



User Manual

JM-203B-230 - Digital Servo Amplifier

60865160

We automate your success.

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This user manual is an integral part of the JetMove 203B-230:

Type: _____
Serial no.: _____
Year of manufacture: _____
Order no.: _____



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 203B-230 and

- must be kept in a way that it is always at hand until the digital servo amplifier JetMove 203B-230, will be disposed of.
- Pass this manual on, if the digital servo amplifier JetMove 203B-230 is sold, alienated or loaned.

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.

Unavoidable residual hazards for persons and property may result from this digital servo amplifier JetMove 203B-230. For this reason, any person who has to deal with the transport, installation, operation, maintenance, and repair of the digital servo amplifier JetMove 203B-230 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	Remarks
2.00	Original issue of the user manual
3.00	For revisions, please refer to Appendix A: "Recent revisions" of the user manual, revision 3.00
3.01	Corrections to style and orthography
3.10	For revisions, please refer to Appendix A: "Recent revisions" of the user manual, revision 3.10
3.11	For revisions, please refer to Appendix A: "Recent revisions" of the user manual, revision 3.11
3.20	For revisions, please refer to Appendix A: "Recent revisions" of the user manual, revision 3.20

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.



This sign instructs you to wear protective goggles. Failure to comply may lead to injuries.



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



NOTICE

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.



INFO

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

1	Safety instructions	11
1.1	General safety instructions	11
1.1.1	Intended Use	11
1.1.2	Usage other than intended	11
1.1.3	Qualified personnel	12
1.1.4	Modifications and alterations to the device	12
1.1.5	Repair and maintenance	13
1.1.6	Disposal	13
1.2	Ensure your own safety	14
1.2.1	Malfunctions	14
1.2.2	Information signs and labels	14
1.2.3	Earthing procedure	15
1.3	Residual dangers	17
1.3.1	Hazards during operation	17
1.3.2	Hazards after POWER is turned OFF	19
1.4	Instructions on EMI	20
2	JetMove 203B-230 - Installation instructions	23
2.1	Scope of delivery	23
2.2	Mechanical installation	24
2.3	Electrical installation	26
2.4	Checking the installation	27
2.5	Notes on safety as regards the installation	27
2.6	Notes on safety as regards commissioning	28
2.7	Notes on decommissioning	29
3	Operating conditions	31
4	Physical dimensions	37
5	Technical data	39
5.1	Electrical specifications	39
5.2	Motor protection	44
5.2.1	Thermal sensor integrated in the motor	44
5.2.2	I ² t calculation	44
5.2.3	Motor overload protection according to UL	45
6	Drive controller structure	47
7	Description of connections	49
7.1	Power supply connection	49

7.2	Motor connection	51
7.2.1	General remarks	51
7.2.2	Assignment and specifications	52
7.2.3	Motor power cable with mating connector SC53	
7.2.4	Connection assignment of terminal box	56
7.3	Resolver connection	57
7.3.1	Specification	57
7.3.2	Resolver cable with mating connector	57
7.4	HIPERFACE connection	59
7.4.1	Specification	59
7.4.2	HIPERFACE cable with mating connector	59
7.5	Sin-cos encoder connection	62
7.5.1	Adapter	62
7.5.2	Specification	62
7.5.3	Connection diagram	63
7.6	Digital inputs, logic power supply	66
7.7	JX2 System Bus	67
7.7.1	JX2 System Bus cable - Specifications	68
8	Status monitoring	71
9	Diagnostics	73
9.1	Error messages	73
9.2	WARNINGS	79
10	Connection diagrams	81
11	Analog input (option)	87
11.1	Operating principle	87
11.2	Technical data	87
11.3	Description of connections	88
12	Ethernet interface (option)	89
12.1	Operating principle	89
12.2	Description of connections	89
12.2.1	Connection between the JetMove 203B-230...-OEM and a PC or JetControl90	
12.2.2	Connection between the JetMove 203B-230...-OEM and a PC or JetControl through a switch90	
12.3	Logic circuit LEDs, DIP switches	91
12.3.1	LEDs	91
12.3.2	The DIP switches	92

12.4	Setting the IP address	92
12.4.1	Default IP address	92
12.4.2	IP address out of the configuration memory	92
12.4.3	IP address taken from the switch position	94
13	Safe Torque OFF (STO) Option	95
14	Counting input (option)	97
14.1	Operating principle	97
14.2	EnDat 2.2	97
14.2.1	Technical data	97
14.2.2	Description of connections	98
14.2.3	EnDat cable with mating connector	98
14.2.4	Power supply of the encoder	100
14.3	Synchronous Serial Interface (SSI)	101
14.3.1	Technical data	101
14.3.2	Description of connections	101
14.3.3	SSI cable	102
14.4	Incremental encoder	103
14.4.1	Technical data	103
14.4.2	Description of connections	103
14.4.3	Incremental encoder cable	104
15	Ordering information	105
15.1	List of documentation	105
15.2	Options	105

List of appendices

Appendix A:	Recent revisions	109
Appendix B:	Differences between JetMove 203-230 and 203B-230	112
Appendix C:	Glossary	115
Appendix D:	Index of illustrations	118
Appendix E:	Index	119

1 Safety instructions

1.1 General safety instructions

The digital servo amplifier JetMove 203B-230 fulfills the accepted safety regulations and standards. Special emphasis was given to the safety of the users.

Further, the user should adhere to the following regulations:

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

1.1.1 Intended Use

Usage according to the intended conditions of use includes operation in accordance with these operating instructions.

Operate the digital servo amplifier JetMove 203B-230 only in a closed control cabinet and within the range of the specified values, see chapter 5 "Technical data", page 39.

Do not apply a voltage to the digital servo amplifier JetMove 203B-230 that is higher than the prescribed operating voltage.

The single phase or three phase operating voltage is AC 195 V ... AC 265 V. Thus, it is subject to the EU Low Voltage Directive.

The JetMove 203B servo amplifier has been designed to drive 3-phase brushless synchronous servo motors in the following modes: speed control, torque control and/or position control. The winding insulation 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 203B-230 is used to drive machinery, such as conveyors, production machines, and handling machines.

1.1.2 Usage other than intended

The digital servo amplifier JetMove 203B-230 must not be used in technical systems which to a high degree have to be fail-safe, e.g. ropeways and aeroplanes.

Do not apply the integrated brake control in safety-relevant systems.

The JetMove 203B-230 is no safety-related part as per Machinery Directive 2006/42/EC. This servo amplifier is not qualified for safety-relevant applications and must, therefore, NOT be used to protect persons.

An exception to this rule is the STO function of devices with the -S1 option, see chapter 13 "Safe Torque OFF (STO) (Option)", page 97.

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 203B-230 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 of, 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 engineering, such as industrial electronics engineers.

1.1.4 Modifications and alterations to the device

For safety reasons, no modifications and alterations to the digital servo amplifier JetMove 203B-230 and its functions are permitted.

Any modifications to the servo amplifier JetMove 203B-230 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 203B-230. Parts and equipment from other manufacturers are not tested by Jetter AG, and are, therefore, not released by Jetter AG.

The installation of such parts may impair the safety and the proper functioning of the digital servo amplifier JetMove 203B-230.

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 Repair and maintenance

Repairs at the digital servo amplifier JetMove 203B-230 must not be carried out by the operator. The servo amplifier JetMove 203B-230 does not contain any parts to be repaired by the operator.

For being repaired, the servo amplifier JetMove 203B-230 must be sent to Jetter AG.

The digital servo amplifier JetMove203B-230 is maintenance-free. Therefore, absolutely no inspection or maintenance works are required for the operation of this device.

1.1.6 Disposal

When disposing of the digital servo amplifier, the local environmental regulations must be complied with.

You can disassemble the servo amplifier JetMove 203B-230 into its main components by unscrewing it (aluminum heat sink and side plate, steel casing cover, electronic boards).

1.2 Ensure your own safety



Warning

- Isolate the digital servo amplifier JetMove 203B-230 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. 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 or the thermal motor circuit-breaker must not in any case be shunted or by-passed.
- Dismantled protective equipment, such as guards and thermal motor circuit-breakers, must be reattached and checked for proper functioning prior to commissioning.
- Prior to commissioning, the machine manufacturer shall conduct a hazard analysis for the machine and take appropriate measures to prevent personal injury and damage to property resulting from accidental movements.

1.2.1 Malfunctions

- **In the case of malfunctions or other faults, please immediately separate the digital servo amplifier JetMove 203B-230 from the mains.** Follow the information given in chapter 1.3 "Residual dangers", page 17.
- Malfunctions or other damages have to be reported to a responsible person at once.
- Secure the servo amplifier JetMove 203B-230 against misuse or accidental use.

1.2.2 Information signs and labels

- Follow the instructions given on markings, information signs, and labels. Keep markings, signs and labels readable.
- Replace damaged or unreadable information signs and labels.

1.2.3 Earthing procedure

➤ Screw the enclosure of the digital servo amplifier JetMove 203B-230 onto a highly conducting, earthed panel.

➤ Do only use the servo amplifier JetMove 203B-230 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 servo amplifier must not be operated when connected to unearthed networks and to unsymmetrically earthed networks.
A one-phase connection to these mains can be established by means of a mains phase and a neutral wire.
The three-phase connection may only be established by means of an isolating or autotransformer (also refer to chapter "Power supply connection", page 39, and chapter 10 "Connection diagrams", page 81).

➤ **The leakage current of the digital servo amplifier JetMove 203B-230 is greater than 3.5 mA. Therefore, a second protective earth conductor is required in order to avoid electric shocks.**

For this, the following measures have to be taken:

- The protective earth conductor must be connected to the PE screw (1) located at the top side of the rack as well as to the PE terminal X1 (2); for this, please refer to fig. 1.
The cross-sectional areas of the two earthing conductors must be equal to the cross-sectional areas of the supply lines (1.5 mm² min.).
- A durable connection with the power supply of the digital servo amplifier JetMove 203B-230 has to be provided.
- Correct cabling of the PE bus according to the connection diagram must be carried out, chapter 10 "Connection diagrams", page 81.

NOTICE



Follow the installation instruction below for the tightening torque of the PE bolt (1) so that it does not become loose or even break off:

➤ Do not overtighten the nut of the PE bolt (1). The maximum tightening torque is 3 Nm!

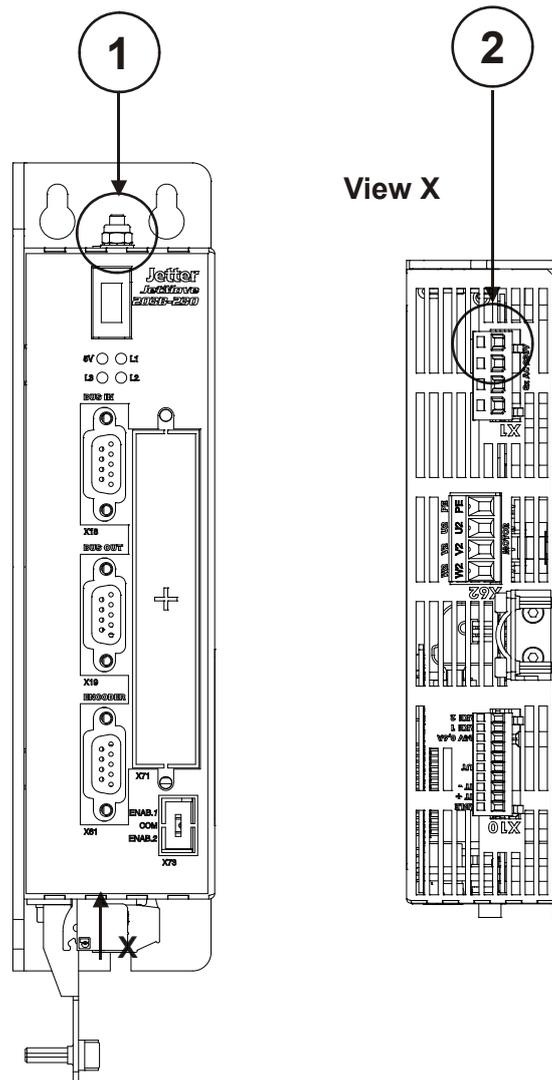


Fig.: 1: Double earthing



NOTICE!



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

Using an earth-leakage current breaker (FI) within the mains power supply is not possible.

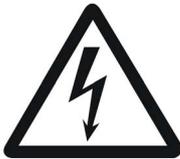
If, in spite of this, an earth-leakage current breaker is installed, it will switch off the digital servo amplifier JetMove 203B-230, although there is no fault.

When a leakage current screen needs to be installed in the JetMove 203B-230, 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 DC 480 V occur!

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

- During operation, all coverings and control cabinet doors have to be kept closed.
- Do not remove the cover.
- Do not disconnect the electric connections of the servo amplifier JetMove 203B-230 when it is live.
- **Do not touch the screws of the terminals X1 and X62 during operation.**
The terminals have the following meaning:

X1:	AC 230 V voltage supply
X62:	DC motor voltage up to 480 V



DANGER!

Hot surface hazard!

During operation, the surfaces, respectively the heat sinks of the digital servo amplifier JetMove 203B-230 can heat up. The left sidewall can reach temperatures of up to 80 °C.



CAUTION!

- Never touch the left sidewall of the servo amplifier JetMove D203 during operation and after switching off, while the device is still cooling down.
- Make sure that no temperature-sensitive parts have been connected or fastened to the servo amplifier JetMove 203B-230.



DANGER!

DANGER in a potentially explosive atmosphere!



Do not operate the digital servo amplifier JetMove 203B-230 in a potentially explosive atmosphere.



CAUTION!

DANGER of injuries caused by mechanic force!

The digital servo amplifier JetMove 203B-230 drives a servo motor. This servo motor moves mechanic parts or sharp edges. Therefore, failure or malfunctioning of the digital servo amplifier JetMove 203B-230 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 devices.

- 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 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 get caught in the rotating drive shaft.



Never touch a rotating drive shaft.



DANGER!

1.3.2 Hazards after POWER is turned OFF

DANGER resulting from electric shock!



DANGER!

Capacitors installed in the servo amplifier can still have dangerous voltages present up to five minutes after switching off the operating voltage.

- **Always wait** at least five minutes after switching off the device, before separating it from the mains or loosening the connections.
- **Always wait** at least ten minutes after switching off, before taking the following actions:
 - Touching the screws of the terminals X1 and X62
 - Disconnecting the terminals and touching the contacts

1.4 Instructions on EMI

The digital servo amplifier JetMove 203B-230 is intended for use in industrial surroundings. It may cause radio interferences when used in residential areas. It is operated at the operator's own risk.

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



NOTICE!

Measures for increasing immunity to interference:

- Ground the enclosure according to chapter 1.2.3 "Earthing procedure", page 15.
- Connect all grounding terminals of the JetMove 203B-230. A double grounding terminal is required!
 - Connect the protective earth terminal located on the enclosure.
 - Connect the protective earth (PE) to terminal X1.Please refer to fig. 1 on page 16.
- The distance between the optional line filters and the servo amplifier 203B-230 must be as short as possible.
- When of a motor cable with included brake lines is used, these brake lines have to 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:

- Screw the enclosure of the digital servo amplifier JetMove 203B-230 onto a highly conducting, earthed panel.
- On principle, **physical separation** should be maintained between signal and voltage lines. We recommend spacings greater than 20 cm. Cables and lines should cross each other at an angle of 90°.
- For the following lines, shielded cables are to be used:
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.
- **Both ends of the cable** must be shielded.

- Unshielded wire ends of shielded cables should be as short as possible.
- The **entire shield** must be drawn behind the isolation, its **greatest possible surface area** being clamped under a strain relief which is extensively earthed.

When male connectors are used:

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

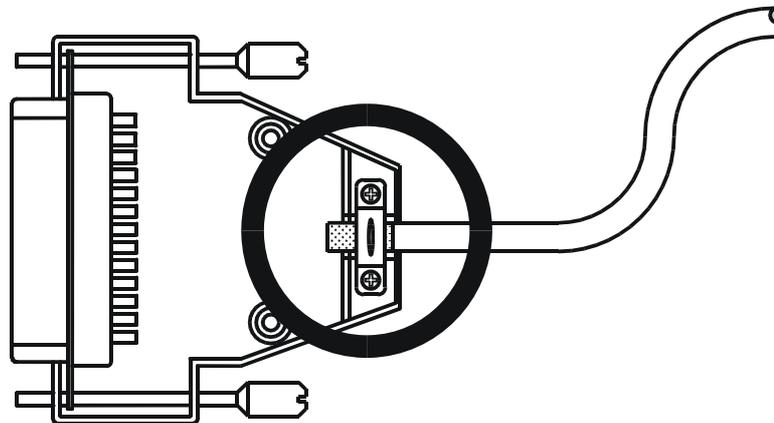


Fig.: 2: Shielding of Sub-D connectors in conformity with EMC standards

If the shield cannot be attached to the connector, for example, with 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 (refer to fig. 3).

We recommend installing the enclosed ferrite core on the motor power supply cable as shown in figure 3.

For optimum results, increase the number of turns around the ferrite.

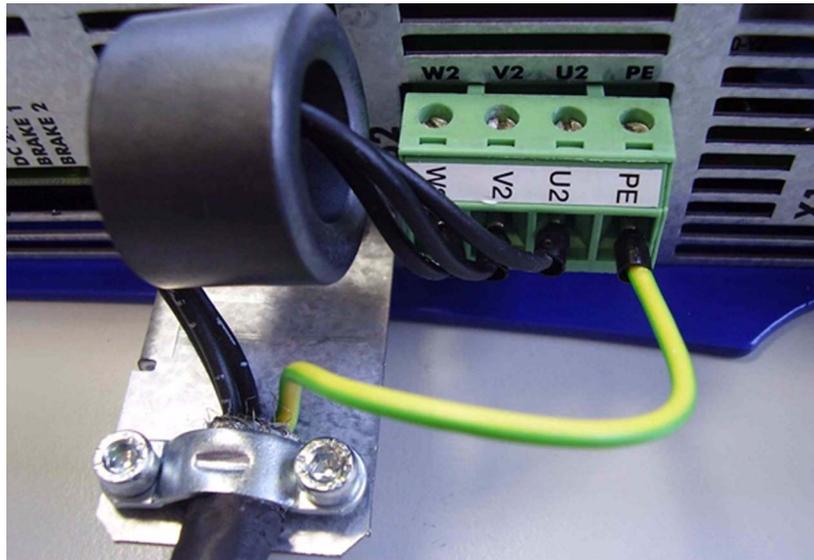


Fig.: 3: Shielding of screw terminals in conformity with the EMC standards

2 JetMove 203B-230 - Installation instructions

2.1 Scope of delivery

- Digital servo amplifier JetMove 203B-230
- The mating connector is 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 assembly number 530 x.x m; length: 0.2 m to 5.0 m. See chapter 7.7 "JX2 System Bus", page 67.
- Motor power cable, see chapter 7.2 "Motor connection", page 51.
- Resolver cable, see chapter 7.3 "Resolver connection", page 57.
- HIPERFACE cable, see chapter 7.4 "HIPERFACE connection", page 59.
- Synchronous servo motors, e. g. the Jetter motor types JL, JK, or JH
- Motor circuit breaker, see chapter 5 "Technical data", page 39.
- Circuit breaker, see chapter 5 "Technical data", page 39.
- Isolating transformer or autotransformer
- Mounting screws, 3 pcs.; refer to 4, page 25.



INFO!

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

2.2 Mechanical installation

-  Prior to installing the digital servo amplifier, check it for possible transport damages.
-  Check the shipment for completeness.
-  Fix the cable strap serving as strain relief and motor cable shield next to connector X62 (see 3, page 22).
-  To ensure proper functioning of the JetMove 203B-230, check whether the mounting plate in the electric cabinet is unpainted.
-  The only possible mounting position is vertical - see 4, page 25.
-  For sufficient air flow there has to be a clearance of 100 mm min. above and below the enclosure of the JetMove 203B-230.
-  Mark on the panel two positions for the fastening screw threads of the JetMove 203B-230 (see 4, page 25).
-  Drill the holes and cut the respective threads 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 203B-230 by the fitting bolts; then screw them tightly.

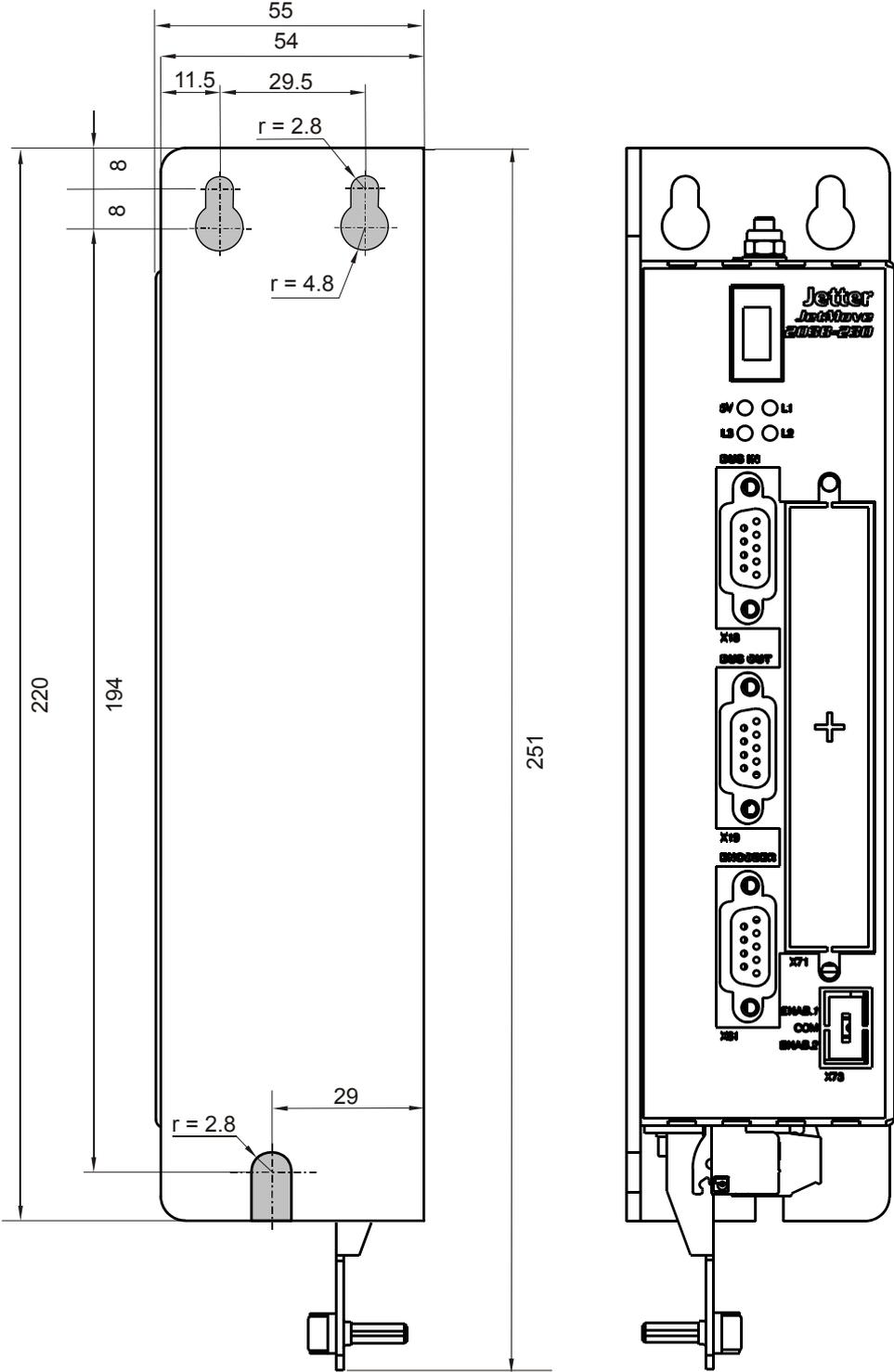


Fig.: 4: Rear and front view of the JetMove 203B-230 enclosure with mounting holes

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 480 V min.; also refer to , .



Connect the JetMove 203B-230 according to the connection wiring diagram shown in chapter 10 "Connection diagrams", page 81.

Especially check the power lines for appropriate protection. For more information see "Overload protection" on page 40.

Protecting the motor cables is not advisable.



Select the cables according to standards.



Verify that all earthing cables are connected (double earthing).

Observe the max. tightening torque, see appendix F.



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 49.



Please regard the following items regarding installation according to EMC:

- If possible, run control cables and power cables separately;
- Connect resolver;
- Use shielded terminals or EMC-compatible connectors;
- Connect holding brake, if available, and connect shields on both sides of the cables;
- Connect the motor lines according to 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 used.
- 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

HAZARD caused by high operating voltage!



DANGER!

Extremely hazardous voltages of up to DC 480 V may occur!

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

- Have installation and maintenance jobs carried out by qualified personnel only 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 is turned OFF", page 19.
- Before carrying out installation and maintenance jobs, separate the servo amplifier JetMove 203B-230 and all connected devices from the mains (pull out the mains plug).

2.6 Notes on safety as regards commissioning

HAZARD caused by high operating voltage!



Danger

Extremely hazardous voltages of up to DC 480 V may occur!

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

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

Before energizing the device make sure that the following requirements are complied with:

- Reattach dismantled protective equipment and check it for proper functioning.
This way, protection from moving parts of the machine will be achieved.
- Secure the servo amplifier JetMove 203B-230 against accidental contact with conductive parts and components.
- Only connect devices or electrical components to the signal lines of the digital servo amplifier JetMove 203B-230 (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.
- Only connect resolver, HIPERFACE and servo motor to the servo amplifier, if they have been sufficiently isolated from the connected electric circuits.
- The leakage current of the digital servo amplifier JetMove 203B-230 is greater than 3.5 mA. Therefore, a second protective earth conductor is required in order to avoid electric shocks.
For this, the measures listed in chapter 1.2.3 "Earthing procedure", page 15 have to be taken.
- Always carry out each commissioning, even a short functional test, with correctly connected PE bus.

2.7 Notes on decommissioning



Before returning the device, remove the cable strap serving as strain relief and motor cable shield.

3 Operating conditions



DANGER

Danger in the event that the operating parameters for the "Safe Torque Off" option of the JM-2xx-xxx...-S1 amplifiers are not complied with.

Serious injuries can occur!

For example from

- electric shock because the electrical safety has been violated by not complying with the degree of pollution;
- crushing if the functionality of the safety function STO is no longer guaranteed.



Make sure that the following operating parameters are met.

Operating parameters		
Ambient conditions		Reference
Transport conditions (units within packing)	Temperature: -25 °C ... 70 °C Air humidity: 5 % ... 95 % Non-condensing	DIN EN 50178
Storage conditions (units within packing)	Temperature: -25 °C ... 55 °C Change max. 20 K/h Air humidity: 5 % ... 95 % Non-condensing Max. storage time: 1 year without any limitations	DIN EN 50178

The "Storage Conditions" are continued on the next page

Operating parameters		
Storage conditions (units within packing)	If this storage time has been exceeded, the device must be connected for at least 2 hours to the mains voltage prior to commissioning. The motor must remain de-energized and the logics circuit must be supplied with power. The servo amplifier can then be used again without restriction.	
Ambient temperature	0 ... 45 °C (45 °C ... 55 °C with derating of 2.5 %/K) Please be careful of sufficient cooling	DIN EN 50178
Air humidity	5 % ... 85 % Non-condensing	DIN EN 50178
Pollution degree	2	DIN EN 50178
Corrosion immunity / chemical resistance	No special protection against corrosion Ambient air has to 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 without derating. From 1,000 to 2,000 m above sea level: Derating of 1.5 % per 100 m increase in altitude.	DIN EN 50178
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	10 Hz ... 57 Hz at 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

Operating parameters		
Mounting position	Vertical (refer to Fig. 4 page 25) For sufficient air flow there has to be a clearance of 100 mm above and below the device.	
Electrical safety conditions		Reference
Class of protection	I	DIN EN 61800-5-1
Dielectric strength	Power to earth and power to logic 1.7 kVdc, 2 s	DIN EN 61800-5-1 DIN EN 60146-1-1 DIN EN 60204
Isolation	Power to earth and power to logic > 1 MOhm at 500 V	
Protective connection	12 V, 25 A, 0.1 Ohm	DIN EN 61800-5-1
Overvoltage category	III	DIN EN 61800-5-1 DIN VDE 0110-1



NOTICE!

Measures to avoid damages in transit and storage:



The packaging material and the storage place are to be chosen in a way that the values given in the above table "Operating parameters" on page 31 are kept to.

The following note must be observed for the amplifier models JM-2xx-xxx-OEM-.....

NOTICE



The quality of the Ethernet cable has a significant influence on the EMC values given in the following tables.



Use a CAT6 cable (S/FTP design) as Ethernet cable.

EMC		
Emitted interference		
Parameter	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
Line AC	<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



NOTICE

This is a product of restricted availability according to IEC/EN 61800-3 and may cause radio interferences in a residential environment.

Follow the instructions below:



If this product is used in a residential environment, take appropriate measures. One of the measures is to use additional line filters. Siehe "Line filter" auf Seite 39.

EMC		
Interference immunity: Enclosure		
Parameter	Value	Reference
RF field, amplitude-modulated	Frequency band 80 ... 1,000 MHz; test field strength 10 V/m AM 80 % at 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 connections and power interfaces		
Parameter	Value	Reference
Conducted radio disturbances	Frequency 0.15 ... 80 MHz Test voltage 10 V AM 80 % at 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 frequency 5 kHz Criterion B	DIN EN 61800-3 DIN EN 61000-4-4
Voltage surges	tr/th 1.2/50 μ s, 8/20 μ s 1 kV (phase to phase) 2 kV (phase to ground) 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 % at 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 frequency 5 kHz Criterion B	DIN EN 61800-3 DIN EN 61000-4-4
Interference immunity: Signal interfaces		
Parameter	Value	Reference
Conducted radio disturbances	Frequency 0.15 ... 80 MHz Test voltage 10 V AM 80 % at 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 frequency 5 kHz Criterion B	DIN EN 61800-3 DIN EN 61000-4-4

4 Physical dimensions

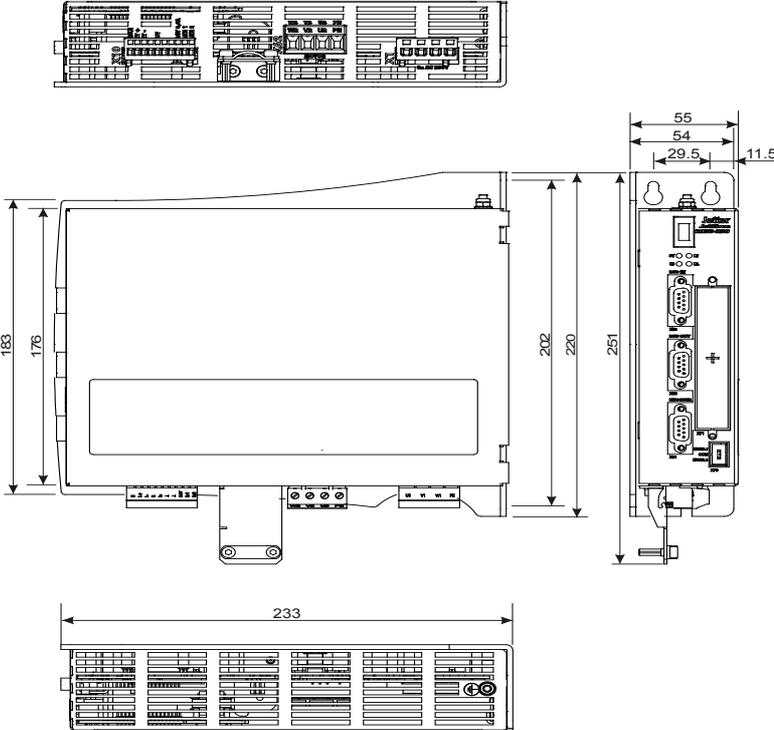


Fig.: 5: Physical dimensions of the JetMove 203B-230 (in mm)

For installation, please also refer to fig. 4 on page 25.

5 Technical data

5.1 Electrical specifications



DANGER

Danger in the event that the Electrical Specification for the "Safe Torque Off (STO)" option of the JM-2xx-xxx...-S1 amplifiers are not complied with.

Serious injuries can occur!

For example from crushing if the functionality of the safety function STO is not ensured.



Make sure that the following electrical specifications are met.

Electrical specifications	
Rated voltage supply	<ul style="list-style-type: none"> • Direct supply $U_{\text{eff}} = 230 \text{ V}$ Common mode voltage 2 % max. Power dissipation 3 ms max. • 48 ... 62 Hz Frequency change max. 2 %/s
Power supply connection	<ul style="list-style-type: none"> • 1-phase: direct ($U_{\text{eff}} = 230 \text{ V}$: L to N) • 3-phase: via autotransformer or isolating transformer e.g. Primary circuit: $U_{\text{eff}} = 3 \times 400 \text{ V}$. Secondary circuit: $U_{\text{eff}} = 3 \times 230 \text{ V}$ <p>See "Note 1!" on page 42.</p>
Power supply tolerance	$U_{\text{eff}} = 195 \text{ V} \dots 265 \text{ V} (-15 \% \dots + 15 \%)$
Inrush current limitation	<p>< 45 A limited to 10 ms during the switch-on-sequence</p> <p>Refer to "Time between deactivating and activating the mains power supply" on page 42</p>

Electrical specifications	
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 NRTL approval use overload protection devices that are NRTL listed (acc. To UL 508)(NKJH) self protected combination motor controller (specification: 10 A). The JetMove 203B-230 is suitable for use on a circuit capable of delivering not more than 5000 (rms) symmetrical Amperes, 480 Volts maximum.</p>
Output voltage of the motor	Three-phase with 325 V typical (480 V max.)
Motor output current at an ambient temperature of 45 °C	<p>Nominal current: $I_{\text{eff}} = 3 \text{ A}$ Peak current for 30 seconds min.: $I_{\text{eff}} = 6 \text{ A}$ (The duration depends on the temperature of the heat sink)</p> <p>See "Note 2!" on page 42.</p>
Continuous output	0.5 kW
Short-circuit protection, motor side	<p>Designed for</p> <ul style="list-style-type: none"> • phase to phase • phase to earth
Motor overload protection	See "Motor protection" on page 44.
Motor cable Cable size Material Capacitance Temperature class Max. length of the motor cable	<p>4 * min. 0.75 mm² (min. AWG 18) Copper < 150 pF/m > 60 °C 50 m max. (for greater lengths please contact Jetter AG)</p>
Line filter	<p>Line filter ensuring EMC in a residential environment to DIN EN 61800-3 with no limitations. The following filters can be applied with input circuits:</p> <ul style="list-style-type: none"> – FMAC-931-0810 8 A – FMAC-932-1610 16 A – FMAC-932-2510 25 A – FMAC-934-3610 36 A <p>See "Note 3!" on page 42.</p>

Electrical specifications	
Voltage supply of processor logics (demands on the power supply module)	<ul style="list-style-type: none"> • DC 24 V (20 ... 28.8 V) • ≤ 0.6 A • The voltage output of the power supply unit must comply with the SELV or PELV type.
Internal ballast resistor	<ul style="list-style-type: none"> • Resistor: 175 Ω (PTC) • Continuous output: 70 W • Maximum capacity internally limited to 1 kW at 0.6 s (warning and error message)
Residual voltage	To avoid hazard of electrical shock wait at least 5 minutes after switching off the digital servo amplifier before attempting to pull out the plug or remove this unit (refer to page 19).
Leakage current	<p>> 3.5 mA</p> <p>See "DANGER resulting from electric shock!" on page 42.</p>
Digital inputs <ul style="list-style-type: none"> – Enable (E) – Reference switch (R) – Limit switch right (L+) – Limit switch left (L-) – Input (Inp) 	DC 20 V ... 28.8 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 66.
Braking relay (contacts: Br1 and Br2)	$V_{\max} = \text{DC } 30 \text{ V}$ $I_{\max} = \text{DC } 2 \text{ A}$ Contact: N/O connected to BR1 and BR2 on X10 The lines may only be connected to devices that are related to the same potential as the power supply of the controller logic. Can be switched by the control program of the PLC or by the operating system of JetMove 203B-230 together with the software enable command.
Power dissipation P_v	Output stage: 25 W max. Logic circuit: 18 W max.

**Note 1!****When a transformer is used:**

The neutral point on the secondary side of the circuit must be grounded.

**Note 2!****Cooling:**

- The overtemperature protection is activated at 80 °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 3!**

A line filter can supply several digital servo amplifiers JetMove 203B-230, as soon as I_f (the current of the line filter) is greater than the total current of the connected servo amplifiers.

**Important****Time between deactivating and activating the mains power supply**

If the drive system has been run by motor power (speed and torque at the moment) and the mains power supply is deactivated, the inrush current limitation unit must cool down for 2 to 3 minutes. If this is not considered, the inrush current limitation unit can be destroyed.

DANGER resulting from electric shock!**Warning**

In order to prevent electric shocks, ground the digital servo amplifier JetMove 203B-230 **by all means** via two positions; for this, refer to chapter 1.2.3 "Earthing procedure", page 15.

Compatible synchronous servo motors

Motor types	Jetter motors of the JHN, JHQ, and JI series with 2-cable technology. Please also refer to the User Manual of the motors or contact the sales department of Jetter AG.
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INFO!

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 Thermal sensor integrated in the motor

The servo amplifier JetMove 203B-230 can read out and process three different motor temperature sensors:

Sensor type	Type of sensor signal evaluation
KTY83-110	Temperature is measured in °C The warning threshold can be set Error detection at maximum motor temperature
PTC	Go-no-go decision Error detection at maximum motor temperature
Temperature switch	Go-no-go decision Error detection at maximum motor temperature

5.2.2 I²t calculation

The digital servo amplifier JetMove 203B-230 calculates the model of motor power loss by an I²t calculation. The calculated value is a measure of the average power dissipation of the motor. It is calculated in percent of the maximum motor power dissipation.

For this calculation it is important, that the parameters are entered correctly:

- Continuous rated current (either continuous rated motor current or continuous rated amplifier current, taking the lower value of the two)
- Overload factor
- and time constant of the motor

The I²t calculation has to 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 203B-230 through JetSym or the PLC.

The digital servo amplifier JetMove 203B-230 calculates the percentage of motor power loss according to the following formula:

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

$x(t)$ = displayed value of motor power dissipation 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 continuous rated 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:

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

After reset, the values of the important parameters are:

Rated current:	3 A
Overload factor:	2
Motor time constant:	1,800 s (30 min)

With these parameters the 100 % error level will be reached if, for example the motor is run by a current of 6 A for about 8 minutes and 30 seconds.



NOTICE

Because of the fact that after reset the I^2t calculation always starts at zero, the motor overload calculation is wrong if the motor is already hot when the digital servo amplifier JetMove 203B-230 is switched on (that is, when parameterization of I^2t calculation is completed and 24 V logic power supply is applied).



Therefore wait until the motor is cold before enabling the axis again.

5.2.3 Motor overload protection according to UL

The UL standard prescribes a motor overload detection for a servo amplifier according to the following criteria:

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

- If the average motor current corresponds to the trip current, the overload protection has to switch off the motor after a limited time.
- If the average motor current is 2 times higher than the trip current the overload protection has to switch off 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 is activated) can be parameterized only through the rated current value.
The motor overload protection is always active and cannot be deactivated.



NOTICE

Because of the fact that after reset the I^2t calculation always starts at zero, the motor overload calculation is wrong if the motor is already hot when the digital servo amplifier JetMove 203B-230 is switched on (that is, when parameterization of I^2t calculation is completed and 24 V logic power supply is applied).



Therefore wait until the motor is cold before enabling the axis again.

6 Drive controller structure

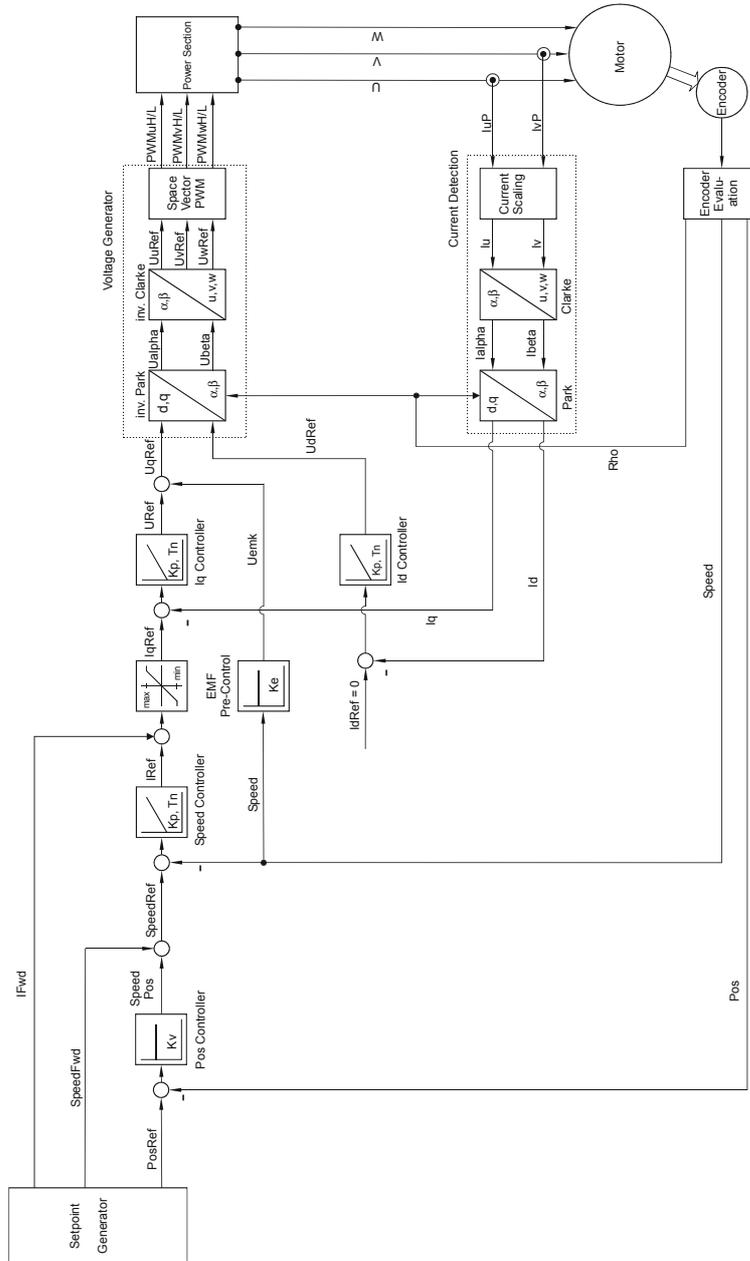


Fig.: 6: Block diagram of drive controller structure

All drive controller types can be parameterized through the control program.

Controller type	Specification
Motor control (commutation)	Space vector modulation
PWM frequency	16 kHz
Current controller – Cycle time	62.5 μ s
Speed controller – Cycle time – Current pre-control	125 μ s adjustable
Position controller – Cycle time – Speed pre-control	250 μ s adjustable
Position setpoint generator – Sine-square and linear acceleration and deceleration ramps – Setpoint output cycle (position feedback controller interpolation)	can be parameterized individually 2 ms
Position sensing Resolver: – Resolution – Scan time Absolute encoder (Multiturn and Single-Turn): – Interface – Resolution of absolute position – Resolution of velocity pickup – Scan time	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 spring tension terminal (type ZEC 1.5/ 4-ST-7.5 C2 R1,4; for printed circuit boards)
- Allowed conductor size: 0.25 ... 1.5 mm² (AWG 24 ... AWG 16)
- Bladed screw-driver: 0.6 x 3.5 x 100 mm²

Connecting cable specifications

- Cable size: 4 * 0.75 mm² (AWG 18(4))
- Material: Copper
- Temperature class: 60 °C
- Stripping length of cores: 6 mm
- Bootlace ferrules are not required.

Cable shielding

- Not needed

Power supply 3-phase connection		
Terminals X1	Signal	Specification
U1	L1	• AC 230 V between the power lines
V1	L2	
W1	L3	
PE	PE conductor	

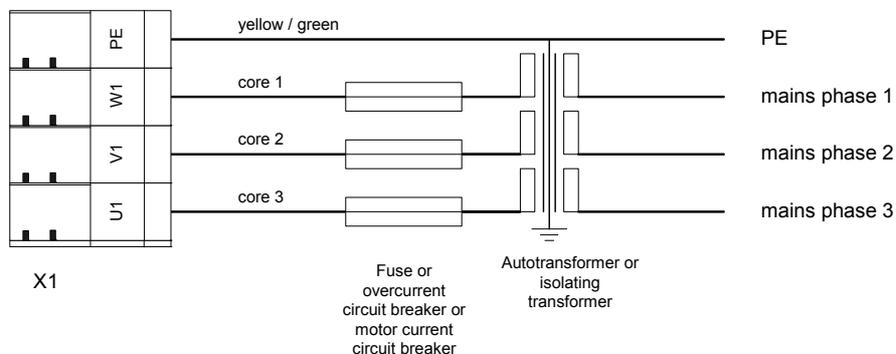


Fig.: 7: Connection of the 3-phase supply line

Power supply 1-phase connection		
Terminals X1 on the amplifier side	Signal	Specification
U1	L	• AC 230 V between mains phase and neutral conductor
V1	N	
W1		
PE	PE conductor	

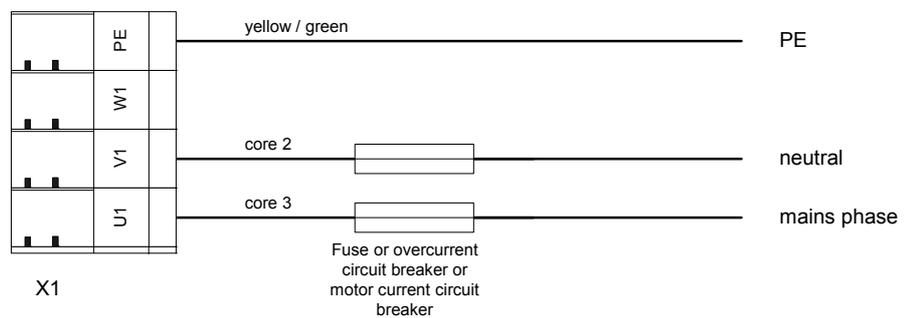


Fig.: 8: Connection of the 1-phase supply line

7.2 Motor connection

7.2.1 General remarks



NOTICE!

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.



NOTICE!

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 specifications

Specification of the connector for terminal X62

- 4-pin connector (type PC 4/ 4-ST-7.62)
- Allowed conductor size: 0.25 ... 4.0 mm² (AWG 24 ... AWG 12)
- Bladed screw-driver: 0.6 x 3.5 x 100 mm²
- Stud torque for the screw clamping terminal:
0.5 Nm (4.4 ... 5.3 lbf-inch)

Specification of the motor cable

- Cable size: 4 * 0.75 mm² (AWG 18(4))
- Material: Copper
- Temperature class: 60 °C
- Stripping length of cores: 6 mm
- Bootlace ferrules are recommended.

Cable shielding

- Braided copper shield of 80 % coverage

Connection of the motor to the digital servo amplifier JetMove 203B-230 has to be done following the wiring diagram below. Connection of the brake is optional.

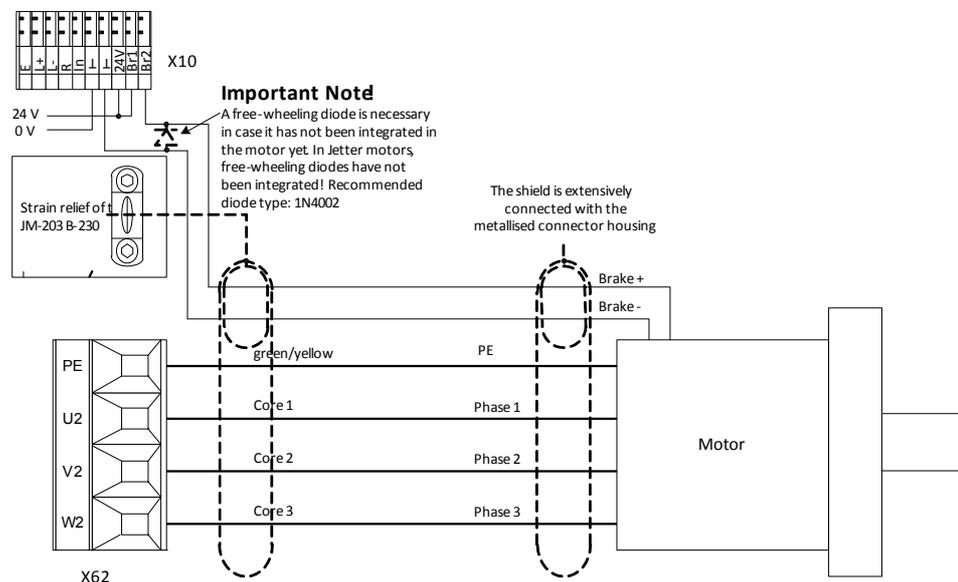


Fig.: 9: Connection of motor lines

7.2.3 Motor power cable with mating connector SC



INFO

The suitable mating connector SC (female connector) can be ordered from Jetter AG under part number 15100070.



INFO

The ready-made motor power cable with SC mating connector can be ordered from Jetter AG. It is equipped with the corresponding motor mating connector and can be ordered from Jetter AG by specifying the following cable confection number (KABEL-KONF):

Without brake:

Cable confection # 26.1

With brake:

Cable confection # 24.1

Mating connector of the motor (solder side)

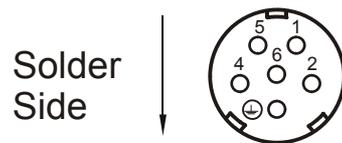
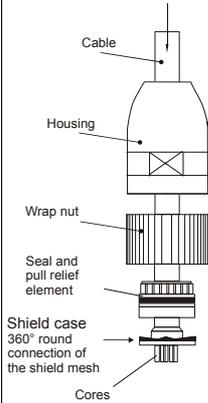
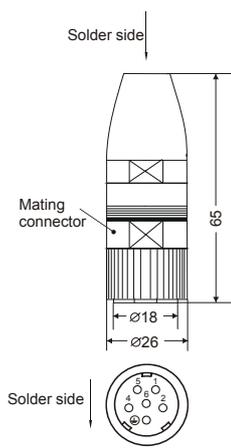
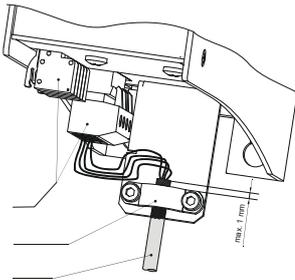


Fig.: 10: View on the SC series mating connector of the motor (internal thread M23)

Specification of the motor power cable with mating connector SC for JetMove 203B-230

For connection without motor holding brake

Motor power cable, cable assy no. 26.1			
Field wiring terminals of the JM-203B-230	Shielding		Motor mating connector (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>Highlyflexible 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	U1	Phase 1	1
X62.V2	V2	Phase 2	5
X62.W2	W3	Phase 3	2
X62.PE	yellow-green	PE conductor	
X10.BRAKE2	BR1	Brake +	6
X10.GND	BR2	Brake -	4

Dimensions of the motor mating connector are specified in millimeters.

For connection with motor holding brake

Motor power cable, cable assy no. 24.1			
Field wiring terminals of the JM-203B-230	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	U1	Phase 1	1
X62.V2	V2	Phase 2	5
X62.W2	W3	Phase 3	2
X62.PE	yellow-green	PE conductor	
X10.BRAKE2	BR1	Brake +	6
X10.GND	BR2	Brake -	4

Dimensions of the motor mating connector are specified in millimeters.

7.2.4 Connection assignment of terminal box

Connection assignment of terminal box ^{*)}		
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	Pin 4	 Protective earth
X10.BRAKE2	Pin 7	Brake +
X10.GND	Pin 8	Brake -

^{*)} alternative to motor connectors

7.3 Resolver connection

7.3.1 Specification

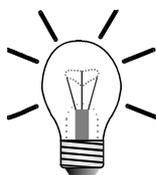
Specification of the connector for terminal X61 (ENCODER)

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

Specification of the resolver cable

- Cable size: 4 * 2 * 0.14 mm² (AWG 26(8)) min.
- 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
- Maximum cable length: 50 m

7.3.2 Resolver cable with mating connector



INFO!

The resolver respectively HIPERFACE mating connector can be ordered from Jetter AG by specifying its item # 15100069.

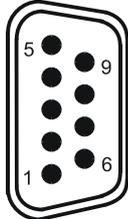
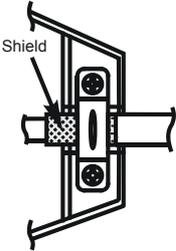
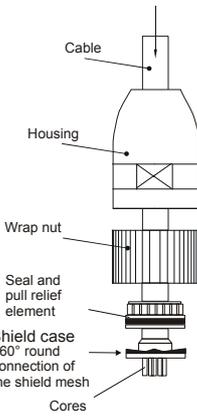
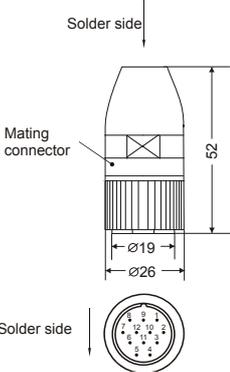
The complete resolver cable between the servo amplifier series JetMove 2xx and Jetter motors can be obtained from Jetter AG. It can be ordered by specifying the following cable assy number:

Cable assy no. 23 For the servo amplifier series JetMove 2xx

Mating connector of the resolver (solder side)



Fig.: 11: RC series mating connector of the resolver (internal thread M23)

Resolver cable of cable assy no. 23			
JetMove 2xx (Sub-D male 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 -	amber	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

Specification of the connector for terminal X61 (ENCODER)

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

HIPERFACE cable specification

- Cable size:
 - 4 * 2 * 0.14 mm² + 2 * 0.5 mm² (AWG 26(8) + AWG 20(2)) min.
 - 2 * 0.5 mm² (AWG 20(2)) must be used for the power supply unit and for GND.
- Twisted-pair cables shielded with the all-over shield must be used; the signal lines must also be twisted in pairs:
 - Sine + and reference sine
 - Cosine + and reference cosine
 - DATA - and DATA +
 - 0 V and power 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
- Maximum cable length: 50 m

7.4.2 HIPERFACE cable with mating connector



INFO

The compatible resolver or HIPERFACE mating connector can be ordered from Jetter AG by specifying its item # 15100069.

The ready-made HIPERFACE cable between servo amplifiers of the JetMove 2xx series and Jetter motors can be ordered from Jetter AG by specifying the cable confection number (KABEL-KONF) and the respective cable length in cm:

KAY_0723-xxxx

For servo amplifiers of the JetMove 2xx series

HIPERFACE mating connector (solder side)

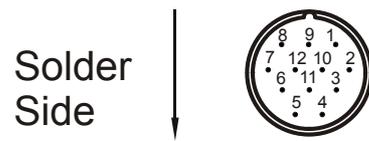
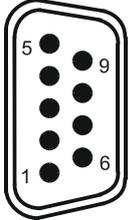
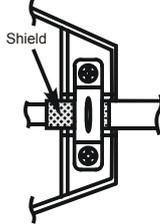
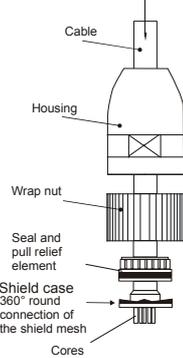
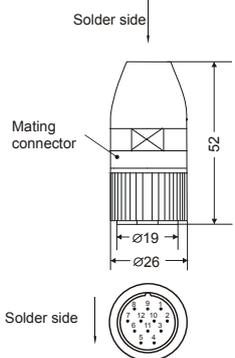


Fig.: 12: RC series HIPERFACE mating connector (internal thread M23)

HIPERFACE cable of KAY_0723-xxxx			
JetMove 2xx (Sub-D male connector X61)	Shielding		Motor (HIPERFACE) (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
-	Unassigned	-	1
-	Unassigned	-	2
7	Sine +	white	3
2	Reference sine	brown	4
8	Cosine +	green	5
3	Reference cosine	amber	6
6	DATA - (RS-485)	gray	7
1	DATA + (RS-485)	pink	8
4	0 V	blue	9 *)
5	Power supply (7 through 12 volts)	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 (item no. 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 an 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 power 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

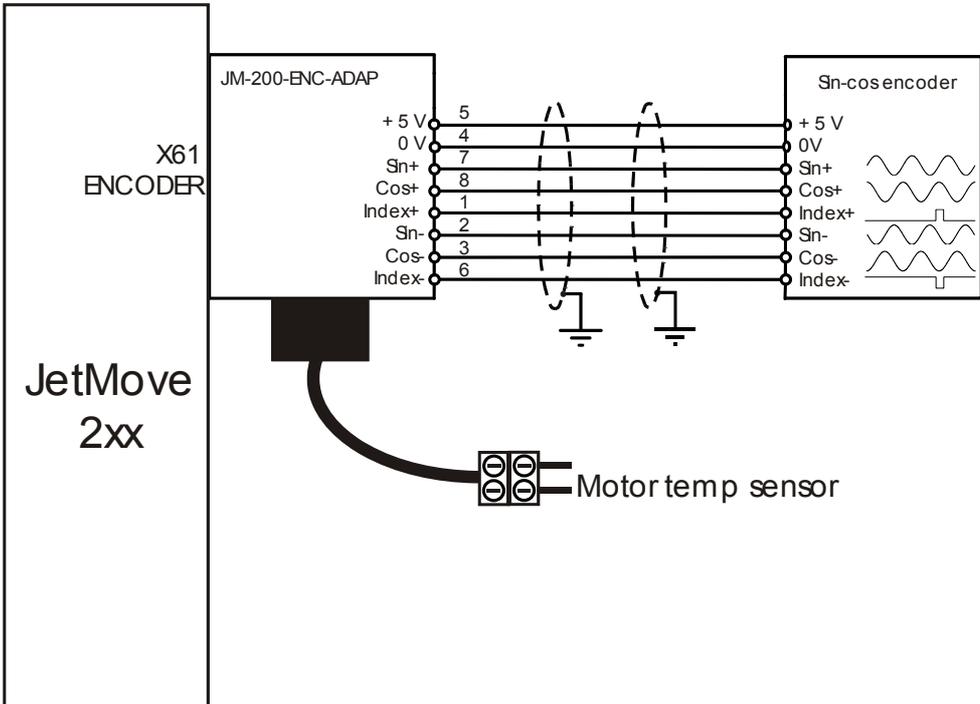
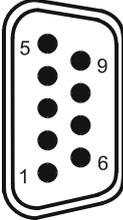
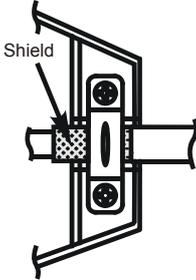


Fig.: 13: Sin-cos encoder connection with adapter

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

**NOTICE!****To be considered before connecting sin-cos encoders:**

- If a sin-cos encoder is to be used, after applying the logic power supply to the JetMove 2xx and before the first enable, commutation finding **always** has to be carried out. 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 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			
Terminals X10	Signal	Description	Specification
ENABLE	Hardware enable for the power supply of the motor (Input)	<ul style="list-style-type: none"> • At this input, a high signal is necessary for power supply of the motor (This signal must have been applied before carrying out the 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 reference run. 	<ul style="list-style-type: none"> • DC 24 V • 7.5 mA max. • Operating point: < 6 V low, > 15 V high <p>NC or NO contact</p>
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 <p>NC or NO contact</p>
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 <p>NC or NO contact</p>

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
⊥	Common ground		GND ^{*)} for all inputs and supply of the logic
⊥	Common ground		GND ^{*)} for all inputs and supply of the logic
DC 24 V	Voltage supply of processor logics		DC 20 ... 28,8 V (I ≤ 0.6 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 203B-230 at release of the motor current.</p> <p>Important note! A free-wheeling diode is necessary in case it has not been integrated in the motor yet. In Jetter motors, free-wheeling diodes have not been integrated! Recommended diode type: 1N4002</p>	<p>N/O</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 ground of the control system.

For connection diagram please refer to "Connection Diagrams" auf Seite 85.

7.7 JX2 System Bus

By means of the JX2 System Bus, the JetMove 203B-230 is interlinked with the controller, additional JetMove amplifiers, or Jetter peripheral modules. The JX2 system bus input BUS-IN is a 9-pin Sub-D male connector, and the JX2 system bus output BUS-OUT is a 9-pin Sub-D female connector.

7.7.1 JX2 System Bus cable - Specifications

Specification of connectors

On the BUS-OUT (X19) side

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

On the BUS-IN (X18) side

- 9-pin female Sub-D connector
- Metallized enclosure

System bus cable specification

The following minimum requirements apply to the manufacture of the system bus cable:

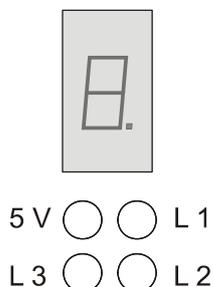
System bus cable - technical data	
Description	Specification
Cable size	1 MBaud: 0.25 - 0.34 mm ²
	500 kBaud: 0.34 - 0.50 mm ²
	250 kBaud: 0.34 - 0.60 mm ²
	125 kBaud: 0.50 - 0.60 mm ²
Cable capacitance	60 pF/m max.
Resistivity	1 MBaud: 70 max. Ω /km
	500 kBaud: 60 max. Ω /km
	250 kBaud: 60 max. Ω /km
	125 kBaud: 60 max. 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 of cable assy no. 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 output stage LEDs indicate the operating status of the digital servo amplifier.



JetMove 203B-230 - LEDs			
LED	Color	State	Description
5 V	green	is lit	Logic module voltage is OK.
L1	amber	is lit	Axis is standing still (speed = 0)
L2	amber	is lit	A voltage of 24 V is applied to the input of the positive limit switch (LIMIT+).
L3	amber	is lit	A voltage of 24 V is applied to the input of the negative limit switch (LIMIT-).

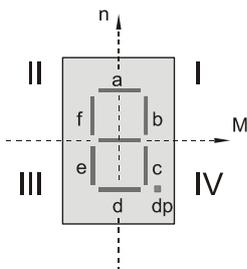


INFO!

The seven-segment display of the output stage indicates the operating and fault conditions of the digital servo amplifier JetMove 203B-230. The various display modes are set by the Motion Setup. Mode 0 (default) is used for normal operation and mode 1 for commissioning.

JetMove 203B-230 - Seven-segment display Mode 0: Normal operation		
Value	State	Description
0	NOT READY TO BE SWITCHED ON	Initialization of amplifier functions
1	SWITCH-ON INHIBIT	Initialization completed. Safe state. Is achieved after initialising and after acknowledging errors. The drive controller can be switched on.
2	READY TO BE SWITCHED ON	Drive controller has been 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 has been enabled.

JetMove 203B-230 - Seven-segment display Mode 0: Normal operation		
Value	State	Description
7	QUICK STOP ACTIVATED	A quick stop has been activated. The drive is being decelerated to $n = 0$ and then locked.
E	ERROR REACTION IS ACTIVATED	An error was recognized. An adjustable error reaction may be active.
F	MALFUNCTION	The drive controller is locked, error can be acknowledged.
F X. X.	ERROR NUMBER	Error with number X. X. has occurred.
.	Flashing dot	Warning activated
0.	Flashing "ZERO"	Boot sector activated
C.	Flashing "C"	OS flash is cleared.
E.	Flashing "E"	OS flash is cleared.
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 203B-230 - Seven-segment display Mode 1: Commissioning		
Value	Description	
g	$n_{as-is \text{ value}} < 0.5 \% n_{max.}$	--
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 Diagnostics

9.1 Error messages



INFO!

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

Error message table JetMove 203B-230

Error number	Type of error	Description	Error response	Troubleshooting
F 00	Hardware error	Internal hardware defect	– Immediate motor power disable	– Separate the drive controller from the power lines. – Return the amplifier for repair.
F 01	Internal voltage supply error	One or more power supply voltages are beyond their limits.	– Immediate motor power disable	– Separate the drive controller from the power lines. – Return the amplifier for repair.
F 02	Mains phase error (is only active in case of a 3-phase connection)	Failure of one of the mains phases.	– Immediate motor power disable	– Check fuses and wiring. – Acknowledge failure.
F 03	Motor cable breakage	The motor cable is broken. Please be careful: The motor cable is tested when the drive controller is enabled for the first time.	– Immediate motor power disable	– Check the motor cable connections. – Acknowledge failure.
F 04	Overvoltage in the DC link	A DC link voltage of > 480 V has been detected.	– Immediate motor power disable	– Check input voltage supply. – If the motor is used as generator, reduce the regenerating power. – Acknowledge failure.

Error message table JetMove 203B-230

Error number	Type of error	Description	Error response	Troubleshooting
F 05	Over-current	The output current has been greater than 2.5 x the rated current.	– Immediate motor power disable	<ul style="list-style-type: none"> – Check cable and motor for a short circuit. – Check current control parameters. If necessary, correct parameters. – Acknowledge failure.
F 06	Ballast resistor overload	The ballast resistor has been overloaded.	– Immediate motor power disable	<ul style="list-style-type: none"> – Let the amplifier cool down. – After cooling down, acknowledge failure. – Reduce regeneration power.
F 07	Amplifier overtemperature	The amplifier has reached the maximum temperature.	– Immediate motor power disable	<ul style="list-style-type: none"> – Let the amplifier cool down. – After cooling down, acknowledge failure. – Reduce power of the motion system.
F 08	Motor overtemperature	The motor has reached the maximum temperature.	– Immediate motor power disable	<ul style="list-style-type: none"> – Let the motor cool down. – After cooling down, acknowledge failure. – Reduce the power of the drive.
F 09	Encoder failure	Encoder breakage or initialization error	– Immediate motor power disable	<ul style="list-style-type: none"> – For extended diagnostics purposes use Motion Setup. – Check the encoder line and all plug-in connections. – Acknowledge failure.
F 10	Overspeed	The actual shaft speed has exceeded a value of 1.25 x maximum speed.	– Immediate motor power disable	<ul style="list-style-type: none"> – Check motor and encoder connections. – Check speed controller parameters. If necessary, modify parameters. – Acknowledge failure.
F 11	Current overrange	A current temporarily too high has been detected.	– Immediate motor power disable	<ul style="list-style-type: none"> – Reduce K_p of the current controller by 10 to 20 %. – Acknowledge failure.

Error message table JetMove 203B-230				
Error number	Type of error	Description	Error response	Troubleshooting
F 12	Ground fault	One or several phases of the motor cable or inside the motor have been short-circuited to earth.	<ul style="list-style-type: none"> – Immediate motor power disable 	<ul style="list-style-type: none"> – Check the motor cable and the motor. – Acknowledge failure.
F 13 (combined with F00)	Internal checksum error	An internal checksum error has occurred.	<ul style="list-style-type: none"> – Immediate motor power 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.	<ul style="list-style-type: none"> – Immediate motor power 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.	<ul style="list-style-type: none"> – Immediate motor power disable 	<ul style="list-style-type: none"> – Disable the drive by means of the software. – Acknowledge failure.
F 16	Power input overcurrent	The current at the power input is too high.	<ul style="list-style-type: none"> – Immediate motor power disable 	<ul style="list-style-type: none"> – Check input voltage. – Reduce mechanical power of the motor. – Acknowledge failure.
F 17	Software limit switch is activated.	Actual position is outside the programmed range, and a software limit switch has tripped.	<ul style="list-style-type: none"> – Stop at max. current (max. torque). 	<ul style="list-style-type: none"> – Check target position. – Check reference position. – Acknowledge failure. – Return the axis to a position within the software travel limits (monitoring of software limit switches is re-enabled automatically at entering this range).

Error message table JetMove 203B-230

Error number	Type of error	Description	Error response	Troubleshooting
F 18	The hardware limit switch is active.	A hardware limit switch is active.	<ul style="list-style-type: none"> – Stop at max. current (max. torque). 	<ul style="list-style-type: none"> – Check target position. – Check reference position. – Acknowledge failure. – Return the axis to a position within the machine travel limits (monitoring of hardware limit switches is re-enabled automatically at entering this range).
F 20	Undervoltage in the DC link	The DC link voltage is less than the set minimum value.	<ul style="list-style-type: none"> – Stop with emergency deceleration ramp. 	<ul style="list-style-type: none"> – Check the supply voltage. – Check the parameter "U_{ZK} min. trip". – Acknowledge failure.
F 21	Overvoltage of the DC link voltage	The DC link voltage has exceeded the set maximum value.	<ul style="list-style-type: none"> – Stop with emergency deceleration ramp. 	<ul style="list-style-type: none"> – Check the supply voltage. – In generator operation, reduce braking power. – Acknowledge failure.
F 22	The drive is blocked.	The drive could not overcome the n = 0 threshold within the time limit specified by the parameter "blocking-tripping time".	<ul style="list-style-type: none"> – Immediate motor power disable 	<ul style="list-style-type: none"> – Eliminate the cause of blocking. – Acknowledge failure.
F 23	Tracking error	The tracking error has exceeded the limit defined in the parameter "tracking error limit" for the time specified in "tracking window time".	<ul style="list-style-type: none"> – Stop with emergency deceleration 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 error window time". – Acknowledge failure.
F 24 (combined with F 01)	Error in 24 V supply voltage	The external 24 V supply was lower than 18 V.	<ul style="list-style-type: none"> – Immediate motor power disable 	<ul style="list-style-type: none"> – Check external power supply. – Acknowledge failure.

Error message table JetMove 203B-230				
Error number	Type of error	Description	Error response	Troubleshooting
F 25 - F 27 (combined with F 01)	Internal power supply error	One or more internal supply voltages have fallen below their limits.	– Immediate motor power disable	– Note the fault number. – Return the amplifier for repair.
F 29	The mains power is too high.	The average mains power of the 230 V supply was too high.	– Immediate motor power disable	– Acknowledge failure. – Reduce the average load of the motor.
F 30	I ² t error	The average power loss of the motor has been greater than the max. value configured by nominal motor current, overload factor and motor time constant. See "I ² t calculation" on page 44.	– Immediate motor power disable	– Let the motor cool down. – Acknowledge failure. – Check the configuration of nominal motor current, overload factor and motor time constant. – Reduce the average load of the motor.
F 31	Motor overload measuring to UL	The average motor power loss was higher than has been defined according to UL. See chapter 5.2.3 "Motor overload protection according to UL", page 45.	– Immediate motor power disable	– Let the motor cool down. – Acknowledge failure. – Reduce the average load of the motor.
F 38	Asymmetric encoder signal	The amplitudes of the analog sine-cosine signals are not identical.	– Immediate motor power disable	– Check wiring or encoder signals. – Acknowledge failure.
F 39	Error at commutation finding	Measuring the commutation offset could not be completed with results being guaranteed.	– Immediate motor power disable	– Check parametering. – Check wiring or encoder signal. – Acknowledge failure.
F 42	Malfunctioning of encoder 2 (only for the option CNT)	Encoder breakage or initialization error	– Immediate motor power disable	– Check the encoder line and all plug-in connections. – Acknowledge failure.
F 43	Communication error	Termination after a max. number of lost cyclic data transmissions	– Stop with emergency stop ramp	– Check the communication connection

Error message table JetMove 203B-230

Error number	Type of error	Description	Error response	Troubleshooting
F 44	Communication error	CAN controller is in Error Passive state. The error counter value exceeds 127.	– Stop with emergency stop ramp	– Check the communication connection
F 45	Communication error	CAN controller is in Bus OFF state. The error counter value has reached 255.	– Stop with emergency stop ramp	– Check the communication connection
F 46	Communication error	A smart encoder (EnDat 2.2) may have sent an error message	– Immediate motor power disable	– Check the parameters – Check the encoder

9.2 WARNINGS

If the dot in the seven-segment display is flashing, one or several warnings have been recognized. Check in the Motion Setup or by issuing the motion instructions in the controller program which warning is active.

10 Connection diagrams

See page 64

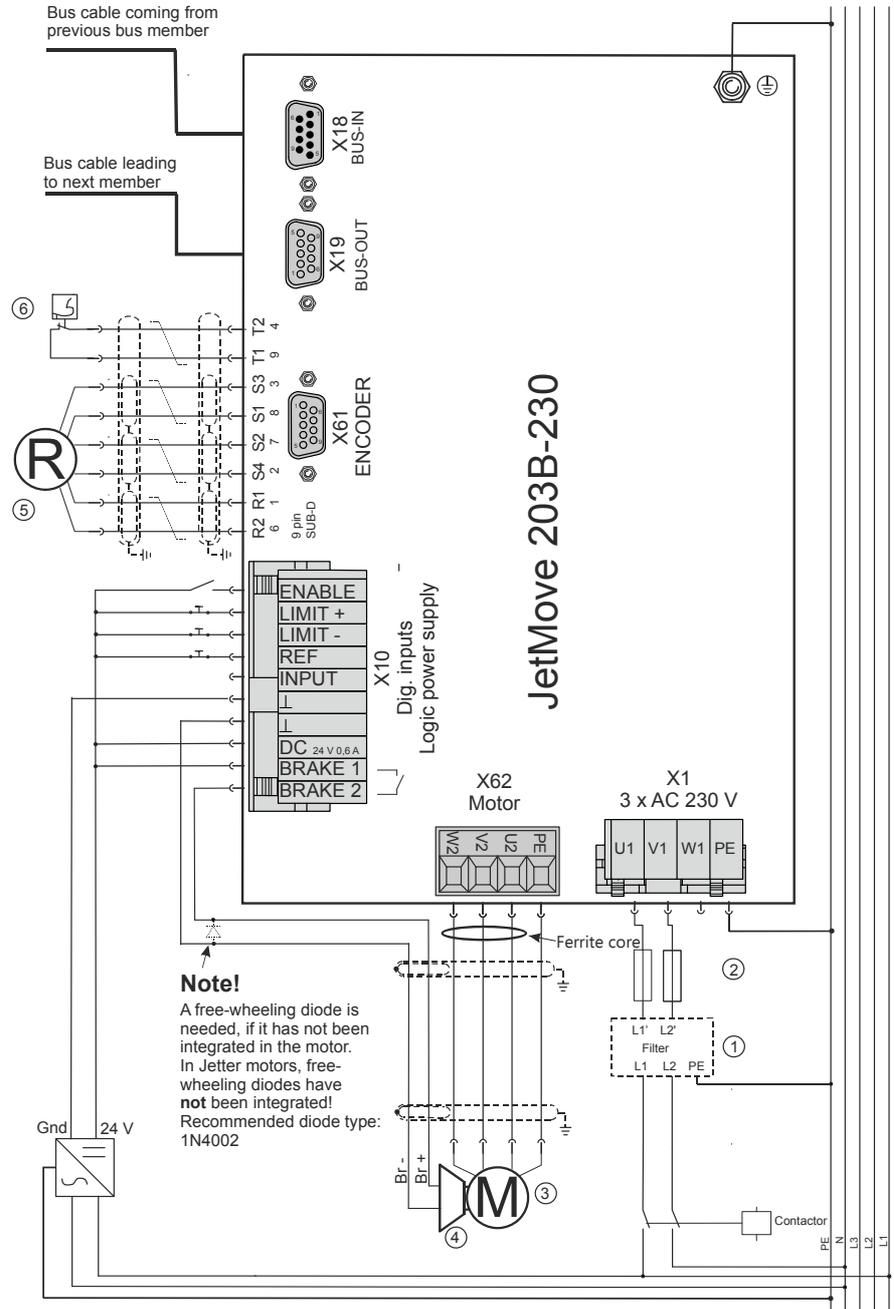


Fig.: 14: Connection diagram JetMove 203B-230, 1-phase connection, type of position transducer: Resolver

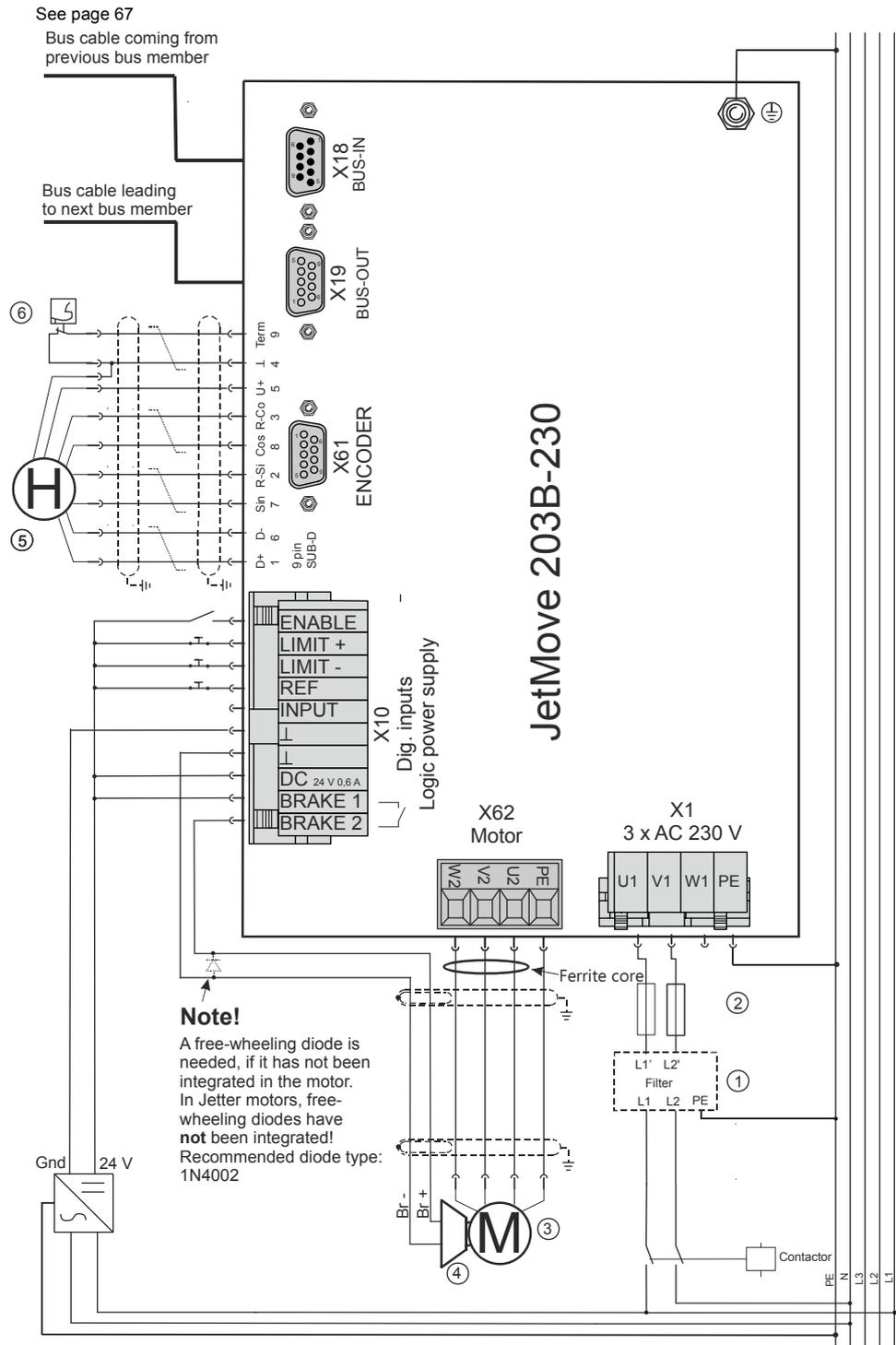
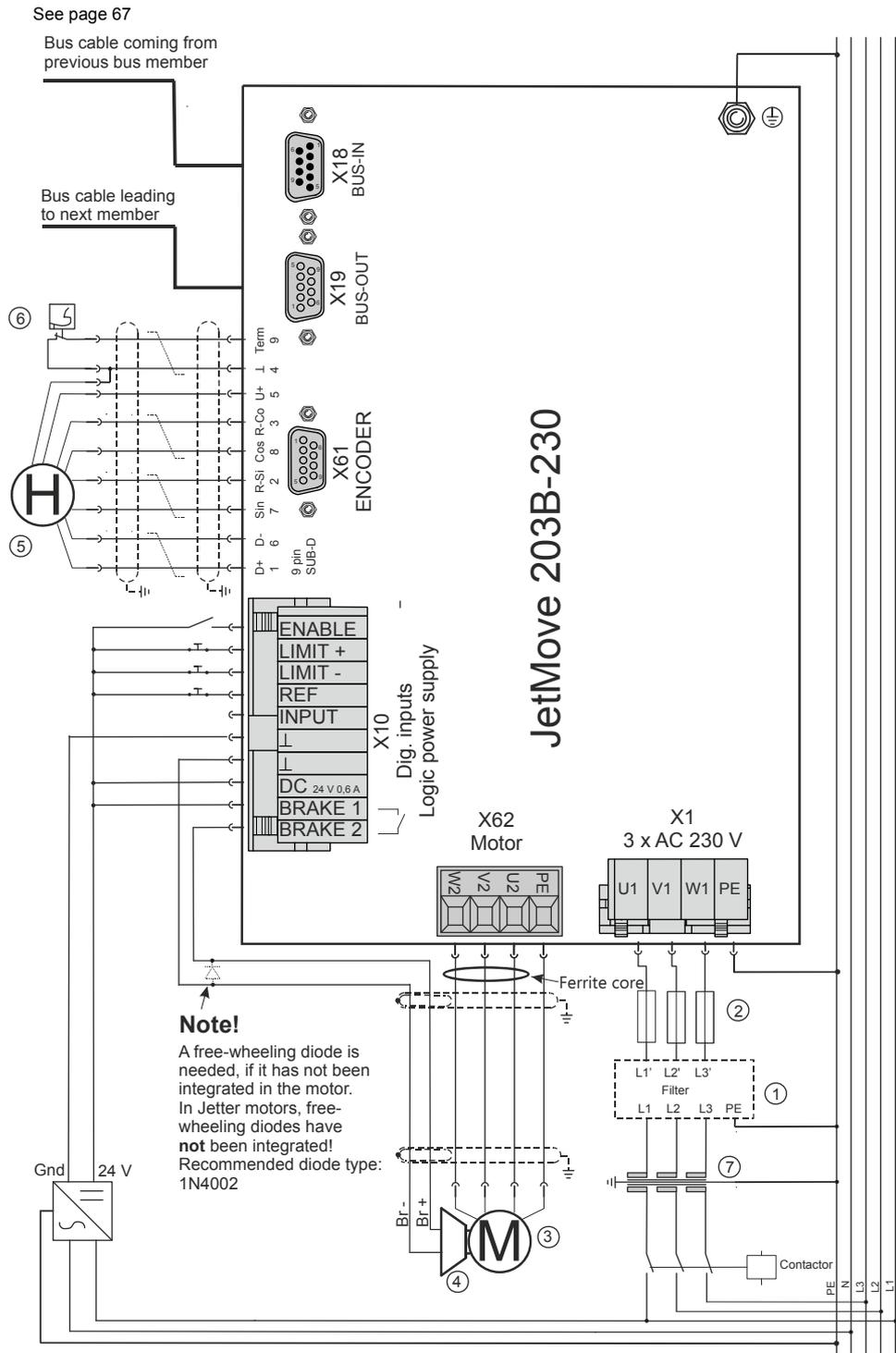


Fig.: 15: Connection diagram JetMove 203B-230, 1-phase connection, type of position transducer: HIPERFACE



Key to the connection diagrams:

- 1 Line filter (optional) (refer to "Line filter" on page 40)
- 2 Mains protection (refer to "Overload protection" on page 40)
- 3 Motor
- 4 Motor holding brake (option)
- 5 Position transducer (resolver or HIPERFACE encoder)
- 6 Motor overtemperature protection
- 7 Isolating transformer or autotransformer

11 Analog input (option)

11.1 Operating principle

For the digital servo amplifier JetMove 203B-230, an optional integrated analog input card can be ordered (article designation of the device: JM-203B-230...-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. A pressure sensor in the machine is connected to the analog input of the JetMove to deliver the actual pressure value for the control loop.

11.2 Technical data

Technical data of the analog input	
Connection	Sub-D connector (male) at the device
Voltage range	0 ... 10 V
Input current	1.4 mA max.
Resolution	12 bits
Value range	0 ... 32767 (resolution in steps of 8)
Electrical isolation	None
Accuracy Zero error Gain error	max. ± 5 LSB (± 40 values) corresponds to ± 12.2 mV max. ± 20 LSB (± 160 values) corresponds to ± 48.8 mV

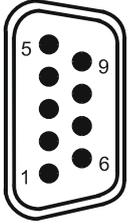
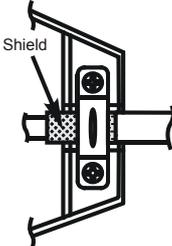
11.3 Description of connections

Specification of the mating connector for X71

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

Specification of the cable leading to the analog input

- Cable size: 2 * 0.14 mm² min. (AWG 26(2))
- Cores have to be twisted and entirely shielded.
- 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

Pin assignment of the analog input	
	Shielding
	
X71	Connect shield with the greatest possible surface area! Use metallized housing only!
Pin	Signal
1	Analog signal (0 - 10 V to pin 6)
6 - 9	Analog GND (connected to earth in the device)
2 - 5	Do not use

12 Ethernet interface (option)

12.1 Operating principle

For the digital servo amplifier JetMove 203B-230, an optional integrated Ethernet interface can be ordered (article designation of the device: JM-203B-230...-OEM). This option lets you address the JetMove 203B-230 from the controller via Jetter Ethernet system bus instead of the JX2 System Bus.

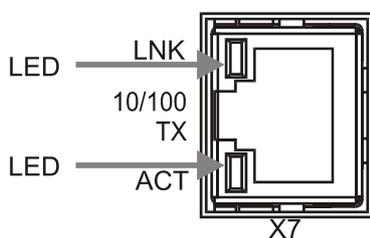
Functional equipment	
1 Ethernet interface	10/100 MBit/s, TX
10-pin DIP switch for the lower 8 bits of the IP address and of various operating modes	RUN / STOP / LOAD
LED for status indication	RUN / ERR

12.2 Description of connections

The digital servo amplifier JetMove 203B-230...-OEM is connected with the Ethernet by a RJ45 socket (X71).

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

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



The LEDs of the JetMove 203B-230...-OEM Ethernet	
Designation	Operating principle
ACT	Activity: The JetMove 203B-230...-OEM transmits or receives data via the Ethernet.
LNK	Linkage: The JetMove 203B-230...-OEM is linked with the Ethernet.

12.2.1 Connection between the JetMove 203B-230...-OEM and a PC or JetControl

Direct connection between a PC or JetControl and a JetMove 203B-230...-OEM is established by means of a crossover cable.

12.2.2 Connection between the JetMove 203B-230...-OEM and a PC or JetControl through a switch

If connection between PC or JetControl and a JetMove 203B-230...-OEM is established through a switch, straight-through cables have to be used.



INFO!

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.

**INFO!**

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, DIP switches

12.3.1 LEDs

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

The as-is state of the LED can be scanned in register 10182.

Error Messages indicated via LEDs	
Following power-up the red LED (ERR) and the green LED (RUN) are flashing.	The selector is in LOAD position. The boot loader is running. The OS of the Ethernet interface is neither checked nor launched.
Following power-up the red LED (ERR) flashes three times, then both LEDs (red = ERR, green = RUN) are flashing.	The selector is in RUN or STOP position. The boot loader is running. There is no valid operating system of the Ethernet interface available.
The red LED (ERR) and the green LED (RUN) are flashing alternately with intermittent breaks during runtime.	Fatal operating system error of the Ethernet interface

12.3.2 The DIP switches

The switches are evaluated at switching on the JetMove 203B-230...-OEM. Switches 1 through 8 influence the IP address; switches 9 through 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 booting proceeds as far as to the initial program loader of the Ethernet interface.
9 = ON	Reserved

After booting, the switch has no influence on the interface functions. The current position of the mode selector can be scanned in register 10181.

12.4 Setting the IP address

There are four ways of assigning an IP address to a JetMove 203B-230...-OEM. The actually used IP address can be scanned in register 2931.

12.4.1 Default IP address

If, at activating the controller, DIP switches 1 through 8 are in "OFF" position, the JetMove 203B-230...-OEM has got IP address 192.168.10.15.

In case of any uncertainties with regard to the IP address used, you can use this "loophole" to set the JetControl to a defined state.

12.4.2 IP address out of the configuration memory

If, at activating the JetMove 203B-230...-OEM, the DIP switches 1 through 8 are in "ON" position, the JetControl has got the IP address saved in 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 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
```



NOTICE!

In no case change the version number.

Registers

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

In order to make a change via registers, first password register 10159 with password value 2002149714 (0x77566152) has to be loaded. Then, registers 10132 through 10145 are modified. Finally, the changes to the configuration memory have to be saved by entering an arbitrary value into register 10100.

Registers	Meaning	Value used 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
10137	Subnet mask 3SB	255
10138	Subnet mask 2SB	255
10139	Subnet mask LSB	0

Registers	Meaning	Value used in the example
10140	Default gateway MSB	192
10141	Default gateway 3SB	128
10142	Default gateway 2SB	10
10143	Default gateway LSB	1
10144	Port number of the JetIP server	50000
10145	IP address of the DNS server	0xC076D2D1 (192.118.210.209)
10159	Password	2002149714 (0x77566152)

**NOTICE!**

Do not change the version number contained in register 10131.

12.4.3 IP address taken from the switch position

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

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

The actual settings of DIP switches 1 through 8 can be scanned from register 10180.

13 Safe Torque OFF (STO) Option

For information on the -S1 option "Safe Torque Off (STO)" refer to the corresponding Function Description which can be downloaded from our homepage:
<https://www.jetter.de/en/downloads/motion-systems/jetmove-series/jetmove-2xx.html>



jm-2xx_sto-option_fb_xxx_function_description

Functional description with safety instructions to be observed and measures concerning "STO".



INFO

At Jetter AG, the safety function "STO" is referred to as "Safe Standstill" in the order list for example.

14 Counting input (option)

14.1 Operating principle

For the digital servo amplifier JetMove 203B-230, an optional integrated analog counting card can be ordered (article designation of the device: JM-203B-230...-CNT). It supplies a counting input equipped 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.

Yet, the actual position of an SSI encoder cannot be used for position control. It only indicates the position of the leading axis.

14.2 EnDat 2.2

14.2.1 Technical data

Technical data - EnDat 2.2 input	
Encoder types	Absolute encoders (single, multiturn or linear)
Scanning	62.5 μ s
Transfer rate	8 MHz
Maximum cable length	100 m
Type of signal	5 V differential signals
Input impedance	22 k Ω
Bus termination	120 Ω Integrated resistance
Electrical isolation	None

14.2.2 Description of connections

Specification of the mating connector for X71

- 9-pin male Sub-D connector
- Metallized 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 mm² must be used for the power supply unit and for GND.
- The cables have to be twisted in pairs and included in an overall shielding
- The following signal lines have to be twisted in pairs:
DATA - and DATA +
Clock - and Clock +
0 V and power 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
- Maximum cable length: 100 m

14.2.3 EnDat cable with mating connector



INFO!

The EnDat mating connector can be ordered from Jetter AG by specifying its item number 15100069.

The complete EnDat cable between servo amplifiers of the JetMove 2xx series and the Jetter motors can be ordered from Jetter AG. It can be ordered by submitting the following cable specifications and the respective cable length in cm:

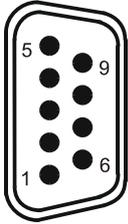
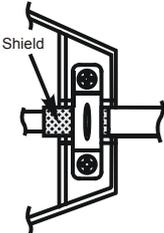
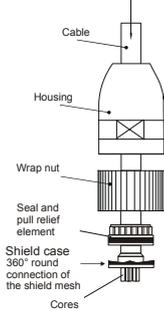
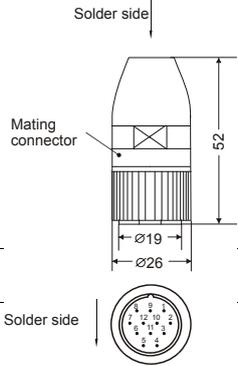
KAY_0723-xxxx

For servo amplifiers of the JetMove 2xx series

EnDat mating connector (solder side)



Fig.: 18: View on EnDat mating connector of the RC series (internal thread M23)

EnDat Cable with KAY_0723-xxxx			
JetMove 2xx (Sub-D male connector X71)	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 housing 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	amber	6
6	Clock - (RS-485)	gray	7
1	Clock + (RS-485)	pink	8
4	0 V	blue	9 ^{*)}
5	5 V power supply 200 mA max.	red	10
9	Unassigned	black	11
	Unassigned	-	12 ^{*)}

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

14.2.4 Power supply of the encoder

The optional counter 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:

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

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

Given	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 rate	100 kHz ... 1 MHz
Maximum cable length	50 ... 100 m
Type of signal	5 V differential signals
Input impedance	22 k Ω
Bus termination	120 Ω integrated resistance
Electrical isolation	None

14.3.2 Description of connections

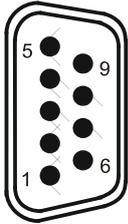
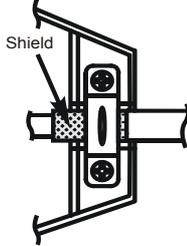
Specification of the mating connector for X71

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

Specification of the SSI cable

- Cable size: 2 * 2 * 0.14 mm² + 2 * 0.25 mm² (AWG 26(4) + AWG 23(2))
2 * 0.25 mm² must be used for the power supply unit and for GND.
- The cables have to be twisted in pairs and included in an overall shielding.
- The following signal lines have to be twisted in pairs:
Clock - and Clock +
DATA - and DATA +
0 V and power 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
- 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 (Sub-D male connector X71)	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 housing only!</p>	<p>Encoder signal: 5 V differential signal Maximum cable length: 100 m</p>
Pin	Signal	
1	Clock +	
2	DATA +	
3	do not use	
4	0 V	
5	Power 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 rate	20 MHz
Maximum cable length	100 m
Type of signal	5 V differential signals
Input impedance	22 k Ω
Bus termination	120 Ω integrated resistance
Electrical isolation	None

14.4.2 Description of connections

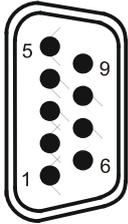
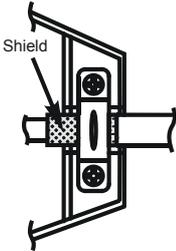
Specification of the mating connector for X71

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

Specification of the incremental encoder cable

- Cable size: 3 * 2 * 0.14 mm² + 2 * 0.25 mm² (AWG 26(6) + AWG 23(2))
2 * 0.25 mm² must be used for the power supply unit and for GND.
- The cables have to be twisted in pairs and included in an overall shielding.
- The following signal lines have to be twisted in pairs:
 - K0 - and K0 +
 - K1 - and K1 +
 - K2 - and K2 +
 - 0 V and power 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
- Maximum cable length: 100 m

14.4.3 Incremental encoder cable

Incremental encoder cable		
JetMove 2xx (Sub-D male connector X71)	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 housing only!</p>	<p>Encoder signal: 5 V differential signal Maximum cable length: 100 m</p>
Pin	Signal	
1	K0 +	
2	K1 +	
3	K2 +	
4	0 V	
5	Power supply 5 V, 200 mA max.	
6	K0 -	
7	K1 -	
8	K2 -	
9	do not use	

15 Ordering information

15.1 List of documentation

The documents listed below are available for download from the website of Jetter AG at <http://www.jetter.de>.

Programming

jetmove_2xx_D203_at_the_jetcontrol_bi_xxxx_user_information.pdf



User information on configuration and operation of the JetMove2xx series at the JetControl 24x
Item no. 60874950

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
Item no. 60866113

15.2 Options

Designation	Ethernet interface (page 89)	Analog input (page 87)	Counter input (page 97)	-S1 (STO) (page 95)
JM-203B-230				
JM-203B-230-OEM	✓			
JM-203B-230-IA1		✓		
JM-203B-230-CNT			✓	
JM-203B-230-S1				✓
JM-203B-230-OEM-S1	✓			✓
JM-203B-230-IA1-S1		✓		✓
JM-203B-230-CNT-S1			✓	✓

Appendices

Appendix A: Recent revisions

Chapter	Comments	Revised	Added	Deleted
Introduction	Language of the original document		✓	
Whole document	Attention replaced by CAUTION Important replaced by NOTICE Note replaced by INFO	✓		
1.1.2	A servo amplifier as such is not a safety component. An exception is the STO feature in devices with option -S1		✓	
1.2.3	Information on damage to the device due to excessive tightening torque of the PE bolt		✓	
3	Danger notice in case of non-compliance with the operating parameters for devices with option -S1		✓	
3	Instructions for action after expiry of the maximum storage period		✓	
3	Note that this product may cause radio interference	✓		
3	Note on the quality of the Ethernet cable		✓	
3	Operating altitude	✓		
5	Tolerance of the power supply of the logics circuit	✓		
5.1	Hazard warning in case of non-compliance with the technical specification for devices with -S1 option		✓	
5.1	Overload protection for UL devices	✓		
5.1	Compatible servomotors. Reference to User Manual instead of Motor Catalog	✓		
5.1	Tolerance of power supply for control logic, digital inputs and digital outputs	✓		
6	Controller specification			✓
6	Function -> Controller type	✓		

Chapter	Comments	Revised	Added	Deleted
6	Meaning -> Specification	✓		
7.2.3	INFO 1	✓		
7.2.3	INFO 2	✓		
7.2.4	INFO 1	✓		
7.2.4	INFO 2	✓		
7.3.2	INFO 1	✓		
7.4.2	INFO 1	✓		
7.7	Function -> Description in table header	✓		
7.7	Specification in line „DC 24 V“ -> DC 20 ... 28.8 V (I < 0.6 A)	✓		
7.8	Specification in line „DC 24 V“ -> DC 20 ... 28.8 V at 2 A max.	✓		
7.9	Introduction the JX2 system bus	✓		
8	Color -> Value	✓		
9	Error F05: Check motor cable for short circuit		✓	
9	Error messages F43 ... F46		✓	
12.3.1	Table header „LED error messages“	✓		
13	Text on STO			✓
13	Link to separate document on STO for JM-2xx		✓	
14.2.3	INFO, first part	✓		
15.1	Link to Jetter AG homepage		✓	
App. C	Abbreviation JX2-SBK1			✓
Whole document	Safe Standstill -> Safe Torque Off (STO)	✓		
Whole document	Hand symbol: Important -> NOTICE	✓		
Whole document	Light bulb symbol: Note -> INFO	✓		
Whole document	Jetter System Bus -> JX2 System Bus	✓		
Whole document	Index entries	✓	✓	✓

Appendix B: Differences between JetMove 203-230 and 203B-230

The JetMove 203-230 servo amplifier has been developed further to become the servo amplifier JetMove 203B-230.

The objectives of this further development have been the following:

- To save components, in order to achieve greater dependability
- To decrease the amount of various models

In the development process, special attention was paid to providing a large scope of interchangeability.

For technical reasons, there will still remain certain differences which must be considered in individual cases.

Automatic encoder recognition

The JetMove 203B-230 is not equipped with two varieties for different position transducers any more. (Up to now, the customer had to decide whether to order the JetMove 203-230-RE servo amplifier for the resolver input circuit or the servo amplifier JetMove 203-230-HI for the HIPERFACE input circuit.)

The JetMove 203B-230 servo amplifier can automatically recognize which encoder has been connected to it and configure its input circuit respectively.

Consequences for the user:

- Even with both encoder types being applied, double stock-keeping can be avoided.
- Irrespective of the encoder type used, the order number is the same.

UL certification

On the development of the servo amplifier JetMove 203B-230 special attention was given to UL certification.

Consequences for the user:

- In future, the servo amplifier JetMove 203B-230 will also be available with UL certification.

Power factor correction

Using a 1-phase power supply the servo amplifier JetMove 203-230 was operated with a power factor correction circuit. In the JetMove 203B-230 amplifier, this is not applied any more.

Consequences for the user:

- In case of a 1-phase connection, the DC link voltage in motor mode (no feedback by braking) is 325 V instead of 380 V. This means that the maximum possible speed by which a motor can be run is decreased by about 15 %. Moreover, the DC link voltage now is directly proportional to the input voltage and no longer independent of it.
- Operating from a 1-phase power supply, the RMS value of the input current is approximately 2.3 times higher at the same motor output level. For this reason, at an average motor power of 500 W, the crucial fusing value (and accordingly the cable size of the power line) has to be increased from 4 A to 10 A.

Operating from a 3-phase power supply, there will be no differences.

Option -S1: Safe Torque Off (STO)

The servo amplifier JetMove 203B-230 can optionally be ordered with option "Safe Torque Off" (-S1).



Important

The servo amplifier JM-203B-230 can only be operated with OS version 2.11.0.0 or higher. When older versions are used, the servo amplifier will issue an error message.

Appendix C: Glossary

AC	Alternating Current
CE	Communautés Européenes European Union
DC	Direct Current
DIN	Deutsches Institut für Normung e.V. = German Industry Standard
EU	Europäische Gemeinschaft = European Union
EC Low Voltage Directive	To be considered when using electric devices of a rated voltage between 50 and 1,000 V AC and between 75 and 1,500 V DC.
Electro-Magnetic 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."
EN	Europäische Norm = European Standard
ESD	Electrostatic Discharge
Hazard analysis	Excerpt from the Machinery Directive: The manufacturer is under an obligation to assess the hazards in order to identify all of those which apply to his machine; he must then design and construct it taking account of his assessment.
HIPERFACE	High Performance Interface HIPERFACE designates a sensor-transducer system by Sick / Stegmann. The SinCos motor feedback system with the standardised HIPERFACE interface is often used in digital drive technology. Unlike the resolver, the SinCos motor feedback system with HIPERFACE interface contains electronic components. Over several motor rotations, a HIPERFACE will report the absolute position values; this cannot be performed by a resolver. A HIPERFACE is far more precise than a resolver, but also more expensive.
IEC	International Electrotechnical Commission
IP	International Protection
JetMove	JetMove is the type designation of a digital servo amplifier series produced by Jetter AG. The extension 203B-230, for example, marks the following features: <ul style="list-style-type: none"> – 203 identifies a rated current of 3 A. – 230 identifies the operating voltage of the rated power supply.

JX2 System Bus	The JX2 System Bus is a system-bus system of a cable length of 200 m max. and of fast data transmission rates of 1 MBit/s max. In addition to this, the JX2 System Bus is highly immune to interferences. Therefore, the JX2 System Bus is suited to realise field bus applications in a limited space.
JetWeb	Control technology comprising control systems, motion systems, user interfaces, visualization devices, remote I/Os and industrial PCs. Programming by means of multitasking and a modern sequence-oriented language. Communication by means of Ethernet TCP/IP and making use of the Web technologies.
Motor circuit-breaker	A circuit-breaker with monitoring functions of phases and temperature of a motor.
NN	Normal Null = Sea Level
PE	"Protective Earth" , respectively "Protective Earth Conductor"
Resolver	Feedback unit at a servo motor for determining the absolute position within one revolution. Other than a HIPERFACE, the resolver will not provide any information on how many revolutions the motor has performed so far. A resolver could be envisaged as a transformer; the couplings of its secondary windings (sine and cosine) change in relation to the position of the motor shaft. Basically, a resolver consists of a rotor with one coil and a stator with two coils. The stator windings are displaced by 90° (sine and cosine). The resolver itself does not contain any electronic components.
SELV	Safe Extra Low Voltage: Voltage, which, under all operating conditions will not exceed a peak or DC voltage of 42.4 V. This voltage is either measured between two conductors or between one conductor and earth. The circuit, in which this voltage occurs, must be separated from the mains power supply by a safety isolating transformer or some equivalent.
Sub-D	Type name of a plug-in connector
t_r/t_h	time rise / time hold: "Rise time of a pulse / total hold time of a pulse"
t_r/t_n	time rise / time normal: "Rise time of a pulse / total duration of a pulse"
TN network	Supply network which is solidly earthed in the neutral point and which is equipped with a protective earth conductor.

TT network	Supply network which is solidly earthed in the neutral point, yet, which is not equipped with a protective earth conductor. Earthing is carried out by means of a local protective earth.
UL	Underwriters Laboratories Inc.
VDE	Verband deutscher Elektrotechniker e.V. = Association of German Electrical Engineers
DC link voltage	DC circuit within a servo drive on the basis of which the motor currents are generated.

Units:

A	Ampere
mA	Milliampere (1 mA = 10 ⁻³ A)
dB	Decibel
g	Gram
h	Hour
Hz	Hertz
K	Kelvin
m	Meter
cm	Centimeter (1 cm = 10 ⁻² m)
mm	Millimeter (1 mm = 10 ⁻³ m)
s	Second
V	Volt
μV	Microvolt (1 μV = 10 ⁻⁶ V)
W	Watt
Ω	Ohm
°C	Degrees centigrade (temperature unit)
°	Degrees (angular dimension)

Appendix D: Index of illustrations

Fig. 1:	Double earthing	16
Fig. 2:	Shielding of Sub-D connectors in conformity with EMC standards	21
Fig. 3:	Shielding of screw terminals in conformity with the EMC standards	22
Fig. 4:	Rear and front view of the JetMove 203B-230 enclosure with mounting holes	25
Fig. 5:	Physical dimensions of the JetMove 203B-230 (in mm)	37
Fig. 6:	Block diagram of drive controller structure	47
Fig. 7:	Connection of the 3-phase supply line	49
Fig. 8:	Connection of the 1-phase supply line	50
Fig. 9:	Connection of motor lines	52
Fig. 10:	View on the SC series mating connector of the motor (internal thread M23)	53
Fig. 11:	RC series mating connector of the resolver (internal thread M23)	57
Fig. 12:	RC series HIPERFACE mating connector (internal thread M23)	60
Fig. 13:	Sin-cos encoder connection with adapter	63
Fig. 14:	Connection diagram JetMove 203B-230, 1-phase connection, type of position transducer: Resolver	81
Fig. 15:	Connection diagram JetMove 203B-230, 1-phase connection, type of position transducer: HIPERFACE	82
Fig. 16:	Connection diagram JetMove 203B-230, 3-phase connection, type of position transducer: Resolver	83
Fig. 17:	Connection diagram JetMove 203B-230, 3-phase connection, type of position transducer: HIPERFACE	84
Fig. 18:	View on EnDat mating connector of the RC series (internal thread M23)	98

Appendix E: Index

A		DIP switches	92
Accessories	23	Disposal	13
Active cooling	42	Drive controller specification	47
Air humidity	32	E	
Ambient temperature	32	Earthing procedure	15
Analog input (option)	87	Earth-leakage current breaker	16
Autotransformer	85	Electrical specifications	39
B		EMC	34
Blocking of the motor	51	EnDat cable	
C		KAY_0723-xxxx	99
Class of protection	33	Error messages	73
Commissioning		Ethernet interface (option)	89
Safety instructions	28	H	
Compatible servo motors	43	HIPERFACE cable	
Configuration memory	92	KAY_0723-xxxx	61
Connection		I	
HIPERFACE	59	Incremental encoder (connections)	103
Resolver	57	Incremental encoder cable	104
Sin-cos encoder	62	Information signs	14
Connection diagrams		Installation	
Wiring diagrams	81	Checks	27
Contact assignment		Electrical	26
Motor	52	Mechanical	24
Power supply	49, 50	Safety instructions	27
Convection	24	Installation to EMC rules	26
Corrosion	32	Instructions on EMI	20
Counting input (option)	97	Intended conditions of use	11
D		J	
Damages in transit and storage	33	JX2 system bus cable	
Decommissioning	29	Cable assy # 530	69
Degree of protection	32	L	
Description of symbols	5	Leakage current	15
Diagnostics	73	LEDs	
Dielectric test voltage	33	Logic circuit	91
Differences between JetMove 203-230 and JetMove 203B-230	112	Line filter	40
Dimensions			
Physical dimensions	37		

M		Reference variables	66
Maintenance	13	Repair	13
Malfunctions	14, 51	Residual dangers	
Modifications	12	Electric shock	19, 27, 28, 42
Motor braking circuit		High operating voltage	17
Free-wheeling diode required!	52,	Hot surfaces	17
67,	81, 82, 83, 84	Mech. force	18
81, 82, 83, 84		Potentially explosive atmosphere	18
Motor power cable		Resolver cable	
Cable assy # 24.1	55	Cable assy # 23	58
Cable assy # 26.1	54		
Motor protection	44	S	
Motor winding isolation	26	Scope of delivery	23
Mounting position	24, 33	Setting the IP address	92
		Seven-segment display	
N		Mode 0 - Normal operation	71
Noise immunity	20	Mode 1 - Commissioning	72
		Specification	
O		JX2 system bus cable	68
Operating altitude	32	Status LEDs	71
Operating conditions	31	STO (option -S1)	95
Ordering information	105	System bus cable	
Oscillating of the motor	51	Specification	68
Overvoltage category	33		
		T	
P		Technical data	
Password		Absolute encoder	48
Configuration memory	94	Analog input	87
Pin assignment		Counter (EnDat 2.2)	97
HIPERFACE	59	Incremental encoder	103
Incremental encoder	104	Servo amplifier	39
Resolver	57	SSI	101
SSI	102	Terminal box of the motor	56
Pollution degree	32		
PWM frequency	48	U	
		Usage other than intended	11
Q			
Qualified personnel	12	V	
		Vibration resistance	32
R			
Reference input	66	W	
		Warnings	79

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