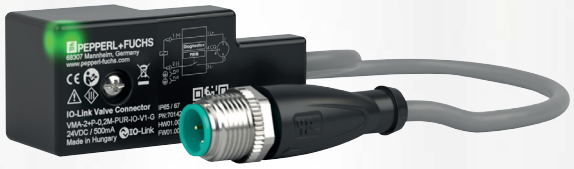
VMA-2+P-*-IO-*/
VMBI-2+P-*-IO-*

Valve Connector with IO-Link

Manual



CE IO-Link

Your automation, our passion.

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1 Introduction

1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include information on the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal

Note

For full information on the product, refer to the further documentation on the Internet at www.pepperl-fuchs.com.

Note

For specific device information such as the year of construction, scan the QR code on the device. As an alternative, enter the serial number in the serial number search at www.pepperl-fuchs.com/device-information.

The documentation comprises the following parts:

- This document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Functional safety manual
- Other documents

1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

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1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:



Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols



Note

This symbol brings important information to your attention.



Tip

This symbol brings an useful tip to your attention.



Example

This symbol provides an example of the issue described.



Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

1.4 Intended Use

The VMA-2+P-*IO-* and VMBI-2+P-*-IO-* valve connectors are used to connect a valve to a control circuit for communication and process control via IO-Link. Use the device for general control and automation tasks.

The intended use also includes EMC-compliant electrical installation.



Caution!

Device interference is possible in mixed and residential areas!

This installation may cause radio interference in mixed and residential areas.

- Observe the applicable standards for the mixed or residential area.
- Take appropriate measures to prevent radio interference.

1.5 General Safety Notice



Danger!

Death or serious injury due to electric shock.

High electrical voltage in the machine/plant.

When working on the device, observe the five safety rules of electrical engineering.

According to DIN VDE 0105-100—Operation of electrical installations—Part 100: General requirements

Protect people and devices from high electrical voltage:

- Disconnect
- Secure against restart
- Make sure that all poles are de–energized
- Ground and short circuit
- Cover or shield adjacent live parts

The device is only approved for appropriate and intended use. Ignoring these instructions will void any warranty and absolve the manufacturer from any liability.

Electrostatic Charge

Avoid electrostatic charges which could result in electrostatic discharges while installing, operating, or maintaining the device.

Ensure adequate grounding of people and equipment.

Disconnect the device from the power supply before unplugging or plugging in connectors and cables.

When taking measurements on electrostatic-sensitive devices, observe the following points:

- Discharge volt-free measuring devices for a short time.
- Ground the measuring devices.

If you are modifying electrostatic-sensitive devices, use a grounded soldering iron.

Operation, Maintenance

Use the device only within the specified ambient and operating conditions.

Observe directives, standards, and national laws applicable to the intended use and the operating location.

Do not use the device outdoors, in potentially explosive atmospheres (explosion protection zones) or for permanent operation in liquids.

Only operate the device in a perfect technical condition.

Do not modify or manipulate the device.

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If cleaning is required, do not use high pressure.

Storage, Transport, Disposal

Always store and transport the device in the original packaging.

The device, built-in components, packaging, and any batteries contained within must be disposed in compliance with the applicable laws and guidelines of the respective country.

2 Product Description

2.1 Use and Application

The valve connectors of types VMA-2+P-*IO-* and VMBI-2+P-*-IO-* are valve drivers with an IO-Link interface, implemented in a DIN interface plug. Connected solenoid valves can be controlled remotely and monitored via the network using the peer-to-peer interface. There are also valve connector versions for IO-Link Class A or IO-Link Class B.

When using an IO-Link master, diagnostic data for the connector, solenoid, and valve system can be called up, monitored, and connected to cloud-based systems.

Depending on the valve connector version, you can connect different solenoid valves:

- VMA-2+P-*IO-* valve connectors are suitable for solenoid valves with form A valve connectors
- VMBI-2+P-*IO-* valve connectors are suitable for solenoid valves with form B valve connectors (industrial)

Operating Modes

A valve connector can operate in one of the following operating modes:

1. **IO-Link mode**
   Operation and control are performed via the IO-Link master
2. **Standard mode**
   The valve connector works in two-wire operation with preset PWM and/or switch-on and switch-off timer function

Intelligent Data Transfer

The connector continuously communicates process data to the master via the IO-Link protocol and enables the electrical signals of the connected valve system to be checked. This allows you to detect whether the valve system is energized.

Asynchronous, request-driven data transfer allows you to query various status variables:

- Supply voltage
- Output current
- On resistance
- Coil resistance
- Coil power consumption

The valve connector uses IO-Link communication mode COM 2. This enables the transmission of the current process signal and the transmission of switching signals and diagnostic messages. COM 2 has a transmission rate of 38.4 kBaud and can transmit 8-bit process data to the controller every 2.8 ms.

Switching Cycle Counter

The device has two built-in counters as limit values for warnings.

Maintenance

To monitor the product life cycle, the valve connector can detect and store switching cycles. There is a counter for monitoring the entire life cycle that cannot be reset. Another counter can be set. You can set a limit value for each counter and for almost every measured variable. When a limit value is reached, you can generate an automatic event that is communicated to the higher-level controller.

You can prevent failures and analyze the product life cycles using the switching cycle counter.

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PWM Mode

To reduce the power consumption of the connected solenoid, the valve connector offers PWM pulse width modulation mode. The PWM mode allows the output current to be regulated. The switch-on time can be set to a maximum of 2,000 milliseconds to ensure the optimal retraction of the valve. In this phase, the coil absorbs full power. After the switch-on time, PWM mode is activated. The desired power reduction can be achieved by setting the duty cycle parameter. PWM operation also works in standard mode[1].

Diagnostic Data

The IO-Link connection has a lot of diagnostic data:

- Supply voltage
- Output current
- Load resistance
- Solenoid power consumption
- Own temperature
- Valve switch-on time

Configuration memory

The configured parameters of the connector are stored in the data memory. In the event of a failure, they can be read out of the affected connector and transferred to the replacement product.

What Is IO-Link?

IO-Link enables seamless communication and digital data transfer from the controller level down to the device level. The intelligent sensors/actuators can be used to their full potential with IO-Link, paving the way for Industry 4.0 in automation technology. The internationally standardized interface provides impressive efficiency and sustainable cost reduction from plant design and installation right through to operation and servicing.

Standardized device description files (IODDs) and parameterization via software tools ensure convenient configuration and integration of IO-Link sensors/actuators. Intelligent, transparent parameter management increases application flexibility and minimizes downtimes. Parameters can be customized quickly and easily, even for complex production and batch changes. Transparency right down to the device gives users access to a comprehensive range of parameterization options and device diagnostics functions, allowing them to perform predictive maintenance.

The technology offers particular benefits during service activities (troubleshooting, maintenance, and device exchange), during commissioning (cloning, identification, configuration, and localization), and during operation (job changeover, continuous parameter monitoring, and online diagnostics).

Device Description File (IODD)

The device parameters are different for each device. A standardized description of these parameters can be found in the IO Device Description file (IODD). IODDs can be integrated into a control environment to allow IO-Link devices to be used for IO-Link operation. Both parameterization and process data exchange can be performed with a PLC, for example. The IODD can also be imported into a range of engineering tools from various system providers for parameterization and, if necessary, diagnostics, provided these tools support IODD.

The relevant device description files (IODDs) can be found at www.pepperl-fuchs.com. Detailed information regarding IO-Link specifications and Smart Sensor profiles can be found at www.io-link.com.

1. without using IO-Link communication

Offline Parameterization

With offline parameterization, IO-Link devices are already configured before installation. To do this, use the Pepperl+Fuchs IO-Link USB master. An IODD is available for the sensor.

We recommend using "PACTware" software as the FDT frame application and user interface.

The software components required in each case are collated in the latest version of the "IO-Link Offline Parameterization Tool" software package. The software package and the documentation on its installation and use can be found online at www.pepperl-fuchs.com.

If the "IO-Link Offline Parameterization Tool" software package is used, there is active internet access, and the device is connected via the Pepperl+Fuchs IO-Link USB master, the IODD can be directly integrated into the IO-Link Offline Parameterization Tool via the "IODD DTM Configurator."

The device description file (IODD) required for integration in an IO-Link system and for the parameterization and diagnostics is available online. Visit www.pepperl-fuchs.com and navigate to the relevant product page for the valve connector.

Online Parameterization

When commissioning machines and plants, master and IO-Link devices must be integrated into the appropriate control environment. Depending on the components used, different software is required.

The devices can be configured and parameterized using an IO-Link configuration tool. During operation, you can check the parameter settings for the IO-Link devices, read out, and monitor status data and diagnostic data. IO-Link data is integrated into an application program using function blocks.

2.2 LED Indicators

The device has 2 LEDs for the status indicator.

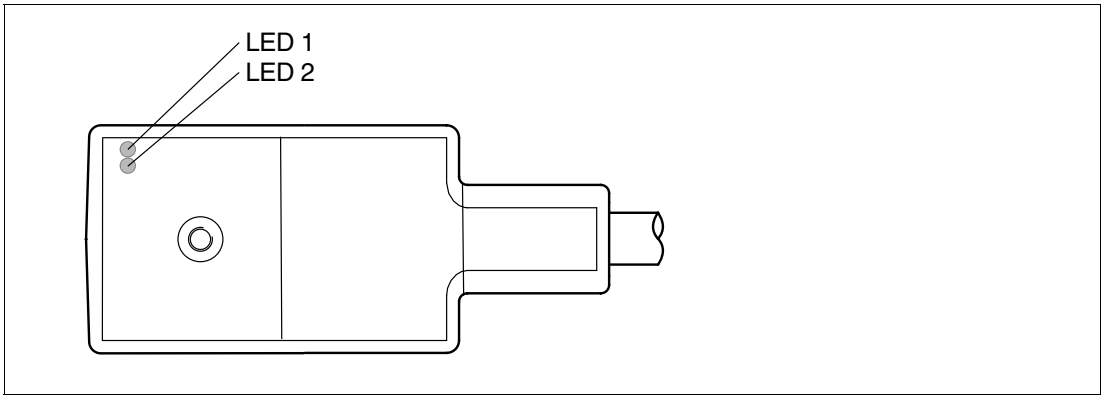


Figure 2.1

1 LED 1: IO-Link status

2 LED 2: Device status / diagnostics

Note

The LEDs are installed inside the valve connector and are visible from three sides due to the semi-transparent housing.

LED 1: IO-Link status

Status	Description
Lit up green[1]	Device is on, status OK
Green off	No voltage supply to device

Table 2.1

1. Parameterizable, see below

LED 2: Device status / diagnostics

Status	Description
Lit up red[1<Default ¬1 Font>]	Contact error or lead breakage at the valve coil
Color lit up	"Locator Indicator" for device identification in the system

Table 2.2

"Find Me" Function

You can turn on the "Find me" function. This feature allows you to locate the device if the solenoid, valve system, or connector itself fails. The connector must be supplied with power for this purpose.

The integrated RGB LED flashes in seven different colors to indicate where the connector is located.

Multicolored RGB LED

You can set different LED colors for different device output statuses:

- Switched off
- Blue
- Green
- Cyan
- Red
- Magenta
- Yellow
- White

2.3 Accessories

Various accessories are available.

2.4 Parameterization Aids

The following parameterization aids are available:

Designation	Description
IODD for VMx-2+P (Class A)	IO device description (IODD)—device description for operating the device, integration in the system environment Refer to the product page at **www.pepperl-fuchs.com** for the relevant valve connector with IO-Link Class A
IODD for VMx-2+P-V15 (Class B)	IO device description (IODD)—device description for operating the device, integration in the system environment Refer to the product page at **www.pepperl-fuchs.com** for the relevant valve connector with IO-Link Class B
IO-Link Offline Parameterization Tool	FDT frame application for operating IODDs and DTMs. This tool contains PACTware, IODD Interpreter DTM, and IO-Link USB Master DTM. See the product page at **www.pepperl-fuchs.com** for the relevant valve connector
IO-Link-Master02-USB	IO-Link USB adapter box for communication with the IO-Link device via a PC, M12 connection for the device

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3 Installation

3.1 Preparation

Unpacking the Device

1. Check the packaging and contents for damage.

   ↳ In the event of damage, inform the shipping company and notify the supplier.

2. Check the package contents against your order and the shipping documents to ensure that all items are present and correct.

   ↳ Should you have any questions, direct them to Pepperl+Fuchs.

3. Retain the original packaging in case the device is to be stored or shipped again at a later date.

3.2 Connecting to a Controller or IO-Link Master

Note

Depending on the device version, there are valve connectors with a 3-pin or 5-pin connector version for connection to a controller or an IO-Link master. The 5-pin IO-Link interface has additional cables for a higher power supply compared to the 3-pin interface.

3-Pin Connection

Connect the valve connector to a controller or an IO-Link master via the fixed cable with M12 plug.

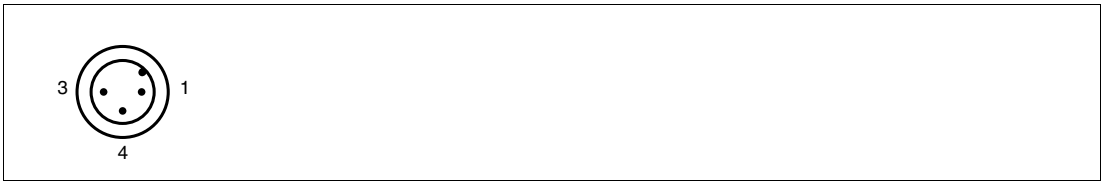


Figure 3.1

Pin Assignment

Pin	Assignment
1	L+, +24 V
3	L-, 0 V
4	C/Q, IO-Link switching and communication cable

Table 3.1 in accordance with IEC 60974-5-2

5-Pin Connection

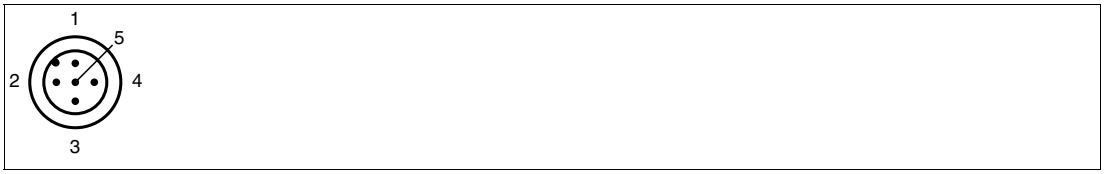


Figure 3.2

Pin Assignment

Pin	Assignment
1	L1+, +24 V
2	L2+,+24 V
3	L1-, 0V
4	C/Q, IO-Link switching and communication cable
5	L2-, 0V

Table 3.2 in accordance with IEC 60974-5-2

3.3 Connecting a Solenoid Valve

Note

Depending on the valve connector, there are versions with form A or form B (industrial) sockets for connecting solenoid valves.

- VMA-2+P-*IO-* valve connectors are suitable for solenoid valves with form A valve connectors
- VMBI-2+P-*IO-* valve connectors are suitable for solenoid valves with form B valve connectors (industrial)

Form A Valve Connector Socket

Connect the solenoid valve for form A valve connector to the VMA-2+P-*IO-* device.

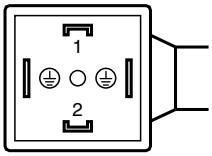


Figure 3.3

Pin Assignment

Pin	Assignment
1	+24 V
2	0 V
3, 4	Not connected

Table 3.3

Form B Valve Connector Socket (Industrial)

Connect the solenoid valve for form B valve connector to the VMBI-2+P-*IO-* device.

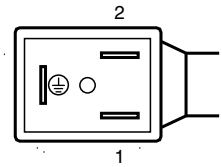


Figure 3.4

Pin Assignment

Pin	Assignment
1	+24 V
2	0 V
3, 4	Not connected

Table 3.4

4 Cybersecurity and Decommissioning Information

To ensure cybersecure operation and to protect the device, implement the following measures.

Security Context

Physically protect the device and the application against unauthorized access.

Manufacturing Interface

For manufacturing purposes, the device features a proprietary manufacturer's service interface that uses the existing connection lines.

After the device is switched on, the service interface is disabled after a defined time.

Operation

Lock the device to prevent hardware tampering. Ensure that only authorized users have access.

Restrict the access to the external interfaces on the device to authorized users only.

Maintenance and Management

Check the website regularly for security advisories publications and subscribe to the RSS feed: https://www.pepperl-fuchs.com/cybersecurity.

Decommissioning and Disposal

The device stores certain operating data permanently.

- Access data
- Configuration settings
- Log data
  - History
  - Event data
  - Fault data
- Additional operating data stored on the device
  - Personal data

To delete data, you have to physically destroy the device.

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5 Commissioning with IO-Link on a Controller (Online Parameterization)

Note

The device description file (IODD) required for integration in an IO-Link system and for parameterization and diagnostics is available online. Visit www.pepperl-fuchs.com and navigate to the relevant product page for the VMA-2+P-*IO-* valve connector or VMBI-2+P-*-IO* valve connector.

To activate the valve connector via IO-Link using a controller, proceed as follows:

1. Check the connection between the valve connector and the IO-Link master.
2. Set the status to IO-Link on the relevant port on the IO-Link master to which the valve connector is connected.

   ↳ Once communication has been successfully established, parameterize the valve connector with the higher-level application either by using an IO-Link configuration tool or retrieving diagnostic information. The device sends the data obtained as process data.

6 Commissioning with IO-Link via FTD Frame Application (Offline Parameterization)

IO-Link Offline Parameterization Tool

An IODD (IO-Link Device Description) file is available to download for parameterization of the valve connector via IO-Link and diagnostics. See the product page online at **www.pepperl-fuchs.com** for the relevant VMA-2+P-*IO-* valve connector or VMBI-2+P-*-IO-* valve connector or use the IODDfinder at https://ioddfinder.io-link.com/.

With offline parameterization, IO-Link devices are already configured before installation. To do this, use the Pepperl+Fuchs IO-Link USB master.

The software components required in each case are collated in the latest version of the "IO-Link Offline Parameterization Tool" software package. The software package and the documentation on its installation and use can be found online at www.pepperl-fuchs.com.

If the "IO-Link Offline Parameterization Tool" software package is used, there is active internet access, and the device is connected via the Pepperl+Fuchs IO-Link USB master, the IODD can be directly integrated into the IO-Link Offline Parameterization Tool via the "IODD DTM Configurator."

Note

Suitable cordsets can be found at **www.pepperl-fuchs.com**. Navigate to the product page for the relevant valve connector under "Accessories."

To activate the valve connector via IO-Link using the corresponding IODD, proceed as follows:

1. Make sure that the "IO-Link Offline Parameterization Tool" software package is installed on your computer.
2. Connect the valve connector to an IO-Link master with a suitable M12 cordset.
3. Make sure that the device description file (IODD) is installed for the relevant valve connector, e.g., via a download from the product page.
4. Start the "IODD DTM Configurator" software and click the "Add IODD" button.
5. Select the appropriate IODD.
6. Connect the IO-Link master to a USB port on your PC via a USB cable.
7. Start PACTware.

   ↳ PACTware directly communicates with the valve connector if PACTware from the "IO-Link Offline Parameterization Tool" is used and the IODD was found automatically.

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7 Process Data Structure

The process data of the valve connectors with IO-Link consists of 8-bit input process data and 8-bit output process data. The following table provides an overview of the order and structure of the process data.

Input Process Data

Name	Data Type	Length	Value	Bit Offset	Description
Valve Status	Boolean	1 bit	0, 1	0	Displays the status of the solenoid valve: • 0 = Off • 1 = On
PWM value	UInteger	7 bit	0, 10 ... 100 %	1	Time to the current PWM value for the valve current

Table 7.1

Output Process Data

Name	Data Type	Length	Value	Bit Offset	Description
Valve Control	Boolean	1 bit	0, 1	0	Controls the on/off status of the solenoid valve: • 0 = Off • 1 = On
PWM Control	UInteger	7 bit	0, 10 ... 100 %	1	Sets the PWM value for the valve current. If the value is 10 or less, the value defined in the "PWM value" parameter is applied.

Table 7.2

8 Troubleshooting

What to Do in the Case of a Fault

In case of a fault, use the following checklist to determine whether a fault with the valve connector can be remedied.

If none of the information provided in the checklist solves the problem, contact Pepperl+Fuchs via your sales office with any queries. If possible, have the model number and firmware version of the valve connector ready.

Checklist

Error	Cause	Remedy
LED 1: "IO-Link status": Does not light up green	No power supply	Check whether there is a reason for the absence of the voltage supply, e.g., a faulty fuse. Switch on the voltage supply.
LED 2: "Device status / diagnostics": Lights up red	Contact error or lead breakage at the valve coil	Check the solenoid valve connected to the valve connector. Replace the solenoid valve if necessary.
No IO-Link connection to valve connector	The C/Q communication port on the valve connector is not connected to the IO-Link master. The data connection between the PC (PACTware), IO-Link master, and the valve connector is not working.	Make sure that the C/Q communication port is connected to the IO-Link master. Restart PACTware if necessary.

Table 8.1

9 Repair and Servicing

The device must not be repaired, changed, or manipulated. In case of failure, always replace the device with an original device.

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Explosion Protection

- Intrinsic Safety Barriers
- Signal Conditioners
- FieldConnex® Fieldbus
- Remote I/O Systems
- Electrical Ex Equipment
- Purge and Pressurization
- Industrial HMI
- Mobile Computing and Communications
- HART Interface Solutions
- Surge Protection
- Wireless Solutions
- Level Measurement

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- Fieldbus Modules
- AS-Interface
- Identification Systems
- Displays and Signal Processing
- Connectivity

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