mm LIPS® G117

Slim-line linear position sensor
Intrinsically safe for harzardous gas / vapor atmospheres

- Intrinsically safe for Gas to:
  Class I, Zone 0 Ex ia / AEx ia
- Non-contacting inductive technology to eliminate wear
- Travel set to customer's requirement
- Compact19 mm diameterbody,
- Highaccuracyandstability
- Sealingto IP67

256053 C US

CE G117-17e

ACS REGISTRARS Quality Assurance ISO 9001 UKAS MANAGEMENT SYSTEMS 229

The G117 LIPS® (Linear Inductive Position Sensor) incorporates electronics system EX06 which is CSA approved for use in potentially explosive gas/vapour atmospheres. The G117 is designed for industrial and scientific feedback applications and is ideal for OEMs seeking good sensor performance for arduous applications in hazardous areas.

Overall performance, repeatability and stability are outstanding over a wide temperature range. The unit is very compact and space-efficient with a small 19 mm diameter body. The sensorisvery robust, the body and push rod being made of stainless steel. These sensor is easy to install with mounting options including M5 malestud and M5 rod eye bearing. The push rod can be supplied free or captive, with male M5t hread or M5 rodeye.

The G117 provides a linear output proportional to travel. Each unit is supplied with the output calibrated to the travel required by the customer, from 5 to 350 mm and with full EMC protection built in. The G117 offers a range of mechanical options, environmental sealing is to IP67.

The sensor can be installed with a cable length up to 1km between the sensor and the amplifier.

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SPECIFICATIONS

- **Dimensions**
  - Body diameter: 19 mm
  - Body length (Axial version): calibrated travel + 109,7 mm
  - Body length (Radial version): calibrated travel + 115 mm - cable / +118,5 mm - connector

  For full mechanical details see drawing G117-11

- **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
  ≤± 0.5% FSO @ 20°C
  ≤± 0.1% FSO @ 20°C* available upon request.

  *Sensors with calibrated travel from 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 IIC T4 (Ta = -40°C to +80°C)
  AEx ia IIC T4 (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 (connector option/s): Ui: 11.4V, Ii: 0.20A, Pi: 0.51W. 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**
  - G117-11: 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.

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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)

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 / vapours.

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. 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 dust (H series, USA only) applications, are also available.

TABLE OF OPTIONS

CALIBRATED TRAVEL:
Factory set to any length from 0-5mm to 0-350mm (e.g. 76mm)

ELECTRICAL INTERFACE OPTIONS
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.

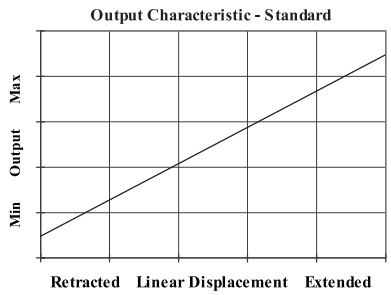
CONNECTOR/CABLE OPTIONS

Connector - Hirschmann ELWIKA 4102	Axial or Radial, IP67
Cable† with Pg 9 gland	Axial, IP67
Cable† with boot	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 or M5x0.8 male thread (radial versions), Body Tube Clamp/s (axialor radialversions).

PUSH ROD OPTIONS – standard retained with M5x0.8 male thread, M5 rodeye bearingor Free.



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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 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 15Ω 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, we recommend five cable connections for cable lengths over 10 meters in 0.25 mm^2 cable to get the full accuracy of the sensor.

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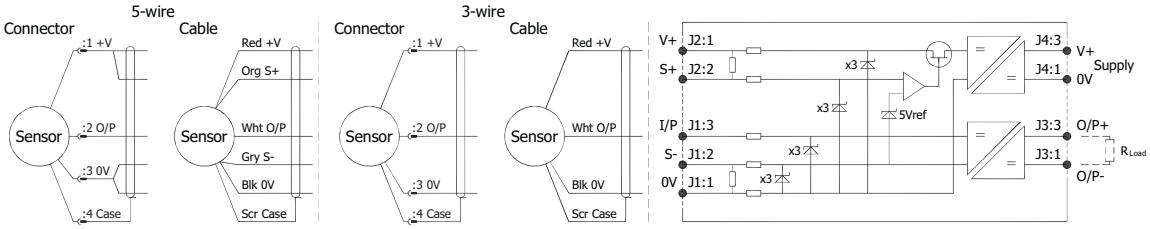
See illustrations below for examples of connecting a sensor to the galvanic isolation amplifier.



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.

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 = pL/A p 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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