8064284

DC motor controller

MPS®
Components

Kurzanleitung
Getting started
Descripción resumida
Description sommaire

Festo Didactic
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Table of contents

1 General prerequisites for operating the devices

General requirements for safe operation of the devices:

- National regulations for operating electrical systems and equipment must be observed in commercial facilities.
- The laboratory or classroom must be overseen by a supervisor.
  - A supervisor is a qualified electrician or a person who has been trained in electrical engineering, knows the respective safety requirements and safety regulations and whose training has been documented accordingly.
- Maximum permissible current loads for cables and devices must not be exceeded.
  - Always compare the current ratings of the device, the cable and the fuse.
  - If these are not the same, use a separate upstream fuse in order to provide appropriate overcurrent protection.
- Devices with an earth terminal must always be grounded.
  - If an earth connection (green-yellow laboratory socket) is available, it must always be connected to protective earth. Protective earth must always be connected first (before voltage), and must always be disconnected last (after voltage).

The laboratory or the classroom must be equipped with the following devices:

- An emergency-off device must be provided.
  - At least one emergency-off device must be located within, and one outside of the laboratory or the classroom.
- The laboratory or classroom must be secured so that operating voltage and compressed air supply cannot be activated by any unauthorized persons, for example with:
  - Key switches
  - Lockable shut-off valves
- The laboratory or classroom must be protected by residual current devices (RCDs).
  - Type B residual current circuit breakers with a residual current of $\leq$ 30 mA
- The laboratory or classroom must be protected by overcurrent protection devices.
  - Fuses or circuit breakers
- The laboratory or classroom must be overseen by a supervisor.
  - A supervisor is a qualified electrician or a person who has been trained in electrical engineering, knows the respective safety requirements and safety regulations and whose training has been documented accordingly.
- No damaged or defective devices may be used.
  - Damaged devices must be banned from further use and removed from the laboratory or classroom.
  - Damaged connecting cables, pneumatic tubing and hydraulic hoses represent a safety risk and must be removed from the laboratory or classroom.

2 Pictograms

This document and the hardware described herein include warnings about possible hazards which may arise if the system is used incorrectly. The following pictograms are used:

Warning
This pictogram indicates that non-observance may result in serious personal injury or damage to property.

3 Use for intended purpose

The stations, modules and components of the Modular Production System may only be used:

- For their intended purpose in teaching and training applications
- When their safety functions are in perfect condition

The stations, modules and components are designed in accordance with the current state of technology as well as recognized safety rules. However, life and limb of the user and third parties may be endangered and the components may be impaired if they are used incorrectly.

The learning system from Festo Didactic has been developed and produced exclusively for basic and further training in the field of automation technology. The training company and/or trainers must ensure that all trainees observe the safety precautions described in this workbook.

Festo Didactic hereby excludes any and all liability for damages suffered by trainees, the training company and/or any third parties, which occur during use of the device in situations which serve any purpose other than training and/or vocational education, unless such damages have been caused by Festo Didactic due to malicious intent or gross negligence.

4 For your safety

4.1 Important information

Fundamental prerequisites for safe use and trouble-free operation of the MPS® include knowledge of basic safety precautions and safety regulations. This manual includes the most important instructions for safe use of the MPS®.

In particular, the safety precautions must be adhered to by all persons who work with the MPS®.
In addition, all pertinent accident prevention rules and regulations, which are applicable at the respective place of use, must be adhered to.

4.2 Obligations of the operating company

The operating company undertakes to allow only those persons to work with the MPS® who:

- Are familiar with the basic regulations regarding work safety and accident prevention and have been instructed in the use of the MPS®
- Have read and understood the chapter concerning safety and the warnings in this manual.

Personnel should be tested at regular intervals for safety-conscious work habits.

4.3 Obligations of the trainees

All persons who have been entrusted to work with the MPS® undertake to complete the following steps before beginning work:

- Read the chapter about safety and warnings in this manual
- Familiarize themselves with the basic regulations regarding work safety and accident prevention

4.4 Dangers associated with the modular production system

The MPS® is designed in accordance with the latest technology and recognized safety rules. However, life and limb of the user and third parties may be endangered and the machine or other property may be damaged during their use.

The MPS® may only be used:

- For its intended purpose
- When its safety functions are in perfect condition.

Malfunctions which may impair safety must be eliminated immediately!

5 Work and safety instructions

General safety

- Trainees should only work with the circuits under the supervision of an instructor.
- Electrical devices (e.g. power packs, compressors and hydraulic units) may only be operated in training rooms that are equipped with residual current devices (RCDs).
- Observe the specifications included in the technical data for the individual components, and in particular all safety instructions!
- Malfunctions which might impair safety must not be generated when the device is operated for training purposes.
- Wear personal safety equipment (safety glasses, safety shoes) when working on circuits.

Mechanical safety

- Switch off the power supply!
  - Switch off working and control power before working on the circuit.
  - Only reach into the setup when it's at a complete standstill.
  - Be aware of potential overtravel times for the drives.
- Mount all of the components securely on the profile plate.
- Make sure that limit valves are not actuated from the front.
- Risk of injury during troubleshooting!
  Use a tool such as a screwdriver to actuate limit switches.
- Set all components up so that it's easy to activate the switches and interrupters.
- Follow the instructions about positioning the components.

Electrical safety

- Disconnect from all sources of electrical power!
  - Switch off the power supply before working on the circuit.
  - Please note that electrical energy may be stored in individual components. Further information on this issue is available in the data sheets and operating instructions included with the components.
- Use protective extra-low voltage only: max. 24 V DC.
- Establishing and disconnecting electrical connections
  - Electrical connections may only be established in the absence of voltage.
  - Electrical connections may only be disconnected in the absence of voltage.
- Maximum permissible current loads for cables and devices must not be exceeded.
  - Always compare the current ratings of the device, the cable and the fuse.
  - If these are not the same, use a separate upstream fuse in order to provide appropriate overcurrent protection.
- Use only connecting cables with safety plugs for electrical connections.
- When laying connecting cables, make sure they are not kinked or pinched.
- Do not lay cables over hot surfaces.
  - Hot surfaces are identified with a corresponding warning symbol.
- Make sure that connecting cables are not subjected to continuous tensile loads.
- Devices with an earth terminal must always be grounded.
  - If an earth connection (green-yellow laboratory socket) is available, it must always be connected to protective earth. Protective earth must always be connected first (before voltage), and must always be disconnected last (after voltage).
  - Some devices have a high leakage current. These devices must be additionally grounded with a protective earth conductor.
- The device is not equipped with an integrated fuse unless specified otherwise in the technical data.
- Always pull on the plug when disconnecting connecting cables; never pull the cable.

6 Technical data

6.1 General specifications

Parameter	Value
Nominal voltage	24 V DC ±10%, safety extra-low voltage (SELV, PELV)
Typical quiescent current	50 mA
Max. power consumption	Approx. 100 W
Continuous motor current	4 A DC
Control inputs , logic 1	10 ... 24 V DC
Control inputs , logic 0	0 ... 4 V DC
Analog input	0 ... 10 V DC, 24 V tolerant, input resistance: approx. 100 kΩ
Reverse polarity protection / short circuit detection	Yes / yes
Overvoltage protection	Yes
Temperature monitoring	Yes
Digital “ready for operation” output	High active, 24 V / 0.7 A, short-circuit proof
Ambient temperature	5 ... 40° C
Max. relative humidity	95%, non-condensing
Operating environment:	Indoor use only, up to 2000 m above sea level
Weight	75 g
Dimensions (W x H x D):	22.5 x 70.4 x 85.0 mm
CE marking per	EMC directive: class B interference emission, class A interference immunity RoHS directive
Subject to change	

Supply must be provided by a power pack with energy limiting, for example Festo Didactic’s tabletop power pack. The recommended wire cross-section is 0.5 to 1.0 sq. mm.

6.2 Notes concerning commissioning and operation

-  **Mortal danger**
  After switching on, do not touch any voltage conducting parts! The motor controller may only be operated with safety extra-low voltage!

  When operated with extra-low voltage (e.g. from a compensator transformer), injury or death may occur!

- **Maximum operating values**
  Maximum operating values may not be exceeded.
- **Installation**
  Installation and commissioning may only be conducted by qualified personnel. All affected components must be deenergized.
- **Commissioning**
  The motor must be operated without load for initial start-up.
- **Fire safety**
  The module must be mounted on a nonflammable surface.
  The module must be protected by a back-up fuse which matches the specified nominal data.
- **Applications**
  The module may only be used for its intended purpose.
  Other components must be checked with regard to approvals and applicable regulations.
- **EMC**
  Motor cables with a length of less than 2 meters do not have to be shielded.
  The module may not be operated in a DC electrical system.
  The module may only be operated with an approved power pack.
- **Repairs**
  Repairs may only be conducted by authorized personnel. Unauthorized opening of the module renders the guarantee null and void and may result in danger for the user and the system.
- **Maintenance**
  The module is laid out for wear-resistant use. Good ventilation must be ensured.

7 Layout and function

The motor controller is for use with DC brush motors with adjustable overcurrent monitoring. A status output indicates the states “ready for operation” and “error”.

External speed selection is made possible by an analog input. If a voltage of greater than 11.5 V (24 V) is connected to the analog input, the motor controller’s internal speed setting function is used.

The motor controller offers the following functions:

- Control of 24 V / 4 A motors
- Counterclockwise/clockwise rotation
- Speed control (internal/external)
- Overcurrent shutdown
- Short-circuit detection
- Quick stop
- Limit switch detection

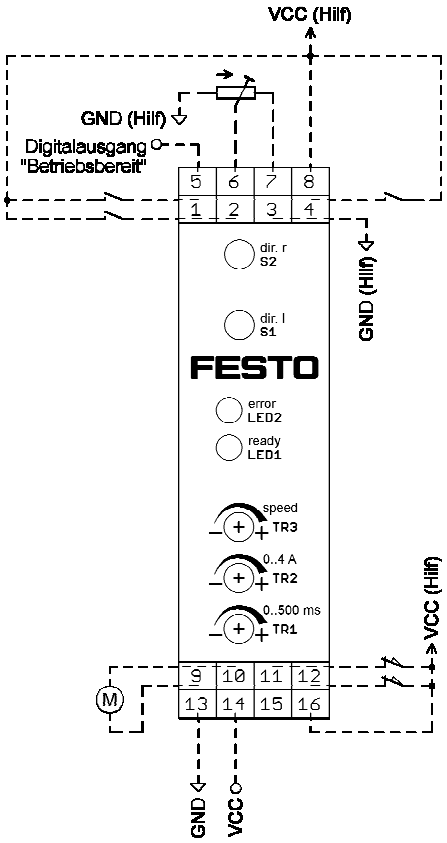
The motor controller can be mounted on a 35 mm top-hat rail. The motor controller has a width of 22.5 mm.

8 Terminal allocations

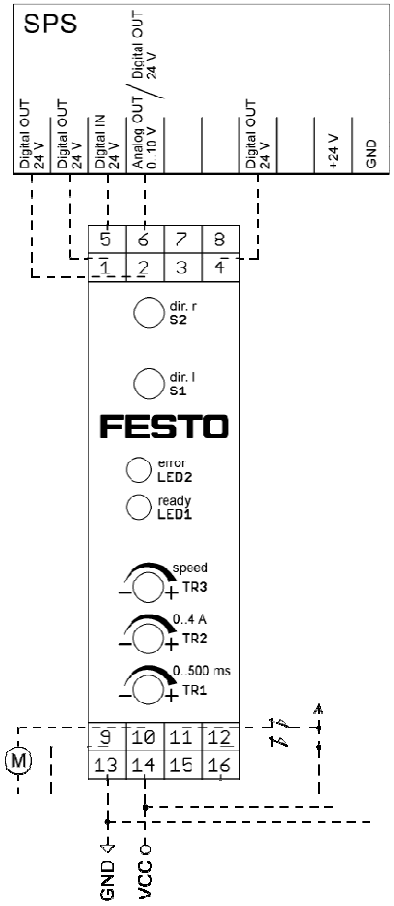
Terminal	Function
1	Digital input, “counterclockwise rotation” (switching to P potential)
2	Digital input, “clockwise rotation” (switching to P potential)
3	GND for external potentiometer, max. 0.5 A
4	Digital input, “creep speed” (switching to P potential)
5	Digital output, “ready for operation”, high active
6	Analog input, 0 ... 12 V, the speed specified by the internal potentiometer applies at greater than 11 V.
7	Auxiliary voltage output, +10 V / approx. 50 mA (PTC fuse)
8	Auxiliary voltage output, +24 V, max. 0.5 A
9	Motor connection –
10	Motor connection +
11	Digital input, “enable counterclockwise rotation / acknowledge” (switching to P potential)
12	Digital input, “enable clockwise rotation / acknowledge” (switching to P potential)
13	GND
14	+24 V DC (±10%) in
15	GND
16	+24 V out

9 Connection options

Stand-alone mode



PLC mode



Direction “clockwise” (2)	Direction “counterclockwise” (1)	Limit switch “right” (12)	Limit switch “left” (11)	Motor + (10)	Motor - (9)	Function
1	0	1	X	VCC	⎍ GND	Clockwise rotation
0	1	X	1	⎍ GND	VCC	Counterclockwise rotation
1	1	X	X	GND	GND	Quick stop
0	0	X	X	Open	Open	Stop

Functions table

10 Functions

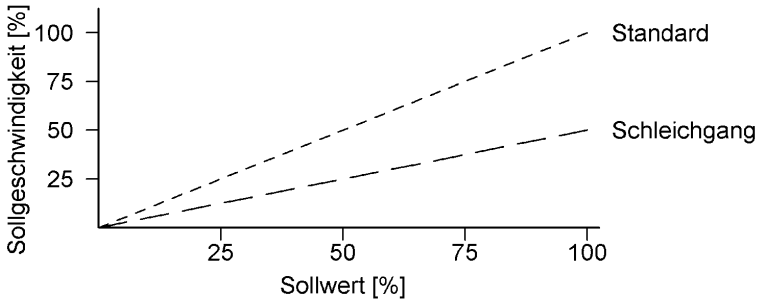
10.1 Speed selection

Various operating modes can be selected via the analog input at terminal 6. Voltage is selected within a range of 0 to 10 V as a percentage from 0 to 100%. If voltage is greater than 11.5 V, the setting at the trimmer (TR3) is used. In the intermediate range, max. PWM (100%) is read out.

Voltage (6)	Speed
› 11.5 V	Internal trimmer (TR3), 0 ... 100%
10 ... 11.5 V	Internal 100%, max. PWM
‹ 10 V	External 0 ... 100%, analog input (6)

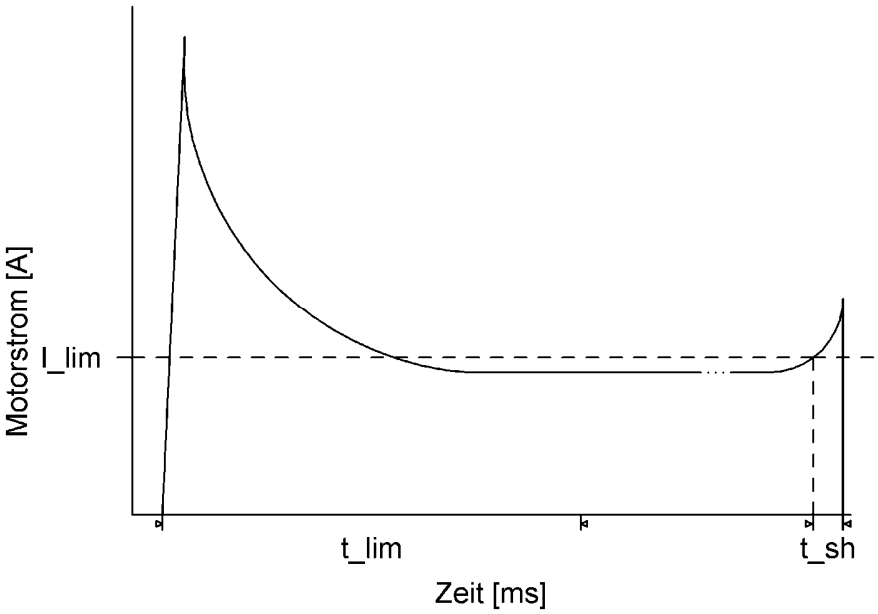
10.2 Creep speed

If the “creep speed” function is active (V_{CC} at terminal 4), the speed setpoint is half of the standard value.



10.3 Overcurrent shutdown

In the event of overcurrent shutdown, maximum permissible current (I_{lim}) at trimmer TR2 and gating time (t_{lim}) at trimmer TR1 for motor start-up can be adjusted. If the selected current value is exceeded after gating time, the outputs are shut down within maximum shutdown time (t_{sh}). Each time the motor is started or the direction of rotation is changed, and each time creep speed mode is deactivated, gating time is restarted.



10.4 Jog mode

The motor can be started with pushbuttons S1 and S2. If the (internal or external) setpoint is zero, the motor is started at full speed. If the setpoint is greater than zero, the motor is started at the setpoint. The limit switches take precedence in either case.

10.5 Quick stop

The quick stop function is activated by simultaneously applying a high signal to the counterclockwise and clockwise terminals. In the event of a quick stop, the motor winding is connected to GND at both terminals. The motor is stopped by means of short-circuit braking.

11 Maintenance and cleaning

The device is maintenance-free. Use a slightly damp, lint-free cloth for cleaning without any abrasive, chemical or solvent-containing cleaning agents.

12 Disposal

Electronic waste contains reusable materials and must not be disposed of with the trash. Bring electronic waste to a designated collection point.

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