LXM32A

AC servo drive
Product manual

V1.08, 04.2014

0198441113755, V1.08, 04.2014

www.schneider-electric.com

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

0198441113755, V1.08, 04.2014

Table of contents

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014

Safety Information

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

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

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

Hazard categories

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

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

0198441113755, V1.08, 04.2014

Qualification of personnel

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

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

Intended use

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

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

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

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

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

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

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

0198441113755, V1.08, 04.2014

Basic information

DANGER

HAZARD DUE TO ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation and who have received safety training to recognize and avoid hazards involved are authorized to work on and with this drive system. Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- The system integrator is responsible for compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Many components of the product, including the printed circuit board, operate with mains voltage. Do not touch. Use only electrically insulated tools.
- Do not touch unshielded components or terminals with voltage present.
- The motor itself generates voltage when the motor shaft is rotated. Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- AC voltage can couple voltage to unused conductors in the motor cable. Insulate both ends of unused conductors of the motor cable.
- Do not short across the DC bus terminals or the DC bus capacitors.
- Before performing work on the drive system:
  - Disconnect all power, including external control power that may be present.
  - Place a "Do Not Turn On" label on all power switches.
  - Lock all power switches in the open position.
  - **Wait 15 minutes** to allow the DC bus capacitors to discharge. Measure the voltage on the DC bus as per chapter "DC bus voltage measurement" and verify the voltage is <42 Vdc. The DC bus LED is not an indicator of the absence of DC bus voltage.
- Install and close all covers before applying voltage.

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

0198441113755, V1.08, 04.2014

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

⚠ WARNING

UNEXPECTED MOVEMENT

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

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

⚠ WARNING

LOSS OF CONTROL

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

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

1) For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control” and to NEMA ICS 7.1 (latest edition), “Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems”.

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

⚠ WARNING

EXPLOSION HAZARD

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

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

0198441113755, V1.08, 04.2014

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 10 minutes to allow the DC bus capacitors to discharge.
- Use a properly rated voltage-sensing device for measuring (>800 Vdc).
- Measure the DC bus voltage between the DC bus terminals (PA/+ and PC/-) to verify that the voltage is less than 42 Vdc.
- Contact your local Schneider Electric representative if the DC bus capacitors do not discharge to less than 42 Vdc within a period of 10 minutes.
- Do not operate the product if the DC bus capacitors do not discharge properly.
- Do not attempt to repair the product if the DC bus capacitors do not discharge properly.

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

Functional safety

Using the safety functions integrated in this product requires careful planning. See chapter "4.9 Safety function STO ("Safe Torque Off")", page 73 for additional information.

Standards and terminology

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

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

Among others, these standards include:

- IEC 61800 series: "Adjustable speed electrical power drive systems"
- IEC 61158 series: "Digital data communications for measurement and control – Fieldbus for use in industrial control systems"
- IEC 61784 series: "Industrial communication networks – Profiles"
- IEC 61508 series: "Functional safety of electrical/electronic/ programmable electronic safety-related systems"

Also see the glossary at the end of this manual.

0198441113755, V1.08, 04.2014

About the book

This manual is valid for LXM32A standard products. Chapter "1 Introduction" lists the type code for this product. The type code allows you to identify whether your product is a standard product or a customized version.

The following manuals belong to this product:

- **Product manual**, describes the technical data, installation, commissioning and the operating modes and functions.
- **Motor manual**, describes the technical characteristics of the motors, including correct installation and commissioning.
- **Fieldbus manual**, description required to integrate the product into a fieldbus.

Source manuals

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

http://www.schneider-electric.com

Source CAD data

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

http://www.schneider-electric.com

Work steps

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

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

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

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

Making work easier

Information on making work easier is highlighted by this symbol:

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

Parameters

In text sections, parameters are shown with the parameter name, for example `_IO_act`. The way parameters are represented in tables is explained in the chapter Parameters. The parameter list is sorted alphabetically by parameter name.

SI units

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

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

Inverted signals

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

0198441113755, V1.08, 04.2014

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

Glossary Explanations of special technical terms and abbreviations.

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

Further reading

Recommended literature for further reading:

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

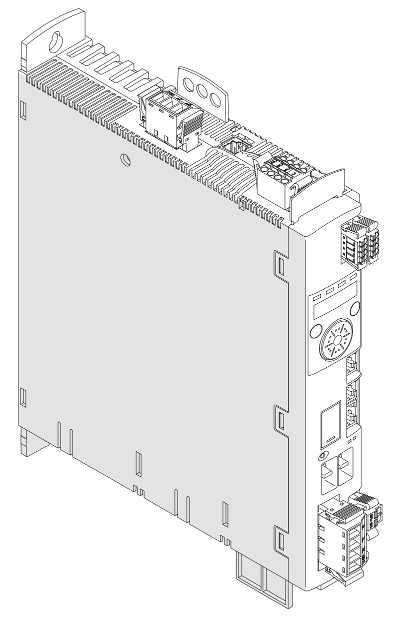
0198441113755, V1.08, 04.2014

1 Introduction

1.1 Device overview

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

Lexium servo drive 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 reference values for numerous operating modes are supplied via this interface.
- The product is commissioned via the integrated HMI, a PC with commissioning software or the fieldbus.
- The safety function "Safe Torque Off" (STO) as per IEC 61800-5-2 is implemented on board.
- A memory card slot is provided for backup and copying of parameters and fast device replacement.

1.2 Components and interfaces

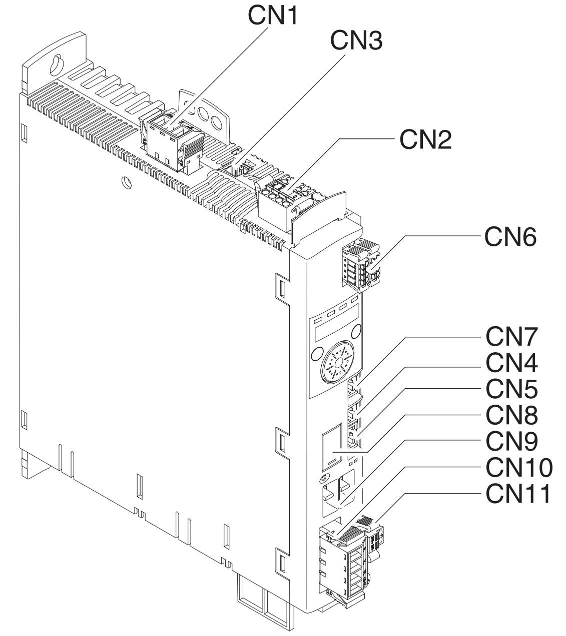


Figure 1: Overview of connections

(CN1) Mains connection (power stage supply)

(CN2) Connection for

- 24V controller supply
- Safety function STO

(CN3) Motor encoder connection (encoder 1)

(CN4) CAN in

(CN5) CAN out

(CN6) Inputs and outputs

- 4 configurable digital inputs
- 2 configurable digital outputs

(CN7) Modbus (commissioning interface)

(CN8) Connection for external braking resistor

(CN9) DC bus connection

(CN10) Motor phases connection

(CN11) Motor holding brake connection

0198441113755, V1.08, 04.2014

1.3 Nameplate

The nameplate contains the following data:

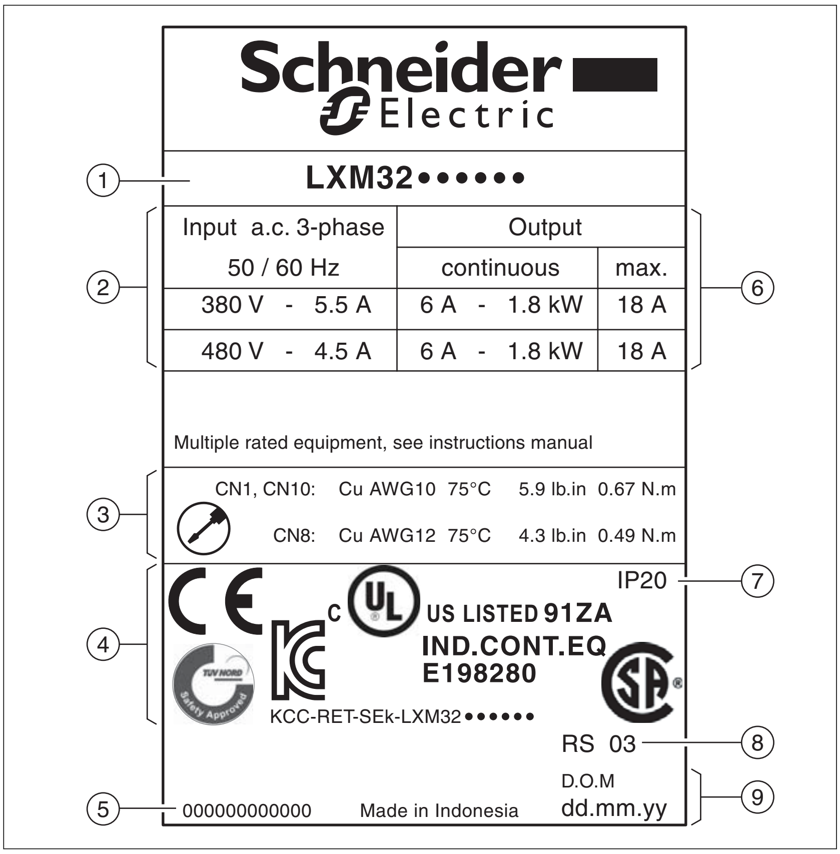


Figure 2: Nameplate

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

1.4 Type code

	LXM	32	A	D18	M2	••••
Product designation LXM = Lexium						
Product type 32 = AC servo drive for one axis						
Interfaces C = Compact Drive with analog inputs and Pulse Train A = Advanced Drive with CANopen fieldbus M = Modular Drive						
Peak current U45 = 4.5 A_{rms} U60 = 6 A_{rms} U90 = 9 A_{rms} D12 = 12 A_{rms} D18 = 18 A_{rms} D30 = 30 A_{rms} D72 = 72 A_{rms}						
Power stage supply M2 = 1~, 115/200/240 Vac N4 = 3~, 208/400/480 Vac [1)]						
Further options						

1) 208 Vac: With firmware version ≥V01.04 and DOM ≥10.05.2010

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

Customized version: Position 12 of the type code is an "S". The subsequent number defines the customized version. Example: LXM32••••••S123

The device designation is shown on the nameplate.

0198441113755, V1.08, 04.2014

2 Technical Data

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

2.1 Ambient conditions

Climatic environmental conditions transportation and storage

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

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

The following relative humidity is permissible during transportation and storage:

Relative humidity (non-condensing)	%	<95

Climatic environmental conditions operation

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

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

The following relative humidity is permissible during operation:

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

0198441113755, V1.08, 04.2014

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

Installation site and connection

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

Pollution degree and degree of protection

Pollution degree		2
Degree of protection		IP 20

Degree of protection when the safety function is used

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

Vibration and shock

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

0198441113755, V1.08, 04.2014

2.2 Mechanical data

2.2.1 Dimensional drawings

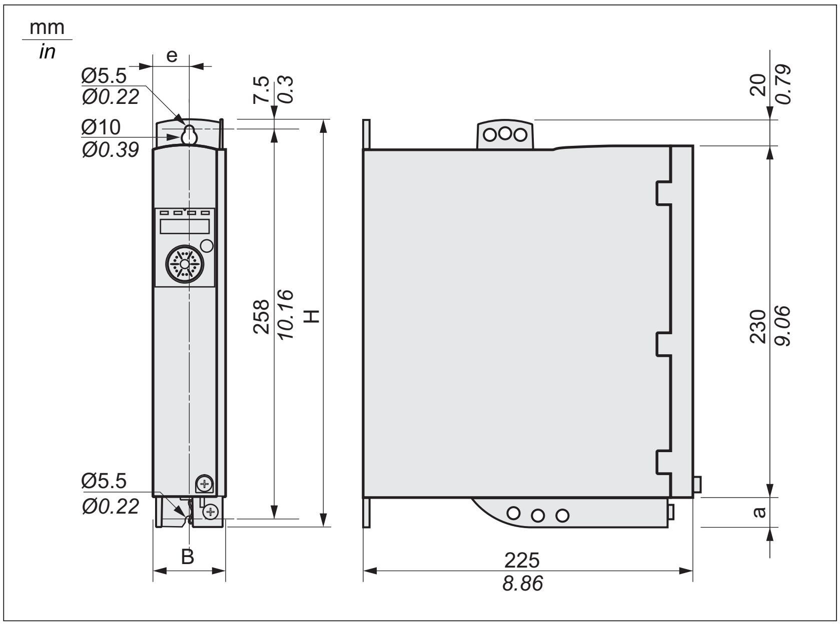


Figure 3: Dimensional drawing

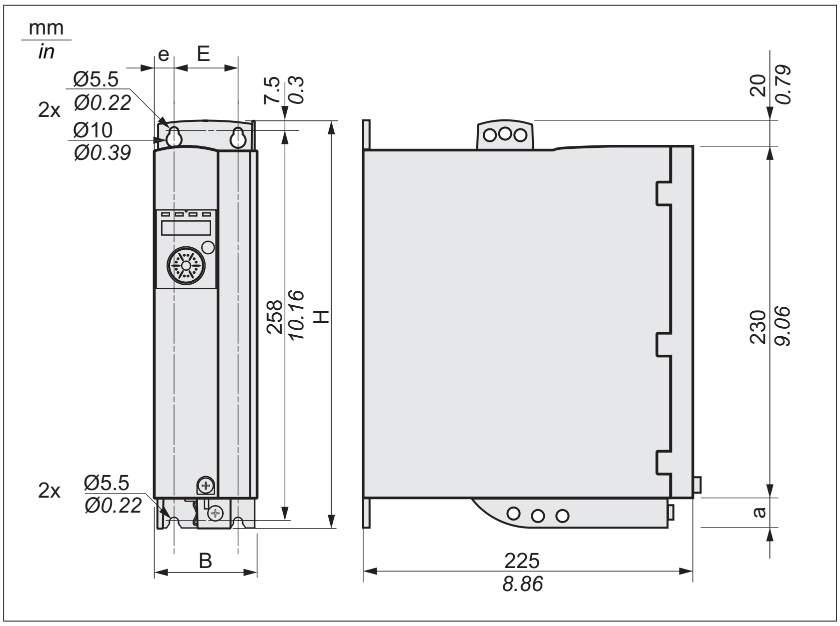


Figure 4: Dimensional drawing

0198441113755, V1.08, 04.2014

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

1) >1 m/s

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

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

Mass

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

0198441113755, V1.08, 04.2014

2.3 Electrical Data

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

2.3.1 Power stage

Mains voltage: range and tolerance

115/230 Vac single-phase	Vac	100 -15% ... 120 +10% 200 -15% ... 240 +10%
208/400/480 Vac three-phase [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

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

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

Type of mains (type of grounding)

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

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

Leakage current

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

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

Harmonic currents and impedance

The harmonic currents depend on the impedance of the supply mains. This is expressed in terms of the short-circuit current of the supply mains. If the supply mains has a higher short-circuit current than indicated in the Technical Data for the device, use upstream mains reactors. See chapter "11.13 Mains reactors" for suitable mains reactors.

Monitoring the continuous output current

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

Monitoring of the continuous output power

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

PWM frequency power stage

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

PWM frequency power stage	kHz	8

0198441113755, V1.08, 04.2014

Approved motors

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

Inquire for other motors.

Inductance of motor

The permissible minimum inductance of the motor to be connected depends on the device type and the nominal mains voltage. See the tables on pages 29 to 33 for the values.

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

0198441113755, V1.08, 04.2014

2.3.1.1 Data for single-phase devices at 115 Vac

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

1) As per IEC 60269; Circuit breakers with B or C characteristic; See "2.4 Conditions for UL 508C and CSA" for UL and CSA; Lower ratings are permissible; The fuse must be rated in such a way that the fuse does not trip at the specified input current.
2) At a mains impedance corresponding to a short-circuit current of the supply mains of 1 kA
3) At nominal power and nominal voltage
4) with reference to the input current
5) Condition: internal braking resistor not active; value at nominal current, nominal voltage and nominal power; value approximately proportional with output current
6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

2.3.1.2 Data for single-phase devices at 230 Vac

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

1) As per IEC 60269; Circuit breakers with B or C characteristic; See "2.4 Conditions for UL 508C and CSA" for UL and CSA; Lower ratings are permissible; The fuse must be rated in such a way that the fuse does not trip at the specified input current.
2) At a mains impedance corresponding to a short-circuit current of the supply mains of 1 kA
3) At nominal power and nominal voltage
4) with reference to the input current
5) Condition: internal braking resistor not active; value at nominal current, nominal voltage and nominal power; value approximately proportional with output current
6) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

0198441113755, V1.08, 04.2014

2.3.1.3 Data for three-phase devices at 208 Vac

LXM32•...		U60N4	D12N4	D18N4	D30N4	D72N4
Nominal voltage (three-phase) 1)	Vac	208	208	208	208	208
Inrush current limitation	A	2.2	4.9	10	10	29
Maximum fuse to be connected upstream 2)	A	32	32	32	32	32
Short-circuit current rating (SCCR)	kA	12	12	12	12	12
Continuous output current	A_{rms}	1.5	3	6	10	24
Peak output current	A_{rms}	6	12	18	30	72
Minimum inductance motor (phase/ phase)	mH	8.5	4.5	3	1.7	0.7
Values without mains reactor						
Nominal power	kW	0.35	0.7	1.2	2.0	5
Input current 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
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) 208 Vac: With firmware version ≥V01.04 and DOM ≥10.05.2010
2) As per IEC 60269; Circuit breakers with B or C characteristic; See "2.4 Conditions for UL 508C and CSA" for UL and CSA; Lower ratings are permissible; The fuse must be rated in such a way that the fuse does not trip at the specified input current.
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

0198441113755, V1.08, 04.2014

2.3.1.4 Data for three-phase devices at 400 Vac

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

1) As per IEC 60269; Circuit breakers with B or C characteristic; See "2.4 Conditions for UL 508C and CSA" for UL and CSA; Lower ratings are permissible; The fuse must be rated in such a way that the fuse does not trip at the specified input current.
2) At nominal power and nominal voltage
3) with reference to the input current
4) Condition: internal braking resistor not active; value at nominal current, nominal voltage and nominal power; value approximately proportional with output current
5) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

0198441113755, V1.08, 04.2014

2.3.1.5 Data for three-phase devices at 480 Vac

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

1) As per IEC 60269; Circuit breakers with B or C characteristic; See "2.4 Conditions for UL 508C and CSA" for UL and CSA; Lower ratings are permissible; The fuse must be rated in such a way that the fuse does not trip at the specified input current.
2) At nominal power and nominal voltage
3) with reference to the input current
4) Condition: internal braking resistor not active; value at nominal current, nominal voltage and nominal power; value approximately proportional with output current
5) Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

2.3.1.6 Peak output currents

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

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

With hardware version ≥RS03: 5 seconds

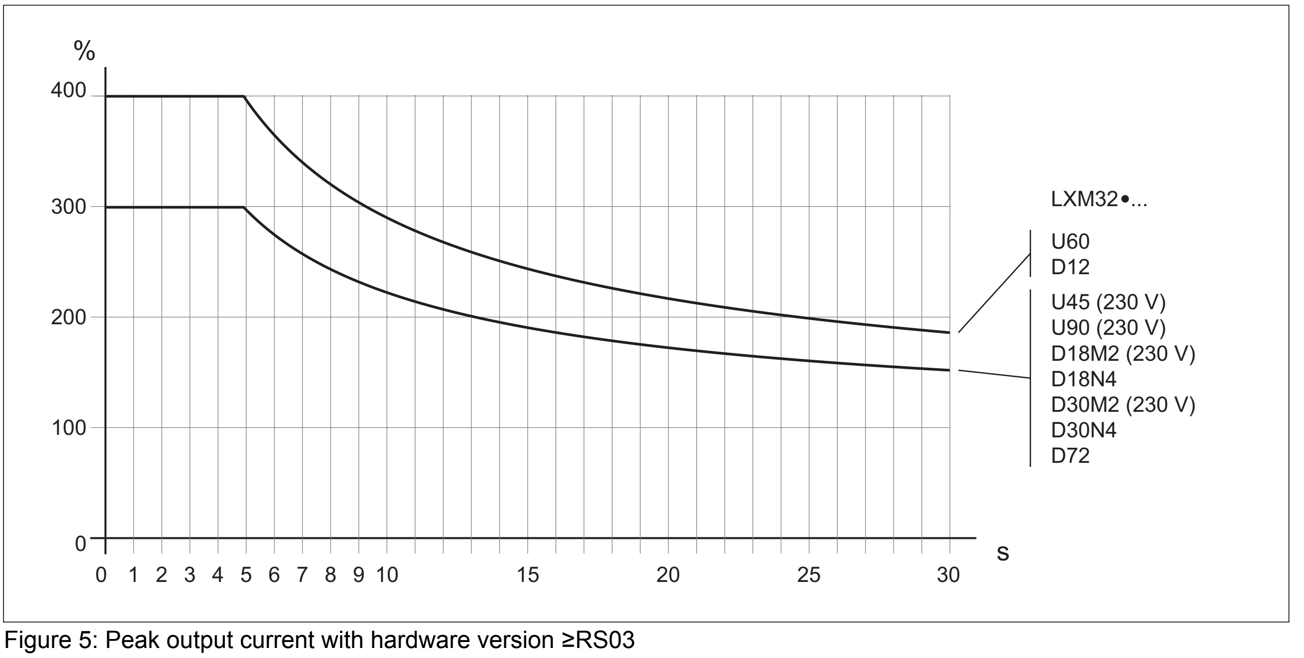


Figure 5: Peak output current with hardware version ≥RS03

With hardware version <RS03: 1 second

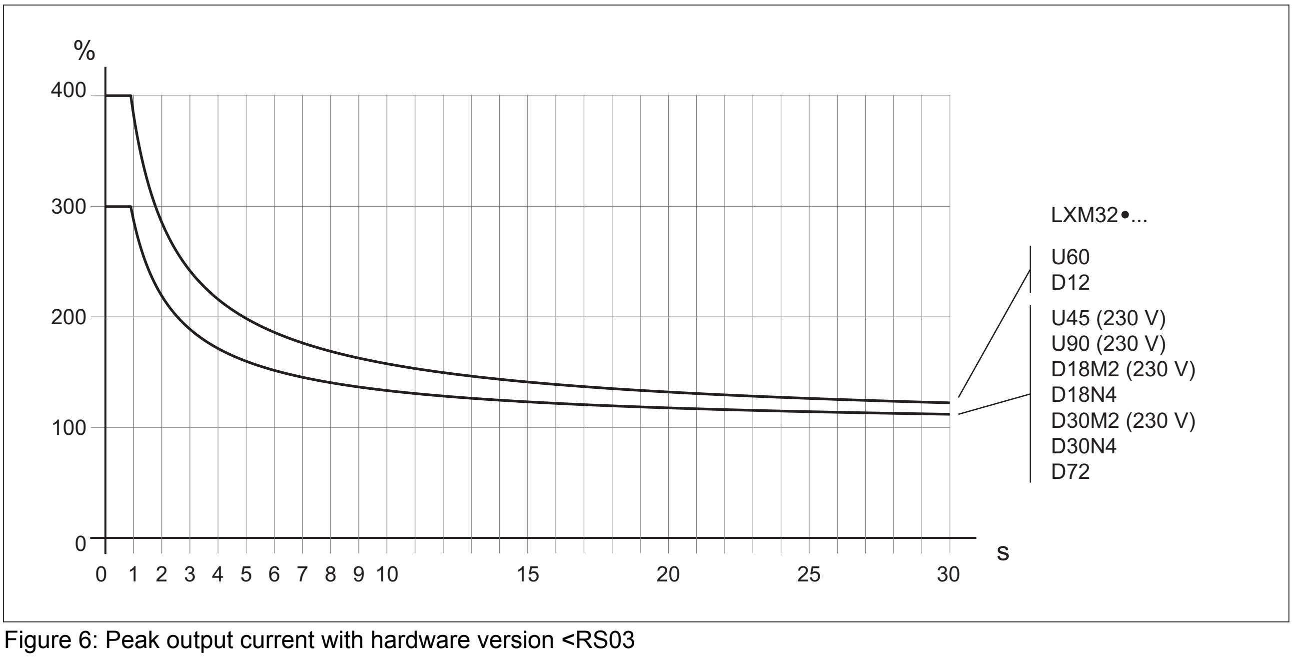


Figure 6: Peak output current with hardware version <RS03

0198441113755, V1.08, 04.2014

2.3.1.7 DC bus data for single-phase devices

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

2.3.1.8 DC bus data for three-phase devices

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

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

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

0198441113755, V1.08, 04.2014

2.3.2 Controller supply voltage 24V

24V supply

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

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

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

Controller supply in the case of motor with holding brake

If a motor with holding brake is connected, the 24 Vdc controller supply must be adjusted according to the connected motor type, the motor cable length and the cross section of the wires for the holding brake. The following diagram applies to the motor cables available as accessories, see chapter "11.8 Motor cables". Refer to the diagram for the voltage that must be available at CN2 for releasing the holding brake. The voltage tolerance is ±5 %.

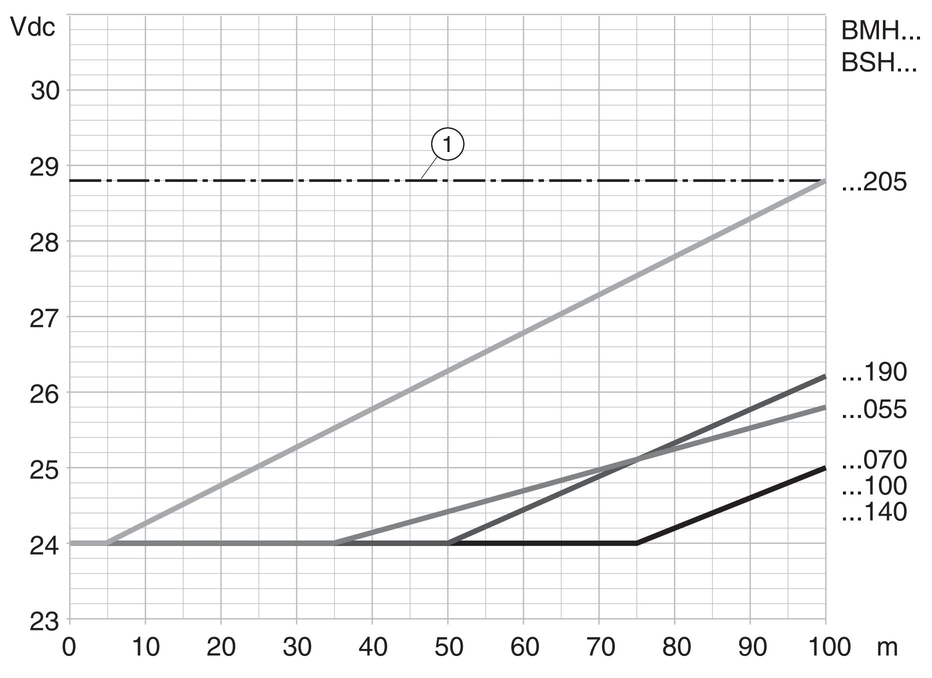


Figure 7: Controller supply in the case of motor with holding brake: the voltage depends on the motor type, the motor cable length and the conductor cross section.

(1) Maximum voltage of controller supply

0198441113755, V1.08, 04.2014

2.3.3 Signals

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

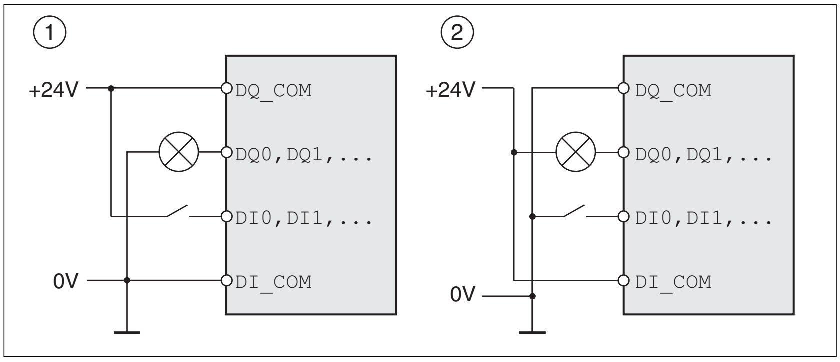


Figure 8: Logic type

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

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

Digital input signals 24 V

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

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

1) Adjustable via parameter (sampling period 250µs)

Capture input signals 24 V

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

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

0198441113755, V1.08, 04.2014

Input signals safety function STO

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

24 V output signals

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

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

Holding brake output CN11

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

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

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

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.

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

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

2.3.4 Functional safety

Data for maintenance plan and safety calculations

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

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

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

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

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

0198441113755, V1.08, 04.2014

2.3.5 Braking resistor

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

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

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

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

See chapter "2.3.1.7 DC bus data for single-phase devices", page 35 for the DC bus data.

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

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

See chapter "2.3.1.8 DC bus data for three-phase devices", page 35 for the DC bus data.

Further information on the subject	Page
Rating the external braking resistor	66
Mounting the external braking resistor (accessory)	86
Electrical installation of the braking resistor (accessory)	66
Setting the braking resistor parameters	161
Order data for external braking resistors (accessory)	473

0198441113755, V1.08, 04.2014

2.3.5.1 External braking resistors (accessories)

VW3A760...		1Rxx [1)]	2Rxx	3Rxx	4Rxx [1)]	5Rxx	6Rxx	7Rxx [1)]
Resistance	Ω	10	27	27	27	72	72	72
Continuous power	W	400	100	200	400	100	200	400
Maximum time in braking at 115 V / 230 V	s	0.72	0.552	1.08	2.64	1.44	3.72	9.6
Peak power at 115 V / 230 V	kW	18.5	6.8	6.8	6.8	2.6	2.6	2.6
Maximum peak energy at 115 V / 230 V	Ws	13300	3800	7400	18100	3700	9600	24700
Maximum time in braking at 400 V / 480 V	s	0.12	0.084	0.216	0.504	0.3	0.78	1.92
Peak power at 400 V / 480 V	kW	60.8	22.5	22.5	22.5	8.5	8.5	8.5
Maximum peak energy at 400 V / 480 V	Ws	7300	1900	4900	11400	2500	6600	16200
Degree of protection		IP65	IP65	IP65	IP65	IP65	IP65	IP65
UL approval (file no.)		-	E233422	E233422	-	E233422	E233422	-

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

VW3A77...		04	05
Resistance	Ω	15	10
Continuous power	W	1000	1000
Maximum time in braking at 115 V / 230 V	s	3.5	1.98
Peak power at 115 V / 230 V	kW	12.3	18.5
Maximum peak energy at 115 V / 230 V	Ws	43100	36500
Maximum time in braking at 400 V / 480 V	s	0.65	0.37
Peak power at 400 V / 480 V	kW	40.6	60.8
Maximum peak energy at 400 V / 480 V	Ws	26500	22500
Degree of protection		IP20	IP20
UL approval (file no.)		E221095	E221095

0198441113755, V1.08, 04.2014

2.3.6 Internal mains filter

Limit values

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

If the selected composition (product itself, mains filter, other accessories and measures) does not meet the requirements of category C1, the following information applies as per IEC 61800-3:

⚠ WARNING

RADIO INTERFERENCE

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

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

Emission

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

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

External mains filters must be used if longer motor cables are used. See page 44 for the technical data of the external mains filters available as accessories.

Further information on the subject	Page
Engineering information external mains filters (accessory)	64
Mounting the external mains filter (accessory)	86
Electrical installation of external mains filters (accessory)	101
Order data external mains filters (accessory)	481

0198441113755, V1.08, 04.2014

2.3.7 External mains filters (accessories)

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

Emission

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

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

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

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

Common external mains filter

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

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

Assignment of external mains filters to device type

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

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

Further information on the subject	Page
Engineering information external mains filters (accessory)	64
Mounting the external mains filter (accessory)	86
Electrical installation of external mains filters (accessory)	101
Order data external mains filters (accessory)	481

0198441113755, V1.08, 04.2014

2.3.8 Mains reactor (accessory)

Mains reactor

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

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

Further information on the subject	Page
Engineering information mains reactor (accessory)	63
Mounting the mains reactor (accessory)	86
Electrical installation of the mains reactor (accessory)	101
Order data mains reactor (accessory)	481

0198441113755, V1.08, 04.2014

2.4 Conditions for UL 508C and CSA

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

Ambient temperature during operation

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

Fuses

Use fuses as per UL 248.

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

Wiring

Use at least 60/75 °C copper conductors.

400/480 V three-phase devices

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

Overvoltage category

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

Motor Overload Protection

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

2.5 Certifications

Product certifications:

Certified by	Assigned number
TÜV Nord	SAS-192/2008TB-1
UL	E116875
CSA	2320425
CiA (Can in Automation)	CiA200906-301V402/20-0104

2.6 Declaration of conformity

Schneider Electric

EC DECLARATION OF CONFORMITY

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

Hereby declare under our own responsibility that the products:

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

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

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

Directive	Harmonized standard / Notified body reference
Directive 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE CONCIL of 12 December 2006 on the harmonization of the laws of the member states relating to electrical equipment designed for use within certain voltage limits	EN 61800-5-1: 2007 Adjustable speed electrical power drive systems – Part 5-1: Safety requirements – Electrical, thermal and energy. (IEC 61800-5-1:2007)
Directive 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE CONCIL of 15 December 2004 on the approximation of the laws of the member states relating to electromagnetic compatibility and repealing directive 89/336/EEC	EN 61800-3: 2004 Adjustable speed electrical power drive systems – part 3: EMC requirements and specific test methods. (IEC 61800-3:2004)
Directive 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE CONCIL of 17 May2006 on machinery, and amending Directive 95/16/EC (recast) Applying article 12(3)a, third alternative.	EN ISO 13849-1/2:2008 PL "e" Safety of machinery – Safety-related parts of control systems.
	EN61800-5-2:2007 SIL 3 Adjustable speed electrical power drive systems – Part 5-2: Safety requirements – Fonctional. (IEC 61800-5-2:2007)
	EN 62061:2005 SIL CL3 Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems.
	A volontary certification has been carried out by TÜV NORD Augsburg. Certificate n° SEBS-A.144502/13, V1.0

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

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

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

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

First year of affixing the CE marking: 2010

Issued at Pacy sur Eure - FRANCE: 21/03/2014

Authorised Signatories

Name: Frederic Roussel
Title: Drives Certification Manager
Signature:

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

CE Declaration LXM32 & Options 2014 wo S.doc

0198441113755, V1.08, 04.2014

Schneider Electric

EC DECLARATION OF CONFORMITY

List of references LXM32:

Single phase 115Vac / 230Vac

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

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

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

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

 CE Declaration LXM32 & Options 2014 wo S.doc

Schneider Electric

EC DECLARATION OF CONFORMITY

Options considered with LXM 32:

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

 CE Declaration LXM32 & Options 2014 wo S.doc

2.7 TÜV certificate for functional safety

TÜV NORD

Certificate

TÜV NORD SysTec GmbH & Co. KG hereby certifies

Schneider Electric Motion Deutschland GmbH
Breslauer Straße 7
77933 Lahr

that the implementation of the safety function "Safe Torque Off" (STO) of the drive

LXM32

meets the requirements listed in the following standards

- IEC 61508:2000; SIL 3
- IEC 61800-5-2:2007; SIL 3
- ISO 13849-1:2006; PL e (category 3)
- IEC 62061:2005; $SIL_{CL}3$

based on report no. SAS-0192/2008TB-1 in the valid version.
This certificate entitles the holder to use the mark

Expiry date: 2014-06-25
Certification No.: SAS-0192/08-1
Reference No: G.SCC.DL.06.007.02.SLA

Augsburg, 2009-06-25

TÜV NORD SysTec GmbH & Co. KG
Branch South
Halderstraße 27
86150 Augsburg

Gerhard M. Rieger

BA51 -10

3 Basics

3.1 Functional safety

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

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

Integrated safety function "Safe Torque Off" STO

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

IEC 61508 and IEC 61800-5-2

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

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

Safety Integrity Level (SIL)

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

Average Frequency of a Dangerous Failure per Hour (PFH)

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

0198441113755, V1.08, 04.2014

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

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

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

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

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

Fault avoidance measures

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

0198441113755, V1.08, 04.2014

4 Engineering

This chapter contains information on the application of the product that is vital in the engineering phase.

4.1 Electromagnetic compatibility (EMC)

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

⚠ WARNING

SIGNAL AND DEVICE INTERFERENCE

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

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

Limit values

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

If the selected composition (product itself, mains filter, other accessories and measures) does not meet the requirements of category C1, the following information applies as per IEC 61800-3:

⚠ WARNING

RADIO INTERFERENCE

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

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

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

0198441113755, V1.08, 04.2014

Overview: EMC-compliant wiring

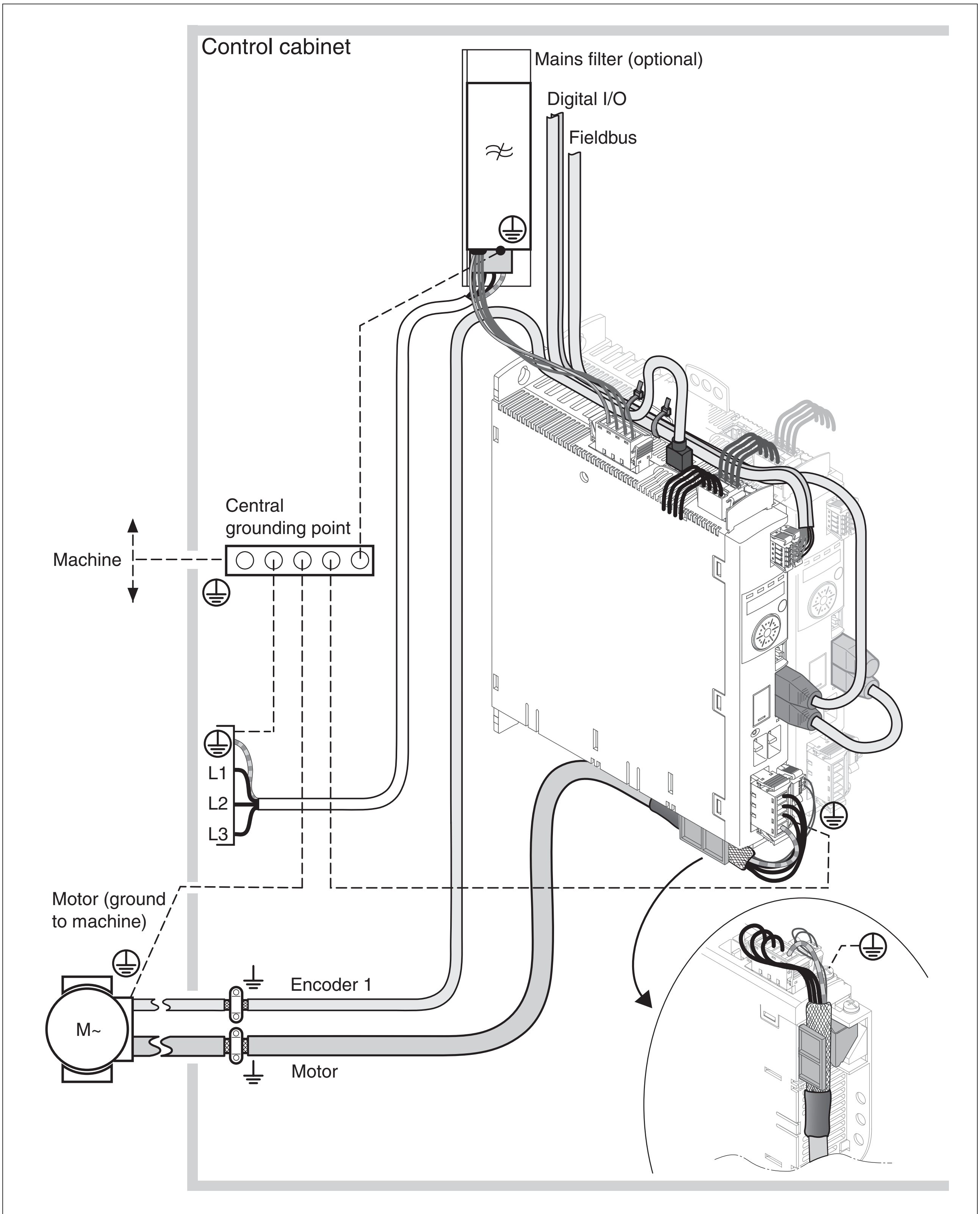


Figure 9: Overview of wiring under EMC considerations

0198441113755, V1.08, 04.2014

EMC requirements for the control cabinet

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

Shielded cables

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

0198441113755, V1.08, 04.2014

Cable installation

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

Power supply

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

Motor and encoder cables

Motor and encoder cables are especially critical in terms of EMC. Use only pre-assembled cables (see chapter "11 Accessories and spare parts") or cables that comply with the specifications (see chapter "4.2 Cables", page 59) and implement the EMC measures described below.

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

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

0198441113755, V1.08, 04.2014

Additional measures for EMC improvement

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

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

0198441113755, V1.08, 04.2014

4.2 Cables

Suitability of the cables

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

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

Connecting shields

Shield connection possibilities:

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

Equipotential bonding conductors

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

The equipotential bonding conductor must be rated for the maximum current flowing. Practical experience has shown that the following conductor cross sections can be used:

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

Cable guides

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

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

0198441113755, V1.08, 04.2014

4.2.1 Overview of the required cables

The properties of the required cables are listed in the table below. Use pre-assembled cables to reduce the risk of wiring errors. Pre-assembled cables can be found in chapter "11 Accessories and spare parts", page 473. If the product is used to comply with the requirements as per UL 508C, the conditions specified in chapter "2.4 Conditions for UL 508C and CSA", page 46, must be met.

	Maximum length:	**Minimum cross section**	**Shielded, both ends grounded**	**Twisted pair**	**PELV**
Controller 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	As power stage supply	Required		
Motor encoder	100 m	6 * 0.14 mm² and 2 * 0.34 mm² (6 * AWG 24 and 2 * AWG 20)	Required	Required	Required
Fieldbus CAN [5)]	– [6)]	0.14 mm² (AWG 24)	Required	Required	Required
Digital inputs / outputs	30 m	0.14 mm² (AWG 24)			Required
PC, commissioning interface	20 m	0.14 mm² (AWG 24)	Required	Required	Required

1) Note the installation requirements (protected cable installation), see page 74.
2) See "5.3.7 Connection of power stage supply voltage (CN1)"
3) Length depends on the required limit values for conducted interference.
4) See "5.3.4 Connection motor phases and holding brake (CN10 and CN11)"
5) The conductor cross section for RJ45 is reduced as compared to a D-Sub connection (0.25 mm² (AWG22)), the permissible length of the cable is reduced to 50% in the case of RJ45.
6) Depends on the baud rate, see "5.3.12 Connecting CAN (CN4 and CN5)", the permissible length of the cable is reduced to 50% in the case of RJ45.

Motor cable and encoder cable

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

The motor cables and encoder cables are suitable for drag chain applications; they are available in various lengths. See page 473 for the versions available as accessories.

0198441113755, V1.08, 04.2014

4.3 Residual current device

⚠ WARNING

THIS PRODUCT MAY CAUSE DIRECT CURRENT IN THE PROTECTIVE GROUND CONDUCTOR

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

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

Conditions for use of residual current device

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

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

Additional conditions:

- The product has an increased leakage current when it is switched on. Use residual current devices with a response delay so that the residual current device does not trip inadvertently due to the peak current that occurs when the product is switched on.
- High-frequency currents must be filtered.
- When using residual current devices, consider the leakage currents of connected consumers.

4.4 Operation in an IT grounding system

See chapter "2.3.1 Power stage", page 27 for the approved types of mains.

0198441113755, V1.08, 04.2014

4.5 Common DC bus

⚠ WARNING

DESTRUCTION OF SYSTEM COMPONENTS AND LOSS OF CONTROL

Incorrect use of a parallel connection of the DC bus may destroy the drives immediately or after a delay.

- Note the requirements concerning the use of a parallel DC bus connection.

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

Function principle

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

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

Requirements for use

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

4.6 Mains reactor

A mains reactor must be used under the following conditions:

- Operation via supply mains with low impedance (short-circuit current of supply mains greater than specified in chapter "2 Technical Data", page 27).
- If the nominal power of the drive is insufficient without mains reactor.
- In the case of high demands concerning the service life of the drive.
- In the case of operation with supply mains with reactive current compensation systems.
- For improvement of the power factor at the mains input and for reduction of mains harmonics.

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

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

Further information on the subject	**Page**
Technical data mains reactor (accessory)	45
Mounting the mains reactor (accessory)	86
Electrical installation of the mains reactor (accessory)	101
Order data mains reactor (accessory)	481

0198441113755, V1.08, 04.2014

4.7 Mains filter

Limit values

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

If the selected composition (product itself, mains filter, other accessories and measures) does not meet the requirements of category C1, the following information applies as per IEC 61800-3:

⚠ WARNING
RADIO INTERFERENCE In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

See chapter Technical Data, page 43, for the category the device complies with.

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

The drives have an integrated mains filter.

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

If the external mains filters offered in chapter "11.14 External mains filters" are used, the limit values specified in chapter "2.3.7 External mains filters (accessories)", page 44, are met.

Further information on the subject	**Page**
Technical data external mains filters (accessory)	44
Mounting the external mains filter (accessory)	86
Electrical installation of external mains filters (accessory)	101
Order data external mains filters (accessory)	481

0198441113755, V1.08, 04.2014

4.7.1 Deactivating the Y capacitors

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

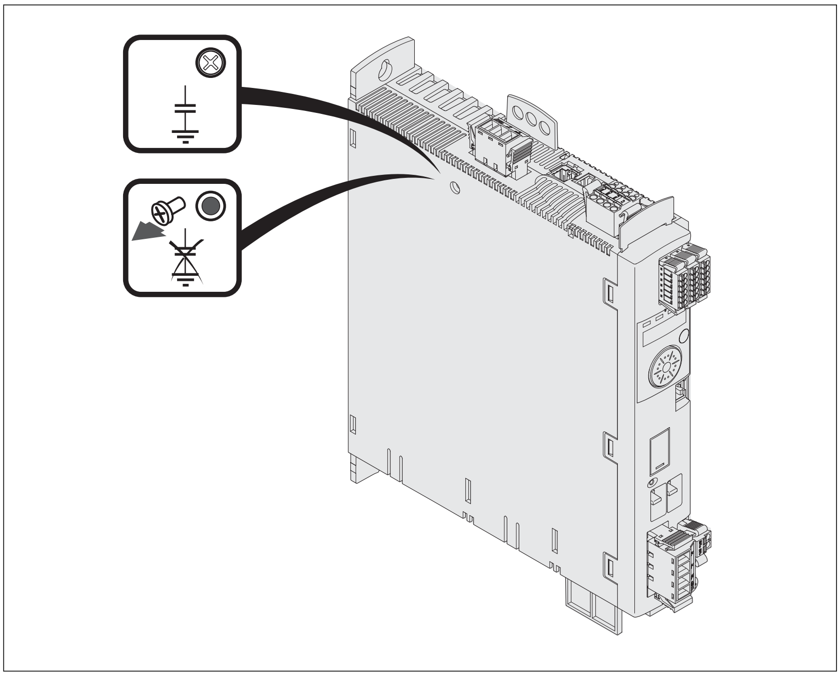


Figure 10: Deactivating/activating the internal Y capacitors

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

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

4.8 Rating the braking resistor

⚠ DANGER

FIRE HAZARD CAUSED BY EXTERNAL DRIVING FORCES ACTING ON MOTOR

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

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

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

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

⚠ WARNING

MOTOR WITHOUT BRAKING EFFECT

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

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

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

⚠ WARNING

HOT SURFACES

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

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

0198441113755, V1.08, 04.2014

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

Further information on the subject	Page
Technical data "2.3.5 Braking resistor"	40
Mounting the "External braking resistor" (accessory)	86
Electrical installation: "4.8 Rating the braking resistor" (accessory)	66
Setting the braking resistor parameters	161
"4.5 Common DC bus"	62
Order data for external braking resistors (accessory)	473

4.8.1 Internal braking resistor

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

0198441113755, V1.08, 04.2014

4.8.2 External braking resistor

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

Monitoring

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

Selection of the external braking resistor

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

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

$$R = U^2 \;/\; P_{max}$$

U :	Switching threshold [V]
P_{max} :	Peek power [W]
R:	Resistance [Ohm]

Figure 11: Calculating the resistance R of an external braking resistor

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

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

See chapter "2.3.5 Braking resistor" for the permissible resistance for the drives. Use only resistors that are specified as braking resistors. For suitable braking resistors, see Accessories, page 480.

Mounting and commissioning of an external braking resistor

A parameter is used to switch between the internal and an external braking resistor. Test the function of the braking resistor under realistic conditions during commissioning, see page 142.

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

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

0198441113755, V1.08, 04.2014

4.8.3 Rating information

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

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

Internal energy absorption

Braking energy is absorbed internally by the following mechanisms:

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

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

Internal braking resistor

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

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

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

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

Electrical losses E_{el}

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

Mechanical losses E_{mech}

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

0198441113755, V1.08, 04.2014

Example

Deceleration of a rotary motor with the following data:

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

Calculation of the energy to be absorbed:

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

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

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

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

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

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

Rating the external braking resistor

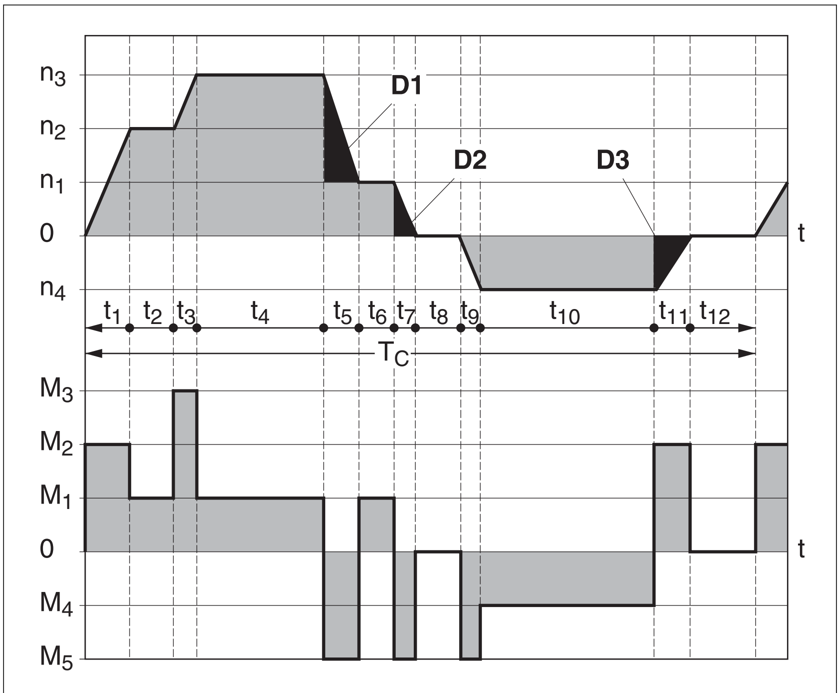


Figure 12: Characteristic curves for rating the braking resistor

0198441113755, V1.08, 04.2014

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

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

$J_t = J_m + J_c$

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

The energy for each deceleration segment is calculated as follows:

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

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

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

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

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

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

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

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

E_{Di} is calculated using the following formula:

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

The continuous power P_c is calculated for each machine cycle:

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

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

0198441113755, V1.08, 04.2014

The selection is made in two steps:

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

For order data for the external braking resistors, see chapter Accessories, page 481.

0198441113755, V1.08, 04.2014

4.9 Safety function STO ("Safe Torque Off")

See chapter 39 for information on using the IEC 61508 standard.

4.9.1 Definitions

Safety function STO (IEC 61800-5-2)
The safety function STO ("Safe Torque Off") shuts off the motor torque safely. It is not necessary to interrupt the supply voltage. There is no monitoring for standstill.

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

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

4.9.2 Function

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

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

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

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

0198441113755, V1.08, 04.2014

4.9.3 Requirements for using the safety function

DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT USE

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

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

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

WARNING

LOSS OF SAFETY FUNCTION

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

- Observe the requirements for using the safety function.

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

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

Category 0 stop

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

Category 1 stop

A controlled stop must be triggered with a category 1 stop. The controlled stop is not monitored by the drive system. In the case of power outage or an error, a controlled stop is impossible. Final shutoff of the motor is achieved by switching off the two inputs of the STO safety function. The shutoff is usually controlled by a standard EMERGENCY STOP safety relay module with a safe time delay.

Behavior of holding brake

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

Vertical axes, external forces

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

Unintended restart

To avoid unintended restart of the motor after restoration of power (for example, after power outage), the parameter `IO_AutoEnable` must be set to "off". Note that a master controller must not trigger an unintended restart.

Degree of protection when the safety function is used

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

0198441113755, V1.08, 04.2014

Protected cable installation

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

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

Data for maintenance plan and safety calculations

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

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

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

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

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

Hazard and risk analysis

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

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

0198441113755, V1.08, 04.2014

4.9.4 Application examples STO

Example of category 0 stop

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

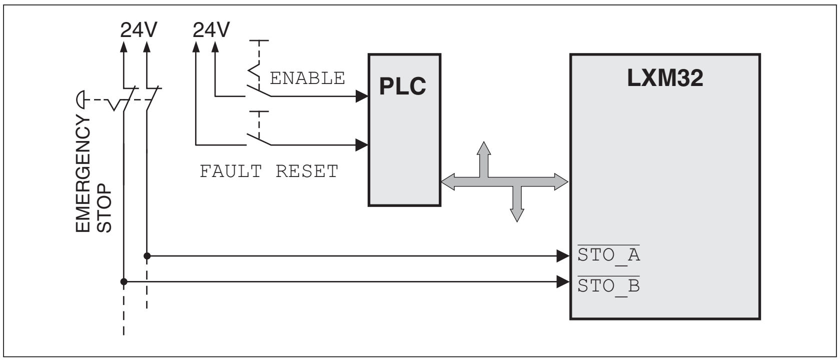


Figure 13: Example of category 0 stop

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

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

0198441113755, V1.08, 04.2014

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

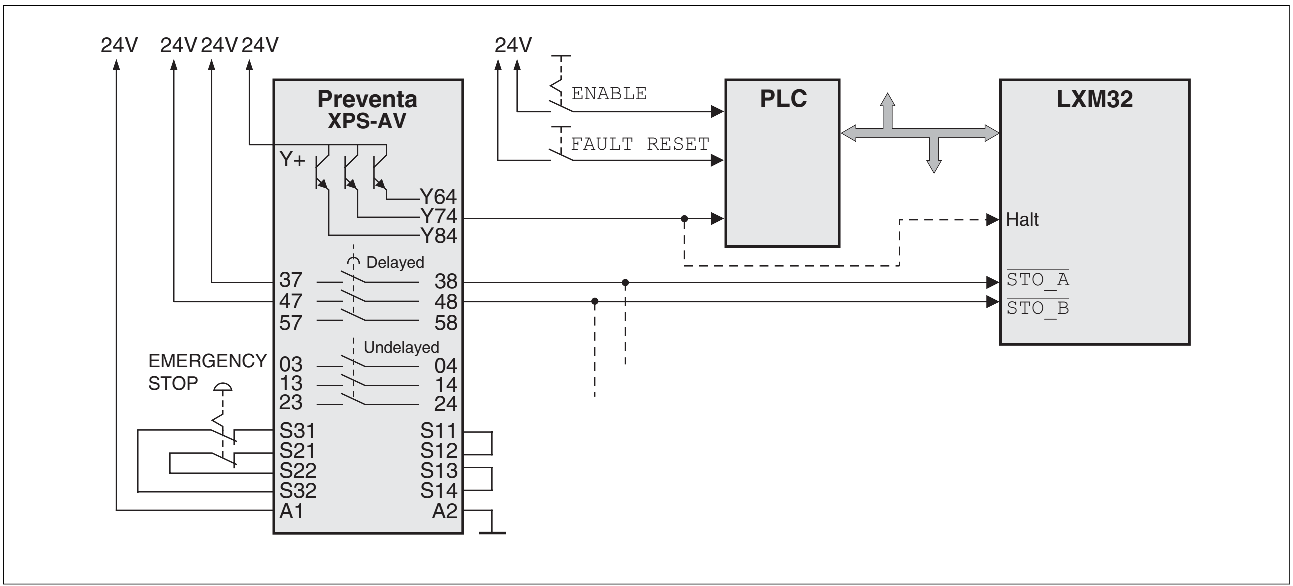


Figure 14: Example of category 1 stop with external Preventa XPS-AV EMERGENCY STOP safety relay module

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

- The function "Halt" is immediately started (undelayed) via the fieldbus or the input HALT (single-channel, not monitored). Any active movement is decelerated via the adjusted ramp.
- The power stage is disabled via the inputs STO_A and STO_B of the safety STO function after the delay time set in the EMERGENCY STOP safety relay module has elapsed. Power can no longer be supplied to the motor. If the motor has not yet stopped when the delay time has elapsed, it coasts down in an uncontrolled way (uncontrolled stop).

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

0198441113755, V1.08, 04.2014

4.10 Logic type

⚠ WARNING

UNINTENDED OPERATION

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

- Use great care in wiring to exclude the possibility of ground faults.

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

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

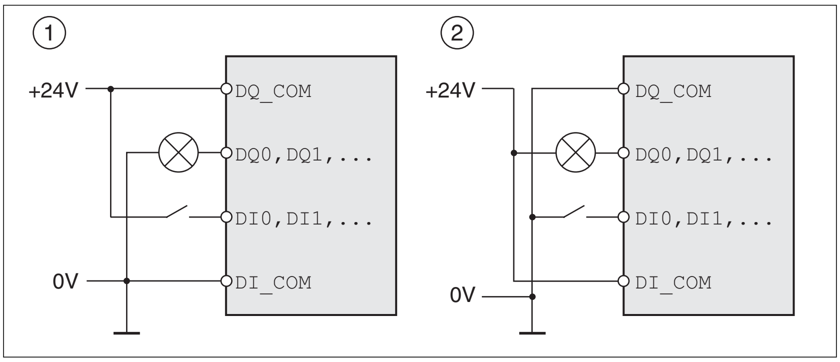


Figure 15: Logic type

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

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

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

Special case: Safety function STO

The inputs for the safety function STO (inputs STO_A and STO_B) are permanently set to logic type 1.

0198441113755, V1.08, 04.2014

4.11 Monitoring functions

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

The following monitoring functions are available:

Monitoring function	Task
Data connection	Monitors data connection for interruption
Limit switch signals	Monitors for permissible movement range
Position deviation	Monitors for difference between actual position and reference position
Motor overload	Monitors for excessively high current in the motor phases
Overvoltage and undervoltage	Monitors for overvoltage and undervoltage of the power stage supply and the DC bus
Overtemperature	Monitors the device for overtemperature
I^2t limitation	Power limitation in the case of overloads for the motor, the output current, the output power and the braking resistor.
Commutation	Plausibility check of motor acceleration and effective torque
Mains phases	Monitoring for missing mains phases
Short circuit / ground fault	Monitors for short circuit between motor phase and motor phase and between motor phase and ground

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

4.12 Configurable inputs and outputs

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

⚠ WARNING

LOSS OF CONTROL

- Check whether your application allows for the use of limit switches. If yes, use limit switches.
- Verify correct connection of the limit switches.
- Verify that the limit switches are mounted in a position far enough away from the mechanical stop to allow for an adequate stopping distance.
- Verify correct parameterization and function of the limit switches.

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

This product has digital inputs and outputs that can be configured. The inputs and outputs have a defined standard assignment depending on the operating mode. This assignment can be adapted to the requirements of the customer's installation. See chapter "7.5.2 Setting the digital signal inputs and signal outputs" for additional information.

0198441113755, V1.08, 04.2014

4.13 CAN fieldbus connection

Connectors D-SUB and RJ45

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

Multiple-port taps can be used to connect an RJ45 system inside the control cabinet to a D-Sub system in the field, see the figure below. The trunk line is connected to the multiple-port tap by means of screw terminals; the devices are connected by means of pre-assembled cables. See chapter "11.6 CANopen cables with open cable ends".

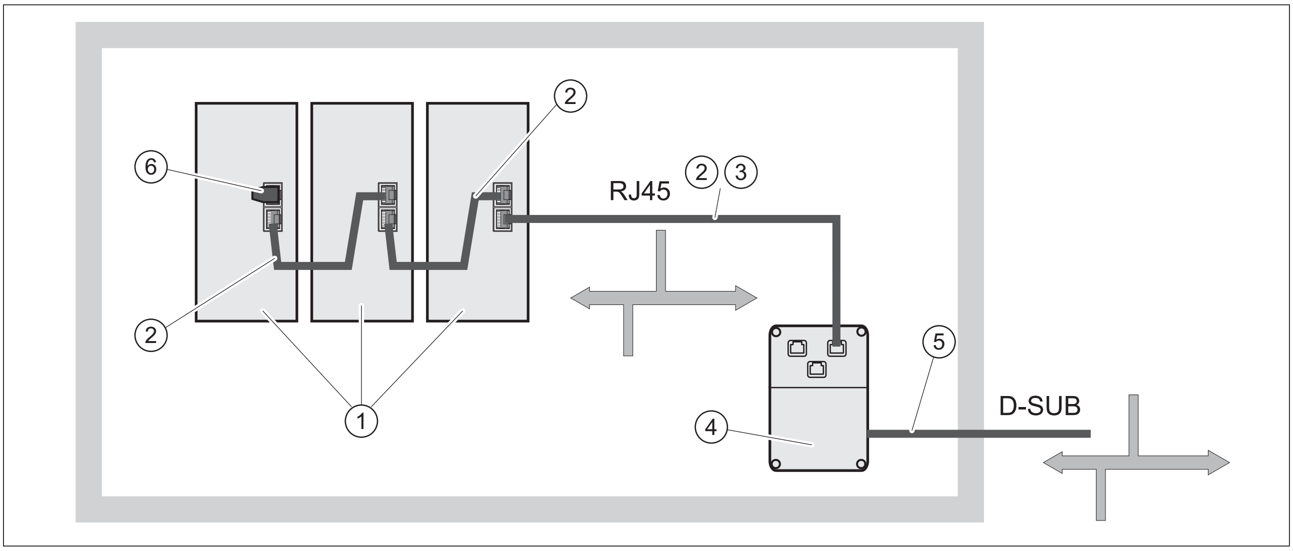


Figure 16: Connection of RJ45 CAN in the control cabinet to the field

(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 mm^2 (AWG 24) for CAN level, cross section 0.25 mm^2 (AWG 22) for reference potential.
(6)	Terminating resistor 120 Ω RJ45 (TCSCAR013M120)

0198441113755, V1.08, 04.2014

5 Installation

An engineering phase is mandatory prior to mechanical and electrical installation. See chapter "4 Engineering", page 53, for basic information.

⚠ WARNING

LOSS OF CONTROL

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

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

1) For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control” and to NEMA ICS 7.1 (latest edition), “Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems”.

0198441113755, V1.08, 04.2014

5.1 Before mounting

Inspecting the product

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

Damages products may cause electric shock or unintended equipment operation.

⚠ ⚠ DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

Do not use damaged products.

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

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

0198441113755, V1.08, 04.2014

5.2 Mechanical installation

DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

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

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

WARNING

LOSS OF SAFETY FUNCTION CAUSED BY FOREIGN OBJECTS

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

- Do not use a safety function unless you have protected the system against contamination by conductive substances.

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

The metal surfaces of the product may exceed 100 °C (212 °F) during operation.

WARNING

HOT SURFACES

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

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

0198441113755, V1.08, 04.2014

5.2.1 Mounting the device

Attaching a label with safety instructions

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

Control cabinet

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

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

Mounting distances, ventilation

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

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

- If the thermal limits are exceeded during operation, the drive switches off (overtemperature).
- Comply with the specifications in chapter "5.2.2 Mounting mains filter, mains reactor and braking resistor", page 86, for mounting additional components (external mains filters, mains reactor, external braking resistor).

0198441113755, V1.08, 04.2014

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

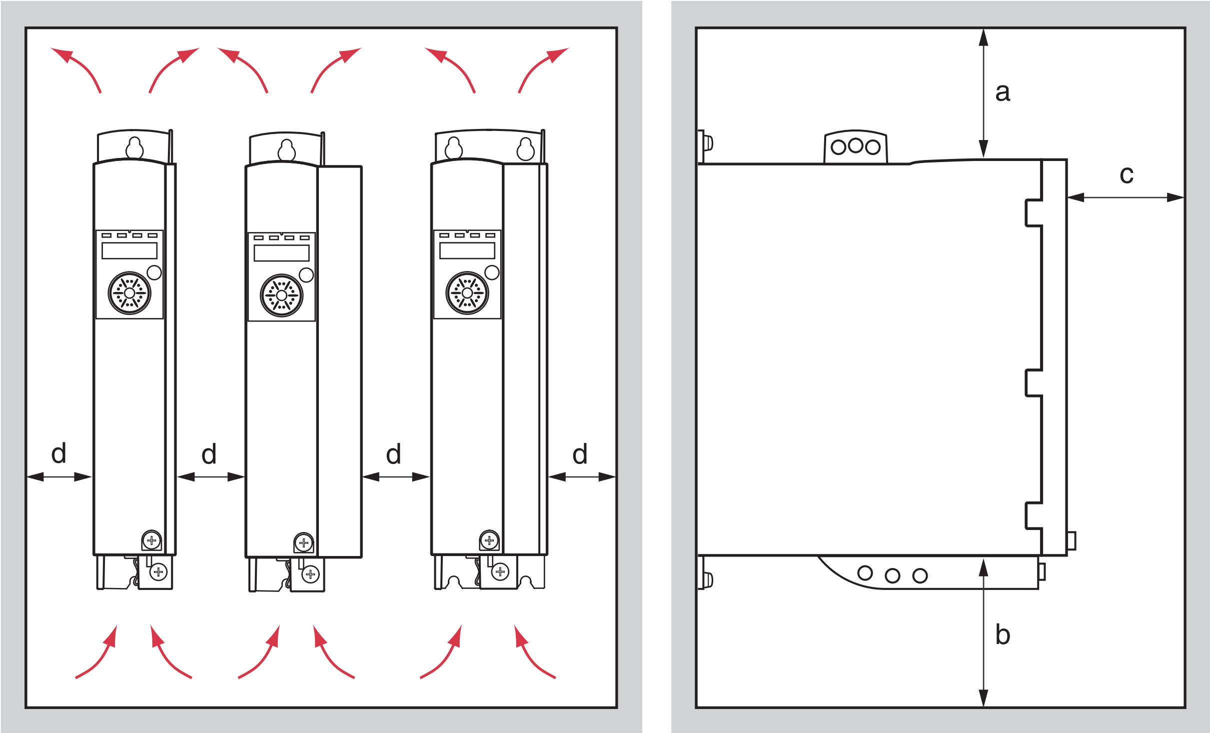


Figure 17: Mounting distances and air circulation

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

Mounting the device

See chapter "2.2.1 Dimensional drawings", page 25 for the dimensions of the mounting holes.

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

- Note the ambient conditions in chapter "2 Technical Data", page 23.
- Mount the device in a vertical position (±10°).

5.2.2 Mounting mains filter, mains reactor and braking resistor

External mains filter

The drives have an integrated mains filter.

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

Further information on the subject	Page
Technical data external mains filters (accessory)	44
Engineering information external mains filters (accessory)	64
Electrical installation of external mains filters (accessory)	101
Order data external mains filters (accessory)	481

Mains reactor

A mains reactor must be used under specific conditions as outlined in chapter "4.6 Mains reactor", page 63. The mains reactor is shipped with an information sheet that provides details on mounting. Information on the electrical installation can be found in chapter "5.3.7 Connection of power stage supply voltage (CN1)", page 101.

If you install a mains reactor, the power provided by the device is increased, see chapter "2.3.1 Power stage", page 27. Increased power is only available if the corresponding parameter is set during commissioning.

Further information on the subject	Page
Technical data mains reactor (accessory)	45
Engineering information mains reactor (accessory)	63
Electrical installation of the mains reactor (accessory)	101
Order data mains reactor (accessory)	481

External braking resistor

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

⚠ WARNING

HOT SURFACES

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

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

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

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014

5.3 Electrical installation

⚠ ⚠ DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

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

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

⚠ ⚠ DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

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

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

⚠ WARNING

THIS PRODUCT MAY CAUSE DIRECT CURRENT IN THE PROTECTIVE GROUND CONDUCTOR

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

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

See chapter "4.3 Residual current device", page 61 for conditions for using a residual current device.

Logic types

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

0198441113755, V1.08, 04.2014

5.3.1 Overview of procedure

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

Sequence of installation steps:

Connection	Connection to	Page
Ground connection	Grounding screw	91
Motor phases	CN10, CN11	92
DC bus connection	CN9	62
External braking resistor	CN8	66
Power stage supply	CN1	101
Motor encoder (encoder 1)	CN3	105
Safety function STO	CN2	107
24 V controller supply	CN2	107
Digital inputs / outputs	CN6	110
Commissioning interface (PC)	CN7	112
Fieldbus CAN	CN4, CN5	113

Finally, verify proper installation.

0198441113755, V1.08, 04.2014

5.3.2 Connection overview

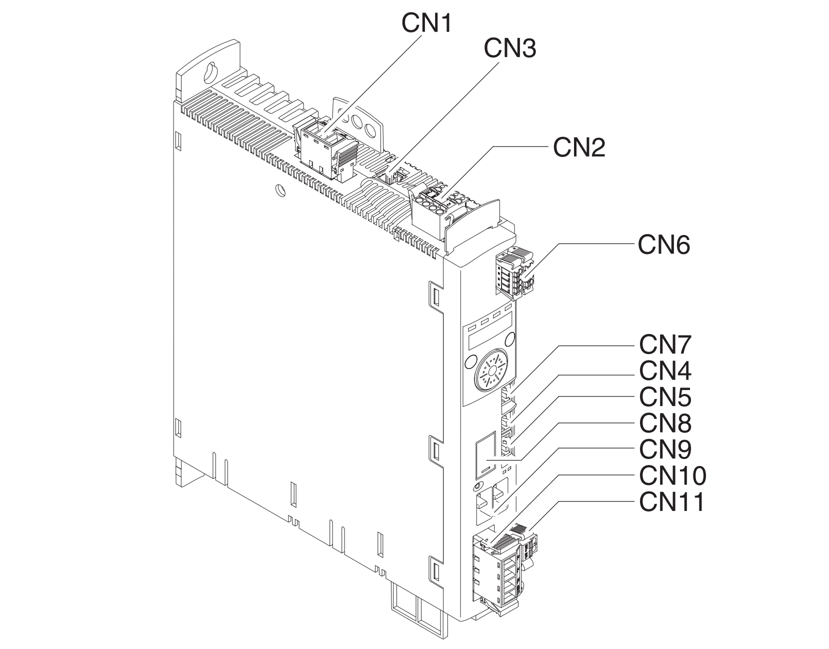


Figure 18: Overview of the signal connections

Connection	Assignment
CN1	Power stage supply
CN2	24 controller supply and safety function STO
CN3	Motor encoder (encoder 1)
CN4	CAN
CN5	CAN
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

5.3.3 Connection grounding screw

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

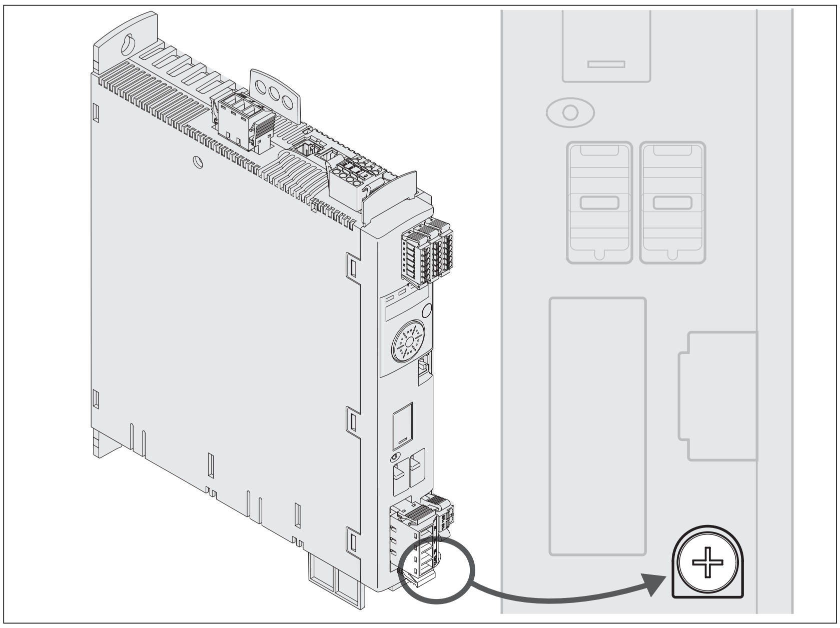
DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

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

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

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



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

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

0198441113755, V1.08, 04.2014

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

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

⚠ ⚠ DANGER

ELECTRIC SHOCK

- Disconnect all power prior to performing any type of work on the drive system.
- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- Insulate both ends of unused conductors of the motor cable.
- Supplement the motor cable grounding conductor with an additional protective ground conductor to the motor housing.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.

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

⚠ WARNING

UNEXPECTED MOVEMENT

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

- Operate the device with approved motors only. Even if motors are similar, different adjustment of the encoder system may be a source of hazards.
- Even if the connectors for motor connection and encoder connection match mechanically, this does NOT imply that they may be used.

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

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

0198441113755, V1.08, 04.2014

Cable specifications

See chapter "4.2 Cables", page 59 for information on the cables.

Shield:	Required, both ends grounded
Twisted Pair:	-
PELV:	The wires for the holding brake must be PELV-compliant.
Cable composition:	3 wires for motor phases 2 wires for holding brake The conductors must have a sufficiently large cross section so that the fuse at the mains connection can trip if required.
Maximum cable length:	Depends on the required limit values for conducted interference, see chapter "2.3.6 Internal mains filter", page 43, and chapter "2.3.7 External mains filters (accessories)", page 44.
Special characteristics:	Contains wires for the holding brake

Note the following information:

- You may only connect the original motor cable (with two wires for the holding brake).
- The wires for the holding brake must also be connected to the device at connection CN11 in the case of motors without holding brakes. At the motor end, connect the wires to the appropriate pins for the holding brake; the cable can then be used for motors with or without holding brake. If you do not connect the wires at the motor end, you must isolate each wire individually (inductive voltages).
- Observe the polarity of the holding brake voltage.
- The voltage for the holding brake depends on the controller supply (PELV). Observe the tolerance for the controller supply and the specified voltage for the holding brake, see chapter "2.3.2 Controller supply voltage 24V", page 36.

▸ Use pre-assembled cables (page 476) to reduce the risk of wiring errors.

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

Properties of the connection terminals CN10

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

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

0198441113755, V1.08, 04.2014

Properties of the connection terminals CN11

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

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

0198441113755, V1.08, 04.2014

Assembling cables Note the dimensions specified when assembling cables.

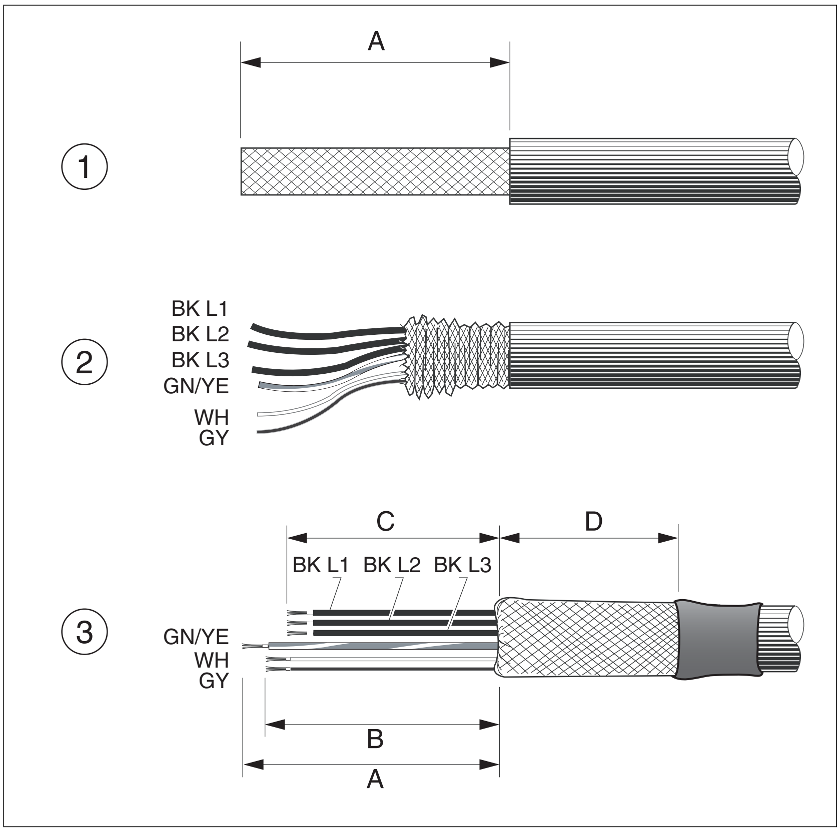


Figure 19: Steps for assembling the motor cable

(1) Strip the cable jacket, length A.

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

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

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

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

Monitoring

The device monitor the motor phases for:

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

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

Wiring diagram motor and holding brake

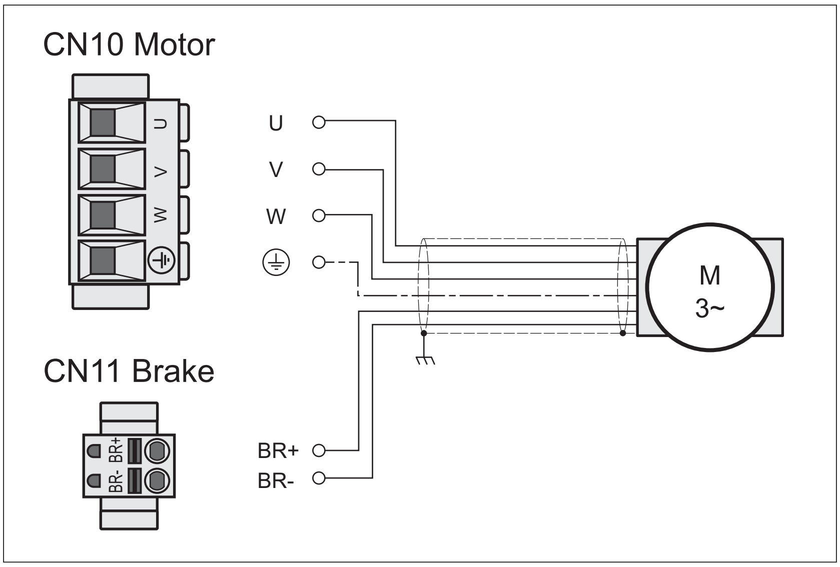


Figure 20: Wiring diagram motor with holding brake

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

0198441113755, V1.08, 04.2014

Connecting the motor cable

- Note the EMC requirements for the motor cables, see page 54.
- Connect the motor phases and protective ground conductor to CN10. Verify that the connections U, V, W and PE (ground) match at the motor and the device.
- Note the tightening torque specified for the terminal screws.
- Connect the white wire or the black wire with the label 5 to connection BR+ of CN11.
  Connect the gray wire or the black wire with the label 6 to connection BR- of CN11.
- Verify that the connector locks snap in properly at the housing.
- Connect the cable shield to the shield clamp (large surface area contact).

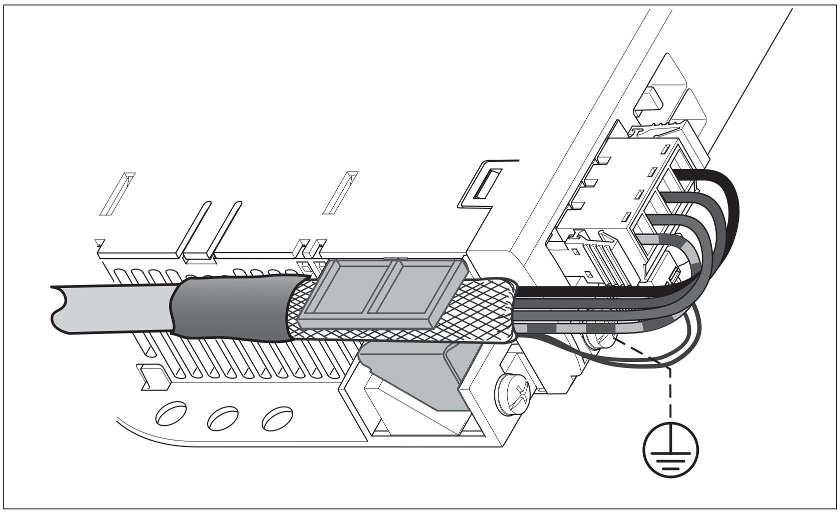


Figure 21: Shield clamp motor cable

0198441113755, V1.08, 04.2014

5.3.5 Connecting the DC bus (CN9, DC bus)

⚠ WARNING

DESTRUCTION OF SYSTEM COMPONENTS AND LOSS OF CONTROL

Incorrect use of a parallel connection of the DC bus may destroy the drives immediately or after a delay.

- Note the requirements concerning the use of a parallel DC bus connection.

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

Requirements for use

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

5.3.6 Braking resistor connection (CN8, Braking Resistor)

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

⚠ WARNING

MOTOR WITHOUT BRAKING EFFECT

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

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

Further information on the subject	Page
Technical data braking resistor	40
Rating the braking resistor	66
Mounting the external braking resistor (accessory)	86
Setting the braking resistor parameters	161
Order data for external braking resistors (accessory)	473

5.3.6.1 Internal braking resistor

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

0198441113755, V1.08, 04.2014

5.3.6.2 External braking resistor

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

Selection and rating of the external braking resistor are described in chapter "4.8 Rating the braking resistor", page 66. For suitable braking resistors, see chapter "11 Accessories and spare parts", page 480.

Cable specifications

See chapter "4.2 Cables", page 59 for information on the cables.

Shield:	Required, both ends grounded
Twisted Pair:	-
PELV:	-
Cable composition:	Minimum conductor cross section: Same cross section as power stage supply, see page 101. The conductors must have a sufficiently large cross section so that the fuse at the mains connection can trip if required.
Maximum cable length:	3 m
Special characteristics:	Temperature resistance

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

Properties of the connection terminals CN8

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

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

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

0198441113755, V1.08, 04.2014

Wiring diagram

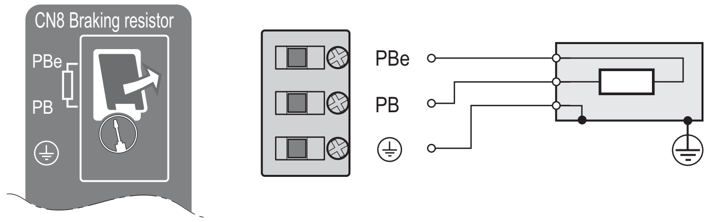


Figure 22: Wiring diagram external braking resistor

Connecting the external braking resistor

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

The parameter `RESint_ext` is used to switch between the internal and an external braking resistor. The parameter settings for the braking resistor can be found in chapter "6.5.10 Setting the braking resistor parameters", page161. Verify that the selected external braking resistor is really connected. Test the function of the braking resistor under realistic conditions during commissioning, see chapter "6.5.10 Setting the braking resistor parameters", page 161.

0198441113755, V1.08, 04.2014

5.3.7 Connection of power stage supply voltage (CN1)

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

DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

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

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

WARNING

INSUFFICIENT PROTECTION AGAINST OVERCURRENTS

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

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

NOTICE

DESTRUCTION DUE TO INCORRECT MAINS VOLTAGE

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

Failure to follow these instructions can result in equipment damage.

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

Prior to connecting the device, check the approved mains types, see chapter "2.3.1 Power stage", page 27.

Cable specifications

Observe the required cable properties, see page 59, and the information on electromagnetic compatibility (EMC), see page 54.

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

Properties of connection terminals CN1

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

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

Prerequisites for connecting the power stage supply

Note the following information:

- Three-phase devices may only be connected and operated via three phases.
- Use upstream mains fuses. See chapter "2.3.1 Power stage", page 27 for information on fuse types and fuse ratings.
- Observe the EMC requirements. If necessary, use surge arresters, mains filters and mains reactors.
- If you use an external mains filter, the mains cable must be shielded and grounded at both ends if the length between the external mains filter and the device exceeds 200 mm.
- See page 23 for a UL-compliant design.
- Due to high leakage currents, use a protective ground conductor at with least 10 mm^2 (AWG 6) or two protective ground conductors with the cross section of the conductors supplying the power terminals. Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.

Accessories: Mains reactor and external mains filter

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

Further information on the subject	Page
Technical data mains reactor (accessory)	45
Engineering information mains reactor (accessory)	63
Mounting the mains reactor (accessory)	86
Order data mains reactor (accessory)	481

Further information on the subject	Page
Technical data external mains filters (accessory)	44
Engineering information external mains filters (accessory)	64
Mounting the external mains filter (accessory)	86
Order data external mains filters (accessory)	481

Power stage supply single-phase device

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

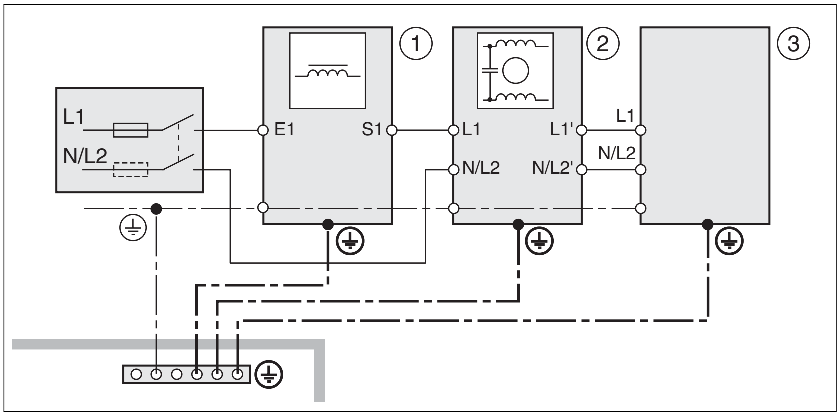


Figure 23: Overview power stage supply for single-phase device

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

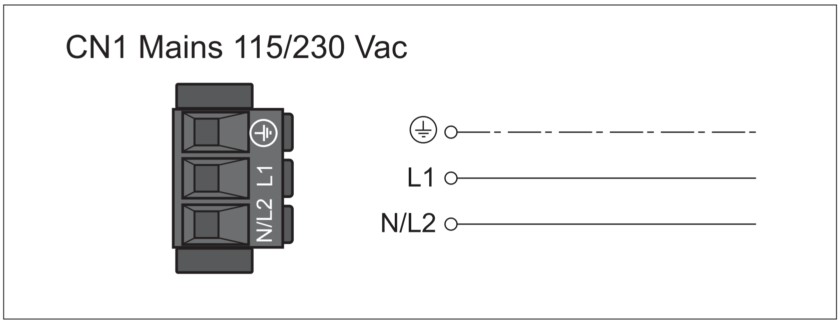


Figure 24: Wiring diagram power stage supply for single-phase device.

- Verify the type of mains. See chapter "2.3.1 Power stage", page 27 for the approved types of mains.
- Connect the mains cable (Figure 24). Note the tightening torque specified for the terminal screws.
- Verify that the connector locks snap in properly at the housing.

0198441113755, V1.08, 04.2014

Power stage supply three-phase device

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

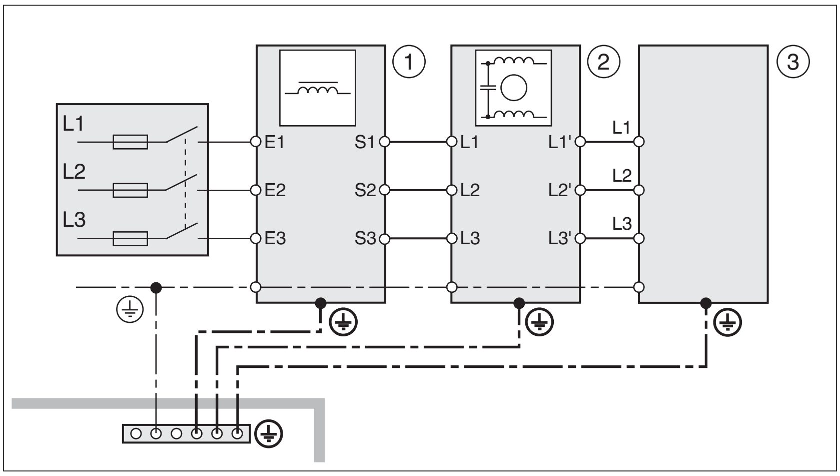


Figure 25: Wiring diagram, power stage supply for three-phase device.

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

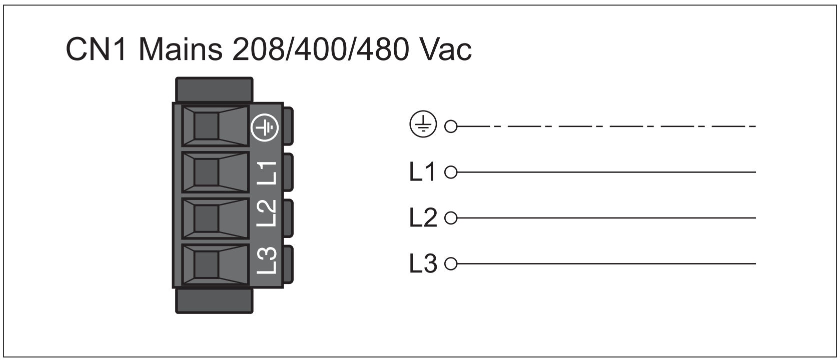


Figure 26: Wiring diagram power stage supply for three-phase device.

- Verify the type of mains. See chapter "2.3.1 Power stage", page 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 at the housing.

0198441113755, V1.08, 04.2014

5.3.8 Motor encoder connection (CN3)

Function and encoder type

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

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

Cable specifications

See chapter "4.2 Cables", page 59 for information on the cables.

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

- Use pre-assembled cables (page 479) to reduce the risk of wiring errors.

Wiring diagram

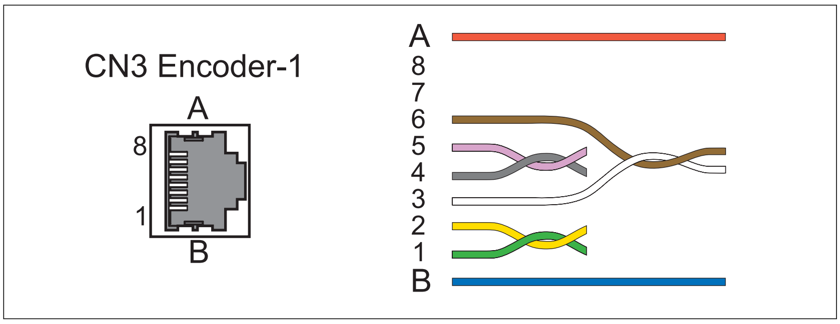


Figure 27: Wiring diagram motor encoder

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

Connecting the motor encoder

- Verify that wiring, cables and connected interface meet the PELV requirements.
- Note the EMC requirements for encoder cables, page 54. Use equipotential bonding conductors for equipotential bonding.
- Connect the connector to CN3 Encoder-1.
- Verify that the connector locks snap in properly at the housing.

0198441113755, V1.08, 04.2014

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

0198441113755, V1.08, 04.2014

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

DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT POWER SUPPLY UNIT

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

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

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

NOTICE

DESTRUCTION OF CONTACTS

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

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

Failure to follow these instructions can result in equipment damage.

Safety function STO

WARNING

LOSS OF SAFETY FUNCTION

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

- Observe the requirements for using the safety function.

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

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

Cable specifications CN2

See chapter "4.2 Cables", page 59 for information on the cables.

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

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

Properties of connection terminals CN2

LXM32•...		
Maximum terminal current	A	16 [1)]
Connection cross section	mm^2 (AWG)	0.5 ... 2.5 (20 ... 14)
Stripping length	mm (in)	12 ... 13 (0.47 ... 0.51)

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

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

Permissible terminal current of controller supply

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

Wiring diagram

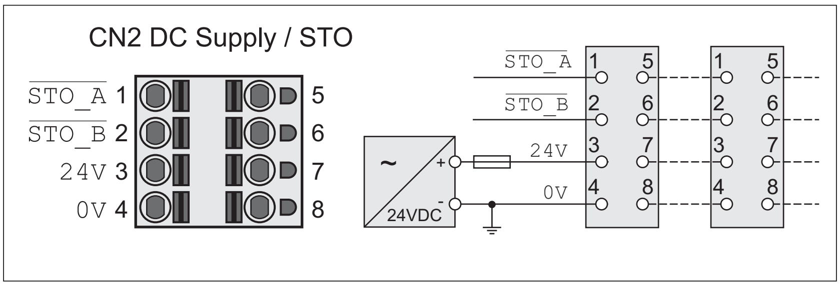


Figure 28: Wiring diagram controller supply

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

Connecting the safety function STO

- ▶ Verify that wiring, cables and connected interfaces meet the PELV requirements.
- ▶ Connect the safety function in accordance with the specifications in chapter "4.9 Safety function STO ("Safe Torque Off")", page 73.

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

0198441113755, V1.08, 04.2014

Connecting the controller supply voltage

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

5.3.10 Connecting the digital inputs/outputs (CN6)

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

Cable specifications

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

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

Properties of connection terminals CN6

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

Wiring diagram

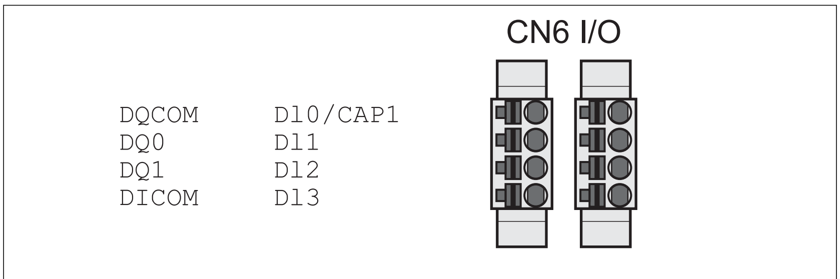


Figure 29: Wiring diagram, digital inputs/outputs

Signal	**Meaning**	**I/O**
`DQ_COM`	Reference potential to `DQ0` ... `DQ4`	
`DQ0`	Digital output 0	O (24 V)
`DQ1`	Digital output 1	O (24 V)
`DI_COM`	Reference potential to `DI0` ... `DI5`	
`DI0` / `CAP1`	Digital input 0 / Capture input 1	I (24 V)
`DI1` / `CAP2` 1)	Digital input 1 / Capture input 2[1]	I (24 V)
`DI2`	Digital input 2	I (24 V)
`DI3`	Digital input 3	I (24 V)

1) Available with hardware version ≥RS03

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

0198441113755, V1.08, 04.2014

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

Connecting the digital inputs/ outputs

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

5.3.11 Connection of PC with commissioning software CN7)

NOTICE

DAMAGE TO PC

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

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

Failure to follow these instructions can result in equipment damage.

Cable specifications

See chapter "4.2 Cables", page 59 for information on the cables.

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

Connecting a PC

A PC with commissioning software can be connected for commissioning. The PC is connected via a bidirectional USB/RS485 converter, see chapter Accessories, page 473.

Wiring diagram

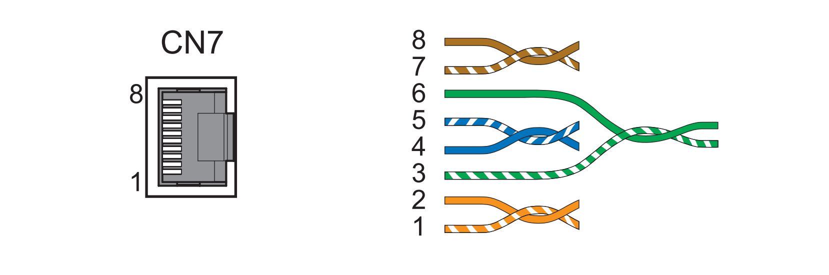


Figure 30: Wiring diagram PC with commissioning software

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

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

0198441113755, V1.08, 04.2014

5.3.12 Connecting 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_h) and 127 ($7F_h$). 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 manual.

Cable specifications

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

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

- Use equipotential bonding conductors, see page 59.
- Use pre-assembled cables (page 479) to reduce the risk of wiring errors.

Connectors D-SUB and RJ45

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

Multiple-port taps can be used to connect an RJ45 system inside the control cabinet to a D-Sub system in the field, see the figure below. The trunk line is connected to the multiple-port tap by means of screw terminals; the devices are connected by means of pre-assembled cables. See chapter "11.4 CANopen cable with connectors".

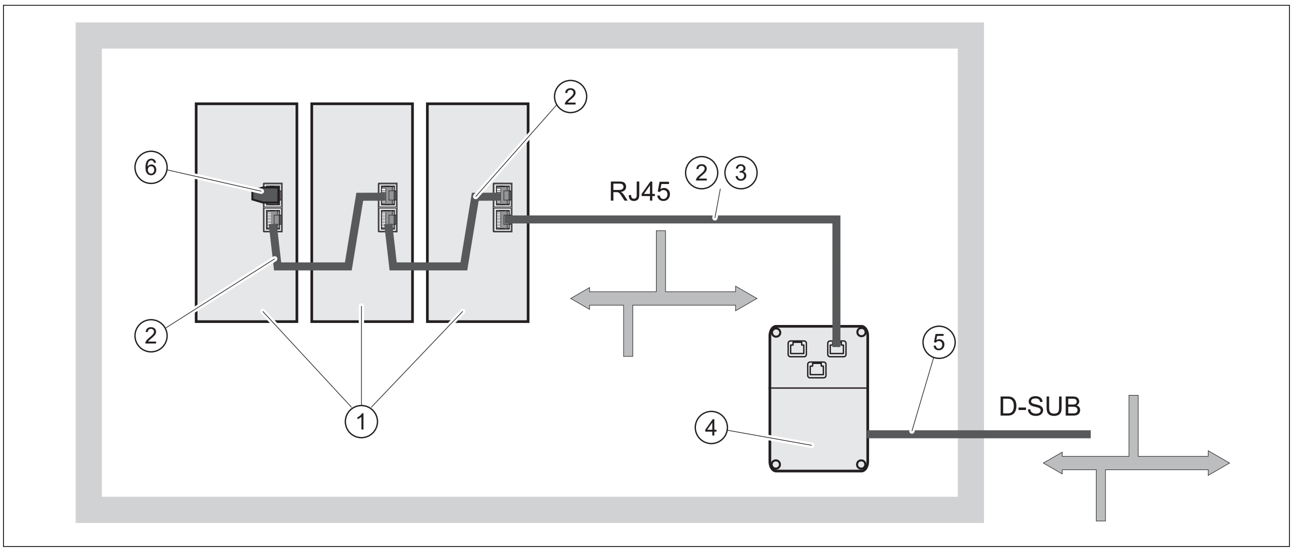


Figure 31: Connection of RJ45 CAN in the control cabinet to the field

(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)

0198441113755, V1.08, 04.2014

Maximum bus length CAN

The maximum bus length depends on the selected baud rate. The following table shows the maximum recommended 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
125 kbit/s	500 m
250 kbit/s	250 m
500 kbit/s	100 m
1000 kbit/s	20 [1)]

1) According to the CANopen specification, the maximum bus length is 4 m. However, in practice, 20 m have been possible in most cases. External interference may reduce this length.

NOTE: 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.

Terminating resistors

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

Connectors with integrated terminating resistors are available as accessories, see chapter
"11.5 CANopen connectors, distributors, terminating resistors", page 474.

Wiring diagram

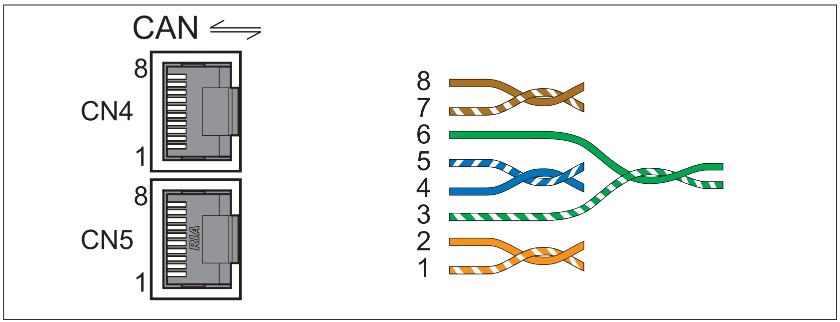


Figure 32: Wiring diagram, CANopen at CN4 and CN5

Pin	Signal	Meaning	I/O
1	`CAN_H`	CAN interface	CAN level
2	`CAN_L`	CAN interface	CAN level
3	`CAN_0V`	Reference potential CAN	-
4 ... 8	–	Reserved	-

Connecting CANopen

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

0198441113755, V1.08, 04.2014

5.4 Checking installation

Verify proper installation:

- ▶ Check 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?
- ▶ Check 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 or insulate all wires at the cable ends?
- • Did you properly connect and install all cables and connectors?
- • Are the mechanical locks of the connectors correct and effective?
- • Did you properly connect the signal wires?
- • Are the required shield connections EMC-compliant?
- • Did you take all measures for EMC compliance?
- ▶ Verify that all covers and seals of the control cabinet are properly installed to meet the required degree of protection.

0198441113755, V1.08, 04.2014

6 Commissioning

This chapter describes how to commission the product.

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

DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT USE

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

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

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

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

WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

WARNING

MOVEMENT WITHOUT BRAKING EFFECT

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

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

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

⚠ WARNING

UNINTENDED MOVEMENT

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

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

The metal surfaces of the product may exceed 100 °C (212 °F) during operation.

⚠ WARNING

HOT SURFACES

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

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

0198441113755, V1.08, 04.2014

6.1 Overview

6.1.1 Commissioning steps

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

To be done

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

0198441113755, V1.08, 04.2014

6.1.2 Commissioning tools

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

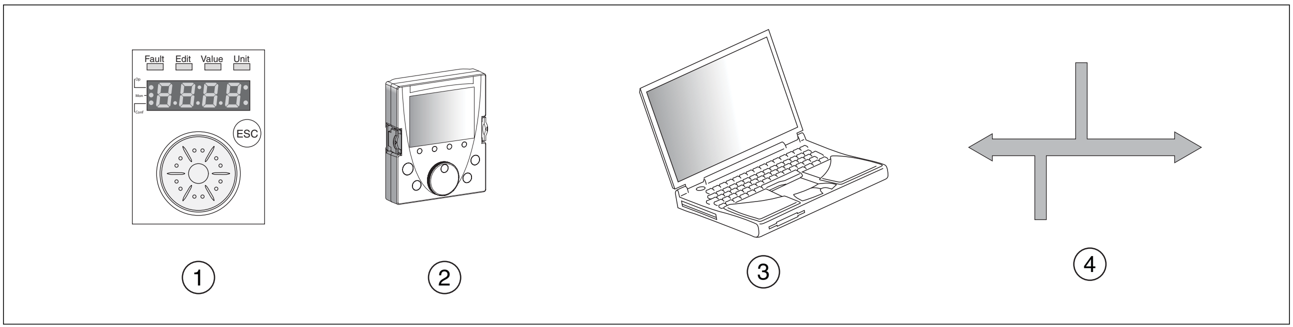


Figure 33: Commissioning tools

(1)	Integrated HMI
(2)	External graphic display terminal
(3)	PC with commissioning software
(4)	Fieldbus

Access to all parameters is only possible with the commissioning software or via the fieldbus.

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

6.2 Integrated HMI

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

Overview

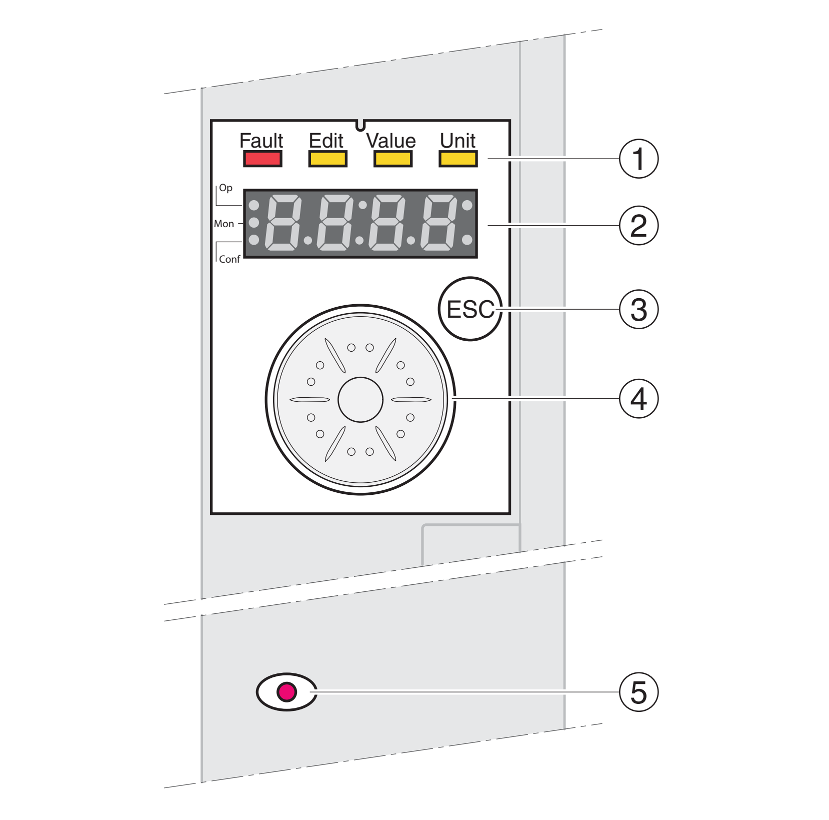


Figure 34: Controls at the integrated HMI

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

0198441113755, V1.08, 04.2014

6.2.1 Indication and operation

Overview

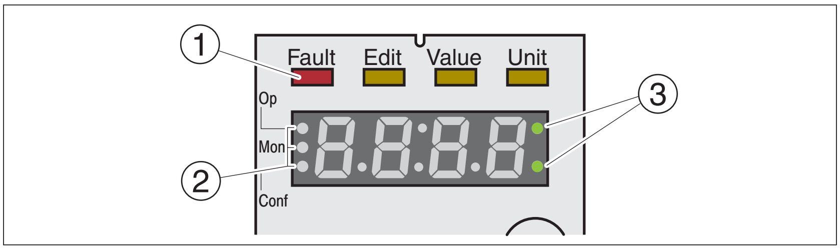
Status LEDs and a 4-digit 7-segment display indicate the device status, menu designation, parameter codes, status codes and error numbers. By turning the navigation button, you can select menu levels and parameters and increment or decrement values. To confirm a selection, press the navigation button.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

Character set on the HMI

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

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

Indication of the device status



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

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

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

LED	**Meaning**
Op	Operation
Mon	Monitoring
Conf	Configuration

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

0198441113755, V1.08, 04.2014

Display of values

The HMI can directly display values up to 999.

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

Example:: Value 1234567890

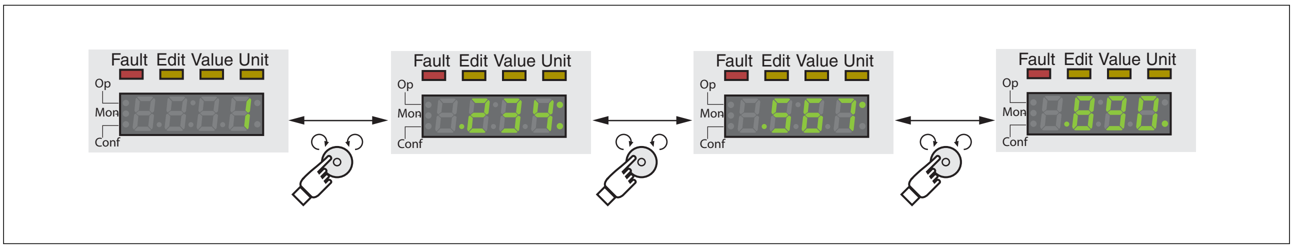


Figure 35: HMI display of values

Navigation button

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

Turn the navigation button to do the following:

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

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

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

Hold down the navigation button to do the following:

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

Access channels

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

0198441113755, V1.08, 04.2014

6.2.2 Menu structure

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

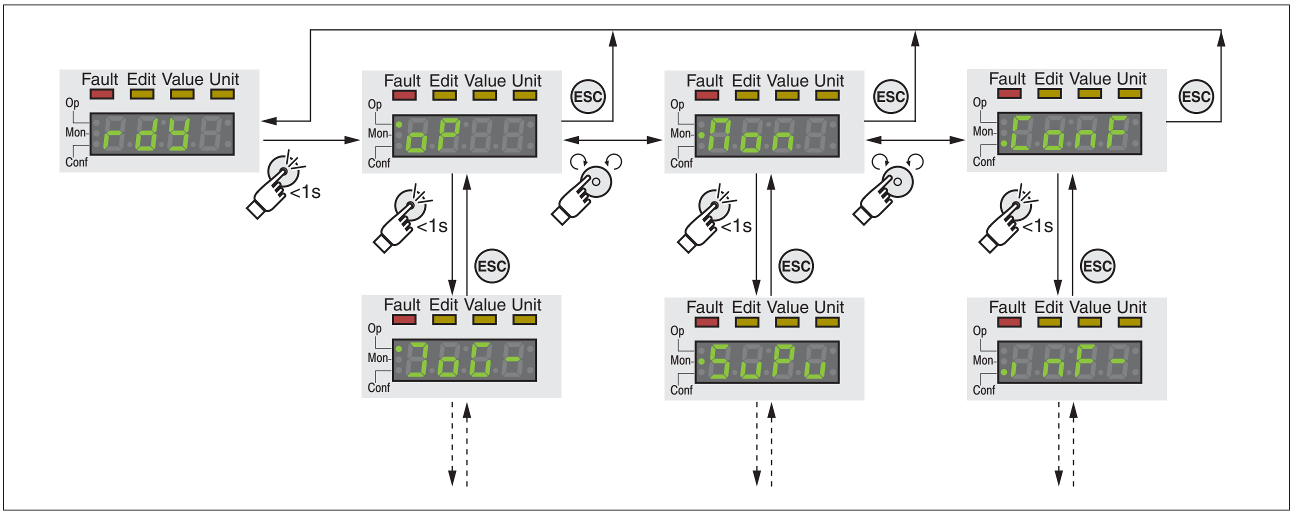


Figure 36: HMI menu structure

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

0198441113755, V1.08, 04.2014

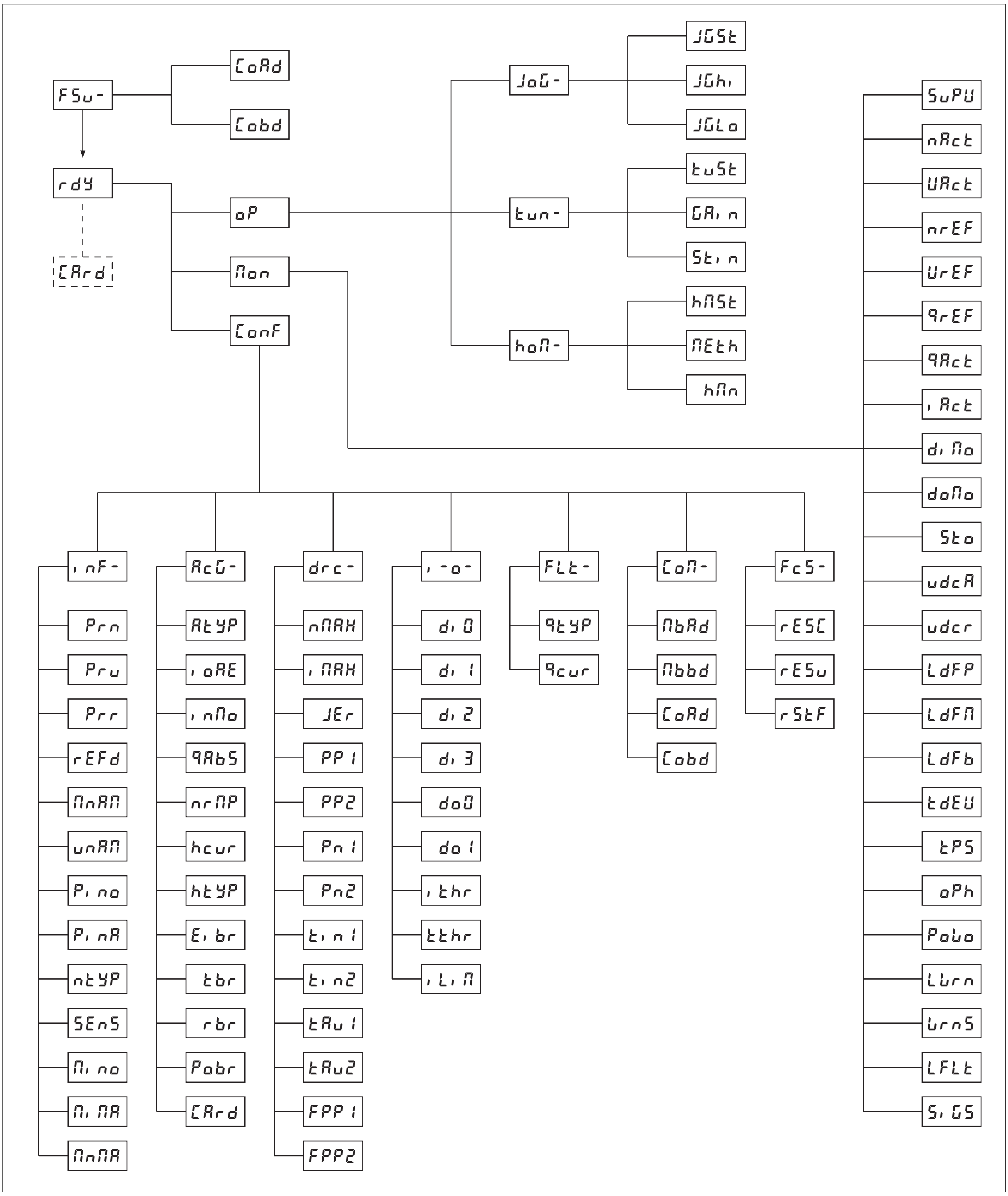


Figure 37: HMI menu structure LXM32A

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 (**O p**eration)
JoG-	Operating mode Jog
tun-	Autotuning
hoM-	Operating mode Homing

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

0198441113755, V1.08, 04.2014

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	Current load of power stage
LdFM	Current load of motor
LdFb	Current load of braking resistor
tdEV	Current device temperature
tPS	Current power stage temperature
oPh	Operating hours counter
PoLo	Number of power on cycles
LWrn	Number of last warning (error class 0)
WrnS	Saved warnings, bit-coded
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**trory **S**ettings)

0198441113755, V1.08, 04.2014

HMI menu **inF-**	**Description**
inF-	Information/Identification (**INF**ormation / Identification)
Prn	Firmware number
PrV	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
ntYP	Motor type
SEnS	Encoder type of motor
MinO	Nominal current of motor
MinA	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
qAbS	Simulation of absolute position at power cycling
nrMP	Maximum velocity of the motion profile for velocity
hcur	Current value for Halt
htYP	Halt option code
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

0198441113755, V1.08, 04.2014

HMI menu drC-	Description
drC-	Device configuration (**DR**ive **C**onfiguration)
nMAX	Velocity limitation
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 P gain
tin1	Velocity controller integral action time
tin2	Velocity controller integral action time
tAu1	Filter time constant of the reference velocity value filter
tAu2	Filter time constant of the reference velocity value filter
FPP1	Feed-forward control Velocity
FPP2	Feed-forward control Velocity

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
do0	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)
MbAd	Modbus address
Mbbd	Modbus baud rate
CoAd	CANopen address (node number)
Cobd	CANopen baud rate

0198441113755, V1.08, 04.2014

HMI menu FcS-	Description
FcS-	Restore factory settings (default values) (**F**a**c**trory **S**ettings)
rESc	Reset controller parameters
rESu	Resetting the user parameters
rStF	Restore factory settings (default values)

0198441113755, V1.08, 04.2014

6.2.3 Making settings

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

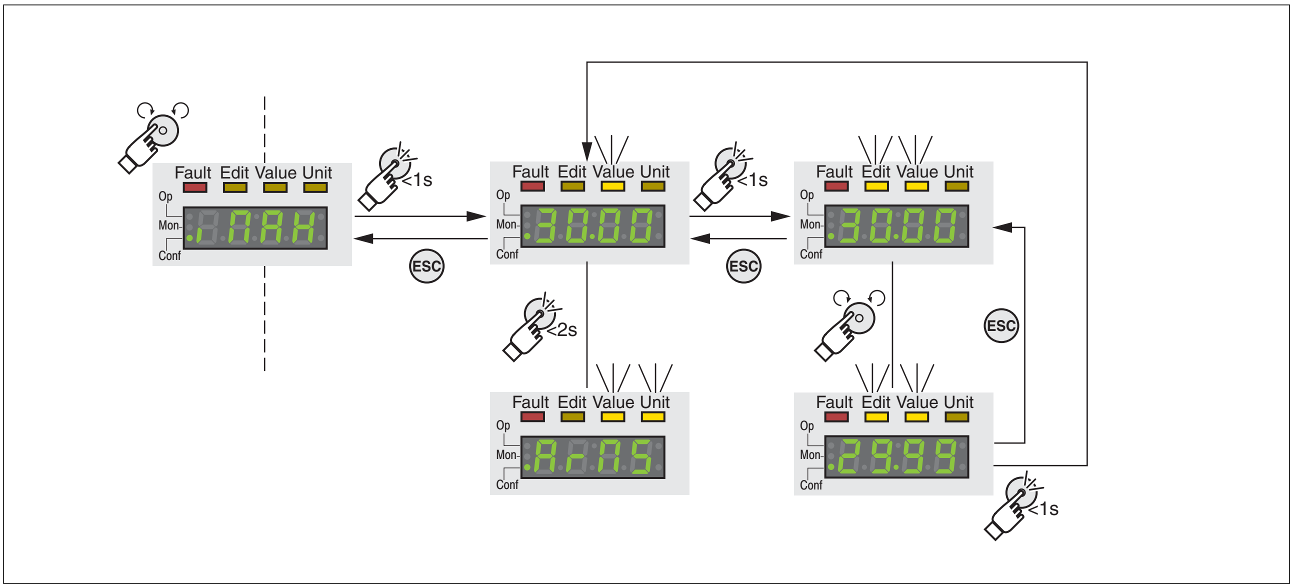


Figure 38: Integrated HMI, example of setting a parameter

0198441113755, V1.08, 04.2014

■ The parameter ıΠAH (iMax) is shown on the 7-segment display, see Figure 38.

▶ Press the navigation button for a longer period of time to display a parameter description.

◁ The parameter description is displayed in the form of horizontally scrolling text.

▶ Briefly press the navigation button to display the current value of the selected parameter.

◁ The Value status LED lights up and the current parameter value is displayed.

▶ Press the navigation button for a longer period of time to display the unit of the current parameter value.

◁ As long as the navigation button is held down, the status LEDs Value and Unit light. The unit of the current parameter value is displayed. Once you release the navigation button, the current parameter value is displayed again and the status LED Value lights.

▶ Briefly press the navigation button to activate the Edit mode which allows you to modify parameter values.

◁ The Edit and Value status LEDs light up and the current parameter value is displayed.

▶ Turn the navigation button to change the value. The increments and the limit value for each parameter are pre-defined.

◁ The Edit and Value status LEDs light and the selected parameter value is displayed.

▶ Briefly press the navigation button to save the changed parameter value.

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

◁ The displayed parameter value flashes once; the changed parameter value is written to the EEPROM.

▶ Press ESC to return to the menu

Setting the 7-segment display

By default, the current operating state is displayed by the 4-digit 7-segment display, see page 194. You can set the following via the menu item drc- / SuPV:

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

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

0198441113755, V1.08, 04.2014

6.3 External graphic display terminal

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

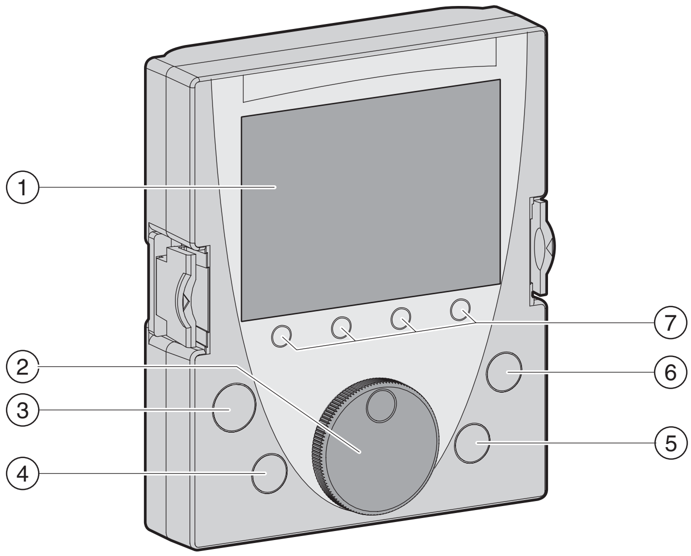


Figure 39: External graphic display terminal

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

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

If you have any questions please contact your sales office. Your sales office staff will be happy to give you the name of a customer service office in your area.

http://www.schneider-electric.com

0198441113755, V1.08, 04.2014

6.3.1 Display and controls

Display field (1) The display is subdivided into 5 areas.

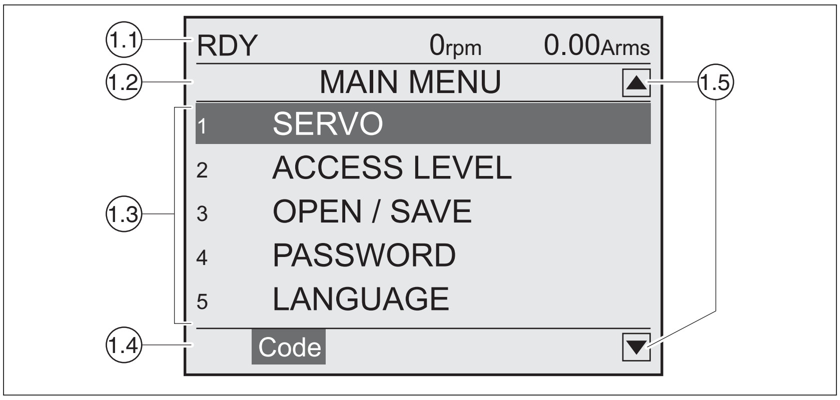


Figure 40: Display of the graphic display terminal (example shows English language)

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

Status information of the drive (1.1) This line displays the current operating state, the actual velocity and the motor current. If an error is detected, the error number is displayed instead of the operating state.

Menu bar (1.2) The menu bar displays the name of the current menu.

Data field (1.3) The following information can be displayed and values entered in the data field:

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

Function bar (1.4) The function bar displays the name of the function that is triggered when you press the corresponding function key. Example: Pressing the F1 function key displays the "Code". If you press F1, the HMI name of the displayed parameter is shown.

Navigation (1.5) Arrows indicate that additional information is available that can be displayed by scrolling.

Navigation button (2) By turning the navigation button, you can select menu levels and parameters and increment or decrement values. To confirm a selection, press the navigation button.

Key STOP/RESET (3) The key STOP/RESET terminates a movement by means of a Quick Stop.

Key RUN (4) The key RUN allows you to start a movement.

Key FWD/REV (5) The key FWD/REV allows you to reverse the direction of movement.

Key ESC (6) The ESC (Escape) button allows you to exit parameters and menus or cancel a movement. If values are displayed, the ESC key lets you return to the last saved value.

Function keys F1 ... F4 (7)

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

6.3.2 Connecting the external graphic display terminal to LXM32

The external graphic display terminal is an accessory for the drive, see chapter "11.1 Commissioning tools", page 473. The external graphic display terminal is connected to CN7 (commissioning interface). Only use the cable shipped with the external graphic display terminal to connect it. If the external graphic display terminal is connected to LXM32, the integrated HMI is deactivated. The integrated HMI shows di SP (Display).

6.3.3 Using the external graphic display terminal

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

Example 'Setting the Language'

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

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

Example 'Using Operating Mode Jog'

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

0198441113755, V1.08, 04.2014

- The external graphic display terminal has been connected to CN7 and the main menu is displayed. The desired language has been set.
- ▶ Rotate the navigation button until item 1 (SERVO) is highlighted.
- ▶ Press the navigation button to confirm the selection.
- ◁ The menu bar shows the selected function ($_1$ SERVO). The data field displays the submenu of the selected function ($_1$ SERVO).
- ▶ Rotate the navigation button until item 1.4 (OPERATION) is highlighted and press the navigation button to confirm the selection.
- ◁ The menu bar shows the selected function ($_{1.4}$ OPERATION). The data field displays the supported operating modes in a submenu.
- ▶ Rotate the navigation button until item 1.4.1 (JOG) is highlighted and press the navigation button to confirm the selection.
- ◁ The menu bar shows the selected function ($_{1.4.1}$ JOG). The data field displays "Op. mode Jog" and the parameters and parameter values for the operating mode
- ▶ Rotate the navigation button until the item "Op. mode Jog" is highlighted and press the navigation button to confirm the selection.
- ◁ The data field displays "JOG → " (Jog, slow movement in positive direction).
- ▶ Rotate the navigation button to change the (slow: → , ← fast: →→ , ←←) and the direction of movement (positive direction of movement: → , →→ , negative direction of movement: ← , ←←). You can also use the FWD/REV key to change the direction of movement.
- ▶ Press the navigation button or the RUN key to enable the power stage.
- ▶ Press the navigation button or the RUN key to start a movement.
- ◁ The movement continues as long as you hold down the navigation button / the RUN key or until you press the STOP/RESET key. You can neither change the velocity nor the direction of movement during the movement.
- ▶ To stop the movement, press the STOP/RESET key or release the navigation button / the RUN key.
- ▶ Press the ESC key to disable the power stage.
- ◁ Power stage is disabled.
- ▶ Press ESC 3 times to return to the main menu.
- ◁ Each time you press ESC you go back by one menu level.

6.4 Commissioning software

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

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

See page 112 for details on connecting a PC to the device.

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

0198441113755, V1.08, 04.2014

6.5 Commissioning procedure

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

⚠ WARNING

UNINTENDED BEHAVIOR CAUSED BY ACCESS CONTROL

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

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

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

6.5.1 "First Setup"

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

Duplicating device settings

A memory card or the commissioning software allows you duplicate device settings. See chapter "6.8 Duplicating existing device settings", page 185 for additional information.

Automatic reading of the motor data record

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

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

0198441113755, V1.08, 04.2014

Preparation

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

Switching on the device

■ The power stage supply is switched off.

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

▸ Switch on the controller supply.

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

If a memory card is in the the slot of the device, the message CArd is displayed by the 7-segment display for a short period of time. This indicates that a memory card has been detected. If the message CArd is permanently displayed by the 7-segment display, there are differences between the content of the memory card and the parameter values stored in the device. See chapter "6.7 Memory Card", page 181 for additional information.

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` (CoAd).

▸ Set the transmission rate in the parameter `CANbaud` (Cobd) 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 → CoM- ConF → FSu- CoAd	CANopen address (node number) Changed settings become active the next time the product is switched on.	- 1 - 127	R/W per. -	
`CANbaud` ConF → CoM- ConF → FSu- 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 Changed settings become active the next time the product is switched on.	- 50 250 1000	R/W per. -	

Restarting the device

A restart of the device is required for the changes to become effective. After the restart, the device is ready for operation. The device is in the operating mode Jog. See chapter "7.3 Operating modes", page 200 for changing operating modes.

Further steps

▸ Attach a label to the device that contains information for servicing the device such as fieldbus type and device address.

▸ Make the settings described below for commissioning.

You can additionally save your settings to a memory card. Use only genuine accessory memory cards, see chapter "11.2 Memory cards", *page* 473.

6.5.2 Operating state (state diagram)

After switching on and when an operating mode is started, the product goes through a number of operating states.

The state diagram (state machine) shows the relationships between the operating states and the state transitions.

The operating states are internally monitored and influenced by monitoring functions.

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

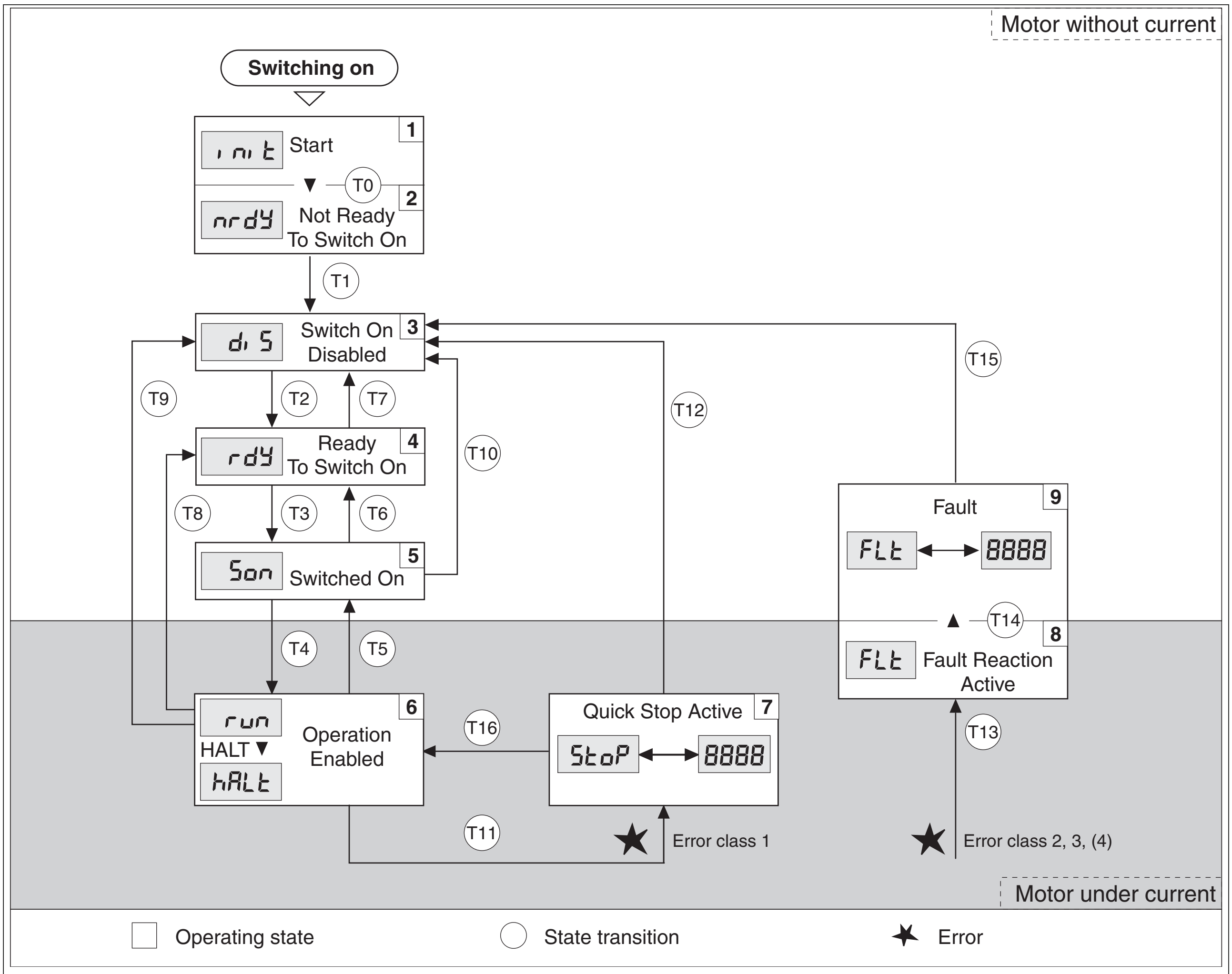


Figure 41: State diagram

Operating states and state transitions See page 194 for detailed information on operating states and state transitions.

0198441113755, V1.08, 04.2014

6.5.3 Setting basic parameters and limit values

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

Controller parameter sets

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

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

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
`CTRL_SelParSet`	Selection of controller parameter set (non-persistent) Coding see parameter: CTRL_PwrUpParSet Changed settings become active immediately.	- 0 1 2	UINT16 UINT16 R/W - -	CANopen $3011:19_h$ Modbus 4402
`_CTRL_ActParSet`	Active controller parameter set Value 1: Controller parameter set 1 is active Value 2: Controller parameter set 2 is active A controller parameter set is active after the time for the parameter switching (CTRL_ParChgTime) has elapsed.	- - - -	UINT16 UINT16 R/- - -	CANopen $3011:17_h$ Modbus 4398
`CTRL_ParChgTime`	Period of time for parameter switching In the case of parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp Such a parameter switching can be caused by - change of the active controller parameter set - change of the global gain - change of any of the parameters listed above - switching off the integral term of the velocity controller Changed settings become active immediately.	ms 0 0 2000	UINT16 UINT16 R/W per. -	CANopen $3011:14_h$ Modbus 4392

Setting limit values

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

Current limitation

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

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

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

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

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

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

0198441113755, V1.08, 04.2014

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

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

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

0198441113755, V1.08, 04.2014

6.5.4 Digital inputs / outputs

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

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

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

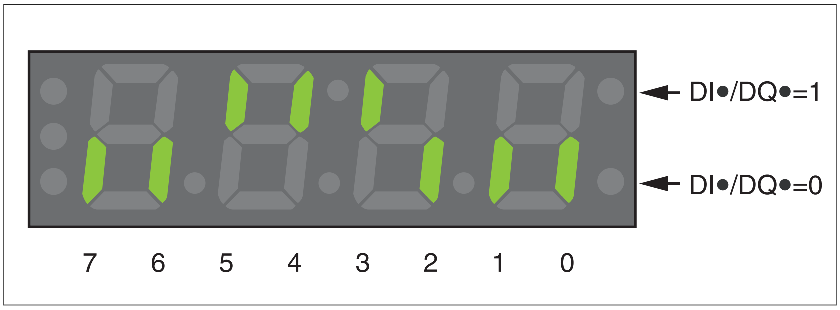


Figure 42: Integrated HMI, displaying the signal state of the digital inputs (DI•) and outputs (DQ•)

Inputs (parameter `_IO_DI_act`):

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

Bit	Signal	I/O
0	DI0	I
1	DI1	I
2	DI2	I
3	DI3	I
4	-	-
5	-	-
6	-	-
7	-	-

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

Outputs (parameter `_IO_DQ_act`):

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

0198441113755, V1.08, 04.2014

Bit	Signal	I/O
0	`DQ0`	O
1	`DQ1`	O
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_IO_act`	Physical status of the digital inputs and outputs Low byte: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3 High byte: Bit 8: DQ0 Bit 9: DQ1	- - - -	UINT16 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 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 UINT16 R/- - -	CANopen 3008:10$_h$ Modbus 2080
`_IO_STO_act` Mon Sto	Status of the inputs for the safety function STO Coding of the individual signals: Bit 0: STO_A Bit 1: STO_B	- - - -	UINT16 UINT16 R/- - -	CANopen 3008:26$_h$ Modbus 2124

0198441113755, V1.08, 04.2014

6.5.5 Testing the signals of the limit switches

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

⚠ WARNING

LOSS OF CONTROL

- Check whether your application allows for the use of limit switches. If yes, use limit switches.
- Verify correct connection of the limit switches.
- Verify that the limit switches are mounted in a position far enough away from the mechanical stop to allow for an adequate stopping distance.
- Verify correct parameterization and function of the limit switches.

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

▸ Set up the limit switches in such a way as to keep the motor from overtraveling the limit switches.

▸ Trigger the limit switches manually.

◃ The HMI displays an error message.

Parameters can be used to release the limit switches and to set the evaluation to active 0 or active 1, see page 307.

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

0198441113755, V1.08, 04.2014

6.5.6 Testing the safety function STO

Operation with STO

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

- Power stage supply is switched off.
  Controller supply voltage is switched off.
- ▶ 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 stage supply is switched on.
  Controller supply voltage is switched on.
- ▶ To 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).
- ▶ Start the operating mode Jog (without motor movement) (see page 202).
- ▶ Trigger the safety function. STO_A and STO_B must be switched off simultaneously.
- ◁ The power stage is disabled and error message 1300 is generated. (NOTE: Error message 1301 indicates a wiring error.)
- ▶ Check the behavior of the drive when errors are present.
- ▶ Document all tests of the safety function in your acceptance protocol.

Operation without STO

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

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

0198441113755, V1.08, 04.2014

6.5.7 Holding brake

Holding brake

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

The signals of the holding brake meet the PELV requirements.

Releasing the holding brake

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

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

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

Applying the holding brake

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

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

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

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

0198441113755, V1.08, 04.2014

6.5.7.1 Releasing the holding brake manually

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

⚠ WARNING

UNINTENDED MOVEMENT

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

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

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

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

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

Releasing the holding brake via a signal input

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

Releasing the holding brake via the fieldbus

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

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via field-bus**
`BRK_release`	Processing of holding brake **0 / Automatic**: Automatic processing **1 / Manual Release**: Manual release of holding brake The holding brake output can only be activated in the operating states 'Switch On Disabled', 'Ready To Switch On' or 'Fault'. If the power stage is active, the value is automatically set to 0. Changed settings become active immediately. Available with firmware version ≥V01.12.	- 0 0 1	UINT16 UINT16 R/W - -	CANopen 3008:A$_h$ Modbus 2068

0198441113755, V1.08, 04.2014

6.5.7.2 Adjustable parameters

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

An additional time delay can be set via parameters.

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

Time delay for releasing the holding brake

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

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

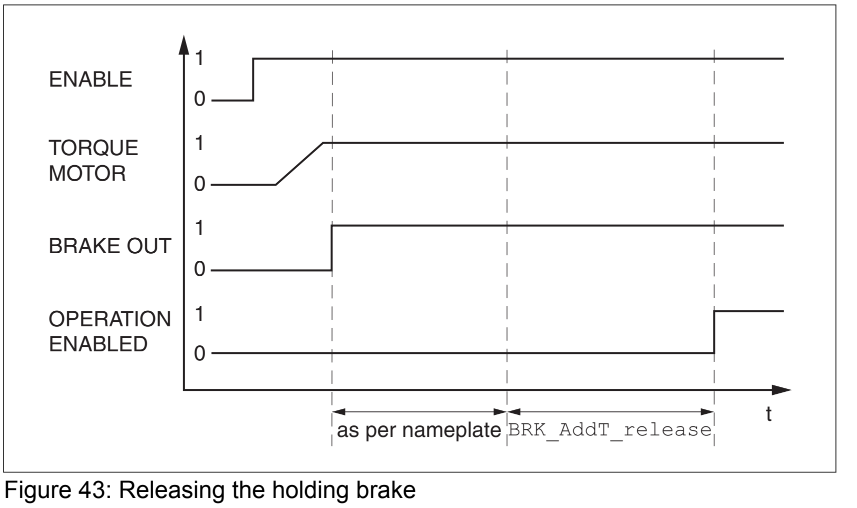


Figure 43: Releasing the holding brake

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

0198441113755, V1.08, 04.2014

Time delay for applying the holding brake

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

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

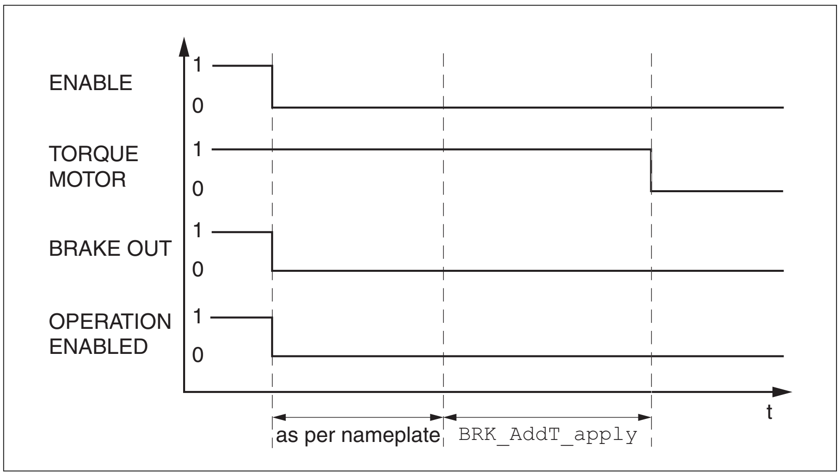


Figure 44: Applying the holding brake

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

0198441113755, V1.08, 04.2014

6.5.7.3 Checking the holding brake

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

⚠ WARNING

UNINTENDED MOVEMENT

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

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

Checking the holding brake

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

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

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

▶ Press the navigation button and hold it down.

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

▶ Press ESC.

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

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

0198441113755, V1.08, 04.2014

6.5.8 Checking the direction of movement

⚠ WARNING

UNEXPECTED MOVEMENT CAUSED BY INTERCHANGED MOTOR PHASES

- Do not interchange the motor phases.
- If required, use the parameter `POSdirOfRotat` for reversing the direction.

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

Direction of movement

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

Checking the direction of movement

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

Movement in positive direction:

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

Movement in negative direction:

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

Changing the direction of movement

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

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

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
InvertDirOfMove ConF → ACG- inMo	Inversion of direction of movement **0 / Inversion Off / oFF** : Inversion of direction of movement is off **1 / Inversion On / on** : Inversion of direction of movement is on The limit switch which is reached with a movement in positive direction must be connected to the positive limit switch input and vice versa. Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3006:Ch Modbus 1560

0198441113755, V1.08, 04.2014

6.5.9 Setting parameters for encoder

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_p_absENC Mon PAMu	Absolute position with reference to the encoder range This value corresponds to the modulo position of the absolute encoder range. The value is no longer valid if the gear ratio of machine encoder and motor encoder is changed. A restart is required in such a case.	usr_p - - -	UINT32 UINT32 R/- - -	CANopen 301E:F$_h$ Modbus 7710

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

Working range of the encoder

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

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

Underrun of absolute position

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

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

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

- Adjustment of the absolute position
- Shifting the working range

0198441113755, V1.08, 04.2014

6.5.9.1 Adjustment of the absolute position

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

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

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

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. NOTE: * If processing is to be performed with inversion of the direction of movement, this must be set before the encoder position is adjusted. * After the write access, a wait time of at least 1 second is required before the drive is switched off. Changed settings become active the next time the product is switched on.	usr_p - - -	INT32 INT32 R/W - -	CANopen 3005:16h Modbus 1324

6.5.9.2 Shifting the working range

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

Working range without shift

The working range without shift comprises:

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

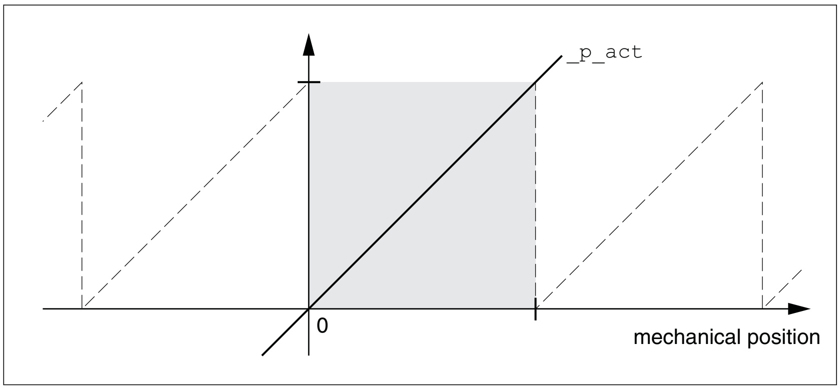


Figure 45: Working range without shift

Working range with shift

The working range with shift comprises:

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

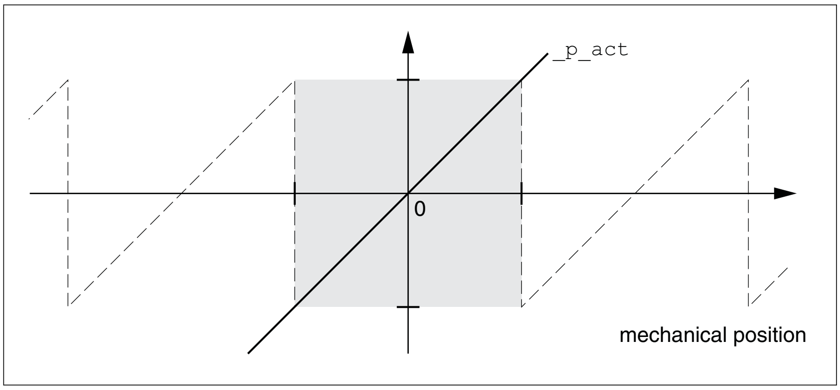


Figure 46: Working range with shift

0198441113755, V1.08, 04.2014

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

6.5.10 Setting the braking resistor parameters

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

⚠ WARNING

MOTOR WITHOUT BRAKING EFFECT

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

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

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

⚠ WARNING

HOT SURFACES

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

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

Further information on braking resistors	Page
Technical data braking resistor	40
Rating the braking resistor	66
Mounting the external braking resistor	86
Electrical installation of the braking resistor	66
Order data for external braking resistors	473

0198441113755, V1.08, 04.2014

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

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
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 changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 0 2	UINT16 UINT16 R/W per. -	CANopen 3005:9h Modbus 1298
RESext_P ConF → ACG- Pobr	Nominal power of external braking resistor Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	W 1 10 32767	UINT16 UINT16 R/W per. -	CANopen 3005:12h Modbus 1316
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 changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	Ω 0.00 100.00 327.67	UINT16 UINT16 R/W per. -	CANopen 3005:13h Modbus 1318
RESext_ton ConF → ACG- tbr	Maximum permissible switch-on time of external braking resistor Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	ms 1 1 30000	UINT16 UINT16 R/W per. -	CANopen 3005:11h Modbus 1314

0198441113755, V1.08, 04.2014

6.5.11 Autotuning the device

There are three ways of tuning the drive control loops:

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

Autotuning

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

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

Autotuning also supports typical vertical axes.

⚠ WARNING

UNEXPECTED MOVEMENT

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

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

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

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

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

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

▶ Start autotuning via the commissioning software.

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

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

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

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

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
AT_dir oP → tun- StiM	Direction of movement for Autotuning **1 / Positive Negative Home / Pnh** : Positive direction first, then negative direction with return to initial position **2 / Negative Positive Home / nPh** : Negative direction first, then positive direction with return to initial position **3 / Positive Home / P-h** : Positive direction only with return to initial position **4 / Positive / P--** : Positive direction only without return to initial position **5 / Negative Home / n-h** : Negative direction only with return to initial position **6 / Negative / n--** : Negative direction only without return to initial position Changed settings become active the next time the motor moves.	- 1 1 6	UINT16 UINT16 R/W - -	CANopen 302F:4$_h$ Modbus 12040
AT_dis_usr	Movement range for Autotuning Range within which the control parameters are automatically optimized. The range is entered with reference to the current position. NOTE: In the case of "Movement in one direction only" (Parameter AT_dir), the specified range is used for each optimization step. The actual movement typically corresponds to 20 times the value, but it is not limited. The minimum value, the factory setting and the maximum value depend on the scaling factor. Changed settings become active the next time the motor moves. Available with firmware version ≥V01.05.	usr_p 1 32768 2147483647	INT32 INT32 R/W - -	CANopen 302F:12$_h$ Modbus 12068
AT_dis	Movement range for Autotuning Range within which the control parameters are automatically optimized. The range is entered with reference to the current position. NOTE: In the case of "Movement in one direction only" (Parameter AT_dir), the specified range is used for each optimization step. The actual movement typically corresponds to 20 times the value, but it is not limited. The parameter AT_dis_usr allows you to enter the value in user-defined units. In increments of 0.1 revolution. Changed settings become active the next time the motor moves.	revolution 1.0 2.0 999.9	UINT32 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 field-bus
AT_mechanical	Type of coupling of the system **1 / Direct Coupling**: Direct coupling **2 / Belt Axis**: Belt axis **3 / Spindle Axis**: Spindle axis Changed settings become active the next time the motor moves.	- 1 2 3	UINT16 UINT16 R/W - -	CANopen 302F:Eh Modbus 12060
AT_start	Autotuning start Value 0: Terminate Value 1: Activate EasyTuning Value 2: Activate ComfortTuning Changed settings become active immediately.	- 0 - 2	UINT16 UINT16 R/W - -	CANopen 302F:1h Modbus 12034

6.5.12 Enhanced settings for autotuning

The following parameters allow you to monitor and influence autotuning.

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

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

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

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL_GlobGain oP → tun- GAin	Global gain factor (affects parameter set 1) The global gain factor affects the following parameters of controller parameter set 1: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref The global gain factor is set to 100% - if the controller parameters are set to default - at the end of the Autotuning process - if the controller parameter set 2 is copied to set 1 via the parameter CTRL_ParSet-Copy NOTE: If a full configuration is transmitted via the fieldbus, the value for CTRL_Glob-Gain must be transmitted prior to the values of the controller parameters CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUn-ref. If CTRL_GlobGain is changed during a configuration transmission, CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUn-ref must also be part of the configuration. In increments of 0.1 %. Changed settings become active immedi-ately.	% 5.0 100.0 1000.0	UINT16 UINT16 R/W per. -	CANopen 3011:15h Modbus 4394
_AT_M_friction	Friction torque of the system Is determined during Autotuning. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 UINT16 R/- - -	CANopen 302F:7h Modbus 12046
_AT_M_load	Constant load torque Is determined during Autotuning. In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 INT16 R/- - -	CANopen 302F:8h Modbus 12048
_AT_J	Moment of inertia of the entire system Is automatically calculated during Autotun-ing. In increments of 0.1 kg cm^2.	kg cm^2 0.1 0.1 6553.5	UINT16 UINT16 R/- per. -	CANopen 302F:Ch 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.

0198441113755, V1.08, 04.2014

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

0198441113755, V1.08, 04.2014

6.6 Controller optimization with step response

6.6.1 Controller structure

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

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

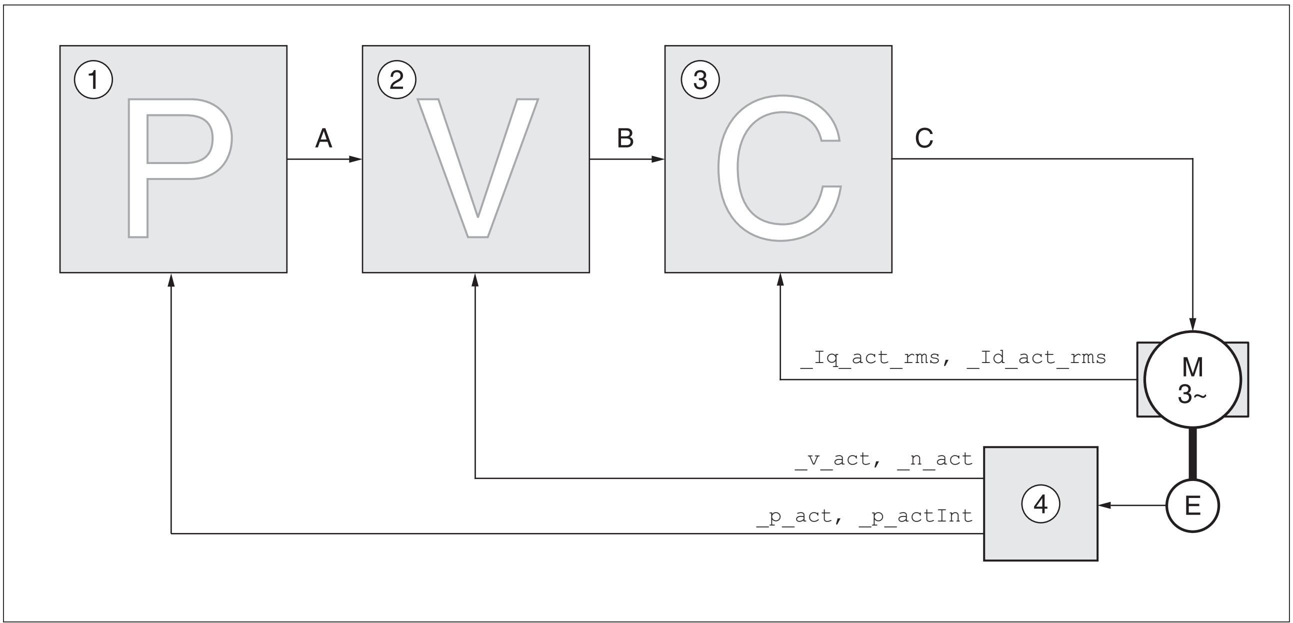


Figure 47: Controller structure

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

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

Current controller

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

Velocity controller

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

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

Position controller

The position controller reduces the difference between the reference position and the actual position of the motor (position deviation) to a

0198441113755, V1.08, 04.2014

minimum. When the motor is at a standstill, the position deviation is close to zero in the case of a well-tuned position controller.

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

6.6.2 Optimization

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

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

Setting reference value signals

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

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

Entering controller values

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

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

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

Controller parameter sets

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

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

6.6.3 Optimizing the velocity controller

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

0198441113755, V1.08, 04.2014

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_KPn ConF → drC- Pn1	Velocity controller P gain The default value is calculated on the basis of the motor parameters. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.0001 A/min-1. Changed settings become active immediately.	A/min-1 0.0001 - 2.5400	UINT16 UINT16 R/W per. -	CANopen 3012:1h 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 controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.0001 A/min-1. Changed settings become active immediately.	A/min-1 0.0001 - 2.5400	UINT16 UINT16 R/W per. -	CANopen 3013:1h Modbus 4866
CTRL1_TNn ConF → drC- tin1	Velocity controller integral action time The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 327.67	UINT16 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 controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 327.67	UINT16 UINT16 R/W per. -	CANopen 3013:2h Modbus 4868

Check and optimize the calculated values in a second step, as described on page 177.

Determining the mechanical system of the system

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

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

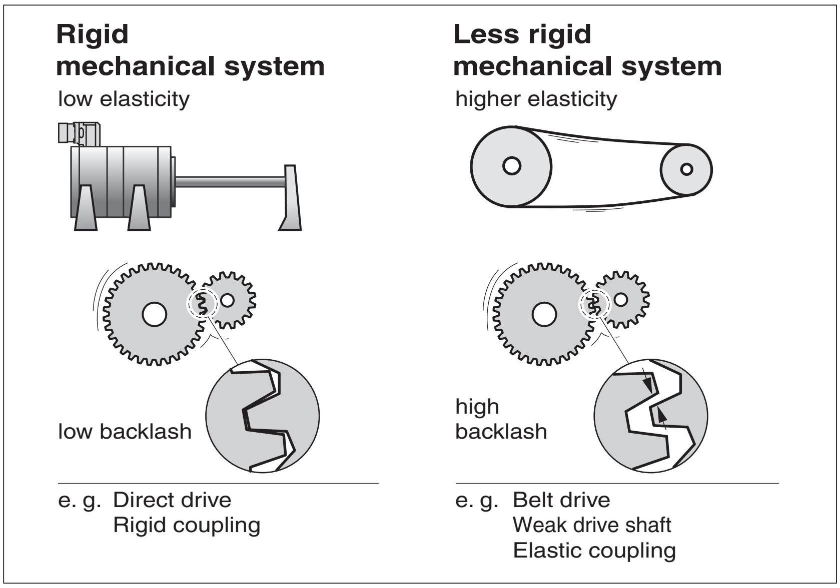


Figure 48: Rigid and less rigid mechanical systems

- ▸ Couple the motor and the mechanical system
- ▸ If you use limit switches: verify the function of the limit switches after installation of the motor.

Switching off the reference value filter of the velocity controller

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

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL1_TAUnref ConF → drC- tAu1	Filter time constant of the reference velocity value filter In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 9.00 327.67	UINT16 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 controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 9.00 327.67	UINT16 UINT16 R/W per. -	CANopen 3013:4h Modbus 4872

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

Determining controller parameter values for rigid mechanical systems

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

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

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

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

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

Determining controller parameter values for rigid mechanical systems

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

- ▶ Set the integral action time CTRL1_TNn (CTRL2_TNn) to infinite (= 327.67 ms).

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

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

⚠ WARNING

UNEXPECTED MOVEMENT

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

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

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

- ▸ Initiate a step function.
- ▸ After the first test, check the maximum amplitude for the reference value for the current `_Iq_ref`.

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

- ▸ Trigger another step function if you had to modify `_v_ref` and check the amplitude of `_Iq_ref`.
- ▸ Increase or decrease the P gain in small increments until `_v_act` is obtained as fast as possible. The following diagram shows the required transient response on the left. Overshooting - as shown on the right - is reduced by reducing `CTRL1_KPn` (`CTRL2_KPn`).

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

0198441113755, V1.08, 04.2014

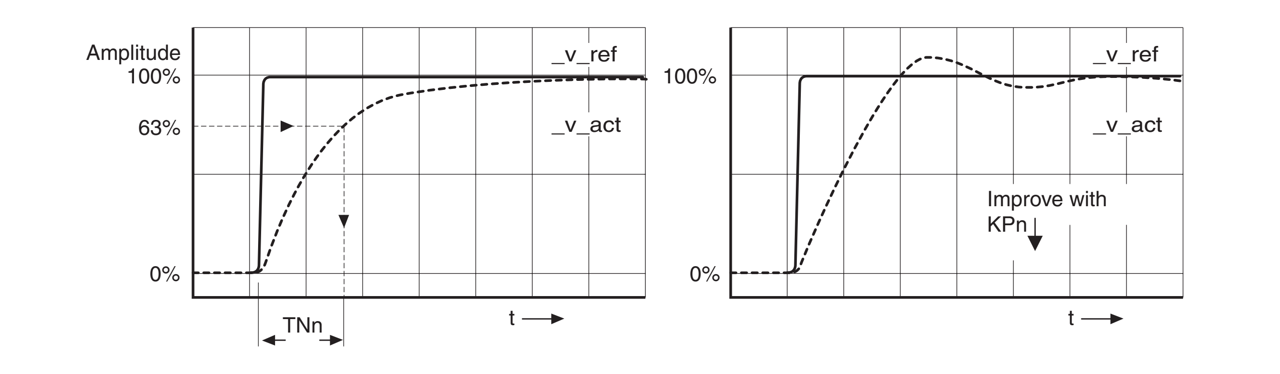


Figure 49: Determining "TNn" for the aperiodic limit

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

Graphic determination of the 63% value

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

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
`CTRL1_TAUiref`	Filter time constant of the reference current value filter In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.50 4.00	UINT16 UINT16 R/W per. -	CANopen 3012:5h Modbus 4618
`CTRL2_TAUiref`	Filter time constant of the reference current value filter In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.50 4.00	UINT16 UINT16 R/W per. -	CANopen 3013:5h Modbus 4874

0198441113755, V1.08, 04.2014

6.6.4 Checking and optimizing default settings

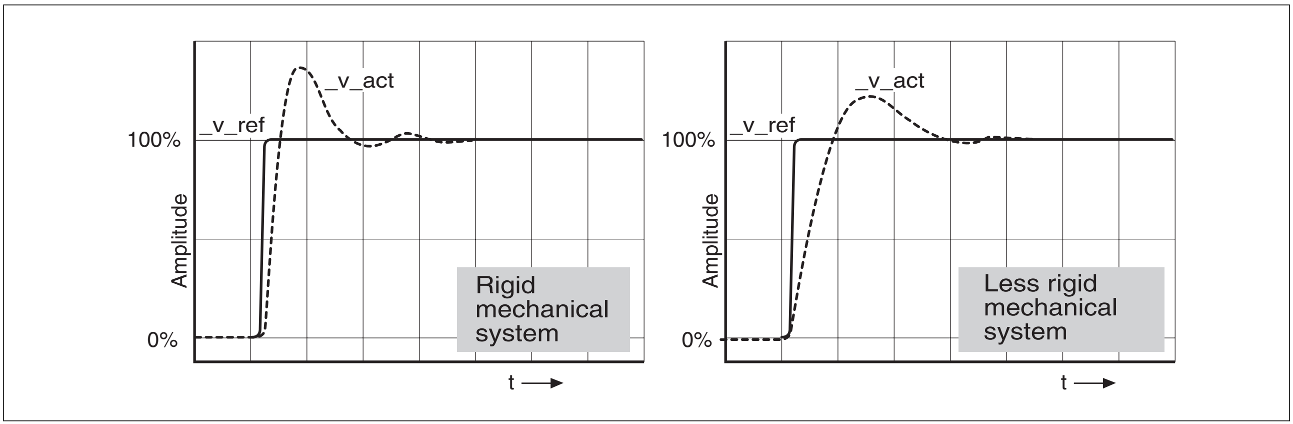


Figure 50: Step responses with good control performance

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

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

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

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

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

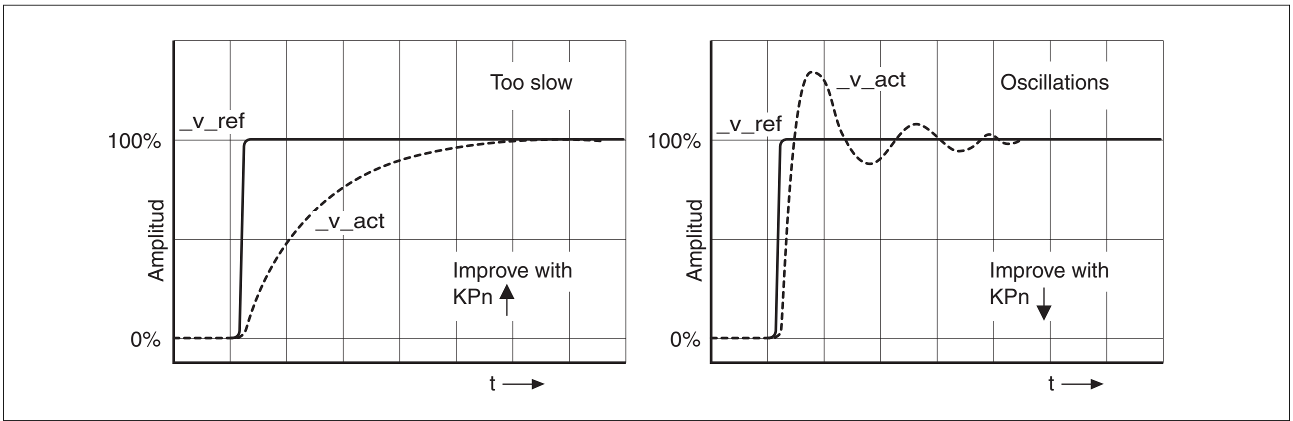


Figure 51: Optimizing insufficient velocity controller settings

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

0198441113755, V1.08, 04.2014

6.6.5 Optimizing the position controller

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

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

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`CTRL1_KPp` ConF → drC- PP1	Position controller P gain The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 1/s. Changed settings become active immediately.	1/s 2.0 - 900.0	UINT16 UINT16 R/W per. -	CANopen 3012:3h Modbus 4614
`CTRL2_KPp` ConF → drC- PP2	Position controller P gain The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 1/s. Changed settings become active immediately.	1/s 2.0 - 900.0	UINT16 UINT16 R/W per. -	CANopen 3013:3h Modbus 4870

⚠ WARNING

UNEXPECTED MOVEMENT

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

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

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

0198441113755, V1.08, 04.2014

Setting the reference value signal

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

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

Selecting the trace signals

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

Optimizing the position controller value

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

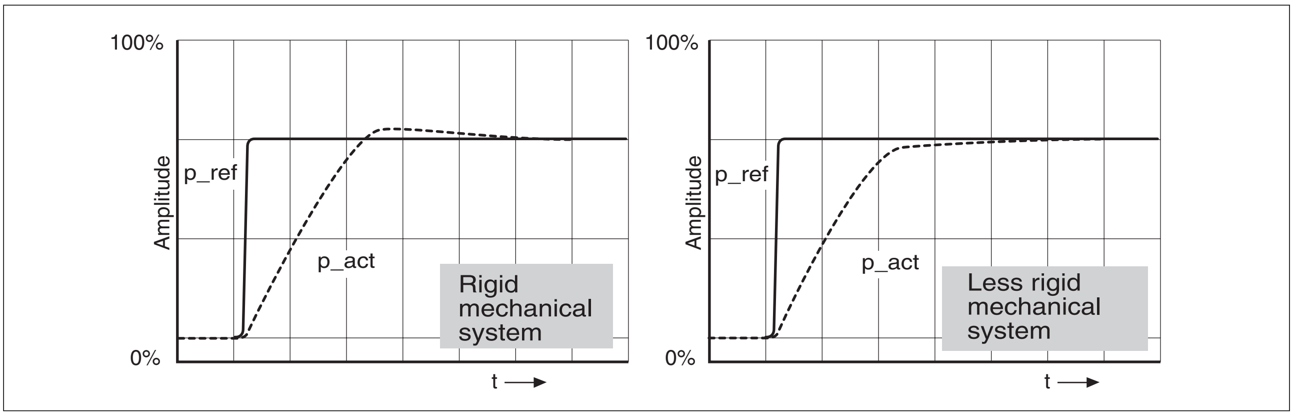


Figure 52: Step responses of a position controller with good control performance

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.

0198441113755, V1.08, 04.2014

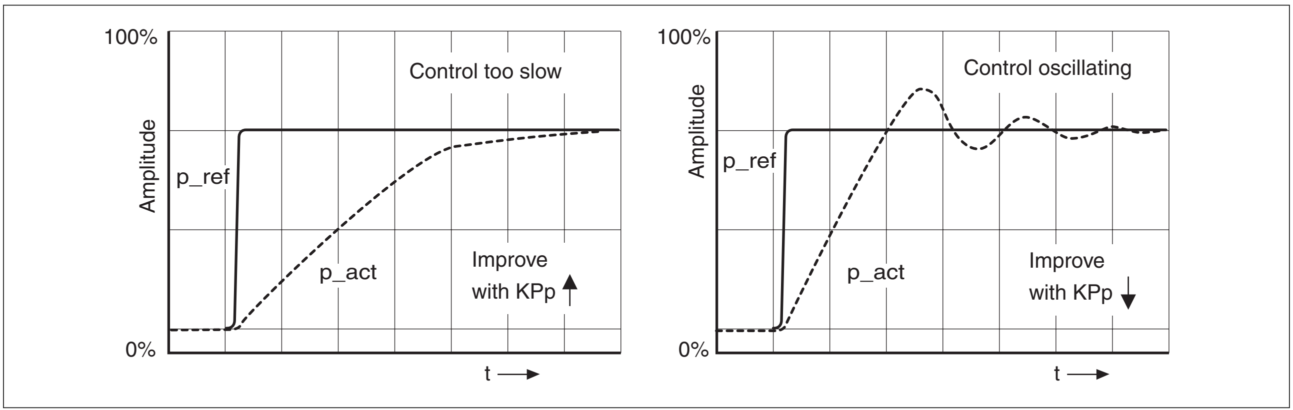


Figure 53: Optimizing inadequate position controller settings

0198441113755, V1.08, 04.2014

6.7 Memory Card

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

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

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

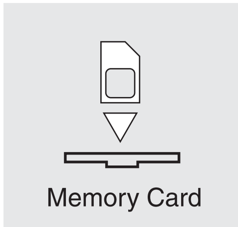


Figure 54: Memory card

Note the following:

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

Inserting a memory card

- ■ The controller supply is switched off.
- ▸ Insert the memory card into the device with the gold contacts face down; the slanted corner must be face to the mounting plate.
- ▸ Switch on the controller supply.
- ▸ Observe the 7-segment display during the initialization of the device.

CArd is displayed for a short period of time

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

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

0198441113755, V1.08, 04.2014

CArd is displayed permanently

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

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

CArd is not displayed

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

0198441113755, V1.08, 04.2014

6.7.1 Data exchange with the memory card

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

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

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

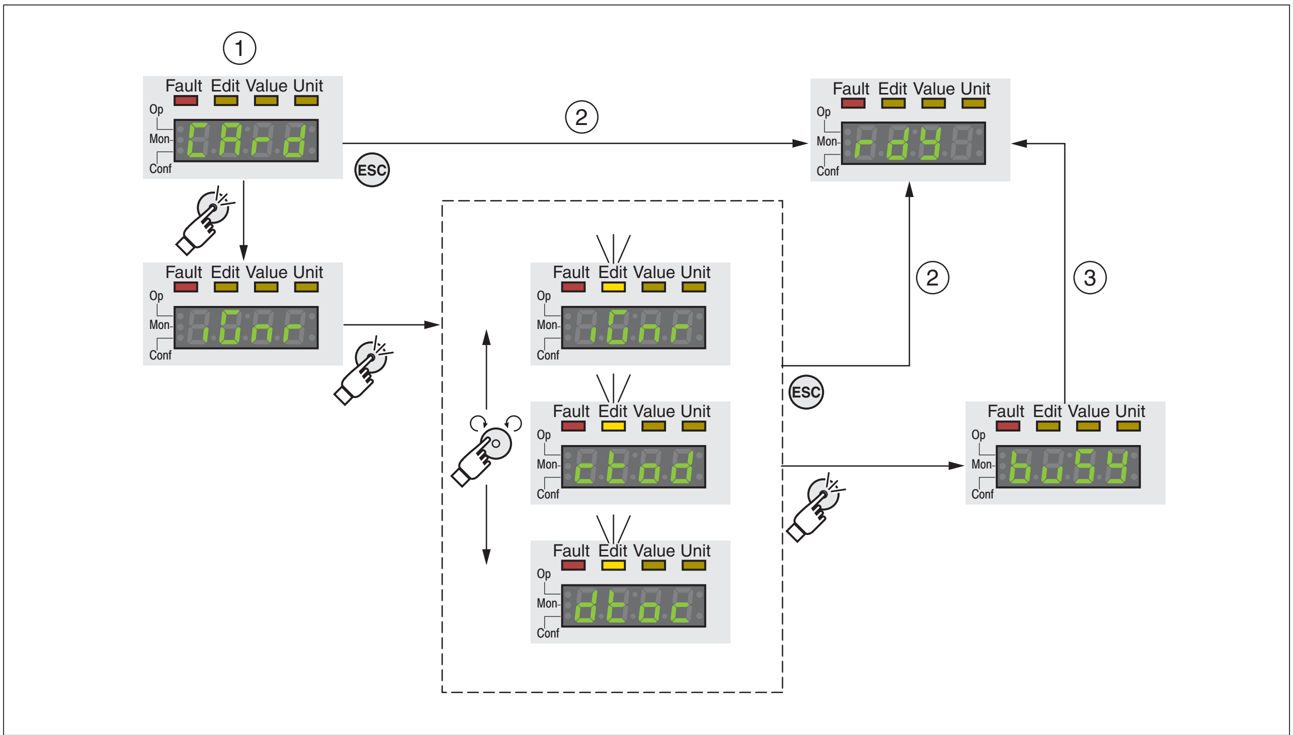


Figure 55: Memory card via integrated HMI

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

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

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

Memory card has been removed (CArd MiSS)

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

2. Options may be limited

0198441113755, V1.08, 04.2014

confirmed this warning, the product switches 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 for LXM 32 (Prot). For example, you may want to write-protect memory cards used for regular duplication of device data.

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

Selection	Meaning
EnPr	Write protection on (Prot)
dIPr	Write protection off

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

6.8 Duplicating existing device settings

Application and advantage

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

Prerequisites

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

Tools for duplication:

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

The controller supply must be switched on at the device.

Duplication using a memory card

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

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

Duplication using the commissioning software

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

See the manual for the commissioning software for additional information.

0198441113755, V1.08, 04.2014

6.9 Resetting the user parameters

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

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

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
PARuserReset ConF → FCS- rESu	Reset user parameters **0 / No / no** : No **65535 / Yes / YES** : Yes Bit 0: Set persistent user and controller 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 NOTE: The new settings are not saved to the EEPROM. Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 - 65535	UINT16 UINT16 R/W - -	CANopen 3004:8h Modbus 1040

Resetting via the HMI

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

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

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

Resetting via the commissioning software

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

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

0198441113755, V1.08, 04.2014

6.10 Restoring factory settings

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

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

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

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

Factory settings via HMI

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

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

Factory settings via commissioning software

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

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

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014

7 Operation

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

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Access channels

"7.1 Access channels"

Operating states

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

Operating modes

"7.3 Operating modes"
"7.3.1 Starting the operating mode"
"7.3.2 Changing the operating mode"
"7.3.3 Operating mode Jog"
"7.3.4 Operating mode Profile Torque"
"7.3.5 Operating mode Profile Velocity"
"7.3.6 Operating mode Profile Position"
"7.3.7 Operating mode Interpolated Position"
"7.3.8 Operating mode Homing"

Movement range

"7.4 Movement range"
"7.4.1 Zero point of the movement range"
"7.4.2 Movement beyond the movement range"
"7.4.3 Setting a modulo range"

Extended settings

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

Functions for target value processing

"7.6 Functions for target value processing"
"7.6.1 Stop movement with Halt"
"7.6.2 Stopping a movement with Quick Stop"
"7.6.3 Limitation of the velocity via signal inputs"
"7.6.4 Limitation of the current via signal inputs"
"7.6.5 Jerk limitation"
"7.6.6 Zero Clamp"
"7.6.7 Setting a signal output via parameter"
"7.6.8 Starting a movement via a signal input"
"7.6.9 Position capture via signal input"
"7.6.10 Relative Movement After Capture (RMAC)"

Functions for monitoring movements

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

0198441113755, V1.08, 04.2014

Functions for monitoring internal device signals

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

7.1 Access channels

⚠ WARNING

UNINTENDED BEHAVIOR CAUSED BY ACCESS CONTROL

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

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

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

The product can be addressed via different access channels. Access channels are:

- Integrated HMI
- Fieldbus
- Commissioning software or external graphic display terminal
- Digital input signals

If several access channels are active at the same time, this may lead to unintended equipment operation.

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

Only one access channel can have exclusive access to the product. An exclusive access can be provided via different access channels:

- Via the integrated HMI:

  The operating mode Jog or Autotuning can be started via the HMI.
- Via a fieldbus:

  Exclusive access is provided to a fieldbus by blocking the other access channels with the parameter `AccessLock`.
- Via the commissioning software:

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

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

The signal input functions "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 ($\overline{\text{STO\_A}}$ and $\overline{\text{STO\_B}}$) are effective during exclusive access.

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

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
AccessLock	Locking other access channels Value 0: Allow control via other access channels Value 1: Lock control via other access channels Example: The access channel is used by the fieldbus. In this case, control via the commissioning software or the HMI is not possible. The access channel can only be locked after the current operating mode has terminated. Changed settings become active immediately.	- 0 0 1	UINT16 UINT16 R/W - -	CANopen 3001:Eh 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 Changed settings become active immediately.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 303A:1h Modbus 14850

7.2 Operating states

7.2.1 State diagram

After switching on and when an operating mode is started, the product goes through a number of operating states.

The state diagram (state machine) shows the relationships between the operating states and the state transitions.

The operating states are internally monitored and influenced by monitoring functions.

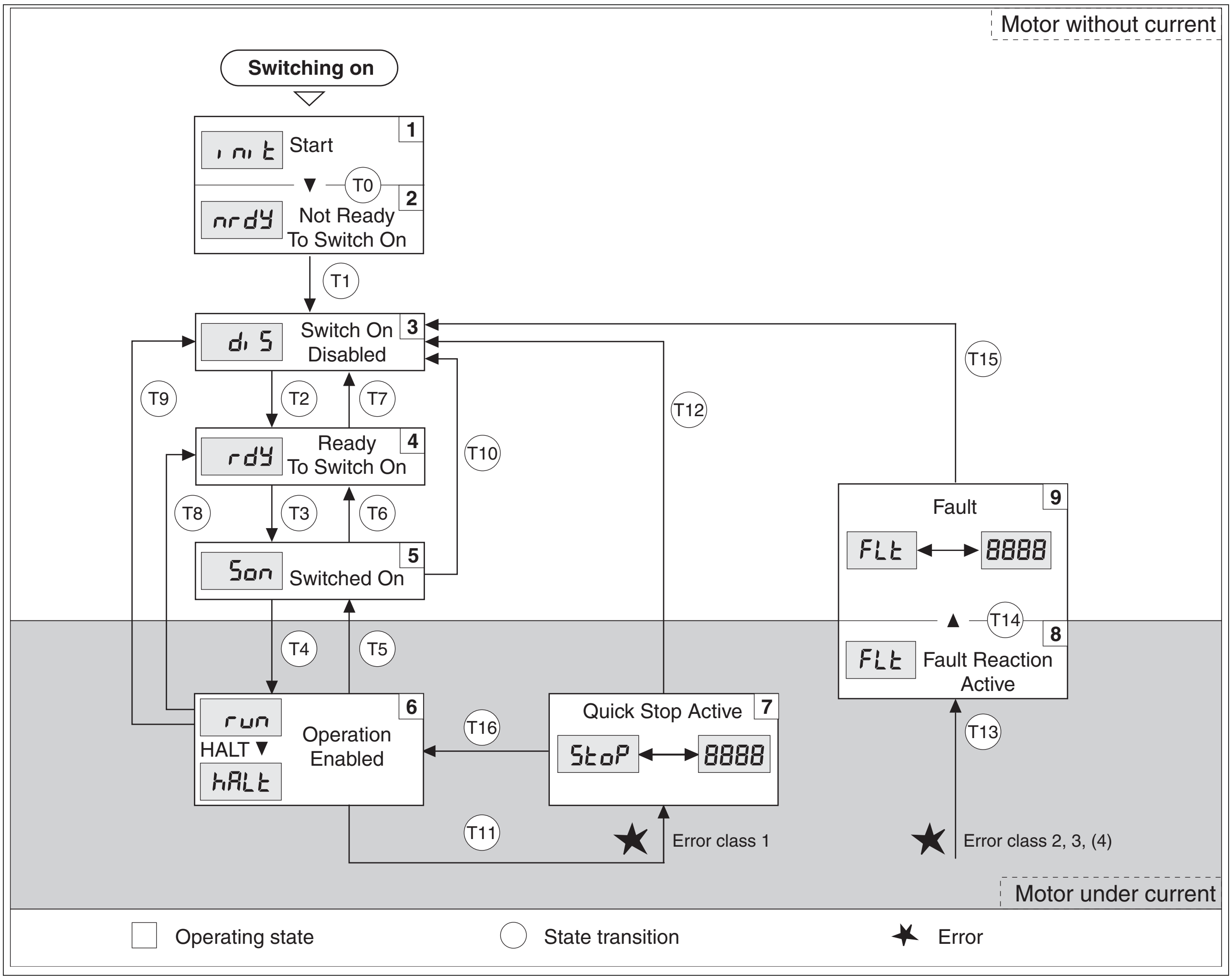


Figure 56: State diagram

0198441113755, V1.08, 04.2014

Operating states

Operating state	Description
1 Start	Electronics are initialized
2 Not Ready To Switch On	The power stage is not ready to switch on
3 Switch On Disabled	Impossible to enable the power stage
4 Ready To Switch On	The power stage is ready to switch on.
5 Switched On	Power stage is switched on
6 Operation Enabled	Power stage is enabled Selected operating mode is active
7 Quick Stop Active	"Quick Stop" is being executed
8 Fault Reaction Active	Error response is active
9 Fault	Error response terminated Power stage is disabled

Error class

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

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

Error response

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

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

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

Resetting an error message

A "Fault Reset" resets an error message.

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

0198441113755, V1.08, 04.2014

7.2.2 State transitions

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

State transition	Operating state	Condition / event [1]	Response
T0	**1**-> **2**	• Device electronics successfully initialized	
T1	**2**-> **3**	• Parameter successfully initialized	
T2	**3** -> **4**	• No undervoltage Encoder successfully checked Actual velocity: <1000 min^{-1} STO signals = +24V 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-defined 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 min^{-1} (for example by external driving force) • Fieldbus command: Disable Voltage	-
T8	**6** -> **4**	• Fieldbus command: Shutdown	Power stage is immediately disabled.
T9	**6** -> **3**	• Request for disabling the power stage • Fieldbus command: Disable Voltage	Power stage is immediately disabled.
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]	

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

0198441113755, V1.08, 04.2014

7.2.3 Indication of the operating state

7.2.3.1 HMI

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

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

7.2.3.2 Signal outputs

Information on the operating state is available via the the signal outputs. The table below provides an overview.

Operating state	"No fault" 1)	"Active" 2)
1 Start	0	0
2 Not Ready To Switch On	0	0
3 Switch On Disabled	0	0
4 Ready To Switch On	1	0
5 Switched On	1	0
6 Operation Enabled	1	1
7 Quick Stop Active	0	0
8 Fault Reaction Active	0	0
9 Fault	0	0

1) The signal output function is factory setting for `DQ0`
2) The signal output function is the factory setting for `DQ1`

7.2.3.3 Fieldbus

Descriptions of how to indicate the operating states via a fieldbus can be found in the fieldbus manual.

0198441113755, V1.08, 04.2014

7.2.4 Changing the operating state

7.2.4.1 HMI

An error message can be reset via the HMI.

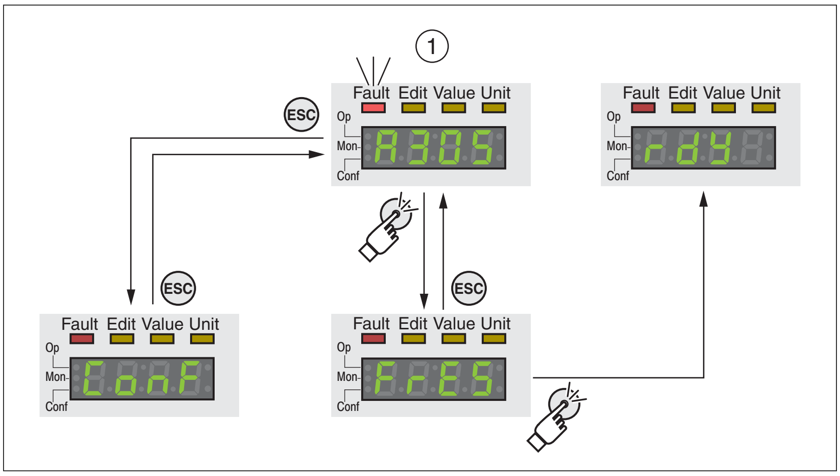


Figure 57: Resetting an error message

In the case of a detected error of error class 1, resetting the error message causes a transition from operating state **7** Quick Stop Active back to operating state **6** Operation Enabled.

In the case of a detected error of error classes 2 or 3, resetting the error message causes a transition from operating state **9** Fault back to operating state **3** Switch On Disable.

7.2.4.2 Signal inputs

It is possible to switch between operating states via the signal inputs.

Signal input function "Enable"

The power stage is enabled by means of the signal input function "Enable".

"Enable"	**State transition**
Rising edge	Enabling the power stage T3
Falling edge	Disabling the power stage T9 and T12

In order to activate the power stage via the signal input, you must first parameterizes the signal input function "Enable", see chapter "7.5.2 Setting the digital signal inputs and signal outputs".

0198441113755, V1.08, 04.2014

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 field-bus
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' during falling edge **2 / OnRisingEdge / riSE** : Additional 'Fault Reset' during rising edge Changed settings become active the next time the power stage is enabled. Available with firmware version ≥V01.12.	- 0 0 2	UINT16 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 via the signal input, you must first parameterize the signal input function "Fault Reset", see chapter "7.5.2 Setting the digital signal inputs and signal outputs".

7.2.4.3 Fieldbus

Descriptions of how to change the operating states via a fieldbus can be found in the fieldbus manual.

7.3 Operating modes

7.3.1 Starting the operating mode

Descriptions of how to start and change operating modes via the fieldbus can be found in the fieldbus manual.

7.3.2 Changing the operating mode

The operating mode can be changed after the current 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.

- Jog
- 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 chapter "7.6.1 Stop movement with Halt".

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 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3023:9$_h$ Modbus 8978

7.3.3 Operating mode Jog

Description

In the operating mode Jog, a movement is made from the actual motor position in the desired direction.

A movement can be made using one of 2 methods:

- Continuous movement
- Step movement

In addition, the product features 2 parameterizable velocities.

Starting the operating mode

The operating mode is started via the fieldbus. See the fieldbus manual 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.

Terminating the operating mode

The operating mode is terminated via the fieldbus. See the fieldbus manual for a description.

Status messages

Information on the operating state and the current movement is available via the fieldbus and the signal outputs.

Descriptions on obtaining information on the operating state and the current movement can be found in the fieldbus manual.

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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

0198441113755, V1.08, 04.2014

7.3.3.1 Continuous movement

As long as the signal for the direction is available, a continuous movement is made in the desired direction.

The illustration below provides an overview of continuous movement:

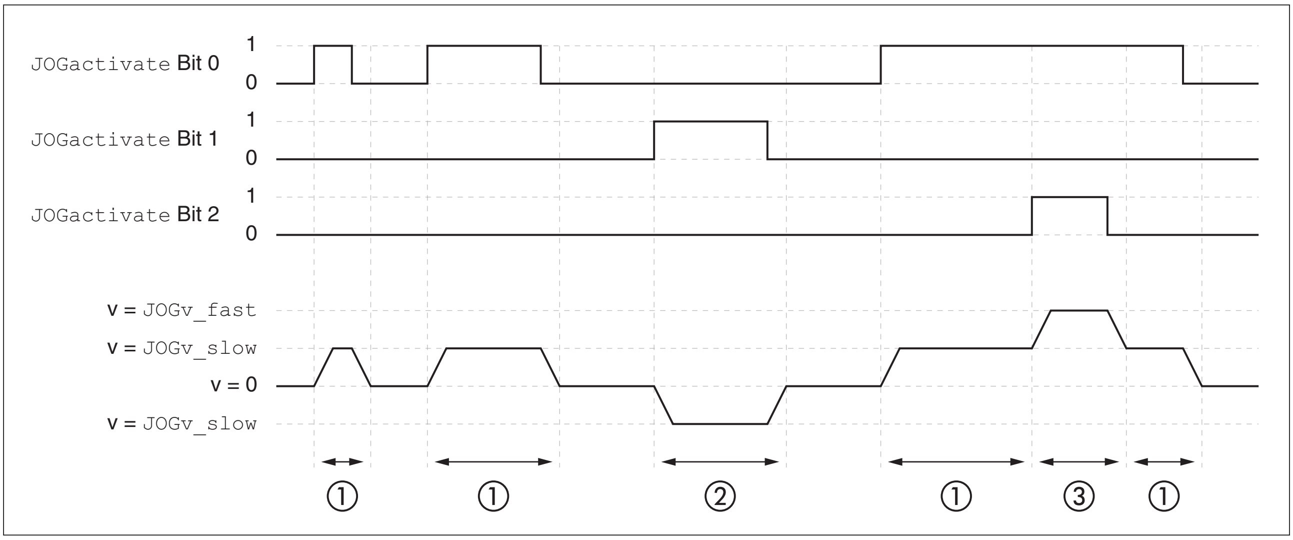


Figure 58: Continuous movement via the fieldbus

(1)	Slow movement in positive direction
(2)	Slow movement in negative direction
(3)	Fast movement in positive direction

0198441113755, V1.08, 04.2014

7.3.3.2 Step movement

If the signal for the direction is available for a short period of time, a movement with a parameterizable number of user-defined units is made in the desired direction.

If the signal for the direction is available continuously, a movement with a parameterizable number of user-defined units is made in the desired direction. After this movement, the motor stops for a defined period of time. Then a continuous movement is made in the desired direction.

The illustration provides an overview of step movement:

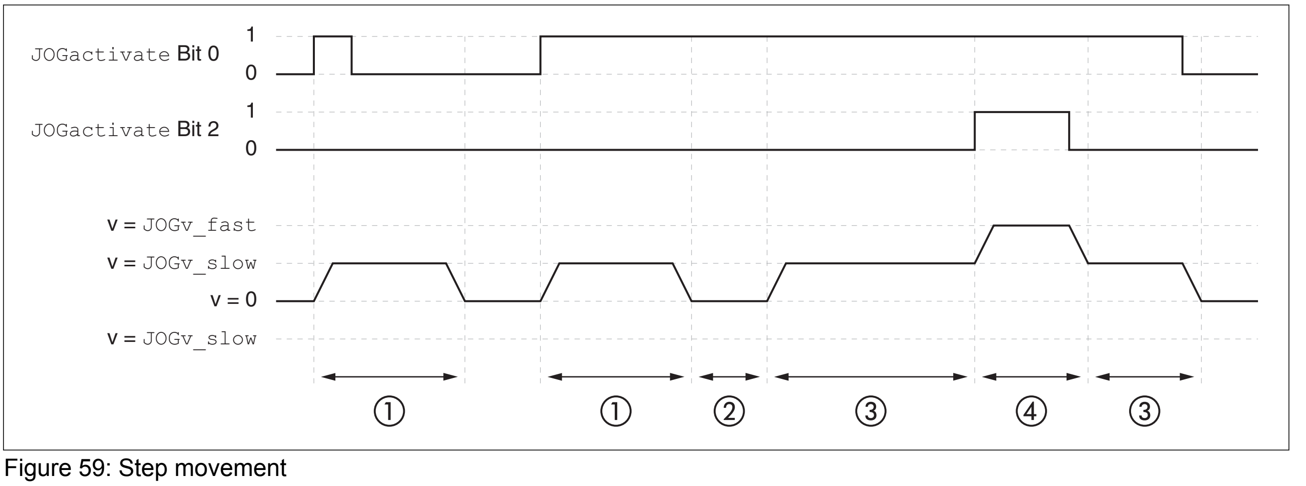


Figure 59: Step movement

(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

0198441113755, V1.08, 04.2014

7.3.3.3 Parameterization

Overview The illustration below provides an overview of the adjustable parameters.

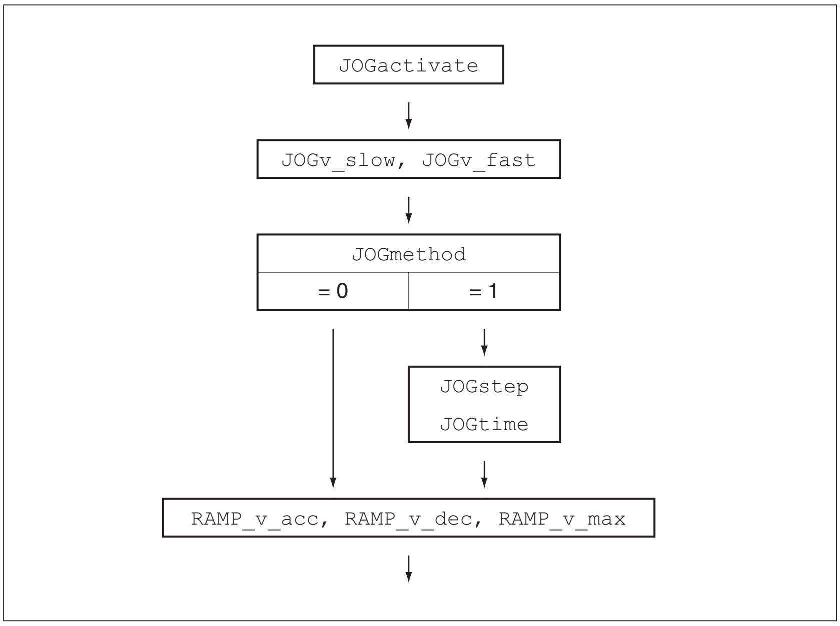


Figure 60: Overview of adjustable parameters

Velocities Two parameterizable velocities are available.

- Set the desired values with the parameters `JOGv_slow` and `JOGv_fast`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`JOGv_slow` oP → JoG- JGLo	Velocity for slow movement The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Changed settings become active immediately.	usr_v 1 60 2147483647	UINT32 UINT32 R/W per. -	CANopen 3029:4h Modbus 10504
`JOGv_fast` oP → JoG- JGhi	Velocity for fast movement The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Changed settings become active immediately.	usr_v 1 180 2147483647	UINT32 UINT32 R/W per. -	CANopen 3029:5h Modbus 10506

Selection of the method The parameter `JOGmethod` lets you set the method.

- Set the desired method with the parameter `JOGmethod`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
JOGmethod	Selection of jog method **0 / Continuous Movement / coMo** : Jog with continuous movement **1 / Step Movement / StMo** : Jog with step movement Changed settings become active immediately.	- 0 1 1	UINT16 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.

▶ Set the desired values with the parameters JOGstep and JOGtime.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
JOGstep	Distance for step movement Changed settings become active the next time the motor moves.	usr_p 1 20 2147483647	INT32 INT32 R/W per. -	CANopen 3029:7h Modbus 10510
JOGtime	Wait time for step movement Changed settings become active the next time the motor moves.	ms 1 500 32767	UINT16 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, see chapter "7.5.4 Setting the motion profile for the velocity".

7.3.3.4 Additional settings

The following functions can be used for target value processing:

- Chapter "7.6.1 Stop movement with Halt"
- Chapter "7.6.2 Stopping a movement with Quick Stop"
- Chapter "7.6.3 Limitation of the velocity via signal inputs"
- Chapter "7.6.4 Limitation of the current via signal inputs"
- Chapter "7.6.5 Jerk limitation"
- Chapter "7.6.7 Setting a signal output via parameter"
- Chapter "7.6.9 Position capture via signal input"
- Chapter "7.6.10 Relative Movement After Capture (RMAC)"

The following functions can be used for monitoring the movement:

- Chapter "7.7.1 Limit switches"
- Chapter "7.7.3 Software limit switches"
- Chapter "7.7.4 Load-dependent position deviation (following error)"
- Chapter "7.7.5 Motor standstill and direction of movement"
- Chapter "7.7.8 Standstill window"

  This function is only available for a step movement.
- Chapter "7.7.9 Position register"
- Chapter "7.7.10 Position deviation window"
- Chapter "7.7.11 Velocity deviation window"
- Chapter "7.7.12 Velocity threshold value"
- Chapter "7.7.13 Current threshold value"

0198441113755, V1.08, 04.2014

7.3.4 Operating mode Profile Torque

Without a proper limit value, the motor can reach a very high velocity in this operating mode.

⚠ WARNING

EXCESSIVELY HIGH VELOCITY DUE TO INCORRECT LIMIT VALUE

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.

Description

In the operating mode Profile Torque, a movement is made with a desired target torque.

Starting the operating mode

The operating mode is started via the fieldbus. See the fieldbus manual for a description.

Terminating the operating mode

The operating mode is terminated via the fieldbus. See the fieldbus manual for a description.

Status messages

Information on the operating state and the current movement is available via the fieldbus and the signal outputs.

Descriptions on obtaining information on the operating state and the current movement can be found in the fieldbus manual.

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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

7.3.4.1 Parameterization

Overview

The illustration below provides an overview of the adjustable parameters.

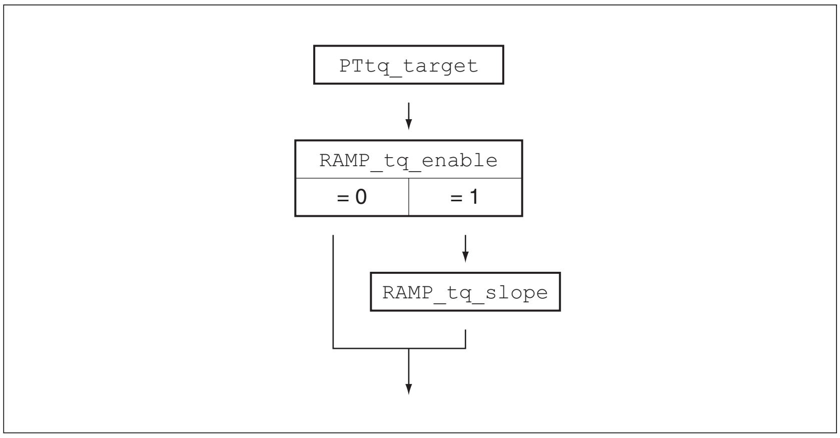


Figure 61: Overview of adjustable parameters

Setting the target torque

The target torque is set by means of the parameter `PTtq_target`.

▸ Set the desired target torque with 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 for operating mode Profile Torque 100.0 % correspond to the continuous stall torque _M_M_0. In increments of 0.1 %. Changed settings become active immediately.	% -3000.0 0.0 3000.0	INT16 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 field-bus
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 changed if power stage is disabled. Changed settings become active immediately.	- 0 1 1	UINT16 UINT16 R/W per. -	CANopen 3006:2Ch 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. Changed settings become active immediately.	%/s 0.1 10000.0 3000000.0	UINT32 UINT32 R/W per. -	CANopen 6087:0h Modbus 1620

7.3.4.2 Additional settings

The following functions can be used for target value processing:

- Chapter "7.6.1 Stop movement with Halt"
- Chapter "7.6.2 Stopping a movement with Quick Stop"
- Chapter "7.6.3 Limitation of the velocity via signal inputs"
- Chapter "7.6.4 Limitation of the current via signal inputs"
- Chapter "7.6.7 Setting a signal output via parameter"
- Chapter "7.6.9 Position capture via signal input"
- Chapter "7.6.10 Relative Movement After Capture (RMAC)"

The following functions can be used for monitoring the movement:

- Chapter "7.7.1 Limit switches"
- Chapter "7.7.3 Software limit switches"
- Chapter "7.7.5 Motor standstill and direction of movement"
- Chapter "7.7.6 Torque window"
- Chapter "7.7.9 Position register"
- Chapter "7.7.12 Velocity threshold value"
- Chapter "7.7.13 Current threshold value"

0198441113755, V1.08, 04.2014

7.3.5 Operating mode Profile Velocity

Description

In the operating mode Profile Velocity, a movement is made with a desired target velocity.

Starting the operating mode

The operating mode is started via the fieldbus. See the fieldbus manual for a description.

Terminating the operating mode

The operating mode is terminated via the fieldbus. See the fieldbus manual for a description.

Status messages

Information on the operating state and the current movement is available via the fieldbus and the signal outputs.

Descriptions on obtaining information on the operating state and the current movement can be found in the fieldbus manual.

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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

0198441113755, V1.08, 04.2014

7.3.5.1 Parameterization

Overview

The illustration below provides an overview of the adjustable parameters.

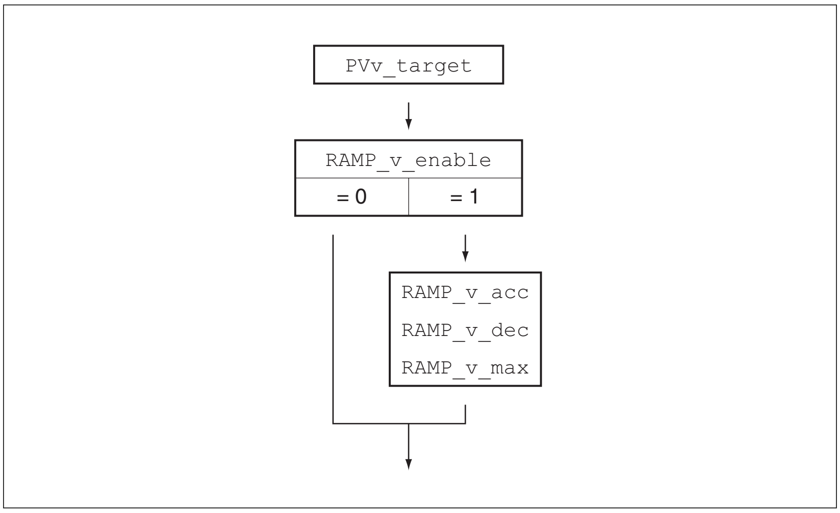


Figure 62: Overview of adjustable parameters

Setting the target velocity

The parameter `PVv_target` allows you to set the target velocity.

▸ Set the target velocity with the parameter `PVv_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**
`PVv_target`	Target velocity for operating mode Profile Velocity The target velocity is limited to the setting in CTRL_v_max and RAMP_v_max. Changed settings become active immediately.	usr_v - 0 -	INT32 INT32 R/W - -	CANopen 60FF:0h Modbus 6938

Changing the motion profile for the velocity

It is possible to change the parameterization of the motion profile for the velocity, see chapter "7.5.4 Setting the motion profile for the velocity".

7.3.5.2 Additional settings

The following functions can be used for target value processing:

- Chapter "7.6.1 Stop movement with Halt"
- Chapter "7.6.2 Stopping a movement with Quick Stop"
- Chapter "7.7.5 Motor standstill and direction of movement"
- Chapter "7.6.3 Limitation of the velocity via signal inputs"
- Chapter "7.6.4 Limitation of the current via signal inputs"
- Chapter "7.6.6 Zero Clamp"
- Chapter "7.6.7 Setting a signal output via parameter"
- Chapter "7.6.9 Position capture via signal input"
- Chapter "7.6.10 Relative Movement After Capture (RMAC)"

The following functions can be used for monitoring the movement:

- Chapter "7.7.1 Limit switches"
- Chapter "7.7.3 Software limit switches"
- Chapter "7.7.7 Velocity window"
- Chapter "7.7.9 Position register"
- Chapter "7.7.11 Velocity deviation window"
- Chapter "7.7.12 Velocity threshold value"
- Chapter "7.7.13 Current threshold value"

0198441113755, V1.08, 04.2014

7.3.6 Operating mode Profile Position

Description

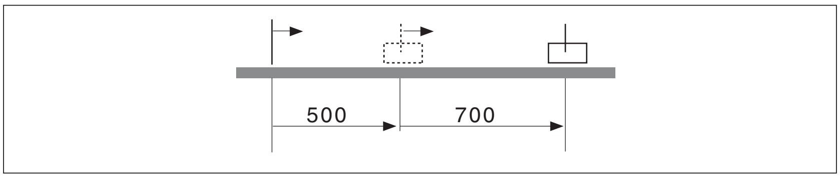
In the operating mode Profile Position, a movement to a desired target position is performed.

A movement can be made using one of 2 methods:

- Relative movement
- Absolute movement

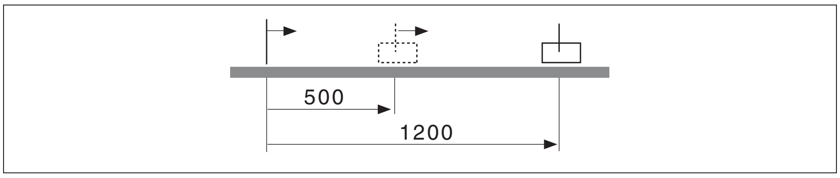
Relative movement

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



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 manual for a description.

Terminating the operating mode

The operating mode is terminated via the fieldbus. See the fieldbus manual for a description.

Status messages

Information on the operating state and the current movement is available via the fieldbus and the signal outputs.

Descriptions on obtaining information on the operating state and the current movement can be found in the fieldbus manual.

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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

0198441113755, V1.08, 04.2014

7.3.6.1 Parameterization

Overview The illustration below provides an overview of the adjustable parameters.

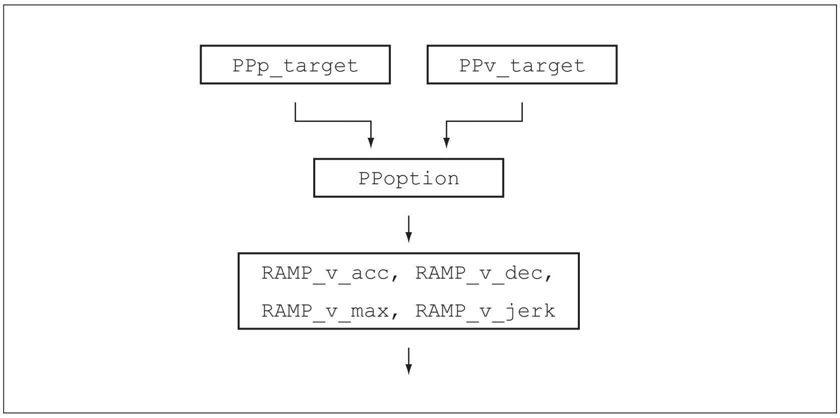


Figure 63: Overview of adjustable parameters

Target position The parameter `PPp_target` allows you to enter the target position.

▶ Set the desired target position with the parameter `PPp_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
`PPp_target`	Target position for operating mode Profile Position Minimum/maximum values depend on: - Scaling factor - Software limit switches (if they are activated) Changed settings become active immediately.	usr_p - - -	INT32 INT32 R/W - -	CANopen 607A:0$_h$ Modbus 6940

Target velocity The parameter `PPv_target` allows you to set the target velocity.

▶ Set the target velocity with the parameter `PPv_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
`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. Changed settings become active the next time the motor moves.	usr_v 1 60 4294967295	UINT32 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.

▶ Set the desired method for a relative movement with the parameter `PPoption`.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`PPoption`	Options for operating mode Profile Position Determines the reference position for relative positioning: 0: Relative with reference to the previous target position of the profile generator 1: Not supported 2: Relative with reference to the actual position of the motor Changed settings become active the next time the motor moves.	- 0 0 2	UINT16 UINT16 R/W - -	CANopen 60F2:0h Modbus 6960

Changing the motion profile for the velocity

It is possible to change the parameterization of the motion profile for the velocity, see chapter "7.5.4 Setting the motion profile for the velocity".

7.3.6.2 Additional settings

The following functions can be used for target value processing:

- Chapter "7.6.1 Stop movement with Halt"
- Chapter "7.6.2 Stopping a movement with Quick Stop"
- Chapter "7.6.3 Limitation of the velocity via signal inputs"
- Chapter "7.6.4 Limitation of the current via signal inputs"
- Chapter "7.6.5 Jerk limitation"
- Chapter "7.6.7 Setting a signal output via parameter"
- Chapter "7.6.8 Starting a movement via a signal input"
- Chapter "7.6.9 Position capture via signal input"
- Chapter "7.6.10 Relative Movement After Capture (RMAC)"

The following functions can be used for monitoring the movement:

- Chapter "7.7.1 Limit switches"
- Chapter "7.7.3 Software limit switches"
- Chapter "7.7.4 Load-dependent position deviation (following error)"
- Chapter "7.7.5 Motor standstill and direction of movement"
- Chapter "7.7.8 Standstill window"
- Chapter "7.7.9 Position register"
- Chapter "7.7.10 Position deviation window"
- Chapter "7.7.11 Velocity deviation window"
- Chapter "7.7.12 Velocity threshold value"
- Chapter "7.7.13 Current threshold value"

0198441113755, V1.08, 04.2014

7.3.7 Operating mode Interpolated Position

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.

- Check cyclical reception of PDOs at the PLC 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:

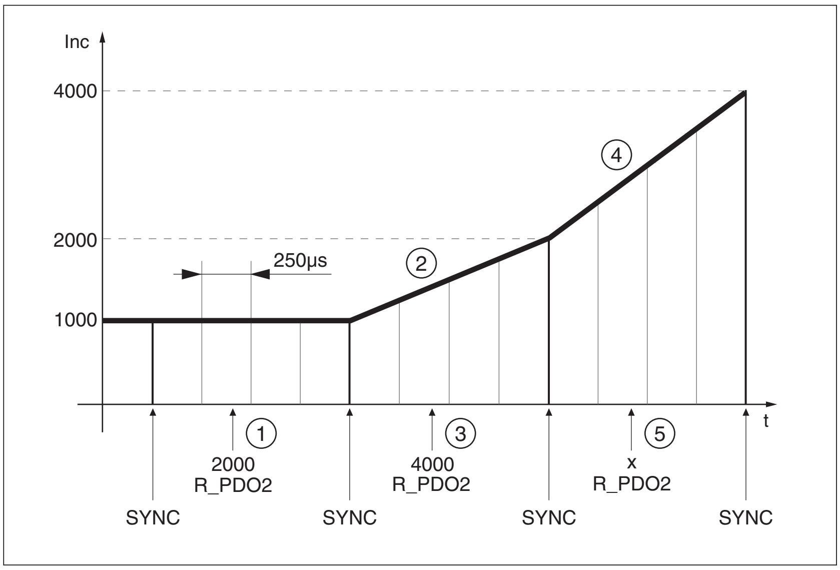


Figure 64: Overview

(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 manual for a description.

Terminating the operating mode The operating mode is terminated via the fieldbus. See the fieldbus manual for a description.

0198441113755, V1.08, 04.2014

Status messages

Information on the operating state and the current movement is available via the fieldbus and the signal outputs.

Descriptions on obtaining information on the operating state and the current movement can be found in the fieldbus manual.

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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

0198441113755, V1.08, 04.2014

7.3.7.1 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. Changed settings become active immediately.	- 0 0 2	UINT16 UINT16 R/W - -	CANopen 3022:5h Modbus 8714
`SyncMechTol`	Synchronization tolerance This parameter is used to increase the synchronization tolerance in the operating mode Interpolated Position. The value is applied when the synchronization mechanism is activated via the parameter SyncMechStart. Changed settings become active immediately. Available with firmware version ≥V01.08.	- 1 1 20	UINT16 UINT16 R/W - -	CANopen 3022:4h 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 UINT16 R/- - -	CANopen 3022:6h Modbus 8716

0198441113755, V1.08, 04.2014

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 PLC 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	0.13 ms	0.26 ms	0.52 ms
R_PDOx	8	0.13 ms	0.26 ms	0.52 ms
T_PDOx	8	0.13 ms	0.26 ms	0.52 ms
R_SDO and T_SDO	16	0.26 ms	0.52 ms	1.040 ms

0198441113755, V1.08, 04.2014

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` * $10^{\texttt{IP\_IntTimInd}}$

- 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.	s 0 1 255	UINT8 UINT16 R/W - -	CANopen 60C2:1h Modbus 7000
`IP_IntTimInd`	Interpolation time index Available with firmware version ≥V01.08.	- -128 -3 63	INT8 INT16 R/W - -	CANopen 60C2:2h Modbus 7002

Position comparison

The drive cyclically processed the reference position as soon as bit 4 of the control word is set to 1 ne. If the difference between reference position and actual position is too great, this results in a following error. To 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 INT32 R/- - -	CANopen 6064:0h Modbus 7706

Reference position

The parameter `IPp_target` cyclically transmits a reference value.

- Set the desired reference value with the parameter `IPp_target`.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IPp_target	Position reference value for operating mode Interpolated Position Available with firmware version ≥V01.08.	- -2147483648 - 2147483647	INT32 INT32 R/W - -	CANopen 60C1:1h Modbus 7004

0198441113755, V1.08, 04.2014

7.3.8 Operating mode Homing

Description

In the operating mode Homing, a reference is generated between a mechanical position and the actual position of the motor.

A reference between a mechanical position and the actual position of the motor is generated by means of a reference movement or by means of position setting.

A successful reference movement or position setting home the motor and the zero point becomes valid.

The zero point is the point of reference for absolute movements in the operating mode Profile Position.

Methods

A movement can be made using different methods:

- Reference movement to a limit switch

  In the case of a reference movement to a limit switch, a movement to the negative limit switch or the positive limit switch is performed. When the limit switch is reached, the motor is stopped and a movement is made back to the switching point of the limit switch.
  From the switching point of the limit switch, a movement is made to the next index pulse of the motor or to a parameterizable distance from the switching point.
  The position of the index pulse or the position of the parameterizable distance from the switching point is the reference point.
- Reference movement to the reference switch

  In the case of a reference movement to the reference switch, a movement to the reference switch is performed.
  When the reference switch is reached, the motor is stopped and a movement is made back to the switching point of the reference switch.
  From the switching point of the reference switch, a movement is made to the next index pulse of the motor or to a parameterizable distance from the switching point.
  The position of the index pulse or the position of the parameterizable distance from the switching point is the reference point.
- Reference movement to the index pulse

  In the case of a reference movement to the index pulse, a movement is made from the actual position to the next index pulse. The position of the index pulse is the reference point.
- Position setting

  In the case of position setting, the current motor position is set to a desired position value.

A reference movement must be terminated without interruption for the new zero point to be valid. If the reference movement is interrupted, it must be started again.

Motors with multiturn encoder deliver a valid zero point after they are switched on.

Starting the operating mode

The operating mode is started via the fieldbus. See the fieldbus manual for a description.

0198441113755, V1.08, 04.2014

Terminating the operating mode

The operating mode is terminated via the fieldbus. See the fieldbus manual for a description.

Status messages

Information on the operating state and the current movement is available via the fieldbus and the signal outputs.

Descriptions on obtaining information on the operating state and the current movement can be found in the fieldbus manual.

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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

0198441113755, V1.08, 04.2014

7.3.8.1 Parameterization

Overview

The illustration below provides an overview of the adjustable parameters.

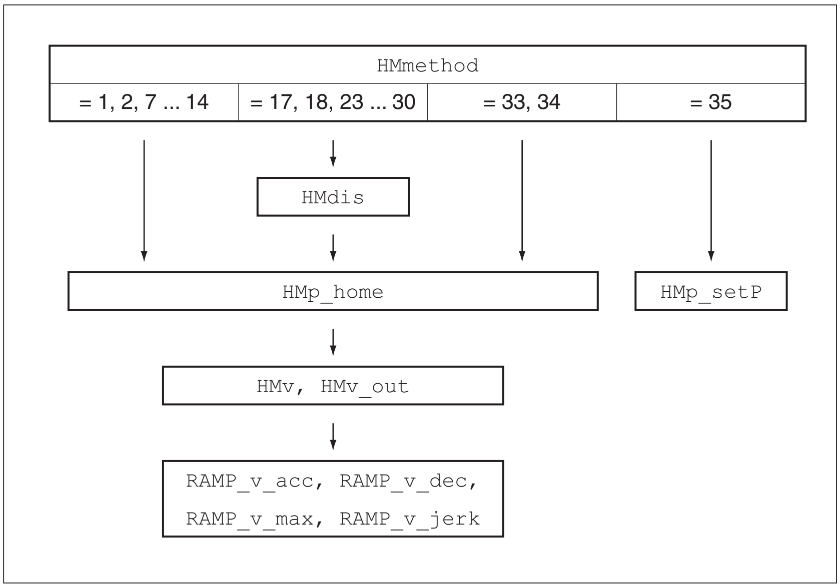


Figure 65: Overview of adjustable parameters

Setting limit switches and reference switches

The limit switches and reference switches must be set to meet the requirements, see chapter "7.7.1 Limit switches" and chapter "7.7.2 Reference switch".

Selection of the method

The operating mode Homing establishes an absolute position reference between the motor position and a defined axis position. There are various Homing methods which can be selected via the parameter `HMmethod`.

The `HMprefmethod` parameter is used to save the preferred method to the EEPROM (persistent). When the preferred method has been set in this parameter, the method is performed during homing even after the device is switched off and on. The value to be entered corresponds to the value in the `HMmethod` parameter.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via 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 neg. direction 34: Index pulse pos. direction 35: Position setting Abbreviations: REF+: Search movement in pos. direction REF-: Search movement in neg. direction inv.: Invert direction in switch not inv.: Direction not inverted in switch outside: Index pulse / distance outside switch inside: Index pulse / distance inside switch Changed settings become active immediately.	- 1 18 35	INT8 INT16 R/W - -	CANopen 6098:0h Modbus 6936
HMprefmethod oP → hoM- MEth	Preferred homing method Changed settings become active immediately.	- 1 18 35	INT16 INT16 R/W per. -	CANopen 3028:Ah 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.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
HMdis	Distance from switching point The distance from the switching point is defined as the reference point. The parameter is only effective during a reference movement without index pulse. Changed settings become active the next time the motor moves.	usr_p 1 200 2147483647	INT32 INT32 R/W per. -	CANopen 3028:7h 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.

NOTE: If the value 0 is used, the zero point corresponds to the reference point.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
HMp_home	Position at reference point After a successful reference movement, this position is automatically set at the reference point. Changed settings become active the next time the motor moves.	usr_p -2147483648 0 2147483647	INT32 INT32 R/W per. -	CANopen 3028:Bh Modbus 10262

Setting monitoring The parameters HMoutdis and HMsrchdis allow you to activate monitoring of the limit switchs and the reference switch.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
HMoutdis	Maximum distance for search for switching point 0: Monitoring of distance inactive >0: Maximum distance After detection of the switch, the drive starts to search for the defined switching point. If the defined switching point is not found within the distance defined here, the reference movement is canceled with an error. Changed settings become active the next time the motor moves.	usr_p 0 0 2147483647	INT32 INT32 R/W per. -	CANopen 3028:6h 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. Changed settings become active the next time the motor moves.	usr_p 0 0 2147483647	INT32 INT32 R/W per. -	CANopen 3028:Dh Modbus 10266

Reading out the position distance

The position distance between the switching point and index pulse can be read out with the following parameters.

The distance between the switching point and the index pulse must be >0.05 revolutions for reproducible reference movements with index pulse.

If the index pulse is too close to the switching point, the limit switch or reference switch can be moved mechanically.

Otherwise the position of the index pulse can be moved with the parameter ENC_pabsusr, see Chapter "6.5.9 Setting parameters for encoder".

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_HMdisREFtoIDX_usr`	Distance from switching point to index pulse It allows to check the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. Available with firmware version ≥V01.05.	usr_p -2147483648 - 2147483647	INT32 INT32 R/- - -	CANopen 3028:F$_{h}$ Modbus 10270
`_HMdisREFtoIDX`	Distance from switching point to index pulse It allows to check the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. The parameter _HMdisREFtoIDX_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution.	revolution - - -	INT32 INT32 R/- - -	CANopen 3028:C$_{h}$ Modbus 10264

Setting velocities

The parameters `HMv` and `HMv_out` are used to set the velocities for searching the switch and for moving away from the switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`HMv` oP → hoM- hMn	Target velocity for searching the switch The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Changed settings become active the next time the motor moves.	usr_v 1 60 2147483647	UINT32 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 current parameter setting in RAMP_v_max. Changed settings become active the next time the motor moves.	usr_v 1 6 2147483647	UINT32 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, see chapter "7.5.4 Setting the motion profile for the velocity".

7.3.8.2 Reference movement to a limit switch

The illustration below shows a reference movement to a limit switch

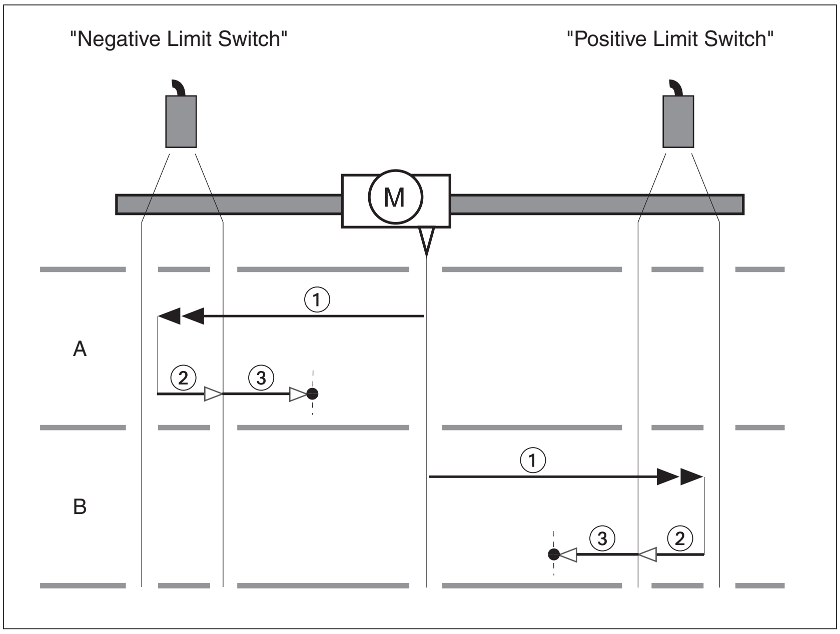


Figure 66: Reference movement to a limit switch

(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.

0198441113755, V1.08, 04.2014

7.3.8.3 Reference movement to the reference switch in positive direction

The illustration below shows a reference movement to the reference switch in positive direction

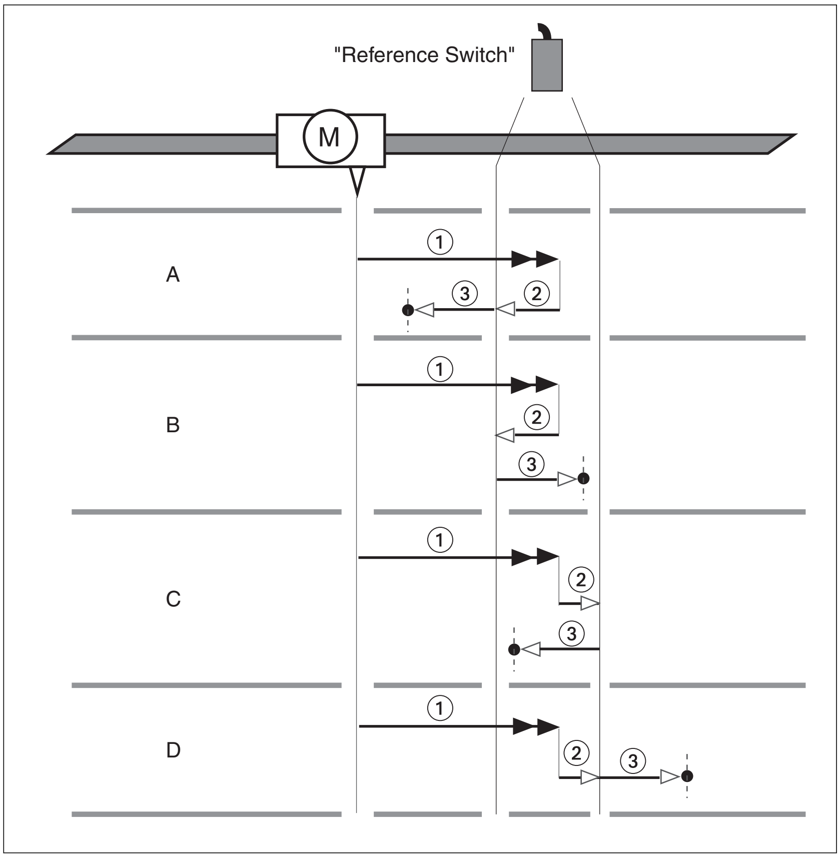


Figure 67: Reference movement to the reference switch in positive direction

(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.

0198441113755, V1.08, 04.2014

7.3.8.4 Reference movement to the reference switch in negative direction

The illustration below shows a reference movement to the reference switch in negative direction

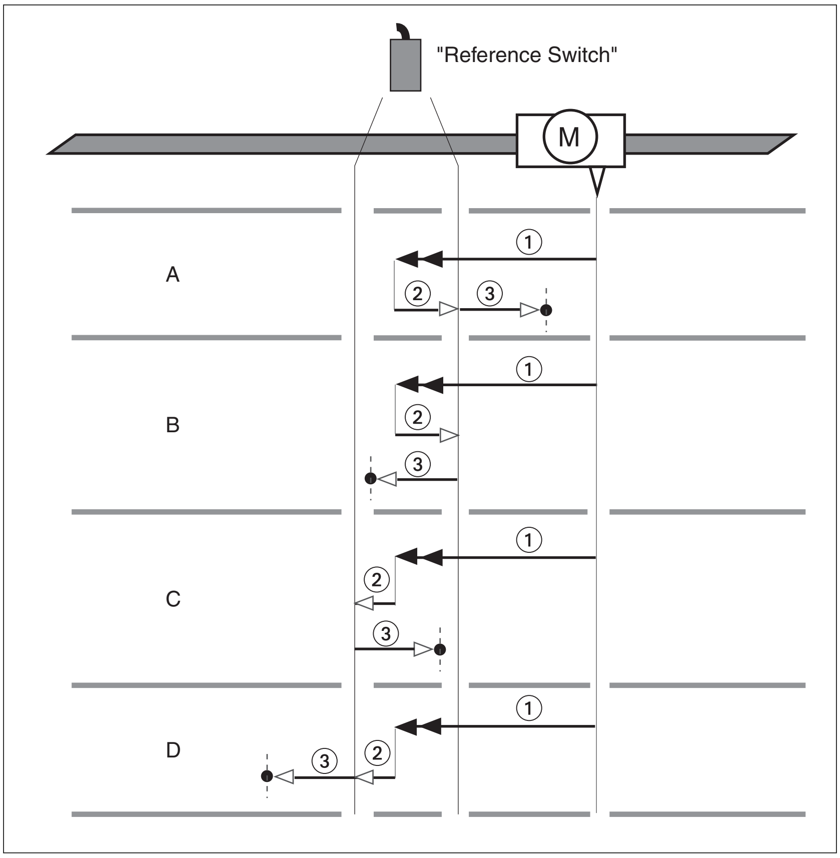


Figure 68: Reference movement to the reference switch in negative direction

(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.

0198441113755, V1.08, 04.2014

7.3.8.5 Reference movement to the index pulse

The illustration below shows a reference movement to the index pulse

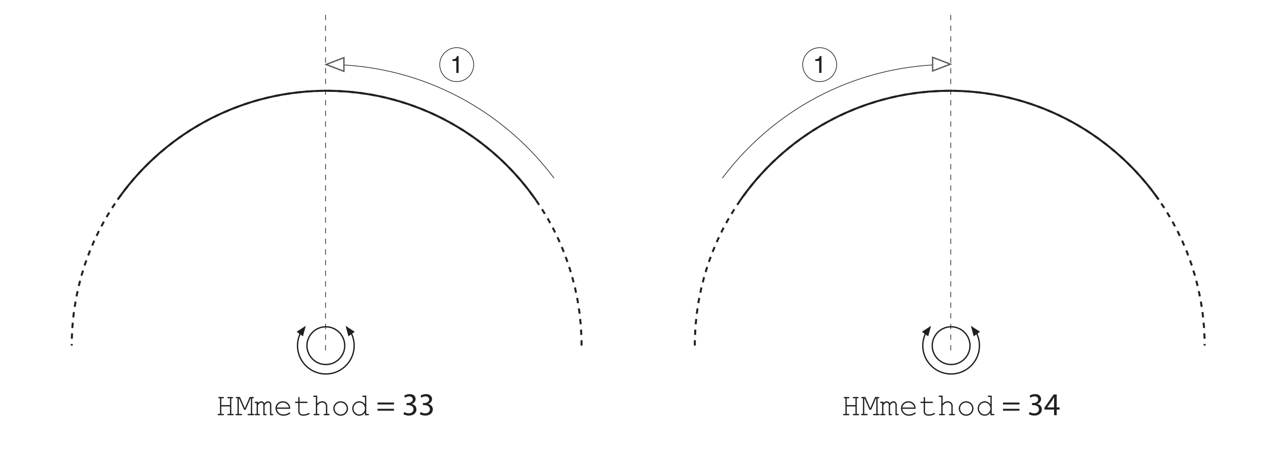


Figure 69: Reference movement to the index pulse

(1) Movement to index pulse at velocity `HMv_out`

0198441113755, V1.08, 04.2014

7.3.8.6 Position setting

Description

By means of position setting, the current motor position is set to the position value in parameter `HMp_setP`. This also defines the zero point.

Position setting is only possible when the motor is at a standstill. Any active position deviation remains active and can still be compensated for by the position controller after position setting.

Setting the position for position setting

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`HMp_setP`	Position for Position Setting Position for operating mode Homing, method 35. Changed settings become active immediately.	usr_p - 0 -	INT32 INT32 R/W - -	CANopen 301B:16h Modbus 6956

Example

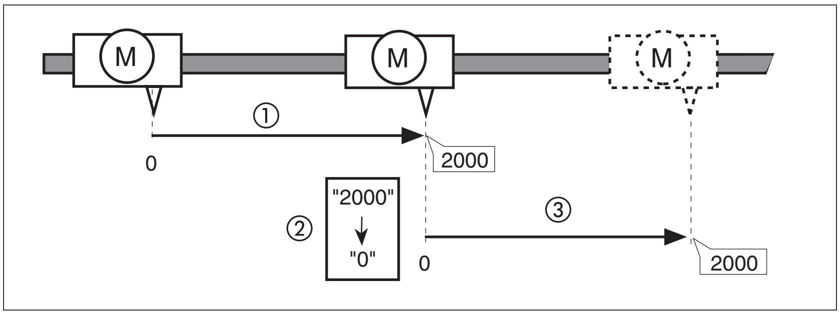


Figure 70: Movement by 4000 user-defined units with position setting

(1) The motor is positioned by 2000 user-defined units.

(2) By means of position setting to 0, the current motor position is set to position value 0 which, at the same time, defines a new zero point.

(3) When a new movement by 2000 user-defined units is triggered, the new target position is 2000 user-defined units.

0198441113755, V1.08, 04.2014

7.3.8.7 Additional settings

The following functions can be used for target value processing:

- Chapter "7.6.1 Stop movement with Halt"
- Chapter "7.6.2 Stopping a movement with Quick Stop"
- Chapter "7.6.3 Limitation of the velocity via signal inputs"
- Chapter "7.6.4 Limitation of the current via signal inputs"
- Chapter "7.6.5 Jerk limitation"
- Chapter "7.6.7 Setting a signal output via parameter"
- Chapter "7.6.9 Position capture via signal input"

The following functions can be used for monitoring the movement:

- Chapter "7.7.1 Limit switches"
- Chapter "7.7.2 Reference switch"
- Chapter "7.7.3 Software limit switches"
- Chapter "7.7.4 Load-dependent position deviation (following error)"
- Chapter "7.7.5 Motor standstill and direction of movement"
- Chapter "7.7.8 Standstill window"
- Chapter "7.7.9 Position register"
- Chapter "7.7.10 Position deviation window"
- Chapter "7.7.11 Velocity deviation window"
- Chapter "7.7.12 Velocity threshold value"
- Chapter "7.7.13 Current threshold value"

7.4 Movement range

The movement range is the maximum possible range within which a movement can be made to any position.

The actual position of the motor is the position in the movement range.

The figure below shows the movement range in user-defined units with the factory scaling.

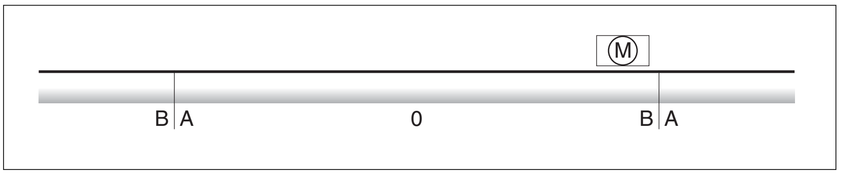


Figure 71: Movement range

(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

7.4.1 Zero point of the movement range

The zero point of the movement range 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.

0198441113755, V1.08, 04.2014

7.4.2 Movement beyond the movement range

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 changed if power stage is disabled. Changed settings become active the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3023:7$_h$ Modbus 8974

7.4.2.1 Behavior for operating mode Jog

Continuous movement

Behavior for continuous movement beyond the movement range:

- The movement range restarts.

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.

7.4.2.2 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.

Absolute movement

Behavior for absolute movement:

- With firmware version ≥V01.06 and setting via parameter `PP_ModeRangeLim` = 1:

  A relative movement beyond the movement range is possible.
- With firmware version <V01.06:

  An absolute movement is made within the movement range. A relative 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)

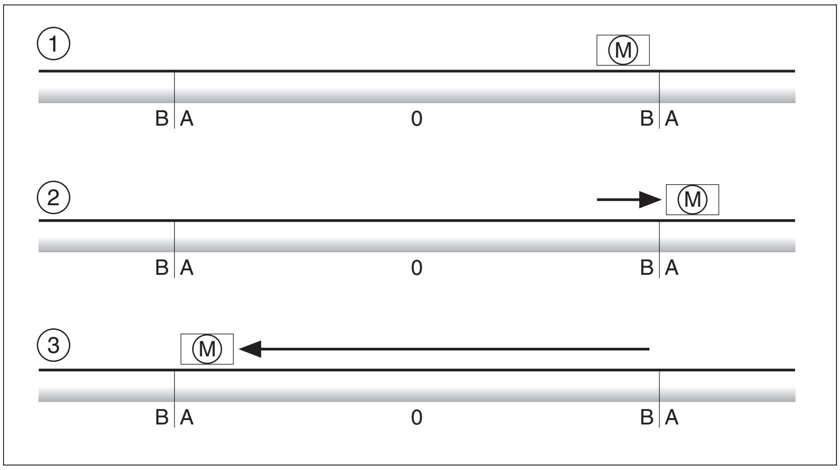


Figure 72: Absolute movement

(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 Parameter `PP_ModeRangeLim` = 1
(3)	Absolute movement to -268435000 user-defined units Parameter `PP_ModeRangeLim` = 0

0198441113755, V1.08, 04.2014

7.4.3 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

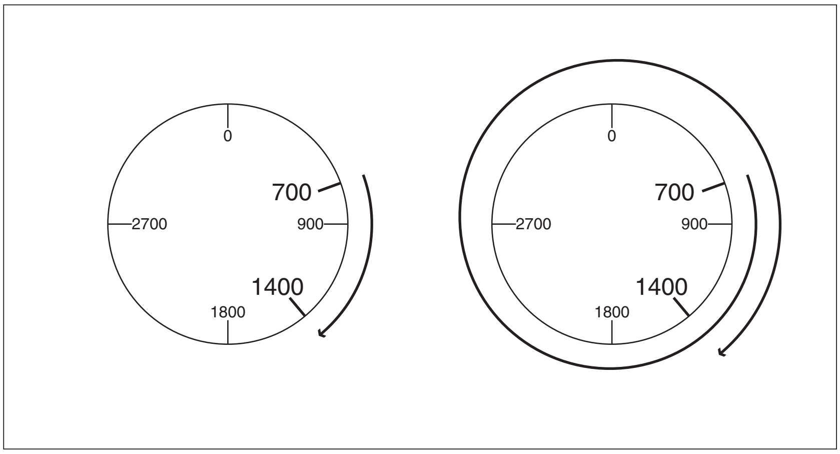


Figure 73: Multiple modulo range

7.4.3.1 Parameterization

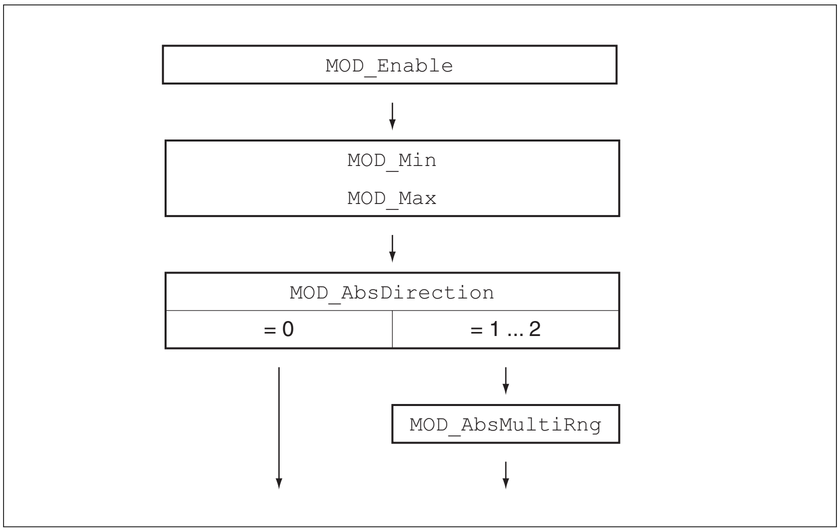


Figure 74: Overview of parameters

General 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 chapter "7.5.1 Scaling".

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 field-bus**
`MOD_Enable` ConF → ACG- AtyP	Activation of Modulo **0 / Modulo Off / oFF** : Modulo is off **1 / Modulo On / on** : Modulo is on Activating Modulo does not automatically change the value of other parameters. Before changing this value, verify that the parameter settings for the intended application are correct. NOTE: Modulo must be deactivated for Autotuning. Setting can only be changed if power stage is disabled. Changed settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3006:38h Modbus 1648

Modulo range The parameters `MOD_Min` and `MOD_Max` can be used to set the modulo range.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`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 changed if power stage is disabled. Changed settings become active immediately. Available with firmware version ≥V01.03.	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 3006:39h 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 changed if power stage is disabled. Changed settings become active immediately. Available with firmware version ≥V01.03.	usr_p - 3600 -	INT32 INT32 R/W per. -	CANopen 3006:3Ah 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 field-bus
`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. Changed settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 2	UINT16 UINT16 R/W per. -	CANopen 3006:3Bh 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 field-bus
MOD_AbsMultiRng	Multiple ranges for absolut movement with Modulo **0 / Multiple Ranges Off**: Absolute movement in one modulo range **1 / Multiple Ranges On**: Absolute movement in multiple modulo ranges Changed settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3006:3C$_h$ Modbus 1656

7.4.3.2 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

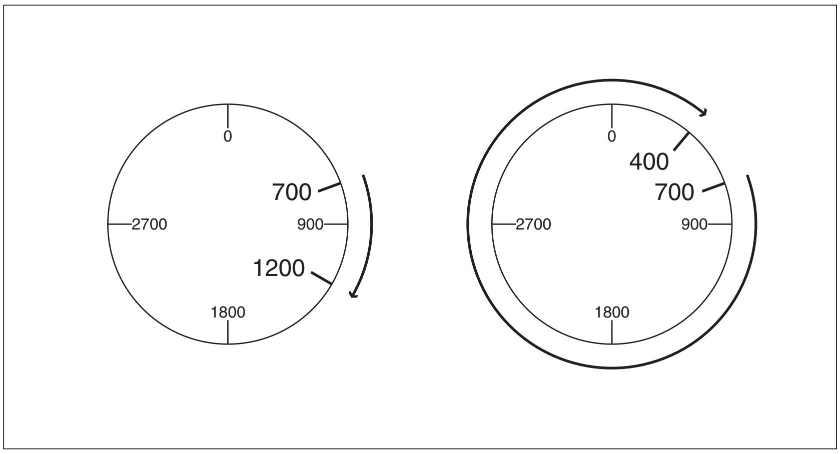


Figure 75: Example 1

Example 2 Target positions relative: -500 usr_p and -3300 usr_p

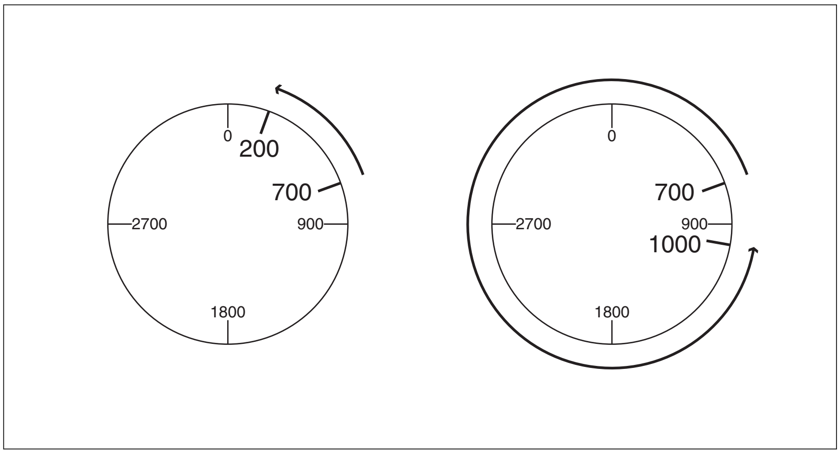


Figure 76: Example 2

0198441113755, V1.08, 04.2014

7.4.3.3 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

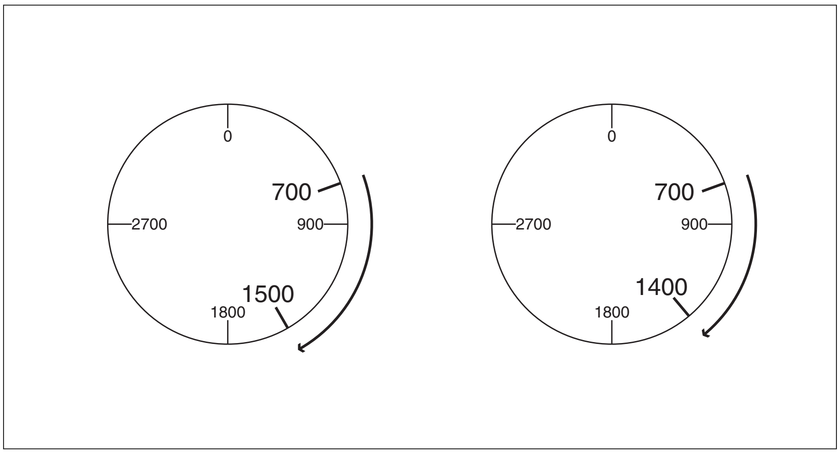


Figure 77: Example 1

Example 2 Target positions absolute: 2500 usr_p and 2900 usr_p

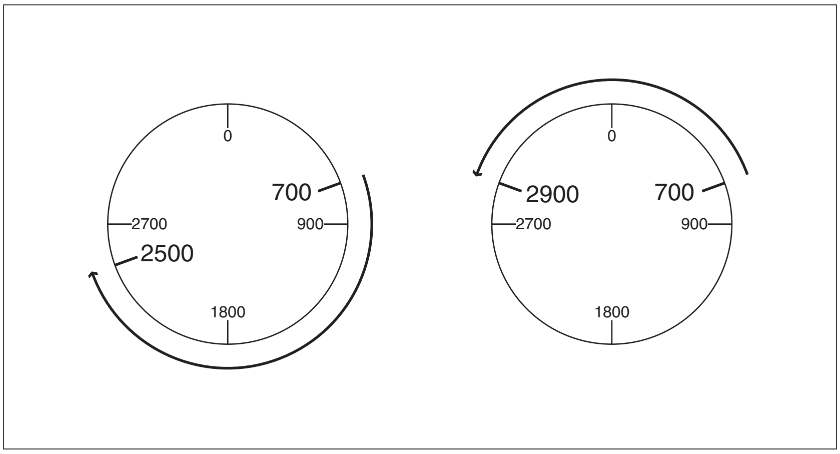


Figure 78: Example 2

0198441113755, V1.08, 04.2014

7.4.3.4 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

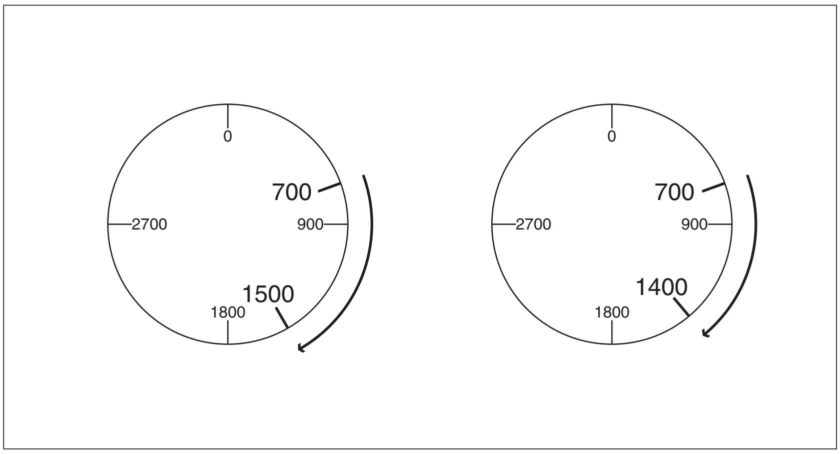


Figure 79: Example 1

Example 2 Parameter `MOD_AbsMultiRng`: On

Target positions absolute: 1500 usr_p and 5000 usr_p

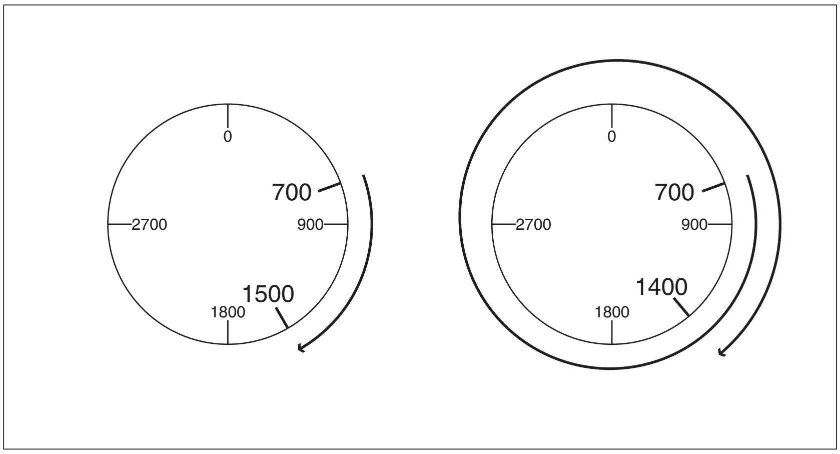


Figure 80: Example 2

0198441113755, V1.08, 04.2014

7.4.3.5 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

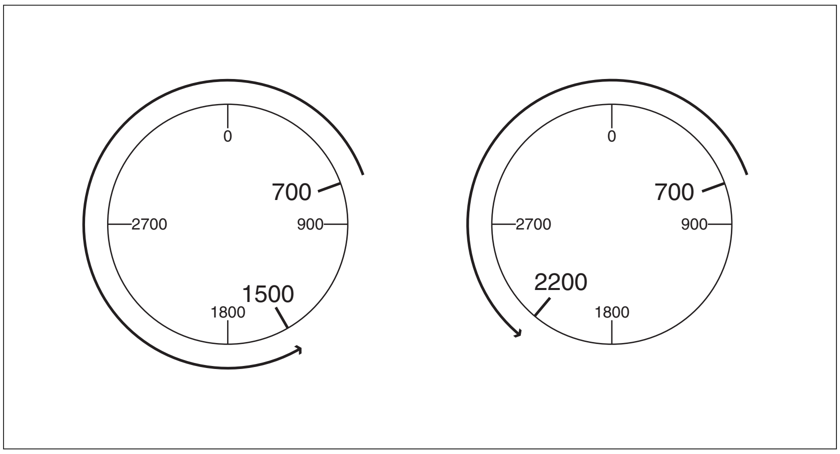


Figure 81: Example 1

Example 2

Parameter `MOD_AbsMultiRng`: On

Target positions absolute: 1500 usr_p and -5000 usr_p

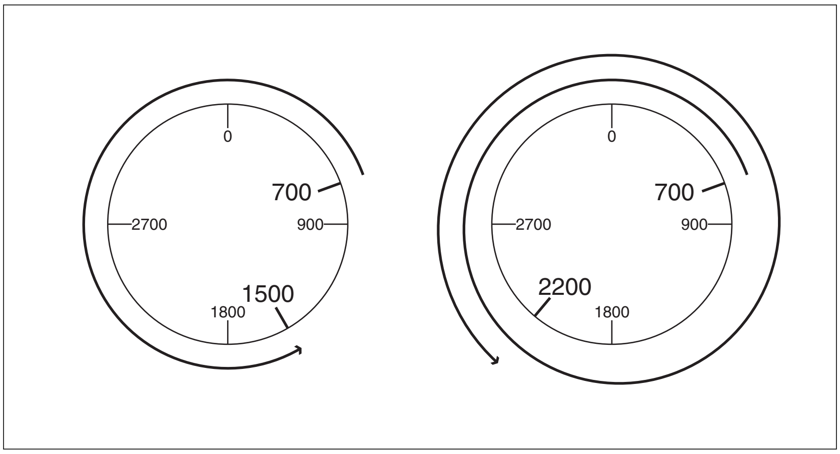


Figure 82: Example 2

0198441113755, V1.08, 04.2014

7.5 Extended settings

7.5.1 Scaling

⚠ WARNING

UNEXPECTED MOVEMENT CAUSED BY CHANGED SCALING

Changing the scaling changes the effect of the values in user-defined units. The same user-defined units cause different movements when the scaling is changed.

- Note that scaling affects all relationships between the user-defined units and the movements.
- Check the parameters with user-defined units.

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

Scaling converts user-defined units into internal units of the device, and vice versa.

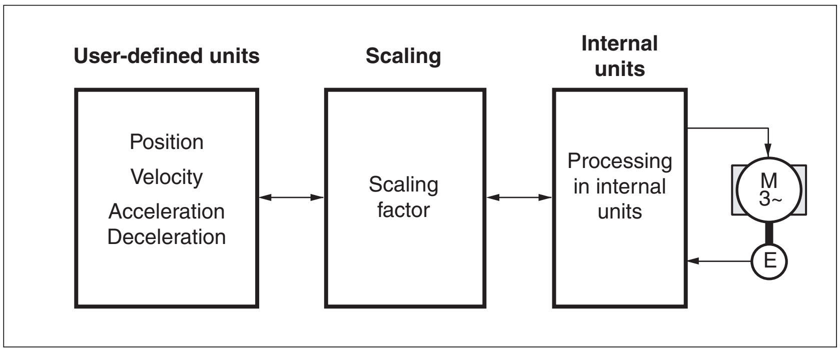


Figure 83: Scaling

User-defined units User-defined units are values for positions, velocities, acceleration and deceleration; they have the following units:

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

Scaling factor The scaling factor is the relationship between the motor movement and the required user-defined units. When specifying the scaling factor, note that numerator and denominator can only be integer values.

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 checked and adjusted.

0198441113755, V1.08, 04.2014

7.5.1.1 Configuration of position scaling

Position scaling is the relationship between the number of motor revolutions and the required user-defined units (usr_p).

Scaling factor

Position scaling is specified by means of scaling factor:

In the case of a rotary motor, the scaling factor is calculated as shown below:

$$\frac{\text{Number of revolutions of the motor}}{\text{Number of user-defined units [usr\_p]}}$$

Figure 84: Scaling factor of position scaling

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 field-bus
`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 changed if power stage is disabled. Changed settings become active immediately.	revolution 1 1 2147483647	INT32 INT32 R/W per. -	CANopen 3006:8h 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 changed if power stage is disabled.	usr_p 1 16384 2147483647	INT32 INT32 R/W per. -	CANopen 3006:7h Modbus 1550

7.5.1.2 Configuration of velocity scaling

Velocity scaling is the relationship between the number of motor revolutions per minute and the required user-defined units (usr_v).

Scaling factor Velocity scaling is specified by means of scaling factor:

In the case of a rotary motor, the scaling factor is calculated as shown below:

$$\frac{\text{Number of revolutions of the motor per minute}}{\text{Number of user-defined units [usr\_v]}}$$

Figure 85: Scaling factor of velocity scaling

Factory setting The following factory settings are used:

- 1 motor revolution per minute corresponds to 1 user-defined unit

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
`ScaleVELnum`	Velocity scaling: Numerator Specification of the scaling factor: Speed of rotation of motor [min^{-1}] -- User-defined units [usr_v] A new scaling is activated when the numerator value is supplied. Setting can only be changed if power stage is disabled. Changed settings become active immediately.	min^{-1} 1 1 2147483647	INT32 INT32 R/W per. -	CANopen 3006:22$_h$ Modbus 1604
`ScaleVELdenom`	Velocity scaling: Denominator Refer to numerator (ScaleVELnum) for a description. A new scaling is activated when the numerator value is supplied. Setting can only be changed if power stage is disabled.	usr_v 1 1 2147483647	INT32 INT32 R/W per. -	CANopen 3006:21$_h$ Modbus 1602

0198441113755, V1.08, 04.2014

7.5.1.3 Configuration of ramp scaling

Ramp scaling is the relationship between the change in velocity and the required user-defined units (usr_a).

Scaling factor

Ramp scaling is specified by means of scaling factor:

$$\frac{\text{Velocity change per second}}{\text{Number of user-defined units [usr\_a]}}$$

Figure 86: Scaling factor of ramp scaling

Factory setting

The following factory settings are used:

- A change of 1 motor revolution per minute per second corresponds to 1 user-defined unit.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via field-bus**
`ScaleRAMPnum`	Ramp scaling: Numerator Setting can only be changed if power stage is disabled. Changed settings become active immediately.	min^{-1}/s 1 1 2147483647	INT32 INT32 R/W per. -	CANopen 3006:31$_h$ Modbus 1634
`ScaleRAMPdenom`	Ramp scaling: Denominator Refer to numerator (ScaleRAMPnum) for a description. A new scaling is activated when the numerator value is supplied. Setting can only be changed if power stage is disabled.	usr_a 1 1 2147483647	INT32 INT32 R/W per. -	CANopen 3006:30$_h$ Modbus 1632

7.5.2 Setting the digital signal inputs and signal outputs

Signal function

Different signal functions can be assigned to the digital signal inputs and digital signal outputs.

Debounce time

Signal input debouncing comprises hardware debouncing and software debouncing.

Hardware debounce time is permanently set, see "2.3.3 Signals". Software debouncing can be adapted via parameters, see chapter "7.5.2.3 Parameterization of software debouncing".

When a set signal function is changed and when the product is switched off and on again, software debouncing is reset to the factory setting.

0198441113755, V1.08, 04.2014

7.5.2.1 Parameterization of the signal input functions

Factory setting

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 chapter
Freely Available	No function
Fault Reset	"7.2 Operating states"
Enable	"7.2 Operating states"
Halt	"7.6.1 Stop movement with Halt"
Start Profile Positioning	"7.6.8 Starting a movement via a signal input"
Current Limitation	"7.6.4 Limitation of the current via signal inputs"
Zero Clamp	"7.6.6 Zero Clamp"
Velocity Limitation	"7.6.3 Limitation of the velocity via signal inputs"
Reference Switch (REF)	"7.7.2 Reference switch"
Positive Limit Switch (LIMP)	"7.7.1 Limit switches"
Negative Limit Switch (LIMN)	"7.7.1 Limit switches"
Switch Controller Parameter Set	"7.5.5.5 Parameterizable controller parameters"
Velocity Controller Integral Off	"7.5.5.9 Deactivating the integral term"
Start Signal Of RMAC	"7.6.10 Relative Movement After Capture (RMAC)"
Activate RMAC	"7.6.10 Relative Movement After Capture (RMAC)"
Release Holding Brake	"6.5.7.1 Releasing the holding brake manually"

The following parameters can be used to parameterize the digital signal inputs:

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`IOfunct_DI0` ConF → i-o- di0	Function Input DI0 **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 controller parameter set **28 / Velocity Controller Integral Off / tnoF** : 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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 UINT16 R/W per. -	CANopen 3007:1h Modbus 1794

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DI1 ConF → i-o- di1	Function Input DI1 **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 controller parameter set **28 / Velocity Controller Integral Off / tnoF** : 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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 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 field-bus
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 controller parameter set **28 / Velocity Controller Integral Off / tnoF** : 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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 UINT16 R/W per. -	CANopen 3007:3h Modbus 1798

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`IOfunct_DI3` ConF → i-o- di3	Function Input DI3 **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 controller parameter set **28 / Velocity Controller Integral Off / tnoF** : 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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 UINT16 R/W per. -	CANopen 3007:4h Modbus 1800

7.5.2.2 Parameterization of the signal output functions

Factory setting

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 depending:

Signal output function	Description in chapter
Freely Available	"7.6.7 Setting a signal output via parameter"
No Fault	"7.2.3 Indication of the operating state"
Active	"7.2.3 Indication of the operating state"
RMAC Active Or Finished	"7.6.10 Relative Movement After Capture (RMAC)"
In Position Deviation Window	"7.7.10 Position deviation window"
In Velocity Deviation Window	"7.7.11 Velocity deviation window"
Velocity Below Threshold	"7.7.12 Velocity threshold value"
Current Below Threshold	"7.7.13 Current threshold value"
Halt Acknowledge	"7.6.1 Stop movement with Halt"
Motor Standstill	"7.7.5 Motor standstill and direction of movement"
Selected Error	"9.1.3 Diagnostics via signal outputs"
Drive Referenced (ref_ok)	"7.3.8 Operating mode Homing"
Selected Warning	"9.1.3 Diagnostics via signal outputs"
Position Register Channel 1	"7.7.9 Position register"
Position Register Channel 2	"7.7.9 Position register"
Position Register Channel 3	"7.7.9 Position register"
Position Register Channel 4	"7.7.9 Position register"
Motor Moves Positive	"7.7.5 Motor standstill and direction of movement"
Motor Moves Negative	"7.7.5 Motor standstill and direction of movement"

The following parameters can be used to parameterize the digital signal outputs:

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DQ0 ConF → i-o- do0	Function Output DQ0 **1 / Freely Available / nonE** : Available as required **2 / No Fault / nFLt** : Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active / Acti** : Signals operating state Operation Enabled **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 selected errors is active **15 / Valid Reference (ref_ok) / rEFo** : Drive has a valid reference (ref_ok) **16 / Selected Warning / SWrn** : One of the selected warnings is active **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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 UINT16 R/W per. -	CANopen 3007:9h Modbus 1810

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DQ1 ConF → i-o- do1	Function Output DQ1 **1 / Freely Available / nonE** : Available as required **2 / No Fault / nFLt** : Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active / Acti** : Signals operating state Operation Enabled **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 selected errors is active **15 / Valid Reference (ref_ok) / rEFo** : Drive has a valid reference (ref_ok) **16 / Selected Warning / SWrn** : One of the selected warnings is active **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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 UINT16 R/W per. -	CANopen 3007:Ah Modbus 1812

0198441113755, V1.08, 04.2014

7.5.2.3 Parameterization of software debouncing

The 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 changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 UINT16 R/W per. -	CANopen 3008:20h 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 changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 UINT16 R/W per. -	CANopen 3008:21h 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 changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 UINT16 R/W per. -	CANopen 3008:22h 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 changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 UINT16 R/W per. -	CANopen 3008:23h Modbus 2118

0198441113755, V1.08, 04.2014

7.5.3 Setting backlash compensation

By setting backlash compensation, you can compensate for mechanical backlash.

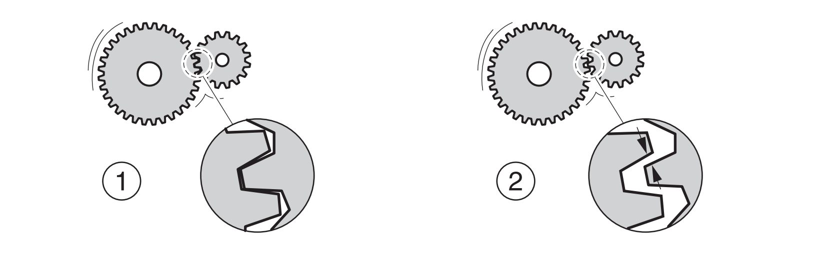


Figure 87: Example of mechanical backlash

(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 changed if power stage is disabled. Changed settings become active the next time the power stage is enabled. Available with firmware version ≥V01.14.	usr_p 0 0 2147483647	INT32 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 field-bus
`BLSH_Time`	Processing time for backlash compensation Value 0: Immediate backlash compensation Value >0: Processing time for backlash compensation Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled. Available with firmware version ≥V01.14.	ms 0 0 16383	UINT16 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 "OnAfterPositive-Movement".
- ▶ If the movement was in negative direction (negative target values), activate backlash compensation with the value "OnAfterNegative-Movement".

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`BLSH_Mode`	Processing mode of backlash compensation **0 / Off**: Backlash compensation is off **1 / OnAfterPositiveMovement**: Backlash compensation is on, last movement was in positive direction **2 / OnAfterNegativeMovement**: Backlash compensation is on, last movement was in negative direction Changed settings become active immediately. Available with firmware version ≥V01.14.	- 0 0 2	UINT16 UINT16 R/W per. -	CANopen 3006:41$_h$ Modbus 1666

0198441113755, V1.08, 04.2014

7.5.4 Setting the motion profile for the velocity

Target position and target velocity are input values specified by the user. A motion profile for the velocity is calculated on the basis of these input values.

The motion profile for the velocity consists of an acceleration, a deceleration and a maximum velocity.

A linear ramp for both directions of movement is available.

Availability

The availability of the motion profile for the velocity depends on the operating mode.

In the following operating modes, the motion profile for the velocity is permanently active:

- Jog
- 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.

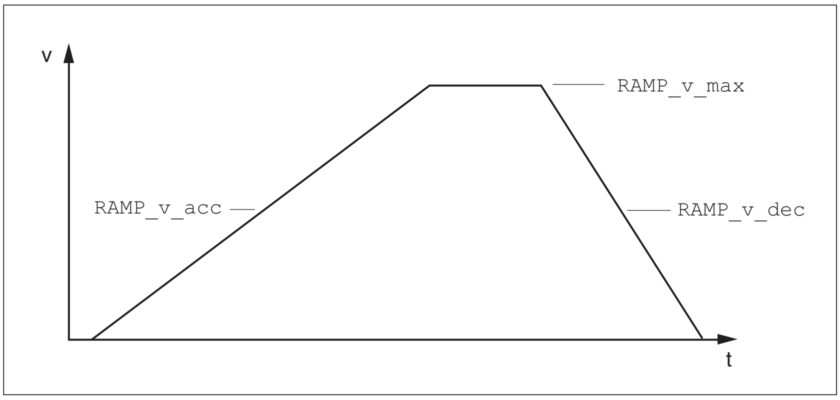


Figure 88: Ramp slope

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
RAMP_v_enable	Activation of the motion profile for velocity **0 / Profile Off**: Profile off **1 / Profile On**: Profile on Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 1 1	UINT16 UINT16 R/W per. -	CANopen 3006:2Bh Modbus 1622
RAMP_v_max ConF → ACG- nrMP	Maximum velocity of the motion profile for velocity If a greater reference speed is set in one of these operating modes, it is automatically limited to RAMP_v_max. This way, commissioning at limited speed is easier to perform. Setting can only be changed if power stage is disabled. Changed settings become active the next time the motor moves.	usr_v 1 13200 2147483647	UINT32 UINT32 R/W per. -	CANopen 607F:0h Modbus 1554
RAMP_v_acc	Acceleration of the motion profile for velocity Writing the value 0 has no effect on the parameter. Changed settings become active the next time the motor moves.	usr_a 1 600 2147483647	UINT32 UINT32 R/W per. -	CANopen 6083:0h 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. Changed settings become active the next time the motor moves.	usr_a 1 600 2147483647	UINT32 UINT32 R/W per. -	CANopen 6084:0h Modbus 1558

0198441113755, V1.08, 04.2014

7.5.5 Setting the controller parameters

7.5.5.1 Overview of the controller structure

The illustration below provides an overview of the controller structure.

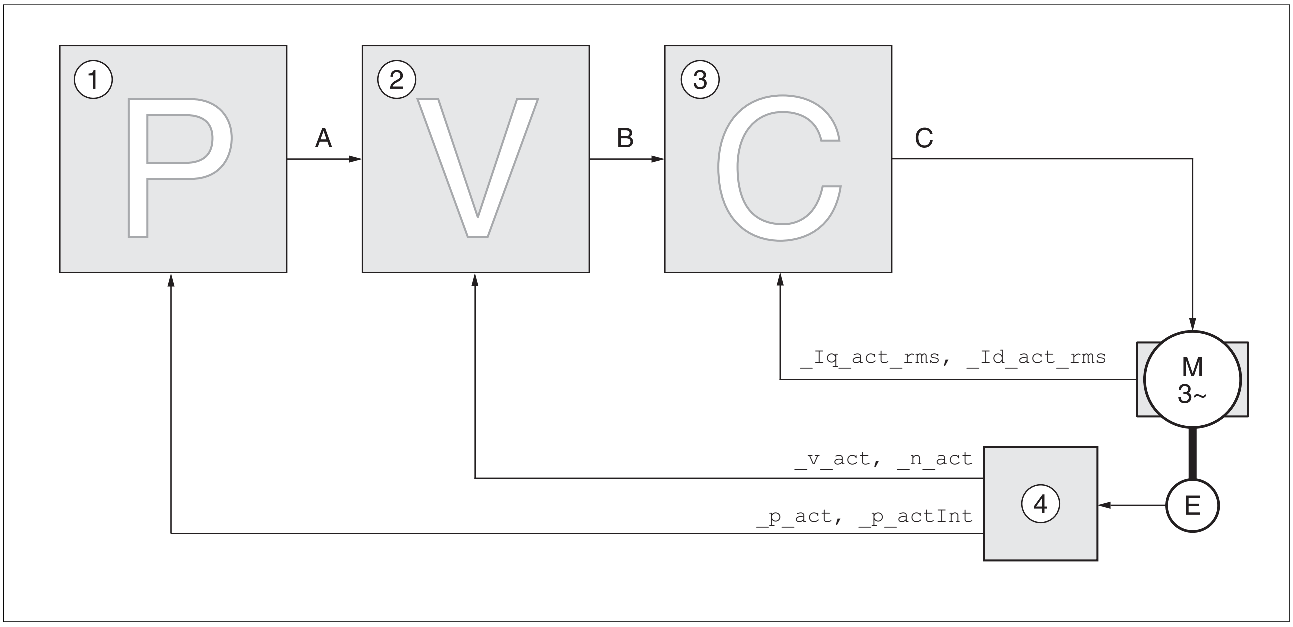


Figure 89: Controller structure, overview

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

Position controller

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

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

Velocity controller

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

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

Current controller

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

0198441113755, V1.08, 04.2014

7.5.5.2 Overview of position controller

The illustration below provides an overview of the position controller.

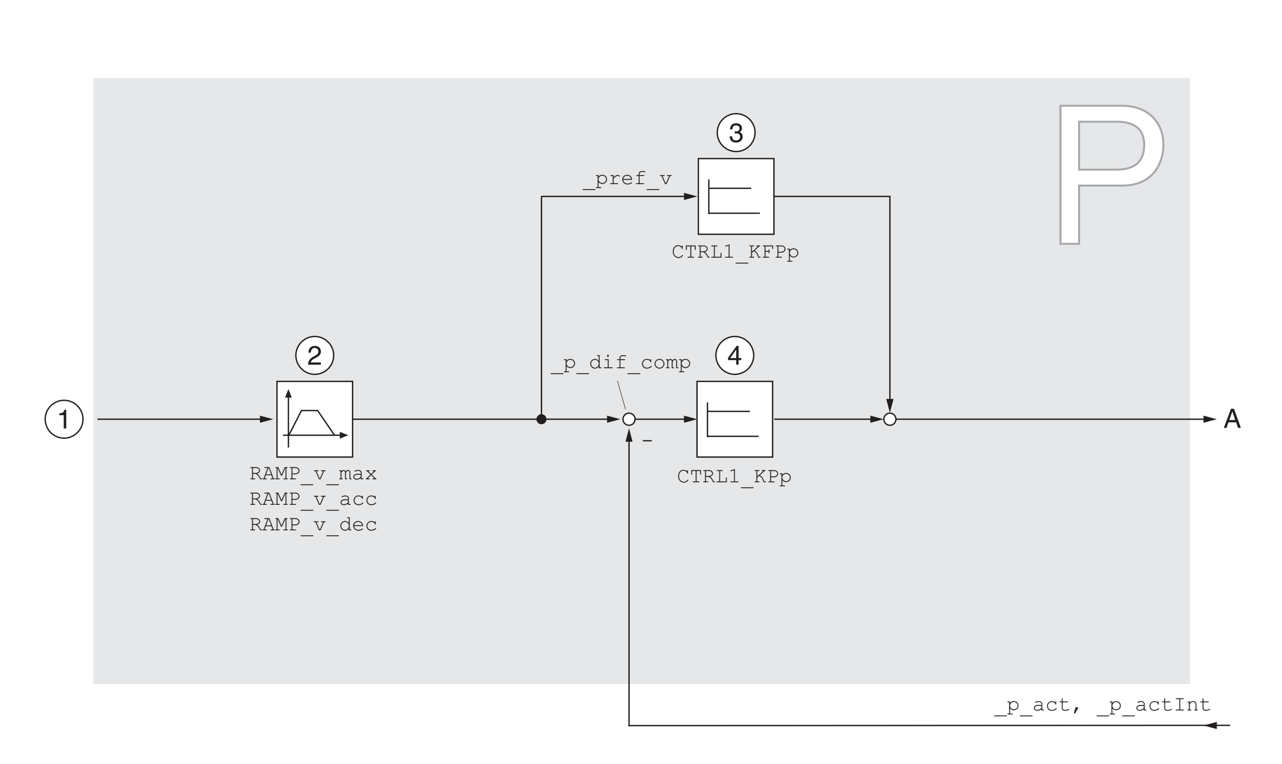


Figure 90: Position controller

(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.

0198441113755, V1.08, 04.2014

7.5.5.3 Overview of velocity controller

The illustration below provides an overview of the velocity controller.

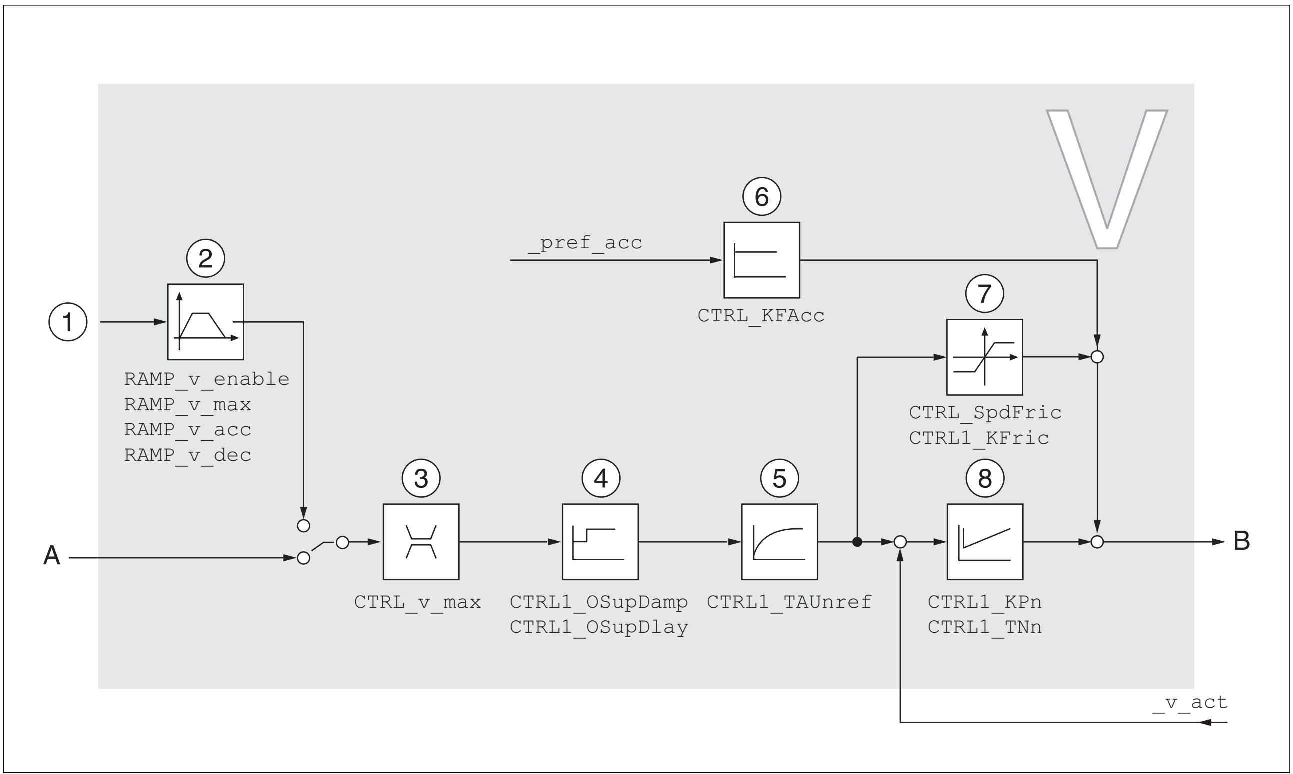


Figure 91: Velocity controller

(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 controller

Sampling period The sampling period of the velocity controller is 62.5 μs.

7.5.5.4 Overview of current controller

The illustration below provides an overview of the current controller.

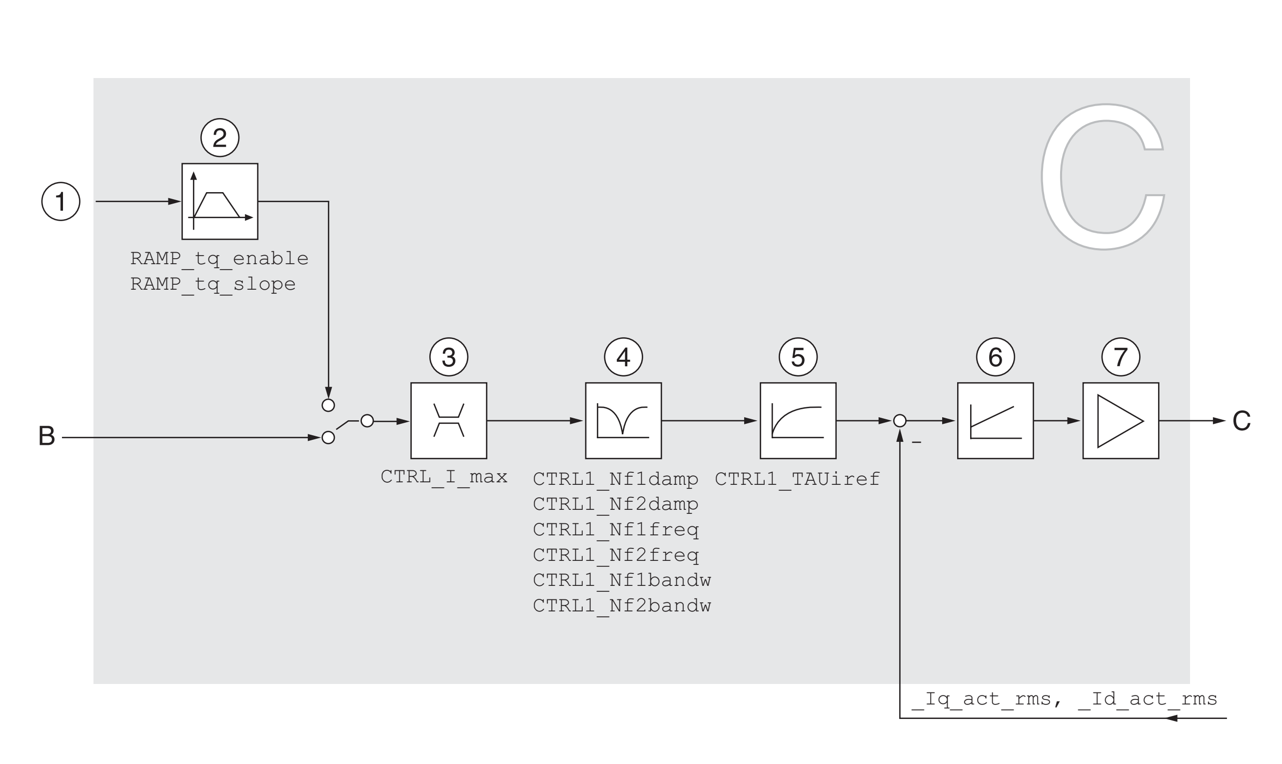


Figure 92: Current controller

(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.

0198441113755, V1.08, 04.2014

7.5.5.5 Parameterizable controller parameters

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

Controller parameter set

A controller parameter set consists of freely accessible parameters and parameters which are only accessible in Expert mode.

Controller parameter set 1	Controller parameter set 2
Freely accessible parameters: CTRL1_KPn CTRL1_TNn CTRL1_KPp CTRL1_TAUiref CTRL1_TAUnref CTRL1_KFPp	Freely accessible parameters: CTRL2_KPn CTRL2_TNn CTRL2_KPp CTRL2_TAUiref CTRL2_TAUnref CTRL2_KFPp
Parameters only accessible in expert mode: CTRL1_Nf1damp CTRL1_Nf1freq CTRL1_Nf1bandw CTRL1_Nf2damp CTRL1_Nf2freq CTRL1_Nf2bandw CTRL1_Osupdamp CTRL1_Osupdelay CTRL1_Kfric	Parameters only accessible in expert mode: CTRL2_Nf1damp CTRL2_Nf1freq CTRL2_Nf1bandw CTRL2_Nf2damp CTRL2_Nf2freq CTRL2_Nf2bandw CTRL2_Osupdamp CTRL2_Osupdelay CTRL2_Kfric

See chapters "7.5.5.10 Controller parameter set 1" and "7.5.5.11 Controller parameter set 2".

Parameterization

- Selecting a controller parameter set

  Select a controller parameter set after switching on.

  See chapter "7.5.5.6 Selecting a controller parameter set".
- Automatically switching between control parameter sets

  It is possible to switch between the two controller parameter sets.

  See chapter "7.5.5.7 Automatically switching between control parameter sets".
- Copying a controller parameter set

  The values of controller parameter set 1 can be copied to controller parameter set 2.

  See chapter "7.5.5.8 Copying a controller parameter set".
- Deactivating the integral term

  The integral term and, by implication, the integral action time, can be switched off via a digital signal input.

  See chapter "7.5.5.9 Deactivating the integral term".

7.5.5.6 Selecting a controller parameter set

The currently active controller parameter set is indicated via the parameter `_CTRL_ActParSet`.

The parameter `CTRL_PwrUpParSet` allows you to set the controller parameter set to be activated after switching on. Alternatively, you can set whether or not the product is to switch automatically between the two controller parameter sets.

The parameter `CTRL_SelParSet` allows you to switch between the two controller parameter sets during operation.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via field-bus**
`_CTRL_ActParSet`	Active controller parameter set Value 1: Controller parameter set 1 is active Value 2: Controller parameter set 2 is active A controller parameter set is active after the time for the parameter switching (CTRL_ParChgTime) has elapsed.	- - - -	UINT16 UINT16 R/- - -	CANopen 3011:17h Modbus 4398
`CTRL_PwrUpParSet`	Selection of controller parameter set at power up **0 / Switching Condition**: The switching condition is used for parameter set switching **1 / Parameter Set 1**: Parameter set 1 is used **2 / Parameter Set 2**: Parameter set 2 is used The selected value is also written to CTRL_ParSetSel (non-persistent). Changed settings become active immediately.	- 0 1 2	UINT16 UINT16 R/W per. -	CANopen 3011:18h Modbus 4400
`CTRL_SelParSet`	Selection of controller parameter set (non-persistent) Coding see parameter: CTRL_PwrUpParSet Changed settings become active immediately.	- 0 1 2	UINT16 UINT16 R/W - -	CANopen 3011:19h Modbus 4402

0198441113755, V1.08, 04.2014

7.5.5.7 Automatically switching between control parameter sets

It is possible to automatically switch between the two controller parameter sets.

The following criteria can be set for switching between the controller parameter sets:

- Digital signal input
- Position deviation window
- Target velocity below parameterizable value
- Actual velocity below parameterizable value

Settings The illustration below provides an overview of switching between the controller parameter sets.

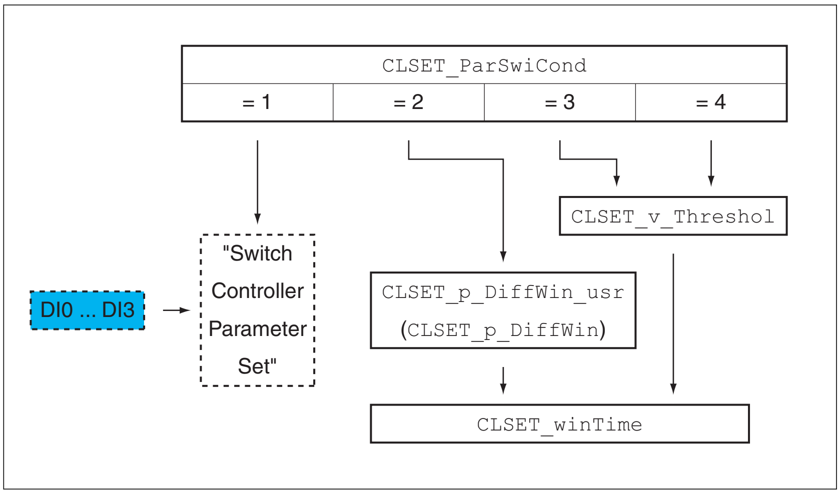


Figure 93: Parameters for switching the controller parameter sets

0198441113755, V1.08, 04.2014

Time chart

The freely accessible parameters are changed linearly. This linear change of the values of controller parameter set 1 to the values of controller parameter set 2 takes place during the parameterizable time `CTRL_ParChgTime`.

The parameters only accessible in Expert mode are directly changed to the values of the other controller parameter set after the parameterizable time `CTRL_ParChgTime` has passed.

The figure below shows the time chart for switching the controller parameters.

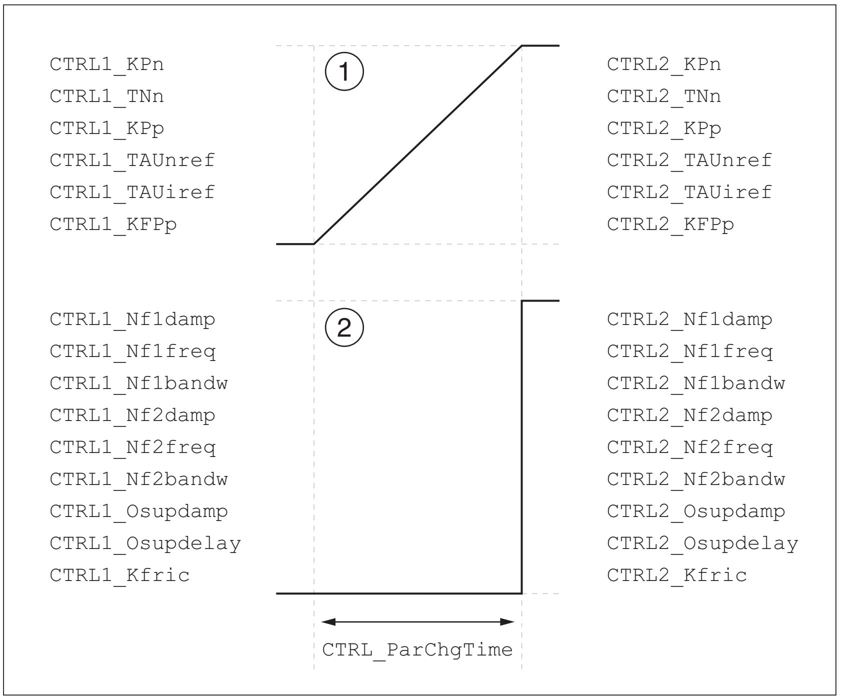


Figure 94: Time chart for switching the controller parameter sets

(1) Freely accessible parameters are changed linearly over time

(2) Parameters which are only accessible in Expert mode are switched over directly

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`CLSET_ParSwiCond`	Condition for parameter set switching **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 Changed settings become active immediately.	- 0 0 4	UINT16 UINT16 R/W per. -	CANopen 3011:1Ah Modbus 4404
`CLSET_p_DiffWin_usr`	Position deviation for parameter set switching If the position deviation of the position controller is less than the value of this parameter, the controller parameter set 2 is used. Otherwise, controller parameter set 1 is used. The minimum value, the factory setting and the maximum value depend on the scaling factor. Changed settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 164 2147483647	INT32 INT32 R/W per. -	CANopen 3011:25h Modbus 4426

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CLSET_p_DiffWin	Position deviation for parameter set switching If the position deviation of the position controller is less than the value of this parameter, the controller parameter set 2 is used. Otherwise, controller parameter set 1 is used. The parameter CLSET_p_DiffWin_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution. Changed settings become active immediately.	revolution 0.0000 0.0100 2.0000	UINT16 UINT16 R/W per. -	CANopen 3011:1Ch Modbus 4408
CLSET_v_Threshol	Velocity threshold for parameter set switching If the reference velocity or the actual velocity are less than the value of this parameter, the controller parameter set 2 is used. Otherwise, controller parameter set 1 is used. Changed settings become active immediately.	usr_v 0 50 2147483647	UINT32 UINT32 R/W per. -	CANopen 3011:1Dh 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. Changed settings become active immediately.	ms 0 0 1000	UINT16 UINT16 R/W per. -	CANopen 3011:1Bh Modbus 4406
CTRL_ParChgTime	Period of time for parameter switching In the case of parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp Such a parameter switching can be caused by - change of the active controller parameter set - change of the global gain - change of any of the parameters listed above - switching off the integral term of the velocity controller Changed settings become active immediately.	ms 0 0 2000	UINT16 UINT16 R/W per. -	CANopen 3011:14h Modbus 4392

0198441113755, V1.08, 04.2014

7.5.5.8 Copying a controller parameter set

The parameter CTRL_ParSetCopy allows you to copy the values of controller parameter set 1 to controller parameter set 2 or the values of controller parameter set 2 to controller parameter set 1.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL_ParSetCopy	Controller parameter set copying Value 1: Copy controller parameter set 1 to set 2 Value 2: Copy controller parameter set 2 to set 1 If parameter set 2 copied to parameter set 1, the parameter CTRL_GlobGain is set to 100%. Changed settings become active immediately.	- 0.0 - 0.2	UINT16 UINT16 R/W - -	CANopen 3011:16h Modbus 4396

7.5.5.9 Deactivating the integral term

The integral term of the velocity controller can be deactivated via the signal input function "Velocity Controller Integral Off". If the integral term is deactivated, the integral action time of the velocity controller (CTRL1_TNn and CTRL2_TNn) is implicitly and gradually reduced to zero. The time it takes to reduce the value to zero depends on the parameter CTRL_ParChgTime. In the case of vertical axes, the integral term is needed to reduce position deviations during standstill.

7.5.5.10 Controller parameter set 1

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
CTRL1_KPn ConF → drC- Pn1	Velocity controller P gain The default value is calculated on the basis of the motor parameters. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.0001 A/min^{-1}. Changed settings become active immediately.	A/min^{-1} 0.0001 - 2.5400	UINT16 UINT16 R/W per. -	CANopen $3012:1_h$ Modbus 4610
CTRL1_TNn ConF → drC- tin1	Velocity controller integral action time The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 327.67	UINT16 UINT16 R/W per. -	CANopen $3012:2_h$ Modbus 4612
CTRL1_KPp ConF → drC- PP1	Position controller P gain The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 1/s. Changed settings become active immediately.	1/s 2.0 - 900.0	UINT16 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 controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.50 4.00	UINT16 UINT16 R/W per. -	CANopen $3012:5_h$ Modbus 4618
CTRL1_TAUnref ConF → drC- tAu1	Filter time constant of the reference velocity value filter In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 9.00 327.67	UINT16 UINT16 R/W per. -	CANopen $3012:4_h$ Modbus 4616

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL1_KFPp ConF → drC- FPP1	Velocity feed-forward control In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 200.0	UINT16 UINT16 R/W per. -	CANopen 3012:6h Modbus 4620
CTRL1_Nf1damp	Notch filter 1: Damping In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 UINT16 R/W per. expert	CANopen 3012:8h Modbus 4624
CTRL1_Nf1freq	Notch filter 1: Frequency The filter is switched off at a value of 15000. In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 UINT16 R/W per. expert	CANopen 3012:9h Modbus 4626
CTRL1_Nf1bandw	Notch filter 1: Bandwidth Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 UINT16 R/W per. expert	CANopen 3012:Ah Modbus 4628
CTRL1_Nf2damp	Notch filter 2: Damping In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 UINT16 R/W per. expert	CANopen 3012:Bh Modbus 4630
CTRL1_Nf2freq	Notch filter 2: Frequency The filter is switched off at a value of 15000. In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 UINT16 R/W per. expert	CANopen 3012:Ch Modbus 4632
CTRL1_Nf2bandw	Notch filter 2: Bandwidth Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 UINT16 R/W per. expert	CANopen 3012:Dh Modbus 4634
CTRL1_Osupdamp	Overshoot suppression filter: Damping The filter is switched off at a value of 0. In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 50.0	UINT16 UINT16 R/W per. expert	CANopen 3012:Eh Modbus 4636

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL1_Osupdelay	Overshoot suppression filter: Time delay The filter is switched off at a value of 0. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.00 75.00	UINT16 UINT16 R/W per. expert	CANopen 3012:F$_h$ Modbus 4638
CTRL1_Kfric	Friction compensation: Gain In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.00 10.00	UINT16 UINT16 R/W per. expert	CANopen 3012:10$_h$ Modbus 4640

0198441113755, V1.08, 04.2014

7.5.5.11 Controller parameter set 2

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL2_KFPp ConF → drC- FPP2	Velocity feed-forward control In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 200.0	UINT16 UINT16 R/W per. -	CANopen 3013:6_h Modbus 4876
CTRL2_Kfric	Friction compensation: Gain In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.00 10.00	UINT16 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 controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.0001 A/min^{-1}. Changed settings become active immediately.	A/min^{-1} 0.0001 - 2.5400	UINT16 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 controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 1/s. Changed settings become active immediately.	1/s 2.0 - 900.0	UINT16 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 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 UINT16 R/W per. expert	CANopen 3013:A_h Modbus 4884
CTRL2_Nf1damp	Notch filter 1: Damping In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 UINT16 R/W per. expert	CANopen 3013:8_h Modbus 4880
CTRL2_Nf1freq	Notch filter 1: Frequency The filter is switched off at a value of 15000. In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 UINT16 R/W per. expert	CANopen 3013:9_h Modbus 4882

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL2_Nf2bandw	Notch filter 2: Bandwidth Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 UINT16 R/W per. expert	CANopen 3013:D$_h$ Modbus 4890
CTRL2_Nf2damp	Notch filter 2: Damping In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 UINT16 R/W per. expert	CANopen 3013:B$_h$ Modbus 4886
CTRL2_Nf2freq	Notch filter 2: Frequency The filter is switched off at a value of 15000. In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 UINT16 R/W per. expert	CANopen 3013:C$_h$ Modbus 4888
CTRL2_Osupdamp	Overshoot suppression filter: Damping The filter is switched off at a value of 0. In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 50.0	UINT16 UINT16 R/W per. expert	CANopen 3013:E$_h$ Modbus 4892
CTRL2_Osupdelay	Overshoot suppression filter: Time delay The filter is switched off at a value of 0. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.00 75.00	UINT16 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 controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.50 4.00	UINT16 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 controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 9.00 327.67	UINT16 UINT16 R/W per. -	CANopen 3013:4$_h$ Modbus 4872

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL2_TNn ConF → drC- tin2	Velocity controller integral action time The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 327.67	UINT16 UINT16 R/W per. -	CANopen 3013:2h Modbus 4868

7.5.6 Settings of parameter _DCOMstatus

The assignment of bit 11 of the parameter _DCOMstatus can be set.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_DCOMstatus	DriveCom status word Bit assignments: Bit 0: Ready To Switch On Bit 1: Switched On Bit 2: Operation Enabled Bit 3: Fault Bit 4: Voltage Enabled Bit 5: Quick Stop Bit 6: Switch On Disabled Bit 7: Warning 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 UINT16 R/- - -	CANopen 6041:0$_h$ Modbus 6916

The assignment of bit 11 can be set via the parameter DS402intLim.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
DS402intLim	DS402 status word: Setting for bit 11 (internal limit) **0 / None**: Not used (reserved) **1 / Current Below Threshold**: Current threshold value **2 / Velocity Below Threshold**: Velocity threshold value **3 / In Position Deviation Window**: Position deviation window **4 / In Velocity Deviation Window**: Velocity deviation window **5 / Position Register Channel 1**: Position register channel 1 **6 / Position Register Channel 2**: Position register channel 2 **7 / Position Register Channel 3**: Position register channel 3 **8 / Position Register Channel 4**: Position register channel 4 **9 / Hardware Limit Switch**: Hardware limit switch **10 / RMAC active or finished**: Relative movement after capture is active or finished **11 / Position Window**: Position window Setting for: Bit 11 of the parameter _DCOMstatus Bit 10 of the parameter _actionStatus Bit 10 of the parameter _DPL_motionStat Changed settings become active immediately.	- 0 0 11	UINT16 UINT16 R/W per. -	CANopen 301B:1E$_h$ Modbus 6972

0198441113755, V1.08, 04.2014

7.6 Functions for target value processing

7.6.1 Stop movement with Halt

With a Halt, the current movement is interrupted; it can be resumed.

A Halt can be triggered via a 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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

The movement can be interrupted with 2 different deceleration types.

- Deceleration via deceleration ramp
- Deceleration via torque ramp

Setting the type of deceleration

The parameter `LIM_HaltReaction` lets you set the type of deceleration.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`LIM_HaltReaction` ConF → ACG- htyP	Halt option code **1 / Deceleration Ramp / dEcE** : Deceleration ramp **3 / Torque Ramp / torq** : Torque ramp Type of deceleration for Halt. Setting of deceleration ramp with parameter RAMP_v_dec. Setting of torque ramp with parameter LIM_I_maxHalt. If a deceleration ramp is already active, the parameter cannot be written. Changed settings become active immediately.	- 1 1 3	INT16 INT16 R/W per. -	CANopen 605D:0h Modbus 1582

Setting the deceleration ramp

The deceleration ramp is set with the parameter `Ramp_v_dec` via the motion profile for the velocity, see chapter "7.5.4 Setting the motion profile for the velocity".

0198441113755, V1.08, 04.2014

Setting the torque ramp The parameter `LIM_I_maxHalt` lets you set the torque ramp.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`LIM_I_maxHalt` ConF → ACG- hcur	Current value for Halt This value is only limited by the minimum/ maximum value range (no limitation of this value by motor/power stage). In the case of a Halt, the actual current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxHalt - _M_I_max - _PS_I_max Further current reductions caused by I2t monitoring are also taken into account during a Halt. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} - - -	UINT16 UINT16 R/W per. -	CANopen 3011:E_h Modbus 4380

0198441113755, V1.08, 04.2014

7.6.2 Stopping a movement with Quick Stop

With a Quick Stop, the current movement is stopped.

A Quick Stop can be triggered by a detected error of error classes 1 or 2 or via a fieldbus command.

The movement can be stopped with 2 different deceleration types.

- Deceleration via deceleration ramp
- Deceleration via torque ramp

In addition, you can set the operating state to switch to after the deceleration.

- Transition to operating state **9** Fault
- Transition to operating state **7** Quick Stop Active

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. Changed settings become active immediately.	- -2 6 7	INT16 INT16 R/W per. -	CANopen 3006:18h 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. Changed settings become active the next time the motor moves.	usr_a 1 6000 2147483647	UINT32 UINT32 R/W per. -	CANopen 3006:12h 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 field-bus**
`LIM_I_maxQSTP` ConF → FLt- qcur	Current value for Quick Stop This value is only limited by the minimum/ maximum value range (no limitation of this value by motor/power stage). In the case of a Quick Stop, the actual current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxQSTP - _M_I_max - _PS_I_max Further current reductions caused by I2t monitoring are also taken into account during a Quick Stop. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} - - -	UINT16 UINT16 R/W per. -	CANopen 3011:D_h Modbus 4378

0198441113755, V1.08, 04.2014

7.6.3 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. NOTE: In operating mode Profile Torque, the minimum velocity is internally limited to 100 min^{-1}. Changed settings become active immediately.	usr_v 0 10 2147483647	UINT32 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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

7.6.4 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- iLiM	Current limitation via input A current limit can be activated via a digital input. In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.20 300.00	UINT16 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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

7.6.5 Jerk limitation

Jerk limitation smoothes sudden acceleration changes to allow for smooth transitions with almost no jerking.

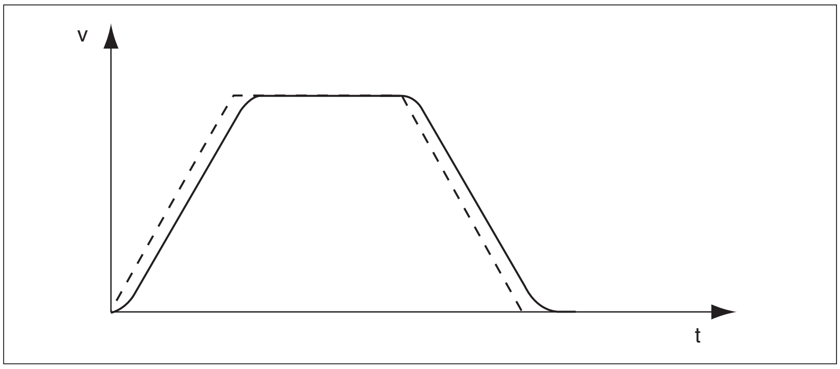


Figure 95: Jerk limitation

Availability

Jerk limitation is available in the following operating modes.

- Jog
- Profile Position
- Homing

Jerk limitation is activated and set via the parameter `RAMP_v_jerk`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`RAMP_v_jerk` ConF → drC- JEr	Jerk limitation of the motion profile for velocity **0 / Off / oFF** : Off **1 / 1 / 1** : 1 ms **2 / 2 / 2** : 2 ms **4 / 4 / 4** : 4 ms **8 / 8 / 8** : 8 ms **16 / 16 / 16** : 16 ms **32 / 32 / 32** : 32 ms **64 / 64 / 64** : 64 ms **128 / 128 / 128** : 128 ms Adjustments can only be made if the operating mode is inactive (x_end=1). Changed settings become active the next time the motor moves.	ms 0 0 128	UINT16 UINT16 R/W per. -	CANopen 3006:D$_h$ Modbus 1562

7.6.6 Zero Clamp

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

Target velocities below the parameterized 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. Changed settings become active immediately.	usr_v 0 10 2147483647	UINT32 UINT32 R/W per. -	CANopen 3006:28h Modbus 1616

In order to stop the motor via a digital signal input, you must first parameterize the signal input function "Zero Clamp", see chapter "7.5.2 Setting the digital signal inputs and signal outputs".

0198441113755, V1.08, 04.2014

7.6.7 Setting a signal output via parameter

The digital signal outputs can be set as required via the fieldbus.

In order to set a digital signal output via the parameter, you must first parameterize the signal input function "Freely Available", see chapter "7.5.2 Setting the digital signal inputs and signal outputs".

The parameter `IO_DQ_set` lets you set the digital signal outputs.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via field-bus**
`IO_DQ_set`	Setting the digital outputs directly Write access to output bits is only active if the signal pin is available as an output and if the function of the output was set to 'Available as required'. Coding of the individual signals: Bit 0: DQ0 Bit 1: DQ1	- - - -	UINT16 UINT16 R/W - -	CANopen 3008:11$_h$ Modbus 2082

7.6.8 Starting a movement via a signal input

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.

0198441113755, V1.08, 04.2014

7.6.9 Position capture via signal input

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 min^{-1}. (3000 min^{-1} = $(3000*16384)/(60*10^6)$ = 0.8 usr_p/µs)

If the factory settings for scaling are used, 1.6 user-defined units correspond to 0.036 °.

The captured motor position is less accurate during the acceleration phase and the deceleration phase.

Selection of profile

The motor position can be captured via 2 different profiles:

- Vendor-specific profile
  See chapter "7.6.9.1 Position capture via vendor-specific profile"
- DS402 profile
  See chapter "7.6.9.2 Position capture via DS402 profile"

0198441113755, V1.08, 04.2014

7.6.9.1 Position capture via vendor-specific profile

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 Changed settings become active immediately.	- 0 0 2	UINT16 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. Changed settings become active immediately.	- 0 0 1	UINT16 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 field-bus
`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. Changed settings become active immediately.	- 0 - 4	UINT16 UINT16 R/W - -	CANopen 300A:4h 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. Changed settings become active immediately.	- 0 - 4	UINT16 UINT16 R/W - -	CANopen 300A:5h 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 field-bus
`_CapStatus`	Status of the capture inputs Read access: Bit 0: Position captured via input CAP1 Bit 1: Position captured via input CAP2	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:1h Modbus 2562

0198441113755, V1.08, 04.2014

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 field-bus
`_Cap1PosCons`	Capture input 1 captured position (consistent) Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap1CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with firmware version ≥V01.12.	usr_p - - -	INT32 INT32 R/- - -	CANopen 300A:18h Modbus 2608
`_Cap1CountCons`	Capture input 1 event counter (consistent) Counts the capture events. The event counter is reset when capture input 1 is activated. By reading this parameter, the parameter "_Cap1PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with firmware version ≥V01.12.	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:17h Modbus 2606
`_Cap2PosCons`	Capture input 2 captured position (consistent) Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". By reading the parameter "_Cap2CountCons", this parameter is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Available with firmware version ≥V01.12.	usr_p - - -	INT32 INT32 R/- - -	CANopen 300A:1Ah Modbus 2612
`_Cap2CountCons`	Capture input 2 event counter (consistent) Counts the capture events. The event counter is reset when capture input 2 is activated. By reading this parameter, the parameter "_Cap2PosCons" is updated and locked so it cannot be changed. Both parameter values remain consistent. Available with hardware version ≥RS03. Available with firmware version ≥V01.12.	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:19h Modbus 2610

0198441113755, V1.08, 04.2014

7.6.9.2 Position capture via DS402 profile

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 Refers to chapter "Touch probe functionality" of the DS402 part2 (operation modes and application data) document. Changed settings become active immediately.	- - - -	UINT16 UINT16 R/W - -	CANopen 60B8:0h 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
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: The motor position can only be captured via Capture input 2 with either a rising edge or with a falling edge. Capturing with both rising edge and falling edge 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 Refers to chapter "Touch probe functionality" of the DS402 part2 (operation modes and application data) document. Changed settings become active immediately.	- - - -	UINT16 UINT16 R/- - -	CANopen 60B9:0h Modbus 7030

0198441113755, V1.08, 04.2014

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:

0198441113755, V1.08, 04.2014

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 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".	usr_p - - -	INT32 INT32 R/- - -	CANopen 60BA:0h Modbus 2634
_Cap1CntRise	Capture input 1 event counter at rising edges Counts the capture events at rising edges. The event counter is reset when capture input 1 is activated.	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:2Bh Modbus 2646
_Cap1PosFallEdge	Capture input 1 captured position at falling edge This parameter contains the position captured at the point in time a falling edge was detected. The captured position is recalculated after "Position Setting" or "Reference Movement".	usr_p - - -	INT32 INT32 R/- - -	CANopen 60BB:0h Modbus 2636
_Cap1CntFall	Capture input 1 event counter at falling edges Counts the capture events at falling edges. The event counter is reset when capture input 1 is activated.	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:2Ch Modbus 2648
_Cap2PosRisEdge	Capture input 2 captured position at rising edge This parameter contains the position captured at the point in time a rising edge was detected. The captured position is recalculated after "Position Setting" or "Reference Movement".	usr_p - - -	INT32 INT32 R/- - -	CANopen 60BC:0h Modbus 2638
_Cap2CntRise	Capture input 2 event counter at rising edges Counts the capture events at rising edges. The event counter is reset when capture input 2 is activated.	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:2Dh Modbus 2650
_Cap2PosFallEdge	Capture input 2 captured position at falling edge This parameter contains the position captured at the point in time a falling edge was detected. The captured position is recalculated after "Position Setting" or "Reference Movement".	usr_p - - -	INT32 INT32 R/- - -	CANopen 60BD:0h Modbus 2640
_Cap2CntFall	Capture input 2 event counter at falling edges Counts the capture events at falling edges. The event counter is reset when capture input 2 is activated.	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:2Eh Modbus 2652

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_CapEventCounters`	Capture inputs 1 and 2 summary of event counters This parameter contains the counted capture events. Bits 0...3: _Cap1CntRise (lowest 4 bits) Bits 4...7: _Cap1CntFall (lowest 4 bits) Bits 8...11: _Cap2CntRise (lowest 4 bits) Bits 12...15: _Cap2CntFall (lowest 4 bits)	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:2Fh Modbus 2654

7.6.10 Relative Movement After Capture (RMAC)

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.

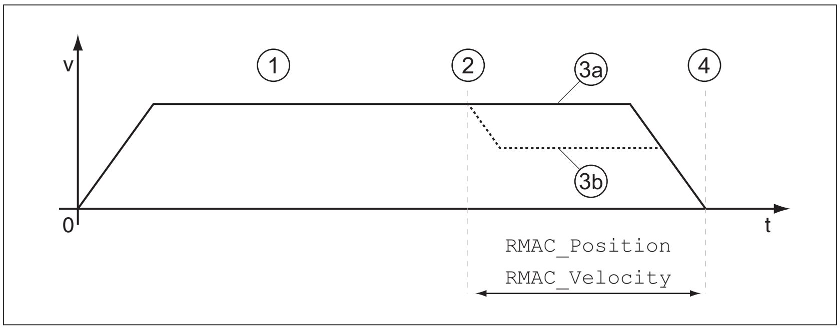


Figure 96: Relative Movement After Capture

(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

Operating modes

A Relative Movement After Capture (RMAC) can be started in the following operating modes:

- Jog
- Profile Torque
- Profile Velocity
- Profile Position

Availability

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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

In order to read the status via the fieldbus, you must set the parameter `DS402intLim` to the value "RMAC active or finished", see chapter "7.5.6 Settings of parameter `_DCOMstatus`".

In addition, the current status is available via the parameters `_RMAC_Status` and `_RMAC_DetailStatus`.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_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 UINT16 R/- - -	CANopen 3023:11h 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 UINT16 R/- - -	CANopen 3023:12h 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 field-bus
`RMAC_Activate`	Activation of relative movement after capture **0 / Off**: Off **1 / On**: On Changed settings become active immediately. Available with firmware version ≥V01.10.	- 0 0 1	UINT16 UINT16 R/W - -	CANopen 3023:Ch 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 field-bus
RMAC_Position	Target position of relative movement after capture Minimum/maximum values depend on: - Scaling factor Changed settings become active the next time the motor moves. Available with firmware version ≥V01.10.	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 3023:Dₕ Modbus 8986
RMAC_Velocity	Velocity of relative movement after capture Value 0: Use of current motor velocity Value >0: Value is the target velocity The adjustable value is internally limited to the setting in RAMP_v_max. Changed settings become active the next time the motor moves. Available with firmware version ≥V01.10.	usr_v 0 0 2147483647	UINT32 UINT32 R/W per. -	CANopen 3023:Eₕ 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 field-bus
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 UINT16 R/W per. -	CANopen 3023:10ₕ Modbus 8992

Response to overtravelling of the target position

Depending on the set velocity, target position and deceleration ramp, the target position may be overtravelled.

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 field-bus
RMAC_Response	Response if target postion is overtraveld **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 Changed settings become active immediately. Available with firmware version ≥V01.10.	- 0 0 2	UINT16 UINT16 R/W per. -	CANopen 3023:Fₕ Modbus 8990

0198441113755, V1.08, 04.2014

7.7 Functions for monitoring movements

7.7.1 Limit switches

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

⚠ WARNING

LOSS OF CONTROL

- Check whether your application allows for the use of limit switches. If yes, use limit switches.
- Verify correct connection of the limit switches.
- Verify that the limit switches are mounted in a position far enough away from the mechanical stop to allow for an adequate stopping distance.
- Verify correct parameterization and function of the limit switches.

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

Limit switches

Movements can be monitored using limit switches. A positive limit switch and a negative limit switch can be used for monitoring.

If the positive or negative limit switch are tripped, the movement stops. An error message is generated and the operating state switches to **7** Quick Stop Active.

The error message can be reset by means of a "Fault Reset". The operating state switches back to **6** Operation Enabled.

The movement can continue, however, only in the opposite direction. For example, if the positive limit switch was triggered, further movement is only possible in negative direction. In the case of further movement in positive direction, a new error message is generated and the operating state switches back to **7** Quick Stop Active.

The parameters `IOsigLIMP` and `IOsigLIMN` are used to set the the type of limit switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`IOsigLIMP`	Signal evaluation for positive limit switch **0 / Inactive**: Inactive **1 / Normally closed**: Normally closed NC **2 / Normally open**: Normally open NO Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 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 changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

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

0198441113755, V1.08, 04.2014

7.7.2 Reference switch

The reference switch is only active in the operating mode Homing.

The parameter `IOsigREF` lets you set the type of reference switch.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`IOsigREF`	Signal evaluation for reference switch **1 / Normally Closed**: Normally closed NC **2 / Normally Open**: Normally open NO The reference switch is only active while a reference movement to the reference switch is processed. Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 1 1 2	UINT16 UINT16 R/W per. -	CANopen 3006:E$_h$ Modbus 1564

The signal input function "Reference Switch (REF)" must have been parameterized, see chapter "7.5.2 Setting the digital signal inputs and signal outputs".

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

0198441113755, V1.08, 04.2014

7.7.3 Software limit switches

Movements can be monitored using software limit switches. A positive position limit and a negative position limit can be set for monitoring.

If the positive or negative position limit switch are reached, the movement stops. An error message is generated and the operating state switches to **7** Quick Stop Active.

The error message can be reset by means of a "Fault Reset". The operating state switches back to **6** Operation Enabled.

The movement can continue, however, only in the opposite direction of the position limit. For example, if the positive position limit was reached, further movement is only possible in negative direction. In the case of further movement in positive direction, a new error message is generated and the operating state switches back to **7** Quick Stop Active.

Prerequisite

Software limit switch monitoring only works with a valid zero point, see chapter "7.4.1 Zero point of the movement range".

Behavior in operating modes with target positions

In the case of operating modes with target positions, the target position is compared to the position limits before the movement is started. The movement is started normally, even if the target position is greater than the positive position limit or less than the negative position limit. However, the movement is stopped before the position limit is exceeded.

In the following operating modes, the target position is checked prior to the start of a movement.

- Jog (step movement)
- Profile Position

Behavior in operating modes without target positions

In operating modes without target position, a Quick Stop is triggered at the position limit.

In the following operating modes, a Quick Stop is triggered at the position limit.

- Jog (continuous movement)
- Electronic Gear
- Profile Torque
- Profile Velocity

As of firmware version ≥V01.16, you can use the parameter MON_SWLimMode to set the behavior for reaching 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 field-bus
MON_SWLimMode	Behavior when position limit is reached **0 / Standstill Behind Position Limit**: Quick Stop is triggered at position limit and standstill is reached behind position limit **1 / Standstill At Position Limit**: Quick Stop is triggered in front of position limit and standstill is reached at position limit Changed settings become active immediately.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3006:47h 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 "7.6.2 Stopping a movement with Quick Stop". If the parameter LIM_QStopReact is set to "Torque ramp (Quick Stop)", the movement may come to a standstill in front of or behind the position limit due to different loads.

Activation The software limit switches are activated via the parameter MON_SW_Limits.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_SW_Limits	Activation of software limit switches **0 / None**: Deactivated **1 / SWLIMP**: Activation of software limit switches positive direction **2 / SWLIMN**: Activation of software limit switches negative direction **3 / SWLIMP+SWLIMN**: Activation of software limit switches both directions Software limit switches can only be activated if the zero point is valid. Changed settings become active immediately.	- 0 0 3	UINT16 UINT16 R/W per. -	CANopen 3006:3h 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 field-bus
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 changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	usr_p - 2147483647 -	INT32 INT32 R/W per. -	CANopen 607D:2h Modbus 1544
MON_swLimN	Negative position limit for software limit switch Refer to description 'MON_swLimP' Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	usr_p - -2147483648 -	INT32 INT32 R/W per. -	CANopen 607D:1h Modbus 1546

7.7.4 Load-dependent position deviation (following error)

The load-dependent position deviation is the difference between the reference position and the actual position caused by the load.

Parameters are available to read the load-dependent position deviation during operation and the maximum position deviation reached so far.

The maximum permissible load-dependent position deviation can be parameterized. In addition, you can set the error class for a following error.

Availability Monitoring of the load-dependent position deviation is available in the following operating modes:

- Jog
- Profile Position
- Homing

Reading the position deviation The following parameters let you read the current load-dependent position deviation in user-defined units or revolutions.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_p_dif_load_usr`	Current load-dependent position deviation between reference and actual position The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. This value is used for following error monitoring. Available with firmware version ≥V01.05.	usr_p -2147483648 - 2147483647	INT32 INT32 R/- - -	CANopen 301E:16h Modbus 7724
`_p_dif_load`	Current load-dependent position deviation between reference and actual position The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. This value is used for following error monitoring. The parameter _p_dif_load_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution.	revolution -214748.3648 - 214748.3647	INT32 INT32 R/- - -	CANopen 301E:1Ch Modbus 7736

The following parameters let you read the maximum value of the load-dependent position deviation reached so far in user-defined units or revolutions.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_p_dif_load_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. Changed settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 - 2147483647	INT32 INT32 R/W - -	CANopen 301E:15h Modbus 7722
`_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. Changed settings become active immediately.	revolution 0.0000 - 429496.7295	UINT32 UINT32 R/W - -	CANopen 301E:1Bh Modbus 7734

Setting the position deviation

The following parameter lets you set the warning threshold for the maximum load-dependent position deviation.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_p_dif_warn`	Maximum load-dependent position deviation (warning) 100.0 % correspond to the maximum position deviation (following error) as specified by means of parameter MON_p_dif_load. Changed settings become active immediately.	% 0 75 100	UINT16 UINT16 R/W per. -	CANopen 3006:29h Modbus 1618

The following parameters let you set the following error threshold in user-defined units or revolutions for the maximum load-dependent position deviation.

0198441113755, V1.08, 04.2014

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 (following error) The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. The minimum value, the factory setting and the maximum value depend on the scaling factor. Changed settings become active immediately. Available with firmware version ≥V01.05.	usr_p 1 16384 2147483647	INT32 INT32 R/W per. -	CANopen 3006:3Eh Modbus 1660
`MON_p_dif_load`	Maximum load-dependent position deviation (following error) The load-dependent position deviation is the difference between the reference position and the actual position caused by the load. The parameter MON_p_dif_load_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution. Changed settings become active immediately.	revolution 0.0001 1.0000 200.0000	UINT32 UINT32 R/W per. -	CANopen 6065:0h Modbus 1606

Setting the error class The following parameter lets you set the error response to an excessively high load-dependent position deviation (following error).

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ErrorResp_p_dif`	Error response to following error **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 1 3 3	UINT16 UINT16 R/W per. -	CANopen 3005:Bh Modbus 1302

7.7.5 Motor standstill and direction of movement

The status of a movement can be monitored. You can read out whether the motor is at a standstill or whether it moves in a specific direction.

Availability Monitoring depends on the firmware version

- Motor standstill: Available with firmware version ≥V01.00.
- Direction of movement: Available with firmware version ≥V01.14.

Monitoring A velocity of <10 min^{-1} is interpreted as standstill.

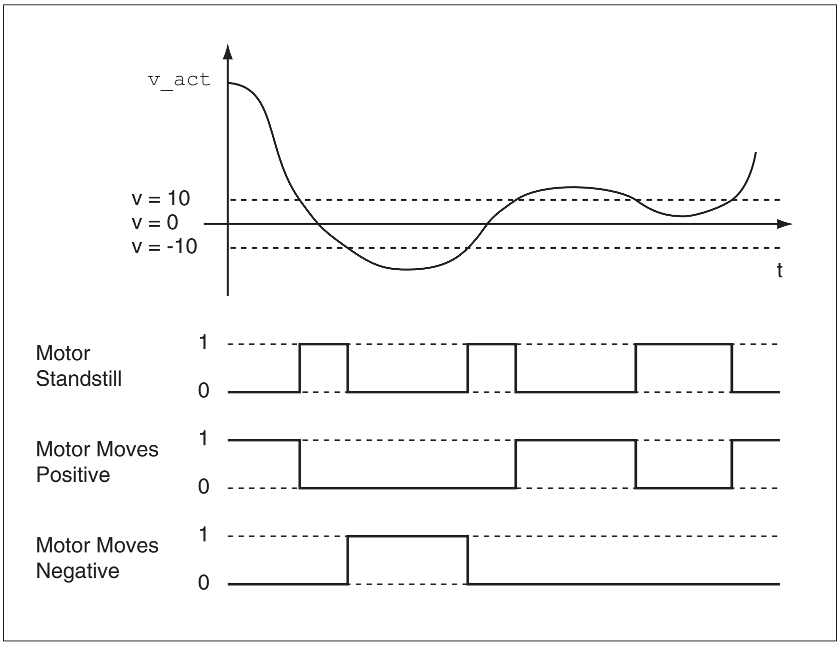


Figure 97: Motor standstill and direction of movement

The status is available via signal outputs. In order to read the status, you must first parameterize the signal output functions "Motor Standstill", "Motor Moves Positive" or "Motor Moves Negative", see chapter "7.5.2 Setting the digital signal inputs and signal outputs".

0198441113755, V1.08, 04.2014

7.7.6 Torque window

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

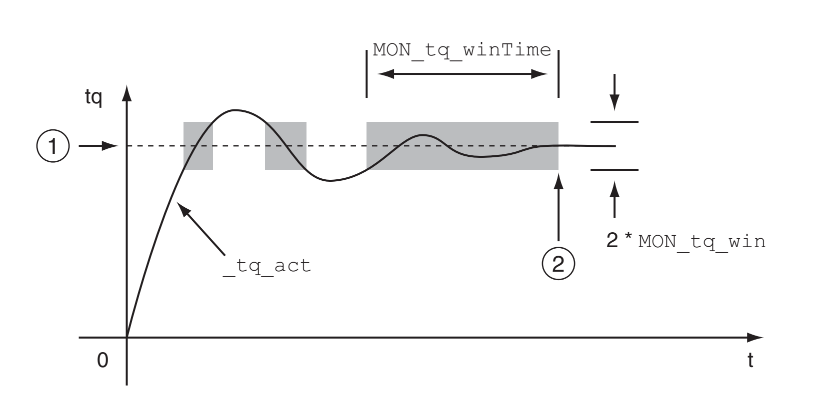


Figure 98: Torque window

(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 %. Changed settings become active immediately.	% 0.0 3.0 3000.0	UINT16 UINT16 R/W per. -	CANopen 3006:2Dₕ Modbus 1626
MON_tq_winTime	Torque window, time Value 0: Torque window monitoring deactivated Changing the value causes a restart of torque monitoring. NOTE: Torque window is only used in operating mode Profile Torque. Changed settings become active immediately.	ms 0 0 16383	UINT16 UINT16 R/W per. -	CANopen 3006:2Eₕ Modbus 1628

7.7.7 Velocity window

The velocity window allows you to monitor whether the motor has reached the target velocity.

If the difference between the target velocity and the current motor 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

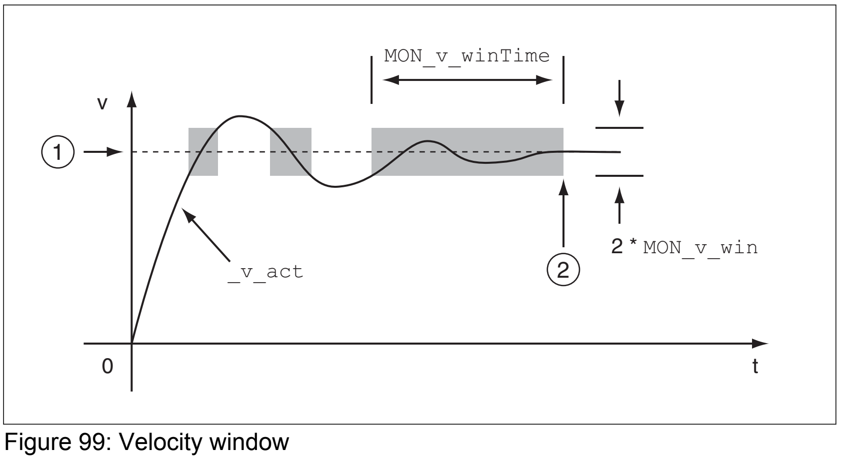


Figure 99: Velocity window

(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 Changed settings become active immediately.	usr_v 1 10 2147483647	UINT16 UINT32 R/W per. -	CANopen 606D:0h Modbus 1576
MON_v_winTime	Velocity window, time Value 0: Velocity window monitoring deactivated Changing the value causes a restart of velocity monitoring. Changed settings become active immediately.	ms 0 0 16383	UINT16 UINT16 R/W per. -	CANopen 606E:0h Modbus 1578

0198441113755, V1.08, 04.2014

7.7.8 Standstill window

The standstill window allows you to monitor whether the motor has reached the target position.

If the difference between the target position and the current motor 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

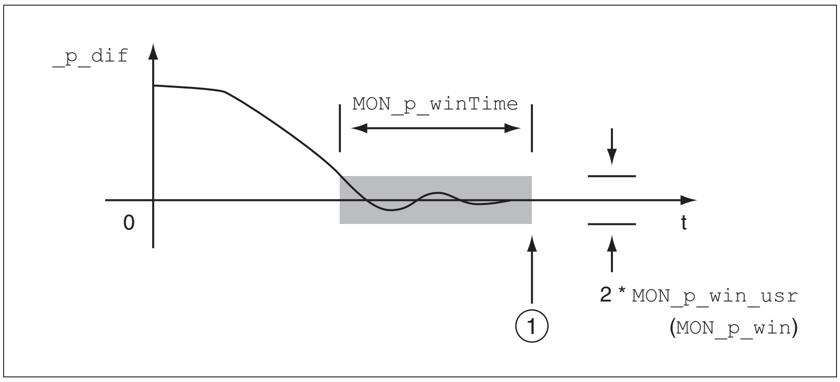


Figure 100: Standstill window

(1) Target position reached (the target 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.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_p_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. Changed settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 16 2147483647	INT32 INT32 R/W per. -	CANopen 3006:40h 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. Changed settings become active immediately.	revolution 0.0000 0.0010 3.2767	UINT32 UINT16 R/W per. -	CANopen 6067:0h Modbus 1608
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 Changed settings become active immediately.	ms 0 0 32767	UINT16 UINT16 R/W per. -	CANopen 6068:0h 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. Changed settings become active immediately.	ms 0 0 16000	UINT16 UINT16 R/W per. -	CANopen 3006:26h Modbus 1612

0198441113755, V1.08, 04.2014

7.7.9 Position register

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.

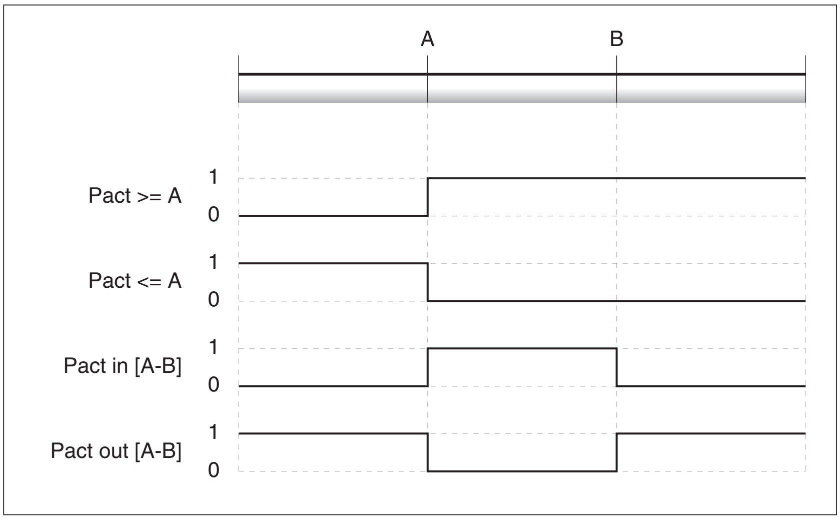


Figure 101: Position register

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 field-bus
`_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 UINT16 R/- - -	CANopen 300B:1h 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 chapter
"7.5.2 Setting the digital signal inputs and signal outputs".

Starting the position registers The channels of the position registers are started via the following parameters.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`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 Changed settings become active immediately.	- 0 0 3	UINT16 UINT16 R/W - -	CANopen 300B:2h 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 Changed settings become active immediately.	- 0 0 3	UINT16 UINT16 R/W - -	CANopen 300B:3h Modbus 2822
`PosReg3Start`	Start/stop of position register channel 3 **0 / Off (keep last state)**: Position Register channel 3 is off and status bit keep 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 Changed settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 3	UINT16 UINT16 R/W - -	CANopen 300B:Ch Modbus 2840
`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 Changed settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 3	UINT16 UINT16 R/W - -	CANopen 300B:Dh Modbus 2842

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`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 Changed settings become active immediately. Available with firmware version ≥V01.14.	- 0 0 15	UINT16 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 field-bus
`PosReg1Mode`	Selection of comparison criterion for position register channel 1 **0 / Pact greater equal A**: Current position is greater than or equal to comparison value A for position register channel 1 **1 / Pact less equal A**: Current position is less than or equal to comparison value A for position register channel 1 **2 / Pact in [A-B] (basic)**: Current position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Current position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Current position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Current position is out of the range A-B excluding limits (extended) Changed settings become active immediately.	- 0 0 5	UINT16 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**: Current position is greater than or equal to comparison value A for position register channel 2 **1 / Pact less equal A**: Current position is less than or equal to comparison value A for position register channel 2 **2 / Pact in [A-B] (basic)**: Current position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Current position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Current position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Current position is out of the range A-B excluding limits (extended) Changed settings become active immediately.	- 0 0 5	UINT16 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 field-bus
PosReg3Mode	Selection of comparison criterion for position register channel 3 **0 / Pact greater equal A**: Current position is greater than or equal to comparison value A for position register channel 3 **1 / Pact less equal A**: Current position is less than or equal to comparison value A for position register channel 3 **2 / Pact in [A-B] (basic)**: Current position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Current position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Current position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Current position is out of the range A-B excluding limits (extended) Changed settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 5	UINT16 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**: Current position is greater than or equal to comparison value A for position register channel 4 **1 / Pact less equal A**: Current position is less than or equal to comparison value A for position register channel 4 **2 / Pact in [A-B] (basic)**: Current position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Current position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Current position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Current position is out of the range A-B excluding limits (extended) Changed settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 5	UINT16 UINT16 R/W per. -	CANopen 300B:F$_h$ Modbus 2846

Setting comparison values The comparison values are set via the following parameters.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
PosReg1ValueA	Comparison value A for position register channel 1	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:8h Modbus 2832
PosReg1ValueB	Comparison value B for position register channel 1	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:9h Modbus 2834
PosReg2ValueA	Comparison value A for position register channel 2	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:Ah Modbus 2836
PosReg2ValueB	Comparison value B for position register channel 2	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:Bh Modbus 2838
PosReg3ValueA	Comparison value A for position register channel 3 Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:12h Modbus 2852
PosReg3ValueB	Comparison value B for position register channel 3 Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:13h Modbus 2854
PosReg4ValueA	Comparison value A for position register channel 4 Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:14h Modbus 2856
PosReg4ValueB	Comparison value B for position register channel 4 Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:15h Modbus 2858

0198441113755, V1.08, 04.2014

7.7.10 Position deviation window

The position deviation window allows you to monitor whether the motor is within a parameterizable position deviation.

The position deviation is the difference between reference position and actual position.

The position deviation window comprises position deviation and monitoring time.

Availability

The position deviation window is available in the following operating modes.

- Jog
- Profile Position
- Homing

Monitoring

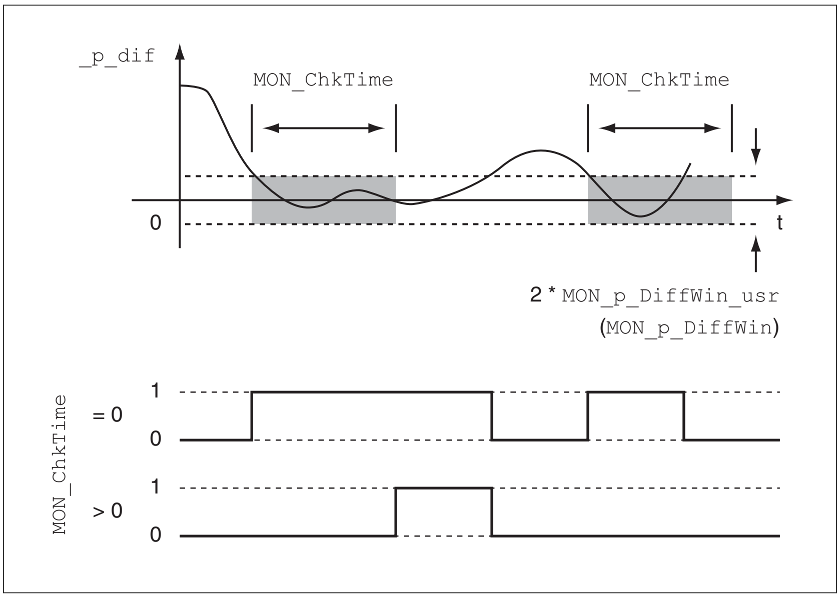


Figure 102: Position deviation window

The parameters MON_p_DiffWin_usr (MON_p_DiffWin) and MON_ChkTime specify the size of the window.

Status indication

The status is available via a signal output 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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

In order to read the status via the fieldbus, you must set the parameter DS402intLim to the value "In Position Deviation Window", see chapter "7.5.6 Settings of parameter _DCOMstatus".

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.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_p_DiffWin_usr	Monitoring of position deviation The system checks whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameteriz-able output. The minimum value, the factory setting and the maximum value depend on the scaling factor. Changed settings become active immedi-ately. Available with firmware version ≥V01.05.	usr_p 0 16 2147483647	INT32 INT32 R/W per. -	CANopen 3006:3Fh Modbus 1662
MON_p_DiffWin	Monitoring of position deviation The system checks whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameteriz-able output. The parameter MON_p_DiffWin_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution. Changed settings become active immedi-ately.	revolution 0.0000 0.0010 0.9999	UINT16 UINT16 R/W per. -	CANopen 3006:19h Modbus 1586
MON_ChkTime ConF → i-o- tthr	Monitoring of time window Adjustment of a time for monitoring of posi-tion deviation, speed deviation, speed value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a posi-tive result. The status can be output via a parameteriz-able output. Changed settings become active immedi-ately.	ms 0 0 9999	UINT16 UINT16 R/W per. -	CANopen 3006:1Dh Modbus 1594

0198441113755, V1.08, 04.2014

7.7.11 Velocity deviation window

The velocity deviation window allows you to monitor whether the motor is within a parameterizable velocity deviation.

The velocity deviation is the difference between the reference velocity and the actual velocity.

The velocity deviation window comprises velocity deviation and monitoring time.

Availability

The velocity deviation window is available in the following operating modes.

- Jog
- Profile Velocity
- Profile Position
- Homing

Monitoring

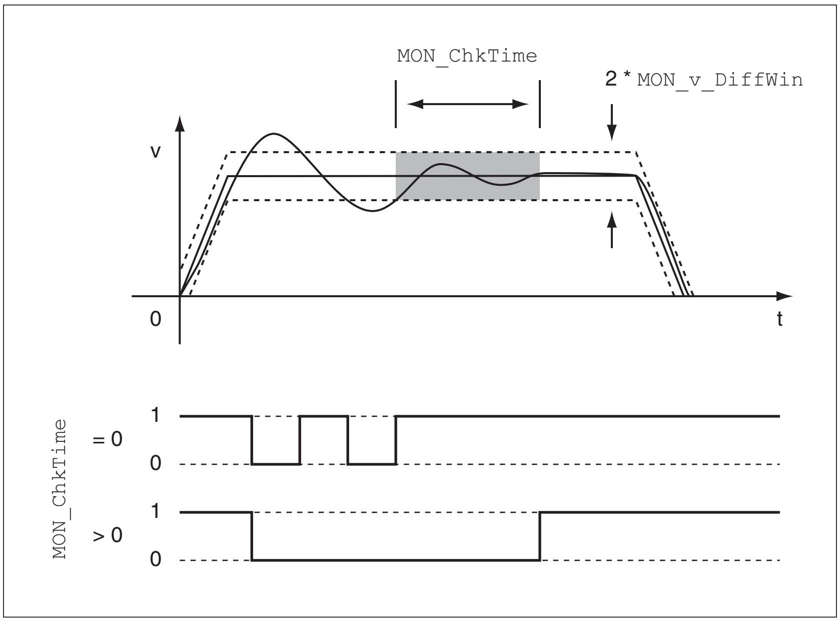


Figure 103: Velocity deviation window

The parameters MON_v_DiffWin and MON_ChkTime specify the size of the window.

Status indication

The status is available via a signal output 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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

In order to read the status via the fieldbus, you must set the parameter DS402intLim to the value "In Velocity Deviation Window", see chapter "7.5.6 Settings of parameter _DCOMstatus".

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.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_v_DiffWin	Monitoring of velocity deviation The system checks whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameteriz-able output. Changed settings become active immedi-ately.	usr_v 1 10 2147483647	UINT32 UINT32 R/W per. -	CANopen 3006:1A$_h$ Modbus 1588
MON_ChkTime ConF → i-o- tthr	Monitoring of time window Adjustment of a time for monitoring of posi-tion deviation, speed deviation, speed value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a posi-tive result. The status can be output via a parameteriz-able output. Changed settings become active immedi-ately.	ms 0 0 9999	UINT16 UINT16 R/W per. -	CANopen 3006:1D$_h$ Modbus 1594

0198441113755, V1.08, 04.2014

7.7.12 Velocity threshold value

The velocity threshold value allows you to monitor whether the actual velocity is below a parameterizable velocity value.

The velocity threshold value comprises the velocity and the monitoring time.

Monitoring

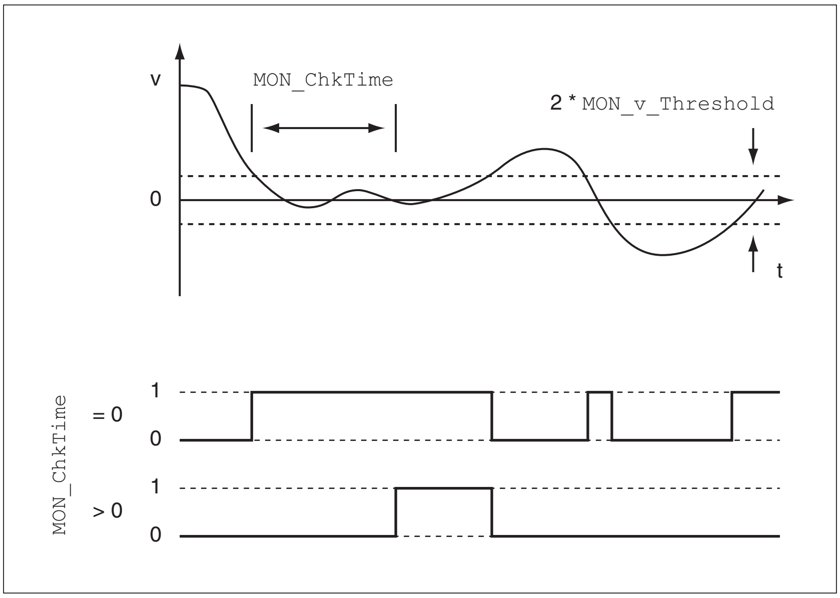


Figure 104: Velocity threshold value

The parameters MON_v_Threshold and MON_ChkTime specify the size of the window.

Status indication

The status is available via a signal output 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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

In order to read the status via the fieldbus, you must set the parameter DS402intLim to the value "Velocity Below Threshold", see chapter "7.5.6 Settings of parameter _DCOMstatus".

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.

0198441113755, V1.08, 04.2014

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 checks whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. Changed settings become active immediately.	usr_v 1 10 2147483647	UINT32 UINT32 R/W per. -	CANopen 3006:1Bh Modbus 1590
MON_ChkTime ConF → i-o- tthr	Monitoring of time window Adjustment of a time for monitoring of position deviation, speed deviation, speed value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Changed settings become active immediately.	ms 0 0 9999	UINT16 UINT16 R/W per. -	CANopen 3006:1Dh Modbus 1594

7.7.13 Current threshold value

The current threshold value allows you to monitor whether the current motor current is below a parameterizable current value.

The current threshold value comprises the current value and the monitoring time.

Monitoring

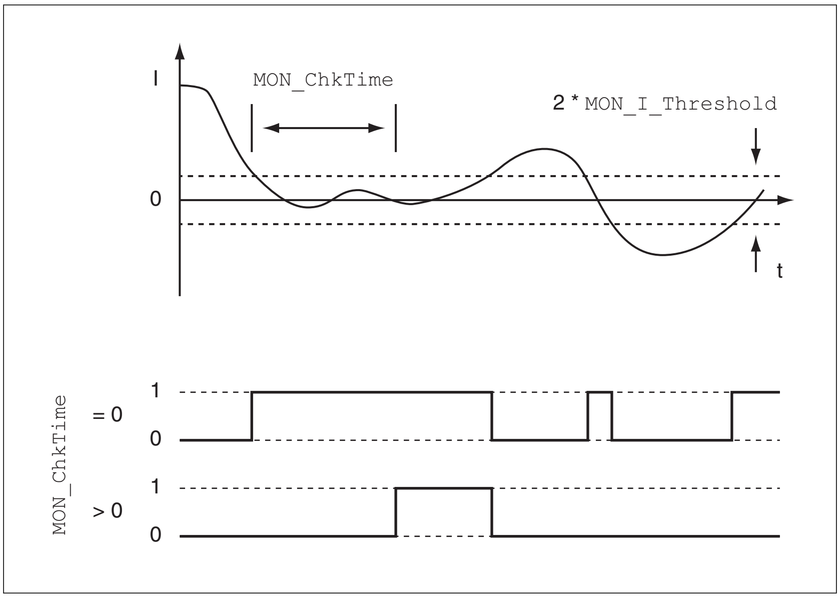


Figure 105: Current threshold value

The parameters MON_I_Threshold and MON_ChkTime specify the size of the window.

Status indication The status is available via a signal output 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 chapter "7.5.2 Setting the digital signal inputs and signal outputs".

In order to read the status via the fieldbus, you must set the parameter DS402intLim to the value "Current Below Threshold", see chapter "7.5.6 Settings of parameter _DCOMstatus".

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.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_I_Threshold ConF → i-o- ithr	Monitoring of current threshold The system checks whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter _Iq_act_rms is used as comparison value. In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.20 300.00	UINT16 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, speed deviation, speed value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Changed settings become active immediately.	ms 0 0 9999	UINT16 UINT16 R/W per. -	CANopen 3006:1D$_h$ Modbus 1594

7.8 Functions for monitoring internal device signals

7.8.1 Temperature monitoring

The power stage temperature and the motor temperature are monitored internally.

Power stage temperature

The parameters `_PS_T_current` and `_PS_T_max` can be used to read the current temperature and the maximum temperature of the power stage.

The parameter `_PS_T_warn` contains as threshold value for a warning.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_PS_T_current` Mon tPS	Current power stage temperature	°C - - -	INT16 INT16 R/- - -	CANopen 301C:10h Modbus 7200
`_PS_T_warn`	Temperature warning threshold of power stage	°C - - -	INT16 INT16 R/- per. -	CANopen 3010:6h Modbus 4108
`_PS_T_max`	Maximum power stage temperature	°C - - -	INT16 INT16 R/- per. -	CANopen 3010:7h Modbus 4110

Motor temperature

The parameters `_M_T_current` and `_M_T_max` can be used to read the current temperature and the maximum temperature of the motor.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_M_T_current`	Current motor temperature	°C - - -	INT16 INT16 R/- - -	CANopen 301C:11h Modbus 7202
`_M_T_max`	Maximum temperature of motor	°C - - -	INT16 INT16 R/- - -	CANopen 300D:10h Modbus 3360

0198441113755, V1.08, 04.2014

7.8.2 Monitoring load and overload (I^2t monitoring)

The load is the thermal load on the power stage, the motor and the braking resistor.

Load and overload on the individual components are monitored internally; the values can be read by means of parameters.

Overload starts at a load value of 100 %.

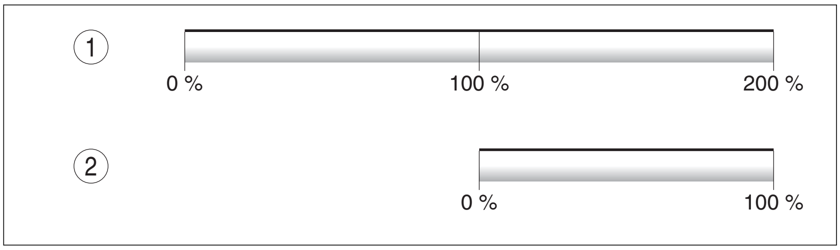


Figure 106: Load and overload

(1) Load
(2) Overload

Load monitoring The current load can be read using the following parameters:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_PS_load` Mon LdFP	Current load of power stage	% - - -	INT16 INT16 R/- - -	CANopen 301C:17h Modbus 7214
`_M_load` Mon LdFM	Current load of motor	% - - -	INT16 INT16 R/- - -	CANopen 301C:1Ah Modbus 7220
`_RES_load` Mon LdFb	Current load of braking resistor The braking resistor set via parameter RESint_ext is monitored.	% - - -	INT16 INT16 R/- - -	CANopen 301C:14h Modbus 7208

0198441113755, V1.08, 04.2014

Overload monitoring

In the case of 100 % overload of the power stage or the motor), the current is limited internally. In the case of 100 % overload of the braking resistor, the braking resistor is switched off.

The current overload and the peak value can be read using the following parameters:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`_PS_overload`	Current overload of power stage	% - - -	INT16 INT16 R/- - -	CANopen 301C:24h Modbus 7240
`_PS_maxoverload`	Maximum value of overload of power stage Maximum overload of power stage during the last 10 seconds.	% - - -	INT16 INT16 R/- - -	CANopen 301C:18h Modbus 7216
`_M_overload`	Current overload of motor (I2t)	% - - -	INT16 INT16 R/- - -	CANopen 301C:19h Modbus 7218
`_M_maxoverload`	Maximum value of overload of motor Maximum overload of motor during the last 10 seconds.	% - - -	INT16 INT16 R/- - -	CANopen 301C:1Bh Modbus 7222
`_RES_overload`	Current overload of braking resistor (I2t) The braking resistor set via parameter RESint_ext is monitored.	% - - -	INT16 INT16 R/- - -	CANopen 301C:13h 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 INT16 R/- - -	CANopen 301C:15h Modbus 7210

0198441113755, V1.08, 04.2014

7.8.3 Commutation monitoring

⚠ WARNING

UNEXPECTED MOVEMENT

The risk of unexpected movements increases if monitoring functions are deactivated.

- Use the monitoring functions.

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

The device checks the plausibility of motor acceleration and effective motor torque in order to recognize uncontrolled movements and to suppress them if required. The monitoring function is referred to as commutation monitoring.

If the motor accelerates for a period of more than 5 to 10 ms even though the drive control decelerates the motor with the maximum current set, commutation monitoring signals an uncontrolled motor movement.

The parameter `MON_commutat` lets you deactivate commutation monitoring.

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via fieldbus**
`MON_commutat`	Commutation monitoring **0 / Off**: Commutation monitoring off **1 / On**: Commutation monitoring on Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 1	UINT16 UINT16 R/W per. -	CANopen 3005:5$_h$ Modbus 1290

7.8.4 Monitoring of mains phases

NOTICE

DESTRUCTION CAUSED BY MISSING MAINS PHASE

If a mains phase for a three-phase product misses and the monitoring function is deactivated, this can cause overload and destruction of the product.

- Use the monitoring functions.
- Do not operate the product if a mains phase misses.

Failure to follow these instructions can result in equipment damage.

The mains phases are monitored internally.

The parameter `ErrorResp_Flt_AC` lets you set the error response to a missing mains phase for three-phase devices.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`ErrorResp_Flt_AC`	Error response to missing mains phase **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 1 2 3	UINT16 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 the mains voltage used.

The type of main phase monitoring is set by means of the parameter `MON_MainsVolt`.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`MON_MainsVolt`	Detection and monitoring of mains phases **0 / Automatic Mains Detection**: Automatic detection and monitoring of mains voltage **1 / DC-Bus Only (Mains 1~230 V / 3~480 V)**: DC bus supply only, corresponding to mains voltage 230 V (single-phase) or 480 V (three phases) **2 / DC-Bus Only (Mains 1~115 V / 3~208 V)**: DC bus supply only, corresponding to mains voltage 115 V (single-phase) or 208 V (three phases) **3 / Mains 1~230 V / 3~480 V**: Mains voltage 230 V (single-phase) or 480 V (three phases) **4 / Mains 1~115 V / 3~208 V**: Mains voltage 115 V (single-phase) or 208 V (three phases) Value 0: As soon as a mains voltage detected, the device automatically checks whether the mains voltage is 115 V or 230 V in the case of single-phase devices or 208 V or 400/480 V in the case of three-phase devices. Values 1 ... 2: If the device is supplied only via the DC bus, the parameter has to be set to the voltage value corresponding to the mains voltage of the supplying device. There is no mains voltage monitoring. Values 3 ... 4: If the mains voltage is not detected properly during start-up, the mains voltage to be used can be selected manually. Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 0 4	UINT16 UINT16 R/W per. expert	CANopen 3005:Fh Modbus 1310

0198441113755, V1.08, 04.2014

7.8.5 Ground fault monitoring

NOTICE

DESTRUCTION CAUSED BY GROUND FAULTS

If the monitoring function is deactivated, the product may be destroyed by a ground fault.

- Use the monitoring functions.
- Avoid ground faults by wiring the product properly.

Failure to follow these instructions can result in equipment damage.

When the power stage is enabled, the device monitors the motor phases for ground faults.

A ground fault of one or more motor phases is detected. A ground fault of the DC bus or the braking resistor is not detected.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
`MON_GroundFault`	Ground fault monitoring **0 / Off**: Ground fault monitoring off **1 / On**: Ground fault monitoring on In exceptional cases, deactivation may be necessary, for example: - Long motor cables Deactivate ground fault monitoring if it responds in an unwanted way. Changed settings become active the next time the product is switched on.	- 0 1 1	UINT16 UINT16 R/W per. expert	CANopen 3005:10$_h$ Modbus 1312

0198441113755, V1.08, 04.2014

8 Examples

8.1 General information

The examples show some typical applications of the product. The examples are intended to provide an overview; they are not exhaustive wiring plans.

Using the safety functions integrated in this product requires careful planning. See chapter "4.9 Safety function STO ("Safe Torque Off")", page 73 for additional information.

0198441113755, V1.08, 04.2014

8.2 Example of operation via fieldbus

The product is controlled via CANopen.

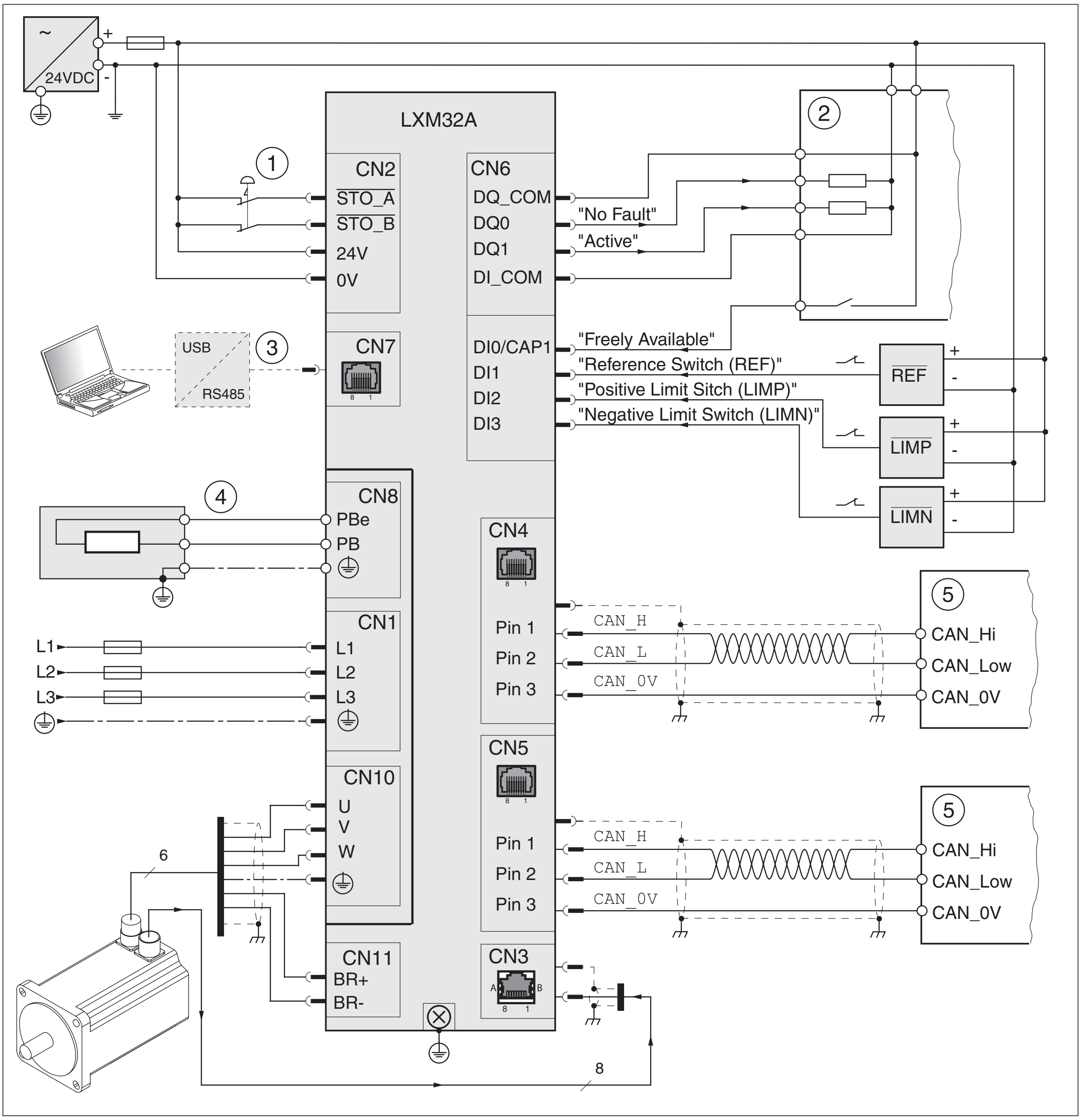


Figure 107: Wiring example

(1)	EMERGENCY STOP
(2)	PLC
(3)	Commissioning accessories
(4)	External braking resistor
(5)	CANopen bus device

0198441113755, V1.08, 04.2014

9 Diagnostics and troubleshooting

This chapter describes the various types of diagnostics and provides troubleshooting assistance.

9.1 Status request/status indication

Information on the product status is provided by:

- Integrated HMI
- Commissioning software
- Fieldbus
- Fieldbus status LEDs

The error memory also contains a history of the last 10 detected errors.

Meaning of a warning

A warning alerts to a problem that was detected by a monitoring function. A warning belongs to error class 0 and does not cause a transition of the operating state.

Meaning of an error

An error is a deviation from the required value or state. Errors are subdivided into different error classes.

Error class

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

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

0198441113755, V1.08, 04.2014

9.1.1 Error diagnostics via integrated HMI

The following illustration shows the status LEDs and the 7-segment display of the integrated HMI

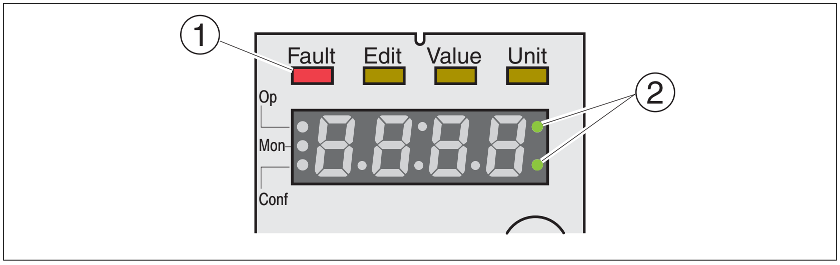


Figure 108: Status indication via the integrated HMI

Status LED "Fault" If the drive is in the operating state Fault, the "Fault" (1) status LED lights.

Indication of a warning If there are warnings (error class 0), the two dots to the right of the 7-segment display (2) flash. Warnings are not directly displayed on the 7-segment display in the form of an error number, bust must be explicitly queried by the user.

See chapter "9.3.1 Reading and acknowledging warnings" for additional information.

Indication of an error In the case of a detected error of error class 1, the error number and StoP are alternately shown on the 7 segment display.

In the case of a detected error of error class 2 ... 4, the error number and FLt are alternately shown on the 7 segment display.

See chapter "9.3.2 Reading and acknowledging detected errors" for information on acknowledging detected errors via the integrated HMI.

The meanings of the error numbers can be found in chapter "9.4 Table of warnings and errors by range".

0198441113755, V1.08, 04.2014

7-segment display

The 7-segment display provides the user with information.

With the factory setting, the 7-segment display shows the operating states. The operating states are described in chapter "7.2 Operating states".

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

The table below provides an overview of the messages that can additionally be displayed on the integrated HMI.

Message	Description
CArd	Data on the memory card differs from data in the product. See chapter "6.7.1 Data exchange with the memory card" for information on how to proceed.
diSP	An external HMI is connected. The integrated HMI has no function.
FSu	Perform a First Setup. See chapter "6.5 Commissioning procedure".
Mot	A new motor was detected. See chapter "9.3.3 Acknowledging a motor change" for replacing a motor.
Prot	Parts of the integrated HMI were locked with the parameter `HMIlocked`.
uLow	Controller supply during initialization not high enough.
WdoG	Unknown system error. Contact technical Support.
8888	Undervoltage controller supply.

9.1.2 Diagnostics via the commissioning software

See the information provided with the commissioning software for details on how to display the device state via the commissioning software.

0198441113755, V1.08, 04.2014

9.1.3 Diagnostics via signal outputs

Information on the operating state is available via the the signal outputs. The table below provides an overview.

Operating state	"No fault" 1)	"Active" 2)
1 Start	0	0
2 Not Ready To Switch On	0	0
3 Switch On Disabled	0	0
4 Ready To Switch On	1	0
5 Switched On	1	0
6 Operation Enabled	1	1
7 Quick Stop Active	0	0
8 Fault Reaction Active	0	0
9 Fault	0	0

1) The signal output function is factory setting for `DQ0`
2) The signal output function is the factory setting for `DQ1`

Indicating warnings and errors

Selected warnings or errors can be output via the signal outputs.

In order to output a warning or an error via a signal outputs, you must first parameterizes the signal output functions "Selected Warning" or "Selected Error", see chapter
"7.5.2 Setting the digital signal inputs and signal outputs".

The parameters `MON_IO_SelWar1`, `MON_IO_SelWar2`, `MON_IO_SelErr1` and `MON_IO_SelErr2` are used to specify the error or warning numbers; if these errors or warnings occur, a signal output is to be set.

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`	First number for the signal output function Selected Warning Changed settings become active immediately.	- 0 0 65535	UINT16 UINT16 R/W per. -	CANopen 303B:8h Modbus 15120
`MON_IO_SelWar2`	Second number for the signal output function Selected Warning Changed settings become active immediately.	- 0 0 65535	UINT16 UINT16 R/W per. -	CANopen 303B:9h Modbus 15122
`MON_IO_SelErr1`	First number for the signal output function Selected Error Changed settings become active immediately.	- 0 0 65535	UINT16 UINT16 R/W per. -	CANopen 303B:6h Modbus 15116
`MON_IO_SelErr2`	Second number for the signal output function Selected Error Changed settings become active immediately.	- 0 0 65535	UINT16 UINT16 R/W per. -	CANopen 303B:7h Modbus 15118

0198441113755, V1.08, 04.2014

9.1.4 Diagnostics via the fieldbus

Asynchronous and synchronous errors

Asynchronous errors are signaled by the product without a request. Example of an asynchronous error: Power stage overtemperature.

Synchronous errors are errors that are detected in response to an incorrect request.
Example of a synchronous error: An invalid parameter value is transmitted to the product. In response, the product signals an error.

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 a warning, bit 7 is set in the parameter `DCOMstatus`.

In the case of an error, 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: Ready To Switch On Bit 1: Switched On Bit 2: Operation Enabled Bit 3: Fault Bit 4: Voltage Enabled Bit 5: Quick Stop Bit 6: Switch On Disabled Bit 7: Warning 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 UINT16 R/- - -	CANopen 6041:0$_h$ Modbus 6916

If the master controller receives information concerning a warning or a detected error via the process data communication, the following parameters can be used to read the error number.

0198441113755, V1.08, 04.2014

Last warning The parameter `_LastWarning` allows you to read the error number of the last warning. As long as no warning threshold has been exceeded, the value of this parameter is 0.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_LastWarning` MOn LWrn	Number of last warning (error class 0) Number of the most recent warning. If the warning becomes inactive again, the number is memorized until the next fault reset. Value 0: No warning occurred	- - - -	UINT16 UINT16 R/- - -	CANopen 301C:9h Modbus 7186

Last detected error The parameter `_LastError` allows you to read the error number of the last detected error. As long as no error is detected, the value of the parameter is 0. If an error is detected, the error is written to the error memory along with other status information.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_LastError` MOn LFLt	Error causing a stop (error classes 1 to 4) Number of the current error. Any consequtive errors do not overwrite this error number. Example: If a limit switch error reaction caused an overvoltage error, this parameter would contain the number of the limit switch error. Exception: Errors of error class 4 overwrite existing entries.	- - - -	UINT16 UINT16 R/- - -	CANopen 603F:0h Modbus 7178

0198441113755, V1.08, 04.2014

9.1.5 Fieldbus status LEDs

General The fieldbus status LEDs visualize the status of the fieldbus.

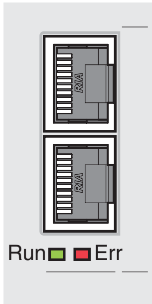


Figure 109: Fieldbus status LEDs

The illustration below shows the fieldbus communication states.

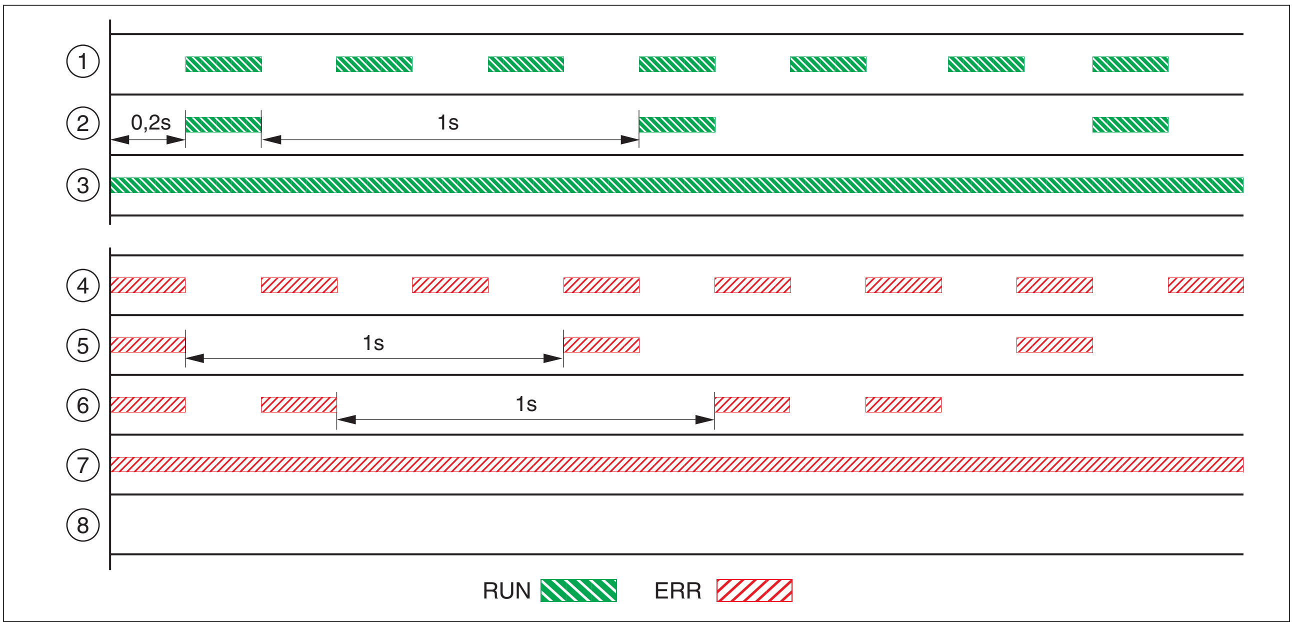


Figure 110: Signals of the CAN bus status LEDs (Run=GN; Err=RD)

(1) NMT state PRE-OPERATIONAL
(2) NMT state STOPPED
(3) NMT state OPERATIONAL
(4) Incorrect settings,
for example, invalid node address
(5) Warning 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.

9.2 Error memory

General

The error memory is an error history of the last 10 detected errors; it is not cleared even if the product is switched off. The error memory allows you to read and evaluate past events.

The following information on the events is stored:

- Error class
- Error number
- Motor current
- Number of switch-on cycles
- Additional error information (for example, parameter numbers)
- Product temperature
- Power stage temperature
- Time the error was detected (with reference to operating hours counter)
- DC bus voltage
- Velocity
- Number of Enable cycles after switch-on
- Time from Enable until detection of the error

The stored information relates to the situation at the point in time the error was detected.

9.2.1 Reading the error memory via the fieldbus

The following parameters allow you to manage the error memory:

Parameter name **HMI menu** **HMI name**	**Description**	**Unit** **Minimum value** **Factory setting** **Maximum value**	**Data type** **R/W** **Persistent** **Expert**	**Parameter address via field-bus**
`ERR_clear`	Clear error memory Value 1: Delete entries in the error memory The clearing process is completed if a 0 is returned after a read access. Changed settings become active immediately.	- 0 - 1	UINT16 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. Changed settings become active immediately.	- 0 - 1	UINT16 UINT16 R/W - -	CANopen 303B:5$_h$ Modbus 15114

0198441113755, V1.08, 04.2014

The error memory can only be read sequentially. The parameter ERR_reset must be used to reset the read pointer. Then the first error entry can be read. The read pointer is automatically set to the next entry. A new read access delivers the next error entry. If the error number 0 is returned, there is no additional error entry.

Position of the entry	Meaning
1	First error entry (oldest message).
2	Second error entry (later message).
...	...
10	Tenth error entry. In the case of ten error entries, the most recent message is contained here.

An error entry consists of several pieces of information which can be read using different parameters. When you read an error entry, the error number must be read first with the parameter _ERR_number.

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_ERR_class`	Error class Value 0: Warning (no response) Value 1: Error class 1 Value 2: Error class 2 Value 3: Error class 3 Value 4: Error class 4	- 0 - 4	UINT16 UINT16 R/- - -	CANopen 303C:2h Modbus 15364
`_ERR_number`	Error number Reading this parameter copies the entire error entry (error class, time of occurrence of error, ...) to an intermediate memory from which the elements of the error can then be read. In addition, the read pointer of the error memory is automatically set to the next error entry.	- 0 - 65535	UINT16 UINT16 R/- - -	CANopen 303C:1h Modbus 15362
`_ERR_motor_I`	Motor current at error time In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 UINT16 R/- - -	CANopen 303C:9h Modbus 15378
`_ERR_powerOn` Mon Powo	Number of power on cycles	- 0 - 4294967295	UINT32 UINT32 R/- - -	CANopen 303B:2h Modbus 15108
`_ERR_qual`	Error additional information This entry contains additional information on the error, depending on the error number. Example: a parameter address	- 0 - 65535	UINT16 UINT16 R/- - -	CANopen 303C:4h Modbus 15368
`_ERR_temp_dev`	Temperature of device at error time	°C - - -	INT16 INT16 R/- - -	CANopen 303C:Bh Modbus 15382
`_ERR_temp_ps`	Temperature of power stage at error time	°C - - -	INT16 INT16 R/- - -	CANopen 303C:Ah Modbus 15380
`_ERR_time`	Error time With reference to operating hours counter	s 0 - 536870911	UINT32 UINT32 R/- - -	CANopen 303C:3h Modbus 15366
`_ERR_DCbus`	DC bus voltage at error time In increments of 0.1 V.	V - - -	UINT16 UINT16 R/- - -	CANopen 303C:7h Modbus 15374
`_ERR_motor_v`	Motor velocity at error time	usr_v - - -	INT32 INT32 R/- - -	CANopen 303C:8h Modbus 15376

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_ERR_enable_cycl`	Number of cycles of enabling the power stage at error time Number of cycles of enabling the power stage from the time the power supply (control voltage) was switched on to the time the error occurred.	- - - -	UINT16 UINT16 R/- - -	CANopen 303C:5h Modbus 15370
`_ERR_enable_time`	Time between enabling of power stage and occurrence of the error	s - - -	UINT16 UINT16 R/- - -	CANopen 303C:6h Modbus 15372

Error bits

The parameters `_WarnLatched` and `_SigLatched` contain information on warnings and errors.

The error bits of the warnings can be read using the parameter `_WarnLatched`.

The error bits of the errors can be read using the parameter `_SigLatched`.

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via fieldbus
_WarnLatched non Wrns	Saved warnings, bit-coded Saved warning bits are deleted in the case of a Fault Reset. Bits 10, 13 are deleted automatically. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General warning Bit 1: Reserved Bit 2: Out of range (SW limit switches, tuning) Bit 3: Reserved Bit 4: Active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following warning limit reached Bit 9: Reserved Bit 10: Inputs STO_A and/or STO_B Bit 11: Reserved Bit 12: Reserved Bit 13: Low voltage DC bus or mains phase missing Bit 14: Reserved Bit 15: Reserved Bit 16: Integrated encoder interface Bit 17: Temperature of motor high Bit 18: Temperature of power stage high Bit 19: Reserved Bit 20: Memory card Bit 21: Optional fieldbus module Bit 22: Optional encoder module Bit 23: Optional safety module eSM or module IOM1 Bit 24: Reserved Bit 25: Reserved Bit 26: Reserved Bit 27: Reserved Bit 28: Reserved Bit 29: Braking resistor overload (I^2t) Bit 30: Power stage overload (I^2t) Bit 31: Motor overload (I^2t) Monitoring functions are product-dependent.	- - - -	UINT32 UINT32 R/- - -	CANopen 301C:C_h Modbus 7192

0198441113755, V1.08, 04.2014

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 Mon SiGS	Saved status of monitoring signals Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General error Bit 1: Hardware limit switches (LIMP/LIMN/REF) Bit 2: Out of range (software limit switches, tuning) Bit 3: Quick Stop via fieldbus Bit 4: Error in active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following error Bit 9: Reserved Bit 10: Inputs STO are 0 Bit 11: Inputs STO different Bit 12: Reserved Bit 13: DC bus voltage low Bit 14: DC bus voltage high Bit 15: Mains phase missing Bit 16: Integrated encoder interface Bit 17: Overtemperature motor Bit 18: Overtemperature power stage Bit 19: Reserved Bit 20: Memory card Bit 21: Optional fieldbus module Bit 22: Optional encoder module Bit 23: Optional safety module eSM or module IOM1 Bit 24: Reserved Bit 25: Reserved Bit 26: Motor connection Bit 27: Motor overcurrent/short circuit Bit 28: Frequency of reference signal too high Bit 29: EEPROM error Bit 30: System start-up (hardware or parameter) Bit 31: System error (for example, watchdog, internal hardware interface) Monitoring functions are product-dependent.	- - - -	UINT32 UINT32 R/- - -	CANopen 301C:8h Modbus 7184

9.2.2 Reading the error memory via the commissioning software

See the information provided with the commissioning software for details on how to read the error memory using the commissioning software.

0198441113755, V1.08, 04.2014

9.3 Special menus at the integrated HMI

The following functions depend on the situation. They are only available in specific contexts.

9.3.1 Reading and acknowledging warnings

Procedure for reading and acknowledging warnings via the integrated HMI:

- ■ A warning is active. The two dots to the right of the 7-segment display flash.
- ▶ Remedy the cause of the warning.
- ▶ Press the navigation button and hold it down.
- ◁ The 7-segment display shows the error number of the warning.
- ▶ Release the navigation button.
- ◁ The 7-segment display shows FrES.
- ▶ Press the navigation button to acknowledge the warning.
- ◁ The 7-segment display returns to the initial state.

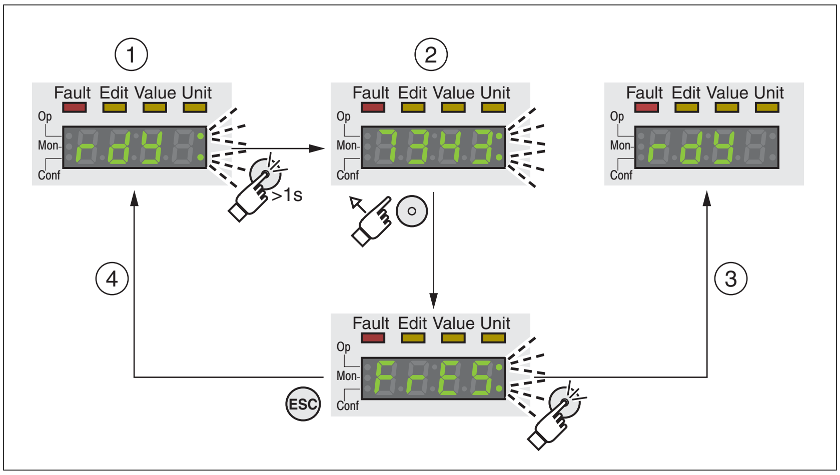


Figure 111: Acknowledging warnings via the integrated HMI

(1)	HMI displays a warning
(2)	Number of detected error is displayed
(3)	Resetting the warning
(4)	Canceling, the warning remains in the memory

See chapter "9.4 Table of warnings and errors by range", page 359, for detailed information on the warnings.

0198441113755, V1.08, 04.2014

9.3.2 Reading and acknowledging detected errors

Procedure for reading and acknowledging detected errors via the integrated HMI:

■ The LED "Fault" is on. The 7-segment display alternately shows FLt and an error number. An error of error classes 2 to 4 has been detected.

▸ Remedy the cause of the detected error.

▸ Press the navigation button.

◁ The 7-segment display shows FrES.

▸ Press the navigation button to acknowledge the detected error.

◁ The product switches to operating state **4** Ready To Switch On.

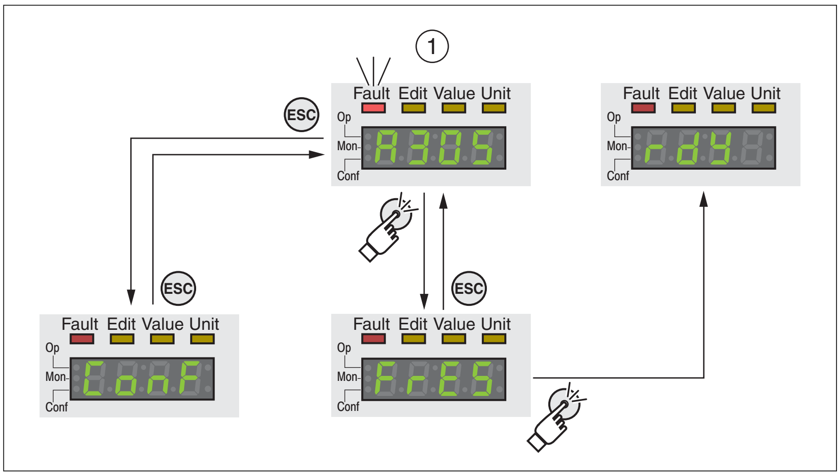


Figure 112: Acknowledging detected errors via the integrated HMI

(1) HMI displays a detected error with error number

The meanings of the error numbers can be determined using the table in chapter "9.4 Table of warnings and errors by range", page 359.

0198441113755, V1.08, 04.2014

9.3.3 Acknowledging a motor change

Procedure for acknowledging a motor change via the integrated HMI:

- The 7-segment display shows nAt .
- ▶ Press the navigation button.
- ◁ The 7-segment display shows SAUE.
- ▶ Press the navigation button to save the new motor parameters to the EEPROM.
- ◁ The product switches to operating state **4** Ready To Switch On.

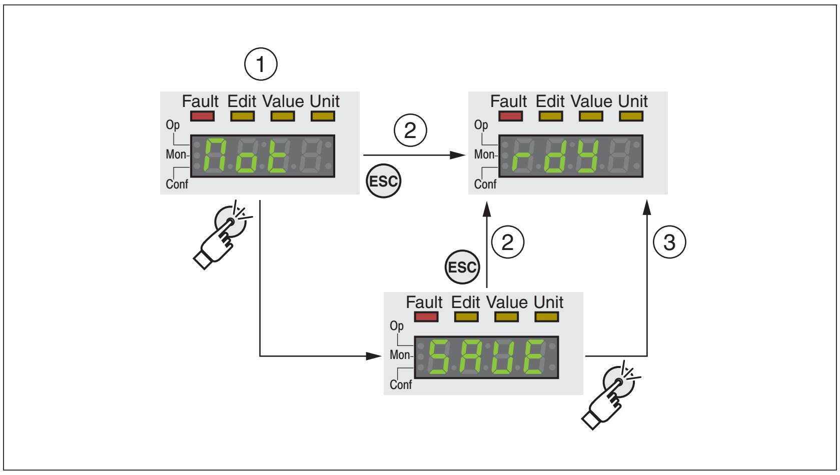


Figure 113: Acknowledging a motor change via the integrated HMI

(1) HMI displays that a replacement of a motor has been detected.

(2) Canceling the saving process

(3) Saving the new motor data and switching to operating state **4** Ready To Switch On.

0198441113755, V1.08, 04.2014

9.4 Table of warnings and errors by range

The table below summarizes the error numbers classified by range.

Error number	Range
E 1xxx	General
E 2xxx	Overcurrent
E 3xxx	Voltage
E 4xxx	Temperature
E 5xxx	Hardware
E 6xxx	Software
E 7xxx	Interface, wiring
E 8xxx	Fieldbus
E Axxx	Motor movement
E Bxxx	Communication

Error number not listed

If the error number is not listed in the table below, the firmware version may be newer than the version of the manual or there may be a system error.

- Verify that you use the correct manual (" About the book")
- Verify that the wiring is EMC-compliant ("4.1 Electromagnetic compatibility (EMC)")
- Contact technical support ("12.1 Service address")

List of error numbers

The table below provides an overview of the error numbers.

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E 1100	-	Parameter out of permissible value range	The value entered was outside of the permissible value range for this parameter.	The entered value must be within the permissible value range.
E 1101	-	Parameter does not exist	Error signaled by parameter management: Parameter (index) does not exist.	Select a different parameter (index).
E 1102	-	Parameter does not exist	Error signaled by parameter management: Parameter (subindex) does not exist.	Select a different parameter (subindex).
E 1103	-	Parameter write not permissible (READ only)	Write access to read only parameter.	Write only to parameters that are not read-only.
E 1104	-	Write access denied (no access authorization)	Parameter only accessible at expert level.	The write access level expert is required.
E 1105	-	Block Upload/Download not initialized		
E 1106	-	Command not permissible while power stage is active	Command not permissible while the power stage is enabled (operating state Operation Enabled or Quick Stop Active).	Disable the power stage and repeat the command.
E 1107	-	Access via other interface blocked	Access occupied by another channel (for example: Commissioning software is active and fieldbus access was tried at the same time).	Check the channel that blocks the access.
E 1108	-	File cannot be uploaded: Unknown file ID		
E 1109	1	Data stored after a power outage is invalid		
E 110A	-	System error: No bootloader available		
E 110B	3	Configuration error (additional info=Modbus register address) Parameter `_SigLatched` Bit 30	Error detected during parameter check (for example, reference velocity value for operating mode Profile Position is greater than maximum permissible velocity of drive).	Value in additional error information shows the Modbus register address of the parameter where the initialization error was detected.
E 110D	1	Basic configuration of drive required after factory setting	The "First Setup" (FSU) was not run at all or not completed.	Perform a First Setup.
E 110E	-	Parameter changed that requires a restart of the drive	Only displayed by the commissioning software. A parameter modification requires the drive to be switched off and on.	Restart the drive to activate the parameter functionality. See the chapter Parameters for the parameter that requires a restart of the drive.
E 110F	-	Function not available in this type of device	The specific type of device does not support this function or this parameter value.	Check if you have the correct device type, in particular type of motor, type of encoder, holding brake.
E 1110	-	Unknown file ID for upload or download	The specific type of device does not support this kind of file.	Verify that you have the correct device type or the correct configuration file.
E 1111	-	File transfer not correctly initialized	A previous file transfer has been aborted.	

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E 1112	-	Locking of configuration denied	An external tool has tried to lock the configuration of the drive for upload or download. This may not work because another tool had already locked the configuration of the drive or the drive is in an operating state that does not allow locking.	
E 1113	-	System not locked for configuration transfer	An external tool has tried to transfer the configuration without locking the drive.	
E 1114	4	Configuration download aborted Parameter `_SigLatched` Bit 5	During a configuration download, a communication error or an error in the external tool occurred. The configuration was only partially transferred to the drive and might be inconsistent now.	Switch the drive off/on and retry to download the configuration or restore the factory settings.
E 1115	0	Incorrect configuration file format Parameter `_WarnLatched` Bit 5	An external tool has downloaded a configuration which has an invalid or unknown format.	
E 1116	-	Request is processed asynchronously		
E 1117	-	Asynchronous request blocked	Request to a module is blocked because the module is currently processing another request.	
E 1118	-	Configuration data incompatible with device	The configuration data contains data from a different device.	Check device type including type of power stage.
E 1119	-	Incorrect data length, too many bytes		
E 111A	-	Incorrect data length, insufficient number of bytes		
E 111B	4	Configuration download error (additional info=Modbus register address)	During a configuration download, one or more configuration values have not been accepted by the drive.	Check whether the configuration file is valid and matches the type and version of the drive. The value in the additional error info shows the Modbus register address of the parameter where the initialization error was detected.
E 111C	1	Not possible to initialize recalculation for scaling	A parameter could not be initialized.	The address of the parameter that caused the error can be read via the parameter _PAR_ScalingError.
E 111D	3	Original state of a parameter after error during recalculation of parameters with user-defined units cannot be restored.	The drive contained an invalid configuration before the recalculation was started. An error occurred during the recalculation.	Switch the drive off and on again. This may help you to identify the affected parameter(s). Change the parameters as required. Verify that the parameter configuration is valid before starting the recalculation procedure.

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E 111F	1	Recalculation not possible.	Invalid scaling factor.	Check whether you really want the selected scaling factor. Try a different scaling factor. Before triggering scaling, reset the parameters with user-defined units.
E 1120	1	Recalculation for scaling not possible	A parameter could not be recalculated.	The address of the parameter that caused the error can be read via the parameter _PAR_ScalingError.
E 1121	-	Incorrect sequence of steps for scaling (fieldbus)	The recalculation has been started prior to the initialization.	The recalculation must be started after the initialization.
E 1122	-	Recalculation for scaling not possible	Recalculation for scaling is already running.	Wait for the running recalculation for scaling to finish.
E 1123	-	Parameter cannot be changed	Recalculation for scaling is running.	Wait for the running recalculation for scaling to finish.
E 1124	1	Timeout during recalculation for scaling	The time between the initialization of the recalculation and the start of the recalculation has been exceeded (30 seconds).	Recalculation must be started within 30 seconds after initialization.
E 1125	1	Scaling not possible	The scaling factors for position, velocity or acceleration/deceleration are beyond internal calculation limits.	Retry with different scaling factors.
E 1126	-	Configuration is blocked by another access channel		Close other access channel (for example, other instance of commissioning software).
E 1127	-	Invalid key received		
E 1128	-	Special login is required for Manufacturing Test Firmware		
E 1129	-	Test step not yet started		
E 112D	-	Current 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".
E 1300	3	Safety function STO activated (STO_A, STO_B) Parameter `_SigLatched` Bit 10	The safety function STO was activated in the operating state Operation Enabled.	Check the wiring of the inputs of the safety function STO and reset the error.
E 1301	4	STO_A and STO_B different level Parameter `_SigLatched` Bit 11	The levels of the inputs STO_A and STO_B were different for more than 1 second.	The drive has to be switched off and the reason fixed (for example, check whether EMERGENCY STOP is active) before it is switched on.
E 1302	0	Safety function STO activated (STO_A, STO_B) Parameter `_WarnLatched` Bit 10	Safety function STO was activated while the power stage was disabled.	The warning is automatically reset once the safety function STO is deactivated.
E 1311	-	The selected signal input function or signal output function cannot be configured	The selected signal input function or signal output function cannot be used in the selected operating mode.	Select another function or change the operating mode.

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E 1312	-	Limit switch or reference switch signal not defined for signal input function	Reference movements require limit switches. These limit switches are not assigned to inputs.	Assign the signal input functions Positive Limit Switch, Negative Limit Switch and Reference Switch.
E 1313	-	Configured debounce time not possible for this signal input function	The signal input function does not support the selected debounce time.	Set the debounce time to a valid value.
E 1314	4	At least two inputs have the same signal input function.	At least two inputs are configured with the same signal input function.	Reconfigure the inputs.
E 1316	1	Position capture via signal input currently not possible Parameter `_SigLatched` Bit 28	Position capture is already being used.	
E 1501	4	System error: DriveCom state machine unknown state		
E 1502	4	System error: HWL low-level state machine unknown state		
E 1503	1	Quick Stop triggered via fieldbus	A Quick Stop has been triggered via the fieldbus. The Quick Stop option code has been set to -1 or -2 which causes the drive to transition to the operating state 9 Fault instead of the operating state 7 Quick Stop Active.	
E 1600	-	Oscilloscope: No additional data available		
E 1601	-	Oscilloscope: Parameterization incomplete		
E 1602	-	Oscilloscope: Trigger variable not defined		
E 1606	-	Logging still active		
E 1607	-	Logging: No trigger defined		
E 1608	-	Logging: Invalid trigger option		
E 1609	-	Logging: No channel selected		
E 160A	-	Logging: No data available		
E 160B	-	Parameter cannot be logged		
E 160C	1	Autotuning: Moment of inertia outside permissible range	The load inertia is too high.	Verify that the system can easily be moved. Check the load. Use a differently rated drive.
E 160E	1	Autotuning: Test movement could not be started		
E 160F	1	Autotuning: Power stage cannot be enabled	Autotuning was not started in the operating state Ready To Switch On.	Start Autotuning when the drive is in the operating state Ready To Switch On.
E 1610	1	Autotuning: Processing stopped	Autotuning process stopped by user command or by drive error (see additional error message in error memory, for example, DC bus undervoltage, limit switches triggered)	Fix the cause of the stop and restart Autotuning.

Error number	Error class	Description	Cause	Correctives
E 1611	1	System error: Autotuning internal write access	HALT is active and an Autotuning parameter is written. Occurs when Autotuning is started.	
E 1612	1	System error: Autotuning internal read access		
E 1613	1	Autotuning: Maximum permissible movement range exceeded Parameter `_SigLatched` Bit 2	The motor exceeded the adjusted movement range during Autotuning.	Increase the movement range value or disable range monitoring by setting AT_DIS = 0.
E 1614	-	Autotuning: Already active	Autotuning has been started twice simultaneously or an Autotuning parameter is modified during Autotuning (parameter AT_dis and AT_dir).	Wait for Autotuning to finish before restarting Autotuning.
E 1615	-	Autotuning: This parameter cannot be changed while Autotuning is active	Parameter AT_gain or AT_J are written during Autotuning.	Wait for Autotuning to finish before changing the parameter.
E 1617	1	Autotuning: Friction torque or load torque too great	The current limit has been reached (parameter CTRL_I_max).	Verify that the system can easily be moved. Check the load. Use a differently rated drive.
E 1618	1	Autotuning: Optimization aborted	The internal Autotuning sequence has not been finished (following error?).	Note the additional information provided in the error memory.
E 1619	-	Autotuning: The velocity jump height in parameter AT_n_ref is too small	Parameter AT_n_ref < 2 * AT_n_tolerance. Checked only once at the first velocity jump.	Modify the parameter AT_n_ref or AT_n_tolerance to meet the desired condition.
E 1620	1	Autotuning: Load torque too high	Product rating is not suitable for the machine load. Detected machine inertia is too high compared to the inertia of the motor.	Reduce load, check rating.
E 1621	1	System error: Calculation error		
E 1622	-	Autotuning: Not possible to perform Autotuning	Autotuning can only be performed if no operating mode is active.	Terminate the active operating mode or disable the power stage.
E 1623	1	Autotuning: HALT request has stopped the autotuning process	Autotuning can only be performed if no operating mode is active.	Terminate the active operating mode or disable the power stage.
E 1A00	-	System error: FIFO memory overflow		
E 1A01	3	Motor has been changed (different type of motor) Parameter `_SigLatched` Bit 16	Detected motor type is different from previously detected motor.	Confirm the change.
E 1A03	4	System error: Hardware and firmware do not match		
E 1B00	3	System error: Incorrect parameters for motor and power stage Parameter `_SigLatched` Bit 30	Incorrect manufacturer parameter value (data) non-volatile memory of device.	Replace device.
E 1B02	3	Target value too high. Parameter `_SigLatched` Bit 30		

Error number	Error class	Description	Cause	Correctives
E 1B05	2	Error during parameter switching Parameter _SigLatched Bit 30		
E 1B0C	3	Actual motor velocity too high.		
E 1B0D	3	Velocity value determined by velocity observer is incorrect	Incorrect system inertia for velocity observer calculations. Incorrect velocity observer dynamics. System inertia changes during operation. In this case, operation with velocity observer is not possible and the velocity observer has to be switched off.	Change the velocity observer dynamics via the parameter CTRL_SpdObsDyn. Change the system inertia used for velocity observer calculations via the parameter CTRL_SpdObsInert. If error persists, deactivate velocity observer.
E 2300	3	Power stage overcurrent Parameter _SigLatched Bit 27	Motor short circuit and disabling of the power stage. Motor phases are inverted.	Check the motor power connection.
E 2301	3	Braking resistor overcurrent Parameter _SigLatched Bit 27	Braking resistor short circuit.	If you use the internal braking resistor, please contact Technical Support. If you use an external braking resistor, check the wiring and the rating of the braking resistor.
E 3100	par.	Missing mains supply, undervoltage mains supply or overvoltage mains supply Parameter _SigLatched Bit 15	Missing phase(s) for more than 50 ms. Mains voltage is out of range. Mains frequency is out of range.	Verify that the values of the mains power supply network comply with the technical data.
E 3200	3	DC bus overvoltage Parameter _SigLatched Bit 14	Excessive regeneration during braking.	Check deceleration ramp, check rating of drive and braking resistor.
E 3201	3	DC bus undervoltage (shutdown threshold) Parameter _SigLatched Bit 13	Power supply loss, poor power supply.	Check mains supply.
E 3202	2	DC bus undervoltage (Quick Stop threshold) Parameter _SigLatched Bit 13	Power supply loss, poor power supply.	Check mains supply.
E 3206	0	Undervoltage DC bus, missing mains supply, undervoltage mains supply or overvoltage mains supply Parameter _WarnLatched Bit 13	Missing phase(s) for more than 50 ms. Mains voltage is out of range. Mains frequency is out of range. Mains voltage and parameter setting of MON_MainsVolt do not match (for example, mains voltage is 230 V and MON_MainsVolt is set to 115 V).	Verify that the values of the mains power supply network comply with the technical data. Check the settings of the parameter for reduced mains voltage.
E 3300	0	Maximum motor voltage is too low for the power stage used	The maximum motor voltage M_U_max is too low. The power stage supply voltage and the maximum motor voltage do not match.	Use a motor with a higher maximum voltage M_U_max. If this warning is ignored, the motor may be damaged.
E 4100	3	Power stage overtemperature Parameter _SigLatched Bit 18	Transistors overtemperature: Ambient temperature is too high, fan is inoperative, dust.	Check the fan, improve the heat dissipation in the cabinet.

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E 4101	0	Warning power stage overtemperature Parameter _WarnLatched Bit 18	Transistors overtemperature: Ambient temperature is too high, fan is inoperative, dust.	Check the fan, improve the heat dissipation in the cabinet.
E 4102	0	Power stage overload (I2t) Parameter _WarnLatched Bit 30	The current has exceeded the nominal value for an extended period of time.	Check rating, reduce cycle time.
E 4200	3	Device overtemperature Parameter _SigLatched Bit 18	Board overtemperature: Ambient temperature is too high.	Check fan, improve the heat dissipation in the cabinet.
E 4300	2	Motor overtemperature Parameter _SigLatched Bit 17	Ambient temperature is too high. Duty cycle is too high. Motor not properly mounted (thermal isolation). Motor overload (power losses too high).	Check motor installation: The heat must be dissipated via the mounting surface. Reduce ambient temperature. Provide ventilation.
E 4301	0	Warning motor overtemperature Parameter _WarnLatched Bit 17	Resistance of thermal sensor is too high; overload, ambient temp (see I2t).	Check motor installation: The heat must be dissipated via the mounting surface.
E 4302	0	Motor overload (I2t) Parameter _WarnLatched Bit 31	The current has exceeded the nominal value for an extended period of time.	Verify that the system can easily be moved. Check the load. Use a differently sized motor, if necessary.
E 4303	0	No motor temperature monitoring	The temperature parameters (in electronic nameplate of motor, non-volatile memory of encoder) are unavailable or invalid; parameter A12 is equal to 0.	Contact Technical Support. Replace motor.
E 4304	0	The encoder type does not support motor temperature monitoring.		
E 4402	0	Warning: Braking resistor overload (I2t > 75%) Parameter _WarnLatched Bit 29	The braking resistor has been switched on for such a long period of time that 75% of its overload capability have been exceeded.	The regeneration energy is too high. Possible causes: The external loads are too high, the motor velocity is too high, the deceleration is too fast.
E 4403	par.	Braking resistor overload (I2t > 100%)	The braking resistor is switched on for an excessively long period of time.	The regeneration energy is too high. Possible causes: The external loads are too high, the motor velocity is too high, the deceleration is too fast.
E 5101	0	Modbus power supply missing		
E 5102	4	Motor encoder supply voltage Parameter _SigLatched Bit 16	Encoder power supply is not within permissible range of 8V to 12V; there may be a hardware problem.	Replace the device. Contact Technical Support.
E 5200	4	Error at connection to motor encoder Parameter _SigLatched Bit 16	Incorrect encoder cable or cable not connected, EMC.	Check the cable connection and the shield.
E 5201	4	Errors in motor encoder communication Parameter _SigLatched Bit 16	Encoder error message: Communication error detected by the encoder itself.	Check the cable connection and the shield.

Error number	Error class	Description	Cause	Correctives
E 5202	4	Motor encoder is not supported Parameter `_SigLatched` Bit 16	Incompatible encoder type is connected.	Use genuine accessories.
E 5203	4	Connection error motor encoder Parameter `_SigLatched` Bit 16		
E 5204	3	Connection to motor encoder lost Parameter `_SigLatched` Bit 16	Encoder cable problems (communication has been interrupted).	Check the cable connection.
E 5206	0	Communication error in encoder Parameter `_WarnLatched` Bit 16	Communication disturbed, EMC.	Check cable specifications, shield connection and EMC.
E 5207	1	Function is not supported	The current hardware revision does not support the function.	
E 5302	4	The motor requires a PWM frequency (16kHz) which the power stage does not support.	The connected motor only works with a PWM frequency of 16 kHz (motor nameplate entry). However, the power stage does not support this PWM frequency.	Use a motor that works with a PWM frequency of 8 kHz.
E 5430	4	System error: EEPROM read error Parameter `_SigLatched` Bit 29		
E 5431	3	System error: EEPROM write error Parameter `_SigLatched` Bit 29		
E 5432	3	System error: EEPROM state machine Parameter `_SigLatched` Bit 29		
E 5433	3	System error: EEPROM address error Parameter `_SigLatched` Bit 29		
E 5434	3	System error: EEPROM incorrect data length Parameter `_SigLatched` Bit 29		
E 5435	4	System error: EEPROM not formatted Parameter `_SigLatched` Bit 29		
E 5436	4	System error: EEPROM incompatible structure Parameter `_SigLatched` Bit 29		
E 5437	4	System error: EEPROM checksum error (manufacturer data) Parameter `_SigLatched` Bit 29		
E 5438	3	System error: EEPROM checksum error (user parameters) Parameter `_SigLatched` Bit 29		
E 5439	3	System error: EEPROM checksum error (fieldbus parameters) Parameter `_SigLatched` Bit 29		

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E 543B	4	System error: No valid manufacturer data Parameter _SigLatched Bit 29		
E 543E	3	System error: EEPROM checksum error (NoInit parameter) Parameter _SigLatched Bit 29		
E 543F	3	System error: EEPROM checksum error (motor parameters) Parameter _SigLatched Bit 29		
E 5441	4	System error: EEPROM checksum error (global controller parameter set) Parameter _SigLatched Bit 29		
E 5442	4	System error: EEPROM checksum error (controller parameter set 1) Parameter _SigLatched Bit 29		
E 5443	4	System error: EEPROM checksum error (controller parameter set 2) Parameter _SigLatched Bit 29		
E 5444	4	System error: EEPROM checksum error (NoReset parameter) Parameter _SigLatched Bit 29		
E 5445	4	System error: EEPROM checksum error (hardware information) Parameter _SigLatched Bit 29		
E 5446	4	System error: EEPROM checksum error (for power outage data) Parameter _SigLatched Bit 29	Problem with internal EEPROM detected.	Restart the drive. If the error persists, contact Technical Support.
E 5447	3	System error: EEPROM checksum error (data sets operating mode Motion Sequence) Parameter _SigLatched Bit 29		
E 5448	2	System error: Communication error to memory card Parameter _SigLatched Bit 20		
E 5449	2	System error: Memory card bus is busy Parameter _SigLatched Bit 20		
E 544A	4	System error: EEPROM checksum error (administration data) Parameter _SigLatched Bit 29		
E 544B	4	System error: EEPROM checksum error (DeviceNet data) Parameter _SigLatched Bit 29		

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E 544C	4	System error: EEPROM is write-protected Parameter `_SigLatched` Bit 29		
E 544D	2	System error: Memory card error Parameter `_SigLatched` Bit 20	An error may have occurred during the last saving procedure or the memory card may be inoperative.	Retry saving the data. Replace the memory card.
E 544E	2	System error: Memory card error Parameter `_SigLatched` Bit 20	An error may have occurred during the last saving procedure or the memory card may be inoperative.	Retry saving the data. Replace the memory card.
E 544F	2	System error: Memory card error Parameter `_SigLatched` Bit 20	An error may have occurred during the last saving procedure or the memory card may be inoperative.	Retry saving the data. Replace the memory card.
E 5451	0	System error: No memory card available Parameter `_WarnLatched` Bit 20		
E 5452	2	System error: Data on memory card and device do not match Parameter `_SigLatched` Bit 20	Different type of device. Different type of power stage. Data on memory card does not match firmware version of device.	
E 5453	2	System error: Incompatible data on the memory card Parameter `_SigLatched` Bit 20		
E 5454	2	System error: Capacity of detected memory card to small Parameter `_SigLatched` Bit 20		
E 5455	2	System error: Memory card not formatted Parameter `_SigLatched` Bit 20		Update memory card via HMI command "dtoc" (drive-to-card).
E 5456	1	System error: Memory card is write-protected Parameter `_SigLatched` Bit 20	The memory card has been write-protected.	Remove memory card or disable write protection via HMI.
E 5457	2	System error: Incompatible memory card Parameter `_SigLatched` Bit 20	Memory card capacity is insufficient.	Replace memory card
E 5462	0	Memory card implicitly written by the device Parameter `_WarnLatched` Bit 20	The content of the memory card and the content of the EEPROM are not equal.	
E 5600	3	Motor connection phase error Parameter `_SigLatched` Bit 26	Missing motor phase.	Check connection of motor phases.
E 5603	3	Commutation error Parameter `_SigLatched` Bit 26	Wiring error of motor cable. Encoder signals are lost or subject to interference. The load torque is greater than the motor torque. The encoder EEPROM contains incorrect data (encoder phase offset is incorrect). Motor is not adjusted.	Check motor phases, check encoder wiring. Check and improve EMC situation, check grounding and shield connection. Resize the motor so it can withstand the load torque. Check the motor data. Contact Technical Support.

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E 6102	4	System error: Internal software error Parameter `_SigLatched` Bit 30		
E 6103	4	System error: System stack overflow Parameter `_SigLatched` Bit 31		
E 6104	-	System error: Division by zero (internal)		
E 6105	-	System error: Overflow during 32 bit calculation (internal)		
E 6106	4	System error: Size of data interface does not match Parameter `_SigLatched` Bit 30		
E 6107	-	Parameter outside of value range (calculation error)		
E 6108	-	Function not available		
E 6109	-	System error: Internal range exceeded		
E 610A	2	System error: Calculated value cannot be represented as 32 bit value		
E 610D	-	Error in selection parameter	Wrong parameter value selected.	Check the value to be written.
E 610E	4	System error: 24 VDC below undervoltage threshold for shutdown		
E 610F	4	System error: Internal timer basis error (Timer0) Parameter `_SigLatched` Bit 30		
E 6111	2	System error: Memory area locked Parameter `_SigLatched` Bit 30		
E 6112	2	System error: Out of memory Parameter `_SigLatched` Bit 30		
E 6113	1	System error: Calculated value cannot be represented as a 16 bit value		
E 6114	4	System error: Impermissible function call from interrupt service routine	Programming error	
E 6115	4	System error: IGBT thermal connection test has been started	Manufacturing Test Firmware	
E 7100	4	System error: Invalid power stage data Parameter `_SigLatched` Bit 30	Power stage data stored in device is corrupt (wrong CRC), error in internal memory data.	Contact Technical Support or replace the device.
E 7110	2	System error: Error internal braking resistor	Internal braking resistor is inoperative or not connected.	Contact Technical Support.

Error number	Error class	Description	Cause	Correctives
E 7111	-	Parameter cannot be changed because the external braking resistor is active.	An attempt is made to change one of the parameters RESext_ton, RESext_P or RESext_R even though the external braking resistor is active.	Verify that the external braking resistor is not active if one of the parameters RESext_ton, RESext_P or RESext_R has to be changed.
E 7112	2	No external braking resistor connected	External braking resistor activated (Parameter RESint_ext), but no external resistor is detected.	Check wiring of the external braking resistor. Verify correct resistance.
E 7120	4	Invalid motor data Parameter `_SigLatched` Bit 16	Motor data is corrupt (wrong CRC).	Contact Technical Support or replace the motor.
E 7121	2	System error: Errors in motor encoder communication Parameter `_SigLatched` Bit 16	EMC, detailed information is included in the error memory that contains the error code of the encoder.	Contact Technical Support.
E 7122	4	Invalid motor data Parameter `_SigLatched` Bit 30	Motor data stored in motor encoder is corrupt, error in internal memory data.	Contact Technical Support or replace the motor.
E 7124	4	System error: Motor encoder inoperative Parameter `_SigLatched` Bit 16	Encoder signals internal error.	Contact Technical Support or replace the motor.
E 7125	4	System error: Length specification for user data too great Parameter `_SigLatched` Bit 16		
E 7129	0	System error: Error in motor encoder Parameter `_WarnLatched` Bit 16		
E 712C	0	System error: Communication with encoder not possible Parameter `_WarnLatched` Bit 16		
E 712D	4	Electronic motor nameplate not found Parameter `_SigLatched` Bit 16	Motor data is corrupt (wrong CRC). Motor without electronic motor nameplate (for example, SER motor)	Contact Technical Support or replace the motor.
E 712F	0	No data segment of the electronic motor nameplate		
E 7132	0	System error: Motor configuration cannot be written		
E 7134	4	Incomplete motor configuration Parameter `_SigLatched` Bit 16		
E 7135	4	Format is not supported Parameter `_SigLatched` Bit 16		
E 7136	4	Incorrect encoder type selected with parameter MotEnctype Parameter `_SigLatched` Bit 16		
E 7137	4	Error during the internal conversion of the motor configuration Parameter `_SigLatched` Bit 16		

Error number	Error class	Description	Cause	Correctives
E 7138	4	Parameter of the motor configuration out of permissible range Parameter _SigLatched Bit 16		
E 7139	0	Encoder offset: Data segment in encoder is corrupt.		
E 713A	3	Adjustment value of the encoder of the third party motor has not yet been determined. Parameter _SigLatched Bit 16		
E 7200	4	System error: Calibration analog/ digital converter during manufacturing / incorrect BLE file Parameter _SigLatched Bit 30		
E 7320	4	System error: Invalid encoder parameter Parameter _SigLatched Bit 16	Communication channel (Hiperface) to encoder is subject to interference, motor encoder has not been factory-parameterized.	Contact Technical Support.
E 7321	3	Timeout reading the absolute position from the encoder Parameter _SigLatched Bit 16	Communication channel (Hiperface) to encoder is subject to interference or motor encoder is inoperative.	Check wiring and shield connection of encoder cable or replace motor.
E 7327	0	Error bit set in Hiperface answer Parameter _WarnLatched Bit 16	EMC problems.	Check wiring (shield).
E 7328	4	Motor encoder: Position evaluation error Parameter _SigLatched Bit 16	Position evaluation problem detected by encoder.	Contact Technical Support or replace the motor.
E 7329	0	Motor encoder: Warning Parameter _WarnLatched Bit 16	EMC, encoder signals internal warning.	Contact Technical Support or replace the motor.
E 7330	4	System error: Motor encoder (Hiperface) Parameter _SigLatched Bit 16		Check wiring and shield connection of encoder cable. Contact Technical Support.
E 7331	4	System error: Motor encoder initialization Parameter _SigLatched Bit 30		Check wiring and shield connection of encoder cable. Contact Technical Support.
E 7335	0	Communication with motor encoder active Parameter _WarnLatched Bit 16	Command is being processed or communication may be disturbed by EMC problems.	Check shield connection of encoder cable. Contact Technical Support.
E 733F	3	Amplitude of encoder analog signals too low Parameter _SigLatched Bit 16	Incorrect encoder wiring. Encoder not connected. Encoder signals subject to EMC interference (shield connection, cabling, etc.).	
E 7340	3	Reading of absolute position aborted, number of unsuccessful consecutive attempts too great Parameter _SigLatched Bit 16	Communication channel (Hiperface) to encoder is subject to interference. Encoder (in motor) is inoperative.	Check wiring and shield connection of encoder cable, replace motor.

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E 7341	0	Encoder temperature warning level reached Parameter _WarnLatched Bit 16	The maximum permissible duty cycle is exceeded. The motor was not mounted properly, for example, it is thermally isolated. The motor is blocked or damaged so that more current is used than under normal conditions. The ambient temperature is too high.	Reduce the duty cycle, for example, reduce acceleration. Supply additional cooling, for example, use a fan. Mount the motor in such a way as to increase thermal conductivity. Use a differently rated drive or motor. Replace the motor if it is damaged.
E 7342	2	Encoder temperature limit reached Parameter _SigLatched Bit 16	The maximum permissible duty cycle is exceeded. The motor was not mounted properly, for example, it is thermally isolated. The motor is blocked or damaged so that more current is used than under normal conditions. The ambient temperature is too high.	Reduce the duty cycle, for example, reduce acceleration. Supply additional cooling, for example, use a fan. Mount the motor in such a way as to increase thermal conductivity. Use a differently rated drive or motor. Replace the motor if it is damaged.
E 7343	0	Warning: Absolute position is different from incremental position Parameter _WarnLatched Bit 16	- Encoder is subject to EMC interference. - Motor encoder is inoperative.	Check wiring and shield connection of encoder cable, replace motor.
E 7344	3	Absolute position is different from incremental position Parameter _SigLatched Bit 16	- Encoder is subject to EMC interference. - Motor encoder is inoperative.	Check wiring and shield connection of encoder cable, replace motor.
E 7345	0	Amplitude of analog signals too high, limit of AD conversion exceeded	Encoder signals subject to EMC interference (shield connection, cabling, etc.). Encoder inoperative.	Check cabling and shield connection. Replace encoder.
E 7346	4	System error: Encoder not ready Parameter _SigLatched Bit 16		Check wiring and shield connection of encoder cable. Contact Technical Support.
E 7347	0	System error: Position initialization not possible	Analog and digital encoder signals subject to massive interference.	Reduce encoder signal interference, check shield connection, etc. Contact Technical Support.
E 7348	3	Timeout reading encoder temperature Parameter _SigLatched Bit 16	Encoder without temperature sensor	Check wiring and shield connection of encoder cable. Contact Technical Support.
E 7349	0	Discrepancy between absolute and analog encoder phases	Analog encoder signals are subject to interference. Encoder inoperative.	Check wiring and shield connection of encoder cable. Replace motor. Contact Technical Support.
E 734A	3	Amplitude of analog signals from encoder too high, signals are clipped Parameter _SigLatched Bit 16	Incorrect encoder wiring. Encoder hardware interface inoperative.	
E 734B	0	Signal position evaluation of analog encoder inoperative Parameter _WarnLatched Bit 16	Incorrect encoder wiring. Encoder hardware interface inoperative.	

Error number	Error class	Description	Cause	Correctives
E 734C	3	Error with quasi absolute position Parameter `_SigLatched` Bit 16	The motor shaft may have been moved while the drive was shut down. A quasi absolute position has been detected that is not within the permissible motor shaft deviation range.	If the quasi absolute function is active, only shut down the drive if the motor is at a standstill and do not move the motor shaft when the drive is off.
E 734D	0	Index pulse is not available for the encoder Parameter `_WarnLatched` Bit 16		
E 7500	0	RS485/Modbus: Overrun error Parameter `_WarnLatched` Bit 5	EMC; cabling problem.	Check cables.
E 7501	0	RS485/Modbus: Framing error Parameter `_WarnLatched` Bit 5	EMC; cabling problem.	Check cables.
E 7502	0	RS485/Modbus: Parity error Parameter `_WarnLatched` Bit 5	EMC; cabling problem.	Check cables.
E 7503	0	RS485/Modbus: Receive error Parameter `_WarnLatched` Bit 5	EMC; cabling problem.	Check cables.
E 7623	0	Absolute encoder signal is not available Parameter `_WarnLatched` Bit 22	There is no encoder available at the input specified via the parameter ENC_abs_source.	Check wiring, check encoder. Change the value of the parameter ENC_abs_source.
E 7625	0	Not possible to set the absolute position for encoder 1. Parameter `_WarnLatched` Bit 22	There is no encoder connected to the input for encoder 1.	Connect an encoder to the input for encoder 1 before trying to set the absolute position directly via ENC1_abs_pos.
E 7701	4	System error: Timeout during connection to power stage Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 7702	4	System error: Invalid data received from power stage Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 7703	4	System error: Data exchange with power stage lost Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 7704	4	System error: Exchange of identification data from power stage not successful Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 7705	4	System error: Checksum identification data from power stage incorrect Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 7706	4	System error: No identification frame received from power stage Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 7707	4	System error: Type of power stage and manufacture data do not match		Contact Technical Support.

Error number	Error class	Description	Cause	Correctives
E 7708	4	PIC voltage supply too low Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 7709	4	System error: Invalid numbers of data received Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 770A	2	PIC received data with incorrect parity Parameter `_SigLatched` Bit 31		Contact Technical Support.
E 8110	0	CANopen: Overflow internal receive queue (message lost) Parameter `_WarnLatched` Bit 21	Two short CAN messages have been sent too fast (at 1MBits only).	
E 8120	0	CANopen: CAN Controller in Error Passive Parameter `_WarnLatched` Bit 21	Too many error frames have been detected.	Check CAN bus installation.
E 8130	2	CANopen: Heartbeat or Life Guard error Parameter `_SigLatched` Bit 21	The bus cycle time of the CANopen master is higher than the programmed heart-beat or node guard time.	Check the CANopen configu-ration, increase the heartbeat or node guard time.
E 8131	0	CANopen: Heartbeat or Life Guard error Parameter `_WarnLatched` Bit 21		
E 8140	0	CANopen: CAN controller was in 'bus-off', communication is possi-ble again Parameter `_WarnLatched` Bit 21		
E 8141	2	CANopen: CAN controller is in 'bus-off' Parameter `_SigLatched` Bit 21	Too many error frames have been detected, CAN devices with different baud rates.	Check CAN bus installation.
E 8142	0	CANopen: CAN controller is in 'bus-off' Parameter `_WarnLatched` Bit 21	Too many error frames have been detected, CAN devices with different baud rates.	Check CAN bus installation.
E 8281	0	CANopen: RxPDO1 could not be processed Parameter `_WarnLatched` Bit 21	Error while processing Receive PDO1: PDO1 con-tains invalid value.	Check RxPDO1 content (appli-cation).
E 8282	0	CANopen: RxPDO2 could not be processed Parameter `_WarnLatched` Bit 21	Error while processing Receive PDO2: PDO2 con-tains invalid value.	Check RxPDO2 content (appli-cation).
E 8283	0	CANopen: RxPDO3 could not be processed Parameter `_WarnLatched` Bit 21	Error while processing Receive PDO3: PDO3 con-tains invalid value.	Check RxPDO3 content (appli-cation).
E 8284	0	CANopen: RxPDO4 could not be processed Parameter `_WarnLatched` Bit 21	Error while processing Receive PDO4: PDO4 con-tains invalid value.	Check RxPDO4 content (appli-cation)
E 8291	0	CANopen: TxPdo could not be processed Parameter `_WarnLatched` Bit 21		

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E 8292	0	CANopen: TxPdo could not be processed Parameter _WarnLatched Bit 21		
E 8293	0	CANopen: TxPdo could not be processed Parameter _WarnLatched Bit 21		
E 8294	0	CANopen: TxPdo could not be processed Parameter _WarnLatched Bit 21		
E 82A0	0	CANopen: Initialization CANopen stack Parameter _WarnLatched Bit 21		
E 82A1	0	CANopen: Overflow internal transmit queue (message lost) Parameter _WarnLatched Bit 21		
E 82B1	0	CANopen: The data tunneling protocol is not Modbus RTU Parameter _WarnLatched Bit 21		
E 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.
E A065	0	Parameters cannot be written Parameter _WarnLatched Bit 4	A data set is still active.	Wait until the currently active data set is terminated.
E A300	-	Braking procedure after HALT request still active	HALT was removed too soon. New command was sent before motor standstill was reached after a HALT request.	Wait for complete stop before removing HALT signal. Wait until motor has come to a complete standstill.
E A301	-	Drive in operating state Quick Stop Active	Error with error class 1 occurred. Drive stopped with Quick Stop.	
E A302	1	Stop by positive limit switch Parameter _SigLatched Bit 1	The positive limit switch was activated because movement range was exceeded, misoperation of limit switch or signal disturbance.	Check application. Check limit switch function and connection.
E A303	1	Stop by negative limit switch Parameter _SigLatched Bit 1	The negative limit switch was activated because movement range was exceeded, misoperation of limit switch or signal disturbance.	Check application. Check limit switch function and connection.
E A304	1	Stop by reference switch Parameter _SigLatched Bit 1		
E A305	-	Power stage cannot be enabled in the current operating state	Fieldbus: An attempt was made to enable the power stage in the operating state Not Ready To Switch On.	Refer to the state diagram.

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E A306	1	Stop by user-initiated software stop Parameter _SigLatched Bit 3	Drive is in operating state Quick Stop Active due to a software stop request. The activation of a new operating mode is not possible, the error code is sent as the response to the activation command.	Clear break condition with command Fault Reset.
E A307	-	Interruption by internal software stop	In the operating mode Homing and Jog, the movement is internally interrupted by an internal software stop. The activation of a new operating mode is not possible, the error code is sent as the response to the activation command.	Clear break condition with command Fault Reset.
E A308	-	Drive is in operating state Fault or Fault Reaction Active	Error with error class 2 or higher occurred.	Check error code (HMI or commissioning software), remove error condition and clear error with command Fault Reset.
E A309	-	Drive not in operating state Operation Enabled	A command was sent that requires the drive to be in the operating state Operation Enabled was sent (for example, a command to change the operating mode).	Set drive to operating state Operation Enabled and repeat the command.
E A310	-	Power stage not enabled	Command cannot be used because the power stage is not enabled (operating state Operation Enabled or Quick Stop Active).	Set drive to an operating state in which the power stage is enabled, refer to the state diagram.
E A311	-	Operating mode change active	A start request for an operating mode has been received while a change of the operating mode was active.	Wait until the operating mode change has terminated before triggering a start request for another operating mode.
E A312	-	Profile generation interrupted		
E A313	-	Position overtraveled, reference point is therefore no longer defined (ref_ok=0)	The movement range limits were exceeded which resulted in a loss of the reference point. An absolute movement cannot be made before a new reference point is defined.	Define a new reference point by means of the operating mode Homing.
E A314	-	No reference point	Command needs a defined reference point (ref_ok=1).	Define a new reference point by means of the operating mode Homing.
E A315	-	Homing active	Command cannot be used while the operating mode Homing is active.	Wait until reference movement is finished.
E A316	-	Overflow during calculation of acceleration		

Error number	Error class	Description	Cause	Correctives
E A317	-	Motor is not at a standstill	Command sent which is not permissible when the motor is not at a standstill. For example: - Change of software limit switches - Change of handling of monitoring signals - Setting of reference point - Teach in of data set	Wait until the motor has come to a standstill (x_end = 1).
E A318	-	Operating mode active (x_end=0)	Activation of a new operating mode is not possible while the current operating mode is still active.	Wait until the command in the operating mode has finished (x_end=1) or terminate current operating mode with HALT command.
E A319	1	Manual tuning/Autotuning: Movement out of permissible range Parameter `_SigLatched` Bit 2	The movement exceeds the parameterized maximum permissible movement range.	Check permissible movement range value and time interval.
E A31A	-	Manual tuning/Autotuning: Amplitude/offset too high	Amplitude plus offset for tuning exceed internal velocity or current limitation.	Choose lower amplitude and offset values.
E A31B	-	Halt requested	Command not permissible while Halt is requested.	Clear Halt request and repeat command.
E A31C	-	Invalid position setting with software limit switch	Value for negative (positive) software limit switch is greater (less) than value for positive (negative) software limit switch.	Set correct position values.
E A31D	-	Velocity range exceeded (parameter CTRL_v_max, M_n_max)	The velocity was set to a value greater than the maximum permissible velocity in parameter CTRL_v_max or M_n_max, whichever is lower.	If the value of parameter M_n_max is greater than the value of parameter CTRL_v_max, increase the value of parameter CTRL_v_max or reduce the velocity value.
E A31E	1	Stop by positive software limit switch Parameter `_SigLatched` Bit 2	Not possible to execute command because positive software limit switch was overtraveled.	Return to the permissible range.
E A31F	1	Stop by negative software limit switch Parameter `_SigLatched` Bit 2	Not possible to execute command because negative software limit switch was overtraveled.	Return to the permissible range.
E A320	par.	Following error Parameter `_SigLatched` Bit 8	External load or acceleration are too high.	Reduce external load or acceleration. Use a differently rated drive, if necessary. Error response can be adjusted via parameter ErrorResp_p_dif.
E A321	-	Invalid setting for RS422 position interface		
E A322	-	Error in ramp calculation		
E A323	3	System error: Processing error during generation of profile (see additional info for details)		

Error number	Error class	Description	Cause	Correctives
E A324	1	Error during homing (additional info = detailed error number) Parameter _SigLatched Bit 4	Homing movement was stopped by an error, the detailed reason is indicated by the additional info in the error buffer.	Possible sub error codes: E A325, E A326, E A327, E A328 or E A329.
E A325	1	Limit switch to be approached not enabled Parameter _SigLatched Bit 4	Homing to positive limit switch or negative limit switch is disabled.	Enable limit switch via 'IOsigLimP' or 'IOsigLimN'.
E A326	1	Reference switch not found between positive limit switch and negative limit switch Parameter _SigLatched Bit 4	Reference switch inoperative or not correctly connected.	Check the function and wiring of the reference switch.
E A329	1	More than one signal positive limit switch/negative limit switch/reference switch signal active Parameter _SigLatched Bit 4	Reference switch or limit switch not connected correctly or supply voltage for switches too low.	Check the wiring and 24VDC supply voltage.
E A32A	1	Positive limit switch triggered with negative direction of movement Parameter _SigLatched Bit 4	Start reference movement with negative direction (for example reference movement to negative limit switch) and activate the positive limit switch (switch in opposite direction of movement).	Check correct connection and function of limit switch. Activate a jog movement with negative movement (target limit switch must be connected to the negative limit switch).
E A32B	1	Negative limit switch triggered with positive direction of movement Parameter _SigLatched Bit 4	Start reference movement with positive direction (for example reference movement to positive limit switch) and activate the negative limit switch (switch in opposite direction of movement).	Check correct connection and function of limit switch. Activate a jog movement with positive movement (target limit switch must be connected to the positive limit switch).
E A32C	1	Reference switch error (switch signal briefly enabled or switch overtraveled) Parameter _SigLatched Bit 4	Switch signal disturbance. Motor subjected to vibration or shock when stopped after activation of the switch signal.	Check supply voltage, cabling and function of switch. Check motor reaction after stopping and optimize controller settings.
E A32D	1	Positive limit switch error (switch signal briefly enabled or switch overtraveled) Parameter _SigLatched Bit 4	Switch signal disturbance. Motor subjected to vibration or shock when stopped after activation of the switch signal.	Check supply voltage, cabling and function of switch. Check motor reaction after stopping and optimize controller settings.
E A32E	1	Negative limit switch error (switch signal briefly enabled or switch overtraveled) Parameter _SigLatched Bit 4	Switch signal disturbance. Motor subjected to vibration or shock when stopped after activation of the switch signal.	Check supply voltage, cabling and function of switch. Check motor reaction after stopping and optimize controller settings.
E A32F	1	Index pulse not found Parameter _SigLatched Bit 4	Index pulse signal not connected or not working properly.	Check index pulse signal and connection.
E A330	0	Reference movement to index pulse cannot be reproduced. Index pulse is too close to the switch Parameter _WarnLatched Bit 4	The position difference between the index pulse and the switching point is insufficient.	Increase the distance between the index pulse and the switching point. If possible, the distance between the index pulse and the switching point should be a half motor revolution.

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E A332	1	Jog error (additional info = detailed error number) Parameter _SigLatched Bit 4	Jog movement was stopped by error.	For additional info, check the detailed error number in the error buffer.
E A333	3	System error: Invalid internal selection		
E A334	2	Timeout Standstill Window monitoring	Position deviation after movement greater than standstill window. This may have been caused by an external load.	Check load. Check settings for standstill window (parameter MON_p_win, MON_p_winTime and MON_p_winTout). Optimize controller settings.
E A336	1	System error: Jerk limitation with position offset after end of movement (additional info = offset in Inc.)		
E A337	0	Operating mode cannot be continued Parameter _WarnLatched Bit 4	Continuation of interrupted movement in operating mode Profile Position is not possible because another operating mode had been active in the meantime. In the operating mode Motion Sequence, continuation is not possible if a motion blend was interrupted.	Restart the operating mode.
E A338	0	Operating mode unavailable Parameter _WarnLatched Bit 4	The selected operating mode is not available.	
E A339	0	No processing of motor encoder selected or position capture of motor index pulse active Parameter _WarnLatched Bit 4		
E A33A	0	Reference point is not defined (ref_ok=0) Parameter _WarnLatched Bit 4	No reference point defined by means of operating mode Homing. Reference position lost because the movement range has been left. Motor does not have an absolute encoder.	Use operating mode Homing to define a reference point. Use a motor with an absolute encoder.
E A33C	0	Function not available in current operating mode Parameter _WarnLatched Bit 4	Activation of a function which is not available in the current operating mode. Example: Start of backlash compensation while autotuning/manual tuning is active.	
E A33D	0	Motion blend is already active Parameter _WarnLatched Bit 4	Change of motion blend during the current motion blend (end position of motion blend not yet reached)	Wait for the motion blend to complete before setting the next position.
E A33E	0	No movement activated Parameter _WarnLatched Bit 4	Activation of a motion blend without movement.	Start a movement before the motion blend is activated.
E A33F	0	Position of motion blend movement not in the range of the active movement Parameter _WarnLatched Bit 4	The position of the motion blend is outside of the current movement range.	Check the position of the motion blend and the current movement range.

Error number	Error class	Description	Cause	Correctives
E A341	0	Position of motion blend has already been passed Parameter `_WarnLatched` Bit 4	The current movement has passed beyond the position of the motion blend.	
E A342	1	Target velocity was not reached at motion blend position. Parameter `_SigLatched` Bit 4	The position of the motion blend was overtraveled, the target velocity was not reached.	Reduce the ramp velocity so that the target velocity is reached at the position of the motion blend.
E A343	0	Processing only possible with linear ramp Parameter `_WarnLatched` Bit 4	Motion blend position was set with a non-linear ramp.	Set a linear ramp type.
E A347	0	Threshold for position deviation warning reached Parameter `_WarnLatched` Bit 8	External load or acceleration are too high.	Reduce external load or acceleration. Threshold can be adjusted via the parameter MON_p_dif_warn.
E A349	-	Position setting exceeds system limits	Position scaling of POSscaleDenom and POSscaleNum results in a scaling factor that is too small.	Change POSscaleDenom and POSscaleNum in such a way as to increase the resulting scaling factor.
E A34A	-	Velocity setting exceeds system limits	The velocity scaling of 'VELscaleDenom' and 'VELscaleNum' results in a scaling factor that is too small. The velocity has been set to a value greater than the maximum possible velocity (the maximum velocity is 13200 rpm).	Change 'VELscaleDenom' and 'VELscaleNum' in such a way as to increase the resulting scaling factor.
E A34B	-	Ramp setting exceeds system limits	The ramp scaling of 'RAMPscaleDenom' and 'RAMPscaleNum' results in a scaling factor that is too small.	Change of 'RAMPscaleDenom' and 'RAMPscaleNum' in such a way as to increase the resulting scaling factor.
E A34C	-	Resolution of scaling too high (range exceeded)		
E A34D	-	The function is not possible when Modulo is active.	The function cannot be executed when Modulo is active.	Deactivate Modulo to use the function.
E A34E	-	Target value for absolute movement not possible with defined modulo range and modulo handling.	If parameter 'MOD_Absolute' is set to: Shortest Distance: Target value is not in defined modulo range. Positive Direction: Target value is less than parameter 'MOD_Min'. Negative Direction: Target value is greater than parameter 'MOD_Max'.	Set a correct target value for absolute movement.
E A34F	-	Target position outside of modulo range. Corresponding movement within range performed instead.	The current setting of parameter 'MOD_AbsMultiRng' only allows for a movement within the modulo range.	Change the parameter 'MOD_AbsMultiRng' to allow for movements beyond the modulo range.

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E A351	1	Function cannot be executed with the current position scaling factor Parameter `_SigLatched` Bit 4	The positions scaling factor is set to a value less than 1rev/ 131072usr_p, which is less than the internal resolution. In the operating mode Cyclic Synchronous Position, the resolution is not set to 1rev/ 131072usr_p.	Use a different position scaling factor or deactivate the selected function.
E A352	-	Position list active		
E A353	-	Position list not sorted		
E A354	-	Position list does not match the configuration of the Modulo range		
E A355	1	Error during relative movement after capture (additional info = detailed error number) Parameter `_SigLatched` Bit 4	Movement was stopped by error.	Check the error memory or the parameter _LastError_Qual for additional information.
E A356	0	Function Relative Movement After Capture not assigned to a digital input.		Assign the function Relative Movement After Capture to a digital input.
E A357	-	Braking procedure still active	Command is not permissible when a braking procedure is active.	Wait until motor has come to a complete standstill.
E A358	1	Target position overtraveled with function Relative Movement After Capture Parameter `_SigLatched` Bit 4	Stopping distance too small or velocity too high at the point in time of the capture event.	Reduce the velocity.
E A359	0	Request cannot be processed since the relative movement after capture is still active		
E A35B	0	Modulo cannot be activated Parameter `_WarnLatched` Bit 4	The set operating mode does not support Modulo.	
E B100	0	RS485/Modbus: Unknown service Parameter `_WarnLatched` Bit 5	Unsupported Modbus service was received.	Check application on the Modbus master.
E B120	2	Cyclic communication: Incorrect cycle time Parameter `_SigLatched` Bit 21	The drive does not support the configured cycle time or the difference between the measured cycle time and the configured cycle time is too great.	Change the cycle time in the master controller to a cycle time supported by the drive or check synchronization requirements.
E B121	2	Cyclic communication: Synchronization signal missing Parameter `_SigLatched` Bit 21	Two cycles have passed without a synchronization signal having been received.	Analyze the communication.
E B122	2	Cyclic communication: Incorrect synchronization Parameter `_SigLatched` Bit 21	One signal was missing and expected second signal was received at an incorrect point in time. The master controller may be unable to provide the required synchronization signals at the current cycle time, for example, due to insufficient computing power.	Analyze the communication or increase the cycle time.

0198441113755, V1.08, 04.2014

Error number	Error class	Description	Cause	Correctives
E B123	2	Cyclic communication: The selected cycle time tolerance is too high. Parameter `_SigLatched` Bit 21	The cycle time tolerance may not exceed one quarter of the set cycle time.	Enter a correct value.
E B124	0	Cyclic Communication: Drive is not synchronous with master cycle. Parameter `_WarnLatched` Bit 21	Operating mode has been activated but drive is not synchronized to external synchronization signal.	After having started the synchronization mechanism, wait for 120 cycles before activating the operating mode.
E B200	0	RS485/Modbus: Protocol error Parameter `_WarnLatched` Bit 5	Logical protocol error: Wrong length or unsupported subfunction.	Check application on the Modbus master.
E B201	2	RS485/Modbus: Connection monitoring error Parameter `_SigLatched` Bit 5	Connection monitoring has detected an interruption of the connection.	Check all connections and cables used for data exchange. Verify that the device is on.
E B202	0	RS485/Modbus: Connection monitoring warning Parameter `_WarnLatched` Bit 5	Connection monitoring has detected an interruption of the connection.	Check all connections and cables used for data exchange. Verify that the device is on.
E B203	0	RS485/Modbus: Incorrect number of monitor objects Parameter `_WarnLatched` Bit 5		
E 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.
E 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.
E B402	0	CAN PLL active Parameter `_WarnLatched` Bit 21	An attempt has been made to start the synchronization mechanism even though the synchronization mechanism was already active.	Deactivate the synchronization mechanism.
E B403	2	Excessive Sync period deviation from ideal value Parameter `_SigLatched` Bit 21	The period time of the SYNC signals is not stable. The deviation is more than 100usec.	The SYNC signals of the motion controller must be more accurate.
E B404	2	Sync signal error Parameter `_SigLatched` Bit 21	SYNC signal missed more than twice.	Check CAN connection, check motion controller.
E 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 considered.	Check the timing requirements regarding interpolation time period and number of devices.
E 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: 250kB, 500kB, 1000kB.
E B407	0	Drive is not synchronous with master cycle Parameter `_WarnLatched` Bit 21	The 'Cyclic Synchronous Mode' cannot be activated as long as the drive is not synchronized.	Check motion controller. To be synchronized, the motion controller must cyclically send SYNC signals.
E B700	0	Drive Profile Lexium: On activation of the profile, no dmControl, refA or refB has been mapped.	dmControl, refA or refB have not been mapped.	dmControl, refA or refB must be mapped.

Error number	Error class	Description	Cause	Correctives
E B702	1	Insufficient velocity resolution due to velocity scaling	Due to the configured velocity scaling, the velocity resolution in REFA16 is insufficient.	Change the velocity scaling.

0198441113755, V1.08, 04.2014

10 Parameters

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

In addition, special parameters for communication via the fieldbus are described in the corresponding fieldbus manual.

⚠ WARNING

UNINTENDED BEHAVIOR CAUSED BY PARAMETERS

Unsuitable parameter values may trigger unintended movements or signals, damage parts and disable monitoring functions.

- Never change a parameter unless you understand its meaning.
- Only start the system if there are no persons or obstructions in the hazardous area.
- When commissioning, carefully run tests for all operating states and potential error situations.

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

0198441113755, V1.08, 04.2014

10.1 Representation of the parameters

The way parameters are shown provides information required for unique identification, the default values and the properties of a parameter.

Structure of the parameter representation:

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ABCDE ConF → inF- Prn	Short description (cross reference) Selection values **1 / Abc1 / AbC1** : Explanation 1 **2 / Abc2 / AbC2** : Explanation 2 Description and details	A_{pk} 0.00 3.00 300.00	UINT32 R/W per. -	Fieldbus 1234:5h

Parameter name The parameter name uniquely identifies a parameter.

HMI menu HMI menu shows the sequence of menus and commands to access the parameter via the HMI.

Description

Short description (cross reference)
The short description contains information on the parameter and a cross reference to the page that describes the use of the parameter.

Selection values:
In the case of parameters which offer a selection of settings, the value to be entered via the fieldbus and the designation of the value for entry via the commissioning software and the HMI are specified.
1 = Value for input via fieldbus
Abc1 = Designation for entry via the commissioning software
AbC1 = Designation for entry via the HMI

Further description and details
Provides further information on the parameter.

Unit The unit of the value.

Minimum value The minimum value which can be entered.

Factory setting Factory settings when the product is shipped

Maximum value The maximum value which can be entered.

Data type If the minimum and the maximum values are not explicitly indicated, the valid range of values is determined by the data type.

Data type	Byte	Minumum value	Maximum value
INT8	1 Byte / 8 Bit	-128	127
UINT8	1 Byte / 8 Bit	0	255
INT16	2 Byte / 16 Bit	-32768	32767
UINT16	2 Byte / 16 Bit	0	65535
INT32	4 Byte / 32 Bit	-2147483648	2147483647
UINT32	4 Byte / 32 Bit	0	4294967295

R/W Indicates read and/or write values

0198441113755, V1.08, 04.2014

"R/" values can only be read
"R/W" values can be read and written.

Persistent

"per." indicates whether the value of the parameter is persistent, i.e. whether it remains in the memory after the device is switched off .

When a value is entered via the HMI, the device stores the value of the parameter automatically each time it is changed.

When changing a value via commissioning software or fieldbus, the user must explicitly store the changed value in the persistent memory.

10.1.1 Decimal numbers for fieldbus

Entering values

Please note that parameter values are entered via the fieldbus without a decimal point. All decimal places must be entered.

Input examples:

Value	Commissioning software	Fieldbus
20	20	20
5.0	5.0	50
23.57	23.57	2357
1.000	1.000	1000

0198441113755, V1.08, 04.2014

10.2 List of parameters

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_AccessInfo`	Current access channel Low byte: Value 0: Used by channel in high byte Value 1: Exclusively used by channel in high byte High byte: Current assignment of access channel Value 0: Reserved Value 1: I/O Value 2: HMI Value 3: Modbus RS485 Value 4: Fieldbus main channel Values 5 ... 12: Modbus TCP, CANopen second SDO or Profibus master class 2 Values 13 ... 28: Ethenet/IP explicit channels	- - - -	UINT16 UINT16 R/- - -	CANopen 3001:C$_h$ Modbus 280
`_actionStatus`	Action word Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: Warning (error class 0) Bit 1: Error class 1 Bit 2: Error class 2 Bit 3: Error class 3 Bit 4: Error class 4 Bit 5: Reserved Bit 6: Motor is at a standstill (_n_act < 9) Bit 7: Motor movement in positive direction Bit 8: Motor movement in negative direction Bit 9: Assignment can be set via parameter DPL_intLim Bit 10: Assignment can be set via parameter DS402intLim Bit 11: Profile generator idle (reference velocity is 0) Bit 12: Profile generator decelerates Bit 13: Profile generator accelerates Bit 14: Profile generator moves at constant speed Bit 15: Reserved	- - - -	UINT16 UINT16 R/- - -	CANopen 301C:4$_h$ Modbus 7176
`_AT_J`	Moment of inertia of the entire system (168) Is automatically calculated during Autotuning. In increments of 0.1 kg cm^2.	kg cm^2 0.1 0.1 6553.5	UINT16 UINT16 R/- per. -	CANopen 302F:C$_h$ Modbus 12056
`_AT_M_friction`	Friction torque of the system (168) Is determined during Autotuning. In increments of 0.01 A$_{rms}$.	A$_{rms}$ - - -	UINT16 UINT16 R/- - -	CANopen 302F:7$_h$ Modbus 12046

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_AT_M_load`	Constant load torque (168) Is determined during Autotuning. In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 INT16 R/- - -	CANopen 302F:8h Modbus 12048
`_AT_progress`	Progress of Autotuning (167)	% 0 0 100	UINT16 UINT16 R/- - -	CANopen 302F:Bh Modbus 12054
`_AT_state`	Autotuning status (167) Bit assignments: Bits 0 ... 10: Last processing step Bit 13: auto_tune_process Bit 14: auto_tune_end Bit 15: auto_tune_err	- - - -	UINT16 UINT16 R/- - -	CANopen 302F:2h Modbus 12036
`_CanDiag`	CANopen diagnosis 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 wrong state received 0080h: CAN warning level set 0100h: CAN message lost 0200h: CAN busoff 0400h: software queue rx/tx overrun 0800h: error indication from last error	- - - -	UINT16 UINT16 R/- - -	CANopen 3041:6h Modbus 16652
`_Cap1CntFall`	Capture input 1 event counter at falling edges (300) Counts the capture events at falling edges. The event counter is reset when capture input 1 is activated.	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:2Ch Modbus 2648
`_Cap1CntRise`	Capture input 1 event counter at rising edges (300) Counts the capture events at rising edges. The event counter is reset when capture input 1 is activated.	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:2Bh Modbus 2646
`_Cap1Count`	Capture input 1 event counter Counts the capture events. The event counter is reset when capture input 1 is activated.	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:8h Modbus 2576

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_Cap1CountCons`	Capture input 1 event counter (consistent) (297) 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 UINT16 R/- - -	CANopen 300A:17h Modbus 2606
`_Cap1Pos`	Capture input 1 captured position Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement".	usr_p - - -	INT32 INT32 R/- - -	CANopen 300A:6h Modbus 2572
`_Cap1PosCons`	Capture input 1 captured position (consistent) (297) 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 INT32 R/- - -	CANopen 300A:18h Modbus 2608
`_Cap1PosFallEdge`	Capture input 1 captured position at falling edge (300) 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".	usr_p - - -	INT32 INT32 R/- - -	CANopen 60BB:0h Modbus 2636
`_Cap1PosRisEdge`	Capture input 1 captured position at rising edge (300) 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".	usr_p - - -	INT32 INT32 R/- - -	CANopen 60BA:0h Modbus 2634
`_Cap2CntFall`	Capture input 2 event counter at falling edges (300) Counts the capture events at falling edges. The event counter is reset when capture input 2 is activated.	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:2Eh Modbus 2652
`_Cap2CntRise`	Capture input 2 event counter at rising edges (300) Counts the capture events at rising edges. The event counter is reset when capture input 2 is activated.	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:2Dh Modbus 2650

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_Cap2Count	Capture input 2 event counter Counts the capture events. The event counter is reset when capture input 2 is activated. Available with hardware version ≥RS03.	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:9h Modbus 2578
_Cap2CountCons	Capture input 2 event counter (consistent) (297) 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 UINT16 R/- - -	CANopen 300A:19h Modbus 2610
_Cap2Pos	Capture input 2 captured position Captured position at the time of the "capture signal". The captured position is re-calculated after "Position Setting" or "Reference Movement". Available with hardware version ≥RS03.	usr_p - - -	INT32 INT32 R/- - -	CANopen 300A:7h Modbus 2574
_Cap2PosCons	Capture input 2 captured position (consistent) (297) 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 INT32 R/- - -	CANopen 300A:1Ah Modbus 2612
_Cap2PosFallEdge	Capture input 2 captured position at falling edge (300) 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".	usr_p - - -	INT32 INT32 R/- - -	CANopen 60BD:0h Modbus 2640
_Cap2PosRisEdge	Capture input 2 captured position at rising edge (300) 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".	usr_p - - -	INT32 INT32 R/- - -	CANopen 60BC:0h Modbus 2638

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_CapEventCounters`	Capture inputs 1 and 2 summary of event counters (301) 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)	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:2Fh Modbus 2654
`_CapStatus`	Status of the capture inputs (296) Read access: Bit 0: Position captured via input CAP1 Bit 1: Position captured via input CAP2	- - - -	UINT16 UINT16 R/- - -	CANopen 300A:1h Modbus 2562
`_Cond_State4`	Conditions for transition to operating state Ready To Switch On Signal state: 0: Condition not met 1: Condition met Bit 0: DC bus or mains voltage Bit 1: Inputs for safety function Bit 2: No configuration download ongoing Bit 3: Velocity greater than limit value Bit 4: Absolut position has been set Bit 5: Holding brake not manually released	- - - -	UINT16 UINT16 R/- - -	CANopen 301C:26h Modbus 7244
`_CTRL_ActParSet`	Active controller parameter set (142) Value 1: Controller parameter set 1 is active Value 2: Controller parameter set 2 is active A controller parameter set is active after the time for the parameter switching (CTRL_ParChgTime) has elapsed.	- - - -	UINT16 UINT16 R/- - -	CANopen 3011:17h 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. Changed settings become active immediately.	V/A 0.5 - 1270.0	UINT16 UINT16 R/- per. -	CANopen 3011:1h 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. Changed settings become active immediately.	V/A 0.5 - 1270.0	UINT16 UINT16 R/- per. -	CANopen 3011:3h 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. Changed settings become active immediately.	ms 0.13 - 327.67	UINT16 UINT16 R/- per. -	CANopen 3011:2h Modbus 4356

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_CTRL_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. Changed settings become active immediately.	ms 0.13 - 327.67	UINT16 UINT16 R/- per. -	CANopen 3011:4$_h$ Modbus 4360
`_DataError`	Error code for 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 caused by the changing of an data value within the process data. The DataError bit relates to MT-independent parameters.	- - - -	UINT16 UINT16 R/- - -	CANopen 301B:1B$_h$ Modbus 6966
`_DataErrorInfo`	Additional error information of a 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 current mapping cause an error in connection with a write command. Example: 1 = First mapped parameter 2 = Second mapped parameter etc.	- - - -	UINT16 UINT16 R/- - -	CANopen 301B:1D$_h$ Modbus 6970
`_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	- -6 - 10	INT8 INT16 R/- - -	CANopen 6061:0$_h$ Modbus 6920

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_DCOMstatus	DriveCom status word (282) Bit assignments: Bit 0: Ready To Switch On Bit 1: Switched On Bit 2: Operation Enabled Bit 3: Fault Bit 4: Voltage Enabled Bit 5: Quick Stop Bit 6: Switch On Disabled Bit 7: Warning 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 UINT16 R/- - -	CANopen 6041:0h Modbus 6916
_DEV_T_current Mon tdEV	Current device temperature	°C - - -	INT16 INT16 R/- - -	CANopen 301C:12h Modbus 7204
_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 consider 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. Changed settings become active immediately.	- 0 0 12	UINT16 UINT16 R/- - -	CANopen 301B:5h Modbus 6922
_DPL_driveInput	Drive Profile Lexium driveInput	- - - -	UINT16 UINT16 R/- - -	CANopen 301B:28h Modbus 6992
_DPL_driveStat	Drive Profile Lexium driveStat	- - - -	UINT16 UINT16 R/- - -	CANopen 301B:25h Modbus 6986
_DPL_mfStat	Drive Profile Lexium mfStat	- - - -	UINT16 UINT16 R/- - -	CANopen 301B:26h Modbus 6988
_DPL_motionStat	Drive Profile Lexium motionStat	- - - -	UINT16 UINT16 R/- - -	CANopen 301B:27h Modbus 6990

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_ERR_class`	Error class (352) Value 0: Warning (no response) Value 1: Error class 1 Value 2: Error class 2 Value 3: Error class 3 Value 4: Error class 4	- 0 - 4	UINT16 UINT16 R/- - -	CANopen 303C:2h Modbus 15364
`_ERR_DCbus`	DC bus voltage at error time (352) In increments of 0.1 V.	V - - -	UINT16 UINT16 R/- - -	CANopen 303C:7h Modbus 15374
`_ERR_enable_cycl`	Number of cycles of enabling the power stage at error time (353) Number of cycles of enabling the power stage from the time the power supply (control voltage) was switched on to the time the error occurred.	- - - -	UINT16 UINT16 R/- - -	CANopen 303C:5h Modbus 15370
`_ERR_enable_time`	Time between enabling of power stage and occurrence of the error (353)	s - - -	UINT16 UINT16 R/- - -	CANopen 303C:6h Modbus 15372
`_ERR_motor_I`	Motor current at error time (352) In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 UINT16 R/- - -	CANopen 303C:9h Modbus 15378
`_ERR_motor_v`	Motor velocity at error time (352)	usr_v - - -	INT32 INT32 R/- - -	CANopen 303C:8h Modbus 15376
`_ERR_number`	Error number (352) Reading this parameter copies the entire error entry (error class, time of occurrence of error, ...) to an intermediate memory from which the elements of the error can then be read. In addition, the read pointer of the error memory is automatically set to the next error entry.	- 0 - 65535	UINT16 UINT16 R/- - -	CANopen 303C:1h Modbus 15362
`_ERR_powerOn` MON POWO	Number of power on cycles (352)	- 0 - 4294967295	UINT32 UINT32 R/- - -	CANopen 303B:2h Modbus 15108
`_ERR_qual`	Error additional information (352) This entry contains additional information on the error, depending on the error number. Example: a parameter address	- 0 - 65535	UINT16 UINT16 R/- - -	CANopen 303C:4h Modbus 15368

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_ERR_temp_dev`	Temperature of device at error time (352)	°C - - -	INT16 INT16 R/- - -	CANopen 303C:B_h Modbus 15382
`_ERR_temp_ps`	Temperature of power stage at error time (352)	°C - - -	INT16 INT16 R/- - -	CANopen 303C:A_h Modbus 15380
`_ERR_time`	Error time (352) With reference to operating hours counter	s 0 - 536870911	UINT32 UINT32 R/- - -	CANopen 303C:3_h Modbus 15366
`_ErrNumFbParSvc`	Last error number of fieldbus parameter services Some fieldbus types only provide general error codes if a request for a parameter service is not successful. This parameter returns the vendor-specific error number of the last unsuccessful service. CANopen: SDO service EtherCAT: CoE SDO service EtherNet/IP: CIP explicit message service DeviceNet: CIP explicit message service Modbus TCP: FC3, FC16	- - - -	UINT16 UINT16 R/- - -	CANopen 3040:43_h Modbus 16518
`_HMdisREFtoIDX_usr`	Distance from switching point to index pulse (229) It allows to check the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. Available with firmware version ≥V01.05.	usr_p -2147483648 - 2147483647	INT32 INT32 R/- - -	CANopen 3028:F_h Modbus 10270
`_HMdisREFtoIDX`	Distance from switching point to index pulse (229) It allows to check the distance between the index pulse and the switching point and serves as a criterion for determining whether the reference movement with index pulse can be reproduced. The parameter _HMdisREFtoIDX_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution.	revolution - - -	INT32 INT32 R/- - -	CANopen 3028:C_h Modbus 10264
`_I_act` MOn iAct	Total motor current In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 INT16 R/- - -	CANopen 301E:3_h Modbus 7686

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_Id_act_rms	Actual motor current (d component, field weakening) In increments of 0.01 A_{rms}.	A_{rms} - - -	INT16 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 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 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 considered in this parameter. In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 UINT16 R/- - -	CANopen 301C:27$_h$ Modbus 7246
_InvalidParam	Modbus address of parameter with invalid value In case of a configuration error, the Modbus address of the parameter with an invalid value is indicated here.	- - 0 -	UINT16 UINT16 R/- - -	CANopen 301C:6$_h$ Modbus 7180
_IO_act	Physical status of the digital inputs and outputs (147) Low byte: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3 High byte: Bit 8: DQ0 Bit 9: DQ1	- - - -	UINT16 UINT16 R/- - -	CANopen 3008:1$_h$ Modbus 2050
_IO_DI_act Mon diMo	Status of digital inputs (147) Bit assignments: Bit 0: DI0 Bit 1: DI1 Bit 2: DI2 Bit 3: DI3	- - - -	UINT16 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 field-bus
_IO_DQ_act Mon doMo	Status of digital outputs (147) Bit assignments: Bit 0: DQ0 Bit 1: DQ1	- - - -	UINT16 UINT16 R/- - -	CANopen 3008:10$_h$ Modbus 2080
_IO_STO_act Mon Sto	Status of the inputs for the safety function STO (147) Coding of the individual signals: Bit 0: STO_A Bit 1: STO_B	- - - -	UINT16 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 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 INT16 R/- - -	CANopen 301E:10$_h$ Modbus 7712
_LastError_Qual	Additional info of last error This parameter contains additional information on the last error, depending on the error number. For example: a parameter address.	- - 0 -	UINT16 UINT16 R/- - -	CANopen 301C:1F$_h$ Modbus 7230
_LastError Mon LFLt	Error causing a stop (error classes 1 to 4) (348) Number of the current error. Any consequtive errors do not overwrite this error number. Example: If a limit switch error reaction caused an overvoltage error, this parameter would contain the number of the limit switch error. Exception: Errors of error class 4 overwrite existing entries.	- - - -	UINT16 UINT16 R/- - -	CANopen 603F:0$_h$ Modbus 7178
_LastWarning Mon LWrn	Number of last warning (error class 0) (348) Number of the most recent warning. If the warning becomes inactive again, the number is memorized until the next fault reset. Value 0: No warning occurred	- - - -	UINT16 UINT16 R/- - -	CANopen 301C:9$_h$ Modbus 7186
_M_BRK_T_apply	Holding brake application time	ms - - -	UINT16 UINT16 R/- - -	CANopen 300D:21$_h$ Modbus 3394
_M_BRK_T_release	Holding brake release time	ms - - -	UINT16 UINT16 R/- - -	CANopen 300D:22$_h$ Modbus 3396

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_M_Encoder` ConF → inF- SEnS	Encoder type of motor **1 / SinCos With HiFa / SChi** : SinCos with Hiperface **2 / SinCos Without HiFa / SCoh** : SinCos without Hiperface **3 / SinCos With Hall / SChA** : SinCos with Hall **4 / SinCos With EnDat / SCEn** : 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 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 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 UINT16 R/- - -	CANopen 300D:13_h Modbus 3366
`_M_I_max` ConF → inF- MiMA	Maximum current of motor In increments of 0.01 A_{rms}.	A_{rms} - - -	UINT16 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 UINT16 R/- - -	CANopen 300D:7_h Modbus 3342
`_M_I2t`	Maximum permissible time for maximum current of motor	ms - - -	UINT16 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 UINT32 R/- - -	CANopen 300D:C_h Modbus 3352
`_M_kE`	Voltage constant kE of motor Voltage constant in Vrms at 1000 min^{-1}. Units: Rotary motors: Vrms/min^{-1} Linear motors: Vrms/(m/s) In increments of 0.1 motor_u.	motor_u - - -	UINT32 UINT32 R/- - -	CANopen 300D:B_h Modbus 3350

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_M_L_d	Inductance d component of motor In increments of 0.01 mH.	mH - - -	UINT16 UINT16 R/- - -	CANopen 300D:F$_h$ Modbus 3358
_M_L_q	Inductance q component of motor In increments of 0.01 mH.	mH - - -	UINT16 UINT16 R/- - -	CANopen 300D:E$_h$ Modbus 3356
_M_load Mon LdFM	Current load of motor (335)	% - - -	INT16 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 UINT16 R/- - -	CANopen 300D:16$_h$ Modbus 3372
_M_M_max	Maximum torque of motor In increments of 0.1 Nm.	Nm - - -	UINT16 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 UINT16 R/- - -	CANopen 300D:8$_h$ Modbus 3344
_M_maxoverload	Maximum value of overload of motor (336) Maximum overload of motor during the last 10 seconds.	% - - -	INT16 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: min^{-1} Linear motors: mm/s	motor_v - - -	UINT16 UINT16 R/- - -	CANopen 300D:4$_h$ Modbus 3336
_M_n_nom	Nominal speed of rotation/velocity of motor Units: Rotary motors: min^{-1} Linear motors: mm/s	motor_v - - -	UINT16 UINT16 R/- - -	CANopen 300D:5$_h$ Modbus 3338
_M_overload	Current overload of motor (I2t) (336)	% - - -	INT16 INT16 R/- - -	CANopen 301C:19$_h$ Modbus 7218

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_M_Polepair`	Number of pole pairs of motor	- - - -	UINT16 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 UINT16 R/- - -	CANopen 300D:23$_h$ Modbus 3398
`_M_R_UV`	Winding resistance of motor In increments of 0.01 Ω.	Ω - - -	UINT16 UINT16 R/- - -	CANopen 300D:D$_h$ Modbus 3354
`_M_T_current`	Current motor temperature (334)	°C - - -	INT16 INT16 R/- - -	CANopen 301C:11$_h$ Modbus 7202
`_M_T_max`	Maximum temperature of motor (334)	°C - - -	INT16 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 UINT32 R/- - -	CANopen 300D:2$_h$ Modbus 3332
`_M_U_max`	Maximum voltage of motor In increments of 0.1 V.	V - - -	UINT16 UINT16 R/- - -	CANopen 300D:19$_h$ Modbus 3378
`_M_U_nom`	Nominal voltage of motor In increments of 0.1 V.	V - - -	UINT16 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 UINT16 R/- - -	CANopen 3041:A$_h$ Modbus 16660
`_ModeError`	Error code for 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 caused by the activation of an operating mode. The ModeError bit relates to MT-dependent parameters.	- - - -	UINT16 UINT16 R/- - -	CANopen 301B:19$_h$ Modbus 6962

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_ModeErrorInfo	Additional error information of a 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 current mapping cause an error in connection with a write command. Example: 1 = First mapped parameter 2 = Second mapped parameter etc.	- - - -	UINT16 UINT16 R/- - -	CANopen 301B:1Ch Modbus 6968
_n_act_ENC1	Actual speed of rotation of encoder 1 Available with firmware version ≥V01.03.	min^{-1} - - -	INT16 INT16 R/- - -	CANopen 301E:28h Modbus 7760
_n_act Mon nAct	Actual speed of rotation	min^{-1} - - -	INT16 INT16 R/- - -	CANopen 301E:8h Modbus 7696
_n_ref Mon nrEF	Reference speed of rotation	min^{-1} - - -	INT16 INT16 R/- - -	CANopen 301E:7h Modbus 7694
_OpHours Mon oPh	Operating hours counter	s - - -	UINT32 UINT32 R/- - -	CANopen 301C:Ah Modbus 7188
_p_absENC Mon PAMu	Absolute position with reference to the encoder range (157) This value corresponds to the modulo position of the absolute encoder range. The value is no longer valid if the gear ratio of machine encoder and motor encoder is changed. A restart is required in such a case.	usr_p - - -	UINT32 UINT32 R/- - -	CANopen 301E:Fh 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 UINT32 R/- - -	CANopen 301E:Eh Modbus 7708
_p_act_ENC1_int	Actual position of encoder 1 in internal units Available with firmware version ≥V01.03.	Inc - - -	INT32 INT32 R/- - -	CANopen 301E:26h Modbus 7756
_p_act_ENC1	Actual position of encoder 1 Available with firmware version ≥V01.03.	usr_p - - -	INT32 INT32 R/- - -	CANopen 301E:27h Modbus 7758

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_p_act_int	Actual position in internal units	Inc - - -	INT32 INT32 R/- - -	CANopen 6063:0h Modbus 7700
_p_act	Actual position (221)	usr_p - - -	INT32 INT32 R/- - -	CANopen 6064:0h Modbus 7706
_p_dif_load_peak_usr	Maximum value of the load-dependent position deviation (312) This parameter contains the maximum load-dependent position deviation reached so far. A write access resets this value. Changed settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 - 2147483647	INT32 INT32 R/W - -	CANopen 301E:15h Modbus 7722
_p_dif_load_peak	Maximum value of the load-dependent position deviation (312) 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. Changed settings become active immediately.	revolution 0.0000 - 429496.7295	UINT32 UINT32 R/W - -	CANopen 301E:1Bh Modbus 7734
_p_dif_load_usr	Current load-dependent position deviation between reference and actual position (311) 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 INT32 R/- - -	CANopen 301E:16h Modbus 7724
_p_dif_load	Current load-dependent position deviation between reference and actual position (311) 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 INT32 R/- - -	CANopen 301E:1Ch Modbus 7736

0198441113755, V1.08, 04.2014

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_usr	Current position deviation including dynamic position deviation Position deviation is the difference between reference position and actual position. The current position deviation consists of the load-dependent position deviation and the dynamic position deviation. Available with firmware version ≥V01.05.	usr_p -2147483648 - 2147483647	INT32 INT32 R/- - -	CANopen 301E:14h Modbus 7720
_p_dif	Current position deviation including dynamic position deviation Position deviation is the difference between reference position and actual position. The current position deviation consists of the load-dependent position deviation and the dynamic position deviation. The parameter _p_dif_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution.	revolution -214748.3648 - 214748.3647	INT32 INT32 R/- - -	CANopen 60F4:0h Modbus 7716
_p_ref_int	Reference position in internal units Value corresponds to the reference position of the position controller.	Inc - - -	INT32 INT32 R/- - -	CANopen 301E:9h Modbus 7698
_p_ref	Reference position Value corresponds to the reference position of the position controller.	usr_p - - -	INT32 INT32 R/- - -	CANopen 301E:Ch Modbus 7704
_PAR_ScalingError	Additional information on error during recalculation Coding: Bits 0 ... 15: Address of the parameter that caused the error Bits 16 ... 31: Reserved Changed settings become active immediately. Available with firmware version ≥V01.05.	- - - -	UINT32 UINT32 R/- - -	CANopen 3004:16h Modbus 1068

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_PAR_ScalingState`	Status of recalculation of the parameters with user-defined units **0 / Recalculation active**: Recalculation active **1 / reserved (1)**: reserved (1) **2 / Recalculation finished - no error**: Recalculation finished, no error **3 / Error during recalculation**: Error during recalculation **4 / Initialization successful**: Initialization successful **5 / reserved (5)**: reserved (5) **6 / reserved (6)**: reserved (6) **7 / reserved (7)**: reserved (7) Status of recalculation of the parameters with user-defined units which are recalculated with a changed scaling factor. Changed settings become active immediately. Available with firmware version ≥V01.05.	- 0 2 7	UINT16 UINT16 R/- - -	CANopen 3004:15h Modbus 1066
`_PosRegStatus`	Status of the position register channels (319) 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 UINT16 R/- - -	CANopen 300B:1h Modbus 2818
`_Power_act`	Current output power	W - - -	INT32 INT32 R/- - -	CANopen 301C:Dh Modbus 7194
`_Power_mean`	Mean output power	W - - -	UINT16 UINT16 R/- - -	CANopen 301C:Eh Modbus 7196
`_pref_acc`	Acceleration of reference value for acceleration feed-forward control Sign according to the changed speed value: Increased speed: Positive sign Reduced speed: Negative sign	usr_a - - -	INT32 INT32 R/- - -	CANopen 301F:9h Modbus 7954
`_pref_v`	Velocity of reference value for velocity feed-forward control	usr_v - - -	INT32 INT32 R/- - -	CANopen 301F:7h Modbus 7950

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_prgNoDEV ConF → inF- Prn	Firmware number of device Example: PR0912.00 The value is provided as a decimal value: 91200	- - - -	UINT32 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 UINT16 R/- - -	CANopen $3001:4_h$ Modbus 264
_prgVerDEV ConF → inF- PrU	Firmware version of device The version format is XX.YY.ZZ. Part XX.YY is contained in this parameter. Part ZZ is contained in parameter _prgRev-DEV. Example: V01.23.45 The value is provided as a decimal value: 123	- - - -	UINT16 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 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 UINT16 R/- per. -	CANopen $3010:1_h$ Modbus 4098
_PS_load Mon LdFP	Current load of power stage (335)	% - - -	INT16 INT16 R/- - -	CANopen $301C:17_h$ Modbus 7214
_PS_maxoverload	Maximum value of overload of power stage (336) Maximum overload of power stage during the last 10 seconds.	% - - -	INT16 INT16 R/- - -	CANopen $301C:18_h$ Modbus 7216
_PS_overload_cte	Current overload of power stage (chip tem-perature)	% - - -	INT16 INT16 R/- - -	CANopen $301C:22_h$ Modbus 7236
_PS_overload_I2t	Current overload of power stage (I2t)	% - - -	INT16 INT16 R/- - -	CANopen $301C:16_h$ Modbus 7212

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_PS_overload_psq	Current overload of power stage (power squared)	% - - -	INT16 INT16 R/- - -	CANopen 301C:23h Modbus 7238
_PS_overload	Current overload of power stage (336)	% - - -	INT16 INT16 R/- - -	CANopen 301C:24h Modbus 7240
_PS_T_current Mon tPS	Current power stage temperature (334)	°C - - -	INT16 INT16 R/- - -	CANopen 301C:10h Modbus 7200
_PS_T_max	Maximum power stage temperature (334)	°C - - -	INT16 INT16 R/- per. -	CANopen 3010:7h Modbus 4110
_PS_T_warn	Temperature warning threshold of power stage (334)	°C - - -	INT16 INT16 R/- per. -	CANopen 3010:6h Modbus 4108
_PS_U_maxDC	Maximum permissible DC bus voltage In increments of 0.1 V.	V - - -	UINT16 UINT16 R/- per. -	CANopen 3010:3h Modbus 4102
_PS_U_minDC	Minimum permissible DC bus voltage In increments of 0.1 V.	V - - -	UINT16 UINT16 R/- per. -	CANopen 3010:4h Modbus 4104
_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 UINT16 R/- per. -	CANopen 3010:Ah 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 INT16 R/- - -	CANopen 301C:1Eh Modbus 7228
_RAMP_p_act	Actual position of profile generator	usr_p - - -	INT32 INT32 R/- - -	CANopen 301F:2h 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 INT32 R/- - -	CANopen 301F:1h Modbus 7938

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_RAMP_v_act`	Actual velocity of profile generator	usr_v - - -	INT32 INT32 R/- - -	CANopen 606B:0$_h$ Modbus 7948
`_RAMP_v_target`	Target velocity of profile generator	usr_v - - -	INT32 INT32 R/- - -	CANopen 301F:5$_h$ Modbus 7946
`_RES_load` Mon LdFb	Current load of braking resistor (335) The braking resistor set via parameter RES-int_ext is monitored.	% - - -	INT16 INT16 R/- - -	CANopen 301C:14$_h$ Modbus 7208
`_RES_maxoverload`	Maximum value of overload of braking resistor (336) Maximum overload of braking resistor during the last 10 seconds. The braking resistor set via parameter RES-int_ext is monitored.	% - - -	INT16 INT16 R/- - -	CANopen 301C:15$_h$ Modbus 7210
`_RES_overload`	Current overload of braking resistor (I2t) (336) The braking resistor set via parameter RES-int_ext is monitored.	% - - -	INT16 INT16 R/- - -	CANopen 301C:13$_h$ Modbus 7206
`_RESint_P`	Nominal power of internal braking resistor	W - - -	UINT16 UINT16 R/- per. -	CANopen 3010:9$_h$ Modbus 4114
`_RESint_R`	Resistance value of internal braking resistor In increments of 0.01 Ω.	Ω - - -	UINT16 UINT16 R/- per. -	CANopen 3010:8$_h$ Modbus 4112
`_RMAC_DetailStatus`	Detailed status of relative movement after capture (RMAC) (303) **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 UINT16 R/- - -	CANopen 3023:12$_h$ Modbus 8996
`_RMAC_Status`	Status of relative movement after capture (303) **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 UINT16 R/- - -	CANopen 3023:11$_h$ Modbus 8994

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_ScalePOSmax	Maximum user-defined value for positions This value depends on ScalePOSdenom and ScalePOSnum.	usr_p - - -	INT32 INT32 R/- - -	CANopen 301F:Ah Modbus 7956
_ScaleRAMPmax	Maximum user-defined value for accelerations and decelerations This value depends on ScaleRAMPdenom and ScaleRAMPnum.	usr_a - - -	INT32 INT32 R/- - -	CANopen 301F:Ch Modbus 7960
_ScaleVELmax	Maximum user-defined value for velocities This value depends on ScaleVELdenom and ScaleVELnum.	usr_v - - -	INT32 INT32 R/- - -	CANopen 301F:Bh Modbus 7958
_SigActive	Current status of monitoring signals See _SigLatched for more details on the bit codes.	- - - -	UINT32 UINT32 R/- - -	CANopen 301C:7h Modbus 7182

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_SigLatched MOn SiGS	Saved status of monitoring signals (355) Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General error Bit 1: Hardware limit switches (LIMP/LIMN/REF) Bit 2: Out of range (software limit switches, tuning) Bit 3: Quick Stop via fieldbus Bit 4: Error in active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following error Bit 9: Reserved Bit 10: Inputs STO are 0 Bit 11: Inputs STO different Bit 12: Reserved Bit 13: DC bus voltage low Bit 14: DC bus voltage high Bit 15: Mains phase missing Bit 16: Integrated encoder interface Bit 17: Overtemperature motor Bit 18: Overtemperature power stage Bit 19: Reserved Bit 20: Memory card Bit 21: Optional fieldbus module Bit 22: Optional encoder module Bit 23: Optional safety module eSM or module IOM1 Bit 24: Reserved Bit 25: Reserved Bit 26: Motor connection Bit 27: Motor overcurrent/short circuit Bit 28: Frequency of reference signal too high Bit 29: EEPROM error Bit 30: System start-up (hardware or parameter) Bit 31: System error (for example, watchdog, internal hardware interface) Monitoring functions are product-dependent.	- - - -	UINT32 UINT32 R/- - -	CANopen 301C:8h Modbus 7184
_SuppDriveModes	Supported operating modes as per DSP402 Bit 0: Profile Position Bit 2: Profile Velocity Bit 3: Profile Torque Bit 5: Homing Bit 16: Jog Bit 21: Manual Tuning	- - - -	UINT32 UINT32 R/- - -	CANopen 6502:0h Modbus 6952
_TouchProbeStat	Touch Probe status (298) Refers to chapter "Touch probe functionality" of the DS402 part2 (operation modes and application data) document. Changed settings become active immediately.	- - - -	UINT16 UINT16 R/- - -	CANopen 60B9:0h Modbus 7030

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
_tq_act	Actual torque value Positive value: Actual torque in positive direction of movement Negative value: Actual torque in negative direction of movement 100.0 % correspond to the continuous stall torque _M_M_0. In increments of 0.1 %.	% - - -	INT16 INT16 R/- - -	CANopen 6077:0h Modbus 7752
_Ud_ref	Reference motor voltage d component In increments of 0.1 V.	V - - -	INT16 INT16 R/- - -	CANopen 301E:5h Modbus 7690
_UDC_act Mon udcA	Voltage at DC bus In increments of 0.1 V.	V - - -	UINT16 UINT16 R/- - -	CANopen 301C:Fh 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 INT16 R/- - -	CANopen 301E:6h Modbus 7692
_Uq_ref	Reference motor voltage q component In increments of 0.1 V.	V - - -	INT16 INT16 R/- - -	CANopen 301E:4h Modbus 7688
_v_act_ENC1	Actual velocity of encoder 1 Available with firmware version ≥V01.03.	usr_v - - -	INT32 INT32 R/- - -	CANopen 301E:29h Modbus 7762
_v_act Mon VAct	Actual velocity	usr_v - - -	INT32 INT32 R/- - -	CANopen 606C:0h Modbus 7744
_v_ref Mon VrEF	Reference velocity	usr_v - - -	INT32 INT32 R/- - -	CANopen 301E:1Fh 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 UINT32 R/- - -	CANopen 301C:29h 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 INT16 R/- - -	CANopen 301E:13h Modbus 7718

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`_WarnActive`	Active warnings, bit-coded See _WarnLatched for more details on the bit codes.	- - - -	UINT32 UINT32 R/- - -	CANopen 301C:Bh Modbus 7190
`_WarnLatched` Mon WrnS	Saved warnings, bit-coded (354) Saved warning bits are deleted in the case of a Fault Reset. Bits 10, 13 are deleted automatically. Signal state: 0: Not activated 1: Activated Bit assignments: Bit 0: General warning Bit 1: Reserved Bit 2: Out of range (SW limit switches, tuning) Bit 3: Reserved Bit 4: Active operating mode Bit 5: Commissioning interface (RS485) Bit 6: Integrated fieldbus Bit 7: Reserved Bit 8: Following warning limit reached Bit 9: Reserved Bit 10: Inputs STO_A and/or STO_B Bit 11: Reserved Bit 12: Reserved Bit 13: Low voltage DC bus or mains phase missing Bit 14: Reserved Bit 15: Reserved Bit 16: Integrated encoder interface Bit 17: Temperature of motor high Bit 18: Temperature of power stage high Bit 19: Reserved Bit 20: Memory card Bit 21: Optional fieldbus module Bit 22: Optional encoder module Bit 23: Optional safety module eSM or module IOM1 Bit 24: Reserved Bit 25: Reserved Bit 26: Reserved Bit 27: Reserved Bit 28: Reserved Bit 29: Braking resistor overload (I^2t) Bit 30: Power stage overload (I^2t) Bit 31: Motor overload (I^2t) Monitoring functions are product-dependent.	- - - -	UINT32 UINT32 R/- - -	CANopen 301C:Ch Modbus 7192

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
AbsHomeRequest	Absolute positioning only after homing **0 / No**: No **1 / Yes**: Yes This parameter has no function if the parameter 'PP_ModeRangeLim' is set to '1' which allows overtraveling of the movement range (ref_ok is set to 0 when the range is overtraveled). Changed settings become active immediately.	- 0 1 1	UINT16 UINT16 R/W per. -	CANopen 3006:16h Modbus 1580
AccessLock	Locking other access channels (193) Value 0: Allow control via other access channels Value 1: Lock control via other access channels Example: The access channel is used by the fieldbus. In this case, control via the commissioning software or the HMI is not possible. The access channel can only be locked after the current operating mode has terminated. Changed settings become active immediately.	- 0 0 1	UINT16 UINT16 R/W - -	CANopen 3001:Eh Modbus 284
AT_dir oP → tun- Sti M	Direction of movement for Autotuning (165) **1 / Positive Negative Home / Pnh** : Positive direction first, then negative direction with return to initial position **2 / Negative Positive Home / nPh** : Negative direction first, then positive direction with return to initial position **3 / Positive Home / P-h** : Positive direction only with return to initial position **4 / Positive / P--** : Positive direction only without return to initial position **5 / Negative Home / n-h** : Negative direction only with return to initial position **6 / Negative / n--** : Negative direction only without return to initial position Changed settings become active the next time the motor moves.	- 1 1 6	UINT16 UINT16 R/W - -	CANopen 302F:4h Modbus 12040

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
AT_dis_usr	Movement range for Autotuning (165) Range within which the control parameters are automatically optimized. The range is entered with reference to the current position. NOTE: In the case of "Movement in one direction only" (Parameter AT_dir), the specified range is used for each optimization step. The actual movement typically corresponds to 20 times the value, but it is not limited. The minimum value, the factory setting and the maximum value depend on the scaling factor. Changed settings become active the next time the motor moves. Available with firmware version ≥V01.05.	usr_p 1 32768 2147483647	INT32 INT32 R/W - -	CANopen 302F:12h Modbus 12068
AT_dis	Movement range for Autotuning (165) Range within which the control parameters are automatically optimized. The range is entered with reference to the current position. NOTE: In the case of "Movement in one direction only" (Parameter AT_dir), the specified range is used for each optimization step. The actual movement typically corresponds to 20 times the value, but it is not limited. The parameter AT_dis_usr allows you to enter the value in user-defined units. In increments of 0.1 revolution. Changed settings become active the next time the motor moves.	revolution 1.0 2.0 999.9	UINT32 UINT32 R/W - -	CANopen 302F:3h Modbus 12038
AT_mechanical	Type of coupling of the system (166) **1 / Direct Coupling**: Direct coupling **2 / Belt Axis**: Belt axis **3 / Spindle Axis**: Spindle axis Changed settings become active the next time the motor moves.	- 1 2 3	UINT16 UINT16 R/W - -	CANopen 302F:Eh Modbus 12060
AT_n_ref	Jump of speed of rotation for Autotuning The parameter AT_v_ref allows you to enter the value in user-defined units. Changed settings become active the next time the motor moves.	min^{-1} 10 100 1000	UINT32 UINT32 R/W - -	CANopen 302F:6h Modbus 12044
AT_start	Autotuning start (166) Value 0: Terminate Value 1: Activate EasyTuning Value 2: Activate ComfortTuning Changed settings become active immediately.	- 0 - 2	UINT16 UINT16 R/W - -	CANopen 302F:1h Modbus 12034

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
AT_v_ref	Jump of velocity for Autotuning The minimum value, the factory setting and the maximum value depend on the scaling factor. Changed settings become active the next time the motor moves. Available with firmware version ≥V01.05.	usr_v 1 100 2147483647	INT32 INT32 R/W - -	CANopen 302F:13h Modbus 12070
AT_wait	Waiting time between Autotuning steps (169) Changed settings become active the next time the motor moves.	ms 300 500 10000	UINT16 UINT16 R/W - -	CANopen 302F:9h Modbus 12050
BLSH_Mode	Processing mode of backlash compensation (262) **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 Changed settings become active immediately. Available with firmware version ≥V01.14.	- 0 0 2	UINT16 UINT16 R/W per. -	CANopen 3006:41h Modbus 1666
BLSH_Position	Position value for backlash compensation (261) Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled. Available with firmware version ≥V01.14.	usr_p 0 0 2147483647	INT32 INT32 R/W per. -	CANopen 3006:42h Modbus 1668
BLSH_Time	Processing time for backlash compensation (262) Value 0: Immediate backlash compensation Value >0: Processing time for backlash compensation Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled. Available with firmware version ≥V01.14.	ms 0 0 16383	UINT16 UINT16 R/W per. -	CANopen 3006:44h Modbus 1672
BRK_AddT_apply	Additional time delay for applying the holding brake (153) 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 changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	ms 0 0 1000	INT16 INT16 R/W per. -	CANopen 3005:8h Modbus 1296

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
BRK_AddT_release	Additional time delay for releasing the holding brake (152) 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 changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	ms 0 0 400	INT16 INT16 R/W per. -	CANopen 3005:7h Modbus 1294
BRK_release	Processing of holding brake (151) **0 / Automatic**: Automatic processing **1 / Manual Release**: Manual release of holding brake The holding brake output can only be activated in the operating states 'Switch On Disabled', 'Ready To Switch On' or 'Fault'. If the power stage is active, the value is automatically set to 0. Changed settings become active immediately. Available with firmware version ≥V01.12.	- 0 0 1	UINT16 UINT16 R/W - -	CANopen 3008:Ah Modbus 2068
CANaddress ConF → CoM- ConF → FSu- CoAd	CANopen address (node number) (139) Changed settings become active the next time the product is switched on.	- 1 - 127	R/W per. -	
CANbaud ConF → CoM- ConF → FSu- Cobd	CANopen baud rate (139) **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 Changed settings become active the next time the product is switched on.	- 50 250 1000	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 Changed settings become active immediately.	- 0 1 15	UINT16 UINT16 R/W - -	CANopen 3041:Bh Modbus 16662

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`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 Changed settings become active immediately.	- 0 1 15	UINT16 UINT16 R/W - -	CANopen 3041:C$_h$ Modbus 16664
`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 Changed settings become active immediately.	- 0 1 15	UINT16 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 Changed settings become active immediately.	- 0 15 15	UINT16 UINT16 R/W - -	CANopen 3041:E$_h$ Modbus 16668
`Cap1Activate`	Capture input 1 start/stop (296) **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. Changed settings become active immediately.	- 0 - 4	UINT16 UINT16 R/W - -	CANopen 300A:4$_h$ Modbus 2568
`Cap1Config`	Capture input 1 configuration (295) **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge **2 / Both Edges**: Position capture at both edges Changed settings become active immediately.	- 0 0 2	UINT16 UINT16 R/W - -	CANopen 300A:2$_h$ Modbus 2564

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
Cap1Source	Capture input 1 encoder source **0 / Pact Encoder 1**: Source for capture input 1 is Pact of encoder 1 Changed settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 0	UINT16 UINT16 R/W - -	CANopen 300A:Ah Modbus 2580
Cap2Activate	Capture input 2 start/stop (296) **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. Changed settings become active immediately.	- 0 - 4	UINT16 UINT16 R/W - -	CANopen 300A:5h Modbus 2570
Cap2Config	Capture input 2 configuration (295) **0 / Falling Edge**: Position capture at falling edge **1 / Rising Edge**: Position capture at rising edge Available with hardware version ≥RS03. Changed settings become active immediately.	- 0 0 1	UINT16 UINT16 R/W - -	CANopen 300A:3h Modbus 2566
Cap2Source	Capture input 2 encoder source **0 / Pact Encoder 1**: Source for capture input 2 is Pact of encoder 1 Changed settings become active immediately.	- 0 0 0	UINT16 UINT16 R/W - -	CANopen 300A:Bh Modbus 2582
CLSET_p_DiffWin_usr	Position deviation for parameter set switching (273) If the position deviation of the position controller is less than the value of this parameter, the controller parameter set 2 is used. Otherwise, controller parameter set 1 is used. The minimum value, the factory setting and the maximum value depend on the scaling factor. Changed settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 164 2147483647	INT32 INT32 R/W per. -	CANopen 3011:25h Modbus 4426

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CLSET_p_DiffWin	Position deviation for parameter set switching (274) If the position deviation of the position controller is less than the value of this parameter, the controller parameter set 2 is used. Otherwise, controller parameter set 1 is used. The parameter CLSET_p_DiffWin_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution. Changed settings become active immediately.	revolution 0.0000 0.0100 2.0000	UINT16 UINT16 R/W per. -	CANopen 3011:1Ch Modbus 4408
CLSET_ParSwiCond	Condition for parameter set switching (273) **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 Changed settings become active immediately.	- 0 0 4	UINT16 UINT16 R/W per. -	CANopen 3011:1Ah Modbus 4404

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CLSET_v_Threshol	Velocity threshold for parameter set switching (274) If the reference velocity or the actual velocity are less than the value of this parameter, the controller parameter set 2 is used. Otherwise, controller parameter set 1 is used. Changed settings become active immediately.	usr_v 0 50 2147483647	UINT32 UINT32 R/W per. -	CANopen 3011:1D$_h$ Modbus 4410
CLSET_winTime	Time window for parameter set switching (274) Value 0: Window monitoring deactivated. Value >0: Window time for the parameters CLSET_v_Threshol and CLSET_p_DiffWin. Changed settings become active immediately.	ms 0 0 1000	UINT16 UINT16 R/W per. -	CANopen 3011:1B$_h$ Modbus 4406
CTRL_GlobGain oP → tun- GAin	Global gain factor (affects parameter set 1) (168) The global gain factor affects the following parameters of controller parameter set 1: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref The global gain factor is set to 100% - if the controller parameters are set to default - at the end of the Autotuning process - if the controller parameter set 2 is copied to set 1 via the parameter CTRL_ParSetCopy NOTE: If a full configuration is transmitted via the fieldbus, the value for CTRL_GlobGain must be transmitted prior to the values of the controller parameters CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref. If CTRL_GlobGain is changed during a configuration transmission, CTRL_KPn, CTRL_TNn, CTRL_KPp and CTRL_TAUnref must also be part of the configuration. In increments of 0.1 %. Changed settings become active immediately.	% 5.0 100.0 1000.0	UINT16 UINT16 R/W per. -	CANopen 3011:15$_h$ Modbus 4394

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`CTRL_I_max_fw`	Maximum current for field weakening (d component) This value is only limited by the minimum/ maximum parameter range (no limitation of this value by motor/power stage). The actual field weakening current is the minimum of CTRL_I_max_fw and one half of the lower value of the nominal current of the power stage and the motor. In increments of 0.01 A_{rms}. Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	A_{rms} 0.00 0.00 300.00	UINT16 UINT16 R/W per. expert	CANopen 3011:F_h Modbus 4382
`CTRL_I_max` ConF → drC- iMAX	Current limitation (144) During operation, the actual current limit is one of the following values (whichever is lowest): - CTRL_I_max - _M_I_max - _PS_I_max - Current limitation via 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}. Changed settings become active immediately.	A_{rms} 0.00 - 463.00	UINT16 UINT16 R/W per. -	CANopen 3011:C_h Modbus 4376
`CTRL_KFAcc`	Acceleration feed-forward control In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 3000.0	UINT16 UINT16 R/W per. expert	CANopen 3011:A_h Modbus 4372

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`CTRL_ParChgTime`	Period of time for parameter switching (142) In the case of parameter set switching, the values of the following parameters are changed gradually: - CTRL_KPn - CTRL_TNn - CTRL_KPp - CTRL_TAUnref - CTRL_TAUiref - CTRL_KFPp Such a parameter switching can be caused by - change of the active controller parameter set - change of the global gain - change of any of the parameters listed above - switching off the integral term of the velocity controller Changed settings become active immediately.	ms 0 0 2000	UINT16 UINT16 R/W per. -	CANopen 3011:14h Modbus 4392
`CTRL_ParSetCopy`	Controller parameter set copying (275) Value 1: Copy controller parameter set 1 to set 2 Value 2: Copy controller parameter set 2 to set 1 If parameter set 2 copied to parameter set 1, the parameter CTRL_GlobGain is set to 100%. Changed settings become active immediately.	- 0.0 - 0.2	UINT16 UINT16 R/W - -	CANopen 3011:16h Modbus 4396
`CTRL_PwrUpParSet`	Selection of controller parameter set at power up (270) **0 / Switching Condition**: The switching condition is used for parameter set switching **1 / Parameter Set 1**: Parameter set 1 is used **2 / Parameter Set 2**: Parameter set 2 is used The selected value is also written to CTRL_ParSetSel (non-persistent). Changed settings become active immediately.	- 0 1 2	UINT16 UINT16 R/W per. -	CANopen 3011:18h Modbus 4400
`CTRL_SelParSet`	Selection of controller parameter set (non-persistent) (142) Coding see parameter: CTRL_PwrUpParSet Changed settings become active immediately.	- 0 1 2	UINT16 UINT16 R/W - -	CANopen 3011:19h Modbus 4402

0198441113755, V1.08, 04.2014

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_SpdFric	Speed of rotation up to which the friction compensation is linear Changed settings become active immediately.	min^{-1} 0 5 20	UINT32 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. Changed settings become active immediately.	ms 0.00 - 30.00	UINT16 UINT16 R/W per. expert	CANopen 3011:8$_h$ Modbus 4368
CTRL_v_max ConF → drC- nMAX	Velocity limitation (145) During operation, the actual velocity limit is one of the following values (whichever is lowest): - CTRL_v_max - M_n_max - Velocity limitation via digital input Changed settings become active immediately.	usr_v 1 13200 2147483647	UINT32 UINT32 R/W per. -	CANopen 3011:10$_h$ Modbus 4384
CTRL_VelObsActiv	Activation of velocity observer **0 / Velocity Observer Off**: Velocity observer is off **1 / Velocity Observer Passive**: Velocity observer is on, but not used for motor control **2 / Velocity Observer Active**: Velocity observer is on and used for motor control Velocity observer control reduces velocity ripple and enhances controller bandwith. NOTE: Set the correct dynamics and inertia values before activation. Setting can only be changed if power stage is disabled. Changed settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 2	UINT16 UINT16 R/W per. expert	CANopen 3011:22$_h$ Modbus 4420
CTRL_VelObsDyn	Dynamics of velocity observer Dynamics of the velocity observer. This time constant should be much smaller than that of the velocity controller. In increments of 0.01 ms. Setting can only be changed if power stage is disabled. Changed settings become active immediately. Available with firmware version ≥V01.03.	ms 0.03 0.25 200.00	UINT16 UINT16 R/W per. expert	CANopen 3011:23$_h$ Modbus 4422

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL_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 changed if power stage is disabled. Changed settings become active immediately. Available with firmware version ≥V01.03.	g cm^2 1 - 2147483648	UINT32 UINT32 R/W per. expert	CANopen 3011:24h Modbus 4424
CTRL_vPIDDPart	PID velocity controller: D gain In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 400.0	UINT16 UINT16 R/W per. expert	CANopen 3011:6h Modbus 4364
CTRL_vPIDDTime	PID velocity controller: Time constant of D term smoothing filter In increments of 0.01 ms. Changed settings become active immediately.	ms 0.01 0.25 10.00	UINT16 UINT16 R/W per. expert	CANopen 3011:5h Modbus 4362
CTRL1_KFPp ConF → drC- FPP1	Velocity feed-forward control (277) In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 200.0	UINT16 UINT16 R/W per. -	CANopen 3012:6h Modbus 4620
CTRL1_Kfric	Friction compensation: Gain (278) In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.00 10.00	UINT16 UINT16 R/W per. expert	CANopen 3012:10h Modbus 4640
CTRL1_KPn ConF → drC- Pn1	Velocity controller P gain (172) The default value is calculated on the basis of the motor parameters. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.0001 A/min^{-1}. Changed settings become active immediately.	A/min^{-1} 0.0001 - 2.5400	UINT16 UINT16 R/W per. -	CANopen 3012:1h Modbus 4610

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL1_KPp ConF → drC- PP1	Position controller P gain (178) The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 1/s. Changed settings become active immediately.	1/s 2.0 - 900.0	UINT16 UINT16 R/W per. -	CANopen 3012:3h Modbus 4614
CTRL1_Nf1bandw	Notch filter 1: Bandwidth (277) Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 UINT16 R/W per. expert	CANopen 3012:Ah Modbus 4628
CTRL1_Nf1damp	Notch filter 1: Damping (277) In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 UINT16 R/W per. expert	CANopen 3012:8h Modbus 4624
CTRL1_Nf1freq	Notch filter 1: Frequency (277) The filter is switched off at a value of 15000. In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 UINT16 R/W per. expert	CANopen 3012:9h Modbus 4626
CTRL1_Nf2bandw	Notch filter 2: Bandwidth (277) Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 UINT16 R/W per. expert	CANopen 3012:Dh Modbus 4634
CTRL1_Nf2damp	Notch filter 2: Damping (277) In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 UINT16 R/W per. expert	CANopen 3012:Bh Modbus 4630
CTRL1_Nf2freq	Notch filter 2: Frequency (277) The filter is switched off at a value of 15000. In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 UINT16 R/W per. expert	CANopen 3012:Ch Modbus 4632
CTRL1_Osupdamp	Overshoot suppression filter: Damping (277) The filter is switched off at a value of 0. In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 50.0	UINT16 UINT16 R/W per. expert	CANopen 3012:Eh Modbus 4636

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL1_Osupdelay	Overshoot suppression filter: Time delay (278) The filter is switched off at a value of 0. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.00 75.00	UINT16 UINT16 R/W per. expert	CANopen 3012:F$_h$ Modbus 4638
CTRL1_TAUiref	Filter time constant of the reference current value filter (176) In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.50 4.00	UINT16 UINT16 R/W per. -	CANopen 3012:5$_h$ Modbus 4618
CTRL1_TAUnref ConF → drC- tAu1	Filter time constant of the reference velocity value filter (174) In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 9.00 327.67	UINT16 UINT16 R/W per. -	CANopen 3012:4$_h$ Modbus 4616
CTRL1_TNn ConF → drC- tin1	Velocity controller integral action time (172) The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 327.67	UINT16 UINT16 R/W per. -	CANopen 3012:2$_h$ Modbus 4612
CTRL2_KFPp ConF → drC- FPP2	Velocity feed-forward control (279) In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 200.0	UINT16 UINT16 R/W per. -	CANopen 3013:6$_h$ Modbus 4876
CTRL2_Kfric	Friction compensation: Gain (279) In increments of 0.01 A$_{rms}$. Changed settings become active immediately.	A$_{rms}$ 0.00 0.00 10.00	UINT16 UINT16 R/W per. expert	CANopen 3013:10$_h$ Modbus 4896

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
CTRL2_KPn ConF → drC- Pn2	Velocity controller P gain (172) The default value is calculated on the basis of the motor parameters. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.0001 A/min^{-1}. Changed settings become active immediately.	A/min^{-1} 0.0001 - 2.5400	UINT16 UINT16 R/W per. -	CANopen 3013:1$_h$ Modbus 4866
CTRL2_KPp ConF → drC- PP2	Position controller P gain (178) The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.1 1/s. Changed settings become active immediately.	1/s 2.0 - 900.0	UINT16 UINT16 R/W per. -	CANopen 3013:3$_h$ Modbus 4870
CTRL2_Nf1bandw	Notch filter 1: Bandwidth (279) Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 UINT16 R/W per. expert	CANopen 3013:A$_h$ Modbus 4884
CTRL2_Nf1damp	Notch filter 1: Damping (279) In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 UINT16 R/W per. expert	CANopen 3013:8$_h$ Modbus 4880
CTRL2_Nf1freq	Notch filter 1: Frequency (279) The filter is switched off at a value of 15000. In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 UINT16 R/W per. expert	CANopen 3013:9$_h$ Modbus 4882
CTRL2_Nf2bandw	Notch filter 2: Bandwidth (280) Definition of bandwidth: 1 - Fb/F0 In increments of 0.1 %. Changed settings become active immediately.	% 1.0 70.0 90.0	UINT16 UINT16 R/W per. expert	CANopen 3013:D$_h$ Modbus 4890
CTRL2_Nf2damp	Notch filter 2: Damping (280) In increments of 0.1 %. Changed settings become active immediately.	% 55.0 90.0 99.0	UINT16 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 field-bus
CTRL2_Nf2freq	Notch filter 2: Frequency (280) The filter is switched off at a value of 15000. In increments of 0.1 Hz. Changed settings become active immediately.	Hz 50.0 1500.0 1500.0	UINT16 UINT16 R/W per. expert	CANopen 3013:C$_h$ Modbus 4888
CTRL2_Osupdamp	Overshoot suppression filter: Damping (280) The filter is switched off at a value of 0. In increments of 0.1 %. Changed settings become active immediately.	% 0.0 0.0 50.0	UINT16 UINT16 R/W per. expert	CANopen 3013:E$_h$ Modbus 4892
CTRL2_Osupdelay	Overshoot suppression filter: Time delay (280) The filter is switched off at a value of 0. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.00 75.00	UINT16 UINT16 R/W per. expert	CANopen 3013:F$_h$ Modbus 4894
CTRL2_TAUiref	Filter time constant of the reference current value filter (176) In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 0.50 4.00	UINT16 UINT16 R/W per. -	CANopen 3013:5$_h$ Modbus 4874
CTRL2_TAUnref ConF → drC- tAu2	Filter time constant of the reference velocity value filter (174) In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 9.00 327.67	UINT16 UINT16 R/W per. -	CANopen 3013:4$_h$ Modbus 4872
CTRL2_TNn ConF → drC- tin2	Velocity controller integral action time (172) The default value is calculated. In the case of switching between the two controller parameter sets, the values are adapted linearly over the time defined in the parameter CTRL_ParChgTime. In increments of 0.01 ms. Changed settings become active immediately.	ms 0.00 - 327.67	UINT16 UINT16 R/W per. -	CANopen 3013:2$_h$ Modbus 4868

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`DCbus_compat`	DC bus compatibility LXM32 and ATV32 **0 / No DC bus or LXM32 only**: DC bus not used or only LXM32 connected via the DC bus **1 / DC bus with LXM32 and ATV32**: LXM32 and ATV32 connected via the DC bus NOTE: Connecting LXM32 drives and ATV32 drives via the DC bus may change the technical data. Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on. Available with firmware version ≥V01.05.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3005:26h Modbus 1356
`DCOMcontrol`	DriveCom control word Refer to chapter Operation, Operating States, for bit assignment information. Bit 0: Switch On Bit 1: Enable Voltage Bit 2: 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) Changed settings become active immediately.	- - - -	UINT16 UINT16 R/W - -	CANopen 6040:0h 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 Changed settings become active immediately.	- -6 - 7	INT8 INT16 R/W - -	CANopen 6060:0h Modbus 6918

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
DI_0_Debounce	Debounce time of DI0 (260) **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 changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 UINT16 R/W per. -	CANopen 3008:20h Modbus 2112
DI_1_Debounce	Debounce time of DI1 (260) **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 changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 UINT16 R/W per. -	CANopen 3008:21h Modbus 2114
DI_2_Debounce	Debounce time of DI2 (260) **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 changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 UINT16 R/W per. -	CANopen 3008:22h Modbus 2116
DI_3_Debounce	Debounce time of DI3 (260) **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 changed if power stage is disabled. Changed settings become active immediately.	- 0 6 6	UINT16 UINT16 R/W per. -	CANopen 3008:23h Modbus 2118

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
DPL_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. Changed settings become active immediately.	- 0 0 1	UINT16 UINT16 R/W - -	CANopen 301B:8h Modbus 6928
DPL_dmControl	Drive Profile Lexium dmControl	- - - -	UINT16 UINT16 R/W - -	CANopen 301B:1Fh 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 Changed settings become active immediately. Available with firmware version ≥V01.08.	- 0 11 11	UINT16 UINT16 R/W per. -	CANopen 301B:35h Modbus 7018
DPL_RefA16	Drive Profile Lexium RefA16	- - - -	INT16 INT16 R/W - -	CANopen 301B:22h Modbus 6980
DPL_RefB32	Drive Profile Lexium RefB32	- - - -	INT32 INT32 R/W - -	CANopen 301B:21h 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 field-bus
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 Ready-ToSwitchOn (4). Setting can only be changed if power stage is disabled. Changed settings become active immedi-ately.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 301B:13$_h$ Modbus 6950
DS402intLim	DS402 status word: Setting for bit 11 (inter-nal limit) (283) **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 Changed settings become active immedi-ately.	- 0 0 11	UINT16 UINT16 R/W per. -	CANopen 301B:1E$_h$ Modbus 6972

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ENC1_adjustment	Adjustment of absolute position of encoder 1 (158) The value range depends on the encoder type. Singleturn encoder: 0 ... x-1 Multiturn encoder: 0 ... (4096*x)-1 Singleturn encoder (shifted with parameter ShiftEncWorkRang): -(x/2) ... (x/2)-1 Multiturn encoder (shifted with parameter ShiftEncWorkRang): -(2048*x) ... (2048*x)-1 Definition of 'x': Maximum position for one encoder turn in user-defined units. This value is 16384 with the default scaling. NOTE: * If processing is to be performed with inversion of the direction of movement, this must be set before the encoder position is adjusted. * After the write access, a wait time of at least 1 second is required before the drive is switched off. Changed settings become active the next time the product is switched on.	usr_p - - -	INT32 INT32 R/W - -	CANopen 3005:16h Modbus 1324
ERR_clear	Clear error memory (350) Value 1: Delete entries in the error memory The clearing process is completed if a 0 is returned after a read access. Changed settings become active immediately.	- 0 - 1	UINT16 UINT16 R/W - -	CANopen 303B:4h Modbus 15112
ERR_reset	Reset error memory read pointer (350) Value 1: Set error memory read pointer to oldest error entry. Changed settings become active immediately.	- 0 - 1	UINT16 UINT16 R/W - -	CANopen 303B:5h Modbus 15114

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`ErrorResp_bit_DE`	Error response to data error (DE bit) **-1 / No Error Response**: No error response **0 / Warning**: Warning **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 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 INT16 R/W per. -	CANopen 301B:6h Modbus 6924
`ErrorResp_bit_ME`	Error response to mode error (ME bit) **-1 / No Error Response**: No error response **0 / Warning**: Warning **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 **3 / Error Class 3**: Error class 3 For Drive Profile Lexium, the error response for an mode error (ME bit) can be parameterized.	- -1 -1 3	INT16 INT16 R/W per. -	CANopen 301B:7h Modbus 6926
`ErrorResp_Flt_AC`	Error response to missing mains phase (338) **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 changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 1 2 3	UINT16 UINT16 R/W per. -	CANopen 3005:Ah Modbus 1300
`ErrorResp_I2tRES`	Error response to 100% I2t braking resistor **0 / Warning**: Warning (error class 0) **1 / Error Class 1**: Error class 1 **2 / Error Class 2**: Error class 2 Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 0 2	UINT16 UINT16 R/W per. -	CANopen 3005:22h Modbus 1348
`ErrorResp_p_dif`	Error response to following error (313) **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 changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 1 3 3	UINT16 UINT16 R/W per. -	CANopen 3005:Bh Modbus 1302

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
HMdis	Distance from switching point (227) The distance from the switching point is defined as the reference point. The parameter is only effective during a reference movement without index pulse. Changed settings become active the next time the motor moves.	usr_p 1 200 2147483647	INT32 INT32 R/W per. -	CANopen 3028:7h Modbus 10254
HMIDispPara Mon SuPV	HMI display when motor moves **0 / OperatingState / StAt** : Operating state **1 / v_act / VAct** : Actual motor velocity **2 / I_act / iAct** : Actual motor current Changed settings become active immediately.	- 0 0 2	UINT16 UINT16 R/W per. -	CANopen 303A:2h Modbus 14852
HMIlocked	Lock HMI (193) **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 Changed settings become active immediately.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 303A:1h 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 field-bus
HMmethod	Homing method (226) 1: LIMN with index pulse 2: LIMP with index pulse 7: REF+ with index pulse, inv., outside 8: REF+ with index pulse, inv., inside 9: REF+ with index pulse, not inv., inside 10: REF+ with index pulse, not inv., outside 11: REF- with index pulse, inv., outside 12: REF- with index pulse, inv., inside 13: REF- with index pulse, not inv., inside 14: REF- with index pulse, not inv., outside 17: LIMN 18: LIMP 23: REF+, inv., outside 24: REF+, inv., inside 25: REF+, not inv., inside 26: REF+, not inv., outside 27: REF-, inv., outside 28: REF-, inv., inside 29: REF-, not inv., inside 30: REF-, not inv., outside 33: Index pulse neg. direction 34: Index pulse pos. direction 35: Position setting Abbreviations: REF+: Search movement in pos. direction REF-: Search movement in neg. direction inv.: Invert direction in switch not inv.: Direction not inverted in switch outside: Index pulse / distance outside switch inside: Index pulse / distance inside switch Changed settings become active immediately.	- 1 18 35	INT8 INT16 R/W - -	CANopen 6098:0h Modbus 6936
HMoutdis	Maximum distance for search for switching point (228) 0: Monitoring of distance inactive >0: Maximum distance After detection of the switch, the drive starts to search for the defined switching point. If the defined switching point is not found within the distance defined here, the reference movement is canceled with an error. Changed settings become active the next time the motor moves.	usr_p 0 0 2147483647	INT32 INT32 R/W per. -	CANopen 3028:6h Modbus 10252
HMp_home	Position at reference point (227) After a successful reference movement, this position is automatically set at the reference point. Changed settings become active the next time the motor moves.	usr_p -2147483648 0 2147483647	INT32 INT32 R/W per. -	CANopen 3028:Bh Modbus 10262

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
HMp_setP	Position for Position Setting (234) Position for operating mode Homing, method 35. Changed settings become active immediately.	usr_p - 0 -	INT32 INT32 R/W - -	CANopen 301B:16h Modbus 6956
HMprefmethod oP → hoM- MEth	Preferred homing method (226) Changed settings become active immediately.	- 1 18 35	INT16 INT16 R/W per. -	CANopen 3028:Ah Modbus 10260
HMsrchdis	Maximum search distance after overtravel of switch (228) 0: Search distance monitoring disabled >0: Search distance The switch must be activated again within this search distance, otherwise the reference movement is canceled. Changed settings become active the next time the motor moves.	usr_p 0 0 2147483647	INT32 INT32 R/W per. -	CANopen 3028:Dh Modbus 10266
HMv_out	Target velocity for moving away from switch (229) The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Changed settings become active the next time the motor moves.	usr_v 1 6 2147483647	UINT32 UINT32 R/W per. -	CANopen 6099:2h Modbus 10250
HMv oP → hoM- hMn	Target velocity for searching the switch (229) The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Changed settings become active the next time the motor moves.	usr_v 1 60 2147483647	UINT32 UINT32 R/W per. -	CANopen 6099:1h Modbus 10248
InvertDirOfMove ConF → ACG- inMo	Inversion of direction of movement (156) **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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3006:Ch 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 field-bus
IO_AutoEnable ConF → ACG- ioAE	Enabling the power stage at PowerOn **0 / RisingEdge / riSE** : After start-up, a rising edge with the signal input function Enable enables the power stage **1 / HighLevel / LEUL** : After start-up, an active signal input with signal input function Enable enables the power stage **2 / AutoOn / Auto** : After start-up, the power stage is automatically enabled Changed settings become active the next time the power stage is enabled.	- 0 0 2	UINT16 UINT16 R/W per. -	CANopen 3005:6h Modbus 1292
IO_AutoEnaConfig ConF → ACG- ioEM	Enables 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 error Changed settings become active the next time the power stage is enabled.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3005:4h Modbus 1288
IO_DQ_set	Setting the digital outputs directly (293) Write access to output bits is only active if the signal pin is available as an output and if the function of the output was set to 'Available as required'. Coding of the individual signals: Bit 0: DQ0 Bit 1: DQ1	- - - -	UINT16 UINT16 R/W - -	CANopen 3008:11h Modbus 2082
IO_FaultResOnEnaInp ConF → ACG- iEFr	Additional 'Fault Reset' for the signal input function 'Enable' (199) **0 / Off / oFF** : No additional 'Fault Reset' **1 / OnFallingEdge / FALL** : Additional 'Fault Reset' during falling edge **2 / OnRisingEdge / riSE** : Additional 'Fault Reset' during rising edge Changed settings become active the next time the power stage is enabled. Available with firmware version ≥V01.12.	- 0 0 2	UINT16 UINT16 R/W per. -	CANopen 3005:34h Modbus 1384
IO_I_limit ConF → i-o- iLiM	Current limitation via input (290) A current limit can be activated via a digital input. In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.20 300.00	UINT16 UINT16 R/W per. -	CANopen 3006:27h Modbus 1614

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IO_v_limit	Velocity limitation via input (289) A velocity limitation can be activated via a digital input. NOTE: In operating mode Profile Torque, the minimum velocity is internally limited to 100 min^{-1}. Changed settings become active immediately.	usr_v 0 10 2147483647	UINT32 UINT32 R/W per. -	CANopen 3006:1E$_h$ Modbus 1596
IOfunct_DI0 ConF → i -o- di 0	Function Input DI0 (253) **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 controller parameter set **28 / Velocity Controller Integral Off / tnoF** : 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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 UINT16 R/W per. -	CANopen 3007:1$_h$ Modbus 1794

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`IOfunct_DI1` ConF → i-o- di1	Function Input DI1 (254) **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 / ULiM** : 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 controller parameter set **28 / Velocity Controller Integral Off / tnoF** : 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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 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 field-bus
IOfunct_DI2 ConF → i-o- di2	Function Input DI2 (255) **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 controller parameter set **28 / Velocity Controller Integral Off / tnoF** : 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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 UINT16 R/W per. -	CANopen 3007:3h Modbus 1798

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DI3 ConF → i-o- di3	Function Input DI3 (256) **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 controller parameter set **28 / Velocity Controller Integral Off / tnoF** : 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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 UINT16 R/W per. -	CANopen 3007:4h Modbus 1800

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DQ0 ConF → i-o- do0	Function Output DQ0 (258) **1 / Freely Available / nonE** : Available as required **2 / No Fault / nFLt** : Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active / Acti** : Signals operating state Operation Enabled **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 selected errors is active **15 / Valid Reference (ref_ok) / rEFo** : Drive has a valid reference (ref_ok) **16 / Selected Warning / SWrn** : One of the selected warnings is active **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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 UINT16 R/W per. -	CANopen 3007:9h Modbus 1810

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOfunct_DQ1 ConF → i -o- do1	Function Output DQ1 (259) **1 / Freely Available / nonE** : Available as required **2 / No Fault / nFLt** : Signals operating states Ready To Switch On, Switched On and Operation Enabled **3 / Active / Acti** : Signals operating state Operation Enabled **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 selected errors is active **15 / Valid Reference (ref_ok) / rEFo** : Drive has a valid reference (ref_ok) **16 / Selected Warning / SWrn** : One of the selected warnings is active **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 changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- - - -	UINT16 UINT16 R/W per. -	CANopen 3007:Ah Modbus 1812
IOsigLIMN	Signal evaluation for negative limit switch (306) **0 / Inactive**: Inactive **1 / Normally closed**: Normally closed NC **2 / Normally open**: Normally open NO Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 UINT16 R/W per. -	CANopen 3006:Fh Modbus 1566

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
IOsigLIMP	Signal evaluation for positive limit switch (306) **0 / Inactive**: Inactive **1 / Normally closed**: Normally closed NC **2 / Normally open**: Normally open NO Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 2	UINT16 UINT16 R/W per. -	CANopen 3006:10h Modbus 1568
IOsigREF	Signal evaluation for reference switch (307) **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 changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 1 1 2	UINT16 UINT16 R/W per. -	CANopen 3006:Eh 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. Changed settings become active immediately.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3006:6h Modbus 1548
IP_IntTimInd	Interpolation time index (221) Available with firmware version ≥V01.08.	- -128 -3 63	INT8 INT16 R/W - -	CANopen 60C2:2h Modbus 7002
IP_IntTimPerVal	Interpolation time period value (221) Available with firmware version ≥V01.08.	s 0 1 255	UINT8 UINT16 R/W - -	CANopen 60C2:1h Modbus 7000
IPp_target	Position reference value for operating mode Interpolated Position (222) Available with firmware version ≥V01.08.	- -2147483648 - 2147483647	INT32 INT32 R/W - -	CANopen 60C1:1h 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 Changed settings become active immediately.	- 0 0 7	UINT16 UINT16 R/W - -	CANopen 301B:9h Modbus 6930

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
JOGmethod	Selection of jog method (206) **0 / Continuous Movement / coNo** : Jog with continuous movement **1 / Step Movement / StNo** : Jog with step movement Changed settings become active immediately.	- 0 1 1	UINT16 UINT16 R/W - -	CANopen 3029:3h Modbus 10502
JOGstep	Distance for step movement (206) Changed settings become active the next time the motor moves.	usr_p 1 20 2147483647	INT32 INT32 R/W per. -	CANopen 3029:7h Modbus 10510
JOGtime	Wait time for step movement (206) Changed settings become active the next time the motor moves.	ms 1 500 32767	UINT16 UINT16 R/W per. -	CANopen 3029:8h Modbus 10512
JOGv_fast oP → JoG- JGhi	Velocity for fast movement (205) The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Changed settings become active immediately.	usr_v 1 180 2147483647	UINT32 UINT32 R/W per. -	CANopen 3029:5h Modbus 10506
JOGv_slow oP → JoG- JGLo	Velocity for slow movement (205) The adjustable value is internally limited to the current parameter setting in RAMP_v_max. Changed settings become active immediately.	usr_v 1 60 2147483647	UINT32 UINT32 R/W per. -	CANopen 3029:4h Modbus 10504
LIM_HaltReaction ConF → ACG- htYP	Halt option code (284) **1 / Deceleration Ramp / dEcE** : Deceleration ramp **3 / Torque Ramp / torq** : Torque ramp Type of deceleration for Halt. Setting of deceleration ramp with parameter RAMP_v_dec. Setting of torque ramp with parameter LIM_I_maxHalt. If a deceleration ramp is already active, the parameter cannot be written. Changed settings become active immediately.	- 1 1 3	INT16 INT16 R/W per. -	CANopen 605D:0h Modbus 1582

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
LIM_I_maxHalt ConF → ACG- hcur	Current value for Halt (145) This value is only limited by the minimum/ maximum value range (no limitation of this value by motor/power stage). In the case of a Halt, the actual current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxHalt - _M_I_max - _PS_I_max Further current reductions caused by I2t monitoring are also taken into account during a Halt. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} - - -	UINT16 UINT16 R/W per. -	CANopen 3011:E_h Modbus 4380
LIM_I_maxQSTP ConF → FLt- qcur	Current value for Quick Stop (144) This value is only limited by the minimum/ maximum value range (no limitation of this value by motor/power stage). In the case of a Quick Stop, the actual current limit (_Imax_act) is one of the following values (whichever is lowest): - LIM_I_maxQSTP - _M_I_max - _PS_I_max Further current reductions caused by I2t monitoring are also taken into account during a Quick Stop. Default: _PS_I_max at 8 kHz PWM frequency and 230/480 V mains voltage In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} - - -	UINT16 UINT16 R/W per. -	CANopen 3011:D_h Modbus 4378

0198441113755, V1.08, 04.2014

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 (287) **-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. Changed settings become active immediately.	- -2 6 7	INT16 INT16 R/W per. -	CANopen 3006:18h 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 changed if power stage is disabled. Changed settings become active immediately.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3005:20h Modbus 1344
MBaddress ConF → CoM- MbAd	Modbus address Valid addresses: 1 to 247 Changed settings become active the next time the product is switched on.	- 1 1 247	UINT16 UINT16 R/W per. -	CANopen 3016:4h 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 Changed settings become active the next time the product is switched on.	- 9600 19200 38400	UINT32 UINT32 R/W per. -	CANopen 3016:3h Modbus 5638
Mfb_ResRatio	Transformation ratio Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0.3 - 1.0	UINT16 UINT16 R/W - -	CANopen 305C:17h Modbus 23598

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MOD_AbsDirection	Direction of absolute movement with Modulo (241) **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. Changed settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 2	UINT16 UINT16 R/W per. -	CANopen 3006:3Bh Modbus 1654
MOD_AbsMultiRng	Multiple ranges for absolut movement with Modulo (242) **0 / Multiple Ranges Off**: Absolute movement in one modulo range **1 / Multiple Ranges On**: Absolute movement in multiple modulo ranges Changed settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3006:3Ch Modbus 1656
MOD_Enable ConF → ACG- AtyP	Activation of Modulo (240) **0 / Modulo Off / oFF** : Modulo is off **1 / Modulo On / on** : Modulo is on Activating Modulo does not automatically change the value of other parameters. Before changing this value, verify that the parameter settings for the intended application are correct. NOTE: Modulo must be deactivated for Autotuning. Setting can only be changed if power stage is disabled. Changed settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3006:38h Modbus 1648

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MOD_Max	Maximum position of modulo range (241) 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 _Scale-POSmax. Setting can only be changed if power stage is disabled. Changed settings become active immediately. Available with firmware version ≥V01.03.	usr_p - 3600 -	INT32 INT32 R/W per. -	CANopen 3006:3Ah Modbus 1652
MOD_Min	Minimum position of modulo range (241) 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 _Scale-POSmax. Setting can only be changed if power stage is disabled. Changed settings become active immediately. Available with firmware version ≥V01.03.	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 3006:39h Modbus 1650
MON_ChkTime ConF → i-o- tthr	Monitoring of time window (327) Adjustment of a time for monitoring of position deviation, speed deviation, speed value and current value. If the monitored value is in the permissible range during the adjusted time, the monitoring function delivers a positive result. The status can be output via a parameterizable output. Changed settings become active immediately.	ms 0 0 9999	UINT16 UINT16 R/W per. -	CANopen 3006:1Dh Modbus 1594
MON_commutat	Commutation monitoring (337) **0 / Off**: Commutation monitoring off **1 / On**: Commutation monitoring on Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 1 1	UINT16 UINT16 R/W per. -	CANopen 3005:5h Modbus 1290
MON_GroundFault	Ground fault monitoring (340) **0 / Off**: Ground fault monitoring off **1 / On**: Ground fault monitoring on In exceptional cases, deactivation may be necessary, for example: - Long motor cables Deactivate ground fault monitoring if it responds in an unwanted way. Changed settings become active the next time the product is switched on.	- 0 1 1	UINT16 UINT16 R/W per. expert	CANopen 3005:10h Modbus 1312

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_I_Threshold ConF → i-o- ithr	Monitoring of current threshold (333) The system checks whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter _Iq_act_rms is used as comparison value. In increments of 0.01 A_{rms}. Changed settings become active immediately.	A_{rms} 0.00 0.20 300.00	UINT16 UINT16 R/W per. -	CANopen 3006:1Ch Modbus 1592
MON_IO_SelErr1	First number for the signal output function Selected Error (346) Changed settings become active immediately.	- 0 0 65535	UINT16 UINT16 R/W per. -	CANopen 303B:6h Modbus 15116
MON_IO_SelErr2	Second number for the signal output function Selected Error (346) Changed settings become active immediately.	- 0 0 65535	UINT16 UINT16 R/W per. -	CANopen 303B:7h Modbus 15118
MON_IO_SelWar1	First number for the signal output function Selected Warning (346) Changed settings become active immediately.	- 0 0 65535	UINT16 UINT16 R/W per. -	CANopen 303B:8h Modbus 15120
MON_IO_SelWar2	Second number for the signal output function Selected Warning (346) Changed settings become active immediately.	- 0 0 65535	UINT16 UINT16 R/W per. -	CANopen 303B:9h Modbus 15122

0198441113755, V1.08, 04.2014

<table>
<tr><th>Parameter name
HMI menu
HMI name</th><th>Description</th><th>Unit
Minimum value
Factory setting
Maximum value</th><th>Data type
R/W
Persistent
Expert</th><th>Parameter address via field-bus</th></tr>
<tr><td>MON_MainsVolt</td><td>Detection and monitoring of mains phases (339)

0 / Automatic Mains Detection: Automatic detection and monitoring of mains voltage
1 / DC-Bus Only (Mains 1~230 V / 3~480 V): DC bus supply only, corresponding to mains voltage 230 V (single-phase) or 480 V (three phases)
2 / DC-Bus Only (Mains 1~115 V / 3~208 V): DC bus supply only, corresponding to mains voltage 115 V (single-phase) or 208 V (three phases)
3 / Mains 1~230 V / 3~480 V: Mains voltage 230 V (single-phase) or 480 V (three phases)
4 / Mains 1~115 V / 3~208 V: Mains voltage 115 V (single-phase) or 208 V (three phases)

Value 0: As soon as a mains voltage detected, the device automatically checks whether the mains voltage is 115 V or 230 V in the case of single-phase devices or 208 V or 400/480 V in the case of three-phase devices.

Values 1 ... 2: If the device is supplied only via the DC bus, the parameter has to be set to the voltage value corresponding to the mains voltage of the supplying device. There is no mains voltage monitoring.

Values 3 ... 4: If the mains voltage is not detected properly during start-up, the mains voltage to be used can be selected manually.

Setting can only be changed if power stage is disabled.

Changed settings become active the next time the power stage is enabled.</td><td>-
0
0
4</td><td>UINT16
UINT16
R/W
per.
expert</td><td>CANopen 3005:Fh
Modbus 1310</td></tr>
<tr><td>MON_p_dif_load_usr</td><td>Maximum load-dependent position deviation (following error) (313)

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.

Changed settings become active immediately.

Available with firmware version ≥V01.05.</td><td>usr_p
1
16384
2147483647</td><td>INT32
INT32
R/W
per.
-</td><td>CANopen 3006:3Eh
Modbus 1660</td></tr>
</table>

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_p_dif_load	Maximum load-dependent position deviation (following error) (313) 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. Changed settings become active immediately.	revolution 0.0001 1.0000 200.0000	UINT32 UINT32 R/W per. -	CANopen 6065:0h Modbus 1606
MON_p_dif_warn	Maximum load-dependent position deviation (warning) (312) 100.0 % correspond to the maximum position deviation (following error) as specified by means of parameter MON_p_dif_load. Changed settings become active immediately.	% 0 75 100	UINT16 UINT16 R/W per. -	CANopen 3006:29h Modbus 1618
MON_p_DiffWin_usr	Monitoring of position deviation (327) The system checks whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. The minimum value, the factory setting and the maximum value depend on the scaling factor. Changed settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 16 2147483647	INT32 INT32 R/W per. -	CANopen 3006:3Fh Modbus 1662
MON_p_DiffWin	Monitoring of position deviation (327) The system checks whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. The parameter MON_p_DiffWin_usr allows you to enter the value in user-defined units. In increments of 0.0001 revolution. Changed settings become active immediately.	revolution 0.0000 0.0010 0.9999	UINT16 UINT16 R/W per. -	CANopen 3006:19h Modbus 1586

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 (318) 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. Changed settings become active immediately. Available with firmware version ≥V01.05.	usr_p 0 16 2147483647	INT32 INT32 R/W per. -	CANopen 3006:40h Modbus 1664
`MON_p_win`	Standstill window, permissible control deviation (318) 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. Changed settings become active immediately.	revolution 0.0000 0.0010 3.2767	UINT32 UINT16 R/W per. -	CANopen 6067:0h Modbus 1608
`MON_p_winTime`	Standstill window, time (318) Value 0: Monitoring of standstill window deactivated Value >0: Time in ms during which the control deviation must be in the standstill window Changed settings become active immediately.	ms 0 0 32767	UINT16 UINT16 R/W per. -	CANopen 6068:0h Modbus 1610
`MON_p_winTout`	Timeout time for standstill window monitoring (318) 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. Changed settings become active immediately.	ms 0 0 16000	UINT16 UINT16 R/W per. -	CANopen 3006:26h Modbus 1612

0198441113755, V1.08, 04.2014

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 (309) **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. Changed settings become active immediately.	- 0 0 3	UINT16 UINT16 R/W per. -	CANopen 3006:3h Modbus 1542
MON_SWLimMode	Behavior when position limit is reached (309) **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 Changed settings become active immediately.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3006:47h Modbus 1678
MON_swLimN	Negative position limit for software limit switch (310) Refer to description 'MON_swLimP' Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	usr_p - -2147483648 -	INT32 INT32 R/W per. -	CANopen 607D:1h Modbus 1546
MON_swLimP	Positive position limit for software limit switch (310) 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 changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	usr_p - 2147483647 -	INT32 INT32 R/W per. -	CANopen 607D:2h Modbus 1544
MON_tq_win	Torque window, permissible deviation (315) The torque window can only be activated in operating mode Profile Torque. In increments of 0.1 %. Changed settings become active immediately.	% 0.0 3.0 3000.0	UINT16 UINT16 R/W per. -	CANopen 3006:2Dh Modbus 1626

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MON_tq_winTime	Torque window, time (315) Value 0: Torque window monitoring deactivated Changing the value causes a restart of torque monitoring. NOTE: Torque window is only used in operating mode Profile Torque. Changed settings become active immediately.	ms 0 0 16383	UINT16 UINT16 R/W per. -	CANopen 3006:2Eh Modbus 1628
MON_v_DiffWin	Monitoring of velocity deviation (329) The system checks whether the drive is within the defined deviation during the period set with MON_ChkTime. The status can be output via a parameterizable output. Changed settings become active immediately.	usr_v 1 10 2147483647	UINT32 UINT32 R/W per. -	CANopen 3006:1Ah Modbus 1588
MON_v_Threshold	Monitoring of velocity threshold (331) The system checks whether the drive is below the defined value during the period set with MON_ChkTime. The status can be output via a parameterizable output. Changed settings become active immediately.	usr_v 1 10 2147483647	UINT32 UINT32 R/W per. -	CANopen 3006:1Bh Modbus 1590
MON_v_win	Velocity window, permissible deviation (316) Changed settings become active immediately.	usr_v 1 10 2147483647	UINT16 UINT32 R/W per. -	CANopen 606D:0h Modbus 1576
MON_v_winTime	Velocity window, time (316) Value 0: Velocity window monitoring deactivated Changing the value causes a restart of velocity monitoring. Changed settings become active immediately.	ms 0 0 16383	UINT16 UINT16 R/W per. -	CANopen 606E:0h Modbus 1578
MON_v_zeroclamp	Velocity limit for Zero Clamp (292) A Zero Clamp operation is only possible if the reference velocity is below the Zero Clamp velocity limit. Changed settings become active immediately.	usr_v 0 10 2147483647	UINT32 UINT32 R/W per. -	CANopen 3006:28h Modbus 1616

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
MT_dismax_usr	Maximum permissible distance If the reference value is active and the maximum permissible distance is exceeded, an error of error class 1 is generated. The value 0 switches off monitoring. The minimum value, the factory setting and the maximum value depend on the scaling factor. Changed settings become active the next time the motor moves. Available with firmware version ≥V01.05.	usr_p 0 16384 2147483647	INT32 INT32 R/W - -	CANopen 302E:A$_h$ Modbus 11796
MT_dismax	Maximum permissible distance If the reference value is active and the maximum permissible distance is exceeded, an error of error class 1 is generated. The value 0 switches off monitoring. The parameter MT_dismax_usr allows you to enter the value in user-defined units. In increments of 0.1 revolution. Changed settings become active the next time the motor moves.	revolution 0.0 1.0 999.9	UINT16 UINT16 R/W - -	CANopen 302E:3$_h$ Modbus 11782
PAR_CTRLreset ConF → FCS- rESC	Reset controller parameters **0 / No / no** : No **1 / Yes / YES** : Yes Reset of the controller parameters. The current controller parameters are recalculated on the basis of the motor data of the connected motor. NOTE: Current and velocity limitations are not reset. Therefore, a user parameter reset is required. NOTE: The new settings are not saved to the EEPROM. Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 0 1	UINT16 UINT16 R/W - -	CANopen 3004:7$_h$ Modbus 1038

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
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 changed if power stage is disabled. Changed settings become active immediately. Available with firmware version ≥V01.05.	- 0 0 2	UINT16 UINT16 R/W - -	CANopen 3004:14h Modbus 1064
PAReeprSave	Save parameter values to EEPROM Value 1: Save persistent parameters The currently set parameters are saved to the non-volatile memory (EEPROM). The saving process is complete when the parameter is read and 0 is returned. Changed settings become active immediately.	- - - -	UINT16 UINT16 R/W - -	CANopen 3004:1h Modbus 1026
PARfactorySet ConF → FCS- rStF	Restore factory settings (default values) (187) **No / no** : No **Yes / YES** : Yes The parameters are reset to the factory settings and subsequently saved to the EEPROM. The factory settings can be restored via the HMI or the commissioning software. The saving process is complete when the parameter is read and 0 is returned. Setting can only be changed if power stage is disabled. Changed settings become active the next time the product is switched on.	- 0 - 1	 R/W - -	

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
PARuserReset ConF → FCS- rESu	Reset user parameters (186) **0 / No / no** : No **65535 / Yes / YES** : Yes Bit 0: Set persistent user and controller 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 NOTE: The new settings are not saved to the EEPROM. Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 - 65535	UINT16 UINT16 R/W - -	CANopen 3004:8h Modbus 1040
PosReg1Mode	Selection of comparison criterion for position register channel 1 (323) **0 / Pact greater equal A**: Current position is greater than or equal to comparison value A for position register channel 1 **1 / Pact less equal A**: Current position is less than or equal to comparison value A for position register channel 1 **2 / Pact in [A-B] (basic)**: Current position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Current position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Current position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Current position is out of the range A-B excluding limits (extended) Changed settings become active immediately.	- 0 0 5	UINT16 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 Changed settings become active immediately.	- 0 0 0	UINT16 UINT16 R/W per. -	CANopen 300B:6h Modbus 2828

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
PosReg1Start	Start/stop of position register channel 1 (321) **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 Changed settings become active immediately.	- 0 0 3	UINT16 UINT16 R/W - -	CANopen 300B:2h Modbus 2820
PosReg1ValueA	Comparison value A for position register channel 1 (325)	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:8h Modbus 2832
PosReg1ValueB	Comparison value B for position register channel 1 (325)	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:9h Modbus 2834
PosReg2Mode	Selection of comparison criterion for position register channel 2 (323) **0 / Pact greater equal A**: Current position is greater than or equal to comparison value A for position register channel 2 **1 / Pact less equal A**: Current position is less than or equal to comparison value A for position register channel 2 **2 / Pact in [A-B] (basic)**: Current position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Current position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Current position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Current position is out of the range A-B excluding limits (extended) Changed settings become active immediately.	- 0 0 5	UINT16 UINT16 R/W per. -	CANopen 300B:5h 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 Changed settings become active immediately.	- 0 0 0	UINT16 UINT16 R/W per. -	CANopen 300B:7h Modbus 2830

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
PosReg2Start	Start/stop of position register channel 2 (321) **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 Changed settings become active immediately.	- 0 0 3	UINT16 UINT16 R/W - -	CANopen 300B:3h Modbus 2822
PosReg2ValueA	Comparison value A for position register channel 2 (325)	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:Ah Modbus 2836
PosReg2ValueB	Comparison value B for position register channel 2 (325)	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:Bh Modbus 2838
PosReg3Mode	Selection of comparison criterion for position register channel 3 (324) **0 / Pact greater equal A**: Current position is greater than or equal to comparison value A for position register channel 3 **1 / Pact less equal A**: Current position is less than or equal to comparison value A for position register channel 3 **2 / Pact in [A-B] (basic)**: Current position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Current position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Current position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Current position is out of the range A-B excluding limits (extended) Changed settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 5	UINT16 UINT16 R/W per. -	CANopen 300B:Eh 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 Changed settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 0	UINT16 UINT16 R/W per. -	CANopen 300B:10h Modbus 2848

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`PosReg3Start`	Start/stop of position register channel 3 (321) **0 / Off (keep last state)**: Position Register channel 3 is off and status bit keep 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 Changed settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 3	UINT16 UINT16 R/W - -	CANopen 300B:C$_h$ Modbus 2840
`PosReg3ValueA`	Comparison value A for position register channel 3 (325) Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:12$_h$ Modbus 2852
`PosReg3ValueB`	Comparison value B for position register channel 3 (325) Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:13$_h$ Modbus 2854
`PosReg4Mode`	Selection of comparison criterion for position register channel 4 (324) **0 / Pact greater equal A**: Current position is greater than or equal to comparison value A for position register channel 4 **1 / Pact less equal A**: Current position is less than or equal to comparison value A for position register channel 4 **2 / Pact in [A-B] (basic)**: Current position is in the range A-B including limits (basic) **3 / Pact out [A-B] (basic)**: Current position is out of the range A-B excluding limits (basic) **4 / Pact in [A-B] (extended)**: Current position is in the range A-B including limits (extended) **5 / Pact out [A-B] (extended)**: Current position is out of the range A-B excluding limits (extended) Changed settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 5	UINT16 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 Changed settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 0	UINT16 UINT16 R/W per. -	CANopen 300B:11$_h$ Modbus 2850

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
PosReg4Start	Start/stop of position register channel 4 (321) **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 Changed settings become active immediately. Available with firmware version ≥V01.06.	- 0 0 3	UINT16 UINT16 R/W - -	CANopen 300B:D$_h$ Modbus 2842
PosReg4ValueA	Comparison value A for position register channel 4 (325) Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:14$_h$ Modbus 2856
PosReg4ValueB	Comparison value B for position register channel 4 (325) Available with firmware version ≥V01.06.	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 300B:15$_h$ Modbus 2858
PosRegGroupStart	Start/stop of position register channels (322) **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 Changed settings become active immediately. Available with firmware version ≥V01.14.	- 0 0 15	UINT16 UINT16 R/W per. -	CANopen 300B:16$_h$ Modbus 2860

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
PP_ModeRangeLim	Absolute movement beyond movement range (237) **0 / NoAbsMoveAllowed**: Absolute movement beyond movement range is not possible **1 / AbsMoveAllowed**: Absolute movement beyond movement range is possible Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3023:7h Modbus 8974
PP_OpmChgType	Change to operating mode Profile Position during movements (201) **0 / WithStandStill**: Change with standstill **1 / OnTheFly**: Change without standstill Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled. Available with firmware version ≥V01.06.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3023:9h Modbus 8978
PPoption	Options for operating mode Profile Position (216) 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 Changed settings become active the next time the motor moves.	- 0 0 2	UINT16 UINT16 R/W - -	CANopen 60F2:0h Modbus 6960
PPp_target	Target position for operating mode Profile Position (215) Minimum/maximum values depend on: - Scaling factor - Software limit switches (if they are activated) Changed settings become active immediately.	usr_p - - -	INT32 INT32 R/W - -	CANopen 607A:0h Modbus 6940
PPv_target	Target velocity for operating mode Profile Position (215) The target velocity is limited to the setting in CTRL_v_max and RAMP_v_max. Changed settings become active the next time the motor moves.	usr_v 1 60 4294967295	UINT32 UINT32 R/W - -	CANopen 6081:0h Modbus 6942

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
PTtq_target	Target torque for operating mode Profile Torque (209) 100.0 % correspond to the continuous stall torque _M_M_0. In increments of 0.1 %. Changed settings become active immediately.	% -3000.0 0.0 3000.0	INT16 INT16 R/W - -	CANopen 6071:0$_h$ Modbus 6944
PVv_target	Target velocity for operating mode Profile Velocity (212) The target velocity is limited to the setting in CTRL_v_max and RAMP_v_max. Changed settings become active immediately.	usr_v - 0 -	INT32 INT32 R/W - -	CANopen 60FF:0$_h$ Modbus 6938
RAMP_tq_enable	Activation of the motion profile for torque (210) **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 changed if power stage is disabled. Changed settings become active immediately.	- 0 1 1	UINT16 UINT16 R/W per. -	CANopen 3006:2C$_h$ Modbus 1624
RAMP_tq_slope	Slope setting of the motion profile for torque (210) 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. Changed settings become active immediately.	%/s 0.1 10000.0 3000000.0	UINT32 UINT32 R/W per. -	CANopen 6087:0$_h$ Modbus 1620
RAMP_v_acc	Acceleration of the motion profile for velocity (264) Writing the value 0 has no effect on the parameter. Changed settings become active the next time the motor moves.	usr_a 1 600 2147483647	UINT32 UINT32 R/W per. -	CANopen 6083:0$_h$ Modbus 1556

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
RAMP_v_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. Changed settings become active the next time the motor moves.	usr_a 1 600 2147483647	UINT32 UINT32 R/W per. -	CANopen 6084:0h Modbus 1558
RAMP_v_enable	Activation of the motion profile for velocity (264) **0 / Profile Off**: Profile off **1 / Profile On**: Profile on Setting can only be changed if power stage is disabled. Changed settings become active immediately.	- 0 1 1	UINT16 UINT16 R/W per. -	CANopen 3006:2Bh Modbus 1622
RAMP_v_jerk ConF → drC- JEr	Jerk limitation of the motion profile for velocity (291) **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). Changed settings become active the next time the motor moves.	ms 0 0 128	UINT16 UINT16 R/W per. -	CANopen 3006:Dh Modbus 1562
RAMP_v_max ConF → ACG- nrMP	Maximum velocity of the motion profile for velocity (264) If a greater reference speed is set in one of these operating modes, it is automatically limited to RAMP_v_max. This way, commissioning at limited speed is easier to perform. Setting can only be changed if power stage is disabled. Changed settings become active the next time the motor moves.	usr_v 1 13200 2147483647	UINT32 UINT32 R/W per. -	CANopen 607F:0h Modbus 1554

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
RAMP_v_sym	Acceleration and deceleration of the motion profile for velocity The values are internally multiplied by 10 (example: 1 = 10 min^{-1}/s). Write access changes the values under RAMP_v_acc and RAMP_v_dec. The limit values are checked on the basis of the values indicated for these parameters. Read access returns the greater value from RAMP_v_acc/RAMP_v_dec. If the value cannot be represented as a 16 bit value, the value is set to 65535 (maximum UINT16 value) Changed settings become active the next time the motor moves.	- - - -	UINT16 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 min^{-1}/s). Write access changes the values in RAMP_v_acc and RAMP_v_dec. The limit values are checked on the basis of the values indicated for these parameters. If the value cannot be represented as a 16 bit value, the value is set to 65535 (maximum UINT16 value). Changed settings become active the next time the motor moves.	- - - -	UINT32 UINT32 R/W - -	CANopen 3006:2h Modbus 1540
RAMPquickstop	Deceleration ramp for Quick Stop (287) Deceleration ramp for a software stop or an error with error class 1 or 2. Changed settings become active the next time the motor moves.	usr_a 1 6000 2147483647	UINT32 UINT32 R/W per. -	CANopen 3006:12h Modbus 1572
RESext_P ConF → ACG- Pobr	Nominal power of external braking resistor (162) Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	W 1 10 32767	UINT16 UINT16 R/W per. -	CANopen 3005:12h Modbus 1316
RESext_R ConF → ACG- rbr	Resistance value of external braking resistor (162) The minimum value depends on the power stage. In increments of 0.01 Ω. Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	Ω 0.00 100.00 327.67	UINT16 UINT16 R/W per. -	CANopen 3005:13h Modbus 1318

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
RESext_ton ConF → ACG- tbr	Maximum permissible switch-on time of external braking resistor (162) Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	ms 1 1 30000	UINT16 UINT16 R/W per. -	CANopen 3005:11h Modbus 1314
RESint_ext ConF → ACG- Eibr	Selection of type of braking resistor (162) **0 / Internal Braking Resistor / int** : Internal braking resistor **1 / External Braking Resistor / Eht** : External braking resistor **2 / Reserved / rSUd** : Reserved Setting can only be changed if power stage is disabled. Changed settings become active the next time the power stage is enabled.	- 0 0 2	UINT16 UINT16 R/W per. -	CANopen 3005:9h Modbus 1298
RMAC_Activate	Activation of relative movement after capture (303) **0 / Off**: Off **1 / On**: On Changed settings become active immediately. Available with firmware version ≥V01.10.	- 0 0 1	UINT16 UINT16 R/W - -	CANopen 3023:Ch Modbus 8984
RMAC_Edge	Edge of capture signal for relative movement after capture (304) **0 / Falling edge**: Falling edge **1 / Rising edge**: Rising edge Available with firmware version ≥V01.10.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3023:10h Modbus 8992
RMAC_Position	Target position of relative movement after capture (304) Minimum/maximum values depend on: - Scaling factor Changed settings become active the next time the motor moves. Available with firmware version ≥V01.10.	usr_p - 0 -	INT32 INT32 R/W per. -	CANopen 3023:Dh Modbus 8986
RMAC_Response	Response if target postion is overtraveld (304) **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 Changed settings become active immediately. Available with firmware version ≥V01.10.	- 0 0 2	UINT16 UINT16 R/W per. -	CANopen 3023:Fh Modbus 8990

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`RMAC_Velocity`	Velocity of relative movement after capture (304) Value 0: Use of current motor velocity Value >0: Value is the target velocity The adjustable value is internally limited to the setting in RAMP_v_max. Changed settings become active the next time the motor moves. Available with firmware version ≥V01.10.	usr_v 0 0 2147483647	UINT32 UINT32 R/W per. -	CANopen 3023:E$_h$ Modbus 8988
`ScalePOSdenom`	Position scaling: Denominator (248) Refer to numerator (ScalePOSnum) for a description. A new scaling is activated when the numerator value is supplied. Setting can only be changed if power stage is disabled.	usr_p 1 16384 2147483647	INT32 INT32 R/W per. -	CANopen 3006:7$_h$ Modbus 1550
`ScalePOSnum`	Position scaling: Numerator (248) 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 changed if power stage is disabled. Changed settings become active immediately.	revolution 1 1 2147483647	INT32 INT32 R/W per. -	CANopen 3006:8$_h$ Modbus 1552
`ScaleRAMPdenom`	Ramp scaling: Denominator (250) Refer to numerator (ScaleRAMPnum) for a description. A new scaling is activated when the numerator value is supplied. Setting can only be changed if power stage is disabled.	usr_a 1 1 2147483647	INT32 INT32 R/W per. -	CANopen 3006:30$_h$ Modbus 1632
`ScaleRAMPnum`	Ramp scaling: Numerator (250) Setting can only be changed if power stage is disabled. Changed settings become active immediately.	min^{-1}/s 1 1 2147483647	INT32 INT32 R/W per. -	CANopen 3006:31$_h$ Modbus 1634
`ScaleVELdenom`	Velocity scaling: Denominator (249) Refer to numerator (ScaleVELnum) for a description. A new scaling is activated when the numerator value is supplied. Setting can only be changed if power stage is disabled.	usr_v 1 1 2147483647	INT32 INT32 R/W per. -	CANopen 3006:21$_h$ Modbus 1602

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
ScaleVELnum	Velocity scaling: Numerator (249) Specification of the scaling factor: Speed of rotation of motor [min^{-1}] -- User-defined units [usr_v] A new scaling is activated when the numerator value is supplied. Setting can only be changed if power stage is disabled. Changed settings become active immediately.	min^{-1} 1 1 2147483647	INT32 INT32 R/W per. -	CANopen 3006:22$_h$ Modbus 1604
ShiftEncWorkRang	Shifting of the encoder working range (160) **0 / Off**: Shifting off **1 / On**: Shifting on Value 0: Position values are between 0 ... 4096 revolutions. Value 1: Position values are between -2048 ... 2048 revolutions. After activating the shifting function, the position range of a multiturn encoder is shifted for half of the range. Example for the position range of a multiturn encoder with 4096 revolutions. Changed settings become active the next time the product is switched on.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3005:21$_h$ Modbus 1346

0198441113755, V1.08, 04.2014

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
SimAbsolutePos ConF → ACG- qAbS	Simulation of absolute position at power cycling **0 / Simulation Off / oFF** : Do not use the last mechanical position after power cycling **1 / Simulation On / on** : Use last mechanical position after power cycling This parameter specifies the way position values are handled over a power cycle and allows for the simulation of an absolute position encoder using singleturn encoders. If this function is activated, the device saves the pertinent position data prior to a shutdown so that it can restore the mechanical position the next time it is switched on. In the case of singleturn encoders, the position can be restored if the motor shaft has not been moved by more than 0.25 revolutions while the drive was off. In the case of multiturn encoders, the permissible shaft movement while the drive is off can be much greater, depending on the type of multiturn encoder. For this function to work, the drive may only be shut down while the motor is at a standstill and the motor shaft must not be moved outside of the permissible range (for example, use a holding brake). Changed settings become active immediately. Available with firmware version ≥V01.03.	- 0 0 1	UINT16 UINT16 R/W per. -	CANopen 3005:23h Modbus 1350
SyncMechStart	Activation of synchronization mechanism (219) 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. Changed settings become active immediately.	- 0 0 2	UINT16 UINT16 R/W - -	CANopen 3022:5h Modbus 8714

Parameter name HMI menu HMI name	Description	Unit Minimum value Factory setting Maximum value	Data type R/W Persistent Expert	Parameter address via field-bus
`SyncMechStatus`	Status of synchronization mechanism (219) 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 UINT16 R/- - -	CANopen 3022:6h Modbus 8716
`SyncMechTol`	Synchronization tolerance (219) This parameter is used to increase the synchronization tolerance in the operating mode Interpolated Position. The value is applied when the synchronization mechanism is activated via the parameter SyncMechStart. Changed settings become active immediately. Available with firmware version ≥V01.08.	- 1 1 20	UINT16 UINT16 R/W - -	CANopen 3022:4h Modbus 8712
`TouchProbeFct`	Touch Probe function (298) Refers to chapter "Touch probe functionality" of the DS402 part2 (operation modes and application data) document. Changed settings become active immediately.	- - - -	UINT16 UINT16 R/W - -	CANopen 60B8:0h Modbus 7028

11 Accessories and spare parts

11.1 Commissioning tools

Description	Order no.
Commissioning software, can be downloaded at: www.schneider-electric.com	-
PC connection kit, serial connection between drive and PC, USB-A to RJ45	TCSMCNAM3M002P
Multi-Loader, device for copying the parameter settings to a PC or to another drive	VW3A8121
Modbus cable, 1 m, 2 x RJ45	VW3A8306R10
External graphic display terminal	VW3A1101

11.2 Memory cards

Description	Order no.
Memory card for copying parameter settings	VW3M8705
25 memory cards for copying parameter settings	VW3M8704

11.3 Application nameplate

Description	Order no.
Application nameplate to be clipped onto the top of the drive, size 38.5 mm x 13 mm for label size 1.5 inches x 0.5 inches, 50 pieces	VW3M2501

0198441113755, V1.08, 04.2014

11.4 CANopen cable with connectors

Description	Order no.
CANopen cable, 0.3 m, 2 x RJ45	VW3CANCARR03
CANopen cable, 1 m, 2 x RJ45	VW3CANCARR1
2 m, 2 x RJ45, shielded twisted pair cable	490NTW00002
5 m, 2 x RJ45, shielded twisted pair cable	490NTW00005
12 m, 2 x RJ45, shielded twisted pair cable	490NTW00012
2 m, 2 x RJ45, shielded twisted pair cable with UL and CSA 22.1 certification	490NTW00002U
5 m, 2 x RJ45, shielded twisted pair cable with UL and CSA 22.1 certification	490NTW00005U
12 m, 2 x RJ45, shielded twisted pair cable with UL and CSA 22.1 certification	490NTW00012U
CANopen cable, 1 m, D9-SUB (female) to RJ45	TCSCCN4F3M1T
CANopen cable, 1 m, D9-SUB (female) with integrated terminating resistor to RJ45	VW3M3805R010
CANopen cable, 3 m, D9-SUB (female) with integrated terminating resistor to RJ45	VW3M3805R030
CANopen cable, 0.3 m, 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, 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, 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, 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, 2 x D9-SUB (female), flame-retardant, tested as per IEC 60332-2, UL certification	TSXCANCBDD03
CANopen cable, 1 m, 2 x D9-SUB (female), flame-retardant, tested as per IEC 60332-2, UL certification	TSXCANCBDD1
CANopen cable, 3 m, 2 x D9-SUB (female), flame-retardant, tested as per IEC 60332-2, UL certification	TSXCANCBDD3
CANopen cable, 5 m, 2 x D9-SUB (female), flame-retardant, tested as per IEC 60332-2, UL certification	TSXCANCBDD5

11.5 CANopen connectors, distributors, terminating resistors

Description	Order no.
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
Two-port tap, for connection of 2 drop lines to trunk line, 4 x D9-SUB (male) with switchable terminating resistor	TSXCANTDM4
CANopen adapter cable D9-SUB to RJ45, 3 m	TCSCCN4F3M3T

0198441113755, V1.08, 04.2014

11.6 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	Order no.
CANopen cable, 50 m, [(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, [(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, [(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, [(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, [(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, [(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, [(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, [(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, [(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

11.7 Adapter cable for encoder signals LXM05/LXM15 to LXM32

Description	Order no.
Encoder adapter cable Molex 12-pin (LXM05) to RJ45 10-pin (LXM32), 1 m	VW3M8111R10
Encoder adapter cable D15-SUB (LXM15) to RJ45 10-pin (LXM32), 1 m	VW3M8112R10

0198441113755, V1.08, 04.2014

11.8 Motor cables

11.8.1 Motor cables 1.5 mm^2

Description	Order no.
Motor cable 1.5 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R15
Motor cable 3 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R30
Motor cable 5 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R50
Motor cable 10 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R100
Motor cable 15 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R150
Motor cable 20 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R200
Motor cable 25 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R250
Motor cable 50 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R500
Motor cable 75 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R750
Motor cable 25 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5301R250
Motor cable 50 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5301R500
Motor cable 100 m, [(4 x 1.5 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5301R1000

0198441113755, V1.08, 04.2014

11.8.2 Motor cables 2.5 mm²

Description	Order no.
Motor cable 1.5 m, [(4 x 2.5 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R15
Motor cable 3 m, [(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, [(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, [(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, [(4 x 2.5 mm²) + (2 x 1 mm²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R150
Motor cable 20 m, [(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, [(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, [(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, [(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, [(4 x 2.5 mm²) + (2 x 1 mm²)] shielded; both cable ends open	VW3M5302R250
Motor cable 50 m, [(4 x 2.5 mm²) + (2 x 1 mm²)] shielded; both cable ends open	VW3M5302R500
Motor cable 100 m, [(4 x 2.5 mm²) + (2 x 1 mm²)] shielded; both cable ends open	VW3M5302R1000

11.8.3 Motor cables 4 mm²

Description	Order no.
Motor cable 3 m, [(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, [(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, [(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, [(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, [(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, [(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, [(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, [(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, [(4 x 4 mm²) + (2 x 1 mm²)] shielded; both cable ends open	VW3M5303R250
Motor cable 50 m, [(4 x 4 mm²) + (2 x 1 mm²)] shielded; both cable ends open	VW3M5303R500
Motor cable 100 m, [(4 x 4 mm²) + (2 x 1 mm²)] shielded; both cable ends open	VW3M5303R1000

0198441113755, V1.08, 04.2014

11.8.4 Motor cables 6 mm^2

Description	Order no.
Motor cable 3 m, [(4 x 6 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R30
Motor cable 5 m, [(4 x 6 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R50
Motor cable 10 m, [(4 x 6 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R100
Motor cable 15 m, [(4 x 6 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R150
Motor cable 20 m, [(4 x 6 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R200
Motor cable 25 m, [(4 x 6 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R250
Motor cable 50 m, [(4 x 6 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R500
Motor cable 75 m, [(4 x 6 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R750
Motor cable 25 m, [(4 x 6 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5305R250
Motor cable 50 m, [(4 x 6 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5305R500
Motor cable 100 m, [(4 x 6 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5305R1000

11.8.5 Motor cables 10 mm^2

Description	Order no.
Motor cable 3 m, [(4 x 10 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R30
Motor cable 5 m, [(4 x 10 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R50
Motor cable 10 m, [(4 x 10 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R100
Motor cable 15 m, [(4 x 10 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R150
Motor cable 20 m, [(4 x 10 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R200
Motor cable 25 m, [(4 x 10 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R250
Motor cable 50 m, [(4 x 10 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R500
Motor cable 75 m, [(4 x 10 mm^2) + (2 x 1 mm^2)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R750
Motor cable 25 m, [(4 x 10 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5304R250
Motor cable 50 m, [(4 x 10 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5304R500
Motor cable 100 m, [(4 x 10 mm^2) + (2 x 1 mm^2)] shielded; both cable ends open	VW3M5304R1000

0198441113755, V1.08, 04.2014

11.9 Encoder cables

Suitable for BMH motors:

Description	Order no.
Encoder cable 1.5 m, [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, [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, [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, [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, [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
Encoder cable 20 m, [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	VW3M8102R200
Encoder cable 25 m, [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	VW3M8102R250
Encoder cable 50 m, [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	VW3M8102R500
Encoder cable 75 m, [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	VW3M8102R750
Encoder cable 25 m, [3 x (2 x 0.14 mm²) + (2 x 0.34 mm²)] shielded; both cable ends open	VW3M8222R250
Encoder cable 50 m, [3 x (2 x 0.14 mm²) + (2 x 0.34 mm²)] shielded; both cable ends open	VW3M8222R500
Encoder cable 100 m, [3 x (2 x 0.14 mm²) + (2 x 0.34 mm²)] shielded; both cable ends open	VW3M8222R1000
D9-SUB (male) connector, for encoder module resolver	AEOCON011
Encoder cable 100 m, [5 x (2 x 0.25 mm²) + (2 x 0.5 mm²)] shielded; both cable ends open	VW3M8221R1000
Encoder cable 1 m, shielded; HD15 D-SUB (male); other cable end open	VW3M4701

11.10 Connectors

Description	Order no.
Encoder connector (cable end) for motor M23, 5 pcs	VW3M8214
Encoder connector (cable end) for drive RJ45 (10 pins), 5 pcs	VW3M2208
Motor connector (cable end) M23, 1.5 ... 2.5 mm², 5 pcs	VW3M8215
Motor connector (cable end) M40, 4 mm², 5 pcs	VW3M8217

Extras The tools required for cable assembly can be ordered directly from the manufacturer.

- Crimping tool for encoder connector M23:
  Coninvers SF-Z0007 www.coninvers.com
- Crimping tool for power connector M23/M40:
  Coninvers SF-Z0008 www.coninvers.com
- Crimping tools for encoder connector RJ45 10 pins:
  Yamaichi Y-ConTool-11, Y-ConTool-20, Y-ConTool-30
  www.yamaichi.com

11.11 External braking resistors

Description	Order no.
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 0.75 m connection cable (2.1 mm²), UL	VW3A7601R07
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 2 m connection cable (2.1 mm²), UL	VW3A7601R20
Braking resistor IP65; 10 Ω; maximum continuous power 400 W; 3 m connection cable (2.1 mm²), UL	VW3A7601R30
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 0.75 m connection cable (2.1 mm²), UL	VW3A7602R07
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 2 m connection cable (2.1 mm²), UL	VW3A7602R20
Braking resistor IP65; 27 Ω; maximum continuous power 100 W; 3 m connection cable (2.1 mm²), UL	VW3A7602R30
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 0.75 m connection cable (2.1 mm²), UL	VW3A7603R07
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 2 m connection cable (2.1 mm²), UL	VW3A7603R20
Braking resistor IP65; 27 Ω; maximum continuous power 200 W; 3 m connection cable (2.1 mm²), UL	VW3A7603R30
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 0.75 m connection cable (2.1 mm²), UL	VW3A7604R07
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 2 m connection cable (2.1 mm²), UL	VW3A7604R20
Braking resistor IP65; 27 Ω; maximum continuous power 400 W; 3 m connection cable (2.1 mm²), UL	VW3A7604R30
Braking resistor IP65; 72 Ω; maximum continuous power 100 W; 0.75 m connection cable (2.1 mm²), UL	VW3A7605R07
Braking resistor IP65; 72 Ω; maximum continuous power 100 W; 2 m connection cable (2.1 mm²), UL	VW3A7605R20
Braking resistor IP65; 72 Ω; maximum continuous power 100 W; 3 m connection cable (2.1 mm²), UL	VW3A7605R30
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 0.75 m connection cable (2.1 mm²), UL	VW3A7606R07
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 2 m connection cable (2.1 mm²), UL	VW3A7606R20
Braking resistor IP65; 72 Ω; maximum continuous power 200 W; 3 m connection cable (2.1 mm²), UL	VW3A7606R30
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 0.75 m connection cable	VW3A7607R07
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 2 m connection cable	VW3A7607R20
Braking resistor IP65; 72 Ω; maximum continuous power 400 W; 3 m connection cable	VW3A7607R30
Braking resistor IP65; 100 Ω; maximum continuous power 100 W; 0.75 m connection cable	VW3A7608R07
Braking resistor IP65; 100 Ω; maximum continuous power 100 W; 2 m connection cable	VW3A7608R20
Braking resistor IP65; 100 Ω; maximum continuous power 100 W; 3 m connection cable	VW3A7608R30
Braking resistor IP20; 15 Ω; maximum continuous power 1000 W; M6 terminals, UL	VW3A7704
Braking resistor IP20; 10 Ω; maximum continuous power 1000 W; M6 terminals, UL	VW3A7705

0198441113755, V1.08, 04.2014

11.12 DC bus accessories

Description	Order no.
DC bus connection cable, pre-assembled, 0.1 m, 5 pieces	VW3M7101R01
LXM ATV cable for DC bus, 2* 5.3 mm² (2* AWG 10), shielded, 15 m	VW3M7102R150
DC bus connector kit, connector housing and contacts, 10 pieces	VW3M2207

A crimping tool is required for the crimp contacts of the connector kit.
Manufacturer:
Tyco Electronics, Heavy Head Hand Tool, Tool Pt. No 180250

11.13 Mains reactors

Description	Order no.
Mains reactor 1~; 50-60 Hz; 7 A; 5 mH; IP00	VZ1L007UM50
Mains reactor 1~; 50-60 Hz; 18 A; 2 mH; IP00	VZ1L018UM20
Mains reactor 3~; 50-60 Hz; 16 A; 2 mH; IP00	VW3A4553
Mains reactor 3~; 50-60 Hz; 30 A; 1 mH; IP00	VW3A4554

11.14 External mains filters

Description	Order no.
Mains filter 1~; 9 A; 115/230 Vac for LXM32	VW3A4420
Mains filter 1~; 16 A; 115/230 Vac for LXM32	VW3A4421
Mains filter 3~; 15 A; 208/400/480 Vac for LXM32	VW3A4422
Mains filter 3~; 25 A; 208/400/480 Vac for LXM32	VW3A4423

11.15 Spare parts connectors, fans, cover plates

Description	Order no.
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 mm x 40 mm, plastic housing, with connection cable	VW3M2401
Cooling fan kit 60 mm x 60 mm, plastic housing, with connection cable	VW3M2402
Cooling fan kit 80 mm x 80 mm, plastic housing, with connection cable	VW3M2403

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014

12 Service, maintenance and disposal

The product may only be repaired by a Schneider Electric customer service center. No warranty or liability is accepted for repairs made by unauthorized persons.

12.1 Service address

If you cannot resolve an error yourself please contact your sales office. Have the following details available:

- Nameplate (type, identification number, serial number, DOM, ...)
- Type of error (with LED flash code or error number)
- Previous and concomitant circumstances
- Your own assumptions concerning the cause of the error

Also include this information if you return the product for inspection or repair.

If you have any questions please contact your sales office. Your sales office staff will be happy to give you the name of a customer service office in your area.

http://www.schneider-electric.com

12.2 Maintenance

Check the product for pollution or damage at regular intervals.

12.2.1 Lifetime safety function STO

The STO safety function is designed for a lifetime of 20 years. After this period, the data of the safety function are no longer valid. The expiry date is determined by adding 20 years to the DOM shown on the nameplate of the product.

▶ This date must be included in the maintenance plan of the system.

Do not use the safety function after this date.

Example The DOM on the nameplate of the product is shown in the format DD.MM.YY, for example 31.12.08. (31 December 2008). This means: Do not use the safety function after December 31, 2028.

12.3 Replacement of drive

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

Observe the following procedure when replacing devices.

- ▶ Save all parameter settings. To do so, use a memory card, see chapter "6.7 Memory Card", page 181, or save the data to a PC using the commissioning software, see chapter "6.4 Commissioning software", page 137.
- ▶ Switch off all supply voltages. Verify that no voltages are present (safety instructions).
- ▶ Label all connections and remove all connection cables (unlock connector locks).
- ▶ Uninstall the product.
- ▶ Note the identification number and the serial number shown on the product nameplate for later identification.
- ▶ Install the new product as per chapter "5 Installation".
- ▶ If the product to be installed has previously been used in a different system or application, you must restore the factory settings before commissioning the product.
- ▶ Commission the product as per chapter "6 Commissioning".

12.4 Changing the motor

⚠ WARNING

UNEXPECTED MOVEMENT

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

- Operate the device with approved motors only. Even if motors are similar, different adjustment of the encoder system may be a source of hazards.
- Even if the connectors for motor connection and encoder connection match mechanically, this does NOT imply that they may be used.

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

- ▸ Switch off all supply voltages. Verify that no voltages are present (safety instructions).
- ▸ Label all connections and uninstall the product.
- ▸ Note the identification number and the serial number shown on the product nameplate for later identification.
- ▸ Install the new product as per chapter "5 Installation".

If the connected motor is replaced by another motor, the motor data set is read again. If the device detects a different motor type, the controller parameters are recalculated and the HMI displays MOT. See chapter "9.3.3 Acknowledging a motor change", page 358 for additional information.

If the motor is replaced, the encoder parameters must also be readjusted, see chapter "6.5.9 Setting parameters for encoder", page 157.

Changing the motor type temporarily

- ▸ If you want to operate the new motor type only temporarily via the device, press ESC at the HMI.
- ◃ The newly calculated controller parameters are not saved to the EEPROM. This way, you can resume operation with the original motor using the saved controller parameters.

Changing the motor type permanently

- ▸ If you want to operate the new motor type permanently via this device, press the navigation button at the HMI.
- ◃ The newly calculated controller parameters are saved to the EEPROM.

See also chapter "9.3.3 Acknowledging a motor change", page 358.

0198441113755, V1.08, 04.2014

12.5 Shipping, storage, disposal

Note the ambient conditions on page 23.

Shipping The product must be protected against shocks during transportation. If possible, use the original packaging for shipping.

Storage The product may only be stored in spaces where the specified permissible ambient conditions are met.
Protect the product from dust and dirt.

Disposal The product consists of various materials that can be recycled. Dispose of the product in accordance with local regulations.

Visit http://www.schneider-electric.com for information and documents on environmental protection as per ISO 14025 such as:

- EoLi (Product End-of-Life Instructions)
- PEP (Product Environmental Profile)

0198441113755, V1.08, 04.2014

Glossary

Units and conversion tables

The value in the specified unit (left column) is calculated for the desired unit (top row) with the formula (in the field).

Example: conversion of 5 meters (m) to yards (yd)
5 m / 0.9144 = 5.468 yd

Length

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

Mass

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

Force

	lb	oz	p	N
lb	-	* 16	* 453.55358	* 4.448222
oz	/ 16	-	* 28.349524	* 0.27801
p	/ 453.55358	/ 28.349524	-	* 9.807*10^{-3}
N	/ 4.448222	/ 0.27801	/ 9.807*10^{-3}	-

Power

	HP	W
HP	-	* 746
W	/ 746	-

0198441113755, V1.08, 04.2014

Rotation

	min^{-1} (RPM)	rad/s	deg./s
min^{-1} (RPM)	-	* π / 30	* 6
rad/s	* 30 / π	-	* 57.295
deg./s	/ 6	/ 57.295	-

Torque

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

Moment of inertia

	lb·in^2	lb·ft^2	kg·m^2	kg·cm^2	kp·cm·s^2	oz·in^2
lb·in^2	-	/ 144	/ 3417.16	/ 0.341716	/ 335.109	* 16
lb·ft^2	* 144	-	* 0.04214	* 421.4	* 0.429711	* 2304
kg·m^2	* 3417.16	/ 0.04214	-	* $10*10^3$	* 10.1972	* 54674
kg·cm^2	* 0.341716	/ 421.4	/ $10*10^3$	-	/ 980.665	* 5.46
kp·cm·s^2	* 335.109	/ 0.429711	/ 10.1972	* 980.665	-	* 5361.74
oz·in^2	/ 16	/ 2304	/ 54674	/ 5.46	/ 5361.74	-

Temperature

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

Conductor cross section

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

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

0198441113755, V1.08, 04.2014

Terms and Abbreviations

See chapter " Standards and terminology" for information on the pertinent standards on which many terms are based. Some terms and abbreviations may have specific meanings with regard to the standards.

AC Alternating current

Actual position Current position of moving components in the drive system.

CAN (**C**ontroller **A**rea **N**etwork), standardized open fieldbus as per ISO 11898, allows drives and other devices from different manufacturers to communicate.

CCW **C**ounter **C**lock**w**ise.

CW **C**lock**w**ise.

DC Direct current

DC bus Circuit that supplies the power stage with energy (direct voltage).

DOM **D**ate **o**f **m**anufacturing: The nameplate of the product shows the date of manufacture in the format DD.MM.YY or in the format DD.MM.YYYY. For example:
31.12.11 corresponds to December 31, 2011
31.12.2011 corresponds to December 31, 2011

Degree of protection The degree of protection is a standardized specification for electrical equipment that describes the protection against the ingress of foreign objects and water (for example: IP 20).

Direction of rotation Rotation of the motor shaft in a positive or negative direction of rotation. Positive direction of rotation is when the motor shaft rotates clockwise as you look at the end of the protruding motor shaft.

Drive system System consisting of controller, drive and motor.

EMC Electromagnetic compatibility

Encoder Sensor that converts a measured distance or angle into an electrical signal. This signal is evaluated by the drive to determine the actual position of a shaft (rotor) or a driving unit.

Error Discrepancy between a detected (computed, measured or signaled) value or condition and the specified or theoretically correct value or condition.

Error class Classification of errors into groups. The different error classes allow for specific responses to errors, for example by severity.

Factory setting Factory settings when the product is shipped

Fault Fault is an operating state. If the monitoring functions detect an error, a transition to this operating state is triggered, depending on the error class. A "Fault Reset" is required to exit this operating state after the cause of the detected error has been removed. Further information can be found in the pertinent standards such as IEC 61800-7, ODVA Common Industrial Protocol (CIP).

Fault Reset A function used to restore the drive to an operational state after a detected error is cleared by removing the cause of the error so that the error is no longer active.

0198441113755, V1.08, 04.2014

Holding brake	The holding brake in the motor has the task of holding the current motor position when the power stage is disabled, even if external forces act (for example, in the case of a vertical axis). The holding brake is not a safety function and not a service brake.
I/O	Inputs/outputs
I^2t monitoring	Anticipatory temperature monitoring. The expected temperature rise of components is calculated in advance on the basis of the motor current. If a limit value is exceeded, the drive reduces the motor current.
IT mains	Mains in which all active components are isolated from ground or are grounded by a high impedance. IT: isolé terre (French), isolated ground. Opposite: Grounded mains, see TT/TN mains
Inc	Increments
Index pulse	Signal of an encoder to reference the rotor position in the motor. The encoder returns one index pulse per revolution.
Internal units	Resolution of the power stage at which the motor can be positioned. Internal units are specified in increments.
Limit switch	Switches that signal overtravel of the permissible range of travel.
Monitoring function	Monitoring functions acquire a value continuously or cyclically (for example, by measuring) in order to check whether it is within permissible limits. Monitoring functions are used for error detection.
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.
PC	Personal Computer
PELV	Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41
PLC	Programmable logic controller
Parameter	Device data and values that can be read and set (to a certain extent) by the user.
Persistent	Indicates whether the value of the parameter remains in the memory after the device is switched off.
Power stage	The power stage controls the motor. The power stage generates current for controlling the motor on the basis of the motion signals from the controller.
Pulse/direction signals	Digital signals with variable pulse frequencies which signal changes in position and direction of movement via separate signal wires.
Quick Stop	The Quick Stop function can be used for fast deceleration of a movement as a response to a detected error or via a command.
RCD	RCD residual current device.
rms	"Root Mean Square" value of a voltage (V_{rms}) or a current (A_{rms})
RS485	Fieldbus interface as per EIA-485 which enables serial data transmission with multiple devices.

0198441113755, V1.08, 04.2014

Safety function Safety functions are defined in the standard IEC 61800-5-2 (for example, Safe Torque Off (STO), Safe Operating Stop (SOS) or Safe Stop 1 (SS1)). If the safety functions are wired properly, they meet the requirements specified in IEC 61800-5-2.

Scaling factor This factor is the ratio between an internal unit and a user-defined unit.

TT mains, TN mains Grounded mains, differ in terms of the ground connection (PE conductor connection). Opposite: Ungrounded mains, see IT mains.

User-defined unit Unit whose reference to motor movement can be determined by the user via parameters.

Warning If the term is used outside the context of safety instructions, a warning alerts to a potential problem that was detected by a monitoring function. A warning does not cause a transition of the operating state.

0198441113755, V1.08, 04.2014

Table of figures

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014

Index

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014

0198441113755, V1.08, 04.2014