limit Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 1678 IDN P-0-3006.0.71
MON_swLimN	Negative position limit for software limit switch *(279)* Refer to description 'MON_swLimP' Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	usr_p - -2147483648 -	INT32 R/W per. -	Modbus 1546 IDN P-0-3006.0.5

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_swLimP	Positive position limit for software limit switch *(279)* If a user-defined value entered is outside of the permissible range, the limit switch limits are automatically set to the maximum user-defined value. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	usr_p - 2147483647 -	INT32 R/W per. -	Modbus 1544 IDN P-0-3006.0.4
MON_v_DiffWin	Monitoring of velocity deviation *(287)* The system checks whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 1 10 2147483647	UINT32 R/W per. -	Modbus 1588 IDN P-0-3006.0.26
MON_v_Threshold	Monitoring of velocity threshold *(289)* The system checks whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 1 10 2147483647	UINT32 R/W per. -	Modbus 1590 IDN P-0-3006.0.27
MON_v_zeroclamp	Velocity limit for Zero Clamp A Zero Clamp operation is only possible if the reference velocity is below the Zero Clamp velocity limit. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v 0 10 2147483647	UINT32 R/W per. -	Modbus 1616 IDN P-0-3006.0.40

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MT_dismax	Maximum permissible distance If the reference value is active and the maximum permissible distance is exceeded, an error of error class 1 is generated. The value 0 switches off monitoring. The parameter MT_dismax_usr allows you to enter the value in user-defined units. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 revolution. Changed settings become active the next time the motor moves.	revolution 0.0 1.0 999.9	UINT16 R/W - -	Modbus 11782 IDN P-0-3046.0.3
MT_dismax_usr	Maximum permissible distance If the reference value is active and the maximum permissible distance is exceeded, an error of error class 1 is generated. The value 0 switches off monitoring. The minimum value, the factory setting and the maximum value depend on the scaling factor. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_p 0 131072 2147483647	INT32 R/W - -	Modbus 11796 IDN P-0-3046.0.10
p_MaxDifToENC2	Max. permissible deviation of encoder positions The maximum permissible position deviation between the encoder positions is cyclically monitored. If the limit is exceeded, an error is generated. The current position deviation is available via the parameter '_p_DifEnc1ToEnc2'. The default value corresponds to 1/2 motor revolution. The maximum value corresponds to 100 motor revolutions. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	Inc 1 65536 13107200	INT32 R/W per. -	Modbus 20494 IDN P-0-3080.0.7

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PAR_CTRLreset ConF → FCS- rESC	Reset controller parameters **0 / No / no** : No **1 / Yes / YES** : Yes Reset of the controller parameters. The current controller parameters are recalculated on the basis of the motor data of the connected motor. NOTE: Current and velocity limitations are not reset. Therefore, a user parameter reset is required. NOTE: The new settings are not saved to the EEPROM. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 1038 IDN P-0-3004.0.7
PAR_ScalingStart	Recalculation of parameters with user-defined units The parameters with user-defined units can be recalculated with a changed scaling factor. Value 0: Inactive Value 1: Initialize recalculation Value 2: Start recalculation Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 0 2	UINT16 R/W - -	Modbus 1064 IDN P-0-3004.0.20
PAReeprSave	Save parameter values to EEPROM Value 1: Save persistent parameters The currently set parameters are saved to the non-volatile memory (EEPROM). The saving process is complete when the parameter is read and 0 is returned. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- - - -	UINT16 R/W - -	Modbus 1026 IDN P-0-3004.0.1

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
PARfactorySet ConF → FCS- rStF	Restore factory settings (default values) *(188)* **No / no** : No **Yes / YES** : Yes The parameters are reset to the factory settings and subsequently saved to the EEPROM. The factory settings can be restored via the HMI or the commissioning software. The saving process is complete when the parameter is read and 0 is returned. Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 - 1	 R/W - -	
PARuserReset ConF → FCS- rESu	Reset user parameters *(187)* **0 / No / no** : No **65535 / Yes / YES** : Yes Bit 0: Reset persistent user parameters and controller parameters to default values Bit 1: Reset Motion Sequence parameters to default values Bits 2 ... 15: Reserved The parameters are reset with the exception of: - Communication parameters - Inversion of direction of movement - Type of reference value signal for PTI interface - Settings of encoder simulation - Functions of digital inputs and outputs - Safety module eSM NOTE: The new settings are not saved to the EEPROM. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 - 65535	UINT16 R/W - -	Modbus 1040 IDN P-0-3004.0.8
PDOmask	Deactivate receive PDO Value 0: Activate receive PDO Value 1: Deactivate receive PDO Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W - -	Modbus 16516 IDN P-0-3064.0.66

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
PPoption	Options for operating mode Profile Position Determines the reference position for relative positioning: 0: Relative with reference to the previous target position of the profile generator 1: Not supported 2: Relative with reference to the actual position of the motor Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	- 0 0 2	UINT16 R/W - -	Modbus 6960 IDN P-0-3027.0.24
PPp_target	Target position for operating mode Profile Position Minimum/maximum values depend on: - Scaling factor - Software limit switches (if they are activated) Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_p - - -	INT32 R/W - -	Modbus 6940 IDN P-0-3027.0.14
PPv_target	Target velocity for operating mode Profile Position The target velocity is limited to the setting in CTRL_v_max and RAMP_v_max. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_v 1 60 4294967295	UINT32 R/W - -	Modbus 6942 IDN P-0-3027.0.15
PTtq_target	Target torque for operating mode Profile Torque 100.0 % correspond to the continuous stall torque _M_M_0. Type: Signed decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Changed settings become active immediately.	% -3000.0 0.0 3000.0	INT16 R/W - -	Modbus 6944 IDN P-0-3027.0.16
PVv_reference	Reference value source for operating mode Profile Velocity **0 / None**: None **1 / Parameter 'PVv_target'**: Reference value via parameter PVv_target **2 / Analog Input**: Reference value via analog input Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 1 2	UINT16 R/W - -	Modbus 7026 IDN P-0-3027.0.57

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
PVv_target	Target velocity for operating mode Profile Velocity The target velocity is limited to the setting in CTRL_v_max and RAMP_v_max. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	usr_v - 0 -	INT32 R/W - -	Modbus 6938 IDN P-0-3027.0.13
PWM_fChop	PWM frequency of power stage **4 / 4 kHz**: 4 kHz **8 / 8 kHz**: 8 kHz **16 / 16 kHz**: 16 kHz Factory setting: Peak output current ≤72 Arms: 8 kHz Peak output current >72 Arms: 4 kHz Changing this setting is only possible in the case of devices with a peak output current >72 Arms. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 4 - 16	UINT16 R/W per. expert	Modbus 1308 IDN P-0-3005.0.14
RAMP_tq_enable	Activation of the motion profile for torque **0 / Profile Off**: Profile off **1 / Profile On**: Profile on In the operating mode Profile Torque, the motion profile for torque can be activated or deactivated. In the other operating modes, the motion profile for torque is inactive. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 1 1	UINT16 R/W per. -	Modbus 1624 IDN P-0-3006.0.44
RAMP_tq_slope	Slope setting of the motion profile for torque 100.00 % of the torque setting correspond to the continuous stall torque _M_M_0. Example: A ramp setting of 10000.00 %/s results in a torque change of 100.0% of _M_M_0 in 0.01s. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %/s. Changed settings become active immediately.	%/s 0.1 10000.0 3000000.0	UINT32 R/W per. -	Modbus 1620 IDN P-0-3006.0.42

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RAMP_v_acc	Acceleration of the motion profile for velocity *(239)* Writing the value 0 has no effect on the parameter. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_a 1 600 2147483647	UINT32 R/W per. -	Modbus 1556 IDN P-0-3006.0.10
RAMP_v_dec	Deceleration of the motion profile for velocity *(239)* The minimum value depends on the operating mode: Operating modes with minimum value 1: Electronic Gear (velocity synchronization) Profile Velocity Motion Sequence (Move Velocity) Operating modes with minimum value 120: Jog Profile Position Homing Motion Sequence (Move Absolute, Move Additive, Move Relative and Reference Movement) Writing the value 0 has no effect on the parameter. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_a 1 600 2147483647	UINT32 R/W per. -	Modbus 1558 IDN P-0-3006.0.11
RAMP_v_enable	Activation of the motion profile for velocity *(239)* **0 / Profile Off**: Profile off **1 / Profile On**: Profile on Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 1 1	UINT16 R/W per. -	Modbus 1622 IDN P-0-3006.0.43

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
RAMP_v_jerk ConF → drC- JEr	Jerk limitation of the motion profile for velocity *(263)* **0 / Off / oFF** : Off **1 / 1 / 1** : 1 ms **2 / 2 / 2** : 2 ms **4 / 4 / 4** : 4 ms **8 / 8 / 8** : 8 ms **16 / 16 / 16** : 16 ms **32 / 32 / 32** : 32 ms **64 / 64 / 64** : 64 ms **128 / 128 / 128** : 128 ms Adjustments can only be made if the operating mode is inactive (x_end=1). Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	ms 0 0 128	UINT16 R/W per. -	Modbus 1562 IDN P-0-3006.0.13
RAMP_v_max ConF → ACG- nrMP	Maximum velocity of the motion profile for velocity *(239)* If a greater reference speed is set in one of these operating modes, it is automatically limited to RAMP_v_max. This way, commissioning at limited speed is easier to perform. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the motor moves.	usr_v 1 13200 2147483647	UINT32 R/W per. -	Modbus 1554 IDN P-0-3006.0.9
RAMP_v_sym	Acceleration and deceleration of the motion profile for velocity The values are internally multiplied by 10 (example: 1 = 10 min^{-1}/s). Write access changes the values under RAMP_v_acc and RAMP_v_dec. The limit values are checked on the basis of the values indicated for these parameters. Read access returns the greater value from RAMP_v_acc/RAMP_v_dec. If the value cannot be represented as a 16 bit value, the value is set to 65535 (maximum UINT16 value) Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	- - - -	UINT16 R/W - -	Modbus 1538 IDN P-0-3006.0.1

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RAMPaccdec	Acceleration and deceleration for the Drive Profile Lexium High word: Acceleration Low word: Deceleration The values are internally multiplied by 10 (example: 1 = 10 min^{-1}/s). Write access changes the values in RAMP_v_acc and RAMP_v_dec. The limit values are checked on the basis of the values indicated for these parameters. If the value cannot be represented as a 16 bit value, the value is set to 65535 (maximum UINT16 value). Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	- - - -	UINT32 R/W - -	Modbus 1540 IDN P-0-3006.0.2
RAMPquickstop	Deceleration ramp for Quick Stop *(261)* Deceleration ramp for a software stop or an error with error class 1 or 2. Type: Unsigned decimal - 4 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the motor moves.	usr_a 1 6000 2147483647	UINT32 R/W per. -	Modbus 1572 IDN P-0-3006.0.18
RESext_P ConF → ACG- Pobr	Nominal power of external braking resistor *(162)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	W 1 10 32767	UINT16 R/W per. -	Modbus 1316 IDN P-0-3005.0.18
RESext_R ConF → ACG- rbr	Resistance value of external braking resistor *(162)* The minimum value depends on the power stage. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.01 Ω. Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	Ω 0.00 100.00 327.67	UINT16 R/W per. -	Modbus 1318 IDN P-0-3005.0.19

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RESext_ton ConF → ACG- tbr	Maximum permissible switch-on time of external braking resistor *(162)* Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	ms 1 1 30000	UINT16 R/W per. -	Modbus 1314 IDN P-0-3005.0.17
RESint_ext ConF → ACG- Eibr	Selection of type of braking resistor *(162)* **0 / Internal Braking Resistor / int** : Internal braking resistor **1 / External Braking Resistor / Eht** : External braking resistor **2 / Reserved / rSUd** : Reserved Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 0 2	UINT16 R/W per. -	Modbus 1298 IDN P-0-3005.0.9
ResolENC2Denom	Resolution of encoder 2, denominator Refer to ResolEnc2Num. Denominator as positive 32 bit number, maximum value 1 million. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	revolution 1 1 16383	INT32 R/W per. -	Modbus 20490 IDN P-0-3080.0.5

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ResolENC2Num	Resolution of encoder 2, numerator Digital encoders: Specification of the encoder increments the external encoder returns for one or several revolutions of the motor shaft. The value is indicated with a numerator and a denominator so that it is possible, for example, to consider the gear ratio of a mechanical gearing. NOTE: The value may not be set to 0. The resolution factor is not applied until this numerator value is specified. Example: One motor revolution causes 1/3 encoder revolution at an encoder resolution of 16384 EncInc/revolution. ResolENC2Num 16384 EncInc -------------------------- = ----------------------- ResolENC2Denom 3 revolutions Analog encoders: Num/Denom must be set equivalent to the number of analog periods per 1 motor revolution. Example: One motor revolution causes 1/3 encoder revolution at an encoder resolution of 16 analog periods per revolution. ResolENC2Num 16 periods -------------------------- = -------------------- ResolENC2Denom 3 revolutions Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	EncInc 1 10000 2147483647	INT32 R/W per. -	Modbus 20492 IDN P-0-3080.0.6
ScaleRAMPdenom	Ramp scaling: Denominator *(223)* Refer to numerator (ScaleRAMPnum) for a description. A new scaling is activated when the numerator value is supplied. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled.	usr_a 1 1 2147483647	INT32 R/W per. -	Modbus 1632 IDN P-0-3006.0.48

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ScaleRAMPnum	Ramp scaling: Numerator *(223)* Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immedi-ately.	min^{-1}/s 1 1 2147483647	INT32 R/W per. -	Modbus 1634 IDN P-0-3006.0.49
ScaleVELdenom	Velocity scaling: Denominator *(222)* Refer to numerator (ScaleVELnum) for a description. A new scaling is activated when the numer-ator value is supplied. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled.	usr_v 1 1 2147483647	INT32 R/W per. -	Modbus 1602 IDN P-0-3006.0.33
ScaleVELnum	Velocity scaling: Numerator *(222)* Specification of the scaling factor: Speed of rotation of motor [min^{-1}] -- User-defined units [usr_v] A new scaling is activated when the numer-ator value is supplied. Type: Signed decimal - 4 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active immedi-ately.	min^{-1} 1 1 2147483647	INT32 R/W per. -	Modbus 1604 IDN P-0-3006.0.34
SercosAddress ConF → CoM- ConF → FSu- Addr	Sercos device address *(135)* This parameter assigns a Sercos address to the drive. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 0 255	UINT16 R/W per. -	Modbus 18178 IDN P-0-3071.0.1
SercosPhaseSta tus Mon S3cP	Sercos communication phase This parameter contains the current Sercos communication phase. Type: Signed decimal - 2 bytes Changed settings become active immedi-ately.	- -1 0 7	INT16 R/- - -	Modbus 18180 IDN P-0-3071.0.2

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ShiftEncWorkRang	Shifting of the encoder working range *(159)* **0 / Off**: Shifting off **1 / On**: Shifting on Value 0: Position values are between 0 ... 4096 revolutions. Value 1: Position values are between -2048 ... 2048 revolutions. After activating the shifting function, the position range of a multiturn encoder is shifted for half of the range. Example for the position range of a multiturn encoder with 4096 revolutions. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active the next time the product is switched on.	- 0 0 1	UINT16 R/W per. -	Modbus 1346 IDN P-0-3005.0.33
SimAbsolutePos ConF → ACG- qAbS	Simulation of absolute position at power cycling **0 / Simulation Off / oFF** : Do not use the last mechanical position after power cycling **1 / Simulation On / on** : Use last mechanical position after power cycling This parameter specifies the way position values are handled over a power cycle and allows for the simulation of an absolute position encoder using singleturn encoders. If this function is activated, the device saves the pertinent position data prior to a shutdown so that it can restore the mechanical position the next time it is switched on. In the case of singleturn encoders, the position can be restored if the motor shaft has not been moved by more than 0.25 revolutions while the drive was off. In the case of multiturn encoders, the permissible shaft movement while the drive is off can be much greater, depending on the type of multiturn encoder. For this function to work, the drive may only be shut down while the motor is at a standstill and the motor shaft must not be moved outside of the permissible range (for example, use a holding brake). Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 1	UINT16 R/W per. -	Modbus 1350 IDN P-0-3005.0.35

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`SPDSercos3Control`	SPD Sercos control *(269)* Bit 0 = 0: Cancel capture function Bit 0 = 1: Start one-time capture via input CAP1 Bit 1 = 0: Cancel capture function Bit 1 = 1: Start one-time capture via input CAP2 Bits 2 … 15: Reserved Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- - - -	UINT16 R/W - -	Modbus 6560 IDN P-0-3025.0.80
`SPDSercos3Status`	SPD Sercos status *(270)* Bit 0 = 0: No position captured via input CAP1 Bit 0 = 1: Position captured via input CAP1 Bit 1 = 0: No position captured via input CAP2 Bit 1 = 1: Position captured via input CAP2 Bit 2 = 0: Positive limit switch not active Bit 2 = 1: Positive limit switch active Bit 3 = 0: Negative limit switch not active Bit 3 = 1: Negative limit switch active Bit 4 = 0: Quick Stop: Standstill not yet reached Bit 4 = 1: Quick Stop: Standstill reached Type: Unsigned decimal - 2 bytes Changed settings become active immediately.	- - - -	UINT16 R/- - -	Modbus 6562 IDN P-0-3025.0.81
`SyncMechStart`	Activation of synchronization mechanism Value 0: Deactivate synchronization mechanism Value 1: Activate synchronization mechanism (CANmotion). Value 2: Activate synchronization mechanism, standard CANopen mechanism. The cycle time of the synchronization signal is derived from the parameters intTimPerVal and intTimInd. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 0 0 2	UINT16 R/W - -	Modbus 8714 IDN P-0-3034.0.5
`SyncMechStatus`	Status of synchronization mechanism Status of synchronization mechanism: Value 1: Synchronization mechanism of drive is inactive. Value 32: Drive is synchronizing with external sync signal. Value 64: Drive is synchronized with external sync signal. Type: Unsigned decimal - 2 bytes	- - - -	UINT16 R/- - -	Modbus 8716 IDN P-0-3034.0.6

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Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`SyncMechTol`	Synchronization tolerance This parameter is used to increase the synchronization tolerance in the operating mode Interpolated Position. The value is applied when the synchronization mechanism is activated via the parameter SyncMechStart. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 Changed settings become active immediately.	- 1 1 20	UINT16 R/W - -	Modbus 8712 IDN P-0-3034.0.4
`WakesAndShakeGain`	Gain for wake and shake If wake and shake did not work properly, this parameter can be used to adapt the dynamics of the wake and shake procedure. Value > 100: Increased dynamics which leads to less motor movement. Value < 100: Reduced dynamics which leads to more motor movement. Type: Unsigned decimal - 2 bytes Write access: CP2, CP3, CP4 In increments of 0.1 %. Setting can only be changed if power stage is disabled. Changed settings become active immediately.	% 1.0 100.0 400.0	UINT16 R/W per. -	Modbus 20508 IDN P-0-3080.0.14

11 Accessories and spare parts

11.1 Commissioning tools

Description	Order no.
Commissioning software, 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
Modbus cable, 1 m, 2 x RJ45	VW3A8306R10
External graphic display terminal	VW3A1101

11.2 Memory cards

Description	Order no.
Memory card for copying parameter settings	VW3M8705
25 memory cards for copying parameter settings	VW3M8704

11.3 Additional modules

Description	Order no.
Encoder module RSR (resolver interface) with DE9 D-SUB connection (female)	VW3M3401
Encoder module DIG (digital interface) with HD15 D-SUB connection (female)	VW3M3402
Encoder module ANA (analog interface) with HD15 D-SUB connection (female)	VW3M3403

11.4 Safety module eSM

Description	Order no.
Safety module eSM with safety functions SOS, SLS, SS1, SS2 as per IEC/EN 61800-5-2	VW3M3501
Cable for safety module eSM, 3 m; 24-pin connector, other cable end open	VW3M8801R30
Cable for safety module eSM, 1.5 m; 2 x 24-pin connector	VW3M8802R15
Cable for safety module eSM, 3 m; 2 x 24-pin connector	VW3M8802R30
Connection terminal adapter for eSM safety module, for easy wiring of several safety modules in the control cabinet	VW3M8810
Connector with wire jumper (for INTERLOCK signal) for eSM terminal adapter; 4 pieces	VW3M8820

11.5 Application nameplate

Description	Order no.
Application nameplate to be clipped onto the top of the drive, size 38.5 mm x 13 mm for label size 1.5 inches x 0.5 inches, 50 pieces	VW3M2501

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11.6 SERCOS III cables with connectors

Description	Order no.
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 0.5 m	VW3E5001R005
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 1 m	VW3E5001R010
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 1.5 m	VW3E5001R015
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 2 m	VW3E5001R020
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 3 m	VW3E5001R030
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 5 m	VW3E5001R050
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 10 m	VW3E5001R100
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 15 m	VW3E5001R150
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 20 m	VW3E5001R200
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 25 m	VW3E5001R250
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 30 m	VW3E5001R300
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 40 m	VW3E5001R400
SERCOS III cable, 2 x RJ45, shielded cable, Twisted Pair, 50 m	VW3E5001R500

11.7 Motor cables

11.7.1 Motor cables 1.5 mm^2

Description	Order no.
Motor cable 1.5 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R15
Motor cable 3 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R30
Motor cable 5 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R50
Motor cable 10 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R100
Motor cable 15 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R150
Motor cable 20 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R200
Motor cable 25 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R250
Motor cable 50 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R500
Motor cable 75 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R750
Motor cable 25 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5301R250
Motor cable 50 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5301R500
Motor cable 100 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5301R1000

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11.7.2 Motor cables 2.5 mm^2

Description	Order no.
Motor cable 1.5 m, [(4 x 2.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R15
Motor cable 3 m, [(4 x 2.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R30
Motor cable 5 m, [(4 x 2.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R50
Motor cable 10 m, [(4 x 2.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R100
Motor cable 15 m, [(4 x 2.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R150
Motor cable 20 m, [(4 x 2.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R200
Motor cable 25 m, [(4 x 2.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R250
Motor cable 50 m, [(4 x 2.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R500
Motor cable 75 m, [(4 x 2.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R750
Motor cable 25 m, [(4 x 2.5 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5302R250
Motor cable 50 m, [(4 x 2.5 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5302R500
Motor cable 100 m, [(4 x 2.5 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5302R1000

11.7.3 Motor cables 4 mm^2

Description	Order no.
Motor cable 3 m, [(4 x 4 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R30
Motor cable 5 m, [(4 x 4 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R50
Motor cable 10 m, [(4 x 4 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R100
Motor cable 15 m, [(4 x 4 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R150
Motor cable 20 m, [(4 x 4 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R200
Motor cable 25 m, [(4 x 4 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R250
Motor cable 50 m, [(4 x 4 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R500
Motor cable 75 m, [(4 x 4 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R750
Motor cable 25 m, [(4 x 4 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5303R250
Motor cable 50 m, [(4 x 4 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5303R500
Motor cable 100 m, [(4 x 4 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5303R1000

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11.7.4 Motor cables 6 mm²

Description	Order no.
Motor cable 3 m, [(4 x 6 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R30
Motor cable 5 m, [(4 x 6 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R50
Motor cable 10 m, [(4 x 6 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R100
Motor cable 15 m, [(4 x 6 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R150
Motor cable 20 m, [(4 x 6 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R200
Motor cable 25 m, [(4 x 6 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R250
Motor cable 50 m, [(4 x 6 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R500
Motor cable 75 m, [(4 x 6 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R750
Motor cable 25 m, [(4 x 6 mm²) + (2 x 1 mm²)] shielded; both cable ends open	VW3M5305R250
Motor cable 50 m, [(4 x 6 mm²) + (2 x 1 mm²)] shielded; both cable ends open	VW3M5305R500
Motor cable 100 m, [(4 x 6 mm²) + (2 x 1 mm²)] shielded; both cable ends open	VW3M5305R1000

11.7.5 Motor cables 10 mm²

Description	Order no.
Motor cable 3 m, [(4 x 10 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R30
Motor cable 5 m, [(4 x 10 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R50
Motor cable 10 m, [(4 x 10 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R100
Motor cable 15 m, [(4 x 10 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R150
Motor cable 20 m, [(4 x 10 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R200
Motor cable 25 m, [(4 x 10 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R250
Motor cable 50 m, [(4 x 10 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R500
Motor cable 75 m, [(4 x 10 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R750
Motor cable 25 m, [(4 x 10 mm²) + (2 x 1 mm²)] shielded; both cable ends open	VW3M5304R250
Motor cable 50 m, [(4 x 10 mm²) + (2 x 1 mm²)] shielded; both cable ends open	VW3M5304R500
Motor cable 100 m, [(4 x 10 mm²) + (2 x 1 mm²)] shielded; both cable ends open	VW3M5304R1000

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11.8 Encoder cables

Suitable for BMH motors:

Description	Order no.
Encoder cable 1.5 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R15
Encoder cable 3 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R30
Encoder cable 5 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R50
Encoder cable 10 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R100
Encoder cable 15 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R150
Encoder cable 20 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R200
Encoder cable 25 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R250
Encoder cable 50 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R500
Encoder cable 75 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R750
Encoder cable 25 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; both cable ends open	VW3M8222R250
Encoder cable 50 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; both cable ends open	VW3M8222R500
Encoder cable 100 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; both cable ends open	VW3M8222R1000
D9-SUB (male) connector, for encoder module resolver	AEOCON011
Encoder cable 100 m, [5 x (2 x 0.25 mm^2) + (2 x 0.5 mm^2)] shielded; both cable ends open	VW3M8221R1000
Encoder cable 1 m, shielded; HD15 D-SUB (male); other cable end open	VW3M4701

11.9 Connectors

Description	Order no.
Encoder connector (cable end) for motor M23, 5 pcs	VW3M8214
Encoder connector (cable end) for drive RJ45 (10 pins), 5 pcs	VW3M2208
Motor connector (cable end) M23, 1.5 ... 2.5 mm^2, 5 pcs	VW3M8215
Motor connector (cable end) M40, 4 mm^2, 5 pcs	VW3M8217

Extras

The tools required for cable assembly can be ordered directly from the manufacturer.

- Crimping tool for encoder connector M23:
  Coninvers SF-Z0007 www.coninvers.com
- Crimping tool for power connector M23/M40:
  Coninvers SF-Z0008 www.coninvers.com
- Crimping tools for encoder connector RJ45 10 pins:
  Yamaichi Y-ConTool-11, Y-ConTool-20, Y-ConTool-30
  www.yamaichi.com

11.10 External braking resistors

Description	Order no.
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 0.75 m connection cable (2.1 mm²), UL	VW3A7601R07
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 2 m connection cable (2.1 mm²), UL	VW3A7601R20
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 3 m connection cable (2.1 mm²), UL	VW3A7601R30
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 0.75 m connection cable (2.1 mm²), UL	VW3A7602R07
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 2 m connection cable (2.1 mm²), UL	VW3A7602R20
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 3 m connection cable (2.1 mm²), UL	VW3A7602R30
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 0.75 m connection cable (2.1 mm²), UL	VW3A7603R07
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 2 m connection cable (2.1 mm²), UL	VW3A7603R20
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 3 m connection cable (2.1 mm²), UL	VW3A7603R30
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 0.75 m connection cable (2.1 mm²), UL	VW3A7604R07
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 2 m connection cable (2.1 mm²), UL	VW3A7604R20
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 3 m connection cable (2.1 mm²), UL	VW3A7604R30
Braking resistor IP65; 72 Ω; maximum continuous power 100 W; 0.75 m connection cable (2.1 mm²), UL	VW3A7605R07
Braking resistor IP65; 72 Ω; maximum continuous power 100 W; 2 m connection cable (2.1 mm²), UL	VW3A7605R20
Braking resistor IP65; 72 Ω; maximum continuous power 100 W; 3 m connection cable (2.1 mm²), UL	VW3A7605R30
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 0.75 m connection cable (2.1 mm²), UL	VW3A7606R07
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 2 m connection cable (2.1 mm²), UL	VW3A7606R20
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 3 m connection cable (2.1 mm²), UL	VW3A7606R30
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 0.75 m connection cable	VW3A7607R07
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 2 m connection cable	VW3A7607R20
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 3 m connection cable	VW3A7607R30
Braking resistor IP65; 100 Ω; maximum continuous power 100 W; 0.75 m connection cable	VW3A7608R07
Braking resistor IP65; 100 Ω; maximum continuous power 100 W; 2 m connection cable	VW3A7608R20
Braking resistor IP65; 100 Ω; maximum continuous power 100 W; 3 m connection cable	VW3A7608R30
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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11.11 DC bus accessories

Description	Order no.
DC bus connection cable, 2 * 6 mm^2 (2 * AWG 10), pre-assembled, 0.1 m, 5 pieces	VW3M7101R01
DC bus connection cable, 2 * 6 mm^2 (2 * AWG 10), Twisted Pair, shielded, 15 m	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

11.12 Mains reactors

Description	Order no.
Mains reactor single-phase; 50-60 Hz; 7 A; 5 mH; IP00	VZ1L007UM50
Mains reactor single-phase; 50-60 Hz; 18 A; 2 mH; IP00	VZ1L018UM20
Mains reactor three-phase; 50-60 Hz; 16 A; 2 mH; IP00	VW3A4553
Mains reactor three-phase; 50-60 Hz; 30 A; 1 mH; IP00	VW3A4554

11.13 External mains filters

Description	Order no.
Mains filter single-phase; 9 A; 115/230 Vac	VW3A4420
Mains filter single-phase; 16 A; 115/230 Vac	VW3A4421
Mains filter three-phase; 15 A; 208/400/480 Vac	VW3A4422
Mains filter three-phase; 25 A; 208/400/480 Vac	VW3A4423

11.14 Spare parts connectors, fans, cover plates

Description	Order no.
Connector kit LXM32M: 3 x AC power stage supply (230/400 Vac), 1 x control supply, 2 x digital inputs/outputs (6-pin), 2 x motor (10 A / 24 A), 1 x holding brake	VW3M2203
Cover plate for module slot, spare part to replace damaged/lost cover plates, 10 pieces	VW3M2405
Cooling fan kit 40 mm x 40 mm, plastic housing, with connection cable	VW3M2401
Cooling fan kit 60 mm x 60 mm, plastic housing, with connection cable	VW3M2402
Cooling fan kit 80 mm x 80 mm, plastic housing, with connection cable	VW3M2403

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12 Service, maintenance and disposal

The product may only be repaired by a Schneider Electric customer service center. No warranty or liability is accepted for repairs made by unauthorized persons.

12.1 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 number)
- 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

12.2 Maintenance

Check the product for pollution or damage at regular intervals.

12.2.1 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.

12.3 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

- 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 changes to the settings or data.
- Only start the system if there are no persons or obstructions in the danger zone.

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. To do so, use a memory card, see chapter *"6.7 Memory Card"*, page *182*, or save the data to a PC using the commissioning software, see chapter *"6.4 Commissioning software"*, page *133*.
- Switch 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"*.

12.4 Replacing modules

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

- 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 changes to the settings or data.
- Only start the system if there are no persons or obstructions in the danger zone.

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.

See chapter *"5.2.1 Installing and removing modules"*, page *86* for information on installing and removing modules.

12.5 Changing the motor

Drive systems may perform unexpected movements because of incorrect connection or other errors.

⚠ WARNING

UNEXPECTED MOVEMENT

- Operate the device with approved motors only. 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 they may be used.

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

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- ▶ 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"*.

If the connected motor is replaced by another motor, the motor data set is read again. If the device detects a different motor type, the controller parameters are recalculated and the HMI displays MOT. See chapter *"9.3.4 Acknowledging a motor change"*, page *319* for additional information.

If the motor is replaced, the encoder parameters must also be re-adjusted, see chapter *"6.5.9 Setting parameters for encoder"*, page *154*.

If a motor encoder is connected via encoder 2 (module), a motor replacement is not detected. Observe the information provided in the encoder manual.

Changing the motor type temporarily

- ▶ If you want to operate the new motor type only temporarily via the device, press ESC at the HMI.
- ◁ The newly calculated controller parameters are not saved to the EEPROM. This way, you can resume operation with the original motor using the saved controller parameters.

Changing the motor type permanently

- ▶ If you want to operate the new motor type permanently via this device, press the navigation button at the HMI.
- ◁ The newly calculated controller parameters are saved to the EEPROM.

See also chapter *"9.3.4 Acknowledging a motor change"*, page *319*.

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12.6 Shipping, storage, disposal

Note the ambient conditions on page *25*.

Shipping The product must be protected against shocks during transportation. If possible, use the original packaging for shipping.

Storage The product may only be stored in spaces where the specified permissible ambient conditions are met.
Protect the product from dust and dirt.

Disposal The product consists of various materials that can be recycled. Dispose of the product in accordance with local regulations.

Visit http://www.schneider-electric.com/green-premium for information and documents on environmental protection as per ISO 14025 such as:

- EoLi (Product End-of-Life Instructions)
- PEP (Product Environmental Profile)

Glossary

Units and conversion tables

The value in the specified unit (left column) is calculated for the desired unit (top row) with the formula (in the field).

Example: conversion of 5 meters (m) to yards (yd)
5 m / 0.9144 = 5.468 yd

Length

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

Mass

	lb	oz	slug	kg	g
lb	-	* 16	* 0.03108095	* 0.4535924	* 453.5924
oz	/ 16	-	* $1.942559*10^{-3}$	* 0.02834952	* 28.34952
slug	/ 0.03108095	/ $1.942559*10^{-3}$	-	* 14.5939	* 14593.9
kg	/ 0.45359237	/ 0.02834952	/ 14.5939	-	* 1000
g	/ 453.59237	/ 28.34952	/ 14593.9	/ 1000	-

Force

	lb	oz	p	N
lb	-	* 16	* 453.55358	* 4.448222
oz	/ 16	-	* 28.349524	* 0.27801
p	/ 453.55358	/ 28.349524	-	* $9.807*10^{-3}$
N	/ 4.448222	/ 0.27801	/ $9.807*10^{-3}$	-

Power

	HP	W
HP	-	* 746
W	/ 746	-

Rotation

	min^{-1} (RPM)	rad/s	deg./s
min^{-1} (RPM)	-	* π / 30	* 6
rad/s	* 30 / π	-	* 57.295
deg./s	/ 6	/ 57.295	-

Torque

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

Moment of inertia

	lb·in²	lb·ft²	kg·m²	kg·cm²	kp·cm·s²	oz·in²
lb·in²	-	/ 144	/ 3417.16	/ 0.341716	/ 335.109	* 16
lb·ft²	* 144	-	* 0.04214	* 421.4	* 0.429711	* 2304
kg·m²	* 3417.16	/ 0.04214	-	* $10*10^3$	* 10.1972	* 54674
kg·cm²	* 0.341716	/ 421.4	/ $10*10^3$	-	/ 980.665	* 5.46
kp·cm·s²	* 335.109	/ 0.429711	/ 10.1972	* 980.665	-	* 5361.74
oz·in²	/ 16	/ 2304	/ 54674	/ 5.46	/ 5361.74	-

Temperature

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

Conductor cross section

AWG	1	2	3	4	5	6	7	8	9	10	11	12	13
mm²	42.4	33.6	26.7	21.2	16.8	13.3	10.5	8.4	6.6	5.3	4.2	3.3	2.6

AWG	14	15	16	17	18	19	20	21	22	23	24	25	26
mm²	2.1	1.7	1.3	1.0	0.82	0.65	0.52	0.41	0.33	0.26	0.20	0.16	0.13

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Terms and Abbreviations

See chapter *" Standards and terminology"* 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.

AC Alternating current

Actual position Current position of moving components in the drive system.

CCW **C**ounter **C**lock**w**ise.

CW **C**lock**w**ise.

DC Direct current

DC bus Circuit that supplies the power stage with energy (direct voltage).

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

Degree of protection The degree of protection is a standardized specification for electrical equipment that describes the protection against the ingress of foreign objects and water (for example: IP 20).

Direction of rotation Rotation of the motor shaft in a positive or negative direction of rotation. Positive direction of rotation is when the motor shaft rotates clockwise as you look at the end of the protruding motor shaft.

Drive system System consisting of controller, drive and motor.

EMC Electromagnetic compatibility

Encoder Sensor that converts a measured distance or angle into an electrical signal. This signal is evaluated by the drive to determine the actual position of a shaft (rotor) or a driving unit.

Error Discrepancy between a detected (computed, measured or signaled) value or condition and the specified or theoretically correct value or condition.

Error class Classification of errors into groups. The different error classes allow for specific responses to errors, for example by severity.

Factory setting Factory settings when the product is shipped

Fault Fault is an operating state. If the monitoring functions detect an error, a transition to this operating state is triggered, depending on the error class. A "Fault Reset" is required to exit this operating state after the cause of the detected error has been removed. Further information can be found in the pertinent standards such as IEC 61800-7, ODVA Common Industrial Protocol (CIP).

Fault Reset A function used to restore the drive to an operational state after a detected error is cleared by removing the cause of the error so that the error is no longer active.

Holding brake The holding brake in the motor has the task of holding the current motor position when the power stage is disabled, even if external forces act (for example, in the case of a vertical axis). The holding brake is not a safety function and not a service brake.

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I/O Inputs/outputs

I^2t monitoring Anticipatory temperature monitoring. The expected temperature rise of components is calculated in advance on the basis of the motor current. If a limit value is exceeded, the drive reduces the motor current.

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

Inc Increments

Index pulse Signal of an encoder to reference the rotor position in the motor. The encoder returns one index pulse per revolution.

Internal units Resolution of the power stage at which the motor can be positioned. Internal units are specified in increments.

Limit switch Switches that signal overtravel of the permissible range of travel.

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.

PC Personal Computer

PELV Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41

PLC Programmable logic controller

Parameter Device data and values that can be read and set (to a certain extent) by the user.

Persistent Indicates whether the value of the parameter remains in the memory after the device is switched off.

Power stage The power stage controls the motor. The power stage generates current for controlling the motor on the basis of the motion signals from the controller.

Pulse/direction signals Digital signals with variable pulse frequencies which signal changes in position and direction of movement via separate signal wires.

Quick Stop The Quick Stop function can be used for fast deceleration of a movement as a response to a detected error or via a command.

RCD RCD residual current device.

rms "Root Mean Square" value of a voltage (V_{rms}) or a current (A_{rms})

RS485 Fieldbus interface as per EIA-485 which enables serial data transmission with multiple devices.

Safety function Safety functions are defined in the standard IEC 61800-5-2 (for example, Safe Torque Off (STO), Safe Operating Stop (SOS) or Safe Stop 1 (SS1)). If the safety functions are wired properly, they meet the requirements specified in IEC 61800-5-2.

Scaling factor This factor is the ratio between an internal unit and a user-defined unit.

TT mains, TN mains Grounded mains, differ in terms of the ground connection (PE conductor connection). Opposite: Ungrounded mains, see IT mains.

User-defined unit Unit whose reference to motor movement can be determined by the user via parameters.

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Warning If the term is used outside the context of safety instructions, a warning alerts to a potential problem that was detected by a monitoring function. A warning does not cause a transition of the operating state.

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