Lexium 26D and BCH2 Servo Drive System
User Guide

Original instructions

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Schneider Electric

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As standards, specifications, and designs change from time to time, information contained in this guide may be subject to change without notice.

Table of Contents

Safety Information

Important Information

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

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

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

Please Note

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

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

QUALIFICATION OF PERSONNEL

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

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

INTENDED USE

The products described or affected by this document are, along with software, accessories and options, servo drive systems for servo motors and intended for industrial use according to the instructions, directions, examples and safety information contained in the present document and other supporting documentation.

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

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

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

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

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

About the Book

Document Scope

This document describes the functions of the Servo Drive LXM26D and the BCH2 motor.

Validity Note

This document has been updated with the firmware release of the Lexium 26D V1.78.

The technical characteristics of the devices described in the present document also appear online. To access the information online, go to the Schneider Electric home page www.se.com/ww/en/download/.

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

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

Related Documents

Use your tablet or your PC to quickly access detailed and comprehensive information on all our products on www.se.com.

The internet site provides the information you need for products and solutions:

- The whole catalog for detailed characteristics and selection guides,
- The CAD files to help design your installation,
- All software and firmware to maintain your installation up to date,
- And finally all the User Guides related to your drive, listed below:

Title of documentation	Reference number
Lexium 26D and BCH2 Servo Drive System - User Guide (This document)	EIO0000002299 (English)
Lexium 26D DTM Commissioning software - User Guide	EIO0000002311 (English)
HBC Holding Brake Controller -Product Manual	0198441113316 (English)
Multi-loader - User Manual	BBV48778 (English)
	BBV48777 (French)

You can download these technical publications, the present document and other technical information from our website www.se.com/en/download/.

Product Related Information

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

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

You must also consider any applicable standards and/or regulations with respect to grounding of all equipment. Verify compliance with any safety information,

different electrical requirements, and normative standards that apply to your machine or process in the use of this equipment.

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

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

⚠ DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

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

⚠ DANGER

POTENTIAL FOR EXPLOSION

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

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

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

> # ⚠**WARNING**
>
> **UNINTENDED MOVEMENT OR MACHINE OPERATION**
>
> - Carefully install the wiring in accordance with the EMC requirements.
> - Do not operate the product with undetermined settings and data.
> - Perform comprehensive commissioning tests that include verification of configuration settings and data that determine position and movement.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

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

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

Terminology Derived from Standards

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

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

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2015	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Standard	Description
ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
IEC 62061:2015	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2016	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

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

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

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

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

Servo Drive System Planning

What's in This Part

General Overview

Servo Drive Device Overview

Presentation

The servo drive system includes:

• the drive, page 23 and the motor, page 37:

• the accessories and spare parts, page 63:

Item	Description
1	Commissioning tools, page 63
2	Connectors and adapters, page 63
3	External mains filters, page 64
4	Not used
5	Application nameplate, page 64
6	Not used
7	Motor cables, page 64
8	Encoder cables, page 64
9	Signal cables, page 65
10	Not used
11	External braking resistors, page 65
12	Circuit breakers, page 66
13	Motor protection switches and power contractors, page 66

Drive / Motor References

Introduction

The present user guide provides information about the following Drives and Motors reference tables.

The Lexium 26D range is defined by AC-servo drives Lexium 26D for combination with AC-servo motors BCH2.

- The combinations of servo motors with servo drives are based on the power class: both servo motor and servo drive must have the same power class.
- The bundle of a servo drive with its related servo motor is designed to cover a nominal power from:
  - 0.05 kW up to 4.5 kW (0.067 up to 6.03 hp) with 200…240 V mains supply voltage.

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table, page 17.

Lexium 26D Drive References List

Drive references	Nominal power	Supply mains
LXM26DUA5M3X	50 W	single phase or 3-phase, 230 Vac
LXM26DU01M3X	100 W	single phase or 3-phase, 230 Vac
LXM26DU02M3X	200 W	single phase or 3-phase, 230 Vac
LXM26DU04M3X	400 W	single phase or 3-phase, 230 Vac
LXM26DU07M3X	750 W	single phase or 3-phase, 230 Vac
LXM26DU10M3X	1000 W	single phase or 3-phase, 230 Vac
LXM26DU15M3X	1500 W	single phase or 3-phase, 230 Vac
LXM26DU20M3X	2000 W	3-phase, 230 Vac
LXM26DU30M3X	3000 W	3-phase, 230 Vac
LXM26DU45M3X	4500 W	3-phase, 230 Vac

For further information, refer to the .

BCH2 Motor References List

Motor references	Nominal power
BCH2MBA53•••5C	50 W
BCH2MB013•••5C	100 W
BCH2LD023•••5C	200 W
BCH2MM031•••6C	300 W
BCH2LD043•••5C	400 W
BCH2LF043•••5C	400 W
BCH2MM052•••6C	500 W
BCH2MM061•••6C	600 W
BCH2HF073•••5C	750 W
BCH2LF073•••5C	750 W
BCH2MM081•••6C	850 W
BCH2MM091•••6C	900 W
BCH2MM102•••6C	1000 W
BCH2HM102•••6C	1000 W
BCH2LH103•••6C	1000 W
BCH2MM152•••6C	1500 W
BCH2MM202•••6C	2000 W
BCH2HM202•••6C	2000 W
BCH2MR202•••6C	2000 W
BCH2HR202•••6C	2000 W
BCH2LH203•••6C	2000 W
BCH2MR301•••6C	3000 W
BCH2MR302•••6C	3000 W
BCH2MR352•••6C	3500 W
BCH2MR451•••6C	4500 W

For further information, refer to .

Drive / Motor Combinations

The permissible Drive / Motor Combinations are detailed in the following table:

Drive	Motor	Nominal power	Nominal speed of rotation	Nominal torque	Peak torque	Rotor inertia without holding brake	Moment of inertia
		W	rpm	Nm	Nm	kg.cm²	-
Devices 220 Vac that can be connected via a single phase or three phases							
LXM26DUA5M3X	BCH2MBA53···5C Hardware version RS 01 or RS 02	50	3000	0.16	0.48	0.054	Medium
	BCH2MBA53···5C Hardware version RS 03					0.044	
LXM26DU01M3X	BCH2MB013···5C Hardware version RS 01 or RS 02	100	3000	0.32	0.96	0.075	Medium
	BCH2MB013···5C Hardware version RS 03					0.065	
LXM26DU02M3X	BCH2LD023···5C	200	3000	0.64	1.92	0.16	Low
	BCH2MM031···6C	300	1000	2.86	8.59	6.63	Medium
LXM26DU04M3X	BCH2LD043···5C	400	3000	1.27	3.81	0.27	Low
	BCH2LF043···5C	400	3000	1.27	3.81	0.67	Low
	BCH2MM052···6C	500	2000	2.39	7.16	6.63	Medium
	BCH2MM061···6C	600	1000	5.73	17.19	6.63	Medium
LXM26DU07M3X	BCH2LF073···5C	750	3000	2.39	7.16	1.19	Low
	BCH2HF073···5C	750	3000	2.39	7.16	1.54	High
	BCH2MM081···6C	850	1500	5.39	13.8	13.5	Medium
	BCH2MM091···6C	900	1000	8.59	25.77	9.7	Medium
LXM26DU10M3X	BCH2LH103···6C	1000	3000	3.18	9.54	2.4	Low
	BCH2MM102···6C	1000	2000	4.77	14.3	6.63	Medium
	BCH2HM102···6C	1000	2000	4.77	14.3	8.41	High
LXM26DU15M3X	BCH2MM152···6C	1500	2000	7.16	21.48	9.7	Medium
Devices 220 Vac that can be connected via three phases							
	BCH2LH203···6C	2000	3000	6.37	19.11	4.28	Low
LXM26DU20M3X	BCH2MM202···6C	2000	2000	9.55	28.65	13.5	Medium
	BCH2MR202···6C	2000	2000	9.55	28.65	26.5	Medium
	BCH2HR202···6C	2000	2000	9.55	28.65	34.68	High
LXM26DU30M3X	BCH2MR301···6C	3000	1500	19.1	57.29	53.56	Medium
	BCH2MR302···6C	3000	2000	14.32	42.97	53.56	Medium
LXM26DU45M3X	BCH2MR352···6C	3500	2000	16.7	50.3	53.56	Medium
	BCH2MR451···6C	4500	1500	28.65	71.62	73.32	Medium

Document Navigator

What's in This Chapter

Document Navigator

Document Content

This user guide contains following data:

- Technical data, page 19
  - Conditions for UL 508C and CSA, page 20
  - Drive, page 23
  - Motor, page 37
  - Accessories and spare parts, page 63
- Engineering, page 67
- Installation, page 79
  - Before mounting, page 81
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  - Operation, page 237
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Servo Drive System Technical Data

What's in This Part

Certifications

What's in This Chapter

Download links

Item	Link
EC Declaration of conformity	LXM26 EC CERTIFICATE
KC certificate - Reference group 1	KC_1333-B797-B43E-FC6C
KC certificate - Reference group 2	KC_8812-6AC0-ECBC-1757
KC certificate - Reference group 3	KC_AE96-6B40-C214-7A18
KC certificate - Reference group 4	KC_A1BB-480B-E156-0EF1

Conditions for UL 508C

Introduction

The UL certification status can be downloaded on the Schneider Electric website.

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

Wiring

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

Fuses

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

LXM26D	UA5, U01, U02, U04, U07, U10, U15	U20, U30, U45
Maximum fuse rating of fuse to be connected upstream	25 A	32 A
Class if fuses are used	J	J
Class if circuit breakers are used	D	D

Overvoltage Category

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

Conditions for CSA

The CSA certificate can be downloaded on the Schneider Electric website.

If the product is used to comply with CSA, the following conditions must also be met.

Integral solid-state short circuit protection in these drives does not provide branch circuit protection.

> ## ⚠⚠ DANGER
>
> **ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**
>
> Provide branch circuit protection in accordance with the manual instructions, National Electrical Code and any additional local codes of the type and size specified in the present document.
>
> **Failure to follow these instructions will result in death or serious injury.**

For reference groups 1, 2, 3, and 4 (see Fuse Types table), this product is suitable for use on a circuit capable of delivering not more than 200 kA RMS symmetrical amperes and 230 Vac (LXM26D•••M3X) maximum, when protected by Listed Class J, CC or RK5 fuses as indicated in this instruction manual and the Fuse Types table. Instead of fuses, protection may be provided by circuit breakers of type C60 by Schneider Electric with the maximum current ratings specified in the Fuse Types table.

For reference group 1 only, this product is suitable for motor group installation on a circuit capable of delivering not more than 5 kA RMS symmetrical amperes and 230 Vac (LXM26D•••M3X) maximum, when protected by Listed Class J or CC fuses as indicated in the instruction manual and the Fuse Types table. Instead of fuses, protection may be provided by circuit breakers of type C60 by Schneider Electric with the maximum current ratings specified in the Fuse Types table.

The opening of the branch-circuit protective device may be an indication that an electrical interruption has been detected.

> ## ⚠⚠ DANGER
>
> **ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**
>
> - Examine all current carrying parts and other components of the drive controller for damage and replace if necessary before replacing fuses or engaging circuit breakers.
> - Completely replace overload relays if burnout of the current element occurs.
>
> **Failure to follow these instructions will result in death or serious injury.**

Capacitive voltages above 42.4 V may remain for up to 15 minutes after power is removed from the drive.

> ### ⚠ DANGER
>
> **ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**
>
> - Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires.
> - Place a "Do Not Turn On" or equivalent hazard label on all power switches and lock them in the non-energized position.
> - Wait 15 minutes to allow the residual energy of the DC bus capacitors to discharge.
> - Do not assume that the DC bus is voltage-free when the DC bus LED is off.
> - Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
> - Do not create a short-circuit across the DC bus terminals or the DC bus capacitors.
> - Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
> - Use only the specified voltage when operating this equipment and any associated products.
>
> **Failure to follow these instructions will result in death or serious injury.**

These drives are provided with load and speed adjustable motor overload and short circuit protection. Adjust the parameter P1-78 'User-Defined maximal current' in the drive which protects the motor by limiting the maximum current according to the required degree of protection of the motors as indicated on the name plate.

Other Characteristics

Maximum surrounding Air Temperature: 40…55 °C (104…131 °F) with current derating of 1% per °C (per 1.8 °F).

Tightening torque for the connectors labelled $\approx$**~220V**, **Resistor** and **Motor** for drive reference group:

- 3 and 4: 0.7 … 0.8 Nm (6.2 … 7 lb.in)

Fuse Types

Reference Group	Reference	Class	Maximum Current
1	LXM26DUA5M3X	CC or J	25 A
	LXM26DU01M3X		
	LXM26DU02M3X		
	LXM26DU04M3X		
	LXM26DU07M3X		
2	LXM26DU10M3X	RK5 or CC or J	25 A
	LXM26DU15M3X		
3	LXM26DU20M3X	RK5 or J	45 A
4	LXM26DU30M3X	RK5 or J	50 A
	LXM26DU45M3X		

Drive

What's in This Chapter

General Overview

Servo Drive Description

Presentation
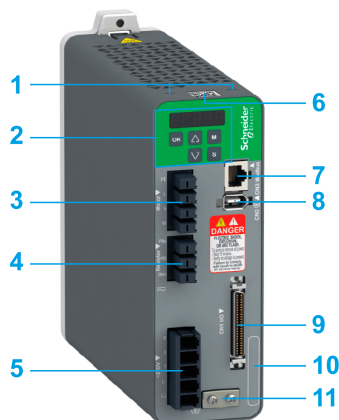
Item	Description	Connector
1	Slot for application name plate (VW3M2501)	-
2	HMI: 7-segment display, 5 buttons, and 2 status LED	-
3	Terminal for motor connection	Motor, page 106
4	Terminal for braking resistor connection	Resistor, page 104
5	Terminal for connecting the power supply	~220 V, page 101
6	QR code for access to technical data	-
7	RJ45 connector for Modbus serial link	CN3, page 99
8	Connector for the encoder of the motor	CN2, page 98
9	Input/output connector	CN1, page 86
10	Device Reference	-
11	Screw terminal for protective ground (protective earth)	-

Parameters Access

Servo drive parameters, page 158 may be accessed using:

- The integrated HMI
- The Device Type Manager (DTM)

Servo Drive Nameplate

Presentation

The nameplate contains the following data:
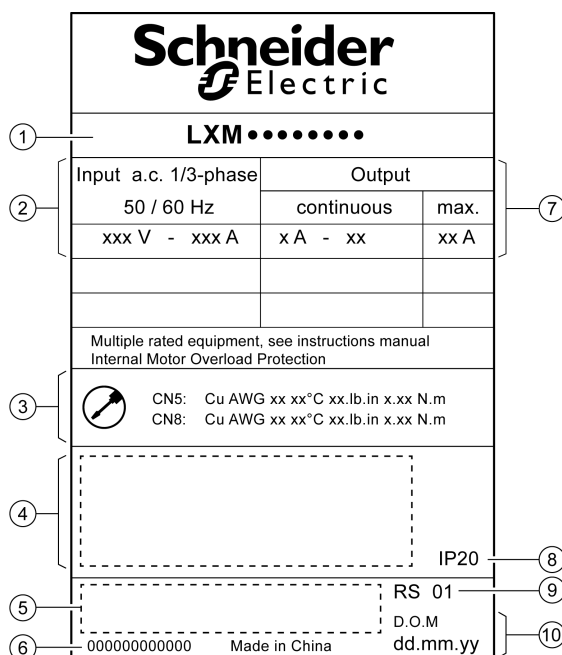
Item	Description
1	Drive reference, page 24
2	Logic supply
3	Cable specifications
4	Certifications
5	Barcode
6	Serial number
7	Output power
8	Degree of protection
9	Hardware version
10	Date of manufacture

Servo Drive Type Code

Servo Drive Type Code

Item	1	2	3	4	5
Type code (example)	LXM	26	D	U07	M3X

Item	Meaning
1	**Product designation** LXM = Lexium
2	**Product type** 26 = AC servo drive for one axis
3	**Interfaces**

Item	Meaning
	D = Modbus RTU, PTI, I/O interface, commissioning via Modbus RTU
4	**Continuous power** UA5 = 0.05 kW U01 = 0.1 kW U02 = 0.2 kW U04 = 0.4 kW U07 = 0.75 kW U10 = 1 kW U15 = 1.5 kW U20 = 2 kW U30 = 3 kW U45 = 4.5 kW
5	**Power stage supply [Vac]** M3X = single phase or 3-phase, 200/230 Vac

Drive Technical Data

Environmental Conditions

Ambient Conditions During Operation

The maximum permissible ambient temperature during operation depends on the mounting distances between the devices and on the required power. Observe the instructions in the chapter Installation, page 82.

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

The following relative humidity is permissible during operation:

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

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

Ambient Conditions During Transportation and Storage

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

Description	Unit	Value
Temperature	°C (°F)	-25…65 (-4…149)

The following relative humidity is permissible during transportation and storage:

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

Installation Site and Connection

For operation, the device must be mounted in a closed control cabinet with a degree of protection of at least IP 54. The device may only be operated with a permanently installed connection.

⚡⚠ **DANGER**
ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
Install the drive in a control cabinet or housing with a minimum IP 54 rating.
Failure to follow these instructions will result in death or serious injury.

Pollution Degree and Degree of Protection

Description	Value
Pollution degree	2
Degree of protection	IP20

Degree of Protection When the Safety Function Is Used

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

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

Vibration and Shock During Operation

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

Vibration and Shock During Transportation and Storage

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

Dimensions

Lexium 26D Dimensions

LXM26DUA5, LXM26DU01, LXM26DU02, LXM26DU04, LXM26DU07, LXM26DU10, LXM26DU15, LXM26DU20
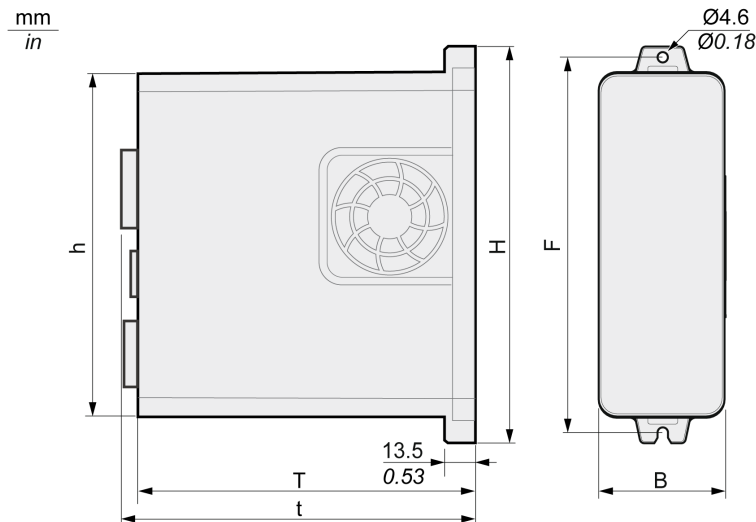
LXM26D	Unit	UA5M3X, U01M3X, U02M3X, U04M3X, U07M3X	U10M3X, U15M3X	U20M3X
B	mm (in)	55 (2.17)	55 (2.17)	62 (2.44)
H	mm (in)	173.2 (6.82)	173.5 (6.83)	194.5 (7.66)
h	mm (in)	150 (5.91)	150 (5.91)	170 (6.69)
F	mm (in)	164 (6.46)	164 (6.46)	185 (7.28)
T	mm (in)	146 (5.75)	170 (6.69)	184 (7.24)
t	mm (in)	152.7 (6.01)	176.3 (6.94)	197 (7.76)

LXM26DU30, LXM26DU45
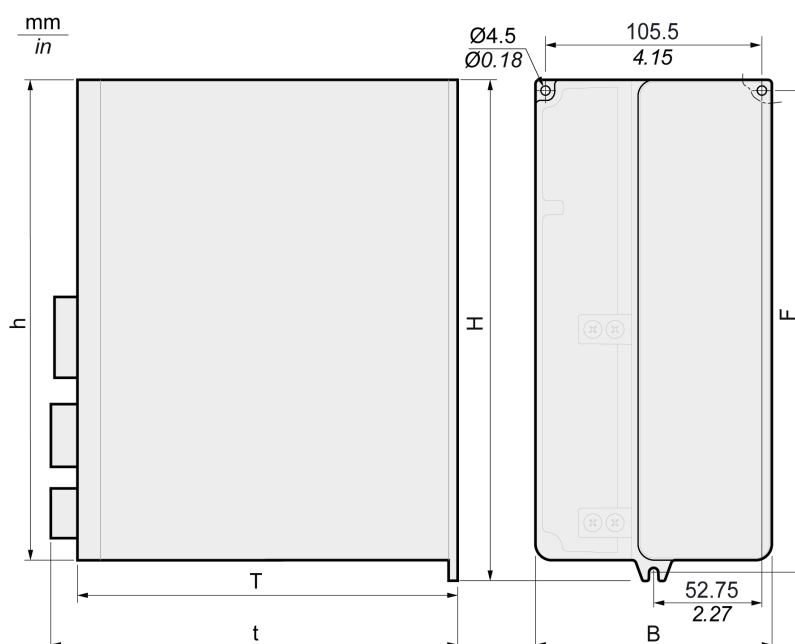
LXM26D	Unit	U30M3X, U45M3X
B	mm (in)	116 (4.57)
H	mm (in)	245 (9.65)
h	mm (in)	234 (9.21)
F	mm (in)	235 (9.25)
T	mm (in)	186 (7.32)
t	mm (in)	199 (7.83)

Electrical Data

Introduction

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

220 Vac Mains Voltage: Range and Tolerance

LXM26D•••M3X

Description	Unit	Value
220 Vac single-phase/three-phase (LXM26D•••M3X)	Vac	200 -15 % ... 230 +10 %
Frequency	Hz	50 -5 % ... 60 +5 %
Transient overvoltages	–	Overvoltage category III[1]
Rated voltage to ground	Vac	230

(1)	Depends on installation altitude, see Environmental Conditions, page 25

Type of Grounding

Description	Value
TT grounding system, TN grounding system	Approved
IT mains	Not approved
Mains with grounded line conductor	Not approved

Leakage Current

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

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

Monitoring of the Continuous Output Power

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

PWM Frequency Power Stage

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

LXM26D	UA5, U01, U02, U04, U07, U10, U15	U20, U30, U45
PWM frequency power stage	16 kHz	8 kHz

Type of Cooling

LXM26D	UA5, U01, U02	U04, U07, U10, U15, U20, U30, U45
Type of cooling	Convection	Fan

Permissible Drive / Motor Combinations

The BCH2 motors can be connected to the Lexium 26D drive range.

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table, page 17.

Single-Phase Connection

Electrical Data for LXM26D⋯M3X Drive Connected Via a Single-Phase 220 Vac

LXM26D⋯M3X	Unit	UA5	U01	U02	U04	U07	U10	U15
Nominal voltage	V	230 (single-phase)						
Inrush current limitation	A	8						
Maximum fuse to be connected upstream[1]	A	25						
Short-circuit current rating (SCCR)	kA	5						
Continuous output current	A_{rms}	0.64	0.9	1.5	2.6	4.5	7	7
Peak output current	A_{rms}	2	2.7	4.5	7.8	13.5	21	21
Nominal power[2]	W	50	100	200	400	750	1000	1500
Input current[2][3]	A_{rms}	0.8	1.2	2.4	3.8	6	8.5	10
THD (total harmonic distortion)[2][4]	%	262.8	239.2	226.8	211.6	181.8	176.3	166.6
Power dissipation[5]	W	8	10	14	22	38	36	41
Maximum inrush current[6]	A	175					235	
Time for maximum inrush current	ms	0.5					0.6	

(1)	As per IEC 60269; Circuit breakers with C characteristic; See Conditions for UL 508C, page 20 for UL and CSA; Lower ratings are permissible; The fuse must be rated in such a way that the fuse does not trip at the specified input current.
(2)	At a mains impedance corresponding to the short-circuit current rating (SCCR)
(3)	At nominal power and nominal voltage
(4)	With reference to the input current
(5)	Condition: internal braking resistor not active; value at nominal current, nominal voltage, and nominal power; value approximately proportional with output current
(6)	Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

DC bus data for drives connected via a single-phase 220 Vac

LXM26D⋯M3X	Unit	UA5	U01	U02	U04	U07	U10	U15
Nominal voltage (single-phase)	Vac	230						
Nominal voltage DC bus	Vdc	322						
Undervoltage limit	Vdc	160						
Overvoltage limit	Vdc	420						
Maximum continuous power via DC bus	W	50	100	200	400	750	1000	1500
Maximum continuous power via DC bus	A	0.2	0.3	0.6	1.2	2.3	3.1	4.6

Three-Phase Connection

Electrical Data for LXM26D⋯M3X Drive Connected Via Three-Phase 220 Vac

LXM26D⋯M3X	Unit	UA5	U01	U02	U04	U07	U10
Nominal voltage	V	230 (3-phase)					
Inrush current limitation	A	8					

LXM26D···M3X	Unit	UA5	U01	U02	U04	U07	U10
Maximum fuse to be connected upstream[1]	A	25					
Short-circuit current rating (SCCR)	kA	5					
Continuous output current	A_{rms}	0.64	0.9	1.5	2.6	4.5	7
Peak output current	A_{rms}	2	2.7	4.5	7.8	13.5	21
Nominal power[2]	W	50	100	200	400	750	1000
Input current[2][3]	A_{rms}	0.42	0.74	1.25	2.2	3.9	5
THD (total harmonic distortion)[2][4]	%	227.8	212.7	200.7	183.7	160.8	155.5
Power dissipation[5]	W	8	10	14	22	38	36
Maximum inrush current[6]	A	175					235
Time for maximum inrush current	ms	0.5					0.6

(1)	As per IEC 60269; Circuit breakers with C characteristic; See Conditions for UL 508C, page 20 for UL and CSA; Lower ratings are permissible; The fuse must be rated in such a way that the fuse does not trip at the specified input current.
(2)	At a mains impedance corresponding to the short-circuit current rating (SCCR)
(3)	At nominal power and nominal voltage
(4)	With reference to the input current
(5)	Condition: internal braking resistor not active; value at nominal current, nominal voltage, and nominal power; value approximately proportional with output current
(6)	Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

LXM26D···M3X	Unit	U15	U20	U30	U45
Nominal voltage	V	230 (3-phase)			
Inrush current limitation	A	8	19.2	17	
Maximum fuse to be connected upstream[1]	A	25	32		
Short-circuit current rating (SCCR)	kA	5		22	
Continuous output current	A_{rms}	7	12	19.8	22.8
Peak output current	A_{rms}	21	36	60	61
Nominal power[2]	W	1500	2000	3000	4500
Input current[2][3]	A_{rms}	5.9	8.7	12.9	18
THD (total harmonic distortion)[2][4]	%	144.8	137.1	155.8	147.1
Power dissipation[5]	W	41		97	
Maximum inrush current[6]	A	235	295	300	
Time for maximum inrush current	ms	0.6	1.0		

(1)	As per IEC 60269; Circuit breakers with C characteristic; See Conditions for UL 508C, page 20 for UL and CSA; Lower ratings are permissible; The fuse must be rated in such a way that the fuse does not trip at the specified input current.
(2)	At a mains impedance corresponding to the short-circuit current rating (SCCR)
(3)	At nominal power and nominal voltage
(4)	With reference to the input current
(5)	Condition: internal braking resistor not active; value at nominal current, nominal voltage, and nominal power; value approximately proportional with output current
(6)	Extreme case, off/on pulse before the inrush current limitation responds, see next line for maximum time

DC bus data for drives connected via three-phase 220 Vac

LXM26D···M3X	Unit	UA5	U01	U02	U04	U07	U10
Nominal voltage (three phases)	Vac	230					
Nominal voltage DC bus	Vdc	322					
Undervoltage limit	Vdc	160					
Overvoltage limit	Vdc	420					
Maximum continuous power via DC bus	W	50	100	200	400	750	1000
Maximum continuous power via DC bus	A	0.2	0.3	0.6	1.2	2.3	3.1

LXM26D···M3X	Unit	U15	U20	U30	U45
Nominal voltage (three phases)	Vac	230			
Nominal voltage DC bus	Vdc	322			
Undervoltage limit	Vdc	160			
Overvoltage limit	Vdc	420			
Maximum continuous power via DC bus	W	1500	2000	3000	4500
Maximum continuous power via DC bus	A	4.6	6.2	9.2	13.8

Inputs / Outputs Characteristics

Logic Type

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

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

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

Digital Input Signals 24 V

When wired as positive logic, the levels of the opto-isolated inputs DI1...DI5 and DI8 comply with IEC 61131-2, type 1. The electrical characteristics are also valid when wired as negative logic.

Description	Unit	Value
"0" signal voltage	Vdc	≤5
"1" signal voltage	Vdc	≥11
Input current (typical)	mA	6
Debounce time[1]	mA	0...20
(1)	Adjustable via parameter P2-09 in increments of 1 ms.	

Digital Output Signals 24 V

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

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

Analog Input Signals

Description	Unit	Value
Voltage range	Vdc	-10...10
Input resistance, typical	kΩ	10
Resolution	Bit	12
Sampling period	µs	32.25

Analog Output Signals

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

Touch Probe Input Signals 24 V

When wired as positive logic, the levels of the opto-isolated inputs DI6 and DI7 comply with IEC 61131-2, type 1. The electrical characteristics are also valid when wired as negative logic.

Description	Unit	Value
"0" signal voltage	Vdc	≤5
"1" signal voltage	Vdc	≥11
Input current (typical)	mA	7
Debounce time[1]	µs	0...20000
Jitter Capture	µs	1

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

24 Vdc Power Supply (Pin 17):

24 Vdc power supply (pin 17):

Description	Unit	Value
Output voltage	Vdc	24
Maximum output current	mA	200

ESIM Output Signals

The ESIM output signals comply with the RS422 interface specification.

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

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

Function A/B Signals

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

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

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

The signal shape shown relates to the factory setting (P1-00 C=0). The direction of movement shown relates to the factory setting (P1-01 C=0).

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

Function CW/CCW

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

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

Time chart with "CW/CCW"

The signal shape shown relates to the factory setting (P1-00 C=0). The direction of movement shown relates to the factory setting (P1-01 C=0).

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

Function P/D

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

Signal	Function
Signal PULSE	Motor movement
Signal SIGN	Direction of movement

Time chart with pulse/direction signal

P1-00 C = 0

The signal shape shown relates to the factory setting (P1-00 C=0). The direction of movement shown relates to the factory setting (P1-01 C=0).

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

Motor

What's in This Chapter

General Overview

Components and Interfaces

Presentation
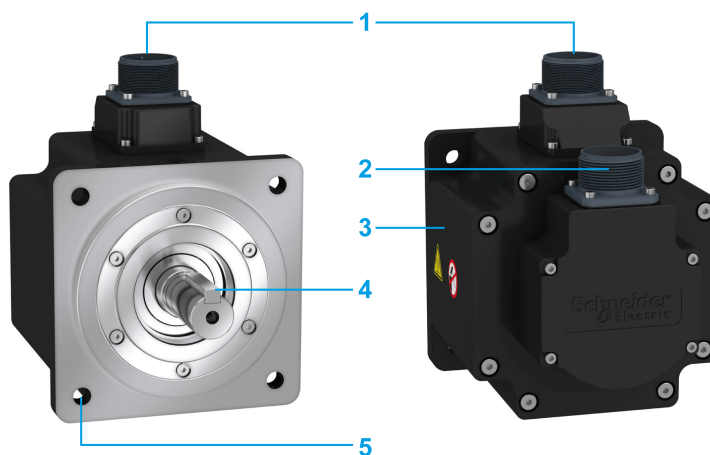
BCH2 servo motors, with a 3-phase stator and rotor with rare earth-based permanent magnets, consist of:

Item	Description
1	Connector of the motor cable, page 64
2	Connector of the encoder cable, page 64
3	Housing
4	Smooth or keyed shaft end, depending on the motor reference
5	4-point axial mounting flange

Servo Motor Nameplate

BCH2·B

The nameplate contains the following data:
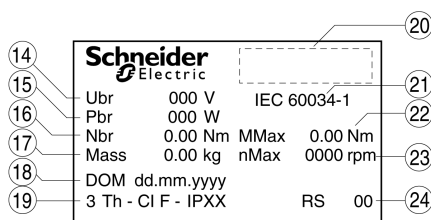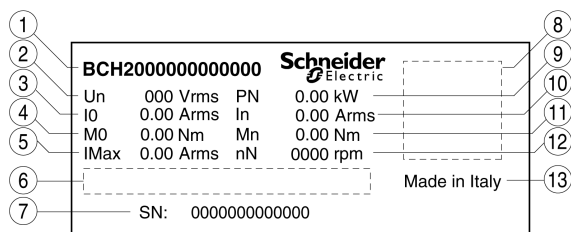
Item	Description	Item	Description
1	Motor reference, page 39	13	Country of manufacture
2	Nominal voltage	14	Nominal voltage of the holding brake (optional)
3	Continuous stall current	15	Nominal power of the holding brake (optional)
4	Continuous stall torque	16	Nominal torque of the holding brake (optional)
5	Maximum current	17	Mass
6	Barcode	18	Date of manufacture DOM
7	Serial number	19	Number of motor phases, temperature class, degree of protection
8	QR code	20	Certifications
9	Nominal power	21	Applied standard
10	Nominal current	22	Peak torque
11	Nominal torque	23	Maximum permissible speed of rotation
12	Nominal speed of rotation	24	Hardware version

BCH2·D, BCH2·F, BCH2·H, BCH2·M, and BCH2·R

The nameplate contains the following data:
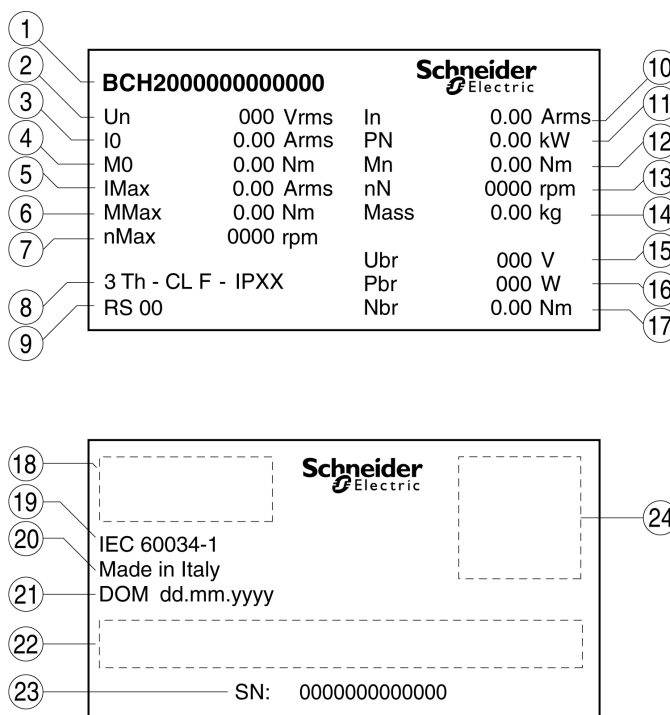
Item	Description	Item	Description
1	Motor reference, page 39	13	Nominal speed of rotation
2	Nominal voltage	14	Mass
3	Continuous stall current	15	Nominal voltage of the holding brake (optional)
4	Continuous stall torque	16	Nominal power of the holding brake (optional)
5	Maximum current	17	Nominal torque of the holding brake (optional)
6	Peak torque	18	Certifications
7	Maximum permissible speed of rotation	19	Applied standard
8	Number of motor phases, temperature class, degree of protection	20	Country of manufacture
9	Hardware version	21	Date of manufacture DOM
10	Nominal current	22	Barcode
11	Nominal power	23	Serial number
12	Nominal torque	24	QR code

Servo Motor Type Code

Servo Motor Type Code

Item	1	2	3	4	5	6	7	8	9	10
Type code (example)	BCH2	M	B	01	3	3	C	A	5	C

Item	Meaning
1	**Product family**
	BCH2 = Brushless servo motors - second generation
2	**Moment of inertia**
	L = Low
	M = Medium
	H = High
3	**Size (housing)**
	B = 40 mm flange
	D = 60 mm flange
	F = 80 mm flange
	H = 100 mm flange
	M = 130 mm flange
	R = 180 mm flange
4	**Nominal power**
	A5 = 50 W
	01 = 100 W
	02 = 200 W
	03 = 300 W
	04 = 400 W
	05 = 500 W
	06 = 600 W
	07 = 750 W
	08 = 850 W
	09 = 900 W
5	**Winding**
	1 = Optimized in terms of torque (1000 rpm/1500 rpm)
	2 = Optimized in terms of torque and speed of rotation (2000 rpm)
	3 = Optimized in terms of speed of rotation (3000 rpm)
6	**Shaft and degree of protection**[1]
	3 = Parallel key; degree of protection: shaft and housing IP 65
7	**Encoder system**
	C = High-resolution encoder single turn
	M = High-resolution encoder multi turn[3]
8	**Holding brake**
	A = Without holding brake
	F = With holding brake
9	**Connection version**
	5 = Flying leads (for BCH2·B, BCH2·D, BCH2·F)
	6 = MIL connector (for BCH2·H, BCH2·M, BCH2·R)

Item 4 additional values:

10 = 1.0 kW
13 = 1.3 kW
15 = 1.5 kW
20 = 2.0 kW
30 = 3.0 kW
35 = 3.5 kW
45 = 4.5 kW

Item	Meaning
10	**Mechanical interface - mounting** C = Asian style

(1)	In the case of mounting position IM V3 (drive shaft vertical, shaft end up), the motor has degree of protection IP 50.
(2)	Only available with single turn encoder, up to 4.5 kW.
(3)	Planned marketing end of 2020.

Motor Technical Data

Environmental Conditions

Ambient Conditions During Operation

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

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

(1)	Limit values with flanged motor, see
(2)	Tested as per IEC 60068-2-6 and IEC 60068-2-27

Ambient Conditions During Transportation and Storage

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

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

Flange Sizes for Limit Values

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

Motor	Flange material	Flange size in [mm (in)]
BCH2MB	Aluminum	185 x 185 x 8 (7.28 x 7.28 x 0.31)
BCH2LD	Aluminum	250 x 250 x 12 (9.84 x 9.84 x 0.47)
BCH2·F	Aluminum	250 x 250 x 12 (9.84 x 9.84 x 0.47)
BCH2LH	Steel	300 x 300 x 20 (11.8 x 11.8 x 0.79)
BCH2·M	Steel	400 x 400 x 20 (15.7 x 15.7 x 0.79)
BCH2·R	Steel	550 x 550 x 20 (21.7 x 21.7 x 0.79)

Compatibility with Foreign Substances

The motor has been tested for compatibility with many known substances and with the latest available knowledge at the moment of the design. Nonetheless, you must perform a compatibility test before using a foreign substance.

Tightening Torque and Property Class of Screws

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

Overload Characteristics Curves
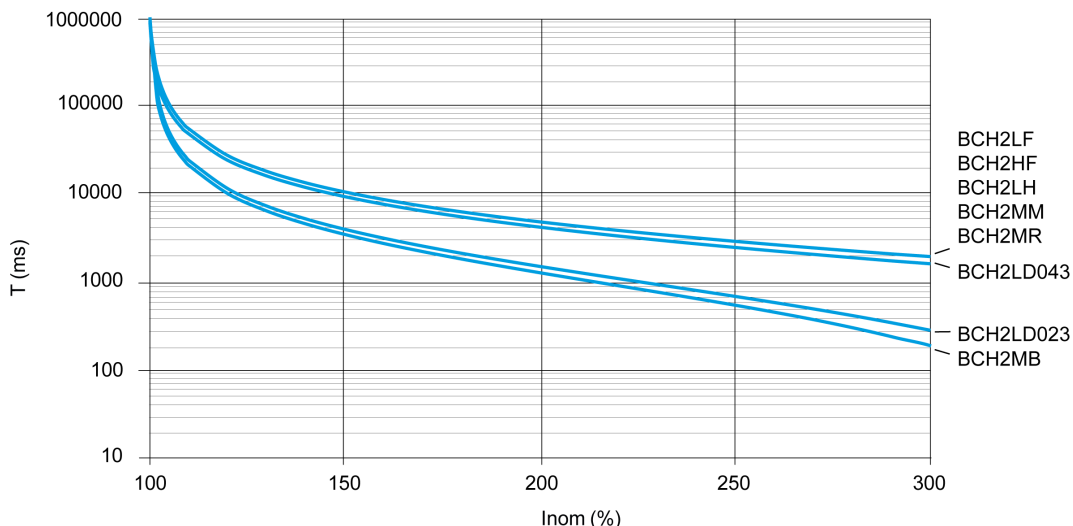
In order to make old MFOLD and new MFOLD be compatible, add new P parameter *P2-71* to active new fold back algorithm. If you want to increase the overload capacity, you can set MFOLD level by new parameter *P2-73* (1~4), default value is 1. The corresponding MFOLDT value is displayed in *P2-72* (see New Motor Fold Back Characteristics and Parameter Setting, page 304).

Encoder Technical Data

Overview

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

The signals meet the PELV requirements.

Depending on the motor reference, the motor are delivered with a single turn encoder or a multi turn encoder.

Single Turn Encoder

Technical data

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

Multi Turn Encoder

Technical data

Description	Value
Measuring range absolute	1 revolution
Resolution in increments	Depending on evaluation
Accuracy of position	±0.044°
Supply voltage	4.1...5.25 Vdc
Maximum supply current	40 µA
Maximum permissible speed of rotation	6000 rpm
Maximum angular acceleration	100,000 rad/s²
Battery nominal voltage	3.6 Vdc
Battery nominal current consumption while the encoder is not powered by the drive	20 µA at standstill 40 µA with rotating shaft
Battery life time (at 25 °C)	3 years

The multi turn counting is preserved through power down by an external battery.

•   For further information on the battery compartment connection, refer to the motor encoder connection, page 99.

•   For further information on the battery replacement, refer to the maintenance of the motor, page 310.

BCH2MB Motor

BCH2MB Dimensions
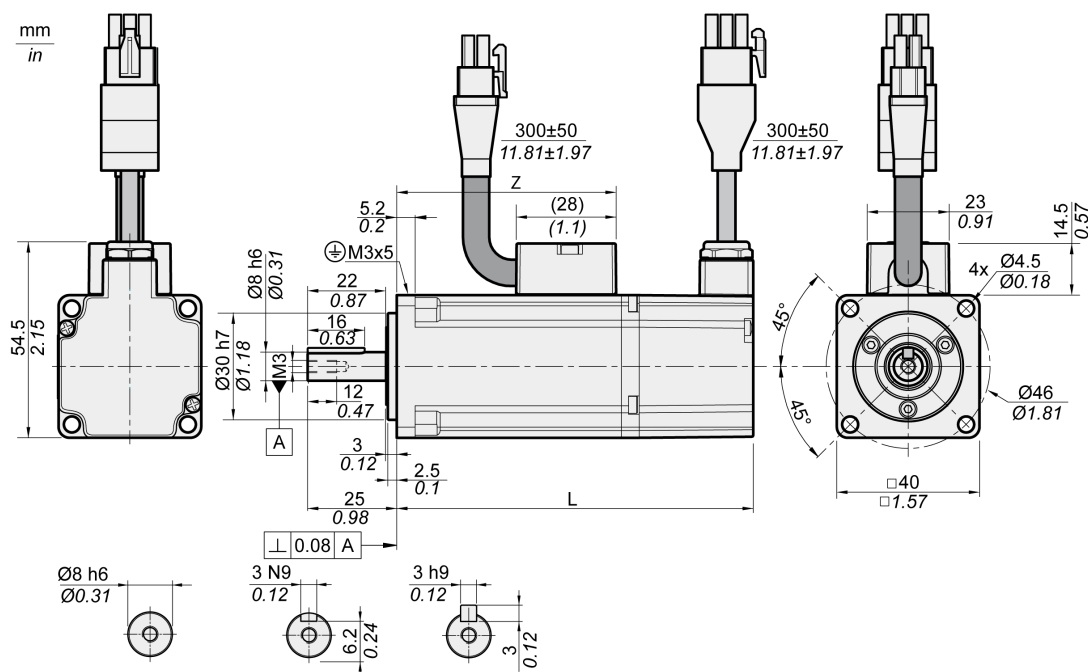
BCH2MB	Unit	A5	01
L (without holding brake)	mm (in)	82 (3.23)	100 (3.94)
L (with holding brake)	mm (in)	112 (4.41)	130 (5.12)
Z	mm (in)	43.5 (1.71)	61.5 (2.42)

BCH2MB Characteristics Table

BCH2MB[1]				A53	013
Technical data - general					
Continuous stall torque[2]		M_0	Nm	0.16	0.32
Peak torque		M_{max}	Nm	0.48	0.96
With supply voltage U_n = 230 Vac					
Nominal speed of rotation		n_N	rpm	3000	3000
Nominal torque		M_N	Nm	0.16	0.32
Nominal Current		I_N	A_{rms}	0.59	0.89
Nominal power		P_N	kW	0.05	0.10
Technical data - electrical					
Maximum winding voltage		U_{max}	Vac	255	255
Maximum winding voltage		U_{max}	Vdc	360	360
Maximum voltage to ground		–	Vac	255	255
Maximum Current		I_{max}	A_{rms}	1.8	2.7
Continuous stall current		I_0	A_{rms}	0.54	0.81
Voltage constant[3]		k_Eu-v	V_{rms}	18	24
Torque constant[4]		k_t	Nm/A	0.30	0.40
Winding resistance		R_{20}u-v	Ω	31.0	23.4
Winding inductance		L_qu-v	mH	26.4	21.5
Winding inductance		L_du-v	mH	24.7	20.6
Technical data - mechanical					
Maximum permissible speed of rotation		n_{max}	rpm	5000	5000
Rotor inertia without brake	Hardware version RS 01 or RS 2	J_M	$kgcm^2$	0.054	0.075
	Hardware version RS 03			0.044	0.065
Rotor inertia with brake	Hardware version RS 01 or RS 2	J_M	$kgcm^2$	0.055	0.076
	Hardware version RS 03			0.045	0.066
Mass without brake		m	kg	0.40	0.56
Mass with brake		m	kg	0.60	0.77
Degree of protection of the shaft		–	–	IP 65	IP 65
Degree of protection of the housing		–	–	IP 65	IP 65
Technical data - holding brake					
Holding torque		–	Nm	0.32	0.32
Nominal voltage		–	Vdc	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)		–	W	4.4	4.4

(1)	Limit values with flanged motor:
	• Flange material: Aluminum
	• Flange size in mm (in): 185 x 185 x 8 (7.28 x 7.28 x 0.31)
(2)	M_0 = Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %.
(3)	RMS value at 1000 rpm and 20 °C (68 °F).
(4)	At n = 20 rpm and 20 °C (68 °F).

BCH2MB Curves

BCH2MBA53 + LXM26DUA5

Without shaft sealing ring	With shaft sealing ring
M [Nm]	M [Nm]
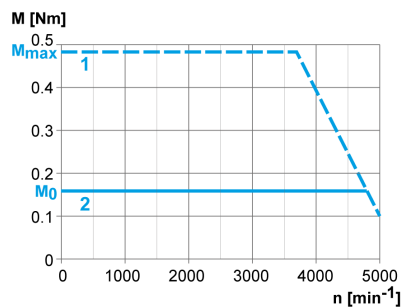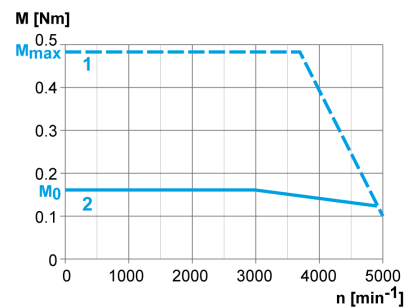
(1)	Peak torque
(2)	Continuous torque

BCH2MB013 + LXM26DU01

Without shaft sealing ring	With shaft sealing ring
M [Nm]	M [Nm]
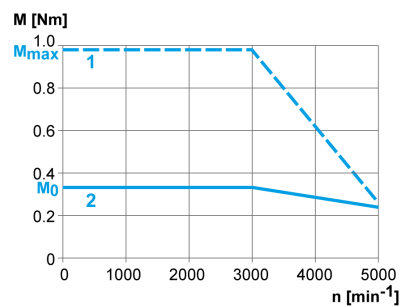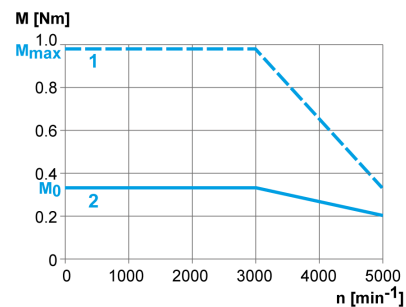
(1)	Peak torque
(2)	Continuous torque

BCH2LD Motor

BCH2LD Dimensions
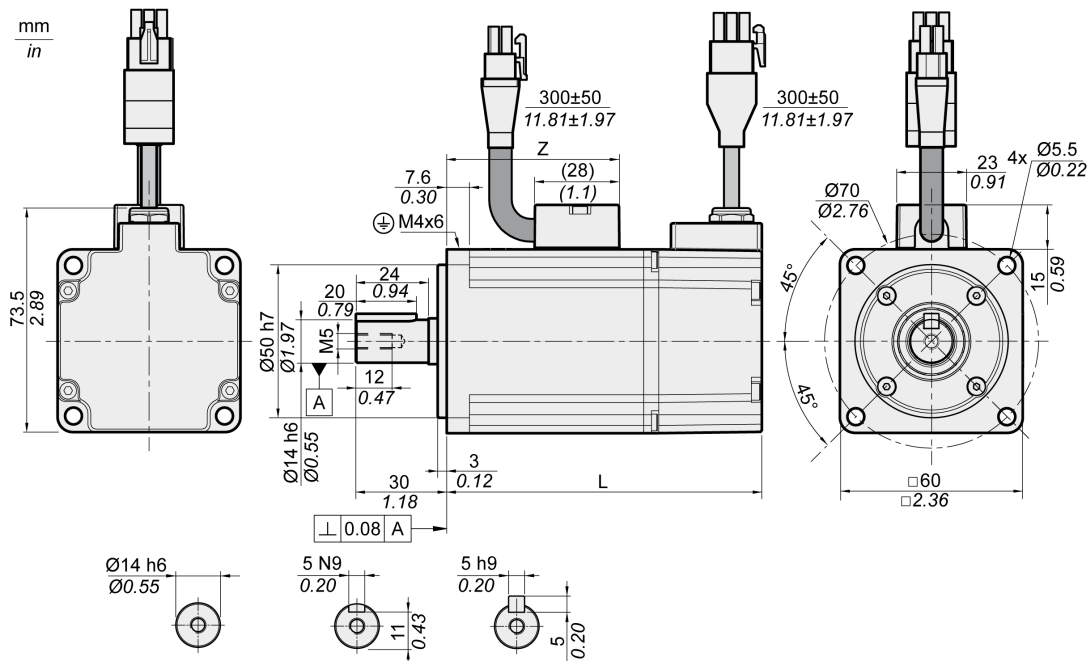
BCH2LD	Unit	02	04
L (without holding brake)	mm (in)	104 (4.09)	129 (5.08)
L (with holding brake)	mm (in)	140 (5.51)	165 (6.5)
Z	mm (in)	57 (2.24)	82 (3.23)

BCH2LD Characteristics Table

BCH2LD[1]			023	043
Technical data - general				
Continuous stall torque[2]	M_0	Nm	0.64	1.27
Peak torque	M_{max}	Nm	1.92	3.81
With supply voltage U_n = 230 Vac				
Nominal speed of rotation	n_N	rpm	3000	3000
Nominal torque	M_N	Nm	0.64	1.27
Nominal Current	I_N	A_{rms}	1.30	2.50
Nominal power	P_N	kW	0.20	0.40
Technical data - electrical				
Maximum winding voltage	U_{max}	Vac	255	255
Maximum winding voltage	U_{max}	Vdc	360	360
Maximum voltage to ground	–	Vac	255	255
Maximum Current	I_{max}	A_{rms}	4.5	7.8
Continuous stall current	I_0	A_{rms}	1.11	2.19

BCH2LD[1]			023	043
Voltage constant[3]	k_Eu-v	V_{rms}	35	35
Torque constant[4]	k_t	Nm/A	0.58	0.58
Winding resistance	R_{20}u-v	Ω	12.2	5.2
Winding inductance	L_qu-v	mH	24.8	12.5
Winding inductance	L_du-v	mH	22.7	12.0
Technical data - mechanical				
Maximum permissible speed of rotation	n_{max}	rpm	5000	5000
Rotor inertia without brake	J_M	kgcm^2	0.15	0.26
Rotor inertia with brake	J_M	kgcm^2	0.16	0.27
Mass without brake	m	kg	1.02	1.45
Mass with brake	m	kg	1.50	2.00
Degree of protection of the shaft	−	−	IP 65	IP 65
Degree of protection of the housing	−	−	IP 65	IP 65
Technical data - holding brake				
Holding torque	−	Nm	1.3	1.3
Nominal voltage	−	Vdc	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)	−	W	11.2	11.2

(1)	Limit values with flanged motor: • Flange material: Aluminum • Flange size in mm (in): 250 x 250 x 12 (9.84 x 9.84 x 0.47)
(2)	M_0=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %
(3)	RMS value at 1000 rpm and 20 °C (68 °F).
(4)	At n = 20 rpm and 20 °C (68 °F).

BCH2LD Curves

BCH2LD023 + LXM26DU02	BCH2LD043 + LXM26DU04

(1)	Peak torque
(2)	Continuous torque
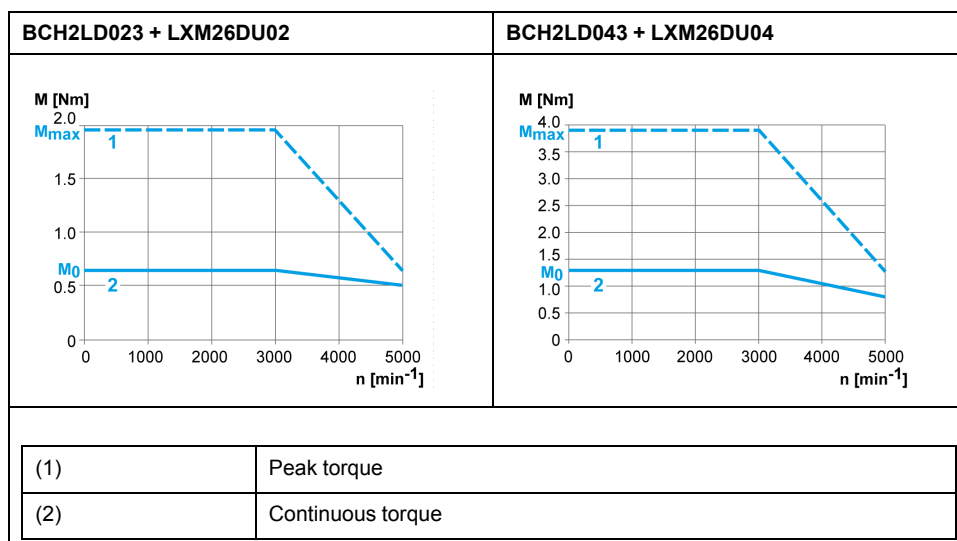
BCH2·F Motor

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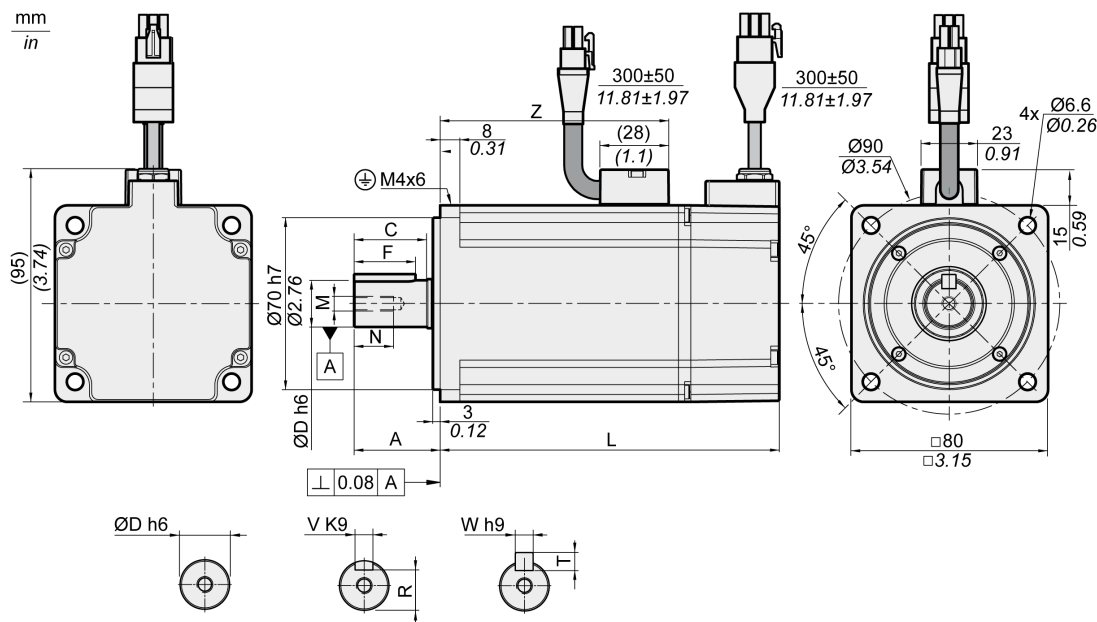
BCH2	Unit	LF04	HF07	LF07
L (without holding brake)	mm (in)	112 (4.41)	138 (5.43)	138 (5.43)
L (with holding brake)	mm (in)	152 (5.98)	178 (7.01)	178 (7.01)
A	mm (in)	30 (1.18)	35 (1.38)	35 (1.38)
C	mm (in)	24.5 (0.96)	29.5 (1.16)	29.5 (1.16)
D	mm (in)	14 (0.55)	19 (0.75)	19 (0.75)
F	mm (in)	20 (0.79)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

BCH2·F Characteristics Table

BCH2[1]			LF043	HF073	LF073
Technical data - general					
Continuous stall torque[2]	M_0	Nm	1.27	2.39	2.39
Peak torque	M_{max}	Nm	3.81	7.16	7.16
With supply voltage U_n = 230 Vac					
Nominal speed of rotation	n_N	rpm	3000	3000	3000

BCH2[1]			LF043	HF073	LF073
Nominal torque	M_N	Nm	1.27	2.39	2.39
Nominal Current	I_N	A_{rms}	2.52	4.29	4.29
Nominal power	P_N	kW	0.40	0.75	0.75
Technical data - electrical					
Maximum winding voltage	U_{max}	Vac	255	255	255
Maximum winding voltage	U_{max}	Vdc	360	360	360
Maximum voltage to ground	−	Vac	255	255	255
Maximum Current	I_{max}	A_{rms}	7.8	13.5	13.5
Continuous stall current	I_0	A_{rms}	2.29	4.01	4.01
Voltage constant[3]	k_Eu-v	V_{rms}	33.5	36	36
Torque constant[4]	k_t	Nm/A	0.55	0.60	0.60
Winding resistance	R_{20}u-v	Ω	3.20	1.50	1.50
Winding inductance	L_qu-v	mH	12.0	6.6	6.6
Winding inductance	L_du-v	mH	11.3	6.1	6.1
Technical data - mechanical					
Maximum permissible speed of rotation	n_{max}	rpm	5000	5000	5000
Rotor inertia without brake	J_M	kgcm^2	0.66	1.53	1.18
Rotor inertia with brake	J_M	kgcm^2	0.71	1.58	1.23
Mass without brake	m	kg	2.00	2.90	2.80
Mass with brake	m	kg	2.80	3.70	3.60
Degree of protection of the shaft	−	−	IP 65	IP 65	IP 65
Degree of protection of the housing	−	−	IP 65	IP 65	IP 65
Technical data - holding brake					
Holding torque	−	Nm	2.5	2.5	2.5
Nominal voltage	−	Vdc	24 +/-10%	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)	−	W	10.2	10.2	10.2

| (1)	Limit values with flanged motor: • Flange material: Aluminum • Flange size in mm (in): 250 x 250 x 12 (9.84 x 9.84 x 0.47)
(2)	M_0=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %
(3)	RMS value at 1000 rpm and 20 °C (68 °F).
(4)	At n = 20 rpm and 20 °C (68 °F).

BCH2·F Curves

BCH2LF043 + LXM26DU04

(1)	Peak torque
(2)	Continuous torque

BCH2HF073 + LXM26DU07	**BCH2LF073 + LXM26DU07**

(1)	Peak torque
(2)	Continuous torque

BCH2LH Motor

BCH2LH Dimensions

BCH2LH	Unit	103	203
L (without holding brake)	mm (in)	153.5 (6.04)	198.5 (7.81)
L (with holding brake)	mm (in)	180.5 (7.11)	225.5 (8.88)
Z	mm (in)	96 (3.78)	141 (5.55)

BCH2LH Characteristics Table

BCH2LH[1]			103	203
Technical data - general				
Continuous stall torque[2]	M_0	Nm	3.18	6.37
Peak torque	M_{max}	Nm	9.54	19.11
With supply voltage U_n = 230 Vac				
Nominal speed of rotation	n_N	rpm	3000	3000
Nominal torque	M_N	Nm	3.18	6.37
Nominal Current	I_N	Arms	6.64	10.27
Nominal power	P_N	kW	1.00	2.00
Technical data - electrical				
Maximum winding voltage	U_{max}	Vac	255	255
Maximum winding voltage	U_{max}	Vdc	360	360
Maximum voltage to ground	–	Vac	255	255
Maximum Current	I_{max}	Arms	20.0	35.0
Continuous stall current	I_0	Arms	5.83	9.87

BCH2LH[1]			103	203
Voltage constant[3]	k_Eu-v	V_{rms}	33	39
Torque constant[4]	k_t	Nm/A	0.55	0.65
Winding resistance	R_{20}u-v	Ω	0.67	0.36
Winding inductance	L_qu-v	mH	4.3	2.6
Winding inductance	L_du-v	mH	4.20	2.59
Technical data - mechanical				
Maximum permissible speed of rotation	n_{max}	rpm	5000	5000
Rotor inertia without brake	J_M	kgcm²	2.39	4.27
Rotor inertia with brake	J_M	kgcm²	2.44	4.34
Mass without brake	m	kg	4.60	6.70
Mass with brake	m	kg	5.10	7.20
Degree of protection of the shaft	–	–	IP 65	IP 65
Degree of protection of the housing	–	–	IP 65	IP 65
Technical data - holding brake				
Holding torque	–	Nm	6.5	6.5
Nominal voltage	–	Vdc	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)	–	W	10.4	10.4

(1)	Limit values with flanged motor: • Flange material: Steel • Flange size in mm (in): 300 x 300 x 20 (11.8 x 11.8 x 0.79)
(2)	M_0=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %
(3)	RMS value at 1000 rpm and 20 °C (68 °F).
(4)	At n = 20 rpm and 20 °C (68 °F).

BCH2LH Curves

BCH2LH103 + LXM26DU10	BCH2LH203 + LXM26DU20

(1)	Peak torque
(2)	Continuous torque
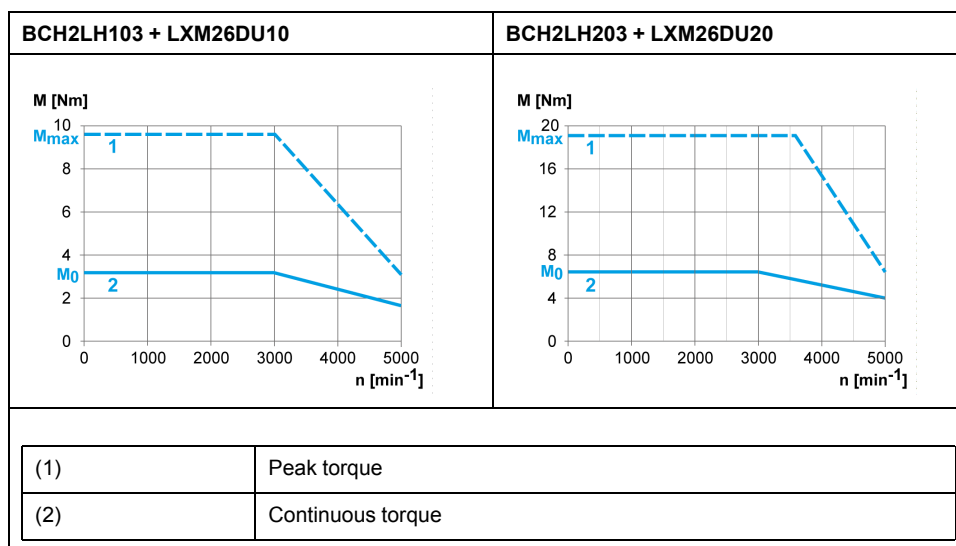
BCH2·M Motor

BCH2·M Dimensions

BCH2·M	Unit	08	03, 05, 06, 10	09, 15	20
L (without holding brake)	mm (in)	187 (7.36)	147 (5.79)	163 (6.42)	187 (7.36)
L (with holding brake)	mm (in)	216 (8.5)	176 (6.93)	192 (7.56)	216 (8.5)
A	mm (in)	48 (1.89)	55 (2.17)	55 (2.17)	55 (2.17)
C	mm (in)	40 (1.57)	47 (1.85)	47 (1.85)	47 (1.85)
D	mm (in)	19 (0.75)	22 (0.87)	22 (0.87)	22 (0.87)
F	mm (in)	25 (0.98)	36 (1.42)	36 (1.42)	36 (1.42)
M	-	M6	M8	M8	M8
N	mm (in)	16 (0.63)	19 (0.75)	19 (0.75)	19 (0.75)
R	mm (in)	15.5 (0.61)	18 (0.71)	18 (0.71)	18 (0.71)
T	mm (in)	6 (0.24)	7 (0.28)	7 (0.28)	7 (0.28)
V	mm (in)	6 (0.24)	8 (0.31)	8 (0.31)	8 (0.31)
W	mm (in)	6 (0.24)	8 (0.31)	8 (0.31)	8 (0.31)
Z	mm (in)	134.5 (5.30)	94.5 (3.72)	110.5 (4.35)	134.5 (5.30)

BCH2·M Characteristics Table

BCH2[1]			MM052	MM031	MM102	HM102	MM081
Technical data - general							
Continuous stall torque[2]	M_0	Nm	2.39	2.86	4.77	4.77	5.39
Peak torque	M_{max}	Nm	7.16	8.59	14.30	14.30	13.80
With supply voltage U_n = 230 Vac							
Nominal speed of rotation	n_N	rpm	2000	1000	2000	2000	1500
Nominal torque	M_N	Nm	2.39	2.86	4.77	4.77	5.39
Nominal Current	I_N	Arms	3.24	2.09	6.29	6.29	6.29

BCH2[1]			MM052	MM031	MM102	HM102	MM081
Nominal power	P_N	kW	0.50	0.30	1.00	1.00	0.85
Technical data - electrical							
Maximum winding voltage	U_{max}	Vac	255	255	255	255	255
Maximum winding voltage	U_{max}	Vdc	360	360	360	360	360
Maximum voltage to ground	−	Vac	255	255	255	255	255
Maximum Current	I_{max}	Arms	9.5	6.0	20.0	20.0	15.0
Continuous stall current	I_0	Arms	2.89	1.88	5.77	5.77	5.62
Voltage constant[3]	k_Eu-v	Vrms	50	92	50	50	58
Torque constant[4]	k_t	Nm/A	0.83	1.52	0.83	0.83	0.96
Winding resistance	R_{20}u-v	Ω	0.74	2.08	0.74	0.74	0.42
Winding inductance	L_qu-v	mH	7.84	26.25	7.84	7.84	4.70
Winding inductance	L_du-v	mH	7.14	23.91	7.14	7.14	4.30
Technical data - mechanical							
Maximum permissible speed of rotation	n_{max}	rpm	3000	2000	3000	3000	3000
Rotor inertia without brake	J_M	kgcm2	6.62	6.62	6.62	8.40	13.49
Rotor inertia with brake	J_M	kgcm2	6.90	6.90	6.90	8.79	14.09
Mass without brake	m	kg	7.00	7.00	7.00	7.10	9.60
Mass with brake	m	kg	8.20	8.20	8.20	8.30	10.90
Degree of protection of the shaft	−	−	IP 65	IP 54	IP 65	IP 65	IP 54
Degree of protection of the housing	−	−	IP 65	IP 65	IP 65	IP 65	IP 65
Technical data - holding brake							
Holding torque	−	Nm	9.6	9.6	9.6	9.6	9.6
Nominal voltage	−	Vdc	24 +/-10%	24 +/-10%	24 +/-10%	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)	−	W	19.7	19.7	19.7	19.7	19.7

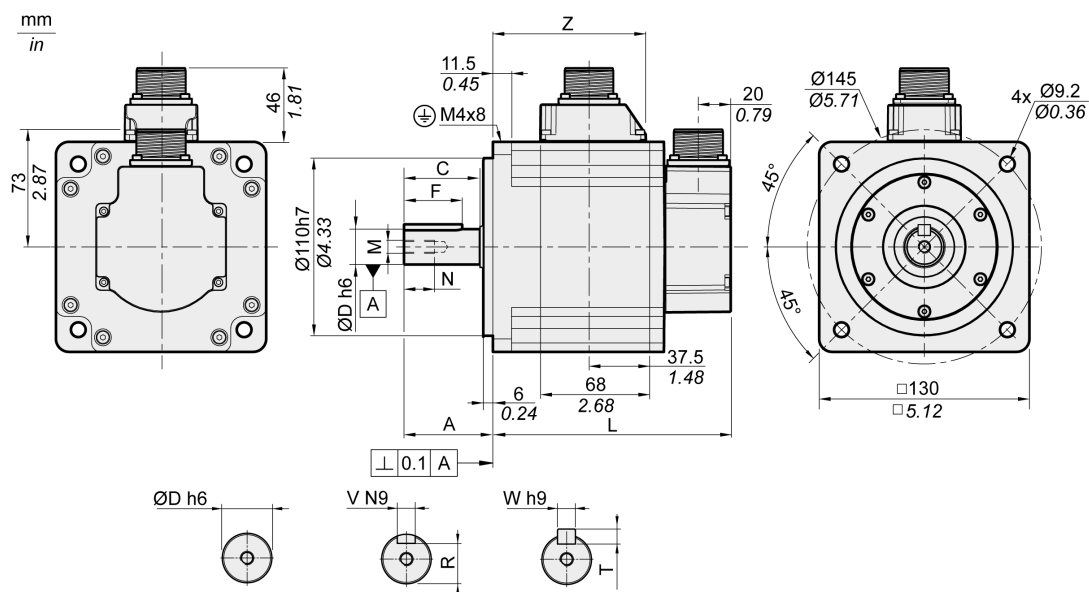| (1)	Limit values with flanged motor: • Flange material: Steel • Flange size in mm (in): 400 x 400 x 20 (15.7 x 15.7 x 0.79)
(2)	M_0=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %
(3)	RMS value at 1000 rpm and 20 °C (68 °F).
(4)	At n = 20 rpm and 20 °C (68 °F).

BCH2[1]			MM061	MM091	MM152	MM202
Technical data - general						
Continuous stall torque[2]	M_0	Nm	5.73	8.59	7.16	9.55
Peak torque	M_{max}	Nm	17.19	25.77	21.48	28.65
With supply voltage U_n = 230 Vac						
Nominal speed of rotation	n_N	rpm	1000	1000	2000	2000
Nominal torque	M_N	Nm	5.73	8.59	7.16	9.55
Nominal Current	I_N	Arms	4.10	6.15	6.74	11.25
Nominal power	P_N	kW	0.60	0.90	1.50	2.00
Technical data - electrical						

BCH2[1]			MM061	MM091	MM152	MM202
Maximum winding voltage	U_{max}	Vac	255	255	255	255
Maximum winding voltage	U_{max}	Vdc	360	360	360	360
Maximum voltage to ground	–	Vac	255	255	255	255
Maximum Current	I_{max}	A_{rms}	13.5	20.0	21.0	33.0
Continuous stall current	I_0	A_{rms}	3.77	5.64	6.18	9.95
Voltage constant[3]	k_Eu-v	V_{rms}	92	92	70	58
Torque constant[4]	k_t	Nm/A	1.52	1.52	1.16	0.96
Winding resistance	R_{20}u-v	Ω	2.08	1.22	0.64	0.42
Winding inductance	L_qu-v	mH	26.25	16.40	7.20	4.70
Winding inductance	L_du-v	mH	23.91	14.90	6.40	4.30
Technical data - mechanical						
Maximum permissible speed of rotation	n_{max}	rpm	2000	2000	3000	3000
Rotor inertia without brake	J_M	kgcm²	6.62	9.69	9.69	13.49
Rotor inertia with brake	J_M	kgcm²	6.90	9.99	9.99	14.09
Mass without brake	m	kg	7.00	7.60	7.60	9.70
Mass with brake	m	kg	8.20	8.80	8.80	11.00
Technical data - holding brake						
Holding torque	–	Nm	9.6	9.6	9.6	9.6
Nominal voltage	–	Vdc	24 +/-10%	24 +/-10%	24 +/-10%	24 +/-10%
Nominal power (electrical pull-in power)	–	W	19.7	19.7	19.7	19.7

(1)	Limit values with flanged motor: • Flange material: Steel • Flange size in mm (in): 400 x 400 x 20 (15.7 x 15.7 x 0.79)
(2)	M_0=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %
(3)	RMS value at 1000 rpm and 20 °C (68 °F).
(4)	At n = 20 rpm and 20 °C (68 °F).

BCH2·M Curves

BCH2MM052 + LXM26DU07	BCH2MM031 + LXM26DU04

(1)	Peak torque
(2)	Continuous torque

BCH2MM102 + LXM26DU10	BCH2HM102 + LXM26DU10

(1)	Peak torque
(2)	Continuous torque

BCH2MM081 + LXM26DU10	BCH2MM061 + LXM26DU07

(1)	Peak torque
(2)	Continuous torque

BCH2MM091 + LXM26DU10	BCH2MM152 + LXM26DU15

(1)	Peak torque
(2)	Continuous torque
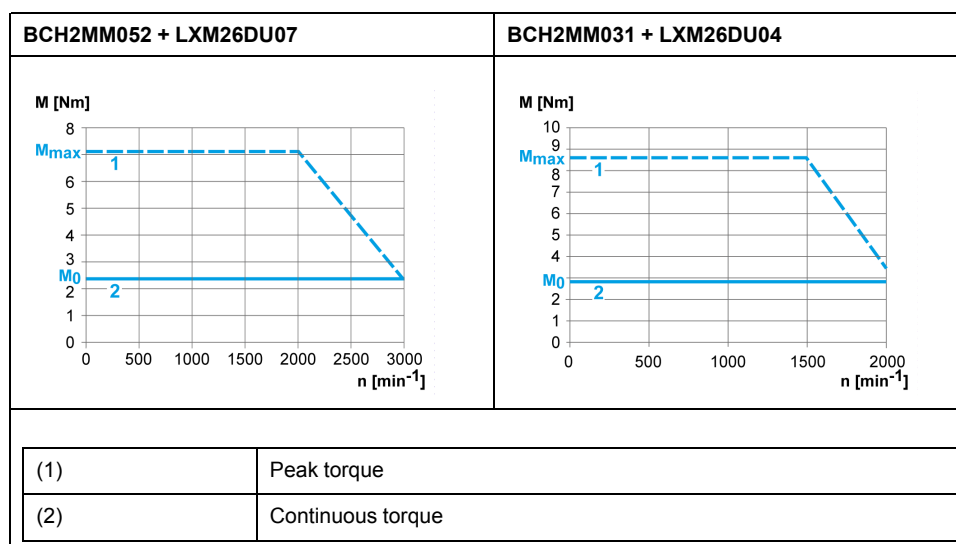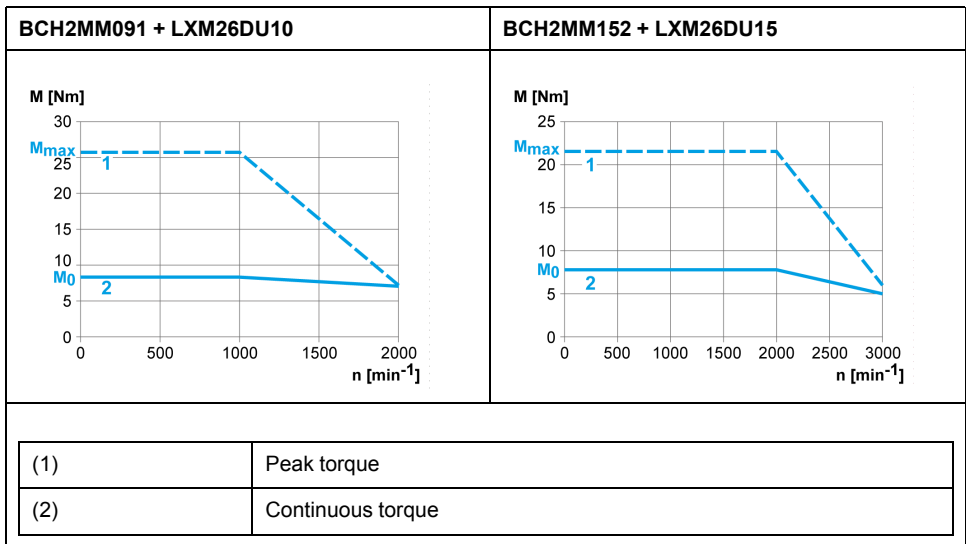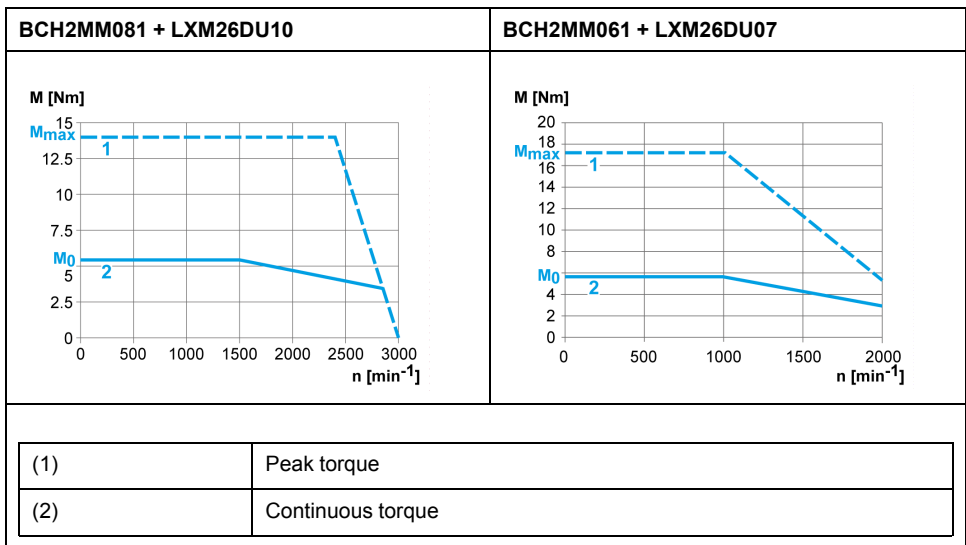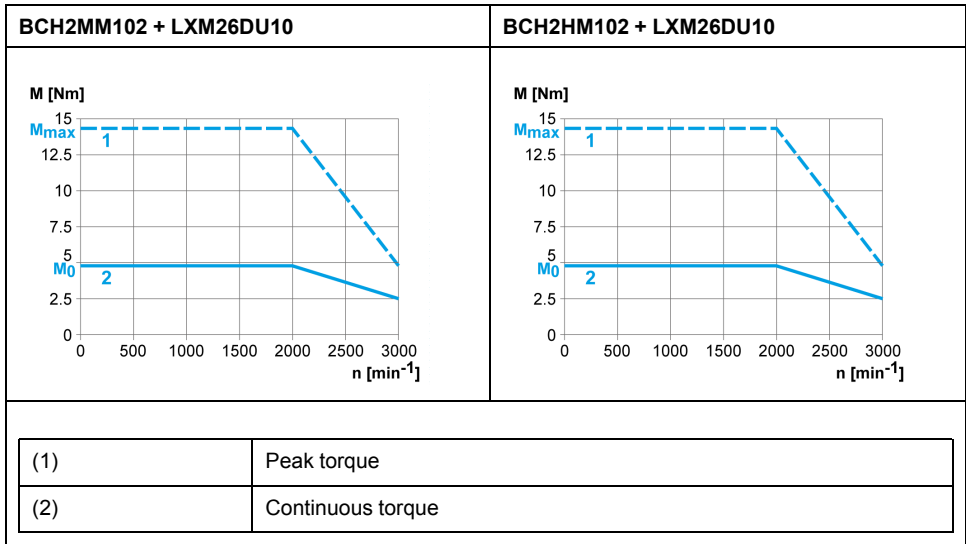
BCH2MM202 + LXM26DU20
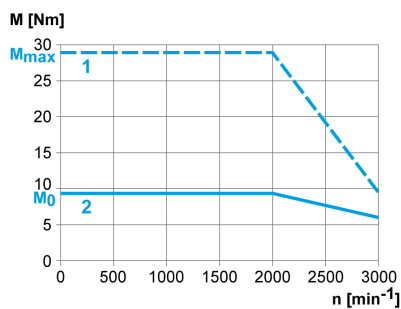
(1)	Peak torque
(2)	Continuous torque

BCH2·R Motor

BCH2·R Dimensions
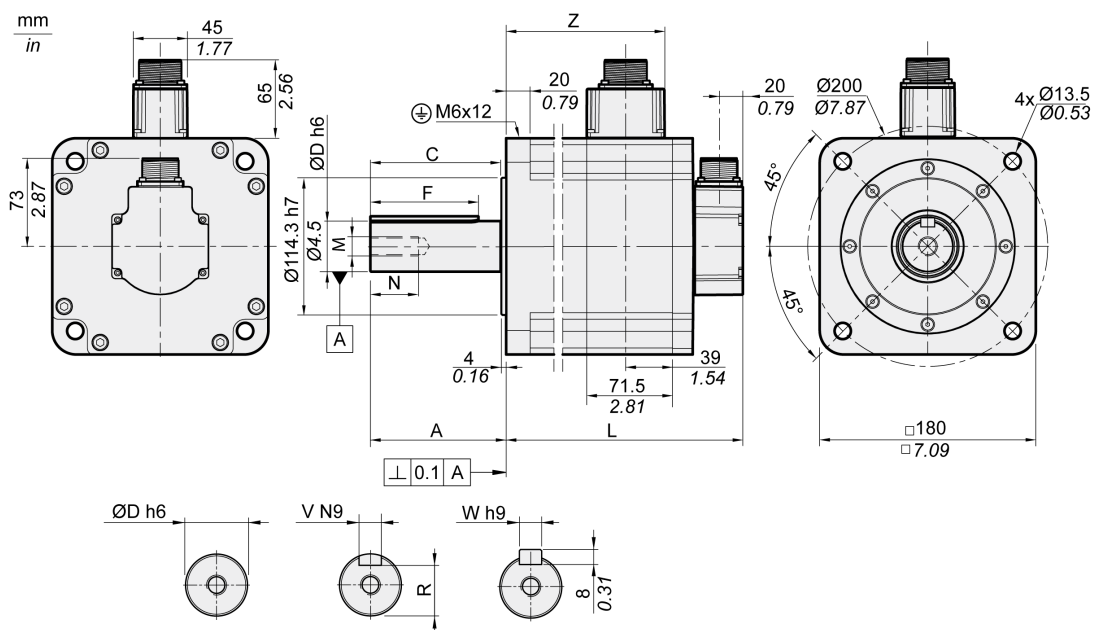
BCH2·R	Unit	20	30, 35	45
L (without holding brake)	mm (in)	168 (6.61)	201 (7.91)	234 (9.21)
L (with holding brake)	mm (in)	203 (7.99)	236 (9.29)	269 (10.59)
A	mm (in)		79 (3.11)	
C	mm (in)		73 (2.87)	
D	mm (in)		35 (1.38)	
F	mm (in)		63 (2.48)	
M	-		M12	
N	mm (in)		28 (1.10)	
R	mm (in)		30 (1.18)	
V	mm (in)		10 (0.39)	

BCH2·R	Unit	20	30, 35	45
W	mm (in)	10 (0.39)		
Z	mm (in)	103 (4.06)	136 (5.35)	169 (6.65)

BCH2·R Characteristics Table

BCH2MR202/301/302, BCH2HR202 technical data

BCH2[1]			MR202	HR202	MR302	MR301
Technical data - general						
Continuous stall torque[2]	M_0	Nm	9.55	9.55	14.32	19.10
Peak torque	M_{max}	Nm	28.65	28.65	42.97	57.29
With supply voltage U_n = 230 Vac						
Nominal speed of rotation	n_N	rpm	2000	2000	2000	1500
Nominal torque	M_N	Nm	9.55	9.55	14.32	19.10
Nominal Current	I_N	A_{rms}	9.6	9.6	18.8	18.8
Nominal power	P_N	kW	2.00	2.00	3.00	3.00
Technical data - electrical						
Maximum winding voltage	U_{max}	Vac	255	255	255	255
Maximum winding voltage	U_{max}	Vdc	360	360	360	360
Maximum voltage to ground	−	Vac	255	255	255	255
Maximum Current	I_{max}	A_{rms}	35.5	35.5	56.0	61.0
Continuous stall current	I_0	A_{rms}	8.75	8.75	16.33	16.49
Voltage constant[3]	k_Eu-v	V_{rms}	66	66	53	70
Torque constant[4]	k_t	Nm/A	1.09	1.09	0.88	1.16
Winding resistance	R_{20}u-v	Ω	0.572	0.572	0.168	0.234
Winding inductance	L_qu-v	mH	6.70	6.70	2.88	3.78
Winding inductance	L_du-v	mH	6.10	6.10	2.71	3.45
Technical data - mechanical						
Maximum permissible speed of rotation	n_{max}	rpm	3000	3000	3000	3000
Rotor inertia without brake	J_M	kgcm^2	26.49	34.67	53.55	53.55
Rotor inertia with brake	J_M	kgcm^2	26.99	36.17	54.09	54.09
Mass without brake	m	kg	13.00	14.30	18.50	18.50
Mass with brake	m	kg	18.00	19.30	23.00	23.00
Degree of protection of the shaft	−	−	IP 65	IP 65	IP 65	IP 54
Degree of protection of the housing	−	−	IP 65	IP 65	IP 65	IP 65
Technical data - holding brake						
Holding torque	−	Nm	48	48	48	48
Nominal voltage	−	Vdc	24 +/-10%	24 +/-10%	24 +/-10%	24 +/-10%

BCH2[1]			MR202	HR202	MR302	MR301
Nominal power (electrical pull-in power)	–	W	49.6	49.6	49.6	49.6

| (1)	Limit values with flanged motor: • Flange material: Steel • Flange size in mm (in): 550 x 550 x 20 (21.7 x 21.7 x 0.79)
(2)	M_0=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %
(3)	RMS value at 1000 rpm and 20 °C (68 °F).
(4)	At n = 20 rpm and 20 °C (68 °F).

BCH2MR352/451 technical data

BCH2[1]			MR352	MR451
Technical data - general				
Continuous stall torque[2]	M_0	Nm	16.70	28.65
Peak torque	M_{max}	Nm	50.30	71.62
With supply voltage U_n = 230 Vac				
Nominal speed of rotation	n_N	rpm	2000	1500
Nominal torque	M_N	Nm	16.70	28.65
Nominal Current	I_N	A_{rms}	19.3	22.8
Nominal power	P_N	kW	3.50	4.50
Technical data - electrical				
Maximum winding voltage	U_{max}	Vac	255	255
Maximum winding voltage	U_{max}	Vdc	360	360
Maximum voltage to ground	–	Vac	255	255
Maximum Current	I_{max}	A_{rms}	61.0	61.0
Continuous stall current	I_0	A_{rms}	16.83	19.68
Voltage constant[3]	k_Eu-v	V_{rms}	60	88
Torque constant[4]	k_t	Nm/A	0.99	1.46
Winding resistance	R_{20}u-v	Ω	0.168	0.199
Winding inductance	L_qu-v	mH	2.80	4.00
Winding inductance	L_du-v	mH	2.57	3.80
Technical data - mechanical				
Maximum permissible speed of rotation	n_{max}	rpm	3000	3000
Rotor inertia without brake	J_M	kgc-m2	53.55	73.31
Rotor inertia with brake	J_M	kgc-m2	54.09	72.99
Mass without brake	m	kg	18.50	23.64
Mass with brake	m	kg	23.00	28.00
Technical data - holding brake				
Holding torque	–	Nm	48	48
Nominal voltage	–	Vdc	24 +/-10%	24 +/-10%

BCH2[1]			MR352	MR451
Nominal power (electrical pull-in power)	–	W	49.6	49.6

(1)	Limit values with flanged motor: • Flange material: Steel • Flange size in mm (in): 550 x 550 x 20 (21.7 x 21.7 x 0.79)
(2)	M_0=Continuous stall torque at 20 rpm and 100 % duty cycle; at speeds of rotation of <20 rpm the continuous stall torque is reduced to 87 %
(3)	RMS value at 1000 rpm and 20 °C (68 °F).
(4)	At n = 20 rpm and 20 °C (68 °F).

BCH2·R Curves

BCH2MR202 + LXM26DU20	BCH2HR202 + LXM26DU20

(1)	Peak torque
(2)	Continuous torque

BCH2MR302 + LXM26DU30	BCH2MR301 + LXM26DU30

(1)	Peak torque
(2)	Continuous torque

BCH2MR352 + LXM26DU45	BCH2MR451 + LXM26DU45
M [Nm] graph	M [Nm] graph

(1)	Peak torque
(2)	Continuous torque
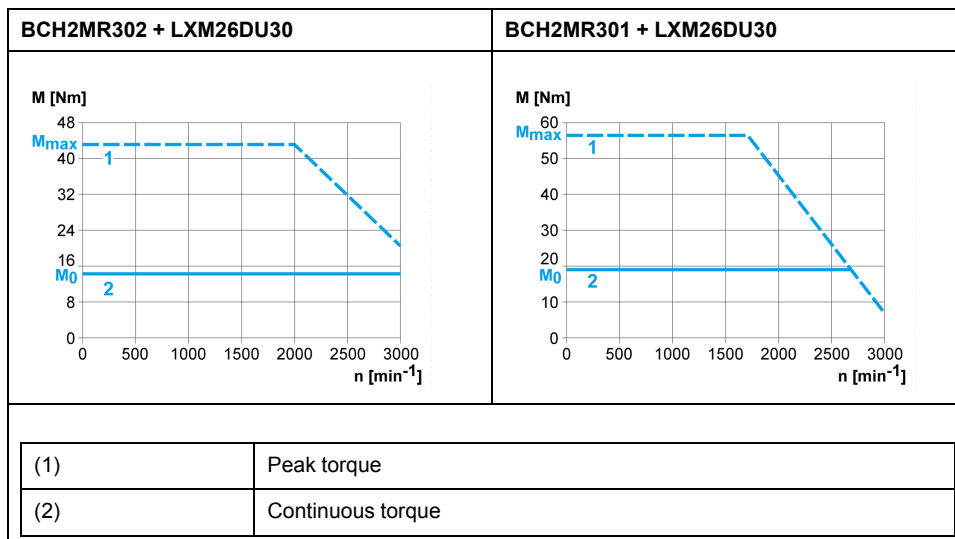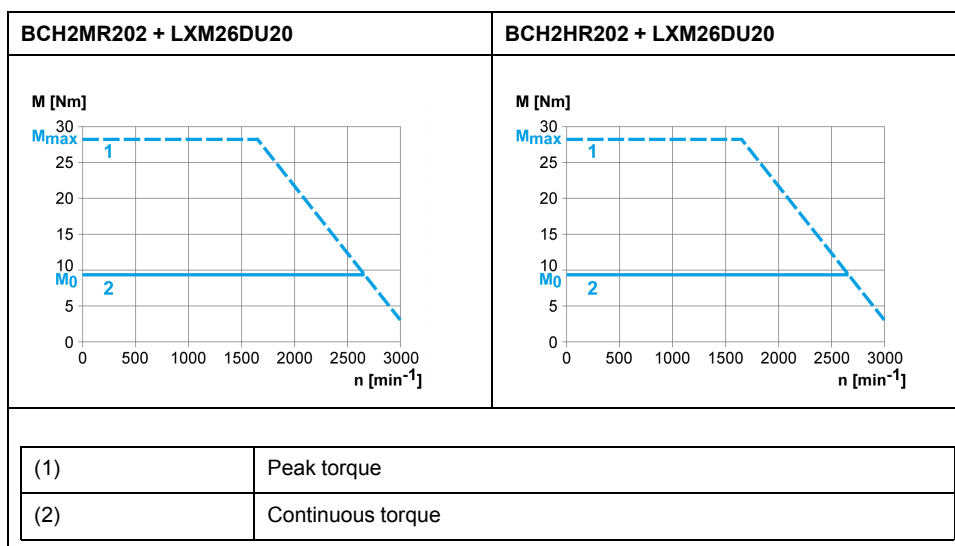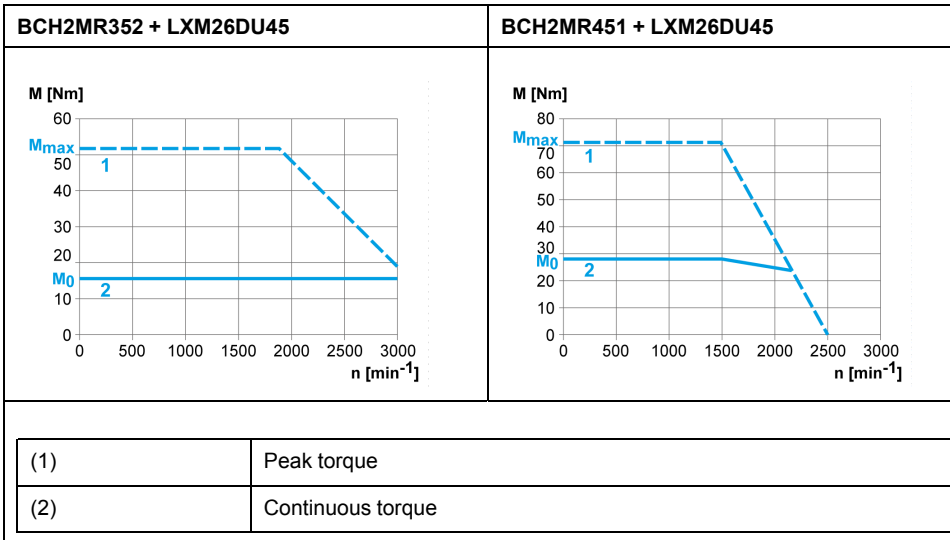
Accessories and Spare Parts

What's in This Chapter

Commissioning Tools

Description	Reference
Commissioning software LXM26 DTM Library, can be downloaded at: www.se.com	-
PC connection kit, serial connection between drive and PC, USB-A to RJ45	TCSMCNAM3M002P
Multi-Loader, device for copying the parameter settings to a PC or to another drive	VW3A8121
Connection cable for Multi-Loader	VW3A8126
Modbus cable, 1 m (3.28 ft), 2 x RJ45	VW3A8306R10

Connectors and Adapters

Description		Drive Type	Reference
Connector kit for logic supply and power stage supply (**~220V**), braking resistor (**Resistor**), and motor (**Motor**)		LXM26DUA5, LXM26DU01, LXM26DU02, LXM26DU04, LXM26DU07, LXM26DU10, LXM26DU15	VW3M4C21
		LXM26DU20	VW3M4C23
		LXM26DU30, LXM26DU45	VW3M4C24
Interface adapter for CN1, connector with 0.5 m (1.64 ft) cable and connection module with screw terminals for DIN rail mounting			VW3M1C13
Connector kit for motor	Motor end plastic connector	Without holding brake	VW3M5D1A
		With holding brake	VW3M5D1F
	Motor end MIL connector	With holding brake, size 100 … 130	VW3M5D2A
		With holding brake, size 180	VW3M5D2B
		For 8 mm^2 (AWG8) up to 16 mm^2 (AWG16) with holding brake, size 180	VW3M5D2C
		Device end IEEE1394 connector	VW3M8D2A
	Motor end flying leads	Device end IEEE1394 connector	VW3M8D1A

External Mains Filters

Description		Reference
Mains filter single-phase;115/230 Vac	9 A	VW3A4420
	16 A	VW3A4421
	23 A	VW3A4426
Mains filter three-phase; 208/400/480 Vac	15 A	VW3A4422
	25 A	VW3A4423
	47 A	VW3A4424

Application Nameplate

Description	Reference
Application nameplate to be clipped onto the top of the drive, size 38.5 mm (1.52 in) x 13 mm (0.51 in), 50 pieces	VW3M2501

Motor Cables

Description				Reference
Shielded motor cable without holding brake	Motor end plastic connector, other cable end flying leads	4 x 0.82 mm² (AWG 18)	1.5 m (4.92 ft)	VW3M5D1AR15
			3 m (9.84 ft)	VW3M5D1AR30
			5 m (16.4 ft)	VW3M5D1AR50
	Motor end MIL connector, other cable end flying leads	4 x 1.3 mm² (AWG 16)	3 m (9.84 ft)	VW3M5D2AR30
			5 m (16.4 ft)	VW3M5D2AR50
		4 x 3.3 mm² (AWG 12)	3 m (9.84 ft)	VW3M5D4AR30
			5 m (16.4 ft)	VW3M5D4AR50
		4 x 6 mm² (AWG 10)	3 m (9.84 ft)	VW3M5D6AR30
			5 m (16.4 ft)	VW3M5D6AR50
Shielded motor cable with holding brake	Motor end plastic connector, other cable end flying leads	6 x 0.82 mm² (AWG 18)	3 m (9.84 ft)	VW3M5D1FR30
			5 m (16.4 ft)	VW3M5D1FR50
	Motor end MIL connector, other cable end flying leads	6 x 1.3 mm² (AWG 16)	3 m (9.84 ft)	VW3M5D2FR30
			5 m (16.4 ft)	VW3M5D2FR50
		6 x 3.3 mm² (AWG 12)	3 m (9.84 ft)	VW3M5D4FR30
			5 m (16.4 ft)	VW3M5D4FR50
		6 x 6 mm² (AWG 10)	3 m (9.84 ft)	VW3M5D6FR30
			5 m (16.4 ft)	VW3M5D6FR50

Encoder Cables and Accessories

Description			Reference
Encoder cable, 10 x 0.13 mm² (AWG 26) shielded	Motor end and device end plastic connector	1.5 m (4.92 ft)	VW3M8D1AR15

Description			Reference
		3 m (9.84 ft)	VW3M8D1AR30
		5 m (16.4 ft)	VW3M8D1AR50
	Motor end MIL connector, other cable end plastic connector	3 m (9.84 ft)	VW3M8D2AR30
		5 m (16.4 ft)	VW3M8D2AR50
Battery compartment for multi turn encoder, cable 0.45 m (1.47 ft)			VW3M8BATC
Battery 3.6 Vdc for multi turn encoder			VW3M9BATT

NOTE: The battery compartment and the battery are not provided with motor equipped with a multi turn encoder and must be ordered separately.

Signal Cables

Description		Reference
Signal cable for signal interface CN1, device end 50-pin connector, other cable end flying leads	1 m (3.28 ft)	VW3M1C10R10
	2 m (6.56 ft)	VW3M1C10R20
	3 m (9.84 ft)	VW3M1C10R30

External Braking Resistors and Holding Brake Controller

Description				Reference
Holding brake controller HBC with automatic voltage reduction; 24 V - 1.6 A				VW3M3103
Braking resistor IP 65 connection cable 2.1 mm² (AWG 14)	10 Ω	Maximum continuous power 400 W	0.75 m (2.46 ft)	VW3A7601R07
			2 m (6.56 ft)	VW3A7601R20
			3 m (9.84 ft)	VW3A7601R30
Braking resistor IP 65, UL connection cable 2.1 mm² (AWG 14)	27 Ω	Maximum continuous power 100 W	0.75 m (2.46 ft)	VW3A7602R07
			2 m (6.56 ft)	VW3A7602R20
			3 m (9.84 ft)	VW3A7602R30
		Maximum continuous power 200 W	0.75 m (2.46 ft)	VW3A7603R07
			2 m (6.56 ft)	VW3A7603R20
			3 m (9.84 ft)	VW3A7603R30
		Maximum continuous power 400 W	0.75 m (2.46 ft)	VW3A7604R07
			2 m (6.56 ft)	VW3A7604R20
			3 m (9.84 ft)	VW3A7604R30
	72 Ω	Maximum continuous power 200 W	0.75 m (2.46 ft)	VW3A7606R07
			2 m (6.56 ft)	VW3A7606R20
			3 m (9.84 ft)	VW3A7606R30
		Maximum continuous power 400 W	0.75 m (2.46 ft)	VW3A7607R07
			2 m (6.56 ft)	VW3A7607R20
			3 m (9.84 ft)	VW3A7607R30
Braking resistor IP20, UL screw terminals M6	16 Ω	Maximum continuous power 956 W	-	VW3A7733
	10 Ω			VW3A7734

Circuit Breakers

Description		Reference
Circuit breaker - thermal magnetic -screw terminals	4 ... 6.3 A	GV2P10
	6 ... 10 A	GV2P14
	9 ... 14 A	GV2P16
	13 ... 18 A	GV2P20
	17 ... 23 A	GV2P21
	20 ... 25 A	GV2P22
	24 ... 32 A	GV2P32

Motor Protection Switches and Power Contactors

Drive	Nominal power	Order no. motor protection switch	Rated continuous current motor protection switch	Order no. power contactor
LXM26DUA5	50 W	GV2L10	6.3 A	LC1K0610••
LXM26DU01	100 W	GV2L10	6.3 A	LC1K0610••
LXM26DU02	200 W	GV2L14	10 A	LC1D09••
LXM26DU04	400 W	GV2L14	10 A	LC1D09••
LXM26DU07	750 W	GV2L16	14 A	LC1D12••
LXM26DU15	1500 W	GV2L22	25 A	LC1D18••
LXM26DU20	2000 W	GV2L32	30 A	LC1D32••
LXM26DU30	3000 W	GV2L32	30 A	LC1D32••

Control voltage power contactor		24 V	48 V	110 V	220 V	230 V	240 V
LC1K••••	50/60 Hz	B7	E7	F7	M7	P7	U7

Control voltage power contactor		24 V	48 V	110 V	220/230 V	230	230/240 V
LC1D••••	50 Hz	B5	E5	F5	M5	P5	U5
	60 Hz	B6	E&	F6	M6	-	U6
	50/60 Hz	B7	E7	F7	M7	P7	U7

Engineering

Engineering

What's in This Chapter

This chapter contains information on the application of the Servo Drive system for the engineering phase.

Electromagnetic Compatibility (EMC)

Electromagnetic Compatibility (EMC)

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

⚠ WARNING

SIGNAL AND EQUIPMENT INTERFERENCE

- Only operate the drive with the specified external mains filter.

- Install the wiring in accordance with the EMC requirements described in the present document.

- Verify compliance with the EMC requirements described in the present document.

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

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

Limit Values

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

⚠ WARNING

ELECTROMAGNETIC DISTURBANCES OF SIGNALS AND DEVICES

Use proper EMC shielding techniques to help prevent unintended device operation in accordance with the standard IEC 61800-3.

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

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

> ### ⚠ WARNING
>
> **RADIO INTERFERENCE**
>
> Do not use these products in domestic electrical networks.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

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

Equipotential Bonding Conductors

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

> ### ⚠ WARNING
>
> **UNINTENDED EQUIPMENT OPERATION**
>
> • Ground cable shields for all fast I/O, analog I/O, and communication signals at a single point. [1]
>
> • Route communications and I/O cables separately from power cables.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

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

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

• 16 mm^2 (AWG 4) for equipotential bonding conductors up to a length of 200 m (656 ft)

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

EMC Requirements for the Control Cabinet

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

Additional Measures for EMC Improvement

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

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

External Mains Filters

Filter/Drive Combinations

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

For further information, refer to Electromagnetic compatibility (EMC), page 68.

LXM26D	Mains filter for single-phase connection	Mains filter for three-phase connection
UA5 = 0.05 kW U01 = 0.1 kW U02 = 0.2 kW U04 = 0.4 kW U07 = 0.75 kW U10 = 1 kW	VW3A4420	VW3A4422
U15 = 1.5 kW	VW3A4421	VW3A4422
U20 = 2 kW	-	VW3A4422
U30 = 3 kW	-	VW3A4422
U45 = 4.5 kW	-	VW3A4423

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

Emission

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

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

Lexium 26D	Category
Conducted interference	C3
Radiated emission	C3

Cables

Cables

Suitability of the Cables

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

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

Equipotential Bonding Conductors

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

⚠ **WARNING**
UNINTENDED EQUIPMENT OPERATION
• Ground cable shields for all fast I/O, analog I/O, and communication signals at a single point. [1]
• Route communications and I/O cables separately from power cables.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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

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

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

Conductor Cross Sections According to Method of Installation

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

- Method of installation B2:

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

  Cables on open cable trays

Cross section in mm² (AWG) [1]	Current-carrying capacity with method of installation B2 in A[2]	Current carrying capacity with method of installation E in A[2]
0.75 (18)	8.5	10.4
1 (16)	10.1	12.4

Cross section in mm² (AWG) [1]	Current-carrying capacity with method of installation B2 in A [2]	Current carrying capacity with method of installation E in A [2]
1.5 (14)	13.1	16.1
2.5 (12)	17.4	22
4 (10)	23	30
6 (8)	30	37
10 (6)	40	52
16 (4)	54	70
25 (2)	70	88

(1)	See chapter "Accessories and spare parts", page 63 for available cables.
(2)	Values as per IEC 60204-1 for continuous operation, copper conductors, and ambient air temperature 40 °C (104 °F); see IEC 60204-1 for additional information.

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

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

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

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

Residual Current Device

Residual Current Device

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

⚠ WARNING

DIRECT CURRENT CAN BE INTRODUCED INTO THE PROTECTIVE GROUND CONDUCTOR

- Use a Type A Residual Current Device (RCD / GFCI) or a Residual Current Monitor (RCM) for single-phase drives connected to a phase and to the neutral conductor.

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

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

Conditions for Use of Residual Current Device

- The drive has an increased leakage current at the moment power is applied. Use residual current devices with a response delay.
- High-frequency currents must be filtered.

Rating the Braking Resistor

Rating the Braking Resistor

Braking resistors are required for dynamic applications. During deceleration, the kinetic energy is transformed into electrical energy in the motor. The electrical energy increases the DC bus voltage. The braking resistor is activated when the defined threshold value is exceeded. The braking resistor transforms electrical energy into heat. If highly dynamic deceleration is required, the braking resistor must be well adapted to the system. External driving forces acting on the motor can cause high currents to be regenerated and supplied back to the drive.

> ⚠ **DANGER**
>
> **FIRE DUE TO EXTERNAL DRIVING FORCES ACTING ON MOTOR**
>
> Verify that no external forces can act on the motor that will exceeded the capacity of the braking resistor.
>
> **Failure to follow these instructions will result in death or serious injury.**

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

> ⚠ **WARNING**
>
> **UNINTENDED EQUIPMENT OPERATION**
>
> - Verify that the braking resistor has a sufficient rating by performing a test run under maximum load conditions.
> - Verify that the parameter settings for the braking resistor are correct.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

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

Internal Braking Resistor

Introduction

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

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

LXM26D••M3X	Unit	UA5, U01, U02, U04	U07	U10, U15	U20	U30, U45
Resistance value of internal braking resistor	Ω	100	40			22
Continuous power internal braking resistor P_{PR}	W	60	60			100
Peak energy E_{CR}[1]	Ws	152	380			691
External braking resistor minimum	Ω	25		15	8	
External braking resistor maximum[2]	Ω	50			25	
Maximum continuous power external braking resistor	W	640		1000	1500	2500
Switch-on voltage braking resistor	V	390				
Capacitance of the internal capacitors	µF	820		1640	2110	3280
Energy absorption of internal capacitors E_{var} at nominal voltage 230 V +10%	Ws	8.87		17.76	22.82	35.51

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

External Braking Resistors

Introduction

An external braking resistor is required for applications in which the motor must be decelerated quickly and the internal braking resistor cannot absorb the excess braking energy. The temperature of the braking resistor may exceed 250 °C (482 °F) during operation.

⚠ WARNING

HOT SURFACES

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

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

VW3A760•	Unit	1R•• [1]	2R••	3R••	4R•• [1]	5R••	6R••	7R•• [1]
Resistance	Ω	10	27			72		
Continuous power	W	400	100	200	400	100	200	400
Maximum time in braking at 115 V / 230 V	s	0.72	0.552	1.08	2.64	1.44	3.72	9.6
Peak power at 115 V / 230 V	kW	18.5	6.8			2.6		
Maximum peak energy at 115 V / 230 V	Ws	13300	3800	7400	18100	3700	9600	24700

VW3A760•	Unit	1R•• [1]	2R••	3R••	4R•• [1]	5R••	6R••	7R•• [1]
Degree of protection	-	IP 65						

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

VW3A77•	Unit	04	05
Resistance	Ω	15	10
Continuous power	W	1000	
Maximum time in braking at 115 V / 230 V	s	3.5	1.98
Peak power at 115 V / 230 V	kW	12.3	18.5
Maximum peak energy at 115 V / 230 V	Ws	43100	36500
Degree of protection	-	IP20	

Monitoring Functions

Monitoring Functions

Overview

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

The following monitoring functions are available:

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

Configurable Inputs and Outputs

Configurable Inputs and Outputs

Presentation

This drive has digital inputs and outputs that can be configured. The inputs and outputs have a defined default assignment depending on the operating mode. This assignment can be adapted to the requirements of the customer's installation.

For further details, refer to chapter Operation, page 237.

Wiring

General Wiring
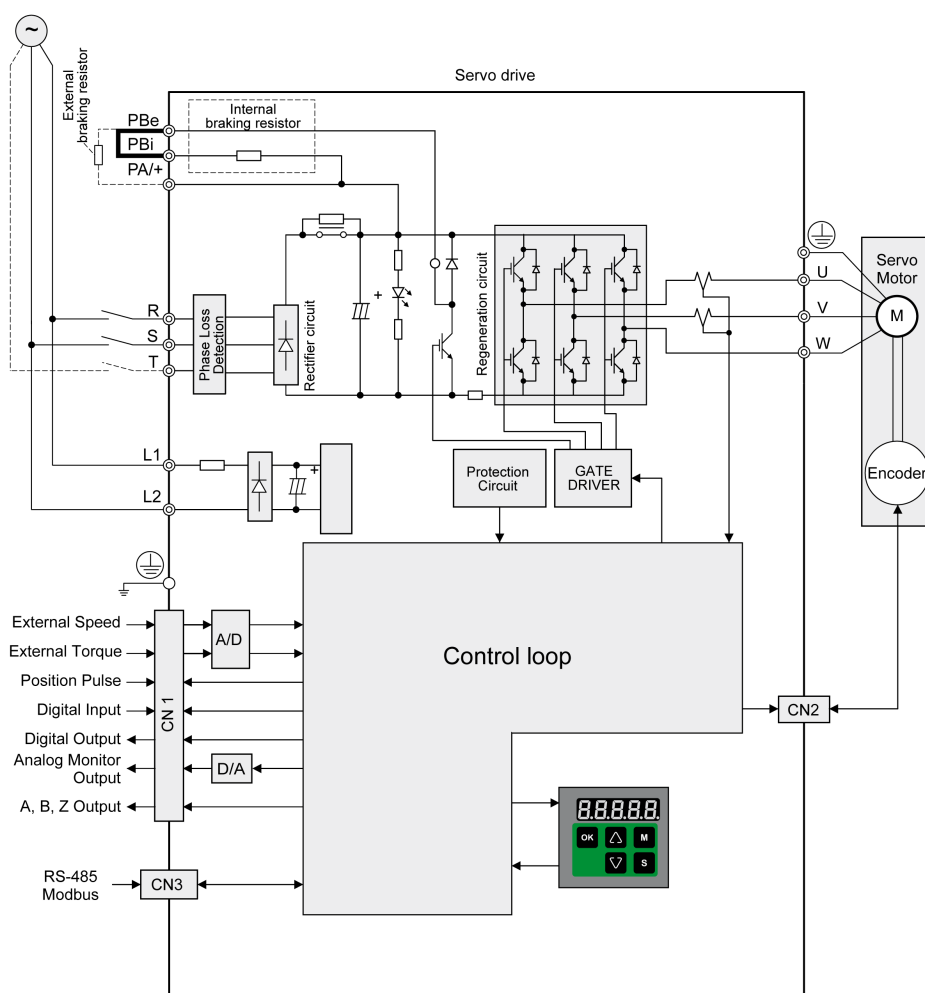
I/O Wiring Example With Modicon M221 Logic Controller

Positive Logic

Wiring example with Modicon M221 Logic Controller (positive logic).
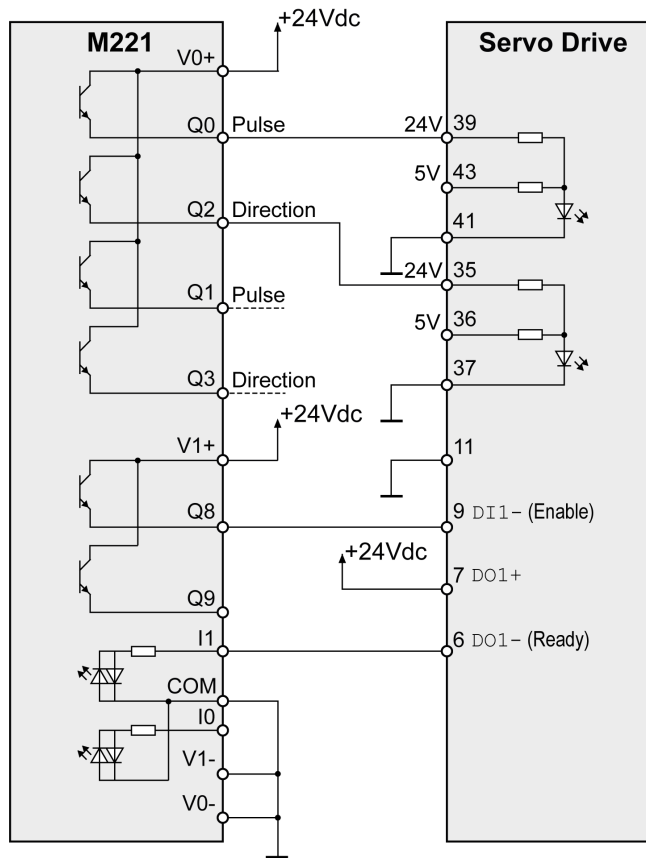
Negative Logic

Wiring example with Modicon M221 Logic Controller (negative logic).
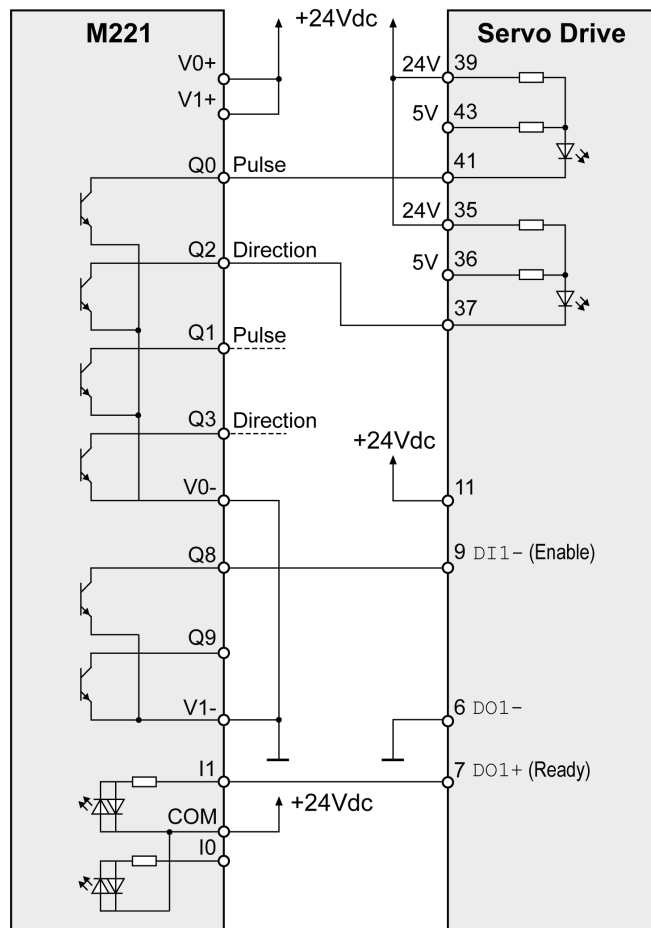
Installation

What's in This Part

Introduction

An engineering phase is mandatory prior to mechanical and electrical installation. For basic information, refer to Engineering, page 68.

⚡⚠ **DANGER**

INSUFFICIENT GROUNDING

- Use a protective ground conductor with at least 10 mm2 (AWG 6) or two protective ground conductors with the cross section of the conductors supplying the power terminals.

- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire drive system.

- Ground the drive system before applying voltage.

- Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.

- Do not use cable shields as protective ground conductors.

- Keep foreign objects from getting into the product.

- Verify the correct seating of seals and cable entries in order to avoid contamination such as deposits and humidity.

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

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

⚠ **DANGER**

FIRE CAUSED BY INCORRECT INSTALLATION

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

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

⚠ WARNING

LOSS OF CONTROL

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

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

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

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

⚠ WARNING

LOSS OF SAFETY FUNCTION CAUSED BY FOREIGN OBJECTS

Protect the system against contamination by conductive substances.

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

The metal surfaces of the product may exceed 65 °C (149 °F) (for bare metal) during operation.

⚠ WARNING

HOT SURFACES

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

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

⚠ CAUTION

INOPERABLE EQUIPMENT DUE TO INCORRECT MAINS VOLTAGE CONNECTION

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

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

Before Mounting

Inspecting the Product

Inspecting the Product

- Verify the product version by means of the type code on the nameplate. Refer to chapter Nameplate, page 24 and chapter Type Code, page 24.
- Prior to mounting, inspect the product for visible damage.

Damaged products may cause electric shock or unintended equipment operation.

> ### ⚠⚠ DANGER
> **ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION**
> - Do not use damaged products.
> - Keep foreign objects (such as chips, screws or wire clippings) from getting into the product.
>
> **Failure to follow these instructions will result in death or serious injury.**

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

Scope of Supply

Drive

- Drive Lexium 26D
- Connector kit with 3 connectors for:
  - Power stage supply and logic supply
  - Braking resistor

    Including jumper between **PBi** and **PBe**
  - Motor
- Plastic tool for opening the spring terminals (available for devices from 50 W to 1.5 kW)
- Adhesive hazard label (Chinese)
- Instruction sheet for the product

Motor

- BCH2 servo motor
- BCH2•R: 2 eyebolts
- Information sheet for the product

Drive Installation

Mechanical Installation Drive

⚡⚠DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

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

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

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

⚠WARNING

LOSS OF SAFETY FUNCTION CAUSED BY FOREIGN OBJECTS

Protect the system against contamination by conductive substances.

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

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

⚠WARNING

HOT SURFACES

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

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

Attaching a Hazard Label with Safety Instructions

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

- Select the hazard label suitable for the target country.

  Respect the safety regulations in the target country.

- Attach the hazard label to the front of the device so that it is clearly visible.

Control Cabinet

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

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

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

Mounting Distances, Ventilation

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

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

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

Mounting distances and air circulation
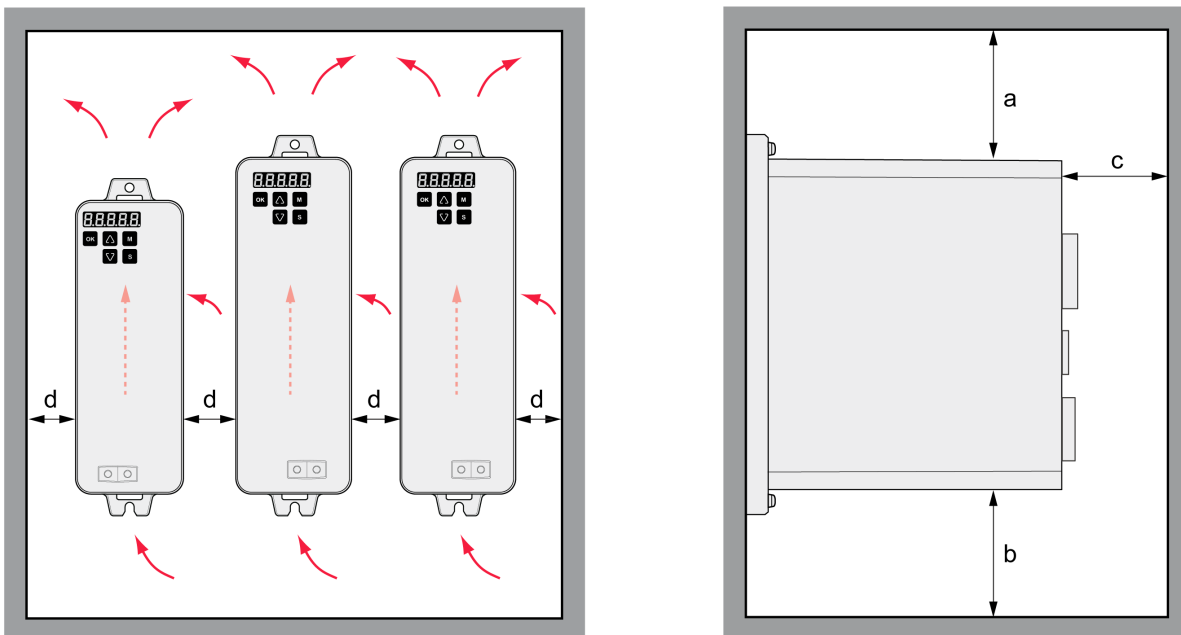
LXM26DUA5, U01, U02, U04, U07, U10, U15, U20, U30, U45

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

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

Mounting the Drive

For further information on the dimensions of the mounting holes, refer to chapter Dimensions, page 27.

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

- Respect the ambient conditions in chapter Environmental Conditions, page 25.
- Mount the device in a vertical position (±10°).

Electrical Installation Drive

Introduction

> ### ⚠⚠ DANGER
>
> **INSUFFICIENT GROUNDING**
>
> - Use a protective ground conductor with at least 10 mm2 (AWG 6) or two protective ground conductors with the cross section of the conductors supplying the power terminals.
> - Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire drive system.
> - Ground the drive system before applying voltage.
> - Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.
> - Do not use cable shields as protective ground conductors.
> - Keep foreign objects from getting into the product.
> - Verify the correct seating of seals and cable entries in order to avoid contamination such as deposits and humidity.
>
> **Failure to follow these instructions will result in death or serious injury.**

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

> ## ⚠ WARNING
>
> **DIRECT CURRENT CAN BE INTRODUCED INTO THE PROTECTIVE GROUND CONDUCTOR**
>
> - Use a Type A Residual Current Device (RCD / GFCI) or a Residual Current Monitor (RCM) for single-phase drives connected to a phase and to the neutral conductor.
> - Use a Type B Residual Current Device (RCD / GFCI) or a Residual Current Monitor (RCM) that has approval for use with frequency inverters and is sensitive to all types of current for three-phase drives and for single-phase drives not connected to a phase and the neutral conductor.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The entire installation procedure must be performed without voltage present.

LXM26DUA5 … U15   LXM26DU20   LXM26DU30, U45
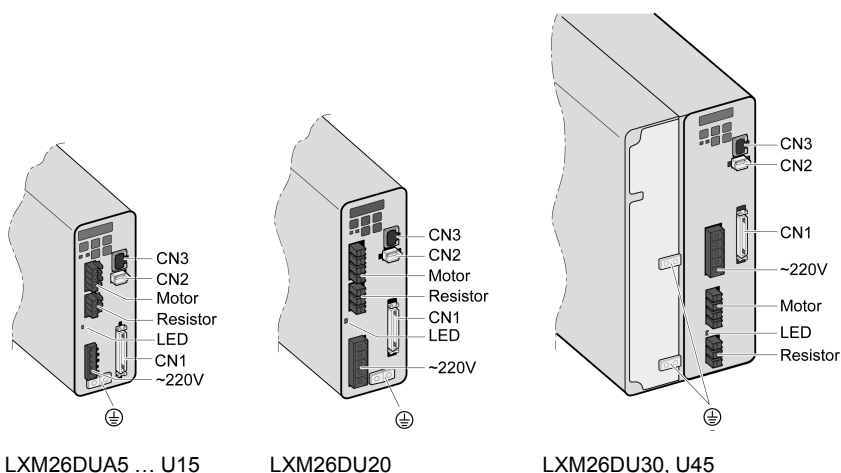
Item	Description	Refer to
CN1	Signal interface For connecting master controller or I/O signals.	Connection I/O Interface (CN1), page 86
CN2	Connection for motor encoder	Connecting the Motor Encoder (CN2), page 98
CN3	Modbus (commissioning interface) For connecting PC via converter TCSMCNAM3M002P	Connection PC (CN3), page 99
~220V	Power stage supply (R,S,T) and logic supply (L1, L2)	Connection Logic Supply and Power Stage Supply (~220V), page 101
LED	DC bus LED The LED is illuminated when mains voltage or internal charge are present. The DC bus LED is not an indicator of the absence of DC bus voltage.	-
Resistor	Connection for external braking resistor	Connection braking resistor (Resistor), page 104
Motor	Motor phases connection (U, V, W, PE)	Connecting the motor phases (Motor), page 106

Connection Grounding Screw

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

⚠⚠⚠ DANGER

INSUFFICIENT GROUNDING

- Use a protective ground conductor with at least 10 mm2 (AWG 6) or two protective ground conductors with the cross section of the conductors supplying the power terminals.

- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire drive system.

- Ground the drive system before applying voltage.

- Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.

- Do not use cable shields as protective ground conductors.

- Keep foreign objects from getting into the product.

- Verify the correct seating of seals and cable entries in order to avoid contamination such as deposits and humidity.

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

The central grounding screws of the product are located at the front side.
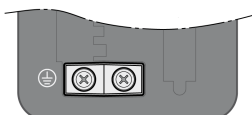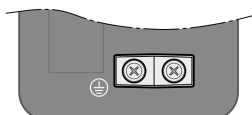
LXM26DUA5…U15   LXM26DU20   LXM26DU30, U45
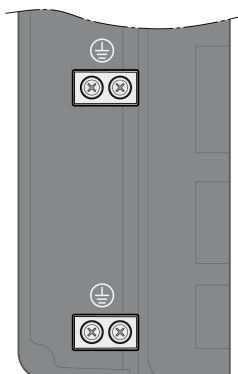
- Use ring-type cable lugs or fork-type cable lugs.

- Connect the ground connection of the device to the equipotential ground plane of your system.

LXM26D	Unit	UA5, U01, U02, U04, U07, U10, U15, U20, U30, U45
Tightening torque of grounding screw	Nm	1.3
	(lb.in)	(11.5)
Screw type	-	M4 x 8 socket button head screw

Connection I/O Interface (CN1)

The I/O Interface (CN1) is a D-Sub 50-pin female connector. The following table describes the contacts of the connector:

Pin	Signal	Meaning	Pin	Signal	Meaning
1	DO4+	Digital output 4	2	DO3-	Digital output 3
3	DO3+	Digital output 3	4	DO2-	Digital output 2
5	DO2+	Digital output 2	6	DO1-	Digital output 1

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Prefabricated Cable VW3M1C10R••

Color assignments of the prefabricated cable connected to the I/O interface (CN1):
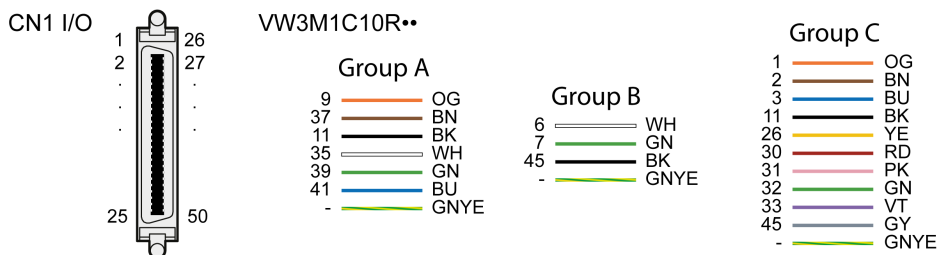
VW3M1C10R•• Pinout

Group A			Group B			Group C		
Pin	Signal	Color	Pin	Signal	Color	Pin	Signal	Color
9	DI1-	OG	6	DO1-	WH	1	DO4+	OG
37		BN	7	DO1+	GN	2	DO3-	BN
11	COM	BK	45	COM-	BK	3	DO3+	BU
35		WH				11	COM	BK
39		GN		-		26	DO4-	YE
41		BU				30	DI8-	RD
	-					31	DI7-	PK
						32	DI6-	GN
						33	DI5-	VT
						45	COM-	BY

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

Inputs and Outputs Signals

The following inputs and outputs signals are available:

- Analog inputs and outputs, page 89
- Pulse input (open collector, negative logic), page 89
- Pulse input (open collector, positive logic), page 90
- Pulse input (line driver), page 91
- High-speed pulse input (line driver), page 92
- Digital outputs (negative logic), page 92
- Digital outputs (positive logic), page 94
- Digital inputs (negative logic), page 95
- Digital inputs (positive logic), page 96
- Encoder output (signal), page 97

Analog Inputs and Outputs

Example of reference value via analog input:
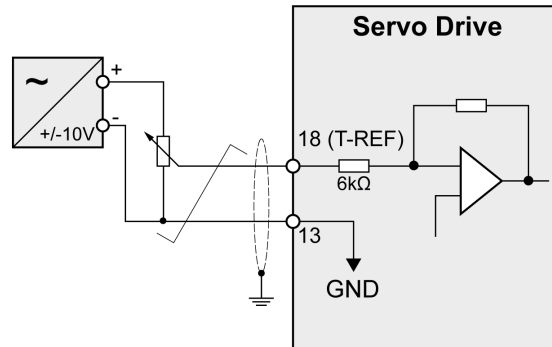
Example of analog output:
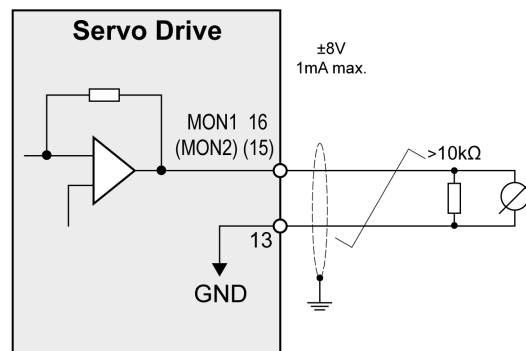
Pulse Input (Open Collector, Negative Logic)

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

Example of pulse input (open collector) with internal power supply (negative logic).
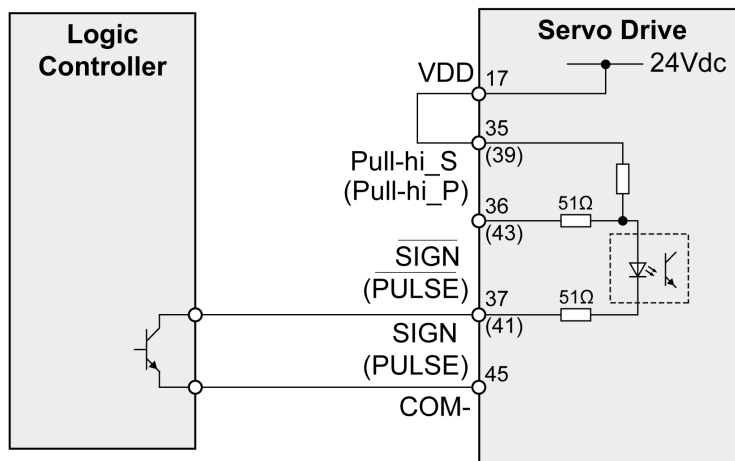
Example of pulse input (open collector) with external power supply (negative logic).

Pulse Input (Open Collector, Positive Logic)

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

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

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

Pulse Input (Line Driver)

Example of pulse input (line driver).

High-Speed Pulses

Example of high-speed pulse input (line driver).
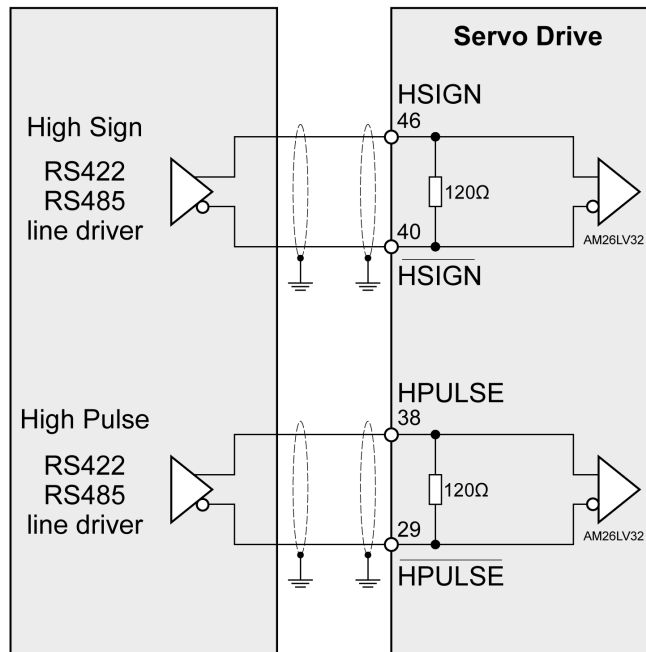
Connect the cable shield to the equipotential ground of your controller/drive electrical system.

Wiring of the Digital Outputs (Negative Logic)

Example of digital outputs DO1 ... DO5 with internal power supply (negative logic):
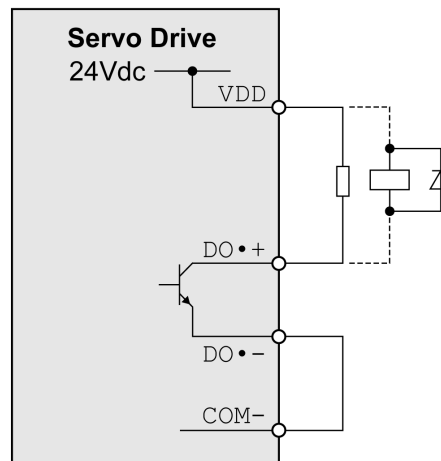
Example of digital outputs DO1 ... DO5 with external power supply (negative logic):
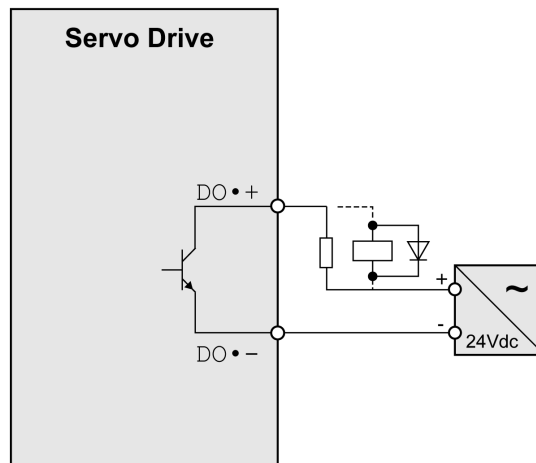
Example of digital output DO6 (OCZ) with internal power supply (negative logic):
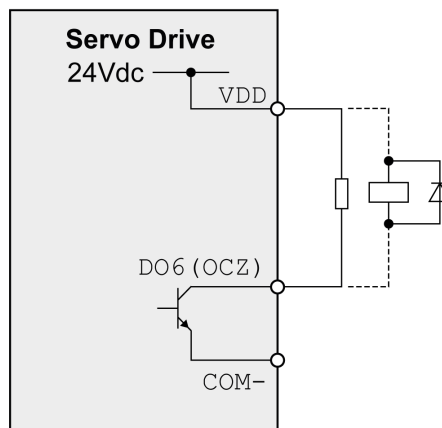
Example of digital output DO6 (OCZ) with external power supply (negative logic):

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

⚠ CAUTION

OUTPUT CIRCUIT DAMAGE DUE TO INDUCTIVE LOADS

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

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

A diode can be used to protect the signal outputs against inductive loads.

Use a diode with the following ratings:

- Reverse withstand voltage: voltage of signal output times 10
- Forward current: greater than the load current

Wiring of the Digital Outputs (Positive Logic)

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

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

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

⚠CAUTION

OUTPUT CIRCUIT DAMAGE DUE TO INDUCTIVE LOADS

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

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

A diode can be used to protect the signal outputs against inductive loads. Use a diode with the following ratings:

Reverse withstand voltage: voltage of signal output times 10

Forward current: greater than the load current

Wiring of the Digital Inputs (Negative Logic)

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

Example of digital input (negative logic) with internal power supply:
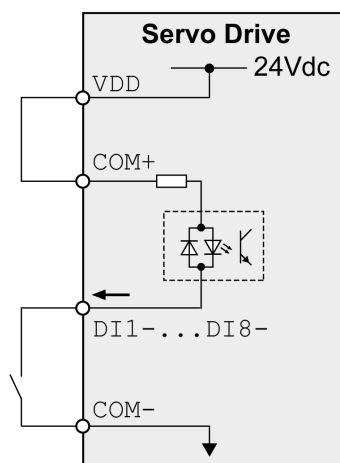
Example of digital input (negative logic) with external power supply:
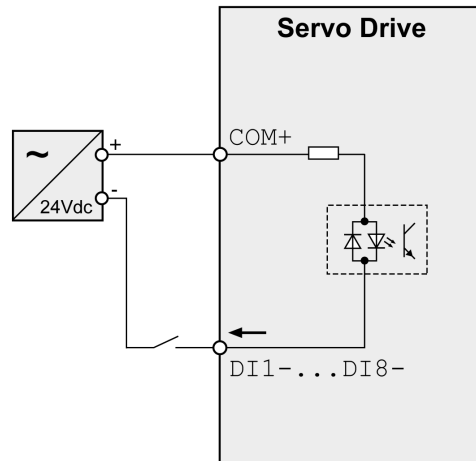
Wiring of the Digital Inputs (Positive Logic)

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

Example of digital input with internal power supply (positive logic):
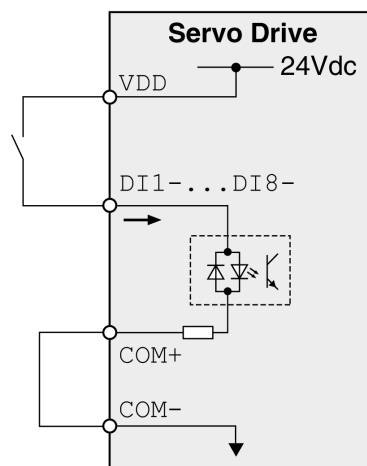
Example of digital input with external power supply (positive logic):
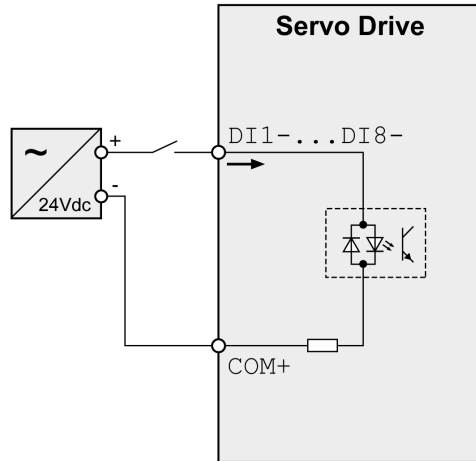
Encoder Output Signal

Example of encoder output signal Line Driver.
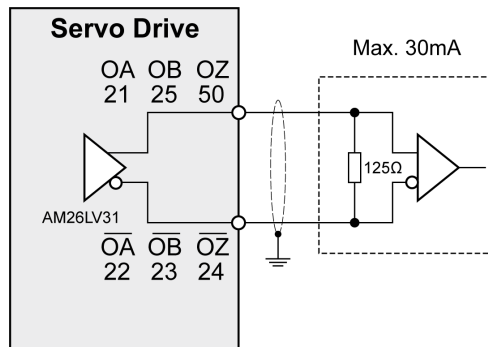
Example of encoder output signal, high-speed optocoupler.
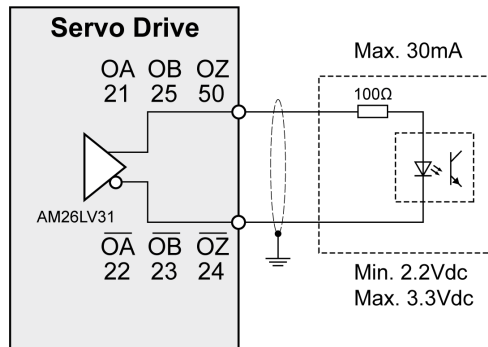
Connecting the Motor Encoder (CN2)

Function and Encoder Type

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

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table, page 17.

Cable Specifications

For further information, refer to chapter Cables, page 71.

Shield:	Required, both ends grounded
Twisted Pair:	Required
PELV:	Required
Cable composition:	10 x 0.13 mm² (10 x AWG 24)
Maximum cable length:	20 m (65.6 ft)
Special characteristics:	Fieldbus cables are not suitable for connecting encoders.

NOTE: Use pre-assembled cables to reduce the risk of wiring errors.

Wiring Diagram

Connection assignment motor encoder (CN2)
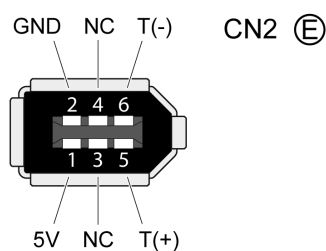
The motor encoder interface (CN2) is a 6-pin connector. The following table describes the contacts of the connector:

Pin	Signal	Color(1)	Meaning	Motor military connector	Motor plastic connector	I/O
5	T+	Blue (BU)	Serial communication	A	1	I/O
6	T-	Blue/Black (BU/BK)		B	4	
1	+5 V	Red, red/white (RD, RD/WH)	5 V encoder supply	S	7	I
2	GND	Black, black/white (BK, BK/WH)	Reference potential for encoder supply	R	8	O
3, 4	N.C.	Reserved	-	-	-	-
(1)			Color information relates to the cables available as accessories.			

> # ⚠ WARNING
>
> **UNINTENDED EQUIPMENT OPERATION**
>
> Do not connect any wiring to reserved, unused connections, or to connections designated as No Connection (N.C.).
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Connecting the Motor Encoder

- Verify that wiring, cables, and connected interface meet the PELV requirements.
- Note the information on EMC, see chapter Electromagnetic Compatibility (EMC), page 68. Use equipotential bonding conductors for equipotential bonding.
- Connect the connector to
  - CN2 Encoder if using a motor equipped with a single turn encoder.
  - the battery compartment if using a motor equipped with a multi turn encoder.
- Verify that the connector locks snap in properly at the housing.

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

Connecting the Battery Compartment When Using a Motor Equipped With a Multi Turn Encoder

The battery compartment is connected to CN2 Encoder, between the drive and the motor encoder cable.

NOTE: The multi turn counting is preserved through power down by the external battery located into the battery compartment.

For further information on the battery replacement, refer to the maintenance of the motor, page 310.

For LXM26D···UA5 …U45, the battery compartment should be installed on a baseplate near the drive

Connection PC (CN3)

Function

The commissioning interface (CN3) is an RS-485 connection, supported on an RJ45 connector. If the PC used to connect to the commissioning interface has an RS-485 port, typically supported on a DB9 connector, you can connect it to this connector (RJ45 / DB9 cable). Otherwise, you can use the USB port of the PC with a USB to RS-485 converter.

The commissioning interface may only be used for a point-to-point connection, but not for a point-to-multipoint connection (RS-485 network).

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

NOTICE

INOPERABLE EQUIPMENT

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

Failure to follow these instructions can result in equipment damage.

Connecting a PC

A PC with the commissioning software LXM26 DTM Library can be connected for commissioning. The PC is connected via a bidirectional USB/RS485 converter, refer to Accessories and Spare Parts, page 63.

Cable Specifications

For further information, refer to chapter Cables, page 71.

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

Wiring Diagram

Wiring diagram PC with commissioning software
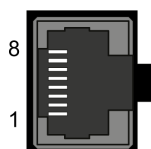
CN3 Modbus

The commissioning interface (CN3) is an RJ45 connector. The following table describes the contacts of the connector:

Pin	Signal	Meaning	I/O
1 ... 3	-	Reserved	-
4	MOD_D1[1]	Bidirectional transmit/receive signal	RS-485 level
5	MOD_D0[1]	Bidirectional transmit/receive signal, inverted	
6 ... 7	-	Reserved	-
8 and connector housing	SHLD	Functional ground / shield - internally connected to ground potential of the drive	-

(1)	No polarization.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

NOTE: Verify that the connector locks snap in properly at the housing.

Connection Logic Supply and Power Stage Supply (~220V)

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

⚠⚠ DANGER

INSUFFICIENT GROUNDING

- Use a protective ground conductor with at least 10 mm2 (AWG 6) or two protective ground conductors with the cross section of the conductors supplying the power terminals.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire drive system.
- Ground the drive system before applying voltage.
- Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.
- Do not use cable shields as protective ground conductors.
- Keep foreign objects from getting into the product.
- Verify the correct seating of seals and cable entries in order to avoid contamination such as deposits and humidity.

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

⚠ WARNING

INSUFFICIENT PROTECTION AGAINST OVERCURRENT

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

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

⚠ WARNING

INCORRECT MAINS VOLTAGE

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

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

The equipment, drives and motors, are intended for industrial use and may only be operated with a permanently installed connection.

Prior to connecting the equipment, verify the approved mains types, see chapter Electrical Data Drive, page 28.

Cable Specifications

Respect the required cable properties in chapter Cables, page 71 and in chapter Electromagnetic Compatibility (EMC), page 68.

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

Properties of the Terminals

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

LXM26D	Unit	UA5, U01, U02, U04, U07, U10, U15	U20, U30, U45
Connection cross section	mm²	0.75 ... 2.5	0.75 ... 6
	(AWG)	(20 ... 14)	(20 ... 10)
Stripping length	mm	8 ... 9	15
	(in)	(0.31 ... 0.35)	(0.59)

Prerequisites for Connecting the Logic Supply

Note the following information:

- Use upstream mains fuses. For further information about fuse types and fuse ratings, refer to chapter Electrical Data Drive, page 28.
- Note the EMC requirements. Where required, use surge arresters and mains reactors.
- If the length of the mains cable between the external mains filter and the drive exceeds 200 mm (7.87 in), it must be shielded and grounded at both ends.
- For a UL-compliant design, refer to chapter Conditions for UL 508C, page 20.

Connection Logic Supply

UA5, U01, U02, U04, U07, U10, U15, U20, U30, U45

~220V
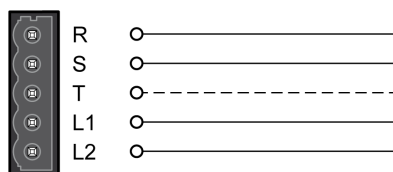
Connection	Meaning
R, S, (T)	Power stage supply
L1, L2	Logic supply

- Verify the type of mains. For the approved types of mains, refer to chapter Electrical Data Drive, page 28.
- Connect the mains cable.
- Verify that the connector locks snap in properly at the housing.

Wiring Diagram for Devices That Can Be Connected Via a Single-Phase or Three Phases

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

Wiring diagram for devices that can be connected via a single-phase or three-phases
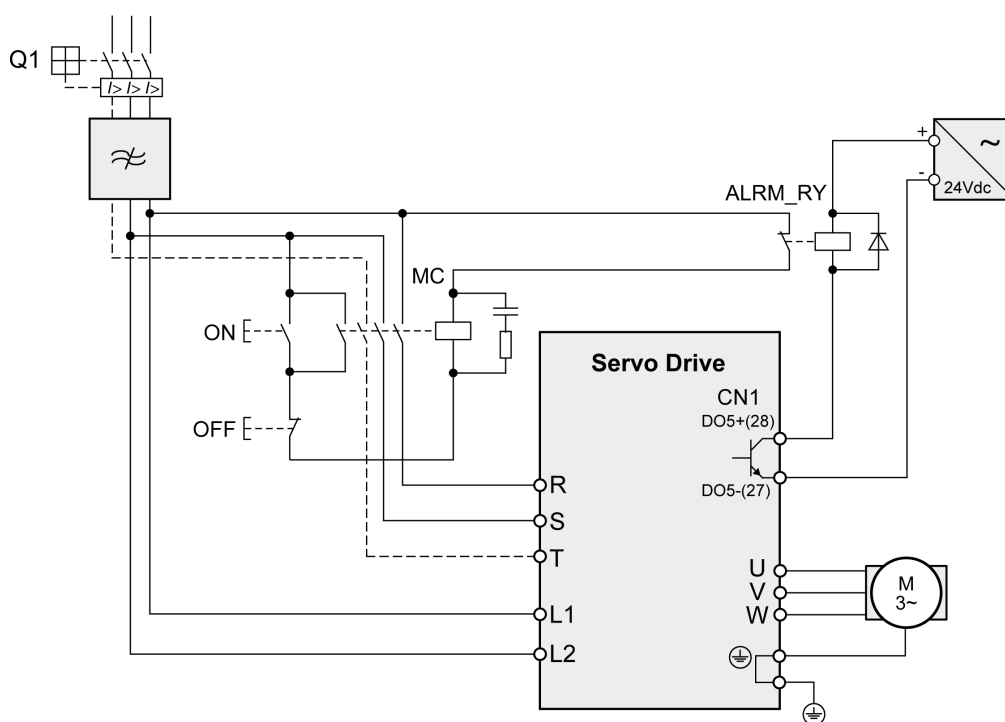
Connection Braking Resistor (Resistor)

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

⚠ **WARNING**
UNINTENDED EQUIPMENT OPERATION
• Verify that the braking resistor has a sufficient rating by performing a test run under maximum load conditions.
• Verify that the parameter settings for the braking resistor are correct.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Internal Braking Resistor

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

External Braking Resistor

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

Selection and rating of the external braking resistor are described in chapter Rating the Braking Resistor, page 73. For suitable braking resistors, refer to chapter Accessories and Spare Parts, page 65.

Cable Specifications

For further information, refer to chapter Cables, page 71.

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

The braking resistors listed in chapter Accessories and Spare Parts, page 65 have a 3-wire, temperature-resistant cable with a length of 0.75 m (2.46 ft) to 3 m (9.84 ft).

Properties of the Terminals (Resistor) LXM26DUA5, U01, U02, U04, U07, U10, U15, U20, U30, U45

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

LXM26D	Unit	UA5, U01, U02, U04, U07, U10, U15	U20, U30, U45
Connection cross section	mm²	0.75 ... 2.5	0.75 ... 6
	(AWG)	(20 ... 14)	(20 ... 10)
Stripping length	mm	8 ... 9	15
	(in)	(0.31 ... 0.35)	(0.59)

The removable terminals are approved for fine-stranded conductors and solid conductors. Respect the maximum permissible connection cross section. Take into account the fact that cable ends (ferrules) increase the conductor cross section.

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

Wiring Diagram

Wiring diagram internal braking resistor activated

LXM26DUA5...U45
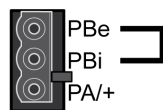
Wiring diagram external braking resistor

LXM26DUA5...U45
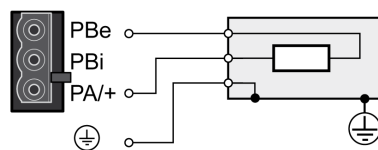
Connecting the External Braking Resistor

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

⚠DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

Connecting the Motor Phases (Motor)

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

⚡⚠DANGER

ELECTRIC SHOCK

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

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

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

⚠⚠DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT WIRING

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

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

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

⚠WARNING

UNINTENDED MOVEMENT

Only use approved combinations of drive and motor.

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

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table, page 17.

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

Cable Specifications

For further information, refer to chapter Cables, page 71.

Shield:	Required, both ends grounded
Twisted Pair:	-
PELV:	The wires for the holding brake must be PELV-compliant.
Cable composition:	3 wires for motor phases The conductors must have a sufficiently large cross section so that the fuse at the mains connection can trip if required.
Maximum cable length:	Depends on the required limit values for conducted interference. Category C3: 20 m (65.6 ft)
Special characteristics:	Contains wires for the temperature sensor

Note the following information:

- You may only connect the original motor cable.
- If you do not connect the wires at the motor end, you must isolate each wire individually (inductive voltages).

- Use pre-assembled cables to reduce the risk of wiring errors.

Properties of the Terminals (Motor)

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

LXM26D	Unit	UA5, U01, U02, U04, U07, U10, U15	U20, U30, U45
Connection cross section	mm²	0.75 ... 2.5	0.75 ... 6
	(AWG)	(20 ... 14)	(20 ... 10)
Stripping length	mm	8 ... 9	15
	(in)	(0.31 ... 0.35)	(0.59)

Monitoring

The drive monitors the motor phases for:

- Short circuit between the motor phases
- Short circuit between the motor phases and ground (Not applicable for LXM26DUA5 … U07 M3X.)

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

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

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

Wiring Diagram Motor

LXM26DUA5…U45
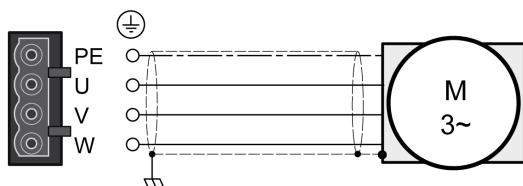
Connection	Meaning	Color[1] (IEC 757)
U		Red (RD)
V	Motor phase	White (WH)
W		Black (BK)
PE	Protective ground conductor	Green/Yellow (GN/YE)
(1)	Color information relates to the cables available as accessories.	

Connecting the Motor Cable

- Note the information on EMC, refer to chapter Electromagnetic Compatibility (EMC), page 68.

- Connect the motor phases and protective ground conductor to the connector labelled **Motor**. Verify that the connections U, V, W, and PE (ground) match at the motor and the device.

- If the product is equipped with removable connectors, Verify that the connector locks snap in properly at the housing.

Holding Brake Connection

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

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

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

The factory settings for the signal outputs depend on the operating mode, see chapter Setting the Digital Signal Outputs, page 244. Depending on the operating mode, the signal output function is either assigned to the digital output DO4 or not assigned at all. When you reset the drive to the factory settings with P2-08 = 10, the assignments of the signal output functions are also reset to the factory settings.

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

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the digital output to which you have assigned the signal output function BRKR has been properly wired and configured.

- Before switching to a different operating mode, verify that the signal output function BRKR for the holding brake will not be assigned to an incorrect digital output in the new operating mode.

- Before resetting the drive to the factory settings, verify that the signal output function BRKR for the holding brake will be assigned to the correct digital output or reassign the signal output function BRKR after the factory reset according to the requirements of your application prior to starting the system.

- In all cases, take all necessary measures to prevent unintended movements of the load caused by a release of the holding brake.

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

Example (negative logic) of wiring the holding brake
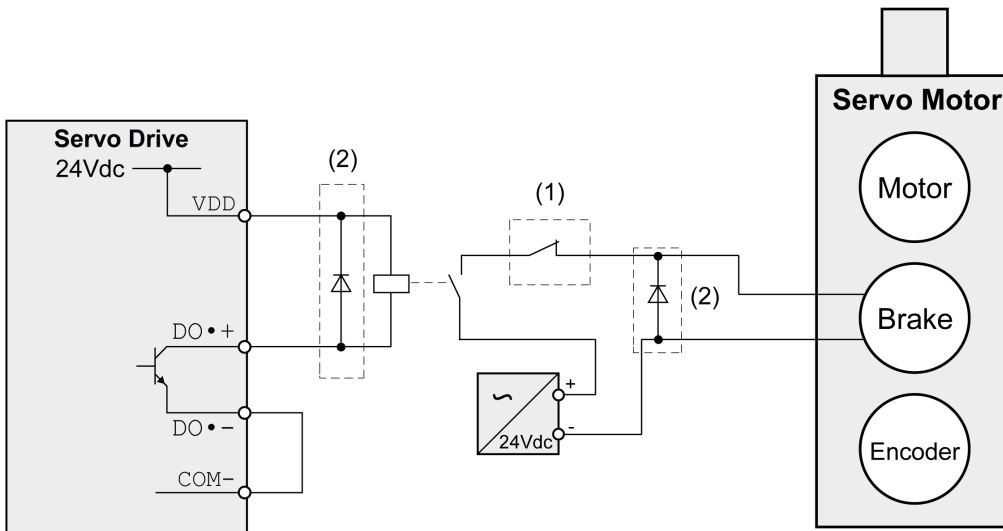
Item	Description
1	Triggering an EMERGENCY STOP should apply the holding brake
2	Flyback diode

Motor Installation

What's in This Chapter

Mechanical Installation Motor

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

⚠ WARNING

HEAVY AND/OR FALLING PARTS

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

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

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

⚠ WARNING

ELECTROMAGNETIC FIELDS

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

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

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

⚠ WARNING

HOT SURFACES

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

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

⚠ CAUTION
IMPROPER APPLICATION OF FORCES
• Do not use the motor as a step to climb into or onto the machine.
• Do not use the motor as a load-bearing part.
• Use hazard labels and guards on your machine to help prevent the improper application of forces on the motor.
Failure to follow these instructions can result in injury or equipment damage.

Mounting Position

The following mounting positions are defined and permissible as per IEC 60034-7:
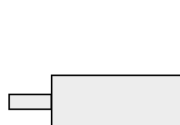
IM B5   IM V1   IM V3

Mounting

When the motor is mounted to the mounting surface, it must be accurately aligned axially and radially and make even contact with the mounting surface. All mounting screws must be tightened with the specified tightening torque. No uneven mechanical load may be applied while the mounting screws are tightened. For data, dimensions, and degrees of protection (IP), refer to chapter Motor, page 37.

Mounting Situation

NOTICE
FORCES APPLIED TO THE REAR SIDE OF THE MOTOR
• Do not place the motor on the rear side.
• Protect the rear side of the motor from impact.
• Do not lift motors via the rear side.
• Only lift motors equipped with eyebolts via the eyebolts.
Failure to follow these instructions can result in equipment damage.

Special Characteristics BCH2•H, BCH2•M, BCH2•R

Rear side of motor
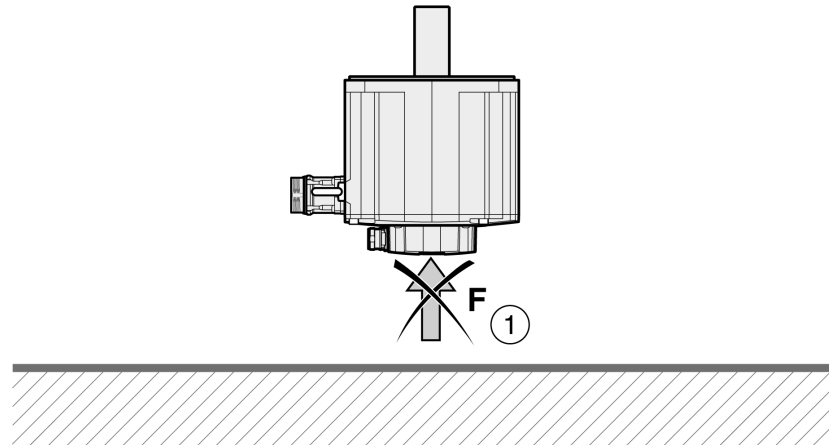
Item	Description
1	Protect the rear side of the motor from application of forces.

Eyebolts BCH2•R

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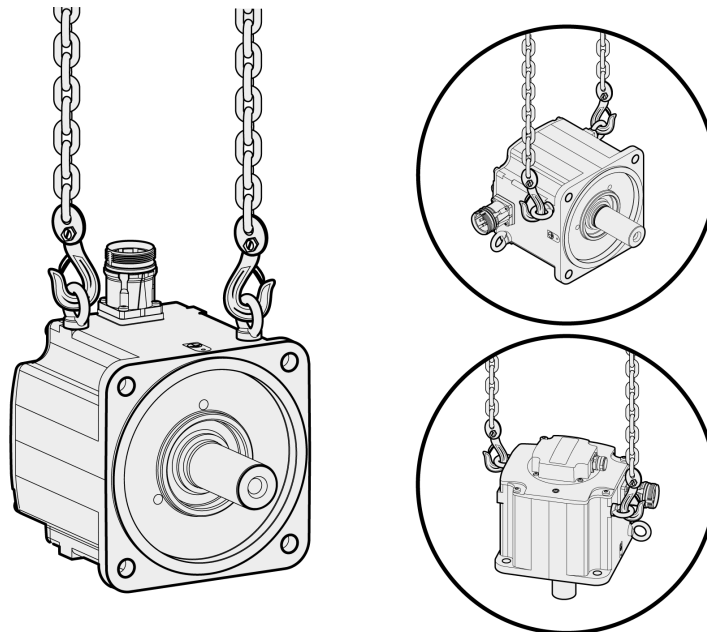
Connections and Pin Assignments

Connection overview
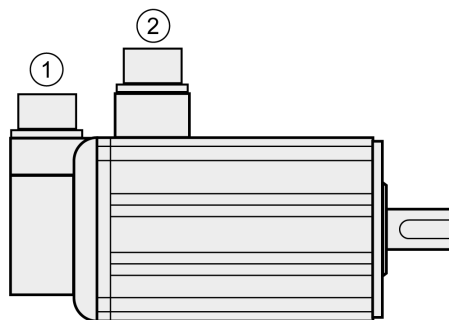
Item	Description
1	Encoder connection
2	Motor connection

Pin Assignment Motor Connection

Pin assignments of motor phases and holding brake

Motor connection plastic connector (type A and type B), drive side:

Motor connection MIL connector (type C and type D), motor side:
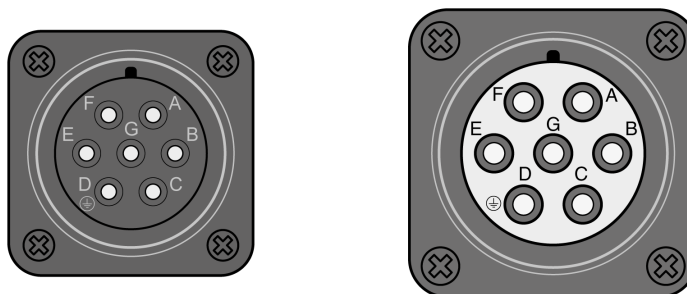
Pin Type A	Pin Type B	Pin Type C and D	Signal	Meaning	Color[1] (IEC 757)	
					Plastic connector	ML connector
1	1	E	U	Motor phase U	Grey (GY)	White (WH)
2	2	G	V	Motor phase V	Black (BK)	Black (BK)
3	4	B	W	Motor phase W	Brown (BN)	Red (RD)
4	5	D	PE	Protective ground (protective earth)	Green/Yellow (GN/YE)	Green/Yellow (GN/YE)

–	3	F	BRAKE_24V	Supply voltage holding brake 24 Vdc	Brown (BN)	Red (RD)
–	6	A	BRAKE_0V	Reference potential holding brake 0 Vdc	White (WH)	Black (BK)
–	–	C	–	Reserved	–	–
(1) Color information relates to the cables available as accessories.						

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Pin Assignment Encoder Connection

Pin assignment of the encoder.

Encoder connection plastic connector (Type A), drive side:
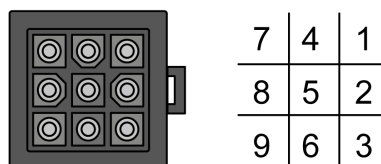
Encoder connection MIL connector (Type B), motor side:
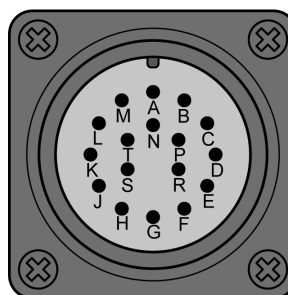
Pin Type A	Pin Type B	Signal	Meaning	Color(1) (IEC 757)
1	A	T+	Data	Blue (BU)
2	C	–	Reserved	–
3	D	–	Reserved	–
4	B	T-	Data	Blue/Black (BU/BK)
5	F	Battery +	Battery +(2)	Red (RD)
6	G	Battery -	Battery -(2)	Black (BK)
7	S	DC+5 V	Supply voltage	Red/White (RD/WH)
8	R	GND	Reference potential	Black/White (BK/WH)
9	L	Shield	Shield	Black (BK)
–	E	–	Reserved	–

Pin Type A	Pin Type B	Signal	Meaning	Color[1] (IEC 757)
–	H	–	Reserved	–
–	J	–	Reserved	–
–	K	–	Reserved	–
–	M	–	Reserved	–
–	N	–	Reserved	–
–	P	–	Reserved	–
–	T	–	Reserved	–

[1] Color information relates to the cables available as accessories.

[2] Used with multi turn encoders.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Mating Connector

For suitable mating connectors, refer to chapter Connectors and Adapters, page 63.

Connection of Motor and Encoder

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

⚠ DANGER

FIRE HAZARD DUE TO INCORRECT CONNECTION

Only connect the motor to a matching, approved drive.

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

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table, page 17.

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

⚠⚠ DANGER

ELECTRIC SHOCK

- Verify that no voltage is present prior to performing any type of work on the drive system.

- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.

- Insulate both ends of unused conductors of the motor cable.

- Supplement the motor cable grounding conductor with an additional protective ground conductor to the motor housing.

- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.

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

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

⚠ WARNING

UNINTENDED MOVEMENT

Only use approved combinations of drive and motor.

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

Compatibility between Drive and Motor is defined in the

Protective Ground Conductor Connection
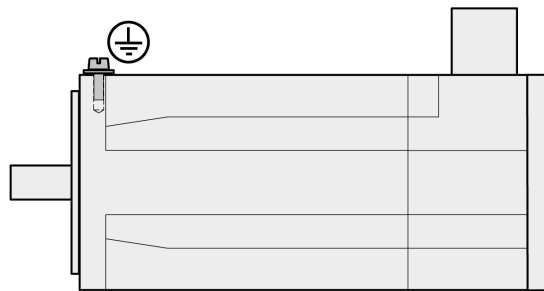
- Ground the motor via a grounding screw if grounding via the flange and the protective ground conductor of the motor cable is not sufficient.

- Use parts with suitable corrosion protection.

Connecting the Cables

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

> ## ⚠⚠⚠DANGER
> **ELECTRIC SHOCK, ARC FLASH AND FIRE CAUSED BY INCORRECT INSTALLATION OF THE CABLE**
> * Disconnect all power before plugging in or unplugging the connectors.
> * Verify correct pin assignment of the connectors according to the specifications in this chapter before connecting the cables.
> * Verify that the connectors are properly inserted and locked before applying power.
> * Avoid forces or movements of the cable at the cable entries.
>
> **Failure to follow these instructions will result in death or serious injury.**

* Connect the motor cable and the encoder cable to the drive according to the wiring diagram of the drive.
* If your motor is equipped with a holding brake, follow the instructions in chapter Holding Brake Connection, page 118.

Holding Brake Connection

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

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

See chapter Holding Brake Connection, page 109 for additional information.

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

> ## ⚠⚠⚠DANGER
> **ELECTRIC SHOCK CAUSED BY DAMAGE TO THE MOTOR CABLE**
> * Use a PELV power supply for the holding brake.
> * Insulate both ends of unused conductors of the motor cable.
>
> **Failure to follow these instructions will result in death or serious injury.**

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

> ## ⚠WARNING
> **UNINTENDED MOVEMENT**
> * Verify that there are no persons or obstacles in the zone of operation when performing a test of the holding brake.
> * Take appropriate measures to avoid damage caused by falling or lowering loads or other unintended movements.
> * Run initial tests without coupled loads.
> * Verify that a functioning emergency stop push-button is within reach of all persons involved in running tests.
> * Anticipate movements in unintended directions or oscillations of the motor.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Cable Specifications

For further information on cable specifications, refer to chapter Cables, page 71.

Verifying Installation

What's in This Chapter

Verifying Installation

Verify the mechanical installation of the entire drive system:

- Does the installation meet the specified distance requirements?
- Did you tighten all fastening screws with the specified tightening torque?

Verify the electrical connections and the wiring:

- Did you connect all protective ground conductors?
- Do all fuses have the correct rating; are the fuses of the specified type?
- Did you connect all wires of the cables or insulate them?
- Did you properly connect and install all cables and connectors?
- Are the mechanical locks of the connectors correct and effective?
- Did you properly connect the signal wires?
- Are the required shield connections EMC-compliant?
- Did you take all measures for EMC compliance?
- Does the drive installation conform to all local, regional, and national electrical safety codes for the eventual placement of the equipment?

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

Commissioning

What's in This Part

Overview

What's in This Chapter

General

You must recommission an already configured device if you want to use it under different operating conditions.

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

⚠ WARNING

LOSS OF BRAKING FORCE DUE TO WEAR OR HIGH TEMPERATURE

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

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

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

⚠ WARNING

HOT SURFACES

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

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

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

⚠ WARNING

MOVING, UNGUARDED EQUIPMENT

Verify that rotating parts cannot cause injuries or equipment damage.

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

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

⚠ WARNING

UNINTENDED MOVEMENT

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

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

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Commissioning Tools

Overview

The can be used for commissioning, parameterization, and diagnostics:
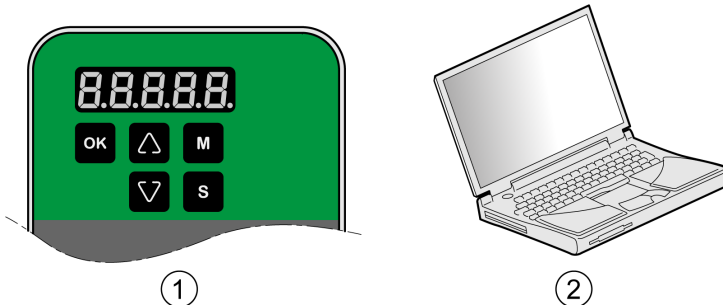
Item	Description
1	Integrated HMI
2	PC with commissioning software LXM26 DTM Library

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

Integrated HMI

What's in This Chapter

Overview

The integrated HMI allows you to edit parameters, start the operating mode Jog or perform autotuning via the integrated Human-Machine Interface (HMI). Diagnostics information (such as parameter values or error codes) can also be displayed. The individual sections on commissioning and operation include information on whether a function can be carried out via the integrated HMI or whether the commissioning software must be used.
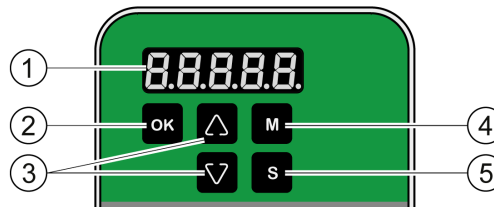
Item	Description
1	5-digit 7-segment display
2	OK key
3	Arrow keys
4	M key
5	S key

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

⚠⚠ **DANGER**

ELECTRIC SHOCK CAUSED BY INCORRECT WIRING

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

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

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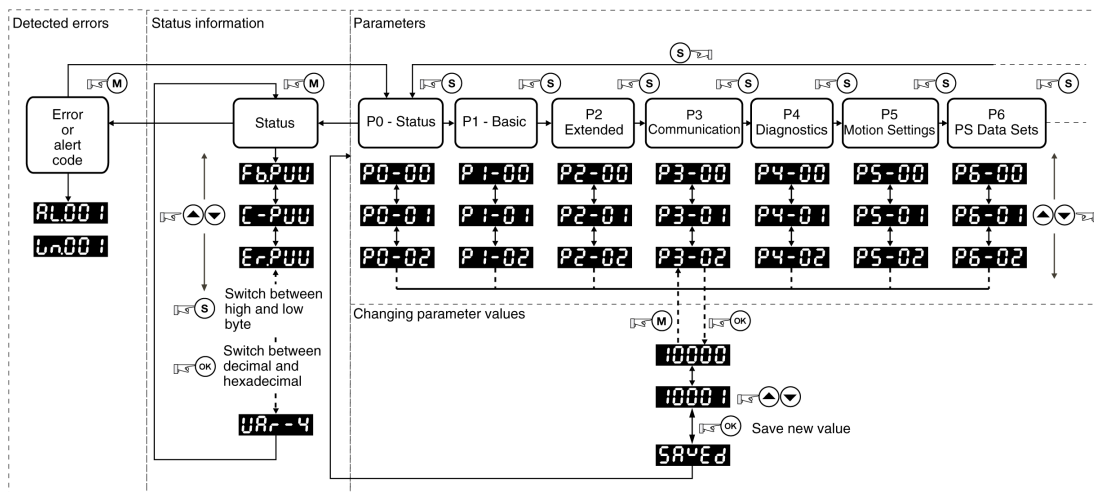
When the drive is powered on, the display shows the name of the selected status information function for approximately one second; after that, it displays the corresponding actual value or status value.

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

7-Segment Display

Saving Settings

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

7-segment display	Description
5 A υ E d	The new parameter value was successfully saved.
r - o L Y	The parameter value is a read-only value and cannot be saved (Read-Only).
P r o t	Changing a parameter value requires exclusive access. See chapter Access Channels, page 237.
o υ t - r	The new parameter value is outside the permissible value range (Out of range).

7-segment display	Description
Sruon	The new parameter value can only be saved when the power stage is disabled (Servo On).
Po-On	The new parameter value becomes active the next time the product is powered on (Power On).
Error	Displayed whenever a value you have entered for a parameter is, for various reasons, rejected by the drive.

Representation of Numerical Values on the 7-Segment Display

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

Example of representation of decimal values

1285:

-1285:

Negative Sign

2147483647:

Low Byte

High Byte

- 2147483648:

Negative Sign   Low Byte

Negative Sign   High Byte
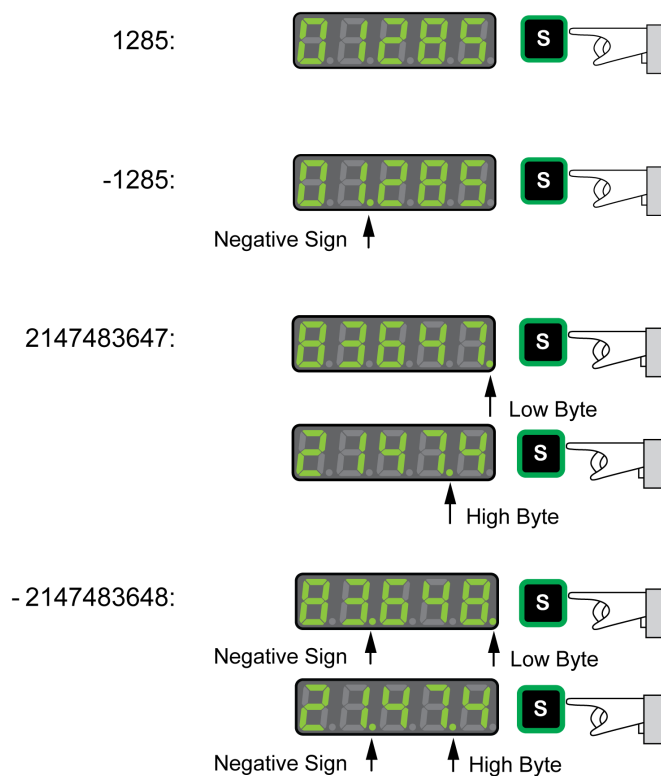
Example of representation of hexadecimal values

Low Byte

0 x 1234FFFF:

High Byte

0 x 1285:
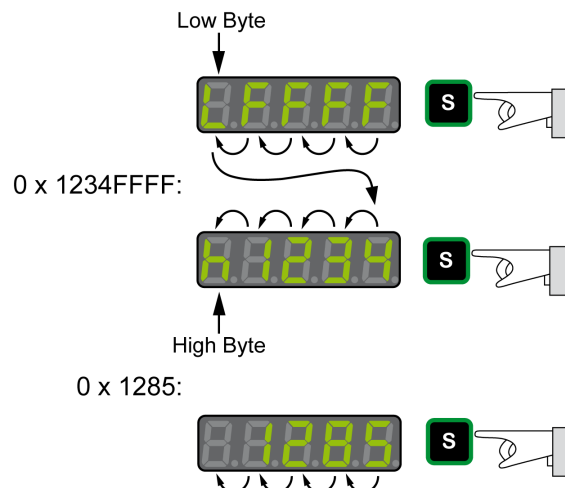
Changing the Sign Via the 7-Segment Display

7-segment display	Description
2 4 6 8 0 2 4.6 8 0 X 3 4 3 E X C 6 C 2	You can change the sign of a value by holding down the **S** key for a period of more than 2 seconds. Negative decimal values are represented with a dot between the second and the third position. Negative hexadecimal values are represented as a two's complement.

Alert Messages and Error Messages on the 7-Segment Display

7-segment display	Description
W n n n n	If an alert condition is detected, **Wnnnn** is displayed. **Win** identifies the code as an alert. The subsequent 3 digit **nnn** represent the number of the alert. For a list of alert codes, refer to Alert Codes and Error Codes, page 299.
A L n n n	If an error is detected **ALnnn** is displayed. **AL** identifies the code as a detected error. The subsequent 3 digit **nnn** represent the error number. For a list of error codes, refer to Alert Codes and Error Codes, page 299.
S t o P	The display shows **STOP** if exclusive access is enableds while the power stage is still enabled. For further information on access channels, refer to Access Channels, page 237.
- - - - -	The display shows **- - - - -** means drive boot failure it may FW lost or HW broken cause it, return drive to factory.

Status Information Via the HMI

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

Setting *P0-02*	Description
0	Actual position (with gear ratio applied) in the unit PUU
1	Target position (with gear ratio applied) in the unit PUU
2	Deviation between actual position and target position (with gear ratio applied) in the unit PUU
3	Actual position in motor increments (1280000 pulses/revolution)
4	Target position in motor increments (1280000 pulses/revolution)
5	Deviation between actual position and target position in motor increments (1280000 pulses/revolution)
6	Reference value in kilopulses per second (kpps)
7	Actual velocity in rpm
8	Voltage for target velocity in V
9	Target velocity in rpm
10	Voltage for target torque in V
11	Target torque in percent of continuous motor current
12	Average load of the motor in percent of continuous motor current (The sampling window duration is specified via parameter *P4-29*)

Setting *P0-02*	Description
13	Peak load of the motor since the last power cycle of the drive in percent of continuous motor current (maximum value of occurring in setting 12 since last power cycle)
14	Mains voltage in V
15	Ratio of load inertia and motor inertia (divided by 10)
16	Power stage temperature in degrees Celsius (°C)
17	Resonance frequency in Hz
18	Absolute pulse number relative to encoder
19	Mapping parameter 1: Content of parameter *P0-25* (mapping target is specified via parameter *P0-35*)
20	Mapping parameter 2: Content of parameter *P0-26* (mapping target is specified via parameter *P0-36*)
21	Mapping parameter 3: Content of parameter *P0-27* (mapping target is specified via parameter *P0-37*)
22	Mapping parameter 4: Content of parameter *P0-28* (mapping target is specified via parameter *P0-38*)
23	Status indication 1: Content of parameter *P0-09* (the status information to be displayed is specified by parameter *P0-17*)
24	Status indication 2: Content of parameter *P0-10* (the status information to be displayed is specified by parameter *P0-18*)
25	Status indication 3: Content of parameter *P0-11* (the status information to be displayed is specified by parameter *P0-19*)
26	Status indication 4: Content of parameter *P0-12* (the status information to be displayed is specified by parameter *P0-20*)
27	Reserved
39	Status of digital inputs (content of P4-07)
40	Status of digital outputs (content of P4-09)
41	Drive status (content of P0-46)
42	Operating mode (content of P1-01)
49	Actual position encoder (content of P5-18)
50	Target velocity in rpm
53	Target torque in 0.1 percent of the nominal torque
54	Actual torque in 0.1 percent of the nominal torque
55	Actual torque in 0.01 A
77	Target velocity in rpm in operating modes PT and PS
96	Firmware version and firmware revision of drive (P0-00 and P5-00)
111	Number of detected errors

Commissioning Procedure

What's in This Chapter

Commissioning Software

The commissioning software LXM26 DTM Library has a graphic user interface and is used for commissioning, diagnostics, and testing settings.

Online Help

The commissioning software offers help functions, which can be accessed via help menu or by pressing the F1 key.

Source of Commissioning Software

The latest version of the commissioning software LXM26 DTM Library is available for download from the Internet.

www.se.com

Setting the Device Address, Baud Rate and Connection Settings

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

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

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

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

Setting the baud rate:

Display	Value
L.0.1.0.0	-
L.0.1.0.1	9600 Baud
L.0.1.0.2	19200 Baud
L.0.1.0.3	38400 Baud
L.0.1.0.4	57600 Baud
L.0.1.0.5	115200 Baud

P.3-01 → (OK) → L.0.1.0.2

A
Modbus

Modbus Connection Settings

P.3-02 → (OK) → L.0.1.0.7

A
Modbus

Display	Value
L.0.1.0.6	Databits 8, Parity None, Stopbits 2
L.0.1.0.7	Databits 8, Parity Even, Stopbits 1
L.0.1.0.8	Databits 8, Parity Odd, Stopbits 1
L.0.1.0.9	Databits 8, Parity None, Stopbits 1
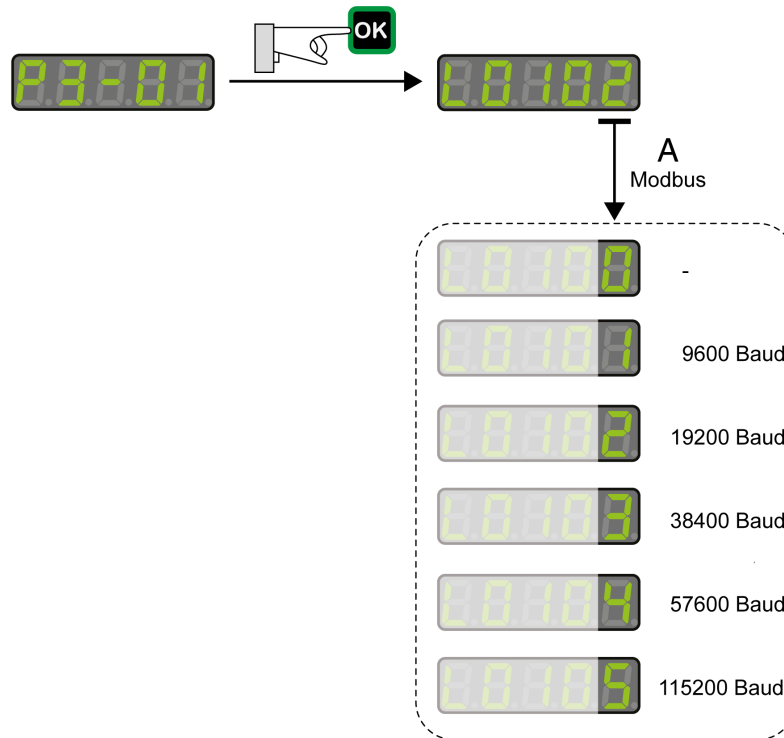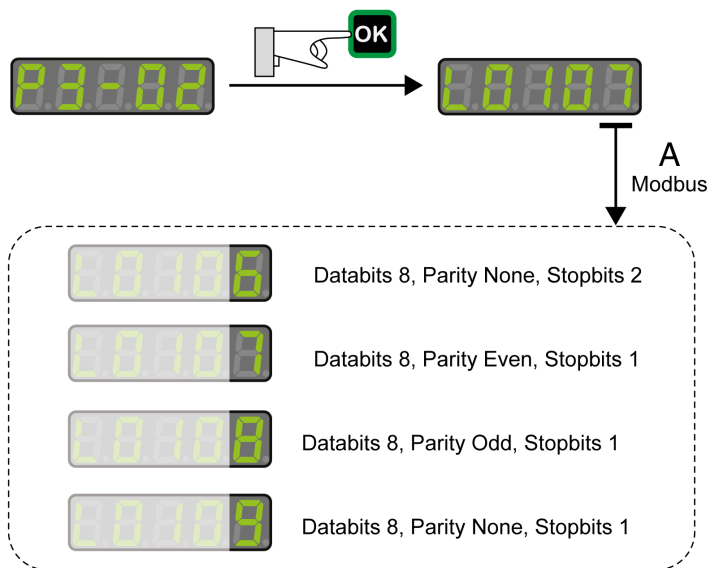
⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P3-00 ADR	Device Address Modbus Applicable operating mode: PT, PS, V, T The device address must be unique. Modified settings become active the next time the product is powered on.	- 1 127 247 Decimal	u16 RW per.	Modbus 400_h
P3-01 BRT	Transmission Rate Applicable operating mode: PT, PS, V, T This parameter is used to set the data transmission rate. Modified settings become active the next time the product is powered on.	- 0_h 102_h 405_h Hexadecimal	u16 RW per.	Modbus 402_h
P3-02 PTL	Modbus Connection Settings Applicable operating mode: PT, PS, V, T This parameter specifies the Modbus connection settings. Modified settings become active the next time the product is powered on.	- 6_h 7_h 9_h Hexadecimal	u16 RW per.	Modbus 404_h
P3-03 FLT	Detected Modbus Communication Errors - Handling Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive to a detected communication error. Value 0: Detected alert Value 1: Detected error	- 0_h 0_h 1_h Hexadecimal	u16 RW per.	Modbus 406_h
P3-04 CWD	Modbus Connection Monitoring Applicable operating mode: PT, PS, V, T This parameter specifies the maximum permissible duration for communication timeout. When this time has elapsed, the communication timeout is treated as a detected error. Setting this parameter to 0 to disables connection monitoring.	ms 0 0 20000 Decimal	u16 RW per.	Modbus 408_h
P3-07 CDT	Modbus Response Delay Time Applicable operating mode: PT, PS, V, T This parameter specifies the time delay with which the drive responds to the Modbus master.	0.5 ms 0 0 1000 Decimal	u16 RW per.	Modbus $40E_h$

Verifying the Direction of Movement

Direction of Movement

⚠ **WARNING**
UNINTENDED MOVEMENT CAUSED BY INTERCHANGED MOTOR PHASES
Do not interchange the motor phases.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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

Movements are made in positive or in negative directions.

Definition of the direction of movement: Positive direction of movement is when the motor shaft rotates counterclockwise as you look at the end of the protruding motor shaft.

Direction of movement with factory settings
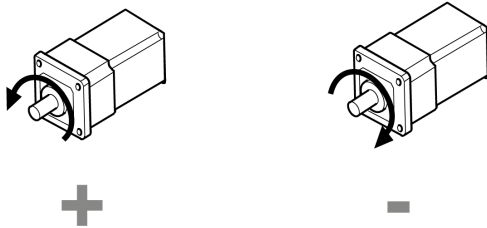
Verifying the Direction of Movement

- Start the operating mode Jog. (HMI: $P4 - 05$)

  The HMI displays the velocity in the unit rpm for the operating mode JOG.
- Set a velocity suitable for your application and conform with the OK key.

  The HMI displays JOG.

Movement in positive direction:

- Press the **Up Arrow** key.

  A movement is made in positive direction.

Movement in negative direction:

- Press the **Down Arrow** key.

  A movement is made in negative direction.

Press the M key to terminate the operating mode Jog.

Changing the Direction of Movement

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

- Inversion of direction of movement is not activated:

  Movements are made in positive direction with positive target values.

- Inversion of direction of movement is activated:

Movements are made in positive direction with negative target values.

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

Changing the direction of movement
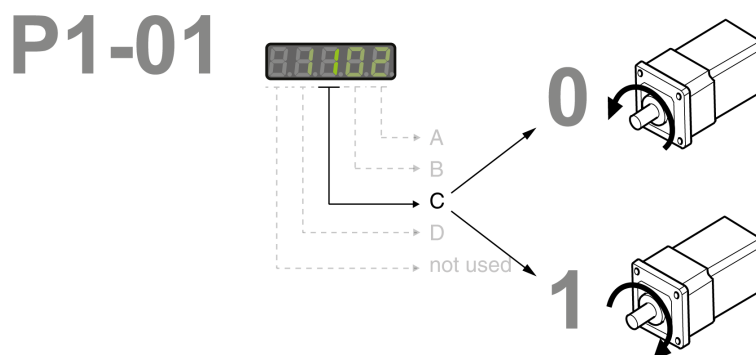
Test Operation in Operating Mode Velocity (V)

- Select the operating mode Velocity (V) via the parameter *P1-01*: = 2. Refer to Setting the Operating Mode, page 252.

- Set the parameter *P1-01* to D=1. This assigns defaults to the signal input functions for the operating mode Velocity (V), DI6…DI8 presets must be modified for this test.

  New settings for the parameter *P1-01* do not become active until the drive is powered on the next time.

- Restart the drive.

- Select the following signal input functions via the parameters P2-10 to P2-17:

Digital input	Parameter	Setting	Signal	Function	Pin at CN1
DI1	*P2-10*	0101$_h$	SON	Enable power stage	9
DI2	*P2-11*	0109$_h$	TRQLM	Activate Torque Limitation	10
DI3	*P2-12*	0114$_h$	SPD0	Velocity Reference Value Bit 0	34
DI4	*P2-13*	0115$_h$	SPD1	Velocity Reference Value Bit 1	8
DI5	*P2-14*	0102$_h$	FAULT_RESET	Fault Reset	33
DI6	*P2-15*	0$_h$	-	-	32
DI7	*P2-16*	0$_h$	-	-	31
DI8	*P2-17*	0$_h$	-	-	30

For further information on the settings, refer to Setting the Digital Signal Inputs, page 239.

Error Messages HMI

If the default presets of the signal inputs OPST, CWL(NL), and CCWL(PL/LIMP) are still present, the following error codes can be displayed:

- AL013: Parameter *P2-17* not set to 0 (deactivated).
- AL014: Parameter *P2-15* not set to 0 (deactivated).
- AL015: Parameter *P2-16* not set to 0 (deactivated).

For further information on error messages, refer to Diagnostics and Troubleshooting, page 299.

Target Velocity

The target velocity is selected via the signal input functions SPD0 (least significant bit) and SPD (most significant bit):

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

- Enable the power stage via DI1 (SON).

  If DI3 (SPD0) and DI4 (SPD1) are deactivated, the target velocity is supplied via the analog input V_REF.

- Activate DI3 (SPD0).

  The target velocity is supplied via the parameter *P1-09*. The factory setting for the target velocity is 1000 rpm.

Tuning the Control Loops

What's in This Chapter

Tuning the Control Loops

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

⚠ WARNING

UNINTENDED MOVEMENT

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

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

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

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

- Easy Tuning: This type of autotuning is performed without user intervention. For most applications, Easy Tuning yields good, highly dynamic results.

- Comfort Tuning: This type of autotuning is performed with user intervention. You can select optimization criteria and set parameters for movement, direction, and velocity.

- Manual Tuning: This type of tuning allows you to perform test movements and optimize the control loop settings using the Scope function.

Easy Tuning

Easy Tuning is started via the HMI or the commissioning software LXM26 DTM Library.

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

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

Performing Easy Tuning

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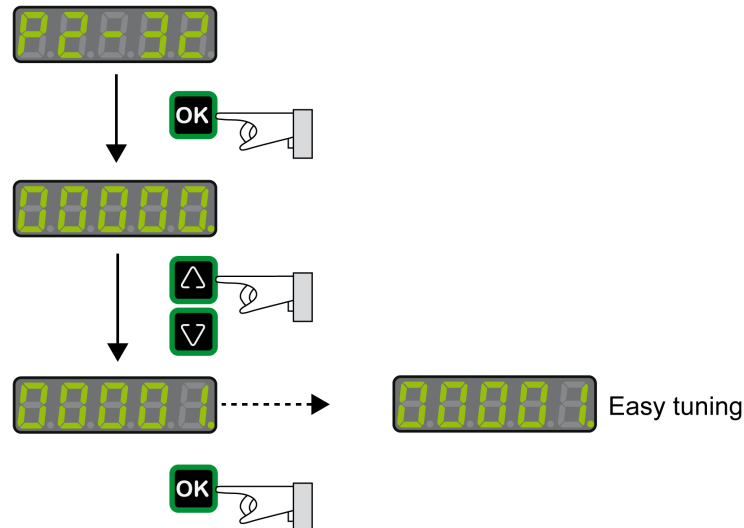
Easy tuning

After you have started Easy Tuning via P2-32, the display of the HMI shows the progress as a percentage from tn000 to tn100.

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

If autotuning completes successfully, the display of the HMI shows the message done.

Press the **OK** key of the HMI to save the control loop parameters. The display of the HMI briefly shows the message saved.

Press the **M** key of the HMI to discard the autotuning results.

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

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

Comfort Tuning

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

Optimization Criteria for Comfort Tuning

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

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

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

The illustration below shows optimization for minimum overshoot and optimization for minimum settling time.
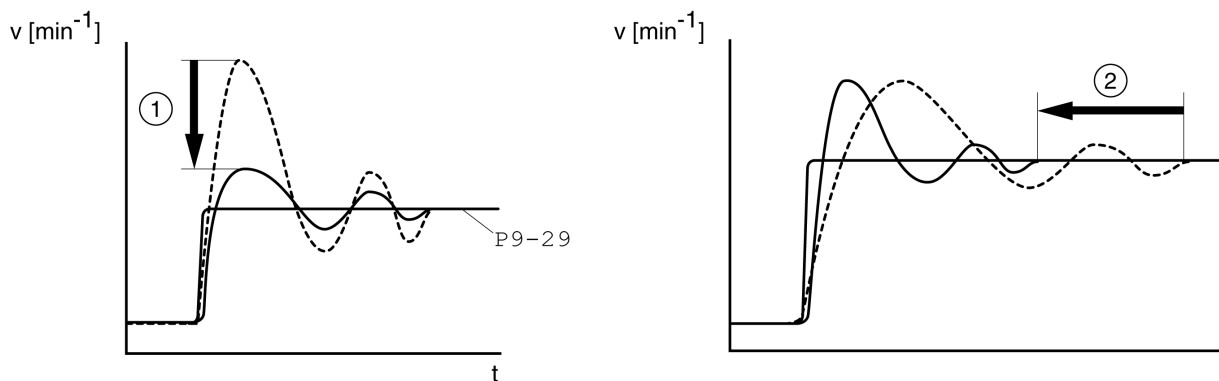
Item	Description
1	Optimization for minimum overshoot
2	Optimization for minimum settling time

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

Parameters for the Movement for Comfort Tuning

The following settings must be made for Comfort Tuning:

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

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

Setting the Direction of Movement

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P9-20 LTNCYCLE	Autotuning - Direction of Movement Applicable operating mode: PT, PS, V This parameter sets the direction of movement for autotuning. Value 0: Both directions of movement Value 2: One direction of movement	- 0 0 3 Decimal	s16 RW -	Modbus A28$_h$

Setting the Velocity

Set the velocity via the parameter P9-29.

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P9-29 LTNVCRUISE	Autotuning - Velocity Applicable operating mode: PT, PS, V Bits 0 … 15: Velocity for positive direction of movement Bits 16 … 31: Velocity for negative direction of movement	0.1rpm|0.1rpm - - - Decimal	u32 RW -	Modbus A3A$_h$

Setting Acceleration and Deceleration

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

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

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

J_M = Moment of inertia of the motor in kg cm^2

J_{load} = Moment of inertia of the load in kg cm^2

M_{max} = Peak torque in Nm

M_N = Nominal torque in Nm

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P9-31 PTACCDEC	Autotuning - Acceleration and Deceleration Applicable operating mode: PT, PS, V Bits 0 … 15: Acceleration for Autotuning Bits 16 … 31: Deceleration for Autotuning	ms|ms 6| 6 6000| 6000 65500| 65500 Decimal	u32 RW -	Modbus A3E$_h$

Setting the Movement Range

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

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P9-26 PTPOS	Autotuning - Movement Range in Direction 1 Applicable operating mode: PS This parameter specifies the movement range for autotuning in direction of movement 1. The sign of the value determines the direction of movement: Positive value: Positive direction of movement as set via parameter P1-01 Negative value: Negative direction of movement as set via parameter P1-01 See parameter P9-20 to select one direction of movement or both directions of movement for Comfort Tuning.	PUU -2147483647 0 2147483647 Decimal	s32 RW -	Modbus A34$_h$
P9-27 PTNEG	Autotuning - Movement Range in Direction 2 Applicable operating mode: PS This parameter specifies the movement range for autotuning in direction of movement 2. The sign of the value determines the direction of movement: Positive value: Positive direction of movement as set via parameter P1-01 Negative value: Negative direction of movement as set via parameter P1-01 See parameter P9-20 for Comfort Tuning in a single or in both directions of movement. See parameter P9-20 to select one direction of movement or both directions of movement for Comfort Tuning.	PUU -2147483647 0 2147483647 Decimal	s32 RW -	Modbus A36$_h$

Setting Smoothing

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

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

The following options are available for manual smoothing:

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

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P9-23 LTNSTIFF	Defines which values are used for the position command filters. Applicable operating mode: PT, PS, V Value 0: Automatic smoothing via S-curve optimization of the value Value 1: Manual smoothing	- 0 0 1 Decimal	u16 RW -	Modbus A2E$_h$
P8-34 MOVESMOOTH-MODE	Smoothing Filter for Operating modes PT and PS - Type Applicable operating mode: PT, PS Value 0: No smoothing Value 1: LPF smoothing Value 2: S-curve smoothing Setting can only be modified if power stage is disabled.	- 0 2 2 Decimal	u16 RW per.	Modbus 944$_h$

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

Comfort Tuning with smoothing via low-pass filter

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P8-33 MOVE-SMOOTHLPFHZ	Low Pass Filter Setting Applicable operating mode: PT, PS	Hz 1 5000 500000 Decimal	u32 RW per.	Modbus 942$_h$

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

Comfort Tuning with smoothing via S-curve

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P8-32 MOVESMOOTHAVG	S-Curve Setting Applicable operating mode: PT, PS Setting can only be modified if power stage is disabled. The maximum value is reduced to 12800 if P8-35 CONTROLMODE (high byte) is set to 5.	0.01 ms 25 400 25600 Decimal	u32 RW per.	Modbus 940h

Performing Comfort Tuning

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

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

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

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

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

After you have started the required Comfort Tuning method via P2-32, the display of the HMI shows the progress as a percentage from *t n 0 0 0* to *t n 1 0 0*.

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

If autotuning completes successfully, the display of the HMI shows the message *d o n E*.

Press the **OK** key of the HMI to save the control loop parameters. The display of the HMI briefly shows the message *S A V E d*.

Press the **M** key of the HMI to discard the autotuning results.

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

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

Manual Tuning

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

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

In addition to the low-pass filter, electronic gear filter function can be used in the following cases:

- Pulse and direction command has a low resolution
- Low rigidity of the coupling between motor and load
- Movement is too short
- Motor is noisy after tuning
- Current is unstable during tuning
- Motor temperature is unusually high

Procedure for Manual Tuning

The control loop parameters are tuned in the following sequence:

Step	Item	Parameters
1	Derivative gain, page 144	*P8-00* (LTND)
2	Low-pass filter, page 146	*P8-14* (NLFILTDAMPING)
		P8-15 (NLFILTT1)

Step	Item	Parameters
3	Retuning of the derivative gain, page 148	*P8-00* (LTND)
4	Proportional gain, page 148	*P8-03* (LTNP)
5	Derivative-integral gain, page 151	*P8-02* (LTNIV)
6	Integral gain, page 153	*P8-01* (LTNI)
7	Compensation of the flexibility of the mechanical system, page 154	*P8-05* (NLAFFLPFHZ) *P8-20* (NLPEAFF)

Depending on the requirements concerning the control performance, steps 2 and 3 can be omitted. Perform a movement in both directions after each of the steps below to check the recorded parameter values on the Scope tab of the commissioning software LXM26 DTM Library.

Step 1: Setting the Derivative Gain

The objective of tuning the derivative gain is to achieve a current ripple that is as low as possible. The optimum value primarily depends on the load.

Criteria for a well-tuned derivative gain include:

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

The derivative gain is set via parameter *P8-00* (LTND).

Procedure:

- Set the value of parameter *P8-03* (LTNP) to 150 (corresponds to 15 Hz).
- Set the value of parameter *P8-01* (LTNI) to 0.
- Set the value of parameter *P8-02* (LTNIV) to 0.
- Progressively increase the value of parameter *P8-00* (LTND) until the oscilloscope shows oscillation of the reference current, *P11-11* (TCMD).

Example *P8-00* (LTND) set to 1340 (134 Hz)
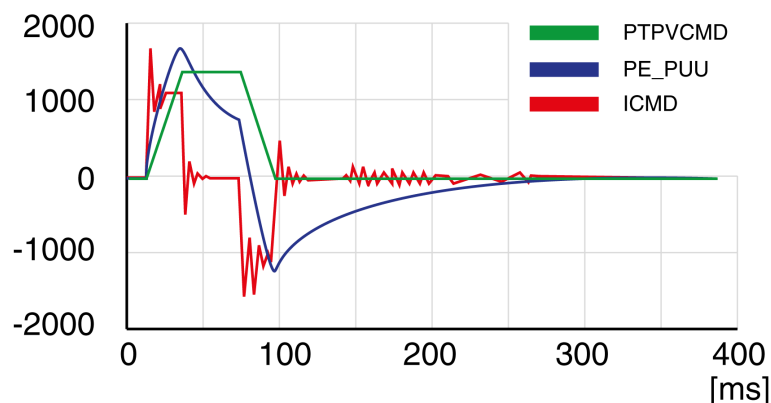
Example *P8-00* (LTND) set too high at 2000 (200 Hz)
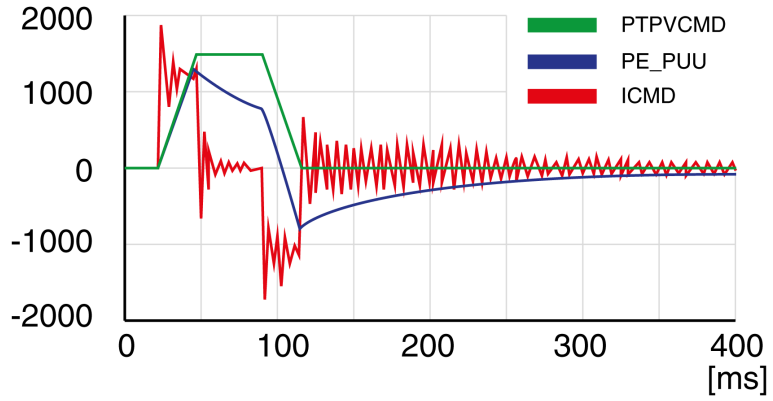
Example *P8-00* (LTND) OK at 1500 (150 Hz)
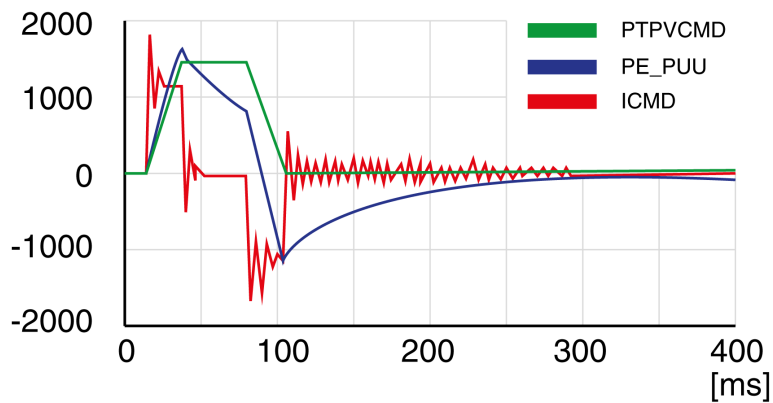
Example *P8-00* (LTND) set too low at 100 (10 Hz)
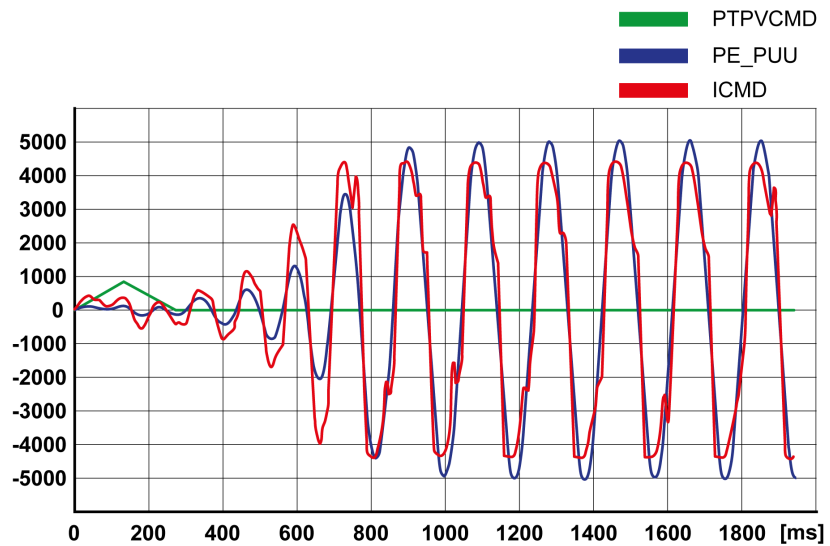
NOTE: The process of tuning requires trials of successive approximations. Values that are too high or too low relative to the other relevant values might cause instability. If it is necessary to have a low or high value of the parameter in the preceding example, you may need to adjust the values of the other relevant parameters to compensate and achieve a stable system.

Step 2: Setting the Low-Pass Filter

Setting the low-pass filter is an optional step in manual tuning of the control loop parameters. The low-pass filter parameters are optimized after you have tuned the derivative gain. The objective of tuning the low-pass filter parameters is to suppress high-frequency resonance and reduce the response time of the control loops to a minimum.

The low-pass filter is set via parameters *P8-14* (NLFILTDAMPING) and *P8-15* (NLFILTT1).

The parameter *P8-14* (NLFILTDAMPING) maintains the bandwidth of the low-pass filter up to the cutoff frequency. The parameter value is expressed as a percentage. The parameter *P8-15* (NLFILTT1) sets the inverse frequency of the cutoff frequency. The parameter *P8-14* (NLFILTDAMPING) can also be used independently to allow for a certain degree of compensation of system-related bandwidth limits.

Criteria for a well-tuned low-pass filter include:

- The value of parameter *P8-14* (NLFILTDAMPING) is as high as possible.
- The value of parameter *P8-15* (NLFILTT1) is as low as possible.

When *P8-35* (CONTROLMODE) (high byte) is set to 5, the following table presents the values for 10 % overshoot. Set the filter parameter values *P8-14* (NLFILTDAMPING) and *P8-15* (NLFILTT1) accordingly:

Frequency (Hz)	*P8-14* (NLFILTDAMPING) (%)	*P8-15* (NLFILTT1) (ms)
100	98.27	122.86
200	29.3	96.5
300	14.3	95
400	7.9	93.32
500	5.05	91.677
600	3.5	90.03
700	2.566	88.4
800	2	86.934
900	1.6056	85.457
1000	1.31	83.98
1100	1.09	82.45
1200	0.928694	81.1
1300	0.815	79.9
1400	0.7	78.4
1500	0.62	77
1600	0.555	75.97
1700	0.496	74.6
1800	0.439	73
1900	0.406	72.19
2000	0.365	70.5

Electronic gear filter example 1:
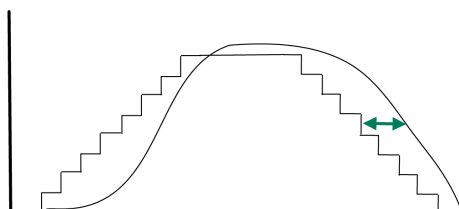
Increasing *P8-27* (GEARFILTT1) smooths the input command, but adds a delay.

Electronic gear filter example 2:
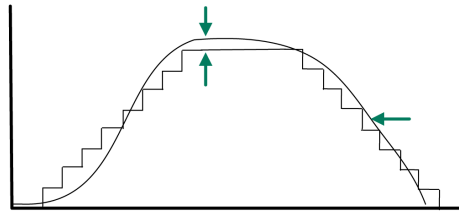
Increasing *P8-28* (GEARFILTT2) and *P8-29* (GEARFILTVELFF) compensate the delay, but adds overshoots.

If *P8-29* (GEARFILTVELFF) has the same value as *P8-28* (GEARFILTT2), there is no delay.

Usual values:

- *P8-27* (GEARFILTT1) is usually around 2 times the input step width
- *P8-28* (GEARFILTT2) is usually 2 times *P8-27* (GEARFILTT1)

  NOTE: When a system has multiple axes, gear filter values must be the same for all axes.

Procedure:

- Progressively increase the value of parameter *P8-14* (NLFILTDAMPING) until the oscilloscope shows noise and/or oscillation of the reference current, *P11-11* (TCMD).
- Progressively decrease the value of parameter *P8-15* (NLFILTT1) until the oscilloscope shows noise and/or oscillation of the reference current *P11-11* (TCMD).
- Increase the value of parameter *P8-15* (NLFILTT1) by 20 %, however, by at least 0.05 ms.

Example *P8-14* (NLFILTDAMPING) OK (75 %)
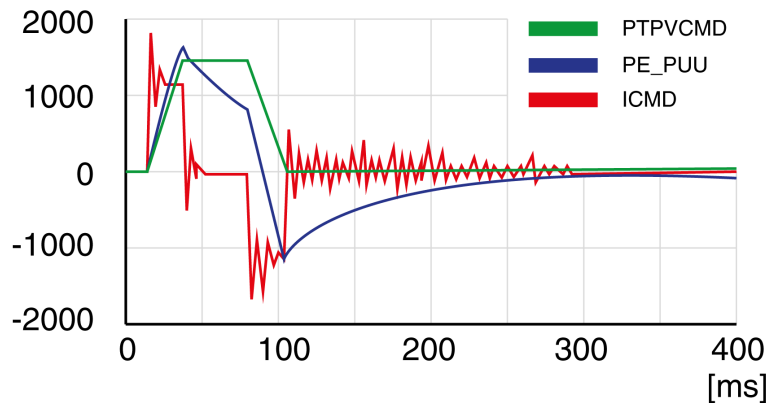
Example *P8-15* (NLFILTT1) too low (0.5 ms)
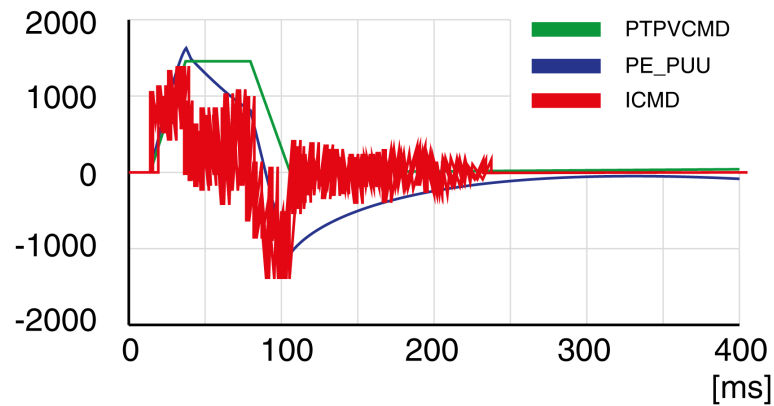
Example *P8-15* (NLFILTT1) OK (1.2 ms)
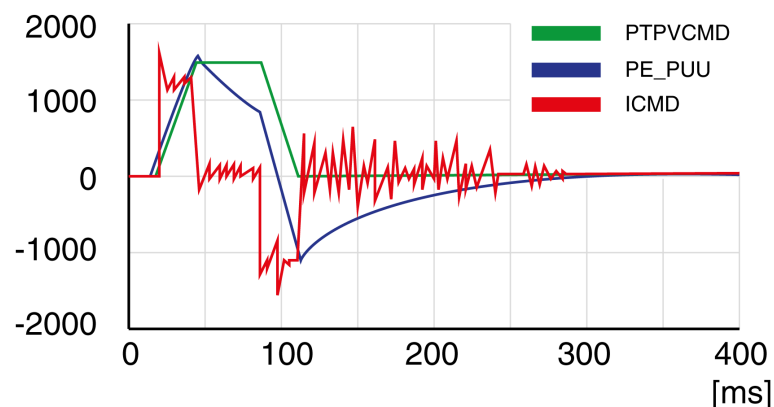
Step 3: Re-Tuning of the Derivative Gain

If you have modified the low-pass filter values in parameters *P8-14* (NLFILTDAMPING) and *P8-15* (NLFILTT1), the derivative gain can be set to a greater value via parameter *P8-00* (LTND). Follow the procedure described in step 1.

The objective of tuning the proportional gain is to get a constant and low position deviation in the acceleration phase, the constant velocity phase, and the deceleration phase and to have no oscillations during the transitions between these phases. In the oscilloscope, this is indicated by a shape that is as square and as flat as possible.

Criteria for a well-tuned proportional gain include:

- No or minimum overshoot of position deviation

- No or minimum current ripple

- No or minimum oscillations at standstill

Step 4: Setting the Proportional Gain

The proportional gain is set via parameter *P8-03* (LTNP).

Procedure:

- Progressively increase the value of parameter *P8-03* (LTNP) to find the optimum value. The figures below show examples of the plot as the value approaches the optimum value.

Example *P8-03* (LTNP) starting value (13 Hz)
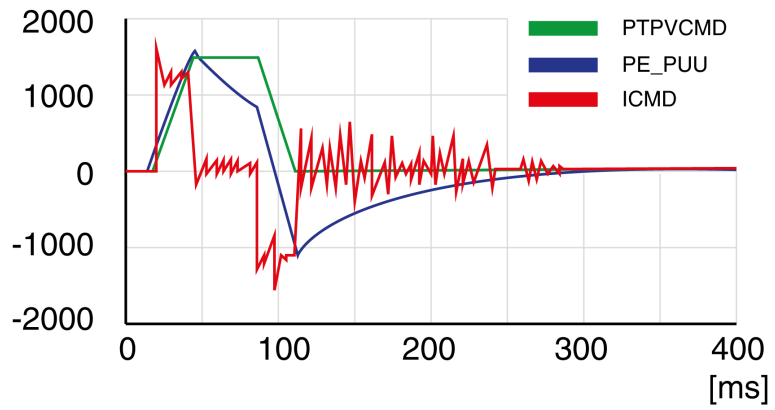
Example *P8-03* (LTNP) position deviation decreased (25 Hz)
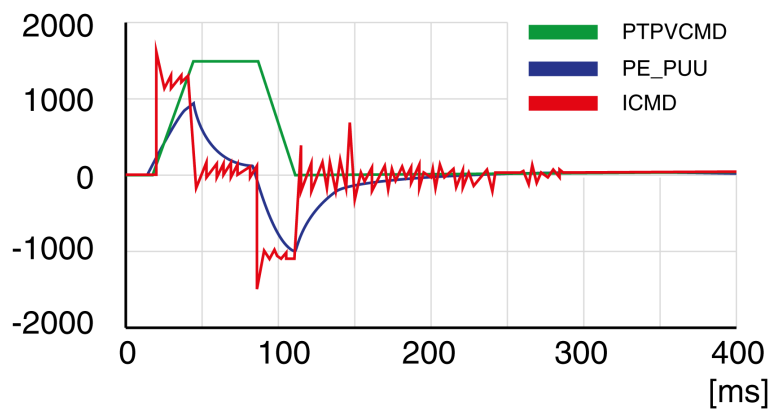
Example *P8-03* (LTNP) position deviation further decreased (35 Hz)
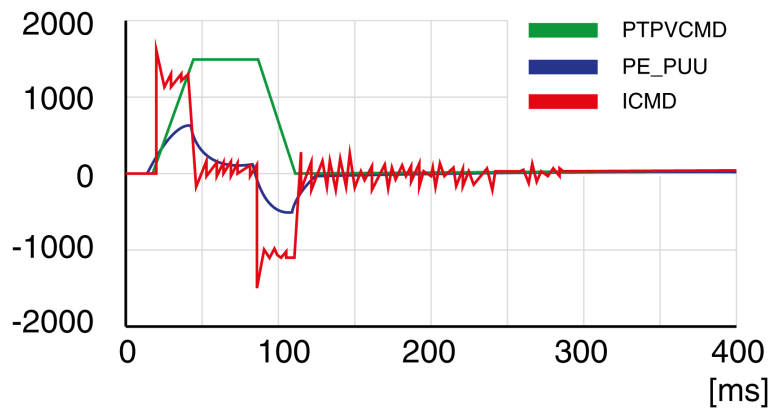
Example *P8-03* (LTNP) position deviation further decreased (45 Hz)
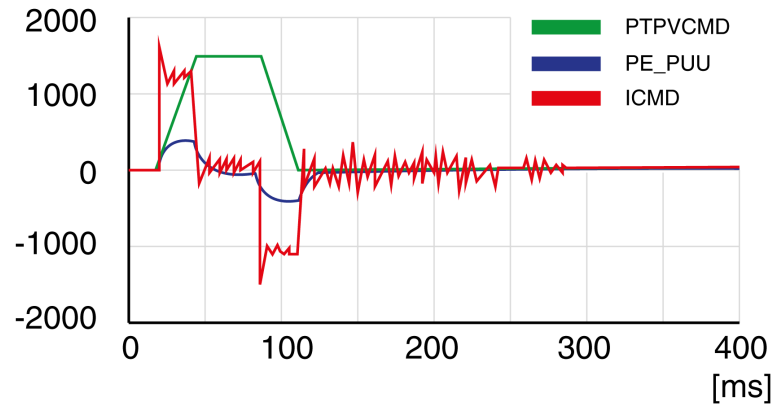
Example *P8-03* (LTNP) value too high - oscillation at standstill (65 Hz)
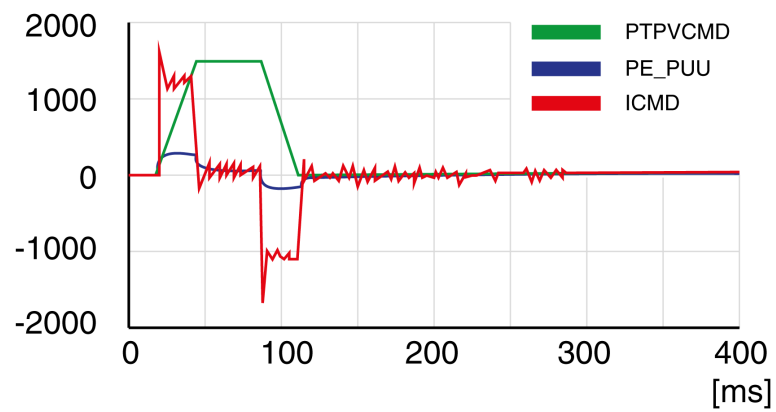
Example *P8-03* (LTNP) value too high - oscillation at standstill (75 Hz)
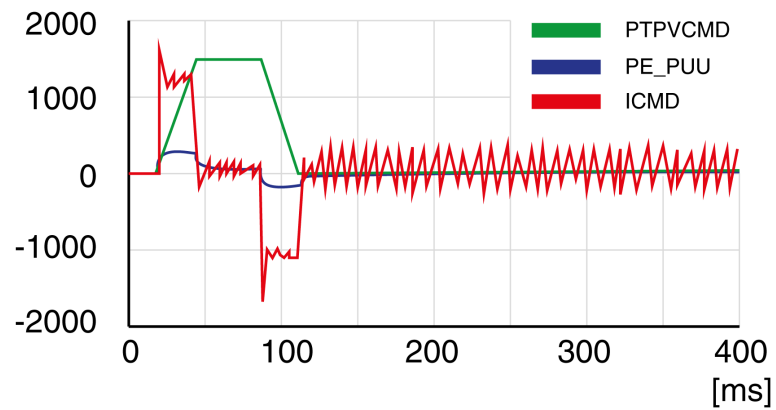
Example *P8-03* (LTNP) value too high - oscillation at standstill, overshoot of position deviation (100 Hz)
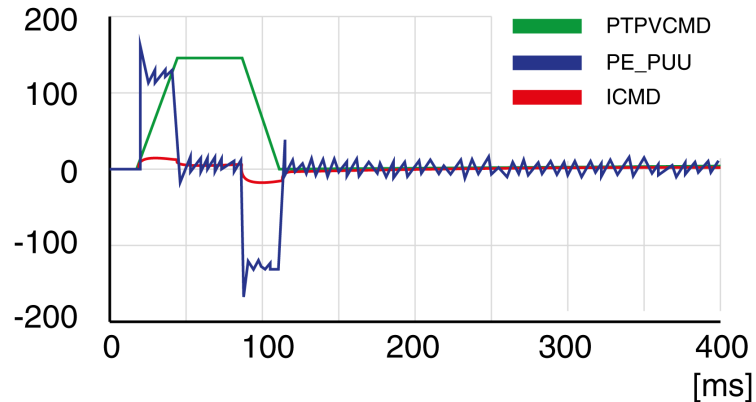
Example *P8-03* (LTNP) OK (65 Hz)
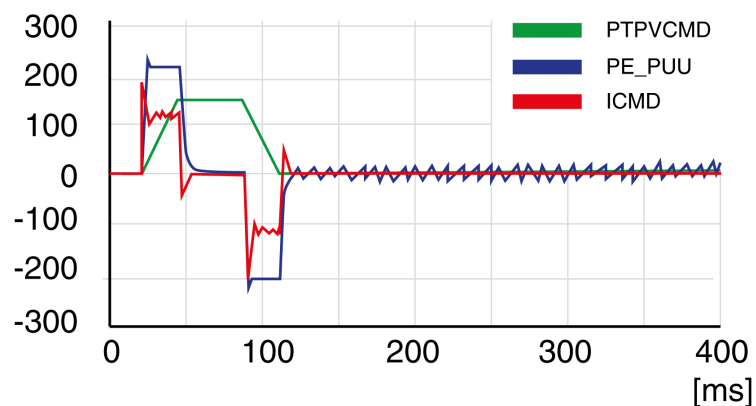
Step 5: Setting the Derivative-Integral Gain

The objective of tuning the derivative-integral gain is to reduce the position deviation. As a general rule, the value for the derivative-integral gain (*P8-02*LTNIV) is within the following range:

P8-03 (LTNP) / 2 < *P8-02* (LTNIV) < 2 x *P8-03* (LTNP)

Progressively increasing the value of the derivative-integral gain progressively decreases the position deviation during the acceleration phase, the constant velocity phase, and the deceleration phase.

Criteria for a well-tuned derivative-integral gain include:

- Position deviation decreases rapidly after each transition of the movement phases (jerk)
- No or minimum overshoot of position deviation
- No or minimum oscillations during transitions between the movement phases
- Oscillations at standstill as low as possible (+/- 1 encoder increment)

The derivative-integral gain is set via parameter *P8-02* (LTNIV).

Procedure:

- Progressively increase the value of parameter *P8-02* (LTNIV) to find the optimum value. The figures below show examples of the plot as the value approaches the optimum value.

Example *P8-02* (LTNIV) starting value (30 Hz)
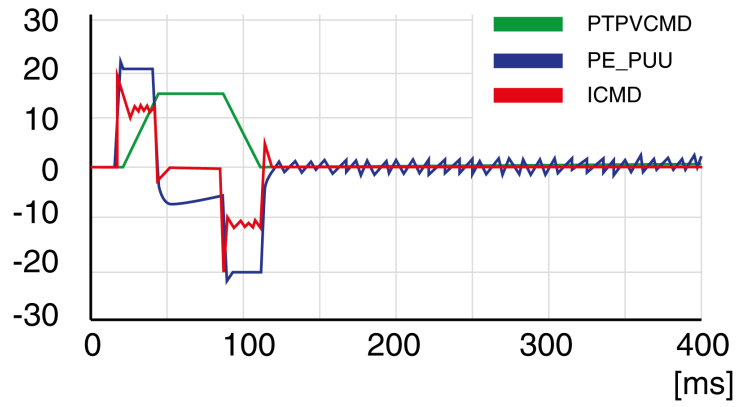
Example *P8-02* (LTNIV) position deviation decreased (60 Hz)
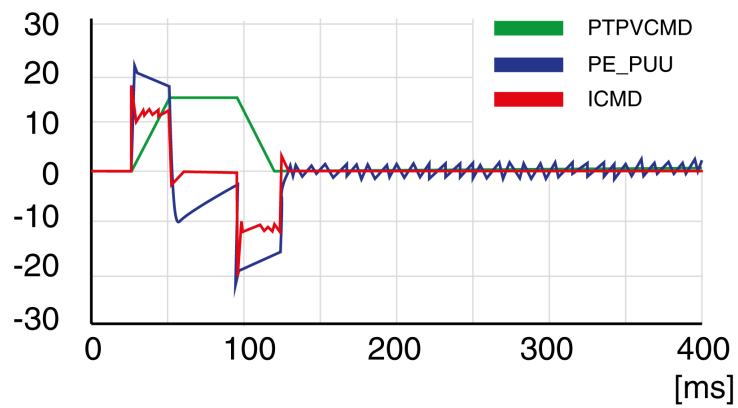
Example *P8-02* (LTNIV) position deviation decreases rapidly when target velocity is reached (90 Hz)
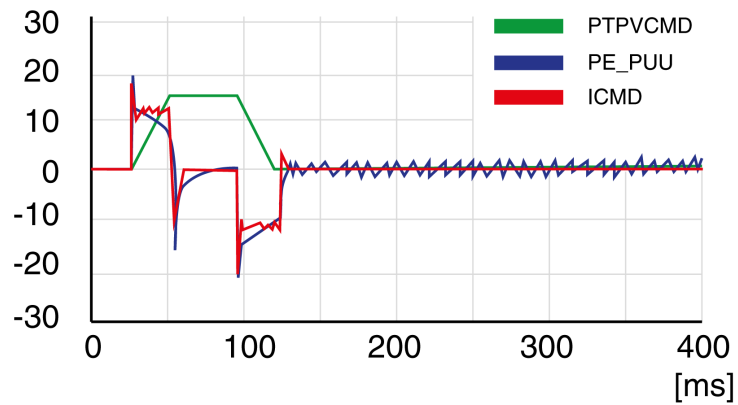
Example *P8-02* (LTNIV) value too high - oscillation at standstill, overshoot of position deviation (120 Hz)
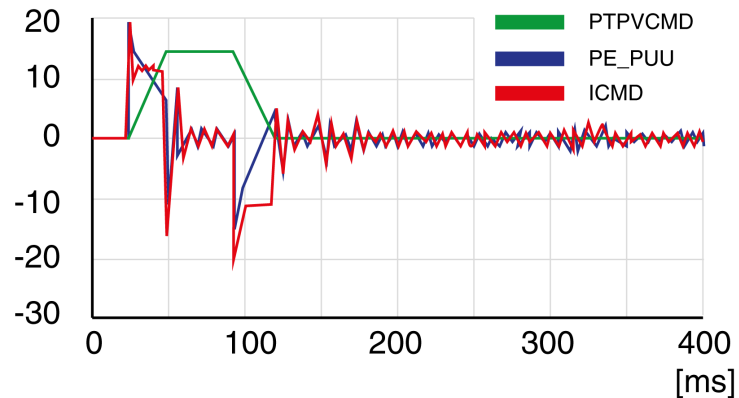
Example *P8-02* (LTNIV) OK (90 Hz)
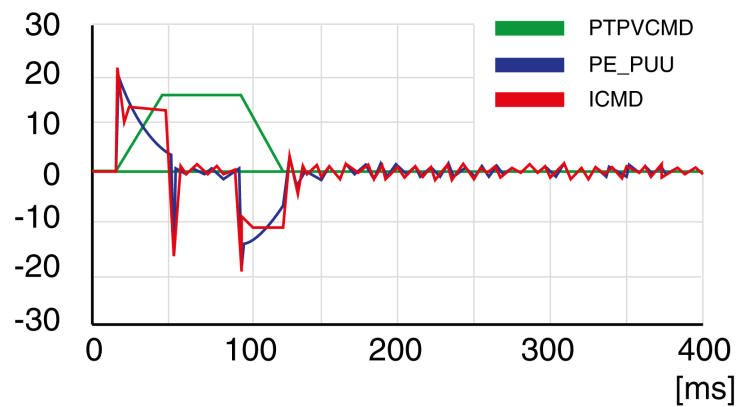
Step 6: Setting the Integral Gain

The objective of tuning the integral gain is to reduce the position deviation during movements and at standstill.

Criteria for a well-tuned integral gain include:

*   Position deviation further reduced
*   No or minimum overshoot of position deviation at the end of the deceleration phase
*   Oscillations at standstill as low as possible (+/- 1 encoder increment)

The integral gain is set via parameter *P8-01* (LTNI).

Procedure:

*   Progressively increase the value of parameter *P8-01* (LTNI) until the oscilloscope shows overshoot or oscillations. The figures below show examples of the plot as the value approaches the optimum value.

Example *P8-01* (LTNI) value too high - oscillation at standstill, overshoot of position deviation (50 Hz)
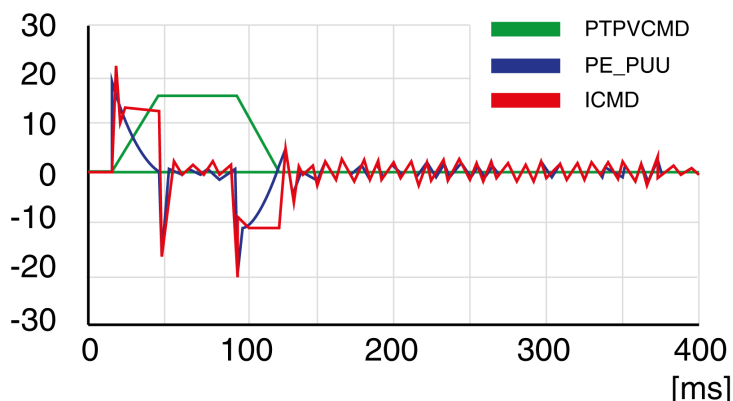
Example *P8-01* (LTNI) OK (25 Hz)
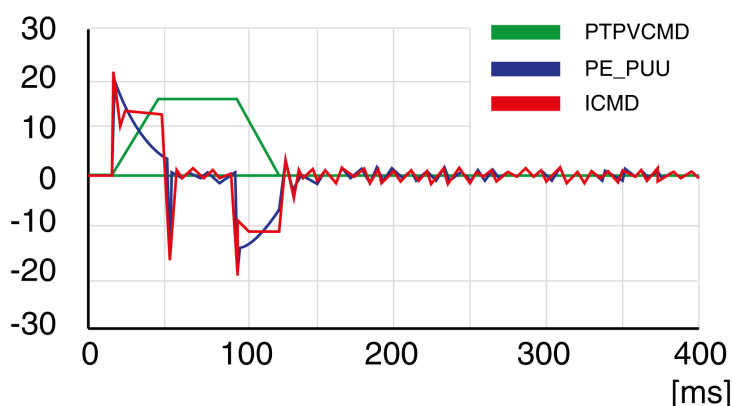
Step 7: Compensation of the Flexibility of the Mechanical System

The parameters for compensation of the system flexibility reduce the vibrations caused by abrupt changes in the acceleration (jerk). The parameters can also be used to further minimize overshoot or settling time.

The value of parameter *P8-20* (NLPEAFF) reflects the oscillation frequency of the mechanical system, i.e. the coupling between the motor and the load. The coupling can be very rigid (for example, a direct drive or a low-backlash coupling) and less rigid (for example, a belt drive or an elastic coupling). Systems with a high rigidity require a high value. Systems with high load inertia and less rigid couplings require lower values. The less rigid the coupling, the lower this frequency. Depending on the application, the typical value range is 400 … 30 Hz.

The parameter *P8-05* (NLAFFLPFHZ) sets a low-pass filter for the acceleration profile. If the target value has a relatively low resolution as, for example, in the case of a pulse train input, the calculated acceleration may be subject to noise. The low-pass filter set via this parameter can be used to smooth the acceleration profile. The parameter can be used if the flexibility compensation set via parameter *P8-20* (NLPEAFF) results in noise.

The compensation of the flexibility of the mechanical system is set via parameters *P8-05* (NLAFFLPFHZ) and *P8-20* (NLPEAFF).

Procedure:

- Set the value of parameter *P8-05* (NLAFFLPFHZ) to a value three times as high as that of parameter *P8-20* (NLPEAFF). With this value, the bandwidth of this low-pass filter is sufficiently higher than the response time of the system.

- Progressively decrease the value of parameter *P8-20* (NLPEAFF) to find the optimum value. The optimum value depends on your optimization criterion: either short settling time or low position deviation.

  Start with a high frequency of 400 Hz. Decrease the value and compare the amplitudes for the position deviation and the settling time. Select the most suitable value according to your optimization criterion. The figures below show examples of the plot as the value approaches the optimum value.

Example *P8-20* (NLPEAFF) without compensation of the flexibility (5000 Hz)
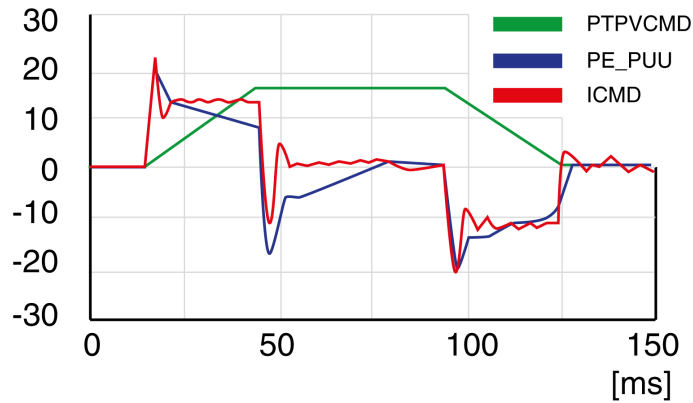
Example *P8-20* (NLPEAFF) maximum position deviation decreased (300 Hz)
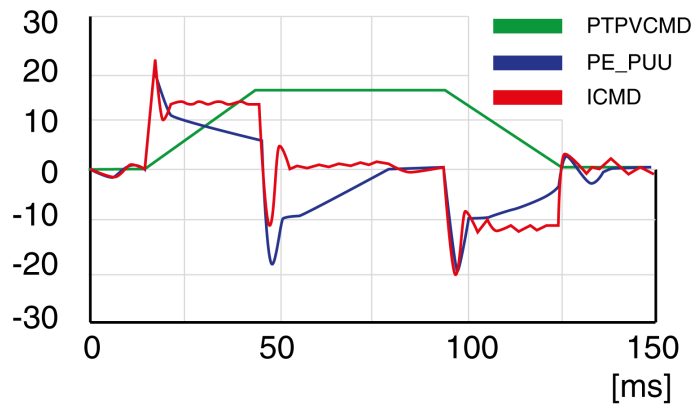
Example *P8-20* (NLPEAFF) maximum position deviation further decreased (220 Hz)
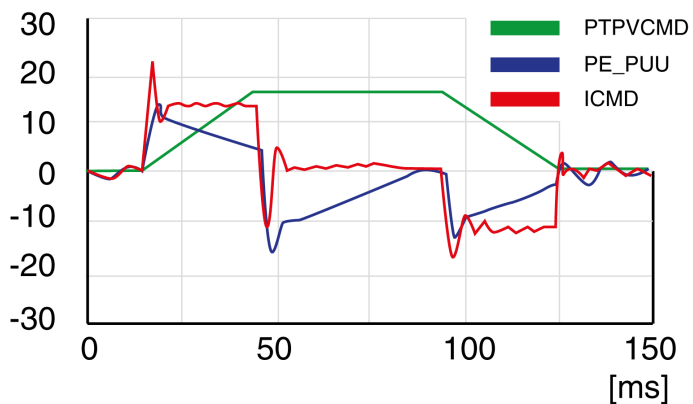
Example *P8-20* (NLPEAFF) minimum position deviation, short settling time, oscillation at standstill (120 Hz)
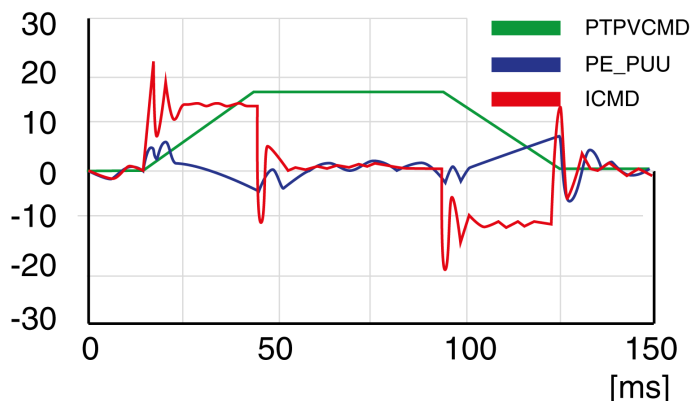
Example *P8-20* (NLPEAFF) negative position deviation during acceleration phase (100 Hz)
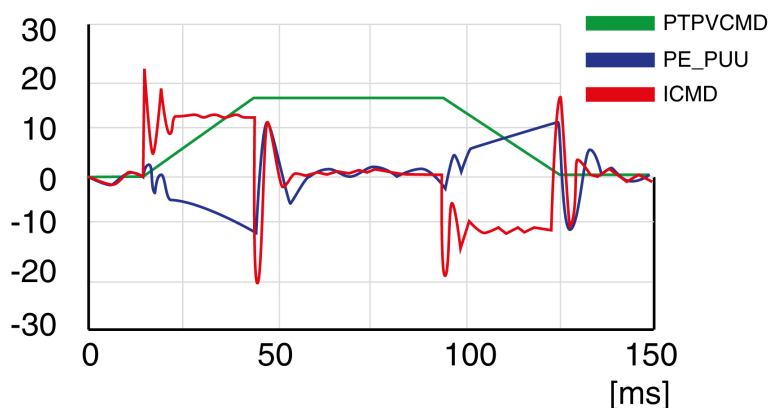
Manual turning steps within cascade mode

Step	Action
1	Increase the speed loop gain *P8-57* to decrease the speed deviation. After increasing the gain value each time, the motor moves in a positive and negative direction at high and low speed respectively. If the motor does not vibrate or scream, the gain can be increased continuously. If the motor vibrates or scream, reduce the current value by 20%.
2	Increase the gain of position loop *P8-53* decrease the position deviation. After increasing the gain value each time, the motor moves in a positive and negative direction at high and low speed respectively. If the motor does not vibrate or scream, the gain can be increased continuously. Slow to reach target position, increase the gain. Shaking near the target position, reduce the gain. If the motor vibrates or scream, reduce the current value by 20%.
3	To further reduce the steady-state error, increase the speed integral *P8-58*.
4	To further reduce the dynamic position error, feed-forward *P8-54* is used.
5	Set the S-curve smoothing time constant *P8-32* appropriately.
6	Use low-pass filtering and notch filter *P8-60*, *P8-61*, *P8-62* as appropriate.

Parameters

Parameters

What's in This Chapter

Representation of the Parameters

This chapter provides an overview of the parameters which can be used for operating the product.

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

NOTE: Possible values of a parameter that are not described are considered as reserved and must not be used.

Parameter Name
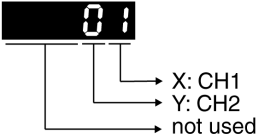
The parameter name uniquely identifies a parameter.

Unit

The unit of the value.

P0 - Status Parameters

P0 - Status Parameters

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P0-00 VER	Firmware Version Applicable operating mode: PT, PS, V, T	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus 100_h
P0-01 ALE	Error code of detected error Applicable operating mode: PT, PS, V, T This parameter contains the error number of the most recently detected error. For a list of the detected error codes, refer to Error Codes, page 299.	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RW -	Modbus 102_h
P0-02 STS	Drive Status Displayed by HMI Applicable operating mode: PT, PS, V, T This parameter selects the type of status information to be displayed on the HMI. Example: If the setting is 7, the HMI displays the speed of rotation of the motor. For further information, refer to chapter Status Information via the HMI, page 128.	- 0 0 123 Decimal	u16 RW per.	Modbus 104_h
P0-03 MON	Function of Analog Outputs Applicable operating mode: PT, PS, V, T This parameter specifies the functions of the analog outputs. 01 X: CH1 Y: CH2 not used XY: (X: MON1; Y: MON2) 0: Actual velocity (+/-8 V correspond to maximum velocity) 1: Actual torque (+/-8 V correspond to maximum torque) 2: Reference value in kilopulses per second (+8 V correspond to 4.5 Mpps) 3: Target velocity (+/-8 V correspond to maximum target velocity) 4: Target torque (+/-8 V correspond to maximum target torque) 5: DC bus voltage (+/-8 V correspond to 450 V) 6: Reserved 7: Reserved	- 0_h 0_h 77_h Hexadecimal	u16 RW per.	Modbus 106_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	See P1-04 and P1-05 for setting a voltage percentage (scaling). Example: P0-03 = 01: Voltage value at analog output indicates the actual velocity. Velocity = (maximum velocity x V1 / 8) x P1-04 / 100 if the output voltage value of MON2 is V1.			
P0-04 FPGAVER	FPGA Version Applicable operating mode: PT, PS, V, T	- 0_h $-_h$ $0000FFFF_h$ Hexadecimal	u16 RO -	Modbus 108_h
P0-08 TSON	Operating Hour Meter in Seconds Applicable operating mode: PT, PS, V, T	s 0 - 4294967295 Decimal	u32 RO -	Modbus 110_h
P0-09 CM1	Status Value 1 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-17. Examples: If the status of the drive is read via the HMI and if P0-02 is set to 23, VAR-1 is displayed for approximately two seconds by the HMI, followed by the value of this parameter. If the setting of P0-17 is 3, reading this parameter displays the actual position in pulses. For reading the status via Modbus, read two 16-bit data stored in the addresses of 0012H and 0013H to generate 32-bit data. (0013H : 0012H) = (high byte : low byte)	- -2147483647 - 2147483647 Decimal	s32 RO -	Modbus 112_h
P0-10 CM2	Status Value 2 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-18. See P0-09 for details.	- -2147483647 - 2147483647 Decimal	s32 RO -	Modbus 114_h
P0-11 CM3	Status Value 3 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-19. See P0-09 for details.	- -2147483647 - 2147483647 Decimal	s32 RO -	Modbus 116_h
P0-12 CM4	Status Value 4 Applicable operating mode: PT, PS, V, T	- -2147483647	s32 RO	Modbus 118_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-20. See P0-09 for details.	- 2147483647 Decimal	- -	
P0-13 CM5	Status Value 5 Applicable operating mode: PT, PS, V, T This parameter is used to provide the value of one of the status indications in P0-02. The value of this parameter is determined via P0-21. See P0-09 for details.	- -2147483647 - 2147483647 Decimal	s32 RO -	Modbus 11A_h
P0-17 CMA1	Indicate status value 1 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-09. Example: If the setting of P0-17 is 7, reading P0-09 returns the speed of rotation of the motor in rpm.	- 0 0 123 Decimal	u16 RW per.	Modbus 122_h
P0-18 CMA2	Indicate status value 2 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-10. See P0-17 for details.	- 0 0 123 Decimal	u16 RW per.	Modbus 124_h
P0-19 CMA3	Indicate status value 3 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-11. See P0-17 for details.	- 0 0 123 Decimal	u16 RW per.	Modbus 126_h
P0-20 CMA4	Indicate status value 4 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-12. See P0-17 for details.	- 0 0 123 Decimal	u16 RW per.	Modbus 128_h
P0-21 CMA5	Indicate status value 5 Applicable operating mode: PT, PS, V, T This parameter is used to select a drive status provided in P0-02. The selected status is indicated via P0-13. See P0-17 for details.	- 0 0 123 Decimal	u16 RW per.	Modbus 12A_h
P0-25 MAP1	Parameter Mapping 1 Applicable operating mode: PT, PS, V, T The parameters from P0-25 ... P0-32 are used to read and write the values of parameters with non-consecutive communication addresses. You can set P0-35 ... P0-42 as the required read and write mapping parameter numbers. When P0-25 ... P0-	- 0_h 0_h FFFFFFFF_h Hexadecimal	u32 RW -	Modbus 132_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	32 are read, the read or write values are equivalent to the values of the parameters specified via P0-35 ... P0-42, and vice versa. See P0-35 for details.			
P0-26 MAP2	Parameter Mapping 2 Applicable operating mode: PT, PS, V, T See P0-25 and P0-36 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus 134_h
P0-27 MAP3	Parameter Mapping 3 Applicable operating mode: PT, PS, V, T See P0-25 and P0-37 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus 136_h
P0-28 MAP4	Parameter Mapping 4 Applicable operating mode: PT, PS, V, T See P0-25 and P0-38 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus 138_h
P0-29 MAP5	Parameter Mapping 5 Applicable operating mode: PT, PS, V, T See P0-25 and P0-39 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus $13A_h$
P0-30 MAP6	Parameter Mapping 6 Applicable operating mode: PT, PS, V, T See P0-25 and P0-40 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus $13C_h$
P0-31 MAP7	Parameter Mapping 7 Applicable operating mode: PT, PS, V, T See P0-25 and P0-41 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus $13E_h$
P0-32 MAP8	Parameter Mapping 8 Applicable operating mode: PT, PS, V, T See P0-25 and P0-42 for details.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW -	Modbus 140_h
P0-35 MAPA1	Block Data Read/Write P0-35…P0-42 1 Applicable operating mode: PT, PS, V, T	- 0_h 0_h	u32 RW per.	Modbus 146_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	The parameters P0-35 ... P0-42 specify the required read and write parameter numbers for P0-25 ... P0-32. They read and write the values of the parameters whose communication addresses are not consecutive. The read/write parameter can be a single 32-bit parameter or two 16-bit parameters. A: Parameter group code in hexadecimal format B: Parameter number in hexadecimal format Example: If you want to read and write the value of P1-44 (32-bit parameter) via P0-25, set P0-35 to 012C012C$_h$. If you want to read and write the values of P2-02 (16-bit parameter) and P2-04 (16-bit parameter) via P0-25, set P0-35 to 02040202$_h$.	FFFFFFFF$_h$ Hexadecimal		
P0-36 MAPA2	Block Data Read/Write P0-35…P0-42 2 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0$_h$ 0$_h$ FFFFFFFF$_h$ Hexadecimal	u32 RW per.	Modbus 148$_h$
P0-37 MAPA3	Block Data Read/Write P0-35…P0-42 3 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0$_h$ 0$_h$ FFFFFFFF$_h$ Hexadecimal	u32 RW per.	Modbus 14A$_h$
P0-38 MAPA4	Block Data Read/Write P0-35…P0-42 4 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0$_h$ 0$_h$ FFFFFFFF$_h$ Hexadecimal	u32 RW per.	Modbus 14C$_h$
P0-39 MAPA5	Block Data Read/Write P0-35…P0-42 5 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0$_h$ 0$_h$ FFFFFFFF$_h$ Hexadecimal	u32 RW per.	Modbus 14E$_h$
P0-40 MAPA6	Block Data Read/Write P0-35…P0-42 6 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0$_h$ 0$_h$ FFFFFFFF$_h$	u32 RW per.	Modbus 150$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Hexadecimal		
P0-41 MAPA7	Block Data Read/Write P0-35…P0-42 7 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0h 0h FFFFFFFFh Hexadecimal	u32 RW per.	Modbus 152h
P0-42 MAPA8	Block Data Read/Write P0-35…P0-42 8 Applicable operating mode: PT, PS, V, T See P0-35 for details.	- 0h 0h FFFFFFFFh Hexadecimal	u32 RW per.	Modbus 154h
P0-46 SVSTS	State of Signal Output Functions Applicable operating mode: PT, PS, V, T This parameter is used to indicate the state of the signal output function of the drive in hexadecimal format. If the function is assigned to a digital output, it would represent the state of the output given no forcing on the output. Bit 0: SRDY (Servo ready) Bit 1: SON (Servo On) Bit 2: ZSPD (Zero speed) Bit 3: TSPD (Speed reached) Bit 4: TPOS (Movement completed) Bit 5: TQL (Torque Limit Reached) Bit 6: ERR (Error Detected) Bit 7: BRKR (Holding brake control) Bit 8: HOMED_OK (Homing completed) Bit 9: OLW (Motor Overload Alert) Bit 10: WARN (indicates that one of the following conditions has been detected: Hardware limit switch triggered, undervoltage, Nodeguard alert, Operational Stop (OPST)) Bits 11 ... 15: Reserved The parameter can also be read via the fieldbus.	- 0h 0h FFFFh Hexadecimal	u16 RO -	Modbus 15Ch
P0-47 LAST_WRN	Number of Last Alert Applicable operating mode: PT, PS, V, T This parameter contains the number of the last detected alert. After a Fault Reset, the number is cleared.	- 0h 0h FFFFh Hexadecimal	u16 RO -	Modbus 15Eh

P1 - Basic Parameters

P1 - Basic Parameters

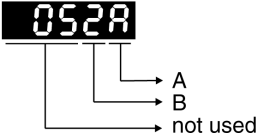| Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P1-00 PTT	Reference Value Signal - Pulse Settings Applicable operating mode: PT **1OO** → A → B → C → D → not used This parameter is used to configure the reference value signals for the operating mode PT. A: Type of reference value signals B: Signal frequency C: Input polarity D: Source of reference value signals Setting can only be modified if power stage is disabled.	- 0_h 2_h 1132_h Hexadecimal	u16 RW per.	Modbus 200_h
P1-01 CTL	Operating Mode and Direction of Rotation Applicable operating mode: PT, PS, V, T **0101** → A → not used → C → D → not used A: Operating mode Refer to chapter Setting the Operating Mode, page 252. C: Direction of movement Refer to chapter Verifying the Direction of Movement, page 133. D: Signal input functions and signal output functions after operating mode switching Value 0: The assignments of the signal input functions and the signal output functions (P2-10 ... P2-22) remain identical for the new operating mode. Value 1: The assignments of the signal input functions and the signal output functions (P2-10 ... P2-22)) are set to the default presets of the new operating mode. Refer to chapters Default Presets	- 0_h 0_h $110A_h$ Hexadecimal	u16 RW per.	Modbus 202_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	of the Signal Inputs, page 239 and Default Presets of the Signal Outputs, page 244. Modified settings become active the next time the product is powered on.			
P1-02 PSTL	Velocity and Torque Limitations Activation/ Deactivation Applicable operating mode: PT, PS, V, T This parameter activates/deactivates velocity limitation and torque limitation. It can also be activated via the signal input functions SPDLM and TRQLM. The signal input functions SPD0 and SPD1 are used to select velocity values set via P1-09 to P1-11. The signal input functions TCM0 and TCM1 are used to select torque values set via P1-12 to P1-14. A: Velocity limitation 0: Deactivate 1: Activate (in operating mode T)) B: Torque limitation 0: Deactivate 1: Activate (operating modes PT, PS, and V) 	- 0_h 0_h 11_h Hexadecimal	u16 RW per.	Modbus 204_h
P1-03 AOUT	Polarity of Analog Outputs / Polarity of Pulse Outputs Applicable operating mode: PT, PS, V, T 	- 0_h 0_h 13_h Hexadecimal	u16 RW per.	Modbus 206_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	This parameter is used to specify the polarity of analog outputs MON1 and MON2 and the polarity of pulse outputs. A: Polarity of analog outputs MON1 and MON2 0: MON1(+), MON2(+) 1: MON1(+), MON2(-) 2: MON1(-), MON2(+) 3: MON1(-), MON2(-) B: Polarity of pulse outputs 0: Not inverted 1: Inverted			
P1-04 MON1	Scaling Factor Analog Output 1 Applicable operating mode: PT, PS, V, T	% 1 100 100 Decimal	u16 RW per.	Modbus 208h
P1-05 MON2	Scaling Factor Analog Output 2 Applicable operating mode: PT, PS, V, T	% 1 100 100 Decimal	u16 RW per.	Modbus 20Ah
P1-07 ReactLimSw	Limit Switch Fault Reaction Applicable operating mode: PT, PS, V, T Fault Reaction selection after a limit switch is at active state while the power stage is disabled 1: The drive does not trigger an error 0: The drive triggers an error	- 0 0 1 Decimal	u16 RW per.	Modbus 20Eh
P1-09 SP1	Target Velocity/Velocity Limitation 1 Applicable operating mode: V, T Target velocity 1 In the operating mode V, this parameter specifies the first target velocity. Velocity limitation 1 In the operating mode T, this parameter specifies the first velocity limitation.	0.1rpm -60000 10000 60000 Decimal	s32 RW per.	Modbus 212h
P1-10 SP2	Target Velocity/Velocity Limitation 2 Applicable operating mode: V, T Target velocity 2 In the operating mode V, this parameter specifies the second target velocity. Velocity limitation 2 In the operating mode T, this parameter specifies the second velocity limitation.	0.1rpm -60000 20000 60000 Decimal	s32 RW per.	Modbus 214h
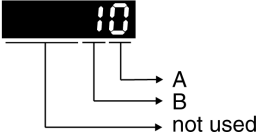
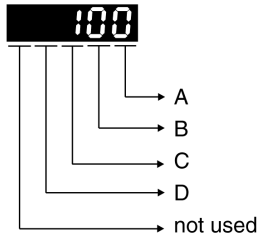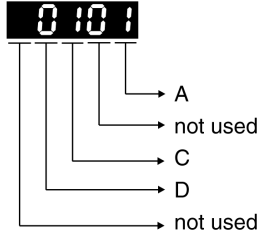| Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P1-11 SP3	Target Velocity/Velocity Limitation 3 Applicable operating mode: V, T Target velocity 3 In the operating mode V, this parameter specifies the third target velocity. Velocity limitation 3 In the operating mode T, this parameter specifies the third velocity limitation.	0.1rpm -60000 30000 60000 Decimal	s32 RW per.	Modbus 216h
P1-12 TQ1	Target Torque/Torque Limitation 1 Applicable operating mode: PT, PS, V, T Target torque 1 in percent of nominal current In the operating mode T, this parameter specifies the first target torque. Torque limitation 1 in percent of nominal current In the operating modes PT, PS and V, this parameter specifies the first torque limitation. The signal output function TQL is activated if the torque reaches the torque limitations set via the parameters P1-12 ... P1-14 or via an analog input.	% -300 100 300 Decimal	s16 RW per.	Modbus 218h
P1-13 TQ2	Target Torque/Torque Limitation 2 Applicable operating mode: PT, PS, V, T Target torque 2 in percent of nominal current In the operating mode T, this parameter specifies the second target torque. Torque limitation 2 in percent of nominal current In the operating modes PT, PS and V, this parameter specifies the second torque limitation. The signal output function TQL is activated if the torque reaches the torque limitations set via the parameters P1-12 ... P1-14 or via an analog input.	% -300 100 300 Decimal	s16 RW per.	Modbus 21Ah
P1-14 TQ3	Target Torque/Torque Limitation 3 Applicable operating mode: PT, PS, V, T Target torque 3 in percent of nominal current In the operating mode T, this parameter specifies the third target torque. Torque limitation 3 in percent of nominal current In the operating modes PT, PS and V, this parameter specifies the third torque limitation. The signal output function TQL is activated if the torque reaches the torque limitations set via the parameters P1-12 ... P1-14 or via an analog input.	% -300 100 300 Decimal	s16 RW per.	Modbus 21Ch
P1-15 LINELOSSMODE	Mains Phase Monitoring - Response to Missing Mains Phase Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive if the mains phase monitoring function detects an error.	- 0 0 2 Decimal	u16 RW per.	Modbus 21Eh

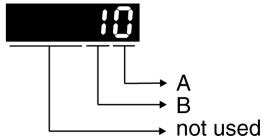| Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	Value 0: Detected error if power stage is enabled or disabled Value 1: Detected error if power stage is enabled, alert if power stage is disabled Value 2: Alert if power stage is enabled or disabled			
P1-16 LINELOSSRECOVER	Mains Phase Monitoring - Fault Reset Applicable operating mode: PT, PS, V, T This parameter specifies the type of Fault Reset after a detected mains phase error has been removed. Value 0: No automatic Fault Reset Value 1: Automatic Fault Reset	- 0 0 1 Decimal	u16 RW per.	Modbus 220$_h$
P1-17 LINELOSSTYPE	Mains Phase Monitoring - Type Applicable operating mode: PT, PS, V, T This parameter specifies the type of mains phase monitoring Value 0: No mains phase monitoring Value 1: Mains phase monitoring single-phase connection Value 2: Mains phase monitoring three-phase connection	- 0 0 2 Decimal	u16 RW per.	Modbus 222$_h$
P1-18	Reserved	–	–	–
P1-19 DISTIME	Active Disable - Delay Time Power Stage Applicable operating mode: PT, PS, V, T This parameter specifies the delay time between standstill of the motor and disabling the power stage.	ms 0 0 6500 Decimal	u16 RW per.	Modbus 226$_h$
P1-20 ESTOPILIM	Current Limit During Quick Stop Applicable operating mode: PT, PS, V This parameter specifies the maximum current during a Quick Stop (expressed as factor of P1-78).	0.001 1 1000 1000 Decimal	s16 RW per.	Modbus 228$_h$
P1-21 FOLD	Status of Foldback Current Drive Applicable operating mode: PT, PS, V, T This parameter indicates whether the foldback current limit is greater than or less than the maximum current of the drive (see P1-78). Value 0: Foldback current limit greater than P1-78 Value 1: Foldback current limit is less than P1-78	- 0 - 1 Decimal	u16 RO -	Modbus 22A$_h$
P1-22 IFOLD	Foldback Current Limit - Drive Applicable operating mode: PT, PS, V, T Drive foldback current limit	0.01A 0 - 30000 Decimal	u32 RO -	Modbus 22C$_h$

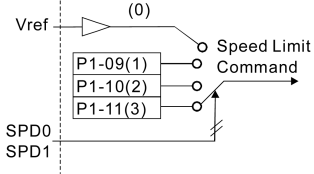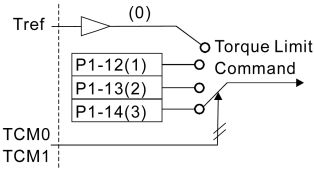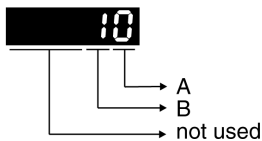| Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P1-23 IFOLDFTHRESH	Current Monitoring Drive - Detected Error Threshold Foldback Current Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the drive current monitoring function to detect a drive foldback current error.	0.01A 0 - 30000 Decimal	u32 RW per.	Modbus 22E$_h$
P1-24 IFOLDWTHRESH	Current Monitoring Drive - Alert Threshold Foldback Current Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the drive current monitoring function to trigger a drive foldback current alert.	0.01A 0 - 30000 Decimal	u32 RW per.	Modbus 230$_h$
P1-25	Reserved	–	–	–
P1-26 MIFOLD	Foldback Current Limit - Motor Applicable operating mode: PT, PS, V, T Motor foldback current limit	0.01A 0 - 30000 Decimal	u32 RO -	Modbus 234$_h$
P1-27 MIFOLDFTHRESH	Motor Current Monitoring - Detected Error Threshold Foldback Current Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the motor current monitoring function to detect a motor foldback current error.	0.01A 0 - 30000 Decimal	u32 RW per.	Modbus 236$_h$
P1-28 MIFOLDWTHRESH	Motor Current Monitoring - Alert Threshold Foldback Current Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the motor current monitoring function to trigger a motor foldback current alert.	0.01A 0 - 30000 Decimal	u32 RW per.	Modbus 238$_h$
P1-29 OVTHRESH	DC Bus Overvoltage Monitoring - Threshold Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value used by the DC bus overvoltage monitoring function.	V - - - Decimal	u16 RO -	Modbus 23A$_h$
P1-30 COMMERRMAXCNT	Commutation Monitoring - Maximum Counter Value Applicable operating mode: PT, PS, V, T	ms 0 0 0 Decimal	u16 RW -	Modbus 23C$_h$
P1-32 LSTP	Stop Method Applicable operating mode: PT, PS, V This parameter specifies how the motor is stopped if the power stage is to be disabled (includes signal input function OPST) or if an error is detected.	- 0$_h$ 0$_h$ 20$_h$ 	u16 RW per.	Modbus 240$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	Value 0$_h$: Deceleration ramp Value 10$_h$: Coast to stop Value 20$_h$: Deceleration ramp to velocity P1-38, then coast to stop (actual velocity must be less than the value of P1-38 for 50 ms before coasting to stop starts) In the operating mode Torque (T), the deceleration ramp is not used. Instead, the current is set to zero. Depending on the event that triggered the stop, the following deceleration ramps are used: - Signal input function STOP: P5-20 - Transmission error detected: P5-21 - Position overflow: P5-22 - Triggering of negative software limit switch: P5-23 - Triggering of positive software limit switch: P5-24 - Triggering of negative hardware limit switch: P5-25 - Triggering of positive hardware limit switch: P5-26 - Any other event: P1-68 The delay time between standstill of the motor and disabling the power stage is set via P1-19.	Hexadecimal		
P1-34 TACC	Acceleration Period Applicable operating mode: PT, V The acceleration period is the time in milliseconds required to accelerate from motor standstill to 6000 rpm. For operating mode V, this parameter specifies the acceleration. For operating mode PT, this parameter specifies an acceleration limitation for the pulses at the PTI interface.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 244$_h$
P1-35 TDEC	Deceleration Period Applicable operating mode: PT, V The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. For operating mode V, this parameter specifies the deceleration. For operating mode PT, this parameter specifies a deceleration limitation for the pulses at the PTI interface.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 246$_h$
P1-37 LMJR	Ratio of Load Inertia to Motor Inertia Applicable operating mode: PT, PS, V, T This parameter specifies the ratio of load inertia to motor inertia (J_load / J_motor). J_load: Total moment of inertia of external mechanical load	0.1 0 10 20000 Decimal	u32 RW per.	Modbus 24A$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	J_motor: Moment of inertia of motor			
P1-38 ZSPD	Signal Output Function ZSPD / Signal Input Function ZCLAMP - Velocity Applicable operating mode: PT, PS, V, T This parameter specifies the velocity for the signal output function ZSPD. The signal output function ZSPD indicates that the velocity of the motor is less than the velocity value set via this parameter. This parameter specifies the velocity for the signal input function ZCLAMP. The signal input function ZCLAMP stops the motor. The velocity of the motor must be below the velocity value set via this parameter.	0.1rpm 0 100 2000 Decimal	s32 RW per.	Modbus 24C$_h$
P1-39 SSPD	Signal Output Function TSPD - Velocity Applicable operating mode: PT, PS, V, T This parameter specifies the velocity for the signal output function TSPD. The signal output function TSPD indicates that the velocity of the motor is greater than the velocity value set via this parameter.	rpm 0 3000 5000 Decimal	u32 RW per.	Modbus 24E$_h$
P1-40 VCM	Velocity Target Value and Velocity Limitation 10 V Applicable operating mode: PT, PS, V, T In the operating mode V, this parameter specifies the target velocity that corresponds to the maximum input voltage of 10 V. In the operating mode T, this parameter specifies the velocity limitation that corresponds to the maximum input voltage of 10 V. Example: If the value of this parameter is 3000 in the operating mode V and if the input voltage is 10 V, the target velocity is 3000 rpm.	rpm 0 - 10001 Decimal	s32 RW per.	Modbus 250$_h$
P1-41 TCM	Torque Target Value and Torque Limitation 10 V Applicable operating mode: PT, PS, V, T In the operating mode T, this parameter specifies the target torque that corresponds to the maximum input voltage of 10 V. In the operating modes PT, PS and V, this parameter specifies the torque limitation that corresponds to the maximum input voltage of 10 V. Example: If the value of this parameter is 100 in the operating mode T and if the input voltage is 10 V, the target torque is 100 % of the nominal torque. Setting can only be modified if power stage is disabled.	% 0 100 1000 Decimal	u16 RW per.	Modbus 252$_h$
P1-42 MBT1	ON Delay Time of Holding Brake Applicable operating mode: PT, PS, V, T This parameter specifies the time between enabling the power stage and starting a movement (opening time for the holding brake).	ms 0 0 1000 Decimal	u16 RW per.	Modbus 254$_h$
P1-44	Electronic Gear Ratio - Numerator 1	-	u32	Modbus 258$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
GR1	Applicable operating mode: PT, PS This parameter is used to set the numerator of the gear ratio. The denominator of the gear ratio is set via P1-45. In the operating mode PS, the value of this parameter can only be modified when the power stage is disabled.	1 128 536870911 Decimal	RW per.	
P1-45 GR2	Electronic Gear Ratio - Denominator Applicable operating mode: PT, PS This parameter is used to set the denominator of the gear ratio. The numerator of the gear ratio is set via P1-44. Setting can only be modified if power stage is disabled.	- 1 10 2147483647 Decimal	u32 RW per.	Modbus 25A$_h$
P1-46 ENCOUTRES	Number of encoder simulation increments (AB signal) per revolution Applicable operating mode: PT, PS, V, T The calculation of the range of this parameter depends on the value of P1-55. Setting can only be modified if power stage is disabled.	LPR - 2048 - Decimal	s32 RW per.	Modbus 25C$_h$
P1-47 SPOK	Signal Output Function SP_OK - Velocity Applicable operating mode: V This parameter specifies the velocity deviation window for the signal output function SP_OK. The signal output function SP_OK indicates that actual velocity is within the velocity deviation window.	rpm 0 10 300 Decimal	u32 RW per.	Modbus 25E$_h$
P1-48 MCOK	Signal Output Function MC_OK - Settings Applicable operating mode: PS This parameter specifies the behavior of the signal output function MC_OK after it has been activated. The signal output function MC_OK indicates that both the signal output functions CMD_OK and TPOS have been activated. In addition, you can specify whether a detected position deviation is to trigger a detected error. A: Behavior of MC_OK after deactivation of TPOS Value 0: When TPOS is deactivated, MC_OK is deactivated. Value 1: When TPOS is deactivated, MC_OK remains activated. B: Response to detected position deviation via TPOS if A is set to 0 Value 0: No response Value 1: Detected alert	- 0$_h$ 0$_h$ 21$_h$ Hexadecimal	u16 RW per.	Modbus 260$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	Value 2: Detected error			
P1-52 REGENRES	Braking Resistor - Resistance Applicable operating mode: PT, PS, V, T This parameter is used to set the resistance of the braking resistor. Value -1: No braking resistor	Ohm -1 - 32767 Decimal	s16 RW per.	Modbus 268h
P1-53 REGENPOW	Braking Resistor - Power Applicable operating mode: PT, PS, V, T This parameter is used to set the power of the braking resistor. Value -1: No braking resistor	W -1 - 32767 Decimal	s16 RW per.	Modbus 26Ah
P1-54 PER	Signal Output Function TPOS - Trigger Value Applicable operating mode: PT, PS This parameter specifies the position deviation value used to activate the signal output function TPOS. Operating mode PT: The signal output function TPOS indicates that the position deviation is within the tolerance set via this parameter. Operating mode PS: The signal output function TPOS indicates that the position deviation at the target position is within the tolerance set via this parameter.	PUU 0 1311 1280000 Decimal	u32 RW per.	Modbus 26Ch
P1-55 VLIM	Maximum Velocity - User-Defined Applicable operating mode: PT, PS, V, T This parameter specifies the maximum velocity. Factory setting: maximum motor speed. Setting can only be modified if power stage is disabled.	rpm 10 - 6000 Decimal	u32 RW per.	Modbus 26Eh
P1-57 CRSHA	Torque Monitoring - Torque Value Applicable operating mode: PT, PS, V, T This parameter is used to configure the torque monitoring function. The torque monitoring function detects an error (AL030) if the torque value set via this parameter is exceeded for a period of time set via P1-58.	% 0 0 300 Decimal	u16 RW per.	Modbus 272h
P1-58 CRSHT	Torque Monitoring - Time Value Applicable operating mode: PT, PS, V, T This parameter is used to configure the torque monitoring function. The torque monitoring function detects an error (AL030) if the torque value set via P1-57 is exceeded for a period of time set via this parameter.	ms 1 1 1000 Decimal	u16 RW per.	Modbus 274h
P1-59 VELCMDMOVEAVG	S Curve Filter for Operating Mode Velocity Applicable operating mode: V This parameter specifies the moving average time in [us] for the S curve filter in the operating mode Velocity. The value of this parameter must be a	us 0 0 255875 Decimal	u32 RW per.	Modbus 276h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	multiple of 125. This filter changes a linear acceleration into an S curve. Setting can only be modified if power stage is disabled.			
P1-60 COMMERRT-THRESH	Commutation Monitoring - Time Threshold Applicable operating mode: PT, PS, V, T	ms 0 0 3000 Decimal	u16 RW per.	Modbus 278ₕ
P1-61 COMMERRV-THRESH	Commutation Monitoring - Velocity Threshold Applicable operating mode: PT, PS, V, T	0.1rpm 0 600 60000 Decimal	u32 RW per.	Modbus 27Aₕ
P1-62 THERMODE	Motor Overtemperature Monitoring - Response Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive if the temperature monitoring function detects motor overtemperature. Value 0: Disable power stage immediately Value 3: Ignore overtemperature Value 4: Alert Value 5: Alert first, then detected error if condition persists after P1-63	- 0 0 5 Decimal	u16 RW per.	Modbus 27Cₕ
P1-63 THERMTIME	Motor Overtemperature Monitoring - Delay Time Applicable operating mode: PT, PS, V, T This parameter specifies the delay time between the detection of motor overtemperature and the transition to the operating state Fault (see P1-62).	s 0 30 300 Decimal	u16 RW per.	Modbus 27Eₕ
P1-64 UVMODE	Undervoltage Monitoring - Response Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive if the undervoltage monitoring function detects undervoltage. Value 0: Detected error Value 1: Alert (if power stage is enabled) Value 2: Alert first, then detected error if condition persists after P1-67 (if power stage is enabled) Value 3: Detected error (if power stage is enabled)	- 0 0 3 Decimal	u16 RW per.	Modbus 280ₕ
P1-65	Reserved	–	–	–
P1-66 MFOLD	Status of Foldback Current Motor Applicable operating mode: PT, PS, V, T This parameter indicates whether the foldback current limit is greater than or less than the maximum current of the motor (see P1-78).	- 0 - 1	u16 RO -	Modbus 284ₕ

Parameter name	Description	Unit / Minimum value / Factory setting / Maximum value / HMI Format	Data type / R/W / Persistent	Parameter address via fieldbus
	Value 0: Foldback current limit greater than P1-78 Value 1: Foldback current limit is less than P1-78	Decimal		
P1-67 UVTIME	Undervoltage Monitoring - Delay Time Applicable operating mode: PT, PS, V, T This parameter specifies the delay time between the detection of an undervoltage condition (displayed as "u")and the response of the drive to this condition as specified in P1-64.	s 0 30 300 Decimal	u16 RW per.	Modbus 286$_h$
P1-68 DECSTOP	Active Disable - Deceleration Ramp Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a power stage Disable request, see P1-32.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 288$_h$
P1-69 DECSTOPTIME	Disable - Deceleration Time Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a power stage Disable request, see P1-32. If the value of this parameter is not 0, this parameter overrides P1-68. Setting can only be modified if power stage is disabled.	ms 0 0 6500 Decimal	u16 RW per.	Modbus 28A$_h$
P1-70 IMAXHALT	Signal Input Function HALT - Maximum Current Applicable operating mode: T This parameter specifies the maximum current for the signal input function Halt. The maximum value for this parameter is the value of P1-79.	0.01A - 0 - Decimal	u32 RW per.	Modbus 28C$_h$
P1-71 REGENMAXONTIME	Braking Resistor - Maximum Time in Braking Applicable operating mode: PT, PS, V, T This parameter specifies the maximum time in braking for the braking resistor. The maximum time in braking is the maximum period of time during which the braking resistor may be activated.	ms 10 40 100 Decimal	u16 RW per.	Modbus 28E$_h$
P1-72 REGENFLTMODE	Braking Resistor Overload Monitoring - Response Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive if the braking resistor overload monitoring function detects braking resistor overload. Value 0: Alert Value 1: Detected error	- 0 0 1 Decimal	u16 RW per.	Modbus 290$_h$
P1-78 ILIM	User-Defined Maximum Current Applicable operating mode: PT, PS, V, T This parameter is specifies a user-defined maximum current for the drive. The maximum value of this parameter is the value of P1-79.	0.01A - - - Decimal	u32 RW per.	Modbus 29C$_h$
P1-79	Maximum Current	0.01A	u32	Modbus 29E$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
IMAX	Applicable operating mode: PT, PS, V, T This parameter indicates the maximum current for a drive / motor combination.	- - - Decimal	RO -	
P1-80 DIPEAK	Maximum Peak Current Applicable operating mode: PT, PS, V, T This parameter indicates the maximum peak current of the drive.	0.01A - - - Decimal	u32 RO -	Modbus 2A0$_h$
P1-81 DICONT	Nominal Current Applicable operating mode: PT, PS, V, T This parameter indicates the nominal current of the drive.	0.01A - - - Decimal	u32 RO -	Modbus 2A2$_h$
P1-84 CFG_MOTOR	Configured motor type Applicable operating mode: PT, PS, V, T	- 0 - 2147483647 Decimal	u32 RW per.	Modbus 2A8$_h$
P1-88 INDEXDURATE	Simulated Enc Index Pulse Duration	- 0 0 100 Decimal	u16 RW per.	Modbus 2B0$_h$
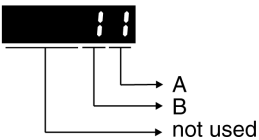
P2 - Extended Parameters

P2 - Extended Parameters

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P2-01 PPR	Gain Switching - Rate for Position Loop Applicable operating mode: PT, PS This parameter specifies the gain switching rate for the position loop. The gain switching function is configured via this parameter and parameters P2-05, P2-27 and P2-29.	% 10 100 500 Decimal	u16 RW per.	Modbus 302$_h$
P2-05 SPR	Gain Switching - Rate for Velocity Loop Applicable operating mode: PT, PS, V, T This parameter specifies the gain switching rate for the velocity loop. The gain switching function is configured via this parameter and parameters P2-01, P2-27 and P2-29.	% 10 100 500 Decimal	u16 RW per.	Modbus 30A$_h$
P2-08 PCTL	Factory Reset / Save Parameters Applicable operating mode: PT, PS, V, T This parameter provides the following functions: - Reset the parameters to the factory settings - Save the current parameter values The factory settings do not become effective until after you have powered the drive off and on again. Value 10: Reset the parameter values to the factory settings Value 11: Save the parameter values Value 400: Normal digital output control operation mode Value 406: Force output control operation mode **NOTE:** Value 999 is displayed when the parameter values are successfully saved.	- 0 0 406 Decimal	u16 RW -	Modbus 310$_h$
P2-09 DRT	Debounce Time - Inputs Applicable operating mode: PT, PS, V, T This parameter specifies the debounce time for the digital inputs DI1 ... DI5 and DI8. See P2-24 for the debounce time for the fast digital inputs DI6 and DI7.	ms 0 2 20 Decimal	u16 RW per.	Modbus 312$_h$
P2-10 DITF1	Signal Input Function for DI1 Applicable operating mode: PT, PS, V, T The parameters P2-10 ... P2-17 are used to assign signal input functions to the digital inputs DI1 ... DI8 and to configure the type of digital input (normally closed, normally open). A: Signal input functions: For the values, refer to chapter Setting the Digital Signal Inputs, page 239. B: Type:	- 0$_h$ 101$_h$ 146$_h$ Hexadecimal	u16 RW per.	Modbus 314$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	0: Normally closed (contact b) 1: Normally open (contact a) Example: If the setting of P2-10 is 101, the signal input function assigned to digital input 1 is SON (0x01) and the type of contact is a normally open contact. The drive must be restarted after the parameters have been modified. Forcing of digital inputs is configured via P3-06 and activated via P4-07. Setting can only be modified if power stage is disabled.			
P2-11 DITF2	Signal Input Function for DI2 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled.	- 0_h 104_h 146_h Hexadecimal	u16 RW per.	Modbus 316_h
P2-12 DITF3	Signal Input Function for DI3 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled.	- 0_h 116_h 146_h Hexadecimal	u16 RW per.	Modbus 318_h
P2-13 DITF4	Signal Input Function for DI4 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled.	- 0_h 117_h 146_h Hexadecimal	u16 RW per.	Modbus $31A_h$
P2-14 DITF5	Signal Input Function for DI5 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled.	- 0_h 102_h 146_h Hexadecimal	u16 RW per.	Modbus $31C_h$
P2-15 DITF6	Signal Input Function for DI6 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled.	- 0_h 22_h 146_h Hexadecimal	u16 RW per.	Modbus $31E_h$
P2-16 DITF7	Signal Input Function for DI7 Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled.	- 0_h 23_h 146_h Hexadecimal	u16 RW per.	Modbus 320_h
P2-17	Signal Input Function for DI8	-	u16	Modbus 322_h
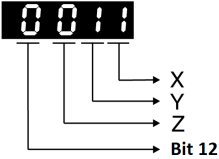
Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
DITF8	Applicable operating mode: PT, PS, V, T See P2-10 for details. Setting can only be modified if power stage is disabled.	0_h 21_h 146_h Hexadecimal	RW per.	
P2-18 DOTF1	Signal Output Function for DO1 Applicable operating mode: PT, PS, V, T The parameters P2-18 ... P2-22 are used to assign signal output functions to the digital outputs DO1 ... DO5 and to configure the type of digital output (normally closed, normally open). A: Signal output functions: For the values, refer to chapter Setting the Digital Signal Outputs, page 244. B: Type: 0: Normally closed (contact b) 1: Normally open (contact a) Example: If the setting of P2-18 is 101, the signal output function assigned to digital output 1 is SRDY (0x01) and the type of contact is a normally open contact.	- 0_h 101_h 137_h Hexadecimal	u16 RW per.	Modbus 324_h
P2-19 DOTF2	Signal Output Function for DO2 Applicable operating mode: PT, PS, V, T See P2-18 for details.	- 0_h 103_h 137_h Hexadecimal	u16 RW per.	Modbus 326_h
P2-20 DOTF3	Signal Output Function for DO3 Applicable operating mode: PT, PS, V, T See P2-18 for details.	- 0_h 109_h 137_h Hexadecimal	u16 RW per.	Modbus 328_h
P2-21 DOTF4	Signal Output Function for DO4 Applicable operating mode: PT, PS, V, T See P2-18 for details.	- 0_h 105_h 137_h Hexadecimal	u16 RW per.	Modbus $32A_h$
P2-22 DOTF5	Signal Output Function for DO5 Applicable operating mode: PT, PS, V, T See P2-18 for details.	- 0_h 7_h 137_h	u16 RW per.	Modbus $32C_h$

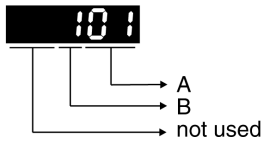| Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Hexadecimal		
P2-23 DOTF6	Signal Output Function for DO6(OCZ) Applicable operating mode: PT, PS, V, T Only the signal output function ESIM can be assigned to the digital output DO6(OCZ). Value 0: Encoder simulation function disabled Value 40$_{(h)}$: Encoder simulation function enabled Use P2-18 … P2-22 for assigning other signal output functions to the other digital outputs DO1 … DO5. See P2-18 for details.	- 0$_h$ 40$_h$ 137$_h$ Hexadecimal	u16 RW per.	Modbus 32E$_h$
P2-24 FDRT	Debounce Time - Fast Inputs Applicable operating mode: PT, PS, V, T This parameter specifies the debounce time for the digital inputs DI6 and DI7. See P2-09 for the debounce time for the digital inputs DI1 … DI5 and DI8.	us 0 50 20000 Decimal	u16 RW per.	Modbus 330$_h$
P2-27 GCC	Gain Switching - Conditions and Type Applicable operating mode: PT, PS, V, T This parameter specifies the conditions for and the type of gain switching. The gain switching function is configured via this parameter and parameters P2-01, P2-05 and P2-29. A: Conditions for gain switching: 0: Disabled 1: Signal input function GAINUP is active 2: In operating modes PT and PS, the position deviation is greater than the value of P2-29 3: Pulse frequency is greater than the value of P2-29 4: Velocity is greater than the value of P2-29 5: Signal input function GAINUP is not active 6: In operating modes PT and PS, the position deviation is less than the value of P2-29 7: Pulse frequency is less than the value of P2-29 8: Velocity is less than the value of P2-29	- 0$_h$ 0$_h$ 18$_h$ Hexadecimal	u16 RW per.	Modbus 336$_h$
P2-29 GPE	Gain Switching - Comparison Value Applicable operating mode: PT, PS, V, T This parameter specifies the comparison value used for the conditions for gain switching. Depending on the selected condition, the value entered represents the number of pulses (position	- 0$_h$ 138800$_h$ 3A9800$_h$ Hexadecimal	u32 RW per.	Modbus 33A$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	deviation), the pulse frequency or the velocity. The gain switching function is configured via this parameter and parameters P2-01, P2-05 and P2-27.			
P2-30 INH	Auxiliary Functions Applicable operating mode: PT, PS, V, T Value 0: Disabled Value 1: Enable the power stage	- -8 0 8 Decimal	s16 RW -	Modbus 33C$_h$
P2-31 LTNEFFORT	Autotuning Optimization Value Threshold Applicable operating mode: PT, PS, V This parameter is used to modify the gain.	0.001 100 1000 10000 Decimal	u32 RW -	Modbus 33E$_h$
P2-32 ATMODE	Autotuning Applicable operating mode: PT, PS, V This parameter is used to start autotuning with the selected autotuning method. Value 0: Stop Autotuning Value 1: Easy Tuning Value 2: Comfort Tuning [minimum settling time, vibration suppression] Value 3: Comfort Tuning [minimum overshoot, vibration suppression] Value 52: Comfort Tuning [minimum settling time, no vibration suppression] Value 53: Comfort Tuning [minimum overshoot, no vibration suppression]	- 0 0 56 Decimal	u16 RW -	Modbus 340$_h$
P2-34 VEMAX	Velocity Monitoring - Threshold Value Applicable operating mode: V This parameter specifies the velocity threshold for the velocity monitoring function. If this value is exceeded, error AL555 is detected.	0.1rpm 0 50000 60000 Decimal	u32 RW per.	Modbus 344$_h$
P2-35 PDEV	Position Deviation Monitoring - Threshold Value Applicable operating mode: PT, PS This parameter specifies the position deviation threshold for the position deviation monitoring function. If this value is exceeded, error AL009 is detected.	10*pulse 1 384000 12800000 Decimal	u32 RW per.	Modbus 346$_h$
P2-36 PT_PULSE_FLTR	PTI Interface Debounce Time - Pulse Applicable operating mode: PT, PS, V, T This parameter specifies the debounce time of the pulse input of the PTI interface.	16.6666*ns 0 30 511 Decimal	u16 RO -	Modbus 348$_h$
P2-37	PTI Interface Debounce Time - Direction	16.6666*ns	u16	Modbus 34A$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
PT_DIRECT_FLTR	Applicable operating mode: PT, PS, V, T This parameter specifies the debounce time of the direction input of the PTI interface.	0 30 511 Decimal	RO -	
P2-44 AUTOR_DOMS	Set the AUTOR feature digital out mode Applicable operating mode: PS This parameter provides information on the status of the sequence of data sets processed with the signal input functions. Value 0: General output mode. The functions assigned to the digital outputs DO1 … DO6 via the parameters P2-18 … P2-23 are active. Value 1: Combination output mode. The digital outputs provide information on the status of the sequence of data sets. When this parameter is reset to 0, the previous assignments and configurations of the digital outputs as set via the parameters P2-18 … P2-23 are restored. See Status of Data Set Sequences for details.	- 0_h 0_h 1_h Hexadecimal	u16 RW per.	Modbus 358_h
P2-50 DCLR	Signal Input Function CLRPOS - Trigger Applicable operating mode: PT This function is only supported in linear control mode (P8-35=0x4001) This parameter specifies how the signal input function CLRPOSDEV is triggered. The signal input function CLRPOSDEV resets the position deviation to zero. Value 0: Rising edge Value 1: Level	- 0_h 0_h 1_h Hexadecimal	u16 RW per.	Modbus 364_h
P2-60 GR2	Electronic Gear Ratio - Numerator 2 Applicable operating mode: PT, PS This parameter can be used to set an additional gear ratio. The additional gear ratio can be selected via the signal input functions GNUM0 and GNUM1. See P1-44 for details.	- 1 128 536870911 Decimal	u32 RW per.	Modbus 378_h
P2-61 GR3	Electronic Gear Ratio - Numerator 3 Applicable operating mode: PT, PS See P2-60 for details.	- 1 128 536870911 Decimal	u32 RW per.	Modbus $37A_h$
P2-62 GR4	Electronic Gear Ratio - Numerator 4 Applicable operating mode: PT, PS See P2-60 for details.	- 1 128 536870911 Decimal	u32 RW per.	Modbus $37C_h$

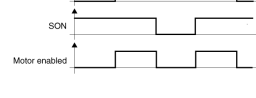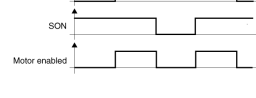| Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P2-65 GBIT	Special Function 1 Applicable operating mode: PT, PS, V Bits 0 … 1: Reserved (must be set to 0). Bit 2: Activate/ deactivate the fault AL560 • 0: The alarm can be triggered • 1: The alarm cannot be triggered Bit 4: Target position rejected monitoring • 0: Function activated (AL520) • 1: Function deactivated Bit 5: Current limitation in torque mode • 0: Function activated • 1: Function deactivated Bit 6: Reference pulse monitoring • 0: Function activated • 1: Function deactivated Bit 7: Pulse signal monitoring • 0: Function activated (AL534) • 1: Function deactivated Bit 8: Motor overload monitoring • 0: Function activated (AL006) • 1: Function deactivated Bit 9: Motor phase monitoring • 0: Function deactivated • 1: Function activated Bit 10: Acceleration and deceleration for ZCLAMP: • 0: Immediate stop. Motor is locked at the position where it was when ZCLAMP became active. • 1: Motor is decelerated with deceleration ramp setting. Motor is locked at the position where standstill is reached.	- 0_h 200_h $FFFC_h$ Hexadecimal	u16 RW per.	Modbus 382_h
P2-65(continued)	Bit 11: NL(CWL)/PL(CCWL) pulse input inhibit function • 0: Function activated • 1: Function deactivated If P8-31 is set to 1 or 3 and if a hardware limit switch is triggered, a Fault Reset clears the missing master pulses. Only use the pulse inhibit function with settings 1 or 3 of P8-31 if you do not need a Fault Reset after a detected hardware limit switch error. To achieve this, set the Automatic Fault Reset function of P2-68 to 1. Bit 12: Mains phase monitoring • 0: Function activated (AL022) • 1: Function deactivated Bit 13: Encoder simulation output monitoring • 0: Function activated (AL018) • 1: Function deactivated Bit 14: Unit of P8-23, P8-24 and P8-33 • 0: Unit is in Hz • 1: Unit is in 0.01Hz Bit 15: Check if phases are connected by current injection • 0: Function activated			

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	• 1: Function deactivated			
P2-66 GBIT2	Special Function 2 Applicable operating mode: PT, PS, V, T Bits 0 … 1: Reserved (must be set to 0). Bit 2: This bit specifies the type of Fault Reset after a detected undervoltage error has been removed. 0: No automatic Fault Reset 1: Automatic Fault Reset Bits 3 … 7: Reserved (must be set to 0).	- 0 0 4 Decimal	u16 RW per.	Modbus 384$_h$
P2-68 AEAL	Auto-Enable and Automatic Hardware Limit Switch Fault Reset Applicable operating mode: PT, PS, V, T Bit12 of P2-68 to switch Error Or Warning when trigger limit switch for IO output function • 0: Digital Output (0x11) WARN Warning Signal Activated = "true" • 1: Digital Output(0x07) ERROR Detected = "true" X: Automatic power stage enabling 0: Trigger SON to enable power stage 1: Enable power stage automatically if SON is active after drive has been powered on Y: Automatic Fault Reset for limit switches 0: Detected hardware limit switch error (AL014 and AL015) requires Fault Reset 1: Detected hardware limit switch error (AL014 and AL015) can be reset without Fault Reset Z: Reserved 0: No detected error 1: Detected error, Fault Reset required Modified settings become active the next time the product is powered on.	- 0$_h$ 0$_h$ 1111$_h$ Hexadecimal	u16 RW per.	Modbus 388$_h$
P2-69	Analog Input 1 Value	mV	s16	Modbus 38A$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
ANIN1	Applicable operating mode: PT, PS, V, T This parameter Indicates the value of analog input 1.	-12500 - 12500 Decimal	RO per.	
P2-70 ANIN2	Analog Input 2 Value Applicable operating mode: PT, PS, V, T This parameter Indicates the value of analog input 2.	mV -12500 - 12500 Decimal	s16 RO per.	Modbus 38C$_h$
P2-71 FOLDBACK_FAULT_ TRIG_IMM	FOLDBACK_FAULT_TRIG_IMM Applicable operating mode: PT, PS, V, T This parameter Active the fault as the fold back limit is equal to current	- 0 1 1 Decimal	u16 RW per.	Modbus 38E$_h$
P2-72 MFOLDT_DISPLY	Motor Foldback Time Constant Applicable operating mode: PT, PS, V, T This parameter Indicates the value of MFOLDT_INDEX according to P2-73 (see Overload Characteristics Curves, page 43).	- - 0 4294967295 Decimal	u32 RO per.	Modbus 390$_h$
P2-73 MFOLDT_INDEX	Motor Foldback level Applicable operating mode: PT, PS, V, T This parameter define the level of MFOLDT. The corresponding MFOLDT value is displayed in P2-72.	- 1 1 4 Decimal	u16 RW per.	Modbus 392$_h$

P3 - Communication Parameters

P3 - Communication Parameters

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P3-00 ADR	Device Address Modbus Applicable operating mode: PT, PS, V, T The device address must be unique. Modified settings become active the next time the product is powered on.	- 1 127 247 Decimal	u16 RW per.	Modbus 400$_h$
P3-01 BRT	Transmission Rate Applicable operating mode: PT, PS, V, T This parameter is used to set the data transmission rate. For further information, refer to chapter Setting the Device Address, Baud Rate and Connection Settings, page 130. Modified settings become active the next time the product is powered on.	- 0$_h$ 102$_h$ 405$_h$ Hexadecimal	u16 RW per.	Modbus 402$_h$
P3-02 PTL	Modbus Connection Settings Applicable operating mode: PT, PS, V, T This parameter specifies the Modbus connection settings. For further information, refer to chapter Setting the Device Address, Baud Rate and Connection Settings, page 130. Modified settings become active the next time the product is powered on.	- 6$_h$ 7$_h$ 9$_h$ Hexadecimal	u16 RW per.	Modbus 404$_h$
P3-03 FLT	Detected Modbus Communication Errors - Handling Applicable operating mode: PT, PS, V, T This parameter specifies the response of the drive to a detected communication error. Value 0: Detected alert Value 1: Detected error	- 0$_h$ 0$_h$ 1$_h$ Hexadecimal	u16 RW per.	Modbus 406$_h$
P3-04 CWD	Modbus Connection Monitoring Applicable operating mode: PT, PS, V, T This parameter specifies the maximum permissible duration for communication timeout. When this time has elapsed, the communication timeout is treated as a detected error. Setting this parameter to 0 to disables connection monitoring.	ms 0 0 20000 Decimal	u16 RW per.	Modbus 408$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P3-06 SDI	Digital Inputs - Forcing Settings Applicable operating mode: PT, PS, V, T This parameter determines whether or not a digital input can be forced. Bits 0 ... 7: Digital input DI1 ... digital input DI8 Bit settings: Value 0: Digital input cannot be forced Value 1: Digital input can be forced To actually start forcing, you must write P4-07. See P2-10 ... P2-17 for the assignment of signal input functions to the digital inputs.	- 0_h 0_h $7FF_h$ Hexadecimal	u16 RW -	Modbus $40C_h$
P3-07 CDT	Modbus Response Delay Time Applicable operating mode: PT, PS, V, T This parameter specifies the time delay with which the drive responds to the Modbus master.	0.5ms 0 0 1000 Decimal	u16 RW per.	Modbus $40E_h$

P4 - Diagnostics Parameters

P4 - Diagnostics Parameters

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P4-00 ASH1	Error History - Error Code of Most Recent Detected Error n Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the most recent detected error. Writing 0 to this parameter clears the error history.	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RW -	Modbus 500_h
P4-01 ASH2	Error History - Error Code of Most Recent Detected Error n - 1 Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the detected error n-1, n being the most recent detected error.	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus 502_h
P4-02 ASH3	Error History - Error Code of Most Recent Detected Error n - 2 Applicable operating mode: PT, PS, V, T	- 0_h 0_h $FFFF_h$	u16 RO -	Modbus 504_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	This parameter indicates the error code of the detected error n-2, n being the most recent detected error.	Hexadecimal		
P4-03 ASH4	Error History - Error Code of Most Recent Detected Error n - 3 Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the detected error n-3, n being the most recent detected error.	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus 506_h
P4-04 ASH5	Error History - Error Code of Most Recent Detected Error n - 4 Applicable operating mode: PT, PS, V, T This parameter indicates the error code of the detected error n-4, n being the most recent detected error.	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus 508_h
P4-05 JOG	Jog Velocity Applicable operating mode: PT, PS, V, T For further information, refer to chapter Jog Operation, page 253.	rpm 0 20 5000 Decimal	u32 RW per.	Modbus $50A_h$
P4-06 FOT	Forcing Matrix of Digital Outputs Applicable operating mode: PT, PS, V, T This parameter lets you set those signal outputs whose signal output functions have been set to SDO_0 … SDO_5. Bit 0 = 1 sets those signal outputs whose signal output function has been set to SDO_0. Bit 1 = 1 sets those signal outputs whose signal output function has been set to SDO_1. Bit 2 = 1 sets those signal outputs whose signal output function has been set to SDO_2. Bit 3 = 1 sets those signal outputs whose signal output function has been set to SDO_3. Bit 4 = 1 sets those signal outputs whose signal output function has been set to SDO_4. Bit 5 = 1 sets those signal outputs whose signal output function has been set to SDO_5. Bit 6 = 1 sets those signal outputs whose signal output function has been set to SDO_6. Bit 7 = 1 sets those signal outputs whose signal output function has been set to SDO_7. See P2-18 ... P2-22 for assigning the functions to the digital outputs.	- 0_h 0_h FF_h Hexadecimal	u16 RW -	Modbus $50C_h$
P4-07 ITST	State of Digital Inputs / Activate Forcing Applicable operating mode: PT, PS, V, T A read access to this parameter indicates the state of the digital inputs in the form of a bit pattern. Example:	- 0_h 0_h FF_h Hexadecimal	u16 RW -	Modbus $50E_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	Read value 0x0011: Digital inputs 1 and 5 are logical 1 By writing this parameter, you can modify the state of the inputs provided that the setting for the corresponding input in P3-06 allows for forcing (value 1 for the bit corresponding to the input). Example: Write value 0x0011: Digital inputs 1 and 5 are set to logical 1, regardless of the previous state See P3-06 for permitting forcing of individual digital inputs. See P2-10 ... P2-17 for the assignment of signal input functions to the digital inputs.			
P4-08 PKEY	Status of HMI Keypad Applicable operating mode: PT, PS, V, T This parameter is used to verify proper operation of the keys on the HMI keypad of the drive As a bitwise: • "1" - key is pressed, • "0" - key is released. When: • **S** key is indicated by bit0 • **M** key is indicated by bit1 • **UP** key is indicated by bit2 • **DOWN** key is indicated by bit3 • **ENT** key is indicated by bit4	- 0_h 0_h FF_h Hexadecimal	u16 RO -	Modbus 510_h
P4-09 MOT	State of Digital Outputs Applicable operating mode: PT, PS, V, T This parameter indicates the state of the digital outputs DO1…DO6. Bit 0 = 1: DO1 is activated Bit 1 = 1: DO2 is activated Bit 2 = 1: DO3 is activated Bit 3 = 1: DO4 is activated Bit 4 = 1: DO5 is activated Bit 5 = 1: DO6 is activated	- 0_h 0_h $3F_h$ Hexadecimal	u16 RO -	Modbus 512_h
P4-10 FLTHISTCLR	Clear Error History Applicable operating mode: PT, PS, V, T Writing 0 to this parameter clears the error history.	- 0 0 0 Decimal	u16 RW -	Modbus 514_h
P4-20 ANIN1DB	Analog Input 1 Dead Band Applicable operating mode: PT, PS, V, T This parameter gets/sets the dead band of analog input 1.	mV 0 0 10000 Decimal	s16 RW per.	Modbus 528_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	If the absolute value of the analog input signal is less than this value, no analog command signal is generated. This function helps to prevent the drive from responding to voltage noise near the zero point of the analog input.			
P4-21 ANIN2DB	Analog Input 2 Dead Band Applicable operating mode: PT, PS, V, T This parameter gets/sets the dead band of analog input 2. If the absolute value of the analog input signal is less than this value, no analog command signal is generated. This function helps to prevent the drive from responding to voltage noise near the zero point of the analog input.	mV 0 0 10000 Decimal	s16 RW per.	Modbus 52A$_h$
P4-22 ANIN1OFFSET	Analog Input 1 Offset Applicable operating mode: V This parameter specifies an offset for the analog input used in operating mode V.	mV -10000 0 10000 Decimal	s16 RW per.	Modbus 52C$_h$
P4-23 ANIN2OFFSET	Analog Input 2 Offset Applicable operating mode: T This parameter specifies an offset for the analog input used in operating mode T.	mV -10000 0 10000 Decimal	s16 RW per.	Modbus 52E$_h$
P4-24 LVL	Undervoltage Monitoring - Threshold Value Applicable operating mode: PT, PS, V, T This parameter specifies the threshold value for DC bus undervoltage monitoring. If the DC Bus voltage is less than the value of P4-24 x √2, the error AL003 is detected.	V 140 160 190 Decimal	u16 RW per.	Modbus 530$_h$
P4-26 DO_FORCEABLE	Forceable digital outputs Applicable operating mode: PT, PS, V, T This parameter shows whether or not a digital output can be forced. Bits 0 … 4: Digital output DO1 … digital output DO5 Bit settings: Value 0: Digital output cannot be forced Value 1: Digital output can be forced	- Hexadecimal	u16 RO -	Modbus 534$_h$
P4-27 DO_FORCE_MASK	Digital output force mask Applicable operating mode: PT, PS, V, T This parameter contains a mask that determines whether or not a digital output can be forced. Bits 0 … 4: Digital output DO1 … digital output DO5	- 0$_h$ 0$_h$ Hexadecimal	u16 RW -	Modbus 536$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	Bit settings: Value 0: Digital output cannot be forced Value 1: Digital output can be forced To actually start forcing, you must write P4-28. See P2-18 … P2-22 for the assignment of signal output functions to the digital outputs.			
P4-28 DO_FORCE_VALUE	Digital output force value Applicable operating mode: PT, PS, V, T A read access to this parameter indicates the state of the digital outputs in the form of a bit pattern. Example: Read value 0x0011: Digital outputs 1 and 5 are logical 1 By writing this parameter, you can modify the state of the outputs provided that the setting for the corresponding output in P4-27 allows for forcing (value 1 for the bit corresponding to the output). Example: Write value 0x0011: Digital outputs 1 and 5 are set to logical 1, regardless of the previous state See P4-27 for permitting forcing of individual digital outputs. See P2-18 … P2-22 for the assignment of signal output functions to the digital outputs.	- 0_h 0_h Hexadecimal	u16 RW -	Modbus 538_h
P4-29 LOAD_PERIOD_ TIME	Motor Load Period Time Applicable operating mode: PT, PS, V, T This parameter specifies the time period in which the average load will be calculated. Modified settings become active the next time the product is powered on.	ms 1 5000 100000 Decimal	u32 RW per.	Modbus $53A_h$

P5 - Motion Settings

P5- Motion Settings

Parameter name	Description	Unit / Minimum value / Factory setting / Maximum value / HMI Format	Data type / R/W / Persistent	Parameter address via fieldbus
P5-00 REV	Firmware Revision Applicable operating mode: PT, PS, V, T This parameter contains the revision number of the firmware.	- 0_h 0_h $FFFF_h$ Hexadecimal	u16 RO -	Modbus 600_h
P5-04 HMOV	Homing - Homing Method Selection Applicable operating mode: PS This parameter is used to select the homing method and configure the behavior of the index pulse and the limit switches. For further information, refer to chapter Operating Mode Position Sequence (PS), page 259. Setting can only be modified if power stage is disabled.	- 0_h 0_h 128_h Hexadecimal	u16 RW per.	Modbus 608_h
P5-05 HOMESPEED1	Homing - Fast Velocity for Reference Movement Applicable operating mode: PS	0.1rpm 10 1000 60000 Decimal	u32 RW per.	Modbus $60A_h$
P5-06 HOMESPEED2	Homing - Slow Velocity for Reference Movement Applicable operating mode: PS	0.1rpm 10 200 60000 Decimal	u32 RW per.	Modbus $60C_h$
P5-07 PRCM	LXM26 is controlled by Modbus and it needs to activate the access P10-32 = 1 (Modbus address 0xb40) before it can be operated by P5-07 Operating Mode PS via Parameter Applicable operating mode: PS The power stage must be enabled by using the parameter P2-30 prior to use this function. The power stage must be disabled by using the parameter P2-30 after using this function. The operating mode Position Sequence (PS) provides 32 data sets that can be executed via the signal input functions POS0 ... POS4 and CTRG or via of this parameter. 0: Start operating mode Homing (Homing data set) 1 ... 32: Trigger data set (equivalent to the signal input functions CTRG and POSn). 33 ... 9999: Not permitted	- 0 0 20032 Decimal	u16 RW -	Modbus $60E_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	10000: Stop movement (equivalent to the signal input function STOP) Values displayed via this parameter: If a data set is active, but not yet completed, the value displayed is the value of this parameter plus 10000. If a data set has been completed, the value displayed is the value of this parameter plus 20000. Example: Displayed value 10003: Data set 3 has been started, but is not yet completed. Displayed value 20003: Data set 3 has been completed. Refer to chapter Operating Mode Position Sequence (PS), page 259.			
P5-08 POSLIMPOS	Positive Software Limit Switch - Position Applicable operating mode: PS Prerequisite: Software limit switches only work with a valid zero point. Setting can only be modified if power stage is disabled.	PUU -2147483647 134217727 2147483647 Decimal	s32 RW per.	Modbus 610h
P5-09 POSLIMNEG	Negative Software Limit Switch - Position Applicable operating mode: PS Prerequisite: Software limit switches only work with a valid zero point. Setting can only be modified if power stage is disabled.	PUU -2147483647 -134217727 2147483647 Decimal	s32 RW per.	Modbus 612h
P5-10 GEARACCTHRESH	Operating mode Pulse Train - Maximum Acceleration Applicable operating mode: PT This parameter is used to reduce the acceleration noise.	ms 6 6 65500 Decimal	u16 RW per.	Modbus 614h
P5-11 POSLIMHYST	Software Limit Switches - Hysteresis Value Applicable operating mode: PS This parameter specifies a hysteresis value for the software limit switches. Setting can only be modified if power stage is disabled.	PULSE 0 3556 35555 Decimal	u16 RW per.	Modbus 616h
P5-12 PROBE_1_LVL_PRD	Touch Probe Input 1 - Stable Level Duration Applicable operating mode: PT, PS This parameter specifies the period of time for which the level at Touch Probe input 1 must be stable.	31.25 µs 2 5 32 Decimal	u16 RW per.	Modbus 618h
P5-13 POSLIMMODE	Position Limiting Mode Applicable operating mode: PS	- 0	u16 RW	Modbus 61Ah

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus

	This parameter activates/deactivates the software limit switches and the homing transient limits.
	
	Value 0:
	   • Deactivate software limit switches.
	   • Activate homing transient limits.
	Value 1:
	   • Activate software limit switches.
	   • Activate homing transient limits.
	Value 2:
	   • Deactivate software limit switches.
	   • Deactivate homing transient limits.
	Value 3:
	   • Activate software limit switches.
	   • Deactivate homing transient limits.
	   NOTE: Software limit switches only work with a valid zero point.
		2
		
		3
		
		Decimal
			per.	

P5-14 ICMDSLOPE	Motion Profile for Torque - Slope Applicable operating mode: T This parameter specifies the slope of the motion profile for torque.	mA/s 1 100000 30000000 Decimal	u32 RW per.	Modbus 61C$_h$
P5-15 ICMDSLOPEEN	Motion Profile for Torque - Activation Applicable operating mode: T This parameter activates the motion profile for torque. Value 0: Deactivate Value 1: Activate Setting can only be modified if power stage is disabled.	- 0 0 1 Decimal	u16 RW per.	Modbus 61E$_h$
P5-16 AXEN	Encoder Increments in PUU Applicable operating mode: PT, PS, V, T Setting can only be modified if power stage is disabled. This parameter specifies an offset to the encoder position.	PUU -2147483647 0 2147483647 Decimal	s32 RW -	Modbus 620$_h$
P5-18 AXPC	External Encoder (Pulses) Applicable operating mode: PT, PS, V, T This parameter contains the cumulated pluses counted at the PTI input multiplied by 16 since the drive has been switched on.	- -2147483648 - 2147483647 Decimal	s32 RO -	Modbus 624$_h$
P5-20 STP	Deceleration Ramp - Signal Input Function STOP Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered via the signal input function STOP.	ms 6 50 65500 Decimal	u16 RW per.	Modbus 628$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp.			
P5-21 CTO	Deceleration Ramp - Detected Transmission Error Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if a transmission error is detected. The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp.	ms 6 50 65500 Decimal	u16 RW per.	Modbus 62A$_h$
P5-22 OVF	Deceleration Ramp - Position Overflow Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if a position overflow is detected. The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 62C$_h$
P5-23 SNL	Deceleration Ramp - Triggering of Negative Software Limit Switch Applicable operating mode: PS This parameter specifies the deceleration ramp for a stop triggered if the negative software limit switch is activated. The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp.	ms 6 50 65500 Decimal	u16 RW per.	Modbus 62E$_h$
P5-24 SPL	Deceleration Ramp - Triggering of Positive Software Limit Switch Applicable operating mode: PS This parameter specifies the deceleration ramp for a stop triggered if the positive software limit switch is activated. The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp.	ms 6 50 65500 Decimal	u16 RW per.	Modbus 630$_h$
P5-25 NL	Deceleration Ramp - Triggering of Negative Hardware Limit Switch Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if the negative hardware limit switch is activated. The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 632$_h$
P5-26 PL	Deceleration Ramp - Triggering of Positive Hardware Limit Switch Applicable operating mode: PT, PS, V This parameter specifies the deceleration ramp for a stop triggered if the positive hardware limit switch is activated.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 634$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp.			
P5-35 PROBES_POLARITY	Touch Probes Polarity Applicable operating mode: PT, PS, V, T This parameter specifies the touch probes polarity.	- 0 - 3 Decimal	u16 RO per.	Modbus 646$_h$
P5-37 CAAX	Touch Probe Input 1 - Captured Position Applicable operating mode: PT, PS, V, T This parameter contains the position captured at Touch Probe input 1.	PUU -2147483647 0 2147483647 Decimal	s32 RO -	Modbus 64A$_h$
P5-38 PROBE1_CNTR	Touch Probe Input 1 - Event Counter Applicable operating mode: PT, PS, V, T The value is increased by 1 each time a position has been captured at Touch Probe input 1.	- 0 0 65535 Decimal	u16 RO -	Modbus 64C$_h$
P5-39 CACT	Touch Probe Input 1 - Configuration Applicable operating mode: PT, PS, V, T X: Activate/deactivate position capture 0: Deactivate 1: Activate (is reset to 0 when the counter in P5-38 is incremented) Y: Reserved U: Reserved Z: Polarity of Touch Probe input 0: Normally open 1: Normally closed Where X is the least significant half-byte and U is the most significant half-byte of the X/Y/U/Z Integer.	- 0$_h$ 0$_h$ 101$_h$ Hexadecimal	u16 RW -	Modbus 64E$_h$
P5-57 CAAX2	Touch Probe Input 2 - Captured Position Applicable operating mode: PT, PS, V, T This parameter contains the position captured at Touch Probe input 2.	PUU -2147483647 0 2147483647 Decimal	s32 RO -	Modbus 672$_h$
P5-58 PROBE2_CNTR	Touch Probe Input 2 - Event Counter Applicable operating mode: PT, PS, V, T The value is increased by 1 each time a position has been captured at Touch Probe input 2.	- 0 0 65535 Decimal	u16 RO -	Modbus 674$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P5-59 CACT2	Touch Probe Input 2 - Configuration Applicable operating mode: PT, PS, V, T X: Activate/deactivate position capture 0: Deactivate 1: Activate (is reset to 0 when the counter in P5-58 is incremented) Y: Reserved Z: Polarity of Touch Probe input 0: Normally open 1: Normally closed U: Reserved	- 0_h 0_h 101_h Hexadecimal	u16 RW -	Modbus 676_h
P5-76 HOME_OFFSET_ MOVE	Move Home Offset When Homing Applicable operating mode: Fieldbus mode This parameter activate/deactivate a movement to a configured home offset position when the homing position is reached.	- 0 0 1 Decimal	u16 RW per.	Modbus 698_h
P5-77 PROBE_2_LVL_PRD	Touch Probe Input 2 - Stable Level Duration Applicable operating mode: PT, PS This parameter specifies the period of time for which the level at Touch Probe input 2 must be stable.	31.25 µs 2 5 32 Decimal	u16 RW per.	Modbus $69A_h$
P5-78 MT_Ref_P	MULTI_TURN_REF_POSITION After a successful reference set (P8-44=2), this P5-78 position is automatically set at the reference point.	PUU -2147483647 0 2147483647 Decimal	s32 RW per	Modbus $69C_h$
P5-79 IGNORE_BATTERY_ FAULTS	Defines whether the drive is to ignore the multi-turn error AL576: • 0: The masking of the multi-turn error AL576 is inactive. • 1: The masking of the multi-turn error AL576 is active. When set P5-79=1, multi-turn encoder can be used as single-turn (even with single-turn cable).	- 0 0 1 Decimal	u16 RW per	Modbus $69E_h$
P5-80 IGNORE_ENCODER _WARNINGS	Defines whether the drive to ignore the multi-turn alert Wn750. • 0: The masking of the Wn750 is inactive. • 1: The masking of the Wn750 is active. For some applications which will rotate motor in one direction, the alert Wn750 for checking turns number within -32767 ... 32768 can be turned off by parameter P5-80=1.	- 0 0 1 Decimal	u16 RW per	Modbus $6A0_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P5-81 IgnorHome	Defines whether absolute positioning is allowed without homing/Reference Position Set. • 0: Not allowed • 1: Allowed When set P5-81=1, absolute positioning is allowed without homing/ set Reference Point.	- 0 0 1 Decimal	u16 RW per	Modbus 6A2$_h$
P5-82 MT_C_P	Current position in revolutions of multi-turn. This parameter is used to monitor the revolutions of multi-turn.	Rev -32767 0 32768 Decimal	s32 RO per	Modbus 6A4$_h$

P6 - Position Sequence Data Sets Group 1

P6 - PS Data Sets Group 1

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P6-00 ODAT	Position of Homing Data Set Applicable operating mode: PS After a successful reference movement, this position is automatically set at the reference point. Bits 0…31: Position	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 700$_h$
P6-01 ODEF	Subsequent Data Set and Auto-start of Homing Data Set Applicable operating mode: PS Bit 0: 0 = Do not start Homing after first power stage enable 1 = Start Homing after first power stage enable Bits 1…7: Reserved Bits 8…15: Number of the subsequent data set	- 0$_h$ 0$_h$ 2001$_h$ Hexadecimal	u32 RW per.	Modbus 702$_h$
P6-02 PATHPOS1	Target Position of Data Set 1 Applicable operating mode: PS Bits 0…31: Target position	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 704$_h$
P6-03	Configuration of Data Set 1	-	u16	Modbus 706$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
PATHCTRL1	Applicable operating mode: PS Bits 0…3: Reserved Bit 4: 0 = Wait for preceding data set to complete, then start this data set 1 = Start this data set immediately Bit 5: Reserved Bit 6: 0 = Path Overlap 1 = Path interrupt, start this data set immediately from actual trigger position Bit 7: 0 = Absolute position 1 = Relative (incremental) position Bits 8…15: Reserved	0_h 80_h $D0_h$ Hexadecimal	RW per.	
P6-04 PATHPOS2	Target Position of Data Set 2 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 708_h
P6-05 PATHCTRL2	Configuration of Data Set 2 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus $70A_h$
P6-06 PATHPOS3	Target Position of Data Set 3 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $70C_h$
P6-07 PATHCTRL3	Configuration of Data Set 3 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus $70E_h$
P6-08 PATHPOS4	Target Position of Data Set 4 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 710_h
P6-09	Configuration of Data Set 4	-	u16	Modbus 712_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
PATHCTRL4	Applicable operating mode: PS See P6-03 for details.	0_h 80_h $D0_h$ Hexadecimal	RW per.	
P6-10 PATHPOS5	Target Position of Data Set 5 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 714_h
P6-11 PATHCTRL5	Configuration of Data Set 5 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus 716_h
P6-12 PATHPOS6	Target Position of Data Set 6 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 718_h
P6-13 PATHCTRL6	Configuration of Data Set 6 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus $71A_h$
P6-14 PATHPOS7	Target Position of Data Set 7 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $71C_h$
P6-15 PATHCTRL7	Configuration of Data Set 7 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus $71E_h$
P6-16 PATHPOS8	Target Position of Data Set 8 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 720_h
P6-17	Configuration of Data Set 8	-	u16	Modbus 722_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
PATHCTRL8	Applicable operating mode: PS See P6-03 for details.	0h 80h D0h Hexadecimal	RW per.	
P6-18 PATHPOS9	Target Position of Data Set 9 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 724h
P6-19 PATHCTRL9	Configuration of Data Set 9 Applicable operating mode: PS See P6-03 for details.	- 0h 80h D0h Hexadecimal	u16 RW per.	Modbus 726h
P6-20 PATHPOS10	Target Position of Data Set 10 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 728h
P6-21 PATHCTRL10	Configuration of Data Set 10 Applicable operating mode: PS See P6-03 for details.	- 0h 80h D0h Hexadecimal	u16 RW per.	Modbus 72Ah
P6-22 PATHPOS11	Target Position of Data Set 11 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 72Ch
P6-23 PATHCTRL11	Configuration of Data Set 11 Applicable operating mode: PS See P6-03 for details.	- 0h 80h D0h Hexadecimal	u16 RW per.	Modbus 72Eh
P6-24 PATHPOS12	Target Position of Data Set 12 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 730h
P6-25	Configuration of Data Set 12	-	u16	Modbus 732h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
PATHCTRL12	Applicable operating mode: PS See P6-03 for details.	0_h 80_h $D0_h$ Hexadecimal	RW per.	
P6-26 PATHPOS13	Target Position of Data Set 13 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 734_h
P6-27 PATHCTRL13	Configuration of Data Set 13 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus 736_h
P6-28 PATHPOS14	Target Position of Data Set 14 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 738_h
P6-29 PATHCTRL14	Configuration of Data Set 14 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus $73A_h$
P6-30 PATHPOS15	Target Position of Data Set 15 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $73C_h$
P6-31 PATHCTRL15	Configuration of Data Set 15 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus $73E_h$
P6-32 PATHPOS16	Target Position of Data Set 16 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 740_h
P6-33	Configuration of Data Set 16	-	u16	Modbus 742_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
PATHCTRL16	Applicable operating mode: PS See P6-03 for details.	0_h 80_h $D0_h$ Hexadecimal	RW per.	
P6-34 PATHPOS17	Target Position of Data Set 17 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 744_h
P6-35 PATHCTRL17	Configuration of Data Set 17 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus 746_h
P6-36 PATHPOS18	Target Position of Data Set 18 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 748_h
P6-37 PATHCTRL18	Configuration of Data Set 18 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus $74A_h$
P6-38 PATHPOS19	Target Position of Data Set 19 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $74C_h$
P6-39 PATHCTRL19	Configuration of Data Set 19 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus $74E_h$
P6-40 PATHPOS20	Target Position of Data Set 20 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 750_h
P6-41	Configuration of Data Set 20	-	u16	Modbus 752_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
PATHCTRL20	Applicable operating mode: PS See P6-03 for details.	0_h 80_h $D0_h$ Hexadecimal	RW per.	
P6-42 PATHPOS21	Target Position of Data Set 21 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 754_h
P6-43 PATHCTRL21	Configuration of Data Set 21 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus 756_h
P6-44 PATHPOS22	Target Position of Data Set 22 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 758_h
P6-45 PATHCTRL22	Configuration of Data Set 22 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus $75A_h$
P6-46 PATHPOS23	Target Position of Data Set 23 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $75C_h$
P6-47 PATHCTRL23	Configuration of Data Set 23 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus $75E_h$
P6-48 PATHPOS24	Target Position of Data Set 24 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 760_h
P6-49	Configuration of Data Set 24	-	u16	Modbus 762_h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
PATHCTRL24	Applicable operating mode: PS See P6-03 for details.	0$_h$ 80$_h$ D0$_h$ Hexadecimal	RW per.	
P6-50 PATHPOS25	Target Position of Data Set 25 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 764$_h$
P6-51 PATHCTRL25	Configuration of Data Set 25 Applicable operating mode: PS See P6-03 for details.	- 0$_h$ 80$_h$ D0$_h$ Hexadecimal	u16 RW per.	Modbus 766$_h$
P6-52 PATHPOS26	Target Position of Data Set 26 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 768$_h$
P6-53 PATHCTRL26	Configuration of Data Set 26 Applicable operating mode: PS See P6-03 for details.	- 0$_h$ 80$_h$ D0$_h$ Hexadecimal	u16 RW per.	Modbus 76A$_h$
P6-54 PATHPOS27	Target Position of Data Set 27 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 76C$_h$
P6-55 PATHCTRL27	Configuration of Data Set 27 Applicable operating mode: PS See P6-03 for details.	- 0$_h$ 80$_h$ D0$_h$ Hexadecimal	u16 RW per.	Modbus 76E$_h$
P6-56 PATHPOS28	Target Position of Data Set 28 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 770$_h$
P6-57	Configuration of Data Set 28	-	u16	Modbus 772$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
PATHCTRL28	Applicable operating mode: PS See P6-03 for details.	0_h 80_h $D0_h$ Hexadecimal	RW per.	
P6-58 PATHPOS29	Target Position of Data Set 29 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 774_h
P6-59 PATHCTRL29	Configuration of Data Set 29 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus 776_h
P6-60 PATHPOS30	Target Position of Data Set 30 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 778_h
P6-61 PATHCTRL30	Configuration of Data Set 30 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus $77A_h$
P6-62 PATHPOS31	Target Position of Data Set 31 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus $77C_h$
P6-63 PATHCTRL31	Configuration of Data Set 31 Applicable operating mode: PS See P6-03 for details.	- 0_h 80_h $D0_h$ Hexadecimal	u16 RW per.	Modbus $77E_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P6-64 PATHPOS32	Target Position of Data Set 32 Applicable operating mode: PS See P6-02 for details.	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 780h
P6-65 PATHCTRL32	Configuration of Data Set 32 Applicable operating mode: PS See P6-03 for details.	- 0h 80h D0h Hexadecimal	u16 RW per.	Modbus 782h

P7 - Position Sequence Data Sets Group 2

P7 - PS Data Sets Group 2

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P7-00 HOME_ACC_DEC	Deceleration and Acceleration of Homing Data Set Applicable operating mode: PS Bits 0 ... 15: Deceleration Bits 16 ... 31: Acceleration	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 800h
P7-01 HOME_DLY	Waiting Time of Homing Data Set Applicable operating mode: PS Bits 0 ... 15: Waiting time until next dataset is started Bits 16 ... 31: Reserved	ms 0 0 32767 Decimal	u32 RW per.	Modbus 802h
P7-02 ACC_DEC1	Deceleration and Acceleration of Data Set 1 Applicable operating mode: PS Bits 0 ... 15: Deceleration Bits 16 ... 31: Acceleration	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 804h
P7-03 SPD_DLY1	Waiting Time and Target Velocity of Data Set 1 Applicable operating mode: PS Bits 0 ... 15: Waiting time until next dataset is started (in ms) Bits 16 ... 31: Target velocity (in rpm)	0.1rpm|ms 0| 0 200| 0 60000| 32767	u32 RW per.	Modbus 806h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Decimal		
P7-04 ACC_DEC2	Deceleration and Acceleration of Data Set 2 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 808h
P7-05 SPD_DLY2	Waiting Time and Target Velocity of Data Set 2 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 80Ah
P7-06 ACC_DEC3	Deceleration and Acceleration of Data Set 3 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 80Ch
P7-07 SPD_DLY3	Waiting Time and Target Velocity of Data Set 3 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 80Eh
P7-08 ACC_DEC4	Deceleration and Acceleration of Data Set 4 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 810h
P7-09 SPD_DLY4	Waiting Time and Target Velocity of Data Set 4 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 812h
P7-10 ACC_DEC5	Deceleration and Acceleration of Data Set 5 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 814h
P7-11 SPD_DLY5	Waiting Time and Target Velocity of Data Set 5 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767	u32 RW per.	Modbus 816h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Decimal		
P7-12 ACC_DEC6	Deceleration and Acceleration of Data Set 6 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 818ₕ
P7-13 SPD_DLY6	Waiting Time and Target Velocity of Data Set 6 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 81Aₕ
P7-14 ACC_DEC7	Deceleration and Acceleration of Data Set 7 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 81Cₕ
P7-15 SPD_DLY7	Waiting Time and Target Velocity of Data Set 7 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 81Eₕ
P7-16 ACC_DEC8	Deceleration and Acceleration of Data Set 8 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 820ₕ
P7-17 SPD_DLY8	Waiting Time and Target Velocity of Data Set 8 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 822ₕ
P7-18 ACC_DEC9	Deceleration and Acceleration of Data Set 9 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 824ₕ
P7-19 SPD_DLY9	Waiting Time and Target Velocity of Data Set 9 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767	u32 RW per.	Modbus 826ₕ

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Decimal		
P7-20 ACC_DEC10	Deceleration and Acceleration of Data Set 10 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 828h
P7-21 SPD_DLY10	Waiting Time and Target Velocity of Data Set 10 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 82Ah
P7-22 ACC_DEC11	Deceleration and Acceleration of Data Set 11 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 82Ch
P7-23 SPD_DLY11	Waiting Time and Target Velocity of Data Set 11 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 82Eh
P7-24 ACC_DEC12	Deceleration and Acceleration of Data Set 12 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 830h
P7-25 SPD_DLY12	Waiting Time and Target Velocity of Data Set 12 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 832h
P7-26 ACC_DEC13	Deceleration and Acceleration of Data Set 13 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 834h
P7-27 SPD_DLY13	Waiting Time and Target Velocity of Data Set 13 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767	u32 RW per.	Modbus 836h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Decimal		
P7-28 ACC_DEC14	Deceleration and Acceleration of Data Set 14 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 838h
P7-29 SPD_DLY14	Waiting Time and Target Velocity of Data Set 14 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 83Ah
P7-30 ACC_DEC15	Deceleration and Acceleration of Data Set 15 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 83Ch
P7-31 SPD_DLY15	Waiting Time and Target Velocity of Data Set 15 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 83Eh
P7-32 ACC_DEC16	Deceleration and Acceleration of Data Set 16 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 840h
P7-33 SPD_DLY16	Waiting Time and Target Velocity of Data Set 16 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 842h
P7-34 ACC_DEC17	Deceleration and Acceleration of Data Set 17 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 844h
P7-35 SPD_DLY17	Waiting Time and Target Velocity of Data Set 17 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767	u32 RW per.	Modbus 846h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Decimal		
P7-36 ACC_DEC18	Deceleration and Acceleration of Data Set 18 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 848ₕ
P7-37 SPD_DLY18	Waiting Time and Target Velocity of Data Set 18 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 84Aₕ
P7-38 ACC_DEC19	Deceleration and Acceleration of Data Set 19 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 84Cₕ
P7-39 SPD_DLY19	Waiting Time and Target Velocity of Data Set 19 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 84Eₕ
P7-40 ACC_DEC20	Deceleration and Acceleration of Data Set 20 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 850ₕ
P7-41 SPD_DLY20	Waiting Time and Target Velocity of Data Set 20 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 852ₕ
P7-42 ACC_DEC21	Deceleration and Acceleration of Data Set 21 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 854ₕ
P7-43 SPD_DLY21	Waiting Time and Target Velocity of Data Set 21 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767	u32 RW per.	Modbus 856ₕ

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Decimal		
P7-44 ACC_DEC22	Deceleration and Acceleration of Data Set 22 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 858ₕ
P7-45 SPD_DLY22	Waiting Time and Target Velocity of Data Set 22 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 85Aₕ
P7-46 ACC_DEC23	Deceleration and Acceleration of Data Set 23 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 85Cₕ
P7-47 SPD_DLY23	Waiting Time and Target Velocity of Data Set 23 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 85Eₕ
P7-48 ACC_DEC24	Deceleration and Acceleration of Data Set 24 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 860ₕ
P7-49 SPD_DLY24	Waiting Time and Target Velocity of Data Set 24 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 862ₕ
P7-50 ACC_DEC25	Deceleration and Acceleration of Data Set 25 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 864ₕ
P7-51 SPD_DLY25	Waiting Time and Target Velocity of Data Set 25 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767	u32 RW per.	Modbus 866ₕ

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Decimal		
P7-52 ACC_DEC26	Deceleration and Acceleration of Data Set 26 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 868h
P7-53 SPD_DLY26	Waiting Time and Target Velocity of Data Set 26 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 86Ah
P7-54 ACC_DEC27	Deceleration and Acceleration of Data Set 27 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 86Ch
P7-55 SPD_DLY27	Waiting Time and Target Velocity of Data Set 27 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 86Eh
P7-56 ACC_DEC28	Deceleration and Acceleration of Data Set 28 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 870h
P7-57 SPD_DLY28	Waiting Time and Target Velocity of Data Set 28 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 872h
P7-58 ACC_DEC29	Deceleration and Acceleration of Data Set 29 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 874h
P7-59 SPD_DLY29	Waiting Time and Target Velocity of Data Set 29 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767	u32 RW per.	Modbus 876h

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Decimal		
P7-60 ACC_DEC30	Deceleration and Acceleration of Data Set 30 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 878_h
P7-61 SPD_DLY30	Waiting Time and Target Velocity of Data Set 30 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 87A_h
P7-62 ACC_DEC31	Deceleration and Acceleration of Data Set 31 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 87C_h
P7-63 SPD_DLY31	Waiting Time and Target Velocity of Data Set 31 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 87E_h
P7-64 ACC_DEC32	Deceleration and Acceleration of Data Set 32 Applicable operating mode: PS See P7-02 for details.	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 880_h
P7-65 SPD_DLY32	Waiting Time and Target Velocity of Data Set 32 Applicable operating mode: PS See P7-03 for details.	0.1rpm|ms 0| 0 200| 0 60000| 32767 Decimal	u32 RW per.	Modbus 882_h

P8 - Control Loops

P8 - Control Loops

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P8-00 LTND	Derivative Gain Applicable operating mode: PT, PS, V This parameter is used to adjust the derivative gain. Refer to chapter Manual Tuning, page 143.	0.1Hz 0 800 20000 Decimal	u32 RW per.	Modbus 900$_h$
P8-01 LTNI	Integral Gain Applicable operating mode: PT, PS, V This parameter is used to adjust the integral gain. Refer to chapter Manual Tuning, page 143.	0.1Hz 0 100 2000 Decimal	u32 RW per.	Modbus 902$_h$
P8-02 LTNIV	Derivative-Integral Gain Applicable operating mode: PT, PS, V This parameter is used to adjust the derivative-integral gain. Refer to chapter Manual Tuning, page 143.	0.1Hz 0 400 4000 Decimal	u32 RW per.	Modbus 904$_h$
P8-03 LTNP	Proportional Gain Applicable operating mode: PT, PS, V This parameter is used to adjust the proportional gain. Refer to chapter Manual Tuning, page 143.	0.1Hz 0 300 4000 Decimal	u32 RW per.	Modbus 906$_h$
P8-04 LTNUSERGAIN	Global Gain Applicable operating mode: PT, PS, V	0.001 100 500 3000 Decimal	u32 RW per.	Modbus 908$_h$
P8-05 NLAFFLPFHZ	LTN Spring Filter Applicable operating mode: PT, PS, V This parameter is used to set a low-pass filter for the acceleration profile during tuning. Refer to chapter Manual Tuning, page 143.	Hz 10 7000 7000 Decimal	u16 RW per.	Modbus 90A$_h$
P8-06 NLANTIVIBGAIN	Anti-Vibration Gain Applicable operating mode: PT, PS, V	Rad*10-3/N 0 0 10000 Decimal	u32 RW per.	Modbus 90C$_h$
P8-07	Pe filter	0.001	u32	Modbus 90E$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
NLANTIVIBGAIN2	Applicable operating mode: PT, PS, V This parameter is used to set the gain of the Pe filter.	0 0 99000 Decimal	RW per.	
P8-08 NLANTIVIBHZ	Anti-Vibration Filter Applicable operating mode: PT, PS, V This parameter is used to set the frequency to remove while using the anti-vibration filter.	0.1Hz 50 4000 4000 Decimal	u32 RW per.	Modbus 910h
P8-09 NLANTIVIBHZ2	Pe filter Applicable operating mode: PT, PS, V This parameter is used to set the frequency to remove with the Pe filter.	0.1Hz 50 4000 8000 Decimal	u32 RW per.	Modbus 912h
P8-10 NLANTIVIBLMJR	Ratio of Load Inertia to Motor Inertia for Anti-Vibration Applicable operating mode: PT, PS, V Expert parameter for the internal control loop.	0.1 0 0 6000 Decimal	u32 RW per.	Modbus 914h
P8-11 NLANTIVIBN	NL Anti-Resonance Filter Divider Applicable operating mode: PT, PS, V Expert parameter for the internal control loop.	0.01 1 200 10000 Decimal	u32 RW per.	Modbus 916h
P8-12 NLANTIVIBSHARP	Anti-Resonance Sharpness Applicable operating mode: PT, PS, V Expert parameter for the internal control loop.	0.001 10 500 10000 Decimal	u16 RW per.	Modbus 918h
P8-13 NLANTIVIBSHARP2	Pe Sharpness Applicable operating mode: PT, PS, V This parameter is used to optimize the Pe filter action.	0.001 10 500 10000 Decimal	u16 RW per.	Modbus 91Ah
P8-14 NLFILTDAMPING	Current Filter Damping Applicable operating mode: PT, PS, V For further details, refer to Manual Tuning, page 143.	% 0 0 100 Decimal	u16 RW per.	Modbus 91Ch
P8-15	Current Filter Low Pass Filter Rise Time	0.01ms	u16	Modbus 91Eh

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
NLFILTT1	Applicable operating mode: PT, PS, V For further details, refer to Manual Tuning, page 143.	0 10 3000 Decimal	RW per.	
P8-16 NLNOTCH2BW	Current Filter - Second Notch Filter Bandwidth Applicable operating mode: PT, PS, V	Hz 0 0 500 Decimal	u16 RW per.	Modbus 920h
P8-17 NLNOTCH2CENTER	Current Filter - Second Notch Filter Center Applicable operating mode: PT, PS, V	Hz 5 100 1800 Decimal	u16 RW per.	Modbus 922h
P8-18 NLNOTCHBW	Current Filter - Notch Filter Bandwidth Applicable operating mode: PT, PS, V	Hz 0 0 500 Decimal	u16 RW per.	Modbus 924h
P8-19 NLNOTCHCENTER	Current Filter - Notch Filter Center Applicable operating mode: PT, PS, V For further details, refer to Manual Tuning, page 143.	Hz 5 100 1800 Decimal	u16 RW per.	Modbus 926h
P8-20 NLPEAFF	Elasticity Compensation Applicable operating mode: PT, PS, V This parameter is used in the compensation of the elasticity of the mechanical system. For further details, refer to Manual Tuning, page 143.	0.1Hz 0 50000 50000 Decimal	u32 RW per.	Modbus 928h
P8-21 NLPEDFFRATIO	Spring Deceleration Ratio Applicable operating mode: PT, PS, V This parameter is used in the compensation of the elasticity of the mechanical system. For further details, refer to Manual Tuning, page 143.	0.001 0 1000 2000 Decimal	u16 RW per.	Modbus 92Ah
P8-22 NLVELLIM	Analog NCT standstill Applicable operating mode: PT, PS, V If the target value is supplied as an analog voltage signal, this parameter can be used to improve the standstill stability. If the voltage drops below the value specified via this parameter, the integral gain set via parameter P8-01 and the derivative-	mV -3815 0 3815 Decimal	s16 RW per.	Modbus 92Ch

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	integral gain set via parameter P8-02 are reduced by one half.			
P8-23 ANIN1LPFHZ	Analog Input 1 - Filter Applicable operating mode: PT, PS, V, T This parameter specifies the cut-off frequency for the first order low-pass filter of analog input 1. The unit is modified to 0.01 Hz if P2-65 GBIT Bit 14 is set to 1.	0.01 HZ | HZ 100 | 1 100000 | 1000 1000000 | 10000 Decimal	u32 RW per.	Modbus 92E$_h$
P8-24 ANIN2LPFHZ	Analog Input 2 - Filter Applicable operating mode: PT, PS, V, T This parameter specifies the cut-off frequency for the first order low-pass filter of analog input 2. The unit is modified to 0.01 Hz if P2-65 GBIT Bit 14 is set to 1.	0.01 HZ | HZ 100 | 1 100000 | 1000 1000000 | 10000 Decimal	u32 RW per.	Modbus 930$_h$
P8-25 GEARFILTAFF	Electronic Gear Filter - Acceleration Feedforward Applicable operating mode: PT This parameter specifies the acceleration feed-forward for the electronic gear filter. Setting can only be modified if power stage is disabled.	0.001 -2000 0 2000 Decimal	s16 RW per.	Modbus 932$_h$
P8-26 GEARFILTMODE	Electronic Gear Filter - Activation Applicable operating mode: PT This parameter activates/deactivates the electronic gear filter. Value 0: Deactivate electronic gear filter Value 1: Activate electronic gear filter Value 2: Activate enhanced electronic gear filter Setting can only be modified if power stage is disabled.	- 0 0 2 Decimal	u16 RW per.	Modbus 934$_h$
P8-27 GEARFILTT1	Electronic Gear Filter - Depth Applicable operating mode: PT	0.01ms 75 200 3200 Decimal	u32 RW per.	Modbus 936$_h$
P8-28 GEARFILTT2	Electronic Gear Filter - Velocity and Acceleration Depth Applicable operating mode: PT	0.01ms 0 400 6000 Decimal	u16 RW per.	Modbus 938$_h$
P8-29 GEARFILTVELFF	Electronic Gear Filter - Velocity Feedforward Applicable operating mode: PT This parameter specifies the velocity feed-forward for the electronic gear filter. Setting can only be modified if power stage is disabled.	0.01ms -20000 0 20000 Decimal	s32 RW per.	Modbus 93A$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P8-30 GEARINMODE	Interpolation of Input Signal for Electronic Gear - Activation Applicable operating mode: PT This parameter allows for interpolation of the input signal for electronic gear and increases the resolution by a factor of 16. Value 0: Deactivate interpolation of input signal for electronic gear Value 1: Activate interpolation of input signal for electronic gear Setting can only be modified if power stage is disabled.	- 0 1 1 Decimal	u16 RW per.	Modbus 93C$_h$
P8-31 GEARING_MODE	Method for Operating Mode Pulse Train (PT) Applicable operating mode: PT Value 0: Synchronization deactivated Value 1: Position synchronization without compensation movement Value 2: Position synchronization with compensation movement Value 3: Velocity synchronization The parameters for acceleration (P1-34), deceleration (P1-35) and velocity (P1-55) act as limitations for the synchronization.	- 0 1 3 Decimal	u16 RW per.	Modbus 93E$_h$
P8-32 MOVESMOOTHAVG	S-Curve Setting Applicable operating mode: PT, PS Setting can only be modified if power stage is disabled. The maximum value is reduced to 12800 if *P8-35* CONTROLMODE (high byte) is set to 5.	0.01ms 25 400 25600 Decimal	u32 RW per.	Modbus 940$_h$
P8-33 MOVE-SMOOTHLPFHZ	Low Pass Filter Setting Applicable operating mode: PT, PS The unit is modified to 0.01Hz if *P2-65* GBIT Bit 14 is set to 1.	0.01 HZ | HZ 100 | 1 500000 | 5000 500000 | 5000 Decimal	u32 RW per.	Modbus 942$_h$
P8-34 MOVESMOOTH-MODE	Smoothing Filter for Operating modes PT and PS - Type Applicable operating mode: PT, PS Value 0: No smoothing Value 1: LPF smoothing Value 2: S-curve smoothing Setting can only be modified if power stage is disabled.	- 0 2 2 Decimal	u16 RW per.	Modbus 944$_h$
P8-35 CONTROLMODE	Type of Velocity Control Type of Position Control Applicable operating mode: PT, PS, V This parameter specifies:	- 5$_h$ 207$_h$ 4001$_h$ Hexadecimal	u16 RW per.	Modbus 946$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus

	• the position control mode (high byte)
	  ◦ value 2: Position control mode 2 (Sample rate 4 kHz)
	  ◦ value 5: Position control mode 5 (Sample rate 8 kHz)
	  ◦ value 40: Linear position control
	• the type of velocity (low byte)
	  ◦ value 1: Linear velocity control
	  ◦ value 5: Velocity control with integral gain (P8-01, P8-02)
	  ◦ value 6: Velocity control without integral gain
	  ◦ value 7: Velocity control with P8-00 = P8-01, P8-02 = 0, P8-03 = 0
	Setting can only be modified if power stage is disabled.			

P8-36 NLANTIVIBGAIN3	Pe filter 3 Applicable operating mode: PT, PS, V This parameter is used to set the gain of the Pe filter 3	0.001 0 0 6000 Decimal	u32 RW per.	Modbus 948$_h$
P8-37 NLANTIVIBHZ3	Pe filter 3 Applicable operating mode: PT, PS, V This parameter is used to set the frequency to remove with the Pe filter 3.	0.1Hz 50 4000 8000 Decimal	u32 RW per.	Modbus 94A$_h$
P8-38 NLANTIVIBQ3	Pe filter 3 Applicable operating mode: PT, PS, V This parameter is used to set the zero-pole alignment with the Pe filter 3.	0.001 200 1000 10000 Decimal	u32 RW per.	Modbus 94C$_h$
P8-39 IGRAV	Gravity Compensation Applicable operating mode: PT, PS, V, T This parameter is used to set the gravity compensation current for unbalanced systems.	0.01A - 0 - Decimal	s16 RW per.	Modbus 94E$_h$
P8-40 LTNAFRC	LTN AFF Applicable operating mode: PT, PS, V This parameter is used to set the feed-forward term for the current command.	- 0 0 200 Decimal	u16 RW per.	Modbus 950$_h$
P8-41 NLANTIVIBSHARP3	Pe Sharpness Applicable operating mode: PT, PS, V This parameter is used to optimize the Pe filter 3 action.	- 10 200 10000	u16 RW per.	Modbus 952$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Decimal		
P8-42 HOME_FAILURE_IND	Homing Error Information Applicable operating mode: PT, PS, V, T This parameter provides information in case of the homing is not successful.	- 0 - FFFFFFFF$_h$ Hexadecimal	u32 RO -	Modbus 954$_h$
P8-43 ZSPDLPFHZ	ZSPD Low Pass Filter Value Applicable operating mode: PT, PS, V, T This parameter sets the low pass filter value for ZSPD output in order to reduce jitters when the motor speed is around the Zero speed Threshold (P1-38) value.	Hz 10 1000 1000 Decimal	u16 RW per.	Modbus 956$_h$
P8-44 MT_COMMANDS	Send commands to multi turn encoder Applicable operating mode: PT, PS, V, T Value 0: No command to send. Value 1: Clear the battery detected error AL576 on the encoder. Value 2: To set an encoder reference position. Clear Wn753.This command can be performed in both (enable and disable) drive states. excluding **CSP** mode. Value 3: Reset the number of accumulated revolutions of the encoder to zero. Clear Wn750. The drive must be disabled.	- 0 - 3 Decimal	u16 RW -	Modbus 958$_h$
P8-45 FEEDBACKTYPE	Feedback type Applicable operating mode: PT, PS, V, T Value 0: No feedback connected or undetermined feedback connected. Value 1: Single turn encoder. Value 2: Multi turn encoder.	- 0 - 2 Decimal	u16 RO -	Modbus 95A$_h$
P8-46 SRVSNS_TEMPERATURE	Encoder temperature Applicable operating mode: PT, PS, V, T	Deg. - - - Decimal	s16 RO -	Modbus 95C$_h$
P8-47 SRVSNS_VER	Encoder firmware and hardware versions Applicable operating mode: PT, PS, V, T The format is: ZZaabbcc • aa.bb.cc: firmware version. • ZZ: hardware version.	- - - 4294967295 Decimal	u32 RO -	Modbus 95E$_h$
P8-48 SRVSNS_FLTS	Encoder errors Applicable operating mode: PT, PS, V, T • Bit 0: The returned position values are no longer considered as reliable. • Bit 1: The device temperature is too high.	- - - 4294967295	u32 RO -	Modbus 960$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	• Bit 2: The device temperature is too low. • Bit 3: The device is not calibrated or the calibration data is corrupted. The device is not able to decode the position. • Bit 4: The device supply voltage has dropped under operational value. • Bit 5: The multi turn encoder battery voltage has dropped under 3 Vdc. • Bit 6: The multi turn encoder requires an explicit configuration command. • Bit 7: Internal position synchronization error detected between the multi turn and the single turn modules. • Bit 8:Generic error code of the multi turn module is detected. • Bit 16…23: Internal Error detected. • Bit 24: The encoder firmware cannot operate on the provided hardware. • Bit 25…31: Reserved.	Hexadecimal		
P8-49 SRVSNS_WRNS	Encoder alerts Applicable operating mode: PT, PS, V, T • Bit 0: The device temperature is too high. • Bit 1: The device temperature is too low. • Bit 2: Over speed. • Bit 3: Over acceleration. • Bit 4: Invalid checksum value detected on non-volatile memory initialization. • Bit 5: non-volatile memory is empty. • Bit 6: Internal Parameters area detected as invalid, default values are used. • Bit 7: Invalid decoding sequence detected. • Bit 8: Encoder internal flash error detected. • Bit 9: The device has detected unusual high shaft displacement. Position error might be greater than usual. • Bit 10: The multi turn encoder battery voltage is in the range 3000 … 3150 mVdc. • Bit 11: Reserved. • Bit 12: The multi turn encoder counter exceeded the range of signed 16 bit value (-32767 … 32768). The warning remains active until MT_COMMANDS (P8-44) is set to 2. The multi turn encoder counter continues to count in the range 0 … 65535. • Bit 13…31: Reserved.	- - - 4294967295 Hexadecimal	u32 RO -	Modbus 962$_h$
P8-51 SPDOBSRVRMODE	Speed Observer Mode Applicable operating mode: PT, PS, V, T Value 0: Speed feedback value is computed by the drive. Value 3:Speed feedback value is measured by the encoder.	- 0 0 3 Decimal	u16 RW per.	Modbus 966$_h$
P8-52 GEARFILTDEPTH	Electronic Gear Filter - Depth Applicable operating mode: PT This parameter sets the value of the depth for the enhanced electronic gear filter (P8-26 set to the value 2).	0.01 ms 75 200 3200	u32 RW per.	Modbus 968$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Decimal		
P8-53 KPP	Position Linear Controller Proportional Gain Applicable operating mode: PT, PS This parameter sets the value of the proportional gain for the linear position controller. **NOTE:** After motor connection, the drive automatically sets the optimized value, page 228.	0.1 rps/rev 0 300 12000 Decimal	u16 RW per.	Modbus 96A$_h$
P8-54 KPVFR	Position Velocity Feedforward This parameter sets the value of the position velocity feedforward to velocity command gain for the linear position controller. This is used to reduce the position following error at constant speed. **NOTE:** Value of 1000 is the nominal design for zero position following error.	0.001 -2000 500 2000 Decimal	s32 RW per.	Modbus 96C$_h$
P8-55 KPAFVRV	Position Acceleration Feedforward This parameter sets the value of the position acceleration feedforward to velocity command gain for the linear position controller. This is used to reduce the position following error at constant acceleration. **NOTE:** Value of 1000 is the nominal design for zero position following error.	0.001 -20000 0 20000 Decimal	s32 RW per.	Modbus 96E$_h$
P8-56 KPAFRC	Position Acceleration Feedforward to Current Loop This parameter sets the value of the position acceleration feedforward to current command gain for the linear position controller. This is used to reduce the position following error at constant acceleration. **NOTE:** Value of 100 is the nominal design for zero position following error. P1-37 value must be correctly set.	0.001 -20000 0 20000 Decimal	s32 RW per.	Modbus 970$_h$
P8-57 KVP	Velocity Proportional Gain This parameter sets the value of the proportional gain for the linear velocity controller. **NOTE:** After motor connection, the drive automatically sets the optimized value, page 228.	0.001 0 100 1000000000 Decimal	u32 RW per.	Modbus 972$_h$
P8-58 KVI	Velocity Integral Gain This parameter sets the value of the integral gain for the linear velocity controller. **NOTE:** After motor connection, the drive automatically sets the optimized value, page 228.	0.001 0 30000 200000000 Decimal	u32 RW per.	Modbus 974$_h$
P8-59 KVFR	Velocity Feedforward Ratio This parameter sets the value of the feedforward ratio for the linear velocity controller. **NOTE:** Value of 1000 makes the control close to a PI control. Higher values reduces the following error but introduces an overshoot.	0.001 0 900 1000 Decimal	u16 RW per.	Modbus 976$_h$
P8-60	Velocity Loop Output Filter Mode	-	u16	Modbus 978$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
FILTMODE	This parameter sets the value of the velocity loop output filter for the linear velocity controller. Value 0: No filtering. Value 1: First order low pass filter; sets P8-61 as corner frequency. Value 2: Double first order low pass filter (sets P8-61 and P8-62 as corner frequencies). Value 3: Notch filter (sets P8-62 as notch center frequency and P8-61 as notch frequency width). **NOTE:** After motor connection, the drive automatically sets the optimized value, page 228.	0 2 3 Decimal	RW per.	
P8-61 FILTHZ1	Velocity Loop Output Filter Parameter 1 The function of this parameter depends on the velocity loop output filter mode (see P8-60). **NOTE:** After motor connection, the drive automatically sets the optimized value, page 228.	- 1 500 10000 Decimal	u16 RW per.	Modbus 97A$_h$
P8-62 FILTHZ2	Velocity Loop Output Filter Parameter 2 The function of this parameter depends on the velocity loop output filter mode (see P8-60). **NOTE:** After motor connection, the drive automatically sets the optimized value, page 228.	- 1 500 10000 Decimal	u16 RW per.	Modbus 97C$_h$
P8-63 VELFILTMODE	Velocity Filter Mode This parameter sets the value of the type of filter that is used for extraction of a velocity signal from the position feedback. Value 0: No filtering. Use derivative of feedback position. Value 1: First order low pass filter; sets P8-64 as corner frequency. Value 2: Use of the velocity feedback provided by the encoder. Setting can only be modified if power stage is disabled.	- 0 1 2 Decimal	u32 RW per.	Modbus 97E$_h$
P8-64 VELFILTFRQ	Velocity Filter Pole Frequency This parameter sets the value of the first order filter, which is applied to the velocity feedback signal before applying the velocity controller. **NOTE:** This parameter value is used only if P8-63 is set to 1. Setting can only be modified if power stage is disabled.	- 20 440 2000 Decimal	u16 RW per.	Modbus 980$_h$
P8-65 IFFLPFHZ	Current Feedforward Low Pass Filter Applicable operating mode: PT, PS This parameter sets the value of the first order filter of the linear controller which is applied to the current feedforward before it is added to current command.	- 10 1000 1000 Decimal	u16 RW per.	Modbus 982$_h$
P8-66	LTN Torque Filter Mode	-	u16	Modbus 984$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
NLTFDESIGNMODE	Applicable operating mode: PT, PS, V This parameter sets the value of the torque filter mode used in the LTN control loop. Value 0: Manual set of P8-15 and P8-14 values. Value 1: P8-15 and P8-14 values are computed based on P8-67 value.	0 0 1 Decimal	RW per.	
P8-67 NLTFBW	LTN Torque Filter Bandwidth Applicable operating mode: PT, PS, V This parameter sets the value of the filter bandwidth used in LTN control loop to define P8-15 and P8-14 values with 10% overshoot.	Hz 50 1000 2000 Decimal	u16 RW per.	Modbus 986$_h$
P8-68 NLNOTCHMODE	Current Filter - Notch Filter Mode Applicable operating mode: PT, PS, V This parameter sets the value of the notch filter mode used in the LTN control loop. Value 0: Original notch filter. Value 1: Advanced notch filter.	- 0 0 1 Decimal	u16 RW per.	Modbus 988$_h$

P8-69
 	
STANDSTILLMODE
	Standstill Mode
	
	Applicable operating mode: PT, PS, V
	
	This parameter sets the value of the standstill mode used for variable gain.
	
	The drive latches the variable gain when the motor is at standstill.
	
	Value 0: The drive revert to the original gain when the motor is not at standstill.
	
	Value 1: The drive revert to the original gain when a new motion command is applied.
	
	    NOTE: The motor is at standstill when:
	
	    • the velocity command is less than the velocity value set via the parameter P1-38
	
	    • and the position deviation is within the tolerance sets via the parameter P1-54.
		-
		
		0
		
		0
		
		1
		
		Decimal
			u16
			
			RW
			
			per.
				Modbus 98A$_h$

P8-70 STANDSTILLGAIN	Standstill Gain Applicable operating mode: PT, PS, V This parameter sets the value of the variable gain used for the linear position controller. When the motor is at standstill, the velocity proportional gain (P8-57 KVP) and the position proportional gain (P8-53 KPP) are multiplied by (P8-70/1024).When the motor is not at standstill, the velocity proportional gain and the position proportional gain revert to their original values.	- 128 1024 1024 Decimal	u16 RW per.	Modbus 98C$_h$
P8-71 SFILTMODE	Encoder Filter Mode Applicable operating mode: PT, PS, V This parameter activates/deactivates the encoder filter. Value 0: Deactivate the encoder filter.	- 0 0 1 Decimal	s16 RW per.	Modbus 98E$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	Value 1: Activate the encoder filter. The encoder filter helps to reduce the feedback jitter.			
P8-72 HWTEMPTHRESH	HW Temperature failure threshold. If HWTEMPTHRESH = 0, AL561 will be disabled.	- 0 2000 32767 Decimal	u16 RW per.	Modbus 990$_h$
P8-99 LTNUSERVCMDG-AIN	Adaptive Velocity Reference Value Gain Applicable operating mode: PT, PS	0.001 0 1000 3000 Decimal	u32 RW per.	Modbus 9C6$_h$

Linear Default Gains Values

The following table displays the optimized values set according to the connected motor:

Motor references	P8-53 KPP	P8-57 KVP	P8-58 KVI	P8-60 FILTMODE	P8-61 FILTHZ1	P8-62 FILTHZ2
BCH2MBA53•••5C	55	0.4	50	0	0	0
BCH2MB013•••5C	25	0.25	50	1	500	0
BCH2LD023•••5C	35	0.5	30	1	800	0
BCH2MM031•••6C	19	4.5	20	2	400	500
BCH2LD043•••5C	30	1.1	25	1	1000	0
BCH2LF043•••5C	35	2	50	1	700	0
BCH2MM052•••6C	18	8	30	2	500	500
BCH2MM061•••6C	20	5	30	1	400	0
BCH2HF073•••5C	25	4	30	1	400	0
BCH2LF073•••5C	30	3	50	1	500	0
BCH2MM081•••6C	23	12	35	2	400	400
BCH2MM091•••6C	25	7	35	1	300	0
BCH2MM102•••6C	16	8.5	50	1	200	0
BCH2HM102•••6C	16	8.5	50	1	200	0
BCH2LH103•••6C	23	7	40	1	700	0
BCH2MM152•••6C	25	8	50	2	500	500
BCH2MM202•••6C	17	11	15	2	400	400
BCH2HM202•••6C	17	11	15	2	400	400
BCH2MR202•••6C	13	21	25	1	200	0
BCH2HR202•••6C	13	21	25	1	200	0
BCH2LH203•••6C	21	9	40	1	700	0

Motor references	P8-53 KPP	P8-57 KVP	P8-58 KVI	P8-60 FILTMODE	P8-61 FILTHZ1	P8-62 FILTHZ2
BCH2MR301•••6C	20	30	25	2	400	400
BCH2MR302•••6C	15	33	30	2	300	300
BCH2MR352•••6C	22	50	30	1	300	0
BCH2MR451•••6C	22	35	30	2	300	400

P9 - DTM Data

P9 - DTM Data

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P9-00 PRGNR	Lexium program number Applicable operating mode: PT, PS, V, T Reads the program number	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RO -	Modbus $A00_h$
P9-01 DATE	Firmware Version Date Applicable operating mode: PT, PS, V, T This parameter contains the date of the firmware version.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RO -	Modbus $A02_h$
P9-02 MTP_ID	MTP Identification Code Applicable operating mode: PT, PS, V, T	- 0_h - $FFFFFFFF_h$ Hexadecimal	u16 RO -	Modbus $A04_h$
P9-06 UNAME1	User-Defined Application Name 1 Applicable operating mode: PT, PS, V, T This parameter is provided for a user-defined application name.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW per.	Modbus $A0C_h$
P9-07 UNAME2	User-Defined Application Name 2 Applicable operating mode: PT, PS, V, T This parameter is provided for a user-defined application name.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW per.	Modbus $A0E_h$
P9-08 UNAME3	User-Defined Application Name 3 Applicable operating mode: PT, PS, V, T This parameter is provided for a user-defined application name.	- 0_h 0_h $FFFFFFFF_h$	u32 RW per.	Modbus $A10_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Hexadecimal		
P9-09 UNAME4	User-Defined Application Name 4 Applicable operating mode: PT, PS, V, T This parameter is provided for a user-defined application name.	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RW per.	Modbus $A12_h$
P9-10 MBWORD	Modbus Word Order Applicable operating mode: PT, PS, V, T This parameter sets the word order for Modbus. Value 0: Order of the bytes: 0 1 2 3 Value 1: Order of the bytes: 2 3 0 1	- 0 0 1 Decimal	u16 RW per.	Modbus $A14_h$
P9-11 SERNUM1	Serial Number Part 1 Applicable operating mode: PT, PS, V, T	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RO -	Modbus $A16_h$
P9-12 SERNUM2	Serial Number Part 2 Applicable operating mode: PT, PS, V, T	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RO -	Modbus $A18_h$
P9-13 SERNUM3	Serial Number Part 3 Applicable operating mode: PT, PS, V, T	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RO -	Modbus $A1A_h$
P9-14 SERNUM4	Serial Number Part 4 Applicable operating mode: PT, PS, V, T	- 0_h 0_h $FFFFFFFF_h$ Hexadecimal	u32 RO -	Modbus $A1C_h$
P9-15 LTN	Autotuning Method Applicable operating mode: PT, PS, V, T	- 0 0 6 Decimal	u16 RW -	Modbus $A1E_h$
P9-16 LTNREFERENCE	Autotuning Motion Profile - Type Applicable operating mode: PT, PS, V	- 0 0 2	u16 RW -	Modbus $A20_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Decimal		
P9-17 LTNAVMODE	Anti-vibration tuning mode. Applicable operating mode: PT, PS, V	- 0 0 6 Decimal	u16 RW -	Modbus A22$_h$
P9-18 LTNSAVEMODE	Autotuning Results - Save/Discard Applicable operating mode: PT, PS, V	- 0 0 3 Decimal	u16 RW -	Modbus A24$_h$
P9-19 LTNNLPEAFF	Autotuning - Elasticity Compensation Filters Applicable operating mode: PT, PS, V	- 0 1 1 Decimal	s16 RW -	Modbus A26$_h$
P9-20 LTNCYCLE	Autotuning - Direction of Movement Applicable operating mode: PT, PS, V This parameter sets the direction of movement for autotuning. Value 0: Both directions of movement Value 2: One direction of movement	- 0 0 3 Decimal	s16 RW -	Modbus A28$_h$
P9-21 LTNDWELLTIME	Minimum Dwell Time for Detection of Movement Cycle Applicable operating mode: PT, PS, V	- 100 200 1000 Decimal	u16 RW -	Modbus A2A$_h$
P9-22 LTNLMJR	Autotuning - Automatic Estimation of Ratio of Load Inertia and Motor Inertia Applicable operating mode: PT, PS, V	- 0 0 1 Decimal	u16 RW -	Modbus A2C$_h$
P9-23 LTNSTIFF	Defines which values will be used for the position command filters. Applicable operating mode: PT, PS, V Value 0: Automatic smoothing via S-curve optimization of the value Value 1: Manual smoothing	- 0 0 1 Decimal	u16 RW -	Modbus A2E$_h$
P9-25 LTNREFEN	Autotuning Motion Profile - Activation Applicable operating mode: PT, PS, V	- 0 0	u16 RW -	Modbus A32$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		1 Decimal		
P9-26 PTPOS	Autotuning - Movement Range in Direction 1 Applicable operating mode: PS This parameter specifies the movement range for autotuning in direction of movement 1. The sign of the value determines the direction of movement: Positive value: Positive direction of movement as set via parameter P1-01 Negative value: Negative direction of movement as set via parameter P1-01 See parameter P9-20 to select one direction of movement or both directions of movement for Comfort Tuning.	PUU -2147483647 0 2147483647 Decimal	s32 RW -	Modbus A34$_h$
P9-27 PTNEG	Autotuning - Movement Range in Direction 2 Applicable operating mode: PS This parameter specifies the movement range for autotuning in direction of movement 2. The sign of the value determines the direction of movement: Positive value: Positive direction of movement as set via parameter P1-01 Negative value: Negative direction of movement as set via parameter P1-01 See parameter P9-20 to select one direction of movement or both directions of movement for Comfort Tuning.	PUU -2147483647 0 2147483647 Decimal	s32 RW -	Modbus A36$_h$
P9-28 LTNACTIVE	Autotuning Active Applicable operating mode: PT, PS, V This parameter indicates whether autotuning is active. Value 0: Autotuning inactive Value 1: Autotuning active	- 0 - 1 Decimal	s16 RO -	Modbus A38$_h$
P9-29 LTNVCRUISE	Autotuning - Velocity Applicable operating mode: PT, PS, V Bits 0 ... 15: Velocity for positive direction of movement Bits 16 ... 31: Velocity for negative direction of movement	0.1rpm|0.1rpm - - - Decimal	u32 RW -	Modbus A3A$_h$
P9-30 LTNST	Autotuning - Status Applicable operating mode: PT, PS, V Value 0: Inactive Value 1: Active Value 2: Successfully completed Values 3 … 9: Reserved	- 0 - 65535 Decimal	u32 RO -	Modbus A3C$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	Value 10: Impossible to set P9-15 Value 11: Impossible to set P9-16 Value 12: Impossible to set P9-17 Value 13: Impossible to set P9-18 Value 14: Impossible to set P9-19 Value 15: Impossible to set P9-21 Value 16: Impossible to set P9-22 Value 17: Impossible to set P9-23 Value 18: Impossible to set P9-24 Value 19: Impossible to set P9-25 Value 20: Impossible to set P9-32 Value 21: Impossible to enable the power stage Value 22: Hold is active Value 23: Undetermined motor Values 24 … 26: Reserved Value 27: Impossible to activate autotuning Value 28: Autotuning did not run successfully Value 29: Reserved Value 30: Low Effort Value 31: AVG Zero Init Value Value 32: Cost factor error detected Value 33: Pos tune user gain modified Value 34: Motor Was Not Recognized Value 35: LTNP Step Updated Value 36: Movement too small Value 37: ICMD Sat. Value 38: Insufficient load estimation time. Value 39: Insufficient acceleration/deceleration (less than 33 % of nominal acc/dec) Value 40: Excessive acceleration/deceleration (more than 90 % of nominal acc/dec)			
P9-30 Continued	Value 41: Need for gravity compensation (see P9-35) Value 42: Insufficient velocity (less than 10 % of nominal velocity) Value 43: Insufficient deceleration (less than deceleration ramp DECSTOP) Value 44: Autotuning timeout Value 45: Invalid default values Values 46 … 49: Reserved Value 50: P9-15 set to 0 Value 51: Power stage disabled during autotuning			

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
	Value 52: Current saturation			
	Value 53: Reserved			
	Value 54: Insufficient excitation for autotuning (poor motion profile: short distance, low acceleration/deceleration, etc.)			
	Value 55: Insufficient tuning effort			
	Value 56: Halt during autotuning			
	Value 57: Undetermined motor			
	Value 58: Motion profile exceeds limits			
	Value 59: Invalid gains during autotuning			
	Value 60: Insufficient movement			
	Value 61: Current limitation during autotuning			
	Value 62: Detected alert during autotuning			
	Values 63 … 69: Reserved			
	Value 70: Positive distance and negative distance are not equal			
	Value 71: Velocity is too low			
	Value 72: Motion profile is not trapezoidal			
	Value 73: Same sign used for positive and negative movement in bidirectional mode			
	Value 74: Different signs used for positive and negative movement in unidirectional mode			
	Values 75 … 89: Reserved			
P9-31 PTACCDEC	Autotuning - Acceleration and Deceleration Applicable operating mode: PT, PS, V Bits 0 ... 15: Acceleration for Autotuning Bits 16 ... 31: Deceleration for Autotuning	ms|ms 6| 6 6000| 6000 65500| 65500 Decimal	u32 RW -	Modbus A3E$_h$
P9-32 LTNADVMODE	Autotune advance mode. Applicable operating mode: PT, PS, V	- 0 1 2 Decimal	u16 RW -	Modbus A40$_h$
P9-33 LTNEFFORTMAX	Maximum Autotuning Optimization Value Applicable operating mode: PT, PS, V Setting can only be modified if power stage is disabled.	0.001 0 - 1000 Decimal	u32 RO -	Modbus A42$_h$
P9-34 LTNBAR	Autotuning Progress Bar Applicable operating mode: PT, PS, V	- 0 0 100	u16 RO -	Modbus A44$_h$

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
		Decimal		
P9-35 LTNIGRAV	Autotuning - Gravity Estimation Applicable operating mode: PT, PS, V	- 0 0 1 Decimal	u16 RW -	Modbus A46_h
P9-36 LTNLAFRC	Set LTNAFRC in Autotune Applicable operating mode: PT, PS, V	- 0 0 2 Decimal	s16 RW -	Modbus A48_h
P9-37 LTNWARNING	Autotuning - Last Stored Event Applicable operating mode: PT, PS, V	- 0 0 65535 Decimal	u32 RO -	Modbus A4A_h
P9-38 LTNIMPROVEMENT	Mode 2 AT improvement Applicable operating mode: PT, PS, V, T	- 0 0 100 Decimal	u16 RO -	Modbus A4C_h
P9-39 LTNCYCLEIDENT	Cycle Identification status Applicable operating mode: PT, PS, V, T	- 0 0 9 Decimal	u16 RO -	Modbus A4E_h
P9-40 LTNDEFAULTS	LTN Autotuning Using Defaults Applicable operating mode: PT, PS, V	- 0 0 1 Decimal	u16 RW -	Modbus A50_h

Operation

What's in This Part

Operation

What's in This Chapter

Access Channels

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

⚠ WARNING
UNINTENDED EQUIPMENT OPERATION
• Verify that simultaneous access via multiple access channels cannot cause unintended triggering or blocking of commands.
• Verify that the use of exclusive access cannot cause unintended triggering or blocking of commands.
• Verify that the required access channels are available.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

The product can be addressed via different access channels.

Access channels are:

- Integrated HMI

- Digital and analog input signals

- Commissioning software LXM26 DTM Library

The product allows you to work with exclusive access which limits access to the product via a single access channel.

Only one access channel can have exclusive access to the product.

Exclusive access can be provided via different access channels:

- Via the integrated HMI:

  The operating mode Jog or Autotuning can be started via the HMI.

- Via the commissioning software LXM26 DTM Library:

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

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

The reference values are effective at the analog inputs and at the pulse inputs when the product is powered on. If exclusive access has been assigned to an access channel, signal at the pulse inputs are ignored.

The signal input functions **HALT**, **FAULT_RESET**, **SON** (falling edge), **CWL(NL)** and **CCWL(PL)** are always effective during exclusive access.

Operating States

State Diagram

When the product is powered on and when an operating mode is started, page 252, the product goes through a number of operating states.

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

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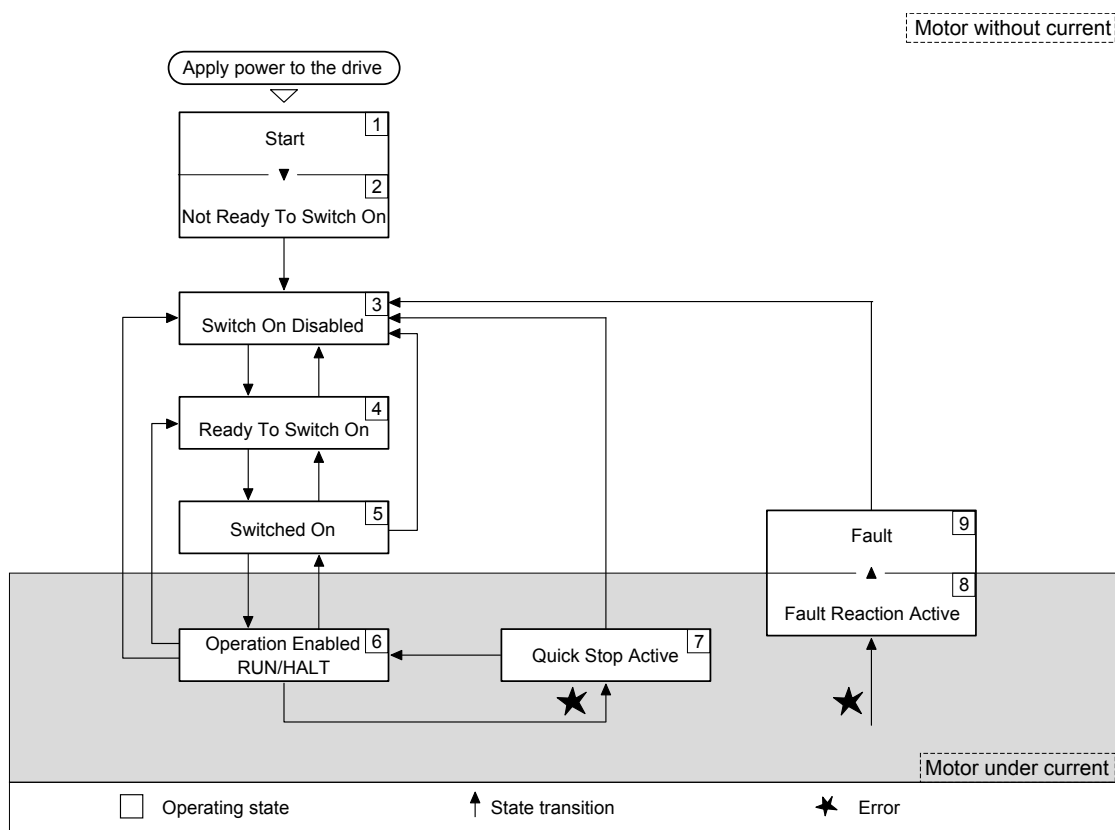
Operating States

Operating state	Description
1 Start	Electronics are initialized
2 Not Ready To Switch On	The power stage is not ready to switch on
3 Switch On Disabled	Impossible to enable the power stage
4 Ready To Switch On	The power stage is ready to switch on.
5 Switched On	Power stage is switched on
6 Operation Enabled	Power stage is enabled Selected operating mode is active
7 Quick Stop Active	Quick Stop is being executed
8 Fault Reaction Active	Error response is active
9 Fault	Error response terminated Power stage is disabled

Resetting an Error Message

After you have removed the cause of the error, you can reset the error message in one of the following ways:

- With a rising edge of the signal input function **FAULT_RESET**
- With a rising edge of the signal input function **SON**
- By using the **Fault Reset** button in the SoMove commissioning software.

Setting the Digital Signal Inputs

Various signal functions can be assigned to the digital signal inputs.

The functions of the inputs and outputs depend on the selected operating mode and the settings of the corresponding parameters.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only start the system if there are no persons or obstructions in the zone of operation.
- Verify that the wiring is appropriate for the settings.
- Carefully run tests for all operating states and potential error situations when commissioning, upgrading or otherwise modifying the operation of the drive.

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

Default Presets of the Signal Inputs

The following table shows the default presets of the digital signal inputs depending on the selected operating mode:

Setting A for P2-10 ... P2-17	Short name	Name	PT	PS	V	T	Vz	Tz	PT V	PT T	PS V	PS T	V T
01$_h$	SON	Servo ON	DI1										
02$_h$	FAULT_RESET	Fault Reset	DI5						-				
03$_h$	GAINUP	Increase Gain	-										
04$_h$	CLRPO-SDEV	Clear Position Deviation	DI2		-				DI2		-		
05$_h$	ZCLAMP	Zero Clamp	-										
06$_h$	INVDIR-ROT	Inverse Direction Of Rotation	-										
07$_h$	HALT	Halt	-										
08$_h$	CTRG	Start Data Set	-	DI2	-						DI2	-	
09$_h$	TRQLM	Activate Torque Limit	-		DI2	-	DI2		-				
10$_h$	SPDLM	Activate Speed Limit	-			DI2	-	DI2	-				
11$_h$	POS0	Data Set Bit 0	-	DI3	-						DI3	-	
12$_h$	POS1	Data Set Bit 1	-	DI4	-						DI4	-	
13$_h$	POS2	Data Set Bit 2	-										
14$_h$	SPD0	Speed Reference Value Bit 0	-	DI3	-	DI3	-	DI3	-	DI5	-	DI3	

Setting A for P2-10 ... P2-17	Short name	Name	PT	PS	V	T	Vz	Tz	PT V	PT T	PS V	PS T	V T
15h	SPD1	Speed Reference Value Bit 1	-	DI4	-	DI4	-	DI4	-	DI6	-	DI4	
16h	TCM0	Torque Reference Value Bit 0	DI3	-	DI3	-	DI3	-	DI3	-	DI5		
17h	TCM1	Torque Reference Value Bit 1	DI4	-	DI4	-	DI4	-	DI4	-	DI6		
18h	V-Px	Velocity - Position	-						DI7	-	DI7	-	
19h	V-T	Velocity - Torque	-										DI7
1Ah	POS3	Data Set Bit 3	-										
1Bh	POS4	Data Set Bit 4	-										
1Ch	TPROB1	Touch Probe 1	-										
20h	T-Px	Torque - Position	-						DI7	-	DI7	-	
21h	OPST	Stop and Disable Power Stage	DI8										
22h	CWL(NL)	Negative Limit Switch (NL/LIMN)	DI6						-				
23h	CCWL (PL)	Positive Limit Switch (PL/LIMP)	DI7						-				
24h	ORGP	Reference Switch	-										
27h	GOTO-HOME	Move To Home Position	-										
2Ch	PTCMS	Type of pulses for operating mode Pulse Train (PT) (OFF: Low-speed pulses, ON: High-Speed pulses)	-										
37h	JOGP	Jog Positive	-										
38h	JOGN	Jog Negative	-										
39h	STEPU	Next Data Set	-										
40h	STEPD	Previous Data Set	-										
41h	STEPB	First Data Set	-										
42h	AUTOR	Automatic Position Sequence: Start with first data set, repeat sequence	-										
43h	GNUM0	Numerator Bit 0 Electronic Gear Ratio	-										
44h	GNUM1	Numerator Bit 1 Electronic Gear Ratio	-										
45h	INHP	Pulse Inhibit	-										
46h	STOP	Stop Motor (operating mode PS only)	-										

Parameterization of the Signal Input Functions

The signal input functions for the inputs DI1 ... DI8 are configured via the parameters *P2-10* ... *P2-17*.

A signal input function can only be assigned to one of the signal inputs.

The operating modes Torque (T) and Torque (Tz) and the dual operating modes with Torque (T) and Torque (Tz) do not provide deceleration functionality in response to a power stage disable request. In these operating modes, the motor coasts down to a standstill in response to a power stage disable request. You must install additional equipment such as a dedicated service brake if your application requires faster deceleration of the load.

⚠ **WARNING**

UNINTENDED EQUIPMENT OPERATION

- During commissioning, trigger all signals and simulate all conditions that cause a power stage disable request in order to verify that all loads come to a secure standstill when the power stage is disabled under maximum load conditions.

- Install a dedicated service brake if removal of power to the motor does not meet the requirements of your application.

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

The following table provides an overview of the possible signal input functions:

Setting A for *P2-10 … P2-17*	Short name	Name	Description	Signal inputs
01_h	SON	Servo ON	The signal input function SON enables the power stage (operating state Operation Enabled). The signal input function SON is only available if no detected errors are present.	DI1 … DI8
02_h	FAULT_ RESET	Fault Reset	The signal input function FAULT_RESET performs a Fault Reset. The cause of the error must have been removed before a Fault Reset is performed.	DI1 … DI8
03_h	GAINUP	Increase Gain	The signal input function GAINUP increases the control gain according to the values and conditions set via parameter P2-27.	DI1 … DI8
04_h	CLRPOS-DEV	Clear Position Deviation	The signal input function CLRPOSDEV resets the position deviation to zero as set via parameter P2-50. This function is only supported in linear control mode (P8-35=4001_h)	DI1 … DI8
05_h	ZCLAMP	Zero Clamp	In the operating mode V, the signal input function ZCLAMP can be used to stop the motor if the velocity of the motor is below the velocity value set via the parameter *P1-38*. The behavior of the signal input function ZCLAMP is set via the parameter *P2-65*, bit 10.	DI1 … DI8
06_h	INVDIRROT	Inverse Direction Of Rotation	The signal input function INVDIRROT inverts the direction of rotation of the motor. The signal input function INVDIRROT is available in the operating modes Velocity (V) and Torque (T).	DI1 … DI8
07_h	HALT	Halt	The signal input function HALT interrupts the movement with the deceleration ramp set via the parameter *P1-68*. The movement is resumed when the signal input function is no longer active.	DI1 … DI8

Setting A for *P2-10* ... *P2-17*	Short name	Name	Description	Signal inputs
08h	CTRG	Start Data Set	The signal input function CTRG starts the selected data set in the operating mode Position Sequence (PS). For further information, refer to Operating Mode Position Sequence (PS), page 259.	DI1 … DI8
09h	TRQLM	Activate Torque Limit	The signal input function TRQLM activates the torque limitations set via parameters P1-12 … P1-14. You can also use the parameter P1-02 to activate the torque limitations set via parameters P1-12 … P1-14.	DI1 … DI8
10h	SPDLM	Activate Speed Limit	The signal input function SPDLM activates the velocity limitations set via parameters P1-09 … P1-11. You can also use the parameter P1-02 to activate the velocity limitations set via parameters P1-09 … P1-11.	DI1 … DI8
11h	POS0	Data Set Bit 0	The signal input functions POS0 ... POS4 represent bits 0 … 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). For further information, refer to Operating Mode Position Sequence (PS), page 259.	DI1 … DI8
12h	POS1	Data Set Bit 1	The signal input functions POS0 ... POS4 represent bits 0 … 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). For further information, refer to Operating Mode Position Sequence (PS), page 259.	DI1 … DI8
13h	POS2	Data Set Bit 2	The signal input functions POS0 ... POS4 represent bits 0 … 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). For further information, refer to Operating Mode Position Sequence (PS), page 259.	DI1 … DI8
14h	SPD0	Speed Reference Value Bit 0	The signal input functions SPD0 and SPD1 represent bits 0 and 1 to select one of the three velocity reference values available in the operating mode Velocity (V). For further information, refer to Operating Modes Velocity (V) and Velocity Zero (Vz), page 290.	DI1 … DI8
15h	SPD1	Speed Reference Value Bit 1	The signal input functions SPD0 and SPD1 represent bits 0 and 1 to select one of the three velocity reference values available in the operating mode Velocity (V). For further information, refer to Operating Modes Velocity (V) and Velocity Zero (Vz), page 290.	DI1 … DI8
16h	TCM0	Torque Reference Value Bit 0	The signal input functions TCM0 and TCM1 represent bits 0 and 1 to select one of the three torque reference values available in the operating mode Torque (T). For further information, refer to Operating Modes Torque (T) and Torque Zero (Tz), page 293.	DI1 … DI8
17h	TCM1	Torque Reference Value Bit 1	The signal input functions TCM0 and TCM1 represent bits 0 and 1 to select one of the three torque reference values available in the operating mode Torque (T). For further information, refer to Operating Modes Torque (T) and Torque Zero (Tz), page 293.	DI1 … DI8
18h	V-Px	Velocity - Position	Operating mode switching between Velocity (V) and Pulse Train (PT) or between Velocity (V) and Position Sequence (PS) . For further information, refer to Setting the Operating Mode, page 252. (OFF: Velocity (V), ON: Pulse Train (PT) or Position Sequence (PS), depending on P1-01)	DI1 … DI8
19h	V-T	Velocity - Torque	Operating mode switching between Velocity (V) and Torque (T). For further information, refer to Setting the Operating Mode, page 252. (OFF: Velocity (V), ON: Pulse Torque (T))	DI1 … DI8
1Ah	POS3	Data Set Bit 3	The signal input functions POS0 ... POS4 represent bits 0 … 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). For further information, refer to Operating Mode Position Sequence (PS), page 259.	DI1 … DI8
1Bh	POS4	Data Set Bit 4	The signal input functions POS0 ... POS4 represent bits 0 … 4 required to select one of the 32 data sets available in the operating mode Position Sequence (PS). For further information, refer to Operating Mode Position Sequence (PS), page 259.	DI1 … DI8
1Ch	TPROB1	Touch Probe 1	The signal input function TPROB1 is used to trigger the Position Capture function. See the sections on the parameters *P5-37* … *P5-39* for additional information.	DI7
1Dh	TPROB2	Touch Probe 2	The signal input function TPROB2 is used to trigger the Position Capture function. See the sections on the parameters *P5-57* … *P5-59* for additional information.	DI6
20h	T-Px	Torque - Position	Operating mode switching between Torque (T) and Pulse Train (PT) or between Torque (T) and Position Sequence (PS) . For further information, refer to Setting the Operating Mode, page 252.	DI1 … DI8

Setting A for *P2-10* ... *P2-17*	Short name	Name	Description	Signal inputs
			(OFF: Torque (T), ON: Pulse Train (PT) or Position Sequence (PS), depending on P1-01)	
21h	OPST	Stop and Disable Power Stage	The signal input function OPST stops the motor with the deceleration ramp set via the parameter *P1-68* and then disables the power stage.	DI1 … DI8
22h	CWL(NL)	Negative Limit Switch (NL/LIMN)	Negative limit switch (NL/LIMN). When the signal input is activated, an alert is triggered. The deceleration ramp is specified via parameter *P5-25*.	DI1 … DI8
23h	CCWL(PL)	Positive Limit Switch (PL/LIMP)	Positive limit switch (PL/LIMP). When the signal input is activated, an alert is triggered. The deceleration ramp is specified via parameter *P5-26*.	DI1 … DI8
24h	ORGP	Reference Switch	The signal input function ORGP is used for the reference switch. For further information, refer to Operating Mode Position Sequence (PS), page 259.	DI1 … DI8
27h	GOTOHOME	Move To Home Position	The signal input function GOTOHOME triggers a movement to the Home position set via the parameter *P5-04*.	DI1 … DI8
2Ch	PTCMS	Type of pulses for operating mode Pulse Train (PT) (OFF: Low-speed pulses, ON: High-Speed pulses)	The signal input function PTCMS selects the type of pulses for the operating mode Pulse Train PT (OFF: Low-speed pulses, ON: High-speed pulses). You can also use the parameter *P1-00* to select the type of pulses.	DI1 … DI8
37h	JOGP	Jog Positive	The signal input function JOGP triggers a Jog movement in positive direction if the value determining the direction of movement in the parameter *P1-01* is set to the default value.	DI1 … DI8
38h	JOGN	Jog Negative	The signal input function JOGN triggers a Jog movement in negative direction if the value determining the direction of movement in the parameter *P1-01* is set to the default value.	DI1 … DI8
39h	STEPU	Next Data Set	The signal input function STEPU starts the next data set in the operating mode Position Sequence (PS).	DI1 … DI8
40h	STEPD	Previous Data Set	The signal input function STEPD starts the previous data set in the operating mode Position Sequence (PS).	DI1 … DI8
41h	STEPB	First Data Set	The signal input function STEPB starts the first data set in the operating mode Position Sequence (PS).	DI1 … DI8
42h	AUTOR	Automatic Position Sequence: Start with first data set, repeat sequence	The signal input function AUTOR starts a sequence of data sets from the first data set in the operating mode Position Sequence (PS). The sequence is repeated as long as the signal input function AUTOR is active.	DI1 … DI8
43h	GNUM0	Numerator Bit 0 Electronic Gear Ratio	The signal input functions GNUM0 and GNUM1 represent bits 0 and 1 to select one of the four numerators set via the parameters *P1-44*, *P2-60 … P2-62*. The denominator is set via the parameter *P1-45* . The ratios are used as gear factors in the operating mode Pulse Train (PT) and as scaling factors. For further information, refer to Gear Ratio, page 256 and Scaling, page 261.	DI1 … DI8
44h	GNUM1	Numerator Bit 1 Electronic Gear Ratio	The signal input functions GNUM0 and GNUM1 represent bits 0 and 1 to select one of the four numerators set via the parameters *P1-44*, *P2-60 … P2-62*. The denominator is set via the parameter *P1-45*. The ratios are used as gear factors in the operating mode Pulse Train (PT) and as scaling factors. For further information, refer to Gear Ratio, page 256 and Scaling, page 261.	DI1 … DI8
45h	INHP	Pulse Inhibit	The signal input function INHP is used in the operating mode Pulse Train (PT) to block pulses received as reference signals. If the signal input function is active, the pulses are no longer evaluated and the motor coasts down.	DI1 … DI8
46h	STOP	Stop Motor (operating mode PS only)	The signal input function STOP stops the motor with the deceleration ramp set via the parameter *P5-20*. The power stage remains enabled. The signal input function STOP is available in the operating mode Position Sequence (PS).	DI1 … DI8

Setting the Digital Signal Outputs

Various signal functions can be assigned to the digital signal outputs.

The functions of the inputs and outputs depend on the selected operating mode and the settings of the corresponding parameters.

⚠ **WARNING**

UNINTENDED EQUIPMENT OPERATION

- Only start the system if there are no persons or obstructions in the zone of operation.
- Verify that the wiring is appropriate for the settings.
- Carefully run tests for all operating states and potential error situations when commissioning, upgrading or otherwise modifying the operation of the drive.

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

Default Presets of the Signal Outputs

The following table shows the default presets of the digital signal outputs depending on the selected operating mode:

Setting A for *P2-18 ... P2-22*	Short name	Name	PT	PS	V	T	Vz	Tz	PT V	PT T	PS V	PS T	V T
01$_h$	SRDY	Servo Ready					DO1						
02$_h$	SON	Servo On					-						
03$_h$	ZSPD	Zero Speed					DO2						
04$_h$	TSPD	Speed Reached	-				DO3						
05$_h$	TPOS	Movement Completed	DO4		-				DO4				-
06$_h$	TQL	Torque Limit Reached					-						
07$_h$	ERROR	Error Detected					DO5						
08$_h$	BRKR	Holding Brake Control	-		DO4				-				
09$_h$	HOME-D_OK	Homing Completed	DO3		-								
10$_h$	OLW	Motor Overload Alert					-						
11$_h$	WARN	Alert Signal activated					-						
12$_h$	OVF	Position command overflow					-						
13$_h$	SCWL (SNL)	Negative Software Limit Switch Reached					-						
14$_h$	SCCWL (SPL)	Positive Software Limit Switch Reached					-						
15$_h$	CMD_OK	Data set completed					-						
16$_h$	CAP1_OK	Capture 1 completed					-						
17$_h$	MC_OK	Motion control completed output					-						
18$_h$	-	-					-						
19$_h$	SP_OK	Speed reached output					-						
1A$_h$…2F$_h$	-	-					-						

Setting A for *P2-18 ... P2-22*	Short name	Name	PT	PS	V	T	Vz	Tz	PT V	PT T	PS V	PS T	V T
30h	SDO_0	Output the status of bit 0 of P4-06.						-					
31h	SDO_1	Output the status of bit 1 of P4-06.						-					
32h	SDO_2	Output the status of bit 2 of P4-06.						-					
33h	SDO_3	Output the status of bit 3 of P4-06.						-					
34h	SDO_4	Output the status of bit 4 of P4-06.						-					
35h	SDO_5	Output the status of bit 5 of P4-06.						-					
36h	SDO_6	Output the status of bit 6 of P4-06.						-					
37h	SDO_7	Output the status of bit 7 of P4-06.						-					
38h ... 3Fh	-	-						-					

Parameterization of the Signal Output Functions

The signal output functions for the outputs DO1 ... DO5 are configured via the parameters *P2-18* ... *P2-22*.

A (Output Function)

1: Normally open

B

0: Normally closed

not used
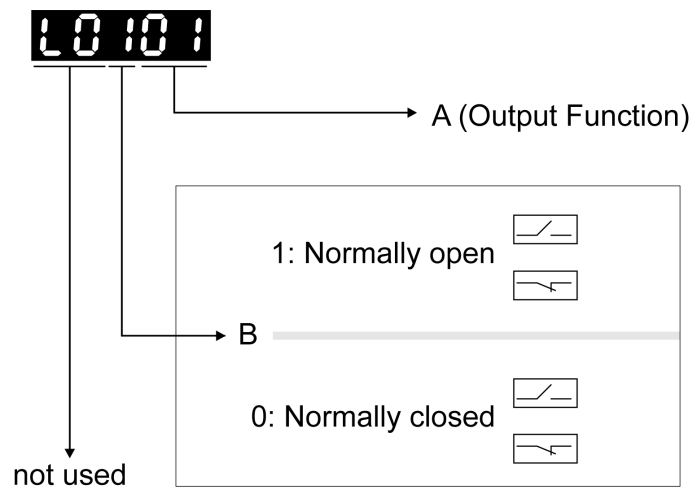
The following table provides an overview of the possible signal output functions:

Setting A for *P2-18 ... P2-22*	Short name	Name	Description
01h	SRDY	Servo Ready	The signal output function SRDY indicates that no errors are detected, i.e., the drive is not in the operating state Fault.
02h	SON	Servo On	The signal output function SON indicates that the drive is in the operating state Operation Enabled .
03h	ZSPD	Zero Speed	The signal output function ZSPD indicates that the velocity of the motor is less than the velocity value set via parameter *P1-38* .
04h	TSPD	Speed Reached	The signal output function TSPD indicates that the velocity of the motor is greater than the velocity value set via parameter *P1-39* .
05h	TPOS	Movement Completed	Operating mode Pulse Train (PT): The signal output function TPOS indicates that the position deviation is within the tolerance set via the parameter *P1-54* and the motor has come to a standstill. Operating mode Position Sequence (PS): The signal output function TPOS indicates that the position deviation at the target position is within the tolerance

Setting A for *P2-18 ... P2-22*	Short name	Name	Description
			set via the parameter *P1-54* and the reference velocity is below the value set via the parameter *P1-38*.
06$_h$	TQL	Torque Limit Reached	The signal output function TQL indicates that the torque of the motor has reached the value set via parameters *P1-12 ... P1-14* or an analog input.
07$_h$	ERROR	Error Detected	The signal output function ERROR indicates that an error has been detected and that the drive has switched to the operating state Fault. For further information, refer to Diagnostics and Troubleshooting, page 298.
08$_h$	BRKR	Holding Brake Control	The signal output function BRKR is used to control the holding brake with the settings made via parameters P1-42 and P1-19. The holding brake must be connected to the output to which the signal output function BRKR is assigned. For further information, refer to Holding Brake Connection, page 109.
09$_h$	HOMED_OK	Homing Completed	The signal output function HOMED_OK indicates that the homing procedure has been successfully completed. The settings for Homing are specified via parameters P5-04 … P5-06. For further information, refer to Operating Mode Position Sequence (PS), page 259.
10$_h$	OLW	Motor Overload Alert	The signal output function OLW indicates a motor overload condition. A threshold for the signal output function OLW can be set via parameter P1-28.
11$_h$	WARN	Alert Signal activated	The signal output function indicates that one of the following conditions has been detected: Hardware limit switch triggered, undervoltage, Nodeguard alert, Operational Stop (OPST). For further information, refer to Diagnostics and Troubleshooting, page 298.
12$_h$	-	-	Reserved
13$_h$	SCWL(SNL)	Negative Software Limit Switch Reached	The signal output function SCWL(SNL) indicates that the negative software limit switch set via parameter P5-09 has been reached. When the software limit switch is reached, an alert is triggered. The deceleration ramp is specified via parameter P5-23.
14$_h$	SCCWL (SPL)	Positive Software Limit Switch Reached	The signal output function SCCWL(SPL) indicates that the positive software limit switch set via parameter P5-08 has been reached. When the software limit switch is reached, an alert is triggered. The deceleration ramp is specified via parameter P5-24.
15$_h$	CMD_OK	Data set completed	The signal output function CMD_OK indicates that the data set including the waiting time has been successfully completed.
16$_h$	CAP1_OK	Capture 1 completed	The signal output function CAP1_OK indicates that a position capture (Touch Probe) has been successfully completed. The settings for position capture (Touch Probe) are specified via parameters P5-37 … P5-39.
17$_h$	MC_OK	Motion control completed output	The signal output function MC_OK indicates that both the signal output functions CMD_OK and TPOS have been activated.
18$_h$	-	-	Reserved
19$_h$	SP_OK	Speed reached output	The signal output function SP_OK indicates that the target velocity has been reached. The velocity range for activating this signal output function is set via parameter P1-47.
1A$_h$…2F$_h$	-	-	Reserved
30$_h$	SDO_0	Output the status of bit 0 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
31$_h$	SDO_1	Output the status of bit 1 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
32$_h$	SDO_2	Output the status of bit 2 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
33$_h$	SDO_3	Output the status of bit 3 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
34$_h$	SDO_4	Output the status of bit 4 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
35$_h$	SDO_5	Output the status of bit 5 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
36$_h$	SDO_6	Output the status of bit 6 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
37$_h$	SDO_7	Output the status of bit 7 of P4-06.	The signal output functions SDO_0 ... SDO_7 provide the bit pattern (bits 0 ... 7) required to determine the setting of the parameter P4-06.
38$_h$…3F$_h$	-	-	Reserved

Functions for Target Value Processing

Interrupting a Movement with HALT

The HALT signal input function is available in the operating mode PT only.

With the signal input function HALT, the ongoing movement is interrupted. When the signal input function HALT is no longer active, the movement is resumed from the point where it was interrupted.

The movement is interrupted via a deceleration ramp. The deceleration ramp is specified via parameter *P1-68*.

In order to interrupt a movement via a signal input, you must first parameterize the signal input function HALT, refer to Setting the Digital Signal Inputs, page 239.

NOTE: The pulses received while the HALT function is active are ignored. When the HALT is no longer active, the drive accepts any on-going pulse stream and start movement according to that stream.

> ### ⚠ WARNING
>
> **UNINTENDED EQUIPMENT OPERATION**
>
> - Do not deactivate the HALT function prior to the deceleration of the motor.
> - If the deactivation of the HALT function prior to the deceleration of the motor is unavoidable, be sure to include these circumstances in your hazard and risk analysis of your application.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

If there is uncertainty of the effect of the movement generated by an ongoing pulse stream at the time of HALT deactivation, you must rehome the application.

Stopping a Movement with OPST

With the signal input function OPST (Operational Stop), the ongoing movement is stopped.

In order to stop a movement via a signal input, you must first parameterize the signal input function OPST, refer to Setting the Digital Signal Inputs, page 239.

The movement is interrupted via a deceleration ramp to the point of the defined standstill. After that, the power stage is disabled once the drive has determined that the motor is at standstill, and if so configured, the holding brake is applied.

> ### ⚠ WARNING
>
> **UNINTENDED EQUIPMENT OPERATION**
>
> - During commissioning, trigger all signals and simulate all conditions that cause a power stage disable request in order to verify that all loads come to a secure standstill when the power stage is disabled under maximum load conditions.
> - Install a dedicated service brake if removal of power to the motor does not meet the requirements of your application.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

An error, AL013, is detected and presented.

The deceleration ramp is specified via parameter *P1-68*.

After the OPST function is enabled, you must disable it and re-enable the power stage for continued operation.

Setting a Signal Output Via Parameter

The digital signal outputs can be set via a parameter.

In order to set a digital signal output via the parameter, you must first parameterize the signal output functions SDO_0 … SDO_7, refer to Setting the Digital Signal Outputs, page 244.

The parameter *P4-06* lets you set the digital signal outputs.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P4-06 FOT	Setting a signal output via parameter Applicable operating mode: PT, PS, V, T This parameter lets you set those signal outputs whose signal output functions have been defined by SDO_0 … SDO_7. Bit 0 = 1 sets those signal outputs whose signal output function has been set to SDO_0. Bit 1 = 1 sets those signal outputs whose signal output function has been set to SDO_1. Bit 2 = 1 sets those signal outputs whose signal output function has been set to SDO_2. Bit 3 = 1 sets those signal outputs whose signal output function has been set to SDO_3. Bit 4 = 1 sets those signal outputs whose signal output function has been set to SDO_4. Bit 5 = 1 sets those signal outputs whose signal output function has been set to SDO_5. Bit 6 = 1 sets those signal outputs whose signal output function has been set to SDO_6. Bit 7 = 1 sets those signal outputs whose signal output function has been set to SDO_7. See P2-18 ... P2-22 for assigning the functions to the digital outputs.	- 0_h 0_h FF_h Hexadecimal	u16 RW -	Modbus $50C_h$

Forcing the Digital Signal Inputs and Signal Outputs

Forcing of signals means that the digital inputs and outputs are set manually. Forcing input and output values can have serious consequences on the operation of a machine or process.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION CAUSED BY FORCING

- Only force I/O if there are no persons or obstructions in the zone of operation.
- Only force I/O if you are fully familiar with the effects of the signals.
- Only force I/O for test purposes, maintenance or other short-term tasks.
- Do not use forcing for regular, long-term or in-service operation.
- Always remove forcing when the task (testing, maintenance or other short-term operation) is completed.

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

Forcing the Digital Inputs

Forcing of the digital inputs is set via the parameters P3-06 and P4-07.

The parameter P3-06 lets you specify which digital signal inputs are allowed to be forced.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P3-06 SDI	Digital Inputs - Forcing Settings Applicable operating mode: PT, PS, V, T This parameter determines whether a digital input can be forced. Bits 0 … 7: Digital input DI1 … Digital input DI8 Bit settings: Value 0: Digital input cannot be forced Value 1: Digital input can be forced To start forcing, you must write P4-07. See P2-10 … P2-17 for the assignment of signal input functions to the digital inputs.	- 0_h 0_h $7FF_h$ Hexadecimal	u16 RW -	Modbus $40C_h$

Use parameter P4-07 to activate forcing of the digital signal inputs.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P4-07 ITST	State of Digital Inputs / Activate Forcing Applicable operating mode: PT, PS, V, T A read access to this parameter indicates the state of the digital inputs in the form of a bit pattern. Example: Read value 0x0011: Digital inputs 1 and 5 are activated By writing this parameter, you can change the state of the inputs provided that the setting for the corresponding input in P3-06 allows for forcing (value 1 for the bit corresponding to the input). Example: Write value 0x0011: Digital inputs 1 and 5 are activated Read value 0x0011: Digital inputs 1 and 5 are activated See P3-06 for permitting forcing of individual digital inputs. See P2-10 … P2-17 for the assignment of signal input functions to the digital inputs.	- 0_h 0_h FF_h Hexadecimal	u16 RW -	Modbus $50E_h$

Forcing the Digital Outputs

Forcing of the digital outputs is set via the parameters P4-27 and P4-28.

The parameter P4-27 lets you specify which digital signal outputs are allowed to be forced.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P4-27 DO_FORCE_MASK	Digital Outputs - Forcing Settings Applicable operating mode: PT, PS, V, T This parameter determines whether a digital output can be forced. Bits 0 … 4: Digital output DO1 … Digital output DO5 Bit settings: Value 0: Digital output cannot be forced Value 1: Digital output can be forced To start forcing, you must write P4-28. See P2-18 … P2-22 for the assignment of signal output functions to the digital outputs.	- 0_h 0_h $1F_h$ Hexadecimal	u16 RW -	Modbus 536_h

Use parameter P4-28 to activate forcing of the digital signal outputs.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P4-28 DO_FORCE_VALUE	State of Digital Outputs / Activate Forcing Applicable operating mode: PT, PS, V, T A read access to this parameter indicates the state of the digital outputs in the form of a bit pattern. Example: Read value 0x0011: Digital outputs 1 and 5 are activated By writing this parameter, you can change the state of the outputs provided that the setting for the corresponding output in P4-27 allows for forcing (value 1 for the bit corresponding to the output). Example: Write value 0x0011: Digital outputs 1 and 5 are activated Read value 0x0011: Digital outputs 1 and 5 are activated See P4-27 for permitting forcing of individual digital outputs. See P2-18 … P2-22 for the assignment of signal output functions to the digital outputs.	- 0_h 0_h $1F_h$ Hexadecimal	u16 RW -	Modbus 538_h

Operating Modes

What's in This Chapter

Setting the Operating Mode

Setting the Operating Mode

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

The drive has the following types of operating modes:

- *Single Mode* operating modes
  - ◦ The drive operates in a single operating mode.
- *Dual Mode* operating modes
  - ◦ The drive operates using 2 operating modes alternately. The signal input functions are used to switch between the operating modes.

The operating modes Torque (T) and Torque (Tz) and the dual operating modes with Torque (T) and Torque (Tz) do not provide deceleration functionality in response to a power stage disable request. In these operating modes, the motor coasts down to a standstill in response to a power stage disable request. You must install additional equipment such as a dedicated service brake if your application requires faster deceleration of the load.

⚠ **WARNING**

UNINTENDED EQUIPMENT OPERATION

- During commissioning, trigger all signals and simulate all conditions that cause a power stage disable request in order to verify that all loads come to a secure standstill when the power stage is disabled under maximum load conditions.
- Install a dedicated service brake if removal of power to the motor does not meet the requirements of your application.

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

Jog Operation

Jog Operation

Description

In the Jog operation, a movement is made from the actual motor position in the specified direction.

The parameter *P4-05* is used to set the velocity for the movement in the unit rpm.

The movement can be performed via the arrow keys at the HMI or via the signal input functions JOGP and JOGN.

For further information on the parameterizable signal input functions, refer to .

Jog Via HMI

If the HMI is used, the movements are performed via the arrow keys. The operating mode is terminated via the **M** key.

If the HMI is used, the movements are performed via the arrow keys. The operating mode is terminated via the **M** key.
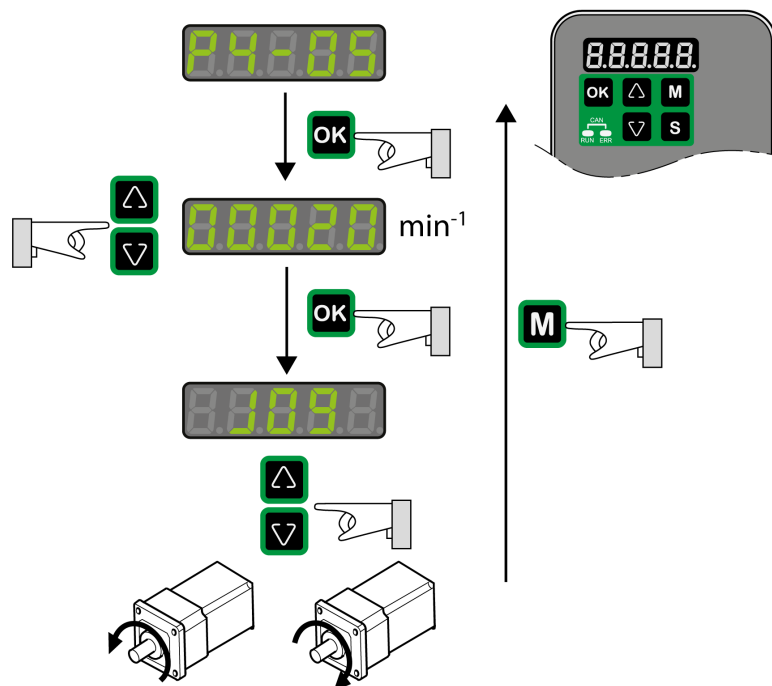
Operating Mode Pulse Train (PT)

Operating mode Pulse Train (PT)

Description

In the operating mode Pulse Train (PT), movements are carried out according to externally supplied reference value signals. A position reference value is calculated on the basis of these external reference values plus an adjustable gear ratio. The reference value signals can be A/B signals, P/D signals or CW/CCW signals.

Method
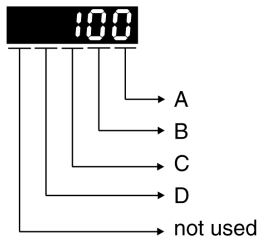
A movement can be made using one of 3 methods:

- Position synchronization without compensation movement

  In the case of position synchronization without compensation movement, the movement is made synchronously (position synchronicity) with the supplied reference value signals. Reference value signals supplied during an interruption are not taken into account.

- Position synchronization with compensation movement

  In the case of position synchronization with compensation movement, the movement is made synchronously (position synchronicity) with the supplied reference value signals. Reference value signals supplied during an interruption are taken into account and compensated for.

- Velocity synchronization

  In the case of velocity synchronization, the movement is made synchronously (velocity synchronicity) with the supplied reference value signals.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P8-31 GEARING_MODE	Method for Operating Mode Pulse Train (PT) Applicable operating mode: PT Value 0: Synchronization deactivated Value 1: Position synchronization without compensation movement Value 2: Position synchronization with compensation movement Value 3: Velocity synchronization The parameters for acceleration (P1-34), deceleration (P1-35) and velocity (P1-55) act as limitations for the synchronization.	- 0 1 3 Decimal	u16 RW per.	Modbus 93E$_h$

Pulse Settings

The parameter *P1-00* lets you specify the type of reference value signals, the input polarity, the maximum signal frequency and the source of the pulses.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P1-00 PTT	Reference Value Signal - Pulse Settings Applicable operating mode: PT **100** → A → B → C → D → not used This parameter is used to configure the reference value signals for the operating mode PT. A: Type of reference value signals B: Signal frequency C: Input polarity D: Source of reference value signals Setting can only be modified if power stage is disabled.	- 0$_h$ 2$_h$ 1132$_h$ Hexadecimal	u16 RW per.	Modbus 200$_h$

Settings A and C

Type of reference value signals and input polarity

–	C = 0 Positive input polarity		C = 1 Negative input polarity	
	Positive direction of movement	Negative direction of movement	Positive direction of movement	Negative direction of movement
A = 0 A/B signals				
A = 1 CW/CCW signals				
A = 2 P/D signals				

Setting B

Maximum signal frequency:

–	Low-speed pulses PULSE, SIGN	High-speed pulses HPULSE, HSIGN
B = 0	500 Kpps[1]	4 Mpps
B = 1	200 Kpps	2 Mpps
B = 2	100 Kpps	1 Mpps
B = 3	50 Kpps	500 Kpps

(1)	Only possible with RS422.

Parameter *P2-65* bit 6 allows you to set an error response for frequencies exceeding the maximum signal frequency by more than 10 %.

Setting D

Source of the pulses:

D = 0	Low-speed pulses	CN1 Terminal: PULSE, SIGN
D = 1	High-speed pulses	CN1 Terminal: HPULSE, HSIGN

The source of the pulses can also be set via the signal input function PTCMS. The settings of the signal input function take priority over the settings of the parameter *P1-00*.

Gear Ratio

The gear ratio is the ratio of the number of motor increments and the number of reference increments.

The reference increments are supplied as reference value signals via the signal inputs.

$$\text{Gear factor} \quad = \quad \frac{\text{Motor increments}}{\text{Reference increments}} \quad = \quad \frac{\text{Gear factor numerator}}{\text{Gear factor denominator}}$$

With the factory setting for the gear ratio, 100000 reference increments correspond to one revolution.

There are 1280000 motor increments per revolution.

Parameterization

You can set up 4 gear ratios. It is possible to switch between these gear ratios via the signal inputs.

The gear ratios are set via parameters P1-44, P1-45, P2-60, P2-61, and P2-62.

You can switch between the gear ratios with the signal input functions GNUM0 and GNUM1.

GNUM1	GNUM0	=
0	0	$\dfrac{\text{P1-44}}{\text{P1-45}}$
0	1	$\dfrac{\text{P2-60}}{\text{P1-45}}$
1	0	$\dfrac{\text{P2-61}}{\text{P1-45}}$
1	1	$\dfrac{\text{P2-62}}{\text{P1-45}}$

In order to switch between the gear ratios via the signal inputs, you must first parameterize the signal input functions GNUM0 and GNUM1, refer to Setting the Digital Signal Inputs, page 239.

Example 1

Calculation of number of motor revolutions corresponding to 30000 PUU:

$$30000 \text{ PUU} \quad \times \quad \frac{\text{P1-44} = 128}{\text{P1-45} = 10} \quad = \quad 384000 \quad \longrightarrow \quad \frac{384000}{1280000} \quad = \quad 0{,}3 \quad \left(\!\!\left(M\right)\!\!\right)$$

Example 2

Calculation of gear ratio if 10000 PUU are to effect 500 revolutions of the motor shaft:

$$10000 \text{ PUU} \quad = \quad 500 \left(\!\!\left(M\right)\!\!\right) \quad \longrightarrow \quad \frac{\text{P1-44} = ?}{\text{P1-45} = ?}$$

$$\frac{1280000}{1 \left(\!\!\left(M\right)\!\!\right)} \quad \longrightarrow \quad \frac{1280000 \times 500}{1 \left(\!\!\left(M\right)\!\!\right) \times 10000} \quad = \quad \frac{128 \times 500}{\left(\!\!\left(M\right)\!\!\right) \times 1}$$

$$\longrightarrow \quad \frac{\text{P1-44} = 128 \times 500}{\text{P1-45} = 1}$$

Example 3

A machine encoder with 1024 lines per revolution is to effect one revolution of the motor shaft with one revolution.
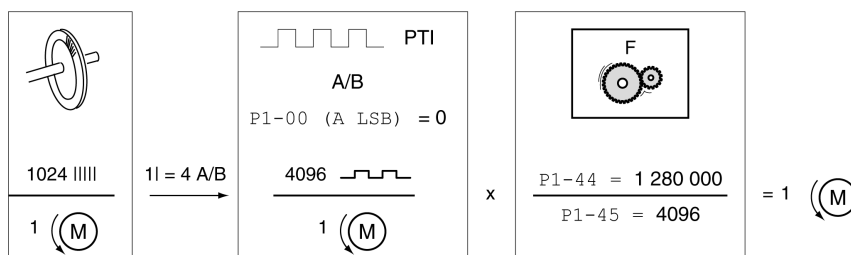
Acceleration and Deceleration Limitation

The parameters P1-34 and P1-35 allow you to set a limitation for the acceleration and deceleration.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P1-34 TACC	Acceleration Period Applicable operating mode: PT, V The acceleration period is the time in milliseconds required to accelerate from motor standstill to 6000 rpm. For operating mode V, this parameter specifies the acceleration. For operating mode PT, this parameter specifies an acceleration limitation for the pulses at the PTI interface.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 244$_h$
P1-35 TDEC	Deceleration Period Applicable operating mode: PT, V The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. For operating mode V, this parameter specifies the deceleration. For operating mode PT, this parameter specifies a deceleration limitation for the pulses at the PTI interface.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 246$_h$

Operating Mode Position Sequence (PS)

Operating mode Position Sequence (PS)

Description

The operating mode Position Sequence (PS) allows you to set and execute 32 motion profiles in any sequence. The motion profiles are defined via 32 data sets.

The following values can be set for each data set:

- Target position
- Type of movement: Absolute or relative
- Type of transition between data sets
- Acceleration
- Target velocity
- Deceleration
- Waiting time after completion of the data set

In addition, a Homing data set is provided. This Homing data set is used to set a reference point for absolute movements.

Configuration

The data sets are configured by means of the commissioning software LXM26 DTM Library.

Structure of a Data Set

Target Position

The target position is set in the user-defined unit. With the factory scaling, the resolution is 100000 user-defined units per revolution.

For further information on scaling, refer to chapter .

Type of Movement

In the case of a relative movement, the movement is relative with reference to the previous target position or the current motor position.
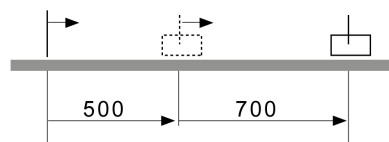
In the case of an absolute movement, the movement is absolute with reference to the zero point.
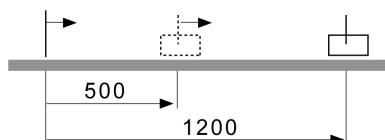
Homing or position setting is required before the first absolute movement can be performed.

Transition Between Data Sets

There are two types of transitions:

- The subsequent data set is only started after the preceding data set has been completed.
- The subsequent data set is started as soon as it is triggered via the signal input function CTRG or the parameter P5-07.

Acceleration Period

The acceleration period is the time in milliseconds required to accelerate from motor standstill to 6000 rpm. It is used to set the acceleration ramp.

Target Velocity

The target velocity is reached after the time required for acceleration has passed.

Deceleration Period

The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. It is used to set the deceleration ramp.

Waiting Time

The waiting time is the period of time that must pass after the target position has been reached for the data set to be considered completed.

Parameters for the Data Sets

The data set are configured via parameters P6-02 ... P6-65 and P7-02 ... P7-65. The following table provides an overview:

Data set	Target position	Type / transition	Acceleration / deceleration	Waiting time / target velocity
1	P6-02	P6-03	P7-02	P7-03
2	P6-04	P6-05	P7-04	P7-05
3	P6-06	P6-07	P7-06	P7-07
4	P6-08	P6-09	P7-08	P7-09
5	P6-10	P6-11	P7-10	P7-11
6	P6-12	P6-13	P7-12	P7-13
7	P6-14	P6-15	P7-14	P7-15
8	P6-16	P6-17	P7-16	P7-17
9	P6-18	P6-19	P7-18	P7-19
10	P6-20	P6-21	P7-20	P7-21
11	P6-22	P6-23	P7-22	P7-23
12	P6-24	P6-25	P7-24	P7-25
13	P6-26	P6-27	P7-26	P7-27
14	P6-28	P6-29	P7-28	P7-29
15	P6-30	P6-31	P7-30	P7-31
16	P6-32	P6-33	P7-32	P7-33
17	P6-34	P6-35	P7-34	P7-35

Data set	Target position	Type / transition	Acceleration / deceleration	Waiting time / target velocity
18	P6-36	P6-37	P7-36	P7-37
19	P6-38	P6-39	P7-38	P7-39
20	P6-40	P6-41	P7-40	P7-41
21	P6-42	P6-43	P7-42	P7-43
22	P6-44	P6-45	P7-44	P7-45
23	P6-46	P6-47	P7-46	P7-47
24	P6-48	P6-49	P7-48	P7-49
25	P6-50	P6-51	P7-50	P7-51
26	P6-52	P6-53	P7-52	P7-53
27	P6-54	P6-55	P7-54	P7-55
28	P6-56	P6-57	P7-56	P7-57
29	P6-58	P6-59	P7-58	P7-59
30	P6-60	P6-61	P7-60	P7-61
31	P6-62	P6-63	P7-62	P7-63
32	P6-64	P6-65	P7-64	P7-65

Scaling

Scaling is the ratio of the number of user-defined units and the number of internal units.

The user-defined units are supplied as parameter values in the unit PUU.

$$\text{Scaling factor} = \frac{\text{Internal units}}{\text{User-defined units}} = \frac{\text{Gear factor numerator}}{\text{Gear factor denominator}}$$

With the factory setting for the scaling factor, 100000 user-defined units correspond to one revolution.

The internal units are 1280000 increments per revolution.

Parameterization

The scaling factor is set using the parameters P1-44 and P1-45.

$$\frac{P1-44}{P1-45}$$

Example 1

Calculation of number of motor revolutions corresponding to 30000 PUU:

$$30000 \text{ PUU} \times \frac{P1\text{-}44 = 128}{P1\text{-}45 = 10} = 384000 \longrightarrow \frac{384000}{1280000} = 0{,}3 \quad \text{M}$$

Example 2

Calculation of the scaling factor if 10000 PUU are to effect 500 revolutions of the motor shaft:

$$10000 \text{ PUU} = 500 \; (\!(M)\!) \longrightarrow \frac{\texttt{P1-44 = ?}}{\texttt{P1-45 = ?}}$$

$$\frac{1280000}{1 \; (\!(M)\!)} \longrightarrow \frac{1280000 \times 500}{1 \; (\!(M)\!) \times 10000} = \frac{128 \times 500}{(\!(M)\!) \times 1}$$

$$\longrightarrow \frac{\texttt{P1-44 = } 128 \times 500}{\texttt{P1-45 = } 1}$$

Homing Data Set for Absolute Movements

The Homing data set is used to establish a reference between a mechanical position and the actual position of the motor.

A reference between a mechanical position and the actual position of the motor is generated by means of a reference movement or by means of position setting.

A successful reference movement, or position setting, homes the motor.

Homing establishes the zero point for absolute movements.

Methods

The following methods are available:

- Reference movement to a limit switch

  In the case of a reference movement to a limit switch, a movement to the negative limit switch or the positive limit switch is performed.

  When the limit switch is reached, the motor is stopped and a movement is made back to the switching point of the limit switch.

  From the switching point of the limit switch, an additional movement can be made to the next index pulse of the motor.

  The switching point of the limit switch or the position of the index pulse point is the reference point.

- Reference movement to the reference switch

  In the case of a reference movement to the reference switch, a movement to the reference switch is performed.

  When the reference switch is reached, the motor is stopped and a movement is made back to the switching point of the reference switch.

  From the switching point of the reference switch, an additional movement can be made to the next index pulse of the motor.

  The switching point of the reference switch or the position of the index pulse point is the reference point.

- Reference movement to the index pulse

  In the case of a reference movement to the index pulse, a movement is made from the actual position to the next index pulse. The position of the index pulse is the reference point.

- Position setting

  In the case of position setting, the current motor position is set to a desired position value.

A reference movement must be terminated without interruption for the new zero point to be valid. If the reference movement is interrupted, it must be started again.

Starting the Homing Data Set

The Homing data set can be started in the following ways:

- Automatic start when the power stage is enabled for the first time

  The automatic start can be set with the parameter P6-01.

- Start via the signal input function GOTOHOME

  The signal input function must have been parameterized, refer to Setting the Digital Signal Inputs, page 239.

Setting Automatic Start and the Subsequent Data Set

The parameter P6-01 is used to set the automatic start and select a data set to be executed after completion of the Homing data set.

The parameter P7-01 is used to set a waiting time for the subsequent data set. The subsequent data set is started after the waiting time has elapsed.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P6-01 ODEF	Subsequent Data Set and Auto-start of Homing Data Set Applicable operating mode: PS Bit 0: 0 = Do not start Homing after first power stage enable 1 = Start Homing after first power stage enable Bits 1 … 7: Reserved Bits 8 … 15: Subsequent data set	- 0_h 0_h 2001_h Hexadecimal	u32 RW per.	Modbus 702_h
P7-01 HOME_DLY	Waiting Time of Homing Data Set Applicable operating mode: PS Bits 0 … 15: Waiting time until next dataset is started Bits 16 … 31: Reserved	ms 0 0 32767 Decimal	u32 RW per.	Modbus 802_h

Setting Acceleration and Deceleration

The acceleration and deceleration for the Homing data set are set via the parameter P7-00.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P7-00 HOME_ACC_DEC	Deceleration and Acceleration of Homing Data Set Applicable operating mode: PS Bits 0 … 15: Deceleration Bits 16 … 31: Acceleration	ms|ms 6| 6 200| 200 65500| 65500 Decimal	u32 RW per.	Modbus 800$_h$

Setting Velocities

The parameters P5-05 and P5-06 are used to set the velocities for searching the switch and for moving away from the switch.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P5-05 HOMESPEED1	Homing - Fast Velocity for Reference Movement Applicable operating mode: PS	0.1rpm 10 1000 60000 Decimal	u32 RW per.	Modbus 60A$_h$
P5-06 HOMESPEED2	Homing - Slow Velocity for Reference Movement Applicable operating mode: PS	0.1rpm 10 200 60000 Decimal	u32 RW per.	Modbus 60C$_h$

Defining the Zero Point

The parameter P6-00 is used to specify a position value, which is set at the reference point after a successful reference movement or after position setting. This position value defines the zero point.

Parameter name	Description	Unit	Data type	Parameter address via fieldbus
		Minimum value	R/W	
		Factory setting	Persistent	
		Maximum value		
		HMI Format		
P6-00	Position of Homing Data Set	PUU	s32	Modbus 700h
ODAT	Applicable operating mode: PS	-2147483647	RW	
	After a successful reference movement, this position is automatically set at the reference point.	0	per.	
		2147483647		
	Bits 0 … 31: Position	Decimal		

Selecting the Homing Method

The parameter P5-04 is used to set the Homing method.
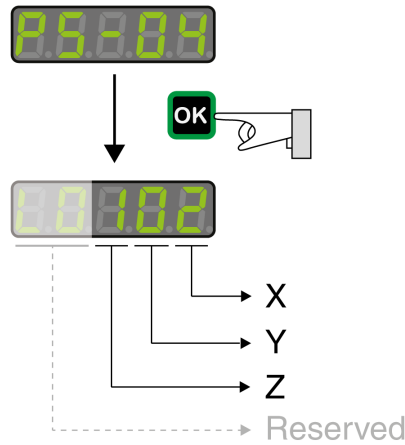
Setting Z - limit switch	Setting Y - index pulse	Settings X - Homing method	
-	Y=0: Movement back to the last index pulse	0	Movement in positive direction to the positive limit switch
-	Y=2: No movement to the index pulse	1	Movement in negative direction to the negative limit switch
Z=0: Stop after limit switch is reached and trigger alert AL014 or AL015	Y=0: Movement back to the last index pulse	2	Movement in positive direction to the rising edge of the reference switch
Z=1: Move in opposite direction after having reached the limit switch, no alert	Y=1: Movement to the next index pulse	3	Movement in negative direction to the rising edge of the reference switch
	Y=2: No movement to the index pulse		
	-	4	Movement in positive direction to the next index pulse
	-	5	Movement in negative direction to the next index pulse
	Y=0: Movement back to the last index pulse	6	Movement in positive direction to the falling edge of the reference switch
	Y=1: Movement to the next index pulse	7	Movement in negative direction to the falling edge of the reference switch
	Y=2: No movement to the index pulse		
-	-	8	Position setting

The illustrations below show the Homing methods.

Reference Movement to the Positive Limit Switch

The following illustrations show reference movements to the positive limit switch from different starting positions.

Reference movement (ZYX = -00)
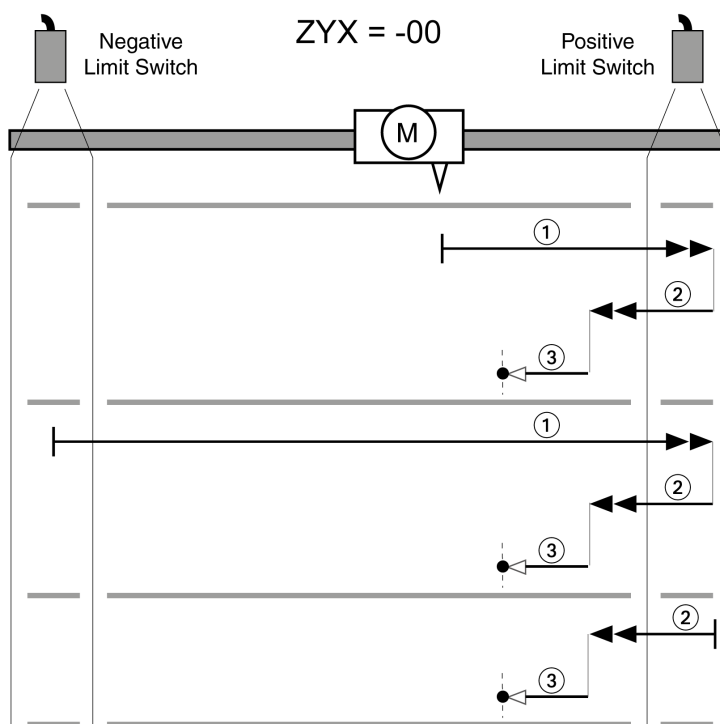
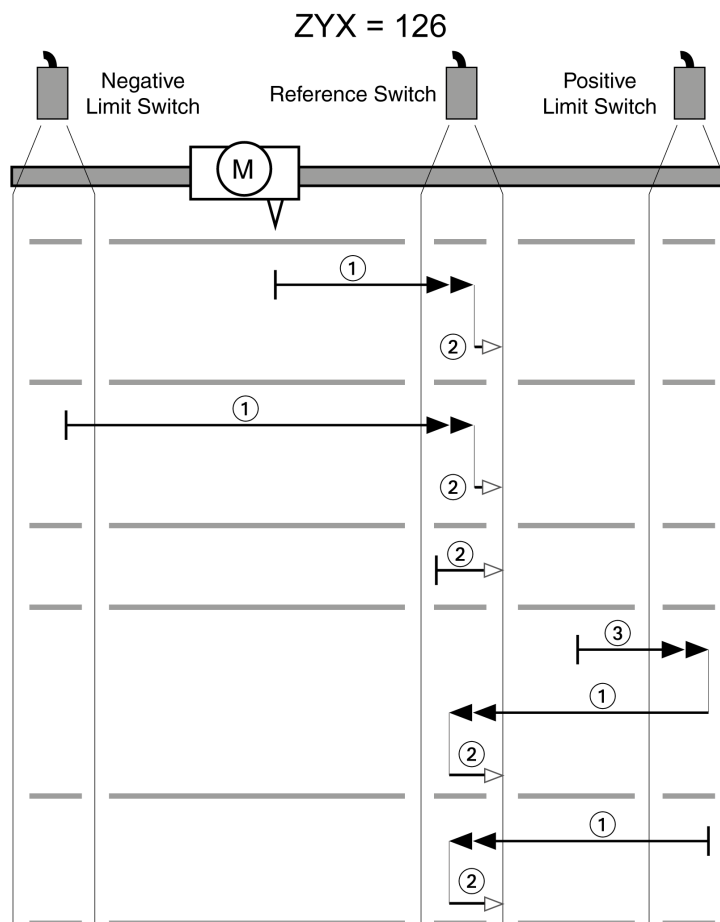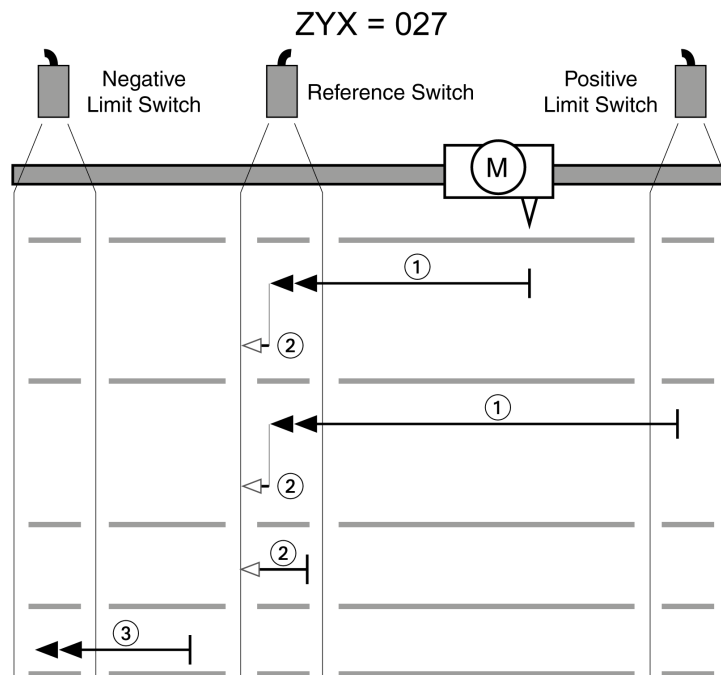| Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-05
3	Movement to the index pulse at velocity P5-06

Reference movement (ZYX = -20)
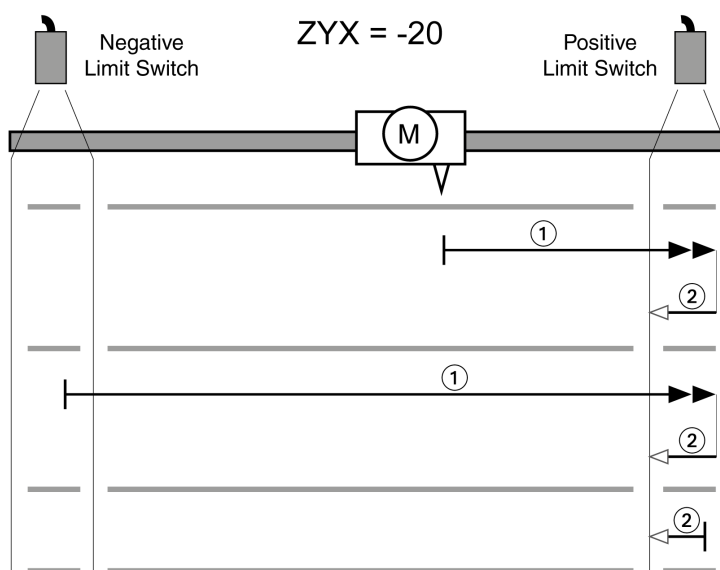
Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-06

Reference Movement to the Negative Limit Switch

The following illustrations show reference movements to the negative limit switch from different starting positions.

Reference movement (ZYX = -01)
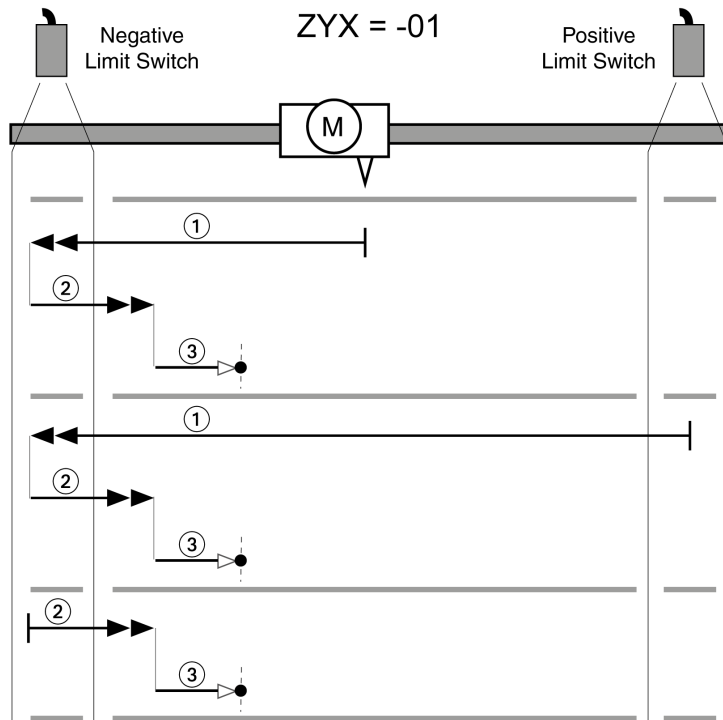
Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-05
3	Movement to the index pulse at velocity P5-06

Reference movement (ZYX = -21)
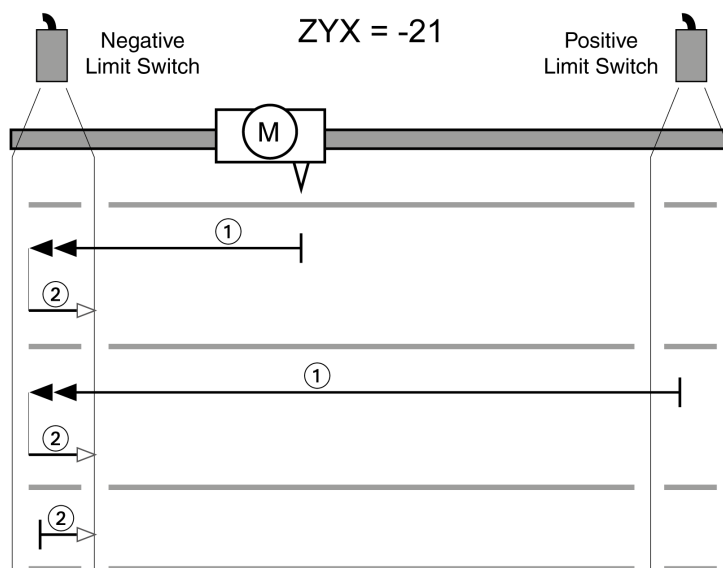
Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-06

Reference Movement in Positive Direction to the Rising Edge of the Reference Switch

The following illustrations show reference movements to the rising edge of the reference switch in positive direction from different starting positions.

Reference movement (ZYX = 002)

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-05
3	Movement to the index pulse at velocity P5-06
4	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 012)

ZYX = 012

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to the index pulse at velocity P5-06
3	Movement to falling edge at velocity P5-05
4	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 022)

ZYX = 022

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-06
3	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 102)

ZYX = 102

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-05
3	Movement to the index pulse at velocity P5-06
4	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 112)

ZYX = 112

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to the index pulse at velocity P5-06
3	Movement to falling edge at velocity P5-05
4	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 122)

ZYX = 122

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-06
3	Movement to the limit switch at velocity P5-05

Reference Movement in Negative Direction to the Rising Edge of the Reference Switch

The following illustrations show reference movements to the rising edge of the reference switch in negative direction from different starting positions.

Reference movement (ZYX = 003)

ZYX = 003

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-05
3	Movement to the index pulse at velocity P5-06
4	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 013)

ZYX = 013

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to the index pulse at velocity P5-06
3	Movement to falling edge at velocity P5-05
4	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 023)

ZYX = 023

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-06
3	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 103)

ZYX = 103

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-05
3	Movement to the index pulse at velocity P5-06
4	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 113)
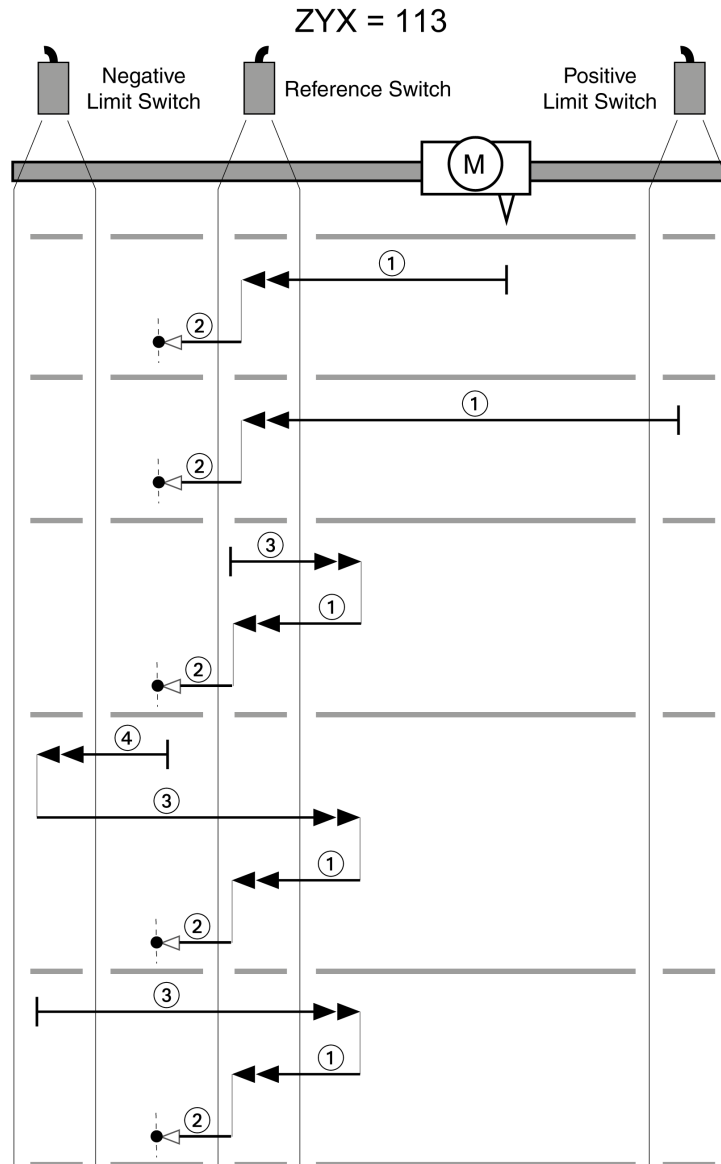
ZYX = 113

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to the index pulse at velocity P5-06
3	Movement to falling edge at velocity P5-05
4	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 123)
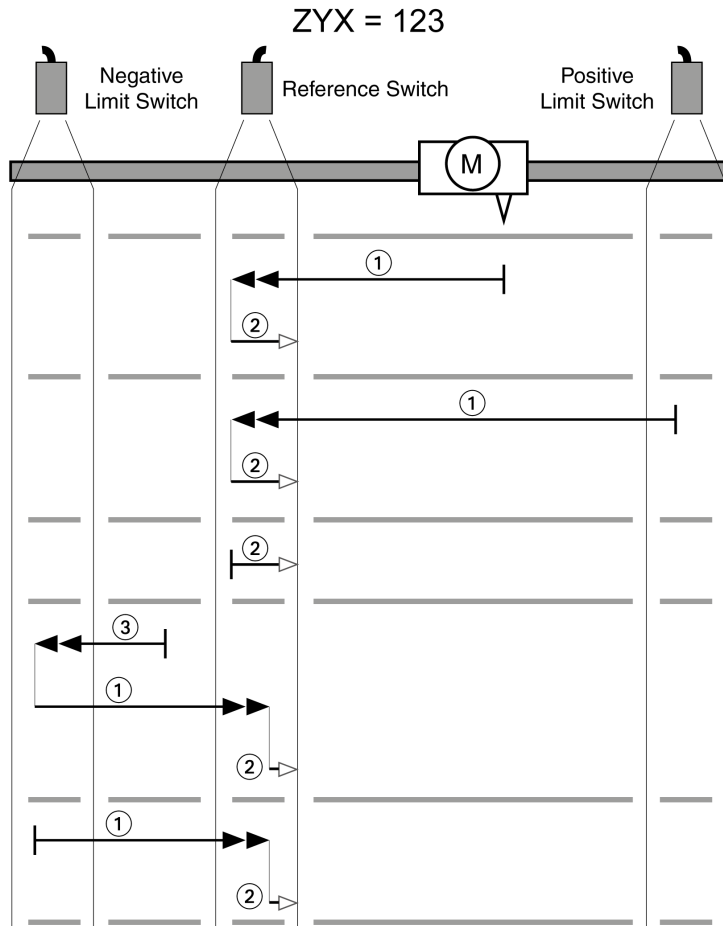
Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-06
3	Movement to the limit switch at velocity P5-05

Reference Movement to the Index Pulse in Positive Direction

The following illustrations show reference movements to the index pulse in positive direction from different starting positions.

Reference movement (ZYX = 0-4)
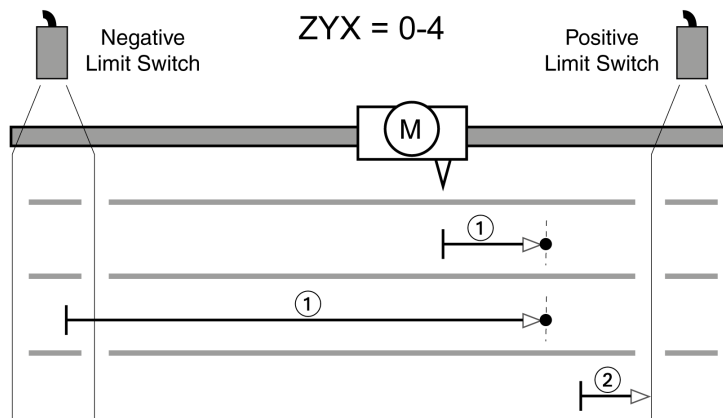
Item	Description
1	Movement to the next index pulse at velocity P5-06
2	Movement to the limit switch at velocity P5-06

Reference movement (ZYX = 1-4)
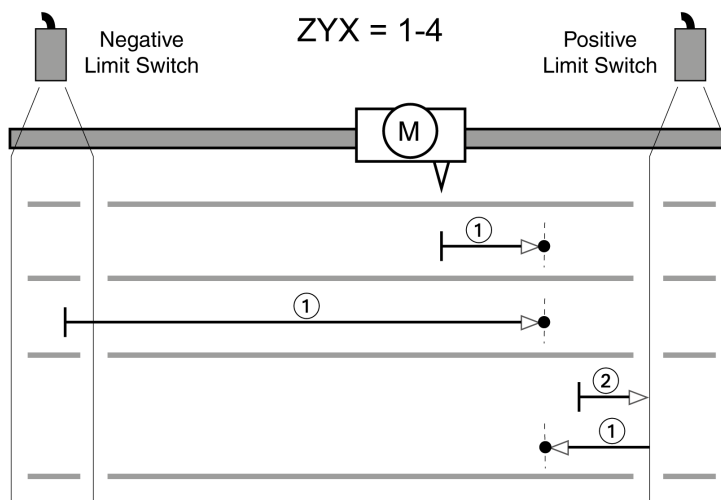
Item	Description
1	Movement to the next index pulse at velocity P5-06
2	Movement to the limit switch at velocity P5-06

Reference Movement to the Index Pulse in Negative Direction

The following illustrations show reference movements to the index pulse in negative direction from different starting positions.

Reference movement (ZYX = 0-5)

Item	Description
1	Movement to the next index pulse at velocity P5-06
2	Movement to the limit switch at velocity P5-06

Reference movement (ZYX = 1-5)

ZYX = 1-5

Item	Description
1	Movement to the next index pulse at velocity P5-06
2	Movement to the limit switch at velocity P5-06

Reference Movement in Positive Direction to the Falling Edge of the Reference Switch

The following illustrations show reference movements to the falling edge of the reference switch in positive direction from different starting positions.

Reference movement (ZYX = 006)

ZYX = 006

Item	Description
1	Movement to falling edge at velocity P5-05
2	Movement to rising edge at velocity P5-05
3	Movement to the index pulse at velocity P5-06
4	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 016)
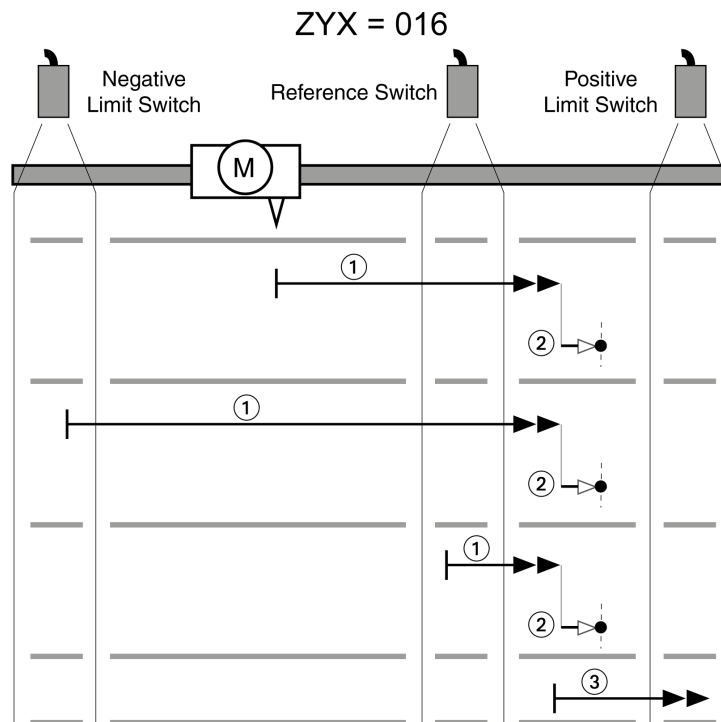
ZYX = 016

Item	Description
1	Movement to falling edge at velocity P5-05
2	Movement to the index pulse at velocity P5-06
3	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 026)

ZYX = 026

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-06
3	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 106)

ZYX = 106

Item	Description
1	Movement to falling edge at velocity P5-05
2	Movement to rising edge at velocity P5-05
3	Movement to the index pulse at velocity P5-06
4	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 116)
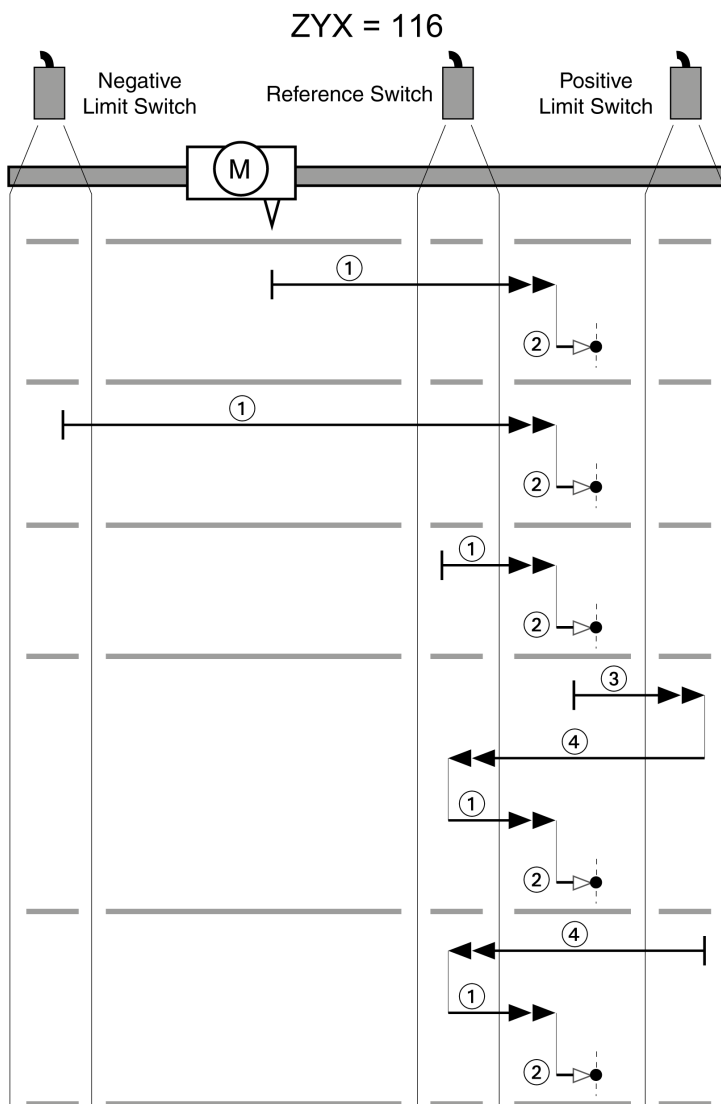
ZYX = 116

Item	Description
1	Movement to falling edge at velocity P5-05
2	Movement to the index pulse at velocity P5-06
3	Movement to the limit switch at velocity P5-05
4	Movement to rising edge at velocity P5-05

Reference movement (ZYX = 126)

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-06
3	Movement to the limit switch at velocity P5-05

Reference Movement in Negative Direction to the Falling Edge of the Reference Switch

The following illustrations show reference movements to the falling edge of the reference switch in negative direction from different starting positions.

Reference movement (ZYX = 007)
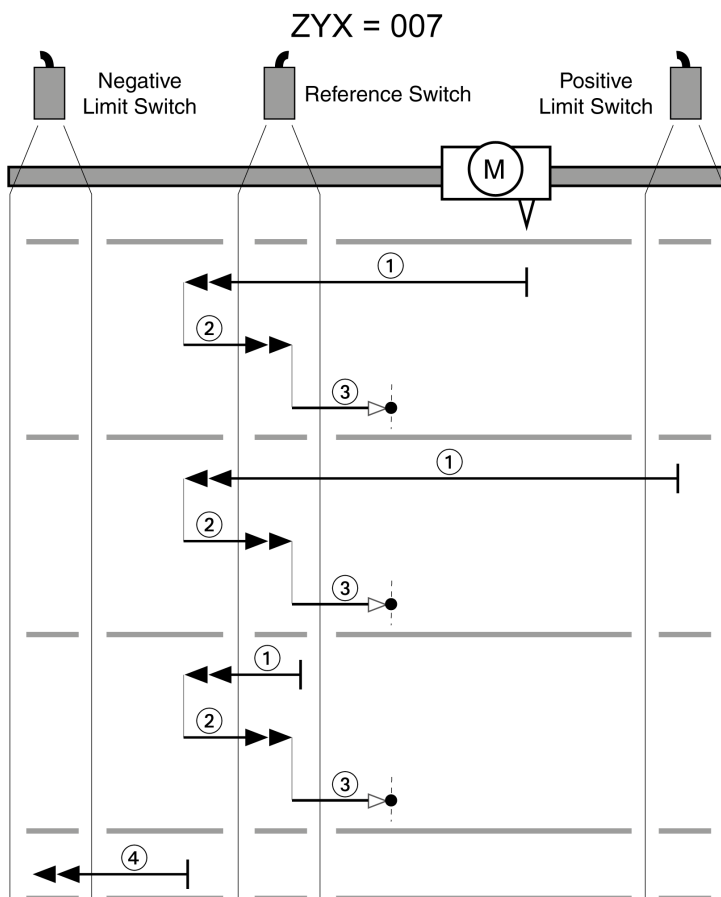
ZYX = 007

Item	Description
1	Movement to falling edge at velocity P5-05
2	Movement to rising edge at velocity P5-05
3	Movement to the index pulse at velocity P5-06
4	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 017)
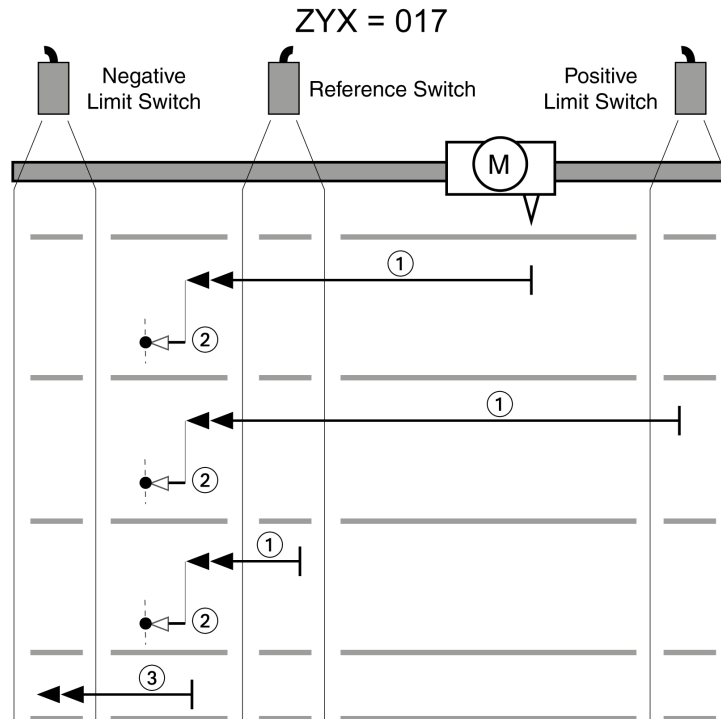
ZYX = 017

Item	Description
1	Movement to falling edge at velocity P5-05
2	Movement to the index pulse at velocity P5-06
3	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 027)

ZYX = 027

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-06
3	Movement to the limit switch at velocity P5-05

Reference movement (ZYX = 107)
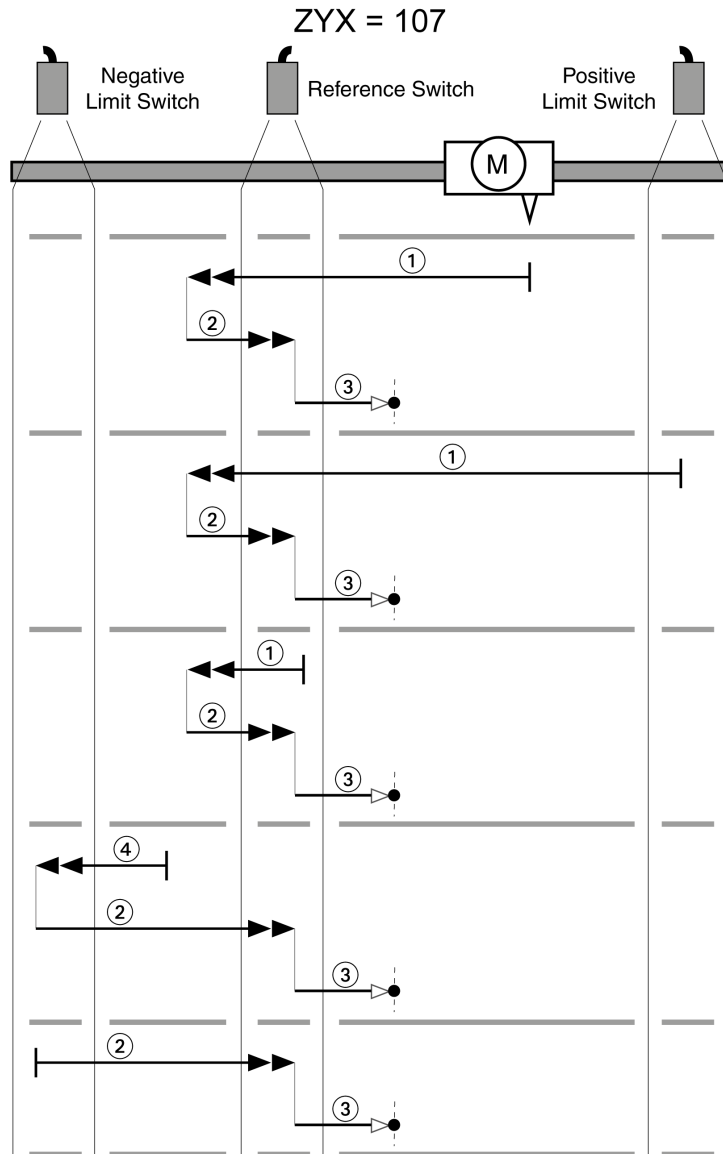
ZYX = 107

Item	Description
1	Movement to falling edge at velocity P5-05
2	Movement to rising edge at velocity P5-05
3	Movement to the limit switch at velocity P5-06

Item	Description
1	Movement to falling edge at velocity P5-05
2	Movement to the index pulse at velocity P5-06
3	Movement to the limit switch at velocity P5-05
4	Movement to rising edge at velocity P5-05

Reference movement (ZYX = 117)

ZYX = 117
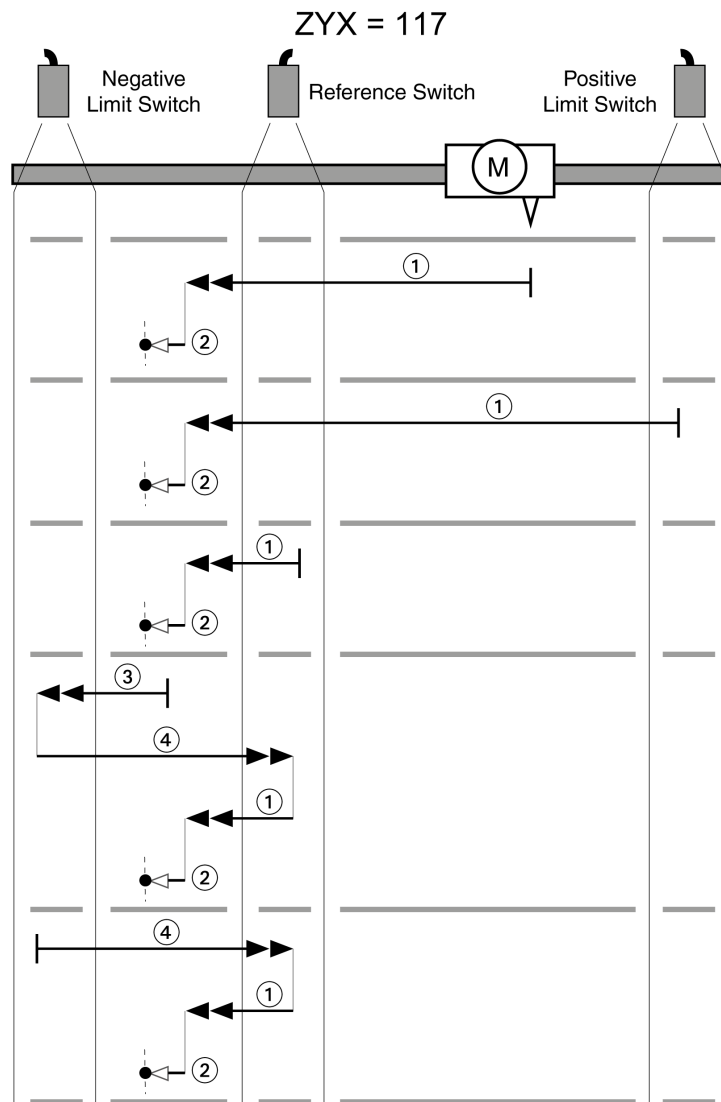
Reference movement (ZYX = 127)
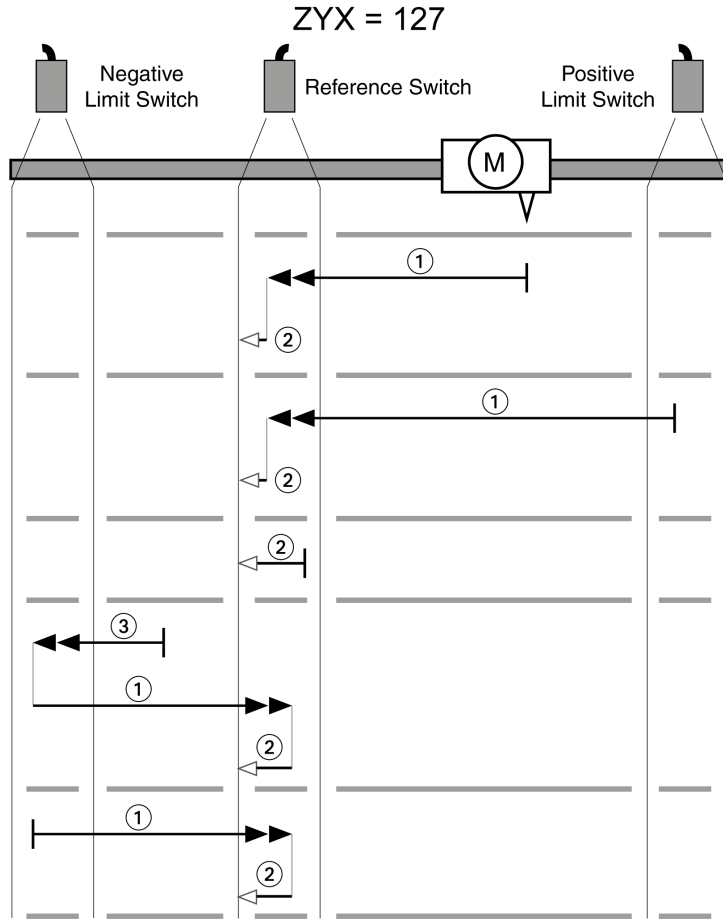
ZYX = 127

Item	Description
1	Movement to rising edge at velocity P5-05
2	Movement to falling edge at velocity P5-06
3	Movement to the limit switch at velocity P5-05

Position Setting

By means of position setting, the current motor position is set to the position value in parameter P6-00. This also defines the zero point.

Position setting is only possible when the motor is at a standstill. Any active position deviation remains active and can still be compensated for by the position controller after position setting.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P6-00 ODAT	Position of Homing Data Set Applicable operating mode: PS After a successful reference movement, this position is automatically set at the reference point. Bits 0 … 31: Position	PUU -2147483647 0 2147483647 Decimal	s32 RW per.	Modbus 700$_h$

Operating Modes Velocity (V) and Velocity Zero (Vz)

Operating Modes Velocity (V) and Velocity Zero (Vz)

Description

In the operating mode Velocity (V), a movement is made with a specified target velocity.

Source of Reference Value Signals

In the operating mode Velocity (V), the source of the reference value signals is one of the three values set via the parameters *P1-09* to *P1-11*.

In the operating mode Velocity Zero (Vz), the source of the reference value signals is either one of the three values set via the parameters *P1-09* to *P1-11* or the fixed target velocity 0.

The values of the parameters *P1-09* to *P1-11* can be selected via the signal input functions SPD0 and SPD1.

The signal input functions SPD0 and SPD1 take priority over the reference value signal at the analog input *V_REF*.

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

For additional information on the parameterizable signal input functions, refer to Setting the Digital Signal Inputs, page 239.

-	Signal state of the digital signal inputs		Target velocity via:		Range
	SPD1	**SPD0**			
S1	0	0	Operating mode Velocity (Vz)	Voltage between V_REF (Pin42) and GND (pin 44)	-10V ... 10V
			Operating mode Velocity Zero (Vz)	0 rpm	
S2	0	1	Internal parameters	*P1-09*	-
S3	1	0		*P1-10*	
S4	1	1		*P1-11*	

Scaling of the Analog Input V_REF

The parameter P1-40 lets you set the velocity corresponding to 10 V. This results in a linear scaling for the analog input V_REF.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P1-40 VCM	Velocity Target Value and Velocity Limitation 10 V Applicable operating mode: PT, PS, V, T In the operating mode V, this parameter specifies the target velocity that corresponds to the maximum input voltage of 10 V. In the operating mode T, this parameter specifies the velocity limitation that corresponds to the maximum input voltage of 10 V. Example: If the value of this parameter is 3000 in the operating mode V and if the input voltage is 10 V, the target velocity is 3000 rpm.	rpm 0 - 10001 Decimal	s32 RW per.	Modbus 250$_h$

Example

The illustration below shows how the target velocities are switched by means of the signal input functions SPD0, SPD1 and SON.

Operating modes Velocity (V) and Velocity Zero (Vz)
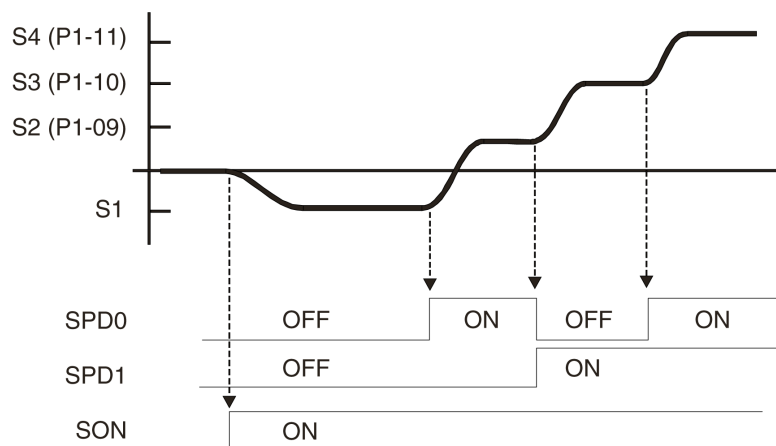
For further information, refer to Setting the Digital Signal Inputs, page 239.

Stopping the Movement via Signal Input Function ZCLAMP

The movement can be stopped via the digital signal input function ZCLAMP.

Conditions for stopping the movement:

- The reference velocity must be below the velocity value defined in parameter P1-38.
- The signal input function ZCLAMP must be assigned and the signal input must be triggered.

For assigning the signal input function, refer to Setting the Digital Signal Inputs, page 239.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P1-38 ZSPD	Signal Output Function ZSPD / Signal Input Function ZCLAMP - Velocity Applicable operating mode: PT, PS, V, T This parameter specifies the velocity for the signal output function ZSPD. The signal output function ZSPD indicates that the velocity of the motor is less than the velocity value set via this parameter. This parameter specifies the velocity for the signal input function ZCLAMP. The signal input function ZCLAMP stops the motor. The velocity of the motor must be below the velocity value set via this parameter.	0.1rpm 0 100 2000 Decimal	s32 RW per.	Modbus 24C$_h$

Additionally the behavior for ZCLAMP can be set via parameter *P2-65* bit 10.

Setting of parameter *P2-65* bit 10:

- Bit 10 = 0: Immediate stop. Motor is locked at the position where it was when ZCLAMP became active.
- Bit 10 = 1: Motor is decelerated with deceleration ramp setting. Motor is locked at the position where standstill is reached.

Acceleration and Deceleration

The parameters *P1-34* and *P1-35* allow you to set the acceleration and deceleration.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P1-34 TACC	Acceleration Period Applicable operating mode: PT, V The acceleration period is the time in milliseconds required to accelerate from motor standstill to 6000 rpm. For operating mode V, this parameter specifies the acceleration. For operating mode PT, this parameter specifies an acceleration limitation for the pulses at the PTI interface.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 244$_h$
P1-35 TDEC	Deceleration Period Applicable operating mode: PT, V The deceleration period is the time in milliseconds required to decelerate from 6000 rpm to motor standstill. For operating mode V, this parameter specifies the deceleration. For operating mode PT, this parameter specifies a deceleration limitation for the pulses at the PTI interface.	ms 6 30 65500 Decimal	u16 RW per.	Modbus 246$_h$

Operating Modes Torque (T) and Torque Zero (Tz)

Operating Modes Torque (T) and Torque Zero (Tz)

Description

In the operating mode Torque (T), a movement is made with a specified target torque. The target torque is specified in percent of the nominal torque of the motor.

The operating modes Torque (T) and Torque (Tz) and the dual operating modes with Torque (T) and Torque (Tz) do not provide deceleration functionality in response to a power stage disable request. In these operating modes, the motor coasts down to a standstill in response to a power stage disable request. You

must install additional equipment such as a dedicated service brake if your application requires faster deceleration of the load.

⚠ **WARNING**
UNINTENDED EQUIPMENT OPERATION
• During commissioning, trigger all signals and simulate all conditions that cause a power stage disable request in order to verify that all loads come to a secure standstill when the power stage is disabled under maximum load conditions.
• Install a dedicated service brake if removal of power to the motor does not meet the requirements of your application.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Source of Reference Value Signals

In the operating mode Torque (T), the source of the reference value signals is either the analog input *T_REF* or one of the three values set via the parameters *P1-12* to *P1-14*.

In the operating mode Torque Zero (Tz), the source of the reference value signals is either one of the three values set via the parameters *P1-12* to *P1-14* or the fixed target torque 0 %.

The values of the parameters *P1-12* to *P1-14* can be selected via the signal input functions TCM0 and TCM1.

The signal input functions TCM0 and TCM1 take priority over the reference value signal of the analog input *T_REF*.

The target torque is selected via the signal input functions TCM0 (LSB) and TCM1 (MSB) (bit-coded):

For further information on the parameterizable signal input functions, refer to .

-	Signal state of the digital signal inputs		Target torque is provided via:		Range
	TCM1	**TCM0**			
T1	0	0	Operating mode Torque (T)	Voltage between T_REF (pin 18) and GND (pin 19)	-10V ... 10V
			Operating mode Torque Zero (Tz)	0 %	-
T2	0	1	Internal parameters	*P1-12*	-300 ... 300%
T3	1	0		*P1-13*	
T4	1	1		*P1-14*	

Scaling of the Analog Input T_REF

The parameter *P1-41* lets you set the torque corresponding to 10 V. This results in a linear scaling for the analog input T_REF.

Parameter name	Description	Unit Minimum value Factory setting Maximum value HMI Format	Data type R/W Persistent	Parameter address via fieldbus
P1-41 TCM	Torque Target Value and Torque Limitation 10 V Applicable operating mode: PT, PS, V, T In the operating mode T, this parameter specifies the target torque that corresponds to the maximum input voltage of 10 V. In the operating modes PT, PS and V, this parameter specifies the torque limitation that corresponds to the maximum input voltage of 10 V. Example: If the value of this parameter is 100 in the operating mode T and if the input voltage is 10 V, the target torque is 100 % of the nominal torque. Setting can only be modified if power stage is disabled.	% 0 100 1000 Decimal	u16 RW per.	Modbus 252$_h$

Example

The illustration below shows how the target torque is switched by means of the signal input functions TCM0,TCM1 and SON.

Operating modes Torque (T) and Torque Zero (Tz)
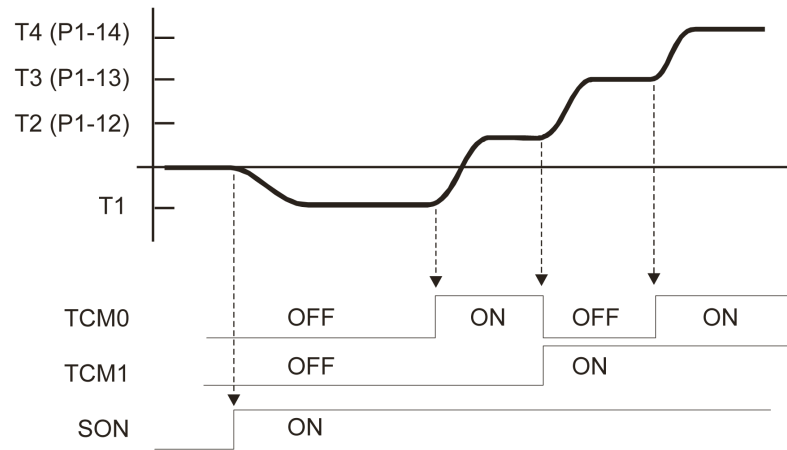
For further information, refer to Setting the Digital Signal Inputs, page 239.

Diagnostics and Troubleshooting

What's in This Part

Diagnostics and Troubleshooting

What's in This Chapter

Diagnostics Via the Integrated HMI

Modbus Activity

The left most decimal point in the integrated HMI indicates Modbus activity by flashing.

Error Memory

Parameters *P4-00* to *P4-04* allow you to read the error memory.

The error memory also contains a history of the last 5 detected errors.
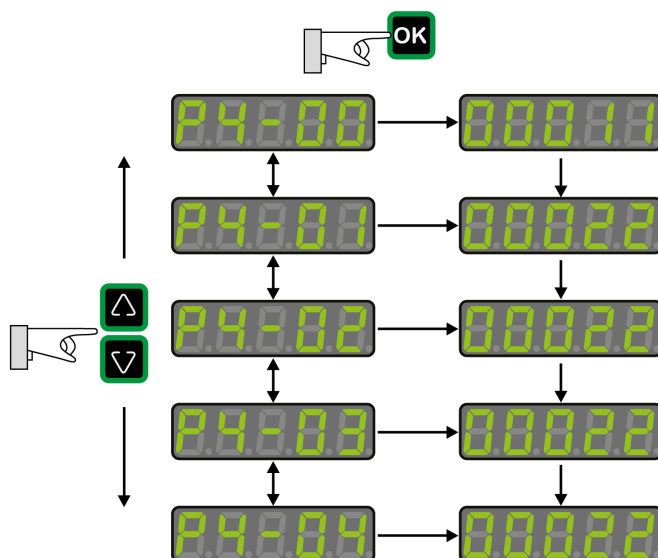
Parameter	Description
P4-00	Error number of the most recently detected error
…	…
P4-04	Error number of the oldest detected error

The parameter *P0-47* allows you to read the last detected alert.

Diagnostics Via the Signal Outputs

The signal outputs allow you to indicate, among other things, operating states and detected errors. The following list is an excerpt of the parameterizable signal output functions. For additional signal output functions, refer to Setting the Digital Signal Outputs, page 244.

Setting A for *P2-18 ... P2-22*	Short name	Name of the output function	Description
1	SRDY	Servo Ready	The signal output function SRDY indicates that no errors are presently detected, i.e. the drive is not in the operating state Fault.
2	SON	Servo On	The signal output function SON indicates that the drive is in the operating state Operation Enabled.
7	ERROR	Error Detected	The signal output function ERROR indicates that an error has been detected and that the drive has switched to the operating state Fault. For further information, refer to Diagnostics and Troubleshooting, page 298.
11	WARN	Advisory or Alert Signal activated	The signal output function indicates that one of the following conditions has been detected: Hardware limit switch triggered, undervoltage, Nodeguard alert, Operational Stop (OPST).

Diagnostics Via the Commissioning Software

See the information provided with the commissioning software for details on how to display the device state via the commissioning software LXM26 DTM Library.

Alert Codes and Error Codes

Meaning of an Alert

An alert indicates a potential issue that was detected by a monitoring function. An alert does not trigger a transition of the operating state.

Number	Description	Cause	Remedy
AL014	Negative hardware limit switch triggered	-	-
AL015	Positive hardware limit switch triggered	-	-
AL283	Positive software limit switch triggered	-	-
AL285	Negative software limit switch triggered	-	-
Wn023	Alert threshold reached: Motor overload (foldback)	The foldback current of the motor has dropped below the alert threshold specified via the parameter P1-28.	Verify correct settings of the parameter P1-28 for the foldback current of the motor.
Wn701	Alert threshold reached: Drive overload (foldback)	The foldback current of the drive has dropped below the alert threshold specified via the parameter P1-24.	Verify correct settings of the parameter P1-24 for the foldback current of the drive.
Wn702	The DC bus voltage has dropped below the alert threshold.	Power supply loss, poor power supply.	Verify correct mains supply. Verify that the undervoltage limit is set correctly via the parameter P4-24.
Wn703	Alert threshold reached: Power stage overtemperature	Ambient temperature is too high, fan is inoperative, dust.	Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive.
Wn704	Alert threshold reached: Motor overtemperature	The motor temperature is excessively high.	Verify correct settings of the parameters for temperature monitoring. Verify proper ventilation and heat dissipation of the motor. Clean off pollutants such as dust. Verify that the motor is evenly mounted to the flange plate. Increase the size of the flange plate to which the motor is mounted to improve heat dissipation. Verify that the motor is properly sized for the application.

Number	Description	Cause	Remedy
Wn707	Alert threshold reached: Drive overtemperature (controller)	Ambient temperature is too high, fan is inoperative, dust.	Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive.
Wn713	Positive hardware limit switch and negative hardware limit triggered	-	-
Wn716	Positive software limit switch and negative software limit triggered	-	-
Wn728	Alert: Missing mains supply, undervoltage mains supply	At least one mains phase is missing. Mains voltage is out of range. Mains frequency is out of range.	Verify correct connection of mains supply. Verify that the values of the mains power supply network comply with the technical data.
Wn729	Modbus: Node Guarding error detected	Incorrect Modbus connection, incorrect data from Modbus master.	Verify correct Modbus connection. Verify correct operation of Modbus master.
Wn730	Alert threshold reached: Braking resistor overload	The permissible braking resistor power has been exceeded.	Verify correct rating of the braking resistor used. Verify your application.
Wn731	Encoder error detected	Refer to parameter P8-49 for details.	-
Wn732	Alert threshold reached: Processing time too long	-	-
Wn734	Alert threshold reached: Drive overtemperature (IPM)	Ambient temperature is too high, fan is inoperative, dust.	Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive.
Wn737	Parameters have been reset to the factory settings, but are not yet saved to the non-volatile memory.	-	Use parameter P2-08 = 11 to save parameters reset to the factory settings to the non-volatile memory and restart the drive.
Wn739	Temperature value for monitoring function not available	-	-
Wn742	Motor type has changed	The type of motor connected is different from the previously connected type of motor.	Reset the drive to the factory settings.
Wn743	Fan circuit warning	The fan circuit is either overloaded or disconnected.	Check for fan short circuit or disconnection.
Wn744	Excessive electronic noise	-	Check proper grounding and shielding. Use line filter.
Wn745	Configured feedbacktype and actual connected encoder mismatch	The connected encoder does not correspond to configured feedback type.	Check that configured feedback type and connected encoder match.
Wn746	Encoder overtemperature	-	-
Wn747	Encoder internal flash memory error detected	-	-
Wn748	Encoderfeedback error detected	The device has detected unusually high shaft displacement. The device can still operate correctly; but position error might be higher than usual.	-
Wn749	The multi turn battery voltage is within the following range: 3 V < VBAT < 3.15V. Battery voltage has started to drop; but the multi turn information is still reliable.	-	Replace encoder battery.
Wn750	The multi turn counter exceeded the range of 16 bit signed value. Multi turn Counter < -32768 Or multi turn Counter > 32767	-	Execute multi turn Config/Reset (Set Reference Point) by command P8-44=3/2. For some applications which will rotate motor in one direction, the warning Wn750 for checking turns number within -32768 ... 32767 can be turned off by parameter P5-80=1.
Wn751	The last save operation was interrupted.	The last save operation was interrupted by power cycle. The old set of parameters are active.	Set the new parameter configuration and perform save command.

Number	Description	Cause	Remedy
Wn752	Stop filter command cannot be set	SensAR Encoder Filter Mode is not supported on the connected Motor.	Set P8-71 to 0 ignore the warning. OR: Upgrade Motor Hardware version.
Wn753	Reference position lost	AL576 or homing procedure failure or the multi turn roll over will cause this warning.	Execute multi turnConfig/Reset (Set Reference Point) by command P8-44 = 2 Or Execute a homing procedure. Or set P5-80 to 1.

Meaning of an Error

An error is a discrepancy between a computed, measured, or signaled value or condition and the specified or theoretically correct value or condition detected by a monitoring function. An error triggers a transition of the operating state.

Number	Short description	Cause	Remedy
AL001	Power stage overcurrent	An overcurrent has been detected at the power stage which may be caused by a short circuit or by incorrect settings of the current loop parameters. This condition may occur up to three times in succession. After the third time, a time delay of one minute must pass before the power stage can be enabled again.	Verify correct connection of the motor. Verify correct settings of the parameters for the current loop.
AL002	DC bus overvoltage	The DC bus voltage exceeded the maximum value.	Verify your application. Reduce the external load, the motor velocity, or the deceleration. Use an appropriately rated braking resistor, if necessary.
AL003	DC bus undervoltage	Power supply loss, poor power supply.	Verify correct mains supply. Verify that the undervoltage limitation is set correctly via the parameter P4-24.
AL005	Braking resistor overload	The braking resistor has been on for such a long period of time that its overload capability has been exceeded.	Verify your application. Reduce the external load, the motor velocity, or the deceleration. Use a braking resistor with a greater rating, if necessary.
AL006	Motor overload (foldback)	The foldback current of the motor has dropped below the value specified via the parameter P1-27.	Verify correct settings for the parameter P1-27.
AL007	Actual motor velocity too high.	The actual motor velocity exceeded the velocity limitation by more than 20% (P1-55). The analog input signal is not stable.	Verify that the velocity limitation set via the parameter P1-55 matches the requirements of the application. Verify that the values for the tuning parameters are suitable. Verify that the frequency of the analog input signal is stable using a signal detector. Use a filter function.
AL008	Frequency of reference value signal is too high	The frequency of the pulse signal (A/B, Pulse/Direction, CW/CCW) exceeds the specified range. Received pulses may be lost.	Adapt the output pulse frequency of the external source to fit the input specification of the drive. Adapt the gear ratios to the application requirements (parameters P1-44, P1-45, P2-60, P2-61 and P2-62).
AL009	Position deviation too high (following error)	The position deviation has exceeded the maximum permissible position deviation specified via the parameter P2-35 and the drive has detected a following error.	Verify your application. Reduce the external load. Increase the permissible position deviation via the parameter P2-35. Reduce the motor velocity via the parameters P1-09 … P1-11 or the analog input V_REF. Increase the torque limitation via the parameters P1-12 … P1-14 or the analog input T_REF.
AL013	The input to which the signal input function OPST is assigned has been activated.	-	Identify the cause which has triggered the signal input function OPST. Remove the cause. If your application does not require the signal input function OPST, disable this signal input function.
AL016	Power stage overtemperature	Ambient temperature is too high, fan is inoperative, dust.	Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust

Number	Short description	Cause	Remedy
			cannot get into the control cabinet or into the drive.
AL017	Error detected in non-volatile memory	The drive was reset to the factory settings via parameter P2-08.	Use parameter P2-08 = 11 to save parameters reset to the factory settings to the non-volatile memory and restart the drive. Contact technical support.
AL018	Encoder simulation frequency exceeded 4 MHz	The computed equivalent encoder output frequency exceeds the maximum limit of 4 MHz for this signal.	Reduce the resolution of the encoder simulation via the parameter P1-46 or reduce the maximum velocity.
AL020	Modbus: Node Guarding error detected	Incorrect Modbus connection, incorrect data from Modbus master.	Verify correct Modbus connection. Verify correct operation of Modbus master.
AL022	Missing mains supply, undervoltage mains supply	At least one mains phase is missing. Mains voltage is out of range. Mains frequency is out of range.	Verify correct connection of mains supply. Verify that the values of the mains power supply network comply with the technical data.
AL025	Not possible to read data of electronic motor nameplate	Incorrect or missing motor data. Motor without electronic motor nameplate has been connected.	Verify that the drive and the connected motor are a permissible product combination. Verify correct connection of the encoder. Contact Technical Support or replace the motor.
AL026	Error detected in communication with motor encoder	Communication with the encoder was not initialized correctly.	Verify correct connection of the encoder. Contact Technical Support or replace the motor.
AL030	Motor torque too high for an excessive period of time	The motor torque has exceeded the value specified via the parameter P1-57 for a period of time exceeding the value specified via the parameter P1-58.	Verify your application. Verify that no movements are made up to a mechanical stop (for example, use limit switches). Verify that the values for the parameters P1-57 and P1-58 are suitable.
AL502	System error detected (FPGA)	-	Contact technical support.
AL503	System error detected (non-volatile memory)	-	Contact technical support.
AL504	System error detected (non-volatile memory)	-	Contact technical support.
AL505	DC bus voltage measurement	An error was detected in the circuit that measures the DC bus voltage.	Perform a Fault Reset. Restart the drive. If the error persists, contact Technical Support.
AL507	System error detected (NV access)	-	Contact technical support.
AL508	Drive overload (foldback)	The foldback current of the drive has dropped below the value specified via the parameter P1-23.	Verify correct settings for the parameter P1-23.
AL514	Motor overtemperature	The motor temperature is excessively high.	Verify correct settings of the parameters P1-62 and P1-63 for temperature monitoring. Verify proper ventilation and heat dissipation of the motor. Clean off pollutants such as dust. Verify that the motor is evenly mounted to the flange plate. Increase the size of the flange plate to which the motor is mounted to improve heat dissipation. Verify that the motor is properly sized for the application.
AL517	Encoder overvoltage or overcurrent	The current supplied by the drive for the 5 V encoder supply has exceeded the limit. This condition may occur up to three times in succession. After the third time, a time delay of one second must pass before the power stage can be enabled again.	Verify correct connection of the encoder (short circuits). Verify the current consumption of the encoder.
AL523	System error detected (self-test)	The self-test has detected an error.	Contact technical support.
AL525	Reserved	–	–
AL526	Reserved	–	–
AL527	System error detected (Watchdog)	The Watchdog function has detected a system error.	Restart the drive. If the error persists, contact Technical Support.

Number	Short description	Cause	Remedy
AL528	Drive overtemperature (IPM)	Ambient temperature is too high, fan is inoperative, dust.	Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive.
AL529	Drive overtemperature (controller)	Ambient temperature is too high, fan is inoperative, dust.	Verify correct operation of the fan. Improve the heat dissipation in the control cabinet. Remove pollution and verify that dust cannot get into the control cabinet or into the drive.
AL532	Calculated offsets for current sensors out of range	The calculated offsets for the current sensors are out of range.	Perform a Fault Reset. Restart the drive. If the error persists, contact Technical Support.
AL533	Reserved	–	–
AL534	Pulse signal missing	One of the pulse signals is not connected.	Verify correct connection of the pulse inputs.
AL535	System error detected (FPGA does not match firmware)	The firmware version is not suitable for the drive.	Update the firmware of the drive. Contact technical support.
AL539	Motor phase missing	One of the motor phases is not connected.	Verify correct connection of the motor phases. Contact technical support.
AL547	Motor blocked	The motor was blocked mechanically, for example, by a mechanical stop or by the load.	Remove condition causing the mechanical blocking. Verify your application.
AL555	Velocity deviation too high	The deviation between actual velocity and reference velocity has exceeded the maximum velocity deviation specified via the parameter P2-34.	Verify your application. Verify that the values for the tuning parameters are suitable. Increase the value for the maximum velocity deviation in the parameter P2-34.
AL558	System error detected	-	Contact technical support.
AL560	Power stage supply off	-	Power on the power stage supply.
AL561	Temperature sensor inoperative	-	Restart the drive. If the error persists, contact Technical Support.
AL563	Commutation error detected	Motor phases have been interchanged.	Verify correct connection of the motor phases.
AL567	System error detected (encoder)	Refer to parameter P8-48 for details.	Contact technical support.
AL568	Braking resistor overload	The permissible braking resistor power has been exceeded.	Verify correct rating of the braking resistor used. Verify your application.
AL569	Configuration not correctly transferred via Modbus	-	Verify correct connection. Verify that configuration file and drive are compatible.
AL570	Overcurrent detected at one of the digital outputs	-	Verify correct wiring of the digital outputs. Verify that there are no short circuits.
AL571	Reference position operation rejected	If user direct perform Homing/P8-44 2 after change P1-01 C without power-cycle the drive, then AL571 will report.	Power-cycle the drive and then perform Homing/P8-44 to 2
AL572	Position deviation too high (following error)	The position deviation has exceeded the maximum permissible position deviation specified via the parameter P2-35 and the drive has detected a following error.	Verify your application. Reduce the external load. Increase the permissible position deviation via the parameter P2-35. Reduce the motor velocity via the parameters P1-09 … P1-11 or the analog input V_REF. Increase the torque limitation via the parameters P1-12 … P1-14 or the analog input T_REF.
AL573	The returned position values are no longer considered valid	Usually caused by bad encoder hardware or bad encoder assembly. For example: damaged hall sensors, damaged encoder rotor, displacement between motor shaft and encoder is too big, corrupted encoder FLASH memory - corrupts calibration tables, SW bug.	Replace new motor.
AL574	The encoder temperature is too high	Caused when temperature on encoder is too high relative to what was configured.	Reduce temperature applied on encoder replace new motor.
AL575	The encoder supply voltage has dropped under operational value	The device supply voltage has dropped under operational value.	Make sure power supplied to encoder is according to specifications.

Number	Short description	Cause	Remedy
			Replace new driver.
AL576	The multi turn encoder battery voltage has dropped under 3 Vdc	The multi turn encoder battery voltage has dropped under 3 Vdc; battery box cable disconnect from motor encoder side.	Check battery box cable. Check battery voltage. Replace encoder battery. Clear AL576 by command P8-44=1.
AL577	The multi turn encoder requires an explicit configuration command	–	Execute multi turn Config/Reset (Set Reference Point) by command P8-44=3/2.
AL578	Internal position synchronization error detected between the multi turn and the single turn modules	Possible likely reasons: bad multi turn calibration, corrupted multi turn calibration data on FLASH, Internal multi turn chip failure, bad multi turn chip magnetic screw, SW Bug.	Replace new motor.
AL579	Generic error code of the multi turn module is detected	Encoder is damaged or that a magnetic screw is missing or multi turn calibration is either missing or corrupt or battery disconnect form encoder for a long time or the FW version of encoder is below 13020023.	Reconnect battery to encoder and execute multi turn Config /Reset (Set Reference Point) by command P8-44=3/2. Then, power cycle the drive. If error happen again, replace motor.
AL580	The encoder firmware cannot operate on the provided hardware	–	–
AL581	The drive firmware cannot operate with the provided encoder version	–	–
AL582	Unsupported HW (110V/Multi Turn Encoder/Size 5 power stage)	–	–
AL588	RT Overload Fault	Real time execution time is more than 31.25 us Mapping large amount of PDO	Too much load on the real time loop- such as: too much PDO (RX/TX) are mapped/ sync-position/record/touch probe are tasks with large impact to the CPU.
AL595	Impermissible combination of drive and motor	-	Use an approved drive/motor combination.
AL596	Unstable current loop	Excessive overshoot in current loop.	Verify correct settings of the parameters for the current loop.
AL5A0	Drive Locked	HW issue causing problem to access the EEprom	Return drive to factory check HW
AL5A1	Drive is not configure	–	Implement factory restore

New Motor Fold Back Characteristics and Parameter Setting

	P2-72: value BCH2 LB - LD	P2-72: value BCH2 LF - HF - LH	P2-72: value BCH2 MM - MR
P2-73: value 1 (default)	MFOLDT=450	MFOLDT=2450	MFOLDT=3400
P2-73: value 2	MFOLDT=750	MFOLDT=7700	MFOLDT=4500
P2-73: value 3	MFOLDT=980	MFOLDT=7700	MFOLDT=5640
P2-73: value 4	MFOLDT=1670	MFOLDT=27340	MFOLDT=6840

Current [%]	BCH2 LB - LD	MFOLDT=1670 Deviation		MFOLDT=980 Deviation		MFOLDT=750 Deviation		MFOLDT=450 Deviation	
	BQ 04 - 06	Overload time [s]	from MPC [%]	Overload time [s]	from MPC [%]	Overload time [s]	from MPC [%]	Overload time [s]	from MPC [%]
120	21	21	0.00	14.8	-29.52	12.7	-39.52	10	-52.38
140	6.9	9.6	39.13	6.9	0.00	6	-13.04	4.8	-30.43
160	4	5.8	45.00	4.2	5.00	3.7	-7.50	3	-25.00
180	2.6	4	53.85	2.9	11.54	2.6	0.00	2.1	-19.23

200	1.8	2.8	55.56	2.1	16.67	1.95	8.33	1.65	-8.33
220	1.3	2.16	1.54	1.65	26.92	1.5	15.38	1.3	0.00
240	1	1.57	57.00	1.27	27.00	1.17 0.93	17.00	1.05	5.00
260	0.8	1.16	45.00	0.99	23.75	0.93	16.25	0.86	7.50
280	0.7	0.85	21.43	0.77	10.00	0.75	7.14	0.71	1.43
300	0.6	0.6	0.00	0.6	0.00	0.6	0.00	0.6	0.00

Current [%]	BCH2 LF - HF - LH	MFOLDT=27340 Deviation		MFOLDT=19500 Deviation		MFOLDT=7700 Deviation		MFOLDT=2450 Deviation	
	BQ08-10	Overload time [s]	from MPC [%]	Overload time [s]	from MPC [%]	Overload time [s]	from MPC [%]	Overload time [s]	from MPC [%]
120	270	270	0.00	199.5	-26.11	93.3	-65.44	46	-82.96
140	90	121.3	34.78	90	0.00	42.8	-52.44	21.8	-75.78
160	36	71.7	99.17	53.5	48.61	25.9	-28.06	13.7	-61.94
180	17.5	47	168.57	35.2	101.14	17.5	0.00	9.6	-45.14
200	8.4	32.1	282.14	24.3	189.29	12.5	48.81	7.2	-14.29
220	5.6	22.2	296.43	17	203.57	9.1	62.50	5.6	0.00
240	4.2	15.1	259.52	11.7	178.57	6.7	59.52	4.4	4.76
260	3.3	9.8	196.97	7.8	136.36	4.9	48.48	3.6	9.09
280	2.5	5.7	128.00	4.8	92.00	3.5	40.00	2.9	16.00
300	2.4	2.4	0.00	2.4	0.00	2.4	0.00	2.4	0.00

Current [%]	BCH2 MM - MR	MFOLDT=6840 Deviation		MFOLDT=5640 Deviation		MFOLDT=4500 Deviation		MFOLDT=3400 Deviation	
	BQ13-18	Overload time [s]	from MPC [%]	Overload time [s]	from MPC [%]	Overload time [s]	from MPC [%]	Overload time [s]	from MPC [%]
120	82.5	82.5	0.00	71.7	-13.09	61.5	-25.45	51.6	-37.45
140	33	37.8	14.55	33	0.00	28.5	-13.64	24.1	-26.97
160	18.6	22.9	23.12	20.1	8.06	17.5	-5.91	14.9	-19.89
180	12	15.5	29.17	13.7	14.17	12	0.00	10.3	-14.17
200	8.1	11	35.80	9.8	20.99	8.7	7.41	7.6	-6.17
220	5.7	8	40.35	7.2	26.32	6.5	14.04	5.7	0.00
240	4.2	5.9	40.48	5.4	28.57	4.9	16.67	4.4	4.76
260	3.3	4.3	30.30	4	21.21	3.7	12.12	3.4	3.03
280	2.7	3	11.11	2.9	7.41	2.8	3.70	2.7	0.00
300	2.1	2.1	0.00	2.1	0.00	2.1	0.00	2.1	0.00

Service, Maintenance and Disposal

What's in This Part

Service, Maintenance, and Disposal

What's in This Chapter

General

The product may only be repaired by a Schneider Electric customer service center.

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

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

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

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

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

⚠**DANGER**

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

Service Address

If you cannot resolve an error yourself, contact your sales office.

Have the following data available:

- Nameplate (type, identification number, serial number, DOM, ...)
- Type of error (with LED flash code or error code)
- Previous and concomitant circumstances
- Your own assumptions concerning the cause of the error

Also include this information if you return the product for inspection or repair.

If you have any questions, contact your sales office. Your sales office staff will provide you the name of a customer service office in your area.

www.se.com

Maintenance of the Drive

Prior to any type of work on the drive system, consult the chapters on Installation and Commissioning for information to be observed.

Repairs cannot be made with the device installed.

Include the following points in the maintenance plan of your machine.

Connections and Fastening

- Check all connection cables and connectors regularly for damage. Replace damaged cables immediately.
- Tighten all mechanical and electrical threaded connections to the specified torque.

Cleaning

Clean dust and dirt off the product at regular intervals. Insufficient heat dissipation to the ambient air may excessively increase the temperature.

Replacement of Drive

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

⚠ **WARNING**

UNINTENDED EQUIPMENT OPERATION

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

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

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

Observe the following procedure when replacing devices:

Step	Action
1	Save all parameter settings. Save the data to your PC using the commissioning software, refer to chapter Commissioning Software, page 130.
2	Power off all supply voltages. Verify that no voltages are present.
3	Label all connections and remove all connection cables (unlock connector locks).
4	Uninstall the product.
5	Note the identification number and the serial number shown on the product nameplate for later identification.
6	Install the new product as per chapter Installation, page 82.
7	If the product to be installed has previously been used in a different system or application, you must restore the factory settings before commissioning the product.
8	Commission the product as per chapter Commissioning, page 121.

Maintenance of the Motor

Prior to any type of work on the drive system, consult the chapters on Installation and Commissioning for information to be observed.

Repairs cannot be made with the device installed.

Include the following points in the maintenance plan of your machine.

Connections and Fastening

- Inspect all connection cables and connectors regularly for damage. Replace damaged cables immediately.
- Verify that all output elements are firmly seated.
- Tighten all mechanical and electrical threaded connections to the specified torque.

Lubricating the Shaft Sealing Ring

In the case of motors with shaft sealing ring, lubricant must be applied to the space between the sealing lip of the shaft sealing ring and the shaft with a suitable non-metallic tool. If the shaft sealing rings are allowed to run dry, the service life of the shaft sealing rings will be significantly reduced.

Cleaning

If the permissible ambient conditions are not respected, external substances from the environment may penetrate the product and cause unintended movement or equipment damage.

> ⚠ **WARNING**
>
> **UNINTENDED MOVEMENT**
>
> - Verify that the ambient conditions are respected.
> - Do not allow seals to run dry.
> - Keep liquids from getting to the shaft bushing (for example, in mounting position IM V3).
> - Do not expose the shaft sealing rings and cable entries of the motor to the direct spray of a pressure washer.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Clean dust and dirt off the product at regular intervals. Insufficient heat dissipation to the ambient air may excessively increase the temperature.

Motors are not suitable for cleaning with a pressure washer. The high pressure may force water into the motor.

When using solvents or cleaning agents, verify that the cables, cable entry seals, O-rings, and motor paint are not damaged.

Replacing the Rolling Bearing

When the rolling bearing is replaced, the motor is partially demagnetized and loses power.

> *NOTICE*
>
> **INOPERABLE EQUIPMENT**
>
> Do not replace the rolling bearing.
>
> **Failure to follow these instructions can result in equipment damage.**

Replacing the Battery for the Multi Turn Encoder

The multi turn counting is preserved through power down by the external battery located into the battery compartment.

- Do not disconnect the encoder cable from the battery compartment or the multi turn information is lost.
- Replace the battery while the encoder is powered by the drive or the multi turn information is lost.

The battery has its manufacturing date printing on it in MMYY format. The expiration date for the battery is 3 years after the manufacturing date.

On the following example, the manufacturing date of the battery is June 2016 (0616). The expiration date is June 2019.
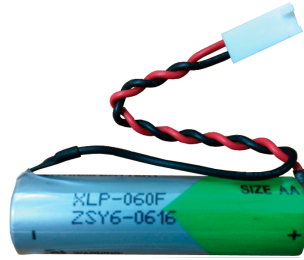
The battery voltage is monitored by the encoder at each power on of the drive.

- An alert Wn749 related to P8-49 Bit 10 is triggered when the measured voltage is in the range 3 … 3.15 Vdc.
- An error AL576 related to P8-48 Bit 5 is triggered when the measured voltage is under 3 Vdc.

    NOTE: After replacing the battery, the detected error is cleared the next time the drive is powered on (next battery voltage measurement), or when an explicit command is sent to the encoder by setting P8-44 to the value 1.

Lexium 26/28 Multi-Turn Encoder

The purpose of this part is to help you understand the interface between the multi-turn encoder and Lexium 26/28 servo drives in order to be able to operate the system with multi-turn encoder.

Introduction

Overview

An absolute system is used in an application which must preserve the motor position even when the power to the servo system is interrupted.

Lexium 26/28 absolute system includes a Lexium 26/28 series servo drive, an absolute type BCH2 series servo motor, a battery compartment VW3M8BATC, and a battery VW3M9BATT. An absolute encoder in an BCH2 series servo motor will constantly record the actual positions at all times.

When power is removed from the system, the encoder will keep operating because the power will be supplied from battery. Therefore, when the motor shaft is rotated during main power off, the system can still calculate its position to its data memory inside encoder.

Lexium 26/28 multi-turn encoder is a digital, single-turn or multi-turn absolute feedback device. Its major output is the absolute position of the motor shaft in a turn, represented digitally as a 22-bit word, and number of total revolutions in a 16-bit word, for the multi-turn one.

Single-Turn versus Multi-Turn

A single-turn absolute encoder is capable of encoding a shaft position of the motor within one revolution (or turn). After each power up of the servo system with a single-turn encoder, the absolute position of the shaft in a turn can be obtained.

During run-time, both the drive and the single-turn encoder are capable of counting the number of motor revolutions (the multi-turn counter). However, after power cycle, the revolutions counter is reset for a single-turn system. For example, the multi-turn counter is volatile in a single-turn system.

Single-turn systems are used in machines that do not have a requirement for maintaining position data after a power cycle. In terms of application, it means that homing of the machine after power cycle is acceptable or the system is not required to be homed during operation.

Contrary to single-turn, the multi-turn system has full absolute position information, including the revolutions counter, even if the power is removed. This is used in machines where positioning of the load in a multi-dimensional space is required. In those systems, the homing (or motion calibration) is only acceptable during initial machine calibration and not acceptable after each power cycle. For such systems, the multi-turn encoder is typically used.

In conclusion, the advantage of the multi-turn over a single-turn system is the absence of the need for homing procedure after each system power cycle. The multi-turn system has the absolute position information including the number of revolutions at any time, even after power cycle.

There are two major types of multi-turn encoders: battery backed up and battery-less.

Lexium 26/28 multi-turn encoder is battery backed, meaning the battery is used to maintain the non-volatility of the revolutions counter. As long as the battery is connected and has enough voltage (> 3 V), the multi-turn counter and revolutions counter will remain during the absence of mains power.

Architecture Single-Turn

Motor with a single-turn encoder is connected to the drive according to the following diagram:
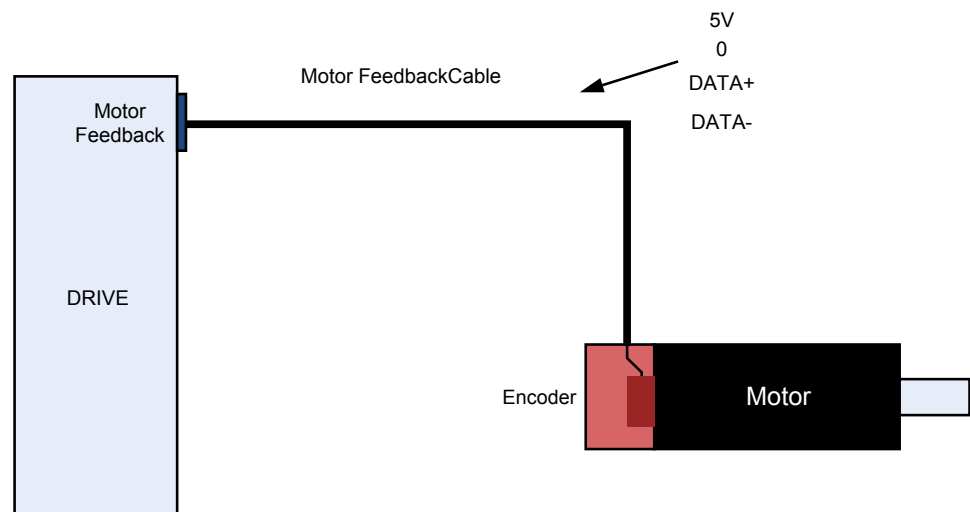
Single-turn encoder is connected to the servo drive over a motor feedback cable. The power to the encoder is supplied over the 5V output of the servo drive. As long as the servo drive is powered, the encoder is powered too, responding with an absolute position in a single revolution.

The servo drive can move the motor and count the number of revolutions. However, right after the 5V output is removed, the multi-turn information is reset. After the power is back again, the encoder will return the information inside one revolution, but the multi-turn counter will be zero.

Architecture Multi-Turn with Battery

Motor with a multi-turn encoder is connected to the drive according to the following diagram:
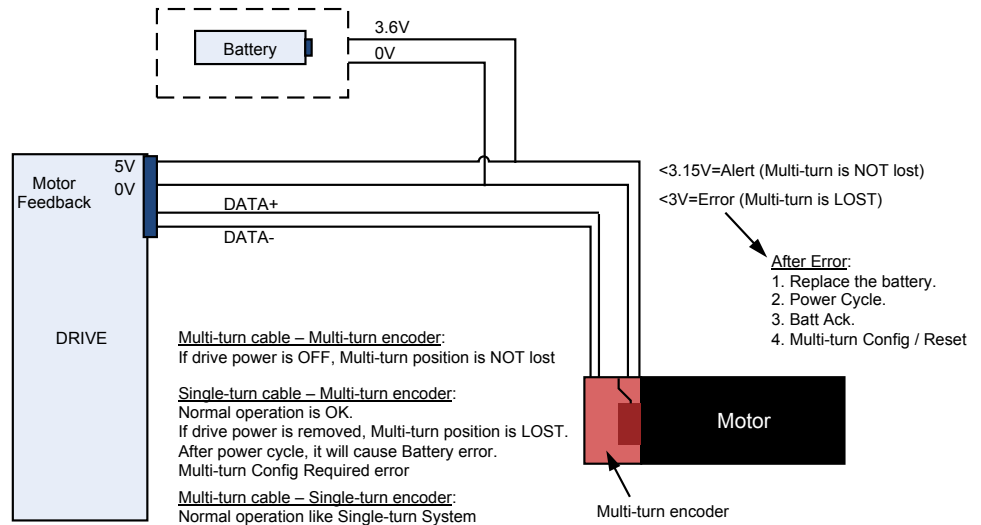
The multi-turn encoder is connected to the servo drive over a battery compartment, which is responsible to supply battery to the multi-turn subsystem in the encoder while power (5V) is off. The battery compartment contains circuitry which controls the switching between the power (5V) and the battery supply automatically.

Since both the battery and the power supply are connected to the same wires in the cable, Lexium 26/28 multi-turn encoder can measure the battery only during power up.

The battery backup is designed to work for at least 3 years. After this period, the battery voltage is expected to drop exponentially. The drop period might take less than a month or maybe more, depending on how much of battery charge has been consumed.

The battery is consumed only when the power supply of 5V is removed, meaning when the servo system mains power is removed. If the motor is at standstill, the power consumption off the battery is relatively low. It grows, however, with rotation velocity. Typically, the motor is not rotated when the servo system is without power. However, the multi-turn system is capable to count the revolutions when powered by battery, while consuming more charge from the battery.

Operation

Functionalities

Reference Position Set

The **Reference Position Set** command is performed in multi-turn motor, only while in the multi-turn mode.

This command can be performed in both (enable and disable) drive states by command (P8-44=2).

The **Reference Position Set** command configures multi-turn encoder and sets new reference position according to the value of P5-78 parameter.

If you implement P8-44=2, then the position equals the reference position as determined by P5-78.

If you implement Homing, then the position equals the home-offset as determined by HOMEOFFSET- (P-0-4020.0.7, usually equals 0).

While a drive is in enable state, this command is performed for all operational modes, excluding **CYCLIC SYNCHRONOUS POSITION** mode.

During the execution of this command, the encoder serial number is read. This serial number is used to check the replacement of the motor or encoder, when a power cycle is performed.

Such as P8-47 ServoSense firmware and hardware versions, P8-45 encoder Feedback type.

When the **Reference Position Set** command is successful, the alert - **reference position not established** (WN753) is cleared, and bit 5 of S-0-0135 in the Statusword is set to 1.

Multi-Turn Battery Acknowledge

The battery error (AL576) is set in the drive, when battery disconnection from the multi-turn encoder is detected after power cycle.

This error automatically produces the **reference position not established** (WN753) alert.

Multi-turn battery Acknowledge command is used to clear **battery voltage is below allowed threshold** error in the multi-turn encoder after battery replacement, and to reset battery error (AL576) in the drive.

This command can be performed by command P8-44=1.

Ignore Multi-Turn Encoder Errors

This feature allows multi-turn encoder work in multi-turn or single-turn mode.

When P5-79 is set to 0, encoder works as multi-turn, when the parameter is set to 1 – as single-turn.

This feature performs the following procedure:

- Get multi-turn encoder error mask by reading special error mask address from the encoder.
- Set new error mask according to the entered value and send command to write updated mask into error mask address in the encoder.

When encoder is set to the single-turn mode, multi-turn errors and alerts are cleared.

Ignore Multi-Turn Encoder Alerts

When encoder is in multi-turn mode, this feature allows to enable or disable multi-turn encoder alerts. Parameter P5-80=1 disables multi-turn encoder alerts.

The alert **MT Encoder rollover** (WN750) is disabled even if the encoder exceeds the counting range. Multi-turn Counter ≤ -32768 or multi-turn Counter ≥ 32767.

This feature performs the following procedure:

- Get multi-turn encoder alert mask by reading special alert mask address from encoder.
- Set new alert mask according to the parameter value and send command to write updated mask into alert mask address in encoder.

Ignore Homing and Reference Position

This feature allows absolute moving with or without homing for both single-turn and multi-turn encoder and without **Reference Position Set** command for multi-turn encoder. Parameter P5-81=1 blocks the multi-turn encoder alerts and sets the

Bit 15 Statusword to 1, when the reference position is not set. The 'isHomed' signal automatic set to on if parameter P5-81=1

Multi-Turn Encoder Position Counter

This feature is used to indicate multi-turn encoder current revolutions.

Special command is sent in the init feedback communication procedure to get encoder's position. An encoder revolutions value can be received by reading the P5-82.

When the encoder is single-turn or is in single-turn mode, the value of position counter always is 0.

Homing Procedure For Multi-Turn Encoder

To set position, drive with multi-turn encoder can independently perform ether homing or reference position set command.

Two main differences for multi-turn encoder:

- Write position to the multi-turn encoder.
- Save homing parameters in NVRAM to reproduce after power cycle.

The homing procedure for multi-turn encoder needs more execution time than for single-turn encoder.

Commands and Parameters

Multi-turn encoder has several commands, which allows managing the errors, multi-turn functionality and battery issues. These commands are encapsulated on the drive side as Parameters. The following table gives a short description of the commands:

Name	Parameters	Description	Use Cases
Battery Acknowledge	P8 – 44 –> 1	Acknowledges the battery event: • Battery Down error - AL576. • Low Battery alert - Wn749.	This command is used to clear the following events: • Battery Down error - AL576 • Low Battery alert - Wn749
MT Set Reference Point	P8 – 44 –> 2	This command performs the following: • Set reference point.	This command can be performed in both (enable and disable) drive states, excluding **CSP** mode When alert Wn753 is indicated.
MT Config /Reset	P8 – 44 –> 3	This command performs the following: • Initialize the multi-turn system. • Reset multi-turn revolution counter to 0.	This command only can be performed in disable drive states. When the multi-turn Config/Reset required error AL577 or Wn750 is indicated.
MULTI_TURN_REF_POSITION	P5-78	Multi-turn reference position in PUU.	After a successful reference set (P8-44=2), this P5-78 position is automatically set at the reference point.
IGNORE_BATTERY_FAULTS	P5-79	Defines whether the drive is to ignore the multi-turn error AL576: • Value 0: The masking of the multi-turn error AL576 is inactive. • Value 1: The masking of the multi-turn error AL576 is active.	When set P5-79=1, multi-turn encoder can be used as single-turn (even with single-turn cable).
IGNORE_ENCODER_WARNINGS	P5-80	Defines whether the drive is to ignore the multi-turn alert Wn750. Multi-turn counter exceeded the range of 16-bit signed value:	For some applications which will rotate motor in one direction, the alert Wn750 for checking turns number within -32768 ... 32767

Name	Parameters	Description	Use Cases
		• Multi-turn Counter ≤ -32768 or; • Multi-turn Counter ≥ 32767 • Value 0: The masking of Wn750 is inactive. • Value 1: The masking of Wn750 is active.	can be turned off by parameter P5-80=1.
IGNORE_HOMING_ REF_POS	P5-81	Ignore homing and reference position set. Defines whether absolute positioning is allowed without homing/Reference Position Set. • Value 0: Not allowed. • Value 1: Allowed.	When set P5-81=1, absolute positioning is allowed without homing/ set Reference Point.
MT_ENCODER_ POSITION	P5-82	Current position in revolutions.	This parameter is used to monitor the current revolutions of multi-turn.

Errors and Alerts

Error Codes	Description	Remedy
AL571	Reference position operation rejected.	Power-cycle the drive and then perform Homing/ P8-44 = 2.
AL576	The multi-turn encoder battery voltage has dropped under 3 Vdc.	Replace encoder battery. Clear AL576 by command P8-44=1.
AL577	The multi-turn encoder requires an Config/Reset command.	Execute multi-turn Config /Reset (Set Reference Point) by command P8-44=3/2.
AL578	Internal position synchronization error detected between the multi-turn and the single-turn modules.	Restart Drive.
AL579	Encoder is damaged or that a magnetic screw is missing.	Implement factory restore if error happen again replace motor.
Wn749	The multi-turn battery voltage is within the following range: 3 V < VBAT < 3.15V. Battery voltage has started to drop; but the multi-turn information is still reliable.	Replace encoder battery. Clear Wn749 by command P8-44=1.
Wn750	The multi-turn counter exceeded the range of 16bit signed value. Multi-turn Counter < -32768 Or multi-turn Counter > 32767.	Execute multi-turn Config /Reset (Set Reference Point) by command P8-44=3/2. For some applications which will rotate motor in one direction, the alert Wn750 for checking turns number within -32768 ... 32767 can be turned off by parameter P5-80=1.
Wn753	Reference position reset.	Execute multi-turn Config /Reset (Set Reference Point) by command P8-44=2 Or Execute a homing procedure.

Initialization Procedure

At the very first time to operate absolute system, there will be an error code AL576 and an alert code Wn753 shown when power on because the initialization procedure has not been done yet. The error and alert will be kept until the initialization procedure is finished. Besides, the AL576 and Wn753 will be displayed when the power from the servo and battery cell box is discontinued that will lead to the coordinate system being reset.

Parameter Settings for first operation:

1. P8-44=1, the AL576 will be cleared.

2. P8-44=3, initialize the multi-turn system.

3. P8-44=2, or execute a homing procedure, the Wn753 will be cleared.

Changing the Motor

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

⚠ WARNING

UNINTENDED MOVEMENT

Only use approved combinations of drive and motor.

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

Compatibility between Drive and Motor is defined in the Drive / Motor combinations table, page 17.

Observe the following procedure when changing motors:

Step	Action
1	Switch off all supply voltages. Verify that no voltages are present.
2	Label all connections and uninstall the product.
3	Note the identification number and the serial number shown on the product nameplate for later identification.
4	Install the new product as per chapter Installation, page 111.
5	Commission the product as per chapter Commissioning, page 121.

If the connected motor is replaced by another approved motor, the new motor is automatically recognized by the drive.

Shipping, Storage, Disposal

Shipping

The product must be protected against shocks during transportation. If possible, use the original packaging for shipping.

Storage

The product may only be stored in spaces where the specified permissible ambient conditions are met.

Protect the product from dust and dirt.

Disposal

The product consists of various materials that can be recycled. Dispose of the product in accordance with local regulations.

Visit www.se.com/green-premium for information and documents on environmental protection as per ISO 14025 such as:

• EoLi (Product End-of-Life Instructions)

- PEP (Product Environmental Profile)

Glossary

A

absolute movement:

A movement to a position defined from a reference point.

analog input:

Converts received voltage or current levels into numerical values. You can store and process these values within the logic controller.

analog output:

Converts numerical values within the logic controller and sends out proportional voltage or current levels.

AWG:

(*American wire gauge*) The standard that specifies wire section sizes in North America.

C

CAN:

(*controller area network*) A protocol (ISO 11898) for serial bus networks, designed for the interconnection of smart devices (from multiple manufacturers) in smart systems and for real-time industrial applications. Originally developed for use in automobiles, CAN is now used in a variety of industrial automation control environments.

CANopen:

An open industry-standard communication protocol and device profile specification (EN 50325-4).

CCW:

Counter ClockWise

CSA:

(*Canadian standards association*) The Canadian standard for industrial electronic equipment in hazardous environments.

CW:

ClockWise

D

Degree of Protection:

The degree of protection is a standardized specification for electrical equipment that describes the protection against the ingress of foreign objects and water (for example: IP 20).

DIN:

(*Deutsches Institut für Normung*) A German institution that sets engineering and dimensional standards.

DOM:

Date of manufacturing: The nameplate of the product shows the date of manufacture in the format DD.MM.YY or in the format DD.MM.YYYY. For example: 31.12.11 corresponds to December 31, 2011; 31.12.2011 corresponds to December 31, 2011

DTM:

(*device type manager*) Classified into 2 categories:

- Device DTMs connect to the field device configuration components.
- CommDTMs connect to the software communication components.

The DTM provides a unified structure for accessing device parameters and configuring, operating, and diagnosing the devices. DTMs can range from a simple graphical user interface for setting device parameters to a highly sophisticated application capable of performing complex real-time calculations for diagnosis and maintenance purposes.

E

EMC:

Electromagnetic compatibility

Encoder :

Sensor that converts a measured distance or angle into an electrical signal. This signal is evaluated by the drive to determine the actual position of a shaft (rotor) or a driving unit.

F

Factory Settings:

Settings when the product is shipped.

Fault :

Fault is an operating state. If the monitoring functions detect an error, a transition to this operating state is triggered, depending on the error class. A "Fault Reset" or a power cycle are required to exit this operating state. Prior to this, the cause of the detected error must be removed. Further information can be found in the pertinent standards such as IEC 61800-7, ODVA Common Industrial Protocol (CIP).

Fault Reset:

Function used to exit the operating state Fault. Before the function is used, the cause of the detected error must be removed.

firmware:

Represents the BIOS, data parameters, and programming instructions that constitute the operating system on a controller. The firmware is stored in non-volatile memory within the controller.

flash memory:

A non-volatile memory that can be overwritten. It is stored on a special EEPROM that can be erased and reprogrammed.

H

HMI:

(*human machine interface*) An operator interface (usually graphical) for human control over industrial equipment.

homing:

The method used to establish the reference point for absolute movement.

I

IEC:

(*international electrotechnical commission*) A non-profit and non-governmental international standards organization that prepares and publishes international standards for electrical, electronic, and related technologies.

I/O:

(*input/output*)

Internal Units:

Resolution of the power stage at which the motor can be positioned. Internal units are specified in increments.

IT Mains:

Mains in which all active components are isolated from ground or are grounded by a high impedance. IT: isolé terre (French), isolated ground. Opposite: Grounded mains, see TT/TN mains

L

LED:

(*light emitting diode*) An indicator that illuminates under a low-level electrical charge.

Limit Switch:

Switches that signal overtravel of the permissible range of travel.

LSB:

(*least significant bit/byte*) The part of a number, address, or field that is written as the right-most single value in conventional hexadecimal or binary notation.

M

Modbus:

The protocol that allows communications between many devices connected to the same network.

Monitoring Function:

Monitoring functions acquire a value continuously or cyclically (for example, by measuring) in order to check whether it is within permissible limits. Monitoring functions are used for error detection.

MSB:

(*most significant bit/byte* The part of a number, address, or field that is written as the left-most single value in conventional hexadecimal or binary notation.

ms:

(*millisecond*)

N

network:

A system of interconnected devices that share a common data path and protocol for communications.

node:

An addressable device on a communication network.

non-volatile memory:

A memory that can be overwritten. It is stored on a special EEPROM that can be erased and reprogrammed.

P

Parameter :

Device data and values that can be read and set (to a certain extent) by the user.

PELV:

Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41

PE:

(*Protective Earth*) A common grounding connection to help avoid the hazard of electric shock by keeping any exposed conductive surface of a device at earth potential. To avoid possible voltage drop, no current is allowed to flow in this conductor (also referred to as *protective ground* in North America or as an equipment grounding conductor in the US national electrical code).

Position Deviation:

The position deviation is the difference between reference position and actual position. The current position deviation consists of the load-dependent position deviation and the dynamic position deviation.

Power Stage :

The power stage controls the motor. The power stage generates current for controlling the motor on the basis of the motion signals from the controller.

PWM:

(*pulse width modulation*) A fast output that oscillates between off and on in an adjustable duty cycle, producing a rectangular wave form (though you can adjust it to produce a square wave). The PTO is well adapted to simulate or approximate an analog output in that it regulates the voltage of the output over its period making it useful in light dimming or speed control applications, among others.

Q

Quick Stop:

The quick Stop function can be used for fast deceleration of a movement as a response to a detected error or via a command.

R

relative movement:

Movement by a specified distance from the current position.

RJ45:

A standard type of 8-pin connector for network cables defined for Ethernet.

rms:

"Root Mean Square" value of a voltage (Vrms) or a current (Arms)

RPM:

(*revolutions per minute*)

S

Safety Function:

Safety functions are defined in the standard IEC 61800-5-2 (for example, Safe Torque Off (STO), Safe Operating Stop (SOS) or Safe Stop 1 (SS1)). If the safety functions are wired properly, they meet the requirements specified in IEC 61800-5-2.

STO:

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

T

TN Mains:

Grounded mains, differ in terms of the ground connection (PE conductor connection). Opposite: Ungrounded mains, see IT mains.

touchprobe input:

Touchprobe inputs are advanced digital inputs. These inputs are used for measuring functions, which accurately detect positions relative to a measure input. Once a touchprobe function has been activated, it runs independently in the system, independent of the IEC program. The IEC program can use parameters to detect the state of the measuring function. This function is supported by hardware and software.

TP:

(*touch probe*) A position capture that is triggered by a fast input signal (quick sensor). On the rising edge of the touch probe input, the position of an encoder is captured.

For example, this is used for packaging machines to capture the position of a printmark on a film to cut on the same position.

TT Mains:

Grounded mains, differ in terms of the ground connection (PE conductor connection). Opposite: Ungrounded mains, see IT mains.

U

UL:

(*underwriters laboratories*) A US organization for product testing and safety certification.

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