


LIPS[®] M111 RUGGED STAND-ALONE LINEAR POSITION SENSOR

INTRINSICALLY SAFE FOR HAZARDOUS MINING ENVIRONMENTS

- **Intrinsically safe for Mining to:**
 **I/II M1/1GD**
- **Travel set to customer's requirement**
- **Compact and self-contained**
- **High durability and reliability**
- **High accuracy and stability**
- **Sealing to IP67**



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 M111 LIPS[®] (Linear Inductive Position Sensor) is ATEX approved for use in potentially explosive **gas/vapour, dust** atmospheres and **mining** environments. This heavy-duty version of the M101 sensor with a stronger 12.7mm push rod, recommended for applications where vibration is an issue or there is a need for longer travel sensors, mounted horizontally, and supported between rod eyes. It remains an affordable, durable, high-accuracy position sensor designed for industrial and scientific feedback applications. The unit is highly compact and space-efficient, being responsive along almost its entire length. Like all Positek sensors, the M111 provides a linear output proportional to displacement. Each sensor is supplied with the output calibrated to the travel required by the customer, from 50 to 600mm and with full EMC protection built in.

The sensor is very robust, the body and push rod being made of stainless steel for long service life and environmental resistance. Overall performance, repeatability and stability are outstanding over a wide temperature range. The sensor is easy to install with mounting options including M8 rod eye bearings and body clamps. The push rod can be supplied free or captive, with female M8 thread, an M8 rod eye, or dome end, Captive push rods can be sprung loaded, in either direction, on sensors up to 250mm of travel. The M111 also offers a range of mechanical options, environmental sealing is to IP67.

SPECIFICATION

DIMENSIONS

Body diameter	35 mm
Body length (Axial version)	measurement length + 163 mm
Body length (Radial version)	measurement length + 186 mm
Push rod extension	measurement length + 7mm, OD 12.6mm

For full mechanical details see drawing M111-11

Independent linearity

< ± 0.25% up to 450mm @ 20°C
 < ± 0.5% over 450mm @ 20°C

Temperature coefficients

< ± 0.01%/°C Gain &
 < ± 0.01%FS/°C Offset

Typical overall accuracy

< ± 0.75%/ FSO

Frequency response

> 10 KHz (-3dB)


Resolution

Infinite

Noise

< 0.02% FSO

Intrinsic Safety

 I/II M1/1GD
 EEx ia I/IIC T4 (Ta = -40°C to +80°C)
 Ex iaD 20 T135°C (Ta = -40°C to +80°C)
 Ui: 11.4V, Ii: 0.46A, Pi: 0.51W.

maximum limits

Environmental Temperature Limits

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

Sealing

IP67

EMC Performance

EN 61000-6-2, EN 61000-6-3

Vibration

IEC 68-2-6: 10g

Shock

IEC 68-2-29: 40 g

MTBF

350,000 hrs 40°C Gf

Drawing List


M111-11 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[®] M111 RUGGED STAND-ALONE LINEAR POSITION SENSOR

INTRINSICALLY SAFE FOR HAZARDOUS MINING ENVIRONMENTS

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  I/II M1/1GD
EEx ia I/IIC T4
Ex iaD 20 T135°C (Ta = -40°C to +80°C)

Designates the sensor as belonging to; Groups I and II: suitable for all areas (**including mining**), Category M1/1 GD: can be used in areas with continuous, long or frequent periods of exposure to hazardous gas (Zones 2 to 0) and dust (Zone 20), equipment remains energised.

Gas:

Protection class ia, denotes intrinsically safe for all zones Apparatus group IIC: suitable for IIA, IIB and IIC explosive gases.

Temperature class T4: maximum sensor surface temperature under fault conditions 135°C.

Dust:

T135°C: maximum sensor surface temperature under fault conditions 135°C.

Ambient temperature range extended to -40°C to +80°C.

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

Ui: 11.4V, Ii: 0.46A, Pi: 0.51W.

Sensor can be installed with a cable length up to 150m maximum from the barrier, capacitance and inductance can be up to:-

Capacitance: 550 nF max, Inductance: 99 µH max.

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 gas (X series) and dust (E series) applications, are also available from Positek.

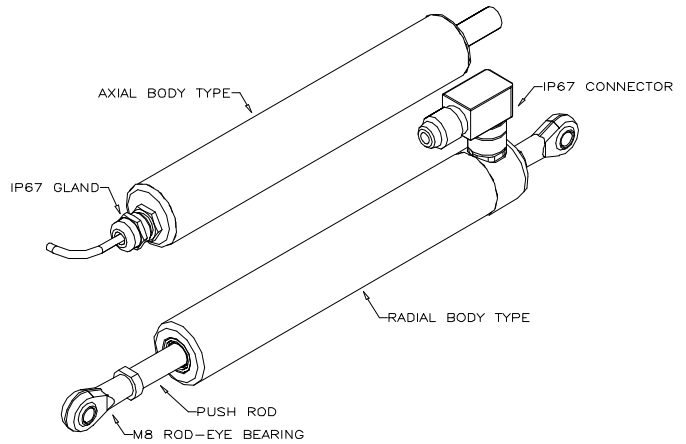


TABLE OF OPTIONS

MEASUREMENT RANGE: Factory-set to any length from 50 to 600 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

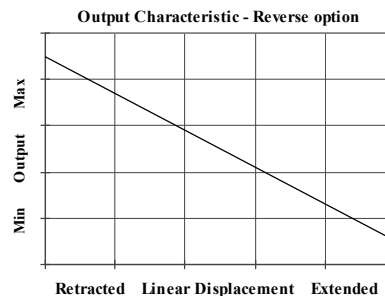
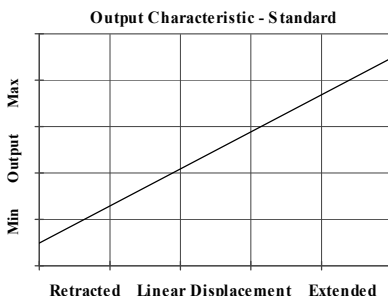
Connector - Binder 713 series Axial or Radial, IP67
Cable with PG9 gland Axial or Radial, IP67

Cable length >50cm – please specify length in cm up to 15000cm maximum.

MOUNTING OPTIONS

M8 rod eye bearing (radial versions), Body Tube Clamp/s (axial or radial versions).

PUSH ROD OPTIONS – standard retained with M8x1.25 female thread M8 rod eye bearing, Dome end, Sprung loaded (retraction or extension) or Free.



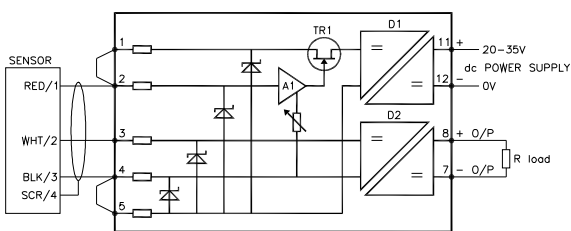
INTRINSICALLY SAFE BX002 and BX003 Sensor Barrier

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 Power rail terminals 11 and 12
 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