BUCHER automation

User Manual



60888137_03

JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406

Servo amplifier

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Translation of the german original User Manual

Revision	1.03
Date of issue	4/22/2026

Table of Contents

1 Introduction 5
1.1 Information about the document 5
1.2 Typographical conventions 6
2 Safety 7
2.1 General 7
2.2 Purpose 7
2.2.1 Intended use 7
2.2.2 Non-intended use 7
2.3 Warnings Used 8
2.4 General safety instructions 9
2.5 Safety labels 13
3 Product description 15
3.1 Design 15
3.2 Product features 15
3.3 Status display 16
3.3.1 Diagnostic capability via the status display 17
3.4 Nameplate 20
3.5 Scope of delivery 21
3.6 Encoder options 22
4 Technical Specifications 25
4.1 Dimensions 25
4.2 Mechanical specifications 26
4.3 Output motor side 26
4.3.1 External braking resistor 26
4.4 Input mains side 27
4.4.1 Fuse types for UL applications 27
4.5 Ports and interfaces 27
4.6 Environmental conditions 28
4.7 External line filter 29
4.8 Derating 29
5 Mechanical installation 31
5.1 Mounting the servo amplifier 32
5.2 Removing the servo amplifier 34
5.3 Mounting the line filter 35
6 Electrical connection 37
6.1 EMC-compliant installation 38

6.1.1 Line filter ... 41
6.2 Removing the lower front cover ... 42
6.3 Connections ... 43
6.3.1 Connection X212 – EtherCAT® ... 45
6.3.2 Connection X1 – AC voltage supply ... 46
6.3.3 Connection X2 – motor connection axis 1 ... 47
6.3.4 Connection X3 – motor connection axis 2 ... 48
6.3.5 Connection X12 – DC 24 V supply ... 49
6.3.6 Connection X21 – motor holding brake axis 1 ... 50
6.3.7 Connection X22 – motor holding brake axis 2 ... 51
6.3.8 Connection X841, X842 – STO + SBC [S1] ... 52
6.3.9 Connection X843 – Extended safety function [S2] ... 54
6.3.10 Connection X210 – digital inputs ... 56
6.3.11 Braking resistors [–R] ... 57
6.4 Encoder plug-in slots ... 59
6.4.1 Encoder option -R / -S2R – resolver ... 60
6.4.2 Encoder options –H – HIPERFACE DSL® ... 61
6.4.3 Encoder option –A – External SinCos encoder ... 63
6.4.4 Encoder option –A – HIPERFACE® analog ... 64
6.4.5 Encoder option –I – incremental encoder ... 65
6.4.6 Encoder option –E6 – EnDat® 2.2 ... 66
7 Maintenance ... 67
7.1 Repairs ... 67
7.2 Storage and Shipment ... 67
7.3 Return and Disposal ... 68
8 Service ... 69
8.1 Technical Support ... 69
9 Spare parts and accessories ... 70
9.1 Spare parts ... 70
9.1.1 Mounting hardware ... 70
9.1.2 Front covers ... 70
9.1.3 Connector sets ... 70
9.2 Accessories ... 71
9.2.1 Pre-assembled cables ... 71
9.2.2 EtherCAT® cable ... 72
9.2.3 External line filter ... 72
9.2.4 Optional external brake resistors ... 72

1 Introduction

1.1 Information about the document

This document is part of the product and must be read and understood before using the device. It contains important and safety-related information to ensure that the product is used properly and in accordance with its intended purpose.

Target audiences

This document is intended for qualified personnel.
The device must only be put into operation by qualified and trained personnel.
Safe use of the device must be ensured at every stage of its life cycle. A lack of or insufficient technical and documentation knowledge will result in the loss of any liability claims.

Availability of information

Ensure that this information is readily available near the product throughout its entire service life.
Please check the Downloads section of our website for updates and the latest version of the document. This document is not subject to automatic version control.

Start | 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
– Software Updates
  Information about changes to your device's software and operating system

NOTICE



Related documents

When installing and connecting the servo amplifiers within the axis system, it is essential to also follow the operating instructions for the other devices as well as the *Function Description Integrated Safety Function S1 - JM-2000 and JM-D2000* . You can find the documentation at www.bucherautomation.com under
Product Page JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 > Downloads.

ⓘ Info

Further information

For more information on system immunity to interference, please refer to Application Note 016 *EMC-Compliant Control Cabinet Installation* at 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

At the time of its release, the product reflects the current state of science and technology.
In addition to the operating instructions, the laws, regulations, and guidelines of the country of use or the EU apply to the operation of the product. The operator is responsible for complying with the relevant accident prevention regulations and generally accepted safety standards.

2.2 Purpose

2.2.1 Intended use

The JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 servo amplifiers are components designed for installation in industrial and commercial systems and machines. Installation is only permitted in stationary equipment. You may only use the servo amplifier in closed control cabinets meeting the requirements of IP54 or higher, taking ambient conditions into account.

When the servo amplifier is installed in a machine, commissioning (i.e., commencement of intended use) of the servo amplifier is prohibited until it has been determined that the machine is in compliance with the Machinery Directive 2006/42/EC. Commissioning (i.e., commencement of intended use) is only permitted if the EMC Directive (2014/30/EU) is complied with.

2.2.2 Non-intended use

Use of the servo amplifier outside of the application areas given here or under operating ranges and ambient conditions other than those described in the documentation is considered non-intended use.

– The servo amplifier must not be used outside a control cabinet.

The following application areas are considered non-intended use:

– Installation in vehicles. Use of the device in non-stationary equipment is considered an exceptional environmental condition and is only permitted after special agreement.
– Installation in environments where there are hazardous oils, acids, gases, vapors, dusts, rays, etc.
– Use in special application areas (e.g. where there is a risk of explosion, corrosion or fire).
– Untypical generation of higher frequency on-board networks.

2.3 Warnings Used

⚠ 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.

2.4 General safety instructions

⚠ DANGER



Danger due to high electrical voltage

Touching live parts may result in death or severe injuries. Carry out the following steps before starting work to ensure safety:

- ► Prepare for shutting off the system. Inform everyone involved who will be affected by the process.
- ► Isolate the drive system from the power supply and secure it against being turned on again.
- ► Wait for the discharge time (approx. 3 minutes) and check all power connections to ensure they are at zero potential.
- ► Ground according to requirements.
- ► Cover over neighboring live parts.
- ► Ensure the drives cannot move.

⚠ DANGER



Danger due to high operating voltage

The high operating voltage may cause serious injury, or death.

Please follow these rules throughout the **entire work process.**

- ► Do not remove any cover plates and keep all control cabinet doors closed during operation.
- ► Check that all live connections are protected against contact.
- ► Do not open the device.
- ► Never touch the device's power supply and DC link terminals (X1, X2, and, for the JM-D2000, X3 as well) while the device is in operation.

⚠ DANGER



Risk of electric arc due to improper handling

Improper handling can cause an electric arc, which can lead to serious injuries or death.

- ► Open the plug connections only in de-energized state.
- ► Install the device only in an environment where there is no risk of fire, corrosion or explosion without any flammable gases or vapors.
- ► Observe the specified limit values for voltage.
- ► Wire according to regulations.

⚠ DANGER



Danger due to high electrical voltage

According to EN 61800-5-1, connecting thermal sensors to the encoder port (extra-low voltage) within the motor requires double or reinforced insulation .

⚠ WARNING



Risk of injury due to electric shock

Triggering the STO function does not include safe electric isolation. The device or equipment is not de-energized!

- ► Safe electric isolation requires the installation of additional isolating equipment, e.g. a mains switch, that disconnects power supply.

⚠ WARNING



Non-observance of safety instructions may result in injuries or physical damage

- ► Prior to assembling and installing the device, read and follow the safety precautions and restrictions of use as set out in the Safety chapter.
- ► Only authorized qualified personnel is allowed to perform any kind work on the device.

⚠ WARNING



Risk of crushing due to uncontrolled axis movements

High mechanical forces due to axis movements and accelerations.

- ► Keep out of the hazard zone of the machines.
- ► Do not disable any safety equipment.
- ► Have malfunctions eliminated by qualified personnel.

⚠ WARNING



Risk of burns due to hot surfaces

The device may become hot during operation and can cause burns if touched.

- ► Take protective measures to prevent inadvertent contact with the device, e.g. protective covers.
- ► Make sure that no temperature-sensitive parts, e.g. connection cables, are attached or fastened to the device.
- ► Ensure there is adequate heat dissipation and maintain the required distances during installation so as not to prevent or restrict ventilation.
- ► Allow the device to cool off for a while before carrying out cleaning or maintenance work.
- ► Wear personal protective equipment.

⚠ WARNING



Danger for persons with pacemakers and implants

Operating the device generates an electromagnetic field. Electric, magnetic and electromagnetic fields are a health risk in particular to persons with pacemakers and implants.

- ► If you belong to the above group of persons you must not be in the immediate vicinity of the device.
- ► Keep a minimum distance as specified below:
  300 mm from a de-energized device, for example when doing installation work;
  600 mm from an energized device running in normal operation.

⚠ WARNING



Risk of death due to falling loads during lifting and transport processes

Improperly performed lifting and transport processes as well as unsuitable or defective devices and tools can lead to severe or fatal injuries and material damage.

- ► Lifting devices, industrial trucks and load handling attachments must meet requirements.
- ► The load capacity of the lifting equipment and load handling attachments must be in line with the weight of the load being transported.
- ► Fasten and secure the load to be transported carefully to the lifting equipment.
- ► Do not stand in the swivel range of lifting equipment or under suspended loads.

⚠ WARNING



Risk of injury due to damaged safety labels

Damaged safety labels endanger people and cause property damage. Possible consequences include severe, potentially fatal injuries caused by moving parts and/or a fatal electric shock.

- ► Make sure that warning signs and safety signs are clearly legible and do not go missing.
- ► Replace them with exact duplicates if they are damaged or lost.

⚠ CAUTION



Risk from unwanted coastdown

Triggering the STO function by deactivating the digital input merely interrupts the energy supplied to the drive while the motor movement can no longer be controlled.

- ► Always stop the drive before you trigger the STO function.
- ► In case of suspended loads, install a mechanical brake to prevent the load from falling down.

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.

NOTICE



Material damage due to loose power connection

Vibrations or insufficient tightening torques can lead to loose power connections. This can lead to fire damage, defects in the device or malfunctions.

- ► Tighten all power connections to the specified tightening torques.
- ► Check all power connections at regular intervals, especially after transport.

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.

NOTICE



Damage due to incorrect storage

Incorrect or improper storage can lead to damage to the device, e.g. due to moisture and dirt.

- ► Avoid large temperature fluctuations and high humidity at the storage location.
- ► Protect the device against moisture and dirt during storage.
- ► Store the device in its original packaging.

NOTICE



Damage due to incorrect storage period

An improper storage period can lead to damage to the device. The duration of storage without connection to the permissible rated voltage must not exceed 1 year.

- ► If the storage period exceeds 1 year, connect the device to the mains voltage for 60 minutes.
- ► If you have any questions prior to commissioning the device, contact Bucher Automation AG.

2.5 Safety labels

On the device

There is a safety label affixed to the front of the device.



Fig. 1: Safety label

The safety label includes 4 warning symbols and an indication of the discharge time.

Meaning of the warning signs

	General warning sign
	Warning: Hot surfaces
	Warning: Electrical voltage
	Electrostatically sensitive components

Included with the delivery

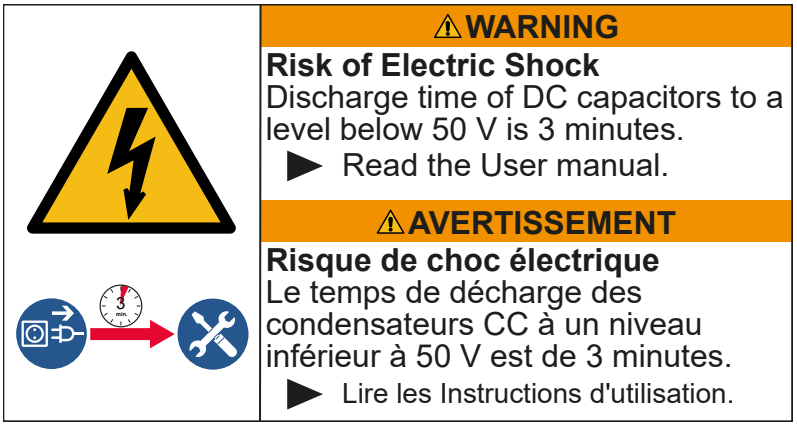


Fig. 2: Safety Label: Discharge Time

Every device in the JM-2000family comes with the safety label shown above.

1. Affix the safety label **in a clearly visible location** near the JM-2000 devices inside the control cabinet.
2. Please note the following safety warning:

⚠ WARNING

Risk of injury due to damaged safety labels

Damaged safety labels endanger people and cause property damage. Possible consequences include severe, potentially fatal injuries caused by moving parts and/or a fatal electric shock.

- ► Make sure that warning signs and safety signs are clearly legible and do not go missing.
- ► Replace them with exact duplicates if they are damaged or lost.

3 Product description

The JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 is a modularly structured servo amplifier with an EtherCAT® bus connection.

3.1 Design

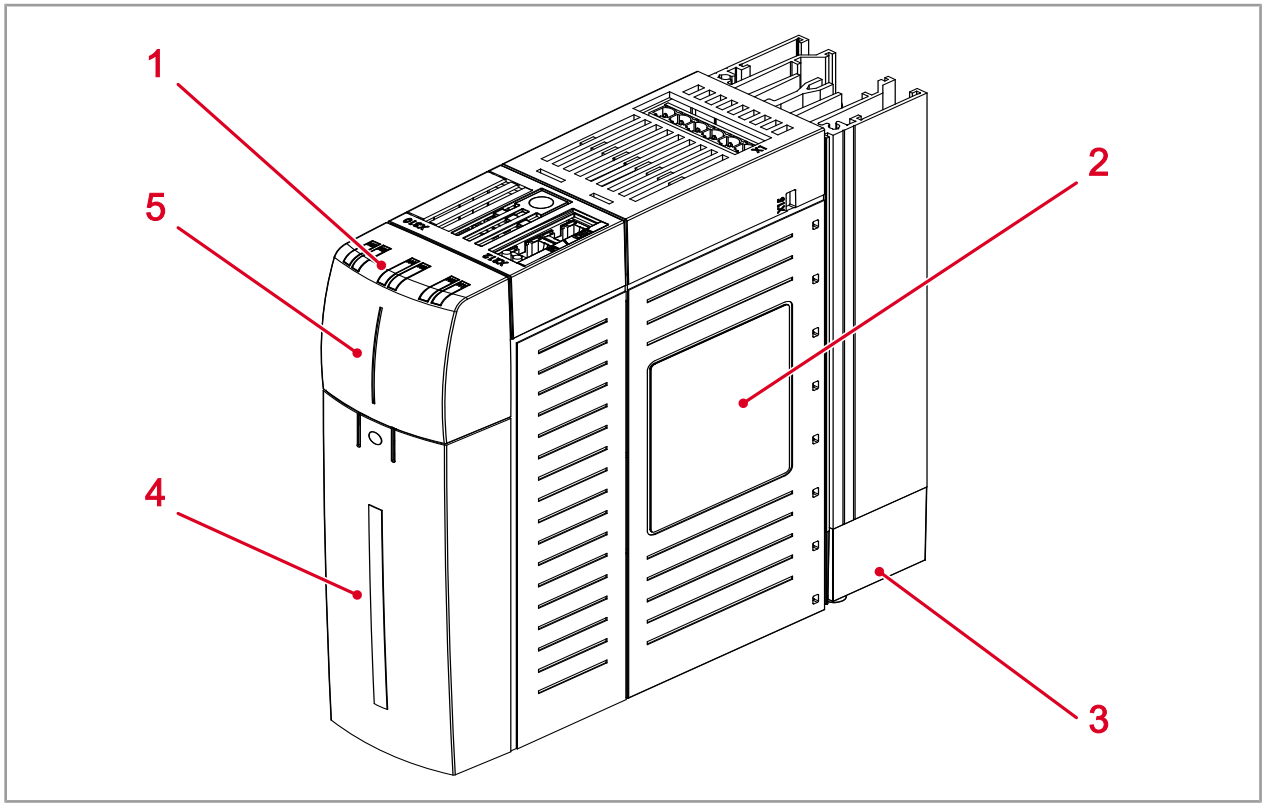


Fig. 3: Design

1	Status indication [▶ 16]
2	Nameplate [▶ 20]
3	Integrated fan
4	Lower front cover
5	Upper front cover

3.2 Product features

- Modular design
- Compact dimensions
- 2 axes per device
- STO (S1) integrated in the standard configuration
- Built-in braking resistor (R1)
- 3 times nominal current for 3 s
- 2 times nominal current for 60 s
- High positioning accuracy
- Easy commissioning by means of the JetSym application software and a JetControl controller

3.3 Status display

The LEDs of the status display indicate the states of the safety functions and the amplifier.

The display differs depending on the safety system being installed (S1 or S2).

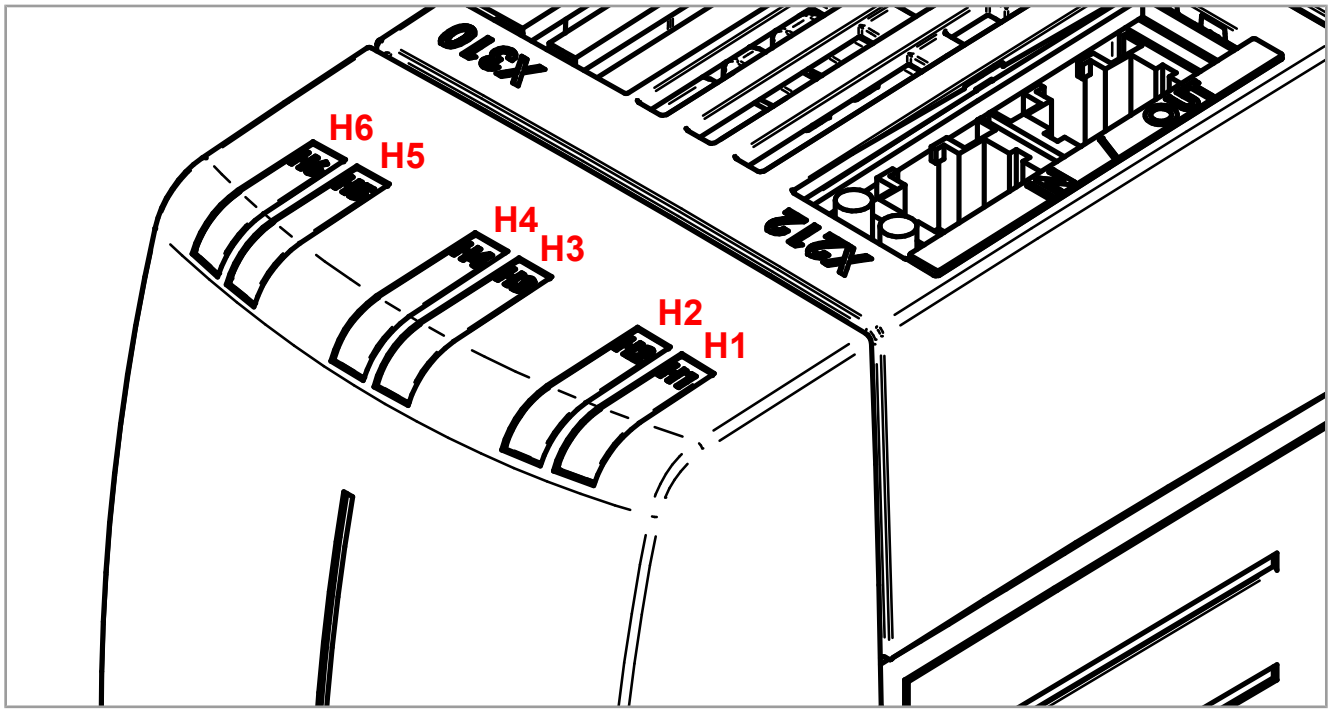


Fig. 4: Status indication

LED	Safety function S1	Safety function S2
H1	Amplifier status – axis 1	Amplifier status – axis 1
H2	Amplifier status – axis 2	Amplifier status – axis 2
H3	Safety status – axis 1	Safety status – axis 1
H4	Safety status – axis 2	Safety status – axis 2
H5 / H6	-	-

3.3.1 Diagnostic capability via the status display

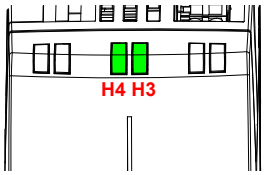
Amplifier status LEDs



LED	H1 axis 1 H2 axis 2		Description
Color	Red / green		Programming phase
Status	Flashing at 4 Hz		
Color	Orange		Initialization phase
Status	ON		
Color	Green	Orange	Voltage is applied (DC 24 V).
Status without warning	Flashing at 2 Hz / 0.5 s pause	-	
Status with warning	Flashing at 2 Hz / 0.5 s pause	Flashing at 1 Hz	
Color	Green	Red	Preparation for controlled operation (Bootstrap, ShortCircuitTest, OffsetAdjustIADCs, FlyingStart, Magnetization)
Status without warning	Flashing at 4 Hz	-	
Status with warning	Flashing at 4 Hz	Flashing at 1 Hz	
Color	Green	Green/orange	Controlled operation including stop and quick stop
Status without warning	ON	-	
Status with warning	-	Flashing at 1 Hz	
Color	Red / green		Error response is active.
Status	Flashing at 4 Hz		
Color	Red		Error that cannot be acknowledged
Status	ON		
Color	Red		Waiting for error acknowledgment.
Status	Flashing at 1 Hz		

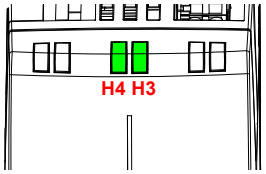
Safety status LEDs

Safety function S1



LED	H4 axis 2	H3 axis 1	Description
Color	Green	Green	STO is not active.
Status	ON	ON	
Color	Green	Green	STO is active.
Status	Flashing at 1 Hz	Flashing at 1 Hz	
Color	Red	Red	Bootloader, initialization, configuration, startup until ready to switch on or error
Status	ON	ON	
Color	-	-	Reset or no voltage
Status	OFF	OFF	

Safety function S2



LED	H4 axis 2	H3 axis 1	Description
Color	Red	Red	Startup
Status	ON	ON	
Color	Green	Green	STO is not activated.
Status	ON	ON	
Color	Red	Red	STO not activated (yet). The safety function should be designed as an error response.
Status	Flashing fast	Flashing fast	
Color	Green	Green	STO is active. Waiting for confirmation of the restart.
Status	Flashing fast	Flashing fast	
Color	Green	Green	STO is active.
Status	Flashing at 1 Hz	Flashing at 1 Hz	

LED	H4 axis 2	H3 axis 1	Description
Color	Red	Red	Error that cannot be acknowledged (safe state)
Status	ON	ON	
Color	-	-	Reset or no voltage.
Status	OFF	OFF	
Color	Red	Red	STO is active. Safety function as error response is to be (or was) executed. Expecting error acknowledgment.
Status	Flashing fast	Flashing fast	
Color	Red	Red	Waiting for error acknowledgment (safe state).
Status	Flashing at 1 Hz	Flashing at 1 Hz	
Color	Red	Red	Waiting for initialization of the safe encoders and FSoE communication.
Status	Lights up briefly	Lights up briefly	

3.4 Nameplate

Main Nameplate

The main nameplate is located on the right side of the housing.

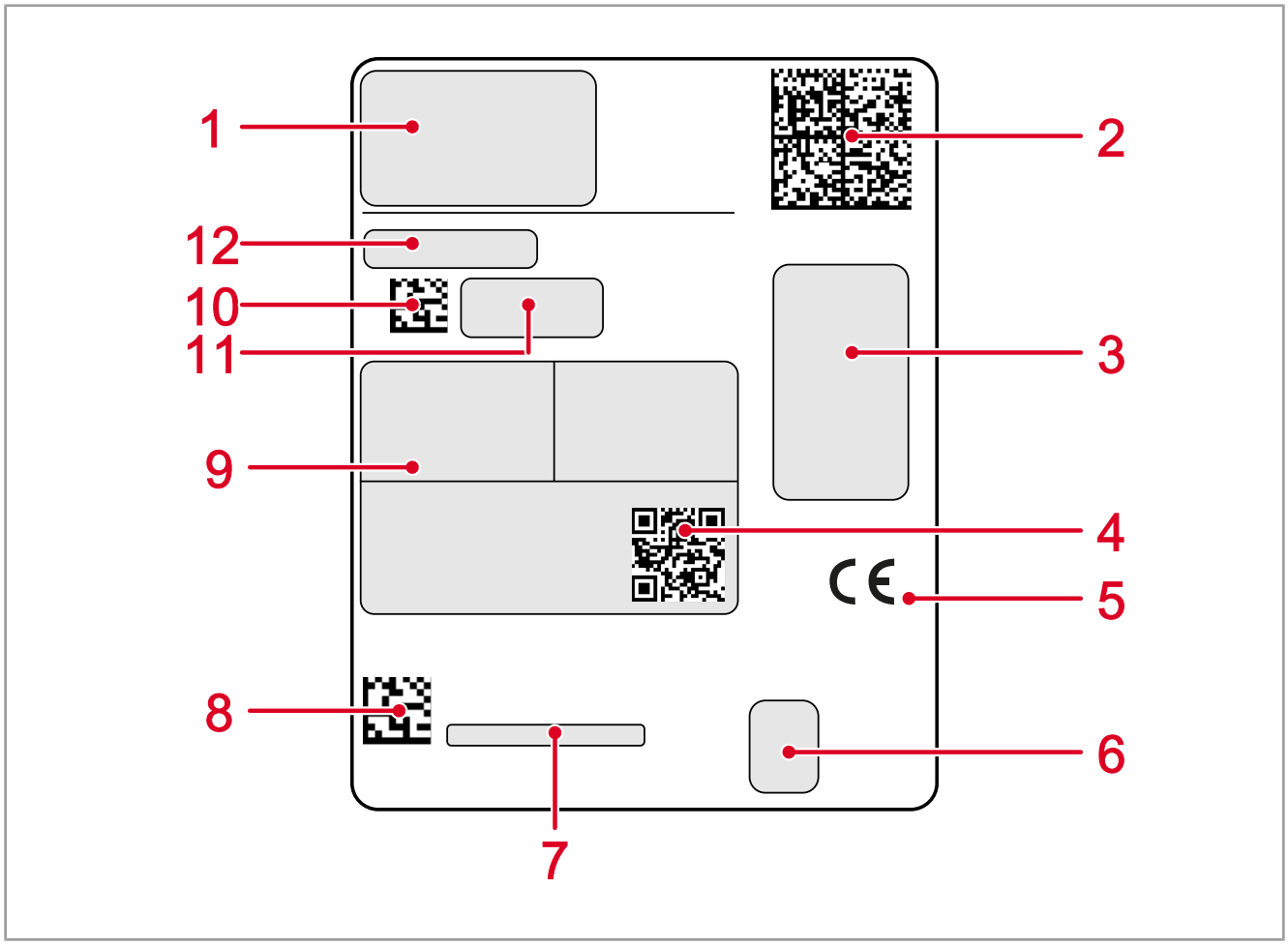


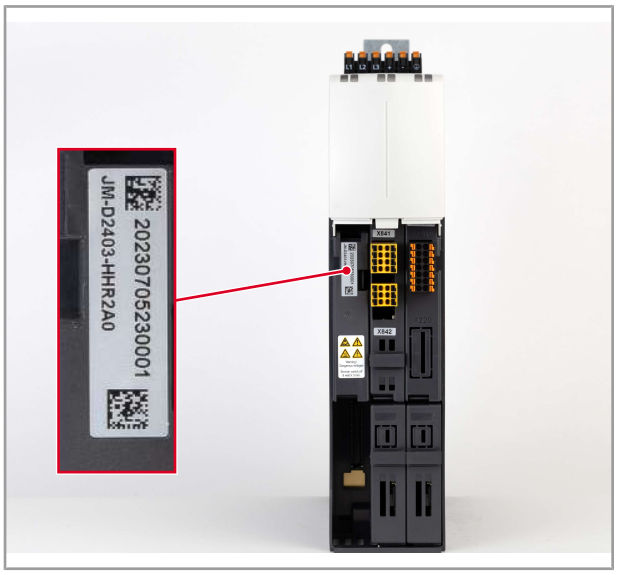
Fig. 5: Main Nameplate

1	Company logo and address
2	Scan - Order number, serial number, and various details
3	UL certification
4	Scan link to the download area
5	Certification mark
6	Mandatory sign
7	Serial number
8	Scan - Serial Number
9	Various details
10	Scan - Item Number
11	Item number
12	Order code

More labels

Additional labels are located on the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 under the lower front cover:

– Label with serial number and order code on the front. The order code [▶ 22] also indicates the encoder configuration.



– Security labels [▶ 13] on the front and included

– Label with Connection Instructions [▶ 42] on the inside of the lower front cover

3.5 Scope of delivery

Scope of delivery	Item number	Quantity
JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406	Depending on options	1
USB stick with complete documentation	60888000	1 per order
Fitting panel (top)	60885886	1
Fitting panel (bottom)	60885603	1
Fastening bracket for motor cable with shielding bracket	60886090	1
Power-level terminal connector set, double-axis, size 2	60886083	1
I/O and S1 connector set, double-axis	60886093	1
OR		
I/O and S2 connector set, double-axis	60887094	1
Warning Label	60888987	1

3.6 Encoder options

The JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 has 3 plug-in slots for encoder options. For the encoder options your device supports, refer to the nameplate and the order code [▶ 23].

Plug-in slots

The order of the encoders on the hardware is always from right to left.

NOTICE

Conversions to the device may only be carried out by Bucher Automation AG.

The installed encoder options have a safety seal.

► Send the device in to Bucher Automation AG if you want to convert from –S1 to –S2 or another encoder placement.



Fig. 6: Example of placement -S2

Encoder options

Encoder option	Description	Motor encoder	Additional encoder	Cable technology
JM-2000-R	Resolver	X		2
JM-2000-H	HIPERFACE DSL®	X		1
JM-2000-A	HIPERFACE® analog / SinCos	X	X	2
JM-2000-E6	EnDat® 2.2	X	X	2
JM-2000-I	Incremental encoder		X	2
JM-2000-S2R	Safe resolver	X		2

Examples

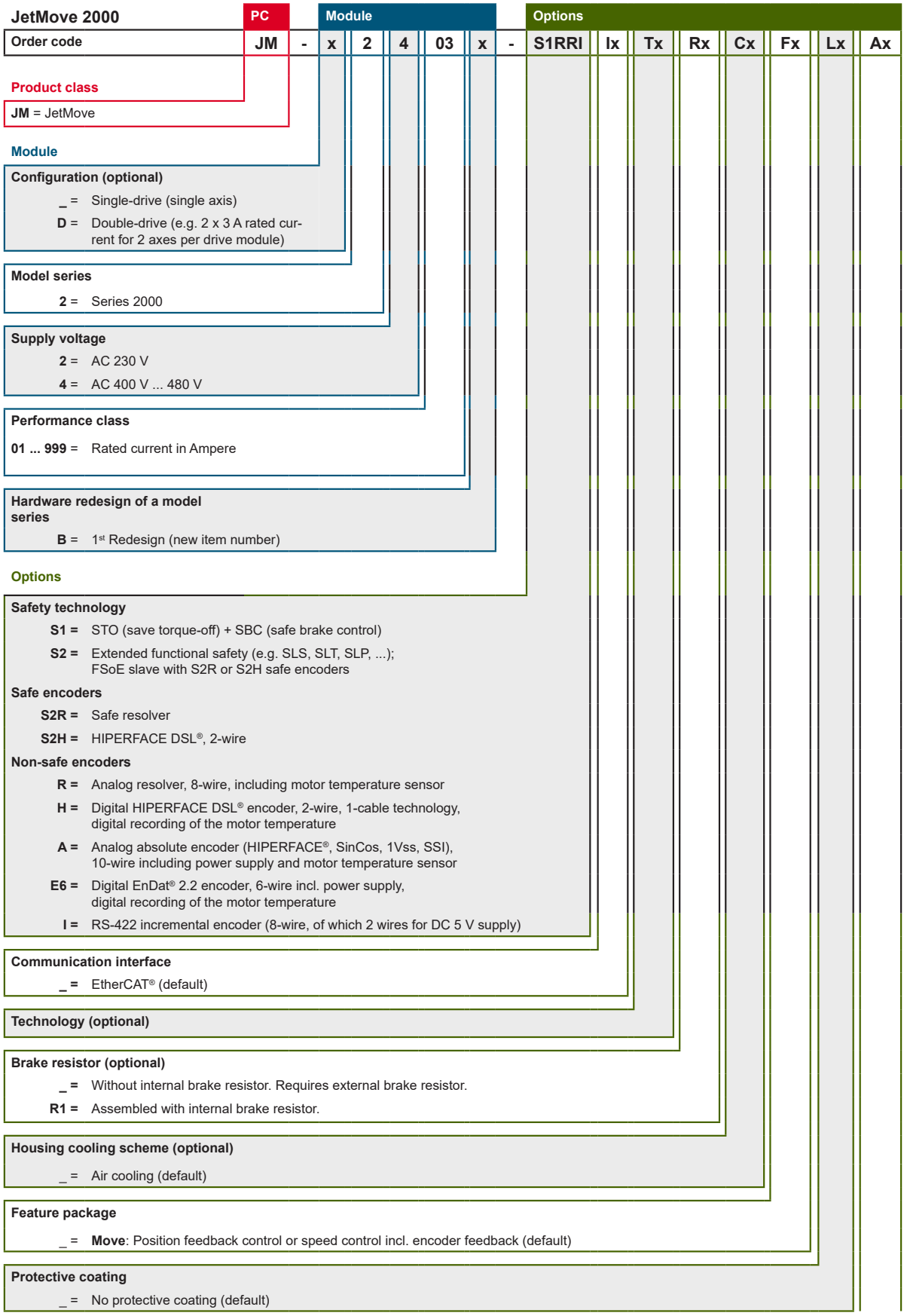
– **–S2RR** = 2x safe resolvers

– **–S2RRI** = 2x safe resolvers and one non-safe incremental encoder as lead axis encoder

See also

Order code [▶ 23]

3.6.1 Order code



JetMove 2000	PC		Module					Options							
Order code	JM	-	x	2	4	03	x	-	S1RRI	Ix	Tx	Rx	Cx	Fx	Lx	Ax

Hardware revision

A0 = Hardware revision 0
A1 = Hardware revision 1
... ...

4 Technical Specifications

This chapter contains the electrical and mechanical specifications, as well as the operating data, for the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 device.

4.1 Dimensions

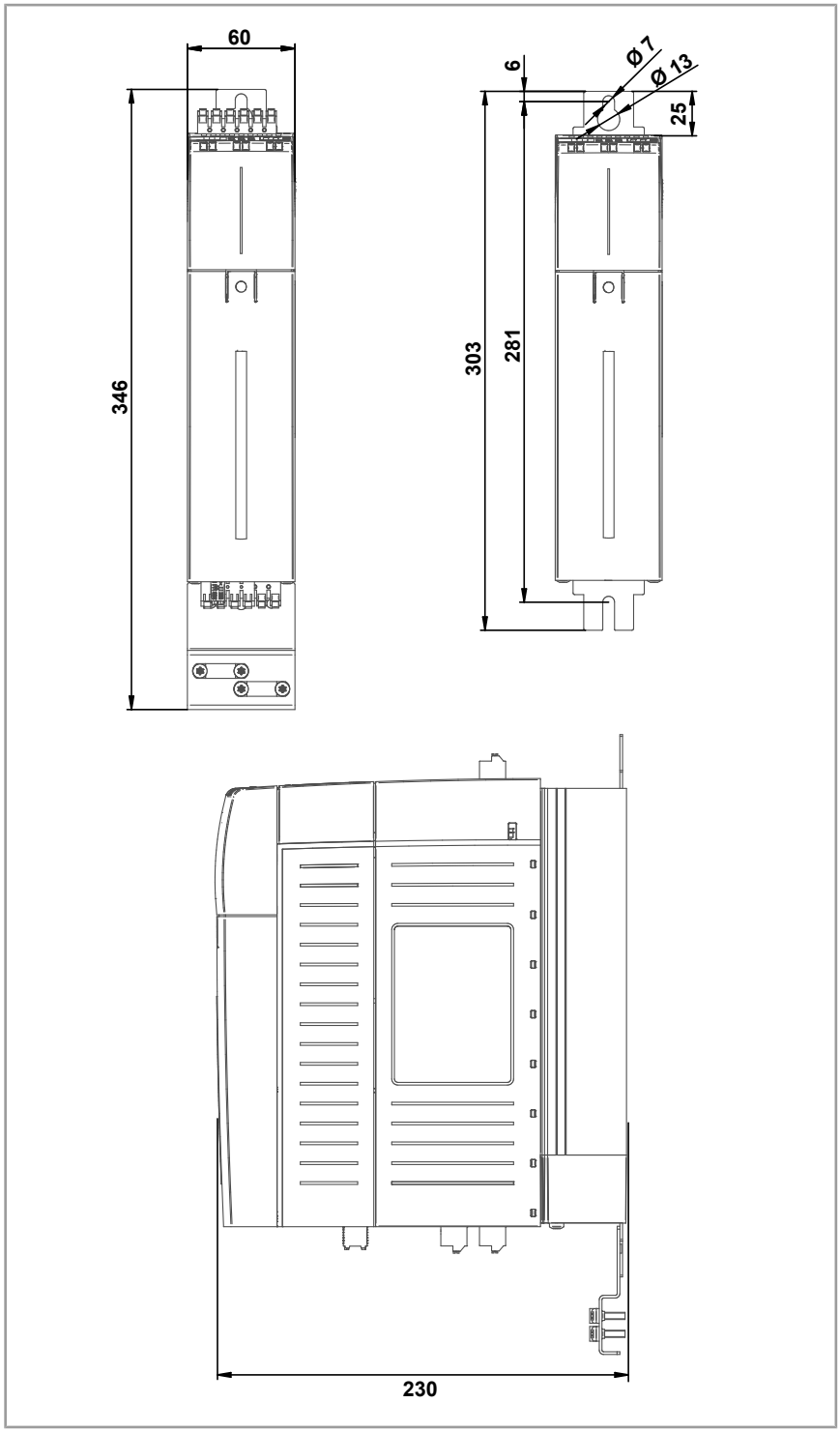


Fig. 7: Dimension in mm

ⓘ Info

CAD data

For CAD data go to www.bucherautomation.com and navigate to the product page *JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 > Downloads*.

4.2 Mechanical specifications

Parameter	Description
Weight approx.	2400 g
Type of installation	vertical
Protection class	IP20 (EN 60529)

Tab. 1: Technical data – mechanical properties

4.3 Output motor side

NOTICE! The device is designed to be used with copper conductors sized according to the 65 °C or 75 °C temperature tables.

Please refer to the information in the section Derating [▶ 29].

Parameter	JM-D2203	JM-D2206	JM-D2403	JM-D2406
Output voltage	0 V ... 230 V	0 V ... 230 V	0 V ... 400 V (480 V)	0 V ... 400 V (480 V)
Output current	3 A	6 A	3 A	6 A
Rotary field frequency	0 Hz ... 599 Hz	0 Hz ... 599 Hz	0 Hz ... 599 Hz	0 Hz ... 599 Hz
Recommended motor shaft power	1ph 0,55 kW / 3ph 1,1 kW	1,5 kW	1,5 kW	2,2 kW
Short-time overcurrent (3 s)	9 A	18 A	9 A	18 A
Switching frequency	8 kHz, 16 kHz	8 kHz, 16 kHz	8 kHz, 16 kHz	8 kHz, 16 kHz
Protection	IP20	IP20	IP20	IP20
Long-time overcurrent (60 s)	6 A	12 A	6 A	12 A

Tab. 2: Technical Specifications – Motor-Side Output

4.3.1 External braking resistor

NOTICE! When using an external braking resistor, the values in the following table must be strictly observed.

Parameter	JM-D2203	JM-D2206	JM-D2403	JM-D2406
Internal braking power P(BR)	140 W	140 W	140 W	140 W
Minimum braking resistance R(BR)	22 Ω	10 Ω	56 Ω	27 Ω
Power at minimum resistance	6.6 kW	14.5 kW	10.4 kW	21.4 kW

Parameter	JM-D2203	JM-D2206	JM-D2403	JM-D2406
Rated braking resistance	68 Ω	33 Ω	150 Ω	68 Ω
Power at rated resistance	2.2 kW	4.4 kW	3.9 Ω	8.5 Ω

Tab. 3: External braking resistor

4.4 Input mains side

NOTICE! The device is designed to be used with copper conductors sized according to the 65 °C or 75 °C temperature tables.

NOTICE! The device must only be operated on a three-phase star-connected system in which no phase is directly grounded and the voltage between phase and ground does not exceed 277 V.

Parameter	JM-D2203	JM-D2206	JM-D2403	JM-D2406
Mains current	1-phase: 14,1 A; 3-phase: 6,6 A	1-phase: 16 A; 3-phase: 13,3 A	3-phase: 6,6 A	3-phase: 13,3 A
Fuse type gRL(gS) 400 V IEC	25 A	25 A	25 A	25 A
Mains frequency	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz
Mains frequency operating range	fLN ±10 %	fLN ±10 %	fLN ±10 %	fLN ±10 %
Mains voltage	230 V	230 V	400 V / (480 V)	400 V / (480 V)
Mains voltage operating range	200 V - 15 % ... 240 V + 10 %	200 V - 15 % ... 240 V + 10 %	380 V - 15 % ... 480 V + 10 %	380 V - 15 % ... 480 V + 10 %
DC input voltage	ULN * 1,41	ULN * 1,41	ULN * 1,41	ULN * 1,41

Tab. 4: Technical data – mains-side input

4.4.1 Fuse types for UL applications

Device	1-phase	3-phase
JM-D2203, JM-D2206, JM-D2403, JM-D2406	FWP20A14F	FWP20A14F

Tab. 5: Eaton Individual circuit breakers

4.5 Ports and interfaces

DC 24 V voltage supply (X12)

Parameter	Description	
Input voltage	20.4 V … 28.8 V (-15 % / +20 %)	
Nominal input current	**Safety function S1**	**Safety function S2**
	5.15 A max	6.0 A max
	Of which 2x 2.0 A for motor holding brake	
Peak switching current	Typical < 8 A	
Peak power	**Logic section**	**incl. motor holding brake and S2 outputs**
	28.2 W	167.5 W

Parameter	Description
External fusing	Using standard fusing elements for nominal current, characteristic: slow-blow
Safety	Safety extra-low voltage (SELV) to DIN EN 61800-5-1

Tab. 6: Technical data – DC 24 V voltage supply

Activation of motor holding brake (X21 / X22)

Parameter	Description
Output voltage	DC 24 V
Output current	2 A

Tab. 7: Technical data – activation of motor holding brake

Digital inputs (X210)

Parameter	Description
U_{max}	30 V, 10 mA at DC 24 V
Input resistance	2.3 kΩ
PLC-compatible	Yes
Response time	approx. 3 ms
Low	0 V … 3 V
High	12 V … 30 V
Type	24 V, type 3 to DIN EN 61131-2

Tab. 8: Technical data – digital inputs

EtherCAT® interface (X212)

Parameter	Description
Terminal type	RJ45 socket
Port count	2
Bit rate	100 MBit/s
Auto cross-over	Yes

Tab. 9: Technical data – EtherCAT® interface

4.6 Environmental conditions

Parameter	Description
Operating temperature	0°C ... +55°C; at temperatures of 45°C or higher, a reduction in performance must be taken into account: -2.5%/K
Storage temperature	-25 °C … +55 °C / -13 °F … +131 °F
Shipping temperature	-25 °C … +70 °C / -13 °F … +158 °F
Rel. humidity	5 % ... 85 %, non-condensing
Elevation above sea level	0 m … 4,000 m (reduced performance above 1,000 m)

Parameter	Description
Mains-side surge protection category	Degree of 3 (III) DIN EN 61800-5- 1
Environmental Specification	Degree of 2 (II) DIN EN 61800-5- 1
Installation location	Contamination level 2 and no conductive condensation

Tab. 10: Technical data - Environmental conditions

4.7 External line filter

Electrical properties

Filter type	I_n/Ph	$I_{overpow.}$/Ph	Leakage current	Power dissipation [4]	Clamping area tightening torque
JEMC25.240-UR	25 A	1.5 x I_N for 60 s [1]	24.5 mA [3]	4.8 W	0.2 mm^2 … 6.0 mm^2 1.5 Nm … 1.8 Nm
JEMC53.240-UR	53 A	2 x I_N for 10 s [2] 3 x I_N for 100 ms [2]		13.6 W	0.5 mm^2 … 16.0 mm^2 2.0 Nm … 2.3 Nm

Tab. 11: Technical data – external line filter

Parameter	Description
Rated voltage	3 x 480 V, +10 %, 50/60 Hz [4]
IEC climate category	25/105/21
Standards	IEC 60939-2 (2006-5), UL 508
Ambient temperature	max. +45 °C (max. +55 °C, 1 % current derating per 1 °C)
Installation altitude	max. 1,000 m (up to 2,000 m 1 % power decrease per 100 m)
Degree of protection	IP20

1) Can be repeated after 30 min

2) Can be repeated after 6 min

3) rms value of the leakage currents to IEC 60939 (2009) at 50 Hz and rated voltage with 2 % asymmetry. The leakage current can be further increased by the device from which interference is being suppressed.

4) If the supply frequency = 60 Hz, the power loss is about 10 % higher!

4.8 Derating

This chapter deals with the power reduction (derating) of devices under certain environmental conditions. The influences on the output power must be taken into account in order to ensure safe operation of the device.

Output current derating

The values are valid for a mains input voltage of 400 V.

Switching frequency	@8 kHz	@16 kHz
JM-D2203	3 A	2.1 A

Switching frequency	@8 kHz	@16 kHz
JM-D2206	6 A	4.2 A
JM-D2403	3 A	2.1 A
JM-D2406	6 A	4.2 A

Tab. 12: Output current derating depending on the switching frequency

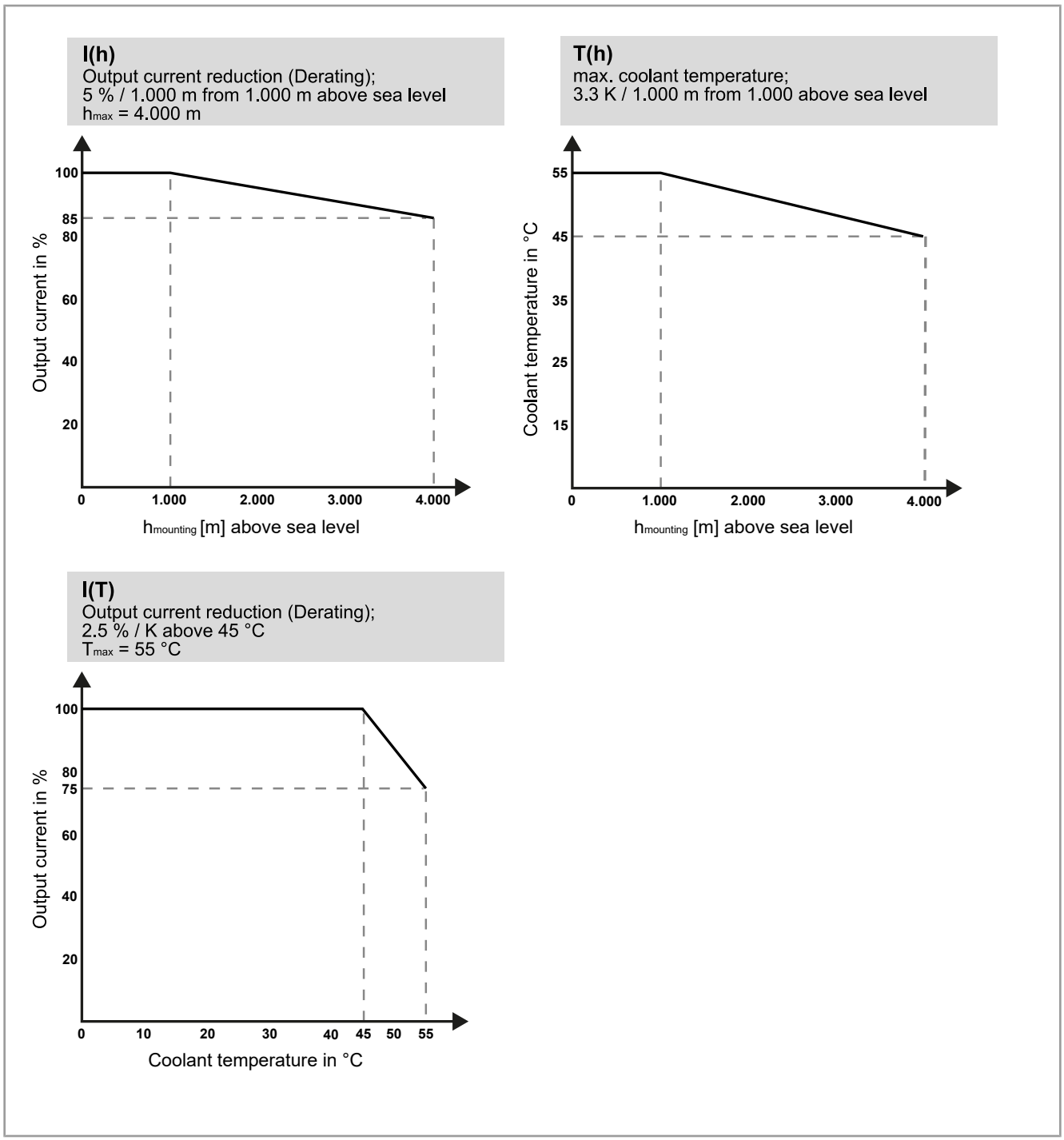


Fig. 8: Derating diagrams

5 Mechanical installation

This chapter describes how to install and remove the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406.

⚠ WARNING



Non-observance of safety instructions may result in injuries or physical damage

- ► Prior to assembling and installing the device, read and follow the safety precautions and restrictions of use as set out in the Safety chapter.
- ► Only authorized qualified personnel is allowed to perform any kind work on the device.

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.

NOTICE



Usage of safety-relevant components

The JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 with -S1 option uses safety-relevant components that put extra requirements on the control cabinet housing.

- ► Install the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 only in control cabinets with a degree of protection of IP54 or higher.

NOTICE



Related documents

When installing and connecting the servo amplifiers within the axis system, it is essential to also follow the operating instructions for the other devices as well as the *Function Description Integrated Safety Function S1 - JM-2000 and JM-D2000* . You can find the documentation at www.bucherautomation.com under
Product Page JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 > Downloads.

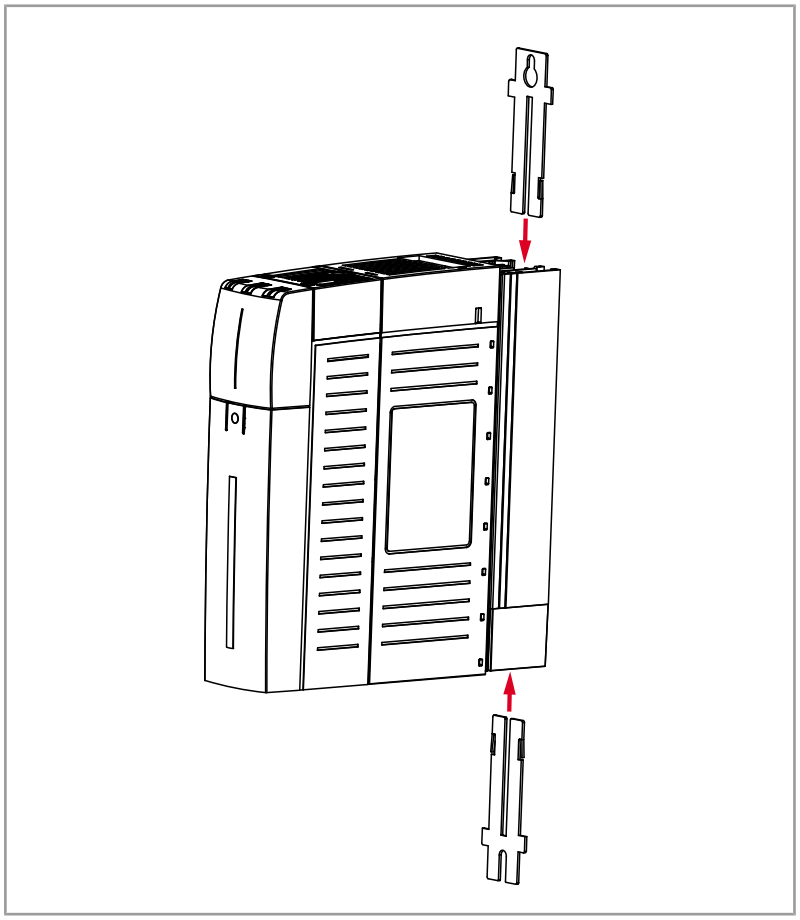
5.1 Mounting the servo amplifier

Use the enclosed mounting material [▶ 70].

For the dimensions refer to the Dimensions [▶ 25] illustration.

Sliding in the fitting panels

► Slide the fitting panels into the cooling ribs from above and below.



Requirements for the installation location

– The mounting plate must be conductive.

– The degree of protection of the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 is IP20. The JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 with -S1 option uses safety-relevant components that require them to be installed in control cabinets with a degree of protection of IP54 or higher.

– Pollution degree 2 without conductive condensation

– Avoid installation locations in the control cabinet where high temperatures occur.

Distances

– Observe the minimum distances above and below the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406. No lateral distance from other devices is required.

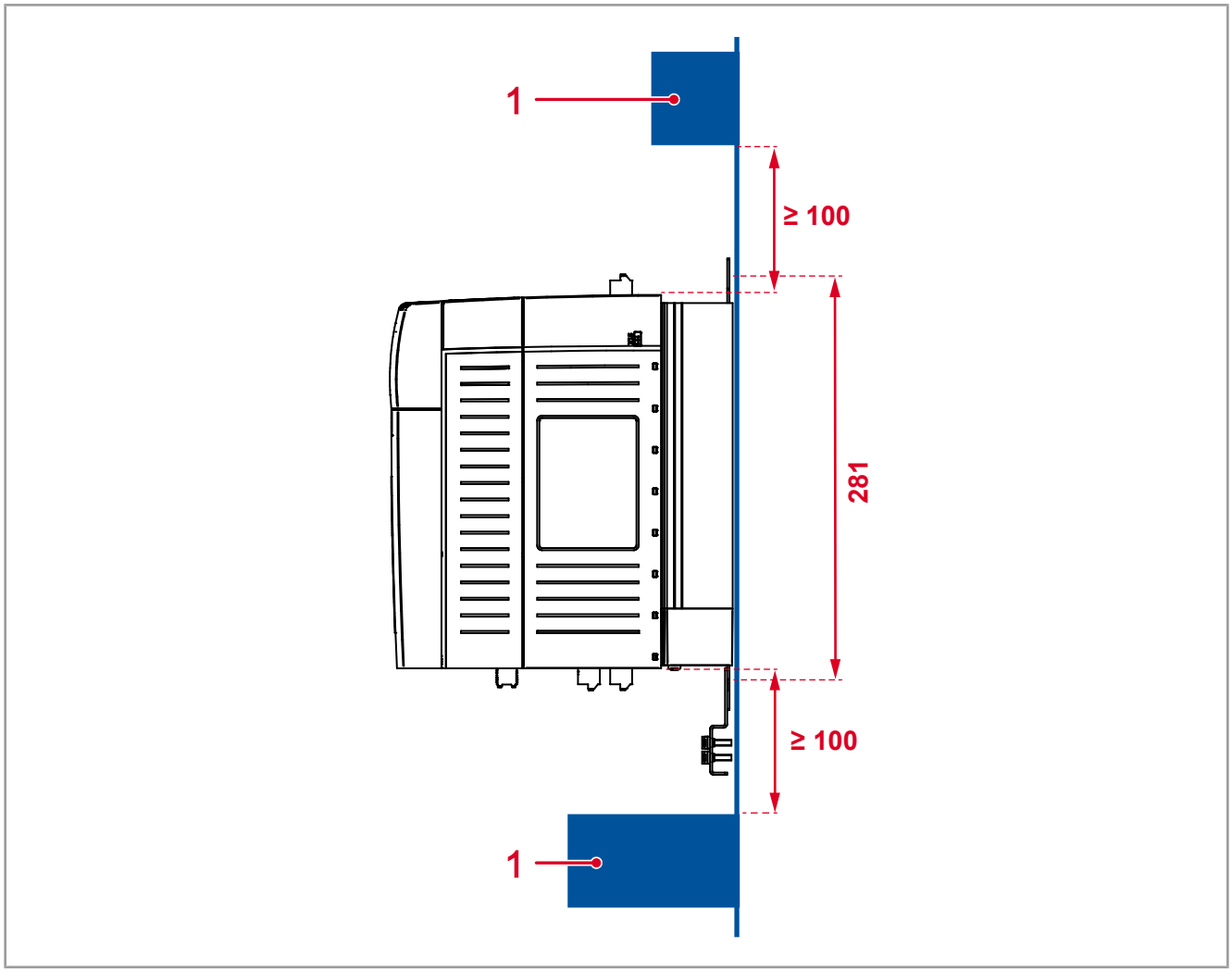


Fig. 9: Distances from surrounding parts in mm

1	Mounting plate with cable ducts

Mechanical installation

ⓘ Info

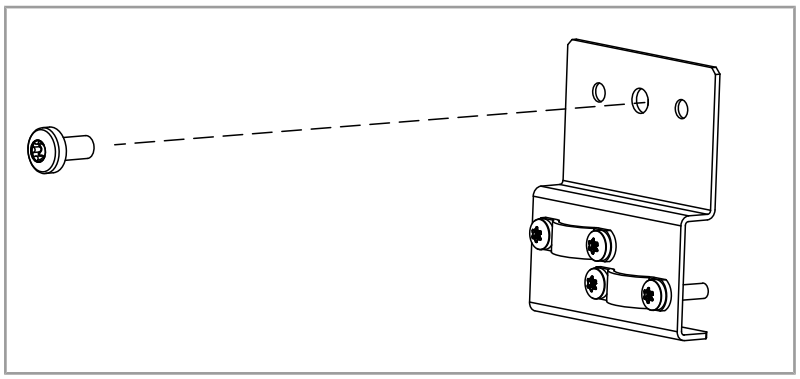
Limited space conditions

The space for wiring may be restricted for wiring the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 in mounted state. If necessary wire the upper and lower connections before you mount the device in the control cabinet (Connections).

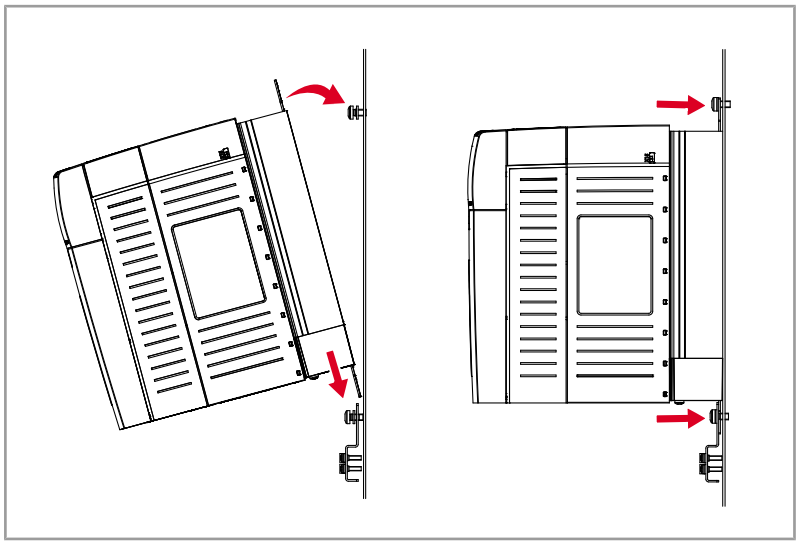
Perform the following steps to install the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406:

1. Hold the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 vertical on the mounting plate of the control cabinet.
2. Mark 2 points on the mounting plate for the mounting holes. Drill the holes and tap the threads.
3. Screw the upper fastening screw halfway into the thread.

4. Screw the shield bracket halfway into the thread with the lower fastening screw.



5. Set the lower fitting panel on the lower fastening screw.
6. Attach the upper fitting panel to the upper fastening screw.
7. Fix the two fastening screws in place.



5.2 Removing the servo amplifier

To dismantle the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406, proceed as follows:

1. De-energize the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406.
2. Unscrew the 2 fastening screws halfway.
3. Slightly lift the Servoverstärker and remove it from the fastening screws.

5.3 Mounting the line filter

Please note

- The line filter must be designed to reduce any interference emitted by the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 servo amplifier as required by the EMC Directive (see also Line filter [▶ 41]).
- Mount the line filter on a grounded mounting plate, preferably chromated or galvanized. Make sure to provide the largest surface possible for contact of the housing with the plate. You can achieve good surface contact with the threaded surface.
- In addition, the line filter should be grounded with a wide ground strap (length max. 300 mm).
- Mount the line filter in the immediate vicinity of the servo amplifier(s).
- Depending on the total output and total motor line length, several JetMoves can be connected to a central line filter in the servo amplifier control cabinet (see also Line filter [▶ 41]).

Dimensions

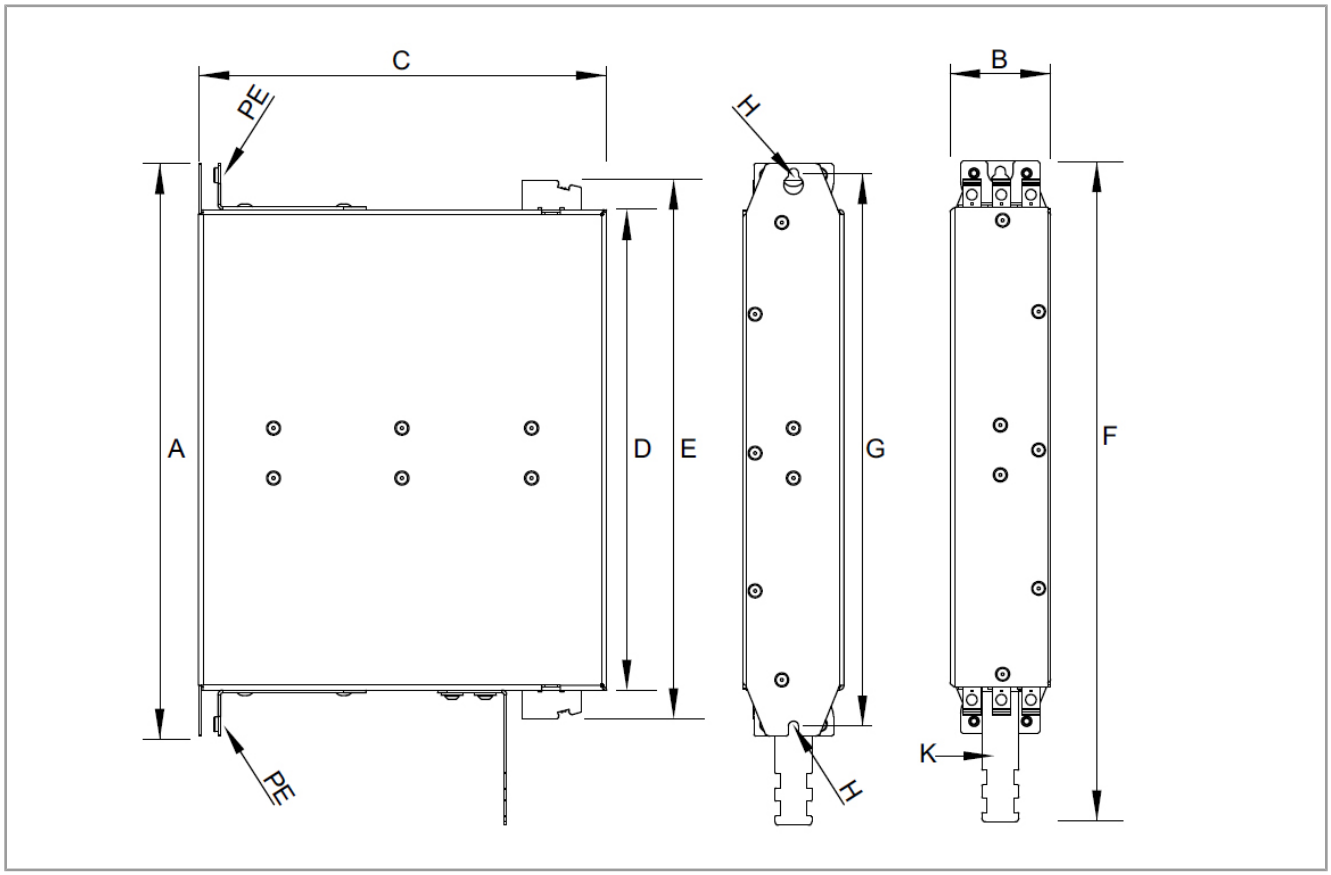


Fig. 10: Dimensions ext. line filter

Dimensions		JEMC25.240-UR	JEMC53.240-UR
A	Height	310 mm	
B	Width	55 mm	
C	Depth	220 mm	
D	Housing	260 mm	
E	Distance between terminals	291 mm	324.6 mm
F	Total height	358 mm	365.3 mm
G		300 mm	

Dimensions		JEMC25.240-UR	JEMC53.240-UR
H	Mounting holes	Ø 5.3 mm	
PE		M4	
Weight		4.6 kg	4.8 kg

Tab. 13: Dimensions – external line filter

Shield connecting bracket

NOTICE

Mounting the shield connecting bracket

The shield connecting bracket (K) is designed to ensure contact with the cable shield.

► Mount the shield connecting bracket (K) on the line filter **before** you install the line filter.

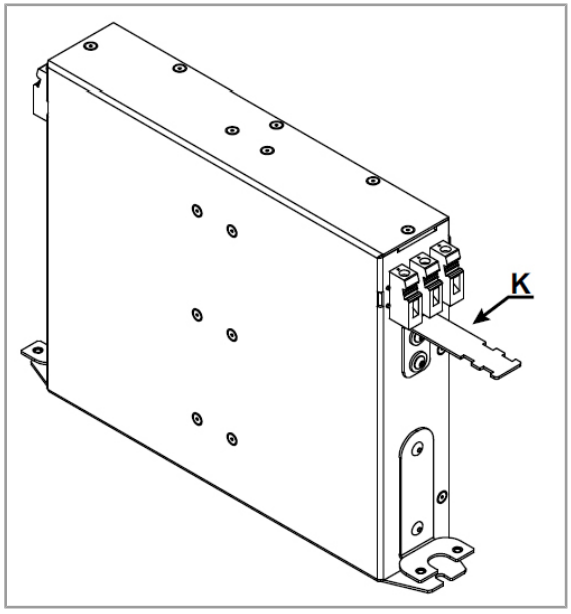


Fig. 11: Mounting the shield connecting bracket on the line filter

Mechanical installation

1. Choose a suitable place for mounting the line filter. Note the bending radii of the connection cables as you do this.
2. Mark the position of the threaded holes on the mounting plate. Cut a thread in the mounting plate for each fastening screw and screw the fastening screws 2 revolutions into the threaded holes.
3. When using shielded cables, mount them to the shielding bracket (K) with shield clamps and fasten them onto the bottom of the line filter with the enclosed screws.
4. Attach the line filter to the fastening screws and tighten them down.

6 Electrical connection

⚠ DANGER



Danger due to high electrical voltage

Touching live parts may result in death or severe injuries. Carry out the following steps before starting work to ensure safety:

- ► Prepare for shutting off the system. Inform everyone involved who will be affected by the process.
- ► Isolate the drive system from the power supply and secure it against being turned on again.
- ► Wait for the discharge time (approx. 3 minutes) and check all power connections to ensure they are at zero potential.
- ► Ground according to requirements.
- ► Cover over neighboring live parts.
- ► Ensure the drives cannot move.

⚠ DANGER



Danger due to high operating voltage

The high operating voltage may cause serious injury, or death.

Please follow these rules throughout the **entire work process.**

- ► Do not remove any cover plates and keep all control cabinet doors closed during operation.
- ► Check that all live connections are protected against contact.
- ► Do not open the device.
- ► Never touch the device's power supply and DC link terminals (X1, X2, and, for the JM-D2000, X3 as well) while the device is in operation.

⚠ DANGER



Danger due to high electrical voltage

According to EN 61800-5-1, connecting thermal sensors to the encoder port (extra-low voltage) within the motor requires double or reinforced insulation .

⚠ WARNING



Non-observance of safety instructions may result in injuries or physical damage

- ► Prior to assembling and installing the device, read and follow the safety precautions and restrictions of use as set out in the Safety chapter.
- ► Only authorized qualified personnel is allowed to perform any kind work on the device.

⚠ WARNING



The JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 generates leakage currents against PE.

An upstream RCD type A must not be used, as pulsating and smooth DC fault currents can impair the function of the RCD.

► If an RCD is required, use either an RCD type B or an isolating transformer.

NOTICE



Related documents

When installing and connecting the servo amplifiers within the axis system, it is essential to also follow the operating instructions for the other devices as well as the *Function Description Integrated Safety Function S1 - JM-2000 and JM-D2000* . You can find the documentation at www.bucherautomation.com under
Product Page JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 > Downloads.

6.1 EMC-compliant installation

The noise immunity of a system is determined by its weakest component. Correct connections, lines and shielding are key factors. Follow the procedures described in this chapter.

ⓘ Info

Further information

For more information on system immunity to interference, please refer to Application Note 016 *EMC-Compliant Control Cabinet Installation* at www.bucherautomation.com.

The following basic rules apply to the installation of servo amplifiers:

– RoHS Directive 2011/65/EU
– EMC Directive 2014/30/EU
– Low Voltage Directive 2014/35/EU
– Machinery Directive 2006/42/EG

Protective earth conductor terminal

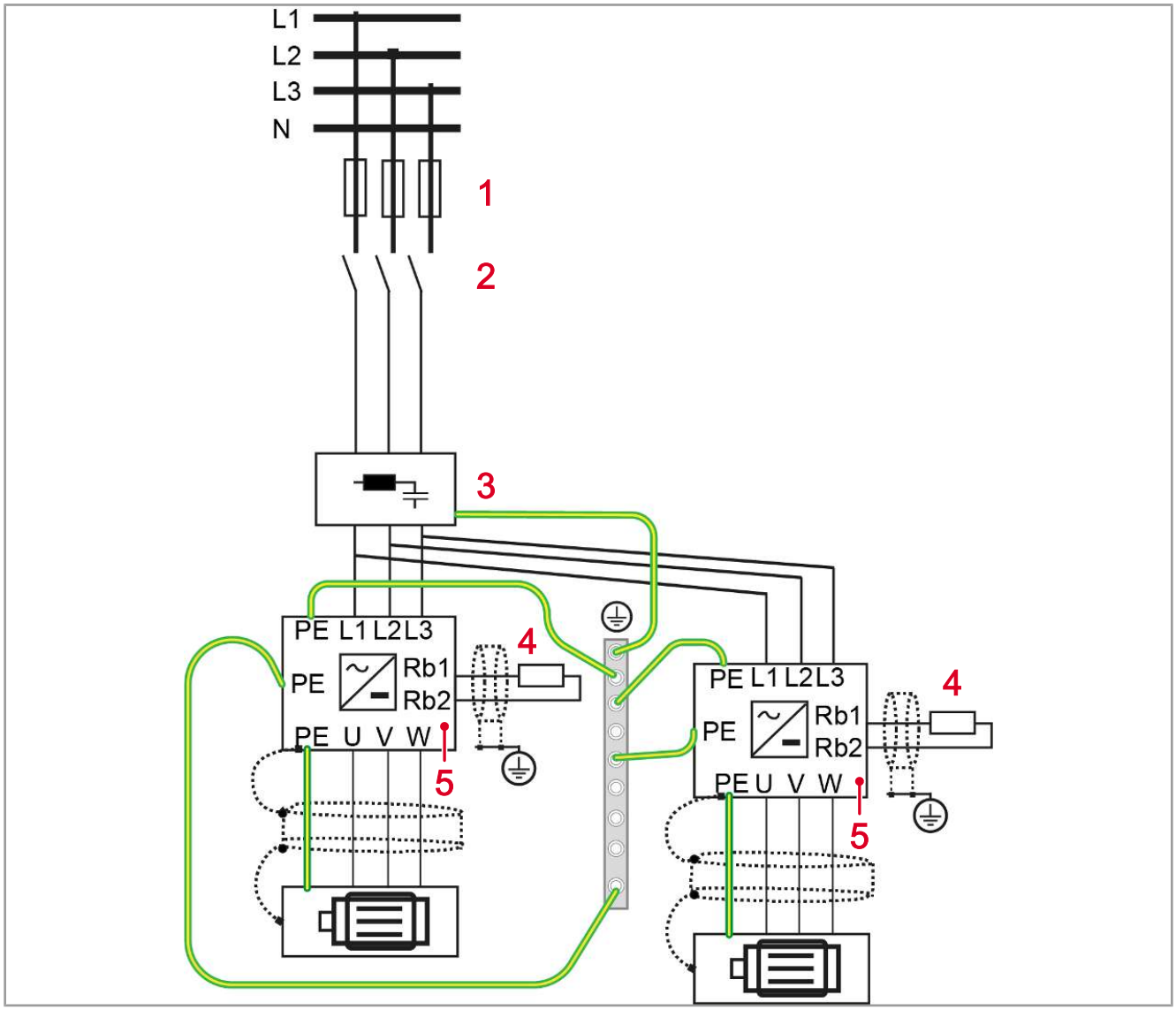


Fig. 12: Protective earth conductor terminal

1	Fuse
2	Line contactor
3	Line filter
4	External braking resistor (optional)
5	JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406

Grounding measures

– Mount the devices on a conductive, grounded mounting plate. The mounting plate must be connected to the control cabinet's central grounding busbar.

– Connect the PE cable with a cross-sectional area of at least 2.5 mm² to the PE terminal on the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406.

– Ground the shields on both sides.

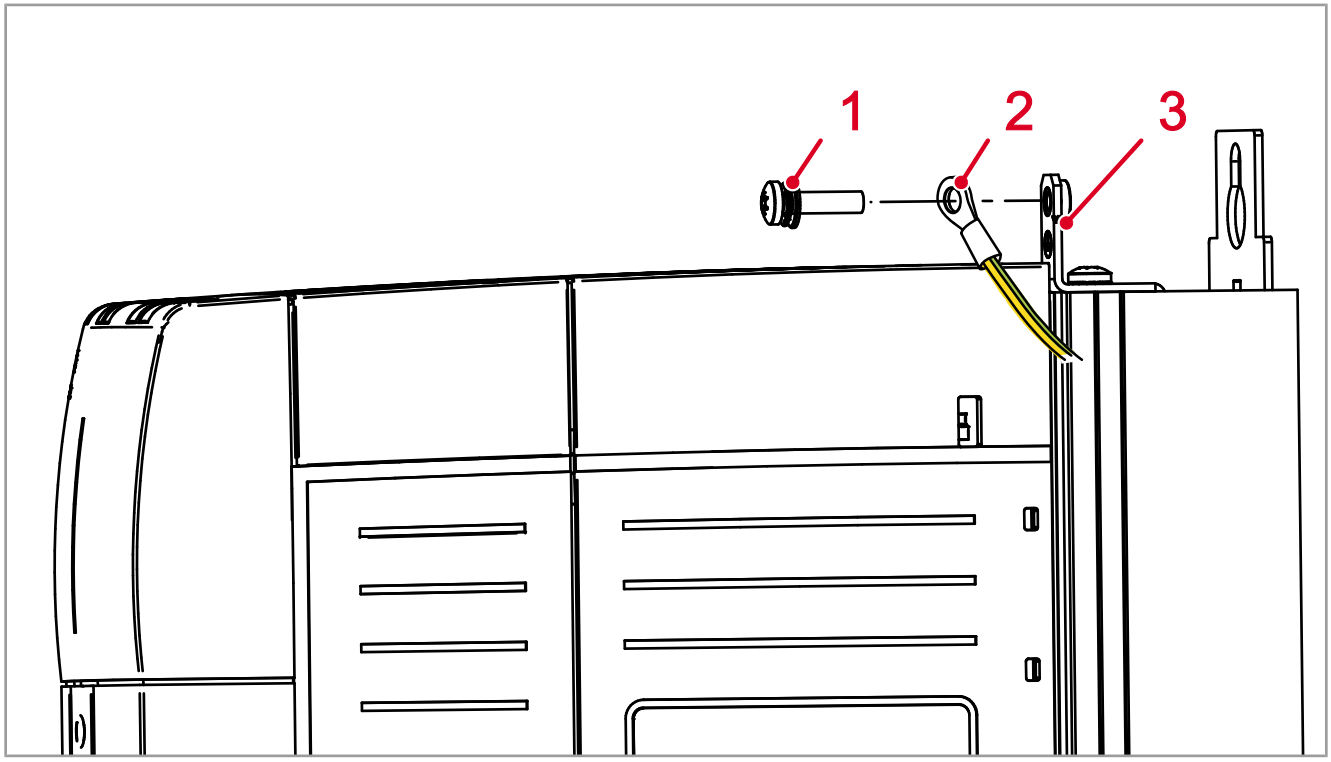


Fig. 13: Connection at the PE connector.

1	Screw-and-washer assembly: Oval-head screw M4x12 Torx 8.8 acc. to DIN 6900
2	Lug on PE cable
3	PE angle on device

Shielding measures

– Use servo cables from Bucher Automation or equivalent servo cables.
– Use shielded encoder and motor cables (including a brake shield) that are suitable for use with servo motors (minimum shield coverage of 80%).
– Place the motor cable shields under the terminals of the shield bracket and against the housing of the M23 connector on the motor side.
– Use Sub-D connectors with a metallized housing and M3 metric screws.

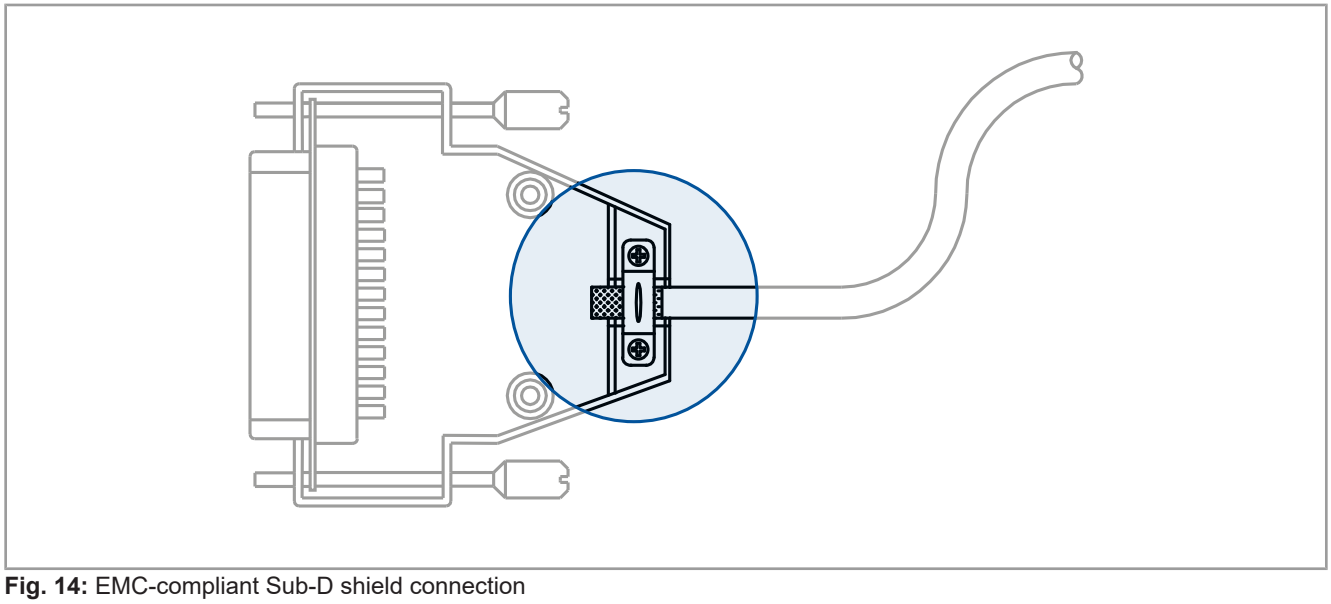


Fig. 14: EMC-compliant Sub-D shield connection

If you like more detailed information about installation, please contact the Bucher Automation hotline.

See also

Technical Support [▶ 69]

6.1.1 Line filter

Compliance with the EMC Directive

Commissioning, i.e., commencement of intended use is only permitted if the EMC Directive 2014/30/EU is complied with. Proof of compliance with the protection objectives required in the standard must be provided by the installer/operating company of a machine and/or system.

To ensure that line-borne interference emission remains limited to the permissible level, external line filters are available. The use of these line filters makes it possible to comply with EMC Directive 2014/30/EU under certain conditions:

– Public low-voltage network "First environment" (residential area C2)
– Industrial low-voltage network "Second environment" (industrial area C3)

Selecting line filters

The table below provides an initial estimate of which line filter can be expected to meet the given EMC requirements. This must be checked by the installer/operating company. Certain conditions require a different line filter. Demonstrate compliance with the EMC requirements metrologically.

Power inlet current I_{IN}		**≤ 25 A**		**≤ 53 A**	
Total motor line length in m		0 … 180	181 … 600	0 … 180	181 … 600
Category	**Clock frequency in kHz**				
C2	4	N/A	N/A	N/A	N/A
	8	N/A	N/A	N/A	N/A
	16	N/A	N/A	N/A	N/A
C3	4	JEMC25.240-UR	JEMC25.240-UR	JEMC53.240-UR	JEMC53.240-UR
	8	JEMC25.240-UR	JEMC25.240-UR	JEMC53.240-UR	JEMC53.240-UR
	16	JEMC25.240-UR	N/A	JEMC53.240-UR	N/A

Tab. 14: Suitable line filters

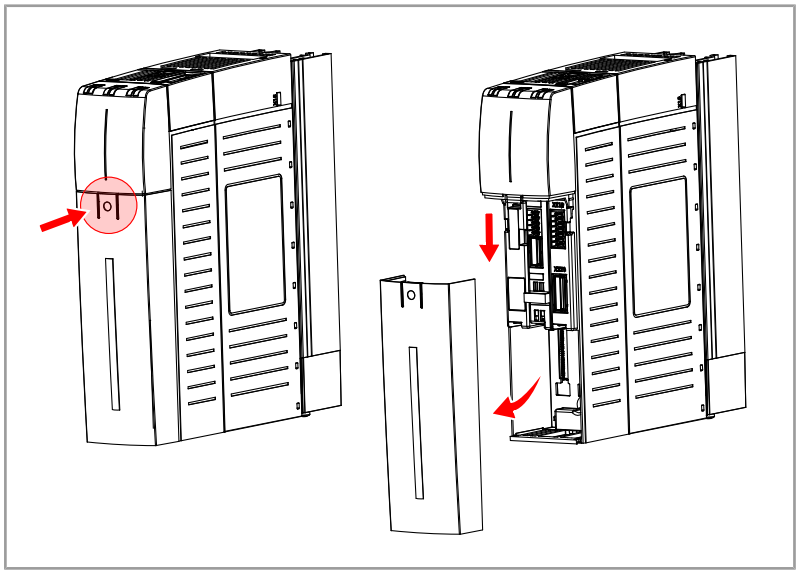
You can order suitable line filters separately as accessories [▶ 72].

6.2 Removing the lower front cover

To access the connections and encoder plug-in slots on the front of the device, the lower front cover must be removed. It is not necessary to remove the upper front cover.

Procedure

1. Gently push down the depression in the middle of the lower front cover.
2. Pull the front cover down and off.



Connection instructions

There is a label located on the inside of the lower front cover with connection instructions for the X210, X12, X21 and X22.

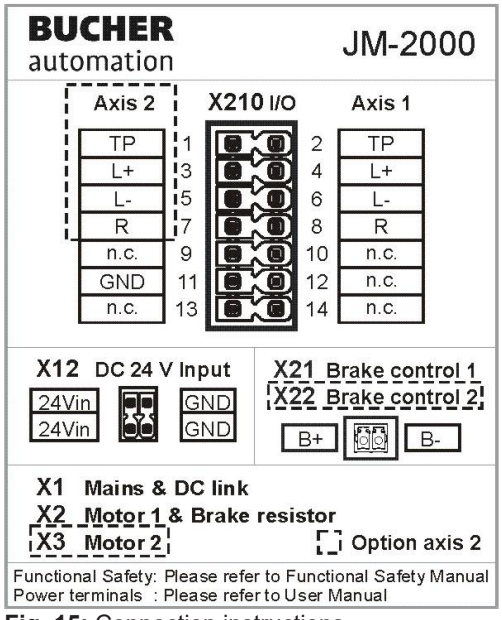


Fig. 15: Connection instructions

Spare parts

If the front cover is lost, it can be ordered as a spare part [▶ 70].

6.3 Connections

Connections at the top and bottom

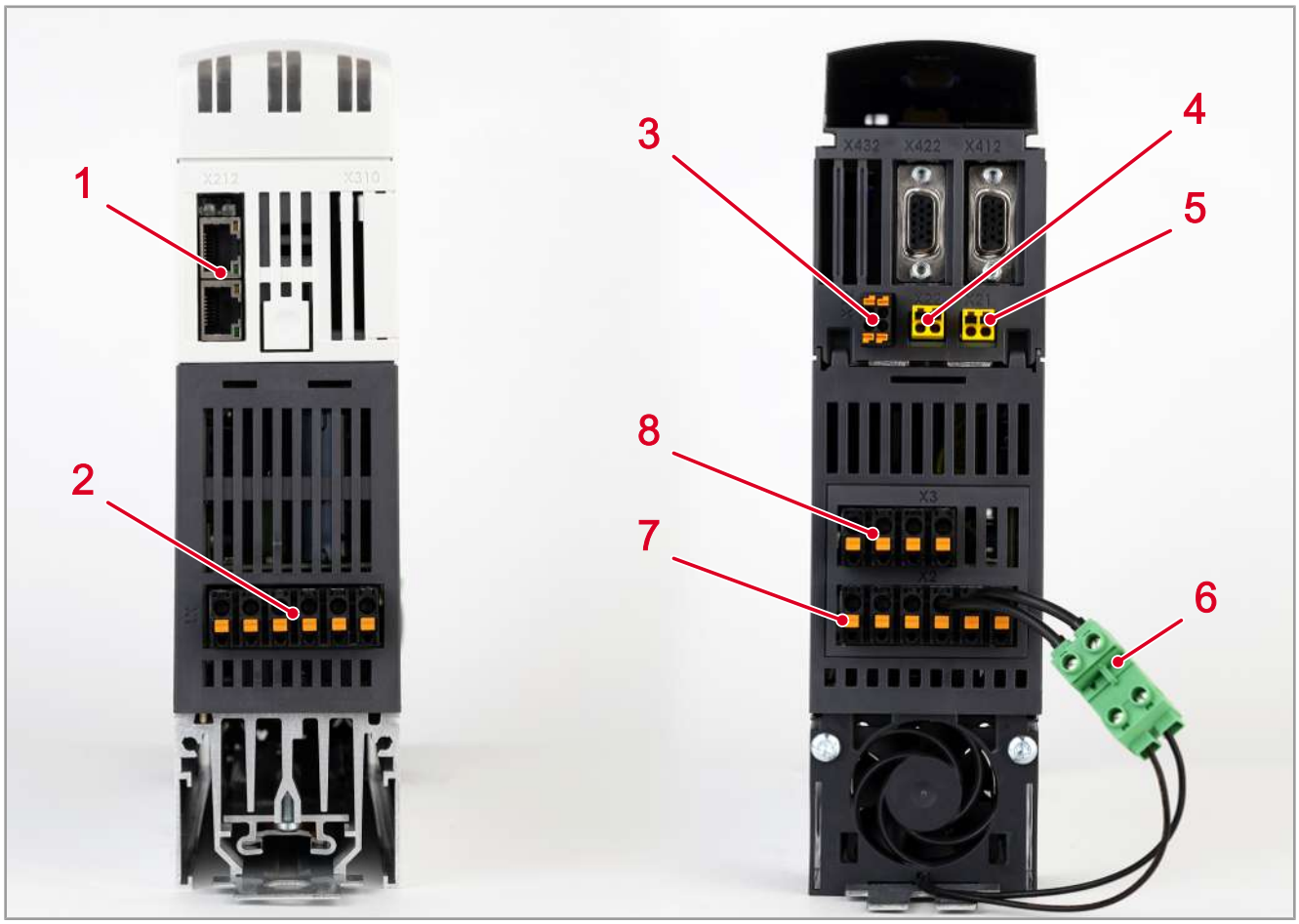


Fig. 16: Connection overview top and bottom

1	Connection X212 – EtherCAT [▶ 45]
2	Connection X1 – AC voltage supply [▶ 46]
3	Connection X12 – DC 24 V supply [▶ 49]
4	Connection X22 – motor holding brake axis 2 [▶ 51]
5	Connection X21 – motor holding brake axis 1 [▶ 50]
6	2-pin adapter plug [▶ 57]
7	Connection X2 – motor connection axis 1 [▶ 47]
8	Connection X3 – motor connection axis 2 [▶ 48]

Connections at the front

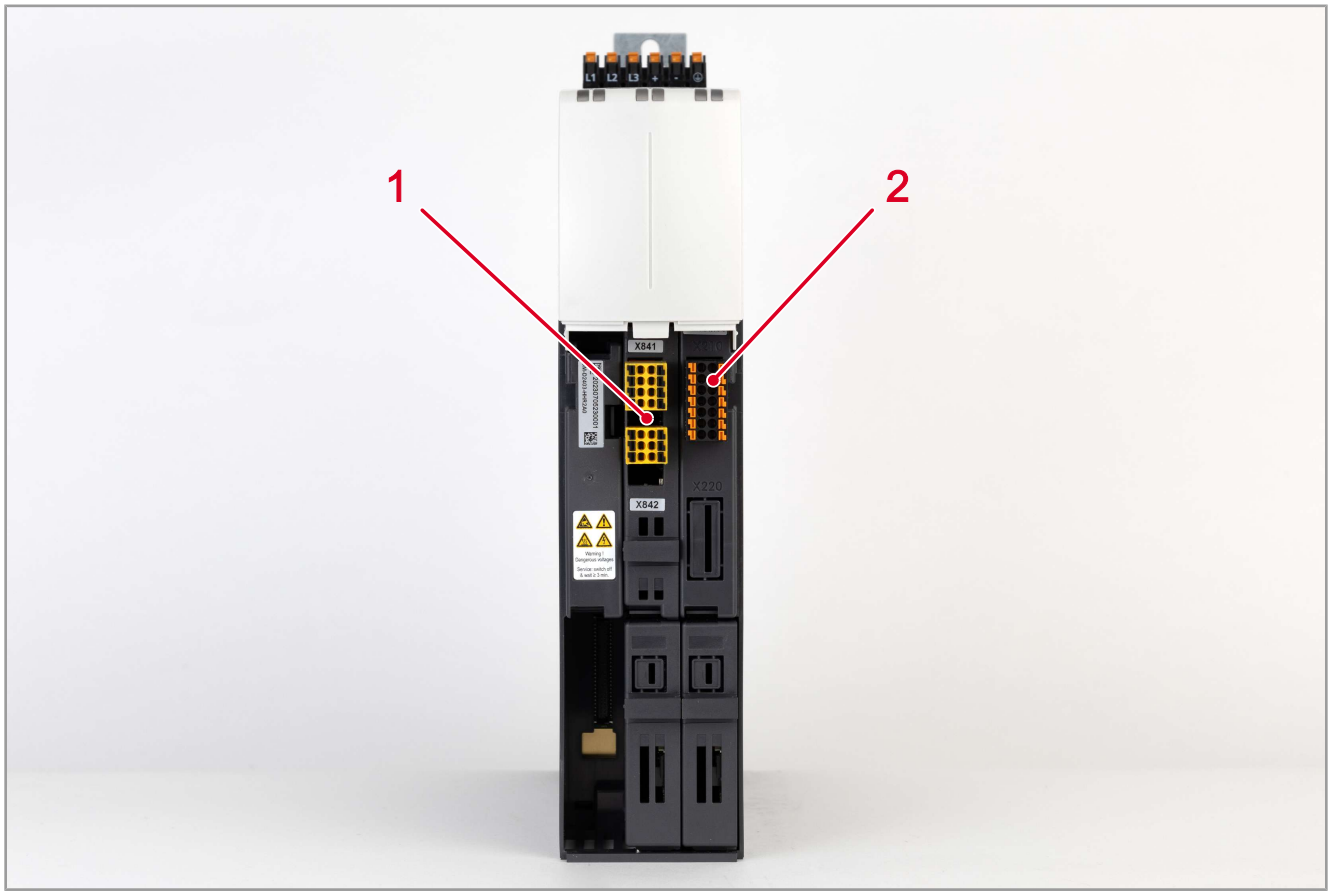


Fig. 17: Connection overview front

1	Connections X841, X842 - STO + SBC [▶ 52]
2	Connection 210 - I/O signals [▶ 56]

NOTICE

Property damage caused by incorrect sizing

Cables that are too small can cause overheating and thus pose a fire hazard.

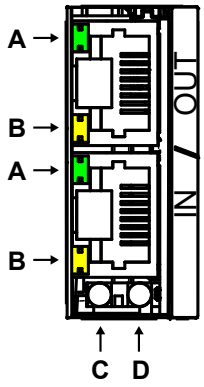
► Use copper conductors rated for 65/75 °C for all power terminals.

6.3.1 Connection X212 – EtherCAT®

X212 connects to:

– EtherCAT® master or EtherCAT® slave

LEDs



RJ45 socket	Signal	LED	Color	Description
OUT	BUS OUT	**A**	Green	ACT: Data transmission
		B	Yellow	LINK: There is a connection to the network
IN	BUS IN	**A**	Green	ACT: Data transmission
		B	Yellow	LINK: There is a connection to the network

Tab. 15: LEDs – EtherCAT® RJ45 socket

Fig. 18: Socket X212

LED	Designation	Color	Description
C	RUN	Green	EtherCAT®-communication active
D	ERR	Red	Error EtherCAT® communication

Tab. 16: LEDs – EtherCAT® status

Cables

You can order suitable cables separately as accessories [▶ 72].

6.3.2 Connection X1 – AC voltage supply

Connect the following to X1:

– AC voltage supply

Pin assignment

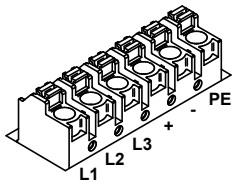


Fig. 19: Terminal X1, 6 pins

Pin	3-phase connection	1-phase connection[1)]
L1	AC voltage phase 1	AC voltage phase
L2	AC voltage phase 2	AC voltage neutral conductor
L3	AC voltage phase 3	-
+	DC link voltage +	
-	DC link voltage -	
PE	PE	

Tab. 17: Pin assignment – terminal X1

[1)] A 1-phase connection is only possible with JM-2000 devices powered by a 230 V supply, e.g. JM-D2203.

NOTICE! The JM-D2206 model variant requires a 3-phase connection.

6-pin connector with push-in connection

Parameter	Description	Standards
Connection technique	Spring connection, push-in	
Type	6-pin, 7.62 mm pitch	
Connectible conductors		
AWG	20 … 12	
Terminal range	0.08 mm² … 2.5 mm²	
Specification without wire end ferrules		
Single-wire	H05(07) V-U	
	0.5 mm² … 1.5 mm²	
Fine-wire	H05(07) V-K	
	0.5 mm² … 2.5 mm²	
Specification with wire end ferrules		
Wire end ferrule without sleeve	0.5 mm² … 2.5 mm²	DIN 46228/1
Wire end ferrule with sleeve	0.5 mm² … 2.5 mm²	DIN 46228/4
Contact length	for wire end ferrule with sleeve up to 1.5 mm²	
	8 mm … 10 mm	
	for wire end ferrule with sleeve up to 2.5 mm²	
	10 mm … 12 mm	

Tab. 18: Connector specification, 6 pins, push-in connection

6.3.3 Connection X2 – motor connection axis 1

Connect the following to X2:

– Motor for axis 1

– External braking resistor

Pin assignment

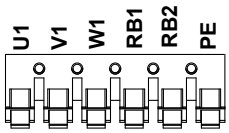


Fig. 20: Terminal X2, 6 pins

Pin	Description
U1	Motor cable U
V1	Motor cable V
W1	Motor cable W
RB1	Braking resistor external +
RB2	Braking resistor external -
PE	Motor cable PE

Tab. 19: Pin assignment- connection X2

6-pin connector with push-in connection

Parameter	Description	Standards
Connection technique	Spring connection, push-in	
Type	6-pin, 7.62 mm pitch	
Connectible conductors		
AWG	20 … 12	
Terminal range	0.08 mm^2 … 2.5 mm^2	
Specification without wire end ferrules		
Single-wire	H05(07) V-U	
	0.5 mm^2 … 1.5 mm^2	
Fine-wire	H05(07) V-K	
	0.5 mm^2 … 2.5 mm^2	
Specification with wire end ferrules		
Wire end ferrule without sleeve	0.5 mm^2 … 2.5 mm^2	DIN 46228/1
Wire end ferrule with sleeve	0.5 mm^2 … 2.5 mm^2	DIN 46228/4
Contact length	for wire end ferrule with sleeve up to 1.5 mm^2	
	8 mm … 10 mm	
	for wire end ferrule with sleeve up to 2.5 mm^2	
	10 mm … 12 mm	

Tab. 20: Connector specification, 6 pins, push-in connection

6.3.4 Connection X3 – motor connection axis 2

Connect the following to X3:

– Motor for axis 2

Pin assignment

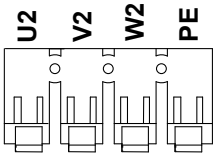


Fig. 21: Terminal X3, 4 pins

Pin	Description
U2	Motor cable U
V2	Motor cable V
W2	Motor cable W
PE	Motor cable PE

Tab. 21: Pin assignment - connection X3

4-pin connector with push-in connection

Parameter	Description	Standards
Connection technique	Spring connection, push-in	
Type	4-pin, 7.62 mm pitch	
Connectible conductors		
AWG	20 … 12	
Terminal range	0.08 mm² … 2.5 mm²	
Specification without wire end ferrules		
Single-wire	H05(07) V-U	
	0.5 mm² … 1.5 mm²	
Fine-wire	H05(07) V-K	
	0.5 mm² … 2.5 mm²	
Specification with wire end ferrules		
Wire end ferrule without sleeve	0.5 mm² … 2.5 mm²	DIN 46228/1
Wire end ferrule with sleeve	0.5 mm² … 2.5 mm²	DIN 46228/4
Contact length	for wire end ferrule with sleeve up to 1.5 mm²	
	8 mm … 10 mm	
	for wire end ferrule with sleeve up to 2.5 mm²	
	10 mm … 12 mm	

Tab. 22: Connector specification, 4 pins, push-in connection

6.3.5 Connection X12 – DC 24 V supply

X12 connects to:

– DC 24 V supply

Pin assignment

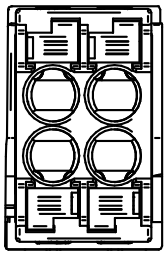


Fig. 22: Terminal X12, 4 pins

X12	
24Vin	**GND**
24Vin	**GND**

Tab. 23: Pin assignment – connection X12

– The 2 inputs for 24Vin are connected internally.

– The 2 GND inputs are connected internally.

– The second input can be used in each case to loop through additional drive controllers.
The max. possible current load in 8 amps.
The number of JetMove servo amplifiers for looping the DC 24 V voltage and GND through depends on the motor type (without or with brake) and the holding current of the motor brake. For larger motors with holding brake you can wire to max. one additional JetMove.

4-pin connector with push-in connection	
Parameter	**Description**
Connection technique	Spring connection, push-in
Type	4-pin, 3.5 mm pitch
Conductor cross-section, multi-wire	0.2 mm^2 … 1.5 mm^2
Stripping length	9 mm … 10 mm
Conductor cross-section, multi-wire with wire end ferrule with sleeve	0.25 mm^2 … 0.75 mm^2
Conductor cross-section, multi-wire with wire end ferrule without sleeve	0.25 mm^2 … 1.5 mm^2
Contact length	8 mm … 10 mm

Tab. 24: Connector specification, 4 pins, push-in connection

6.3.6 Connection X21 – motor holding brake axis 1

X21 connects to:

– Motor holding brake for axis 1

Pin assignment

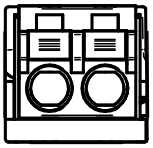


Fig. 23: Terminal X21, 2 pins

X21	
B+	**B-**

Tab. 25: Pin assignment – connection X21

2-pin connector with push-in connection

Parameter	Description
Connection technique	Spring connection, push-in
Type	2-pin, 3.81 mm pitch
Conductor cross-section, multi-wire	0.2 mm^2 … 1.5 mm^2
Stripping length	9 mm … 10 mm
Conductor cross-section, multi-wire with wire end ferrule with sleeve	0.25 mm^2 … 1.5 mm^2
Conductor cross-section, multi-wire with wire end ferrule without sleeve	0.25 mm^2 … 1.5 mm^2
Contact length	10 mm

Tab. 26: Connector specification, 2 pins, push-in connection

6.3.7 Connection X22 – motor holding brake axis 2

X22 connects to:

– Motor holding brake for axis 2

Pin assignment

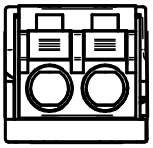


Fig. 24: Connection X22, 2 pins

X22	
B+	**B-**

Tab. 27: Pin assignment – connection X22

2-pin connector with push-in connection

Parameter	Description
Connection technique	Spring connection, push-in
Type	2-pin, 3.81 mm pitch
Conductor cross-section, multi-wire	0.2 mm^2 … 1.5 mm^2
Stripping length	9 mm … 10 mm
Conductor cross-section, multi-wire with wire end ferrule with sleeve	0.25 mm^2 … 1.5 mm^2
Conductor cross-section, multi-wire with wire end ferrule without sleeve	0.25 mm^2 … 1.5 mm^2
Contact length	10 mm

Tab. 28: Connector specification, 2 pins, push-in connection

6.3.8 Connection X841, X842 – STO + SBC [S1]

Pin assignment X841

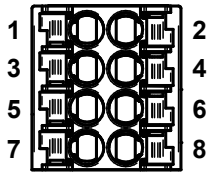


Fig. 25: Terminal X841, 8 pins

Pin	Signal	Description
1	**AX1_STOA_In**	STO input AX1 - requirement for pulse lock, channel A
2	**AX1_STOB_In**	STO input AX1 - requirement for pulse lock, channel B
3	**GND_AX1**	Reference potential AX1
4	**GND_AX1**	Reference potential AX1
5	**AX1_SBCA_In**	SBC input AX1 - requirement for safe brake, channel A
6	**AX1_SBCB_In**	SBC input AX1 - requirement for safe brake, channel B
7	n.c.	n.c.
8	n.c.	n.c.

Tab. 29: Pin assignment – connection X841

Pin assignment X842

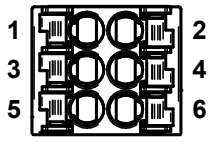


Fig. 26: Terminal X842, 6 pins

Pin	Signal	Description
1	**AX2_STOA_In**	STO input AX2 - requirement for pulse lock, channel A
2	**AX2_STOB_In**	STO input AX2 - requirement for pulse lock, channel B
3	**GND_AX2**	Reference potential AX2
4	**GND_AX2**	Reference potential AX2
5	**AX2_SBCA_In**	SBC input AX2 - requirement for safe brake activation, channel A
6	**AX2_SBCB_In**	SBC input AX2 - requirement for safe brake activation, channel B

Tab. 30: Pin assignment – connection X842

8-pin connector with push-in connection

Parameter	Description
Connection technique	Spring connection, push-in
Type	8-pin, 3.5 mm pitch
Conductor cross-section, multi-wire	0.2 mm^2 … 1.5 mm^2
Stripping length	9 mm … 10 mm
Conductor cross-section, multi-wire with wire end ferrule with sleeve	0.25 mm^2 … 0.75 mm^2
Conductor cross-section, multi-wire with wire end ferrule without sleeve	0.25 mm^2 … 1.5 mm^2
Contact length	8 mm … 10 mm

Tab. 31: Connector specification, 8 pins, push-in connection

6-pin connector with push-in connection

Parameter	Description
Connection technique	Spring connection, push-in
Type	6-pin, 3.5 mm pitch
Conductor cross-section, multi-wire	0.2 mm^2 … 1.5 mm^2
Stripping length	9 mm … 10 mm
Conductor cross-section, multi-wire with wire end ferrule with sleeve	0.25 mm^2 … 0.75 mm^2
Conductor cross-section, multi-wire with wire end ferrule without sleeve	0.25 mm^2 … 1.5 mm^2
Contact length	8 mm … 10 mm

Tab. 32: Connector specification, 6 pins, push-in connection

6.3.9 Connection X843 – Extended safety function [S2]

There is a modified, extended signal assignment for the optional extended safety function FSoE -S2 that deviates from the built-in default STO function. The X843 connection is present on -S2 devices only.

Safe resolvers and safe HIPERFACE DSL® are the only possible safe encoder interfaces. The motors must be equipped with safe encoders.

Programming the digital I/Os and extended safety functions in the FSoE slave mandates a safety programming software and the use of a safety controller (e.g. JSC) as FSoE master to complement the motion control.

NOTICE



Applicable documents

Please observe the information given in the *Integrated Safety Function S2* Functional Description for further details.

Pin assignment

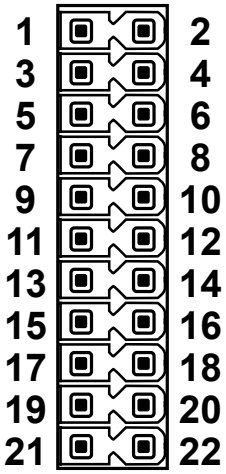


Fig. 27: Connection X843

Pin	Signal	Description
1	**DI1-A**	Digital input 1-A
2	**DI1-B**	Digital input 1-B
3	**DI2-A**	Digital input 2-A
4	**Digital Input 2-B**	Digital input 2-B
5	**DI3-A**	Digital input 3-A
6	**DI3-B**	Digital input 3-B
7	**DI4-A**	Digital input 4-A
8	**DI4-B**	Digital input 4-B
9	**Error ACK**	Error acknowledgment
10	**Restart ACK**	Restart confirmation
11	**GND**	
12	**GND**	
13	**DO1-A**	Digital output 1-A
14	**DO1-B**	Digital output 1-B
15	**DO2-A**	Digital output 2-A
16	**DO2-B**	Digital output 2-B
17	**GND**	
18	**GND**	
19	**Status of SBC**	State of SBC
20	n.c.	

Pin	Signal	Description
21	**DC 24 V (U_{OSSD})**	OSSD supply (Output Signal Switching Device)
22	**DC 24 V (U_{OSSD})**	OSSD supply (Output Signal Switching Device)

22-pin connector with push-in connection

Parameter	Description
Connection technique	Spring connection, push-in
Type	22-pin, 3.5 mm pitch
Conductor cross-section, multi-wire	0.2 mm^2 … 1.5 mm^2
Stripping length	9 mm … 10 mm
Conductor cross-section, multi-wire with wire end ferrule with sleeve	0.25 mm^2 … 0.75 mm^2
Conductor cross-section, multi-wire with wire end ferrule without sleeve	0.25 mm^2 … 1.5 mm^2
Contact length	8 mm … 10 mm

Tab. 33: Connector specification, 22 pins, push-in connection

6.3.10 Connection X210 – digital inputs

– 8 digital inputs

Pin assignment

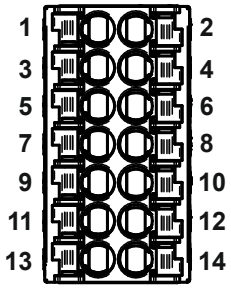


Fig. 28: Terminal X210,
14 pins

Description	Axis 2	Pin		Axis 1	Description
TouchProbe 1 for axis 2 or TouchProbe 2 for axis 1	**TP**	**1**	**2**	**TP**	TouchProbe 1 for axis 1 or TouchProbe 2 for axis 2
Limit switch + (limit +)	**L+**	**3**	**4**	**L+**	Limit switch + (limit +)
Limit switch - (limit -)	**L-**	**5**	**6**	**L-**	Limit switch - (limit -)
Reference signal	**R**	**7**	**8**	**R**	Reference signal
	n.c.	9	10	n.c.	
	GND	**11**	12	n.c.	
	n.c.	13	14	n.c.	

Tab. 34: Pin assignment – connection X210

14-pin connector with push-in connection	
Parameter	**Description**
Connection technique	Spring connection, push-in
Type	14-pin, 3.5 mm pitch
Conductor cross-section, multi-wire	0.2 mm^2 … 1.5 mm^2
Stripping length	9 mm … 10 mm
Conductor cross-section, multi-wire with wire end ferrule with sleeve	0.25 mm^2 … 0.75 mm^2
Conductor cross-section, multi-wire with wire end ferrule without sleeve	0.25 mm^2 … 1.5 mm^2
Contact length	8 mm … 10 mm

Tab. 35: Connector specification, 14 pins, push-in connection

6.3.11 Braking resistors [–R]

An internal braking resistor is installed in the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 device (ID **–R1** in the order code).

Connection

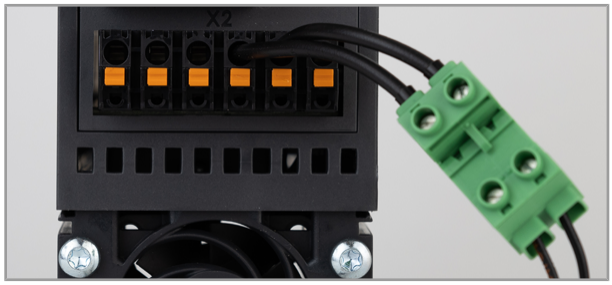


Fig. 29: 2-pin adapter plug to X2

The internal or optional external braking resistor is connected via a 2-pin adapter plug with terminals **RB1** and **RB2** of connector terminal **X2**.

If you would like to use an external braking resistor, disconnect the 2 wires from connector terminal X2. Connect the external braking resistor to **RB1** and **RB2**. The 2-pin adapter plug no longer has any function, but can be left on the device in the control cabinet.

2-pin adapter plug, socket (female)	
Parameter	**Description**
Connection technique	Screw connection with puller sleeve
Type	2-pin, 7.62 mm pitch
Nominal cross section	2.5 mm²
Conductor cross-section single-wire	0.2 mm^2 … 2.5 mm^2
Conductor cross-section, multi-wire	0.2 mm^2 … 2.5 mm^2
Stripping length	8 mm
Conductor cross-section, multi-wire with wire end ferrule without sleeve	0.25 mm^2 … 2.5 mm^2
Conductor cross-section, multi-wire with wire end ferrule with sleeve	0.25 mm^2 … 2.5 mm^2
Conductor with same cross-section, single-wire	0.2 mm² ... 1 mm²
2 conductors with same cross-section, multi-wire	0.2 mm² ... 1.5 mm²
2 conductors with same cross-section, multi-wire end ferrule without sleeve	0.25 mm² ... 1 mm²
2 conductors with same cross-section, multi-wire with TWIN wire end ferrule and sleeve	0.5 mm² ... 1 mm²
Plug gauge a x b / diameter	2.8 mm x 2.4 mm / 2.5 mm
Tightening torque	0.5 Nm ... 0.6 Nm

Tab. 36: Connector specification, 2-pin, adapter plug

2-pin adapter plug, pins (male)	
Parameter	**Description**
Connection technique	Screw connection with puller sleeve

Parameter	Description
Type	2-pin, 7.62 mm pitch
Nominal cross section	2.5 mm²
Conductor cross-section single-wire	0.2 mm^2 … 2.5 mm^2
Conductor cross-section, multi-wire	0.2 mm^2 … 2.5 mm^2
Stripping length	8 mm
Conductor cross-section, multi-wire with wire end ferrule without sleeve	0.25 mm^2 … 2.5 mm^2
Conductor cross-section, multi-wire with wire end ferrule with sleeve	0.25 mm^2 … 2.5 mm^2
Conductor with same cross-section, single-wire	0.2 mm² ... 1 mm²
2 conductors with same cross-section, multi-wire	0.2 mm² ... 1.5 mm²
2 conductors with same cross-section, multi-wire end ferrule without sleeve	0.25 mm² ... 1 mm²
2 conductors with same cross-section, multi-wire with TWIN wire end ferrule and sleeve	0.5 mm² ... 1 mm²
Plug gauge a x b / diameter	2.8 mm x 2.0 mm / 2.4 mm
Tightening torque	0.5 Nm ... 0.6 Nm

Tab. 37: Connector specification, 2-pin, adapter plug

6.4 Encoder plug-in slots

The JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 servo amplifier has 3 encoder plug-in slots.

The order of the encoders on the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406 is always from right to left.

For the encoder assembly, refer to the nameplate [▶ 20] and the order code.



Fig. 30: Encoder plug-in slots

1	Connection X412 - motor encoder for axis 1
2	Connection X422 - motor encoder for axis 2
3	Connection X432 - additional encoder

6.4.1 Encoder option -R / -S2R – resolver

Encoder option –R is designed to connect to a resolver. Encoder option –S2R is designed to connect to a safe resolver.

Fields of application

Encoder option – R can be used as:

– Motor encoder for axis 1 to X412
– Motor encoder for axis 2 to X422

Encoder option –S2R can be used as:

– Motor encoder for axis 1 to X412
– Motor encoder for axis 2 to X422

Pin assignment

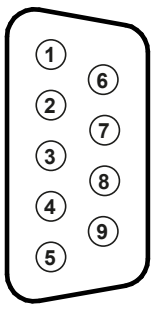


Fig. 31: Sub-D, 9-pin, socket

Pin	Signal	Description
1	R1 (Err +)	Excitation winding +
2	S4 (Sin -)	Resolver winding A -
3	S3 (Cos -)	Resolver winding B +
4	Th1 -	Terminal for motor temperature sensor -
6	R2 (Err -)	Excitation winding -
7	S2 (Sin +)	Resolver winding A+
8	S1 (Cos +)	Resolver winding B -
9	Th1 +	Terminal for motor temperature sensor +

Ready-made cable

You can order suitable ready-made KAY_1423_xxxx cables separately as accessories [▶ 71]. Due to the installation space constraints in the control cabinet, we recommend using the Bucher Automation cable with angled Sub-D housing.

For example, 12-pin M23 socket on the Bucher Automation motor	Resolver	Cables	Sub-D, 9-pin, plug to KAY_1423_xxxx
Pin	**Signal**	**Color**	**Pin**
1	S1 (Cos +)	RD	**8**
2	S3 (Cos -)	BU	**3**
3	S4 (Sin -)	YE	**2**
4	S2 (Sin +)	GN	**7**
5	R1 (Err +)	PK	**1**
6	R2 (Err -)	GY	**6**
7	Th1 +	WH	**9**
8	Th1 -	BN	**4**

Colors and indicate twisted wires in the encoder cables with encoder shield.

6.4.2 Encoder options –H – HIPERFACE DSL®

Encoder option –H is designed to connect to a HIPERFACE-DSL® encoder with 2-wire design (1-cable system). The encoder module can supply an encoder with a maximum of 1 W.

Fields of application

Encoder option –H can be used as:

– Motor encoder for axis 1 to X412
– Motor encoder for axis 2 to X422

Pin assignment

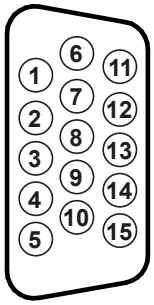


Fig. 32: Sub-D, 15-pin, socket

Pin	Signal
9	DSL-
14	DSL+

Ready-made cable

You can order the suitable ready-made KAY_1411_xxxx and KAY_1413_xxxx cables separately as accessories [▶ 71]. Due to the installation space constraints in the control cabinet, we recommend using the Bucher Automation cable with angled Sub-D housing.

This cable is a hybrid cable. The wiring leads to 3 different connectors on the JM-D2203 / JM-D2206 / JM-D2403 / JM-D2406. The pin names differ depending on the servo motor being used. For details, refer to the user manual of the respective servo motor available on www.bucherautomation.com.

E.g. socket on Bucher Automation motor (M23)	**HIPERFACE-DSL® encoder**	**Cables**	**Sub-HD, 15-pin, plug to KAY_1411_xxxx KAY_1413_xxxx**	**Connection to the JM-2000 (not number of axes)**
Pin	**Signal**	**Wire no. / color**	**Pin**	**Motor connection**
A	Phase 1	1		X2/X3
B	Phase 2	2		
C	Phase 3	3		
D	Protective conductor	GN-YE		
				Brake
G	Brake+	6		X21/X22
F	Brake-	5		
				Encoder connection
E	DSL+	WH	**14**	X412/X422
H	DSL-	BU	**9**	
L	DSL shield			

The color indicates twisted pair wires in the encoder cables with encoder shield.

6.4.3 Encoder option –A – External SinCos encoder

Encoder option –A makes it possible to connect an external SinCos encoder (2-cable system).

Fields of application

Encoder option –A can be used as:

– Motor encoder for axis 1 to X412
– Motor encoder for axis 2 to X422
– Additional encoder on X432

Pin assignment

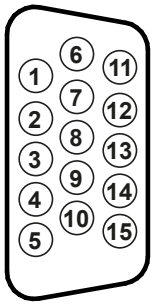


Fig. 33: Sub-D, 15-pin, socket

Pin	Description
3	Reference cosine
4	Cosine+
5	Terminal for motor temperature sensor -
6	Voltage supply (DC 12 V max)
7	Reference pulse -
9	Reference sine
10	Terminal for motor temperature sensor +
11	V_Sense
12	Reference pulse +
14	Sine+
15	Ground (GND)

6.4.4 Encoder option –A – HIPERFACE® analog

Encoder option –A is designed to connect to a HIPERFACE encoder (2-cable system).

Fields of application

Encoder option –A can be used as:

– Motor encoder for axis 1 to X412
– Motor encoder for axis 2 to X422
– Additional encoder on X432

Pin assignment

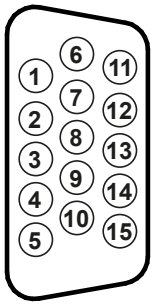


Fig. 34: Sub-D, 15-pin, socket

Pin	Description
3	Reference cosine
4	Cosine+
5	Terminal for motor temperature sensor -
6	Voltage supply (DC 7 V ... DC 12 V)
8	DATA - (RS-485)
9	Reference sine
10	Terminal for motor temperature sensor +
11	V_Sense
13	DATA + (RS-485)
14	Sine +
15	Ground (GND)

Ready-made cable

You can order suitable ready-made KAY_1433_xxxx cables separately as accessories [▶ 71]. Due to the installation space constraints in the control cabinet, we recommend using the Bucher Automation cable with angled Sub-D housing.

12-pin socket	HIPERFACE® encoder	Cables	HD-Sub-D, 15-pin, plug o KAY_1433_xxxx
Pin	**Signal**	**Wire color**	**Pin**
1	-	-	-
2	-	-	-
3	Sin +	WH	**14**
4	Sin -	BN	**9**
5	Cos +	GN	**4**
6	Cos -	YE	**3**
7	Data - (RS-485)	GY	**8**
8	Data + (RS-485)	PK	**13**

12-pin socket	HIPERFACE® encoder	Cables	HD-Sub-D, 15-pin, plug o KAY_1433_xxxx
9	0 V	BU	**15**
10	Vers. 7 … 12 V	RD	**6**
11	Th1 +	BK	**10**
12	Th1 -	VT	**5**
			11

Colors and indicate twisted wires in the encoder cables with encoder shield.

6.4.5 Encoder option –I – incremental encoder

Encoder option –I makes it possible to connect an incremental encoder (2-cable system).

Fields of application

Encoder option –I can be used as:

– Additional encoder on X432

Pin assignment

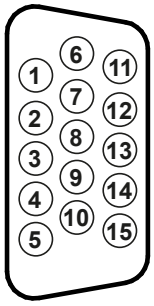


Fig. 35: Sub-D, 15-pin, socket

Pin	Signal	Description
3	B_IN - (B -)	Input channel B -
4	B_IN + (B +)	Input channel B +
5	TM - (T -)	Input thermistor Th1 -
6	V_ABS (max. DC 12 V)	Output DC 5 V supply of external encoders
7	R_IN - (C -)	Input zero pulse -
9	A_IN - (A -)	Input channel A -
10	TM + (T +)	Input thermistor Th1 +
11	V_Sense	Input for voltage correction via sense line
12	R_IN + (C +)	Input zero pulse +
14	A_IN + (A +)	Input channel A +
15	GND	Output DC 0 V supply of external encoders

6.4.6 Encoder option –E6 – EnDat® 2.2

Encoder option –E6 is designed to connect to an EnDat® 2.2 encoder (2-cable system).

Fields of application

Encoder option –E6 can be used as:

– Motor encoder for axis 1 to X412
– Motor encoder for axis 2 to X422
– Additional encoder on X432

Pin assignment

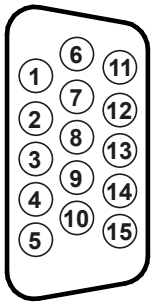


Fig. 36: Sub-D, 15-pin, socket

Pin	Signal	Description
1	Clock -	Endat® 2.2 signal
2	Clock +	Endat® 2.2 signal
6	V_ABS (DC 12 V max)	DC 5 V supply voltage for an external encoder
8	Data -	Endat® 2.2 signal
13	Data +	Endat® 2.2 signal
15	(GND)	DC 0 V supply voltage for an external encoder

Ready-made cable

You can order suitable ready-made KAY_1431_xxxx cables separately as accessories [▶ 71]. Due to the installation space constraints in the control cabinet, we recommend using the Bucher Automation cable with angled Sub-D housing.

12-pin socket	EnDat® 2.2 encoder	Cables	HD-Sub-D, 15-pin, plug o KAY_1433_xxxx
Pin	**Signal**	**Wire color**	**Pin**
1	Th1 +	GN	**10**
2	Th1 -	YE	**5**
3	Data -	WH	**8**
4	Data +	BN	**13**
5	-		
6	-		
7	Clock -	GY	**1**
8	Clock +	PK	**2**
9	0 V	BU	**15**
10	DC 5 V	RD	**6**
11	-		
12	-		

Colors and indicate twisted wires in the encoder cables with encoder shield.

7 Maintenance

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

7.1 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.

7.2 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.

7.3 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. 37: 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.

8 Service

8.1 Technical Support

If you have any questions, suggestions, or issues, our technical support team is here to assist you with their expertise. You can reach them by phone or through the contact form on our website:

Technical Support | www.bucherautomation.com

Or send us an email:

support@bucherautomation.com

Technical Support needs the following information:

– Hardware Revision and Serial Number
  You can find the serial number and hardware revision of your product on the nameplate.
– Operating system version
  You can determine the operating system version using the development environment.

9 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.

9.1 Spare parts

Component	Item number
USB stick with complete documentation	60888000

9.1.1 Mounting hardware

Component	Item number
Top fitting panel	60885886
Bottom fitting panel	60885603
Fastening bracket for motor cable with shielding bracket	60886090

9.1.2 Front covers

Component	Item number
Upper front cover with Bucher Automation logo	60885604
Bottom front cover, frame sizes 2 … 3	60886062

9.1.3 Connector sets

Component	Item number
Brake resistor connector set	60887619
I/O and S1 connector set, double-axis	60886093
I/O and S2 connector set, double-axis	60887094
Power-level terminal connector set, double-axis, frame size 2	60886083

Tab. 38: Spare parts – connector sets

9.2 Accessories

9.2.1 Pre-assembled cables

Encoder cables

Component	Cable assembly
KAY_1423_xxxx resolver cable	(4 x 2 x 0.25)
KAY_1423Y_xxxx Resolver cable for motor with Y-Tec connector (12-pin operation)	(4 x 2 x 0.25)
KAY_1424_xxxx SinCos cable	(5 x 2 x 0.25)
KAY_1425_xxxx Incremental encoder cable with 17-pin operation Intercontec for JHQ motor (F41)	(5 x 2 x 0.25)
KAY_1425A_xxxx Incremental encoder cable with 12-pin operation Intercontec	(5 x 2 x 0.25)
KAY_1431_xxxx EnDat 2.2 cable, 6 wires	(4 x 2 x 0.25)
KAY_1433_xxxx HIPERFACE® cable	(5 x 2 x 0.25)
KAY_1433Y_xxxx HIPERFACE®-cable for motor with Y-Tec connector (12-pin operation)	(5 x 2 x 0.25)

Power cables

Component	Cable assembly
KAY_1410_xxxx 1.5 mm² power cable without brake (2-cable system)	(4 x 1.5)
KAY_1410Y_xxxx 1.5 mm² power cable without brake (2-cable system), for motor with Y-Tec connector	(4 x 1.5)
KAY_1412_xxxx 1.5 mm² power cable with brake (2-cable system)	(4 x 1.5 + (2 x 1.5))
KAY_1412Y_xxxx 1.0 mm² power cable with brake (2-cable system), for motor with Y-Tec connector	(4 x 1.0 + (2 x 0.5))
KAY_1414_xxxx power cable (2-cable system)	(4 x 2.5 + (2 x 1.5))

HIPERFACE® DSL cable (always with brake wires)

Component	Cable assembly
KAY_1411_xxxx 1.0 mm² HIPERFACE® DSL (1-cable system) for motor with M23 connector	(4 x 1.0 + (2 x 0.75) + (2 x AWG22))
KAY_1411I_xxxx 1.0 mm² HIPERFACE® DSL (1-cable system) for motor with I-Tec connector	(4 x 1.0 + (2 x 0.75) + (2 x AWG22))
KAY_1413_xxxx 1.5 mm² HIPERFACE® DSL (1-cable system) for motor with M23 connector	(4 x 1.5 + (2 x 0.75) + (2 x AWG22))
KAY_1415_xxxx 2.5 mm² HIPERFACE® DSL (1-cable system) for motor with M23 connector	(4 x 2.5 + (2 x 0.75) + (2 x AWG22))

9.2.2 EtherCAT® cable

Component	Item number
Patch cable 1:1, 0.25 m, gray, Hirose, Cat 5e, shielded	60887736
Patch cable 1:1, 1 m, gray, Hirose, Cat 5e, shielded	60537500
Patch cable 1:1, 2 m, gray, Hirose, Cat 5e, shielded	60854512

9.2.3 External line filter

Type	Item number
JEMC25.240-UR	60880639
JEMC53.240-UR	60880640

9.2.4 Optional external brake resistors

For JM-D2403 / JM-D2406

Type	External	Rated power	Peak power	Item number
JBR039.02.540-UR	39 Ω	150 W	16,000 W	60880604_00
JBR039.03.540-UR		300 W	16,000 W	60880606_00
JBR039.10.201-UR		1,000 W	16,000 W	60880608_00
JBR039.20.201-UR		2,000 W	16,000 W	60880610_00

For JM-D2203 / JM-D2206

Type	External	Rated power	Peak power	Item number
JBR020.02.540-UR	20 Ω	150 W	32,000 W	60880605_00
JBR020.03.540-UR		300 W	32,000 W	60880607_00
JBR020.10.201-UR		1,000 W	32,000 W	60880609_00
JBR039.20.201-UR		2,000 W	32,000 W	60880611_00

List of figures

Fig. 1 Safety label ... 13
Fig. 2 Safety Label: Discharge Time ... 14
Fig. 3 Design ... 15
Fig. 4 Status indication ... 16
Fig. 5 Main Nameplate ... 20
Fig. 6 Example of placement -S2 ... 22
Fig. 7 Dimension in mm ... 25
Fig. 8 Derating diagrams ... 30
Fig. 9 Distances from surrounding parts in mm ... 33
Fig. 10 Dimensions ext. line filter ... 35
Fig. 11 Mounting the shield connecting bracket on the line filter ... 36
Fig. 12 Protective earth conductor terminal ... 39
Fig. 13 Connection at the PE connector. ... 40
Fig. 14 EMC-compliant Sub-D shield connection ... 40
Fig. 15 Connection instructions ... 42
Fig. 16 Connection overview top and bottom ... 43
Fig. 17 Connection overview front ... 44
Fig. 18 Socket X212 ... 45
Fig. 19 Terminal X1, 6 pins ... 46
Fig. 20 Terminal X2, 6 pins ... 47
Fig. 21 Terminal X3, 4 pins ... 48
Fig. 22 Terminal X12, 4 pins ... 49
Fig. 23 Terminal X21, 2 pins ... 50
Fig. 24 Connection X22, 2 pins ... 51
Fig. 25 Terminal X841, 8 pins ... 52
Fig. 26 Terminal X842, 6 pins ... 52
Fig. 27 Connection X843 ... 54
Fig. 28 Terminal X210, 14 pins ... 56
Fig. 29 2-pin adapter plug to X2 ... 57
Fig. 30 Encoder plug-in slots ... 59
Fig. 31 Sub-D, 9-pin, socket ... 60
Fig. 32 Sub-D, 15-pin, socket ... 61
Fig. 33 Sub-D, 15-pin, socket ... 63
Fig. 34 Sub-D, 15-pin, socket ... 64
Fig. 35 Sub-D, 15-pin, socket ... 65
Fig. 36 Sub-D, 15-pin, socket ... 66
Fig. 37 WEEE icon – crossed out wheeled bin ... 68

List of tables

Tab. 1 Technical data – mechanical properties 26
Tab. 2 Technical Specifications – Motor-Side Output 26
Tab. 3 External braking resistor 26
Tab. 4 Technical data – mains-side input 27
Tab. 5 Eaton Individual circuit breakers 27
Tab. 6 Technical data – DC 24 V voltage supply 27
Tab. 7 Technical data – activation of motor holding brake 28
Tab. 8 Technical data – digital inputs 28
Tab. 9 Technical data – EtherCAT® interface 28
Tab. 10 Technical data - Environmental conditions 28
Tab. 11 Technical data – external line filter 29
Tab. 12 Output current derating depending on the switching frequency 29
Tab. 13 Dimensions – external line filter 35
Tab. 14 Suitable line filters 41
Tab. 15 LEDs – EtherCAT® RJ45 socket 45
Tab. 16 LEDs – EtherCAT® status 45
Tab. 17 Pin assignment – terminal X1 46
Tab. 18 Connector specification, 6 pins, push-in connection 46
Tab. 19 Pin assignment- connection X2 47
Tab. 20 Connector specification, 6 pins, push-in connection 47
Tab. 21 Pin assignment - connection X3 48
Tab. 22 Connector specification, 4 pins, push-in connection 48
Tab. 23 Pin assignment – connection X12 49
Tab. 24 Connector specification, 4 pins, push-in connection 49
Tab. 25 Pin assignment – connection X21 50
Tab. 26 Connector specification, 2 pins, push-in connection 50
Tab. 27 Pin assignment – connection X22 51
Tab. 28 Connector specification, 2 pins, push-in connection 51
Tab. 29 Pin assignment – connection X841 52
Tab. 30 Pin assignment – connection X842 52
Tab. 31 Connector specification, 8 pins, push-in connection 53
Tab. 32 Connector specification, 6 pins, push-in connection 53
Tab. 33 Connector specification, 22 pins, push-in connection 55
Tab. 34 Pin assignment – connection X210 56
Tab. 35 Connector specification, 14 pins, push-in connection 56
Tab. 36 Connector specification, 2-pin, adapter plug 57
Tab. 37 Connector specification, 2-pin, adapter plug 57
Tab. 38 Spare parts – connector sets 70

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