

MANUAL

PMI360D-F130-IE8-V15
INDUCTIVE POSITIONING
SYSTEM



CE

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"

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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.

Before mounting and commissioning this device, please read these operating instructions carefully. The instructions and notices contained in these operating instructions serve to guide you step by step through the mounting and commissioning operations, thereby ensuring error-free use of this product. This is to your advantage because this is the only way to:

- ensure safe operation of the device
- utilize the full scope of device functions
- avoid incorrect uses that can lead to errors
- avoid costs incurred by interruption of use and repairs
- increase the effectiveness and economic efficiency of your system.

Keep these operating instructions in a safe place so that they are easily on hand for subsequent work on the device.

Please check immediately after opening the packaging that the device is intact and that all the listed parts are included.

Contact

If you have any questions concerning the device, its accessories or the suitability of the device for your application, please contact:

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e-mail: fa-info@de.pepperl-fuchs.com

2 Declaration of Conformity

This product has been developed and manufactured in accordance with applicable European standards and directives.



Note!

A Declaration of Conformity can be requested from the manufacturer.

The manufacturer of this product, Pepperl+Fuchs GmbH, in D-68307 Mannheim, Germany, has a certified quality management system in accordance with ISO 9001.



3 Safety

3.1 Used Symbols

Safety-relevant Symbols



Danger!

This symbol indicates a warning about a possible danger.

In the event the warning is ignored, the consequences may range from personal injury to death.



Warning!

This symbol indicates a warning about a possible fault or danger.

In the event the warning is ignored, the consequences may course personal injury or heaviest property damage.



Caution!

This symbol warns of a possible fault.

Failure to observe the instructions given in this warning may result in the devices and any connected facilities or systems develop a fault or fail completely.

Informative Symbols



Note!

This symbol brings important information to your attention.



Action

This symbol marks an acting paragraph.

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 notes on safety

The operator of the system is responsible in terms of planning, mounting, commissioning, operating and maintenance.

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

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended purpose.

Observe the laws and/or directives applicable to the use or planned application. The devices are only approved for proper and intended use. Failure to comply with these provisions will invalidate all warranties and absolve the manufacturer of all responsibility.

The handheld supports different interfaces such as Bluetooth, USB, RS 232 or PS/2. Always use correctly configured devices and recommended original accessoires to ensure reliable communication. Suitable accessories .

If faults or errors cannot be resolved, shut down the unit, protect it from being switched on and send the unit to Pepperl+Fuchs for repair. Tampering with or modifying the unit is dangerous, voids all warranties and relieves the manufacturer of all liability.

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.

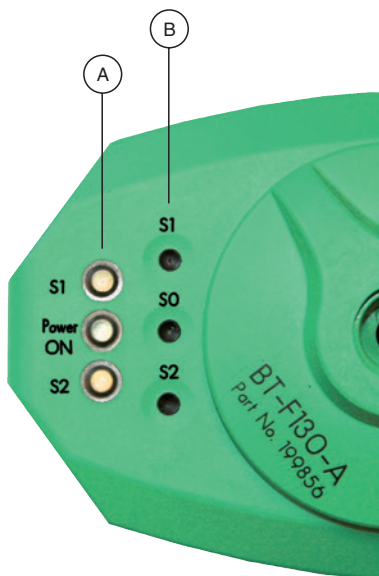
Mounting the BT-F130-A target (see chapter 4.4) on the sensor housing bore enables position sensing. This target rotates in the central bore of the PMI360D-F130 and contains the metal insert required for position sensing. It is optimally designed for the mechanical conditions of valves or rotary actuators.



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

Several accessories are available.

4.4.1 Connecting cable

You can use the following cables for the electrical connection:

M12 x 1 connectors, 5-pin

Figure	Material	Length	Order designation
	PVC	2 m	V15-G-2M-PVC
		5 m	V15-G-5M-PVC
		10 m	V15-G-10M-PVC
	PUR	2 m	V15-G-2M-PUR
		5 m	V15-G-5M-PUR
		10 m	V15-G-10M-PUR
	PVC	2 m	V15-W-2M-PVC
		5 m	V15-W-5M-PVC
		10 m	V15-W-10M-PVC
	PUR	2 m	V15-W-2M-PUR
		5 m	V15-W-5M-PUR
		10 m	V15-W-10M-PUR

Different lengths on request.

4.4.2 Target

The BT-F130-A target is particularly well-suited for mounting directly on the drive shaft or a servodrive.



5 Installation

5.1 Note on safety



Warning!

Risk of short circuit

Injuries and damage to the device are possible when working with live parts.

- 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

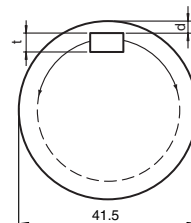
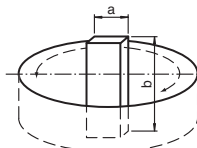
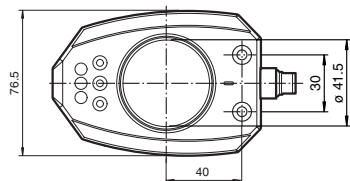
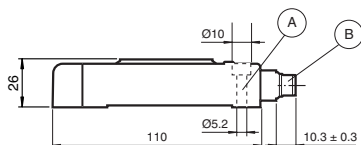
When mounting the sensor, proceed as follows:



Mounting

1. Place the sensor on a stable mounting bracket (provided by the customer) or another suitable bracket.
2. Align the sensor to the bracket so that the rotational axis of the motion to be recorded is aligned with the sensor housing bore.
3. Secure the sensor using two M5 screws (thread length ≥ 20 mm).
4. Check that the sensor is securely and stably mounted.
5. If not already mounted, mount the BT-F130-A target or your own target on the rotational axis.
6. Check that the required dimensions for the target and the distance between target and sensor housing are met and that the target does not rub against the sensor housing during its rotation.

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

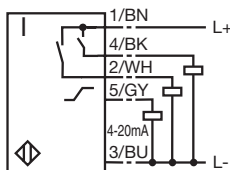
When connecting the sensor electrically, proceed as follows:



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

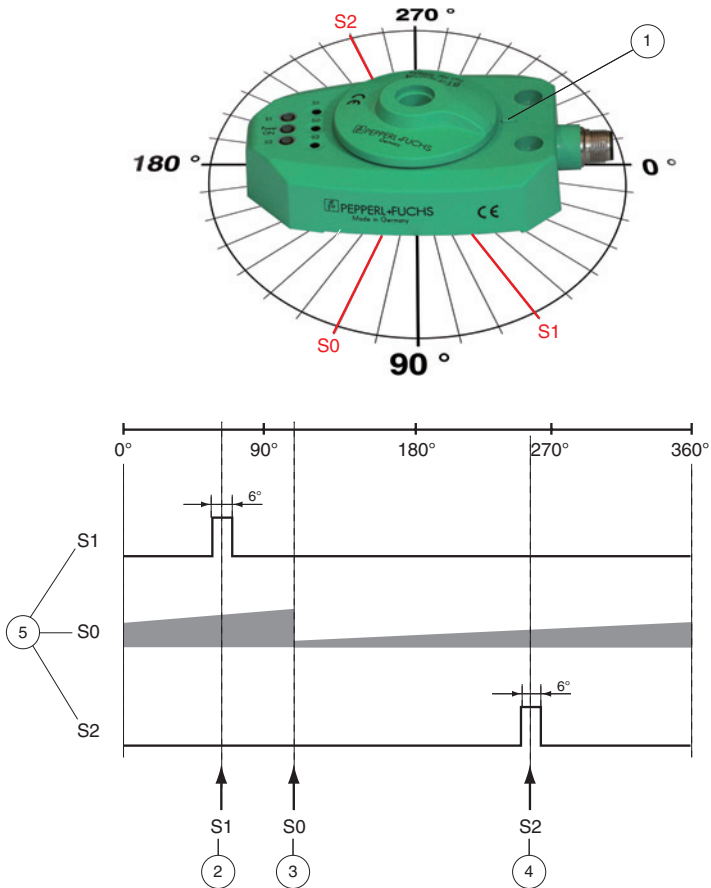


Figure 7.1: Output performance dependent on the position of the target

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 target 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

10 Appendix

10.1 Technical data

GENERAL DATA

Switching-element function	Analog current output and 2 switching outputs PNP, NO contact
Installation	Not flush
Measuring range	0° ... 360°
Maximum speed	100 rpm

LED indicators and control buttons

Buttons	3 buttons for programming the two switching points and the start point of the analog output
LEDs	1 green LED: operation indicator, indication of programming mode, analog output 2 yellow LEDs: switching-state indicator, indication of programming mode, switching points

Characteristic data

Supply voltage	18 V ... 30 V DC
No-load current	≤ 45 mA
Reverse polarity protection	Protected against reverse polarity
Short-circuit protection	Clocking
Temperature drift	1.5° (-25 °C ... 70 °C)
Analog output	
Output current	4 mA ... 20 mA
Load impedance	≤ 500 Ω
Resolution	0.4°
Linearity error	1.2°
Switching outputs	
Load current	0 mA ... 100 mA
Voltage drop	≤ 3 V
Repeat accuracy	0.5°
Switching hysteresis	5°

Conformity to standards

EMC in accordance with	IEC / EN 60947-5-2:2004
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Ambient conditions

Ambient temperature -25 °C ... 70 °C

Mechanical data

Connection type M12 x 1 connector, 5-pin

Housing material PBT

Degree of protection IP67

Mass 180 g

Shaft diameter max. 27.5 mm (steel)

10.2 Electrical connection

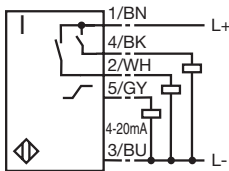


Figure 10.1: Electrical connection

Connection pin	Meaning
1	+UB
2	S2 switching output
3	-UB
4	S1 switching output
5	S0 analog output S0 (4 mA ... 20 mA)

10.3 Dimensions

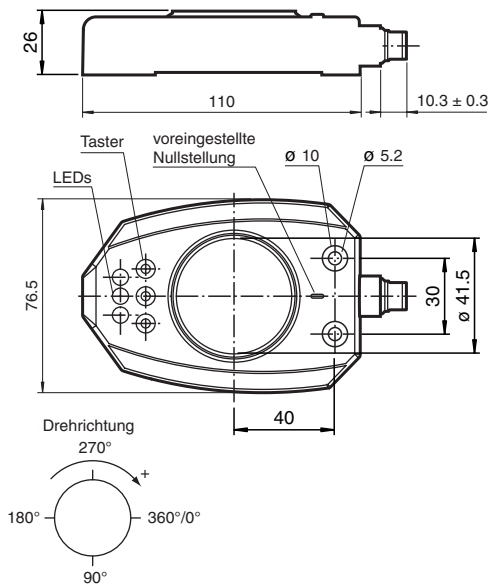


Figure 10.2: Dimensions

FACTORY AUTOMATION – SENSING YOUR NEEDS



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