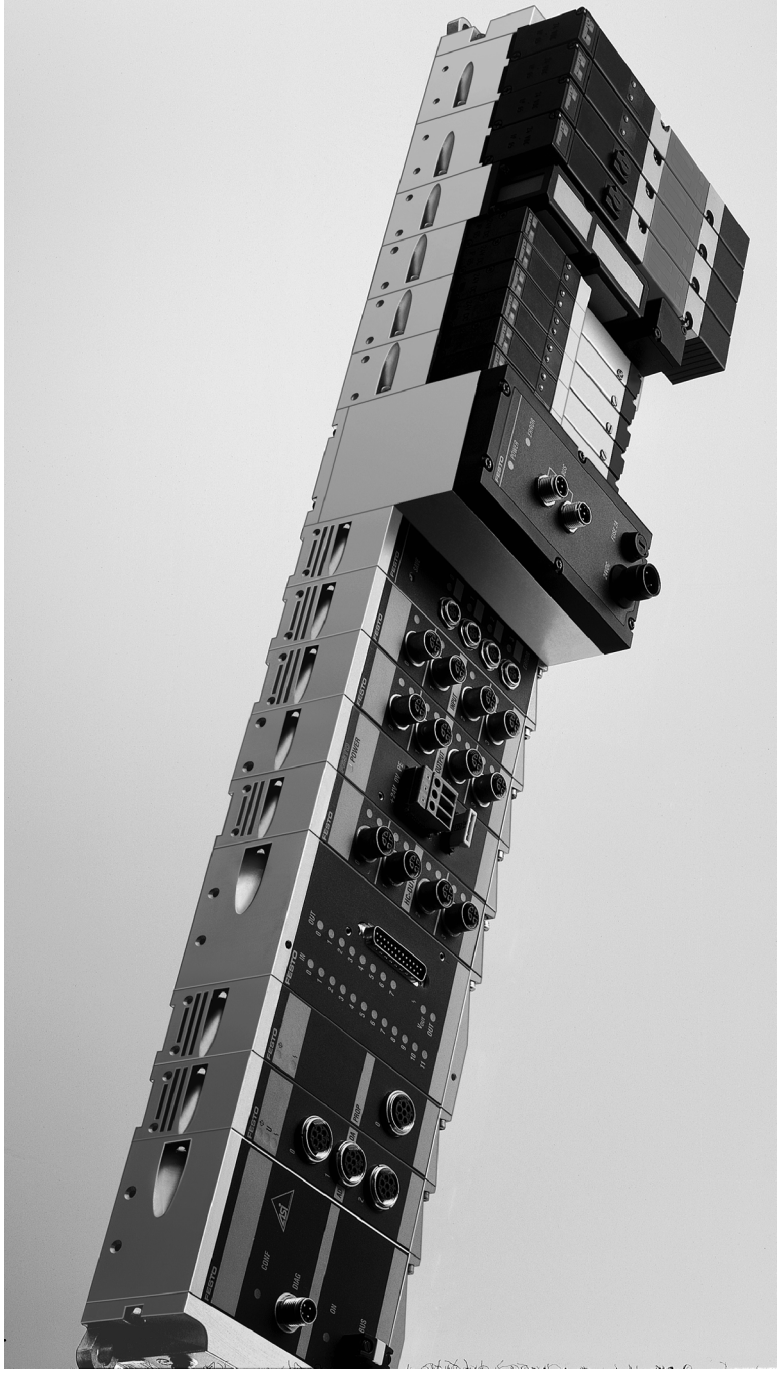
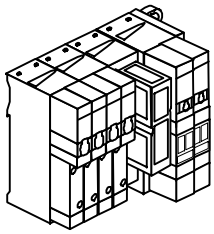
Valve Terminal Type 03



FESTO

User manual
Pneumatics

Valve terminal with
MIDI/MAXI valves
Type IFB..-03



User manual
152 771
en 0005e

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Designation P.BE-MIDI/MAXI-03-EN

Order-no. 152 771

Contents

Designated use

The pneumatic modules described in this manual are intended for use exclusively in connection with Festo valve terminals type 03.

The pneumatic modules may only be used as follows:

– in accordance with designated use

– in faultless technical condition.

– without any modifications by the user

If additional commercially-available components such as sensors and actuators are connected, the specifiedlimits for pressures, temperatures, electrical data, torques, etc. must not be exceeded.

Please observe the standards specified in the relevant chapters and comply with technical regulations, as well as with national and local regulations.

Target group

This manual is intended exclusively for technicians trained in control and automation technology, who have experience in installing, commissioning, programming and diagnosing programmablelogic controllers and field bus systems.

Service

Please consult your local Festo service if you have any technical problems.

Additional modules for this valve terminal

The multifunctional valve terminal can be extended with the following modules:

I/O modules

Type designation	Title
VIGE-03-FB-...	Input module with 4 or 8 inputs, PNP or NPN, 4-pin or 5-pin, with/ without electronic fuse
VIGE-03-FB-16-SUBD-S	Input module with 16 inputs, PNP, 15-pin sub-D connection socket, with electronic fuse
VIGA-03-FB-...	Output module with 4 outputs, PNP or NPN, 4-pin or 5-pin
VIGV-03-FB-...	Additional supply module 24 V/25 A for high-current outputs
VIEA-03-FB-...	Multi I/O module with 12 inputs and 8 outputs, PNP
VIA-03-FB	Analog I/O module with 3 inputs and 3 outputs
VIAP-03-FB	Analog I/O module with 1 input and 1 output
VIASI-03-M	AS-Interface Master

Important user instructions

Danger categories

This manual contains instructions on the possible dangers which may occur if the product is not used correctly. These instructions are marked (Warning, Caution, Please note), printed on a shaded background andmarked additionally with a pictogram. A distinction is made between the following danger warnings:

Warning
... This means that failure to observe this instruction may result in serious personal injury or damage to property.

Caution
... This means that failure to observe this instruction may result in personal injury or damage to property.

Please note
... This means that failure to observe this instruction may result in damage to property.

The following pictogram marks passages in the text which describe activities withelectrostatically sensitive components.

Electrostatically sensitive components may be damaged if they are not handled correctly.

Marking special information

The following pictograms mark passages in the text containing special information.

Pictograms

Information:
Recommendations, tips and references to other information sources.

Accessories:
Information on necessary or sensible accessories for the Festo product.

Environment:
Information on environment-friendly use of Festo products.

Text markings

- The bullet point indicates activities that may be carried out in any order.

1. Figures denote activities which must be carried out in the numerical order specified.

– Hyphens indicate general activities.

Abbreviations

The following product-specific abbreviations are used in this manual:

Abbreviation	Meaning
Component	Common term for valve, adapter plate
Flow control	Flow control plate
FOC	Fibre optic cable
I O I/O	Input Output Input and/or output
I/O module	General module with digital inputs or outputs
Nodes	Fieldbus nodes or control unit SB202, SF202 SB50, SF50
P-module	General pneumatic modules
PLC	Programmable logic controller; abbreviated: controller
Regulator	Pressure regulator valve
Sub-base Single-solenoid sub-base Double-solenoid sub-base	Pneumatic sub-base for two valves Sub-base for single-solenoid valves Sub-base for double-pilot or mid-position valves
Terminal or valve terminal	Valve terminal type 03 with or without electric IOs

Fig. 0/1: List of abbreviations

Please note
A simplified representation of a type 03 valve terminal with four pneumatic sub-bases and four input/output modules (standard fitting) has been used for most drawings in this manual.

1 Input/output modules

2 Fieldbus nodes

3 Valves

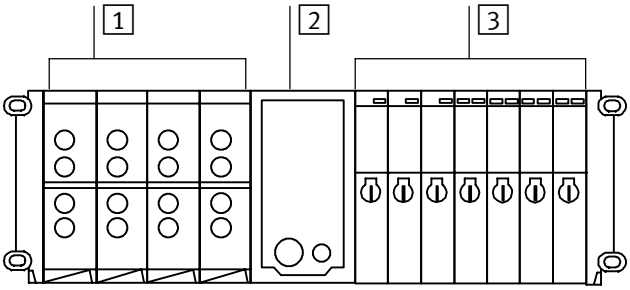


Fig. 0/2: Standard fitting for the drawings

Manuals on this valve terminal

The current manual describes the following pneumatic modules:

Product	Design/equipment	Number of valve locations
Valve terminal type 03	MIDI/MAXI valves with separate auxiliary pilot air (18 mm; NW 4.0/25 mm; NW 7.0) – Single-solenoid valves – Double-pilot valves – Mid-position valves, blocked, pressurized, exhausted	 2...26 2...13 2...13
	Pressure (auxiliary) feed Pressure feed adapter Pressure regulator and flow control plate Pressure zone feed End plate with regulator	

Fig. 0/3: Pneumatic modules type 03

The manual includes a technical annex with the technical data for the pneumatic components of the valve terminal.
For information regarding power supply and the electric modules of the valve terminal type 03, look at the appropriate electronics manual for the valve terminal.

Depending on what you have ordered and on the further extension of your complete system, the following Festo manuals are necessary for the complete documentation of the modular valve terminal:

Festo designation	**Title/product**
P.BE-VIISO-04-B-...	Pneumatics manual – Valve terminal type 04-B, ISO 5599-2 (this manual)
P.BE-VIEA-03...	Supplementary description for I/O modules (digital I/O modules 4I, 8O, 4O, high-current output modules, multi I/O modules)
P.BE-VIAX-03...	Analog I/O manual
P.BE-VIASI-03...	AS-i Master manual
P.BE-VIFB..-03...	Electronics manual *) (for the fieldbus connection) *) Available fieldbus nodes: FB1-FB17, SB50, SB60, SB202, SF3, SF50, SF60, SF202

Summary of components

Chapter 1

Contents

1.1 Overview of multi-functional Festo valve terminals

The multi-functional valve terminal is composed of individual modules and components.

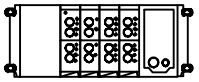
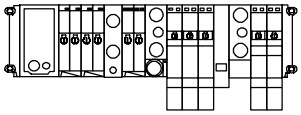
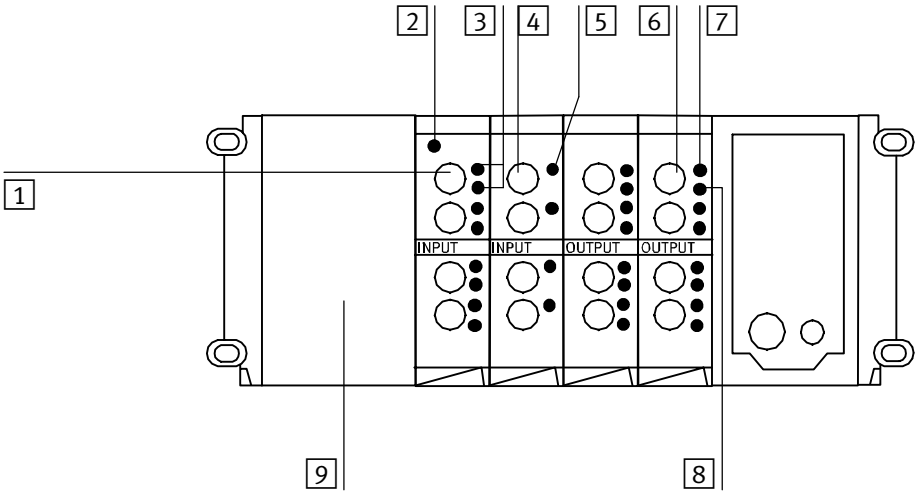
Valve terminal	Description of the modules
Type 03 Electric modules 	Electric modules suitable for type 03/04B (PNP or NPN), fitted with: – digital inputs (modules with 4, 8 or 16 inputs) – digital outputs (modules with 4 outputs), 0.5 A – high-current outputs 2 A – multi-I/Os (modules with 12I/8O), 0.5 A – analog I/Os, AS-i-Master (not possible with all nodes)
Type 03 Pneumatic modules 	Pneumatic modules, type 03, fitted with: – Sub-bases (MIDI and MAXI), equipped with 5/2 solenoid valves, 5/2 double-pilot valves, 5/3 mid-position valves (with auxiliary pilot air) or cover plates – Special modules for pressure (auxiliary) feed, pressure zone formation, pressure regulation and flow control. – End plate right, with/without integrated regulator or with/without pneumatic common line connections

Fig. 1/1: Overview of modules in the multi-functional Festo valve terminals

1.2 Component description

1.2.1 Type 03/04-B: Electric modules

You will find the following connecting and display elements on the electric modules: Further details can be found in the manual for the node. Only the pneumatic modules are described below.



1 Input socket for two electric inputs (PNP or NPN)

2 Red LED (error display for input module with electronic fuse)

3 Two green LEDs (one LED for each input)

4 Input socket for one electric input (PNP or NPN)

5 Green LED (per input)

6 Output socket for electric output (PNP)

7 Yellow LED (status display for output)

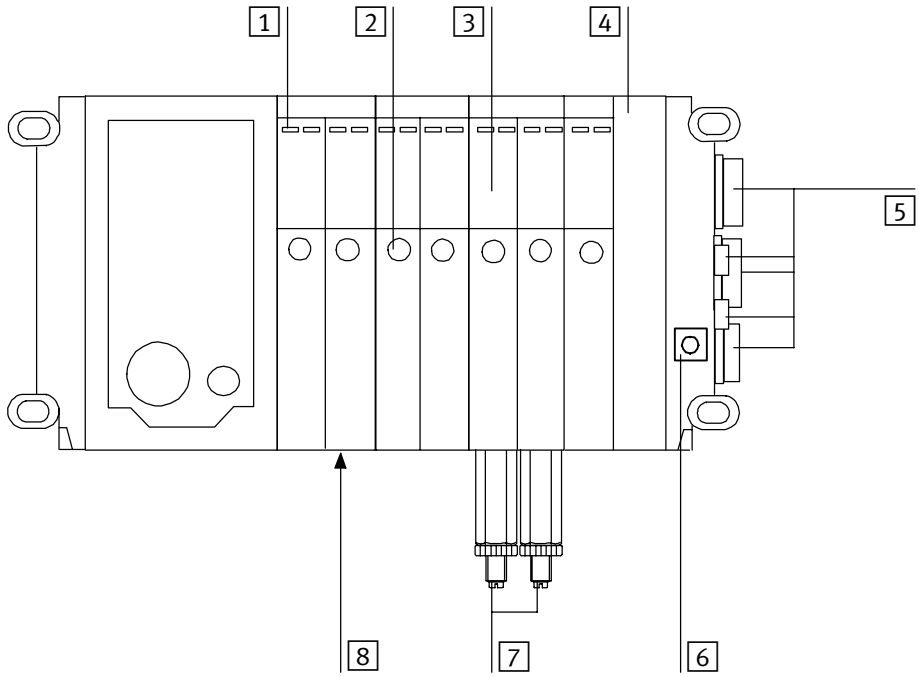
8 Red LED (error display per output)

9 Further modules (e.g. auxiliary power supply, high-current outputs PNP/ NPN)

Fig. 1/2: Connecting and display elements of the electric modules

1.2.2 Type 03: MIDI pneumatic modules

The following connecting, display and operating elements are located on the components of the pneumatic MIDI modules:



1 Yellow LEDs (for each valve solenoid coil)

2 Manual override (for each valve solenoid coil)

3 Valve location inscription field

4 Vacant valve location with cover plate

5 Common line connections

6 Regulator

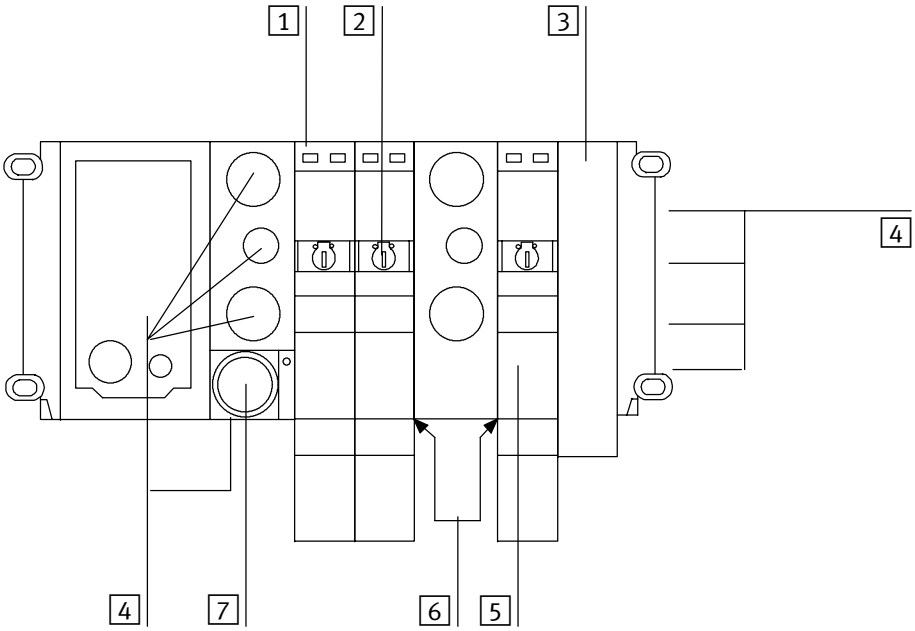
7 Pressure regulator screw

8 Working connections (2 per valve opposite each other)

Fig. 1/3: Connections, display and operating elements of the MIDI module

1.2.3 Type 03: MAXI pneumatic modules

The following connecting, display and operating elements are located on the components of the pneumatic MAXI modules type 03:



1 Yellow LED (for each valve solenoid coil)

2 Manual override (for each valve solenoid coil), non-locking or locking option

3 Vacant valve location with cover plate

4 Common line connections

5 Valve location inscription field (designation signs)

6 Working connections 2, 4 (2 per valve opposite each other)

7 Regulator for limiting the pressure of auxiliary pilot air

Fig. 1/4: Connections, display and operating elements of the MAXI module type 03

A multipin node with integrated left end plate can also by used as an alternative for electrical connection.

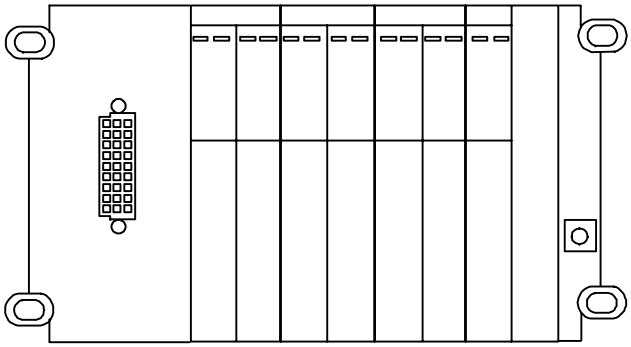


Fig. 1/5: Alternative for electrical connection:
Integrated (left) end plate

1.3 Combination options valve/sub-base

Please note
The valve locations are provided for Festo valves of the corresponding size and may only be equipped with valves authorised by Festo.

Any other use of the valve locations is not permitted.

MIDI-Valves

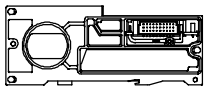
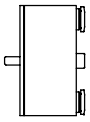
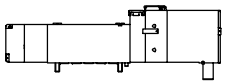
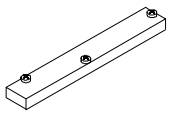
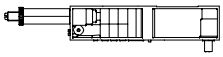
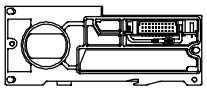
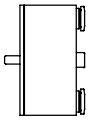
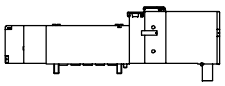
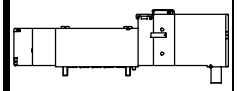
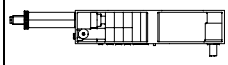
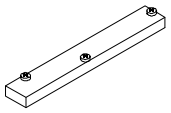
Sub-base used	**Optional auxiliary plate**	**Valve**	**Valve alternative**
Single-solenoid sub-base VIGM-03-4,0 	Flow control plate IGR-03-...-QS6 	5/2-way valve, single-solenoid, MT2H-5/2-4,0-... 	Cover plate IAP-03-4,0 
	Pressure regulator plate ILR-03-...-4,0 		
Double-solenoid sub-base VIGI-03-4,0 	Flow control plate IGR-03-...-QS6 	5/2-way valve,- double-solenoid, JMT2H-5/2-4,0-... or 5/3-way valve, mid-position G, E, B MT2H-5/3.-4,0-... 	5/2-way valve, single-solenoid, MT2H-5/2-4,0-... 
	Pressure regulator plate ILR-03-...-4,0 		Cover plate IAP-03-4,0 

Fig. 1/6: Combination options - valve/sub-base – MIDI

MAXI-Ventile

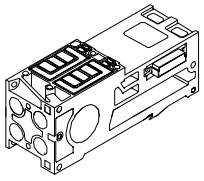
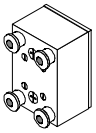
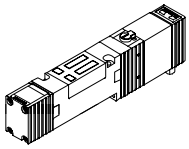
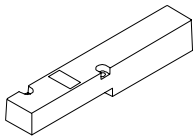
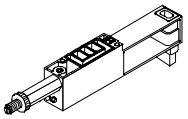
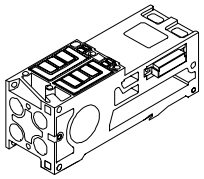
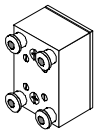
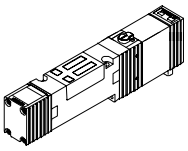
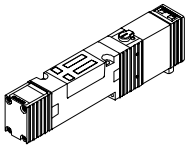
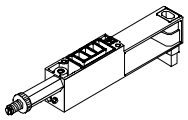
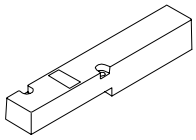
verwendeter Anschlussblock	mögliche Zusatzplatte	Ventil	Ventil-Alternative
Single-solenoid sub-base VIGM-03-7,0 	Flow control plate IGR-03-...-QS8 	5/2-way valve, single-solenoid, MTH-5/2-7,0-... 	Cover plate IAP-03-7,0 
	Pressure regulator plate ILR-03-...-7,0 		
Double-solenoid sub-base VIGI-03-7,0 	Flow control plate IGR-03-...-QS8 	5/2-way valve,- double-solenoid, JMTH-5/2-7,0-... or 5/3-way valve, mid-position G, E, B MTH-5/3.-7,0-... 	5/2-way valve, single-solenoid MTH-5/2-7,0-... 
	Pressure regulator plate ILR-03-...-7,0 		Cover plate IAP-03-7,0 

Fig. 1/7: Combination options - valve/sub-base – MAXI

1.4 Method of operation

The nodes carry out the following functions:

– Connection of the terminal to the respective fieldbus and power supply.

– System settings of the terminal: Settings can be made for automatic valve test and other node-dependent functions.

– Control of data transfer to/from the fieldbus interface components of the control system.

– Internal control of the terminal.

1 Incoming fieldbus

2 Continuing fieldbus

3 Node

4 Compressed air

5 Work air (2, 4)

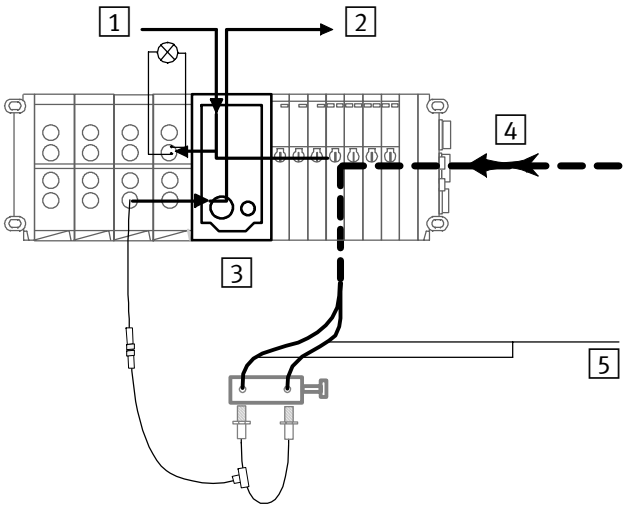


Fig. 1/8: Function overview of a valve terminal

Further information regarding nodes can be found in the respective valve terminal manual “Electronics manual”.

The input modules carry out the processing of input signals (e.g. from sensors) and forward these signals via the fieldbus to the control system.

The output modules are universal electric outputs and control small consumers with positive logic, e.g. other valves, lamps, etc.

Additional I/O modules for special applications are also available.

Further information about the use of all I/O modules can be found in the “Supplementary manual for I/O modules” in the valve terminal manual.

The pneumatic modules provide the following connections:

– common ducts for supply and exhaust air

– electric signals for all solenoid valve coils

Each individual pneumatic module is fitted with the working connections 2 and 4 for all valve locations.

The valves are supplied with compressed air and their exhaust and pilot exhaust air is ducted away via the common ducts of the valves. Two designs are available for supplying the S-valves with auxiliary pilot air:

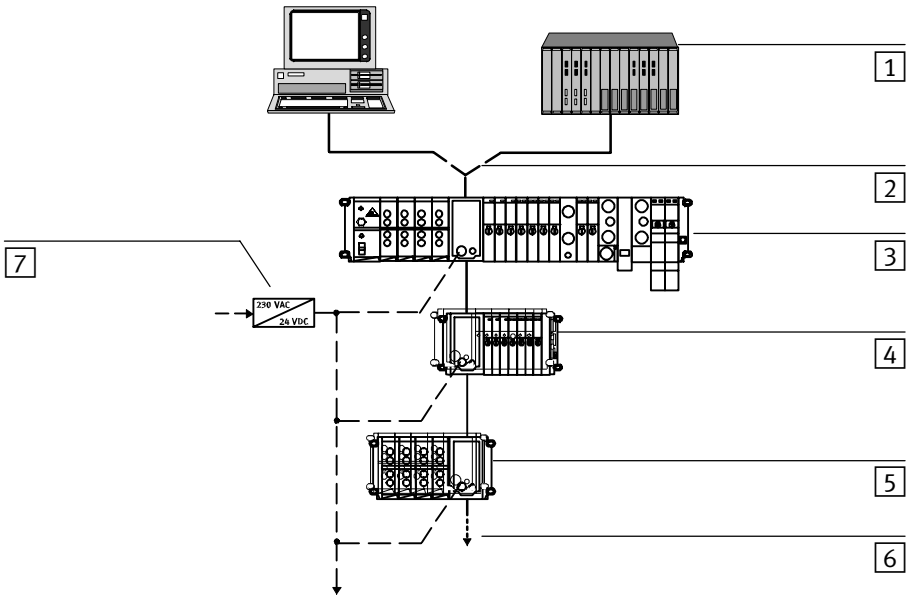
– internal auxiliary pilot air branched off from the complete supply. This requires an end plate with regulator

– external auxiliary pilot air, separately pressure regulated (4...6 bar)

Other modules for pressure feed are available as supplements to, e.g. work at different working pressures.

1.5 System structure

Festo can support you in solving your automation requirements at machine level with their valve terminals. The type 03 valve terminals are modular in construction and permit combinations of pneumatic and electronic modules so that the following groupings are possible in a fieldbus:



1 PC or PLC with interface

2 Field bus

3 Valve terminal type 03: pneumatic and electrical modules

4 Valve terminal type 03: electric modules only

5 Valve terminal type 03: pneumatic modules only

6 Other fieldbus slaves

7 Power unit for fieldbus slave

Fig. 1/9: System structure with valve terminal

The valve terminal type 03 with fieldbus connection offers the following advantages:

- variable equipment with electric inputs and outputs and pneumatic valve locations
- subsequent expansion/conversion possible
- application-specific valve designs
  MIDI valve series, 18 mm wide
  MAXI valve series, 25 mm wide
- various control systems can be connected
- low wiring requirement
- more transparent system layout by spatial separation of control system and machines
- pre-mounted valves
- wired valve solenoid coils
- central air supply
- central exhaust
- tested unit

A fieldbus system provides the following advantages:

- reduces output components in the control system
- cost-effective data transmission across greater distances
- higher data transmission rate
- connection of a greater number of slaves
- simplified error diagnosis

Fitting

Chapter 2

Contents

2.1 Installing the modules and components

Warning
Before carrying out installation or maintenance work, switch off the following:

- the compressed air supply
- the load voltage supply (pin 2)

You can thereby avoid:

– uncontrolled movements of loose tubing.

– unexpected movements of the connected actuators.

– non-defined switching states of the electronic components.

The valve terminal is delivered fully assembled from the factory. If you wish to add or replace individual modules and components, please note the following manuals:

– “Supplementary manual for IO modules” for fitting the electric IO modules

– “Pneumatics manual” for fitting the pneumatic modules

– For modules and components ordered at a later date, see the installation instructions in the accompanying product leaflet.

Please note
Handle the modules and components of the valve terminal carefully. Pay particular attention to the following:

- tighten screws without warping or mechanical stress correct positioning of the screws (otherwise danger of damaging the threads)
- maintain the specified torque
- avoid offset between modules (IP65)
- clean contact surfaces (avoidance of leakages and contact faults)
- for modules and components ordered at a later date, see the installation instructions in the accompanying product leaflet.
- straight contacts on the type 03 valve solenoid coils (not bending resistant, i.e. they break when bent back)

- electrostatically sensitive components.
  Do not touch any contact surfaces on the lateral plug connectors of the modules and components.

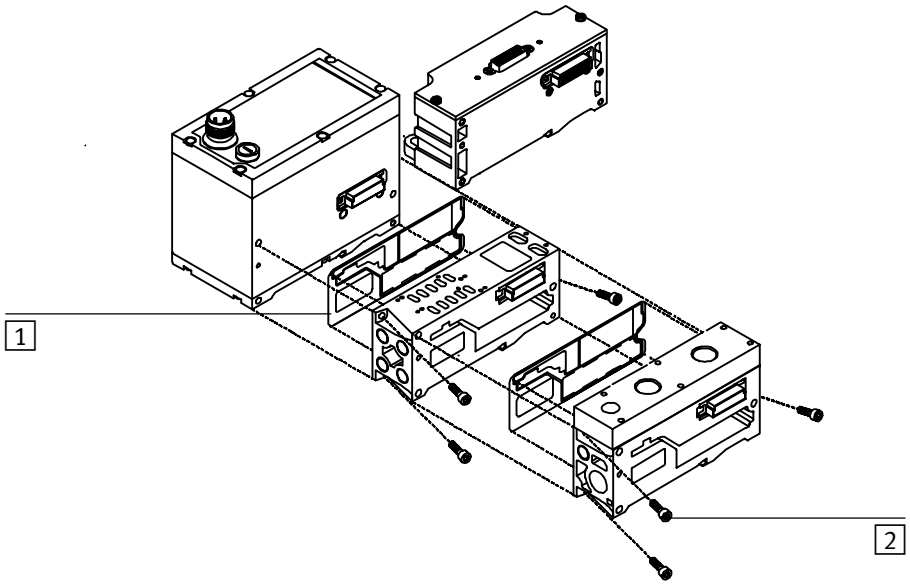
2.1.1 Pneumatic modules

- The screwed on terminal must be removed to extend or modify the valve terminal. Removal (see diagram below):
- Switch off the power and compressed air supply for the terminal.
- Remove the terminal from the connection surfaces and place it on a flat surface.
- Remove the screws completely from the relevant module. The modules are now only held together by the electric plug connection.
- Carefully pull the module away, without tilting, from the electric plug connections.
- Replace damaged seals.

Please note
- Position modules ordered at a later date behind the last module of similar size.
- Size adaptation is necessary if extending by an additional valve size.

Fit the modules as follows:

- Insert a (new) seal on the left contact surface facing the node
- Fit the proposed pneumatic module of the appropriate size as shown in the following diagram.



[1] Seal

[2] Fastening screws, max. 1 Nm

Fig. 2/1: Fitting pneumatic modules, MIDI example shown

2.1.2 Valves and auxiliary plates

Proceed as follows:

1. Check each air duct in the module for soiling
2. Clean the surfaces and if necessary the individual air ducts of the modules by blowing them out before assembly
3. Fit seals if missing
4. Fit them according to the following diagrams

[1] Manual override

[2] Through bolts, max. 0.6 Nm

[3] Cover plate

[4] Flow control plate

[5] Regulator plate

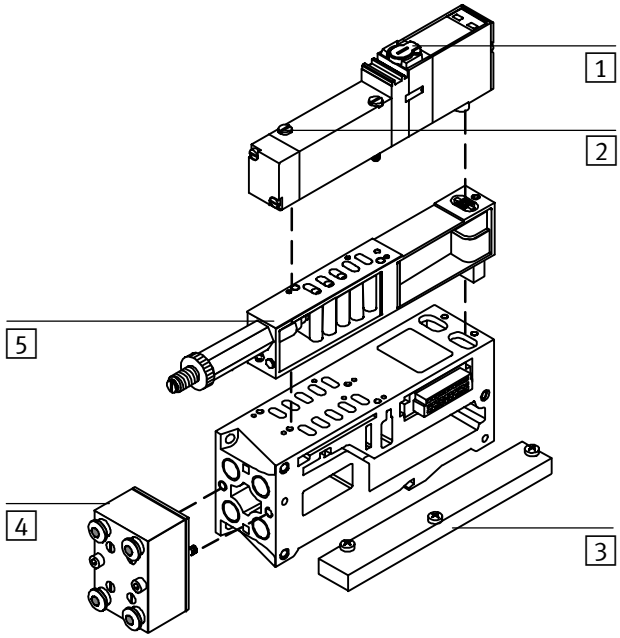


Fig. 2/2: Fitting MIDI valves

1 Designation signs

2 Manual override MO

3 Pressure regulator plate

4 Cover plate

5 Flow control plate

6 Pre-embossed sign holder for removal

7 Grooved screw M4, max. 1.5 Nm

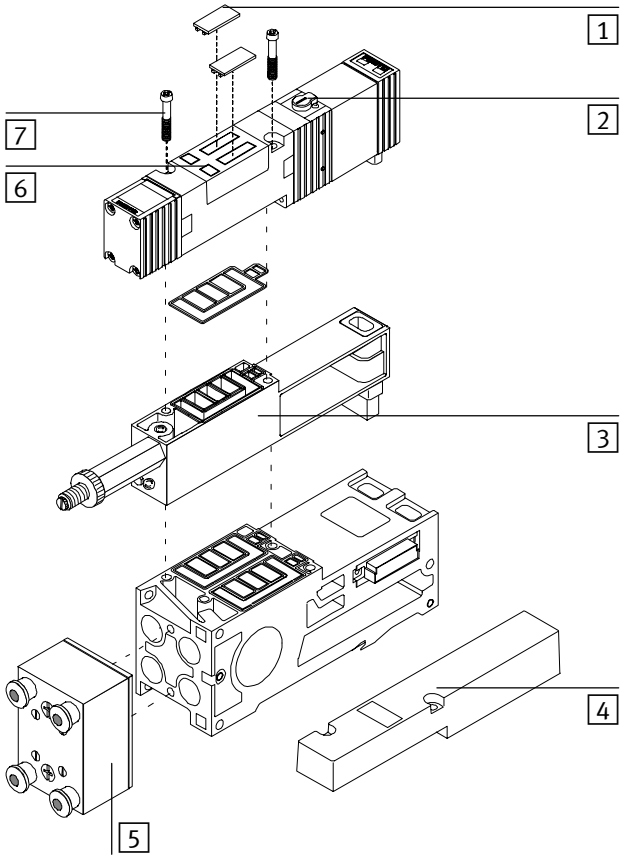


Fig. 2/3: Fitting MAXI valves

- Rotate the regulator screw on the pressure regulator plate counter-clockwise until fully closed to set the lowest possible pressure.
- Completely close the flow screws on the flow control plate and then open them by one turn. You can then avoid unwanted movements of the connected actuators.

2.1.3 End plates

Caution
Earth the right end plate after expansion/conversion of the pneumatic modules before reassembly.

This will prevent high voltages on the metal surfaces in cases of faults.

Please note
When switching on the valve terminal using a safety start-up valve, turn the pressure up slowly:

- If necessary use the end plate for separate supply of auxiliary pilot air (see start-up).
- Only use compressed air for modules with regulators (end plate). In vacuum operation the regulator function does not work.

The valve terminal is fitted with left and right end plates to mechanically close the terminal. These end plates carry out the following functions:

– ensure protection class IP65

– contain connections/contacts for earthing

– contain bores for wall mounting and the hat rail clamping unit

The right end plate is available in various sizes and designs:

MIDI

– with common line connections for the compressed air supply of the pneumatic modules and integrated regulator for the necessary adjusted auxiliary pilot air (5 bar)

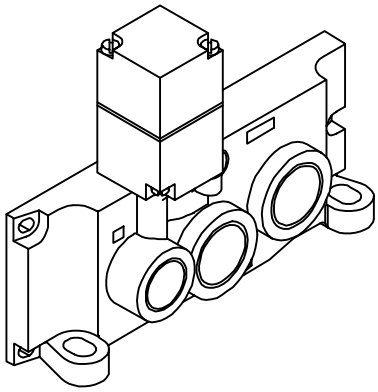


Fig. 2/4: MIDI end plate with regulator

MIDI and MAXI

– with common line connections for the compressed air supply of pneumatic modules without integrated regulators

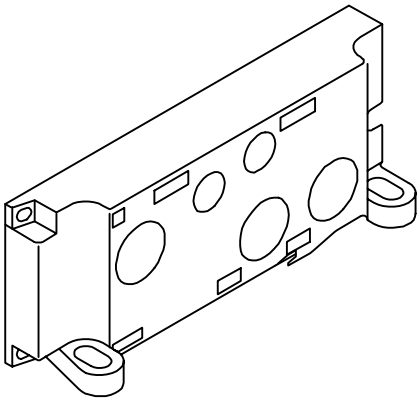


Fig. 2/5: End plate right

– without common line connections for valve terminals without valves

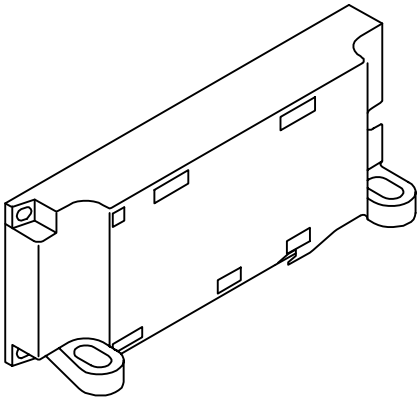


Fig. 2/6: MAXI end plate without connections

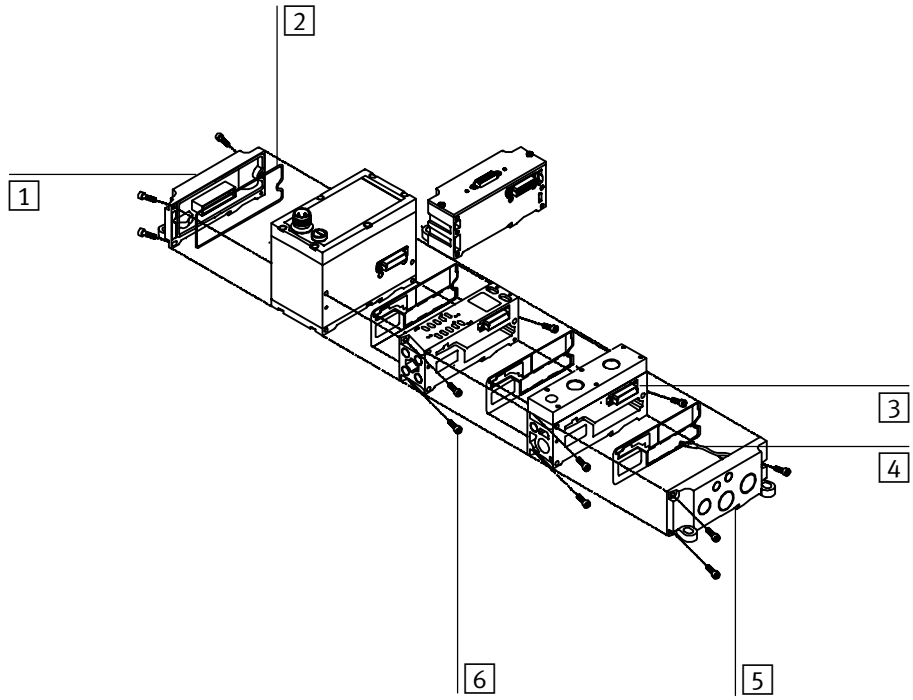
Earth the end plates after expansion/conversion as follows:

1. Right end plate:
   connect the cable already fitted to the interior of the right end plate to the corresponding contacts of the pneumatic module or the node for earthing (see diagram below).

2. Left end plate:
   the left end plate is conductively connected by pre-assembled spring contacts with the other components
   Multipin valve terminal: see earthing the right end plate.
   Multipin node with integrated left end plate:
   earthing occurs via the cylindrically ground contact rail.

Please note:
Instructions on earthing the complete valve terminal can be found in the “Installation” chapter of the corresponding node manual.

The diagram below shows an example for fitting the end plates:



1 Left end plate

2 Seal

3 Contact for earthing cable

4 Pre-assembled earthing cable

5 Right end plate

6 All fastening screws, max. 1 Nm

Fig. 2/7: Mounting the end plate

2.2 Hat rail mounting

The terminal is suitable for mounting on a hat rail (mounting rail as per EN 50022). For this purpose, the back of every module is equipped with a guide notch for attachment to the hat rail.

Caution
- Hat rail mounting without the hat rail clamping unit is not permitted.
- If installed at an angle or if there is fluctuating stress, additionally support the hat rail clamping unit
  - against slippage and use the provided locking screws (item 6)
  - against unwanted loosening/opening.

Please note
- When installing horizontally and under static stress, the hat rail clamping unit can be supported without locking screws (item 6).
- If your terminal is not equipped with a hat rail clamping unit, this can be ordered and fitted at a later date.
- The use of MIDI or MAXI clamping units is dependent on the existing end plates (MIDI/MAXI).

Hat rail clamping unit

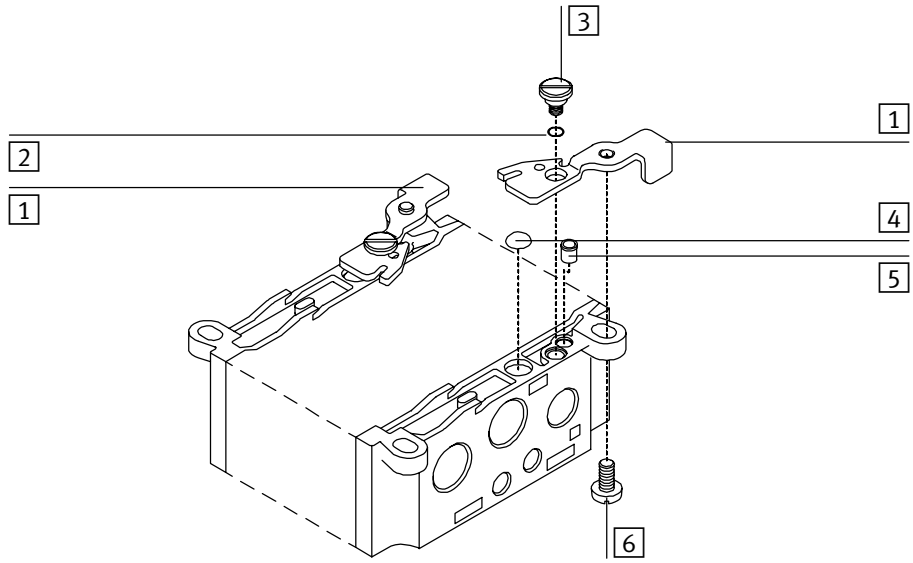
A hat rail clamping unit is required to mount the valve terminal on the hat rail. This is mounted on the rear of the end plate as shown in the following diagram. Pay particular attention to the following:

Before mounting

- Clean adhesion surfaces for the rubber feet (clean with spirit)
- Tighten flat headed screws (item 3)

After mounting

- Secure the lever with locking screws (item 6)



1 Lever *)	4 Self-adhesive rubber foot
2 O-ring	5 Pressure pads
3 Flat head screw	6 Locking screw

*) Different lever lengths for MIDI and MAXI

Fig. 2/8: Mounting the hat rail clamping unit

Proceed as follows:

1. Determine the weight of the terminal as shown in chapter 2.3
2. Ensure that your mounting surface can support this weight
3. Fit a hat rail (mounting rail EN 50022 35x15, width 35 mm, height 15 mm)
4. Fasten the hat rail ca. every 100 mm to the mounting surface
5. Hang the terminal in the hat rail. Secure the terminal on both sides with the hat rail clamping unit against tilting or slipping (see diagram below)
6. Secure the hat rail clamping unit with two screws (item 3) gainst unwanted loosening/opening if there will be a fluctuating stress or when installed at an angle

[1] Hat rail clamping unit released

[2] Hat rail clamping unit locked

[3] Locking screw

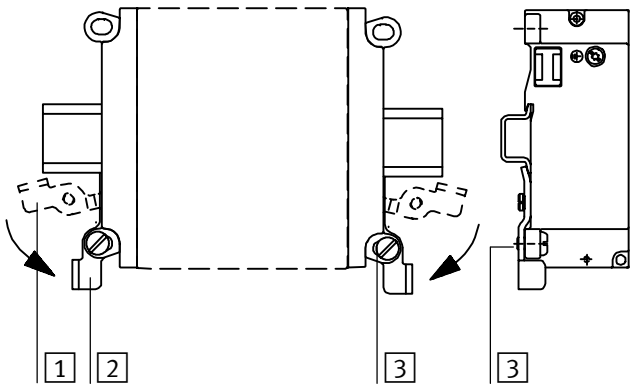


Fig. 2/9: Example of mounting a terminal on a hat rail

2.3 Wall mounting

Caution
Use additional angle brackets for the modules (ca. every 200 mm) for longer terminals with several IO modules. You can thereby avoid:

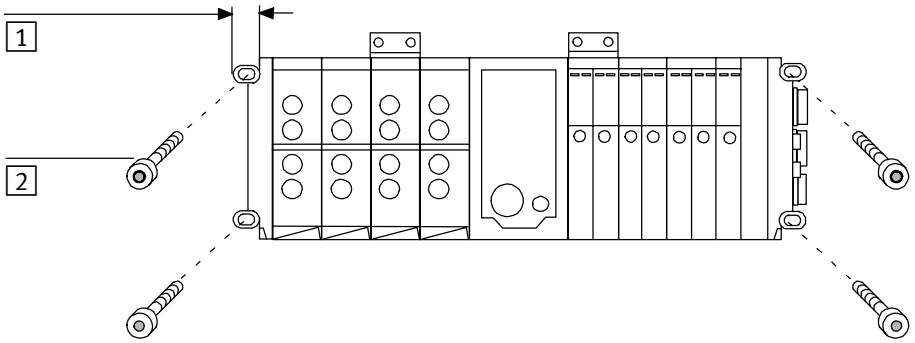
- overloading the fixing eyes on the left end plate
- sagging of the terminal (IO side)
- self-resonances

Proceed as follows:

1. Determine the weight of the terminal (weigh or calculate). Reference values:

	MIDI	MAXI
Per pneumatic module	0.8 k g	1.2 kg
Per node	1 kg	1 kg
Per electric module	0.4 kg	0.4 kg

2. Ensure that your mounting surface can support this weight Check whether angle brackets are required for the IO modules.
3. Use washers if necessary.
4. Mount the terminal, dependent on the type, in compliance with the following table. Any mounting position is possible for the terminal.



1 7.6 mm

2 M6 screw

Fig. 2/10: Mounting options for wall mounting

Installation

Chapter 3

Contents

3.1 General connection methods

Warning
Before carrying out installation or maintenance work, switch off the following:

- the compressed air supply
- the load voltage supply (pin 2).

You can thereby avoid:

– uncontrolled movements of loose tubing.

– unexpected movements of the connected actuators.

– non-defined switching states of the electronic components.

Laying the tubing

Please note

- Place a suitable seal under each screw connector or silencer in order to avoid leakage. Lightly greasing the seals will additionally improve the sealing effect.
- If elbow screw connectors or multiple distributors are used, the airflow will be reduced slightly.

Basic information

Connecting

1. Push the tubing as far as possible over or into the tube connection of the screw connector.
2. If necessary, pull locking ring (A) over the tube connection or tighten locking screw (B).
3. For reasons of clarity, group the tubing together with
   – tube straps or
   – multiple hose holders.

Removing

1. If necessary, loosen the locking screw or locking ring of the screw connector.
2. Pull out the tubing
3. If necessary, replace the screw connectors with blind plugs (C).

1 Connecting

2 Removing

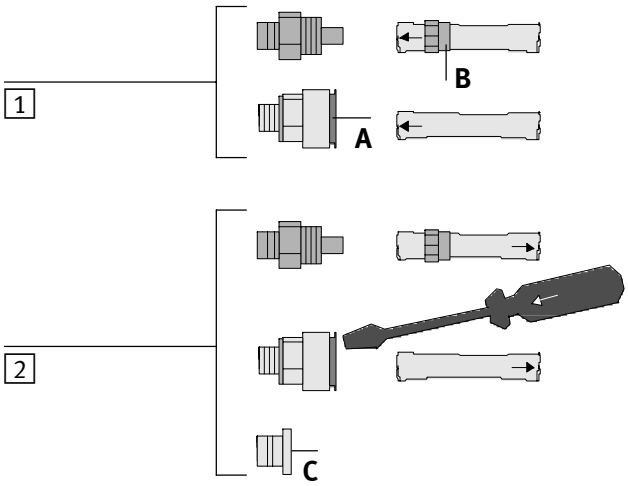


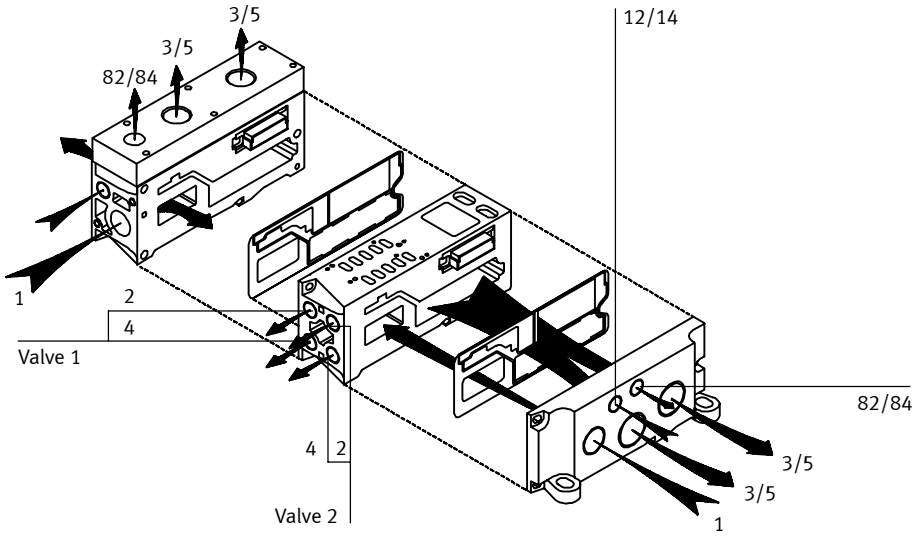
Fig. 3/1: Tubing variants

3.2 Connecting the valve terminal

Please note

- To protect against dirt, some connections are covered with adhesive film. All adhesive film must be removed from the connections.
- If not used, close:
  - vacant valve locations with cover plates
  - work connections (2, 4) with blind plugs
- Comply with the following sequence when connecting the work air, dependent on the tools used:
  - when screwing on connections with an Allen key, any sequence can be used.
  - when screwing on connections with a hexagon insert bit, connection must be made from left to right (space for wrench).

3.2.1 Assignment of connections



Tubing	Connectiondesig-nation (ISO 5599)	Connectionsize (ISO 228)	Connection
Compressed air/ vacuum	1	G 3/8	Screw connector
Work air/vacuum	2/4	G 1/8	Screw connector
Auxiliary pilot air	12/14	G 1/8 (G 1/4)	Screw connection in end plate without regulator (omitted in end plates with regulators)
Exhaust air	3/5 82/84	G 1/2 G 1/8 (G 1/4)	Screw connection (with non-return valve or silencer)

Fig. 3/2: Assignment of sub-bases

Please note
Only use compressed air (> 3 bar) for modules with regulators (end plate). In vacuum operation the regulator function does not work.

Please note
With several systems with central ducted exhaust air: use non-return valves in the common exhaust lines in order to prevent functional impairment due to back pressures.

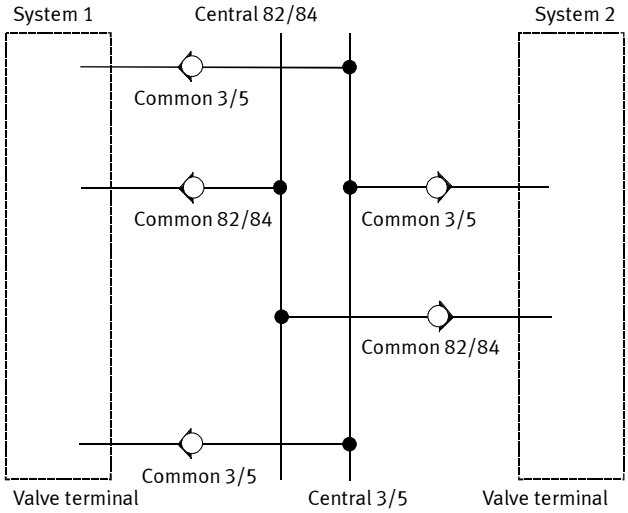


Fig. 3/3: Common lines with non-return valve

3.2.2 Auxiliary pilot air

The auxiliary air connections 12/14 are required if auxiliary pilot air is to be supplied separately. Auxiliary pilot air connections on modules for compressed air supply are closed as standard with blind plugs.

Please note
Use either:

– only internally regulated auxiliary pilot air

or

– only externally regulated auxiliary pilot air (4...6 bar).

Reliable faultless operation of the valve terminal is then possible.

Internally regulated auxiliary pilot air is branched off from the main supply and reduced to 5 bar through an internal regulator.

Please note that the regulated auxiliary pilot air must only be supplied or branched from one position on all pneumatic modules if common tubing is used.

This also applies if the valve terminal is operated with various pressure zones.

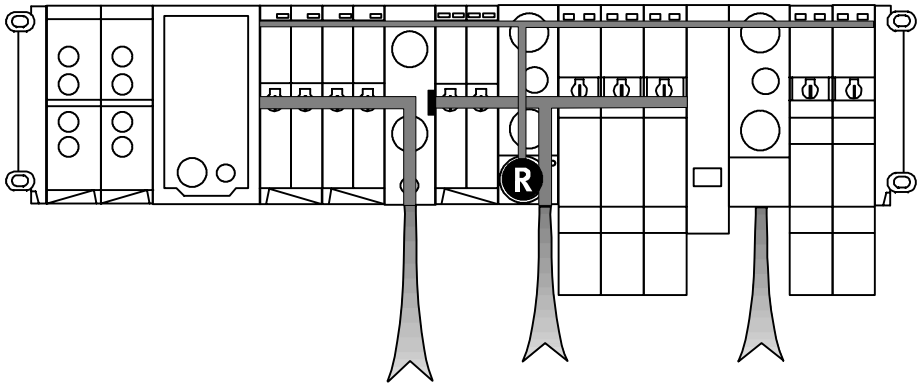


Fig. 3/4: Example of a valve terminal with regulated auxiliary pilot air with different pressure zones

Warning
When exhausting individual pressure zones (e.g. during an EMERGENCY STOP case) the regulator should never be depressurized otherwise there will not be any auxiliary pilot air supply for the other pressure zones.

3.3 Connection of additional compressed air supply modules

For optimal performance of the terminal, an additional compressed air supply is required in the following cases:

- in valve terminals with more than 10 valves (nominal supply pressure 6 bar)
- for actuators with large volumes

Required modules and respective sizes	**Desired operating status**		
	Pressure zones	**Size linking**	**Performance increase**
MIDI	Pressure **zone** feed	Pressure **feed adapter**	Pressure feed
MAXI	Sub-base with sealing disc and auxiliary pressure feed or pressure feed adapter or feed through end plate		Pressure **auxiliary** feed

Fig. 3/5: Overview of pressure feed modules

A MIDI pressure zone feed is required in the following cases:

– supplying another, different work pressure

Caution
When using additional pressure feeds or pressure zone feeds, the terminal must also be exhausted via connections 3 and 5.

Please note
– When operating with different pressure zones, feed the higher pressure through the pressure feed adapter with regulator or end plate with regulator. This increase regulating accuracy.
– When converting pressure feeds from sub-bases for exhaust air on the surface silencer, use the existing flat seal if it is not damaged. Fasten the surface silencer with the screws provided.

The following diagrams show, for the following modules:

– the MIDI pressure feeds

– the MAXI pressure feed without regulator

MIDI pressure feed

[1] Pressure feed, flow direction both sides

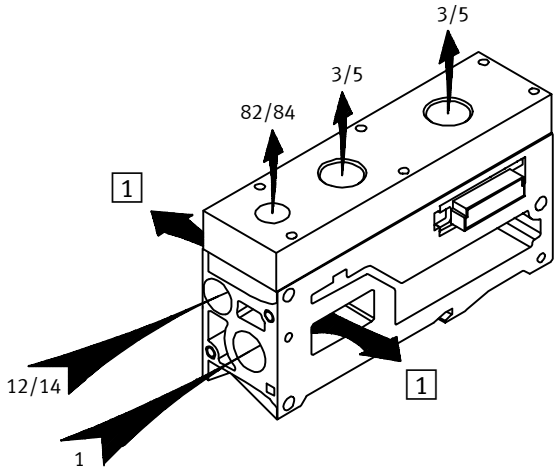


Fig. 3/6: Pressure feed connections

MIDI pressure zone feed

[1] Pressure feed only in left-hand zone (one-sided flow direction)

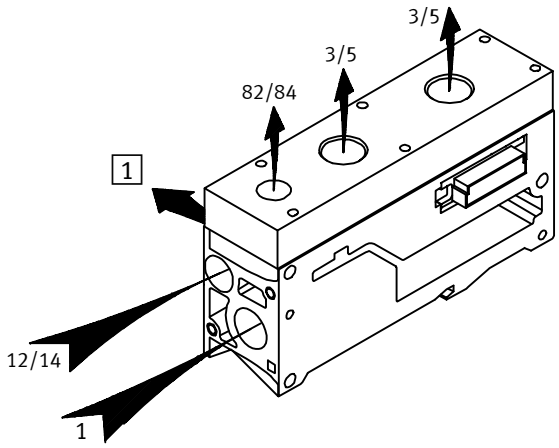


Fig. 3/7: Pressure zone feed connections

MIDI/MAXI pressure feed adapter

1 MIDI side

2 MAXI side

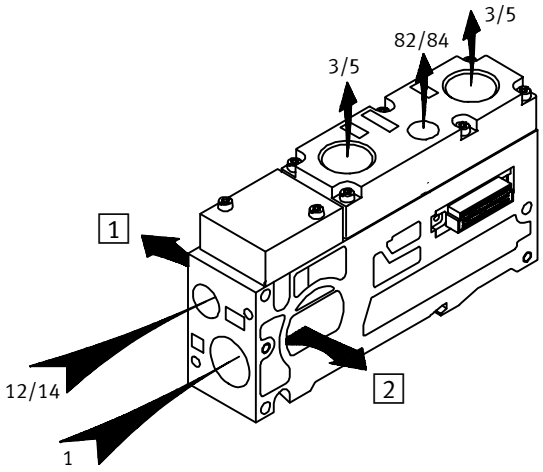


Fig. 3/8: Pressure feed adapter connections

MAXI auxiliary pressure feed

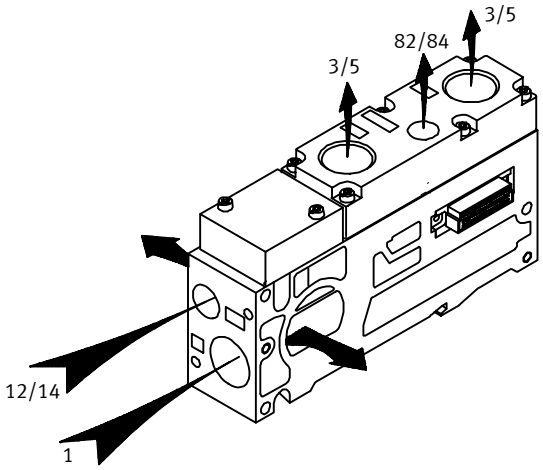


Fig. 3/9: Auxiliary pressure feed connections

MIDI pressure feed with surface silencer

[1] Pressure feed, flow direction both sides

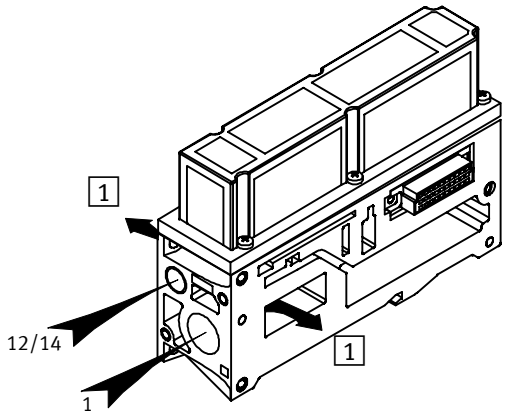


Fig. 3/10: Pressure feed with surface silencer connections

MIDI pressure zone feed with surface silencer

[1] Pressure feed only in left-hand zone (one-sided flow direction)

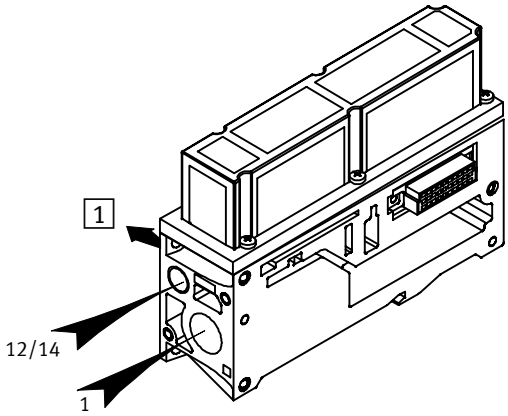


Fig. 3/11: Pressure zone feed with surface silencer connections

MIDI-MAXI pressure feed adapter with surface silencer

1 MIDI side

2 MAXI side

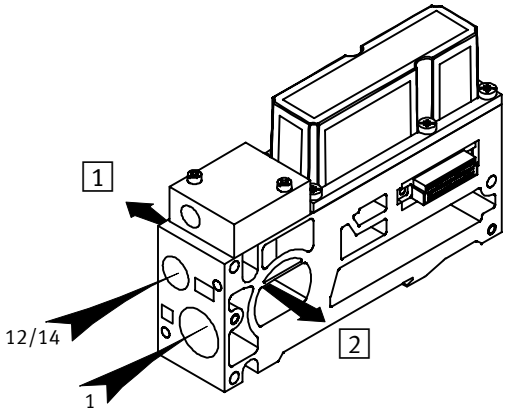


Fig. 3/12: Pressure feed adapter with surface silencer connections

MAXI auxiliary pressure feed with surface silencer

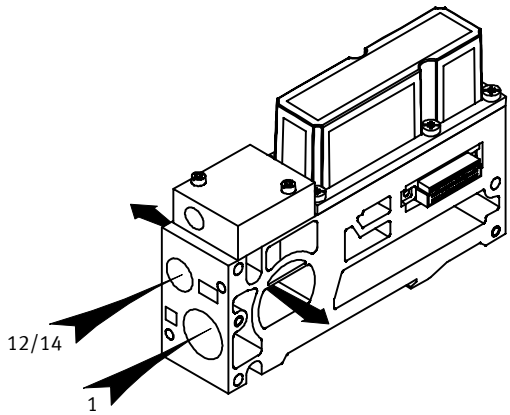


Fig. 3/13: Pressure zone feed with surface silencer connections

MAXI sealing disc

Please note
When using different pressure zones, feed in the higher pressure close to the regulator. This increase regulating accuracy.

Sealing discs permit use of MAXI valve terminals with several pressure zones. The pressure zone is set by inserting the sealing discs (see diagram). Sealing discs can only be inserted in the sub-bases. The zone pressure feed is implemented with the following modules:

– auxiliary pressure feed *)
– pressure feed adapter *)
– right end plate *)

*) Sealing disc cannot be inserted

Indicate the use of the disc by means of a designation sign. Insert the designation sign in the cut-out provided before screwing the sub-bases together.

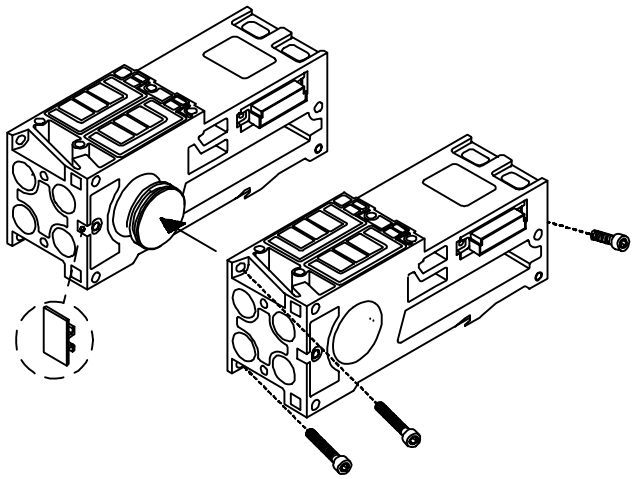


Fig. 3/14: Positioning the sealing disc for MAXI pressure zones

3.4 Connecting vacuum/low pressure

The valve terminal can be operated under the following conditions with vacuum or low pressure (< 3 bar):

– separate feed of externally regulated auxiliary pilot air. Internally regulated auxiliary pilot air is branched off from the main supply and reduced with an internal regulator. This regulator only operates during pressurized operation (> 3 bar).

3.5 Connecting auxiliary plates

Pressure regulator plate

The pressure regulator plate regulates the work air pressure of the attached valve on one or both sides by means of supply pressure regulation.

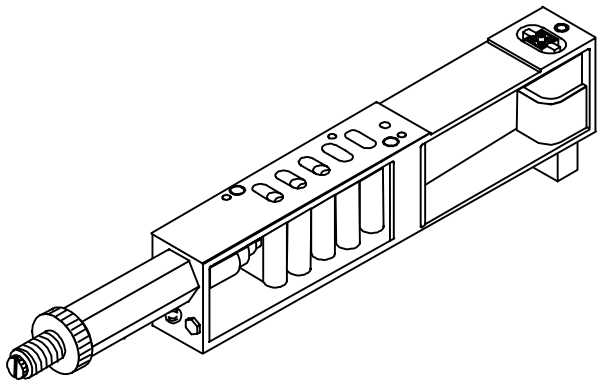


Fig. 3/15: MIDI pressure regulator plate

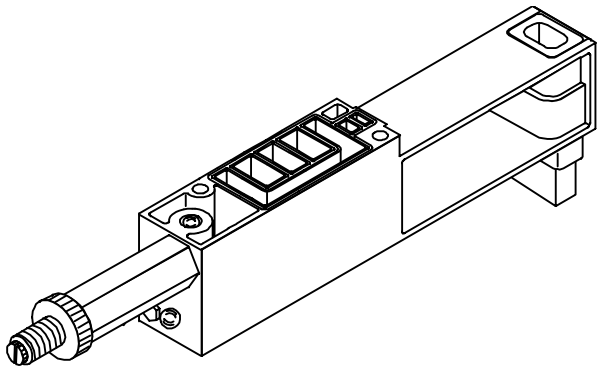


Fig. 3/16: MAXI pressure regulator plate

Flow control plate

The flow control plate regulates the flow rate of the actuator exhaust air. The flow rate of the supply air is not regulated by passing the flow control. However, the flow behaviour in the plate is effectively limited with reference to the maximum flow rate.

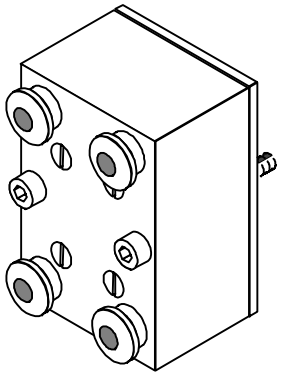


Fig. 3/17: MIDI flow control plate

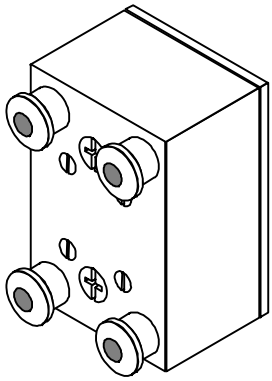


Fig. 3/18: MAXI flow control plate

Commissioning

Chapter 4

Contents

4.1 Settings

Prerequisites:

(see chapter: Fitting pneumatic – valves and auxiliary plates)

Pressure regulator plate

1. Replace the blind plug and seal disc during the setting up process with a connection tube and manometer.
2. Pressurize the valve terminal with the operating pressure.
3. Turn the regulator screw clockwise until the manometer shows the required pressure.
4. Exhaust the valve terminal again.
5. Replace the connection tube and manometer with the blind plug and seal disc.
6. Repeat this procedure if necessary on all other pressure regulator plates.

Flow control plate

1. Pressurize the valve terminal with the operating pressure.
2. Start with a test run of the connected component.
3. Open the flow control screw step by step until the component has reached the required speed.
4. End the test run.
5. Exhaust the valve terminal again.

4.2 Commissioning tests

The valve terminal should be commissioned as follows:

Commissioning variants	Activity
Preliminary test of the pneumatic tubing	Moving the valve-cylinder-combination by means of the manual override
Complete commissioning of the complete system	Installing and connecting the complete system (all fieldbus slaves) Program control via PLC/industrial PC

Fig. 4/1: Commissioning variants

Commissioning by means of the manual override is described below. Commissioning by means of program is described in the relevant manual of the node.

4.2.1 Checking the valve functions

Manual override

Warning
Only use the MO when the valves are in a voltage-free state. Before actuation by electric signals:

- Ensure that all MO are reset to the start position.

You should use the manual override especially when commissioning the pneumatic system, in order to check the functioning and operation of the valve or the valve-cylinder-combination.
By actuating the manual override, you can switch the valve without an electric signal. You only need to switch on the compressed air supply.

1 Solenoid valve, single-solenoid

2 Double-pilot valve

3 Mid-position valve

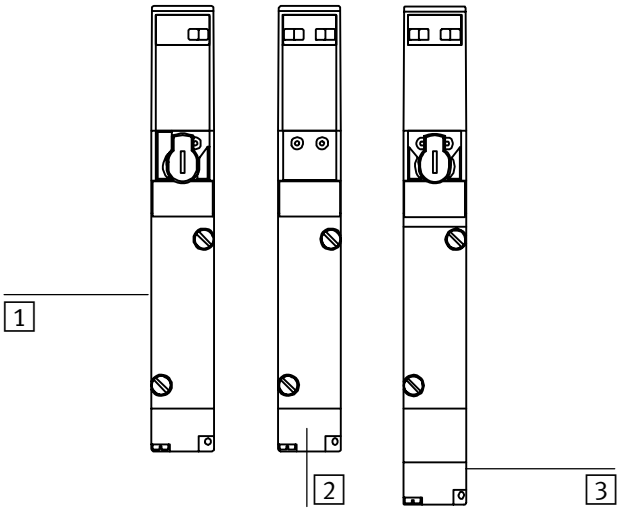


Fig. 4/2: Position of MIDI manual overrides

1 Solenoid valve, single-solenoid, locking

2 Double-pilot valve, non-locking

3 Mid-position valve, locking

4 MO

5 Slot for screw-driver

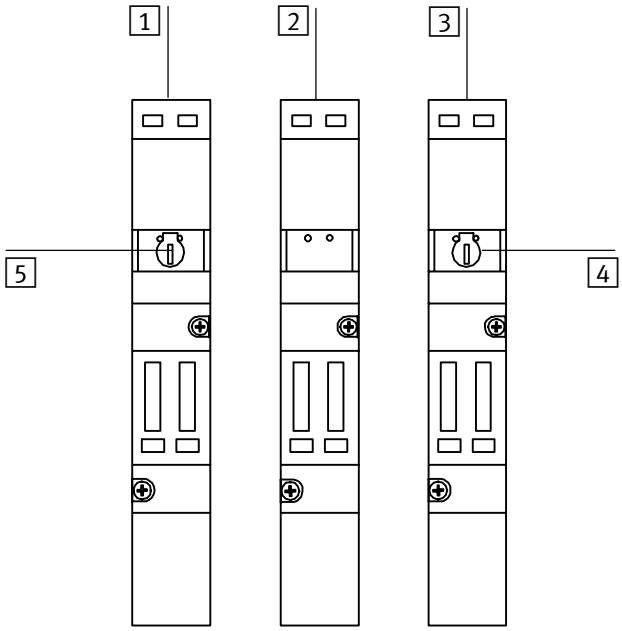


Fig. 4/3: Position of MAXI manual overrides

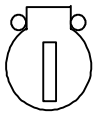
Setting of the MO			
Resulting setting of valve slide	End position; connection 2 pressurized	Mid-position; connections 2, 4 pressureless	End position; connection 4 pressurized

Fig. 4/4: Function of MAXI manual override

Types of manual override

The manual override has been designed to be used as follows:

	Types of manual override	**Method of operation**
MIDI/MAXI	Manual override with automatic return (non-locking)	After operation the manual override is reset by a spring
	Manual override locking	The manual override remains actuated until it is reset by hand

Fig. 4/5: Types of manual override

4.2.2 Checking the valve-cylinder combination

Warning
When pressurizing or re-pressurizing the valve terminal under the following conditions:

– with the safety start-up valve (slow build up of pressure)
– when there are electric signals (e.g. after EMERGENCY STOP actuation)

Feed the auxiliary pilot air in separately via an end plate without regulator (4...6 bar).

The auxiliary pilot air must reach full pressure immediately after being switched on, otherwise the slow build-up in pressure of the complete supply will have no effect on the following cylinders:

– activated by the mid-position valve exhausted in the normal position
– activated by the mid-position valve blocked in the normal position
– activated by single-solenoid valves
– activated by double-pilot valves which are switched during the pressureless phase.

End plates used	Pressure increase in the complete supply (1)	Pressure increase in the auxiliary pilot air (12,14)	Time of switching point of a valve	Movement of the cylinder
With regulator	**Slowly**	Slowly	**after** pressure increase with (1)	**Fast**
Without regulator	**Slowly**	Fast	**before** pressure increase with (1)	**Slowly**

Fig. 4/6: Effects of slow switch-on pressurization with existing electric signals

1. Switch on the compressed air supply.
2. Check the functioning and operation of each individual valve-cylinder combination by actuating the manual override.
3. Switch off the compressed air supply after checking the valves.

Secure the MO

The MO can be secured against unwanted actuation in open access systems. The MO can be secured as follows:

MIDI/MAXI
By removing the adjusting toggle (store in a safe place)

Fig. 4/7: Securing the MO

4.3 Troubleshooting

4.3.1 Impairment of function

After switching on the compressed air supply or when subsequently testing the individual valves, you can learn the following about the operating status of the pneumatic system:

Operating status of the pneumatic system	**Valve position**	**Troubleshooting when the compressed air supply has been switched off**
Air escapes ... – from the common line connections – from the work line connections – between the modules	 – Basic position – Switching position – Basic position	 • Checking the seal ring or the tube fittings (grease lightly if necessary) • After switching on again, regulate the separate auxiliary pilot air to 4...6 bar
The valve or the pneumatic system ... – does not react as expected – does not react – does not react	 – Switching position – Switching position – Basic position	 • Check the tubing • After switching on again check the operating pressure (e.g. pressure zones) • Servicing required • Check the basic position, regulator connection (apply pressure > 3 bar at regulator)

Fig. 4/8: Operating status of pneumatic system

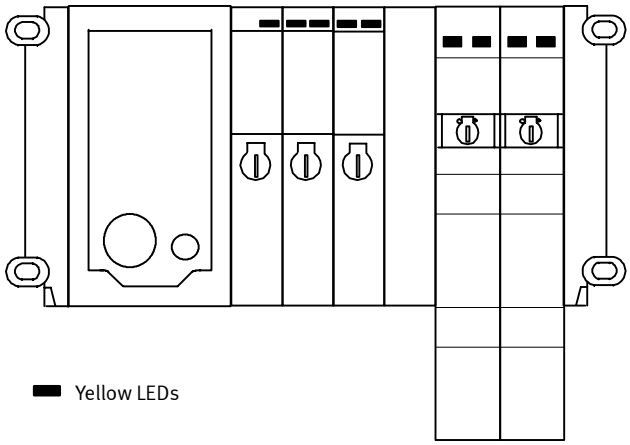
If the operating status of the pneumatic system differs from the desired pneumatic operating status, the following conditions are probably not fulfilled:

Desired pneumatic operating status	**Prerequisites**	**Remarks**
Free of leakage	– careful tubing connection – regulated auxiliary pilot air (4...6 bar)	
Fast reaction	Sufficient pressure supply via pressure supply points	Exhaust valve terminal also at additional pressure feeds
Faultless	Non-return valves in common exhaust line	Applies to several systems with centrally ducted exhaust
Several pressure zones	Both-sided restriction of pressure zone by alternatives: – Pressure zone feed – Sealing disc – End plate – Nodes	Higher pressure zones close to regulator, lower pressure zones away from regulator
Vacuum operation/low-pressure operation	Separately supplied regulated auxiliary pilot air (4...6 bar)	Regulator can only be operated with pressure (>3 bar)
EMERGENCY STOP with pressure zones	Guarantees the regulator function for the auxiliary pilot air despite the complete supply being switched off	Regulator regulates the auxiliary pilot air for the whole pneumatic module
Slow switch-on pressurization after emergency stop	Using end plates with separate connections for auxiliary pilot air	If there are control signals, the auxiliary pilot air must be at full pressure immediately after being switched on

Fig. 4/9: Causes of possible deviations from the nominal status

4.3.2 LED displays of the valves

There is a yellow LED for every valve solenoid coil. This LED indicates the switching status of the valve solenoid coil.



LED	Switching position of the valve solenoid coil	Meaning
Yellow off	Basic position	Logic 0 (no signal)
Yellow lit	– Switching position or – Basic position	Logic 1 (signal present) Logic 1, but: – operating voltage of outputs outside permitted tolerance range (21.6 V to 26.4 V DC) or – compressed air supply not OK or – pilot exhaust blocked or – auxiliary pilot air outside range of 4...6 bar or – servicing required

Fig. 4/10: Example of LED display – switching status of valve solenoid coil

Technical data

Appendix A

Contents

A.1 Pneumatic technical specifications

General		
Mounting position	As desired	
Design	Modular system for centralized control of valves and acquiring sensor message signals	
Module grid dimension/width – Valve – Sub-base – Multipin Quader-Sub-D – AS-i bus nodes – Input/output stages – End plate right – Pressure feed	**MIDI** 18 mm (NW 4.0) 36 mm (NW 4.0) 45 mm 45 mm 36 mm 27 mm 36 mm	**MAXI** 25 mm 50 mm 45 mm 45 mm 36 mm 36 mm 36 mm
Weights – End plate without connections – Input stages – Multipin nodes – Cover plate – AS-i bus nodes – Output stages – Sub-base – Valves: Single-solenoid Double-pilot Mid-position – Pressure regulator plate – Flow control plate	**MIDI** 120 g 360 g 580 g 60 g ca. 1000 g 400 g 300 g 140 g 150 g 160 g 100 g 120 g	**MAXI** 435 g 360 g 580 g 63 g ca. 1000 g 400 g 552 g ca. 313 g 188 g 237 g
Connections – Compressed air (1) – Exhaust air (3/5) – Auxiliary pilot air (12/14) – Pilot exhaust air (82/84) – Work air (2/4)	**MIDI** G 3/8 G 1/2 G 1/8 G 1/8 (G 1/4) G 1/8	**MAXI** G 1/2 G 1/2 (2x) G 1/4 (G 1/8) G 1/4 NW 7

General	
Materials	
– Valve	AL, PEI, POM, PPS, PA, NBR, Ms St, PC
– Sub-base	AL
– Multipin Quader-Sub-D	AL, St, NBR
– AS-i bus nodes	AL, St, PC, NBR
– End plate right	AL
– Cover plate	AL
– Seals	NBR
Vibration (as per DIN/IEC68/EN 60068 part 2-6 and as per IEC 721/ EN 60068 part 2-3)	
– Transport	3.5 mm path at 2...8 Hz 1 g acceleration at 8...25 Hz
– Operation	0.35 mm path at 25...57 Hz 5 g acceleration at 57...150 Hz 1 g acceleration at 150...200 Hz
Shock (as per DIN/IEC 68/EN 60068 part 2-27 and IEC 721)	30 g at 11 ms duration
Temperature range	
– Storage	- 20 ... + 40 °C
– Operation	- 5 ... + 50 °C
– Medium	- 5 ... + 50 °C
Protection class as per DIN 40050	IP65 (fully mounted)
Torques	
– Fastening screws	1.0 Nm, modules
– Through bolts	0.6 Nm, valves
– Grooved screw	1.5 Nm, valves

Electricity		
Voltages – Operation	24 V DC, tolerance: -15 % / +10 %	
Switch-on peak consumption – Per solenoid coil at ca. 24 V (with LEDs) – Total with maximum number of valve coils (with LEDs)	**MIDI** 62 mA 1.6 A	**MAXI** 100 mA 2.6 A
Power consumption per solenoid coil	**MIDI** 1.5 W	**MAXI** 2.2 W

Pneumatics		
Medium	Compressed air, filtered (40 µm), lubricated or unlubricated/ vacuum dependent	
Pressure range – With integrated regulator – With external auxiliary pilot air	4...8 bar (NW 4.0) P_{12}, P_{14}: 4...6 bar P_1: - 0.9...+ 8 bar	
Manual override of the valve – Single-solenoid – Double-pilot – Mid-position	**MIDI** locking non-locking locking	**MAXI** locking non-locking locking
Valve switching times – (5/2 singe-solenoid, pneumatic spring) – (5/2 singe-solenoid, spring) – (5/2 double-pilot) – (5/3 mid-position)	**MIDI** ON: 12 ms, OFF: 22 ms ON: 10 ms, OFF: 26 ms SWITCH: 10 ms ON: 12 ms, OFF: 25 ms	**MAXI** ON: 25 ms, OFF: 30 ms SWITCH: 18 ms ON: 25 ms, OFF: 55 ms

Pneumatics				
Rated flow of MIDI valves [l/min]	**1 → 2**	**1 → 4**	**2 → 3**	**4 → 5**
– 5/2 (single-solenoid, pneumatic spring or spring), actuated/ not actuated	-/500	500/-	-/500	500/-
– 5/2 (double-pilot) actuated/ not actuated	500/-		500/-	
– 5/3 (mid-position) closed, actuated/not actuated	500/-		500/-	
– 5/3 (mid-position) exhausted, actuated/not actuated	300/-		300/200	
– 5/3 (mid-position) pressurized, actuated/not actuated	300/200		300/-	
Rated flow of MAXI valves [l/min] *)	**1 → 2**	**1 → 4**	**2 → 3**	**4 → 5**
– 5/2 (single-solenoid), actuated/ not actuated	-/1300	1300/-	-/1600	1600/-
– 5/2 (double-pilot) actuated/ not actuated	1300/-		1600/-	
– 5/3 (mid-position) closed, actuated/not actuated	1300/-		1600/-	
– 5/3 (mid-position) exhausted, actuated/not actuated	1300/-		1600/1000	
– 5/3 (mid-position) pressurized, actuated/not actuated	1300/1000		1600/1000	
Rated flow [l/min] **flow rate parameter** (dependent on rated flow)	**MIDI**		**MAXI**	
	300 0.31	500 0.51	1000 1.02	1300 1.32	1600 1.62
*) Data without screwed connections				

A.2 Index

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