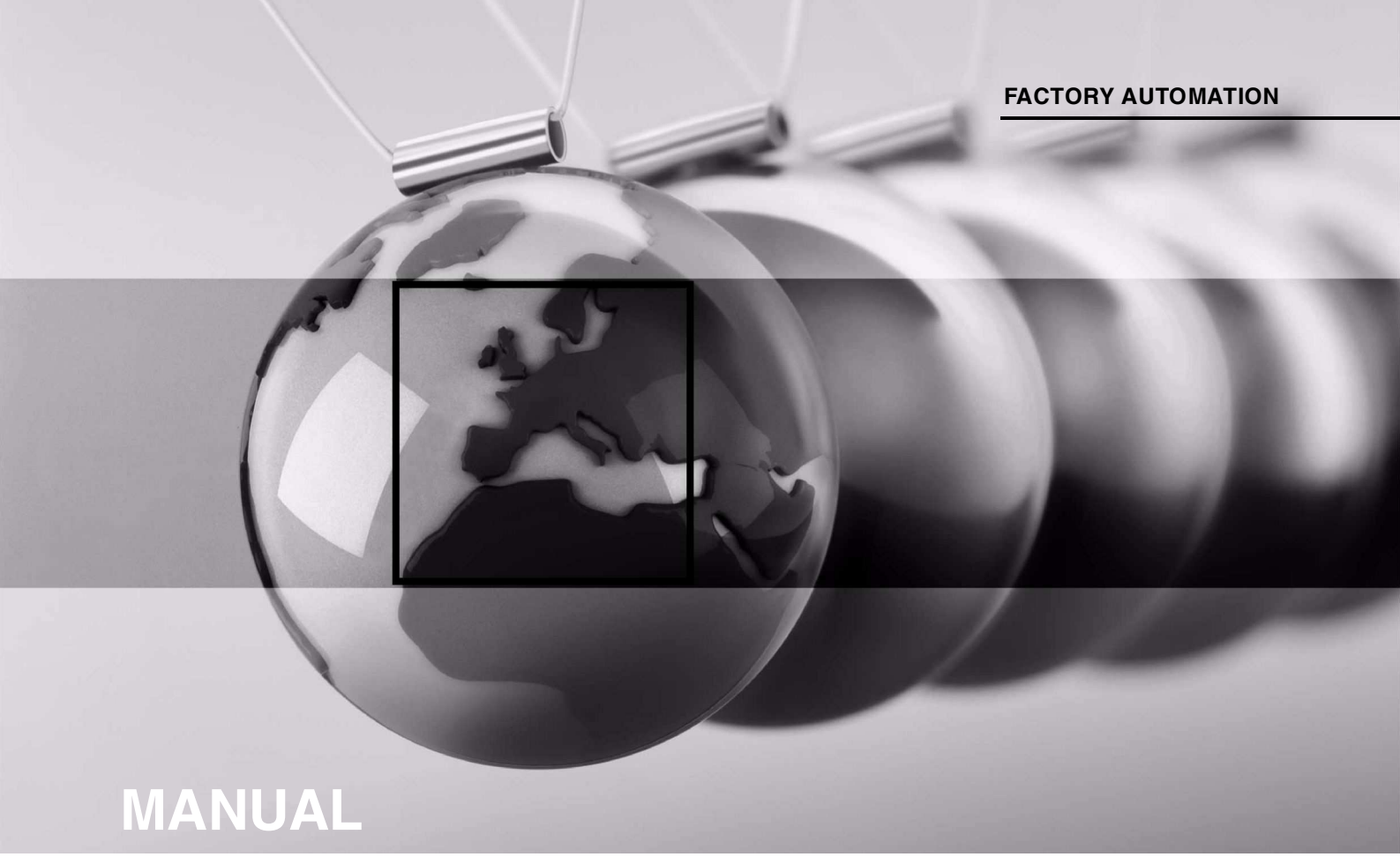
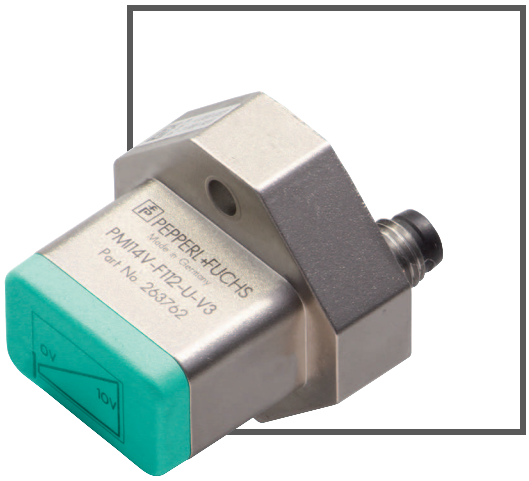


# MANUAL

# PMI14V-F112-...-U-...

## F112 Inductive Positioning System

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With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

# 1 Introduction

## Congratulations

You have chosen a device manufactured by Pepperl+Fuchs. Pepperl+Fuchs develops, produces and distributes electronic sensors and interface modules for the market of automation technology on a worldwide scale.

Please read the operating instructions carefully before installing this device and putting it into operation. The instructions and notes contained in this document will guide you step-by-step through the installation and commissioning procedures to ensure trouble-free use of this product. By doing so, you:

- Guarantee safe operation of the device
- Can utilize the entire range of device functions
- Avoid faulty operation and associated errors
- Reduce costs associated with downtime and incidental repairs
- Increase the effectiveness and operating efficiency of your plant.

***Note!***

Store these instructions somewhere safe in order to have them available for future work on the device.

## Contact

If you have any questions about the device, its functions, or accessories, please contact us at:

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Lilienthalstraße 200
68307 Mannheim
Telephone: +49 621 776-4411
Fax: +49 621 776-274411
E-Mail: fa-info@pepperl-fuchs.com

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# 2 Declaration of Conformity

This product was developed and manufactured under observance of the applicable European standards and guidelines.

***Note!***

A Declaration of Conformity can be requested from the manufacturer.

The product manufacturer, Pepperl+Fuchs GmbH, D-68307 Mannheim, has a certified quality assurance system that conforms to ISO 9001.

ISO**9001**

# 3 Safety

## 3.1 Used Symbols

### Safety-relevant Symbols


***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.

Action

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

## 3.2 Intended Use

The F112 inductive positioning system is optimized for highly accurate, continuous position detection. Based on the precise evaluation of several coil systems, the device combines a proven inductive sensor with innovative microcontroller technology. The compact design of the F112 enables position detection tasks to be carried out in a noncontact, wear-free process to a measuring length of 14 mm, even in confined installation locations.

***Note!***
The optimum measurement accuracy is achieved at an actuator distance of 1 mm ... 2 mm.

Only use recommended original accessories.

## 3.3 General safety instructions

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

Installation and commissioning of all devices must be performed by a trained professional only.

User modification and or repair are dangerous and will void the warranty and exclude the manufacturer from any liability. If serious faults occur, stop using the device. Secure the device against inadvertent operation. In the event of repairs, return the device to your local Pepperl+Fuchs representative or sales office.

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***Note!***

***Disposal***

Electronic waste is hazardous waste. When disposing of the equipment, observe the current statutory requirements in the respective country of use, as well as local regulations.

# 4 Product Description

## 4.1 Use and Application

The PMI14V-F112-...-U-... inductive positioning system is optimized for highly accurate, continuous position detection.

Based on the precise evaluation of several coil systems, the device combines a proven inductive sensor with innovative microcontroller technology.

The compact design of the F112 enables position detection tasks to be carried out in a noncontact and wear-free process to a measuring length of 14 mm. This includes installation locations where space is limited.

With its integrated temperature compensation feature, the inductive positioning system is ideal for use in harsh environments and for critical positioning tasks.

Due to the inductive functional principle, ferrites or magnets are not necessary as a counterpart. As is the case with an inductive proximity switch, the damping element can be made of any type of metal.

The benefits of the PMI14V-F112-...-U-... inductive positioning system include:

- High resolution and accuracy
- Minimal temperature drift
- Noncontact operation
- Measuring range that can be taught in
- Minimal susceptibility to interference due to the inductive functional principle

The PMI14V-F112-...-U-... inductive positioning system delivers a voltage signal between 0 V ... 10 V at the output that is proportional to the position of the damping element.

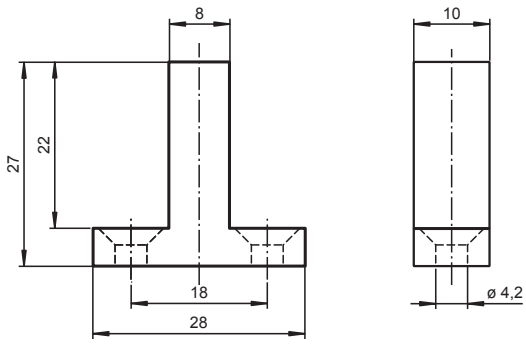
## 4.2 Accessories

Various accessories are available.

### 4.2.1 Damping Elements

We recommend using either the BT-F90-W or BT-F90-G damping element.

**BT-F90-W** Material: ST37 steel

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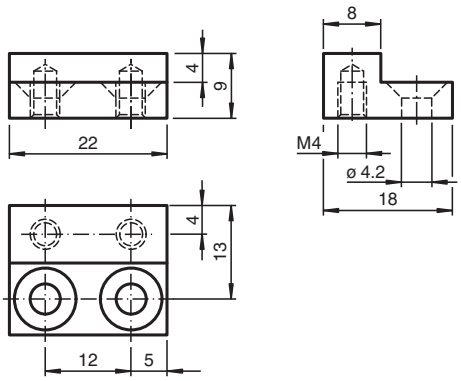
**BT-F90-G** Material: ST37 steel




**Using Your Own Damping Element**
In principle, it is possible to use your own damping element. The damping element must have the following properties to be able to make use of the sensor's specified accuracy:
Material: construction steel such as S235JR+AR (previously St37-2)
Dimensions as per BT-F90-W (L x W x H): ≥ 18 mm x 8 mm x ≥ 4 mm

Alternatively, the element must have the same dimensions as the BT-F90-G damping element.

***Note!***

The exact width of the damping element of 8 mm must be observed. If the width of the damping element deviates from this value, the position values will differ.

## 4.2.2 Connection Cable with Plug, 3-Wire

Below is a list of 3-wire female single-ended cordsets with a core cross-section of 3 x 0.25 $m^2$ suitable for establishing the electrical connection for PMI14V-F112-...-U-... devices:

| Type | Straight | Right angle | Cable Lengths |
|---|---|---|---|
| V3-GM-2M-PVC | X | | 2 m |
| V3-WM-2M-PUR | X | | 2 m |
| V3-GM-5M-PVC | X | | 5 m |
| V3-GM-5M-PUR | X | | 5 m |
| V3-WM-2M-PVC | | X | 2 m |
| V3-WM-2M-PUR | | X | 2 m |
| V3-WM-5M-PVC | | X | 5 m |
| V3-WM-5M-PUR | | X | 5 m |

Other lengths on request.

# 5 Installation

## 5.1 Safety Information

***Caution!***
Risk of short circuit

Carrying out work while the system is energized may result in damage to the device.

- Always disconnect the supply voltage before carrying out work on the device.
- Only connect the device to the supply voltage once all work has been completed.

## 5.2 Measuring Range of the PMI14V-...-U-...

### General

On delivery, the measuring range of the PMI14V-F112-...-U-... is 14 mm. This is indicated by the framed area at the front of the inductive positioning system.

It is possible to reduce the measuring range by parameterizing the sensor. When adjusting the measuring range, the end point of the sensor is fixed; it is the starting point of the measuring range that can be changed.

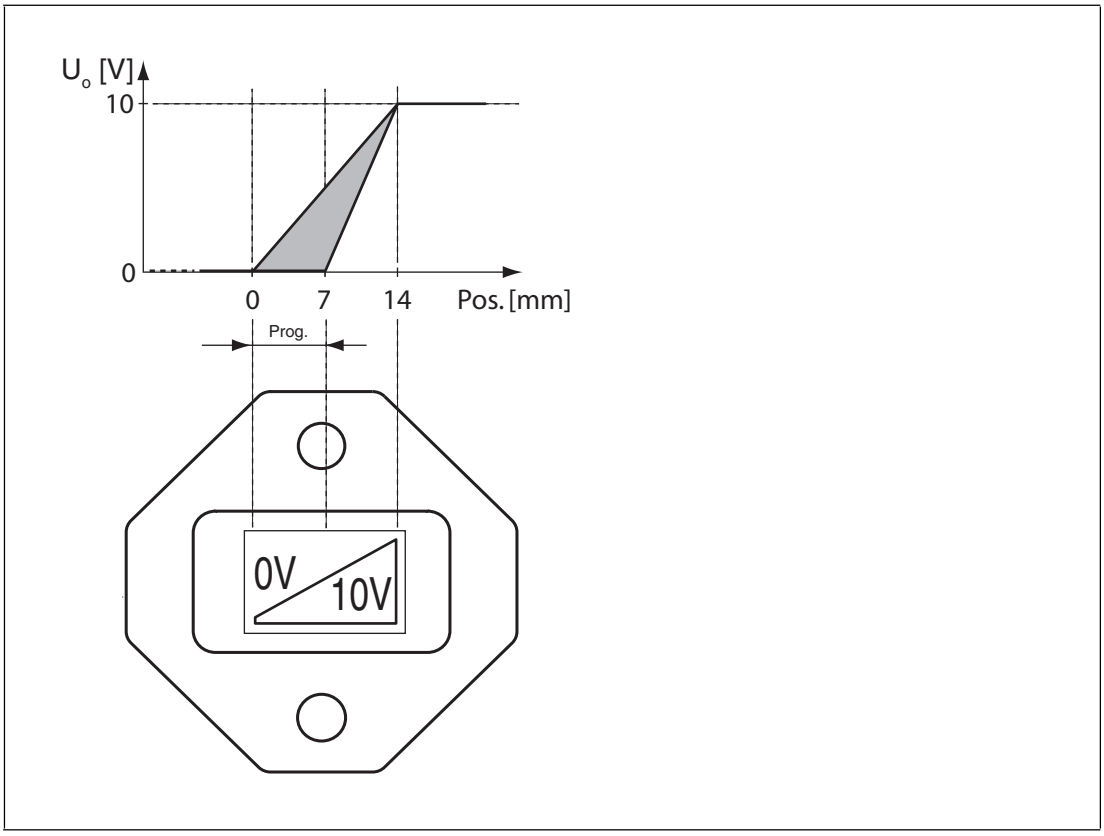



Figure 5.1

**$U_0$ [V]** Voltage at the analog output in volts

**Pos. [mm]** Position of the actuator in mm

The starting point can be taught in within a range of 0 mm to 7 mm

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## Definition of the Measuring Range/Position

The position of the damping element defined by the positioning system relates to half of the width (center) of the damping element. The measuring range begins and ends with the half coverage provided by the damping element when moving lengthwise.

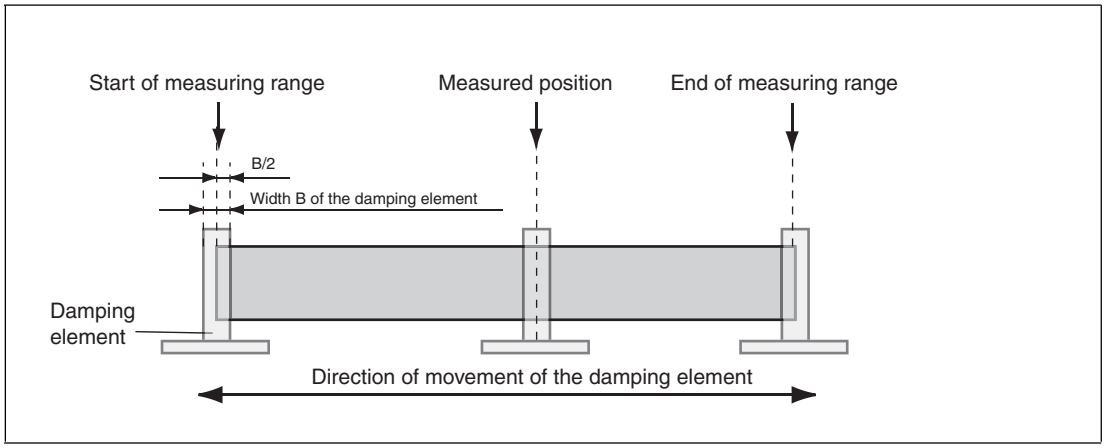



Figure 5.2

## Operating Instructions

If the damping element leaves the detection range of the positioning system, the last valid value is retained at the voltage output until the damping element enters the valid area again. This is illustrated in the figure below.

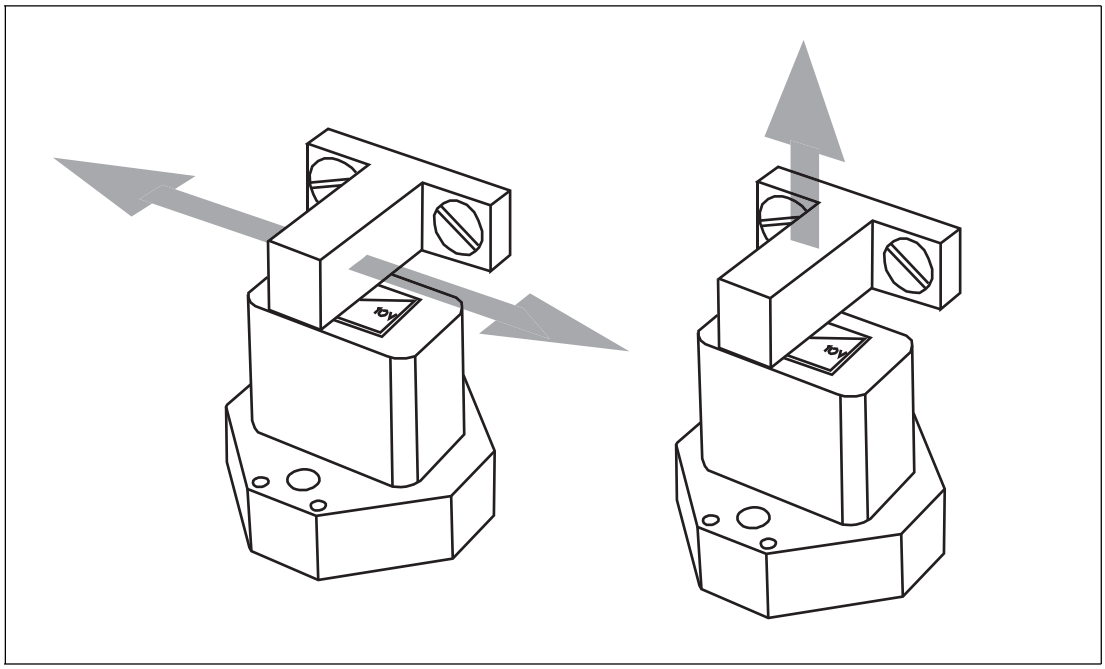


Figure 5.3

# 5.3 Preparation

## Unpacking the unit

1. Check that all package contents are present and undamaged.
   ↳ If anything is damaged, inform the shipper and contact the supplier.

2. Check that all items are present and correct based on your order and the shipping documents.

   ↳ If you have any questions, please contact Pepperl+Fuchs.

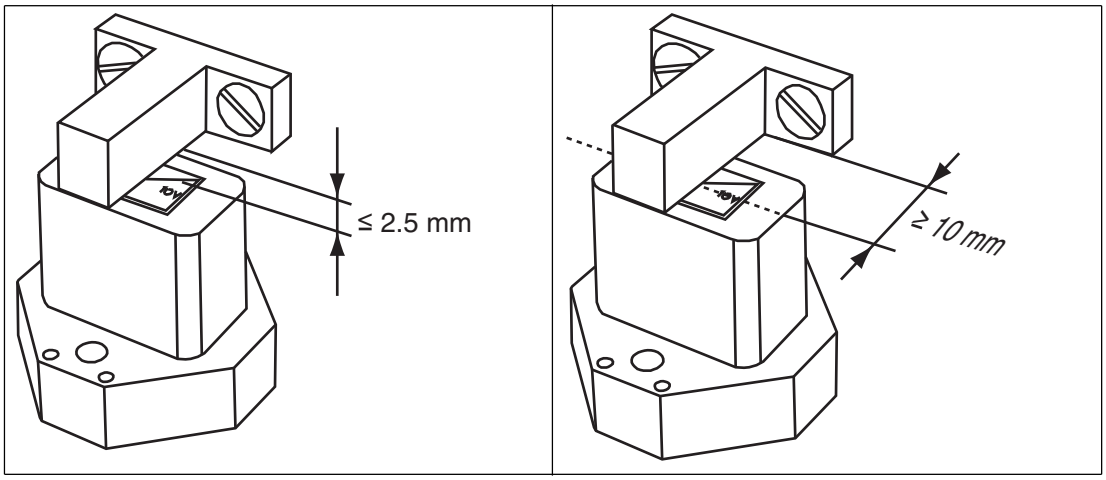
3. Keep the original packing material in case you need to store or ship the unit at a later time.

## 5.4 Mounting

- A flush mount is possible in metallic and nonmetallic environments
- The distance between the measuring field (framed area at the front of the sensor) and the mounting base or fastening screws on the damping element must be at least 3 mm.

  Watch out for any protruding metal parts such as screw heads when mounting the device.
- The damping element must be attached to the sensor at a right angle to guarantee the relevant measurement accuracy.
- The distance between the damping element and the sensor can be a maximum of 2.5 mm and must be at least 1 mm.

**Distance of the Damping Element**




## 5.5 Connection

### Connecting the Supply Voltage

To supply voltage to the sensor, proceed as follows:

1. Insert the prepared connection cable into the connector plug provided for this purpose on the underside of the housing.
2. Screw the cap nut onto the connector plug as far as it will go. This ensures that the power cable cannot be inadvertently pulled out.
3. Now connect the supply voltage to the cable provided.

   ↳ The sensor is now ready for operation.

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# 6 Commissioning

## 6.1 Commissioning in Line with Default Settings

1. Check that the distance between the damping element and the sensor is correct.
2. Switch on the supply voltage. The operating indicator on the sensor lights up yellow.

   ↳ The sensor will now function using the default parameters.

## 6.2 Programming the Measuring Range

### Operating and Display Elements

The PMI14V-F112-...-U-... inductive positioning system features a small, slightly recessed push button (1) on the back that is used to program the measuring range.

The measuring range starting point that is taught in is saved in the internal nonvolatile memory. This ensures that the value remains available even if the power supply is disconnected.

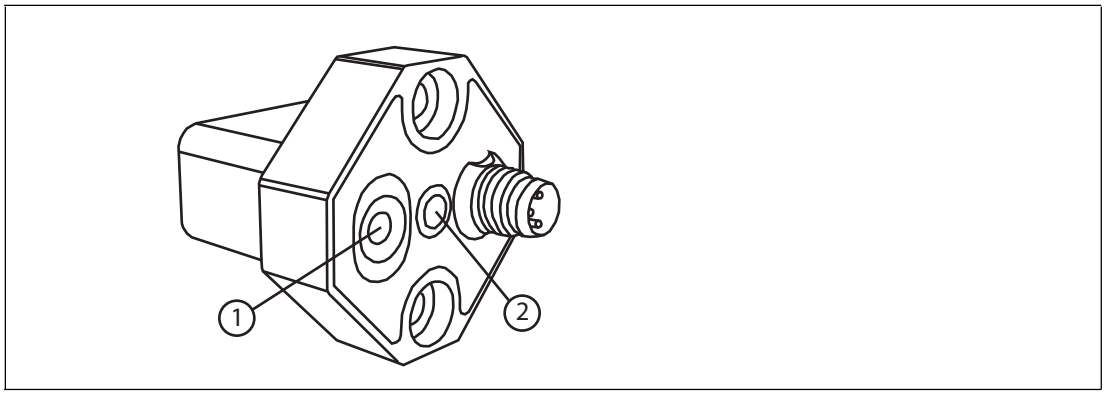


Figure 6.1

**1** Push button for programming the measuring range

**2** Operating display: LED (yellow/red)

### Teaching in the Measuring Range

1. Position the damping element for position detection at the measuring range starting point to be taught in. The geometric center of the damping element is crucial here.
2. Press and hold the push button with a thin object for at least 2 seconds. When doing so, make sure that the damping element does not move.

   ↳ The LED flashes yellow to indicate that the inductive positioning system is in Teach-in mode. If the LED is not flashing yellow or flashes red, read the section "Troubleshooting during Teach-in".
3. Confirm the taught-in starting point by pressing the push button again.

   ↳ If the now yellow LED lights up continuously, the starting point has been taught in. The end point of the measuring range remains unchanged. This point is marked by the area labeled "10 V" on the front. If the LED flashes red, read the section "Troubleshooting during Teach-in".

***Note!***

***Cancelation if Starting Point Not Confirmed***

If the starting point that has been taught in is not confirmed within 120 seconds, the inductive positioning system exits "Teach-in mode" and continues operation using the previous value.

## 6.3 Troubleshooting during Teach-in

### After pressing the push button once, the LED continues to light up yellow

If there is no damping element in the defined detection range of the inductive positioning system, the device does not switch to "Teach-in mode".

**Remedy:** Position the damping element at the measuring range starting point at a maximum distance of 2.5 mm.

### After pressing the push button once, the LED flashes red

The damping element is located within the detection range of the inductive positioning system at a position that is not valid for the Teach-in process. The LED flashes red for 20 seconds. The sensor then returns to normal mode.

**Remedy:** Position the damping element within 0 mm ... 7 mm of the detection range. This is the area within which you can teach in the measuring range starting point.

### In Teach-in mode, the LED changes from flashing yellow to flashing red

When calling up Teach-in mode, the damping element was in a valid position. Before the measuring range starting point had been confirmed, the damping element left the detection range of the inductive positioning system.

**Remedy:** Ensure that the damping element is not moved during the Teach-in process.

### The LED flashes red after confirming the measuring range starting point

When calling up Teach-in mode, the damping element was in a valid position. Before the measuring range starting point had been confirmed, the damping element left the valid area for Teach-in at the measuring range starting point (0 mm … 7 mm).

**Remedy:** Ensure that the damping element is not moved during the Teach-in process.

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# 7 Maintenance and Repair

## 7.1 Maintenance

The sensor's transmission properties are stable over long periods. For this reason, regular adjustments to, and maintenance on the sensor itself, are not necessary. Nevertheless check in the course of normal maintenance intervals that the sensor, the actuator and the connector are securely attached. Also check that the connecting cable is intact and correctly routed.

# 8 Troubleshooting

## 8.1 What to Do in the Event of a Fault

Before requesting a service call, please check that the following actions have been taken:

- The customer has tested the system according to the checklist below.
- Telephone assistance has been sought from the Service Center to isolate the problem.

**Checklist**

| Fault | Cause | Remedy |
|---|---|---|
| "Operating indicator" LED does not light up | The power supply is switched off. | Check whether there is a reason why the power supply is switched off (installation or maintenance work, etc.). Switch on the power supply if appropriate. |
| "Operating indicator" LED does not light up | The plug is not connected to the connector on the sensor. | Connect the plug to the sensor and tighten the cap nut by hand. |
| "Operating indicator" LED does not light up | Wiring fault in the splitter or switch cabinet. | Check the wiring carefully and repair any wiring faults. |
| "Operating indicator" LED does not light up | Supply cable to the sensor is damaged. | Replace the damaged cable. |
| Object is not detected | Sensor is too far away from the item to be detected | Check the mounting and, if necessary, adjust the sensor to the correct distance |

- If none of the above actions solves the problem, contact the Pepperl+Fuchs Service Center. Have details of the model number and firmware version of the sensor ready if possible.

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# FACTORY AUTOMATION – SENSING YOUR NEEDS


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