

# User Manual

---



---

60873348\_01

## **JX3-AO4** Analog Output Module

This document has been compiled by Bucher Automation AG with due diligence based on the state of the art as known to them. Any revisions and technical advancements of our products are not automatically made available in a revised document.

Bucher Automation AG shall not be liable for any errors either in form or content, or for any missing updates, as well as for any damage or detriment resulting from such failure.



**Bucher Automation AG**

Thomas-Alva-Edison-Ring 10  
71672 Marbach/Neckar, Germany  
T +49 7141 2550-0  
[info@bucherautomation.com](mailto:info@bucherautomation.com)

Technical support

T +49 7141 2550-444  
[support@bucherautomation.com](mailto:support@bucherautomation.com)

Sales

T +49 7141 2550-663  
[sales@bucherautomation.com](mailto:sales@bucherautomation.com)

[www.bucherautomation.com](http://www.bucherautomation.com)

Translation of the german original User Manual

Revision	1.04.2
Date of issue	2/26/2025

# Table of contents

<b>1</b>	<b>Introduction.....</b>	<b>6</b>
1.1	Information on this document .....	6
1.2	Typographical conventions.....	6
<b>2</b>	<b>Safety.....</b>	<b>7</b>
2.1	General Information.....	7
2.2	Purpose .....	7
2.2.1	Intended use.....	7
2.2.2	Usage other than intended .....	7
2.2.3	Warnings used in this document .....	8
<b>3</b>	<b>Product description.....</b>	<b>9</b>
3.1	Design .....	9
3.2	Product features .....	10
3.3	Status indication .....	10
3.3.1	Diagnostics capabilities by means of status indication.....	10
3.4	Nameplate .....	11
3.5	Scope of Delivery .....	11
<b>4</b>	<b>Technical Specifications.....</b>	<b>12</b>
4.1	Dimensions.....	12
4.2	Mechanical Specifications .....	12
4.3	Electrical properties .....	13
4.4	Environmental Conditions.....	14
4.5	EMC Values.....	15
4.5.1	Enclosure.....	15
4.5.2	DC Power Supply Inputs and Outputs.....	15
4.5.3	Shielded Data and I/O Lines.....	16
<b>5</b>	<b>Mechanical Installation .....</b>	<b>18</b>
5.1	Installing Device on DIN Rail .....	18
5.2	Removing Device from DIN Rail.....	19
5.3	Dismounting Enclosure from Backplane Module.....	20
<b>6</b>	<b>Electrical Connection.....</b>	<b>21</b>
6.1	Improving EMC Noise Immunity .....	21
6.2	Interfaces.....	23
6.2.1	Terminals X51, X52 – analog outputs .....	23
6.3	Connecting voltage and current actuators.....	25
6.4	Commissioning .....	26

<b>7</b>	<b>Identification .....</b>	<b>27</b>
7.1	Electronic Data Sheet EDS .....	27
7.1.1	EDS Registers .....	27
7.1.2	Accessing EDS data via the Hardware Manager Setup page .....	28
7.1.3	Accessing EDS data via FTP client .....	29
<b>8</b>	<b>Programming .....</b>	<b>30</b>
8.1	Abbreviations, module register properties and formats .....	30
8.2	Addressing I/O Expansion Modules .....	30
8.2.1	Numbering Registers and I/Os .....	32
8.3	Version Registers .....	36
8.3.1	Registers - Description .....	37
8.4	Module state .....	37
8.5	Module commands .....	39
8.6	Analog outputs 1 ... 4.....	40
8.6.1	Address ranges of analog outputs.....	40
8.6.2	Forcing analog outputs .....	41
8.6.3	Monitoring the state by means of collective bits .....	42
8.6.4	Register description.....	42
8.7	Converting digital values to analog.....	44
8.7.1	Digital values in MR 0002 ... 0005.....	45
8.7.2	Monitoring of limit values .....	46
8.7.3	Trailing indicator .....	48
8.7.4	Upper and lower capping limits .....	49
8.7.5	Application-specific scaling.....	50
8.7.6	D/A conversion .....	52
8.8	Module registers of the analog outputs .....	52
8.9	Configuring an analog channel.....	53
8.10	Scaling a pressure value - Example .....	53
8.11	User-configurable behavior under fault condition .....	54
8.12	Oscilloscope Function .....	54
8.12.1	Start/Stop Recording .....	55
8.12.2	Continuous recording mode .....	56
8.12.3	Recording with Trigger Condition .....	57
8.12.4	Reading Out Recorded Values.....	58
8.12.5	Register description.....	59
<b>9</b>	<b>Register overview.....</b>	<b>61</b>

<b>10 Maintenance</b> .....	<b>63</b>
10.1 Repairs .....	63
10.2 Storage and Shipment.....	63
10.3 Return and Disposal .....	64
<b>11 Service</b> .....	<b>65</b>
11.1 Technical support .....	65
<b>12 Spare parts and accessories</b> .....	<b>66</b>
12.1 Spare Parts.....	66
12.2 Accessories .....	66

# 1 Introduction

## 1.1 Information on this document

This document forms an integral part of the product and must be read and understood prior to using the device. It contains important and safety-related information for the proper use of the product as intended.

### Target Groups

This document is intended for specialists with appropriate qualifications.

Only competent and trained personnel are allowed to put this device into operation.

During the whole product life cycle, safe handling and operation of the device must be ensured. In the case of missing or inadequate technical knowledge or knowledge of this document any liability is excluded.

### Availability of Information

Make sure this document is kept at the ready in the vicinity of the product throughout its service life.

For information on new revisions of this document, visit the download area on our website. This document is not subject to any updating service.

[Start | www.bucherautomation.com](http://www.bucherautomation.com)

For further information refer to the following information products:

- Online help for the JetSym software  
Functions of software products with application examples
- Application-oriented manuals  
Product-independent documentation
- Version updates  
Information about changes to the software products and operating system of your device

### Info

#### Further information

For further information on the noise immunity of a system, please refer to the Application Note 016 *EMC-Compatible Installation of the Electric Cabinet* available for download on [www.bucherautomation.com](http://www.bucherautomation.com).

### Info

#### EtherCAT®

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

## 1.2 Typographical conventions

This manual uses different typographical effects to support you in finding and classifying information. Below, there is an example of a step-by-step instruction:

- ✓ This symbol indicates requirements which have to be met before executing the following action.
- ▶ This sign or a numbering at the beginning of a paragraph marks an action instruction that must be executed by the user. Execute the instructions one after the other.
- ⇒ The target after a list of instructions indicates reactions to, or results of these actions.

### Info

#### Further information and practical tips

In the info box you will find helpful information and practical tips about your product.

## 2 Safety

### 2.1 General Information

The product corresponds to the current state of science and technology when placed on the market. In addition to this user manual, the laws, regulations and directives of the country of operation or the EU apply to the operation of the product. The operator is responsible for compliance with the relevant accident prevention regulations and generally recognized safety rules.

### 2.2 Purpose

#### 2.2.1 Intended use

This expansion module is for adding analog outputs to controllers.

Operate the device only in accordance with the intended conditions of use and within the limits set forth in the technical specifications.

Intended use of the product includes its operation in accordance with this manual.

#### **SELV**

The operating voltage of this device is classified as Safety Extra Low Voltage and is, therefore, not subject to the EU Low Voltage Directive. The device may only be operated from a SELV source.

#### 2.2.2 Usage other than intended

This device must not be used in technical systems which to a high degree have to be fail-safe.

#### **Machinery Directive**

This device is no safety-related part as per Machinery Directive 2006/42/EC, and must, therefore, not be used for safety-relevant applications. This device is NOT intended for the purpose of personal safety, and must, therefore, not be used to protect persons.

### 2.2.3 Warnings used in this document

#### **DANGER**



**High risk**

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

#### **WARNING**



**Medium risk**

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

#### **CAUTION**



**Low risk**

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

#### **NOTICE**



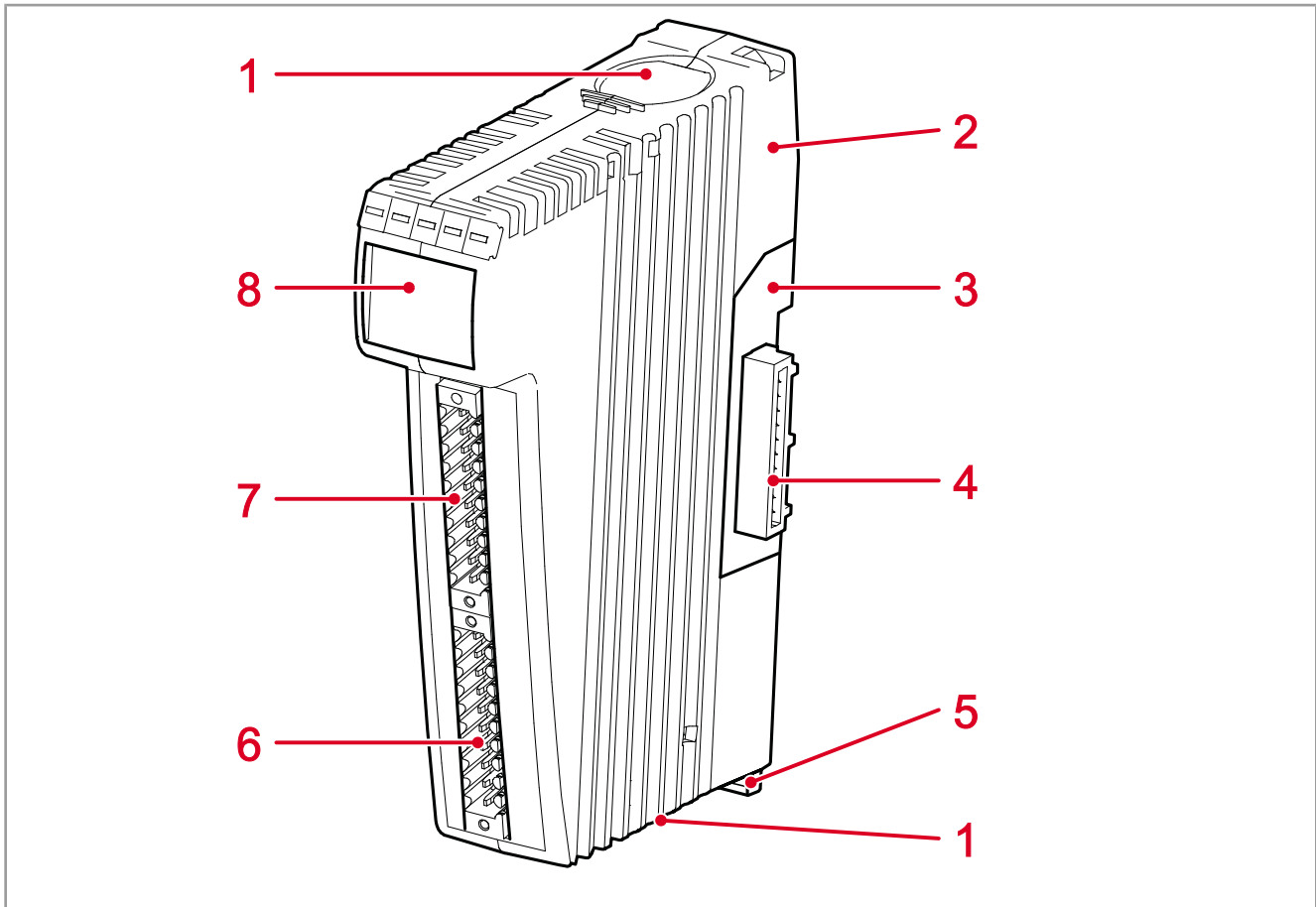
**Material damage**

Indicates a situation which, if not avoided, could result in malfunctions or material damage.

# 3 Product description

The JX3-AO4 is a peripheral module designed for the connection of analog actuators. This module features 4 analog voltage and current outputs.

## 3.1 Design



**Fig. 1:** Device design

1	Latch
2	Housing
3	Backplane module
4	X119 plug: Port for JX3-I/O modules
5	DIN rail release latch
6	X52 terminal: Analog outputs 3 and 4
7	X51 terminal: Analog outputs 1 and 2
8	Status indication

### 3.2 Product features

- User-defined scaling of output values
- Monitoring of limit values
- Saving of minimum/maximum values
- Limiting of output values
- Forcing
- User-defined behavior under fault condition
- Table function
- Oscilloscope function

### 3.3 Status indication

Status indication LEDs indicate the communication status of the device as well as the status of the power supply.

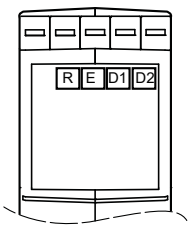


Fig. 2: Status indication

LED	Description
R	Logic circuit supply
E	Communication with controller or bus node
D1	Hardware errors
D2	Operating system

#### 3.3.1 Diagnostics capabilities by means of status indication

Color and status of the LEDs are an excellent source of information for analyzing various states. In the Jet-Sym programming tool, diagnostics can be performed in the Hardware Manager or via the Setup pane by entering the corresponding register number.

LEDs	Status	Color	Description
R	OFF	---	No logic circuit supply
	ON	Green	Logic voltage supply is OK
E	OFF	---	Communication with controller or bus node is active
	ON	Red	Communication with controller or bus node is Inactive
D1	ON	Red	Hardware errors
D2	Blinking at 1 Hz	Red	There is no valid OS
D1/D2	Blinking	Red	An operating system update is being executed

### 3.4 Nameplate

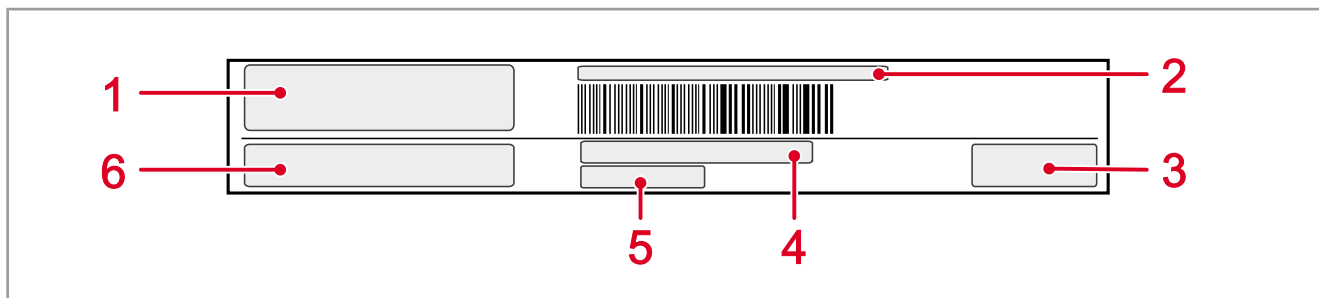


Fig. 3: Sample nameplate

1	Company logo
2	Serial number
3	Certification mark
4	Item number
5	Hardware revision
6	Item name

### 3.5 Scope of Delivery

Scope of delivery	Item number	Quantity
JX3-AO4	10000569	1
Male connector in spring-cage technology, 10-pin	60869252	2
<b>OR</b>		
JX3-AO4_PI	10001484	1
Male connector with PUSH-IN connection, 10-pin	60869254	2
<b>AND</b>		
Terminal labels	60870411	10
Keying pins	60870410	1
Installation manual	60871899	1

# 4 Technical Specifications

This chapter contains information on both electrical and mechanical data as well as on operating data of the JX3-AO4 device.

## 4.1 Dimensions

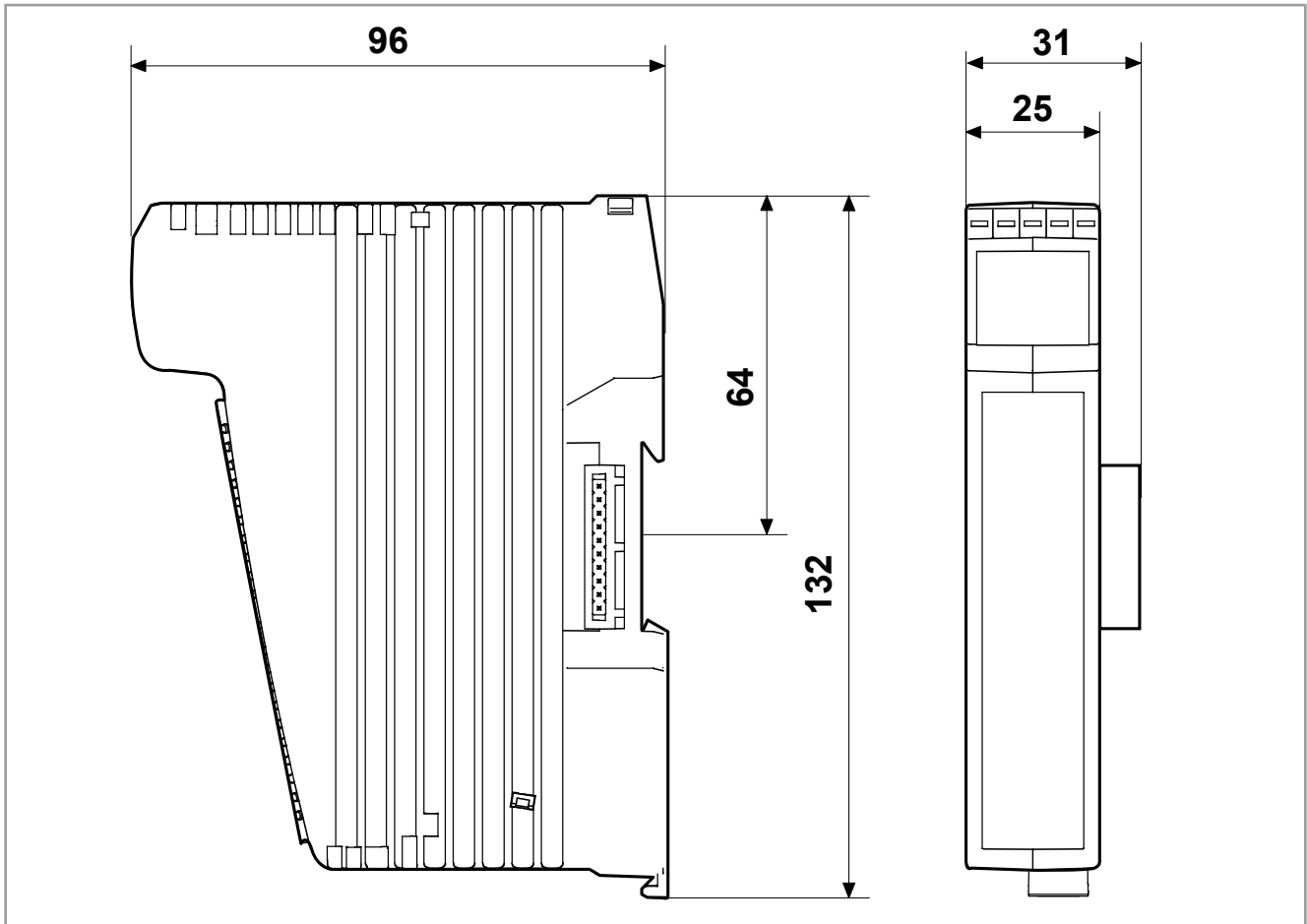


Fig. 4: Dimension in mm

## 4.2 Mechanical Specifications

Parameter	Description	Standards
Mounting orientation	Vertically mounted on DIN rail	
Weight	160 g	
<b>Enclosure specifications</b>		
Material	Plastic	
<b>Maximum height of fall</b>		
with shipping packaging	1 m	DIN EN 61131-2
with product packaging	0.3 m	DIN EN 60068-2-31
<b>Vibration resistance</b>		
Frequency sweeps	1 octave/minute, sinusoidal	DIN EN 61131-2 DIN EN 60068-2-6

Parameter	Description	Standards
Constant amplitude	3.5 mm	$5 \text{ Hz} \leq f \leq 9 \text{ Hz}$
Constant acceleration	1 g	$9 \text{ Hz} \leq f \leq 150 \text{ Hz}$
Number and direction	10 sweeps for all 3 spatial axes	
<b>Shock resistance</b>		
Type of shock	Half-sine wave	DIN EN 61131-2
Intensity and duration	15 g for 11 ms	DIN EN 60068-2-27
Number and direction	3 shocks in the directions of all 3 spatial axes	
<b>Degree of protection</b>		
Degree of protection	IP20	DIN EN 60529

Tab. 1: Mechanical specifications

## 4.3 Electrical properties

### Expansion module

Category	Description	
Analog outputs	4	
<b>Current consumption via backplane module</b>		
From logic voltage	70 mA	
From additional voltage	Voltage outputs	Current outputs
	10 mA	120 mA
Logic voltage	DC 5 V (-15 % ... +10 %)	
Additional voltage	DC 24 V (-15 % ... +10 %)	
<b>Nominal power consumption</b>		
Voltage outputs	2.03 W	
Current outputs	3.23 W	

Tab. 2: Expansion module

### Analog voltage outputs

Category	Description	
Output voltage	Range 1	Range 2
	0 V ... +10 V	-10 V ... +10 V
Load impedance	$\geq 2 \text{ k}\Omega$	
Measuring error	< 0.5 %	
Resolution	15 bit + sign	
Conversion time	10 $\mu\text{s}$	
Electrical isolation	None	
Short-circuit capability	To reference potential 0 V	
Open-circuit resistance	Yes	

Tab. 3: Analog voltage outputs

### Analog current outputs

Category	Description
Rated current output range	0 mA ... 20 mA
Load impedance	≤ 450 Ω
Measuring error	< 0.5 %
Resolution	15 bits
Conversion time	10 μs
Electrical isolation	None
Short-circuit capability	To reference potential 0 V
Open-circuit resistance	Yes

Tab. 4: Analog current outputs

### Electrical safety

Parameter	Description	Standards
Class of protection	III	DIN EN 61131-2
Dielectric test voltage	Functional ground is internally connected to the device ground	
Protective connection	0	
Overvoltage category	II	

Tab. 5: Electrical safety

## 4.4 Environmental Conditions

Parameter	Description	Standards
Operating temperature	0 °C ... +50 °C	DIN EN 61131-2
Storage temperature	-40 °C ... +70 °C	DIN EN 60068-2-1
Humidity	10 % ... 95 %, non-condensing	DIN EN 60068-2-2
Max. operating altitude	2,000 m above sea level	DIN EN 61131-2
Corrosion immunity and chemical resistance	No special protection against corrosion. Ambient air must be free from higher concentrations of acids, alkaline solutions, corrosive agents, salts, metal vapors and other corrosive or electroconductive contaminants.	
Degree of pollution – Electronics	Level 2	DIN EN 61131-2
	Usually, the pollution is non-conductive. However, temporary conductivity due to condensation may occur.	

Tab. 6: Environmental conditions

## 4.5 EMC Values

### 4.5.1 Enclosure

#### Emitted interference

Parameter	Values	Standards
<b>Frequency band</b>	<b>30 MHz ... 230 MHz</b>	DIN EN 61000-6-3 DIN EN 61131-2 DIN EN 55011
Limit value	30 dB ( $\mu\text{V}/\text{m}$ ) at 10 m distance	
<b>Frequency band</b>	<b>230 MHz ... 1,000 MHz</b>	
Limit value	37 dB ( $\mu\text{V}/\text{m}$ ) at 10 m distance	
	Class B	

Tab. 7: Emitted interference

#### Immunity to Interference

Parameter	Values	Standards
<b>Magnetic field with mains frequency</b>		
Frequency	50 Hz	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-8
Magnetic field	30 A/m	
<b>RF field, amplitude-modulated</b>		
Frequency band	80 MHz ... 2 GHz	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-3
Test field strength	10 V/m	
	AM 80 % with 1 kHz	
	Criterion A	
<b>ESD</b>		
Discharge through air Test peak voltage	8 kV	DIN EN 61131-2 DIN EN 61000-6-2 DIN EN 61000-4-2
Discharge through air Test peak voltage	4 kV	
		Criterion A

Tab. 8: Immunity to interference

### 4.5.2 DC Power Supply Inputs and Outputs

#### Emitted Interference

Parameter	Values	Standards
<b>Signal and control line connections, DC voltage supply inputs and outputs</b>		
Frequency band	0.15 ... 0.5 MHz	DIN EN 61000-6-3
Limit value	40 to 30 dB	
Frequency band	0.5 ... 30 MHz	
Limit value	30 dB	
	Class B	

Tab. 9: Emitted interference of the DC power supply inputs and outputs

## Immunity to Interference

Parameter	Values	Standards
<b>RF field, asymmetric, amplitude-modulated</b>		
Frequency band	0.15 ... 80 MHz	DIN EN 61131-2
Test voltage	3 V	DIN EN 61000-6-2
	AM 80 % with 1 kHz	DIN EN 61000-4-6
Source impedance	150 $\Omega$	
	Criterion A	
<b>Bursts</b>		
Test voltage	2 kV	DIN EN 61131-2
	tr/tn 5/50 ns	DIN EN 61000-6-2 DIN EN 61000-4-4
Repetition frequency	5 kHz	
	Criterion A	
<b>Surge voltages, symmetric, line to line</b>		
Differential-mode coupling	tr/th 1.2/50 $\mu$ s	DIN EN 61131-2
	0.5 kV	DIN EN 61000-6-2 DIN EN 61000-4-5
<b>Surge voltages, asymmetric, line to earth</b>		
Common-mode coupling	tr/th 1.2/50 $\mu$ s	DIN EN 61131-2
	1 kV	DIN EN 61000-6-2 DIN EN 61000-4-5

Tab. 10: Immunity to interference of the DC power supply inputs and outputs

### 4.5.3 Shielded Data and I/O Lines

#### Immunity to interference

Parameter	Values	Standards
<b>RF field, asymmetric, amplitude-modulated</b>		
Frequency band	0.15 MHz ... 80 MHz	DIN EN 61131-2
Test voltage	3 V	DIN EN 61000-6-2
	AM 80 % with 1 kHz	DIN EN 61000-4-6
Source impedance	150 $\Omega$	
Criterion	A	
<b>Bursts</b>		
Test voltage	1 kV	DIN EN 61000-6-2
	tr/tn 5/50 ns	DIN EN 61000-6-2 DIN EN 61000-4-4
Repetition frequency	5 kHz	
Criterion	A	

Parameter	Values	Standards
<b>Surge voltages, asymmetric, line-to-ground</b>		
Common-mode coupling	tr/th 1.2/50 $\mu$ s	DIN EN 61131-2
	1 kV	DIN EN 61000-6-2 DIN EN 61000-4-5

**Tab. 11:** Immunity of shielded data lines and I/O lines

# 5 Mechanical Installation

This chapter describes how to install and remove the JX3-AO4.

## NOTICE



### Damaged devices

Damaged devices may cause considerable physical damage.

- ▶ Check the device for external damage and faulty connections.
- ▶ Ensure to install only fully functional devices.

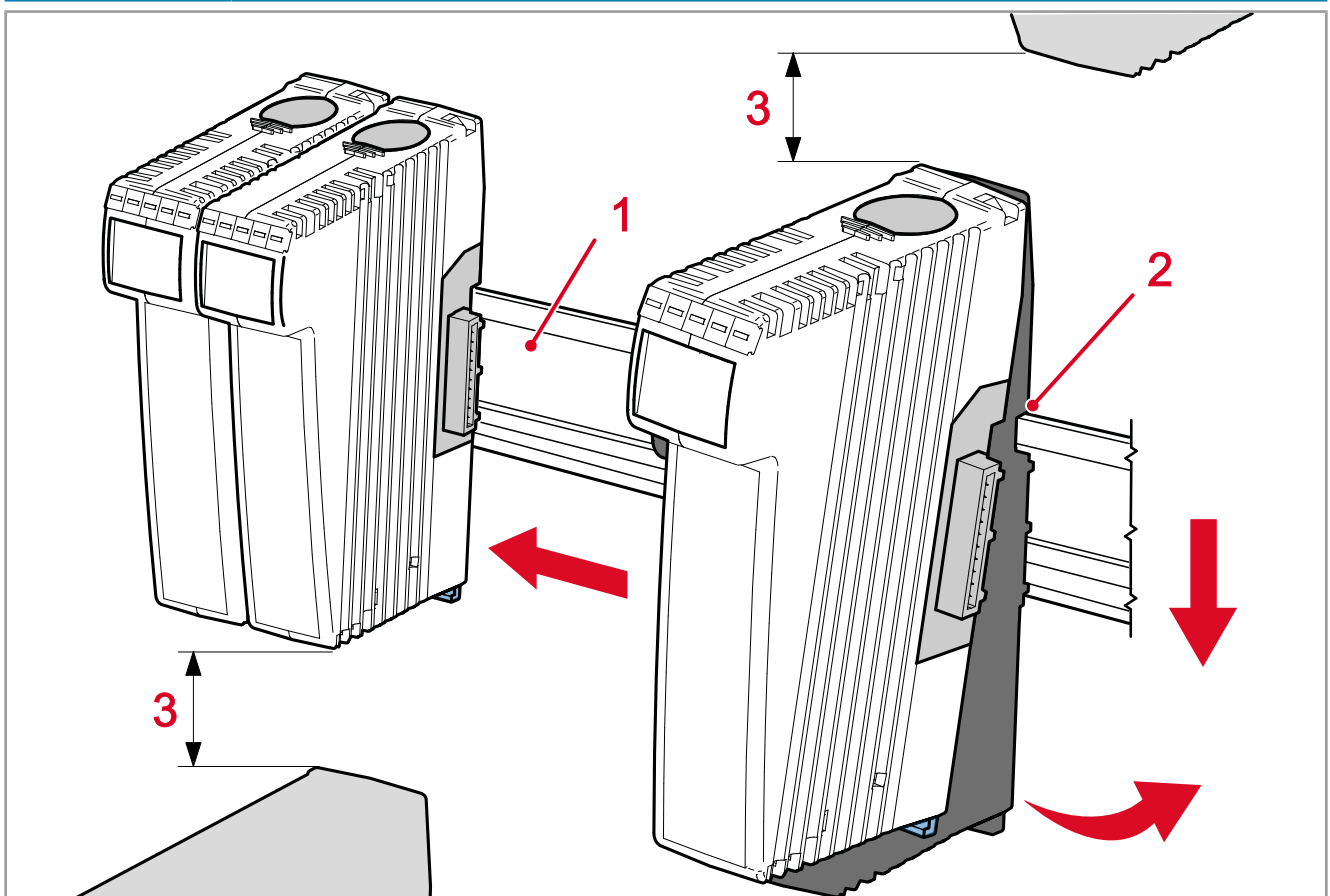
## 5.1 Installing Device on DIN Rail

## NOTICE



### Functional impairment caused by unfavorable installation

- ▶ Install the device only in vertical position on the DIN rail (DIN EN 60715).
- ▶ Keep a minimum distance of 30 mm to surrounding parts.



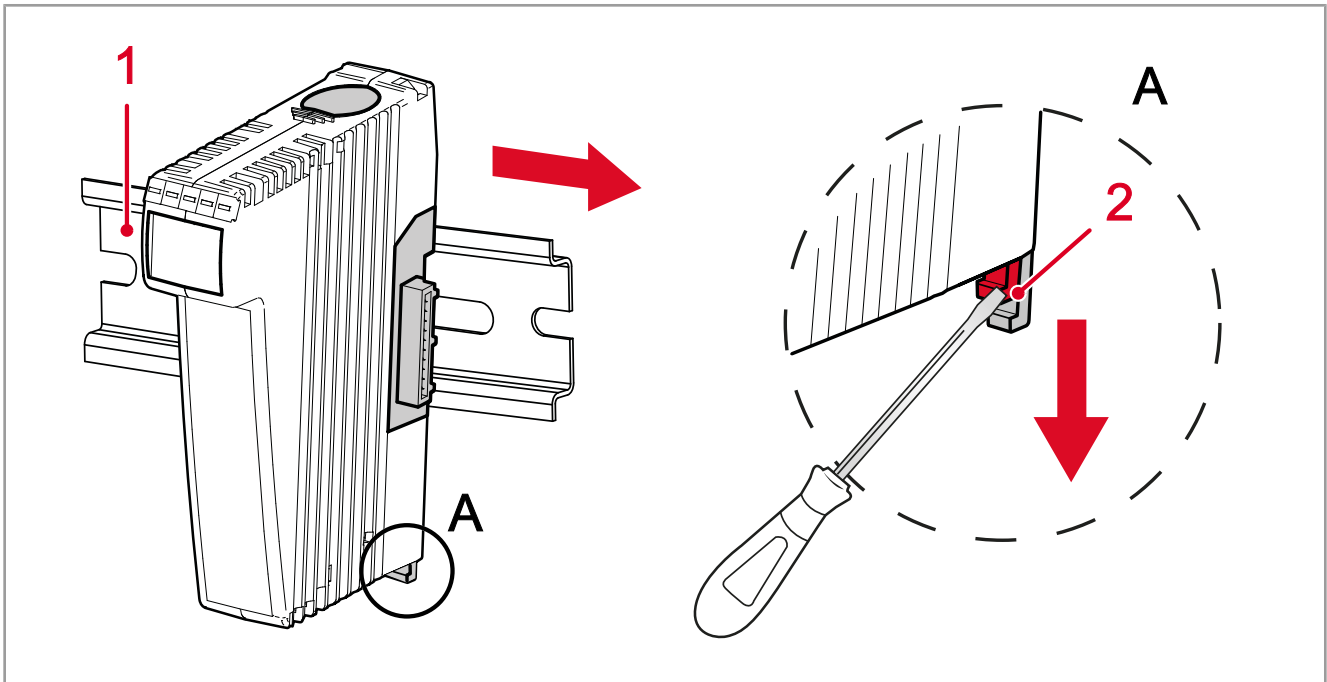
**Fig. 5:** Installing the device on the DIN rail

1	DIN rail
2	Upper latch
3	Minimum distance to surrounding parts (30 mm min.)

1. Disconnect the system from the power supply.
2. Place the upper latch (2) in an angled position on the DIN rail (1).
3. Snap the lower latch of the device onto the DIN rail.
4. Slide the device on the DIN rail to its intended position.

## 5.2 Removing Device from DIN Rail

Applying force to the release latch disengages the device from the DIN rail.



**Fig. 6:** Removing the device from the DIN rail

1	DIN rail
2	DIN rail release latch
A	Detail view

1. Disconnect the system from the power supply.
2. Pull the device off the overall assembly.
3. Pry the release latch (2) downwards and pull the device off the DIN rail (1).

### 5.3 Dismounting Enclosure from Backplane Module

Pressing down on the upper and the lower backplane latches of the device allows you to remove the enclosure from the backplane module.

#### NOTICE



#### Mechanical damage and reduced EMC noise immunity

If devices are replaced, degree of protection IP20 is not ensured. Touching the EMC clip may lead to mechanical damage to the device and reduced EMC noise immunity.

- ▶ Do not touch any electronic components once the enclosure has been removed from the backplane module.

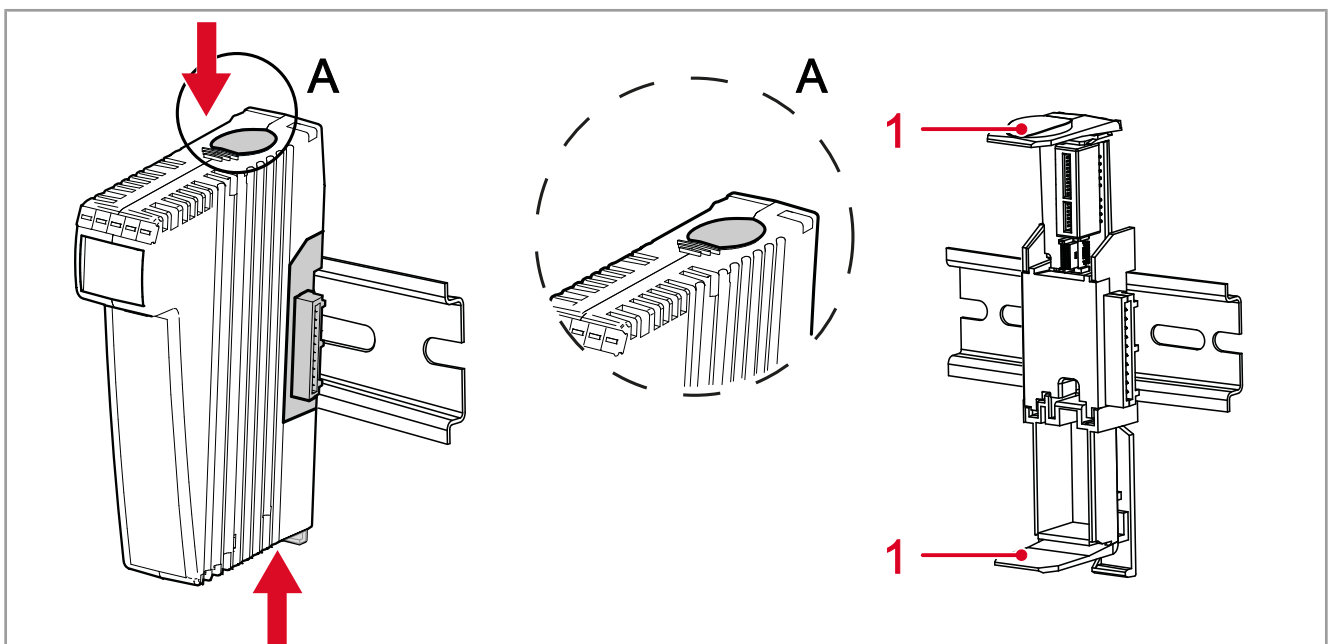


Fig. 7: Removing the enclosure from the backplane module

A	Detail view
1	Latch

1. Disconnect the system from the power supply.
2. Simultaneously, press and hold the upper and lower latches (1) of the device.
3. With the latches pressed down pull the enclosure away from DIN rail.

## 6 Electrical Connection

### NOTICE



#### Damages to material or functional impairment

Improper implementation of the wiring harness may cause mechanical stress.

- ▶ Protect the cables from bending, twisting or chafing.
- ▶ Install strain reliefs for the connecting cables.

### 6.1 Improving EMC Noise Immunity

A system's immunity to noise is determined by its weakest component. Key factors are correct connections, lines and proper shielding. Take note of the measures described in this section.

#### Info

#### Further information

For further information on the noise immunity of a system, please refer to the Application Note 016 *EMC-Compatible Installation of the Electric Cabinet* available for download on [www.bucherautomation.com](http://www.bucherautomation.com).

#### DIN rail

- Attach the JX3-AO4 device to a DIN rail to EN 60715 with the dimensions 35 x 7.5 mm.
- The DIN rail must be electrically conducting and grounded by either of the following two ways:
  - Directly
  - Via rear panel of the electric cabinet

#### Application Note 016

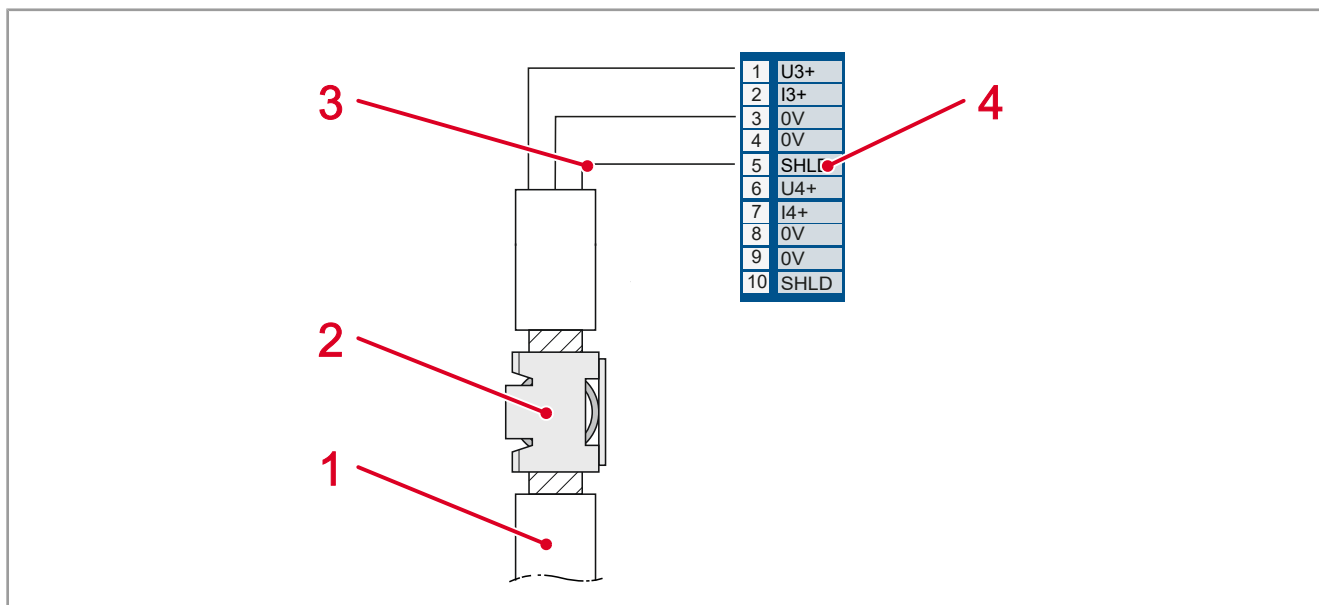
Follow the instructions given in Application Note 016 *EMC-Compatible Installation of the Electric Cabinet*.

The following instructions are excerpts from Application Note 016:

- Keep signal and power lines **separated from each other** at all times. Bucher Automation AG recommends that there be a minimum distance of 20 cm. Cables and lines should cross each other at an angle of 90°.
- Shield the following cables and lines:
  - Analog lines
  - Data lines
  - Motor cables coming from inverter drives (servo output stage, frequency converter)
  - Lines between components and interference suppressor filter, where the suppressor filter is located not immediately adjacent to the component.
- Place the shield **on both sides**.
- Keep unshielded wire ends of shielded cables as short as possible.
- Span the shield **entirely** across the isolation. For **wide-area grounding**, clamp it down tightly with an extensively earthed strain relief.

### Use of terminals

To ensure the highest level of noise immunity, use extensive shielding measures.



**Fig. 8:** Shielding measures

1	Line to the analog actuator
2	Shield clamp
3	Drain wire (copper)
4	JX3-AO4

1. Connect the drain wire (3) directly to terminal X51.SHLD, respectively X52.SHLD.
2. Use a shield clamp (2) to provide additional grounding of the shield.

## 6.2 Interfaces

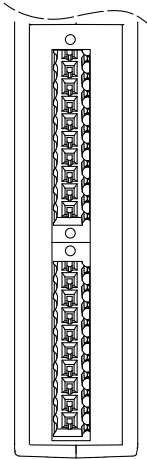
### 6.2.1 Terminals X51, X52 – analog outputs

#### Ports and interfaces

Terminals X51 and X52 connect to:

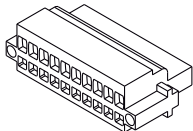
- 2 analog outputs each connecting to voltage and current sensors

#### Pinning



Position 1		Position 2	
Pin	X51	Pin	X52
U1+	Voltage output 1	U3+	Voltage output 3
I1+	Current output 1	I3+	Current output 3
0 V	Reference potential	0 V	Reference potential
0 V	Reference potential	0 V	Reference potential
SHLD	Shielding connection	SHLD	Shielding connection
U2+	Voltage output 2	U4+	Voltage output 4
I2+	Current output 2	I4+	Current output 4
0 V	Reference potential	0 V	Reference potential
0 V	Reference potential	0 V	Reference potential
SHLD	Shielding connection	SHLD	Shielding connection

#### 10-pin connector, spring-cage technology

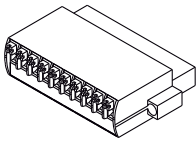


Parameter	Description	Standards
<b>Connector</b>		
Designation	BU_10_E_BLZF_GE_RM3.5	
Item number	60869252	
Connector technology	Spring-cage connection	
Type	10-pin, 3.5 mm pitch	
<b>Connectible conductors</b>		
Outer diameter of the isolation	Max. 2.90 mm	
AWG	16 ... 28	
Clamping range	0.13 ... 1.5 mm <sup>2</sup>	
Stripping length	10 mm	
<b>Specification without wire end ferrules</b>		
Solid conductor	H05(07) V-U	
	0.2 ... 1.5 mm <sup>2</sup>	
Flexible conductor	H05(07) V-K	
	0.2 ... 1.5 mm <sup>2</sup>	

Parameter	Description	Standards
<b>Specification with wire end ferrules</b>		
Wire end ferrule without sleeve	0.2 ... 1.5 mm <sup>2</sup>	DIN 46228/1
Wire end ferrule with sleeve	0.2 ... 1.5 mm <sup>2</sup>	DIN 46228/4
Crimping tool	PZ 4, PZ 6 ROTO, PZ 6/5	DIN 46228

**Tab. 12:** Connector specification, 10-pin connector, spring-cage technology

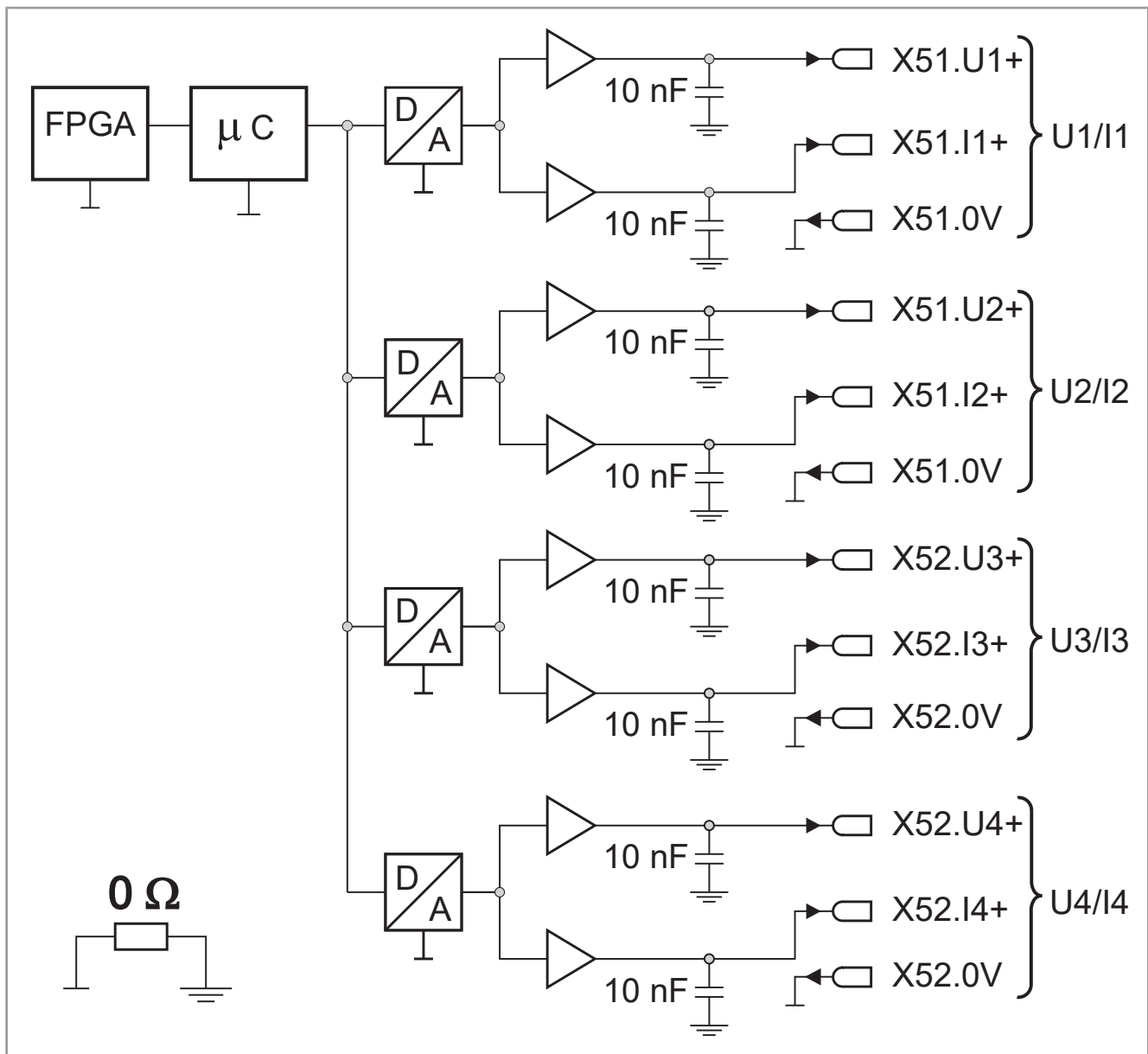
**10-pin male connector with PUSH-IN connection**



Parameter	Description	Standards
<b>Connector</b>		
Designation	BU_10_E_BL-I/O_GE_RM3.5	
Item number	60869254	
Connector technology	Spring connection, push-in	
Type	10-pin, 3.5 mm pattern	
<b>Connectible conductors</b>		
Outer diameter of the isolation	Max. 2.90 mm	
AWG	16 ... 24	
Terminal range	0.2 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>	
Stripping length	10 mm	
<b>Specification without wire end ferrules</b>		
Solid conductor	H05(07) V-U	
	0.2 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>	
Flexible conductor	H05(07) V-K	
	0.2 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>	
<b>Specification with wire end ferrules</b>		
Wire end ferrule without sleeve	0.25 mm <sup>2</sup> ... 1.0 mm <sup>2</sup>	DIN 46228/1
Wire end ferrule with sleeve	0.25 mm <sup>2</sup> ... 0.75 mm <sup>2</sup>	DIN 46228/4
Crimping tool	PZ 4, PZ 6 ROTO, PZ 6/5	DIN 46228

**Tab. 13:** Connector specification, 10-pin, PUSH-IN connection

**Block diagram of terminals X51, X52**



**Fig. 9:** Block diagram of terminals X51, X52

Part	Description
FPGA	Communication chip
µC	Controller
D/A	Digital-analog converter
10 nF	Capacitance at the analog output

### 6.3 Connecting voltage and current actuators

#### Design of Cable

The design of the cable must meet the following requirements:

- Shielded cable with 85 % coverage
- Drain wire, tin-coated copper
- Cable cross-section 0.14 mm<sup>2</sup>

### Power supply

The voltage actuator and JX3 station can use the same power supply unit (PSU) or separate ones.

### Connection

Voltage and current actuators connect identically to all 4 analog outputs. In the following illustration a voltage or current actuator is connected to analog output 1.

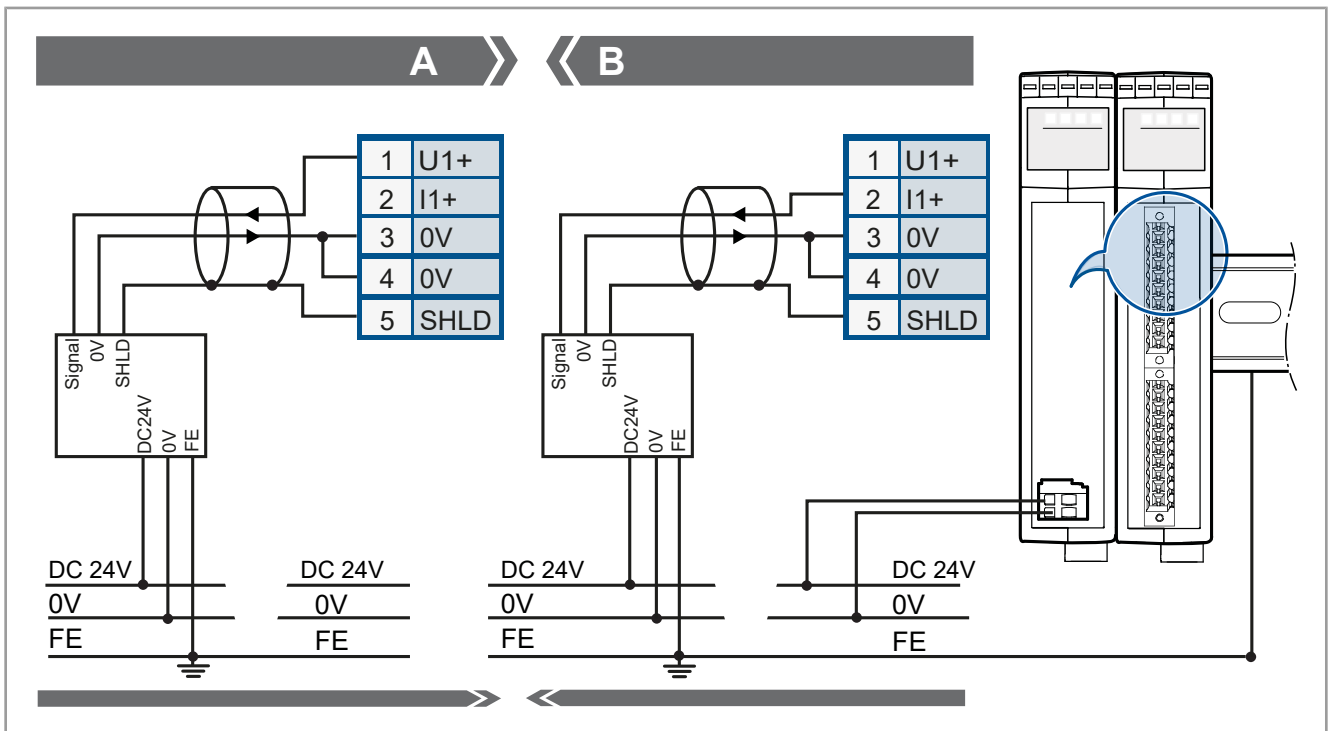


Fig. 10: Connecting voltage and current actuators

A Voltage actuator connection	B Current actuator connection
-------------------------------	-------------------------------

## 6.4 Commissioning

This chapter describes the general commissioning procedure of the device.

- ▶ Enter the digital values for the analog outputs into MR 0002 ... 0005.

⇒ The analog output gives a voltage value.

In order to output a certain voltage, configuring after power-up is not needed. After power-up, the behavior of the 4 analog outputs is as follows:

- The module is configured to support voltage between -10 V ... +10 V.
- The analog outputs emit 0 V.
- Any additional functions do not influence the voltage emitted.

### **i** Info

#### Further information

For more information, refer to the JetSym online help.

# 7 Identification

This chapter describes the identification of the JX3-AO4:

- Determining the versions of the module
- Retrieving Electronic Data Sheet (EDS) information. The EDS holds numerous non-volatile production-relevant data.

## Requirements

To be able to identify the module, the following requirements must be fulfilled:

- The module has been connected to a JC controller.
- The controller must be connected to a PC.
- The JetSym programming software has been installed on the PC.
- The minimum requirements regarding modules, controllers and software are fulfilled.

## 7.1 Electronic Data Sheet EDS

Each device in a JX3 system features an Electronic Data Sheet EDS. Numerous production-relevant data are permanently stored in the EDS. The EDS data can be read out via files in the file system of the controller or via special registers.

### 7.1.1 EDS Registers

Use the EDS registers to retrieve Electronic Data Sheet (EDS) information. These registers contain the exact same information as the EDS file. They are read-only (ro).

#### Abbreviations

The abbreviations used in this document are listed in the table below:

Abbreviation	Meaning
R 100500	Register 100500

Tab. 14: Abbreviations

#### Register numbers

The basic register number depends on the controller. The register number is calculated by adding the number of the system register to the number of the basic register.

Device	Basic register number	Register numbers
JX3 bus master (e.g. JC-4xx)	R 100000	R 100500 ... R 100827

Tab. 15: EDS register numbers

#### Register overview

The following table gives an overview of the EDS registers. By means of this register set, you can display the EDS of the controller or of a JX3 module. To do so, select the controller or the desired JX3 module via system registers 100500 and 100501. Data of the selected EDS can be read from 100600 onwards.

Registers	Section in eds.ini	Name in eds.ini	Description
R 100500	-	-	Functional group 0: CPU 1: JX3 modules
R 100501	-	-	Module number (if 100500 > 0)
R 100600	IDENTIFICATION	Version	Version of this section
R 100601		Code	Module code
R 100602		Name	Module name or controller name
...			
R 100612			
R 100613		PcbRev	PCB revision
R 100614	PcbOpt	PCB option	
R 100700	PRODUCTION	Version	Version of this section
R 100701		SerNum	Serial number
...			
R 100707			
R 100708		Day	Production date: Day
R 100709		Month	Production date: Month
R 100710		Year	Production date: Year
R 100711		TestNum	Internal usage
R 100712		TestRev	Internal usage

Tab. 16: Summary of the EDS registers

### 7.1.2 Accessing EDS data via the Hardware Manager Setup page

Integrated into the JetSymb programming tool, the Hardware Manager offers convenient access to EDS data and configuration.

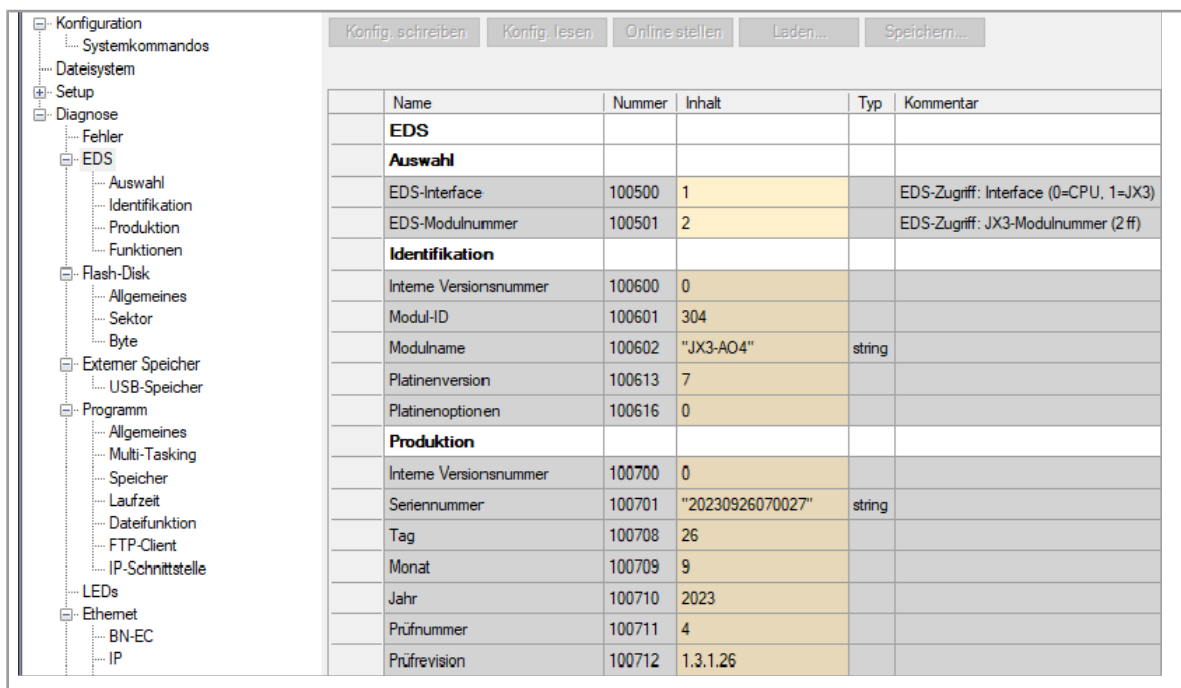


Fig. 11: Setup of the HW Manager

### Selecting the register

1. In the structure tree, open the *Diagnostics* folder.
  2. Select the EDS interface.
- ⇒ The above dialog box opens.

### Reading out a register value

The register value is displayed in the corresponding cell of the **Content** column.

### Writing a register value

1. Double-click the corresponding cell of the **Content** column.
2. Enter the new register value in the new window.
3. Click **OK**.

### Example

You want to address the **2nd JX3 module**.

1. Go to **EDS interface > Content** and enter the value **1**.
2. Go to **EDS module number > Content** and enter the value **3**.

## 7.1.3 Accessing EDS data via FTP client

Another convenient way of accessing EDS data is via FTP client.

- ✓ The IP address of the FTP server must be known.
  - ✓ The FTP server login credentials (user name and password) must be known.
1. To login to the server, enter the correct **IP address**, **user name** and **password** in the corresponding fields.
  2. Click *Connect*.

# 8 Programming

## 8.1 Abbreviations, module register properties and formats

### Abbreviations

Abbreviation	Meaning
MR 0009	Module register 0009

### Module register properties

Each module register is characterized by certain properties. Most properties are identical for many module registers. In the following description, module register properties are mentioned only if a property deviates from the default properties listed below.

Property	Default
Access	Read/write
Value after reset	0 or undefined (e.g. revision/version number)
Takes effect	Immediately
Write access	Always
Data type	Integer

Tab. 17: Module register properties

### Numerical formats

The numerical formats used in this document are listed in the table below:

Decimal	Hexadecimal	Binary
81	0x51	0b01010001

Tab. 18: Numerical formats

## 8.2 Addressing I/O Expansion Modules

The JX3 I/O module connects to sensors and actuators. The data are either sent directly to the controller via the JX3 system bus or, if the JX3 modules are located remotely, via Ethernet bus nodes or EtherCAT® bus nodes.

Each JX3 I/O module provides 10,000 module registers.

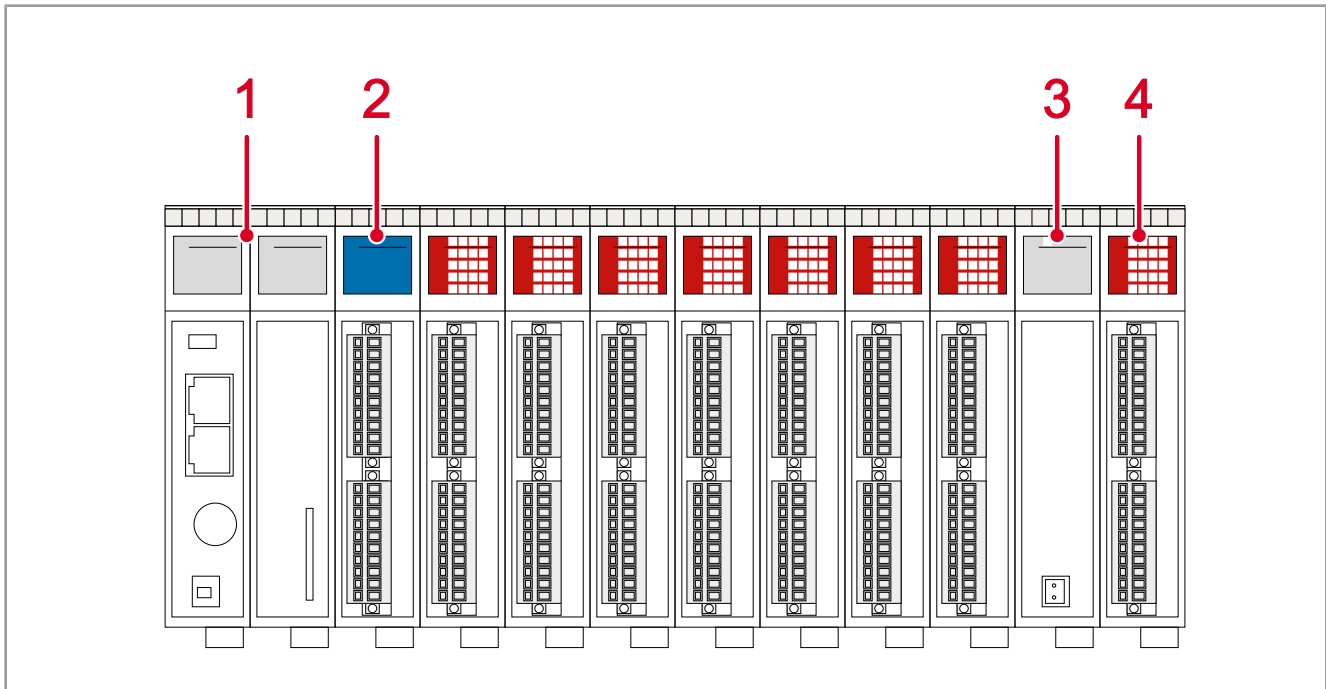
These module registers are mapped to registers in the controller. The only way of writing and reading process, configuration and diagnostic data to and from an expansion module is via controller registers. Controller registers can be accessed in the application program of the controller, in a setup pane of JetSym or via a visualization application.

The number of a controller register or I/O being mapped to a module register depends on the following parameters:

- Controller model
- Type of connection between controller and expansion module
  - Local direct connection
  - Remote connection via Ethernet
  - Remote connection via EtherCAT®

- Position and number of expansion modules in the system  
 The number of expansion modules that can be connected to a controller depends on the model of the expansion module. After max. 8 expansion modules, a power supply module must be inserted.

**Example system overview**



**Fig. 12:** Example: System overview of a controller together with various expansion modules

1	Controller
2	First expansion module
3	Power supply module
4	Further expansion modules

**i Info**

**Number of connectible expansion modules**

You can calculate the exact amount of connectible expansion modules by means of the system bus configurator, JX3-sysbus\_configurator\_XXX\_e. The configurator is available for download. Go to [www.bucherautomation.com](http://www.bucherautomation.com) and navigate to the JX3Modules product page > Downloads.

**i Info**

**Further information**

For in-depth information, see the JX3 System application-oriented manual. For application-oriented manuals open [www.bucherautomation.com](http://www.bucherautomation.com) and go to product page JX3-AO4 > Product-independent documentation.

## 8.2.1 Numbering Registers and I/Os

### Definition of module registers

Module registers are the data interface of the JX3 module. Use module registers to read process, configuration and diagnostics data from the JX3 module, or write such data to the JX3 module.

- The module register number within a module is unique.
- This unique register number gives access to a specific module register within the system.

### Definition of registers

There are several ways to access registers directly and indirectly:

- From an application program
- From the JetSym Setup pane
- From a visualization application

The register number within the system is unique.

#### Info

#### Further information

For in-depth information, see the *JX3 System* application-oriented manual.

For application-oriented manuals open [www.bucherautomation.com](http://www.bucherautomation.com) and go to *product page JX3-AO4 > Product-independent documentation*.

### Expansion modules connected with a controller

Our products offer a host of features accessible to the user via registers. Each register is addressed by a unique number – the register number. Each digital input and output has a unique I/O number.

#### Register numbering system

Register numbers consist of a prefix, the module position in the system and the module register number. If the expansion modules are connected with the controller via JX3 system bus, the prefix is 100. In this case, the module register number is always a four-digit number.

100XXZZZZ

**Fig. 13:** Example: Register numbers

Digits	Description	Value range
100	Prefix	
XX	Position of the module in the system	02 ... 17
ZZZZ	Module register number	0000 ... 9999

#### I/O numbering system

I/O numbers provide direct access to the inputs or outputs of the module. These I/O numbers consist of a five-digit prefix, the module position in the system and the I/O number of the module. The I/O numbers always start with the constant prefix **10000**.

10000XXZZ

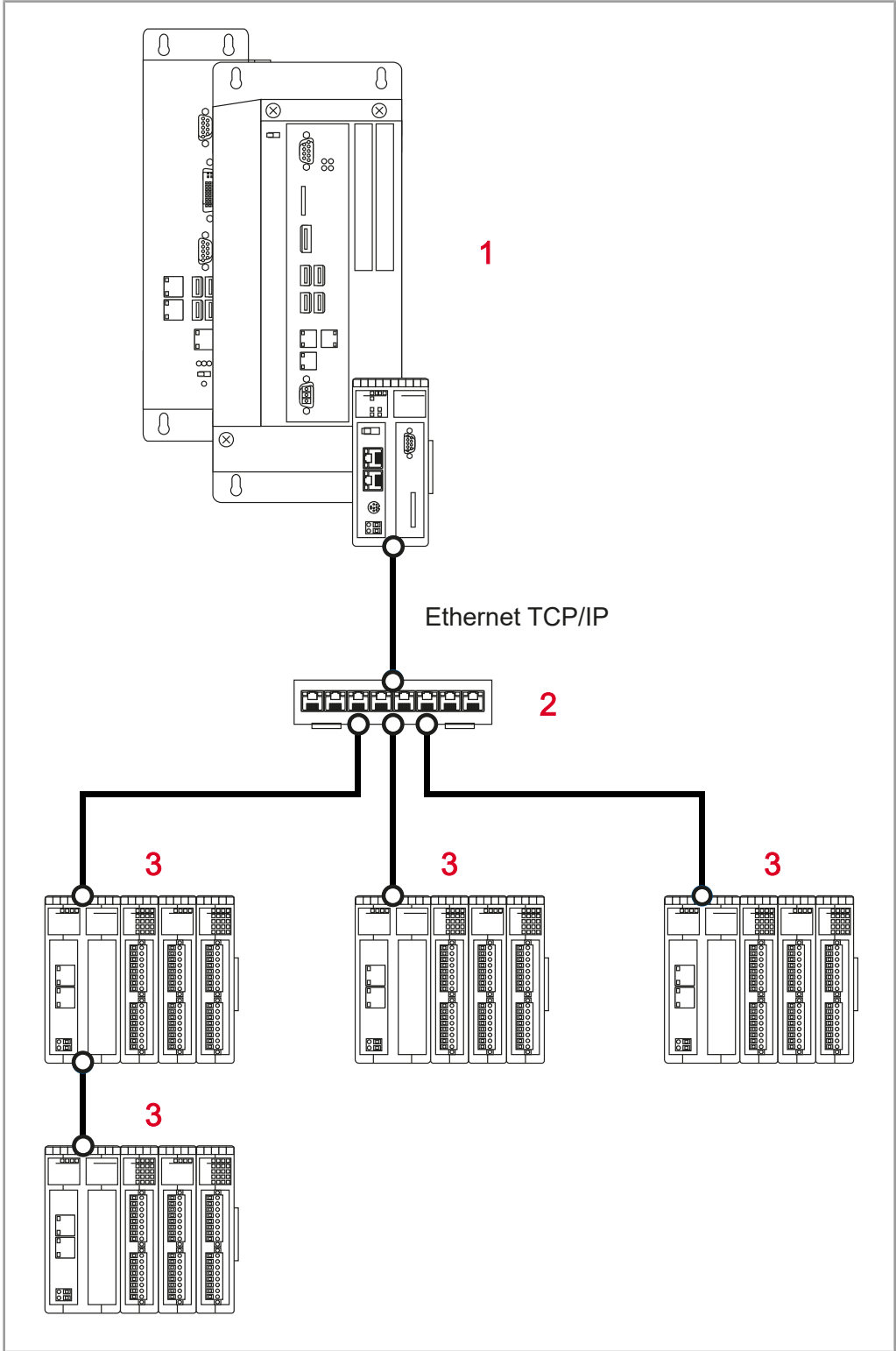
**Fig. 14:** Example: I/O numbers

Digits	Description	Value range
10000	Prefix	
XX	Position of the module in the system	02 ... 17
ZZ	Module-specific I/O number	01 ... 16

## Expansion modules connected to an Ethernet bus node

The Ethernet bus node and the controller communicate via Ethernet system bus. When addressing expansion modules via Ethernet bus node, the Global Node Number (GNN) becomes part of the register number.

### System overview



**Fig. 15:** System overview

1	Controller
2	Ethernet switch
3	Up to 64 Ethernet bus nodes per controller and up to 16 JX3-IO modules per Ethernet bus node

### Definition of global node number

The Global Node Number (GNN) is used to identify Bucher Automation devices (e.g. controllers, bus nodes) within an Ethernet network:

- Within one network, each Bucher Automation device must have a unique GNN.
- The JetSym Hardware Manager automatically assigns the GNN during configuration.
- The value range of the GNN within a project is 000 ... 199.
- The GNN of the controller is always 000.

### Register numbering system

Register numbers consist of a prefix, the GNN, the module position within the system and the module-specific register number.

1NNNXXZZZZ

**Fig. 16:** Example: Register numbers

Digits	Description	Value range
1	Prefix	
NNN	Bus node ID, GNN	001 ... 199
XX	Position of the module within the station	02 ... 17
ZZZZ	Module register number	0000 ... 9999

### I/O numbering system

I/O numbers provide direct access to the inputs or outputs of the module. The I/O numbers consist of prefix 1, the GNN, prefix 2, the module position in the system and the module-specific I/O number.

1NNN01XXZZ

**Fig. 17:** Example: I/O numbers

Digits	Description	Value range
1	Prefix 1	
NNN	Bus node ID, GNN	001 ... 199
01	Prefix 2	
XX	Position of the module within the station	02 ... 17
ZZ	Module-specific I/O number	01 ... 16

#### Info

#### Further information

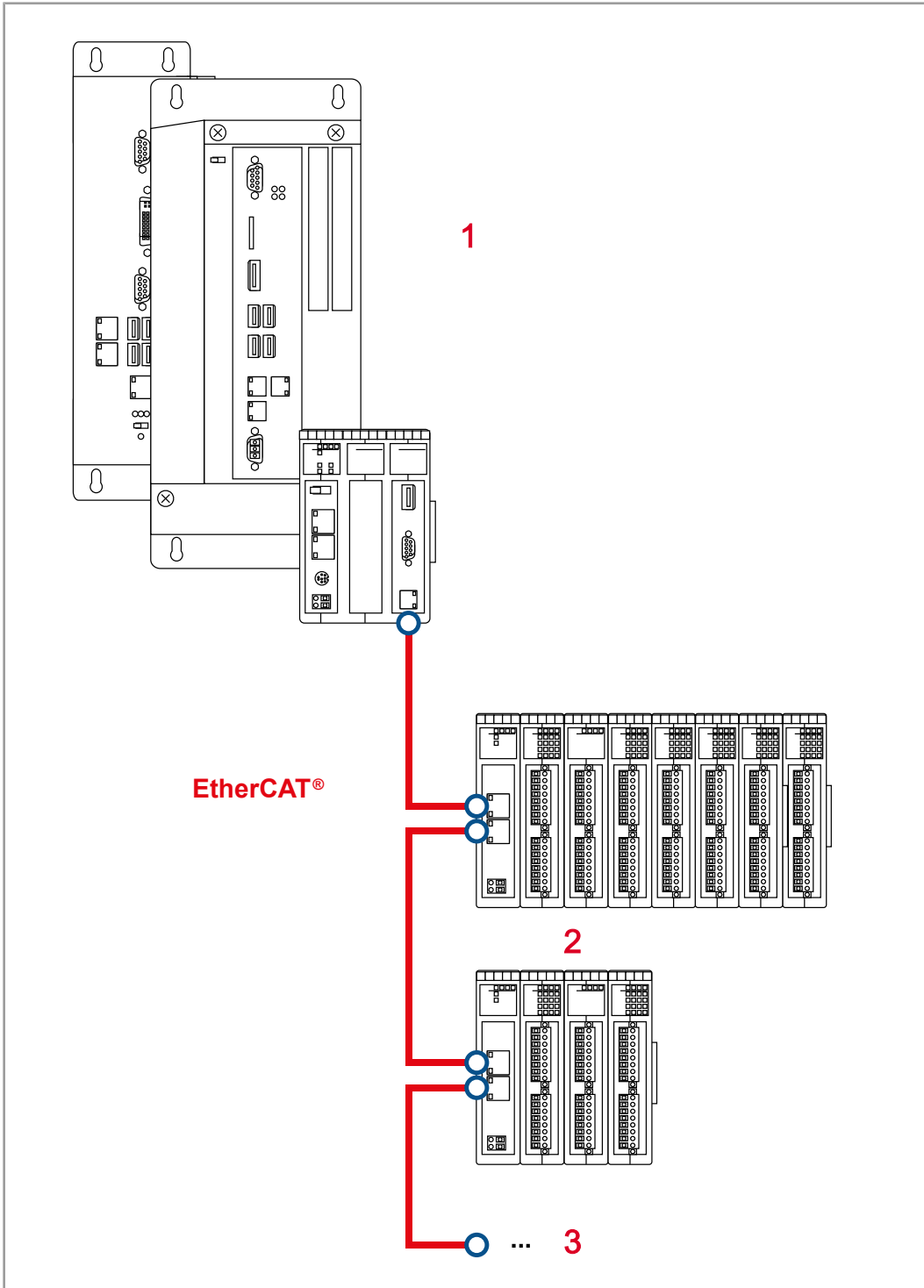
For in-depth information, see the *Ethernet System Bus* application-oriented manual.

For application-oriented manuals open [www.bucherautomation.com](http://www.bucherautomation.com) and go to *product page JX3-AO4 > Product-independent documentation*.

**Expansion modules connected to an EtherCAT® bus node**

EtherCAT® bus node and controller communicate via EtherCAT® system bus. When addressing the expansion modules via EtherCAT® bus node, the EtherCAT® Node Number (ENN) becomes part of the register number. The ENN is used to identify controllers and EtherCAT® bus nodes within an EtherCAT® network. The ENN is automatically assigned by JetSym.

**System overview**



**Fig. 18:** System overview

1	EtherCAT® master
2	EtherCAT® bus node with up to 16 JX3 I/O modules
3	Up to 99 JX3-BN-EC

### Register numbering system

The register numbers consist of a prefix, the ENN, the module position within the system and the module-specific register number.

12NNXXZZZZ

**Fig. 19:** Register numbers

Digits	Description	Value range
12	Prefix	
NN	Bus node ID, ENN	01 ... 99
XX	Position of the module within the station	02 ... 33
ZZZZ	Module register number	0000 ... 9999

### I/O numbering system

I/O numbers provide direct access to the inputs or outputs of the module. The I/O numbers consist of prefix 1, the ENN, prefix 2, the module position in the system and the module-specific I/O number.

12NN00XXZZ

**Fig. 20:** I/O numbers

Digits	Description	Value range
12	Prefix 1	
NN	Bus node ID, ENN	01 ... 99
00	Prefix 2	
XX	Position of the module within the station	02 ... 33
ZZ	Module-specific I/O number	01 ... 16

## 8.3 Version Registers

Each JX3 module features software with a unique revision number which can be read out via module registers. You will need these revision data if you have to contact the hotline of Bucher Automation AG in case of a problem.

### Format of software version numbers

The JX3-AO4 software version is identified by a 4-part number.

1 . 2 . 3 . 4

**Fig. 21:** Software version numbers

Digits	Description
1	Represents major or main version number
2	Represents minor or secondary version number
3	Represents branch or intermediate version number
4	Represents build version number

**Tab. 19:** Format of software version numbers

### Released version

A released version is identified by both the branch and build values being 0.

## Register Overview

The versions can be read out from the following registers:

Register	Description
MR 0009	OS version
MR 0032	FPGA version
MR 0769	Bootloader version

Tab. 20: Register overview

### 8.3.1 Registers - Description

#### MR 0009

##### OS version

MR 0009 shows the module's operating system version.

JetSym lets you transfer another operating system to the module.

Property	Description	
Type of access	Read	
Values	Released OS version	IP#1.0.0.0 ... IP#254.255.0.0
	Bootloader version	IP#255.1.0.0 ... IP#255.255.0.0
Value after reset	OS version	

Tab. 21: OS version

#### MR 0032

##### FPGA version

MR 0032 shows the module's FPGA revision number. The FPGA revision number cannot be changed by the user.

Property	Description
Type of access	Read
Values	IP#1.0.0.0 ... IP#255.255.0.0
Value after reset	FPGA version

Tab. 22: FPGA version

## 8.4 Module state

The module register 0000 *Module state* allows you to diagnose and manage the JX3-AO4 module.

The JX3-AO4 module regularly checks the hardware for various errors. When an error is detected, the module switches to the error state. The cause of the error is entered into the module register 0000 *Module state*.

#### MR 0000

##### Module state

Module register 0000 displays status and error messages of the module and all analog channels.

Property	Description
Type of access	Read
Value range	32 bits, bit-coded
Value after reset	Depending on state and error messages of the module

Property	Description	
<b>Meaning of the bits</b>		
<b>Bit 0</b>	<b>Hardware error</b>	
	0 =	No error
	1 =	Hardware error Bit 0 can be set after a delay when bit 4 and bit 7 have been set. The exact error cause can be determined by means of bits 4 ... 7.
<b>Bit 4</b>	<b>Calibration value error</b>	
	0 =	Reference values have been read correctly
	1 =	Hardware error when reading the stored reference values. The error cannot be fixed by the user. Please contact Support.
<b>Bit 6</b>	<b>DA converter error</b>	
	0 =	No error
	1 =	Hardware error when reading the output values of the DA converter. The error can be acknowledged by means of command 5 <i>Acknowledging hardware errors</i> . If the error persists, the hardware is defective. Please contact Support.
<b>Bit 7</b>	<b>Internal voltage error</b>	
	0 =	No error
	1 =	At least one internal voltage reading is or was not within the permitted limits. The error bit is set by the JX3-AO4 module. The error can be acknowledged by executing command 5 <i>Acknowledging hardware errors</i> . If the error persists, the hardware is defective. Please contact Support.
<b>Bit 19</b>	<b>Collective bit: Value below lower limit</b>	
	0 =	No error
	1 =	The value of at least one analog channel is below the configured lower limit. The bit is set by the JX3-AO4 module when the value falls below the limit. It is not reset by the module. The bit must be reset by the user. Acknowledge bit 19 in MR 1y00, then enter command 6 into MR 0001.
<b>Bit 20</b>	<b>Collective bit: Value exceeds upper limit</b>	
	0 =	No error
	1 =	The configured upper limit of at least one analog channel has been exceeded. The bit is set by the JX3-AO4 module when the value exceeds the limit. It is not reset by the module. The bit must be reset by the user. Acknowledge bit 20 in MR 1y00, then enter command 6 into MR 0001.

Property	Description	
<b>Bit 23</b>	<b>Collective bit: Forcing</b>	
	0 =	Forcing is not active
	1 =	Forcing is active for at least one analog channel Forcing can be enabled and disabled by way of commands via the command register of the analog output.
<b>Bit 24</b>	<b>Monitoring internal voltages</b>	
	0 =	Monitoring is not active
	1 =	Monitoring is active Monitoring can be enabled and disabled by way of commands.
<b>Bit 30</b>	<b>Synchronous data exchange</b>	
	0 =	Data exchange between the JX3-AO4 module and the bus head or controller is asynchronous.
	1 =	Data exchange between the JX3-AO4 module and the bus head or controller is synchronous.

Tab. 23: Module state

## 8.5 Module commands

Commands enable or disable module functions.

### MR 0001

#### Module-specific command registers

MR 0001 is used to configure functions provided by the module.

Property	Description
Type of access	Read/write
Value range	32 bits
Value after reset	0
<b>Command</b>	
<b>3</b>	<b>Disabling monitoring of internal voltages</b>
	Disables the monitoring function.
<b>4</b>	<b>Enabling monitoring of internal voltages</b>
	Enables the monitoring function.
<b>5</b>	<b>Acknowledging hardware failures</b>
	Resets all error bits written to module register <i>module state</i> .
<b>6</b>	<b>Acknowledging collective bits</b>
	Resets all collective bits written to module register <i>module state</i> .

Tab. 24: Command register of analog output

## 8.6 Analog outputs 1 ... 4

### 8.6.1 Address ranges of analog outputs

#### Introduction

Each output and some of the additional functions have got an address range of their own. The address ranges of the different outputs are structured in a way that the same functions of different outputs have the same register number ending (last two places).

#### Meaning of the variable "y" in this user manual

The variable "y" stands for identical functions provided by different outputs. The variable "y" as the second digit of the register number (e.g. 1y00) identifies the output.

Register range	y	Description
MR 1100 ... 1199	y = 1	Module registers of analog output 1
MR 1200 ... 1299	y = 2	Module registers of analog output 2
MR 1300 ... 1399	y = 3	Module registers of analog output 3
MR 1400 ... 1499	y = 4	Module registers of analog output 4

**Tab. 25:** Meaning of the variable "y" in this user manual

#### Examples of module registers

- The status register of all outputs is 1y00.
- The command register of all outputs is 1y01.
- etc.

### 8.6.2 Forcing analog outputs

When forcing analog outputs, the JX3-AO4 module's analog outputs return a configurable voltage or current value. The returned voltage or current value depends on the value in MR 0002 ... 0005 *Digital value of analog output y*.

#### Operating principle

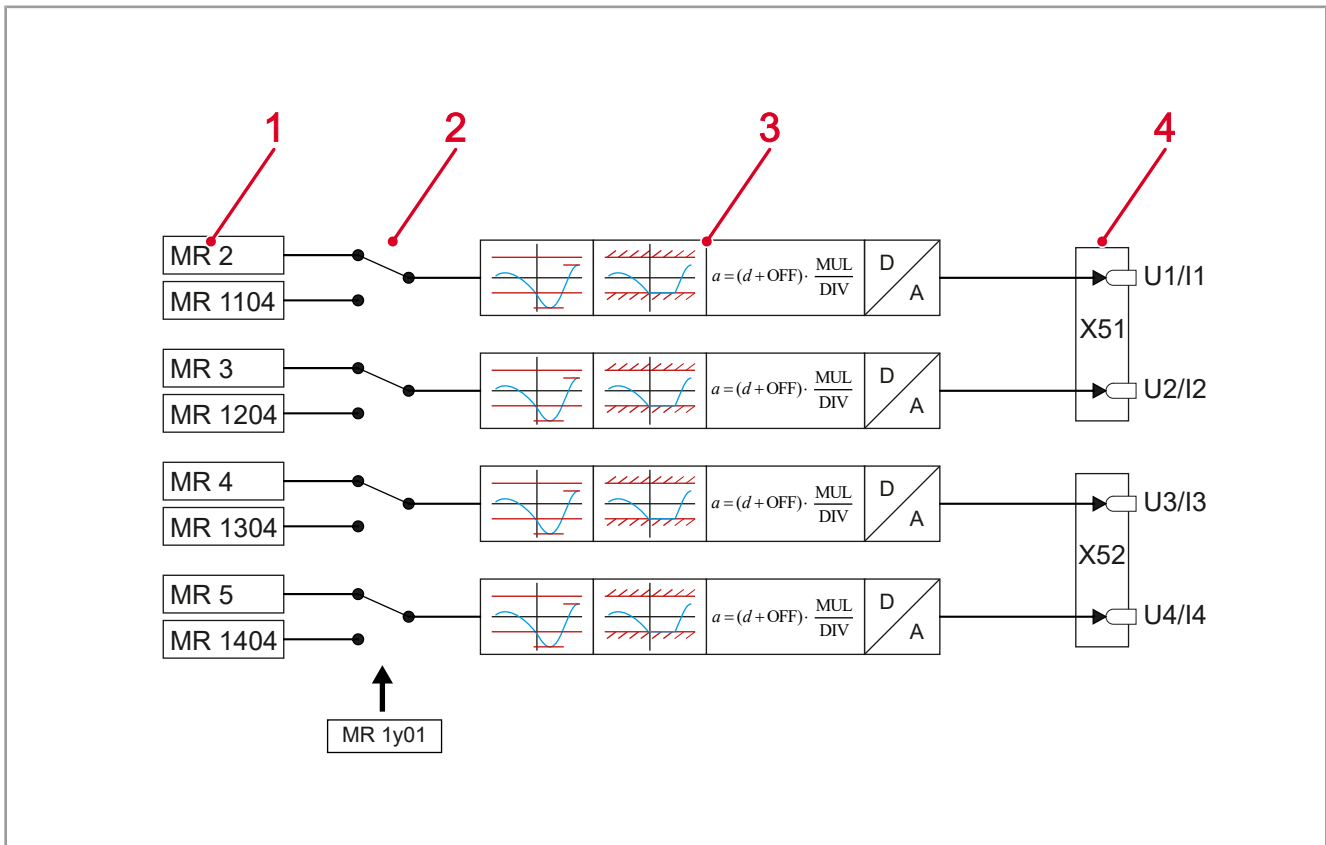


Fig. 22: The functioning principle of forcing

Step	Description
1	Writing an analog output value as digital value to MR 0002 ... 0005 or setting a force value in MR 1y04
2	Enabling forcing via MR 1y01 <i>Command for analog output y</i>
3	Digital-to-analog value conversion
4	Voltage or current value output at terminals X51 or X52

#### Enabling the forcing function

- Enter the value 31 in MR 1y01 *Command for analog output y*.
  - ⇒ Forcing has been enabled.
  - ⇒ Bit 23 = 1 in MR 0000 and MR 1y00.
- Enter the force value for the analog output in MR 1y04.

#### Disabling the forcing function

- Enter the value 30 in MR 1y01 *Command for analog output y*.
  - ⇒ Forcing has been disabled.
  - ⇒ Bit 23 = 0 in MR 0000 and MR 1y00.
- Set an analog value via MR 0002 ... 0005 *Digital value of analog output y*.

### 8.6.3 Monitoring the state by means of collective bits

The JX3-AO4 module signals the state of individual analog outputs by means of collective bits in MR 0000 *Module state*. This allows the system to respond to the state of an individual analog output by just polling MR 0000 from within the application program.

#### Advantages

Monitoring the state of analog outputs by means of collective bits offers the following benefit:

- You can read the state of all 4 analog outputs from within the application program by just polling MR 0000.

#### States

The collective bits signal the following states:

- Value below lower limit
- Value above upper limit
- Forcing function enabled

#### Collective bits – signalization

A collective bit in MR 0000 *Module state* is set if at least one corresponding status bit in MR 1y00 *State of analog output y* is set and JX3-AO4 module signals the state.

#### Acknowledging collective bits

The application program detects, if a collective bit was set in MR 0000 *Module state* and checks, if the bits 19 ... 23 are set in MR 1100 ... 1400 (= *state of analog outputs 1 ... 4*).

The application program deletes the collective bits in MR 0000 *Module state* when command 6 is written to MR 0001 *Command*.

### 8.6.4 Register description

#### MR 1y00

##### Status register of analog output y

The module uses MR 1y00 to signal status notifications of analog output y.

Property	Description
Type of access	Read
Value range	32 bits, bit-coded
Value after reset	0x00000100
<b>Meaning of the bits</b>	
<b>Bit 8</b>	<b>Writing error values</b>
	0 =      On error, write present analog output value.
	1 =      On error, write configured analog output value from MR 1y10.
<b>Bit 19</b>	<b>Value below lower limit</b>
	1 =      Value is below the limit configured in MR 1y08.
<b>Bit 20</b>	<b>Value exceeds upper limit</b>
	1 =      Value is above the limit configured in MR 1y09.

Property	Description	
Bit 23	<b>Forcing</b>	
	0 =	Forcing is not active
	1 =	Forcing is enabled for this analog output. Forcing can be enabled and disabled by way of commands via the command register of the analog output.

**Tab. 26:** Status register of analog output y

## MR 1y01

### Command register for analog output y

Use MR 1y01 to configure the functions provided by the module. You can enable and disable the functions of the analog output using commands.

Property	Description
Type of access	Read/write
Value range	32 bits
Value after reset	0
<b>Command</b>	
6	<b>Acknowledging the collective bits of an analog output</b>
	Resets all collective bits written to MR 1y00.
20	<b>On error, leave analog value unchanged</b>
	The value at the analog output remains unchanged.
21	<b>On error, output the error value</b>
	In the event of an error, the user-defined scaling computes an analog value from MR 1y10. which is then output.
30	<b>Disabling the forcing function</b>
	The analog outputs give the values stored in MR 0002 ... 0005.
31	<b>Enabling the forcing function</b>
	The analog outputs give the value stored in MR 1y04.

**Tab. 27:** Command register of analog output

## MR 1y04

### Force value

MR 1y04 allows you to simulate a value for analog output y.

Property	Description
Type of access	Read/write
Value range	-32,768 ... 32,767
Value after reset	0

**Tab. 28:** Force value

## 8.7 Converting digital values to analog

In subsequent steps, the JX3-AO4 module converts the digital values in MR 0002 ... 0005 to analog values. Using additional functions, you can adjust the digital value of any analog output to meet application-specific demands. The following additional functions can be configured separately for each analog output:

- Trailing indicator
- Monitoring of limit values
- Application-specific scaling

### Operating principle

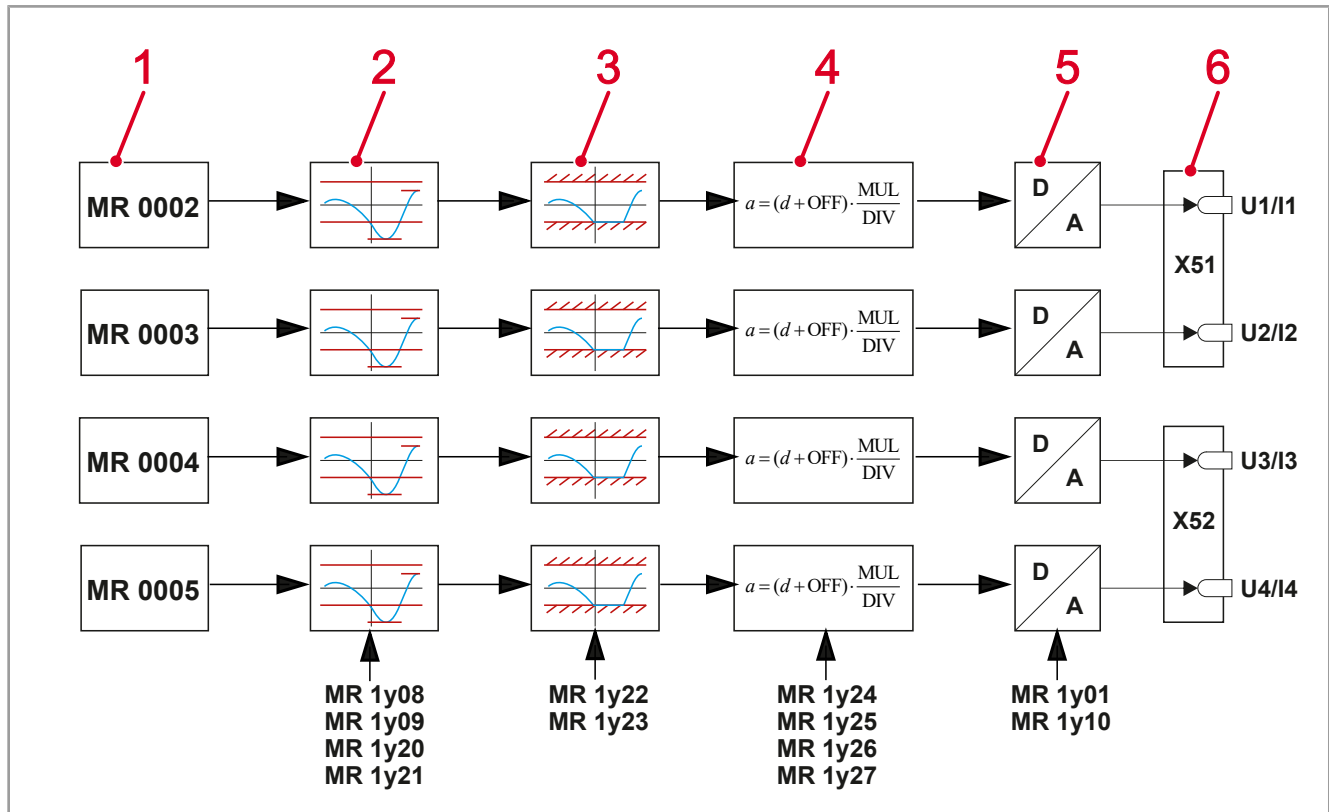


Fig. 23: Overview of additional functions

Abbreviation	Corresponding module register	Name in the hardware manager and module headers	Task
MUL	MR 1y13	factor	Conversion of process values in MR 0002 ... 0005 to output values
DIV	MR 1y14	divisor	
OFF	MR 1y15	offset	

Tab. 29: Register names

Step	Description
1	Digital values in MR 0002 ... 0005.
2	Monitoring of limits / trailing indicator
3	Capping of values to configured limits
4	Application-specific scaling
5	D/A conversion
6	Voltage or current value output at terminals X51 or X52

### 8.7.1 Digital values in MR 0002 ... 0005

The controller writes the analog output value as digital value to MR 0002 ... 0005.

#### Register description

#### MR 0002 ... 0005

#### Digital value of analog output y

The digitized values of an analog output can be read from the respective MR 0002 ... 0005. The value is output at the terminals.

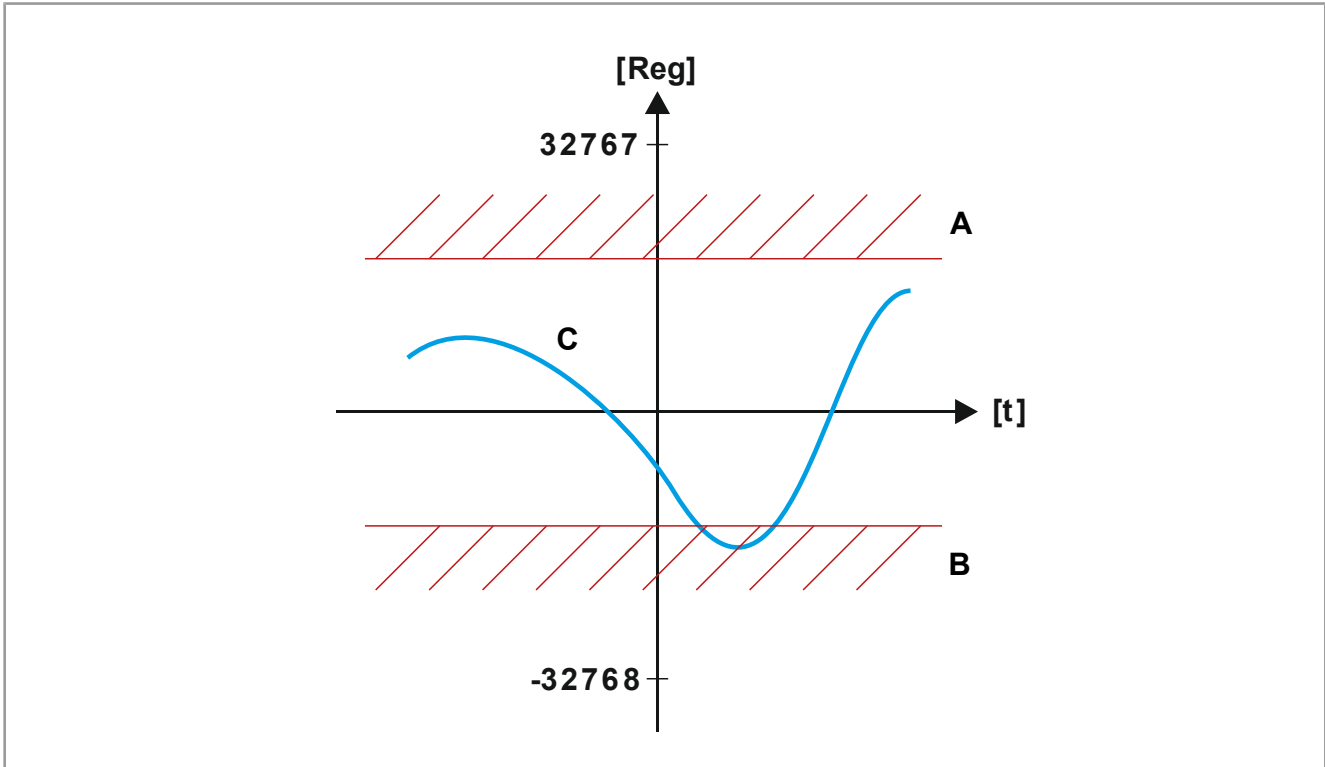
Property	Description	
Register assignment	MR 0002	Digital value for analog output 1
	MR 0003	Digital value for analog output 2
	MR 0004	Digital value for analog output 3
	MR 0005	Digital value for analog output 4
Type of access	Read/write	
Value range	Configuration -10 V ... +10 V	-32,768 ... 32,767
	Configuration 0 V ... +10 V	0 ... 32,767
	Configuration 0 mA ... 20 mA	0 ... 32,767
Value after reset	0	

**Tab. 30:** Digital value of analog output y

### 8.7.2 Monitoring of limit values

With each conversion procedure, the JX3-AO4 module checks the converted value against specified upper and lower limits. defined by the user for each analog output individually.

**Illustration**



**Fig. 24:** Monitoring of limit values

A	Upper limit	B	Lower limit
C	Digital value of analog output y		

**Operating principle**

The JX3-AO4 module verifies the limit values as follows:

If a value is above or below the set limits, the system sets the corresponding bit in the channel state MR 1y00 and the collective bit in the module state MR 0000. This bit even continues to be set, if the value is again within the permissible thresholds.

**Reset**

There are 2 options for resetting the bits in the channel state MR 1y00:

- ▶ Write Null (= false) to the bit(s)

or

- ▶ Write command 6 (= reset state bits) to the channel command MR 1y01.

**NOTICE! The collective bit in the module state MR 0000 remains active. To reset this bit, write the value 6 (= reset state bit) to the module command MR 0001.**

**Registers - Description**

**MR 1y08**

**Lower limit**

Define the lower limit value in MR 1y08. With each conversion procedure, the JX3-AO4 module checks the converted value against the specified lower limit.

Property	Description
Type of access	Read/write
Value range	-32,768 ... 32,767
Value after reset	-32,768

**Tab. 31:** Lower limit

**MR 1y09**

**Upper limit**

Define the upper limit value in MR 1y08. With each conversion procedure, the JX3-AO4 module checks the converted value against the specified upper limit.

Property	Description
Type of access	Read/write
Value range	-32,768 ... 32,767
Value after reset	32,767

**Tab. 32:** Upper limit

### 8.7.3 Trailing indicator

With each conversion procedure, the JX3-AO4 module updates the trailing indicators for the lower and upper limits. The trailing indicators show the lowest and highest values that have been output to date. The trailing indicator contents are not kept when the module is switched off.

#### Initialization

After power-up, the JX3-AO4 module automatically initializes the trailing indicators for minimum and maximum value.

#### Illustration

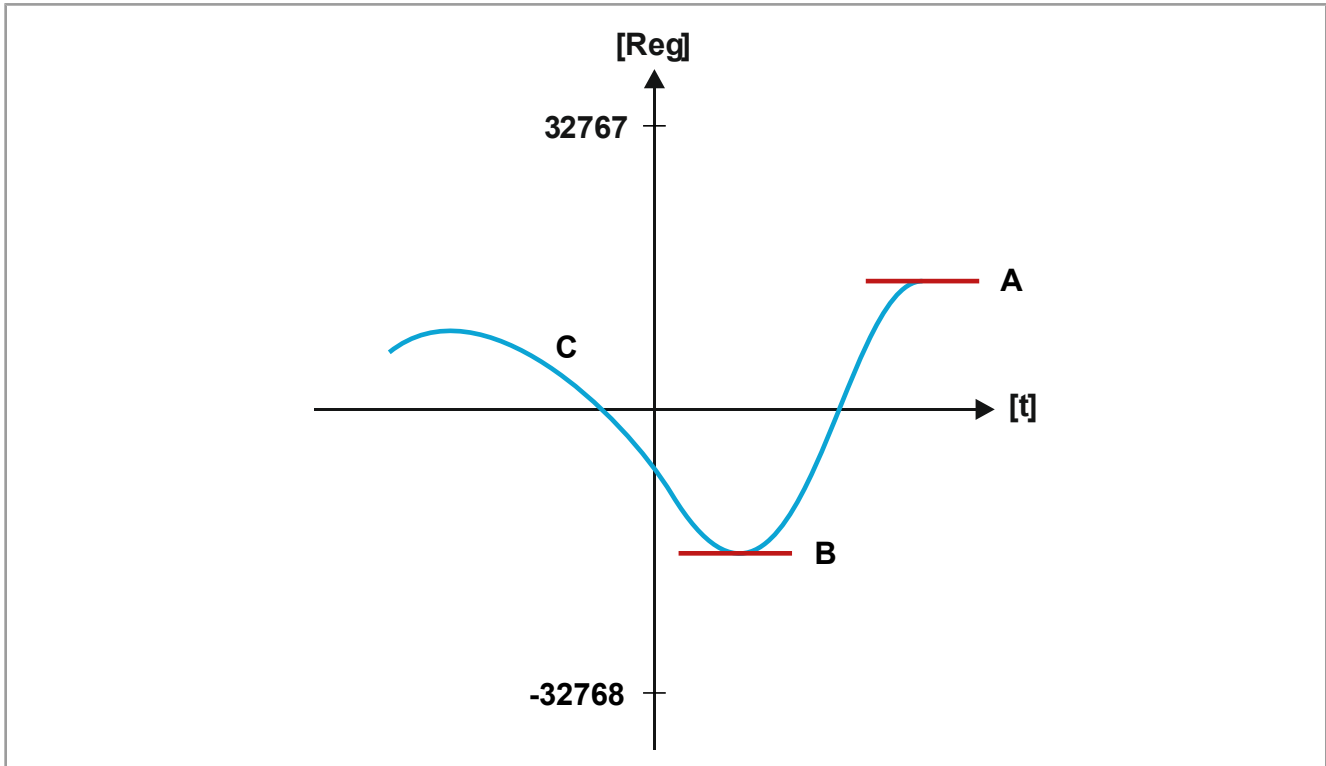


Fig. 25: Trailing indicator

A	Trailing indicator for maximum value	B	Trailing indicator for minimum value
C	Digital value of analog output y		

#### Operating principle

The JX3-AO4 module checks the trailing indicators as follows:

Step	Description	
1	The module receives a new value in MR 0002 ... 0003 <i>Digital value of analog output y.</i>	
2	<b>If the result is ...</b>	<b>... then ...</b>
	< MR 1y20,	MR 1y20 = Digital value of analog output y
	> MR 1y21,	MR 1y21 = Digital value of analog output y

**Registers - Description**

**MR 1y20**

**Trailing indicator for minimum value**

MR 1y20 contains the lowest value converted as yet.

Property	Description
Type of access	Read/write
Value range	-32,768 ... 32,767
Value after reset	-32,768

**Tab. 33:** Trailing indicator for minimum value

**MR 1y21**

**Trailing indicator for maximum value**

MR 1y21 contains the highest value converted as yet.

Property	Description
Type of access	Read/write
Value range	-32,768 ... 32,767
Value after reset	-32,768

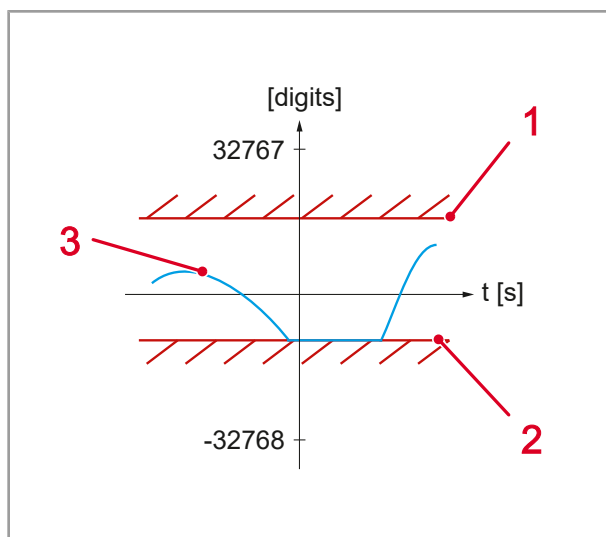
**Tab. 34:** Trailing indicator for minimum value

**8.7.4 Upper and lower capping limits**

After power-up, the user-defined upper and lower capping limits are disabled. To enable them, write the corresponding values to MR 1y22 and MR 1y23.

This caps any value outside the limits to set thresholds.

**Illustration**



**Fig. 26:** Upper and lower capping limits

1	Upper cap, MR 1y23
2	Lower cap, MR 1y22
3	Digital value of analog output y (y = 1 ... 4), MR 0002 ... 0005

Module register	1y22
Description	Lower capping limit of analog output y (y = 1 ... 4)
	The module applies the lower capping limit to each new digital value of the analog output y.
Type of access	Read/write
Value range	-32,768 ... 32,767
Value after reset	-32,768
Takes effect	Immediately after a value was written

Module register	1y23
Description	Upper capping limit of analog output y (y = 1 ... 4)
	The module applies the upper capping limit to each new digital value of the analog output y.
Type of access	Read/write
Value range	-32,768 ... 32,767
Value after reset	-32,768
Takes effect	Immediately after a value was written

### 8.7.5 Application-specific scaling

After power-up, user-defined scaling is disabled. It is enabled by setting two vertex pairs. Each vertex pair represents the voltage respectively current value and a digital value. The module then calculates an offset, multiplier and divisor for scaling the digital values. Scaling follows a straight-line equation. User-defined scaling is computed directly before A/D conversion.

Module register	1y24	
Description	First voltage/current value	
	The voltage/current value of the first vertex pair is entered into module register 1y24.	
Type of access	Read/write	
Value range	Configuration -10 V ... +10 V	-10,000 ... +10,000 [mV]
	Configuration 0 V ... +10 V	0 ... +10,000 [mV]
	Configuration 0 mA ... 20 mA	0 ... 20,000 [ $\mu$ A]
Value after reset	-10,000	
Takes effect	After write access to module register 1y27	

Module register	1y25
Description	First digital value
	The digital value of the first vertex pair is entered into module register 1y25.
Type of access	Read/write
Value range	-32,768 ... 32,767
Value after reset	-32,768
Takes effect	After write access to module register 1y27

Module register	1y26	
Description	Second voltage/current value	
	The voltage/current value of the second vertex pair is entered into module register 1y26.	
Type of access	Read/write	
Value range	Configuration -10 V ... +10 V	-10,000 ... +10,000 [mV]
	Configuration 0 V ... +10 V	0 ... +10,000 [mV]
	Configuration 0 mA ... 20 mA	0 ... 20,000 [ $\mu$ A]
Value after reset	+10,000	
Takes effect	After write access to module register 1y27	

Module register	1y27
Description	Second digital value
	The digital value of the second vertex pair is entered into module register 1y27.
Type of access	Read/write
Value range	-32,768 ... 32,767
Value after reset	+32,768

### Configuring the registers – process steps

It is mandatory that the following steps be executed in the given order to ensure that the scaling procedure is successful.

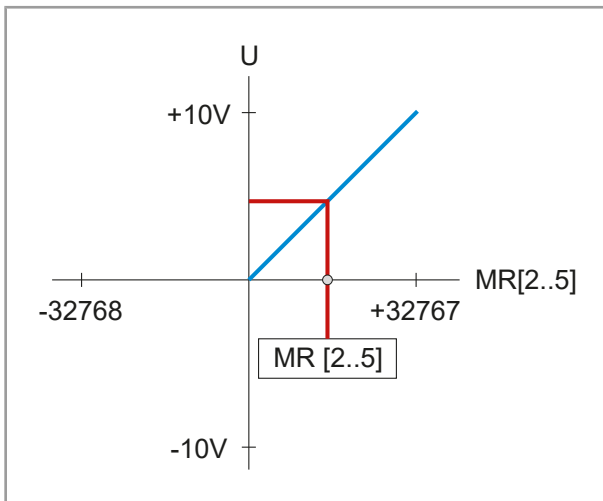
- In MR 1y07, set up the configuration.
  - ⇒ The physical unit, [ $\mu$ A] or [mV], for MR 1y24 and 1y26 has been defined.
- Finalize the scaling settings using MR 1y24 ... 1y27 as described in [Application-specific scaling \[▶ 50\]](#).
  - ⇒ The 4 values will be checked only after MR 1y27 was written to. If the values prove to be correct, a new set of MUL, DIV and OFF conversion values is written to the registers MR 1y13 ... 1y15.
  - ⇒ Output values will be scaled to the user-defined setting.

### 8.7.6 D/A conversion

In subsequent steps, the JX3-AO4 module converts the digital values in MR 0002 ... 0005 to analog values.

#### Converting voltage readings

##### Conversion



**Fig. 27:** Converting voltage readings

If a voltage range was configured, the JX3-AO4 module converts a digital value to a voltage value. according to the following formula:

$$MR[2...5] = U \cdot \frac{32767}{10V}$$

## 8.8 Module registers of the analog outputs

Properties of the module registers		
Assignment		
0002	Channel 1	
0003	Channel 2	
0004	Channel 3	
0005	Channel 4	
Type of access	Read/write	
Data type	Integer	
Value ranges	-10 V ... +10 V	-32,768 ... 32,767
	0 V ... +10 V	0 ... 32,767
	0 mA ... 20 mA	0 ... 32,767
Value after reset	0	

Voltage range		Current range	
Voltage	Module register	Current	Module register
+10 V	32,767	20 mA	32,767
+4.9998 V	16,383	9.99969 mA	16,383
0	0	0 mA	0
-4.9998 V	-16,383	0 mA	< 0
-10.000 V	-32,768		

Tab. 35: Conversion examples of frequently used values

## 8.9 Configuring an analog channel

Module register	1y07	
Description	Configuring the voltage or current ranges of an analog channel	
Type of access	Read/write	
Value after reset	1	Range -10 V ... +10 V
	5	Range 0 V ... +10 V
	6	Range 0 mA ... 20 mA

## 8.10 Scaling a pressure value - Example

The user wants to set a pressure range between 0 ... 6 bar by means of a pneumatic proportional valve with an electric current interface. The proportional valve controls the pressure to 0 bar, if the output current is 4 mA. If the output current is 20 mA, the pressure is controlled to 6 bar.

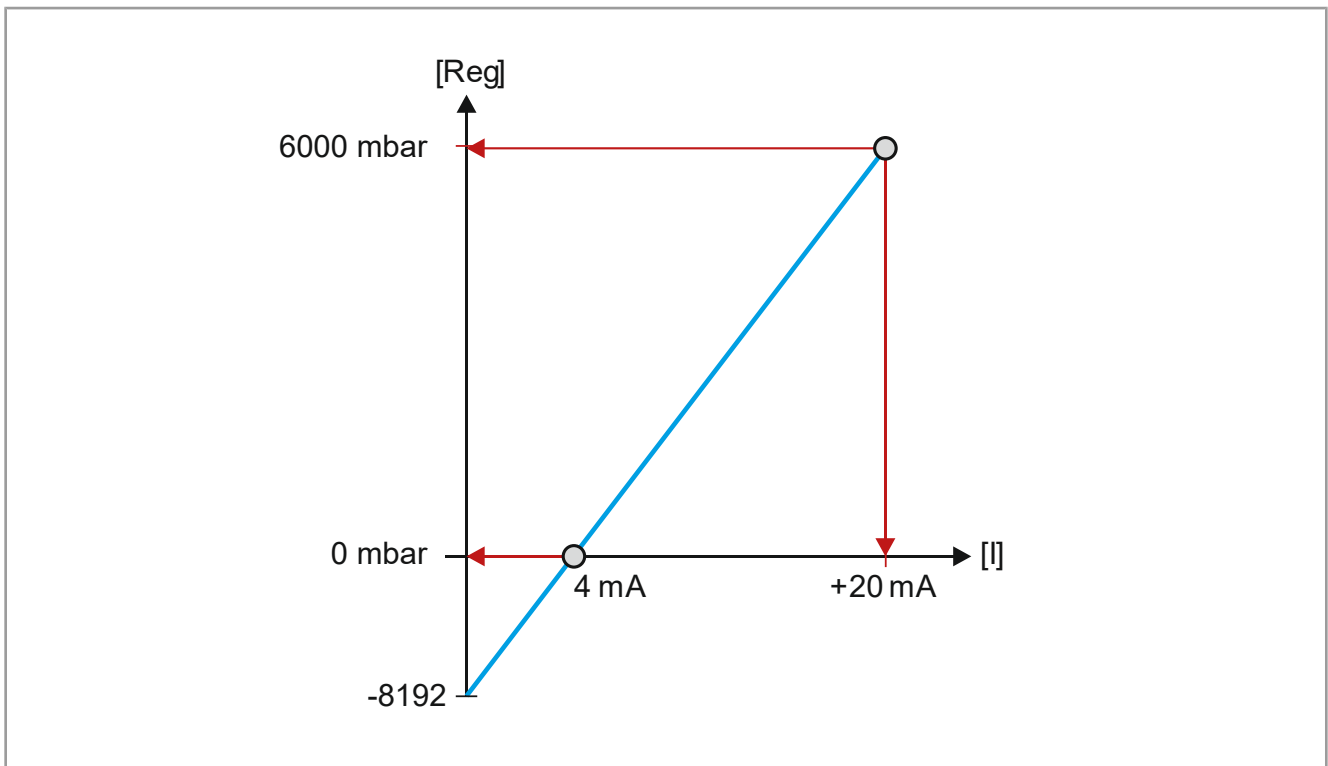


Fig. 28: Scaling a pressure value

The conversion function of the measured values is defined by two vertex pairs. A current of 4 mA corresponds to 0 bar. A current of 20 mA corresponds to 6 bar. The configuration requires the current unit to be microampere and the pressure to be mbar.

To set up the application-specific scaling you need to define the configuration and two points:.

- MR 1y07 = 6 [current output]
- MR 1y24= 4000 [ $\mu$ A]
- MR 1y25= 0 [mbar]
- MR 1y26= 20000 [ $\mu$ A]
- MR 1y27= 6000 [mbar]

## 8.11 User-configurable behavior under fault condition

If the module detects an error event, its analog outputs give a defined voltage or current.

In the following error event, the defined value is written to the analog outputs:

- Cyclic data exchange with the bus node or the controller is interrupted.

Possible use case:

- If the bus node and controller are disconnected, the module outputs a voltage of 0 V to a connected proportional valve. The proportional valve interrupts the flow.

Behavior after power-up:

On error, all analog outputs of the module give 0 V or 0 mA after power-up.

Command MR 1y01	
20	On error, the present output value of the analog output remains unchanged.
21	On error, the value of MR 1y10 is output.

Module register	1y10
Description	Value on error
	Definition of the value for analog output y
Type of access	Read/write
Value range	-32,768 ... 32,767
Value after reset	0

## 8.12 Oscilloscope Function

The JX3-AO4 module features an integrated oscilloscope function. The oscilloscope function enables you to record values from several module registers.

### Info

#### JetSym

The JetSym programming tool lets you operate the oscilloscope function and have the recorded values displayed as diagrams in a very convenient way.

### Technical specifications

Parameter	Description
Recording interval	1 ms ... 65,535 ms
Number of channels	4 max.

Parameter	Description
Number of readings per channel	300 max.
Recordable module registers	MR 0002: Digital value of analog output 1 MR 0003: Digital value of analog output 2 MR 0004: Digital value of analog output 3 MR 0005: Digital value for analog output 4
Module registers that can a assigned a trigger condition	MR 0002: Digital value of analog output 1 MR 0003: Digital value of analog output 2 MR 0004: Digital value of analog output 3 MR 0005: Digital value for analog output 4

Tab. 36: Oscilloscope – technical specifications

### Applications

The following applications are possible:

- Graphical visualization of output values, e.g. for documentation purposes.

### 8.12.1 Start/Stop Recording

In start/stop recording mode, the JX3-AO4 module records values until the maximum number of measured values per channel is reached. Initiate the start/stop recording mode via command 1.

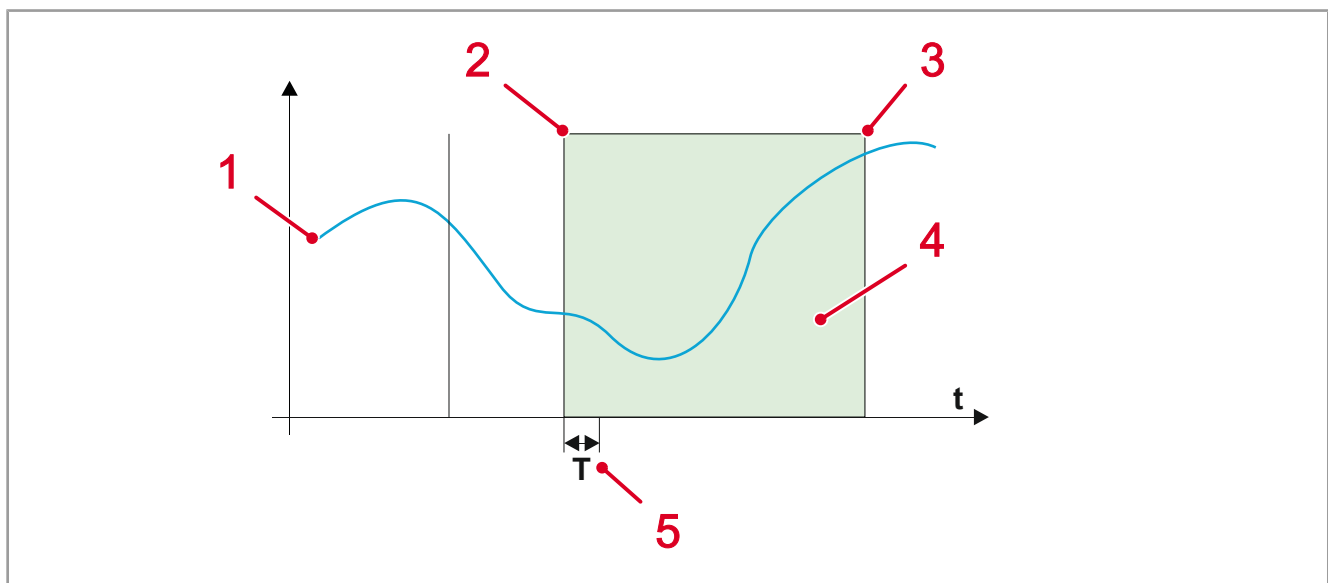


Fig. 29: Start/stop recording mode

1	Values of the module register selected for recording.
2	Starting point of the recording
3	Endpoint of the recording
4	Recorded values
5	Recording interval

### Configuration

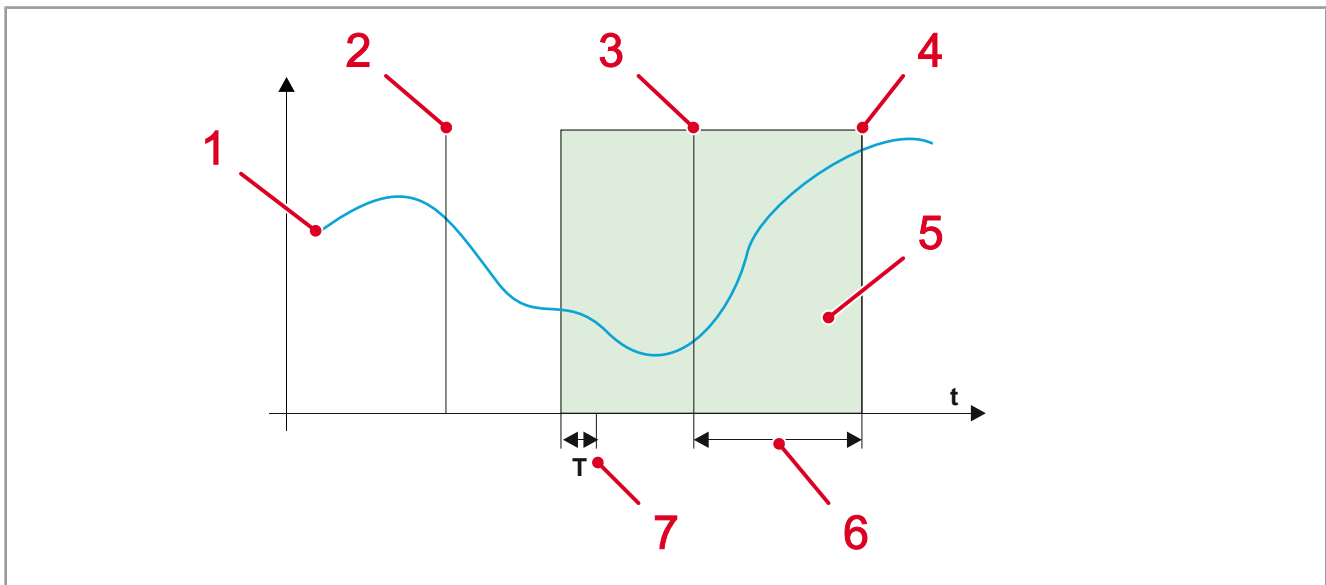
Configuration of the start/stop recording mode includes the following steps:

1. Configure the module registers to be recorded.  
MR 9741 := 11 ... 14;  
MR 9742 := module register number;
2. Configure the recording interval.  
MR 9741 := 10;  
MR 9742 := recording interval;

3. Write value 1 to MR 9740 *Command oscilloscope*.
  - ⇒ The JX3-AO4 module starts recording.
  - ⇒ The JX3-AO4 module continues to record values until the maximum number of measured values per channel has been recorded.
4. Check bit 0 of the *Status* parameter.
  - MR 9741 := 0;
  - If bit 0 = 0 in MR 9742, the module has finished recording.

### 8.12.2 Continuous recording mode

In continuous recording mode, the JX3-AO4 module continually records measured values. If you call *Stop* command (command 2), the JX3-AO4 module continues recording values until the post buffer is full. To initiate the continuous recording mode, enter command 4.



**Fig. 30:** Continuous recording mode

1	Values of the module register to be recorded
2	Continuous recording starts
3	Stop command is called
4	Continuous recording stops; post buffer is full
5	Recorded values
6	Size of the post buffer
7	Recording interval

### Configuration

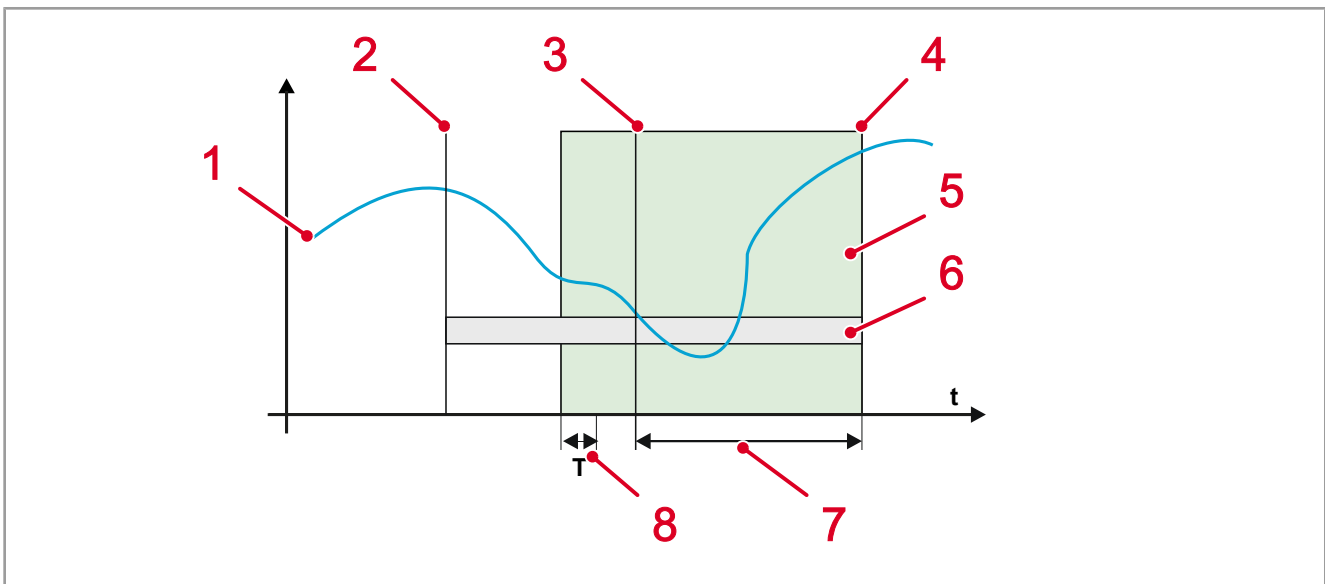
Configuration of the continuous recording mode includes the following steps:

1. Configure the module registers to be recorded.
  - MR 9741 := 11 ... 14;
  - MR 9742 := module register number;
2. Configure the recording interval.
  - MR 9741 := 10;
  - MR 9742 := recording interval;
3. Configure the size of the post buffer.
  - MR 9741 := 30;
  - MR 9742 := percentage of the maximum number of measured values per channel;

4. Write value 4 to MR 9740 *Command oscilloscope*.  
 ⇒ The JX3-AO4 module starts recording.
5. Stop the recording by writing value 2 to MR 9740 *Command oscilloscope*.
6. The JX3-AO4 module continues to record values until the post buffer is full.
7. Check bit 0 of the *Status* parameter.  
 MR 9741 := 0;  
 If bit 0 = 0 in MR 9742, the module has finished recording.

### 8.12.3 Recording with Trigger Condition

When recording with trigger condition, the JX3-AO4 module constantly records measured values. As soon as the trigger condition is met, recording continues until the post-buffer is filled with values. Recording with trigger condition is started via command 3.



1	Values of the module register selected for recording.
2	Start time of recording with trigger condition
3	Trigger condition met
4	Continuous recording stops; post buffer is full
5	Recorded values
6	Value range of trigger condition
7	Size of the post buffer
8	Recording interval

#### Trigger Condition

The JX3-AO4 module checks the trigger condition using the following rules:

- The value in the module register for trigger # 1 must be greater than a configured value.
- The value in the module register for trigger # 2 must be smaller than a configured value.
- The module register numbers for trigger # 1 and 2 can be different.

**MR [trigger 1] > VAL [trigger 1]**

**AND**

**MR [trigger 2] < VAL [trigger 2]**

Element	Description
MR [Trigger 1]	Value in module register for trigger 1
VAL [Trigger 1]	Value for trigger 1
MR [Trigger 2]	Value in module register for trigger 2
VAL [Trigger 2]	Value for trigger 2

## Configuration

Recording with trigger condition is configured as follows:

- Configure the module registers to be recorded:  
MR 9741 := 11 ... 14;  
MR 9742 := module register number;
- Configure the recording interval:  
MR 9741 := 10;  
MR 9742 := recording interval;
- Configure the size of the post-buffer:  
MR 9741 := 30;  
MR 9742 := percentage of the maximum number of measured values per channel;
- Configure trigger # 1:  
MR 9741 := 20;  
MR 9742 := module register number for trigger # 1;  
MR 9741 := 21;  
MR 9742 := value for trigger # 1;
- Configure trigger # 2:  
MR 9741 := 22;  
MR 9742 := module register number for trigger # 2;  
MR 9741 := 23;  
MR 9742 := value for trigger # 2;
- Write value 3 to MR 9740 *Command oscilloscope*.  
⇒ The JX3-AO4 module starts recording.  
⇒ The JX3-AO4 module constantly checks the trigger condition.  
If the trigger condition is met, the JX3-AO4 module continues to record values until the post-buffer is filled.
- Check bit 0 of parameter *Index*.  
MR 9741 := 0;  
If bit 0 = 0 in MR 9742, the module has finished recording.

### 8.12.4 Reading Out Recorded Values

The JX3-AO4 module stores recorded values in a volatile memory area. The recorded data are lost when the module is switched off. Also, if a new recording cycle is started, these values are overwritten.

#### Reading Out the Recorded Values

To read out the recorded values, proceed as follows:

- Check bit 0 of parameter *Status*.  
MR 9741 := 0;  
If bit 0 = 0 in MR 9742, the module has finished recording.

2. Enter the value 0 into MR 9743 *Index of recorded values*.  
MR 9743 := 0;
3. Each read access to MR 9744 *Recorded values* reads out the next recorded value.  
If you have read out MR 9744 300 times, then all recorded values from channel 1 have been read.
4. Enter the value 300 into MR 9743 *Index of recorded values*.  
MR 9743 := 300;
5. Each read access to MR 9744 *Recorded values* reads out the next recorded value.  
If you have read out MR 9744 300 times, then all recorded values from channel 2 have been read.
6. Enter the value 300 into MR 9743 *Index of recorded values*.  
MR 9743 := 600;

### 8.12.5 Register description

#### MR 9740

##### Command register Oscilloscope function

MR 9740 lets you configure the functionalities of the oscilloscope functions.

Property	Description
Type of access	Read/write
Value range	0 ... 4
Value after reset	0
<b>Command</b>	
<b>1</b>	<b>Starting a recording session</b> The module starts recording the previously configured values. Once the internal memory is full, the module stops recording.
<b>2</b>	<b>Stopping a recording session</b> The <i>Stop</i> command pauses a recording that has been started.
<b>3</b>	<b>Starting a recording session once a trigger condition is fulfilled</b> The module starts monitoring the trigger condition. Once the trigger condition is fulfilled, the module starts recording the values. Recording stops once the memory for the measured values is full.
<b>4</b>	<b>Starting continuous recording</b> The module starts recording immediately. Recording is continues until you call command <i>Stopping a recording session</i> .

Tab. 37: Command register Oscilloscope function

#### MR 9741

##### Parameter index

MR 9741 contains the parameter index. The parameter index is used to select the parameter for the oscilloscope function. The parameter value can then be read from or written to MR 9742.

Property	Description
Type of access	Read/write
Value range	0 ... 23

Tab. 38: Parameter index

**MR 9742****Parameter**

MR 9742 contains the parameter. The parameter is selected via the parameter index (MR 9741).

Index	Description
Type of access	Read/write
Value range	32 bits
Value after reset	0
<b>Parameter</b>	
<b>0</b>	<b>Status (read-only)</b>
	Bit 0 = 1      Recording
	Bit 1 = 1      Trigger enabled
<b>10</b>	<b>Sampling interval</b>
	The sampling interval defines the time period between recordings. The interval between 2 recordings (in milliseconds) results from the product of minimum sampling interval and sampling interval.
	Value range      1 ... 65,535
<b>11 ... 12</b>	<b>Module register number for channels 1 ... 2</b>
	Parameters 11 to 12 are used to configure the module registers to be recorded.
<b>20</b>	<b>Module register number for trigger 1</b>
	Number of the module register for trigger condition 1.
<b>21</b>	<b>Value for trigger 1</b>
	Value defined in module register for trigger condition 1.
<b>22</b>	<b>Module register number for trigger 2</b>
	Number of the module register for trigger condition 2.
<b>23</b>	<b>Value for trigger 2</b>
	Value defined in module register for trigger condition 2.
<b>30</b>	<b>Size of the post buffer</b>
	Value range      0 % ... 100 %

Tab. 39: Parameter

**MR 9743****Index of the recorded values**

The index is used to select recorded values.

**MR 9744****Recorded Values**

This module register is used to read recorded values.

## 9 Register overview

This register overview gives a condensed summary of the registers of the JX3-AO4 device as applies to the operating system version .

### Module code

Each module has a unique module code for identification purposes (see module register 100601 *Module code*).

- Module code JX3-AO4: 304

### General overview - Registers

Register range	Description
0000	Module-specific status register
0001	Module-specific command registers
0002 ... 0005	Analog channels 1 ... 4
0007 ... 0008	Indirect register access
0009, 0032, 0257	Version registers
1100 ... 1199	Configuration of analog channel 1
1200 ... 1299	Configuration of analog channel 2
1300 ... 1399	Configuration of analog channel 3
1400 ... 1499	Configuration of analog channel 4
9740 ... 9744	Oscilloscope

### Module state

Registers	Description
<b>0000</b>	<b>Module-specific status register</b>
Bit 0 = 1	Hardware error
Bit 4 = 1	Calibration value error
Bit 6 = 1	DA converter error
Bit 7 = 1	Internal voltage error
Bit 19 = 1	Collective bit: Value below lower limit

Registers	Description
Bit 20 = 1	Collective bit: Value above upper limit
Bit 23 = 1	Collective bit: Forcing
Bit 24 = 1	Voltage monitoring
Bit 30 = 1	Synchronous data exchange

### Module commands

Registers	Description
<b>0001</b>	<b>Module-specific command registers</b>
1	Enabling the single conversion operating mode
3	Monitoring of internal voltages OFF
4	Monitoring of internal voltages ON
5	Acknowledging hardware errors
6	Acknowledgment of collective bits

### Analog outputs

Registers	Description
0002	Analog output 1
0003	Analog output 2
0004	Analog output 3
0005	Analog output 4

### Revisions

Registers	Description
0009	OS version
0032	FPGA version
0257	Bootloader version

### Status of analog outputs

Registers	Description
<b>1y00</b>	<b>Status registers of analog output y (y = 1 ... 4)</b>
Bit 8 = 1	Error value output is active
Bit 19 = 1	Value below lower limit
Bit 20 = 1	Value above upper limit
Bit 23 = 1	Forcing function is enabled

## Command register for analog outputs

Registers	Description
<b>1y01</b>	<b>Command registers of analog output y (y = 1 ... 4)</b>
6	Acknowledging the channel state bit
20	On error, leave analog value unchanged
21	On error, output the error value
30	Forcing of analog output OFF
31	Forcing of analog output ON

## Configuration of analog output y

Registers	Description
<b>1y07</b>	<b>Configuration of analog output y (y = 1 ... 4)</b>
1	-10 V ... +10 V
5	0 V ... +10 V
6	0 mA ... 20 mA

## Application-specific scaling

Registers	Description
1y24	1 <sup>st</sup> voltage/current value for analog output y
1y25	1 <sup>st</sup> Digital value for analog output y
1y26	2 <sup>nd</sup> voltage/current value for analog output y
1y27	2 <sup>nd</sup> Digital value for analog output y

Registers	Description
1y13	Factor for analog output y
1y14	Divisor for analog output y
1y15	Offset value for analog output y

## Other configurations

Registers	Description
1y04	Force value for analog output y
1y08	Lower limit of analog output y
1y09	Upper limit of analog output y
1y10	Error value
1y13	
1y14	
1y15	
1y20	Trailing indicator for minimum value of analog output y
1y21	Trailing indicator for maximum value of analog output y
1y22	Lower cap limit
1y23	Upper cap limit

## Oscilloscope function

Register	Description
9740	Command
9741	Parameter index
9742	Parameter
9743	Data index
9744	Data

# 10 Maintenance

This product is maintenance-free. The operation of the product does not require inspection or maintenance efforts.

## 10.1 Repairs

Defective components can cause dangerous malfunctions and compromise safety.

Only the manufacturer is authorized to perform repair work.

It is forbidden to open the product.

### Product modifications

Modifications and alterations to the product and its functions are not allowed. The manufacturer exempts from liability for any modifications made to the product.

The original parts are specifically designed for the product. Parts and equipment from other manufacturers must not be used.

The manufacturer exempts from liability for any damage resulting from the use of non-original parts and equipment is excluded.

## 10.2 Storage and Shipment

### Storage

When storing the product, observe the environmental conditions given in chapter "Technical specifications".

### Shipment and packaging

The product contains electrostatically sensitive components which can be damaged if not handled properly. Damages to the product can impair its reliability.

To protect the product from impact or shock, it must be shipped in its original packaging, or in an appropriate protective ESD packaging.

If the packaging is damaged, inspect the device for any visible damage, and immediately inform your freight forwarder and Bucher Automation AG of the damage caused during shipment. It is strictly forbidden to use a product that has been damaged or dropped.

## 10.3 Return and Disposal

The WEEE icon (crossed-out wheeled bin) says that end users must not dispose of waste electrical and electronic equipment together with household waste, but separately in an appropriate way. Applicable local environmental directives and regulations must be complied with.



Fig. 31: WEEE icon – crossed out wheeled bin

### Disposal options

To do so, you may either resort to professional disposal service providers or return waste electronics to Bucher Automation AG.

Find detailed information along with the required Return Delivery Form on our [website](#).

### Batteries

Prior to disposing of waste electronics, remove any batteries where this is possible in a safe and non-destructive way. Dispose of batteries properly.

### Personal data

It is the responsibility of the end user to delete any personal data stored on waste electric and electronic equipment prior to disposal.

### Packaging material

The product's packaging materials must not be disposed of together with household waste. Find detailed information on how to return packaging material to Bucher Automation AG on our [website](#).

# 11 Service

## 11.1 Technical support

In case of questions, suggestions, or issues, please contact our experts from Technical Support. You may reach out by phone or through the contact form on our homepage:

[Technical Support | www.bucherautomation.com](http://www.bucherautomation.com)

Or email us:

[support@bucherautomation.com](mailto:support@bucherautomation.com)

Please supply the following information when contacting Technical Support:

- Hardware revision and serial number  
The hardware revision and serial number is printed on the nameplate of the product.
- OS version  
To determine the operating system version, use the functions of the development environment.

# 12 Spare parts and accessories

## NOTICE



### Inadequate accessories might cause damage to the product

Parts and equipment from other manufacturers might impede the function of the device and cause damage to the product.

- ▶ Only use accessories recommended by Bucher Automation AG.

## 12.1 Spare Parts

Component	Item number
Terminal labels	60870411
Key	60870410
Male connector in spring-cage technology, 10-pin	60869252
Male connector with PUSH-IN connection, 10-pin	60869254

Tab. 40: Spare parts

## 12.2 Accessories

### Info

#### Ordering Accessories

The accessories are not part of the scope of delivery.

Suitable accessories can be obtained from Bucher Automation AG.

Component	Item number
Screwdriver	60871712
End clamp for DIN rail	60863970
Strain relief	60870963

Tab. 41: Accessories

---

**Bucher Automation AG**

Thomas-Alva-Edison-Ring 10  
71672 Marbach/Neckar, Germany  
T +49 7141 2550-0  
[info@bucherautomation.com](mailto:info@bucherautomation.com)



[www.bucherautomation.com](http://www.bucherautomation.com)