ILE1B, ILE1F, ILE1R
Lexium Integrated Drive
Product manual
V2.00, 09.2008
Important information

This manual is part of the product. Carefully read this manual and observe all instructions. Keep this manual for future reference. Hand this manual and all other pertinent product documentation over to all users of the product. Carefully read and observe all safety instructions and the chapter "Before you begin - safety information".

Important information

Some products are not available in all countries. For information on the availability of products, please consult the catalog. Subject to technical modifications without notice. All details provided are technical data which do not constitute warranted qualities. Most of the product designations are registered trademarks of their respective owners, even if this is not explicitly indicated.
## Table of Contents

### Important information ................................................. 2

### Table of Contents ..................................................... 3

### Writing conventions and symbols ..................................... 7

### 1 Introduction ......................................................... 9

#### 1.1 About this manual .................................................. 9

#### 1.2 Unit overview ...................................................... 9

#### 1.3 Components and interfaces ........................................ 10

##### 1.3.1 Components .................................................. 11

##### 1.3.2 Interfaces ................................................... 12

#### 1.4 Name plate ....................................................... 13

#### 1.5 Type code ........................................................ 14

#### 1.6 Documentation and literature references ....................... 15

#### 1.7 Declaration of conformity ......................................... 16

#### 1.8 TÜV certificate for functional safety .......................... 17

### 2 Before you begin - safety information .......................... 19

#### 2.1 Qualification of personnel ........................................ 19

#### 2.2 Intended use ...................................................... 19

#### 2.3 Hazard categories ................................................ 20

#### 2.4 Basic information ................................................ 21

#### 2.5 Functional safety ................................................ 22

#### 2.6 Standards and terminology ....................................... 23

### 3 Technical Data ........................................................ 25

#### 3.1 Certifications ..................................................... 25

#### 3.2 Ambient conditions ................................................ 25

#### 3.3 Mechanical data ................................................... 27

##### 3.3.1 Degree of protection ......................................... 27

##### 3.3.2 Mounting position ............................................ 28

##### 3.3.3 Dimensions .................................................. 29

#### 3.4 Electrical Data ..................................................... 32

##### 3.4.1 Supply Voltage VDC at CN1 .................................. 32

##### 3.4.2 Fieldbus at CN2 ............................................. 32

##### 3.4.3 Fieldbus at CN3 ............................................. 33

##### 3.4.4 24V signals to CN4 ........................................ 33

##### 3.4.5 STO safety function at CN5 and CN6 ....................... 33

#### 3.5 Conditions for UL 508C ........................................... 34
4 Basics ................................................................. 35
  4.1 Functional safety. .................................. 35

5 Engineering ......................................................... 37
  5.1 External power supply units ................. 37
  5.1.1 Supply voltage ......................... 37
  5.2 Ground design .................................. 39
  5.3 Safety function STO ("Safe Torque Off") .... 40
    5.3.1 Definitions .................................. 40
    5.3.2 Function .................................. 40
    5.3.3 Requirements for using the safety function .... 41
    5.3.4 Application examples STO ........... 43
  5.4 Monitoring functions .......................... 44

6 Installation ...................................................... 45
  6.1 Electromagnetic compatibility, EMC ........ 46
  6.2 Mechanical installation ....................... 47
  6.3 Electrical installation ......................... 49
    6.3.1 Wiring examples ...................... 50
    6.3.2 Overview of all connections ............ 51
    6.3.3 Connection via cable entry ............ 52
    6.3.4 Connection with industrial connectors .... 56
    6.3.5 Connection of VDC supply voltage ...... 56
    6.3.6 PROFIBUS DP connection ............... 59
    6.3.7 CAN connection ...................... 63
    6.3.8 RS485 connection ....................... 66
    6.3.9 24V signal interface connection ...... 69
    6.3.10 Connection of STO safety function .... 71
  6.4 Connection accessories ......................... 73
    6.4.1 Accessory "Insert kit, 3x I/O" ........ 73
    6.4.2 Accessory "Insert kit, 2x I/O, 1x STO in" .... 73
    6.4.3 Accessory "Insert kit, 1x STO in, 1x STO out" .... 73
    6.4.4 Accessory "Insert kit, 4x I/O, 1x STO in, 1x STO out" .... 74
  6.5 Checking wiring ................................ 74
## Table of Contents

### 7 Commissioning .................................................. 75
- 7.1 Preparing for commissioning .............................. 76
- 7.2 Running commissioning ....................................... 77
  - 7.2.1 First setup ............................................ 77
  - 7.2.2 Starting 24V signal interface ...................... 78
  - 7.2.3 Testing safety functions ............................ 82
  - 7.2.4 Testing with relative positioning ................. 83
  - 7.2.5 Optimizing the motor behavior .................... 84
- 7.3 Lexium CT commissioning software ....................... 86
  - 7.3.1 Firmware update via fieldbus ..................... 87

### 8 Operation ......................................................... 89
- 8.1 Basics .......................................................... 89
  - 8.1.1 Default parameter values ............................ 89
  - 8.1.2 External monitoring signals ......................... 90
  - 8.1.3 Positioning limits .................................... 92
  - 8.1.4 Internal monitoring signals ......................... 93
  - 8.1.5 Operating states and state transitions .......... 96
  - 8.1.6 Operating-mode-specific status information .... 98
  - 8.1.7 Other status information ............................ 99
- 8.2 Operating modes ............................................... 100
  - 8.2.1 Operating mode Jog .................................. 101
  - 8.2.2 Operating mode Profile velocity ................. 104
  - 8.2.3 Operating mode Profile position ................. 105
  - 8.2.4 Operating mode Homing ............................. 108
- 8.3 Functions ...................................................... 115
  - 8.3.1 Definition of the direction of rotation ....... 115
  - 8.3.2 Motion profile ........................................ 115
  - 8.3.3 Quick Stop ............................................ 116
  - 8.3.4 Programmable inputs and outputs ............... 118
  - 8.3.5 Standstill window .................................... 122

### 9 Diagnostics and troubleshooting .............................. 123
- 9.1 Error indication and troubleshooting ................... 123
  - 9.1.1 Diagnostics via commissioning software .......... 123
  - 9.1.2 Diagnostics via fieldbus ........................... 124
  - 9.1.3 Operation state and error indication .......... 129
  - 9.1.4 Reset error message ................................. 129
  - 9.1.5 Error classes and error response ............... 129
  - 9.1.6 Causes of errors and troubleshooting .......... 130
- 9.2 Overview of error numbers ................................ 133
# Table of Contents

**ILE1B, ILE1F, ILE1R**

## 10 Parameters ................................................. 137
  10.1 Representation of parameters ................. 137
  10.2 Overview Parameters ............................. 138
  10.3 Parameter groups .................................. 139
    10.3.1 Parameter group "CAN" ......................... 139
    10.3.2 Parameter group "Commands" .................. 139
    10.3.3 Parameter group "Config" ...................... 140
    10.3.4 Parameter group "Control" .................... 141
    10.3.5 Parameter group "ErrMem0*" ................. 142
    10.3.6 Parameter group "Homing" ..................... 142
    10.3.7 Parameter group "I/O*" ....................... 144
    10.3.8 Parameter group "Manual" ...................... 145
    10.3.9 Parameter group "Motion" ...................... 145
    10.3.10 Parameter group "Profibus" ................... 146
    10.3.11 Parameter group "ProgIO0*" ................. 147
    10.3.12 Parameter group "PTP" ....................... 148
    10.3.13 Parameter group "RS485*" .................... 148
    10.3.14 Parameter group "Settings" ................. 149
    10.3.15 Parameter group "Status" .................... 150
    10.3.16 Parameter group "VEL" ....................... 154

## 11 Accessories and spare parts .................... 1555
  11.1 Accessories ......................................... 155
  11.2 Gearboxes ........................................... 157

## 12 Service, maintenance and disposal ............ 159
  12.1 Service address ..................................... 160
  12.2 Maintenance ........................................ 160
    12.2.1 Lifetime STO safety function ............... 160
  12.3 Replacing units ..................................... 161
  12.4 Shipping, storage, disposal ..................... 161

## 13 Glossary .................................................. 163
  13.1 Units and conversion tables .................... 163
    13.1.1 Length .......................................... 163
    13.1.2 Mass ............................................ 163
    13.1.3 Force ........................................... 163
    13.1.4 Power ........................................... 163
    13.1.5 Rotation ......................................... 164
    13.1.6 Torque ........................................... 164
    13.1.7 Moment of inertia .............................. 164
    13.1.8 Temperature .................................... 164
    13.1.9 Conductor cross section ..................... 164
  13.2 Terms and Abbreviations .......................... 165

## 14 Index ..................................................... 167
Writing conventions and symbols

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.

Bulleted lists  The items in bulleted lists are sorted alphanumerically or by priority. Bulleted lists are structured as follows:

- Item 1 of bulleted list
- Item 2 of bulleted list
  - Subitem for 2
  - Subitem for 2
- Item 3 of bulleted list

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  Parameters are shown as follows:

Gruppe.Name Index:Subindex

SI units  SI units are the original values. Converted units are shown in brackets behind the original value; they may be rounded.

Example:
Minimum conductor cross section: 1.5 mm² (AWG 14)
1 Introduction

1.1 About this manual

This manual is valid for all ILE1B, ILE1F, ILE1R standard products. This chapter lists the type code for this product. The type code can be used to identify whether your product is a standard product or a customized model.

1.2 Unit overview

Figure 1.1 Device overview

The "Lexium Integrated Drive" consists of a brushless DC motor with integrated gearbox and integrated electronics. The product integrates interfaces, control electronics and the power stage.

Reference value supply

The "Lexium Integrated Drive" moves the motor according to the commands received by a fieldbus master, e.g. a PLC or a PC.

Safety function

The integrated safety function STO (IEC 61800-5-2) meets the requirements of Safety Integrity Level SIL2. The safety function allows for a category 0 stop as per EN 60204-1 without external power contactors. It is not necessary to interrupt the supply voltage. This reduces the system costs and the response times.

Using the library considerably facilitates controlling the device. The library is available for download from the Internet.

http://www.schneider-electric.com
1.3 Components and interfaces

Figure 1.2 Components and interfaces

1. Brushless DC motor
2. Electronics housing
3. Insert for sealing (accessory)
4. Insert with cable entry (accessory)
5. I/O insert with industrial connector (accessory)
6. Switches for settings
7. Cover of electronics housing, must not be removed
8. Cover of connector housing, to be removed for installation
9. Cover with industrial connector for Vdc supply voltage and IN/OUT fieldbus connection (optional)
10. Electrical interfaces
1.3.1 Components

**Motor**
The motor is a brushless direct current motor with permanent magnet excitation with an internal resolution of 12 increments per revolution. The motor has a high detent torque, therefore a brake is not required for most applications.

**Gearbox**
The motor can be operated with a spur wheel gear.

The following gear ratios are available:
- Three-stage, 18:1 (160:9)
- Three-stage 38:1 (75:2)
- Four-stage 54:1 (490:9)
- Four-stage 115:1 (3675:32)

The motor can also be operated with a worm gear with hollow shaft.

The following gear ratios are available:
- Two-stage 24:1 (525:22)
- Three-stage 54:1 (1715:32)
- Three-stage 92:1 (735:5)
- Three-stage 115:1 (3675:32)

**Encoder**
The drive system operates with a BLDC encoder. Three Hall sensors capture the actual position of the rotor with 12 increments per second and monitor the commutation status of the motor.

The actual position is converted to a 32 bit absolute value by a position counter. When the drive is switched off, the commutation status and absolute value are saved in the internal data memory.

For the correct motor position to be available again after the motor is switched on, the motor must not be turned when it is off.

**Electronics**
The electronic system comprises control electronics and power stage. They have a common power supply and are not galvanically isolated.

The drive can be parameterized and controlled via the fieldbus interface. 4 digital 24V signals are also available. Each of them can be used as an input or output.
1.3.2 Interfaces

Standard available interfaces:

**Supply voltage** $V_{DC}$

The supply voltage $V_{DC}$ supplies the control electronics and the power stage.

*The ground connections of all interfaces are galvanically connected. For more information see chapter 5.2 "Ground design". This chapter also provides information on protection against reverse polarity.*

**Fieldbus interface**

Functions:

- Profibus DP connection
- CAN bus connection
- RS485 bus connection

The fieldbus interface is used for parameterizing and controlling the drive. The fieldbus interface allows the drive to be integrated into a fieldbus network and controlled by a master such as a PLC.

The drive can be commissioned via any of the above interfaces. This requires, for example, a PC with a suitable fieldbus converter (e.g. USB-CAN). The commissioning software is available for PCs; it supports the various fieldbus versions.

The firmware can be updated via any of the interfaces.

**24 V signal interface**

4 digital 24V signals are available. Each of them can be used as an input or outputs.

The 24V signals are available to the master controller. However, it is also possible to parameterize special functions such as connection of limit switches.
1.4 Name plate

The nameplate contains the following data:

![Diagram of nameplate with labels](image)

1. Type code
2. Type code (old designation)
3. Nominal voltage
4. Nominal torque
5. Maximum input current
6. Nominal speed
7. Date of manufacture
8. Insulation class
9. Maximum ambient air temperature
10. Software revision
11. Hardware revision
12. Firmware number
13. Material number
14. Serial Number

Figure 1.3 Nameplate
## 1.5 Type code

<table>
<thead>
<tr>
<th>ILE</th>
<th>1</th>
<th>F</th>
<th>66</th>
<th>1</th>
<th>P</th>
<th>B</th>
<th>1</th>
<th>F</th>
<th>0</th>
<th>--</th>
</tr>
</thead>
</table>

### Motor
ILE = Brushless DC motor

### Supply voltage
1 = 24 ... 36 V<sub>DC</sub>

### Communication interface
- B = PROFIBUS DP
- F = CANopen DS301
- R = RS485

### Size
66 = 66 mm

### Length
1 = 1 stack

### Winding
P = Medium speed of rotation/medium torque

### Connection version
- B = Printed circuit board connector
- C = Industrial connector

### Position capture
1 = BLDC encoder

### Holding brake
A = Without holding brake

### Gearbox
- 0 = Without gearbox
- 1 = Spur wheel gear 18:1 (160:9)
- 2 = Spur wheel gear 38:1 (75:2)
- 3 = Spur wheel gear 54:1 (490:9)
- 4 = Spur wheel gear 115:1 (3675:32)
- 5 = Worm gear with hollow shaft 24:1 (525:22)
- 6 = Worm gear with hollow shaft 54:1 (1715:32)
- 7 = Worm gear with hollow shaft 92:1 (735:5)
- 8 = Worm gear with hollow shaft 115:1 (3675:32)

### Reserved

---

**Customized product**

In the case of a customized product, position 9 is an "S". Positions 10 ... 13 are the number of the customized product.

Example: IL•••••S1234--
1.6 Documentation and literature references

The following manuals belong to this product:

- **Product manual**, describes the technical data, installation, commissioning and all operating modes and functions.
- **Fieldbus manual**, description required to integrate the product into a fieldbus.

**Source product manuals**
The current product manuals are available for download from the Internet.
http://www.schneider-electric.com

**Source EPLAN Macros**
For easier engineering, macro files and product master data are available for download from the Internet at:
http://www.schneider-electric.com

**Additional literature**
We recommend the following literature for more in-depth information:

- Kuo, Benjamin; Golnaraghi, Farid: Automatic Control Systems. John Wiley & Sons
1.7 Declaration of conformity

EC DECLARATION OF CONFORMITY
YEAR 2008

☐ according to EC Directive Machinery 98/37/EC
☒ according to EC Directive EMC 2004/108/EC
☐ according to EC Directive Low Voltage 2006/95/EC

We declare that the products listed below meet the requirements of the mentioned EC Directives with respect to design, construction and version distributed by us. This declaration becomes invalid with any modification on the products not authorized by us.

Designation: Motors with integrated control electronics

Type: ILA, ILE, ILS

Product number: 0x6600xxxxxxx, 0x6610xxxxxxx, 0x66206xxxxxx, 0x66307xxxxxx
0x6640xxxxxxx, 0x66606xxxxxx, 0x66707xxxxxx

Applied harmonized standards, especially:
EN ISO 13849-1:2006, Performance Level "d" (category 3)
EN 61800-3:2004, second environment
EN 62061:2005, SILcl 2
EN 61508:2001, SIL 2

Applied national standards and technical specifications, especially:
UL 508C
Product documentation

Schneider Electric Motion Deutschland
GmbH & Co. KG

Company stamp:
Postfach 11 80 • D-77901 Lahr
Breslauer Str. 7 • D-77933 Lahr

Date/ Signature: 10 July 2008

Name/ Department: Wolfgang Brandstätter/Development
1.8 TÜV certificate for functional safety
2 Before you begin - safety information

2.1 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.

2.2 Intended use

This product is a motor with an integrated drive 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 (e.g. machine design).

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

The product must NEVER be operated in explosive atmospheres (hazardous locations, Ex areas).

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.
2.3 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.

CAUTION

CAUTION used without the safety alert symbol, is used to address practices not related to personal injury (e.g. can result in equipment damage).
2.4 Basic information

⚠️ DANGER

UNINTENDED CONSEQUENCES OF EQUIPMENT OPERATION
When the system is started, the drives are usually out of the operator’s view and cannot be visually monitored.

- Only start the system if there are no persons in the hazardous area.

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

⚠️ WARNING

UNEXPECTED MOVEMENT
Drives may perform unexpected movements because of incorrect wiring, incorrect settings, incorrect data or other errors.
Interference (EMC) may cause unpredictable responses in the system.

- Carefully install the wiring in accordance with the EMC requirements.
- Switch off the voltage at the inputs STO_A (PWRR_A) and STO_B (PWRR_B) to avoid an unexpected restart of the motor before switching on and configuring the drive system.
- Do NOT operate the drive system with unknown settings or data.
- Perform a comprehensive commissioning test.

Failure to follow these instructions can result in death or serious injury.
2.5 Functional safety

Using the safety functions integrated in this product requires careful planning. For more information see chapter 5.3 "Safety function STO ("Safe Torque Off")" on page 40.
2.6 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", "warning message", "alarm", etc.

Among others, these standards include:

- IEC 61800 series: "Adjustable speed electrical power drive systems"
- IEC 61800-7 series: "Adjustable speed electrical power drive systems - Part 7-1: Generic interface and use of profiles for power drive systems - Interface definition"
- IEC 61158 series: "Industrial communication networks - Fieldbus specifications"
- 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.
3  Technical Data

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

3.1  Certifications

Product certifications:

<table>
<thead>
<tr>
<th>Certified by</th>
<th>Assigned number</th>
<th>Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>TÜV Nord</td>
<td>SAS-1728/08</td>
<td>2013-01-09</td>
</tr>
<tr>
<td>UL</td>
<td>File E 153659</td>
<td></td>
</tr>
</tbody>
</table>

Certified safety function

This product has the following certified safety function:
- Safety function STO "Safe Torque Off" (IEC 61800-5-2)

3.2  Ambient conditions

**Ambient temperature during operation**

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

<table>
<thead>
<tr>
<th>Operating temperature 1) 2)</th>
<th>°C</th>
<th>0 ... 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature with current reduction of 2% per Kelvin 1)</td>
<td>°C</td>
<td>50 ... 65</td>
</tr>
</tbody>
</table>

1) Limit values with flanged motor (steel plate 300x300x10 mm)
2) If the product is to be used in compliance with UL 508C, note the information provided in chapter 3.5 "Conditions for UL 508C".

**Ambient conditions transportation and storage**

The environment during transport and storage must be dry and free from dust. The maximum vibration and shock load must be within the specified limits.

<table>
<thead>
<tr>
<th>Temperature</th>
<th>°C</th>
<th>-25 ... +70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. temperature of power stage 1)</td>
<td>°C</td>
<td>105</td>
</tr>
<tr>
<td>Max. temperature of motor 2)</td>
<td>°C</td>
<td>110</td>
</tr>
</tbody>
</table>

1) Can be read via parameter
2) Measured on the surface

**Relative humidity**

The following relative humidity is permissible during operation:

<table>
<thead>
<tr>
<th>Relative humidity (non-condensing)</th>
<th>%</th>
<th>15 ... 85</th>
</tr>
</thead>
</table>

3 Technical Data

### Installation altitude

The installation altitude is defined as height above sea level.

<table>
<thead>
<tr>
<th>Installation altitude</th>
<th>[m]</th>
<th>≤1000</th>
</tr>
</thead>
</table>

### Vibration and shock

<table>
<thead>
<tr>
<th>Vibration, sinusoidal</th>
<th>As per IEC/EN 60068-2-6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.15 mm (from 10 Hz ... 60 Hz)</td>
</tr>
<tr>
<td></td>
<td>20 m/s² (from 10 Hz ... 500 Hz)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shock, semi-sinusoidal</th>
<th>As per IEC/EN 60068-2-27:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>150 m/s² (11 ms)</td>
</tr>
</tbody>
</table>

### EMC

<table>
<thead>
<tr>
<th>Emission</th>
<th>IEC/EN 61800-3: Class C2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EN 61000-6-4</td>
</tr>
<tr>
<td></td>
<td>EN 55022: Class A</td>
</tr>
</tbody>
</table>

| Noise immunity          | IEC/EN 61800-3: Second environment |
3.3 Mechanical data

3.3.1 Degree of protection

The product has the following IP degree of protection as per EN 60529.

**IP degree of protection**

![Figure 3.1 IP degree of protection]

The total degree of protection is determined by the component with the lowest degree of protection.

<table>
<thead>
<tr>
<th>Item</th>
<th>Degree of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shaft bushing</td>
</tr>
<tr>
<td></td>
<td>Shaft bushing with GBX gear (accessory)</td>
</tr>
<tr>
<td>2</td>
<td>Housing, except shaft bushing</td>
</tr>
</tbody>
</table>

**Overview of IP degrees of protection**

<table>
<thead>
<tr>
<th>First digit</th>
<th>Second digit</th>
<th>Protection against intrusion of objects</th>
<th>Protection against intrusion of water</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>No protection</td>
<td>No protection</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>External objects &gt;50 mm</td>
<td>Vertically falling dripping water</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>External objects &gt;12 mm</td>
<td>Dripping water falling at an angle (75 ° ... 90 °)</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>External objects &gt;2.5 mm</td>
<td>Spraying water</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>External objects &gt;1 mm</td>
<td>Splashing water</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Dust-protected</td>
<td>Water jets</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>Dust-tight</td>
<td>Heavy sea</td>
</tr>
</tbody>
</table>

**Degree of protection if STO is used**

You must ensure that conductive substances cannot get into the product (pollution degree 2). If you use the safety function and conductive substances get into the product, the safety function may become inoperative.
3.3.2 Mounting position

The following mounting positions are defined and approved as per EN 60034-7:

- IM B5 drive shaft horizontal
- IM V1 drive shaft vertical, shaft end down
- IM V3 drive shaft vertical, shaft end up
3.3.3 Dimensions

Figure 3.2 Dimensions

(1) Insert with cable entry (accessory)
(2) Insert kit (accessory)
(3) Industrial connector (option)

<table>
<thead>
<tr>
<th>Total length L</th>
<th>ILE••661...</th>
<th>P•1A0</th>
</tr>
</thead>
<tbody>
<tr>
<td>L [mm]</td>
<td>122</td>
<td></td>
</tr>
</tbody>
</table>
Figure 3.3 Dimensions

(1) Insert with cable entry (accessory)
(2) Insert kit (accessory)
(3) Industrial connector (option)
(4) Parallel key
### Lexium Integrated Drive

#### 3 Technical Data

**Figure 3.4 Dimensions**

1. Insert with cable entry (accessory)
2. Insert kit (accessory)
3. Industrial connector (option)

<table>
<thead>
<tr>
<th></th>
<th>P•1A1</th>
<th>P•1A2</th>
<th>P•1A3</th>
<th>P•1A4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ILE••661...</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L [mm]</td>
<td>174</td>
<td>174</td>
<td>174</td>
<td>174</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>P•1A6</th>
<th>P•1A7</th>
<th>P•1A8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ILE••661...</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L [mm]</td>
<td>229</td>
<td>229</td>
<td>229</td>
</tr>
</tbody>
</table>
3.4 Electrical Data

Overview of printed circuit board connectors

3.4.1 Supply Voltage $V_{DC}$ at CN1

<table>
<thead>
<tr>
<th></th>
<th>ILE1•66+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage $[V_{dc}]$</td>
<td>24 / 36</td>
</tr>
<tr>
<td>Limit values $[V_{dc}]$</td>
<td>18 ... 40</td>
</tr>
<tr>
<td>Ripple at nominal voltage $[V_{pp}]$</td>
<td>≤3.6</td>
</tr>
<tr>
<td>Max. continuous current input 1)  $[A]$</td>
<td>5.5</td>
</tr>
<tr>
<td>Winding type P</td>
<td></td>
</tr>
<tr>
<td>Peak input current $[A]$</td>
<td>7</td>
</tr>
<tr>
<td>Winding type P</td>
<td></td>
</tr>
<tr>
<td>Fuse to be connected upstream 2)    $[A]$</td>
<td>≤16</td>
</tr>
</tbody>
</table>

1) The actual power requirement is often significantly lower, because the maximum possible motor torque is usually not required for operation of a system.
2) See chapter 5.1.1 “Supply voltage”

Inrush current current

Charging current for capacitor $C=1500 \mu F$

3.4.2 Fieldbus at CN2

**CAN bus signals**

The CAN bus signals comply with the ISO 11898 standard and are not galvanically isolated.

<table>
<thead>
<tr>
<th>Transmission rate $[k$Baud$]$</th>
<th>50 / 100 / 125 / 250 / 500 / 800 / 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission protocol</td>
<td>CANopen as per DS301</td>
</tr>
</tbody>
</table>

**Profibus signals**

The Profibus signals comply with the RS485 standard and are galvanically isolated.

<table>
<thead>
<tr>
<th>Transmission rate $[k$Baud$]$</th>
<th>9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 / 1500 / 3000 / 6000 / 12000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission protocol</td>
<td>Profibus DP V0</td>
</tr>
</tbody>
</table>
### 3.4.3 Fieldbus at CN3

**RS485 signals**

The RS485 signals conform to the RS485 standard and are not galvanically isolated.

<table>
<thead>
<tr>
<th>Transmission rate</th>
<th>[kBaud]</th>
<th>9.6 / 19.2 / 38.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission protocol</td>
<td>Manufacturer-specific protocol</td>
<td></td>
</tr>
</tbody>
</table>

### 3.4.4 24V signals to CN4

**Signal inputs**

The signal inputs are galvanically connected to 0 VDC and not protected against reverse polarity.

| Logic 0 (U\text{low}) | [V]  | -3 ... +4.5 |
| Logic 1 (U\text{high}) | [V]   | +15 ... +30 |
| Input current (typical at 24V) | [mA] | 2 |
| Debounce time \text{IO0} ... \text{IO3} | [ms] | 0.1 |
| Debounce time \text{IO2} and \text{IO3} \text{1)} | [ms] | 0.01 |

\text{1)} When the function "Fast Position Capture is used"

**Signal outputs**

The signal outputs are galvanically connected to 0 VDC and short-circuit protected.

| Nominal voltage | [V]  | 24 |
| Voltage range | [V]   | 23 ... 25 |
| Maximum current (total) | [mA] | 200 |
| Maximum current per output | [mA] | 100 |
| Suitable for inductive loads | [mH] | 1000 |

### 3.4.5 STO safety function at CN5 and CN6

The signal inputs are galvanically connected to 0 VDC.

| Logic 0 (U\text{low}) | [V]  | -3 ... +4.5 |
| Logic 1 (U\text{high}) | [V]   | +15 ... +30 |
| Input current \text{STO_A} (\text{PWRR_A}) (typical at 24V) | [mA] | ≤10 |
| Input current \text{STO_B} (\text{PWRR_B}) (typical at 24V) | [mA] | ≤3 |
| Debounce time | [ms] | 1 |
| Detection of signal difference between \text{STO_A} (\text{PWRR_A}) and \text{STO_B} (\text{PWRR_B}) | [s] | ≥1 |
| Response time (until shutdown of power stage) | [ms] | <50 |
| Permitted test pulse width of upstream devices | [ms] | <1 |
Use the following data of the STO safety function for your maintenance plan and the safety calculations:

<table>
<thead>
<tr>
<th>Data for maintenance plan and safety calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lifetime (IEC 61508)</strong></td>
</tr>
<tr>
<td><strong>SFF (IEC 61508)</strong></td>
</tr>
<tr>
<td><strong>HFT (IEC 61508)</strong></td>
</tr>
<tr>
<td><strong>Pollution degree</strong></td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
</tr>
<tr>
<td><strong>Ambient temperature during operation</strong></td>
</tr>
<tr>
<td><strong>Surrounding air temperature</strong></td>
</tr>
<tr>
<td><strong>Surrounding air temperature with current reduction of 2% per Kelvin</strong></td>
</tr>
<tr>
<td><strong>PFH (IEC 61508)</strong></td>
</tr>
<tr>
<td><strong>PL (ISO 13849-1)</strong></td>
</tr>
<tr>
<td><strong>MTTF_d (EN 13849-1)</strong></td>
</tr>
<tr>
<td><strong>DC (EN 13849-1)</strong></td>
</tr>
<tr>
<td><strong>SIL</strong></td>
</tr>
<tr>
<td><strong>SILCL2</strong></td>
</tr>
<tr>
<td><strong>SIL2</strong></td>
</tr>
<tr>
<td><strong>SILCL2</strong></td>
</tr>
<tr>
<td><strong>PFH (IEC 61508)</strong></td>
</tr>
<tr>
<td><strong>PL (ISO 13849-1)</strong></td>
</tr>
<tr>
<td><strong>MTTF_d (EN 13849-1)</strong></td>
</tr>
<tr>
<td><strong>DC (EN 13849-1)</strong></td>
</tr>
</tbody>
</table>

3.5 Conditions for UL 508C

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

<table>
<thead>
<tr>
<th>Conditions for UL 508C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ambient temperature during operation</strong></td>
</tr>
<tr>
<td>Surrounding air temperature [°C] 0 ... +50</td>
</tr>
<tr>
<td>Surrounding air temperature with current reduction of 2% per Kelvin [°C] 50 ... 65</td>
</tr>
<tr>
<td><strong>Pollution degree</strong></td>
</tr>
<tr>
<td>Use in an environment with pollution degree 2.</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
</tr>
<tr>
<td>Use only power supply units that are approved for overvoltage category III.</td>
</tr>
<tr>
<td><strong>Wiring</strong></td>
</tr>
<tr>
<td>Use only 60/75 °C copper conductors.</td>
</tr>
</tbody>
</table>
4 Basics

4.1 Functional safety

Automation and safety engineering are two areas that were completely separated in the past but recently have become more and more integrated. Engineering and installation of complex automation solutions are greatly simplified by integrated safety functions.

Usually, the safety engineering requirements depend on the application. The level of the requirements results from the risk and the hazard potential arising from the specific application.

Working with IEC 61508

IEC 61508 standard
The standard IEC 61508 "Functional safety of electrical/electronic/programmable electronic safety-related systems" covers the safety-related function. It is not only one single component but the entire function chain (e.g. from the sensor through the logical processing unit to the actuator) that is considered as one single unit. This function chain must meet the requirements of the specific safety integrity level as a whole. Systems and components that can be used in various applications for safety tasks with comparable risk levels can be developed on this basis.

SIL, Safety Integrity Level
The standard IEC 61508 defines 4 safety integrity levels (SIL) for safety functions. SIL1 is the lowest level and SIL4 is the highest level. A hazard and risk analysis serves as a basis for determining the required safety integrity level. This is used to decide whether the relevant function chain is to be considered as a safety function and which hazard potential it must cover.

PFH, Probability of a dangerous hardware failure per hour
To maintain the safety function, the IEC 61508 standard requires various levels of measures for avoiding and controlling faults, depending on the required SIL. All components of a safety function must be subjected to a probability assessment to evaluate the effectiveness of the measures implemented for controlling faults. This assessment determines the PFH (probability of a dangerous failure per hour) for a safety system. This is the probability per hour that a safety system fails in a hazardous manner and the safety function cannot be correctly executed. Depending on the SIL, the PFH must not exceed certain values for the entire safety system. The individual PFH values of a function chain are added; the total PFH value must not exceed the maximum value specified in the standard.

<table>
<thead>
<tr>
<th>SIL</th>
<th>PFH at high demand or continuous demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>$\geq 10^{-9} \ldots &lt; 10^{-8}$</td>
</tr>
<tr>
<td>3</td>
<td>$\geq 10^{-8} \ldots &lt; 10^{-7}$</td>
</tr>
<tr>
<td>2</td>
<td>$\geq 10^{-7} \ldots &lt; 10^{-6}$</td>
</tr>
<tr>
<td>1</td>
<td>$\geq 10^{-6} \ldots &lt; 10^{-5}$</td>
</tr>
</tbody>
</table>
HFT and SFF

Depending on the SIL for the safety system, the IEC 61508 standard requires a specific hardware fault tolerance HFT in connection with a specific proportion of safe failures SFF (safe failure fraction). The hardware fault tolerance is the ability of a system to execute the required safety function in spite of the presence of one or more hardware faults. The SFF of a system is defined as the ratio of the rate of safe failures to the total failure rate of the system. According to IEC 61508, the maximum achievable SIL of a system is partly determined by the hardware fault tolerance HFT and the safe failure fraction SFF of the system.

<table>
<thead>
<tr>
<th>SFF</th>
<th>HFT type A subsystem</th>
<th>HFT type B subsystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 60%</td>
<td>SIL1</td>
<td>SIL2</td>
</tr>
<tr>
<td>60% ... &lt;90%</td>
<td>SIL2</td>
<td>SIL3</td>
</tr>
<tr>
<td>90% ... &lt; 99%</td>
<td>SIL3</td>
<td>SIL4</td>
</tr>
<tr>
<td>≥99%</td>
<td>SIL3</td>
<td>SIL4</td>
</tr>
</tbody>
</table>

Fault avoidance measures

Systematic errors in the specifications, in the hardware and the software, usage faults and maintenance faults of the safety 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 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.
5 Engineering

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

5.1 External power supply units

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELECTRIC SHOCK CAUSED BY INCORRECT POWER SUPPLY UNIT</td>
</tr>
<tr>
<td>The VDC and +24VDC supply voltages are connected with many exposed signal connections in the drive system.</td>
</tr>
<tr>
<td>• Use a power supply unit that meets the PELV (Protective Extra Low Voltage) requirements.</td>
</tr>
<tr>
<td>• Connect the negative output of the power supply unit to PE (ground).</td>
</tr>
<tr>
<td>Failure to follow these instructions will result in death or serious injury.</td>
</tr>
</tbody>
</table>

5.1.1 Supply voltage

**General** The power supply unit must be rated for the power requirements of the drive. The input current can be found in the technical data.

The actual power requirements are often significantly lower because the maximum possible motor torque is usually not required for normal operation of a system.

When designing the system, note that the input current of the drive is higher during the motor acceleration phase than during constant movement.

**Protection against reverse polarity** In the case of reverse polarity, the supply voltage is short-circuited. The drive is continuous short circuit-proof up to a short-circuit current of a maximum of 15 A. If the power is supplied by a transformer power supply unit, several hundred amperes may flow for a short period of time in the event of reverse polarity; the drive is rated for this and will not be damaged.

Fuse: a circuit-breaker (16 A, trip characteristic B) or a blade fuse (FKS, max. 15 A) or a fuse (5 mm x 20 mm, 10 A slow-blow).
Regeneration condition

Note the following for drives with large external mass moments of inertia or for highly dynamic applications:

Motors return regeneration energy during deceleration. The DC bus can store a limited amount of energy in the capacitors. Connecting additional capacitors to the DC bus increases the amount of energy that can be stored.

If the capacity of the capacitors is exceeded, the excess energy must be discharged via internal or external braking resistors. If the energy is not discharged, an overvoltage monitor will shut off the power stage.

Overvoltages can be limited by adding a braking resistor with a corresponding braking resistor controller. This converts the regenerated energy to heat energy during deceleration.

Braking resistor controllers can be found in chapter 11 "Accessories and spare parts". See the product manual for a description of the braking resistor controller.

⚠️ CAUTION

LOSS OF CONTROL DUE TO REGENERATION CONDITION

Regeneration conditions resulting from braking or external driving forces may increase the $V_{DC}$ supply voltage to an unexpected level. Components not rated for this voltage may be destroyed or cause misoperation.

- Verify that all $V_{DC}$ consumers are rated for the voltage occurring during regeneration conditions (for example limit switches).
- Use only power supply units that will not be damaged by regeneration conditions.
- Use a braking resistor controller, if necessary.

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

24V signal power supply

A constant 24V signal power supply is available for the sensor system. It must not be connected in parallel with the 24V signal power supply of a different drive.
5.2 Ground design

The ground connections of all interfaces are galvanically connected, including the ground for the VDC supply voltage.

The module interfaces with galvanic isolation such as Profibus are exceptions to this.

The following points must be considered when you wire the drives in a system:

- The voltage drop in the VDC power supply lines must be kept as low as possible (less than 1 V). At higher ground potential differences between different drives, the communication / control signals may be affected.

- If the distance between the system components is greater, it is recommended to use decentralized power supply units close to the individual drives to supply the VDC voltage. However, the ground connections of the individual power supply units must be connected with the largest possible conductor cross section.

- The internal 24V signal power supply must not be connected in parallel with the internal 24V signal power supply of a different drive.

- If the master controller (e.g. PLC, IPC etc.) does not have galvanically isolated outputs for the drives, you must verify that the current of the VDC supply voltage has no path back to the power supply unit via the master controller. Therefore, the master controller ground may be connected to the VDC supply voltage ground at a single point only. This is usually the case in the control cabinet. The ground contacts of the various signal connectors in the drive are therefore not connected; there is already a connection via the VDC supply voltage ground.

- If the controller has a galvanically isolated interface for communication with the drives, the ground of this interface must be connected to the signal ground of the first drive. This ground may be connected to a single drive only to avoid ground loops. This also applies to a galvanically isolated CAN connection.

 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 mm² (AWG 4) for equipotential bonding conductors up to a length of 200 m

- 20 mm² (AWG 4) for equipotential bonding conductors with a length of more than 200 m
5.3  Safety function STO ("Safe Torque Off")

See page 35 for information on using the IEC 61508 standard.

5.3.1  Definitions

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

"Power Removal"
The STO safety function ("Safe Torque Off") is also known as "Power Removal".

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

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

5.3.2  Function

The STO safety function integrated into the product can be used to implement an "EMERGENCY STOP" (EN 60204-1) for category 0 stops. With an additional, approved EMERGENCY STOP 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 always two channels.

The switching process must be simultaneous for both inputs (skew <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 skew is too great. This error message can only be reset by switching off the product.
5.3.3 Requirements for using the safety function

⚠️ 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 or serious injury.

**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 a power outage or an error, the stop may not be performed correctly. 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 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. Especially in the case of vertical axes it is important to verify whether additional measures are required to avoid lowering of the load.

**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, corresponding to the required safety.

**Unintended restart**
Note that a master controller must not trigger an unintended restart after restoration of power (e.g. after a power outage).

**Degree of protection if STO is used**
You must ensure that conductive substances cannot get into the product (pollution degree 2). If you use the safety function and conductive substances get into the product, the safety function may become inoperative.
**Protected cable installation**

If short circuits or cross circuits can be expected in connection with the two signals of the STO safety function and if they are not detected by upstream devices, protected cable installation is required.

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

Protected cable installation possibilities:

- Use separate cables for two signals. Any additional wires in these cables may only carry voltages according to PELV.
- Use a shielded cable. The grounded shield is designed to dissipate the external voltage in the case of damages and to trip the fuse in this way.
- Use a separately grounded shield. If there are other wires in the cable, the two signals must be isolated from these wires by a grounded, separate shield.

**Data for maintenance plan and safety calculations**

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

<table>
<thead>
<tr>
<th>Lifetime (IEC 61508)</th>
<th>20 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFF (IEC 61508)</td>
<td>[%] 66</td>
</tr>
<tr>
<td>HFT (IEC 61508)</td>
<td>1</td>
</tr>
<tr>
<td>Type A subsystem</td>
<td></td>
</tr>
<tr>
<td>Safety integrity level</td>
<td>SIL2</td>
</tr>
<tr>
<td>IEC 61508</td>
<td></td>
</tr>
<tr>
<td>IEC 62061</td>
<td>SIICL2</td>
</tr>
<tr>
<td>PFH (IEC 61508)</td>
<td>[1/h] 1.84*10⁻⁹</td>
</tr>
<tr>
<td>PL (ISO 13849-1)</td>
<td>d (Category 3)</td>
</tr>
<tr>
<td>MTTF_d (EN 13849-1)</td>
<td>4566 years</td>
</tr>
<tr>
<td>DC (EN 13849-1)</td>
<td>[%] 90</td>
</tr>
</tbody>
</table>

**Hazard and risk analysis**

As a system manufacturer you must conduct a hazard and risk analysis of the entire system. The results must be taken into account in the application of the STO 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 always have priority.
5.3.4 Application examples STO

**Example of category 0 stop**  Application without EMERGENCY STOP module, category 0 stop.

![Figure 5.1 Example of category 0 stop](image)

Please note:

- When the EMERGENCY STOP switch is tripped, this initiates a category 0 stop

**Example of category 1 stop**  Application with EMERGENCY STOP module, category 1 stop.

![Figure 5.2 Example of category 1 stop](image)

Please note:

- The master controller must immediately trigger a controlled stop, e.g. via the "Quick Stop" function.
- The inputs STO_A (PWRR_A) and STO_B (PWRR_B) must be switched off with a time delay. The delay is set at the EMERGENCY STOP safety module. If the motor has not yet stopped when the delay time has elapsed, it coasts down in an uncontrolled way (uncontrolled stop).
- The specified minimum current and the permissible maximum current of the relay must be observed if the relay outputs of the EMERGENCY STOP module are used.
5.4 Monitoring functions

The monitoring functions in the product can help to guard the system and reduce the risks involved in a system misoperation. These monitoring functions may not be used to protect persons.

The following monitoring functions are available:

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blocking error</td>
<td>Error message if, in spite of maximum current, the motor shaft does not move for the time set with this parameter.</td>
</tr>
<tr>
<td>Data link</td>
<td>Error response if the link becomes inoperative</td>
</tr>
<tr>
<td>Limit switch signals</td>
<td>Monitors for permissible range of travel</td>
</tr>
<tr>
<td>I²t limitation</td>
<td>Power limitation in event of overloading</td>
</tr>
<tr>
<td>Tracking error</td>
<td>Monitors for difference between actual motor position and reference position</td>
</tr>
<tr>
<td>STOP switch signal</td>
<td>Stops motor with “Quick Stop”</td>
</tr>
<tr>
<td>Overvoltage and undervoltage</td>
<td>Monitors for overvoltage and undervoltage of the supply voltage</td>
</tr>
<tr>
<td>Motor overload</td>
<td>Monitors for excessively high current in the motor phases</td>
</tr>
<tr>
<td>Overtemperature</td>
<td>Monitors the device for overtemperature</td>
</tr>
</tbody>
</table>
6 Installation

⚠️ 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 the 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 or serious injury.


⚠️ CAUTION

RISK OF INJURY WHEN REMOVING CIRCUIT BOARD PLUGS

- When removing them note that the connectors must be unlocked.
  - Supply voltage $V_{DC}$: Unlock by pulling at the plug housing
  - Miscellaneous: Unlock by pressing the locking lever
- Always hold the plug to remove it (not the cable).

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

The chapter Engineering contains basic information that you should know before starting the installation.
6.1 Electromagnetic compatibility, EMC

⚠️ WARNING

SIGNAL AND DEVICE INTERFERENCE
Signal interference can cause unexpected responses of device.

- Install the wiring in accordance with the EMC requirements.
- Verify compliance with the EMC requirements.

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

This drive system meets the EMC requirements according to the standard IEC 61800-3, if the described measures are implemented during installation. If it is operated outside this scope, note the following:

⚠️ WARNING

HIGH-FREQUENCY INTERFERENCE
In a domestic environment this product may cause high-frequency interference that may require action to suppress interference.

<table>
<thead>
<tr>
<th>EMC measures</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep cables as short as possible. Do not install unnecessary cable loops, use short cables from the star point in the control cabinet to the external ground connection.</td>
<td>Reduces capacitive and inductive interference.</td>
</tr>
<tr>
<td>Ground the product via the motor flange or with a ground strap to the ground connection at the cover of the connector housing.</td>
<td>Reduces emissions, increases immunity.</td>
</tr>
<tr>
<td>Ground shields of digital signal wires at both ends by connecting them to a large surface or via conductive connector housings.</td>
<td>Reduces interference affecting the signal wires, reduces emissions</td>
</tr>
<tr>
<td>Connect large surface areas of cable shields, use cable clamps and ground straps</td>
<td>Reduces emissions.</td>
</tr>
</tbody>
</table>

The following cables must be shielded:

- Fieldbus cable
- STO safety function, see the requirements in chapter 5.3.3 "Requirements for using the safety function".

The following cables do not need to be shielded:

- Supply voltage \( V_{DC} \)
- 24 V signal interface
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 mm² (AWG 4) for equipotential bonding conductors up to a length of 200 m
- 20 mm² (AWG 4) for equipotential bonding conductors with a length of more than 200 m

6.2 Mechanical installation

⚠️ CAUTION

HOT SURFACES
Depending on the operation, the surface may heat up to more than 100°C (212°F).
- Do not allow contact with the hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity.
- Consider the measures for heat dissipation described.
- Check the temperature during test runs.

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

⚠️ CAUTION

MOTOR DAMAGE AND LOSS OF CONTROL
Shock or strong pressure applied to the motor shaft may destroy the motor.
- Protect the motor shaft during handling and transportation.
- Avoid shocks to the motor shaft during mounting.
- Do not press parts onto the shaft. Mount parts to the shaft by glueing, clamping, shrink-fitting or screwing.

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

MOTOR WITHOUT BRAKING EFFECT

To install a drive in locations difficult to access, it may be useful to carry out the electrical installation first and then install the fully wired drive.

Heat dissipation

The motor may become very hot, e.g. in the case of incorrect arrangement of multiple motor. The surface temperature of the motor must not exceed 110 °C during continuous operation.

- Verify that the maximum temperature is not exceeded.
- Verify that there is sufficient heat dissipation, e.g. by means of good ventilation or heat dissipation via the motor flange.

Mounting

The motor is designed to be mounted using four M5 screws. The motor flange must be mounted on a flat surface to avoid mechanical tension from being transmitted to the housing.

Painted surfaces have an insulating effect. During mounting verify that the motor flange is mounted in such a way as to allow for good conductivity (electrical and thermal).

Mounting distances

No minimum clearances are required for installation. However, note that the motor can become very hot.

Observe the bending radii of the cables used.

Ambient conditions

Observe the permissible ambient conditions.
6.3 Electrical installation

⚠️ WARNING

UNEXPECTED BEHAVIOR CAUSED BY FOREIGN OBJECTS
Foreign objects, deposits or humidity can cause unexpected behavior.
- Keep foreign objects from getting into the product.
- Do not remove the cover of the electronics housing. Only remove the connector housing cover.
- Verify correct seat of seals and cable entries.

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

⚠️ WARNING

LOSS OF SAFETY FUNCTION CAUSED BY FOREIGN OBJECTS
Conductive foreign objects, dust or liquids may cause the STO safety function to become inoperative.
- You may not use the STO safety function unless you have protected the system against contamination by conductive substances.

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

⚠️ CAUTION

DAMAGE TO SYSTEM COMPONENTS AND LOSS OF CONTROL
Interruptions of the negative connection of the controller supply voltage can cause excessively high voltages at the signal connections.
- Do not interrupt the negative connection between the power supply unit and load with a fuse or switch.
- Verify correct connection before switching on.
- Do not connect the controller supply voltage or change its wiring while the supply voltage present.

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

The chapter Engineering contains basic information that you should know before starting the installation.

The drive is equipped with parameter switches in the connector housing. Set the parameter switches before connecting the cables, because after connection they are difficult to access.
6.3.1 Wiring examples

The following figure shows a typical wiring example. The limit switches and the reference switch are supplied via the internal 24V signal power supply.

![Wiring diagram]

Figure 6.1 Wiring example

The UBC60 braking resistor controller is available as an accessory, see chapter 11 "Accessories and spare parts".
6.3.2 Overview of all connections

The following figure shows the pin assignment of the interfaces with the connector housing cover open.

![Diagram showing pin assignments]

**Connection Assignment**

<table>
<thead>
<tr>
<th>Connection</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN1</td>
<td>Supply voltage VDC</td>
</tr>
<tr>
<td>CN2</td>
<td>Interface for PROFIBUS DP</td>
</tr>
<tr>
<td>CN3</td>
<td>Interface for CAN or RS485</td>
</tr>
<tr>
<td>CN4</td>
<td>24 V signal interface</td>
</tr>
<tr>
<td>CN5</td>
<td>Interface for STO safety function</td>
</tr>
<tr>
<td>CN6</td>
<td>Jumper for disabling STO safety function</td>
</tr>
</tbody>
</table>

The drive can be connected via cable entries or industrial connectors.
For connection via cable entries see page 52.
For connection via industrial connectors see page 56.
6.3.3 Connection via cable entry

The cable specifications and pin assignments can be found in the chapters that describe the connections.

Preparing and fastening cables

![Diagram of cable preparation and fastening](image)

- Trim the cable bushings to fit the cable.
  - NOTE: The specified degree of protection IP54 can only be achieved with properly trimmed cable bushings.
- (A) Strip the jacket of all cables; length 70 mm.
- (B) Shorten the shield to a rest of 10 mm.
- (C) Slide the shield braiding back over the cable jacket.
- (D) Loosen the strain relief.
- Push the cables through the strain relief.
- Glue EMC shielding foil around the shield.
- Pull the cable back to the strain relief.
- Fasten the strain relief.

Mounting connectors

The table below lists the parts and data required for assembly. Connector housings and crimp contacts are included in the accessories kit. See also chapter 11 "Accessories and spare parts".

Only use the special tool listed in the Accessories chapter to release single crimp contacts from the connector housing.
Prepare the cable for connection as follows:

- Strip the ends of the cable.
- Attach cable lugs and crimp contacts. Verify that you have the correct crimp contacts and the matching crimping tool.
- Slide the cable lugs and crimp contacts straight into the connector until they snap in place.

### Table: Connection Conductor cross section of the crimp contact [mm²] Stripping length [mm] Manufacturer’s crimp contact no. Crimping tool Connector manufacturer Connector type

<table>
<thead>
<tr>
<th>Connection</th>
<th>Conductor cross section of the crimp contact [mm²]</th>
<th>Stripping length [mm]</th>
<th>Manufacturer’s crimp contact no.</th>
<th>Crimping tool</th>
<th>Connector manufacturer</th>
<th>Connector type</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN1</td>
<td>0.75 ... 1.5 (AWG 18 ... 16) 2.5 ... 4.0 (AWG 12)</td>
<td>5 ... 65 ... 6</td>
<td>160773-6 341001-6</td>
<td>654174-1</td>
<td>Tyco Electronics</td>
<td>Positive Lock 1-926 522-1</td>
</tr>
<tr>
<td>CN2</td>
<td>0.14 ... 0.6 (AWG 24 ... 20) 2.5 ... 3.0</td>
<td></td>
<td>43030-0007</td>
<td>69008-0982</td>
<td>Molex</td>
<td>Micro-Fit 3.0 43025-1200</td>
</tr>
<tr>
<td>CN3</td>
<td>0.25 ... 1.0 (AWG 24 ... 18) 3.0 ... 3.5</td>
<td></td>
<td>39-00-0060</td>
<td>69008-0724</td>
<td>Molex</td>
<td>Mini-Fit Jr. 39-01-2065</td>
</tr>
<tr>
<td>CN4</td>
<td>0.14 ... 0.6 (AWG 24 ... 20) 2.5 ... 3.0</td>
<td></td>
<td>43030-0007</td>
<td>69008-0982</td>
<td>Molex</td>
<td>Micro-Fit 3.0 43025-0600</td>
</tr>
<tr>
<td>CN5</td>
<td>0.14 ... 0.6 (AWG 24 ... 20) 2.5 ... 3.0</td>
<td></td>
<td>43030-0007</td>
<td>69008-0982</td>
<td>Molex</td>
<td>Micro-Fit 3.0 43645-0200</td>
</tr>
</tbody>
</table>
Figure 6.4 Connectors, cable lugs and crimp contacts

(1) Supply voltage \( \text{VDC} \)
(2) Fieldbus IN for PROFIBUS DP
(3) Fieldbus OUT for PROFIBUS DP
(4) Fieldbus IN for CAN or RS485
(5) Fieldbus OUT for CAN or RS485
(6) 24 V signal interface
(7) Shield wire with EMC shield foil
Mounting the cable entry

Unscrew the connector housing cover.

NOTE: Shipping locks made of cardboard must not be used for operating the drive. Replace all shipping locks by cable entries or signal inserts.

First adjust the parameter switches as these are difficult to access once the cables are connected.

For a description of the parameter switches, see the chapters describing the connections.

Connect the plug of the assembled cable to the matching socket. The plugs cannot be turned out of position and must click into place when being plugged in.

Only pull the connector housing (not the cable).

Plug the cable entry in one of the two cutouts provided. The side to be used for the cable entry depends on the space available in your system.

NOTE: The pointed corners of the cable entry must point in the direction of the connector housing cover. Degree of protection IP54 is not reached if the cable entry is mounted the other way round.

Close the cutout that is not used with a sealing insert for cutouts.

Finally, screw the connector housing cover back into place.

If screws are lost use M3x12 only.
6.3.4 Connection with industrial connectors

<table>
<thead>
<tr>
<th>Interface</th>
<th>Connector used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage VDC</td>
<td>Hirschmann STASEI 200</td>
</tr>
<tr>
<td>Fieldbus PROFIBUS DP in/out</td>
<td>Circular connector M12, 5 poles, B-coded</td>
</tr>
<tr>
<td>Fieldbus CAN in/out</td>
<td>Circular connector M12 , 5 poles, A-coded</td>
</tr>
<tr>
<td>24V signal inputs and outputs</td>
<td>Circular connector M8, 3 poles</td>
</tr>
<tr>
<td>Safety function STO &quot;Safe Torque Off&quot; (IEC/EN 61800-5-2)</td>
<td>Circular connector M8, 4 poles</td>
</tr>
</tbody>
</table>

Because the requirements are different depending on the system configuration, pre-assembled cables specially designed for Ethernet fieldbus connections can be procured from various suppliers.

Information on pre-assembled cables, connector kits and recommended suppliers can be found in chapter 11 "Accessories and spare parts".

6.3.5 Connection of VDC supply voltage

⚠️ DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT POWER SUPPLY UNIT

The VDC and +24VDC supply voltages are 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.

⚠️ CAUTION

LOSS OF CONTROL DUE TO REGENERATION CONDITION

Regeneration conditions resulting from braking or external driving forces may increase the VDC supply voltage to an unexpected level. Components not rated for this voltage may be destroyed or cause misoperation.

- Verify that all VDC consumers are rated for the voltage occurring during regeneration conditions (for example limit switches).
- Use only power supply units that will not be damaged by regeneration conditions.
- Use a braking resistor controller, if necessary.

Failure to follow these instructions can result in injury or equipment damage.
Cable specifications and terminal

Two different crimp contacts are available for different conductor cross sections, see chapter 6.3.3 "Connection via cable entry".

| Minimum conductor cross section [mm²] | 0.75 (AWG 18) |
| Maximum connection cross section [mm²] | 4.0 (AWG 12) |
| Stripping length [mm] | 5 ... 65 ... 6 |

| Crimp contact 1607736-6 [mm²] |
| Minimum connection cross section | 0.75 (AWG 18) |
| Maximum connection cross section | 1.5 (AWG 16) |
| Crimp contact 341001-6 [mm²] |
| Minimum connection cross section | 2.5 (AWG 12) |
| Maximum connection cross section | 4.0 (AWG 12) |

Unshielded cables may be used for the VDC supply voltage. Twisted pair is not required.

- Use pre-assembled cables to reduce the risk of wiring errors.
- Verify that wiring, cables and connected interfaces meet the PELV requirements.
Connecting the cables

- Note the specified technical data.
- Note the information provided in chapters 5.1 "External power supply units" and 5.2 "Ground design".
- Install fuses for the power supply cable accordance with the selected conductor cross section / wire gauge (note the inrush currents).

Pin assignment printed circuit board connector

![Figure 6.6 Pin assignment supply voltage](image)

<table>
<thead>
<tr>
<th>Signal</th>
<th>Meaning</th>
<th>Number 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDC</td>
<td>Supply voltage</td>
<td>1</td>
</tr>
<tr>
<td>0VDC</td>
<td>Reference potential to VDC</td>
<td>2</td>
</tr>
</tbody>
</table>

1) Information relates to pre-assembled cables

You can crimp together two wires to supply multiple drives via one DC bus. Two different crimp contacts are available for different conductor cross sections, see chapter 6.3.3 "Connection via cable entry".

Pin assignment industrial connector

![Figure 6.7 Pin assignment supply voltage](image)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Meaning</th>
<th>Number 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VDC</td>
<td>Supply voltage</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>0VDC</td>
<td>Reference potential to VDC</td>
<td>2</td>
</tr>
</tbody>
</table>

1) Information relates to pre-assembled cables
6.3.6 PROFIBUS DP connection

**Function**
The PROFIBUS DP interface allows you to network the product as a slave in a Profibus network.

The drive system receives data and commands from a master bus device. Status information such as operating state and processing state is sent to the master as acknowledgement.

The fieldbus manual for the product provides detailed description on fieldbus networking.

**Cable specifications and terminal**
- Shielded cable
- Twisted-pair cables
- Grounding of the shield at both ends

<table>
<thead>
<tr>
<th>Maximum cable length [m]</th>
<th>See next table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum conductor cross section [mm²]</td>
<td>0.34 (AWG 24)</td>
</tr>
<tr>
<td>Maximum connection cross section [mm²]</td>
<td>0.6 (AWG 20)</td>
</tr>
<tr>
<td>Stripping length [mm]</td>
<td>2.5 ... 3.0</td>
</tr>
</tbody>
</table>

The maximum cable length depends on the baud rate and the signal propagation delay. The higher the baud rate, the shorter the bus cable needs to be.

<table>
<thead>
<tr>
<th>Baud rate [kBaud]</th>
<th>Max. cable length [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.6</td>
<td>1200</td>
</tr>
<tr>
<td>19.2</td>
<td>1200</td>
</tr>
<tr>
<td>45.45</td>
<td>1200</td>
</tr>
<tr>
<td>93.75</td>
<td>1200</td>
</tr>
<tr>
<td>187.5</td>
<td>1000</td>
</tr>
<tr>
<td>500</td>
<td>400</td>
</tr>
<tr>
<td>1500</td>
<td>200</td>
</tr>
<tr>
<td>3000</td>
<td>100</td>
</tr>
<tr>
<td>6000</td>
<td>100</td>
</tr>
<tr>
<td>12000</td>
<td>100</td>
</tr>
</tbody>
</table>

- Use equipotential bonding conductors, see page 47.
- Use pre-assembled cables to reduce the risk of wiring errors.
- Verify that wiring, cables and connected interfaces meet the PELV requirements.
**Terminating resistor**

Both ends of the entire bus system must be terminated with a terminating resistor.

The terminating resistor is already integrated and can be activated at the end of the network with a switch.

The diagram below shows the integrated terminating resistor.

![Terminating Resistor Diagram](image-url)
Setting address and baud rate

Every device on the network is identified by a unique, adjustable node address. Slaves on a Profibus network may have addresses in the range from 3 to 126. Addresses 0 to 2 are reserved for master devices.

The baud rate is detected automatically.

Factory settings:

- Address: 126
- Terminating resistor: OFF

![Parameter switch diagram]

**Switch setting S1:**

<table>
<thead>
<tr>
<th>Address bit:</th>
<th>S1.2</th>
<th>S1.3</th>
<th>S1.4</th>
<th>S1.5</th>
<th>S1.6</th>
<th>S1.7</th>
<th>S1.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fieldbus address 126 (default)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Fieldbus address 25 (example)</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Switch setting S2:**

- Terminating resistor on: ON
- Terminating resistor off: OFF

**LED Communication indicator**

- LED on: Communication OK
- LED off: No communication

Reserved parameter switches are provided for future extensions and must be set to OFF.

**NOTE:** Each device must have its own unique node address, which may only be assigned once in the network.
Pin assignment printed circuit board connector

Figure 6.10 Pin assignment of Profibus fieldbus interface

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Meaning (Color 1)</th>
<th>SUB-D 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Rx/D/TxD-N</td>
<td>Profibus interface (green) IN</td>
<td>8</td>
</tr>
<tr>
<td>11</td>
<td>Rx/D/TxD-P</td>
<td>Profibus interface (red) IN</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Rx/D/TxD-N</td>
<td>Profibus interface (green) OUT</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>Rx/D/TxD-P</td>
<td>Profibus interface (red) OUT</td>
<td>3</td>
</tr>
</tbody>
</table>

1) Information refers to pre-assembled cables

Pin assignment industrial connector

Figure 6.11 Pin assignment of Profibus fieldbus interface

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Rx/D/TxD-N</td>
<td>Profibus interface</td>
</tr>
<tr>
<td>4</td>
<td>Rx/D/TxD-P</td>
<td>Profibus interface</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Internally connected to housing</td>
</tr>
</tbody>
</table>

The shield of the cable (SHLD) must be connected to the connector housing.
6.3.7 CAN connection

**Function**
The CAN interface allows you to network the product as a slave in a CANopen network as per DS301.

The drive system receives data and commands from a master bus device. Status information such as operating state and processing state is sent to the master as acknowledgement.

The fieldbus manual for the product provides detailed description on fieldbus networking.

**Cable specifications and terminals**
- Shielded cable
- Twisted-pair cables
- Grounding of the shield at both ends

<table>
<thead>
<tr>
<th>Maximum cable length [m]</th>
<th>See next table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum conductor cross section [mm²]</td>
<td>0.25 (AWG 22)</td>
</tr>
<tr>
<td>Maximum connection cross section [mm²]</td>
<td>1.0 (AWG 18)</td>
</tr>
<tr>
<td>Stripping length [mm]</td>
<td>3.0 ... 3.5</td>
</tr>
</tbody>
</table>

The maximum cable length depends on the number of network devices, the baud rate and the signal propagation delay. The higher the baud rate, the shorter the bus cable needs to be.

<table>
<thead>
<tr>
<th>Baud rate [kBaud]</th>
<th>Max. cable length [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>25</td>
</tr>
<tr>
<td>800</td>
<td>80</td>
</tr>
<tr>
<td>500</td>
<td>100</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>100</td>
<td>600</td>
</tr>
<tr>
<td>50</td>
<td>1000</td>
</tr>
</tbody>
</table>

► Use equipotential bonding conductors, see page 47.
► Use pre-assembled cables to reduce the risk of wiring errors.
► Verify that wiring, cables and connected interfaces meet the PELV requirements.

**Terminating resistor**
Both ends of the entire bus system must be terminated with a terminating resistor.

The terminating resistor is already integrated and can be activated at the end of the network with a switch.

<table>
<thead>
<tr>
<th>Fieldbus</th>
<th>Terminating resistor</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN-Bus</td>
<td>120 Ω between CAN_H and CAN_L</td>
</tr>
</tbody>
</table>
**Setting address and baud rate**

Every device on the network is identified by a unique, adjustable node address.

Factory settings:

- Address: 127
- Baud rate: 125 kBaud

![Parameter switch diagram]

**Figure 6.12 Parameter switch**

<table>
<thead>
<tr>
<th>Switch settings S1 and S2:</th>
<th>S1.2</th>
<th>S1.3</th>
<th>S1.4</th>
<th>S2.1</th>
<th>S2.2</th>
<th>S2.3</th>
<th>S2.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address bit:</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Fieldbus address 127 (default)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Fieldbus address 25 (example)</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Switch setting S4</th>
<th>Baud rate (Kbaud)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>125</td>
</tr>
<tr>
<td>4</td>
<td>250</td>
</tr>
<tr>
<td>5</td>
<td>500</td>
</tr>
<tr>
<td>6</td>
<td>800</td>
</tr>
<tr>
<td>7</td>
<td>1000</td>
</tr>
</tbody>
</table>

Reserved parameter switches are provided for future extensions and must be set to OFF.

**NOTE:** Each device must have its own unique node address, which may only be assigned once in the network.
**Pin assignment printed circuit board connector**

Figure 6.13 Pin assignment of CAN fieldbus interface

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Meaning</th>
<th>SUB-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>CAN_H</td>
<td>CAN interface</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>CAN_L</td>
<td>CAN interface</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>CAN_0V</td>
<td>Internally connected to CN1.0VDC</td>
<td>3</td>
</tr>
</tbody>
</table>

1) Information relates to pre-assembled cables

**Pin assignment industrial connector**

Figure 6.14 Pin assignment of CAN fieldbus interface

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SHLD</td>
<td>Shield connection</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>internally bridged from IN to OUT</td>
</tr>
<tr>
<td>3</td>
<td>CAN_0V</td>
<td>Internally connected to CN1.0VDC</td>
</tr>
<tr>
<td>4</td>
<td>CAN_H</td>
<td>CAN interface</td>
</tr>
<tr>
<td>5</td>
<td>CAN_L</td>
<td>CAN interface</td>
</tr>
</tbody>
</table>
6.3.8 RS485 connection

**Function**
The drive system is commissioned via the RS485 interface and the commissioning software.

In addition, the RS485 interface allows you to network the product as a slave in an RS485 network.

The fieldbus manual for the product provides detailed description on fieldbus networking.

**Cable specifications and terminal**
- Shielded cable
- Twisted-pair cables
- Grounding of the shield at both ends

<table>
<thead>
<tr>
<th>Maximum cable length [m]</th>
<th>400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum conductor cross section [mm^2]</td>
<td>0.25 (AWG 22)</td>
</tr>
<tr>
<td>Maximum connection cross section [mm^2]</td>
<td>1.0 (AWG 18)</td>
</tr>
<tr>
<td>Stripping length [mm]</td>
<td>3.0 ... 3.5</td>
</tr>
</tbody>
</table>

- Use equipotential bonding conductors, see page 47.
- Use pre-assembled cables to reduce the risk of wiring errors.
- Verify that wiring, cables and connected interfaces meet the PELV requirements.

**Terminating resistor**
Both ends of the entire bus system must be terminated with a terminating resistor.

The terminating resistor is already integrated and can be activated at the end of the network with a switch.

<table>
<thead>
<tr>
<th>Fieldbus</th>
<th>Terminating resistor</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS485 bus</td>
<td>120 Ω between +RS485 and -RS485</td>
</tr>
</tbody>
</table>

**Setting address and baud rate**
Each device on the network is identified by a unique, adjustable node address.

Factory settings:
- Address: 1
- Baud rate: 9600
- Data format: 7 bits
  - Even parity
  - 1 stop bit

In the case of devices with CAN or Profibus fieldbus interfaces, the address and the baud rate of the RS485 interface are set via the commissioning software.

In the case of devices without CAN or Profibus fieldbus interfaces, the address and the baud rate of the RS485 interface are set via parameter switches.
Figure 6.15 Parameter switch

<table>
<thead>
<tr>
<th>Switch settings S1 and S2:</th>
<th>S1.4</th>
<th>S2.1</th>
<th>S2.2</th>
<th>S2.3</th>
<th>S2.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address bit:</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Address 1 (Default)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Address 25 (example)</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Switch setting S4</th>
<th>Baud rate (Kbaud)</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9600</td>
<td>7-E-1</td>
</tr>
<tr>
<td>1</td>
<td>19200</td>
<td>7-E-1</td>
</tr>
<tr>
<td>2</td>
<td>38400</td>
<td>7-E-1</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>9600</td>
<td>7-N-1</td>
</tr>
<tr>
<td>5</td>
<td>19200</td>
<td>7-N-1</td>
</tr>
<tr>
<td>6</td>
<td>38400</td>
<td>7-N-1</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>9600</td>
<td>8-E-1</td>
</tr>
<tr>
<td>9</td>
<td>19200</td>
<td>8-E-1</td>
</tr>
<tr>
<td>A</td>
<td>38400</td>
<td>8-E-1</td>
</tr>
<tr>
<td>B</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>9600</td>
<td>8-N-1</td>
</tr>
<tr>
<td>D</td>
<td>19200</td>
<td>8-N-1</td>
</tr>
<tr>
<td>E</td>
<td>38400</td>
<td>8-N-1</td>
</tr>
<tr>
<td>F</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Reserved parameter switches are provided for future extensions and must be set to OFF.

NOTE: Each device must have its own unique node address, which may only be assigned once in the network.

Pin assignment printed circuit board connector

![Pin assignment printed circuit board connector](image1)

Figure 6.16 Pin assignment RS485

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Meaning</th>
<th>SUB-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>+RS485</td>
<td>RS485 interface</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>-RS485</td>
<td>RS485 interface</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>RS485_0V</td>
<td>Internally connected to CN1,0VDC</td>
<td>3</td>
</tr>
</tbody>
</table>

1) Information relates to pre-assembled cables

Pin assignment industrial connector

![Pin assignment industrial connector](image2)

Figure 6.17 Pin assignment of the RS485 fieldbus interface

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SHLD</td>
<td>Shield connection</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>Not assigned</td>
</tr>
<tr>
<td>3</td>
<td>RS485_0V</td>
<td>Internally connected to CN1,0VDC</td>
</tr>
<tr>
<td>4</td>
<td>+RS485</td>
<td>RS485 interface</td>
</tr>
<tr>
<td>5</td>
<td>-RS485</td>
<td>RS485 interface</td>
</tr>
</tbody>
</table>
6.3.9 24V signal interface connection

**24V signal power supply**
The 24V signal power supply provided for constant supply of the sensor system.
It must not be connected in parallel with the 24V signal power supply of a different drive.

**Cable specifications and terminal**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum conductor cross section</td>
<td>0.2 (AWG 24)</td>
</tr>
<tr>
<td>Maximum connection cross section</td>
<td>0.6 (AWG 20)</td>
</tr>
<tr>
<td>Stripping length</td>
<td>2.5 ... 3.0</td>
</tr>
</tbody>
</table>

- Use pre-assembled cables to reduce the risk of wiring errors.
- Verify that wiring, cables and connected interfaces meet the PELV requirements.

**Parameterization**
The 24V signals can be configured with the parameters IO.IO0_def, 34:1 to IO.IO3_def, 34:4 as either input or output. Specific functions can also be assigned.

<table>
<thead>
<tr>
<th>Function</th>
<th>Possible for signal</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive limit switch</td>
<td>IO0</td>
<td>Logic level can be configured</td>
</tr>
<tr>
<td>Negative limit switch</td>
<td>IO1</td>
<td>Logic level can be configured</td>
</tr>
<tr>
<td>STOP switch</td>
<td>IO0..3</td>
<td>Logic level can be configured</td>
</tr>
<tr>
<td>Reference switch</td>
<td>IO0..3</td>
<td>For reference movement to REF, level can be configured</td>
</tr>
<tr>
<td>Freely usable</td>
<td>IO0..3</td>
<td>Free access via fieldbus</td>
</tr>
<tr>
<td>Programmable</td>
<td>IO0..3</td>
<td>see chapter 8.3.4 &quot;Programmable inputs and outputs&quot;</td>
</tr>
</tbody>
</table>

The external monitoring signals LIMP, LIMN, REF and STOP are enabled with the parameter Settings.SignEnabl, 28:13.

Use active 0 monitoring signals if possible, because they are failsafe. Evaluation for active 0 or 1 is set with the parameter Settings.SignLevel, 28:14.

For more information see chapter 7 "Commissioning".
Pin assignment printed circuit board connector

![Diagram of pin assignment](image)

Figure 6.18 Pin assignment of the 24V signal interface

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Meaning</th>
<th>I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24VDC_OUT</td>
<td>The 24V signal supply may be used to supply the sensor system (e.g. limit switches)</td>
<td>O</td>
</tr>
<tr>
<td>2</td>
<td>IO2</td>
<td>Freely usable input / output</td>
<td>I/O</td>
</tr>
<tr>
<td>3</td>
<td>IO0</td>
<td>Freely usable input / output</td>
<td>I/O</td>
</tr>
<tr>
<td>4</td>
<td>0VDC</td>
<td>Internally connected to CN1.0VDC</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>IO3</td>
<td>Freely usable input / output</td>
<td>I/O</td>
</tr>
<tr>
<td>6</td>
<td>IO1</td>
<td>Freely usable input / output</td>
<td>I/O</td>
</tr>
</tbody>
</table>
6.3.10 Connection of STO safety function

### 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 or serious injury.**

### Requirements

For information and requirements relating to the STO safety function, see chapter 5.3 "Safety function STO ("Safe Torque Off")".

### Cable specifications and terminal

- Shielded cable corresponding to the requirements for protected layout of wires

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum conductor cross section</td>
<td>[mm²]</td>
<td>0.34 (AWG 20)</td>
</tr>
<tr>
<td>Maximum connection cross section</td>
<td>[mm²]</td>
<td>0.6 (AWG 20)</td>
</tr>
<tr>
<td>Stripping length</td>
<td>[mm]</td>
<td>2.5 … 3.0</td>
</tr>
</tbody>
</table>

- Use equipotential bonding conductors, see page 47.
- Use pre-assembled cables to reduce the risk of wiring errors.
- Verify that wiring, cables and connected interfaces meet the PELV requirements.

The cable available as an accessory is a special cable that is only available with a connector. The shield of the cable is connected to the grounded housing of the drive via the metal connector. It is sufficient to connect one end of the cable to the grounded housing.
Pin assignment printed circuit board connector

Figure 6.19  Pin assignment of safety function

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN5.1</td>
<td>STO_A (PWRR_A)</td>
<td>Safety function STO “Safe Torque Off” (IEC/EN 61800-5-2)</td>
</tr>
<tr>
<td>CN5.2</td>
<td>STO_B (PWRR_B)</td>
<td>Safety function STO “Safe Torque Off” (IEC/EN 61800-5-2)</td>
</tr>
<tr>
<td>CN6</td>
<td>Jumper plugged in: STO disabled</td>
<td>Jumper removed: STO enabled</td>
</tr>
</tbody>
</table>

NOTE: Jumper CN5 cannot be plugged in as long as jumper CN6 is still plugged in (mechanical lock).

Connecting the safety function

- Remove jumper CN6.
- Connect the connector to CN5.
6.4 Connection accessories

6.4.1 Accessory "Insert kit, 3x I/O"

The accessory makes the signals IO0, IO1 and IO3 available outside of the device via industrial connectors.

![Pin assignment](image1)

Pin 1 is internally connected to CN4.1 (+24VDC_OUT).
Pin 3 is internally connected to CN4.4 (0VDC).

6.4.2 Accessory "Insert kit, 2x I/O, 1x STO in"

The accessory makes the signals IO0, IO1 and the signals of the STO safety function available outside of the device via industrial connectors.

![Pin assignment](image2)

Pin 1 is internally connected to CN4.1 (+24VDC_OUT).
Pin 3 is internally connected to CN4.4 (0VDC).

6.4.3 Accessory "Insert kit, 1x STO in, 1x STO out"

The accessory makes the signals of the STO safety function available outside of the device via industrial connectors.

![Pin assignment](image3)
6.4.4 Accessory "Insert kit, 4x I/O, 1x STO in, 1x STO out"

The accessory makes the signals IO0, IO1, IO2 and IO3 and the signals of the STO safety function available outside of the device via industrial connectors.

Pin 1 is internally connected to CN4.1 (+24VDC_OUT).
Pin 3 is internally connected to CN4.4 (0VDC).

6.5 Checking wiring

Check the following:

► Did you properly install and connect all cables and connectors?

► Are there any live, exposed cables?

► Did you properly connect the signal wires?

► Did you properly install all seals (degree of protection IP54)?
7 Commissioning

⚠️ WARNING
UNEXPECTED MOVEMENT
When the drive is operated for the first time, there is a risk of unexpected movements caused by possible wiring errors or unsuitable parameters.

- Perform the first test run without coupled loads.
- Verify that a functioning button for EMERGENCY STOP is within reach.
- Anticipate movements in the incorrect direction or oscillation of the drive.
- 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.

⚠️ WARNING
UNINTENDED BEHAVIOR
The behavior of the drive system is governed by numerous stored data or settings. Unsuitable settings or data may trigger unexpected movements or responses to signals and disable monitoring functions.

- Do NOT operate the drive system with unknown settings or data.
- Verify that the stored data and settings are correct.
- When commissioning, carefully run tests for all operating states and potential fault 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 hazardous area.

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

⚠️ WARNING
ROTATING PARTS
Rotating parts may cause injuries and may catch clothing or hair. Loose parts or parts that are unbalanced may be flung.

- Verify correct mounting and installation of all rotating parts.
- Use a cover to help protect against rotating parts.

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

The following tests are required before commissioning:

- Wiring and connection of all cables and system components
- Function of the limit switch, if installed

One of the following must be available:

- Fieldbus master (e.g. PLC) or industrial PC
- Commissioning software

---

**WARNING**

MOTOR WITHOUT BRAKING EFFECT

If power outage and faults cause the power stage to be switched off, the motor is no longer stopped by the brake and may increase its speed even more until it reaches a mechanical stop.

- Verify the mechanical situation.
- If necessary, use a cushioned mechanical stop or a suitable brake.

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

---

**WARNING**

FALLING PARTS

The motor may move as a result of the reaction torque; it may tip and fall.

- Mount the motor securely so it will not break loose during strong acceleration.

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

---

**CAUTION**

HOT SURFACES

Depending on the operation, the surface may heat up to more than 100°C (212°F).

- Do not allow contact with the hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity.
- Consider the measures for heat dissipation described.
- Check the temperature during test runs.

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

7.2.1 First setup

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

**Direction of rotation**
Rotation of the motor shaft in a clockwise or counterclockwise direction of rotation. Clockwise rotation is when the motor shaft rotates clockwise as you look at the end of the protruding motor shaft.

The direction of rotation can be reversed with the parameter `Motion.invertDir 28:6`.

The new value is only activated when the drive is switched on.

- Save the parameter to the EEPROM
- Switch the supply voltage off and on.

*If you invert the direction of rotation, verify once again that the limit switches are properly wired.*

- Connect the positive limit switch to `IO0`
- Connect the negative limit switch to `IO1`

**Reference speed**
The reference speed for the motor depends on the application requirements.

- Set the reference speed with the parameter `Motion.v_target0 29:23`.

**Acceleration/deceleration**
Note that when the drive decelerates, it recovers energy from the system and the voltage may increase depending on the external torque and the deceleration value set.

The drive has two acceleration settings:

- Acceleration/deceleration
  Parameter `Motion.acc, 29:26`
- Deceleration for "Quick Stop"
  Parameter `Motion.dec_Stop, 28:21`

**Homing the drive**
As long as the drive has not yet been referenced, absolute positioning is not possible in the operating mode Profile Position. However, all other operating modes can be used even if the drive has not been referenced. You can use the function Position Setting or run a reference movement to home the drive, see chapter 8.2.4 "Operating mode Homing".
Setting the current limitation

The motor controller limits the maximum current and, by implication, the maximum torque of the drive to an adjustable configurable value. The maximum possible value depends on the combination of drive power stage, motor and gearbox.

Parameter:

- Read value: Nominal current of drive
  Config.I_nomDrv, 15:1
- Read value: Maximum current of drive
  Config.I_maxDrv, 15:2
- User-defined maximum current for normal operation
  Settings.I_max, 15:3
- User-defined maximum current for Stop via torque ramp
  Settings.I_maxStop, 15:4

Current limitation is also controlled by \( I^2t \) monitoring; this type of monitoring is described in chapter 8.1.4 "Internal monitoring signals".

Tuning the controllers

The drive has an encoder and operates as a "closed loop" system. The controller is a classic cascade controller with current, speed and positioning loops.

The controller parameters are factory-set and do not need to be modified for most applications.

- Speed controller P term
  Control.KPn, 15:8
- Speed controller integral action time
  Control.TNn, 15:9
- Position controller P term
  Control.KPp, 15:10
- Speed feed-forward control position controller
  Control.KFPp, 15:11

7.2.2 Starting 24V signal interface

7.2.2.1 Setting the functions of the 24V signals

You can configure the 24V signals as input or output with the parameters IO.IO0_def 34:1 to IO.IO3_def 34:4 and assign specific functions to the 24V signals.

For more information see chapter 6 "Installation".
7.2.2.2 Testing 24V signals

The following table shows the readable and writable status of the 24V signals and the possible parameter settings.

<table>
<thead>
<tr>
<th>Group/Name</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type</th>
<th>Unit Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O.IO_act 33:1 (21:01h)</td>
<td>Status of digital inputs and outputs</td>
<td>Assignment of bits: Bit 0: IO0 Bit 1: IO1 Bit 2: IO2 Bit 3: IO3 Bit 4: STO_A (PWRR_A) Bit 5: STO_B (PWRR_B)</td>
<td>UINT16</td>
<td>0..15</td>
<td>0</td>
</tr>
</tbody>
</table>

Reading returns the status of the inputs and outputs. Writing only changes the status of outputs.

| I/O.IO0_def 34:1 (22:01h) | Configuration of IO0 | | UINT16 | 0..255 | 1 | R/W per. |
|-------------------------------|---------------------|------------------------|----------|-----------|--------|
| Value 0: Input freely usable Value 1: Input LIMP (only with IO0) Value 2: Input LIMN (only with IO1) Value 3: Input STOP Value 4: Input REF Value 5: Input programmable Value 128: Output freely usable Value 130: Output programmable |

| I/O.IO1_def 34:2 (22:02h) | Configuration of IO1 | See parameter IO0_def | UINT16 | 0..255 | 2 | R/W per. |
|-------------------------------|---------------------|---------------------|----------|-----------|--------|

| I/O.IO2_def 34:3 (22:03h) | Configuration of IO2 | See parameter IO0_def | UINT16 | 0..255 | 3 | R/W per. |
|-------------------------------|---------------------|---------------------|----------|-----------|--------|

| I/O.IO3_def 34:4 (22:04h) | Configuration of IO3 | See parameter IO0_def | UINT16 | 0..255 | 4 | R/W per. |
|-------------------------------|---------------------|---------------------|----------|-----------|--------|

**Testing the signal inputs and limit switches**

Proceed as follows for testing:

- Trigger the limit switch or the sensor manually.

  The corresponding bit in parameter \texttt{IO.IO\_act 33:1} must be 1 as long as the input is logic 1.

**Checking the freely usable signal outputs**

Proceed as follows for testing:

- Write the value required to set the associated output to logic 1 to parameter \texttt{IO.IO\_act 33:1}.

- Measure the voltage at the output or check the response of the connected actuator.


### 7.2.2.3 Testing the function of limit switches

Monitoring of the **LIMP**/**LIMN** limit switches is activated in the factory settings. In all drives without limit switches, monitoring must be disabled with the parameter `Settings.SignEnabl`, **23:13**, value = 0. The factory setting for the STOP input is "disabled".

**Condition:** The limit switch signals are monitored.

For more information see chapter 7.2.2.2 "Testing 24V signals".

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>Default</th>
<th>R/W per.</th>
</tr>
</thead>
</table>
| **Settings.SignEnabl** 28:13 (1C:0Dh) | Activation of monitoring inputs  
  Bit value 0: Monitoring is not active  
  Bit value 1: Monitoring is active  
  Assignment of bits:  
  Bit 0: LIMP (positive limit switch)  
  Bit 1: LIMN (negative limit switch)  
  Bit 2: STOP (STOP switch)  
  Bit 3: REF (reference switch)  
  NOTE: Monitoring is only active if the I/O port is configured as the corresponding function (parameter I/O.IO0_def to IO3_def). | UINT16    | -    | 3       | R/W per. |
| **Settings.SignLevel** 28:14 (1C:0Eh) | Signal level for monitoring inputs  
  Used to define whether errors are triggered at 0 or 1 level.  
  Bit value 0: Response at 0 level  
  Bit value 1: Response at 1 level  
  Assignment of bits:  
  Bit 0: LIMP  
  Bit 1: LIMN  
  Bit 2: STOP  
  Bit 3: REF | UINT16    | -    | 0       | R/W per. |
| **Status.Sign_SR** 28:15 (1C:0Fh) | Stored signal status of external monitoring signals  
  Bit value 0: not activated  
  Bit value 1: activated  
  Assignment of bits:  
  Bit 0: LIMP  
  Bit 1: LIMN  
  Bit 2: STOP  
  Bit 3: REF  
  Bit 7: SW stop  
  Stored signal status of released external monitoring signals | UINT16    | -    | -       | R/-     |
You can change enabling of the external monitoring signals LIMF, LIMN and STOP with the parameter Settings.SignEnabl 28:13; use the parameter Settings.SignLevel 28:14 to change evaluation for active LOW or HIGH.

- Connect the limit switch that limits the working range for clockwise rotation to LIMF.
- Connect the limit switch that limits the working range for counterclockwise rotation to LIMN.

- Verify the function of the limit switches with the parameter Status.Sign_SR 28:15.
- Enable the power stage.
- Run a "Fault Reset".
  After that, no bit may be set in parameter Status.Sign_SR 28:15.
- Briefly actuate the limit switch manually.
  After that, the corresponding bit must be set in parameter Status.Sign_SR 28:15.
- Run a "Fault Reset".
  After that, no bit may be set in parameter Status.Sign_SR 28:15.
7.2.3 Testing safety functions

*Operation with STO*  
If you wish to use the STO safety function, carry out the following steps. Perform the steps exactly in the sequence described.

- Supply voltage switched off.
  - Verify that the inputs \( \text{STO}_A (\text{PWRR}_A) \) and \( \text{STO}_B (\text{PWRR}_B) \) are electrically isolated from each other. The two signals must not be electrically connected.

- Supply voltage switched on.
  - Enable the power stage.  
    (Parameter \text{Commands.driveCtrl}, 28:1 bit 1)
  - Trigger the safety function. \( \text{STO}_A (\text{PWRR}_A) \) and \( \text{STO}_B (\text{PWRR}_B) \) must be switched off simultaneously (time offset <1s).
  
    □ The power stage is disabled and error message 0119\(_h\) is generated. (NOTE: Error message 011Ah indicates a wiring error.)
  
    (Parameter \text{Status.StopFault}, 32:7)
  - Check the behavior of the drive during fault conditions.
  - Document all tests of the safety function in your acceptance certificate.

*Operation without STO*  
If you do not want to use the STO safety function:

- Verify that jumper CN6 is connected.

---

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
</table>
| Commands.driveCtrl 28:1 (1C:01h) | Control word | Assignment of bits:
  Bit 0: Disable power stage
  Bit 1: Enable power stage
  Bit 2: Quicktop
  Bit 3: FaultReset
  Bit 4: QuickStop-Release
  Bits 5..15: Reserved | UINT16 0..31 0 | R/W |
7.2.4 Testing with relative positioning

Positioning can be tested by means of relative positioning in "Profile Position" operating mode.

**WARNING**

UNINTENDED OPERATION

- Note that any changes to the values of these parameters are executed by the drive controller immediately on receipt of the data set.
- Verify that the system is free and ready for movement before changing these parameters.

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

All speed and position values listed below relate to the motor drive shaft (without gearbox).

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commands.driveCtrl 28:1 (1C:01h)</td>
<td>Control word</td>
<td>Assignment of bits:</td>
<td>Bit 0: Disable power stage  Bit 1: Enable power stage  Bit 2: Quicktop  Bit 3: FaultReset  Bit 4: QuickStop-Release  Bits 5..15: Reserved</td>
<td>UINT16</td>
<td>0..31</td>
<td>R/W</td>
</tr>
<tr>
<td>PTP.p_relPTP 35:3 (23:03h)</td>
<td>Target position for relative positioning and start of positioning</td>
<td>Action object: write access triggers relative positioning in increments</td>
<td>INT32</td>
<td>Inc</td>
<td>R/W</td>
<td></td>
</tr>
<tr>
<td>PTP.v_tarPTP 35:5 (23:05h)</td>
<td>Target speed of rotation for positioning</td>
<td>Positioning can be temporarily stopped with value 0. The default value is the value of parameter Motion.v_target0. The minimum speed of rotation is 300 min⁻¹.</td>
<td>UINT16</td>
<td>min⁻¹</td>
<td>R/W</td>
<td></td>
</tr>
</tbody>
</table>
Performing the test run

To perform the test run, proceed as described below.

- Enable the power stage.
  (Parameter Commands.driveCtrl 28:1 Bit 1)
- Set the target speed, e.g. 600 min⁻¹.
  (Parameter PTP.v_tarPTP 35:5)
- Start relative positioning, e.g. by 1000 increments.
  (Parameter PTP.v_relPTP 35:3)
- Verify the function of the limit switches at a low speed.

7.2.5 Optimizing the motor behavior

Setting the slope of the ramps

- Enter the slopes of the ramp function in the parameter Motion.acc, 29:26. The following formulas can be used to estimate the values for input:

\[
\text{Moment of acceleration} \leq \frac{30 \alpha}{\pi}
\]

\[
\alpha = \frac{M_M - M_L}{J_{total}}
\]

<table>
<thead>
<tr>
<th>Physical value/ nominal value</th>
<th>Meaning</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(M_M)</td>
<td>Available torque of motor</td>
<td>Nm</td>
</tr>
<tr>
<td>(M_L)</td>
<td>Load torque</td>
<td>Nm</td>
</tr>
<tr>
<td>(J_{total})</td>
<td>Mass moment of inertia</td>
<td>kgm²</td>
</tr>
<tr>
<td>(\alpha)</td>
<td>Angular acceleration</td>
<td>rad/sec²</td>
</tr>
<tr>
<td>Motion.acc</td>
<td>Acceleration parameters</td>
<td>min⁻¹/s</td>
</tr>
</tbody>
</table>

Reference speed

The reference speed for the motor depends on the application requirements.

- Set the reference speed with the parameter Motion.v_target0 29:23.
Torque characteristic of the motor

The available torque of the motor depends on the following factors:

- Size
- Speed
- Supply voltage (the dependency starts at a specific speed of rotation at which the torque decreases drastically)

See the characteristic curve of the motor in the catalog for the dependency of the torque on the speed.

![Typical torque characteristic of a brushless DC motor](image)

Figure 7.1 Typical torque characteristic of a brushless DC motor

(1.1) 36 V
(1.2) 24 V

At a specific speed of rotation the available torque decreases drastically with increasing speeds. The available acceleration is reduced correspondingly.
7.3 Lexium CT commissioning software

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

**Source commissioning software**

The latest version of the commissioning software is available for download from the internet:

http://www.schneider-electric.com

**Functions of the commissioning software**

The functions of the commissioning software include:

- Scan various fieldbuses for devices
- Extensive information on connected devices
- Display and enter device parameters
- Archive and duplicate device parameters
- Manual positioning of the motor
- Test input and output signals
- Record, evaluate and archive motion and signals
- Error diagnostics
- Optimize control behavior (servo motors only)

**System requirements**

The minimum hardware requirements for installation and operation of the software are:

- IBM-compatible PC
- Approx. 200 MB of hard disk space
- 512 MB RAM
- Graphics card and monitor with a resolution of at least 1024x768 pixels
- Free serial interface (RS232) or free USB interface
- Operating system Windows 2000, Windows XP Professional or Windows Vista
- Acrobat Reader 5.0 or newer
- Internet connection (for initial installation and updates)

**Online help**

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

<table>
<thead>
<tr>
<th>Interface</th>
<th>PC interface</th>
<th>Required fieldbus converter</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS485</td>
<td>USB</td>
<td>NuDAM ND-6530</td>
<td><a href="http://www.acceed.com">http://www.acceed.com</a></td>
</tr>
<tr>
<td>RS485</td>
<td>RS232</td>
<td>NuDAM ND-6520</td>
<td><a href="http://www.acceed.com">http://www.acceed.com</a></td>
</tr>
<tr>
<td>CAN</td>
<td>USB</td>
<td>PCAN-USB, Peak</td>
<td><a href="http://www.peak-system.com">http://www.peak-system.com</a></td>
</tr>
<tr>
<td>CAN</td>
<td>parallel</td>
<td>PCAN-Dongle, Peak</td>
<td><a href="http://www.peak-system.com">http://www.peak-system.com</a></td>
</tr>
<tr>
<td>PROFIBUS DP</td>
<td>USB</td>
<td>PROFIsbus PB-USB</td>
<td><a href="http://www.softing.com">http://www.softing.com</a></td>
</tr>
<tr>
<td>Profibus-DP</td>
<td>PCMCIA</td>
<td>Siemens CP5511/12</td>
<td><a href="http://www.ad.siemens.com">http://www.ad.siemens.com</a></td>
</tr>
<tr>
<td>Profibus-DP</td>
<td>PCI</td>
<td>Siemens CP5611/13</td>
<td><a href="http://www.ad.siemens.com">http://www.ad.siemens.com</a></td>
</tr>
</tbody>
</table>
7.3.1 Firmware update via fieldbus

**CAUTION**

**DAMAGE TO THE PRODUCT CAUSED BY POWER OUTAGE**

If the supply voltage becomes unavailable during an update, the product will be damaged and must be sent in for repair.

- Do not switch off the supply voltage during the update.
- Update the firmware only with a reliable supply voltage.

*Failure to follow these instructions can result in equipment damage.*

**Flashkit**

The Flashkit allows you to update the firmware via the relevant fieldbus. The Flashkit supports the same fieldbus converters as the commissioning software.

*Please contact your local sales office to obtain the Flashkit and for support.*

**Determining the firmware version**

You can determine the firmware number and the firmware version with the commissioning software by opening the device information window.

Information on the following parameters can be determined via the fieldbus:

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Index: Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type</th>
<th>Unit Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Config.PrgNo</td>
<td>1:1 (01:01h)</td>
<td>Firmware number</td>
<td>High word: Program number Low word: Program version Example: PR802.10 High word: 802 Low word: 10</td>
<td>UINT32</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td>Config.PrgVer</td>
<td>1:2 (01:02h)</td>
<td>Firmware version</td>
<td>High word: Program version Low word: Program revision Example: V1.003 High word: 1 Low word: 3</td>
<td>UINT32</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td>Config.OptPrgNo</td>
<td>13:11 (0D:0Bh)</td>
<td>Firmware number in option module Identifies the program number of the internal Profibus interface of drives with Profibus</td>
<td></td>
<td>UINT32</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td>Config.OptPrgVer</td>
<td>13:12 (0D:0Ch)</td>
<td>Firmware version in option module Identifies the program version of the internal Profibus interface of drives with Profibus</td>
<td></td>
<td>UINT32</td>
<td>-</td>
<td>R/-</td>
</tr>
</tbody>
</table>
8 Operation

The chapter "Operation" describes the basic operating states, operating modes and functions of the drive.

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

8.1 Basics

All speed and position values listed below relate to the motor drive shaft (without gearbox).

8.1.1 Default parameter values

The following default parameter values can be adapted to meet the requirements of the application.

- Accelerations
  - Acceleration and deceleration in general
    (parameter Motion.acc, 29:26)
  - Deceleration for "Quick Stop"
    (parameter Motion.dec_Stop, 28:21)
- Definition of the direction of rotation
  (parameter Motion.invertDir, 28:6)
- Controller settings
- Signal interface
  - Definition of I/O signals
    (Parameter group I/O)
  - Enabling limit switches
    (Parameter group I/O)
- User device name
  (Parameters Settings.name1, 11:1 and Settings.name2, 11:2)
8.1.2 External monitoring signals

You can enable, set and monitor the external monitoring signals.

Available external monitoring signals:

- **Axis signals**
  - Positive limit switch **LIMP**
  - Negative limit switch **LIMN**
  - Stop switch **STOP**
  - Reference switch **REF**
- **Software stop "SW STOP"**

8.1.2.1 Axis signals

**Configuring the axis signals**

Before the external monitoring signals can be used, the signal inputs must be configured for this function (parameter group I/O).

**Setting the signal levels**

After you have configured the signal inputs, adjust the signal levels for the individual signal inputs.

- Value 0: Response at 0 level (failsafe)
- Value 1: Response at 1 level

**Activating the axis signals**

In the last step you enable the external signal inputs so the incoming signals will be evaluated.

**Reading the axis signals**

The saved signal status of the enabled external signal inputs can read out at any time.

**Monitoring the axis signals**

During operation the two limit switches **LIMN** and **LIMP** are monitored. If a limit switch is tripped, the motor stops with the set "Quick Stop" deceleration (parameter **Motion.dec_Stop**, 28:21) and the event is saved (parameter **Status.Sign_SR**, 28:15).

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

**Moving away from switch**

The drive can be moved away from the limit switch range at any time by a reference movement or a jog movement.

For more information see chapter 8.2.4 "Operating mode Homing" or 8.2.1 "Operating mode Jog".

**External monitoring signal **REF****

The external monitoring signal **REF** does not have to be enabled for the reference movement. If the external monitoring signal **REF** is enabled, the reference switch also takes the function of an additional stop switch.
**External monitoring signal STOP**

The external monitoring signal STOP stops the motor with a "Quick Stop". The signal is stored in the parameter Status.Sign_SR, 28:15, bit 2.

To resume processing:

- Reset the external monitoring signal STOP at the signal input.
- Run a "Fault Reset".
  
  (parameter Commands.driveCtrl, 28:1, Bit 3)

- Start a new motion command.

The external monitoring signal STOP is enabled with the parameter Settings.SignEnabl, 28:13, Bit 2.

The signal level of the external monitoring signal STOP is set with the parameter Settings.SignLevel, 28:14, Bit 2.

**8.1.2.2 Software stop "SW STOP"**

The software "STOP" is a fieldbus command (parameter Commands.driveCtrl, 28:1, bit 2) which brings the drive to an immediate standstill with the specified "Quick Stop" deceleration (parameter Motion.dec_Stop, 28:21).

After an "SW STOP" the drive switches to the operating state "Quick Stop". The power stage remains enabled.

Carry out one of the following steps to continue processing:

- Run a "Fault Reset".
  
  (parameter Commands.driveCtrl, 28:1, Bit 3)

  Note that in the event of a "Fault Reset" any other errors that may have occurred are also reset!

- Run a "Quick Stop Release".
  
  (parameter Commands.driveCtrl, 28:1, Bit 4)

After acknowledgement, the drive switches to the operating state "Operation Enable".
### 8.1.3 Positioning limits

The motor can move to any point within the positioning range once an absolute position has been specified.

The positioning range is $-2^{31}$ to $+2^{31}$ increments (inc).

The positioning resolution is 12 increments per revolution measured at the motor output shaft (without gearbox).

![Positioning range and range overrun](image)

If the motor exceeds the positioning limits, the internal monitoring signal for position overrun (parameter `Status.WarnSig, 28:10`, bit 0) is set and the working range is shifted by $2^{32}$ increments.

If the drive was previously referenced, the bit `ref_ok` (parameter `Status.xMode_act, 28:3, Bit 5`) is also reset.

The internal monitoring signal remains set when the motor moves back into the valid range.

Use the parameter `Settings.WarnOvrun, 28:11` to parameterize whether the overrun of the positioning limits is signaled as a warning in the parameter `Status.driveStat, 28:2` bit 7.

"Absolute positioning" is no longer possible after a position overrun.

**Resetting the signal**

A reference movement or position setting resets the internal monitoring signal for position overrun.

**Operating modes with position overrun**

Modes in which the positioning limits can be overtraveled:

- Jog (as of software version 1.101 and later)
- Profile Velocity
- Relative positioning in Profile Position
8.1.4 Internal monitoring signals

The internal monitoring signals are used to monitor the drive itself.

Available internal monitoring signals (parameters Status.WarnSig, 28:10 and Status.FltSig, 28:17):

- Positional deviation with disabled power stage (warning)
- Blocking error
- Position overrun profile generator (warning)
- Safety function STO "Safe Torque Off" (IEC/EN 61800-5-2)
- Hardware error
- Internal system error
- Nodeguard error fieldbus
- Protocol error fieldbus
- Position deviation of position controller
- I2t Limit (warning)
- Overvoltage or undervoltage error
- Motor overload
- Overtemperature error

Reading stored internal monitoring signals

The signal status of the enabled internal monitoring signals is saved.

If an internal monitoring error occurs, the corresponding bit is set in the parameters Status.FltSig, 28:17 and Status.FltSig_SR, 28:18.

After the cause of the error has been corrected, the bit in parameter Status.FltSig, 28:17 is automatically reset.

The bit in parameter Status.FltSig_SR, 28:18 is not automatically reset. The bit is only reset by a "Fault Reset" (parameter Commands.driveCtrl, 28:1, bit 3). This way it is possible to even detect errors that occur for a very short period of time only.

Blocking error

Blocking monitoring

If, in spite of maximum current, the motor shaft does not move for a parameterized time, the monitoring system signals a blocking error.

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings.T_block</td>
<td>Response time of blocking monitoring</td>
<td>UINT16</td>
<td>ms</td>
<td>R/W</td>
</tr>
<tr>
<td>15:12 (0F:0Ch)</td>
<td>If, in spite of maximum current, the motor shaft does not move for the time set with this parameter, the monitoring system signals a blocking error. A value of 0 deactivates blocking monitoring.</td>
<td>0..10000 ms 100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Position deviation with power stage disabled

The drive system has a high holding torque even when the power stage is disabled; in combination with a gearbox this is sufficient for many applications. When the power stage is disabled, the drive continuously compares the actual motor position to the last approached reference position and generates a warning (bit 9) if the position deviation is greater than ±1 increment.

Tracking error monitoring

Tracking error monitoring monitors the position deviation between the reference position and the actual position of the motor. If the difference exceeds a limit value, the drive signals a tracking error. The limit value for the tracking error deviation can be parameterized. In addition, it is possible to change the error response to a tracking error.

If "error class 2" is selected, the motor is stopped. As soon as the motor has come to a standstill, the power stage is disabled, even if the position deviation has not yet been cleared.

### Group.Name
<table>
<thead>
<tr>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings.Flt_pDif 28:24 (1C:18h)</td>
<td>Error response to tracking error</td>
<td></td>
<td>UINT16 0..3</td>
<td>-</td>
<td>RW per.</td>
</tr>
</tbody>
</table>
If the drive is operating with high peak currents, temperature monitoring with sensors may be too slow. With $I^2t$ monitoring, the closed loop control anticipates a rise in temperature in time and if the $I^2t$ threshold is exceeded, it reduces the motor and power amplifier current to the specified nominal value. If the temperature drops below the threshold, the component can again be operated at the performance limit.

Bit 5 is set in the warning word as long as the monitoring is reducing the current.

---

**$I^2t$ monitoring**

- If the drive is operating with high peak currents, temperature monitoring with sensors may be too slow. With $I^2t$ monitoring, the closed loop control anticipates a rise in temperature in time and if the $I^2t$ threshold is exceeded, it reduces the motor and power amplifier current to the specified nominal value. If the temperature drops below the threshold, the component can again be operated at the performance limit.

- Bit 5 is set in the warning word as long as the monitoring is reducing the current.

---

#### Group.Name | Description | Bit assignment | Data type | Unit | R/W

| Status.p_difPeak 15:13 (0F:0Dh) | Maximum position deviation reached | Bit assignment | UINT32 | Inc 0 | R/-

The value is updated on an ongoing basis. The parameter value is set to the current position deviation value by writing 0.

| Status.p_dif 31:7 (1F:07h) | Position deviation of position controller | INT32 | Inc | R/-

---

### Additional Parameters

#### Status.WarnSig 28:10 (1C:0Ah)

Warnings

- Monitoring signals with error class 0.

Assignment of bits:

- Bit 0: Position overrun profile generator
- Bit 1: Temperature of power stage $>100^\circ$C
- Bit 5: $I^2t$ limitation active
- Bit 9: Position deviation with power stage disabled

The remaining bits are reserved for future extensions.

---

*Lexium Integrated Drive*
### 8.1.5 Operating states and state transitions

<table>
<thead>
<tr>
<th>Operating states</th>
<th>State transitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Start</td>
<td>A Automatic transition</td>
</tr>
<tr>
<td>2 Not ready to switch on</td>
<td>B If the operating state 2 was successful, the transition is performed automatically.</td>
</tr>
<tr>
<td>3 Switch on disabled</td>
<td>C STO_A (PWRR_A) and STO_B (PWRR_B) must have level 1 or jumper CN6 must be plugged in. At the same time, the supply voltage must rise above the threshold value. The transition is performed automatically.</td>
</tr>
<tr>
<td>4 Ready to switch on</td>
<td>D The transition is triggered by writing the parameter Commands.driveCtrl, 28:1, value 2.</td>
</tr>
<tr>
<td>6 Operation enable</td>
<td>E The transition is triggered by writing parameter Commands.driveCtrl, 28:1, value 1. For example, this transition can be used to shut off the current to the motor for maintenance or for work on the system.</td>
</tr>
<tr>
<td>7 Quick-Stop active</td>
<td>F If the supply voltage drops below the threshold value or the STO_A (PWRR_A) and STO_B (PWRR_B) inputs drop to 0 level, this triggers an automatic transition.</td>
</tr>
<tr>
<td>8 Fault reaction active</td>
<td>G Causes: &quot;Quick Stop&quot; caused by writing of parameter Commands.driveCtrl, 28:1, value 4 or error of error classes 1 or 2.</td>
</tr>
<tr>
<td>9 Fault</td>
<td>H The motor coasts down. The cause is an error of error class 2</td>
</tr>
</tbody>
</table>

**Reading the current operating state**

The current operating state can be read at any time via the fieldbus. (parameter Status.driveStat, 28:2).
### Bit Meaning

<table>
<thead>
<tr>
<th>Bit</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0..3</td>
<td>Operating state of the drive</td>
</tr>
<tr>
<td></td>
<td>For more information see 8.1.5 &quot;Operating states and state transitions&quot;</td>
</tr>
<tr>
<td>5</td>
<td>Error message by internal monitoring</td>
</tr>
<tr>
<td></td>
<td>The bit is set if at least one bit is set in the parameter</td>
</tr>
<tr>
<td></td>
<td>Status.FltSig_SR, 28:18</td>
</tr>
<tr>
<td></td>
<td>The cause of the error can be read with the parameter</td>
</tr>
<tr>
<td></td>
<td>Status.FltSig_SR, 28:18</td>
</tr>
<tr>
<td>6</td>
<td>Error message by external monitoring</td>
</tr>
<tr>
<td></td>
<td>The bit is set if at least one bit is set in the parameter</td>
</tr>
<tr>
<td></td>
<td>Status.Sign_SR, 28:15</td>
</tr>
<tr>
<td></td>
<td>The cause of the error can be read with the parameter</td>
</tr>
<tr>
<td></td>
<td>Status.Sign_SR, 28:18</td>
</tr>
<tr>
<td>7</td>
<td>Warning message</td>
</tr>
<tr>
<td></td>
<td>The bit is set if at least one bit is set in the parameter</td>
</tr>
<tr>
<td></td>
<td>Status.WarnSig, 28:10</td>
</tr>
<tr>
<td></td>
<td>The cause can be read with the parameter Status.WarnSig, 28:10</td>
</tr>
<tr>
<td>12..15</td>
<td>Monitoring the operating state</td>
</tr>
<tr>
<td></td>
<td>The bits are identical to:</td>
</tr>
<tr>
<td></td>
<td>Manual.stateMan, 41:2, bits 12..15</td>
</tr>
<tr>
<td></td>
<td>VEL.stateVel, 36:2, bits 12..15</td>
</tr>
<tr>
<td></td>
<td>PTP.statePTP, 35:2, bits 12..15</td>
</tr>
<tr>
<td></td>
<td>Homing.stateHome, 40:2, bits 12..15</td>
</tr>
<tr>
<td></td>
<td>Gear.stateGear, 38:2, bits 12..15</td>
</tr>
<tr>
<td></td>
<td>For more information see chapter 8.2 &quot;Operating modes&quot;</td>
</tr>
</tbody>
</table>
8.1.6 Operating-mode-specific status information

Each operating mode has an acknowledgement parameter:

- Jog (as of software version 1.101 and later)
  (parameter Manual.stateMan, 41:2)

- Profile Velocity
  (parameter VEL.stateVel, 36:2)

- Profile Position
  (parameter PTP.statePTP, 35:2)

- Homing
  (parameter Homing.stateHome, 40:2)

Information stored in every acknowledgement parameter:

- Bit 0: Error LIMP
  Error message caused by positive limit switch

- Bit 1: Error LIMN
  Error message caused by negative limit switch

- Bit 2: Error STOP
  Error response with "Quick Stop"

- Bit 3: Error REF
  Error message caused by reference switch

- Bit 7: "SW Stop"
- Bit 12: Operating-mode-specific
- Bit 13: Operating-mode-specific
- Bit 14: "xxx_end"
  Operating mode terminated
- Bit 15: "xxx_err"
  Fault occurred

Operating-mode-specific status information can be found in chapter 8.2 "Operating modes".

If an error occurs during operation, only bit 15 "xxx_err" is set immediately.

In the event of an error of error class 1 or 2 the motor is ultimately brought to a standstill by "Quick Stop" and then bit 14 "xxx_end" is set.

In the case of an error of error class 3 the power amplifier is immediately switched off and bit 14 and 15 are set before the motor is released.
8.1.7 Other status information

In addition to the external and internal monitoring signals, there is status information that contains general information on the drive.

Other available status information:

- **Operating mode**
  - Current operating mode
    Status.action_st, 28:19 and Status.xMode_act, 28:3

- **Speed of rotation per minute (min\(^{-1}\))**
  - Actual speed of motor
    Status.n_act, 31:9
  - Reference speed
    Status.n_ref, 31:8
  - Actual speed of profile generator
    Status.n_profile, 31:35
  - Target speed of profile generator
    Status.n_target, 31:38

- **Speed in increments per second (Inc/s)**
  - Actual speed of motor
    Status.v_act, 31:2
  - Reference speed
    Status.v_ref, 31:1

- **Position**
  - Actual position of motor
    Status.p_act, 31:6
  - Reference position
    Status.p_ref, 31:5
  - Actual position of profile generator
    Status.p_profile, 31:31
  - Target position of profile generator
    Status.p_target, 31:30

- **Voltage**
  - Voltage at DC bus
    Status.UDC_act, 31:20

- **Current**
  - Current of motor
    Status.I_act, 31:12

- **Temperature**
  - Power stage temperature
    Status.TPA_act, 31:25
8.2 Operating modes

The following operating modes have been implemented:

- Jog
- Profile Velocity
- Profile Position
- Homing

The operating modes represent different options for positioning. You can parameterize the operating modes to meet the requirements of your application.

**Changing the operating mode**

A new operating mode can only be started after the old one has been terminated.

Termination of an operating mode can be read out with the following parameters:

- Operating-mode-independent
  - Parameter `Status.driveStat, 28:2, bit 14`

- Operating-mode-dependent
  - Jog
    - Parameter `Manual.stateMan, 41:2, bit 14`
  - Profile Velocity
    - Parameter `Vel.stateVel, 36:2, bit 14`
  - Profile Position
    - Parameter `PTP.statePTP, 35:2, bit 14`
  - Homing
    - Parameter `Homing.stateHome, 40:2, bit 14`

An operating mode is considered to be terminated under the following conditions:

- Jog: Drive at standstill
- Profile Velocity: Drive at standstill
- Profile Position: Drive at standstill
- Reference Movement: Drive at standstill
- Position setting: Immediately after position setting
Parameters for starting a new operating mode:

- Jog
  
  (parameter Manual.startMan, 41:1)

- Profile Velocity
  
  (parameter VEL.velocity, 36:1)

- Profile Positioning: Absolute positioning
  
  (parameter PTP.p_absPTP, 35:1)

- Profile Positioning: Relative positioning
  
  (parameter PTP.p_relPTP, 35:3)

- Homing: Reference movement
  
  (parameter Homing.startHome, 40:1)

- Homing: Position setting
  
  (parameter Homing.startSetP, 40:3)

### Operating-mode-independent settings

Setting options that apply in all operating modes:

- Acceleration and deceleration behavior with the function "Ramp Setting" function
- Deceleration behavior with the function "Quick Stop"

### 8.2.1 Operating mode Jog

#### WARNING

**UNINTENDED OPERATION**

- Note that any changes to the values of these parameters are executed by the drive controller immediately on receipt of the data set.
- Verify that the system is free and ready for movement before changing these parameters.

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

**Availability**

The operating mode is available as of firmware version 1.100 and later.

**Description**

Jog movements represent "classical jogging". The motor is moved over a selected distance by start signals. If the start signal is applied for a longer period of time, the motor switches to continuous movement.

The operating mode can be started via:

- Commissioning software
- Fieldbus
- Inputs of the signal interface if the signal interface is configured with the "programmable inputs" function.
Operation with commissioning software

The commissioning software supports this operating mode with special dialog boxes and menus.

Starting the operating mode

The motor can be moved in both directions at two speeds. Jog movements are started with the `Manual.startMan` parameter. The current axis position is the start position for jog movements. The values for position and speed are specified via the corresponding parameters.

Jog is finished when the motor has come to a standstill

- the direction signal is inactive,
- the operating mode was interrupted by an error response.

The `Manual.statusMan` parameter provides information on the processing status.

<table>
<thead>
<tr>
<th>Group_Name</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W per.</th>
</tr>
</thead>
</table>
| Manual.startMan 41:1 (29:01h) | Starting a jog | Assignment of bits:  
  Bit 0: Clockwise direction of rotation  
  Bit 1: Counterclockwise direction of rotation  
  Bit 2: 0 = slow 1 = fast  
  Bit 3: Automatic processing of power stage | UINT16 | - | R/W |
| Manual.stateMan 41:2 (29:02h) | Acknowledgement: Jog | Assignment of bits:  
  Bit 0: Error LIMP  
  Bit 1: Error LIMN  
  Bit 2: Error HW_STOP  
  Bit 3: Error REF  
  Bit 7: Error SW_STOP  
  Bit 14: manu_end  
  Bit 15: manu_err | UINT16 | - | R/- |
Classical jog

Triggered by the start signal for jog, the motor first moves over a defined distance \( \text{Manual.stepMan} \). If the start signal is still available after a specific delay time \( \text{Manual.timeMan} \), the controller switches to continuous movement.

Figure 8.2 Classical jog, slow and fast

Jog distance, waiting time and jog speeds are adjustable. If the jog distance is zero, the jog movement starts directly as a continuous movement, irrespective of the waiting time.

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual.n_slowMan 41:4 (29:04h)</td>
<td>Speed for slow jog</td>
<td>UINT16</td>
<td>300..5000 min(^{-1})</td>
<td>R/W per.</td>
</tr>
<tr>
<td>Manual.n_fastMan 41:5 (29:05h)</td>
<td>Speed for fast jog</td>
<td>UINT16</td>
<td>300..5000 min(^{-1})</td>
<td>R/W per.</td>
</tr>
<tr>
<td>Manual.step_Man 41:7 (29:07h)</td>
<td>Jogging distance at jog start</td>
<td>UINT16</td>
<td>Inc 2</td>
<td>R/W per.</td>
</tr>
<tr>
<td>Manual.time_Man 41:8 (29:08h)</td>
<td>Waiting time until continuous movement starts</td>
<td>UINT16</td>
<td>1..10000 ms</td>
<td>R/W per.</td>
</tr>
</tbody>
</table>

Moving away from limit switch range

The drive can be moved away out of the limit switch range to a valid movement range at any time by means of a jog movement.

If the positive limit switch signal \( \text{LIMP} \) was activated, the jog movement must be in negative direction; in the case of \( \text{LIMN} \), the movement must be in positive direction. If the motor does not move away, verify that you have selected the correct direction for the jog movement.
8.2.2 Operating mode Profile velocity

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VEL.velocity</td>
<td>36:1 (24:01h)</td>
<td>Start with target speed</td>
<td></td>
<td>INT16</td>
<td>min⁻¹</td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Action object: write access triggers a movement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The minimum speed of rotation is 300 min⁻¹.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VEL.stateVEL</td>
<td>36:2 (24:02h)</td>
<td>Acknowledgement: Profile Velocity</td>
<td></td>
<td>UINT16</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assignment of bits:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 0: Error LIMP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 1: Error LIMN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 2: Error STOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 3: Error REF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 7: SW_STOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 13: Target speed reached</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 14: vel_end</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 15: vel_err</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**WARNING**

UNINTENDED OPERATION

- Note that any changes to the values of these parameters are executed by the drive controller immediately on receipt of the data set.
- Verify that the system is free and ready for movement before changing these parameters.

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

In the operating mode Profile Velocity, the drive accelerates to an adjustable target speed of rotation. You can set a motion profile with values for acceleration and deceleration ramps.

Starting the operating mode

As soon as a target speed of rotation is transmitted with the parameter VEL.velocity, 36:1, the drive switches to the operating mode Profile Velocity and accelerates to the target speed of rotation.

- Send the parameter VEL.velocity, 36:1 with a value not equal to 0 to start the operating mode.

Monitoring the operating mode

The target speed of rotation can be changed at any time during operation:

- Target speed of rotation
  (parameter VEL.velocity, 36:1)

The status of the operating mode can be read with the parameter VEL.stateVel, 36:2.

- Target speed of rotation reached (bit 13)
- Operating mode ended (bit 14: vel_end)
- Error (bit 15: vel_err)
**Position overrun**

In the Profile Velocity operating mode, the drive may exceed the position range (32 bit).

This is not an error, the operating mode continues to run. However, the following monitoring signals are set or reset; they can be read with status parameters:

- Parameter `Status.WarnSig, 28:10, bit 0` is set
- Parameter `Status.xMode_act, 28:3, bit 5` is reset

This parameter indicates that the drive has been referenced.

For more information see chapter 8.1.3 "Positioning limits".

**Terminating the operating mode**

The following options are available for stopping the drive via the fieldbus:

- Set the target speed of rotation to 0
  (parameter `VEL.velocity, 36:1`)

- "Quick Stop" via fieldbus
  The drive comes to a stop via "Quick Stop".
  (parameter `Commands.driveCtrl, 28:1, setting of bit 2`)

In the case of an error the drive is also stopped. This is indicated by parameter `VEL.state, 36:2, bit 15`.

The `VEL.stateVel, 36:2` parameter provides information on the current processing status.

### 8.2.3 Operating mode Profile position

⚠️ **WARNING**

**UNINTENDED OPERATION**

- Note that any changes to the values of these parameters are executed by the drive controller immediately on receipt of the data set.
- Verify that the system is free and ready for movement before changing these parameters.

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

In Profile Position operating mode, a movement with an adjustable motion profile is performed from a start position to a target position. The value of the target position can be specified as either a relative or an absolute position.
You can set a motion profile with values for acceleration ramp, deceleration ramp and target speed.

### Settings

The positioning path can be entered in 2 ways:

- Absolute positioning, reference point is the zero point.
- Relative positioning, reference point is the current reference position of the motor (parameter `Status.p_ref, 31:5`).

### Starting the operating mode

As soon as a target position is transmitted in the parameters `PTP.p_absPTP, 35:1` or `PTP.p_relPTP, 35:3`, the drive switches to the Profile Position operating mode and starts positioning at the target speed of rotation specified with parameter `PTP.v_tarPTP, 35:5`.

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>PTPp_absPTP</code></td>
<td>Target position for absolute positioning and start of positioning</td>
<td>INT32</td>
<td>Inc</td>
<td>-</td>
<td>R/W</td>
</tr>
<tr>
<td><code>PTPStatePTP</code></td>
<td>Acknowledgement: Profile Position</td>
<td>UINT16</td>
<td>-</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td><code>PTPp_relPTP</code></td>
<td>Target position for relative positioning and start of positioning</td>
<td>INT32</td>
<td>Inc</td>
<td>-</td>
<td>R/W</td>
</tr>
<tr>
<td><code>PTP.continue</code></td>
<td>Continue interrupted positioning</td>
<td>UINT16</td>
<td>-</td>
<td>0</td>
<td>R/W</td>
</tr>
<tr>
<td><code>PTPv_tarPTP</code></td>
<td>Target speed of rotation for positioning</td>
<td>UINT16</td>
<td>min(^{-1})</td>
<td>0..5000</td>
<td>1000</td>
</tr>
</tbody>
</table>

The minimum speed of rotation is 300 min\(^{-1}\).
Start absolute positioning
Absolute positioning can only be started if the drive is homed (see chapter 8.2.4 "Operating mode Homing"). The parameter Status.xMode_act, 28:3, bit 5 (ref_ok) indicates whether or not the drive is homed.

Procedure for starting absolute positioning:
- Set the target speed of rotation with the parameter PTP.v_tarPTP, 35:5.
- Start absolute positioning by specifying the absolute target position in parameter PTP.p_absPTP, 35:1.

Absolute positioning cannot be started after a position overrun, because the absolute position reference is lost during the position overrun. A position overrun is indicated in parameter Status.WarnSig, 28:10, bit 0. In addition, bit 5 (ref_ok) in parameter Status.xMode_act, 28:3 is reset.

Starting relative positioning
Procedure for starting relative positioning:
- Set the target speed of rotation with the parameter PTP.v_tarPTP, 35:5.
- Start relative positioning by specifying the relative target position in parameter PTP.p_relPTP, 35:3.

Continuing the operating mode
If a positioning process is interrupted by, for example, an external stop signal, the process can be continued via a write access to the parameter PTP.continue, 35:4 so it can be completed. Before you can continue, you must remedy the problem that caused the interruption and execute a "Fault-Reset". The value transmitted with PTP.continue, 35:4 is not evaluated.

Monitoring the operating mode
The parameter PTP.statePTP, 35:2 lets you get the processing status.
- Target position reached and operating mode ended. Not signalled if movement was interrupted. (Bit 13)
- Operating mode terminated (bit 14)
- Error (bit 15)

Terminating the operating mode
Conditions that terminate the operating mode:
- Target position reached, motor at standstill (Parameter PTP.statePTP, 35:2, bit 14)
- In the case of an error the drive is stopped. This is indicated by parameter PTP.statePTP, 35:2, bit 15.
- Fieldbus command "Quick Stop" (writing of value 4 to parameter Commands.driveCtrl, 28:1)
  The drive comes to a stop with "Quick Stop".
8.2.4 Operating mode Homing

**WARNING**

UNINTENDED OPERATION

- Note that any changes to the values of these parameters are executed by the drive controller immediately on receipt of the data set.
- Verify that the system is free and ready for movement before changing these parameters.

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

8.2.4.1 Overview

Overview of Homing

The operating mode Homing establishes an absolute position reference between the motor position and a defined axis position. Homing can be carried out by a means of a reference movement or by position setting.

- A reference movement is a movement to a defined point, the reference point, on the axis; the objective is to establish the absolute position reference between the motor position and the axis position. The reference point also defines the zero point that is used for all subsequent absolute positionings as a reference point. It is possible to parameterize a shift of the zero point.

A reference movement must be completed for the new zero point to be valid. If the reference movement is interrupted, it must be completed before you can switch to a new operating mode.

The signals required for the reference movement must be wired. Monitoring signals that are not used must be deactivated.

- Position setting lets you set the current motor position to a desired position value to which the subsequent position specifications will relate.

There are 6 standard types of reference movements:

- Movement to negative limit switch $\text{LIMN}$
- Movement to positive limit switch $\text{LIMP}$
- Movement to reference switch $\text{REF}$ with counterclockwise direction of rotation
- Movement to reference switch $\text{REF}$ with clockwise direction of rotation
- Movement to block with counterclockwise direction of rotation
- Movement to block with clockwise direction of rotation

**Monitoring reference movements**

The parameter $\text{Homing.stateHome, 40:2}$ lets you get information on the processing status.

The parameter $\text{Status.xMode_act, 28:3, bit 5}$ is set if the reference movement was successful.
**Terminating a reference movement**

Conditions that terminate the reference movement:

- The motor has reached the target position and is at a standstill.
- Error response
- "Quick Stop" via fieldbus command

When the power stage is disabled, the valid reference point is retained.

**Special features reference position**

The drive stores the position so that it remains referenced even if it is switched off. However, the drive loses the reference position in the following cases:

- If the drives moves beyond the positioning limits \(-2^{31} \ldots +2^{31}-1\).
- If a running reference movement is interrupted.
- If the drive is turned while it is switched off.

**NOTE:** Because of the encoder used, the drive only has a 50% chance of detecting that the motor was turned when it starts up.

- If the drive is switched off with the motor running and external consumers cause a fast voltage drop, the microprocessor does not have time enough to save the position after standstill.

**Motor position after Homing**

A special feature is that the controller cannot compensate for position deviations of \(\pm 1\) increments. This means that the reference position of the position controller `Status.p_ref, 31:5` and the actual motor position delivered by the encoder `Status.p_act, 31:6` can differ by \(\pm 1\) increment. Since position setting and reference movements use the reference position `Status.p_ref, 31:5`, the actual motor position `Status.p_act, 31:6` may also differ by \(\pm 1\) increment after such position setting or reference movements.

After position setting to 0, the drive may deliver, e.g. `Status.p_act, 31:6 = -1, 0` or `+1`.

<table>
<thead>
<tr>
<th>Group.Name Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homing.startHome 40:1 (28:01h)</td>
<td>Start operating mode Homing</td>
<td>Action object: Write access triggers reference movement.</td>
<td>UINT16 1..8</td>
<td>-</td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value 1: LIMP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value 2: LIMN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value 3: REF counterclockwise direction of rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value 4: REF clockwise direction of rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value 7: Movement to block counterclockwise direction of rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value 8: Movement to block clockwise direction of rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homing.stateHome 40:2 (28:02h)</td>
<td>Acknowledgement: Homing</td>
<td>Assignment of bits:</td>
<td>UINT16</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 0: Error LIMP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 1: Error LIMN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 2: Error HW_STOP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 3: Error REF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 7: Error SW_STOP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 15: ref_err</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 14: ref_end</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group.Name</td>
<td>Index:Subindex dec. (hex.)</td>
<td>Description</td>
<td>Data type range dec.</td>
<td>Unit Default dec.</td>
<td>R/W per.</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------</td>
<td>-------------</td>
<td>---------------------</td>
<td>------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Homing.startSetp</td>
<td>40:3 (28:03h)</td>
<td>Position setting to position setting position&lt;br&gt;Action object: write access triggers position setting&lt;br&gt;Only possible if the motor is at standstill.</td>
<td>INT32</td>
<td>Inc</td>
<td>R/W</td>
</tr>
<tr>
<td>Homing.v_Home</td>
<td>40:4 (28:04h)</td>
<td>Speed of rotation for search of switch</td>
<td>UINT16 300..5000</td>
<td>min⁻¹</td>
<td>1000 R/W per.</td>
</tr>
<tr>
<td>Homing.v_outHome</td>
<td>40:5 (28:05h)</td>
<td>Speed of rotation for moving away from switch</td>
<td>UINT16 300..5000</td>
<td>min⁻¹</td>
<td>500 R/W per.</td>
</tr>
<tr>
<td>Homing.p_outHome</td>
<td>40:6 (28:06h)</td>
<td>Maximum distance for search for switching edge&lt;br&gt;After detection of the switch, the drive starts to search for the defined switching edge. If it is not found within the distance defined here, the reference movement is canceled with an error.</td>
<td>INT32</td>
<td>Inc 200000</td>
<td>200000 R/W per.</td>
</tr>
<tr>
<td>Homing.p_disHome</td>
<td>40:7 (28:07h)</td>
<td>Distance from switching edge to reference point&lt;br&gt;After the drive moves away from the switch, it is positioned into the working range by a defined distance; this is defined as the reference point.</td>
<td>INT32</td>
<td>Inc 1..2147483647</td>
<td>200 R/W per.</td>
</tr>
<tr>
<td>Homing.RefSwMod</td>
<td>40:9 (28:09h)</td>
<td>Processing sequence during reference movement to REF&lt;br&gt;Bit value 0: In positive direction&lt;br&gt;Bit value 1: In negative direction&lt;br&gt;Assignment of bits:&lt;br&gt;Bit 0: Direction of movement to switching edge&lt;br&gt;Bit 1: Direction of movement to distance from switching edge</td>
<td>UINT16</td>
<td>0..3</td>
<td>0 R/W per.</td>
</tr>
<tr>
<td>Homing.RefAppPos</td>
<td>40:11 (28:0Bh)</td>
<td>Application position at reference point&lt;br&gt;After a successful reference movement, this position is set at the reference point.&lt;br&gt;This automatically defines the application zero point.</td>
<td>INT32</td>
<td>Inc 0</td>
<td>0 R/W per.</td>
</tr>
<tr>
<td>Homing.refError</td>
<td>40:13 (28:0Dh)</td>
<td>Cause of error during reference movement&lt;br&gt;Error code during reference movement processing</td>
<td>UINT16</td>
<td>-</td>
<td>- R/-</td>
</tr>
</tbody>
</table>
8.2.4.2 Reference movement to limit switch

The following illustration shows a reference movement to the negative limit switch with distance from the switching edge (Homing.startHome, 40:1 = 2).

![Illustration of reference movement to limit switch]

Figure 8.4 Reference movement to the negative limit switch

(1) Movement to limit switch
(2) Movement to switching edge
(3) Movement to distance from switching edge

Starting the reference movement

Procedure:

- Set the speed of rotation for the search for the switch (parameter Homing.v_Home, 40:4)
- Set the speed of rotation for moving away from the switch. (parameter Homing.v_outHome, 40:5).
- Set the distance from the switching edge. (parameter Homing.p_disHome, 40:7).
- Start the reference movement to the desired limit switch. (parameter Homing.startHome, 40:1 = 1 or 2)
8.2.4.3 Reference movement to reference switch

A reference movement to the reference switch does not require the reference switch to be enabled. The signal level can be inverted with the parameter Settings.SignLevel, 28:14.

The following illustration shows reference movements to the reference switch with distance from the switching edge (Homing.startHome, 40:1 = 3).

![Reference Movement Diagram](image)

Figure 8.5 Reference movement to reference switch

(1) Movement to limit switch
(2) Movement to switching edge
(3) Movement to distance from switching edge

If a reference movement was started with the wrong direction of rotation, the motor stops at the limit switch. The reference movement is interrupted and must be restarted with the correct direction of rotation.

Starting the reference movement

Procedure:

- Set the speed of rotation for the search for the switch.
  (parameter Homing.v_Home, 40:4)

- Set the speed of rotation for moving away from the switch.
  (parameter Homing.v_outHome, 40:5)

- Set the directions.
  (parameter Homing.RefSwMod, 40:9)

- Set the distance from the switching edge.
  (parameter Homing.p_disHome, 40:7)

- Start the reference movement to the reference switch with movement at counterclockwise direction of rotation.
  (parameter Homing.startHome, 40:1 = 3 or 4)
8.2.4.4 Reference movement to block

The drive allows you to perform a reference movement to a mechanical stop.

Please note the following information:

- The mechanical stop must be sufficiently sturdy
- Set a low search speed to avoid damage to the gearbox and the mechanical components
- Reduce the max. current for the movement to block to a value as low as possible

During the reference movement to block, the current limitation for normal operation Settings.I_max, 15:3 is initially active during the acceleration process. This is necessary to overcome the detent torque of the drive and to get the drive to move. When a constant speed is reached, the reference movement switches the current limitation to the reduced value Settings.I_maxBlk, 15:5.

**Starting the reference movement**

Procedure:

- Set the speed of rotation to be used for searching the switch (parameter Homing.v_Home, 40:4).
- Set the maximum current for reference movement to block. (parameter Settings.I_maxBlk, 15:5)
- Start the reference movement to block with movement at the desired direction of rotation. (parameter Homing.startHome, 40:1 = 7 or 8)
8.2.4.5 Position setting

Position setting defines an absolute position reference depending on the current motor position.

The position value is delivered in increments in the parameter `Homing.startSetP`, 40:3.

Position setting is only possible when the motor is at a standstill.

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homing.startSetp 40:3 (28:03h)</td>
<td>Position setting to position setting position Action object: write access triggers position setting Only possible if the motor is at standstill.</td>
<td>INT32</td>
<td>Inc</td>
<td>R/W</td>
</tr>
</tbody>
</table>

Example

Position setting can be used to carry out a continuous motor movement without exceeding the positioning limits.

![Diagram](image.png)

Figure 8.6 Positioning by 4000 increments with position setting

1. The motor is positioned by 2000 inc.
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 motion command by 2000 inc is triggered, the new target position is 2000 inc.

This method avoids overtravel of the absolute position limits during a positioning operation because the zero point is continuously adjusted.

Starting position setting

Procedure:

- Write the new position setting position. (parameter `Homing.startSetP`, 40:3)

The command is executed immediately and the operating mode is ended.

Monitoring position setting

The parameter `Homing.stateHome`, 40:2 lets you get information on the processing status.

The parameter `Status.xMode_act`, 28:3, bit 5, is set if position setting was successful.

Terminating position setting

The operating mode is terminated immediately upon completion.
8.3 Functions

8.3.1 Definition of the direction of rotation

The direction of rotation can be inverted.

The direction of rotation should be defined only once when you commission the product. The definition of the direction of rotation is not intended to reverse the direction of rotation during operation.

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motion.invertDir</td>
<td>Definition of direction of rotation</td>
<td>UINT16</td>
<td>-</td>
<td>R/W</td>
</tr>
<tr>
<td>28:6 (1C:06h)</td>
<td>Value 0: Clockwise direction of rotation</td>
<td>0..1</td>
<td>0</td>
<td>dec.</td>
</tr>
<tr>
<td></td>
<td>With positive reference values, the motor rotates clockwise (as you look at the end of the protruding motor shaft).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value 1: Counterclockwise direction of rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>With positive reference values, the motor rotates counterclockwise (as you look at the end of the protruding motor shaft).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOTE: The new value is only activated when the drive is switched on.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8.3.2 Motion profile

Profile generator

Target position and target speed of rotation are input values to be specified by the user. The profile generator uses these values to calculate a motion profile depending on the selected operating mode.

The following properties can be set for the motion profile:

- Symmetrical and linear acceleration ramp.
- Change of speed of rotation and position during movements.
- Acceleration parameters \( \text{min}^{-1}/\text{s} \).
  
  Value range 1000 \( \ldots \) 100000 \( \text{min}^{-1}/\text{s} \).
  
  Internal resolution approx. 77 \( \text{min}^{-1}/\text{s} \).

- Speed values in \( \text{min}^{-1} \).
  
  Value range 300 \( \ldots \) 5000 \( \text{min}^{-1} \).
  
  Resolution 1 \( \text{min}^{-1} \).

- Position values in increments (inc).
  
  Value range \( -2^{31} \ldots +2^{31} -1 \) inc.
  
  With reference to the motor output shaft, the drive has a resolution of 12 inc/rev.
8.3.3 Quick Stop

"Quick Stop" is a quick brake function which stops the motor as a result of a fault of error classes 1 and 2 or as a result of a software stop.

In the event of an error response to an error of error class 1, the power stage remains enabled. In the case of error class 2, the power stage is disabled after the drive has come to a standstill.

Events that trigger a "Quick Stop":

- Input signal STOP
  (parameter Status.Sign_SR, bit 2)

- Limit switch overtraveled
  (parameter Status.Sign_SR, bit 0 and bit 1)

- Error of error classes 1 or 2
- "Quick Stop" triggered via a fieldbus command
  (parameter Commands.driveCtrl, 28:1, Bit 2)
**Settings**  
In the following operating modes, motor deceleration is controlled via a profile. The deceleration can be set with the parameter Motion.dec_Stop, 28:21.

- Profile Velocity
- Profile Position
- Homing
- Jog

The drive absorbs excess braking energy during a "Quick Stop". If the DC bus voltage exceeds the permissible limit value, the drive disables the power stage and signals an "overvoltage error". The motor then coasts down without any braking force.

Procedure if the drive repeatedly switches off with an "Overvoltage" error during "Quick Stop".

- Reduce the deceleration or the maximum current for stop via the torque ramp.
- Reduce the drive load

**Acknowleding a Quick Stop**  
Procedure after an error or a "Quick Stop" executed by a fieldbus command:

- Reset the error.
  
  (parameter Commands.driveCtrl, 28:1, Bit 3)

Procedure after a "STOP" signal:

- Reset the "STOP" signal at the signal input.
- Reset the error.
  
  (parameter Commands.driveCtrl, 28:1, Bit 3)

Procedure after a "Quick Stop" via the limit switch signals LIMN and LIMP:

- Move the motor out of the limit switch range.

  (For more information see chapter 8.1.2 "External monitoring signals".)

**More information**  
For more information see Chapter 8.1.5 "Operating states and state transitions" and Chapter 6 "Installation".
8 Operation

8.3.4 Programmable inputs and outputs

If a 24V signal is configured as a "programmable input or output", the drive automatically accesses this signal input or output.

This can be set for each of the 4 signals with the parameters IO.IO0_def to IO.IO3_def.

**Programmable input**

If a signal is configured as a programmable input, the drive monitors this signal continuously and accesses parameters independently whenever it a change of edge is detected. The parameter accesses can be parameterized as follows:

- Evaluation of rising and falling edges
- Parameter to be influenced by specification of index and subindex
- Write value for parameter with rising edge
- Write value for parameter with falling edge
- Bit mask for writing the object

Structure of the parameter access:

- Rising or falling edge detected
- Parameter is read
- Result of AND operation with bit mask
- Result of OR operation with write value for parameter with rising and falling edge
- Write result to parameter

**Shown as pseudo code:**

- Rising edge -> object_WriteValue = (object_ReadValue AND bitmask) OR WriteValue_pos
- Falling edge -> object_WriteValue = (object_ReadValue AND bitmask) OR WriteValue_neg

**Special case if bit mask = 0:**

- Rising edge -> object_WriteValue = WriteValue_pos
- Falling edge -> object_WriteValue = WriteValue_neg
Programmable output

If a signal is defined as a programmable output, the drive accesses (read) parameters cyclically and sets the signal level in accordance with the read value. The accesses can be parameterized with the following parameters:

- Selection of the parameter to be read by specification of index and sub-index
- Comparison value for 1 level at output
- Comparison operator: equal, not equal, less than, greater than
- Bit mask for the comparison

Structure of the parameter access:

- Parameter is read
- Result of AND operation with bit mask
- Compare result with comparison value
- Depending on result, set output to HIGH or LOW

Shown as pseudo code:

IF (object_ReadValue AND bit mask) <comparison_operator> comparison_value THEN set output=1
ELSE set output=0

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ProgIO0.Index 800:1 (320:01h)</td>
<td>Index of the control parameter</td>
<td>UINT16</td>
<td>-</td>
<td>R/W</td>
</tr>
<tr>
<td>ProgIO0.Index 800:1 (320:01h)</td>
<td>If prog. input: index of parameter to be written</td>
<td>-</td>
<td>-</td>
<td>per.</td>
</tr>
<tr>
<td>ProgIO0.Index 800:1 (320:01h)</td>
<td>If prog. output: index of parameter to be read</td>
<td>-</td>
<td>-</td>
<td>per.</td>
</tr>
<tr>
<td>ProgIO0.Index 800:1 (320:01h)</td>
<td>If prog. input:</td>
<td>write(Index,Subindex) = (read(Index,Subindex) BAND BitMask) BOR VALUEx</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ProgIO0.Index 800:1 (320:01h)</td>
<td>If prog. output:</td>
<td>1 level at output if (read(Index,Subindex) BAND BitMask) =&lt;&gt; VALUE1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ProgIO0.Subindex 800:2 (320:02h)</td>
<td>Subindex of control parameter</td>
<td>UINT16</td>
<td>-</td>
<td>R/W</td>
</tr>
<tr>
<td>ProgIO0.Subindex 800:2 (320:02h)</td>
<td>If prog. input: subindex of parameter to be written</td>
<td>-</td>
<td>-</td>
<td>per.</td>
</tr>
<tr>
<td>ProgIO0.Subindex 800:2 (320:02h)</td>
<td>If prog. output: subindex of parameter to be read</td>
<td>-</td>
<td>-</td>
<td>per.</td>
</tr>
<tr>
<td>ProgIO0.BitMask 800:3 (320:03h)</td>
<td>Bitmask for the parameter value</td>
<td>UINT32</td>
<td>-</td>
<td>R/W</td>
</tr>
<tr>
<td>ProgIO0.BitMask 800:3 (320:03h)</td>
<td>If programmable input or programmable output:</td>
<td>Bit mask used to link the read value (index, subindex) of the parameter with the operator AND before the value is processed.</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Example Parameterization for a simple manual control

<table>
<thead>
<tr>
<th>Input</th>
<th>L -&gt; H</th>
<th>Commands.driveCtrl 2 (Enable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H -&gt; L</td>
<td>Commands.driveCtrl 9 (Disable + FaultReset)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter name</th>
<th>Idx:Six</th>
<th>Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O.IO0_def</td>
<td>34:1</td>
<td>5</td>
<td>Input programmable</td>
</tr>
<tr>
<td>ProgIO0.Index</td>
<td>800:1</td>
<td>28</td>
<td>Index 28</td>
</tr>
<tr>
<td>ProgIO0.Subindex</td>
<td>800:2</td>
<td>1</td>
<td>Subindex 1</td>
</tr>
<tr>
<td>ProgIO0.Bitmask</td>
<td>800:3</td>
<td>0</td>
<td>Mask</td>
</tr>
<tr>
<td>ProgIO0.Switch</td>
<td>800:4</td>
<td>3</td>
<td>Detect both edges</td>
</tr>
<tr>
<td>ProgIO0.Value1</td>
<td>800:5</td>
<td>2</td>
<td>Value at pos. edge: Enable</td>
</tr>
<tr>
<td>ProgIO0.Value2</td>
<td>800:6</td>
<td>9</td>
<td>Value at neg. edge: Disable+Fault-Reset</td>
</tr>
</tbody>
</table>
### input IO1

**Input**
- L -> H  VEL.velocity 600 (positive movement)
- H -> L  VEL.velocity 0 (stop)

<table>
<thead>
<tr>
<th>Parameter name</th>
<th>Idx:Six</th>
<th>Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O.IO1_def</td>
<td>34:2</td>
<td>5</td>
<td>input programmable</td>
</tr>
<tr>
<td>ProgIO1.Index</td>
<td>801:1</td>
<td>36</td>
<td>Index 36</td>
</tr>
<tr>
<td>ProgIO1.Subindex</td>
<td>801:2</td>
<td>1</td>
<td>Subindex 1</td>
</tr>
<tr>
<td>ProgIO1.Bitmask</td>
<td>801:3</td>
<td>0</td>
<td>Mask</td>
</tr>
<tr>
<td>ProgIO1.Switch</td>
<td>801:4</td>
<td>3</td>
<td>detect both edges</td>
</tr>
<tr>
<td>ProgIO1.Value1</td>
<td>801:5</td>
<td>600</td>
<td>speed value with rising edge</td>
</tr>
<tr>
<td>ProgIO1.Value2</td>
<td>801:6</td>
<td>0</td>
<td>speed value with falling edge</td>
</tr>
</tbody>
</table>

### input IO2

**Input**
- L -> H  VEL.start -600 (neg. movement)
- H -> L  VEL.start 0 (stop)

<table>
<thead>
<tr>
<th>Parameter name</th>
<th>Idx:Six</th>
<th>Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O.IO2_def</td>
<td>34:3</td>
<td>5</td>
<td>input programmable</td>
</tr>
<tr>
<td>ProgIO2.Index</td>
<td>802:1</td>
<td>36</td>
<td>Index 36</td>
</tr>
<tr>
<td>ProgIO2.Subindex</td>
<td>802:2</td>
<td>1</td>
<td>Subindex 1</td>
</tr>
<tr>
<td>ProgIO2.Bitmask</td>
<td>802:3</td>
<td>0</td>
<td>Mask</td>
</tr>
<tr>
<td>ProgIO2.Switch</td>
<td>802:4</td>
<td>3</td>
<td>detect both edges</td>
</tr>
<tr>
<td>ProgIO2.Value1</td>
<td>802:5</td>
<td>-600</td>
<td>speed value with rising edge</td>
</tr>
<tr>
<td>ProgIO2.Value2</td>
<td>802:6</td>
<td>0</td>
<td>speed value with falling edge</td>
</tr>
</tbody>
</table>

### Output IO3

**Output**
- High if status 6  (Status.driveStat AND 15) = 6

<table>
<thead>
<tr>
<th>Parameter name</th>
<th>Idx:Six</th>
<th>Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O.IO3_def</td>
<td>34:4</td>
<td>130</td>
<td>Output programmable</td>
</tr>
<tr>
<td>ProgIO3.Index</td>
<td>803:1</td>
<td>28</td>
<td>Index 28</td>
</tr>
<tr>
<td>ProgIO3.Subindex</td>
<td>803:2</td>
<td>2</td>
<td>Subindex 2</td>
</tr>
<tr>
<td>ProgIO3.Bitmask</td>
<td>803:3</td>
<td>15</td>
<td>Mask: Bit 0..3</td>
</tr>
<tr>
<td>ProgIO3.Switch</td>
<td>803:4</td>
<td>0</td>
<td>condition: &quot;:=&quot;</td>
</tr>
<tr>
<td>ProgIO3.Value1</td>
<td>803:5</td>
<td>6</td>
<td>Comparison value: 6 = Operation Enable</td>
</tr>
</tbody>
</table>
8.3.5 Standstill window

The standstill window can be used to check whether the drive has reached the reference position.

If the control deviation Status.p_dif of the position controller remains in the standstill window after the end of the positioning for the period Settings.p_winTime, the device signals the end of processing (x_end = 0→1).

The parameters Settings.p_win and Settings.p_winTime define the size of the window.

The standstill window primarily affects the x_end bit of the operating mode: The corresponding operating mode does not signal x_end=1 unless the is in the standstill window after the end of the movement.

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings.p_win</td>
<td>15:15 (0F:0Fh)</td>
<td>Standstill window, permissible control deviation</td>
<td>See parameter Settings.p_winTime</td>
<td>UINT16</td>
<td>0..32767</td>
<td>R/W per.</td>
</tr>
<tr>
<td>Settings.p_winTime</td>
<td>15:16 (0F:10h)</td>
<td>Standstill window, time</td>
<td>The control deviation p_dif must be within the position window for this period of time for the movement to be detected as finished. This is signalled by the x_end bit in the status word. Value 0: Standstill window deactivated</td>
<td>UINT16</td>
<td>0..32767</td>
<td>R/W per.</td>
</tr>
</tbody>
</table>
9 Diagnostics and troubleshooting

9.1 Error indication and troubleshooting

9.1.1 Diagnostics via commissioning software

The commissioning software can be used to display the following diagnostics information:

- Indication of current operating state
  Lets you draw conclusions concerning the reasons for the drive not being ready for operation.

- Status word
  Indicates which of the 3 following signals is active:
  - External monitoring signal
  - Internal monitoring signal
  - Warning

- Parameter Status.StopFault, 32:7
  Cause of last interruption, error number

- Error memory
  The error memory contains the last 7 errors. The error memory is not volatile, i.e. it is not cleared when the drive is switched off.

  The following information is output for every error:
  - Age
  - Description of error as text
  - Error class
  - Error number
  - Frequency
  - Additional information
9 Diagnostics and troubleshooting

9.1.2 Diagnostics via fieldbus

Asynchronous errors

In fieldbus mode, device errors are signaled as asynchronous errors by the monitoring system of the controller. An asynchronous error is indicated by the status word "fb_statusword". Signal status 1 indicates an error message or a warning message. The parameters allow you to determine details concerning the cause of the error.

![Figure 9.1 Evaluation of asynchronous errors](image)

Description of the bits:

- Bit 5, "FltSig"
  
  Message from internal monitoring signal (e.g. power amplifier over-temperature)
  
  Parameter Status.FltSig_SR, 28:18

- Bit 6, "Sign_SR"
  
  Message from external monitoring signal (e.g. movement interruption by limit switch)
  
  Parameter Status.Sign_SR, 28:15

- Bit 7, "warning"
  
  Warning message (e.g. temperature warning)
  
  Parameter Status.WarnSig, 28:10

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status.p_difPeak</td>
<td>Maximum position deviation reached</td>
<td>15:13 (0F:0Dh)</td>
<td>UINT32</td>
<td>Inc</td>
<td>R/-</td>
</tr>
<tr>
<td>Status.driveStat</td>
<td>Status word for the operating state</td>
<td>28:2 (1C:02h)</td>
<td>LOW-UINT16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LOW-UINT16:

- Bits 0 ... 3: Current operating state
- Bit 4: reserved
- Bit 5: Error detected by internal monitoring
- Bit 6: Error detected by external monitoring
- Bit 7: Warning active
- Bits 8 ... 11: Reserved
- Bits 12 ... 15: Operating-mode specific coding

Corresponds to the assignment of bits 12 ... 15 in the operating mode-specific acknowledgement data.

HIGH-UINT16:

Assignment see parameter Status.xMode_act.
### ILE1B, ILE1F, ILE1R

#### 9 Diagnostics and troubleshooting

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type</th>
<th>Unit Default</th>
<th>R/W per.</th>
</tr>
</thead>
</table>
| Status.xMode_act | 28:3 (1C:03h) | Current operating mode with additional information | Assignment of bits:
- Bits 0..3: Current operating mode (see below)
- Bit 4: reserved
- Bit 5: Drive referenced (ref_ok)
- Bits 6 ... 15: Reserved | UINT16 | - | R/- |
| Status.WarnSig | 28:10 (1C:0Ah) | Warnings | Monitoring signals with error class 0. | UINT16 | - | R/- |
| Status.Sign_SR | 28:15 (1C:0Fh) | Stored signal status of external monitoring signals | Bit value 0: not activated
Bit value 1: activated | UINT16 | 0..15 | R/- |
| Status.FltSig | 28:17 (1C:11h) | Active monitoring signals | The error bits remain set as long as the error persists (i.e. as long as the limit value is exceeded).
Assignment as parameter Status.FltSig_SR | UINT32 | - | R/- |
### 9 Diagnostics and troubleshooting

#### Status.FltSig_SR (28:18 (1C:12h))

**Description**: Stored monitoring signals

Error bits remain set until a FaultReset is executed.

**Assignment of bits**:
- Bit 0: Undervoltage 1 power supply
- Bit 1: Undervoltage 2 power supply
- Bit 2: Overvoltage power supply
- Bit 5: Motor overload
- Bit 7: Overtemperature power stage (≥105°C)
- Bit 16: Blocking error
- Bit 17: Tracking error
- Bit 18: Encoder inoperative
- Bit 21: Protocol error fieldbus
- Bit 22: Nodeguard error
- Bit 23: Pulse/directing input timing
- Bit 25: STO safety function triggered
- Bit 26: Signals of the STO safety function have different levels
- Bit 28: Hardware error EEPROM
- Bit 29: Start-up error
- Bit 30: Internal system error
- Bit 31: Watchdog

**Data type**: UINT32

**Unit**: -

**R/W**: R/-

#### Status.action_st (28:19 (1C:13h))

**Description**: Action word

**Assignment of bits**:
- Bit 0: Bit latched error class 0
- Bit 1: Bit latched error class 1
- Bit 2: Bit latched error class 2
- Bit 3: Bit latched error class 3
- Bit 4: Bit latched error class 4
- Bit 5: reserved
- Bit 6: Motor at standstill: actual speed of rotation is zero
- Bit 7: Motor rotates clockwise
- Bit 8: Motor rotates counterclockwise
- Bit 9: reserved
- Bit 10: reserved
- Bit 11: Motor at standstill: reference speed of rotation is 0
- Bit 12: Motor decelerates
- Bit 13: Motor accelerates
- Bit 14: Motor moves at constant speed
- Bit 15: reserved

**Data type**: UINT16

**Unit**: -

**R/W**: R/-

#### Status.v_ref (31:1 (1F:01h))

**Description**: Reference speed

**Reference value of speed controller**

**Data type**: INT32

**Unit**: Inc/s

**Default**: -

**R/W**: R/-

#### Status.v_act (31:2 (1F:02h))

**Description**: Actual speed of motor

**The speed captured by the encoder.**

**Data type**: INT32

**Unit**: Inc/s

**Default**: -

**R/W**: R/-

#### Status.p_ref (31:5 (1F:05h))

**Description**: Reference position

**Reference value of position controller.**

**Data type**: INT32

**Unit**: Inc

**Default**: -

**R/W**: R/-

#### Status.p_act (31:6 (1F:06h))

**Description**: Actual position of motor

**The motor position captured by the encoder.**

**Data type**: INT32

**Unit**: Inc

**Default**: -

**R/W**: R/-

#### Status.p_dif (31:7 (1F:07h))

**Description**: Position deviation of position controller

**Data type**: INT32

**Unit**: Inc

**Default**: -

**R/W**: R/-

#### Status.n_ref (31:8 (1F:08h))

**Description**: Reference speed

**Reference value of speed controller**

**Data type**: INT16

**Unit**: min⁻¹

**Default**: -

**R/W**: R/-
ILE1B, ILE1F, ILE1R

9 Diagnostics and troubleshooting

Synchronous errors

In addition to asynchronous errors, synchronous errors are also signaled in fieldbus operation; they are caused by communication problems (e.g. unauthorized access or incorrect command).

Both types of errors are described in the fieldbus manual.
Error memory

The last 7 error messages are saved in a separate error memory. The error messages are sorted in chronological order and can be read via index and subindex. The last error that caused an interruption is also saved to the parameter \textit{Status.StopFault, 32:7}.

<table>
<thead>
<tr>
<th>Index:Subindex</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>900:1, 900:2, 900:3 ...</td>
<td>1st entry, oldest error message</td>
</tr>
<tr>
<td>901:1, 901:2, 901:3 ...</td>
<td>2nd entry</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>906:1, 906:2, 906:3</td>
<td>7th entry, latest error message</td>
</tr>
</tbody>
</table>

More information on each error message can be obtained via subindices 1 … 5:

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
</table>
| ErrMem0.ErrNum 900:1 (384:01\text{h}) | Coded error number | Index 900: First error entry (oldest)  
Index 901: Next error entry  
... | | UINT16 - | - | R/- |
| | NOTE: Reading this parameter copies the entire error entry (9xx.1 - 9xx.5) to an intermediate memory from which all elements are then loaded. |
| ErrMem0.Class 900:2 (384:02\text{h}) | Error class | The error class determines the error response of the controller. | | UINT16 0..4 - | - | R/- |
| ErrMem0.Age 900:3 (384:03\text{h}) | Age of the error in device switch-on cycles | Value 0: Error occurred since the last switch-on of the device  
Value 1: Error occurred during last operation  
Value 2: Error occurred during last but one operation etc. | | UINT32 - | - | R/- |
| ErrMem0.Repeat 900:4 (384:04\text{h}) | Error repetitions | Number of consecutive errors with this error number:  
Value 0: Error occurred only once  
Value 1: 1 repetition  
Value 2: 2 repetitions etc.  
When the maximum number of 255 is reached, the repetition counter is no longer incremented. | | UINT16 0..255 - | - | R/- |
| ErrMem0.ErrQual 900:5 (384:05\text{h}) | Error identifier | This entry contains additional information on the error.  
The meaning depends on the error number. | | UINT16 - | - | R/- |
9.1.3 Operation state and error indication

**Status indication**
The LED shows error messages and warnings. It indicates the operating states in coded form.

<table>
<thead>
<tr>
<th>Status indication</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Diagram" /></td>
<td><img src="list" alt="List" /></td>
</tr>
</tbody>
</table>

- Start-up
- Undervoltage or STO
- Power stage disabled
- Power stage enabled
- “Quick Stop”
- Error
- Internal error

9.1.4 Reset error message

To reset the error message are correcting the fault, send a "Fault Reset" command via the fieldbus by writing the value 8 to the control word, parameter Commands.driveCtrl, 28:1. An error message can also be reset with the commissioning software.

9.1.5 Error classes and error response

**Error class**
The product triggers an error response in the event of a fault. Depending upon the severity of the fault, the device responds in accordance with one of the following error classes:

<table>
<thead>
<tr>
<th>Error class</th>
<th>Reaction</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Warning</td>
<td>Message only, no interruption.</td>
</tr>
<tr>
<td>1</td>
<td>&quot;Quick Stop&quot;</td>
<td>Motor stops with &quot;Quick Stop&quot;, power stage and controller remain switched on and enabled.</td>
</tr>
<tr>
<td>2</td>
<td>&quot;Quick Stop&quot; with switch-off</td>
<td>Motor stops with &quot;Quick Stop&quot;, power stage and controller are disabled after standstill has been achieved.</td>
</tr>
<tr>
<td>3</td>
<td>Fatal error</td>
<td>Power stage and controller switch off immediately without stopping the motor first.</td>
</tr>
<tr>
<td>4</td>
<td>Uncontrolled operation</td>
<td>Power stage and controller switch off immediately without stopping the motor first. Error response can only be reset by switching off the device.</td>
</tr>
</tbody>
</table>
### 9.1.6 Causes of errors and troubleshooting

If communication via the fieldbus is impossible, proceed as follows:

- Open the connector housing cover
- Compare the behavior of LED with the information in the table below.

<table>
<thead>
<tr>
<th>Error</th>
<th>Error class</th>
<th>Cause of error</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication impossible</td>
<td></td>
<td>Incorrect communication parameters</td>
<td>Set the parameter switches correctly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Set the parameters correctly</td>
</tr>
<tr>
<td>Communication unreliable</td>
<td></td>
<td>Missing terminating resistors Poor shielding of lines</td>
<td>Connect terminating resistors correctly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connect the shield correctly (see chapter 6 &quot;Installation&quot;)</td>
</tr>
<tr>
<td>LED off</td>
<td></td>
<td>No supply voltage</td>
<td>Check supply voltage and fuses</td>
</tr>
<tr>
<td>LED flashes at 6 Hz</td>
<td>4</td>
<td>Incorrect flash checksum</td>
<td>Reinstall firmware or replace product</td>
</tr>
<tr>
<td>LED flashes at 10 Hz</td>
<td>4</td>
<td>Hardware error Internal system error</td>
<td>Switch drive off and on</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Watchdog</td>
<td>Drive requires service</td>
</tr>
</tbody>
</table>

Error messages and warnings can be read out via the fieldbus.

Errors detected by internal monitoring are signaled by the corresponding bits in the parameter `Status.FltSig_SR, 28:18`.

The bits remain set even if the monitored limit values are no longer exceeded.

The bits can be cleared by a "Fault Reset".

<table>
<thead>
<tr>
<th>Monitoring bit</th>
<th>Error</th>
<th>Error class</th>
<th>Cause of error</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Undervoltage</td>
<td>2</td>
<td>Supply voltage below threshold value for switching off the drive</td>
<td>Check voltage, check connections at the drive</td>
</tr>
<tr>
<td>1</td>
<td>Undervoltage</td>
<td>3</td>
<td>Supply voltage below threshold value for switching off the drive</td>
<td>Check voltage, check connections at the drive</td>
</tr>
<tr>
<td>2</td>
<td>Overvoltage</td>
<td>3</td>
<td>Overvoltage, regeneration condition</td>
<td>See chapter 5.1 &quot;External power supply units&quot;</td>
</tr>
<tr>
<td>5</td>
<td>Motor overload</td>
<td></td>
<td>Load torque too high Motor phase current set too high</td>
<td>Reduce load torque</td>
</tr>
<tr>
<td>12</td>
<td>Power stage over-temperature</td>
<td>3</td>
<td>The power stage overheated Ambient temperature too high Poor heat dissipation</td>
<td>Improved heat dissipation via the motor flange</td>
</tr>
<tr>
<td>16</td>
<td>Blocking error</td>
<td>3</td>
<td>Drive blocked or stalled Movement frequency too high Acceleration too high</td>
<td>Reduce load torque or motor torque; check settings for motor phase current; Reduce movement frequency Reduce acceleration</td>
</tr>
<tr>
<td>17</td>
<td>Tracking error</td>
<td></td>
<td>Load torque too high Ramp too steep</td>
<td>Reduce load torque or motor torque; check settings for motor phase current; reduce speed; reduce acceleration</td>
</tr>
<tr>
<td>18</td>
<td>Encoder inoperative</td>
<td>4</td>
<td>Defective encoder</td>
<td>Drive requires service</td>
</tr>
</tbody>
</table>
## 9 Diagnostics and troubleshooting

<table>
<thead>
<tr>
<th>Monitoring bit</th>
<th>Error number</th>
<th>Error type</th>
<th>Cause of error</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>C013Fh</td>
<td>EEPROM not initialized</td>
<td>Hardware error</td>
<td>Hardware error / send product for service</td>
</tr>
<tr>
<td>22</td>
<td>C0140h</td>
<td>EEPROM not compatible with current software</td>
<td>Hardware error</td>
<td>Hardware error / send product for service</td>
</tr>
<tr>
<td>25</td>
<td>C0141h</td>
<td>EEPROM read error</td>
<td>Hardware error</td>
<td>Hardware error / send product for service</td>
</tr>
<tr>
<td>26</td>
<td>C0142h</td>
<td>EEPROM write error</td>
<td>Hardware error</td>
<td>Hardware error / send product for service</td>
</tr>
<tr>
<td>27</td>
<td>C0143h</td>
<td>Checksum error in EEPROM</td>
<td>Hardware error</td>
<td>Hardware error / send product for service</td>
</tr>
<tr>
<td>28</td>
<td>C0148h</td>
<td>Serial interface: Overrun error</td>
<td>Hardware error</td>
<td>Check shield at serial cable, avoid ground loops</td>
</tr>
<tr>
<td>29</td>
<td>C0149h</td>
<td>Serial interface: Framing error</td>
<td>Hardware error</td>
<td>Check shield at serial cable, avoid ground loops</td>
</tr>
<tr>
<td></td>
<td>C014Ah</td>
<td>Serial interface: Parity error</td>
<td>Hardware error</td>
<td>Check shield at serial cable, avoid ground loops</td>
</tr>
<tr>
<td></td>
<td>C014Bh</td>
<td>Serial interface: Receive error</td>
<td>Hardware error</td>
<td>Check shield at serial cable, avoid ground loops</td>
</tr>
<tr>
<td></td>
<td>C014Ch</td>
<td>Serial interface: Buffer overflow</td>
<td>Hardware error</td>
<td>Check shield at serial cable, avoid ground loops</td>
</tr>
<tr>
<td></td>
<td>C014Dh</td>
<td>Serial interface: Protocol error</td>
<td>Hardware error</td>
<td>Check shield at serial cable, avoid ground loops</td>
</tr>
<tr>
<td></td>
<td>C014Eh</td>
<td>Nodeguarding</td>
<td>Hardware error</td>
<td>Serial connection interrupted.</td>
</tr>
<tr>
<td></td>
<td>C0150h</td>
<td>Impermissible limit switch is active</td>
<td>Hardware error</td>
<td>Reference movement started in wrong direction? Limit switch incorrectly wired?</td>
</tr>
<tr>
<td></td>
<td>C0151h</td>
<td>Switch was overtraveled</td>
<td>Hardware error</td>
<td>Parameter value for search speed for reference movement too high?</td>
</tr>
<tr>
<td></td>
<td>C0152h</td>
<td>Switching edge not found</td>
<td>Hardware error</td>
<td>Parameter value for distance for moving away from switch for reference movement too low?</td>
</tr>
</tbody>
</table>

The cause of the error can also be read out in the form of the error number in the parameter "Last cause of interruption" (parameter Status.StopFault, 32:7):
## 9 Diagnostics and troubleshooting

### ILE1B, ILE1F, ILE1R

<table>
<thead>
<tr>
<th>Error number</th>
<th>Error type</th>
<th>Cause of error/troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>0153&lt;sub&gt;h&lt;/sub&gt;</td>
<td>Index pulse not found</td>
<td>Encoder/Hall sensor defective?</td>
</tr>
<tr>
<td>0154&lt;sub&gt;h&lt;/sub&gt;</td>
<td>Reference movement to index pulse cannot be reproduced. Index pulse is too close to switch</td>
<td>Move switch or slightly turn motor shaft and re-mount motor</td>
</tr>
<tr>
<td>0155&lt;sub&gt;h&lt;/sub&gt;</td>
<td>Switch still active after movement away from switch</td>
<td>Switch may bounce. Set longer distance for moving away from switch</td>
</tr>
<tr>
<td>0157&lt;sub&gt;h&lt;/sub&gt;</td>
<td>Interruption/QuickStopActive by LIMP</td>
<td>Limit switch was activated</td>
</tr>
<tr>
<td>0158&lt;sub&gt;h&lt;/sub&gt;</td>
<td>Interruption or QuickStopActive by LIMN</td>
<td>Limit switch was activated</td>
</tr>
<tr>
<td>0159&lt;sub&gt;h&lt;/sub&gt;</td>
<td>Interruption or QuickStop Active by REF</td>
<td>Reference switch was activated and is parameterized as interruption input</td>
</tr>
<tr>
<td>015A&lt;sub&gt;h&lt;/sub&gt;</td>
<td>Interruption or QuickStopActive by STOP</td>
<td>Stop input was activated and is parameterized as interrupt input</td>
</tr>
</tbody>
</table>
### 9.2 Overview of error numbers

<table>
<thead>
<tr>
<th>hex</th>
<th>dec</th>
<th>Error class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0100h</td>
<td>256</td>
<td>2</td>
<td>Undervoltage 1 power supply</td>
</tr>
<tr>
<td>0101h</td>
<td>257</td>
<td>3</td>
<td>Undervoltage 2 power supply</td>
</tr>
<tr>
<td>0102h</td>
<td>258</td>
<td>3</td>
<td>Overvoltage power supply</td>
</tr>
<tr>
<td>0105h</td>
<td>261</td>
<td>3</td>
<td>Motor overload</td>
</tr>
<tr>
<td>010Ch</td>
<td>268</td>
<td>2</td>
<td>Power stage overtemperature</td>
</tr>
<tr>
<td>0110h</td>
<td>272</td>
<td>3</td>
<td>Motor blocked or stalled</td>
</tr>
<tr>
<td>0111h</td>
<td>273</td>
<td>3</td>
<td>Tracking error</td>
</tr>
<tr>
<td>0112h</td>
<td>274</td>
<td>4</td>
<td>Encoder defective</td>
</tr>
<tr>
<td>0115h</td>
<td>277</td>
<td>1</td>
<td>Protocol error fieldbus</td>
</tr>
<tr>
<td>0116h</td>
<td>278</td>
<td>2</td>
<td>Fieldbus: Nodeguarding/Watchdog or Clear</td>
</tr>
<tr>
<td>0117h</td>
<td>279</td>
<td>3</td>
<td>Frequency at pulse/direction input too high</td>
</tr>
<tr>
<td>0118h</td>
<td>280</td>
<td>3</td>
<td>Short circuit digital outputs</td>
</tr>
<tr>
<td>0119h</td>
<td>281</td>
<td>3</td>
<td>STO safety function triggered</td>
</tr>
<tr>
<td>011Ah</td>
<td>282</td>
<td>4</td>
<td>Inputs of the STO safety function have different levels (&gt;1s)</td>
</tr>
<tr>
<td>011Ch</td>
<td>284</td>
<td>4</td>
<td>EEPROM hardware error</td>
</tr>
<tr>
<td>011Dh</td>
<td>285</td>
<td>4</td>
<td>Start-up error</td>
</tr>
<tr>
<td>011Eh</td>
<td>286</td>
<td>4</td>
<td>Internal system error</td>
</tr>
<tr>
<td>011Fh</td>
<td>287</td>
<td>4</td>
<td>Watchdog</td>
</tr>
<tr>
<td>0120h</td>
<td>288</td>
<td>0</td>
<td>Warning position overrun profile generator</td>
</tr>
<tr>
<td>0121h</td>
<td>289</td>
<td>0</td>
<td>Warning overtemperature IGBTs</td>
</tr>
<tr>
<td>0128h</td>
<td>296</td>
<td>0</td>
<td>Warning I/O timing</td>
</tr>
<tr>
<td>0130h</td>
<td>304</td>
<td>0</td>
<td>Parameter does not exist, invalid index</td>
</tr>
<tr>
<td>0131h</td>
<td>305</td>
<td>0</td>
<td>Parameter does not exist, invalid subindex</td>
</tr>
<tr>
<td>0132h</td>
<td>306</td>
<td>0</td>
<td>Communication protocol: Unknown service</td>
</tr>
<tr>
<td>0133h</td>
<td>307</td>
<td>0</td>
<td>Writing of parameter not permissible</td>
</tr>
<tr>
<td>0134h</td>
<td>308</td>
<td>0</td>
<td>Parameter value out of permissible range</td>
</tr>
<tr>
<td>0135h</td>
<td>309</td>
<td>0</td>
<td>Segment service not initialized</td>
</tr>
<tr>
<td>0136h</td>
<td>310</td>
<td>0</td>
<td>Error during recording function</td>
</tr>
<tr>
<td>0137h</td>
<td>311</td>
<td>0</td>
<td>State is not Operation Enable</td>
</tr>
<tr>
<td>0138h</td>
<td>312</td>
<td>0</td>
<td>Processing in current operating state not possible</td>
</tr>
<tr>
<td>0139h</td>
<td>313</td>
<td>0</td>
<td>Generation of reference position interrupted</td>
</tr>
<tr>
<td>013Ah</td>
<td>314</td>
<td>0</td>
<td>Switching impossible while operating mode is active</td>
</tr>
<tr>
<td>013Bh</td>
<td>315</td>
<td>0</td>
<td>Command not allowed during processing (xxxx_end=0)</td>
</tr>
<tr>
<td>013Ch</td>
<td>316</td>
<td>0</td>
<td>Error in selection parameter</td>
</tr>
<tr>
<td>013Dh</td>
<td>317</td>
<td>0</td>
<td>Position overrun</td>
</tr>
<tr>
<td>013Eh</td>
<td>318</td>
<td>0</td>
<td>Actual position is not yet defined</td>
</tr>
<tr>
<td>013Fh</td>
<td>319</td>
<td>4</td>
<td>EEPROM not initialized</td>
</tr>
<tr>
<td>0140h</td>
<td>320</td>
<td>4</td>
<td>EEPROM not compatible with current software</td>
</tr>
<tr>
<td>0141h</td>
<td>321</td>
<td>4</td>
<td>EEPROM read error</td>
</tr>
</tbody>
</table>
## 9 Diagnostics and troubleshooting

<table>
<thead>
<tr>
<th>hex</th>
<th>dec</th>
<th>Error class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0142h</td>
<td>322</td>
<td>4</td>
<td>EEPROM write error</td>
</tr>
<tr>
<td>0143h</td>
<td>323</td>
<td>4</td>
<td>Checksum error in EEPROM</td>
</tr>
<tr>
<td>0144h</td>
<td>324</td>
<td>0</td>
<td>Value cannot be calculated</td>
</tr>
<tr>
<td>0145h</td>
<td>325</td>
<td>0</td>
<td>Function only allowed at standstill</td>
</tr>
<tr>
<td>0146h</td>
<td>326</td>
<td>0</td>
<td>Reference movement is active</td>
</tr>
<tr>
<td>0147h</td>
<td>327</td>
<td>0</td>
<td>Command not allowed during processing (xxx_end=0)</td>
</tr>
<tr>
<td>0148h</td>
<td>328</td>
<td>1</td>
<td>RS485 interface: Overrun error</td>
</tr>
<tr>
<td>0149h</td>
<td>329</td>
<td>1</td>
<td>RS485 interface: Framing error</td>
</tr>
<tr>
<td>014Ah</td>
<td>330</td>
<td>1</td>
<td>RS485 interface: Parity error</td>
</tr>
<tr>
<td>014Bh</td>
<td>331</td>
<td>1</td>
<td>RS485 interface: Receive error</td>
</tr>
<tr>
<td>014Ch</td>
<td>332</td>
<td>1</td>
<td>RS485 interface: Buffer overflow</td>
</tr>
<tr>
<td>014Dh</td>
<td>333</td>
<td>1</td>
<td>RS485 interface: Protocol error</td>
</tr>
<tr>
<td>014 Eh</td>
<td>334</td>
<td>1</td>
<td>Nodeguarding, interface no longer serviced</td>
</tr>
<tr>
<td>014Fh</td>
<td>335</td>
<td>0</td>
<td>&quot;Quick Stop&quot; state activated</td>
</tr>
<tr>
<td>0150h</td>
<td>336</td>
<td>1</td>
<td>Impermisssible limit switch is active</td>
</tr>
<tr>
<td>0151h</td>
<td>337</td>
<td>1</td>
<td>Switch was overtraveled, moving away from switch impossible</td>
</tr>
<tr>
<td>0152h</td>
<td>338</td>
<td>1</td>
<td>Switching edge not found in distance for search for switching edge during movement away from switch</td>
</tr>
<tr>
<td>0153h</td>
<td>339</td>
<td>1</td>
<td>Index pulse not found</td>
</tr>
<tr>
<td>0154h</td>
<td>340</td>
<td>1</td>
<td>Unreliable reproducibility of the index pulse movement, index pulse too close to the switch</td>
</tr>
<tr>
<td>0155h</td>
<td>341</td>
<td>1</td>
<td>Switch still active after movement away from switch</td>
</tr>
<tr>
<td>0156h</td>
<td>342</td>
<td>1</td>
<td>Input not parameterized as LIMP/LIMN/REF</td>
</tr>
<tr>
<td>0157h</td>
<td>343</td>
<td>1</td>
<td>Interruption / &quot;Quick Stop&quot; by LIMP</td>
</tr>
<tr>
<td>0158h</td>
<td>344</td>
<td>1</td>
<td>Interruption / &quot;Quick Stop&quot; by LIMN</td>
</tr>
<tr>
<td>0159h</td>
<td>345</td>
<td>1</td>
<td>Interruption / &quot;Quick Stop&quot; by REF</td>
</tr>
<tr>
<td>015Ah</td>
<td>346</td>
<td>1</td>
<td>Interruption / &quot;Quick Stop&quot; by STOP</td>
</tr>
<tr>
<td>015Bh</td>
<td>347</td>
<td>1</td>
<td>Limit switch not released</td>
</tr>
<tr>
<td>015Ch</td>
<td>348</td>
<td>0</td>
<td>Processing not allowed in current operating mode</td>
</tr>
<tr>
<td>015Dh</td>
<td>349</td>
<td>0</td>
<td>Parameter not available with this device</td>
</tr>
<tr>
<td>015 Eh</td>
<td>350</td>
<td>0</td>
<td>Function not available with this device</td>
</tr>
<tr>
<td>015Fh</td>
<td>351</td>
<td>0</td>
<td>Access denied</td>
</tr>
<tr>
<td>0160h</td>
<td>352</td>
<td>4</td>
<td>Production data in EEPROM not compatible with current software</td>
</tr>
<tr>
<td>0161h</td>
<td>353</td>
<td>4</td>
<td>Index pulse sensor not compensated</td>
</tr>
<tr>
<td>0162h</td>
<td>354</td>
<td>0</td>
<td>Drive is not referenced</td>
</tr>
<tr>
<td>0163h</td>
<td>355</td>
<td>0</td>
<td>CAN interface: COB-ID incorrect</td>
</tr>
<tr>
<td>0164h</td>
<td>356</td>
<td>0</td>
<td>CAN interface: Incorrect request</td>
</tr>
<tr>
<td>0165h</td>
<td>357</td>
<td>0</td>
<td>CAN interface: Overrun error</td>
</tr>
<tr>
<td>0166h</td>
<td>358</td>
<td>0</td>
<td>CAN interface: Telegram could not be saved</td>
</tr>
<tr>
<td>0167h</td>
<td>359</td>
<td>0</td>
<td>CAN interface: General error CAN stack</td>
</tr>
<tr>
<td>0168h</td>
<td>360</td>
<td>0</td>
<td>Fieldbus: Data type and parameter length do not match</td>
</tr>
<tr>
<td>hex</td>
<td>dec</td>
<td>Error class</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>-------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>0169h</td>
<td>361</td>
<td>0</td>
<td>Blocking detection is switched off</td>
</tr>
<tr>
<td>016Ah</td>
<td>362</td>
<td>0</td>
<td>Connection to DSP boot loader not successful</td>
</tr>
<tr>
<td>016Bh</td>
<td>363</td>
<td>0</td>
<td>Error in communication with DSP boot loader</td>
</tr>
<tr>
<td>016Ch</td>
<td>364</td>
<td>0</td>
<td>Error initializing SPC3 memory</td>
</tr>
<tr>
<td>016Dh</td>
<td>365</td>
<td>0</td>
<td>Error in calculation of the length of input/output data</td>
</tr>
<tr>
<td>016Eh</td>
<td>366</td>
<td>0</td>
<td>Specified Profibus address is outside permissible range</td>
</tr>
<tr>
<td>016Fh</td>
<td>367</td>
<td>0</td>
<td>Impermissible use of parameter switch S1.1</td>
</tr>
<tr>
<td>0170h</td>
<td>368</td>
<td>0</td>
<td>DSP software not compatible with Profibus software</td>
</tr>
<tr>
<td>0171h</td>
<td>369</td>
<td>0</td>
<td>Checksum of Profibus DP interface software incorrect</td>
</tr>
<tr>
<td>0172h</td>
<td>370</td>
<td>0</td>
<td>Oscilloscope function: No other data available</td>
</tr>
<tr>
<td>0173h</td>
<td>371</td>
<td>0</td>
<td>Oscilloscope function: Trigger variable was not defined</td>
</tr>
<tr>
<td>0174h</td>
<td>372</td>
<td>0</td>
<td>Parameterization of oscilloscope function incomplete</td>
</tr>
<tr>
<td>0175h</td>
<td>373</td>
<td>1</td>
<td>Internal communication</td>
</tr>
<tr>
<td>0177h</td>
<td>375</td>
<td>1</td>
<td>Interruption / &quot;Quick Stop&quot; by software limit switch clockwise rotation</td>
</tr>
<tr>
<td>0178h</td>
<td>376</td>
<td>1</td>
<td>Interruption / &quot;Quick Stop&quot; by software limit switch counterclockwise rotation</td>
</tr>
</tbody>
</table>
10 Parameters

10.1 Representation of parameters

The way parameters are shown provides information required for unique identification of a parameter. In addition, information is provided on possible settings, defaults and parameter properties.

Parameters are represented as shown below:

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W</th>
<th>Persistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example.Name</td>
<td>Example</td>
<td>UINT16</td>
<td>127</td>
<td>R/W</td>
<td>per.</td>
</tr>
</tbody>
</table>

**Group.Name**
Parameter name consisting of the name of the parameter group ("Group") and the name of the specific parameter ("Name").

**Default value**
Factory setting.

**Data type**
The data type determines the valid range of values, especially if minimum and maximum values are not explicitly indicated for a parameter.

<table>
<thead>
<tr>
<th>Data type</th>
<th>Byte</th>
<th>Min value</th>
<th>Max value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT8</td>
<td>1 Byte / 8 Bit</td>
<td>-128</td>
<td>127</td>
</tr>
<tr>
<td>UINT8</td>
<td>1 Byte / 8 Bit</td>
<td>0</td>
<td>255</td>
</tr>
<tr>
<td>INT16</td>
<td>2 Byte / 16 Bit</td>
<td>-32768</td>
<td>32767</td>
</tr>
<tr>
<td>UINT16</td>
<td>2 Byte / 16 Bit</td>
<td>0</td>
<td>65535</td>
</tr>
<tr>
<td>INT32</td>
<td>4 Byte / 32 Bit</td>
<td>-2147483648</td>
<td>2147483647</td>
</tr>
<tr>
<td>UINT32</td>
<td>4 Byte / 32 Bit</td>
<td>0</td>
<td>4294967295</td>
</tr>
</tbody>
</table>

**Unit**
The unit of the value.

**R/W**
Indicates read and/or write values

"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 changing a value via commissioning software or fieldbus, the user must explicitly store the changed value in the persistent memory.
## 10.2 Overview Parameters

<table>
<thead>
<tr>
<th>CAN</th>
<th>Settings CAN bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commands</td>
<td>State change</td>
</tr>
<tr>
<td></td>
<td>Save parameters to EEPROM</td>
</tr>
<tr>
<td></td>
<td>Initialize default parameters</td>
</tr>
<tr>
<td>Config</td>
<td>Drive configuration</td>
</tr>
<tr>
<td>Control</td>
<td>Controller settings</td>
</tr>
<tr>
<td>ErrMem0</td>
<td>Error memory</td>
</tr>
<tr>
<td>Homing</td>
<td>Operating mode &quot;Homing&quot;</td>
</tr>
<tr>
<td>I/O</td>
<td>Status and definition of inputs and outputs</td>
</tr>
<tr>
<td>Manual</td>
<td>Operating mode &quot;Jog&quot;</td>
</tr>
<tr>
<td>Motion</td>
<td>Function &quot;Definition of the direction of rotation&quot;</td>
</tr>
<tr>
<td></td>
<td>Function &quot;Quick Stop&quot;</td>
</tr>
<tr>
<td></td>
<td>Default reference speed</td>
</tr>
<tr>
<td></td>
<td>Acceleration and deceleration</td>
</tr>
<tr>
<td>Profibus</td>
<td>Settings Profibus</td>
</tr>
<tr>
<td>ProgIO0..3</td>
<td>Function &quot;Programmable inputs/outputs&quot;</td>
</tr>
<tr>
<td>PTP</td>
<td>Operating mode &quot;Profile Position&quot;</td>
</tr>
<tr>
<td>RS485</td>
<td>Setting RS485 bus</td>
</tr>
<tr>
<td>Settings</td>
<td>User-defined device name</td>
</tr>
<tr>
<td></td>
<td>Phase currents</td>
</tr>
<tr>
<td></td>
<td>Monitoring inputs</td>
</tr>
<tr>
<td>Status</td>
<td>Status information and read values</td>
</tr>
<tr>
<td>VEL</td>
<td>Operating mode &quot;Profile Velocity&quot;</td>
</tr>
</tbody>
</table>
10.3 Parameter groups

10.3.1 Parameter group "CAN"

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN.canAddr</td>
<td>Address CAN Bus</td>
<td>UINT16</td>
<td>-</td>
<td>127</td>
<td>R/W per.</td>
</tr>
<tr>
<td></td>
<td>Permissible values 1..127</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAN.canBaud</td>
<td>Baud rate CAN bus</td>
<td>UINT16</td>
<td>-</td>
<td>125</td>
<td>R/W per.</td>
</tr>
<tr>
<td></td>
<td>The following values are permitted: Value 50: 50 kBaud Value 100: 100 kBaud Value 125 = 125 kBaud Value 250: 250 kBaud Value 500: 500 kBaud Value 800: 800 kBaud Value 1000: 1 MBaud</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAN.pdo4msk1</td>
<td>32 bit mask for process data change part 1</td>
<td>UINT32</td>
<td>-</td>
<td>4294967295</td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td>32 bit mask for event-controlled PDO4: This value allows you to mask bytes 1..4. In the case of event-controlled transmission, a message is sent whenever the T-PDO data changes. This mask lets you specify the transmission of messages in more detail or limit it. Changes for event-controlled transmission are ignored at all bits at which the mask contains a 0. Assignment of bits: Bits 0 ... 7: ioSignals Bits 8 ...15: modeStat Bits 16 ... 23: warn Sig_SR FltSig cos Bits 24 ... 31: x_end x_err x_info</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAN.pdo4msk2</td>
<td>32 bit mask for process data change part 2</td>
<td>UINT32</td>
<td>-</td>
<td>0</td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td>32 bit mask for event-controlled PDO4: Mask for bytes 5..8. For a description see parameter CAN.pdo4msk1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10.3.2 Parameter group "Commands"

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commands.eeprSave</td>
<td>Save parameter values to EEPROM Value 1: Save user-defined parameters</td>
<td>UINT16</td>
<td>-</td>
<td>-</td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td>The currently set parameters are saved to the EEPROM The saving process is completed when the parameter Commands.stateSave, 11:7 returns 1. NOTE: Saving is only possible when the drive is at standstill.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commands.stateSave</td>
<td>Save processing state of parameter to EEPROM 0: Saving process active 1: Saving process completed</td>
<td>UINT16</td>
<td>-</td>
<td>-</td>
<td>R/-</td>
</tr>
</tbody>
</table>
### 10 Parameters

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commands.default</td>
<td>11:8 (0B:08h)</td>
<td>Reset user-defined parameters</td>
<td></td>
<td>UINT16</td>
<td>-</td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value 1: All user-defined parameters are initialized with their default values and saved to the EEPROM. The default state only becomes active at the next start-up.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOTE: Only possible if the drive is at standstill.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commands.state-Def</td>
<td>11:9 (0B:09h)</td>
<td>Processing state of parameter Commands.default</td>
<td></td>
<td>UINT16</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0: Basic initialization active</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1: Basic initialization completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commands.driveCtrl</td>
<td>28:1 (1C:01h)</td>
<td>Control word</td>
<td>Assignment of bits: Bit 0: Disable power stage Bit 1: Enable power stage Bit 2: Quicktop Bit 3: FaultReset Bit 4: QuickStop-Release Bits 5..15: Reserved Default bits 0 ... 4: 0 A write access automatically triggers processing of the operating states.</td>
<td></td>
<td>UINT16 0..31</td>
<td>0</td>
</tr>
<tr>
<td>Commands.del_err</td>
<td>32:2 (20:02h)</td>
<td>Delete error memory</td>
<td>Write value 1: Delete all entries in error memory</td>
<td>UINT16 1..1</td>
<td>1</td>
<td>R/W</td>
</tr>
</tbody>
</table>

### 10.3.3 Parameter group "Config"

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Config.PrgNo</td>
<td>1:1 (01:01h)</td>
<td>Firmware number</td>
<td>High word: Program number Low word: Program version Example: PR802.10</td>
<td>UINT32</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Config.PrgVer</td>
<td>1:2 (01:02h)</td>
<td>Firmware version</td>
<td>High word: Program version Low word: Program revision Example: V1.003</td>
<td>UINT32</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Config.SerialNo1</td>
<td>1:20 (01:14h)</td>
<td>Serial number of the drive art 1 Digits 10-13 of the serial number To be represented as a decimal number.</td>
<td></td>
<td>UINT16</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Config.SerialNo2</td>
<td>1:21 (01:15h)</td>
<td>Serial number of the drive art 2 Digits 1-9 of the serial number To be represented as a decimal number.</td>
<td></td>
<td>UINT32</td>
<td>-</td>
<td>R/-</td>
</tr>
</tbody>
</table>
### 10.3.4 Parameter group "Control"

<table>
<thead>
<tr>
<th>Group.Name Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Config.OptPrgNo 13:11 (0D:0Bh)</td>
<td>Firmware number in option module</td>
<td>UINT32</td>
<td>-</td>
<td>R-/</td>
<td></td>
</tr>
<tr>
<td>Identifies the program number of the internal Profibus interface of drives with Profibus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Config.OptPrgVer 13:12 (0D:0Ch)</td>
<td>Firmware version in option module</td>
<td>UINT32</td>
<td>-</td>
<td>R-/</td>
<td></td>
</tr>
<tr>
<td>Identifies the program version of the internal Profibus interface of drives with Profibus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Config.GearNum 13:14 (0D:0Eh)</td>
<td>Numerator of gear ratio</td>
<td>INT32</td>
<td>-</td>
<td>R-/</td>
<td></td>
</tr>
<tr>
<td>Gear ratio of gearbox mounted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note: The value is only correct if the gearbox was installed by the manufacturer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Config.GearDen 13:15 (0D:0Fh)</td>
<td>Denominator of gear ratio</td>
<td>INT32</td>
<td>-</td>
<td>R-/</td>
<td></td>
</tr>
<tr>
<td>Gear ratio of gearbox mounted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note: The value is only correct if the gearbox was installed by the manufacturer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Config.STO_con 13:16 (0D:10h)</td>
<td>Status of signal inputs STO_A (PWRR_A) and STO_B (PWRR_B) of the STO safety function</td>
<td>UINT16</td>
<td>0..3</td>
<td>R-/</td>
<td></td>
</tr>
<tr>
<td>Value 0: Inputs not available</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value 1: Jumper plugged in (safety function inactive)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value 3: Current at inputs (safety function active)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Config.I_nomDrv 15:1 (0F:01h)</td>
<td>Nominal current of drive</td>
<td>UINT16</td>
<td>0..100</td>
<td>A</td>
<td>R-/</td>
</tr>
<tr>
<td>Current that can flow continuously without overheating or damaging the drive.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit: [0.1A]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Config.I_maxDrv 15:2 (0F:02h)</td>
<td>Maximum current of drive</td>
<td>UINT16</td>
<td>0..100</td>
<td>A</td>
<td>R-/</td>
</tr>
<tr>
<td>Maximum current that may only flow for a short period of time. This is monitored by I²t monitoring.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit: [0.1A]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Config.ResolutM 29:2 (1D:02h)</td>
<td>Positioning resolution of the drive</td>
<td>UINT16</td>
<td>Inc 12</td>
<td>R-/</td>
<td></td>
</tr>
<tr>
<td>Read value for the resolution of the drive in increments per revolution.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value is applicable directly at the motor shaft (without gearbox).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**ILE1B, ILE1F, ILE1R 10 Parameters**

Lexium Integrated Drive 141
## 10.3.5 Parameter group "ErrMem0"

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ErrMem0.ErrNum 900:1 (384:01h)</td>
<td>Coded error number</td>
<td>UINT16</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td>ErrMem0.Class 900:2 (384:02h)</td>
<td>Error class</td>
<td>UINT16</td>
<td>0..4</td>
<td>R/-</td>
</tr>
<tr>
<td>ErrMem0.Age 900:3 (384:03h)</td>
<td>Age of the error in device switch-on cycles</td>
<td>UINT32</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td>ErrMem0.Repeat 900:4 (384:04h)</td>
<td>Error repetitions</td>
<td>UINT16</td>
<td>0..255</td>
<td>R/-</td>
</tr>
<tr>
<td>ErrMem0.ErrQual 900:5 (384:05h)</td>
<td>Error identifier</td>
<td>UINT16</td>
<td>-</td>
<td>R/-</td>
</tr>
</tbody>
</table>

### Notes
- **ErrMem0.ErrNum**
  - Index 900: First error entry (oldest)
  - Index 901: Next error entry
  - ... 
  - NOTE: Reading this parameter copies the entire error entry (9xx.1 - 9xx.5) to an intermediate memory from which all elements are then loaded.

### Description
- **ErrMem0.Class**: Error class
  - 0: Normal operation
  - 1: Motor stopped due to an error
  - 2: Motor stopped due to an error and a limit switch is closed
  - 3: Motor stopped due to an error and a limit switch is open
  - 4: Motor stopped due to an error and a limit switch is closed

- **ErrMem0.Age**: Age of the error in device switch-on cycles
  - Value 0: Error occurred since the last switch-on of the device
  - Value 1: Error occurred during last operation
  - Value 2: Error occurred during last but one operation etc.

- **ErrMem0.Repeat**: Error repetitions
  - Value 0: Error occurred only once
  - Value 1: 1 repetition
  - Value 2: 2 repetitions etc.
  - When the maximum number of 255 is reached, the repetition counter is no longer incremented.

### Notes
- **ErrMem0.Repeat**: The meaning depends on the error numer.

## 10.3.6 Parameter group "Homing"

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homing.startHome 40:1 (28:01h)</td>
<td>Start operating mode Homing</td>
<td>UINT16</td>
<td>1..8</td>
<td>R/W</td>
</tr>
</tbody>
</table>

### Notes
- **Homing.startHome**: Action object: Write access triggers reference movement.
  - Value 1: LIMP
  - Value 2: LIMN
  - Value 3: REF counterclockwise direction of rotation
  - Value 4: REF clockwise direction of rotation
  - Value 7: Movement to block counterclockwise direction of rotation
  - Value 8: Movement to block clockwise direction of rotation
### ILE1B, ILE1F, ILE1R 10 Parameters

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homing.stateHome 40:2 (28:02h)</td>
<td>Acknowledgement: Homing</td>
<td>UINT16</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td></td>
<td>Assignment of bits:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 0: Error LIMP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 1: Error LIMN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 2: Error HW_STOP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 3: Error REF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 7: Error SW_STOP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 15: ref_err</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 14: ref_end</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homing.startSetp 40:3 (28:03h)</td>
<td>Position setting to position setting position</td>
<td>INT32</td>
<td>Inc</td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td>Action object: write access triggers position setting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Only possible if the motor is at standstill.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homing.v_Home 40:4 (28:04h)</td>
<td>Speed of rotation for search of switch</td>
<td>UINT16</td>
<td>300..5000</td>
<td>1000 per.</td>
</tr>
<tr>
<td>Homing.v_outHome 40:5 (28:05h)</td>
<td>Speed of rotation for moving away from switch</td>
<td>UINT16</td>
<td>300..5000</td>
<td>500 per.</td>
</tr>
<tr>
<td>Homing.p_outHome 40:6 (28:06h)</td>
<td>Maximum distance for search for switching edge</td>
<td>INT32</td>
<td>1..2147483647</td>
<td>200000 per.</td>
</tr>
<tr>
<td></td>
<td>After detection of the switch, the drive starts to search for the defined switching edge. If it is not found within the distance defined here, the reference movement is canceled with an error.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homing.p_disHome 40:7 (28:07h)</td>
<td>Distance from switching edge to reference point</td>
<td>INT32</td>
<td>1..2147483647</td>
<td>200 per.</td>
</tr>
<tr>
<td></td>
<td>After the drive moves away from the switch, it is positioned into the working range by a defined distance; this is defined as the reference point.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homing.RefSwMod 40:9 (28:09h)</td>
<td>Processing sequence during reference movement to REF</td>
<td>UINT16</td>
<td>0..3</td>
<td>0 per.</td>
</tr>
<tr>
<td></td>
<td>Bit value 0: In positive direction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit value 1: In negative direction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assignment of bits:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 0: Direction of movement to switching edge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 1: Direction of movement to distance from switching edge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homing.RefAppPos 40:11 (28:0Bh)</td>
<td>Application position at reference point</td>
<td>INT32</td>
<td>Inc</td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td>After a successful reference movement, this position is set at the reference point. This automatically defines the application zero point.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homing.refError 40:13 (28:0Dh)</td>
<td>Cause of error during reference movement</td>
<td>UINT16</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td></td>
<td>Error code during reference movement processing</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10 Parameters

10.3.7 Parameter group "I/O"

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O.IO_act</td>
<td>Status of digital inputs and outputs</td>
<td>UINT16</td>
<td></td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td>Assignment of bits: Bit 0: IO0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 1: IO1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 2: IO2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 3: IO3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 4: STO_A (PWRR_A)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 5: STO_B (PWRR_B)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/O.IO0_def</td>
<td>Configuration of IO0</td>
<td>UINT16</td>
<td></td>
<td>R/W per.</td>
</tr>
<tr>
<td></td>
<td>Value 0: Input freely usable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value 1: Input LIMP (only with IO0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value 2: Input LIMN (only with IO1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value 3: Input STOP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value 4: Input REF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value 5: Input programmable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value 128: Output freely usable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value 130: Output programmable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/O.IO1_def</td>
<td>Configuration of IO1</td>
<td>UINT16</td>
<td></td>
<td>R/W per.</td>
</tr>
<tr>
<td></td>
<td>See parameter IO0_def</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/O.IO2_def</td>
<td>Configuration of IO2</td>
<td>UINT16</td>
<td></td>
<td>R/W per.</td>
</tr>
<tr>
<td></td>
<td>See parameter IO0_def</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/O.IO3_def</td>
<td>Configuration of IO3</td>
<td>UINT16</td>
<td></td>
<td>R/W per.</td>
</tr>
<tr>
<td></td>
<td>See parameter IO0_def</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/O.progDelay</td>
<td>Delay time for programmed I/O processing</td>
<td>UINT16</td>
<td></td>
<td>R/W per.</td>
</tr>
<tr>
<td></td>
<td>After the drive is switched on, the function &quot;programmable inputs and outputs&quot; is only activated after the delay time set here.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>This allows you to lock manual operation of a system for a certain period during start-up until a fieldbus controller takes over.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 10.3.8 Parameter group "Manual"

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type</th>
<th>Unit</th>
<th>Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual.startMan</td>
<td>41:1 (29:01h)</td>
<td>Starting a jog</td>
<td>Assignment of bits: Bit 0: Clockwise direction of rotation Bit 1: Counterclockwise direction of rotation Bit 2: 0 = slow 1 = fast Bit 3: Automatic processing of power stage</td>
<td>UINT16</td>
<td>-</td>
<td>0</td>
<td>R/W</td>
</tr>
<tr>
<td>Manual.stateMan</td>
<td>41:2 (29:02h)</td>
<td>Acknowledgement: Jog</td>
<td>Assignment of bits: Bit 0: Error LIMP Bit 1: Error LM</td>
<td>UINT16</td>
<td>-</td>
<td>-</td>
<td>R/-</td>
</tr>
<tr>
<td>Manual.n_slowMan</td>
<td>41:4 (29:04h)</td>
<td>Speed for slow jog</td>
<td>UINT16</td>
<td>min⁻¹</td>
<td>300</td>
<td>R/W per.</td>
<td></td>
</tr>
<tr>
<td>Manual.n_fastMan</td>
<td>41:5 (29:05h)</td>
<td>Speed for fast jog</td>
<td>UINT16</td>
<td>min⁻¹</td>
<td>1000</td>
<td>R/W per.</td>
<td></td>
</tr>
<tr>
<td>Manual.step_Man</td>
<td>41:7 (29:07h)</td>
<td>Jogging distance at jog start</td>
<td>UINT16</td>
<td>Inc</td>
<td>2</td>
<td>R/W</td>
<td></td>
</tr>
<tr>
<td>Manual.time_Man</td>
<td>41:8 (29:08h)</td>
<td>Waiting time until continuous movement starts</td>
<td>Only effective if jog distance is not set to equal 0.</td>
<td>UINT16</td>
<td>ms</td>
<td>500</td>
<td>R/W per.</td>
</tr>
</tbody>
</table>

## 10.3.9 Parameter group "Motion"

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type</th>
<th>Unit</th>
<th>Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motion.invertDir</td>
<td>28:6 (1C:06h)</td>
<td>Definition of direction of rotation</td>
<td>Value 0: Clockwise direction of rotation With positive reference values, the motor rotates clockwise (as you look at the end of the protruding motor shaft). Value 1: Counterclockwise direction of rotation With positive reference values, the motor rotates counterclockwise (as you look at the end of the protruding motor shaft).</td>
<td>UINT16</td>
<td>-</td>
<td>0</td>
<td>R/W per.</td>
</tr>
<tr>
<td>Motion.dec_Stop</td>
<td>28:21 (1C:15h)</td>
<td>Deceleration for &quot;Quick Stop&quot;</td>
<td>Deceleration that is used for every &quot;Quick Stop&quot;: - &quot;Quick Stop&quot; via control word - &quot;Quick Stop&quot; via external monitoring signal - &quot;Quick Stop&quot; via error of classes 1 and 2</td>
<td>UINT32</td>
<td>min⁻¹/s</td>
<td>5000</td>
<td>R/W per.</td>
</tr>
</tbody>
</table>
### 10 Parameters

**ILE1B, ILE1F, ILE1R**

#### 10.3.10 Parameter group "Profibus"

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profibus.MapOut</td>
<td>Value in PZD5+6 to product</td>
<td>UINT32</td>
<td>-</td>
<td>See text left</td>
</tr>
<tr>
<td>Profibus.MapIn</td>
<td>Value in PZD5+6 to master</td>
<td>UINT32</td>
<td>0</td>
<td>R/W per.</td>
</tr>
<tr>
<td>Profibus.PkInhibit</td>
<td>Update cycle for static read requests</td>
<td>UINT32</td>
<td>1..60000</td>
<td>1000</td>
</tr>
<tr>
<td>Profibus.SafeState</td>
<td>Response to 'Clear' and watchdog</td>
<td>UINT32</td>
<td>0..1</td>
<td>R/W per.</td>
</tr>
</tbody>
</table>

**Group.Name**

<table>
<thead>
<tr>
<th>Index:Subindex (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motion.v_target0 29:23 (1D:17₁₀)</td>
<td>Speed of rotation for parameter PTP.v_tarPTP</td>
<td>Speed of rotation for Profile Position operating mode if no value was written to PTP.v_tarPTP.</td>
<td>UINT16</td>
<td>300..5000</td>
<td>min⁻¹</td>
</tr>
<tr>
<td>Motion.acc 29:26 (1D:1A₁₀)</td>
<td>Acceleration</td>
<td>Value determines acceleration and deceleration. New values do not become effective until after standstill.</td>
<td>UINT32</td>
<td>1000..10000</td>
<td>2500</td>
</tr>
</tbody>
</table>

**NOTE:** This persistent value is only used as a default assignment for PTP.v_tarPTP during switching on.
10.3.11 Parameter group "ProgIO0"

The meanings for parameter groups "ProgIO0" (Index 800), "ProgIO1" (Index 801), "ProgIO2" (Index 802), "ProgIO3" (Index 803) are identical.

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>V2.00</td>
<td>09.2008</td>
<td>ILE1B, ILE1F, ILE1R</td>
<td>10 Parameters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profibus.profiAddr 24:13 (18:00Dh)</td>
<td>Profibus address</td>
<td>Address set with the parameter switches</td>
<td></td>
<td>UINT32</td>
<td>-</td>
<td>R/-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ProgIO0.Index 800:1 (320:01h)</td>
<td>Index of the control parameter</td>
<td>If prog. input: index of parameter to be written If prog. output: index of parameter to be read If prog. input: write(Index,Subindex) = (read(Index,Subindex) BAND BitMask) BOR VALUEx If prog. output: 1 level at output if (read(Index,Subindex) BAND BitMask) =&lt;&gt; VALUE1</td>
<td></td>
<td>UINT16</td>
<td>-</td>
<td>R/W per.</td>
</tr>
<tr>
<td>ProgIO0.Subindex 800:2 (320:02h)</td>
<td>Subindex of control parameter</td>
<td>If prog. input: subindex of parameter to be written If prog. output: subindex of parameter to be read</td>
<td></td>
<td>UINT16</td>
<td>-</td>
<td>R/W per.</td>
</tr>
<tr>
<td>ProgIO0.BitMask 800:3 (320:03h)</td>
<td>Bitmask for the parameter value</td>
<td>If programmable input or programmable output: Bit mask used to link the read value (index, subindex) of the parameter with the operator AND before the value is processed.</td>
<td></td>
<td>UINT32</td>
<td>-</td>
<td>R/W per.</td>
</tr>
<tr>
<td>ProgIO0.Switch 800:4 (320:04h)</td>
<td>Edge detection and comparison operator</td>
<td>If programmable input: Selection of the edges to be detected Value 0: No response to level change Value 1: Response to rising edge Value 2: Response to falling edge Value 3: Response to both edges If programmable output: Selection of condition for comparison: Value 0: (parameter read value = comparison value) Value 1: (parameter read value &lt;&gt; comparison value) Value 2: (parameter read value &lt; comparison value) Value 0: (parameter read value &gt; comparison value)</td>
<td></td>
<td>UINT16</td>
<td>-</td>
<td>R/W per.</td>
</tr>
<tr>
<td>ProgIO0.Value1 800:5 (320:05h)</td>
<td>Write Write value at rising edge and comparison value</td>
<td>If programmable input: Parameter write value at rising edge If programmable output: Comparison value for condition</td>
<td></td>
<td>INT32</td>
<td>0..4294967295</td>
<td>R/W per.</td>
</tr>
</tbody>
</table>
## 10 Parameters

### 10.3.12 Parameter group "PTP"

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type</th>
<th>Unit</th>
<th>Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ProgIO0.Value2 800:6 (320:06h)</td>
<td></td>
<td>Write value at falling edge</td>
<td></td>
<td>INT32</td>
<td>-</td>
<td>R/W per.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If programmable input: Parameter write value at falling edge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If programmable output: no meaning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PTP .p_absPTP 35:1 (23:01h)**
- Target position for absolute positioning and start of positioning
- Action object: write access triggers absolute positioning in increments
- **Data type**: INT32
- **Unit**: Inc
- **Default**: -
- **R/W per.**: R/W

**PTP .StatePTP 35:2 (23:02h)**
- Acknowledgement: Profile Position
- Assignment of bits:
  - Bit 0: Error LIMP
  - Bit 1: Error LIMN
  - Bit 2: Error STOP
  - Bit 3: Error REF
  - Bit 7: SW_STOP
  - Bit 13: Target position reached
  - Bit 14: ptp_end
  - Bit 15: ptp_err
- **Data type**: UINT16
- **Unit**: -
- **Default**: -
- **R/W per.**: -

**PTP .p_relPTP 35:3 (23:03h)**
- Target position for relative positioning and start of positioning
- Action object: write access triggers relative positioning in increments
- **Data type**: INT32
- **Unit**: Inc
- **Default**: -
- **R/W per.**: R/W

**PTP .continue 35:4 (23:04h)**
- Continue interrupted positioning
- The target position was specified with the previous positioning command.
- The value indicated here is not relevant for positioning.
- **Data type**: UINT16
- **Unit**: -
- **Default**: 0
- **R/W per.**: R/W

**PTP .v_tarPTP 35:5 (23:05h)**
- Target speed of rotation for positioning
- Positioning can be temporarily stopped with value 0.
- The default value is the value of parameter Motion.v_target0.
- The minimum speed of rotation is 300 min⁻¹.
- **Data type**: UINT16
- **Unit**: min⁻¹
- **Default**: 1000
- **R/W per.**: R/W

### 10.3.13 Parameter group "RS485"

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type</th>
<th>Unit Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS485.timeout 1:11 (01:00Bh)</td>
<td>Node Guard Timer</td>
<td></td>
<td></td>
<td>UINT16</td>
<td>ms</td>
<td>R/W</td>
</tr>
</tbody>
</table>
| | Value 0: Connection monitoring active
| | Value >0: Connection monitoring active, time in milliseconds
| | Value is automatically set to 0 after a nodeguard error. | | | | |
### 10.3.14 Parameter group "Settings"

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS485.serBaud</td>
<td>22:1 (16:01h)</td>
<td>Baud rate</td>
<td></td>
<td>UINT16</td>
<td>0..38400</td>
<td>- 9600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The following values are permitted:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value 9600: 9600 Baud</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value 19200: 19200 Baud</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value 38400: 38400 Baud</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RS485.serAdr</td>
<td>22:2 (16:02h)</td>
<td>Address</td>
<td></td>
<td>UINT16</td>
<td>1..31</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Permissible values 1...31</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RS485.serFormat</td>
<td>22:3 (16:03h)</td>
<td>Data format</td>
<td></td>
<td>UINT16</td>
<td>0..15</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assignment of bits:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 0: 0 = no parity, 1 = parity on</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 1: 0 = parity even, 1 = parity odd</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 2: 0 = 7 data bits, 1 = 8 data bits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bit 3: 0 = 1 stop bit, 1 = 2 stop bits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Default is 0 = 7-E-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Settings.name1

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings.name1</td>
<td>11:1 (0B:01h)</td>
<td>User device name part 1</td>
<td></td>
<td>UINT32</td>
<td>- 538976288</td>
<td>R/W per.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Default = 538976288 = 20202020h = 4 spaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>User-programmable designation in the form of a text with a length of 8 characters</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Settings.name2

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings.name2</td>
<td>11:2 (0B:02h)</td>
<td>User device name part 2</td>
<td></td>
<td>UINT32</td>
<td>- 538976288</td>
<td>R/W per.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Default = 538976288 = 20202020h = 4 spaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>User-programmable designation in the form of a text with a length of 8 characters</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Settings.i_max

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings.i_max</td>
<td>15:3 (0F:03h)</td>
<td>Maximum current for normal operation</td>
<td></td>
<td>UINT16</td>
<td>0..100</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The current limitation can be set as required by the system. The default value is the maximum current of the parameter Config.I_maxDrv. Unit: [0.1A]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Settings.i_maxBlk

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings.i_maxBlk</td>
<td>15:5 (0F:05h)</td>
<td>Maximum current for reference movement to block</td>
<td></td>
<td>UINT16</td>
<td>0..100</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Current limit for the operating mode Homing with the homing method “Reference movement to block”. Unit: [0.1A]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Settings.p_maxDiff

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings.p_maxDiff</td>
<td>15:7 (0F:07h)</td>
<td>Maximum permissible position deviation of the position controller</td>
<td></td>
<td>UINT16</td>
<td>1..600</td>
<td>Inc</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If, in spite of maximum current, the motor shaft does not move for the time set with this parameter, the monitoring system signals a blocking error. A value of 0 deactivated blocking monitoring.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Settings.T_block

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings.T_block</td>
<td>15:12 (0F:0C7h)</td>
<td>Response time of blocking monitoring</td>
<td></td>
<td>UINT16</td>
<td>0..10000</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If, in spite of maximum current, the motor shaft does not move for the time set with this parameter, the monitoring system signals a blocking error. A value of 0 deactivated blocking monitoring.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Settings.p_win

<table>
<thead>
<tr>
<th>Group.Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings.p_win</td>
<td>15:15 (0F:0Fh)</td>
<td>Standstill window, permissible control deviation</td>
<td></td>
<td>UINT16</td>
<td>0..32767</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See parameter Settings.p_winTime</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10 Parameters

**Group.Name** | **Description** | **Data type** | **Range** | **Unit** | **Default** | **R/W per.**
--- | --- | --- | --- | --- | --- | ---
Settings.p_winTime | Standstill window, time | UINT16 | 0..32767 | | 0 | R/W per.

The control deviation p_dif must be within the position window for this period of time for the movement to be detected as finished. This is signalled by the x_end bit in the status word.

Value 0: Standstill window deactivated

**Group.Name** | **Description** | **Data type** | **Range** | **Unit** | **Default** | **R/W per.**
--- | --- | --- | --- | --- | --- | ---
Settings.WarnOvrun | Response to position overtravel | UINT16 | 0..1 | | 0 | R/W per.

Value 0: Set warning bit in status word
Value 1: Do not set warning bit in status word

**Group.Name** | **Description** | **Data type** | **Range** | **Unit** | **Default** | **R/W per.**
--- | --- | --- | --- | --- | --- | ---
Settings.SignEnabl | Activation of monitoring inputs | UINT16 | 0..15 | | 3 | R/W per.

Bit value 0: Monitoring is not active
Bit value 1: Monitoring is active

Assignment of bits:
Bit 0: LIMP (positive limit switch)
Bit 1: LIMN (negative limit switch)
Bit 2: STOP (STOP switch)
Bit 3: REF (reference switch)

NOTE: Monitoring is only active if the I/O port is configured as the corresponding function (parameter I/O.IO0_def to IO3_def).

**Group.Name** | **Description** | **Data type** | **Range** | **Unit** | **Default** | **R/W per.**
--- | --- | --- | --- | --- | --- | ---
Settings.SignLevel | Signal level for monitoring inputs | UINT16 | 0..15 | | 0 | R/W per.

Used to define whether errors are triggered at 0 or 1 level.

Bit value 0: Response at 0 level
Bit value 1: Response at 1 level

Assignment of bits:
Bit 0: LIMP
Bit 1: LIMN
Bit 2: STOP
Bit 3: REF

**Group.Name** | **Description** | **Data type** | **Range** | **Unit** | **Default** | **R/W per.**
--- | --- | --- | --- | --- | --- | ---
Settings.Flt_pDif | Error response to tracking error | UINT16 | 0..3 | | 3 | R/W per.

Value 1: Error class 1
Value 2: Error class 2
Value 3: Error class 3

10.3.15 Parameter group "Status"

**Group.Name** | **Description** | **Data type** | **Range** | **Unit** | **Default** | **R/W per.**
--- | --- | --- | --- | --- | --- | ---
Status.p_diffPeak | Maximum position deviation reached | UINT32 | 0..2147483647 | | Inc 0 | R/-

The value is updated an ongoing basis.
The parameter value is set to the current position deviation value by writing 0.
### Status.driveStat

**28:2 (1C:02h)**

Status word for the operating state

**LOW-UINT16:**
Assignment of bits:
- Bits 0 ... 3: Current operating state
- Bit 4: reserved
- Bit 5: Error detected by internal monitoring
- Bit 6: Error detected by external monitoring
- Bit 7: Warning active
- Bits 8 ... 11: Reserved
- Bits 12 ... 15: Operating-mode specific coding
  Correlates to the assignment of bits 12 ... 15 in the operating mode-specific acknowledgement data.

**HIGH-UINT16:**
Assignment see parameter `Status.xMode_act`.

### Status.xMode_act

**28:3 (1C:03h)**

Current operating mode with additional information

Assignment of bits:
- Bits 0..3: Current operating mode (see below)
- Bit 4: reserved
- Bit 5: Drive referenced (ref_ok)
- Bits 6 ... 15: Reserved

Values for bits 0 ... 3:
- Value 1: Jog
- Value 2: Homing
- Value 3: Profile Position
- Value 4: Profile Velocity

Other numbers are reserved for future extensions.

### Status.WarnSig

**28:10 (1C:0Ah)**

Warnings
Monitoring signals with error class 0.

Assignment of bits:
- Bit 0: Position overrun profile generator
- Bit 1: Temperature of power stage >100°C
- Bit 5: Pt limitation active
- Bit 9: Position deviation with power stage disabled
The remaining bits are reserved for future extensions.

### Status.Sign_SR

**28:15 (1C:0Fh)**

Stored signal status of external monitoring signals

Bit value 0: not activated
Bit value 1: activated

Assignment of bits:
- Bit 0: LIMP
- Bit 1: LIMN
- Bit 2: STOP
- Bit 3: REF
- Bit 7: SW stop

Stored signal status of released external monitoring signals

### Status.FltSig

**28:17 (1C:11h)**

Active monitoring signals

The error bits remain set as long as the error persists (i.e. as long as the limit value is exceeded).

Assignment as parameter `Status.FltSig_SR`
## 10 Parameters

### Status.FltSig_SR

**Group: Name**

Status.FltSig_SR

**Index: Subindex**

28:18 (1C:12h)

**Description**

Stored monitoring signals

**Data type**

UINT32

**Unit**

- dec.

**Default**

- dec.

**R/W**

R/-

**Bit assignment**

Error bits remain set until a FaultReset is executed.

**Assignment of bits:**

- Bit 0: Undervoltage 1 power supply
- Bit 1: Undervoltage 2 power supply
- Bit 2: Overvoltage power supply
- Bit 5: Motor overload
- Bit 12: Overtemperature power stage (≥105°C)
- Bit 16: Blocking error
- Bit 17: Tracking error
- Bit 18: Encoder inoperative
- Bit 21: Protocol error fieldbus
- Bit 22: Nodeguard error
- Bit 23: Pulse/directing input timing
- Bit 25: STO safety function triggered
- Bit 26: Signals of the STO safety function have different levels
- Bit 28: Hardware error EEPROM
- Bit 29: Start-up error
- Bit 30: Internal system error
- Bit 31: Watchdog

### Status.action_st

**Group: Name**

Status.action_st

**Index: Subindex**

28:19 (1C:13h)

**Description**

Action word

**Data type**

UINT16

**Unit**

- dec.

**Default**

- dec.

**R/W**

R/-

**Bit assignment**

**Assignment of bits:**

- Bit 0: Bit latched error class 0
- Bit 1: Bit latched error class 1
- Bit 2: Bit latched error class 2
- Bit 3: Bit latched error class 3
- Bit 4: Bit latched error class 4
- Bit 5: reserved
- Bit 6: Motor at standstill: actual speed of rotation is zero
- Bit 7: Motor rotates clockwise
- Bit 8: Motor rotates counterclockwise
- Bit 9: reserved
- Bit 10: reserved
- Bit 11: Motor at standstill: reference speed of rotation is 0
- Bit 12: Motor decelerates
- Bit 13: Motor accelerates
- Bit 14: Motor moves at constant speed
- Bit 15: reserved

### Settings.SwLimP

**Group: Name**

Settings.SwLimP

**Index: Subindex**

29:4 (1D:04h)

**Description**

Positive position limit for software limit switch

**Data type**

INT32

**Unit**

Inc

**Default**

0

**R/W**

R/W per.

### Settings.SwLimN

**Group: Name**

Settings.SwLimN

**Index: Subindex**

29:5 (1D:05h)

**Description**

Negative position limit for software limit switch

**Data type**

INT32

**Unit**

Inc

**Default**

0

**R/W**

R/W per.

### Status.SwLimEna

**Group: Name**

Status.SwLimEna

**Index: Subindex**

29:6 (1D:06h)

**Description**

Monitoring of software limit switches

**Data type**

UINT16

**Unit**

0..3

**Default**

0

**R/W**

R/W per.

**Value 0: None**

**Value 1: Enable software limit switch clockwise direction of rotation**

**Value 2: Enable software limit switch counterclockwise direction of rotation**

**Value 3: Enable software limit switches both directions of rotation**

The software limit switches are only available for drives with multturn encoders.
### ILE1B, ILE1F, ILE1R

#### 10 Parameters

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Index:Subindex dec. (hex.)</th>
<th>Description</th>
<th>Bit assignment</th>
<th>Data type range dec.</th>
<th>Unit Default dec.</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status.ModeError 30:11 (1E:0Bh)</td>
<td>Manufacturer-specific error code that caused the ModeError flag to be set. Usually, this is an error that was caused by the activation of an operating mode.</td>
<td>UINT16</td>
<td>-</td>
<td>0</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.v_ref 31:1 (1F:01h)</td>
<td>Reference speed</td>
<td>INT32</td>
<td>Inc/s</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.v_act 31:2 (1F:02h)</td>
<td>Actual speed of motor The speed captured by the encoder.</td>
<td>INT32</td>
<td>Inc/s</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.p_ref 31:5 (1F:05h)</td>
<td>Reference position</td>
<td>INT32</td>
<td>Inc</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.p_act 31:6 (1F:06h)</td>
<td>Actual position of motor The motor position captured by the encoder.</td>
<td>INT32</td>
<td>Inc</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.p_dif 31:7 (1F:07h)</td>
<td>Reference deviation of position controller</td>
<td>INT32</td>
<td>Inc</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.n_ref 31:8 (1F:08h)</td>
<td>Reference speed</td>
<td>INT16</td>
<td>min&lt;sup&gt;-1&lt;/sup&gt;</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.n_act 31:9 (1F:09h)</td>
<td>Actual speed of motor Corresponds to parameter Status.v_act, but converted to revolutions per minute.</td>
<td>INT16</td>
<td>min&lt;sup&gt;-1&lt;/sup&gt;</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.l_act 31:12 (1F:0Ch)</td>
<td>Current motor current Unit: [0.1A]</td>
<td>INT16</td>
<td>A</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.UDC_act 31:20 (1F:14h)</td>
<td>Voltage power supply Unit [0.1V]</td>
<td>UINT16</td>
<td>V</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.TPA_act 31:25 (1F:19h)</td>
<td>Power stage temperature</td>
<td>UINT16</td>
<td>20..110°C</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.v_pref 31:28 (1F:1Ch)</td>
<td>Speed of reference position Status.p_ref</td>
<td>INT32</td>
<td>Inc/s</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.p_target 31:30 (1F:1Eh)</td>
<td>Target position of profile generator Absolute position value of the profile generator, calculated on the basis of the relative and absolute position values specified.</td>
<td>INT32</td>
<td>Inc</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.p_profile 31:31 (1F:20h)</td>
<td>Actual position of profile generator Corresponds to the reference position Status.p_ref.</td>
<td>INT32</td>
<td>Inc</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.n_profile 31:35 (1F:23h)</td>
<td>Actual speed of profile generator Corresponds to parameter Status.n_pref.</td>
<td>INT16</td>
<td>min&lt;sup&gt;-1&lt;/sup&gt;</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.n_target 31:38 (1F:26h)</td>
<td>Target speed of profile generator</td>
<td>INT16</td>
<td>min&lt;sup&gt;-1&lt;/sup&gt;</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
<tr>
<td>Status.n_pref 31:45 (1F:2Dh)</td>
<td>Speed of rotation of reference position Status.p_ref Corresponds to parameter Status.v_pref, but converted to revolutions per minute.</td>
<td>INT16</td>
<td>min&lt;sup&gt;-1&lt;/sup&gt;</td>
<td>-</td>
<td>R/-</td>
<td></td>
</tr>
</tbody>
</table>

Lexium Integrated Drive
## 10 Parameters

**ILE1B, ILE1F, ILE1R**

### Status.StopFault

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>32:7 (20:07h)</td>
<td>Cause of last interruption, error number</td>
<td>UINT16</td>
<td></td>
<td>0</td>
<td>R/-</td>
</tr>
</tbody>
</table>

### 10.3.16 Parameter group "VEL"

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Data type</th>
<th>Unit</th>
<th>Default</th>
<th>R/W per.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VEL.velocity</td>
<td>Start with target speed</td>
<td>INT16</td>
<td>min(^{-1})</td>
<td>-</td>
<td>R/W</td>
</tr>
<tr>
<td></td>
<td>Action object: write access triggers a movement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The minimum speed of rotation is 300 min(^{-1}).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VEL.stateVEL</td>
<td>Acknowledgement: Profile Velocity</td>
<td>UINT16</td>
<td></td>
<td>-</td>
<td>R/-</td>
</tr>
</tbody>
</table>

Assignment of bits:

- Bit 0: Error LIMP
- Bit 1: Error LIMN
- Bit 2: Error STOP
- Bit 3: Error REF
- Bit 7: SW_STOP
- Bit 13: Target speed reached
- Bit 14: vel_end
- Bit 15: vel_err
11 Accessories and spare parts

11.1 Accessories

Source commissioning software

The latest version of the commissioning software is available for download from the internet:

http://www.schneider-electric.com

Source EPLAN Macros

For easier engineering, macro files and product master data are available for download from the Internet at:

http://www.schneider-electric.com

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Braking Resistor Controller UBC60</td>
<td>ACC3EA001</td>
</tr>
<tr>
<td>Installation kit</td>
<td>VW3L10111</td>
</tr>
<tr>
<td>Insert with cable entry (2 pcs)</td>
<td>VW3L10100N2</td>
</tr>
<tr>
<td>Insert with cable entry (10 pcs)</td>
<td>VW3L10100N10</td>
</tr>
<tr>
<td>Cable entry for commissioning</td>
<td>VW3L10222</td>
</tr>
<tr>
<td>Insert for sealing (10 pcs)</td>
<td>VW3L10000N10</td>
</tr>
<tr>
<td>Insert for sealing (20 pcs)</td>
<td>VW3L10000N20</td>
</tr>
<tr>
<td>Insert for sealing (50 pcs)</td>
<td>VW3L10000N50</td>
</tr>
<tr>
<td>Cable for commissioning interface, 3m</td>
<td>VW3L1R000R30</td>
</tr>
<tr>
<td>Insert kit for commissioning</td>
<td>VW3L1R000</td>
</tr>
<tr>
<td>Cable kit, power supply, CANopen, 3m</td>
<td>VW3L2F001R30</td>
</tr>
<tr>
<td>Cable kit, power supply, RS485, 3m</td>
<td>VW3L2R001R30</td>
</tr>
<tr>
<td>Cable kit, power supply, PROFIBUS DP, 3m</td>
<td>VW3L2B001R30</td>
</tr>
<tr>
<td>Cable kit, STO, 3m</td>
<td>VW3L20010R30</td>
</tr>
<tr>
<td>Cable kit, STO, 5m</td>
<td>VW3L20010R50</td>
</tr>
<tr>
<td>Cable kit, STO, 10m</td>
<td>VW3L20010R100</td>
</tr>
<tr>
<td>Cable kit, STO, 15m</td>
<td>VW3L20010R150</td>
</tr>
<tr>
<td>Cable kit, STO, 20m</td>
<td>VW3L20010R200</td>
</tr>
<tr>
<td>Cable, power supply, 3m</td>
<td>VW3L30001R30</td>
</tr>
<tr>
<td>Cable, power supply, 5m</td>
<td>VW3L30001R50</td>
</tr>
<tr>
<td>Cable, power supply, 10m</td>
<td>VW3L30001R100</td>
</tr>
<tr>
<td>Cable, power supply, 15m</td>
<td>VW3L30001R150</td>
</tr>
<tr>
<td>Cable, power supply, 20m</td>
<td>VW3L30001R200</td>
</tr>
<tr>
<td>Cable, STO, 3m</td>
<td>VW3L30010R30</td>
</tr>
<tr>
<td>Cable, STO, 5m</td>
<td>VW3L30010R50</td>
</tr>
<tr>
<td>Cable, STO, 10m</td>
<td>VW3L30010R100</td>
</tr>
<tr>
<td>Cable, STO, 15m</td>
<td>VW3L30010R150</td>
</tr>
<tr>
<td>Cable, STO, 20m</td>
<td>VW3L30010R200</td>
</tr>
<tr>
<td>Connector kit, PROFIBUS DP (2 pcs)</td>
<td>VW3L5B000</td>
</tr>
<tr>
<td>Connector kit, CANopen/RS485 (2 pcs)</td>
<td>VW3L5F000</td>
</tr>
</tbody>
</table>
### Cable

Supplier recommendations:
- Profibus cable, both ends pre-assembled, 5 poles, B-coded
  Male M12 to female M12
  Vendor: Lumberg, www.lumberg.de
  Order no.: 0975 254 101 / ... M
- Profibus cable, both ends pre-assembled, 5 poles, B-coded
  Female M12 to SubD connector 9 poles with activatable terminating resistor
  Vendor: Lumberg, www.lumberg.de
  Order no.: 0975 254 104 / ... M
- Profibus cable, both ends pre-assembled, 5 poles, B-coded
  Male M12 to SubD connector 9 poles with activatable terminating resistor
  Vendor: Lumberg, www.lumberg.de
  Order no.: 0975 254 105 / ... M

### Tool

The tools required for cable assembly must be ordered directly from the manufacturer.
- Crimping tool for CN1: AMP 654174-1
- Crimping tool for CN2, CN4 and CN5: Molex 69008-0982
- Crimping tool for CN3: Molex 69008-0724
- Extraction tool for CN2, CN4 and CN5: Molex 11-03-0043
- Extraction tool for CN3: Molex 11-03-0044

### Converter

An RS232/USB to RS485 converter is required for service and to upgrade the operating system.
- NuDAM converter RS232-RS485: Acceed ND-6520
- NuDAM converter USB-RS485: Acceed ND-6530

---

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector kit, 2 x I/O</td>
<td>VW3L40210</td>
</tr>
<tr>
<td>Connector kit, 3 x I/O</td>
<td>VW3L40020</td>
</tr>
<tr>
<td>Connector, STO output</td>
<td>VW3L50010</td>
</tr>
<tr>
<td>Insert kit, 3 x I/O</td>
<td>VW3L40300</td>
</tr>
<tr>
<td>Insert kit, 2 x I/O, 1 x STO input</td>
<td>VW3L40300</td>
</tr>
<tr>
<td>Insert kit, 1 x STO input, 1 x STO output</td>
<td>VW3L40020</td>
</tr>
<tr>
<td>Insert kit, 4 x I/O, 1 x STO input, 1 x STO output</td>
<td>VW3L40420</td>
</tr>
</tbody>
</table>
## 11.2 Gearboxes

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planetary gear for Lexium Integrated Drive ILExx661, ratio 3/1</td>
<td>GBX040003E661L</td>
</tr>
<tr>
<td>Planetary gear for Lexium Integrated Drive ILExx661, ratio 5/1</td>
<td>GBX040005E661L</td>
</tr>
<tr>
<td>Planetary gear for Lexium Integrated Drive ILExx661, ratio 8/1</td>
<td>GBX040008E661L</td>
</tr>
<tr>
<td>Planetary gear for Lexium Integrated Drive ILExx661, ratio 16/1</td>
<td>GBX060016E661L</td>
</tr>
<tr>
<td>Planetary gear for Lexium Integrated Drive ILExx661, ratio 40/1</td>
<td>GBX060040E661L</td>
</tr>
<tr>
<td>Planetary gear for Lexium Integrated Drive ILExx662, ratio 3/1</td>
<td>GBX040003E662L</td>
</tr>
<tr>
<td>Planetary gear for Lexium Integrated Drive ILExx662, ratio 5/1</td>
<td>GBX040005E662L</td>
</tr>
<tr>
<td>Planetary gear for Lexium Integrated Drive ILExx662, ratio 8/1</td>
<td>GBX040008E662L</td>
</tr>
<tr>
<td>Planetary gear for Lexium Integrated Drive ILExx662, ratio 16/1</td>
<td>GBX060016E662L</td>
</tr>
<tr>
<td>Planetary gear for Lexium Integrated Drive ILExx662, ratio 40/1</td>
<td>GBX060040E662L</td>
</tr>
</tbody>
</table>
12 Service, maintenance and disposal

⚠️ CAUTION

DAMAGE TO SYSTEM COMPONENTS AND LOSS OF CONTROL
Interruptions of the negative connection of the controller supply voltage can cause excessively high voltages at the signal connections.

- Do not interrupt the negative connection between the power supply unit and load with a fuse or switch.
- Verify correct connection before switching on.
- Do not connect the controller supply voltage or change its wiring while the is supply voltage present.

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

⚠️ CAUTION

RISK OF INJURY WHEN REMOVING CIRCUIT BOARD PLUGS
- When removing them note that the connectors must be unlocked.
  - Supply voltage $V_{DC}$:
    Unlock by pulling at the plug housing
  - Miscellaneous:
    Unlock by pressing the locking lever
- Always hold the plug to remove it (not the cable).

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

The product may only be repaired by a certified customer service center. No warranty or liability is accepted for repairs made by unauthorized persons.
12 Service, maintenance and disposal

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 (such as 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, depending on the way you use it.

12.2.1 Lifetime STO safety function

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.

- 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 device is shown in the format DD.MM.YY, e.g. 31.12.07. (December 31, 2007). This means: Do not use the safety function after December 31, 2027.
12.3 Replacing units

⚠️ WARNING

**UNINTENDED BEHAVIOR**

The behavior of the drive system is governed by numerous stored data or settings. Unsuitable settings or data may trigger unexpected movements or responses to signals and disable monitoring functions.

- Do NOT operate the drive system with unknown settings or data.
- Verify that the stored data and settings are correct.
- When commissioning, carefully run tests for all operating states and potential fault 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 hazardous area.

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

Observe the following procedure when replacing devices.

- Save all parameter settings to your PC using the commissioning software, see chapter 7.3 "Lexium CT commissioning software".
- 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 6 "Installation"
- Commission the product as per chapter 7 "Commissioning".

12.4 Shipping, storage, disposal

**Removal**

Removal procedure:

- Switch off the power supply.
- Disconnect the power supply.
- Pull out all plugs.
- Remove the product from the system.

**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 for room temperature and humidity are met. Protect the product from dust and dirt.

**Disposal**

The product consists of various materials that can be recycled and must be disposed of separately. Dispose of the product in accordance with local regulations.
13 Glossary

13.1 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]

\[
5 \text{ m} / 0.9144 = 5.468 \text{ yd}
\]

13.1.1 Length

<table>
<thead>
<tr>
<th>in</th>
<th>ft</th>
<th>yd</th>
<th>m</th>
<th>cm</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>-</td>
<td>/ 12</td>
<td>/ 36</td>
<td>* 0.0254</td>
<td>* 2.54</td>
</tr>
<tr>
<td>ft</td>
<td>* 12</td>
<td>-</td>
<td>/ 3</td>
<td>* 0.30479</td>
<td>* 30.479</td>
</tr>
<tr>
<td>yd</td>
<td>* 36</td>
<td>* 3</td>
<td>-</td>
<td>* 0.9144</td>
<td>* 91.44</td>
</tr>
<tr>
<td>m</td>
<td>/ 0.0254</td>
<td>/ 0.30479</td>
<td>/ 0.9144</td>
<td>-</td>
<td>* 100</td>
</tr>
<tr>
<td>cm</td>
<td>/ 2.54</td>
<td>/ 30.479</td>
<td>/ 91.44</td>
<td>/ 100</td>
<td>-</td>
</tr>
<tr>
<td>mm</td>
<td>/ 25.4</td>
<td>/ 304.79</td>
<td>/ 914.4</td>
<td>/ 1000</td>
<td>/ 10</td>
</tr>
</tbody>
</table>

13.1.2 Mass

<table>
<thead>
<tr>
<th>lb</th>
<th>oz</th>
<th>slug</th>
<th>kg</th>
<th>g</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb</td>
<td>-</td>
<td>* 16</td>
<td>* 0.03108095</td>
<td>* 0.4535924</td>
</tr>
<tr>
<td>oz</td>
<td>/ 16</td>
<td>-</td>
<td>* 1.942559*10^-3</td>
<td>* 0.02834952</td>
</tr>
<tr>
<td>slug</td>
<td>/ 0.03108095</td>
<td>/ 1.942559*10^-3</td>
<td>-</td>
<td>* 14.5939</td>
</tr>
<tr>
<td>kg</td>
<td>/ 0.453592370</td>
<td>/ 0.02834952</td>
<td>/ 14.5939</td>
<td>-</td>
</tr>
<tr>
<td>g</td>
<td>/ 453.592370</td>
<td>/ 28.34952</td>
<td>/ 14593.9</td>
<td>/ 1000</td>
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</table>

13.1.3 Force

<table>
<thead>
<tr>
<th>lb</th>
<th>oz</th>
<th>p</th>
<th>dyne</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb</td>
<td>-</td>
<td>* 16</td>
<td>* 453.55358</td>
<td>* 444822.2</td>
</tr>
<tr>
<td>oz</td>
<td>/ 16</td>
<td>-</td>
<td>* 28.349524</td>
<td>* 27801</td>
</tr>
<tr>
<td>p</td>
<td>/ 453.55358</td>
<td>/ 28.349524</td>
<td>-</td>
<td>* 980.7</td>
</tr>
<tr>
<td>dyne</td>
<td>/ 444822.2</td>
<td>/ 27801</td>
<td>/ 980.7</td>
<td>-</td>
</tr>
<tr>
<td>N</td>
<td>/ 4.448222</td>
<td>/ 0.27801</td>
<td>/ 9.807*10^-3</td>
<td>* 100*10^3</td>
</tr>
</tbody>
</table>

13.1.4 Power

<table>
<thead>
<tr>
<th>HP</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP</td>
<td>-</td>
</tr>
<tr>
<td>W</td>
<td>/ 745.72218</td>
</tr>
</tbody>
</table>
## 13.1.5 Rotation

<table>
<thead>
<tr>
<th>min⁻¹ (RPM)</th>
<th>rad/s</th>
<th>deg./s</th>
</tr>
</thead>
<tbody>
<tr>
<td>min⁻¹ (RPM)</td>
<td>* π / 30</td>
<td>* 6</td>
</tr>
<tr>
<td>rad/s</td>
<td>30 / π</td>
<td>57.295</td>
</tr>
<tr>
<td>deg./s</td>
<td>6</td>
<td>57.295</td>
</tr>
</tbody>
</table>

## 13.1.6 Torque

<table>
<thead>
<tr>
<th>lb·in</th>
<th>lb·ft</th>
<th>oz·in</th>
<th>Nm</th>
<th>kp·m</th>
<th>kp·cm</th>
<th>dyne·cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb·in</td>
<td>-</td>
<td></td>
<td>* 16</td>
<td>* 0.112985</td>
<td>* 0.011521</td>
<td>* 1.1521</td>
</tr>
<tr>
<td>lb·ft</td>
<td>* 12</td>
<td>* 192</td>
<td>* 1.355822</td>
<td>* 0.138255</td>
<td>* 13.8255</td>
<td>* 13.558*10⁶</td>
</tr>
<tr>
<td>oz·in</td>
<td>/ 16</td>
<td>/ 192</td>
<td>-</td>
<td>* 7.0616*10⁻³</td>
<td>* 720.07*10⁻⁶</td>
<td>* 72.007*10⁻³</td>
</tr>
<tr>
<td>Nm</td>
<td>/ 0.112985</td>
<td>/ 1.355822</td>
<td>/ 7.0616*10⁻³</td>
<td>-</td>
<td>* 0.101972</td>
<td>* 10.1972</td>
</tr>
<tr>
<td>kp·m</td>
<td>/ 0.011521</td>
<td>/ 0.138255</td>
<td>/ 720.07*10⁻⁶</td>
<td>/ 0.101972</td>
<td>-</td>
<td>* 100</td>
</tr>
<tr>
<td>kp·cm</td>
<td>/ 1.1521</td>
<td>/ 13.8255</td>
<td>/ 72.007*10⁻³</td>
<td>/ 10.1972</td>
<td>/ 100</td>
<td>-</td>
</tr>
<tr>
<td>dyne·cm</td>
<td>/ 1.129*10⁶</td>
<td>/ 13.558*10⁶</td>
<td>/ 70615.5</td>
<td>/ 10*10⁶</td>
<td>/ 98.066*10⁶</td>
<td>/ 0.9806*10⁶</td>
</tr>
</tbody>
</table>

## 13.1.7 Moment of Inertia

<table>
<thead>
<tr>
<th>lb·in²</th>
<th>lb·ft²</th>
<th>kg·m²</th>
<th>kg·cm²</th>
<th>kp·cm·s²</th>
<th>oz·in²</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb·in²</td>
<td>-</td>
<td>/ 144</td>
<td>/ 3417.16</td>
<td>/ 0.341716</td>
<td>/ 335.109</td>
</tr>
<tr>
<td>lb·ft²</td>
<td>* 144</td>
<td>-</td>
<td>* 0.04214</td>
<td>* 421.4</td>
<td>* 0.429711</td>
</tr>
<tr>
<td>kg·m²</td>
<td>* 3417.16</td>
<td>-</td>
<td>* 10*10³</td>
<td>* 10.1972</td>
<td>* 54674</td>
</tr>
<tr>
<td>kg·cm²</td>
<td>* 0.341716</td>
<td>/ 421.4</td>
<td>-</td>
<td>/ 980.665</td>
<td>5.46</td>
</tr>
<tr>
<td>kp·cm·s²</td>
<td>* 335.109</td>
<td>/ 0.429711</td>
<td>/ 10.1972</td>
<td>/ 980.665</td>
<td>-</td>
</tr>
<tr>
<td>oz·in²</td>
<td>/ 16</td>
<td>/ 2304</td>
<td>/ 54674</td>
<td>/ 5.46</td>
<td>/ 5361.74</td>
</tr>
</tbody>
</table>

## 13.1.8 Temperature

<table>
<thead>
<tr>
<th>°F</th>
<th>°C</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>(°F - 32) * 5/9</td>
<td>(°F - 32) * 5/9 + 273.15</td>
</tr>
<tr>
<td>°C</td>
<td>°C * 9/5 + 32</td>
<td>-</td>
</tr>
<tr>
<td>K</td>
<td>(K - 273.15) * 9/5 + 32</td>
<td>K - 273.15</td>
</tr>
</tbody>
</table>

## 13.1.9 Conductor cross section

<table>
<thead>
<tr>
<th>AWG</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm²</td>
<td>42.4</td>
<td>33.6</td>
<td>26.7</td>
<td>21.2</td>
<td>16.8</td>
<td>13.3</td>
<td>10.5</td>
<td>8.4</td>
<td>6.6</td>
<td>5.3</td>
<td>4.2</td>
<td>3.3</td>
<td>2.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AWG</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm²</td>
<td>2.1</td>
<td>1.7</td>
<td>1.3</td>
<td>1.0</td>
<td>0.82</td>
<td>0.65</td>
<td>0.52</td>
<td>0.41</td>
<td>0.33</td>
<td>0.26</td>
<td>0.20</td>
<td>0.16</td>
<td>0.13</td>
</tr>
</tbody>
</table>
## 13.2 Terms and Abbreviations

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AC</strong></td>
<td>Alternating current</td>
</tr>
<tr>
<td><strong>ASCII</strong></td>
<td>American Standard Code for Information Interchange. Standard for coding of characters</td>
</tr>
<tr>
<td><strong>Blocking detection</strong></td>
<td>Blocking detection monitors the max. current, the time and the rotation of the motor shaft. If, in spite of maximum current, the motor shaft does not move for a parameterized time, the monitoring system signals a blocking error.</td>
</tr>
<tr>
<td><strong>CAN</strong></td>
<td>(Controller Area Network), standardized open fieldbus as per ISO 11898, allows drives and other devices from different manufacturers to communicate.</td>
</tr>
<tr>
<td><strong>DC</strong></td>
<td>Direct current</td>
</tr>
<tr>
<td><strong>Default value</strong></td>
<td>Factory setting.</td>
</tr>
<tr>
<td><strong>Direction of rotation</strong></td>
<td>Rotation of the motor shaft in a clockwise or counterclockwise direction of rotation. Clockwise rotation is when the motor shaft rotates clockwise as you look at the end of the protruding motor shaft.</td>
</tr>
<tr>
<td><strong>DOM</strong></td>
<td>The Date of manufacturing on the nameplate of the device is shown in the format DD.MM.YY, e.g. 31.12.06 (December 31, 2006).</td>
</tr>
<tr>
<td><strong>EMC</strong></td>
<td>Electromagnetic compatibility</td>
</tr>
<tr>
<td><strong>Encoder</strong></td>
<td>Sensor for detection of the angular position of a rotating component. The motor encoder shows the angular position of the rotor.</td>
</tr>
<tr>
<td><strong>Error class</strong></td>
<td>Classification of errors into groups. The different error classes allow for specific responses to faults, e.g. by severity.</td>
</tr>
<tr>
<td><strong>Fatal error</strong></td>
<td>In the case of fatal error, the drive is not longer able to control the motor, so that an immediate switch-off of the drive is necessary.</td>
</tr>
<tr>
<td><strong>Fault</strong></td>
<td>Operating state of the drive caused as a result of a discrepancy between a detected (computed, measured or signaled) value or condition and the specified or theoretically correct value or condition.</td>
</tr>
<tr>
<td><strong>Fault reset</strong></td>
<td>A function used to restore the drive to an operational state after a detected fault is cleared by removing the cause of the fault so that the fault is no longer active (transition from state &quot;Fault&quot; to state &quot;Operation Enable&quot;).</td>
</tr>
<tr>
<td><strong>Forcing</strong></td>
<td>Forcing switching states of inputs/outputs. Forcing switching states of inputs/outputs.</td>
</tr>
<tr>
<td><strong>I/O</strong></td>
<td>Inputs/outputs</td>
</tr>
<tr>
<td><strong>$\dot{I}t$ monitoring</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Inc</strong></td>
<td>Increments</td>
</tr>
<tr>
<td><strong>Index pulse</strong></td>
<td>Signal of an encoder to reference the rotor position in the motor. The encoder returns one index pulse per revolution.</td>
</tr>
<tr>
<td><strong>Limit switch</strong></td>
<td>Switch that signals overtravel of the permissible range of travel.</td>
</tr>
</tbody>
</table>
Node guarding: Monitoring of the connection with the slave at an interface for cyclic data traffic.

Parameter: Device data and values that can be set by the user.

Parameter switch: Small switches adjacent to each other.

Persistent: Indicates whether the value of the parameter remains in the memory after the device is switched off.

PLC: Programmable logic controller.

Profibus: Standardized open fieldbus as per EN 50254-2 which allows drives and other devices from different manufacturers to communicate.

Power stage: The power stage controls the motor. The power stage generates currents for controlling the motor on the basis of the positioning signals from the controller.

PWM: Pulse width modulation.

Quick Stop: Function used to enable fast deceleration of the motor via a command or in the event of a malfunction.

RS485: Fieldbus interface as per EIA-485 which enables serial data transmission with multiple devices.

Torque ramp: Deceleration of the motor with the maximum possible deceleration, which is only limited by the maximum permissible current. The higher the permissible braking current, the stronger the deceleration. Because energy is recovered up depending on the coupled load, the voltage may increase to excessively high values. In this case the maximum permissible current must be reduced.

Warning: If not used within the context of safety instructions, a warning alerts to a potential problem detected by a monitoring function. A warning is not a fault and does not cause a transition of the operating state. Warnings belong to error class 0.

Watchdog: Unit that monitors cyclic basic functions in the product. Power stage and outputs are switched off in the event of faults.

Zero voltage window: Voltage range that is interpreted as 0 V.
Index

Numerics
24V signal interface
   Cable specifications and terminal 69
   Connecting 69
   Function 69
   Setting functions 78
   starting 78
   testing function of limit switches 80
24V signals
   testing 79

A
Abbreviations 165
Accessories and spare parts 155
Address and baud rate
   Fieldbus interface CAN 64
   Fieldbus interface Profibus 61
   Fieldbus interface RS485 66
Air humidity 25
Ambient conditions 25
   Air humidity operation 25
   Operation 25
   Relative air humidity operation 25
   Transportation and storage 25
Axis signals
   Moving away from switch 90
   REF 90
   STOP 91
Axis signals, monitoring signals 90

B
Before you begin
   Safety information 19

C
Cable specifications
   Protected cable installation 42
Cable specifications and terminal
   24V signal interface 69
   Fieldbus interface CAN 63
   Fieldbus interface PPROFIBUS DP 59
   Fieldbus interface RS485 66
   Safety function STO 71
   Supply voltage 57
Cables, assembling 52
CAN 139
Category 0 stop 40
Category 1 stop 40
Causes of errors 130
Certifications 25
Classical jog 103
Commands 139
Commissioning 75
  24V signal interface 78
  checking safety functions 82
  Optimizing motion behavior 84
  preparation 76
  running 77
  testing function of limit switches 80
  testing positioning mode 83
  Torque characteristic 85
Commissioning software 86, 155
  Online help 86
Commissioning software Lexium CT 86
Components and interfaces 10
Config 140
Control 141

D
Declaration of conformity 16
Definition
  STO 40
Definition of direction of rotation 115
Diagnostics 123
dimensional drawing, see dimensions
Dimensions 29
Direction of rotation, definition of 115
Disposal 159, 161
Documentation and literature references 15

E
Electrical installation 49
EMC 46
EPLAN Macros 15, 155
Equipotential bonding conductors 39, 47
ErrMem0 142
Error class 129
Error classes 129
Error indication 123
Error memory 124
Error numbers 133
Error response 129
  Meaning 129
External axis signals 90
External power supply unit 37

F
Fault reset 129
Fieldbus interface CAN
  Address and baud rate 64
  Cable specifications and terminal 63
  Connection 63
  Function 63
Fieldbus interface Profibus
  Address and baud rate 61
Terminating resistor 60, 63, 66
Fieldbus interface PROFIBUS DP
  Cable specifications and terminal 59
  Connection 59
  function 59
Fieldbus interface RS485
  Address and baud rate 66
  Cable specifications and terminal 66
  Function 66
Function
  Fieldbus interface CAN 63
  Fieldbus interface RS485 66
  PROFIBUS DP fieldbus interface 59
Functional safety 22, 35
Functions 115
  Definition of direction of rotation 115
  Programmable inputs/outputs 118
  Quick Stop 116
  standstill window 122
  travel profile 115
Functions of the commissioning software 86

G
Glossary 163

H
Hazard categories 20
Homing 108, 142
   Position setting 114
Humidity 25

I
I/O 144
Installation
   electrical 49
   mechanical 47
Installation, electrical
   Assembling cables 52
   Connecting 24V signal interface 69
   Connecting CAN fieldbus interface 63
   Connecting supply voltage 56
   Fieldbus interface PROFIBUS DP, connection 59
Intended use 19
Introduction 9

J
Jog 101

L
Lexium CT commissioning software 86
Limit switches
   testing function 80
M
Macros EPLAN  15, 155
Maintenance  159
Manual  145
manuals  15
Max. humidity operation  25
Mechanical installation  47
Monitoring functions  44
Monitoring signals, external  90
   Axis signals
      REF  90
      STOP  91
Moving away from switch  90
Monitoring signals, internal  93
   read  93
Motion  139, 145
Motion behavior optimization  84
Motor
   Optimizing motion behavior  84
   Ramp slope  84
   Torque characteristic  85
Mounting position  28
Moving away from limit switch range  103
Moving away from switch  90

N
Name plate  13

O
Operating mode
   Change  100
   Homing  108
   homing  108
   jog  101
   profile position  105
   profile velocity  104
Operating modes  100
Operating state
   Read  96
Operating States  96
Operation  89
Operation ambient temperature  25
Optimizing the motor behavior  84

P
Parameter
   Representation  137
Parameter group
   CAN  139
   Commands  139
   Config  140
   Control  141
   ErrMem0  142
   Homing  142
ILE1B, ILE1F, ILE1R
14 Index

I/O 144
Manual 145
Motion 145
motion 139
Profibus 146
ProgIO0 147
PTP 148
RS485 148
Settings 149
Status 150
VEL 154

Parameter values, default 89
Parameters 137
overview 138
Position setting 114
Positioning limits 92
Positioning range 92
Positioning resolution 92
product manuals 15
Profibus 146
Profile generator 115
Profile position 105
Profile velocity 104
ProgIO0 147
Programmable inputs/outputs 118
Protected cable installation 42
PTP 148

Q
Qualification of personnel 19
Quick Stop 116

R
Ramp slope 84
REF 90
Reference movement
To limit switch 111
Relative air humidity 25
Reset error message 129
RS485 148

S
Safe Torque Off 40
Definition 40
Safety disconnect moment 40
Safety function 40
Application examples 43
Category 0 stop 40
Category 1 stop 40
Definition 40
Definitions 40
Requirements 41
Safety function STO
Cable specifications and terminal 71
Service 159
Service address 160
Settings 149
  Operating-mode-independent 101
Shipping 161
Software stop 91
software STOP 91
Source
  Commissioning software 86, 155
  EPLAN Macros 15, 155
  product manuals 15
Standstill window 122
State transitions 96
Status 150
Status information
  Operating-mode-specific 98
  Other 99
STO 40
  Application examples 43
  Definitions 40
  Requirements 41
STOP 91
Storage 161
Supply voltage
  Cable specifications and terminal 57
  Connecting 56
System requirements 86

T
Technical data 25
Temperature during operation 25
Terminating resistor
  Fieldbus interface Profibus 60, 63, 66
Terms 165
Testing
  positioning mode 83
Testing positioning mode 83
Testing safety functions 82
Travel profile 115
Troubleshooting 123, 130
Type code 14

U
Unit overview 9
Units and conversion tables 163

V
VEL 154