

User Manual



60888134_01

JM-2203 / JM-2403

Servo amplifier

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

Technical support
T +49 7141 2550-444
support@bucherautomation.com

Sales

T +49 7141 2550-663 sales@bucherautomation.com

www.bucherautomation.com

Translation of the german original User Manual

Revision 1.01

Date of issue 1/17/2025

Table of Contents

1	Intro	ductionduction	5
	1.1	Information on this document	5
	1.2	Typographical conventions	6
2	Safe	ty	7
	2.1	General Information	7
	2.2	Purpose	7
		2.2.1 Intended use	7
		2.2.2 Non-intended use	7
	2.3	Warnings used in this document	8
	2.4	General safety instructions	9
	2.5	Safety label	13
3	Prod	uct description	14
	3.1	Design	14
	3.2	Product features	14
	3.3	Status display	15
		3.3.1 Diagnostic capability via the status display	16
	3.4	Nameplate	19
	3.5	Scope of Delivery	20
	3.6	Encoder options	21
4	Tech	nical Specifications	24
	4.1	Dimensions	24
	4.2	Mechanical specifications	25
	4.3	Output motor side	25
	4.4	Input mains side	25
	4.5	Ports and interfaces	26
	4.6	Environmental conditions	27
	4.7	External line filter	28
5	Mech	nanical installation	29
	5.1	Mounting the servo amplifier	30
	5.2	Removing the servo amplifier	32
	5.3	Mounting the line filter	33
6	Elect	trical connection	35
	6.1	EMC-compliant installation	36
		6.1.1 Line filter	39
	6.2	Removing the lower front cover	40

	6.3	3 Connections				
		6.3.1	Connection X212 – EtherCAT®	42		
		6.3.2	Connection X1 – AC voltage supply	43		
		6.3.3	Connection X2 – motor connection axis 1	44		
		6.3.4	Connection X12 – DC 24 V supply	45		
		6.3.5	Connection X21 – motor holding brake axis 1	46		
		6.3.6	Connection X841 – STO + SBC [S1]	47		
		6.3.7	Connection X843 – Extended safety function [S2]	48		
		6.3.8	Connection X210 – digital inputs	49		
		6.3.9	Braking resistors [–R]	50		
	6.4	Encod	er plug-in slots	52		
		6.4.1	Encoder option -R / -S2R – resolver	53		
		6.4.2	Encoder options –H – HIPERFACE DSL®	54		
		6.4.3	Encoder option –A – External SinCos encoder	55		
		6.4.4	Encoder option –A – HIPERFACE® analog	56		
		6.4.5	Encoder option –I – incremental encoder	57		
		6.4.6	Encoder option –E6 – EnDat® 2.2	58		
7	Main	tenanc	e	59		
	7.1	Repair	rs	59		
	7.2	Storag	e and Shipment	59		
	7.3	Return	and Disposal	60		
8	Serv	ice		61		
	8.1	Techn	ical support	61		
9	Spar	e parts	and accessories	62		
	• 9.1	_	parts			
		9.1.1	Mounting hardware			
		9.1.2	Front covers	62		
		9.1.3	Connector sets	62		
	9.2	Acces	sories	63		
		9.2.1	Pre-assembled cables	63		
		9.2.2	EtherCAT® cable			
		9.2.3	External line filter	64		
		9.2.4	Optional external brake resistors	64		

Bucher Automation AG Introduction | 1

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 it. 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

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

NOTICE



Applicable documents

When installing and connecting the servo amplifier within an multi-axis system, it is mandatory that the operating instructions of the additional devices and the *Functional Description Integrated Safety Function S1- JM-2000 and JM-D2000* be observed. You can find these documents on www.bucherautomation.com.

Go to the JM-2203 / JM-2403 product page > Downloads.

(i) 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.

(i) Info

EtherCAT®

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

Bucher Automation AG Introduction | 1

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.



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

The JM-2203 / JM-2403 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 in this document

▲ DANGER



High risk

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

MARNING



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 due to high operating voltage

The high operating voltage of the device leads to severe injuries or death.

Comply with the following rules throughout the entire work process.

- ▶ Do not remove any covers during operation and keep the switch cabinet doors closed.
- ► Check whether all live connections are safely protected against contact.
- ▶ Never open the device.
- Never touch the wiring terminals of the device for voltage supply and DC link voltage during operation.





Risk of electric arc due to improper handling

Improper handling can result in an electric arc, which may lead to severe injury 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, 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.

MARNING



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.

MARNING



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.

MARNING



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.

MARNING



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.

MARNING



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.

A 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.

2.5 Safety label

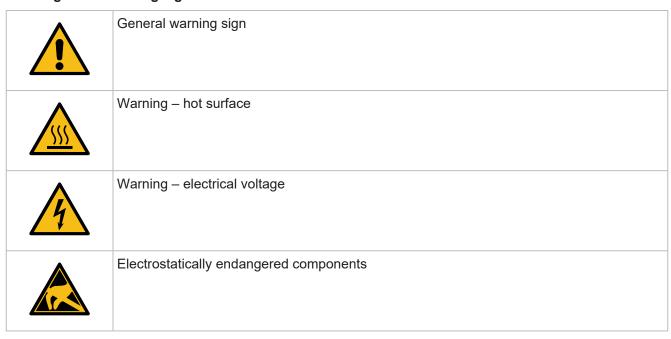
A safety label is affixed to the front of the device.



Fig. 1: Safety label

The safety label contains 4 warning signs and an indication of the discharge time.

Meaning of the warning signs



3 Product description

The JM-2203 / JM-2403 is a modularly structured servo amplifier with an EtherCAT® bus connection.

3.1 Design

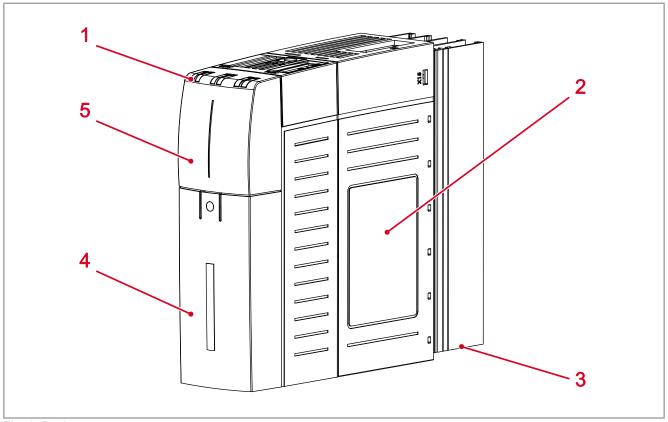


Fig. 2: Design

1	Status indication [▶ 15]
2	Nameplate [▶ 19]
3	Integrated fan
4	Lower front cover
5	Upper front cover

3.2 Product features

- Modular design
- Compact dimensions
- 1 axis 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).

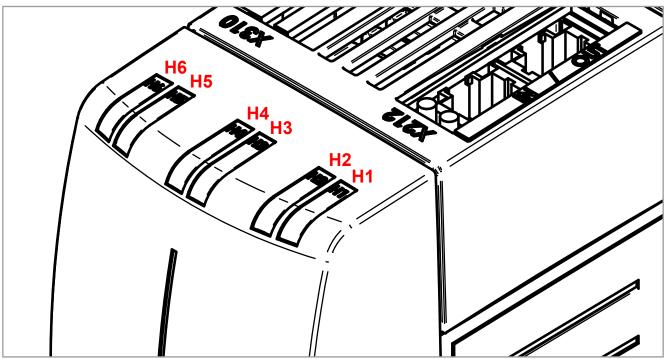
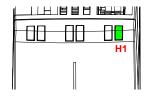


Fig. 3: Status indication

LED	Safety function S1	Safety function S2
H1	Amplifier status – axis 1	Amplifier status – axis 1
H2	-	-
Н3	Safety status – axis 1	Safety status – axis 1
H4	-	Safety status – axis 1
H5 / H6	-	-

3.3.1 Diagnostic capability via the status display

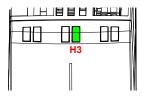
Amplifier status LEDs



LED	D H1		Description	
Color	Red / green		Programming phase	
Status Flashing at 4 Hz		g at 4 Hz		
Color	Ora	inge	Initialization phase	
Status	C	N		
Color	Green	Orange	Voltage is applied (DC 24 V).	
Status with- out warning	Flashing at 2 Hz / 0.5 s pause	-		
Status with warning	Flashing at 2 Hz / 0.5 s pause	Flashing at 1 Hz		
Colon	C	Ded	Due a continue for a controlle d	
Color	Green	Red	Preparation for controlled operation (Bootstrap, ShortCir-	
Status with- out warning	Flashing at 4 Hz	-	cuitTest, OffsetAdjustIADCs,	
Status with warning	Flashing at 4 Hz	Flashing at 1 Hz	FlyingStart, Magnetization)	
Color	Green	Green / or- ange	Controlled operation including stop and quick stop	
Status with- out warning	ON	-		
Status with warning	-	Flashing at 1 Hz		
	I			
Color	Red / green		Error response is active.	
Status Flashing at 4 Hz		g at 4 Hz		
Color	Color Red		Error that cannot be acknowl-	
Status	o ON		edged	
Color	R	ed	Waiting for error acknowledg-	
Status Flashing at 1 Hz		ment.		

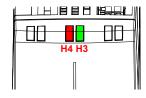
Safety status LEDs

Safety function S1



LED	Н3	Description	
Color	Green	STO is not active.	
Status	ON		
Color	Green	STO is active.	
Status	Flashing at 1 Hz		
Color	Red	Bootloader, initialization, configuration, startup un-	
Status	ON	til ready to switch on or error	
Color	-	Reset or no voltage	
Status	OFF		

Safety function S2



LED	H4	Н3	Description
Color	Red	Green	Startup
Status	ON	ON	
Color	-	Green	STO is not activated.
Status	OFF	ON	
Color	Red	Green	STO is not active (yet). The safety
Status	Flashing fast	ON	function should be designed as an error response.
Color	-	Green	STO is active. Waiting for confirma-
Status	OFF	Flashing fast	tion of the restart.
		·	
Color	-	Green	STO is active.
Status	OFF	Flashing at 1 Hz	
	ı	1	1

LED	H4	Н3	Description
Color	Red	-	Error that cannot be acknowledged
Status	ON	OFF	(safe state)
Color	-	-	Reset or no voltage
Status	OFF	OFF	
Color	Red	-	STO is active. Safety function as
Status	Flashing fast	OFF	error response is to be (or was) executed. Expecting error acknowledgment.
Color	Red	-	Waiting for error acknowledgment
Status	Flashing fast	OFF	(safe state).
Color	Red	Green	Waiting for initialization of the safe
Status	Lights up briefly	Flashing at 1 Hz	encoders and FSoE communication.

3.4 Nameplate

Main nameplate

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

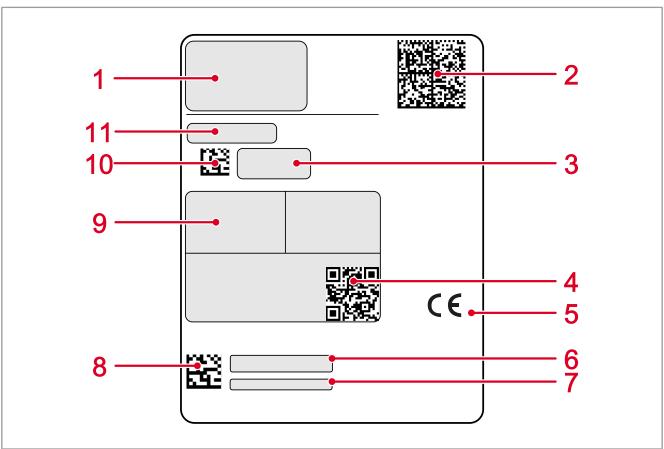


Fig. 4: Main nameplate

1	Company logo and address	
2	Scan - order code, serial number and various details	
3	Item number	
4	Scan - link to the download area	
5 Certification mark		
6 Hardware revision		
7	Serial number	
8 Scan - serial number		
9	Various details	
10	Scan - article number	
11	Order code	

Further labels

Further labels are attached to the JM-2203 / JM-2403 beneath the lower front cover:

Product face with label featuring the serial number and order code. The order code [▶ 21] shows the encoder placement.



- Safety label [▶ 13] on the front
- Label with connection instructions [▶ 40] on the inside of the lower front cover

3.5 Scope of Delivery

Scope of delivery	Item number	Quantity
JM-2203 / JM-2403	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, single-axis, size 1	60886080	1
I/O and S1 connector set, single-axis	60886077	1
OR		
I/O and S2 connector set, single-axis	60886078	1

3.6 Encoder options

The JM-2203 / JM-2403 has 2 plug-in slots for encoder options. For the encoder options your device supports, refer to the nameplate and the order code [22].

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. 5: Example of placement -S2

Encoder options

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

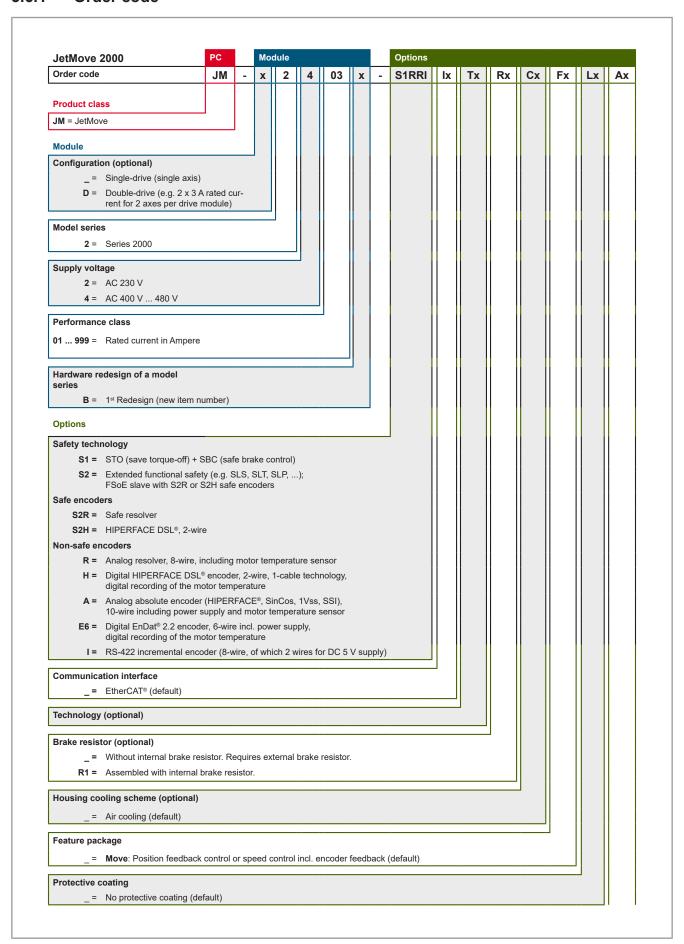
Examples

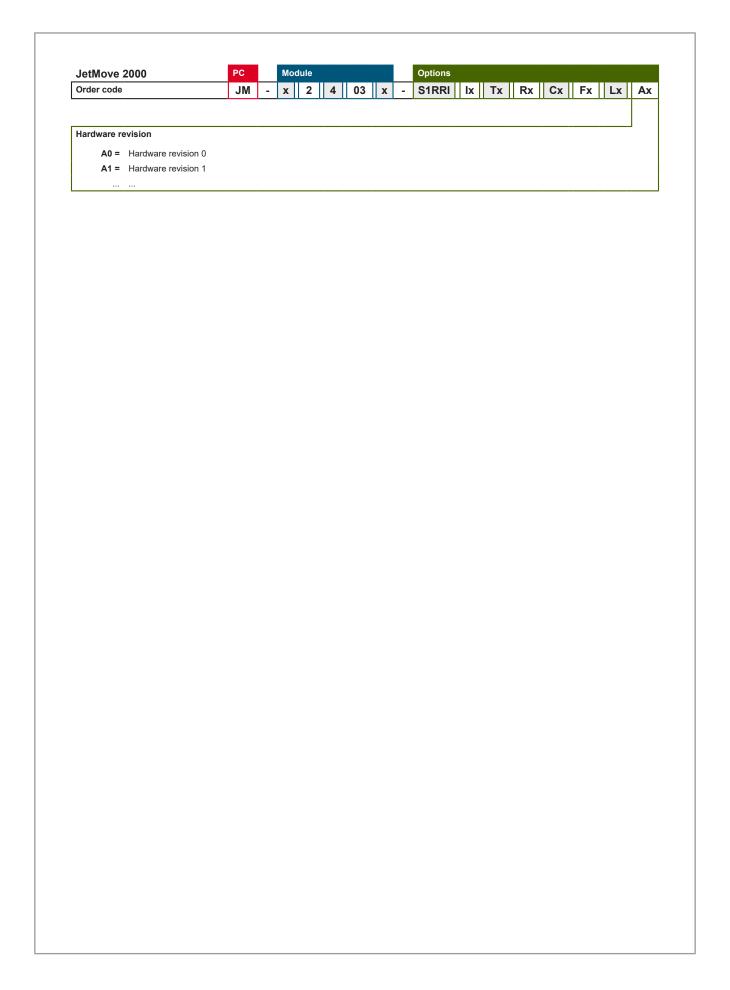
- S1R = Resolver without additional encoder
- S1RA = Resolver with analog additional encoder

See also

Order code [▶ 22]

3.6.1 Order code





4 Technical Specifications

This chapter contains information on both electrical and mechanical data as well as on operating data of the JM-2203 / JM-2403 device.

4.1 Dimensions

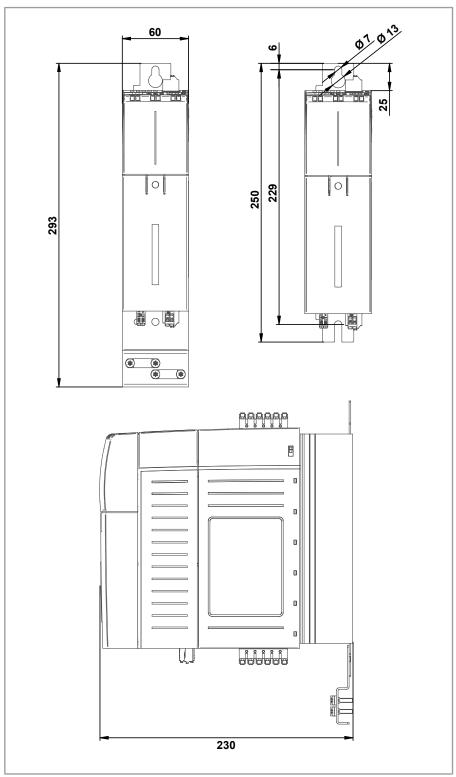


Fig. 6: Dimension in mm



CAD data

For CAD data go to <u>www.bucherautomation.com</u> and navigate to the product page *JM-2203 / JM-2403 > Downloads*.

4.2 Mechanical specifications

Parameter	Description
Weight approx.	1590 g
Type of installation	vertical
Protection class	IP20 (EN 60529)

Tab. 1: Technical data - mechanical properties

4.3 Output motor side

Parameter	JM-2203	JM-2403
Output voltage	0 V 230 V	0 V 400 V (480 V)
Output current	3 A	3 A
Braking power R(BR)	70 W	70 W
Rotary field frequency	0 Hz 599 Hz	0 Hz 599 Hz
Recommended motor shaft power	1ph 0,55 kW / 3ph 1,1 kW	1,5 kW
Short-time overcurrent (3 s)	9 A	9 A
Min. braking resistance R(BR)	47 Ω	100 Ω
Rated braking resistance	100 Ω	330 Ω
Switching frequency	8 kHz	8 kHz
Protection	IP20	IP20
Long-time overcurrent (60 s)	6 A	6 A

Tab. 2: Technical data - output on motor side

4.4 Input mains side

Parameter	JM-2203	JM-2403
Mains current	3 A	3 A
Fuse type gRL(gS) 400 V IEC	6 A	6 A
Mains frequency	50 Hz / 60 Hz	50 Hz / 60 Hz
Mains frequency operating range	fLN ±10 %	fLN ±10 %
Mains voltage	230 V	400 V / (480 V)
Mains voltage operating range	200 V - 15 % 240 V + 10 %	380 V - 15 % 480 V + 10 %
DC input voltage	ULN * 1,41	ULN * 1,41

Tab. 3: Technical data - mains-side input

4.5 Ports and interfaces

DC 24 V voltage supply (X12)

Parameter	Description	Description		
Input voltage	20.4 V 28.8 V (-15 % / +20 %	20.4 V 28.8 V (-15 % / +20 %)		
Nominal input current	Safety function S1	Safety function S2		
	2.80 A max	3.65 A max		
	Of which 2.0 A for motor holding	Of which 2.0 A for motor holding brake		
Peak switching current	Typical < 8 A	Typical < 8 A		
Peak power	Logic section	incl. motor holding brake and S2 outputs		
	19.5 W	101.5 W		
External fusing	Using standard fusing elements slow-blow	Using standard fusing elements for nominal current, characteristic: slow-blow		
Safety	Safety extra-low voltage (SELV)	Safety extra-low voltage (SELV) to DIN EN 61800-5-1		
Max. line length	≤ 30 m	≤ 30 m		

Tab. 4: Technical data – DC 24 V voltage supply

Activation of motor holding brake (X21)

Parameter	Description
Output voltage	DC 24 V
Output current	2 A

Tab. 5: 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
Туре	24 V, type 3 to DIN EN 61131-2

Tab. 6: Technical data - digital inputs

Bucher Automation AG Technical Specifications | 4

EtherCAT® interface (X212)

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

Tab. 7: Technical data - EtherCAT® interface

4.6 Environmental conditions

Parameter	Description
Cooling air temperature	0°C +55 °C, power decrease must be taken into account at 45 °C or higher: -2.5 %/K
Storage temperature	-25 °C +55 °C / -13 °F +131 °F
Transport temperature	-25 °C +70 °C / -13 °F +158 °F
Relative humidity	5 % 85 %, non-condensing
Installation altitude above sea level	0 m 4000 m (power decrease above 1000 m)
Overvoltage category on mains side	3 (III) to DIN EN 61800-5-1
Environmental specification	2 (II) to DIN EN 61800-5-1
Installation location	Pollution degree 2 without conductive condensation

Tab. 8: Technical data – environmental conditions

Bucher Automation AG Technical Specifications | 4

4.7 External line filter

Electrical properties

Filter type	I _n /Ph	I _{overpow.} /Ph	Leakage cur- rent	Power dis- sipation 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		13.6 W	0.5 mm ² 16.0 mm ² 2.0 Nm 2.3 Nm

Tab. 9: 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 degree)
Installation altitude	max. 1000 m (up to 2000 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!

5 Mechanical installation

This chapter describes how to install and remove the JM-2203 / JM-2403.

MARNING



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-2203 / JM-2403 with -S1 option uses safety-relevant components that put extra requirements on the control cabinet housing.

► Install the JM-2203 / JM-2403 only in control cabinets with a degree of protection of IP54 or higher.

NOTICE



Applicable documents

When installing and connecting the servo amplifier within an multi-axis system, it is mandatory that the operating instructions of the additional devices and the *Functional Description Integrated Safety Function S1- JM-2000 and JM-D2000* be observed.

You can find these documents on www.bucherautomation.com.

Go to the JM-2203 / JM-2403 product page > Downloads.

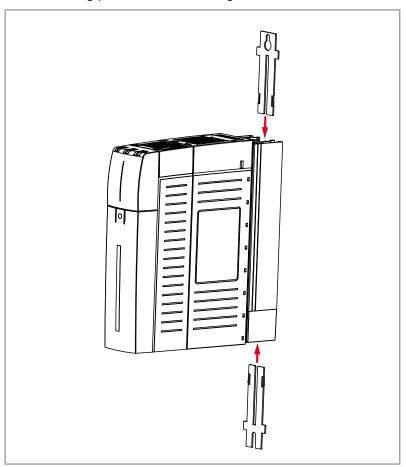
5.1 Mounting the servo amplifier

Use the enclosed mounting material [▶ 62].

For the dimensions refer to the Dimensions [▶ 24] 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-2203 / JM-2403 is IP20. The JM-2203 / JM-2403 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-2203 / JM-2403. No lateral distance from other devices is required.

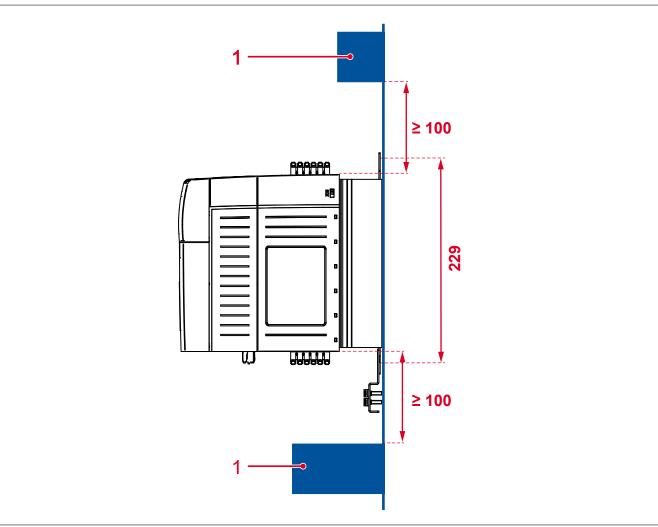


Fig. 7: Distances from surrounding parts in mm

1 Mounting plate with cable ducts

Mechanical installation



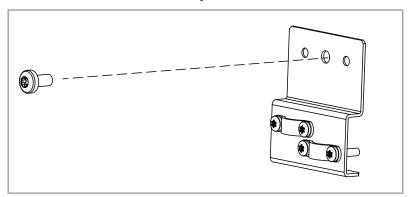
Limited space conditions

The space for wiring may be restricted for wiring the JM-2203 / JM-2403 in mounted state. If necessary wire the upper and lower connections before you mount the device in the control cabinet (Connections [> 41]).

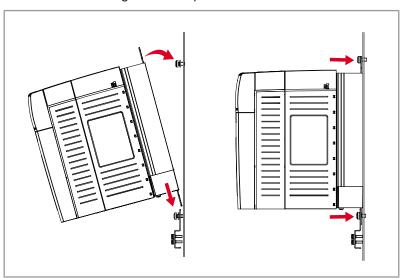
Perform the following steps to install the JM-2203 / JM-2403:

- 1. Hold the JM-2203 / JM-2403 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-2203 / JM-2403, proceed as follows:

- 1. De-energize the JM-2203 / JM-2403.
- 2. Unscrew the 2 fastening screws halfway.
- 3. Slightly lift the Servo amplifier 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-2203 / JM-2403 servo amplifier as required by the EMC Directive (see also Line filter [▶ 39]).

- 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 [▶ 39]).

Dimensions

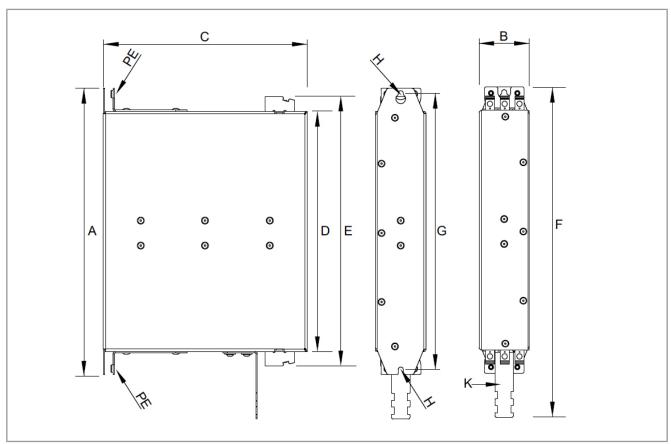


Fig. 8: Dimensions ext. line filter

Dimensions		JEMC25.240-UR	JEMC53.240-UR	
А	Height	310 mm		
В	Width	55 mm		
С	Depth	220 mm		
D	Housing	260 mm		
E	Distance between terminals	291 mm 324.6 mm		
F	Total height	358 mm	365.3 mm	

Dimensions		JEMC25.240-UR JEMC53.240-UR		
G		300 mm		
Н	Mounting holes	Ø 5.3 mm		
PE		M4		
Weight		4.6 kg 4.8 kg		

Tab. 10: 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.

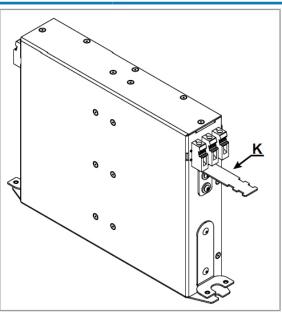


Fig. 9: Mounting the shield connecting bracket on the line filter

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 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 .

MARNING



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



Applicable documents

When installing and connecting the servo amplifier within an multi-axis system, it is mandatory that the operating instructions of the additional devices and the *Functional Description Integrated Safety Function S1- JM-2000 and JM-D2000* be observed.

You can find these documents on www.bucherautomation.com.

Go to the JM-2203 / JM-2403 product page > Downloads.

Bucher Automation AG Electrical connection | 6

6.1 EMC-compliant installation

A system's immunity to noise is determined by its weakest component. Key factors are correct connections, lines and proper shielding. Observe the measures set out in this chapter.



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.

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

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

Protective earth (PE) terminal

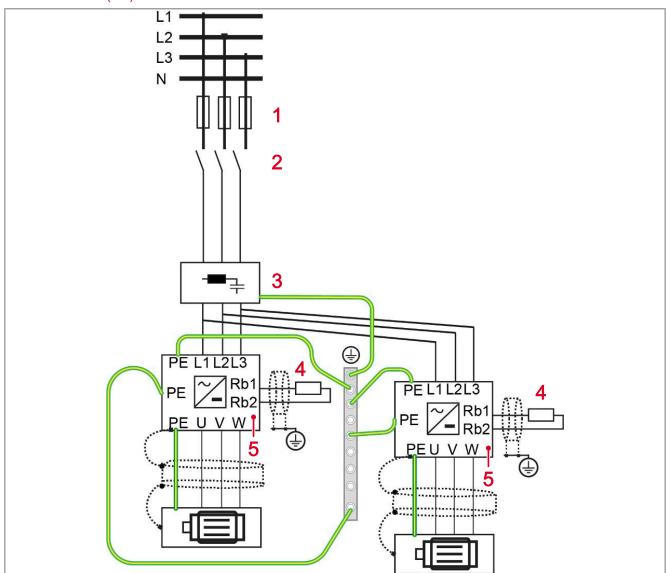


Fig. 10: Protective earth (PE) terminal

1	Fuse
2	Line contactor
3	Line filter
4	External braking resistor (optional)
5	JM-2203 / JM-2403

Grounding measures

- Mount the devices on a conductive, grounded mounting plate. The mounting plate must be connected
 with the central grounding rail of the control cabinet.
- Use a PE cable with a minimum conductor cross-section of 2.5 mm² and fasten it to the PE bracket of the JM-2203 / JM-2403.
- Ground both ends of the shield.

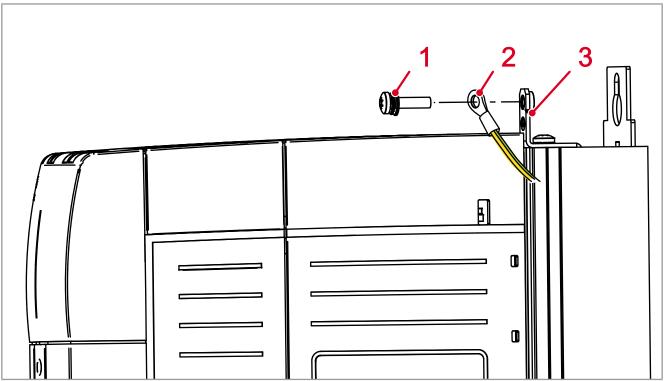


Fig. 11: Connection to the PE angle

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 supplied by Bucher Automation or of equivalent quality.
- Use shielded encoder and motor lines (incl. brake shield) that are suitable for servo motors (80 % overlap min.).
- Place the shields of the motor cables under the terminals of the shield bracket and on the housing of the M23 connector on the motor side.
- Use Sub-D connectors with metalized housing and metric M3 screws.

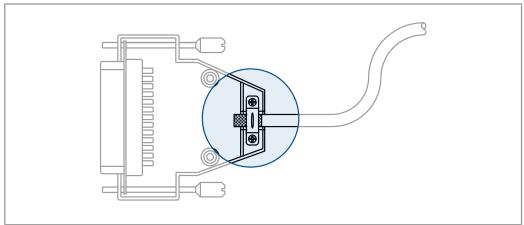


Fig. 12: EMC-compliant Sub-D shielding

If you would like more detailed information about installation, please contact our technical support [61].

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. 11: Suitable line filters

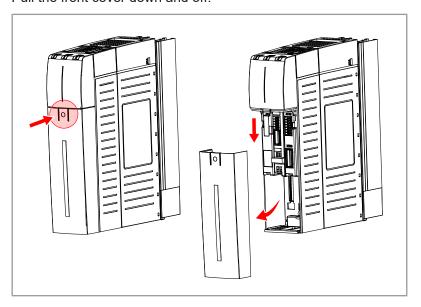
You can order suitable line filters separately as accessories [64].

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.

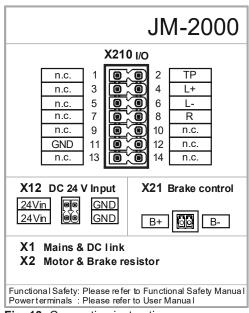


Fig. 13: Connection instructions

Spare parts

If the front cover is lost, it can be ordered as a spare part [62].

6.3 Connections

Top and bottom connections

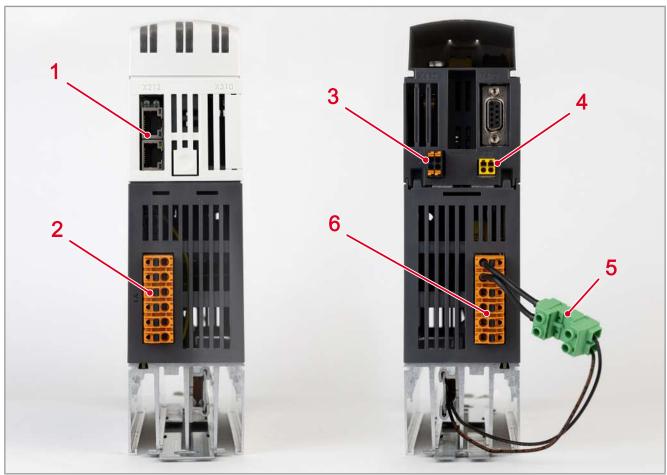


Fig. 14: Overview of top and bottom connections

1	Connection X212 – EtherCAT [▶ 42]
2	Connection X1 – AC voltage supply [▶ 43]
3	Connection X12 – DC 24 V supply [▶ 45]
4	Connection X21 – motor holding brake axis 1 [▶ 46]
5	2-pin adapter plug [▶ 50]
6	Connection X2 – motor connection axis 1 [▶ 44]

Front connections

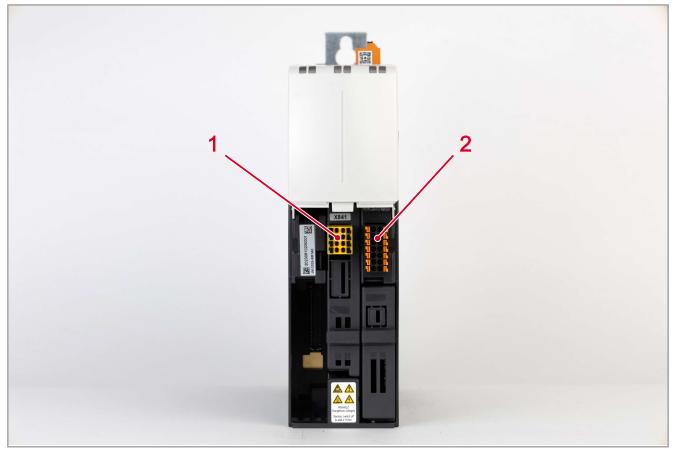


Fig. 15: Connection overview front

1	Connection X841 - STO + SBC [▶ 47]
2	Connection 210 - I/O signals [▶ 49]

6.3.1 Connection X212 - EtherCAT®

Connect the following to connection X212:

EtherCAT[®] master or EtherCAT[®] slave

LEDs

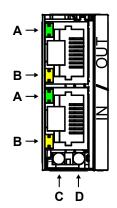


Fig. 16: Socket X212

RJ45 jack	Signal	LED	Color	Description
OUT	BUS	Α	Green	ACT: Data transmission
	OUT	В	Yellow	LINK: There is a connection to the network
IN	BUS IN	Α	Green	ACT: Data transmission
		В	Yellow	LINK: There is a connection to the network

Tab. 12: LEDs - EtherCAT® RJ45 socket

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

Tab. 13: LEDs - EtherCAT® status

Cables

You can order suitable cables separately as accessories [64].

6.3.2 Connection X1 – AC voltage supply

Connect the following to X1:

AC voltage supply

Pin assignment

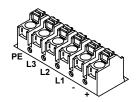


Fig. 17: Terminal X1, 6 pins

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. 14: 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-2203.

Parameter	Description Standards			
Connection technique	Spring connection, push-in	Spring connection, push-in		
Туре	6-pin, grid 7.62 mm			
Conductors that can be connected	ed			
AWG	20 12			
Clamping range	0.08 mm ² 2.5 mm ²			
Specification without wire end ferrules				
Rigid	H05(07) V-U			
	0.5 mm ² 1.5 mm ²			
Flexible	H05(07) V-K			
	0.5 mm² 2.5 mm²			

Parameter	Description	Standards
Specification with wire end ferru	lles	
Wire end ferrule without collar	0.5 mm ² 2.5 mm ²	DIN 46228/1
Wire end ferrule with collar	0.5 mm ² 1.5 mm ² DIN 46228/4	
Contact length	8 mm 10 mm	

Tab. 15: Connector specification, 6 pins, push-in connection

6.3.3 Connection X2 – motor connection axis 1

Connect the following to connection X2:

- Motor for axis 1
- External braking resistor

Pin assignment

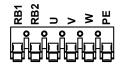


Fig. 18: Terminal X2, 6 pins

Pin	Description			
RB1	Braking resistance internal / external +			
RB2	Braking resistance internal / external -			
U	Motor cable U			
V	Motor cable V			
W	Motor cable W			
PE	Motor cable PE			

Tab. 16: Pin assignment- connection X2

Parameter	Description	Standards		
Connection technique	Spring connection, push-in			
Туре	6-pin, grid 7.62 mm			
Conductors that can be connected	ed			
AWG	20 12			
Clamping range	0.08 mm ² 2.5 mm ²			
Specification without wire end fe	rrules			
Rigid	H05(07) V-U			
	0.5 mm ² 1.5 mm ²			
Flexible	H05(07) V-K			
	0.5 mm ² 2.5 mm ²			
Specification with wire end ferrules				
Wire end ferrule without collar	0.5 mm ² 2.5 mm ² DIN 46228/1			
Wire end ferrule with collar	0.5 mm ² 2.5 mm ²	DIN 46228/4		
Contact length	8 mm 10 mm			

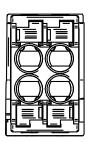
Tab. 17: Connector specification, 6 pins, push-in connection

6.3.4 Connection X12 - DC 24 V supply

Connect the following to connection X12:

DC 24 V supply

Pin assignment



X12			
24Vin GND			
24Vin	GND		

Tab. 18: Pin assignment – connection X12

Fig. 19: Terminal X12, 4 pins

- 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 JetMoves 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.

Parameter	Description	
Connection technique	Spring connection, push-in	
Туре	4-pin, grid 3.5 mm	
Conductor cross-section, multi-wire	0.2 mm ² 1.5 mm ²	
Conductor cross-section, flexible with wire end ferrule with plastic sleeve	0.25 mm ² 0.75 mm ²	
Stripping length	9 mm 10 mm	

Tab. 19: Connector specification, 4 pins, push-in connection

6.3.5 Connection X21 – motor holding brake axis 1

X21 connects to:

Motor holding brake for axis 1

Pin assignment



X21	
B+ B-	

Tab. 20: Pin assignment – connection X21

Fig. 20: Terminal X21, 2 pins

Parameter	Description	
Connection technique	Spring connection, push-in	
Туре	2-pin, grid 3.81 mm	
Conductor cross-section, multi-wire	0.2 mm ² 1.5 mm ²	
Conductor cross-section, flexible with wire end ferrule with plastic sleeve	0.25 mm ² 0.75 mm ²	
Stripping length	9 mm 10 mm	

Tab. 21: Connector specification, 2 pins, push-in connection

6.3.6 Connection X841 – STO + SBC [S1]

X841 connects to:

STO for axis 1

NOTICE



Applicable documents

When installing and connecting the servo amplifier within an multi-axis system, it is mandatory that the operating instructions of the additional devices and the *Functional Description Integrated Safety Function S1- JM-2000 and JM-D2000* be observed. You can find these documents on www.bucherautomation.com. Go to the *JM-2203 / JM-2403 product page > Downloads*.

Pin assignment X841

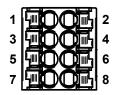


Fig. 21: Terminal X841, 8 pins

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 AX2 - requirement for safe brake, channel B		
7	n.c.	n.c.		
8	n.c.	n.c.		

Tab. 22: Pin assignment – connection X841

Parameter	Description	
Connection technique	Spring connection, push-in	
Туре	8-pin, grid 3.5 mm	
Conductor cross-section, multi-wire	0.2 mm ² 1.5 mm ²	
Conductor cross-section, flexible with wire end ferrule with plastic sleeve	0.25 mm ² 0.75 mm ²	
Stripping length	9 mm 10 mm	

Tab. 23: Connector specification, 8 pins, push-in connection

6.3.7 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

1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20
21	22

Fig. 22: 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
Туре	22-pin, grid 3.5 mm
Conductor cross-section, multi-wire	0.2 mm ² 1.5 mm ²
Conductor cross-section, flexible with wire end ferrule with plastic sleeve	0.25 mm ² 0.75 mm ²
Stripping length	9 mm 10 mm

Tab. 24: Connector specification, 22 pins, push-in connection

6.3.8 Connection X210 – digital inputs

4 digital inputs

Pin assignment

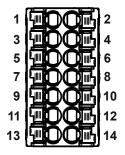


Fig. 23: Terminal X210, 14 pins

	Р	in	Axis 1	Description
n.c.	1	2	TP1	TouchProbe
n.c.	3	4	L+	Limit switch + (limit +)
n.c.	5	6	L-	Limit switch – (limit -)
n.c.	7	8	R	Reference signal
n.c.	9	10	n.c.	
GND	11	12	n.c.	
n.c.	13	14	n.c.	

Tab. 25: Pin assignment – connection X210

Parameter	Description
Connection technique	Spring connection, push-in
Туре	14-pin, grid 3.5 mm
Conductor cross-section, multi-wire	0.2 mm ² 1.5 mm ²
Conductor cross-section, flexible with wire end ferrule with plastic sleeve	0.25 mm ² 0.75 mm ²
Stripping length	9 mm 10 mm

Tab. 26: Connector specification, 14 pins, push-in connection

6.3.9 Braking resistors [-R]

An internal braking resistor is installed in the JM-2203 / JM-2403 device (ID -R1 in the order code).

Connection



Fig. 24: 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	
Туре	2-pin, grid 7.62 mm	
Nominal cross section	2.5 mm ²	
Conductor cross-section rigid	0.2 mm ² 2.5 mm ²	
Conductor cross-section flexible	0.2 mm ² 2.5 mm ²	
Conductor cross-section, flexible with wire end ferrule without plastic sleeve	0.25 mm ² 2.5 mm ²	
Conductor cross-section, flexible with wire end ferrule with plastic sleeve	0.25 mm ² 2.5 mm ²	
Conductor with same cross-section, rigid	0.2 mm ² 1 mm ²	
2 conductors with same cross-section, flexible	0.2 mm ² 1.5 mm ²	
2 conductors with same cross-section, flexible with wire end ferrule without plastic sleeve	0.25 mm² 1 mm²	

Parameter	Description
2 conductors with same cross-section, flexible with TWIN wire end ferrule and plastic sleeve	0.5 mm ² 1 mm ²
Plug gauge a x b / diameter	2.8 mm x 2.4 mm / 2.5 mm
Stripping length	8 mm
Tightening torque	0.5 Nm 0.6 Nm

Tab. 27: Connector specification, 2-pin, adapter plug

2-pin adapter plug, pins (male)

Parameter	Description
Connection technique	Screw connection with puller sleeve
Туре	2-pin, grid 7.62 mm
Nominal cross section	2.5 mm²
Conductor cross-section rigid	0.2 mm ² 2.5 mm ²
Conductor cross-section flexible	0.2 mm ² 2.5 mm ²
Conductor cross-section, flexible with wire end ferrule without plastic sleeve	0.25 mm ² 2.5 mm ²
Conductor cross-section, flexible with wire end ferrule with plastic sleeve	0.25 mm ² 2.5 mm ²
Conductor with same cross-section, rigid	0.2 mm ² 1 mm ²
2 conductors with same cross-section, flexible	0.2 mm ² 1.5 mm ²
2 conductors with same cross-section, flexible with wire end ferrule without plastic sleeve	0.25 mm² 1 mm²
2 conductors with same cross-section, flexible with TWIN wire end ferrule and plastic sleeve	0.5 mm ² 1 mm ²
Plug gauge a x b / diameter	2.8 mm x 2.0 mm / 2.4 mm
Stripping length	8 mm
Tightening torque	0.5 Nm 0.6 Nm

Tab. 28: Connector specification, 2-pin, adapter plug

6.4 Encoder plug-in slots

The JM-2203 / JM-2403 has 2 encoder plug-in slots.

The order of the encoders on the JM-2203 / JM-2403 is always from right to left.

To see how your device is fitted, refer to the nameplate [▶ 19] and the order code.



Fig. 25: Encoder plug-in slots

1	Connection X412 - motor encoder for axis 1	
2	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.

Possible applications

Encoder option - R can be used as:

Motor encoder for axis 1 to X412

Encoder option -S2R can be used as:

Motor encoder for axis 1 to X412

Pin assignment

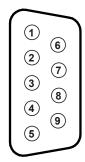


Fig. 26: Sub-D, 9-pin, socket

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 [▶ 63]. 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®

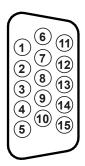
Encoder option –H is designed to connect to a HIPERFACE-DSL® encoder with 2-wire design (1-cable system).

Possible applications

Encoder option -H can be used as:

Motor encoder for axis 1 to X412

Pin assignment



Pin	Signal
9	DSL-
14	DSL+

Fig. 27: Sub-D, 15-pin, socket

Ready-made cable

You can order the suitable ready-made KAY_1411_xxxx and KAY_1413_xxxx cables separately as accessories [> 63]. 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-2203 / JM-2403. 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 Automa- tion 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
А	Phase 1	1		X2/X3
В	Phase 2	2		
С	Phase 3	3		
D	Protective conductor	GN-YE		
				Brake
G	Brake+	6		X21/X22
F	Brake-	5		

E.g. socket on Bucher Automa- tion 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)
				Encoder connection
E	DSL+	WH	14	X412/X422
Н	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).

Possible applications

Encoder option -A can be used as:

- Motor encoder for axis 1 to X412
- Additional encoder on X432

Pin assignment

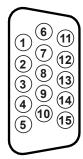


Fig. 28: Sub-D, 15-pin, female

Pin	Description	
3	Reference cosine	
4	Cosine+	
5	Terminal for motor temperature sensor -	
6	Voltage supply (DC 5.25 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).

Possible applications

Encoder option -A can be used as:

- Motor encoder for axis 1 to X412
- Additional encoder on X432

Pin assignment

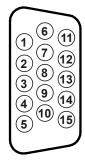


Fig. 29: Sub-D, 15-pin, socket

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 [▶ 63]. 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-(RS485)	GY	8
8	Data+(RS485)	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.7-12V	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).

Possible applications

Encoder option -I can be used as:

Additional encoder on X432

Pin assignment

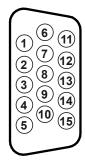


Fig. 30: Sub-D, 15-pin, female

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 5.25 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).

Possible applications

Encoder option -E6 can be used as:

- Motor encoder for axis 1 to X412
- Additional encoder on X432

Pin assignment

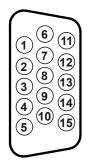


Fig. 31: Sub-D, 15-pin, socket

Pin	Signal	Description
1	Clock-	Endat® 2.2 signal
2	Clock+	Endat [®] 2.2 signal
6	V_ABS (max. DC 5.25 V)	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 [> 63]. 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.

Bucher Automation AG Maintenance | 7

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.

Bucher Automation AG Maintenance | 7

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. 32: 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.

Bucher Automation AG Service | 8

8 Service

8.1 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

Or email us:

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.

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 size 1	60886060

9.1.3 Connector sets

Component	Item number
Brake resistor connector set	60887619
I/O and S1 connector set, single-axis	60886077
I/O and S2 connector set, single-axis	60886078
Power-level terminal connector set, single-axis, frame size 1	60886080

Tab. 29: Spare parts - connector sets

9.2 Accessories

9.2.1 Pre-assembled cables

Encoder cable

Component	Cable structure
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 structure
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 structure
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

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

9.2.4 Optional external brake resistors

For JM-2203

Туре	External	Rated power	Peak power	Item number
JBR090.02.540-UR	90 Ω	200 W	6,250 W	60880282
JBR090.03.540-UR		300 W	6,250 W	60880283

For JM-2403

Туре	External	Rated power	Peak power	Item number
JBR200.02.540-UR	200 Ω	200 W	2,813 W	60880287

List of figures

Fig. 1	Safety label	13
Fig. 2	Design	14
Fig. 3	Status indication	15
Fig. 4	Main nameplate	19
Fig. 5	Example of placement -S2	21
Fig. 6	Dimension in mm	24
Fig. 7	Distances from surrounding parts in mm	31
Fig. 8	Dimensions ext. line filter	33
Fig. 9	Mounting the shield connecting bracket on the line filter	34
Fig. 10	Protective earth (PE) terminal	37
Fig. 11	Connection to the PE angle	38
Fig. 12	EMC-compliant Sub-D shielding	38
Fig. 13	Connection instructions	40
Fig. 14	Overview of top and bottom connections	41
Fig. 15	Connection overview front	42
Fig. 16	Socket X212	42
Fig. 17	Terminal X1, 6 pins	43
Fig. 18	Terminal X2, 6 pins	44
Fig. 19	Terminal X12, 4 pins	45
Fig. 20	Terminal X21, 2 pins	46
Fig. 21	Terminal X841, 8 pins	47
Fig. 22	Connection X843	48
Fig. 23	Terminal X210, 14 pins	49
Fig. 24	2-pin adapter plug to X2	50
Fig. 25	Encoder plug-in slots	52
Fig. 26	Sub-D, 9-pin, socket	53
Fig. 27	Sub-D, 15-pin, socket	54
Fig. 28	Sub-D, 15-pin, female	55
Fig. 29	Sub-D, 15-pin, socket	56
Fig. 30	Sub-D, 15-pin, female	57
Fig. 31	Sub-D, 15-pin, socket	58
Fig. 32	WEEE icon – crossed out wheeled bin	60

Bucher Automation AG

List of tables

List of tables

Tab. 1	Technical data – mechanical properties	25
Tab. 2	Technical data – output on motor side	25
Tab. 3	Technical data – mains-side input	25
Tab. 4	Technical data – DC 24 V voltage supply	26
Tab. 5	Technical data – activation of motor holding brake	26
Tab. 6	Technical data – digital inputs	26
Tab. 7	Technical data – EtherCAT® interface	27
Tab. 8	Technical data – environmental conditions	27
Tab. 9	Technical data – external line filter	28
Tab. 10	Dimensions – external line filter	33
Tab. 11	Suitable line filters	39
Tab. 12	LEDs – EtherCAT® RJ45 socket	42
Tab. 13	LEDs – EtherCAT® status	43
Tab. 14	Pin assignment – terminal X1	43
Tab. 15	Connector specification, 6 pins, push-in connection	43
Tab. 16	Pin assignment- connection X2	44
Tab. 17	Connector specification, 6 pins, push-in connection	44
Tab. 18	Pin assignment – connection X12	45
Tab. 19	Connector specification, 4 pins, push-in connection	45
Tab. 20	Pin assignment – connection X21	46
Tab. 21	Connector specification, 2 pins, push-in connection	46
Tab. 22	Pin assignment – connection X841	47
Tab. 23	Connector specification, 8 pins, push-in connection	47
Tab. 24	Connector specification, 22 pins, push-in connection	49
Tab. 25	Pin assignment – connection X210	49
Tab. 26	Connector specification, 14 pins, push-in connection	49
Tab. 27	Connector specification, 2-pin, adapter plug	50
Tab. 28	Connector specification, 2-pin, adapter plug	51
Tab. 29	Spare parts – connector sets	62

