

JetMove 204-480

Digital Servo Amplifier



User Manual

Jetter

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This User Manual is an Integral Part of the JetMove 204-480:

Model:

Serial number:

Year of construction:

Order number:



To be entered by the customer:

Inventory number:

Place of operation:

Significance of this User Manual

This user manual is an integral part of the digital servo amplifier JetMove 204-480.

- Therefore it must be kept in a way that it is always at hand until the digital servo amplifier JetMove 204-480 will be disposed of.
- Pass this user manual on if the JetMove 204-480 is sold or loaned/leased out.

In any case you encounter difficulties to clearly understand this user manual, please contact the manufacturer.

We would appreciate any suggestions and contributions on your part and would ask you to contact us. This will help us to produce manuals that are more user-friendly and to address your wishes and requirements.

From the servo amplifier JetMove 204-480 module may result unavoidable residual risks to persons and property. For this reason, any person who has to deal with the transport, installation, operation, maintenance, and repair of the digital servo amplifier JetMove 204-480 must have been familiarised with it and must be aware of these dangers.

Therefore, this person must carefully read, understand and observe this manual, and especially the safety instructions.

Missing or inadequate knowledge of the manual results in the loss of any claim of liability on part of Jetter AG. Therefore, the operating company is recommended to have the instruction of the persons concerned confirmed in writing.

History

Edition	Meaning
1.00	First edition
1.01	Modifications, see Appendix A of user manual rev. 1.01
2.00	Modifications, see Appendix A of user manual rev. 2.00
2.01	Style and spelling have been revised

Description of Symbols



Danger

This sign is to indicate a possible impending danger of serious physical damage or death.



Attention

This sign is to indicate a possible impending danger of light physical damage. This sign is also to warn you of material damage.



This sign indicates hazard of life due to electric shock caused by a high operating voltage.



This sign is to indicate hazard of serious physical damage or death due to accidentally touching dangerous parts of the device.



You are asked to wear goggles. Failure to comply may lead to bodily injuries.



This sign is to warn you of material damage due to applying hard blows or shocks to the motor flange and shaft.



Important

This sign is to indicate a possible impending situation which might bring damage to the product or to its surroundings. It also identifies requirements necessary to ensure faultless operation.

**Note**

You will be informed of various possible applications and will receive further useful suggestions.
It also gives you words of advice on how to efficiently use hardware and software in order to avoid unnecessary efforts.

· / -

Enumerations are marked by full stops, strokes or scores.



Operating instructions are marked by this arrow.



Automatically running processes or results to be achieved are marked by this arrow.



PC and user interface keys.



This symbol informs you of additional references (data sheets, literature, etc.) associated with the given subject, product, etc. It also helps you to find your way around this manual.

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1 Safety Instructions

1.1 General Information

The digital servo amplifier JetMove 204-480 fulfils the accepted safety regulations and standards. Special emphasis was given to the safety of the users.

The following additional regulations apply to the user:

- pertinent accident prevention regulations;
- accepted safety rules;
- EC guidelines and other country-specific regulations.

1.1.1 Usage to the intended purpose

Usage to the intended purpose includes operation in accordance with this user manual.

The digital servo amplifier JetMove 204-480 may only be operated in the closed control cabinet and within the range of the set values.

Do not apply a voltage to the digital servo amplifier JetMove 204-480 that is higher than the prescribed operating voltage.

Each of the three phases of the digital servo amplifier JetMove 204-480 has got an operating voltage ranging between AC 340 V and AC 530 V. Thus, the digital servo amplifier JetMove 204-480 comes under the EG Low Voltage Directive.

It is the explicit purpose of the digital servo controller JetMove 204-480 to torque-, speed- and/or position-control, and to drive brushless synchronous servo motors, asynchronous motors and three-phase stepper motors. The rated voltage of the motors must be higher than, or at least equal to, the DC link voltage supplied by the servo amplifier.

The digital servo amplifier JetMove 204-480 is used to control machinery, such as conveyors, production machines, and handling machines.

1.1.2 Non-intended use

The digital servo amplifier JetMove 204-480 must not be used in technical systems which to a high degree have to be fail-save, e. g. ropeways and aeroplanes.

Please do not use the integrated braking circuit in applications, where safety hazards can occur.

The digital servo amplifier JetMove 204-480 is not a safety-relevant device according to the machinery directive 2006/42/EG. Therefore, using this servo amplifier for safety-relevant applications as regards safety of persons is neither adequate nor permitted.

1.1.3 Qualified personnel

Depending on individual phases of the product life cycle, there are different demands on the personnel being involved. These demands have to be met, in order to grant safety in handling the JetMove 204-480 at each phase of the product life cycle.

Phase of the Product Life Cycle	Minimum Demands on the Personnel
Transport / Storage:	Only properly trained and instructed personnel with knowledge of correctly handling electrostatically sensitive components.
Mounting / Installation:	Trained personnel specified in electrical automotive engineering, such as industrial electronics engineers.
Commissioning / Programming:	Trained and instructed specialist personnel having got broad knowledge and experience in electrical engineering / motion systems, such as industrial electronics engineers of automation engineering.
Operation:	Only trained, instructed and authorized personnel with knowledge of correctly handling electrostatically sensitive devices.
Decommissioning:	Trained personnel specified in electrical automotive engineering, such as industrial electronics engineers.

1.1.4 Modifications and alterations to the module

Due to safety reasons, neither opening the digital servo amplifier JetMove 204-480, nor carrying out any modifications or alterations to the device and its functions is allowed.

Any modifications to the servo amplifier JetMove 204-480 not expressly authorised by the manufacturer will result in a loss of any liability claims to Jetter AG.

The original parts are specifically designed for the servo amplifier JetMove 204-480. Parts and equipment of other manufacturers are not tested on our part, and are, therefore, not released by us.

The installation of such parts may impair the safety and the proper functioning of the digital servo amplifier JetMove 204-480.

Any liability on the part of Jetter AG for any damages resulting from the use of non original parts and equipment is excluded.

1.1.5 Servicing and repairs

Repairs at the digital servo amplifier JetMove 204-480 must not be carried out by the operator. The digital servo amplifier JetMove 204-480 does not contain any parts to be repaired by the operator.

For being repaired, the servo amplifier JetMove 204 -480 must be sent to Jetter AG.

The digital servo amplifier JetMove 204-480 is maintenance-free. Therefore, absolutely no inspection or maintenance works are required for the operation of the module.

1.1.6 Disposal

In case of obvious damage or erratic behavior, the servo amplifier must not be used any more.

The environmental regulations for the respective country apply to disposing of the digital servo JetMove 204-480 amplifier on the operating company's premises.

You can disassemble the digital servo amplifier JetMove 204-480 into its main components by unscrewing it (aluminium heat sink and side plate, steel casing cover, electronic boards).

1.2 Ensure Your Own Safety



Danger

- Isolate the digital servo amplifier JetMove 204-480 from the mains, if maintenance works have to be carried out. By doing so, you will prevent accidents resulting from electric voltage and moving parts. Please follow the information given in chapter 1.3 "Residual Dangers", page 17.
- Safety and protective devices, e.g. the barrier and cover of the terminal box must never be shunted or by-passed.
- Dismantled protective equipment, such as the fuses and the thermal motor circuit-breakers, must be reattached prior to commissioning and checked for proper functioning.
- Before commissioning, the machine manufacturer must carry out a danger analysis of the respective machine and take adequate measures so that inadvertent motions will not lead to personal injury and to material damage.

1.2.1 Malfunctions

- **In the case of malfunctions or other faults, please immediately separate the digital servo amplifier JetMove 204-480 from the mains.** Please follow the information given in chapter 1.3 "Residual Dangers", page 17.
- Malfunctions or other damages are to be reported to an authorised person at once.
- Secure the digital servo amplifier JetMove 204-480 against misuse or accidental use.

1.2.2 Information signs and labels

- Writings, information signs, and labels always have to be observed and kept readable.
- Damaged or unreadable information signs and labels have to be exchanged.

1.2.3 Earthing procedure



Screw the enclosure of the digital servo amplifier JetMove 204-480 onto a highly conducting, earthed panel.



Do only use the digital servo amplifier JetMove 204-480 at the three-phase, earthed industrial network (TN network, TT network with earthed neutral, 5,000 A max, symmetric rated current at 400 / 480 V + 10 %). The digital servo amplifier must not be operated when connected to unearthed networks and to asymmetrically earthed networks.



The digital servo amplifier JetMove 204-480 has got a leakage current greater than 3.5 mA. In order to avoid electric shocks, a second protective earth conductor will be required.

For this, the following measures must be taken:

- The protective earth bus must be connected to the PE (GND) bolt (1) located at the top side of the rack as well as to the PE (GND) terminal X1 (2) (please refer to fig. 1).
The diameter of the two earthing conductors must be equal to the diameter of the supply lines (1.5 mm² min. / AWG 16).
- A durable connection with the power supply of the digital servo amplifier JetMove 204-480 must be provided.
- Correct cabling of the PE (GND) bus according to the connection diagram (cf. chapter 10 "Connection Diagrams", page 83) must be carried out.

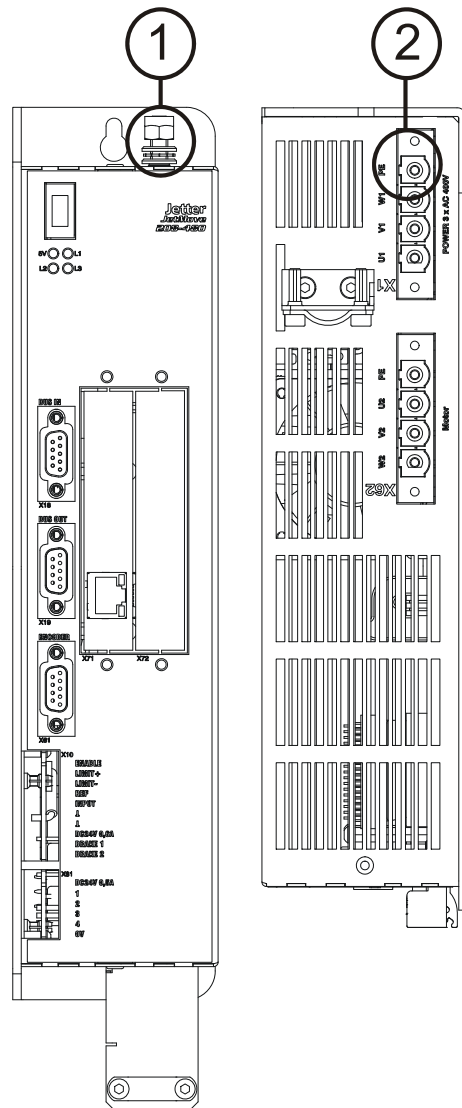


Fig. 1: Double earthing

**Important!**

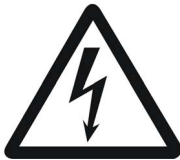
Do not loop an earth-leakage current breaker into the mains power supply.

Do not install a leakage current protection switch in the supply line.
 If, in spite of this, a leakage current protection switch is installed, same will switch off the digital servo amplifier JetMove 204-480, although there is no fault.
 When an earth-leakage current breaker needs to be installed in the JetMove 204-480, an isolating transformer must be used.

1.3 Residual Dangers

1.3.1 Hazards during operation

HAZARD caused by high operating voltage!



Warning

Extremely hazardous voltages of up to 850 V may occur!

Such voltages may result in muscle cramps, burns, unconsciousness, respiratory standstill, or death.



During operation, keep all cover plates and control cabinet doors closed.



Do not remove the cover.



Do by no means disconnect the electric connections of the digital servo amplifier JetMove 204-480 when it is live.



Do not touch the terminals X1, X62, and X63 while the servo amplifier is running.

In the given context, the terminals have the following meaning:

X1: AC 400/480 V voltage supply

X62: DC motor voltage up to 850 V

X63: DC link voltage up to 850 V



Warning

CAUTION! Hot surfaces!



Warning

During operation, the surfaces, respectively the heat sinks of the digital servo amplifier JetMove 204-480 can heat up. The internal heat sink can reach temperatures of up to 85 °C.



Do by no means touch the enclosure of the digital servo amplifier JetMove 204-480 near the internal heat sink during operation and during the cooling-off period after switching off the device.



Ensure that no temperature sensitive parts are attached to the digital servo amplifier JetMove 204-480.



Warning

DANGER in potentially explosive atmosphere!



Do not operate the digital servo amplifier JetMove 204-480 in a potentially explosive atmosphere.



Caution

DANGER of injuries caused by mechanic force!

The digital servo amplifier JetMove 204-480 runs a servo motor. This servo motor moves mechanic parts or sharp edges. Therefore, failure or malfunctioning of the digital servo amplifier JetMove 204-480 can be dangerous for persons or damage the manufacturing plant to an amount depending on the respective kind of plant. This should be prevented by installing additional safety devices.

- One safety precaution is to install a second set of limit switches to interrupt the power supply of the motor.
- Another safety precaution is to install a guard.



Make sure that hazards to persons are precluded even when the drive is rotating unintentionally.



Do not remove any guards.



Do not wear gloves, lest they should inadvertently get caught in the rotating shaft.



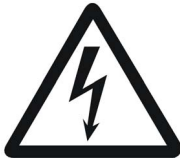
Never touch a rotating drive shaft.



Warning

1.3.2 Hazards after POWER has been turned OFF

DANGER resulting from electric shock!



Warning

Up to 7 minutes after switching off the operating voltages, capacitors still carry hazardous residual voltages.



As a precaution, measure the voltage in the DC link circuit (amplifier terminal) and wait until it has fallen below DC 40 V.



Always wait at least 7 minutes after switching off the device, before separating it from the mains or loosening the connections.



Always wait at least 10 minutes after switching off the device before taking the following actions:

- Touching the screws of the terminals X1, X62 and X63;
- Disconnecting the terminals and touching the contacts.

1.4 Instructions on EMI

The digital servo amplifier JetMove 204-480 is intended for use in industrial surroundings. This module can cause radio interferences in residential areas. This module is operated at the operator's own risk.

The noise immunity of a system corresponds to the weakest component of the system. For this reason, correct wiring and shielding of cables is of paramount importance.



Important!

Measures for increasing immunity to interference:

- Earth the device adequately according to chapter 1.2.3 "Earthing procedure", page 15.
- Connect all grounding terminals of the JetMove 204-480. A double grounding terminal will be needed!
 - Connect the earth to the cover. For this, please refer to fig. 1 on page 16.
 - Connect protective earth (PE / GND) at terminal X1
- The distance between the optional line filters and the digital servo amplifier JetMove 204-480 must be as short as possible.
- When of a motor cable with included brake lines is used, these brake lines must be shielded separately.
- Follow the instructions given in Application Note 016 "EMC-Compatible Installation of the Electric Cabinet" published by Jetter AG.

The following instructions are excerpts from Application Note 016:

- On principle, **physical separation** should be maintained between signal and power lines. We recommend spacings greater than 20 cm. Cables and lines should cross each other at an angle of 90°.
- Shielded cables **must** be used for the following lines:
Analog lines, data lines, motor cables coming from inverter drives (servo output stage, frequency converter), lines between components and interference suppressor filter, if the suppressor filter has not been placed at the component directly.
- Shield cables **at both ends**.
- Unshielded wire ends of shielded cables should be as short as possible.

- The **entire** shield must be drawn behind the isolation, and then be clamped under a flat earthed cable strap at the greatest possible surface area.

When male connectors are used:

- The shield (impedance shielding) **must**, in its entire perimeter, be drawn behind the shielding clamp of the metallised connector housing, respectively of the EMC gland bushing, its greatest possible surface area being clamped under the strain relief.
- Only use metallised connectors, e.g. SUB-D with metallised housing. Make sure that the strain relief is directly connected with the housing here as well (see fig. 2).

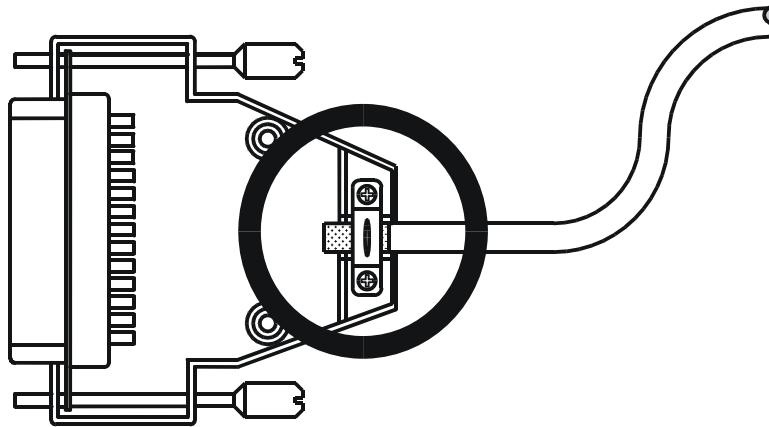


Fig. 2: Shielding of SUB-D connectors in conformity with the EMC standards

If the shield cannot be directly attached to the connector, for example, by a screw type terminal:

- It is important that shield and strain relief are highly conductive and directly connected to a grounded surface with the greatest possible surface area. When doing so, grounding must be implemented in a way that the unshielded portion of the cable is as short as possible.

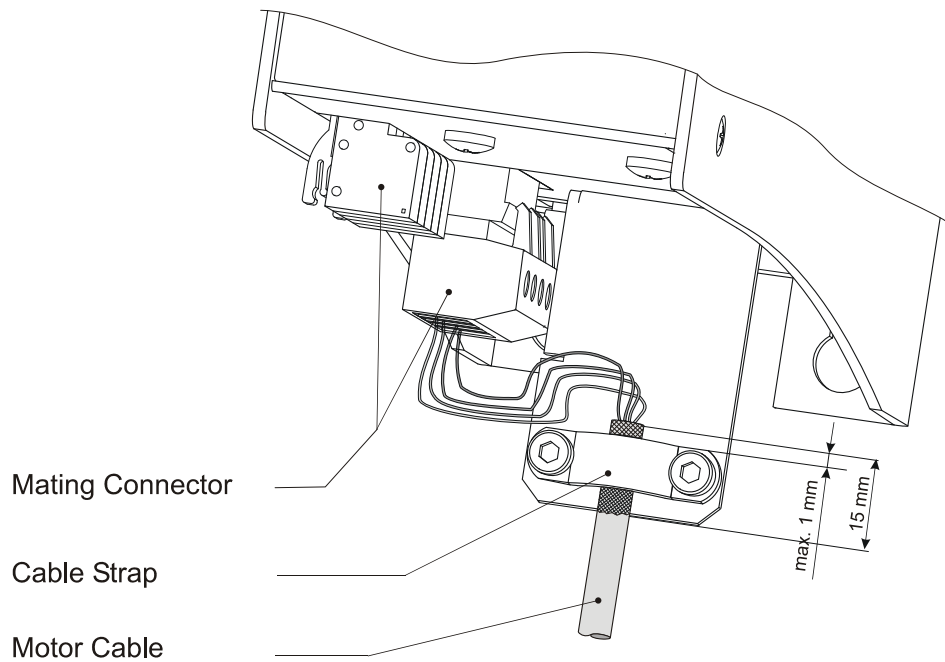


Fig. 3: EMC-compatible connection of motor cables

2 Installing the JetMove 204-480

2.1 Scope of Delivery

- Digital servo amplifier JetMove 204-480
- Mating connector plugged on
- Cable strap serving as strain relief and motor cable shield
- User manual

Installation Accessories (not included in the scope of delivery)

(Please obtain an individual offer from the Jetter headquarters, the Jetter subsidiaries or the distributors.)

System bus cable of cable confection # 530 x.x m; length: 0.2 m to 5.0 m. For details see chapter 7.9 "Jetter System Bus", page 73.

- Motor cable; refer to chapter 7.2 "Motor Connection", page 46
- Synchronous servo motors, e.g. the Jetter JL, JK or JH series
- HIPERFACE cable; please refer to chapter 7.4 "HIPERFACE Connection", page 57
- Resolver cable; refer to chapter 7.3 "Resolver Connection", page 55
- Motor circuit-breaker; refer to chapter 5 "Technical Data", page 35
- Circuit-breaker, see chapter 5 "Technical Data", page 35
- Thermostatic motor circuit-breaker; refer to chapter 7 "Description of Connections", page 45
- Mounting screws, 2 pcs.; refer to fig. 5, page 33



Note:

If you are not sure which mounting accessories you require, please contact Jetter AG.

2.2 Mechanical Installation



Prior to installing the digital servo amplifier check it for possible transport damages.



Please check the shipment for completeness.



To ensure proper functioning of the JetMove 204-480 check whether the mounting plate in the electric cabinet is unpainted.



The only possible mounting direction is vertical - see "Rear and front view of the JetMove 204-480 enclosure with mounting holes" on page 25.



Please make sure there is a clearance of at least 100 mm under and above the JetMove 204-480 - unobstructed ventilation must be ensured.



Please mark on the panel two positions for the fastening screw threads of the JetMove 204-480 (see fig. 4, page 25).



Drill the holes and cut the thread into the panel.



Screw the corresponding fitting bolts into the thread by approximately half of their length.



By means of the oblong holes in the rear plate, hang up the JetMove 204-480 by the fitting bolts; then screw them tightly.

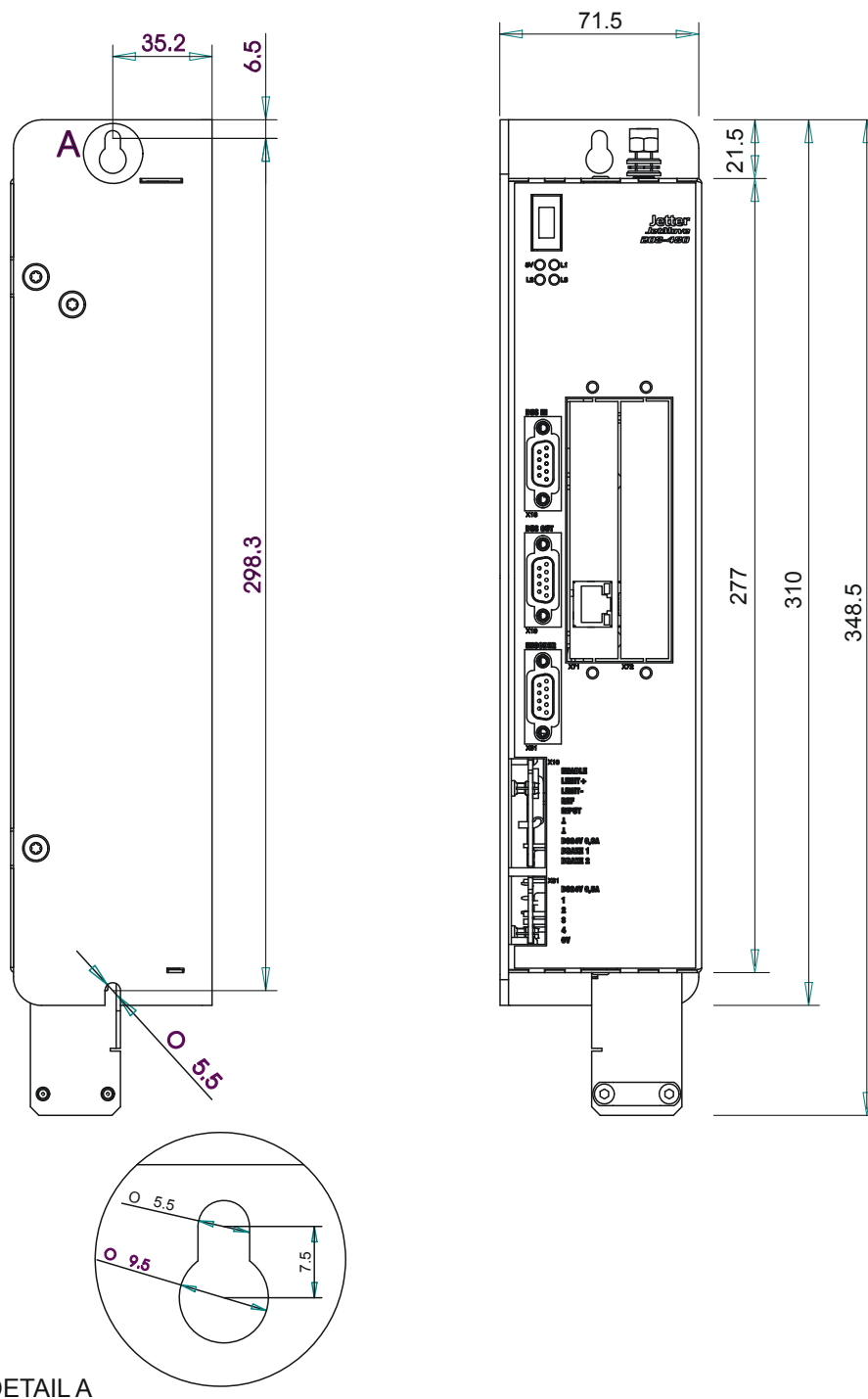


Fig. 4: Rear and front view of the JetMove 204-480 enclosure with mounting holes

2.3 Electrical Installation



Check for correct motor and servo amplifier assignment.



Compare rated voltage and continuous rated current of servo amplifier and motor.

The motor must be isolated against voltages of DC 850 V min.; also refer to "Compatible AC Servo Motors" on page 39.



Connect the JetMove 204-480 according to the connection wiring diagram shown in chapter 10 "Connection Diagrams", page 83. Especially check the power lines for appropriate protection, see "Overload protection" on page 35. Protecting the motor cables is not advisable.



Select the cables according to standards.



Check whether all ground cables are connected (double earthing), see chapter 1.2.3 "Earthing procedure", page 15.



To connect resolvers or power units you can use prefabricated cables available from Jetter or opt for self-made cables. For details see chapter 7 "Description of Connections", page 45.



To ensure that installation is carried out in conformance with EMC regulations, the following items have to be observed especially:

- If possible, run control cables and power cables separately;
- Connect the encoder (resolver or HIPERFACE encoder);
- Use shielded terminals or EMC-compatible connectors;
- Connect holding brake, if available, and connect shields on both sides of the cables;
- Connect the motor leads according to fig. 3, page 22.

Please further note the chapter 1.4 "Instructions on EMI", page 20.

2.4 Checking the Installation

- Check motor and servo amplifier wiring and connections by means of the connection diagrams.
- Check the holding brake, if existing, for proper functioning.
- Check to see whether all necessary protection measures against accidental contact with live or moving parts have been taken.
- Carry out any other checks specific to or required for your system.

2.5 Notes on Safety as regards the Installation



Danger

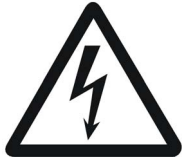
HAZARD caused by high operating voltage and electric shock!

Extremely hazardous voltages of up to 850 V may occur!

Please observe the following precautions in order to avoid muscle cramps, burns, unconsciousness, respiratory standstill, etc., and death:

- Have installation and maintenance jobs carried out by qualified personnel only, see chapter 1.1.3 "Qualified personnel", page 12.
- Switch off the operating voltage.
- Please take into account the information on residual dangers given in chapter 1.3.2 "Hazards after POWER has been turned OFF", page 19.
- Before carrying out installation and maintenance jobs, separate the servo amplifier JetMove 204-480 and all connected devices from the mains (pull out the mains plug).

2.6 Notes on Safety as regards Commissioning



Danger

HAZARD caused by high operating voltage and electric shock!

Extremely hazardous voltages of up to 850 V may occur!

Please observe the following precautions in order to avoid muscle cramps, burns, unconsciousness, respiratory standstill, etc., and death:

- Have commissioning jobs carried out by qualified personnel only, see chapter 1.1.3 "Qualified personnel", page 12.

Prior to commissioning, please do the following:

- Reattach dismantled protective equipment and check it for proper functioning.
By doing so, you will prevent accidents resulting from moving parts.
- Secure the servo amplifier JetMove 204-480 against accidental contact with conductive parts and components.
- Only connect devices or electrical components to the signal lines of the digital servo amplifier JetMove 204-480 (Enable, Limit+/-, REF, BRAKE 1 and BRAKE 2) that have been sufficiently isolated against the connected electric circuits. These signal lines may only be connected with units that have got the ground potential of the DC 24 V power supply.
- The digital servo amplifier JetMove 204-480 has got a leakage current greater than 3.5 mA. In order to avoid electric shocks, a second protective earth conductor will be required.
For this, the measures listed in chapter 1.2.3 "Earthing procedure", page 15 must be taken.
- Each commissioning, even a short functional test, must always be carried out with a PE (GND) bus correctly connected.

3 Operating Conditions

Operating Parameters		
Ambient Conditions		Reference
Transport conditions (Units within packing)	Temperature: -25 °C ... 70 °C Air Humidity: 5% ... 95% No condensing	DIN EN 50178
Storage conditions (Units within packing)	Temperature: -25 °C ... 55 °C change 20 K/h max. Air Humidity: 5 % ... 95 % No condensing Max. Storage Time: 1 Year	DIN EN 50178
Ambient temperature	0 ... 45 °C (45 °C ... 55 °C with derating of 2.5 %/K) Take care for sufficient cooling	DIN EN 50178
Air humidity	5 % ... 85 % No condensing	DIN EN 50178
Pollution degree	2	DIN EN 50178
Corrosion immunity / Chemical resistance	No special protection against corrosion. Ambient air must be free from higher concentrations of acids, alkaline solutions, salts, metal vapours, or other corrosive or electroconductive contaminants.	DIN EN 50178
Operating altitude	Up to 1,000 m above sea level. 1,000 to 2,500 m above sea level with derating of 1.5 % per 100 m.	DIN EN 50178

Operating Parameters		
Mechanical Conditions		Reference
Free falls withstanding test	Within original packing, the device withstands dropping over all of its edges	DIN EN 50178 DIN EN 60068-2-31
Vibration resistance	<ul style="list-style-type: none"> • 10 Hz ... 57 Hz: with an amplitude of 0.075 mm • 57 Hz ... 150 Hz: 1.0 g constant acceleration • 1 octave per minute, 10 frequency sweeps (sinusoidal), all three spatial axes 	DIN EN 50178 DIN EN 60068-2-6
Degree of protection	IP20	DIN EN 60529
Mounting position	Vertical (refer to Fig. 4, page 25) For sufficient air flow there must be a clearance of 100 mm above and below the device	
Electrical Safety Conditions		Reference
Protection class	I	DIN EN 50178
Dielectric strength	Power to Earth and Power to Logic 2.65 kV, 2 s	DIN EN 61800-5-1 DIN EN 60146-1-1 DIN EN 60204
Insulation	Power to Earth and Power to Logic > 1 MOhm at 500 V	
Protective connection	12 V, 25 A, 0.1 Ohm	DIN EN 60204
Overvoltage category	III	DIN EN 50178 DIN VDE 0110-1



Important!

Measures to avoid damages in transit and storage:



The packing material and the storage place are to be chosen in a way that the values given in the above table "Operating Parameters", page 29 are met.

EMC		
Emitted Interference		
Parameters	Value	Reference
Enclosure	<ul style="list-style-type: none"> Frequency band 30 ... 230 MHz, limit 30 dB ($\mu\text{V}/\text{m}$) at 30 m Frequency band 230 ... 1,000 MHz, limit 37 dB ($\mu\text{V}/\text{m}$) at 30 m (class B) 	DIN EN 61800-3
Mains alternating current	<ul style="list-style-type: none"> Frequency band 0.15 ... 0.5 MHz, limit 79 dB(μV) Frequency band 0.5 ... 30 MHz, limit 73 dB(μV) 	DIN EN 61800-3



Important!



This is a product of restricted availability according to IEC/EN 61800-3. This module can cause radio interferences in residential areas; in this case, the user must take adequate measures to prevent this.

Additional line filters can be helpful here. See "Line filter" on page 36.

EMC		
Interference Immunity: Enclosure		
Parameters	Value	Reference
RF Field, amplitude-modulated	Frequency band 80 ... 1,000 MHz; test field strength 10 V/m AM 80 % with 1 kHz Criterion A	DIN EN 61000-4-3 DIN EN 61800-3
ESD	Contact discharge: Test peak voltage 6 kV Criterion B	DIN EN 61800-3 DIN EN 61000-4-2

EMC		
Interference Immunity: Power Lines and Power Interfaces		
Parameters	Value	Reference
Conducted radio disturbances	Frequency 0.15 ... 80 MHz Test voltage 10 V AM 80 % with 1 kHz Criterion A	DIN EN 61800-3 DIN EN 61000-4-6
Burst (fast transients)	Test voltage 2 kV tr/tn 5/50 ns Repetition rate 5 kHz Criterion B	DIN EN 61800-3 DIN EN 61000-4-4
Impulse voltages	tr/th 1.2/50 μ s, 8/20 μ s 1 kV (Launching phase conductor against phase conductor) 2 kV (Launching phase conductor against ground potential) Criterion B	DIN EN 61800-3 DIN EN 61000-4-5
Interference Immunity: Process, Measuring and Control Lines		
Parameters	Value	Reference
Conducted radio disturbances	Frequency 0.15 ... 80 MHz Test voltage 10 V AM 80 % with 1 kHz Criterion A	DIN EN 61800-3 DIN EN 61000-4-6
Burst (fast transients)	Test voltage 2 kV tr/tn 5/50 ns Repetition rate 5 kHz Criterion B	DIN EN 61800-3 DIN EN 61000-4-4
Interference Immunity: Signal Lines		
Parameters	Value	Reference
Conducted radio disturbances	Frequency 0.15 ... 80 MHz Test voltage 10 V AM 80 % with 1 kHz Criterion A	DIN EN 61800-3 DIN EN 61000-4-6
Burst (fast transients)	Test voltage 1 kV tr/tn 5/50 ns Repetition rate 5 kHz Criterion B	DIN EN 61800-3 DIN EN 61000-4-4

4 Physical Dimensions

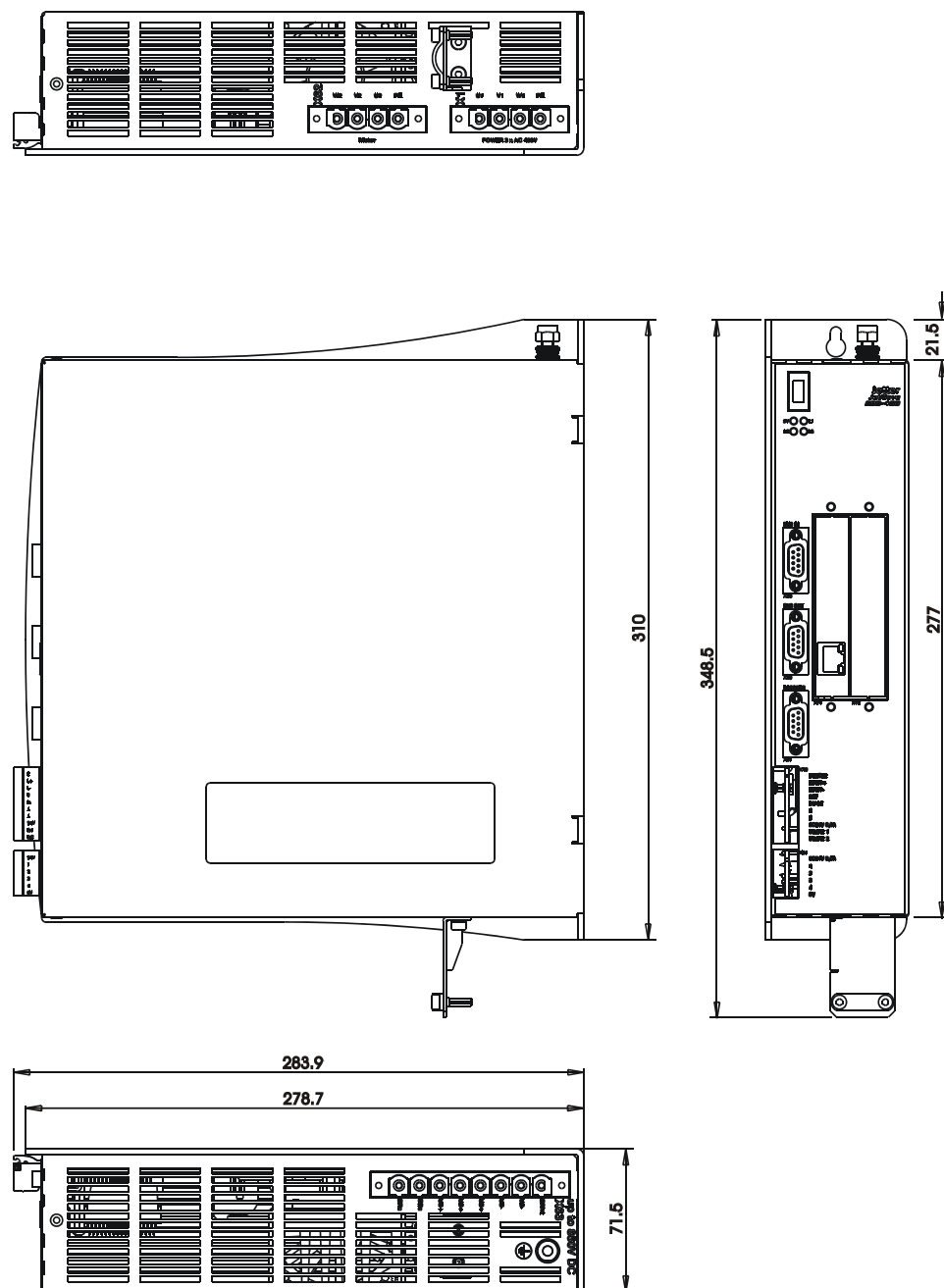


Fig. 5: Mounting dimensions of the JetMove 204-480 (in mm)

5 Technical Data

5.1 Electrical Specification

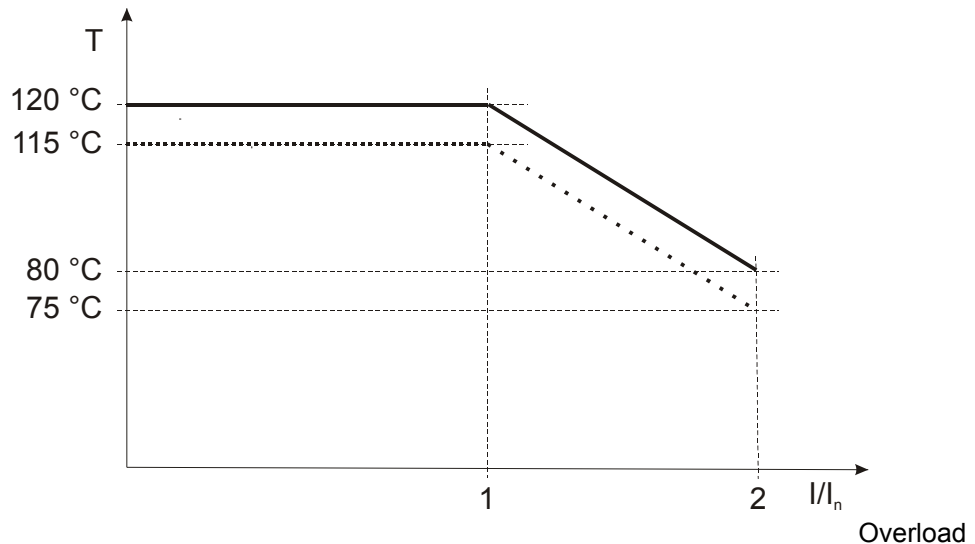
Electrical Specification	
Rated voltage supply	<ul style="list-style-type: none"> 3-phase Direct supply $V_{\text{rms}} = 3 \times 400/480 \text{ V}$ Common mode of the voltage 2 % max. (voltage dips 10 ms max. at continuous power) 48 ... 62 Hz (Frequency change 2 % / s max.)
Power supply tolerance	-15 % ... + 10 %
Inrush current limitation	< 10 A limited to < 500 ms during the switch-on sequence
Overload protection	<p>For each phase an external overload protection is required, for example</p> <ul style="list-style-type: none"> – circuit-breaker 10 A C – fuse 10 A M (medium time lag) – motor circuit breaker 10 A <p>For systems with UL approval use overload protection devices that are UL listed (acc. to UL 508)(NKJH) self protected combination motor controller (Specification: 480 V, 16 A). The JetMove 204-480 is suitable for use on a circuit capable of delivering not more than 50 kA (symmetric) at 600 Volt eff. max.</p>
Supply cable Cable size Material Temperature class	<p>4 * 1.5 mm² min. (AWG 16)</p> <p>Copper</p> <p>> 60 °C</p>
Maximum output voltage of the motor	850 V
Motor output current at an ambient temperature of 45 °C	<p>Nominal current: $I_{\text{rms}} = 4 \text{ A}$ Peak current for a max. period of 3 minutes: $I_{\text{rms}} = 8 \text{ A}$ (The duration depends on the temperature of the heat sink)</p> <p>See "Note 1!" on page 38.</p>
Continuous power of motor	2 kW (1.5 hp)

Electrical Specification	
Short-circuit protection, motor side	Designed for: <ul style="list-style-type: none"> • phase to phase • phase to earth
Motor overload protection	Refer to "Motor Protection" on page 39.
Motor cable Cable size Material Capacity Temperature class Max. length of motor cable	4 * 1.0 mm ² min. (AWG 16) Copper < 150 pF/m > 60 °C max. 50 m (for greater length please contact Jetter AG)
Line filter	Line filter ensuring EMC in a residential environment to DIN EN 61800-3. The following filters can be applied with input circuits: <ul style="list-style-type: none"> – FMAC-932-1610 with I_r = 16 A – FMAC-932-2510 with I_r = 25 A – FMAC-934-3610 with I_r = 36 A See "Note 2!" on page 38.
Voltage supply of processor logics (demands on power supply module)	<ul style="list-style-type: none"> • DC 24 V (20 ... 30 V) • ≤ 0.6 A • The voltage output of the power supply unit must comply with the SELV or PELV type.
Inrush current limitation of the processor logics	<ul style="list-style-type: none"> • The JM-204-480 is equipped with a 220 µF capacitor for buffering. The inrush current is not limited.
Internal ballast resistor	<ul style="list-style-type: none"> • Resistor: approx. 120 Ω (PTC) • Continuous power: 75 Watt Power consumption depends on the present temperature of the heat sink • Maximum capacity: 1 kW for 0.6 s • Overload protection internal (warning and error)
External ballast resistor	In order to achieve greater brake power, an external ballast resistor can be installed. For this, see "Connection of External Ballast Resistor and DC link Circuit of Another JM-204-480" on page 64.
Residual voltage	To avoid hazard of electrical shock wait at least 7 minutes after switching-off the digital servo amplifier before attempting to pull out the plug or remove this unit (see page 19).

Electrical Specification	
Leakage current	<p>> 3.5 mA</p> <p>See "Danger" on page 38.</p>
Digital inputs <ul style="list-style-type: none"> – Enable (E); – Reference switch (R); – Limit switch RH (L+); – Limit switch LH (L-); – Input (Inp) 	<p>DC 20 V ... 30 V related to the ground potential of voltage supply of processor logics, with an input current of 7.5 mA max. each.</p> <p>See "Digital Inputs, Logic Power Supply" on page 70.</p>
Braking relays	<p> V_{\max} = DC 30 V I_{\max} = DC 2 A Contact: N/O connected to BR1 and BR2 on X10 </p> <p>The lines may only be connected to devices that are related to the same potential as the power supply of the controller logic.</p> <p>Can be switched by the control program of PLC or by operating system of JetMove 204-480 together with software enable.</p>
Digital outputs Number of outputs Type of outputs Rated voltage Voltage range Load current Electrical isolation Protective circuit Protection against inductive loads Signal voltage ON	<p> 4 Transistor pnp type 24 V 20 ... 30 V related to the ground potential of voltage supply of processor logics max. 0.5 A / output None Short-circuit, overload, overvoltage, overtemperature protection Yes Type $V_{\text{supply}} - 1.5 \text{ V}$ </p>
Power dissipation P_v	<p>Output stage: 65 W max. Logic circuit: 20 W max.</p>

**Note 1!****Active Cooling:**

- The fan is activated at 60 °C and deactivated at 40 °C.
- The temperature limit of the heat sink for overtemperature protection is dynamically set, depending on the overload limit.

**Fig. 6: Maximum heat sink temperature depending on the motor current**

- Shutdown threshold for heat sink temperature monitoring
- Alarm threshold for heat sink temperature monitoring.

- The duration of operation by maximum motor current is evaluated by a starting temperature of 45 °C.

**Note 2!**

A line filter can supply several digital servo amplifiers, as long as I_f (line filter current) is greater than the total current required by all connected servo amplifiers.

**Danger****DANGER resulting from electric shock!**

In order to prevent electric shocks, ground the digital servo amplifier JetMove 204-480 **by all means** via two positions; for this, refer to chapter 1.2.3 "Earthing procedure", page 15.

Compatible AC Servo Motors

Motor types	Jetter motors of the JH, JL and JK series Please refer to "Jetter Motor Catalog" or contact the sales department of Jetter AG.
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Note:

In case you intend to use motors other than the types mentioned above, please contact Jetter AG.

5.2 Motor Protection

There are three ways of motor protection.

5.2.1 Built-in temperature sensor

JetMove 204-480 is able to run with three different temperature sensors:

Sensor type	Type of sensor signal evaluation
KTY83-110	Temperature is measured in °C. Warning level is adjustable. Error detection at max. temperature of motor.
PTC	Go-no-go decision Error detection at max. temperature of motor.
Temperature switch	Go-no-go decision Error detection at max. temperature of motor.

5.2.2 I²t calculation

The digital servo amplifier JetMove 204-480 calculates the model of motor power loss by an I²t calculation. The determined value is related to the average power loss of the motor. It is specified in percent of the maximum power loss of the motor.

For this calculation it is important, that the parameters

- nominal current (which is the minimum of nominal motor current and nominal servo amplifier current).
 - current overload factor
 - and time constant of the motor
- are programmed correctly.

The I²t calculation must be activated by JetSym or by the PLC program. It is possible to parameterize the warning level. The error level (error 30) is set to 100 %.

The I²t value is readable in a register of JetMove 204-480 through JetSym or the PLC.

The digital servo amplifier JetMove 204-480 calculates the percentage of motor power loss according to the following formula:

$$x(t) = 100\% \times \left(\frac{\text{average motor current}}{\text{set current}} \right)^2 \times \left(1 - e^{-\frac{t}{T}} \right)$$

x(t) = displayed value of motor power loss in %

t = Time since start of motor running it with the average current (in seconds)

T = Motor time constant (in seconds)

The formula shows that the 100 % value will never be reached as long as the average motor current is lower than the nominal current of the motor.

Further, calculating always starts by 0 (at t=0, the result of the equation is 0). After some time that is by far longer than the motor time constant, the result does virtually not change any more.

The time till error stop (x = 100 %) is a result of the following formula:

$$t = -T \times \ln \left[1 - \left(\frac{\text{set current}}{\text{average motor current}} \right)^2 \right]$$

After reset, the values of the important parameters are the following ones:

Continuous rated current:	4 A
Overload factor:	2
Motor time constant:	1800 s (30 min.)

With these parameters the 100 % error level will be reached if, for example the motor is run by a current of 8 A for about 8 minutes and 30 seconds.



Important

Because of the fact that after reset the I²t calculation always starts with zero, the motor overload calculation is wrong if the motor is already hot when the digital servo amplifier JetMove 204-480 is switched on (i. e. at the time of parameters of I²t calculation are written after switching on 24 V logic power supply).

5.2.3 Motor overload protection according to UL

The UL standard prescribes a motor overload detection for a servo amplifier that meets the following points:

The "trip current" is defined to be 1.15 times the user-set nominal current.

- If the average motor current corresponds to the trip current the overload protection must switch off the motor after a limited time.
- If the average motor current is 2 times higher than the trip current the overload protection must switch of the motor after at least 8 minutes.
- If the average motor current is 6 times higher than the trip current the overload protection must switch off the motor after at least 20 seconds.

This protection (error message 31 will occur) can be parameterised only through the nominal current value.

The motor overload protection is always active and cannot be deactivated.

**Important**

Because of the fact that after reset the motor overload calculation always starts with zero, the result is wrong if the motor is already hot when the digital servo amplifier JetMove 204-480 is switched on (i. e. at the time of switching on the 24 V logic power supply).

6 Drive Controller Structure

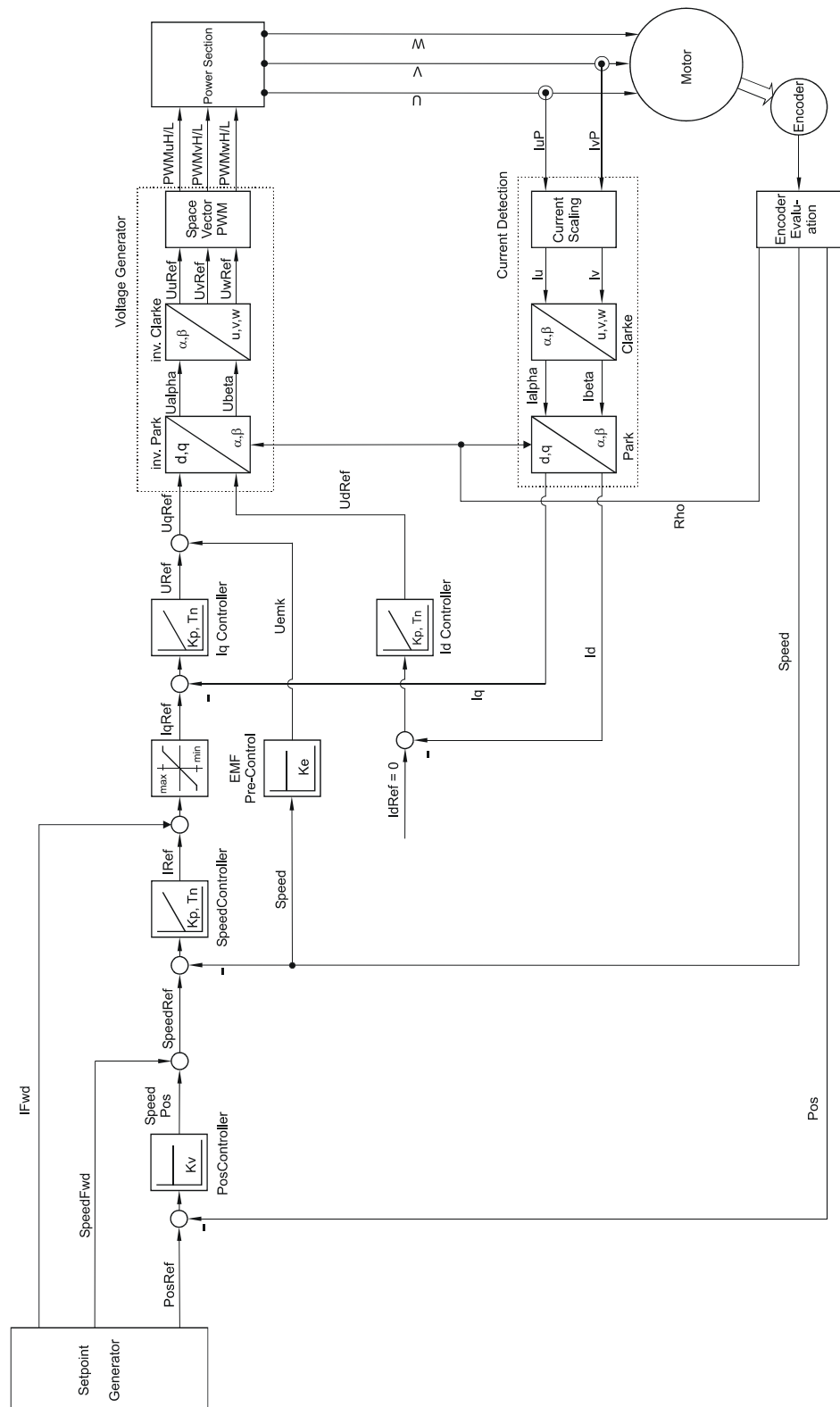


Fig. 7: Block diagram of drive controller structure

Drive controller specification

All drive controllers can be parameterized through the control program.

Function	Meaning
Motor control (commutation)	Space vector modulation
PWM frequency	8 kHz
Current controller – Cycle time	62.5 μ s
Speed controller – Cycle time – Current pre-control	125 μ s adjustable
Position feedback controller – Cycle time – Speed pre-control	250 μ s adjustable
Position setpoint generator – Sine-square and linear acceleration/deceleration ramps – Setpoint output cycle (position feedback controller interpolation)	can be parameterized individually 2 ms
Position sensing Resolver: – Resolution – Sampling interval Sine-cosine sensor (multi- and single-turn): – Interface – Resolution of absolute position – Resolution of velocity pickup – Sampling interval	12 bits per revolution 62.5 μ s HIPERFACE 15 bits per revolution 20 bits per revolution 62.5 μ s

7 Description of Connections

7.1 Power Supply Connection

Specification of Terminal X1

- 4-pin male connector; screw connection (type: Phoenix PC 6/4-ST-10,16)
- Allowed conductor size: max. 0.5 ... 6 mm² (AWG 20 ... 7)
- Torque: 1.2 ... 1.5 Nm (10.6 ... 13.3 lbf-inch)
- Ambient temperature: max. 45 °C
- Field wiring

Specifications of Connecting Cable

- Cable size: min. 4 * 1.0 mm² (AWG 18)
- Material: Copper
- Temperature class: 60 °C

Shielding

- Not required

Power Supply		
Amplifier Field Wiring Terminal X1	Power Lines	Specification
U1	L1	• AC 400 ... 480 V between the power lines
V1	L2	
W1	L3	
PE (GND)	PE / GND conductor	

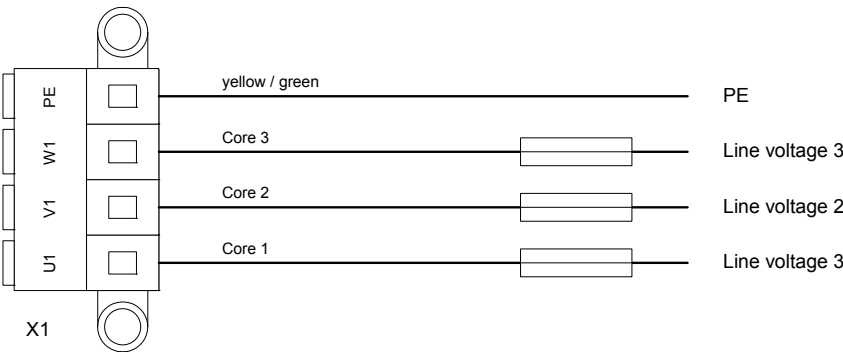


Fig. 8: Power supply connection

7.2 Motor Connection

7.2.1 General remarks



Important!

Measures to avoid malfunctions of the control system and the motor:



Always connect brake lines to a separate power supply unit DC 24 V if brake and motor lines are run together in one bunch of cables, and are not separately shielded.



Important!

Measures to avoid oscillation and blocking of the motor:



Avoid mixing-up of phase cables, resp. be sure to connect the phase cables according to pin assignment.

7.2.2 Assignment and specification

Specification of Terminal X62

- 4-pin connector (type Phoenix PC 6 / 4 - ST - 10,16)
- Allowed conductor size: max. 0.5 ... 6 mm² (AWG 20 ... 7)
- Torque: 1.2 ... 1.5 Nm (10.6 ... 13.3 lbf-inch)
- Ambient temperature: max. 45 °C
- Field wiring

Specifications of Connecting Cable

- Cable size: min. 4 * 1.0 mm² (AWG 18)
- Material: Copper
- Temperature class: 60 °C

Shielding

- Braided copper shield of 80 % coverage

Connection of the motor to the digital servo amplifier JetMove 204-480 has to be done following the wiring diagram below. Connection of the brake is optional. In this case, the wires for the brake have to be at least 300 mm longer than the wires of the motor.

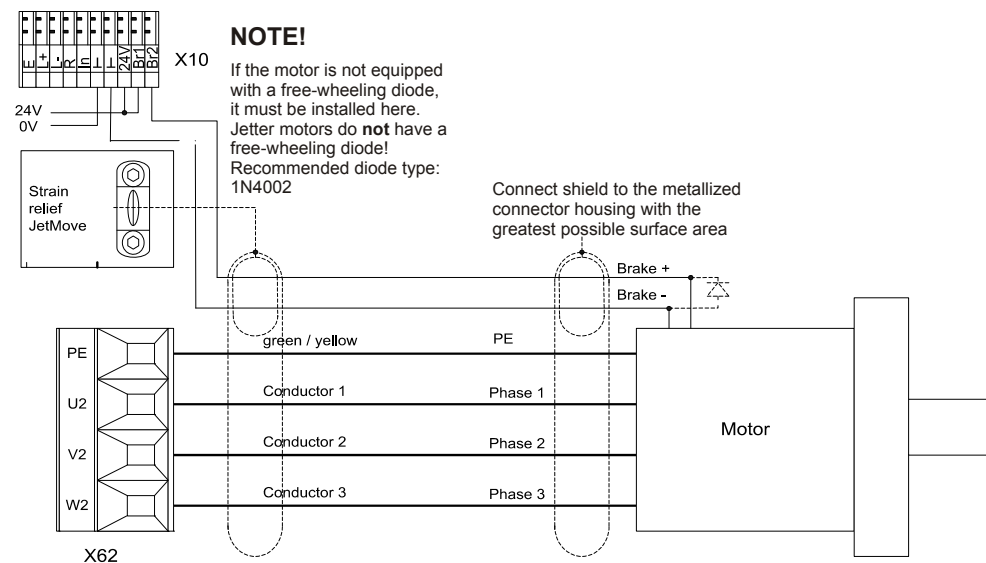


Fig. 9: Connection of motor lines

7.2.3 Motor power cable with mating connector SC



Note!

The suitable mating connector SC (female connector) can be ordered from Jetter AG by supplying the following particulars:

Art. no. 15100070	Motor mating connector for the Jetter motor series JH2, JH3, JH4, JH5, JL2, JL3, JL4, JK4, JK5, JK6 without brake
Art. no. 15100105	Motor mating connector for the Jetter motor series JH2, JH3, JH4, JH5, JL2, JL3, JL4, JK4, JK5, JK6 with brake



Note!

The motor power cable with mating connector SC for the Jetter motor series JL2, JL3, JL4, JK5, JK6, JH2, JH3, JH4 and JH5 can be purchased from Jetter AG. It is equipped with the respective motor mating connector and can be ordered by the following cable confection numbers (KABEL-KONF-Nr.):

Without brake:

Cable confection no. 26.1

With brake:

Cable confection no. 24.1

Mating connector of the motor (solder side)

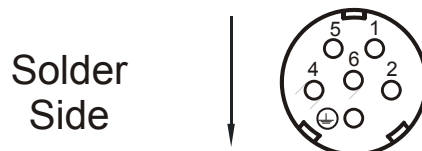
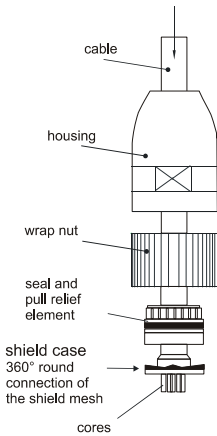
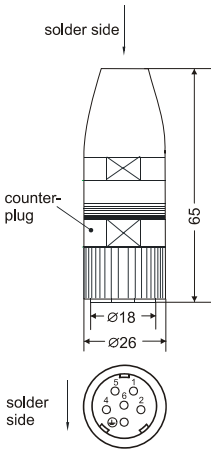



Fig. 10: View on the SC series mating connector of the motor (internal thread M23)

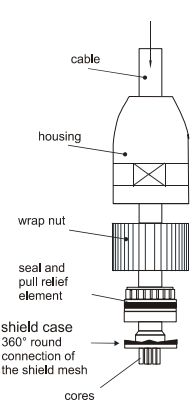
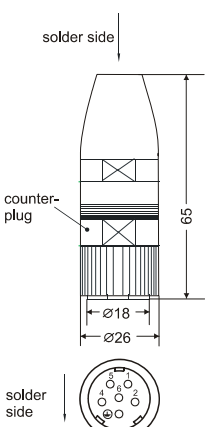
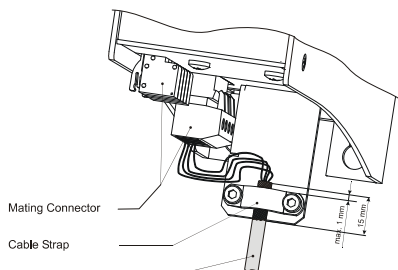

Cable Specification of the Motor Power Cable with Mating Connector SC for JetMove 204-480

For connection without motor holding brake

Motor Power Cable - Cable Confection No. 26.1			
Field Wiring Terminals of the JetMove 204-480	Shielding		Mating Connector of the Motor (female, solder side)
<p>4 x 1.5 mm² (AWG 16(4))</p> <p>The wires are equipped with wire end ferrules.</p>	<p>Shielded, highly flexible 4-wire cable with PE (GND)</p>		
<p>Connect both sides of the shield with the greatest possible surface area! Use metallized housing only!</p>			
Pin	Wire Number	Signal	Pin
X62.U2	1	Phase 1	1
X62.V2	2	Phase 2	5
X62.W2	3	Phase 3	2
X62.PE (GND)	yellow-green	PE/GND grounding	

Dimensions of the motor mating connector are specified in millimeters.

For connection with motor holding brake

Motor Power Cable - Cable Confection No. 24.1			
Field Wiring Terminals of the JetMove 204-480	Shielding		Mating Connector of the Motor (female, solder side)
<p>(4 x 1.5 mm² (2 x 1.5 mm²)) (AWG 16(6))</p> <p>The wires are equipped with wire end ferrules.</p>	<p>Highly flexible 6-wire cable with PE (GND) (separately shielded brake lines and all-over shielding)</p>		
		<p>Connect both sides of the shield with the greatest possible surface area! Use metallized housing only!</p>	
Pin	Wire Number	Signal	Pin
X62.U2	1	Phase 1	1
X62.V2	2	Phase 2	5
X62.W2	3	Phase 3	2
X62.PE (GND)	yellow-green	PE / GND grounding	
X10.BRAKE2	5	Brake +	6
X10.GND	4	Brake -	4

Dimensions of the motor mating connector are specified in millimeters.

7.2.4 Motor power cable with mating connector SM



Note!

The suitable mating connector SM (female connector) can be ordered from Jetter AG by supplying the following particulars:

Article no. 60860443

Motor mating connector for the motor series JL5, JL6, JL7, JL8, and JK7



Note!

The motor power cable with mating connector SM, matching the Jetter motor series JL5 to JL8 and JK7, can be obtained from Jetter AG. It is equipped with the respective motor mating connector and can be ordered by the following cable confection numbers (KABEL-KONF-Nr.):

Without brake:

Cable confection no. 201

With brake:

Cable confection no. 202

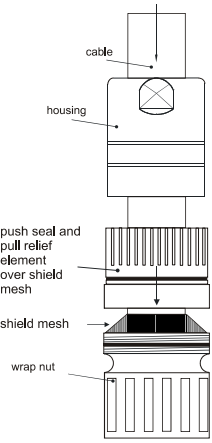
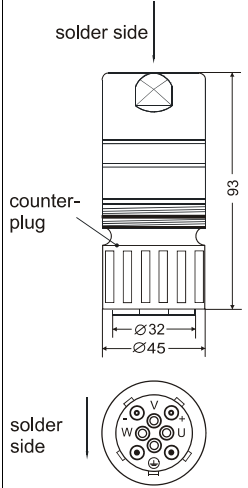
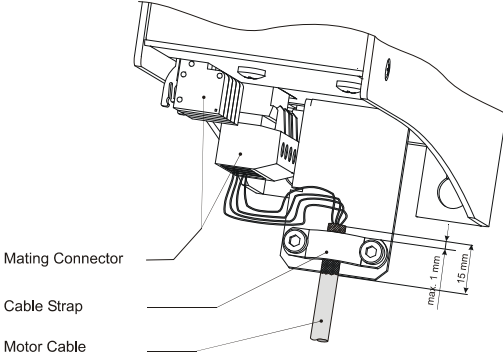

Mating connector of the motor (solder side)



Fig. 11: View on the SM series mating connector of the motor (internal thread M40)

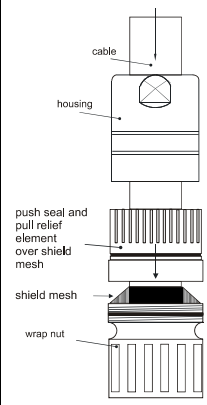
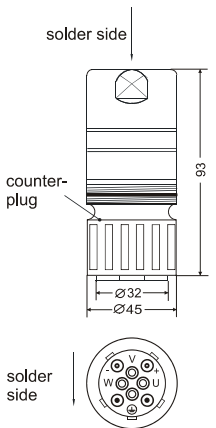
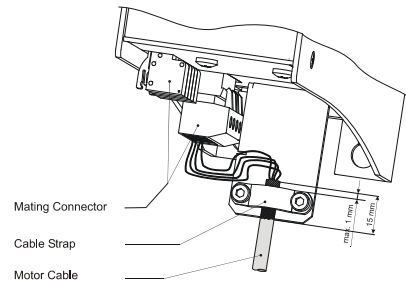

Cable Specification of the Motor Power Cable with Mating Connector SM for JetMove 204-480

For connection without motor holding brake

Motor Power Cable - Cable Confection No. 201			
Field Wiring Terminals of the JetMove 204-480	Shielding		Mating Connector of the Motor (female, solder side)
<p>4 x 4 mm² (AWG 12(4))</p> <p>The wires are equipped with wire end ferrules.</p>	<p>Shielded, highly flexible 4-wire cable with PE (GND).</p> 		
			
	<p>Connect both sides of the shield with the greatest possible surface area! Use metallized housing only!</p>		
Pin	Wire Number	Signal	Pin
X62.U2	1	Phase 1	U
X62.V2	2	Phase 2	V
X62.W2	3	Phase 3	W
X62.PE (GND)	yellow-green	PE / GND conductor	


Dimensions of the motor mating connector are specified in millimeters.

For connection with motor holding brake

Motor Power Cable - Cable Confection No. 202			
Field Wiring Terminals of the JetMove 204-480	Shielding		Mating Connector of the Motor (female, solder side)
<p>(4 x 4 mm² + (2 x 0.5 mm²)) (AWG 12(4) + AWG 20(2))</p> <p>The wires are equipped with wire end ferrules.</p>	<p>Highly flexible 6-wire cable with PE (GND) (separately shielded brake lines and all-over shielding)</p>		
		<p>Connect both sides of the shield with the greatest possible surface area! Use metallized housing only!</p>	
Pin	Wire Number	Signal	Pin
X62.U2	1	Phase 1	U
X62.V2	2	Phase 2	V
X62.W2	3	Phase 3	W
X62.PE (GND)	yellow-green	PE / GND conductor	
X10.BRAKE2	5	Brake +	+
X10.GND	6	Brake -	-

Dimensions of the motor mating connector are specified in millimeters.

7.2.5 Connection assignment of terminal box

Connection Assignment of Terminal Box ^{*)} for the Jetter Motor Series		
Field Wiring Terminals of the Amplifier	Motor Terminal Box - Terminal Assignment	
X62.U2	PIN 1	Phase 1
X62.V2	PIN 2	Phase 2
X62.W2	PIN 3	Phase 3
X62.PE (GND)	PIN 4	 PE / GND conductor
X10.BRAKE2	PIN 7	Brake +
X10.GND	PIN 8	Brake -

^{*)} alternative to motor connectors

7.3 Resolver Connection

7.3.1 Specification

Specifications of the Mating Connector for X61

- 9-pin male SUB-D connector
- Metallized enclosure

Specification of Resolver Cable

- Cable size: 4 * 2 * 0.14 mm² (AWG 26(8))
- Cores have to be shielded and twisted in pairs and have to be included in an overall shielding
- The shield must be connected to the connector housings on both ends of the cable with the greatest possible surface area.
- Material: Copper
- Temperature class: 60 °C
- Max. cable length: 50 m

7.3.2 Resolver cable with mating connector



Note!

The resolver respectively HIPERFACE mating connector of the Jetter motor series JL, JK and JH and can be ordered from Jetter AG by supplying the following particulars:

Article no. 15100069 Resolver / HIPERFACE

The complete resolver cable between the servo amplifier series JetMove 2xx and the Jetter motor series JL, JK, and JH can be ordered from Jetter AG. It can be ordered by supplying the following cable confection number:

Cable confection no. 23 for the servo amplifier series JetMove 2xx

Mating connector of the resolver (solder side)

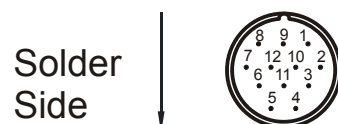
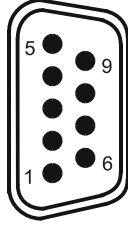
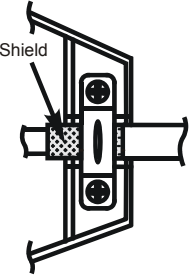
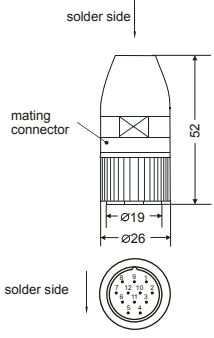


Fig. 12: View on the RC series mating connector of the resolver (internal thread M23)

Resolver Cable - Cable Confection No. 23			
JetMove 2xx (SUB-D connector X61)	Shielding		Motor (Resolver) (female, solder side)
 <p>Attaching screws must have a metric thread!</p>			<p>Connect shield with the greatest possible surface area! Use metallized housing only!</p>
Pin	Signal	Core Color	Pin
8	Cosine +	red	1
3	Cosine -	blue	2
2	Sine -	yellow	3
7	Sine +	green	4
1	R1R (exciter winding +)	pink	5
6	R2L (exciter winding -)	gray	6
9	Th1 (thermal sensor)	white	7
4	Th2 (thermal sensor)	brown	8
-	unassigned	-	9 - 12

Dimensions of the resolver mating connector are specified in millimeters.

7.4 HIPERFACE Connection

7.4.1 Specification

Specifications of the Mating Connector for X61 (ENCODER)

- 9-pin male SUB-D connector
- Metallized enclosure

Specification of HIPERFACE Cable

- Cable size: $4 * 2 * 0.14 \text{ mm}^2 + 2 * 0.5 \text{ mm}^2$ (AWG 26(8) + AWG 20(2))
 $2 * 0.5 \text{ mm}^2$ (AWG 20(2)) must be used for the power supply unit and for GND.
- Cores have to be twisted in pairs and have to be included in an overall shielding.
- The following signal lines have to be twisted in pairs:
 - Sine + and reference sine
 - Cosine+ and reference cosine
 - DATA - and DATA +
 - 0 V and voltage supply
- The shield must be connected to the connector housings on both ends of the cable with the greatest possible surface area.
- Material: Copper
- Temperature class: 60 °C
- Max. cable length: 50 m

7.4.2 HIPERFACE cable with mating connector



Note!

The resolver respectively HIPERFACE mating connector of the Jetter motor series JL, JK and JH and can be ordered from Jetter AG by supplying the following particulars:

Article no. 15100069 Resolver / HIPERFACE

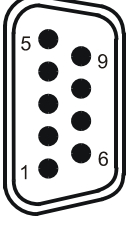
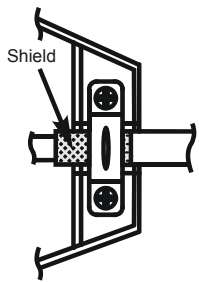
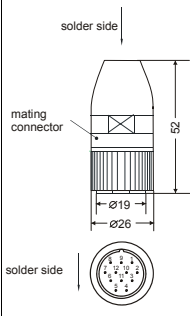
The complete HIPERFACE cable between the servo amplifier series JetMove 2xx and the Jetter motor series JL, JK, and JH can be ordered from Jetter AG. It can be ordered by supplying the cable designation and the respective cable length in cm:

KAY_0723-xxxx for the digital servo amplifier series JetMove 2xx

HIPERFACE mating connector (solder side)



Fig. 13: RC series HIPERFACE mating connector (internal thread M23)

HIPERFACE Cable - KAY_0723-xxxx			
JetMove 2xx (SUB-D connector X61)	Shielding		Motor HIPERFACE (female, solder side)
 <p>Attaching screws must have a metric thread!</p>			
	Connect shield with the greatest possible surface area! Use metallized housing only!		
Pin	Signal	Core Color	Pin
-	unassigned	-	1
-	unassigned	-	2
7	Sine +	white	3
2	Reference sine	brown	4
8	Cosine +	green	5
3	Reference cosine	yellow	6
6	DATA - (RS-485)	gray	7
1	DATA + (RS-485)	pink	8
4	0 V	blue	9 *)
5	Power supply (7 through 12 V)	red	10
9	Thermal sensor	black	11
	Thermal sensor	-	12 *)

*) Pin 9 and pin 12 are short-circuited

Dimensions of the HIPERFACE mating connector are specified in millimeters.

7.5 Sin-Cos Encoder Connection

7.5.1 Adapter

An adapter is needed for connecting a sin-cos encoder. This adapter can be obtained from Jetter AG by the following specification:

JM-200-ENC-ADAP (Article # 10000430)

Another 9-pin SUB-D connector of the encoder cable can be connected to this adapter. Further, this adapter allows for connecting an individual temperature sensor of the motor, as normally these signals are not conducted via the encoder cable, if a sin-cos encoder is used.

7.5.2 Specification

Specifications of the Mating Connector for X61 (ENCODER)

- 9-pin male SUB-D connector
- Metallized enclosure

Sin-Cos Encoder Cable Specifications

- Cable size: $2 * 2 * 0.14 \text{ mm}^2 + 2 * 0.5 \text{ mm}^2$ (AWG 26(4) + AWG 20(2)), if there is no index signal.
- Cable size: $3 * 2 * 0.14 \text{ mm}^2 + 2 * 0.5 \text{ mm}^2$ (AWG 26(6) + AWG 20(2)), if there is no index signal.
- $2 * 0.5 \text{ mm}^2$ (AWG 20(2)) must be used for the power supply unit and for GND.
- Cores have to be twisted in pairs and have to be included in an overall shielding.
- The following signal lines have to be twisted in pairs:
 - Sine + and reference sine
 - Cosine+ and reference cosine
 - Index + and reference index
 - 0 V and voltage supply
- The shield must be connected to the connector housings on both ends of the cable with the greatest possible surface area.
- Material: Copper
- Temperature class: 60 °C
- Max. cable length: 100 m

7.5.3 Connection diagram

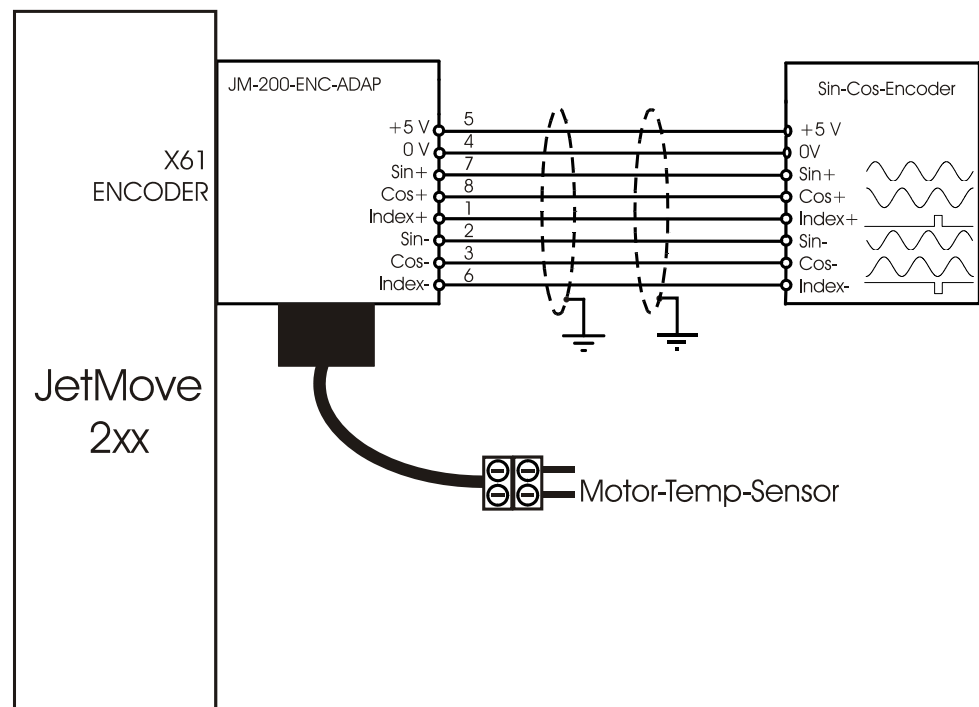
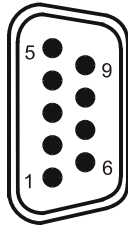
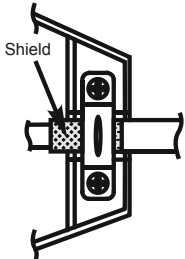


Fig. 14: Sin-cos encoder connection with adapter

Sin-Cos Encoder Cable	
JetMove 2xx (SUB-D Connector X61) with Adapter JM-200-ENC-ADAP	Shielding
	
Attaching screws must have a metric thread!	Connect shield with the greatest possible surface area! Use metallized housing only!
Pin	Signal
7	Sine +
2	Reference sine
8	Cosine +
3	Reference cosine
1	Index +
6	Reference index
4	0 V
5	Power supply (5 V - 100 mA max.)
9	unassigned



Important!

To be considered before connecting sin-cos encoders



If a sin-cos encoder is to be used, commutation finding **always** has to be carried out after applying the logic power supply and before giving the first enable.

If this is not considered, the motor might move uncontrollably.



The counting direction of the position in the JetMove 2xx is reversed in the following cases:

Case 1: The signal sine+ is exchanged with the signal cosine+, and the signal reference-sine is exchanged with the signal reference cosine

Case 2: The signal sine is exchanged with the signal reference sine

Case 3: The signal cosine is exchanged with the signal reference cosine



Due to conduction loss, a voltage smaller than 5 V might reach the encoder. If necessary, the encoder supply cords have to have a greater diameter.

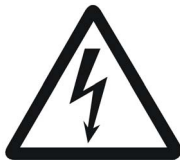


If a motor temperature sensor is not used, the inputs have to be short-circuited at the adapter, so the JetMove 2xx will not give an error message.

7.6 External Ballast Resistor and DC Link Connection

Connection of External Ballast Resistor and DC link Circuit of Another JM-204-480	
Field Wiring Terminals X63	Connector Pin Assignment
U_{B-}	Negative pole of the DC link voltage
U_{B+}	Positive pole of the DC link voltage
BR_{int}	Connection with the internal ballast resistor (for this purpose, it must be connected with BR_c)
BR_c	Reference potential for the ballasting circuit

HAZARD caused by high operating voltage!



Danger

Extremely hazardous voltages of up to 850 V may occur!

Please, observe the following precautions in order to avoid injuries such as muscle cramps, burns, unconsciousness, respiratory standstill, etc., and possibly death:

A high DC link voltage is applied to each of the eight terminals X63!



Please do **never** establish a connection to these terminals, while power is being supplied to the JetMove 204-480 or up to 7 minutes after having separated the JetMove 204-480 from the power supply.

Ballast System

When a mechanic system is braked by the motor, the energy will be given back to the servo amplifier. This energy is led to the ballast resistor to convert it into heat. The ballast resistor is switched into the DC link circuit by the ballast circuit. The JetMove 204-480 is supplied with an internal ballast resistor. If the power that is supplied back is too high for the internal resistor, an external ballast resistor can be added. It is also possible to run the JetMove 204-480 with an external ballast resistor only.

Use of internal ballast resistor (delivered condition)

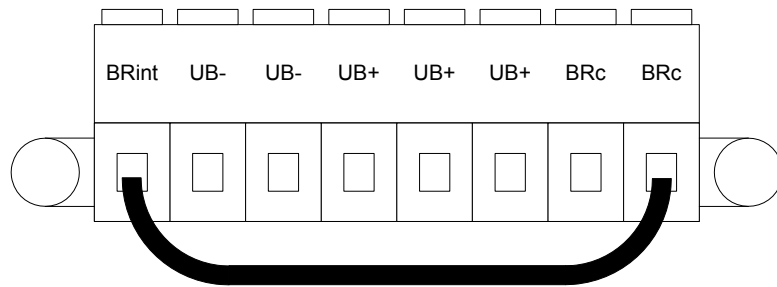


Fig. 15: Wiring of X63 for connecting the internal ballast resistor

For the use of the internal ballast resistor the terminal BRint and one BRc terminal of X63 have to be connected. This is the standard wiring of the JetMove 204-480 in delivered condition by Jetter AG.

The JetMove 204-480 is measuring the load of the ballast resistor and sets a warning bit, if the ballast load reaches a specific value. If the resistor is overloaded, an error occurs (error F06).

In this case, an external ballast resistor has to be used.

Use of external ballast resistor in addition to the internal ballast resistor

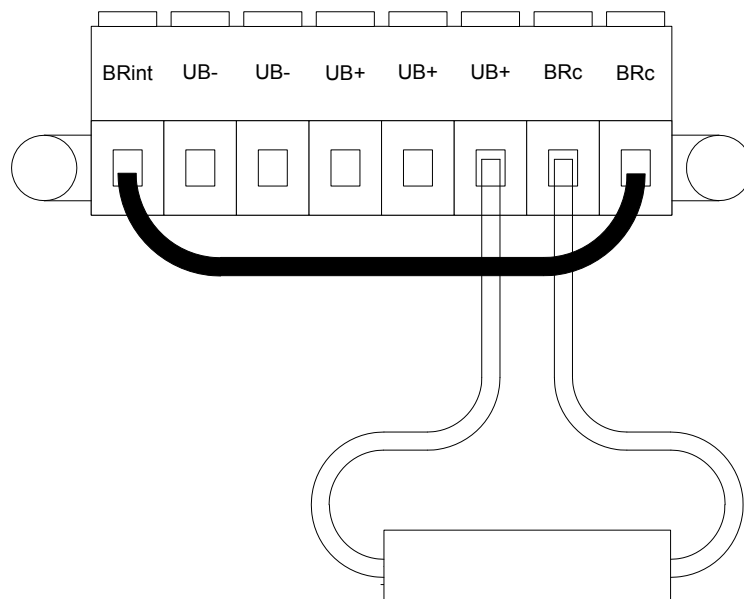


Fig. 16: Wiring of X63 for connecting the internal and external ballast resistor

Mount the external ballast resistor between a terminal UB+ and a terminal BR_c.

Parameters of external ballast resistor for this configuration:

Value of the resistor:	120 Ω
Continuous output:	75 W or greater
Maximum capacity:	1 kW for 0.6 s
Type:	Low inductivity

This configuration causes the energy dissipation to be twice as high as it would be if configured with an internal resistor only.
Still, half of the heat is still emitted inside the cover of the amplifier.

In order to prevent this, a third variety of a configuration can be chosen:

Use of external ballast resistor instead of the internal ballast resistor

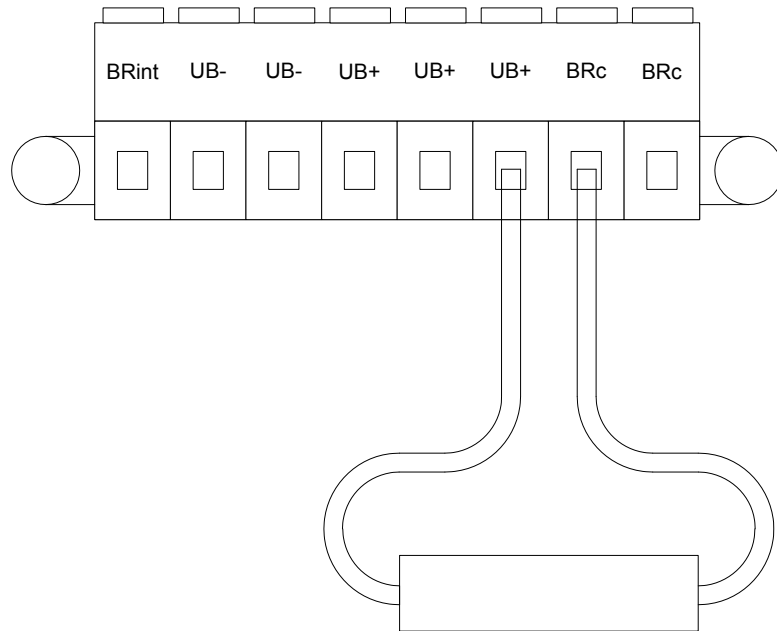


Fig. 17: Wiring of X63 for connecting the external ballast resistor

Mount the external ballast resistor between a terminal UB₊ and a terminal BR_c.
Remove the bridge between BR_{int} and BR_c.

Parameters of external ballast resistor in this configuration:

Value of the resistor:	120 Ω
Continuous output:	75 W or greater
Maximum capacity:	1 kW for 0.6 s
Type:	Low inductivity

These are the same values as with the internal resistor.

As an alternative, the following parameters can apply to a resistor:

Value of the resistor:	60 Ω
Continuous output:	150 W or greater
Maximum capacity:	2 kW for 0.6 s
Type:	Low inductivity

This configuration causes the energy dissipation to be twice as high as it would be if configured with an internal resistor only.

With both resistors, the internal overload control is working as well as using the internal ballast resistor only.

Coupling DC Link Circuits of Two or Three JetMove 204-480

Another way of utilizing the braking energy of the motor is to couple the DC links of several JetMove 204-480. In most cases, not all axes of a machine have to decelerate at the same time. This way, other axes can use the feedback energy for acceleration.

The coupling both reduces the heat inside the amplifier emitted by the ballast resistor and leads to higher dynamic performance, provided that not all axes accelerate at the same time.

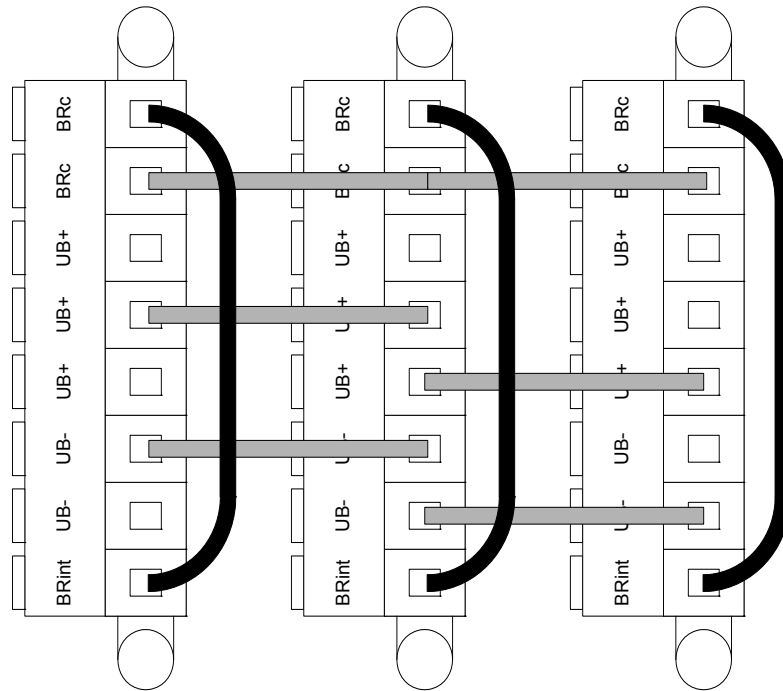


Fig. 18: Wiring of X63 for coupling DC link circuits of up to three JetMove 204-480

Coupling DC links guarantees equal distribution of load for all internal ballast resistors. A special ballast circuit ensures that the braking energy which is not used by another amplifier is equally distributed among all ballast resistors.



Important!

Requirements on the coupling of DC link circuits:

- Before connecting a coupled JetMove 204-480, completely connect all wires of X63.
Otherwise the device could be damaged!
- Do not couple more than three JetMove 204-480.
- Do not couple JetMove 204-480 with other amplifier types.
- Do not release the other JetMoves 204-480 if one of the coupled devices is not ready for operation.
- The power supplies of coupled JetMoves 204-480 have to be activated and deactivated simultaneously.
For this reason, please connect the supply lines of the coupled JetMove 204-480 with exactly the same contactor and the same fuses, identical cable diameters and cable lengths (difference <0.5 m).



The minimum cable size for a DC link coupling is 4 mm² (AWG 12).



The maximum cable length between two JetMoves 204-480 is 0.5 m.

It is also possible to combine coupled DC links with external ballast resistors. In this case, it is important to use identical resistors and cables for all coupled JetMove 204-480.

7.7 Digital Inputs, Logic Power Supply

Specification of terminal X10

- 10-pin spring tension terminal (type ZEC 1,0/10-ST-3,5)
- Diameter of the cable apt for connecting: 0.2 ... 1 mm² (AWG 24 ... AWG 16)
with bootlace ferrules in a plastic sleeve: 0.25 ... 0.75 mm² (AWG 24 ... AWG 18)
- Bladed screw-driver: 0.4 x 2.5 mm

Digital Inputs, Logic Power Supply			
Wiring Terminal X10 at the Amplifier	Signal	Function	Specification
ENABLE	Hardware enable for the power supply of the motor (input)	<ul style="list-style-type: none"> • A high signal at this input is necessary for the motor to be supplied (the power supply has to be connected before software enable). • A low signal de-energizes the motor immediately. 	<ul style="list-style-type: none"> • DC 24 V • 7.5 mA max. • Operating point: < 6 V low, > 15 V high
REF	Reference switch (input)	<ul style="list-style-type: none"> • Depending on the parameter setting, this input is used for referencing. 	<ul style="list-style-type: none"> • DC 24 V • 7.5 mA max. • Operating point: < 6 V low, > 15 V high NC or NO contact
LIMIT +	Positive limit switch (input)	<ul style="list-style-type: none"> • Depending on the parameter setting, this input is used as a positive limit switch. 	<ul style="list-style-type: none"> • DC 24 V • 7.5 mA max. • Operating point: < 6 V low, > 15 V high NC or NO contact NC contact recommended
LIMIT -	Negative limit switch (input)	<ul style="list-style-type: none"> • Depending on the parameter setting, this input is used as a negative limit switch. 	<ul style="list-style-type: none"> • DC 24 V • 7.5 mA max. • Operating point: < 6 V low, > 15 V high NC or NO contact NC contact recommended

INPUT	Digital input	<ul style="list-style-type: none"> Depending on the parameter setting, this input can be used for quick stop, position capture or referencing without stop. 	<ul style="list-style-type: none"> DC 24 V 7.5 mA max. Operating point: < 6 V low, > 15 V high
\perp	Common ground		GND ^{*)} for all inputs and supply of the logic
\perp	Common ground		GND ^{*)} for all inputs and supply of the logic
DC 24 V	Power supply for the controller logic		DC 20 ... 30 V (I < 0.8 A)
BRAKE 1	Braking relay contact Br1	Relay contact for motor holding brake	V _{max.} = DC 30 V I _{max.} = DC 2 A
BRAKE 2	Braking relay contact Br2	<p>The relay can be operated either by the control program or by the firmware of the JetMove 204-480 at release of the motor current.</p> <p>Important Note! A free-wheeling diode is necessary if not integrated in the motor already. In Jetter motors, free-wheeling diodes have not been integrated! Recommended diode type: 1N4002</p>	<p>Contact: Type NO</p> <p>These connections are only for devices having got the same reference to ground as the power supply of the logic.</p>

^{*)} is connected to the GND of the control system

For connection diagram please refer to "Connection Diagrams", page 83.

7.8 Connection Details for Digital Outputs

Digital Outputs		
Terminals X31 on the Amplifier Side	Signal	Specification
DC 24 V	Power supply for the outputs	DC 20 ... 30 V with $I = \max. 2 \text{ A}$ (max. 0.5 A per output)
1 2 3 4	Digital output signals (PNP outputs)	See "Digital outputs", page 37.
0 V	Common ground	Ground ^{*)}

^{*)} is connected to the GND of the control system

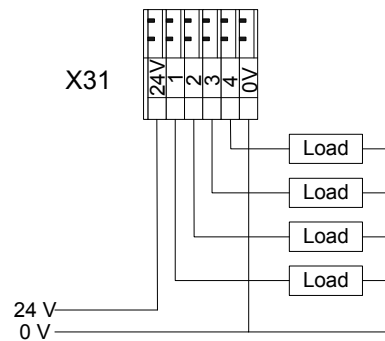


Fig. 19: Connection details for digital outputs

7.9 Jetter System Bus

The Jetter system bus is used for connecting the JetMove 204-480 to the PLC and to other JetMoves or Jetter PLC modules. The system bus input BUS-IN is a 9-pin SUB-D male connector, while the output BUS-OUT is a 9-pin SUB-D female connector.

7.9.1 Specifications of the Jetter system bus cable

Specification of Connectors

BUS-OUT side (X19)

- 9-pin male SUB-D connector
- Metallized housing

BUS-IN side (X18)

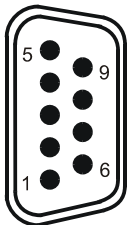
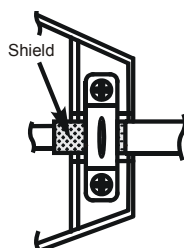
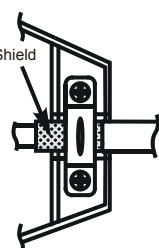
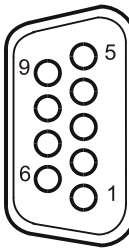
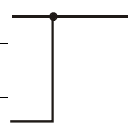
- 9-pin female SUB-D connector
- Metallized housing

System bus cable specification

For manufacturing a system bus cable, the following minimum requirements have to be considered:

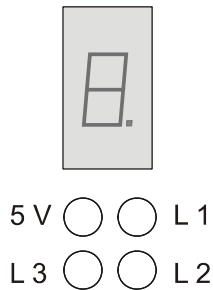
System Bus Cable - Technical Data		
Function	Description	
Core cross-sectional area	1 MBaud:	0.25 to 0.34 mm ² (AWG 24 to 22)
	500 kBaud:	0.34 to 0.50 mm ² (AWG 22 to 20)
	250 kBaud:	0.34 to 0.60 mm ² (AWG 22 to 19)
	125 kBaud:	0.50 to 0.60 mm ² (AWG 20 to 19)
Cable capacitance	Maximum 60 pF / m	
Resistivity	1 MBaud:	Maximum 70 Ω /km
	500 kBaud:	Maximum 60 Ω /km
	250 kBaud:	Maximum 60 Ω /km
	125 kBaud:	Maximum 60 Ω /km
Number of cores	5	
Shielding	Complete shielding, no paired shielding	
Twisting	Core pairs CL and CH must be twisted.	
Material	Copper	
Temperature class	60 °C	

Allowed Cable Lengths			
Baud Rate	Max. Cable Length	Max. Tap Line Length	Max. Overall Tap Line Length
1 MBaud	30 m	0.3 m	3 m
500 kBaud	100 m	1 m	39 m
250 kBaud	200 m	3 m	78 m
125 kBaud	200 m	-	-

System Bus Cable - Cable Confection Number 530			
	Shielding		
			
BUS-OUT		Connect shield with the greatest possible surface area! Use metallized housing only!	BUS-IN
Pin		Signal	Pin
1		CMODE0	1
2		CL	2
3		GND	3
4		CMODE1	4
5		TERM	5
6		unassigned	6
7		CH	7
8		unassigned	8
9		Do not connect	9

8 Status Monitoring

The amplifier LEDs indicate the operating status of the digital servo amplifier.



JetMove 204-480 - LEDs		
LED	Color	Meaning
5 V	Green	Logic module voltage is OK
L1	Yellow	Axis is standing still (speed = 0)
L2	Yellow	A voltage of 24 V is applied to the input of the positive limit switch (LIMIT+).
L3	Yellow	A voltage of 24 V is applied to the input of the negative limit switch (LIMIT-).

Note!

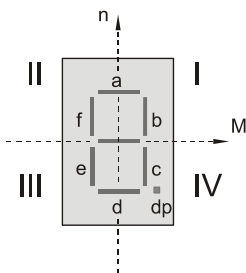


The seven-segment display of the output stage indicates the operating and fault conditions of the digital servo amplifier. The various display modes are set by the Motion Setup. Mode 0 (default) is used for normal operation and mode 1 for commissioning.

JetMove 204-480 - 7-Segment Display Mode 0: Normal Operation		
Color	Status	Meaning
0	NOT READY TO BE SWITCHED ON	Initialisation of amplifier functions
1	SWITCH-ON INHIBIT	Initialization completed. Safe state achieved after initialization and acknowledgement of errors. The drive controller can be switched on.
2	READY TO BE SWITCHED ON	Drive controller was disabled by software command. The drive controller can be switched on.
3	SWITCHED ON	DC link monitoring is activated.
4	OPERATION_ENABLED	The drive controller is enabled.
7	QUICK STOP ACTIVATED	A quick stop has been activated. The drive was decelerated to zero speed and then locked.

JetMove 204-480 - 7-Segment Display Mode 0: Normal Operation

E	ERROR REACTION ACTIVATED	A fault has been recognized. An adjustable error reaction may be activated.
F	MALFUNCTION	The drive controller is locked, error can be acknowledged.
F X. X.	ERROR NUMBER	Error of number X. X. has occurred.
.	Flashing dot	Warning activated
0.	Flashing "ZERO"	Boot sector has been activated
C.	Flashing "C"	OS flash gets deleted
E.	Flashing "E"	OS flash gets deleted
L.	Flashing "L"	OS loader gets loaded
P.	Flashing "P"	OS is transferred to the flash memory
U.	Flashing "U"	The boot sector waits for OS update



JetMove 204-480 - 7-Segment Display Mode 1: Commissioning

Color	Meaning	Meaning
g	$n_{\text{Actual Value}} < 0,5 \% n_{\text{max.}}$	--
b	$M > 0, n > 0 \rightarrow$ quadrant I	Mode of operation - Motor
c	$M < 0, n > 0 \rightarrow$ quadrant II	Mode of operation - Generator
e	$M < 0, n < 0 \rightarrow$ quadrant III	Mode of operation - Motor
f	$M > 0, n < 0 \rightarrow$ quadrant IV	Mode of operation - Generator
a	The positive current limit has been reached	--
d	The negative current limit has been reached	--

9 Diagnostics

9.1 Error Messages



Note!

In the case of an error message, the letter "F" and two successive numbers appear on the 7-segment display every second.

Error Message Table JetMove 204-480

Error number	Error type	Description	Response to errors	Troubleshooting
F 00	Hardware error	Internal hardware defect	– Immediate controller disable	– Cut drive controller from power lines – Return the amplifier for repair
F 01	Internal supply error	One or more power supply voltages are beyond their limits.	– Immediate controller disable	– Cut drive controller from power lines – Return the amplifier for repair
F 02	Mains phase error	Failure of one of the mains phases.	– Immediate controller disable	– Check fuses and wiring – Acknowledge the error
F 03	Motor cable breakage	The motor cable is broken Be careful: The motor cable is tested when the drive controller is enabled for the first time.	– Immediate controller disable	– Check the motor cable connections – Acknowledge the error
F 04	Overvoltage in the DC link	A DC link voltage >850 V has been detected.	– Immediate controller disable	– Check input voltage supply. – If the motor is used as generator, reduce the regenerating power. – Acknowledge the error

Error Message Table JetMove 204-480

Error number	Error type	Description	Response to errors	Troubleshooting
F 05	Current overload	Output current was greater than 2.5 x rated current.	– Immediate controller disable	<ul style="list-style-type: none"> – Check motor cable for short circuit between lines or lines to earth – Check current regulations. Correct the parameters, if required – Acknowledge the error
F 06	Ballast resistor overload	The ballast resistor has been overloaded	– Immediate controller disable	<ul style="list-style-type: none"> – Let the amplifier cool down – After cooling down, acknowledge the error – Reduce regeneration power
F 07	Overtemperature of the device	The amplifier has reached the maximum temperature	– Immediate controller disable	<ul style="list-style-type: none"> – Let the amplifier cool down – After cooling down, acknowledge the error – Reduce power of drive system
F 08	Motor overtemperature	The motor has reached the maximum temperature Also refer to "Built-in temperature sensor", page 39.	– Immediate controller disable	<ul style="list-style-type: none"> – Let the motor cool down – After cooling down, acknowledge the error – Reduce the average load of motor
F 09	Encoder failure	Encoder breakage or initialisation error	– Immediate controller disable	<ul style="list-style-type: none"> – For extended diagnostics purposes use motion setup – Check the encoder line and all plug-in connections – Acknowledge the error
F 10	Overspeed	The actual shaft speed has exceeded a value of 1.25 x maximum speed.	– Immediate controller disable	<ul style="list-style-type: none"> – Check motor and encoder connections – Check the speed controller parameters. Modify parameters, if required. – Acknowledge the error
F 11	Current overrange	A current temporarily too high has been detected	– Immediate controller disable	<ul style="list-style-type: none"> – Reduce Kp of the current controller by 10 to 20 % – Acknowledge the error

Error Message Table JetMove 204-480				
Error number	Error type	Description	Response to errors	Troubleshooting
F 12	Ground fault	One or more phases of the motor cable or inside the motor have been short-circuited to earth	– Immediate controller disable	<ul style="list-style-type: none"> – Check the motor cable and the motor – Acknowledge the error
F 13 (combined with F00)	Internal checksum error	An internal checksum error has occurred	– Immediate controller disable	<ul style="list-style-type: none"> – Switch the 24 V supply off and on again – If the error occurs repeatedly, return the amplifier for repair
F 14 (combined with F 00)	Internal communication error	An internal communication error has occurred	– Immediate controller disable	<ul style="list-style-type: none"> – Switch the 24 V supply off and on again – If the error occurs repeatedly, return the amplifier for repair
F 15	The hardware enable is missing	The software enable is given without a hardware enable.	– Immediate controller disable	<ul style="list-style-type: none"> – Disable the drive by means of the software – Acknowledge the error
F16	Power input overcurrent	The current at the power input is too high	– Immediate controller disable	<ul style="list-style-type: none"> – Check input voltage – Reduce mechanical power of the motor – Acknowledge the error
F 17	Software limit switch has been actuated	Actual position is outside the programmed range and a software limit switch has tripped	– Stop at max. current (max. torque)	<ul style="list-style-type: none"> – Check target position – Acknowledge the error – Return the axis to a position within the software travel limits (monitoring of software limit switches is re-enabled automatically at entering this range)
F 18	Hardware limit switch has been actuated	One hardware limit switch has tripped	– Stop at max. current (max. torque)	<ul style="list-style-type: none"> – Check target position – Check reference position – Acknowledge the error – Return the axis to a position within the machine travel limits (monitoring of hardware limit switches is re-enabled automatically at entering this range)

Error Message Table JetMove 204-480

Error number	Error type	Description	Response to errors	Troubleshooting
F 20	Undervoltage in the DC link voltage	The DC link voltage is less than the minimum value	– Stop with emergency stop ramp	<ul style="list-style-type: none"> – Check the voltage of the power line – Check the parameter "U_{ZK} min. trip" – Acknowledge the error
F 21	Overvoltage DC link voltage	The DC link voltage has exceeded the maximum value	– Stop with emergency stop ramp	<ul style="list-style-type: none"> – Check the voltage of the power line – In generator operation reduce braking power – Acknowledge the error
F 22	The drive has stalled	The drive could not overcome the $n = 0$ threshold within the time limit specified by the parameter "blocking-tripping time".	– Immediate controller disable	<ul style="list-style-type: none"> – Eliminate the cause of stalling – Acknowledge the error
F 23	Tracking error	The tracking error has exceeded the limit defined in parameter "tracking error limit" for the time specified in "tracking window time".	– Stop with emergency stop ramp	<ul style="list-style-type: none"> – Check the drive mechanism – Check steepness of acceleration/ deceleration ramps and amplifier parameters in relation to the parameters "tracking error limit" and "tracking window time" – Acknowledge the error
F 24 (combined with F 01)	Error in 24 V supply voltage	External 24 V supply was lower than 18 V	– Immediate controller disable	<ul style="list-style-type: none"> – Check external power supply – Acknowledge the error
F 25 - F 27 (combined with F 01)	Internal supply error	One or more internal supply voltages has fallen below their limit	– Immediate controller disable	<ul style="list-style-type: none"> – Note the number of error – Return the amplifier for repair
F 28	Error in power charging circuit	The input current limitation circuit is defective	– Immediate controller disable	<ul style="list-style-type: none"> – Note the number of error – Return the amplifier for repair
F 29	Mains power too high	The average mains power is too high	– Immediate controller disable	<ul style="list-style-type: none"> – Acknowledge the error – Reduce the average load of motor

Error Message Table JetMove 204-480				
Error number	Error type	Description	Response to errors	Troubleshooting
F 30	I ² t error	The average power loss of the motor was more than the max. value configured by nominal motor current, overload factor and motor time constant Refer to "I ² t calculation", page 39.	– Immediate controller disable	<ul style="list-style-type: none"> – Let the motor cool down – After cooling down, acknowledge the error – Check the configuration of nominal motor current, overload factor and motor time constant – Reduce the average load of motor
F 31	Motor overload protection to UL	Average motor power loss was higher than the definition according to UL. See chapter 5.2.3 "Motor overload protection according to UL", page 40	– Immediate controller disable	<ul style="list-style-type: none"> – Let the motor cool down – Acknowledge the error – Reduce the average load of motor
F 38	Asymmetric encoder signal	The analog sine-cosine signals have not got the same amplitude.	– Immediate controller disable	<ul style="list-style-type: none"> – Check wiring or encoder signals – Acknowledge the error
F 39	Error at commutation finding	Measuring the commutation offset could not be completed with results being guaranteed.	– Immediate controller disable	<ul style="list-style-type: none"> – Check parametering – Check wiring or encoder signal – Acknowledge the error
F 42	Malfunction of encoder 2 (only for the option CNT)	Encoder breakage or initialisation error of the encoder	– Immediate controller disable	<ul style="list-style-type: none"> – Check the encoder line and all plug-in connections – Acknowledge the error

9.2 Alarms

If the dot in the display is flashing, one or several warnings have been recognized. Please check in the motion setup or by issuing the motion commands in the PLC program which warning is active.

10 Connection Diagrams

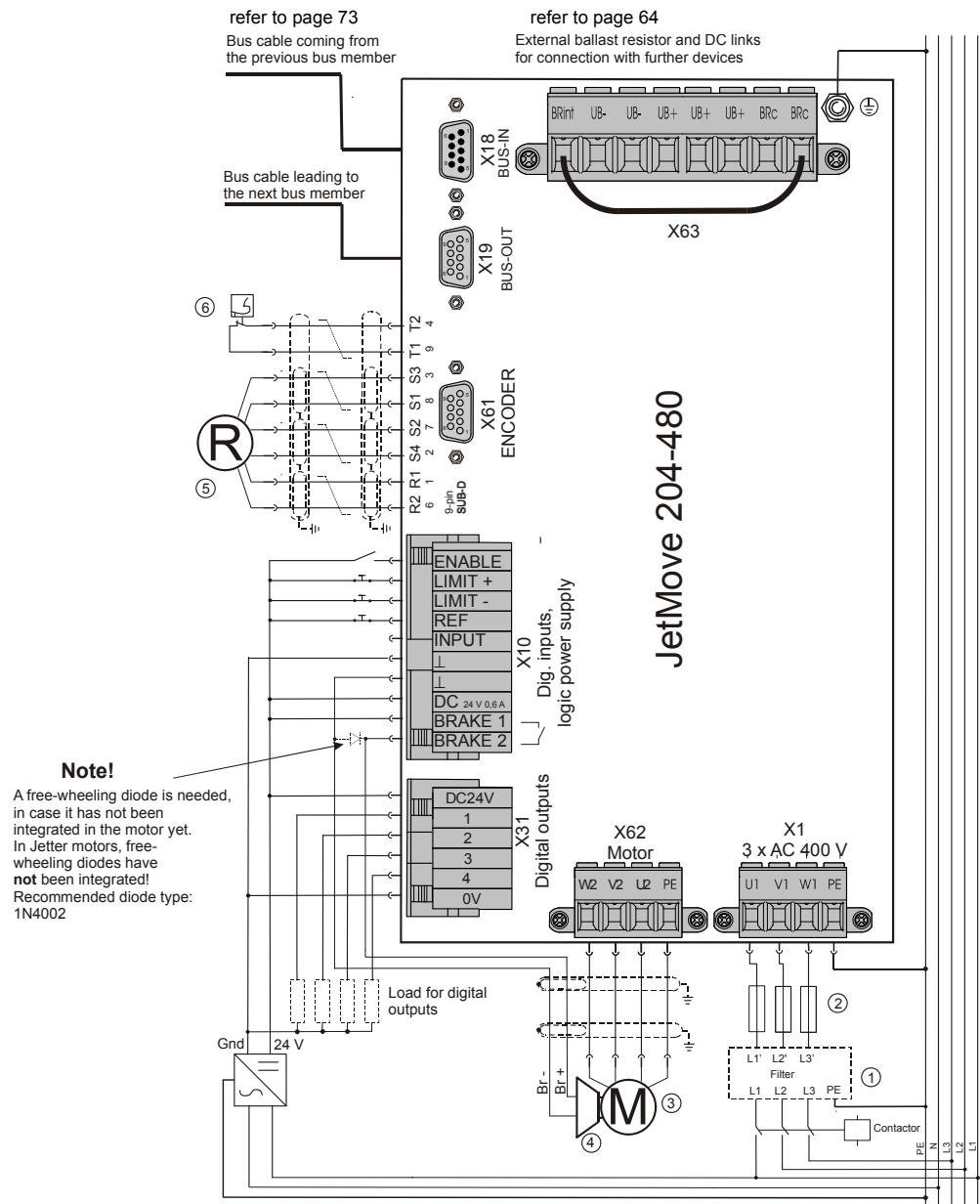


Fig. 20: Connection diagram JetMove 204-480-RE

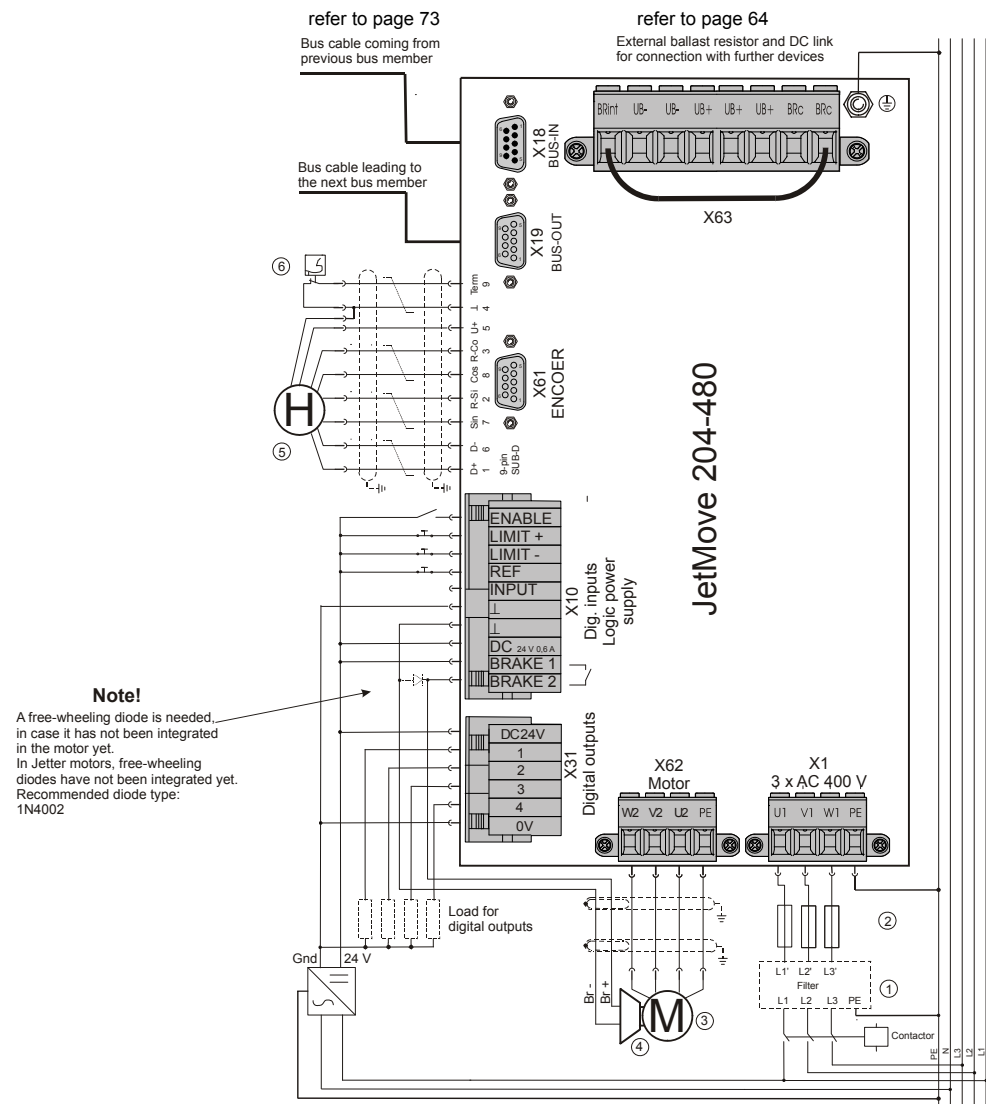


Fig. 21: Connection diagram JetMove 204-480-HI

Key to the connection diagrams:

- | | |
|----------|---|
| 1 | Line filter (optional) (refer to "Line filter" on page 36) |
| 2 | Mains protection (refer to "Overload protection" on page 35) |
| 3 | Motor |
| 4 | Motor holding brake (optional) |
| 5 | Position transducer (resolver or absolute encoder with HIPERFACE) |
| 6 | Motor overtemperature protection |

11 Analog Input (Option)

11.1 Function

For the digital servo amplifier JetMove 204-480, an optional integrated analog input card can be ordered (article designation of the device: JM-204-480...-IA1). This card supplies an analog input of a 12-bit resolution. The converted value of the measured voltage can be read by a register of the JetMove in the PLC program or processed by the firmware of the JetMove in an additional controller. This way it is possible, for example, to realize a pressure control loop in which the motor controlled by the JetMove generates the pressure. In this case, a pressure sensor in the machine connected to the analog input of the JetMove would deliver the actual pressure value to the control loop.

11.2 Technical Data

Technical Data for the Analog Input	
Connection	SUB-D connector (male) at the device
Voltage range	0 ... 10 V
Input current	max. 1.4 mA
Resolution	12 bits
Value range	0 .. 32767 (resolution in steps of 8)
Electrical isolation	None
Accuracy	
Zero error	max. ± 5 LSB (± 40 values) corresponds to ± 12.2 mV
Gain error	max. ± 10 LSB (± 80 values) corresponds to ± 24.4 mV

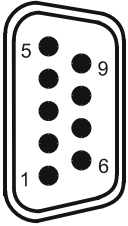
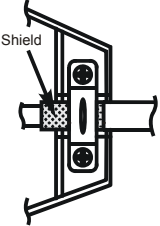
11.3 Description of Connections

Specification of the mating connector for X72

- SUB-D, 9-pin female connector
- Metallized enclosure

Specification of the cable to the analog input

- Cable size: 2 * 0.14 mm² min. (AWG 26(2))
- Cores have to be twisted and shielded.
- Shielding has to be connected to the connector housings on both sides.
- Material: Copper
- Temperature class: 60 °C

Pin Assignment of the Analog Input	
	Shielding
	
X72	Connect shield with the greatest possible surface area! Use metallized enclosure only!
Pin	Signal
1	Analog signal (0 - 10 V to pin 6)
6 - 9	Analog GND (connected to earth in device)
2 - 5	Keep unoccupied

12 Ethernet Interface (Option)

12.1 Function

For the JetMove 204-480, an optional integrated Ethernet interface can be ordered (article designation of the device: JM-204-480...-OEM). This enables the JetMove 204-480 to be addressed by the controller via Ethernet instead of being addressed by the Jetter system bus.

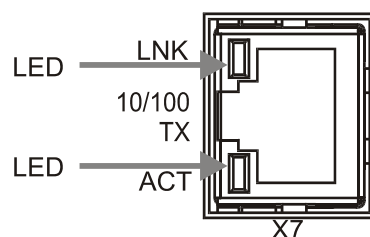
Functional Equipment	
1 Ethernet interface	10/100 MBit/s, TX
10-pin DIP switch for the lower 8 bits of the IP address and various operating modes	RUN / STOP / LOAD
LED for status indication	RUN / ERR

12.2 Description of Connections

The digital servo amplifier JetMove 204-480...-OEM is connected with the Ethernet by the RJ45 female connector (X71).

There are two types of interconnecting cables used for 10/100 MBit/s twisted pair Ethernet.

- Straight-through twisted pair cables
- Crossover cables (transmitting and receiving lines are crossed)



The LEDs of the JetMove 204-480...-OEM Ethernet	
Designation	Function
ACT	Activity: The JetMove 204-480...-OEM transmits or receives data via the Ethernet
LNK	Linkage: The JetMove 204-480...-OEM is connected with the Ethernet

12.2.1 Connection JetMove 204-480...-OEM - PC or JetControl

Direct connection between a PC or JetControl and a JetMove 204-480...-OEM is established by means of a crossover cable.

12.2.2 Connection JetMove 204-480...-OEM - PC or JetControl via a switch

If the connection between PC or JetControl and a JetMove 204-480...-OEM is established through a switch, straight-through cables have to be used.



Note!

Terminals have to be interconnected by means of crossover cables:

- PC to PC
- JetControl to PC
- JetControl to JetMove...-OEM
- etc.

Terminals with infrastructure components (e. g. switch) have to be interconnected via straight-through cables:

- PC to switch
- JetControl to switch
- JetMove...-OEM to switch
- etc.

**Note!**

If the proper cable is not available, the uplink port of a switch/hub can be used. The pin assignment of an uplink port allows connection of terminals or can be switched over.

Some devices are provided with an automatic crossover function which ensures automatic adjustment to the cable and distant station.

12.3 Logic Circuit LEDs, Mode Selector

12.3.1 LEDs

Logic Circuit LEDs	
ERR (red LED)	Flashes shortly at initializing. It remains lit in case of an initialization error at the Ethernet interface
RUN (green LED)	Flashes regularly at correct functioning of the Ethernet interface

The current state of the LED can be queried in register 10182.

LED Error Messages	
Following power-up the red LED (ERR) and the green LED (RUN) are flashing	The switch is in LOAD position. The boot loader is running. The operating system of the Ethernet interface is neither being checked, nor has it been started.
After start-up, the red LED (ERR) flashes three times, after this, both LEDs, red (ERR) and green (RUN) are flashing simultaneously	The switch is in RUN or STOP position. The boot loader is running. There is no valid operating system of the Ethernet interface.
The red LED (ERR) and the green LED (RUN) are flashing alternately during runtime	Fatal operating system error of the Ethernet interface

12.3.2 The DIP switches

The switches are evaluated at starting up the JetMove 204-480...-OEM. Switches 1 through 8 influence the IP address, while switches 9 and 10 influence starting the operating system.

Start-Up Process

Switches 9 and 10	
Position	Meaning
9 = OFF, 10 = OFF (NORMAL OPERATION)	Normal function of the Ethernet interface
9 = OFF, 10 = ON (LOAD)	The boot process proceeds as far as to the initial program loader of the Ethernet interface
9 = ON	Reserved

After power-up the switch has no influence on the interface function. The current position of the switch can be scanned in register 10181.

12.4 Setting the IP Address

There are four ways of assigning an IP address to a JetMove 204-480...-OEM. The IP address that is actually being used can be read in register 2931.

12.4.1 Fixed IP address

At activating the controller, while the DIP-switches 1 to 8 are set to "OFF", the JetMove 204-480...-OEM has got the IP-address 192.168.10.15.

If, at the other possibilities of setting, it is not clear which IP address is being used, a definite state can be achieved by this way of "emergency setting".

12.4.2 IP address taken out of the configuration store

At activating the JetMove 204-480...-OEM, while the DIP-switches 1 to 8 are set to "ON", the JetControl has got the IP-address which has been stored to the configuration memory.

The configuration memory can be accessed by means of the "/System/cfgvar.ini" file or registers 10131 through 10145.

Configuration file

In order to gain FTP access to the configuration file "/System/cfgvar.ini", the user having got the administrator rights must have been connected.

This file has the same structure as a Windows *.Ini file:

```
[CFGVAR]
Version      = 4
IP_Address   = 192.128. 10. 97
IP_SubNetMask = 255.255.255. 0
IP_DefGateway = 192.128. 10. 1
BasePort     = 50000
IP_DNS       = 192.118.210.209
```



Important!

Do not change the version number.

Register(s)

Alternative access to the configuration memory is possible via registers 10131 through 10145.

In order to make a change via registers, first the password register with password value 2002149714 (0x77566152) must be loaded. Then, registers 10132 through 10145 are modified. After this, the changes must be saved to the configuration memory by writing any value into register 10100.

Register	Meaning	Value in the Example
10100	Saving the configuration values	
10131	Version number	4
10132	IP address MSB	192
10133	IP address 3SB	128
10134	IP address 2SB	10
10135	IP address LSB	97
10136	Subnet mask MSB	255

Register	Meaning	Value in the Example
10137	Subnet mask 3SB	255
10138	Subnet mask 2SB	255
10139	Subnet mask LSB	0
10140	Default gateway MSB	192
10141	Default gateway 3SB	128
10142	Default gateway 2SB	10
10143	Default gateway LSB	1
10144	Port number of JetIP server	50000
10145	IP address of the DNS server	0xC076D2D1 (192.118.210.209)
10159	Password	2002149714 (0x77566152)



Important!

Do not change the version number contained in register 10131.

12.4.3 IP address taken out of the switch position

In all other switch positions, the IP-address is taken out of the configuration memory for generating a new IP address; the lowest-order byte (fourth octet) is substituted by the position of the DIP switches 1 to 8.

To make up the IP address, the position DIP switches 1 through 8 is being read in during the start-up procedure.

The present setting of DIP switches 1 through 8 can be read out of register 10180.

13 Safe Standstill (Option)

For the digital servo amplifier JetMove 204-480, an optional integrated card for the "Safe Standstill" and "Safe Restart Inhibit" functions can be ordered (designation of the article: JM-204-480...-S1).

13.1 Introduction

The option "Safe Standstill" serves for safe de-energising of the motor, if personal or material damage caused by a moving or inadvertently started motor is to be safely prevented. This safe switching off meets the stop class 0 to EN 60204. Additionally, by this function a safe restart inhibit has been supplied; as long as the inputs for enable are not being controlled, any restart of the motion system is blocked. Notes and descriptions on this can be found in this manual.

For controlling this function, there exist the terminals Enable1, COM, and Enable2. In order to make dual-channel switch-off possible, two independent enable inputs and ground reference have been supplied. The ground reference of the enable inputs (COM) is potentially isolated from the ground reference of the servo amplifier (see "Common ground" on page 71). The ground reference of enable inputs can differ by up to +/- 100 V from the ground of the control system.

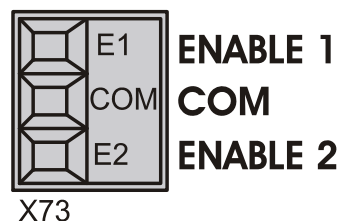


Fig. 22: Connection X73 for "Safe Standstill"



Note!

Even if the device has been equipped with the option -S1, the function of the ENABLE input at the terminal array X10 is still active. This means the motion system can only produce a certain torque, if this input has been connected to 24 V (against reference ground \perp).

13.2 Motion System JetMove 204-480

The following figure is to demonstrate the basic setting of a motion system using a servo amplifier JM-204-480 equipped with the "Safe Standstill" function.

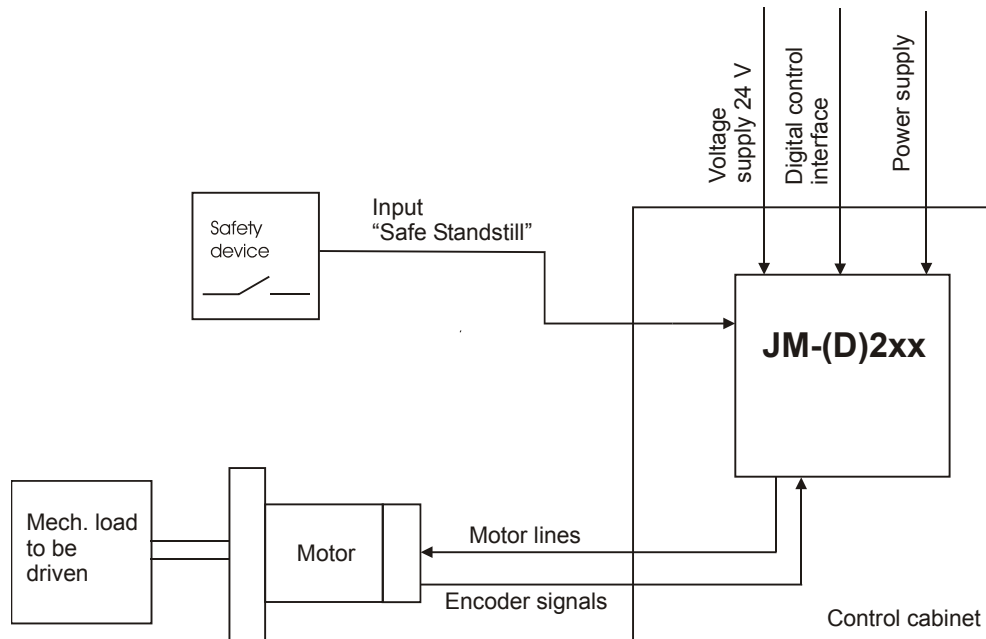


Fig. 23: Motion system using a servo JM-(D)2xx servo amplifier

The digital servo amplifier JM-204-480 has been designed for being installed in a control cabinet. The energy for driving a motor is supplied by a one-phase mains system. Further, an extra-low safety voltage of 24 V supplies the control electronics. Via various inputs and outputs of a digital signal interface, communication with higher-level control elements is established; these control elements issue the motion commands for the motor, receive status reports and transmit them, if necessary. Usually, the motor has been mounted at or within a machine outside the control cabinet. It is connected via a cable to the JetMove 204-480. For reporting the position, it has got an actual position value encoder. The mechanic load to be driven has been mounted to the motor shaft.

A safety-relevant device accesses the electronic control system of the JetMove via controller inputs "ENABLE1" and "ENABLE2". If Safe Standstill has been required, the motor is de-energized in a way that the torque will be safely deactivated. Yet, this does not mean that there is a safe electric isolation. If a safe electric isolation is necessary, an additional isolating device for interrupting the power supply (e.g. mains switch) must be supplied according to EN 60204.

13.3 Safety Instructions



The "Safe Standstill" function has got the sole purpose to switch off a motion system or to secure it against restarting. In order to gain Personal Safety, the control of the safety circuit must meet the safety requirements to EN 60204, EN 92, and EN ISO 13849-1.

13.4 Performance Test



At the first commissioning, after each intervention into the safety chain of a system, or after exchanging one or more than one components, the "Safe Standstill" function must be checked:

1. Disable all motion systems; mechanically secure pendant loads.
2. Lock the safety chain.
3. Enable an axis (ENABLE, ENABLE1, ENABLE2 and software release). Drive the axis, in case the torque cannot be checked.
4. Interrupt the circuit of the Enable1 circuit at encoder terminal X73; the axis must be de-energised (no torque), respectively stop rotating, immediately.
5. Re-activate the Enable1 input at terminal X73; clear errors within the amplifier.
6. Re-enable the same axis. Drive the axis, in case the torque cannot be checked.
7. Interrupt the circuit of the Enable2 circuit at encoder terminal X73; the axis must be de-energized (no torque), respectively stop rotating, immediately.
8. Re-activate the Enable2 input at terminal X73; clear errors within the amplifier.

13.5 Demands on the Safety System

This paragraph is to describe the safety requirements that can be met by the system. They are based on the standards EN ISO 13849-1 and IEC 61508.

The following safety functions can be applied:

- Safe Standstill according to EN 954-1, category 3, and IEC 61508 SIL2
- Safe Standstill according to EN 954-1, category 4, and IEC 61508 SIL3
- Safe Standstill according to PL "e" to EN ISO 13849-1
- Restart inhibit according to EN 954-1, category 3, and IEC 61508 SIL2
- Restart inhibit according to EN 954-1, category 4, and IEC 61508 SIL3
- Restart inhibit according to PL "e" to EN ISO 13849-1

"Safe Standstill" is to be realised according to Stop Category 0 or Stop Category 1 according to EN 60204:

- Stop Category 0
After calling up the safety function, the power supply of the motor is switched off absolutely and immediately.
According to IEC 61800 Part 5.2, Stop Category 0 is also called STO (Save Torque Off).
- Stop Category 1
After calling up the safety function, the motor is deactivated in a controlled manner, while, after a set delay time, the power supply for the motor is switched off absolutely and immediately.
According to IEC 61800 Part 5.2, SLA (Safety-Limited Acceleration) is not kept in case of switching off via time-relay.

JM-2xx-S1 - Performance Level Classification to EN ISO 13849-1

Performance level "e" is based on the following data:

Structure:	Cat 3
MTTF _d :	high (> 100 years)
DC:	medium (DC _{avg} = 0.96)
PFH _d :	0 (all failures will result in a safe condition)

CCF Portion

Within the framework of this classification, the CCF ("Common Cause Failure") referred to in the standard mainly applies to the related application. Here we proceed from the assumption that the measures taken by R&D and application departments will ensure that the required score is achieved.

Basically, the following measures make sure that servo amplifiers of the JetMove 2xx avoid Common Cause Failures:

- Electrical isolation (optocoupler) from power supply units
- Compliance with clearances and creepage distances (layout and wiring)
- Overrating of components and derating

13.5.1 Control variants for "Safe Standstill"

- Controlling via safety relays
- OSSD control

OSSD: Online Switched Silicon Device (switched semiconductor)

Controlling the inputs "Safe Standstill" with test pulses for recognizing short circuits, shorts between contacts, or shunts of the control cable. The test pulses have a length of 1 ms and a repetition frequency of 100 Hz. At applying a control logic with OSSD signals, errors (e.g. short circuits or shorts between contacts) can be recognized by the logic circuit itself, and they will lead to switching off both signal ways.

The following signal waveforms are accepted by the OSSD signals without triggering an error message:

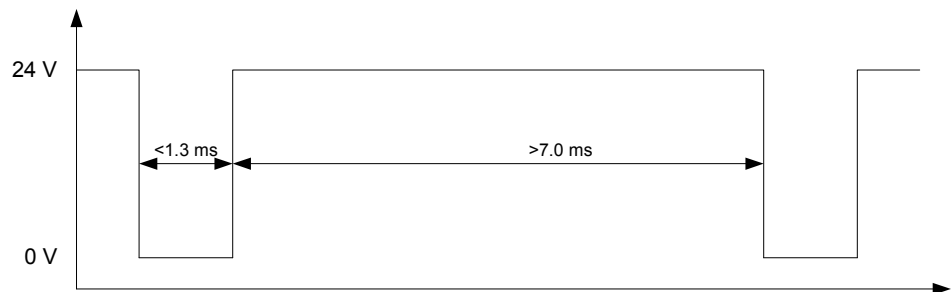


Fig. 24: Example: OSSD-signal waveform, single pulse

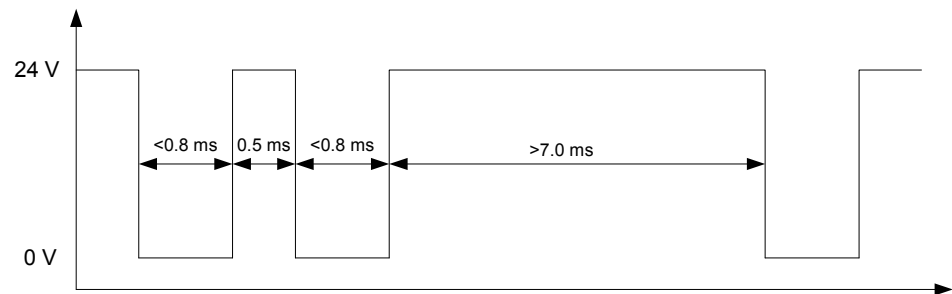


Fig. 25: Example: OSSD-signal waveform, dual pulse

The following figures show the basic illustrations of the respective applications.

13.5.2 Application 1

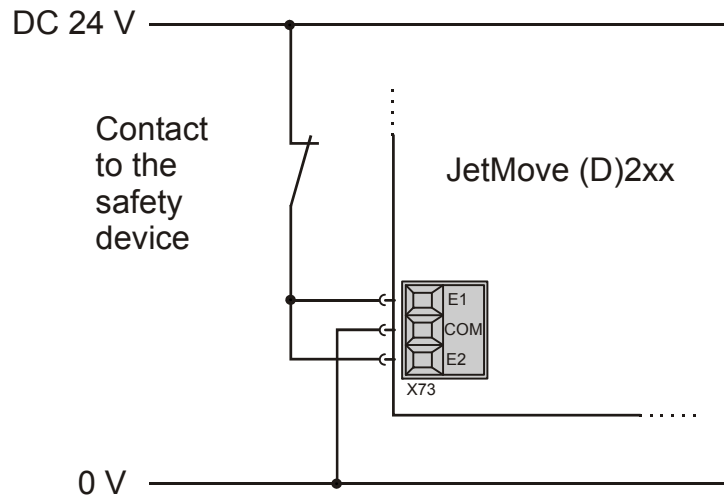


Fig. 26: Application 1

The safety device transmits a +24 V signal for activating the servo controller to the two parallel inputs Enable1 and Enable2. At calling up the safety function, the contact opens and thus blocks the enabling signal. The digital servo amplifier switches off the motor power supply safely. By opening the contact, the safety function can be tested. Deactivating the input leads to immediate switching off the motor (Stop Category 0). Give heed that the external safety devices (e.g. emergency stop device) are of the set safety category.

Following this example, "Safe Standstill" (according to EN 954-1 Category 1) with Stop Category 0 (according to EN 60204) can be set up, if all safety devices involved also meet the requirements of Category 1.

13.5.3 Application 2

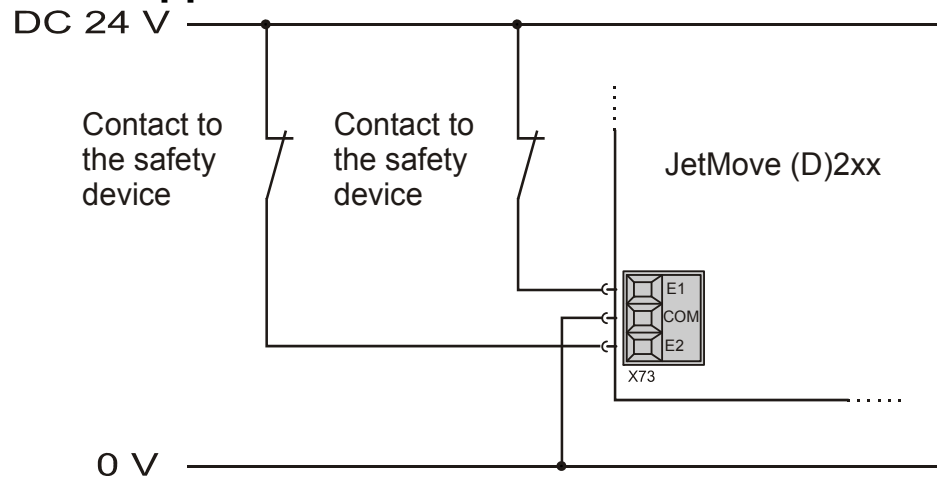


Fig. 27: Application 2

The safety device(s) transmit(s) a +24 V signal for activating the digital servo amplifier to the input Enable1 and Enable2 individually. At calling up the safety function, both contacts open and thus block the enabling signal. In case of an error, it is sufficient that at least one of those two contacts opens, in order to switch off the motor safely (dual-channel switch-off). Deactivating the inputs leads to immediate switching off the motor (Stop Category 0). By means of the wiring technology, a short, both between the contacts of the emergency stop device, and between the two lines, can be precluded.

As this application is not self-testing, proper function must be tested regularly. These tests are to prove freedom from faults of the entire system.

Following this example, "Safe Standstill" (according to EN 954-1 Category 2) with Stop Category 0 (according to EN 60204) can be set up, if all safety devices involved also meet the requirements of Category 2.

13.5.4 Application 3

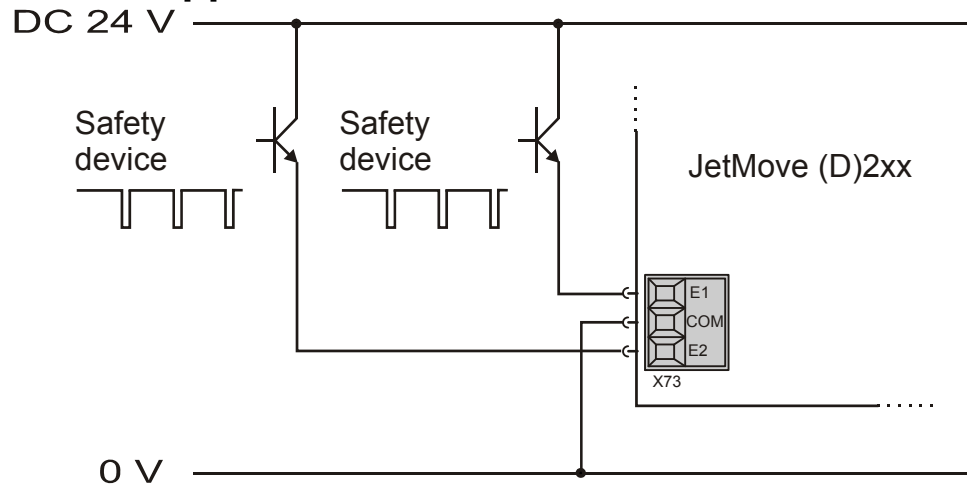


Fig. 28: Application 3

The safety device(s) transmit(s) a +24 V signal for activating the digital servo amplifier to the input Enable1 and Enable2 individually. There are alternating interruptions of 1 ms max. with each signal, which serve checking the signals for shorts between contacts, short circuits or interference voltages (OSSD-signals). This interruption of 1 ms max. will not lead to deactivating the servo amplifier, though. At calling up the safety function, the signals are omitted. This blocks the servo controller from being activated. In case of an error, it is sufficient that at least one of those two signals is omitted, in order to switch off the motor safely (dual-channel switch-off). Deactivating the inputs leads to immediate switching off the motor (Stop Category 0). Possible errors (such as short circuits, shorts between contacts, or a quadrature-axis component of voltage) can be recognized and safely controlled.

Following this example, "Safe Standstill" (according to EN 954-1 Category 3) with Stop Category 0 (according to EN 60204) can be set up, if all safety devices involved also meet the requirements of Category 3.

If the application allows for regular tests of the switch-off function, even the requirements of category 4 to EN 954-1 can be met by means of connections to fig. 28, if all safety measures taken also meet the requirements of category 4. The time intervals in between the test runs depend on the quality of the external controlling devices, yet they should exceed 24 hours.

13.5.5 Application 4

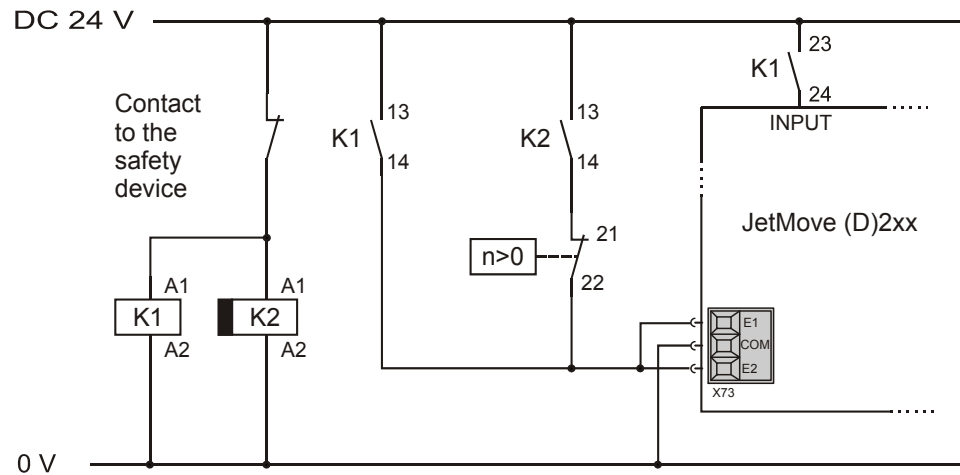


Fig. 29: Application 4

The safety device activates relay K1, which activates the digital servo amplifier via NOC 13-14 and the controller input "INPUT" via another NOC 23-24. The input must be configured either by the controller program or via the motion setup in a way that at 0 V, the emergency stop function of the servo amplifier is activated.

Simultaneously with relay K1, a dropout-delayed safety relay K2 is activated. Its NOC is series-connected to a contact monitoring the motor speed. The contact of the speed monitoring is closed, while the motor is running; it opens at zero speed. When the Safety function is called up, relays K1 and K2 are deactivated. By opening, the NOC 23-24 of K1 triggers a controlled braking process. The servo amplifier still remains active, until relay K2 also drops out due to the drop-out delay, or until the motor has come to a standstill due to the braking process that has been triggered. Deactivating the Enable1- and Enable2- inputs leads to switching off the motor immediately after a pre-defined delay time, respectively, after the motor has come to a standstill (Stop Category 1). In case switching off or braking fails, the time relay K2 limits the maximum runtime, in order to always grant safe switching off the power supply when the set time value has been reached. The option of stopping via the emergency stop function as shown in the example circuit "Application 4" need not necessarily be provided. The motion system can also be ramped down by a control instruction or by a mechanical brake.

Please make sure that the timing element (time relay) grants safe switching off.

Following this example, "Safe Standstill" (according to EN 954-1 Category 1) with Stop Category 1 (according to EN 60204) can be set up, if all safety devices involved also meet the requirements of Category 1.

Yet, the Safety Limited Acceleration (SLA) standard is not met.

This means that for driving the motor, both inputs Enable1 and Enable2 must be controlled. At calling up "Safe Standstill", the inputs must be de-energized. This way, supplying the driver levels and opto isolators will not be necessary any more; the same way, the DSP will recognise this at the status outputs. This causes the motor to come to "Safe Standstill".

In a fault condition it is sufficient to only deactivate only one path, as a phase sequence is not generated any more, if only the "upper" or only the "lower" IGBTs have been switched off.

For decoupling the control signals of the DSP, especially for excluding a faulty supply of the driver levels / opto isolator by the control signals of the DSP, all signals have been equipped with resistors of apt design and values at their interface.

The broken line marks the border between the safety-relevant components.



Note!

In spite of these safety precautions, the motor can jerk due to defective IGBTs. The possible rotation angle depends on the pole pair number of the motion system in use.

Pole Pair Number of the Motor	Possible Rotation Angle
1	180°
2	90°
3	60°
5	36°

Fig. 31: Possible rotation angle in case of defective IGBTs

In the risk analysis, this behavior must be taken into consideration. If this can lead to a hazard, the function is not apt for use in this case.

The possibility that this occurs is very low, though. If the unit for the failure rate of an IGBT is 100 fit (10E-7 per hour), the possibility of two IGBTs failing at the same time is 10E-14 per hour (several million years). Out of these, only 6 out of 15 cases lead to jerking. This means that practically, there is no possibility of this to happen. Moreover, the IGBTs are continually being checked at each commutation.

14 Counting Input (Option)

14.1 Function

For the digital servo amplifier JetMove 204-480, an optional integrated counter card can be ordered (article designation of the device: JM-204-480...-CNT). It supplies a counter input with the following interface:

- EnDat 2.2 by Heidenhain
- Synchronous Serial Interface (SSI)
- Incremental counter

The received or counted value of an actual position can be read via a JetMove register by the controller program or processed by the firmware of the JetMove in the controllers.

14.2 EnDat 2.2

14.2.1 Technical data

Technical Data EnDat 2.2 Input	
Encoder types	Single, multiturn, or linear absolute encoders
Scanning	62.5 μ s
Baud rate	8 MHz
Maximum cable length	100 m
Type of signal	5 V differential signal
Input impedance	22 k Ω
Bus termination	120 Ω integrated resistance
Electrical isolation	None

14.2.2 Description of connections

Specification of mating connector for X72

- 9-pin male SUB-D connector
- Metallised enclosure

EnDat cable specification

- Cable size: $2 * 2 * 0.14 \text{ mm}^2 + 2 * 0.25 \text{ mm}^2$ (AWG 26(4) + AWG 23(2))
 $2 * 0.25 \text{ mm}^2$ has to be used for power supply and GND wiring.
- The cables have to be twisted in pairs and must be included in an overall shielding.
- The following signal lines must be twisted in pairs:
 DATA- and DATA+
 Clock- und Clock+
 0 V and voltage supply
- The shield must be connected to the connector enclosures on both ends of the cable with the greatest possible surface area.
- Material: Copper
- Temperature class: 60 °C
- Maximum cable length: 100 m

14.2.3 EnDat cable with mating connector



Note!

The resolver-, HIPERFACE-, respectively EnDat mating connector of the synchronous servo motor series JL and JK can be ordered from Jetter AG by supplying the following particulars:

Art. no.15100069 Resolver / HIPERFACE

The complete HIPERFACE/EnDat cable between the servo amplifier series JetMove 2xx and the synchronous servo motor series JL, JK and JH can be ordered from Jetter AG.

It can be ordered by supplying the cable designation and the respective length in cm:

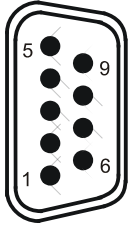
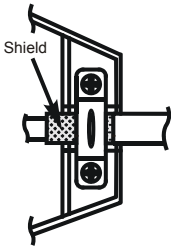
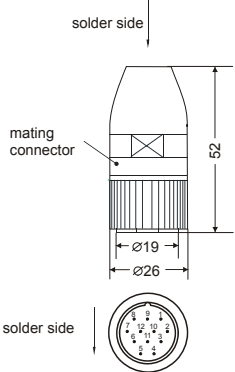
KAY_0723-xxxx For the servo amplifier series JetMove 2xx

HIPERFACE mating connector (solder side)

solder
side



Fig. 32: EnDat mating connector of the RC series (internal thread M23)

HIPERFACE-, EnDat Cable of KAY_0723-xxxx			
JetMove 2xx (SUB-D Connector X72)	Shielding		Motor (EnDat) (female, solder side)
 <p>Attaching screws must have a metric thread!</p>	 <p>5 * 2 * 0.25 mm²</p>		
	<p>Connect shield with the greatest possible surface area! Use metallized enclosure only!</p>		
Pin	Signal	Core color	Pin
-	Unassigned	-	1
-	Unassigned	-	2
7	DATA - (RS-485)	white	3
2	DATA + (RS-485)	brown	4
8	unassigned	green	5
3	unassigned	yellow	6
6	Clock - (RS-485)	gray	7
1	Clock + (RS-485)	pink	8
4	0 V	blue	9 *)
5	5 V power supply max. 200 mA	red	10
9	unassigned	black	11
	unassigned	-	12 *)

*) Pin 9 and pin 12 are short-circuited (thermal sensor HIPERFACE)
Dimensions of the EnDat mating connector are specified in millimeters.

14.2.4 Voltage supply encoder

The counter option card supplies a voltage of 5 V +/-5 %.

The EnDat encoders by Heidenhain have been specified to 3.6 through 5.25 V of 0.2 A max. This results in a maximum voltage drop of $\Delta U = 1.15$ V on the EnDat cable. The voltage drop can generally be calculated as follows:

$$\Delta U = \frac{2 \cdot I_n \cdot l}{\gamma \cdot A}$$

This results in the maximum cable length or in a minimum cable cross section:

$$l = \frac{\Delta U \cdot \gamma \cdot A}{2 \cdot I_n} = 161 \cdot \frac{\text{m}}{\text{mm}^2} \cdot A$$

$$A = \frac{2 \cdot I_n}{\Delta U \cdot \gamma} = \frac{\text{mm}^2}{161 \cdot \text{m}} \cdot l$$

By means of the instructions ΔU : Voltage drop in V

I_n : Current consumption by the measuring device in A

A : Cross section of the supply cable in mm^2

l : Cable length

γ : Electric conductivity: (for copper: $56 \frac{\text{m}}{\Omega \text{mm}^2}$)

Example:

At a cable cross section of 0.34 mm^2 , there results a maximum cable length of $l = 54.74 \text{ m}$ or - at a cable length of 80 m - the following cross section is needed:

$A = 0.5 \text{ mm}^2$.

By a double wiring arrangement, the cable length can be doubled.

14.3 Synchronous Serial Interface (SSI)

14.3.1 Technical data

Technical Data of the SSI Input	
Encoder types	Multiturn absolute encoder
Scanning	Up to 2 ms
Transmission frequency	100 kHz ... 1 MHz
Maximum cable length	50 ... 100 m
Type of signal	5 V differential signal
Input impedance	22 k Ω
Bus termination	120 Ω integrated resistance
Electrical isolation	None

14.3.2 Description of connections

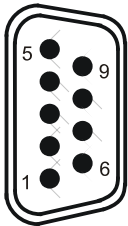
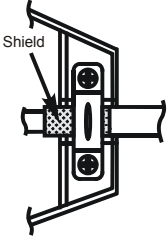
Specification of mating connector for X72

- 9-pin male SUB-D connector
- Metallized enclosure

Specification of SSI cable

- Cable cross section:
 $2 * 2 * 0.14 \text{ mm}^2 + 2 * 0.25 \text{ mm}^2$ (AWG 26(4) + AWG 23(2))
 $2 * 0.25 \text{ mm}^2$ has to be used for power supply and GND wiring.
- The cables have to be twisted in pairs and must be included in an overall shielding.
- The following signal lines must be twisted in pairs:
Clock- und Clock+
DATA- and DATA+
0 V and voltage supply
- The shield must be connected to the connector enclosures on both ends of the cable with the greatest possible surface area.
- Material: Copper
- Temperature class: 60 °C
- Maximum cable length: 100 m
Dependent on the encoder type, the transmission frequency has to be reduced due to the signal runtimes in long cables.

14.3.3 SSI cable

SSI Cable		
JetMove 2xx (Male SUB-D Connector X72)	Shielding	Specification of the Cable
 <p>Attaching screws must have a metric thread!</p>	 <p>Connect shield with the greatest possible surface area! Use metallized enclosure only!</p>	Encoder signal: 5 V difference signal Maximum cable length: 100 m
Pin	Signal	
1	Clock+	
2	DATA+	
3	do not use	
4	0 V	
5	Voltage supply 5 V, 200 mA max.	
6	Clock-	
7	DATA -	
8	do not use	
9	do not use	

14.4 Incremental Encoder

14.4.1 Technical data

Technical Data of the Incremental Encoder Input	
Encoder types	Rotatory or linear encoders
Scanning	62.5 μ s
Maximum counting frequency	20 MHz
Maximum cable length	100 m
Type of signal	5 V differential signal
Input impedance	22 k Ω
Bus termination	120 Ω integrated resistance
Electrical isolation	None

14.4.2 Description of connections

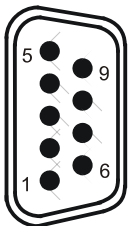
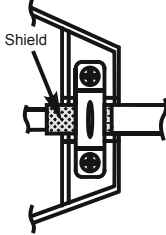
Specification of mating connector for X72 (ENCODER)

- 9-pin male SUB-D connector
- Metallized enclosure

Specification of the SSI cable

- Cable cross section:
 $3 \times 2 \times 0.14 \text{ mm}^2 + 2 \times 0.25 \text{ mm}^2$ (AWG 26(6) + AWG 23(2))
 $2 \times 0.25 \text{ mm}^2$ has to be used for power supply and GND wiring
- The cables have to be twisted in pairs and must be included in an overall shielding;
- The following signal lines must be twisted in pairs:
 K0- und K0+
 K1- und K1+
 K2- und K2+
 0 V and voltage supply
- The shield must be connected to the connector enclosures on both ends of the cable with the greatest possible surface area.
- Material: Copper
- Temperature class: 60 °C
- Maximum cable length: 100 m

14.4.3 Incremental encoder cable

Incremental Encoder Cable		
JetMove 2xx (SUB-D Connector X72)	Shielding	Specification of the Cable
 <p>Attaching screws must have a metric thread!</p>		Encoder signal: 5 V Difference signal Maximum cable length: 100 m
	<p>Connect shield with the greatest possible surface area! Use metallized enclosure only!</p>	
Pin	Signal	
1	K0+	
2	K1+	
3	K2+	
4	0 V	
5	Voltage supply 5 V, 200 mA max.	
6	K0-	
7	K1-	
8	K2-	
9	do not use	

15 Ordering Information

15.1 Document Survey

The documents listed below have been supplied on the website of Jetter AG at <http://www.jetter.de/Service Center> for download.

Programming



jm2xx_at_jetcontrol_bi_xxxx_user_information.pdf

User information on configuration and operation of the JetMove 2xx series at the JetControl 24x
Article no.: 60866114



jetmove_2xx_at_nano_bi_xxxx_user_information.pdf

User information on configuration and operation of the JetMove 2xx series at the NANO-B/C/D
Article no.: 60866113

15.2 Options

Designation	Ethernet Interface (Page 89)	Analog Input (Page 87)	Counting Input (Page 107)	Safe Standstill (Page 95)
JM-204-480				
JM-204-480-OEM	✓			
JM-204-480-IA1		✓		
JM-204-480-CNT			✓	
JM-204-480-S1				✓
JM-204-480-OEM-IA1	✓	✓		
JM-204-480-OEM-CNT	✓		✓	
JM-204-480-OEM-S1	✓			✓
JM-204-480-IA1-S1		✓		✓
JM-204-480-CNT-S1			✓	✓
JM-204-480-OEM-IA1-S1	✓	✓		✓
JM-204-480-OEM-CNT-S1	✓		✓	✓

Appendices

Appendix A: Recent Revisions

Style and spelling have been revised.

Appendix B: Glossary

Analog	A parameter, e.g. voltage, which can be adjusted steplessly. Contrasted with digital.
Autotransformer	Transformer without electrical isolation between primary and secondary circuit.
Ballast resistor	Resistor converting into heat the energy fed back to the drive during rheostatic braking or braking operation.
Circuit-breaker	A circuit-breaker without monitoring function. Also known as automatic circuit-breaker.
DC link voltage	DC circuit within a servo drive on the basis of which the motor currents are generated.
Digital	Presentation of a parameter, e.g. time, in the form of characters or figures. This parameter in digital representation can be changed in given steps only. Contrasted with analog.
Electromagnetic Compatibility (EMC)	Definition according to the EMC regulations: "EMC is the ability of a device to function in a satisfactory way in an electro-magnetic environment without causing electromagnetic disturbances itself, which would be unbearable for other devices in this environment."
Encoder	A feedback element that converts linear or rotary position (absolute or incremental) into a digital signal.
HIPERFACE	HIPERFACE is the name of a transducer system developed by Max Stegmann GmbH. The SinCos motor feedback system with standardised HIPERFACE is often used in digital drive technology. In contrast with the resolver, the SinCos motor feedback system with HIPERFACE interface contains electronic components.
Interference	(lat. interfere - to carry in) Superposition of waves.
JetMove 204-480	JetMove 2xx is the product designation of a digital servo amplifier series produced by Jetter AG. The extension marks the following features: <ul style="list-style-type: none"> – 204 identifies a rated current of 4 A; – 480 identifies an operating voltage of max 480 V;
Leakage-Current Protection Switch	A protection device that is monitoring whether the sum of all currents flowing into a circuit and out of it is zero. If the limit is exceeded, the circuit will be de-energized.
Line filter	A filter installed in the mains to suppress radio-frequency interferences in the supply voltage.
Motor circuit-breaker	A circuit-breaker with monitoring functions of phases and temperature of a motor.
Primary circuit	Incoming circuit of a transformer.
Process	A program or a part of it. A related sequence of steps carried out by a program.

Register(s)	A high-speed memory for a group of bits placed in a microprocessor or in another electronic device where data can be buffered for a specific purpose. On JETTER controllers, usually, these are 32 bit wide storage positions in a remanent RAM.
Resolver	Built-on accessory of an electric motor serving as position transducer. A resolver is a position transducer continuously measuring motor shaft position. The resolver itself does not contain any electronic components.
Secondary circuit	Output circuit of a transformer.
Sensor	Electronic detector, pick-up.

Appendix C: List of Abbreviations

AC	A lternating C urrent
cf.	cf. = see
DC V	D irect C urrent V oltage
e.g.	e.g. (lat.: exempli gratia) - for example
EMC	E lectro M agnetic C ompatib i lity
COI	E arth-leakage current b reaker
GND (Ground)	G round:
HIPERFACE	H igh P erformance I nter f ace
Hz	Hertz
IEC	I nternational E lectrotechnical C ommission Internationale Elektrotechnische Kommission
IP	I nternational P rotection
JX2-SBK1	J etter E xtended M odule 2 - S ystembuskabel 1 = S ystem B us C able. The numeral 2 stands for PROCESS-PLC and JetControl 200
LED	L ight E mitting D iode
n	Speed
PE	P rotective E arth
PELV	P rotective E xtra L ow V oltage
PFC	P ower F actor C ontrol
P _V	Power loss
PWM	P ulse W idth M odulation
RS485	RS : R ecommended S tandard - an accepted industry standard for serial communications connections. RS 485 is used for transmission distances over 15 m, two lines for differential mode evaluation; transmitting and sending on the same line.
SELV	S afe E xtra L ow V oltage: Voltage up to 60 V, galvanically separated from the network.
SUB-D	Type name of a plug-in connector
Temp	T emperature
U	Electric voltage (potential difference)

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