DSP

Principle of Operation

While the monitored shaft is rotating, the pulser disc or wrap mounted on the shaft generates an alternating magnetic field whose frequency is proportional to the speed of the monitored shaft. This alternating magnetic field is detected by the sensor and is transmitted to the speed switch in the form of a digital pulsed signal. The digital signal is then converted to a proportional voltage that is continually compared to a reference voltage corresponding to each relay set point. The relay energizes or de-energizes whenever the control signal voltage crosses the set-point reference voltage.

Pulser Disc

To mount the Pulser Disc, center drill the monitored shaft to a depth of 1/2" with a No.21 drill and tap it for a 10/32 UNF screw. Apply LoctiteTM, or a similar adhesive, on the screw threads to keep the Pulser Disc tight. Attach the disc, decal side out, with the 10/32 UNF machine screw provided. Pulser Discs can be used with all ESI sensors.

Pulser Wrap (optional)

Pulser Wraps are custom manufactured to fit the specific diameter of the shaft on which they will be mounted. To mount the Pulser Wrap, remove the 4 Allen head cap screws holding the halves of the wrap together, place the halves around the shaft, and reinsert the screws. Tighten the screws to 8 ft. lbs. Pulser Wraps can be used with all ESI Sensors.

Sensor Installation

The standard Sensor is supplied with a mounting bracket and two jam nuts. The explosion-proof Sensor is supplied with a slotted mounting bracket. Install sensors so the center of the sensor passes through the centerline of the magnets as they rotate. The center of the magnetized area of the pulser disc shown as Dimension "B" in figures 1 and 3 is 1 3/4 inches from the center hole of the disc. The gap distance between the sensor and the disc or wrap, Dimension "A" in the diagrams, can be from 1/16" to 3/8". Achieve the proper gap distance by adjusting the jam nuts on the standard sensor and by adjusting the position of the, explosion proof sensor using the slots on the mounting bracket.

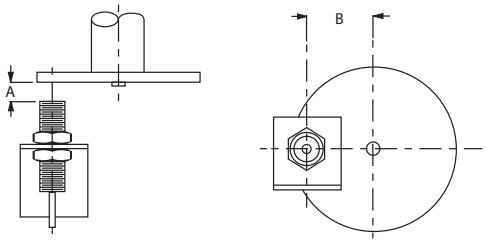

Figure 1: Standard 906 Sensor and Pulser Disc

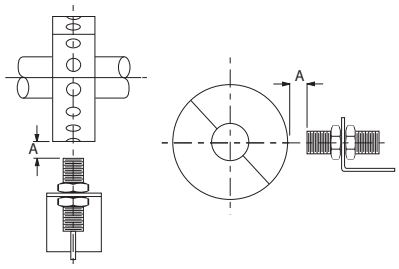

Figure 2: Standard 906 Sensor and Pulser Wrap

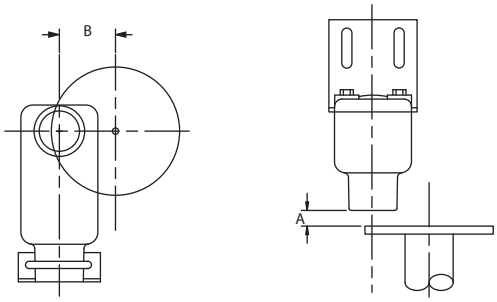

Figure 3: Explosion proof Sensor and Pulser Disc

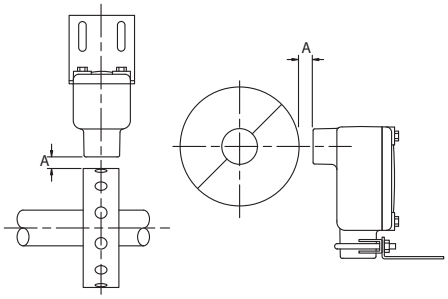

Figure 4: Explosion proof Sensor and Pulser Wrap

Input Power

Connections for the input power are made via terminal strip TB1. Refer to the tables below for the proper power connections.

Terminal	115 VAC	230 VAC	12 & 24 VAC	12 & 24 VDC
TB1-1	Hot	Hot (L1)	High	High
TB1-2	Neutral	Hot (L2)	Low	Low
TB1-3	Ground	Ground	Ground	Ground

Sensor

Connections for the Sensor are made via terminal strip TB2. Refer to the table below for the proper connections.

Connection	ESI Sensor 906 - 907	ESI Prox Type NPN	Other standard ESI Sensors
TB2-7 Supply	Red	Brown	Red
TB2-8 Signal	Black	Black	Clear
TB2-9 Ground	Clear/Shield	Blue	Black/Shield

6111 Blue Circle Drive
Minnetonka, MN 55343
Phone: 952.930.0100
Fax: 952.930.0130
ISO 9001:2000 Certified

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Calibration

Refer to figure below for all calibration adjustments. To calibrate the DSP, a device with a visual readout of RPM or voltage must be used. If an Electro-Sensors analog or digital meter is not included as part of the system package, any analog or digital voltmeter in the 0-10 VDC range may be used. Connect the voltmeter to the 0-10 VDC output terminals (TB2-1 and TB2-2) observing the proper polarity. With the voltmeter connected, 115 VAC input power connected and the monitored system off, place the Range Selector Switch (S3) in the position corresponding to the appropriate RPM range at which the monitored shaft will be running. Next, place the Readout Select Switch (S1) in the far left position (A). Turn the 0-10 VDC Zero Adjustment Potentiometer (R16) counterclockwise to decrease and clockwise to increase until a reading of zero is attained. Next, with the monitored shaft running at full operating speed, turn the 0-10 VDC Gain Adjustment Potentiometer (R17) clockwise to increase and counterclockwise to decrease until a reading of 10 VDC is attained. Because there is a slight interaction between the zero and gain adjustments, it is recommended that the calibration procedure be repeated to assure maximum accuracy.

Set-Point Adjustment

Each relay set-point on the DSP must be individually adjusted to the desired tripping point. Each Set-Point is set to a specific voltage that corresponds to an exact RPM based on the original calibration. For example, if the monitored shaft was calibrated for 0-l0 VDC @ 0-200 RPM operating speed range, then a selling of 5 volts would correspond to 50%, or 100 RPM. To calibrate each individual set point, the Readout Select Switch (S1) is used. By sliding the switch to the appropriate set-point number, a voltage reading will appear on the voltmeter connected to the 0-10 VDC output terminal. Adjust the set-point potentiometer (R3 for Set-point 1 and R4 for Set-point 2) to the voltage that corresponds to the desired RPM set point. Each Set-Point also has the capability of over speed or under speed actuation. This selection is made by using the over/under speed slide switches (S2 for Set-point 1 and S4 for Set-point 2) as illustrated in drawing below. A green LED indicator light will illuminate when the relay is energized.

4-20 mA Output (optional)

This option provides a 4-20 mA current output proportional to speed for interfacing with other external monitoring devices such as computers, chart recorders, PLCs, etc. To calibrate the 4-20 mA output, connect a milliammeter in series with the external monitoring device and to TB2-3 and TB2-4 while observing the proper polarity. When the monitored shaft is at zero, turn the 4-20 mA Offset Adjustment (R1) clockwise to increase and counterclockwise to decrease until the milliammeter reads 4 mA. With the monitored shaft running at full operating speed, turn the 4-20 mA Gain Adjustment (R2) clock-wise to increase and counterclockwise to decrease until the milliammeter reads 20 mA. Because there is a slight interaction between the offset and gain adjustments, the calibration procedure should be repeated to assure maximum accuracy. The 4-20 mA output has a 500-ohm maximum load capacity. This option is not available on units with 12 volt AC or DC power supplies.

TB1 Connections	
TB1-1	Input power Hot
TB1-2	Input power Neutral
TB1-3	Input power Ground
TB1-4	SP1 Common
TB1-5	SP1 N.O.
TB1-6	SP1 N.C.
TB1-7	SP2 Common
TB1-8	SP2 N.O.
TB1-9	SP2 N.C.

TB2 Connections	
TB2-1	0-10 +
TB2-2	0-10 -
TB2-3	4-20mA + (optional)
TB2-4	4-20mA - (optional)
TB2-5	Reset
TB2-6	Reset
TB2-7	Sensor Supply
TB2-8	Sensor signal
TB2-9	Sensor Ground/Shield

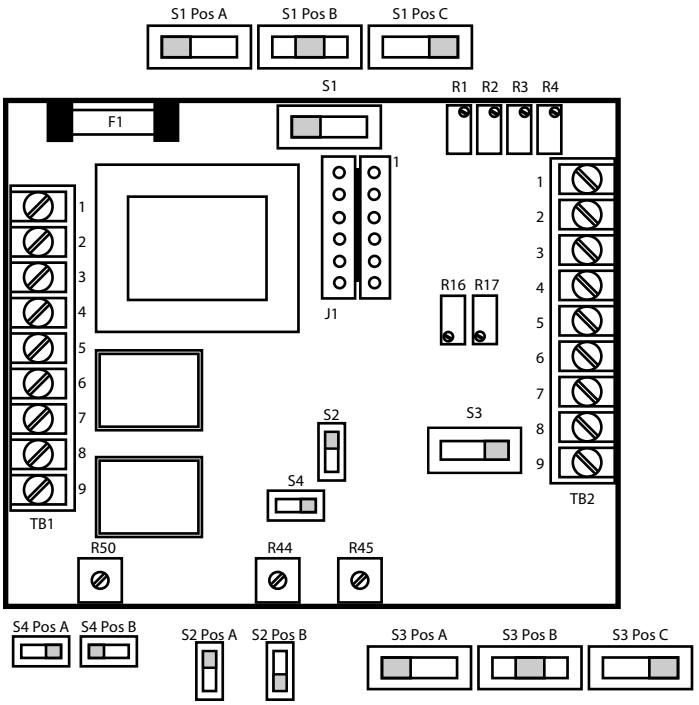
Potentiometer	Adjusment
R1	4-20mA Offest
R2	4-20mA Gain
R3	SP1
R4	SP2
R16	0-10 Vdc Zero
R17	0-10 Vdc Gain
R44	Start Delay
R45	SP1 Delay
R50	SP2 Delay

S2 Over/Under Speed SP1	
Switch Pos.	Desc.
A	Under
B	Over

S4 Over/Under Speed SP2	
Switch Pos.	Desc.
A	Under
B	Over

S1 Readout Select	
Switch Pos.	Desc.
A	Operate
B	SP1 Select
C	SP2 Select

S3 Range Select	
Switch Pos.	Desc.
A	0-20,000
B	0-2,000
C	0-200



Relay Latch Function (optional)

This option provides the user with the ability to latch the relay in the de-energized mode once it has been tripped. The relay may only be reset via an external momentary contact closure on the reset terminals, TB2-5 TB2-6. This option must be specified at the time of the order because it involves additional components on the circuit board.

Start Delay (optional)

This option effects both relay Set Points by allowing the monitored shaft to come up to speed with the set-point relays in the energized state for a time period of 0.1 to 15 seconds thus eliminating the need for an operator to hold the "start" button until the shaft comes up to speed. A momentary contact closure on the reset terminals (TB2-5 and TB2-6) is required to start the timing. This closure may originate from either a set of motor starter contacts or the motor starter switch. After wiring the momentary contact closure, turn the Start Delay Adjustment (R44) clockwise to increase and counterclockwise to decrease until the desired time delay is attained. The adjustment may have to be made a few times to achieve the exact desired delay time. If a delay time longer than 15 seconds is desired, please consult the factory. These adjustments are single turn potentiometers with 0' to 270' of rotation. Do not force the adjustment or damage to the potentiometer may occur.

Set-Point Relay Delay (optional)

This option will keep the set-point relay energized for a period of 0.1 to 15 seconds after a fault condition has been detected. The delay will automatically reset itself when the fault condition is cleared or the relay will de-energize if the fault condition persists beyond the delay time. A typical example may be a conveyor that slows down briefly due to overloading. Each set-point has an independent single turn adjustment for setting the delay time. For Set-Point 1, turn the SP1 Delay Adjustment (R45) clockwise to increase and counterclockwise to decrease until the desired delay time is achieved. For Set-Point 2, the delay adjustment is R50 and it operates in the same manner as Set-Point 1. The adjustment may have to be made a few times to achieve the exact desired delay time. If a delay time longer than 15 seconds is desired, please consult factory. "These adjustments are single turn potentiometers with 0' to 270' of rotation. Do not force the adjustment or damage to the potentiometer may occur.

Analog or Digital Meters (optional)

This optional meter is connected with a wire harness using the 12 pin receptacle in the center of the circuit board and operated from the 0-10 VDC calibration output of the DSP. The meter provides a convenient method of accurately calibrating the DSP as well as providing an indication of actual running speed after set up. You may also use a DC voltmeter to calibrate the unit.

Model No. 264 (SIN 510-000100)

The analog meter (p/n 510-000100) is connected to the DSP via the same wire harness as the digital meter. This meter is also calibrated using the Zero Adjustment (R16) and the Gain Adjustment (R17) on the DSP circuit board. The analog meter is a 50 graduation, 100 micro- Amp, taut band meter movement factory scaled to the customer's specifications.

Troubleshooting Guide

Problem	Troubleshooting step / Solution
Unit dead	Check for blown fuse / replace if bad
Unstable output	Check the sensor / adjust sensor gap and alignment as necessary
No Output	Check the sensor / adjust sensor gap and alignment as necessary
	Check for sensor signal at board / replace sensor if the gap and alignment are good and board has a good sensor supply and unit works with a generator.
	Check for sensor signal at board / replace unit if the input to the DSP has a good sensor supply of 15 Vdc and signal is present, 15 Vdc squarewave, but there is no analog or relay activity.
Unable to calibrate unit	Verify Unit is set to correct range / Set to appropriate range if necessary

DSP Series General Specifications:

Input Power	Parameters
Voltage	115 Vac +1-10% Standard 230 Vac +1-10% optional 12, 24 Vac/dc optional
Frequency	50-60 Hz
Wattage	12 VA
Fuse	1/8 Amp slo-blo 115Vac 1/16 Amp slo-blow 230 Vac

Input Signal	Parameters
Type	Open collector/logic
Amplitude	15 volts nom. 8 volts min
Impedance	2200 Ohms to 15 Vdc
Frequency	Minimum 3.33 Hz Maximum 2.66 KHz
Duty Cycle	50% required for linear output
Sensor Supply	+15Vdc, 50mA max

Output signal	Parameters
Type	0-10 Vdc (standard calibration) 4-20 mA optional (external devices) not available in 12 volt models
Accuracy	+/- 0.5% at midrange
Calibration	Switchable (3 ranges) 0-200 RPM 0-2,000 RPM 0-20,000 RPM Offset and Gain adustment potentiometer (22 turn)

Set Point Data	Parameters
Number Available	1 or 2
Adjustments	22-turn potentiometer
Hysteresis	0.1% of full scale
Range	1% to 100% full scale
Mode (selectable)	Over or Under speed
Response time	0-200 RPM 1.5 seconds 0-2,000 RPM 0.5 seconds 0-20,000 RPM 0.5 seconds

Relay Output	Parameters
Contact Configuration	1 Form C (SPDT) per relay
Rating	5 Amp 0.28 Vdc or 115 Vac resistive
Indication	Green LED illuminates when energized

Physical/Environment	Parameters
Mounting	Chassis (See dimensional drawing)
Operating Temperature	-10°C to +60°C
Storage Temperature	-40°C to +85°C
Electrical Connections	Terminal strip

Pulser Disc (standard)	Parameters
Material	Nylon 12 (standard) For other materials please consult factory
Dimensions	4” Diameter x 1/4” thick
Operating temperature	-40°C to +60°C
Maximum Speed	Consult factory

Pulser Wrap (optional)	Parameters
Material	PVC (standard) For other materials please consult factory
Dimensions	O.D. = Shaft O.D. + 3.00” 1.5” wide
Operating Temperature	-40°C to +60°C
Maximum Speed	Consult factory

906 Sensor (std.)	Parameters
Material Body	Aluminum
Material Bracket	Steel
Thread Size	3/4-16 UNF
Output Type	Open collector, Current sinking 20 mA maximum
Signal Cable	3 conductor sheilded 10 ft. supplied (standard) 50 and 100 ft (optional)
Operating Temperature	-40°C to +60°C
Sensing Distance	1/16” to 3/8”

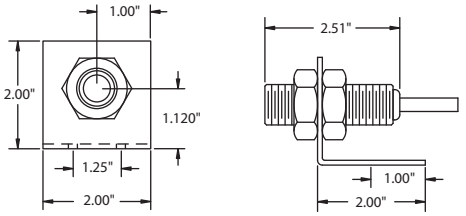
Explosionproof Sensor	Parameters
Housing and Cover	Cast aluminum, C.S.A. and FM, Approved UL, Rated Class I Group C, D; Class II Group E, F, G; Class III
Signal Cable	3 conductor shielded,10 ft. supplied 50 and 100 ft optional
Operating Temperature	-40° to +60°C

Analog Meter (optional)	Parameters
Scale Size	4”
Movement	Taut Band
Resolution	50 graduation
Current Input	100 uA for full-scale deflection

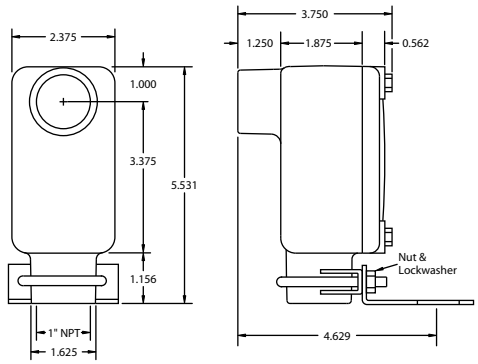
*Higher temperature ranges available. Specifications Subject to Change without Notice.

WARNING!
During a stopped condition, even a slight movement of the shaft or magnetic disc could energize the control relay and start the motor if the Motor Starter Auxiliary Normally Open Contact (MS Aux N.O.) Is not wired in series as shown in these typical wiring diagrams. This situation could cause equipment damage or PERSONAL INJURY! To prevent starting the motor accidentally, ALWAYS USE PROPER LOCKOUT — TAG-OUT PROCEDURES.

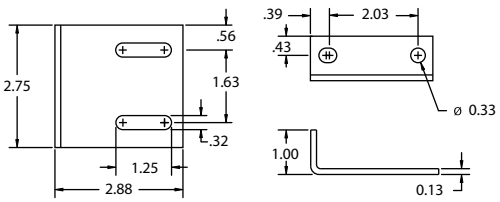
Dimensional Drawings



Standard 906 Sensor



Standard XP Sensor



XP Sensor Bracket