H103
Short Stroke Linear Position Sensor

Intrinsically Safe For Hazardous Dust Atmospheres

H103-17f

FEATURES

- 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
- Short body length
- Accurate, stable, durable and reliable
- Sealing to IP67

Our intrinsically safe H103 LIPS® (Linear Inductive Position Sensor) incorporates electronics system EX06 which is CSA approved for use in potentially explosive gas/vapour and dust atmospheres. The H103 is designed for a wide range of industrial applications and is ideal for OEMs seeking good sensor performance in situations where a short-bodied sensor is required for operation in hazardous areas.

The unit is compact and space-efficient, being responsive along almost its entire length, and like all sensors provides a linear output proportional to travel. Each unit is supplied with the output calibrated to the travel required by the customer, from 2 to 50mm and with full EMC protection built in.

Overall performance, repeatability and stability are outstanding over a wide temperature range. The sensor has a rugged stainless steel body and plunger. It is easy to install and set up, the stainless steel mounting flange has two 4.5mm by 30 degree wide slots on a 48mm pitch.

The plunger can be supplied free or captive, with female M4 thread, or spring-loaded with a ball end. The H103 also offers a range of mechanical options, environmental sealing is to IP67.

SPECIFICATION

Dimensions

Body diameter	35 mm
Body Length:	Dependant on calibrated travel
Calibrated Travel	
2 mm to 10 mm	81.3 mm
11 mm to 20 mm	91.3 mm
21 mm to 30 mm	101.3 mm
31 mm to 50 mm	121.3 mm
Plunger	Ø 6mm
For full mechanical details see	drawing H103-11
Power Supply	+5V dc nom. ± 0.5V, 10mA typ 20mA max
Output Signal	0.5-4.5V dc ratiometric, Load: 5k min.
Independent Linearity	" ± 0.25% FSO @ 20°C " ± 0.1% FSO @ 20°C* available upon request.

*Sensors with calibrated travel of 10 mm and above.

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 II C T4 (Ta = -40°C to +80°C) AEx ia II C T4 (Ta = -40°C to +80°C) AEx ia D III 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

H103-11	Sensor Outline

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

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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.

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 intrinsically safe sensors be used in conjunction with a galvanic barrier to meet the requirements of the product certification. The G005 Galvanic Isolation Amplifier is purpose made for 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.

TABLE OF OPTIONS

CALIBRATED TRAVEL: Factory set to any length from 0-2mm to 0-50mm (e.g. 36mm).

ELECTRICAL INTERFACE OPTIONS
The **G005** Galvanic Isolation Amplifier is available with the following output options;

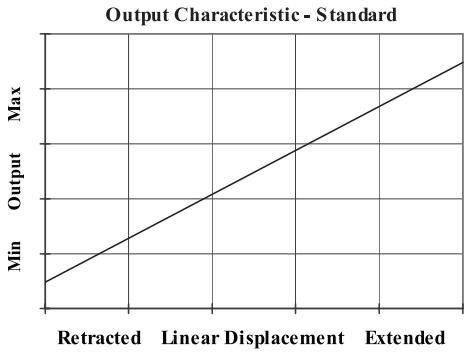
Standard:	0.5 - 9.5V or 4 - 20mA.
Reverse:	9.5 - 0.5V or 20 - 4mA.

CONNECTOR/CABLE OPTIONS

Connector - Binder 713 series	IP67
Cable† with Pg 9 gland or short gland	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.

PUSH ROD OPTIONS – standard retained with M4x0.7 female thread Sprung loaded (spring supplied loose), Dome end (sprung loaded) or Free.



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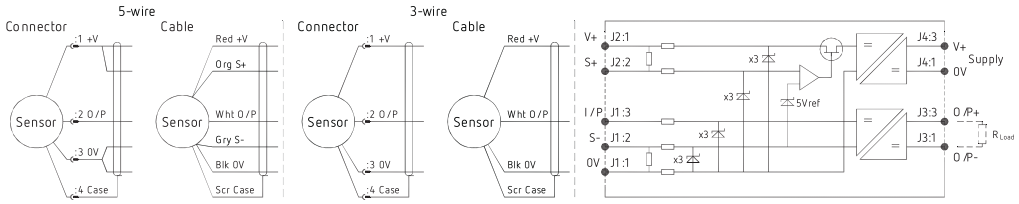
The aim of this document is to help readers who do not understand what is meant by three or five wire modes of connection between the galvanic isolation amplifier and sensor, and the factors behind them. It is by no means an in-depth technical analysis of the subject. Whether opting for a pre-wired Intrinsically 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 0.75mm^2, 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 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 15 per conductor with a current flow of 15mA, which is more than adequate for 150m of 0.25 mm^2 cable, longer lengths will require larger conductors. **For this reason recommends five wire connections for cable lengths exceeding 10 metres in 0.25 mm^2 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.

The sensors are supplied with three core 0.25 mm^2 cable as standard, however five core 0.25 mm^2 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 = L/A is the resistivity of the conductor (Ωm) L is the length of conductor (m) A is the conductor cross-sectional area (m^2).
‡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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