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Positioning Controller for
3-phase Stepping Motors

WDP3-01X

Edition: g156 08.03

Ident. no.: 00441109760

Software version: 02.0XX

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Safety requirements

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

- The intended use of the device is described under “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 in the chapter “Description of 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.

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Proposals
Improvements

Berger Lahr GmbH & Co. KG

Breslauer Str. 7
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D-77901 Lahr

WDP3-01X

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1 General description

1.1 Structure and characteristics

Purpose

The WDP3-01X positioning controller (fig. 1-1) can be used for controlling the following BERGER LAHR 3-phase stepping motors with a rated motor voltage of 325 V:

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

One unit is used for controlling one axis. The difference between the positioning controllers WDP3-014 and WDP3-018 consists in their power ratings.

Interface options and device functions

Additional interface options allow you to implement various device functions. The controller detects the interfaces installed and configures itself automatically for the appropriate device functions.

Documentation

This documentation describes installation and operation via the front panel keys and the inputs/outputs of the signal interface as well as via the analog and encoder interfaces. Setup and operation of the unit via the serial interface or the field bus interface (e.g. Interbus-S or Profibus-DP) are described in separate documentations on the appropriate interface.

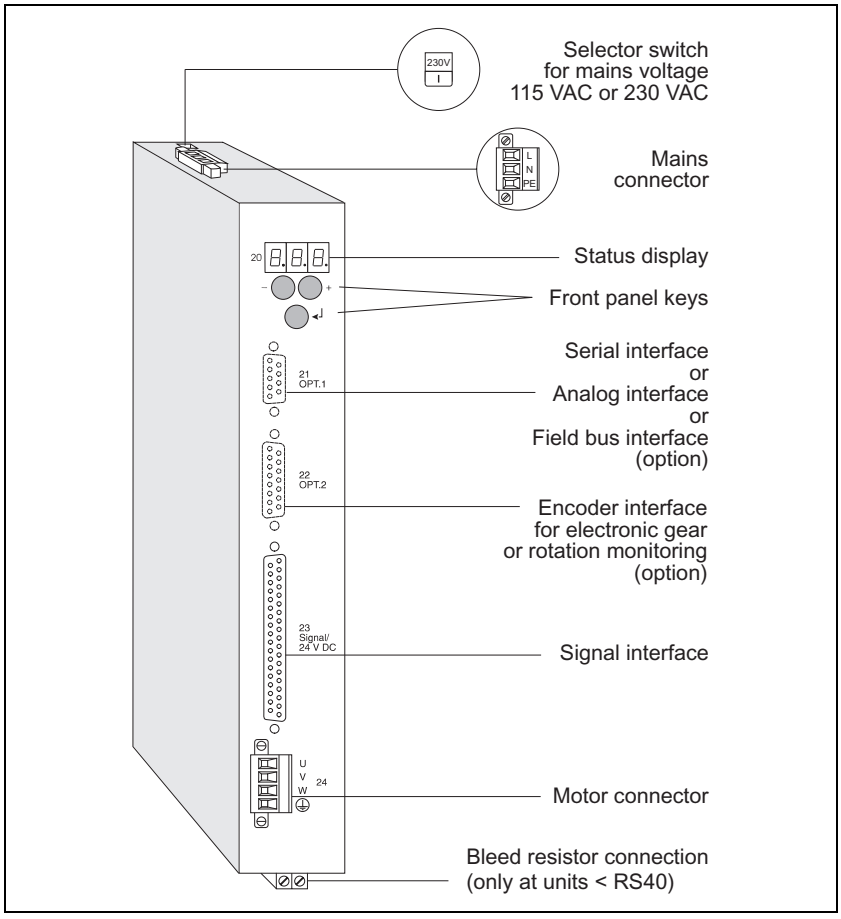


Fig. 1-1 WDP3-01X positioning controller

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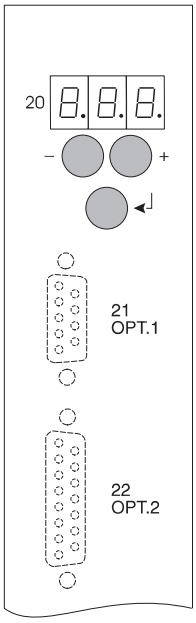
1.2 Function

1.2.1 Hardware components

Interface configuration for OPT.1 and OPT.2

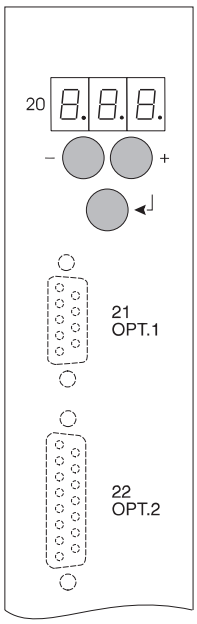
The actual function of the controller depends on the configuration of the interface adapter slots OPT.1 and OPT.2.

The following configuration options are available:



Interface adapter slot		Device functions
OPT.1	**OPT.2**	
Not installed	Not installed	**Oscillator mode or position processing via inputs/outputs** – Position processing via inputs/outputs or front panel, or oscillator mode via inputs/outputs (can be set with front panel parameter P00) – Manual mode via inputs/outputs or front panel – Teach-in mode via inputs/outputs or front panel – Position and parameter input via front panel
	RS 422	– Rotation monitoring, if parameter P20 = 2 and P00 ≠ 3
RS 232 or RS 485	Not installed	**Position processing via inputs/outputs or on-line command processing via serial interface** Position processing or on-line command processing (can be set with front panel parameter P00): – In position processing mode, the unit has the same scope of functions as the basic unit, except oscillator mode via inputs/outputs. In addition, positions and parameters can be uploaded and downloaded via the serial interface. – In on-line command processing mode, the unit has the same scope of functions as the unit with field bus interface.
	RS 422	– Rotation monitoring, if parameter P20 = 2 and P00 ≠ 3 – Electronic gear, If P00 = 3, the gear parameters are input via the front panel or a download via the serial interface. If P00 = 2, the gear parameters are input using on-line command processing via serial interface.

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Interface adapter slot		Device functions
OPT.1	**OPT.2**	
Field bus (e.g. IBS or PBDP)	Not installed	**On-line command processing via field bus interface** – Manual mode via inputs/outputs or front panel – On-line command processing The controller (slave) receives commands from a master unit and executes them immediately. – Parameter input via front panel
	RS 422	– Rotation monitoring, if parameter P20 = 2 and P00 ≠ 3 – Electronic gear, Gear parameter input by on-line command processing via field bus
Analog (ANOZ)	Not installed	**Oscillator mode via analog interface** – Oscillator mode via analog ±10 V input – Manual mode via inputs/outputs or front panel – Parameter input via front panel
	RS 422	– Rotation monitoring, if parameter P20 = 2 and P00 ≠ 3
Not installed or RS 232 or RS 485 or field bus	RS 422	**Electronic gear via encoder interface** – Electronic gear, via encoder interface – Manual mode via inputs/outputs or front panel – Parameter input via front panel or serial interface or field bus

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

ANOZ	*Analog interface*
CAN	*CAN-Bus interface*
IBS	*Interbus-S interface*
PBDP	*Profibus-DP interface*
RS 232	*Serial interface RS 232*
LRS 422-IN	*Encoder interface RS 422*
RS 485 LS	*Serial interface RS 485*
RS 485 HS	*Serial interface RS 485 for SUCONET*

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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 mains supplies. 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.

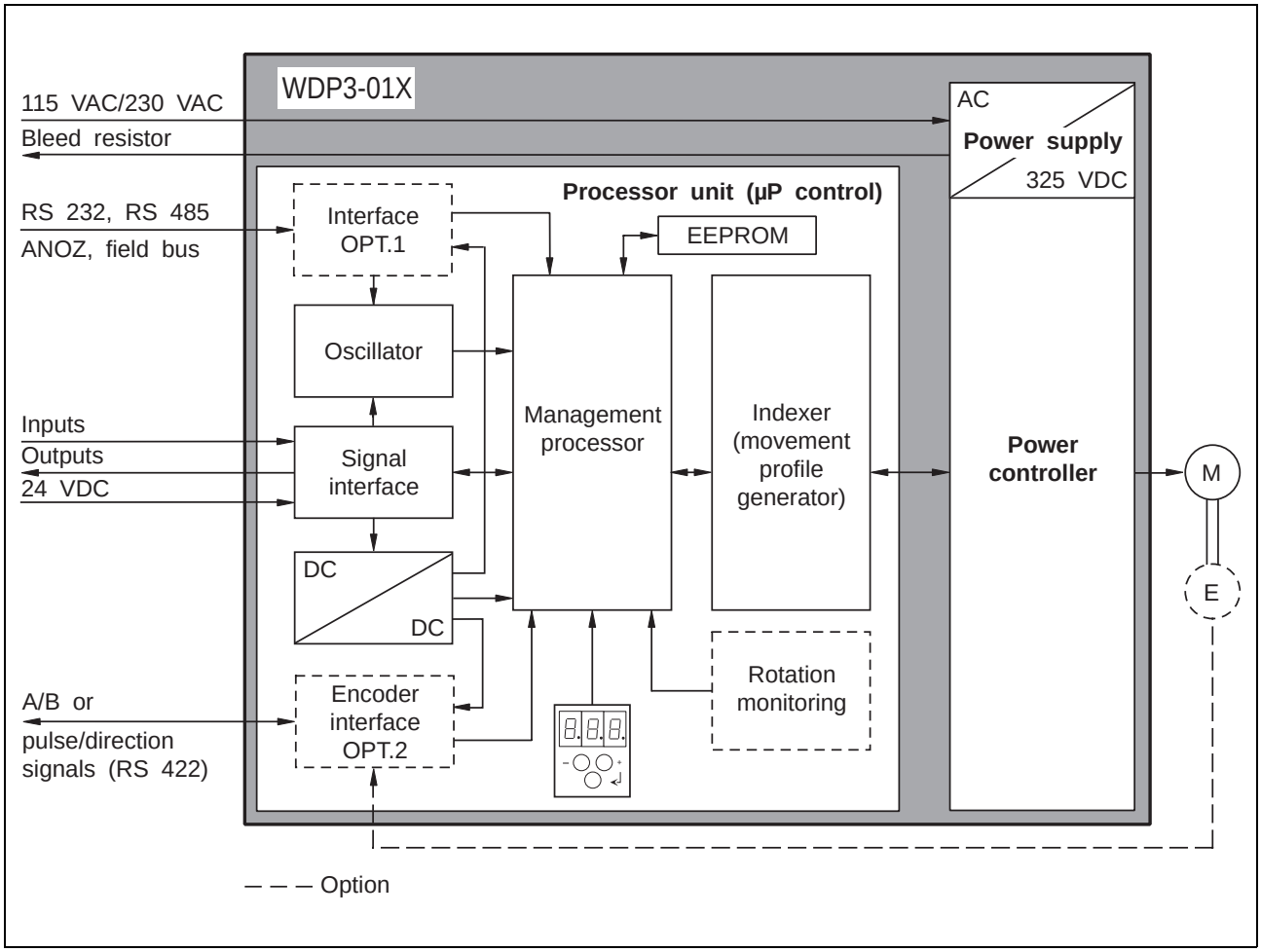


Fig. 1-2 Block diagram

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

Field bus interface The controller can be provided with a standardized field bus interface (e.g. Interbus-S or Profibus-DP). This enables the controller to receive and execute commands from a master unit.

Encoder interface The encoder interface RS 422 (OPT.2) can be used for implementing an electronic gear or for rotation monitoring. This depends on the setting of the parameters P00 and P20.

Oscillator The oscillator generates the movement frequency for controlling the stepping motor. The oscillator may be controlled either by an analog signal (in the range of ±10 V) if the controller has an analog interface (ANOZ), or by the digital signal FH/$\overline{\text{FL}}$ of the signal interface, if the controller does not feature an additional interface in the OPT.1 adapter slot. The two speeds f_H and f_L for oscillator mode via the inputs/outputs of the signal interface are set on the front panel.

Management processor The microprocessor controls all interfaces. The movement profile generator is activated by the microprocessor.

Status display Three seven-segment displays indicate positions, parameters, 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 with a front panel parameter.

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1.2.2 Operating modes and system environment

The controller can be operated in different system environments, depending on the OPT.1 and OPT.2 interface configuration.

The following operating modes are available:

Manual mode

In manual mode, positions are approached using the inputs and outputs or the front panel keys. Acceleration and manual speeds of the 3-phase stepping motor can be adjusted.

Teach-in mode

In teach-in mode, positions are approached and stored using the inputs and outputs or the front panel keys by manual control. A maximum of ten positions can be stored.

Position processing

In this mode (fig. 1-3), up to ten stored positions can be selected and approached via inputs or front panel control. The positions can be input via teach-in, via the front panel or via download through the serial interface and are stored in the same locations in the controller.
Positioning can be effected with absolute values (relative to a reference point) or with incremental values (relative to the current position). The system of either absolute or incremental dimensions is selected on the front panel (P21 parameter). Before executing a positioning operation in the system of absolute dimensions, a reference movement must be executed towards a limit switch or a reference switch (see chapter 1.2.3). Alternatively, the current position can be set as the reference position (current position = 0).

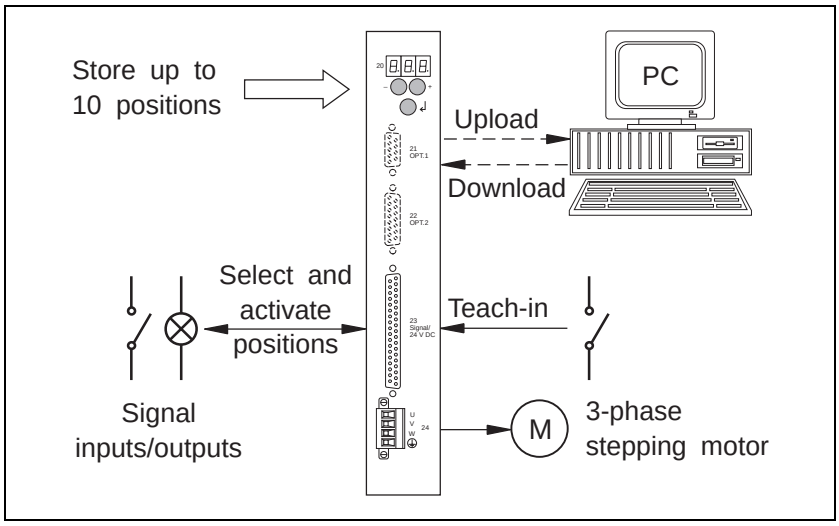


Fig. 1-3 Position processing

Upload/download via serial interface

If the controller is provided with a serial interface and position processing mode has been selected (parameter P00 = 0), positions and parameters can be read (upload) or input (download) through the serial interface.
Uploading and downloading is described in the separate On-line Command Processing and Upload/Download via Serial Interface documentation.

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On-line command processing

The on-line command processing mode is active if the controller is provided with a serial interface and the parameter P00 = 2 has been set or if the controller is provided with a field bus interface. In this mode, single movement commands and other commands are transmitted to the controller and executed immediately. A comprehensive command set for programming is available for on-line command processing. The signal inputs and outputs of the controller can be freely used in this mode. This operating mode is described in a separate documentation for each appropriate interface.

Communication via the serial interface

If the controller is provided with a serial interface (RS 232 or RS 485), either position processing mode or on-line command processing mode can be selected via the front panel (parameter P00).

RS 485 network

Several controllers with RS 485 interfaces can be addressed from a master control unit or a PC. The network address of the controller is set on the front panel with the P60 parameter. The master controller must use a polling command to specify the unit with which it wants to communicate (see separate documentation).

Communication via field bus network

A standardized field bus interface, e.g. Interbus-S (fig. 1-4) or Profibus-DP, can be used for transmitting movement and other commands from a master unit to the controller for execution; see on-line command processing.
Communication via a field bus interface is described in a separate documentation for each appropriate interface.

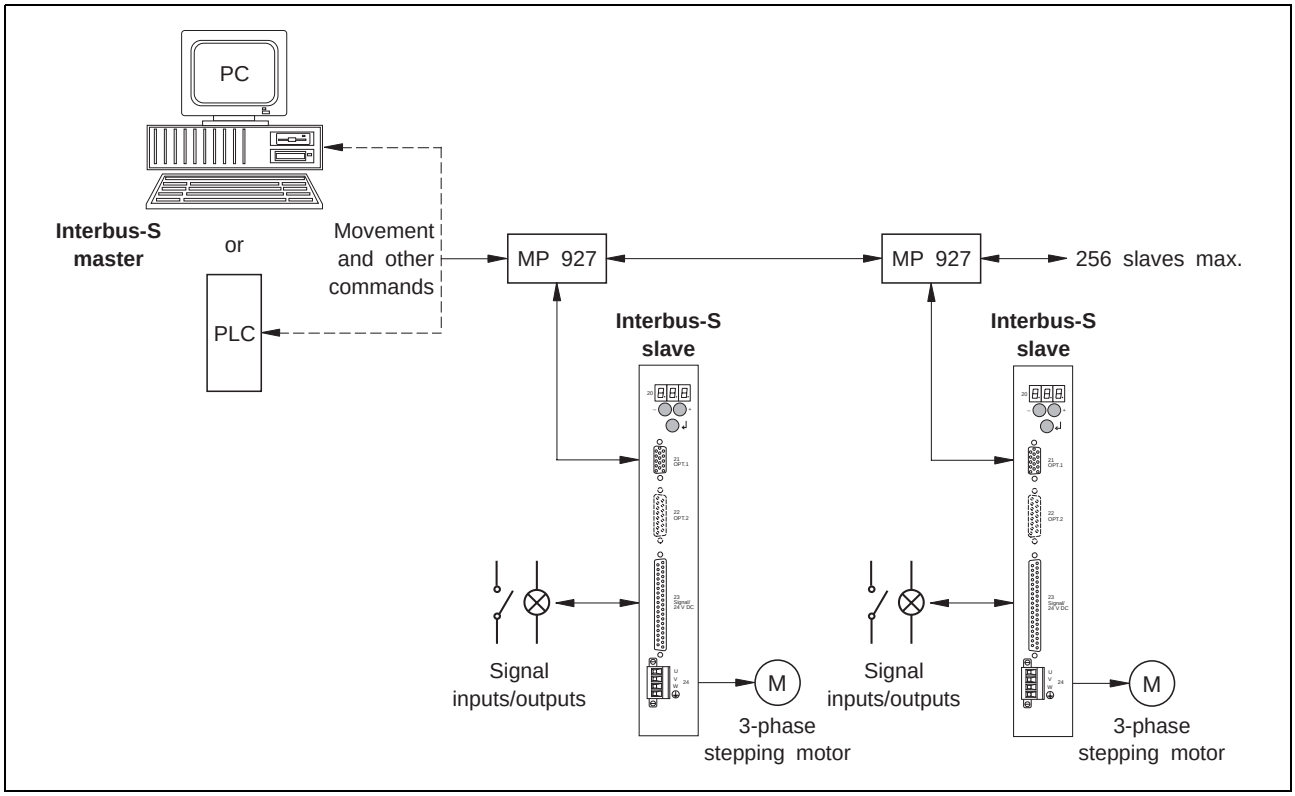


Fig. 1-4 Interbus-S network configuration

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Oscillator mode via inputs/outputs

When using a basic unit without any additional interfaces, oscillator mode via inputs/outputs (fig. 1-5) is available. In this mode, the movement frequencies f_H and f_L are set via the front panel and activated via the FH/$\overline{FL}$ and START inputs. This mode is set with the parameter P00.

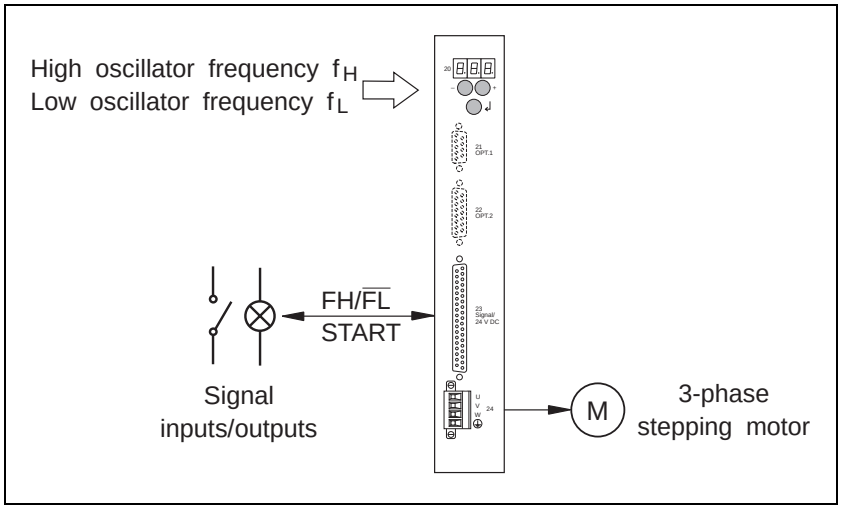


Fig. 1-5 Oscillator mode via inputs/outputs

Oscillator mode via analog interface

In this operating mode (fig. 1-6), an external voltage is fed in via input ANA_IN and converted to a voltage-proportional pulse frequency for controlling the stepping motor. The standard voltage range is -10 V to +10 V, however, it can also be freely selected.
Maximum speed and maximum acceleration as well as the voltage at maximum speed, the voltage range, the zero window parameter and the braking ramp are set as parameters via the front panel.

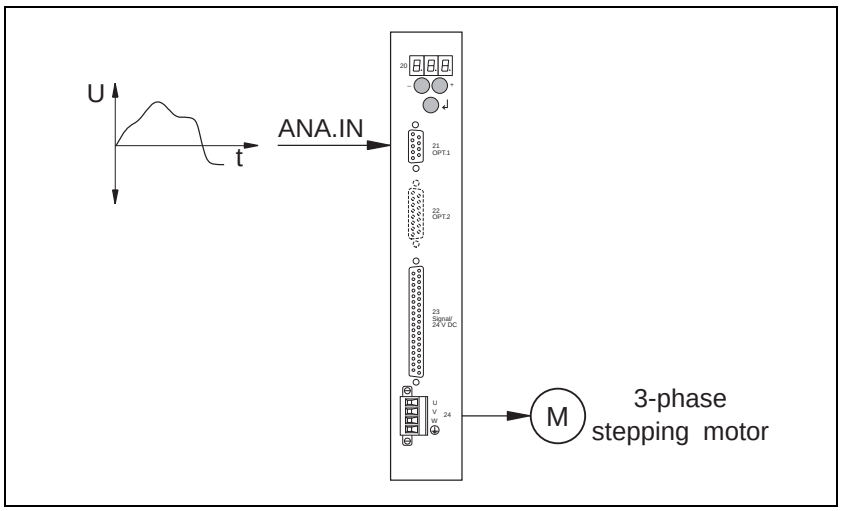


Fig. 1-6 Oscillator mode via analog interface

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Electronic gear

If an RS 422 interface (OPT.2) is installed in the controller, an electronic gear can be implemented. For this purpose, the parameter P00 = 3 must be set on the front panel.
In electronic gear mode (fig. 1-7), an external signal and a gear ratio combine to determine the shaft movement.
The externally supplied pulses are counted as A/B encoder signals or pulse/direction signals and multiplied with a gear ratio (parameters P51 and P52). These pulses are used as the reference variable for the stepping motor position.
The pulse memory is cleared whenever an error occurs or when resetting input AUTOM from 1 to 0.
The maximum acceleration, the gear ratios and the encoder signal type are set via front panel parameters.

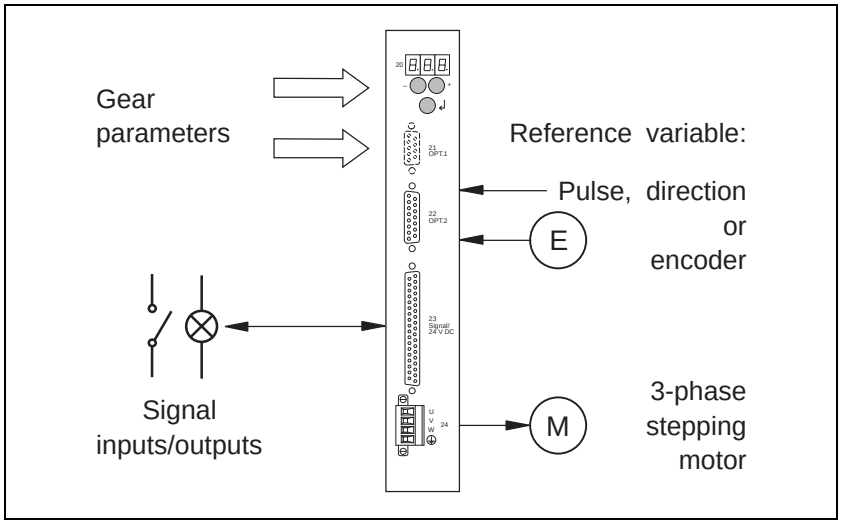


Fig. 1-7 Operation with electronic gear

NOTE
If the controller features a field bus or serial interface in addition, the electronic gear parameters can be set using on-line command processing.

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Rotation monitoring

If an RS 422 interface (OPT.2) is installed in the controller, motor rotation monitoring can be implemented (fig. 1-8). For this purpose, the parameter P20 = 2 must be set on the front panel and a type 1000 encoder must be installed on the stepping motor.
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 (18 steps).

NOTE
Rotation monitoring is possible in all modes except electronic gear mode (P00 = 3).

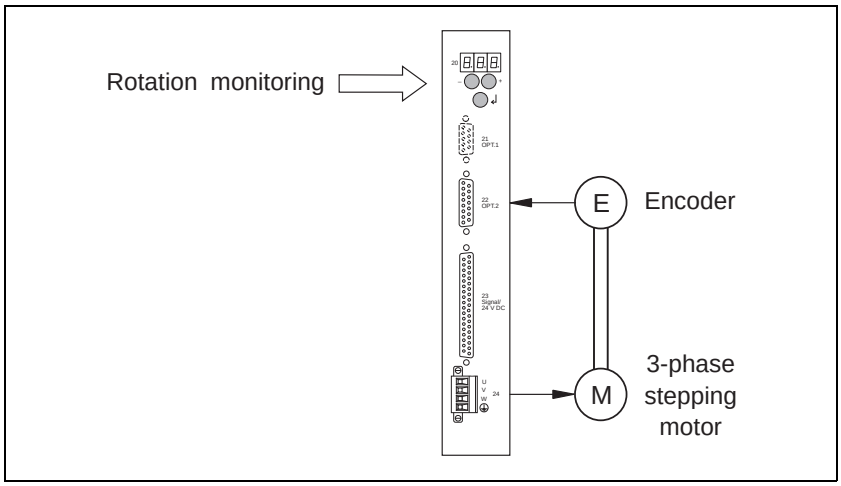


Fig. 1-8 Rotation monitoring

Manual and automatic mode

The input AUTOM can be used (depending on the interface configuration) for selecting one of the following modes:

Input AUTOM = 0

– Parameter and data input via front panel or
– Manual mode or
– Teach-in mode or
– Upload/download (only with serial interface, if parameter P00 = 0)

Input AUTOM = 1

– Oscillator mode via inputs/outputs or
– Oscillator mode via analog interface or
– Position processing mode via inputs/outputs or
– Electronic gear (only with encoder interface, if parameter P00 = 3)

NOTE
In on-line command processing mode, mode selection via the AUTOM input is only possible if parameter P69 = 1.

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1.2.3 Principle of a reference movement

When executing a reference movement, a reference point is approached which is defined as the zero point for the system of dimensions. All subsequent absolute positioning operations refer to this zero point.

Reference movements can be made towards the CCW limit switch, CW limit switch and the reference switch.
The reference movement is executed at reference speed REF_IN (parameter P06). The shaft moves away from the limit or reference switch at reference speed REF_OUT (parameter P07).

Figures 1-9 and 1-10 illustrate the principles of various reference movements.

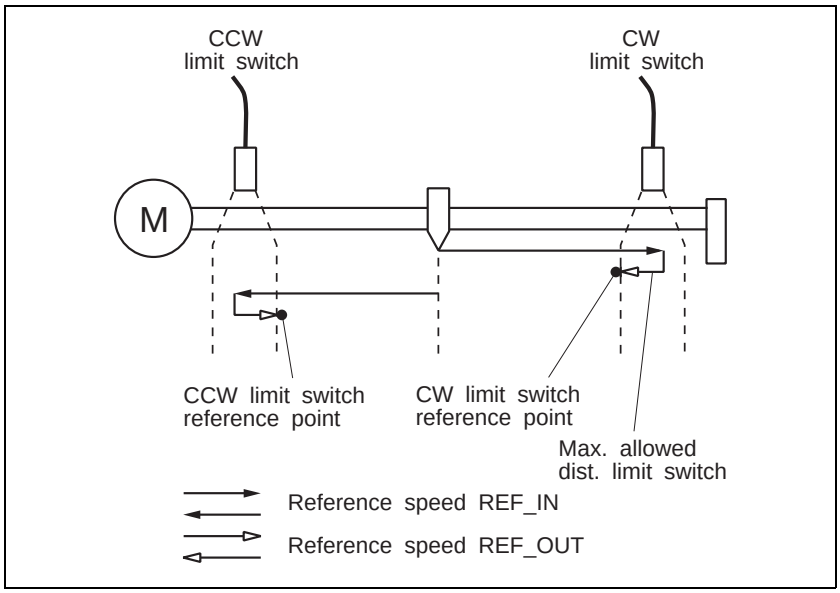


Fig. 1-9 Principle of reference movement to limit switch

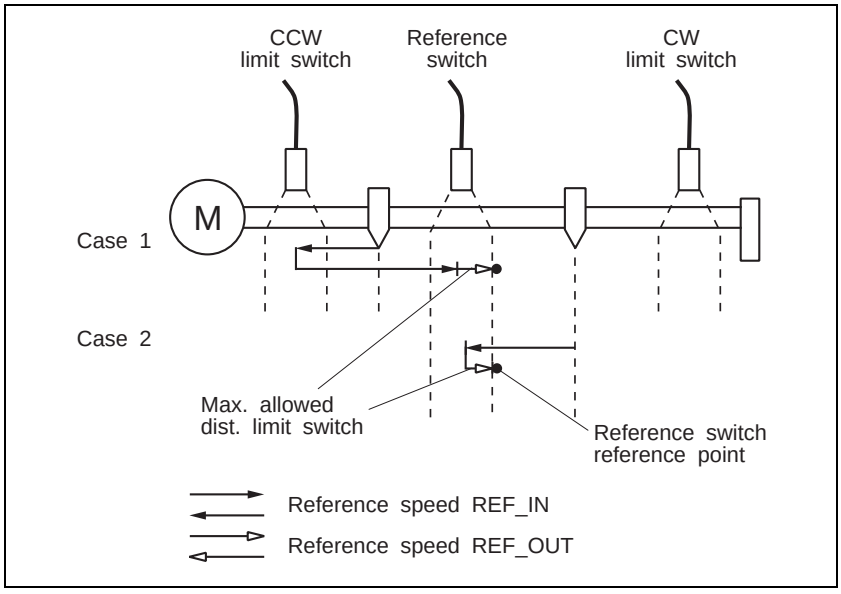


Fig. 1-10 Principle of reference movement to reference switch

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1.3 Technical data

1.3.1 Electrical data

	Supply voltage, selectable	115 VAC 230 VAC to 240 VAC
Mains connection		
	Power loss	
	WDP3-014	60 W max.
	WDP3-018	110 W max.
	Mains frequency	50 to 60 Hz
	Mains error protection	one period
	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	maximum 70 A
	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	maximum 40 kHz
	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

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Signal interface

Electrical characteristics of the inputs

Polarity reversal protection, hardware debounce (settling time 1.0 ms to 1.5 ms)

Signal voltage U_{high}	15 VDC to 30 VDC
Signal voltage U_{low}	< 5 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	50 mA
Voltage drop at 50 mA	< 2 VDC



DANGER
The signal inputs and the 24 VDC supply voltages at 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.)

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Field bus interfaces

All field bus interfaces are opto-isolated and have an internal leakage resistance towards ground of 1 Mohm.

Interbus-S slave interface (IBS option)

Two-line remote bus	
4 data words	
Transmission rate	500 kbauds
Distance to adjacent station	400 m max.

Profibus-DP slave interface (PBDP option)

The transmission rate is set by the master (12 Mbauds max.).

Line length	see Profibus-DP specifications

CAN-Bus interface (CAN option)

Transmission rate	10 kbauds to 500 kbauds
Line length	
at 10 kbauds	7000 m max.
at 125 kbauds	570 m max.
at 500 kbauds	80 m max.

SUCONET slave interface (RS 485 HS option)

Bus interface	RS 485 HS
Bus cable	Shielded twisted-pair cable
Transmission speed	187.5 kbauds and 375 kbauds



NOTE
The BERGER LAHR controller automatically adjusts to the baud rate of the master; it is therefore not necessary to set it on the unit.

Analog interface

ANOZ (option)

Internal leakage resistance towards ground	1 Mohm

Electrical characteristics of the analog input

1 signal input, opto-isolated	±10 V
Precision	±0.25%, ±25 mV
A/D converter resolution	3700 steps min.
Input resistance	>10 kohms

Electrical characteristics of the analog output

1 signal output, opto-isolated, short-circuit protected	10 V (30 mA max.)
Precision	±0.5%, ±50 mV
D/A converter resolution	200 steps min.

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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), undervoltage and overvoltage

Type of protection	IP 20 acc. to EN 60529: 1991

Regulations

Machinery directive

Insofar as the machinery corresponds to the machinery directive 89/392/EEC and the configuration meets the EMC test conditions specified by BERGER LAHR, conformity with the machinery directive is hereby certified.

EMC directive

In a configuration which meets the EMC test conditions specified by BERGER LAHR, conformity with the following standards can be certified in accordance with the EMC directive 89/336/EEC:

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 4
Burst	according to IEC 801-4: 1988, class 4

BERGER LAHR EMC test requirements

- Use a BERGER LAHR motor lead. Length of motor lead is 10 m.
- Insert a BERGER LAHR mains filter into the mains supply line.
- Install the device into the control cabinet.
- Use BERGER LAHR signal cables and wire them according to the documentation.
- Run signal, mains and motor cables separately (non-parallel) and ensure a large surface area contact between the cable shield and ground on both ends.
- Install the mains filter directly at the device. If this is not possible, use a shielded connection line (1 m max.) between filter and device.
- Ensure a large surface area contact between filter, device and ground (mount on a grounded metal plate or on control cabinet rear panel, 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

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Approvals

prEN 50178 classification VDE 0160/11.94

EN 60950 classification VDE 0805: 1993 + A2: 1994

UL 508 file no. 153 659

1.3.2	**Mechanical data**	Dimensions (fig. 1-11)	249 x 240 x 52 mm
		Weight	approx. 3200 g
1.3.3	**Ambient conditions**	Ambient temperature	0°C to +50°C
		Storage temperature	-25°C to +70°C
		Relative humidity	15% to 85% (non-condensing)

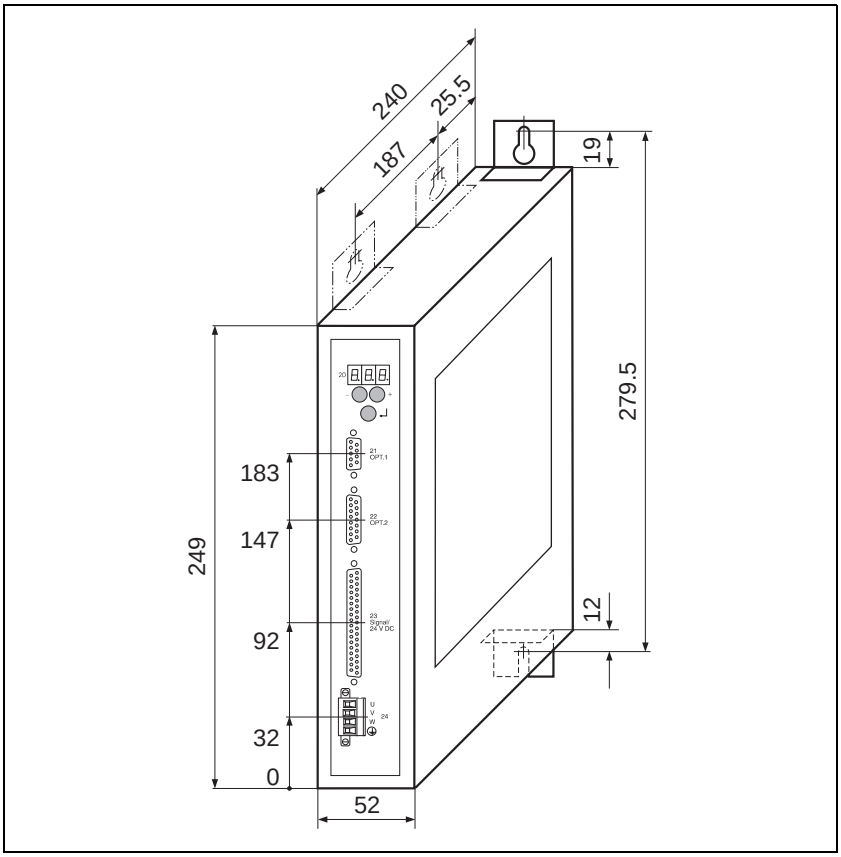


Fig. 1-11 Dimensions of WDP3-014 and WDP3-018

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2 Installation

2.1 Scope of supply

The delivery must be checked for completeness.

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

Qty.	Designation
1	WDP3-014 positioning controller or WDP3-018 positioning controller
1	Product insert
1	Ground strap
4	Mounting bracket
1	Fan for WDP3-018
1*	Diskette with PC program for upload/download via serial interface or diskette with device master file for setup with Profibus-DP interface

* If the appropriate interface is installed.

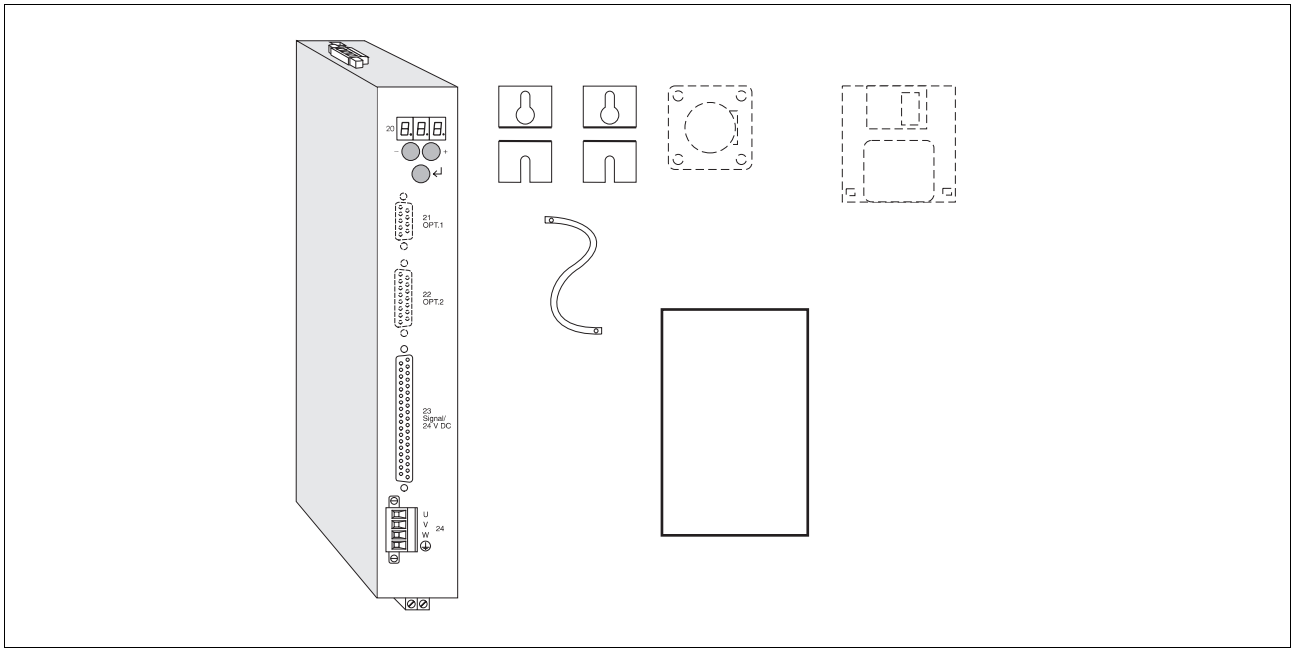


Fig. 2-1 Scope of supply

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2.2 Accessories

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

- 3-phase stepping motor
- ANOZ/customer signal cable
- MP 927 Interbus-S interface adapter
- Interbus-S/MP 927 signal cable
- Cable for encoder
- Fan for WDP3-014
- 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
- Profibus-DP bus terminal or adapter
- 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
- RS 485 LS/MP 924 signal cable
- Signal connection/customer signal cable
- Signal connection signal cable
- Signal cable for adapter slot OPT.1
- Signal cable (encoder) for adapter slot OPT.2
- Signal cable (pulse, direction) for adapter slot OPT.2
- Set of connectors (all sub-D connectors)



NOTE
Refer to the sales documentation of the WDP3-01X positioning controller for the accessory order numbers.

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2.3 Mounting

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 control cabinet and may have to be ventilated externally (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 control cabinet.

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

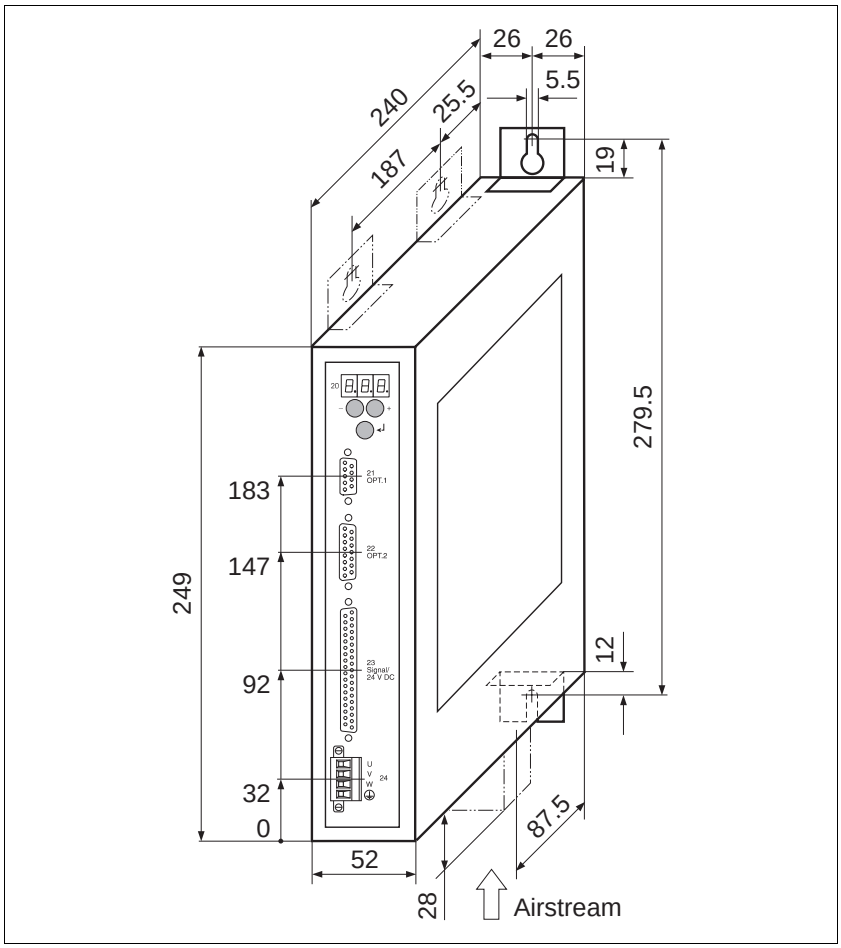


Fig. 2-2 Installation

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Ventilation

The WDP3-014 positioning controller can be operated without ventilation, if the minimum clearances (10 cm) are observed.

The WDP3-018 positioning controller 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 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.

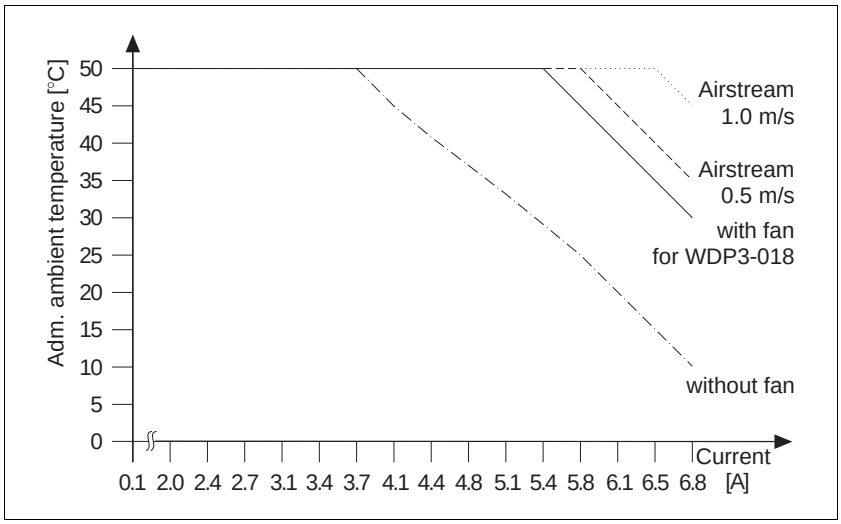


Fig. 2-3 Temperature – phase current – ventilation

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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 unit 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 must 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

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Wiring layout

Figure 2-4 illustrates the wiring layout of the positioning controller with the available interfaces.
Communication between PC and positioning controller is effected either through the RS 232 or RS 485 serial interface or the field bus interface (e.g. Interbus-S), 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.

NOTE
With an RS 485 interface, the MP 924 interface distributor can be used for implementing a network (see chapter 6.2.4).

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

NOTE
With an Interbus-S interface, the MP 927 Interbus-S interface adapter must be used (see separate documentation).

NOTE
With a Profibus-DP interface, e.g. a bus terminal must be used.

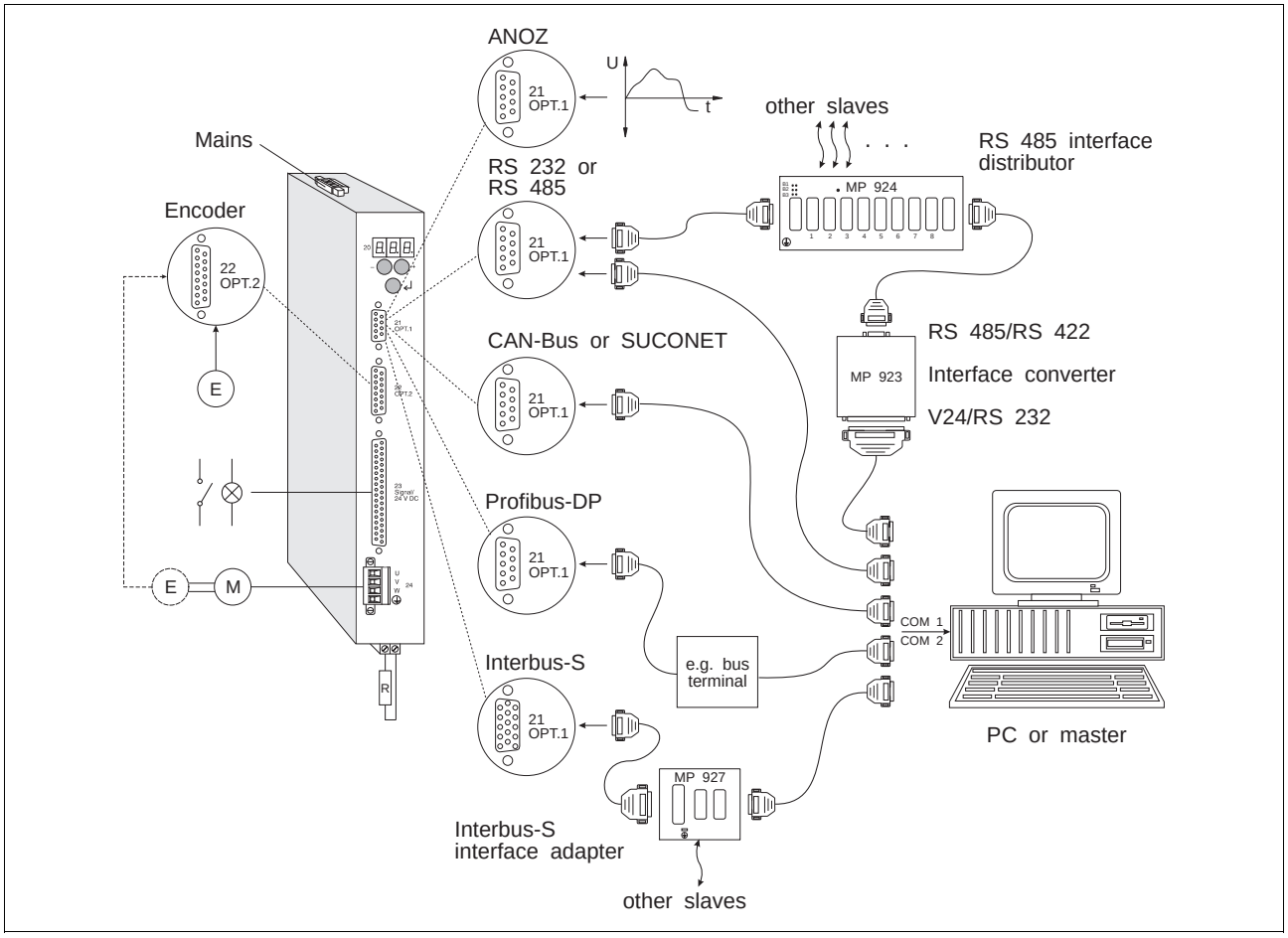


Fig. 2-4 Wiring diagram

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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).

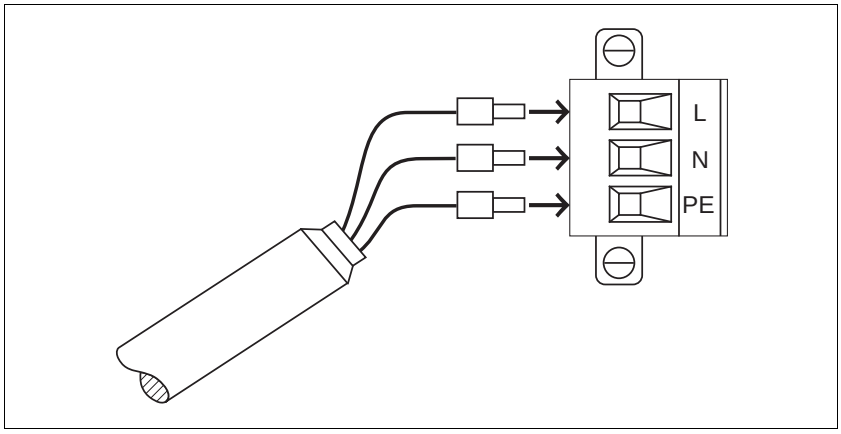


Fig. 2-5 Mains connection – device end

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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), an mount wire end ferrules on the device end of the motor cable..
3. Fasten the litz wires with screws.
4. Fasten the connector to the front panel (item 24).

Preparation the motor cable

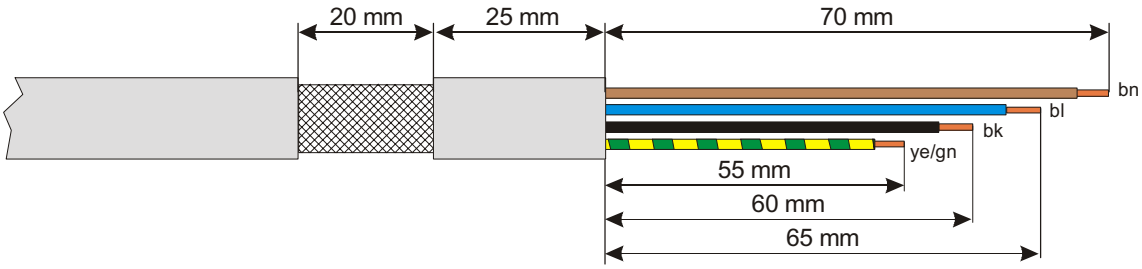


Fig. 2-6 Preparing the motor cable

Motor connection

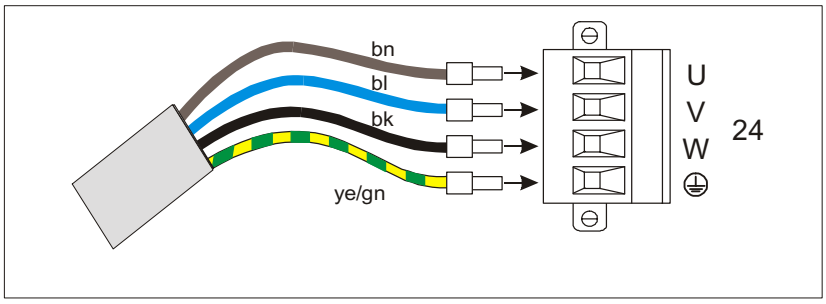


Fig. 2-7 Motor connection

NOTE
An additional bleed resistor can be used for dissipating a higher amount of braking energy (see chapter 6.2.5).

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.

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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 serrated washers supplied with the device. Correct installation of the terminal angle is extremely important for grounding the motor cable shield and for strain relief.

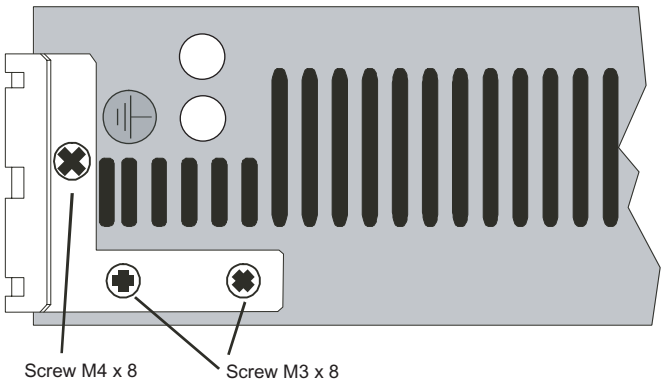


Fig. 2-8 Installing the terminal angle

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.

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Fastening the shield terminal

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

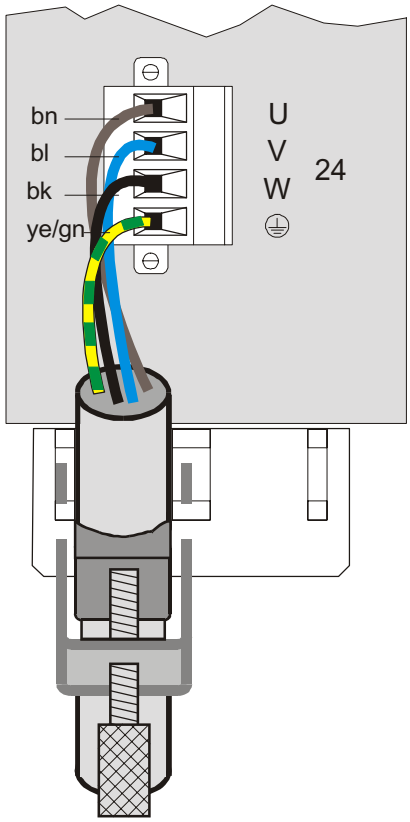


Fig. 2-9 Fastening the shield terminal

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.

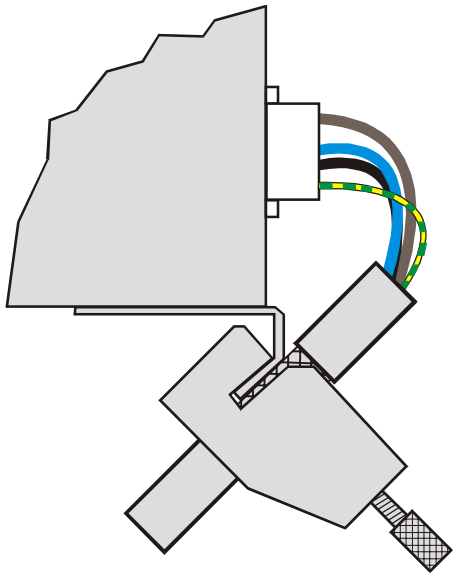


Fig. 2-10 Installed motor cable

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2.4.3 Signal interface

1. Solder the litz wires to the connector as required for the desired operating mode. The available operating modes depend on the device variant; see chapter 3.

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 threaded 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 with screws, providing for strain relief.

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 screws.

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.

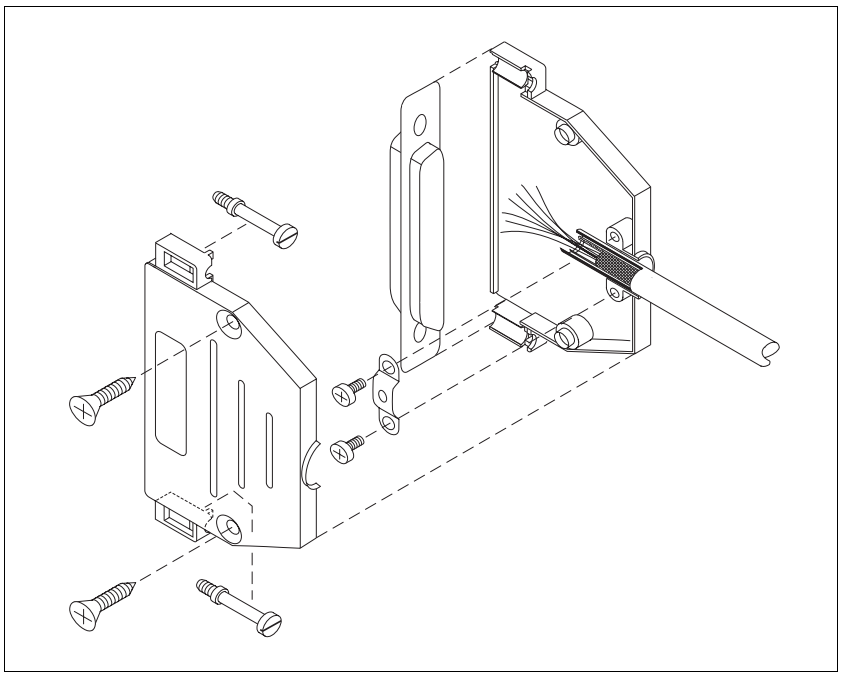


Fig. 2-7 Signal connector assembly – device end

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Pin	Assignment for			Function	
	Position processing	**On-line command processing**	**Electronic gear**		
1*	**$\overline{\text{LIMN}}$**	**I 13: $\overline{\text{LIMN}}$**	**IO24VDC**	**CCW limit switch** **I/O supply voltage**	← ←
2	–	–	–	–	
3	–	–	–	–	
4	START	I 11	–	Start	←
5	TEACH_IN	I 10	–	Teach-in	←
6*	**$\overline{\text{REF}}$**	**I 14: $\overline{\text{REF}}$**	**$\overline{\text{REF}}$**	**Reference switch**	←
7	MAN_N	I 7 (MAN_N)	MAN_N	Manual movement, CCW rotation	←
8	ERR_RESET	I 5	ERR_RESET	Reset error	←
9	DATA4	I 3	–	Position no. selection	←
10	DATA1	I 1	–	Position no. selection	←
11	–	–	–	–	
12	–	–	–	–	
13	–	–	–	–	
14	NO_ERROR	Q 3 (NO_ERROR)	NO_ERROR	No error	→
15	ACTIVE	Q 1 (ACTIVE)	ACTIVE	Ready for operation, brake signal	→
16*	**24VDC**	**24VDC**	**24VDC**	**System supply voltage**	←
17*	**24VDC**	**24VDC**	**24VDC**	**System supply voltage**	←
18*	**IO24VDC**	**IO24VDC**	**IO24VDC**	**I/O supply voltage**	←
19*	**IO24VDC**	**IO24VDC**	**IO24VDC**	**I/O supply voltage**	←
20*	**$\overline{\text{LIMP}}$**	**I 12: $\overline{\text{LIMP}}$**	**IO24VDC**	**CW limit switch** **I/O supply voltage**	← ←
21	–	–	–	–	
22	–	–	–	–	
23*	**$\overline{\text{STOP}}$**	**I 15: $\overline{\text{STOP}}$**	**$\overline{\text{STOP}}$**	**Stop**	←
24	–	–	–	–	
25	AUTOM	I 8 (AUTOM)	AUTOM	Automatic	←
26	MAN_P	I 6 (MAN_P)	MAN_P	Manual movement, CW rotation	←
27	–	I 4	–	–	←
28	DATA8	I 2	–	Position no. selection	←
29	DATA2	I 0	–	Position no. selection	←
30	–	–	–	–	
31	–	–	–	–	
32	–	–	–	–	
33	FUNCTION1	Q 2 (FUNCTION1)	FUNCTION1	Status output (see chapter 4.1)	→
34	FUNCTION2	Q 0 (FUNCTION2)	FUNCTION2	Status output (see chapter 4.1)	→
35*	**GND**	**GND**	**GND**	**System and I/O supply voltage ground**	←
36*	**GND**	**GND**	**GND**	**System and I/O supply voltage ground**	←
37	–	–	–	–	

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

(Signals in parentheses) = Input/output assignment if parameter P69 = 1, see chapter 3.3.1.

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

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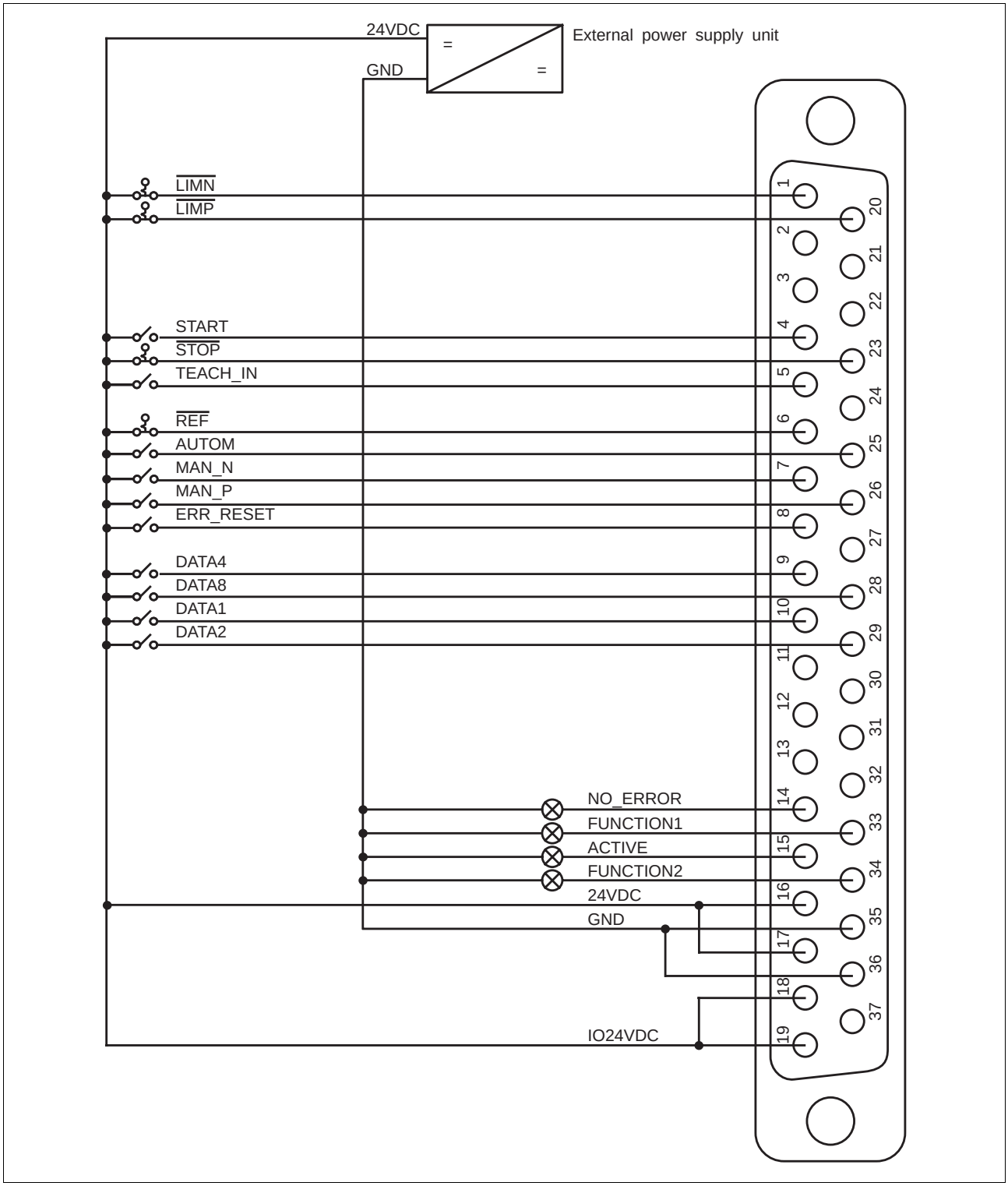


Fig. 2-8 Wiring example for position processing

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Pin	Assignment for		Function	
	Oscillator mode via inputs/outputs	Oscillator mode via ANOZ		
1*	**IO24VDC**	**IO24VDC**	**I/O supply voltage**	←
2	–	–	–	
3	–	–	–	
4	START	–	Start	←
5	INV_DIR	INV_DIR	Direction reversal	←
6	–	–	–	
7	MAN_N	MAN_N	Manual movement, CCW rotation	←
8	ERR_RESET	ERR_RESET	Reset error	←
9	–	–	–	
10	FH/$\overline{\text{FL}}$	–	High and low oscillator frequency	←
11	–	–	–	
12	–	–	–	
13	–	–	–	
14	NO_ERROR	NO_ERROR	No error	→
15	ACTIVE	ACTIVE	Ready for operation, brake signal	→
16*	**24VDC**	**24VDC**	**System supply voltage**	←
17*	**24VDC**	**24VDC**	**System supply voltage**	←
18*	**IO24VDC**	**IO24VDC**	**I/O supply voltage**	←
19*	**IO24VDC**	**IO24VDC**	**I/O supply voltage**	←
20*	**IO24VDC**	**IO24VDC**	**I/O supply voltage**	←
21	–	–	–	
22	–	–	–	
23*	**$\overline{\text{STOP}}$**	**$\overline{\text{STOP}}$**	**Stop**	←
24	–	–	–	
25	AUTOM	AUTOM	Automatic	←
26	MAN_P	MAN_P	Manual movement, CW rotation	←
27	–	–	–	
28	–	–		
29	CURRENT_OFF	CURRENT_OFF	Zero current	←
30	–	–	–	
31	–	–	–	
32	–	–	–	
33	FUNCTION1	FUNCTION1	Status output (see chapter 4.1)	→
34	FUNCTION2	FUNCTION2	Status output (see chapter 4.1)	→
35*	**GND**	**GND**	**System and I/O supply voltage ground**	←
36*	**GND**	**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 ← Input → Output

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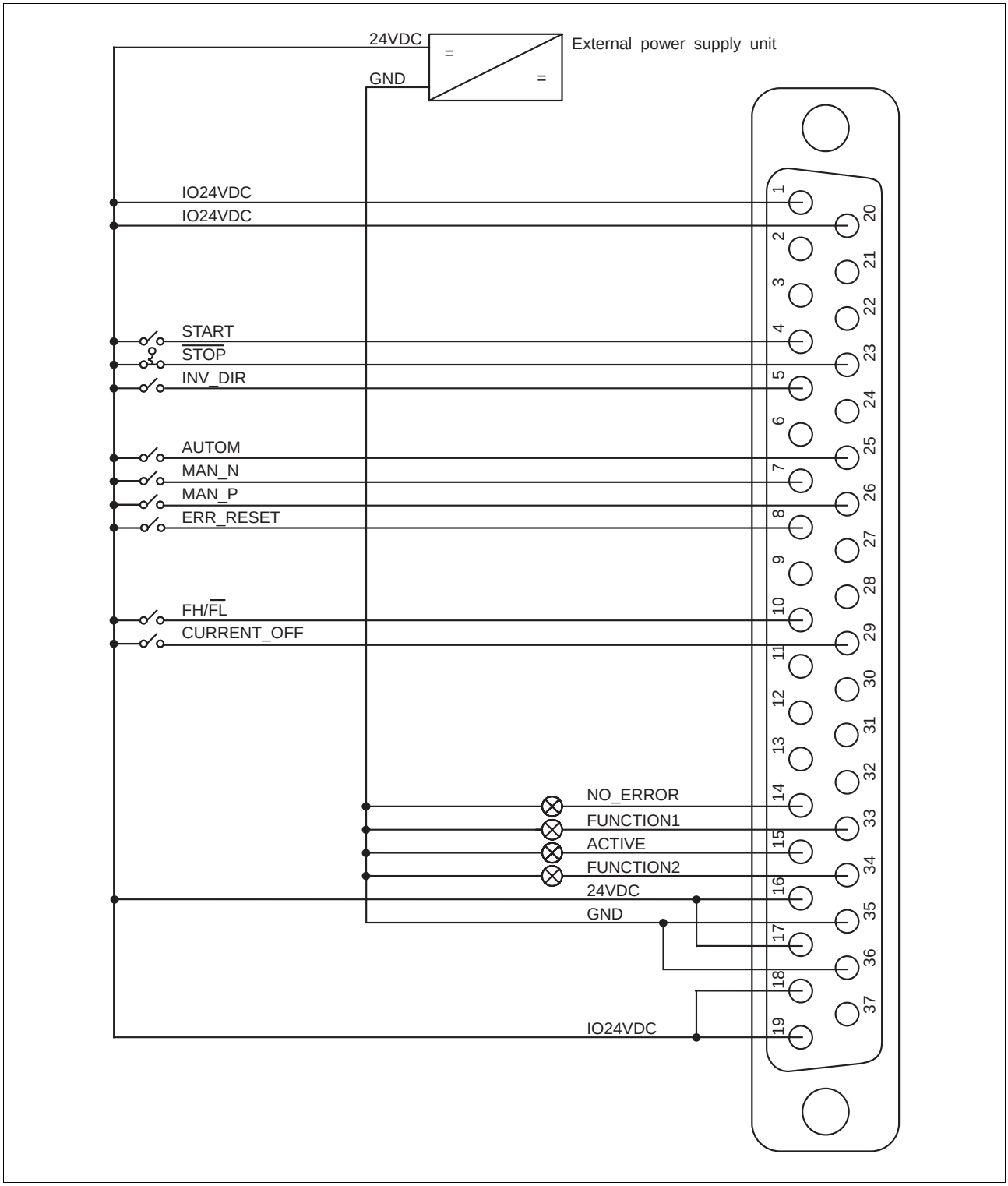


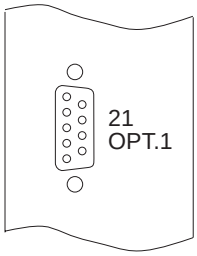
Fig. 2-9 Wiring example for oscillator mode via inputs/outputs

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2.4.4 Analog interface (OPT.1)

NOTE
The analog interface ANOZ is installed in adapter slot 21; see type plate.

1. Solder the litz wires to the connector as illustrated in fig. 2-10.



Pin	Signal	Meaning	
1	ANA_OUT	Voltage output 10 V (30 mA max.)	→
2	ANA_OUT GND	Voltage output ground	→
3	–	–	
4	–	–	
5	–	–	
6	–	–	
7	ANA_IN GND	Ground for analog input	←
8	–	–	
9	ANA_IN	Analog input -10 V to +10 V	←

← Input → Output

NOTE
ANA_OUT GND is the ground for the internal voltage supply. The reference potential of the ANA_IN GND input must not deviate from the reference potential of ANA_OUT GND by more than ±0.5 V.

2. Push the shield back and fix with a cable tie.

3. Insert two threaded bolts (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 with screws, providing for strain relief.

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 screws.

ATTENTION
The ground connections of the interfaces in adapter slots 21 and 22 are internally interconnected. In the case of multiple ground connections, this may cause ground loops with resulting interference at the analog inputs. Such interference can be reduced by means of bonding lines.

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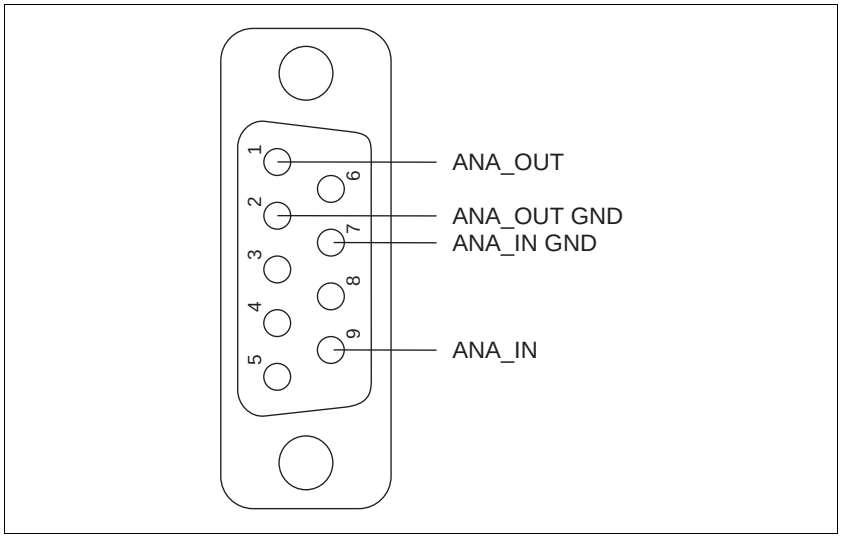


Fig. 2-10 Interface connection – device end

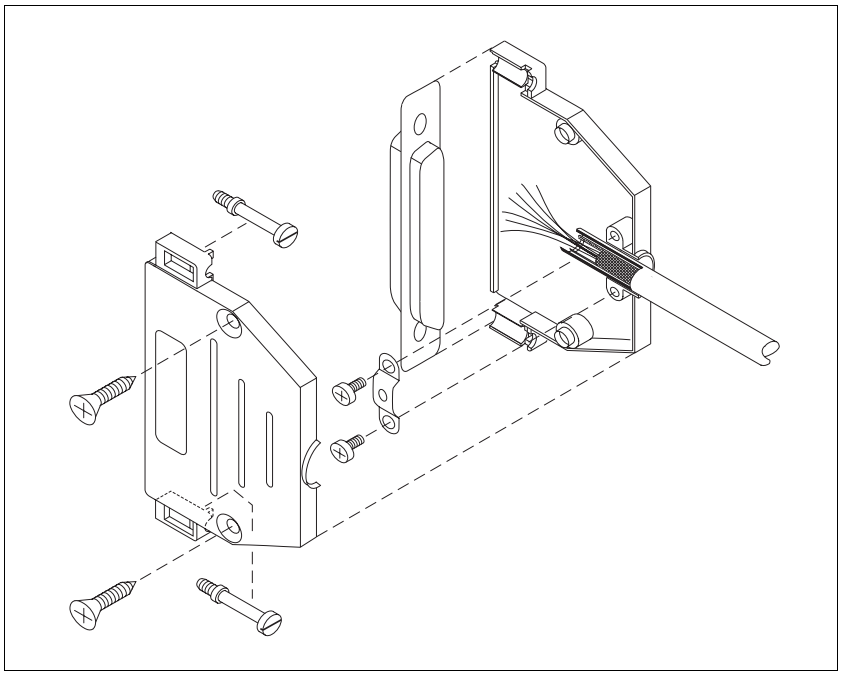


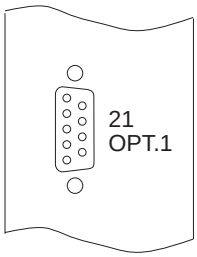
Fig. 2-11 Interface connector assembly – device end

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2.4.5 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. 2-12 and fig. 2-13.



Pin	Signal	Meaning
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 threaded 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 with screws, providing for strain relief.

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 screws.

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.

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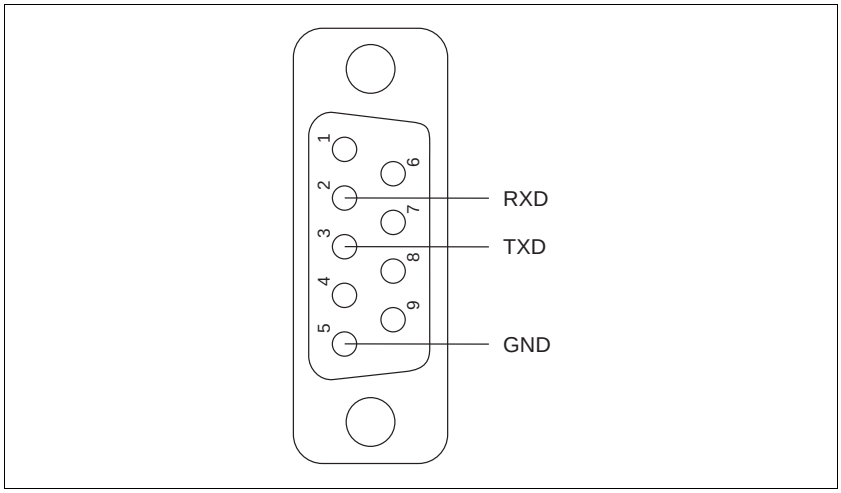


Fig. 2-12 Interface connection – device end

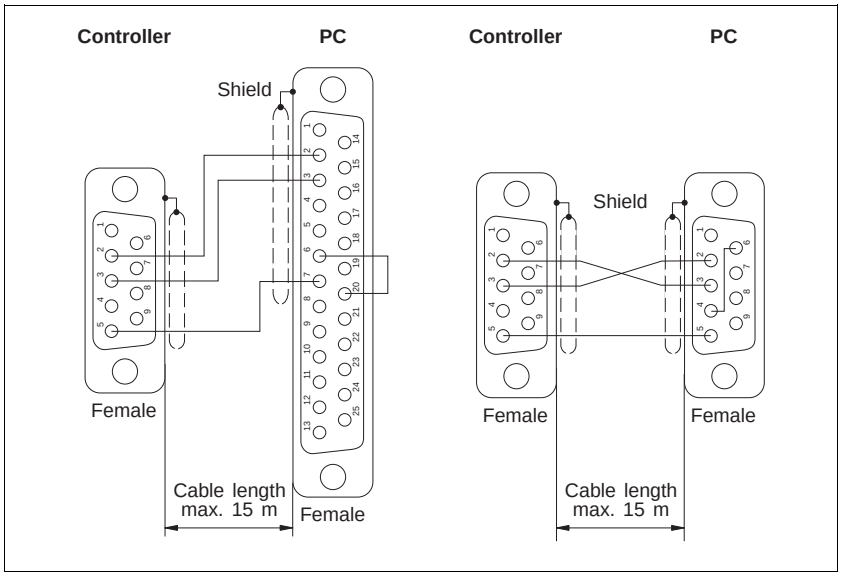


Fig. 2-13 Controller/PC wiring

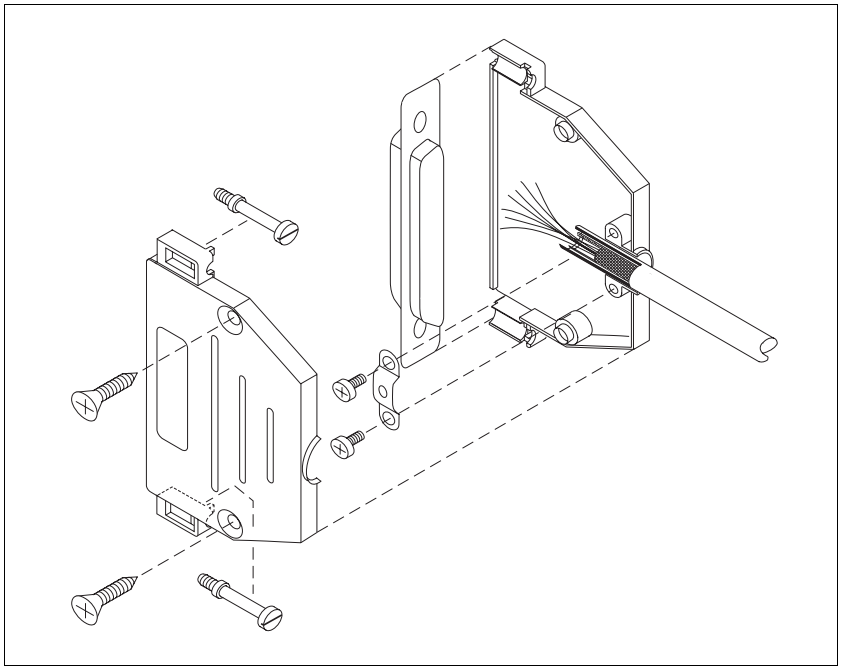


Fig. 2-14 Interface connector assembly – device end

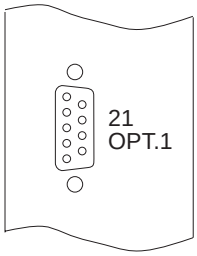
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2.4.6 RS 485 serial interface (OPT.1)

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. 2-15.



Pin	Signal	Meaning	
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 threaded bolts (fig. 2-16) into the connector shell.
4. Place the connector into the connector shell.
5. Fasten the cable and the shield to the connector shell with screws, providing for strain relief.

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 screws.

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

NOTE
The MP 924 interface distributor can be used for controlling eight units (see chapter 6.2.4).

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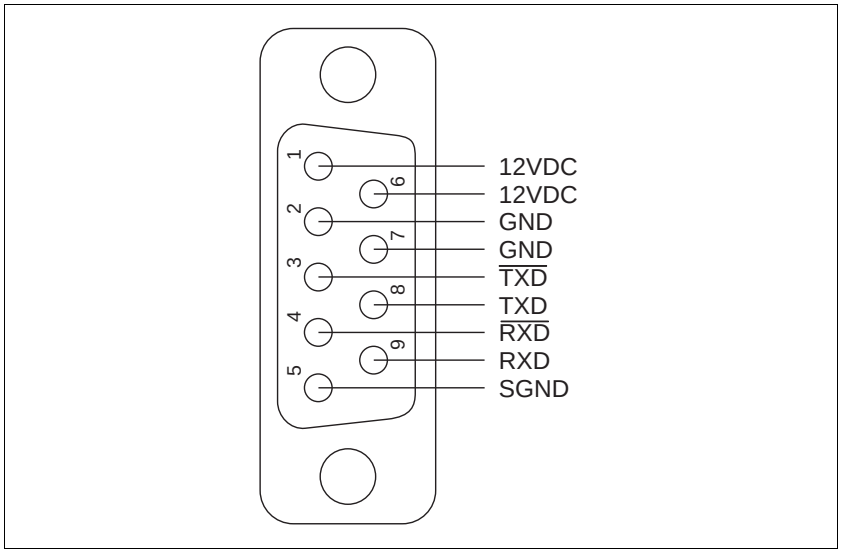


Fig. 2-15 Interface connection – device end

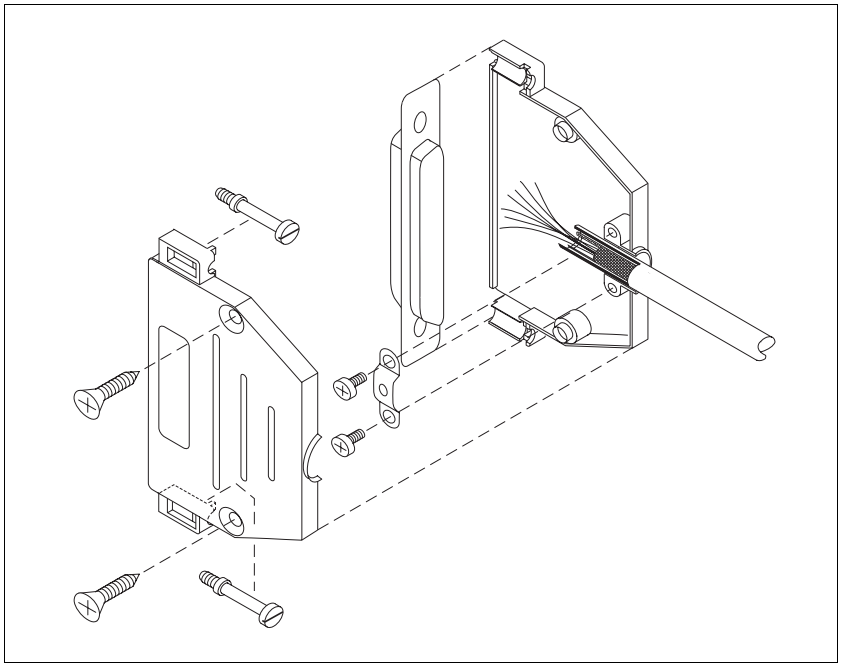
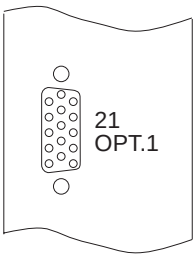


Fig. 2-16 Interface connector assembly – device end

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2.4.7 Field bus interface (OPT.1)

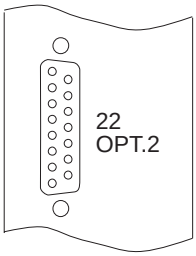


NOTE
The field bus interface (e.g. Interbus-S or Profibus-DP) is located in adapter slot 21; see type plate.

NOTE
Setup of the field bus interface is described in a separate documentation for each type of interface.

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2.4.8 Encoder interface (OPT.2)



NOTE
The encoder interface is installed in adapter slot 22; see type plate. Power is supplied independently of the power controller.

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 threaded bolts (fig. 2-17) into the connector shell.
4. Place the connector into the connector shell.
5. Fasten the cable and the shield to the connector shell with screws, providing for strain relief.

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 screws.
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 with the P50 parameter; see chapter 3.3.1.

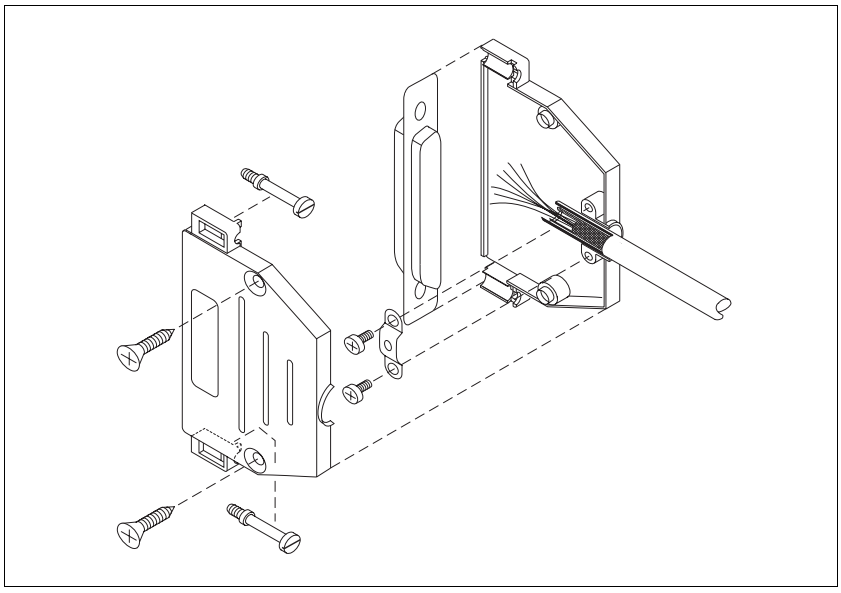
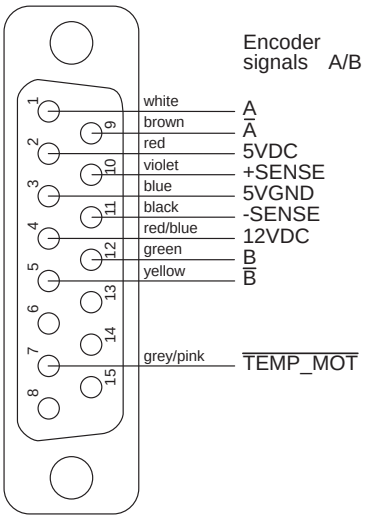


Fig. 2-17 Encoder connector assembly – device end

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Encoder interface: Encoder signal type A/B

Pin	Signal	Meaning
1	A	Encoder signal A ←
2	5VDC	Sensor supply voltage →
3	5VGND	Sensor supply voltage ground →
4	12VDC	Sensor supply voltage →
5	B̄	Encoder signal B̄ ←
6	–	–
7	TEMP_MOT	Line interruption ←
8	–	–
9	Ā	Encoder signal Ā ←
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 $\overline{\text{TEMP_MOT}}$ input is used for detecting a line interruption. For this purpose, $\overline{\text{TEMP_MOT}}$ must be connected to 5VDC on the encoder.

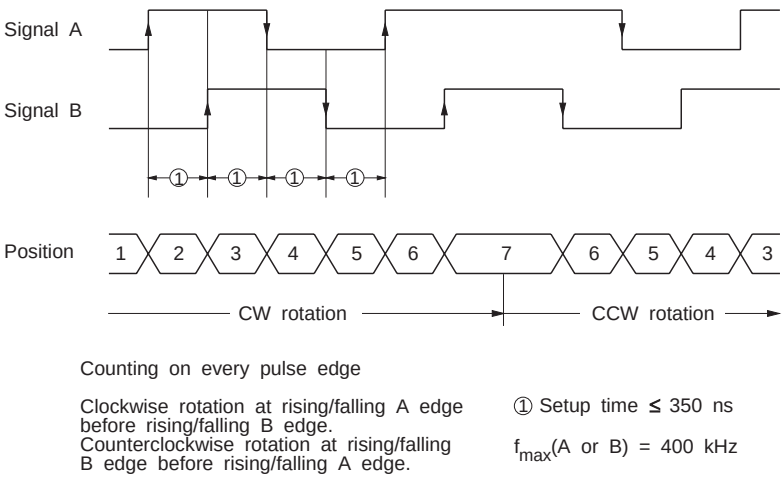
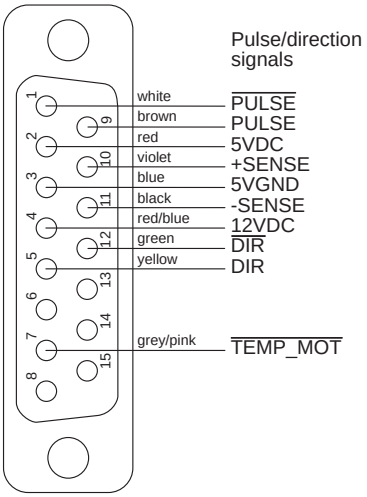


Fig. 2-18 Encoder signals A/B timing diagram with quadruple evaluation

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Encoder interface: Pulse/direction signal type

Pin	Signal	Meaning	
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.

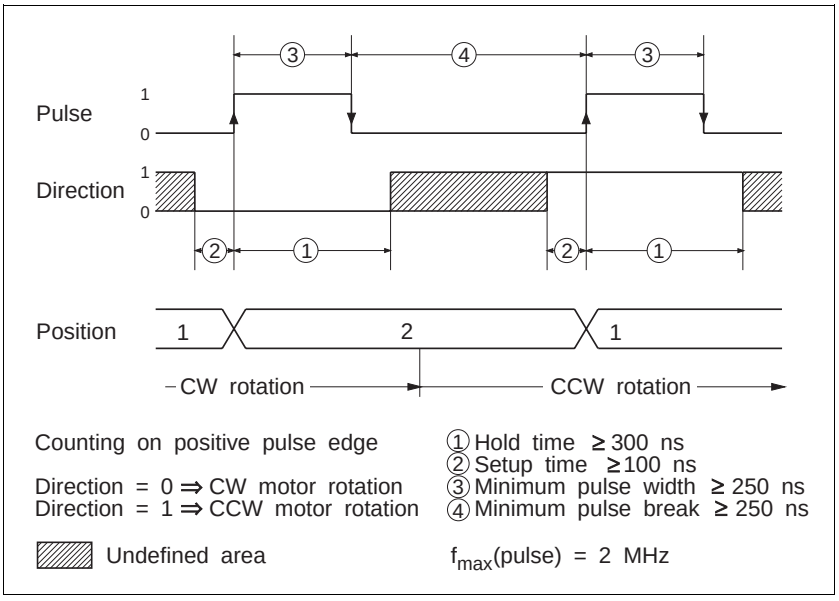
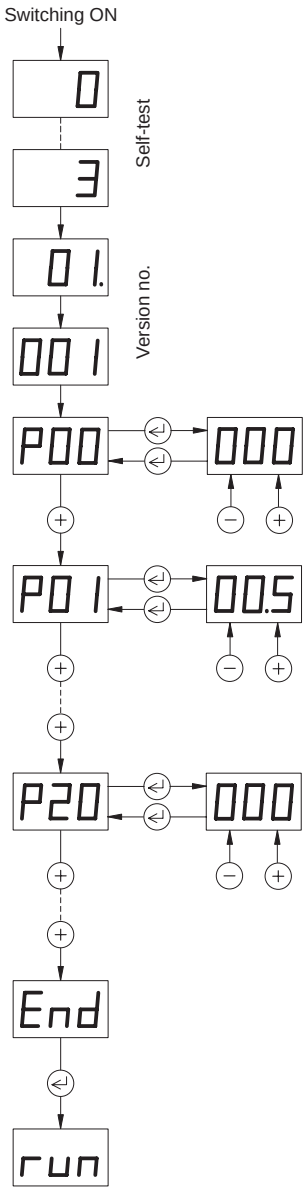


Fig. 2-19 Pulse/direction timing diagram

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2.5 First start-up



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).

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 with the selector switch on the unit top.

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

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

3. Switch on the 24 V supply voltage for the processor unit. (Mains voltage and 24 V supply voltage may also be switched on simultaneously.)
   → The controller executes a self-test during which the numbers 0, 1, 2, 3 appear in the status display, followed by the software version number.
   → Subsequently, the parameter “P00” is displayed.

NOTE
The P00 parameter can be used for setting the operating mode for the controller (see chapter 3.3.1).

4. Use the keys to set the following motor parameters:

   P01 = Motor phase current (in A) according to the motor type plate

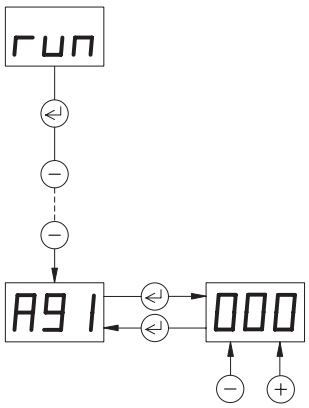
ATTENTION
The set phase current must be equal to or less than the nominal phase current specified on the motor type plate (the lower the set phase current, the lower the motor torque).

   P20 = 2 Activate rotation monitoring if an encoder is installed on the motor.

NOTE
Operation via front panel and setting of other parameters is described in chapter 3.3.

5. Completing the parameter setting process:
   Select the “End” option and confirm by pressing ↵.
   → The “run” message is displayed.

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

– Deactivate the AUTOM input.

– Select manual movement A91 by pressing the ⊖ key and move the motor by pressing the ⊕ or ⊖ key.

⊕ key	CW rotation
⊖ key	CCW rotation (as seen from front towards the motor shaft)

Single step:
If the key is pressed for ≤ 0.5 s, the motor performs a single step in slow manual speed.

Continuous operation:
If the key is pressed for > 0.5 s, the motor starts running at slow manual speed (parameter P90). While the key is kept pressed, the speed increases every 5 seconds (in 10 stages) up to fast manual speed (parameter P91).

→ The current position digits representing ones appear in the status display.

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

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3 Operation

3.1 Functions

The functions of the WDP3-01X positioning controller depend on the interface configuration of the OPT.1 and OPT.2 adapter slots (device variants) and on the P00 parameter setting.
In the following table, the functions of the various device variants are marked “X”.

Function / **Interfaces**	**OPT.1**						**OPT.2**		**See chapter**
	without additional interface		with analog interface (ANOZ)	with serial interface (RS 232 or RS 485)		with field bus interface (CAN/IBS/PBDP/SUCONET)	with encoder interface (RS 422)		
	Parameter			Parameter			Parameter		
	P00 = 0	P00 = 1		P00 = 0	P00 = 2		P00 = 3	P00 ≠ 3 P20 = 2	
Front panel operation									**3.3.**
– Parameter setting	X	X	X	X	X	X	X		**3.3.1**
– Position value input	X			X					**3.3.2**
– Teach-in	X			X					**3.3.3**
– Value display	X	X	X	X	X	X	X		**3.3.4**
– Start positioning and actions	X			X					**3.3.5**
– Manual movement	X	X	X	X	X	X	X		**3.3.6**
Manual mode via inputs/outputs	X	X	X	X	X	X	X		**3.4**
Teach-in via inputs/outputs	X			X					**3.5**
Position processing via inputs/outputs	X			X					**3.6**
Upload/download via serial interface				X			X[1)]		**3.7**
On-line command processing					X	X			**3.8**
Electronic gear							X		**3.9**
Oscillator mode via inputs/outputs		X							**3.10**
Oscillator mode via analog interface			X						**3.11**
Rotation monitoring[2)]								X	**3.12**

1) Only available if a serial interface is installed.
2) Rotation monitoring is possible with all OPT.1 adapter slot configurations.

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3.2 Switching ON/OFF

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

DANGER
Live parts of the device or system may never be touched by persons or with electrically conductive objects.

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

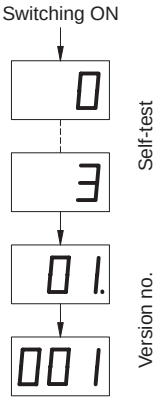
ATTENTION
The unit must be grounded with a protective conductor.

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

3.2.1 Switching on



1. Switch on the power supply for the power controller.
2. Switch on the 24 V supply voltage for the processor unit.
3. The controller executes a self-test.
   → In the status display, the digits “0” to “3” and the controller software version number are displayed.
4. Two basic modes are available, depending on the parameter P99 setting (see fig. 3-2):

– If the parameter menue is enabled (P99 = 1), “P00” appears in the status display. The entire parameter menue is then enabled for setting (see chapter 3.3.1).



– If the parameter menue is disabled (P99 = 0), “run” appears in the status display. The controller is then ready for operation, i.e. the individual functions can be selected (see chapter 3.1).



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3.2.2 Operation with brake

1. After applying the 24 VDC supply voltage and the system booting process, the controller signals readiness on the ACTIVE signal output after approx. 2 seconds (fig. 3-1). This signal can be used with a suitable relay for releasing the brake.
   The stepping motor is energized just before the ACTIVE output is set.

2. After the brake-specific time for opening, the brake is released.

3. Activate automatic mode with input AUTOM = 1 or manual mode with input AUTOM = 0.

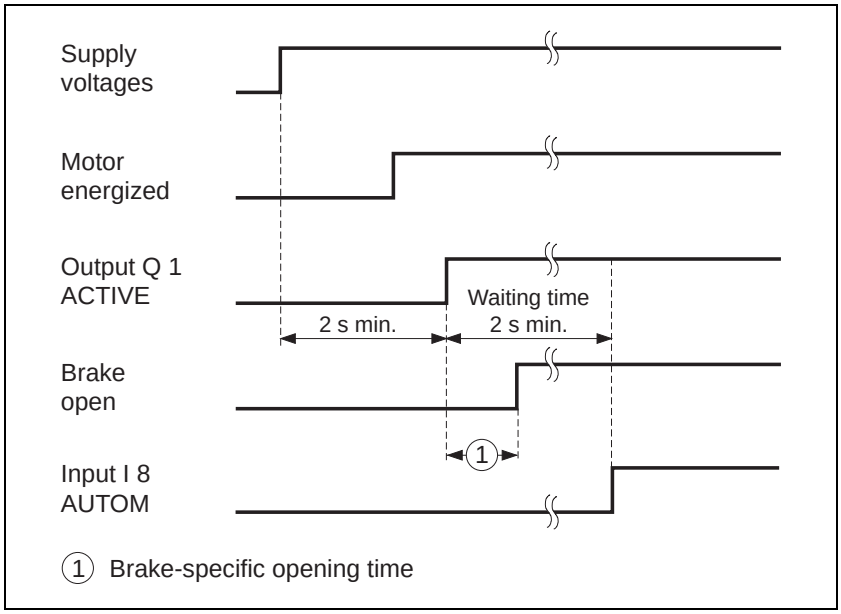


Fig. 3-1 Timing diagram for operation with brake

NOTE
If the parameter P69 is set to 0 in on-line command processing mode, the BRAKE command can be used for defining any output (e.g. Q1) for controlling a brake; see the documentation on the serial interface or the field bus interface (e.g. Interbus-S or Profibus-DP).
If the parameter P69 is set to 1 in on-line command processing mode, the output Q1 can be used for controlling a brake.

3.2.3 Switching off

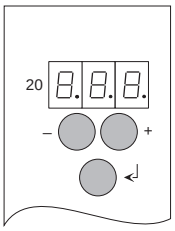
1. The connected motor is deenergized after disconnecting the mains or 24 V supply voltage, i.e. it does not have any holding torque.

ATTENTION
Before switching off the mains and 24 V supply voltage ensure that any vertical loads are secured against falling down (e.g. use motor with brake).

2. Switch off the mains power supply to the power controller and the 24 V supply voltage for the processor unit.

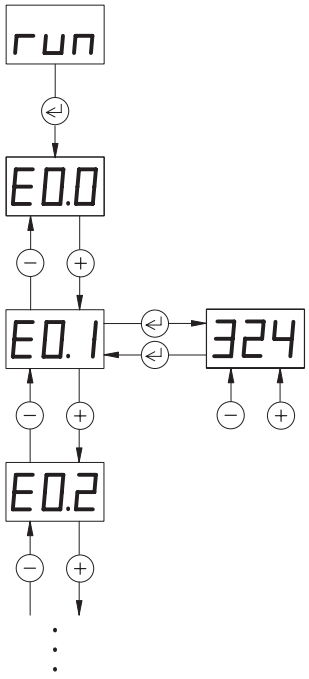
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3.3 Front panel operation



The following functions are executed via the front panel, depending on the device variant:

Display	Meaning
Pxx	Parameter setting
Exx	Position set input
Lxx	Teach-in
dxx	Value display
Axx	Positioning activation and manual movement



Operation is effected using the three keys ⊕, ⊖ and ↵, which have the following functions:

⊕ Scroll display down
or
Increment input value

⊖ Scroll display up
or
Decrement input value

↵ Start editing
Select menue option
Save input value
Stop editing
Acknowledge error

NOTE
Any previous values are overwritten and the current values are retained also after switching off.

The three seven-segment displays reflect parameters, input values, operating states and error codes.

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Meanings of runtime messages:

Display	Meaning
run	Controller ready. The power controller has been switched on (with the INITDRIVE command in on-line command processing mode). The individual functions can be activated.
End	Exit the selection menue for front panel operation. Pressing ↵ changes to “run” mode.
20	Flashing error code; see chapter 4.2. Acknowledge with ↵ key after eliminating the cause of the error. It is possible that another error is then displayed.
Err	See chapter 4.2 for troubleshooting. Clearing the display, or the error memory, is only possible by activating the ERR_RESET input.
OFF	See chapter 4.2 for troubleshooting. Clearing the display, or the error memory, is only possible by switching the 24 V power supply to the processor unit off and on again.
-99 1.0.0.	Negative values for two-digit values with a minus sign; for values with more digits with three flashing points. Only the last few digits are displayed, e.g. -251.0.0.
888	Interbus-S diagnostics for testing the Interbus-S interface.

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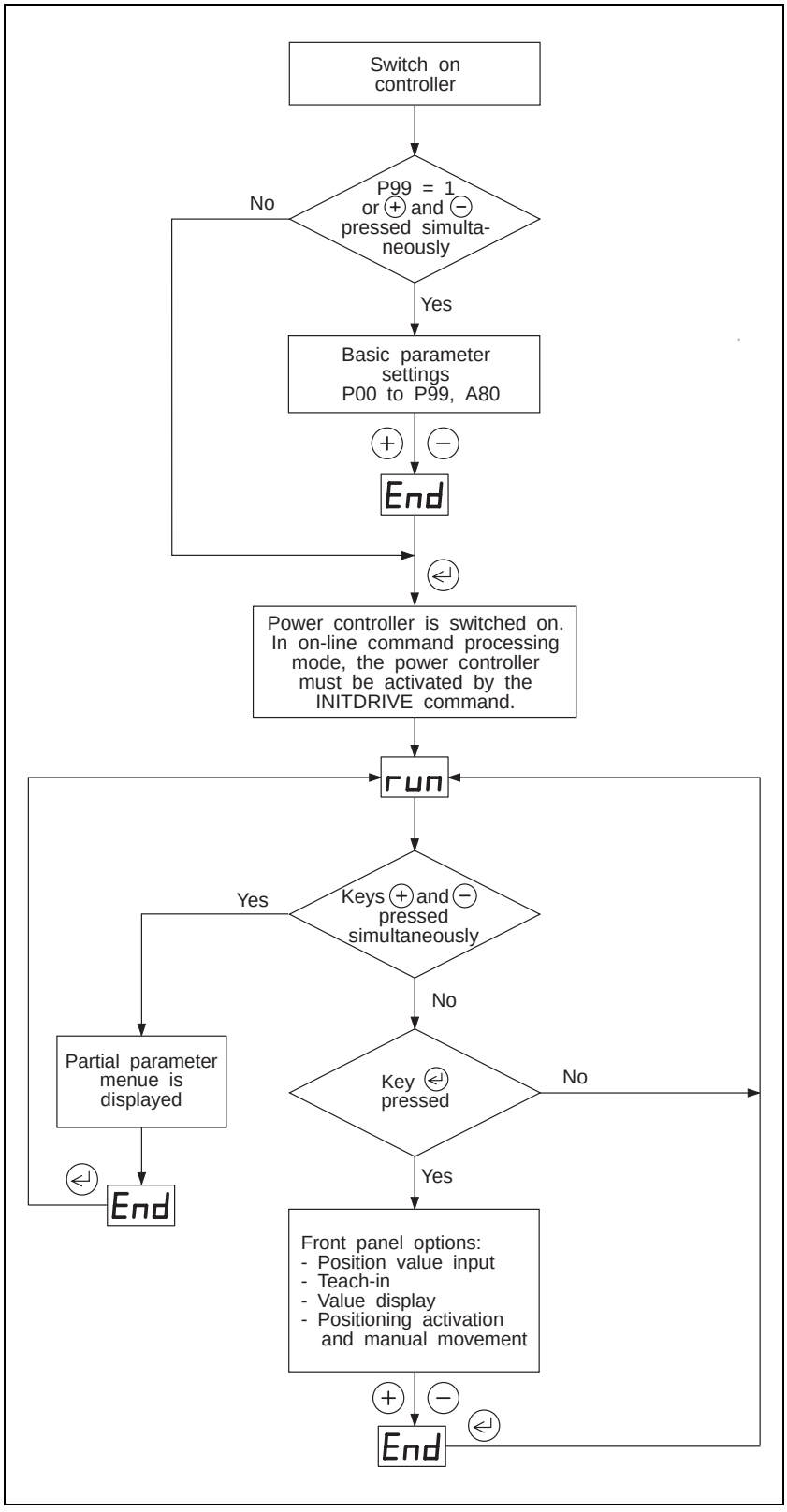


Fig. 3-2 Front panel operation

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3.3.1 Parameter setting

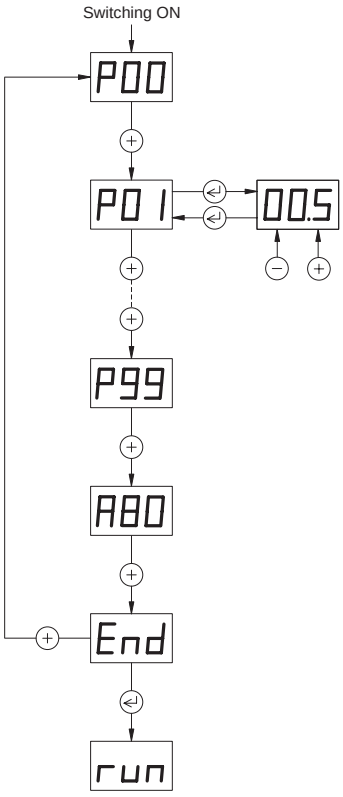
Setting functions depend on device variant and parameter menue activation

After switching on the controller, the entire parameter menue is displayed with the status display “P00” if P99 = 1 is set or if P99 = 0 and both keys ⊕ and ⊖ are pressed simultaneously at power on.

If parameter P99 = 0 is set, “run” appears in the status display after power-on, and the parameters are not accessible. Pressing both keys ⊕ and ⊖ simultaneously invokes a restricted parameter menue, i.e. only some parameters are accessible.

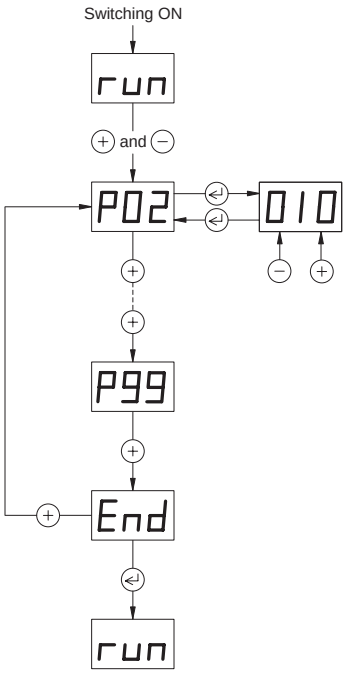
Entire parameter menue

Prerequisites: P99 = 1 or P99 = 0 and keys ⊕ and ⊖ pressed simultaneously



Restricted parameter menue

Prerequisites: P99 = 0 and no on-line command processing



NOTE
The parameter P99 = 0 can be used for disabling the parameter menue. This means that the parameters are not automatically displayed when the controller is switched on the next time. In this case, only a restricted parameter menue can be displayed.

NOTE
After displaying the entire parameter menue, the function A80 = 1 can be used for resetting the parameters to their default values. All position values are then zeroed.

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The following table lists the possible parameter displays. These depend on the OPT.1 and OPT.2 interface configurations and the settings of the parameters P00 and P99.

Parameter display	Meaning	Setting range	Factory default	Selected setting	Restricted parameter menue, if P99 = 0	Accessible by upload/ download via serial interface
P00	Operating mode	0 = Position processing 1 = Oscillator mode via I/O 2 = On-line command processing 3 = Electronic gear	0			
P01	Motor phase current	WDP3-014: 0.1 A to 2.5 A WDP3-018: 0.1 A to 6.8 A	0.5 1.0			X
P02	Acceleration	1 Hz/ms to 999 Hz/ms	10		X	X
P04	Maximum speed, higher oscillator frequency f_H	0.1 kHz to 40.0 kHz	1.0		X	X
P06	Reference speed REF_IN	0.1 kHz to 40.0 kHz	1.0		X	X
P07	Reference speed REF_OUT	0.1 kHz to 5.0 kHz	0.1		X	X
P8.0	Maximum allowed distance from limit switch or reference switch during a reference movement. One's digits of the travel.	10 to 999 steps Enter in the same way as position sets; see chapter 3.3.2	0			X
P8.1	Maximum allowed distance from limit switch or reference switch during a reference movement. Thousand's digits of the travel.	0 to 999 x 10^3 steps Enter in the same way as position sets; see chapter 3.3.2	10			X
P8.2	Maximum allowed distance from limit switch or reference switch during a reference movement. Million's digits of the travel.	0 to 55 x 10^6 steps, max. 55924053 Enter in the same way as position sets; see chapter 3.3.2	0			X
P20	Rotation monitoring	0 = OFF; 2 = ON; 1 = Reserved	0			X
P21	System of dimensions for position processing	0 = Absolute system 1 = Incremental system	0			X
P22	Standstill current as a percentage of the set motor phase current	1 % to 100 %	75			X
P50	Encoder signal type for electronic gear	1 = Pulse/direction 2 = A/B signals single 3 = A/B double 4 = A/B quadruple	2			X
P51	Gear ratio numerator	-999 to +999	1		X	X
P52	Gear ratio denominator	1 to 999	1		X	X
P60	Network address: RS 232/RS 485 Profibus-DP/CAN-Bus SUCONET	1 to 31 0 to 126 2 to 126	1 126 126			
P61	Baud rate RS 232/RS 485 Interbus-S CAN-Bus	1.2; 9.6; 19.2; 38.4 kbauds 500 kbauds 01 = 500 kbauds 05 = 50 kbauds 02 = 250 kbauds 06 = 20 kbauds 03 = 125 kbauds 07 = 10 kbauds 04 = 100 kbauds	9.6 500 3			

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Parameter display	Meaning	Setting range	Factory default	Selected setting	Restricted parameter menue, if P99 = 0	Accessible by upload/ download via serial interface
P62	CAN-Bus operating mode	1 = Simple CAN-Bus protocol 2 = CAL protocol	1			
P69	Manual mode via inputs/outputs and indication of operating states via outputs in on-line command processing mode	0 = OFF; 1 = ON	0			
P70	Voltage at maximum speed with CW rotation	-10.0 V to +10.0 V	10.0		X	
P71	Voltage at maximum speed with CCW rotation	-10.0 V to +10.0 V	-10.0		X	
P72	Zero window	0.01 V to 1.0 V	0.01		X	
P73	Lower oscillator frequency f_L	0.1 kHz to 5.0 kHz	0.1		X	
P74	Braking ramp with ANOZ	0 Hz/ms to 999 Hz/ms	0		X	
P90	Slow manual speed	0.1 kHz to 40.0 kHz	0.1		X	X
P91	Fast manual speed	1.0 kHz to 40.0 kHz	1.0		X	X
P99	Parameter menue	0 = OFF; 1 = ON	1		X	X

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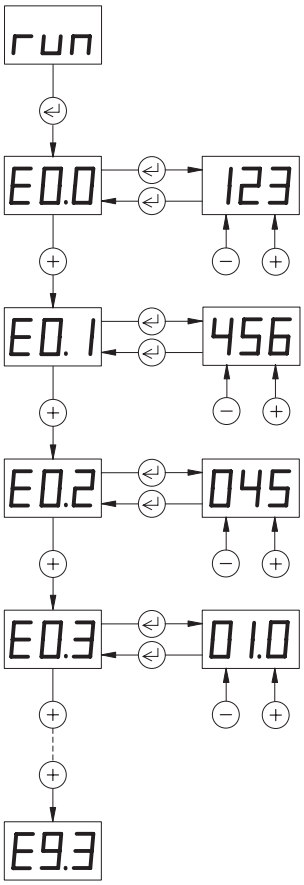
3.3.2 Position set input via front panel

Only available for some unit variants; see chapter 3.1

This function can be used for storing ten position sets. A position set consists of a position value and a speed value. Each position value is structured according to digits representing millions, thousands and ones. The position sets can be overwritten by teach-in or by download via the serial interface.

Prerequisites:

– Manual mode, teach-in or oscillator mode via inputs/outputs not activated.



1. Deactivate the AUTOM input.

2. Select the position set:

Display	Meaning	Setting range
E0.0 to E9.0	Position for sets 0 to 9 Position value digits representing ones	0 to 999 increments
E0.1 to E9.1	Position for sets 0 to 9 Position value digits representing thousands	0 to 999 x 10^3 increments
E0.2 to E9.2	Position for sets 0 to 9 Position value digits representing millions	-55 to +55 x 10^6 steps; ±55924053 steps max.
E0.3 to E9.3	Speed for sets 0 to 9	0.0 to 40.0 kHz If 0.0 is set, the speed is determined by the parameter P04 by default.

Example for position input:

E0.2			E0.1			E0.0			
0	4	5	4	5	6	1	2	3	steps
-	2	0	0.	2.	1.	9.	6.	0.	steps
Millions			Thousands			Ones			

NOTE
1000 steps are equivalent to one motor revolution.

NOTE
Three flashing points or a minus sign represent negative position values.

3. Edit the values using the ⊕ and ⊖ keys.

4. Save the values by pressing ↵.

NOTE
Stored positions can be approached via front panel or input/output control; see chapter 3.3.5.

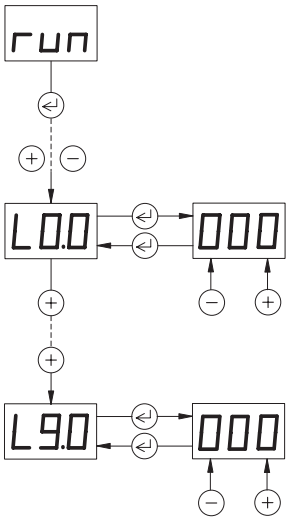
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3.3.3 Teach-in via front panel

Only available for some unit variants; see chapter 3.1

Teach-in via front panel can be used for approaching and storing as absolute positions a maximum of ten positions using the front panel keys. The stored positions can be displayed and changed via the front panel menue Exx, see chapter 3.3.2.

NOTE
The ten position sets can be stored in the controller memory. This memory area can be accessed directly by
Position sets via front panel,
Upload/download via serial interface,
Teach-in via front panel or
Teach-in via inputs/outputs.



Prerequisites:

– Manual mode, teach-in or oscillator mode via inputs/outputs not activated.

– Reference point previously defined by reference movement or setting dimensions (see chapter 3.3.5).

1. Deactivate the AUTOM input.

2. Select position number L0.0 to L9.0:
   → The digits representing ones appear in the status display.

Display	Meaning
L0.0 to L9.0	Position number 0 to 9 Teach-in position digits representing ones are displayed

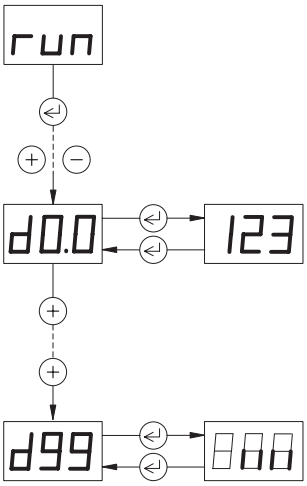
3. Use the ⊕ and ⊖ keys to move to the desired position.

4. Store the actual position by pressing the ↵ key.
   → The positions are stored as absolute positions.

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3.3.4 Value display on front panel

Available for all device variants



The actual position and the software version can be displayed.

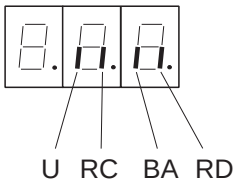
With an Interbus-S interface, d99 can be used for activating the diagnostic function.

1. Set AUTOM input inactive unless on-line command processing is active.

2. Select the value to be displayed:

Display	Meaning
d0.0	Actual position digits representing ones
d0.1	Actual position digits representing thousands
d0.2	Actual position digits representing millions
d10	Software version
d99	Interbus-S diagnostic function

The Interbus-S diagnostics is activated with the d99 function and indicates the following four states:



U Operating voltage
RC Interbus-S link o.k.
BA Interbus-S transmission active
RD No other Interbus-S slave available

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3.3.5 Starting positioning and other operations

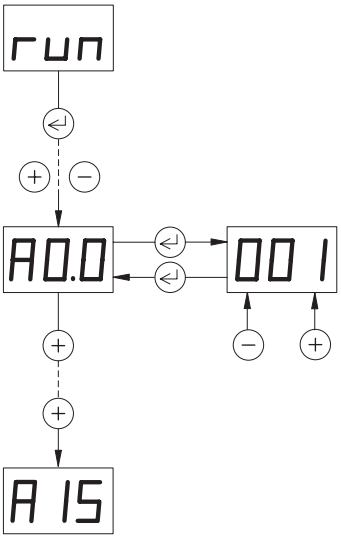
Only available for some unit variants; see chapter 3.1

This function can be used for starting the following operations:

– Move to stored positions
– Continue an interrupted positioning operation
– Perform reference movements
– Activate setting of dimensions
– Read voltage on analog input

Prerequisites:

– Manual mode, teach-in or oscillator mode via inputs/outputs not activated.
– If positioning is to be performed in a system of absolute dimensions (P21 = 0), a reference point must be defined. For this purpose, perform a reference movement or set dimensions.



1. Deactivate the AUTOM input.
2. Select the desired action:

Display	Meaning	Setting range
A0.0 to A9.0	Activate positioning to stored positions 0 to 9	0 = Inactive; 1 = Active
A10	Continue an interrupted positioning operation	0 = Inactive; 1 = Active
A11	Reserved	
A12	Reference movement to CW limit switch	0 = Inactive; 1 = Active
A13	Reference movement to CCW limit switch	0 = Inactive; 1 = Active
A14	Setting dimensions to position value 0	0 = Inactive; 1 = Active
A15	Reference movement to reference switch	0 = Inactive; 1 = Active
A70*	Voltage on analog input corresponds to maximum speed in CW rotation	0 = Inactive; 1 = Active
A71*	Voltage on analog input corresponds to maximum speed in CCW rotation	0 = Inactive; 1 = Active

* Only in oscillator mode via analog interface; see chapter 3.11.

3. Enable the function by setting it to 1 = active with the ⊕ key.
4. Activate the function by pressing ↵.
   → The function is executed.

NOTE
Positioning operations and reference movements are performed using the set speed and acceleration parameters; see chapter 3.3.1.

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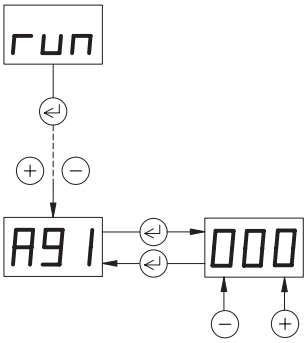
3.3.6 Manual movement via front panel

Available for all device variants

This function can be used for manually moving the motor using the keys on the front panel.

Prerequisites:

– Manual mode, teach-in or oscillator mode via inputs/outputs not activated.



1. Set AUTOM input inactive.
2. Select the function A91 for manual movement.
3. Select the sense of rotation:

   ⊕ key CW rotation
   ⊖ key CCW rotation
   (as seen from front towards motor shaft)

NOTE
The sense of rotation of the motor can be changed by inverting two motor phase leads; see chapter 2.4.

4. **Single step:**
   If the key is pressed for ≤ 0.5 s, the motor performs a single step in slow manual speed.

   Continuous operation:
   If the key is pressed for > 0.5 s, the motor starts running at slow manual speed (parameter P90). While the key is kept pressed, the speed increases every 5 seconds (in 10 stages) up to fast manual speed (parameter P91).

   → The current position digits representing ones appear in the status display.

NOTE
Three flashing points represent negative position values.
The movement characteristics for manual mode are illustrated in fig. 3-3.

If an error occurs during activation, an error message is displayed and the position indication goes out.

5. Stop the manual movement by pressing ↵.

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3.4 Manual mode via inputs/outputs

Available for all device variants

In manual mode, positions are approached using the inputs and outputs. Acceleration and manual speeds of the motor can be set.

Prerequisites:

– Teach-in or oscillator mode via inputs/outputs not activated.
– Front panel operation inactive.
– The parameter P69 must be set to 1 in on-line command processing mode.

1. Deactivate the AUTOM input.
2. Select the sense of rotation:

Input MAN_P	CW rotation
Input MAN_N	CCW rotation (as seen from front towards motor shaft)

3. Activate MAN_P or MAN_N input.

   Single step:
   If the input is activated for ≤ 0.5 s, the motor performs a single step in slow manual speed.

   Continuous operation:
   If the input is activated for > 0.5 s, the motor starts running at slow manual speed (parameter P90). While the input is active, the speed increases every 5 seconds (in 10 stages) up to fast manual speed (parameter P91).

If an error occurs during activation, an error message is displayed and the position indication goes out.
The error indication is cleared upon restarting if the cause of the error has been eliminated.



NOTE
The output states are described in chapter 4.



ATTENTION
Due to varying signal transmission times on the individual outputs, an output state is only valid if it remains stable for at least 0.5 ms. In addition, the signal transmission times of the master controller must be taken into account for signal evaluation.

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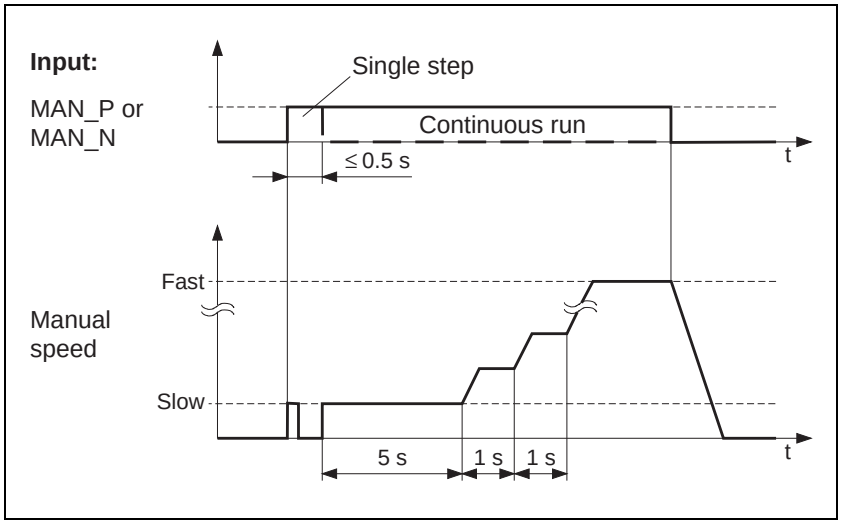


Fig. 3-3 Movement characteristics in manual mode

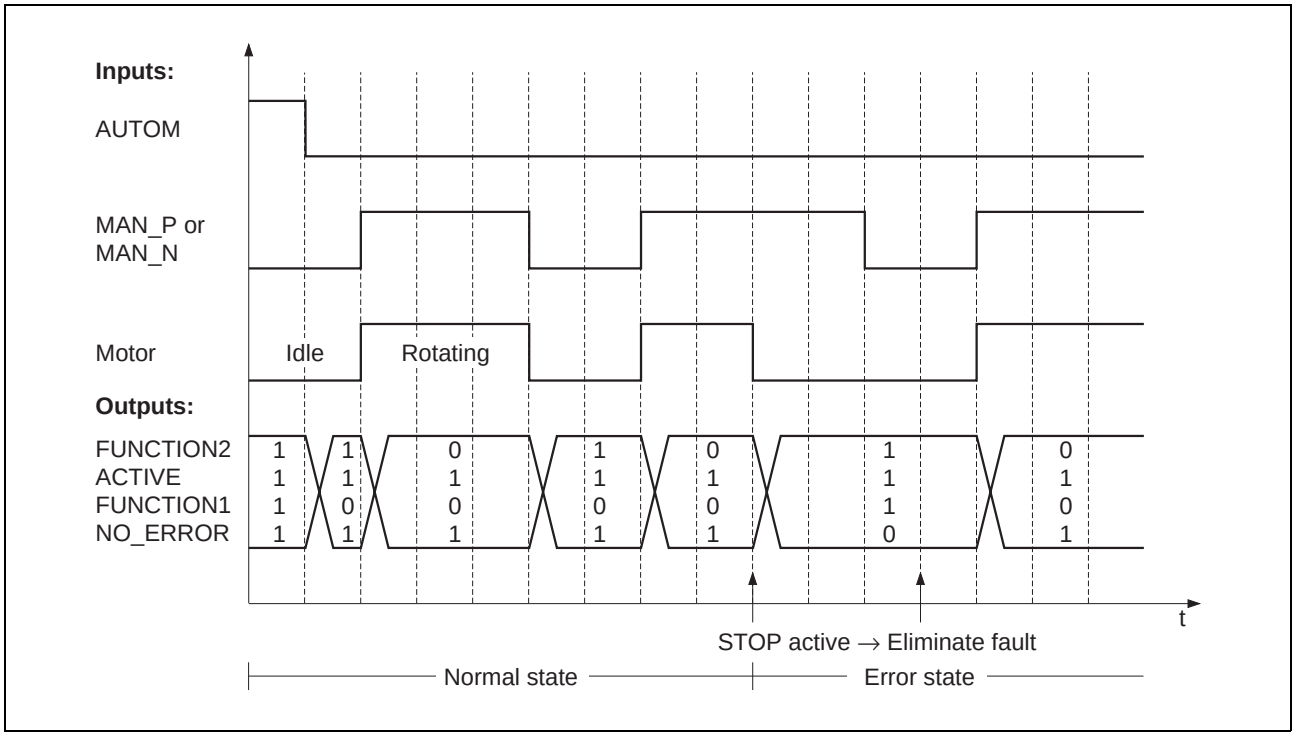


Fig. 3-4 Manual mode timing diagram

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3.5 Teach-in mode via inputs/outputs

Only available for some unit variants; see chapter 3.1

In teach-in mode, positions are approached using the inputs and outputs and stored as absolute positions. A maximum of ten positions can be stored. The stored positions can be displayed and changed via the front panel menue Exx, see chapter 3.3.2.

NOTE
The ten position sets can be stored in the controller memory. This memory area can be accessed directly by
Position sets via front panel,
Upload/download via serial interface,
Teach-in via front panel or
Teach-in via inputs/outputs.

Prerequisites:

– Front panel operation inactive.

– Reference movement or dimension setting performed; see chapter 3.6.

1. Deactivate the AUTOM input.

2. Approach the desired position using input MAN_P with CW (positive) rotation or input MAN_N with CCW (negative) rotation.

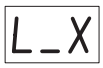
3. Select the position number the position should be assigned. For this purpose, activate or deactivate the inputs DATA1 to DATA8 as follows:



DATA8	DATA4	DATA2	DATA1	Position number
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9

0 = Input inactive; 1 = Input active

4. Activate the TEACH_IN input.
   → The position is stored as an absolute position.
   → The status display reflects L_0 to L_9 for the selected position number.



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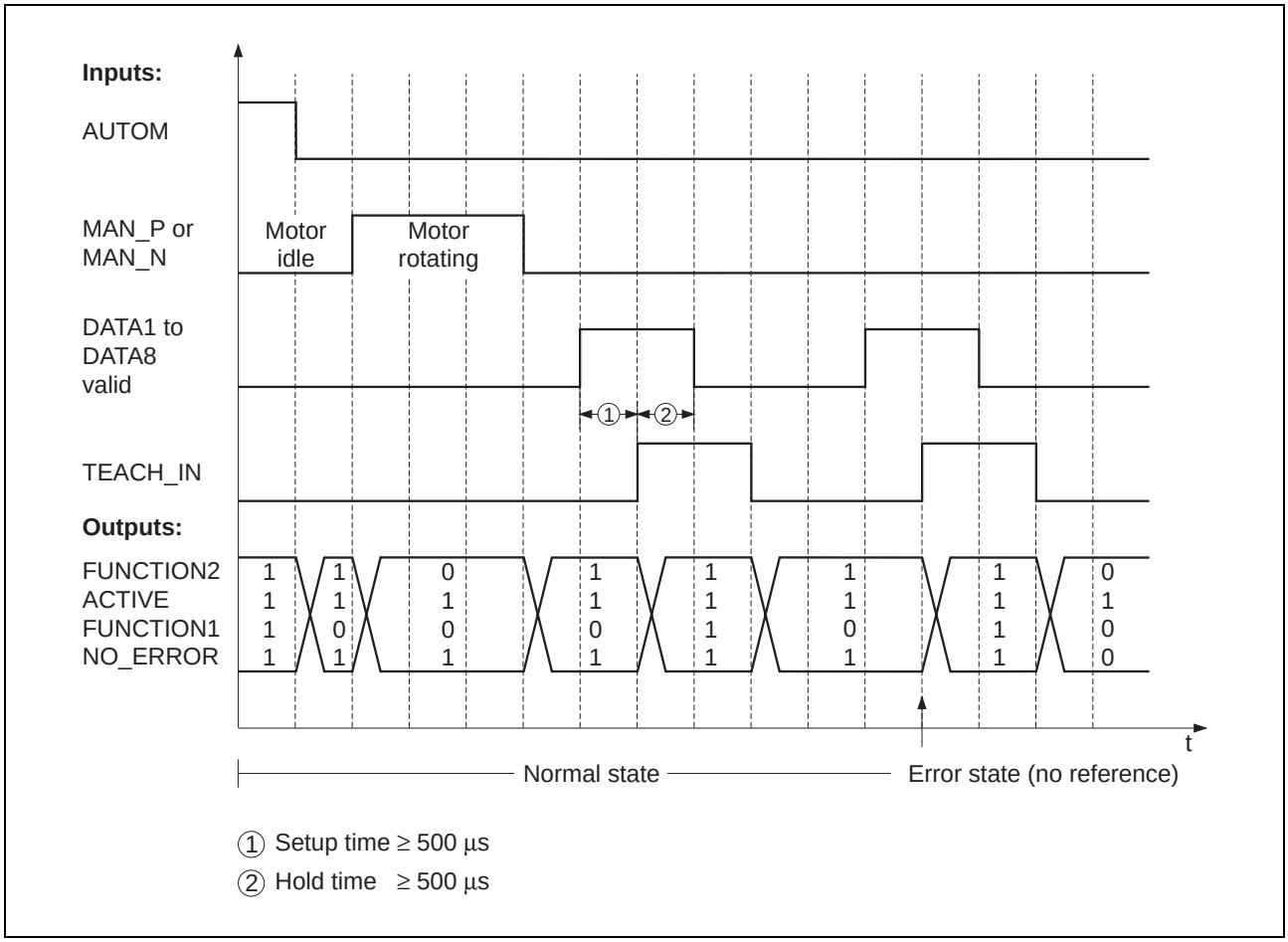


Fig. 3-5 Teach-in mode timing diagram

NOTE
The output states are described in chapter 4.

ATTENTION
Due to varying signal transmission times on the individual outputs, an output state is only valid if it remains stable for at least 0.5 ms. In addition, the signal transmission times of the master controller must be taken into account for signal evaluation.

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3.6 Position processing via inputs/outputs

Only available for some unit variants; see chapter 3.1.

In this mode, up to ten positions can be selected and approached via inputs. The positions can be defined by teach-in, by position input via front panel or, if operated with a serial interface, via download. Positioning is effected in the system of absolute or incremental dimensions (parameter P21).

Prerequisites:

– Manual mode, teach-in or oscillator mode via inputs/outputs not activated.

– Front panel operation inactive.

– For absolute positioning, define a reference point (perform reference movement or dimension setting).

1. Activate the AUTOM input.

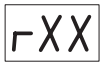
2. Select a position number or perform another activity.
For this purpose, activate or deactivate the inputs DATA1 to DATA8 as follows:



DATA8	DATA4	DATA2	DATA1	Position number
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
				Action
1	0	1	0	Continue an interrupted positioning operation
1	0	1	1	Reserved
1	1	0	0	Reference movement towards CW limit switch
1	1	0	1	Reference movement towards CCW limit switch
1	1	1	0	Set dimensions to position value 0
1	1	1	1	Reference movement towards reference switch



0 = Input inactive; 1 = Input active



3. Activate the START input.
→ During positioning, the position or action number is displayed in the status display.

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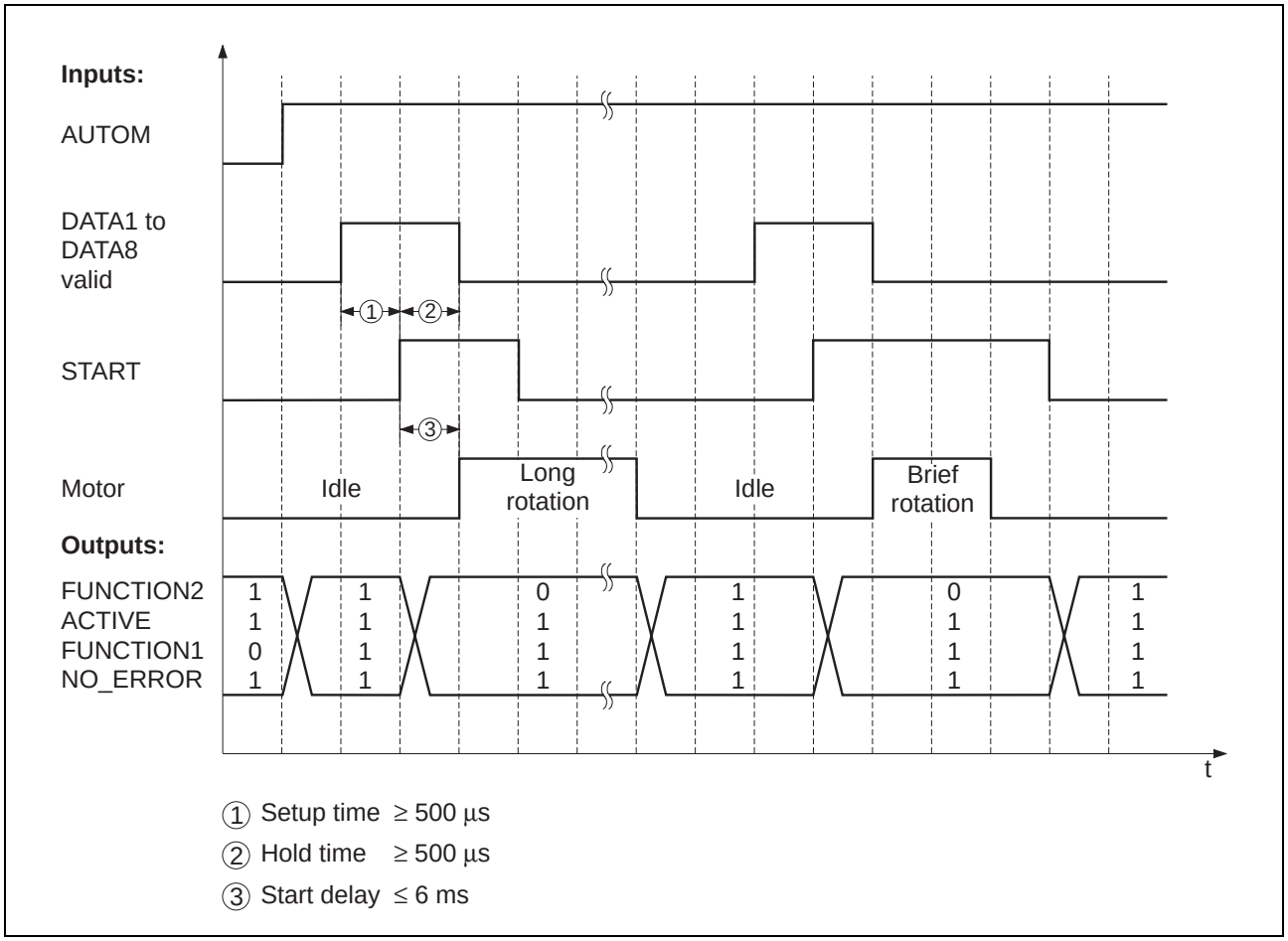


Fig. 3-6 Position processing mode timing diagram

NOTE
The output states are described in chapter 4.

ATTENTION
Due to varying signal transmission times on the individual outputs, an output state is only valid if it remains stable for at least 0.5 ms. In addition, the signal transmission times of the master controller must be taken into account for signal evaluation.

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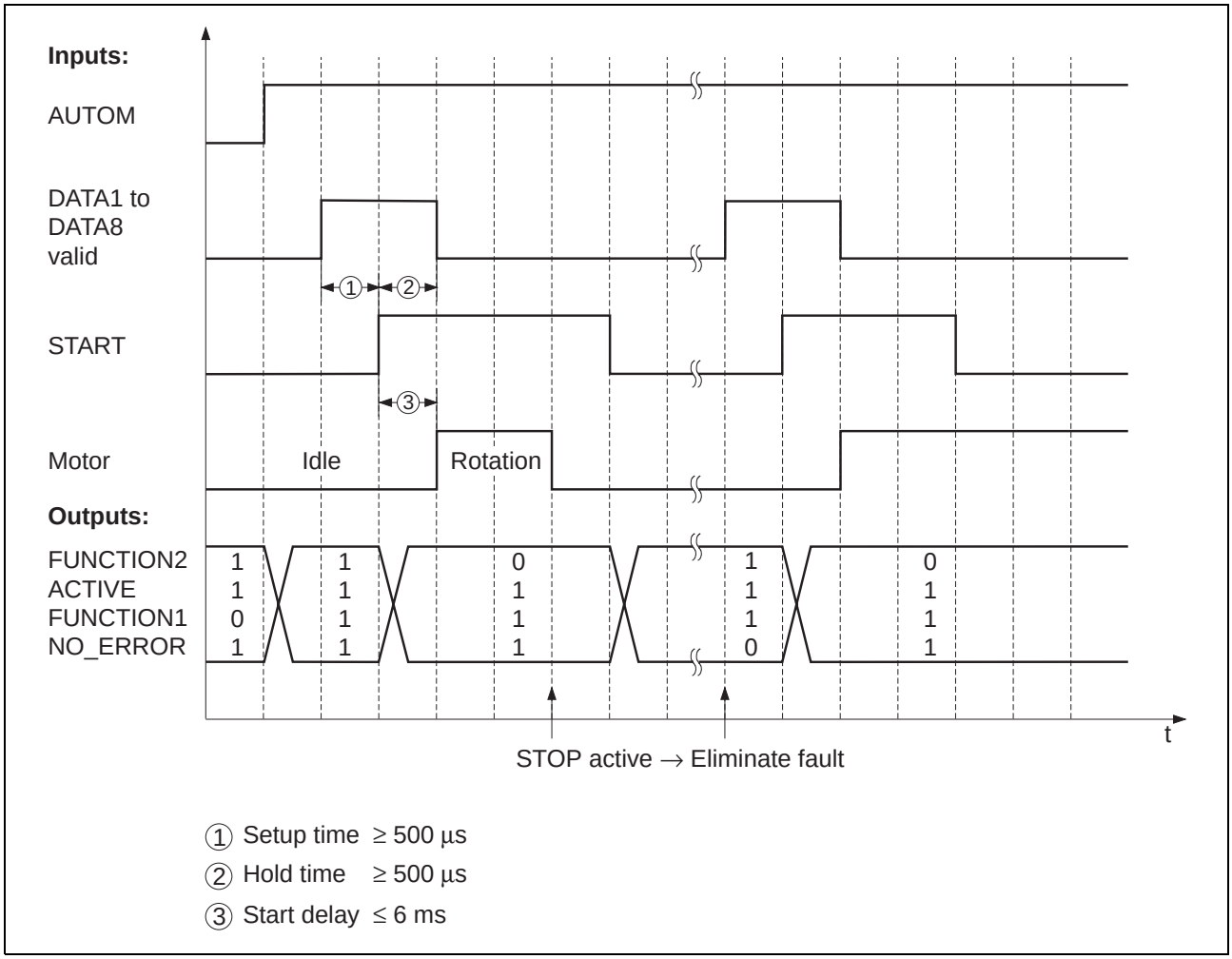


Fig. 3-7 Position processing interrupt timing diagram

NOTE
The output states and the rectification of malfunctions are described in chapter 4.

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3.7 Upload/download via serial interface

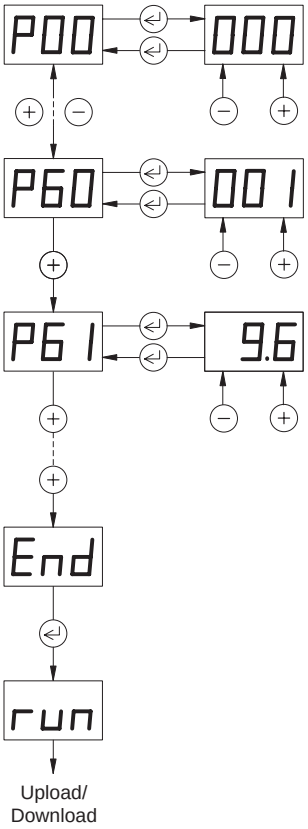
Only available for some unit variants; see chapter 3.1.

The format for data transmission is 7-bit ASCII with even parity bit and one stop bit. The transmission rate can be set to 1.2 kbauds, 9.6 kbauds, 19.2 kbauds or 38.4 kbauds.

The RS 485 interface can be used for networking up to 31 units.

Parameters and data records are read from/loaded into the controller.

NOTE
The ten position sets can be stored in the controller memory. This memory area can be accessed directly by
Position sets via front panel,
Upload/download via serial interface,
Teach-in via front panel or
Teach-in via inputs/outputs.



Prerequisites:

– Front panel operation inactive.
– Motor at standstill.
– No error active.

NOTE
The following parameters must have been set (see chapter 3.3.1):
– Operating mode with parameter P00 = 0 or P00 = 3 (for electronic gear)
– Network address with parameter P60 (for RS 232 always 1)
– Baud rate with parameter P61

1. Deactivate the AUTOM input.

2. If “run” is displayed in the status display, upload/download of parameters and positions is enabled.

NOTE
The transmitted values are retained after switching off.

Reference documentation

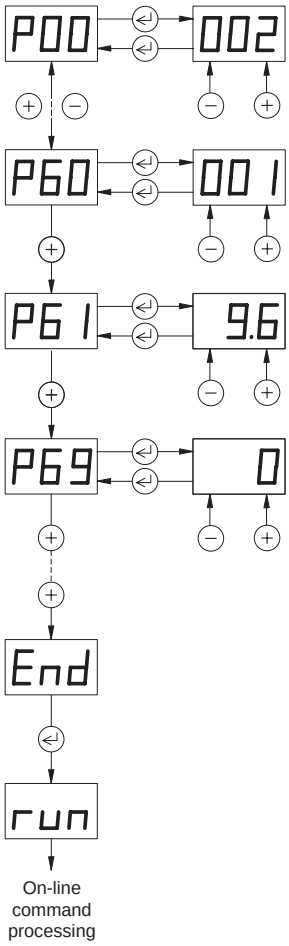
Uploading and downloading is described in the separate On-line Command Processing and Upload/Download via Serial Interface documentation.

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3.8 On-line command processing via serial or field bus interface

Only available for some unit variants; see chapter 3.1.

This mode is available if the unit has a serial interface RS 232 or RS 485 or a field bus interface (e.g. Interbus-S or Profibus-DP) installed in adapter slot OPT.1.
In this mode, single movement commands and other commands are transmitted to the controller and executed immediately. A comprehensive command set is available for this purpose.



NOTE
The following parameters must have been set (see chapter 3.3.1):
- *For serial interface, operating mode with parameter P00 = 2*
- *For CAN-Bus, operating mode with parameter P62*
- *Network address with parameter P60 (only for RS 485, Profibus-DP, CAN-Bus and SUCONET)*
- *Baud rate with parameter P61 (only for serial interface, Interbus-S and CAN-Bus)*

If “run” is displayed in the status display, on-line command processing is enabled.
Start by activating the power controller with the INITDRIVE command before executing any movement commands.

ATTENTION
The parameters set via the front panel are used for the basic settings of the unit. Some of these settings can be changed by on-line command processing.
The transmitted values will be lost when switching off.

Reference documentation

On-line command processing mode is described in the following documentations:

- On-line Command Processing and Upload/Download via Serial Interface
- On-line Command Processing via CAN-Bus
- On-line Command Processing via Interbus-S
- On-line Command Processing via Profibus-DP
- On-line Command Processing via SUCONET

Description of the P69 parameter

If the parameter P69 = 1, a manual movement via I/O (see chapter 3.4) and status output via outputs (see chapter 4.1) is possible.
During a manual movement (signal AUTOM = 0), only read commands can be processed.

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Summary of read and write commands

Write command	Meaning
BRAKE	Define output for brake
CLRERROR	Clear error information
CLRSIG_SR	Clear temporarily stored axis signals
CONT	Continue interrupted shaft movement
ENSIG	Enable or disable axis signals
INITDRIVE	Initalize axis
MOVE	Incremental (relative) positioning operation
POS	Absolute positioning operation
RAMP_EXP	Set exponential ramp
RAMP_LIN	Set linear ramp
RAMP_SIN	Set sine square ramp
REF_OUT_DISTANCE	Set maximum allowed distance from limit switch for reference movement
REFPOS_LIMN	Reference movement towards CCW limit switch
REFPOS_LIMP	Reference movement towards CW limit switch
REFPOS_REF	Reference movement towards reference switch
ROTMON_DISABLE	Disable rotation monitoring
ROTMON_ENABLE	Enable rotation monitoring
ROTMON_RESET	Reset rotation monitoring
SETCURRENT	Set motor current
SETENCODER	Set encoder signal type
SETHARDWARE	Set hardware settings
SETMODE	Set operating mode
SETNORM_GEAR_DEN	Set gear ratio denominator
SETNORM_GEAR_NUM	Set gear ratio numerator
SETOFFSET	Set reference variable offset
SETPOS	Set current position
SETSIG_ACTIV_H	Set active state of axis signals
SETVEL_START	Set start/stop speed
SETVEL_SYS	Set maximum system speed
STOP_AXIS	Stop shaft movement
TIMEOUT*	Set or disable timeout monitoring
VEL	Set the set speed
WRITE_OUTPUT	Set outputs directly

* Only for units with serial interface.

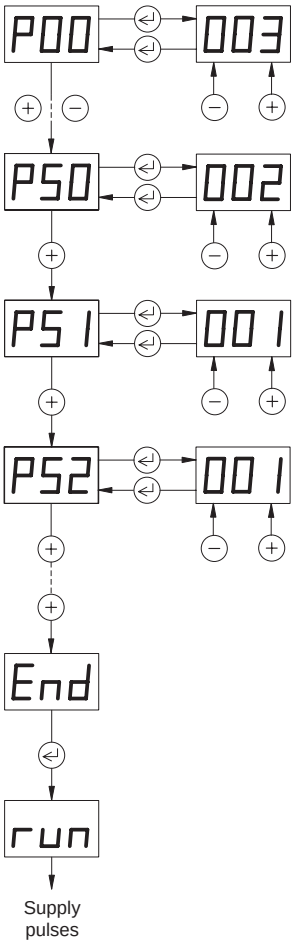
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Read command	Meaning
GETCURRENT	Read electrical current values
GETENSIG	Read enabled or disabled axis signals
GETERROR	Read error
GETMODE	Read operating mode
GETPOS	Read position values
GETSIG	Read current axis signal states
GETSIG_ACTIV_H	Read active state of axis signals
GETSIG_SR	Read temporarily stored axis signals
GETSTATE	Read error status of an axis
GETVEL	Read speed value
READ_INPUT	Read inputs directly

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3.9 Electronic gear

Available for units:
– with encoder interface
if P00 = 3



In this mode, an external signal and a gear ratio combine to determine the shaft movement. The externally supplied pulses (fig. 3-8) are counted as A/B encoder signals or pulse/direction signals and multiplied with a gear ratio (numerator by denominator). These pulses are used as the reference variable for the stepping motor position.
The pulse memory is cleared whenever an error occurs or when input AUTOM changes from 1 to 0.
The electronic gear parameters can be set using on-line command processing (see chapter 3.8) or via the front panel. The following paragraphs describe parameter setting via the front panel.

NOTE
The following parameters must have been set (see chapter 3.3.1):
– Operating mode with parameter P00 = 3
– Encoder signal type with parameter P50
– Gear ratios with parameters P51 and P52

1. Activate the AUTOM input.

NOTE
The motor accelerates using the parameter value P02 if the ramp of the supplied pulses multiplied with the gear ratio exceeds this value. If the ramp is less than the parameter value, the motor accelerates precisely according to the supplied pulses.

2. If the status display shows “run”, pulses can be supplied via the encoder interface.

The limit switches and the $\overline{\text{STOP}}$ input are not monitored.

NOTE
Any supplied pulses are ignored while the AUTOM input is inactive. Also, they are not traced back when the AUTOM input is reactivated.

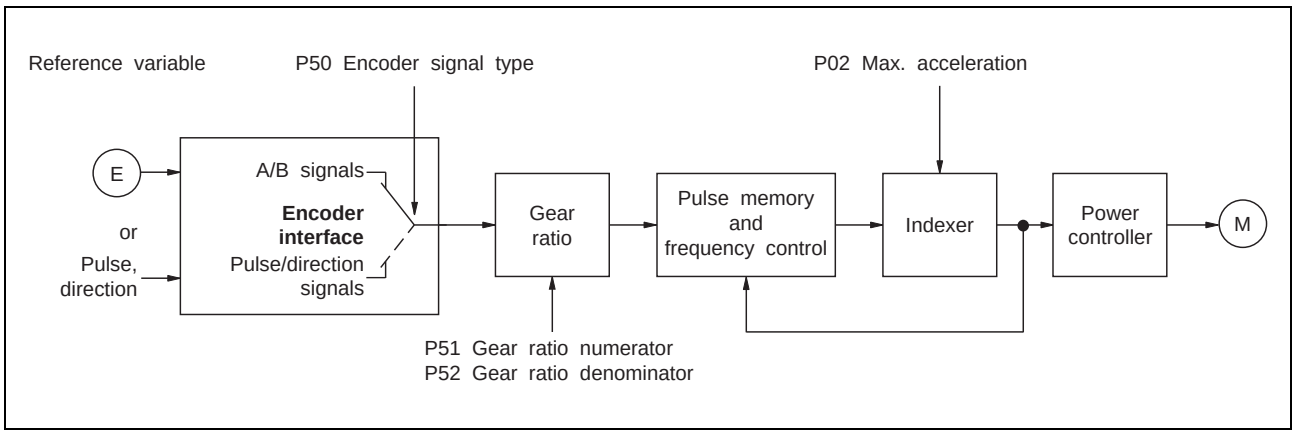


Fig. 3-8 Electronic gear block diagram

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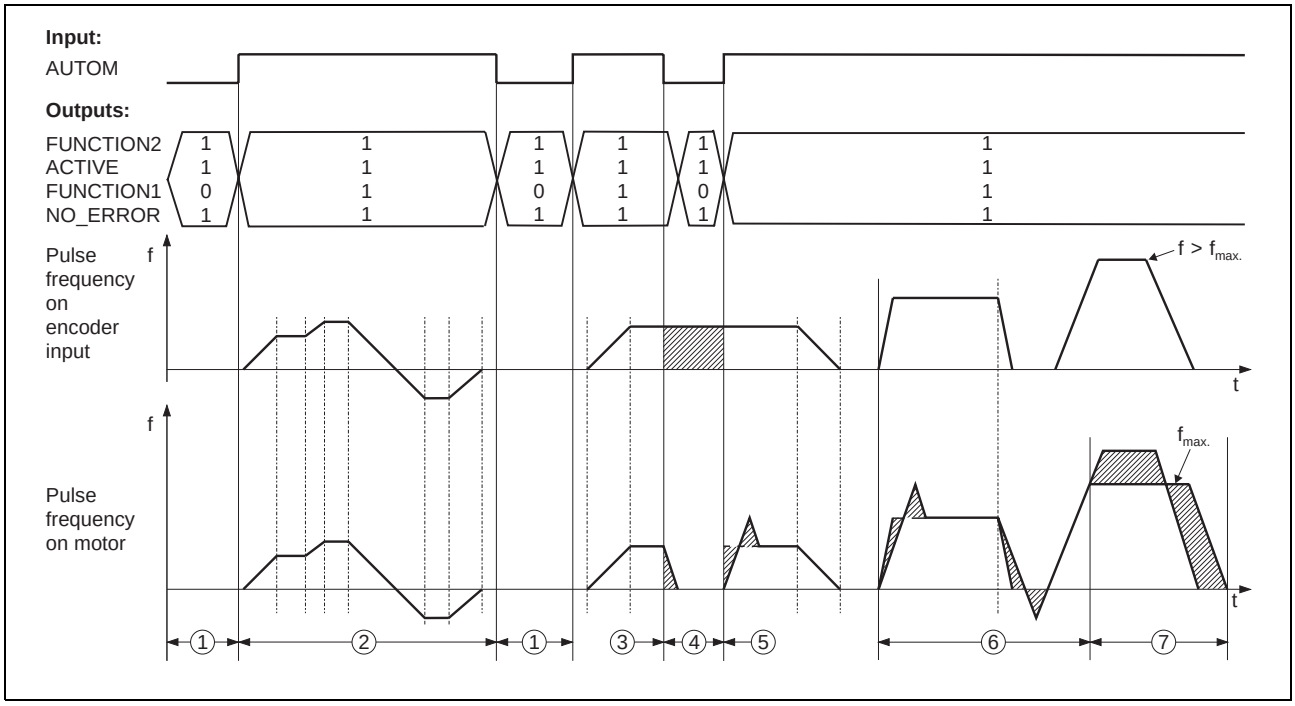


Fig. 3-9 Electronic gear timing diagram with gear ratio 1:1

① Manual mode

② The ramp of the supplied pulses is less than the acceleration set in parameter P02.
The frequency of the supplied pulses is less than 40 kHz.
→ The motor accelerates and moves precisely according to the supplied pulses.

③ The AUTOM input is not activated although pulses continue to be supplied.
→ The motor decelerates at parameter value P02 down to standstill. The combination of states does not change before standstill.

④ The pulses hatched in the drawing are ignored.

⑤ Pulses are already supplied at the time the AUTOM input is activated.
→ As a result, an excessive motor speed occurs.

⑥ The increase in frequency of the supplied pulses is greater than the acceleration set in parameter P02.
→ The motor accelerates and decelerates at parameter value P02.
→ As a result, an excessive motor speed occurs.

⑦ The frequency of the supplied pulses exceeds 40 kHz.
→ As soon as the frequency of the supplied pulses drops below 40 kHz, the pulses are re-traced.

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3.10 Oscillator mode via inputs/outputs

Available for units:
– without interface in OPT.1, if P00 = 1

In oscillator mode, the two movement frequencies f_H and f_L can be set via the front panel and activated by the input FH/$\overline{FL}$.

Prerequisites:

– Manual mode via inputs/outputs inactive.

– Front panel operation inactive.

NOTE
The following parameters must have been set (see chapter 3.3.1):
– Oscillator mode with parameter P00 = 1
– Higher oscillator frequency f_H with parameter P04
– Lower oscillator frequency f_L with parameter P73

1. Activate the AUTOM input.

ATTENTION
The lower oscillator frequency f_L must be less than the starting limit frequency f_{AM} of the stepping motor; see stepping motor sales documentation.

2. Set the higher and lower oscillator frequency via input FH/$\overline{FL}$.
   Input high: Accelerate to higher oscillator frequency f_H.
   Input low: Accelerate or decelerate to lower oscillator frequency f_L.

NOTE
The INV_DIR input can be used for inverting the motor's sense of rotation.

3. Activate the START input.
   → The motor rotates at the set movement frequency.

4. Deactivate the START input or activate the $\overline{STOP}$ input.
   → The motor stops.

NOTE
For accurate stopping at the desired position, the $\overline{STOP}$ input should be used.

NOTE
The motor can be deenergized with the CURRENT_OFF signal. In this state, it does not have any holding torque.
The CURRENT_OFF signal is always evaluated.

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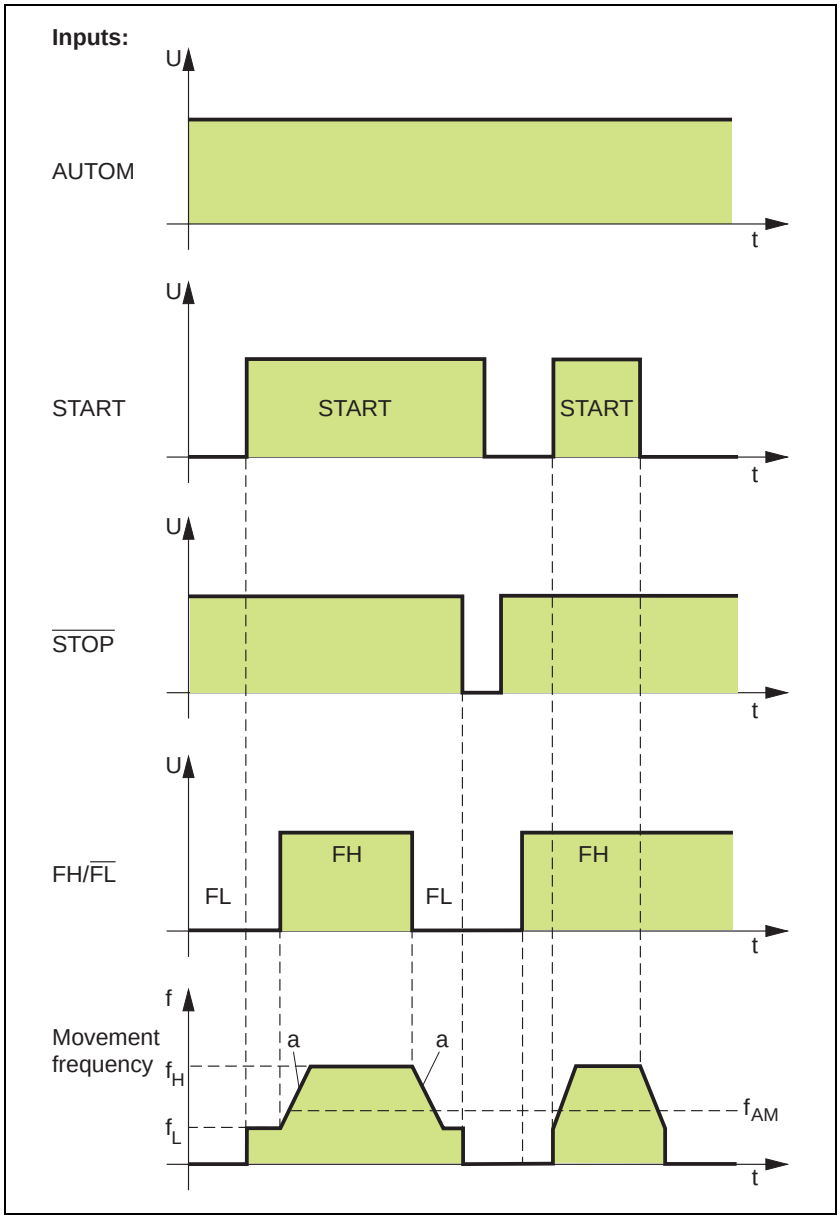


Fig. 3-10 Timing diagram for oscillator mode via inputs/outputs

a	Acceleration (can be set by parameter P02)
f_{AM}	Starting limit frequency of stepping motor
f_H	Higher oscillator frequency (can be set by parameter P04)
f_L	Lower oscillator frequency (can be set by parameter P73)

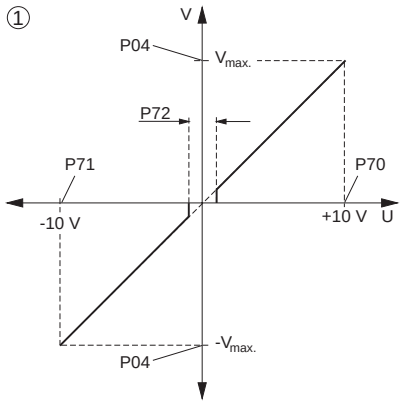
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3.11 Oscillator mode via analog interface

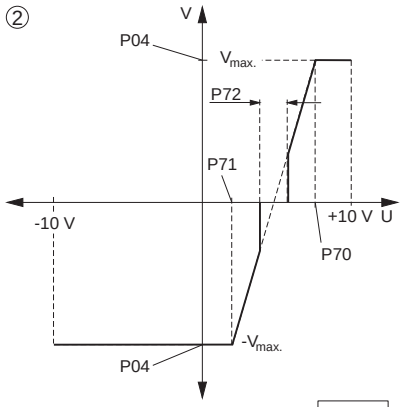
Available for units:
– with analog interface

In oscillator mode, the speed of the stepping motor can be set via an analog voltage on the ANA_IN input. The voltage range can be set on the front panel from -10 V to +10 V.

①



②



Prerequisites:

– Manual mode via inputs/outputs inactive.

The following parameters must have been set (see chapter 3.3.1):

P02 Acceleration

P04 Maximum speed in CW and CCW sense of rotation.

P70 Voltage (±10 V) at maximum speed in CW sense of rotation.
P70 can be used to define the ANA_IN input voltage at which the motor is to move at maximum speed in CW sense of rotation.

P71 Voltage (±10 V) at maximum speed in CCW sense of rotation.
P71 can be used to define the ANA_IN input voltage at which the motor is to move at maximum speed in CCW sense of rotation.

The two graphics show:

① Normal case: ±10 V input voltage (maximum resolution)

② Special case: Limited working range (reduced resolution)

NOTE
With the actions A70 and A71, the working range can be defined by applying two voltages on the analog input; see chapter 3.3.5. The two voltages are stored in the parameters P70 and P71.

P72 Zero window.
If the voltage on the ANA_IN input is within the range of the window specified with P72, the motor is decelerated.

P74 Braking ramp with analog interface ANOZ.
P74 can be used for setting the deceleration at which the motor comes to a standstill, if

– the AUTOM input is inactive;

– the $\overline{\text{STOP}}$ input is activated.

NOTE
If P74 = 0, the motor is decelerated at the value of P02.

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1. Activate the AUTOM input.

2. Apply a voltage to the ANA_IN input.
   → The motor rotates at the speed which is proportional to this voltage.

NOTE
The INV_DIR input can be used for inverting the motor's sense of rotation.

3. Deactivate the AUTOM input.
   → The motor is decelerated.

NOTE
The motor can be deenergized with the CURRENT_OFF signal. In this state, it does not have any holding torque.
To quickly stop and resume a motor movement, use the $\overline{STOP}$ input.

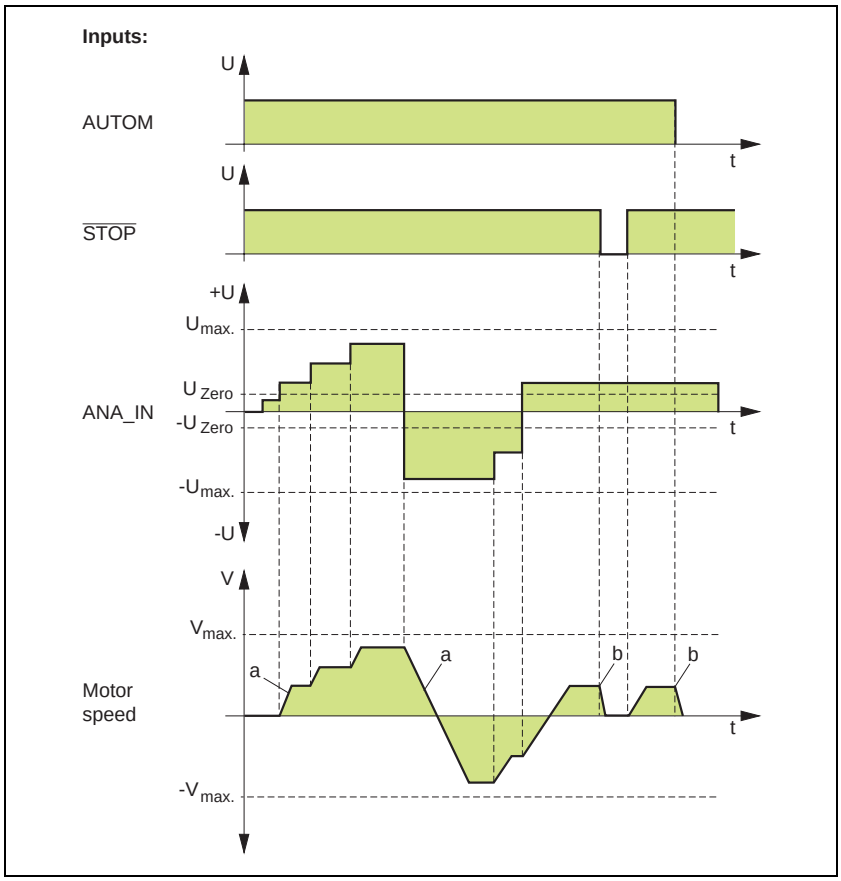


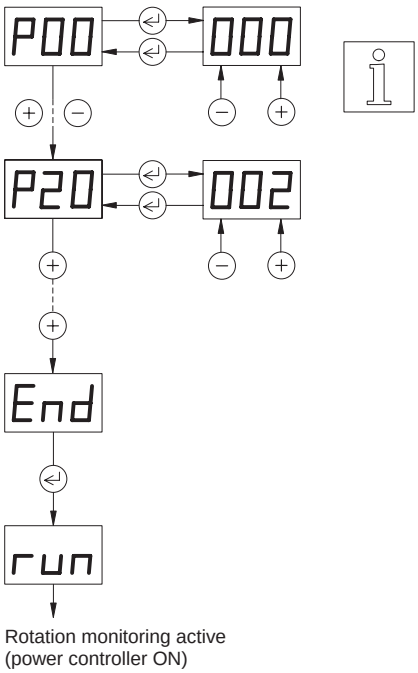
Fig. 3-11 Timing diagram for oscillator mode via analog interface

a	Acceleration (can be set by parameter P02)
b	Braking ramp (can be set by parameter P74)
$U_{max.}$	Voltage at maximum speed with CW sense of rotation (can be set by parameter P70)
$-U_{max.}$	Voltage at maximum speed with CCW sense of rotation (can be set by parameter P71)
U_{Zero}	Zero window (can be set by parameter P72)
$V_{max.}$	Maximum speed (can be set by parameter P04)

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3.12 Rotation monitoring

Available for units:
– with encoder interface, if P00 ≠ 3 and P20 = 2



Rotation monitoring active
(power controller ON)

The rotation monitoring function is available if the controller has an encoder interface and the motor a type 1000 encoder installed.

The rotation monitoring feature signals a contouring error if the difference between set and actual position of the motor is more than 18 steps.

NOTE
The following parameters must have been set (see chapter 3.3.1):
– Operating mode with parameter P00 ≠ 3
– Rotation monitoring with parameter P20 = 2

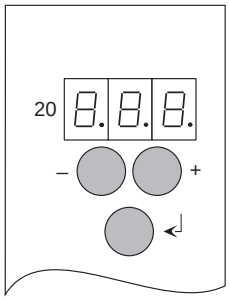
In on-line command processing mode, rotation monitoring can be enabled with the ROTMON_ENABLE command or disabled with the ROTMON_DISABLE command.

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4 Malfunctions

4.1 Status indicators

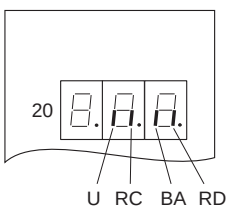
The three seven-segment displays (item 20) indicate parameters, input values, operating states and error codes.



Meanings of runtime messages:

Display	Meaning
run	Controller ready. The power controller has been switched on (with the INITDRIVE command in on-line command processing mode). The individual functions can be activated.
End	Exit the selection menue for front panel operation. Pressing ↵ changes to “run” mode.
20	Flashing error code; see chapter 4.2. Acknowledge with ↵ key after eliminating the cause of the error. It is possible that another error is then displayed.
L_X	Teach-in mode via inputs/outputs; see chapter 3.5
rXX	Position processing via inputs/outputs; see chapter 3.6
Err	For troubleshooting, see chapter 4.2
OFF	For troubleshooting, see chapter 4.2
-99 100.	Negative values for two-digit values with a minus sign; for values with more digits with three flashing points. Only the last few digits are displayed, e.g. -251.0.0.
888	Interbus-S diagnostics for testing the Interbus-S interface.

Interbus-S diagnostics



The following four indications are used for diagnostic purposes on units with Interbus-S interface.

U Operating voltage
RC Interbus-S link o.k.
BA Interbus-S transmission active
RD No other Interbus-S slave available

The diagnostics is activated with the function d99 from the front panel (see chapter 3.3.4).

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Output states

Output states Q0 FUNCTION2	Q1 ACTIVE	Q2 FUNCTION1	Q3 NO_ERROR	**Meaning**	**Rectification**	**Acknow-ledgement**
0	0	0	0	24 V supply voltage not available	Switch on supply voltage	
1	0	0	0	Fatal error	See chapter 4.2	1
				Power controller not ready	In on-line command processing mode, use the INITDRIVE command to initialize the power controller.	
1	0	1	0	Contouring error detected	See chapter 4.2	2, 3
0	1	0	0	Reference not available	Execute reference movement	2, 4, 5
1	1	0	0	Limit switch approached unintentionally	Move out of limit switch range by manual control	2, 4, 5
0	1	1	0	Other error detected	See chapter 4.2	2, 4, 5
1	1	1	0	Stop	See chapter 4.2	2, 4, 5
0	1	0	1	Manual movement active	–	
1	1	0	1	Manual movement completed	–	
0	1	1	1	Input AUTOM = 1 and motor rotates or dimension setting active	–	
1	1	1	1	Input AUTOM = 1 and motor stops or teach-in acknowledgement	–	

NOTE
If on-line command processing is active and P69 = 0, the outputs can be freely used.

Errors are acknowledged in four ways:

1 Switch the mains voltage off and on again.
2 Press the ↵ key on the front panel. This does not change the status of the outputs.
3 Activate ERR_RESET input unless on-line command processing mode is active.
4 Change the signal level on AUTOM input. This merely clears the error display.
5 New action after eliminating the cause of the error.

ATTENTION
Due to varying signal transmission times on the individual outputs, an output state is only valid if it remains stable for at least 0.5 ms. In addition, the signal transmission times of the master controller must be taken into account for signal evaluation.

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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 ↵; see page 4-5.

Display	Cause	Rectification
03	Motor lead short-circuit	Check the motor wiring; see chapter 2.4.2.
		Install a correct motor; see chapter 6.1.
04	Combined message for power controller fault	Retrieve details on the cause of the fault by pressing ↵. It may be necessary to switch off the controller.
05	Power controller overvoltage (intermediate circuit voltage >395 V)	Connect an external bleed resistor; see chapter 6.2.5.
07	Power controller overtemperature	Let the power controller cool down while the motor is at a standstill.
		Install a fan; see chapter 6.2.1.
11	Power controller undervoltage (<200 V)	Check the voltage supply. If on-line command processing inactive: Activate ERR_RESET input. In on-line command processing mode: Use SETHARDWARE to switch power controller off and on again; set CLRSIG_SR to ampnotready.
12	Contouring error (rotation monitoring)	Check encoder or wiring of encoder interface; see chapter 2.4.8.
		Reduce acceleration; see chapter 3.3.1.
		Check electrical current setting; see chapter 3.3.1.
		Reduce any excessive mechanical load or friction moment.
		If on-line command processing inactive: Activate ERR_RESET input. In on-line command processing mode: Enter the ROTMON_RESET command.
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 impossible, call Technical Services department.
17	System without reference	Perform reference movement or dimension setting; see chapter 3.3.5 or 3.6.
20	Incorrect limit switch $\overline{\text{LIMP}}$, or limit switch malfunction	Check wiring and function of the limit switch or the sense of rotation of the motor; see chapter 2.5. $\overline{\text{LIMP}}$ must be approached with CW rotation of the motor.

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Display	Cause	Rectification
21	Incorrect limit switch $\overline{\text{LIMN}}$, or limit switch malfunction	Check wiring and function of the limit switch or the sense of rotation of the motor; see chapter 2.5. $\overline{\text{LIMN}}$ must be approached with CCW rotation of the motor.
22	CW limit switch $\overline{\text{LIMP}}$ actuated	With manual movement: Movement to opposite direction; see chapter 3.3.6 or 3.4. In position processing mode: Perform reference movement; see chapter 3.6.
23	CCW limit switch $\overline{\text{LIMN}}$ actuated	With manual movement: Movement to opposite direction; see chapter 3.3.6 or 3.4. In position processing mode: Perform reference movement; see chapter 3.6.
29	Both limit switches activated or reference switch malfunction	Check function, wiring and voltage supply of limit switch or reference switch.
30	Stop via $\overline{\text{STOP}}$ input	Continue interrupted movement or activate a new movement; see chapter 3.6.
40	System error	If on-line command processing inactive: Call Technical Services department.
		In on-line command processing mode: Determine the cause of the error using the GETERROR_SR command.
51	Link via serial interface or field bus interface disrupted (timeout)	Check wiring and master function.
54	Only for on-line command processing: Invalid address when accessing inputs/outputs	Check the command transfer parameters.
57	EEPROM write error	Call Technical Services department.
81	Invalid position number in teach-in mode	Select a valid position number.
82	Basic settings of parameters and data in EEPROM made	Acknowledge by pressing ↵.
83	Only for on-line command processing: Manual movement not possible since motor moves	Bring motor to a standstill.
Other error indications	System error	Call Technical Services department.



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

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Clearing an error

The error codes in the status display or error memory can be cleared by pressing ↵.
After clearing the error code, “Err”, “OFF” or “run” appears in the status display.

Display	Cause	Rectification
Err	The error codes “11”, “12” or “14” are cleared.	Eliminate the cause of the error (see troubleshooting table) and activate the ERR_RESET input.
OFF	One or more error codes are cleared.	Eliminate the cause of the error (see troubleshooting table) and switch the 24 V supply voltage for the processor unit off and on again.
run	Controller ready.	–

Other malfunctions

The following table lists possible malfunctions which are not indicated.

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.
Motor does not move		
Motor does not follow control	Motor leads interchanged, or one or more motor leads interrupted	
	Motor and positioning controller do not match	Use the proper 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.

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4.3 Repair work

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

Mark all connections when 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 against 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.

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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.**

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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 controlled and depending on the interface configuration:

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

Interface (adapter slot 21 OPT.1)	**Encoder interface (adapter slot 22 OPT.2)**	
Not installed	Not installed	LRS 422 IN
ANOZ	Not installed	LRS 422 IN
RS 232	Not installed	LRS 422 IN
RS 485 LS	Not installed	LRS 422 IN
CAN-Bus (CAN)	Not installed	LRS 422 IN
Interbus-S (IBS)	Not installed	LRS 422 IN
Profibus-DP (PBDP)	Not installed	LRS 422 IN



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

ANOZ	*Analog interface*
CAN	*CAN-Bus interface*
IBS	*Interbus-S interface*
PBDP	*Profibus-DP interface*
RS 232	*Serial interface RS 232*
LRS 422 IN	*Encoder interface RS 422*
RS 485 LS	*Serial interface RS 485*
RS 485 HS	*Serial interface RS 485 for SUCONET*

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6.2 Description of accessories

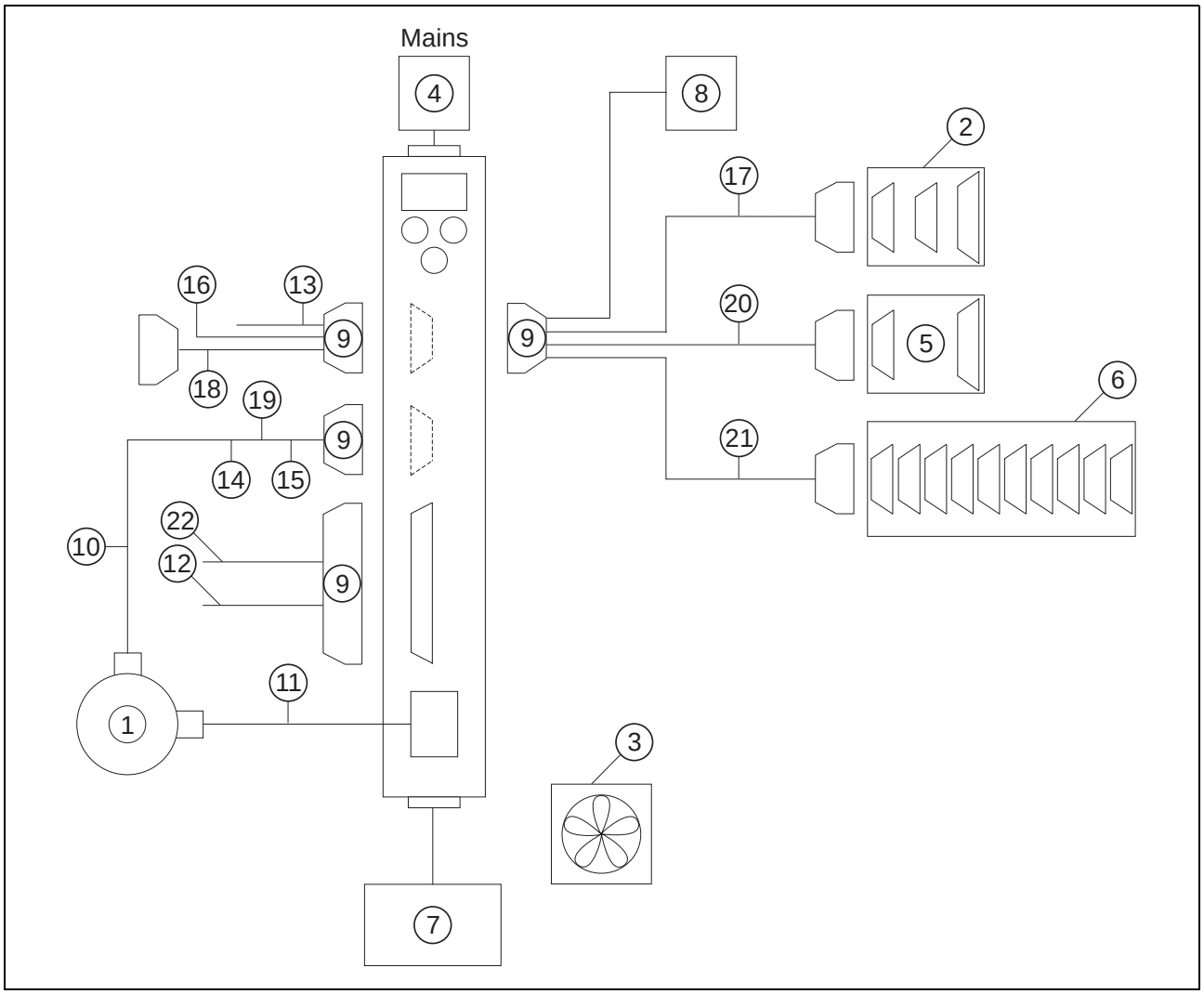


Fig. 6-1 Accessories

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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	MP 927 Interbus-S interface adapter	See On-line Command Processing via Interbus-S documentation
3	Fan for WDP3-014	See chapter 6.2.1
4	Mains filter	See chapter 6.2.2
5	MP 923 interface converter RS 232/RS 485	See chapter 6.2.3
6	MP 924 interface distributor RS 485	See chapter 6.2.4
7	Additional bleed resistor	See chapter 6.2.5
8	Profibus-DP bus terminal or adapter	–
9	Set of connectors (all sub-D connectors)	–
	Non-terminated cables	See sales documentation
10	Cable for encoder	
11	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	
12	Signal cable for signal connection	
13	Signal cable for adapter slot OPT.1	
14	Signal cable (encoder) for adapter slot OPT.2	
15	Signal cable (pulse, direction) for adapter slot OPT.2	
	Ready-made cables	
16	ANOZ/customer signal cable, terminated on device end	
17	Interbus-S/MP 927 signal cable, terminated on both ends	
18	RS 232/PC signal cable, terminated on both ends	
19	RS 422 IN/customer signal cable, terminated on device end	
20	RS 485 LS/MP 923 signal cable, terminated on both ends	
21	RS 485 LS/MP 924 signal cable, terminated on both ends	
22	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 of the WDP3-01X positioning controller for the accessory order numbers.

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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.

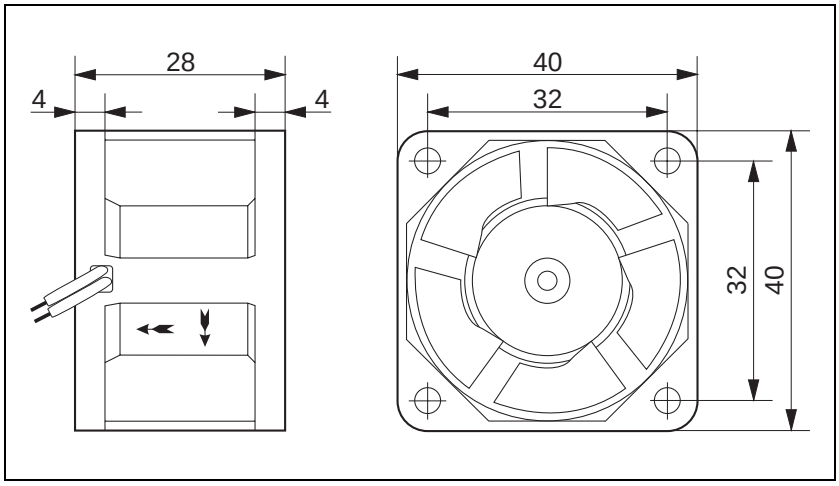


Fig. 6-2 Fan

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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.

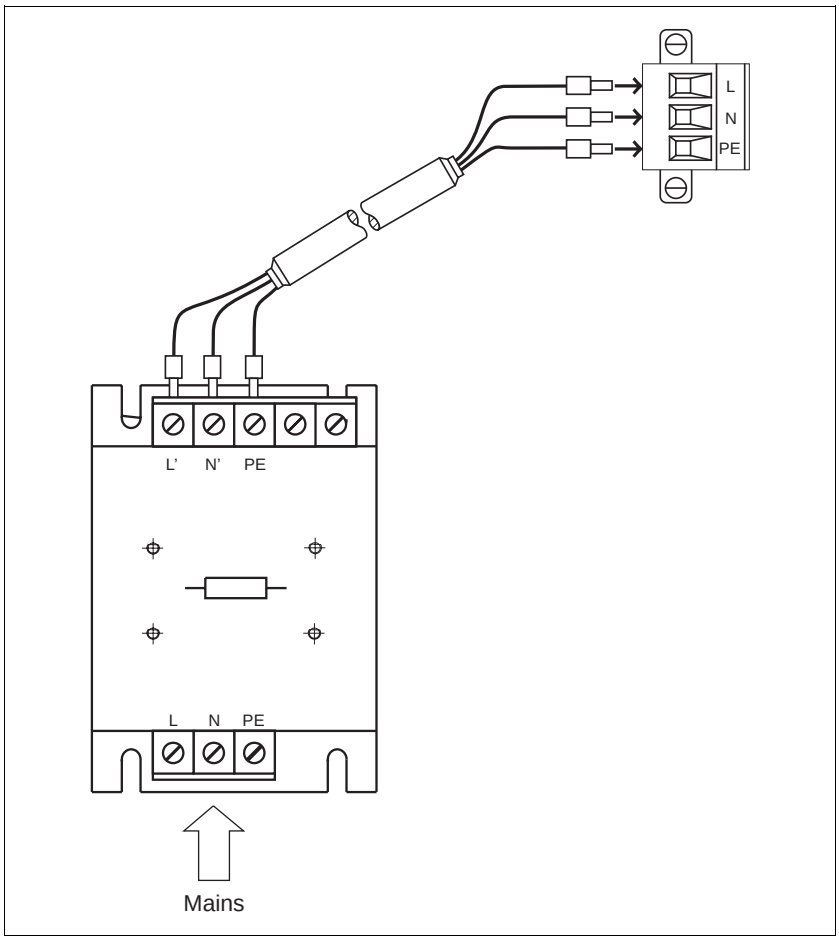


Fig. 6-3 Mains filter

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%

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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%

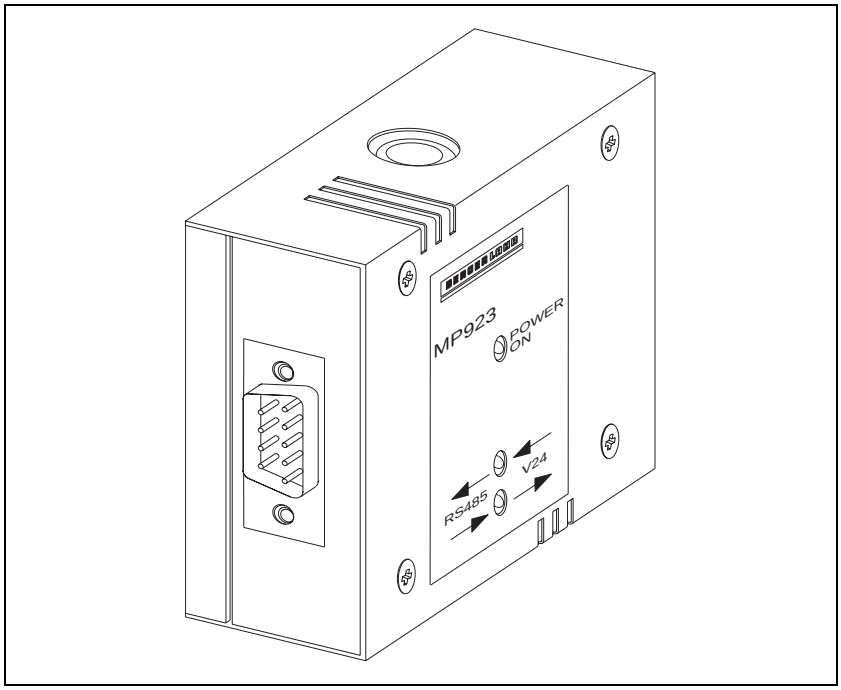


Fig. 6-4 MP 923 interface converter

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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 ($\overline{\text{TxD}}$) and RxD ($\overline{\text{RxD}}$) 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

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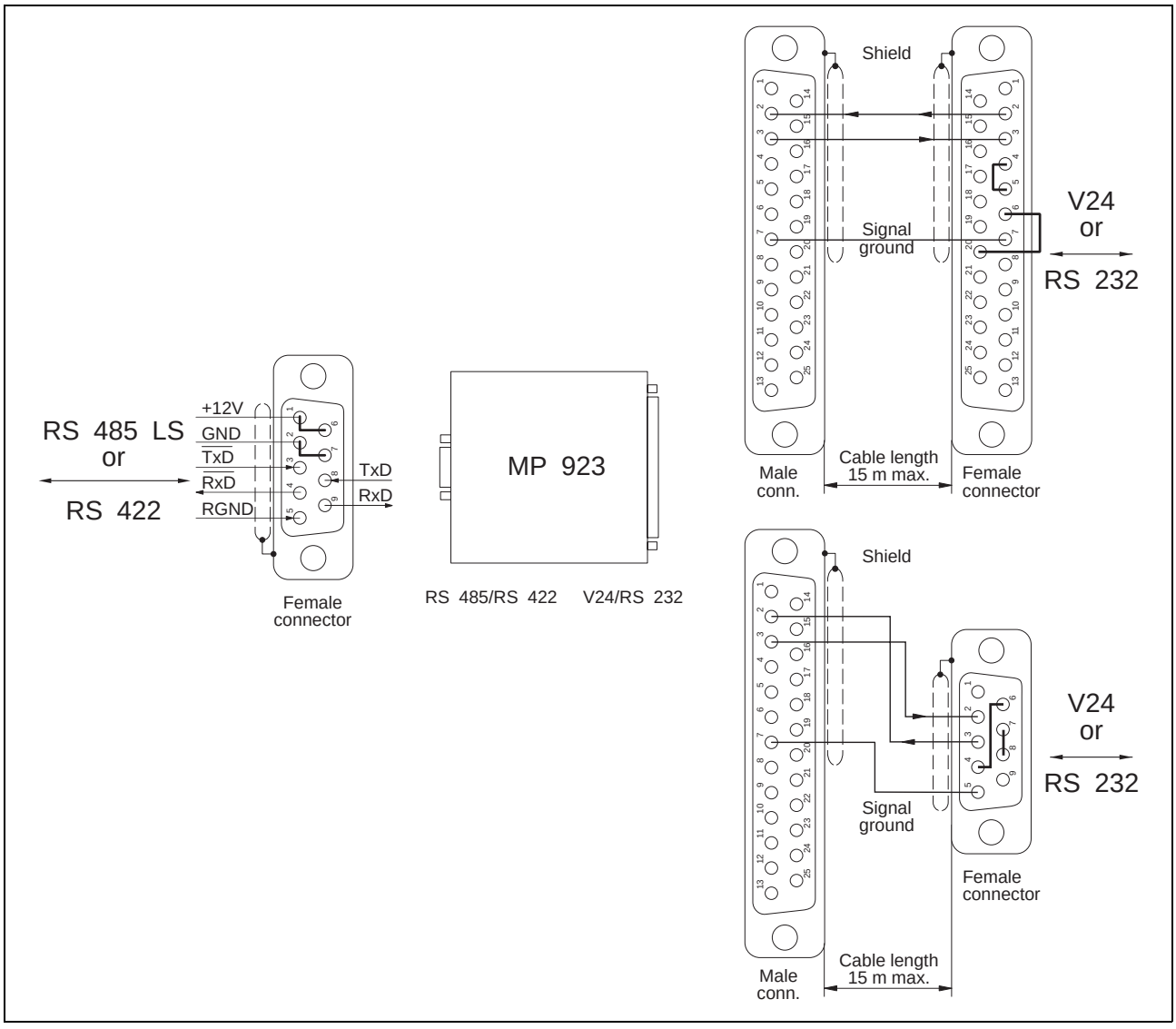


Fig. 6-5 MP 923 interface converter setup

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6.2.4 MP 924 interface distributor

6.2.4.1 General description

Up to nine networkable BERGER LAHR units can be controlled from one PC when using an MP 924 interface distributor. If more than nine units are planned to be used in a network, several MP 924 interface distributors must be combined.

6.2.4.2 Technical data

Electrical data

10 serial interfaces	RS 485 LS (RS 422)

Mechanical data

Dimensions	approx. 205 x 80 x 32 mm
Weight	approx. 260 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%

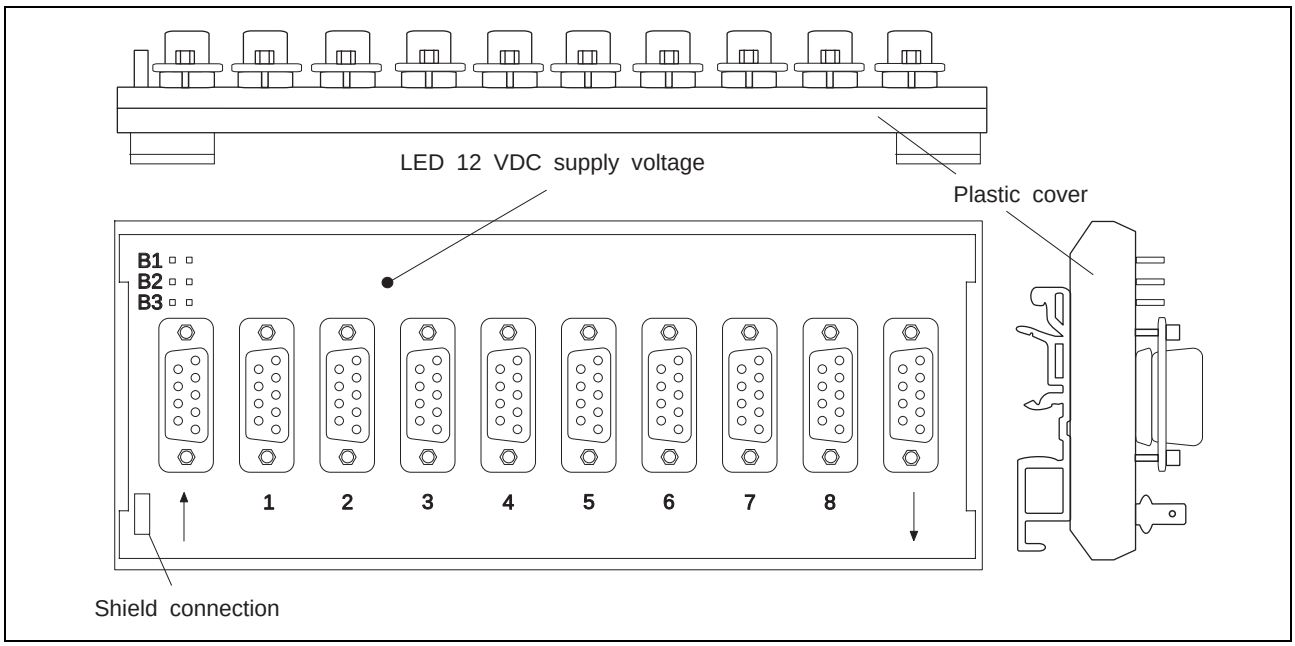


Fig. 6-6 MP 924 interface distributor

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6.2.4.3 Setup

1. Wire the MP 924 interface distributor in accordance with fig. 6-7. For interface conversion RS 232 ↔ RS 485 (RS 422), use the MP 923 interface converter (see chapter 6.2.3).

ATTENTION
The interface cables must be shielded on both ends (connect shield on MP 924 to protective ground).

ATTENTION
Never connect a terminator.

2. If several MP 924 interface distributors are used, combine them as illustrated in fig. 6-7.

3. Set the connected units to network mode and switch them on.

ATTENTION
The same baud rate must be set on all units for network mode.

ATTENTION
When using an MP 923 interface converter, at least one unit attached to the first MP 924 interface distributor must be switched on in order to ensure that power is supplied to the MP 923.

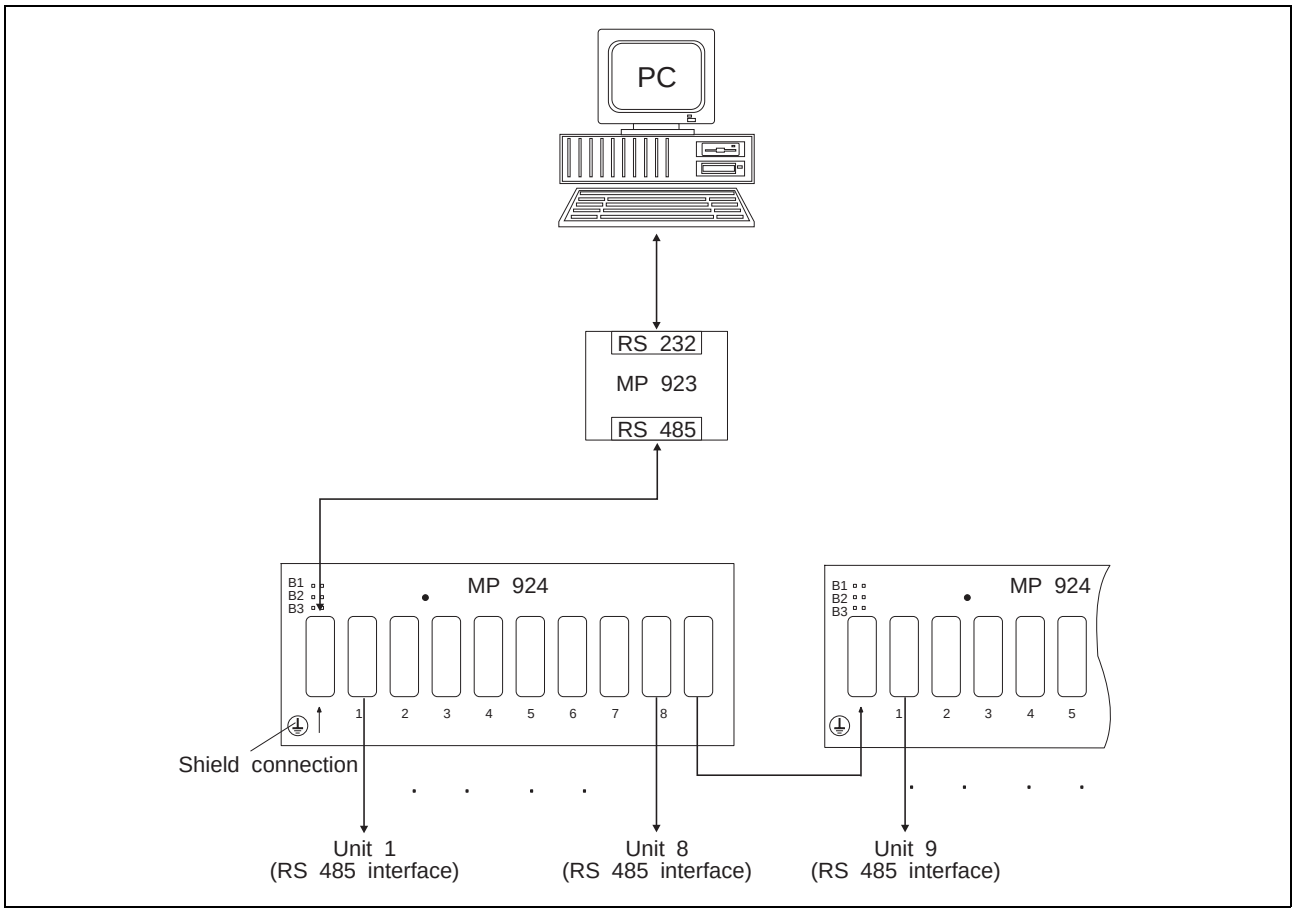


Fig. 6-7 MP 924 interface distributor setup

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6.2.5 Additional bleed resistor (only at units < RS40)

The additional bleed resistor FZP 200 (180 ohms, 150 W) can be used for dissipating a larger amount of braking energy (fig. 6-8).

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.

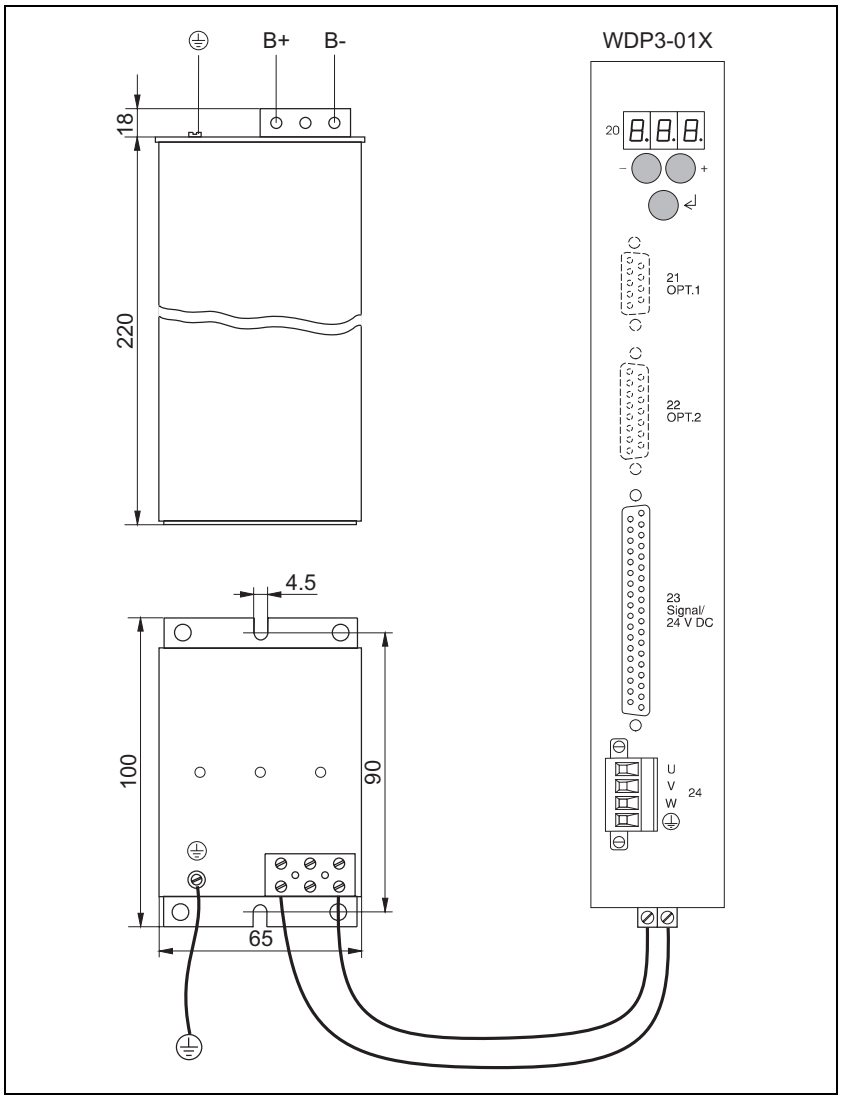


Fig. 6-8 Additional bleed resistor

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6.3 Glossary

A/B Encoder signals
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.

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).

Command
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).

Error memory
Runtime errors are written to the controller's error memory and indicated in the controller's status display.

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

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Incremental (relative) dimensions

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

Input/output

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

Interbus-S network

Standardized field bus for data exchange in automation technology. The Interbus-S standard can be used for interconnecting several devices from different manufacturers and with different functionality through one uniform interface.
An Interbus-S network consists of a central master and up to 256 slaves. The slaves are connected to the master by a serial cable in a ring topology. Data exchange is effected by a cyclic transmission method.

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 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 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.

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Profibus-DP network

Standardized field bus for data exchange in automation technology. The Profibus-S standard can be used for interconnecting several devices from different manufacturers and with different functionality through one uniform interface.

A Profibus-DP network may consist of several masters and several slaves. Data exchange is effected by a cyclic transmission method.

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 (incremental) 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.

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6.4 Abbreviations

AC	Alternating Current
ANOZ	Analog interface
ASCII	American Standard Code for Information Interchange
CAL	CAN Application Layer
CAN	CAN-Bus interface
CMOS	Complementary Metal-Oxide Semiconductor
DC	Direct Current
DP	Decentralized peripheral equipment
E	Encoder
FI	Fault current
HU	Height unit
I	Input
IBS	Interbus-S interface
I/O	Input/output
LED	Light Emitting Diode
M	Motor
PBDP	Profibus-DP interface
PC	Personal Computer
PELV	Protected Extra Low Voltage
PLC	Programmable Logic Controller
Q	Output

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8 Corrections and additions

At present there are no corrections or additions.

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