Operating Instructions

Double Multiple Plug Connector

HF03 / HF02

1987765492/08.2014, Replaces: 06.2002, EN
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1 Notes on safety

Please observe the notes on safety.
This valve system may only be used for industrial applications.
Installation may only be performed in a voltage-free and pressure-free state and only by a qualified technician.
In order to avoid accidents, electrical start-up is to be carried out only in a pressure-free state.
Please familiarise yourself thoroughly with the contents of the operating instructions before installing the valve system and connecting it to the compressed air or electrical systems.

⚠️ WARNING

Ground the valve system. Please observe the following standards when installing the system: VDE 0160 (DIN EN 50178) and VDE 0100

Do not put the valve system into operation before it is completely assembled as well as correctly wired and tested.

⚠️ NOTICE

Before connecting or disconnecting the plugs, switch off the operating voltage to prevent damage to the electrical system.

If the valve system is occupied completely by components, or subject to continuous loading of the solenoids, be sure to provide adequate exchange of air, or air cooling.

Validity

These operating instructions apply to:
- The passive I/O modules in conjunction with the series HF 03 / HF 02 valve system with a double multiple plug connector.
2 System architecture

The versatility and flexibility of this valve system enables AVENTICS to support your automation tasks. The valves are completely assembled and tested according to your requirements; the electrical connection is made via multiple plug connectors. I/O modules are installed in the system as per your specifications. The valve system in the local or external pilot control versions is then ready for use. Its modular construction allows existing systems to be expanded or converted at any time.

The valve system’s operating instructions are composed of individual components.
2.1 Construction and design

valve system with double multiple plug connector and passive I/O modules

The HF 03 / HF 02 valve system is composed of the following components depending on the order:
- right end plate for connecting the pneumatics,
- valve in expansion levels for 1 to 16 valves,
- adapter plate for the pneumatic connection,
- multiple plug connector, double,
- I/O modules, passive (4 maximum),
- left side cover.

2.2 Function

M12×1 connections for passive I/O modules

The passive I/O module makes it possible to connect a sensor or an actuator to each of the eight M12×1 connections. Up to 32 sensors/actuators are possible per valve system with multiple plug connector at a maximum of 4 I/O modules. The switching state is displayed by a yellow LED on each I/O connection.

Multiple plug connector II for passive I/O modules

The M12×1 I/O connections are internally connected to the multiple plug connector II. They are connected to the PLC via mating plug II. See figure 2 and 3.

LED display for the supply voltage

The supply voltage’s presence is shown by a green LED.

2.3 I/O connections

I/O connection M12×1

Sensor/actuator connection, 8× connection socket with internal M12×1 thread, for 4 or 5-pin plug

Accessories

M12×1 mating plug

Multiple plug connector II

I/O module connection to the controls

Accessories

Mating plug II

Marking

On the I/O module beneath each M12×1 connection
3 Installation

3.1 HF 03 mounting

Dimensions The valve system can be mounted in any desired position with 4 screws (e.g. M6) or placed on a DIN rail, DIN EN 50022, 35 × 15.

<table>
<thead>
<tr>
<th>n</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>173</td>
<td>165</td>
</tr>
<tr>
<td>2</td>
<td>189</td>
<td>181</td>
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<tr>
<td>3</td>
<td>205</td>
<td>197</td>
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<td>4</td>
<td>221</td>
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<td>5</td>
<td>237</td>
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<td>6</td>
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<td>268</td>
<td>260</td>
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<td>8</td>
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<td>9</td>
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<td>292</td>
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<td>10</td>
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<td>308</td>
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<tr>
<td>11</td>
<td>331</td>
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<td>12</td>
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<td>14</td>
<td>379</td>
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<tr>
<td>15</td>
<td>395</td>
<td>387</td>
</tr>
<tr>
<td>16</td>
<td>410</td>
<td>402</td>
</tr>
</tbody>
</table>

n = number of valve positions

Fig. 2: HF 03 dimensioned drawing
### 3.2 HF 02 mounting

#### Dimensions

The valve system can be mounted in any desired position with 4 screws (e.g. M6) or placed on a DIN rail, DIN EN 50022, 35 × 15.

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Fig. 3: HF 02 dimensioned drawing
Installation

3.3 Marking and identification

I/O module, passive  The I/O connections are inscribed directly on the I/O modules.

![I/O module, passive](image)

Fig. 4: I/O module, passive

3.4 Electrical connection

M12×1 connections for passive I/O modules  The passive I/O module makes it possible to connect a sensor or an actuator to each of the eight M12×1 connections. Up to 32 sensors/actuators are possible per valve system with multiple plug connector at a maximum of 4 I/O modules.

LED display for M12×1 connections  The switching state is displayed by a yellow LED on each M12×1 connection.

Numbering the M12×1 connections  The M12×1 connections are numbered from 0 to 7. See figure 4.

Method for counting the I/O modules  The maximum of 4 I/O modules are counted starting with the first I/O module next to the multiple plug connector II. This I/O module is marked as IO 1 according to the plug assignment count. See figure 2 and 3.

Multiple plug connector II for I/O modules  The I/O connections are internally connected to the multiple plug connector II. They are connected to the PLC via mating plug II. See figure 2 and 3.
LED display for the supply voltage

The supply voltage’s presence is shown by a green LED.

3.4.1 M12×1 connections

M12×1 connections for the I/O modules

A sensor or an actuator can be connected to each of the eight M12×1 connections of an I/O module via M12×1 plug (4 or 5-pin).

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>When connecting the peripheral equipment (I/O interface), the requirements for protection against accidental contact must be observed in accordance with EN 50178, classification VDE 0160.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is no protection to prevent reverse polarization or feedback of the supply voltage. Ensure that the permissible current load of 0.5 A per signal and supply line is not exceeded, whereby the total current of all supply lines may not exceed 4 A per module!</td>
</tr>
</tbody>
</table>

Fig. 5: M12×1 connection layout

<table>
<thead>
<tr>
<th>Table 1: M12×1 connection layout</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>
Installation

3.4.2 Multiple plug connection for I/O modules

Both the multiple plug connector I for the valve controls (right next to the valves) and the multiple plug connector II for the I/O modules (right next to the I/O modules) are located on the adapter plate. See Figure 2 and 3.

The I/O modules are connected to the PLC via the multiple plug connector II on the I/O module side.

### NOTICE

24 V DC supply voltage with electrical isolation via a power supply unit according to DIN EN 60742, classification VDE 0551.

All GND pins and all +24 V pins are bridged in the multiple plug connector. There must be a sufficient number of pins connected to supply and accept the total current of all consumers. There should be at least 3 GND pins connected.

The total current of all I/O modules may not exceed the fuse value of 8 A!

The crimped contact connections fit wire cross sections of 0.14 ... 0.56 mm². Please only use multiple-strand cables with an external insulation diameter from 9.0 to 15.5 mm; use the appropriate mating plug sealing element to ensure that the IP 65 degree of protection and the strain relief are guaranteed.

![Mating plug II assignment](image-url)
### Mating plug II assembly

1. Select a suitable sealing element and insert it into the mating plug’s terminal fitting:
   - red: cable Ø 9.0 ... 13.0 mm
   - white: cable Ø 11.5 ... 15.5 mm
2. Push the terminal fitting and mating plug casing over the cable.
3. Remove about 5 cm of the cable sheath. Remove about 5 mm of insulation from the strands and mark them according to their assignment and function.
4. Crimp the plug connections to the single cable strands.
5. Click the plug connections into the socket body according to the assignment.
6. Screw the socket body to the mating plug casing; pay attention to the orientation (different pin Ø on the mating plug provide clarity).
7. Tighten the terminal fitting’s lock nut until the sealing element firmly holds the cable (IP 65 degree of protection, strain relief).

### 3.5 Making connections

**NOTICE**

Please ensure that enough free space is left for the electrical connections so that the permissible minimum bending radii are adhered to.

**Making connections**

1. Make the PE connection (M5 screw on the adapter plate) according to VDE 100 and VDE 160.
2. Connect the cable to the controlling electrical system.
3. Plug mating plug I onto the multiple plug connector I for valve control and
4. mating plug II onto the multiple plug connector II for the I/O modules and screw tightly.
Testing and start-up

4 Testing and start-up

4.1 Testing

The functional reliability and operating method of the actuator/sensor controls should be checked before start-up.

4.2 Start-up

**NOTICE**

Before switching the system on, ensure that it is in a defined state!
Also ensure that all manual overrides are set to zero.

- Switch on the operating voltage.
- Switch on the compressed air supply.

5 Conversion and extension

5.1 Adding passive I/O modules

**NOTICE**

Please observe the following if additional passive I/O modules are to be added on at a later date:
- Turn off the system operating voltage and compressed air.
- A maximum of 4 passive I/O modules can be connected!

Adding I/O module(s)

1. Remove the left side cover from the valve system’s last I/O module (3 hexagon socket-head screws, DIN 912 M4 with wrench width 3).
2. Put the additional I/O module in place. Ensure that the gasket has been inserted properly and that the contacts have been plugged in.

3. Screw the I/O module tight (3 hexagon socket-head screws, DIN 912 M4, wrench width 3). Tightening torque: 2.5 ... 3.0 Nm.

4. Screw the left side cover back on after the last I/O module (3 hexagon socket-head screws, DIN 912 M4, wrench width 3). Tightening torque: 2.5 ... 3.0 Nm.

5. Make connections. See section 3.

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6. Characteristics, service parts and accessories

6.1 Characteristics

Table 2:

<table>
<thead>
<tr>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of protection</td>
</tr>
<tr>
<td>EN60529 / IEC529</td>
</tr>
<tr>
<td>Number of connections per unit</td>
</tr>
</tbody>
</table>

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Fig. 7: Adding an I/O module (picture shows HF 03 with double multiple plug connector)
Characteristics, service parts and accessories

Table 3:

<table>
<thead>
<tr>
<th>Electrical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
</tr>
<tr>
<td>24 V DC (-15% / +20%)</td>
</tr>
<tr>
<td>Max. current load:</td>
</tr>
<tr>
<td>Signal line</td>
</tr>
<tr>
<td>0.5 A</td>
</tr>
<tr>
<td>Supply line</td>
</tr>
<tr>
<td>0.5 A</td>
</tr>
<tr>
<td>Total supply line current</td>
</tr>
<tr>
<td>4.0 A/module</td>
</tr>
<tr>
<td>Fuse for I/O modules</td>
</tr>
<tr>
<td>8.0 A medium time lag</td>
</tr>
</tbody>
</table>

6.2 Service parts and accessories

Table 4:

<table>
<thead>
<tr>
<th>Order code</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O module, passive *</td>
<td>IOP</td>
</tr>
</tbody>
</table>

Table 5:

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mating plug II, straight, for I/O modules</td>
<td>1824484061</td>
</tr>
<tr>
<td>Mating plug II, angled, for I/O modules</td>
<td>1824484025</td>
</tr>
<tr>
<td>M12x1 plug, straight, for I/O connection</td>
<td>1834484222</td>
</tr>
<tr>
<td>M12x1 plug, angled, for I/O connection</td>
<td>1834484223</td>
</tr>
</tbody>
</table>

* Delivery incl. 3 fastening screws and 1 gasket
The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The given information does not release the user from the obligation of own judgement and verification. It must be remembered that our products are subject to a natural process of wear and aging.

An example configuration is depicted on the title page. The delivered product may thus vary from that in the illustration.

Translation of the original operating instructions. The original operating instructions were created in the German language.

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