


LIPS® X112 GAUGE HEAD POSITION SENSOR

INTRINSICALLY SAFE FOR HAZARDOUS GAS/VAPOUR ATMOSPHERES

- Intrinsically safe for Gas to:

- Gauge head positioning for industrial and scientific applications
- Non-contacting inductive technology to eliminate wear
- Travel set to customer's requirement
- Compact 19 mm diameter body



As a leading designer and manufacturer of linear, rotary, tilt and intrinsically safe position sensors, Positek® has the expertise to supply a sensor to suit a wide variety of applications.

Our X112 LIPS® (Linear Induction Position Sensor) is ATEX approved for use in potentially explosive gas/vapour atmospheres. It is designed for gauge head positioning in industrial and scientific applications and is ideal for OEMs seeking good sensor performance for arduous applications in hazardous areas. The X112, like all Positek sensors, provides a linear output proportional to displacement. Each sensor is supplied with the output calibrated to the travel required by the customer, from 10mm to 50mm and with full EMC protection built in.

Overall performance, repeatability and stability are outstanding over a wide temperature range. The sensor is very robust, the body and plunger being made of stainless steel for long service life and environmental resistance.

The plunger is spring loaded with a domed end. The X112 is easy to install with a long ½ inch UNF mounting thread and is supplied with two lock nuts for positioning. Environmental sealing is to IP67.

SPECIFICATION

DIMENSIONS

Body diameter	19 mm
Body Length (excluding thread)	
(Axial cable version)	160.7 mm
(Axial connector version)	160.7 mm
(Radial cable version)	166 mm
(Radial connector version)	169.5 mm
Mounting Thread Length	59 mm

For full mechanical details see drawing X112-11

Spring Force	1.5 - 4.5 N approx.
Independent linearity	< ± 0.25% @ 20°C
Temperature coefficients	< ± 0.01%/°C Gain & < ± 0.01%FS/°C Offset
Frequency response	> 10 KHz (-3dB)
Resolution	Infinite
Noise	< 0.02% FSO

Intrinsic Safety



II 1G

EEx ia IIC T4 (Ta = -40°C to +80°C)
 Ui: 11.4V, Ii: 0.20A, Pi: 0.51W.

maximum limits

Environmental Temperature Limits

Operating	-40 to +80°C
Storage	-40 to +125°C

Sealing

EMC Performance

Vibration

Shock

MTBF

Drawing List

X112-11

Sensor Outline

Drawings, in AutoCAD® dwg or dxf format, available on request.

Do you need a position sensor made to order to suit a particular installation requirement or specification? We'll be happy to modify any of our designs to suit your needs - please contact us with your requirements.

LIPS® X112 GAUGE HEAD POSITION SENSOR

INTRINSICALLY SAFE FOR HAZARDOUS GAS/VAPOUR ATMOSPHERES

Intrinsically safe equipment is defined as "equipment which is incapable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a specific hazardous atmosphere mixture in its most easily ignited concentration."

ATEX approved to  II 1G EEx ia IIC T4 (Ta = -40°C to +80°C)

Designates the sensor as belonging to; Group II: suitable for all areas **except mining**, Category 1 G: can be used in areas with continuous, long or frequent periods of exposure to hazardous gas (Zone 0).

Protection class ia, denotes intrinsically safe for all zones
 Apparatus group IIC: suitable for IIA to IIC explosive gas.
 Temperature class T4: maximum sensor surface temperature under fault conditions 135°C.
 Ambient temperature range extended to -40°C to +80°C.

Positek intrinsically safe sensors (Electronics system EX04) are designed to be used with a galvanically isolated barrier with safety parameters not exceeding:-

Ui: 11.4V, Ii: 0.20A, Pi: 0.51W.

Sensor can be installed with a cable length up to 1000m maximum from the barrier, capacitance and inductance can be up to:-

Capacitance: 200 nF max, Inductance: 660 µH max.

For cable lengths exceeding 10 metres a five wire connection is recommended to eliminate errors introduced by cable resistance and associated temperature coefficients.

Approved barriers are available from Positek®; there is a choice of 0.5-9.5V or 4-20mA transmission outputs.

0.5-9.5V barrier option - BX002.

4-20mA barrier option - BX003.

ATEX approved sensors suitable for dust (E series) and mining (M series) applications, are also available from Positek.

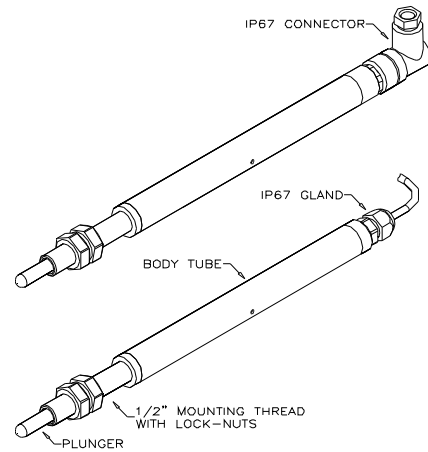


TABLE OF OPTIONS

MEASUREMENT RANGE: Factory-set to any length from 10 to 50 mm in increments of 1mm.

ELECTRICAL INTERFACE OPTIONS

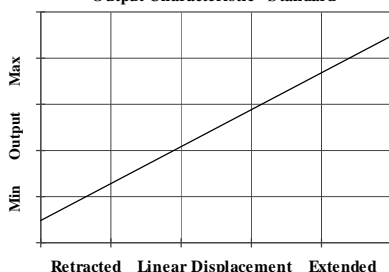
A galvanic isolation barrier is required to meet IS approval - 0.5-9.5V or 4-20mA options, see barrier data sheet overleaf.

CONNECTOR/CABLE OPTIONS

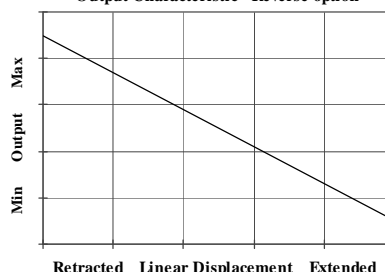
Connector - Hirschmann ELWIK 4102 Axial, IP67
 Connector - Hirschmann ELWIK 4102 Radial, IP67
 Cable with M12 gland Axial, IP67
 Cable with M12 gland Radial, IP67
 Cable length >50cm – please specify length in cm up to 15000cm maximum.

We recommend all customers refer to the 3 & 5-Wire Connection Information.

Output Characteristic - Standard



Output Characteristic - Reverse option



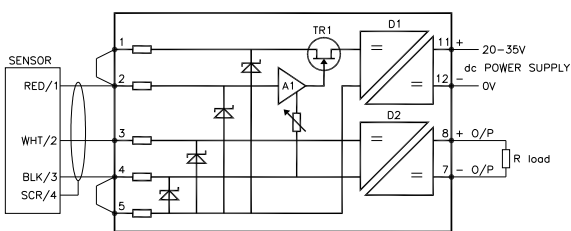
INTRINSICALLY SAFE BX002 and BX003 Sensor Barrier

Intrinsic safety means limiting the electrical energy in a system to a level incapable of causing ignition in any normal or fault condition. This can only be accomplished by installing an energy-limiting interface in the wiring between hazardous and non-hazardous areas.

Limiting the discharge of energy-stored devices in electrical equipment such as capacitors and inductors virtually eliminates the possibility of generating a spark and thus a source of ignition.

The BX002 (0.5 to 9.5V) and BX003 (4 to 20mA) Isolated Galvanic Barriers are the best choice for use with Positek Intrinsically Safe Position Sensors. The hazardous area circuits are certified intrinsically safe [EEx ia] IIC. Connections between hazardous and non-hazardous areas are transformer isolated, eliminating the requirement for a high-integrity intrinsically safe earth.

Choosing either a BX002 or BX003 barrier not only provides signal isolation but allows sensors to be calibrated to a specific barrier type before shipping, ensuring the respective barrier output corresponds to the sensor position over the calibrated range. The isolated power circuit limits the energy supply to the sensor to ensure the maximum safety parameters required for Positek sensors are not exceeded.



How it works; a 20-35V dc external power supply is connected to the dc/dc converter D1 which provides isolation. The output from D1 is regulated by A1 and TR1 to provide a nominal 5V supply for the sensor. The barrier and sensor can be connected by three wires; 5-wire connection capability is available to compensate for volts drop in long cable runs. D2 provides isolation between the sensors output and the barriers 0.5-9.5V or 4-20mA current loop output.

- ATEX approved
- Tri-port isolated
- DIN rail mounted
- Voltage and current output versions



SPECIFICATION

POWER SUPPLY
 Voltage 20-35V dc
 Power consumption ca. 0.7W for voltage output, 1.4W current output

INPUT CIRCUIT (terminals 1,2,3,4,5)
 Transformer isolated
 Intrinsically Safe [EEx ia] IIC
 BAS00ATEX7171
 U_{max} out = 10.4V
 I_{max} out = 46mA
 Voltage across sensor ca. 4.8 volts
 Lead resistance for 15mA 12Ω maximum (all connections)
 Input resistance terminal 3 17MΩ min

OUTPUT CIRCUIT (terminals 7/8)
 Output options
 Voltage BX002 0.5 to 9.5V
 Output resistance < 30Ω
 Current loop BX003 4 to 20mA
 Load resistance 0 - 1kΩ

TRANSFER CHARACTERISTICS
 Non-linearity: < ± 5mV for voltage outputs
 < ± 10μ A for current outputs
 Temperature drift: < 0.5mV/°C for voltage outputs
 < 1μA/°C for current outputs
 Settling time to 1% of span: < 25ms for 10-90% step change
 Rise time: < 8ms 10-90% of step change
 Bandwidth dc to 100Hz (-3dB)
 Isolation: 2500V between safe area terminals and hazardous area terminals, 50V between power rail terminals and output terminals (7 and 8)

ELECTROMAGNETIC COMPATIBILITY
 Emissions: to EN50081-2
 Immunity: to EN50082-2
 Ambient temperature range: -20° to 60°C working, -40°C to +100°C storage
 Protection class IP20

INTRINSICALLY SAFE

BX002 and BX003 Sensor Barrier

3 & 5-WIRE CONNECTION INFORMATION

The following discussion about 3 and 5 wire connections between sensors and the Galvanic Isolation Amplifiers is intended as an aid for end-users who are not familiar with the topic.

Whether opting for a pre-wired Positek® Intrinsically Safe sensor or one with a connector, choosing the right mode of connection and cable to suit the application requires consideration. Conductor resistance, a function of cross-section, length and current, causes volts drop across cable. This can significantly alter the perceived accuracy of the sensor which is ratiometric i.e. the output signal is directly affected by the supply voltage at the sensor.

3-wire connections are common for connecting sensors but accuracy can become an issue. Increasing conductor cross-section reduces volts drop and is suitable for all but very long lengths or applications that require a high degree of accuracy. Another factor to consider is conductor temperature. Fluctuations in temperature cause minor changes in resistance, the effects of which will be seen as gain variation in the sensor output.

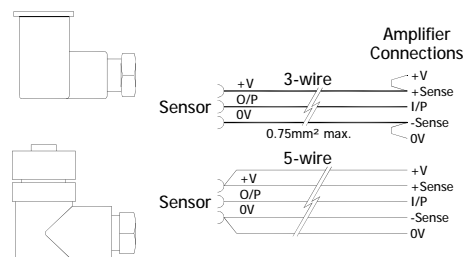
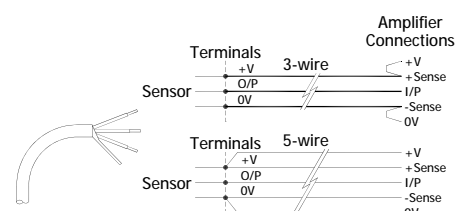
Sensors supplied with cable are calibrated with the cable fitted which negates errors due to conductor resistance at room temperature; however, small gain errors due to temperature fluctuations in the cable should be expected.

Large cross-section cables are not always practical. For example, sensors supplied with either the IP65 or IP67 connectors have a maximum conductor size of 0.75mm².

See illustrations right for examples of connecting a sensor to the Galvanic Isolation Amplifier.

5-wire connections have significant benefits over three wire connections as losses in the power and ground conductors are compensated. The Galvanic Isolation Amplifier senses and dynamically adjusts the output voltage so that the voltage at the sensor is correct, the effects of cable resistance and associated temperature coefficients are eliminated. BX002 and BX003 amplifiers can compensate for up to 12Ω per conductor with a current flow of 15mA, which is more than adequate for 150m of 0.25mm² cable.

For this reason Positek® recommends five wire connections for cable lengths exceeding 10 metres in 0.25 mm² cable to preserve the full accuracy of the sensor.



The barrier will compensate for up to 12 ohms resistance in each conductor so this imposes the following minimum cable sizes:-

0.25 mm ²	Ok for up to 150m
0.5 mm ²	Ok for up to 300m
0.75 mm ²	Ok for up to 450m
1 mm ²	Ok for up to 600m
1.5 mm ²	Ok for up to 900m
2 mm ²	Ok for up to 1000m

These lengths and sizes used in a three wire connection will introduce a gain reduction of 5% and a +/-1% temperature dependence of gain over the range -40°C to +80°C for the cable temperature. (i.e. about -150 ppm/°C for the maximum lengths shown and less pro rata for shorter lengths.)