# SLOW SPEED Rate Meter/Tachometer



## ELECTRO SENSORS SSA-50P


### Features:

**• Simple Installation and Calibration • Microprocessor Based Circuitry • Highly Accurate Conversion Technique • .43" High-Efficiency Displays • Barrier Strip Connections • Field Selection of Decimal Point**

### Options:

**• 230Vac Operation • One or Two Set Points • Front Panel Selection of Readout • 5A Form C Relay Outputs • Front Panel Indication of Relay Status • Selectable Over/Under Set Point Detection • Selectable Relay Latch or Auto Reset • Set Point Delays • Front Panel Set Point Adjustment • 4 - 20mA Output • 500 Ohm Maximum Load • JIC Enclosure Mounting • Special Scaling • Remote Reset of Relays • Waterproof Bezel • Scaling in Engineering Units • Optical Encoder for Enhanced Response Time**

### Description:

The unique features of this Slow Speed Tachometer combined with its selection of available options make the SSA-50P a complete rate meter system that provides digital indication of speeds as low as .1rpm. The SSA-50P utilizes microprocessor based circuitry and can display ranges as low as 0 – 19.99rpm or as high as 0 – 1000rpm with eight factory selectable ranges for fine tuning your system to an accuracy of ±.1% ±1count.

The highly readable 3-1/2 digit LED display with its .43" character height indicates actual production rates in desired engineering units. Readout and circuitry are housed in an easy-to-install panel-mount enclosure.

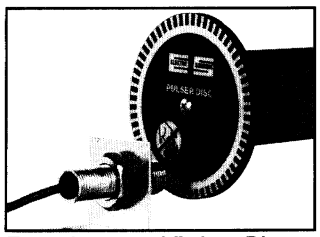
The standard system comes complete with panel-mount circuitry, a digital sensing head with 10 feet of three-conductor shielded cable, and a 4" diameter magnetic pulser disc. Input power is 115Vac, 50 - 60Hz with 230Vac optional.

Optional features include: one or two set points, external set point adjustments, adjustable set point delays, and independent 4 - 20mA output for controlling or recording process variables.

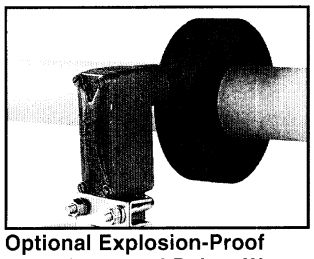
### Principle of Operation:

The SSA-50P can be thought of as a timing device with the sensing head acting as the reset switch. The internal electronics have a count generator built in, which continously generates counts. As the shaft rotates, the magnet pulser disc passes in front of the digital sensing head and detects the magnetic poles of each magnet, which provides eight pulses per revolution.

Starting at time zero, with the readout at zero, the first input pulse begins a timing sequence, or an accumulation of counts in the microprocessor. As the next phase comes around, the existing timing sequence ends, and starts a new one. The accumulation of counts from the first sequence is then divided into a constant which is contained within the software program. This resulting number is proportional to the speed of the rotating shaft. It is stored in the microprocessor memory and is also transferred to a 12-bit D/A, where it is converted to a 0 – 2Vdc signal. This timing and conversion sequence is performed eight times per revolution. If a new input is not received in time or if the shaft stops, the readout unit will start to decay to zero. The 0 – 2Vdc signal from the D/A is used for driving the display driver. It may also be used for the set point comparators and 4 – 20mA amplifier when specified.



Transducer and Pulser Disc



Optional Explosion-Proof Transducer and Pulser Wrap

### 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 10-32UNF. Apply Loctite® or a similar adhesive on the threads to keep the pulser disc tight. Attach the disc, decal side out, with the 10/32UNF machine screw provided. Pulser discs can be used with all Electro-Sensors 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. Wraps can be used with all Electro-Sensors sensors.

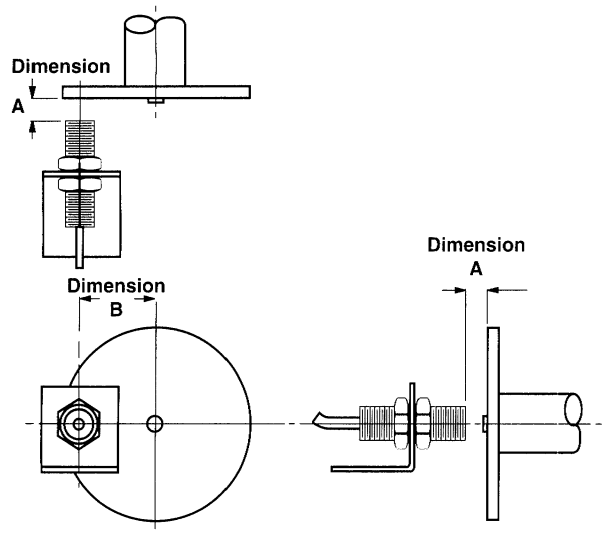
### Transducer Installation

The standard transducer is supplied with a mounting bracket and two jam nuts. The explosion-proof transducer is supplied with a slotted mounting bracket. Transducers should be installed so that the center of the transducer passes through the center line of the magnets as they rotate. When using the pulser disc, the center of the magnetized area of the disc, shown on Dimension B in figures 1 and 3 below, is 1 3/4" 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 1/4". The proper gap distance is achieved by adjusting the jam nuts on the standard transducer, or by adjusting the position of the explosion-proof transducer, using the slots on the mounting bracket.

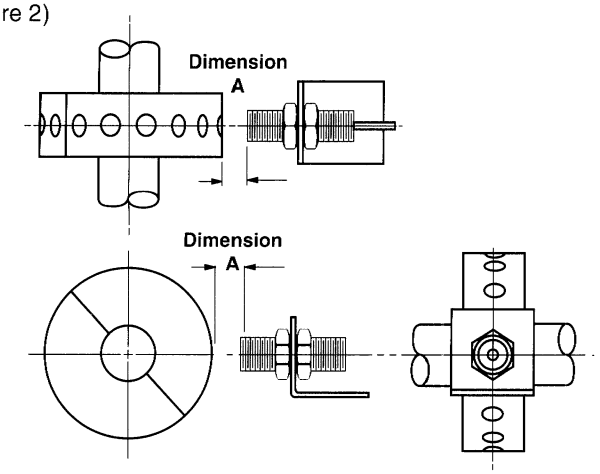
### Transducer and Disc

(figure 1)



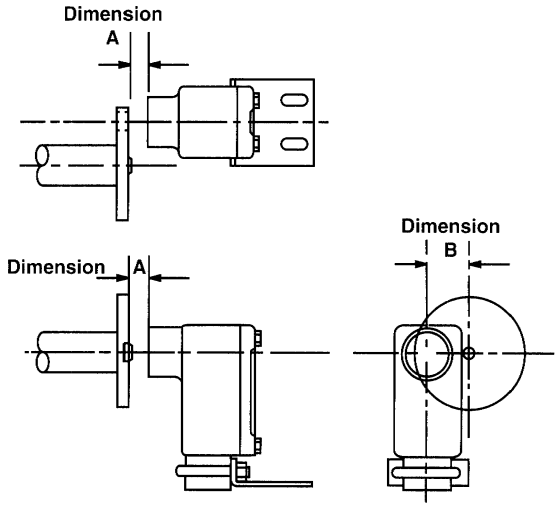

### Transducer and Wrap

(figure 2)



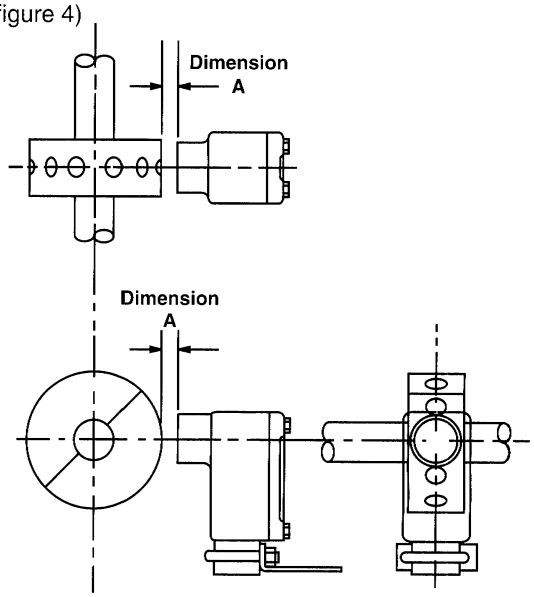

### Explosion-Proof Transducer and Disc

(figure 3)



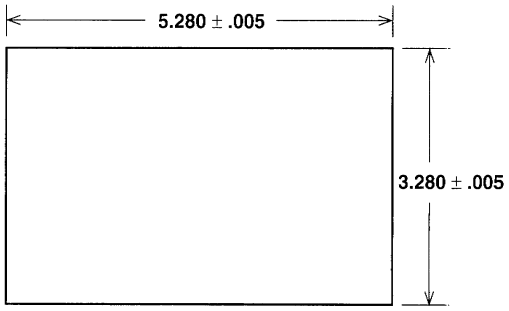

### Explosion-Proof Transducer and Wrap

(figure 4)



## Enclosure Installation

Figure 5 illustrates the cutout necessary for installation of the SSA-50P into a panel. After the cutout has been made, remove the two screws which hold the mounting bracket to the unit. Remove the bracket and slide enclosure into the panel. Reinstall the mounting bracket using the two screws removed earlier. Tighten screws until the unit is securely held in place. The unit is now ready for wiring.




**Panel Cutout**
(figure 5)

## Wiring Connections

Refer to figure 6 for all wiring connections.

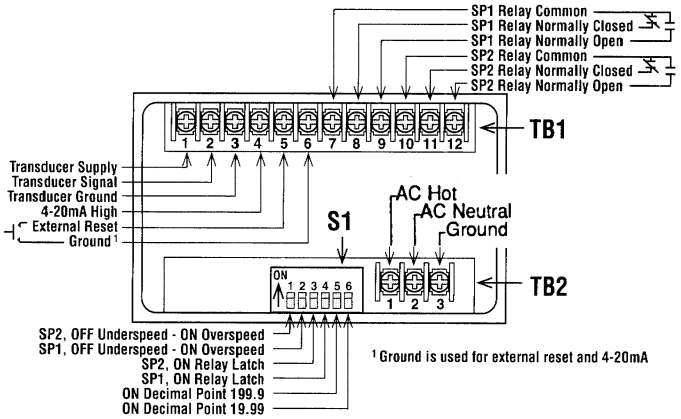
### Transducer

Connect the transducer cable to terminal strip TB1. Refer to the table below for the proper connections.

| Terminal | Description | Sensor Model 906-907 | Sensor Model 930-931-1101-1102 |
|---|---|---|---|
| TB1-1 | Supply | Red | Red |
| TB1-2 | Signal | Black | Clear |
| TB1-3 | Ground | Clear/Shield | Black/Shield |

*Note : up to 1500 feet of shielded 3-conductor cable may be run.*

### Wiring Connections
(figure 6)




### Input Power

Connections for input power are made via terminal strips TB2. Refer to the tables below for the proper connections.

| 115Vac (Standard) | | 230Vac (Optional) | |
|---|---|---|---|
| Hot | TB2-1 | Hot | TB2 - 1 |
| Neutral | TB2-2 | Hot | TB2 - 2 |
| Earth Ground | TB2-3 | Earth Ground | TB2 - 3 |

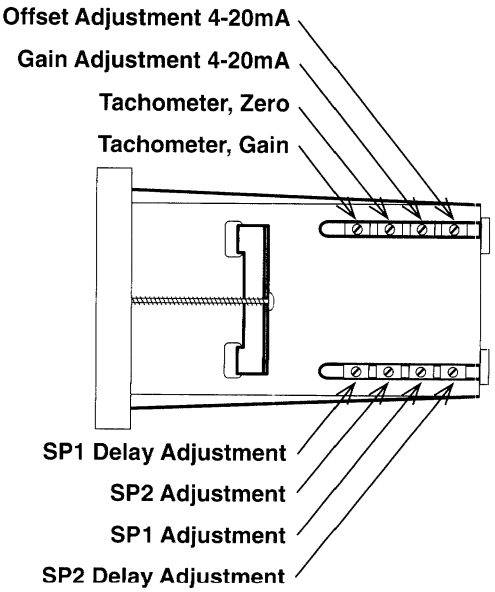
Refer to the **Options** section for all other wiring connections.

### Programming Switch Functions (S1)

| Switch # | Switch ON | Switch OFF |
|---|---|---|
| 1** | Set Point Two output is fail-safe when detecting overspeed, i.e., relay is energized when process is running normally and will de-energize when program exceeds Set Point Two setting. | Set Point Two output is fail-safe when detecting underspeed, i.e., relay is energized when process is running normally and will de-energize when it drops below Set Point Two setting. |
| 2* | Operates the same as position one, but affects Set Point One. | Operates the same as position one, but affects Set Point One. |
| 3** | When a fault condition is detected by Set Point Two, relay is de-energized and latched. | When a fault condition is detected by Set Point Two, relay is de-energized. then will automatically re-energize. |
| 4* | Operates the same as position three, but affects Set Point One relay. | Operates the same as position three but affects Set Point One relay. |
| 5+ | Select decimal point 199.9. | No decimal point. |
| 6+ | Select decimal point 19.99. | No decimal point. |

* Applies to those units with Set Point One option.
** Applies to those units with Set Point Two option.
\+ Cannot have both S1-5 and S1-6 "ON" at the same time.

### Calibration Adjustments
(figure 7)



## Calibration:

### Tachometer

Refer to figure 7 for the location of all calibration adjustments. All units come precalibrated from the factory. If the system is to be used for engineering units other than RPM, then the necessary information for conversion should be supplied with the order. Examples of the information required to do a conversion could be: Shaft size for FPM, gallons per revolution for GPM, or reduction ratio for RPM. If it becomes necessary to recalibrate the meter, the following procedure should be followed:

*Note: Due to the nature of the speeds in which this system is used, an adequate amount of time must be allowed between adjustments for the system to settle.*

*1. With the monitored shaft stopped and AC power applied, adjust the Tachometer Zero Pot clockwise to increase and counterclockwise to decrease for a meter reading of zero.
*2. After adjusting the Tachometer Zero Pot, run the monitored shaft at a known speed and adjust the Tachometer Gain Pot clockwise to increase and counterclockwise to decrease for a meter reading of a known speed. Since there is some interaction between zero and gain potentiometers, it is recommended that the above procedure be repeated to obtain accurate zero speed and operating speed readings.

**For those units with optional set points, the front panel selector switch must be in the OPERATE position to make these adjustments. Refer to the Options section for all other calibration adjustments.*

### Function Programming Switch (S1)

Refer to figure 6 for the location of S1. Refer to the table on page 3 for the functional description of each of the six switches contained on S1.

## Options:
## Set Points (two maximum)

### Set Point One

This option provides the user with one Form C (SPDT) isolated relay output rated at 5A, 115Vac, resistive. A relay status indicator located on the front panel provides the user with a visual indication of relay status. When the LED is lit, the relay is energized.

### Wiring Connections

Connections for Set Point One relay output are made via terminal strip TB1. Refer to the table below for proper connections.

### Set Point One Connection Table

| Terminal # | Description |
|---|---|
| TB1-7 | Common Contact |
| TB1-8 | Normally Closed Contact (N.C.) |
| TB1-9 | Normally Open Contact (N.O.) |

### Calibration

Refer to figure 7 for the location of calibration adjustments.

1. Place the front panel selector switch in the Set Point One position.
2. Adjust the Set Point One (SP1) adjustment clockwise to increase and counterclockwise to decrease, until the desired relay trip point is reached.
3. Return the front panel selector switch to the OPERATE position.
4. Select relay functions on S1-2 (overspeed or underspeed) and S1-4 (relay latch or auto reset).

### Set Point Two

This option provides the user with a second Form C (SPDT) isolated relay output rated at 5A, 115Vac, resistive. A relay status indicator located on the front panel provides the user with a visual indication of relay status. When the LED is lit, the relay is energized.

### Wiring Connections

Connections for Set Point Two relay output are made via terminal strip TB1. Refer to the table below for proper connections.

### Set Point Two Connection Table

| Terminal # | Description |
|---|---|
| TB1-10 | Common Contact |
| TB1-11 | Normally Closed Contact (N.C.) |
| TB1-12 | Normally Open Contact (N.O.) |

### Calibration

Refer to figure 7 for the location of calibration adjustments.

1. Place the front panel selector switch in the Set Point Two position.
2. Adjust the Set Point Two (SP2) adjustment clockwise to increase and counterclockwise to decrease until the desiredrelay trip point is reached.
3. Return the front panel selector switch to the OPERATE position.
4. Select relay functions on S1-3 (relay latch or auto reset).

### Set Point Delay

The purpose of this option is to provide the user with a field settable relay delay. This adjustment keeps the set point relay energized for a period of time (.1 second to 15 seconds) after a fault condition is detected. The delay will automatically reset when the fault condition is cleared. Each time delay is independently field adjustable via a single turn potentiometer.

### Calibration

Refer to figure 7 for the location of calibration adjustments. There is no visual indication of the amount of delay time with these adjustments. Therefore they may have to be adjusted more than once to achieve a desired exact delay time.

### *Set Point One Delay; *Set Point Two Delay

Adjust the SP1 or the SP2 delay adjustment clockwise for more delay time and counterclockwise for less delay time until the desired delay time is achieved.

**These adjustments are single turn potentiometers with 0° to 270° of rotation. Do not force the adjustment or damage to the potentiometer may occur.*

### Relay Latch Function

This function provides the user with the ability to latch the relay in the de-energized mode once it has been tripped, and may only be reset via an external momentary contact closure. This function is made available to the user via a selector switch, S1, located on the rear of the unit. When S1-3 is "ON" the relay for Set Point Two will latch off when a fault condition is detected. When S1-4 is "ON" the relay for Set Point One will latch off when a fault condition is detected. When either S1-3 or S1-4 is in the "OFF" position each respective relay will reset automatically when the process returns to its present tolerances. The connections for the external reset are made via TB1. The external reset has to be a momentary contact closure wired across TB1-5 and TB1-6.

### Front Panel Adjustments

This option provides for one or two potentiometers to be installed in the front panel and wired to the set point circuitry. The adjustment devices are 10-turn, turns-counting dials allowing set point adjustment without going behind the panel.

### 4-20mA

This option will provide a 4-20mA current loop proportional to the monitored shaft speed. Calibration and functioning are totally independent of all other adjustments. Maximum load resistance is 500 ohms.
Wiring connections for the 4-20mA output are made via terminal strip TB1. Refer to the table below for proper connections.

### 4-20mA Connection Table

| Terminal # | Description |
|---|---|
| TB1-4 | 4-20mA + |
| TB1-6 | 4-20mA - (Ground) |

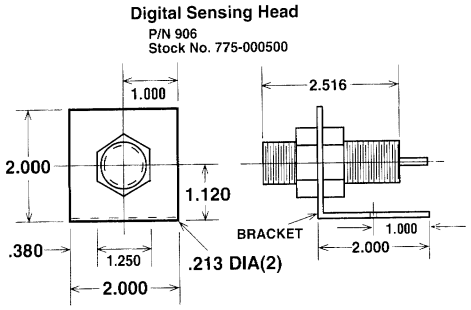
### Calibration

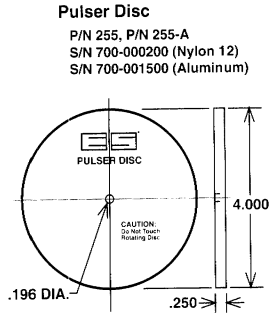
Refer to figure 7 for the location of all calibration adjustments. All units come precalibrated from the factory. If it becomes necessary to recalibrate the 4-20mA output, the following procedure should be followed.

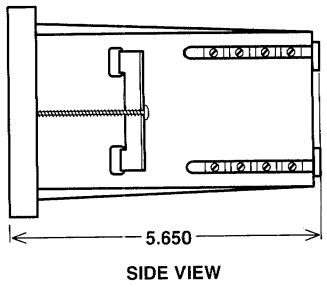
1. Connect a milliammeter in series with the actual load or a simulated load observing the proper polarities.
2. With the monitored shaft stopped and AC power applied, adjust the 4-20mA offset adjustment, clockwise to increase and counterclockwise to decrease, for a reading of 4mA on the milliammeter.
3. With the monitored shaft running at the speed at which you want the 20mA output, adjust the 4-mA gain adjustment, clockwise to increase and counterclockwise to decrease, for a reading of 20mA on the milliammeter. Since there is some interaction between the two adjustments, it is recommended that the calibration procedure be repeated to obtain maximum accuracy.

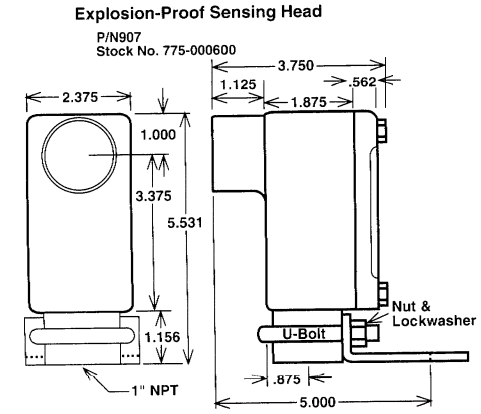
## SSA-50P Dimensional Drawings

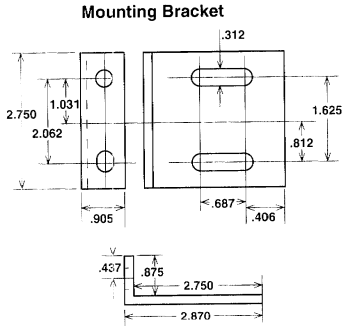
Dimensions in Inches:

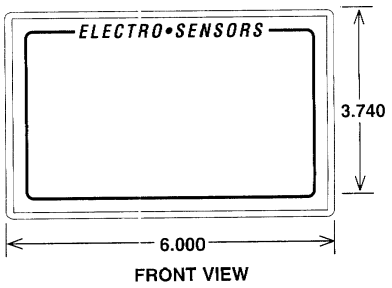


## SSA-50P General Specifications:

### Power:

| | |
|---|---|
| Voltage | 115 ±10% Standard, 230Vac ±10% Optional |
| Frequency | 50 - 60Hz |
| Wattage | 10VA |
| Fuse | 1/8A Slo-Blo 115Vac<br>1/16A Slo-Blo 230Vac |

### Input Signal:

| | |
|---|---|
| Type | Open Collector/Logic |
| Amplitude | 15V Nom. 7V Min., 60V Max. |
| Impedence | 2200 Ohms to 15V |
| Pulse Width | 15msec. Min. |
| Frequency | 226Hz Max. 0Hz Min. |
| Transducer Supply | 15Vdc, 50mA Max. |

### Display:

| | |
|---|---|
| Type | .43" LED |
| Resolution | 3½ Digit |
| Ranges | to 19.99, or 199.9 |
| Accuracy | ±0.1% of Reading ±1 Count |
| Calibration Adjustments | 15-Turn Potentiometers |
| Decimal Point | Switch Selectable |
| Update Time | Update = 1/f Where<br>f = # of Pulses per Rev. x RPM / 60 |

### Set Point Data:

| | |
|---|---|
| Number Available | Two |
| Adjustments | 15-Turn Potentiometer |
| Hysteresis | 0.1% of Full Scale |
| Range | 0.25% to 100% of Full Scale |
| Mode | Selectable Over or Under |
| Accuracy | 0.1% of Setting |
| Response Time | Proportional to Update Time |

### Relay Output:

| | |
|---|---|
| Contact Configuration | 1 Form C |
| Rating | 5A, 115Vac, Resistive |
| Mode | Selectable Auto Reset or Latching |
| Indication | LED Lit when Relay Energized |

### Physical/Environmental:

| | |
|---|---|
| Enclosure Material | Noryl 225 |
| Enclosure Dimensions | 3.25" x 6.00"W x 5.50"D |
| Operating Temperature | 0° to 60°C* |
| Storage Temperature | -65° to 70°C |

### Pulser Disc:

| | |
|---|---|
| Material | Nylon 12 – Aluminum (optional) |
| Dimensions | 4" Dia. x ¼" Thick |
| Operating Temperature | -40° to 60°C* |
| Maximum Speed Range | Consult Factory |

### Transducer:

| | |
|---|---|
| Material (Transducer Body) | Aluminum |
| Material (Mounting Bracket) | Steel |
| Thread Size (Std. Transducer) | ¾-16UNF |
| Output Type | Open Collector, Current Sinking 20mA Max. |
| Signal Cable | 3-Conductor Shielded, 10' Supplied |
| Maximum Cable Length | 1500 Feet |
| Operating Temperature | -40° to 60°C* |
| Sensing Distance Between Transducer and Pulser Disc | 1/16" to ¼" |

### Optional Explosion-Proof Transducer:

| | |
|---|---|
| Signal Cable | 3-Conductor Shielded, 10' Supplied |
| Housing and Cover | Cast Aluminum, C.S.A. Approved U.L. Rated: Class I Group D; Class II Group E, F, G; Class III |

### SSA-50P Spare Parts List:

| | |
|---|---|
| Pulser Disc (Nylon 12) | S/N 700-000200 |
| Pulser Disc (Aluminum) | S/N 700-001500 |
| Standard Digital Sensing Head | S/N 775-000500 |
| Explosion-Proof Digital Sensing Head | S/N 775-000600 |

**Higher temperature ranges available. Consult factory.*

**Specifications Subject to Change Without Notice.**



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