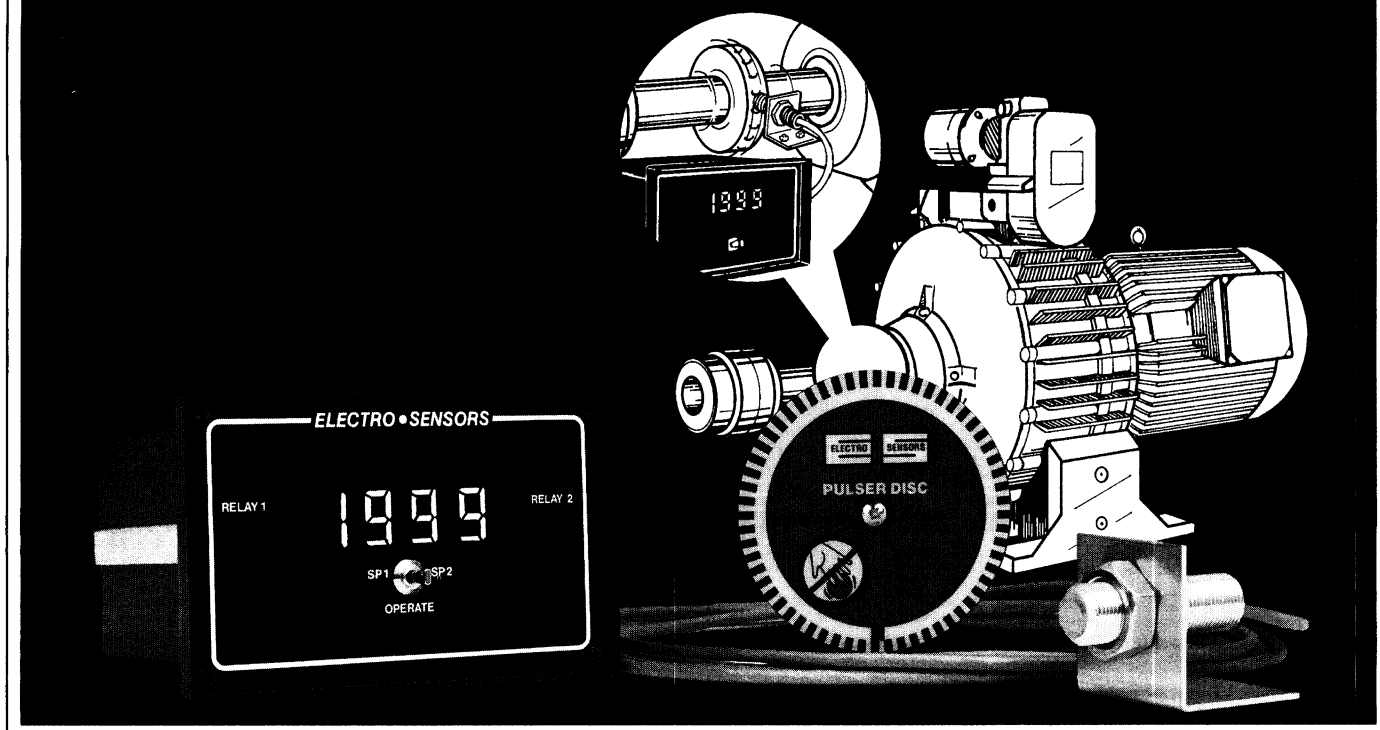


Digital Tach w/Set Points ©1994

ELECTRO

SENSORS

DTD Series



Features:

- Simple Installation and Calibration
- 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 features of this Ratemeter/Tachometer, combined with its selection of available options, make the DTD a complete ratemeter system that provides digital indication of speeds up to 2000RPM. The DTD employs a precision frequency-to-voltage converter followed by a tracking filter designed to

provide precise set point comparison at optimal response times. It has two speed ranges: 20-200RPM and 20-2000RPM, and an accuracy of $0.05\% \pm 1$ count.

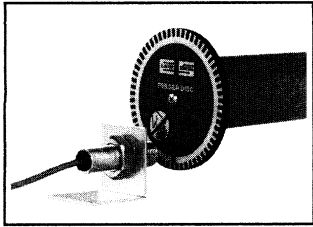
The highly readable 3-1/2 digit LED display with its .43" character height indicates actual production rates in desired engineering units. Readout and circuitry are housed in an easy-to-install panel-mount enclosure.

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.

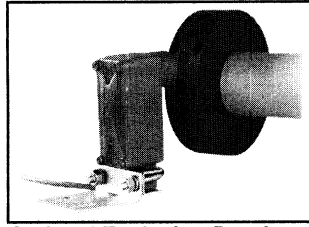
Optional features include: one or two set points, external set point adjustments, adjustable set point delays, and independent 4 - 20mA output for controlling or recording process variables.

Principle of Operation:

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 magnetic field is detected by the transducer and is transmitted to the unit in the form of a digital signal. There, the digital signal is conditioned to drive an A/D converter for the display, 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 four 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.

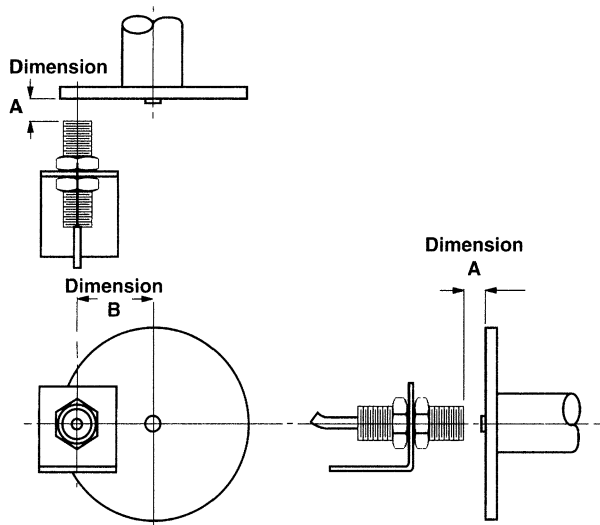
Transducer Installation

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.

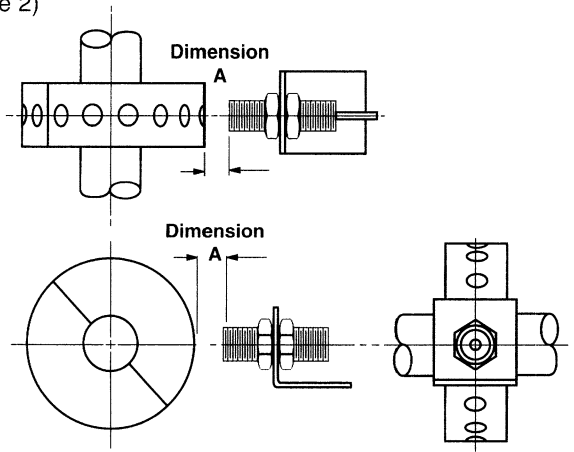
Transducer and Disc

(Figure 1)



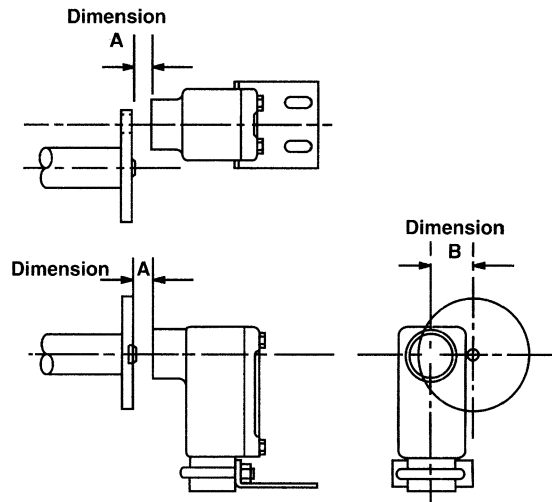
Transducer and Wrap

(Figure 2)



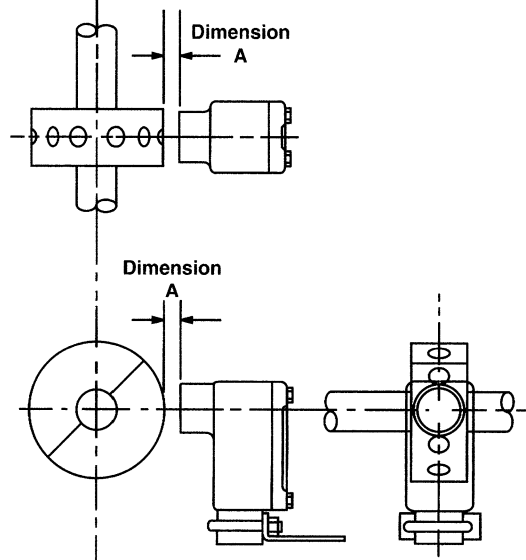
Explosion-Proof Transducer and Disc

(Figure 3)



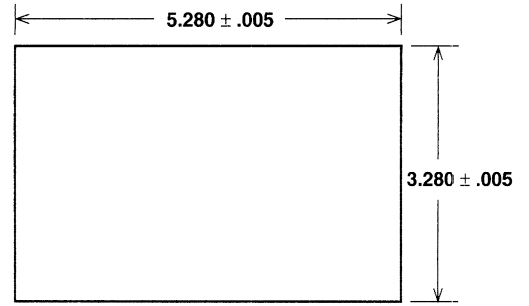
Explosion-Proof Transducer and Wrap

(Figure 4)



Enclosure Installation

Figure 5 illustrates the cutout necessary for installation of the DTD 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.

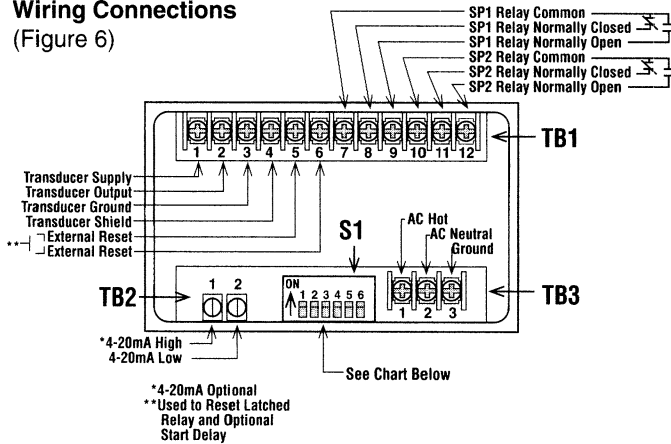
Transducer

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 930-931-932- 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 TB3. Refer to the tables below for the proper connections.

115Vac (Standard)		230Vac (Optional)	
Hot	TB3-1	Hot	TB3 - 1
Neutral	TB3-2	Hot	TB3 - 2
Earth Ground	TB3-3	Earth Ground	TB3 - 3
24Vac & 12Vac (optional)		24Vdc & 12Vdc (optional)	
High	TB3-1	Positive (+)	TB3-1
Low	TB3-2	Negative (-)	TB3-2
Chassis Ground	TB3-3	Chassis Ground	TB3-3

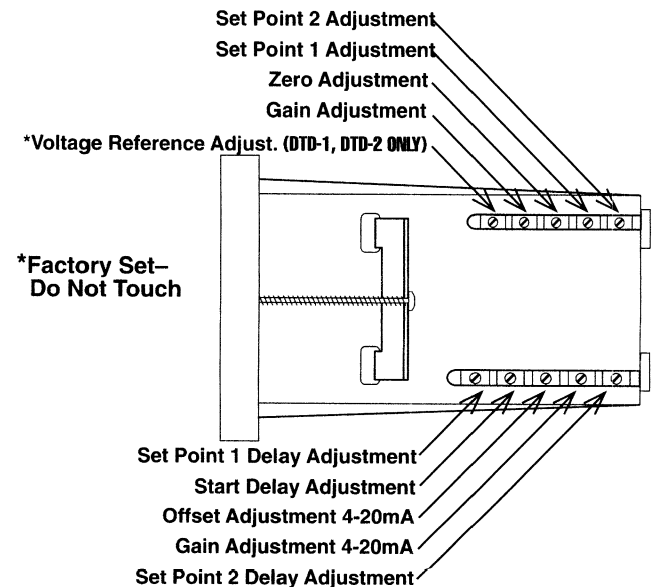
Refer to the **Options** section for all other wiring connections.

Calibration Adjustments
(Figure 7)

Programming Switch Functions (S1)

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

*Cannot have both S1-5 and S1-6 "ON" at the same time.



Electro-Sensors, Inc. Digital Tach w/Set Points DTD Series

Calibration:

Tachometer

Refer to Figure 7 for the location of all calibration adjustments. Due to the availability of two speed ranges (20-200RPM & 20-2000RPM), it is necessary to specify which speed range is required for the application. If the system is to be used for engineering units other than RPM, then the information pertaining to the conversion must be supplied with the order. Examples of the information required for a conversion might be: shaft size for RPM; gallons per revolution for GPM; or reduction ratio for RPM.

All units come precalibrated from the factory, but if it should become necessary to re-calibrate 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. Place the front panel selector switch in the OPERATE position.
2. 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.
3. 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 the known speed. Since there is some interaction between the 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 below 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 desired relay 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.

*Start Delay

Adjust Start Delay Adjustment clockwise for more delay time and counterclockwise for less delay time, until the desired time delay is achieved.

***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 "OFF", 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 on 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 function 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 TB2. Refer to the table below for proper connections.

4-20mA Connection Table

Terminal #	Description
TB2-1	4-20mA +
TB2-2	4-20mA - (Ground)

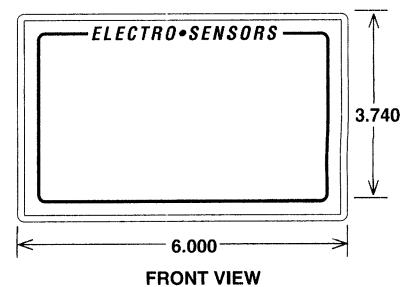
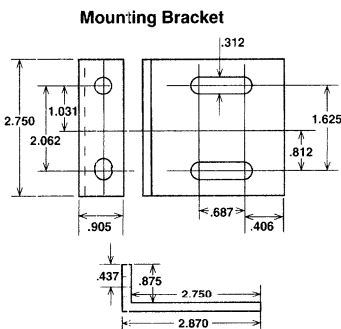
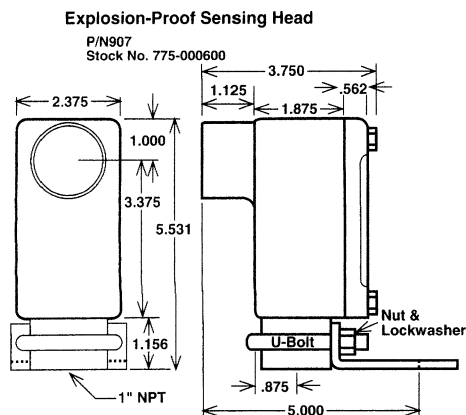
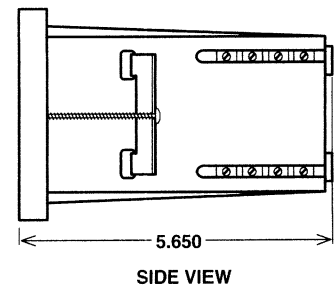
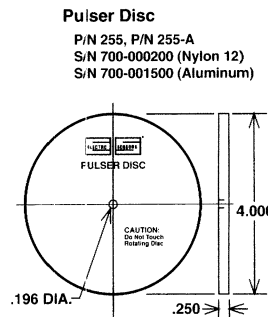
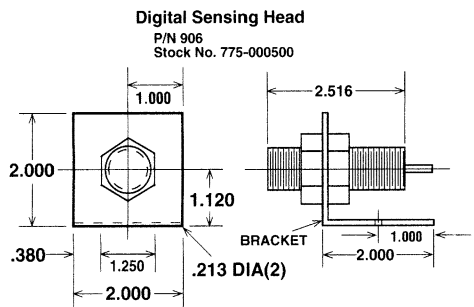
Calibration

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.

DTD Dimensional Drawings

Dimensions in Inches:



Electro-Sensors, Inc. Digital Tach w/Set Points, DTD Series

DTD General Specifications:

Power:

Voltage 115 ±10% Standard;
230Vac, 24Vac, 12Vac,
24Vdc, 12Vdc, Optional
Frequency 50 - 60Hz
Wattage 6VA
Fuse 1/8A Slo-Blo 115Vac
1/16A Slo-Blo 230Vac

Input Signal:

Type Open Collector/Logic
Amplitude 12V Nom., 7V Min., 60V Max.
Impedance 2200 Ohms to 12V
Pulse Width 15msec. Min.
Frequency 40 KHz Max.
Transducer Supply 12Vdc, 50mA Max.

Display:

Type43" LED
Resolution 3-1/2 Digit
Ranges 0-199.9, or 0-1999
Accuracy ±0.05% ±1 Count
Calibration Adjustments 15-Turn Potentiometer
Decimal Point Switch Selectable

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 0.2% of Setting
Response Time 0-200RPM 1.5 Sec. Nominal
0-2000RPM 0.5 Sec. Nominal

Relay Output:

Contact Configuration 1 Form C (SPDT) Per Relay
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 -40° to 85°C

Pulser Disc:

Material Nylon 12; Aluminum and PVC
Optional
Dimensions 4" Dia. x 1/4" Thick
Operating Temperature -40° to 60°C*
Maximum Speed Range Consult Factory

Pulser Wrap:

Material PVC; Aluminum Optional
Dimensions O.D. (Shaft O.D. +3.00") x 1.5" Width
Operating Temperatures -40° to 60°C*
Maximum Speed Consult Factory

Transducer:

Material (Transducer Body) .. Aluminum
Material (Mounting Bracket) .. Steel
Thread Size (Std. Transducer) 3/4-16UNF
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 1/4"

Optional Explosion-Proof Transducer:

Signal Cable 3-Conductor Shielded, 10' Supplied
Maximum Cable Length 1500'
Housing and Cover Cast Aluminum, C.S.A. Approved
U.L. Rated: Class I Group D; Class
II Group E, F, G; Class III.

DTD Series Spare Parts List:

**Pulser Disc (Nylon 12) S/N 700-000200
Pulser Disc (Aluminum) S/N 700-001500
Pulser Disc (PVC) S/N 700-000204
Standard Digital Sensing Head S/N 775-000500
Explosion-Proof Digital
Sensing Head S/N 775-000600
Pulser Wraps Consult Factory
Fuse 1/8 Amp 470-002000
Fuse 1/16 Amp 470-002400

* Higher temperature ranges available. Consult factory.
** If disc must be bored specify aluminum (255A).

Specifications Subject to Change Without Notice.

Conditional Limited Warranty

Electro-Sensors, Inc. warrants to the purchaser for one year from the date of purchase, any defect which upon our examination proves to have been caused by faulty material or workmanship. This warranty does not cover abuse, normal wear or careless handling, and it is void if the product has been repaired or serviced by personnel not authorized by Electro-Sensors, Inc. No other warranty, however expressed or implied, on our products is authorized by us.

Electro-Sensors, Inc. disclaims any liability due to misapplication of any of its manufactured products. Installation of Electro-Sensors, Inc. products is the sole responsibility of the purchaser and is in no way guaranteed by Electro-Sensors, Inc.

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