DC Fastar Transducer
&
Signal Processor
User Instructions

Contents:

Warranty

All Sentech, Inc. products are warranted against defective materials and workmanship. This warranty applies for a period of one year from date of delivery to the original purchaser. Any product that is found within the one year period not to meet these standards will be replaced or repaired at the discretion of Sentech, Inc.. No other warranty is expressed or implied. Although Sentech, Inc. manufactures its products to exacting specification standards, we assume no responsibility for their misuse or unauthorized modification. Sentech, Inc. accepts no liability for damages, incidental or punitive, in applications using our products.

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DC Fastar, Figure 1, is a fast response transducer which measures linear displacement and absolute position. A DC Fastar system is comprised of the transducer mounted to the User's machine or mechanical system and a signal processor which is normally mounted near the transducer. These instructions cover DC Fastar transducer and signal processor installation and operation.

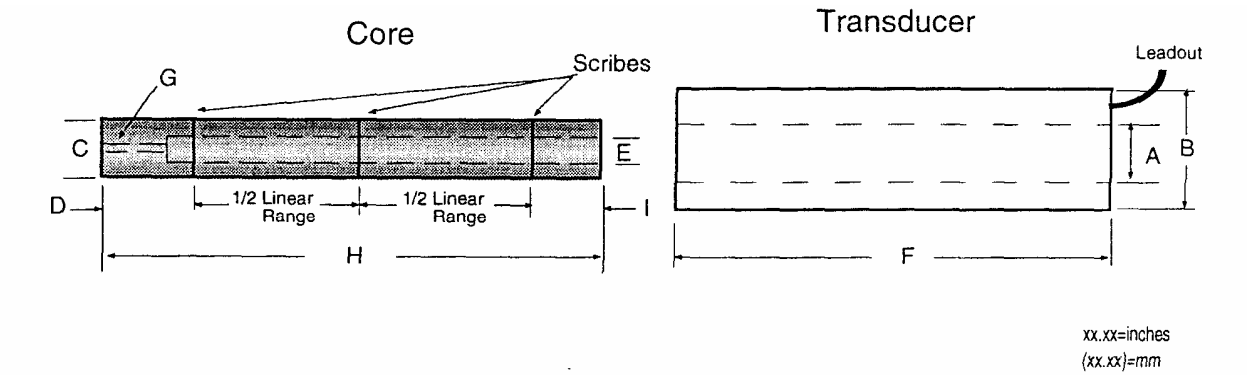

Figure 1. Orientation of core and coil

A	B	C	E	F	G
.385 ±.005 (9.78) ±(0.13)	.746 ±.002 (18.98) ±(0.05)	.372 ±.002 (9.45) ±(0.05)	.277 ±.005 (7.04) ±(0.13)	See table below	Either 6-32 UNC-2B or M4x0.7-6H select at order

Table A.

DC Fastar is intended for system integrators and Original Equipment Manufacturers (OEM's) that need a complete, ready-to-use transducer and processor system. DC Fastar has a unique temperature compensation circuit (patent pending) that reduces errors caused by ambient temperature changes at the transducer.

DC Fastar can be powered by any unregulated DC power supply with output from +10 to +36 Vdc.

The DC Fastar transducer is a precision variable inductor. Inductance decreases linearly with insertion of an aluminum core. DC Fastar's output is a DC voltage or current proportional to the change in inductance caused by core movement. DC Fastar can accurately sense dynamic motion up to 10 kHz, much higher than other non-contact displacement transducers.

Nine DC Fastar, ranges are presently available as standard. The models and their corresponding linear ranges are listed in Table B. Model numbers are marked on the transducer.

	MODELS								
	DCFS3/4	**DCFS2**	**DCFS4**	**DCFS6**	**DCFS8**	**DCFS10**	**DCFS12**	**DCFS18**	**DCFS24**
Nominal Linear Range	.76 (19)	2.0 (51)	4.0 (101)	6.0 (152)	8.0 (203)	10.0 (254)	12.0 (305)	18.0 (457)	24.0 (609)
D	.72 (18.3)	.89 (22.6)	.88 (22.4)	.88 (22.4)	.88 (22.4)	.88 (22.4)	.88 (22.4)	.88 (22.4)	.88 (22.4)
F **Tol: ±.500 ±(0.13)**	1.752 (44.50)	3.327 (84.51)	5.295 (134.5)	7.295 (185.29)	9.295 (236.09)	11.295 (286.89)	13.295 (337.69)	19.295 (490.09)	25.295 (642.49)
H	1.812 (46.02)	3.387 (86.03)	5.355 (136.02)	7.355 (186.82)	9.355 (237.62)	11.355 (288.42)	13.355 (339.22)	19.355 (491.62)	25.355 (644.02)
I	.33 (8.4)	.50 (12.7)	.48 (12.2)	.48 (12.2)	.48 (12.2)	.48 (12.2)	.48 (12.2)	.48 (12.2)	.48 (12.2)

xxx.xx = inches
(xx.x) = mm

Table B.

Transducer Installation

Insert the open end of the core into the transducer body as shown in Figure 1. When the center scribe is flush with the end of the transducer opposite the leadout, the core is at the center of the linear measurement range. The end scribes mark the limits of the linear range.

The transducer can be mounted in various ways, but the most common method is by clamping the transducer with a split collar or shaft hanger. The installer should mount the transducer in a location that does not interfere with the normal operation or maintenance of the machine. The mounting surfaces should be machined flat, otherwise surface irregularities will lead to axial misalignment between the core and the transducer. Sentech, Inc. carries a rod end, item #2217901, that fits the #6-32 core. The rod end eases alignment difficulties between the transducer and the moving member by providing a swivel action at the end of the linear travel to compensate for slight misalignment.

> Note
> Although some rubbing of the core in the transducer is tolerable, DC Fastar cannot tolerate side loading. The bobbin is **not** intended to be used as a bearing. Premature failure will result.

CAUTION

Do not use the end of a screw to clamp the transducer. Point loading from a screw or excessive force may deform the mild steel shell. This can affect linearity.

The mounting clamps shown in Figures 2 and 3 are clamps that can be purchased from Sentech, Inc.. While these clamps may not work in every application, they will work in many.

The single bolt clamp (Figure 2) is made of polyamide plastic and fastened with a 1/4-20 (6mm) screw to the user's machine. This clamp is fastened at one point. Because this clamp is fastened at only one point, the clamp may pivot about the mounting bolt which could cause core misalignment in some applications. It is recommended that the user mount the transducer with two of these clamps to eliminate any pivoting or misalignment. This small clamp is useful in situations where there is little clearance.

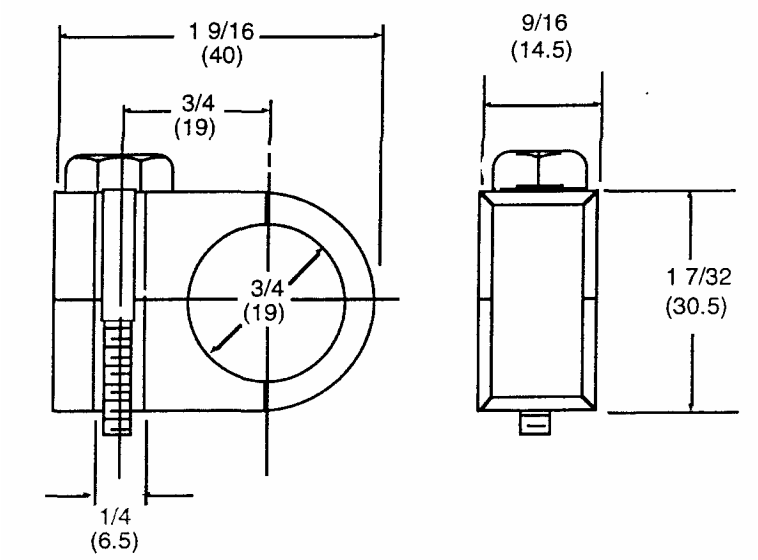

Figure 2. Single bolt mounting clamp (Item #2213901)

The double bolt clamp is shown in Figure 3. The bottom plate is steel and can be welded or bolted to a machine. The installer may also use epoxy to mount the bottom plate of this clamp to the mounting surface. The double bolt clamp provides more stability than the single bolt clamp because it can be fastened at two points rather than one.

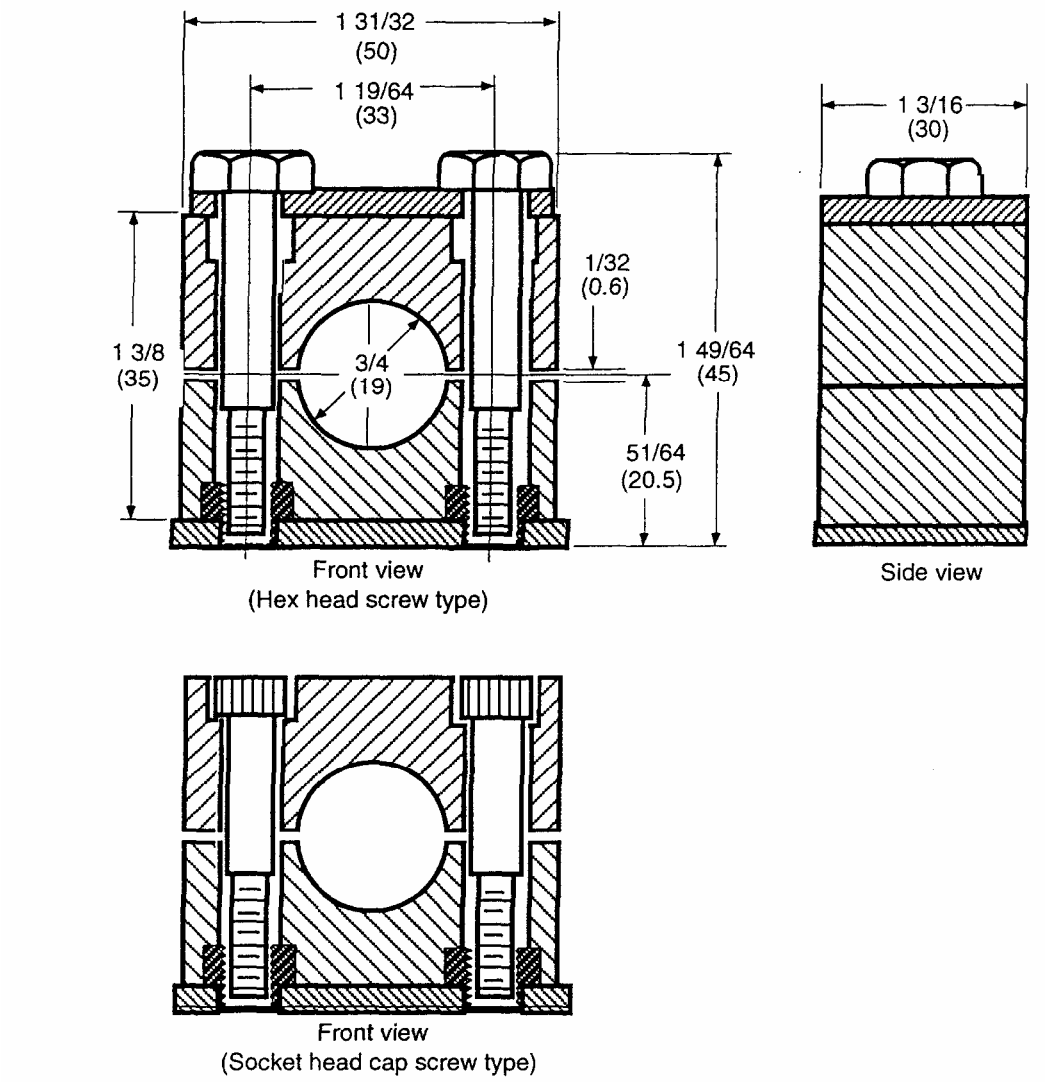

Figure 3. Double bolt mounting clamp (Top- Item # 2213902, Bottom- Item #2213903)

The installer should clamp with enough force to hold the transducer firmly. Longitudinal alignment of the transducer body, the core and the moving member is very important. Shim stock can be used when mounting the core and transducer to ensure proper alignment. Fasten the core to the moving member with a 6-32 or M-4 screw or stud. Thread must be specified at order.

Before proceeding with zero and span adjustments, Fastar's case should be electrically connected to earth ground. When using multiple transducers on the same machine it is important that all of the transducer cases are well connected to a common earth ground.

Processor Wiring

1. Separate twisted pairs should be used for the power and output connections. An overall shield may be used where the two pairs share the same route. Where the power and output routes separate, the shield should at least enclose the output pair. In any case, the power and output return leads should be joined at pin 3 only (-supply/4-20 return). The shield(s) should be connected to pin 3 as well. Pin 1, case ground, has no connection to the processor circuit, but has been made available as a means of grounding the case to either the local or instrument ground whichever works best. The transducer case is also insulated from its internal wiring, and is grounded by its mounting. This allows the internal circuitry to float and avoids ground loops which can introduce unnecessary noise and interference.

2. With the power off, connect the transducer to the signal processor (See Figure 16 for connections). Please note that the transducer shield is at +5 V and should not be grounded.

3. Connect the DC supply (+supply output to pin 4 and -supply output to pin 3).

4. Shielded cable is recommended for the signal-output connection. This can be the same shield as for the power connection, but the signal-return lead must be separate and part of a twisted pair. Connect a DVM or Oscilloscope to the signal-output line (pin 2) and the signal-return and shield to pin 3. If 50-60 Hz pickup is observed, it may necessary to connect the case of the DVM or Oscilloscope to the signal-return lead as well. Often the DC power output or the Oscilloscope is ungrounded and may introduce line-frequency components into the instrumentation.

5. When two or more transducers are close to each other, there can be a beat-frequency effect where outputs fluctuate (30 mV peak-to-peak typ.) at a low rate of a few Hz, because of a different crystal oscillator in each unit. If the transducers are housed in a metal container, this effect will occur when the cases are connected but ungrounded. However grounding the containers to the local power ground will eliminate this effect. When operation of multiple transducers in close proximity is required, such as in oven testing, there is an internal point which can be used, with the processor covers are removed, to couple and synchronize the oscillators together with point-to-point wiring.

Processor Output

The DC processor has either of two output options selected on order: 0 to + 10V or 4 to 20 mA.

The transducer output is unidirectional, i.e., the zero position is always with the core fully inserted to the inner scribe mark as shown in Figure 5. The full-scale position is with the core extracted to the outer or end-scribe mark. Motion beyond these limits will exceed linearity specification. The center scribe mark indicates the center of the linear range.

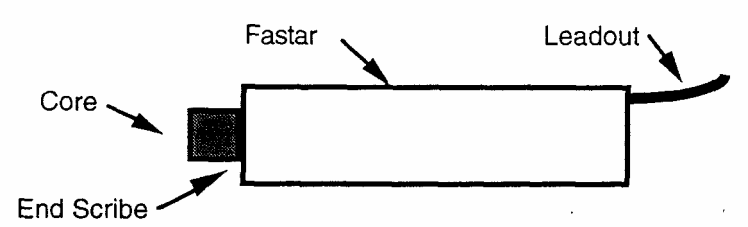

Figure 5. Zero In

Zero and Span Adjustments

1. Connect the transducer as described in the **Processor Wiring** section above and turn on the DC supply. Allow the processor to warm up for two minutes or more. For the voltage-output option, the supply voltage must exceed the full-scale output by 20 mV if not loaded, 160 mV if loaded with 2 mA or 1.5V if loaded with 15 mA. For the 4-20 mA, current-output option, sufficient supply voltage must be used for the output voltage expected across the sampling resistor. Otherwise the output will be limited by the supply voltage and appear to be low and sensitive to the zero-adjustment setting. However supply voltages above 20 V (36 V max.) will noticeably increase warm-up time and should be avoided if that is of concern.

2. Position the mechanical system so that the transducer core is fully-inserted to the inner-scribe mark. It is recommended that the core position be monitored with an indicator such as a caliper or dial indicator or checked with gauge blocks or mechanical stops for greatest accuracy.

3. Adjust the Zero potentiometer for a slight offset of about +60mV for the voltage output, or 4.1 mA for the current output to allow for temperature drift. The output will not respond below +10 mV for the voltage output.

4. Move the core to the full-scale position with the core extracted to the outer or end-scribe mark.

5. Adjust the Span potentiometer to full-scale output, +10V for the 0-10 V output option (plus the initial offset if so desired), or 20 mA for the 4-20 mA output option.

6. Move the core back to the zero position to see if the intended zero offset has changed. Readjust the Zero potentiometer if necessary. A change in the zero offset will be reflected in the full-scale output unless limited by insufficient supply voltage, so move the core to the outer or end position and check the full-scale reading and reset the Span setting if necessary.

7. Operate the transducer at normal operating ambient for a minimum of thirty minutes and reset Zero and Span potentiometers as needed.

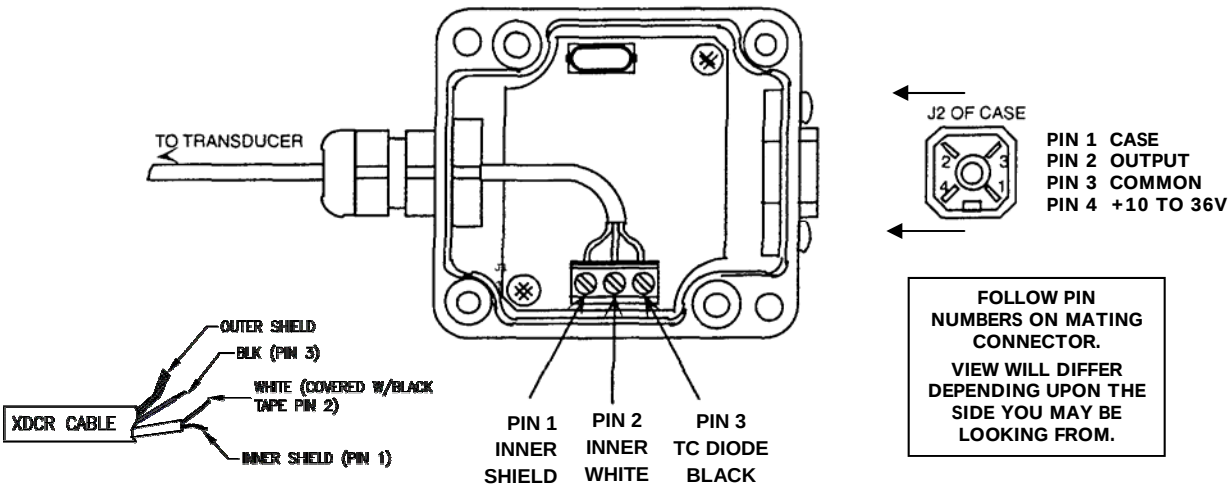

Figure 6. Signal Processor

Removing or Extending the Transducer Cable & Cable Installation

The cable connecting the transducer to the signal processor is part of the sensing circuit. Modifying the cable length between the transducer and the signal processor is not recommended. Each signal processor is built for a specific stroke and cable length at the factory. Increasing or decreasing the length of cable between the transducer and the signal conditioner will reduce the linearity by approximately 0.01% for each foot added or removed.

Significant vibration or flexure of this cable may cause a shift in the transducer output signal. The cable should be held in place with tie wraps or other standard cable securing devices so that it does not flex or vibrate excessively during operation. It is recommended that cable be secured every three inches in high vibration installations.

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SPECIFICATIONS

PHYSICAL

Signal Processor Construction	NEMA 4 aluminum case
Transducer Construction	300 Series Stainless Steel
Transducer Shell Material	Nickel Plated Steel
Transducer Core Material	Hard Anodized Aluminum

ELECTRICAL

Output(Choice of one)	4-20 mA or 0-10 Vdc
Frequency Response	DC to 10,000 Hz(-3db)
Connections	Shielded pair for power Shielded pair for output Case Ground
Excitation	10 to 36 Vdc @ 30 to 50 mA (current increases directly with current loop output)
Response time	35 µS
Leadout	10 ft (3m)
Insulation Resistance	1000 MΩ

PERFORMANCE

Signal Processor Temp. Coefficients	
F.S.O.	60 ppm/˚F typical
Null	50 ppm/˚F typical
Transducer Temp. Coefficients	
F.S.O.	20 ppm/˚F typical
Null	70 ppm/˚F typical
Warm-up	2 minutes for excitation < 20 Vdc
Adjustments	Zero and full scale output trim
Transducer Non-linearity	0.1%
Resolution	0.001 % F.S.
Transducer Compensated Temp. Range	-5˚ to 80˚C (25˚ to 175˚F)
Transducer Operating Temp. Range	-51˚ to 105˚C (-60 to 221˚F)
Signal Processor Operating Temp. Range	-34˚ to 60˚C (-30˚ to 140˚F)
Transducer Shock	100 g's Peak (6 millisecond) half sine
Transducer Vibration	Meets Mil-STD 810C, Figure 514-5, Curve AK Time Schedule II Random Vibration test (Overall grms=20.7)