

## OPERATING INSTRUCTIONS

# INDUCTIVE POSITIONING SYSTEM F112





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Warning

*This symbol warns the user of potential danger. Nonobservance may lead to personal injury or death and/or damage to property.*



Attention

*This symbol warns the user of potential device failure. Nonobservance may lead to the complete failure of the device or other devices connected.*



Note

*This symbol calls attention to important notes.*

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**Security advice**

Warning

***This product must not be used in applications, where safety of persons depend on the correct device function.***  
***This product is not a safety device according to EC machinery directive.***

**Notes**

These operating instructions refer to proper and intended use of this product. They must be read and observed by all persons making use of this product. This product is only able to fulfill the tasks for which it is designed if it is used in accordance with specifications of Pepperl+Fuchs.

The warrantee offered by Pepperl+Fuchs for this product is null and void if the product is not used in accordance with the specifications of Pepperl+Fuchs.

Changes to the devices or components and the use of defective or incomplete devices or components are not permitted. Repairs to devices or components may only be performed by Pepperl+Fuchs or authorized work shops. These work shops are responsible for acquiring the latest technical information about Pepperl+Fuchs devices and components. Repair tasks made on the product that are not performed by Pepperl+Fuchs are not subject to influence on the part of Pepperl+Fuchs. Our liability is thus limited to repair tasks that are performed by Pepperl+Fuchs.

The preceding information does not change information regarding warrantee and liability in the terms and conditions of sale and delivery of Pepperl+Fuchs.

This device contains sub-assemblies that are electrostatically sensitive. Only qualified specialists may open the device to perform maintenance and repair tasks. Touching the components without protection involves the risk of dangerous electrostatic discharge, and must be avoided. Destruction of basic components caused by an electrostatic discharge voids the warrantee!

Subject to technical modifications.

Pepperl+Fuchs GmbH in D-68301 Mannheim maintains a quality assurance system certified according to ISO 9001.



### 1 System Description

The inductive positioning system F112 is optimized for a high-precision, continuous position sensing.

Based on the precise evaluation of a multi-coil system it is a combination of well-proved inductive sensor and microcontroller technology.

The compact design of F112 allows a non tactile and free of wear position sensing in a measuring length of 14 mm, even in installation positions with constricted space conditions.

Thanks to the integrated temperature compensation it is also particularly suited for rough environments and critical positioning tasks.

Due to the inductive active principle, you do not require ferrits or magnets as counterpart. As in the case of an inductive proximity switch, the attenuating element can be made of any metal.

The advantages of the inductive positioning system F112 are:

- High resolution and accuracy
- Min. temperature drift
- No-contact
- Teach-in measuring range
- Low disturbance susceptibility thanks to inductive active principle

The inductive positioning system F112 delivers a voltage signal of 0 V ... 10 V on the output. This signal is proportional to the position of the attenuating element.



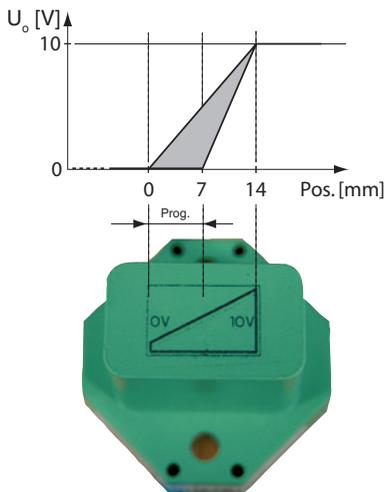
## 2 Measuring Range of PMI14V-F112-U-V3

### 2.1 General

The measuring range of PMI14V-F112-U-V3 is 14 mm in state as supplied, shown by the framed area on the front of the sensor.

The measuring range can be reduced by setting the parameters of the sensor; the end of the measuring range is fixed, and the starting point of the measuring range can be changed.

A teach-in of the starting point in the range between 0 mm and 7 mm is possible, so that depending on the taught-in starting point the measuring range will be between 0 mm ... 14 mm and 7 mm ... 14 mm.



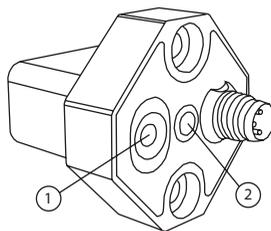
**Legend:**

$U_o$  [V]: Voltage at analog output in Volts

Pos. [mm]: Position of the attenuating element in mm

### 2.2 Programming the Measuring Range

Sensor PMI14V-F112-U-V3 is equipped with a small, recessed push button ① on the back which is used to program the measuring range. The taught-in starting point of the measuring range is saved in the non-volatile permanent memory of the sensor. Even after disconnecting the sensor from the supply voltage, it will remain unchanged after switching it on again.



**Legend:**

①: Push button to program the measuring range

②: Display LED (yellow/red)

To teach-in the measuring range proceed as follows:

1. Place the attenuating element for the position sensing on the requested position - the teach-in starting point of the measuring range. The geometric center of the attenuating element is decisive
2. Use a thin object to press the push button for min. 2 seconds. The related display LED starts to flash in yellow, showing that the sensor is in "teach-in mode".  
If the LED does not flash or if the LED flashes red, please refer to Section 2. 3 "Sources of trouble with the Teach-In procedure and their elimination" on page 5.  
Make sure that the attenuating element is on the requested position and that it is not moved.

3. Press the push button again to confirm the requested starting point of the measuring range. Now, the display LED lights up permanently in yellow.

If after the reset the LED flashes red, please refer to Section 2.3 "Sources of trouble with the Teach-In procedure and their elimination" on page 5.

The starting-point of the measuring range is now taught-in. The end of the measuring range cannot be changed and is indicated by the point marked with 10 V on the front of the sensor.



Attention

*If the starting point of the measuring range is not confirmed within 120 seconds, the sensor will exit the "teach-in mode" and will continue operating with the former value.*

## 2.3 Sources of trouble with the Teach-In procedure and their elimination

### 2.3.1 After having reset the push button, the yellow LED continues lighting in red

If there is no attenuating element in the detection range of the sensor, the sensor will not change over to the teach-in mode.

Remedy: Position the attenuating element in a distance of max. 2.5 mm before the sensor on the requested position for the start of the measuring range.

### 2.3.2 After having pressed the push button, the LED flashes red

The attenuating element is in the detection range of the sensor on a position which is invalid for teach-in procedure. The LED flashes red for 20 seconds. Subsequently, the sensor returns to normal operation.

Remedy: Place the attenuating element in the range 0 mm ... 7 mm. This is the range within which the starting point for the measuring range can be taught in.

### 2.3.3 In Teach-In Mode the LED changes from flashing yellow to red

When calling the teach-in mode, the attenuating element was placed on a valid position. Before confirming the starting point for the measuring range, the attenuating element left the detection range of the sensor.

Remedy: Make sure that the attenuating element is not moved during the teach-in procedure.

### 2.3.4 After having confirmed the starting point for the measuring range the LED flashes red

When calling the teach-in mode, the attenuating element was placed on a valid position. Before confirming the starting point for the measuring range, the attenuating element left the valid area for the teach-in of the starting point for the measuring area (0 mm ... 7 mm).

Remedy: Make sure that the attenuating element is not moved during the teach-in procedure.

### 2.3.5 After the Teach-In the Measuring Range has not changed

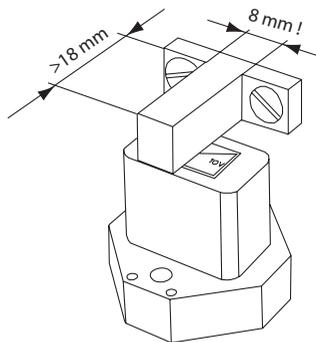
The teach-in procedure has not been completed by confirmation. The sensor left the teach-in mode after 80 s and performs normal operation with unchanged values.

Remedy: Confirm the teach-in procedure within 120 s by pressing the push button again on the back of the sensor.

### 3 Attenuating Elements

The inductive position measuring system F112 is optimally adapted to the geometry of the attenuating elements recommended by Pepperl+Fuchs (see Section 6 "Accessories" on page 10).

When other attenuating elements are used, make sure that the active surface of the attenuating element shows a width of exactly 8 mm and that the complete sensor width is protruding.



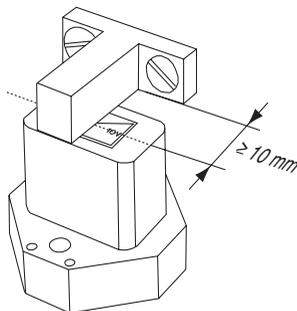
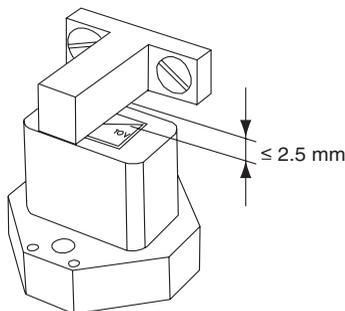
Achtung

*A different width of the attenuating element immediately affects the achievable resolution and accuracy of the system.*

## 4 Installation and Operation

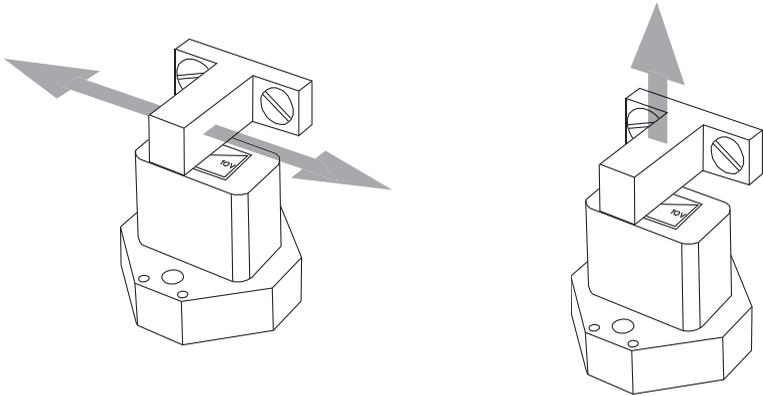
### 4.1 Notes on Installation

- Embeddable installation is possible.
- The distance between measuring field (framed area on the sensor front) and fastening basis or fixing screws on the attenuating element has to amount to min. 3 mm. Especially observe protruding metallic parts such as screw heads.



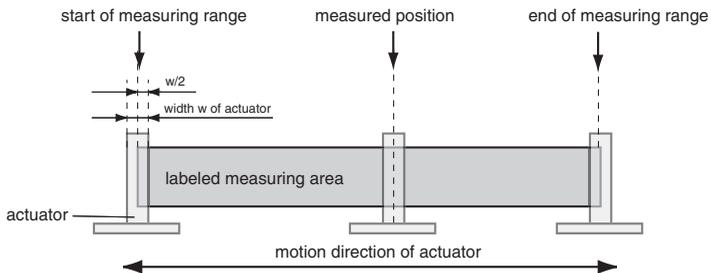
## 4.2 Operating Instructions

If the attenuating element leaves the detection range of the sensor (figure below), the last valid value on the voltage output will be maintained until the attenuating element returns to the valid area.



## 4.3 Definition of the Measuring Range/the Position

The position of the attenuation element determined by path measurement system F112 refers to the center of the attenuating element. The measuring range starts and ends with the half coverage by the attenuating element in case of movement in longitudinal direction.



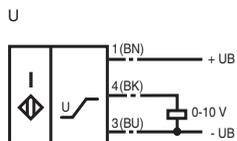
## 5 Technical Data

### 5.1 Specification Data

General specifications	
Function of the switching element	Analog voltage output
Object distance	max. 2.5 mm
Installation	embeddable
Reduction factor $r_{Al}$	0.45
Reduction factor $r_{Cu}$	0.4
Reduction factor $r_{V2A}$	0.75
Measuring range	0 ... 14 mm
Nominal values	
Operating voltage $U_B$	18 ... 30 V
Reverse polarity protected	with reverse polarity protection
Short circuit protection	phased
Output voltage	0 ... 10 V
Linearity error	$\pm 0.3$ mm
Temperature drift	$\pm 0.4$ mm
Repeat accuracy	$\pm 0.05$ mm
Resolution	33 $\mu$ m
No load current $I_0$	$\leq 20$ mA
Load resistor	Voltage output: $> 1000 \Omega$
Indication of the operating voltage	LED
Conformity to standard	
EMC conforming	IEC / EN 60947-5-2:2004
Standards	IEC / EN 60947-5-2:2004
Ambient conditions	
Ambient temperature	-25 ... 70 °Celsius (248 ... 343 K)
Mechanical specifications	
Type of connection	MB connector, 3 pin
Housing material	PA 6
Protection degree	IP67

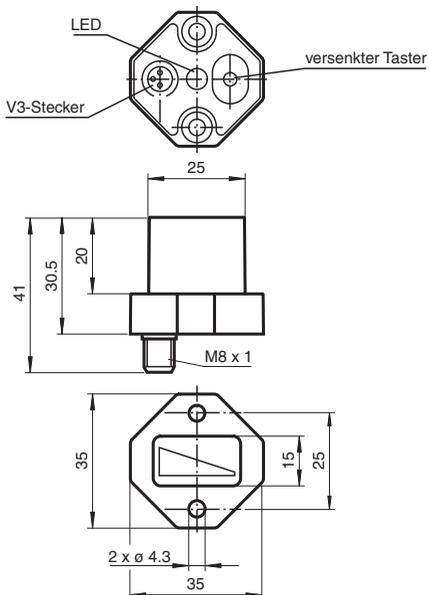
Note: The precision indications only apply to a distance of the object to be sensed of 1 ... 2.5 mm.

## 5.2 Electrical Connection



Core colours in accordance with  
 EN 60947-5-2.

## 5.3 Dimensions



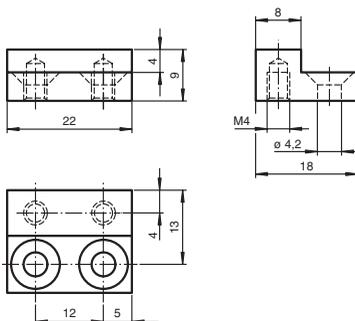
## 6 Accessories

### 6.1 Attenuating Elements

BT-F90-G



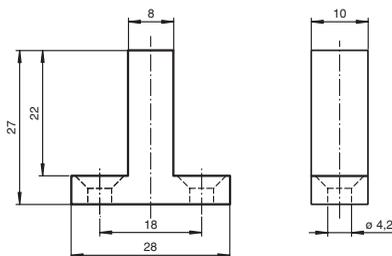
Material: steel ST37



BT-F90-W



Material: steel ST37



### 6.2 Cable Sockets

Type	Straight	Straight	Cable length	Number of wires	Cross section of wires	Covering material
V3-GM-2M-PVC	●		2 m	3	3 x 0.25 mm <sup>2</sup>	PVC
V3-GM-2M-PUR	●		2 m	3	3 x 0.25 mm <sup>2</sup>	PUR
V3-GM-5M-PVC	●		5 m	3	3 x 0.25 mm <sup>2</sup>	PVC
V3-GM-5M-PUR	●		5 m	3	3 x 0.25 mm <sup>2</sup>	PUR
V3-WM-2M-PVC		●	2 m	3	3 x 0.25 mm <sup>2</sup>	PVC
V3-WM-2M-PUR		●	2 m	3	3 x 0.25 mm <sup>2</sup>	PUR
V3-WM-5M-PVC		●	5 m	3	3 x 0.25 mm <sup>2</sup>	PVC
V3-WM-5M-PUR		●	5 m	3	3 x 0.25 mm <sup>2</sup>	PUR

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## 7 Notes

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