



X132 GAUGE HEAD POSITION SENSOR

INTRINSICALLY SAFE FOR HAZARDOUS GAS/VAPOUR ATMOSPHERES

- **Intrinsically safe for Gas to: Ex II 1G**
- **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**
- **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 X132 incorporates electronics system EX07 which is ATEX / IECEx / UKEX approved for use in potentially explosive **gas/vapour** atmospheres. The X132 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 X132, like all Positek® sensors, provides a linear output proportional to travel. Each sensor is supplied with the output calibrated to the travel required by the customer, from 51 mm to 100 mm 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 X132 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)	256.7 mm
(Radial boot)	262 mm
(Radial)	265.5 mm
Mounting Thread Length	79 mm
<i>For full mechanical details see drawing X132-11</i>	
Spring Force	4 - 8 N approx.
Independent Linearity	≤ ± 0.25% FSO @ 20°C
Temperature Coefficients	< ± 0.01%/°C Gain & < ± 0.01%FS/°C Offset > 10 kHz (-3dB)
Frequency Response	Infinite
Resolution	< 0.02% FSO
Noise	Ex II 1G
Intrinsic Safety	Ex ia IIC T4 Ga (Ta= -40°C to 80°C)
Approval only applies to the specified ambient temperature range and atmospheric conditions in the range 0.80 to 1.10 Bar, oxygen ≤ 21%	
Sensor Input Parameters	Ui: 11.4V, Ii: 0.20A, Pi: 0.51W.
(without cable)	Ci: 1.16µF, Li: 50µH
(with supplied cable)	Ci: 1.36µF, Li: 860µH with 1km max. cable
Environmental Temperature Limits	
Operating	-40°C to +80°C
Storage	-40°C to +125°C
Sealing	IP67
EMC Performance	EN 61000-6-2, EN 61000-6-3
Vibration	IEC 68-2-6: 10 g
Shock	IEC 68-2-29: 40 g
MTBF	350,000 hrs 40°C Gf
Drawing List	
X132-11	Sensor Outline
<i>3D models, step or .igs format, available on request.</i>	

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.



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X132-17a

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X132 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 / IECEx / UKEX approved to;

Ex II 1G
Ex ia IIC T4 Ga (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 / vapour (Zones 2 to 0).

Gas / Vapour:

Protection class ia, denotes intrinsically safe for all zones

Apparatus group IIC: suitable for IIA, IIB and IIC explosive gas / vapour.

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

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

It is imperative Positek® intrinsically safe sensors be used in conjunction with a galvanic barrier to meet the requirements of the product certification. The Positek X005 Galvanic Isolation Amplifier is purpose made for Positek IS sensors making it the perfect choice. Refer to the X005 datasheet for product specification and output configuration options.

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

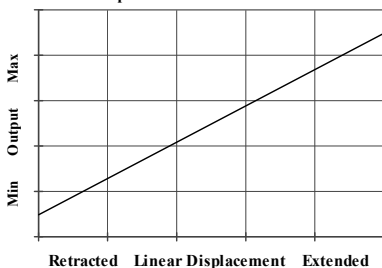
ATEX / IECEx / UKEX approved sensors suitable for dust (E series) and mining (M series) applications, are also available from Positek.

X132	a	b	c	d
	Displacement	A	Connections	Z000

a Displacement	Value
Displacement in mm e.g. 0 - 66 mm	66
b Output	Code
Supply V_{dc} (tolerance)	Output
+5V (4.5 - 5.5V)	0.5 - 4.5V (ratiometric with supply)
c Connections	Code
Cable boot radial IP67, 3-core cable	Ixx
Cable boot radial IP67, 5-core cable	IQxx
Cable gland radial IP67 Pg9, metal, 3-core cable	IAxx
Cable gland radial IP67 Pg9, metal, 5-core cable	IAQxx
Connector axial IP67 4 pin M12 IEC 61076-2-101, metal	J
Connector axial IP67 4 pin M12 IEC 61076-2-101, metal, pre-wired 3-core cable	Jxx
Connector axial IP67 4 pin M12 IEC 61076-2-101, metal, pre-wired 5-core cable	JQxx
Connector radial IP67 4 pin M12 IEC 61076-2-101, metal	K
Connector radial IP67 4 pin M12 IEC 61076-2-101, metal, pre-wired 3-core cable	Kxx
Connector radial IP67 4 pin M12 IEC 61076-2-101, metal, pre-wired 5-core cable	KQxx

c Connections	Code
Cable gland axial IP67 Pg9, metal, 3-core cable	Lxx
Cable gland axial IP67 Pg9, metal, 5-core cable	LQxx
Specify required cable length 'xx' in cm. e.g. L2000 specifies cable gland with 20 m of cable, 50 cm supplied as standard, 15000 cm maximum supplied length.	
d Z-code	Code
Calibration to suit X005 - Default	Z000
$\leq \pm 0.1\%$ FSO @20°C Independent Linearity	Z650

Output Characteristic - Standard



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Three or Five-Wire Mode Connection FOR INTRINSICALLY SAFE SENSORS IN HAZARDOUS ATMOSPHERES

The aim of this document is to help readers who do not understand what is meant by three or five wire modes of connection between the galvanic isolation amplifier and sensor, and the factors behind them. It is by no means an in-depth technical analysis of the subject.

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 careful consideration.

Interconnecting cables are not perfect conductors and offer resistance to current flow, the magnitude of resistance[†] depends on conductors resistivity, which changes with temperature, cross sectional area[‡] and length. If the voltage were to be measured at both ends of a length of wire it would be found they are different, this is known as volts drop. Volts drop changes with current flow and can be calculated using Ohm's law, it should be noted that volts drop occurs in both positive and negative conductors. The effects of volts drop can be reduced by increasing the conductors cross sectional area, this does not however eliminate the effects due to temperature variation. There are instances where large cross-section cables are not practical; for example most standard industrial connectors of the type used for sensors have a maximum conductor capacity of 0.75mm², copper prices and ease of installation are other considerations.

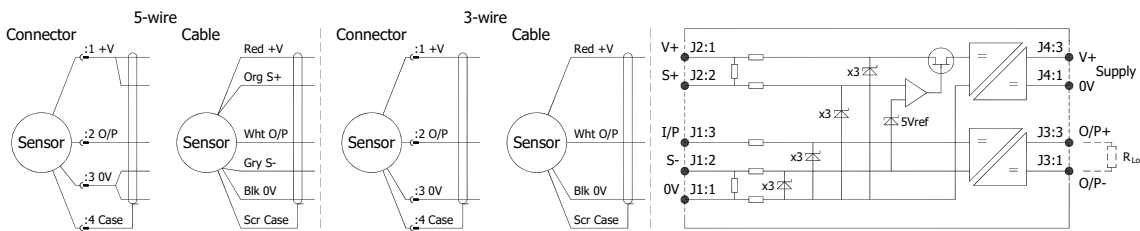
This is important because the effects of volts drop can significantly alter the perceived accuracy of the sensor which is ratiometric i.e. the output signal is directly affected by the voltage across the sensor. Changes in temperature will also be seen as gain variation in the sensor output.

Three wire mode connections are common and are suitable in most cases with short or moderate cable runs. Applications that do not require a high degree of accuracy but have cable runs, say in excess of 10m, volts drop can be reduced by introducing a terminal box close to the sensor and using a larger cross-section cable for a majority of the cable run. Sensors supplied with three core cable are calibrated with the cable fitted which largely eliminates errors due to conductor resistance at room temperature however, as mentioned above, small gain errors due to temperature fluctuations should be expected.

Five wire mode connections have significant benefits as losses in the positive and negative conductors are compensated for by the galvanic isolation amplifier which can 'sense' the voltage across the sensor and dynamically adjust the output voltage so that the voltage across the sensor is correct. The effects of cable resistance and associated temperature coefficients are eliminated allowing for smaller conductors than a three wire connection for the same cable run. The amplifier can compensate for up to 15Ω per conductor with a current flow of 15mA, which is more than adequate for 150m of 0.25 mm² cable, longer lengths will require larger conductors.

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.

See illustrations below for examples of connecting a sensor to the galvanic isolation amplifier.



Cable Length (metres)	Up to 150	150 - 300	300 - 450	450 - 600	600 - 900	900 - 1000
Cross Section (mm ²)	0.25	0.5	0.75	1.0	1.5	2.0

The table above shows recommended conductor sizes with respect to cable length for both three and five wire connections, based on copper conductors. Three wire connections 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.)

It should be noted that the maximum cable length, as specified in the sensor certification, takes **precedence** and **must not** be exceeded.

Positek® sensors are supplied with three core 0.25 mm² cable as standard, however five core 0.25 mm² cable can be supplied on request. The galvanic isolation amplifier is available as;

- G005-*** for 'G' and 'H' prefix sensors
- X005-*** for 'E', 'M' and 'X' prefix sensors

[†] $R = \rho L/A$ ρ is the resistivity of the conductor (Ωm) L is the length of conductor (m) A is the conductor cross-sectional area (m²).

[‡] It is presumed that direct current flow is uniform across the cross-section of the wire, the galvanic isolation amplifier and sensor are a dc system.



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