JetMove 215-480

Drive

JetWeb

User Manual

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This User Manual is an Integral Part of the JetMove 215-480:

Model:	
Serial No:	
Year of Manufacture:	
Order No:	

CE

To be entered by the customer:

Inventory No:	
Place of Operation:	

Significance of this User Manual

This user manual is an integral part of the digital servo amplifier JetMove 215-480.
- Therefor it must be kept in a way that it is always at hand until the digital servo amplifier JetMove 215-480 will be disposed of.
- Pass this manual on if the JetMove 215-480 is sold or loaned/leased out.

In any case you encounter difficulties to clearly understand the manual, please contact the manufacturer.
We would appreciate any kind of suggestions and contributions on your part and would ask you to inform or write 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 215-480 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 215-480 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

Revision	Comment
1.11	Original issue in English
1.2	Operating conditions, electrical specification, coupling of DC link voltage, external ballast resistor and error messages more detailed. Addresses of subsidiaries corrected
1.3	Revision of many chapters for better description and according to the requirements of UL

For more detailed information see “Recent Revisions” , page 83.

Description of Symbols

Danger

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

Caution

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.

Table of Contents

Appendices

1 Safety Instructions

1.1 General Information

The digital servo amplifier JetMove 215-480 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:
- relevant accident prevention regulations;
- accepted safety rules;
- EC guidelines and other country-specific regulations.

1.1.1 Usage as agreed upon

Usage as agreed upon includes operation in accordance with the operating instructions.

The digital servo amplifier JetMove 215-480 may only be operated in the enclosed control cabinet and within the range of the set values.
Do not apply a voltage to the digital servo amplifier JetMove 215-480 that is higher than the prescribed operating voltage.

Each of the three phases of the digital servo amplifier JetMove 215-480 has got an operating voltage ranging between AC 340 V and AC 530 V. Thus, the digital servo amplifier JetMove 215-480 comes under the EG Low Voltage Directive.

It is the explicit purpose of the digital servo controller JetMove 215-480 to torque-, speed- and/or position-control, and to drive brushless synchronous servo 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 215-480 is used to control machinery, such as conveyors, production machines, and handling machines.

1.1.2 Usage other than agreed upon

The digital servo amplifier JetMove 215-480 must not be used in technical systems which to a high degree have to be fail-save, e. g. ropeways and aeroplanes.

If the digital servo amplifier JetMove 215-480 is to be run under operating conditions, which differ from the conditions mentioned in chapter 3 "Operating Conditions", page 27, the manufacturer is to be contacted beforehand.

1.1.3 Who may operate the servo amplifier JetMove 215-480?

Only instructed, trained and authorised persons are permitted to operate the digital servo amplifier JetMove 215-480.

Transport:	Only by persons with knowledge in handling electrostatically sensitive components.
Installation:	Only by specialists with training in electrical engineering.
Commissioning:	Only by specialists with extensive knowledge of and experience with electrical engineering / drive technology.

1.1.4 Modifications and alterations to the module

Due to safety reasons, no modifications and alterations to the digital servo amplifier JetMove 215-480 and its functions are allowed.
Any modifications to the servo amplifier JetMove 215-480 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 215-480. 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 215-480.

For any damages resulting from the use of non original parts and equipment any claims with respect to liability of Jetter AG are excluded.

1.1.5 Repairing and servicing the servo amplifier JetMove 215-480

Repairs at the digital servo amplifier JetMove 215-480 must not be carried out by the operator. The digital servo amplifier JetMove 215-480 does not contain any parts to be repaired by the operator.
For being repaired, the servo amplifier JetMove 215 -480 must be sent to Jetter AG.

The digital servo amplifier JetMove 215-480 is maintenance-free. Therefore, no inspection or maintenance are required for the operation of the module.

1.1.6 Decommissioning and disposing of the digital servo amplifier JetMove 215-480

The environmental regulations for the respective country apply to shutting down and disposing of the digital servo JetMove 215-480 amplifier on the operating company's premises.

You can disassemble the digital servo amplifier JetMove 215-480 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 215-480 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 note chapter 1.3 "Residual Dangers", page 15.
- Safety and protective devices, e.g. the barrier and cover of the terminal box must not in any case 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 215-480 from the mains.**
  Please note chapter 1.3 "Residual Dangers", page 15.
- Malfunctions or other damages are to be reported to an authorised person at once.
- Secure the digital servo amplifier JetMove 215-480 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 are to be exchanged.

1.2.3 Earthing procedure

- Screw the enclosure of the digital servo amplifier JetMove 215-480 onto a highly conducting, earthed panel.

- Do only use the digital servo amplifier JetMove 215-480 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 unsymmetrically earthed networks.

- **The digital servo amplifier JetMove 215-480 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 (min. 2.5 mm^2 / AWG 14).
  - A durable connection with the power supply of the digital servo amplifier JetMove 215-480 must be provided.
  - Correct cabling of the PE (GND) bus according to the connection diagram (cf. chapter 10 "Connection Diagrams", page 75) must be carried out.

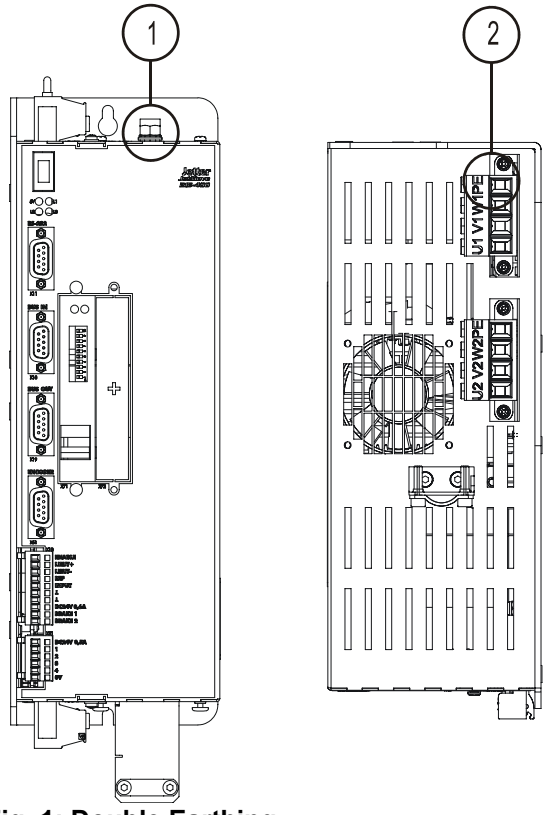


Fig. 1: Double Earthing

Important!

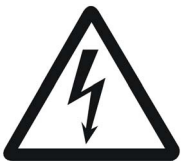
- Do not install an earth-leakage current breaker in the power supply network.

Do not install a earth-leakage current breaker in the supply line.
If, in spite of this, a earth-leakage current breaker is installed, it will switch off the digital servo amplifier JetMove 215-480, although there is no fault.
When a earth-leakage current breaker needs to be installed in the JetMove 215-480, an isolating transformer must be used.

1.3 Residual Dangers

1.3.1 Hazards during operation

HAZARD caused by high operating voltage!



Danger

Extremely hazardous voltages of up to 850 V may occur!

These voltages lead to muscle cramps, burns, unconsciousness, respiratory standstill, and death.

- During operation, all coverings and control cabinet doors must be kept closed.
- Do not open the device.
- Do by no means disconnect the electric connections of the digital servo amplifier JetMove 215-480 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

Danger

CAUTION! Hot Surfaces!

Caution

During operation, the surfaces, respectively the heat sinks of the digital servo amplifier JetMove 215-480 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 215-480 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 215-480

DANGER in potentially explosive atmosphere!

Danger

Do not operate the digital servo amplifier JetMove 215-480 in a potentially explosive atmosphere.

DANGER of injuries caused by mechanic force!

Caution

The digital servo amplifier JetMove 215-480 runs a servo motor. This servo motor moves mechanic parts or sharp edges. Therefore, failure or malfunctioning of the digital servo amplifier JetMove 215-480 can be dangerous for man or damage the manufacturing plant to an amount depending on the respective kind of plant. This should be prevented by installing additional safety precautions.

- One safety precaution is to install a second set of limit switches to interrupt the power supply of the motor.
- Another safety precaution would be installing a protection cover.

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

Do not dismount any necessary protective covers.

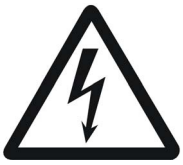
Danger

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

Never touch a rotating drive shaft.

1.3.2 Hazards after POWER has been turned OFF

DANGER resulting from electric shock!



Danger

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 215-480 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 the cables is important.

Important!

Measures for increasing immunity to interfering in electric plants:

- Earth the device adequately according to chapter 1.2.3 "Earthing procedure", page 13.
- Connect all grounding terminals of the JetMove 215-480. A double grounding terminal will be needed!
  – Connect the earth to the cover. For this please refer to Fig. 1 on page 13.
  – Connect protective earth (PE / GND) at terminal X1
- The distance between the optional line filters and the digital servo amplifier JetMove 215-480 must be as short as possible.
- When of a motor cable with included brake lines is used, these brake lines must be shielded separately .
- Please 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 **both sides** of the cable.
- 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:

- Only use metallised connectors, e.g. SUB-D with metallised housing. Please take care of direct connection of the strain relief with the housing here as well (see Fig. 2).

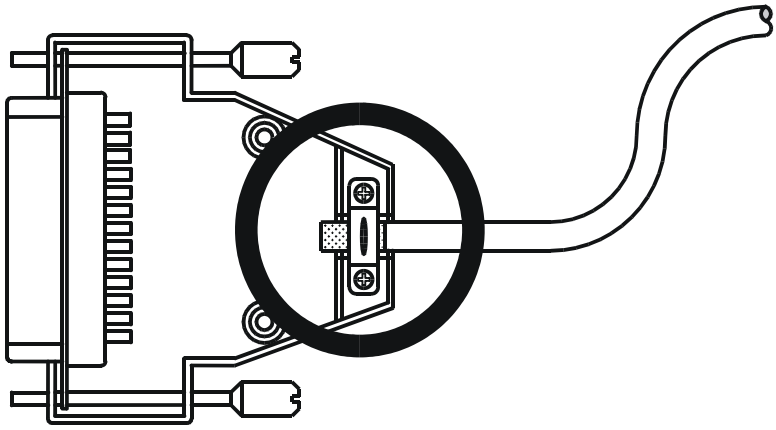


Fig. 2: Shielding of SUB-D connectors in conformity with the EMC standards.

If the shield cannot be connected directly at the connector, e.g. when signal lines are connected to scew terminals:

Shield and cable strap must be connected with low impedance to earthed surfaces. Earthing must be done in a way that keeps the unshielded part of the signal lines as short as possible.

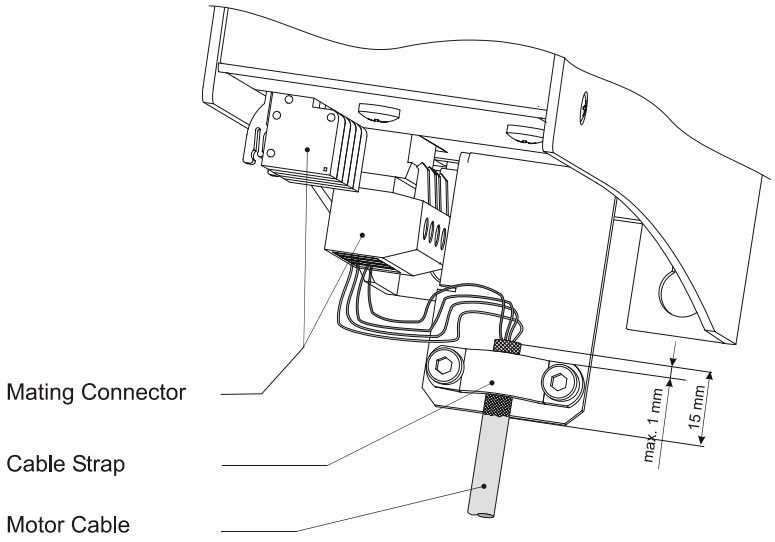


Fig. 3: EMC-compatible connection of motor cables

2 Installing the JetMove 215-480

2.1 Scope of Delivery

- Digital servo amplifier JetMove 215-480
- Mating connectors, plugged
- 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.)

- Interconnecting cable with cable confection # 530 x.x m; length: 0.2 m through 5.0 m
- Motor connecting cable, see chapter 7 "Description of Connections", page 41
- Resolver cable, see chapter 7 "Description of Connections", page 41
- Motors, e.g. AC servo motors of the Jetter motor series JK or JL
- Motor circuit-breaker, see chapter 5 "Technical Data", page 33
- Circuit-breaker, see chapter 5 "Technical Data", page 33
- Motor overtemperature protection, see chapter 7 "Description of Connections", page 41
- Mounting screws, 2 pcs.; refer to Fig. 5, page 31

Please 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 delivery package for completeness.

To ensure proper functioning of the JetMove 215-480 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 215-480 enclosure with mounting holes" on page 22.

Please make sure there is a clearance of at least 100 mm under and above the JetMove 215-480 - unobstructed ventilation must be ensured.

- Please mark on the panel two positions for the fastening screw threads of the JetMove 215-480 (see Fig. 4, page 22).
- Drill the holes and cut the thread 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 215-480 by the fitting bolts; then screw them tightly.

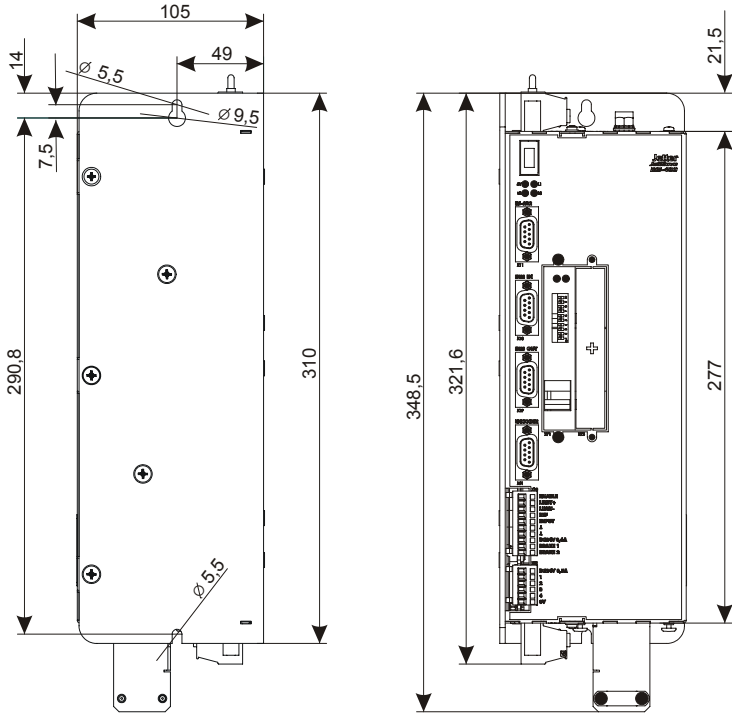


Fig. 4: Rear and front view of the JetMove 215-480 enclosure with mounting holes

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 36.

- Connect the JetMove 215-480 according to the connection wiring diagram shown in chapter 10 "Connection Diagrams", page 75.
  Especially check the power lines for appropriate protection, see “Branch circuit short-circuit protection" on page 33.
  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 13.

- To connect resolvers or power units you can use prefabricated cables available from Jetter or opt for self-made cables. Please refer to chapter 7 "Description of Connections", page 41.

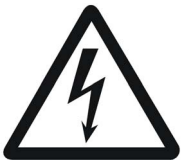
- To ensure that installation is carried out in conformance with EMC regulations, the following items have to be observed especially:
  – If possible, run control cables and power cables separately;
  – Connect the encoder (resolver or HIPERFACE encoder);
  – Use shielded terminals or EMC-compatible connectors;
  – Connect holding brake, if available, and connect shields on both sides of the cables;
  – Connect the motor leads according to Fig. 3, page 20,

  Please further note the chapter 1.4 "Instructions on EMI", page 18.

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

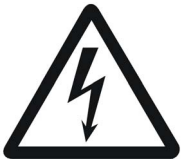
HAZARD caused by high operating voltage and electric shock!

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 "Who may operate the servo amplifier JetMove 215-480?", page 10.
- Switch off the operating voltage.
- Consider the warnings of residual dangers in chapter 1.3.2 "Hazards after POWER has been turned OFF", page 17.
- Before carrying out installation and maintenance jobs, separate the servo amplifier JetMove 215-480 and all connected devices from the mains (pull out the mains plug).

2.6 Safety Instructions for 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 "Who may operate the servo amplifier JetMove 215-480?", page 10.

What must be done before switching on:

- 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 215-480 against accidental contact with conductive parts and components.
- Only connect devices or electrical components to the signal lines of the digital servo amplifier JetMove 215-480 (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 215-480 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 13 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 (in original packaging)	Temperature: -25 °C .. 70 °C Air Humidity: 5%.. 95% no condensation	DIN EN 50178
Storage Conditions (in original packaging)	Temperature: -25 °C .. 55 °C change max. 20 K / h Air Humidity: 5% .. 95% no condensation 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, alcaline solutions, salts, metal va-pours, or other corrosive or electroconductive contaminants.	DIN EN 50178
Operating Altitude	Up to 1000 m above sea level. 1000 to 2500 m above sea level with derating of 1.5% / 100m	DIN EN 50178

Operating Parameters		
Mechanical Conditions		**Reference**
Transport stability	With original packing Device withstands tip over all of it's edges	DIN EN 50178 DIN EN 60068-2-31
Vibration Resistance	• 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	IP 20	DIN EN 60529
Mounting Position	Vertical (refer to Fig. 4 on page 22) For sufficient air flow there must be a clearance of 100 mm above and below the device	

Electrical Safety Conditions		Reference
Class of Protection	I	DIN EN 50178
Dielectric Strength Insulation	Power to Earth and Power to Logic 2.9 kV, 1 min Power to Earth and Power to Logic > 1 MOhm with 500 V	DIN EN 50178 DIN EN 60146-1-1 DIN EN 60204
Earth Connection	12 V, 10 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" are kept to.

EMC		
Emitted Interference		
Parameter	**Value**	**Reference**
Enclosure	• Frequency band 30 - 230 MHz, limit 30 dB (µV/m) at 30 m • Frequency band 230 - 1000 MHz, limit 37 dB (µV/m) at 30 m (class B)	DIN EN 61800-3
Power Line	• 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 with restricted sales distribution class to IEC/EN 61800-3. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

In this case additional line filters can be used. See “Line filter” on page 34.

EMC		
Interference Immunity: Enclosure		
Parameter	**Value**	**Reference**
RF Field, amplitude-modulated	Frequency band 80 -1000 MHz; test signal 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		
Parameter	**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	Test voltage 2 kV tr/tn 5/50 ns Repetition rate 5 kHz Criterion B	DIN EN 61800-3 DIN EN 61000-4-4
Puls Voltage	tr/th 1,2/50 µs, 8/20 µs 1 kV (coupling line to line) 2 kV (coupling line to earth) Criterion B	DIN EN 61800-3 DIN EN 61000-4-5
Interference Immunity: Process, Measuring and Control Lines		
Parameter	**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	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		
Parameter	**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	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

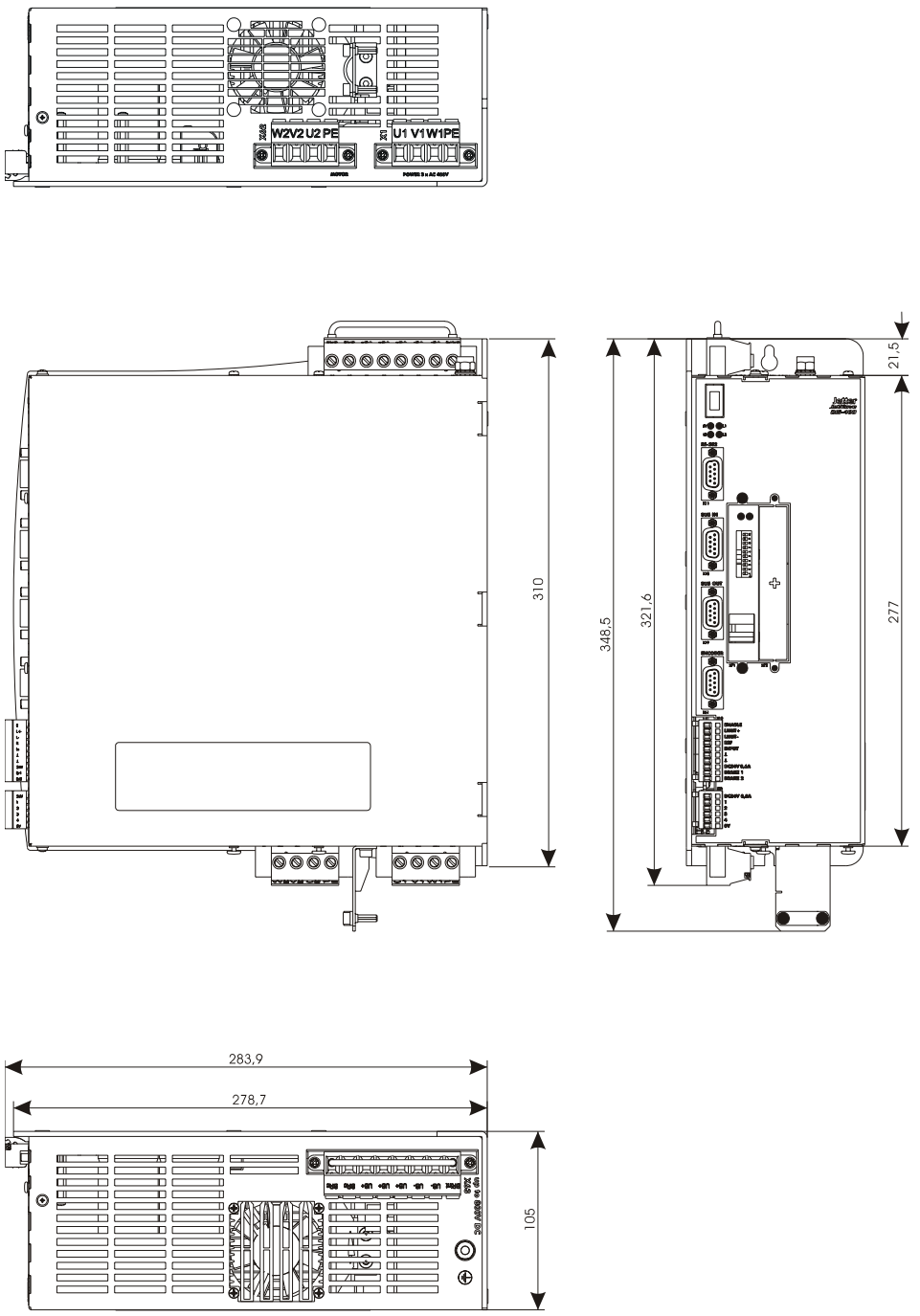


Fig. 5: Mounting dimensions of the JetMove 215-480 (in mm)

5 Technical Data

5.1 Electrical Specification

Electrical Specification	
Voltage of the rated power supply	• 3-phase • 48 ... 62 Hz (Frequency change 2 % / s max.) • Direct supply V_{rms} = 3 x 400/480 V (Common mode of the voltage 2 % max.) (Power dissipation 3 ms max.)
Power supply tolerance	-15 % ... + 10 %
Inrush current limitation	< 10 A limited to 500 ms during the switch-on-sequence
Branch circuit short-circuit protection	For each phase an external overload protection is required, for example – Circuit-breaker 32 A C – Fuse 32 A M (medium time-lag) – Motor circuit breaker 32 A For **systems with UL approval** use overload protection devices that are UL listed (acc. to UL 508)(NKJH) self protected combination motor controller (Specification: 480V, 32A). The JetMove 215-480 is suitable for use on a circuit capable of delivering not more than 50 k rms symmetrical Ampere, 600 Volt maximum.
Supply cable Cable size Material Temperature class	 4 * 2.5 mm^2 min. (AWG 14) copper > 60 °C
Motor output voltage	Three-phase with 560 V typical (850V max.)
Motor output current at an ambient temperature of 45 °C	Nominal current: I_{rms} = 15 A Peak current for 5 minutes maximum: I_{rms} = 30 A (The duration depends on the temperature of the heat sink) See “Note 1!” on page 35.
Continuous power of motor	5.5 kW (7.49 hp)

Electrical Specification	
Motor side short-circuit protection	Designed for: • phase to phase • phase to earth
Motor overload protection	Refer to “Motor Protection" on page 37
Motor cable Cable size Material Capacity Temperature class Max. length of motor cable	 4 * 2.5 mm^2 min. (AWG 14) copper < 150pF / m > 60 °C 50 m max. (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 used for the input circuit: – NEFB 10332 with I_r = 16 A – NEFB 10333 with I_r = 25 A – NEFB 10334 with I_r = 36 A See “Note 2!” on page 36.
Voltage supply of processor logics (demands on power supply module)	• 24 V DC (20 .. 30 V) • ≤ 0.6 A • The voltage output of the power supply unit must comply with the SELV or PELV type.
Internal ballast resistor	• Resistance: 100 Ω. • Continuous power: 250 Watt • Maximum capacity: 7 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 215-480" on page 56
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 17).
Leakage current	> 3.5 mA **See “Danger” on page 36.**

Electrical Specification	
Digital Inputs – Enable (E), – Reference switch (R); – Limit switch RH (L+), and – Limit switch LH (L+); – Input (Inp)	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. See “Digital Inputs, Logic Power Supply” on page 62.
Braking relay	V_{max} = DC 30 V I_{max} = DC 2 A Contact: Type NO connected to BR1 and BR2 on X10 These lines may be only connected to devices having the same ground potential than voltage supply of processor logics; Can be switched by the control program of PLC or by operating system of JetMove 215-480 together with software enable.
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	 4 Transistor pnp type 24 V 20 .. 30 V related to the ground potential of voltage supply of processor logics Max. 0.5 A per output None Short-circuit, overload, overvoltage, overtemperature protection Yes Typ. V_{Supply} - 1.5 V
Power loss P_v	max. 250 W

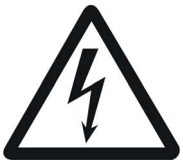
Note 1!

Active Cooling:
- the fan is activated at 60 °C and deactivated at 40 °C;
- the overtemperature protection is activated at 85 °C;
- the overtemperature alarm is activated at 75 °C;
- the duration of the peak current is measured at a starting temperature of 45°C at the heat sink

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 resulting from electric shock!



Danger

In order to prevent electric shocks, ground the digital servo amplifier JetMove 215-480 **by all means** via two positions; for this, refer to chapter 1.2.3 "Earthing procedure", page 13.

Compatible AC Servo Motors	
Motor types	Jetter motors of the JL and JK series, as well as Bautz motors of the M and F series. Please refer to "Jetter Motor Catalog" or contact the sales department of Jetter AG

Note!

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

5.2 Motor Protection

There are three ways of motor protection:

5.2.1 Built-in temperature sensor

JetMove 215-480 is able to run with three different temperature sensors:

Type of sensor	Type of evaluation of sensor
KTY83-110	Temperature is measured in °C Warning level is adjustable Error detection at max. temperature of motor
PTC	good or bad decision Error detection at max. temperature of motor
Temperature switch	good or bad decision Error detection at max. temperature of motor

5.2.2 I²t calculation

The digital servo amplifierJetMove 215-480 calculates the model of motor power loss by an I²t calculation. The calculated value is a measure of the average power loss of the motor and is calculated in percent of the maximum motor power loss.
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 in 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 variable of JetMove 215-480 through JetSym or the PLC.

The digital servo amplifier JetMove 215-480 calculates the percentage of motor power loss according to the following formula:

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

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 the calculated value always starts with value 0 (with (t = 0) the result of the equation is zero) and its change approaches zero for times much higher than the motor time constant.
The time till error stop (x = 100 %) is a result of the following formula:

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

After reset, the values of the important parameters are:
nominal current: 15 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 30 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 215-480 is switched on (i. e. at the time of parameters of I²t calculation are written after switching on 24V 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 1.15 times the user-set nominal current.

- If the average motor current corresponds to the trip current the overload protection must switch of 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 of the motor after at least 20 seconds.

This protection (error message 31 will occur) can be parameterized 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 215-480 is switched on (i. e. at the time of switching on the 24 V logic power supply).

6 Drive Controller Structure

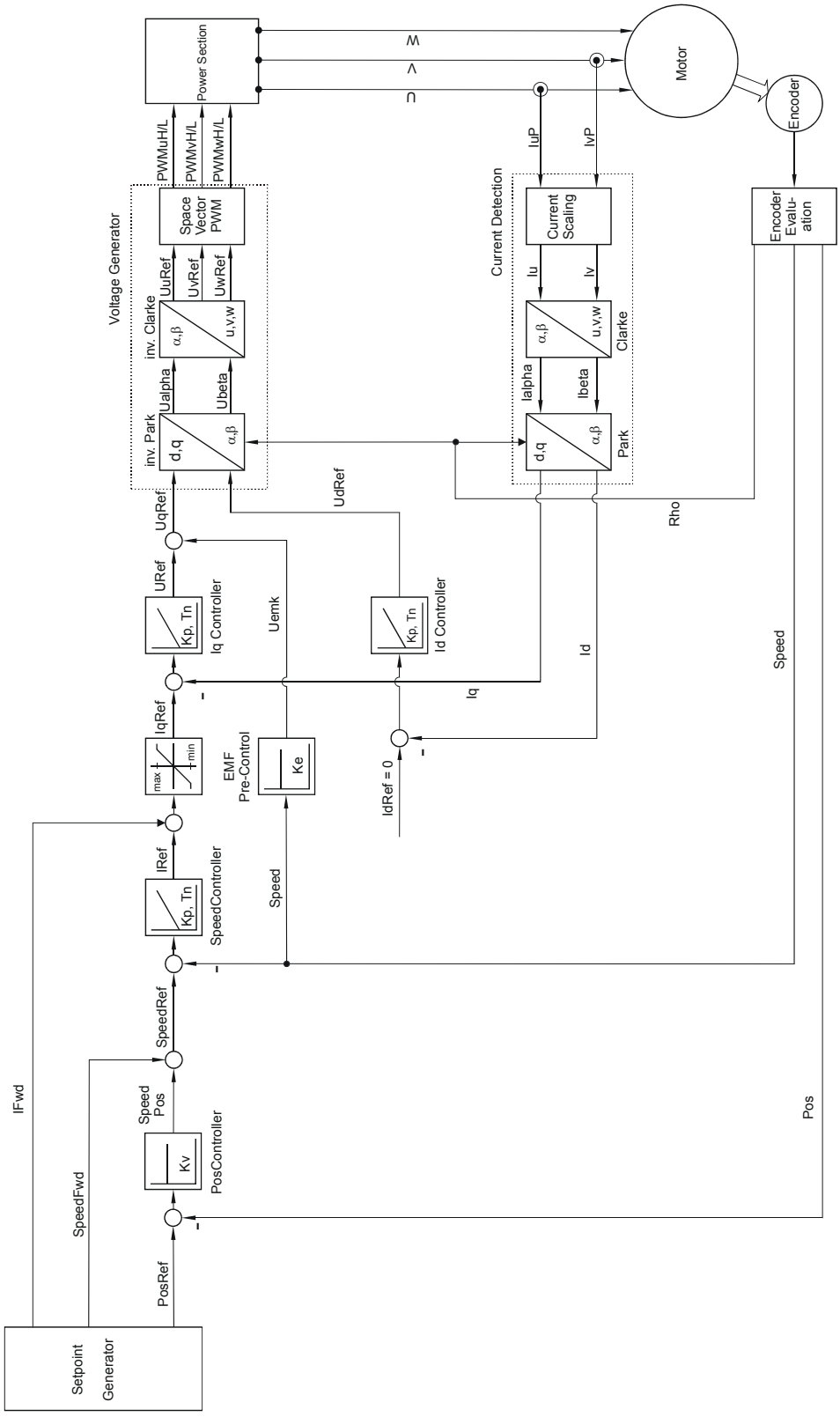


Fig. 6: Block Diagram of Drive Controller Structure

Drive controller specification

All drive controllers can be parameterized through the control program.

Function	Comment
Motor control (commutation)	Space vector modulation
PWM frequency	8 kHz
Current controller – Cycle time	 62.5 µs
Speed controller – Cycle time – Current pre-control	 125 µs adjustable
Position feedback controller – Cycle time – Speed pre-control	 250 µs 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 µs Hiperface 15 bits per revolution 20 bits per revolution 62.5 µs

7 Description of Connections

7.1 Power Supply Connection

Specification terminal X1

- 4-pole plug; screw connection (Type: Phoenix PC6/4-ST-10,16)
- Maximum cable size: 6 mm^2 (AWG 10)
- Torque: 1.2 .. 1.5 Nm (10.6 .. 13.3 lbf-inch)
- Ambient temperature: max. 45 °C
- Field wiring

Specification of cable

- Cable size: min 4 * 2.5 mm² (AWG 14)
- Material: copper
- Temperature class: 60 °C
- Length of stripped conductor end: 6 mm

Shielding

- Not required.

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

7.2 Motor Connection

7.2.1 General information

Important!

Alternative 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.
- The brake must be operated via separately shielded cables.

Important!

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

7.2.2 Specification

Specification terminal X62

- 4-pole plug (Typ: Phoenix PC6/4-ST-10,16)
- Cable size: max 6 mm^2 (AWG 10)
- Torque: 1.2 .. 1.5 Nm (10.6 .. 13.3 lbf-inch)
- Ambient temperature: max. 45 °C
- Field wiring

Specification of cable

- Cable size: min 4 * 2.5 mm² (AWG 14)
- Material: copper
- Temperature class: 60 °C
- Length of stripped conductor end: 6 mm

Shielding

- Braided copper shield of 80% coverage

Connection of the motor to the digital servo amplifier JetMove 215-480 has to be done following the wiring diagram below. (Connection of the brake is optional.)

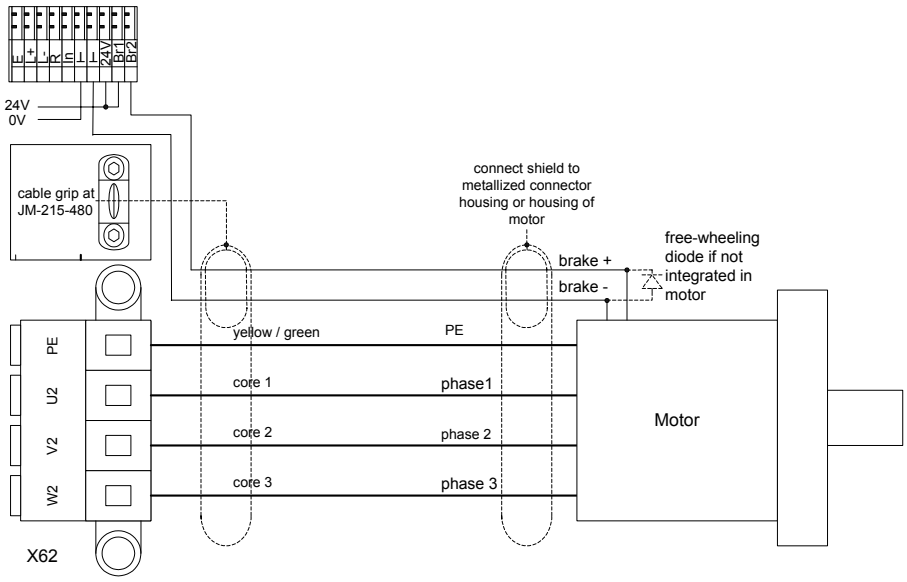


Fig. 7: Connection of motor lines

7.2.3 Motor power cable with mating connector SC

Note!

The suitable mating connector (female connector) of the synchronous servo motor series JL3, JL4, JK5, JK6 can be ordered from Jetter AG by supplying the following particulars:

Article # 15100070	Motor connector JL2-JL4/JK4-JK6 without brake
Article # 15100105	Motor connector JL2-JL4/JK4-JK6 with brake

Note!

The Jetter Motor power cable of the synchronous servomotor series JL3, JL4, JK5, JK6 can be purchased from Jetter AG. It is confectioned with the matching motor connector and can be ordered by the following cable confection numbers:

Without Brake:

Cable confection # 26.1

With Brake:

Cable confection # 24.1

Mating connector of the motor (solder side)

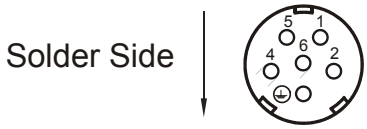


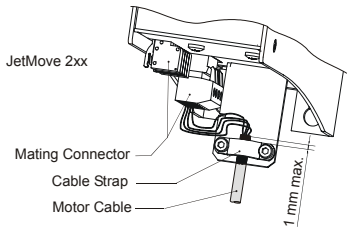
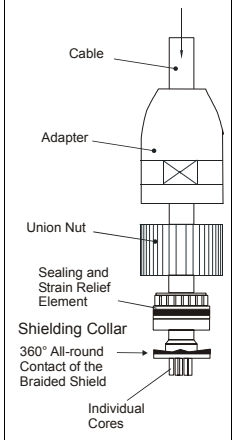
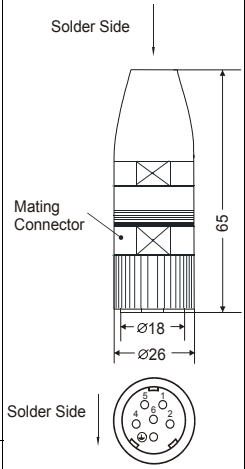
Fig. 8: View on the SC series mating connector of the motor (internal thread M23)

Motor power cable with mating connector SC for JetMove 215-480

Connection without motor brake

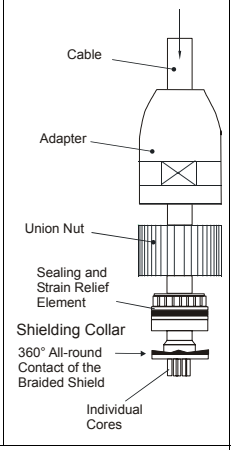
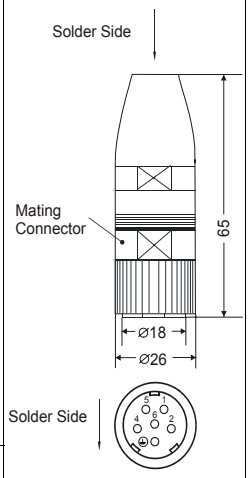
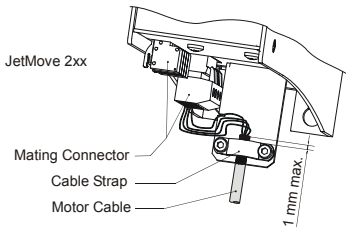
<table>
<tr><th colspan="4">Motor power cable - Cable confection # 26.1</th></tr>
<tr><td>Connecting terminals of JetMove 2xx</td><td colspan="2">Shield</td><td>Mating connector of the motor (female, solder side)</td></tr>
<tr><td>4 x 1.5 mm^2
(AWG 16(4))

The wires have been equipped with wire end ferrules.</td><td colspan="2">Shielded, highly flexible 4-wire cable with PE.(GND)

 
</td><td> 
</td><td> 
</td></tr>
<tr><td></td><td colspan="2">Connect both sides of the shield with the greatest possible surface area!
Use metallized housing only!</td><td></td></tr>
<tr><td>Pin</td><td>Wire Number</td><td>Signal</td><td>Pin</td></tr>
<tr><td>X62.U2</td><td>1</td><td>Phase 1</td><td>1</td></tr>
<tr><td>X62.V2</td><td>2</td><td>Phase 2</td><td>5</td></tr>
<tr><td>X62.W2</td><td>3</td><td>Phase 3</td><td>2</td></tr>
<tr><td>X62.PE
(GND)</td><td>Yellow-green</td><td>PE / GND conductor</td><td>  </td></tr>
</table>

Dimensions of the motor mating connector are specified in millimeters.

Connection with motor brake

Motor power cable - Cable confection # 24.1			
Connecting terminals of JetMove 2xx	**Shield**		**Mating connector of the motor (female, solder side)**
7 x 1.5 mm^2 (AWG 16(7)) The wires have been equipped with wire end ferrules.	Shielded, highly flexible 6-wire cable with PE.(GND)		
			
	Connect both sides of the shield with the greatest possible surface area! Use metallized housing only!		
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 conductor	⏚
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 (female connector) of the synchronous servo motor series JL5 - JL8 and JK7 can be ordered from Jetter AG by supplying the following particulars:

Article # 60860443 Motor connector JL5-JL8/JK7

Note!

The Jetter Motor power cable of the synchronous servomotor series JL5-JL8 and JK7 can be purchased from Jetter AG. It is confectioned with the matching motor connector and can be ordered by the following cable confection numbers:

Without Brake:

Cable confection # 201

With Brake:

Cable confection # 202

Mating connector of the motor (solder side)

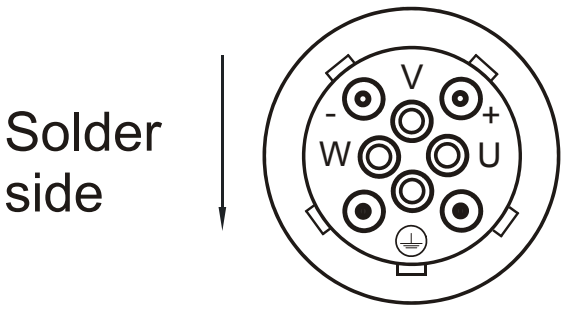
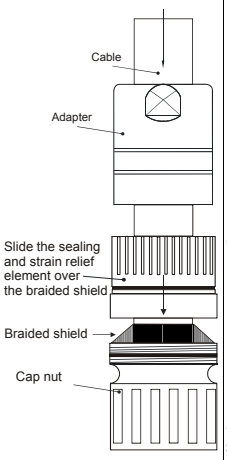
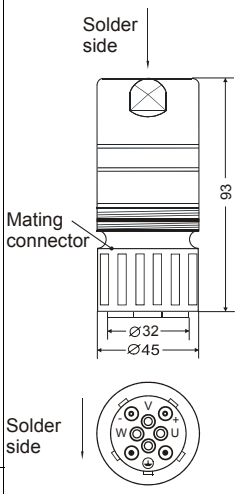
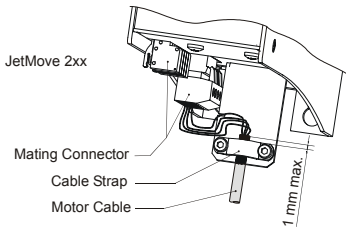


Fig. 9: SM series mating connector of the motor (internal thread M40)

Motor power cable with mating connector SM for JetMove 215-480

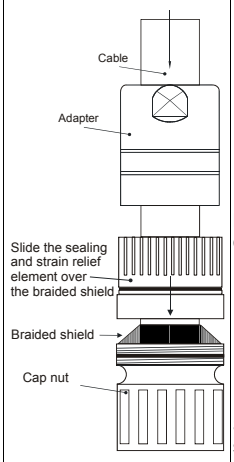
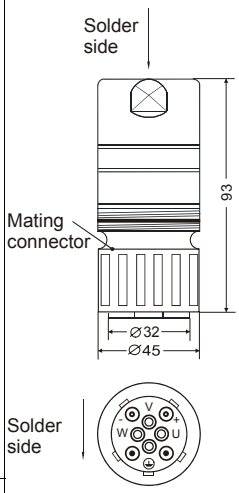
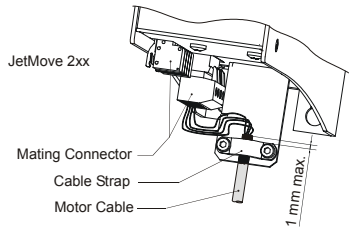
Connection without motor brake

Motor power cable - Cable confection # 201			
Connecting terminals of JetMove 2xx	**Shield**		**Mating connector of the motor (female, solder side)**
4 x 4 mm^2 (AWG 12(4)) The wires are equipped with wire end ferrules.	Shielded, highly flexible 4-wire cable with PE (GND).		
			
	Connect both sides of the shield with the greatest possible surface area! Use metallized housing only!		
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.

Connection with motor brake

Motor power cable - Cable confection # 202

Connecting terminals of JetMove 2xx	Shield		Mating connector of the motor (female, solder side)
4 x 4 + 2 x 0.5 mm^2 (AWG 12(4) + AWG 20(2)) The wires are equipped with wire end ferrules.	Shielded, highly flexible 6-wire cable with PE (GND).		
			
	Connect both sides of the shield with the greatest possible surface area! Use metallized housing only!		

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 Jetter Motor Series:		
Amplifier Terminals	**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 -

*) alternatively to motor connectors

7.3 Resolver Connection

7.3.1 Specification

Specification of mating connector for X61 (ENCODER)

- 9-pole Sub-D-plug (mail)
- Metallized housing

Specification of resolver cable

- Cable size: 3 * 2 * 0.14 mm² + 2 * 0.5 mm² (AWG 26(3) + AWG 20(2))
  2 * 0.5 mm² (AWG 20(2)) are for connection of the temperature sensor
- Cores have to be shielded and twisted in pairs and must be included in an overall shielding
- Shielding has to be connected to the connector housings on both sides
- Material: copper
- Temperature class: 60 °C
- Maximum cable length: 50 m

7.3.2 Resolver cable with mating connector

Note!

The resolver respectively HIPERFACE mating connector of the synchronous servo motor series JL5 can be ordered from Jetter AG by supplying the following particulars:

Article # 15100069 Resolver / HIPERFACE

The complete resolver cable connecting the servo amplifier series JetMove 2xx, as well as the synchronous servo motor series JL and JK can be ordered from Jetter AG by supplying the following cable confection number and specifications:

Cable confection # 23 for the servo amplifier series JetMove 2xx

Mating connector of the resolver (solder side)

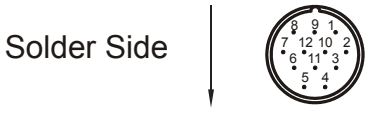
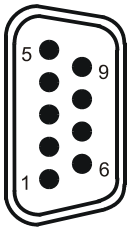
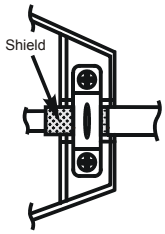
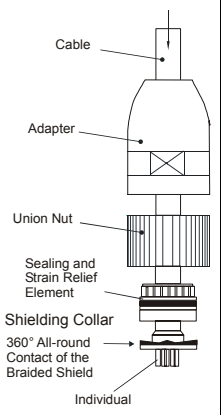
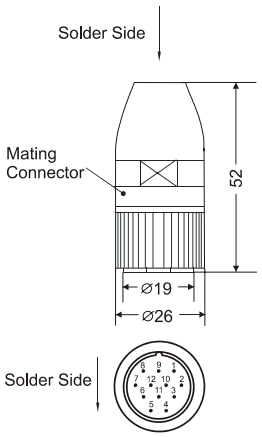


Fig. 10: RC series mating connector of the resolver (internal thread M23)

Resolver cable of cable confection # 23			
JetMove 2xx (SUB-D connector X61)	**Shield**		**Motor (Resolver) (female, solder side)**
 Attaching screws must have a metric thread!			
	Connect shield with the greatest possible surface area! Use metallized housing only!		
Pin	**Signal**	**Core Color**	**Pin**
8	S1 (cosine +)	red	1
3	S3 (cosine -)	blue	2
2	S4 (sine -)	yellow	3
7	S2 (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 motor mating connector are specified in millimeters.

7.4 HIPERFACE Connection

7.4.1 Specification

Specification of mating connector for X61 (ENCODER)

- 9-pole Sub-D-plug (mail)
- Metallized housing

Specification of HIPERFACE cable

- Cable size: 4*2*0.14 mm² + 2*0.5 mm² (AWG 26(4*2) + AWG 20(2))
  2 * 0.5 mm² (AWG 20(2)) are for connection of the power supply and GND signal
- Cores have to be twisted in pairs and must be included in an overall shielding
- The following signals must be twisted in pairs :
  Sine+ and reference sine
  Cosine+ and reference cosine
  DATA - and DATA +
  0 V and power supply
- Shielding has to be connected to the connector housings on both sides
- Material: copper
- Temperature class: 60 °C
- Maximum cable length: 50 m

7.4.2 HIPERFACE cable with mating connector

Note!

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

Article # 15100069 Resolver / HIPERFACE

The complete HIPERFACE cable connecting the servo amplifier series JetMove 2xx, respectively JetMove 6xx and the synchronous servo motor series JL and JK can be ordered from Jetter AG by supplying the following cable confection number and specifications:

Cable confection # 723 for the digital servo amplifier JetMove 2xx

HIPERFACE mating connector (solder side)

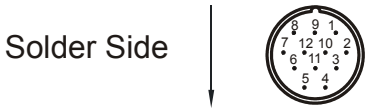
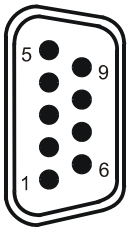
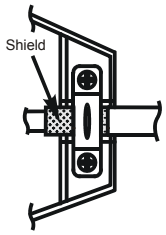
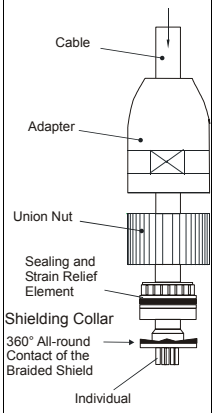
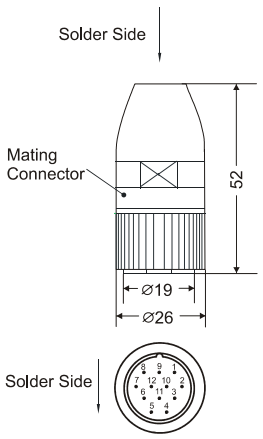


Fig. 11: RC series HIPERFACE mating connector (internal thread M23)

HIPERFACE cable of cable confection # 723

JetMove 2xx (SUB-D connector X61)	Shield		Motor (HIPERFACE) (female, solder side)
 Attaching screws must have a metric thread!			
	Connect shield with the greatest possible surface area! Use metallized housing only!		

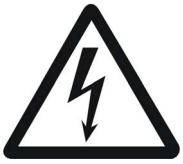
Pin	Signal	Core Color	Pin
-	Unassigned	-	1
-	Unassigned	-	2
7	Sine +	white	3
2	Reference sine	brown	4
8	Cosine +	green	5
3	Reference cosine	yellow	6
6	DATA - (RS-485)	gray	7
1	DATA + (RS-485)	pink	8
4	0 V	blue	9 *)
5	Power Supply (7 through 12 V)	red	10
9	Thermal sensor	black	11
	Thermal sensor	-	12 *)

*) Pin 9 and Pin 12 are short-circuited

Dimensions of the motor mating connector are specified in millimeters.

7.5 External Ballast Resistor and DC Link Connection

Connection of External Ballast Resistor and DC link Circuit of Another JM 215-480	
Amplifier Terminals X63	**Pin Assignment**
U_B-	Negative pole of DC link voltage
U_B+	Positive pole of DC link voltage
BR_{int}	Connection to internal ballast resistor (must be connected to BR_c for use of internal ballast resistor)
BR_c	Common line of ballast circuit



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:

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 215-480 or up to 7 minutes after having separated the JetMove 215-480 from the power supply.

Ballast system

When a mechanical system is braked by the motor the energy is fed 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.
JetMove 215-480 is delivered with an internal ballast resistor. If the power that is supplied back is to high for the internal resistor, an external ballast resistor can be added. It is also possible to run the JetMove 215-480 with an external ballast resistor only.

Use of internal ballast resistor (delivered condition)

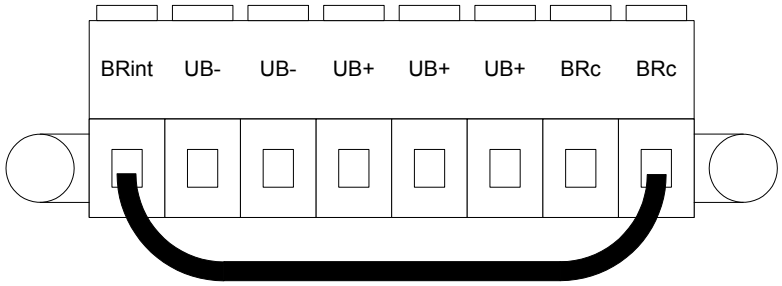


Fig. 12: Wiring of X63 for internal ballast resistor

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 when the JetMove 215-480 is delivered from JETTER AG.
JetMove 215-480 is measuring the load of the ballast resistor and sets a warning bit If the ballast load reaches a specific value. It 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

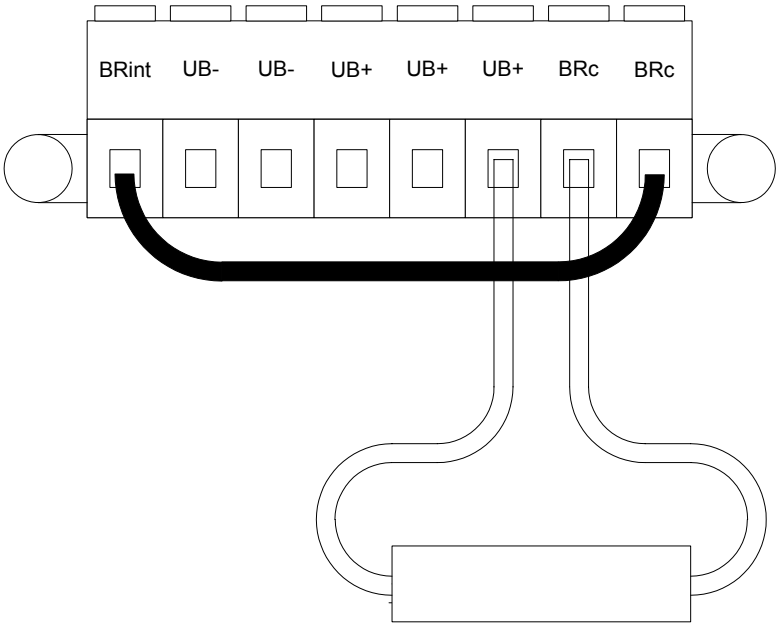


Fig. 13: Wiring of X63 for internal and external ballast resistor

Connect the external ballast resistor between one UB+ terminal and one BR_c terminal.

Parameters of external ballast resistor for this configuration:

Resistor value:	100 Ω
Continuous power:	250 W or higher
Peak power:	7 kW for 0.6 s
Type:	low inductivity

In this configuration the energy absorption is twice as much as in the configuration that uses the internal resistor only.
But half of the heat is still emitted inside the cover of the amplifier.

To avoid this, a third configuration can be chosen:

Use of external ballast resistor instead of the internal ballast resistor

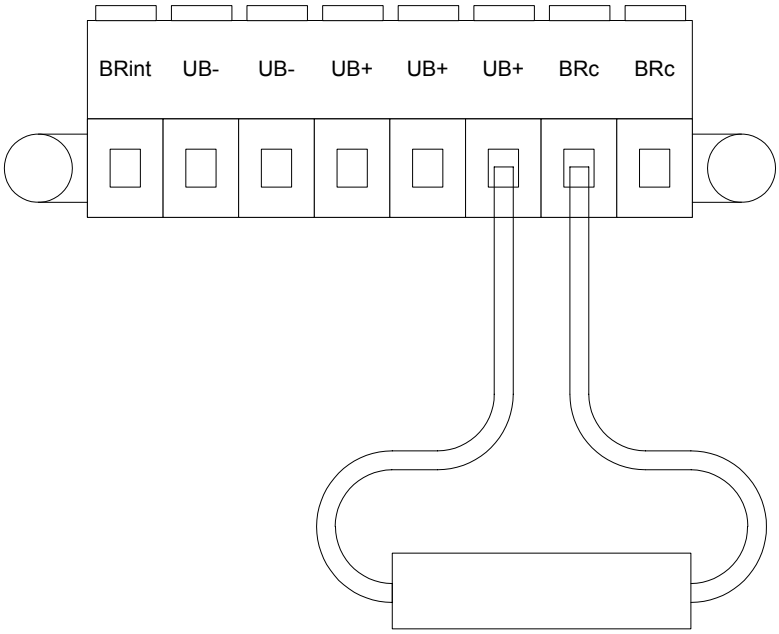


Fig. 14: Wiring of X63 for external ballast resistor only

Connect the external ballast resistor between one UB+ terminal and one BR_c terminal.
(Remove the bridge between BR_{int} and BR_c.)

Parameters of external ballast resistor in this configuration:

Resistor value:	100 Ω
Continuous power:	250 W or higher
Peak power:	7 kW for 0.6 s
Type:	low inductivity

This are the same values as that one oft the internal resistor.

Alternatively the resistor can have the following parameters:

Resistor value:	50 Ω
Continuous power:	500 W or higher
Peak power:	15 kW for 0.6 s
Type:	low inductivity

In this configuration the energy absorption is twice as much as in the configuration that uses only the internal resistor.
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 215-480

Another way to handle the energy coming back from the motor while braking is to couple the DC link circuits of several JetMove 215-480. In most cases, not all axes of a machine have to brake at the same time. So, other axes can use the energy coming back for acceleration.
The coupling reduces the heat inside the amplifier emitted by the ballast resistor and provides a higher dynamic if not all axes accelerate at the same time.

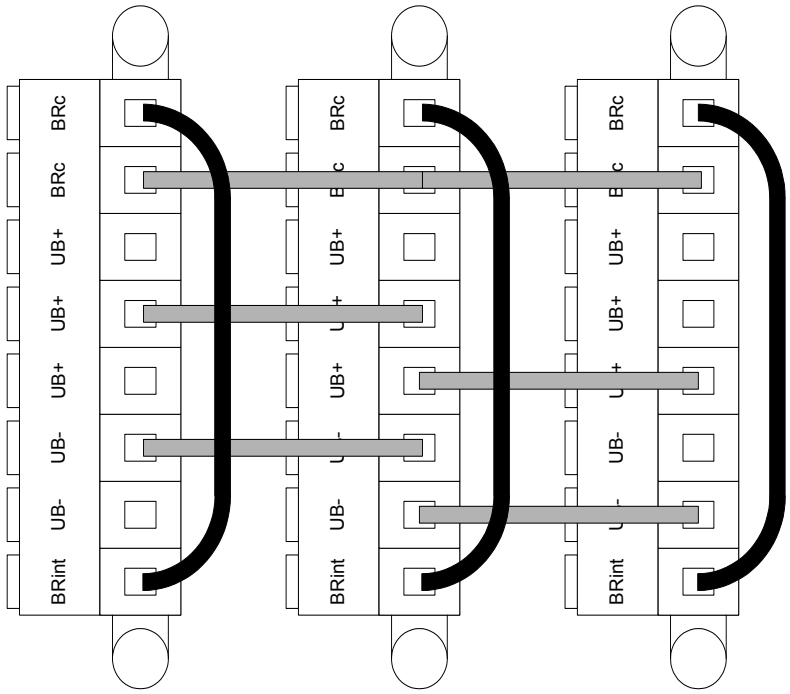


Fig. 15: Wiring of X63 for coupling DC link circuits of up to three JetMove 215-480

The coupling provides an even load for all internal ballast resistors. A special ballast circuit ensures that the braking energy which is not used by an other amplifier is equally distributed among all ballast resistors.

Important!

Requirements on the coupling of DC link circuits:

- Before connecting a coupled JetMove 215-480, completely connect all wires of X63.
  Otherwise the device could be damaged!
- Do not couple more than three JetMove 215-480.
- Do not couple JetMove 215-480 with other amplifier types.
- Do not release the other JetMoves 215-480 if one of the coupled devices is not ready for operation.
- The power supplies of coupled JetMoves 215-480 must be activated and deactivated simultaneously.
  For this reason, please connect the supply lines of the coupled JetMove 215-480 with exactly the same relays 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 215-480 is 0.5 m.

It is also possible to combine the coupling of DC link circuits with the use of external ballast resistors. In this case, it is important to use identical resistors and cables for all coupled JetMove 215-480.

7.6 Digital Inputs and Logic Power Supply Connection

Digital Inputs, Logic Power Supply			
Terminals X10 on the amplifier side	**Signal**	**Function**	**Specification**
ENABLE	Hardware Enable of motor power (input)	• High signal at this input is necessary for running the Motor (must be set before software enable) • Low signal de-energizes the motor immediately	• DC 24 V • max. 7.5 mA • Operating point: < 6 V low, > 15 V high
REF	Reference switch (input)	• Depending on parameter setting this input is used for reference run	• DC 24 V • max. 7.5 mA • Operating point: < 6 V low, > 15 V high NC or NO contact
LIMIT +	Positive limit switch (input)	• Depending on parameter setting this input is used as positiv limit switch.	• DC 24 V • max. 7.5 mA • Operating point: < 6 V low, > 15 V high NC or NO contact NC contact recommended
LIMIT -	Negative limit switch (input)	• Depending on parameter setting this input is used as negativ limit switch.	• DC 24 V • max. 7.5 mA • Operating point: < 6 V low, > 15 V high NC or NO contact NC contact recommended
INPUT	Digital Input	• Depending on parameter setting this input can be used for quick stop or capturing or referencing without stop	• DC 24 V • max. 7.5 mA • Operating point: < 6 V low, > 15 V high

⊥	Common ground		Ground*) for all inputs and logic power supply
⊥	Common ground	Relays	Ground*) for all inputs and logic power supply
DC 24 V	Voltage supply of processor logics		DC 20 .. 30 V (I < 0.8 A)
BRAKE 1	Braking relay contact Br1	Relay contact for motor brake. Can be switched by the control program of PLC or by operating system of JetMove 215-480 together with software enable. A free-wheeling diode is necessary if not integrated in the motor.	$V_{max.}$ = DC 30 V $I_{max.}$ = DC 2 A Contact: Type NO These lines may be only connected to devices having the same ground potential than voltage supply of processor logics;
BRAKE 2	Braking relay contact Br2		

*) is connected to the GND of the control system

For connection diagram please refer to “Connection Diagrams” ,page 75

7.7 Digital Output Connection

Digital Outputs		
Terminals X31 on the amplifier side	**Signal**	**Specification**
DC 24V	Power Supply for outputs	DC 20 .. 30 V with I = max. 2 A (max. 0,5 A per output)
1 2 3 4	Digital output signals (PNP outputs)	See “Digital Outputs", page 35
0 V	Common ground	Ground*) for limit, and reference switches, and enable

*) is connected to the GND of the control system

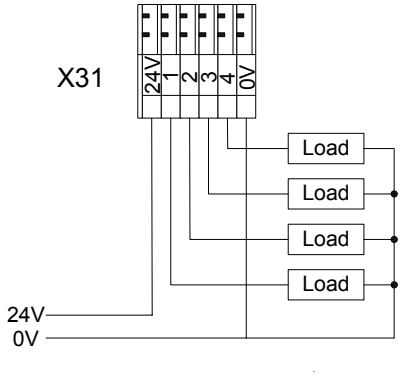


Fig. 16: Connection of digital outputs

7.8 Jetter System Bus

The Jetter system bus is used to connect the JetMove215-480 to the PLC and to other JetMoves or Jetter PLC modules. The system bus input BUS-IN is a 9-pole Sub-D male connector while the output BUS-OUT is a 9-pole Sub-D female connector

7.8.1 Specification of Jetter system bus

Specification of the mating connectors

On side of BUS-OUT (X19)
- 9-pole Sub-D-mail connector
- Metallized housing

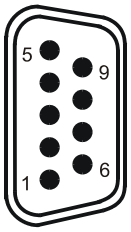
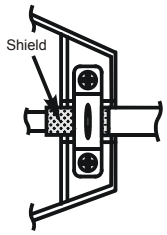
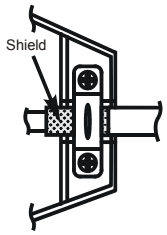
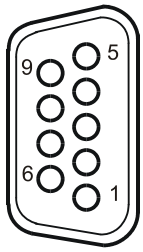
On side of BUS-IN (X18)
- 9-pole Sub-D-plug femail connector
- Metallized housing

Specification of the system bus cable

For manufacturing a system bus cable, the following minimum requirements are important:

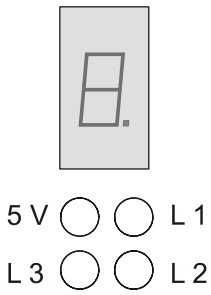
Technical Data of System Bus Cable		
Function	**Description**	
Cable size	1 MBaud:	0.25 to 0.34 mm^2 (AWG 24 to 22)
	500 kBaud:	0.34 to 0.50 mm^2 (AWG 22 to 20)
	250 kBaud:	0.34 to 0.60 mm^2 (AWG 22 to 19)
	125 kBaud:	0.50 to 0.60 mm^2 (AWG 20 to 19)
Capacity of cable	Maximum 60 pF/m	
Specific resistance	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, not paired	
Twisting	Cores CL and CH must be twisted	
Material	Copper	
Temperature class	60 °C	

Permissible Cable length			
Baud rate	**Max. cable length**	**Max. stub line length**	**Max. overall stub 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 with Cable-Conf. 530		
	Shielding	
	 	
BUS-OUT	Connect the shielding on both sides! Metallized housing necessary!	**BUS-IN**
Pin	**Signal**	**Pin**
1	CMODE0	1
2	CL	2
3	GND	3
4	CMODE1	4
5	TERM	5
6	n.c.	6
7	CH	7
8	n. c.	8
9	do not connect	9

8 Status Monitoring

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



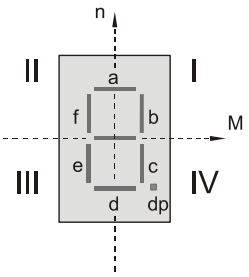
JetMove 215-480 - LEDs		
LED	**Colour**	**Meaning**
5V	Green	Logic module voltage is OK
L1	Yellow	Axis is standing still (speed = 0)
L2	Yellow	A voltage of 24 V is applied to the input of the positive limit switch (LIMIT+).
L3	Yellow	A voltage of 24 V is applied to the input of the negative limit switch (LIMIT-).

Note!

The 7-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 215-480 - 7-Segment Display Mode 0: Normal Operation		
Colour	**State**	**Meaning**
0	NOT READY TO BE SWITCHED ON	Initialization of amplifier functions
1	INITIALIZATION COMPLETE	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 215-480 - 7-Segment Display Mode 0: Normal Operation		
E	ERROR REACTION ACTIVATED	An error 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 is being deleted
E.	Flashing "E"	OS flash is being deleted
L.	Flashing "L"	OS loader being loaded
P.	Flashing "P"	OS is being transferred to the flash memory
U.	Flashing "U"	The boot sector waits for OS update



JetMove 215-480 - 7-Segment Display Mode 1: Commissioning		
Colour	**Meaning**	**Comment**
g	**n** $_{\text{Actual Value}}$ < 0.5 % **n** $_{\text{max.}}$	--
b	**M > 0, n > 0** --> quadrant I	Mode of operation - Motor
c	**M < 0, n > 0** --> quadrant II	Mode of operation - Generator
e	**M < 0, n < 0** --> quadrant III	Mode of operation - Motor
f	**M > 0, n < 0** --> quadrant IV	Mode of operation - Generator
a	Positive current limit has been reached	--
d	Negative current limit has been reached	--

9 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 215-480				
Error #	**Type of Error**	**Description**	**Effect**	**Troubleshooting**
F 00	Hardware Error	Internal hardware defect	– Immediate pulse disable	– Disconnect drive controller from power lines – Return the amplifier for repair
F 01	Error of internal voltage supply	One or more power supply voltages are beyond their limits.	– Immediate pulse 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 pulse disable	– Check fuses and wiring – Acknowledge failure
F 03	Motor cable breakage	The motor cable is broken Note: The motor cable is tested when the drive controller is enabled for the first time.	– Immediate pulse disable	– Check the motor cable connections – Acknowledge failure
F 04	Overvoltage in the DC link circuit	A DC link voltage > 850 V has been detected.	– Immediate pulse disable	– Check input voltage supply. – If the motor is used as generator, reduce the regenerating power – Acknowledge failure
F 05	Current overload	Output current was greater than 2.5 x rated current.	– Immediate pulse disable	– Check motor cable for short circuit between lines or lines to earth – Check current control parameters. If necessary, correct parameters – Acknowledge failure

Error Message Table JetMove 215-480				
Error #	**Type of Error**	**Description**	**Effect**	**Troubleshooting**
F 06	Ballast resistor overload	The ballast resistor has been overloaded	– Immediate pulse disable	– Let the drive controller cool down – After cooling down, acknowledge failure – Reduce regeneration power
F 07	Amplifier over temperature	The amplifier has reached the maximum temperature	– Immediate pulse disable	– Let the drive controller cool down – After cooling down, acknowledge failure – Reduce power of drive system
F 08	Motor overtemperature	The motor has reached the maximum temperature Refer also to “Built-in temperature sensor”, page 37	– Immediate pulse disable	– Let the motor cool down – After cooling down, acknowledge failure – Reduce the average load of the motor
F 09	Encoder failure	Encoder breakage or initialization error	– Immediate pulse disable	– For extended diagnostics purposes use motion setup – Check the encoder line and all plug-in connections – Acknowledge failure
F 10	Over speed	The actual shaft speed has exceeded a value of 1.25 x maximum speed	– Immediate pulse disable	– Check motor and encoder connections – Check speed controller parameters. If necessary, modify parameters – Acknowledge failure
F 11	Overshoot of current measuring range	A current temporarily too high has been detected	– Immediate pulse disable	– Reduce Kp of the current controller by 10 to 20 % – Acknowledge failure
F 12	Short circuit to earth	One or more phases of the motor cable or inside the motor have been short-circuited to earth	– Immediate pulse disable	– Check the motor cable and the motor – Acknowledge failure
F 13 (combined with F00)	Internal checksum error	An internal checksum error has occurred	– Immediate pulse disable	– Switch the 24 V supply off and on again – If the error occurs repeatedly, return the amplifier for repair

Error Message Table JetMove 215-480				
Error #	**Type of Error**	**Description**	**Effect**	**Troubleshooting**
F 14 (combined with F 00)	Internal communication error	An internal communication error has occurred	– Immediate pulse disable	– 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 pulse disable	– Disable the drive by means of the software – Acknowledge failure
F16	Power input over current	The current at the power input was to high	– Immediate pulse disable	– Check input voltage – Reduce mechanical power of the motor – Acknowledge failure
F 17	Trip of software limit switch	Actual position is outside the range of software limits and software limit switches are active	– Stop with max. current (torque)	– Check destination position – Acknowledge failure – Run axis back inside the range of software limits (software limit switches will be active automatically by entering this range)
F 18	Trip of hardware limit switch	One hardware limit switch was activated	– Stop with max. current (torque)	– Check destination position – Check reference position – Acknowledge failure – Run axis back inside the range of hardware limits (software limit switches will be active automatically at leaving the switch)
F 20	Undervoltage DC link voltage	The DC link voltage is less than the minimum value	– Stop with emergency stop ramp	– Check the voltage of the power line – Check parameter „DC link voltage - min. trip“ – Acknowledge failure
F 21	Overvoltage DC link voltage	The DC link voltage has exceeded the maximum value	– Stop with emergency stop ramp	– Check the voltage of the power line – In generator operation reduce braking power – Acknowledge failure

Error Message Table JetMove 215-480				
Error #	**Type of Error**	**Description**	**Effect**	**Troubleshooting**
F 22	The drive has stalled	The drive could not overcome the n = 0 threshold within the time limit specified by the parameter "blocking-triping time".	– Immediate pulse disable	– Eliminate the cause of stalling – Acknowledge failure
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	– 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 failure
F 24 (combined with F 01)	Error in 24 V supply voltage	External 24 V supply was lower than 18 V	– Immediate pulse disable	– Check external power supply – Acknowledge failure
F 25 - F 27 (combined with F 01)	Internal supply error	One or more internal supply voltages has fallen below their limit	– Immediate pulse disable	– Note the number of error – Return the amplifier for repair
F28	Error in power charging circuit	The input current limitation circuit is defective	– Immediate pulse disable	– Note the number of error – Return the amplifier for repair
F29	Mains power too high	The average mains power is too high	– Immediate pulse disable	– Acknowledge failure – Reduce the average load of motor
F30	I²t 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. See also to “I²t calculation”, page 37	– Immediate pulse disable	– Let the motor cool down – After cooling down, acknowledge failure – Check the configuration of nominal motor current, overload factor and motor time constant – Reduce the average load of motor

Error Message Table JetMove 215-480				
Error #	**Type of Error**	**Description**	**Effect**	**Troubleshooting**
F31	Motor Overload Protection According 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 38	– Immediate pulse disable	– Let the motor cool down – After cooling down, acknowledge failure – Reduce the average load of motor

Warnings

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

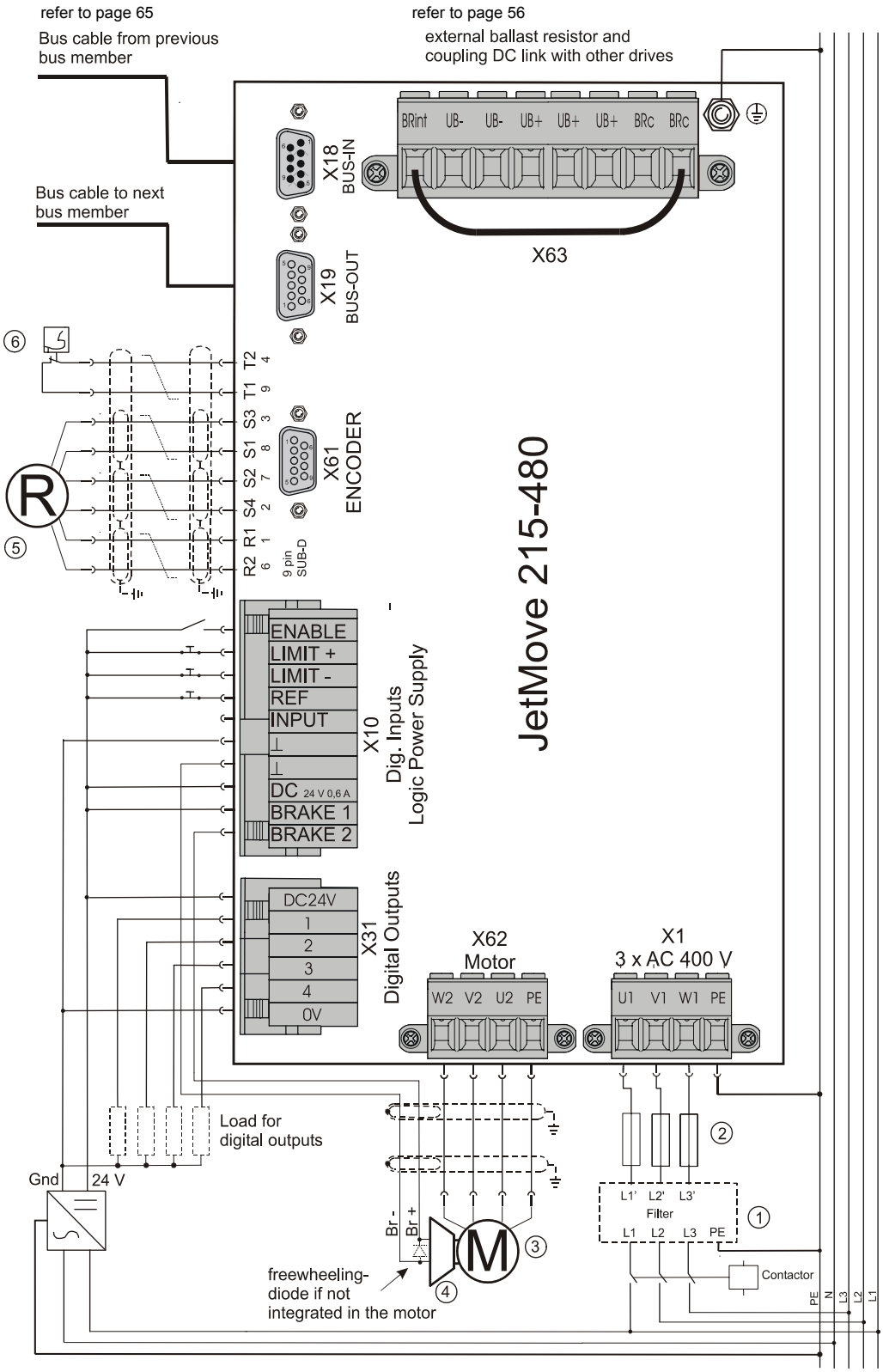


Fig. 17: Connection Diagram JetMove 215-480-RE

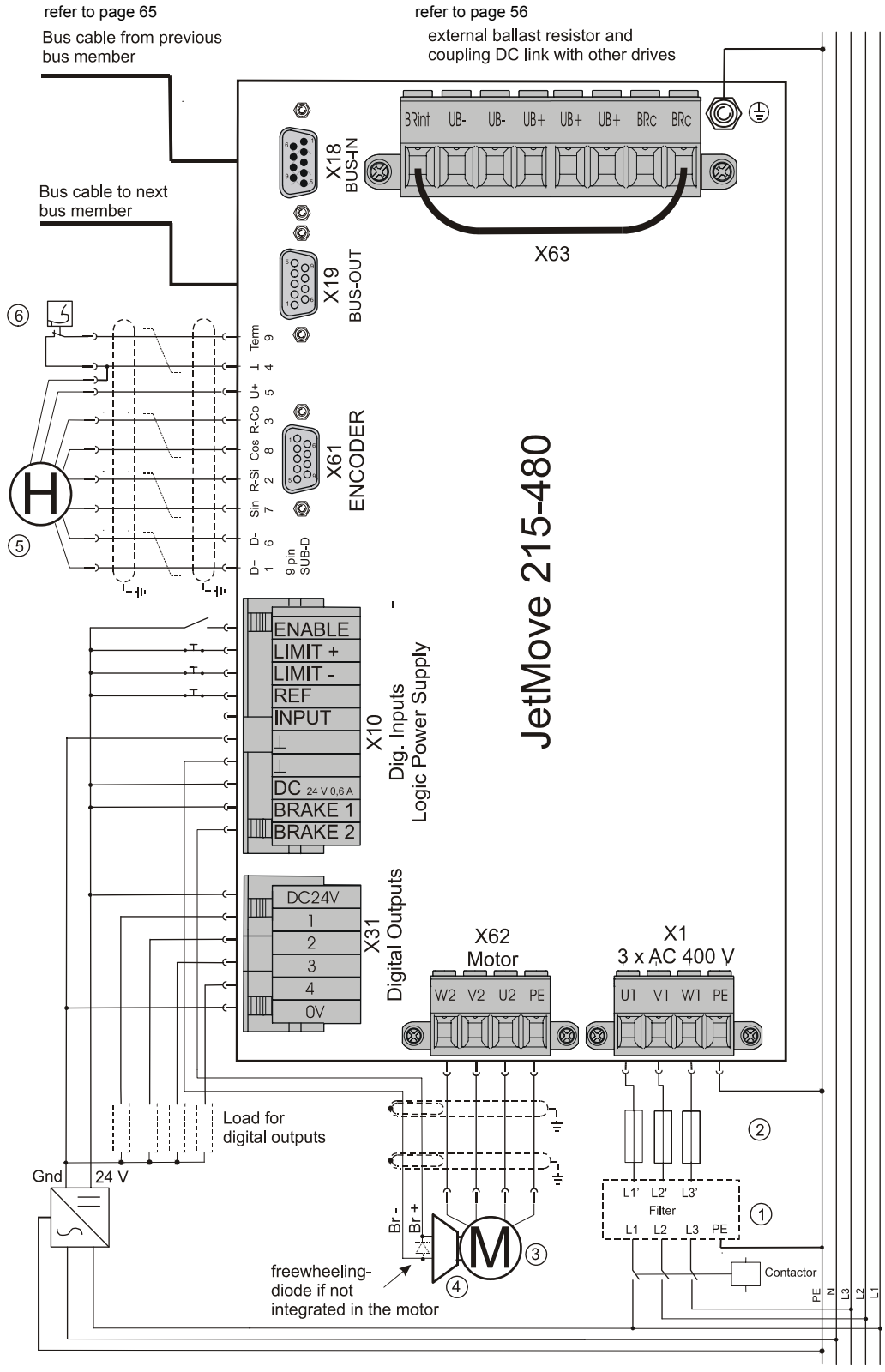


Fig. 18: Connection Diagram JetMove 215-480-HI

Key to the wiring diagrams:

1	Line filter (optional) (refer to “Line filter” on page 34)
2	Mains protection (refer to “Branch circuit short-circuit protection” on page 33)
3	Motor
4	Motor brake (optional)
5	Resolver or Hiperface encoder
6	Motor overtemperature protection

11 Analogue Input (Option)

11.1 Function

It is possible to order an optional integrated analogue input card for JetMove 215-480, which provides an analogue input with a resolution of 12 bit. The converted value of the measured voltage can be read by an 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. A pressure sensor in the machine is connected to the analogue input of the JetMove to deliver the actual pressure value for the control loop.

11.2 Technial Data

Technical Data Analogue Input	
Connection	SUB-D-connector (mail) at device
Voltage range	0 - 10 V
Input current	max. 1.4 mA
Resolution	12 bit
Value range	0 .. 32767 (resolution in steps of 8)
Isolation	none
Accuracy Offset error Gain error	 max. ± 5 LSB (± 40 values) corresponds to ± 12.2 mV max. ± 10 LSB (± 80 values) corresponds to ± 24.4 mV

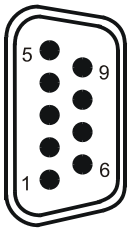
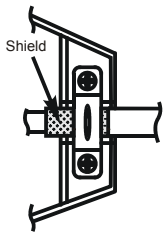
11.3 Description of Connections

Specification of mating connector for X72

- 9-pol Sub-D-plug (femail)
- Metallized housing

Specification of the cable to the analogue 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 Analogue Input	
	Shield
	
X72	Connect shield with the greatest possible surface area! Use metallized housing only!
Pin	**Signal**
1	Analogue signal (0 - 10 to Pin 6)
6 - 9	Analogue GND (connected to earth in device)
2 - 5	don’t use

Appendices

Appendix A: Recent Revisions

Chapter	Comment	Revised	Added	Deleted
diverse	Value of max. DC link voltage changed from 800 V to 850 V	✓		
1	Symbols, Safety Instructions, Instructions on EMI: more detailed description	✓	✓	
2	Notes on Safety as regards the Installation		✓	
	Safety Instructions for Commissioning		✓	
5	Overload protection Definition according to UL		✓	
	Continuous power of motor		✓	
	Motor overload protection Braking relays	✓		
7	Description of connection	✓	✓	
8	7-segment display mode 0	✓	✓	
9	Error Messages F29 - F31		✓	
10	Connection Diagrams Figures newly drawn for better clarity	✓		
11	New chapter		✓	
Index		✓		
Last page	Addresses of subsidiaries corrected	✓		

Appendix B: Glossary

Analog	A parameter, e.g. voltage, which is steplessly adjustable. 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 made up.
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 electro-magnetic surroundings without causing electromagnetic disturbances itself, which would be unbearable for other devices in these surroundings."
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. interferre - to carry in) Superposition of waves.
JetMove 215-480	JetMove 2xx is the product designation of a digital servo amplifier series produced by Jetter AG. The extension marks the following features: – 215 identifies a rated current of 15 A; – 480 identifies an operating voltage of max 480 V;
Leakage current protection switch	A protection device which 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 as to 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 program.
Register	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**ompatibility
E.L.C.B.	**E**arth-**l**eakage **c**urrent **b**reaker
Gnd	**G**rou**nd**
Hiperface	**Hi**gh **Per**formance Inter**face**
Hz	Hertz
IEC	**I**nternational **E**lectrotechnical **C**ommission
IP	**I**nternational **P**rotection
JX2-SBK1	**J**etter E**x**tended Module **2** - **S**ystembus**k**abel **1 = System Bus Cable.** 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
RS 485	**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	**Temp**erature
U	Symbol for voltage (electric potential difference)

Appendix D: List of Illustrations

Appendix E: Index

S

T

U

V

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