

SPECTEC

THUNDERBIRD INTERNATIONAL CORPORATION

P.O. Box 360, Emigrant, MT 59027-0360
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INSTRUCTION MANUAL

XP1 Series, Conduit Style Passive Speed Sensors

85045X

Engineering Approval:

Date: 11-16-2022

Revision: 3

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 XP1 Bulletin for specifications and configuration options.

Marking

Unit Type No.: XP1-xxxxxx
Date Code: WW/YY (Week/Year)
Conduit Size: 1/2- NPT or M20x1.5
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: CL I DIV 1 GP ABCD T6...T2
CL I ZN 1 AEx/Ex db IIC T6...T2 Gb
T2@ Ta = -50°C...+200°C (marked)
T3@ Ta = -50°C...+190°C
T4@ Ta = -50°C...+125°C
T5@ Ta = -50°C...+90°C
T6@ Ta = -50°C...+75°C



II 2 G Ex db IIC T6...T2 Gb
T2@ Ta = -55°C...+200°C (marked)
T3@ Ta = -55°C...+190°C
T4@ Ta = -55°C...+125°C
T5@ Ta = -55°C...+90°C
T6@ Ta = -55°C...+75°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 POUCHES
(.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 XP1 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:

USA 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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Approval agency controlled document. Do not alter without authorization.

Approved Feb 17th, 2023

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Engineering Approval: *JE*

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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.
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.
5. **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 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) (Dual Coil options have a second wire set)

Green - Internal Housing Ground (connect to earth)
 Bare - Cable shield (connect to instrument ground)

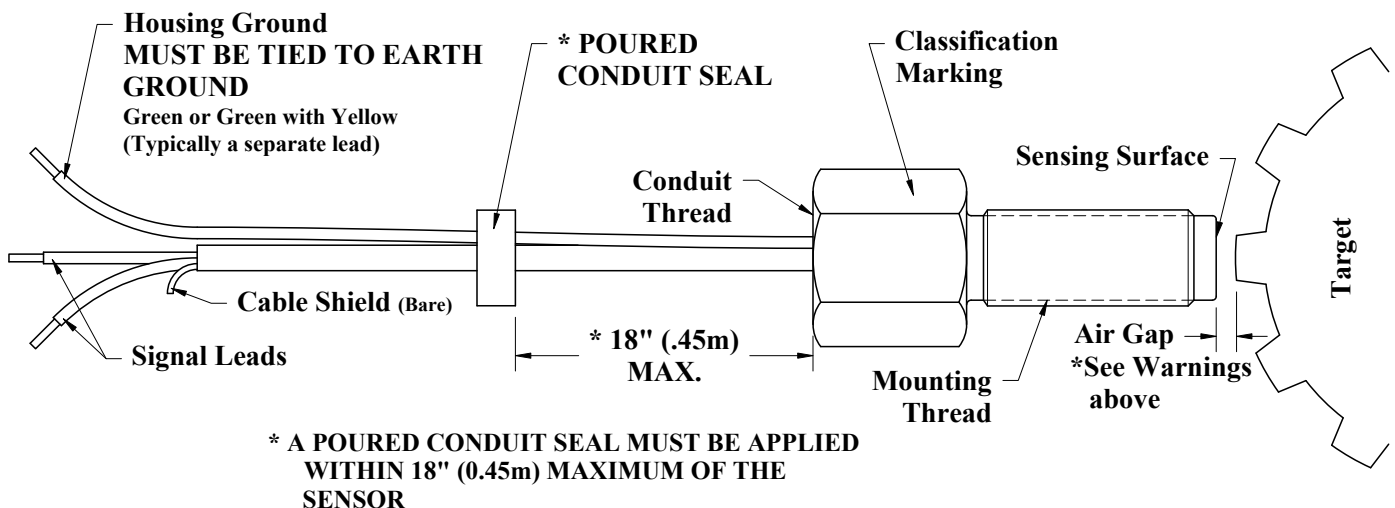
RF Sensor Type (must be used with a 4013 type signal conditioner)

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

Any unused wires MUST be connected to an earth ground. 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

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.