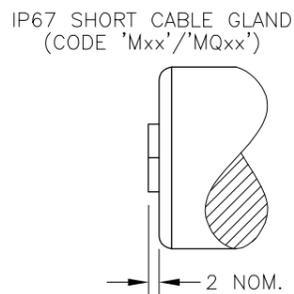
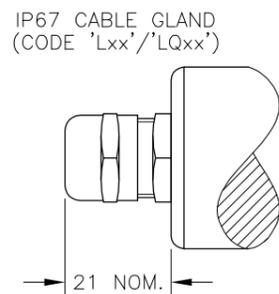
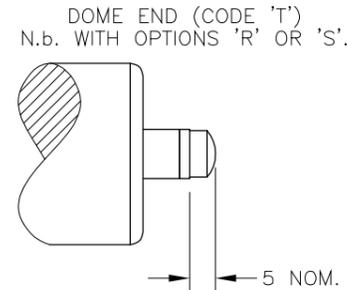
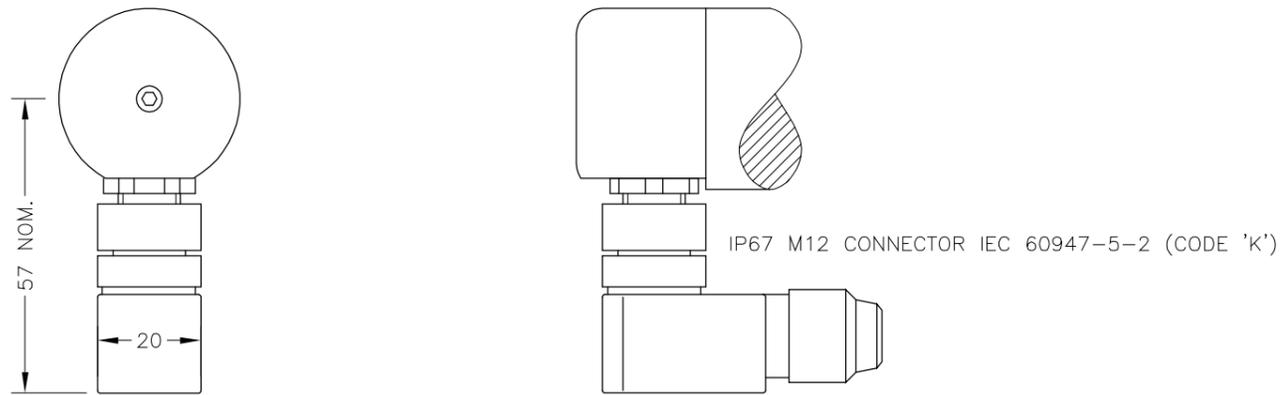
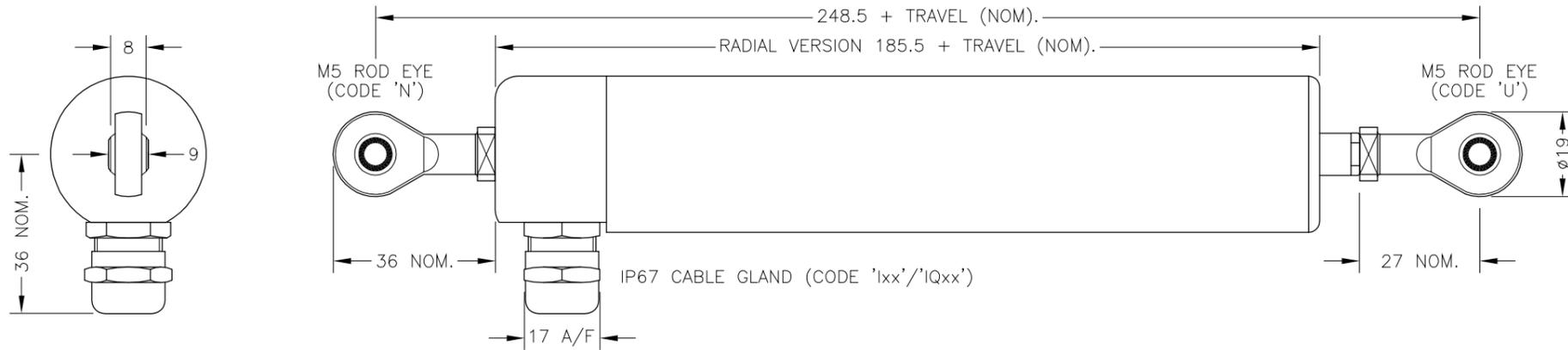
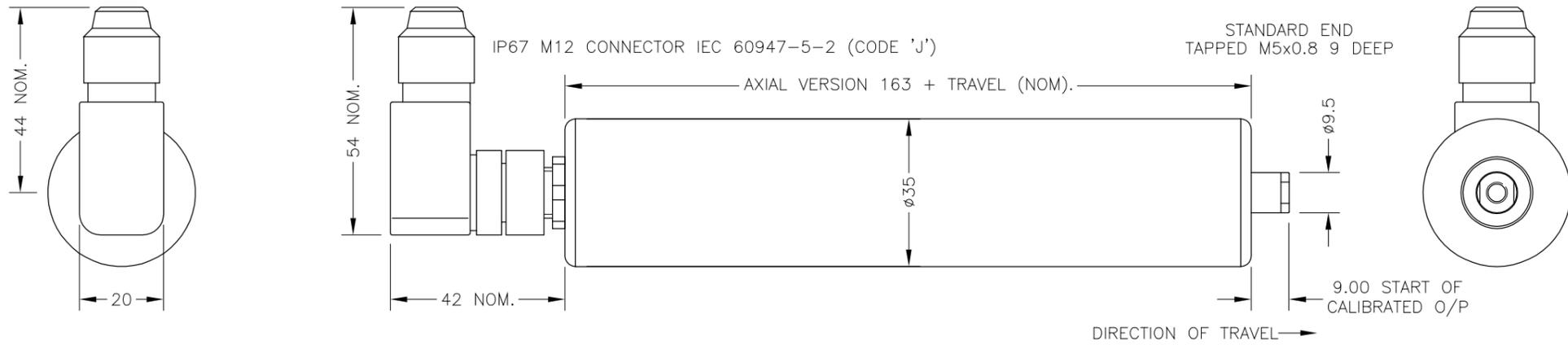


N.b. ROD-EYE ORIENTATION NOT GUARANTEED.



ELECTRICAL OPTIONS/ SPECIFICATIONS

OUTPUT SUPPLY

0.5 TO 4.5V RATIOMETRIC 5V
SUPPLY CURRENT 12mA TYP. 20mA MAX.

CABLE: 0.2mm², O/A SCREEN, PUR JACKET - SUPPLIED WITH 50cm OR REQUIRED LENGTH IN cm (15000cm MAX).
STANDARD 3-CORE: JACKET Ø4mm BLACK e.g. 'L50'
OPTIONAL 5-CORE: JACKET Ø4.6mm BLUE e.g. 'LQ50'

CABLE/CONNECTOR* CONNECTIONS;
3 CORE 5 CORE CONNECTOR
RED RED :1 +Ve
- ORG :1 +SENSE (5-WIRE ONLY)
BLACK BLACK :3 0V
- GRY :3 -SENSE (5-WIRE ONLY)
WHITE WHITE :2 OUTPUT
SCREEN SCREEN :4 BODY

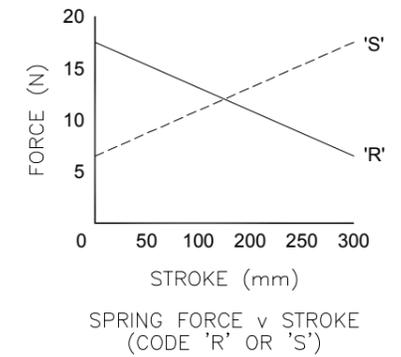
*CONNECTORS; MAXIMUM CONDUCTOR CROSS SECTION 0.75mm²

RANGE OF DISPLACEMENT FROM 0-5mm TO 0-800mm e.g.76, IN INCREMENTS OF 1mm.

BODY MATERIAL: STAINLESS STEEL.

FURTHER OPTIONS:

- SINGLE PAIR OF BODY CLAMPS 'P'
- TWO PAIRS OF BODY CLAMPS 'P2'
- SPRING RETURN PUSH-ROD, TRAVEL ≤300mm
- RETURN TO EXTENDED POSITION (CODE 'R')
- RETURN TO RETRACTED POSITION (CODE 'S')
- PUSH-ROD FREE (CODE 'V') - NOT AVAILABLE WITH SPRUNG OPTIONS.



NOTE:- READ INSTALLATION SHEET H000-19 FOR FULL INSTRUCTIONS FOR USE.

CSA APPROVED TO
Class I Zone 0
Ex/AEx ia IIC T4 (Ta= -40 to 80°C)
Ex iaD 20 T93°C(Ta= -40 to 80°C)
Ui 11.4V, Ii 0.2A, Pi 0.51W

APPROVED FOR USE IN CONJUNCTION WITH A GALVANICALLY ISOLATED BARRIER.

NOTE: APPROVAL ONLY APPLIES AT NORMAL ATMOSPHERIC PRESSURE!

C	OPTIONS 'R' & 'S' OVER TRAVEL DIMS MODIFIED - RAN1030.	PDM
D	RANGE WAS 50-600mm RAN1056	RDS
E	5-CORE OPTION ADDED ~ RAN1102	PDM
F	OPTION 'M' ADDED ~ RAN1166, RANGE NOTE AMENDED ~ RAN1200	PDM



THE PUSH-ROD RETRACTS A FURTHER 4mm NOM. FROM START OF CALIBRATED TRAVEL. STANDARD VERSIONS THE PUSH-ROD EXTENDS A FURTHER 8mm NOM. FROM END OF CALIBRATED TRAVEL, FOR SPRUNG VERSIONS: 'R': 1mm, 'S': 2mm. 'V' CODED PUSH-ROD WILL DEPART SENSOR BODY.

DRAWINGS NOT TO BE CHANGED WITHOUT REFERENCE TO THE CHANGE PROCEDURE. CHANGES TO PARTS USED IN INTRINSICALLY SAFE PRODUCT MUST BE APPROVED BY THE AUTHORISED PERSON
THIS IS AN UNCONTROLLED PRINT AND WILL NOT BE UPDATED.



C	28/07/15		CHECKED BY	X ±0.4
D	9/11/15		RDS	X.X ±0.2
E	07/04/17			X.XX ±0.1
F	29/08/17			DIMS mm
		DESCRIPTION		
		H101 INTRINSICALLY SAFE STAND ALONE LINEAR POSITION SENSOR		
SCALE 12.5mm		DRAWING NUMBER H101-11 REV F		
		SHEET 1 OF 1		

LIPS[®] H101 STAND-ALONE LINEAR POSITION SENSOR INTRINSICALLY SAFE FOR HAZARDOUS DUST ATMOSPHERES

- Intrinsically safe for Gas and Dust to:
 Class I, Zone 0 Ex ia / AEx ia
- Non-contacting inductive technology to eliminate wear
- Travel set to customer's requirement
- 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 intrinsically safe H101 LIPS[®] (Linear Inductive Position Sensor) incorporates electronics system EX06 which is CSA approved for use in potentially explosive gas/vapour and dust atmospheres. The H101 is designed for industrial and scientific feedback applications and is ideal for OEMs seeking good sensor performance for arduous applications in hazardous areas. The unit is highly compact and space-efficient, being responsive along almost its entire length.

The H101, like all Positek[®] sensors, provides a linear output proportional to travel. Each unit is supplied with the output calibrated to the travel required by the customer, any stroke from 0-5mm to 0-800mm 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 M5 rod eye bearings and body clamps. The push rod can be supplied free or captive, with female M5 thread, an M5 rod eye, or dome end. Captive push rods can be sprung loaded, in either direction, on sensors up to 250mm of travel. The H101 also offers a range of mechanical options, environmental sealing is to IP65 or IP67, depending on selected cable or connector options.



SPECIFICATION

Dimensions	
Body diameter	35 mm
Body length (Axial version)	calibrated travel + 163 mm
Body length (Radial version)	calibrated travel + 186 mm
Push rod extension	calibrated travel + 9 mm, OD 9.5 mm
For full mechanical details see drawing H101-11	
Power Supply	+5V dc nom. ± 0.5V, 10mA typ 20mA max
Output Signal	0.5-4.5V dc ratiometric, Load: 5kΩ min.
Independent Linearity	≤ ± 0.25% FSO @ 20°C - up to 450 mm ≤ ± 0.5% FSO @ 20°C - over 450 mm ≤ ± 0.1% FSO @ 20°C* available upon request.
*Sensors with calibrated travel from 10 mm up to 400 mm.	
Temperature Coefficients	< ± 0.01%/°C Gain & < ± 0.01%FS/°C Offset
Frequency Response	> 10 kHz (-3dB)
Resolution	Infinite
Noise	< 0.02% FSO
Intrinsic Safety	Class I, Zone 0 Ex ia IIC T4 (Ta= -40°C to 80°C) AEx ia IIC T4 (Ta= -40°C to 80°C) AEx ia D IIC T93°C (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.
(connector option/s)	Ci: 1.16µF, Li: 50µH
(cable option/s)	Ci: 1.36µF, Li: 710µH 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	
H101-11	Sensor Outline
Drawings, in AutoCAD [®] dwg or dxf format, available on request.	

For further information please contact:

www.positek.com sales@positek.com

Tel: +44(0)1242 820027 fax: +44(0)1242 820615

Positek Ltd, Andoversford Industrial Estate, Cheltenham GL54 4LB U.K.

LIPS[®] H101 STAND-ALONE LINEAR POSITION SENSOR

INTRINSICALLY SAFE FOR HAZARDOUS DUST 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."

CSA approved to;

- Class I, Zone 0
- Ex ia IIC T4 (Ta = -40°C to +80°C)
- AEx ia IIC T4 (Ta = -40°C to +80°C)
- AEx ia D IIIC T93°C (Ta = -40°C to +80°C)

Designates the sensor as belonging to; Class I, Zone 0: can be used in areas with continuous, long or frequent periods of exposure to hazardous gas or dust.

Gas:

Protection class ia IIC, denotes intrinsically safe for Zones 0, 1 & 2 and IIA, IIB and IIC explosive gases.

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

Dust:

T93°C: maximum sensor surface temperature under fault conditions 93°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 G005 Galvanic Isolation Amplifier is purpose made for Positek IS sensors making it the perfect choice. Refer to the G005 datasheet for product specification and output configuration options.

Safety Parameters:-

- Ui: 11.4V, Ii: 0.20A, Pi: 0.51W
- Ci = 1.36µF* Li = 710µH* (cable option/s)
- Ci = 1.16µF Li = 50µH (connector option/s)

*Figures for 1km cable where: Ci = 200pF/m & Li = 660nH/m

Sensors can be installed with a maximum of 1000m of cable.

Cable characteristics must not exceed:-

Capacitance: ≤ 200 pF/m for max. total of: 200 nF.

Inductance: ≤ 660 nH/m for max. total of: 660 µH

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

CSA approved sensors suitable for gas (G series) applications, are also available from Positek.

TABLE OF OPTIONS

CALIBRATED TRAVEL: Factory set to any length from 0-5mm to 0-800mm (e.g. 254mm)

ELECTRICAL INTERFACE OPTIONS

The Positek[®] G005 Galvanic Isolation Amplifier is available with the following output options:

- Standard: 0.5 - 9.5V or 4 - 20mA.
- Reverse: 9.5 - 0.5V or 20 - 4mA.

CONNECTOR/CABLE OPTIONS

- Connector - Binder 713 series Axial or Radial, IP67
- Cable[†] with Pg 9 gland or short gland Axial, IP67
- Cable[†] with Pg 9 gland Radial, IP67

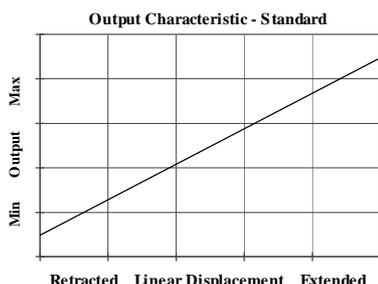
[†]Three core (black jacket) or five core (blue jacket) cable options available. Cable length >50 cm – please specify length in cm up to 15000 cm max.

We recommend all customers refer to the 3 or 5-Wire Mode Connection page.

MOUNTING OPTIONS

M5 rod eye bearing (radial versions), Body Tube Clamp/s (axial or radial versions).

PUSH ROD OPTIONS – standard retained with M5x0.8 female thread, M5 rod eye bearing, Dome end, Sprung loaded (retraction or extension) or Free.



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256053



H101-17f

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® Intrinsicly 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.

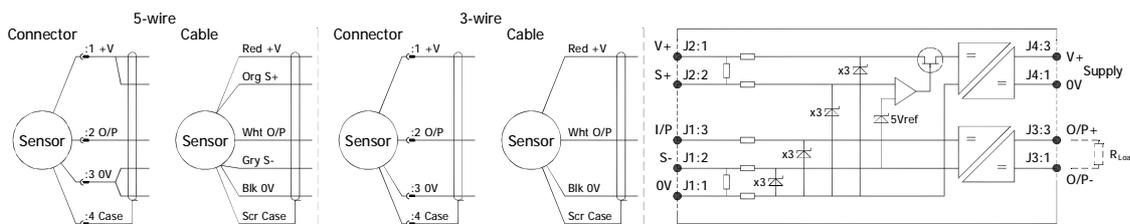
This is important because the effects of volts drop can significantly alter the perceived accuracy of the sensor which is ratiometric i.e. the output signal is directly affected by the voltage across the sensor. Changes in temperature will also be seen as gain variation in the sensor output.

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.

Intrinsically Safe - Dust Atmospheres

LIPS® SERIES H101 Stand-Alone Linear Position Sensor

a	b	c	d	e	f	g	h	j
H101	Displacement	A	Y	Connections	Option	Option	Option	Z-code

a Displacement (mm)	Value
Displacement in mm	e.g. 0 - 254 mm 254
b Output	
Supply V dc V _s (tolerance)	Output
+5V (4.5 - 5.5V)	0.5 - 4.5V (ratiometric with supply) A
c Calibration Adjustments	Code
Sealed	Y
d Connections Cable* or Connector	Code
Cable Gland - Radial	IP67 Pg9 - 3-core cable Ixx
Cable Gland - Radial	IP67 Pg9 - 5-core cable IQxx
Connector - Axial	IP67 M12 IEC 60947-5-2 J
Connector - Radial	IP67 M12 IEC 60947-5-2 K
Cable Gland - Axial	IP67 Pg9 - 3-core cable Lxx
Cable Gland - Axial	IP67 Pg - 5-core cable LQxx
Cable Gland - Axial	IP67 Short - 3-core cable Mxx
Cable Gland - Axial	IP67 Short - 5-core cable MQxx
<small>*Supplied with 50 cm as standard, specify required cable length specified in cm. e.g. L2000 specifies cable gland with 20 metres of cable. Nb: restricted cable pull strength.</small>	
e Body Fittings	Code
None - default	blank
M5 Rod-eye Bearing	Radial body style only N
Body Clamps - 1 pair	P
Body Clamps - 2 pairs	P2
f Sprung Push Rod	Code
None - default	blank
Spring Extend	Up to 300mm displacement. R
Spring Retract	Captive push rod only. S
g Push Rod Fittings	Code
None - default	Female Thread M5x0.8x9 deep blank
Dome end	Required for option 'R' T
M5 Rod-eye Bearing	U
h Push Rod Options	Code
Captive - default	Push rod is retained blank
Non-captive	Push rod can depart body V
j Z-code	Code
Calibration to suit G005 - Default	Z000
≤± 0.1% @20°C Independent Linearity displacement between 10mm & 400mm only!	Z650
Connector with cable option 'J', 'JQ', 'K' or 'KQ' with length required in cm i.e. J100 specifies connector with 100cm of cable.	Z999

Note!

All Intrinsically Safe (IS) sensors must have a Z-code suffix.

IS sensors must be used in conjunction with a Galvanic Isolation Amplifier - See G005 for Output options.

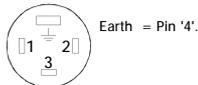
Generic Installation Information

H SERIES SENSORS

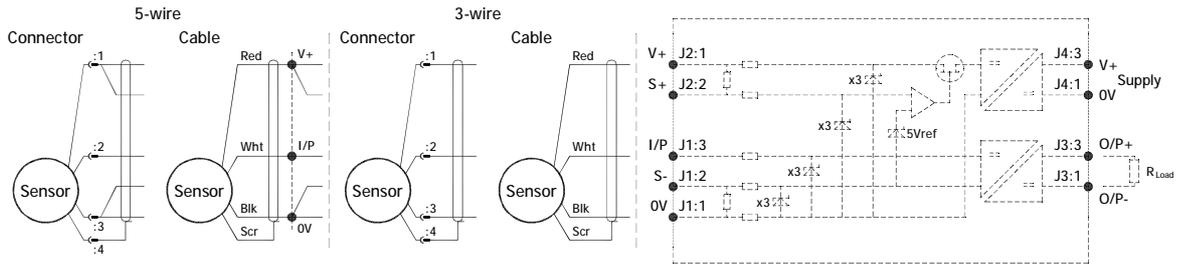
INTRINSICALLY SAFE FOR HAZARDOUS GAS/VAPOUR & DUST ATMOSPHERES

CSA Qualified Intrinsically Safe Device Certificate number 13.2588225		Class I, Zone 0 Ex ia IIC T4 (Ta = -40°C to +80°C) AEx ia IIC T4 / Ex ia IIC T4 (Ta = -40°C to +80°C) AEx ia D IIC T93°C (Ta = -40°C to +80°C)	
Electronics Option	Output Description:	Supply Voltage: V _s (tolerance)	Load resistance:
A	0.5 - 4.5V (ratiometric with supply)	+5V (4.5 - 5.5V)	5kΩ min

Connector Pin Layout:
DIN 43650 C



IEC 60947-5-2



Putting Into Service:

The sensor must be used with a galvanic isolation barrier designed to supply the sensor with a nominal 5V and to transmit the sensor output to a safe area. The barrier parameters must not exceed:-

$U_i = 11.4V$	$I_i = 0.20A$	$P_i = 0.51W$
$C_i = 1.36\mu F^*$	$L_i = 710\mu H^*$	(with maximum length integral cable)
$C_i = 1.16\mu F$	$L_i = 50\mu H$	(without integral cable)

*Figures for 1km cable where: $C_i = 200pF/m$ & $L_i = 660nH/m$

The sensor is certified to be used with up to 1000m of cable, cable characteristics must not exceed:-
 Capacitance: $\leq 200 pF/m$ for max. total of: 200 nF
 Inductance: $\leq 660 nH/m$ for max. total of: 660 μH

Use:

The sensor is designed to measure Linear or rotary displacement and provide an analogue output signal.

Assembly and Dismantling:

The unit is not to be serviced or dismantled and re-assembled by the user.

WARNING: Substitution of components may impair intrinsic safety
AVERTISSEMENT: La substitution de composants peut altérer la sécurité intrinsèque

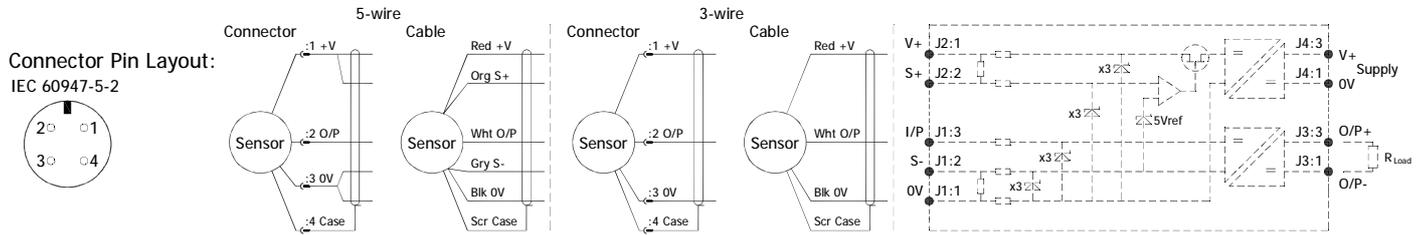
Maintenance:

Accumulated dust layer must not exceed a depth of 50mm.



Installation Information

LIPS[®] H101 STAND-ALONE LINEAR POSITION SENSOR INTRINSICALLY SAFE FOR HAZARDOUS DUST ATMOSPHERES



Approval only applies to specified ambient temperature range and atmospheric conditions in the range: 0.80 to 1.10 Bar, oxygen \leq 21%.

The H101 is available with the following connections:-

- | | | | |
|------|-------------------------|-----------------|---|
| IP67 | IEC 60947-5-2 Connector | Axial or Radial | Options 'J' or 'K' |
| IP67 | Cable gland with cable | Axial or Radial | Options 'Lxx', 'LQxx', 'Mxx', 'MQxx', 'lxx' or 'lQxx' |

The performance of the sensor may be affected by voltage drops associated with long cable lengths; For cable lengths exceeding 10 metres a five wire connection is recommended to eliminate errors introduced by cable resistance and associated temperature coefficients.

Cable Up to 150m of 0.2 mm², screened, PUR jacket; 3 core cable 4 mm dia. black, 5 core cable 4.6 mm dia. Blue.

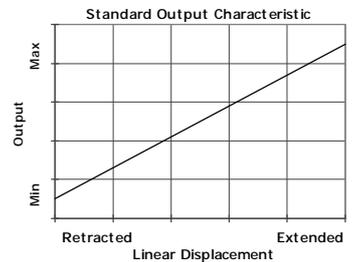
N.b. sensors supplied with cable, the free end must be appropriately terminated.

Warning - The M12 IEC 60947 connector may be rotated for purposes of convenient orientation of the connector and cable, however rotating the connector more than one complete revolution is not recommended.

Repeated rotation of the connector will damage the internal wiring!

Mechanical Mounting: Depending on options; Body can be mounted by M5x0.8 male thread, M5 rod eye or by clamping the sensor body - body clamps are available, if not already ordered. Target by M5x0.8 female thread or M5 rod eye.

Output Characteristic: Target is extended 9 mm from end of body at start of normal travel. The output increases as the target extends from the sensor body, the calibrated stroke is between 5 mm and 800 mm.



Incorrect Connection Protection levels: Not protected – the sensor is **not** protected against either reverse polarity or over-voltage. The risk of damage should be minimal where the supply current is limited to less than 50mA.