Magnetic Field Sensors

- For Steel Cylinder Position Sending
- Detects piston position without cylinder bore holes
- Can locate piston position anywhere along cylinder
- More cost effective than other cylinder positioning solutions

4-wire DC, NPN. N.O. and N.C

In the past, cylinder position sensing using magnetic sensors was only possible using a thin-walled aluminum cylinder. But with Pepperl+Fuchs' new Magnetic Field Sensor, pistons can be detected through steel and other ferromagnetic cylinders.

Requirements

For proper operation, the magnetic field sensor must be used on a pneumatic or hydraulic cylinder that is made from steel (or other ferromagnetic material). The magnetic field sensor will work properly on cylinders up to 1 inch thick. A magnet system must also be attached to the piston without the cylinder. The sensor detects the change in polarity of the magnetic field as the magnet system attached to the piston passes through the cylinder.

Sensor Operation

Formatting

Before the sensor is used for the first time, the piston with magnet system attached should be run in and out of the cylinder to magnetically format the cylinder wall.

Field Direction without magnet system

The sensor will detect the polarity of the residual magnetic field created by previous movement of the piston and magnet system in the cylinder,

Field Direction with magnet system

As the piston with magnet system moves through the cylinder, the magnet system creates a stronger field opposite in polarity to the residual magnetism in the cylinder wall. As it moves under the sensor, the change in the polarity of the magnetic field on the cylinder wall is detected.

Switch Zone

The magnetic field sensor measures the flux density of the field in the cylinder wall, which results in a switch zone rather than an exact switch point like other sensors. The switch zone width is typically 50mm, but is affected by the following:

- Cylinder wall material and thickness
- Number and size of magnets in magnet system
- Piston speed

The switch output changes state when the piston reaches the switch zone and returns to its original state after the piston passes out of the switch zone.

Hysteresis is typically 5mm and repeatability is 0.5mm at a constant piston speed.

LED Indicators

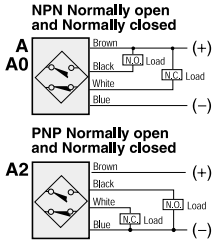
There are two LED's (yellow and red) to indicate that the piston is inside or outside the switch zone of the sensor The sequence of the LED's is determined
by the orientation of the north pole of the
magnet system to the connector. When the north pole of the magnet system faces the connector, the red LED
turns ON when the piston is within the switching zone. The yellow LED is ON otherwise.

Wiring Diagrams

4-Wire DC

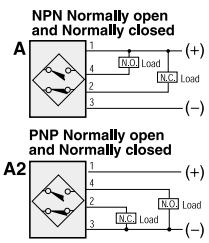
Cable Connection

4-wire DC output



Terminal Connection

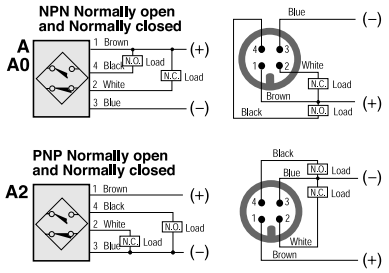
4-wire DC output



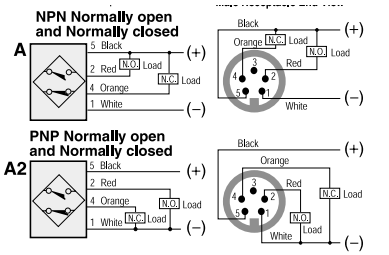
Quick Connection

Note: Wiring diagrams show quick disconnect pin numbers.

V1 Type



BHM Type



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When the south pole of the magnet system faces the connector, the yellow LED turns ON when the piston is within the switching zone. The red LED is ON otherwise

MAGNET SYSTEM

The magnet system components are as follows:

- Cylindrical magnets
- Magnet mounting ring
- Two pole pieces
- Spacer (necessary if piston is magnetic)

The magnet ring must be made out of nonmagnetic material (i.e. aluminum, brass, plastic). If the magnet system is made out of magnetic material, the magnetic field lines will short out and the magnet system will not operate properly. The pole pieces have to be made of magnetic material (preferably the same material as the cylinder) to properly guide the magnetic lines of force from the magnets to the cylinder wall to magnetize it.

DESIGN THE MAGNET SYSTEM

Since each magnet system must be customized to the particular dimensions of the cylinder, the MagCalc software is available to help design your magnet system.

The software inputs cylinder dimensions, piston dimensions, magnet size, material specifications, operating temperature and piston speed, then provides dimensional drawings for the magnet ring and pole pieces as well as total number of magnets required for proper operation of the magnet system. Consult MagCalc manual for further details.

Accessories

Magnets (Neodymium Iron Boron)

Model Number	Dimensions
DM06-05 NDFEB	6mm diameter x 5mm height
DM10-NDFEB	10mm diameter x 10mm height

Mounting Straps

Model Number	Cylinder Size
SB40-60 09R	30-48mm diameter
SB50-70 09R	40-58mm diameter
SB60-80 09R	50-68mm diameter
SB70-90 09R	60-78mm diameter

Magnetic Field Tester (MT01)

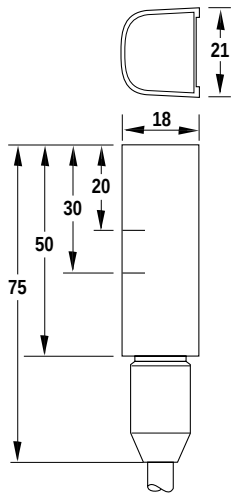
The magnet field tester is used to verify that the magnet system within the cylinder is working properly. The tester gives a visual LED readout of the flux density at a particular point on the cylinder. The flux density should be the highest when the tester is positioned by the piston. The flux density sufficient if one or more of the yellow LEDs are ON.

Specifications	4-wire DC	
MODEL NUMBER	**MB-F32-A2**	**MB-F32-A2-V1**
SWITCH ZONE*	50mm	50mm
HYSTERESIS*	5mm	5mm
REPEATABILITY*	0.5mm	0.5mm
OUTPUT: Transistor, Normally Open and Normally Closed *Suffix **A2***	PNP, sourcing	PNP, sourcing
LOAD CURRENT	100mA	100mA
LEAKAGE CURRENT	≤10µA	≤10µA
VOLTAGE DROP	≤1.5VDC	≤1,5VDC
SHORT CIRCUIT AND OVERLOAD PROTECTION	Yes	Yes
REVERSE POLARITY PROTECTION	Yes	Yes
SUPPLY VOLTAGE	10-30VDC	10-30VDC
LED(s)	Yes (2)	Yes (2)
CURRENT CONSUMPTION	≤30mA	≤30mA
HOUSING MATERIAL	Crastin	Crastin
ELECTRICAL CONNECTION	2-meter cable, PVC covered, 2-conductor, #22AWG	Quick disconnect type V1 or BHM

* Switch zone, hysteresis and repeatability based on measurements with a cylinder outer diameter of 46mm, wall thickness of 3mm and piston speed of 0.5m/s.

Dimensions (mm)

Classic Series
MB-F32-A2



Classic Series
MB-F32-A2-V1