

PMI360D-F130-IE8-V15

**Inductive Position
Measuring System**

Manual



Your automation, our passion.

 **PEPPERL+FUCHS**

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1	Introduction	4
2	Declaration of Conformity	5
3	Safety	6
3.1	Symbols Used	6
3.2	Intended use	6
3.3	General safety instructions	6
4	Product Description	7
4.1	Use and application	7
4.2	LED indicators and control buttons	8
4.3	Scope of supply	8
4.4	Accessories	9
4.4.1	Connection Cables	9
4.4.2	Actuator	9
5	Installation	10
5.1	Note on safety	10
5.2	Mounting	10
5.3	Electrical connection	12
6	Commissioning	13
6.1	Configuration of switching outputs	13
6.2	Configuration of analog output	14
7	Output performance in normal operation	15
7.1	Performance of S1 and S2 switching outputs	15
7.2	Performance of S0 analog output	16
8	Maintenance and Repair	17
8.1	Maintenance	17
9	Troubleshooting	18
9.1	Errors when programming outputs	18
9.2	Errors in normal operation	19

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.

Symbols used

The following symbols are used in this manual:



Note

This symbol draws your attention to important information.



Handling instructions

You will find handling instructions beside this symbol

Contact

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

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2 Declaration of Conformity

This product was developed and manufactured in line with the applicable European standards and directives.



Note

A declaration of conformity can be requested from the manufacturer.

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



3 Safety

3.1 Symbols Used

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 PMI360D-F130... inductive position measuring system is used for high-precision sensing of the position of rotary actuators or valves. In addition to these main applications, the PMI360D-F130... inductive position measuring system is suitable for precise, non-contact sensing of all motion sequences which involve machine or system parts rotating around a center of rotation.

3.3 General safety instructions

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

Installation and commissioning of all devices may be performed only by trained and qualified personnel.

It is dangerous for the user to carry out modifications and/or repairs and doing so will void the warranty and exclude the manufacturer from any liability. In the event of any serious errors, stop using the device. Secure the device against unintended operation. To have the device repaired, return it to your local Pepperl+Fuchs representative or your sales center.



Note

Disposal

Electronic waste is hazardous. 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 PMI360D-F130... inductive position measuring system is a high-precision measuring system for non-contact recording of the position of rotary actuators and valves. But, thanks to the option of user-friendly and flexible configuration, it is also suitable for universal sensing of rotary motions around a fixed center of rotation in all fields of mechanical, system and apparatus engineering.



In addition to its 4 ... 20 mA analog output, the PMI360D-F130... has two independently configurable switching outputs providing two important positions (e.g. start and stop positions).

Furthermore, the "zero point" of the analog output can be selected as desired to balance out mechanical ranges, e.g. during mounting. This significantly facilitates both mounting of the PMI260D-F130... and subsequent calibration during commissioning.

Mounting the BT-F130-A target (see chapter 4.4) on the sensor housing bore enables position sensing. This target rotates in the central bore of the PMI360D-F130 and contains the metal insert required for position sensing. It is optimally designed for the mechanical conditions of valves or rotary actuators.



Note

The BT-F130-A target can be omitted. If you choose to do so, a metal target must be secured to the sensor housing bore. This metal target must meet the material, dimensional and distance requirements of the PMI360D-F130... inductive position measuring system.

4.2 LED indicators and control buttons



- A** Display LEDs
B Programming teach-in buttons

There are 3 LEDs and 3 programming buttons on the top of the PMI360D-F130....

The middle "Power ON" LED is green and lights up when the position measuring system is connected to the supply voltage. The two "S1" and "S2" LEDs are yellow and serve to indicate the status during the configuration process and in normal operation.

The programming buttons serve to configure the position measuring system. The middle S0 button is used to configure the "zero point" of the analog output and the outer "S1" and "S2" buttons are used to configure the switching points of the sensor's two switching output stages.

The "S1" and "S2" LEDs correspond in each case to the "S1" and "S2" programming buttons.

4.3 Scope of supply

- PMI360D-F130-IE8-V15
- Mounting screws
- Manual



4.4 Accessories

Various accessories are available.

4.4.1 Connection Cables

You can use the following single-ended female cordsets to establish the electrical connection:

M12 x 1 single-ended female cordsets, 5-pin

Illustration	Material	Length	Model number
 M12 x 1, straight, 5-pin	PVC	2 m 5 m 10 m	V15-G-2M-PVC V15-G-5M-PVC V15-G-10M-PVC
	PUR	2 m 5 m 10 m	V15-G-2M-PUR V15-G-5M-PUR V15-G-10M-PUR
 M12 x 1, angled, 5-pin	PVC	2 m 5 m 10 m	V15-W-2M-PVC V15-W-5M-PVC V15-W-10M-PVC
	PUR	2 m 5 m 10 m	V15-W-2M-PUR V15-W-5M-PUR V15-W-10M-PUR

Other lengths on request. If the cordset is to be used in environments with significant potential for electromagnetic interference, please use shielded single-ended female cordsets from our extensive range of accessories.

4.4.2 Actuator

The BT-F130-A actuator is designed for mounting directly on the drive shaft or a servodrive.



5 Installation

5.1 Note on safety

**Warning!**

Risk of short circuit

Working on live parts can cause injuries and can compromise the function and the electrical safety of the device.

- Before working on the device, always disconnect the supply voltage.
- Connect the device to the supply voltage only after completion of the work.

5.2 Mounting

Mount the sensor as follows:

**Caution!**

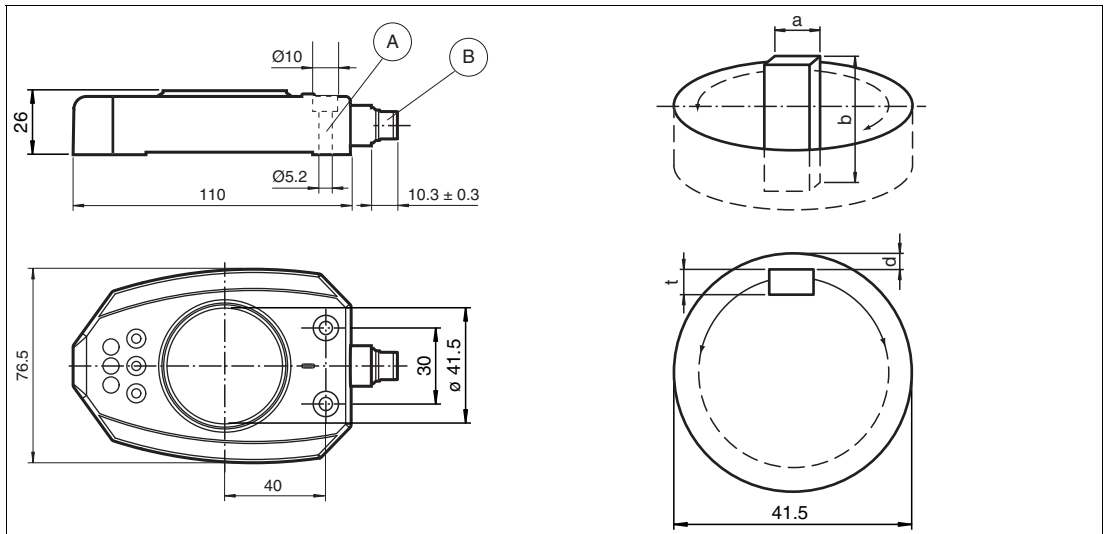
Avoid suspended mounting at temperatures below 0 °C and in humid environments!

In principle, the sensor can be installed in any position. However, avoid suspended mounting (upside down) if the ambient temperature is below 0 °C and in humid environments. Otherwise moisture may penetrate the inside of the sensor during prolonged exposure.

**Mounting**

1. Place the sensor on a stable mounting bracket or another flat surface.
2. Align the sensor so that the rotational axis of the movement that you wish to detect is positioned centrally in relation to the housing bore.
3. Secure the sensor using two M5 cylinder head screws (thread length ≥ 20 mm).
4. Check that the sensor is seated firmly and securely.
5. Unless already fitted, mount the actuator or a different actuator element on the rotational axis.
6. Check that the actuator is positioned in the center of the sensor so that the actuator does not rub against the sensor housing while the actuator is rotating.

Dimensions and distances



- A** 2 mounting holes, length 17 mm
- B** M12 x 1 connector, 5-pin

Dimension	[mm]
a	8
b	≥ 23
d	1 ... 2
t	≥ 2

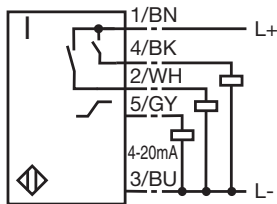
5.3 Electrical connection

When connecting the sensor electrically, proceed as follows:



Electrical connection

1. To connect the sensor electrically, use one of the cables listed in the chapter entitled Accessories with an M12 x 1 5-pin connector.
 2. Make sure when laying electrical cables that you have the cable at the correct orientation for connection.
 3. Make sure when routing cables that they are sufficiently spaced away from other current-carrying system parts. This is the only way of ensuring adequate protection against short circuits and/or crosstalk.
 4. Before connecting the cable to the sensor, make sure that you have aligned the cores. On Pepperl+Fuchs connectors, the core colors are assigned to the connection pins in accordance with DIN EN 60947-5-2.
 5. Connect the cable to the sensor-side connector and tighten the union nut by hand.
 6. Connect the operating voltage.
- ↳ The green "Power ON" LED on the sensor will now light up. The yellow "S1" and "S2" LEDs can also light up, depending on the position of the target.



Match the cable colors to the connection pins in the connector in accordance with DIN EN60947-5-2.

Connection pin	Cable color
1	Brown
2	White
3	Blue
4	Black
5	Gray

6 Commissioning

6.1 Configuration of switching outputs

The switching points are set at the factory to the angular positions 30° (S1) and 220° (S2). Configuration can be used to locate these switching points at each desired position. To configure switching output 1 (S1), proceed as follows:



Configuration of S1 switching output

1. Make sure that the sensor is correctly and securely mounted and that a target with the specified dimensions is located at the correct distance to the sensor surface (see chapter entitled Installation).
 - ↳ The sensor's green LED lights up.
2. Move the target to the desired position at which the S1 switching output is to be active.
3. Press the S1 button for ≥ 2 s.
 - ↳ The yellow LED flashes to indicate the teach-in position of the S1 switching point.
4. Check that the target is in the correct position and press the S1 button again.
 - ↳ The setting is now saved in the sensor's memory. The yellow S1 LED now lights up permanently. This serves to indicate that the S1 switching point has been successfully taught at the current position.



To configure switching output 2 (S2), proceed in the same way. Actuate the S2 button for this purpose. An indication is made by the S2 LED.

6.2 Configuration of analog output

The start point of the analog output is set at the factory to the position angle 0°. When the target is put in this position, a current value of 4 mA is the analog output. You can configure the start point of the analog output at any desired position. To configure the analog output, proceed as follows:



Configuration of analog output

1. Make sure that the sensor is correctly and securely mounted and that a target with the specified dimensions is located at the correct distance to the sensor surface (see chapter entitled Installation).
2. Switch on the sensor.
 - ↳ The sensor's green "Power ON" LED lights up.
3. Move the target to the desired position in which the start point (smallest analog value - 4 mA) of the analog output is to be located.
4. Press the S0 button for ≥ 2 s.
 - ↳ The green "Power ON" LED flashes to indicate the teach-in of the start point for the analog output.
5. Check that the target is in the correct position and press the S0 button again.
 - ↳ The setting is now saved in the sensor's memory. The green "Power ON" LED now lights up again permanently. This serves to indicate that the start point for the analog output has been successfully taught at the current position.



The analog output value increases beginning at the configured position when the target moves in the clockwise direction. The entire range of analog output values is reproduced in one rotation of the target.

7 Output performance in normal operation

Example

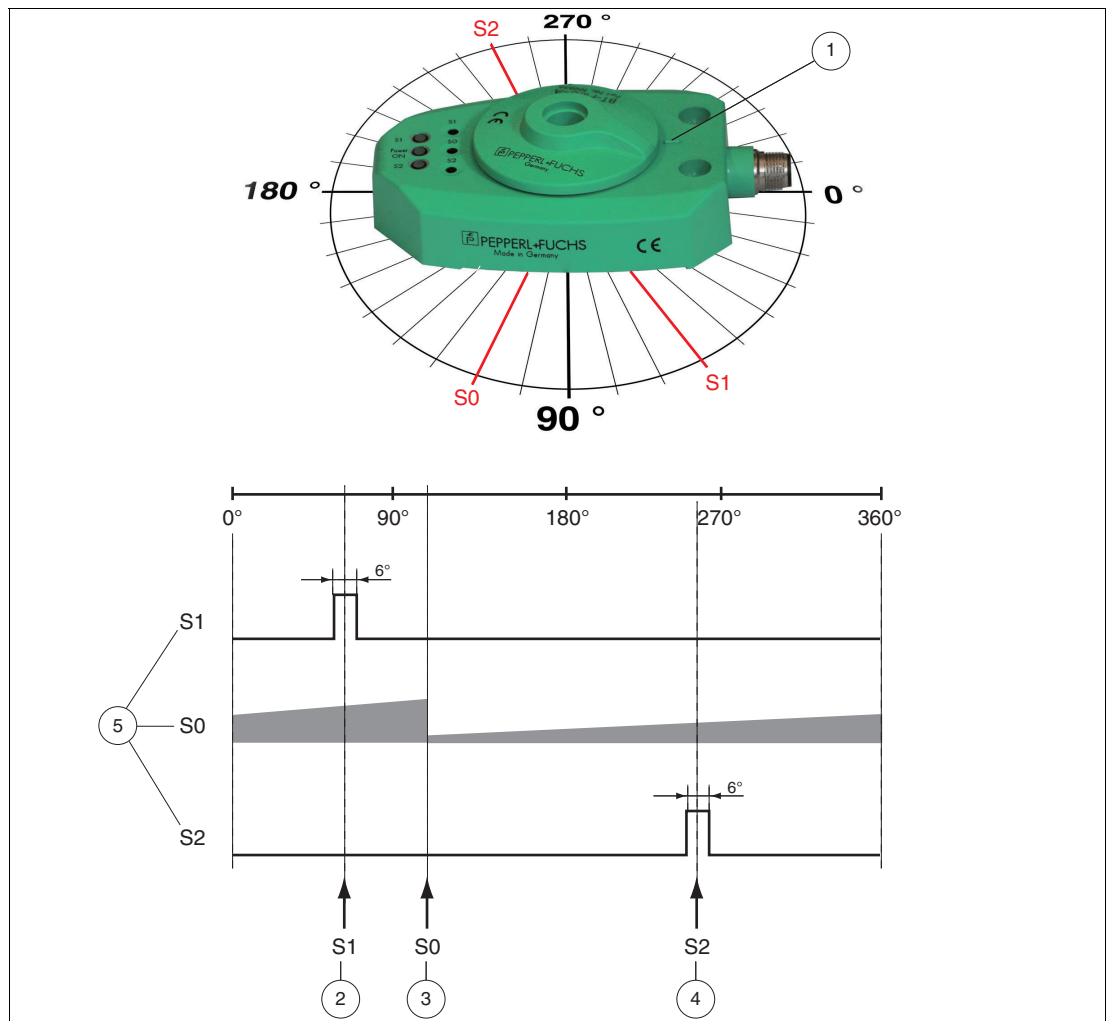


Figure 7.1 Output performance dependent on the position of the target

1. Marking, angular position 0° (factory setting)
2. Position for programming S1 (example)
3. Position for programming S0 (example)
4. Position for programming S2 (example)
5. Output signals

7.1 Performance of S1 and S2 switching outputs

The position of the target is determined by the position measuring system. It is half the target width (middle of target). The switching points are set at the factory to the angular positions 30° (S1) and 220° (S2). You can configure the sensor to locate these switching points at each desired position see chapter 6.1.

The corresponding switching output is activated when the metal target reaches the programmed S1 or S2 position. When the metal target is removed from the programmed S1 or S2 position, the switching output returns to the original position. When the metal target leaves the evaluation range of the position measuring system, an active switching output changes to the original position ("Up" position), while a non-activated switching output remains unaffected by this.

7.2 Performance of S0 analog output

The position of the target is determined by the position measuring system. It is half the target width (middle of target). The start point of the analog output is set at the factory to the position angle 0° . The start point of the analog output can be configured to any desired position angle see chapter 6.2. At this position the analog output indicates a current value of 4 mA. When the target rotates in the clockwise direction, the current increases proportionally to the scanned angle of rotation. After precisely one rotation, the analog output reaches its maximum value of 20 mA. If the target continues to rotate slightly, the output value jumps to 4 mA and a new cycle begins.

When the target leaves the measurement range of the position measuring system (e.g. when the target is removed), the last valid value is retained for 0.5 seconds. Then the output value changes to the default current of 3.6 mA. The output remains at 3.6 mA until the target returns to the measurement range of the position measuring system.

8 Maintenance and Repair

8.1 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.

9 Troubleshooting

9.1 Errors when programming outputs

If you experience difficulties when programming the outputs of the inductive position measuring system, you will find below a list of the possible causes and information on troubleshooting.

Fault	Cause	Rectification
Sensor cannot be placed in programming mode (LED does not flash when button is pressed)	Button not pressed long enough	Press the button for programming the output ≥ 2 s.
Sensor cannot be placed in programming mode (LED does not flash when button is pressed)	No target mounted	Mount the BT-F130-A target or your own suitable target
Sensor cannot be placed in programming mode (LED does not flash when button is pressed)	Customer's own target is mounted too far away from sensor surface	Mount a target according to specification (see chapter 5.2)
LED stops flashing	Timeout when programming the output.	Place sensor in programming mode again
After programming, the switching point or the start point of the analog output is still unchanged.	Programming process not concluded within the timeframe	Conclude the programming process by pressing the button corresponding to the output a second time within the timeframe (see chapter 6.1 or see chapter 6.2)

9.2 Errors in normal operation

In the event that the inductive position measuring system does not function correctly, you will find below a list of the possible causes and information on troubleshooting.

Error	Cause	Solution
"Power ON" LED does not light up	The power supply is switched off.	Determine whether there is a reason for the deactivation (installation work, maintenance work ...). If necessary, switch on the power supply.
"Power ON" LED does not light up	The connector is not connected to the sensor.	Connect the connector to the sensor and tighten the union nut by hand.
"Power ON" LED does not light up	Wiring fault in the distribution board or control cabinet.	Carefully check the wiring and if necessary eliminate any wiring errors.
"Power ON" LED does not light up	Supply cable lead to the sensor is damaged.	Replace the damaged cable lead.
No output signal at the switching output even though associated LED is lit	Output cable lead not connected	Connect output cable lead
No output signal at the switching output even though associated LED is lit	Output cable lead short-circuited	Eliminate short circuit
No output signal at the switching output. Associated LED not lit	Switching point not correctly programmed	Program switching point correctly
No output signal at the analog output	Output cable lead not connected or short-circuited	Connect output cable lead or eliminate short circuit
Start point of the analog signal not in the correct position	Start point of the analog output not programmed or incorrectly programmed	Program start point for the analog output
Output signal of the switching output "bounces"	Use of customer's own target with incorrect dimensions or incorrect distance to the sensor	Use a target as described in the specification (see chapter 5.2)
Output signal unstable	Target motion too fast	Make sure that the target speed is ≤ 100 rpm

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