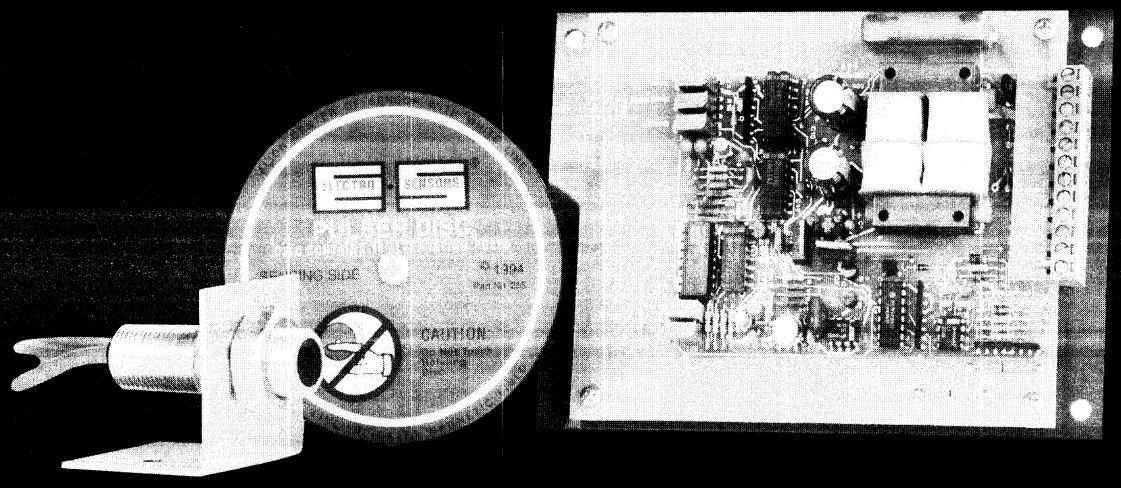
Digital Signal Conditioner

ELECTRO SENSORS DSC-10CA



Converts Shaft Speed to Dual Analog Outputs

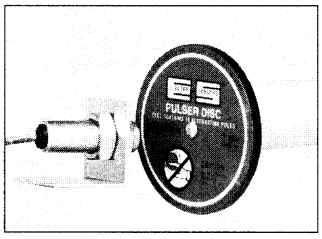
Features:

- **0–10 Vdc and 4–20 mA Outputs**
- **Accurate at Slow Speeds**
- **Interfaces with a Variety of Sensors**
- **Input Frequencies from 5 Hz to 20 Khz**
- **115 Vac Standard**
- **220 Vac 12/24 Vdc Optional**
- **Simple Installation and Calibration**

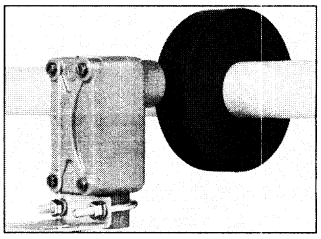
Description:

The Electro-Sensors' DSC-10CA Signal Conditioner provides an analog signal directly proportional to the speed of a monitored shaft. The 0–10 Vdc and 4–20 mA outputs can be sent to a chart recorder, digital display, PLC, loop controller, drive speed controller, or other control or monitoring devices. The wide voltage range and wave shape flexibility of the DSC's sensor input circuitry allow it to translate signals from Hall Effect Sensors, proximity switches, magnetic sensors, and a wide variety of other pulse generator devices into analog outputs.

The standard DSC-10CA system includes the DSC-10CA circuitry mounted on a chassis, a Hall Effect sensor, and an end of shaft magnetic pulser disc. A split collar magnetic pulser wrap that clamps around the monitored shaft, and an explosionproof version of the Hall Effect sensor are also optional. Other options include: NEMA 12, NEMA 4, or other enclosures for the circuit card, alternative power supplies, and a variety of sensing methods designed to fit specific needs. Consult an Electro-Sensors Application Specialist for more information on customized systems.



Sensing Head and Pulser Disc



Optional Explosionproof Sensor and Pulser Wrap

Pulser Disc:

The end of the shaft to be monitored must be center drilled to a depth of 1/2-inch with a No. 21 drill and tapped for 10-32 UNF. After applying Loctite® or a similar adhesive on the threads to keep the pulser disc tight, the pulser disc should be attached, decal side out, with the supplied 10-32 UNF machine screw and lock washer.

Pulser Wrap (optional):

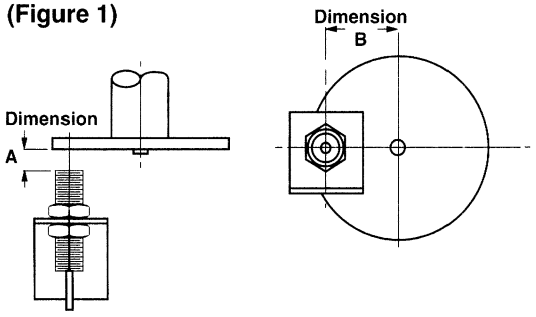
Pulser Wraps are custom manufactured to fit the shaft they will be mounted on. When the wrap is shipped, four Allen-head cap screws hold the two halves of the wrap together. These screws must be removed so that the wrap is in two halves. Place the halves around the shaft, reinsert the screws and torque them to 8 foot pounds.

Sensor Installation:

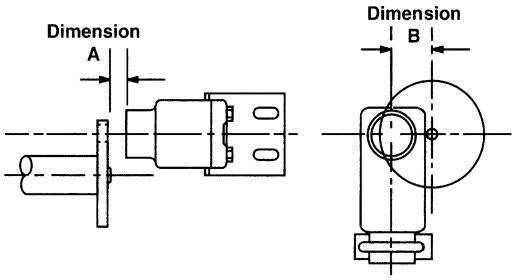
The standard sensor is supplied with a mounting bracket and two jam nuts. The explosionproof sensor is supplied with a slotted mounting bracket. Sensors should be installed so the center line of the magnets pass in front of the center of the sensor as the disc or wrap rotates. When using the pulser disc, the center of the magnetized area of the 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 inch to 1/4 inch. To achieve the proper gap distance, adjust the jam nuts holding the standard sensor in the mounting bracket, or adjust the position of the explosionproof sensor using the slots on its mounting bracket.

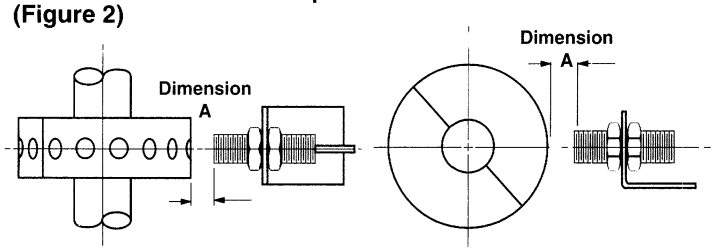
Standard Sensor and Disc (Figure 1)



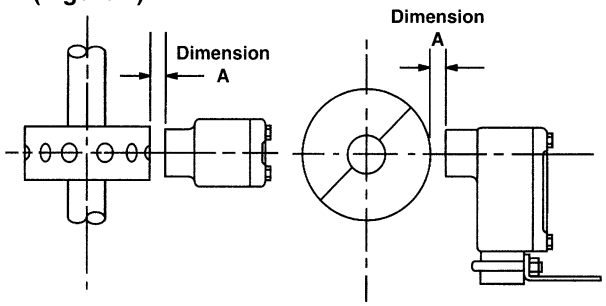
Explosionproof Sensor and Disc (Figure 3)



Standard Sensor and Wrap (Figure 2)



Explosionproof Sensor and Wrap (Figure 4)



Wiring Connections:

The sensor connections are made via terminal strip TB1. Refer to the table below for proper connections

Sensor Wire Connections:

Terminal	Description	Sensor Model 906 - 907	All Other Sensor Models
TB1-12	Supply	Red	Red
TB1-11	Signal	Black	Clear
TB1-9	Ground	Clear/Shield	Black/Shield

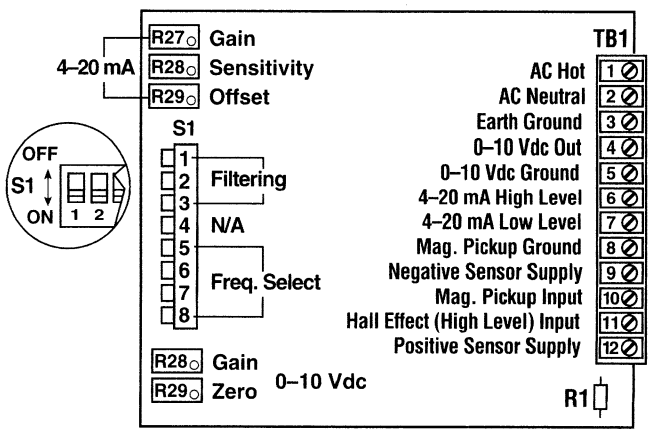
Input Power Connections:

115 Vac (standard)		230 Vac (optional)	
Hot	TB1-1	Hot	TB1-1
Neutral	TB1-2	Hot	TB1-2
Chassis Ground	TB1-3	Chassis Ground	TB1-3

24 Vdc and 12 Vdc (optional)	
Positive (+)	TB1-1
Negative (-)	TB1-2
Chassis Ground	TB1-3

Wiring Diagram

Figure 5



Note: When using a Magnetic Pickup the 2.2 K Ohm Pull-Up Resistor (R1) Must be Removed

Calibration:

Refer to figure 5 for all potentiometer positions and wiring connections.

A. Calculate the maximum frequency input from the sensing system using the following formula:

$$\text{Max. Frequency} = \frac{\text{Max. Shaft RPM x Sensor Pulses per Revolution*}}{60}$$

** With Standard Disc and Sensor, 8 Pulses per Rev. are Generated*

B. Set the range of the frequency into input switches S1–4 through S1–8. Refer to the table below for switch settings. Only the shaded portion of the chart applies when using a sensor such as a magnetic pickup. The entire chart is used when using a sensor with a 50/50 duty cycle such as an Electro-Sensors Hall Effect sensor and standard disc.

Frequency	S1–4	S1–5	S1–6	S1–7	S1–8
0–10 Hz	ON	OFF	OFF	OFF	OFF
0–100 Hz	OFF	ON	OFF	OFF	OFF
0–1000 Hz	OFF	OFF	ON	OFF	OFF
0–10,000 Hz	OFF	OFF	OFF	ON	OFF
0–20 Hz	ON	OFF	OFF	OFF	ON
0–200 Hz	OFF	ON	OFF	OFF	ON
0–2000 Hz	OFF	OFF	ON	OFF	ON
0–20,000 Hz	OFF	OFF	OFF	ON	ON

C. Set the Input Signal Filtering to the desired level using switches S1–1, S1–2, and S1–3. The filtering reduces the "ripple" effect, or instability of the analog output signal when the feedback from the monitored shaft is a low frequency. Increased filtering results in slower response times.

Example: if the maximum speed of the monitored shaft is 10 rpm and it is being monitored with a 60-pulse per revolution feedback device, the maximum frequency is 10 Hz, which is very low. To eliminate instabilities in the analog output signal at that slow speed, maximum filtering (16.9 µf) would be used.

Because the shaft is slow, and the frequency is low, maximum filtering stabilizes the signal output, but the response time increases. This may be acceptable in many cases, but if a quicker response at slow speeds is required, an alternate sensor system with higher frequency output can be used. Once the maximum feedback frequency is higher than 1000 Hz, the filtering can be turned completely off. Consult an Electro-Sensors Application Specialist for any special requirements.

S1-1	S1-2	S1-3	Filtering	
OFF	OFF	OFF	None	↑
OFF	OFF	ON	2.2 µf	*Faster*
OFF	ON	OFF	4.7 µf	*Response*
OFF	ON	ON	6.9 µf	
ON	OFF	OFF	10 µf	*More*
ON	OFF	ON	12.2 µf	*Filtering*
ON	ON	ON	16.9 µf	↓

Calibrating the 0–10 Vdc Output:

To calibrate the DSC-10CA accurately, a device with a visual readout of voltage must be used. Use a voltmeter set in the 0–10 Vdc range during calibration. Connect the voltmeter to the 0–10 Vdc output terminals (positive lead to TB1-4, and negative lead to TB1-5).

1. Complete Calibration steps A, B, and C.
2. With the monitored shaft stopped, turn the 0–10 Vdc Zero Adjustment (R31) potentiometer (CW to increase, CCW to decrease) until a reading of 0 Vdc is displayed on the meter.

Calibrating the 4–20mA Output:

To calibrate the 4–20 mA output, connect a milliammeter to the 4–20 mA outputs TB1-6 (high level) and TB1-7 (low level). Be sure to maintain proper polarity.

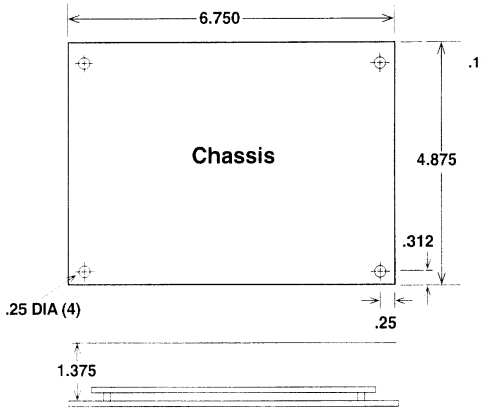
1. Complete steps A, B, and C, above.
2. Adjust the sensitivity (R28) potentiometer to its mid-range (11- turns from the end).
3. With the monitored shaft stopped, turn the 4–20 mA Offset (R29) potentiometer (CW to increase, CCW to decrease) until the milliammeter reads 4 mA.
4. With the monitored shaft running at maximum speed, turn the 4–20 mA Gain (R27) potentiometer (CW to increase, CCW to decrease) until the milliammeter reads 20 mA.

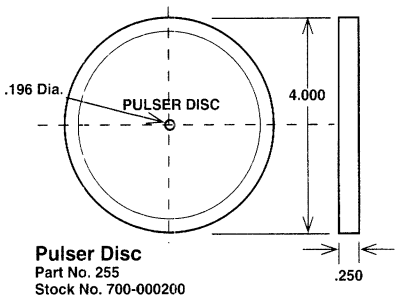
If the Gain Adjustment is too sensitive (i.e. it is hard to keep the potentiometer adjusted for a 20 mA reading), turn the Sensitivity (R28) Adjustment CCW to decrease sensitivity. If a 20 mA reading cannot be reached with the Gain (R27) potentiometer fully CW, turn the Sensitivity (R28) Adjustment CW until 20 mA is reached.

Troubleshooting Guide:

Problem:	Possible Solutions:
No 0–10 Vdc or 4–20 mA Output.	1. Is Power Present on TB1-1 and TB1-2? 2. Check Fuse "F1." 3. Check Sensor Supply "Approx. 13.6 Vdc" on TB1-9 and TB1-12. 4. Check Square Wave Frequency Input on TB1-9 and TB1-11 "Approx. 13.6 Vdc Square Wave." 5. If No Frequency is Present, Check Sensor Alignment and Gap.

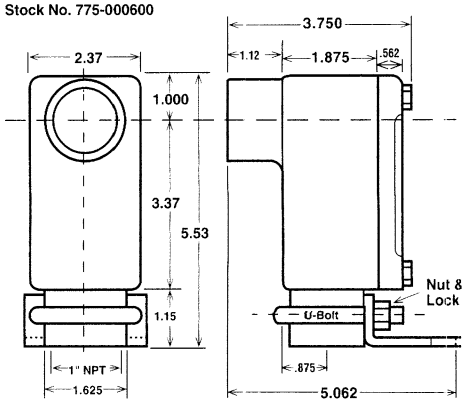
DSC-10CA Dimensional Drawings:
Dimensions in Inches





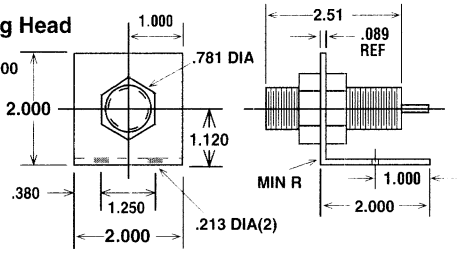
Pulser Disc
Part No. 255
Stock No. 700-000200

Explosionproof Sensor
Part No. 907
Stock No. 775-000600



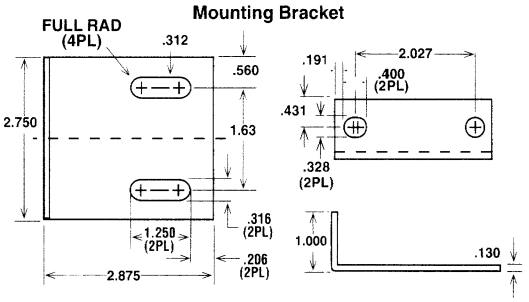
*Sensing Head Dimensions are ±.062

Digital Sensing Head
Part No. 906
Stock No. 775-000500



*Sensing Head Dimensions are ±.062

Mounting Bracket



DSC-10CA General Specifications:

Power:

Voltage	115 Vac ±10%, Standard, 12/24 Vdc, Optional 230 Vac ±10%, Optional
Frequency	50 – 60 Hz
Wattage	12 Va
Fuse	1/8 Amp slo-blo 115 Vac 1/16 Amp slo-blo 230 Vac

Input Signal:

Wave shape	Pulse, Sine, Square, Sawtooth, 50/50 Squarewave

Note: When using a Magnetic Pickup, the 2.2 k Ω Pull-Up Resistor (R1) Must be Removed.

Amplitude	High Level Input: 5 to 50 Vp-p max. positive going Low Level Input: 20 mV to 15 Vp-p maximum Zero Crossing
Frequency	4.8 Hz minimum, 20 kHz maximum
Transducer Supply	13.6 Vdc, 50 mA max. (+6.8 Vdc to -6.8 Vdc) Note: -6.8 Vdc is sensor reference ground.

Output Signal:

Type	0–10 Vdc and 4–20 mA
Accuracy	±0.5%
Load	500 Ω maximum
Response Time	Approx. 2-Sec. for 10% – 90% step
Minimum Full Scale RPM	40 at 8 pulses per rev.

Physical/Environmental:

Mounting	Chassis
Operating Temperature	0°C to +60°C*
Storage Temperature	-65°C to +125°C*
Electrical Connections	Removable Terminal Strip
Shipping Weight (System)	2 lb

Pulser Disc:

Material	Nylon® 12, Standard
Dimensions	4 inch Diameter X 1/4-inch Thick
Operating Temperature	-40°C to +60°C*
Maximum Speed Range	Consult Factory

Sensor:

Material (Sensor Body)	Aluminum
Material (Mounting Bracket)	Steel
Thread Size (Std. Sensor)	3/4-16 UNF
Output Type	Open Collector, Current Sinking, 20 mA Maximum
Signal Cable	3-Conductor Shielded, 10-feet Supplied
Maximum Cable Length	1500-Feet
Operating Temperature	-40°C to +60°C*
Air Gap	1/16 inch to 1/4 inch

Optional Explosionproof Sensor:

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

**Higher Temperature Ranges Available. Consult Factory*

Spare Parts List	Stock No.	Part No.
Pulser Disc (Nylon 12)	700-000200	255
Pulser Disc (Aluminum)	700-001500	255A
Standard Digital Sensing Head	775-000500	906
XP Digital Sensing Head	775-000600	907
DSC -10CA Circuit Board	878-000400	935
Pulser Wraps	Consult Factory	
Sensor Cable	610-000200	213-A
Male Conduit Adapter for Sensor	271-000100	259-M
NEMA 4 Enclosure	285-000100	
NEMA 12 Enclosure	287-000300	

Specifications Subject to Change Without Notice.

CALL TOLL FREE FOR MORE INFORMATION

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