

# SPECTEC

THUNDERBIRD INTERNATIONAL CORPORATION  
P.O. Box 360, Emigrant, MT 59027-0360  
406-333-4967 · FAX 406-333-4259

## INSTRUCTION MANUAL XP1cg Series, Cable Gland Style Passive Speed Sensors

# 85045Xcg

Engineering Approval:

Date: 03-18-2019

Revision: 2

### Introduction

SPECTEC's Explosion Proof / Flame Proof sensors are designed for installation in hazardous locations. They are offered in a wide variety of configurations. See the XP1cg Bulletin for specifications and configuration options.

### Marking

Unit Type No.: XP1cg-xxxxx  
Date Code: WW/YY (Week/Year)  
Electrical Rating: Limit to 32 VAC RMS (89Vp-p) by installation  
(for Magnetic VRS and Inductive Sensors)  
2 VAC RMS @ ≤40 mA (for RF Sensors)

Codes: II 2 G Ex db IIC T6...T4 Gb  
T4@ Ta = -40°C...+90°C (marked)  
T5@ Ta = -40°C...+90°C  
T6@ Ta = -40°C...+75°C

Certificate No.: FM16ATEX0086X IECEx FMG 16.0035X

CE Marking: 2809

Warnings: DISCONNECT POWER BEFORE REMOVING

### Specific Conditions of Use

1. Refer to these instructions for complete temperature ratings and suitability.
2. No external grounding is provided. The sensor must be mounted as part of a bonded structure.
3. The wiring shall be mechanically protected as required by the applicable area electrical code and shall be terminated in a suitable terminal or junction facility.

### Warnings

1. Disconnect power before removing the sensor.

### Compatibility

Refer to the listed certification and temperature ratings for suitability. The intended environmental and operating conditions should be verified to be in compliance with these ratings.

Housing: 303 or 304 series Stainless Steel  
Cable: PVC insulated (Polyvinyl chloride)

### Type Approval Standards

The XP1cg product series have certificates issued by FM Approvals and have been approved to the following standards:

ATEX Standards:

EN60079-0:2012 + A11:2013	General Requirements
EN60079-1:2014	Flameproof Enclosures 'd'

IECEX Standards:

IEC60079-0:2011	General Requirements
IEC60079-1:2014	Flameproof Enclosures 'd'

### Installation Requirements

The installation shall be carried out by suitably trained personnel. The sensor must be installed in accordance with the latest issue of the following standards:

ATEX installations: follow EN 60079-14,  
IECEX installations: follow IEC 60079-14.

The installation must also be in accordance with any local codes and national regulations that apply.

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## Installation Procedure

### Mounting

1. Thread the sensor into a suitable bracket or housing with the Sensing Surface aimed toward the Target.
2. Set the Air Gap (shortest distance from Target to Sensing Surface) at a typical distance of .020" (0.5mm). A larger Air Gap can be used depending on Target size, speed, and sensor type. Be sure to account for any eccentricity of the Target to avoid damage to the sensor which can affect safety. This distance should be >.010" (0.25mm) over the eccentricity of the Target.

**WARNING: Adjust the Air Gap so that the Output Voltage does not exceed 32VAC RMS (89V Peak to Peak) at any speed of the Target (under normal and worst case conditions).**

3. Securely lock the sensor at the correct Air Gap using a jam nut or other suitable means. **Do not over torque the mounting thread.** Recommended tightening torque is listed below. Apply torque only to the large 1" Hex portion with the classification marking (not the factory installed cable gland).
4. Make all wiring connections as listed in 'Wiring'. Then verify operation using the 'Operation' and 'Adjustment' procedures listed later in this document. Verify maximum output voltage at worst case speed per Warning above.

Mounting Thread	Recommended Maximum Torque
1/2-20 UNF, M12x1-6g	11.0 lbf-ft (14.9 N·m)
5/8-18 UNF, M16x1.5-6g	19.0 lbf-ft (25.7 N·m)
1 1/16-24 UNEF, 3/4-16 UNF, 3/4-20 UNEF, M18x1.0-6g, M18x1.5-6g	33.0 lbf-ft (44.7 N·m)

### Wiring

Make all wire connections before using the equipment. The wiring shall be mechanically protected as required by the applicable area electrical code and shall be terminated in a suitable terminal or junction facility. Control Equipment connected to this equipment must not use or generate more than 250V.

Wire Color codes are as follows:

#### Magnetic VRS Sensor Type

- Black and White - Signal wires (white wire is positive when a Target is approaching the Sensing Face).
  - Green - Internal Housing Ground (connect to earth)
  - Red - Unused (connect to earth)
- [For Dual Coil Options, red and orange are the second set of Signal wires (red wire is positive when a Target is approaching the Sensing Face)]
- Bare - Cable shield (connect to instrument ground)

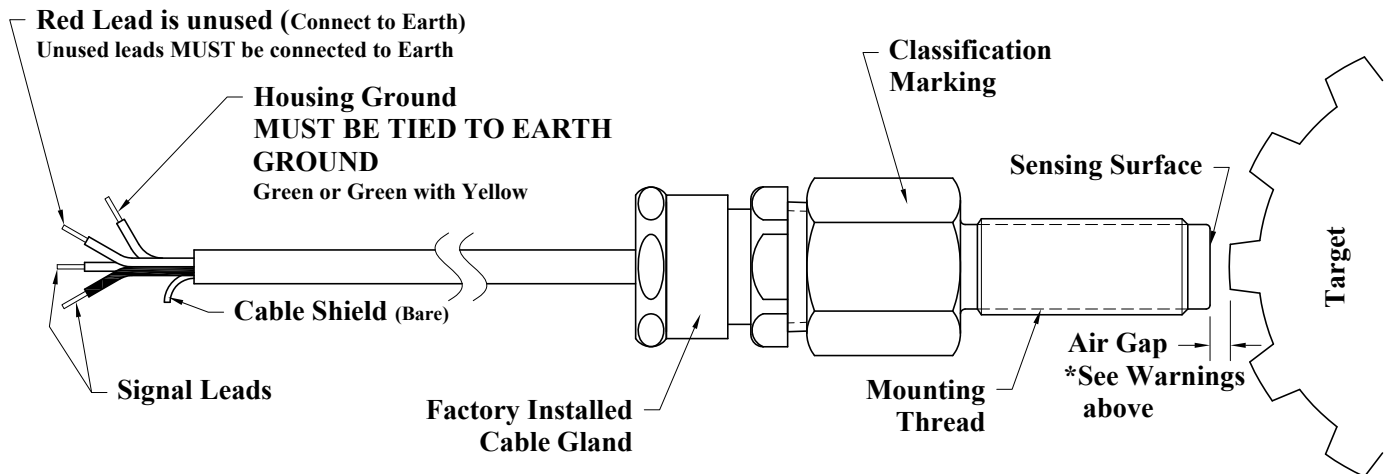
#### RF Sensor Type (must be used with a 4013 type signal conditioner)

- Black and White - Signal (no polarity applies)
- Green - Internal Housing Ground (connect to earth)
- Red - Unused (connect to earth)
- Bare - Cable shield (connect to instrument ground)

Any unused wires **MUST** be connected to an earth ground. The wiring is provided as shielded cable. The cable temperature range is -40°C to +90°C. Minimum bending radius is 6x cable diameter (approximately 1.3 to 1.6" (33 to 41mm) depending on cable size).

### Earthing / Grounding

The green (or green with yellow stripe) wire of the sensor is an internal connection to the metal housing. This wire **must be connected to an earth ground** to maintain the safety of the sensor. Additionally, no external ground is provided so the sensor **must be mounted as part of a bonded structure.**



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### Sensor Type Notes

#### Magnetic VRS Sensor

This Sensor Type uses a fixed magnetic field projected from an internal permanent magnet in the sensor. When interacting with passing ferrous metal targets, a current is induced in the sensor coil windings producing an AC voltage. Amplitude (Vp-p) is dependent on target mass, speed, air gap, coil resistance, inductance, and magnetization level of the sensor. Low magnetization versions are called for when low magnetic drag is required for the free movement of the target or rotor. This is particularly important in a Turbine Flowmeter. Because of the simplicity and ruggedness of this sensor type it is widely used for engine, machinery RPM, and process speed measurement.

#### Inductive Sensor

This Sensor Type works on the same principal as the Magnetic VRS sensors except that an external magnet or magnetic field interacts with the sensor.

#### RF Sensor

This Sensor Type operates on the Eddy Current principle and interacts with a ferrous or aluminum target without imposing magnetic drag. It must be used with a 4013 type signal conditioner. SPECTEC's RF sensors are specifically designed for precision Turbine Flowmeters where no magnetic drag is required. They are also used for high pressure applications with the ability to sense through a non-magnetic stainless steel wall. They also function close to zero speed, but are typically limited to 5kHz maximum frequency.

### Operation and Usage

#### Operation

1. Verify that the sensor is properly mounted and all electrical connections are made (including earthing).
2. Allow the Target to move. The sensor should now produce an output signal.
3. If a signal is not produced, verify that the Target is moving faster than the minimum detectable frequency of the Sensor Type. If a signal is still not produced, follow the steps in the Adjustment process detailed below.
4. For Magnetic VRS and Inductive Sensors the output signal will resemble a sinusoidal wave. The amplitude and frequency will vary based on the speed of the Target.
5. For RF sensors (used with a 4013 type signal conditioner) the output signal will switch state when a target enters or leaves the detection area. The High state will be (5V, 10V, or the supply voltage) and the Low state will be near 0V.

#### Adjustment

1. Stop the rotation or movement of the target.
2. Loosen the jam nut or other locking device.
3. Decrease the Air Gap by .005 - .010" (0.12 - 0.25mm). Be sure to account for any eccentricity in the rotation and movement of the target. Otherwise the sensor may be damaged.
4. Re-tighten the jam nut or locking device and check again for an output signal.

### Removal

Removing or Uninstalling the sensor is the reverse of the Installation Procedure.

**WARNING:** Before separating connections, the target must be stopped and the sensor should be de-energized.

### Service and Repair

The sensor cannot be serviced or repaired in the field. Please contact sales to purchase a replacement.

**WARNING:** Do not remove plugs, fittings, cable glands, or blanking elements installed by the manufacturer.