Jetter automation

User Manual

JetMove 1432 – Servo Amplifier

60880301

We automate your success.

Item number 60880301
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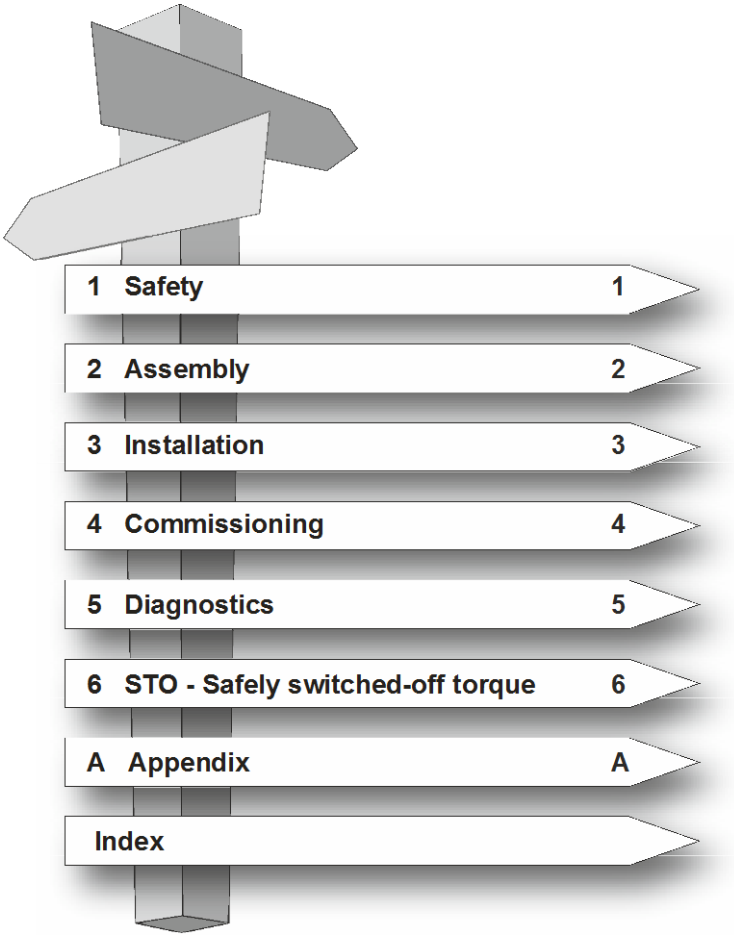
The German version is the original of this user manual.

Navigating through this document

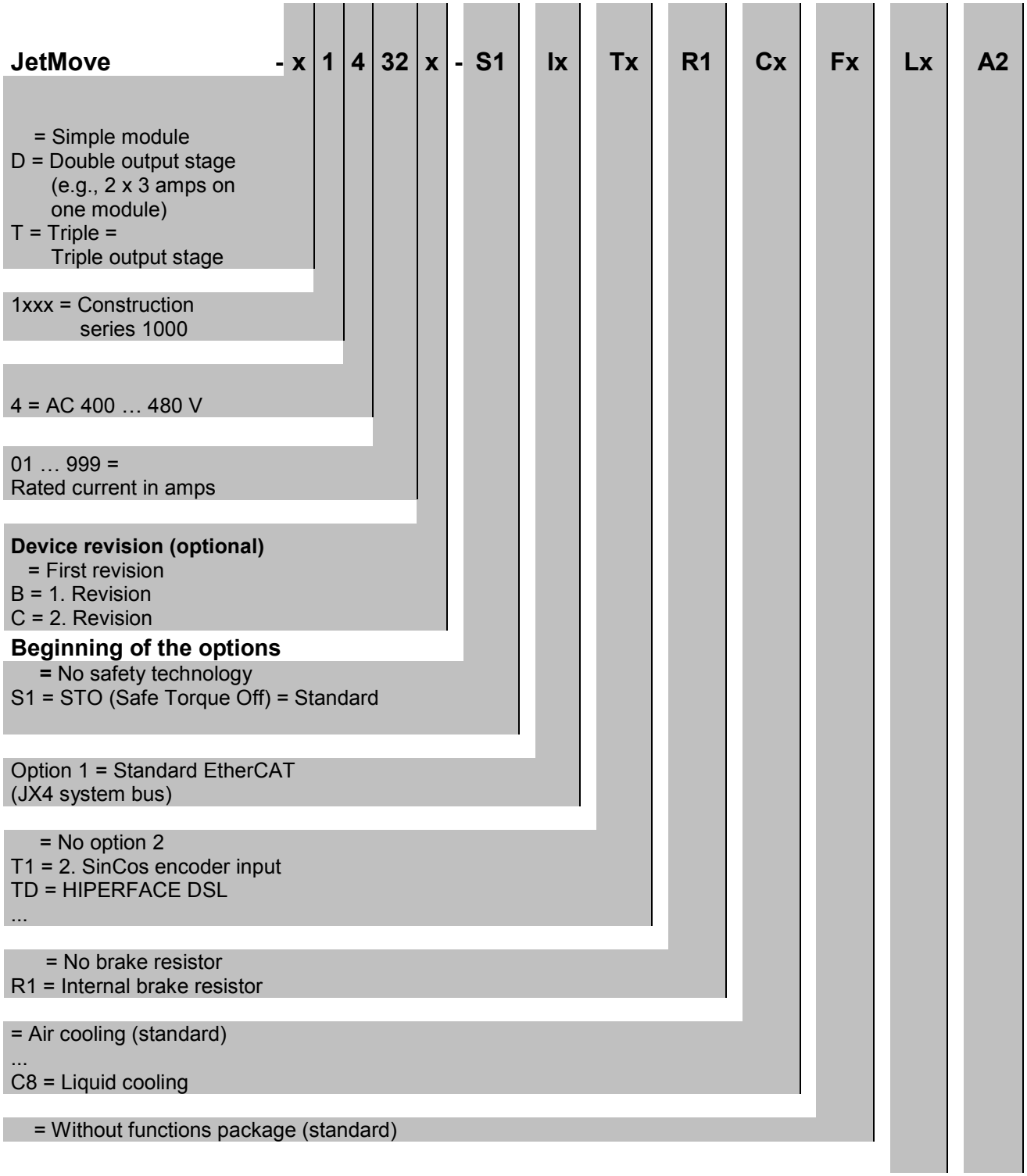
In order that you can commission your new JM-1432 as quickly and smoothly as possible, we ask that you first read through this user manual thoroughly and carefully.

Step	Action	Remark
1.	With this user manual, you will be able to install and commission the servo amplifier JM-1432 very easily and quickly.	Instructions for a quick start
2.	Just follow the step-by-step instructions in the chapters.	Let's get started!



Order code

The item designation JM-1xxx-xxxxxxx provides you with information about the specific design variant of the servo amplifier delivered to you. You can take the meaning of the individual positions in the item designation from the following order code. You can find a complete order code with all values in the Jetter industrial automation catalog..



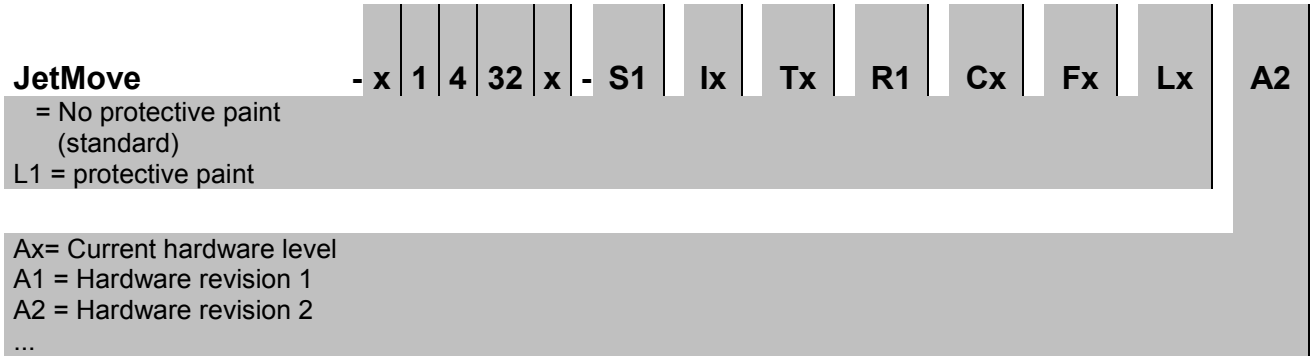


Fig. 1 Order code JM-1432

Manufacturing data

You will find the serial number on the nameplate of JM-1432 servo amplifier, from which you can read the manufacturing data according to the following code. The positions where the nameplates are attached to the JM-1432 are listed in Fig. 5 on page 21.

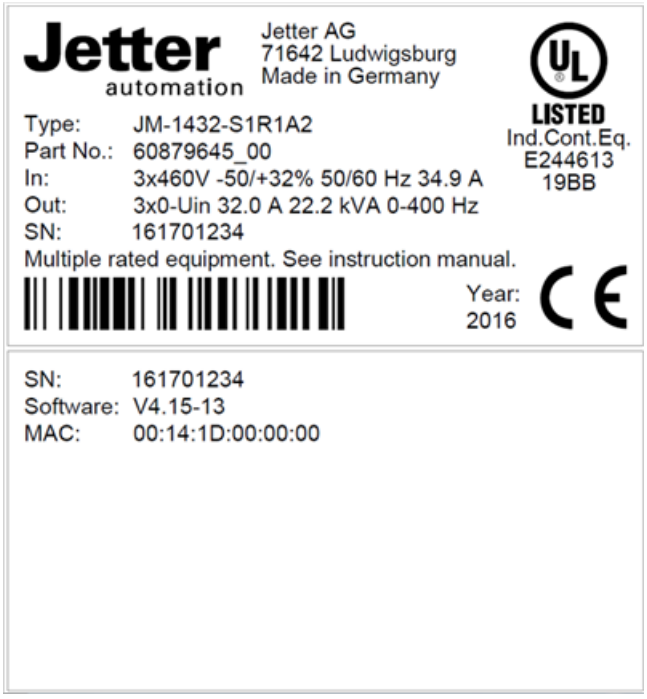


Fig. 2 Nameplate, JM-1432 hardware and software

The serial number contains information about:

- Year of production: here, 16
- Week of production: here, 17
- Manufacturing code: here, 0
- Parts per week: here, 1234

CE declaration of conformity

The CE declaration of conformity is part of the document “STO JM-1000” which has been published in 24 languages (item no. 60879033, file name: jm-1000_ba_xxx_dokumentation_sto_de-en.pdf,). The file is on a CD which comes with this servo amplifier.

Scope of delivery

The scope of delivery includes:

- Servo amplifier JM-1432
- Terminal accessories kit for control and power terminals (depending on device performance and variant)
- Product DVD

Pictograms

Pictograms are used in these operating instructions to improve orientation; their meaning is described in the following table. The meaning of each pictogram is always the same even when it appears without text, such as when it is placed next to a connection diagram.

Warning (see also chapter 1.1)	
	**ATTENTION!** Incorrect operation can damage the drive or cause it to malfunction.
	**DANGER FROM ELECTRICAL VOLTAGE!** Incorrect actions can endanger human life.
	**DANGER FROM ROTATING PARTS!** The drive can start up automatically.
Notices & assistance	
NOTICE	**NOTICE:** Useful information or reference to other documents.
	**STEP:** Processing step within a sequence of several actions.

Table of contents

1 Safety

1.1 Measures to ensure your safety

To prevent injury and/or property damage, please read the following information before initial commissioning. Observe the safety instructions at all times.

NOTICE **First read the operating instructions!**

- Observe the safety information!
- Observe the user information!

Electric drives are fundamentally dangerous:

- Electrical voltages from 230 V to 480 V
- Dangerous high voltages ≥ 50 V may be present even 30 minutes after disconnection from mains power (capacitor charge).
  Therefore check that no voltages are present!
- Rotating parts
- Hot surfaces

Protection from magnetic and/or electromagnetic fields during installation and operation:

Persons with heart pacemakers, metallic implants or hearing aids, etc. must not enter the following areas:

- Areas where drive systems are installed, repaired or operated.
- Areas where motors are installed, repaired or operated. Motors with permanent magnets are particularly dangerous.
- If it is necessary to enter these areas, first consult a doctor for a decision if this is safe.

Your qualification:

- To prevent injury and property damage, only qualified personnel with an electrotechnical education are permitted to work on the device.
- The qualified person must be familiar with the operating instructions (cf. IEC 364, DIN VDE 0100).
- Knowledge of the national accident prevention requirements (e.g., BGV A3 in Germany)

During the installation, pay attention to:

- Compliance with connection conditions and technical data is mandatory.
- Observe the standards for electrical installation, such as conductor cross-section and protective and ground cable connections.
- Do not touch electronic components or contacts (electrostatic discharge can destroy components).

1.2 Warning symbols

The safety instructions describe the following danger classes.

The danger class describes the risk when the safety instructions are not followed.

Warning symbols	General explanation	Danger class to ANSI Z 535
	**Warning!** Incorrect operation can damage the drive or cause it to malfunction.	Injury or property damage may occur.
	**Danger from electrical voltage!** Incorrect actions can endanger human life.	Death or severe injury will occur.
	**Danger from rotating parts!** The drive can start up automatically.	Death or severe injury will occur.

Table 1 Explanation of warning symbols

1.3 Intended use

JM-1000 servo amplifiers are built-in devices intended to be incorporated into stationary, industrial and commercial systems or machines.

When the servo amplifier is installed in a machine, commissioning (i.e., the start of intended operation) is prohibited until it has been determined that the entire machine complies with Machinery Directive 2006/42/EC; observe EN 60204.

Commissioning, i.e., the start of intended operation, is only permitted when EMC Directive (2004/108/EC) is complied with.

CE The JM-1432 servo amplifier complies with the Low-Voltage Directive 2006/95/EC.

The servo amplifier satisfies the requirements of the harmonized product standard EN 61800-5-1.

If the servo amplifier is used in special application areas, such as in potentially explosive atmospheres, it is imperative that the applicable requirements and standards (e.g., in EX areas, DIN EN 60079-0 *General Provisions* and DIN EN 60079-1 *Flameproof enclosure*) are observed.

Only authorized repair centers are permitted to carry out repairs. Independent, unauthorized repairs can lead to death, injury and property damage, and will invalidate the warranty from Jetter AG.

NOTICE The use of the servo amplifier in non-stationary equipment constitutes an exceptional environmental condition and is only permitted after special agreement.

1.4 Responsibility

Electronic devices are inherently not immune to failure. The constructor and/or the operator of the machine or system is responsible for ensuring that if the device fails, the drive will be set to a safe state.

In EN 60204-1/DIN VDE 0113 *Safety of machinery*, safety requirements for electrical controls are presented under the topic *Electrical equipment of machines*. These requirements are intended to protect persons and machinery and to maintain the functional capability of the machine or system, and must be observed.

The function of emergency stop equipment is not necessarily required to switch off the power supply to the drive. To avert dangers, it can be sensible to keep individual drives in operation or to initiate specific safety procedures. The design of the emergency stop measures was evaluated during a risk assessment of the machine or system, including the electrical equipment, complying with DIN EN ISO 12100:2011-03 (formerly DIN EN 14121) and determined with selection of the switching category according to EN ISO 13849-1 (formerly DIN EN 954-1) *Safety of Machinery - Safety-related parts of control systems*.

2 Mechanical installation

2.1 Information on mechanical installation

ATTENTION!

During mechanical installation

- Be absolutely certain that no drilling chips, screws or other foreign objects fall into the device.
- Be absolutely certain that no moisture penetrates into the device.

Control cabinet

- This device is intended exclusively for installation inside a stationary control cabinet. The control cabinet must satisfy at least protection class IP4x.
- When the safety function STO (Safe Torque OFF) is used, according to EN ISO 13849-2 the control cabinet must have a protection class of IP54 or higher.

Environment

- Do not install servo amplifiers in areas where they will be exposed to continued shocks. You will find additional information in Table 38 on page 60 of the Appendix.
- The device heats up during operation and can reach temperatures of up to 100 °C at the heat sink. Take this into account for adjacent components.

The following basic rules apply to installing the servo amplifier:

Cooling

It must be possible for cooling air to flow through the device with no obstructions. When installing in control cabinets with natural convection (= heat loss is discharged to the outside via the control cabinet walls), always provide an internal fan.

Installation to EMC rules

The best results for installation complying with EMC requirements are achieved with a well-grounded chrome- or zinc-plated mounting plate. If the mounting plates have been painted, remove the paint from the contact areas!

Pollution

Maximum pollution degree 2 per EN 60664-1. You will find additional information about the environmental conditions in Table 36 on page 59 of the Appendix.

If you would like more detailed information about mechanical installation, please contact the Jetter hotline, see page 53.

2.2 Mechanical installation

Step	Action	Remark
1.	Mark the position of the threaded holes and where necessary, the tube supports, on the mounting plate. For each fastening screw, drill a hole and cut threads in the mounting plate.	Pay attention to the mounting distances! Take into account the bending radii of the connection cables! For dimension drawings and hole distances, see Fig. 3 and Fig. 4.
2.	Install the drive controller vertically on the mounting plate.	Pay attention to the mounting distances! The contact surfaces must be bare metal.
3.	Install the additional components such as line filter, line choke, etc., on the mounting plate.	The cable between line filter and drive controller must not be longer than 30 cm.
4.	For information on electrical installation, please turn to chapter 3.1 on page 18.	

Table 2 Installing the device

2.2.1 JetMove 1432 - Dimensions

	JM-1432 (BG4)
Weight [kg]	7.5
W (width)	171
H (height)[1)]	295
D (depth)[1)]	224
A	120
C	344.5
C1	5
D Ø	4.8
E	2
F[2)]	≥ 150
G[2)]	≥ 270
H1	355
H2	38.5
Screws/bolts	4 x M4

All dimensions in mm

1) Without terminals, connectors and shielding plates

2) Take into account the bending radius of the connection cables.

Table 3 Air-cooled housing dimensions, see Fig. 3 and Fig. 4

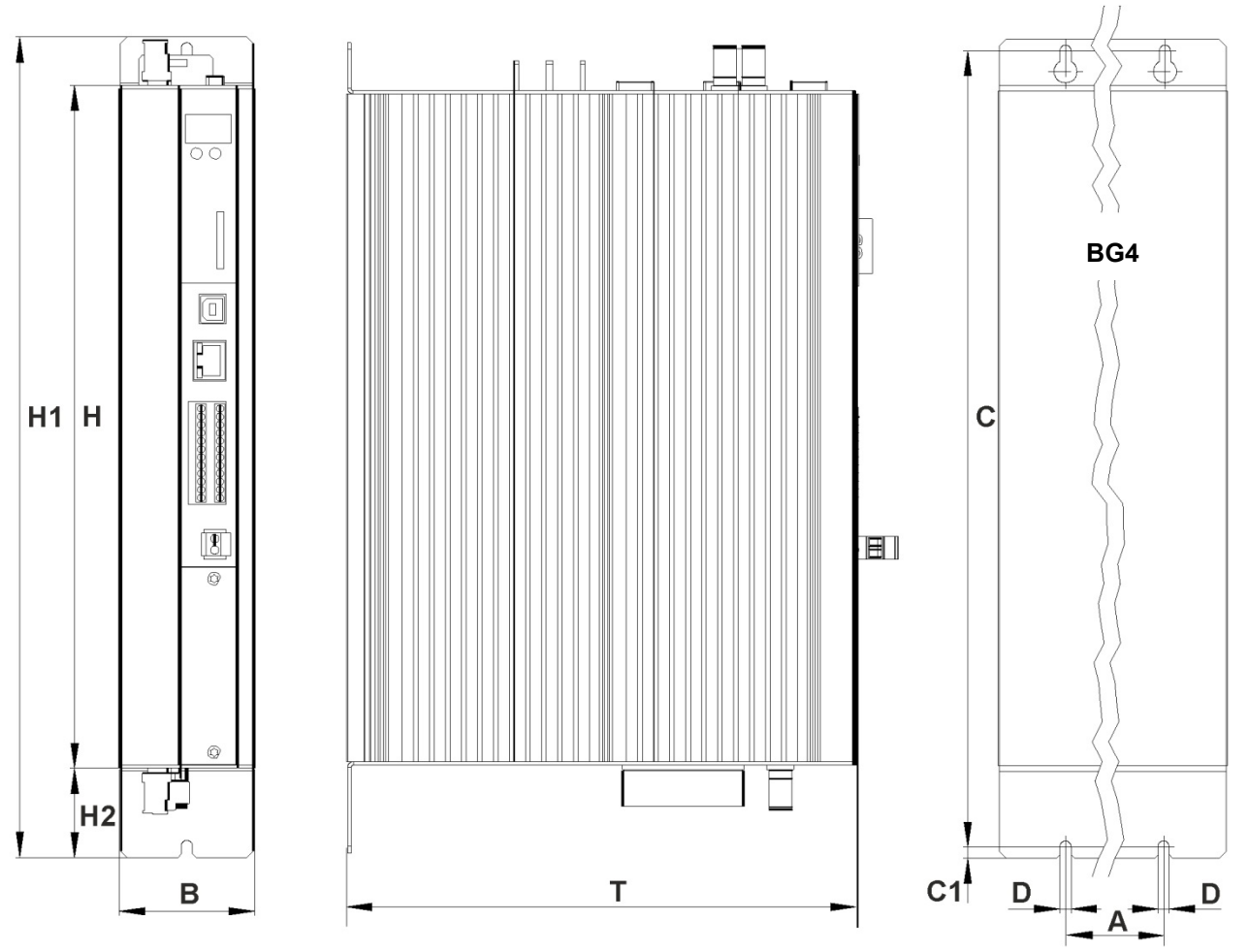


Fig. 3 Mounting distances for air cooling (BG4)

Mounting distances

NOTICE

The minimum distance **E** entered in the table for installation size BG4 applies to devices of identical output. When installing different drive outputs in a row, be sure they are in a staged arrangement according to output. This minimizes mutual thermal influences.

When installing JM-1432 servo amplifiers in a row with other devices, make sure the devices do not thermically influence each other.

	JM-1432 (BG4)
E	2
F[2)]	≥ 150
G[2)]	≥ 270

All dimensions in mm

[2)] Take into account the bending radius of the connection cables.

Table 4 Mounting distance dimensions from Fig. 4

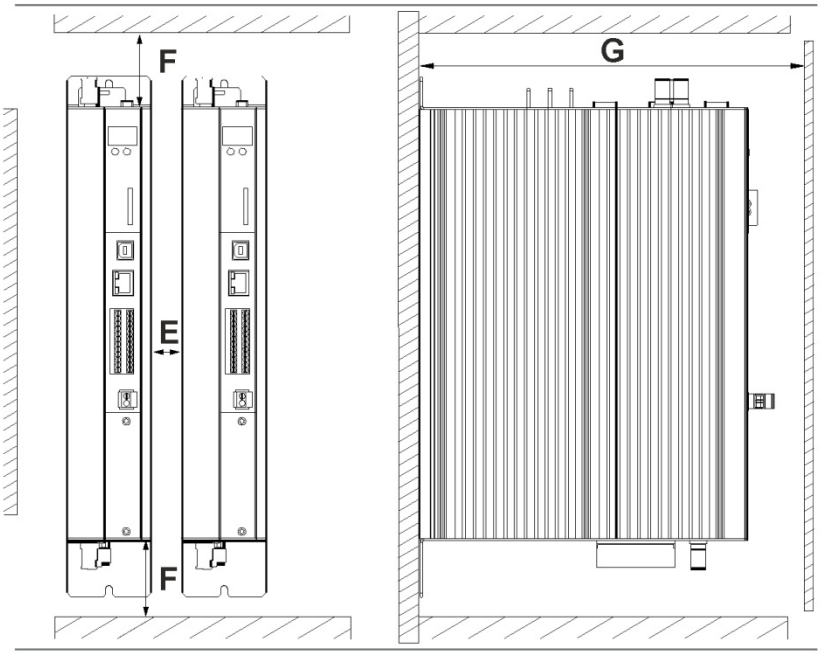


Fig. 4 Mounting distances for air cooling (BG4)

3 Installation

3.1 Information on installation

ATTENTION!

Qualified personnel

- Only qualified personnel who have completed an electrotechnical education and been instructed in accident prevention are permitted to carry out the installation.

During the installation

- Be absolutely certain that no screws, cable remains or other foreign bodies fall into the device.
- Be absolutely certain that no moisture penetrates into the device.

DANGER of electrical voltage!

Risk of death!

- Never wire or loosen live electrical connections!
- Before performing any kind of work, disconnect the device from the mains supply (AC 230/400/460/480 V).
  Dangerous high voltages ≥ 50 V may be present even 30 minutes after disconnection from mains power (capacitor charge). Only work on the device when the DC link voltage has fallen below a residual voltage of 50 V, measured at terminals X12/L-.
- Even if no optical or acoustic signals/signs are apparent or perceptible on the device, dangerous high voltage may be present on the device (e.g., with mains voltage switched on at terminal X11 and there is no +24 V control supply at X9/X10)!

Compliance with EMC product standards

- Commissioning (i.e., the start of intended operation) is only permitted when EMC standard EN 61800-3 is observed.
- Verification of compliance with the safety objectives required by the standard must be provided by the constructor/operator of the machine and/or system.

Cable type

- Use shielded mains, motor and signal cables with doubled copper braiding providing 60 to 70 % coverage.
- If very large conductor cross-sections need to be laid, shielded single wires can be used instead of shielded cables.

Laying cables

- Lay mains, motor and signal cables separated from each other.
- Maintain a distance of at least 0.2 m; use separator plates if necessary.
- Always route motor cables along the shortest way to the control cabinet without interruption. If a motor protection switch or a motor choke is used, position the components directly on the servo amplifier and do not remove the motor cable shielding too soon.
- As much as possible, only route the signal cables into the control cabinet from one side.
- Twist cables of the same electric circuit together.
- Avoid unnecessarily long cable lengths and loops.

Grounding measures

- The grounding measures pertinent to the servo amplifier are described in chapter 3.5 *Connecting protective earth* on page 25.

Shielding measures

- Do not remove the cable shielding too soon and always lay it to both the components and the PG rail (primary ground) of the mounting plate with as great a surface as possible.

External components

- Place larger consumers near the electric supply.
- Always wire contactors, relays, solenoid valves (switched inductances) with surge protectors. The wiring must be directly on the respective coil.
- Switched inductances should be at least 0.2 m distant from process-controlled assemblies.

NOTICE

You will also find supplementary information in the respective description of connections. If you would like more detailed information about installation, please contact the Jetter hotline, see page 53.

3.2 Electrical installation

Step	Action	Remark
1.	Determine the connection allocation applicable to your device.	Chapter 3.3
2.	Connect all required in- and output units to the control connections and to any options.	Chapter 3.8 Chapters 3.11 and 3.12
3.	Connect the encoder, the motor and if there is one, the external brake resistor.	Chapters 3.13, 3.14 and 3.15
4.	Connect the protective earth and the supply voltages.	Chapters 3.5 and 3.7
5.	For information on commissioning, please turn to chapter 4.1.	

Table 5 Electrical installation

3.3 Overview of the JM-1432 connections

In the following, you will find a layout diagram from which the respective positions of the connectors and terminals can be taken. For better orientation, we have given the connector and terminal designations a code.

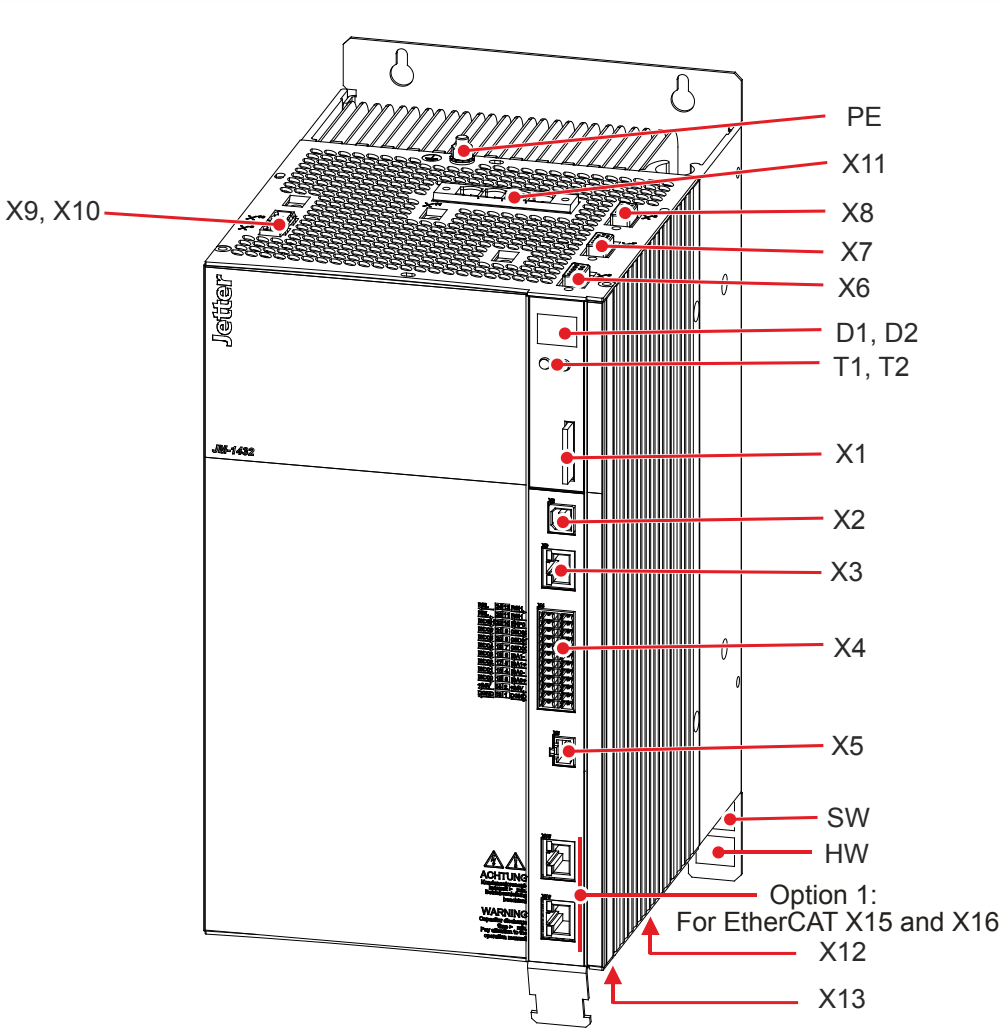


Fig. 5 JM-1432 (BG4) layout diagram

Number	Order reference
D1, D2	7-segment display
T1, T2	Pushbuttons
X1	Slot for MMC card
X2	USB 1.1 port
X3	Ethernet port
X4	Control terminals
X15, X16	Communication EtherCAT X15 (= in from control) and X16

Number	Order reference
(option 1)	(= out to next node)
X11	AC mains supply connection
PE	Protective earth cable connection
X9, X10	Control supply connection
X8 (option 2)	Technology
X7	High-resolution encoder connection
X6	Resolver connection
X5	Motor temperature monitoring connection
X13	Motor brake connection
X12	Motor, brake resistor and DC link connection
HW	Hardware nameplate
SW	Software nameplate

Table 6 JM-1432 (BG4) - Layout diagram legend

3.4 JM-1432 - Connection diagram

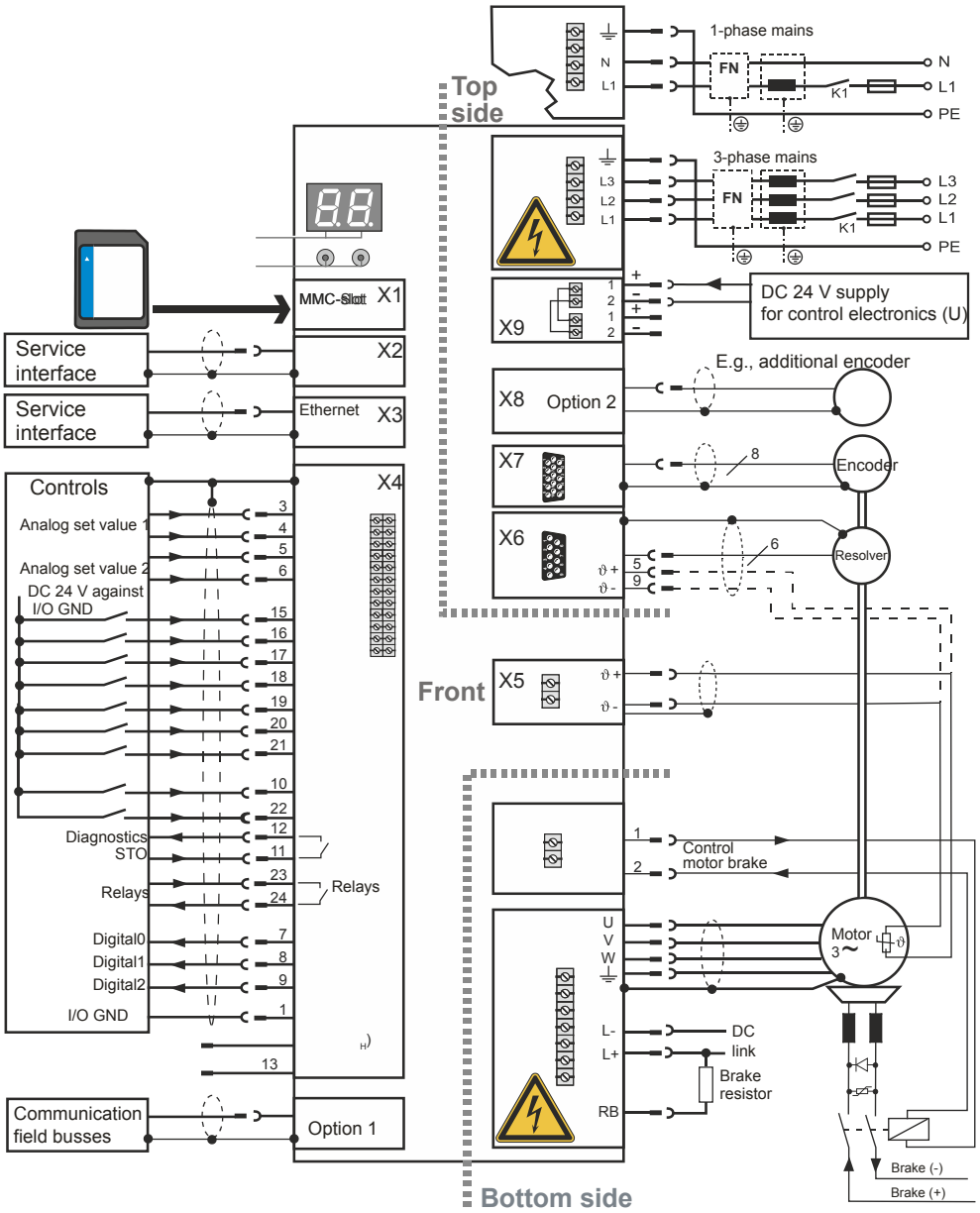


Fig. 6 JM-1432 (BG4) connection diagram

Number	Order reference	Details
D1, D2	7-segment display	Page 50
T1, T2	Pushbuttons	Page 50
X1	Slot for MMC card	Page 50
X2	USB 1.1 port	Page 35
X3	Ethernet port	Page 36

Number	Order reference	Details
X4	Control terminals	Page 32
X15, X16 (option 1)	Communication EtherCAT X15 (= in from control) and X16 (= out to next node)	Page 36
X11	AC mains supply connection	Page 29
PE	Protective earth cable connection	Page 25
X9, X10	Control supply connection	Page 28
X8 (option 2)	Technology	Page 36
X7	High-resolution encoder connection	Page 39
X6	Resolver connection	Page 38
X5	Motor temperature monitoring connection	Page 41
X13	Motor brake connection	Page 35
X12	Motor, brake resistor and DC link connection	Page 41
HW	Hardware nameplate	Page 6
SW	Software nameplate	

Table 7 JM-1432 (BG4) - Connection diagram legend

3.5 Protective earth cable connection

Step	Action	PE connection
1.	Ground every servo amplifier! Connect the connection ⏚ with the PG rail (primary ground) in the control cabinet in a star configuration and over a wide area.	The following applies to the PE connection (because of leakage current > 3.5 mA): ■ Mains connection < 10 mm² copper: Protective earth cable cross-section at least 10 mm² copper or two cables with the same cross-section as the mains cable. ■ Mains connection ≥ 10 mm² copper: Use a protective earth cable cross-section corresponding to the mains cable cross-section. The respective local and national regulations and conditions must also be observed.
2.	Also connect the protective earth connections of all further components, including mains throttle, filter, etc., to the PG rail (primary ground) in the control cabinet in a star configuration and over a wide area.	

Table 8 Grounding the servo amplifiers

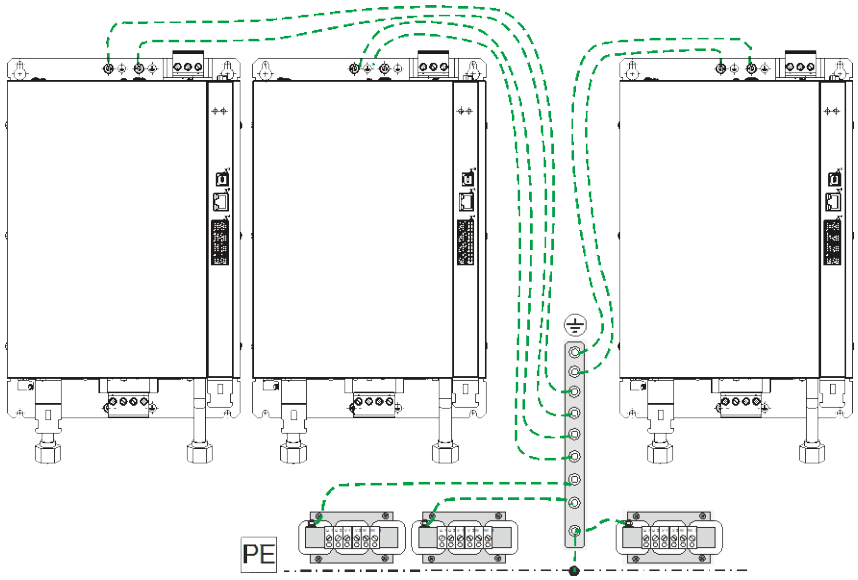


Fig. 7 Laying the protective earth connections in a star configuration

3.6 Electrical isolation concept

The control electronics with their logic (µp), the encoder connections and the in- and outputs are galvanically isolated from the power unit (mains supply/DC link). All control connections are executed as safety low voltage circuits (SELV/PELV) and must only be operated with such SELV or PELV voltages in accordance with the respective specifications. This means a secure protection from electric shock on the control side.

Therefore it needs a separate power supply which corresponds to the requirements for an SELV/PELV.

The following overview details the potential references of the individual connections.

This concept also gains higher operating reliability for the servo amplifier.

ATTENTION!

The isolation and separation of terminal X5 (motor PTC) represent a special feature. For this terminal, please observe the information in chapter 3.14 *Motor connections* starting on page 41.

SELV = Safety Extra Low Voltage

PELV = Protective Extra Low Voltage

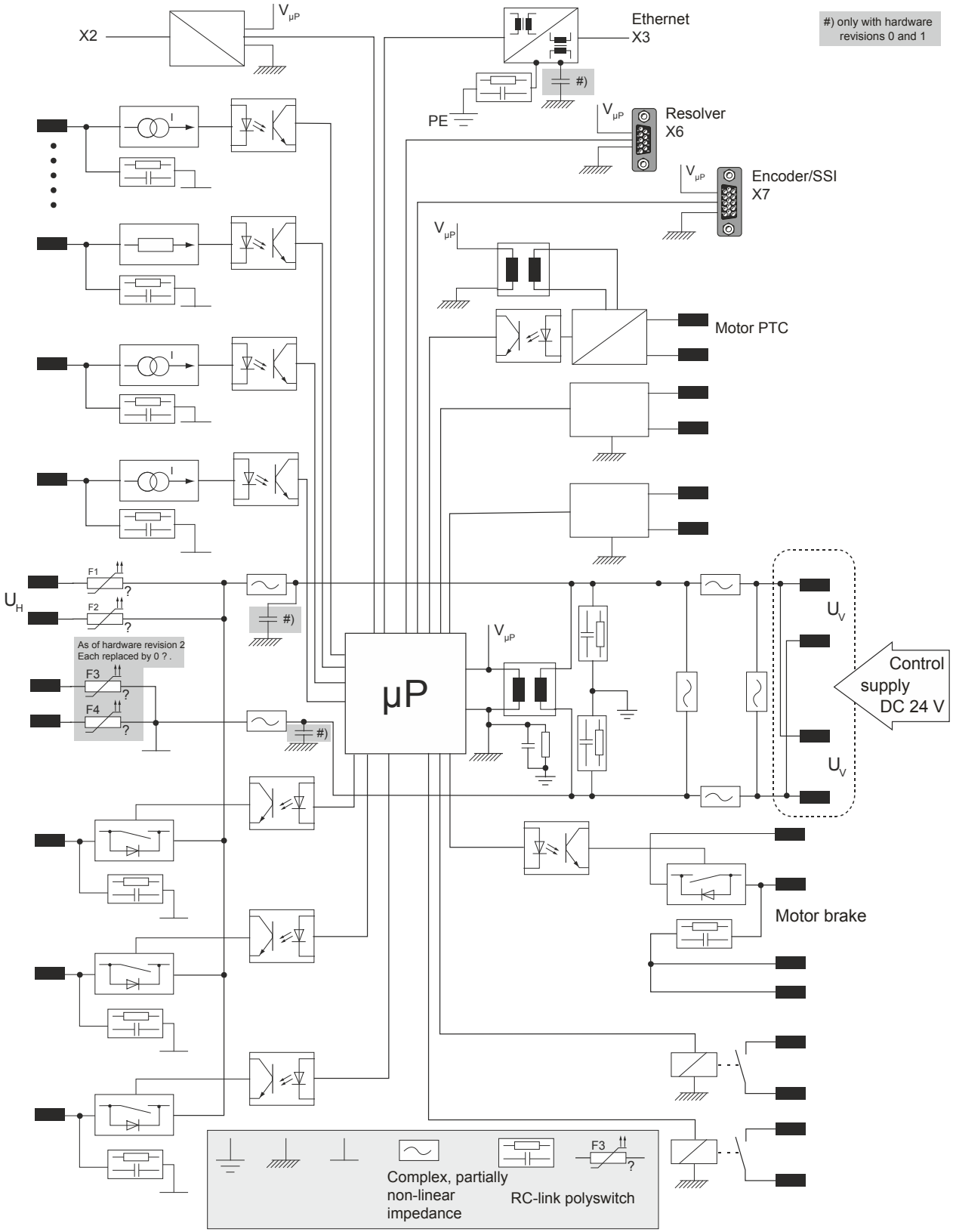


Fig. 8 Electrical isolation concept for JM-1432 (BG4)

3.7 Connecting the supply voltages

The JM-1432 has got an individual power supply for the control unit and for the power section. Always connect the control voltage in the series first, so the activation of the JM-1432 can be checked and the device can be parameterized for the planned application.

DANGER of electrical voltage!

Even if no optical or acoustic signals/signs are apparent or perceptible on the device, dangerous high voltage may be present (e.g., with mains voltage switched on at terminal X11 and at the same time, there is no DC 24 V control supply at X9/X10)!

3.7.1 Connecting the control supply (DC 24 V)

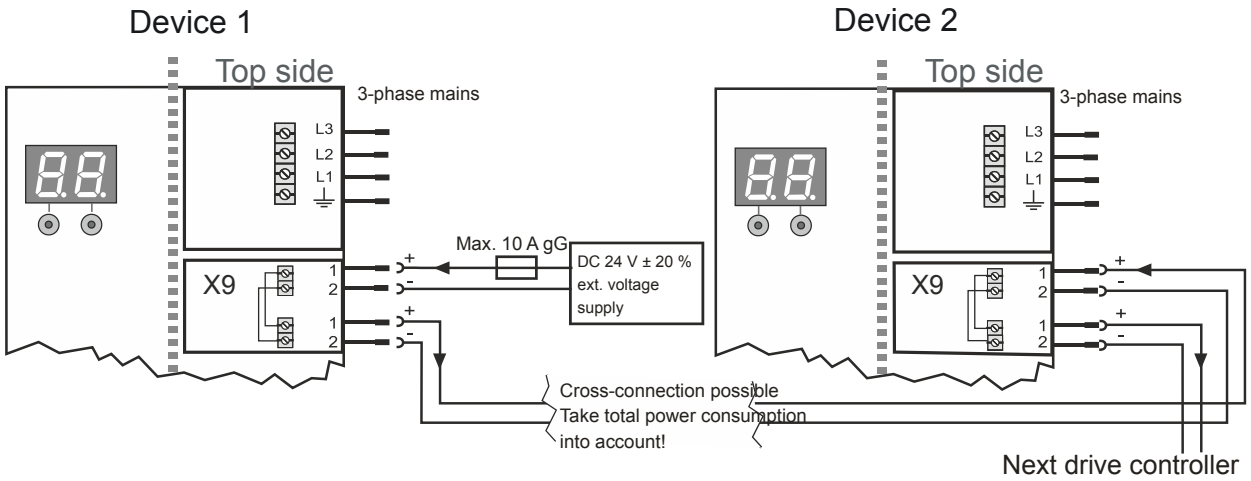


Fig. 9 BG4 control supply connection

ATTENTION!

In general, suitable measures must be taken to ensure corresponding circuit breaking.

Terminal/pin	Specification
X9/1 = + X9/2 = -	▪ U_V = DC 24 V ± 20 % (BG5 to BG6a + 20/-10 %), stabilized and smooth ▪ For the maximum startup and continuous currents, see Table 35 on page 58. ▪ Continuous current carrying capacity of terminal: 10 A max., internal polarity reversal protection ▪ The power supply unit used must have a secure separation from the mains that complies with EN 50178 or EN 61800-5-1. ▪ Connected internally with X10
X10/1 = + X10/2 = -	▪ Continuous current carrying capacity of terminal: 10 A max. ▪ Connected internally with X9

Table 9 JM-1432 (BG4) - Control current supply specification

NOTICE On the JM-1432, the external voltage supply supplies both the control unit and the output for the motor brake. If this output is active, the power for the control unit and the power for the motor brake and for the additional power consumption of digital in- and outputs flows through terminal X9. Take this into account when dimensioning the voltage supply for the control unit and when looping through to other devices. You will find the power consumption of the individual devices in the Appendix on page 58 in Table 35.

3.7.2 AC mains supply connection

Step	Action	Remark
1.	Determine the conductor cross-section in dependence on the maximum current and ambient temperature.	The conductor cross-section must comply with local and national regulations and conditions.
2.	Wire the servo amplifier according to its installation size and connection type. Use a cable shielded after 0.3 mm cable length!	See Fig. 10.
3.	Wire the mains choke if needed, see chapter 3.7.2	This reduces the voltage distortions (THD) in the mains and increases the service life of the servo amplifier.
4.	Install a circuit breaker K1 (power switch, contactor, etc.).	**Do not switch on** the AC mains supply yet!
5.	Use mains fuses (operating class gG, see Table 11) that separate the servo amplifier from the mains at all poles.	To comply with equipment safety to EN 61800-5-1

Table 10 AC power supply connection

DANGER of electrical voltage!

Risk of death!

Never wire or loosen live electrical connections! Before performing any kind of work, disconnect the device from the mains supply. Dangerous high voltages ≥ 50 V -may be present even 30 minutes after disconnection from mains power (capacitor charge). Therefore check that no voltages are present!

ATTENTION!

If local regulations require providing a residual current device, the following applies:

In case of fault, the servo amplifier can generate DC fault currents without zero crossing. Therefore only operate the servo amplifier with residual-current-operated protective devices (RCDs)[1)] type B for AC residual currents, pulsating or smooth DC fault currents, that are suitable for servo amplifier operation, see IEC 60755. In addition, residual current monitoring devices (RCMs)[2)] can be used for monitoring tasks.

[1)] *Engl.: residual current protective device*

[2)] *Engl.: residual current monitor*

Please note:

Switching the mains voltage:

- At switching too frequently, the device protects itself by high-impedance disconnection from the mains; after a recovery phase of several minutes, the device is ready for operation again.

TH and TT mains: Operation is permitted in the following cases:

- For single-phase devices with 1 x AC 230 V, the supply mains corresponds to maximum overvoltage category III to EN 61800-5-1.
- For three-phase devices with the external conductor voltages 3 x AC 230 V, 3 x AC 400 V, 3 x AC 460 V and 3 x AC 480 V, the star point of the supply mains is grounded and the supply mains is suitable for maximum overvoltage category III to EN 61800-5-1 at a system voltage (external conductor → start point) of maximum 277 V.

IT network: not permitted!

- With ground connection, the voltage stress is about doubled. Clearance and creepage distances to EN 61800-5-1 are no longer maintained.

It is imperative that the servo amplifier is connected via a mains choke in the following situation:

- If the servo amplifier is used in applications with disturbance variables corresponding to environment class 3, to EN 61000-2-4 and above (harsh industrial environments).
- For compliance with EN 61800-3 or IEC 61800-3, see Appendix.

For additional information about current carrying capacity, technical specifications and environmental conditions, please refer to the Appendix.

NOTICE Please note that the JM-1432 is not designed for environmental class 3. To attain this environmental class, additional methods are absolutely imperative! For details, please contact your project engineer.

NOTICE Before commissioning, set the value of the connected mains voltage in the servo amplifier (factory setting = 3 x AC 400 V).

JM-1432	Values
Device connected load[1)] With mains choke (4 % U_K) Without mains choke	 22.2 kVA 30.0 kVA
Max. conductor cross-section [2)] for terminals	16 mm²
Prescribed mains fuse, operating class gG	3 x max. 63 A

[1)] At 3 x 400 V mains voltage

[2)] The minimum cross-section of the mains connection cable complies with the local regulations and conditions and the rated current of the drive controller.

Table 11 Connected load and mains fuse

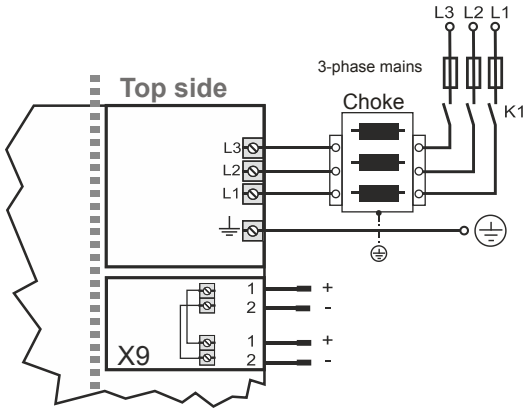


Fig. 10 Connection of the mains power supply 3 x 230/400/460/480 V

3.7.3 Applying a mains choke

Applying mains chokes:

- Required when the servo amplifier is used in harsh industrial mains grids
- Recommended for increasing the lifespan of DC link capacitors

3.7.4 Applying an internal line filter

The servo amplifiers are equipped with integrated line filters. With the measurement procedures prescribed by the standard, the drive controllers satisfy the EMC protective goals to EN 61800-3 for *First environment* (residential C2) and *Second environment* (industrial C3) . For additional information, see chapter G *Line filter*, page 61.

ATTENTION!

This is a product with restricted availability to EN 61800-3. This product may cause radio interferences in residential areas; if it does, the operator may be required to take corresponding measures.

3.7.5 Applying an external line filter

External radio interference filters (EMCxxx) are available for the servo amplifiers. With the prescribed measurement procedures and the external line filter, the servo amplifiers also satisfy the EMC product standards to EN 61800--3 for *First environment* (residential C2) and *Second environment* (industrial C3).

To use longer motor cables and achieve compliance with EMC product standard EN 61800-3 for *General availability* (residential C1), additional external line filters are available for devices with an internal line filter (BG4).

3.8 Control connections

Step	Action	Remark
1.	Check whether the present devices have already been completely set up, i.e., the drive has already been configured.	
2.	If it has been, a special connection assignment of the control terminals is required. Be absolutely certain to ask your project engineer about the connection assignmetn	
3.	Decide on a connection assiginment.	
4.	Wire the control terminals with shielded cables. The following are absolutely necessary: ISDSH (X4/22) and ENPO (X4/10)	Ground the cable shields over a wide area on both sides. Cable cross-sections: 0.2 to 1.5 mm²; for ferrules with plastic sleeves, max. 0.75 mm²
5.	Leave all contacts open at this point (inputs active).	
6.	Check all connections again!	

Table 12 Wiring the control connections

3.8.1 Control connection specifications

Desig.	Term.	Specification	Electrical isolation
Analog inputs			
ISA0+ ISA0- ISA1+ ISA1-	X4/3 X4/4 X4/5 X4/6	■ U_{IN} = ± DC 10 V ■ 12-bit resolution; RIN approx. 101 kΩ ■ Terminal sampling cycle in *IP mode* 125 µs, otherwise 1 ms ■ Tolerance: U ± 1 % of upper range limit value	No
Digital inputs			
ISD00 ISD01 ISD02 ISD03 ISD04	X4/15 X4/16 X4/17 X4/18 X4/19	Standard input ■ Frequency band: < 500 Hz ■ Sampling cycle: 1 ms ■ Low/high switching level: ≤ 4.8 V / ≥ 18 V ■ $U_{IN\ max}$ = DC 24 V + 20 % ■ I_{IN} at DC 24 V = typically 3 mA	Yes
ISD05 ISD06	X4/20 X4/21	Touch sensor (measuring sensor) or standard input ■ Input for touch sensor (measuring sensor) for fast saving of process data (e.g., actual position) ■ Internal signal delay **Hardware version 0 and 1** / **Min.** / **Max.** / **Typ.** ISD05 ↓ — 3 µs — 16 µs — 8 µs ISD05 ↑ — 4 µs — 27 µs — 15 µs ISD06 ↓↑ — — 2 µs — **As of hardware version 2** / **Min.** / **Max.** / **Typ.** ISD05 ↓↑ — — 2 µs — ISD06 ↓↑ — — 2 µs — ■ Activation via ISD05/ISD06 = 15 (PROBE) ■ Standard input ■ Frequency band: < 500 Hz ■ Sampling cycle: 1 ms ■ $U_{IN\ max}$ = DC 24 V + 20 % ■ $I_{IN\ max}$ = at DC 24 V = 10 mA, R_{IN} = approx 3 kΩ ■ Low/high switching level: ≤ 4.8 V / ≥ 18 V	Yes
ENPO	X4/10	■ Deactivating restart lock (STO) and release of output stage = high level ■ OSSD-capable (as of hardware version 2) ■ Reaction time approx. 10 ms ■ Low/high switching level: ≤ 4.8 V / ≥ 18 V ■ $U_{IN\ max}$ = DC 24 V + 20 % ■ I_{IN} at DC 24 V = typically 3 mA	Yes

X4

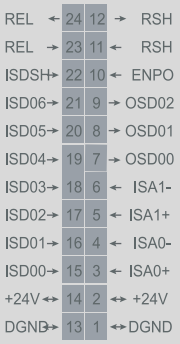


Table 13 Specification of control connections X4, Part 1

Desig.	Term.	Specification		Electrical isolation
Digital outputs				
OSD00 OSD01 OSD02	X4/7 X4/8 X4/9	■ No destruction by short circuit (+24 V → GND); but device may switch off briefly. ■ I_{max} = 50 mA, PLC-compatible ■ Terminal sampling cycle = 1 ms ■ High side driver		Yes
STO (”Safe Torque Off” = safely switched-off torque)				
ISDSH (STO)	X4/22	■ Input *STO request* = low level ■ OSSD-capable (as of hardware version 2) ■ Low/high switching level: ≤ 4.8 V / ≥ 18 V ■ $U_{IN\ max}$ = DC 24 V + 20 % ■ I_{IN} at DC 24 V = typically 3 mA		Yes
RSH	X4/11 X4/12	STO diagnostics, both switch-off channels active, an NC contact with self-resetting fuse (polyswitch) ■ AC 25 V / 200 mA, cos φ = 1 ■ AC 30 V / 200 mA, cos φ = 1	X4/12 X4/11	Yes
Relay output				
REL	X4/23 X4/24	Relay, 1 NC contact ■ AC 25 V / 1.0 A, cos φ = 1 ■ AC 30 V / 1.0 A, cos φ = 1 ■ Switching delay approx. 10 ms ■ Cycle time 1 ms	X4/23 X4/24	
Auxiliary voltage				
+24 V		■ Auxiliary voltage for supplying digital inputs ■ $U_H = U_V - \Delta U$ (ΔU typically approx. 1.2 V), no destruction by short circuit (+24 V → GND); device may switch itself off briefly. ■ I_{max} = 80 mA (per pin) with self-resetting fuse (polyswitch)		Yes
Digital ground				
DGND	X4/1 X4/13	Ground reference for 24 V, I_{max} = 80 mA (per pin), hardware versions 0 and 1 with self-resetting fuse (polyswitch)		Yes

X4

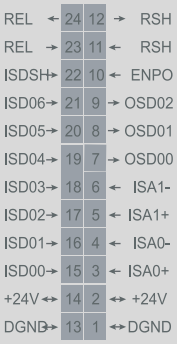


Table 14 Specification of control connections X4, Part 2

NOTICE **High ohmic separation from device ground**

If currents are too high, a high ohmic separation from the device ground is possible via the ground terminal. Under some circumstances, this can lead to faulty drive operation. To prevent this, avoid circular currents in the wiring.

Standard allocation X4

Signal	Standard allocation
ISD00	Positive limit switch
ISD01	Negative limit switch
ISD02	Reference switch

Table 15 Standard allocation of connector X4

3.8.2 Motor brake connection

Connector X13 is intended for connection of a motor brake.

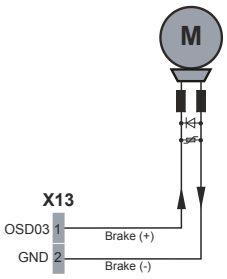
Desig.	Term.	Specification	Connection
OSD03	X13/1	■ Short-circuit-proof	
GND	X13/2	■ Voltage supply is via control supply U_V at X9/X10. ■ $U_{BR} = U_V - \Delta U`$ ($\Delta U`$ typically approx. 1.4 V) ■ For actuation of motor brakes up to I_{BR} = max. 2.0 A; for brakes with greater power consumption, connect an upstream relay. ■ Overcurrent causes switch-off ■ Also usable as configurable digital output ■ Switchable cable break monitoring < 500 mA in state **1** (up to relay)	

Table 16 X13 (BG4) terminal connections specification

3.9 USB interface specification

Technical specification:

- USB 1.1 standard - full-speed device interface
- Connection through typical USB interface cable type A to type B

3.10 Ethernet interface specification

The service and diagnostics interface X3 is designed as an Ethernet interface. It is only suitable for connecting a PC for commissioning, service and diagnostics with the software JetSym.

Technical specification:

- Transfer rate 10/100 Mbit/s BASE-T
- Transfer profile complies with IEEE802.3
- Connection via typical crossover cable (see also Jetter accessories catalog)

3.11 Option 1

Depending on the design variant of the servo amplifier JM-1432, option 1 is executed with EtherCAT at the factory.

You will find all available options in the Jetter industry catalog.

Detailed information is available on request.

3.12 Option 2

Option 2 can be equipped with different technology options at the factory. For example, additional or special encoders can be evaluated here.

You will find all available options in the Jetter industry catalog.

Detailed information is available on request.

3.13 Encoder connection

All encoder connections are located on the top of the device.

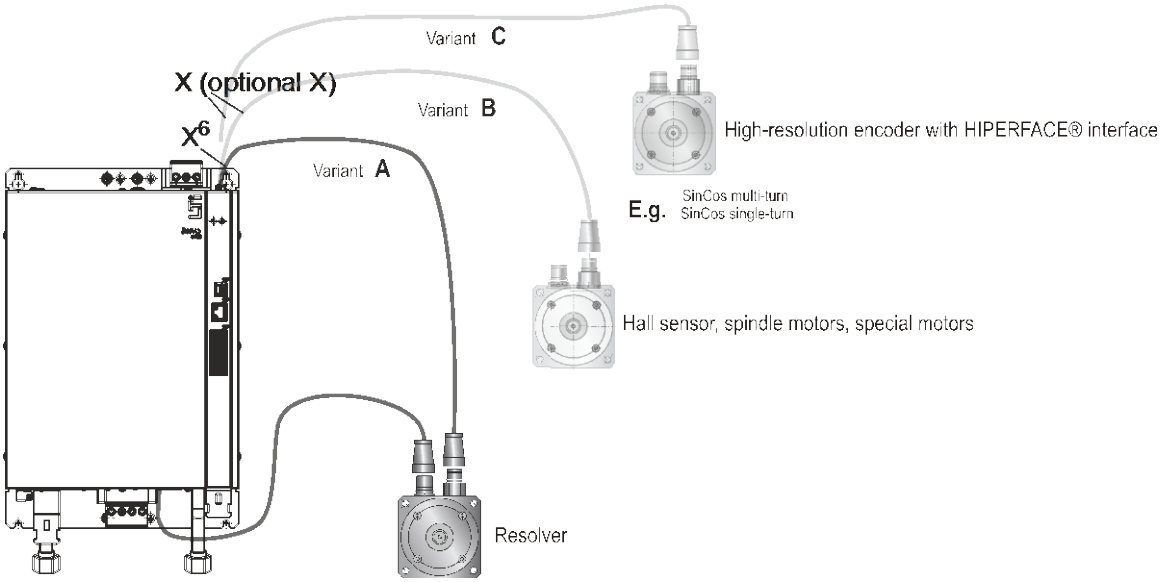


Fig. 11 Motor/encoder cable allocation

3.13.1 Jetter motor encoder connection

To connect the Jetter synchronous motors, please use the pre-assembled motor and encoder cable from Jetter AG.

3.13.2 Motor/encoder cable allocation to servo amplifier

Compare the component type plates. Make absolutely certain that you use the correct components according to a variant A, B or C!

	Motor (with built.in encoder)	Encoder cable	Connection of Servo amplifier
Variant A	With resolver	KAY_1123_xxxx	X6
Variant B	SinCos single-turn encoder with HIPERFACE® interface	KAY_1233_xxxx	X7
Variant C	SinCos multi-turn encoder with HIPERFACE® interface	KAY_1233_xxxx	X7

Table 17 Motor, encoder type and encoder cable variants

NOTICE Do not unravel the encoder cable to, for example, route the signals via terminals in the control cabinet. Lock the knurled screws on the Sub-D connector housing tightly!

3.13.3 Pre-assembled encoder cable

The technical specifications can only be assured when Jetter servo cables are used. You will find a list of the available pre-assembled servo cables in our accessories catalog.

3.13.4 Resolver connection

A resolver is connected to slot X6 (9-pole Sub-D socket).

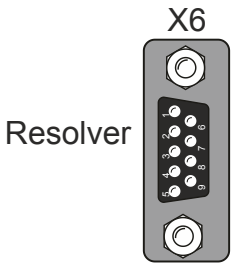
Figure	Pin X6	Function
	1	Sin+ / (S2) analog differential input track A
	2	REFSIN+ / (S4) analog differential input track A
	3	Cos+ / (S1) analog differential input track B
	4	Supply voltage 5 V … 12 V, connected internally with X7/3
	5	ϑ+ (PTC, KTY, Klixon)[1)]
	6	R2 analog excitation
	7	R1 analog excitation (reference ground point to pin 6)
	8	REFCOS / (S3) analog differential input track B
	9	ϑ- (PTC , KTY, Klixon)[1)]

Table 18 Pin allocation X6

[1)] ATTENTION!

The motor PTC (KTY and Klixon also) must be executed with reinforced insulation with respect to the motor winding per EN 61800-5-1.

3.13.5 High-resolution encoder connection

Interface X7 enables evaluation of the encoder types listed below:

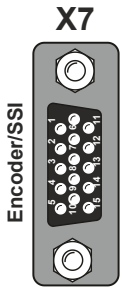
Figure	Function
	SinCos encoder with zero pulse, e.g., Heidenhain ERN 1381, ROD486
	Heidenhain SinCos encoder with EnDat interface, e.g., 13-bit single-turn encoder (ECN 1313.EnDat01) and 25-bit multi-turn encoder (EQN1325-EnDat01)
	Heidenhain encoder with digital EnDat interface Single- or multi-turn encoder
	SinCos encoder with SSI interface, e.g., 13-bit single-turn encoder and 25-bit multi-turn encoder (ECN 413-SSI, EQN425-SSI)
	Sick-Stegmann SinCos encoder with HIPERFACE® interface Single- and multi-turn encoder, e.g., SRS50, SRM50

Table 19 Encoder types for use at X7

NOTICE

- The use of encoders other than those specified by the Jetter delivery program requires a special release through Jetter AG.
- The maximum signal input frequency is 500 kHz.
- Encoders with a supply voltage of 5 V ± 5 % must have a separate connection for a sensor cable. The sensor cable is used for recording the actual supply voltage at the encoder, whereby a voltage drop in the cable can be compensated. Only use of the sensor cable can ensure that the encoder is supplied with the correct voltage. Always connect the sensor cable.

Select the cable type according to the motor or encoder manufacturer's specifications. Please take note of the following general conditions thereby:

- Only use shielded cables. Connect the shielding at both ends.
- Wire the differential track signals A/B, R or CLK, DATA via wires twisted in pairs.
- Do not unravel the encoder cable to, for example, route the signals via terminals in the control cabinet.

Figure	Pin X7	SinCos and TTL	SinCos absolute - value encoder SSI/EnDat	Absolute - value encoder EnDat (digital)	Absolute - value encoder HIPERFACE®
	1	A-	A-	-	REFCOS
	2	A+	A+	-	+COS
	3	DC 5 V ± 5 %, $IOUT_{max}$ = 250 mA (150 mA for hardware versions 0 to 1), monitoring via sensor cable			7 … 12 V (typical 11 V) max. 100 mA
	4	-	Data +	Data +	Data +
X7  Encoder/SSI	5	-	Data -	Data -	Data -
	6	B-	B-	-	REFSIN
	7	-	-	-	U_S - switch
	8	GND	GND	GND	GND
	9	R-	-	-	-
	10	R+	-	-	-
	11	B+	B+	-	+SIN
	12	Sense +	Sense +	Sense+	U_S - switch
	13	Sense -	Sense -	Sense -	-
	14	-	CLK+	CLK+	-
	15	-	CLK-	CLK-	-

The sum of the currents taken from X7/3 and X6/4 must not exceed the specified value.

After pin 7 is connected with pin 12, a voltage of 11.8 V is set at X7, pin 3!

Table 20 Plug connection X7 pin allocation

NOTICE The encoder supply at X7/3 is short-circuit-proof in both 5 V operation and 11 V operation. The servo amplifier remains in operation as long as a corresponding fault message can be generated during evaluation of the encoder signals.

3.14 Motor connection

Step	Action	Remark
1.	Determine the conductor cross-section in dependence on the maximum current and ambient temperature.	The conductor cross-section must comply with local and national regulations and conditions.
2.	Connect the shielded motor cable to terminals X12/ U, V, W and ground the motor at ⏚.	Shielding to reduce interference signals; connect shielding at both ends. Fasten shielding connection plate of motor connection X12 with both screws.
3.	Wire the temperature sensor PTC (if present) to X5 with separately shielded cables and activate the temperature monitoring with JetSym.	Shielding to reduce interference signals; connect shielding at both ends.

Table 21 Motor connection

ATTENTION!

The temperature sensor can also be connected to X6/5 and X6/9 via the resolver cable. However, this requires a reinforced insulation per EN 61800-5-1 between PTC and motor winding.

To connect X5, make sure the temperature sensor used has basic insulation with respect to the motor winding per EN 61800-5-1.

NOTICE If a ground fault or a short circuit in the motor cable occur during operation, the output stage is locked and a fault message is generated.

3.14.1 Jetter motor connection

NOTICE To connect the Jetter servo motors, please use a pre-assembled motor cable (see motor catalog).

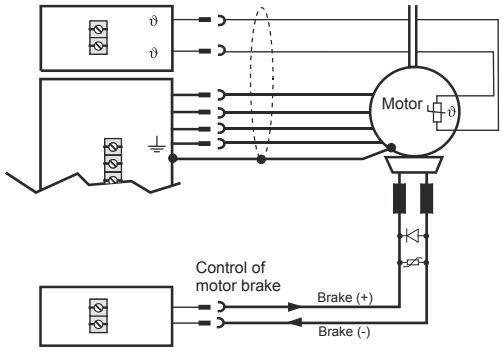


Fig. 12 Motor connection at BG4

NOTICE On Jetter motors with a resolver, connect the PTC via the Sub-D9 (X6) of JM-1432.

3.14.2 Switching in the motor cable

ATTENTION!

- Switching in the motor cable must always be done in a de-energized state with deactivated output stage; otherwise problems such as burnt-out contactor contacts may occur.
- To ensure switching-on takes place without power, make sure that the motor contactor contacts are closed before the servo amplifier output stage is released.
- At contactor tripping torque, it is necessary for the contacts to remain closed until the servo amplifier output stage is switched off and the motor current is 0. This is achieved by including corresponding safety times for tripping the motor contactor in the control process of your machine.

Despite this measure, the possibility of the servo amplifier faulting when switching in the motor cable cannot be excluded.

3.15 Brake resistor

In generator operation, e.g., when braking the drive, the motor energy is supplied back to the servo amplifier. This increases the voltage in the DC link (DCL). If the voltage exceeds the tripping threshold, the internal brake chopper transistor is switched on and the generated energy is converted to heat via a brake resistor.

Device	Mains voltage			
	3 x 230 V	3 x 400 V	3 x 460 V	3 x 480 V
JM-1432	DC 390 V	DC 650 V	DC 745 V	DC 765 V

Table 22 Brake chopper tripping thresholds (DC link voltage)

3.15.1 Protection for fault in brake chopper

ATTENTION!

The fault messages in JM-1000 (also BC_FAIL as protection for faults in the brake chopper) are parameterized so that the relay output DO04 opens when a severe fault occurs.

We recommend integrating relay DO04 into the actuation of the power contactor for the JM-1000 supply with AC 400 V.

3.15.2 Version with integrated brake resistor

Only the peak braking power for the servo amplifier with integrated brake resistor (version JM-1xxx-xxR1xxx, only available up to BG4) is specified in the catalog. The permissible continuous braking power must be calculated. It is dependent on the effective load on the servo amplifier present in the specific application.

ATTENTION!

Do not connect any additional external brake resistors to the servo amplifier JM-1432 with integrated brake resistor.

In principle, the thermal aspects of the servo amplifier are designed so that in continuous operation with rated current and maximum environmental temperature, no energy input through the external brake resistor is permitted. Therefore the drive version with integrated brake resistor is only reasonable if the effective load on the servo amplifier is ≤ 80 %, or if the brake resistor is intended for a one-time emergency stop.

In case of an emergency stop, only the heat capacity of the brake resistor can be used for a one-time braking process. Please take the permissible energy W_{Br} from the following table:

Device	Technology	Peak braking power P_{Br}	Pulse energy W_{Br}	K1
JM-1432	Wire resistor	4700 W[1)] 6170 W[2)] 6500 W[3)]	6000 S	480 W

[1)] *Data referenced to 3 x 400 V mains voltage (BR tripping threshold DC 650 V)*

[2)] *Data referenced to 3 x 460 V mains voltage (BR tripping threshold DC 745 V)*

[3)] *Data referenced to 3 x 480 V mains voltage (BR tripping threshold DC 765 V)*

Table 23 Integrated brake resistor data (version JM 1432)

If the drive is not continually operated at its power limits, the reduced power dissipation of the drive can be used as braking power.

NOTICE The following calculations assume servo amplifier operation at maximum ambient temperature. I.e., an additional energy input via the internal brake resistor due to a lower ambient temperature was not considered.

To calculate the continuous braking power, proceed as follows:

- Calculation of the effective load on the servo amplifier in cycle T:

$$I_{eff} = \sqrt{\frac{1}{T}\int_0^T i^2 dt}$$

- Determination of the continuous braking power from unused drive power:

$$P_{DBr} = \left\{1 - \frac{I_{eff}}{I_N}\right\} \times K1$$

General conditions

- A single braking process must not exceed the maximum pulse energy of the brake resistor.

$W_{Br} \geq P_{Br} \times T_{Br}$

- The continuous braking power calculated for the device must be greater than the effective braking power of one drive cycle.

$$P_{DBr} \geq \frac{1}{T} \times \int_0^T P_{PBr} dt_{Br}$$

This yields the minimum permissible time for cycle T at the calculated continuous braking power:

$$T = \frac{P_{PBr}}{P_{DBr}} \times \int_0^T dt_{Br}$$

The maximum total tripping time of the brake resistor in a predetermined cycle T at the calculated continuous braking power results from:

$$T_{BrSum} = \frac{P_{DBr}}{P_{PBr}} \times T$$

3.15.3 Connecting an external braking resistor

DANGER of electrical voltage!

Risk of death!

The connection L+ (BG4) is permanently switched to DC-link potential (> DC 300 V). The connection is not protected within the device.

Never wire or loosen live electrical connections!

Before performing any kind of work, disconnect the device from the mains supply. Dangerous high voltages ≥ 50 V may be present even 30 minutes after disconnection from mains power (capacitor charge).

Therefore check that no voltages are present!

ATTENTION!

- Observe the braking resistor mounting instructions without fail.
- Wire the temperature sensor (bimetal switch) on the braking resistor in such a way that if the braking resistor overheats, the output stage is deactivated and the connected drive controller is disconnected from the mains.
- The minimum permissible externally installed brake resistance must not be fallen below and the permissible continuous braking power must not be exceeded; see technical specifications, chapter C in Appendix, from page 57.
- Connect the braking resistor with a shielded cable.

Frame size BG4

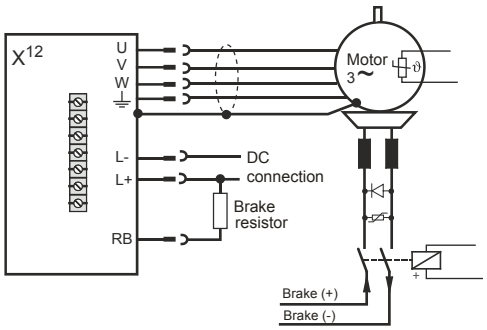


Fig. 13 Braking resistor connection

ATTENTION!

Do not connect any additional external braking resistors to servo amplifiers with integrated brake resistor.

NOTICE You will find the exact specifications, especially surface temperature, maximum connection voltage and high voltage resistance, in the JM-1432 Jetter industry catalog.

For detailed information about the design of the braking resistor, please contact your project engineer.

4 Commissioning

4.1 Instructions for operating

ATTENTION!

Safety instructions

- During operation, observe the safety information in chapter 1, page10.

During operation

- Prevent foreign objects and moisture from entering the device.
- Keep aggressive or conductive materials away from the surrounding area.
- Do not permit the ventilation openings to be covered.

Cooling

- The device heats up during operation and can reach temperatures of up to 100 °C at the heat sink. There is a danger of skin burns from touching the device.
- It must be possible for cool air to flow through the device with no obstructions.

4.2 Initial commissioning

After the JM-1432 has been installed according to chapter 2 and wired with all necessary voltage supplies and external components as described in chapter 3, initial commissioning takes place with the assistance of JetSym and a JetControl as described in the JetSym online help.

NOTICE Details of the *STO* (Safe Torque Off) were not taken into account for the initial commissioning. You will find all information about the function *STO* in the 24-language document *Description of the STO safety function* (item no. 60879033).

4.2.1 Switching on the control supply

To initialize and set the parameters, first switch on the 24 V control supply. Do **not** switch on the AC mains supply yet!

Display readout after control supply is switched on

D1	D2	Action	Explanation
		Switching on external 24 V control supply	Initialization is running
		Initialization completed	Not ready to be switched on

Table 24 Initial state of the JM-1432 (when DC 24 V control supply is connected)

NOTICE You will find details of the control supply in chapter 3.7 *Connecting the supply voltages* from page 28.

4.2.2 Setting the parameters

The drive system settings are made with JetSym. Launch JetSym and open the JetSym online help.

NOTICE

- **Help system**
  For a detailed description of the initial commissioning, please refer to the JetSym online help.
- **Motor dataset**
  When using Jetter servo motors, the corresponding motor dataset can be selected in JetSym.

4.2.3 Drive control by a JetControl

Switch on the AC mains supply.

Then enable the output stage and activate the controls.

The drive should be tested without any mechanisms connecte!

DANGER from rotating parts!

Risk of death from uncontrolled rotation!

- Before initial commissioning of motors with a parallel feather key at the shaft end, secure the feather key against being ejected if this is not prevented by drive elements such as belt pulleys, couplings, etc.

ATTENTION!

Prevent damage by motor testing!

- In this case, ensure that nothing is damaged by testing the system! Pay particular attention to the limits of the travel range.
- Please note that you are responsible yourself for safe operation. Jetter AG is not liable for any damage that occurs under any circumstances.

Destruction of the motor!

- Specific motors are intended for operation on the servo amplifier.
  Direct connection to the mains can destroy the motor.
- The motor surfaces can become extremely hot. Do not place or fasten any temperature-sensitive parts on the motor surfaces; where necessary, provide protective measures against contact.
- To prevent the motor from overheating, the motor holding brake installed in the winding must be connected to the servo amplifier temperature monitoring (X5 or X6).
- Before initial commissioning of the motor, check that the motor brake (if present) functions flawlessly. Motor holding brakes are only designed for a limited number of emergency braking operations. Using them as a working brake is forbidden!

Display readout after AC mains supply is switched on

D1	D2	Action	Response	Explanation
		Switching on the AC -mains supply	Open-loop control ready, output stage ready, closed-loop control deactivated	Device ready to be switched on

Table 25 Display D1/D2 after AC mains supply is switched on

NOTICE

- Inputs **ISDSH** and **ENPO**
  For step 1 from Table 26, at least the two inputs **ISDSH** and **ENPO** on terminal X4 must be wired.

Sequence for switching on the drive

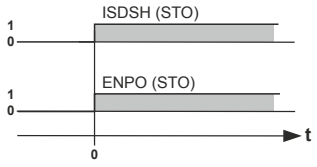
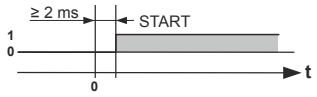
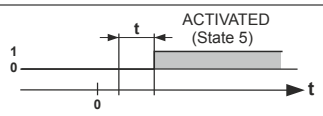
Step 1: Deactivate the *STO* safety function by setting the inputs **ISDSH** and **ENPO**.	
Step 2: Activate *START CONTROL* at the earliest 2 ms after step 1 and set the speed setpoint value.	
Step 3: Observe your system/plant and check the drive response.	
t = Motor-dependent delay time	

Table 26 Sequence for switching on

Display readout after drive is started

D1	D2	Action	Response	Explanation
		*STO*and output stage **ENPO** enabled	Ready to be switched on	Output stage ready
		**ATTENTION!** Make sure to preset a plausible setpoint value before the next step, *Start enable*, because the preset setpoint value is transferred directly to the drive when the motor control starts.		
		*Start* enabled	Enabled	Drive powered, control active

Table 27 Display D1/D2 during motor activation

For details on optimizing the drive your application uses, please refer to the JetSym online help.

4.3 Serial commissioning

An existing parameter dataset can be transferred to other JM-1432 servo amplifiers by using JetSym online help. For details, please refer to the JetSym online help.

4.4 Integrated operating unit

The built-in operating unit permits diagnosis of the JM-1432. The operating unit comprises the following elements, all located on the front of the device:

- 2-digit 7-segment display (D1, D2)
- Two pushbuttons (T1, T2)
- MMC slot (X1)

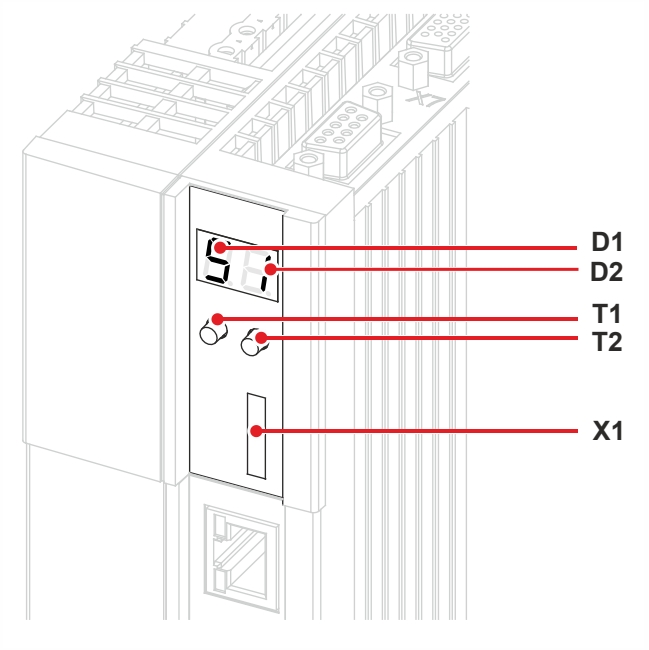


Fig. 14 Integrated operating unit

The following functions and displays are available:

- Display of device state (see chapter 5.1.1, from page 51)
  The device state is displayed after the control voltage is switched on. If there is no pushbutton entry within 60 seconds, the device state display is reset.
- Display of device fault (see chapter 5.1.2, from page 52)
  If there is a device fault, the display is immediately changed to the fault codes.

5 Diagnostics

5.1 Status display on the device

The device states are displayed on the device via the 7-segment display.

5.1.1 Device states

Display	System state
	Device in reset state
	Self-initialization at device start
 *)	Not ready for switching on (no DC link voltage)[1)]
 *)	Switch-on lock (DC link OK, output stage not ready)[1)]
	Ready to be switched on (output stage ready)
	Switched on (drive energized) [2)]
	Drive ready (drive energized and ready for setpoint input)[2)]
	Quick stop[2)]
	Fault reaction active[2)]

*) *This is not a **secure display** as described by EN 61800-5-2*

1) *S. flashes when the function STO (Safe Torque Off) is active. Display goes out when the function is inactive.*

2) *This point flashes when the output stage is active.*

Table 28 Device states

5.1.2 Fault display

Individual fault codes are displayed in the 7-segment display for each fault. Each fault code comprises the repeating sequence ►**Er** ►Fault number►Fault location.

Display	Meaning
	Device fault
↓ Display changes after about 1 s	
	Fault number (decimal) Example: 05 = Overcurrent
↓ Display changes after about 1 s	
	Fault location (decimal) Example: 01 = Hardware monitoring
↑ After about 1 s, display skips back to “Er”	

Table 29 Fault code display

NOTICE **Acknowledge error**

The faults can be confirmed according to their programmed reaction (Er) or can only be set back by a 24 V reset (X9/X10) (Er). Faults marked by a point can only be reset after the cause of the fault has been remedied.

5.2 Hotline/Support and service

If you have technical questions about project engineering or commissioning the servo amplifier, our hotline can provide you with fast, focused assistance. Before contacting us, please have the following information ready:

- Type designation, serial number and software version of the device (see software nameplate)
- JetSym version used (Menu ►Help ►Info for JetSym…)
- Displayed fault code (corresponding to 7-segment display or JetSym)
- Description of fault, how it started and the general conditions
- JetSym device settings saved in a file
- Name of company and contact partner, telephone number and e-mail-address

The hotline can be reached by telephone, e-mail or Internet:

Service times:	Monday through Thursday 8:00 a.m. to 5:00 p.m. (CET) and Friday from 8:00 a.m. to 3:00 p.m. (CET)
Phone:	(+49) 7141-2550-444
Email:	hotline@jetter.de
Internet:	www.jetter.de ►Support

NOTICE If you need consultation beyond the scope of the hotline, you will find all offered services in the industry catalog. You can download the industry catalog from our Internet site www.jetter.de under the heading *Quicklinks*.

6 Safe Torque Off (STO)

NOTICE For any kind of information on the function *STO*, please refer to our 24-language document *Description of the STO safety function* (item no. 60879033).

Appendix

A: Servo amplifier current carrying capacity

The maximum permissible output current and the peak current of the servo - amplifier are dependent on the mains voltage, the length of the motor cables, the output stage switching frequency, the type of cooling technology and the ambient temperature.

If any of the operating conditions changes, so does the maximum servo amplifier current carrying capacity.

B: Current carrying capacity BG4, air cooling, three-phase

JM-1432 for 3 x AC 400 V

Device	Output stage switching frequency	Ambient - temperature	Rated current I_n	Peak current [A_{eff}]			
				For rotary field frequency increasing linearly 0 … 5 Hz		For inter-mittent oper-ation	For time[1)]
	[kHz]	Max. [°C]	[A_{RMS}]	0 Hz	5 Hz	> 5 Hz	[s]
JM-1432	4	45	32.0	64.0	64.0	64.0	10.0
	8	40	32.0	64.0	64.0	64.0	10.0
	12	40	21.0	42.0	42.0	42.0	10.0
	16	40	15.0	30.0	30.0	30.0	10.0

Table 30 Rated and peak current BG4 (3 x AC 400 V)

JM-1432 for 3 x AC 460 V

Device	Output stage switching frequency	Ambient - temperature	Rated current I_n	Peak current [A_{eff}]			
				For rotary field frequency increasing linearly 0 … 5 Hz		For inter-mittent – opera-tion	For time[1)]
	[kHz]	Max. [°C]	[A_{RMS}]	0 Hz	5 Hz	> 5 Hz	[s]
JM-1432	4	45	32.0	64.0	64.0	64.0	10.0
	8	40	28.0	64.0	64.0	64.0	10.0
	12	40	16.5	42.0	42.0	42.0	10.0
	16	40	12.2	30.0	30.0	30.0	10.0

Table 31 Rated and peak current BG4 (3 x AC 460 V)

JM-1432 for 3 x AC 480 V

Device	Output stage switching frequency	Ambient - temperature	Rated current I_n	Peak current [A_{eff}]			
				For rotary field frequency increasing linearly 0 … 5 Hz		For inter-mittent – opera-tion	For time[1)]
	[kHz]	Max. [°C]	[A_{RMS}]	0 Hz	5 Hz	> 5 Hz	[s]
JM-1432	4	45	32.0	64.0	64.0	64.0	10.0
	8	40	26.7	64.0	64.0	64.0	10.0
	12	40	15.0	42.0	42.0	42.0	10.0
	16	40	11.2	30.0	30.0	30.0	10.0

Table 32 Rated and peak current BG4 (3 x AC 480 V)

C: JM-1432 - Technical specifications

Technical specifications		
Type	**Device**	**Values**
Output, motor side[1)]		
Voltage		3-phase U_{Mains}
Effective rated current (I_n)		32 A
Peak current		See Table 30 to Table 32
Rotary field frequency		0 … 400 Hz
Output stage switching frequency		4, 8, 12, 16 kHz
Input, mains side		
Mains voltage		3 x 400 V/3 x 460 V/3 x 480 V ± 10 %
Device-connected load [1)] (with mains choke)		22.2 kVA
Current [1)] (with mains choke)		34.9 A
Mains voltage unbalance	JM-1432	± 3 % max.
Frequency		50/60 Hz ± 10 %
Power loss at I_N[1)]		515 W
DC link		
Capacity		2000 µF
Brake chopper tripping threshold		DC 650 V[1)]
Minimal ohmic resistance of an externally installed brake resistor		12 Ω[3)]
Brake chopper continuous output with external brake resistor		35 kW[1)]
Brake chopper peak output with external brake resistor		35 kW[1)]
Option: Internal brake resistor	JM-1432	90 Ω
Brake chopper continuous output with internal brake resistor		see chapter 3.15.2
Brake chopper peak output with internal brake resistor		see chapter 3:15.2

[1)] Values referenced to mains voltage 3 x 400 V_{eff} and output stage switching frequency 8 kHz.

3) Connecting an external brake resistor to devices with an internal brake resistor is not permitted.

Table 33 JM-1432 - Technical specifications, air cooling

NOTICE For further information on brake resistors and brake choppers refer to chapter 3.15 on page 42.

D: Motor cable connections

Features	BG3 + BG4
Cable connection capacity (flexible with ferrule)	0.75 … 16 mm^2 (AWG 18 … AWG 6)
Stud torque (Nm)	1.7 … 1.8
Recommended crimping tool	Phoenix CRIMPFOX 6 or 16S

Table 34 Technical specifications - Connection terminals for motor cables

E: Power consumption of the control supply

Housing variant	Frame size	Max. starting current	Continuous current
Wall-mounted	BG4	6 A	2 A

Table 35 Power consumption of the control supply

F: Ambient conditions

Ambient conditions	JetMove
Degree of protection	IP20, except for terminals (IP00)
Accident prevention regulation	According to local regulations (e.g., BGV A3 in Germany)
Mounting height	Up to 1000 m above sea level NN, over 1000 m above sea level NN with power reduction (1 % per 100 m, max. 2000 m above sea level NN)
Pollution degree	2
Type of mounting	Built-in device, only for vertical mounting in a control cabinet with minimum protection class IP4x; if STO function used, minimum IP54.

Table 36 JetMove - Ambient conditions

Climate conditions		JetMove
During transport	To EN 61800-2, IEC 60721-3-2 class 2K3[1)]	
	Temperature	-25 °C to +70 °C
	Relative humidity	95 % at max. +40 °C
During storage	Per EN 61800-2, IEC 60721-3-1 classes 1K3 and 1K4[2)]	
	Temperature	-25 °C to +55 °C
	Relative humidity	5 to 95 %
During operation	To EN 61800-2, IEC 60721-3-3 class 3K3[3)]	
	Temperature Air cooling	**BG4** -10 °C to +45 °C (4 kHz), to 55 °C with power reduction (5 % per °C) -10 °C to +40 °C (8, 12, 16 kHz), to 55 °C with power reduction (4 % per °C)
	Relative humidity	5 to 85 % without condensation

[1)] The absolute humidity is limited to 60 g/m^3 max. This means that, at 70 °C for example, the relative humidity must still be 40 °C max.

[2)] The absolute humidity is limited to a maximum of 29 g/m3 . The maximum values for temperature and relative humidity listed in the table must not occur at the same time.

[3)] The absolute humidity is limited to 25 g/m^3 max. This means that the maximum values listed in the table for temperature and relative humidity must not occur at the same time.

Table 37 JetMove - Climate conditions

Mechanical conditions	JetMove		
Vibration limits during transport	To EN 61800-2, IEC 60721-3-2 class 2M1		
	Frequency [Hz]	**Amplitude [mm]**	**Acceleration [m/s^2]**
	2 ≤ f < 9	3.5	Not applicable
	9 ≤ f < 200	Not applicable	10
	9 ≤ f < 500	Not applicable	15
Shock limit value during transport	To EN 61800-2, IEC 60721-2-2 class 2M1		
	Height of fall (units within packing): 0.25 m max.		
System vibration limits[1)]	To EN 61800-2, IEC 60721-3-3 class 3M1		
	Frequency [Hz]	**Amplitude [mm]**	**Acceleration [m/s2]**
	2 ≤ f < 9	0.3	Not applicable
	9 ≤ f < 200	Not applicable	1

[1)] *Notice: These devices are only intended for stationary use.*

Table 38 JetMove - Mechanical conditions

ATTENTION!

Control cabinet - IP54 min. for STO

- According to EN ISO 13849-2, when the STO (Safe Torque OFF) function is used, the control cabinet must have a protection class of IP54 or higher.

No continued shocks!

- Do not install servo amplifiers in areas where they will be exposed to continued shocks.

G: Line filter

You will find details for the topic *Electromagnetic compatibility* in chapter 3.1 *Information on the installation* from page 18.

The following table shows the permissible motor cable lengths in compliance with the standard EN 61800-3.

	4 kHz output stage switching frequency		8 kHz output stage switching frequency		12 kHz output stage switching frequency		16 kHz output stage switching frequency	
Device	**Category**							
	C3	**C2**	**C3**	**C2**	**C3**	**C2**	**C3**	**C2**
JM-1432[1)]	40 m	10 m	40 m	10 m	40 m	10 m	40 m	10 m
C3 = Second environment (industrial)								
C2 = First environment (residential)								
[1)] The motor shielding connection is not located on the shielding plate, but directly on the device connection terminals.								

Table 39 Permissible motor cable lengths

H: UL approval

Measures to comply with UL approval (UL 508C) BG4

- Only operate these devices on mains with overvoltage category III.
- The devices can be used in mains with a maximum current carrying - capacity of 5 kA, with phase-symmetrical current and maximum voltage of 480 V, with mains fusing to Table 40.
- These devices are intended for installation in an environment with a measured degree of contamination of 2 to EN 60664-1.
- The integrated short-circuit fuse is not intended as a protective device for branch cables. Execute the protective device for branch cables in compliance with the manufacturer's instructions, the NEC regulations (National Electrical Code) and other applicable local standards.
- Use only UL-approved device connection cables (mains, motor and control cables):
    - Use copper conductors with temperature resistance of at least 75 °C.
    - For the required stud torques for connection terminals, see Table 40.
- For the maximum ambient air temperature, see Table 37 on page 59.
- For the relay output OSD04, use an isolated voltage supply with a rated voltage of DC 24 V with an output fused externally with a 4 A fuse to UL 248.

Frame size	Device	Stud torque of mains and motor terminals	Stud torque of control terminals	Mains fuses/class
BG4	JM-1432	1.7 Nm	0.56 to 0.79 Nm	3 x 60 A /K5

Table 40 BG4 stud torques and mains fuses

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