Positioning and
Sequence Control Unit for
3-phase Stepping Motors

WDP3-01X with OED3

Doc. no. 214.157/DGB

Ident. no.: 00441110002

Edition: e220 09.2003

Software version: 03.1XX

Safety instructions

Please read the following safety instructions prior to installation, operation, maintenance and repair of the device.

- The intended use of the device under is described “Purpose” and must be observed.
- Installation, maintenance and repair of the device shall be performed by a qualified electrician. National regulations concerning
  – accident prevention
  – installation of electrical and mechanical systems
  – radio interference suppression
  shall be observed.
- The technical data of the device, particularly the ambient conditions, shall be observed.
- The device shall only be operated by trained personnel.
- The warranty is invalidated in case of unauthorized modification or opening of the device.
- Please ask your technical consultant prior to installing accessories not listed under “Accessories”.
- The safety symbols and notes on the device and in the manual shall be observed.

Explanation of symbols

ATTENTION
Reference to a danger for the device or components, possibly resulting in the endangering of human life.
DANGER
Reference to a direct endangering of human life.

DANGER
High voltage at component, do not touch.

DANGER
High temperature at component, do not touch.

ATTENTION
Warning against electrostatic discharge (ESD).
Only touch the PC-board or component in an electrostatically-protected environment.

NOTE
Important or additional information concerning the device or the manual.

Proposals
Improvements

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WDP3-01X with OED3

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Please inform us, using this form, if you have discovered any errors when reading this document.
We should also appreciate any new ideas and proposals.

Proposal and/or improvements:

Table of contents

Table of contents

Table of contents

1 General description

1.1 Structure and characteristics

Purpose

The WDP3-01X positioning and sequence control unit, which comprises the OED3 operating system, can be used for controlling the following BERGER LAHR 3-phase stepping motors:

– with WDP3-014, motors of type size 90, (VRDM 39xx/50 LW.)
– with WDP3-018, motors of type size 110, (VRDM 311xx/50 LW.)

Each unit is used for controlling one axis. The difference between the positioning and sequence control units WDP3-014 and WDP3-018 consists in their power ratings.

The controller can be freely programmed using a PC and the ProOED3 programming software. A PLC with integrated movement programming is possible.
An electronic gear or rotation monitoring can be implemented via the optional encoder interface.

Documentation

This documentation describes installation and operation via the front panel keys, the inputs/outputs of the signal interface and the encoder interface.
Programming of the device is described in the documentation of the ProOED3 programming software.

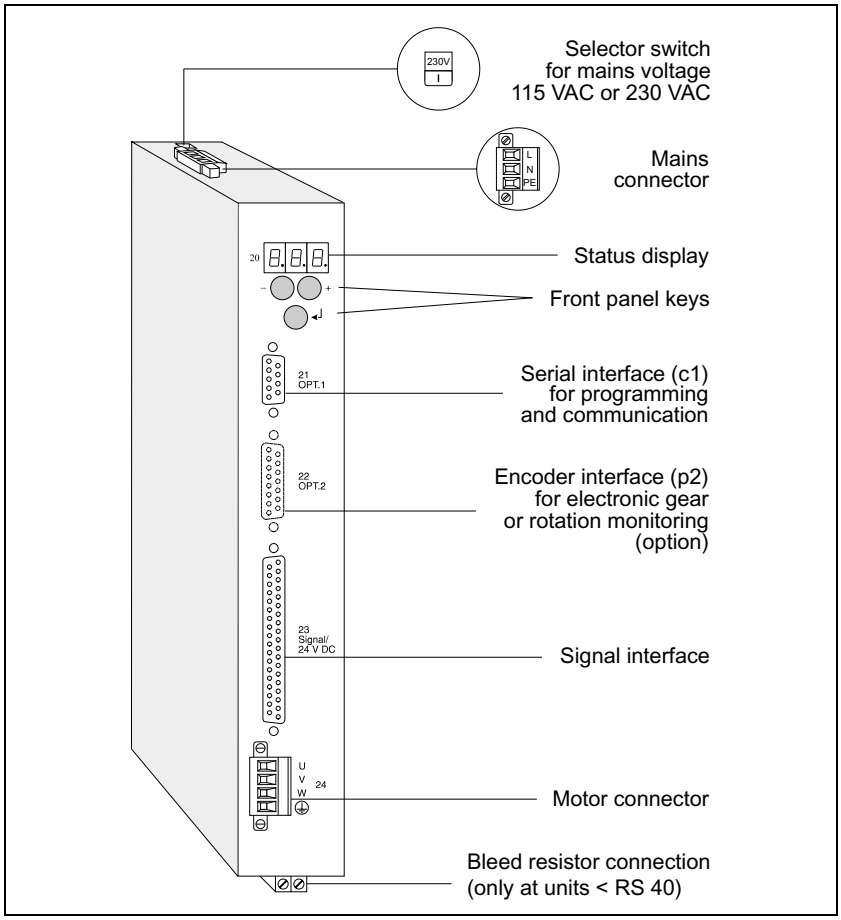


Fig. 1-1 WDP3-01X positioning and sequence control unit with OED3

1.2 Function

1.2.1 Hardware components

A built-in PC board in Eurocard format type size 6 HU accommodates the processor unit, the power controller and the power supply unit. The most important function blocks of the unit are evident in the block diagram (fig. 1-2).

Power supply unit

The power supply unit is a high-performance AC/DC converter which can be connected to 115 VAC or 230 VAC supply voltages. The energy recovered by a motor during braking can be temporarily stored up to a certain extent. To dissipate a higher amount of braking energy, an external bleed resistor must be connected.

External bleed resistor

DC/DC power supply unit

A DC/DC power supply unit generates various voltage levels for supplying the internal electronic circuits of the processor unit from the 24 VDC voltage supply.

NOTE
The electronic circuitry of the processor unit consists of PELV circuits as defined in the DIN standard VDE 0160.

Interface configuration

Various interface configurations are possible according to the actual requirements.

NOTE
The interfaces installed in the device are indicated on the type plate. The following abbreviations are used:

RS 232	*Serial interface RS 232*
RS 485 LS	*Serial interface RS 485*
LRS 422 IN	*Encoder interface RS 422*

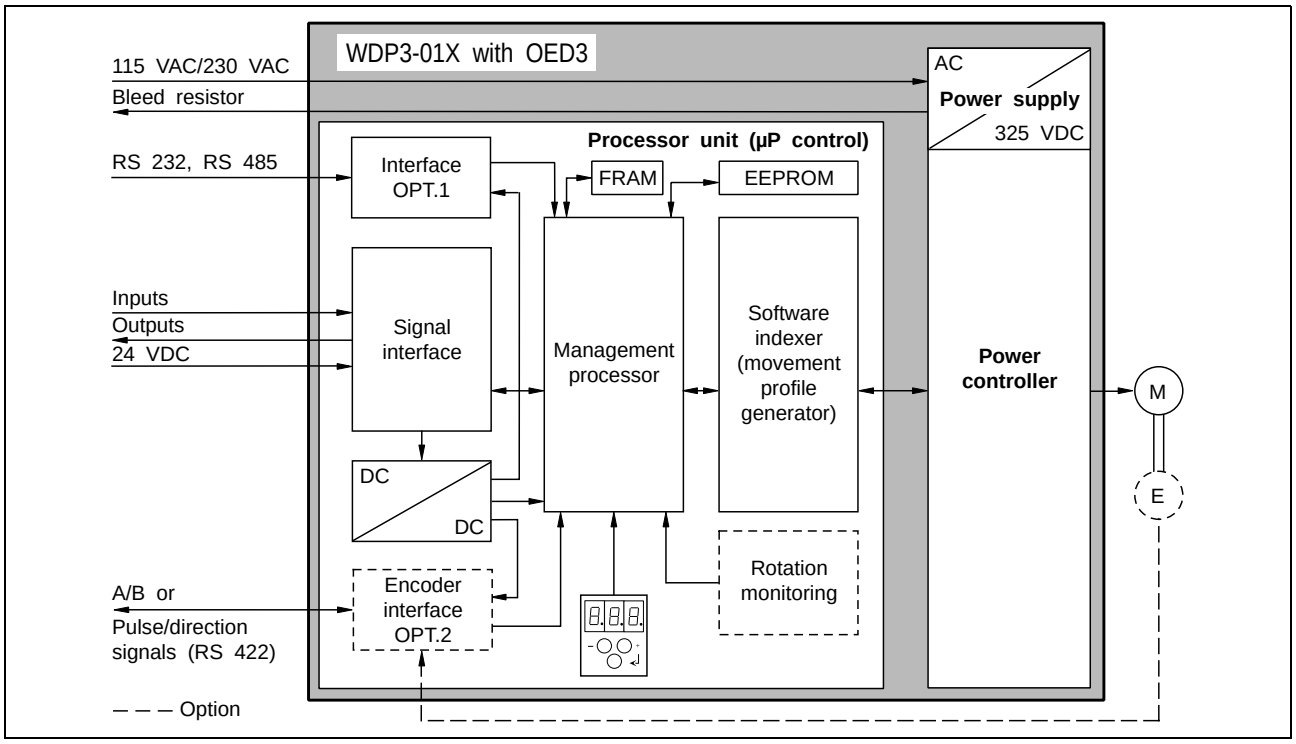


Fig. 1-2 Block diagram

Signal interface The signal interface carries the input and output signals as well as the 24 VDC signal voltage.

Encoder interface The encoder interface RS 422 (OPT.2) can be used for implementing an electronic gear or for rotation monitoring.

Serial interface The RS 232 or RS 485 serial interface can be used for programming the controller (in editing mode) using a PC and the ProOED3 programming software. In addition, programmed communication, e.g. with an operating terminal, can be implemented via the serial interface (in automatic mode).

Management processor The management processor is used in controller automatic mode for editing the application program and addressing the corresponding interfaces. In order to retain the application program on the controller after disconnecting the supply voltage, it must be written to the controller's EEPROM using a PC and the ProOED3 programming software. In the controller's FRAM, 3 variables can be stored to be retained even in case of power failure.

Status display Three seven-segment displays indicate operating states and any malfunctions.

Keys Three keys are provided on the front panel for operation and error acknowledgement.

Indexer The indexer (movement profile generator) generates a pulse sequence from the current movement parameters (travel, speed and acceleration). This pulse sequence is passed on to the power controller.

Power controller The power controller converts the pulse sequence received from the indexer into a current pattern for controlling the 3-phase stepping motor. The motor phase current can be set on the front panel; see chapter 3.5.

1.2.2 Operating modes

The following operating modes can be set on the front panel.

- Manual mode via front panel
- Automatic mode
- Editing mode

Manual mode via front panel

In manual mode via front panel, you can move the motor to the left or right using the front panel keys.

NOTE
In controller automatic mode, manual mode and teach-in mode is possible via the signal inputs of the controller if the corresponding application program was loaded into the controller; see ProOED3 documentation.

Automatic mode

In automatic mode, you can start an application program which is loaded in the controller. The application program must previously have been created using a PC and the ProOED3 programming software and loaded into the controller (download).

NOTE
Since the controller does not have a battery-buffered main memory, the application program must be written to the controller's EEPROM after downloading. When switching on the controller, the application program is automatically loaded from the EEPROM into the main memory of the controller.

Editing mode

In controller editing mode, you can load an application program created with the PC and the ProOED3 programming software on the controller and test it in on-line mode.

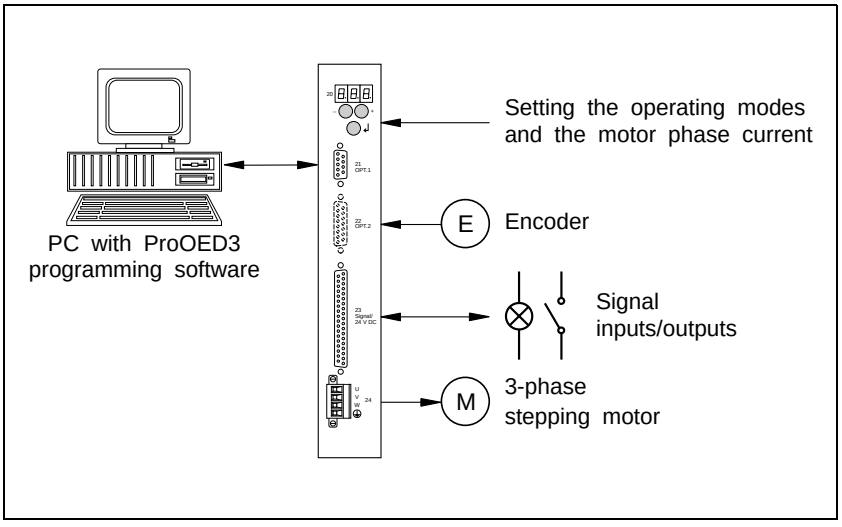


Fig. 1-3 System environment

Axis operating modes

In controller automatic mode, you can use the ProOED3 command “mode” in the application program to activate the following axis operating modes:

– Point-to-point mode
  Positioning the axis from a given point A to a given point B at a programmed acceleration, speed and travel. Positioning can be effected with absolute values (relative to a reference point) or with incremental values (relative to the current position).
– Position following mode (electronic gear)
  In position following mode, you can implement an electronic gear via the encoder interface of the controller or a variable. The pulses fed to the encoder interface or stored in the variable are multiplied with a gear ratio and used for controlling the stepping motor.

Rotation monitoring

If the controller is equipped with an encoder interface (RS 422 IN), you can activate motor rotation monitoring from the application program; see ProOED3 documentation. For rotation monitoring, the motor must be fitted with an encoder. The rotation monitoring feature compares the set and actual positions of the motor and reports a rotation monitoring error if the difference between set and actual position exceeds a certain limit value (19 steps).

1.3 Technical data

1.3.1 General data

Power fail safe application program memory	EEPROM
Power fail safe memory for 3 variables	FRAM

ATTENTION
After power-off, the contents of the FRAM variables is retained only for a certain period:
– at an ambient temperature of 30°C: approx. 250 days
– at an ambient temperature of 50°C: approx. 60 days

Memory space for sequence program	2000 instructions
Memory space for PLC program	1000 instructions
Time for a PLC instruction	approx. 1.5 ms

1.3.2 Electrical data

Mains connection

Supply voltage, selectable	115 VAC 230 VAC to 240 VAC
Power loss	
WDP3-014	60 W max.
WDP3-018	110 W max.
Mains frequency	50 to 60 Hz
Mains error protection	one period
Overvoltage stability acc. to DIN VDE 0160	Class 1
Nominal power consumption	
WDP3-014	3.6 A at 115 VAC 2.0 A at 230 VAC
WDP3-018	6.5 A at 115 VAC 3.5 A at 230 VAC
Starting current	70 A max.
Leakage current (IEC60990)	Motor cable <5m : <10mA Motor cable 5-50m : <50mA
External fuse	6 A at 230 VAC 10 A at 115 VAC (“K” characteristic)

NOTE
The devices may only be operated with fuse protection as specified above.
If necessary, use r.c.c.b. protection according to DIN VDE 0664, part 1/10.85.

System supply via signal interface

Supply voltage	20 VDC to 30 VDC
Power consumption	1 A max.
Ripple voltage	< 2 V_{pp}

NOTE
The 24 V voltage supply must meet the specifications of the DIN standard VDE 0160 on safety extra-low voltage.

Motor connection

Phase current	
WDP3-014	0.1 A to 2.5 A
WDP3-018	0.1 A to 6.8 A
No. of steps	1000 steps per revolution
Pulse rate	40 kHz max.
Motor voltage	3 x 325 VDC (connected to mains)
Motor cable (observe EN 60204 standard)	
Length	maximum 50 m
Cross-section	≥ 0.75 mm^2 at cable length ≤ 30 m ≥ 1.5 mm^2 at cable length > 30 m
Shield connection	On both ends

Signal interface

Electrical characteristics of the inputs

Polarity reversal protection, hardware debounce (settling time 0.8 ms to 1.5 ms)

Signal voltage U_{high}	15 VDC to 30 VDC
Signal voltage U_{low}	< 3 VDC
Input current at 24 VDC	7 mA

Electrical characteristics of the outputs

Short-circuit protected, inductive loadability	
Maximum output voltage	30 VDC
Maximum switching current on output Q0	400 mA
Voltage drop at 400 mA	< 2 VDC
Maximum switching current on outputs Q1 to Q3	50 mA
Voltage drop at 50 mA	< 2 VDC

DANGER
The signal inputs and the 24 VDC supply voltages on the signal connection must be definitely isolated from mains. The maximum voltage towards ground must not exceed 60 VDC or 25 VAC.

Serial interfaces

RS 232 interface (option)

Internal leakage resistance towards ground	1 Mohm

RS 485 four-wire interface (option)

Short-circuit protected	150 mA max. at short-circuit
Internal leakage resistance towards ground	1 Mohm
Supply voltage output for MP 923	12 VDC (10 VDC min., 18 VDC max.)

	Encoder interface	**RS 422 IN signal level (option)**	
		Short-circuit protected	
		Internal leakage resistance towards ground	1 Mohm
		Maximum cable length	100 m
		Wire cross-section	2 x 0.5 mm^2 and 10 x 0.25 mm^2
		Shield connection	On both ends
		Supply voltage output	5 VDC ±5% (300 mA max.) or 12 VDC, 10 VDC min./18 VDC max. (200 mA max.)
	Device protection	Protection and monitoring circuits: Power amplifier overtemperature, short-circuit between motor leads (no ground fault protection), under-voltage and overvoltage	
		Type of protection	IP 20 acc. to EN 60529: 1991
1.3.3	**Mechanical data**	Dimensions (fig. 1-4)	249 x 240 x 52 mm
		Weight	approx. 3200 g
1.3.4	**Ambient conditions**	Ambient temperature	0°C to +50°C
		Storage temperature	-25°C to +70°C
		Relative humidity	15% to 85% (non-condensing)

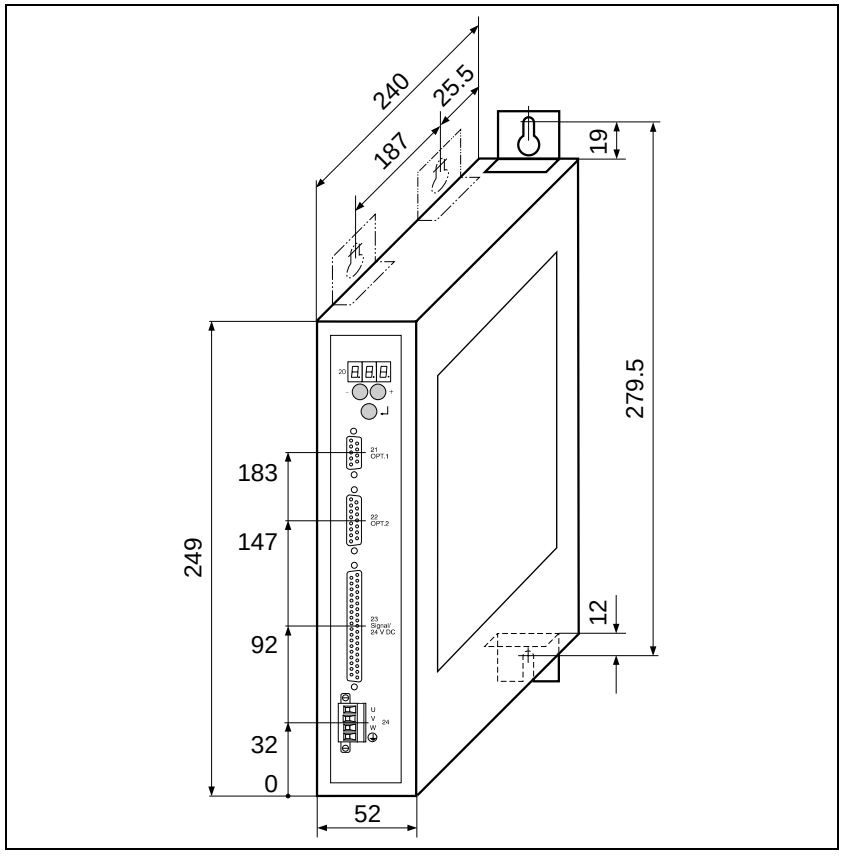


Fig. 1-4 Dimensions

1.3.5 Regulations

Machinery directive

Insofar as the other equipment complies with the machinery directive 89/392/EWG and the configuration meets the EMC testing requirements of BERGER LAHR, conformity with the machinery directive is hereby certified.

EMC directive

In a configuration which meets the EMC testing requirements of BERGER LAHR, conformity with the following standards can be certified in accordance with the EMC directive 89/336/EWG:

Radio interference suppression (when using a mains filter, see Accessories)	according to EN 50081-2: 1993
Static discharge	according to EN 60801-2: 1993, class 3
Burst	according to IEC 801-4: 1988, class 4

BERGER LAHR EMC testing requirements

- Use motor leads supplied by BERGER LAHR. Motor lead length is 10 m.
- Insert a mains filter supplied by BERGER LAHR into the mains power supply line.
- Install the unit in a switch cabinet.
- Use signal lines supplied by BERGER LAHR and wire according to the documentation.
- Run signal, mains and motor cables separately (non-parallel) and establish a large surface area contact between the cable shield and ground/earth.
- Install the mains filter directly at the unit. If this is not possible, use a shielded connection cable (1 m max.) between the filter and the unit.
- Establish a large surface area contact between filter/device and ground (mount on a grounded metal plate or on the switch cabinet rear wall or use a ground strap).

Low-voltage equipment directive

Pursuant to the low-voltage equipment directive 73/23/EEC, the products are in conformity with the following standards:

Protection class	1 acc. to prEN 50178: 1994
Overvoltage	Category III acc. to prEN 50178: 1994
Contamination	Grade 2 acc. to prEN 50178: 1994

1.3.6 Approvals

prEN 50178 classification VDE 0160/11.94

EN 60950 classification VDE 0805: 1993 + A2: 1994

UL 508 file no. 153 659

2 Installation

2.1 Scope of supply

Check that the delivery is complete.

The scope of supply (fig. 2-1) comprises:

Qty.	Designation
1	Positioning and sequence control unit WDP3-014 with OED3 or WDP3-018 with OED3
1	Product insert
1	Ground strap
4	Mounting bracket
1	Fan for WDP3-018 with OED3

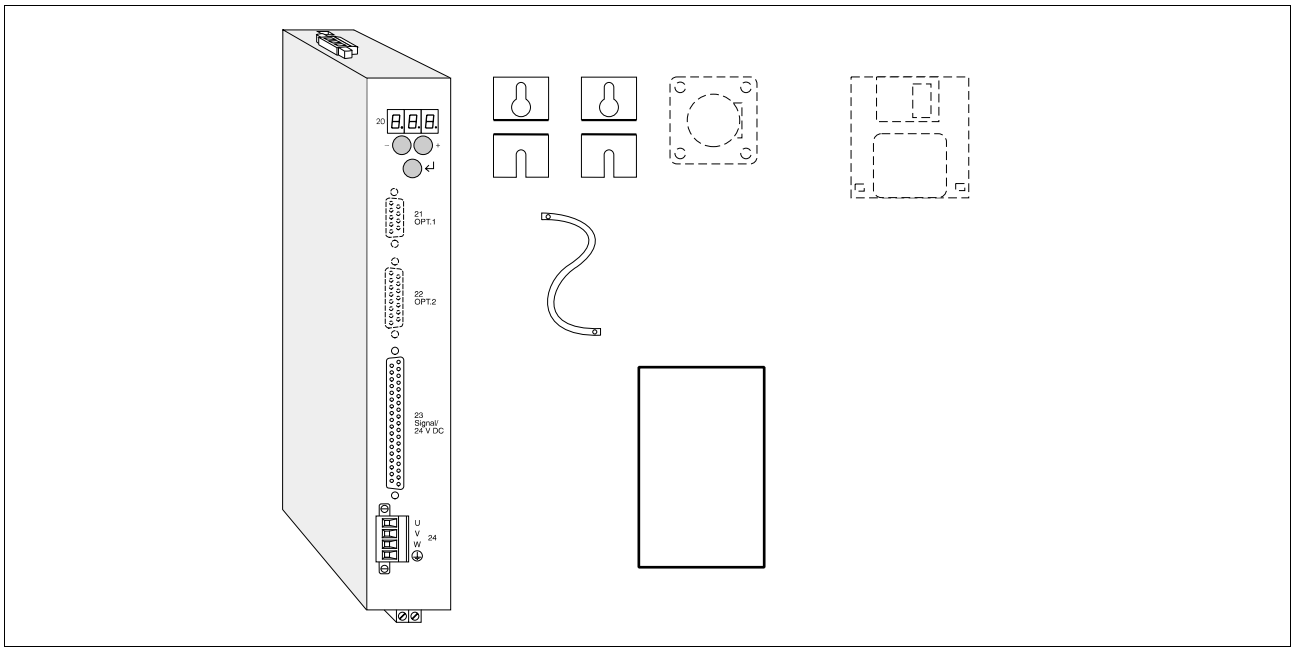


Fig. 2-1 Scope of supply

2.2 Accessories

The following accessories are available and must be ordered separately (for a description of accessories, see chapter 6.2):

- ProOED3 programming software (documentation with diskettes)
- 3-phase stepping motor
- Cable for encoder
- Fan for WDP3-018
- Motor cable 3 x 1.5 mm and 2 x 1.0 mm
- Motor cable 3 x 2.5 mm and 2 x 1.5 mm
- Mains filter
- MP 923 interface converter RS 232/RS 485
- RS 232/PC signal cable
- RS 422 IN/customer signal cable
- MP 924 interface distributor RS 485
- RS 485 LS/MP 923 signal cable
- Signal connection/customer signal cable
- Signal connection cable
- Signal cable for adapter slot option 1
- Signal cable (encoder) for adapter slot option 2
- Signal cable (pulse, direction) for adapter slot option 2
- Set of connectors (all sub-D connectors)
- Electronic gear cable

NOTE
Refer to the sales documentation for the positioning and sequence control unit WDP3-01X with OED3 for the accessory order numbers.

2.3 Assembly

DANGER
The supply voltage must be disconnected whenever assembly work is carried out.

NOTE
When installing the unit, a minimum clearance of 10 cm must be ensured above and below the unit or to the adjacent unit. Leave 15 cm free in front of the unit to give room for fitting the cable connections.

The unit should be installed vertically in a switch cabinet and it may be necessary to provide external ventilation (see fig. 2-3).
You can use the mounting brackets to install the unit on the rear or on the left (fig. 2-2).

Fasten the ground strap supplied at the bottom front of the unit with screws and connect it to a grounded part of the switch cabinet.

ATTENTION
Clean air supply must be ensured in the switch cabinet.

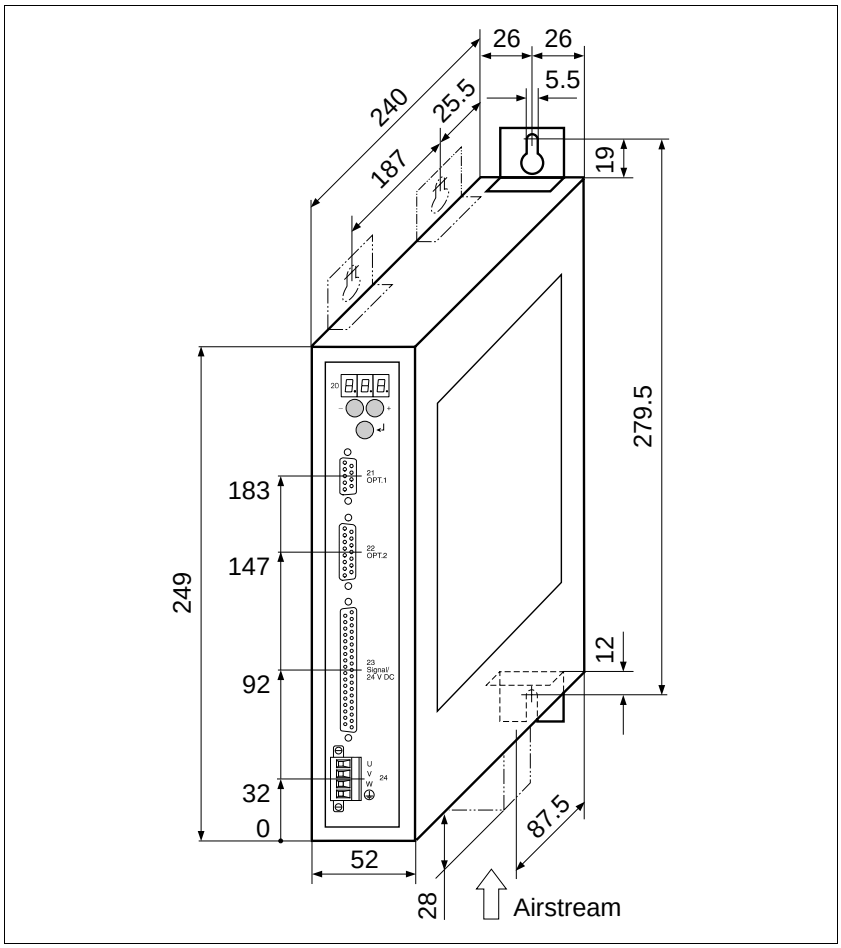


Fig. 2-2 Installation

Ventilation

The positioning and sequence control unit WDP3-014 with OED3 can be operated without ventilation, if the minimum clearances (10 cm) are observed.

The positioning and sequence control unit WDP3-018 with OED3 can be operated without ventilation up to a phase current of 3.7 A and an ambient temperature of 50°C.
If these values are exceeded or if the status display “07” repeatedly indicates overtemperature, the unit must be ventilated externally (fig. 2-3).

Accessory fan

The fan on the WDP3-018 unit with OED3 must be mounted at the bottom. The airstream must pass through the unit from bottom up (see fig. 2-2). The arrow on the fan indicates the direction of the airstream if the fan is connected correctly (red = 24 VDC, black = 24 VGND).
Fasten the fan with four screws at the bottom of the unit after having cut out the grille (see chapter 6.2.1). Connect the fan to the external 24 VDC voltage supply.

NOTE
Ensure that the airstream in and around the unit is unobstructed.

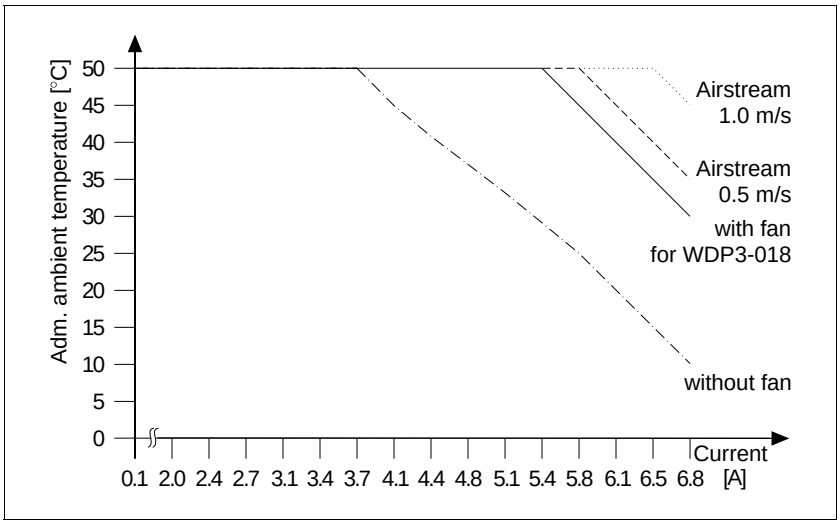


Fig. 2-3 Temperature – phase current – ventilation

2.4 Wiring

DANGER
The supply voltage must be disconnected whenever wiring work is carried out.

DANGER
The motor connection is internally linked to the supply connection (325 V).

ATTENTION
Wiring work may only be carried out in accordance with the DIN standard VDE 0105 by trained personnel.

ATTENTION
Run and shield power, motor and signal cables separately.

ATTENTION
Free, unassigned pins must not be wired.

ATTENTION
The unit must have external fuse protection (see chapter 1.3).

ATTENTION
Good heat dissipation must be ensured when installing a bleed resistor (accessory).

NOTE
See chapter 1.3 for the technical data of the individual connections and interfaces.

NOTE
The interfaces installed in the device are indicated on the type plate.

NOTE
The ground connections of the interfaces in adapter slots 21 and 22 are internally interconnected.

NOTE
Shield connection on both ends ensures optimum protection against interference for digital systems. However, it should be noted that differential potentials (in particular in case of supply from different sources) may cause inadmissible currents in the shields. Such interfering currents can be avoided by using suitable bonding conductors. The following cross-sections should be used for bonding lines:

16 mm^2 Cu for bonding lines up to 200 m
25 mm^2 Cu for bonding lines longer than 200 m

Wiring layout

Figure 2-4 illustrates the wiring layout of the positioning and sequence control unit with the available interfaces.
Communication between PC and positioning and sequence control unit is effected either through the RS 232 or the RS 485 interface, depending on the actual interface configuration.

NOTE
If the controller is provided with an RS 485 interface and the PC with an RS 232 interface, an interface converter (e.g. MP 923, see chapter 6.2.3) must be used.

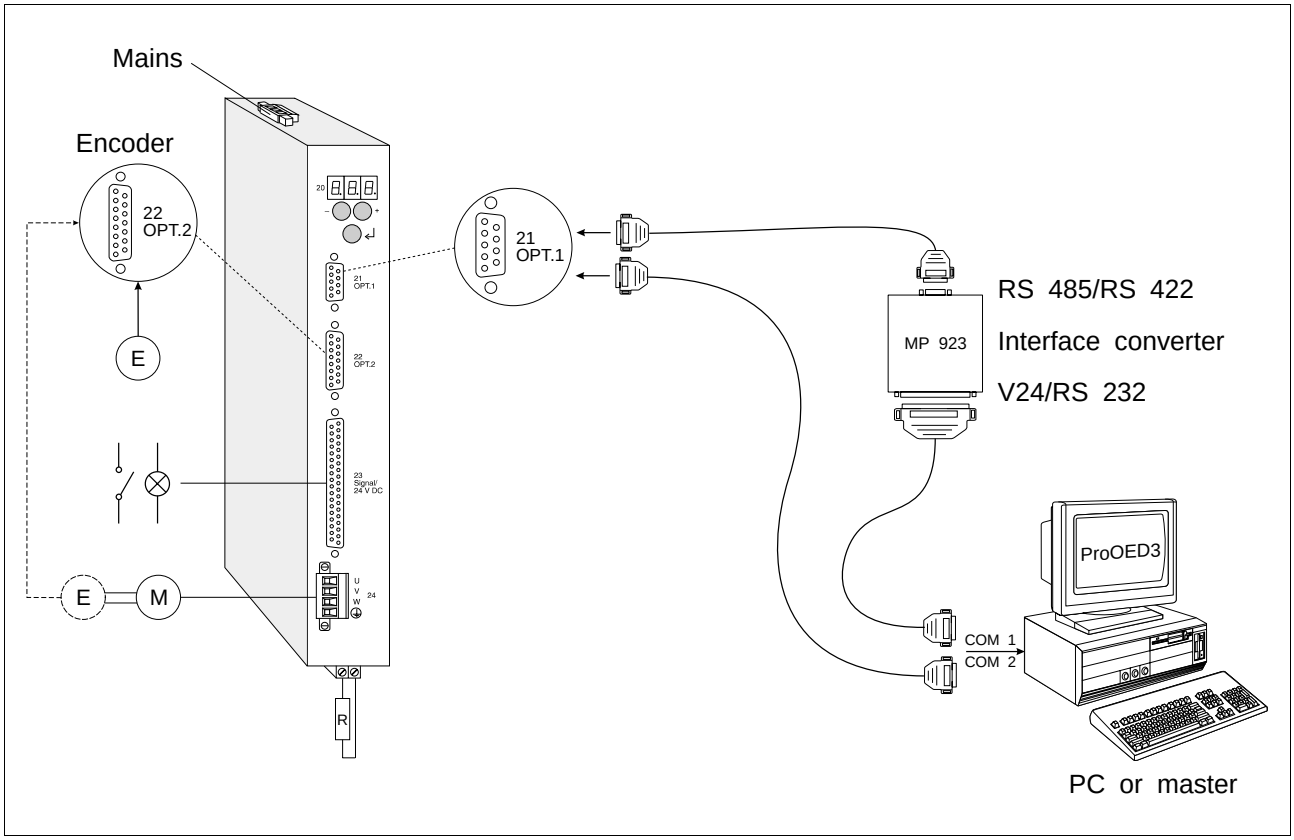


Fig. 2-4 Wiring diagram

2.4.1 Mains connection

1. Set the 115 V or 230 V mains voltage on the selector switch at the unit top.

ATTENTION
The setting must correspond to the actual mains voltage available.

2. Mount wire end ferrules on the device end of the mains power cable.

3. Fasten three litz wires (fig. 2-5) with screws:

L	Phase (115 VAC or 230 VAC)
N	Neutral
PE	Protective conductor

NOTE
A mains filter can be inserted in order to shield the unit against interference (see chapter 6.2.2).

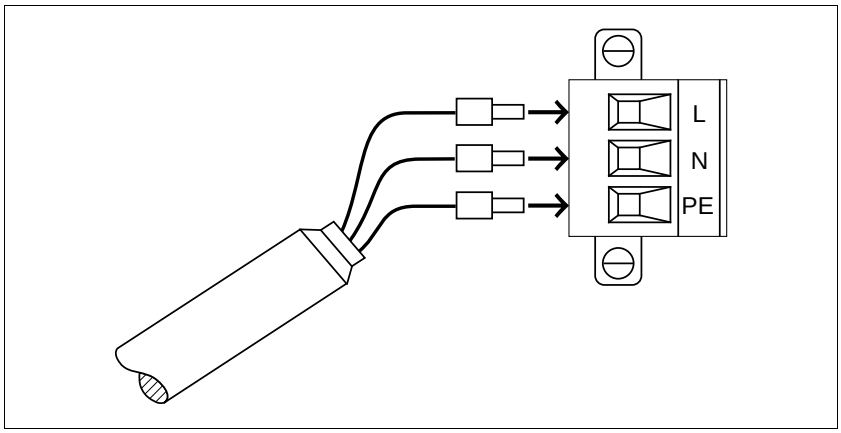


Fig. 2-5 Mains connection – device end

2.4.2 Motor connection

1. Release the two screws and remove the connector (fig. 2-7) from the unit.
2. Preparation the motor cable (fig. 2-6), and mount wire end ferrules on the device end of the motor cables.
3. Fasten the litz wires with screws.
4. Fastenthe connector to the front panel (item 24) with screws.

Preparation the motor cable

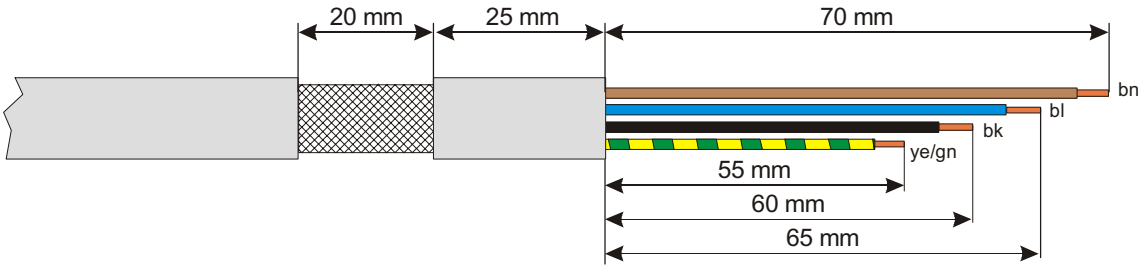


Fig. 2-6 Preparing the motor cable

Motor connection

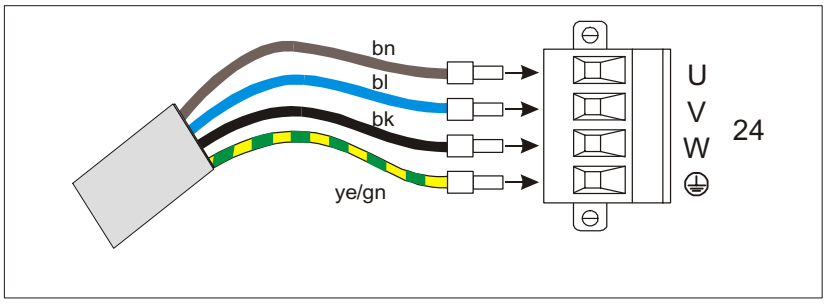


Fig. 2-7 Motor connection

NOTE
An additional bleed resistor can be used for dissipating a higher amount of braking energy (see chapter 6.2.4).

NOTE
The sense of rotation of the motor can be inverted by interchanging two motor leads. In this case, also the limit switch inputs LIMP and LIMN as well as the A and Ā signals of any rotation monitoring encoder connected must be interchanged.

ATTENTION
Connect the shield of the motor cable after the following assembly instruction!

Installing the motor cable

The following items required for installing the motor cable on the side of the device are included in the accessory bag:

Qty.	Designation
1	Terminal angle
1	Shield terminal
1	Screw M4 x 8
2	Screw M3 x 8 with serrated washer
1	Serrated washer M4

Installing the terminal angle

DANGER
Electric shock from high voltage!
If longer screws are used, they may contact live parts. This may result in fatal injury.

The terminal angle is fastened to the bottom of the device with the screws and serrared washers supplied with the device. Correct installation of the terminal angle is extremely important for grounding the motor cable shield and for strain relief.

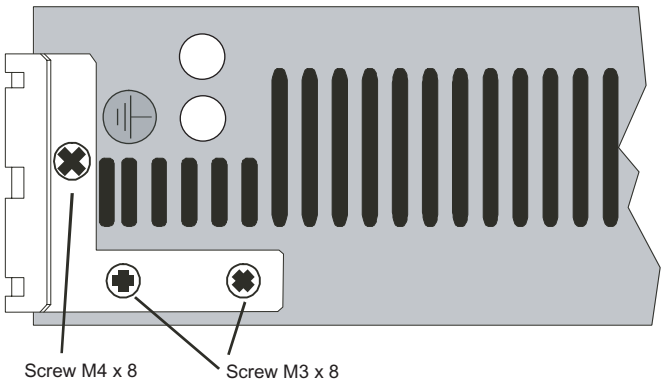


Fig. 2-8 Installing the terminal angle

DANGER
Electrical device with higher deflection current > 3,5mA.
Connection of a second protective conductor absolutely necessary.
Please note minimum cross-section according to IEC 60364-5-54.

Fastening the shield terminal

The left position is provided for fastening the cable tothe fastening bracket.

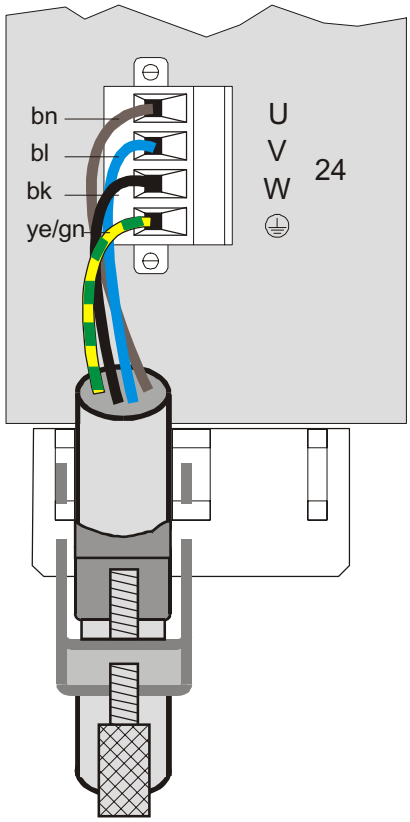


Fig. 2-9 Fastening the shield terminal

The shield angle is suspended on the bracket from below. The motor cable is not subject to strain and securely grounds shield when installed in this way.

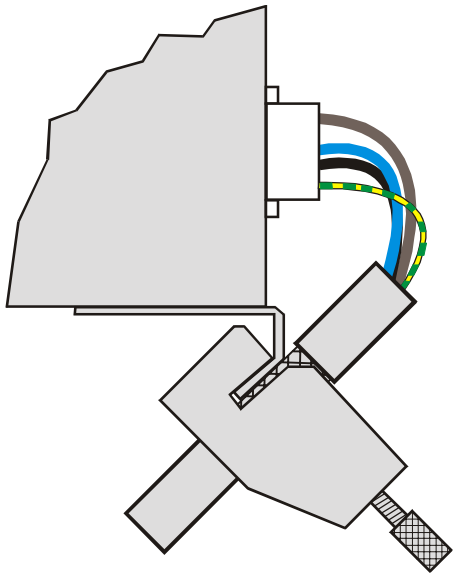


Fig. 2-10 Installed motor cable

2.4.3 Signal interface

The signal inputs I 16 to I 20 are pre-assigned ex works. The other signal inputs and outputs can be freely assigned.

1. Solder the litz wires to the connector according to the signal connection pin assignment table.

ATTENTION
Free, unassigned pins must not be wired.

NOTE
Connect system supply voltage ground to protective ground.

2. Push the shield back and fix with a cable tie.
3. Insert two bolts (fig. 2-7) into the connector shell.
4. Place the connector into the connector shell.
5. Fasten the cable and the shield to the connector shell by clamping it with the strain relief bracket.

ATTENTION
Ensure good electrical contact between the shield and the connector shell.
Connect the shield on both ends.

6. Assemble the two parts of the connector shell with two screws.
7. Fasten the connector to the front panel (item 23) with the bolts.

DANGER
All signal connections must be definitely isolated from mains. The voltage towards ground must not exceed 60 VDC or 25 VAC. All signal circuits are internally grounded via a 1 Mohm bleed resistor.

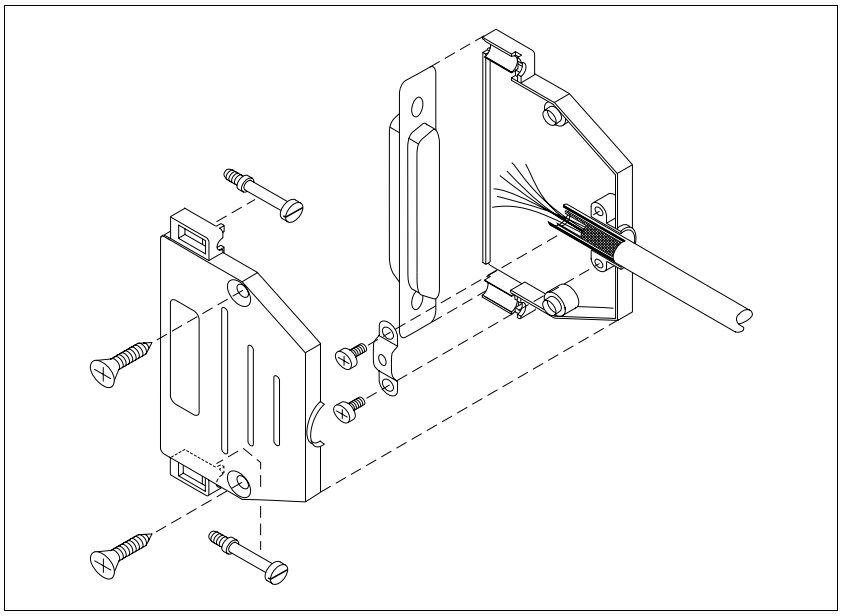


Fig. 2-7 Signal connector assembly – device end

2.4.3.1 Signal connection pin assignment

The following table shows the pin assignment of the signal connection.

Pin		Assignment	
1*	**I 13: $\overline{\text{LIMN}}$**	**Negative limit switch** **I/O supply voltage**	← ←
2	–	–	
3	–	–	
4	I 11		←
5	I 10		←
6*	**I 14: $\overline{\text{REF}}$**	**Reference switch**	←
7	I 7		←
8	I 5		←
9	I 3		←
10	I 1		←
11	–	–	
12	–	–	
13	–	–	
14	Q 3		→
15	Q 1		→
16*	**24VDC**	**System supply voltage**	←
17*	**24VDC**	**System supply voltage**	←
18*	**IO24VDC**	**I/O supply voltage**	←
19*	**IO24VDC**	**I/O supply voltage**	←
20*	**I 12: $\overline{\text{LIMP}}$**	**Positive limit switch** **I/O supply voltage**	← ←
21	–	–	
22	–	–	
23*	**I 15: $\overline{\text{STOP}}$**	**Stop**	←
24	–	–	
25	I 8		←
26	I 6		←
27	I 4		←
28	I 2		←
29	I 0		←
30	–	–	
31	–	–	
32	–	–	
33	Q 2		→
34	Q 0		→
35*	**GND**	**System and I/O supply voltage ground**	←
36*	**GND**	**System and I/O supply voltage ground**	←
37	–	–	

*** Minimum wiring requirement for starting up via front panel (e.g. manual movement mode).**

$\overline{\text{Signal}}$ = active low I = Input Q = Output

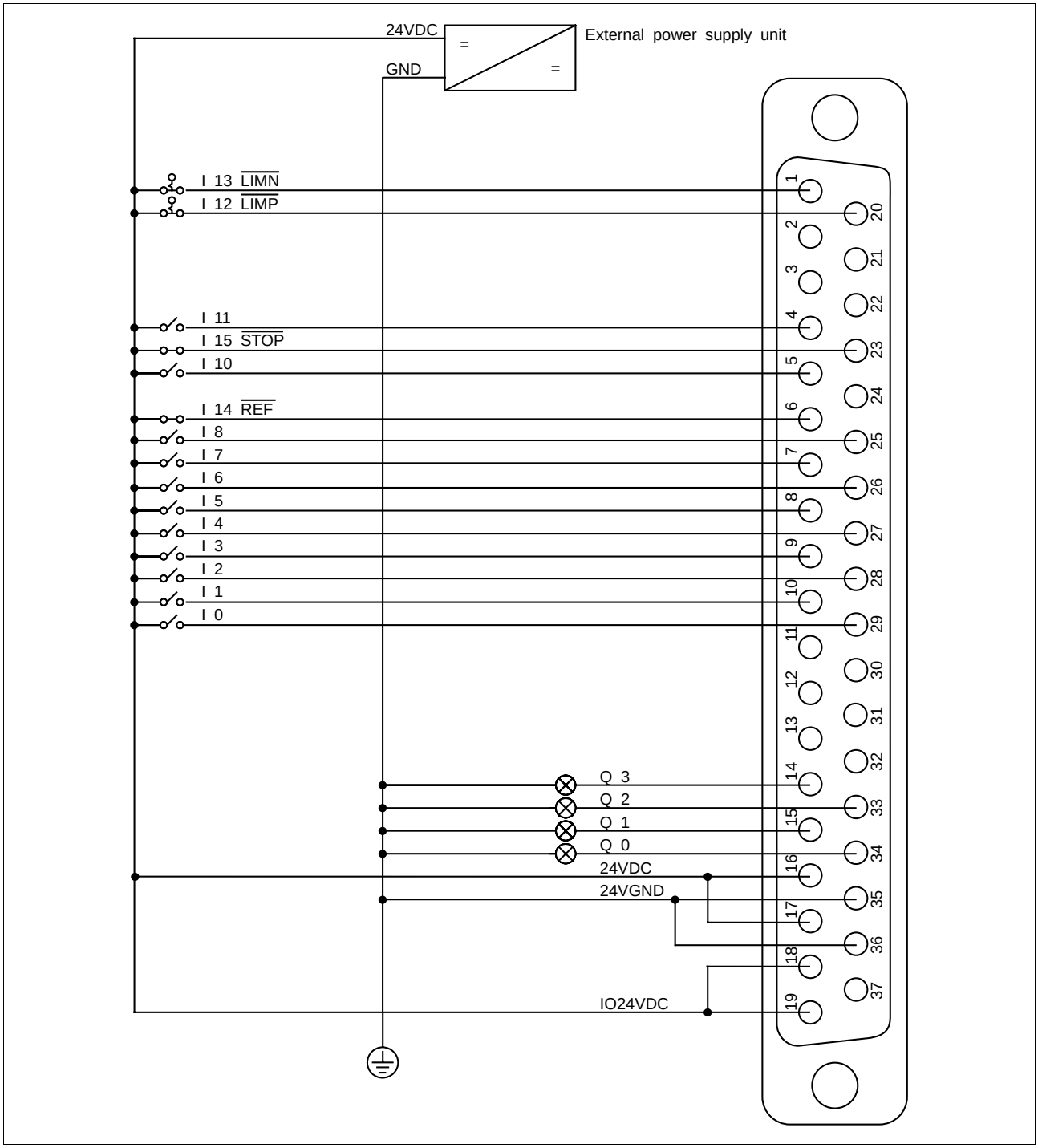
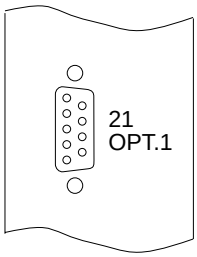


Fig. 2-8 Wiring example

2.4.4 RS 232 serial interface (OPT.1)

NOTE
The RS 232 serial interface is installed in adapter slot 21; see type plate.

1. Solder the litz wires to the connector in accordance with fig. 2-9 and fig. 2-10.



Pin	Signal	Description
1	–	–
2	RXD	Received data ←
3	TXD	Transmitted data →
4	–	–
5	GND	Ground
6	–	–
7	–	–
8	–	–
9	–	–

← Input → Output

2. Push the shield back and fix with a cable tie.
3. Insert two bolts (see fig. 2-11) into the connector shell.
4. Place the connector into the connector shell.
5. Fasten the cable and the shield to the connector shell by clamping it with the strain relief bracket.

ATTENTION
Ensure good electrical contact between the shield and the connector shell.
Connect the shield on both ends.

6. Assemble the two parts of the connector shell with two screws.
7. Fasten the connector to the front panel (item 21) with the bolts.

ATTENTION
For reasons of noise immunity, the RS 232 cable should be as short as possible (15 m max.)!

NOTE
The attachment screws of the connector shells must have M3 thread on the device end and UNC thread on the PC end.

NOTE
With an RS 232 interface, networking is not possible.

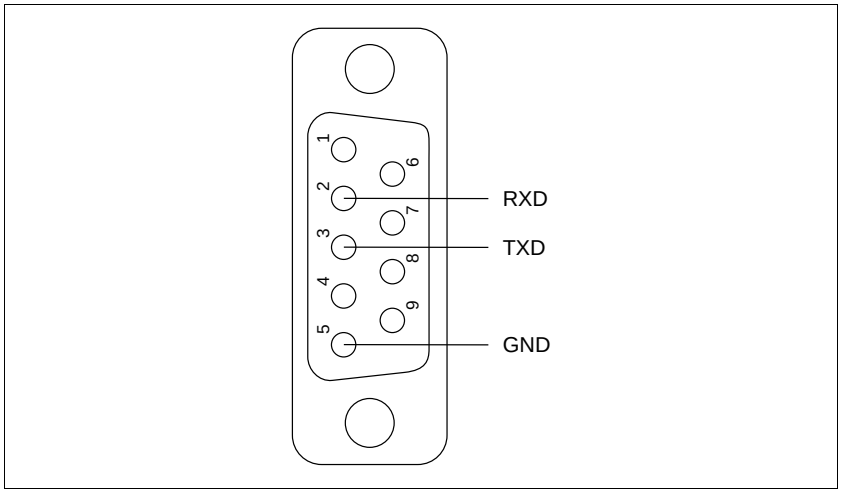


Fig. 2-9 Interface connection – device end

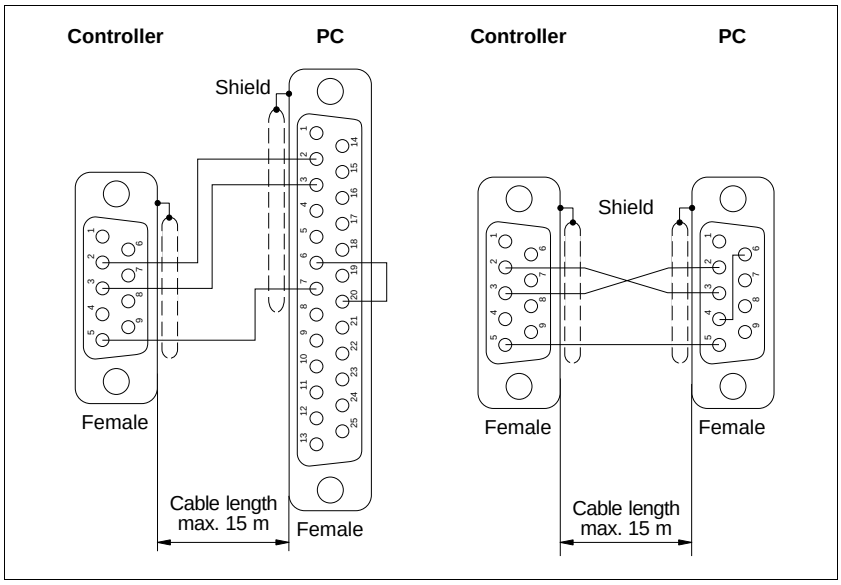


Fig. 2-10 Controller/PC wiring

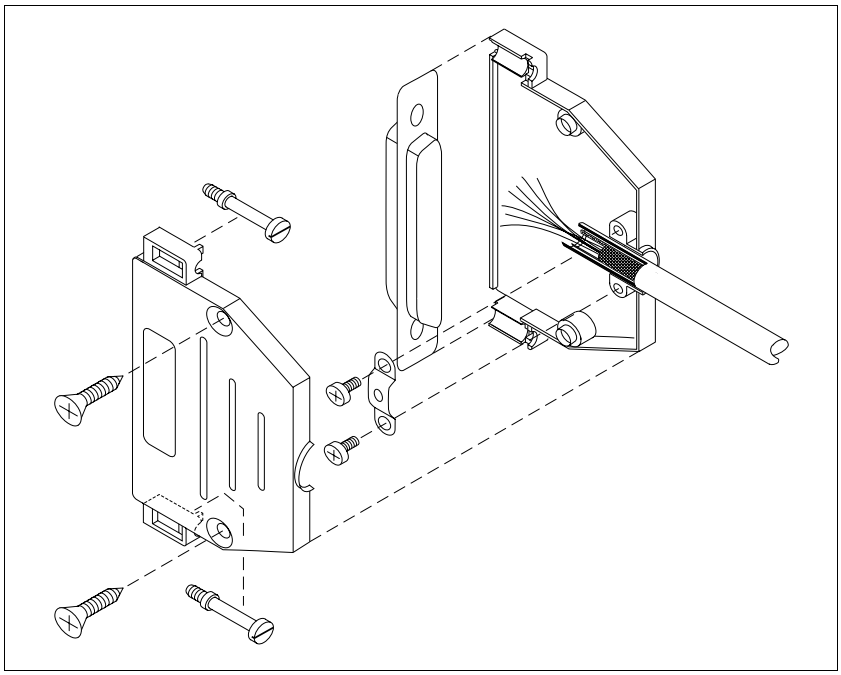
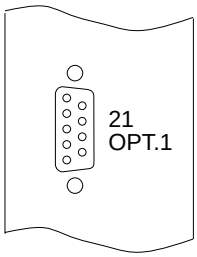


Fig. 2-11 Interface connector assembly – device end

2.4.5 RS 485 serial interface (OPT.1)

NOTE
The RS 485 serial interface is installed in adapter slot 21; see type plate.

NOTE
The serial interface is a four-wire interface.



1. Solder the litz wires to the connector as illustrated in fig. 2-12.

Pin	Signal	Description	
1, 6	12VDC	MP 923 supply voltage	→
2, 7	GND	MP 923 supply voltage ground	→
3	$\overline{\text{TXD}}$	Inverted transmitted data	→
4	$\overline{\text{RXD}}$	Inverted received data	←
5	SGND	Signal ground	
8	TXD	Transmitted data	→
9	RXD	Received data	←

← Input → Output

2. Push the shield back and fix with a cable tie.
3. Insert two bolts (see fig. 2-13) into the connector shell.
4. Place the connector into the connector shell.
5. Fasten the cable and the shield to the connector shell by clamping it with the strain relief bracket.

ATTENTION
Ensure good electrical contact between the shield and the connector shell.
Connect the shield on both ends.

6. Assemble the two parts of the connector shell with two screws.
7. Fasten the connector to the front panel (item 21) with the bolts.

NOTE
For a PC with RS 232 interface, the MP 923 interface converter can be used (see chapter 6.2.3).

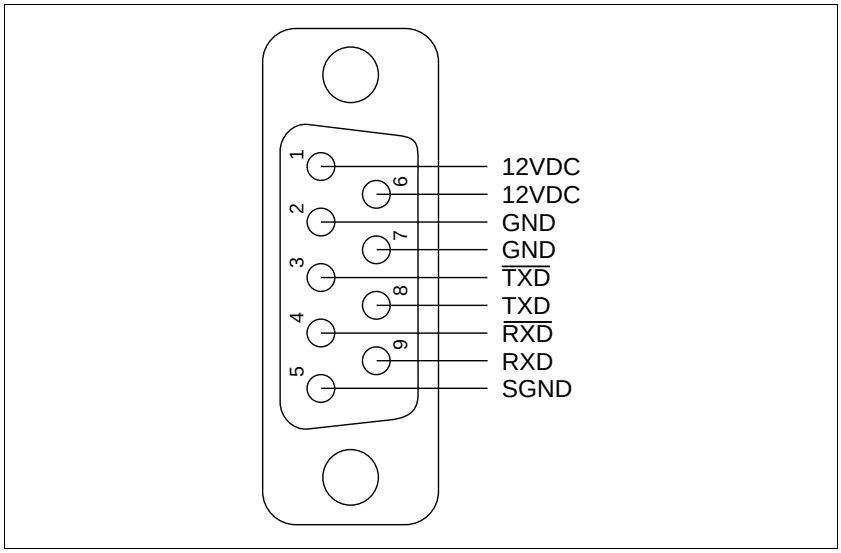


Fig. 2-12 Interface connection – device end

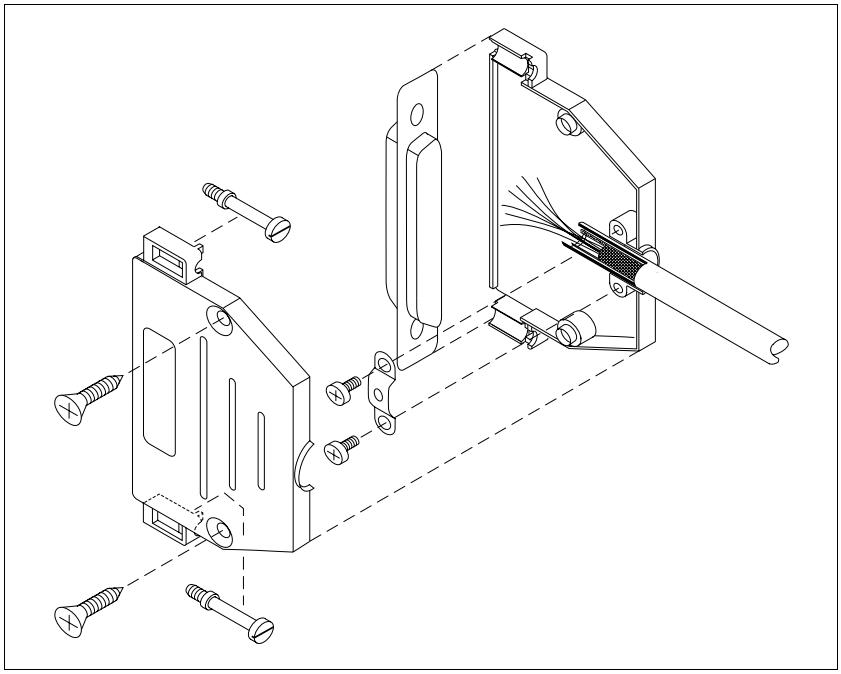
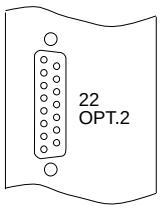


Fig. 2-13 Interface connector assembly – device end

2.4.6 Encoder interface (OPT.2)

The encoder connection can be used either for rotation monitoring or for an electronic gear (position following mode).



NOTE
The encoder interface is installed in adapter slot 22; see type plate.

Wiring

1. Solder the litz wires to the connector as described below.
2. Push the shield back and fix with a cable tie.
3. Insert two bolts (fig. 2-14) into the connector shell.
4. Place the connector into the connector shell.
5. Fasten the cable and the shield to the connector shell by clamping it with the strain relief bracket.

ATTENTION
Ensure good electrical contact between the shield and the connector shell.
Connect the shield on both ends.

6. Assemble the two parts of the connector shell with two screws.
7. Fasten the connector to the front panel (item 22) with the bolts.
8. Twist the encoder cable wires in pairs.
9. Establish the connection on the motor end.

ATTENTION
When using 5 V encoders, –SENSE must be connected to 5VGND and +SENSE to 5VDC on the encoder end of the cable.

NOTE
The encoder signal type (pulse/direction or A/B signals) and the internal evaluation (single, double or quadruple) must be selected for an electronic gear (see chapter 6 in the ProOED3 documentation).

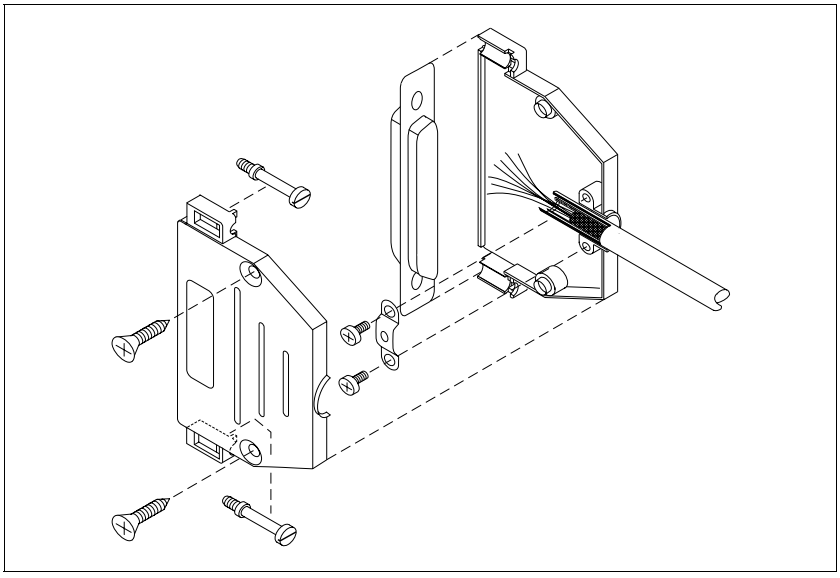
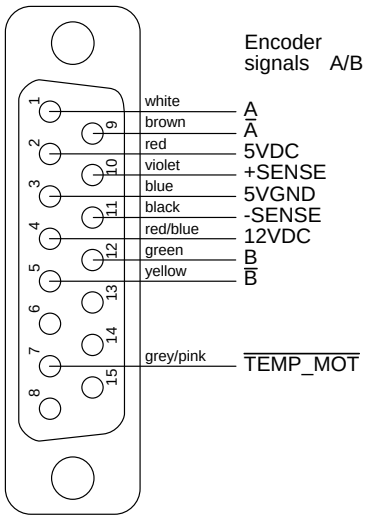


Fig. 2-14 Encoder connector assembly – device end

Encoder interface: Encoder signal type A/B



Pin	Signal	Description	
1	A	Encoder signal A	←
2	5VDC	Sensor supply voltage	→
3	5VGND	Sensor supply voltage ground	→
4	12VDC	Sensor supply voltage	→
5	$\overline{B}$	$\overline{\text{Encoder signal B}}$	←
6	–	–	
7	$\overline{TEMP\_MOT}$	Line interruption	←
8	–	–	
9	$\overline{A}$	$\overline{\text{Encoder signal A}}$	←
10	+SENSE	Sense regulator 5VDC	←
11	–SENSE	Sense regulator 5VGND	←
12	B	Encoder signal B	←
13	–	–	
14	–	–	
15	–	–	

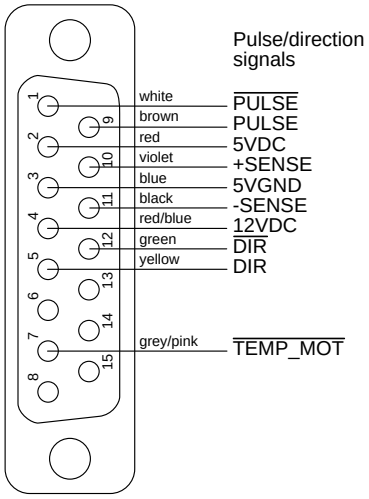
$\overline{\text{Signal}}$ = active low ← Input → Output

The encoder can be supplied with 12 V or from a 5 V sense regulator.

ATTENTION
When using 5 V encoders, –SENSE must be connected to 5VGND and +SENSE to 5VDC on the encoder end of the cable.

ATTENTION
The $\overline{TEMP\_MOT}$ input is used for detecting a line interruption. For this purpose, $\overline{TEMP\_MOT}$ must be connected to 5VDC on the encoder.

Encoder interface: Pulse/direction signal type



Pin	Signal	Description
1	$\overline{\text{PULSE}}$	$\overline{\text{Pulse}}$ ←
2	5VDC	Sensor supply voltage →
3	5VGND	Sensor supply voltage ground →
4	12VDC	Sensor supply voltage →
5	DIR	Direction ←
6	–	–
7	$\overline{\text{TEMP\_MOT}}$	Line interruption ←
8	–	–
9	PULSE	Pulse ←
10	+SENSE	Sense regulator 5VDC ←
11	–SENSE	Sense regulator 5VGND ←
12	$\overline{\text{DIR}}$	$\overline{\text{Direction}}$ ←
13	–	–
14	–	–
15	–	–

$\overline{\text{Signal}}$ = active low ← Input → Output

The encoder can be supplied with 12 V or from a 5 V sense regulator.

ATTENTION
When using 5 V encoders, –SENSE must be connected to 5VGND and +SENSE to 5VDC on the encoder end of the cable.

ATTENTION
The $\overline{\text{TEMP\_MOT}}$ input is used for detecting a line interruption. For this purpose, $\overline{\text{TEMP\_MOT}}$ must be connected to 5VDC on the encoder.

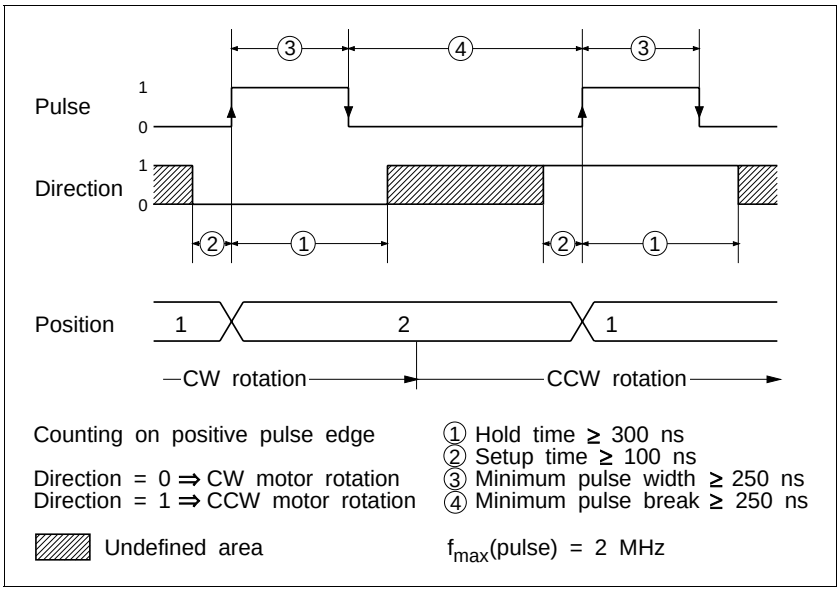


Fig. 2-15 Pulse/direction timing diagram

2.5 Setup

2.5.1 Defaults

After switching on, and after program start, the unit is set to the following default parameters:

Parameter	**Default**
Axis operating mode	Point-to-point
Motor position	0
Number of steps	1000 steps per revolution
Maximum system speed	32768 Hz
Set speed	1000 Hz
Start/stop speed	100 Hz
Safety distance for reference movement	0 steps
Acceleration	125 Hz/ms (linear ramp)
Signal evaluation	Positive and negative limit switch, stop
Normalizing factors for position	Numerator 1000; Denominator 1000
Gear ratio for electronic gear	Numerator 0; Denominator 1; Gear ratio 0
Motor current (can be set via front panel) when stopped when accelerating/decelerating at constant speed	WDP3-014 = 0.5 A WDP3-018 = 1.0 A as a percentage of front panel setting 50% 100% 80%
Rotation monitoring	inactive

NOTE
For other control parameters, see ProOED3 documentation.

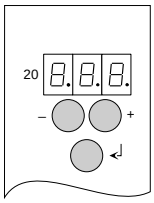
NOTE
Before starting up the unit for the first time, check that the connected motor is suitable for the respective device variant (see chapter 6.1) and that the controller has been wired correctly (see chapter 2.4).
For starting up via the front panel, the minimum wiring requirements for the signal interface must be observed (see chapter 2.4.3.1).

ATTENTION
The mains power supply and the 24 V supply voltage of the unit must be switched off.

1. Set the mains voltage to 115 V or 230 V, as appropriate, with the selector switch on the unit top.

ATTENTION
The setting must correspond to the actual mains voltage available.

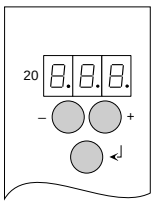
2. Check that all connectors are properly connected.
3. Switch on the power supply for the power controller.
4. Switch on the 24 V supply voltage for the processor unit.
   (Mains voltage and 24 V supply voltage may also be switched on simultaneously.)
5. Press the ⊖ key until “01” is displayed. The controller is now in STOP status.

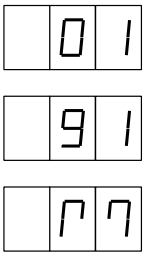


6. Set the motor phase current in accordance with the motor type plate:
   – Press the ↵ key until “01” starts flashing in the display.
   – Press and hold the ↵ key and press the ⊕ key several times until “11” is displayed.
   – Release the ↵ key. The latest selection appears flashing in the seven-segment display:
     Display = Motor phase current (in A)
   – Use the ⊕ and ⊖ keys to set the motor phase current according to the motor type plate.
   – Confirm and input the set value by pressing the ↵ key.

ATTENTION
The set phase current must be equal to or less than the nominal phase current specified on the motor type plate (the lower the set phase current, the lower the motor torque).

2.5.2 Motor test





A manual movement should be executed in order to check the motor wiring and the current settings:

– Press the ↵ key until “01” starts flashing in the display.

– Press and hold the ↵ key and press the ⊕ key several times until “91” is displayed.

– Release the ↵ key. An “M” starts flashing in the seven-segment display.

– Move the motor in single step or continuous running mode by pressing ⊕ and ⊖ as appropriate:

⊕ key	Clockwise rotation
⊖ key	Counterclockwise rotation (as seen from front towards the motor shaft)

– Exit manual mode by pressing the ↵ key.

Single step:
If you press the key only briefly, the motor performs a single step.

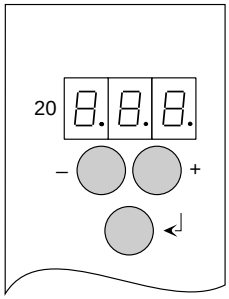
Continuous operation:
If you keep the key pressed, the motor starts at a speed of 100 Hz. As long as you keep the key pressed, the speed increases up to 4 kHz in 5 speed steps.

NOTE
The sense of rotation of the motor can be changed by inverting the motor lines. If you do this, you also have to interchange the limit switch inputs LIMP and LIMN as well as the signals A and A of any connected encoder for rotation monitoring.

NOTE
Further tests, e.g. I/O test, are available in the ProOED3 programming software; see ProOED3 documentation.

3 Operation

3.1 Controller operating modes



Processor unit status displays	Operating mode	Description	Reference
01	Controller STOP	Program execution stopped	See chapter 3.3
Ed	Editing mode	Programming with ProOED3 software	See ProOED3 documen-tation
11	Set motor current	Setting the motor phase current according to motor type plate	See chapter 3.5
91 nn	Manual mode	Moving the motor manually via front panel keys during drive setup and testing	See chapter 3.6
.	Automatic mode	Automatic program execution	See chapter 3.7

The following figure shows the major mode transitions:

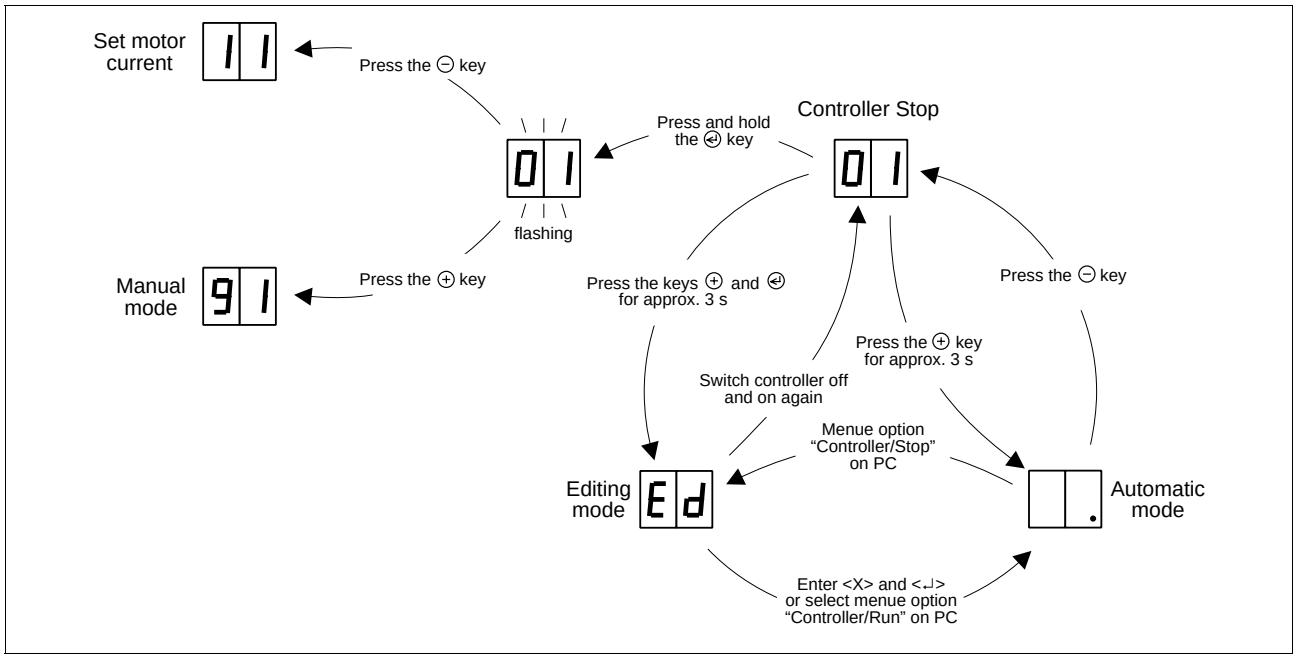


Fig. 3-1 Mode transitions

3.2 Switching ON

ATTENTION
The mains voltage set on the selector switch must correspond to the required supply voltage (see type plate).

DANGER
Persons or electrically conductive objects must never touch live parts of the device or equipment.

DANGER
The movement range of the equipment must be kept clear of persons and objects.

ATTENTION
The unit must be grounded with a protective conductor.

ATTENTION
The basic settings of the unit must conform to the actual requirements; see chapter 2.5.

The following requirements must be fulfilled before switching on the unit:

Requirement	**Reference**
Ambient conditions in line with the technical data?	See chapter 1.3
Sufficient space for ventilation available?	See chapter 1.3
Wiring of the unit (in particular signal inputs for limit switches, reference switch and stop) carried out properly?	See chapter 2.4
Mains voltage set correctly on the selector switch?	See chapter 2.5
Motor phase current set correctly?	See chapter 2.5

1. Switch on the power supply for the power controller.

ATTENTION
If a program was loaded into the controller's EEPROM with the ProOED3 programming software, the program starts automatically after power-on.
You can prevent this by pressing the ⊖ key while switching on.

2. Switch on the supply voltage for the processor unit (24 VDC).
   After power-on, the controller performs a self-test with the hardware and software components. Fig. 3-2 shows the power-on sequence of the controller.

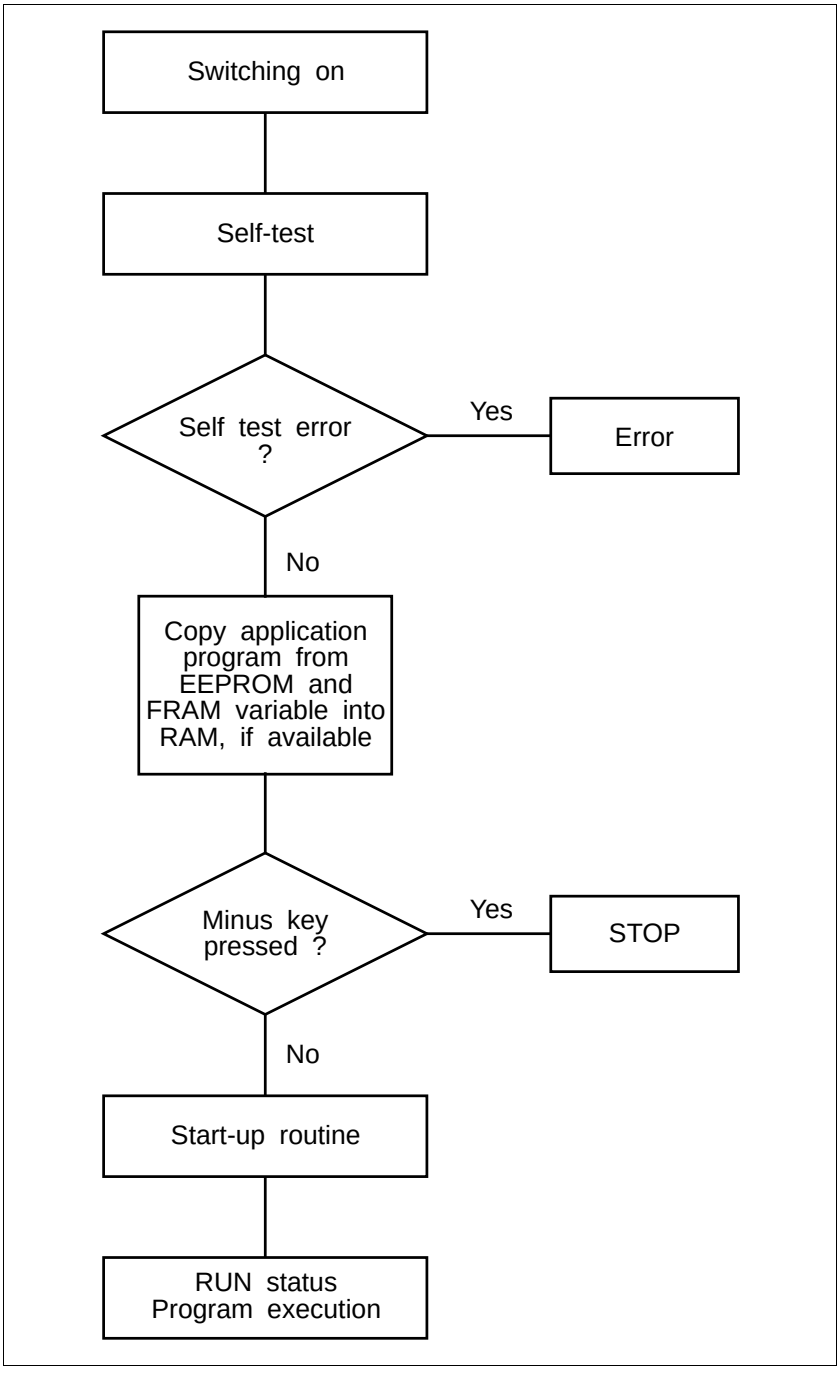
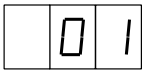


Fig. 3-2 Power-on sequence

3.3 Controller STOP

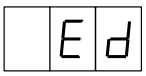


The application program is stopped. To change to this status, press the ⊖ key until “01” is displayed.
From this status, you can call various functions:

– Editing mode for programming the controller with the ProOED3 programming software.
– Setting the motor phase current.
– Manual movement of the motor with the ⊕ and ⊖ keys on the front panel.

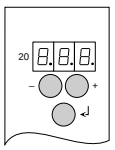
When you set the controller to automatic mode by pressing the ⊕ key, the program always starts at the beginning.

3.4 Editing mode



This operating mode is used for programming and operation with ProOED3.

Activate editing mode as follows:



1. Press the ⊖ key until “01” is displayed. The controller is now in STOP status.
2. Press and hold the ↵ key and press the ⊕ key several times until “Ed” is displayed.

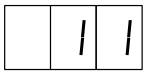
You can now program the controller with a PC and the ProOED3 software.

NOTE
For more information, refer to the ProOED3 documentation.

3.5 Setting the motor phase current

Since it is possible to connect various motor types to the controller, the maximum phase current must be adjusted to the motor actually connected.

1. Press the ⊖ key until “01” is displayed. The controller is now in STOP status.
2. Press the ↵ key until “01” starts flashing in the display.
3. Press and hold the ↵ key and press the ⊕ key several times until “11” is displayed.



4. Release the ↵ key. The latest selection appears flashing in the seven-segment display: Display = Motor phase current (in A).
5. Use the ⊕ and ⊖ keys to set the motor phase current according to the motor type plate. Confirm and input the set value by pressing the ↵ key.

ATTENTION
The set phase current must be equal to or less than the nominal phase current specified on the motor type plate (the lower the set phase current, the lower the motor torque).

3.6 Manual mode via front panel

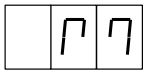
Before calling manual mode, you must set the correct motor phase current first; see chapter 3.5.

In manual mode, you can move the stepping motor manually using the controller front panel keys. You can do this either in single steps or in continuous running mode.

Proceed as follows:

1. Press the ⊖ key until “01” is displayed. The controller is now in STOP status.

2. Press and hold the ↵ key and press the ⊕ key several times until “91” is displayed.



3. Release the ↵ key. An “M” starts flashing in the seven-segment display.

4. Move the motor in single step or continuous running mode by pressing ⊕ and ⊖ as appropriate:

   ⊕ key — Clockwise rotation
   ⊖ key — Counterclockwise rotation (as seen from front towards motor shaft)

   Single step:

   If you press the key only briefly, the motor performs a single step.

   Continuous operation:

   If you keep the key pressed, the motor starts at a speed of 100 Hz. As long as you keep the key pressed, the speed increases up to 4 kHz in 5 speed steps.

5. Exit manual mode by pressing the ↵ key.

NOTE
The sense of rotation of the motor can be changed by inverting the motor lines. If you do this, you also have to interchange the limit switch inputs $\overline{LIMP}$ and $\overline{LIMN}$ as well as the signals A and $\overline{A}$ of any connected encoder for rotation monitoring.

NOTE
In manual mode, all limit switches are monitored.

3.7 Automatic mode

Before calling automatic mode, you must set the correct motor phase current first; see chapter 3.5.

In this mode, an application program developed with the ProOED3 programming software can be executed.

Program start

As a prerequisite, an application program must have been loaded into the controller and written to the controller's EEPROM with the ProOED3 programming software.
Automatic mode is automatically activated after controller power-on.
In controller STOP status, the ⊕ key must be pressed for approx. 3 sec. to activate automatic mode.

NOTE
An application program can also be started, stopped or tested ("debugged") from the programming device ("on-line").

– The program is always executed from program start.
  → A dot is displayed in the status displays.

NOTE
For more information, see ProOED3 documentation.

3.8 Programming

Programming of the unit is effected in editing mode (see chapter 3.4) using the ProOED3 programming software and a PC.

ATTENTION
Before switching off power supply the programme transfer must be completed.
Important program data will otherwise be destroyed which can only be restored by the Berger Lahr Service.

Documentation note

Programming an application program with ProOED3 is described in the ProOED3 documentation.

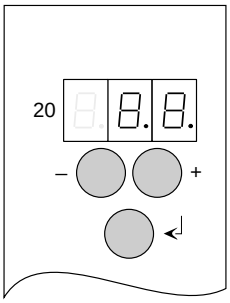
3.9 Switching OFF

Switch off the supply voltages for the power controller and the processor unit.

ATTENTION
The connected motor is deenergized after disconnecting the power controller supply voltage, i.e. it does not have any holding torque. Before disconnecting the supply voltage, ensure that any vertical loads are prevented from falling down (e.g. use motor with brake).

4 Malfunctions

4.1 Status indicators



Processor unit status displays

The two seven-segment displays on the right (item 20) indicate operating states, malfunctions on the processor unit and power controller (see chapter 4.2 for a troubleshooting table).

The displays show the following operating modes:

Processor unit status displays	Operating mode	Description
01	Controller STOP	Program execution stopped; see chapter 3.3
Ed	Editing mode	Programming with the ProOED3 software; see chapter 3.4
11	Set motor current	Setting the motor phase current according to the motor type plate; see chapter 3.5
91 nn	Manual mode	Moving the motor manually using the front panel keys during drive setup and testing; see chapter 3.6
.	Automatic mode	Automatic program execution; see chapter 3.7

4.2 Troubleshooting tables

The following table lists the possible malfunctions indicated with an error code in the status display (item 20), their possible causes and methods for rectification.
If several errors occur, the corresponding error codes are stored in the controller.
The error codes can be displayed one after the other by pressing the ↵ key.

Display	Cause	Rectification
A ...	Self-test error	Call Technical Services department.
03	Motor lead short-circuit	Check the motor wiring.
04	Power controller not ready	Switch on the supply voltage.
	Line interruption	Disconnect the unit and check the cable.
05	Overvoltage on power controller	Connect a bleed resistor; see chapter 6.2.4.
07	Power controller overtemperature	Let the power controller cool down while the motor is at a standstill.
		Install a fan set; see chapter 6.2.1.
08	Error on encoder for electronic gear; line broken	Check encoder wiring; see chapter 2.4.6.
09	Motor overtemperature	Reduce the phase current; see chapter 3.5.
		Reduce the load.
11	Power controller undervoltage (<200 V)	Check the voltage supply.
12	Rotation monitoring active, contouring error	Check mechanical components for ease of movement.
14	Power controller without voltage supply	Check voltage supply. Switch on the voltage supply for the power controller first before switching on the voltage supply for the processor unit.
	Internal power controller defective	If switching on is not possible, call Technical Services department.
16	Short-circuit on an output q	Check signal connector wiring; see chapter 2.4.3.
20	Incorrect limit switch LIMP or limit switch malfunction	Check wiring and function of the limit switch or the sense of rotation of the motor; see chapter 2.4.3.1. LIMP must be approached with CW rotation of the motor.
21	Incorrect limit switch LIMN or limit switch malfunction	Check wiring and function of the limit switch or the sense of rotation of the motor; see controller manual. LIMN must be approached with CCW rotation of the motor.
22	CW limit switch LIMP actuated	Move out of the limit switch range in manual mode; see chapter 3.6.
23	CCW limit switch LIMN actuated	Move out of the limit switch range in manual mode; see chapter 3.6.

Display	Cause	Rectification
26	Reference switch defective or disconnected	Check the reference switch.
30	STOP input active	Deactivate the STOP input.
40 41 42	Internal errors: 40 = Error during initialization 41 = Error in SEQUENCE component 42 = Error in PLC component	Controller errors, call Technical Services department.
48	OED3 operating system not found on controller	Call Technical Services department.
56	No EEPROM available	Call Technical Services department.
57	EEPROM write error	Call Technical Services department.
98	Error handling by application program	Eliminate the error by application program; see ProOED3 documentation.
		Change the control parameter “Error handling by user” in ProOED3; see ProOED3 documentation.
99	Error display by ProOED3 error menue	Display error with ProOED3 error menue and eliminate it; see ProOED3 documentation.

DANGER
The mains supply voltage must be disconnected for any check on the mains, motor, or bleed resistor wiring.

NOTE
If error handling is not effected by the application program, errors can be acknowledged via the front panel keys.

Other malfunctions

The following table lists possible malfunctions which are not displayed.

Malfunction	Cause	Rectification
Motor does not move even with current available	Motor is mechanically blocked	Release motor brake, if available.
No motor torque	One or more motor leads interrupted	Check motor wiring; see chapter 2.4.2.
Motor does not move		
Motor does not follow control	Motor leads interchanged or one or more motor leads interrupted	
	Motor and positioning and sequence control unit do not match	Use the appropriate motor type; see chapter 6.1.

DANGER
The mains supply voltage must be disconnected for any check on the mains, motor, or bleed resistor wiring.

4.3 Repair work

ATTENTION
Any necessary repair work must not be carried out except by BERGER LAHR!

Mark all connections whenever disassembling the unit.

The set parameters and the mounting location number of the old unit must be transferred to the new one when replacing a unit.

4.4 Storage, shipment

The following requirements apply when storing units or PC boards:

- The maximum air humidity must not be exceeded (see chapter 1.3).
- The storage temperature specification must be observed (see chapter 1.3).
- Stored parts must be protected from dust and dirt.
- Units or PC boards marked with the symbol

  may only be unpacked, stored and installed in an electrostatically protected environment.
- The original packing material should be kept for later use.

The following requirements apply when shipping units or PC boards:

- Units or PC boards must be shipped in their original packing material.
- PC boards without batteries or accumulators must be packed in wrapping which is electrically conductive on both sides (use original wrapping, if possible).
- PC boards with batteries or accumulators must be packed in wrapping which is electrically conductive on the outside and antistatic on the inside (use original wrapping, if possible).
- Units or PC boards marked with the symbol

  may only be packed in an electrostatically protected environment.

5 Customer service

The Technical Services department offer the following services under the phone numbers given:

– **Spare part information** by direct line

Phone: +49 (0) 7821 - 946 - 606

Express spare part shipment from Lahr;
reaches most destinations in Europe within 24 hours.

– **Technical advice in case of failures** by hotline

Phone: +49 (0) 7808 - 943 - 226

Fax: +49 (0) 7808 - 943 - 499

Internet e-mail: hotline@berger-lahr.com

Of course, the Technical Services department also offer the following services:

– **On-site maintenance** and

– **direct communication with your service specialist.**

6 Appendix

6.1 Device variants

The following device variants are available, depending on the 3-phase stepping motors with a motor voltage of 325 V which can be used and depending on the interface configuration:

Unit	**For use with motor type**
WDP3-014 with OED3	Type size 90 VRDM 39xx/50 LW.
WDP3-018 with OED3	Type size 110 VRDM 311xx/50 LW.

Interface (adapter slot 21 OPT.1)	**Encoder interface (adapter slot 22 OPT.2)**	
RS 232	Not installed	LRS 422 IN
RS 485 LS	Not installed	LRS 422 IN

NOTE
The interfaces installed in the device are indicated on the type plate. The following abbreviations are used:

RS 232	*Serial interface RS 232*
RS 485 LS	*Serial interface RS 485*
LRS 422 IN	*Encoder interface RS 422*

6.2 Description of accessories

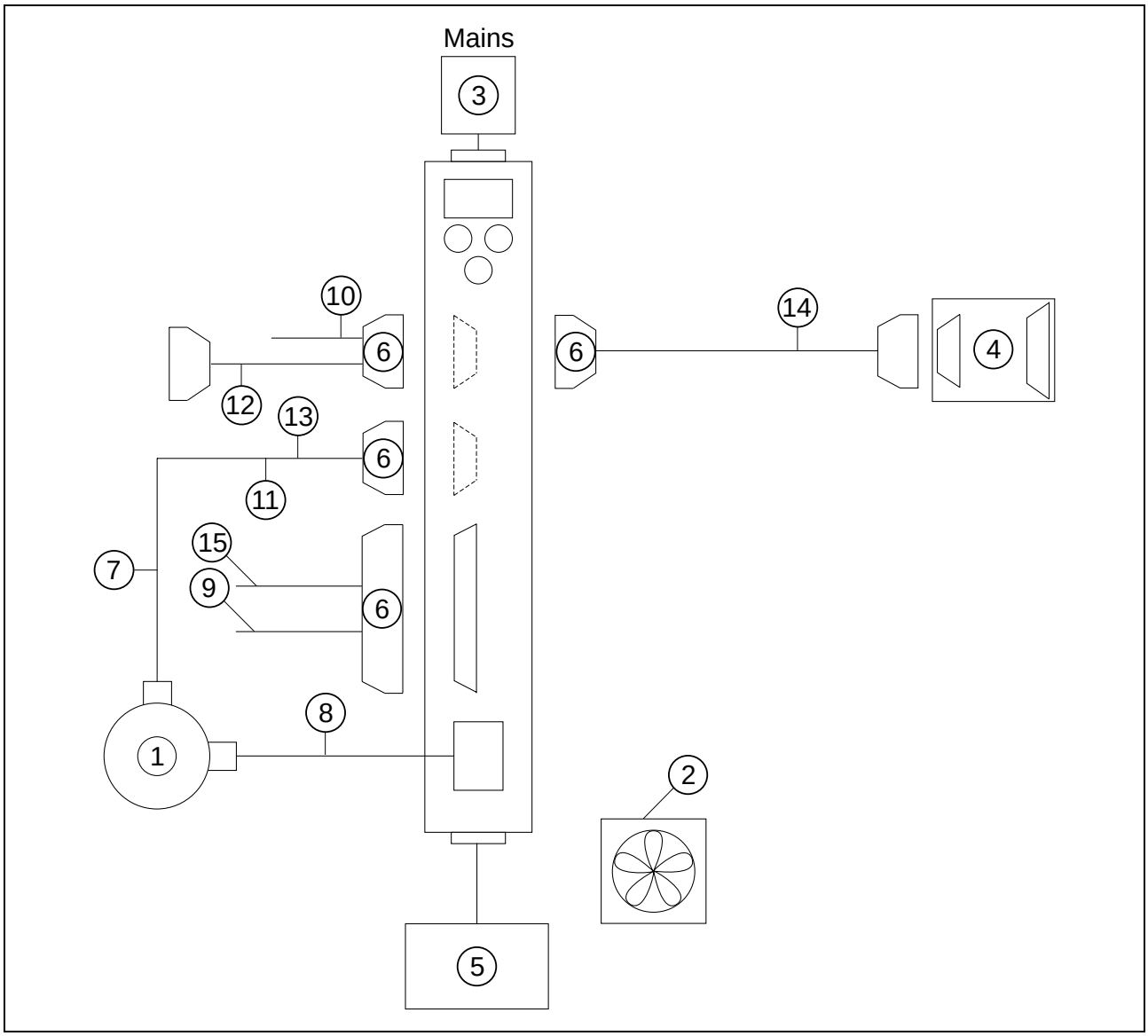


Fig. 6-1 Accessories

The following accessories may be ordered separately (see fig. 6-1):

Item no.	Designation	Reference
1	3-phase stepping motor with or without encoder	See chapter 6.1 and 3-phase stepping motor drives catalogue
2	Fan for WDP3-014	See chapter 6.2.1.
3	Mains filter	See chapter 6.2.2.
4	MP 923 interface converter RS 232/RS 485	See chapter 6.2.3.
5	Additional bleed resistor	See chapter 6.2.4.
6	Set of connectors (all sub-D connectors)	See sales documentation
	Non-terminated cables	
7	Cable for encoder	
8	Motor cable 3 x 1.5 mm and 2 x 1.0 mm Motor cable 3 x 2.5 mm and 2 x 1.5 mm	
9	Signal cable for signal connection	
10	Signal cable for serial interface	
11	Motor encoder cable	
	Ready-made cables	
12	RS 232/PC signal cable, terminated on both ends	
13	RS 422 IN/customer signal cable, terminated on device end	
14	RS 485 LS/MP 923 signal cable, terminated on both ends	
15	Signal connection/customer signal cable, terminated on device end	

Non-terminated cables are available in the following lengths:

5 m 10 m 15 m 20 m 25 m 30 m 50 m 75 m 100 m 200 m

Ready-made cables are available in the following lengths:

1.5 m 2 m 3 m 5 m

NOTE
Refer to the sales documentation for the positioning and sequence control unit WDP3-01X with OED3 for the accessory order numbers.

6.2.1 Fan

The unit can be provided with a fan in order to improve heat dissipation (see chapter 2.3).

The fan (fig. 6-2) must be mounted at the bottom of the unit.
The airstream must pass through the unit from bottom up (see fig. 2-2). The arrow on the fan indicates the direction of the airstream if the fan is connected correctly (red = 24 VDC, black = 24 VGND).

1. Cut out the grille on the unit.
2. Fasten the fan to the bottom of the unit with four screws.
3. Connect the fan to the external 24 VDC voltage supply.

NOTE
Ensure that the airstream in and around the unit is unobstructed.

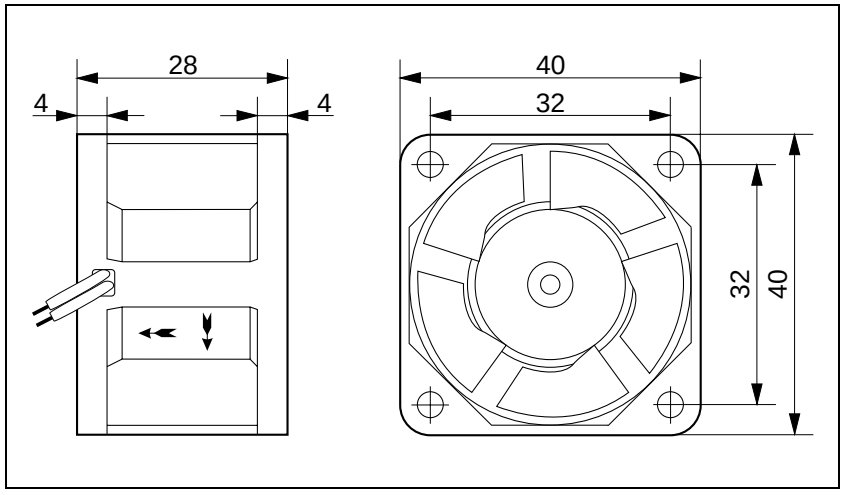


Fig. 6-2 Fan

6.2.2 Mains filter

A mains filter (fig. 6-3) can be inserted into the mains supply line for radio interference suppression.

NOTE
When connecting the mains filter, the EMC testing specifications of BERGER LAHR must be observed.

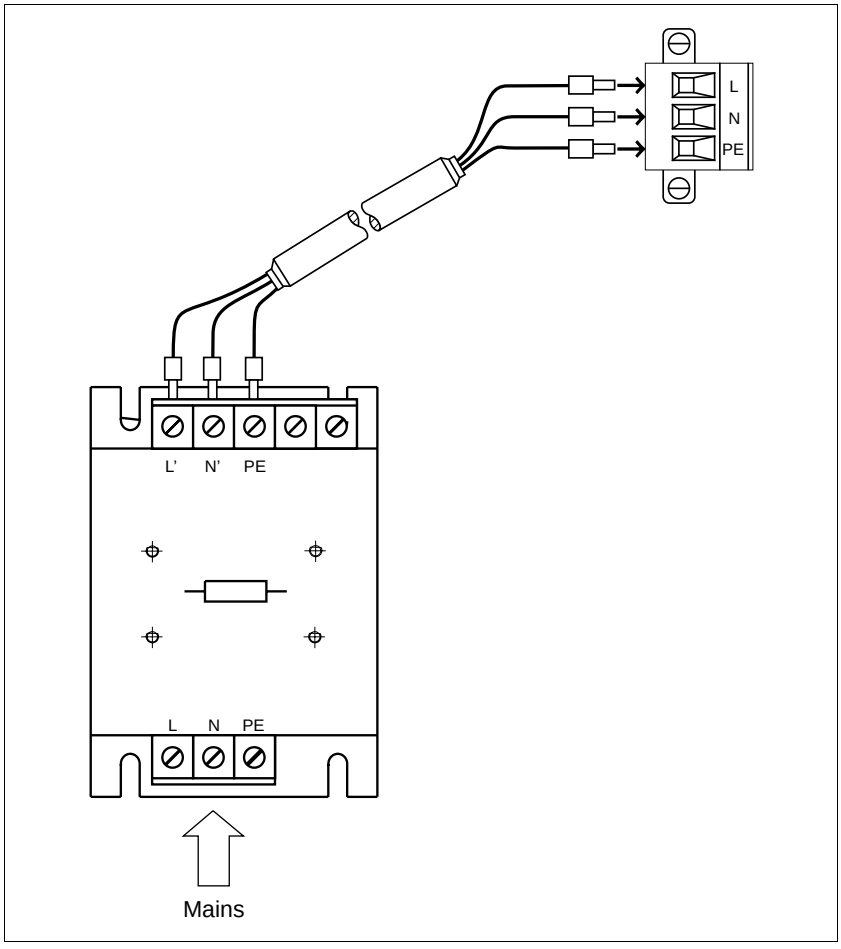


Fig. 6-3 Mains filter

Ambient conditions

Storage temperature	-25°C to +70°C
Operating temperature	0°C to +55°C
Humidity class	F acc. to DIN 40040
Humidity class, tested to IEC 68 part 2-3 at:	
Air temperature	+40°C, +2°C
Relative humidity non-condensing	93%, +2%, -3%

6.2.3 MP 923 interface converter

6.2.3.1 General description

The MP 923 interface converter is used for data transmission from an RS 485 LS (RS 422) interface to a V24 (RS 232) interface and vice versa.

The interface converter must be powered either via the power supply unit connection (2-pin female diode connector) or via the RS 485 (RS 422) connector with 12 VDC. With BERGER LAHR positioning units (e.g. WDP3), power is supplied via the RS 485 (RS 422) connection.

6.2.3.2 Technical data

Electrical data

Voltage supply	9.6 to 15 VDC/150 mA
Interfaces	RS 485 LS (RS 422) V24 (RS 232)

Mechanical data

Dimensions	97 x 65 x 30 mm
Weight	approx. 130 g

Ambient conditions

Storage temperature	-25°C to +70°C
Operating temperature	0°C to +55°C
Humidity class	F acc. to DIN 40040
Humidity class, tested to IEC 68 part 2-3 at:	
Air temperature	+40°C, +2°C
Relative humidity non-condensing	93%, +2%, -3%

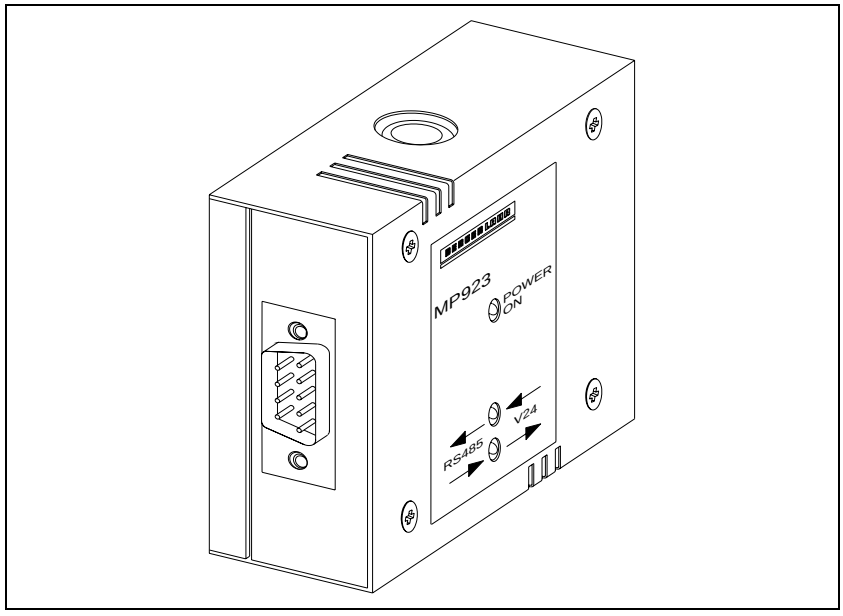


Fig. 6-4 MP 923 interface converter

6.2.3.3 Setup

1. Wire the MP 923 interface converter in accordance with fig. 6-5.

NOTE
The MP 923 is supplied with 12 VDC power via the RS 485 (RS 422) connector of the BERGER LAHR controller.

ATTENTION
The interface cables must be shielded on both ends via the connector shells!

ATTENTION
For reasons of noise immunity, the V24 (RS 232) cable should be as short as possible (15 m max.)!

2. Switch on the mains voltage.
   → The LED “POWER ON” lights up. The two other LEDs remain dark.

3. Start data transmission.
   → Depending on the sense of the data transmission, either the LED marked “RS 485 → V24” or the LED marked “RS 485 ←V24” lights up.

6.2.3.4 Status indicators

The status indicators show the operating status or any malfunction.

LED	Lit	Not lit	Flashing
“POWER ON”	Supply voltage available	Supply voltage not available	
“RS 485 → V24”	RS 485 (RS 422) interface incorrectly wired (signal lines TxD ($\overline{TxD}$) and RxD ($\overline{RxD}$) interchanged)	No data transmission from RS 485 (RS 422) to V24 (RS 232)	Data transmission from RS 485 (RS 422) to V24 (RS 232) enabled
“RS 485 ← V24”	V24 (RS 232) interface incorrectly wired (pins 2 and 3 interchanged)	No data transmission from V24 (RS 232) to RS 485 (RS 422)	Data transmission from V24 (RS 232) to RS 485 (RS 422) enabled

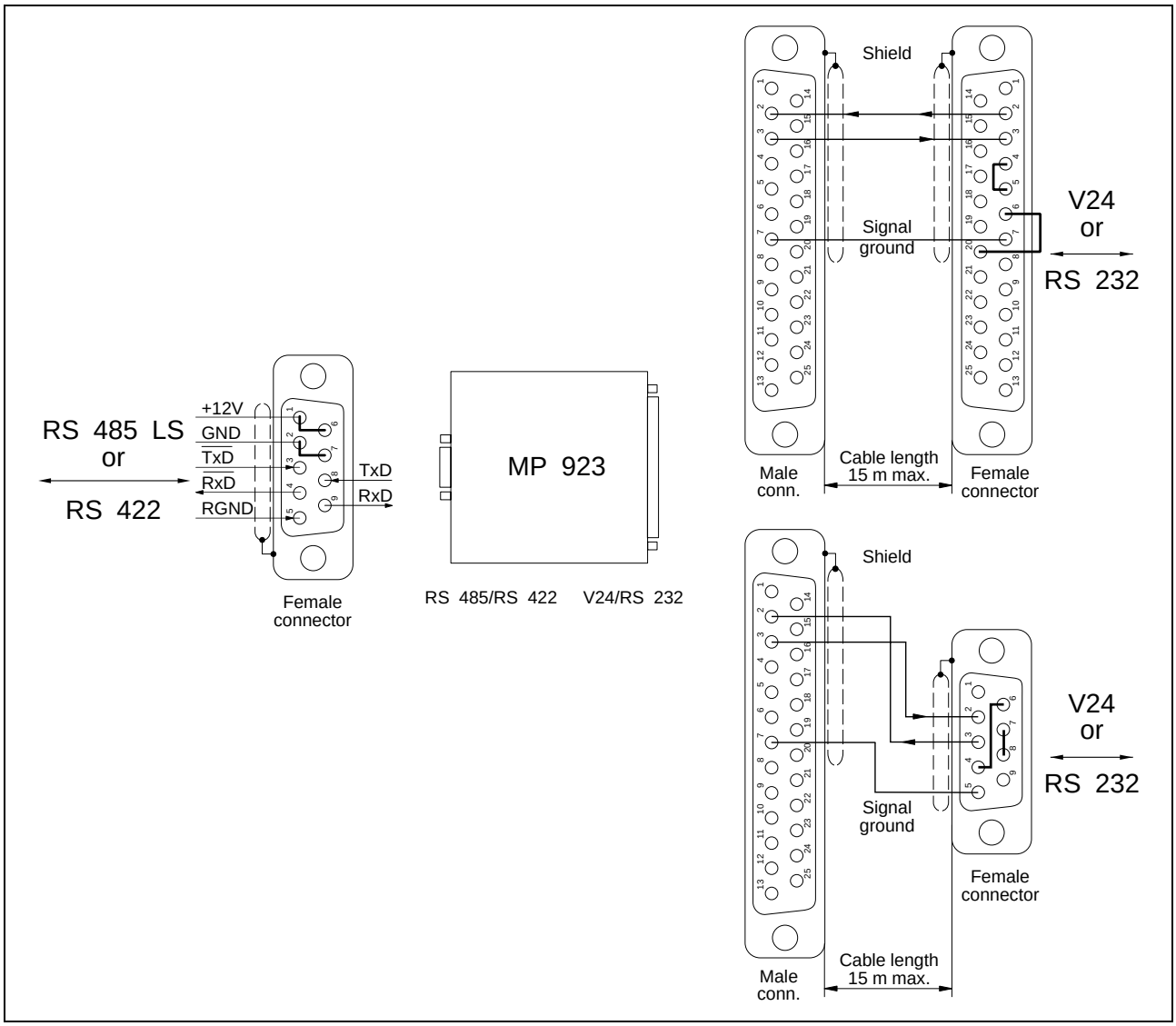


Fig. 6-5 MP 923 interface converter setup

6.2.4 Additional bleed resistor (only at units < RS 40)

The additional bleed resistor FZP 200 (180 ohms, 150 W) can be used for dissipating a major amount of braking energy (fig. 6-6).

DANGER
High voltages are present at the bleed resistor connections (approx. 325 VDC).

DANGER
The bleed resistor heats up when a great amount of braking energy is produced.

ATTENTION
Good heat dissipation must be ensured when installing the bleed resistor.

1. Switch the mains voltage OFF.
2. Provide the two bleed resistor leads with wire end ferrules on the device end.
3. Connect the two litz wires to the terminals at the bottom of the unit.

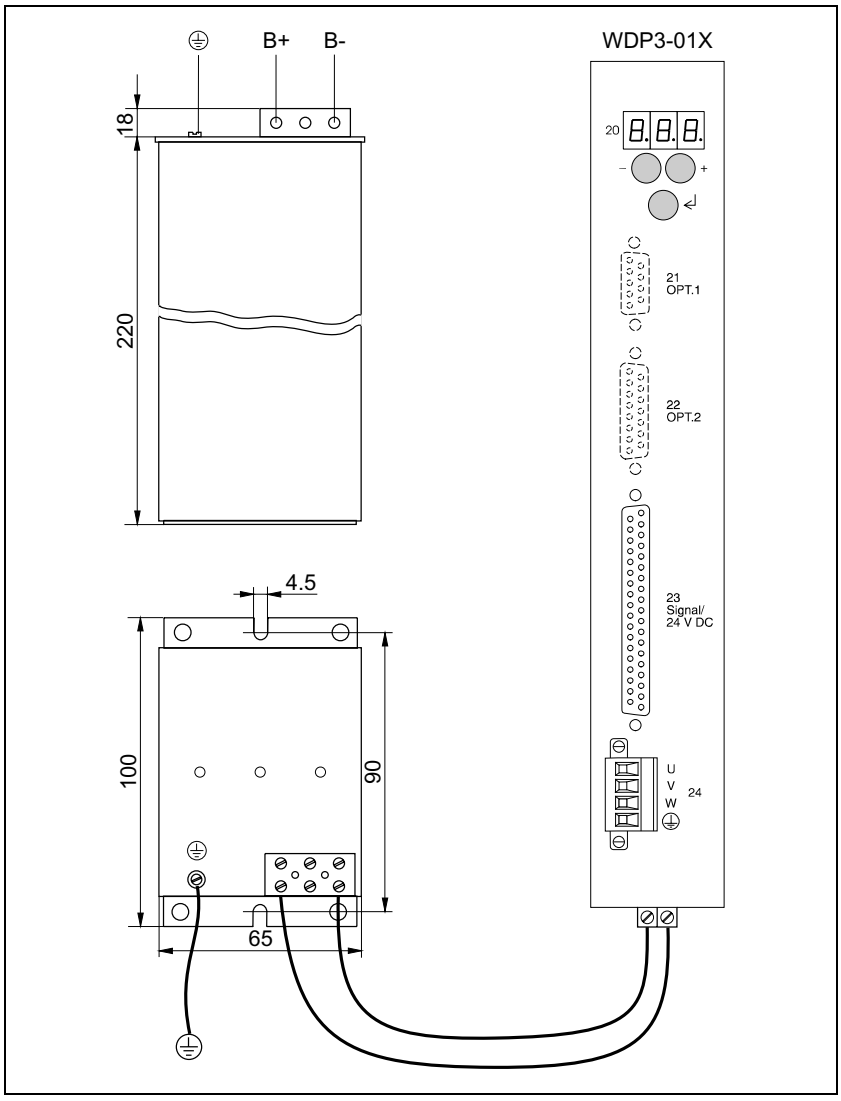


Fig. 6-6 Additional bleed resistor

6.3 Glossary

Absolute dimensions
Refers to a system of dimensions for positioning operations. The reference point for positioning is the reference point of the system.

Absolute positioning
For absolute positioning, the position value refers to the zero point of the axis.

CCW rotation
Sense of rotation of the motor in a counterclockwise direction (as seen from front towards the motor shaft).

Commands
The functions of a controller are accessed using commands. Commands are sent from the master to a controller (slave). The controller interprets and executes the commands.

CW rotation
Sense of rotation of the motor in a clockwise direction (as seen from front towards the motor shaft).

Download
With the download function, data are loaded into the controller from a master computer.

Electronic gear
Externally supplied pulses are counted as A/B encoder signals or pulse/direction signals and multiplied with a gear ratio. These pulses are used as the reference variable for stepping motor positioning.

Encoder
Sensor for motor position detection (actual position detection).

Encoder signals A/B
Pulse signals of an encoder. For one motor revolution, a defined number of pulse signals (e.g. 1000) is generated by the encoder. The encoder signals are subjected to single, double or quadruple evaluation.

Gear ratio
Multiplication factor for positioning operations, which is composed of a numerator and a denominator (step-down gearing or step-up gearing).

Incremental (relative) dimensions
Refers to a system of dimensions for the positioning unit. The reference point for positioning is the current position.

Inputs/outputs
The controller is provided with a certain number of inputs and outputs through which sequential operations are controlled.

Limit switch
Switch for limiting the travel and for reference movements.

Master/slave principle
Principle of communication in a network.
Only the master is permitted to send commands. Slaves only receive and execute commands.

Negative limit switch
Limit switch in CCW (counterclockwise) direction. Motor rotation in a counterclockwise sense as seen from front towards the motor shaft.

Network mode
An operating mode used for a network of positioning units. Several units are connected to a host via a physical link. Selection of the units to be addressed is effected by a device polling command.

Positive limit switch
Limit switch in CW (clockwise) direction. Motor rotation in a clockwise sense as seen from front towards the motor shaft.

Power controller
A motor is controlled by a power controller. The power controller converts positioning signals from the processor control into signals for motor control.

Pulse/direction signals
Signals for reference variable input for an electronic gear.

Reference movement
Motor movement towards the CCW or CW limit switch or a reference switch for setting a reference point for the system of dimensions.

Reference point
Position value after a reference movement or after setting the reference point.

Reference speed
The reference speed is the speed at which the axis moves away from a limit switch.

Reference switch
A switch which can be approached from either direction for a reference movement.

Relative positioning
For incremental positioning, the position value refers to the current position of the axis.

Rotation monitoring
Rotation monitoring is used for detecting positional deviations of motor movements. The actual position is detected by an encoder and then compared with the setpoint. If the difference between actual and set position exceeds a preset value, a contouring error is reported and the motor is decelerated.

RS 485 interface
Serial interface for a network configuration.

Teach-in
The teach-in function is used for storing positions which have been approached by manual control.

Upload
The upload function is used for reading data from the controller.

6.4 Abbreviations

AC	Alternating Current
ASCII	American Standard Code for Information Interchange
DC	Direct Current
Doc. no.	Documentation number
DP	Decentralized peripheral equipment
E	Encoder
FI	Fault current
HU	Height Unit
I	Input
I/O	Input/Output
IBS	Interbus-S interface
LED	Light Emitting Diode
M	Motor
PBDP	Profibus-DP interface
PC	Personal Computer
PELV	Protected Extra Low Voltage
PLC	Programmable Logic Controller
Q	Output

7 Index

8 Corrections and additions

At present there are no corrections or additions.