

# SPECTEC

THUNDERBIRD INTERNATIONAL CORPORATION

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

## INSTRUCTION MANUAL

### XP2 Series, Conduit Style Active Speed Sensors

# 85047X

Engineering Approval: *JE*

Date: 11-16-2022

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 XP2 Bulletin for specifications and configuration options.

### Marking

Unit Type No.: XP2-xxxxxx  
Date Code: WW/YY (Week/Year)  
Conduit Size: 1/2- NPT or M20x1.5  
Electrical Rating: xx to xx V DC @ ≤xx mA (marked according to sensor type, see XP2 Bulletin)

Codes: CL I DIV 1 GP ABCD T6...T3  
CL I ZN 1 AEx/Ex db IIC T6...T3 Gb  
T3@ Ta = -50°C...+140°C (marked)  
T4@ Ta = -50°C...+112°C  
T5@ Ta = -50°C...+77°C  
T6@ Ta = -50°C...+62°C



II 2 G Ex db IIC T6...T3 Gb  
T3@ Ta = -55°C...+140°C (marked)  
T4@ Ta = -55°C...+112°C  
T5@ Ta = -55°C...+77°C  
T6@ Ta = -55°C...+62°C



Certificate No.: FM16US0288X & FM16CA0147X  
FM16ATEX0086X & FM22UKEX0112X  
IECEx FMG 16.0035X

CE Marking: **CE** 2809

Warnings: SEAL ALL CONDUITS WITHIN 18 INCHES  
DISCONNECT POWER BEFORE OPENING  
FERMER TOUS LES CONDUITS SOUS 18 POUCES  
(.45m) MAXIMUM  
DÉBRANCHER L'ALIMENTATION ELECTRIQUE  
AVANT L'OUVERTURE

### 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. A poured conduit seal must be applied within 18 inches (0.45m) of the sensor.
2. Disconnect power before opening or 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: PTFE insulated (Polytetrafluoroethylene)  
or FEP insulated (Fluorinated ethylene propylene)

**NOTE:** For Canadian installations, only female NPT or metric entries are permissible per CSA C22.2 No. 0.5 & 30.

### Type Approval Standards

The XP2 product series have certificates issued by FM Approvals and have been approved to the following standards:

United States of America (USA) Standards:

FM Class 3600:2022	Electrical Equip for Hazardous Locations
FM Class 3615:2022	Explosionproof General Requirements
FM Class 3810:2021	Electrical Equip for Measurement, Control
ANSI/ISA61010-1:2012	Safety General Requirements
ANSI/ISA60079-0:2013	General Requirements
ANIS/UL60079-1:2015	Flameproof Enclosures 'd'

Canadian Standards:

CSA C22.2 No. 0.4:2022	Bonding of Electrical Equipment
CSA C22.2 No. 0.5:2020	Threaded Conduit Entries
CSA C22.2 No. 30:2020	Explosion-proof Equipment
CSA C22.2 No. 61010-1:2022	Safety General Requirements
CSA C22.2 No. 60079-0:2019	General Requirements
CSA C22.2 No. 60079-1:2021	Flameproof Enclosures 'd'

ATEX & UKEX Standards:

EN IEC 60079-0:2018	General Requirements
EN 60079-1:2014	Flameproof Enclosures 'd'

IECEx Standards:

IEC 60079-0:2017	General Requirements
IEC 60079-1:2014	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:

US installations:

follow the National Electrical Code ANSI/NFPA 70,

Canadian installations:

follow the Canadian Electrical Code CSA C22.1,

ATEX & UKEX 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" to .040" (0.5 to 1.0mm). 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. NOTE: Rotate the alignment mark to point at the gear for Dual Output and Directional Sensor Types.
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.
4. **A poured conduit seal must be applied within 18 inches (0.45m) of the sensor.**

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)
11/16-24 UNEF, 3/4-16 UNF, 3/4-20 UNEF, M18x1.0-6g, M18x1.5-6g	33.0 lbf-ft (44.7 N·m)

### Wiring

The wiring is provided as either shielded cable or individual leads. Make all wire connections before applying power to the circuit.

The appropriate DC (direct current) power supply for each Sensor Type is detailed on the XP2 Bulletin and marked on each sensor. 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.

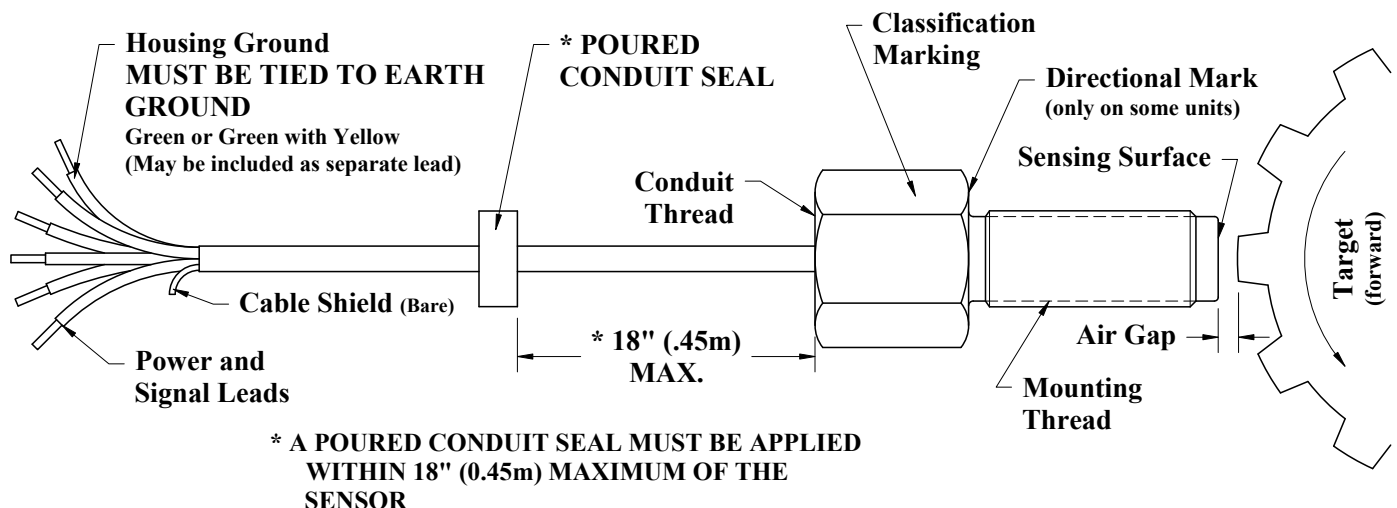
Wire Color codes are as follows:

- Red - + Power, DC Voltage positive
- Black - - Common, DC Voltage negative
- White - Signal A output, referenced from Common
- Green - Internal Housing Ground (connect to earth)
- Bare - Cable shield (connect to instrument ground)
- Yellow - Signal B output, as applicable
- Blue - Direction Signal output, as applicable

Cable and individual leads temperature range is -55°C to +200°C.

### 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

#### DIGISPEC Hall Effect Sensor

##### H Type Magnet Actuated

This zero speed sensor is triggered by a magnet or a magnetic field and offers sensing over larger air gaps. This Sensor Type is typically used on gear meters or magnet wheels. Dual and directional output options are also available. It is available in the following types:

Ho - Omnipolar (north or south pole activation)

Hs - South pole only activation

Hn - North pole only activation

H - Bipolar Latch (requires alternating north and south poles)

##### HF Type Gear Actuated

This zero speed sensor is triggered by a ferrous metal target (bolt, keyway, or typically a gear tooth). The HF Sensor Type is usually used in motor RPM and camshaft timing. Dual and directional output options are also available. An HFd Type differential sensor (for high vibration environments) is also available as an option.

#### DIGISPEC Magnetic VRS Sensor

This Sensor Type also requires a ferrous metal target. A smaller air gap and a minimum surface speed are required to operate properly. It is usually used on flowmeters because it can detect more precisely and with lower magnetic drag than HF Type sensors.

#### DIGISPEC RF Sensor

This Sensor Type operates on the Eddy Current principle and interacts with a ferrous or aluminum target without imposing a magnetic drag. SPECTEC's RF sensors are specifically designed for precision Turbine Flowmeters where no magnetic drag can be tolerated. 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.

See the XP2 Bulletin for details on the supply voltage range, frequency range, and maximum Air Gap for each Sensor Type.

### Operation and Usage

#### Operation

1. Verify that the sensor is properly mounted and all electrical connections are made (including earthing).
2. Switch on the DC supply voltage and 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. The output signal will switch state when a target enters or leaves the detection area. For the NPN output options, the signal will be High (5V, 10V, or the supply voltage) without a target in the detection area. The output will switch Low when a target enters the detection area. For the PNP output option, the output will be inverted from the above.
5. Directional Hall Effect sensors will output a High signal on the Direction Output when the target is rotating in the Forward direction. If the correct signal is not produced, follow the Directional Alignment process detailed below.

#### 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.

#### Directional Alignment (only applicable to some Sensor Types)

1. The Target should approach the Directional Mark when moving in the forward direction. However, with smaller targets the alignment may need adjusted.
2. Loosen the jam nut or other locking device.
3. Rotate the Directional Mark of the sensor slightly away from the approaching Target until the signal has the correct 90° electrical phasing (easily viewed on an oscilloscope).
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.

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