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Lexium 32A

Servo Drive

User Guide

Original instructions

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Safety Information

Important Information

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



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



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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

Please Note

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

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

Qualification of Personnel

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

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

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

Intended Use

The products described or affected by this document are, along with software, accessories and options, servo-drive systems for three-phase servo motors.

The products are intended for industrial use according to the instructions, directions, examples, and safety information contained in the present user guide and other supporting documentation.

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

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

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

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

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

Before You Begin

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

⚠WARNING

UNGUARDED EQUIPMENT

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

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

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National

Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

Start-up and Test

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check are made and that enough time is allowed to perform complete and satisfactory testing.

⚠WARNING

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

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

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

Operation and Adjustments

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer’s instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer’s instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Book

Document Scope

This manual describes technical characteristics, installation, commissioning, operation and maintenance of the servo drive Lexium 32A (LXM32A).

Validity Note

This manual is valid for the standard products listed in the type code, see Type Code, page 22.

For product compliance and environmental information (RoHS, REACH, PEP, EOLI, etc.), go to www.se.com/ww/en/work/support/green-premium/.

The characteristics that are described in the present document, as well as those described in the documents included in the Related Documents section below, can be found online. To access the information online, go to the Schneider Electric home page www.se.com/ww/en/download/.

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

Related Documents

Title of documentation	Reference number
Lexium 32A - Servo Drive - User Guide (this user guide)	0198441113755 (eng) 0198441113756 (fre) 0198441113754 (ger) 0198441113758 (spa) 0198441113757 (ita) 0198441113759 (chi)
LXM32A - CANopen Interface - User Guide	0198441113779 (eng) 0198441113780 (fre) 0198441113778 (ger)
LXM32 - Common DC Bus - Application Note	MNA01M001EN (eng) MNA01M001DE (ger)

Product Related Information

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

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

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

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

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

⚠DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires.
- Place a "Do Not Turn On" or equivalent hazard label on all power switches and lock them in the non-energized position.
- Wait 15 minutes to allow the residual energy of the DC bus capacitors to discharge.
- Measure the voltage on the DC bus with a properly rated voltage sensing device and verify that the voltage is less than 42 Vdc.
- Do not assume that the DC bus is voltage-free when the DC bus LED is off.
- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- Do not create a short-circuit across the DC bus terminals or the DC bus capacitors.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

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

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

⚠DANGER

POTENTIAL FOR EXPLOSION

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

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

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

⚠WARNING

UNINTENDED MOVEMENT OR MACHINE OPERATION

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

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

⚠WARNING

LOSS OF CONTROL

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

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

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

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

Schneider Electric adheres to industry best practices in the development and implementation of control systems. This includes a "Defense-in-Depth" approach to secure an Industrial Control System. This approach places the controllers behind one or more firewalls to restrict access to authorized personnel and protocols only.

⚠WARNING

UNAUTHENTICATED ACCESS AND SUBSEQUENT UNAUTHORIZED MACHINE OPERATION

- Evaluate whether your environment or your machines are connected to your critical infrastructure and, if so, take appropriate steps in terms of prevention, based on Defense-in-Depth, before connecting the automation system to any network.
- Limit the number of devices connected to a network to the minimum necessary.
- Isolate your industrial network from other networks inside your company.
- Protect any network against unintended access by using firewalls, VPN, or other, proven security measures.
- Monitor activities within your systems.
- Prevent subject devices from direct access or direct link by unauthorized parties or unauthenticated actions.
- Prepare a recovery plan including backup of your system and process information.

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

For more information on organizational measures and rules covering access to infrastructures, refer to 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.

For reasons of Internet security, for those devices that have a native Ethernet connection, TCP/IP forwarding is disabled by default. Therefore, you must manually enable TCP/IP forwarding. However, doing so may expose your network to possible cyberattacks if you do not take additional measures to protect your enterprise. In addition, you may be subject to laws and regulations concerning cybersecurity.

⚠WARNING

UNAUTHENTICATED ACCESS AND SUBSEQUENT NETWORK INTRUSION

- Observe and respect any and all pertinent national, regional and local cybersecurity and/or personal data laws and regulations when enabling TCP/IP forwarding on an industrial network.
- Isolate your industrial network from other networks inside your company.
- Protect any network against unintended access by using firewalls, VPN, or other, proven security measures.

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

Consult the Schneider Electric Cybersecurity Best Practices for additional information.

Firmware

Use the latest firmware version. Visit https://www.se.com or contact your Schneider Electric representative for information on firmware updates.

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 (greater than 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.
- Do not assume that the DC bus is voltage-free when the DC bus LED is off.

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

Terminology Derived from Standards

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

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

Among others, these standards include:

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

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

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

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

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

Introduction

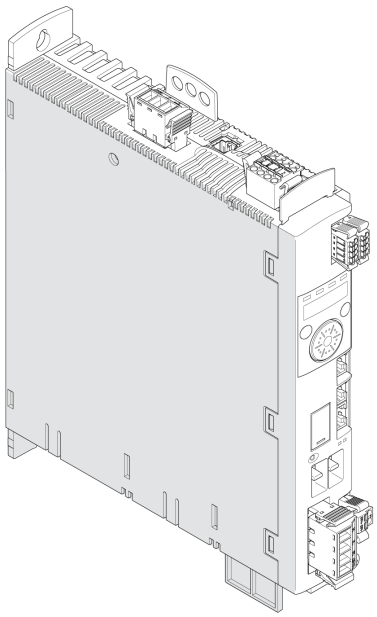
Device Overview

General

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

Lexium Servo Drive LXM32A

This product manual describes the LXM32A servo drive.

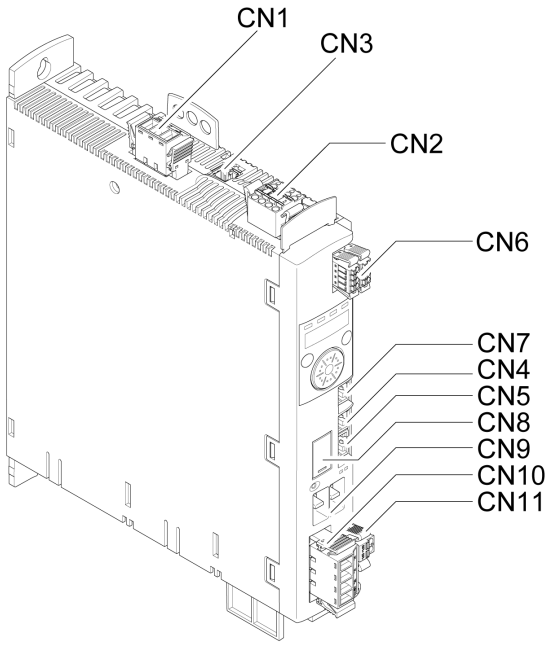


Overview of some of the features of the servo drive:

- Communication interface for CANopen and CANmotion.
- The product is commissioned via the integrated HMI, the external graphic display terminal, a PC with commissioning software or the fieldbus.
- The safety function "Safe Torque Off" (STO) as per IEC 61800-5-2 is integrated into the drive.
- A memory card slot is provided for backup and copying of parameters and fast device replacement.

Components and Interfaces

Overview



CN1 Power stage supply

CN2 24 Vdc control supply and safety function STO

CN3 Motor encoder (Encoder 1)

CN4 CAN in

CN5 CAN out

CN6 4 digital inputs and 2 digital outputs

CN7 Modbus (commissioning interface)

CN8 External braking resistor

CN9 DC bus

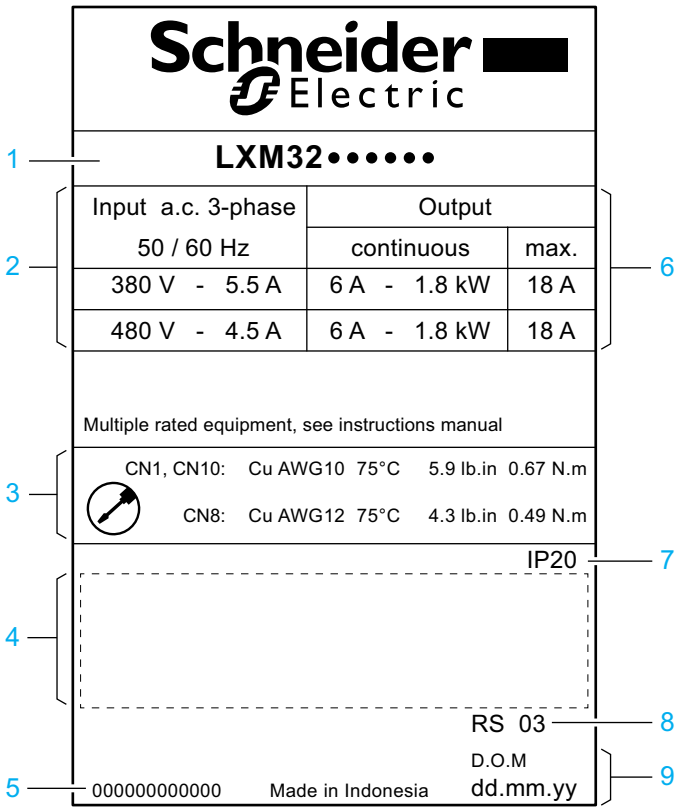
CN10 Motor phases

CN11 Motor holding brake

Nameplate

Description

The nameplate contains the following data:



1 Product type, see Type Code, page 22

2 Power stage supply

3 Cable specifications and tightening torque

4 Certifications (see product catalog)

5 Serial number

6 Output power

7 Degree of protection

8 Hardware version

9 Date of manufacture

Type Code

Description

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

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

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

Designation Customized Version

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

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

Technical Data

Environmental Conditions

Conditions for Operation

The maximum permissible ambient temperature during operation depends on the clearances between the devices and on the power consumption. Observe the pertinent instructions in the section Installation, page 75.

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

The following relative humidity is permissible during operation:

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

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

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

Conditions for Transportation and Storage

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

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

The following relative humidity is permissible during transportation and storage:

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

Installation Site and Connection

For operation, the device must be mounted in a closed and appropriately rated control cabinet secured by a keyed or tooled locking mechanism. The device may only be operated with a permanently installed connection.

Pollution Degree and Degree of Protection

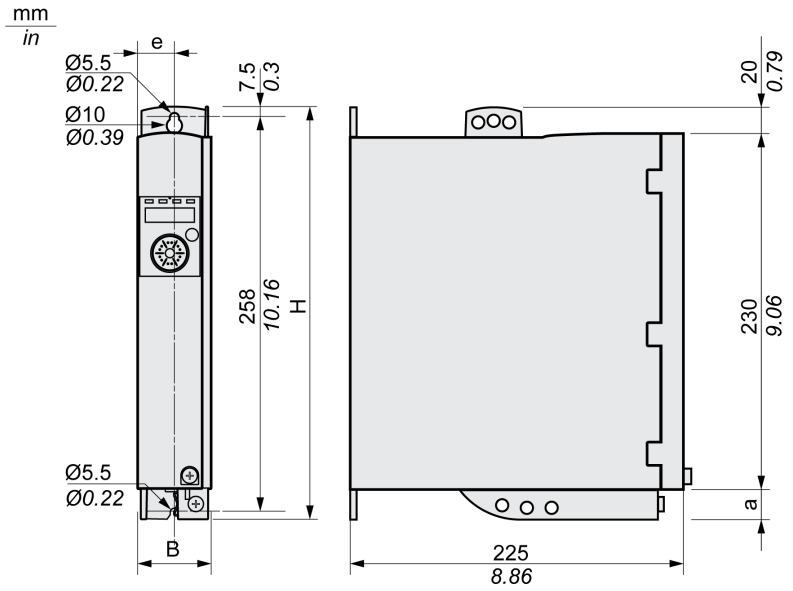
Characteristic	Value
Pollution degree	2
Degree of protection	IP20

Vibration and Shock

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

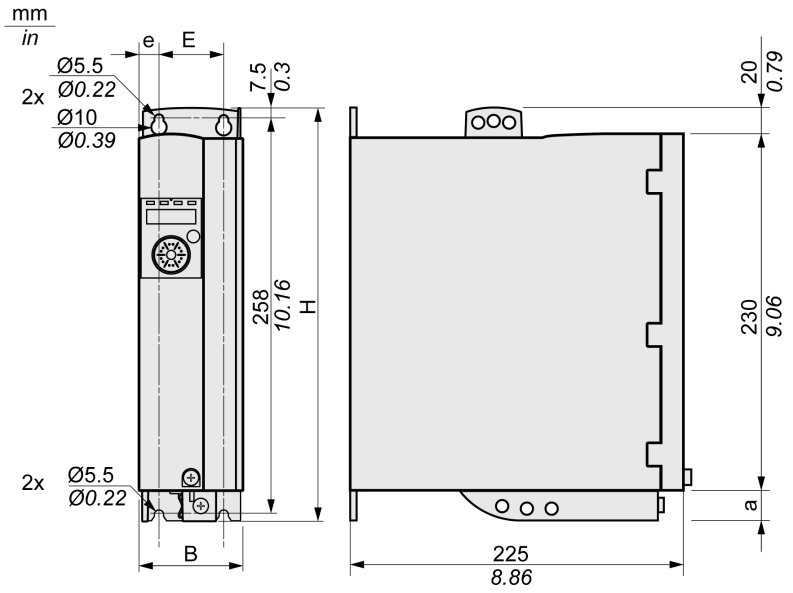
Dimensions

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



Characteristic	Unit	Value	
		LXM32•U45, LXM32•U60, LXM32•U90	**LXM32•D12, LXM32•D18, LXM32•D30M2**
B	mm (in)	48 ±1 (1.99 ±0.04)	48 ±1 (1.99 ±0.04)
H	mm (in)	270 (10.63)	270 (10.63)
e	mm (in)	24 (0.94)	24 (0.94)
a	mm (in)	20 (0.79)	20 (0.79)
Type of cooling	-	Convection(1)	Fan 40 mm (1.57 in)
(1) Greater than 1 m/s			

Dimensions LXM32•D30N4 and LXM32•D72



Characteristic	Unit	Value	
		LXM32•D30N4	LXM32•D72
B	mm (in)	68 ±1 (2.68 ±0.04)	108 ±1 (4.25 ±0.04)
H	mm (in)	270 (10.63)	274 (10.79)
e	mm (in)	13 (0.51)	13 (0.51)
E	mm (in)	42 (1.65)	82 (3.23)
a	mm (in)	20 (0.79)	24 (0.94)
Type of cooling	-	Fan 60 mm (2.36 in)	Fan 80 mm (3.15 in)

Mass

Characteristic	Unit	Value					
		LXM32•U45	LXM32•U60, LXM32•U90	LXM32•D12, LXM32•D18-M2	LXM32•D18-N4, LXM32•D30-M2	LXM32•D30-N4	LXM32•D72
Mass	kg (lb)	1.6 (3.53)	1.7 (3.75)	1.8 (3.97)	2.0 (4.41)	2.6 (5.73)	4.7 (10.36)

Power Stage Data - General

Mains Voltage: Range and Tolerance

Characteristic	Unit	Value
115/230 Vac single-phase	Vac	100 -15% ... 120 +10% 200 -15% ... 240 +10%
208/400/480 Vac three-phase (1)	Vac	200 -15% ... 240 +10% 380 -15% ... 480 +10%
Frequency	Hz	50 -5% ... 60 +5%
(1) 208 Vac: With firmware version ≥V01.04 and DOM ≥10.05.2010		

Characteristic	Unit	Value
Transient overvoltages	-	Overvoltage category III(1)
Rated voltage to ground	Vac	300
(1) Depends on installation altitude, see Environmental Conditions, page 23.		

Type of Grounding

Characteristic	Value
TT grounding system, TN grounding system	Approved
IT grounding system	Depends on hardware version: ≥RS02: Approved(1) <RS02: Not approved
Mains with corner grounded system	Not approved
(1) Depending on installation altitude, see Environmental Conditions, page 23.	

Leakage Current

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

Harmonic Currents and Impedance

The harmonic currents depend on the impedance of the supply mains. This is expressed in terms of the short-circuit current of the supply mains. If the supply mains has a higher short-circuit current than indicated in the Technical Data for the drive, use upstream mains reactors. See Accessories and Spare Parts, page 418 for suitable mains reactors.

Monitoring the Motor Phases for Short-Circuit

The drive provides short-circuit protection according to IEC 60364-4-41:2005/ AMD1:-, Clause 411.

Monitoring the Continuous Output Current

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

PWM Frequency Power Stage

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

Characteristic	Unit	Value
PWM frequency power stage	kHz	8

Approved Motors

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

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

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

Inductance of Motor

The permissible minimum inductance of the motor to be connected depends on the drive type and the nominal mains voltage. See Power Stage Data - Drive-Specific, page 29.

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

Power Stage Data - Drive-Specific

Data for Single-Phase Devices at 115 Vac

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

(1) As per IEC 60269. Circuit breakers with B or C characteristic. See Conditions for UL 508C and CSA, page 47. Lower ratings are permissible. The fuse must be rated in such a way that the fuse does not trip at the specified input current.

(2) At a mains impedance corresponding to a short-circuit current of the supply mains of 1 kA.

(3) At nominal power and nominal voltage.

(4) With reference to the input current.

(5) Condition: internal braking resistor not active. Value at nominal current, nominal voltage and nominal power. Value approximately proportional with output current.

(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time.

Data for Single-Phase Devices at 230 Vac

Characteristic	Unit	Value			
		LXM32•U45M2	LXM32•U90M2	LXM32•D18M2	LXM32•D30M2
Nominal voltage (single-phase)	Vac	230	230	230	230
Inrush current limitation	A	3.5	6.9	16	33
Maximum fuse to be connected upstream(1)	A	25	25	25	25
Continuous output current	A_{rms}	1.5	3	6	10
Peak output current	A_{rms}	4.5	9	18	30
Minimum inductance motor (phase/phase)	mH	5.5	3	1.4	0.8

Characteristic	Unit	Value			
		LXM32•U45M2	LXM32•U90M2	LXM32•D18M2	LXM32•D30M2
Values without mains reactor(2)					
Nominal power	kW	0.3	0.5	1.0	1.6
Input current(3)	A_{rms}	2.9	4.5	8.4	12.7
THD (total harmonic distortion)(4)	%	181	166	148	135
Power dissipation(5)	W	10	18	34	38
Maximum inrush current(6)	A	142	197	240	270
Time for maximum inrush current	ms	1.1	1.5	1.8	2.1
Values with mains reactor					
Mains reactor	mH	5	2	2	2
Nominal power	kW	0.5	0.9	1.6	2.2
Input current(3)	A_{rms}	3.4	6.3	10.6	14.1
THD (total harmonic distortion)(4)	%	100	107	93	86
Power dissipation(5)	W	11	20	38	42
Maximum inrush current(6)	A	42	90	106	116
Time for maximum inrush current	ms	3.5	3.2	3.6	4.0

(1) As per IEC 60269. Circuit breakers with B or C characteristic. See Conditions for UL 508C and CSA, page 47. Lower ratings are permissible. The fuse must be rated in such a way that the fuse does not trip at the specified input current.

(2) At a mains impedance corresponding to a short-circuit current of the supply mains of 1 kA.

(3) At nominal power and nominal voltage.

(4) With reference to the input current.

(5) Condition: internal braking resistor not active. Value at nominal current, nominal voltage and nominal power. Value approximately proportional with output current.

(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time.

Data for Three-Phase Devices at 208 Vac

Characteristic	Unit	Value				
		LXM32•U60-N4	LXM32•D12-N4	LXM32•D18-N4	LXM32•D30-N4	LXM32•D72-N4
Nominal voltage (three-phase)	Vac	208	208	208	208	208
Inrush current limitation	A	2.2	4.9	10	10	29
Maximum fuse to be connected upstream(1)	A	32	32	32	32	32
Continuous output current	A_{rms}	1.5	3	6	10	24
Peak output current	A_{rms}	6	12	18	30	72
Minimum inductance motor (phase/phase)	mH	8.5	4.5	3	1.7	0.7
Values without mains reactor(2)						
Nominal power	kW	0.35	0.7	1.2	2.0	5
Input current(3)	A_{rms}	1.8	3.6	6.2	9.8	21.9
THD (total harmonic distortion)(4)	%	132	136	140	128	106
Power dissipation(5)	W	13	26	48	81	204
Maximum inrush current(6)	A	60	180	276	341	500
Time for maximum inrush current	ms	0.5	0.7	0.9	1.1	1.5
Values with mains reactor						
Mains reactor	mH	2	2	1	1	1
Nominal power	kW	0.4	0.8	1.5	2.6	6.5

Characteristic	Unit	Value				
		LXM32•U60-N4	LXM32•D12-N4	LXM32•D18-N4	LXM32•D30-N4	LXM32•D72-N4
Input current(3)	A_{rms}	1.7	3.1	6.0	9.2	21.1
THD (total harmonic distortion)(4)	%	97	79	78	59	34
Power dissipation(5)	W	13	27	51	86	218
Maximum inrush current(6)	A	19	55	104	126	155
Time for maximum inrush current	ms	1.9	2.6	2.6	3.0	3.6

(1) As per IEC 60269. Circuit breakers with B or C characteristic. See Conditions for UL 508C and CSA, page 47. Lower ratings are permissible. The fuse must be rated in such a way that the fuse does not trip at the specified input current.

(2) At a mains impedance corresponding to a short-circuit current of the supply mains of 5 kA.

(3) At nominal power and nominal voltage.

(4) With reference to the input current.

(5) Condition: internal braking resistor not active. Value at nominal current, nominal voltage and nominal power. Value approximately proportional with output current.

(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time.

Data for Three-Phase Devices at 400 Vac

Characteristic	Unit	Value				
		LXM32•U60-N4	LXM32•D12-N4	LXM32•D18-N4	LXM32•D30-N4	LXM32•D72-N4
Nominal voltage (three-phase)	Vac	400	400	400	400	400
Inrush current limitation	A	4.3	9.4	19	19	57
Maximum fuse to be connected upstream(1)	A	32	32	32	32	32
Continuous output current	A_{rms}	1.5	3	6	10	24
Peak output current	A_{rms}	6	12	18	30	72
Minimum inductance motor (phase/phase)	mH	8.5	4.5	3	1.7	0.7
Values without mains reactor(2)						
Nominal power	kW	0.4	0.9	1.8	3.0	7
Input current(3)	A_{rms}	1.4	2.9	5.2	8.3	17.3
THD (total harmonic distortion)(4)	%	191	177	161	148	126
Power dissipation(5)	W	17	37	68	115	283
Maximum inrush current(6)	A	90	131	201	248	359
Time for maximum inrush current	ms	0.5	0.7	0.9	1.1	1.4
Values with mains reactor						
Mains reactor	mH	2	2	1	1	1
Nominal power	kW	0.8	1.6	3.3	5.6	13
Input current(3)	A_{rms}	1.8	3.4	6.9	11.1	22.5
THD (total harmonic distortion)(4)	%	108	90	90	77	45
Power dissipation(5)	W	19	40	74	125	308
Maximum inrush current(6)	A	28	36	75	87	112

Characteristic	Unit	Value				
		LXM32•U60-N4	LXM32•D12-N4	LXM32•D18-N4	LXM32•D30-N4	LXM32•D72-N4
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 Conditions for UL 508C and CSA, page 47. Lower ratings are permissible. The fuse must be rated in such a way that the fuse does not trip at the specified input current.

(2) At a mains impedance corresponding to a short-circuit current of the supply mains of 5 kA

(3) At nominal power and nominal voltage.

(4) With reference to the input current.

(5) Condition: internal braking resistor not active. Value at nominal current, nominal voltage and nominal power. Value approximately proportional with output current.

(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time.

Data for Three-Phase Devices at 480 Vac

Characteristic	Unit	Value				
		LXM32•U60-N4	LXM32•D12-N4	LXM32•D18-N4	LXM32•D30-N4	LXM32•D72-N4
Nominal voltage (three-phase)	Vac	480	480	480	480	480
Inrush current limitation	A	5.1	11.3	23	23	68
Maximum fuse to be connected upstream(1)	A	32	32	32	32	32
Continuous output current	A_{rms}	1.5	3	6	10	24
Peak output current	A_{rms}	6	12	18	30	72
Minimum inductance motor (phase/phase)	mH	8.5	4.5	3	1.7	0.7
Values without mains reactor(2)						
Nominal power	kW	0.4	0.9	1.8	3.0	7
Input current(3)	A_{rms}	1.2	2.4	4.5	7.0	14.6
THD (total harmonic distortion)(4)	%	201	182	165	152	129
Power dissipation(5)	W	20	42	76	129	315
Maximum inrush current(6)	A	129	188	286	350	504
Time for maximum inrush current	ms	0.6	0.7	1.0	1.2	1.6
Values with mains reactor						
Mains reactor	mH	2	2	1	1	1
Nominal power	kW	0.8	1.6	3.3	5.6	13
Input current(3)	A_{rms}	1.6	2.9	6.0	9.6	19.5
THD (total harmonic distortion)(4)	%	116	98	98	85	55
Power dissipation(5)	W	21	44	82	137	341
Maximum inrush current(6)	A	43	57	116	137	177
Time for maximum inrush current	ms	1.9	2.4	2.4	2.7	3.2

(1) As per IEC 60269. Circuit breakers with B or C characteristic. See Conditions for UL 508C and CSA, page 47. Lower ratings are permissible. The fuse must be rated in such a way that the fuse does not trip at the specified input current.

(2) At a mains impedance corresponding to a short-circuit current of the supply mains of 5 kA

(3) At nominal power and nominal voltage.

(4) With reference to the input current.

(5) Condition: internal braking resistor not active. Value at nominal current, nominal voltage and nominal power. Value approximately proportional with output current.

(6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time.

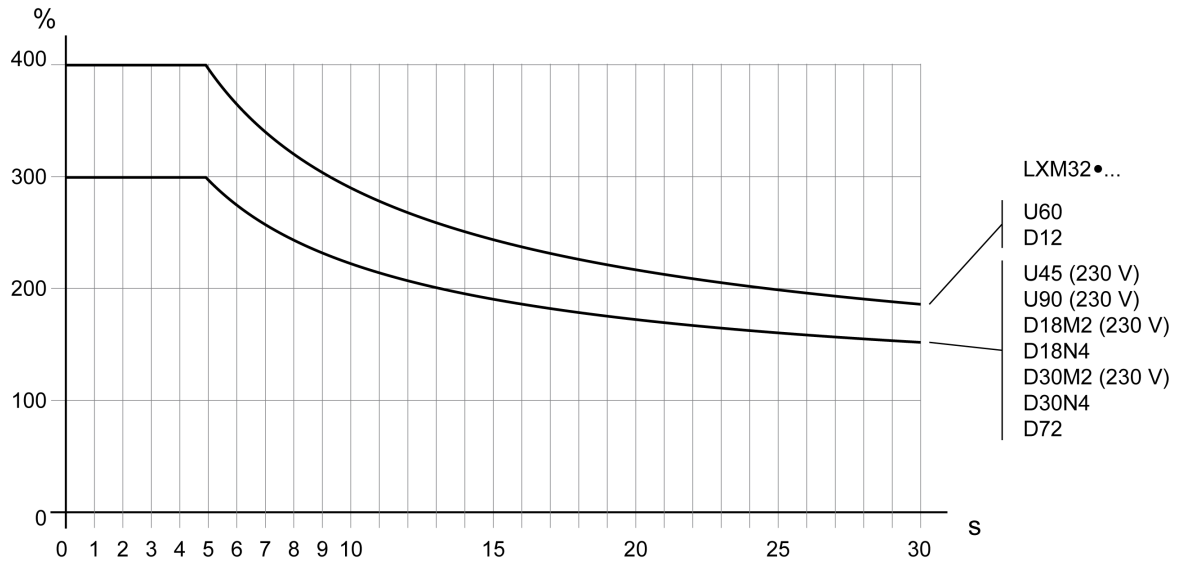
Peak Output Currents

Description

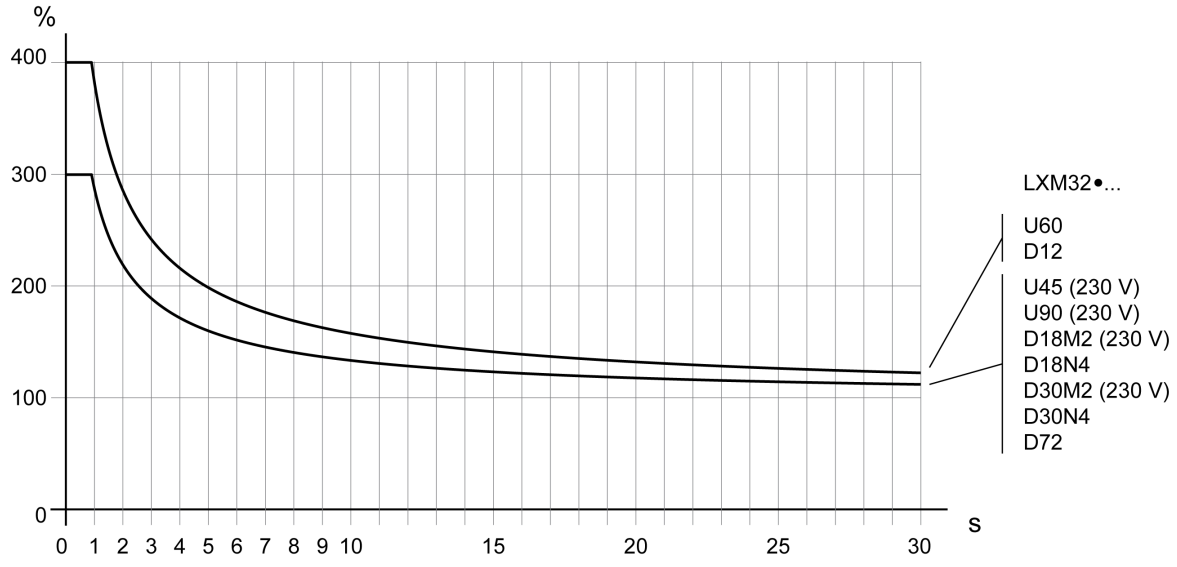
The device can provide the peak output current for a limited period of time. If the peak output current flows when the motor is at a standstill, the higher load on a single semiconductor switch causes the current limitation to become active earlier than when the motor moves.

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

Peak output current with hardware version ≥RS03: 5 seconds



Peak output current with hardware version <RS03: 1 second



DC Bus Data

DC Bus Data for Single-Phase Drives

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

DC Bus Data for Three-Phase Drives

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

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

24 Vdc Control Supply

Description

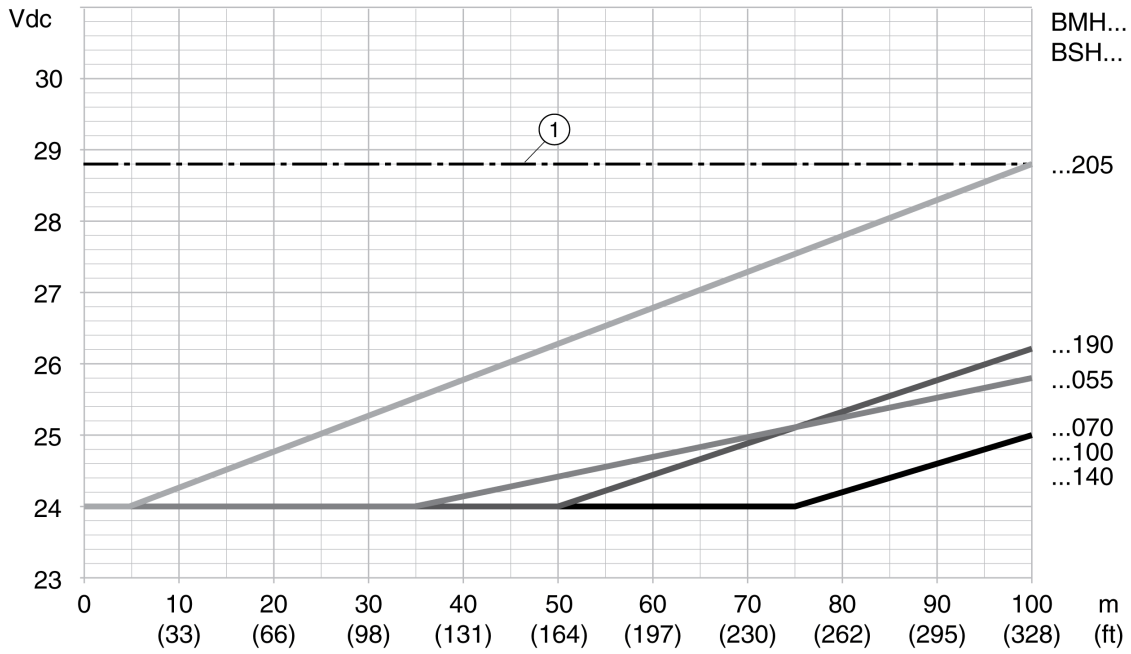
The 24 Vdc control supply must meet the requirements of IEC 61131-2 (PELV standard power supply unit):

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

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

If a motor with holding brake is connected, the 24 Vdc control supply must be adjusted according to the connected motor type, the motor cable length and the cross section of the wires for the holding brake. The following diagram applies to the motor cables available as accessories, see Accessories and Spare Parts, page 418. See the diagram for the voltage that must be available at CN2 for releasing the holding brake. The voltage tolerance is ±5 %.

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

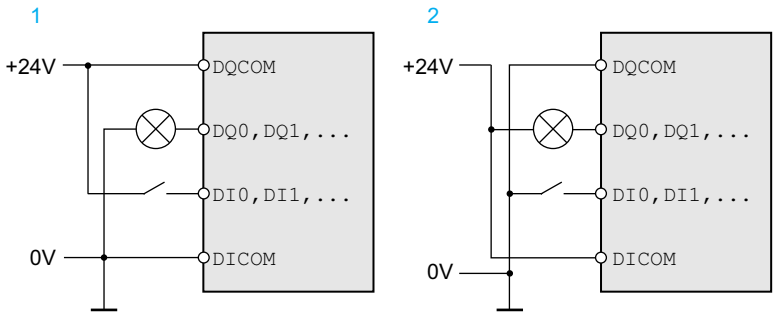


1 Maximum voltage of the 24 Vdc control supply

Signals

Logic Type

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



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

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

Refer to Logic Type, page 58 for more information on sinking, sourcing and positive and negative logic.

Digital Input Signals 24 V

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

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

Digital Output Signals 24 V

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

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

Input Signals Safety Function STO

The inputs for the safety function STO (inputs *STO_A* and *STO_B*) can only be wired for sinking inputs. Observe the information provided in section Functional Safety, page 66.

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

Holding Brake Output CN11

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

Characteristic	Unit	Value
Output voltage(1)	V	Voltage at 24 Vdc control supply CN2 minus 0.8 V
Maximum switching current	A	1.7
Energy inductive load(2)	Ws	1.5
(1) See 24 Vdc Control Supply, page 36 **(2)** Time between switch off procedures: > 1 s		

CAN Bus Signals

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

Encoder Signals

The encoder signals comply with the Stegmann Hiperface specification.

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

The output voltage is short-circuit protected and overload protected.

Capacitor and Braking Resistor

Description

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

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

Data of Internal Capacitor

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

Characteristic	**Unit**	**Value**				
		LXM32•U60-N4	**LXM32•D12-N4**	**LXM32•D18-N4**	**LXM32•D30-N4**	**LXM32•D72-N4**
Capacitance of internal capacitor	µF	110	195	390	560	1120
Energy absorption of internal capacitors E_{var} at nominal voltage 208 V +10%	Ws	4	8	16	22	45
Energy absorption of internal capacitors E_{var} at nominal voltage 380 V +10%	Ws	14	25	50	73	145
Energy absorption of internal capacitors E_{var} at nominal voltage 400 V +10%	Ws	12	22	43	62	124
Energy absorption of internal capacitors E_{var} at nominal voltage 480 V +10%	Ws	3	5	10	14	28
Parameter *DCbus_compat* has no effect in the case of three-phase devices						

Data of Internal Braking Resistor

Characteristic	**Unit**	**Value**			
		LXM32•U45M2	**LXM32•U90M2**	**LXM32•D18M2**	**LXM32•D30M2**
Resistance value of internal braking resistor	Ω	94	47	20	10
Continuous power internal braking resistor P_{PR}	W	10	20	40	60
Peak energy E_{CR}	Ws	82	166	330	550
Parameter *DCbus_compat* **= 0** (default value)					

Characteristic	Unit	Value			
		LXM32•U45M2	LXM32•U90M2	LXM32•D18M2	LXM32•D30M2
Switch-on voltage of braking resistor at nominal voltage 115 V	V	236	236	236	236
Switch-on voltage of braking resistor at nominal voltage 200 V and 230 V	V	430	430	430	430
Parameter *DCbus_compat* **= 1** (reduced switch-on voltage)					
Switch-on voltage of braking resistor	V	395	395	395	395

Characteristic	Unit	Value				
		LXM32•U60-N4	LXM32•D12-N4	LXM32•D18-N4	LXM32•D30-N4	LXM32•D72-N4
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
Switch-on voltage of braking resistor at nominal voltage 208 V	V	430	430	430	430	430
Switch-on voltage of braking resistor at nominal voltage 380 V, 400 V and 480 V	V	780	780	780	780	780
Parameter *DCbus_compat* has no effect in the case of three-phase devices						

Data for External Braking Resistor

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

Characteristic	Unit	Value				
		LXM32•U60-N4	LXM32•D12-N4	LXM32•D18-N4	LXM32•D30-N4	LXM32•D72-N4
Minimum resistance value of external braking resistor	Ω	70	47	25	15	8
Maximum resistance value of external braking resistor(1)	Ω	145	73	50	30	12
Maximum continuous power of external braking resistor	W	200	500	800	1500	3000
Switch-on voltage of braking resistor at nominal voltage 208 V	V	430	430	430	430	430
Switch-on voltage of braking resistor at nominal voltage 380 V, 400 V and 480 V	V	780	780	780	780	780

Characteristic	Unit	Value				
		LXM32•U60-N4	LXM32•D12-N4	LXM32•D18-N4	LXM32•D30-N4	LXM32•D72-N4
Parameter *DCbus_compat* has no effect in the case of three-phase devices						
(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.						

Data of External Braking Resistors (Accessories)

Characteristic	Unit	Value							
		VW3-A7601Rx-x	VW3-A7602Rx-x	VW3-A7603Rx-x	VW3-A7604Rx-x	VW3-A7605Rx-x	VW3-A7606Rx-x	VW3-A7607Rx-x	VW3-A7608Rx-x
Resistance	Ω	10	27	27	27	72	72	72	100
Continuous power	W	400	100	200	400	100	200	400	100
Maximum time in braking at 115 V	s	3	1.8	4.2	10.8	6.36	16.8	42	10.8
Peak power at 115 V	kW	5.6	2.1	2.1	2.1	0.8	0.8	0.8	0.6
Maximum peak energy at 115 V	kWs	16.7	3.7	8.7	22.3	4.9	13	32.5	6
Maximum time in braking at 230 V	s	0.72	0.55	1.08	2.64	1.44	3.72	9.6	2.4
Peak power at 230 V	kW	18.5	6.8	6.8	6.8	2.6	2.6	2.6	1.8
Maximum peak energy at 230 V	kWs	13.3	3.8	7.4	18.1	3.7	9.6	24.7	4.4
Maximum time in braking at 400 V and 480 V	s	0.12	0.084	0.216	0.504	0.3	0.78	1.92	0.48
Peak power at 400 V and 480 V	kW	60.8	22.5	22.5	22.5	8.5	8.5	8.5	6.1
Maximum peak energy at 400 V and 480 V	kWs	7.3	1.9	4.9	11.4	2.5	6.6	16.2	2.9
Degree of protection		IP65	IP65	IP65	IP65	IP65	IP65	IP65	IP65
UL approval (file no.)		-	E233422	E233422	-	E233422	E233422	-	E233422

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

Electromagnetic Emission

Overview

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

⚠WARNING

ELECTROMAGNETIC DISTURBANCES OF SIGNALS AND DEVICES

Use proper EMI shielding techniques to help prevent unintended device operation.

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

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

⚠WARNING

RADIO INTERFERENCE

Do not use these products in domestic electrical networks.

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

EMC Categories

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

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

EMC Categories With External Mains Filter

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

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

Assignment of External Mains Filters

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

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

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

Prerequisites:

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

Nonvolatile Memory and Memory Card

Nonvolatile Memory

The following table shows characteristics for the nonvolatile memory:

Characteristic	Value
Minimum number of writing cycles	100000
Type	EEPROM

Memory Card

The following table shows characteristics for the memory card:

Characteristic	Value
Minimum number of writing cycles	100000
Minimum number of insertion cycles	1000

Memory Card Holder

The following table shows characteristics for the memory card holder:

Characteristic	Value
Minimum number of insertion cycles	5000

Conditions for UL 508C and CSA

General

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

Ambient Temperature During Operation

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

Fuses

Use fuses as per UL 248.

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

Circuit Breaker

Characteristic	Unit	Value				
		LXM32•U45-M2, LXM32•U90-M2	LXM32•D18-M2, LXM32•D30-M2	LXM32•U60N4, LXM32•D12N4, LXM32•D18N4		LXM32•D30-N4, LXM32•D72-N4
Catalog number of type E combination motor controller		GV2P14 or GV3P25	GV3P25	GV2P14 or GV3P25	GV2P22	GV2P22
Short-circuit current rating (SCCR)	kA	12	12	12	10	10

Wiring

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

400/480 V Three-Phase Devices

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

Overvoltage Category

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

Motor Overload Protection

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

Engineering

Electromagnetic Compatibility (EMC)

General

EMC-Compliant Wiring

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

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

⚠WARNING

SIGNAL AND EQUIPMENT INTERFERENCE

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

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

⚠WARNING

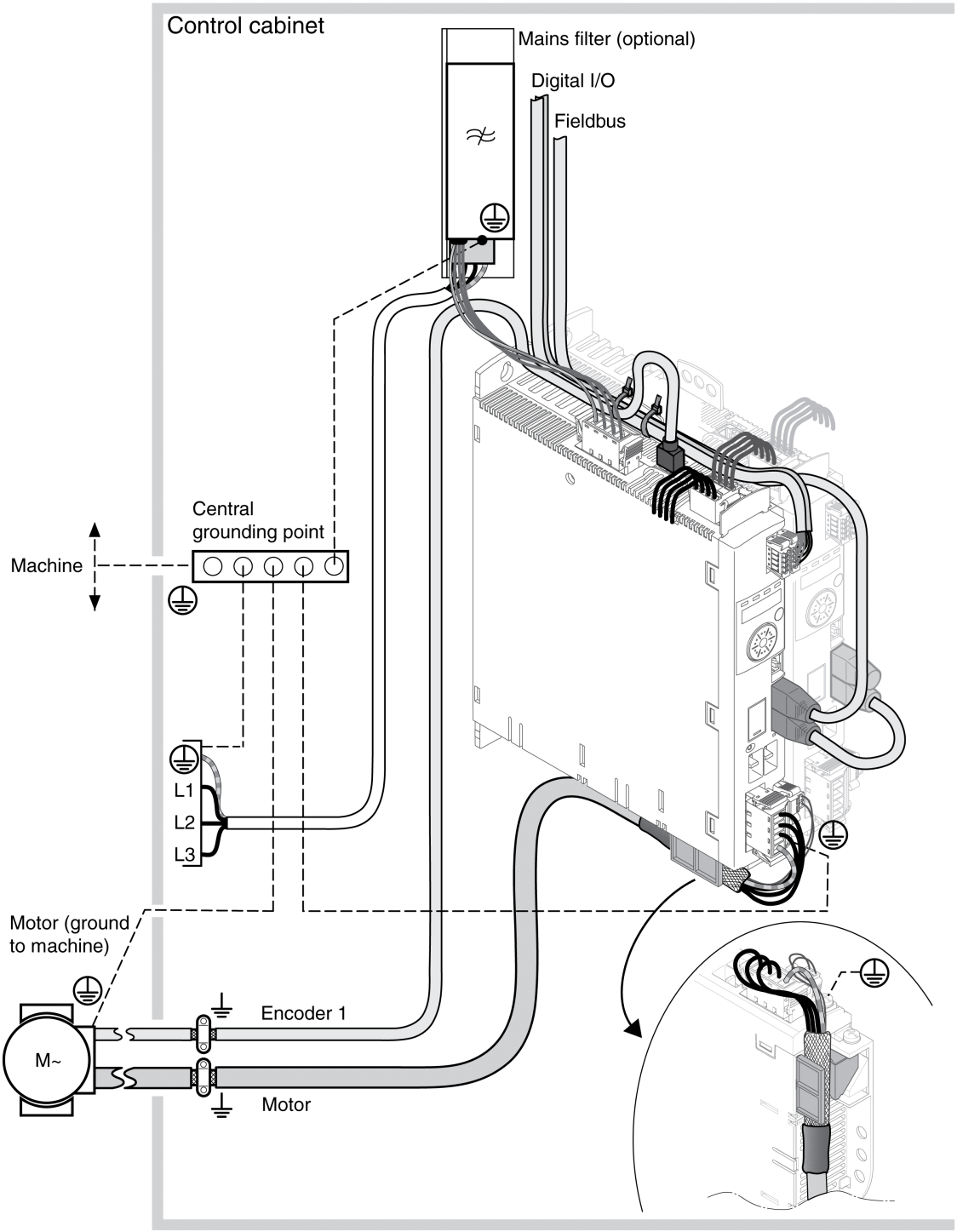
ELECTROMAGNETIC DISTURBANCES OF SIGNALS AND DEVICES

Use proper EMI shielding techniques to help prevent unintended device operation.

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

See Electromagnetic Emission, page 44 for the EMC categories.

Overview of wiring with EMC details



EMC Requirements for the Control Cabinet

EMC measures	Objective
Use mounting plates with good electrical conductivity, connect large surface areas of metal parts, remove paint from contact areas.	Good conductivity due to large surface contact.
Ground the control cabinet, the control cabinet door and the mounting plate with ground straps or ground wires. The conductor cross section must be at least 10 mm^2 (AWG 6).	Reduces emissions.

EMC measures	Objective
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 drive (signal input); insulate the shield at the other cable end or ground it via a capacitor (for example, 10 nF).	Reduces ground loops due to low-frequency interference.
Use only shielded motor cables with copper braid and a coverage of at least 85%, ground a large surface area of the shield at both ends.	Diverts interference currents in a controlled way, reduces emissions.

Cable Installation

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

Power Supply

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

Motor and Encoder Cables

Motor and encoder cables require particular attention in terms of EMC. Use only pre-assembled cables (see Accessories and Spare Parts, page 418) or cables that comply with the specifications (see Cables and Signals, page 53) and implement the EMC measures described below.

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

Additional Measures for EMC Improvement

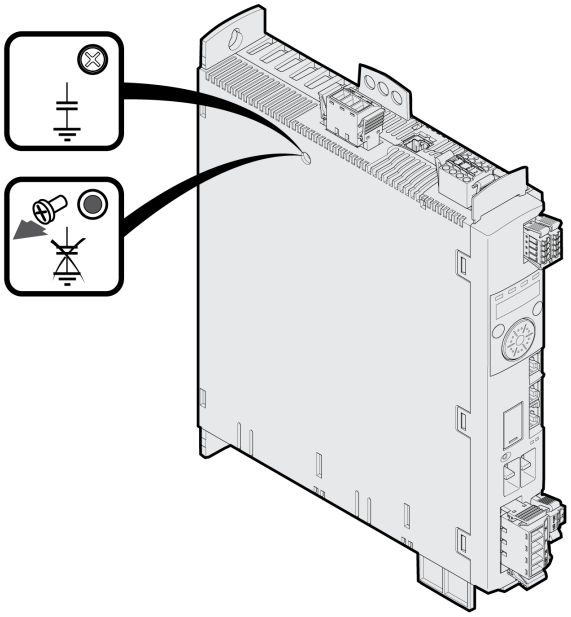
Depending on the application, the following measures can improve the EMC-dependent values:

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

Deactivating the Y Capacitors

Description

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



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

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

Cables and Signals

Cables - General

Suitability of the Cables

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

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

Connecting Shields

Shield connection possibilities:

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

Equipotential Bonding Conductors

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

Conductor Cross Sections According to Method of Installation

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

- Method of installation B2:

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

  Cables on open cable trays

Cross section in mm² (AWG)	Current-carrying capacity with method of installation B2 in A(1)	Current carrying capacity with method of installation E in A(1)
0.75 (18)	8.5	10.4
1 (16)	10.1	12.4

Cross section in mm² (AWG)	Current-carrying capacity with method of installation B2 in A(1)	Current carrying capacity with method of installation E in A(1)
1.5 (14)	13.1	16.1
2.5 (12)	17.4	22
4 (10)	23	30
6 (8)	30	37
10 (6)	40	52
16 (4)	54	70
25 (2)	70	88
(1) Values as per IEC 60204-1 for continuous operation, copper conductors and ambient air temperature 40 °C (104 °F). See IEC 60204-1 for additional information. The table is an excerpt from this standard and also shows cable cross-sections that are not applicable with regard to the product.		

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

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

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

Overview of the Required Cables

Overview

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 section Accessories and Spare Parts, page 418. If the product is used to comply with the requirements as per UL 508C, the conditions specified in section Conditions for UL 508C and CSA, page 47 must be met.

	Maximum length:	Minimum cross section	Shielded, both ends grounded	Twisted pair	PELV
24 Vdc control supply	-	0.75 mm² (AWG 18)	-	-	Required
Safety function STO(1)	-	0.75 mm² (AWG 18)	(1)	-	Required
Power stage supply	-	–(2)	-	-	-
Motor phases	–(3)	–(4)	Required	-	-
External braking resistor	3 m (9.84 ft)	As power stage supply	Required	-	-
Motor encoder	100 m (328.01 ft)	6 * 0.14 mm² and 2 * 0.34 mm² (6 * AWG 24 and 2 * AWG 20)	Required	Required	Required
Fieldbus CAN	-	0.14 mm² (AWG 24)	Required	Required	Required
Digital inputs / outputs	30 m (98.43 ft)	0.14 mm² (AWG 24)	-	-	Required
PC, commissioning interface	20 m (65.62 ft)	0.14 mm² (AWG 24)	Required	Required	Required

(1) Note the installation requirements (protected cable installation), see Functional Safety, page 66.

(2) See Connection Power Stage Supply (CN1), page 89

(3) Length depends on the required limit values for conducted interference.

(4) See Connection Motor Phases and Holding Brake (CN10 and CN11), page 82

Cable Specifications

General

Using pre-assembled cables helps to reduce the possibility of wiring errors. See Accessories and Spare Parts, page 418.

The genuine accessories have the following properties:

Motor Cable With Connector

Characteristic	Unit	Value					
		VW3-M5100R•••	VW3-M5101R•••	VW3-M5102R•••	VW3-M5103R•••	VW3-M5105R•••	VW3-M5104R•••
Cable jacket, insulation	-	PUR orange (RAL 2003), TPM	PUR orange (RAL 2003), polypropylene (PP)				
Capacitance power wires Wire/wire Wire/shield	pF/m	 80 145	 80 135	 80 150	 90 150	 85 150	 100 160
Number of contacts (shielded)	-	(4 x 1 mm² + 2 x (2 x 0.75 mm²))	(4 x 1.5 mm² + (2 x 1 mm²))	(4 x 2.5 mm² + (2 x 1 mm²))	(4 x 4 mm² + (2 x 1 mm²))	(4 x 6 mm² + (2 x 1 mm²))	(4 x 10 mm² + (2 x 1 mm²))
Connector motor side	-	8-pin circular Y-TEC	8-pin circular M23		8-pin circular M40		
Connector drive side	-	Open					
Cable diameter	mm (in)	11 ± 0.3 (0.43 ± 0.01)	12 ± 0.2 (0.47 ± 0.01)	14.3 ± 0.3 (0.55 ± 0.01)	16.3 ± 0.3 (0.64 ± 0.01)	18.8 ± 0.4 (0.74 ± 0.02)	23.5 ± 0.6 (0.93 ± 0.02)
Minimum bend radius with fixed installation	-	10 times the cable diameter	5 times the cable diameter				
Minimum bend radius with moving installation	-	10 times the cable diameter	7.5 times the cable diameter			10 times the cable diameter	
Nominal voltage Motor phases Holding brake	V	 1000 1000	 600 300				
Maximum orderable length	m (ft)	25 (82)	75 (246)				
Permissible temperature range during operation with fixed installation	°C (°F)	-40 ... 80 (-40 ... 176)					
Permissible temperature range during operation with moving installation	°C (°F)	-20 ... 60 (-4 ... 140)	-20 ... 80 (-4 ... 176)				
Certifications / declaration of conformity	-	CE, DESINA					

Motor Cable Without Connector

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

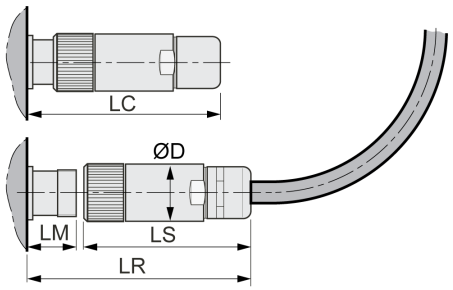
Encoder Cable With and Without Connectors

Characteristic	Unit	Value		
		VW3M8100R•••	**VW3M8102R•••**	**VW3M8222R•••**
Cable jacket, insulation	-	PUR green (RAL 6018), polypropylene (PP)		
Capacitance	pF/m	Approx. 135 (wire/wire)		
Number of contacts (shielded)	-	(3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2)		
Connector motor side	-	12-pin circular Y-TEC	12-pin circular M23	Open
Connector drive side	-	10-pin RJ45	10-pin RJ45	Open
Cable diameter	mm (in)	6.8 ± 0.2 (0.27 ± 0.1)		
Minimum bend radius	mm (in)	68 (2.68)		
Nominal voltage	V	300		

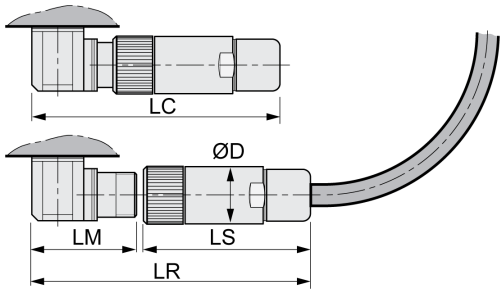
Characteristic	Unit	Value		
		VW3M8100R•••	VW3M8102R•••	VW3M8222R•••
Maximum orderable length	m (ft)	25 (82)	75 (246)	100 (328)
Permissible temperature range during operation with fixed installation	°C (°F)	-40 ... 80 (-40 ... 176)		
Permissible temperature range during operation with moving installation	°C (°F)	-20 ... 80 (-4 ... 176)		
Certifications / declaration of conformity	-	DESINA		c-UR-us, DESINA

Clearance For Connectors

Straight connectors



Angular connectors



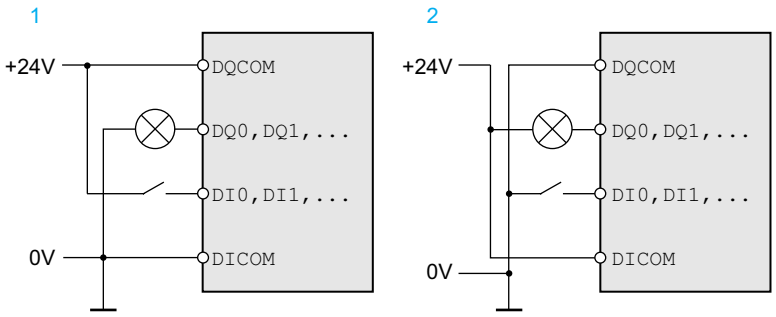
Dimensions		Motor connectors straight		Encoder connector straight
		M23	M40	M23
D	mm (in)	28 (1.1)	46 (1.81)	26 (1.02)
LS	mm (in)	76 (2.99)	100 (3.94)	51 (2.01)
LR	mm (in)	117 (4.61)	155 (6.1)	76 (2.99)
LC	mm (in)	100 (3.94)	145 (5.71)	60 (2.36)
LM	mm (in)	40 (1.57)	54 (2.13)	23 (0.91)

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

Logic Type

Overview

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



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

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

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Selection of the Logic Type

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

Special Case: Safety Function STO

The inputs for the safety function STO (inputs *STO_A* and *STO_B*) can only be wired for sinking inputs.

Configurable Inputs and Outputs

Description

This product has digital inputs and outputs that can be configured for specific functional assignments. The inputs and outputs have a defined standard assignment depending on the operating mode. This assignment can be adapted to the requirements of the customer's installation. See Digital Signal Inputs and Digital Signal Outputs, page 173 for information.

Mains Supply

Residual Current Device

Description

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

⚠WARNING

DIRECT CURRENT CAN BE INTRODUCED INTO THE PROTECTIVE GROUND CONDUCTOR

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

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

Further conditions for use of a residual current device:

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

Common DC Bus

Function Principle

The DC buses of several drives can be connected so that energy can be used efficiently. If on drive decelerates, a different drive 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 drive would have to be supplied with energy from mains.

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

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

Requirements for Use

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

Mains Reactor

Description

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 section Technical Data, page 23.
- If the nominal power of the drive is insufficient.
- In the case of operation with supply mains with reactive power compensation systems.
- For improvement of the power factor at the mains input and for reduction of mains harmonics.

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

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

Rating the Braking Resistor

Internal Braking Resistor

Description

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

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

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

External Braking Resistor

Description

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

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

⚠WARNING

HOT SURFACES

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

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

Monitoring

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

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

Selection of the External Braking Resistor

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

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

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

R = Resistance in Ω

U = Switching threshold for braking resistor V

P_{max} = Required peak power in W

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

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

Use only resistors that are specified as braking resistors. For suitable braking resistors, see Accessories and Spare Parts, page 418.

Mounting and Commissioning of an External Braking Resistor

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

The external braking resistors listed in the Accessories and Spare Parts, page 418 section are shipped with an information sheet that provides details on their installation.

Rating Information

Description

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

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

Internal Energy Absorption

Braking energy is absorbed internally by:

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

Values for the energy absorption E_{var} can be found in section Capacitor and Braking Resistor, page 40.

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 section Capacitor and Braking Resistor, page 40.

Electrical Losses E_{el}

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

Mechanical Losses E_{mech}

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

Example

Deceleration of a rotary motor with the following data:

- Initial speed of rotation: n = 4000 RPM
- Rotor inertia: J_R = 4 kgcm²
- Load inertia: J_L = 6 kgcm²
- 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 drive type).

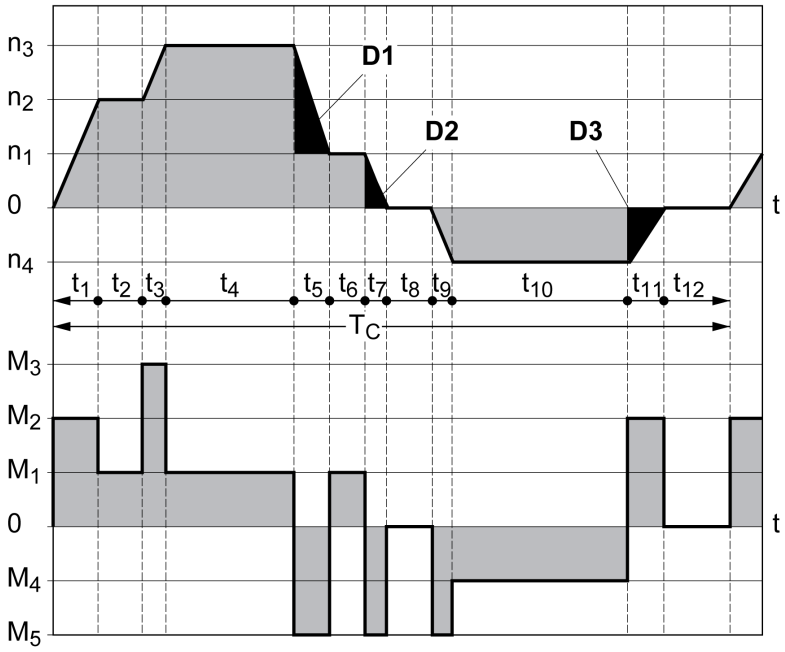
The internal braking resistor must absorb the remaining 65 Ws. It can absorb a pulse of E_{CR} = 80 Ws. If the load is decelerated once, the internal braking resistor is sufficient.

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

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

Rating the External Braking Resistor

Characteristic curves for rating the braking resistor



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

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

$J_t = J_m + J_c$

J_m: Motor inertia (with holding brake)

J_c: Load inertia

The energy for each deceleration segment is calculated as follows:

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

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

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

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

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

Units: E_i in Ws (wattseconds), J_t in kgm², ω in rad and n_i in RPM.

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

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

E_{Di} is calculated using the following formula:

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

The continuous power P_c is calculated for each machine cycle:

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

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

The selection is made in two steps:

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

For order data for the external braking resistors, see Accessories and Spare Parts, page 418.

Functional Safety

Basics

Functional Safety

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

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

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

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

⚠WARNING

NON-CONFORMANCE TO SAFETY FUNCTION REQUIREMENTS

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

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

Hazard and Risk Analysis

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

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

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

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

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

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

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

Additional information is available on https://www.se.com.

Safety Integrity Level (SIL)

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

Average Frequency of a Dangerous Failure per Hour (PFH)

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

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

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

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

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

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

Fault Avoidance Measures

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

Data for Maintenance Plan and the Calculations for Functional Safety

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

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

Characteristic	Unit	Value
Lifetime of the safety function STO (IEC 61508)	Years	20 See also Lifetime Safety Function STO, page 426.
SFF (IEC 61508) Safe Failure Fraction	%	90
HFT (IEC 61508) Hardware Fault Tolerance Type A subsystem	-	1
Safety integrity level IEC 61508	-	SIL3
Safety integrity level IEC 62061	-	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	-	High (1400 years)
DC (ISO 13849-1) Diagnostic Coverage	%	90

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

Definitions

Integrated Safety-Related Function "Safe Torque Off" STO

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

Category 0 Stop (IEC 60204-1)

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

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Category 1 Stop (IEC 60204-1)

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

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

Function

General

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

Function Principle

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

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

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

Requirements for Using the Safety-Related Function STO

General

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

⚠⚠DANGER

ELECTRIC SHOCK

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

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

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Install a dedicated, external safety-related brake if coasting does not meet the deceleration requirements of your application.

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

Logic Type

The inputs for the safety-related function STO (inputs *STO_A* and *STO_B*) can only be wired for sinking inputs.

Holding Brake and Safety-Related Function STO

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

⚠WARNING

FALLING LOAD

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

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

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

⚠WARNING

UNINTENDED AXIS MOVEMENT

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

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

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

Unintended Restart

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that your risk assessment covers all potential effects of automatic or unintended enabling of the power stage, for example, after power outage.
- Implement all measures such as control functions, guards, or other safety-related functions, required to reliably protect against all hazards that may result from automatic or unintended enabling of the power stage.
- Verify that a master controller cannot enable the power stage in an unintended way.

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Set the parameter *IO_AutoEnable* to "off" if the automatic enabling of the power stage presents hazards in your application.

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

Degree of Protection when the Safety-Related Function STO is Used

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

⚠WARNING

INOPERABLE SAFETY-RELATED FUNCTION

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

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

Protected Cable Installation

If short circuits and other wiring errors such as a cross circuit between the signals of the safety-related function STO can be expected in connection with safety-related signals, and if these short circuits and cross circuits 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-related function may be connected to external voltage if a cable is damaged. If the two channels are connected to external voltage, the safety-related function is no longer operative.

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

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

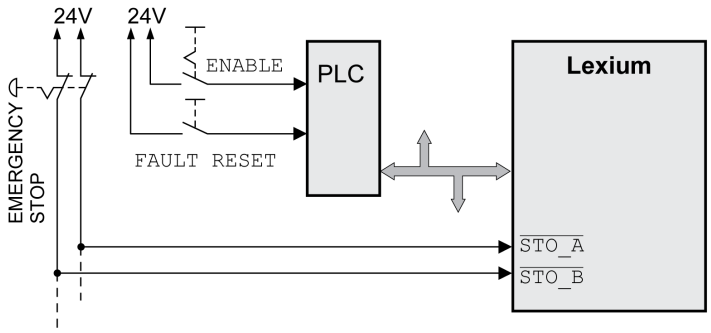
- Use shielded cables for the signals of the safety-related function STO.
- Do not use the cable for the signals of the safety-related function STO for other signals.
- Connect one end of the shield.

Application Examples STO

Example of Category 0 stop

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

Example of category 0 stop:



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

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

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

If coasting of the motor and its potential load is unsatisfactory as determined by your risk assessment, an external safety-related brake may also be required.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Install a dedicated, external safety-related brake if coasting does not meet the deceleration requirements of your application.

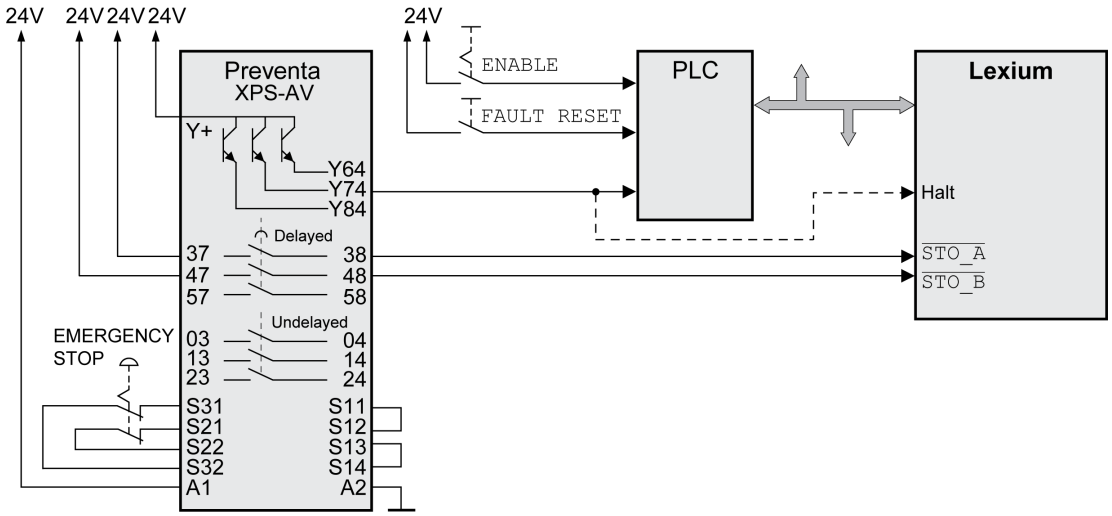
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Refer to section Holding Brake and Safety-Related Function STO, page 71.

Example of Category 1 stop

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

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



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

The EMERGENCY STOP safety relay module requests an immediate stop (undelayed) of the drive. After the time delay set in the EMERGENCY STOP safety relay module has elapsed, the EMERGENCY STOP safety relay triggers the safety-related function STO.

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

If coasting of the motor and its potential load is unsatisfactory as determined by your risk assessment, an external safety-related brake may also be required.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Install a dedicated, external safety-related brake if coasting does not meet the deceleration requirements of your application.

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

Refer to section Holding Brake and Safety-Related Function STO, page 71.

Installation

Mechanical Installation

Before Mounting

General

An engineering phase is mandatory prior to mechanical and electrical installation. See section Engineering, page 48 for basic information.

⚠⚠DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

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

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

⚠⚠DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

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

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

⚠WARNING

LOSS OF CONTROL

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

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

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

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

⚠WARNING

LOSS OF SAFETY-RELATED FUNCTION CAUSED BY FOREIGN OBJECTS

Protect the system against contamination by conductive substances.

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

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

⚠CAUTION

HOT SURFACES

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

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

⚠CAUTION

INOPERABLE EQUIPMENT DUE TO INCORRECT MAINS VOLTAGE CONNECTION

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

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

Inspecting the Product

- Verify the product version by means of the Type Code, page 22 on the Nameplate, page 21.
- Prior to mounting, inspect the product for visible damage.

Damaged products may cause electric shock or unintended equipment operation.

⚠⚠DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

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

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

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

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

Mounting the Drive

Attaching a Hazard Label with Safety Instructions

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

- Select the label suitable for the target country.

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

Control Cabinet

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

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

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

Mounting Distances, Ventilation

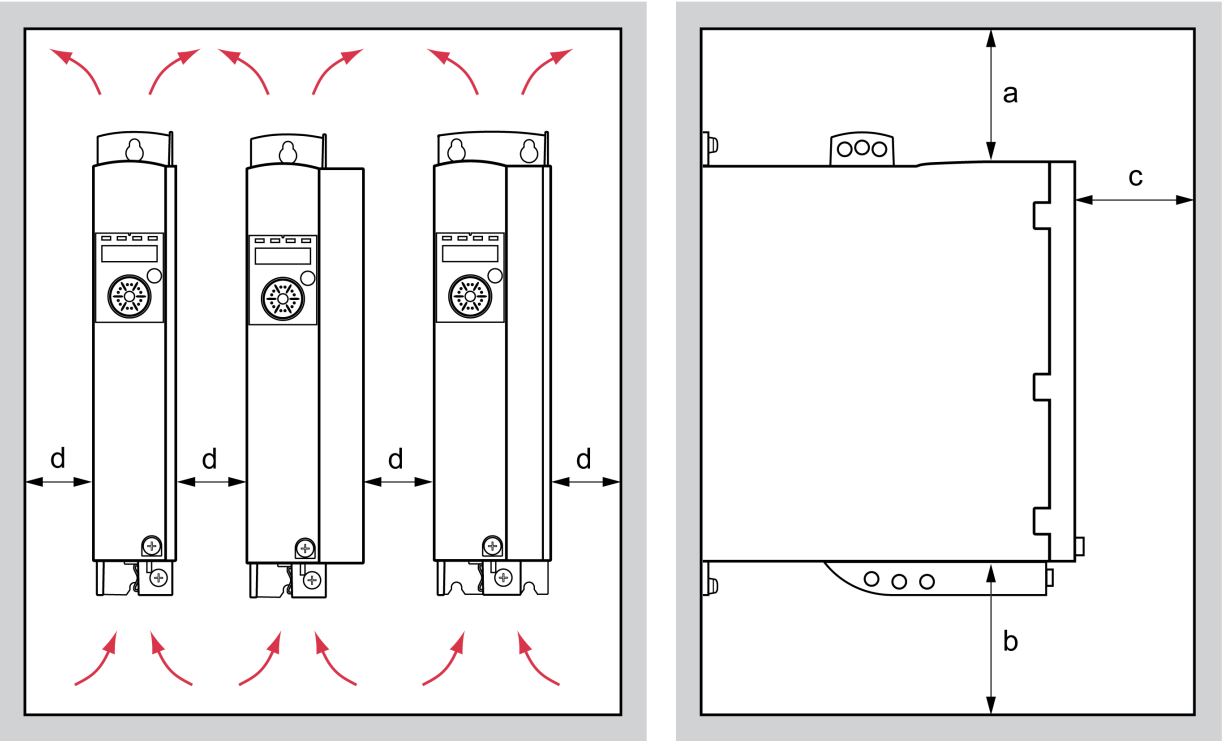
When selecting the position of the device in the control cabinet, note the following:

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

- If the thermal limits are exceeded during operation, the power stage of the drive is disabled (overtemperature).

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

Mounting distances and air circulation



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

Mounting the Device

See section Dimensions, page 25 for the dimensions of the mounting holes.

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

Electrical Installation

Overview of Procedure

General

⚠⚠DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

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

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

⚠⚠DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

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

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

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

⚠WARNING

DIRECT CURRENT CAN BE INTRODUCED INTO THE PROTECTIVE GROUND CONDUCTOR

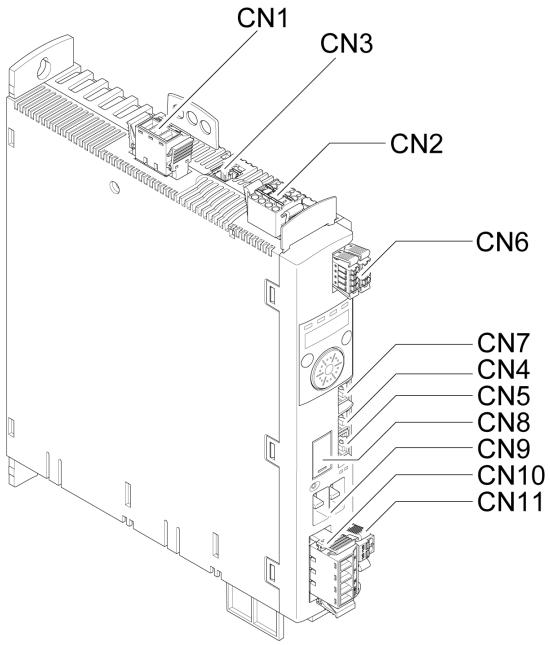
- Use a Type A Residual Current Device (RCD / GFCI) or a Residual Current Monitor (RCM) for single-phase drives connected to a phase and to the neutral conductor.
- Use a Type B Residual Current Device (RCD / GFCI) or a Residual Current Monitor (RCM) that has approval for use with frequency inverters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

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

The entire installation procedure must be performed without voltage present.

Connection Overview

Description



Connection	Assignment
CN1	Power stage supply
CN2	24 Vdc control supply and safety function STO
CN3	Motor encoder (encoder 1)
CN4	Fieldbus CANopen
CN5	Fieldbus CANopen
CN6	Digital inputs/outputs
CN7	Modbus (commissioning interface)
CN8	External braking resistor
CN9	DC bus connection for parallel operation
CN10	Motor phases
CN11	Holding brake

Connection Grounding Screw

Description

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

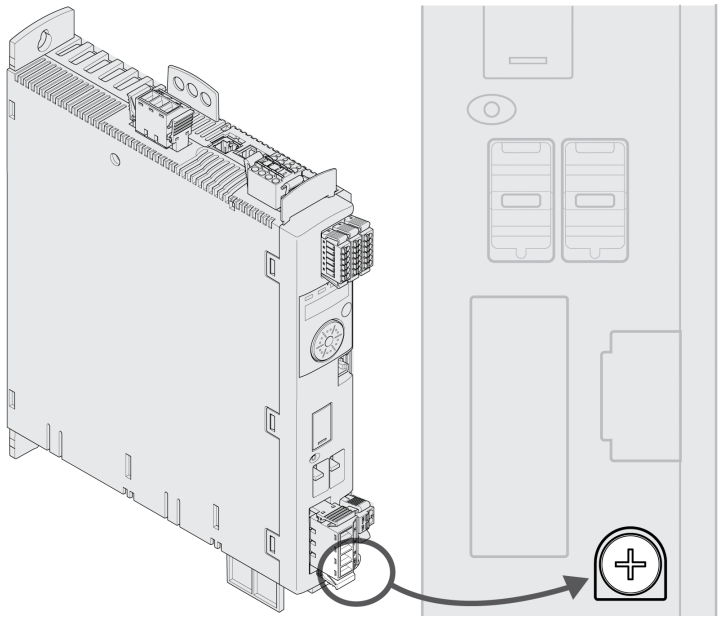
⚠⚠DANGER

INSUFFICIENT GROUNDING

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

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

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



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

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

Connection Motor Phases and Holding Brake (CN10 and CN11)

General

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

⚠DANGER

POTENTIAL FOR EXPLOSION

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

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

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

⚠⚠DANGER

ELECTRIC SHOCK

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

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

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

⚠WARNING

UNINTENDED MOVEMENT

Only use approved combinations of drive and motor.

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

See section Approved Motors, page 28 for additional information.

When using pre-assembled cables, route the cables from the motor to the drive starting from the motor. Due to the pre-assembled connectors on the motor side, this direction is often faster and easier.

Cable Specifications

Shield:	Required, both ends grounded
Twisted Pair:	-

PELV:	The wires for the holding brake are PELV-compliant.
Cable composition:	3 wires for motor phases 2 wires for holding brake 1 wire for protective ground (PE)
Maximum cable length:	Depends on the required limit values for conducted interference, see Electromagnetic Emission, page 44.

Note the following information:

- You may only connect the Schneider Electric original motor cable either pre-assembled or open wire.
- The wires for the holding brake must also be connected to the drive at connection CN11 in the case of motors without holding brakes. At the motor end, connect the wires to the appropriate pins for the holding brake; the cable can then be used for motors with or without holding brake. If you do not connect the wires at the motor end, you must isolate each wire individually (inductive voltages).
- Observe the polarity of the holding brake voltage.
- The voltage for the holding brake depends on the 24 Vdc control supply (PELV). Observe the tolerance for the 24 Vdc control supply and the specified voltage for the holding brake, see 24 Vdc Control Supply, page 36.
- Use pre-assembled cables to reduce the risk of wiring errors, see Accessories and Spare Parts, page 418.

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

Properties of the Connection Terminals CN10

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

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

Properties of the Connection Terminals CN11

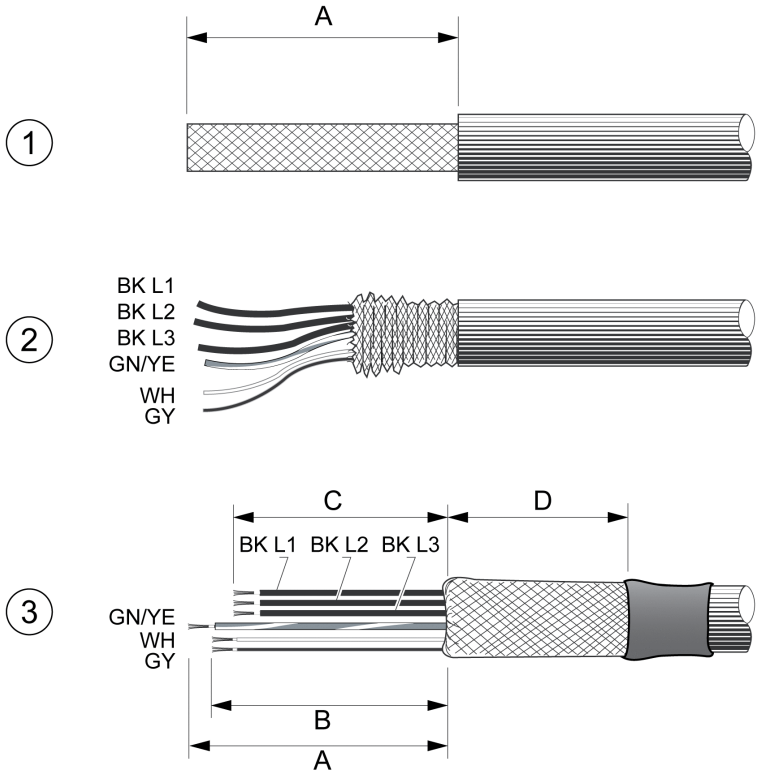
The terminals are approved for stranded conductors and solid conductors. Use wire cable ends (ferrules), if possible.

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

Assembling Cables

Note the dimensions specified when assembling cables.

Steps for assembling the motor cable



1 Strip the cable jacket, length A.

2 Slide the shielding braid back over the cable jacket.

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

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

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

Monitoring

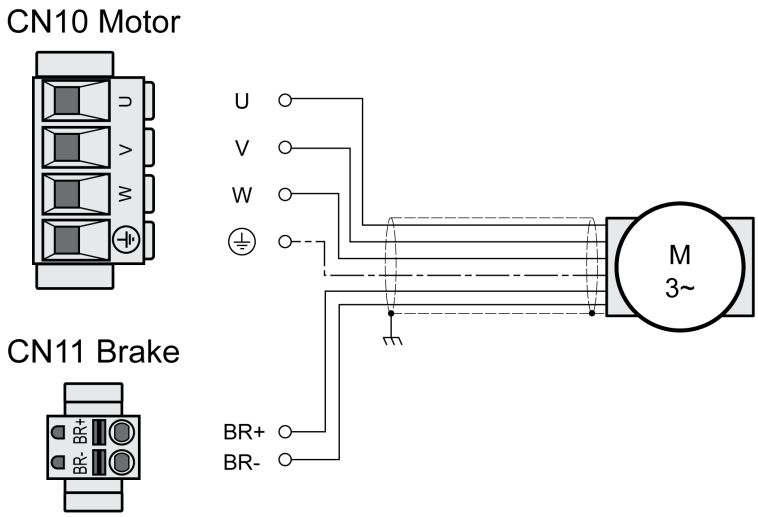
The drive monitors the motor phases for:

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

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

Wiring Diagram Motor and Holding Brake

Wiring diagram motor with holding brake



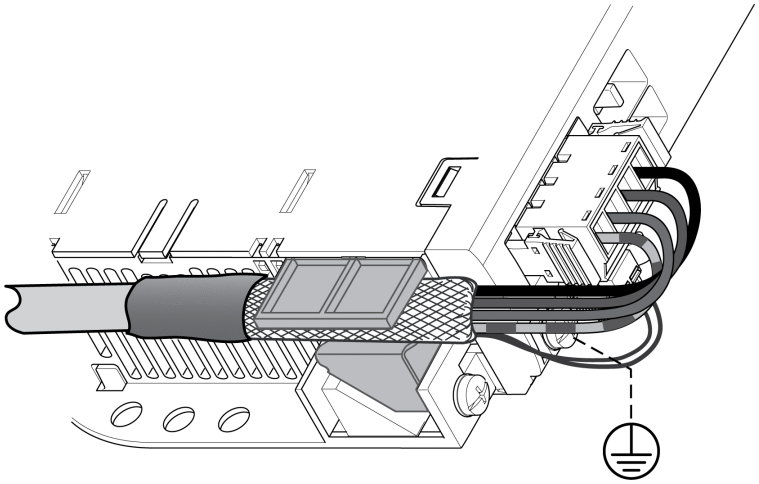
Connection	Meaning	Color
U	Motor phase	Black L1 (BK)
V	Motor phase	Black L2 (BK)
W	Motor phase	Black L3 (BK)
PE	Protective ground conductor	Green/yellow (GN/YE)
BR+	Holding brake +	White (WH) or black 5 (BK)
BR-	Holding brake -	Gray (GR) or black 6 (BK)

Connecting the Motor Cable

- Connect the motor phases and protective ground conductor to CN10. Verify that the connections U, V, W and PE (ground) match at the motor and the drive.
- Note the tightening torque specified for the terminal screws.
- Connect the white wire or the black wire with the label 5 to connection BR+ of CN11.

  Connect the gray wire or the black wire with the label 6 to connection BR- of CN11.
- Verify that the connector locks snap in properly.
- Connect the cable shield to the shield clamp (large surface area contact).

Shield clamp motor cable



Connection DC Bus (CN9, DC Bus)

General

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

⚠WARNING

INOPERABLE SYSTEM COMPONENTS AND LOSS OF CONTROL

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

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

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

Requirements for Use

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

Connection Braking Resistor (CN8, Braking Resistor)

General

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Internal Braking Resistor

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

External Braking Resistor

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

Selection and rating of the external braking resistor are described in section Rating the Braking Resistor, page 61. For suitable braking resistors, see Accessories and Spare Parts, page 418.

Cable Specifications

Shield:	Required, both ends grounded
Twisted Pair:	-
PELV:	-
Cable composition:	Minimum conductor cross section: Same cross section as power stage supply, see Connection Power Stage Supply (CN1), page 89. The conductors must have a sufficiently large cross section so that the fuse at the mains connection can protect the equipment if necessary.
Maximum cable length:	3 m (9.84 ft)

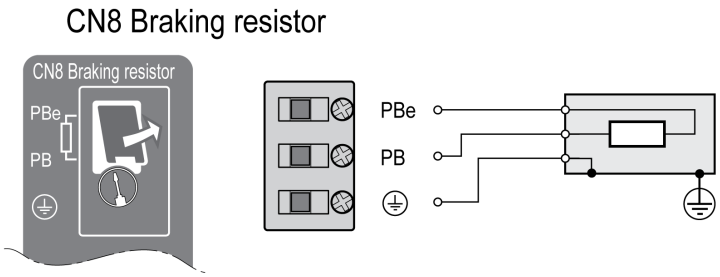
Properties of the Connection Terminals CN8

Characteristic	**Unit**	**Value**
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-stranded conductors and solid conductors. Observe the maximum permissible connection cross section. Take into account the fact that wire cable ends (ferrules) increase the cross section size.

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

Wiring Diagram



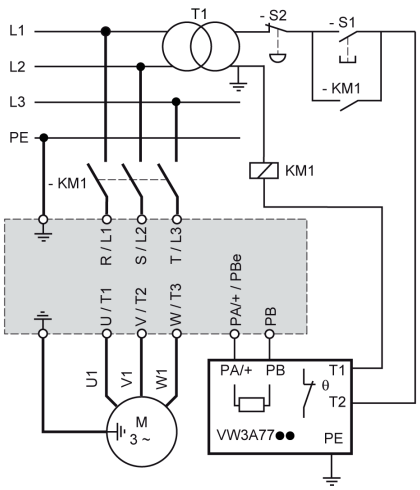
Connecting the External Braking Resistor

- Power off all supply voltages. Observe the safety instructions concerning electrical installation, see Product Related Information, page 13.
- 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 drive. Note the tightening torque specified for the terminal screws.
- Connect the cable shield to the shield connection at the bottom of the drive (large surface area contact).

The parameter *RESint_ext* is used to switch between the internal and an external braking resistor. See section Setting the Braking Resistor Parameters, page 134 for the parameter settings for the braking resistor. Verify correct operation of the braking resistor during commissioning.

Wiring Example

The following graphic shows a functional principle:



Connection Power Stage Supply (CN1)

General

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

⚠⚠DANGER

INSUFFICIENT GROUNDING

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

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

⚠WARNING

INSUFFICIENT PROTECTION AGAINST OVERCURRENT

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

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

⚠WARNING

INCORRECT MAINS VOLTAGE

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

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

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

Prior to connecting the drive, verify the approved mains types, see Power Stage Data - General, page 27.

Cable Specifications

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

Properties of Connection Terminals CN1

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

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

Prerequisites for Connecting the Power Stage Supply

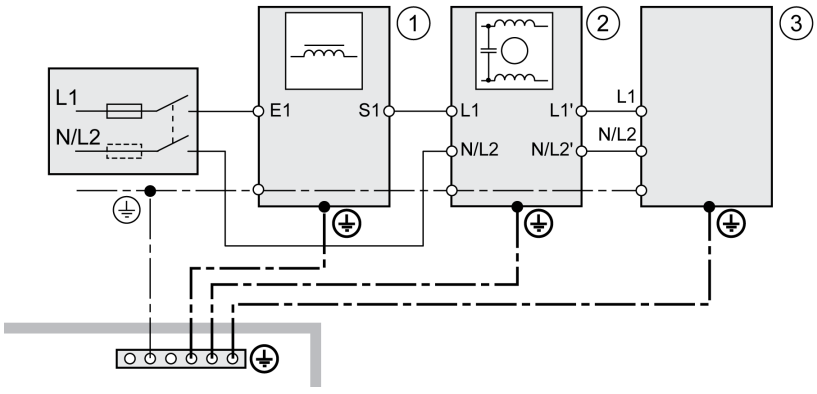
Note the following information:

- Three-phase drives may only be connected and operated via three phases.
- Use upstream mains fuses.
- If you use an external mains filter, the mains cable must be shielded and grounded at both ends if the length between the external mains filter and the drive exceeds 200 mm (7.87 in).
- See section Conditions for UL 508C and CSA, page 47 for a UL-compliant design.

Power Stage Supply Single-Phase Drive

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

Overview power stage supply for single-phase drive

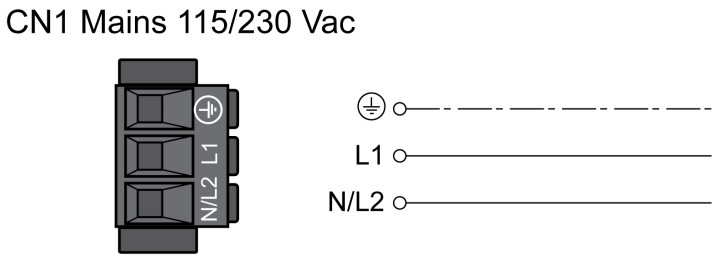


1 Mains reactor (accessory)

2 External mains filter (accessory)

3 Drive

Wiring diagram power stage supply for single-phase drive.

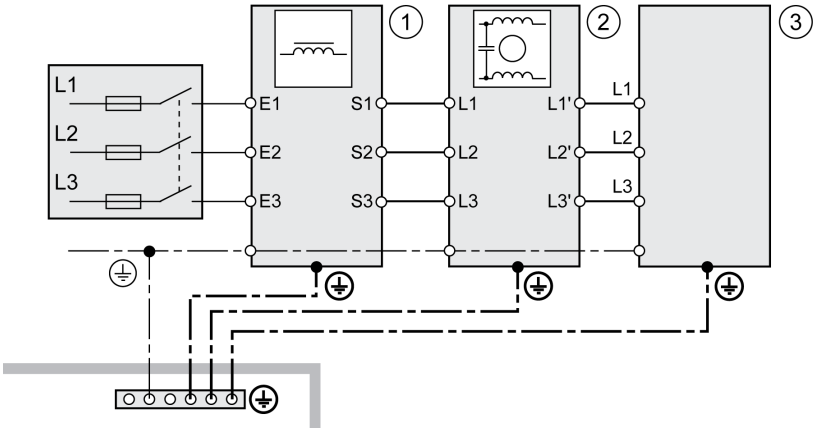


- Verify the type of mains. See section Power Stage Data - General, page 27 for the approved types of mains.
- Connect the mains cable. Note the tightening torque specified for the terminal screws.
- Verify that the connector locks snap in properly.

Power Stage Supply Three-Phase Drive

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

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

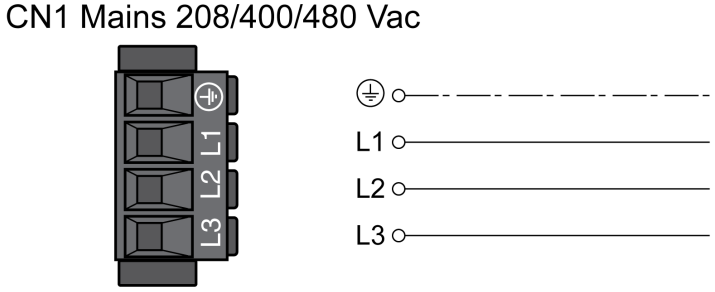


1 Mains reactor (accessory)

2 External mains filter (accessory)

3 Drive

Wiring diagram power stage supply for three-phase drive.



- Verify the type of mains. See section Power Stage Data - General, page 27 for the approved types of mains.
- Connect the mains cable. Note the tightening torque specified for the terminal screws.
- Verify that the connector locks snap in properly.

Connection Motor Encoder (CN3)

Function and Encoder Type

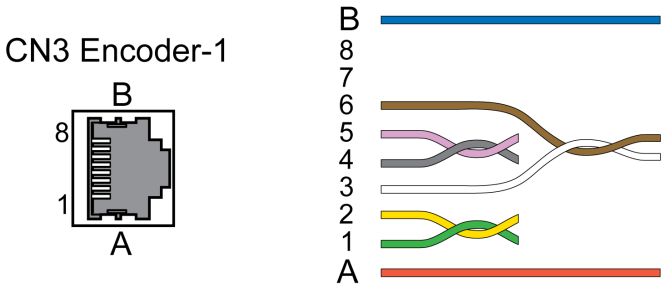
The motor encoder is a Hiperface encoder integrated in the motor. It provides the device with information on the motor position.

Cable Specifications

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

Use pre-assembled cables to reduce the risk of wiring errors, see Accessories and Spare Parts, page 418.

Wiring Diagram



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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Connecting the Motor Encoder

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

When using pre-assembled cables, route the cables from the motor to the drive starting from the motor. Due to the pre-assembled connectors on the motor side, this direction is often faster and easier.

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

General

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Use power supply units that meet the PELV (Protective Extra Low Voltage) requirements.
- Connect the 0 Vdc outputs of all power supply units to FE (functional earth/ functional ground), for example, for the VDC supply voltage and for the 24 Vdc voltage for the safety-related function STO.
- Interconnect all 0 Vdc outputs (reference potentials) of all power supply units used for the drive.

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

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

NOTICE

PERMANENT DAMAGE TO CONTACTS

- Switch the power input (primary side) of the power supply unit.
- Do not switch the output voltage (secondary side) of the power supply unit.

Failure to follow these instructions can result in equipment damage.

Safety Function STO

Information on the signals of the safety function STO can be found in section Functional Safety, page 66. If the safety function is not required, the inputs *STO_A* and *STO_B* must be connected to *+24VDC*.

Cable Specifications CN2

Shield:	-(1)
Twisted Pair:	-
PELV:	Required
Minimum conductor cross section:	0.75 mm² (AWG 18)
Maximum cable length:	100 m (328 ft)
(1) See Functional Safety, page 66	

Properties of Connection Terminals CN2

Characteristic	Unit	Value
Maximum terminal current	A	16(1)
Connection cross section	mm²	0.5 ... 2.5
	(AWG)	(20 ... 14)
Stripping length	mm	12 ... 13
	(in)	(0.47 ... 0.51)
(1) Note the maximum permissible terminal current when connecting several drives.		

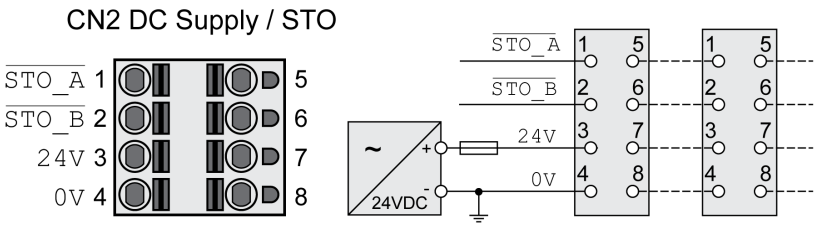
The terminals are approved for stranded conductors and solid conductors. Use wire cable ends (ferrules), if possible.

Permissible Terminal Current of 24 Vdc Control Supply

- Connection CN2, pins 3 and 7 as well as pins 4 and 8 can be used as 24V/0V connections for additional consumers.

  In the connector, the following pins are connected: pin 1 to pin 5, pin 2 to pin 6, pin 3 to pin 7 and pin 4 to pin 8.
- The voltage at the holding brake output depends on the 24 Vdc control supply. Note that the current of the holding brake also flows via this terminal.

Wiring Diagram



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	*24V*	24 Vdc control supply
4, 8	*0V*	Reference potential for 24 Vdc control supply and reference potential for STO

Connecting the Safety Function STO

- Verify that wiring, cables and connected interfaces meet the PELV requirements.

- Connect the safety function in accordance with the specifications in section Functional Safety, page 66.

Connecting the 24 Vdc Control Supply

- Verify that wiring, cables and connected interfaces meet the PELV requirements.
- Route the 24 Vdc control supply from a power supply unit (PELV) to the drive.
- Ground the 0 Vdc output at the power supply unit.
- Note the maximum permissible terminal current when connecting several drives.
- Verify that the connector locks snap in properly at the housing.

Connection Digital Inputs and Outputs (CN6)

General

The device has configurable inputs and configurable outputs. The standard assignment and the configurable assignment depend on the selected operating mode. For more information, see Digital Signal Inputs and Digital Signal Outputs, page 173.

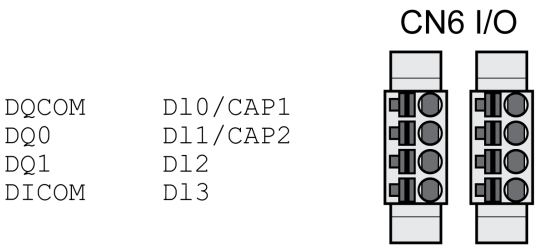
Cable Specifications

Shield:	-
Twisted Pair:	-
PELV:	Required
Cable composition:	0.25 mm², (AWG 22)
Maximum cable length:	30 m (98.4 ft)

Properties of Connection Terminals CN6

Characteristic	Unit	Value
Connection cross section	mm² (AWG)	0.2 ... 1.0 (24 ... 16)
Stripping length	mm (in)	10 (0.39)

Wiring Diagram



Signal	Meaning
DQCOM	Reference potential to *DQ0* ... *DQ1*
DQ0	Digital output 0
DQ1	Digital output 1
DICOM	Reference potential to *DI0* ... *DI3*
DI0/*CAP1*	Digital input 0 / Capture input 1
DI1/*CAP2*(1)	Digital input 1 / Capture input 2(1)
DI2	Digital input 2
DI3	Digital input 3
(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 section Digital Signal Inputs and Digital Signal Outputs, page 173.

Connecting the Digital Inputs/Outputs

- Wire the digital connections to CN6.
- Verify that the connector locks snap in properly.

Connection PC with Commissioning Software (CN7)

General

A PC with the commissioning software Lexium DTM Library can be connected for commissioning. The PC is connected via a bidirectional USB/RS485 converter, see Accessories and Spare Parts, page 418.

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

NOTICE

DAMAGE TO PC

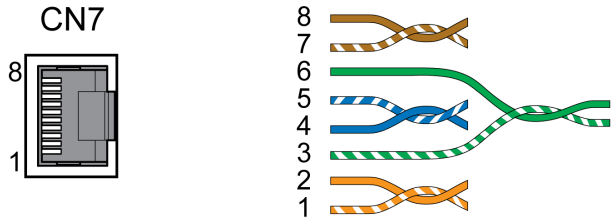
- Use a bidirectional RJ45/USB-A adapter with an RS485/USB converter to connect to a PC.
- Do not directly connect an Ethernet interface to the commissioning interface of this product.

Failure to follow these instructions can result in equipment damage.

Cable Specifications

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

Wiring Diagram



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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Verify that the connector locks snap in properly.

Connection CAN (CN4 and CN5)

Function

The device is suitable for connection to CANopen and CANmotion.

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

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

The baud rate must be the same for all devices in the fieldbus. For further information on the fieldbus, see the fieldbus user guide.

Cable Specifications

Shield:	Required, both ends grounded
Twisted Pair:	Required
PELV:	Required
Cable composition for cables with RJ45 connectors(1):	8 * 0.14 mm² (AWG 24)
Cable composition with D-SUB connectors:	2 * 0.25 mm², 2 * 0.20 mm² (2 * AWG 22, 2 * AWG 24) Cross section 0.20 mm² (AWG 24) for CAN level, cross section 0.25 mm² (AWG 22) for reference potential.
(1) Cables with RJ45 connectors may only be used inside of control cabinets.	

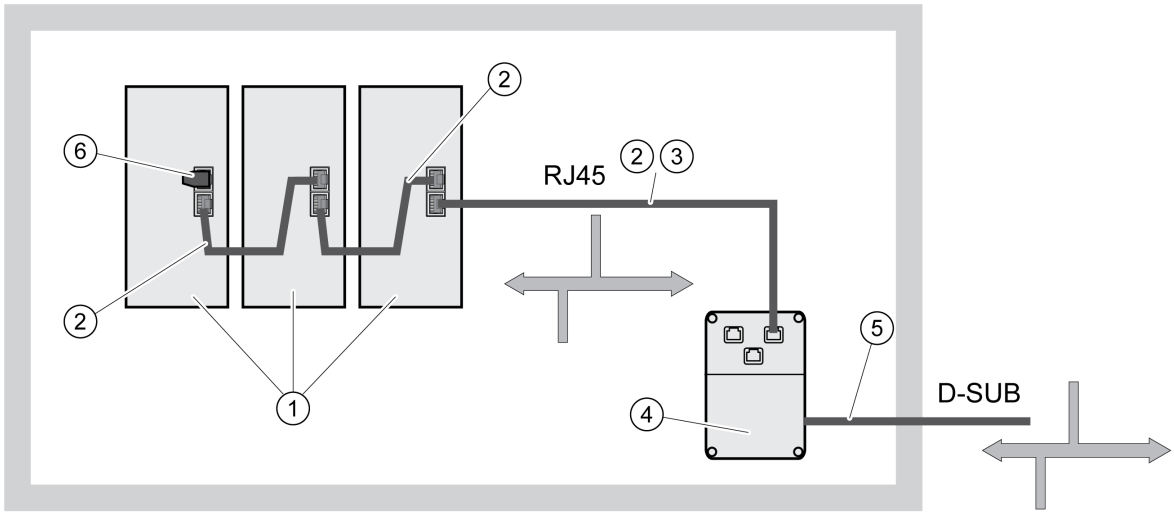
Use pre-assembled cables to reduce the risk of wiring errors, see Accessories and Spare Parts, page 418.

Connectors D-SUB and RJ45

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

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

Connection of RJ45 CAN in the control cabinet to the field



1 Devices with RJ45 CAN connection in the control cabinet

2 CANopen cables with RJ45 connectors

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

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

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

6 Terminating resistor 120 Ω RJ45 (TCSCAR013M120)

Maximum Bus Length CAN

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

Baud rate	Maximum bus length
50 kbit/s	1000 m (3281 ft)
125 kbit/s	500 m (1640 ft)
250 kbit/s	250 m (820 ft)
500 kbit/s	100 m (328 ft)
1000 kbit/s	20 m (65.6 ft)(1)
(1) According to the CANopen specification, the maximum bus length is 4 m (13.2 ft). However, in practice, 20 m (65.6 ft) have been possible in most cases. External interference may reduce this length.	

If you use cables with RJ45 connectors, the maximum bus length is reduced by 50%.

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

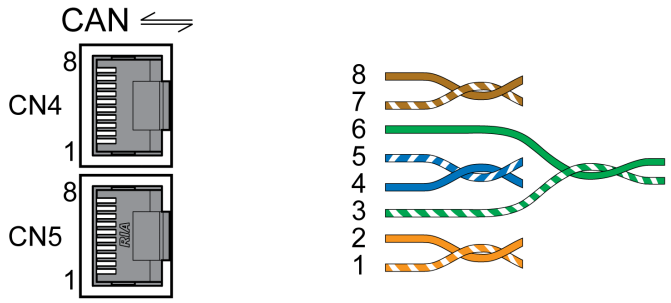
Terminating Resistors

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

Connectors with integrated terminating resistors are available as accessories, see Accessories and Spare Parts, page 418.

Wiring Diagram

Wiring diagram, CANopen at CN4 and CN5



Pin	Signal	Meaning
1	*CAN_H*	CAN interface
2	*CAN_L*	CAN interface
3	*CAN_0V*	Reference potential CAN
4 ... 8	-	Reserved

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Connecting CAN

- Connect the CAN cable to CN4 (pins 1, 2 and 3) with an RJ45 connector.
- Verify that the connector locks snap in properly.

Verifying Installation

Description

Verify proper installation:

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

Commissioning

Overview

General

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

⚠⚠DANGER

ELECTRIC SHOCK

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

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

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

⚠DANGER

FIRE DUE TO EXTERNAL DRIVING FORCES ACTING ON MOTOR

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

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

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

⚠WARNING

LOSS OF BRAKING FORCE DUE TO WEAR OR HIGH TEMPERATURE

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

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

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

⚠WARNING

UNINTENDED MOVEMENT

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

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

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

⚠CAUTION

HOT SURFACES

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

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

If the drive was not connected to mains for more than 24 months, the capacitors must be restored to their full performance before the motor is started.

NOTICE

REDUCED CAPACITOR PERFORMANCE

Apply mains voltage to the drive for at least one hour before enabling the power stage for the first time in case that the drive has not been under power for a period of 24 months or greater.

Failure to follow these instructions can result in equipment damage.

If the drive is being commissioned for the first time, verify the date of manufacture and run the procedure specified above if the date of manufacture is more than 24 months in the past.

Preparation

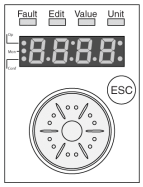
Required Components

The following is required for commissioning:

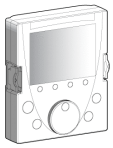
- Commissioning software “Lexium DTM Library”
  https://www.se.com/ww/en/download/document/Lexium_DTM_Library/
- Fieldbus converter for the commissioning software for connection via the commissioning interface

Interfaces

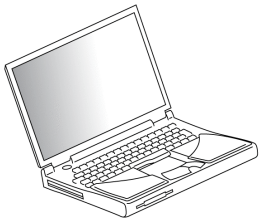
The following interfaces can be used for commissioning, parameterization and diagnostics:



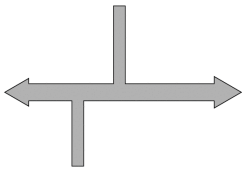
①



②



③



④

1 Integrated HMI

2 External graphic display terminal

3 PC with commissioning software “Lexium DTM Library”

4 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.

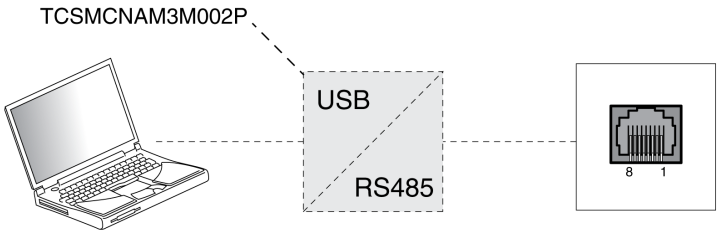
Commissioning Software

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

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

Connecting a PC

A PC with commissioning software can be connected for commissioning. The PC is connected to a bidirectional USB/RS485 converter, see Accessories and Spare Parts, page 418.

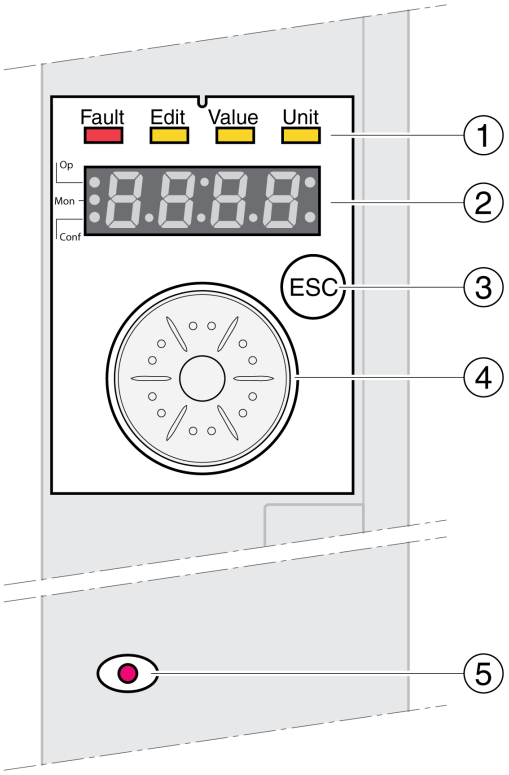


Integrated HMI

Overview of Integrated HMI

Overview

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



1 Status LEDs

2 7-segment display

3 ESC key

4 Navigation button

5 Red LED on: Voltage present at DC bus

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

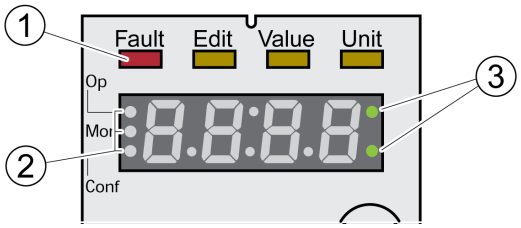
The ESC (Escape) button allows you to exit parameters and menus. If values are displayed, the ESC button lets you return to the last saved value.

Character Set on the HMI

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

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

Indication of the Device Status



1 Four status LEDs

2 Three status LEDS for identification of the menu levels

3 Flashing dots indicate an error of error class 0

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

Fault	Edit	Value	Unit	Meaning
Red	-	-	-	Operating state Fault
-	Yellow	Yellow	-	Parameter value can be edited
-	-	Yellow	-	Value of the parameter
-	-	-	Yellow	Unit of the selected parameter

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

LED	Meaning
Op	Operation
Mon	Status information
Conf	Configuration

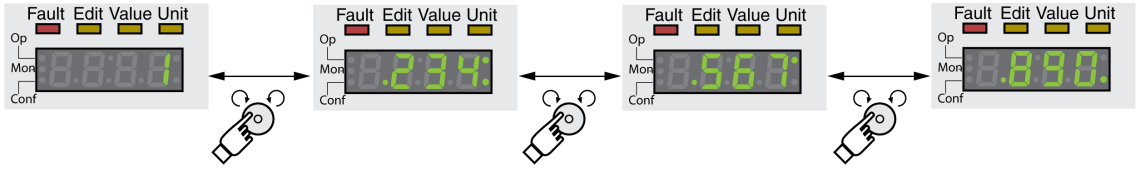
3: Flashing dots indicate an error of error class 0, for example, if a limit value has been exceeded.

Display of Values

The HMI can directly display values up to 999.

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

Example: Value 1234567890



Navigation Button

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

Turn the navigation button to do the following:

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

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

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

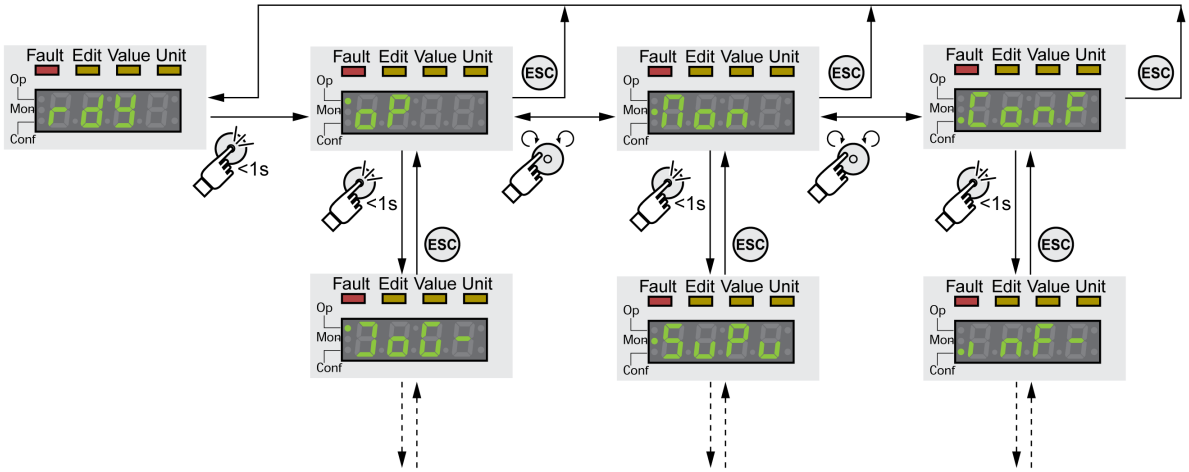
Hold down the navigation button to do the following:

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

Menu Structure

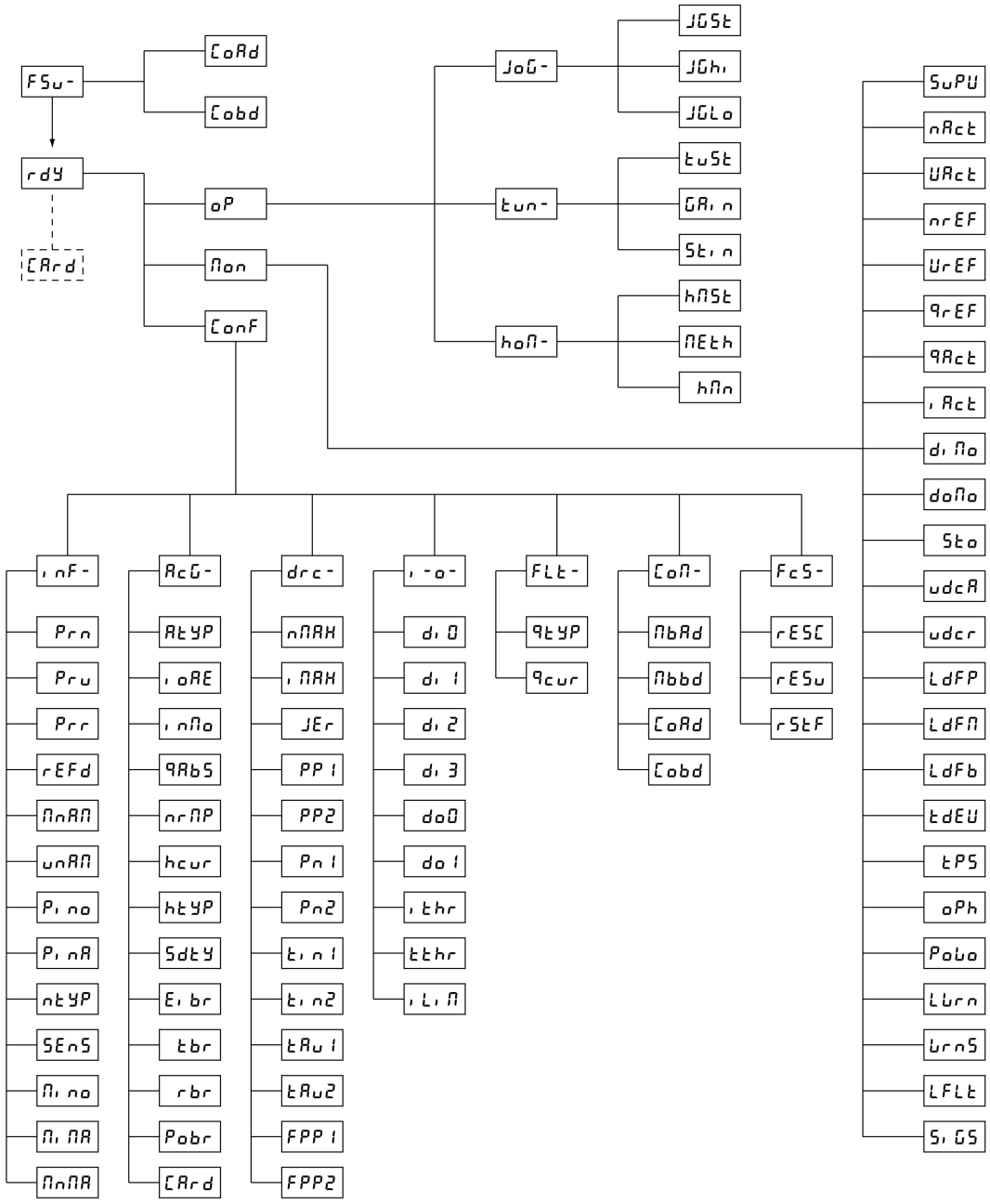
Description

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



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

Menu Overview



HMI menu FSu-	Description
FSu-	First setup (**F**irst **S**et**u**p)
CoAd	CANopen address (node number)
Cobd	CANopen baud rate

HMI menu oP	Description
oP	Operating mode (**Op**eration)
JoG-	Operating mode Jog
tun-	Autotuning
hoM-	Operating mode Homing

HMI menu JoG-	Description
JoG-	Operating mode Jog
JGSt	Start operating mode Jog

HMI menu JoG-	Description
JGhi	Velocity for fast movement
JGLo	Velocity for slow movement

HMI menu tun-	Description
tun-	Autotuning
tuSt	Start autotuning
GAin	Global gain factor (affects parameter set 1)
Stin	Direction of movement for Autotuning

HMI menu hoM-	Description
hoM-	Operating mode Homing
hMSt	Start operating mode Homing
MEth	Preferred homing method
hMn	Target velocity for searching the switch

HMI menu Mon	Description
Mon	Monitoring (**Mon**itoring)
SuPu	HMI display when motor moves
nAct	Actual speed of rotation
VAct	Actual velocity
nrEF	Reference speed of rotation
VrEF	Reference velocity
qrEF	Reference motor current (q component, generating torque)
qAct	Actual motor current (q component, generating torque)
iAct	Total motor current
diMo	Status of digital inputs
doMo	Status of digital outputs
Sto	Status of the inputs for the safety function STO
udcA	Voltage at DC bus
udcr	Degree of utilization of DC bus voltage
LdFP	Load of power stage
LdFM	Load of motor
LdFb	Load of braking resistor
tdEV	Device temperature
tPS	Temperature of power stage
oPh	Operating hours counter
PoLo	Number of power on cycles
LWrn	Detected error not causing a stop (error class 0)
WrnS	Detected error of error class 0, bit-coded (parameter *_WarnLatched*)
LFLt	Detected error causing a stop (error classes 1 to 4)
SiGS	Saved status of monitoring signals

HMI menu CONF	Description
CONF	Configuration (**Conf**iguration)
INF -	Information/Identification (**INF**ormation / Identification)
ACG -	Axis configuration (**A**xis **C**onfi**g**uration)
DRC -	Device configuration (**DR**ive **C**onfiguration)
I-O -	Configurable inputs/outputs (**I**n **O**ut)
FLT -	Indication of detected error
COM -	Communication (**COM**munication)
FCS -	Restore factory settings (default values) (**Fac**tory **S**ettings)

HMI menu INF -	Description
INF -	Information/Identification (**INF**ormation / Identification)
PRN	Firmware number
PRU	Firmware Version
PRR	Firmware Revision
REFD	Product name
MNAM	Type
UNAM	User application name
PINO	Nominal current of power stage
PINA	Maximum current of power stage
MTYP	Motor type
SENS	Encoder type of motor
MINO	Nominal current of motor
MIMA	Maximum motor current
MNMA	Maximum permissible speed of rotation/velocity of motor

HMI menu ACG -	Description
ACG -	Axis configuration (**A**xis **C**onfi**g**uration)
atyp	Activation of Modulo
IOAE	Enabling the power stage at PowerOn
INMO	Inversion of direction of movement
SIMABS	Simulation of absolute position at power cycling
MNMP	Maximum velocity of the motion profile for velocity
HCUR	Current value for Halt
HTYP	Halt option code
SDTY	Behavior for disabling the power stage during movement
EIBR	Selection of internal or external braking resistor
TBR	Maximum permissible activation duration of external braking resistor
RBR	Resistance value of external braking resistor
POBR	Nominal power of external braking resistor
CARD	Memory card management

HMI menu DRC -	Description
DRC -	Device configuration (**DR**ive **C**onfiguration)
NMAX	Velocity limitation

HMI menu drC -	Description
iMAX	Current limitation
JEr	Jerk limitation of the motion profile for velocity
PP1	Position controller P gain
PP2	Position controller P gain
Pn1	Velocity controller P gain
Pn2	Velocity controller integral action time
tin1	Velocity controller integral action time
tin2	Filter time constant of the reference velocity value filter
tAu1	Filter time constant of the reference velocity value filter
tAu2	Feed-forward control Velocity
FPP1	Feed-forward control Velocity
FPP2	

HMI menu i-o -	Description
i-o -	Configurable inputs/outputs (**I**n **O**ut)
di0	Function Input DI0
di1	Function Input DI1
di2	Function Input DI2
di3	Function Input DI3
doO	Function Output DQ0
do1	Function Output DQ1
ithr	Monitoring of current threshold
tthr	Monitoring of time window
iLin	Current limitation via input

HMI menu FLt -	Description
FLt -	Indication of detected error
qtyP	Quick Stop option code
qcur	Current value for Quick Stop

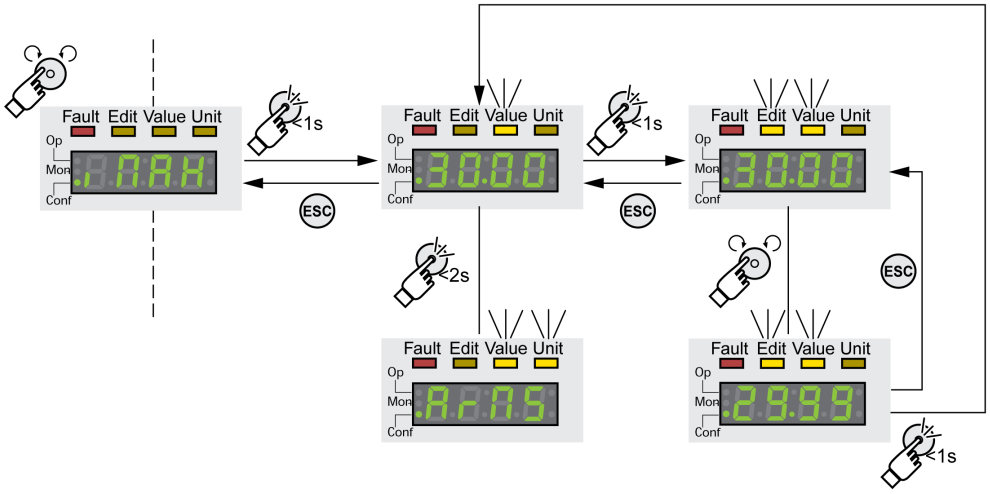
HMI menu CoM -	Description
CoM -	Communication (**COM**munication)
NbAd	Modbus address
Nbbd	Modbus baud rate
CoAd	CANopen address (node number)
Cobd	CANopen baud rate

HMI menu FcS -	Description
FcS -	Restore factory settings (default values) (**Fac**tory **S**ettings)
rESc	Reset control loop parameters
rESu	Resetting the user parameters
rStF	Restore factory settings (default values)

Setting Parameters

Displaying and Setting Parameters

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



- Go to the parameter ,ΠAX (iMax).
- Press the navigation button for a longer period of time to display a parameter description.

  The parameter description is displayed in the form of horizontally scrolling text.
- Briefly press the navigation button to display the value of the selected parameter.

  The LED Value illuminates and the parameter value is displayed.
- Press the navigation button for a longer period of time to display the unit of the parameter value.

  As long as the navigation button is held down, the status LEDs Value and Unit illuminate. The unit of the parameter value is displayed. Once you release the navigation button, the parameter value is displayed again.
- Press the navigation button to modify the value of the parameter.

  The status LEDs Edit and Value illuminate and the parameter value is displayed.
- Turn the navigation button to modify the value of the parameter. The increments and the limit value for each parameter are pre-defined.
- Briefly press the navigation button to save the modified parameter value.

  If you do not want to save the modified parameter value, press the ESC button to cancel. The display returns to the original value of the parameter.

  The displayed modified value of the parameter flashes once and is written to the nonvolatile memory.
- Press ESC to return to the menu

Information to be Displayed During Motor Movements

By default, the 7-segment display displays the operating state during motor movements.

You can select the type of information to be displayed during motor movements via the menu item Mon / SUPV:

- STAT displays the operating state (default)
- VAct displays the actual velocity of the motor
- iAct displays the actual torque of the motor

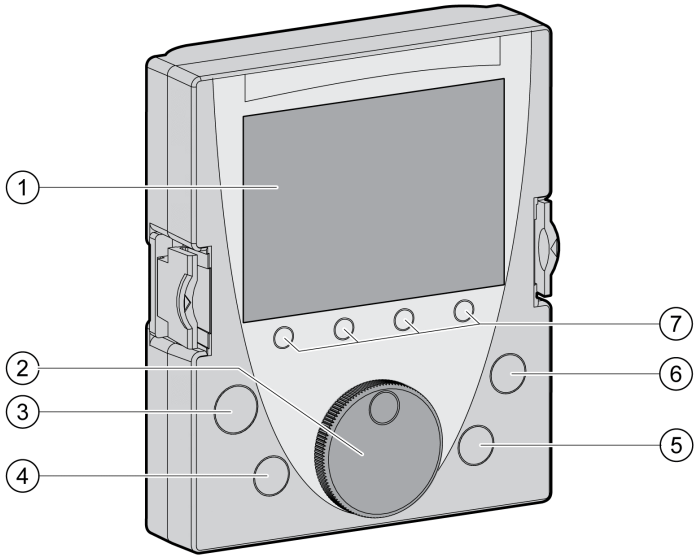
The modified value of the parameter is only taken into account at motor standstill.

External Graphic Display Terminal

Display and Controls

Overview

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



1 Display field

2 Navigation button

3 STOP/RESET key

4 RUN key

5 FWD/REV key

6 ESC key

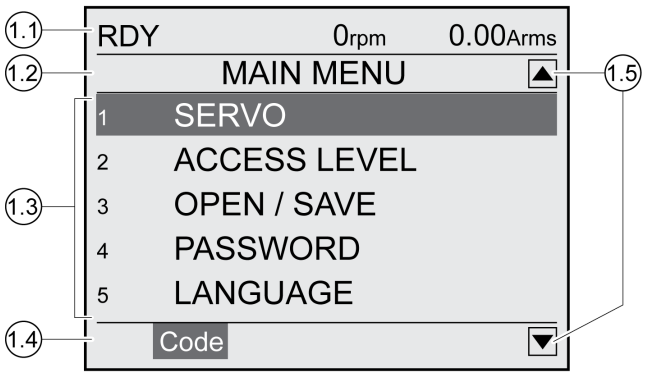
7 Function keys F1 ... F4

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

Display Field (1)

The display is subdivided into 5 areas.

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



1.1 Status information of the drive

1.2 Menu bar

1.3 Data field

1.4 Function bar

1.5 Navigation

Status Information of the Drive (1.1)

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

Menu Bar (1.2)

The menu bar displays the name of the menu.

Data Field (1.3)

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

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

Function Bar (1.4)

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

Navigation (1.5)

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

Navigation Button (2)

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

Key STOP/RESET (3)

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

Key RUN (4)

The key RUN allows you to start a movement.

Key FWD/REV (5)

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

Key ESC (6)

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

Function Keys F1 ... F4 (7)

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

Connecting the External Graphic Display Terminal to LXM32

Description

The external graphic display terminal is an accessory for the drive, see Accessories and Spare Parts, page 418. The external graphic display terminal is connected to CN7 (commissioning interface). Only use the cable shipped with the external graphic display terminal to connect it. If the external graphic display terminal is connected to LXM32, the integrated HMI is deactivated. The integrated HMI shows d ,SP (Display).

Using the External Graphic Display Terminal

Example

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

Example 'Setting the Language'

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

- Go to the main menu.
- Rotate the navigation button until item 5 (LANGUAGE) is highlighted.
- Press the navigation button to confirm the selection.

  The menu bar shows the selected function 5 (LANGUAGE). The data field displays the selected value, in this case the selected language.
- Press the navigation button to change the value.

  The menu bar displays the selected function "Language". The supported languages are shown in the data field.
- Turn the navigation button to select the desired language.

  The currently active language is highlighted by a check.
- Press the navigation button to confirm the selected value.

The menu bar displays the selected function "Language". The selected language is shown in the data field.

- Press ESC to return to the main menu.

  The main menu is displayed in the selected language.

Commissioning Procedure

Powering on the Drive for the First Time

Performing a "First Setup"

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

Automatic Reading of the Motor Data Record

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

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

Preparation

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

Powering On the Drive

- Verify that the power stage supply and the 24 Vdc control supply are powered off.
- Disconnect the product from the fieldbus during commissioning in order to help avoid conflicts by simultaneous access.
- Power on the 24 Vdc control supply.

  The drive goes through an initialization routine. The segments of the 7-segment display and the status LEDs illuminate.

If a memory card is in the slot of the drive, 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 drive. See section Memory Card, page 151 for additional information.

CANopen Interface

After the initialization, the CAN interface must be configured. You must assign a unique network address (node address) to each device. The transmission rate (baud rate) must be the same for all devices in the network.

- Enter the network address. The network address is stored in the parameter *CANaddress* (`Co Ad`).
- Set the transmission rate in the parameter *CANbaud* (`Co bd`) to meet the requirements of your network.

The settings are valid for CANopen and for CANmotion.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CANaddress CONF → CAN - CoAd	CANopen address (node number). Modified settings become active the next time the product is powered on.	- 1 - 127	UINT16 R/W per. -	-
CANbaud CONF → CAN - Cobd	CANopen baud rate. **50 kBaud** / 50: 50 kBaud **125 kBaud** / 125: 125 kBaud **250 kBaud** / 250: 250 kBaud **500 kBaud** / 500: 500 kBaud **1 MBaud** / 1000: 1 MBaud Modified settings become active the next time the product is powered on.	- 50 250 1000	UINT16 R/W per. -	-

Restarting the Drive

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

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

Further Steps

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

  NOTE: For more information on the presentation of parameters and a list of all operational parameters of the drive, see Parameters, page 332.

Setting Limit Values

Setting Limit Values

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

Current Limitation

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

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

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

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

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL_I_max CONF → drC - iMAX	Current limitation. During operation, the current limit is one of the following values (whichever is lowest): - *CTRL_I_max* - *_M_I_max* - *_PS_I_max* - 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 In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} 0.00 - 463.00	UINT16 R/W per. -	CANopen 3011:C_h Modbus 4376
LIM_I_maxQSTP CONF → FLt - qcur	Current for Quick Stop. This value is only limited by the minimum/ maximum value range (no limitation of this value by motor/power stage). In the case of a Quick Stop, the current limit (*_Imax_act*) is one of the following values (whichever is lowest): - *LIM_I_maxQSTP* - *_M_I_max* - *_PS_I_max* Further current limitations caused by I2t monitoring are also taken into account during a Quick Stop. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} - - -	UINT16 R/W per. -	CANopen 3011:D_h Modbus 4378
LIM_I_maxHalt CONF → ACG - hcur	Current for Halt. This value is only limited by the minimum/ maximum value range (no limitation of this value by motor/power stage). In the case of a Halt, the current limit (*_Imax_act*) is one of the following values (whichever is lowest): - *LIM_I_maxHalt* - *_M_I_max* - *_PS_I_max* Further current limitations caused by I2t monitoring are also taken into account during a Halt. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} - - -	UINT16 R/W per. -	CANopen 3011:E_h Modbus 4380

Velocity Limitation

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

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

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

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
CTRL_v_max CONF → DRC - nMAX	Velocity limitation. During operation, the velocity limit is one of the following values (whichever is lowest): - CTRL_v_max - M_n_max - Velocity limitation via digital input Modified settings become active immediately.	usr_v 1 13200 2147483647	UINT32 R/W per. -	CANopen 3011:10$_h$ Modbus 4384

Digital Inputs and Outputs

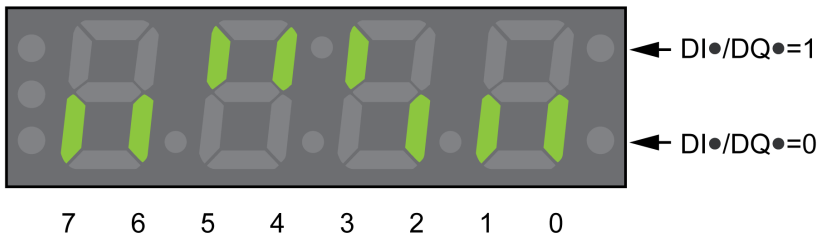
General

The device has configurable inputs and configurable outputs. See section Digital Signal Inputs and Digital Signal Outputs, page 173 for additional information.

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

Integrated HMI

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



Inputs (parameter *_IO_DI_act*):

Open the menu item - MON → DIAG.

The digital inputs are displayed in a bit-coded way.

Bit	**Signal**
0	*DI0*
1	*DI1*
2	*DI2*

Bit	Signal
3	*DI3*
4 ... 7	-

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

Outputs (parameter *_IO_DQ_act*):

Open the menu item - Mon → doMo.

The digital outputs are displayed in a bit-coded way.

Bit	Signal
0	*DQ0*
1	*DQ1*
2 ... 7	-

Fieldbus

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_IO_act	Physical status of the digital inputs and outputs. Low byte: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3 High byte: Bit 8: DQ0 Bit 9: DQ1	- - - - 	UINT16 R/- - -	CANopen 3008:1_h Modbus 2050
_IO_DI_act Mon diMo	Status of digital inputs. Bit assignments: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3	- - - -	UINT16 R/- - -	CANopen 3008:F_h Modbus 2078

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_IO_DQ_act Mon doMo	Status of digital outputs. Bit assignments: Bit 0: DQ0 Bit 1: DQ1	- - - -	UINT16 R/- - -	CANopen 3008:10h Modbus 2080
_IO_STO_act Mon Sto	Status of the inputs for the safety-related function STO. Coding of the individual signals: Bit 0: STO_A Bit 1: STO_B	- - - -	UINT16 R/- - -	CANopen 3008:26h Modbus 2124

Verifying the Signals of the Limit Switches

General

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

⚠WARNING

LOSS OF CONTROL

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

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

- Install and configure the limit switches in such a way that no movements are made beyond the range defined by the limit switches.
- Trigger the limit switches manually.

  If an error message is indicated, the limit switches were triggered.

Parameters can be used to release the limit switches and to set them up as normally closed contacts or normally open contacts, see Limit Switches, page 259.

Verifying the Safety Function STO

Operation with Safety Function STO

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

- To help avoid unintended restart after restoration of power, the parameter *IO_AutoEnable* must be set to "off". Verify that the parameter *IO_AutoEnable* is set to "off".

  HMI: CONF→ACG→IOAE.

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

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

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

- Enable the power stage without starting a motor movement.
- Trigger the safety function STO.

  If the power stage is now disabled and the error message 1300 is indicated, the safety function STO was triggered.

  If a different error message is indicated, the safety function STO was not triggered.
- Document all tests of the safety function in your acceptance protocol.

Operation without Safety Function STO

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

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

Holding Brake (Option)

Holding Brake

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

⚠WARNING

UNINTENDED AXIS MOVEMENT

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

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

Releasing the Holding Brake

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

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

An additional time delay can be set via parameters, see Additional Time Delay for Releasing the Holding Brake, page 126.

Applying the Holding Brake

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

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

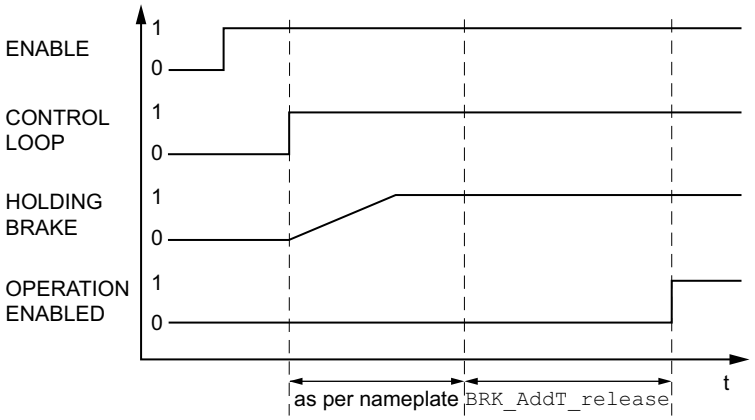
See section Functional Safety, page 66 for additional information on the behavior of the holding brake when the safety function STO is triggered.

An additional time delay can be set via parameters, see Additional Time Delay for Applying the Holding Brake, page 127.

Additional Time Delay for Releasing the Holding Brake

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

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

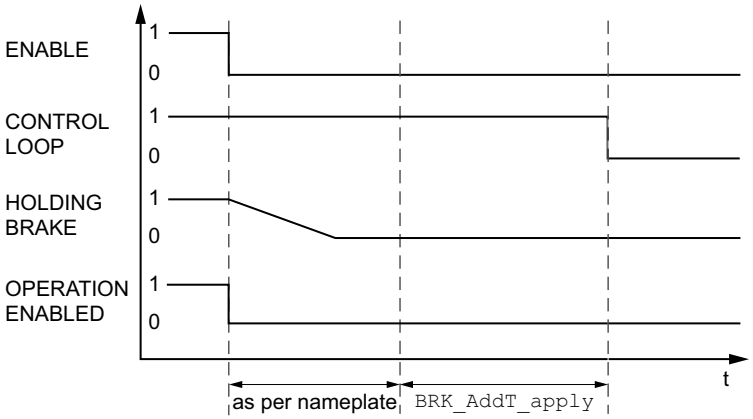


Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
BRK_AddT_release	Additional time delay for releasing the holding brake. The overall time delay for releasing the holding brake is the time delay from the electronic nameplate of the motor and the additional time delay in this parameter. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	ms 0 0 400	INT16 R/W per. -	CANopen 3005:7$_h$ Modbus 1294

Additional Time Delay for Applying the Holding Brake

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

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



Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
BRK_AddT_apply	Additional time delay for applying the holding brake. The overall time delay for applying the holding brake is the time delay from the electronic nameplate of the motor and the additional time delay in this parameter. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	ms 0 0 1000	INT16 R/W per. -	CANopen 3005:8$_h$ Modbus 1296

Verifying the Function of the Holding Brake

The device is in the operating state **4** Ready To Switch On.

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

Releasing the Holding Brake Manually

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

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

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

⚠WARNING

UNINTENDED MOVEMENT

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

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

As of firmware version ≥V01.12, you can manually release the holding brake.

Applying the Holding Brake Manually

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

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

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

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

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

NOTICE

BRAKE WEAR AND LOSS OF BRAKING TORQUE

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

Failure to follow these instructions can result in equipment damage.

As of firmware version ≥V01.20, you can manually apply the holding brake.

Releasing the Holding Brake Manually via a Signal Input

In order to release the holding brake via a signal input, you must first parameterize the signal input function "Release Holding Brake", see Digital Signal Inputs and Digital Signal Outputs, page 173.

Releasing or Applying the Holding Brake Manually via the Fieldbus

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
BRK_release	Manual operation of the holding brake. **0 / Automatic**: Automatic processing **1 / Manual Release**: Manual release of holding brake **2 / Manual Application**: Manual applying of holding brake You can apply or release the holding brake manually. The holding brake can only be manually released in the operating states 'Switch On Disabled', 'Ready To Switch On' or 'Fault'. If you have applied the holding brake manually and then want to release it manually, you must first set this parameter to Automatic and then to Manual Release. Modified settings become active immediately. Available with firmware version ≥V01.12.	- 0 0 2	UINT16 R/W - -	CANopen 3008:A_h Modbus 2068

Verifying the Direction of Movement

Definition of Direction of Movement

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

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

⚠WARNING

UNINTENDED MOVEMENT CAUSED BY INTERCHANGED MOTOR PHASES

Do not interchange the motor phases.

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

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

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

Verifying the Direction of Movement

Power supply has been powered on.

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

Movement in positive direction:

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

Movement in negative direction:

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

Changing the Direction of Movement

You can invert the direction of movement.

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

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

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
InvertDirOfMove CONF → ACG - InVo	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. Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.	- 0 0 1	UINT16 R/W per. -	CANopen 3006:C_h Modbus 1560

Setting Parameters for Encoder

General

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

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

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

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_p_absENC MON PANU	Absolute position with reference to the encoder range. This value corresponds to the modulo position of the absolute encoder range.	usr_p - - -	UINT32 R/- - -	CANopen 301E:F_h Modbus 7710

Working Range of the Encoder

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

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

Underrun of Absolute Position

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

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

- Adjustment of the absolute position
- Shifting the working range

Adjustment of the Absolute Position

When the motor is at a standstill, the new absolute position of the motor can be set to the current mechanical motor position the with the parameter *ENC1_ adjustment*.

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

Procedure:

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

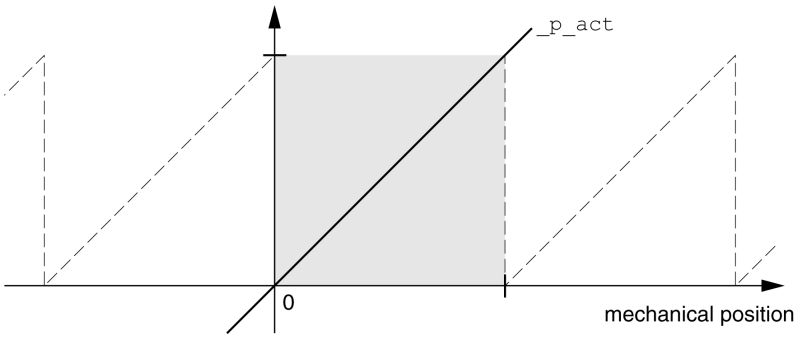
Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ENC1_adjustment	Adjustment of absolute position of encoder 1. The value range depends on the encoder type. Singleturn encoder: 0 ... x-1 Multiturn encoder: 0 ... (4096*x)-1 Singleturn encoder (shifted with parameter *ShiftEncWorkRang*): -(x/2) ... (x/2)-1 Multiturn encoder (shifted with parameter *ShiftEncWorkRang*): -(2048*x) ... (2048*x)-1 Definition of 'x': Maximum position for one encoder turn in user-defined units. This value is 16384 with the default scaling. If processing is to be performed with inversion of the direction of movement, this must be set before the encoder position is adjusted. After the write access, a wait time of at least 1 second is required before the drive can be powered off. Modified settings become active the next time the product is powered on.	usr_p - - -	INT32 R/W - -	CANopen 3005:16$_h$ Modbus 1324

Shifting the Working Range

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

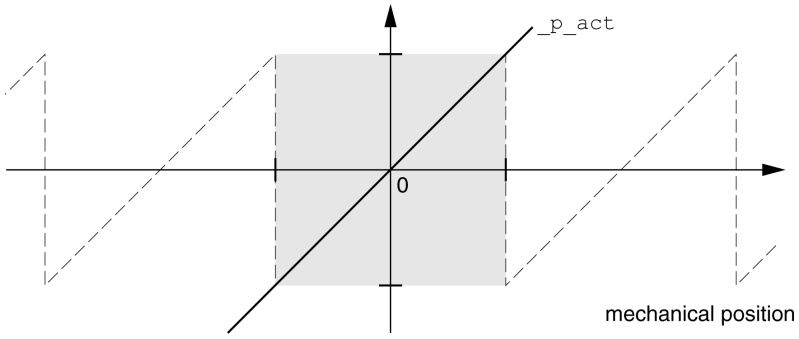
The working range without shift comprises:

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



The working range with shift comprises:

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



Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ShiftEncWorkRang	Shifting of the encoder working range. **0 / Off**: Shifting off **1 / On**: Shifting on After activating the shifting function, the position range of a multiturn encoder is shifted by one half of the range. Example for the position range of a multiturn encoder with 4096 revolutions: Value 0: Position values are between 0 … 4096 revolutions. Value 1: Position values are between -2048 … 2048 revolutions. Modified settings become active the next time the product is powered on.	- 0 0 1	UINT16 R/W per. -	CANopen 3005:21$_h$ Modbus 1346

Setting the Braking Resistor Parameters

Description

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

⚠WARNING

HOT SURFACES

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

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

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

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

The maximum value of *RESext_P* and the minimum value of *RESext_R* depend on the power stage, see Data for External Braking Resistor, page 41.

See section Rating the Braking Resistor, page 61 for additional information.

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

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
RESint_ext CONF → ACG - Ebr	Selection of type of braking resistor. **0 / Internal Braking Resistor /** Int: Internal braking resistor **1 / External Braking Resistor /** EHt: External braking resistor **2 / Reserved /** rSVd: Reserved Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 0 2	UINT16 R/W per. -	CANopen 3005:9_h Modbus 1298
RESext_P CONF → ACG - Pobr	Nominal power of external braking resistor. The maximum value depends on the power stage. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	W 1 10 -	UINT16 R/W per. -	CANopen 3005:12_h Modbus 1316

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RESext_R ConF → ACG - rbr	Resistance value of external braking resistor. The minimum value depends on the power stage. In increments of 0.01 Ω. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	Ω - 100.00 327.67	UINT16 R/W per. -	CANopen 3005:13$_h$ Modbus 1318
RESext_ton ConF → ACG - tbr	Maximum permissible switch-on time of external braking resistor. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	ms 1 1 30000	UINT16 R/W per. -	CANopen 3005:11$_h$ Modbus 1314

Autotuning

General

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

⚠WARNING

UNINTENDED MOVEMENT

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

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

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

External factors such as a load at the motor are considered. Autotuning optimizes the settings of the control loop parameters, see Controller Optimization with Step Response, page 141.

Autotuning also supports vertical axes.

Methods

There are three ways of tuning the drive control loops:

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

Function

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

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

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

- Start autotuning via the commissioning software.

  It is also possible to start autotuning via the HMI.

  HMI: oP → tun → tuSt
- Save the new settings to the nonvolatile memory via the commissioning software.

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

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

If autotuning cancels with an error message, the default values are used. Change the mechanical position and restart autotuning. If you want to verify the plausibility of the calculated values, you can have them displayed; see Enhanced Settings for Autotuning, page 138.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
AT_dir ꞵP → tUn- SEtUP	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 Modified settings become active the next time the motor moves.	- 1 1 6	UINT16 R/W - -	CANopen 302F:4_h Modbus 12040
AT_dis_usr	Movement range for Autotuning. Movement range within which the control parameters are automatically optimized. The movement range is entered with reference to the actual position. In the case of "Movement in one direction only" (Parameter AT_dir), the specified range is used for each optimization step. The movement typically corresponds to 20 times the value, but it is not limited. The minimum value, the factory setting and the maximum value depend on the scaling factor. Modified settings become active the next time the motor moves. Available with firmware version ≥V01.05.	usr_p 1 32768 2147483647	INT32 R/W - -	CANopen 302F:12_h Modbus 12068
AT_mechanical	Type of coupling of the system. **1 / Direct Coupling**: Direct coupling **2 / Belt Axis**: Belt axis **3 / Spindle Axis**: Spindle axis Modified settings become active the next time the motor moves.	- 1 2 3	UINT16 R/W - -	CANopen 302F:E_h Modbus 12060
AT_start	Autotuning start. Value 0: Terminate Value 1: Activate EasyTuning Value 2: Activate ComfortTuning Modified settings become active immediately.	- 0 - 2	UINT16 R/W - -	CANopen 302F:1_h Modbus 12034

Enhanced Settings for Autotuning

Description

The following parameters allow you to monitor and influence autotuning.

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_AT_state	Autotuning status. Bit assignments: Bits 0 ... 10: Last processing step Bit 13: auto_tune_process Bit 14: auto_tune_end Bit 15: auto_tune_err	- - - -	UINT16 R/- - -	CANopen 302F:2_h Modbus 12036
_AT_progress	Progress of Autotuning.	% 0 0 100	UINT16 R/- - -	CANopen 302F:B_h Modbus 12054

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL_GlobGain oP → tUn - GAin	Global gain factor (affects control loop parameter set 1). The global gain factor affects the following parameters of control loop parameter set 1: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref The global gain factor is set to 100% - if the control loop parameters are set to default - at the end of the Autotuning process - if control loop parameter set 2 is copied to set 1 via the parameter CTRL_ParSetCopy If a full configuration is transmitted via the fieldbus, the value for CTRL_GlobGain must be transmitted prior to the values of the control loop parameters CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref. If CTRL_GlobGain is changed during a configuration transmission, CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref must also be part of the configuration. In increments of 0.1 %. Modified settings become active immediately.	% 5.0 100.0 1000.0	UINT16 R/W per. -	CANopen 3011:15_h Modbus 4394
_AT_M_friction	Friction torque of the system. Is determined during Autotuning. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	CANopen 302F:7_h Modbus 12046

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_AT_M_load	Constant load torque. Is determined during Autotuning. In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	CANopen 302F:8_h Modbus 12048
_AT_J	Moment of inertia of the system. Is automatically calculated during Autotuning. In increments of 0.1 kg cm^2.	kg cm^2 0.1 0.1 6553.5	UINT16 R/- per. -	CANopen 302F:C_h Modbus 12056

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
AT_wait	Waiting time between Autotuning steps. Modified settings become active the next time the motor moves.	ms 300 500 10000	UINT16 R/W - -	CANopen 302F:9_h Modbus 12050

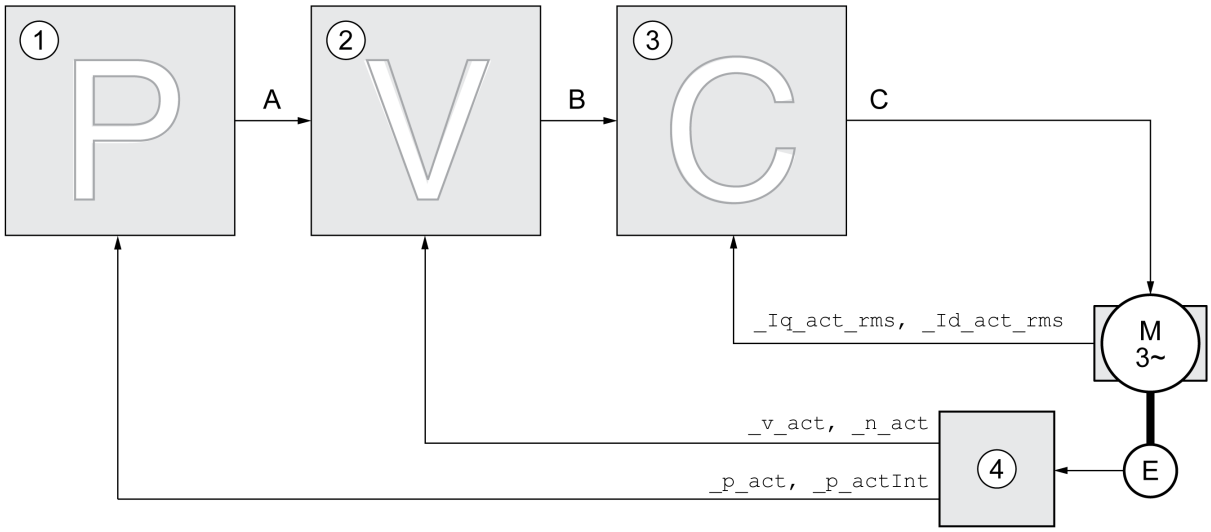
Controller Optimization with Step Response

Controller Structure

Overview

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

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



1 Position controller

2 Velocity controller

3 Current controller

4 Encoder evaluation

See section Overview of the Controller Structure, page 184 for a detailed description of the controller structure.

Current Controller

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

Velocity Controller

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

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

Position Controller

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

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

Control Loop Parameters

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

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

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
CTRL_SelParSet	Selection of control loop parameter set. Coding see parameter: CTRL_PwrUpParSet Modified settings become active immediately.	- 0 1 2	UINT16 R/W - -	CANopen 3011:19$_h$ Modbus 4402
_CTRL_ActParSet	Active control loop parameter set. Value 1: Control loop parameter set 1 is active Value 2: Control loop parameter set 2 is active A control loop parameter set is active after the time for the parameter switching (CTRL_ParChgTime) has elapsed.	- - - -	UINT16 R/- - -	CANopen 3011:17$_h$ Modbus 4398
CTRL_ParChgTime	Period of time for control loop parameter set switching. In the case of control loop parameter set switching, the values of the following parameters are changed linearly: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp Modified settings become active immediately.	ms 0 0 2000	UINT16 R/W per. -	CANopen 3011:14$_h$ Modbus 4392

Optimization

General

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

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

Setting Reference Value Signals

Start controller optimization with the commissioning software.

Set the following values for the reference value signal:

- Signal type: Step "positive"
- Amplitude: 100 RPM
- Cycle duration: 100 ms
- Number of repetitions: 1
- Start the trace.

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

Entering Values for Optimization

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

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

Control Loop Parameters

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

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

For details see section Switching Between Control Loop Parameter Sets, page 184.

Optimizing the Velocity Controller

General

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

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_KPn CONF → drC - Pn 1	Velocity controller P gain. The default value is calculated on the basis of the motor parameters. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.0001 A/RPM. Modified settings become active immediately.	A/RPM 0.0001 - 2.5400	UINT16 R/W per. -	CANopen 3012:1$_h$ Modbus 4610
CTRL2_KPn CONF → drC - Pn2	Velocity controller P gain. The default value is calculated on the basis of the motor parameters. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.0001 A/RPM. Modified settings become active immediately.	A/RPM 0.0001 - 2.5400	UINT16 R/W per. -	CANopen 3013:1$_h$ Modbus 4866
CTRL1_TNn CONF → drC - tn 1	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	CANopen 3012:2$_h$ Modbus 4612
CTRL2_TNn CONF → drC - tn2	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	CANopen 3013:2$_h$ Modbus 4868

Verify and optimize the calculated values in a second step, see Verifying and Optimizing the P Gain, page 148.

Reference Value Filter of the Velocity Controller

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

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

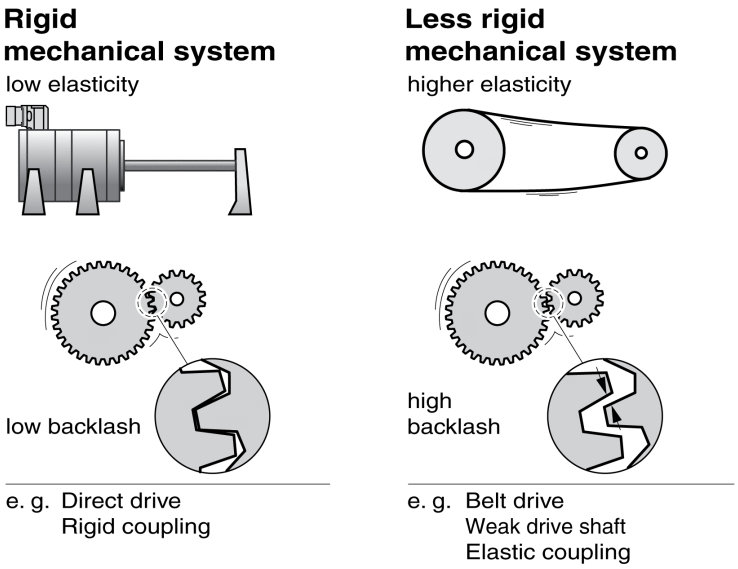
Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_TAUnref CONF → DRC - TAU 1	Filter time constant of the reference velocity value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	CANopen 3012:4h Modbus 4616
CTRL2_TAUnref CONF → DRC - TAU2	Filter time constant of the reference velocity value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	CANopen 3013:4h Modbus 4872

Determining the Type of Mechanical System

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

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

Rigid and less rigid mechanical systems



Determining Values for Rigid Mechanical Systems

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

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

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

- J_L: Moment of inertia of the load

- J_M: Moment of inertia of the motor
- Determine the values on the basis of the following table:

	$J_L = J_M$		$J_L = 5 * J_M$		$J_L = 10 * J_M$	
J_L	**KPn**	**TNn**	**KPn**	**TNn**	**KPn**	**TNn**
1 kgcm²	0.0125	8	0.008	12	0.007	16
2 kgcm²	0.0250	8	0.015	12	0.014	16
5 kgcm²	0.0625	8	0.038	12	0.034	16
10 kgcm²	0.125	8	0.075	12	0.069	16
20 kgcm²	0.250	8	0.150	12	0.138	16

Determining Values for Less Rigid Mechanical Systems

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

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

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

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

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

⚠WARNING

UNINTENDED MOVEMENT

- Only start the system if there are no persons or obstructions in the zone of operation.
- Verify that the values for the velocity and the time do not exceed the available movement range.
- Verify that a functioning emergency stop push-button is within reach of all persons involved in the operation.

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

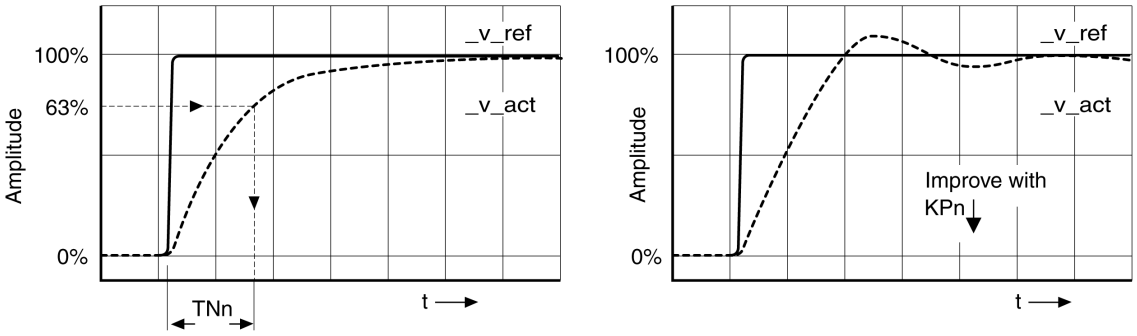
- Trigger a step function.
- After the first test, verify the maximum amplitude for the reference value for the current *_Iq_ref*.

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

- Trigger another step function if you had to modify *_v_ref* and verify the amplitude of *_Iq_ref*.
- Increase or decrease the P gain in small increments until *_v_act* is obtained as fast as possible. The following diagram shows the required transient response on the left. Overshooting - as shown on the right - is reduced by reducing *CTRL1_KPn* (*CTRL2_KPn*).

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

Determining "TNn" for the aperiodic limit



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

Graphic Determination of the 63% Value

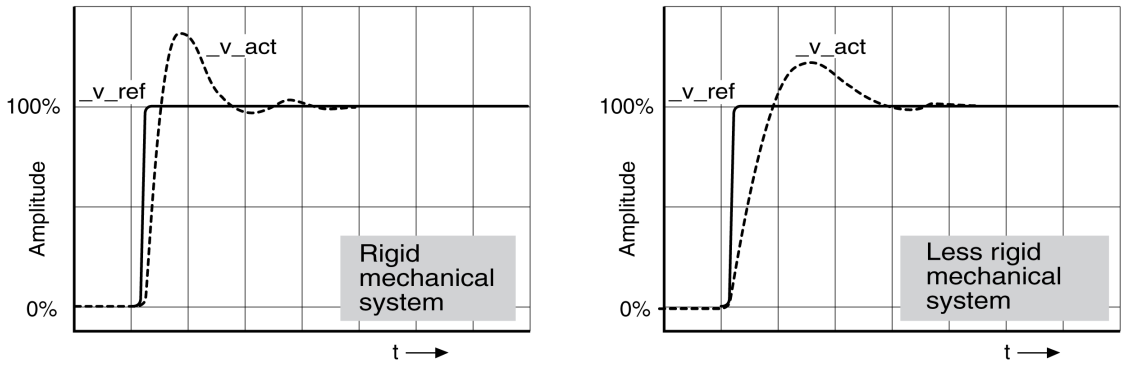
Graphically determine the point at which the actual velocity *_v_act* reaches 63% of the final value. The integral action time *CTRL1_TNn* (*CTRL2_TNn*) then results as a value on the time axis. The commissioning software supports you with the evaluation:

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
CTRL1_TNn ConF → drC - tin1	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	CANopen 3012:2h Modbus 4612
CTRL2_TNn ConF → drC - tin2	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	CANopen 3013:2h Modbus 4868

Verifying and Optimizing the P Gain

General

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

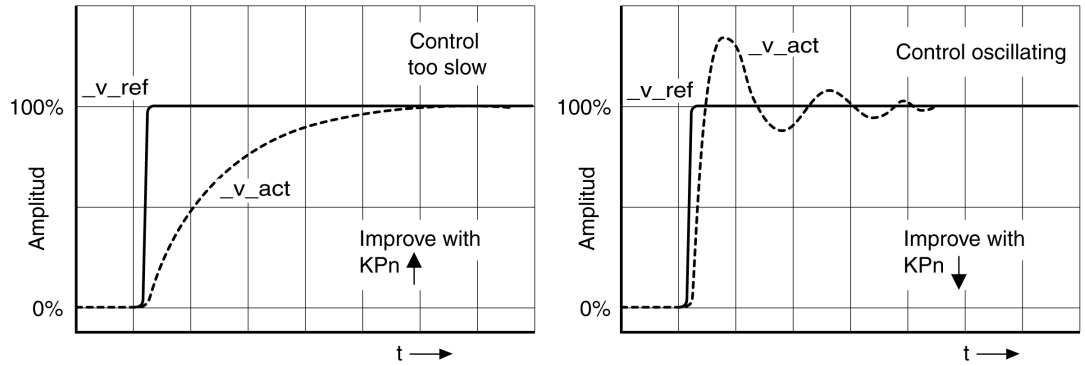
- Fast transient response
- Overshooting with 20%, up to a maximum of 40%.

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

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

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

Optimizing insufficient velocity controller settings



Optimizing the Position Controller

General

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

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

- *CTRL1_KPp* (*CTRL2_KPp*) too high: Overshooting, instability
- *CTRL1_KPp* (*CTRL2_KPp*) too low: High position deviation

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_KPp CONF → DRC - PP 1	Position controller P gain. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 1/s. Modified settings become active immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	CANopen 3012:3h Modbus 4614
CTRL2_KPp CONF → DRC - PP 2	Position controller P gain. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 1/s. Modified settings become active immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	CANopen 3013:3h Modbus 4870

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

⚠WARNING

UNINTENDED MOVEMENT

- Only start the system if there are no persons or obstructions in the zone of operation.
- Verify that the values for the velocity and the time do not exceed the available movement range.
- Verify that a functioning emergency stop push-button is within reach of all persons involved in the operation.

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

Setting the Reference Value Signal

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

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

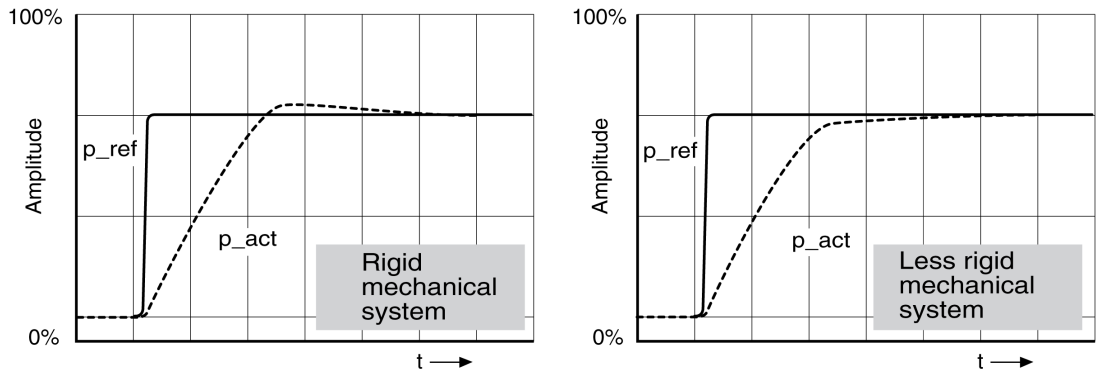
Selecting the Trace Signals

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

Optimizing the Position Controller Value

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

Step responses of a position controller with good control performance

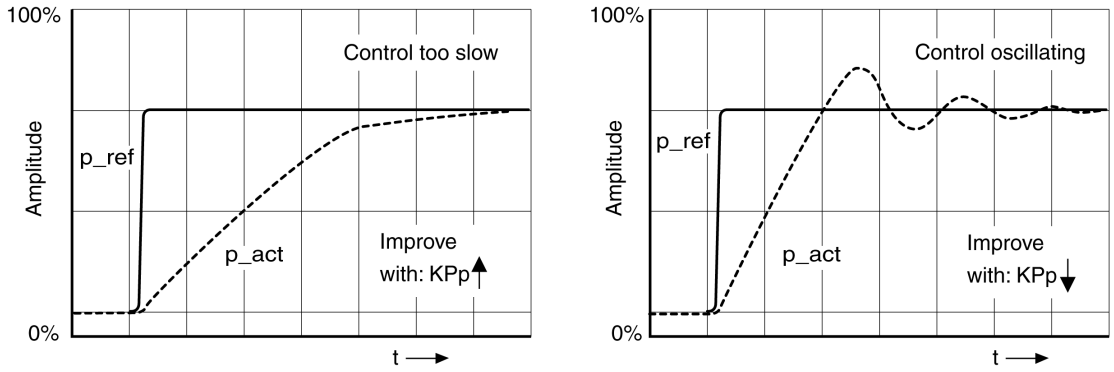


The p gain setting *CTRL1_KPp* (*CTRL2_KPp*) is optimal if the reference value is reached rapidly and with little or no overshooting.

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

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

Optimizing inadequate position controller settings



Parameter Management

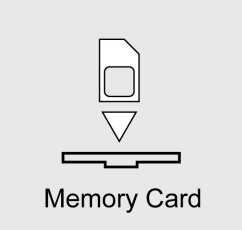
Memory Card

Description

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

The contents of the memory card is compared to the parameters stored in the drive when the drive is powered on.

When the parameters are written to the nonvolatile memory, they are also saved to the 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 drive.
- The memory card can only be removed from the drive by pulling (not by pushing).

NOTICE
ELECTROSTATIC DISCHARGE OR INTERMITTENT CONTACT AND LOSS OF DATA Do not touch the contacts of the memory card. **Failure to follow these instructions can result in equipment damage.**

Inserting a Memory Card

- 24 Vdc control supply has been powered off.
- Insert the memory card into the drive with the gold contacts face down; the slanted corner must be face to the mounting plate.
- Power on the 24 Vdc control supply.
- Observe the 7-segment display during the initialization of the drive.

C A r d is Displayed for a Short Period of Time

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

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

CArd is Displayed Permanently

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

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

CArd is Not Displayed

The drive has not detected a memory card. Power off the 24 Vdc control supply. Verify that the memory card has been properly inserted (contacts, slanted corner).

Data Exchange with the Memory Card

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

Copying Data or Ignoring the Memory Card (CArd, iGnr, ctod, dtoc)

If the 7-segment display shows CArd:

- Press the navigation button.

  The 7-segment display shows the last setting, for example iGnr.
- Briefly press the navigation button to activate the Edit mode.

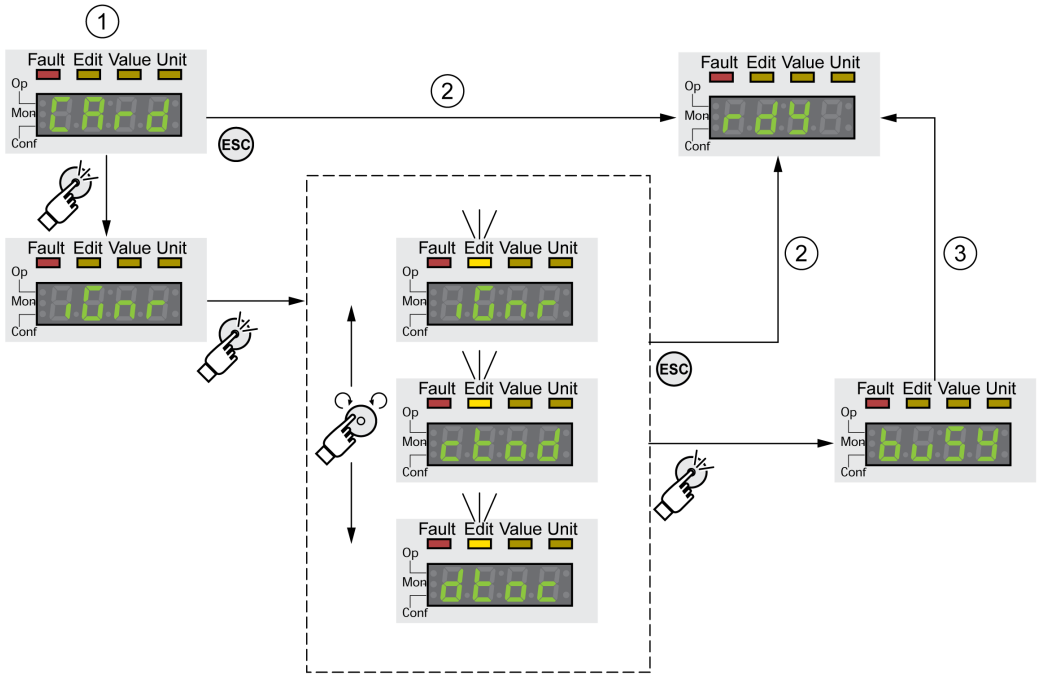
  The 7-segment display continues to display the last setting, the LED Edit illuminates.
- Select with the navigation button:

  iGnr ignores the memory card.

  ctod transfers the data from the memory card to the drive.

  dtoc transfers the data from the drive to the memory card.

  The drive switches to operating state **4** Ready To Switch On.



1 Data on the memory card and in the drive are different: The drive 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 drive, `dtoc` = drive to card) and transition to operating state **4** Ready To Switch On.

Memory Card has Been Removed (`CArd`, `noSS`)

If you removed the memory card, the drive displays `CArd` after initialization. If you confirm this, the display shows `noSS`. If you confirm again, the product transitions to the operating state .**4** Ready To Switch On.

Write Protection for Memory Card (`CArd`, `EnPr`, `diPr`, `Prot`)

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

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

Selection	Meaning
`EnPr`	Write protection on (`Prot`)
`diPr`	Write protection off

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

Duplicating Existing Parameter Values

Application

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

Prerequisites

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

- Tools for duplication:
  - Memory card
  - Commissioning software
- The 24 Vdc control supply must be powered on.

Duplication Using a Memory Card

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

The stored device settings can be copied to a device of the same type. Note that the fieldbus address and the settings for the monitoring functions are copied along with this information.

Duplication Using the Commissioning Software

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

See the manual for the commissioning software for additional information.

Resetting the User Parameters

Description

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

Disconnect the drive from the fieldbus.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
PARuserReset CONF → FCS - rESU	Reset user parameters. **0 / No /** noo: No **65535 / Yes /** YES: Yes Bit 0: Reset persistent user parameters and control loop parameters to default values Bits 1 … 15: Reserved The parameters are reset with the exception of: - Communication parameters - Inversion of direction of movement - Functions of digital inputs and outputs The new settings are not saved to the nonvolatile memory. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 - 65535	UINT16 R/W - -	CANopen 3004:8_h Modbus 1040

Resetting via the HMI

Use the menu items CONF -> FCS - -> rESU of the HMI to reset the user parameters. Confirm the selection with YES.

The new settings are not saved to the nonvolatile memory.

If the drive transitions to the operating state "**2** Not Ready To Switch On" after the user parameters are reset, the new settings only become active after the 24 Vdc control supply of the drive is power cycled.

Resetting via the Commissioning Software

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

If the drive transitions to the operating state "**2** Not Ready To Switch On" after the user parameters are reset, the new settings only become active after the 24 Vdc control supply of the drive is power cycled.

Restoring Factory Settings

Description

The parameter values, both active and those saved in nonvolatile memory, are lost in this process.

NOTICE
LOSS OF DATA Perform a backup of the drive parameters prior to restoring factory settings (factory established parameter values). **Failure to follow these instructions can result in equipment damage.**

The commissioning software allows you to save the parameter values set for a drive as a configuration file. For information on saving the existing parameters in the drive, see Parameter Management, page 151.

The factory settings can be restored via the HMI or the commissioning software.

Disconnect the drive from the fieldbus before you restore the factory settings.

Factory Settings via HMI

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

The new settings only become active until after the 24 Vdc control supply of the drive is power cycled.

Factory Settings via Commissioning Software

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

The new settings only become active until after the 24 Vdc control supply of the drive is power cycled.

Operation

Access Channels

Description

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

The product can be addressed via different access channels. Access channels are:

- Integrated HMI
- External graphic display terminal
- Fieldbus
- Commissioning software
- Digital signal inputs

Only one access channel can have exclusive access to the product. An exclusive access can be provided via different access channels:

- Via the integrated HMI:

  The operating mode Jog or Autotuning can be started via the HMI.
- Via a fieldbus:

  Exclusive access is provided to a fieldbus by blocking the other access channels with the parameter *AccessLock*.
- Via the commissioning software:

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

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

The signal input functions "Halt", "Fault Reset", "Enable", "Positive Limit Switch (LIMP)", "Negative Limit Switch (LIMN)" and "Reference Switch (REF)" as well as the signals of the safety function STO (*STO_A* and *STO_B*) are available during exclusive access.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_AccessInfo	Access channel information. Low byte: Exclusive access Value 0: No Value 1: Yes High byte: Access channel Value 0: Reserved Value 1: I/O Value 2: HMI Value 3: Modbus RS485 Value 4: Fieldbus main channel Value 5: CANopen second SDO	- - - -	UINT16 R/- - -	CANopen 3001:C_h Modbus 280
AccessLock	Locking other access channels. Value 0: Allow control via other access channels Value 1: Lock control via other access channels Example: The access channel is used by the fieldbus. In this case, control via the commissioning software, for example, is not possible. The access channel can only be locked after the currently active operating mode has terminated. Modified settings become active immediately.	- 0 0 1	UINT16 R/W - -	CANopen 3001:E_h Modbus 284
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 Modified settings become active immediately.	- 0 0 1	UINT16 R/W per. -	CANopen 303A:1_h Modbus 14850

Movement Range

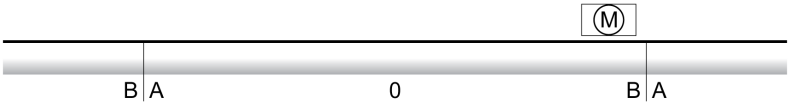
Size of the Movement Range

Description

The movement range is the maximum possible range within which a movement can be made to any position.

The actual position of the motor is the position in the movement range.

The figure below shows the movement range in user-defined units with the factory scaling.



A -268435456 user-defined units (usr_p)

B 268435455 user-defined units (usr_p)

Availability

The movement range is relevant in the following operating modes:

- Jog
- Profile Position
- Homing

Zero Point of the Movement Range

The zero point is the point of reference for absolute movements in the operating mode Profile Position.

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.

Movement Beyond the Movement Range

Description

The behavior in the case of a movement beyond the movement range depends on the operating mode and the type of movement.

The following behavior is possible:

- In the case of a movement beyond the movement range, the movement range restarts.
- In the case of a movement with a target position outside of the movement range, position setting to 0 is performed before the movement is started.

As of firmware version ≥V01.06, you can use the parameter *PP_ModeRangeLim* to set the behavior.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PP_ModeRangeLim	Absolute movement beyond movement range. **0 / NoAbsMoveAllowed**: Absolute movement beyond movement range is not possible **1 / AbsMoveAllowed**: Absolute movement beyond movement range is possible Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 0 0 1	UINT16 R/W per. -	CANopen 3023:7$_h$ Modbus 8974

Behavior for Operating Mode Jog (Continuous Movement)

Behavior for continuous movement beyond the movement range:

- The movement range restarts.

Behavior for Operating Mode Jog (Step Movement)

Behavior for step movement beyond the movement range:

- With firmware version ≥V01.06 and setting via parameter *PP_ ModeRangeLim* = 1:

  The movement range restarts.
- With firmware version <V01.06:

  Internal position setting to 0.

Behavior for Operating Mode Profile Position (Relative Movement)

Behavior for relative movement beyond the movement range:

- With firmware version ≥V01.06 and setting via parameter *PP_ ModeRangeLim* = 1:

  The movement range restarts.

  A relative movement is possible when the motor is at a standstill and during movements
- With firmware version <V01.06:

  Internal position setting to 0.

  A relative movement is only possible when the motor is at a standstill.

Behavior for Operating Mode Profile Position (Absolute Movement)

Behavior for absolute movement:

- With firmware version ≥V01.06 and setting via parameter *PP_ ModeRangeLim* = 1:

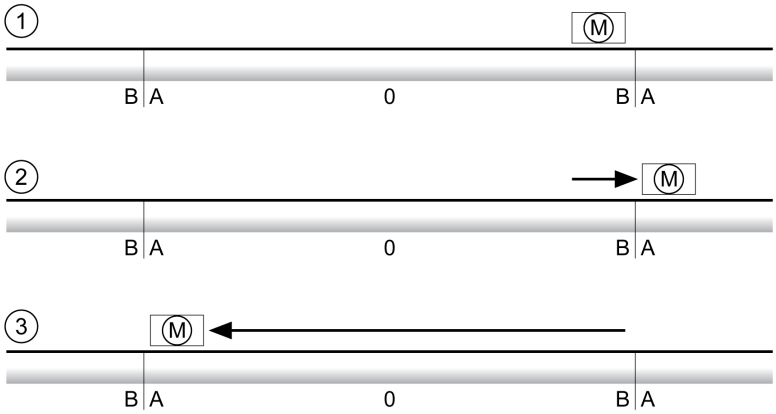
  An absolute movement beyond the movement range is possible.
- With firmware version <V01.06:

  An absolute movement is made within the movement range. An absolute movement beyond the movement range is not possible.

Example:

Actual position: 268435000 user-defined units (usr_p)

Target position absolute: -268435000 user-defined units (usr_p)



A -268435456 user-defined units (usr_p)

B 268435455 user-defined units (usr_p)

1 Actual position: 268435000 user-defined units

2 Absolute movement to -268435000 user-defined units with parameter *PP_ModeRangeLim* = 1

3 Absolute movement to -268435000 user-defined units with parameter *PP_ModeRangeLim* = 0

Setting a Modulo Range

Description

The modulo range supports applications with repeating arrangements of target positions (such as rotary indexing tables). The target positions are mapped to a parameterizable movement range.

For details see section Modulo Range, page 161.

Modulo Range

Setting a Modulo Range

Availability

Available with firmware version ≥V01.03.

Description

The modulo range supports applications with repeating arrangements of target positions (such as rotary indexing tables). The target positions are mapped to a parameterizable movement range.

Direction of Movement

The direction of movement for absolute target positions can be adjusted to meet the requirements of the application.

- Shortest distance
- Positive direction of movement only
- Negative direction of movement only

Multiple Modulo Range

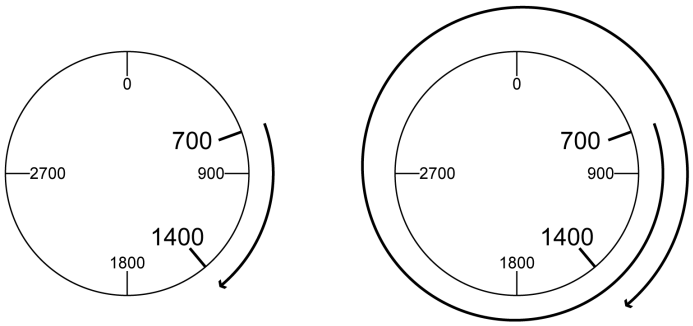
In addition, it is possible to set a multiple modulo range for absolute target positions. A movement with an absolute target position beyond the modulo range is performed in a way as if several modulo ranges had been arranged one after the other.

Example:

- Modulo range
  - Minimum position: 0 usr_p
  - Maximum position: 3600 usr_p
- Actual position: 700 usr_p
- Target positions absolute: 5000 usr_p
- Left: Without multiple modulo range

  Right: With multiple modulo range

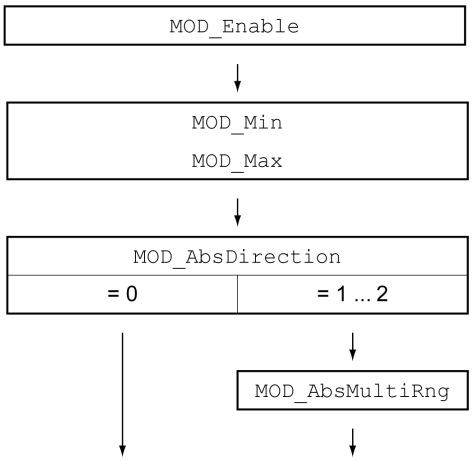
Multiple modulo range



Parameterization

Overview

Overview of parameters



Scaling

Using a modulo range requires the scaling to be adapted. The scaling of the motor must be adapted to the requirements of the application, see Scaling, page 169.

Activation

The modulo range is activated with the parameter *MOD_Enable*.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
MOD_Enable CONF → RCG- RETYP	Activation of Modulo function. **0 / Modulo Off /** oFF: Modulo is off **1 / Modulo On /** on: Modulo is on Setting can only be modified if power stage is disabled. Modified settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 1	UINT16 R/W per. -	CANopen 3006:38$_h$ Modbus 1648

Modulo Range

The parameters *MOD_Min* and *MOD_Max* can be used to set the modulo range.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MOD_Min	Minimum position of modulo range. The minimum position value of the modulo range must be less than the maximum position value of the modulo range. The value must not exceed the maximum possible value of position scaling _ScalePOSmax. Setting can only be modified if power stage is disabled. Modified settings become active immediately. Available with firmware version ≥V01.03.	usr_p - 0 -	INT32 R/W per. -	CANopen 3006:39$_h$ Modbus 1650
MOD_Max	Maximum position of modulo range. The maximum position value of the modulo range must be greater than the minimum position value of the modulo range. The value must not exceed the maximum possible value of position scaling _ScalePOSmax. Setting can only be modified if power stage is disabled. Modified settings become active immediately. Available with firmware version ≥V01.03.	usr_p - 3600 -	INT32 R/W per. -	CANopen 3006:3A$_h$ Modbus 1652

Direction for Absolute Movements

The parameter *MOD_AbsDirection* lets you set the direction of movement for absolute movements.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MOD_AbsDirection	Direction of absolute movement with Modulo. **0 / Shortest Distance**: Movement with shortest distance **1 / Positive Direction**: Movement only in positive direction **2 / Negative Direction**: Movement only in negative direction If the parameter is set to 0, the drive calculates the shortest way to the new target position and starts the movement in the corresponding direction. If the distance to the target position is identical in positive and negative directions, the movement takes place in positive direction. Modified settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 2	UINT16 R/W per. -	CANopen 3006:3B$_h$ Modbus 1654

Multiple Modulo Range for Absolute Movements

The parameter *MOD_AbsMultiRng* lets you set a multiple modulo range for absolute movements.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MOD_AbsMultiRng	Multiple ranges for absolute movement with Modulo. **0 / Multiple Ranges Off**: Absolute movement in one modulo range **1 / Multiple Ranges On**: Absolute movement in multiple modulo ranges Modified settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 1	UINT16 R/W per. -	CANopen 3006:3C$_h$ Modbus 1656

Examples with Relative Movements

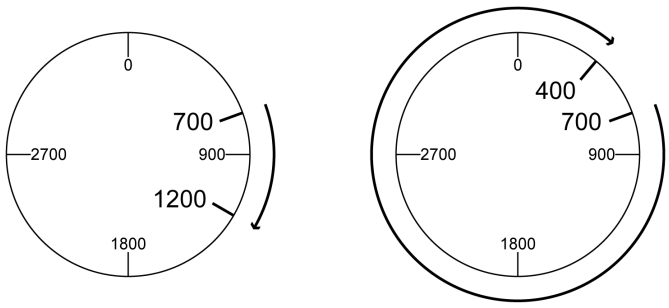
Assumptions

The settings below are assumed for the examples.

- Rotary motor
- Position scaling
  - Numerator: 1
  - Denominator: 3600
- Modulo range
  - Minimum position: 0 usr_p
  - Maximum position: 3600 usr_p
- Actual position: 700 usr_p

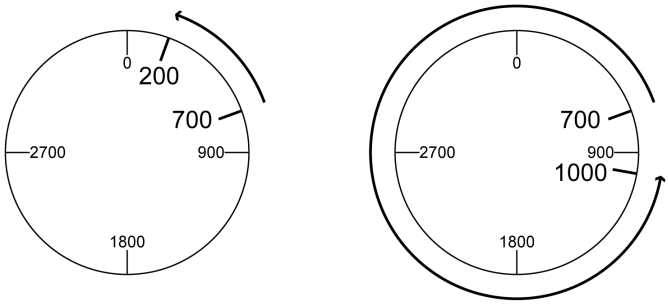
Example 1

Target positions relative: 500 usr_p and 3300 usr_p



Example 2

Target positions relative: -500 usr_p and -3300 usr_p



Examples with Absolute Movements and "Shortest Distance"

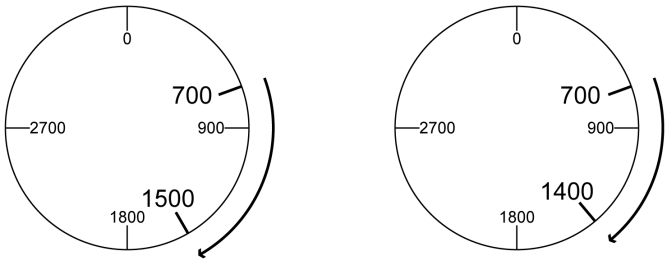
Assumptions

The settings below are assumed for the examples.

- Rotary motor
- Position scaling
  - Numerator: 1
  - Denominator: 3600
- Modulo range
  - Minimum position: 0 usr_p
  - Maximum position: 3600 usr_p
- Actual position: 700 usr_p

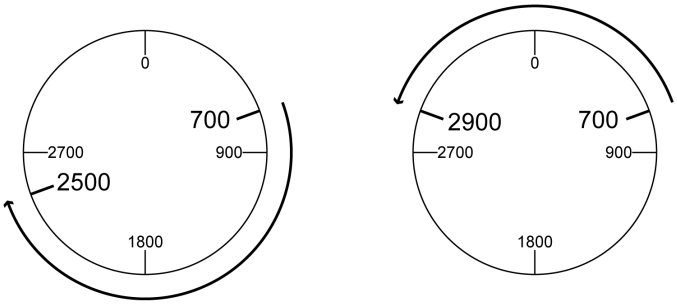
Example 1

Target positions absolute: 1500 usr_p and 5000 usr_p



Example 2

Target positions absolute: 2500 usr_p and 2900 usr_p



Examples with Absolute Movements and "Positive Direction"

Assumptions

The settings below are assumed for the examples.

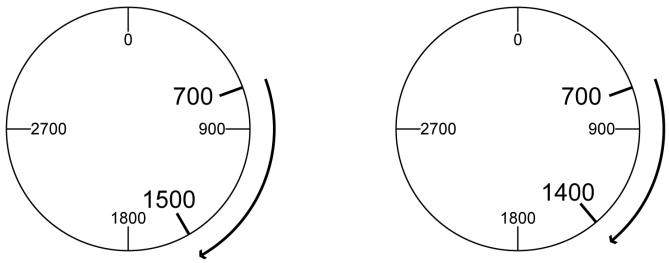
- Rotary motor
- Position scaling
  - Numerator: 1
  - Denominator: 3600
- Modulo range
  - Minimum position: 0 usr_p
  - Maximum position: 3600 usr_p
- Actual position: 700 usr_p

Parameter *MOD_AbsDirection*: Positive Direction

Example 1

Parameter *MOD_AbsMultiRng*: Off

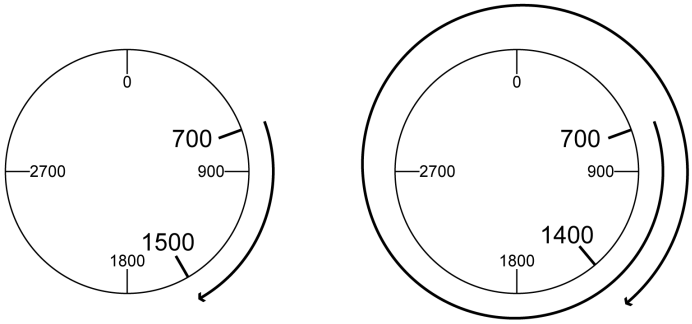
Target positions absolute: 1500 usr_p and 5000 usr_p



Example 2

Parameter *MOD_AbsMultiRng*: On

Target positions absolute: 1500 usr_p and 5000 usr_p



Examples with Absolute Movements and "Negative Direction"

Assumptions

The settings below are assumed for the examples.

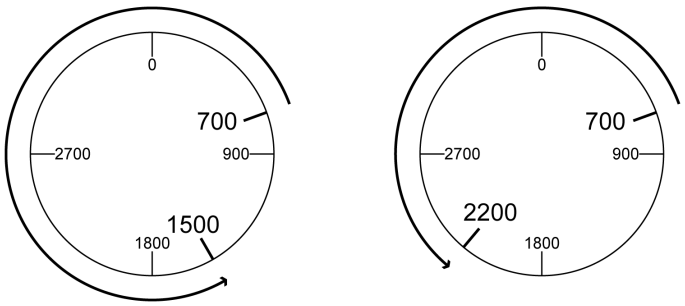
- Rotary motor
- Position scaling
  - Numerator: 1
  - Denominator: 3600
- Modulo range
  - Minimum position: 0 usr_p
  - Maximum position: 3600 usr_p
- Actual position: 700 usr_p

Parameter *MOD_AbsDirection*: Negative Direction

Example 1

Parameter *MOD_AbsMultiRng*: Off

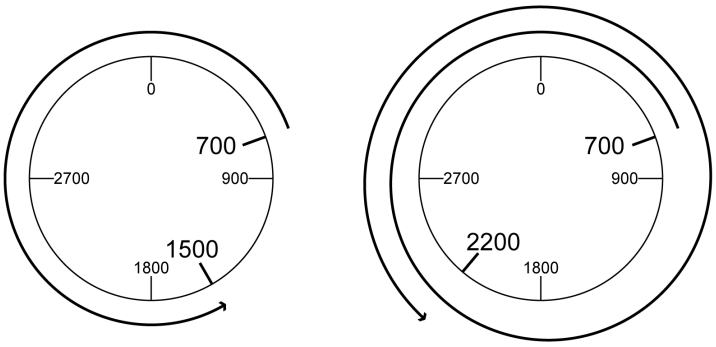
Target positions absolute: 1500 usr_p and -5000 usr_p



Example 2

Parameter *MOD_AbsMultiRng*: On

Target positions absolute: 1500 usr_p and -5000 usr_p

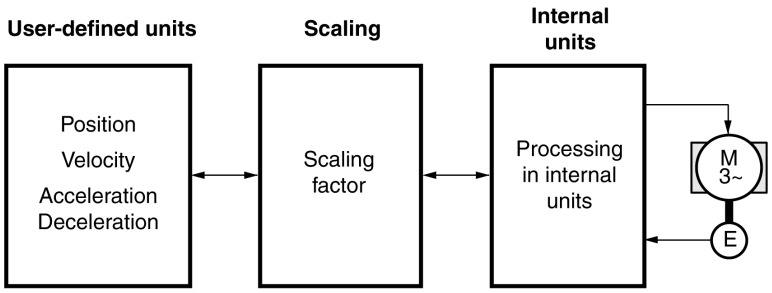

0
700
2700
900
1500
1800
0
700
2700
900
2200
1800

Scaling

General

Overview

Scaling converts user-defined units into internal units of the device, and vice versa.



User-Defined Units

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

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

Modifying the scaling modifies the ratio between user-defined units and internal units. After a modification to the scaling, the same value of a parameter specified in a user-defined unit causes a different movement than before the modification. A modification of the scaling affects all parameters whose values are specified in user-defined units.

⚠WARNING

UNINTENDED MOVEMENT

- Verify all parameters with user-defined units before modifying the scaling factor.
- Verify that a modification of the scaling factor cannot cause unintended movements.

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

Scaling Factor

The scaling factor is the relationship between the motor movement and the required user-defined units.

Commissioning Software

As of firmware version ≥V01.06, you can adjust the scaling via the commissioning software. The parameters with user-defined units are automatically adjusted.

Configuration of Position Scaling

Description

Position scaling is the relationship between the number of motor revolutions and the required user-defined units (usr_p).

Scaling Factor

Position scaling is specified by means of scaling factor:

In the case of a rotary motor, the scaling factor is calculated as shown below:

$$\frac{\text{Number of revolutions of the motor}}{\text{Number of user-defined units [usr_p]}}$$

A new scaling factor is activated when you specify the numerator value.

With a scaling factor of < 1 / 131072, it is not possible to perform a movement outside of the movement range.

Factory Setting

The following factory settings are used:

1 motor revolution corresponds to 16384 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**
ScalePOSnum	Position scaling: Numerator. Specification of the scaling factor: Motor revolutions ---------- User-defined units [usr_p] A new scaling is activated when the numerator value is supplied. Setting can only be modified if power stage is disabled. Modified settings become active immediately.	revolution 1 1 2147483647	INT32 R/W per. -	CANopen 3006:8$_h$ Modbus 1552
ScalePOSdenom	Position scaling: Denominator. Refer to numerator (ScalePOSnum) for a description. A new scaling is activated when the numerator value is supplied. Setting can only be modified if power stage is disabled.	usr_p 1 16384 2147483647	INT32 R/W per. -	CANopen 3006:7$_h$ Modbus 1550

Configuration of Velocity Scaling

Description

Velocity scaling is the relationship between the number of motor revolutions per minute and the required user-defined units (usr_v).

Scaling Factor

Velocity scaling is specified by means of scaling factor:

In the case of a rotary motor, the scaling factor is calculated as shown below:

$$\frac{\text{Number of revolutions of the motor per minute}}{\text{Number of user-defined units [usr_v]}}$$

Factory Setting

The following factory settings are used:

1 motor revolution per minute corresponds to 1 user-defined unit

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
ScaleVELnum	Velocity scaling: Numerator. Specification of the scaling factor: Speed of rotation of motor [RPM] ---------- User-defined units [usr_v] A new scaling is activated when the numerator value is supplied. Setting can only be modified if power stage is disabled. Modified settings become active immediately.	RPM 1 1 2147483647	INT32 R/W per. -	CANopen 3006:22$_h$ Modbus 1604
ScaleVELdenom	Velocity scaling: Denominator. See numerator (ScaleVELnum) for a description. A new scaling is activated when the numerator value is supplied. Setting can only be modified if power stage is disabled.	usr_v 1 1 2147483647	INT32 R/W per. -	CANopen 3006:21$_h$ Modbus 1602

Configuration of Ramp Scaling

Description

Ramp scaling is the relationship between the change in velocity and the required user-defined units (usr_a).

Scaling Factor

Ramp scaling is specified by means of scaling factor:

$$\frac{\text{Velocity change per second}}{\text{Number of user-defined units [usr_a]}}$$

Factory Setting

The following factory settings are used:

A change of 1 motor revolution per minute per second corresponds to 1 user-defined unit.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
ScaleRAMPnum	Ramp scaling: Numerator. Setting can only be modified if power stage is disabled. Modified settings become active immediately.	RPM/s 1 1 2147483647	INT32 R/W per. -	CANopen 3006:31$_h$ Modbus 1634
ScaleRAMPdenom	Ramp scaling: Denominator. See numerator (ScaleRAMPnum) for a description. A new scaling is activated when the numerator value is supplied. Setting can only be modified if power stage is disabled.	usr_a 1 1 2147483647	INT32 R/W per. -	CANopen 3006:30$_h$ Modbus 1632

Digital Signal Inputs and Digital Signal Outputs

Parameterization of the Signal Input Functions

Signal Input Function

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

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the wiring is appropriate for the factory settings and any subsequent parameterizations.
- Only start the system if there are no persons or obstructions in the zone of operation.
- Carefully run tests for all operating states and potential error situations when commissioning, upgrading or otherwise modifying the operation of the drive.

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

Factory Settings

The table below shows the factory settings of the digital signal inputs:

Signal	Signal input function
DI0	Freely Available
DI1	Reference Switch (REF)
DI2	Positive Limit Switch (LIMP)
DI3	Negative Limit Switch (LIMN)

Parameterization

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

Signal input function	Description in section
Freely Available	Setting a Signal Output via Parameter, page 244
Fault Reset	Changing the Operating State via Signal Inputs, page 202
Enable	Changing the Operating State via Signal Inputs, page 202
Halt	Stopping Movement with Halt, page 239
Start Profile Positioning	Starting a Movement via a Signal Input, page 245
Current Limitation	Limitation of the Current via Signal Inputs, page 243
Zero Clamp	Zero Clamp, page 244
Velocity Limitation	Limitation of the Velocity via Signal Inputs, page 242
Reference Switch (REF)	Reference Switch, page 260
Positive Limit Switch (LIMP)	Limit Switches, page 259
Negative Limit Switch (LIMN)	Limit Switches, page 259
Switch Controller Parameter Set	Switching Between Control Loop Parameter Sets, page 184
Velocity Controller Integral Off	Switching Between Control Loop Parameter Sets, page 184
Start Signal Of RMAC	Relative Movement After Capture (RMAC), page 253
Activate RMAC	Relative Movement After Capture (RMAC), page 253
Release Holding Brake	Releasing the Holding Brake Manually, page 128

The following parameters can be used to parameterize the digital signal inputs:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persis-tent Expert	Parameter address via fieldbus
IOfunct_DI0 CONF → I-O- dI0	Function Input DI0. **1 / Freely Available /** noAnE: Available as required **2 / Fault Reset /** FrES: Fault reset after error **3 / Enable /** EnAb: Enables the power stage **4 / Halt /** hALt: Halt **5 / Start Profile Positioning /** SPtP: Start request for movement **6 / Current Limitation /** IL IM: Limits the current to parameter value **7 / Zero Clamp /** CLMP: Zero clamping **8 / Velocity Limitation /** VL IM: Limits the velocity to parameter value **21 / Reference Switch (REF) /** rEF: Reference switch **22 / Positive Limit Switch (LIMP) /** L IMP: Positive limit switch **23 / Negative Limit Switch (LIMN) /** L IMn: Negative limit switch **24 / Switch Controller Parameter Set /** CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off /** EnoF: Switches off velocity controller integral term **30 / Start Signal Of RMAC /** SrMc: Start signal of relative movement after capture (RMAC) **31 / Activate RMAC /** ArMc: Activates the relative movement after capture (RMAC) **40 / Release Holding Brake /** rEhb: Releases the holding brake Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.	- - - -	UINT16 R/W per. -	CANopen 3007:1h Modbus 1794
IOfunct_DI1 CONF → I-O- dI1	Function Input DI1. **1 / Freely Available /** noAnE: Available as required **2 / Fault Reset /** FrES: Fault reset after error **3 / Enable /** EnAb: Enables the power stage **4 / Halt /** hALt: Halt **5 / Start Profile Positioning /** SPtP: Start request for movement **6 / Current Limitation /** IL IM: Limits the current to parameter value **7 / Zero Clamp /** CLMP: Zero clamping **8 / Velocity Limitation /** VL IM: Limits the velocity to parameter value **21 / Reference Switch (REF) /** rEF: Reference switch **22 / Positive Limit Switch (LIMP) /** L IMP: Positive limit switch **23 / Negative Limit Switch (LIMN) /** L IMn: Negative limit switch	- - - -	UINT16 R/W per. -	CANopen 3007:2h Modbus 1796

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persis-tent Expert	Parameter address via fieldbus
	24 / Switch Controller Parameter Set / CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off /** tnoF: Switches off velocity controller integral term **30 / Start Signal Of RMAC /** Srnc: Start signal of relative movement after capture (RMAC) **31 / Activate RMAC /** Arnc: Activates the relative movement after capture (RMAC) **40 / Release Holding Brake /** rEhb: Releases the holding brake Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.			
IOfunct_DI2 Conf → I-O- di2	Function Input DI2. **1 / Freely Available /** nonE: Available as required **2 / Fault Reset /** FrES: Fault reset after error **3 / Enable /** EnAb: Enables the power stage **4 / Halt /** hALt: Halt **5 / Start Profile Positioning /** SPtP: Start request for movement **6 / Current Limitation /** iLim: Limits the current to parameter value **7 / Zero Clamp /** CLMP: Zero clamping **8 / Velocity Limitation /** VLim: Limits the velocity to parameter value **21 / Reference Switch (REF) /** rEF: Reference switch **22 / Positive Limit Switch (LIMP) /** LimP: Positive limit switch **23 / Negative Limit Switch (LIMN) /** Limn: Negative limit switch **24 / Switch Controller Parameter Set /** CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off /** tnoF: Switches off velocity controller integral term **30 / Start Signal Of RMAC /** Srnc: Start signal of relative movement after capture (RMAC) **31 / Activate RMAC /** Arnc: Activates the relative movement after capture (RMAC) **40 / Release Holding Brake /** rEhb: Releases the holding brake Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.	- - - -	UINT16 R/W per. -	CANopen 3007:3$_h$ Modbus 1798

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persis-tent Expert	Parameter address via fieldbus
IOfunct_DI3 CONF → I-O- dI3	Function Input DI3. **1 / Freely Available /** noAE: Available as required **2 / Fault Reset /** FrES: Fault reset after error **3 / Enable /** EnAb: Enables the power stage **4 / Halt /** hALt: Halt **5 / Start Profile Positioning /** SPtP: Start request for movement **6 / Current Limitation /** IL IM: Limits the current to parameter value **7 / Zero Clamp /** CLMP: Zero clamping **8 / Velocity Limitation /** VL IM: Limits the velocity to parameter value **21 / Reference Switch (REF) /** rEF: Reference switch **22 / Positive Limit Switch (LIMP) /** L IMP: Positive limit switch **23 / Negative Limit Switch (LIMN) /** L IMn: Negative limit switch **24 / Switch Controller Parameter Set /** CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off /** EnoF: Switches off velocity controller integral term **30 / Start Signal Of RMAC /** SrMc: Start signal of relative movement after capture (RMAC) **31 / Activate RMAC /** ArMc: Activates the relative movement after capture (RMAC) **40 / Release Holding Brake /** rEHb: Releases the holding brake Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.	- - - -	UINT16 R/W per. -	CANopen 3007:4h Modbus 1800

Parameterization of the Signal Output Functions

Signal Output Function

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

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the wiring is appropriate for the factory settings and any subsequent parameterizations.
- Only start the system if there are no persons or obstructions in the zone of operation.
- Carefully run tests for all operating states and potential error situations when commissioning, upgrading or otherwise modifying the operation of the drive.

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

In the case of a detected error the state of the signal outputs remains active according to assigned signal output function.

Factory Settings

The table below shows the factory settings of the digital signal outputs:

Signal	Signal output function
DQ0	No Fault
DQ1	Active

Parameterization

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

Signal output function	Description in section
Freely Available	Setting a Signal Output via Parameter, page 244
No Fault	Indication of the Operating State via Signal Inputs, page 201
Active	Indication of the Operating State via Signal Inputs, page 201
RMAC Active Or Finished	Relative Movement After Capture (RMAC), page 253
In Position Deviation Window	Position Deviation Window, page 276
In Velocity Deviation Window	Velocity Deviation Window, page 278
Velocity Below Threshold	Velocity Threshold Value, page 280
Current Below Threshold	Current Threshold Value, page 281
Halt Acknowledge	Stopping Movement with Halt, page 239
Motor Standstill	Motor Standstill and Direction of Movement, page 266
Selected Error	Indicating Error Messages, page 299
Drive Referenced (ref_ok)	Operating Mode Homing, page 226
Selected Warning	Indicating Error Messages, page 299
Position Register Channel 1	Position Register, page 270
Position Register Channel 2	Position Register, page 270
Position Register Channel 3	Position Register, page 270
Position Register Channel 4	Position Register, page 270
Motor Moves Positive	Motor Standstill and Direction of Movement, page 266
Motor Moves Negative	Motor Standstill and Direction of Movement, page 266

The following parameters can be used to parameterize the digital signal outputs:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DQ0 CONF → I-O- dO0	Function Output DQ0. **1 / Freely Available /** nonE: Available as required **2 / No Fault /** nFLt: Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active /** Act1: Signals operating state Operation Enabled **4 / RMAC Active Or Finished /** rMcA: Relative movement after capture active or finished (RMAC) **5 / In Position Deviation Window /** In-P: Position deviation is within window **6 / In Velocity Deviation Window /** In-V: Velocity deviation is within window **7 / Velocity Below Threshold /** VthR: Motor velocity below threshold **8 / Current Below Threshold /** ItHr: Motor current below threshold **9 / Halt Acknowledge /** hALt: Halt acknowledgement **13 / Motor Standstill /** MStd: Motor at a standstill **14 / Selected Error /** SErr: One of the specified errors of error classes 1 … 4 is active **15 / Valid Reference (ref_ok) /** rEFo: Zero point is valid (ref_ok) **16 / Selected Warning /** SWrn: One of the specified errors of error class 0 is active **18 / Position Register Channel 1 /** PrC1: Position register channel 1 **19 / Position Register Channel 2 /** PrC2: Position register channel 2 **20 / Position Register Channel 3 /** PrC3: Position register channel 3 **21 / Position Register Channel 4 /** PrC4: Position register channel 4 **22 / Motor Moves Positive /** MPoS: Motor moves in positive direction **23 / Motor Moves Negative /** MnEG: Motor moves in negative direction Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.	- - - -	UINT16 R/W per. -	CANopen 3007:9_h Modbus 1810
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 /** Act1: Signals operating state Operation Enabled	- - - -	UINT16 R/W per. -	CANopen 3007:A_h Modbus 1812

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
	4 / RMAC Active Or Finished / rMcA: Relative movement after capture active or finished (RMAC) **5 / In Position Deviation Window /** inP: Position deviation is within window **6 / In Velocity Deviation Window /** inV: Velocity deviation is within window **7 / Velocity Below Threshold /** VEhr: Motor velocity below threshold **8 / Current Below Threshold /** iEhr: Motor current below threshold **9 / Halt Acknowledge /** hALt: Halt acknowledgement **13 / Motor Standstill /** MStd: Motor at a standstill **14 / Selected Error /** SErr: One of the specified errors of error classes 1 … 4 is active **15 / Valid Reference (ref_ok) /** rEFo: Zero point is valid (ref_ok) **16 / Selected Warning /** SWrn: One of the specified errors of error class 0 is active **18 / Position Register Channel 1 /** PrC1: Position register channel 1 **19 / Position Register Channel 2 /** PrC2: Position register channel 2 **20 / Position Register Channel 3 /** PrC3: Position register channel 3 **21 / Position Register Channel 4 /** PrC4: Position register channel 4 **22 / Motor Moves Positive /** MPoS: Motor moves in positive direction **23 / Motor Moves Negative /** MnEG: Motor moves in negative direction Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.			

Parameterization of Software Debouncing

Debounce Time

Signal input debouncing comprises hardware debouncing and software debouncing.

Hardware debounce time is permanently set, see Digital Input Signals 24 V (Hardware switching time), page 37.

When a set signal function is modified, software debouncing is reset to the factory setting on the next power cycle.

The software debounce time can be set via the following parameters.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
DI_0_Debounce	Debounce time of DI0. **0 / No**: 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 Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 6 6	UINT16 R/W per. -	CANopen 3008:20_h Modbus 2112
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 Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 6 6	UINT16 R/W per. -	CANopen 3008:21_h Modbus 2114

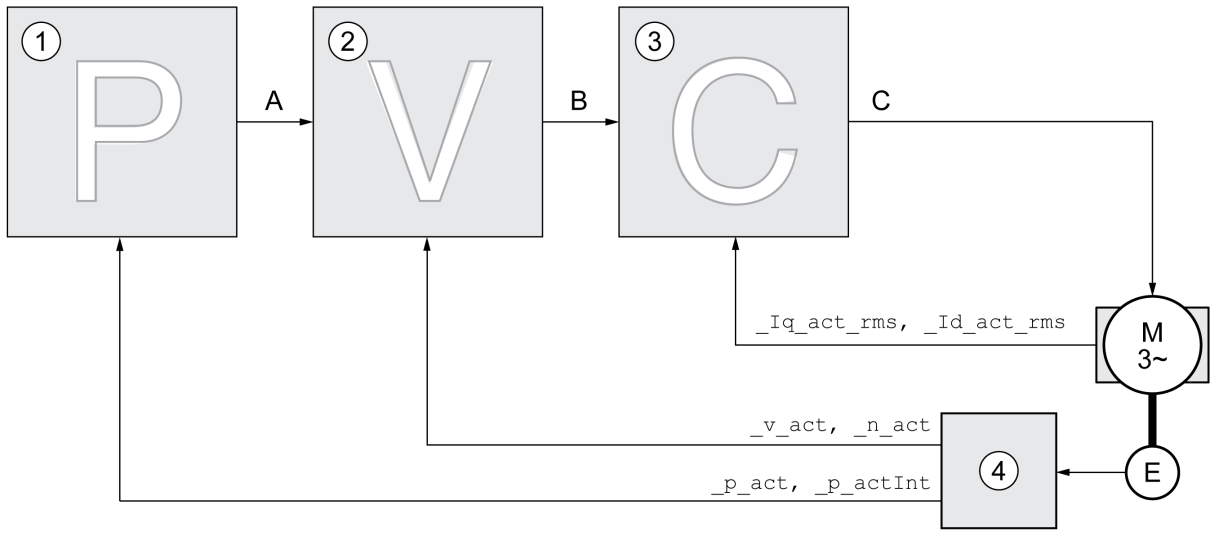
Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
DI_2_Debounce	Debounce time of DI2. **0 / No**: No software debouncing **1 / 0.25 ms**: 0.25 ms **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 Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 6 6	UINT16 R/W per. -	CANopen 3008:22$_h$ Modbus 2116
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 Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 6 6	UINT16 R/W per. -	CANopen 3008:23$_h$ Modbus 2118

Switching Between Control Loop Parameter Sets

Overview of the Controller Structure

General

The illustration below provides an overview of the controller structure.



1 Position controller

2 Velocity controller

3 Current controller

4 Encoder evaluation

Position Controller

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

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

Velocity Controller

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

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

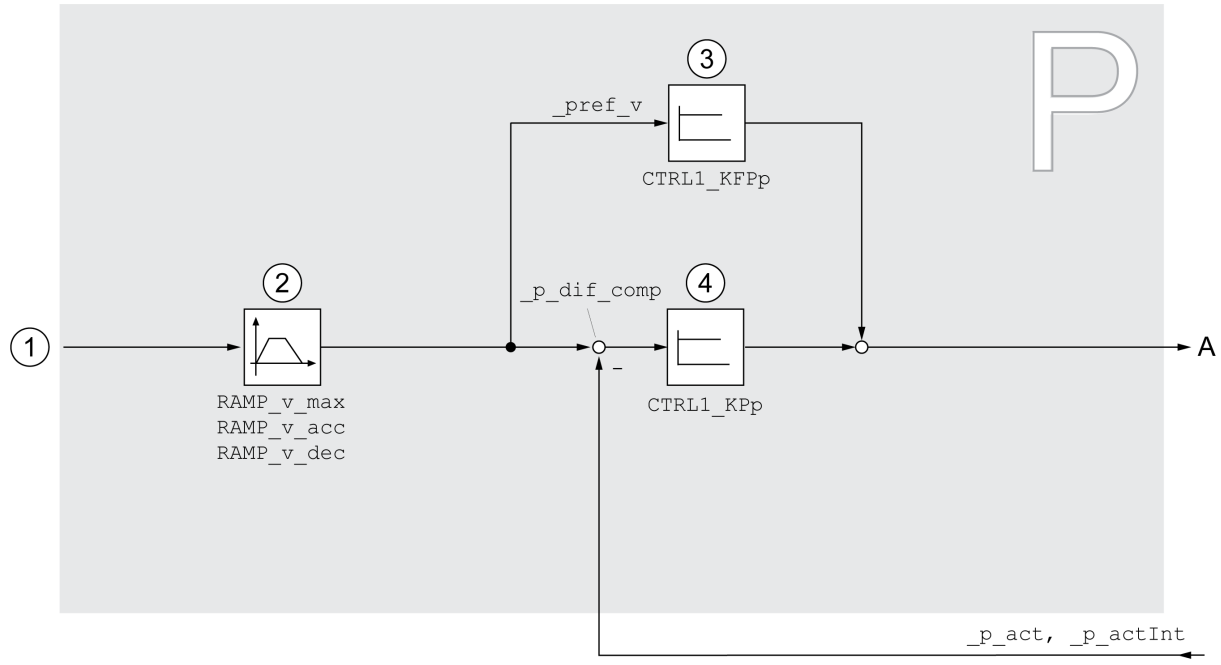
Current Controller

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

Overview of Position Controller

Overview

The illustration below provides an overview of the position controller.



1 Target values for the operating modes Jog, Profile Position and Homing

2 Motion profile for the velocity

3 Velocity feed-forward control

4 Position controller

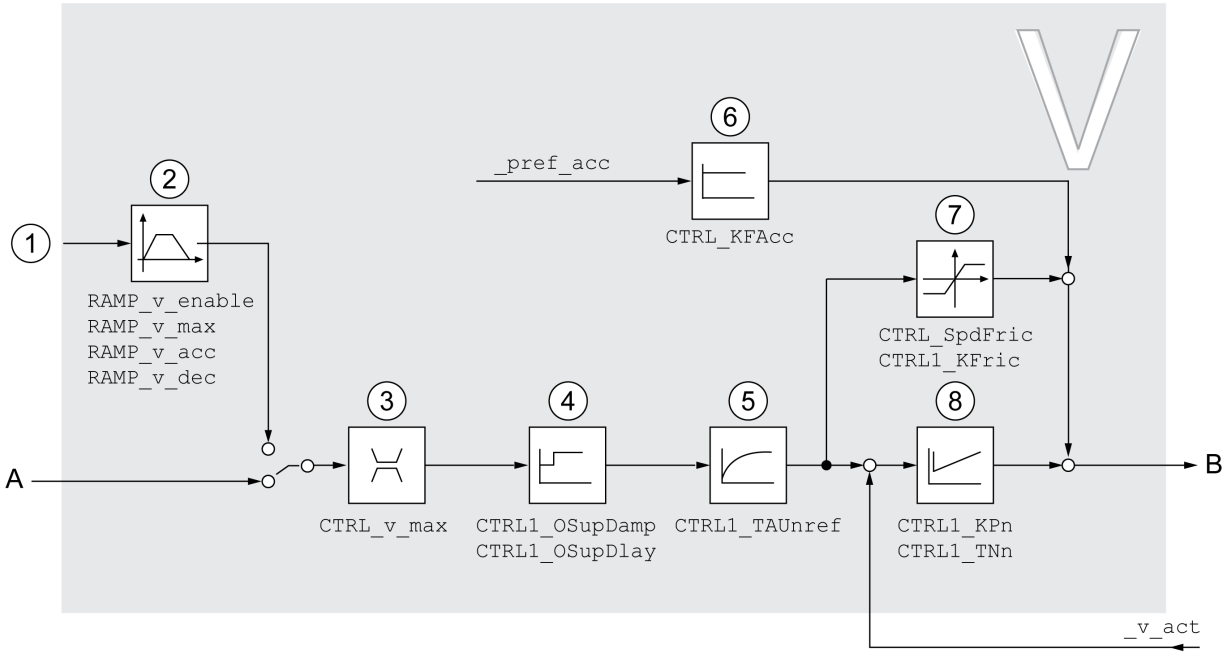
Sampling Period

The sampling period of the position controller is 250 µs.

Overview of Velocity Controller

Overview

The illustration below provides an overview of the velocity controller.



1 Target values for the operating mode Profile Velocity

2 Motion profile for the velocity

3 Velocity limitation

4 Overshoot suppression filter (parameter accessible in Expert mode)

5 Filter time constant of the reference velocity value filter

6 Acceleration feed forward control (parameter accessible in Expert mode)

7 Friction compensation (parameter accessible in Expert mode)

8 Velocity Loop Controller

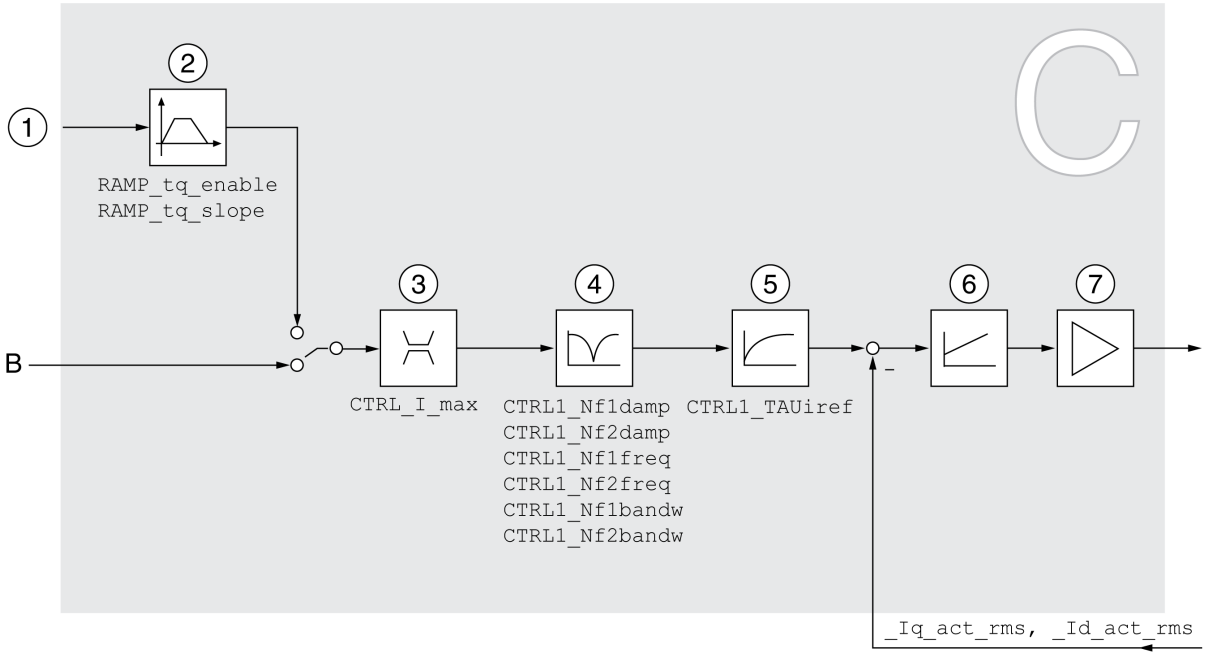
Sampling Period

The sampling period of the velocity controller is 62.5 µs.

Overview of Current Controller

Overview

The illustration below provides an overview of the current controller.



1 Target values for the operating mode Profile Torque

2 Motion profile for the torque

3 Current limitation

4 Notch filter (parameter accessible in Expert mode)

5 Filter time constant of the reference current value filter

6 Current controller

7 Power stage

Sampling Period

The sampling period of the current controller is 62.5 µs.

Parameterizable Control Loop Parameters

Control Loop Parameter Set

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

A control loop parameter set consists of freely accessible parameters and parameters which are only accessible in Expert mode.

Control loop parameter set 1	Control loop parameter set 2
Freely accessible parameters:	Freely accessible parameters:
CTRL1_KPn	*CTRL2_KPn*
CTRL1_TNn	*CTRL2_TNn*
CTRL1_KPp	*CTRL2_KPp*
CTRL1_TAUiref	*CTRL2_TAUiref*
CTRL1_TAUnref	*CTRL2_TAUnref*
CTRL1_KFPp	*CTRL2_KFPp*
Parameters only accessible in expert mode:	Parameters only accessible in expert mode:
CTRL1_Nf1damp	*CTRL2_Nf1damp*
CTRL1_Nf1freq	*CTRL2_Nf1freq*
CTRL1_Nf1bandw	*CTRL2_Nf1bandw*
CTRL1_Nf2damp	*CTRL2_Nf2damp*
CTRL1_Nf2freq	*CTRL2_Nf2freq*
CTRL1_Nf2bandw	*CTRL2_Nf2bandw*
CTRL1_Osupdamp	*CTRL2_Osupdamp*
CTRL1_Osupdelay	*CTRL2_Osupdelay*
CTRL1_Kfric	*CTRL2_Kfric*

See sections Control Loop Parameter Set 1, page 193 and Control Loop Parameter Set 2, page 195.

Parameterization

- Selecting a control loop parameter set

  Select a control loop parameter set after switching on.

  See Selecting a Control Loop Parameter Set, page 188.
- Automatically switching between control loop parameter sets

  It is possible to switch between the two control loop parameter sets.

  See Automatically Switching Between Control Loop Parameter Sets, page 189.
- Copying a control loop parameter set

  The values of control loop parameter set 1 can be copied to control loop parameter set 2.

  See Copying a Control Loop Parameter Set, page 192.
- Deactivating the integral term

  The integral term and, by implication, the integral action time, can be deactivated via a digital signal input.

  See Deactivating the Integral Term, page 193.

Selecting a Control Loop Parameter Set

Description

The active control loop parameter set is indicated via the parameter *_CTRL_ActParSet*.

The parameter *CTRL_PwrUpParSet* allows you to set the control loop parameter set to be activated after powering on. Alternatively, you can set whether or not the product is to switch automatically between the two control loop parameter sets.

The parameter *CTRL_SelParSet* allows you to switch between the two control loop parameter sets during operation.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_CTRL_ActParSet	Active control loop parameter set. Value 1: Control loop parameter set 1 is active Value 2: Control loop parameter set 2 is active A control loop parameter set is active after the time for the parameter switching (CTRL_ ParChgTime) has elapsed.	- - - -	UINT16 R/- - -	CANopen 3011:17$_h$ Modbus 4398
CTRL_PwrUpParSet	Selection of control loop parameter set at power up. **0 / Switching Condition**: The switching condition is used for control loop parameter set switching **1 / Parameter Set 1**: Control loop parameter set 1 is used **2 / Parameter Set 2**: Control loop parameter set 2 is used The selected value is also written to CTRL_ SelParSet (non-persistent). Modified settings become active immediately.	- 0 1 2	UINT16 R/W per. -	CANopen 3011:18$_h$ Modbus 4400
CTRL_SelParSet	Selection of control loop parameter set. Coding see parameter: CTRL_PwrUpParSet Modified settings become active immediately.	- 0 1 2	UINT16 R/W - -	CANopen 3011:19$_h$ Modbus 4402

Automatically Switching Between Control Loop Parameter Sets

Description

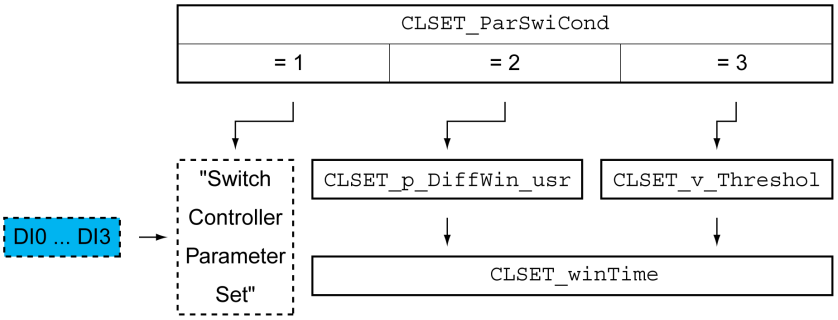
It is possible to automatically switch between the two control loop parameter sets.

The following criteria can be set for switching between the control loop parameter sets:

- Digital signal input
- Position deviation window
- Target velocity below parameterizable value
- Actual velocity below parameterizable value

Settings

The illustration below provides an overview of switching between the parameter sets.



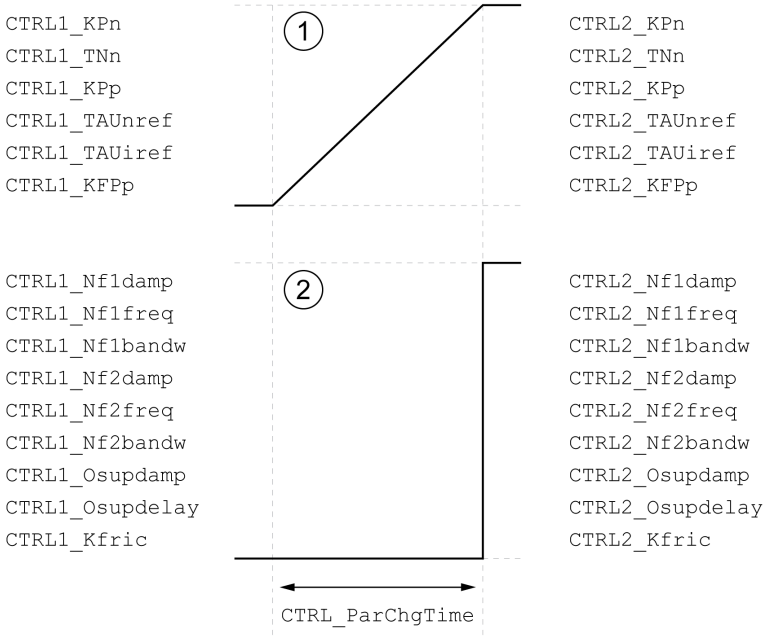
Time Chart

The freely accessible parameters are changed linearly. This linear change of the values of control loop parameter set 1 to the values of control loop parameter set 2 takes place during the parameterizable time *CTRL_ParChgTime*.

The parameters only accessible in Expert mode are directly changed to the values of the other control loop parameter set after the parameterizable time *CTRL_ ParChgTime* has passed.

The figure below shows the time chart for switching the control loop parameters.

Time chart for switching the control loop parameter sets



1 Freely accessible parameters are changed linearly over time

2 Parameters which are only accessible in Expert mode are switched over directly

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
CLSET_ParSwiCond	Condition for parameter set switching. **0 / None Or Digital Input**: None or digital input function selected **1 / Inside Position Deviation**: Inside position deviation (value definition in parameter CLSET_p_DiffWin) **2 / Below Reference Velocity**: Below reference velocity (value definition in parameter CLSET_v_Threshol) **3 / Below Actual Velocity**: Below actual velocity (value definition in parameter CLSET_v_Threshol) **4 / Reserved**: Reserved In the case of parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp The following parameters are changed immediately after the time for parameter set switching (CTRL_ParChgTime): - CTRL_Nf1damp - CTRL_Nf1freq - CTRL_Nf1bandw - CTRL_Nf2damp - CTRL_Nf2freq - CTRL_Nf2bandw - CTRL_Osupdamp - CTRL_Osupdelay - CTRL_Kfric Modified settings become active immediately.	- 0 0 4	UINT16 R/W per. -	CANopen 3011:1A$_h$ Modbus 4404
CLSET_p_DiffWin_usr	Position deviation for control loop parameter set switching. If the position deviation of the position controller is less than the value of this parameter, control loop parameter set 2 is used. Otherwise, control loop parameter set 1 is used. The minimum value, the factory setting and the maximum value depend on the scaling factor. Modified settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 164 2147483647	INT32 R/W per. -	CANopen 3011:25$_h$ Modbus 4426

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_v_Threshol	Velocity threshold for control loop parameter set switching. If the reference velocity or the actual velocity are less than the value of this parameter, control loop parameter set 2 is used. Otherwise, control loop parameter set 1 is used. Modified settings become active immediately.	usr_v 0 50 2147483647	UINT32 R/W per. -	CANopen 3011:1D$_h$ Modbus 4410
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. Modified settings become active immediately.	ms 0 0 1000	UINT16 R/W per. -	CANopen 3011:1B$_h$ Modbus 4406
CTRL_ParChgTime	Period of time for control loop parameter set switching. In the case of control loop parameter set switching, the values of the following parameters are changed linearly: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp Modified settings become active immediately.	ms 0 0 2000	UINT16 R/W per. -	CANopen 3011:14$_h$ Modbus 4392

Copying a Control Loop Parameter Set

Description

The parameter *CTRL_ParSetCopy* allows you to copy the values of control loop parameter set 1 to control loop parameter set 2 or the values of control loop parameter set 2 to control loop parameter set 1.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL_ParSetCopy	Control loop parameter set copying. Value 1: Copy control loop parameter set 1 to set 2 Value 2: Copy control loop parameter set 2 to set 1 If control loop parameter set 2 is copied to control loop parameter set 1, the parameter CTRL_ GlobGain is set to 100%. Modified settings become active immediately.	- 0.0 - 0.2	UINT16 R/W - -	CANopen 3011:16$_h$ Modbus 4396

Deactivating the Integral Term

Description

The integral term of the velocity controller can be deactivated via the signal input function "Velocity Controller Integral Off". If the integral term is deactivated, the integral action time of the velocity controller (*CTRL1_TNn* and *CTRL2_TNn*) is implicitly and gradually reduced to zero. The time it takes to reduce the value to zero depends on the parameter *CTRL_ParChgTime*. In the case of vertical axes, the integral term is needed to reduce position deviations during standstill.

Control Loop Parameter Set 1

Overview

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
CTRL1_KPn CONF → DRC- PnI	Velocity controller P gain. The default value is calculated on the basis of the motor parameters. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.0001 A/RPM. Modified settings become active immediately.	A/RPM 0.0001 - 2.5400	UINT16 R/W per. -	CANopen 3012:1$_h$ Modbus 4610
CTRL1_TNn CONF → DRC- tnI	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	CANopen 3012:2$_h$ Modbus 4612
CTRL1_KPp CONF → DRC- PPI	Position controller P gain. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 1/s. Modified settings become active immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	CANopen 3012:3$_h$ Modbus 4614
CTRL1_TAUiref	Filter time constant of the reference current value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	CANopen 3012:5$_h$ Modbus 4618

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 - tAu 1	Filter time constant of the reference velocity value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	CANopen 3012:4$_h$ Modbus 4616
CTRL1_KFPp ConF → drC - FPP 1	Velocity feed-forward control. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 %. Modified settings become active immediately.	% 0.0 0.0 200.0	UINT16 R/W per. -	CANopen 3012:6$_h$ Modbus 4620
CTRL1_Nf1damp	Notch filter 1: Damping. In increments of 0.1 %. Modified settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	CANopen 3012:8$_h$ Modbus 4624
CTRL1_Nf1freq	Notch filter 1: Frequency. The filter is deactivated at a value of 15000. In increments of 0.1 Hz. Modified settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	CANopen 3012:9$_h$ Modbus 4626
CTRL1_Nf1bandw	Notch filter 1: Bandwidth. Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Modified settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	CANopen 3012:A$_h$ Modbus 4628
CTRL1_Nf2damp	Notch filter 2: Damping. In increments of 0.1 %. Modified settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	CANopen 3012:B$_h$ Modbus 4630
CTRL1_Nf2freq	Notch filter 2: Frequency. The filter is deactivated at a value of 15000. In increments of 0.1 Hz. Modified settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	CANopen 3012:C$_h$ Modbus 4632
CTRL1_Nf2bandw	Notch filter 2: Bandwidth. Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Modified settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	CANopen 3012:D$_h$ Modbus 4634
CTRL1_Osupdamp	Overshoot suppression filter: Damping. The filter is deactivated at a value of 0. In increments of 0.1 %. Modified settings become active immediately.	% 0.0 0.0 50.0	UINT16 R/W per. expert	CANopen 3012:E$_h$ Modbus 4636

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_Osupdelay	Overshoot suppression filter: Time delay. The filter is deactivated at a value of 0. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 0.00 75.00	UINT16 R/W per. expert	CANopen 3012:F_h Modbus 4638
CTRL1_Kfric	Friction compensation: Gain. In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} 0.00 0.00 10.00	UINT16 R/W per. expert	CANopen 3012:10_h Modbus 4640

Control Loop Parameter Set 2

Overview

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL2_KPn CONF → DRC - Pn2	Velocity controller P gain. The default value is calculated on the basis of the motor parameters. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.0001 A/RPM. Modified settings become active immediately.	A/RPM 0.0001 - 2.5400	UINT16 R/W per. -	CANopen 3013:1_h Modbus 4866
CTRL2_TNn CONF → DRC - tn2	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	CANopen 3013:2_h Modbus 4868
CTRL2_KPp CONF → DRC - PP2	Position controller P gain. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 1/s. Modified settings become active immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	CANopen 3013:3_h Modbus 4870

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_TAUiref	Filter time constant of the reference current value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	CANopen 3013:5$_h$ Modbus 4874
CTRL2_TAUnref ConF → drC - tAu2	Filter time constant of the reference velocity value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	CANopen 3013:4$_h$ Modbus 4872
CTRL2_KFPp ConF → drC - FPP2	Velocity feed-forward control. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 %. Modified settings become active immediately.	% 0.0 0.0 200.0	UINT16 R/W per. -	CANopen 3013:6$_h$ Modbus 4876
CTRL2_Nf1damp	Notch filter 1: Damping. In increments of 0.1 %. Modified settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	CANopen 3013:8$_h$ Modbus 4880
CTRL2_Nf1freq	Notch filter 1: Frequency. The filter is deactivated at a value of 15000. In increments of 0.1 Hz. Modified settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	CANopen 3013:9$_h$ Modbus 4882
CTRL2_Nf1bandw	Notch filter 1: Bandwidth. Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Modified settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	CANopen 3013:A$_h$ Modbus 4884
CTRL2_Nf2damp	Notch filter 2: Damping. In increments of 0.1 %. Modified settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	CANopen 3013:B$_h$ Modbus 4886
CTRL2_Nf2freq	Notch filter 2: Frequency. The filter is deactivated at a value of 15000. In increments of 0.1 Hz. Modified settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	CANopen 3013:C$_h$ Modbus 4888

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_Nf2bandw	Notch filter 2: Bandwidth. Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Modified settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	CANopen 3013:D_h Modbus 4890
CTRL2_Osupdamp	Overshoot suppression filter: Damping. The filter is deactivated at a value of 0. In increments of 0.1 %. Modified settings become active immediately.	% 0.0 0.0 50.0	UINT16 R/W per. expert	CANopen 3013:E_h Modbus 4892
CTRL2_Osupdelay	Overshoot suppression filter: Time delay. The filter is deactivated at a value of 0. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 0.00 75.00	UINT16 R/W per. expert	CANopen 3013:F_h Modbus 4894
CTRL2_Kfric	Friction compensation: Gain. In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} 0.00 0.00 10.00	UINT16 R/W per. expert	CANopen 3013:10_h Modbus 4896

Operating States and Operating Modes

Operating States

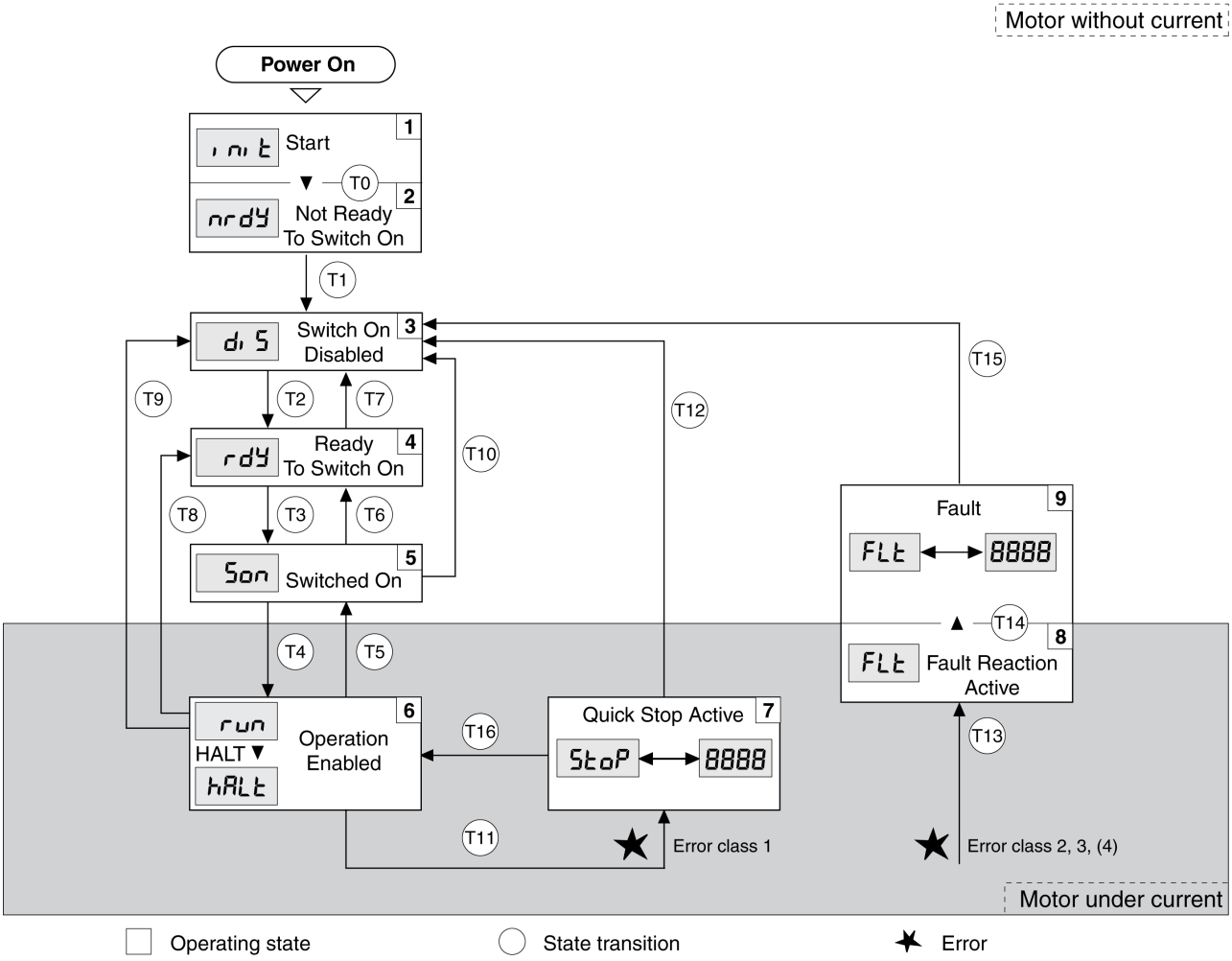
State Diagram and State Transitions

State Diagram

When the product is powered on and when an operating mode is started, the product goes through a number of operating states.

The state diagram (state machine) shows the relationships between the operating states and the state transitions.

The operating states are internally monitored and influenced by monitoring functions.



Operating States

Operating state	Description
1 Start	Electronics are initialized
2 Not Ready To Switch On	The power stage is not ready to switch on
3 Switch On Disabled	Impossible to enable the power stage
4 Ready To Switch On	The power stage is ready to switch on.
5 Switched On	Power stage is switched on
6 Operation Enabled	Power stage is enabled

Operating state	Description
	Selected operating mode is active
7 Quick Stop Active	"Quick Stop" is being executed
8 Fault Reaction Active	Error response is active
9 Fault	Error response terminated Power stage is disabled

Error Class

The errors are classified according to the following error classes:

Error class	State transition	Error response	Resetting an error message
0	-	No interruption of the movement	Function "Fault Reset"
1	T11	Stop movement with "Quick Stop"	Function "Fault Reset"
2	T13, T14	Stop movement with "Quick Stop" and disable the power stage when the motor has come to a standstill	Function "Fault Reset"
3	T13, T14	Disable the power stage immediately without stopping the movement first	Function "Fault Reset"
4	T13, T14	Disable the power stage immediately without stopping the movement first	Power cycle

Error Response

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

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

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

Resetting an Error Message

A "Fault Reset" resets an error message.

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

State Transitions

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

State transition	Operating state	Condition / event[1]	Response
T0	**1**-> **2**	• Device electronics successfully initialized	
T1	**2**-> **3**	• Parameter successfully initialized	

State transition	Operating state	Condition / event[1]	Response
T2	**3** -> **4**	• No undervoltage and Encoder successfully checked and Actual velocity: <1000 RPM and STO signals = +24V and fieldbus command: Shutdown[2]	
T3	**4** -> **5**	• Request for enabling the power stage • Fieldbus command: Switch On or Enable Operation	
T4	**5** -> **6**	• Automatic transition • Fieldbus command: Enable Operation	Power stage is enabled. User parameters are checked. Holding brake is released (if available).
T5	**6** -> **5**	• Fieldbus command: Disable Operation	Movement is canceled with "Halt". Holding brake is applied (if available). Power stage is disabled.
T6	**5** -> **4**	• Fieldbus command: Shutdown	
T7	**4** -> **3**	• Undervoltage • STO signals = 0V • Actual velocity: >1000 RPM (for example by external driving force) • Fieldbus command: Disable Voltage	-
T8	**6** -> **4**	• Fieldbus command: Shutdown	Movement is canceled with "Halt" or power stage is immediately disabled. Can be set via parameter *DSM_ShutDownOption*.
T9	**6** -> **3**	• Request for disabling the power stage • Fieldbus command: Disable Voltage	For “Request for disabling the power stage”: Movement is canceled with "Halt" or power stage is immediately disabled. Can be set via parameter *DSM_ShutDownOption*. For “Fieldbus command: Disable Voltage”: Power stage is disabled immediately.
T10	**5** -> **3**	• Request for disabling the power stage • Fieldbus command: Disable Voltage	
T11	**6** -> **7**	• Error of error class 1 • Fieldbus command: Quick Stop	Movement is canceled with "Quick Stop".
T12	**7** -> **3**	• Request for disabling the power stage • Fieldbus command: Disable Voltage	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" • Fieldbus command: Enable Operation[3]	In the event of a "Quick Stop" triggered by a detected error of class 1, a "Fault Reset" causes a direct transition to the operating state **6** Operation Enabled.

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

(2) Only required with parameter *DS402compatib* = 1.

(3) Possible only if operating state was triggered via the fieldbus.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
DSM_ ShutDownOption ConF → ACG - SdtY	Behavior for disabling the power stage during movement. **0 / Disable Immediately** / dIS I: Disable power stage immediately **1 / Disable After Halt** / dISh: Disable power stage after deceleration to standstill This parameter specifies the response to a power stage disable request. Halt is used for deceleration to standstill. Modified settings become active immediately. Available with firmware version ≥V01.26.	- 0 0 1	INT16 R/W per. -	CANopen 605B:0_h Modbus 1684

Indication of the Operating State via HMI

Description

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

Operating state	HMI
1 Start	Init
2 Not Ready To Switch On	nrdy
3 Switch On Disabled	dIS
4 Ready To Switch On	rdy
5 Switched On	Son
6 Operation Enabled	run
7 Quick Stop Active	StoP
8 Fault Reaction Active	FLt
9 Fault	FLt

Indication of the Operating State via Signal Outputs

Description

Information on the operating state is available via the signal outputs. The table below provides an overview:

Operating state	Signal output function "No fault"(1)	Signal output function "Active"(2)
1 Start	0	0
2 Not Ready To Switch On	0	0
3 Switch On Disabled	0	0
4 Ready To Switch On	1	0
5 Switched On	1	0
6 Operation Enabled	1	1
7 Quick Stop Active	0	0
8 Fault Reaction Active	0	0

Operating state	Signal output function "No fault"(1)	Signal output function "Active"(2)
9 Fault	0	0
(1) The signal output function is factory setting for *DQ0* **(2)** The signal output function is the factory setting for *DQ1*		

Indication of the Operating State via Fieldbus

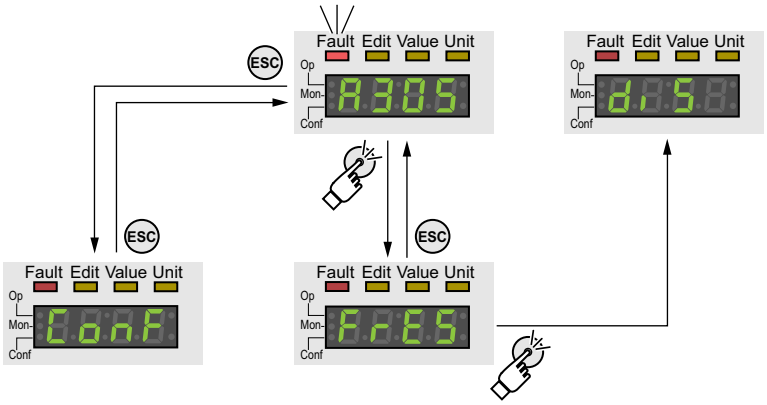
Description

Descriptions of how to indicate the operating states via a fieldbus can be found in the fieldbus user guide.

Changing the Operating State via HMI

Description

An error message can be reset via the HMI.



In the case of a detected error of error class 1, resetting the error message causes a transition from operating state **7** Quick Stop Active back to operating state **6** Operation Enabled.

In the case of a detected error of error classes 2 or 3, resetting the error message causes a transition from operating state **9** Fault back to operating state **3** Switch On Disabled.

Changing the Operating State via Signal Inputs

Overview

It is possible to switch between operating states via the signal inputs.

- Signal input function "Enable"
- Signal input function "Fault Reset"

Signal Input Function "Enable"

The power stage is enabled by means of the signal input function "Enable".

"Enable"	State transition
Rising edge	Enable power stage (T3)
Falling edge	Disabling the power stage (T9 and T12)

In order to enable the power stage via the signal input, you must first parameterize the signal input function "Enable", see Digital Signal Inputs and Digital Signal Outputs, page 173.

As of firmware version ≥V01.12, it is possible to also reset an error message with a rising or a falling edge at the signal input.

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_FaultResOnEnaInp CONF → ACG- iEFr	Additional 'Fault Reset' for the signal input function 'Enable'. **0 / Off /** oFF: No additional 'Fault Reset' **1 / OnFallingEdge /** FALL: Additional 'Fault Reset' with falling edge **2 / OnRisingEdge /** r iSE: Additional 'Fault Reset' with rising edge Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.12.	- 0 0 2	UINT16 R/W per. -	CANopen 3005:34$_h$ Modbus 1384

Signal Input Function "Fault Reset"

The signal input function "Fault Reset" is used to reset an error message.

"Fault Reset"	**State transition**
Rising edge	Resetting an error message (T15 and T16)

In order to reset an error message via the signal input, you must first parameterize the signal input function "Fault Reset", see Digital Signal Inputs and Digital Signal Outputs, page 173.

Changing the Operating State via Fieldbus

Description

Descriptions of how to change the operating states via a fieldbus can be found in the fieldbus user guide.

Operating Modes

Starting and Changing an Operating Mode

Starting the Operating Mode

Descriptions of how to start and change operating modes via the fieldbus can be found in the fieldbus user guide.

Changing the Operating Mode

The operating mode can be changed after the active operating mode has been terminated.

In addition, it is also possible to change the operating mode during a running movement; however, this is only possible in certain operating modes.

Changing the Operating Mode During a Movement

You can switch between the following operating modes during a running movement.

- Profile Torque
- Profile Velocity
- Profile Position

The operating mode can be changed while the motor is at a standstill or while the motor is not at a standstill, depending on the new operating mode.

Operating mode to be changed to	**Motor standstill**
Jog	With motor standstill
Profile Torque	Without motor standstill
Profile Velocity	Without motor standstill
Profile Position With firmware version ≥V01.06	Drive profile Drive Profile Lexium: Adjustable via parameter *PP_OpmChgType* Drive profile DS402: With motor standstill(1)
Profile Position With firmware version <V01.06	With motor standstill
(1) Parameter *PP_OpmChgType* must be set to the value 0.	

The motor is decelerated to a standstill via the ramp set in the parameter *LIM_HaltReaction*, see Stopping Movement with Halt, page 239.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
PP_OpmChgType	Change to operating mode Profile Position during movements. **0 / WithStandStill**: Change with standstill **1 / OnTheFly**: Change without standstill If Modulo is active, a transition to the operating mode Profile Position is performed with the setting WithStandStill, regardless of the setting of this parameter. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 0 0 1	UINT16 R/W per. -	CANopen 3023:9_h Modbus 8978

Operating Mode Jog

Overview

Description

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

A movement can be made using one of two methods:

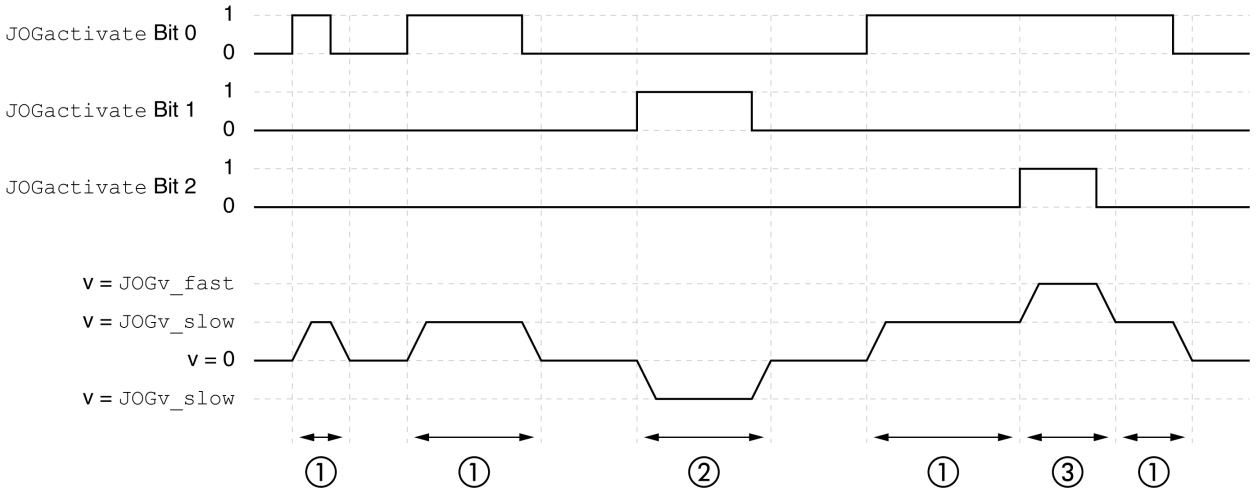
- Continuous movement
- Step movement

In addition, the product features two parameterizable velocities.

Continuous Movement

As long as the signal for the direction is available, a continuous movement is made in the desired direction.

The illustration below provides an example of continuous movement:



1 Slow movement in positive direction

2 Slow movement in negative direction

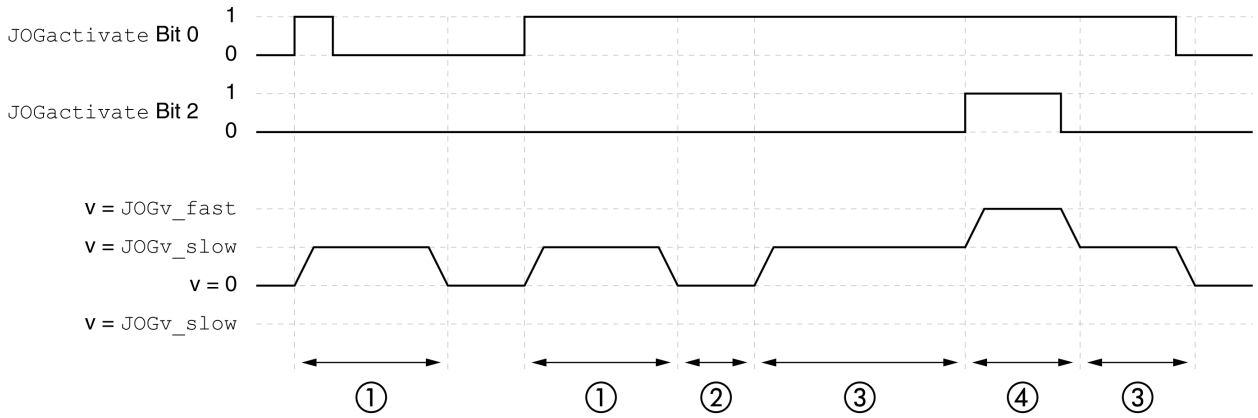
3 Fast movement in positive direction

Step Movement

If the signal for the direction is available for a short period of time, a movement with a parameterizable number of user-defined units is made in the desired direction.

If the signal for the direction is available continuously, a movement with a parameterizable number of user-defined units is made in the desired direction. After this movement, the motor stops for a defined period of time. Then a continuous movement is made in the desired direction.

The illustration provides an example of step movement:



1 Slow movement in positive direction with a parameterizable number of user-defined units *JOGstep*

2 Waiting time *JOGtime*

3 Slow continuous movement in positive direction

4 Fast continuous movement in positive direction

Starting the Operating Mode

The operating mode is started via the fieldbus. See the fieldbus user guide for a description.

Integrated HMI

It is also possible to start the operating mode via the HMI. Calling →oP→JoG-→JGSt enables the power stage and starts the operating mode.

The method Continuous Movement is controlled via the HMI.

Turn the navigation button to select one of 4 types of movement:

- JG- : slow movement in positive direction
- JG= : fast movement in positive direction
- -JG : slow movement in negative direction
- =JG : fast movement in negative direction

Press the navigation button to start the movement.

Status Messages

Information on the operating state and the ongoing movement is available via the fieldbus and the signal outputs.

Descriptions on obtaining information on the operating state and the ongoing movement can be found in the fieldbus user guide.

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

It is possible to change the factory settings of the signal outputs, see Digital Signal Inputs and Digital Signal Outputs, page 173.

Terminating the Operating Mode

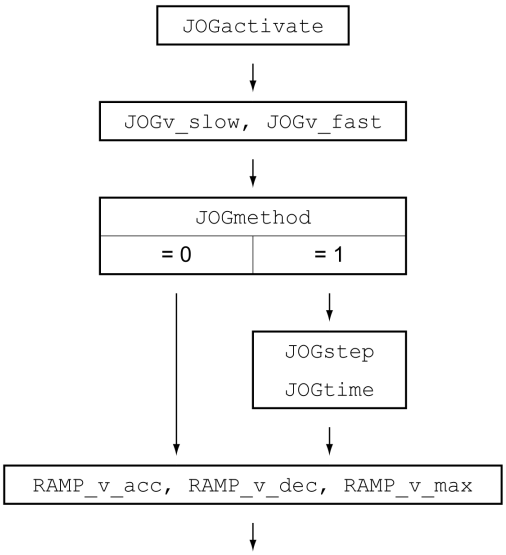
The operating mode is terminated when the motor is at a standstill and one of the following conditions is met:

- Stop caused by “Halt” or “Quick Stop”
- Stop caused by a detected error

Parameterization

Overview

The illustration below provides an overview of the adjustable parameters.



Velocities

Two parameterizable velocities are available.

Set the desired values with the parameters *JOGv_slow* and *JOGv_fast*.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
JOGv_slow oP → JoG - JGLo	Velocity for slow movement. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Modified settings become active immediately.	usr_v 1 60 2147483647	UINT32 R/W per. -	CANopen 3029:4$_h$ Modbus 10504
JOGv_fast oP → JoG - JGh i	Velocity for fast movement. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Modified settings become active immediately.	usr_v 1 180 2147483647	UINT32 R/W per. -	CANopen 3029:5$_h$ Modbus 10506

Selection of the Method

The parameter *JOGmethod* lets you set the method.

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 /** cont: Jog with continuous movement **1 / Step Movement /** Step: Jog with step movement Modified settings become active immediately.	- 0 1 1	UINT16 R/W - -	CANopen 3029:3h Modbus 10502

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.

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. Modified settings become active the next time the motor moves.	usr_p 1 20 2147483647	INT32 R/W per. -	CANopen 3029:7h Modbus 10510
JOGtime	Wait time for step movement. Modified settings become active the next time the motor moves.	ms 1 500 32767	UINT16 R/W per. -	CANopen 3029:8h Modbus 10512

Changing the Motion Profile for the Velocity

It is possible to change the parameterization of the Motion Profile for the Velocity, page 237.

Additional Settings

Overview

The following functions can be used for target value processing:

- Jerk Limitation, page 238
- Stopping Movement with Halt, page 239
- Stopping Movement with Quick Stop, page 241
- Limitation of the Velocity via Signal Inputs, page 242
- Limitation of the Current via Signal Inputs, page 243
- Setting a Signal Output via Parameter, page 244
- Position Capture via Signal Input (Vendor-Specific Profile), page 245
- Position Capture via Signal Input (DS402 Profile), page 249

- Relative Movement After Capture (RMAC), page 253

The following functions can be used for monitoring the movement:

- Limit Switches, page 259
- Software Limit Switches, page 260
- Load-Dependent Position Deviation (Following Error), page 262
- Motor Standstill and Direction of Movement, page 266
- Standstill Window, page 268
  This function is only available for a step movement.
- Position Register, page 270
- Position Deviation Window, page 276
- Velocity Deviation Window, page 278
- Velocity Threshold Value, page 280
- Current Threshold Value, page 281

Operating Mode Profile Torque

Overview

Description

In the operating mode Profile Torque, a movement is made with a specified target torque.

Without a proper limit value, the motor can reach an unintentionally high velocity in this operating mode.

⚠WARNING

UNINTENTIONALLY HIGH VELOCITY

Verify that the parameterized velocity limitation is appropriate for the motor.

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

Starting the Operating Mode

The operating mode is started via the fieldbus. See the fieldbus user guide for a description.

Status Messages

Information on the operating state and the ongoing movement is available via the fieldbus and the signal outputs.

Descriptions on obtaining information on the operating state and the ongoing movement can be found in the fieldbus user guide.

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

It is possible to change the factory settings of the signal outputs, see Digital Signal Inputs and Digital Signal Outputs, page 173.

Terminating the Operating Mode

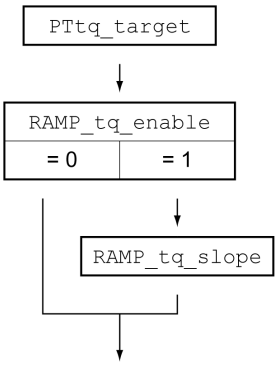
The operating mode is terminated when the motor is at a standstill and one of the following conditions is met:

- Stop caused by “Halt” or “Quick Stop”
- Stop caused by a detected error

Parameterization

Overview

The illustration below provides an overview of the adjustable parameters.



Setting the Target Torque

The target torque is set by means of the parameter *PTtq_target*.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
PTtq_target	Target torque. 100.0 % correspond to the continuous stall torque _M_M_0. In increments of 0.1 %. Modified settings become active immediately.	% -3000.0 0.0 3000.0	INT16 R/W - -	CANopen 6071:0$_h$ Modbus 6944

Changing the Motion Profile for the Torque

It is possible to change the parameterization of the motion profile for the torque.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RAMP_tq_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. Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 1 1	UINT16 R/W per. -	CANopen 3006:2C$_h$ Modbus 1624
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. In increments of 0.1 %/s. Modified settings become active immediately.	%/s 0.1 10000.0 3000000.0	UINT32 R/W per. -	CANopen 6087:0$_h$ Modbus 1620

Additional Settings

Overview

The following functions can be used for target value processing:

- Stopping Movement with Halt, page 239
- Stopping Movement with Quick Stop, page 241
- Limitation of the Velocity via Signal Inputs, page 242
- Limitation of the Current via Signal Inputs, page 243
- Setting a Signal Output via Parameter, page 244
- Position Capture via Signal Input (Vendor-Specific Profile), page 245
- Position Capture via Signal Input (DS402 Profile), page 249
- Relative Movement After Capture (RMAC), page 253

The following functions can be used for monitoring the movement:

- Limit Switches, page 259
- Software Limit Switches, page 260
- Motor Standstill and Direction of Movement, page 266
- Torque Window, page 266
- Position Register, page 270
- Velocity Threshold Value, page 280
- Current Threshold Value, page 281

Operating Mode Profile Velocity

Overview

Description

In the operating mode Profile Velocity, a movement is made with a specified target velocity.

Starting the Operating Mode

The operating mode is started via the fieldbus. See the fieldbus user guide for a description.

Status Messages

Information on the operating state and the ongoing movement is available via the fieldbus and the signal outputs.

Descriptions on obtaining information on the operating state and the ongoing movement can be found in the fieldbus user guide.

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

It is possible to change the factory settings of the signal outputs, see Digital Signal Inputs and Digital Signal Outputs, page 173.

Terminating the Operating Mode

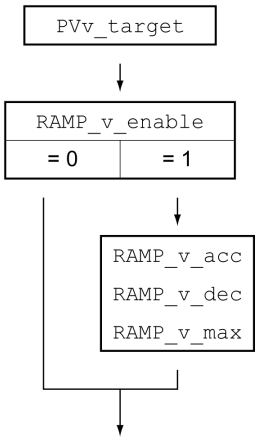
The operating mode is terminated when the motor is at a standstill and one of the following conditions is met:

- Stop caused by “Halt” or “Quick Stop”
- Stop caused by a detected error

Parameterization

Overview

The illustration below provides an overview of the adjustable parameters.



Setting the Target Velocity

The parameter *PVv_target* allows you to set the target velocity.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
PVv_target	Target velocity. The target velocity is limited to the setting in CTRL_v_max and RAMP_v_max. Modified settings become active immediately.	usr_v - 0 -	INT32 R/W - -	CANopen 60FF:0_h Modbus 6938

Changing the Motion Profile for the Velocity

It is possible to change the parameterization of the Motion Profile for the Velocity, page 237.

Additional Settings

Overview

The following functions can be used for target value processing:

- Stopping Movement with Halt, page 239
- Stopping Movement with Quick Stop, page 241
- Limitation of the Velocity via Signal Inputs, page 242
- Limitation of the Current via Signal Inputs, page 243
- Zero Clamp, page 244
- Setting a Signal Output via Parameter, page 244
- Position Capture via Signal Input (Vendor-Specific Profile), page 245
- Position Capture via Signal Input (DS402 Profile), page 249
- Relative Movement After Capture (RMAC), page 253

The following functions can be used for monitoring the movement:

- Limit Switches, page 259
- Software Limit Switches, page 260
- Motor Standstill and Direction of Movement, page 266

- Velocity Window, page 267
- Position Register, page 270
- Velocity Deviation Window, page 278
- Velocity Threshold Value, page 280
- Current Threshold Value, page 281

Operating Mode Profile Position

Overview

Description

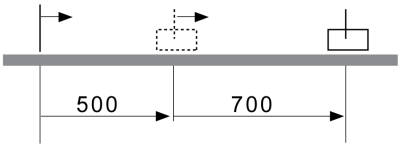
In the operating mode Profile Position, a movement to a desired target position is performed.

A movement can be made using one of 2 methods:

- Relative movement
- Absolute movement

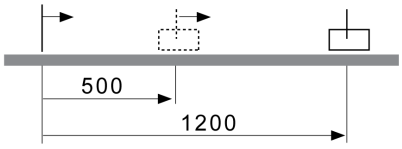
Relative Movement

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



Absolute Movement

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



A zero point must be defined with the operating mode Homing prior to the first absolute movement.

Starting the Operating Mode

The operating mode is started via the fieldbus. See the fieldbus user guide for a description.

Status Messages

Information on the operating state and the ongoing movement is available via the fieldbus and the signal outputs.

Descriptions on obtaining information on the operating state and the ongoing movement can be found in the fieldbus user guide.

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

It is possible to change the factory settings of the signal outputs, see Digital Signal Inputs and Digital Signal Outputs, page 173.

Terminating the Operating Mode

The operating mode is terminated when the motor is at a standstill and one of the following conditions is met:

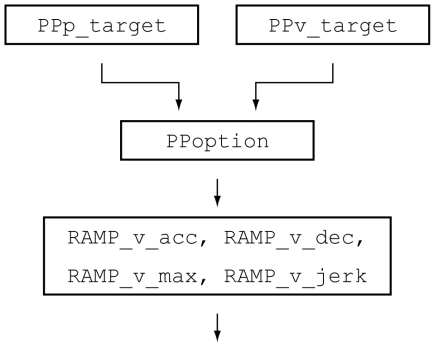
- Target position reached
- Stop caused by “Halt” or “Quick Stop”
- Stop caused by a detected error

Parameterization

Overview

The illustration below provides an overview of the adjustable parameters.

Overview of adjustable parameters



Target Position

The parameter *PPp_target* allows you to set the target position.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
PPp_target	Target position for operating mode Profile Position. Minimum/maximum values depend on: - Scaling factor - Software limit switches (if they are activated) Modified settings become active immediately.	usr_p - - -	INT32 R/W - -	CANopen 607A:0_h Modbus 6940

Target Velocity

The parameter *PPv_target* allows you to set the target velocity.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PPv_target	Target velocity for operating mode Profile Position. The target velocity is limited to the setting in CTRL_v_max and RAMP_v_max. Modified settings become active the next time the motor moves.	usr_v 1 60 4294967295	UINT32 R/W - -	CANopen 6081:0_h Modbus 6942

Selection of the Method

The parameter *PPoption* allows you to set the method for a relative movement.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
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 Modified settings become active the next time the motor moves.	- 0 0 2	UINT16 R/W - -	CANopen 60F2:0_h Modbus 6960

Changing the Motion Profile for the Velocity

It is possible to change the parameterization of the Motion Profile for the Velocity, page 237.

Additional Settings

Overview

The following functions can be used for target value processing:

- Jerk Limitation, page 238
- Stopping Movement with Halt, page 239
- Stopping Movement with Quick Stop, page 241
- Limitation of the Velocity via Signal Inputs, page 242
- Limitation of the Current via Signal Inputs, page 243
- Setting a Signal Output via Parameter, page 244
- Starting a Movement via a Signal Input, page 245
- Position Capture via Signal Input (Vendor-Specific Profile), page 245
- Position Capture via Signal Input (DS402 Profile), page 249
- Relative Movement After Capture (RMAC), page 253

The following functions can be used for monitoring the movement:

- Limit Switches, page 259

- Software Limit Switches, page 260
- Load-Dependent Position Deviation (Following Error), page 262
- Motor Standstill and Direction of Movement, page 266
- Standstill Window, page 268
- Position Register, page 270
- Position Deviation Window, page 276
- Velocity Deviation Window, page 278
- Velocity Threshold Value, page 280
- Current Threshold Value, page 281

Operating Mode Interpolated Position

Overview

Availability

Available with firmware version ≥V01.08.

Description

In the operating mode Interpolated Position, movements are made to cyclically set reference positions.

The monitoring functions Heartbeat and Node Guarding cannot be used in this operating mode.

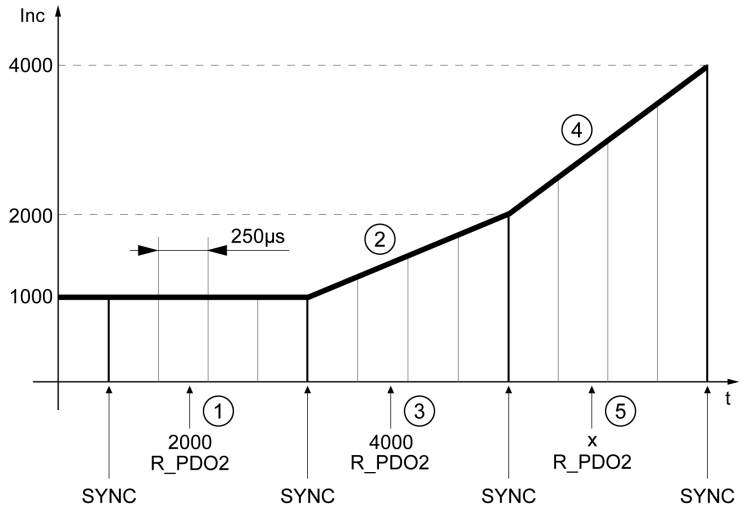
Verify cyclical reception of PDOs at the controller in order to detect an interruption of the connection.

The reference positions are transmitted synchronously with each cycle. The cycle time of a cycle can be set from 1 ... 20 ms.

The movement to the reference positions starts with the SYNC signal.

The drive performs an internal fine interpolation with a raster of 250 µs.

The illustration below provides an overview:



1 Transmission of first reference position (example)

2 Movement to first reference position

3 Transmission of second reference position (example)

4 Movement to second reference position

5 Transmission of next reference position (example)

Starting the Operating Mode

The operating mode is started via the fieldbus. See the fieldbus user guide for a description.

Status Messages

Information on the operating state and the ongoing movement is available via the fieldbus and the signal outputs.

Descriptions on obtaining information on the operating state and the ongoing movement can be found in the fieldbus user guide.

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

It is possible to change the factory settings of the signal outputs, see Digital Signal Inputs and Digital Signal Outputs, page 173.

Terminating the Operating Mode

The operating mode is terminated via the fieldbus. See the fieldbus user guide for a description.

Parameterization

Synchronization Mechanism

The synchronization mechanism must be activated for the operating mode Interpolated Position.

The synchronization mechanism is activated via the parameter *SyncMechStart* = 2.

The parameter *SyncMechTol* is used to set a synchronization tolerance. The value of the parameter *SyncMechTol* is internally multiplied by 250 µs. For example, a value of 4 corresponds to a tolerance of 1 ms.

The status of the synchronizations mechanism can be read by means of the parameter *SyncMechStatus*.

Activate the synchronization mechanism by means of the parameter *SyncMechStart*.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
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. Modified settings become active immediately.	- 0 0 2	UINT16 R/W - -	CANopen 3022:5$_h$ Modbus 8714
SyncMechTol	Synchronization tolerance. The value is applied when the synchronization mechanism is activated via the parameter SyncMechStart. Modified settings become active immediately. Available with firmware version ≥V01.08.	- 1 1 20	UINT16 R/W - -	CANopen 3022:4$_h$ Modbus 8712
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. Available with firmware version ≥V01.08.	- - - -	UINT16 R/- - -	CANopen 3022:6$_h$ Modbus 8716

Cycle Time

The cycle time is set via the parameters *IP_IntTimPerVal* and *IP_IntTimInd*.

The cycle time depends on the following factors:

- Number of drives
- Baud rate
- Time of the minimum data packets per cycle:
  - SYNC
  - R_PDO2, T_PDO2
  - EMCY (This time must be reserved.)
- Optionally the time of the additional data packets per cycle:
  - R_SDO and T_SDO

    The controller must make sure that the number of requests (R_SDO) and the cycle time match. The response (T_SDO) is transmitted with the next cycle.
  - n_{PDO} - additional R_PDO and T_PDO:

    R_PDO1, T_PDO1, R_PDO3, T_PDO3, R_PDO4 and T_PDO4

The table below shows the typical values for the individual data packets, depending on the baud rate:

Data packets	Size in bytes	1 Mbit	500 kbit	250 kbit
R_PDO2	6	0.114 ms	0.228 ms	0.456 ms
T_PDO2	6	0.114 ms	0.228 ms	0.456 ms
SYNC	0	0.067 ms	0.134 ms	0.268 ms
EMCY	8	0.130 ms	0.260 ms	0.520 ms
R_PDOx	8	0.130 ms	0.260 ms	0.520 ms
T_PDOx	8	0.130 ms	0.260 ms	0.520 ms
R_SDO and T_SDO	16	0.260 ms	0.520 ms	1.040 ms

In the case of one drive, the minimum cycle time is calculated as follows: t_{cycle}= SYNC + R_PDO2+ T_PDO2 + EMCY + SDO +n_{PDO}

The following table shows t_{cycle} depending on the baud rate and the number of additional PDOs n_{PDO}, based on one drive:

Number of additional PDOs (n_{PDO})	Minimum cycle time at 1 Mbit	Minimum cycle time at 500 kbit	Minimum cycle time at 250 kbit
0	1 ms	2 ms	3 ms
1	1 ms	2 ms	3 ms
2	1 ms	2 ms	4 ms
3	2 ms	2 ms	4 ms
4	2 ms	3 ms	5 ms
5	2 ms	3 ms	5 ms
6	2 ms	3 ms	6 ms

Cycle time in seconds: *IP_IntTimPerVal* * 10 IP_IntTimInd

Set the desired cycle time with the parameters *IP_IntTimPerVal* and *IP_IntTimInd*.

Valid cycle times are 1 ... 20 ms in increments of 1 ms.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IP_IntTimPerVal	Interpolation time period value. Available with firmware version ≥V01.08. * Datatype for CANopen: UINT8	s 0 1 255	UINT16* R/W - -	CANopen 60C2:1_h Modbus 7000
IP_IntTimInd	Interpolation time index. Available with firmware version ≥V01.08. * Datatype for CANopen: INT8	- -128 -3 63	INT16* R/W - -	CANopen 60C2:2_h Modbus 7002

Position Comparison

The drive cyclically processes the reference position as soon as bit 4 of the control word is set to 1. If the difference between reference position and actual position is too great, a position deviation error (following error) is detected. To help avoid such an error, the actual position must be read via the parameter *_p_act* before the operating mode is activated or continued. New reference positions must correspond to the actual position in the first cycle.

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_act	Actual position.	usr_p - - -	INT32 R/- - -	CANopen 6064:0$_h$ Modbus 7706

Reference Position

The parameter *IPp_target* cyclically transmits a reference value.

Set the desired reference value with the parameter *IPp_target*.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IPp_target	Position reference value for operating mode Interpolated Position. Available with firmware version ≥V01.08.	- -2147483648 - 2147483647	INT32 R/W - -	CANopen 60C1:1$_h$ Modbus 7004

Operating Mode Homing

Overview

Description

In the operating mode Homing, a reference is generated between a mechanical position and the actual position of the motor.

A reference between a mechanical position and the actual position of the motor is generated by means of a reference movement or by means of position setting.

A successful reference movement or position setting homes the motor and the zero point becomes valid.

The zero point of the movement range is the point of reference for absolute movements in the operating mode Profile Position.

Methods

Different methods are available:

- Reference movement to a limit switch

  In the case of a reference movement to a limit switch, a movement to the negative limit switch or the positive limit switch is performed.

  When the limit switch is reached, the movement is stopped and then 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 movement is stopped and then a movement is made to the switching point of the reference switch.

  From the switching point of the reference switch, a movement is made to the next index pulse of the motor or to a parameterizable distance from the switching point.

  The position of the index pulse or the position of the parameterizable distance from the switching point is the reference point.
- Reference movement to the index pulse

  In the case of a reference movement to the index pulse, a movement is made from the actual position to the next index pulse. The position of the index pulse is the reference point.
- Position setting

  In the case of position setting, the actual position of the motor is set to a desired position value.

A reference movement must be terminated without interruption for the new zero point to be valid. If the reference movement is interrupted, it must be started again.

Motors with multiturn encoder deliver a valid zero point after they are powered on.

Starting the Operating Mode

The operating mode is started via the fieldbus. See the fieldbus user guide for a description.

Status Messages

Information on the operating state and the ongoing movement is available via the fieldbus and the signal outputs.

Descriptions on obtaining information on the operating state and the ongoing movement can be found in the fieldbus user guide.

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

It is possible to change the factory settings of the signal outputs, see Digital Signal Inputs and Digital Signal Outputs, page 173.

Terminating the Operating Mode

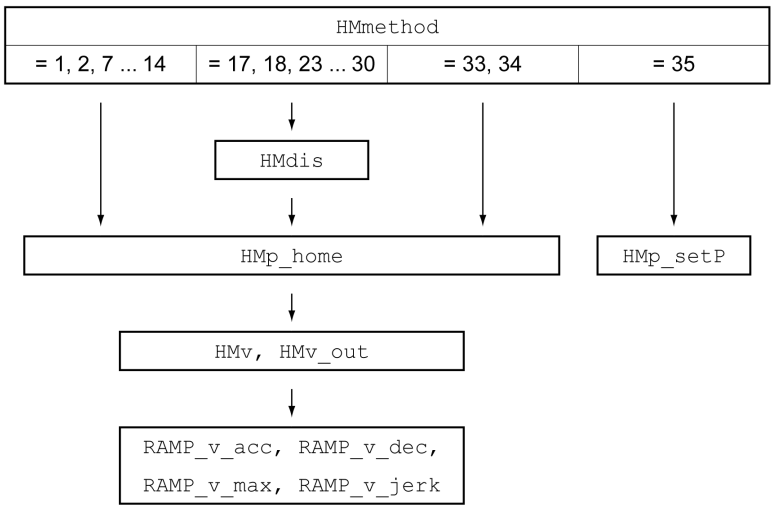
The operating mode is terminated when the motor is at a standstill and one of the following conditions is met:

- Homing successful
- Stop caused by “Halt” or “Quick Stop”
- Stop caused by a detected error

Parameterization

Overview

The illustration below provides an overview of the adjustable parameters.



Setting Limit Switches and Reference Switches

The limit switches and reference switches must be set to meet the requirements, see Limit Switches, page 259 and Reference Switch, page 260.

Selection of the Method

The operating mode Homing establishes an absolute position reference between the motor position and a defined axis position. There are various Homing methods which can be selected via the parameter *HMmethod*.

The *HMprefmethod* parameter is used to save the preferred method to the nonvolatile memory (persistent). When the preferred method has been set in this parameter, the method is performed during homing even after the device is powered off and on. The value to be entered corresponds to the value in the *HMmethod* parameter.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
HMmethod	Homing method. 1: LIMN with index pulse 2: LIMP with index pulse 7: REF+ with index pulse, inv., outside 8: REF+ with index pulse, inv., inside 9: REF+ with index pulse, not inv., inside 10: REF+ with index pulse, not inv., outside 11: REF- with index pulse, inv., outside 12: REF- with index pulse, inv., inside 13: REF- with index pulse, not inv., inside 14: REF- with index pulse, not inv., outside 17: LIMN 18: LIMP 23: REF+, inv., outside 24: REF+, inv., inside 25: REF+, not inv., inside 26: REF+, not inv., outside 27: REF-, inv., outside 28: REF-, inv., inside 29: REF-, not inv., inside 30: REF-, not inv., outside 33: Index pulse negative direction 34: Index pulse positive direction 35: Position setting Abbreviations: REF+: Search movement in positive direction REF-: Search movement in negative 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 Modified settings become active immediately. * Datatype for CANopen: INT8	- 1 18 35	INT16* R/W - -	CANopen 6098:0_h Modbus 6936
HMprefmethod oP → hoM - MEth	Preferred homing method. Modified settings become active immediately.	- 1 18 35	INT16 R/W per. -	CANopen 3028:A_h Modbus 10260

Setting the Distance From the Switching Point

A distance to the switching point of the limit switch or the reference switch must be parameterized for a reference movement with index pulse. The parameter *HMdis* lets you set the distance to the switching limit switch or the reference switch.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
HMdis	Distance from switching point. The distance from the switching point is defined as the reference point. The parameter is only effective during a reference movement without index pulse. Modified settings become active the next time the motor moves.	usr_p 1 200 2147483647	INT32 R/W per. -	CANopen 3028:7_h Modbus 10254

Defining the Zero Point

The parameter *HMp_home* is used to specify a desired position value, which is set at the reference point after a successful reference movement. The desired position value at the reference point defines the zero point.

If the value 0 is used, the zero point corresponds to the reference point.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
HMp_home	Position at reference point. After a successful reference movement, this position is automatically set at the reference point. Modified settings become active the next time the motor moves.	usr_p -2147483648 0 2147483647	INT32 R/W per. -	CANopen 3028:B_h Modbus 10262

Setting Monitoring

The parameters *HMoutdis* and *HMsrchdis* allow you to activate monitoring of the limit switches and the reference switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
HMoutdis	Maximum distance for search for switching point. 0: Monitoring of distance inactive >0: Maximum distance After detection of the switch, the drive starts to search for the defined switching point. If the defined switching point is not found within the distance defined here, the reference movement is canceled and an error is detected. Modified settings become active the next time the motor moves.	usr_p 0 0 2147483647	INT32 R/W per. -	CANopen 3028:6_h Modbus 10252
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. Modified settings become active the next time the motor moves.	usr_p 0 0 2147483647	INT32 R/W per. -	CANopen 3028:D_h Modbus 10266

Reading out the Position Distance

The position distance between the switching point and index pulse can be read out with the following parameter.

The distance between the switching point and the index pulse must be >0.05 revolutions for reproducible reference movements with index pulse.

If the index pulse is too close to the switching point, the limit switch or reference switch can be moved mechanically.

Otherwise the position of the index pulse can be moved with the parameter *ENC_pabsusr*, see Setting Parameters for Encoder, page 131.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_HMdisREFtoIDX_usr	Distance from switching point to index pulse. Allows you to verify the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. Available with firmware version ≥V01.05.	usr_p -2147483648 - 2147483647	INT32 R/- - -	CANopen 3028:F_h Modbus 10270

Setting Velocities

The parameters *HMv* and *HMv_out* are used to set the velocities for searching the switch and for moving away from the switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
HMv oPr → hoM - hMo	Target velocity for searching the switch. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Modified settings become active the next time the motor moves.	usr_v 1 60 2147483647	UINT32 R/W per. -	CANopen 6099:1$_h$ Modbus 10248
HMv_out	Target velocity for moving away from switch. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Modified settings become active the next time the motor moves.	usr_v 1 6 2147483647	UINT32 R/W per. -	CANopen 6099:2$_h$ Modbus 10250

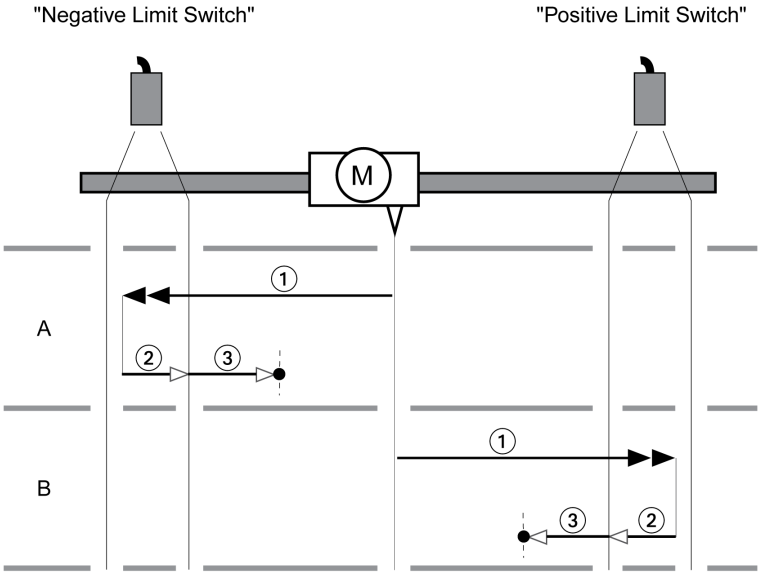
Changing the Motion Profile for the Velocity

It is possible to change the parameterization of the Motion Profile for the Velocity, page 237.

Reference Movement to a Limit Switch

Overview

The illustration below shows a reference movement to a limit switch



1 Movement to limit switch at velocity *HMv*

2 Movement to the switching point of the limit switch at velocity *HMv_out*

3 Movement to index pulse or movement to a distance from the switching point at velocity *HMv_out*

Type A

Method 1: Movement to the index pulse.

Method 17: Movement to distance from switching point.

Type B

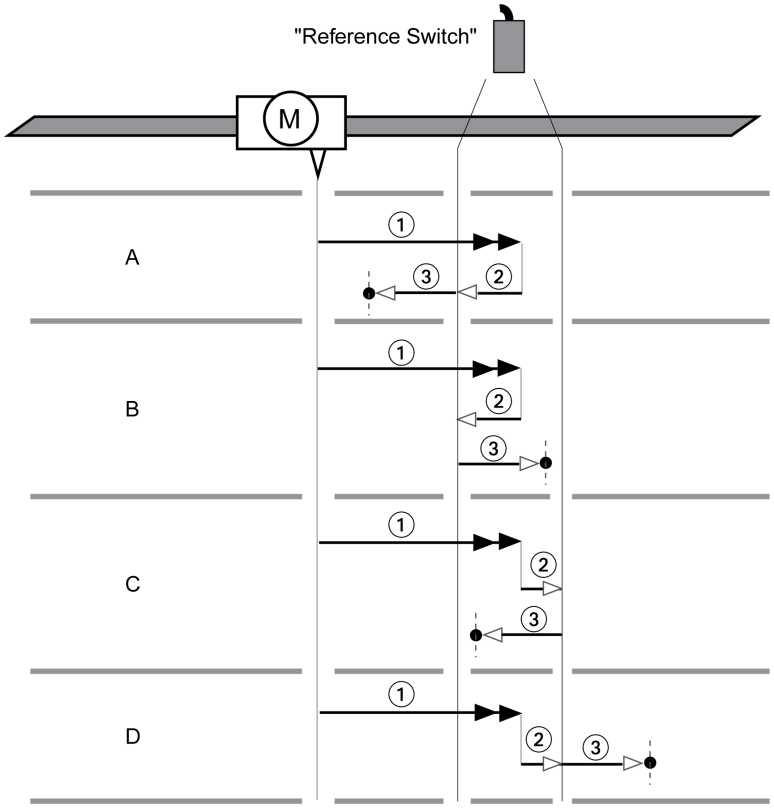
Method 2: Movement to the index pulse.

Method 18: Movement to distance from switching point.

Reference Movement to the Reference Switch in Positive Direction

Overview

The illustration below shows a reference movement to the reference switch in positive direction



1 Movement to reference switch at velocity *HMv*

2 Movement to the switching point of the reference switch at velocity *HMv_out*

3 Movement to index pulse or movement to a distance from the switching point at velocity *HMv_out*

Type A

Method 7: Movement to the index pulse.

Method 23: Movement to distance from switching point.

Type B

Method 8: Movement to the index pulse.

Method 24: Movement to distance from switching point.

Type C

Method 9: Movement to the index pulse.

Method 25: Movement to distance from switching point.

Type D

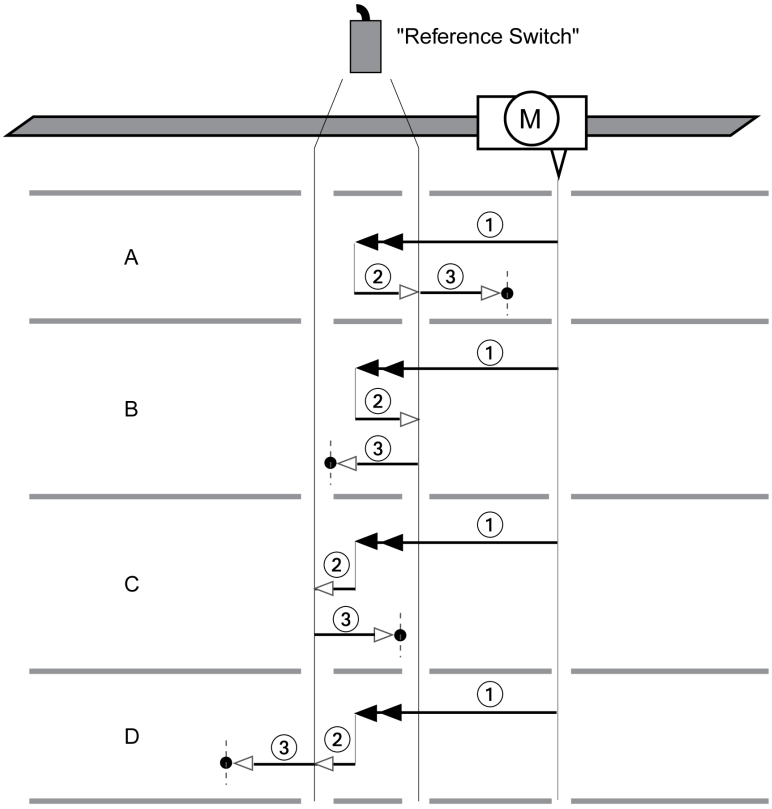
Method 10: Movement to the index pulse.

Method 26: Movement to distance from switching point.

Reference Movement to the Reference Switch in Negative Direction

Overview

The illustration below shows a reference movement to the reference switch in negative direction



1 Movement to reference switch at velocity *HMv*

2 Movement to the switching point of the reference switch at velocity *HMv_out*

3 Movement to index pulse or movement to a distance from the switching point at velocity *HMv_out*

Type A

Method 11: Movement to the index pulse.

Method 27: Movement to distance from switching point.

Type B

Method 12: Movement to the index pulse.

Method 28: Movement to distance from switching point.

Type C

Method 13: Movement to the index pulse.

Method 29: Movement to distance from switching point.

Type D

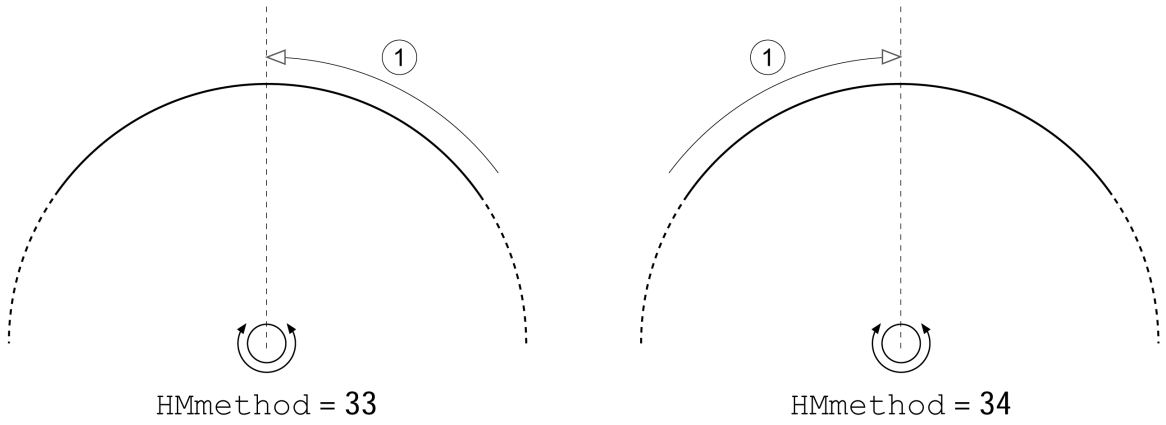
Method 14: Movement to the index pulse.

Method 30: Movement to distance from switching point.

Reference Movement to the Index Pulse

Overview

The illustration below shows a reference movement to the index pulse



1 Movement to index pulse at velocity *HMv_out*

Position Setting

Description

By means of position setting, the actual position of the motor is set to the position value in parameter *HMp_setP*. This also defines the zero point.

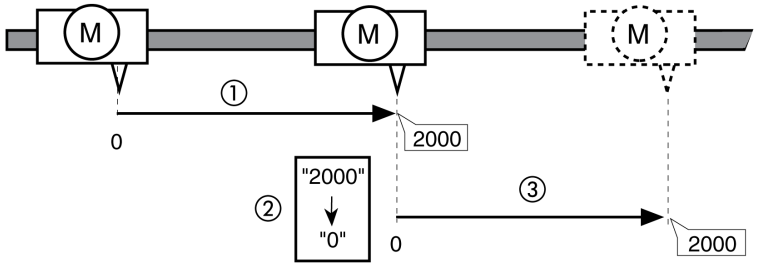
Position setting is only possible when the motor is at a standstill. Any active position deviation remains active and can still be compensated for by the position controller after position setting.

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 fieldbus**
HMp_setP	Position for Position Setting. Position for operating mode Homing, method 35. Modified settings become active immediately.	usr_p - 0 -	INT32 R/W - -	CANopen 301B:16$_h$ Modbus 6956

Example

Movement by 4000 user-defined units with position setting



1 The motor is positioned by 2000 user-defined units.

2 By means of position setting to 0, the actual position of the motor is set to position value 0 which, at the same time, defines a new zero point.

3 When a new movement by 2000 user-defined units is triggered, the new target position is 2000 user-defined units.

Additional Settings

Overview

The following functions can be used for target value processing:

- Jerk Limitation, page 238
- Stopping Movement with Halt, page 239
- Stopping Movement with Quick Stop, page 241
- Limitation of the Velocity via Signal Inputs, page 242
- Limitation of the Current via Signal Inputs, page 243
- Setting a Signal Output via Parameter, page 244
- Position Capture via Signal Input (Vendor-Specific Profile), page 245
- Position Capture via Signal Input (DS402 Profile), page 249

The following functions can be used for monitoring the movement:

- Limit Switches, page 259
- Reference Switch, page 260
- Software Limit Switches, page 260
- Load-Dependent Position Deviation (Following Error), page 262
- Motor Standstill and Direction of Movement, page 266
- Standstill Window, page 268
- Position Register, page 270
- Position Deviation Window, page 276
- Velocity Deviation Window, page 278
- Velocity Threshold Value, page 280
- Current Threshold Value, page 281

Functions for Operation

Functions for Target Value Processing

Motion Profile for the Velocity

Description

Target position and target velocity are input values specified by the user. A motion profile for the velocity is calculated on the basis of these input values.

The motion profile for the velocity consists of an acceleration, a deceleration and a maximum velocity.

A linear ramp for both directions of movement is available.

Availability

The availability of the motion profile for the velocity depends on the operating mode.

In the following operating modes, the motion profile for the velocity is permanently active:

- Jog
- Profile Position
- Homing

In the following operating modes, the motion profile for the velocity can be activated and deactivated:

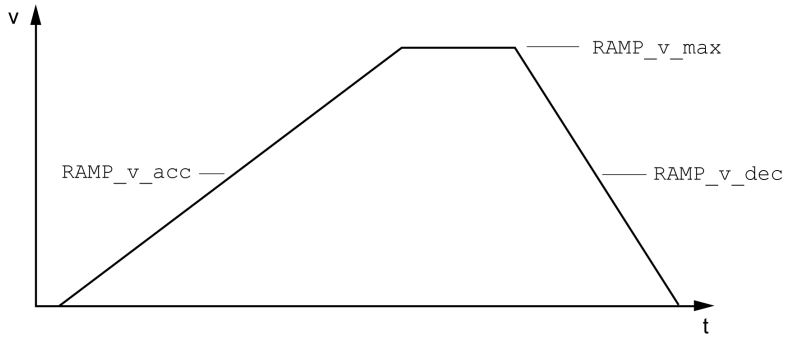
- Profile Velocity

In the following operating modes, the motion profile for the velocity is unavailable:

- Profile Torque
- Interpolated Position

Ramp Slope

The ramp slope determines the velocity changes of the motor per time unit. The ramp slope can be set for acceleration and deceleration.

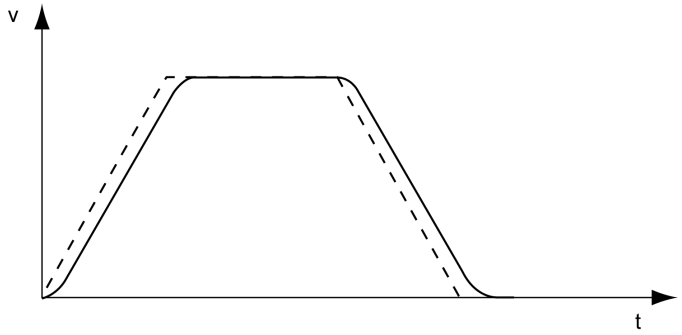


Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
RAMP_v_enable	Activation of the motion profile for velocity. **0 / Profile Off**: Profile off **1 / Profile On**: Profile on Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 1 1	UINT16 R/W per. -	CANopen 3006:2B$_h$ Modbus 1622
RAMP_v_max ConF → ACG - nrMP	Maximum velocity of the motion profile for velocity. If a greater reference velocity is set in one of these operating modes, it is automatically limited to RAMP_v_max. This way, commissioning at limited velocity is easier to perform. Setting can only be modified if power stage is disabled. Modified settings become active the next time the motor moves.	usr_v 1 13200 2147483647	UINT32 R/W per. -	CANopen 607F:0$_h$ Modbus 1554
RAMP_v_acc	Acceleration of the motion profile for velocity. Writing the value 0 has no effect on the parameter. Modified settings become active the next time the motor moves.	usr_a 1 600 2147483647	UINT32 R/W per. -	CANopen 6083:0$_h$ Modbus 1556
RAMP_v_dec	Deceleration of the motion profile for velocity. The minimum value depends on the operating mode: Operating modes with minimum value 1: Profile Velocity Operating modes with minimum value 120: Jog Profile Position Homing Writing the value 0 has no effect on the parameter. Modified settings become active the next time the motor moves.	usr_a 1 600 2147483647	UINT32 R/W per. -	CANopen 6084:0$_h$ Modbus 1558

Jerk Limitation

Description

Jerk limitation smoothes sudden acceleration changes to allow for smooth transitions with almost no jerking.



Availability

Jerk limitation is available in the following operating modes.

- Jog
- Profile Position
- Homing

Settings

Jerk limitation is activated and set via the parameter *RAMP_v_jerk*.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
RAMP_v_jerk CONF → DRC- JER	Jerk limitation of the motion profile for velocity. **0 / Off /** OFF: Off **1 / 1 /** 1: 1 ms **2 / 2 /** 2: 2 ms **4 / 4 /** 4: 4 ms **8 / 8 /** 8: 8 ms **16 / 16 /** 16: 16 ms **32 / 32 /** 32: 32 ms **64 / 64 /** 64: 64 ms **128 / 128 /** 128: 128 ms Adjustments can only be made if the operating mode is inactive (x_end=1). Modified settings become active the next time the motor moves.	ms 0 0 128	UINT16 R/W per. -	CANopen 3006:D_h Modbus 1562

Stopping Movement with Halt

Description

With a Halt, the ongoing movement is interrupted. The movement can be resumed when the Halt is cleared.

A Halt can be triggered via a digital signal input or a fieldbus command.

In order to interrupt a movement via a signal input, you must first parameterize the signal input function “Halt”, see Digital Signal Inputs and Digital Signal Outputs, page 173.

The following deceleration types are available:

- 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 /** tor9: Torque ramp Set the deceleration ramp with parameter RAMP_v_dec. Set the torque ramp with parameter LIM_I_maxHalt. If a deceleration ramp is already active, the parameter cannot be written. Modified settings become active immediately.	- 1 1 3	INT16 R/W per. -	CANopen 605D:0_h Modbus 1582

Setting the Deceleration Ramp

The deceleration ramp is set with the parameter *Ramp_v_dec* via the Motion Profile for the Velocity, page 237.

Setting the Torque Ramp

The parameter *LIM_I_maxHalt* lets you set the torque ramp.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
LIM_I_maxHalt CONF → ACG - hcur	Current for Halt. This value is only limited by the minimum/maximum value range (no limitation of this value by motor/power stage). In the case of a Halt, the current limit (*_Imax_act*) is one of the following values (whichever is lowest): - *LIM_I_maxHalt* - *_M_I_max* - *_PS_I_max* Further current limitations caused by I2t monitoring are also taken into account during a Halt. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} - - -	UINT16 R/W per. -	CANopen 3011:E_h Modbus 4380

Stopping Movement with Quick Stop

Description

With a Quick Stop, the ongoing movement is stopped.

A Quick Stop can be triggered by a detected error of error classes 1 or 2 or via a fieldbus command.

The movement can be stopped with 2 different deceleration types.

- Deceleration via deceleration ramp
- Deceleration via torque ramp

In addition, you can set the operating state to switch to after the deceleration.

- Transition to operating state **9** Fault
- Transition to operating state **7** Quick Stop Active

Setting the Type of Deceleration

The parameter *LIM_QStopReact* lets you set the type of deceleration.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
LIM_QStopReact	Quick Stop option code. **-2 / Torque ramp (Fault)**: Use torque ramp and transit to operating state 9 Fault **-1 / Deceleration Ramp (Fault)**: Use deceleration ramp and transit to operating state 9 Fault **6 / Deceleration ramp (Quick Stop)**: Use deceleration ramp and remain in operating state 7 Quick Stop **7 / Torque ramp (Quick Stop)**: Use torque ramp and remain in operating state 7 Quick Stop Type of deceleration for Quick Stop. Setting of deceleration ramp with parameter RAMPquickstop. Setting of torque ramp with parameter LIM_I_maxQSTP. If a deceleration ramp is already active, the parameter cannot be written. Modified settings become active immediately.	- -2 6 7	INT16 R/W per. -	CANopen $3006:18_h$ Modbus 1584

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. Modified settings become active the next time the motor moves.	usr_a 1 6000 2147483647	UINT32 R/W per. -	CANopen 3006:12$_h$ Modbus 1572

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 - 9cur	Current for Quick Stop. This value is only limited by the minimum/ maximum value range (no limitation of this value by motor/power stage). In the case of a Quick Stop, the current limit (*_Imax_act*) is one of the following values (whichever is lowest): - *LIM_I_maxQSTP* - *_M_I_max* - *_PS_I_max* Further current limitations caused by I2t monitoring are also taken into account during a Quick Stop. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} - - -	UINT16 R/W per. -	CANopen 3011:D$_h$ Modbus 4378

Limitation of the Velocity via Signal Inputs

Limitation via Digital Signal Input

The velocity can be limited to a specific value via a digital signal input.

The parameter *IO_v_limit* lets you set the velocity limitation.

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_v_limit	Velocity limitation via input. A velocity limitation can be activated via a digital input. In operating mode Profile Torque, the minimum velocity is internally limited to 100 RPM. Modified settings become active immediately.	usr_v 0 10 2147483647	UINT32 R/W per. -	CANopen 3006:1E$_h$ Modbus 1596

In order to limit the velocity via a digital signal input, you must first parameterize the signal input function “Velocity Limitation”, see Digital Signal Inputs and Digital Signal Outputs, page 173.

As of firmware version ≥V01.26 you can configure the signal evaluation of the signal input function via the parameter *IOsigVelLim*.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOsigVelLim	Signal evaluation for signal input function Velocity Limitation. **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.26.	- 1 2 2	UINT16 R/W per. -	CANopen 3008:27$_h$ Modbus 2126

Limitation of the Current via Signal Inputs

Limitation via Digital Signal Input

The current can be limited to a specific value via a digital signal input.

The parameter *IO_I_limit* lets you set the current limitation.

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_I_limit CONF → I-O- IL IN	Current limitation via input. A current limit can be activated via a digital input. In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} 0.00 0.20 300.00	UINT16 R/W per. -	CANopen 3006:27$_h$ Modbus 1614

In order to limit the current via a digital signal input, you must first parameterize the signal input function “Current Limitation”, see Digital Signal Inputs and Digital Signal Outputs, page 173.

As of firmware version ≥V01.26 you can configure the signal evaluation of the signal input function via the parameter *IOsigCurrLim*.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOsigCurrLim	Signal evaluation for signal input function Current Limitation. **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.26.	- 1 2 2	UINT16 R/W per. -	CANopen 3008:28$_h$ Modbus 2128

Zero Clamp

Description

The motor can be stopped via a digital signal input. The velocity of the motor must be below a parameterizable velocity value.

Availability

The signal input function “Zero Clamp” is available in the following operating mode:

- Profile Velocity

Settings

Target velocities below the parameterizable velocity value are interpreted as "Zero".

The signal input function “Zero Clamp” has a hysteresis of 20 %.

The parameter *MON_v_zeroclamp* lets you set the velocity value.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
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. Modified settings become active immediately.	usr_v 0 10 2147483647	UINT32 R/W per. -	CANopen 3006:28$_h$ Modbus 1616

In order to stop the motor via a digital signal input, you must first parameterize the signal input function “Zero Clamp”, see Digital Signal Inputs and Digital Signal Outputs, page 173.

Setting a Signal Output via Parameter

Description

The digital signal outputs can be set as required via the fieldbus.

In order to set the digital signal outputs via the parameter, you must first parameterize the signal output function “Freely Available”, see Digital Signal Inputs and Digital Signal Outputs, page 173.

If one or more of the outputs are not set to "Freely Available", writing to that or those outputs is ignored.

The parameter *IO_DQ_set* lets you set the digital signal outputs.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
IO_DQ_set	Setting the digital outputs directly. Digital outputs can only be set directly if the signal output function has been set to 'Freely Available'. Bit assignments: Bit 0: DQ0 Bit 1: DQ1	- - - -	UINT16 R/W - -	CANopen 3008:11$_h$ Modbus 2082

Starting a Movement via a Signal Input

Description

The signal input function “Start Profile Positioning” sets the start signal for the movement in the operating mode Profile Position. The positioning movement is then executed when the edge at the digital input rises.

Position Capture via Signal Input (Vendor-Specific Profile)

Description

The motor position can be captured when a signal is detected at a Capture input.

Number of Capture Inputs

The number of Capture inputs depends on the hardware version.

- With hardware version ≥RS03:
  2 Capture inputs: *DI0/CAP1* and *DI1/CAP2*
- With hardware version <RS03:
  1 Capture input: *DI0/CAP1*

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 1.6 user-defined units at a velocity of 3000 RPM.

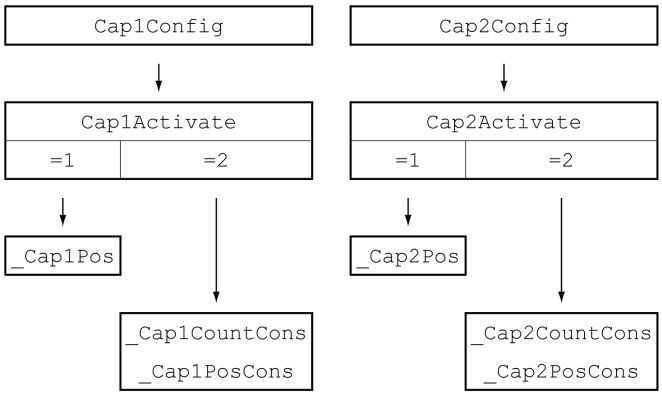
(3000 RPM = (3000*16384)/(60*10^6) = 0.8 usr_p/µs)

If the factory settings for scaling are used, 1.6 user-defined units correspond to 0.035 °.

The captured motor position is less accurate during the acceleration phase and the deceleration phase.

Overview of the Parameters

The following graphics provide an overview of the parameters:



Setting the Edge

The following parameters let you set the edge for position capture.

Set the desired edge with the parameters *Cap1Config* and *Cap2Config*.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
Cap1Config	Capture input 1 configuration. **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge **2 / Both Edges**: Position capture at both edges Modified settings become active immediately.	- 0 0 2	UINT16 R/W - -	CANopen 300A:2_h Modbus 2564
Cap2Config	Capture input 2 configuration. **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge Available with hardware version ≥RS03. Modified settings become active immediately.	- 0 0 1	UINT16 R/W - -	CANopen 300A:3_h Modbus 2566

Starting Position Capture

The following parameters let you start position capture.

Set the desired method with the parameters *Cap1Activate* and *Cap2Activate*.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
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. Modified settings become active immediately.	- 0 - 4	UINT16 R/W - -	CANopen 300A:4_h Modbus 2568
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. Available with hardware version ≥RS03. Modified settings become active immediately.	- 0 - 4	UINT16 R/W - -	CANopen 300A:5_h Modbus 2570

Status Messages

The parameter *_CapStatus* indicates the capture status.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_CapStatus	Status of the capture inputs. Read access: Bit 0: Position captured via input CAP1 Bit 1: Position captured via input CAP2	- - - -	UINT16 R/- - -	CANopen 300A:1_h Modbus 2562

Captured Position

The captured positions for one-time capture can be read via the following parameters:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_Cap1Pos	Capture input 1 captured position (one-time). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement".	usr_p - - -	INT32 R/- - -	CANopen 300A:6_h Modbus 2572
_Cap2Pos	Capture input 2 captured position (one-time). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". Available with hardware version ≥RS03.	usr_p - - -	INT32 R/- - -	CANopen 300A:7_h Modbus 2574

The captured positions for continuous capture can be read via the following parameters:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_Cap1CountCons	Capture input 1 event counter (continuous). Counts the capture events. The event counter is reset when capture input 1 is activated. By reading this parameter, the parameter "_Cap1PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with firmware version ≥V01.12.	- - - -	UINT16 R/- - -	CANopen 300A:17_h Modbus 2606
_Cap1PosCons	Capture input 1 captured position (continuous). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap1CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with firmware version ≥V01.12.	usr_p - - -	INT32 R/- - -	CANopen 300A:18_h Modbus 2608

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_Cap2CountCons	Capture input 2 event counter (continuous). Counts the capture events. The event counter is reset when capture input 2 is activated. By reading this parameter, the parameter "_Cap2PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Available with firmware version ≥V01.12.	- - - -	UINT16 R/- - -	CANopen 300A:19$_h$ Modbus 2610
_Cap2PosCons	Capture input 2 captured position (continuous). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap2CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Available with firmware version ≥V01.12.	usr_p - - -	INT32 R/- - -	CANopen 300A:1A$_h$ Modbus 2612

Position Capture via Signal Input (DS402 Profile)

Description

The motor position can be captured when a signal is detected at a Capture input.

Availability

Available with firmware version ≥V01.16.

Number of Capture Inputs

The number of Capture inputs depends on the hardware version.

- With hardware version ≥RS03:
  2 Capture inputs: *DI0/CAP1* and *DI1/CAP2*
- With hardware version <RS03:
  1 Capture input: *DI0/CAP1*

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 1.6 user-defined units at a velocity of 3000 RPM.

(3000 RPM = (3000*16384)/(60*10^6) = 0.8 usr_p/µs)

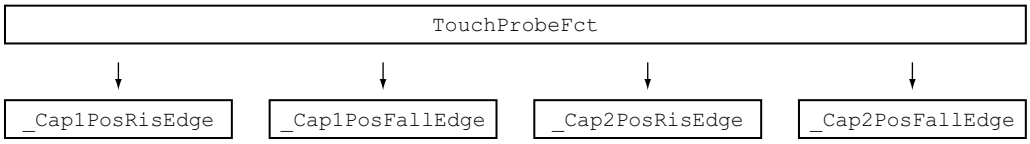
If the factory settings for scaling are used, 1.6 user-defined units correspond to 0.035 °.

The captured motor position is less accurate during the acceleration phase and the deceleration phase.

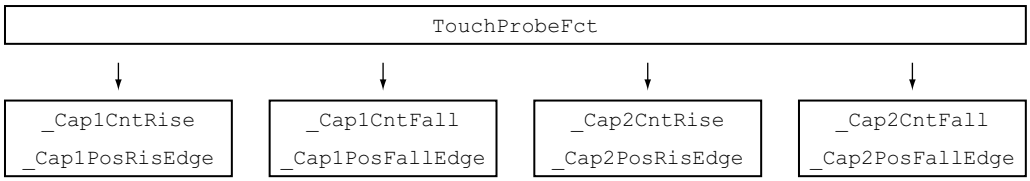
Overview of the Parameters

The following graphics provide an overview of the parameters.

Parameters for one-time capture:



Parameters for continuous capture:



Adjusting and Starting Position Capture

The following parameter let you adjust and start position capture.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
TouchProbeFct	Touch Probe function (DS402). Modified settings become active immediately. Available with firmware version ≥V01.16.	- - - -	UINT16 R/W - -	CANopen 60B8:0_h Modbus 7028

Bit	**Value 0**	**Value 1**
0	Deactivate Capture input 1	Activate Capture input 1
1	One-time capture	Continuous capture
2 ... 3	Reserved (must be 0)	-
4	Disabling capture with rising edge	Enabling capture with rising edge
5	Disabling capture with falling edge	Enabling capture with falling edge
6 ... 7	Reserved (must be 0)	-
8	Deactivate Capture input 2	Activate Capture input 2

Bit	Value 0	Value 1
9	One-time capture	Continuous capture
10 ... 11	Reserved (must be 0)	-
12	Disabling capture with rising edge	Enabling capture with rising edge
13	Disabling capture with falling edge	Enabling capture with falling edge
14 ... 15	Reserved (must be 0)	-

NOTE: With Capture input 2 the motor position can only be captured with either a rising edge or with a falling edge. Capturing with both edges is not possible.

Status Messages

The following parameter lets you indicate the capture status.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_TouchProbeStat	Touch Probe status (DS402). Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 60B9:0$_h$ Modbus 7030

Bit	Value 0	Value 1
0	Capture input 1 deactivated	Capture input 1 activated
1	Capture input 1 no value captured for rising edge	Capture input 1 value captured for rising edge
2	Capture input 1 no value captured for falling edge	Capture input 1 value captured for falling edge
3 ... 7	Reserved	-
8	Capture input 2 deactivated	Capture input 2 activated
9	Capture input 2 no value captured for rising edge	Capture input 2 value captured for rising edge
10	Capture input 2 no value captured for falling edge	Capture input 2 value captured for falling edge
11 ... 15	Reserved	-

Captured Position

The captured position can be read via the following parameters:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_Cap1PosRisEdge	Capture input 1 captured position at rising edge (DS402). 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". Available with firmware version ≥V01.16.	usr_p - - -	INT32 R/- - -	CANopen 60BA:0_h Modbus 2634
_Cap1CntRise	Capture input 1 event counter at rising edges (DS402). Counts the capture events at rising edges. The event counter is reset when capture input 1 is activated. Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 300A:$2B_h$ Modbus 2646
_Cap1PosFallEdge	Capture input 1 captured position at falling edge (DS402). 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". Available with firmware version ≥V01.16.	usr_p - - -	INT32 R/- - -	CANopen 60BB:0_h Modbus 2636
_Cap1CntFall	Capture input 1 event counter at falling edges (DS402). Counts the capture events at falling edges. The event counter is reset when capture input 1 is activated. Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 300A:$2C_h$ Modbus 2648
_Cap2PosRisEdge	Capture input 2 captured position at rising edge (DS402). 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". Available with firmware version ≥V01.16.	usr_p - - -	INT32 R/- - -	CANopen 60BC:0_h Modbus 2638
_Cap2CntRise	Capture input 2 event counter at rising edges (DS402). Counts the capture events at rising edges. The event counter is reset when capture input 2 is activated. Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 300A:$2D_h$ Modbus 2650
_Cap2PosFallEdge	Capture input 2 captured position at falling edge (DS402). 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". Available with firmware version ≥V01.16.	usr_p - - -	INT32 R/- - -	CANopen 60BD:0_h Modbus 2640

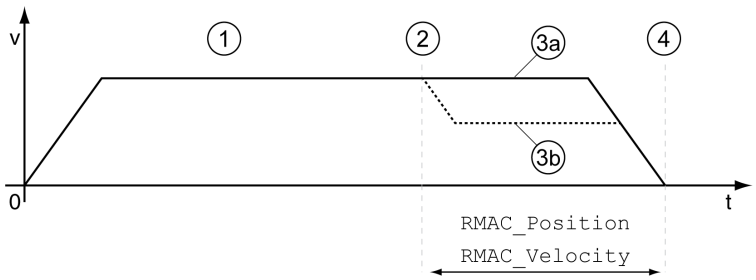
Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_Cap2CntFall	Capture input 2 event counter at falling edges (DS402). Counts the capture events at falling edges. The event counter is reset when capture input 2 is activated. Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 300A:2E$_h$ Modbus 2652
_CapEventCounters	Capture inputs 1 and 2 summary of event counters (DS402). 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) Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 300A:2F$_h$ Modbus 2654

Relative Movement After Capture (RMAC)

Description

Relative Movement After Capture (RMAC) starts a relative movement via a signal input while another movement is running.

The target position and the velocity can be parameterized.



1 Movement with set operating mode (for example operating mode Profile Velocity)

2 Start of the relative movement after capture with the signal input function Start Signal Of RMAC

3a Relative movement after capture is performed with unchanged velocity

3b Relative movement after capture is performed with parameterized velocity

4 Target position reached

Availability

A Relative Movement After Capture (RMAC) can be started in the following operating modes:

- Jog
- Profile Torque

- Profile Velocity
- Profile Position

Available with hardware version ≥RS03.

Signal Input Functions

The signal input function “Start Signal Of RMAC” is required to start the relative movement.

The signal input function must have been parameterized, see Digital Signal Inputs and Digital Signal Outputs, page 173.

Status Indication

The status is available via a signal output or via the fieldbus.

In order to read the status via a signal output, you must first parameterize the signal output function “RMAC Active Or Finished”, see Digital Signal Inputs and Digital Signal Outputs, page 173.

In order to read the status via the fieldbus, you must set the status bits of the status parameters, see Adjustable Bits of the Status Parameters, page 282.

In addition, the status is available via the parameters *_RMAC_Status* and *_RMAC_DetailStatus*.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_RMAC_Status	Status of relative movement after capture. **0 / Not Active**: Not active **1 / Active Or Finished**: Relative movement after capture is active or finished Available with firmware version ≥V01.10.	- 0 - 1	UINT16 R/- - -	CANopen 3023:11$_h$ Modbus 8994
_RMAC_DetailStatus	Detailed status of relative movement after capture (RMAC). **0 / Not Activated**: Not activated **1 / Waiting**: Waiting for capture signal **2 / Moving**: Relative movement after capture running **3 / Interrupted**: Relative movement after capture interrupted **4 / Finished**: Relative movement after capture terminated Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 3023:12$_h$ Modbus 8996

Activates Relative Movement After Capture

Relative Movement After Capture (RMAC) must be activated before it can be started.

Relative Movement After Capture (RMAC) is activated via the following parameter:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RMAC_Activate	Activation of relative movement after capture. **0 / Off**: Off **1 / On**: On Modified settings become active immediately. Available with firmware version ≥V01.10.	- 0 0 1	UINT16 R/W - -	CANopen 3023:C_h Modbus 8984

It is also possible to activate relative Movement After Capture (RMAC) via the signal input function "Activate RMAC".

Target Values

The target position and the velocity for the relative movement are set via the following parameters.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RMAC_Position	Target position of relative movement after capture. Minimum/maximum values depend on: - Scaling factor Modified settings become active the next time the motor moves. Available with firmware version ≥V01.10.	usr_p - 0 -	INT32 R/W per. -	CANopen 3023:D_h Modbus 8986
RMAC_Velocity	Velocity of relative movement after capture. Value 0: Use actual motor velocity Value >0: Value is the target velocity The adjustable value is internally limited to the setting in RAMP_v_max. Modified settings become active the next time the motor moves. Available with firmware version ≥V01.10.	usr_v 0 0 2147483647	UINT32 R/W per. -	CANopen 3023:E_h Modbus 8988

Edge for the Start Signal

The edge which is to trigger the relative movement is set via the following parameter.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RMAC_Edge	Edge of capture signal for relative movement after capture. **0 / Falling edge**: Falling edge **1 / Rising edge**: Rising edge Available with firmware version ≥V01.10.	- 0 0 1	UINT16 R/W per. -	CANopen 3023:10_h Modbus 8992

Response to Overtravelling of the Target Position

Depending on the set velocity, target position and deceleration ramp, the target position may be overtraveled.

The response to overtravelling of the target position is set via the following parameter.

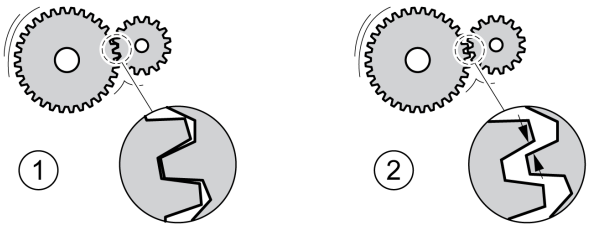
Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
RMAC_Response	Response if target position is overtraveled. **0 / Error Class 1**: Error class 1 **1 / No Movement To Target Position**: No movement to target position **2 / Movement To Target Position**: Movement to target position Modified settings become active immediately. Available with firmware version ≥V01.10.	- 0 0 2	UINT16 R/W per. -	CANopen 3023:F_h Modbus 8990

Backlash Compensation

Description

By setting backlash compensation, you can compensate for mechanical backlash.

Example of mechanical backlash



1 Example of low mechanical backlash

2 Example of high mechanical backlash

When backlash compensation is activated, the drive automatically compensates for the mechanical backlash during each movement.

Availability

Available with firmware version ≥V01.14.

Backlash compensation is possible in the following operating modes:

- Jog
- Profile Position
- Interpolated Position
- 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. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.14.	usr_p 0 0 2147483647	INT32 R/W per. -	CANopen 3006:42$_h$ Modbus 1668

In addition, you can set a processing time. The processing time specifies the period of time during which the mechanical backlash is to be compensated for.

The parameter *BLSH_Time* lets you set the processing time in ms.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
BLSH_Time	Processing time for backlash compensation. Value 0: Immediate backlash compensation Value >0: Processing time for backlash compensation Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.14.	ms 0 0 16383	UINT16 R/W per. -	CANopen 3006:44$_h$ Modbus 1672

Activating Backlash Compensation

Before you can activate backlash compensation, there must be a movement in positive or negative direction. Backlash compensation is activated with the parameter *BLSH_Mode*.

- Start a movement in positive direction or in negative direction. This movement must last as long as it takes to move the mechanical system connected to the motor.
- If the movement was in positive direction (positive target values), activate backlash compensation with the value "OnAfterPositiveMovement".
- If the movement was in negative direction (negative target values), activate backlash compensation with the value "OnAfterNegativeMovement".

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
BLSH_Mode	Processing mode of backlash compensation. **0 / Off**: Backlash compensation is off **1 / OnAfterPositiveMovement**: Backlash compensation is on, last movement was in positive direction **2 / OnAfterNegativeMovement**: Backlash compensation is on, last movement was in negative direction Modified settings become active immediately. Available with firmware version ≥V01.14.	- 0 0 2	UINT16 R/W per. -	CANopen 3006:41$_h$ Modbus 1666

Functions for Monitoring Movements

Limit Switches

Description

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

⚠WARNING

LOSS OF CONTROL

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

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

Movements can be monitored using limit switches. A positive limit switch and a negative limit switch can be used for monitoring.

If the positive or negative limit switch are tripped, the movement stops. An error message is generated and the operating state switches to **7** Quick Stop Active.

The error message can be reset by means of a “Fault Reset”. The operating state switches back to **6** Operation Enabled.

The movement can continue, however, only in the opposite direction. For example, if the positive limit switch was triggered, further movement is only possible in negative direction. In the case of further movement in positive direction, a new error message is generated and the operating state switches back to **7** Quick Stop Active.

The parameters *IOsigLIMP* and *IOsigLIMN* are used to set the type of limit switch.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
IOsigLIMP	Signal evaluation for positive limit switch. **0 / Inactive**: Inactive **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	CANopen 3006:10_h Modbus 1568
IOsigLIMN	Signal evaluation for negative limit switch. **0 / Inactive**: Inactive **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	CANopen 3006:F_h Modbus 1566

The signal input functions “Positive Limit Switch (LIMP)” and “Negative Limit Switch (LIMN)” must have been parameterized, see Digital Signal Inputs and Digital Signal Outputs, page 173.

Reference Switch

Description

The reference switch is only active in the operating mode Homing.

The parameter *IOsigREF* lets you set the type of reference switch.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
IOsigREF	Signal evaluation for reference switch. **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO The reference switch is only active while a reference movement to the reference switch is processed. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 1 1 2	UINT16 R/W per. -	CANopen 3006:E_h Modbus 1564

The signal input function “Reference Switch (REF)” must have been parameterized, see Digital Signal Inputs and Digital Signal Outputs, page 173.

Software Limit Switches

Description

Movements can be monitored using software limit switches. A positive position limit and a negative position limit can be set for monitoring.

If the positive or negative position limit switch are reached, the movement stops. An error message is generated and the operating state switches to **7** Quick Stop Active.

The error message can be reset by means of a “Fault Reset”. The operating state switches back to **6** Operation Enabled.

The movement can continue, however, only in the opposite direction of the position limit. For example, if the positive position limit was reached, further movement is only possible in negative direction. In the case of further movement in positive direction, a new error message is generated and the operating state switches back to **7** Quick Stop Active.

Prerequisite

Software limit switch monitoring only works with a valid zero point, see Size of the Movement Range, page 158.

Behavior in Operating Modes with Target Positions

In operating modes with target positions, the movement is started even if the target position is beyond the positive position limit or the negative position limit.

The movement is stopped so that the motor comes to a standstill at the position limit. After standstill, the drive transitions to the operating state Quick Stop Active.

In the following operating modes, the target position is verified prior to the start of a movement so that the position limit is not exceeded regardless of the target position.

- Jog (step movement)
- Profile Position

Behavior in Operating Modes Without Target Positions

In the following operating modes, a Quick Stop is triggered at the position limit.

- Jog (continuous movement)
- Profile Torque
- Profile Velocity

As of firmware version ≥V01.16, you can use the parameter *MON_SWLimMode* to set the behavior for approaching a position limit.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
MON_SWLimMode	Behavior when position limit is reached. **0 / Standstill Behind Position Limit**: Quick Stop is triggered at position limit and standstill is reached behind position limit **1 / Standstill At Position Limit**: Quick Stop is triggered in front of position limit and standstill is reached at position limit Modified settings become active immediately. Available with firmware version ≥V01.16.	- 0 0 1	UINT16 R/W per. -	CANopen 3006:47$_h$ Modbus 1678

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 Stopping Movement with Quick Stop, page 241. If the parameter *LIM_QStopReact* is set to "Torque ramp (Quick Stop)", the movement may come to a standstill in front of or behind the position limit due to different loads.

Activation

The software limit switches are activated via the parameter *MON_SW_Limits*.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_SW_Limits	Activation of software limit switches. **0 / None**: Deactivated **1 / SWLIMP**: Activation of software limit switches positive direction **2 / SWLIMN**: Activation of software limit switches negative direction **3 / SWLIMP+SWLIMN**: Activation of software limit switches both directions Software limit switches can only be activated if the zero point is valid. Modified settings become active immediately.	- 0 0 3	UINT16 R/W per. -	CANopen 3006:3$_h$ Modbus 1542

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. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	usr_p - 2147483647 -	INT32 R/W per. -	CANopen 607D:2$_h$ Modbus 1544
MON_swLimN	Negative position limit for software limit switch. See description 'MON_swLimP'. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	usr_p - -2147483648 -	INT32 R/W per. -	CANopen 607D:1$_h$ Modbus 1546

Load-Dependent Position Deviation (Following Error)

Description

The load-dependent position deviation is the difference between the reference position and the actual position caused by the load inertia.

Parameters are available to read the load-dependent position deviation during operation and the maximum position deviation reached since the last power cycle.

The maximum permissible load-dependent position deviation can be parameterized. In addition, you can set the error class.

Availability

Monitoring of the load-dependent position deviation is available in the following operating modes:

- Jog
- Profile Position
- Homing

Reading the Position Deviation

The following parameters let you read the load-dependent position deviation.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_p_dif_load_usr	Load-dependent position deviation between reference and actual positions. The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. This value is used for following error monitoring. Available with firmware version ≥V01.05.	usr_p -2147483648 - 2147483647	INT32 R/- - -	CANopen 301E:16$_h$ Modbus 7724

The following parameters let you read the maximum value of the load-dependent position deviation reached since the last power cycle.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_p_dif_load_peak_usr	Maximum value of the load-dependent position deviation. This parameter contains the maximum load-dependent position deviation reached so far. A write access resets this value. Modified settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 - 2147483647	INT32 R/W - -	CANopen 301E:15$_h$ Modbus 7722

Setting the Maximum Values for the Position Deviation

The following parameter lets you set the threshold for the maximum load-dependent position deviation that is to trigger an error of error class 0.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
MON_p_dif_warn	Advisory limit of the load-dependent position deviation (error class 0). 100.0 % correspond to the maximum position deviation (following error) as specified by means of parameter MON_p_dif_load. Modified settings become active immediately.	% 0 75 100	UINT16 R/W per. -	CANopen 3006:29$_h$ Modbus 1618

The following parameters let you set the maximum load-dependent position deviation at which a movement is canceled with an error of error classes 1, 2, or 3.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
MON_p_dif_load_usr	Maximum load-dependent position deviation. The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. The minimum value, the factory setting and the maximum value depend on the scaling factor. Modified settings become active immediately. Available with firmware version ≥V01.05.	usr_p 1 16384 2147483647	INT32 R/W per. -	CANopen 3006:3E$_h$ Modbus 1660

Setting the Error Class

The following parameter lets you set the error class for an excessively high load-dependent position deviation.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
ErrorResp_p_dif	Error response to excessively high load-dependent position deviation. **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 1 3 3	UINT16 R/W per. -	CANopen 3005:B$_h$ Modbus 1302

Load-Dependent Velocity Deviation

Description

The load-dependent velocity deviation is the difference between the reference velocity and the actual velocity caused by the load.

The maximum permissible load-dependent velocity deviation can be parameterized. In addition, you can set the error class.

Availability

Monitoring of the load-dependent velocity deviation is available in the following operating modes:

- Profile Velocity

Reading the Velocity Deviation

The following parameters let you read the load-dependent velocity deviation.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_v_dif_usr	Load-dependent velocity deviation. The load-dependent velocity deviation is the difference between reference velocity and actual velocity. Available with firmware version ≥V01.26.	usr_v -2147483648 - 2147483647	INT32 R/- - -	CANopen 301E:2C$_h$ Modbus 7768

Setting the Maximum Values for the Velocity Deviation

The following parameters let you specify the size of the window for the maximum load-dependent velocity deviation at which a movement is canceled.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_VelDiff	Maximum load-dependent velocity deviation. Value 0: Monitoring deactivated. Value >0: Maximum value Modified settings become active immediately. Available with firmware version ≥V01.26.	usr_v 0 0 2147483647	UINT32 R/W per. -	CANopen 3006:4B$_h$ Modbus 1686
MON_VelDiff_Time	Time window for maximum load-dependent velocity deviation. Value 0: Monitoring deactivated. Value >0: Time window for maximum value Modified settings become active immediately. Available with firmware version ≥V01.26.	ms 0 10 -	UINT16 R/W per. -	CANopen 3006:4C$_h$ Modbus 1688

Setting the Error Class

The following parameter lets you set the error class for an excessively high load-dependent velocity deviation.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ErrorResp_v_dif	Error response to excessively high load-dependent velocity deviation. **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.26.	- 1 3 3	UINT16 R/W per. -	CANopen 3005:3C$_h$ Modbus 1400

Motor Standstill and Direction of Movement

Availability

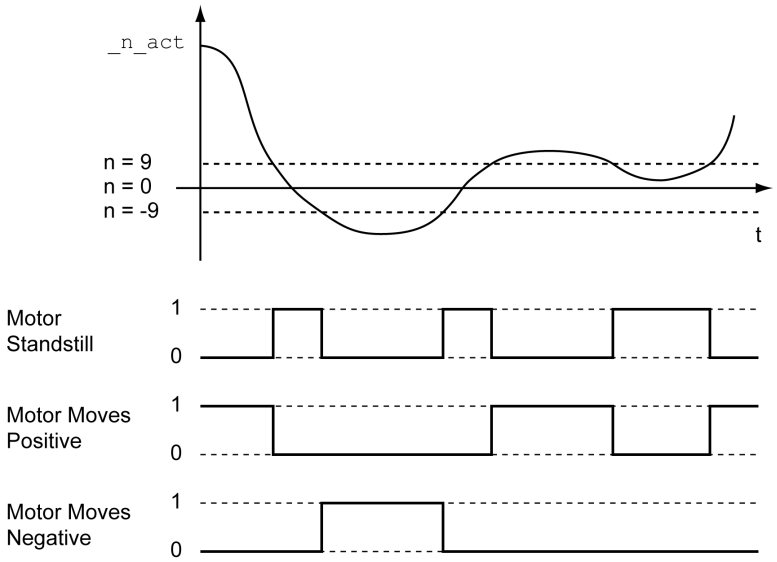
Monitoring depends on the firmware version

- Motor standstill: Available with firmware version ≥V01.00.
- Direction of movement: Available with firmware version ≥V01.14.

Description

The status of a movement can be monitored. You can determine whether the motor is at a standstill or whether it moves in a specific direction.

A velocity of <9 RPM is interpreted as standstill.



The status is available via signal outputs. In order to read the status, you must first parameterize the signal output functions “Motor Standstill”, “Motor Moves Positive” or “Motor Moves Negative”, see Digital Signal Inputs and Digital Signal Outputs, page 173.

Torque Window

Description

The torque window allows you to monitor whether the motor has reached the target torque.

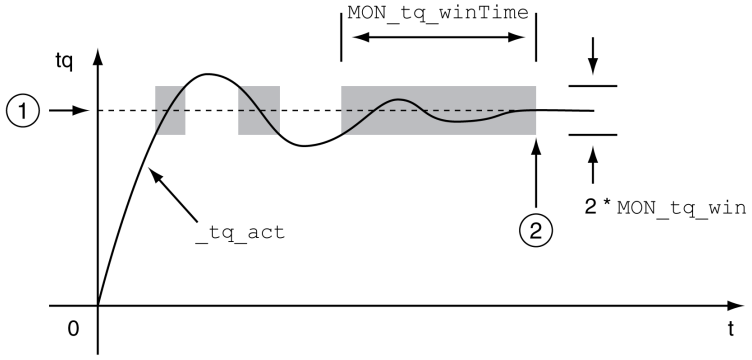
If the difference between the target torque and the actual torque remains in the torque window for the time *MON_tq_winTime*, the target torque is considered to have been reached.

Availability

The torque window is available in the following operating modes.

- Profile Torque

Setings



1 Target torque

2 Target torque reached (the actual torque did not exceed the permissible deviation *MON_tq_win* during time *MON_tq_winTime*).

The parameters *MON_tq_win* and *MON_tq_winTime* specify the size of the window.

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_tq_win	Torque window, permissible deviation. The torque window can only be activated in operating mode Profile Torque. In increments of 0.1 %. Modified settings become active immediately.	% 0.0 3.0 3000.0	UINT16 R/W per. -	CANopen 3006:2D$_h$ Modbus 1626
MON_tq_winTime	Torque window, time. Value 0: Torque window monitoring deactivated Changing the value causes a restart of torque monitoring. Torque window is only used in operating mode Profile Torque. Modified settings become active immediately.	ms 0 0 16383	UINT16 R/W per. -	CANopen 3006:2E$_h$ Modbus 1628

Velocity Window

Description

The velocity window allows you to monitor whether the motor has reached the target velocity.

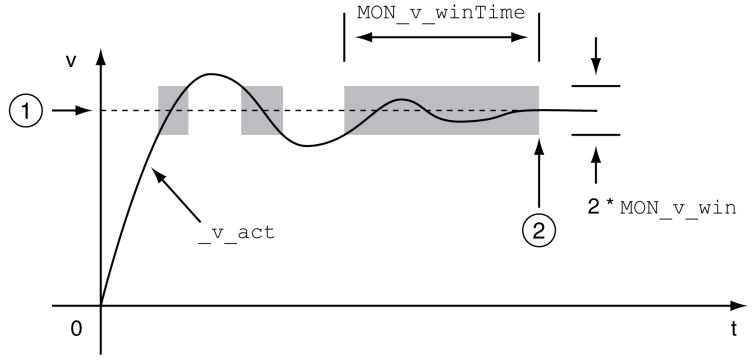
If the difference between the target velocity and the actual velocity remains in the velocity window for the time *MON_v_winTime*, the target velocity is considered to have been reached.

Availability

The velocity window is available in the following operating modes.

- Profile Velocity

Settings



1 Target velocity

2 Target velocity reached (the target velocity did not exceed the permissible deviation *MON_v_win* during time *MON_v_winTime*).

The parameters *MON_v_win* and *MON_v_winTime* specify the size of the window.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
MON_v_win	Velocity window, permissible deviation. Modified settings become active immediately. * Datatype for CANopen: UINT16	usr_v 1 10 2147483647	UINT32* R/W per. -	CANopen 606D:0_h Modbus 1576
MON_v_winTime	Velocity window, time. Value 0: Velocity window monitoring deactivated Changing the value causes a restart of velocity monitoring. Modified settings become active immediately.	ms 0 0 16383	UINT16 R/W per. -	CANopen 606E:0_h Modbus 1578

Standstill Window

Description

The standstill window allows you to monitor whether the motor has reached the target position.

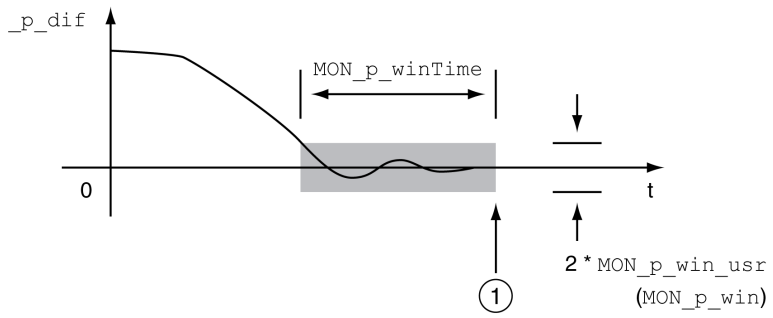
If the difference between the target position and the actual position remains in the standstill window for the time *MON_p_winTime*, the target position is considered to have been reached.

Availability

The standstill window is available in the following operating modes.

- Jog (step movement)
- Profile Position
- Homing

Settings



1 Target position reached (the actual position did not exceed the permissible deviation *MON_p_win_usr* during time *MON_p_winTime*).

The parameters *MON_p_win_usr(MON_p_win)* and *MON_p_winTime* specify the size of the window.

The parameter *MON_p_winTout* can be used to set the period of time after which a detected error is signaled if the standstill window was not reached.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
MON_p_win_usr	Standstill window, permissible control deviation. The control deviation for the standstill window time must be within this range for a standstill of the drive to be detected. Processing of the standstill window must be activated via the parameter MON_p_winTime. The minimum value, the factory setting and the maximum value depend on the scaling factor. Modified settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 16 2147483647	INT32 R/W per. -	CANopen 3006:40$_h$ Modbus 1664
MON_p_win	Standstill window, permissible control deviation. The control deviation for the standstill window time must be within this range for a standstill of the drive to be detected. Processing of the standstill window must be activated via the parameter MON_p_winTime. The parameter MON_p_win_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution. Modified settings become active immediately. * Datatype for CANopen: UINT32	revolution 0.0000 0.0010 3.2767	UINT16* R/W per. -	CANopen 6067:0$_h$ Modbus 1608

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_p_winTime	Standstill window, time. Value 0: Monitoring of standstill window deactivated Value >0: Time in ms during which the control deviation must be in the standstill window Modified settings become active immediately.	ms 0 0 32767	UINT16 R/W per. -	CANopen 6068:0$_h$ Modbus 1610
MON_p_winTout	Timeout time for standstill window monitoring. Value 0: Timeout monitoring deactivated Value >0: Timeout time in ms Standstill window processing values are set via MON_p_win and MON_p_winTime. Time monitoring starts when the target position (reference position of position controller) is reached or when the profile generator has finished processing. Modified settings become active immediately.	ms 0 0 16000	UINT16 R/W per. -	CANopen 3006:26$_h$ Modbus 1612

Position Register

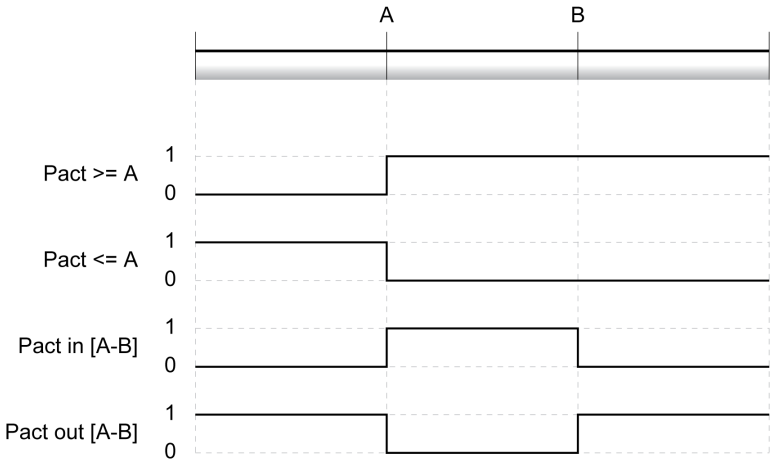
Description

The position register allows you to monitor whether the motor is within a parameterizable position range.

A movement can be monitored using one of 4 methods:

- The motor position is greater than or equal to comparison value A.
- The motor position is less than or equal to comparison value A.
- The motor position is within the range between comparison value A and comparison value B.
- The motor position is outside the range between comparison value A and comparison value B.

Separate channels are available for monitoring.



Number of Channels

The number of channels depends on the firmware version:

- 4 channels (with firmware version ≥V01.06)
- 2 channels (with firmware version <V01.06)

Status Messages

The status of the position register is available via the parameter *_PosRegStatus*.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_PosRegStatus	Status of the position register channels. Signal state: 0: Comparison criterion not met 1: Comparison criterion met Bit assignments: Bit 0: State of position register channel 1 Bit 1: State of position register channel 2 Bit 2: State of position register channel 3 Bit 3: State of position register channel 4	- - - -	UINT16 R/- - -	CANopen 300B:1_h Modbus 2818

In addition, the status is available via signal outputs. In order to read the status via the signal outputs, you must first parameterize the signal output function “Position Register Channel 1”,“Position Register Channel 2”, “Position Register Channel 3” and “Position Register Channel 4”, see Digital Signal Inputs and Digital Signal Outputs, page 173.

Starting the Position Registers

The channels of the position registers are started via the following parameters.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
PosReg1Start	Start/stop of position register channel 1. **0 / Off (keep last state)**: Position Register channel 1 is off and status bit keeps last state **1 / On**: Position Register channel 1 is on **2 / Off (set state 0)**: Position Register channel 1 is off and status bit is set to 0 **3 / Off (set state 1)**: Position Register channel 1 is off and status bit is set to 1 Modified settings become active immediately.	- 0 0 3	UINT16 R/W - -	CANopen 300B:2_h Modbus 2820
PosReg2Start	Start/stop of position register channel 2. **0 / Off (keep last state)**: Position Register channel 2 is off and status bit keeps last state **1 / On**: Position Register channel 2 is on **2 / Off (set state 0)**: Position Register channel 2 is off and status bit is set to 0 **3 / Off (set state 1)**: Position Register channel 2 is off and status bit is set to 1 Modified settings become active immediately.	- 0 0 3	UINT16 R/W - -	CANopen 300B:3_h Modbus 2822
PosReg3Start	Start/stop of position register channel 3. **0 / Off (keep last state)**: Position Register channel 3 is off and status bit keeps last state **1 / On**: Position Register channel 3 is on **2 / Off (set state 0)**: Position Register channel 3 is off and status bit is set to 0 **3 / Off (set state 1)**: Position Register channel 3 is off and status bit is set to 1 Modified settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 3	UINT16 R/W - -	CANopen 300B:C_h Modbus 2840

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PosReg4Start	Start/stop of position register channel 4. **0 / Off (keep last state)**: Position Register channel 4 is off and status bit keeps last state **1 / On**: Position Register channel 4 is on **2 / Off (set state 0)**: Position Register channel 4 is off and status bit is set to 0 **3 / Off (set state 1)**: Position Register channel 4 is off and status bit is set to 1 Modified settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 3	UINT16 R/W - -	CANopen 300B:D_h Modbus 2842
PosRegGroupStart	Start/stop of position register channels. **0 / No Channel**: No channel activated **1 / Channel 1**: Channel 1 activated **2 / Channel 2**: Channel 2 activated **3 / Channel 1 & 2**: Channels 1 and 2 activated **4 / Channel 3**: Channel 3 activated **5 / Channel 1 & 3**: Channels 1 and 3 activated **6 / Channel 2 & 3**: Channels 2 and 3 activated **7 / Channel 1 & 2 & 3**: Channels 1, 2 and 3 activated **8 / Channel 4**: Channel 4 activated **9 / Channel 1 & 4**: Channels 1 and 4 activated **10 / Channel 2 & 4**: Channels 2 and 4 activated **11 / Channel 1 & 2 & 4**: Channels 1, 2 and 4 activated **12 / Channel 3 & 4**: Channels 3 and 4 activated **13 / Channel 1 & 3 & 4**: Channels 1, 3 and 4 activated **14 / Channel 2 & 3 & 4**: Channels 2, 3 and 4 activated **15 / Channel 1 & 2 & 3 & 4**: Channels 1, 2, 3 and 4 activated Modified settings become active immediately. Available with firmware version ≥V01.14.	- 0 0 15	UINT16 R/W per. -	CANopen 300B:16_h Modbus 2860

Setting the Comparison Criterion

The comparison criterion is set via the following parameters.

In the case of the comparison criteria “Pact in” and “Pact out”, there is a difference between “basic” and “extended”.

- Basic: The movement to be performed remains within the movement range.
- Extended: The movement to be performed can extend beyond the movement range.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PosReg1Mode	Selection of comparison criterion for position register channel 1. **0 / Pact greater equal A**: Actual position is greater than or equal to comparison value A for position register channel 1 **1 / Pact less equal A**: Actual position is less than or equal to comparison value A for position register channel 1 **2 / Pact in [A-B] (basic)**: Actual position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Actual position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Actual position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Actual position is out of the range A-B excluding limits (extended) Modified settings become active immediately.	- 0 0 5	UINT16 R/W per. -	CANopen 300B:4_h Modbus 2824
PosReg2Mode	Selection of comparison criterion for position register channel 2. **0 / Pact greater equal A**: Actual position is greater than or equal to comparison value A for position register channel 2 **1 / Pact less equal A**: Actual position is less than or equal to comparison value A for position register channel 2 **2 / Pact in [A-B] (basic)**: Actual position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Actual position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Actual position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Actual position is out of the range A-B excluding limits (extended) Modified settings become active immediately.	- 0 0 5	UINT16 R/W per. -	CANopen 300B:5_h Modbus 2826

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PosReg3Mode	Selection of comparison criterion for position register channel 3. **0 / Pact greater equal A**: Actual position is greater than or equal to comparison value A for position register channel 3 **1 / Pact less equal A**: Actual position is less than or equal to comparison value A for position register channel 3 **2 / Pact in [A-B] (basic)**: Actual position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Actual position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Actual position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Actual position is out of the range A-B excluding limits (extended) Modified settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 5	UINT16 R/W per. -	CANopen 300B:E_h Modbus 2844
PosReg4Mode	Selection of comparison criterion for position register channel 4. **0 / Pact greater equal A**: Actual position is greater than or equal to comparison value A for position register channel 4 **1 / Pact less equal A**: Actual position is less than or equal to comparison value A for position register channel 4 **2 / Pact in [A-B] (basic)**: Actual position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Actual position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Actual position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Actual position is out of the range A-B excluding limits (extended) Modified settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 5	UINT16 R/W per. -	CANopen 300B:F_h Modbus 2846

Setting Comparison Values

The comparison values are set via the following parameters.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PosReg1ValueA	Comparison value A for position register channel 1.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:8_h Modbus 2832
PosReg1ValueB	Comparison value B for position register channel 1.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:9_h Modbus 2834
PosReg2ValueA	Comparison value A for position register channel 2.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:A_h Modbus 2836
PosReg2ValueB	Comparison value B for position register channel 2.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:B_h Modbus 2838
PosReg3ValueA	Comparison value A for position register channel 3. Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:12_h Modbus 2852
PosReg3ValueB	Comparison value B for position register channel 3. Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:13_h Modbus 2854
PosReg4ValueA	Comparison value A for position register channel 4. Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:14_h Modbus 2856
PosReg4ValueB	Comparison value B for position register channel 4. Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:15_h Modbus 2858

Position Deviation Window

Description

The position deviation window allows you to monitor whether the motor is within a parameterizable position deviation.

The position deviation is the difference between reference position and actual position.

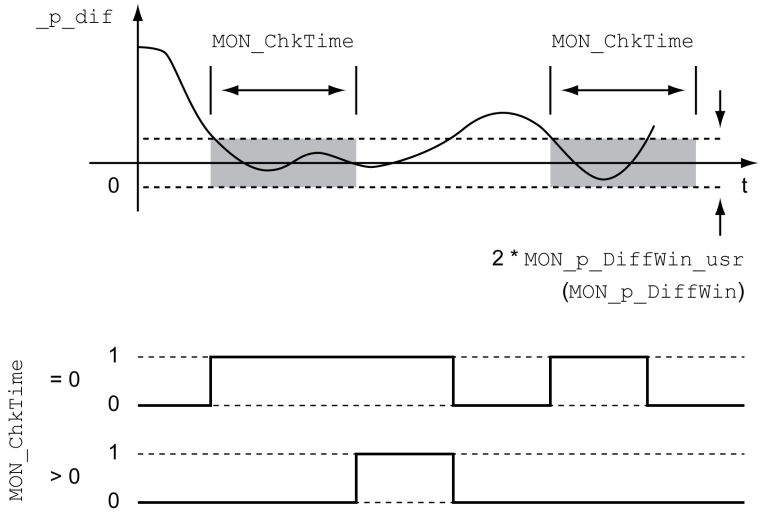
The position deviation window comprises position deviation and monitoring time.

Availability

The position deviation window is available in the following operating modes.

- Jog
- Profile Position
- Homing

Settings



The parameters *MON_p_DiffWin_usr* and *MON_ChkTime* specify the size of the window.

Status Indication

The status is available via a signal output or via the fieldbus.

In order to read the status via a signal output, you must first parameterize the signal output function “In Position Deviation Window”, see Digital Signal Inputs and Digital Signal Outputs, page 173.

In order to read the status via the fieldbus, you must set the status bits of the status parameters, see Adjustable Bits of the Status Parameters, page 282.

The parameter *MON_ChkTime* acts on the parameters *MON_p_DiffWin_usr* (*MON_p_DiffWin*), *MON_v_DiffWin*, *MON_v_Threshold* and *MON_I_Threshold*.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_p_DiffWin_usr	Monitoring of position deviation. The system verifies whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. The minimum value, the factory setting and the maximum value depend on the scaling factor. Modified settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 16 2147483647	INT32 R/W per. -	CANopen 3006:3F$_h$ Modbus 1662
MON_ChkTime ConF → i-o-tthr	Monitoring of time window. Adjustment of a time for monitoring of position deviation, velocity deviation, velocity value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Modified settings become active immediately.	ms 0 0 9999	UINT16 R/W per. -	CANopen 3006:1D$_h$ Modbus 1594

Velocity Deviation Window

Description

The velocity deviation window allows you to monitor whether the motor is within a parameterizable velocity deviation.

The velocity deviation is the difference between the reference velocity and the actual velocity.

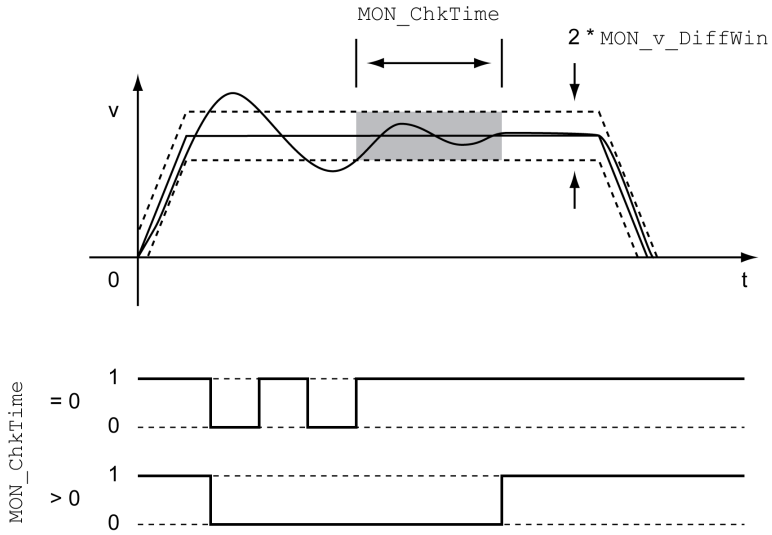
The velocity deviation window comprises velocity deviation and monitoring time.

Availability

The velocity deviation window is available in the following operating modes.

- Jog
- Profile Velocity
- Profile Position
- Homing

Settings



The parameters *MON_v_DiffWin* and *MON_ChkTime* specify the size of the window.

Status Indication

The status is available via a signal output or via the fieldbus.

In order to read the status via a signal output, you must first parameterize the signal output function "In Velocity Deviation Window", see Digital Signal Inputs and Digital Signal Outputs, page 173.

In order to read the status via the fieldbus, you must set the status bits of the status parameters, see Adjustable Bits of the Status Parameters, page 282.

The parameter *MON_ChkTime* acts on the parameters *MON_p_DiffWin_usr*, *MON_v_DiffWin*, *MON_v_Threshold* and *MON_I_Threshold*.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
MON_v_DiffWin	Monitoring of velocity deviation. The system monitors whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. Modified settings become active immediately.	usr_v 1 10 2147483647	UINT32 R/W per. -	CANopen 3006:1A$_h$ Modbus 1588
MON_ChkTime CONF → I-O-ETHR	Monitoring of time window. Adjustment of a time for monitoring of position deviation, velocity deviation, velocity value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Modified settings become active immediately.	ms 0 0 9999	UINT16 R/W per. -	CANopen 3006:1D$_h$ Modbus 1594

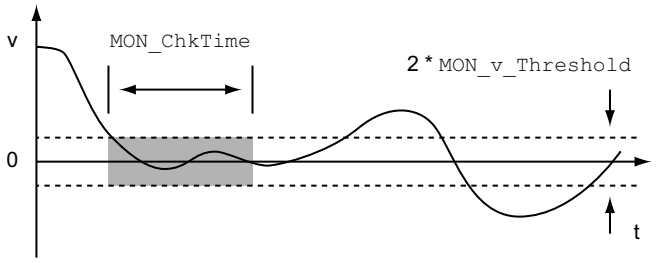
Velocity Threshold Value

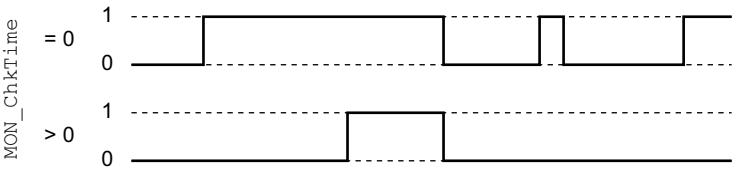
Description

The velocity threshold value allows you to monitor whether the actual velocity is below a parameterizable velocity value.

The velocity threshold value comprises the velocity and the monitoring time.

Settings





The parameters *MON_v_Threshold* and *MON_ChkTime* specify the size of the window.

Status Indication

The status is available via a signal output or via the fieldbus.

In order to read the status via a signal output, you must first parameterize the signal output function "Velocity Below Threshold", see Digital Signal Inputs and Digital Signal Outputs, page 173.

In order to read the status via the fieldbus, you must set the status bits of the status parameters, see Adjustable Bits of the Status Parameters, page 282.

The parameter *MON_ChkTime* acts on the parameters *MON_p_DiffWin_usr*, *MON_v_DiffWin*, *MON_v_Threshold* and *MON_I_Threshold*.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_v_Threshold	Monitoring of velocity threshold. The system monitors whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. Modified settings become active immediately.	usr_v 1 10 2147483647	UINT32 R/W per. -	CANopen 3006:1B$_h$ Modbus 1590
MON_ChkTime ConF → I-O-tthr	Monitoring of time window. Adjustment of a time for monitoring of position deviation, velocity deviation, velocity value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Modified settings become active immediately.	ms 0 0 9999	UINT16 R/W per. -	CANopen 3006:1D$_h$ Modbus 1594

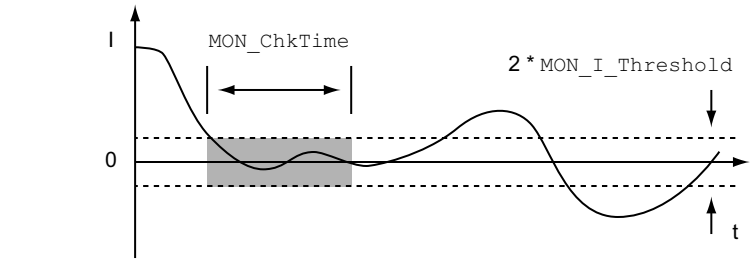
Current Threshold Value

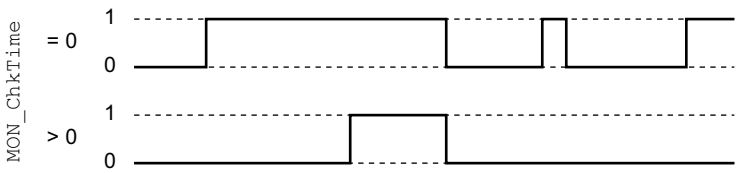
Description

The current threshold value allows you to monitor whether the actual current is below a parameterizable current value.

The current threshold value comprises the current value and the monitoring time.

Settings





The parameters *MON_I_Threshold* and *MON_ChkTime* specify the size of the window.

Status Indication

The status is available via a signal output or via the fieldbus.

In order to read the status via a signal output, you must first parameterize the signal output function "Current Below Threshold", see Digital Signal Inputs and Digital Signal Outputs, page 173.

In order to read the status via the fieldbus, you must set the status bits of the status parameters, see Adjustable Bits of the Status Parameters, page 282.

The parameter *MON_ChkTime* acts on the parameters *MON_p_DiffWin_usr*, *MON_v_DiffWin*, *MON_v_Threshold* and *MON_I_Threshold*.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
MON_I_Threshold ConF → i-o- ithr	Monitoring of current threshold. The system monitors whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter _Iq_act_rms is used as comparison value. In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} 0.00 0.20 300.00	UINT16 R/W per. -	CANopen 3006:1C$_h$ Modbus 1592
MON_ChkTime ConF → i-o- tthr	Monitoring of time window. Adjustment of a time for monitoring of position deviation, velocity deviation, velocity value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Modified settings become active immediately.	ms 0 0 9999	UINT16 R/W per. -	CANopen 3006:1D$_h$ Modbus 1594

Adjustable Bits of the Status Parameters

Overview

The status bits of the following parameters can be adjusted:

- Parameter *_actionStatus*
  - Setting of bit 9 via parameter *DPL_intLim*
  - Setting of bit 10 via parameter *DS402intLim*
- Parameter *_DPL_motionStat*
  - Setting of bit 9 via parameter *DPL_intLim*
  - Setting of bit 10 via parameter *DS402intLim*
- Parameter *_DCOMstatus*
  - Setting of bit 11 via parameter *DS402intLim*

Status Parameter

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_actionStatus	Action word. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: Error class 0 Bit 1: Error class 1 Bit 2: Error class 2 Bit 3: Error class 3 Bit 4: Error class 4 Bit 5: Reserved Bit 6: Motor is at a standstill (_n_act < 9 RPM) Bit 7: Motor movement in positive direction Bit 8: Motor movement in negative direction Bit 9: Assignment can be set via parameter DPL_intLim Bit 10: Assignment can be set via parameter DS402intLim Bit 11: Profile generator idle (reference velocity is 0) Bit 12: Profile generator decelerates Bit 13: Profile generator accelerates Bit 14: Profile generator moves at constant speed Bit 15: Reserved	- - - -	UINT16 R/- - -	CANopen 301C:4$_h$ Modbus 7176
_DCOMstatus	DriveCom status word. Bit assignments: Bit 0: Operating state Ready To Switch On Bit 1: Operating state Switched On Bit 2: Operating state Operation Enabled Bit 3: Operating state Fault Bit 4: Voltage Enabled Bit 5: Operating state Quick Stop Bit 6: Operating state Switch On Disabled Bit 7: Error of error class 0 Bit 8: HALT request active Bit 9: Remote Bit 10: Target Reached Bit 11: Internal Limit Active Bit 12: Operating mode-specific Bit 13: x_err Bit 14: x_end	- - - -	UINT16 R/- - -	CANopen 6041:0$_h$ Modbus 6916

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
	Bit 15: ref_ok			
_DPL_motionStat	Drive Profile Lexium motionStat.	- - - -	UINT16 R/- - -	CANopen 301B:27_h Modbus 6990

Parameter for Setting the Status Bits

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
DPL_intLim	Setting for bit 9 of _DPL_motionStat and _actionStatus. **0 / None**: Not used (reserved) **1 / Current Below Threshold**: Current threshold value **2 / Velocity Below Threshold**: Velocity threshold value **3 / In Position Deviation Window**: Position deviation window **4 / In Velocity Deviation Window**: Velocity deviation window **5 / Position Register Channel 1**: Position register channel 1 **6 / Position Register Channel 2**: Position register channel 2 **7 / Position Register Channel 3**: Position register channel 3 **8 / Position Register Channel 4**: Position register channel 4 **9 / Hardware Limit Switch**: Hardware limit switch **10 / RMAC active or finished**: Relative movement after capture is active or finished **11 / Position Window**: Position window Setting for: Bit 9 of the parameter _actionStatus Bit 9 of the parameter _DPL_motionStat Modified settings become active immediately. Available with firmware version ≥V01.08.	- 0 11 11	UINT16 R/W per. -	CANopen 301B:35_h Modbus 7018
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	- 0 0 11	UINT16 R/W per. -	CANopen 301B:$1E_h$ Modbus 6972

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
	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 Modified settings become active immediately.			

Functions for Monitoring Internal Device Signals

Temperature Monitoring

Temperature of Power Stage

The parameter *_PS_T_current* indicates the temperature of the power stage.

The parameter *_PS_T_warn* contains the threshold value for an error of error class 0. The parameter *_PS_T_max* indicates the maximum power stage temperature.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_PS_T_current Mon tPS	Temperature of power stage.	°C - - -	INT16 R/- - -	CANopen 301C:10h Modbus 7200
_PS_T_warn	Advisory temperature limit of power stage (error class 0).	°C - - -	INT16 R/- per. -	CANopen 3010:6h Modbus 4108
_PS_T_max	Maximum temperature of power stage.	°C - - -	INT16 R/- per. -	CANopen 3010:7h Modbus 4110

Temperature of Motor

The parameter *_M_T_current* indicates the motor temperature.

The parameter *_M_T_max* indicates the maximum motor temperature.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_M_T_current Mon tMot	Temperature of motor.	°C - - -	INT16 R/- - -	CANopen 301C:11h Modbus 7202
_M_T_max	Maximum temperature of motor.	°C - - -	INT16 R/- - -	CANopen 300D:10h Modbus 3360

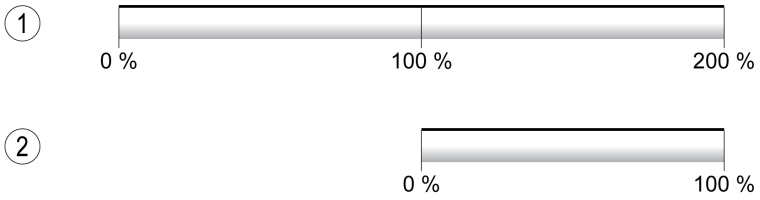
Monitoring Load and Overload (I^2T Monitoring)

Description

The load is the thermal load on the power stage, the motor and the braking resistor.

Load and overload on the individual components are monitored internally; the values can be read by means of parameters.

Overload starts at a load value of 100 %.



1 Load

2 Overload

Load Monitoring

The load can be read using the following parameters:

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_PS_load *MON* *LdFP*	Load of power stage.	% - - -	INT16 R/- - -	CANopen 301C:17$_h$ Modbus 7214
_M_load *MON* *LdFM*	Load of motor.	% - - -	INT16 R/- - -	CANopen 301C:1A$_h$ Modbus 7220
_RES_load *MON* *LdFb*	Load of braking resistor. The braking resistor set via parameter RESint_ext is monitored.	% - - -	INT16 R/- - -	CANopen 301C:14$_h$ Modbus 7208

Overload Monitoring

In the case of 100 % overload of the power stage or the motor, the current is limited internally. In the case of 100 % overload of the braking resistor, the braking resistor is deactivated.

The overload and the peak value can be read using the following parameters:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_PS_overload	Overload of power stage.	% - - -	INT16 R/- - -	CANopen 301C:24$_h$ Modbus 7240
_PS_maxoverload	Maximum value of overload of power stage. Maximum overload of power stage during the last 10 seconds.	% - - -	INT16 R/- - -	CANopen 301C:18$_h$ Modbus 7216
_M_overload	Overload of motor (I2t).	% - - -	INT16 R/- - -	CANopen 301C:19$_h$ Modbus 7218
_M_maxoverload	Maximum value of overload of motor. Maximum overload of motor during the last 10 seconds.	% - - -	INT16 R/- - -	CANopen 301C:1B$_h$ Modbus 7222
_RES_overload	Overload of braking resistor (I2t). The braking resistor set via parameter RESint_ext is monitored.	% - - -	INT16 R/- - -	CANopen 301C:13$_h$ Modbus 7206
_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.	% - - -	INT16 R/- - -	CANopen 301C:15$_h$ Modbus 7210

Commutation Monitoring

Description

Commutation monitoring verifies the plausibility of acceleration and effective motor torque.

If the motor accelerates though the drive control decelerates the motor with the maximum current, an error is detected.

Deactivating commutation monitoring can cause unintended movements.

⚠WARNING

UNINTENDED MOVEMENT

- Only deactivate commutation monitoring during commissioning and only for test purposes.
- Verify that the commutation monitoring is active prior to putting the equipment into service.

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

The parameter *MON_commutat* lets you deactivate commutation monitoring.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_commutat	Commutation monitoring. **0 / Off**: Commutation monitoring off **1 / On**: Commutation monitoring on in operating states 6, 7 and 8 **2 / On (OpState6+7)**: Commutation monitoring on in operating states 6 and 7 Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	CANopen 3005:5_h Modbus 1290

Monitoring of Mains Phases

Description

If a three-phase drive is missing a mains phase and mains phase monitoring is not correctly set, this can cause overload of the product.

NOTICE

INOPERABLE EQUIPMENT DUE TO MISSING MAINS PHASE

- Verify that mains phase monitoring is set to "Automatic Mains Detection" or to "Mains ..." with the correct voltage value if the drive is supplied via the mains phases.
- Verify that mains phase monitoring is set to "DC bus only ..." with the correct voltage value if the drive is supplied via the DC bus.

Failure to follow these instructions can result in equipment damage.

NOTE: The mains phases are only monitored in the operating states **5** Switched On, **6** Operation Enabled, **7** Quick Stop Active, and **8** Fault Reaction Active.

The parameter *ErrorResp_Flt_AC* lets you set the error response to a missing mains phase for three-phase devices.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ErrorResp_Flt_AC	Error response to missing mains phase. **0 / Error Class 0**: Error class 0 **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 2 3	UINT16 R/W per. -	CANopen 3005:A_h Modbus 1300

If the product is supplied via the DC bus, mains phase monitoring must be set to "DC bus only ..." with the correct voltage value.

Mains phase monitoring is set by means of the parameter *MON_MainsVolt*.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
MON_MainsVolt	Detection and monitoring of mains phases. **0 / Automatic Mains Detection**: Automatic detection and monitoring of mains voltage **1 / DC-Bus Only (Mains 1~230 V / 3~480 V)**: DC bus supply only, corresponding to mains voltage 230 V (single-phase) or 480 V (three phases) **2 / DC-Bus Only (Mains 1~115 V / 3~208 V)**: DC bus supply only, corresponding to mains voltage 115 V (single-phase) or 208 V (three phases) **3 / Mains 1~230 V / 3~480 V**: Mains voltage 230 V (single-phase) or 480 V (three phases) **4 / Mains 1~115 V / 3~208 V**: Mains voltage 115 V (single-phase) or 208 V (three phases) **5 / Reserved**: Reserved Value 0: As soon as mains voltage detected, the device automatically verifies whether the mains voltage is 115 V or 230 V in the case of single-phase devices or 208 V or 400/480 V in the case of three-phase devices. Values 1 … 2: If the device is supplied only via the DC bus, the parameter has to be set to the voltage value corresponding to the mains voltage of the supplying device. There is no mains voltage monitoring. Values 3 … 4: If the mains voltage is not detected properly during start-up, the mains voltage to be used can be selected manually. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 0 5	UINT16 R/W per. expert	CANopen 3005:F_h Modbus 1310

Ground Monitoring

Description

When the power stage is enabled, the device monitors the motor phases for ground errors. A ground error occurs when one or more motor phases are short-circuited to the ground (earth) of the application.

A ground error of one or more motor phases is detected. A ground error of the DC bus or the braking resistor is not monitored.

If the ground error monitoring is deactivated, the drive may be rendered inoperable by a ground error.

NOTICE

INOPERABLE EQUIPMENT DUE TO GROUND ERRORS

- Only deactivate ground monitoring during commissioning and only for test purposes.
- Verify that the ground monitoring is active prior to putting the equipment into service.

Failure to follow these instructions can result in equipment damage.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
MON_GroundFault	Ground monitoring. **0 / Off**: Ground monitoring off **1 / On**: Ground monitoring on Modified settings become active the next time the product is powered on.	- 0 1 1	UINT16 R/W per. expert	CANopen 3005:10_h Modbus 1312

Examples

Examples

General Information

The examples show some typical applications of the product. The examples are intended to provide an overview; they are not exhaustive wiring plans.

The examples described here are intended for learning purposes only. In general, they are intended to help you understand how to develop, test, commission, and integrate application logic and/or the device wiring of the equipment associated with your own design in your control systems. The examples are not intended to be used directly on products that are part of a machine or process.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Do not include any wiring information, programming or configuration logic, or parameterization values from the Examples in your machine or process without thoroughly testing your entire application.

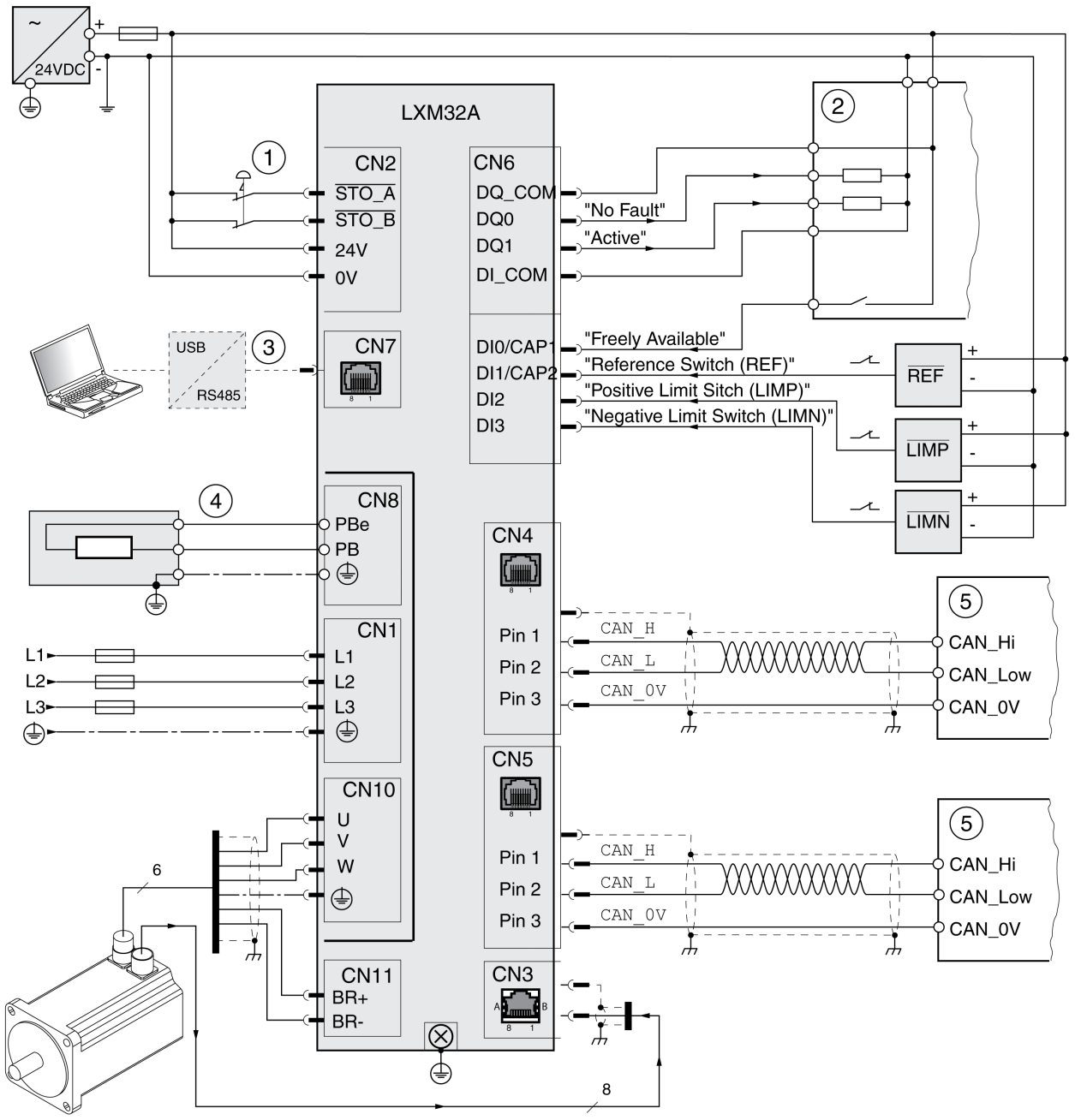
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Using the safety function STO integrated in this product requires careful planning. See section Functional Safety, page 66 for additional information.

Example of Operation via Fieldbus

The product is controlled via CANopen.

Wiring example



1 EMERGENCY STOP

2 Controller

3 Commissioning accessories

4 External braking resistor

5 CANopen bus device

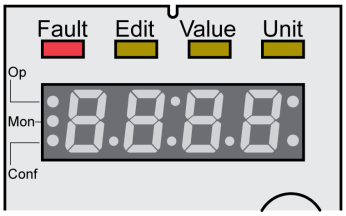
Diagnostics and Troubleshooting

Diagnostics via HMI

Diagnostics via the Integrated HMI

Overview

The 7-segment display provides the user with information.



With the factory setting, the 7-segment display shows the operating states. The operating states are described in section Operating States, page 198.

Message	Description
`init`	Operating state **1** Start
`nrdy`	Operating state **2** Not Ready To Switch On
`dIS`	Operating state **3** Switch On Disabled
`rdy`	Operating state **4** Ready To Switch On
`Son`	Operating state **5** Switched On
`run` and `HALt`	Operating state **6** Operation Enabled
`StoP`	Operating state **7** Quick Stop Active
`FLt`	Operating state **8** Fault Reaction Active and **9** Fault

Additional Messages

The table below provides an overview of the messages that can additionally be displayed on the integrated HMI.

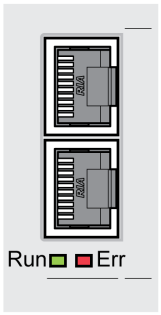
Message	Description
`CArd`	Data on the memory card differs from data in the product. See Memory Card, page 151 for information on how to proceed.
`dISP`	An external HMI is connected. The integrated HMI has no function.
`FSu`	Perform a First Setup. See Powering on the Device for the First Time, page 119.
`Mot`	A new motor was detected. See section Acknowledging a Motor Change, page 296 for replacing a motor.
`Prot`	Parts of the integrated HMI were locked with the parameter *HMIlocked*.
`uLoW`	24 Vdc control supply during initialization not high enough.
`8888`	Undervoltage 24 Vdc control supply.
`WdoG`	Undeterminable system error. Contact your Schneider Electric representative.
`----`	Firmware not available. Retry to flash the firmware. If the condition persists, contact your Schneider Electric representative.

If the HMI displays a message that is not contained in this user guide, contact your Schneider Electric representative.

Fieldbus Status LEDs

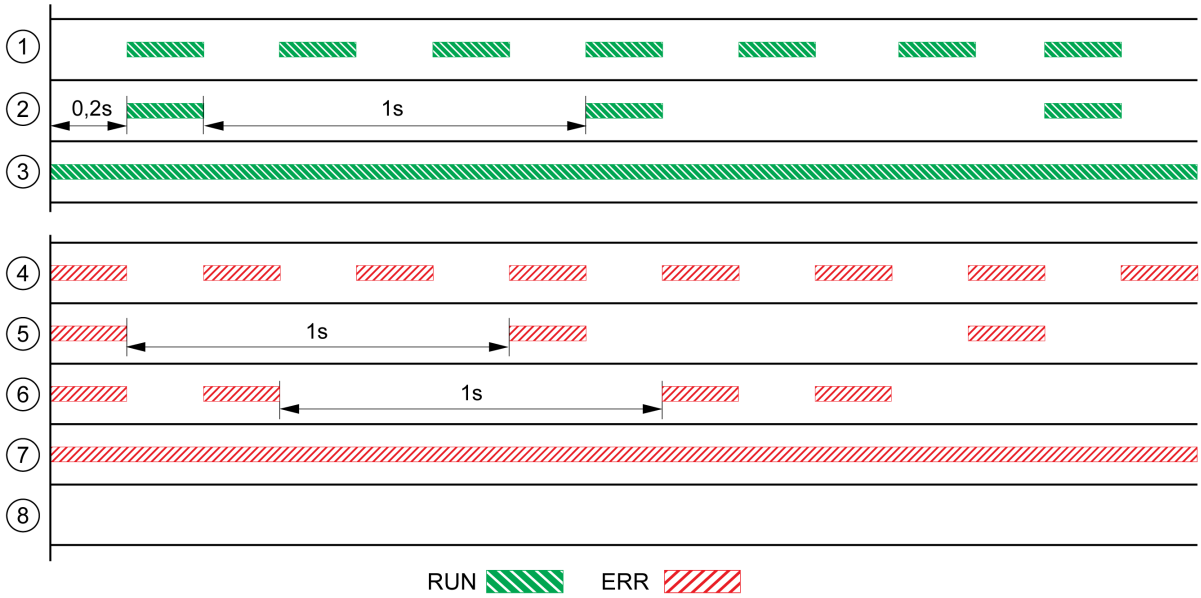
General

The fieldbus status LEDs indicate the status of the fieldbus.



The illustration below shows the fieldbus communication states.

Signals of the CAN bus status LEDs (Run=GN; Err=RD)



1 NMT state PRE-OPERATIONAL

2 NMT state STOPPED

3 NMT state OPERATIONAL

4 Incorrect settings, for example, invalid node address

5 Limit reached, for example after 16 incorrect transmission attempts

6 Monitoring event (Node Guarding)

7 CAN is BUS-OFF, for example after 32 incorrect transmission attempts.

8 Fieldbus communication without error message.

Acknowledging a Motor Change

Description

Procedure for confirming a motor change via the integrated HMI.

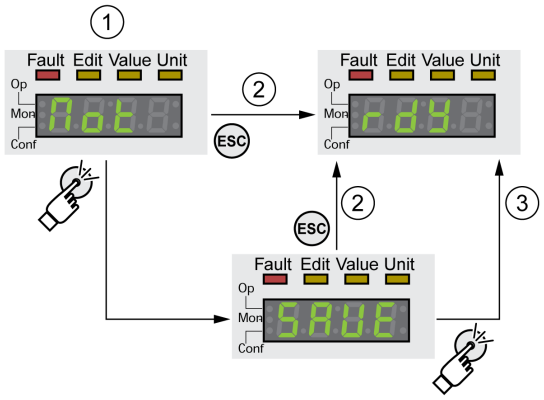
If the 7-segment display shows nOt:

- Press the navigation button.

  The 7-segment display shows SAVE.
- Press the navigation button to save the new motor parameters to the nonvolatile memory.

  The drive switches to operating state **4** Ready To Switch On.

Confirming a motor change via the integrated HMI



1 HMI displays that a replacement of a motor has been detected.

2 Canceling the saving process

3 Saving switching to operating state **4** Ready To Switch On.

Displaying Error Messages via the HMI

Resetting Errors of Error Class 0

If there are errors of error class 0, the two dots to the right of the 7-segment display (2) flash. The error code is not directly displayed on the 7-segment display, but must be explicitly queried by the user.

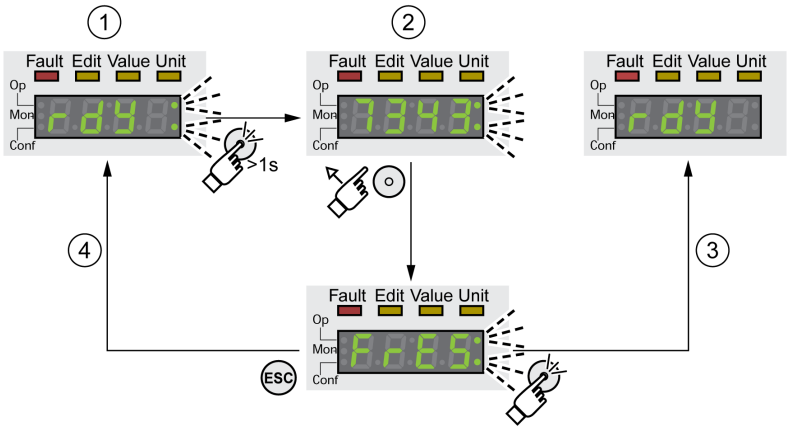
Procedure for displaying and resetting:

- Press the navigation button and hold it down.

  The 7-segment display shows the error code.
- Release the navigation button.

  The 7-segment display shows FrES.
- Remedy the cause.
- Press the navigation button to reset the error message.

  The 7-segment display returns to the initial state.



1 HMI shows an error of error class 0

2 Indication of error code

3 Resetting an error message

4 Canceling (the error code remains in the memory)

See Error Messages, page 309 for the meaning of the error codes.

Reading and Acknowledging Errors of Error Classes 1 ...4

In the case of a detected error of error class 1, the error code and `StoP` are alternately shown on the 7 segment display.

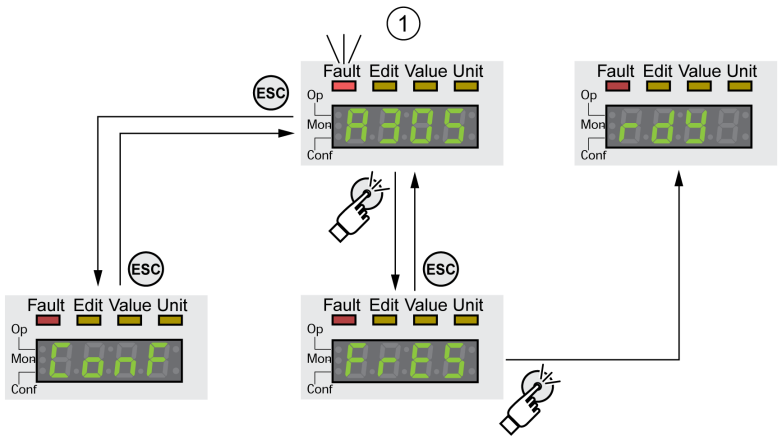
In the case of a detected error of error class 2 ... 4, the error code and `FLt` are alternately shown on the 7 segment display.

Procedure for displaying and resetting:

- Remedy the cause.
- Press the navigation button.

  The 7-segment display shows `FrES`.
- Press the navigation button to reset the error message.

  The product switches to operating state **4** Ready To Switch On.



1 HMI shows and error message with an error code

See Error Messages, page 309 for the meaning of the error codes.

Diagnostics via Signal Outputs

Indicating the Operating State

Description

Information on the operating state is available via the signal outputs.

The table below provides an overview.

	Signal output function	
Operating state	**“No fault”(1)**	**“Active”(2)**
1 Start	0	0
2 Not Ready To Switch On	0	0
3 Switch On Disabled	0	0
4 Ready To Switch On	1	0
5 Switched On	1	0
6 Operation Enabled	1	1
7 Quick Stop Active	0	0
8 Fault Reaction Active	0	0
9 Fault	0	0
(1) The signal output function is factory setting for signal output DQ0 **(2)** The signal output function is the factory setting for signal output DQ1		

Indicating Error Messages

Description

Selected error messages can be output via the signal outputs.

In order to output an error message via a signal output, you must first parameterizes the signal output functions “Selected Warning” or “Selected Error”, see Digital Signal Inputs and Digital Signal Outputs, page 173.

The parameters *MON_IO_SelWar1* and *MON_IO_SelWar2* are used to specify error codes with the error class 0.

The parameters *MON_IO_SelErr1* and *MON_IO_SelErr2* are used to specify error codes with the error classes 1 ... 4.

If an error specified in one of these parameters is detected, the corresponding signal output is to be set.

The list of the error messages sorted by error code can be found in the section Error Messages, page 309.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
MON_IO_SelWar1	Signal output function Selected Warning (error class 0): First error code. This parameter specifies the error code of an error of error class 0 which is to activate the signal output function. Modified settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	CANopen 303B:8_h Modbus 15120
MON_IO_SelWar2	Signal output function Selected Warning (error class 0): Second error code. This parameter specifies the error code of an error of error class 0 which is to activate the signal output function. Modified settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	CANopen 303B:9_h Modbus 15122
MON_IO_SelErr1	Signal output function Selected Error (error classes 1 to 4): First error code. This parameter specifies the error code of an error of error classes 1 ... 4 which is to activate the signal output function. Modified settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	CANopen 303B:6_h Modbus 15116
MON_IO_SelErr2	Signal output function Selected Error (error classes 1 to 4): Second error code. This parameter specifies the error code of an error of error classes 1 ... 4 which is to activate the signal output function. Modified settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	CANopen 303B:7_h Modbus 15118

Diagnostics via the Fieldbus

Fieldbus Communication Error Diagnostics

Verifying Connections

A properly operating fieldbus is essential for evaluating status and error messages.

If the product cannot be addressed via the fieldbus, first verify the connections.

Verify the following connections:

- System power supply
- Supply connections
- Fieldbus cables and wiring
- Fieldbus connection

Fieldbus Function Test

If the connections are correct, verify that you can address the product on the fieldbus.

Most Recent Detected Error - Status Bits

Parameter *DCOMstatus*

The parameter *DCOMstatus* is a part of the process data communication. The parameter *DCOMstatus* is transmitted asynchronously and in an event-driven way whenever the status information changes.

In the case of an error of error class 0, bit 7 is set in the parameter *DCOMstatus*.

In the case of an error of error class 1, 2, 3 or 4, bit 13 is set in the parameter *DCOMstatus*.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_DCOMstatus	DriveCom status word. Bit assignments: Bit 0: Operating state Ready To Switch On Bit 1: Operating state Switched On Bit 2: Operating state Operation Enabled Bit 3: Operating state Fault Bit 4: Voltage Enabled Bit 5: Operating state Quick Stop Bit 6: Operating state Switch On Disabled Bit 7: Error of error class 0 Bit 8: HALT request active Bit 9: Remote Bit 10: Target Reached Bit 11: Internal Limit Active Bit 12: Operating mode-specific Bit 13: x_err Bit 14: x_end Bit 15: ref_ok	- - - - 	UINT16 R/- - -	CANopen 6041:0_h Modbus 6916

Error Bits

The parameters *_WarnLatched* and *_SigLatched* contain information on errors of error class 0 and errors of error classes 1 ... 4.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_WarnLatched Mon WrnS	Saved errors of error class 0, bit-coded. The bits are set to 0 in the case of a Fault Reset. Bits 10 and 13 are set to 0 automatically. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General Bit 1: Reserved Bit 2: Out of range (software limit switches, tuning) Bit 3: Reserved Bit 4: Active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following error Bit 9: Reserved Bit 10: Inputs STO_A and/or STO_B Bits 11 ... 12: Reserved Bit 13: Low voltage DC bus or mains phase missing Bits 14 ... 15: Reserved Bit 16: Integrated encoder interface Bit 17: Temperature of motor high Bit 18: Temperature of power stage high Bit 19: Reserved Bit 20: Memory card Bit 21: Fieldbus module Bit 22: Encoder module Bit 23: Safety module eSM or module IOM1 Bits 24 … 27: Reserved Bit 28: Transistor for braking resistor overload (I^2t) Bit 29: Braking resistor overload (I^2t) Bit 30: Power stage overload (I^2t) Bit 31: Motor overload (I^2t) Monitoring functions are product-dependent.	- - - -	UINT32 R/- - -	CANopen 301C:C$_h$ Modbus 7192
_SigLatched Mon SiGS	Saved status of monitoring signals. Signal state: 0: Not activated 1: Activated Bit assignments:	- - - -	UINT32 R/- - -	CANopen 301C:8$_h$ Modbus 7184

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
	Bit 0: General error Bit 1: Hardware limit switches (LIMP/LIMN/REF) Bit 2: Out of range (software limit switches, tuning) Bit 3: Quick Stop via fieldbus Bit 4: Error in active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following error Bit 9: Reserved Bit 10: Inputs STO are 0 Bit 11: Inputs STO different Bit 12: Reserved Bit 13: DC bus voltage low Bit 14: DC bus voltage high Bit 15: Mains phase missing Bit 16: Integrated encoder interface Bit 17: Overtemperature motor Bit 18: Overtemperature power stage Bit 19: Reserved Bit 20: Memory card Bit 21: Fieldbus module Bit 22: Encoder module Bit 23: Safety module eSM 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: Nonvolatile memory error detected Bit 30: System start-up (hardware or parameter) Bit 31: System error detected (for example, watchdog, internal hardware interface) Monitoring functions are product-dependent.			

Most Recent Detected Error - Error Code

Description

If the controller receives information concerning a detected error via the process data communication, the following parameters can be used to read the error code.

The list of the error messages sorted by error code can be found in the section Error Messages, page 309.

Most Recent Detected Error with Error Class 0

The parameter *_LastWarning* allows you to read the error number of the last detected error with error class 0.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_LastWarning Mon LWrn	Code of most recent error of error class 0. If the error is no longer active, the code is stored until the next Fault Reset. Value 0: No error of error class 0	- - - -	UINT16 R/- - -	CANopen 301C:9$_h$ Modbus 7186

Most Recent Detected Error with Error Class 1 ... 4

The parameter *_LastError* allows you to read the error number of the last detected error with error class 1 ... 4.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_LastError Mon LFLt	Detected error causing a stop (error classes 1 to 4). Error code of the most recent detected error. Consecutive detected errors do not overwrite this error code. Example: If an error response to a detected limit switch error causes overvoltage, this parameter contains the code of the detected limit switch error. Exception: Detected errors of error class 4 overwrite existing entries.	- - - -	UINT16 R/- - -	CANopen 603F:0$_h$ Modbus 7178

Error Memory

General

The error memory is an error history of the last 10 error messages. It is not cleared even if the product is powered off. The error memory allows you to read and evaluate past events.

The following information on the events is stored:

- Error class
- Error code
- Motor current
- Number of power on cycles
- Additional error information (for example, parameter numbers)
- Product temperature
- Power stage temperature
- Time the error was detected (with reference to operating hours counter)

- DC Bus Voltage
- Velocity
- Number of Enable cycles after powering on
- Time from Enable until detection of the error

The stored information relates to the situation at the point in time the error was detected.

The list of the error messages sorted by error code can be found in the section Error Messages, page 309.

Reading the Error Memory

The error memory can only be read sequentially. The parameter *ERR_reset* must be used to reset the read pointer. Then the first error entry can be read. The read pointer is automatically set to the next entry. A new read access delivers the next error entry. If the error code 0 is returned, there is no additional error entry.

Position of the entry	Meaning
1	First error message (oldest message).
2	Second error message (later message).
...	...
10	Tenth error message. In the case of ten error messages, the most recent error message is contained here.

An error entry consists of several pieces of information which can be read using different parameters. When you read an error entry, the error code must be read first with the parameter *_ERR_number*.

The following parameters allow you to manage the error memory:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_ERR_class	Error class. Value 0: Error class 0 Value 1: Error class 1 Value 2: Error class 2 Value 3: Error class 3 Value 4: Error class 4	- 0 - 4	UINT16 R/- - -	CANopen 303C:2_h Modbus 15364
_ERR_number	Error code. Reading this parameter copies the entire entry for the detected error (error class, time of detection of error, …) to an intermediate memory from which the elements of the detected error can then be read. In addition, the read pointer of the error memory is automatically set to the next error entry.	- 0 - 65535	UINT16 R/- - -	CANopen 303C:1_h Modbus 15362
_ERR_motor_I	Motor current at the time the error was detected. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	CANopen 303C:9_h Modbus 15378

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_ERR_powerOn *Pon* *PoWo*	Number of power on cycles.	- 0 - 4294967295	UINT32 R/- - -	CANopen 303B:2_h Modbus 15108
_ERR_qual	Additional information on detected error. This entry contains additional information on the detected error, depending on the error number. Example: a parameter address	- 0 - 65535	UINT16 R/- - -	CANopen 303C:4_h Modbus 15368
_ERR_temp_dev	Temperature of device at the time the error was detected.	°C - - -	INT16 R/- - -	CANopen 303C:B_h Modbus 15382
_ERR_temp_ps	Temperature of power stage at the time the error was detected.	°C - - -	INT16 R/- - -	CANopen 303C:A_h Modbus 15380
_ERR_time	Time of detection of error. With reference to operating hours counter	s 0 - 536870911	UINT32 R/- - -	CANopen 303C:3_h Modbus 15366
_ERR_DCbus	DC bus voltage at the time the error was detected. In increments of 0.1 V.	V - - -	UINT16 R/- - -	CANopen 303C:7_h Modbus 15374
_ERR_motor_v	Motor velocity at the time the error was detected.	usr_v - - -	INT32 R/- - -	CANopen 303C:8_h Modbus 15376
_ERR_enable_cycl	Number of cycles of enabling the power stage at error time. Number of cycles of enabling the power stage from the time the control voltage was applied to the time the error was detected.	- - - -	UINT16 R/- - -	CANopen 303C:5_h Modbus 15370
_ERR_enable_time	Time between enabling of power stage and detection of the error.	s - - -	UINT16 R/- - -	CANopen 303C:6_h Modbus 15372

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
ERR_reset	Reset error memory read pointer. Value 1: Set error memory read pointer to oldest error entry. Modified settings become active immediately.	- 0 - 1	UINT16 R/W - -	CANopen 303B:5_h Modbus 15114
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. Modified settings become active immediately.	- 0 - 1	UINT16 R/W - -	CANopen 303B:4_h Modbus 15112

Error Messages

Description of Error Messages

Description

If monitoring functions of the drive detect an error, the drive generates an error message. Each error message is identified by an error code.

The following information is available for each error message:

- Error code
- Error class
- Description of error
- Possible causes
- Possible remedies

Range of Error Messages

The table below summarizes the error codes classified by range.

Error code	Range
E 1xxx	General
E 2xxx	Overcurrent
E 3xxx	Voltage
E 4xxx	Temperature
E 5xxx	Hardware
E 6xxx	Software
E 7xxx	Interface, wiring
E 8xxx	Fieldbus
E Axxx	Motor movement
E Bxxx	Communication

Error Class of Error Messages

The error messages are classified according to the following error classes:

Error class	State transition(1)	Error response	Resetting the error message
0	-	No interruption of the movement	Function “Fault Reset”
1	T11	Stop movement with “Quick Stop”	Function “Fault Reset”
2	T13, T14	Stop movement with “Quick Stop” and disable the power stage when the motor has come to a standstill	Function “Fault Reset”
3	T13, T14	Disable the power stage immediately without stopping the movement first	Function “Fault Reset”
4	T13, T14	Disable the power stage immediately without stopping the movement first	Power cycle
(1) See section Operating States, page 198.			

Table of Error Messages

List of the Error Messages Sorted by Error Code

Error code	Error class	Description	Cause	Correctives
1100	0	Parameter out of permissible value range	The value entered was outside of the permissible value range for this parameter.	The entered value must be within the permissible value range.
1101	0	Parameter does not exist	Error detected by parameter management: Parameter (index) does not exist.	Select a different parameter (index).
1102	0	Parameter does not exist	Error detected by parameter management: Parameter (subindex) does not exist.	Select a different parameter (subindex).
1103	0	Parameter write not permissible (READ only)	Write access to read only parameter.	Write only to parameters that are not read-only.
1104	0	Write access denied (no access authorization)	Parameter only accessible at expert level.	The write access level expert is required.
1105	0	Block Upload/Download not initialized	-	-
1106	0	Command not permissible while power stage is active	Command not permissible while the power stage is enabled (operating state Operation Enabled or Quick Stop Active).	Disable the power stage and repeat the command.
1107	0	Access via other interface blocked	Access occupied by another channel (for example: Commissioning software is active and fieldbus access was tried at the same time).	Verify the channel that blocks access.
1108	0	File cannot be uploaded: Incorrect file ID	-	-
1109	1	Data stored after a power outage is invalid	-	-
110A	0	System error detected: No bootloader available	-	-
110B	3	Configuration error detected. Additional information in the error memory indicates the 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.
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.
110E	0	Parameter changed that requires a restart of the drive	Only displayed by the commissioning software. A parameter modification requires the drive to be powered off and on.	Restart the drive to activate the parameter functionality. See the section Parameters for the parameter that requires a restart of the drive.
110F	0	Function not available in this type of device	The specific type of device does not support this function or this parameter value.	Verify that you have the correct device type, in particular type of motor, type of encoder, holding brake.
1110	0	Incorrect file ID for upload or download	The specific type of device does not support this kind of file.	Verify that you have the correct device type or the correct configuration file.
1111	0	File transfer not correctly initialized	A previous file transfer has been aborted.	-
1112	0	Locking of configuration denied	An external tool has tried to lock the configuration of the drive for upload or download. This may not work because another tool had already locked the configuration of the drive or the drive is in an operating state that does not allow locking.	-

Error code	Error class	Description	Cause	Correctives
1113	0	System not locked for configuration transfer	An external tool has tried to transfer the configuration without locking the drive.	-
1114	4	Configuration download aborted Parameter *_SigLatched* Bit 5	During a configuration download, a communication error or an error in the external tool was detected. The configuration was only partially transferred to the drive and might be inconsistent now.	Power the drive off/on and retry to download the configuration or restore the factory settings.
1115	0	Incorrect configuration file format Parameter *_WarnLatched* Bit 5	An external tool has downloaded a configuration which has an incorrect format.	-
1116	0	Request is processed asynchronously	-	-
1117	0	Asynchronous request blocked	Request to a module is blocked because the module is currently processing another request.	-
1118	0	Configuration data incompatible with device	The configuration data contains data from a different device.	Verify device type including type of power stage.
1119	0	Incorrect data length, too many bytes	-	-
111A	0	Incorrect data length, insufficient number of bytes	-	-
111B	4	Configuration download error detected. Additional information in the error memory indicates the Modbus register address.	During a configuration download, one or more configuration values were not accepted by the drive.	Verify that the configuration file is valid and matches the type and version of the drive. The value in the additional error info shows the Modbus register address of the parameter where the initialization error was detected.
111C	1	Not possible to initialize recalculation for scaling	A parameter could not be initialized.	The address of the parameter that caused the detected error can be read via the parameter _PAR_ ScalingError.
111D	3	Original state of a parameter cannot be restored after an error was detected during recalculation of parameters with user-defined units.	The drive contained an invalid configuration before the recalculation was started. An error was detected during the recalculation.	Power the drive off and on again. This may help you to identify the affected parameter(s). Change the parameters as required. Verify that the parameter configuration is valid before starting the recalculation procedure.
111F	1	Recalculation not possible.	Invalid scaling factor.	Verify that you really want the selected scaling factor. Try a different scaling factor. Before triggering scaling, reset the parameters with user-defined units.
1120	1	Recalculation for scaling not possible	A parameter could not be recalculated.	The address of the parameter that caused this condition can be read via the parameter _PAR_ScalingError.
1121	0	Incorrect sequence of steps for scaling (fieldbus)	The recalculation has been started prior to the initialization.	The recalculation must be started after the initialization.
1122	0	Recalculation for scaling not possible	Recalculation for scaling is already running.	Wait for the running recalculation for scaling to finish.
1123	0	Parameter cannot be changed	Recalculation for scaling is running.	Wait for the running recalculation for scaling to finish.
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.
1125	1	Scaling not possible	The scaling factors for position, velocity or acceleration/deceleration are beyond internal calculation limits.	Retry with different scaling factors.
1126	0	Configuration is blocked by another access channel	-	Close other access channel (for example, other instance of commissioning software).

Error code	Error class	Description	Cause	Correctives
1127	0	Invalid key received	-	-
1128	0	Special login is required for Manufacturing Test Firmware	-	-
1129	0	Test step not yet started	-	-
112D	0	Configuration of edges is not supported	The selected capture input does not support rising and falling edge at the same time.	Set the edge to either "rising" or "falling".
112F	0	Time filter settings cannot be changed	Position capture is already active with a time filter. The filter settings cannot be changed.	Deactivate position capture.
1132	0	Incorrect size of configuration file (odd number of bytes)	Incorrect number of bytes.	Retry. If the condition persists, contact your Schneider Electric service representative.
1300	3	Safety function STO activated (STO_A, STO_B) Parameter *_SigLatched* Bit 10	The safety function STO was activated in the operating state Operation Enabled.	Verify correct wiring of the inputs of the safety function STO and perform a Fault Reset.
1301	4	STO_A and STO_B different level Parameter *_SigLatched* Bit 11	The levels of the inputs STO_A and STO_B were different for more than 1 second.	Verify correct wiring of the inputs of the safety function STO.
1302	0	Safety function STO activated (STO_A, STO_B) Parameter *_WarnLatched* Bit 10	Safety function STO was activated while the power stage was disabled.	Verify correct wiring of the inputs of the safety function STO.
1311	0	The selected signal input function or signal output function cannot be configured	The selected signal input function or signal output function cannot be used in the selected operating mode.	Select another function or change the operating mode.
1312	0	Limit switch or reference switch signal not defined for signal input function	Reference movements require limit switches. These limit switches are not assigned to inputs.	Assign the signal input functions Positive Limit Switch, Negative Limit Switch and Reference Switch.
1313	0	Configured debounce time not possible for this signal input function	The signal input function does not support the selected debounce time.	Set the debounce time to a valid value.
1314	4	At least two inputs have the same signal input function.	The same signal input function has been assigned to at least two inputs.	Reconfigure the inputs.
1316	1	Position capture via signal input currently not possible Parameter *_SigLatched* Bit 28	Position capture is already being used.	-
1501	4	System error detected: DriveCom state machine indeterminable state	-	-
1502	4	System error detected: HWL low-level state machine indeterminable state	-	-
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.	-
1600	0	Oscilloscope: No additional data available	-	-
1601	0	Oscilloscope: Parameterization incomplete	-	-
1602	0	Oscilloscope: Trigger variable not defined	-	-
1606	0	Logging still active	-	-
1607	0	Logging: No trigger defined	-	-
1608	0	Logging: Invalid trigger option	-	-
1609	0	Logging: No channel selected	-	-
160A	0	Logging: No data available	-	-

Error code	Error class	Description	Cause	Correctives
160B	0	Parameter cannot be logged	-	-
160C	1	Autotuning: Moment of inertia outside permissible range	The load inertia is too high.	Verify that the system can easily be moved. Verify the load. Use a differently rated drive.
160E	1	Autotuning: Test movement could not be started	-	-
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.
1610	1	Autotuning: Processing stopped	Autotuning stopped by user command or by detected error (see additional error message in error memory, for example, DC bus undervoltage, limit switches triggered)	Remove the cause of the stop and restart Autotuning.
1611	1	System error detected: Parameter could not be written during Autotuning. Additional information in the error memory indicates the Modbus register address.	-	-
1612	1	System error detected: Parameter could not be read during Autotuning	-	-
1613	1	Autotuning: Maximum permissible movement range exceeded Parameter *_SigLatched* Bit 2	The movement exceeded the adjusted movement range during Autotuning.	Increase the movement range value or disable movement range monitoring by setting AT_DIS = 0.
1614	0	Autotuning: Already active	Autotuning has been started twice simultaneously or an Autotuning parameter is modified during Autotuning (parameter AT_dis and AT_dir).	Wait for Autotuning to finish before restarting Autotuning.
1615	0	Autotuning: This parameter cannot be changed while Autotuning is active	Parameter AT_gain or AT_J are written during Autotuning.	Wait for Autotuning to finish before changing the parameter.
1617	1	Autotuning: Friction torque or load torque too great	The current limit has been reached (parameter CTRL_I_max).	Verify that the system can easily be moved. Verify the load. Use a differently rated drive.
1618	1	Autotuning: Optimization aborted	The internal Autotuning sequence has not been finished, there may have been a following error.	See the additional information provided in the error memory.
1619	0	Autotuning: Velocity jump in parameter AT_n_ref is not sufficient	Parameter AT_n_ref < 2 * AT_n_ tolerance. The drive only checks this for the first velocity jump.	Modify the parameter AT_n_ref or AT_n_tolerance to meet the required condition.
1620	1	Autotuning: Load torque too high	Product rating is not suitable for the machine load. Detected machine inertia is too high compared to the inertia of the motor.	Reduce load, verify rating.
1621	1	System error detected: Calculation error	-	-
1622	0	Autotuning: Not possible to perform Autotuning	Autotuning can only be performed if no operating mode is active.	Terminate the active operating mode or disable the power stage.
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.
1A00	0	System error detected: FIFO memory overflow	-	-

Error code	Error class	Description	Cause	Correctives
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.
1A03	4	System error detected: Hardware and firmware do not match	-	-
1B00	3	System error detected: Incorrect parameters for motor and power stage Parameter _*SigLatched* Bit 30	Incorrect manufacturer parameter value (data) nonvolatile memory of device.	Replace device.
1B02	3	Target value too high. Parameter _*SigLatched* Bit 30	-	-
1B05	2	Error detected during parameter switching Parameter _*SigLatched* Bit 30	-	-
1B0C	3	Motor velocity too high.	-	-
1B0D	3	Velocity value determined by velocity observer is incorrect	Incorrect system inertia for velocity observer calculations. Incorrect velocity observer dynamics. System inertia changes during operation. In this case, operation with velocity observer is not possible and the velocity observer must be deactivated.	Change the velocity observer dynamics via the parameter CTRL_SpdObsDyn. Change the system inertia used for velocity observer calculations via the parameter CTRL_SpdObsInert. If the detected error persists, deactivate the velocity observer.
1B0F	3	Velocity deviation too high	-	-
2300	3	Power stage overcurrent Parameter _*SigLatched* Bit 27	Motor short circuit and disabling of the power stage. Motor phases are inverted.	Verify the motor power connection.
2301	3	Braking resistor overcurrent Parameter _*SigLatched* Bit 27	Braking resistor short circuit.	If you use the internal braking resistor, contact your Schneider Electric service representative. If you use an external braking resistor, verify correct wiring and rating of the braking resistor.
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.
3200	3	DC bus overvoltage Parameter _*SigLatched* Bit 14	Excessive regeneration during deceleration.	Verify correct deceleration ramp, rating of drive and braking resistor.
3201	3	DC bus undervoltage (shutdown threshold) Parameter _*SigLatched* Bit 13	Power supply outage, insufficient power supply.	Verify mains supply.
3202	2	DC bus undervoltage (Quick Stop threshold) Parameter _*SigLatched* Bit 13	Power supply outage, insufficient power supply.	Verify mains supply.
3206	0	Undervoltage DC bus, missing mains supply, undervoltage mains supply or overvoltage mains supply Parameter _*WarnLatched* Bit 13	Missing phase(s) for more than 50 ms. Mains voltage is out of range. Mains frequency is out of range. Mains voltage and setting of parameter MON_MainsVolt do not match (for example, mains voltage is 230 V and MON_MainsVolt is set to 115 V).	Verify that the values of the mains power supply network comply with the technical data. Verify the settings of the parameter for reduced mains voltage.

Error code	Error class	Description	Cause	Correctives
3300	0	The winding voltage of the motor is lower than the nominal supply voltage of the drive	If the winding voltage of the motor is lower than the nominal supply voltage of the drive, this may result in motor overtemperature due to high current ripple.	Verify the motor temperature. In the case of overtemperature, use a motor with a higher winding voltage or use a drive with a lower nominal supply voltage.
4100	3	Power stage overtemperature Parameter *_SigLatched* Bit 18	Excessively high ambient temperature due to, for example, dust.	Improve heat dissipation. If a fan is installed, verify correct operation of the fan.
4101	0	Power stage overtemperature Parameter *_WarnLatched* Bit 18	Excessively high ambient temperature due to, for example, dust.	Improve heat dissipation. If a fan is installed, verify correct operation of the fan.
4102	0	Power stage overload (I2t) Parameter *_WarnLatched* Bit 30	The current has exceeded the nominal value for an extended period of time.	Verify rating, reduce cycle time.
4200	3	Device overtemperature Parameter *_SigLatched* Bit 18	Excessively high ambient temperature due to, for example, dust.	Improve heat dissipation. If a fan is installed, verify correct operation of the fan.
4300	2	Motor overtemperature Parameter *_SigLatched* Bit 17	Ambient temperature is too high. Duty cycle is too high. Motor not properly mounted (thermal isolation). Motor overload.	Verify motor installation: The heat must be dissipated via the mounting surface. Reduce ambient temperature. Provide ventilation.
4301	0	Motor overtemperature Parameter *_WarnLatched* Bit 17	Ambient temperature is too high. Duty cycle is too high. Motor not properly mounted (thermal isolation). Motor overload.	Verify motor installation: The heat must be dissipated via the mounting surface. Reduce ambient temperature. Provide ventilation.
4302	0	Motor overload (I2t) Parameter *_WarnLatched* Bit 31	The current has exceeded the nominal value for an extended period of time.	Verify that the system can easily be moved. Verify the load. Use a differently sized motor, if necessary.
4303	0	No motor temperature monitoring	The temperature parameters (in electronic nameplate of motor, nonvolatile memory of encoder) are unavailable or invalid; parameter A12 is equal to 0.	Contact your Schneider Electric service representative. Replace motor.
4304	0	The encoder does not support motor temperature monitoring.	-	-
4402	0	Braking resistor overload (I2t > 75%) Parameter *_WarnLatched* Bit 29	Regeneration energy too high. External loads too high. Motor velocity too high. Deceleration too fast. Insufficient braking resistor.	Reduce load, velocity, deceleration. Verify correct braking resistor rating.
4403	par.	Braking resistor overload (I2t > 100%)	Regeneration energy too high. External loads too high. Motor velocity too high. Deceleration too fast. Insufficient braking resistor.	Reduce load, velocity, deceleration. Verify correct braking resistor rating.
4404	0	Overload of transistor for braking resistor Parameter *_WarnLatched* Bit 28	Regeneration energy too high. External loads too high. Deceleration too fast.	Reduce load and/or deceleration.

Error code	Error class	Description	Cause	Correctives
5101	0	Modbus power supply missing	-	-
5102	4	Motor encoder supply voltage Parameter *_SigLatched* Bit 16	Encoder power supply is not within permissible range of 8 V to 12 V.	Replace the device. Contact your Schneider Electric service representative.
5200	4	Error detected at connection to motor encoder Parameter *_SigLatched* Bit 16	Encoder not properly connected, EMI	-
5201	4	Error detected in motor encoder communication Parameter *_SigLatched* Bit 16	Encoder not properly connected, EMI	-
5202	4	Motor encoder is not supported Parameter *_SigLatched* Bit 16	Incompatible encoder connected.	-
5203	4	Error detected in connection motor encoder Parameter *_SigLatched* Bit 16	Encoder not properly connected	-
5204	3	Connection to motor encoder lost Parameter *_SigLatched* Bit 16	Encoder not properly connected	-
5206	0	Communication error detected in encoder Parameter *_WarnLatched* Bit 16	Communication channel to encoder is subject to interference.	Verify EMC measures.
5207	1	Function is not supported	The hardware revision does not support the function.	-
5302	4	The motor requires a PWM frequency (16kHz) which the power stage does not support.	The motor only works with a PWM frequency of 16 kHz (motor nameplate entry). However, the power stage does not support this PWM frequency.	Use a motor that works with a PWM frequency of 8 kHz. Contact your Schneider Electric service representative.
5430	4	System error detected: Nonvolatile memory read error Parameter *_SigLatched* Bit 29	-	-
5431	3	System error: Nonvolatile memory write error Parameter *_SigLatched* Bit 29	-	-
5432	3	System error: Nonvolatile memory state machine Parameter *_SigLatched* Bit 29	-	-
5433	3	System error: Nonvolatile memory address error Parameter *_SigLatched* Bit 29	-	-
5434	3	System error: Nonvolatile memory incorrect data length Parameter *_SigLatched* Bit 29	-	-
5435	4	System error: Nonvolatile memory not formatted Parameter *_SigLatched* Bit 29	-	-
5436	4	System error: Nonvolatile memory incompatible structure Parameter *_SigLatched* Bit 29	-	-
5437	4	System error detected: Nonvolatile memory checksum error (manufacturer data) Parameter *_SigLatched* Bit 29	-	-

Error code	Error class	Description	Cause	Correctives
5438	3	System error detected: Nonvolatile memory checksum error (user parameters) Parameter *_SigLatched* Bit 29	-	-
5439	3	System error detected: Nonvolatile memory checksum error (fieldbus parameters) Parameter *_SigLatched* Bit 29	-	-
543B	4	System error detected: No valid manufacturer data Parameter *_SigLatched* Bit 29	-	-
543E	3	System error detected: Nonvolatile memory checksum error (NoInit parameter) Parameter *_SigLatched* Bit 29	-	-
543F	3	System error detected: Nonvolatile memory checksum error (motor parameters) Parameter *_SigLatched* Bit 29	-	-
5441	4	System error detected: Nonvolatile memory checksum error (global control loop parameter set) Parameter *_SigLatched* Bit 29	-	-
5442	4	System error detected: Nonvolatile memory checksum error (control loop parameter set 1) Parameter *_SigLatched* Bit 29	-	-
5443	4	System error detected: Nonvolatile memory checksum error (control loop parameter set 2) Parameter *_SigLatched* Bit 29	-	-
5444	4	System error detected: Nonvolatile memory checksum error (NoReset parameter) Parameter *_SigLatched* Bit 29	-	-
5445	4	System error detected: Nonvolatile memory checksum error (hardware information) Parameter *_SigLatched* Bit 29	-	-
5446	4	System error detected: Nonvolatile memory checksum error (for power outage data) Parameter *_SigLatched* Bit 29	Internal nonvolatile memory not operative.	Restart the drive. If the detected error persists, contact your Schneider Electric service representative.
5448	2	System error detected: Communication with memory card Parameter *_SigLatched* Bit 20	-	-
5449	2	System error detected: Memory card bus is busy Parameter *_SigLatched* Bit 20	-	-
544A	4	System error detected: Nonvolatile memory checksum error (administration data) Parameter *_SigLatched* Bit 29	-	-

Error code	Error class	Description	Cause	Correctives
544C	4	System error detected: Nonvolatile memory is write-protected Parameter _*SigLatched* Bit 29	-	-
544D	2	System error detected: Memory card Parameter _*SigLatched* Bit 20	The last saving procedure may not have been successful; the memory card may be inoperative.	Retry saving the data. Replace the memory card.
544E	2	System error detected: Memory card Parameter _*SigLatched* Bit 20	The last saving procedure may not have been successful; the memory card may be inoperative.	Retry saving the data. Replace the memory card.
544F	2	System error detected: Memory card Parameter _*SigLatched* Bit 20	The last saving procedure may not have been successful; the memory card may be inoperative.	Retry saving the data. Replace the memory card.
5451	0	System error detected: No memory card available Parameter _*WarnLatched* Bit 20	-	-
5452	2	System error detected: Data on memory card and device do not match Parameter _*SigLatched* Bit 20	Different type of device. Different type of power stage. Data on memory card does not match firmware version of device.	-
5453	2	System error detected: Incompatible data on the memory card Parameter _*SigLatched* Bit 20	-	-
5454	2	System error detected: Capacity of detected memory card insufficient Parameter _*SigLatched* Bit 20	-	-
5455	2	System error detected: Memory card not formatted properly Parameter _*SigLatched* Bit 20	-	Format memory card or copy data from drive to memory card.
5456	1	System error detected: Memory card is write-protected Parameter _*SigLatched* Bit 20	The memory card has been write-protected.	Remove memory card or disable write protection.
5457	2	System error detected: Incompatible memory card Parameter _*SigLatched* Bit 20	Memory card capacity is insufficient.	Replace memory card
5462	0	Memory card implicitly written by the device Parameter _*WarnLatched* Bit 20	The content of the memory card and the content of the nonvolatile memory are not identical.	-
546C	0	Nonvolatile memory file not available	-	-
5600	3	Motor connection phase error detected Parameter _*SigLatched* Bit 26	Missing motor phase.	-
5603	3	Commutation error detected. Additional information in the error memory indicates Internal_ DeltaQuep. Parameter _*SigLatched* Bit 26	Incorrect wiring of motor cable. Encoder signals are lost or subject to interference. The load torque is greater than the motor torque. The encoder nonvolatile memory contains incorrect data (encoder phase offset is incorrect). Motor is not adjusted.	Verify motor phases, verify encoder wiring. Improve EMC, verify grounding and shield connection. Use a differently sized motor that can withstand the load torque. Verify the motor data. Contact your Schneider Electric service representative.
6102	4	System error detected: Internal software error Parameter _*SigLatched* Bit 30	-	-

Error code	Error class	Description	Cause	Correctives
6103	4	System error detected: System stack overflow Parameter *_SigLatched* Bit 31	-	-
6104	0	System error detected: Division by zero (internal)	-	-
6105	0	System error detected: Overflow during 32 bit calculation (internal)	-	-
6106	4	System error detected: Size of data interface does not match Parameter *_SigLatched* Bit 30	-	-
6107	0	Parameter outside of value range (calculation error detected)	-	-
6108	0	Function not available	-	-
6109	0	System error detected: Internal range exceeded	-	-
610A	2	System error detected: Calculated value cannot be represented as a 32 bit value	-	-
610D	0	Error detected in selection parameter	Incorrect parameter value selected.	Verify the value to be written.
610E	4	System error detected: 24 VDC below undervoltage threshold for shutdown	-	-
610F	4	System error detected: Internal timer basis missing (Timer0) Parameter *_SigLatched* Bit 30	-	-
6111	2	System error detected: Memory area locked Parameter *_SigLatched* Bit 30	-	-
6112	2	System error detected: Out of memory Parameter *_SigLatched* Bit 30	-	-
6113	1	System error detected: Calculated value cannot be represented as a 16 bit value	-	-
6114	4	System error detected: Impermissible function call from interrupt service routine	Incorrect programming	-
6117	0	Holding brake cannot be released manually.	The holding brake cannot be released manually because it is still applied manually.	First, switch from applying the holding brake manually to Automatic, then to releasing the holding brake manually.
7100	4	System error detected: Invalid power stage data Parameter *_SigLatched* Bit 30	Error detected in power stage data stored in device (incorrect CRC), error detected in internal memory data.	Contact your Schneider Electric service representative or replace the device.
7110	2	System error detected: Internal braking resistor	Internal braking resistor is inoperative or not connected.	Contact your Schneider Electric service representative.
7111	0	Parameter cannot be changed because the external braking resistor is active.	An attempt is made to change one of the parameters RESext_ton, RESext_P or RESext_R even though the external braking resistor is active.	Verify that the external braking resistor is not active if one of the parameters RESext_ton, RESext_P or RESext_R has to be changed.
7112	2	No external braking resistor connected	External braking resistor activated (Parameter RESint_ext), but no external resistor is detected.	Verify wiring of the external braking resistor. Verify correct resistance.
7120	4	Invalid motor data Parameter *_SigLatched* Bit 16	Motor data is incorrect (incorrect CRC).	Contact your Schneider Electric service representative or replace the motor.

Error code	Error class	Description	Cause	Correctives
7121	2	System error detected: Error in motor encoder communication Parameter *_SigLatched* Bit 16	EMI, detailed information can be found in the error memory that contains the error code of the encoder.	Contact your Schneider Electric service representative.
7122	4	Invalid motor data Parameter *_SigLatched* Bit 30	Error detected in motor data stored in motor encoder, error detected in internal memory data.	Contact your Schneider Electric service representative or replace the motor.
7124	4	System error detected: Motor encoder inoperative Parameter *_SigLatched* Bit 16	-	Contact your Schneider Electric service representative or replace the motor.
7125	4	System error detected: Length specification for user data too great Parameter *_SigLatched* Bit 16	-	-
7129	0	System error detected: Motor encoder Parameter *_WarnLatched* Bit 16	-	-
712C	0	System error detected: Communication with encoder not possible Parameter *_WarnLatched* Bit 16	-	-
712D	4	Electronic motor nameplate not found Parameter *_SigLatched* Bit 16	Incorrect motor data (incorrect CRC). Motor without electronic motor nameplate (for example, SER motor)	Contact your Schneider Electric service representative or replace the motor.
712F	0	No data segment of the electronic motor nameplate	-	-
7132	0	System error detected: Motor configuration cannot be written	-	-
7134	4	Incomplete motor configuration Parameter *_SigLatched* Bit 16	-	-
7135	4	Format is not supported Parameter *_SigLatched* Bit 16	-	-
7136	4	Incorrect encoder type selected with parameter MotEnctype Parameter *_SigLatched* Bit 16	-	-
7137	4	Error detected during the internal conversion of the motor configuration Parameter *_SigLatched* Bit 16	-	-
7138	4	Parameter of the motor configuration out of permissible range Parameter *_SigLatched* Bit 16	-	-
7139	0	Encoder offset: Data segment in encoder is incorrect.	-	-
713A	3	Adjustment value of the encoder of the third party motor has not yet been determined. Parameter *_SigLatched* Bit 16	-	-
7200	4	System error detected: Calibration analog/digital converter during manufacturing / incorrect BLE file Parameter *_SigLatched* Bit 30	-	-
7320	4	System error detected: Invalid encoder parameter Parameter *_SigLatched* Bit 16	Communication channel (Hiperface) to encoder is subject to interference, motor encoder has not been factory-parameterized.	Contact your Schneider Electric service representative.

Error code	Error class	Description	Cause	Correctives
7321	3	Timeout reading the absolute position from the encoder Parameter *_SigLatched* Bit 16	Communication channel (Hiperface) to encoder is subject to interference or motor encoder is inoperative.	Verify EMC measures.
7327	0	Error bit set in Hiperface answer Parameter *_WarnLatched* Bit 16	EMI.	Verify wiring (shield).
7328	4	Motor encoder: Position evaluation error detected Parameter *_SigLatched* Bit 16	Encoder has detected incorrect position evaluation.	Contact your Schneider Electric service representative or replace the motor.
7329	0	Motor encoder Warn signal Parameter *_WarnLatched* Bit 16	EMI.	Contact your Schneider Electric service representative or replace the motor.
7330	4	System error detected: Motor encoder (Hiperface) Parameter *_SigLatched* Bit 16	-	Verify EMC measures. Contact your Schneider Electric service representative.
7331	4	System error detected: Motor encoder initialization Parameter *_SigLatched* Bit 30	-	Verify EMC measures. Contact your Schneider Electric service representative.
7335	0	Communication with motor encoder active Parameter *_WarnLatched* Bit 16	Command is being processed or communication may be disturbed (EMI).	Verify EMC measures. Contact your Schneider Electric service representative.
733F	4	Amplitude of encoder analog signals too low Parameter *_SigLatched* Bit 16	Incorrect encoder wiring. Encoder not connected. Encoder signals subject to EMI (shield connection, cabling, etc.).	Verify EMC measures. Contact your Schneider Electric service representative.
7340	3	Reading of absolute position aborted Parameter *_SigLatched* Bit 16	Communication channel (Hiperface) to encoder is subject to interference. Encoder (in motor) is inoperative.	Verify EMC measures. Contact your Schneider Electric service representative.
7341	0	Encoder overtemperature Parameter *_WarnLatched* Bit 16	The maximum permissible duty cycle is exceeded. The motor was not mounted properly, for example, it is thermally isolated. The motor is blocked so that more current is used than under normal conditions. The ambient temperature is too high.	Reduce the duty cycle, for example, reduce acceleration. Supply additional cooling, for example, use a fan. Mount the motor in such a way as to increase thermal conductivity. Use a differently rated drive or motor. Replace the motor.
7342	2	Encoder overtemperature Parameter *_SigLatched* Bit 16	The maximum permissible duty cycle is exceeded. The motor was not mounted properly, for example, it is thermally isolated. The motor is blocked so that more current is used than under normal conditions. The ambient temperature is too high.	Reduce the duty cycle, for example, reduce acceleration. Supply additional cooling, for example, use a fan. Mount the motor in such a way as to increase thermal conductivity. Use a differently rated drive or motor. Replace the motor.
7343	0	Absolute position is different from incremental position Parameter *_WarnLatched* Bit 16	Encoder is subject to EMI. Motor encoder is inoperative.	Verify EMC measures. Contact your Schneider Electric service representative.
7344	3	Absolute position is different from incremental position Parameter *_SigLatched* Bit 16	Encoder is subject to EMI. Motor encoder is inoperative.	Verify EMC measures. Contact your Schneider Electric service representative.

Error code	Error class	Description	Cause	Correctives
7345	0	Amplitude of analog signals too high, limit of AD conversion exceeded	Encoder signals subject to EMI (shield connection, wiring, etc.). Encoder inoperative.	Verify EMC measures. Contact your Schneider Electric service representative.
7346	4	System error detected: Encoder not ready Parameter _*SigLatched* Bit 16	-	Verify EMC measures. Contact your Schneider Electric service representative.
7347	0	System error detected: Position initialization not possible	Analog and digital encoder signals subject to massive interference.	Verify EMC measures. Contact your Schneider Electric service representative.
7348	3	Timeout reading encoder temperature Parameter _*SigLatched* Bit 16	Encoder without temperature sensor, incorrect encoder connection.	Verify EMC measures. Contact your Schneider Electric service representative.
7349	0	Discrepancy between absolute and analog encoder phases	Analog encoder signals are subject to interference. Encoder inoperative.	Verify EMC measures. Contact your Schneider Electric service representative.
734A	3	Amplitude of analog signals from encoder too high, signals are clipped Parameter _*SigLatched* Bit 16	Incorrect encoder wiring. Encoder hardware interface inoperative.	-
734B	0	Signal position evaluation of analog encoder inoperative Parameter _*WarnLatched* Bit 16	Incorrect encoder wiring. Encoder hardware interface inoperative.	-
734C	par.	Error detected with quasi absolute position Parameter _*SigLatched* Bit 16	The motor shaft may have been moved while the drive was powered down. A quasi absolute position has been detected that is not within the permissible motor shaft deviation range.	If the quasi absolute function is active, only power down the drive if the motor is at a standstill and do not move the motor shaft when the drive is off.
734D	0	Index pulse is not available for the encoder Parameter _*WarnLatched* Bit 16	-	-
734E	4	Error in analog signals from encoder detected. Additional information in the error memory indicates Internal_ DeltaQuep. Parameter _*SigLatched* Bit 16	Encoder cable not properly connected. Encoder signals subject to EMI (shield connection, wiring, etc.). Mechanical issue.	Verify EMC measures. Contact your Schneider Electric service representative.
7500	0	RS485/Modbus: Overrun error detected Parameter _*WarnLatched* Bit 5	EMI; incorrect cabling.	Verify cables.
7501	0	RS485/Modbus: Framing error detected Parameter _*WarnLatched* Bit 5	EMI; incorrect cabling.	Verify cables.
7502	0	RS485/Modbus: Parity error detected Parameter _*WarnLatched* Bit 5	EMI; incorrect cabling.	Verify cables.
7503	0	RS485/Modbus: Receive error detected Parameter _*WarnLatched* Bit 5	EMI; incorrect cabling.	Verify cables.
7623	0	Absolute encoder signal is not available Parameter _*WarnLatched* Bit 22	There is no encoder available at the input specified via the parameter ENC_abs_source.	Verify wiring, verify encoder. Change the value of the parameter ENC_ abs_source.
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.

Error code	Error class	Description	Cause	Correctives
7701	4	System error detected: Timeout during connection to power stage Parameter *_SigLatched* Bit 31	-	Contact your Schneider Electric service representative.
7702	4	System error detected: Invalid data received from power stage Parameter *_SigLatched* Bit 31	-	Contact your Schneider Electric service representative.
7703	4	System error detected: Data exchange with power stage lost Parameter *_SigLatched* Bit 31	-	Contact your Schneider Electric service representative.
7704	4	System error detected: Exchange of identification data from power stage not successful Parameter *_SigLatched* Bit 31	-	Contact your Schneider Electric service representative.
7705	4	System error detected: Checksum identification data from power stage incorrect Parameter *_SigLatched* Bit 31	-	Contact your Schneider Electric service representative.
7706	4	System error detected: No identification frame received from power stage Parameter *_SigLatched* Bit 31	-	Contact your Schneider Electric service representative.
7707	4	System error detected: Type of power stage and manufacture data do not match	-	Contact your Schneider Electric service representative.
7708	4	PIC voltage supply too low Parameter *_SigLatched* Bit 31	-	Contact your Schneider Electric service representative.
7709	4	System error detected: Invalid numbers of data received Parameter *_SigLatched* Bit 31	-	Contact your Schneider Electric service representative.
770A	2	PIC received data with incorrect parity Parameter *_SigLatched* Bit 31	-	Contact your Schneider Electric service representative.
8110	0	CANopen: Overflow internal receive queue (message lost) Parameter *_WarnLatched* Bit 21	Two short CAN messages have been sent too fast (at 1 Mbits only).	-
8120	0	CANopen: CAN Controller in state Error Passive Parameter *_WarnLatched* Bit 21	Too many error frames have been detected.	Verify CAN bus installation.
8130	par.	CANopen: Detected Heartbeat or Life Guard error Parameter *_SigLatched* Bit 21	The bus cycle time of the CANopen master is longer than the programmed heartbeat or node guarding time.	Verify the CANopen configuration, increase the heartbeat or node guarding time.
8131	0	CANopen: Detected Heartbeat or Life Guard error Parameter *_WarnLatched* Bit 21	-	-
8140	0	CANopen: CAN controller was in state 'bus-off', communication is possible again Parameter *_WarnLatched* Bit 21	-	-
8141	2	CANopen: CAN controller is in state 'bus-off' Parameter *_SigLatched* Bit 21	Too many error frames have been detected, CAN devices with different baud rates.	Verify CAN bus installation.

Error code	Error class	Description	Cause	Correctives
8142	0	CANopen: CAN controller is in state 'bus-off' Parameter _*WarnLatched* Bit 21	Too many error frames have been detected, CAN devices with different baud rates.	Verify CAN bus installation.
8281	0	CANopen: RxPDO1 could not be processed Parameter _*WarnLatched* Bit 21	Error detected while processing Receive PDO1: PDO1 contains invalid value.	Verify RxPDO1 content (application).
8282	0	CANopen: RxPDO2 could not be processed Parameter _*WarnLatched* Bit 21	Error detected while processing Receive PDO2: PDO2 contains invalid value.	Verify RxPDO2 content (application).
8283	0	CANopen: RxPDO3 could not be processed Parameter _*WarnLatched* Bit 21	Error detected while processing Receive PDO3: PDO3 contains invalid value.	Verify RxPDO3 content (application).
8284	0	CANopen: RxPDO4 could not be processed Parameter _*WarnLatched* Bit 21	Error detected while processing Receive PDO4: PDO4 contains invalid value.	Verify RxPDO4 content (application)
8291	0	CANopen: TxPdo could not be processed Parameter _*WarnLatched* Bit 21	-	-
8292	0	CANopen: TxPdo could not be processed Parameter _*WarnLatched* Bit 21	-	-
8293	0	CANopen: TxPdo could not be processed Parameter _*WarnLatched* Bit 21	-	-
8294	0	CANopen: TxPdo could not be processed Parameter _*WarnLatched* Bit 21	-	-
82A0	0	CANopen: Initialization CANopen stack Parameter _*WarnLatched* Bit 21	-	-
82A1	0	CANopen: Overflow internal transmit queue (message lost) Parameter _*WarnLatched* Bit 21	-	-
82B1	0	CANopen: The data tunneling protocol is not Modbus RTU Parameter _*WarnLatched* Bit 21	-	-
82B2	0	CANopen: Data frame is still being processed Parameter _*WarnLatched* Bit 21	A new data frame was written but the previous data frame is still being processed.	Write the data frame again later on.
A065	0	Parameters cannot be written Parameter _*WarnLatched* Bit 4	A data set is still active.	Wait until the currently active data set has been terminated.
A300	0	Deceleration after HALT request still running	HALT was removed too soon. New command was sent before motor standstill was reached after a HALT request.	Wait for complete stop before removing HALT signal. Wait until motor has come to a complete standstill.
A301	0	Drive in operating state Quick Stop Active	Error with error class 1 detected. Drive stopped with Quick Stop.	-
A302	1	Stop by positive limit switch Parameter _*SigLatched* Bit 1	The positive limit switch was activated because movement range was exceeded, incorrect operation of limit switch or signal disturbance.	Verify application. Verify limit switch function and connection.

Error code	Error class	Description	Cause	Correctives
A303	1	Stop by negative limit switch Parameter *_SigLatched* Bit 1	The negative limit switch was activated because movement range was exceeded, incorrect operation of limit switch or signal disturbance.	Verify application. Verify limit switch function and connection.
A304	1	Stop by reference switch Parameter *_SigLatched* Bit 1	-	-
A305	0	Power stage cannot be enabled in the operating state Not Ready To Switch On	Fieldbus: An attempt was made to enable the power stage in the operating state Not Ready To Switch On.	Refer to the state diagram.
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.
A307	0	Interruption by internal software stop	In the operating modes Homing and Jog, the movement is internally interrupted by an internal software stop. The activation of a new operating mode is not possible, the error code is sent as the response to the activation command.	Perform a Fault Reset.
A308	0	Drive is in operating state Fault or Fault Reaction Active	Error with error class 2 or higher detected.	Verify the error code, remove the cause and perform a Fault Reset.
A309	0	Drive not in operating state Operation Enabled	A command was sent that requires the drive to be in the operating state Operation Enabled (for example, a command to change the operating mode).	Set drive to operating state Operation Enabled and repeat the command.
A310	0	Power stage not enabled	Command cannot be used because the power stage is not enabled (operating state Operation Enabled or Quick Stop Active).	Set drive to an operating state in which the power stage is enabled, see state diagram.
A311	0	Operating mode change active	A start request for an operating mode has been received while a change of the operating mode was active.	Wait until the operating mode change has terminated before triggering a start request for another operating mode.
A312	0	Profile generation interrupted	-	-
A313	0	Position overflow, zero point is therefore no longer valid (ref_ok=0)	The movement range limits were exceeded and the zero point is no longer valid. An absolute movement requires a valid zero point.	Define a valid zero point by means of the operating mode Homing.
A314	0	No valid zero point	Command needs a valid zero point (ref_ok=1).	Define a valid zero point by means of the operating mode Homing.
A315	0	Homing active	Command cannot be used while the operating mode Homing is active.	Wait until reference movement is finished.
A316	0	Overflow during calculation of acceleration	-	-
A317	0	Motor is not at a standstill	Command sent which is not permissible when the motor is not at a standstill. For example: - Change of software limit switches - Change of handling of monitoring signals - Setting of reference point - Teach in of data set	Wait until the motor has come to a standstill (x_end = 1).

Error code	Error class	Description	Cause	Correctives
A318	0	Operating mode active (x_end=0)	Activation of a new operating mode is not possible while another operating mode is still active.	Wait until the command in the operating mode has finished (x_end= 1) or terminate active operating mode with HALT command.
A319	1	Manual tuning/Autotuning: Movement out of range Parameter *_SigLatched* Bit 2	The movement exceeds the parameterized maximum movement range.	Verify permissible movement range value and time interval.
A31A	0	Manual tuning/Autotuning: Amplitude/offset too high	Amplitude plus offset for tuning exceed internal velocity or current limitation.	Choose lower amplitude and offset values.
A31B	0	Halt requested	Command not permissible while Halt is requested.	Clear Halt request and repeat command.
A31C	0	Invalid position setting with software limit switch	Value for negative (positive) software limit switch is greater (less) than value for positive (negative) software limit switch.	Set correct position values.
A31D	0	Velocity range exceeded (parameter CTRL_v_max, M_n_max)	The velocity was set to a value greater than the maximum permissible velocity in parameter CTRL_v_max or M_n_max, whichever is lower.	If the value of parameter M_n_max is greater than the value of parameter CTRL_v_max, increase the value of parameter CTRL_v_max or reduce the velocity value.
A31E	1	Stop by positive software limit switch Parameter *_SigLatched* Bit 2	Not possible to execute command because positive software limit switch was triggered.	Return to the permissible movement range.
A31F	1	Stop by negative software limit switch Parameter *_SigLatched* Bit 2	Not possible to execute command because negative software limit switch was triggered.	Return to the permissible movement range.
A320	par.	Permissible position deviation exceeded Parameter *_SigLatched* Bit 8	External load or acceleration are too high.	Reduce external load or acceleration. Use a differently rated drive, if necessary. Error response can be adjusted via parameter ErrorResp_p_dif.
A321	0	Invalid setting for RS422 position interface	-	-
A322	0	Error detected in ramp calculation	-	-
A323	3	System error detected: Processing error detected during generation of profile	-	-
A324	1	Error detected during homing. Additional information in the error memory indicates the detailed error code. Parameter *_SigLatched* Bit 4	Homing movement was stopped in response to a detected error, the detailed reason is indicated by the additional info in the error memory.	Possible sub-error codes: A325, A326, A327, A328 or A329.
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'.
A326	1	Reference switch not found between positive limit switch and negative limit switch Parameter *_SigLatched* Bit 4	Reference switch inoperative or not correctly connected.	Verify the function and wiring of the reference switch.
A329	1	More than one signal positive limit switch/negative limit switch/reference switch active Parameter *_SigLatched* Bit 4	Reference switch or limit switch not connected correctly or supply voltage for switches too low.	Verify the wiring and 24 VDC supply voltage.

Error code	Error class	Description	Cause	Correctives
A32A	1	Positive limit switch triggered with negative direction of movement Parameter *_SigLatched* Bit 4	Start reference movement with negative direction (for example, reference movement to negative limit switch) and activate the positive limit switch (switch in opposite direction of movement).	Verify correct connection and function of limit switch. Activate a jog movement with negative direction of movement (target limit switch must be connected to the negative limit switch).
A32B	1	Negative limit switch triggered with positive direction of movement Parameter *_SigLatched* Bit 4	Start reference movement with positive direction (for example, reference movement to positive limit switch) and activate the negative limit switch (switch in opposite direction of movement).	Verify correct connection and function of limit switch. Activate a jog movement with positive direction of movement (target limit switch must be connected to the positive limit switch).
A32C	1	Reference switch error detected (switch signal briefly enabled or switch overtraveled) Parameter *_SigLatched* Bit 4	Switch signal disturbance. Motor subjected to vibration or shock when stopped after activation of the switch signal.	Verify supply voltage, cabling and function of switch. Verify motor response after stopping and optimize control loop settings.
A32D	1	Positive limit switch error detected (switch signal briefly enabled or switch overtraveled) Parameter *_SigLatched* Bit 4	Switch signal disturbance. Motor subjected to vibration or shock when stopped after activation of the switch signal.	Verify supply voltage, cabling and function of switch. Verify motor response after stopping and optimize control loop settings.
A32E	1	Negative limit switch error detected (switch signal briefly enabled or switch overtraveled) Parameter *_SigLatched* Bit 4	Switch signal disturbance. Motor subjected to vibration or shock when stopped after activation of the switch signal.	Verify supply voltage, cabling and function of switch. Verify motor response after stopping and optimize control loop settings.
A32F	1	Index pulse not found Parameter *_SigLatched* Bit 4	Index pulse signal not connected or not working properly.	Verify index pulse signal and connection.
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.
A332	1	Jog error detected. Additional information in the error memory indicates the detailed error code. Parameter *_SigLatched* Bit 4	Jog movement was stopped in response to a detected error.	For additional info, verify the detailed error code in the error memory.
A333	3	System error detected: Invalid internal selection	-	-
A334	2	Timeout Standstill Window monitoring	Position deviation after movement greater than standstill window. This may have been caused by an external load.	Verify load. Verify settings for standstill window (parameter MON_p_win, MON_p_winTime and MON_p_winTout). Optimize control loop settings.
A336	1	System error detected: Jerk limitation with position offset after end of movement. Additional information in the error memory indicates the offset in Increments.	-	-
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.
A338	0	Operating mode unavailable Parameter *_WarnLatched* Bit 4	The selected operating mode is not available.	-

Error code	Error class	Description	Cause	Correctives
A339	0	No processing of motor encoder selected or position capture of motor index pulse active Parameter *_WarnLatched* Bit 4	-	-
A33A	0	No valid zero point (ref_ok=0) Parameter *_WarnLatched* Bit 4	No zero point defined by means of operating mode Homing. Zero point no longer valid due to movement beyond permissible movement range. Motor does not have an absolute encoder.	Use operating mode Homing to define a valid zero point. Use a motor with an absolute encoder.
A33C	0	Function not available in this operating mode Parameter *_WarnLatched* Bit 4	Activation of a function which is not available in the active operating mode. Example: Start of backlash compensation while autotuning/ manual tuning is active.	-
A33D	0	Motion blend is already active Parameter *_WarnLatched* Bit 4	Change of motion blend during the ongoing motion blend (end position of motion blend not yet reached)	Wait for the motion blend to complete before setting the next position.
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.
A33F	0	Position of motion blend movement not in the range of the ongoing movement Parameter *_WarnLatched* Bit 4	The position of the motion blend is outside of the movement range.	Verify the position of the motion blend and the movement range.
A341	0	Position of motion blend has already been passed Parameter *_WarnLatched* Bit 4	The movement has passed beyond the position of the motion blend.	-
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.
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.
A347	0	Permissible position deviation exceeded Parameter *_WarnLatched* Bit 8	External load or acceleration are too high.	Reduce external load or acceleration. Threshold value can be adjusted via the parameter MON_p_dif_warn.
A349	0	Position setting exceeds system limits	Position scaling of POSscaleDenom and POSscaleNum results in a scaling factor that is too small.	Change POSscaleDenom and POSscaleNum in such a way as to increase the resulting scaling factor.
A34A	0	Velocity setting exceeds system limits	The velocity scaling of 'VELscaleDenom' and 'VELscaleNum' results in a scaling factor that is too small. The velocity has been set to a value greater than the maximum possible velocity (the maximum velocity is 13200 RPM).	Change 'VELscaleDenom' and 'VELscaleNum' in such a way as to increase the resulting scaling factor.
A34B	0	Ramp setting exceeds system limits	The ramp scaling of 'RAMPscaleDenom' and 'RAMPscaleNum' results in a scaling factor that is too small.	Change of 'RAMPscaleDenom' and 'RAMPscaleNum' in such a way as to increase the resulting scaling factor.
A34C	0	Resolution of scaling too high (range exceeded)	-	-
A34D	0	Function not available when Modulo is active	The function cannot be executed when Modulo is active.	Deactivate Modulo to use the function.

Error code	Error class	Description	Cause	Correctives
A34E	0	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.
A34F	0	Target position outside of modulo range. Corresponding movement within range performed instead.	The 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.
A351	1	Function cannot be executed with this position scaling factor Parameter *_SigLatched* Bit 4	The positions scaling factor is set to a value less than 1rev/131072usr_p, which is less than the internal resolution. In the operating mode Cyclic Synchronous Position, the resolution is not set to 1rev/131072usr_p.	Use a different position scaling factor or deactivate the selected function.
A352	0	Position list active	-	-
A353	0	Position list not sorted	-	-
A354	0	Position list does not match the configuration of the Modulo range	-	-
A355	1	Error detected during relative movement after capture. Additional information in the error memory indicates the detailed error code. Parameter *_SigLatched* Bit 4	Movement was stopped by error.	Verify the error memory.
A356	0	Function Relative Movement After Capture not assigned to a digital input	-	Assign the function Relative Movement After Capture to a digital input.
A357	0	Deceleration still running	Command is not permissible during deceleration.	Wait until motor has come to a complete standstill.
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.
A359	0	Request cannot be processed since the relative movement after capture is still active	-	-
A35B	0	Modulo cannot be activated Parameter *_WarnLatched* Bit 4	The set operating mode does not support Modulo.	-
A35D	par.	Permissible velocity deviation exceeded Parameter *_SigLatched* Bit 8	Load or acceleration too high.	Reduce load or acceleration.
A35E	0	The selected velocity scaling factor reduces the accuracy of the velocity scaling.	-	Increase or decrease the value of the numerator and/or denominator of the scaling factor. If the condition persists, contact your Schneider Electric service representative.
A35F	0	The selected ramp scaling factor reduces the accuracy of the ramp scaling.	-	Increase or decrease the value of the numerator and/or denominator of the scaling factor. If the condition persists, contact your Schneider Electric service representative.
B100	0	RS485/Modbus: Indeterminable service Parameter *_WarnLatched* Bit 5	Unsupported Modbus service was received.	Verify application on the Modbus master.

Error code	Error class	Description	Cause	Correctives
B120	2	Cyclic communication: Incorrect cycle time Parameter _*SigLatched* Bit 21	The drive does not support the configured cycle time or the difference between the measured cycle time and the configured cycle time is too great.	Change the cycle time in the master controller to a cycle time supported by the drive or verify synchronization requirements.
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.
B122	2	Cyclic communication: Incorrect synchronization Parameter _*SigLatched* Bit 21	One signal was missing and the expected second signal was received at an incorrect point in time. The master controller may be unable to provide the required synchronization signals at the set cycle time, for example, due to insufficient computing power.	Analyze the communication or increase the cycle time.
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.
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.
B200	0	RS485/Modbus: Protocol error detected Parameter _*WarnLatched* Bit 5	Logical protocol error detected: Incorrect length or unsupported subfunction.	Verify application on the Modbus master.
B201	2	RS485/Modbus: Interruption of the connection Parameter _*SigLatched* Bit 5	Connection monitoring has detected an interruption of the connection.	Verify all connections and cables used for data exchange. Verify that the device is on.
B202	0	RS485/Modbus: Interruption of the connection Parameter _*WarnLatched* Bit 5	Connection monitoring has detected an interruption of the connection.	Verify all connections and cables used for data exchange. Verify that the device is on.
B203	0	RS485/Modbus: Incorrect number of monitor objects Parameter _*WarnLatched* Bit 5	-	-
B400	2	CANopen: NMT reset with power stage enabled Parameter _*SigLatched* Bit 21	NMT Reset command is received while drive is in operating state Operation Enabled.	Disable the power stage before sending a NMT reset command.
B401	2	CANopen: NMT stop with power stage enabled Parameter _*SigLatched* Bit 21	NMT Stop command is received while drive is in operating state Operation Enabled.	Disable the power stage before sending a NMT Stop command.
B402	0	CAN PLL active Parameter _*WarnLatched* Bit 21	An attempt has been made to start the synchronization mechanism, but the synchronization mechanism was already active.	Deactivate the synchronization mechanism.
B403	2	Excessive Sync period deviation Parameter _*SigLatched* Bit 21	The period time of the SYNC signals is not stable. The deviation is more than 100 usec.	The SYNC signals of the motion controller must be more accurate.
B404	2	Sync signal error detected Parameter _*SigLatched* Bit 21	SYNC signal missed more than twice.	Verify CAN connection, verify motion controller.
B405	2	Drive could not be adapted to master cycle Parameter _*SigLatched* Bit 21	The jitter of the SYNC object is too great or the motion bus requirements are not taken into account.	Verify the timing requirements regarding interpolation time period and number of devices.
B406	0	Baud rate is not supported Parameter _*WarnLatched* Bit 21	The configured baud rate is not supported.	Choose one of the following baud rates: 250 kB, 500 kB, 1000 kB.

Error code	Error class	Description	Cause	Correctives
B407	0	Drive is not synchronous with master cycle Parameter *_WarnLatched* Bit 21	The operating mode 'Cyclic Synchronous Mode' cannot be activated as long as the drive is not synchronized.	Verify motion controller. To be synchronized, the motion controller must cyclically send SYNC signals.
B700	0	Drive Profile Lexium: On activation of the profile, no dmControl, refA or refB has been mapped.	dmControl, refA or refB have not been mapped.	Map dmControl, refA or refB.
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.

Parameters

Representation of the Parameters

Description

This section provides an overview of the parameters which can be used for operating the drive.

In addition, special parameters for communication via the fieldbus are described in the corresponding fieldbus user guide.

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Overview

The way parameters are shown provides information required for unique identification, the default values and the properties of a parameter.

Structure of the parameter representation:

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
ABCDE CONF → INF- PRO	Short description Selection values **1 / Abc1 /** ABC 1: Explanation 1 **2 / Abc2 /** ABC 2: Explanation 2 Description and details	A_{pk} 0.00 3.00 300.00	UINT32 R/W per. -	Fieldbus 1234

Field “Parameter Name”

The parameter name uniquely identifies a parameter.

Field “HMI menu” and “HMI name”

HMI menu shows the sequence of menus and commands to access the parameter via the HMI.

Field “Description”

Short description:

The short description contains information on the parameter and a cross reference to the page that describes the use of the parameter.

Selection values:

In the case of parameters which offer a selection of settings, the value to be entered via the fieldbus, the designation of the value for entry via the commissioning software and the designation of the value for entry via the HMI are specified.

1 = Value for input via fieldbus

Abc1 = Designation for entry via the commissioning software

Abc 1 = Designation for entry via the HMI

Description and details:

Provides further information on the parameter.

Field “Unit”

The unit of the value.

Field “Minimum Value”

The minimum value which can be entered.

Field “Factory Settings”

Settings when the product is shipped.

Field “Maximum Value”

The maximum value which can be entered.

Field “Data Type”

If the minimum and the maximum values are not explicitly indicated, the valid range of values is determined by the data type.

Data type	Minumum value	Maximum value
INT8	-128	127
UINT8	0	255
INT16	-32768	32767
UINT16	0	65535
INT32	-2147483648	2147483647
UINT32	0	4294967295

Field “R/W”

Indicates read and/or write values

"R/" values can only be read

"R/W" values can be read and written.

Field “Persistent”

“per.” indicates whether the value of the parameter is persistent, i.e. whether it remains in the memory after the device is powered off.

When a value of a persistent parameter is modified via the HMI, the drive stores the value automatically in the persistent memory.

When a value of a persistent parameter is modified via the commissioning software or the fieldbus, the user must explicitly store the modified value in the persistent memory.

Field “Parameter Address”

Each parameter has a unique parameter address.

Decimal Numbers Entered via the Fieldbus

Note that parameter values are entered via the fieldbus without a decimal point. All decimal places must be entered.

Input examples:

Value	Commissioning software	Fieldbus
20	20	20
5.0	5.0	50
23.57	23.57	2357
1.000	1.000	1000

List of Parameters

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_AccessInfo	Access channel information. Low byte: Exclusive access Value 0: No Value 1: Yes High byte: Access channel Value 0: Reserved Value 1: I/O Value 2: HMI Value 3: Modbus RS485 Value 4: Fieldbus main channel Value 5: CANopen second SDO	- - - -	UINT16 R/- - -	CANopen 3001:C_h Modbus 280
_actionStatus	Action word. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: Error class 0 Bit 1: Error class 1 Bit 2: Error class 2 Bit 3: Error class 3 Bit 4: Error class 4 Bit 5: Reserved Bit 6: Motor is at a standstill (_n_act < 9 RPM) Bit 7: Motor movement in positive direction Bit 8: Motor movement in negative direction Bit 9: Assignment can be set via parameter DPL_intLim Bit 10: Assignment can be set via parameter DS402intLim Bit 11: Profile generator idle (reference velocity is 0) Bit 12: Profile generator decelerates Bit 13: Profile generator accelerates Bit 14: Profile generator moves at constant speed Bit 15: Reserved	- - - -	UINT16 R/- - -	CANopen 301C:4_h Modbus 7176
_AT_J	Moment of inertia of the system. Is automatically calculated during Autotuning. In increments of 0.1 kg cm^2.	kg cm^2 0.1 0.1 6553.5	UINT16 R/- per. -	CANopen 302F:C_h Modbus 12056

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_AT_M_friction	Friction torque of the system. Is determined during Autotuning. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	CANopen 302F:7_h Modbus 12046
_AT_M_load	Constant load torque. Is determined during Autotuning. In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	CANopen 302F:8_h Modbus 12048
_AT_progress	Progress of Autotuning.	% 0 0 100	UINT16 R/- - -	CANopen 302F:B_h Modbus 12054
_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	- - - -	UINT16 R/- - -	CANopen 302F:2_h Modbus 12036
_CanDiag	CANopen diagnostics word. 0001h: pms read error for TxPdo 0002h: pms write error for RxPdo1 0004h: pms write error for RxPdo2 0008h: pms write error for RxPdo3 0010h: pms write error for RxPdo4 0020h: heartbeat or lifeguard error (timer expired) 0040h: heartbeat msg with incorrect state received 0080h: CAN error counter >96 0100h: CAN message lost 0200h: CAN error counter = 256 (bus-off) 0400h: software queue rx/tx overrun 0800h: error indication from last detected error	- - - -	UINT16 R/- - -	CANopen 3041:6_h Modbus 16652
_Cap1CntFall	Capture input 1 event counter at falling edges (DS402). Counts the capture events at falling edges. The event counter is reset when capture input 1 is activated. Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 300A:$2C_h$ Modbus 2648

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_Cap1CntRise	Capture input 1 event counter at rising edges (DS402). Counts the capture events at rising edges. The event counter is reset when capture input 1 is activated. Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 300A:$2B_h$ Modbus 2646
_Cap1Count	Capture input 1 event counter (one-time). Counts the capture events. The event counter is reset when capture input 1 is activated.	- - - -	UINT16 R/- - -	CANopen 300A:8_h Modbus 2576
_Cap1CountCons	Capture input 1 event counter (continuous). Counts the capture events. The event counter is reset when capture input 1 is activated. By reading this parameter, the parameter "_Cap1PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with firmware version ≥V01.12.	- - - -	UINT16 R/- - -	CANopen 300A:17_h Modbus 2606
_Cap1Pos	Capture input 1 captured position (one-time). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement".	usr_p - - -	INT32 R/- - -	CANopen 300A:6_h Modbus 2572
_Cap1PosCons	Capture input 1 captured position (continuous). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap1CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with firmware version ≥V01.12.	usr_p - - -	INT32 R/- - -	CANopen 300A:18_h Modbus 2608
_Cap1PosFallEdge	Capture input 1 captured position at falling edge (DS402). 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". Available with firmware version ≥V01.16.	usr_p - - -	INT32 R/- - -	CANopen 60BB:0_h Modbus 2636
_Cap1PosRisEdge	Capture input 1 captured position at rising edge (DS402). 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". Available with firmware version ≥V01.16.	usr_p - - -	INT32 R/- - -	CANopen 60BA:0_h Modbus 2634

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_Cap2CntFall	Capture input 2 event counter at falling edges (DS402). Counts the capture events at falling edges. The event counter is reset when capture input 2 is activated. Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 300A:2E$_h$ Modbus 2652
_Cap2CntRise	Capture input 2 event counter at rising edges (DS402). Counts the capture events at rising edges. The event counter is reset when capture input 2 is activated. Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 300A:2D$_h$ Modbus 2650
_Cap2Count	Capture input 2 event counter (one-time). Counts the capture events. The event counter is reset when capture input 2 is activated. Available with hardware version ≥RS03.	- - - -	UINT16 R/- - -	CANopen 300A:9$_h$ Modbus 2578
_Cap2CountCons	Capture input 2 event counter (continuous). Counts the capture events. The event counter is reset when capture input 2 is activated. By reading this parameter, the parameter "_Cap2PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Available with firmware version ≥V01.12.	- - - -	UINT16 R/- - -	CANopen 300A:19$_h$ Modbus 2610
_Cap2Pos	Capture input 2 captured position (one-time). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". Available with hardware version ≥RS03.	usr_p - - -	INT32 R/- - -	CANopen 300A:7$_h$ Modbus 2574
_Cap2PosCons	Capture input 2 captured position (continuous). Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap2CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Available with firmware version ≥V01.12.	usr_p - - -	INT32 R/- - -	CANopen 300A:1A$_h$ Modbus 2612

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_Cap2PosFallEdge	Capture input 2 captured position at falling edge (DS402). 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". Available with firmware version ≥V01.16.	usr_p - - -	INT32 R/- - -	CANopen 60BD:0_h Modbus 2640
_Cap2PosRisEdge	Capture input 2 captured position at rising edge (DS402). 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". Available with firmware version ≥V01.16.	usr_p - - -	INT32 R/- - -	CANopen 60BC:0_h Modbus 2638
_CapEventCounters	Capture inputs 1 and 2 summary of event counters (DS402). 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) Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 300A:$2F_h$ Modbus 2654
_CapStatus	Status of the capture inputs. Read access: Bit 0: Position captured via input CAP1 Bit 1: Position captured via input CAP2	- - - -	UINT16 R/- - -	CANopen 300A:1_h Modbus 2562
_CommutCntAct	Actual value of commutation monitoring counter. Available with firmware version ≥V01.32.	- - - -	INT16 R/- - -	CANopen 303F:62_h Modbus 16324
_Cond_State4	Conditions for transition to operating state Ready To Switch On. Signal state: 0: Condition not met 1: Condition met Bit 0: DC bus or mains voltage Bit 1: Inputs for safety function Bit 2: No configuration download ongoing Bit 3: Velocity greater than limit value Bit 4: Absolute position has been set Bit 5: Holding brake not manually released	- - - -	UINT16 R/- - -	CANopen 301C:26_h Modbus 7244

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_CTRL_ActParSet	Active control loop parameter set. Value 1: Control loop parameter set 1 is active Value 2: Control loop parameter set 2 is active A control loop parameter set is active after the time for the parameter switching (CTRL_ ParChgTime) has elapsed.	- - - -	UINT16 R/- - -	CANopen 3011:17$_h$ Modbus 4398
_CTRL_KPid	Current controller d component P gain. This value is calculated on the basis of the motor parameters. In increments of 0.1 V/A.	V/A 0.5 - 1270.0	UINT16 R/- per. -	CANopen 3011:1$_h$ Modbus 4354
_CTRL_KPiq	Current controller q component P gain. This value is calculated on the basis of the motor parameters. In increments of 0.1 V/A.	V/A 0.5 - 1270.0	UINT16 R/- per. -	CANopen 3011:3$_h$ Modbus 4358
_CTRL_TNid	Current controller d component integral action time. This value is calculated on the basis of the motor parameters. In increments of 0.01 ms.	ms 0.13 - 327.67	UINT16 R/- per. -	CANopen 3011:2$_h$ Modbus 4356
_CTRL_TNiq	Current controller q component integral action time. This value is calculated on the basis of the motor parameters. In increments of 0.01 ms.	ms 0.13 - 327.67	UINT16 R/- per. -	CANopen 3011:4$_h$ Modbus 4360
_DataError	Error code for detected synchronous errors (DE bit). Drive Profile Lexium: Manufacturer-specific error code that caused the DataError bit to be set. Usually, this is an error that was detected as a result to changing of a data value within the process data. The DataError bit relates to MT-independent parameters.	- - - -	UINT16 R/- - -	CANopen 301B:1B$_h$ Modbus 6966
_DataErrorInfo	Additional error information of a detected DataError (DE bit). Drive Profile Lexium: Indicates the parameter of the mapping that caused the DE bit to be set. The DE bit is set if MT-independent parameters of the active mapping cause an error in connection with a write command. Example: 1 = First mapped parameter 2 = Second mapped parameter etc.	- - - -	UINT16 R/- - -	CANopen 301B:1D$_h$ Modbus 6970

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_DCOMopmd_act	Active operating mode. **-6 / Manual Tuning / Autotuning**: Manual Tuning / Autotuning **-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 * Datatype for CANopen: INT8	- -6 0 10	INT16* R/- - -	CANopen 6061:0_h Modbus 6920
_DCOMstatus	DriveCom status word. Bit assignments: Bit 0: Operating state Ready To Switch On Bit 1: Operating state Switched On Bit 2: Operating state Operation Enabled Bit 3: Operating state Fault Bit 4: Voltage Enabled Bit 5: Operating state Quick Stop Bit 6: Operating state Switch On Disabled Bit 7: Error of error class 0 Bit 8: HALT request active Bit 9: Remote Bit 10: Target Reached Bit 11: Internal Limit Active Bit 12: Operating mode-specific Bit 13: x_err Bit 14: x_end Bit 15: ref_ok	- - - -	UINT16 R/- - -	CANopen 6041:0_h Modbus 6916
_DEV_T_current *Ποη* *tdEV*	Temperature of device.	°C - - -	INT16 R/- - -	CANopen 301C:12_h Modbus 7204

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_DPL_BitShiftRefA16	Bit shift for RefA16 for Drive Profile Lexium. Velocity scaling may lead to values that cannot be represented as 16 bit values. If RefA16 is used, this parameter indicates the number of bits by which the value is shifted so that transmission is possible. The master must take into account this value prior to transmission and shift the bits to the right accordingly. The number of bits is recalculated each time the power stage is enabled.	- 0 0 12	UINT16 R/- - -	CANopen 301B:5_h Modbus 6922
_DPL_driveInput	Drive Profile Lexium driveInput.	- - - -	UINT16 R/- - -	CANopen 301B:28_h Modbus 6992
_DPL_driveStat	Drive Profile Lexium driveStat.	- - - -	UINT16 R/- - -	CANopen 301B:25_h Modbus 6986
_DPL_mfStat	Drive Profile Lexium mfStat.	- - - -	UINT16 R/- - -	CANopen 301B:26_h Modbus 6988
_DPL_motionStat	Drive Profile Lexium motionStat.	- - - -	UINT16 R/- - -	CANopen 301B:27_h Modbus 6990
_ENC_AmplMax	Maximum value of the SinCos amplitude. This value is only available if monitoring of the SinCos amplitude has been activated. Available with firmware version ≥V01.26.	mV - - -	UINT16 R/- - -	CANopen 303F:60_h Modbus 16320
_ENC_AmplMean	Mean value of the SinCos amplitude. This value is only available if monitoring of the SinCos amplitude has been activated. Available with firmware version ≥V01.26.	mV - - -	UINT16 R/- - -	CANopen 303F:$5E_h$ Modbus 16316
_ENC_AmplMin	Minimum value of the SinCos amplitude. This value is only available if monitoring of the SinCos amplitude has been activated. Available with firmware version ≥V01.26.	mV - - -	UINT16 R/- - -	CANopen 303F:$5F_h$ Modbus 16318
_ENC_AmplVal	Value of the SinCos amplitude. This value is only available if monitoring of the SinCos amplitude has been activated. Available with firmware version ≥V01.26.	mV - - -	UINT16 R/- - -	CANopen 303F:$5D_h$ Modbus 16314

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_ERR_class	Error class. Value 0: Error class 0 Value 1: Error class 1 Value 2: Error class 2 Value 3: Error class 3 Value 4: Error class 4	- 0 - 4	UINT16 R/- - -	CANopen 303C:2_h Modbus 15364
_ERR_DCbus	DC bus voltage at the time the error was detected. In increments of 0.1 V.	V - - -	UINT16 R/- - -	CANopen 303C:7_h Modbus 15374
_ERR_enable_cycl	Number of cycles of enabling the power stage at error time. Number of cycles of enabling the power stage from the time the control voltage was applied to the time the error was detected.	- - - -	UINT16 R/- - -	CANopen 303C:5_h Modbus 15370
_ERR_enable_time	Time between enabling of power stage and detection of the error.	s - - -	UINT16 R/- - -	CANopen 303C:6_h Modbus 15372
_ERR_motor_I	Motor current at the time the error was detected. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	CANopen 303C:9_h Modbus 15378
_ERR_motor_v	Motor velocity at the time the error was detected.	usr_v - - -	INT32 R/- - -	CANopen 303C:8_h Modbus 15376
_ERR_number	Error code. Reading this parameter copies the entire entry for the detected error (error class, time of detection of error, …) to an intermediate memory from which the elements of the detected error can then be read. In addition, the read pointer of the error memory is automatically set to the next error entry.	- 0 - 65535	UINT16 R/- - -	CANopen 303C:1_h Modbus 15362
_ERR_powerOn nOn PoWo	Number of power on cycles.	- 0 - 4294967295	UINT32 R/- - -	CANopen 303B:2_h Modbus 15108
_ERR_qual	Additional information on detected error. This entry contains additional information on the detected error, depending on the error number. Example: a parameter address	- 0 - 65535	UINT16 R/- - -	CANopen 303C:4_h Modbus 15368

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_ERR_temp_dev	Temperature of device at the time the error was detected.	°C - - -	INT16 R/- - -	CANopen 303C:B_h Modbus 15382
_ERR_temp_ps	Temperature of power stage at the time the error was detected.	°C - - -	INT16 R/- - -	CANopen 303C:A_h Modbus 15380
_ERR_time	Time of detection of error. With reference to operating hours counter	s 0 - 536870911	UINT32 R/- - -	CANopen 303C:3_h Modbus 15366
_ErrNumFbParSvc	Last error code of fieldbus parameter services. Some fieldbusses only provide general error codes if a request for a parameter service is not successful. This parameter returns the vendor-specific error code of the last unsuccessful service.	- - - -	UINT16 R/- - -	CANopen 3040:43_h Modbus 16518
_HMdisREFtoIDX	Distance from switching point to index pulse. Allows you to verify the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. The parameter _HMdisREFtoIDX_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution.	revolution - - -	INT32 R/- - -	CANopen 3028:C_h Modbus 10264
_HMdisREFtoIDX_usr	Distance from switching point to index pulse. Allows you to verify the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. Available with firmware version ≥V01.05.	usr_p -2147483648 - 2147483647	INT32 R/- - -	CANopen 3028:F_h Modbus 10270
_hwVersCPU	Hardware version of control board.	- - - -	UINT16 R/- - -	CANopen 3002:12_h Modbus 548
_hwVersPS	Hardware version of power stage.	- - - -	UINT16 R/- - -	CANopen 3002:14_h Modbus 552
_I_act Mon iAct	Total motor current. In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	CANopen 301E:3_h Modbus 7686

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_Id_act_rms	Actual motor current (d component, field weakening). In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	CANopen 301E:2_h Modbus 7684
_Id_ref_rms	Reference motor current (d component, field weakening). In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	CANopen 301E:11_h Modbus 7714
_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. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	CANopen 301C:28_h Modbus 7248
_Imax_system	Current limitation of the system. This parameter specifies the maximum system current. This is the lower value of the maximum motor current and the maximum power stage current. If no motor is connected, only the maximum power stage current is taken into account in this parameter. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	CANopen 301C:27_h Modbus 7246
_InvalidParam	Modbus address of parameter with invalid value. If a configuration error is detected, the Modbus address of the parameter with an invalid value is indicated here.	- - 0 -	UINT16 R/- - -	CANopen 301C:6_h Modbus 7180
_IO_act	Physical status of the digital inputs and outputs. Low byte: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3 High byte: Bit 8: DQ0 Bit 9: DQ1	- - - -	UINT16 R/- - -	CANopen 3008:1_h Modbus 2050

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_DI_act Mon diMo	Status of digital inputs. Bit assignments: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3	- - - -	UINT16 R/- - -	CANopen 3008:F_h Modbus 2078
_IO_DQ_act Mon doMo	Status of digital outputs. Bit assignments: Bit 0: DQ0 Bit 1: DQ1	- - - -	UINT16 R/- - -	CANopen 3008:10_h Modbus 2080
_IO_STO_act Mon Sto	Status of the inputs for the safety-related function STO. Coding of the individual signals: Bit 0: STO_A Bit 1: STO_B	- - - -	UINT16 R/- - -	CANopen 3008:26_h Modbus 2124
_Iq_act_rms Mon qAct	Actual motor current (q component, generating torque). In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	CANopen 301E:1_h Modbus 7682
_Iq_ref_rms Mon qrEF	Reference motor current (q component, generating torque). In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 R/- - -	CANopen 301E:10_h Modbus 7712
_LastError Mon LFLt	Detected error causing a stop (error classes 1 to 4). Error code of the most recent detected error. Consecutive detected errors do not overwrite this error code. Example: If an error response to a detected limit switch error causes overvoltage, this parameter contains the code of the detected limit switch error. Exception: Detected errors of error class 4 overwrite existing entries.	- - - -	UINT16 R/- - -	CANopen 603F:0_h Modbus 7178
_LastError_Qual	Additional info on most recent error. This parameter contains additional information on the most recent detected error, depending on the error code. For example: a parameter address.	- - 0 -	UINT16 R/- - -	CANopen 301C:$1F_h$ Modbus 7230
_LastWarning Mon LWrn	Code of most recent error of error class 0. If the error is no longer active, the code is stored until the next Fault Reset. Value 0: No error of error class 0	- - - -	UINT16 R/- - -	CANopen 301C:9_h Modbus 7186

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_BRK_T_apply	Holding brake application time.	ms - - -	UINT16 R/- - -	CANopen 300D:21$_h$ Modbus 3394
_M_BRK_T_release	Holding brake release time.	ms - - -	UINT16 R/- - -	CANopen 300D:22$_h$ Modbus 3396
_M_Enc_Cosine	Voltage of cosine signal of encoder. In increments of 0.001 V. Available with firmware version ≥V01.26.	V - - -	INT16 R/- - -	CANopen 301C:2B$_h$ Modbus 7254
_M_Enc_Sine	Voltage of sine signal of encoder. In increments of 0.001 V. Available with firmware version ≥V01.26.	V - - -	INT16 R/- - -	CANopen 301C:2C$_h$ Modbus 7256
_M_Encoder CONF → INF-SENS	Type of motor encoder. **1 / SinCos With HiFa /** SWHI: SinCos with Hiperface **2 / SinCos Without HiFa /** SWOH: SinCos without Hiperface **3 / SinCos With Hall /** SWHA: SinCos with Hall **4 / SinCos With EnDat /** SWEN: SinCos with EnDat **5 / EnDat Without SinCos /** ENDA: EnDat without SinCos **6 / Resolver /** RESO: Resolver **7 / Hall /** HALL: Hall (not supported yet) **8 / BISS /** BISS: BISS High byte: Value 0: Rotary encoder Value 1: Linear encoder	- - - -	UINT16 R/- - -	CANopen 300D:3$_h$ Modbus 3334
_M_HoldingBrake	Holding brake identification. Value 0: Motor without holding brake Value 1: Motor with holding brake	- - - -	UINT16 R/- - -	CANopen 300D:20$_h$ Modbus 3392
_M_I_0	Continuous stall current of motor. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	CANopen 300D:13$_h$ Modbus 3366

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_I_max CONF → INF- MIMA	Maximum current of motor. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	CANopen 300D:6_h Modbus 3340
_M_I_nom CONF → INF- MINO	Nominal current of motor. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- - -	CANopen 300D:7_h Modbus 3342
_M_I2t	Maximum permissible time for maximum current of motor.	ms - - -	UINT16 R/- - -	CANopen 300D:11_h Modbus 3362
_M_Jrot	Moment of inertia of motor. Units: Rotary motors: $kgcm^2$ Linear motors: kg In increments of 0.001 motor_f.	motor_f - - -	UINT32 R/- - -	CANopen 300D:C_h Modbus 3352
_M_kE	Voltage constant kE of motor. Voltage constant in Vrms at 1000 RPM. Units: Rotary motors: Vrms/RPM Linear motors: Vrms/(m/s) In increments of 0.1 motor_u.	motor_u - - -	UINT32 R/- - -	CANopen 300D:B_h Modbus 3350
_M_L_d	Inductance d component of motor. In increments of 0.01 mH.	mH - - -	UINT16 R/- - -	CANopen 300D:F_h Modbus 3358
_M_L_q	Inductance q component of motor. In increments of 0.01 mH.	mH - - -	UINT16 R/- - -	CANopen 300D:E_h Modbus 3356
_M_load MON LdFM	Load of motor.	% - - -	INT16 R/- - -	CANopen 301C:$1A_h$ Modbus 7220
_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	motor_m - - -	UINT16 R/- - -	CANopen 300D:16_h Modbus 3372

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_M_max	Maximum torque of motor. In increments of 0.1 Nm.	Nm - - -	UINT16 R/- - -	CANopen 300D:9_h Modbus 3346
_M_M_nom	Nominal torque/force of motor. Units: Rotary motors: Ncm Linear motors: N	motor_m - - -	UINT16 R/- - -	CANopen 300D:8_h Modbus 3344
_M_maxoverload	Maximum value of overload of motor. Maximum overload of motor during the last 10 seconds.	% - - -	INT16 R/- - -	CANopen 301C:$1B_h$ Modbus 7222
_M_n_max CONF → INF - MNMA	Maximum permissible speed of rotation/velocity of motor. Units: Rotary motors: RPM Linear motors: mm/s	motor_v - - -	UINT16 R/- - -	CANopen 300D:4_h Modbus 3336
_M_n_nom	Nominal speed of rotation/velocity of motor. Units: Rotary motors: RPM Linear motors: mm/s	motor_v - - -	UINT16 R/- - -	CANopen 300D:5_h Modbus 3338
_M_overload	Overload of motor (I2t).	% - - -	INT16 R/- - -	CANopen 301C:19_h Modbus 7218
_M_Polepair	Number of pole pairs of motor.	- - - -	UINT16 R/- - -	CANopen 300D:14_h Modbus 3368
_M_PolePairPitch	Pole pair pitch of motor. In increments of 0.01 mm. Available with firmware version ≥V01.03.	mm - - -	UINT16 R/- - -	CANopen 300D:23_h Modbus 3398
_M_R_UV	Winding resistance of motor. In increments of 0.01 Ω.	Ω - - -	UINT16 R/- - -	CANopen 300D:D_h Modbus 3354
_M_T_current MON ETMOT	Temperature of motor.	°C - - -	INT16 R/- - -	CANopen 301C:11_h Modbus 7202

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_max	Maximum temperature of motor.	°C - - -	INT16 R/- - -	CANopen 300D:10_h Modbus 3360
_M_Type CONF → INF- MTYP	Motor type. Value 0: No motor selected Value >0: Connected motor type	- - - -	UINT32 R/- - -	CANopen 300D:2_h Modbus 3332
_M_U_max	Maximum voltage of motor. In increments of 0.1 V.	V - - -	UINT16 R/- - -	CANopen 300D:19_h Modbus 3378
_M_U_nom	Nominal voltage of motor. In increments of 0.1 V.	V - - -	UINT16 R/- - -	CANopen 300D:A_h Modbus 3348
_ManuSdoAbort	CANopen manufacturer-specific SDO abort code. Provides more detailed information on a general SDO abort code (0800 0000).	- - - -	UINT16 R/- - -	CANopen 3041:A_h Modbus 16660
_ModeError	Error code for detected synchronous errors (ME bit). Drive Profile Lexium: Manufacturer-specific error code that caused the ModeError bit to be set. Usually, this is an error that was detected as a result of the activation of an operating mode. The ModeError bit relates to MT-dependent parameters.	- - - -	UINT16 R/- - -	CANopen 301B:19_h Modbus 6962
_ModeErrorInfo	Additional error information of a detected ModeError (ME bit). Drive Profile Lexium: Indicates the parameter of the mapping that caused the ME bit to be set. The ME bit is set if MT-dependent parameters of the active mapping cause an error in connection with a write command. Example: 1 = First mapped parameter 2 = Second mapped parameter etc.	- - - -	UINT16 R/- - -	CANopen 301B:$1C_h$ Modbus 6968
_n_act MON nACT	Actual speed of rotation.	RPM - - -	INT16 R/- - -	CANopen 301E:8_h Modbus 7696

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_n_act_ENC1	Actual speed of rotation of encoder 1. Available with firmware version ≥V01.03.	RPM - - -	INT16 R/- - -	CANopen 301E:28$_h$ Modbus 7760
_n_ref nOn nrEF	Reference speed of rotation.	RPM - - -	INT16 R/- - -	CANopen 301E:7$_h$ Modbus 7694
_OpHours nOn oPh	Operating hours counter.	s - - -	UINT32 R/- - -	CANopen 301C:A$_h$ Modbus 7188
_p_absENC nOn PAnu	Absolute position with reference to the encoder range. This value corresponds to the modulo position of the absolute encoder range.	usr_p - - -	UINT32 R/- - -	CANopen 301E:F$_h$ Modbus 7710
_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).	Inc - - -	UINT32 R/- - -	CANopen 301E:E$_h$ Modbus 7708
_p_act	Actual position.	usr_p - - -	INT32 R/- - -	CANopen 6064:0$_h$ Modbus 7706
_p_act_ENC1	Actual position of encoder 1. Available with firmware version ≥V01.03.	usr_p - - -	INT32 R/- - -	CANopen 301E:27$_h$ Modbus 7758
_p_act_ENC1_int	Actual position of encoder 1 in internal units. Available with firmware version ≥V01.03.	Inc - - -	INT32 R/- - -	CANopen 301E:26$_h$ Modbus 7756
_p_act_int	Actual position in internal units.	Inc - - -	INT32 R/- - -	CANopen 6063:0$_h$ Modbus 7700

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_p_dif	Position deviation including dynamic position deviation. Position deviation is the difference between reference position and actual position. The position deviation consists of the load-dependent position deviation and the dynamic position deviation. The parameter _p_dif_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution.	revolution -214748.3648 - 214748.3647	INT32 R/- - -	CANopen 60F4:0$_h$ Modbus 7716
_p_dif_load	Load-dependent position deviation between reference and actual positions. The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. This value is used for following error monitoring. The parameter _p_dif_load_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution.	revolution -214748.3648 - 214748.3647	INT32 R/- - -	CANopen 301E:1C$_h$ Modbus 7736
_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. In increments of 0.0001 revolution. Modified settings become active immediately.	revolution 0.0000 - 429496.7295	UINT32 R/W - -	CANopen 301E:1B$_h$ Modbus 7734
_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. Modified settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 - 2147483647	INT32 R/W - -	CANopen 301E:15$_h$ Modbus 7722
_p_dif_load_usr	Load-dependent position deviation between reference and actual positions. The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. This value is used for following error monitoring. Available with firmware version ≥V01.05.	usr_p -2147483648 - 2147483647	INT32 R/- - -	CANopen 301E:16$_h$ Modbus 7724
_p_dif_usr	Position deviation including dynamic position deviation. Position deviation is the difference between reference position and actual position. The position deviation consists of the load-dependent position deviation and the dynamic position deviation. Available with firmware version ≥V01.05.	usr_p -2147483648 - 2147483647	INT32 R/- - -	CANopen 301E:14$_h$ Modbus 7720
_p_ref	Reference position. Value corresponds to the reference position of the position controller.	usr_p - - -	INT32 R/- - -	CANopen 301E:C$_h$ Modbus 7704

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_p_ref_int	Reference position in internal units. Value corresponds to the reference position of the position controller.	Inc - - -	INT32 R/- - -	CANopen 301E:9_h Modbus 7698
_PAR_ScalingError	Additional information on error detected during recalculation. Coding: Bits 0 ... 15: Address of the parameter that caused the error Bits 16 ... 31: Reserved Available with firmware version ≥V01.05.	- - - -	UINT32 R/- - -	CANopen 3004:16_h Modbus 1068
_PAR_ScalingState	Status of recalculation of the parameters with user-defined units. **0 / Recalculation Active**: Recalculation active **1 / Reserved (1)**: Reserved **2 / Recalculation Finished - No Error**: Recalculation finished, no error **3 / Error During Recalculation**: Error during recalculation **4 / Initialization Successful**: Initialization successful **5 / Reserved (5)**: Reserved **6 / Reserved (6)**: Reserved **7 / Reserved (7)**: Reserved Status of recalculation of the parameters with user-defined units which are recalculated with a changed scaling factor. Available with firmware version ≥V01.05.	- 0 2 7	UINT16 R/- - -	CANopen 3004:15_h Modbus 1066
_PosRegStatus	Status of the position register channels. Signal state: 0: Comparison criterion not met 1: Comparison criterion met Bit assignments: Bit 0: State of position register channel 1 Bit 1: State of position register channel 2 Bit 2: State of position register channel 3 Bit 3: State of position register channel 4	- - - -	UINT16 R/- - -	CANopen 300B:1_h Modbus 2818
_Power_act	Output power.	W - - -	INT32 R/- - -	CANopen 301C:D_h Modbus 7194
_Power_mean	Mean output power.	W - - -	UINT16 R/- - -	CANopen 301C:E_h Modbus 7196

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_pref_acc	Acceleration of reference value for acceleration feed-forward control. Sign according to the changed velocity value: Increased velocity: Positive sign Reduced velocity: Negative sign	usr_a - - -	INT32 R/- - -	CANopen 301F:9$_h$ Modbus 7954
_pref_v	Velocity of reference value for velocity feed-forward control.	usr_v - - -	INT32 R/- - -	CANopen 301F:7$_h$ Modbus 7950
_prgNoDEV CONF → INF - PRN	Firmware number of device. Example: PR0912.00 The value is provided as a decimal value: 91200	- - - -	UINT32 R/- - -	CANopen 3001:1$_h$ Modbus 258
_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	- - - -	UINT16 R/- - -	CANopen 3001:4$_h$ Modbus 264
_prgVerDEV CONF → INF - PRV	Firmware version of device. The version format is XX.YY.ZZ. Part XX.YY is contained in this parameter. Part ZZ is contained in parameter *_prgRevDEV*. Example: V01.23.45 The value is provided as a decimal value: 123	- - - -	UINT16 R/- - -	CANopen 3001:2$_h$ Modbus 260
_PS_I_max CONF → INF - PIMA	Maximum current of power stage. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- per. -	CANopen 3010:2$_h$ Modbus 4100
_PS_I_nom CONF → INF - PINO	Nominal current of power stage. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 R/- per. -	CANopen 3010:1$_h$ Modbus 4098
_PS_load MON LDFP	Load of power stage.	% - - -	INT16 R/- - -	CANopen 301C:17$_h$ Modbus 7214

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_maxoverload	Maximum value of overload of power stage. Maximum overload of power stage during the last 10 seconds.	% - - -	INT16 R/- - -	CANopen 301C:18$_h$ Modbus 7216
_PS_overload	Overload of power stage.	% - - -	INT16 R/- - -	CANopen 301C:24$_h$ Modbus 7240
_PS_overload_cte	Overload of power stage (chip temperature).	% - - -	INT16 R/- - -	CANopen 301C:22$_h$ Modbus 7236
_PS_overload_I2t	Overload of power stage (I2t).	% - - -	INT16 R/- - -	CANopen 301C:16$_h$ Modbus 7212
_PS_overload_psq	Overload of power stage (power squared).	% - - -	INT16 R/- - -	CANopen 301C:23$_h$ Modbus 7238
_PS_T_current Pon tPS	Temperature of power stage.	°C - - -	INT16 R/- - -	CANopen 301C:10$_h$ Modbus 7200
_PS_T_max	Maximum temperature of power stage.	°C - - -	INT16 R/- per. -	CANopen 3010:7$_h$ Modbus 4110
_PS_T_warn	Advisory temperature limit of power stage (error class 0).	°C - - -	INT16 R/- per. -	CANopen 3010:6$_h$ Modbus 4108
_PS_U_maxDC	Maximum permissible DC bus voltage. In increments of 0.1 V.	V - - -	UINT16 R/- per. -	CANopen 3010:3$_h$ Modbus 4102
_PS_U_minDC	Minimum permissible DC bus voltage. In increments of 0.1 V.	V - - -	UINT16 R/- per. -	CANopen 3010:4$_h$ Modbus 4104

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_PS_U_minStopDC	DC bus voltage low threshold for Quick Stop. If the threshold is reached, the drive performs a Quick Stop. In increments of 0.1 V.	V - - -	UINT16 R/- per. -	CANopen 3010:A_h Modbus 4116
_PT_max_val	Maximum possible value for operating mode Profile Torque. 100.0 % correspond to the continuous stall torque _M_M_0. In increments of 0.1 %.	% - - -	INT16 R/- - -	CANopen 301C:$1E_h$ Modbus 7228
_RAMP_p_act	Actual position of profile generator.	usr_p - - -	INT32 R/- - -	CANopen 301F:2_h Modbus 7940
_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.	usr_p - - -	INT32 R/- - -	CANopen 301F:1_h Modbus 7938
_RAMP_v_act	Actual velocity of profile generator.	usr_v - - -	INT32 R/- - -	CANopen 606B:0_h Modbus 7948
_RAMP_v_target	Target velocity of profile generator.	usr_v - - -	INT32 R/- - -	CANopen 301F:5_h Modbus 7946
_RES_load Map LdFb	Load of braking resistor. The braking resistor set via parameter RESint_ext is monitored.	% - - -	INT16 R/- - -	CANopen 301C:14_h Modbus 7208
_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.	% - - -	INT16 R/- - -	CANopen 301C:15_h Modbus 7210
_RES_overload	Overload of braking resistor (I2t). The braking resistor set via parameter RESint_ext is monitored.	% - - -	INT16 R/- - -	CANopen 301C:13_h Modbus 7206
_RESint_P	Nominal power of internal braking resistor.	W - - -	UINT16 R/- per. -	CANopen 3010:9_h Modbus 4114

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_R	Resistance value of internal braking resistor. In increments of 0.01 Ω.	Ω - - -	UINT16 R/- per. -	CANopen 3010:8_h Modbus 4112
_RMAC_DetailStatus	Detailed status of relative movement after capture (RMAC). **0 / Not Activated**: Not activated **1 / Waiting**: Waiting for capture signal **2 / Moving**: Relative movement after capture running **3 / Interrupted**: Relative movement after capture interrupted **4 / Finished**: Relative movement after capture terminated Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 3023:12_h Modbus 8996
_RMAC_Status	Status of relative movement after capture. **0 / Not Active**: Not active **1 / Active Or Finished**: Relative movement after capture is active or finished Available with firmware version ≥V01.10.	- 0 - 1	UINT16 R/- - -	CANopen 3023:11_h Modbus 8994
_ScalePOSmax	Maximum user-defined value for positions. This value depends on ScalePOSdenom and ScalePOSnum.	usr_p - - -	INT32 R/- - -	CANopen 301F:A_h Modbus 7956
_ScaleRAMPmax	Maximum user-defined value for acceleration and deceleration. This value depends on ScaleRAMPdenom and ScaleRAMPnum.	usr_a - - -	INT32 R/- - -	CANopen 301F:C_h Modbus 7960
_ScaleVELmax	Maximum user-defined value for velocity. This value depends on ScaleVELdenom and ScaleVELnum.	usr_v - - -	INT32 R/- - -	CANopen 301F:B_h Modbus 7958
_SigActive	Status of monitoring signals. See _SigLatched for more details on the bit codes.	- - - -	UINT32 R/- - -	CANopen 301C:7_h Modbus 7182

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_SigLatched	Saved status of monitoring signals.	-	UINT32	CANopen 301C:8$_h$
Mon	Signal state:	-	R/-	Modbus 7184
SigS	0: Not activated	-	-	
	1: Activated	-	-	
	Bit assignments:			
	Bit 0: General error			
	Bit 1: Hardware limit switches (LIMP/LIMN/REF)			
	Bit 2: Out of range (software limit switches, tuning)			
	Bit 3: Quick Stop via fieldbus			
	Bit 4: Error in active operating mode			
	Bit 5: Commissioning interface (RS485)			
	Bit 6: Integrated fieldbus			
	Bit 7: Reserved			
	Bit 8: Following error			
	Bit 9: Reserved			
	Bit 10: Inputs STO are 0			
	Bit 11: Inputs STO different			
	Bit 12: Reserved			
	Bit 13: DC bus voltage low			
	Bit 14: DC bus voltage high			
	Bit 15: Mains phase missing			
	Bit 16: Integrated encoder interface			
	Bit 17: Overtemperature motor			
	Bit 18: Overtemperature power stage			
	Bit 19: Reserved			
	Bit 20: Memory card			
	Bit 21: Fieldbus module			
	Bit 22: Encoder module			
	Bit 23: Safety module eSM 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: Nonvolatile memory error detected			
	Bit 30: System start-up (hardware or parameter)			
	Bit 31: System error detected (for example, watchdog, internal hardware interface)			
	Monitoring functions are product-dependent.			
_SuppDriveModes	Supported operating modes as per DSP402.	-	UINT32	CANopen 6502:0$_h$
	Bit 0: Profile Position	-	R/-	Modbus 6952

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
	Bit 2: Profile Velocity Bit 3: Profile Torque Bit 5: Homing Bit 6: Interpolated Position Bit 7: Cyclic Synchronous Position Bit 8: Cyclic Synchronous Velocity Bit 9: Cyclic Synchronous Torque Bit 16: Jog Bit 21: Manual Tuning	- - 	- - 	
_TouchProbeStat 	Touch Probe status (DS402). Available with firmware version ≥V01.16.	- - - -	UINT16 R/- - -	CANopen 60B9:0_h Modbus 7030
_tq_act 	Actual torque. Positive value: Actual torque in positive direction of movement Negative value: Actual torque in negative direction of movement 100.0 % correspond to the continuous stall torque _M_M_0. In increments of 0.1 %.	% - - -	INT16 R/- - -	CANopen 6077:0_h Modbus 7752
_Ud_ref 	Reference motor voltage d component. In increments of 0.1 V.	V - - -	INT16 R/- - -	CANopen 301E:5_h Modbus 7690
_UDC_act Mon udcA	Voltage at DC bus. In increments of 0.1 V.	V - - -	UINT16 R/- - -	CANopen 301C:F_h Modbus 7198
_Udq_ref 	Total motor voltage (vector sum d components and q components). Square root of (_Uq_ref² + _Ud_ref²) In increments of 0.1 V.	V - - -	INT16 R/- - -	CANopen 301E:6_h Modbus 7692
_Uq_ref 	Reference motor voltage q component. In increments of 0.1 V.	V - - -	INT16 R/- - -	CANopen 301E:4_h Modbus 7688
_v_act Mon VAct	Actual velocity.	usr_v - - -	INT32 R/- - -	CANopen 606C:0_h Modbus 7744

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_v_act_ENC1	Actual velocity of encoder 1. Available with firmware version ≥V01.03.	usr_v - - -	INT32 R/- - -	CANopen 301E:29_h Modbus 7762
_v_dif_usr	Load-dependent velocity deviation. The load-dependent velocity deviation is the difference between reference velocity and actual velocity. Available with firmware version ≥V01.26.	usr_v -2147483648 - 2147483647	INT32 R/- - -	CANopen 301E:$2C_h$ Modbus 7768
_v_ref *Mon* *vREF*	Reference velocity.	usr_v - - -	INT32 R/- - -	CANopen 301E:$1F_h$ Modbus 7742
_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	usr_v - - -	UINT32 R/- - -	CANopen 301C:29_h Modbus 7250
_VoltUtil *Mon* *udcr*	Degree of utilization of DC bus voltage. With a value of 100%, the drive operates at the voltage limit.	% - - -	INT16 R/- - -	CANopen 301E:13_h Modbus 7718
_WarnActive	Active errors of error class 0, bit-coded. See parameter *_WarnLatched* for more details on the bits.	- - - -	UINT32 R/- - -	CANopen 301C:B_h Modbus 7190

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
_WarnLatched Non WrnS	Saved errors of error class 0, bit-coded. The bits are set to 0 in the case of a Fault Reset. Bits 10 and 13 are set to 0 automatically. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General Bit 1: Reserved Bit 2: Out of range (software limit switches, tuning) Bit 3: Reserved Bit 4: Active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following error Bit 9: Reserved Bit 10: Inputs STO_A and/or STO_B Bits 11 ... 12: Reserved Bit 13: Low voltage DC bus or mains phase missing Bits 14 ... 15: Reserved Bit 16: Integrated encoder interface Bit 17: Temperature of motor high Bit 18: Temperature of power stage high Bit 19: Reserved Bit 20: Memory card Bit 21: Fieldbus module Bit 22: Encoder module Bit 23: Safety module eSM or module IOM1 Bits 24 … 27: Reserved Bit 28: Transistor for braking resistor overload (I^2t) Bit 29: Braking resistor overload (I^2t) Bit 30: Power stage overload (I^2t) Bit 31: Motor overload (I^2t) Monitoring functions are product-dependent.	- - - - 	UINT32 R/- - -	CANopen 301C:C_h Modbus 7192
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	- 0 1 1	UINT16 R/W per. -	CANopen 3006:16_h Modbus 1580

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
	overtraveling of the movement range (ref_ok is set to 0 when the range is overtraveled). Modified settings become active immediately.			
AccessLock	Locking other access channels. Value 0: Allow control via other access channels Value 1: Lock control via other access channels Example: The access channel is used by the fieldbus. In this case, control via the commissioning software, for example, is not possible. The access channel can only be locked after the currently active operating mode has terminated. Modified settings become active immediately.	- 0 0 1	UINT16 R/W - -	CANopen 3001:E_h Modbus 284
AT_dir oP → tun- SEtM	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 Modified settings become active the next time the motor moves.	- 1 1 6	UINT16 R/W - -	CANopen 302F:4_h Modbus 12040
AT_dis	Movement range for Autotuning. Movement range within which the control parameters are automatically optimized. The movement range is entered with reference to the actual position. In the case of "Movement in one direction only" (Parameter AT_dir), the specified movement range is used for each optimization step. The movement typically corresponds to 20 times the value, but it is not limited. The parameter AT_dis_usr allows you to enter the value in user-defined units. In increments of 0.1 revolution. Modified settings become active the next time the motor moves.	revolution 1.0 2.0 999.9	UINT32 R/W - -	CANopen 302F:3_h Modbus 12038

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_dis_usr	Movement range for Autotuning. Movement range within which the control parameters are automatically optimized. The movement range is entered with reference to the actual position. In the case of "Movement in one direction only" (Parameter AT_dir), the specified range is used for each optimization step. The movement typically corresponds to 20 times the value, but it is not limited. The minimum value, the factory setting and the maximum value depend on the scaling factor. Modified settings become active the next time the motor moves. Available with firmware version ≥V01.05.	usr_p 1 32768 2147483647	INT32 R/W - -	CANopen 302F:12$_h$ Modbus 12068
AT_mechanical	Type of coupling of the system. **1 / Direct Coupling**: Direct coupling **2 / Belt Axis**: Belt axis **3 / Spindle Axis**: Spindle axis Modified settings become active the next time the motor moves.	- 1 2 3	UINT16 R/W - -	CANopen 302F:E$_h$ Modbus 12060
AT_n_ref	Velocity jump for Autotuning. The parameter AT_v_ref allows you to enter the value in user-defined units. Modified settings become active the next time the motor moves.	RPM 10 100 1000	UINT32 R/W - -	CANopen 302F:6$_h$ Modbus 12044
AT_start	Autotuning start. Value 0: Terminate Value 1: Activate EasyTuning Value 2: Activate ComfortTuning Modified settings become active immediately.	- 0 - 2	UINT16 R/W - -	CANopen 302F:1$_h$ Modbus 12034
AT_v_ref	Velocity jump for Autotuning. The minimum value, the factory setting and the maximum value depend on the scaling factor. Modified settings become active the next time the motor moves. Available with firmware version ≥V01.05.	usr_v 1 100 2147483647	INT32 R/W - -	CANopen 302F:13$_h$ Modbus 12070
AT_wait	Waiting time between Autotuning steps. Modified settings become active the next time the motor moves.	ms 300 500 10000	UINT16 R/W - -	CANopen 302F:9$_h$ Modbus 12050

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
BLSH_Mode	Processing mode of backlash compensation. **0 / Off**: Backlash compensation is off **1 / OnAfterPositiveMovement**: Backlash compensation is on, last movement was in positive direction **2 / OnAfterNegativeMovement**: Backlash compensation is on, last movement was in negative direction Modified settings become active immediately. Available with firmware version ≥V01.14.	- 0 0 2	UINT16 R/W per. -	CANopen 3006:41$_h$ Modbus 1666
BLSH_Position	Position value for backlash compensation. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.14.	usr_p 0 0 2147483647	INT32 R/W per. -	CANopen 3006:42$_h$ Modbus 1668
BLSH_Time	Processing time for backlash compensation. Value 0: Immediate backlash compensation Value >0: Processing time for backlash compensation Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.14.	ms 0 0 16383	UINT16 R/W per. -	CANopen 3006:44$_h$ Modbus 1672
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. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	ms 0 0 1000	INT16 R/W per. -	CANopen 3005:8$_h$ Modbus 1296
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. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	ms 0 0 400	INT16 R/W per. -	CANopen 3005:7$_h$ Modbus 1294

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
BRK_release	Manual operation of the holding brake. **0 / Automatic**: Automatic processing **1 / Manual Release**: Manual release of holding brake **2 / Manual Application**: Manual applying of holding brake You can apply or release the holding brake manually. The holding brake can only be manually released in the operating states 'Switch On Disabled', 'Ready To Switch On' or 'Fault'. If you have applied the holding brake manually and then want to release it manually, you must first set this parameter to Automatic and then to Manual Release. Modified settings become active immediately. Available with firmware version ≥V01.12.	- 0 0 2	UINT16 R/W - -	CANopen 3008:A_h Modbus 2068
CANaddress CONF → COM - CAAd	CANopen address (node number). Modified settings become active the next time the product is powered on.	- 1 - 127	UINT16 R/W per. -	-
CANbaud CONF → COM - Cobd	CANopen baud rate. **50 kBaud** / 50: 50 kBaud **125 kBaud** / 125: 125 kBaud **250 kBaud** / 250: 250 kBaud **500 kBaud** / 500: 500 kBaud **1 MBaud** / 1000: 1 MBaud Modified settings become active the next time the product is powered on.	- 50 250 1000	UINT16 R/W per. -	-
CANpdo1Event	PDO 1 event mask. Changes of values in the object trigger an event: Bit 0: First PDO object Bit 1: Second PDO object Bit 2: Third PDO object Bit 3: Fourth PDO object Modified settings become active immediately.	- 0 1 15	UINT16 R/W - -	CANopen 3041:B_h Modbus 16662
CANpdo2Event	PDO 2 event mask. Changes of values in the object trigger an event: Bit 0: First PDO object Bit 1: Second PDO object Bit 2: Third PDO object Bit 3: Fourth PDO object Modified settings become active immediately.	- 0 1 15	UINT16 R/W - -	CANopen 3041:C_h Modbus 16664

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
CANpdo3Event	PDO 3 event mask. Changes of values in the object trigger an event: Bit 0: First PDO object Bit 1: Second PDO object Bit 2: Third PDO object Bit 3: Fourth PDO object Modified settings become active immediately.	- 0 1 15	UINT16 R/W - -	CANopen 3041:D_h Modbus 16666
CANpdo4Event	PDO 4 event mask. Changes of values in the object trigger an event: Bit 0: First PDO object Bit 1: Second PDO object Bit 2: Third PDO object Bit 3: Fourth PDO object Modified settings become active immediately.	- 0 15 15	UINT16 R/W - -	CANopen 3041:E_h Modbus 16668
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. Modified settings become active immediately.	- 0 - 4	UINT16 R/W - -	CANopen 300A:4_h Modbus 2568
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 Modified settings become active immediately.	- 0 0 2	UINT16 R/W - -	CANopen 300A:2_h Modbus 2564

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
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. Available with hardware version ≥RS03. Modified settings become active immediately.	- 0 - 4	UINT16 R/W - -	CANopen 300A:5_h Modbus 2570
Cap2Config	Capture input 2 configuration. **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge Available with hardware version ≥RS03. Modified settings become active immediately.	- 0 0 1	UINT16 R/W - -	CANopen 300A:3_h Modbus 2566
CLSET_p_DiffWin	Position deviation for control loop parameter set switching. If the position deviation of the position controller is less than the value of this parameter, control loop parameter set 2 is used. Otherwise, control loop parameter set 1 is used. The parameter CLSET_p_DiffWin_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution. Modified settings become active immediately.	revolution 0.0000 0.0100 2.0000	UINT16 R/W per. -	CANopen 3011:$1C_h$ Modbus 4408
CLSET_p_DiffWin_usr	Position deviation for control loop parameter set switching. If the position deviation of the position controller is less than the value of this parameter, control loop parameter set 2 is used. Otherwise, control loop parameter set 1 is used. The minimum value, the factory setting and the maximum value depend on the scaling factor. Modified settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 164 2147483647	INT32 R/W per. -	CANopen 3011:25_h Modbus 4426

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 Modified settings become active immediately.	- 0 0 4	UINT16 R/W per. -	CANopen 3011:1A$_h$ Modbus 4404
CLSET_v_Threshol	Velocity threshold for control loop parameter set switching. If the reference velocity or the actual velocity are less than the value of this parameter, control loop parameter set 2 is used. Otherwise, control loop parameter set 1 is used. Modified settings become active immediately.	usr_v 0 50 2147483647	UINT32 R/W per. -	CANopen 3011:1D$_h$ Modbus 4410
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. Modified settings become active immediately.	ms 0 0 1000	UINT16 R/W per. -	CANopen 3011:1B$_h$ Modbus 4406

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CommutCntCred	Value for increased threshold for commutation monitoring. This parameter contains the value which is added to the threshold value for commutation monitoring. Setting can only be modified if power stage is disabled. Modified settings become active immediately. Available with firmware version ≥V01.32.	- 0 0 1000	INT16 R/W per. expert	CANopen 3005:3E$_h$ Modbus 1404
CommutCntMax	Maximum value the commutation monitoring counter has reached. This parameter contains the maximum value the commutation monitoring counter has reached since power on or reset. The maximum value can be reset by writing the value 0. Available with firmware version ≥V01.32.	- - - -	INT16 R/W - expert	CANopen 303F:63$_h$ Modbus 16326
CTRL_GlobGain oP → tun- GAin	Global gain factor (affects control loop parameter set 1). The global gain factor affects the following parameters of control loop parameter set 1: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref The global gain factor is set to 100% - if the control loop parameters are set to default - at the end of the Autotuning process - if control loop parameter set 2 is copied to set 1 via the parameter CTRL_ParSetCopy If a full configuration is transmitted via the fieldbus, the value for CTRL_GlobGain must be transmitted prior to the values of the control loop parameters CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref. If CTRL_GlobGain is changed during a configuration transmission, CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref must also be part of the configuration. In increments of 0.1 %. Modified settings become active immediately.	% 5.0 100.0 1000.0	UINT16 R/W per. -	CANopen 3011:15$_h$ Modbus 4394

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 current limit is one of the following values (whichever is lowest): - *CTRL_I_max* - *_M_I_max* - *_PS_I_max* - 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 In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} 0.00 - 463.00	UINT16 R/W per. -	CANopen 3011:C_h Modbus 4376
CTRL_I_max_fw	Maximum current for field weakening (d component). This value is only limited by the minimum/ maximum parameter range (no limitation of this value by motor/power stage). The actually effective field weakening current is the minimum of CTRL_I_max_fw and one half of the lower value of the nominal current of the power stage and the motor. In increments of 0.01 A_{rms}. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	A_{rms} 0.00 0.00 300.00	UINT16 R/W per. expert	CANopen 3011:F_h Modbus 4382
CTRL_KFAcc	Acceleration feed-forward control. In increments of 0.1 %. Modified settings become active immediately.	% 0.0 0.0 3000.0	UINT16 R/W per. expert	CANopen 3011:A_h Modbus 4372
CTRL_ParChgTime	Period of time for control loop parameter set switching. In the case of control loop parameter set switching, the values of the following parameters are changed linearly: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp Modified settings become active immediately.	ms 0 0 2000	UINT16 R/W per. -	CANopen 3011:14_h Modbus 4392

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
CTRL_ParSetCopy	Control loop parameter set copying. Value 1: Copy control loop parameter set 1 to set 2 Value 2: Copy control loop parameter set 2 to set 1 If control loop parameter set 2 is copied to control loop parameter set 1, the parameter CTRL_ GlobGain is set to 100%. Modified settings become active immediately.	- 0.0 - 0.2	UINT16 R/W - -	CANopen 3011:16$_h$ Modbus 4396
CTRL_PwrUpParSet	Selection of control loop parameter set at power up. **0 / Switching Condition**: The switching condition is used for control loop parameter set switching **1 / Parameter Set 1**: Control loop parameter set 1 is used **2 / Parameter Set 2**: Control loop parameter set 2 is used The selected value is also written to CTRL_ SelParSet (non-persistent). Modified settings become active immediately.	- 0 1 2	UINT16 R/W per. -	CANopen 3011:18$_h$ Modbus 4400
CTRL_SelParSet	Selection of control loop parameter set. Coding see parameter: CTRL_PwrUpParSet Modified settings become active immediately.	- 0 1 2	UINT16 R/W - -	CANopen 3011:19$_h$ Modbus 4402
CTRL_SmoothCurr	Smoothing factor for current controller. This parameter decreases the dynamics of the current control loop. Modified settings become active immediately. Available with firmware version ≥V01.26.	% 50 100 100	UINT16 R/W per. -	CANopen 3011:26$_h$ Modbus 4428
CTRL_SpdFric	Speed of rotation up to which the friction compensation is linear. Modified settings become active immediately.	RPM 0 5 20	UINT32 R/W per. expert	CANopen 3011:9$_h$ Modbus 4370
CTRL_TAUnact	Filter time constant to smooth velocity of motor. The default value is calculated on the basis of the motor data. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 - 30.00	UINT16 R/W per. expert	CANopen 3011:8$_h$ Modbus 4368
CTRL_v_max CONF → DRC - nMAX	Velocity limitation. During operation, the velocity limit is one of the following values (whichever is lowest): - CTRL_v_max - M_n_max - Velocity limitation via digital input Modified settings become active immediately.	usr_v 1 13200 2147483647	UINT32 R/W per. -	CANopen 3011:10$_h$ Modbus 4384

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_VelObsActiv	Activation of velocity observer. **0 / Velocity Observer Off**: Velocity observer is off **1 / Velocity Observer Passive**: Velocity observer is on, but not used for motor control **2 / Velocity Observer Active**: Velocity observer is on and used for motor control Velocity observer control reduces velocity ripple and enhances controller bandwidth. Set the correct dynamics and inertia values before activation. Setting can only be modified if power stage is disabled. Modified settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 2	UINT16 R/W per. expert	CANopen 3011:22$_h$ Modbus 4420
CTRL_VelObsDyn	Dynamics of velocity observer. The value of this parameter must be less than (for example, between 5 % and 20 %) the integral action time of the velocity controller (parameter CTRL1_TNn und CTRL2_TNn). In increments of 0.01 ms. Setting can only be modified if power stage is disabled. Modified settings become active immediately. Available with firmware version ≥V01.03.	ms 0.03 0.25 200.00	UINT16 R/W per. expert	CANopen 3011:23$_h$ Modbus 4422
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. Setting can only be modified if power stage is disabled. Modified settings become active immediately. Available with firmware version ≥V01.03.	g cm^2 1 - 2147483648	UINT32 R/W per. expert	CANopen 3011:24$_h$ Modbus 4424
CTRL_vPIDDPart	PID velocity controller: D gain. In increments of 0.1 %. Modified settings become active immediately.	% 0.0 0.0 400.0	UINT16 R/W per. expert	CANopen 3011:6$_h$ Modbus 4364
CTRL_vPIDDTime	PID velocity controller: Time constant of D term smoothing filter. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.01 0.25 10.00	UINT16 R/W per. expert	CANopen 3011:5$_h$ Modbus 4362

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_KFPp CONF → DRC - FPP I	Velocity feed-forward control. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 %. Modified settings become active immediately.	% 0.0 0.0 200.0	UINT16 R/W per. -	CANopen 3012:6_h Modbus 4620
CTRL1_Kfric	Friction compensation: Gain. In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} 0.00 0.00 10.00	UINT16 R/W per. expert	CANopen 3012:10_h Modbus 4640
CTRL1_KPn CONF → DRC - Pn I	Velocity controller P gain. The default value is calculated on the basis of the motor parameters. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.0001 A/RPM. Modified settings become active immediately.	A/RPM 0.0001 - 2.5400	UINT16 R/W per. -	CANopen 3012:1_h Modbus 4610
CTRL1_KPp CONF → DRC - PP I	Position controller P gain. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 1/s. Modified settings become active immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	CANopen 3012:3_h Modbus 4614
CTRL1_Nf1bandw	Notch filter 1: Bandwidth. Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Modified settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	CANopen 3012:A_h Modbus 4628
CTRL1_Nf1damp	Notch filter 1: Damping. In increments of 0.1 %. Modified settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	CANopen 3012:8_h Modbus 4624
CTRL1_Nf1freq	Notch filter 1: Frequency. The filter is deactivated at a value of 15000. In increments of 0.1 Hz. Modified settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	CANopen 3012:9_h Modbus 4626
CTRL1_Nf2bandw	Notch filter 2: Bandwidth. Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Modified settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	CANopen 3012:D_h Modbus 4634

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_Nf2damp	Notch filter 2: Damping. In increments of 0.1 %. Modified settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	CANopen 3012:B_h Modbus 4630
CTRL1_Nf2freq	Notch filter 2: Frequency. The filter is deactivated at a value of 15000. In increments of 0.1 Hz. Modified settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	CANopen 3012:C_h Modbus 4632
CTRL1_Osupdamp	Overshoot suppression filter: Damping. The filter is deactivated at a value of 0. In increments of 0.1 %. Modified settings become active immediately.	% 0.0 0.0 50.0	UINT16 R/W per. expert	CANopen 3012:E_h Modbus 4636
CTRL1_Osupdelay	Overshoot suppression filter: Time delay. The filter is deactivated at a value of 0. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 0.00 75.00	UINT16 R/W per. expert	CANopen 3012:F_h Modbus 4638
CTRL1_TAUiref	Filter time constant of the reference current value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	CANopen 3012:5_h Modbus 4618
CTRL1_TAUnref CONF → DRC - TAU I	Filter time constant of the reference velocity value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	CANopen 3012:4_h Modbus 4616
CTRL1_TNn CONF → DRC - TIN I	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	CANopen 3012:2_h Modbus 4612
CTRL2_KFPp CONF → DRC - FPP2	Velocity feed-forward control. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 %. Modified settings become active immediately.	% 0.0 0.0 200.0	UINT16 R/W per. -	CANopen 3013:6_h Modbus 4876

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_Kfric	Friction compensation: Gain. In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} 0.00 0.00 10.00	UINT16 R/W per. expert	CANopen 3013:10_h Modbus 4896
CTRL2_KPn *ConF → drC - Pn2*	Velocity controller P gain. The default value is calculated on the basis of the motor parameters. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.0001 A/RPM. Modified settings become active immediately.	A/RPM 0.0001 - 2.5400	UINT16 R/W per. -	CANopen 3013:1_h Modbus 4866
CTRL2_KPp *ConF → drC - PP2*	Position controller P gain. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 1/s. Modified settings become active immediately.	1/s 2.0 - 900.0	UINT16 R/W per. -	CANopen 3013:3_h Modbus 4870
CTRL2_Nf1bandw	Notch filter 1: Bandwidth. Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Modified settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	CANopen 3013:A_h Modbus 4884
CTRL2_Nf1damp	Notch filter 1: Damping. In increments of 0.1 %. Modified settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	CANopen 3013:8_h Modbus 4880
CTRL2_Nf1freq	Notch filter 1: Frequency. The filter is deactivated at a value of 15000. In increments of 0.1 Hz. Modified settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	CANopen 3013:9_h Modbus 4882
CTRL2_Nf2bandw	Notch filter 2: Bandwidth. Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Modified settings become active immediately.	% 1.0 70.0 90.0	UINT16 R/W per. expert	CANopen 3013:D_h Modbus 4890
CTRL2_Nf2damp	Notch filter 2: Damping. In increments of 0.1 %. Modified settings become active immediately.	% 55.0 90.0 99.0	UINT16 R/W per. expert	CANopen 3013:B_h Modbus 4886

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_Nf2freq	Notch filter 2: Frequency. The filter is deactivated at a value of 15000. In increments of 0.1 Hz. Modified settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 R/W per. expert	CANopen 3013:C_h Modbus 4888
CTRL2_Osupdamp	Overshoot suppression filter: Damping. The filter is deactivated at a value of 0. In increments of 0.1 %. Modified settings become active immediately.	% 0.0 0.0 50.0	UINT16 R/W per. expert	CANopen 3013:E_h Modbus 4892
CTRL2_Osupdelay	Overshoot suppression filter: Time delay. The filter is deactivated at a value of 0. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 0.00 75.00	UINT16 R/W per. expert	CANopen 3013:F_h Modbus 4894
CTRL2_TAUiref	Filter time constant of the reference current value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 0.50 4.00	UINT16 R/W per. -	CANopen 3013:5_h Modbus 4874
CTRL2_TAUnref CONF → DRC - tAU2	Filter time constant of the reference velocity value filter. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 9.00 327.67	UINT16 R/W per. -	CANopen 3013:4_h Modbus 4872
CTRL2_TNn CONF → DRC - tin2	Velocity controller integral action time. The default value is calculated. In the case of switching between the two control loop parameter sets, the values are changed linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Modified settings become active immediately.	ms 0.00 - 327.67	UINT16 R/W per. -	CANopen 3013:2_h Modbus 4868
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 Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on. Available with firmware version ≥V01.05.	- 0 0 1	UINT16 R/W per. -	CANopen 3005:26_h Modbus 1356

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
DCOMcontrol	DriveCom control word. See Operation, Operating States, for bit assignment information. Bit 0: Operating state Switch On Bit 1: Enable Voltage Bit 2: Operating state Quick Stop Bit 3: Enable Operation Bits 4 … 6: Operating mode-specific Bit 7: Fault Reset Bit 8: Halt Bit 9: Operating mode-specific Bits 10 … 15: Reserved (must be 0) Modified settings become active immediately.	- - - -	UINT16 R/W - -	CANopen 6040:0_h Modbus 6914
DCOMopmode	Operating mode. **-6 / Manual Tuning / Autotuning**: Manual Tuning or Autotuning **-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 Modified settings become active immediately. * Datatype for CANopen: INT8	- -6 - 7	INT16* R/W - -	CANopen 6060:0_h Modbus 6918
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 Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 6 6	UINT16 R/W per. -	CANopen 3008:20_h Modbus 2112

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
DI_1_Debounce	Debounce time of DI1. **0 / No**: 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 Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 6 6	UINT16 R/W per. -	CANopen 3008:21$_h$ Modbus 2114
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 Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 6 6	UINT16 R/W per. -	CANopen 3008:22$_h$ Modbus 2116
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 Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 6 6	UINT16 R/W per. -	CANopen 3008:23$_h$ Modbus 2118
DPL_Activate	Activation of Drive Profile Lexium. Value 0: Deactivate Drive Profile Lexium Value 1: Activate Drive Profile Lexium The access channel via which the drive profile has been activated is the only access channel that can use the drive profile. Modified settings become active immediately.	- 0 0 1	UINT16 R/W - -	CANopen 301B:8$_h$ Modbus 6928

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
DPL_dmControl	Drive Profile Lexium dmControl.	- - - -	UINT16 R/W - -	CANopen 301B:1F$_h$ Modbus 6974
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 Modified settings become active immediately. Available with firmware version ≥V01.08.	- 0 11 11	UINT16 R/W per. -	CANopen 301B:35$_h$ Modbus 7018
DPL_RefA16	Drive Profile Lexium RefA16.	- - - -	INT16 R/W - -	CANopen 301B:22$_h$ Modbus 6980
DPL_RefB32	Drive Profile Lexium RefB32.	- - - -	INT32 R/W - -	CANopen 301B:21$_h$ Modbus 6978

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
DS402compatib	DS402 state machine: State transition from 3 to 4. **0 / Automatic**: Automatic (state transition is performed automatically) **1 / DS402-compliant**: DS402-compliant (state transition must be controlled via the fieldbus) Determines the state transition between the states SwitchOnDisabled (3) and ReadyToSwitchOn (4). Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 0 1	UINT16 R/W per. -	CANopen 301B:13_h Modbus 6950
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 Modified settings become active immediately.	- 0 0 11	UINT16 R/W per. -	CANopen 301B:$1E_h$ Modbus 6972
DSM_ ShutDownOption ConF → ACG - SdtY	Behavior for disabling the power stage during movement. **0 / Disable Immediately** / diS: Disable power stage immediately **1 / Disable After Halt** / diSh: Disable power stage after deceleration to standstill This parameter specifies the response to a power stage disable request. Halt is used for deceleration to standstill. Modified settings become active immediately. Available with firmware version ≥V01.26.	- 0 0 1	INT16 R/W per. -	CANopen 605B:0_h Modbus 1684

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ENC1_adjustment	Adjustment of absolute position of encoder 1. The value range depends on the encoder type. Singleturn encoder: 0 ... x-1 Multiturn encoder: 0 ... (4096*x)-1 Singleturn encoder (shifted with parameter *ShiftEncWorkRang*): -(x/2) ... (x/2)-1 Multiturn encoder (shifted with parameter *ShiftEncWorkRang*): -(2048*x) ... (2048*x)-1 Definition of 'x': Maximum position for one encoder turn in user-defined units. This value is 16384 with the default scaling. If processing is to be performed with inversion of the direction of movement, this must be set before the encoder position is adjusted. After the write access, a wait time of at least 1 second is required before the drive can be powered off. Modified settings become active the next time the product is powered on.	usr_p - - -	INT32 R/W - -	CANopen 3005:16$_h$ Modbus 1324
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. Modified settings become active immediately.	- 0 - 1	UINT16 R/W - -	CANopen 303B:4$_h$ Modbus 15112
ERR_reset	Reset error memory read pointer. Value 1: Set error memory read pointer to oldest error entry. Modified settings become active immediately.	- 0 - 1	UINT16 R/W - -	CANopen 303B:5$_h$ Modbus 15114
ErrorResp_bit_DE	Error response to detected data error (DE bit). **-1 / No Error Response**: No error response **0 / Error Class 0**: Error class 0 **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 For the Drive Profile Lexium, the error response to a detected data error (DE bit) can be parameterized. For EtherCAT RxPDO data error handling, this parameter is also used to classify the error response.	- -1 -1 3	INT16 R/W per. -	CANopen 301B:6$_h$ Modbus 6924

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ErrorResp_bit_ME	Error response to detected mode error (ME bit). **-1 / No Error Response**: No error response **0 / Error Class 0**: Error class 0 **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 For the Drive Profile Lexium, the error response to a detected mode error (ME bit) can be parameterized.	- -1 -1 3	INT16 R/W per. -	CANopen 301B:7_h Modbus 6926
ErrorResp_Flt_AC	Error response to missing mains phase. **0 / Error Class 0**: Error class 0 **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 2 3	UINT16 R/W per. -	CANopen 3005:A_h Modbus 1300
ErrorResp_I2tRES	Error response to 100% I2t braking resistor. **0 / Error Class 0**: Error class 0 **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 0 2	UINT16 R/W per. -	CANopen 3005:22_h Modbus 1348
ErrorResp_p_dif	Error response to excessively high load-dependent position deviation. **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 1 3 3	UINT16 R/W per. -	CANopen 3005:B_h Modbus 1302
ErrorResp_QuasiAbs	Error response to detected error with quasi absolute position. **3 / Error Class 3**: Error class 3 **4 / Error Class 4**: Error class 4 Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.26.	- 3 3 4	UINT16 R/W per. -	CANopen 3005:$3A_h$ Modbus 1396

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
ErrorResp_v_dif	Error response to excessively high load-dependent velocity deviation. **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.26.	- 1 3 3	UINT16 R/W per. -	CANopen 3005:3C$_h$ Modbus 1400
ErrResp_HeartB_ LifeG	CANopen error response to detected Heartbeat or Life Guarding error. **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.32.	- 1 2 3	UINT16 R/W per. -	CANopen 3041:11$_h$ Modbus 16674
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. Modified settings become active the next time the motor moves.	usr_p 1 200 2147483647	INT32 R/W per. -	CANopen 3028:7$_h$ Modbus 10254
HMIDispPara nonE 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 Modified settings become active immediately.	- 0 0 2	UINT16 R/W per. -	CANopen 303A:2$_h$ Modbus 14852
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 Modified settings become active immediately.	- 0 0 1	UINT16 R/W per. -	CANopen 303A:1$_h$ Modbus 14850

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
HMmethod	Homing method. 1: LIMN with index pulse 2: LIMP with index pulse 7: REF+ with index pulse, inv., outside 8: REF+ with index pulse, inv., inside 9: REF+ with index pulse, not inv., inside 10: REF+ with index pulse, not inv., outside 11: REF- with index pulse, inv., outside 12: REF- with index pulse, inv., inside 13: REF- with index pulse, not inv., inside 14: REF- with index pulse, not inv., outside 17: LIMN 18: LIMP 23: REF+, inv., outside 24: REF+, inv., inside 25: REF+, not inv., inside 26: REF+, not inv., outside 27: REF-, inv., outside 28: REF-, inv., inside 29: REF-, not inv., inside 30: REF-, not inv., outside 33: Index pulse negative direction 34: Index pulse positive direction 35: Position setting Abbreviations: REF+: Search movement in positive direction REF-: Search movement in negative 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 Modified settings become active immediately. * Datatype for CANopen: INT8	- 1 18 35	INT16* R/W - -	CANopen 6098:0_h Modbus 6936
HMoutdis	Maximum distance for search for switching point. 0: Monitoring of distance inactive >0: Maximum distance After detection of the switch, the drive starts to search for the defined switching point. If the defined switching point is not found within the distance defined here, the reference movement is canceled and an error is detected. Modified settings become active the next time the motor moves.	usr_p 0 0 2147483647	INT32 R/W per. -	CANopen 3028:6_h Modbus 10252

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
HMp_home	Position at reference point. After a successful reference movement, this position is automatically set at the reference point. Modified settings become active the next time the motor moves.	usr_p -2147483648 0 2147483647	INT32 R/W per. -	CANopen 3028:B_h Modbus 10262
HMp_setP	Position for Position Setting. Position for operating mode Homing, method 35. Modified settings become active immediately.	usr_p - 0 -	INT32 R/W - -	CANopen 301B:16_h Modbus 6956
HMprefmethod oP → hoM - MEth	Preferred homing method. Modified settings become active immediately.	- 1 18 35	INT16 R/W per. -	CANopen 3028:A_h Modbus 10260
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. Modified settings become active the next time the motor moves.	usr_p 0 0 2147483647	INT32 R/W per. -	CANopen 3028:D_h Modbus 10266
HMv oP → hoM - hMn	Target velocity for searching the switch. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Modified settings become active the next time the motor moves.	usr_v 1 60 2147483647	UINT32 R/W per. -	CANopen 6099:1_h Modbus 10248
HMv_out	Target velocity for moving away from switch. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Modified settings become active the next time the motor moves.	usr_v 1 6 2147483647	UINT32 R/W per. -	CANopen 6099:2_h Modbus 10250
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. Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.	- 0 0 1	UINT16 R/W per. -	CANopen 3006:C_h Modbus 1560

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_AutoEnable CONF → ACG - IOAE	Enabling the power stage at PowerOn. **0 / RisingEdge /** rISE: A rising edge with the signal input function "Enable" enables the power stage **1 / HighLevel /** LEVL: An active signal input with signal input function "Enable" enables the power stage **2 / AutoOn /** Auto: The power stage is automatically enabled Modified settings become active the next time the power stage is enabled.	- 0 0 2	UINT16 R/W per. -	CANopen 3005:6$_h$ Modbus 1292
IO_AutoEnaConfig CONF → ACG - IOEN	Enabling the power stage as set via IO_ AutoEnable even after error. **0 / Off /** _OFF: Setting in parameter IO_ AutoEnable is only used after start-up **1 / On /** on: Setting in parameter IO_AutoEnable is used after start-up and after detected error Modified settings become active the next time the power stage is enabled.	- 0 0 1	UINT16 R/W per. -	CANopen 3005:4$_h$ Modbus 1288
IO_DQ_set	Setting the digital outputs directly. Digital outputs can only be set directly if the signal output function has been set to 'Freely Available'. Bit assignments: Bit 0: DQ0 Bit 1: DQ1	- - - -	UINT16 R/W - -	CANopen 3008:11$_h$ Modbus 2082
IO_ FaultResOnEnaInp CONF → ACG - IEFr	Additional 'Fault Reset' for the signal input function 'Enable'. **0 / Off /** oFF: No additional 'Fault Reset' **1 / OnFallingEdge /** FALL: Additional 'Fault Reset' with falling edge **2 / OnRisingEdge /** rISE: Additional 'Fault Reset' with rising edge Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.12.	- 0 0 2	UINT16 R/W per. -	CANopen 3005:34$_h$ Modbus 1384
IO_I_limit CONF → I-O - ILIM	Current limitation via input. A current limit can be activated via a digital input. In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} 0.00 0.20 300.00	UINT16 R/W per. -	CANopen 3006:27$_h$ Modbus 1614
IO_v_limit	Velocity limitation via input. A velocity limitation can be activated via a digital input. In operating mode Profile Torque, the minimum velocity is internally limited to 100 RPM. Modified settings become active immediately.	usr_v 0 10 2147483647	UINT32 R/W per. -	CANopen 3006:1E$_h$ Modbus 1596

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DI0 CONF → I-O- dI0	Function Input DI0. **1 / Freely Available /** noonE: Available as required **2 / Fault Reset /** FrES: Fault reset after error **3 / Enable /** EnAb: Enables the power stage **4 / Halt /** hALt: Halt **5 / Start Profile Positioning /** SPtP: Start request for movement **6 / Current Limitation /** ILIM: Limits the current to parameter value **7 / Zero Clamp /** CLMP: Zero clamping **8 / Velocity Limitation /** VLIM: Limits the velocity to parameter value **21 / Reference Switch (REF) /** rEF: Reference switch **22 / Positive Limit Switch (LIMP) /** LIMP: Positive limit switch **23 / Negative Limit Switch (LIMN) /** LIMn: Negative limit switch **24 / Switch Controller Parameter Set /** CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off /** InoF: Switches off velocity controller integral term **30 / Start Signal Of RMAC /** SrMc: Start signal of relative movement after capture (RMAC) **31 / Activate RMAC /** ArMc: Activates the relative movement after capture (RMAC) **40 / Release Holding Brake /** rEhb: Releases the holding brake Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.	- - - -	UINT16 R/W per. -	CANopen 3007:1h Modbus 1794
IOfunct_DI1 CONF → I-O- dI1	Function Input DI1. **1 / Freely Available /** noonE: Available as required **2 / Fault Reset /** FrES: Fault reset after error **3 / Enable /** EnAb: Enables the power stage **4 / Halt /** hALt: Halt **5 / Start Profile Positioning /** SPtP: Start request for movement **6 / Current Limitation /** ILIM: Limits the current to parameter value **7 / Zero Clamp /** CLMP: Zero clamping **8 / Velocity Limitation /** VLIM: Limits the velocity to parameter value **21 / Reference Switch (REF) /** rEF: Reference switch **22 / Positive Limit Switch (LIMP) /** LIMP: Positive limit switch	- - - -	UINT16 R/W per. -	CANopen 3007:2h Modbus 1796

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
	23 / Negative Limit Switch (LIMN) / L iMn: Negative limit switch **24 / Switch Controller Parameter Set /** CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off /** EnoF: Switches off velocity controller integral term **30 / Start Signal Of RMAC /** SrMc: Start signal of relative movement after capture (RMAC) **31 / Activate RMAC /** ArMc: Activates the relative movement after capture (RMAC) **40 / Release Holding Brake /** rEhb: Releases the holding brake Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.			
IOfunct_DI2 ConF → i-o-di2	Function Input DI2. **1 / Freely Available /** nonE: Available as required **2 / Fault Reset /** FrES: Fault reset after error **3 / Enable /** EnAb: Enables the power stage **4 / Halt /** hALt: Halt **5 / Start Profile Positioning /** SPtP: Start request for movement **6 / Current Limitation /** iLiM: Limits the current to parameter value **7 / Zero Clamp /** CLMP: Zero clamping **8 / Velocity Limitation /** VLiM: Limits the velocity to parameter value **21 / Reference Switch (REF) /** rEF: Reference switch **22 / Positive Limit Switch (LIMP) /** LiMP: Positive limit switch **23 / Negative Limit Switch (LIMN) /** LiMn: Negative limit switch **24 / Switch Controller Parameter Set /** CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off /** EnoF: Switches off velocity controller integral term **30 / Start Signal Of RMAC /** SrMc: Start signal of relative movement after capture (RMAC) **31 / Activate RMAC /** ArMc: Activates the relative movement after capture (RMAC) **40 / Release Holding Brake /** rEhb: Releases the holding brake Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.	- - - -	UINT16 R/W per. -	CANopen 3007:3$_h$ Modbus 1798

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOfunct_DI3 ConF → I-O-dI3	Function Input DI3. **1 / Freely Available /** nonE: Available as required **2 / Fault Reset /** FrES: Fault reset after error **3 / Enable /** EnAb: Enables the power stage **4 / Halt /** hALt: Halt **5 / Start Profile Positioning /** SPtP: Start request for movement **6 / Current Limitation /** ILIM: Limits the current to parameter value **7 / Zero Clamp /** CLMP: Zero clamping **8 / Velocity Limitation /** VLIM: Limits the velocity to parameter value **21 / Reference Switch (REF) /** rEF: Reference switch **22 / Positive Limit Switch (LIMP) /** LIMP: Positive limit switch **23 / Negative Limit Switch (LIMN) /** LIMn: Negative limit switch **24 / Switch Controller Parameter Set /** CPAr: Switches control loop parameter set **28 / Velocity Controller Integral Off /** InoF: Switches off velocity controller integral term **30 / Start Signal Of RMAC /** SrMc: Start signal of relative movement after capture (RMAC) **31 / Activate RMAC /** ArMc: Activates the relative movement after capture (RMAC) **40 / Release Holding Brake /** rEhb: Releases the holding brake Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.	- - - -	UINT16 R/W per. -	CANopen 3007:4h Modbus 1800
IOfunct_DQ0 ConF → I-O-doD	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 /** Act I: Signals operating state Operation Enabled **4 / RMAC Active Or Finished /** rMcA: Relative movement after capture active or finished (RMAC) **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 /** VthrE: Motor velocity below threshold **8 / Current Below Threshold /** IthrE: Motor current below threshold	- - - -	UINT16 R/W per. -	CANopen 3007:9h Modbus 1810

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
	9 / Halt Acknowledge / hALt: Halt acknowledgement **13 / Motor Standstill /** MStd: Motor at a standstill **14 / Selected Error /** SErr: One of the specified errors of error classes 1 … 4 is active **15 / Valid Reference (ref_ok) /** rEFo: Zero point is valid (ref_ok) **16 / Selected Warning /** SWrn: One of the specified errors of error class 0 is active **18 / Position Register Channel 1 /** PrC 1: Position register channel 1 **19 / Position Register Channel 2 /** PrC2: Position register channel 2 **20 / Position Register Channel 3 /** PrC3: Position register channel 3 **21 / Position Register Channel 4 /** PrC4: Position register channel 4 **22 / Motor Moves Positive /** MPoS: Motor moves in positive direction **23 / Motor Moves Negative /** MnEG: Motor moves in negative direction Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.			
IOfunct_DQ1 ConF → I-O- do 1	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 /** Act 1: Signals operating state Operation Enabled **4 / RMAC Active Or Finished /** rMcA: Relative movement after capture active or finished (RMAC) **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 /** VEhr: Motor velocity below threshold **8 / Current Below Threshold /** IEhr: Motor current below threshold **9 / Halt Acknowledge /** hALt: Halt acknowledgement **13 / Motor Standstill /** MStd: Motor at a standstill **14 / Selected Error /** SErr: One of the specified errors of error classes 1 … 4 is active **15 / Valid Reference (ref_ok) /** rEFo: Zero point is valid (ref_ok)	- - - -	UINT16 R/W per. -	CANopen 3007:A_h Modbus 1812

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
	16 / Selected Warning / SWrn: One of the specified errors of error class 0 is active **18 / Position Register Channel 1** / PrC1: Position register channel 1 **19 / Position Register Channel 2** / PrC2: Position register channel 2 **20 / Position Register Channel 3** / PrC3: Position register channel 3 **21 / Position Register Channel 4** / PrC4: Position register channel 4 **22 / Motor Moves Positive** / MPoS: Motor moves in positive direction **23 / Motor Moves Negative** / MnEG: Motor moves in negative direction Setting can only be modified if power stage is disabled. Modified settings become active the next time the product is powered on.			
IOsigCurrLim	Signal evaluation for signal input function Current Limitation. **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.26.	- 1 2 2	UINT16 R/W per. -	CANopen 3008:28$_h$ Modbus 2128
IOsigLIMN	Signal evaluation for negative limit switch. **0 / Inactive**: Inactive **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	CANopen 3006:F$_h$ Modbus 1566
IOsigLIMP	Signal evaluation for positive limit switch. **0 / Inactive**: Inactive **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	CANopen 3006:10$_h$ Modbus 1568

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
IOsigREF	Signal evaluation for reference switch. **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO The reference switch is only active while a reference movement to the reference switch is processed. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 1 1 2	UINT16 R/W per. -	CANopen 3006:E_h Modbus 1564
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. Modified settings become active immediately.	- 0 0 1	UINT16 R/W per. -	CANopen 3006:6_h Modbus 1548
IOsigVelLim	Signal evaluation for signal input function Velocity Limitation. **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.26.	- 1 2 2	UINT16 R/W per. -	CANopen 3008:27_h Modbus 2126
IP_IntTimInd	Interpolation time index. Available with firmware version ≥V01.08. * Datatype for CANopen: INT8	- -128 -3 63	INT16* R/W - -	CANopen 60C2:2_h Modbus 7002
IP_IntTimPerVal	Interpolation time period value. Available with firmware version ≥V01.08. * Datatype for CANopen: UINT8	s 0 1 255	UINT16* R/W - -	CANopen 60C2:1_h Modbus 7000
IPp_target	Position reference value for operating mode Interpolated Position. Available with firmware version ≥V01.08.	- -2147483648 - 2147483647	INT32 R/W - -	CANopen 60C1:1_h Modbus 7004
JOGactivate	Activation of operating mode Jog. Bit 0: Positive direction of movement Bit 1: Negative direction of movement Bit 2: 0=slow 1=fast Modified settings become active immediately.	- 0 0 7	UINT16 R/W - -	CANopen 301B:9_h Modbus 6930

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 /** c o n o: Jog with continuous movement **1 / Step Movement /** S t E P o: Jog with step movement Modified settings become active immediately.	- 0 1 1	UINT16 R/W - -	CANopen 3029:3h Modbus 10502
JOGstep	Distance for step movement. Modified settings become active the next time the motor moves.	usr_p 1 20 2147483647	INT32 R/W per. -	CANopen 3029:7h Modbus 10510
JOGtime	Wait time for step movement. Modified settings become active the next time the motor moves.	ms 1 500 32767	UINT16 R/W per. -	CANopen 3029:8h Modbus 10512
JOGv_fast o P → J o G - J G h i	Velocity for fast movement. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Modified settings become active immediately.	usr_v 1 180 2147483647	UINT32 R/W per. -	CANopen 3029:5h Modbus 10506
JOGv_slow o P → J o G - J G L o	Velocity for slow movement. The adjustable value is internally limited to the parameter setting in RAMP_v_max. Modified settings become active immediately.	usr_v 1 60 2147483647	UINT32 R/W per. -	CANopen 3029:4h Modbus 10504
LIM_HaltReaction C o n F → A C G - h t Y P	Halt option code. **1 / Deceleration Ramp /** d E c E: Deceleration ramp **3 / Torque Ramp /** t o r q: Torque ramp Set the deceleration ramp with parameter RAMP_v_dec. Set the torque ramp with parameter LIM_I_maxHalt. If a deceleration ramp is already active, the parameter cannot be written. Modified settings become active immediately.	- 1 1 3	INT16 R/W per. -	CANopen 605D:0h Modbus 1582

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
LIM_I_maxHalt CONF → ACG - hcur	Current for Halt. This value is only limited by the minimum/ maximum value range (no limitation of this value by motor/power stage). In the case of a Halt, the current limit (*_Imax_act*) is one of the following values (whichever is lowest): - *LIM_I_maxHalt* - *_M_I_max* - *_PS_I_max* Further current limitations caused by I2t monitoring are also taken into account during a Halt. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} - - -	UINT16 R/W per. -	CANopen 3011:E_h Modbus 4380
LIM_I_maxQSTP CONF → FLT - qcur	Current for Quick Stop. This value is only limited by the minimum/ maximum value range (no limitation of this value by motor/power stage). In the case of a Quick Stop, the current limit (*_Imax_act*) is one of the following values (whichever is lowest): - *LIM_I_maxQSTP* - *_M_I_max* - *_PS_I_max* Further current limitations caused by I2t monitoring are also taken into account during a Quick Stop. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} - - -	UINT16 R/W per. -	CANopen 3011:D_h Modbus 4378

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. Modified settings become active immediately.	- -2 6 7	INT16 R/W per. -	CANopen 3006:18$_h$ Modbus 1584
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. Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 0 1	UINT16 R/W per. -	CANopen 3005:20$_h$ Modbus 1344
MBaddress ConF → CoM- MbAd	Modbus address. Valid addresses: 1 to 247 Modified settings become active the next time the product is powered on.	- 1 1 247	UINT16 R/W per. -	CANopen 3016:4$_h$ Modbus 5640
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 Modified settings become active the next time the product is powered on.	- 9600 19200 38400	UINT32 R/W per. -	CANopen 3016:3$_h$ Modbus 5638

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MOD_AbsDirection	Direction of absolute movement with Modulo. **0 / Shortest Distance**: Movement with shortest distance **1 / Positive Direction**: Movement only in positive direction **2 / Negative Direction**: Movement only in negative direction If the parameter is set to 0, the drive calculates the shortest way to the new target position and starts the movement in the corresponding direction. If the distance to the target position is identical in positive and negative directions, the movement takes place in positive direction. Modified settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 2	UINT16 R/W per. -	CANopen 3006:3B$_h$ Modbus 1654
MOD_AbsMultiRng	Multiple ranges for absolute movement with Modulo. **0 / Multiple Ranges Off**: Absolute movement in one modulo range **1 / Multiple Ranges On**: Absolute movement in multiple modulo ranges Modified settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 1	UINT16 R/W per. -	CANopen 3006:3C$_h$ Modbus 1656
MOD_Enable *ConF → ACG-ATYP*	Activation of Modulo function. **0 / Modulo Off / oFF**: Modulo is off **1 / Modulo On / on**: Modulo is on Setting can only be modified if power stage is disabled. Modified settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 1	UINT16 R/W per. -	CANopen 3006:38$_h$ Modbus 1648
MOD_Max	Maximum position of modulo range. The maximum position value of the modulo range must be greater than the minimum position value of the modulo range. The value must not exceed the maximum possible value of position scaling _ScalePOSmax. Setting can only be modified if power stage is disabled. Modified settings become active immediately. Available with firmware version ≥V01.03.	usr_p - 3600 -	INT32 R/W per. -	CANopen 3006:3A$_h$ Modbus 1652
MOD_Min	Minimum position of modulo range. The minimum position value of the modulo range must be less than the maximum position value of the modulo range. The value must not exceed the maximum possible value of position scaling _ScalePOSmax. Setting can only be modified if power stage is disabled. Modified settings become active immediately. Available with firmware version ≥V01.03.	usr_p - 0 -	INT32 R/W per. -	CANopen 3006:39$_h$ Modbus 1650

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_ChkTime CONF → I-O-ETHR	Monitoring of time window. Adjustment of a time for monitoring of position deviation, velocity deviation, velocity value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Modified settings become active immediately.	ms 0 0 9999	UINT16 R/W per. -	CANopen 3006:1D$_h$ Modbus 1594
MON_commutat	Commutation monitoring. **0 / Off**: Commutation monitoring off **1 / On**: Commutation monitoring on in operating states 6, 7 and 8 **2 / On (OpState6+7)**: Commutation monitoring on in operating states 6 and 7 Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 R/W per. -	CANopen 3005:5$_h$ Modbus 1290
MON_ ConfModification	Configuration modification monitoring. Value 0: Modification detected for each write access. Value 1: Modification detected for each write access which modifies a value. Value 2: Identical to value 0 if commissioning software is not connected. Identical to value 1 if commissioning software is connected. Modified settings become active immediately. Available with firmware version ≥V01.26.	- 0 2 2	UINT16 R/W per. -	CANopen 3004:1D$_h$ Modbus 1082
MON_ DCbusVdcThresh	DC bus overvoltage monitoring threshold. **0 / Reduction Off**: Reduction is off **1 / Reduction On**: Reduction is on This parameter is used to reduce the threshold for DC bus overvoltage monitoring. The parameter only affects single-phase devices supplied with 115 V and three-phase devices supplied with 208 V. Value 0: Single-phase: 450 Vdc Three-phase: 820 Vdc Value 1: Single-phase: 260 Vdc Three-phase: 450 Vdc Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.26.	- 0 0 1	UINT16 R/W per. -	CANopen 3005:3D$_h$ Modbus 1402

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_ENC_Ampl	Activation of monitoring of SinCos amplitude. Value 0: Deactivate monitoring Value 1: Activate monitoring Modified settings become active immediately. Available with firmware version ≥V01.26.	- 0 0 1	UINT16 R/W - -	CANopen 303F:61$_h$ Modbus 16322
MON_GroundFault	Ground monitoring. **0 / Off**: Ground monitoring off **1 / On**: Ground monitoring on Modified settings become active the next time the product is powered on.	- 0 1 1	UINT16 R/W per. expert	CANopen 3005:10$_h$ Modbus 1312
MON_I_Threshold ConF → I-O-tHr	Monitoring of current threshold. The system monitors whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter _Iq_act_rms is used as comparison value. In increments of 0.01 A_{rms}. Modified settings become active immediately.	A_{rms} 0.00 0.20 300.00	UINT16 R/W per. -	CANopen 3006:1C$_h$ Modbus 1592
MON_IO_SelErr1	Signal output function Selected Error (error classes 1 to 4): First error code. This parameter specifies the error code of an error of error classes 1 ... 4 which is to activate the signal output function. Modified settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	CANopen 303B:6$_h$ Modbus 15116
MON_IO_SelErr2	Signal output function Selected Error (error classes 1 to 4): Second error code. This parameter specifies the error code of an error of error classes 1 ... 4 which is to activate the signal output function. Modified settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	CANopen 303B:7$_h$ Modbus 15118
MON_IO_SelWar1	Signal output function Selected Warning (error class 0): First error code. This parameter specifies the error code of an error of error class 0 which is to activate the signal output function. Modified settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	CANopen 303B:8$_h$ Modbus 15120
MON_IO_SelWar2	Signal output function Selected Warning (error class 0): Second error code. This parameter specifies the error code of an error of error class 0 which is to activate the signal output function. Modified settings become active immediately.	- 0 0 65535	UINT16 R/W per. -	CANopen 303B:9$_h$ Modbus 15122

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_MainsVolt	Detection and monitoring of mains phases. **0 / Automatic Mains Detection**: Automatic detection and monitoring of mains voltage **1 / DC-Bus Only (Mains 1~230 V / 3~480 V)**: DC bus supply only, corresponding to mains voltage 230 V (single-phase) or 480 V (three phases) **2 / DC-Bus Only (Mains 1~115 V / 3~208 V)**: DC bus supply only, corresponding to mains voltage 115 V (single-phase) or 208 V (three phases) **3 / Mains 1~230 V / 3~480 V**: Mains voltage 230 V (single-phase) or 480 V (three phases) **4 / Mains 1~115 V / 3~208 V**: Mains voltage 115 V (single-phase) or 208 V (three phases) **5 / Reserved**: Reserved Value 0: As soon as mains voltage detected, the device automatically verifies whether the mains voltage is 115 V or 230 V in the case of single-phase devices or 208 V or 400/480 V in the case of three-phase devices. Values 1 … 2: If the device is supplied only via the DC bus, the parameter has to be set to the voltage value corresponding to the mains voltage of the supplying device. There is no mains voltage monitoring. Values 3 … 4: If the mains voltage is not detected properly during start-up, the mains voltage to be used can be selected manually. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 0 5	UINT16 R/W per. expert	CANopen 3005:F_h Modbus 1310
MON_ MotOvLoadOvTemp	Motor overload and overtemperature monitoring. Value 0: Motor overload and overtemperature monitoring using thermal retention and speed sensitivity (as per IEC 61800-5-1:2007/ AMD1:2016) Value 1: Motor overload and overtemperature monitoring using the nominal stall torque of the motor, without thermal retention and speed sensitivity. Additional external measures may have to be implemented. Setting can only be modified if power stage is disabled. Modified settings become active immediately. Available with firmware version ≥V01.32.	- 0 0 1	UINT16 R/W per. expert	CANopen 303F:68_h Modbus 16336
MON_p_dif_load	Maximum load-dependent position deviation. The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. The parameter MON_p_dif_load_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution. Modified settings become active immediately.	revolution 0.0001 1.0000 200.0000	UINT32 R/W per. -	CANopen 6065:0_h Modbus 1606

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_p_dif_load_usr	Maximum load-dependent position deviation. The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. The minimum value, the factory setting and the maximum value depend on the scaling factor. Modified settings become active immediately. Available with firmware version ≥V01.05.	usr_p 1 16384 2147483647	INT32 R/W per. -	CANopen 3006:3E$_h$ Modbus 1660
MON_p_dif_warn	Advisory limit of the load-dependent position deviation (error class 0). 100.0 % correspond to the maximum position deviation (following error) as specified by means of parameter MON_p_dif_load. Modified settings become active immediately.	% 0 75 100	UINT16 R/W per. -	CANopen 3006:29$_h$ Modbus 1618
MON_p_DiffWin	Monitoring of position deviation. The system verifies whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter MON_p_DiffWin_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution. Modified settings become active immediately.	revolution 0.0000 0.0010 0.9999	UINT16 R/W per. -	CANopen 3006:19$_h$ Modbus 1586
MON_p_DiffWin_usr	Monitoring of position deviation. The system verifies whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. The minimum value, the factory setting and the maximum value depend on the scaling factor. Modified settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 16 2147483647	INT32 R/W per. -	CANopen 3006:3F$_h$ Modbus 1662
MON_p_win	Standstill window, permissible control deviation. The control deviation for the standstill window time must be within this range for a standstill of the drive to be detected. Processing of the standstill window must be activated via the parameter MON_p_winTime. The parameter MON_p_win_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution. Modified settings become active immediately. * Datatype for CANopen: UINT32	revolution 0.0000 0.0010 3.2767	UINT16* R/W per. -	CANopen 6067:0$_h$ Modbus 1608

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_p_win_usr	Standstill window, permissible control deviation. The control deviation for the standstill window time must be within this range for a standstill of the drive to be detected. Processing of the standstill window must be activated via the parameter MON_p_winTime. The minimum value, the factory setting and the maximum value depend on the scaling factor. Modified settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 16 2147483647	INT32 R/W per. -	CANopen 3006:40$_h$ Modbus 1664
MON_p_winTime	Standstill window, time. Value 0: Monitoring of standstill window deactivated Value >0: Time in ms during which the control deviation must be in the standstill window Modified settings become active immediately.	ms 0 0 32767	UINT16 R/W per. -	CANopen 6068:0$_h$ Modbus 1610
MON_p_winTout	Timeout time for standstill window monitoring. Value 0: Timeout monitoring deactivated Value >0: Timeout time in ms Standstill window processing values are set via MON_p_win and MON_p_winTime. Time monitoring starts when the target position (reference position of position controller) is reached or when the profile generator has finished processing. Modified settings become active immediately.	ms 0 0 16000	UINT16 R/W per. -	CANopen 3006:26$_h$ Modbus 1612
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. Modified settings become active immediately.	- 0 0 3	UINT16 R/W per. -	CANopen 3006:3$_h$ Modbus 1542
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 Modified settings become active immediately. Available with firmware version ≥V01.16.	- 0 0 1	UINT16 R/W per. -	CANopen 3006:47$_h$ Modbus 1678

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_swLimN	Negative position limit for software limit switch. See description 'MON_swLimP'. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	usr_p - -2147483648 -	INT32 R/W per. -	CANopen 607D:1_h Modbus 1546
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. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	usr_p - 2147483647 -	INT32 R/W per. -	CANopen 607D:2_h Modbus 1544
MON_tq_win	Torque window, permissible deviation. The torque window can only be activated in operating mode Profile Torque. In increments of 0.1 %. Modified settings become active immediately.	% 0.0 3.0 3000.0	UINT16 R/W per. -	CANopen 3006:$2D_h$ Modbus 1626
MON_tq_winTime	Torque window, time. Value 0: Torque window monitoring deactivated Changing the value causes a restart of torque monitoring. Torque window is only used in operating mode Profile Torque. Modified settings become active immediately.	ms 0 0 16383	UINT16 R/W per. -	CANopen 3006:$2E_h$ Modbus 1628
MON_v_DiffWin	Monitoring of velocity deviation. The system monitors whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. Modified settings become active immediately.	usr_v 1 10 2147483647	UINT32 R/W per. -	CANopen 3006:$1A_h$ Modbus 1588
MON_v_Threshold	Monitoring of velocity threshold. The system monitors whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. Modified settings become active immediately.	usr_v 1 10 2147483647	UINT32 R/W per. -	CANopen 3006:$1B_h$ Modbus 1590
MON_v_win	Velocity window, permissible deviation. Modified settings become active immediately. * Datatype for CANopen: UINT16	usr_v 1 10 2147483647	UINT32* R/W per. -	CANopen 606D:0_h Modbus 1576

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
MON_v_winTime	Velocity window, time. Value 0: Velocity window monitoring deactivated Changing the value causes a restart of velocity monitoring. Modified settings become active immediately.	ms 0 0 16383	UINT16 R/W per. -	CANopen 606E:0_h Modbus 1578
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. Modified settings become active immediately.	usr_v 0 10 2147483647	UINT32 R/W per. -	CANopen 3006:28_h Modbus 1616
MON_VelDiff	Maximum load-dependent velocity deviation. Value 0: Monitoring deactivated. Value >0: Maximum value Modified settings become active immediately. Available with firmware version ≥V01.26.	usr_v 0 0 2147483647	UINT32 R/W per. -	CANopen 3006:$4B_h$ Modbus 1686
MON_VelDiff_Time	Time window for maximum load-dependent velocity deviation. Value 0: Monitoring deactivated. Value >0: Time window for maximum value Modified settings become active immediately. Available with firmware version ≥V01.26.	ms 0 10 -	UINT16 R/W per. -	CANopen 3006:$4C_h$ Modbus 1688
MON_VelDiffOpSt578	Maximum load-dependent velocity deviation for operating states 5, 7 and 8. Maximum load-dependent velocity deviation for operating states 5 Switch On, 7 Quick Stop Active and 8 Fault Reaction Active. Value 0: Monitoring deactivated. Value >0: Maximum value. Monitoring is active if parameter *LIM_QStopReact* is set to "Deceleration Ramp (Fault)" or to "Deceleration ramp (Quick Stop)". Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.32.	usr_v 0 0 2147483647	UINT32 R/W per. -	CANopen 3006:48_h Modbus 1680
MT_dismax	Maximum permissible distance. If the reference value is active and the maximum permissible distance is exceeded, an error of error class 1 is detected. The value 0 switches off monitoring. The parameter MT_dismax_usr allows you to enter the value in user-defined units. In increments of 0.1 revolution. Modified settings become active the next time the motor moves.	revolution 0.0 1.0 999.9	UINT16 R/W - -	CANopen 302E:3_h Modbus 11782

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_usr	Maximum permissible distance. If the reference value is active and the maximum permissible distance is exceeded, an error of error class 1 is detected. The value 0 switches off monitoring. The minimum value, the factory setting and the maximum value depend on the scaling factor. Modified settings become active the next time the motor moves. Available with firmware version ≥V01.05.	usr_p 0 16384 2147483647	INT32 R/W - -	CANopen 302E:A_h Modbus 11796
PAR_CTRLreset CONF → FCS - rESC	Reset control loop parameters. **0 / No /** no: No **1 / Yes /** YES: Yes Reset of the control loop parameters. The control loop parameters are recalculated on the basis of the motor data of the connected motor. Current and velocity limitations are not reset. Therefore, a user parameter reset is required. The new settings are not saved to the nonvolatile memory. Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 0 1	UINT16 R/W - -	CANopen 3004:7_h Modbus 1038
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 Setting can only be modified if power stage is disabled. Modified settings become active immediately. Available with firmware version ≥V01.05.	- 0 0 2	UINT16 R/W - -	CANopen 3004:14_h Modbus 1064
PAReeprSave	Save parameter values to the nonvolatile memory. Value 1: Save persistent parameters The currently set parameters are saved to the nonvolatile memory. The saving process is complete when the parameter is read and 0 is returned. Modified settings become active immediately.	- - - -	UINT16 R/W - -	CANopen 3004:1_h Modbus 1026

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PARuserReset CONF → FCS - rESU	Reset user parameters. **0 / No** / no: No **65535 / Yes** / YES: Yes Bit 0: Reset persistent user parameters and control loop parameters to default values Bits 1 … 15: Reserved The parameters are reset with the exception of: - Communication parameters - Inversion of direction of movement - Functions of digital inputs and outputs The new settings are not saved to the nonvolatile memory. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 - 65535	UINT16 R/W - -	CANopen 3004:8h Modbus 1040
PosReg1Mode	Selection of comparison criterion for position register channel 1. **0 / Pact greater equal A**: Actual position is greater than or equal to comparison value A for position register channel 1 **1 / Pact less equal A**: Actual position is less than or equal to comparison value A for position register channel 1 **2 / Pact in [A-B] (basic)**: Actual position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Actual position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Actual position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Actual position is out of the range A-B excluding limits (extended) Modified settings become active immediately.	- 0 0 5	UINT16 R/W per. -	CANopen 300B:4h Modbus 2824
PosReg1Source	Selection of source for position register channel 1. **0 / Pact Encoder 1**: Source for position register channel 1 is Pact of encoder 1 Modified settings become active immediately.	- 0 0 0	UINT16 R/W per. -	CANopen 300B:6h Modbus 2828
PosReg1Start	Start/stop of position register channel 1. **0 / Off (keep last state)**: Position Register channel 1 is off and status bit keeps last state **1 / On**: Position Register channel 1 is on **2 / Off (set state 0)**: Position Register channel 1 is off and status bit is set to 0 **3 / Off (set state 1)**: Position Register channel 1 is off and status bit is set to 1 Modified settings become active immediately.	- 0 0 3	UINT16 R/W - -	CANopen 300B:2h Modbus 2820

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PosReg1ValueA	Comparison value A for position register channel 1.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:8_h Modbus 2832
PosReg1ValueB	Comparison value B for position register channel 1.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:9_h Modbus 2834
PosReg2Mode	Selection of comparison criterion for position register channel 2. **0 / Pact greater equal A**: Actual position is greater than or equal to comparison value A for position register channel 2 **1 / Pact less equal A**: Actual position is less than or equal to comparison value A for position register channel 2 **2 / Pact in [A-B] (basic)**: Actual position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Actual position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Actual position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Actual position is out of the range A-B excluding limits (extended) Modified settings become active immediately.	- 0 0 5	UINT16 R/W per. -	CANopen 300B:5_h Modbus 2826
PosReg2Source	Selection of source for position register channel 2. **0 / Pact Encoder 1**: Source for position register channel 2 is Pact of encoder 1 Modified settings become active immediately.	- 0 0 0	UINT16 R/W per. -	CANopen 300B:7_h Modbus 2830
PosReg2Start	Start/stop of position register channel 2. **0 / Off (keep last state)**: Position Register channel 2 is off and status bit keeps last state **1 / On**: Position Register channel 2 is on **2 / Off (set state 0)**: Position Register channel 2 is off and status bit is set to 0 **3 / Off (set state 1)**: Position Register channel 2 is off and status bit is set to 1 Modified settings become active immediately.	- 0 0 3	UINT16 R/W - -	CANopen 300B:3_h Modbus 2822
PosReg2ValueA	Comparison value A for position register channel 2.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:A_h Modbus 2836
PosReg2ValueB	Comparison value B for position register channel 2.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:B_h Modbus 2838

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PosReg3Mode	Selection of comparison criterion for position register channel 3. **0 / Pact greater equal A**: Actual position is greater than or equal to comparison value A for position register channel 3 **1 / Pact less equal A**: Actual position is less than or equal to comparison value A for position register channel 3 **2 / Pact in [A-B] (basic)**: Actual position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Actual position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Actual position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Actual position is out of the range A-B excluding limits (extended) Modified settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 5	UINT16 R/W per. -	CANopen 300B:E_h Modbus 2844
PosReg3Source	Selection of source for position register channel 3. **0 / Pact Encoder 1**: Source for position register channel 3 is Pact of encoder 1 Modified settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 0	UINT16 R/W per. -	CANopen 300B:10_h Modbus 2848
PosReg3Start	Start/stop of position register channel 3. **0 / Off (keep last state)**: Position Register channel 3 is off and status bit keeps last state **1 / On**: Position Register channel 3 is on **2 / Off (set state 0)**: Position Register channel 3 is off and status bit is set to 0 **3 / Off (set state 1)**: Position Register channel 3 is off and status bit is set to 1 Modified settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 3	UINT16 R/W - -	CANopen 300B:C_h Modbus 2840
PosReg3ValueA	Comparison value A for position register channel 3. Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:12_h Modbus 2852
PosReg3ValueB	Comparison value B for position register channel 3. Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:13_h Modbus 2854

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PosReg4Mode	Selection of comparison criterion for position register channel 4. **0 / Pact greater equal A**: Actual position is greater than or equal to comparison value A for position register channel 4 **1 / Pact less equal A**: Actual position is less than or equal to comparison value A for position register channel 4 **2 / Pact in [A-B] (basic)**: Actual position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Actual position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Actual position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Actual position is out of the range A-B excluding limits (extended) Modified settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 5	UINT16 R/W per. -	CANopen 300B:F_h Modbus 2846
PosReg4Source	Selection of source for position register channel 4. **0 / Pact Encoder 1**: Source for position register channel 4 is Pact of encoder 1 Modified settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 0	UINT16 R/W per. -	CANopen 300B:11_h Modbus 2850
PosReg4Start	Start/stop of position register channel 4. **0 / Off (keep last state)**: Position Register channel 4 is off and status bit keeps last state **1 / On**: Position Register channel 4 is on **2 / Off (set state 0)**: Position Register channel 4 is off and status bit is set to 0 **3 / Off (set state 1)**: Position Register channel 4 is off and status bit is set to 1 Modified settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 3	UINT16 R/W - -	CANopen 300B:D_h Modbus 2842
PosReg4ValueA	Comparison value A for position register channel 4. Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:14_h Modbus 2856
PosReg4ValueB	Comparison value B for position register channel 4. Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 R/W per. -	CANopen 300B:15_h Modbus 2858

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PosRegGroupStart	Start/stop of position register channels. **0 / No Channel**: No channel activated **1 / Channel 1**: Channel 1 activated **2 / Channel 2**: Channel 2 activated **3 / Channel 1 & 2**: Channels 1 and 2 activated **4 / Channel 3**: Channel 3 activated **5 / Channel 1 & 3**: Channels 1 and 3 activated **6 / Channel 2 & 3**: Channels 2 and 3 activated **7 / Channel 1 & 2 & 3**: Channels 1, 2 and 3 activated **8 / Channel 4**: Channel 4 activated **9 / Channel 1 & 4**: Channels 1 and 4 activated **10 / Channel 2 & 4**: Channels 2 and 4 activated **11 / Channel 1 & 2 & 4**: Channels 1, 2 and 4 activated **12 / Channel 3 & 4**: Channels 3 and 4 activated **13 / Channel 1 & 3 & 4**: Channels 1, 3 and 4 activated **14 / Channel 2 & 3 & 4**: Channels 2, 3 and 4 activated **15 / Channel 1 & 2 & 3 & 4**: Channels 1, 2, 3 and 4 activated Modified settings become active immediately. Available with firmware version ≥V01.14.	- 0 0 15	UINT16 R/W per. -	CANopen 300B:16$_h$ Modbus 2860
PP_ModeRangeLim	Absolute movement beyond movement range. **0 / NoAbsMoveAllowed**: Absolute movement beyond movement range is not possible **1 / AbsMoveAllowed**: Absolute movement beyond movement range is possible Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 0 0 1	UINT16 R/W per. -	CANopen 3023:7$_h$ Modbus 8974
PP_OpmChgType	Change to operating mode Profile Position during movements. **0 / WithStandStill**: Change with standstill **1 / OnTheFly**: Change without standstill If Modulo is active, a transition to the operating mode Profile Position is performed with the setting WithStandStill, regardless of the setting of this parameter. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 0 0 1	UINT16 R/W per. -	CANopen 3023:9$_h$ Modbus 8978

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
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 Modified settings become active the next time the motor moves.	- 0 0 2	UINT16 R/W - -	CANopen 60F2:0$_h$ Modbus 6960
PPp_target	Target position for operating mode Profile Position. Minimum/maximum values depend on: - Scaling factor - Software limit switches (if they are activated) Modified settings become active immediately.	usr_p - - -	INT32 R/W - -	CANopen 607A:0$_h$ Modbus 6940
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. Modified settings become active the next time the motor moves.	usr_v 1 60 4294967295	UINT32 R/W - -	CANopen 6081:0$_h$ Modbus 6942
PTtq_target	Target torque. 100.0 % correspond to the continuous stall torque _M_M_0. In increments of 0.1 %. Modified settings become active immediately.	% -3000.0 0.0 3000.0	INT16 R/W - -	CANopen 6071:0$_h$ Modbus 6944
PVv_target	Target velocity. The target velocity is limited to the setting in CTRL_v_max and RAMP_v_max. Modified settings become active immediately.	usr_v - 0 -	INT32 R/W - -	CANopen 60FF:0$_h$ Modbus 6938
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. Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 1 1	UINT16 R/W per. -	CANopen 3006:2C$_h$ Modbus 1624

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RAMP_tq_slope	Slope setting of the motion profile for torque. 100.00 % of the torque setting correspond to the continuous stall torque _M_M_0. Example: A ramp setting of 10000.00 %/s results in a torque change of 100.0% of _M_M_0 in 0.01s. In increments of 0.1 %/s. Modified settings become active immediately.	%/s 0.1 10000.0 3000000.0	UINT32 R/W per. -	CANopen 6087:0_h Modbus 1620
RAMP_v_acc	Acceleration of the motion profile for velocity. Writing the value 0 has no effect on the parameter. Modified settings become active the next time the motor moves.	usr_a 1 600 2147483647	UINT32 R/W per. -	CANopen 6083:0_h Modbus 1556
RAMP_v_dec	Deceleration of the motion profile for velocity. The minimum value depends on the operating mode: Operating modes with minimum value 1: Profile Velocity Operating modes with minimum value 120: Jog Profile Position Homing Writing the value 0 has no effect on the parameter. Modified settings become active the next time the motor moves.	usr_a 1 600 2147483647	UINT32 R/W per. -	CANopen 6084:0_h Modbus 1558
RAMP_v_enable	Activation of the motion profile for velocity. **0 / Profile Off**: Profile off **1 / Profile On**: Profile on Setting can only be modified if power stage is disabled. Modified settings become active immediately.	- 0 1 1	UINT16 R/W per. -	CANopen 3006:$2B_h$ Modbus 1622
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). Modified settings become active the next time the motor moves.	ms 0 0 128	UINT16 R/W per. -	CANopen 3006:D_h Modbus 1562

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RAMP_v_max CONF → ACG - nrMP	Maximum velocity of the motion profile for velocity. If a greater reference velocity is set in one of these operating modes, it is automatically limited to RAMP_v_max. This way, commissioning at limited velocity is easier to perform. Setting can only be modified if power stage is disabled. Modified settings become active the next time the motor moves.	usr_v 1 13200 2147483647	UINT32 R/W per. -	CANopen 607F:0h Modbus 1554
RAMP_v_sym	Acceleration and deceleration of the motion profile for velocity. The values are internally multiplied by 10 (example: 1 = 10 RPM/s). Write access changes the values of RAMP_v_acc and RAMP_v_dec. The limit values are verified on the basis of the values indicated for these parameters. Read access returns the greater value from RAMP_v_acc/RAMP_v_dec. If the value cannot be represented as a 16 bit value, the value is set to 65535 (maximum UINT16 value) Modified settings become active the next time the motor moves.	- - - -	UINT16 R/W - -	CANopen 3006:1h Modbus 1538
RAMPaccdec	Acceleration and deceleration for the Drive Profile Lexium. High word: Acceleration Low word: Deceleration The values are internally multiplied by 10 (example: 1 = 10 RPM/s). Write access changes the values of RAMP_v_acc and RAMP_v_dec. The limit values are verified on the basis of the values indicated for these parameters. If the value cannot be represented as a 16 bit value, the value is set to 65535 (maximum UINT16 value). Modified settings become active the next time the motor moves.	- - - -	UINT32 R/W - -	CANopen 3006:2h Modbus 1540
RAMPquickstop	Deceleration ramp for Quick Stop. Deceleration ramp for a software stop or an error with error class 1 or 2. Modified settings become active the next time the motor moves.	usr_a 1 6000 2147483647	UINT32 R/W per. -	CANopen 3006:12h Modbus 1572
RESext_P CONF → ACG - Pobr	Nominal power of external braking resistor. The maximum value depends on the power stage. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	W 1 10 -	UINT16 R/W per. -	CANopen 3005:12h Modbus 1316

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RESext_R CONF → ACG - rbr	Resistance value of external braking resistor. The minimum value depends on the power stage. In increments of 0.01 Ω. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	Ω - 100.00 327.67	UINT16 R/W per. -	CANopen 3005:13$_h$ Modbus 1318
RESext_ton CONF → ACG - tbr	Maximum permissible switch-on time of external braking resistor. Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	ms 1 1 30000	UINT16 R/W per. -	CANopen 3005:11$_h$ Modbus 1314
RESint_ext CONF → ACG - Eibr	Selection of type of braking resistor. **0 / Internal Braking Resistor /** int: Internal braking resistor **1 / External Braking Resistor /** EHt: External braking resistor **2 / Reserved /** rSVd: Reserved Setting can only be modified if power stage is disabled. Modified settings become active the next time the power stage is enabled.	- 0 0 2	UINT16 R/W per. -	CANopen 3005:9$_h$ Modbus 1298
ResWriComNotOpEn	Response to write command (operating state is not Operation Enabled). **0 / Emergency Message**: An Emergency message is sent **1 / Error class 0**: An error with error class 0 is sent This parameter specifies the response of the drive to a write command that cannot be executed because the operating state is not Operation Enabled. Modified settings become active immediately. Available with firmware version ≥V01.26.	- 0 0 1	UINT16 R/W per. -	CANopen 3006:49$_h$ Modbus 1682
RMAC_Activate	Activation of relative movement after capture. **0 / Off**: Off **1 / On**: On Modified settings become active immediately. Available with firmware version ≥V01.10.	- 0 0 1	UINT16 R/W - -	CANopen 3023:C$_h$ Modbus 8984
RMAC_Edge	Edge of capture signal for relative movement after capture. **0 / Falling edge**: Falling edge **1 / Rising edge**: Rising edge Available with firmware version ≥V01.10.	- 0 0 1	UINT16 R/W per. -	CANopen 3023:10$_h$ Modbus 8992

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
RMAC_Position	Target position of relative movement after capture. Minimum/maximum values depend on: - Scaling factor Modified settings become active the next time the motor moves. Available with firmware version ≥V01.10.	usr_p - 0 -	INT32 R/W per. -	CANopen 3023:D_h Modbus 8986
RMAC_Response	Response if target position is overtraveled. **0 / Error Class 1**: Error class 1 **1 / No Movement To Target Position**: No movement to target position **2 / Movement To Target Position**: Movement to target position Modified settings become active immediately. Available with firmware version ≥V01.10.	- 0 0 2	UINT16 R/W per. -	CANopen 3023:F_h Modbus 8990
RMAC_Velocity	Velocity of relative movement after capture. Value 0: Use actual motor velocity Value >0: Value is the target velocity The adjustable value is internally limited to the setting in RAMP_v_max. Modified settings become active the next time the motor moves. Available with firmware version ≥V01.10.	usr_v 0 0 2147483647	UINT32 R/W per. -	CANopen 3023:E_h Modbus 8988
ScalePOSdenom	Position scaling: Denominator. Refer to numerator (ScalePOSnum) for a description. A new scaling is activated when the numerator value is supplied. Setting can only be modified if power stage is disabled.	usr_p 1 16384 2147483647	INT32 R/W per. -	CANopen 3006:7_h Modbus 1550
ScalePOSnum	Position scaling: Numerator. Specification of the scaling factor: Motor revolutions ---------- User-defined units [usr_p] A new scaling is activated when the numerator value is supplied. Setting can only be modified if power stage is disabled. Modified settings become active immediately.	revolution 1 1 2147483647	INT32 R/W per. -	CANopen 3006:8_h Modbus 1552
ScaleRAMPdenom	Ramp scaling: Denominator. See numerator (ScaleRAMPnum) for a description. A new scaling is activated when the numerator value is supplied. Setting can only be modified if power stage is disabled.	usr_a 1 1 2147483647	INT32 R/W per. -	CANopen 3006:30_h Modbus 1632

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
ScaleRAMPnum	Ramp scaling: Numerator. Setting can only be modified if power stage is disabled. Modified settings become active immediately.	RPM/s 1 1 2147483647	INT32 R/W per. -	CANopen 3006:31$_h$ Modbus 1634
ScaleVELdenom	Velocity scaling: Denominator. See numerator (ScaleVELnum) for a description. A new scaling is activated when the numerator value is supplied. Setting can only be modified if power stage is disabled.	usr_v 1 1 2147483647	INT32 R/W per. -	CANopen 3006:21$_h$ Modbus 1602
ScaleVELnum	Velocity scaling: Numerator. Specification of the scaling factor: Speed of rotation of motor [RPM] ---------- User-defined units [usr_v] A new scaling is activated when the numerator value is supplied. Setting can only be modified if power stage is disabled. Modified settings become active immediately.	RPM 1 1 2147483647	INT32 R/W per. -	CANopen 3006:22$_h$ Modbus 1604
ShiftEncWorkRang	Shifting of the encoder working range. **0 / Off**: Shifting off **1 / On**: Shifting on After activating the shifting function, the position range of a multiturn encoder is shifted by one half of the range. Example for the position range of a multiturn encoder with 4096 revolutions: Value 0: Position values are between 0 … 4096 revolutions. Value 1: Position values are between -2048 … 2048 revolutions. Modified settings become active the next time the product is powered on.	- 0 0 1	UINT16 R/W per. -	CANopen 3005:21$_h$ Modbus 1346

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
SimAbsolutePos CONF → ACG- 9Abs	Simulation of absolute position at power cycling. **0 / Simulation Off / oFF**: Do not use the last mechanical position after power cycling **1 / Simulation On / on**: Use last mechanical position after power cycling This parameter specifies the way position values are handled over a power cycle and allows for the simulation of an absolute position encoder using singleturn encoders. If this function is activated, the drive saves the pertinent position data prior to a power removal so that the drive can restore the mechanical position the next time it is powered on. In the case of singleturn encoders, the position can be restored if the motor shaft has not been moved by more than 0.25 revolutions while the drive was powered off. In the case of multiturn encoders, the permissible shaft movement while the drive is off can be much greater, depending on the type of multiturn encoder. For this function to work, the drive may only be powered off while the motor is at a standstill and the motor shaft must not be moved outside of the permissible range (for example, use a holding brake). Modified settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 1	UINT16 R/W per. -	CANopen 3005:23h Modbus 1350
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. Modified settings become active immediately.	- 0 0 2	UINT16 R/W - -	CANopen 3022:5h Modbus 8714
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. Available with firmware version ≥V01.08.	- - - -	UINT16 R/- - -	CANopen 3022:6h Modbus 8716
SyncMechTol	Synchronization tolerance. The value is applied when the synchronization mechanism is activated via the parameter SyncMechStart. Modified settings become active immediately. Available with firmware version ≥V01.08.	- 1 1 20	UINT16 R/W - -	CANopen 3022:4h Modbus 8712

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
TouchProbeFct	Touch Probe function (DS402). Modified settings become active immediately. Available with firmware version ≥V01.16.	- - - -	UINT16 R/W - -	CANopen 60B8:0_h Modbus 7028
UsrAppDataMem1	User-specific data 1. This parameter can be used to store user-specific data. Modified settings become active immediately. Available with firmware version ≥V01.20.	- - - -	UINT32 R/W per. -	CANopen 3001:43_h Modbus 390
UsrAppDataMem2	User-specific data 2. This parameter can be used to store user-specific data. Modified settings become active immediately. Available with firmware version ≥V01.20.	- - 0 -	UINT32 R/W per. -	CANopen 3001:44_h Modbus 392

Accessories and Spare Parts

Commissioning Tools

Description	Reference
PC connection kit, serial connection between drive and PC, USB-A to RJ45	TCSMCNAM3M002P
Multi-Loader, device for copying the parameter settings to a PC or to another drive	VW3A8121
Modbus cable, 1 m (3.28 ft), 2 x RJ45	VW3A8306R10
External graphic display terminal	VW3A1101

Memory Cards

Description	Reference
Memory card for copying parameter settings	VW3M8705
25 memory cards for copying parameter settings	VW3M8704

CANopen Cable With Connectors

Description	Reference
CANopen cable, 0.3 m (0.98 ft), 2 x RJ45	VW3CANCARR03
CANopen cable, 1 m (3.28 ft), 2 x RJ45	VW3CANCARR1
CANopen cable, 2 m (6.56 ft), 2 x RJ45, shielded twisted pair cable	490NTW00002
CANopen cable, 5 m (16.4 ft), 2 x RJ45, shielded twisted pair cable	490NTW00005
CANopen cable, 12 m (39.4 ft), 2 x RJ45, shielded twisted pair cable	490NTW00012
CANopen cable, 2 m (6.56 ft), 2 x RJ45, shielded twisted pair cable with UL and CSA 22.1 certification	490NTW00002U
CANopen cable, 5 m (16.4 ft), 2 x RJ45, shielded twisted pair cable with UL and CSA 22.1 certification	490NTW00005U
CANopen cable, 12 m (39.4 ft), 2 x RJ45, shielded twisted pair cable with UL and CSA 22.1 certification	490NTW00012U
CANopen cable, 1 m (3.28 ft), D9-SUB (female) to RJ45	TCSCCN4F3M1T
CANopen cable, 1 m (3.28 ft), D9-SUB (female) with integrated terminating resistor to RJ45	VW3M3805R010
CANopen cable, 3 m (9.84 ft), D9-SUB (female) with integrated terminating resistor to RJ45	VW3M3805R030
CANopen cable, 0.3 m (0.98 ft), 2 x D9-SUB (female), LSZH standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1)	TSXCANCADD03
CANopen cable, 1 m (3.28 ft), 2 x D9-SUB (female), LSZH standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1)	TSXCANCADD1
CANopen cable, 3 m (9.84 ft), 2 x D9-SUB (female), LSZH standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1)	TSXCANCADD3
CANopen cable, 5 m (16.4 ft), 2 x D9-SUB (female), LSZH standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1)	TSXCANCADD5
CANopen cable, 0.3 m (0.98 ft), 2 x D9-SUB (female), flame-retardant, tested as per IEC 60332-2, UL certification	TSXCANCBDD03
CANopen cable, 1 m (3.28 ft), 2 x D9-SUB (female), flame-retardant, tested as per IEC 60332-2, UL certification	TSXCANCBDD1
CANopen cable, 3 m (9.84 ft), 2 x D9-SUB (female), flame-retardant, tested as per IEC 60332-2, UL certification	TSXCANCBDD3
CANopen cable, 5 m (16.4 ft), 2 x D9-SUB (female), flame-retardant, tested as per IEC 60332-2, UL certification	TSXCANCBDD5

CANopen Connectors, Distributors, Terminating Resistors

Description	Reference
CANopen terminating resistor, 120 Ohm, integrated in RJ45 connector	TCSCAR013M120
CANopen connector with PC interface, D9-SUB (female), with switchable terminating resistor and additional D9-SUB (male) to connect a PC to the bus, PC interface straight, bus cable angled 90°	TSXCANKCDF90TP
CANopen connector, D9-SUB (female), with switchable terminating resistor, angled 90°	TSXCANKCDF90T
CANopen connector, D9-SUB (female), with switchable terminating resistor, straight	TSXCANKCDF180T
Four-port tap, for connection of 4 drop lines to trunk line, 4 x D9-SUB (male) with switchable terminating resistor	TSXCANTDM4
Two-port tap for connection of 2 drop lines to trunk line, with additional commissioning interface, 3 x RJ45 (female), with switchable terminating resistor	VW3CANTAP2
CANopen adapter cable D9-SUB to RJ45, 3 m (9.84 ft)	TCSCCN4F3M3T

CANopen Cables With Open Cable Ends

Cables with open cable ends are suitable for connection of D-SUB connectors. Observe the cable cross section and the connection cross section of the required connector.

Description	Reference
CANopen cable, 50 m (164 ft), [(2 x AWG 22) + (2 x AWG 24)], LSZH standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1), both cable ends open	TSXCANCA50
CANopen cable, 100 m (328 ft), [(2 x AWG 22) + (2 x AWG 24)], LSZH standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1), both cable ends open	TSXCANCA100
CANopen cable, 300 m (984 ft), [(2 x AWG 22) + (2 x AWG 24)], LSZH standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1), both cable ends open	TSXCANCA300
CANopen cable, 50 m (164 ft), [(2 x AWG 22) + (2 x AWG 24)], flame-retardant, tested as per IEC 60332-2, UL certification, both cable ends open	TSXCANCB50
CANopen cable, 100 m (328 ft), [(2 x AWG 22) + (2 x AWG 24)], flame-retardant, tested as per IEC 60332-2, UL certification, both cable ends open	TSXCANCB100
CANopen cable, 300 m (984 ft), [(2 x AWG 22) + (2 x AWG 24)], flame-retardant, tested as per IEC 60332-2, UL certification, both cable ends open	TSXCANCB300
CANopen cable, 50 m (164 ft), [(2 x AWG 22) + (2 x AWG 24)], flexible LSZH HD standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1), for heavy-duty or flexible installation, oil-resistant, both cable ends open	TSXCANCD50
CANopen cable, 100 m (328 ft), [(2 x AWG 22) + (2 x AWG 24)], flexible LSZH HD standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1), for heavy-duty or flexible installation, oil-resistant, both cable ends open	TSXCANCD100
CANopen cable, 300 m (984 ft), [(2 x AWG 22) + (2 x AWG 24)], flexible LSZH HD standard cable (low-smoke, zero halogen, flame-retardant, tested as per IEC 60332-1), for heavy-duty or flexible installation, oil-resistant, both cable ends open	TSXCANCD300

Adapter Cable for Encoder Signals LXM05/LXM15 to LXM32

Description	Reference
Encoder adapter cable Molex 12-pin (LXM05) to RJ45 10-pin (LXM32), 1 m (3.28 ft)	VW3M8111R10
Encoder adapter cable D15-SUB (LXM15) to RJ45 10-pin (LXM32), 1 m (3.28 ft)	VW3M8112R10

Motor Cables

Motor cables 1.0 mm²

Description	Reference
Motor cable 3 m (9.84 ft), (4 x 1.0 mm² + 2 x (2 x 0.75 mm²)) shielded; motor end 8-pin circular connector Y-TEC, other cable end open	VW3M5100R30
Motor cable 5 m (16.4 ft), (4 x 1.0 mm² + 2 x (2 x 0.75 mm²)) shielded; motor end 8-pin circular connector Y-TEC, other cable end open	VW3M5100R50
Motor cable 10 m (32.8 ft), (4 x 1.0 mm² + 2 x (2 x 0.75 mm²)) shielded; motor end 8-pin circular connector Y-TEC, other cable end open	VW3M5100R100
Motor cable 15 m (49.2 ft), (4 x 1.0 mm² + 2 x (2 x 0.75 mm²)) shielded; motor end 8-pin circular connector Y-TEC, other cable end open	VW3M5100R150
Motor cable 25 m (82 ft), (4 x 1.0 mm² + 2 x (2 x 0.75 mm²)) shielded; motor end 8-pin circular connector Y-TEC, other cable end open	VW3M5100R250
Motor cable 100 m (328 ft), (4 x 1.0 mm² + 2 x (2 x 0.75 mm²)) shielded; both cable ends open	VW3M5300R1000

Motor cables 1.5 mm²

Description	Reference
Motor cable 1.5 m (4.92 ft), (4 x 1.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R15
Motor cable 3 m (9.84 ft), (4 x 1.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R30
Motor cable 5 m (16.4 ft), (4 x 1.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R50
Motor cable 10 m (32.8 ft), (4 x 1.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R100
Motor cable 15 m (49.2 ft), (4 x 1.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R150
Motor cable 20 m (65.6 ft), (4 x 1.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R200
Motor cable 25 m (82 ft), (4 x 1.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R250
Motor cable 50 m (164 ft), (4 x 1.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R500
Motor cable 75 m (246 ft), (4 x 1.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R750
Motor cable 25 m (82 ft), (4 x 1.5 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5301R250
Motor cable 50 m (164 ft), (4 x 1.5 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5301R500
Motor cable 100 m (328 ft), (4 x 1.5 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5301R1000

Motor cables 2.5 mm²

Description	Reference
Motor cable 3 m (9.84 ft), (4 x 2.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R30
Motor cable 5 m (16.4 ft), (4 x 2.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R50
Motor cable 10 m (32.8 ft), (4 x 2.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R100
Motor cable 15 m (49.2 ft), (4 x 2.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R150

Description	Reference
Motor cable 20 m (65.6 ft), (4 x 2.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R200
Motor cable 25 m (82 ft), (4 x 2.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R250
Motor cable 50 m (164 ft), (4 x 2.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R500
Motor cable 75 m (246 ft), (4 x 2.5 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R750
Motor cable 25 m (82 ft), (4 x 2.5 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5302R250
Motor cable 50 m (164 ft), (4 x 2.5 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5302R500
Motor cable 100 m (328 ft), (4 x 2.5 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5302R1000

Motor cables 4 mm²

Description	Reference
Motor cable 3 m (9.84 ft), (4 x 4 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R30
Motor cable 5 m (16.4 ft), (4 x 4 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R50
Motor cable 10 m (32.8 ft), (4 x 4 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R100
Motor cable 15 m (49.2 ft), (4 x 4 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R150
Motor cable 20 m (65.6 ft), (4 x 4 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R200
Motor cable 25 m (82 ft), (4 x 4 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R250
Motor cable 50 m (164 ft), (4 x 4 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R500
Motor cable 75 m (246 ft), (4 x 4 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R750
Motor cable 25 m (82 ft), (4 x 4 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5303R250
Motor cable 50 m (164 ft), (4 x 4 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5303R500
Motor cable 100 m (328 ft), (4 x 4 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5303R1000

Motor cables 6 mm²

Description	Reference
Motor cable 3 m (9.84 ft), (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 (16.4 ft), (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 (32.8 ft), (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 (49.2 ft), (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 (65.6 ft), (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 (82 ft), (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 (164 ft), (4 x 6 mm² + (2 x 1 mm²)) shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R500

Description	Reference
Motor cable 75 m (246 ft), (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 (82 ft), (4 x 6 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5305R250
Motor cable 50 m (164 ft), (4 x 6 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5305R500
Motor cable 100 m (328 ft), (4 x 6 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5305R1000

Motor cables 10 mm²

Description	Reference
Motor cable 3 m (9.84 ft), (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 (16.4 ft), (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 (32.8 ft), (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 (49.2 ft), (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 (65.6 ft), (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 (82 ft), (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 (164 ft), (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 (246 ft), (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 (82 ft), (4 x 10 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5304R250
Motor cable 50 m (164 ft), (4 x 10 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5304R500
Motor cable 100 m (328 ft), (4 x 10 mm² + (2 x 1 mm²)) shielded; both cable ends open	VW3M5304R1000

Encoder Cables

Description	Reference
Encoder cable 3 m (9.84 ft), (3 x 2 x 0.14 mm² + 2 x 0.34 mm²) shielded; motor end 12-pin circular connector Y-TEC, device end 10-pin connector RJ45	VW3M8100R30
Encoder cable 5 m (16.4 ft), (3 x 2 x 0.14 mm² + 2 x 0.34 mm²) shielded; motor end 12-pin circular connector Y-TEC, device end 10-pin connector RJ45	VW3M8100R50
Encoder cable 10 m (32.8 ft), (3 x 2 x 0.14 mm² + 2 x 0.34 mm²) shielded; motor end 12-pin circular connector Y-TEC, device end 10-pin connector RJ45	VW3M8100R100
Encoder cable 15 m (49.2 ft), (3 x 2 x 0.14 mm² + 2 x 0.34 mm²) shielded; motor end 12-pin circular connector Y-TEC, device end 10-pin connector RJ45	VW3M8100R150
Encoder cable 25 m (82 ft), (3 x 2 x 0.14 mm² + 2 x 0.34 mm²) shielded; motor end 12-pin circular connector Y-TEC, device end 10-pin connector RJ45	VW3M8100R250
Encoder cable 1.5 m (4.92 ft), (3 x 2 x 0.14 mm² + 2 x 0.34 mm²) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R15
Encoder cable 3 m (9.84 ft), (3 x 2 x 0.14 mm² + 2 x 0.34 mm²) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R30
Encoder cable 5 m (16.4 ft), (3 x 2 x 0.14 mm² + 2 x 0.34 mm²) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R50
Encoder cable 10 m (32.8 ft), (3 x 2 x 0.14 mm² + 2 x 0.34 mm²) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R100
Encoder cable 15 m (49.2 ft), (3 x 2 x 0.14 mm² + 2 x 0.34 mm²) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R150

Description	Reference
Encoder cable 20 m (65.6 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R200
Encoder cable 25 m (82 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R250
Encoder cable 50 m (164 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R500
Encoder cable 75 m (246 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R750
Encoder cable 25 m (82 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; both cable ends open	VW3M8222R250
Encoder cable 50 m (164 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; both cable ends open	VW3M8222R500
Encoder cable 100 m (328 ft), (3 x 2 x 0.14 mm^2 + 2 x 0.34 mm^2) shielded; both cable ends open	VW3M8222R1000
Encoder cable 100 m (328 ft), (5 x 2 x 0.25 mm^2 + 2 x 0.5 mm^2) shielded; both cable ends open	VW3M8221R1000
Encoder cable 1 m (3.28 ft), shielded; HD15 D-SUB (male); other cable end open	VW3M4701

Connectors

Description	Reference
Connector for motor cable, motor end Y-TEC, 1 mm^2, 5 pieces	VW3M8219
Connector for motor cable, motor end M23, 1.5 ... 2.5 mm^2, 5 pieces	VW3M8215
Connector for motor cable, motor end M40, 4 mm^2, 5 pieces	VW3M8217
Connector for motor cable, motor end M40, 6...10 mm^2, 5 pieces	VW3M8218
Connector for encoder cable, motor end Y-TEC, 5 pieces	VW3M8220
Connector for encoder cable, motor end M23, 5 pieces	VW3M8214
Connector for encoder cable, drive end RJ45 (10 pins), 5 pieces	VW3M2208

The tools required for cable assembly can be ordered directly from the manufacturer.

- Crimping tool for power connector Y-TEC:
  Intercontec C0.201.00 or C0.235.00
  www.intercontec.com
- Crimping tool for power connector M23/M40:
  Coninvers SF-Z0025, SF-Z0026
  www.coninvers.com
- Crimping tool for encoder connector Y-TEC:
  Intercontec C0.201.00 or C0.235.00
  www.intercontec.com
- Crimping tool for encoder connector M23:
  Coninvers RC-Z2514
  www.coninvers.com
- Crimping tools for encoder connector RJ45 10 pins:
  Yamaichi Y-ConTool-11, Y-ConTool-20, Y-ConTool-30
  www.yamaichi.com

External Braking Resistors

Description	Reference
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7601R07
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7601R20
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7601R30
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7602R07
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7602R20
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7602R30
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7603R07
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7603R20
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7603R30
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7604R07
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7604R20
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7604R30
Braking resistor IP65; 72 Ω; maximum continuous power 100 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7605R07
Braking resistor IP65; 72 Ω; maximum continuous power 100 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7605R20
Braking resistor IP65; 72 Ω; maximum continuous power 100 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7605R30
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7606R07
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7606R20
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7606R30
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7607R07
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7607R20
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14)	VW3A7607R30
Braking resistor IP65; 100 Ω; maximum continuous power 100 W; 0.75 m (2.46 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7608R07
Braking resistor IP65; 100 Ω; maximum continuous power 100 W; 2 m (6.56 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7608R20
Braking resistor IP65; 100 Ω; maximum continuous power 100 W; 3 m (9.84 ft) connection cable, 2.1 mm² (AWG 14), UL	VW3A7608R30
Braking resistor IP20; 16 Ω; maximum continuous power 960 W; M6 terminals, UL	VW3A7733
Braking resistor IP20; 10 Ω; maximum continuous power 960 W; M6 terminals, UL	VW3A7734

DC Bus Accessories

Description	Reference
DC bus connection cable, 0.1 m (0.33 ft), 2 * 6 mm² (2 * AWG 10), pre-assembled, 5 pieces	VW3M7101R01
DC bus connection cable, 15 m (49.2 ft), 2 * 6 mm² (2 * AWG 10), Twisted Pair, shielded	VW3M7102R150
DC bus connector kit, connector housing and crimp contacts for 3 ... 6 mm² (AWG 12 ... 10), 10 pieces	VW3M2207

A crimping tool is required for the crimp contacts of the connector kit.
Manufacturer:

Tyco Electronics, Heavy Head Hand Tool, Tool Pt. No 180250

Mains Reactors

Description	Reference
Mains reactor single-phase; 50-60 Hz; 7 A; 5 mH; IP00	VZ1L007UM50
Mains reactor single-phase; 50-60 Hz; 18 A; 2 mH; IP00	VZ1L018UM20
Mains reactor three-phase; 50-60 Hz; 16 A; 2 mH; IP00	VW3A4553
Mains reactor three-phase; 50-60 Hz; 30 A; 1 mH; IP00	VW3A4554

External Mains Filters

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

Spare Parts Connectors, Fans, Cover Plates

Description	Reference
Connector kit LXM32A: 3 x AC power stage supply (230/400 Vac), 1 x control supply, 2 x digital inputs/outputs (4-pin), 2 x motor (10 A / 24 A), 1 x holding brake	VW3M2202
Cooling fan kit 40 x 40 mm (1.57 x 1.57 in), plastic housing, with connection cable	VW3M2401
Cooling fan kit 60 x 60 mm (2.36 x 2.36 in), plastic housing, with connection cable	VW3M2402
Cooling fan kit 80 x 80 mm (3.15 x 3.15 in), plastic housing, with connection cable	VW3M2403

Service, Maintenance, and Disposal

Maintenance

Maintenance Plan

Inspect the product for pollution or damage at regular intervals.

Repairs may only be made by the manufacturer.

Prior to any type of work on the drive system, consult the sections on Installation and Commissioning for information on the precautions and processes to be observed.

Include the following points in the maintenance plan of your machine.

Connections and Fastening

- Inspect all connection cables and connectors regularly for damage. Replace damaged cables immediately.
- Verify that all output elements are firmly seated.
- Tighten all mechanical and electrical threaded connections to the specified torque.

Lifetime Safety Function STO

The STO safety function is designed for a lifetime of 20 years. After this period, the data of the safety function are no longer valid. The expiry date is determined by adding 20 years to the DOM shown on the nameplate of the product.

This date must be included in the maintenance plan of the system.

Do not use the safety function after this date.

Example:

The DOM on the nameplate of the product is shown in the format DD.MM.YY, for example 31.12.20. (31 December 2020). This means: Do not use the safety function after December 31, 2040.

Replacing the Product

Description

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Follow the procedure below for replacing devices.

- Save all parameter settings. To do so, use a memory card or save the data to a PC using the commissioning software, see Parameter Management, page 151.
- Power off all supply voltages. Verify that no voltages are present (safety instructions), see Product Related Information, page 13.
- 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 section Installation, page 75.
- 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 section Commissioning, page 102.

Replacement of the Motor

Description

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

⚠WARNING

UNINTENDED MOVEMENT

Only use approved combinations of drive and motor.

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

- Power off all supply voltages. Verify that no voltages are present (safety instructions), see Product Related Information, page 13.
- 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 section Installation, page 75.

If the connected motor is replaced by another motor, the motor data set is read again. If the device detects a different motor type, the control loop parameters are recalculated and the HMI displays nOt. See section Acknowledging a Motor Change, page 296 for additional information.

If the motor is replaced, the encoder parameters must also be re-adjusted, see Setting Parameters for Encoder, page 131.

Changing the Motor Type Temporarily

If you want to operate the new motor type only temporarily via the device, press ESC at the HMI.

The newly calculated control loop parameters are not saved to the nonvolatile memory. This way, you can resume operation with the original motor using the saved control loop parameters.

Changing the Motor Type Permanently

If you want to operate the new motor type permanently via this device, press the navigation button at the HMI.

The newly calculated control loop parameters are saved to the nonvolatile memory.

See also Acknowledging a Motor Change, page 296.

Shipping, Storage, Disposal

Shipping

The product must be protected against shocks during transportation. If possible, use the original packaging for shipping.

Storage

The product may only be stored in spaces where the specified permissible ambient conditions are met.

Protect the product from dust and dirt.

Disposal

The product consists of various materials that can be recycled. Dispose of the product in accordance with local regulations.

Visit https://www.se.com/green-premium for information and documents on environmental protection as per ISO 14025 such as:

- EoLi (Product End-of-Life Instructions)
- PEP (Product Environmental Profile)

Glossary

A

Actual value:

In control engineering, the actual value is the value of the controlled variable at a given instant (for example, actual velocity, actual torque, actual position, actual current, and so on). An actual value can be a measured value (for example, the actual position can be a value measured by an encoder) or a derived value (for example, the actual torque can be a value derived from the actual current). The actual value is an input value used by the control loops of the drive to reach the reference value. Definition as per IEC 61800-7 series and IEC 60050.

C

CCW:

Counter **C**lock**w**ise.

CW:

Clock**w**ise.

D

DC bus:

Circuit that supplies the power stage with energy (direct voltage).

Degree of protection:

The degree of protection is a standardized specification for electrical equipment that describes the protection against the ingress of foreign objects and water (for example: IP 20).

Direction of movement :

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

DOM:

Date **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:

31.12.19 corresponds to December 31, 2019.

31.12.2019 corresponds to December 31, 2019.

Drive system:

System consisting of controller, drive and motor.

E

Electronic gear:

Calculation of a new output velocity for the motor movement based on the input velocity and the values of an adjustable gear ratio; calculated by the drive system.

EMC:

Electromagnetic compatibility

Encoder :

Sensor that converts a measured distance or angle into an electrical signal. This signal is evaluated by the drive to determine the actual position of a shaft (rotor) or a driving unit.

Error class :

Classification of errors into groups. The different error classes allow for specific responses to errors, for example by severity.

Error:

Discrepancy between a detected (computed, measured or signaled) value or condition and the specified or theoretically correct value or condition.

F

Factory settings:

Settings when the product is shipped.

Fault Reset:

Function used to exit the operating state Fault. Before the function is used, the cause of the detected error must be removed.

Fault:

Fault is an operating state. If the monitoring functions detect an error, a transition to this operating state is triggered, depending on the error class. A "Fault Reset" or a power cycle are required to exit this operating state. Prior to this, the cause of the detected error must be removed. Further information can be found in the pertinent standards such as IEC 61800-7, ODVA Common Industrial Protocol (CIP).

I

I/O:

Inputs/outputs

I2t monitoring:

Anticipatory temperature monitoring. The expected temperature rise of components is calculated in advance on the basis of the motor current. If a limit value is exceeded, the drive reduces the motor current.

Inc:

Increments

Index pulse:

Signal of an encoder to reference the rotor position in the motor. The encoder returns one index pulse per revolution.

Internal units:

Resolution of the power stage at which the motor can be positioned. Internal units are specified in increments.

L

Limit switch:

Switches that signal overtravel of the permissible range of travel.

M

Monitoring function:

Monitoring functions acquire a value continuously or cyclically (for example, by measuring) in order to check whether it is within permissible limits. Monitoring functions are used for error detection. Monitoring functions are not safety functions.

N

NMT:

Network Management (NMT), part of the CANopen communication profile; tasks include initialization of the network and devices, starting, stopping and monitoring of devices

Node guarding:

Monitoring of the connection to the slave at an interface for cyclic data traffic.

P

Parameter :

Device data and values that can be read and set (to a certain extent) by the user.

PELV:

Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41

Persistent:

Indicates whether the value of the parameter remains in the memory after the device is switched off.

Power stage :

The power stage controls the motor. The power stage generates current for controlling the motor on the basis of the motion signals from the controller.

Pulse/direction signals:

Digital signals with variable pulse frequencies which signal changes in position and direction of movement via separate signal wires.

Q

Quick Stop:

The function can be used for fast deceleration of a movement as a response to a detected error or via a command.

R

RCD:

RCD residual current device.

rms:

"Root Mean Square" value of a voltage (V_{rms}) or a current (A_{rms})

RS485 :

Fieldbus interface as per EIA-485 which enables serial data transmission with multiple devices.

S

Safety-related function:

Safety-related 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)).

Scaling factor:

This factor is the ratio between an internal unit and a user-defined unit.

U

User-defined unit:

Unit whose reference to motor movement can be determined by the user via parameters.

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