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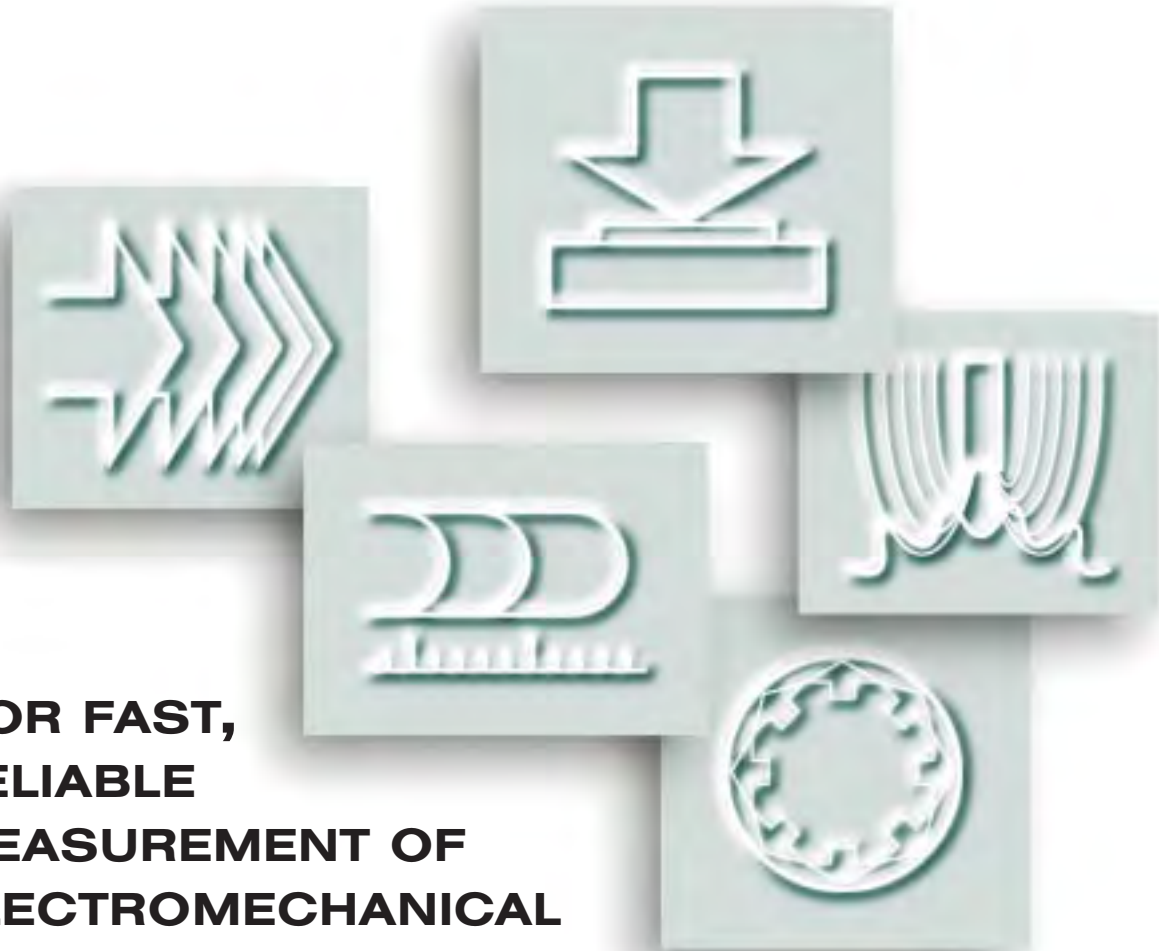
*For fast, reliable measurement of  
electromechanical phenomena*

# Transducers



 DAYTRONIC

# TRANSDUCERS



**FOR FAST,  
RELIABLE  
MEASUREMENT OF  
ELECTROMECHANICAL  
PHENOMENA**

LVDT'S

LOAD CELLS

PRESSURE  
TRANSDUCERSOTHER  
TRANSDUCERS

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## **Daytronic Corporation**

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## ABOUT THE COMPANY...

Since its founding in 1954, Daytronic Corporation has been in the business of solving unique, challenging measurement and control problems. A recognized leader in sensor-based signal conditioning, Daytronic is uniquely positioned to serve the needs of today's fast-changing digital world using the proven capabilities of analog measurement technology. Combining advanced modular hardware design with sophisticated software tools, Daytronic instruments and systems have found their way into virtually every kind of industrial data-acquisition application, and into many areas of scientific and academic research as well.

Daytronic offers a comprehensive hardware family—from transducers and single-channel benchtop or machine-dedicated conditioner/indicators to high-speed PC/PLC front ends and factory-wide distributed networks. Typical applications include production-line automatic testing, remote safety monitoring, prototype evaluation, real-time process control via closed-loop servo systems, and statistical analysis of both real-time and historical data. Daytronic products are extensively used not only in automobile and turbine engine testing, but in durability, structural, and environmental tests of all kinds.

Daytronic is located in Dayton, Ohio. In addition to its in-house staff of sales application engineers, it has an international network of independent sales representatives in over 20 countries. Several offices are designated as Authorized Service Facilities. Daytronic is a wholly owned subsidiary of GPT, a technology holding company based in Edison, NJ. GPT is also the parent company of Dranetz, a leading supplier of advanced electric power instrumentation, and Electrotek Concepts, a power quality consulting and engineering group.

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# TRANSDUCERS FOR LINEAR DISPLACEMENT

*For precise electrical measurement of linear motion, size, strain, position, distortion, expansion, and similar mechanical phenomena*

Daytronic **Linear Displacement Transducers** are rugged, sensitive measuring devices that produce an electrical output signal precisely proportional to the mechanical displacement of a sensing probe.

These robust, *full ratiometric* instruments yield exceptional dimensional stability. With applications in gaging, automatic inspection, process control, and countless specific research operations, the models described on the following pages yield repeatable measurements from less than a micron to over three feet.

Models include

- **GENERAL-PURPOSE LVDT's** with various electrical and mechanical configurations, for use in a broad range of industrial and research applications\*
- Exceptionally reliable **PRECISION LVDT's** with high-quality linear bearings, for the most sensitive gaging and quality control operations

- Rugged **SUBMERSIBLE LVDT's**, hermetically sealed for use in hostile industrial and research environments (corrosive fluids and gases, high temperature and vibration, etc.)

Based on the [linear variable differential transformer \(LVDT\)](#) principle, the performance of these sensors depends on inductance effects that do not involve flexing wires or sliding electrical contacts. All coils are magnetically shielded, and are cased in hardened stainless-steel housings.

As a result, these transducers are virtually "noise-free," displaying extreme resistance to the effects of vibration, rotation, and electrical interference, as well as to adverse environmental factors like humidity, ambient temperature variation, and corrosive atmospheric conditions. Calibration remains stable for years of operation—even in the most unfavorable industrial surroundings.

Daytronic offers

- [AC-operated LVDT's](#)
- [DC-operated LVDT's](#)

For both AC- and DC-operated transducers, there are

- **Short-stroke LVDT's**  
These LVDT's have full-scale linear ranges from  $\pm 0.01$  inch ( $\pm 0.25$  mm) to  $\pm 0.5$  inch ( $\pm 12.7$  mm). A number of [high-precision short-stroke models](#) are available.
- **Long-stroke LVDT's**  
These LVDT's have full-scale linear ranges from  $\pm 0.5$  inch ( $\pm 12.7$  mm) to  $\pm 18.5$  inches ( $\pm 470$  mm). [Long-stroke DC-to-DC models](#) offer both  $\pm 2$ -V and  $\pm 5$ -V output.

Three different [armature types](#) are available, to meet varying application requirements:

- **Spring-extended armature**
- **Unguided armature**
- **Captive armature**

See [LVDT Model-Numbering System](#) and [General LVDT Categories](#).

\* Many units have a threaded shank and locking nut for secure positioning in a simple mounting fixture.



# How They Work

Differential transformers (also known as *linear variable differential transformers*, or LVDT's) are inductive sensing devices that produce an AC output voltage proportional to the mechanical displacement of a small iron core. They are simple and rugged, have completely stepless resolution, and can resolve fractions of a microinch, if required.

One primary and two secondary coils are symmetrically arranged to form a hollow cylinder, as shown in the cross-section of a typical LVDT with spring-extended armature (Fig. LT.1). A magnetic nickel-iron core, supported by a nonmagnetic push rod, moves axially within the cylinder in response to mechanical displacement of the probe tip.

With excitation of the primary coil, induced voltages will appear in the secondary coils. Because of the symmetry of magnetic coupling to the primary, these secondary induced voltages are *equal* when the core is in the central ("null" or "electric zero") position. When the secondary coils are connected in series opposition, as shown in Fig. LD.1, the secondary voltages will cancel and (ideally) there will be no net output voltage.

If, however, the core is *displaced* from "null" position, in either direction, one secondary voltage will increase, while the other decreases. Since the two voltages no longer cancel, a net output voltage will now result. If the transducer has been properly designed, this output will be exactly proportional to the *magnitude* of the displacement, with a phase polarity (as referenced to the primary excitation voltage) corresponding to the *direction* of displacement (see the graph in Fig. LT.1).

The actual (as opposed to the "ideal") AC output voltage of an LVDT would be represented by the solid line in the graph. Notice that there is no ability to distinguish

between displacements on either side of null, and that the voltage does not go to zero at null, but retains some finite minimum value.

This "residual null" voltage, which is always present to some degree, is composed partly of extraneous electrical pickup and partly of quadrature voltage components arising from capacitive and other effects.

To achieve useful readout of LVDT-generated measurement data, a signal conditioner must be used that can eliminate the effects of residual null voltages, and also discriminate between positive and negative inputs, thereby producing an output conforming to the "ideal" characteristic represented by the dashed line in the graph.

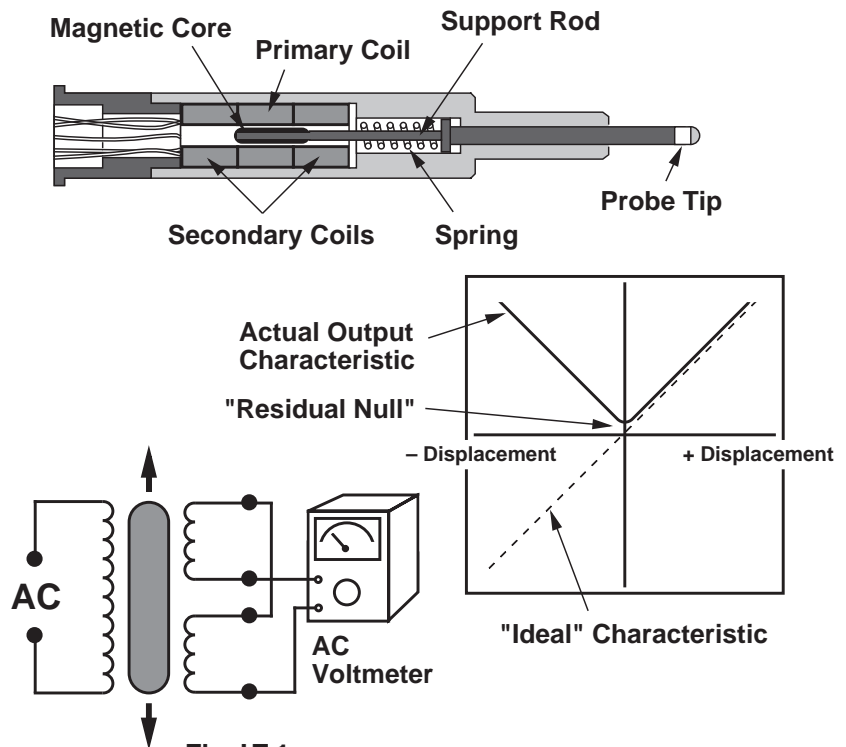
In the case of AC-excited LVDT's, a conditioner of *phase-sensitive carrier amplifier* design provides optimum sensitivity and accuracy. Responding only to the modulated carrier frequency, such an instrument is insensitive to extraneous DC and AC "noise" voltages at other frequencies.

**AC vs. DC Excitation**

The major advantages of **DC-to-DC LVDT's** are ease of installation and signal conditioning, the ability to operate from dry cell batteries in remote locations, and lower system cost (especially in multipoint applications).

### AC vs. DC Excitation

**AC-operated LVDT's** are generally smaller in body size and more accurate than DC versions. They will also normally operate at higher temperatures.



**Fig. LT.1**  
**Typical AC-Excited, Spring-Extended Linear Displacement Transducer**

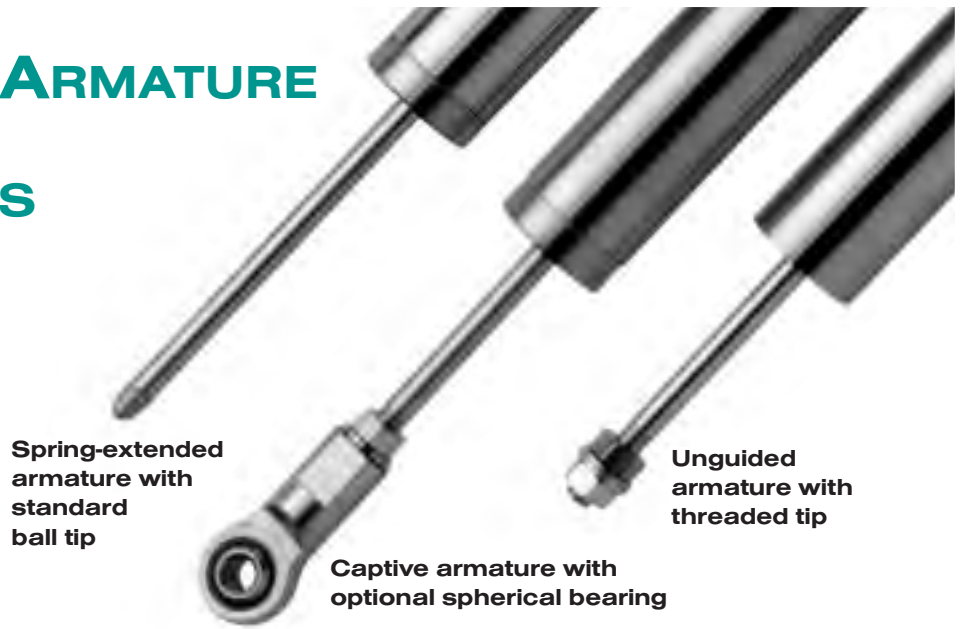
# A CHOICE OF ARMATURE TO SUIT YOUR REQUIREMENTS

## Unguided Armature

This is the simplest mechanical configuration, where the armature fits loosely in the bore of the LVDT, being attached to the moving point by a male thread. It can be completely separated from the transducer body without demounting either part.

Proper installation of this type of LVDT requires that the armature and LVDT body be separately supported so as to ensure relative movement along a common axis. When properly aligned, this non-contact arrangement allows essentially frictionless movement with zero wear, and ensures continued repeatability with infinite resolution.\* With no internal springs or bearings, the unit has virtually unlimited fatigue life.

A free unguided armature is most suitable for short-range, high-speed applications (such as mechanical vibration measurements) or applications with a very high number of cycles. It is also recommended for applications in which the target being measured moves parallel to the transducer body.



**Spring-extended armature with standard ball tip**

**Unguided armature with threaded tip**

**Captive armature with optional spherical bearing**

## Captive Armature

This configuration can be used for both static and dynamic applications, including applications where the target being measured moves in a direction transverse to the transducer body. Here, the armature is both restrained and guided by a low-friction bearing assembly. This allows all units to be mounted vertically between optional self-aligning bearings, if desired. Units measuring ranges of  $\pm 3$  inches ( $\pm 76$  mm) or less can also be mounted horizontally. Units with a range greater than  $\pm 3$  inches, however, may require additional support along the transducer body, to prevent flexing.\*

Captive-armature LVDT's are suitable for applications with a longer working range, where the transducer is to be mounted by its ends only, or where misalignment might occur if the armature were unguided.

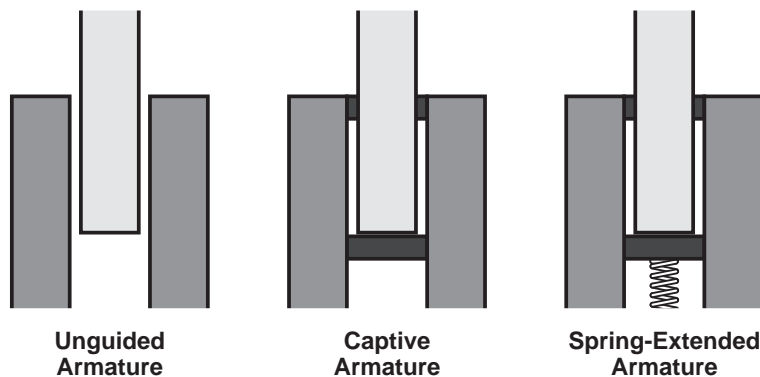
## Spring-Extended Armature

In this configuration, the armature is both restrained and guided by a low-friction bearing assembly (as with the "captive" armature). In addition, it has an internal spring to continuously push the armature to its fullest possible extension, thereby maintaining light yet reliable contact with the measured object. This feature is appropriate where the contact surface moves periodically beyond the range of the transducer (as, for example, when multiple separate parts are being gaged on a production line).

Spring-loaded LVDT's only require a fixing point for the transducer body, and are most suited to static or relatively slow-moving applications. The probe end of the armature is normally tipped with a ball, although optional flat or roller ends are also available (see the [Model 106 Contact Tip](#)).

\* With all LVDT types, *side loads* must be kept to a minimum, since they will cause rubbing between the armature and the LVDT body, thus reducing the unit's life and accuracy. In extreme cases, they may cause the armature to bend.

**Fig. LT.2**  
**LVDT Armature Configurations**



**Unguided Armature**

**Captive Armature**

**Spring-Extended Armature**

# LVDT MODEL-NUMBERING SYSTEM

Daytronic's LVDT products are mainly classified by

- **Excitation type (AC or DC)**
- **Stroke length (Short or Long)**
- **Armature type (Unguided, Captive, or Spring-Extended)**
- **Operating measurement range (full stroke length expressed as  $\pm$  in/mm)**

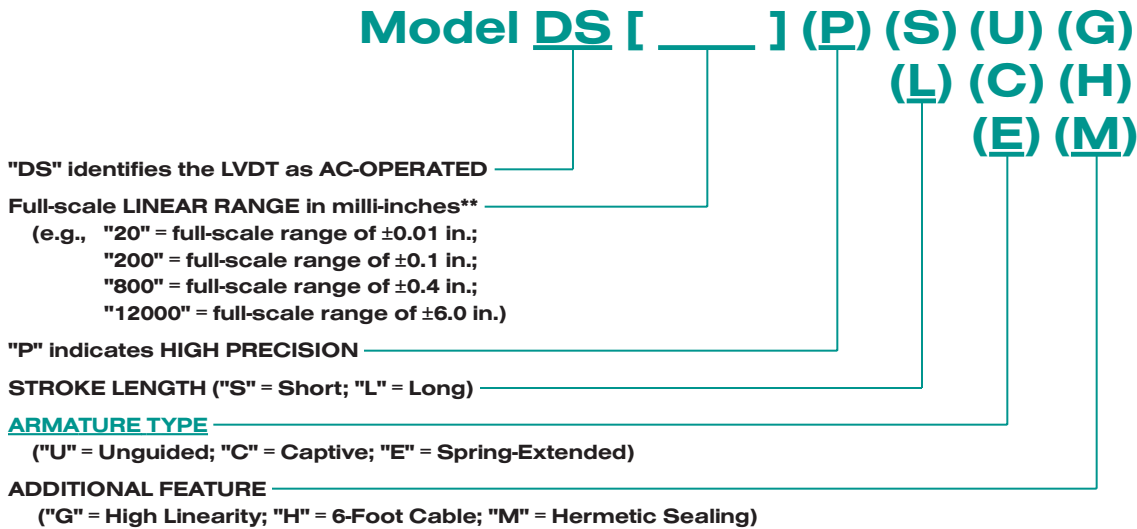
- **Additional feature(s), including high precision and/or linearity, cable length, hermetic sealing, DC voltage output level, etc.)**

The tables below show how these characteristics are employed in each LVDT's model-number designation.\*

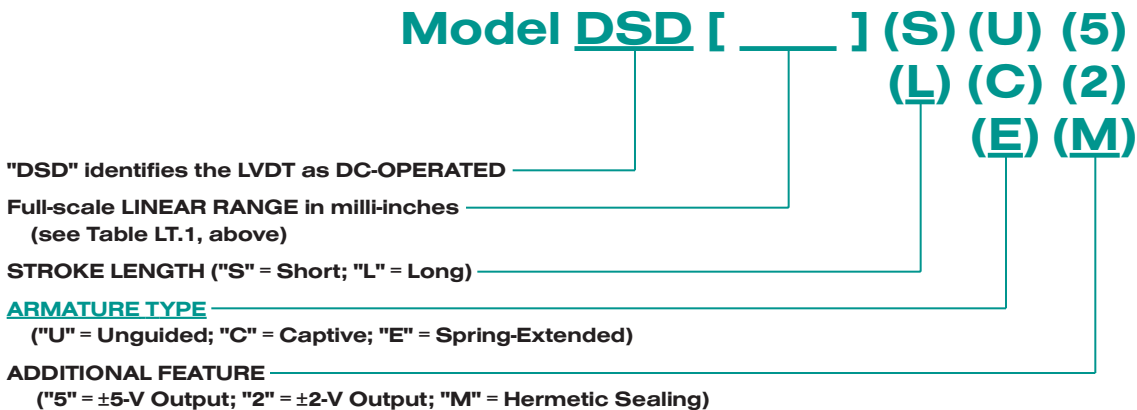
See the [General LVDT Categories](#) that correspond to the general model-numbering scheme.

\* There are a few exceptions. The following units, for example, have retained their "traditional" Daytronic model numbers: DS20A through DS400A; DS1000A through DS6000A; DS200B, DS500, and DS2000.

**Table LT.1**  
**Model-Numbering System for AC LVDT's**



**Table LT.2**  
**Model-Numbering System for DC LVDT's**



\*\* Or, for the ["PSEG" Series](#), in millimeters.

# GENERAL LVDT CATEGORIES

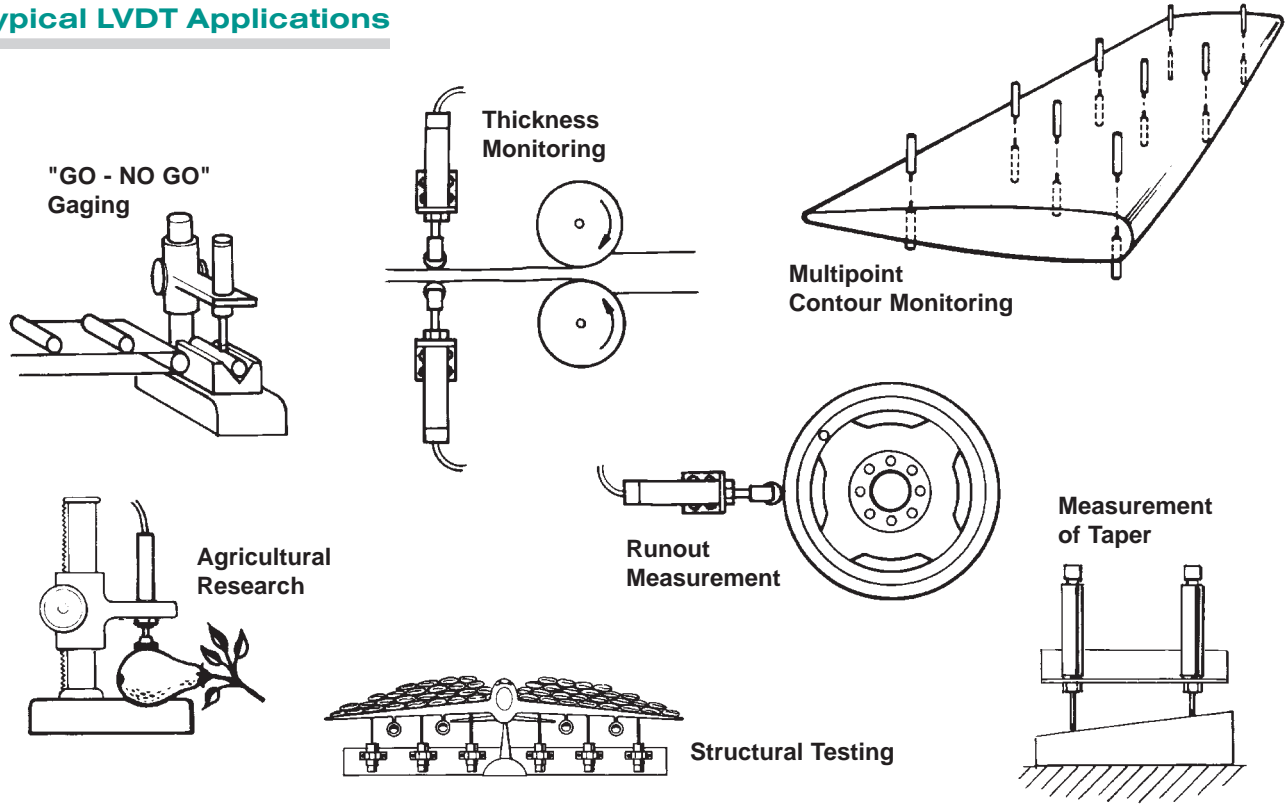
## AC-OPERATED ("DS") LVDT's

- **Short-Stroke ("S")**
  - Unguided Armature ("U")
    - [With 6-ft. Cable \("SUH"\)](#) (DS50SUH - DS1000SUH)
    - [Hermetically Sealed \("SUM"\)](#) (DS80SUM - DS1000SUM)
  - Spring-Extended Armature ("E")
    - [Standard Models \(High Precision; "PSE"\)](#) (DS20B - DS400B; DS600PSE - DS1000PSE)
    - [High Precision, High Linearity \("PSEG"\)](#) (DS1000PSEGA - DS10000PSEGA)
    - [Hermetically Sealed \("SEM"\)](#) (DS80SEM - DS1000SEM)
    - ["Locking Nut" Models](#) (DS200B, DS500)
- **Long-Stroke ("L")**
  - Unguided Armature ("U")
    - [Standard Models \("LU"\)](#) (DS1000LU - DS16000LU)
    - [Hermetically Sealed \("LUM"\)](#) (DS1000LUM - DS12000LUM)
  - Captive Armature ("C")
    - [Standard Models \("LC"\)](#) (DS1000LC - DS37000LC)
    - [Hermetically Sealed \("LCM"\)](#) (DS1000LCM - DS12000LCM)
  - Spring-Extended Armature ("E")
    - [Standard Models \("LE"\)](#) (DS1000A - DS6000A)
    - [Hermetically Sealed \("LEM"\)](#) (DS1000LEM - DS6000LEM)
    - ["Locking Nut" Model \(High Precision\)](#) (DS2000)

## DC-OPERATED ("DSD") LVDT's

- **Short-Stroke ("S")**
  - Unguided Armature ("U")
    - [Standard Models \("SU"\)](#) (DSD200SU, DSD400SU)
    - [High Voltage \( \$\pm 5\$ -V Output; "SU5"\)](#) (DSD200SU5 - DSD800SU5)
  - Spring-Extended Armature ("E")
    - [Standard Models \("SE"\)](#) (DSD200SE, DSD400SE)
    - [High Voltage \( \$\pm 5\$ -V Output; "SE5"\)](#) (DSD200SE5 - DSD800SE5)
- **Long-Stroke ("L")**
  - Unguided Armature ("U")
    - [Standard Models \( \$\pm 5\$ -V Output; "LU5"\)](#) (DSD1000LU5 - DSD16000LU5)
    - [Low Voltage \( \$\pm 2\$ -V Output; "LU2"\)](#) (DSD1000LU2 - DSD16000LU2)
    - [Hermetically Sealed \("LUM"\)](#) (DSD1000LUM - DSD12000LUM)
  - Captive Armature ("C")
    - [Standard Models \( \$\pm 5\$ -V Output; "LC5"\)](#) (DSD1000LC5 - DSD37000LC5)
    - [Low Voltage \( \$\pm 2\$ -V Output; "LC2"\)](#) (DSD1000LC2 - DSD37000LC2)
    - [Hermetically Sealed \("LCM"\)](#) (DSD1000LCM - DSD12000LCM)
  - Spring-Extended Armature ("E")
    - [Standard Models \( \$\pm 5\$ -V Output; "LE5"\)](#) (DSD1000LE5 - DSD6000LE5)
    - [Low Voltage \( \$\pm 2\$ -V Output; "LE2"\)](#) (DSD1000LE2 - DSD6000LE2)
    - [Hermetically Sealed \("LEM"\)](#) (DSD1000LEM - DSD6000LEM)

**Fig. LT.3**  
**Typical LVDT Applications**


**LVDT'S**
**LOAD CELLS**
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## CONCERNING LVDT SPECIFICATIONS GIVEN IN THIS CATALOG...

The stated linearity characteristics represent minimum values at the stated excitation level, and refer to the full-scale range over which the LVDT is calibrated. Use of less than nominal range results in the same percentage linearity but in proportionally better absolute linearity.

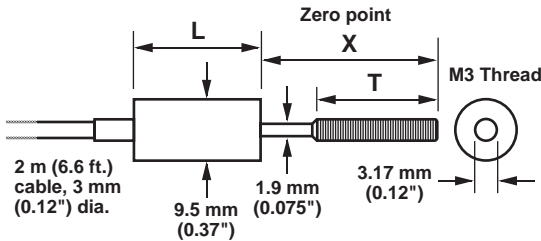
LVDT's (unlike strain gages) cannot be supplied with meaningful calibration data. System sensitivity is a function of excitation frequency, cable loading, amplifier phase characteristics, and other factors. It is a practical necessity to calibrate each LVDT/cable/instrument system after installation, using a *known input standard*. The sensitivity and repeatability values given are typical minimum values only.

# AC "SU" AND "SUH" LVDT SERIES

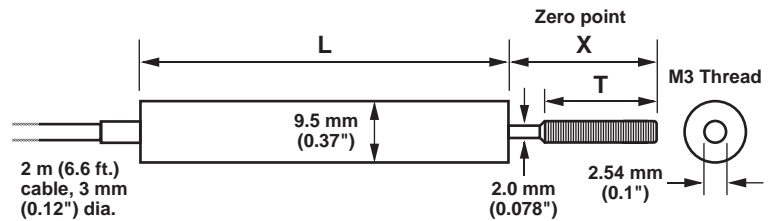
## AC-OPERATED SHORT-STROKE UNGUIDED ARMATURE

**Fig. LT.4**  
**AC "SUH" Series Dimensions**

These are the standard AC-EXCITED SHORT-STROKE LVDT models with UNGUIDED ARMATURE. "SUH" models include a 2-meter (6.6-foot) cable.



**Fig. LT.4(c)**  
**Model DS50SUH Dimensions**



**Fig. LT.4(d)**  
**Dimensions for Models DS200SUH - DS1000SUH**

LVDT Model	Linear Range (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Dimension "T" (mm / in.)	Armature Weight (g / oz.)	Total Weight (g / oz.)
DS50SUH	±0.63 / ±0.025	35.0 / 1.37	28.0 / 1.10	19.0 / 0.75	3.5 / 0.12	14 / 0.49
DS200SUH	±2.5 / ±0.10	42.8 / 1.68	19.0 / 0.75	15.2 / 0.60	2.0 / 0.07	16 / 0.56
DS400SUH	±5.0 / ±0.20	45.5 / 1.79	25.4 / 1.00	17.7 / 0.70	2.0 / 0.07	18 / 0.63
DS600SUH	±7.5 / ±0.30	58.0 / 2.28	30.0 / 1.18	18.4 / 0.72	2.0 / 0.07	22 / 0.77
DS800SUH	±10.0 / ±0.40	63.0 / 2.48	32.5 / 1.28	18.4 / 0.72	3.0 / 0.10	28 / 0.99
DS1000SUH	±12.7 / ±0.50	79.0 / 3.11	35.0 / 1.37	18.4 / 0.72	4.0 / 0.14	36 / 1.27

## GENERAL AC "SUH" SPECIFICATIONS

**Excitation:** 5 V-AC (RMS) at 5 kHz\*; 30 mA nominal at 5 kHz

**Armature:** Unguided

**Linearity:** Better than ±0.5% of full scale\*\*

\* Will operate equally well over the range of 2 to 10 kHz, and down to 1 V-AC (RMS).

\*\* ±0.25% and ±0.1% linearity are available as options (contact the factory for details).

**Sensitivity:** 80 mV/V/mm (2 mV/V/0.001"), typical

**Repeatability:** Absolute, but dependent on system mechanics

**Phase Shift:** Typically 10° (depends on frequency)

**Temperature Coefficient of Sensitivity:** 0.01% of full scale/°C (0.005% of full scale/°F), typical

**Operating Temperature Range:** -20° C to +125° C (-4° F to +257° F)

# AC "SUM" SEALED LVDT SERIES

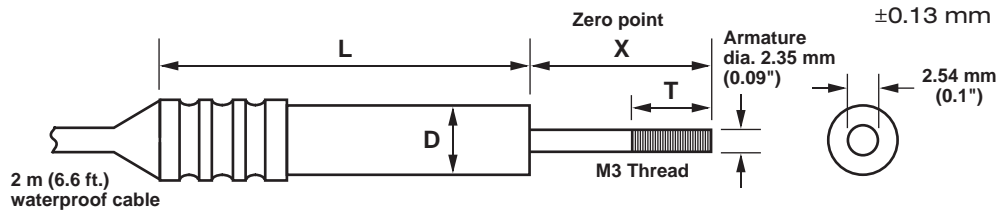
## AC-OPERATED SHORT-STROKE UNGUIDED ARMATURE

Designed for use while submerged under fresh water and most other non-corrosive liquids and gases, these LVDT's are extensively used in industrial and R&D applications.

The stainless-steel body is **hermetically sealed** and has a cable exit which is double-sealed using an internal rubber gland plus a poly-

olefin shrink tube covering the cable and transducer body. An alternative MI stainless-steel sheathed cable option is available for use under high liquid pressures (as in soil testing apparatus, hydraulics, vessel studies, etc.)

**Fig. LT.5**  
**AC "SUM" Series Dimensions**



**NOTE:** All dimensions nominal, except Diameter ("D"), which is  $\pm 0.13 \text{ mm} / \pm 0.005 \text{ in.}$

LVDT Model	Linear Range (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Dimension "D" (mm / in.)	Dimension "T" (mm / in.)	Armature Weight (g / oz.)	Total Weight* (g / oz.)
DS80SUM	$\pm 1.0 / \pm 0.04$	41.0 / 1.61	19.0 / 0.75	8.0 / 0.31	15.0 / 0.6	4 / 0.14	25 / 0.8
DS200SUM	$\pm 2.5 / \pm 0.1$	52.5 / 2.06	19.5 / 0.77	9.5 / 0.37	15.0 / 0.6	6 / 0.21	28 / 1.0
DS400SUM	$\pm 5.0 / \pm 0.2$	55.0 / 2.16	26.5 / 1.04	9.5 / 0.37	18.5 / 0.73	8 / 0.28	32 / 1.15
DS600SUM	$\pm 7.5 / \pm 0.3$	70.0 / 2.75	30.0 / 1.18	9.5 / 0.37	18.5 / 0.73	10 / 0.35	36 / 1.27
DS800SUM	$\pm 10.0 / \pm 0.4$	74.0 / 2.91	32.5 / 1.28	9.5 / 0.37	18.5 / 0.73	12 / 0.42	40 / 1.41
DS1000SUM	$\pm 12.5 / \pm 0.5$	90.0 / 3.54	35.0 / 1.38	9.5 / 0.37	18.5 / 0.73	15 / 0.53	50 / 1.76

## GENERAL AC "SUM" SPECIFICATIONS

**Excitation:** 5 V-AC (RMS) at 5 kHz\*\*; 20 - 30 mA at 5 kHz

**Armature:** [Unguided](#)

**Linearity:** Better than  $\pm 0.5\%$  of full scale\*\*\*

\* Excluding cable.

\*\* Will operate equally well over the range of 2 to 10 kHz, and down to 1 V-AC (RMS).

\*\*\*  $\pm 0.25\%$  and  $\pm 0.1\%$  linearity are available as options (contact the factory for details).

**Sensitivity:** 80 mV/V/mm (2 mV/V/0.001"), typical

**Repeatability:** Absolute, but dependent on system mechanics

**Temperature Coefficient of Sensitivity:** 0.01% of full scale/ $^{\circ}\text{C}$  (0.005% of full scale/ $^{\circ}\text{F}$ ), typical

**Operating Temperature Range:**  $-20^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$  to  $+257^{\circ}\text{F}$ )

# "PSE" PRECISION LVDT SERIES

These AC units present the optimum combination of range, accuracy, versatility, and small size required for general-purpose applications. A spring-extended armature and a special linear bearing technique yield virtually friction-free probe action over a wide temperature range. With suitable signal conditioning equipment, they can provide repeatability of well within a micron (0.001 mm).

These LVDT's are a logical selection when ambient temperature control is impossible or inconvenient, since small size and AISI-446 stainless-

steel construction normally reduce thermal expansion errors to insignificance.\* The Models DS20A, DS40A, and DS80A have a sealed rubber boot to prevent entry of dust or liquid into the transducer housing.

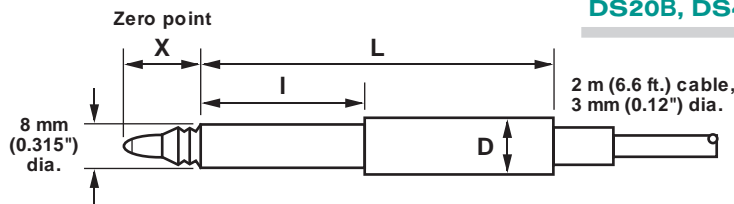
In addition to high mechanical strength, all models have fully encapsulated, magnetically shielded windings for use with ESI or other carrier amplifier equipment.\*\* They can be mounted in any position, and are unaffected by being clamped into the steel housings of most gaging fixtures. With a built-in "anti-rotate" mechanism, each ball-

ended probe can withstand the high side loads often encountered in multipoint gaging operations, without loss of accuracy.

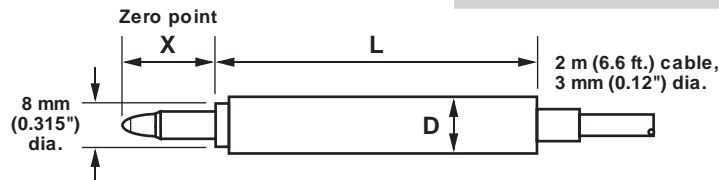
\* Temperature errors attributable to the transducer-instrument combination amount to less than one microinch per °F. This is smaller than the errors that inevitably arise—even in the most well designed fixture systems—from ordinary thermal expansion and contraction. In general, dimensional measurement with meaningful precision to 0.0001" or better demands a carefully controlled temperature environment.

\*\* Differential-inductance windings are also available, for use with equipment with half-bridge input circuitry.

**Fig. LT.6**  
"PSE" Series Dimensions



**Fig. LT.6(a)**  
Dimensions for Models  
DS20B, DS40B, DS80C, and DS80D



**Fig. LT.6(b)**  
Dimensions for Models  
DS190B, DS400B, DS600PSE,  
DS800PSE, and DS1000PSE

LVDT Model	Linear Range (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Dimension "I" (mm / in.)	Dimension "D" (mm / in.)	Maximum Spring Force (g / oz.)
DS20B	±0.25 / ±0.010	49.25 / 1.94	10.9 / 0.43	— / —	8 / 0.31	214 / 7.5
DS40B	±0.50 / ±0.020	49.25 / 1.94	12.2 / 0.48	— / —	8 / 0.31	214 / 7.5
DS80C	±1.0 / ±0.040	52.4 / 2.062	13.1 / 0.515	22.4 / 0.88	9.5 / 0.37	214 / 7.5
DS80D	±1.0 / ±0.040	52.4 / 2.062	13.1 / 0.515	— / —	8 / 0.31	214 / 7.5
DS190B	±2.5 / ±0.100	60.8 / 2.393	11.5 / 0.45	— / —	9.5 / 0.37	120 / 4.23
DS400B	±5.0 / ±0.200	67.7 / 2.665	11.5 / 0.45	— / —	9.5 / 0.37	130 / 4.58
DS600PSE	±8.0 / ±0.300	84.5 / 3.325	15.2 / 0.60	— / —	9.5 / 0.37	245 / 8.64
DS800PSE	±10.0 / ±0.400	95.5 / 3.750	19.0 / 0.75	— / —	9.5 / 0.37	210 / 7.40
DS1000PSE	±12.7 / ±0.500	118 / 4.640	21.6 / 0.85	— / —	9.5 / 0.37	215 / 7.58

(cont'd)



# "PSE" PRECISION LVDT SERIES *(cont'd)*

## AC-OPERATED SHORT-STROKE SPRING-EXTENDED ARMATURE

### GENERAL "PSE" SPECIFICATIONS

**Excitation:** 5 V-AC (RMS) at 5 kHz\*; 20 mA nominal at 5 kHz for Models DS20B through DS80D; 25 mA nominal at 5 kHz for Models DS190B through DS1000PSE

**Armature:** [Spring-extended](#)

**Linearity:** Better than  $\pm 0.5\%$  of full scale\*\*

\* Will operate equally well over the range of 2 to 10 kHz.

\*\*  $\pm 0.25\%$  and  $\pm 0.1\%$  linearity are available as options (contact the factory for details).

**Sensitivity:** 80 mV/V/mm (2 mV/V/0.001"), typical

**Repeatability:** Within 0.5 micron (20 microinches)

**Phase Shift:** Typically  $10^\circ$  (depends on frequency)

**Temperature Coefficient of Sensitivity:** 0.01% of full scale/ $^\circ\text{C}$  (0.005% of full scale/ $^\circ\text{F}$ ), typical

**Operating Temperature Range:**  $-20^\circ\text{C}$  to  $+125^\circ\text{C}$  ( $-4^\circ\text{F}$  to  $+257^\circ\text{F}$ )

LVDT'S

LOAD CELLS

PRESSURE  
TRANSDUCERSOTHER  
TRANSDUCERS

# "PSEGA" PRECISION LVDT SERIES

## AC-OPERATED SHORT-STROKE SPRING-EXTENDED ARMATURE

Featuring **high repeatability and linearity**, the "PSEGA" Series LVDT's have been designed for precision measurement in gaging and quality control applications.

A spring-extended armature and a special high-precision linear bearing assembly yield virtually friction-free probe action over a wide temperature range. With suitable signal conditioning equipment, these LVDT's can provide repeatability of 0.15 micron (6 microinches).

These LVDT's are a logical selection when ambient temperature control is impossible or inconvenient, since small size and AISI-446 stainless-steel construction normally reduce thermal expansion errors to

insignificance.\* All models have rubber sealing bellows to prevent entry of dust or liquid into the transducer housing.

The bearing assembly has its own outer case, which adds to the high mechanical strength of these transducers. All models have fully encapsulated, magnetically shielded windings for use with ESI or other carrier amplifier equipment.\*\* They can be mounted in any position, and are unaffected by being clamped into the steel housings of most gaging fixtures. With a built-in "anti-rotate" mechanism, each tungsten-carbide-tipped probe can withstand the high side loads often encountered in multipoint gaging operations, without loss of accuracy.

Securely clamped LVDT cables are sheathed in the highest quality polyurethane, for maximum strength and resistance to chemical/oil attack.

\* Temperature errors attributable to the transducer-instrument combination amount to less than one microinch per °F. This is smaller than the errors that inevitably arise—even in the most well designed fixture systems—from ordinary thermal expansion and contraction. In general, dimensional measurement with meaningful precision to 0.0001" or better demands a carefully controlled temperature environment.

\*\* Differential-inductance windings are also available, for use with equipment with half-bridge input circuitry.

Fig. LT.7  
"PSEGA" Series Dimensions

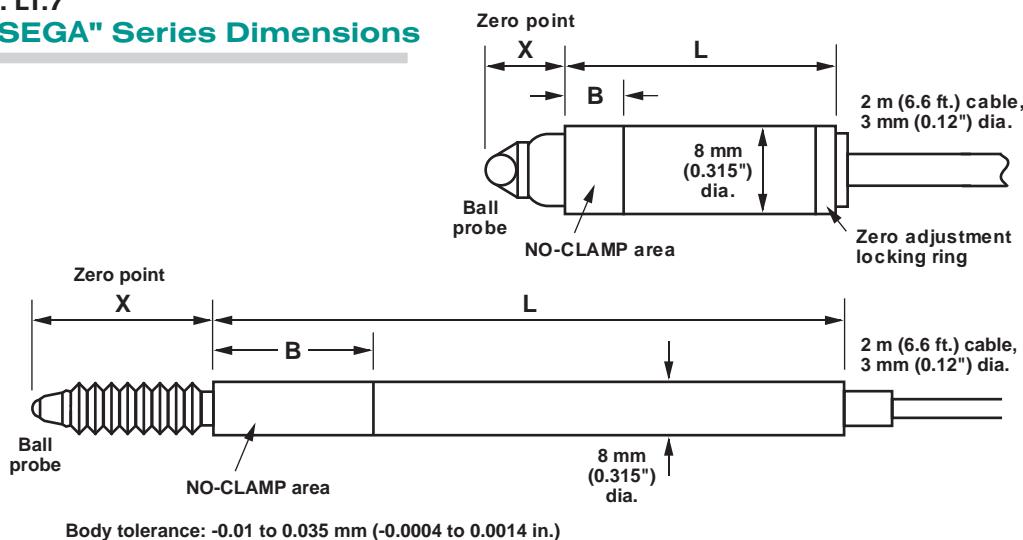


Fig. LT.7(a)  
Model DS1000PSEGA Dimensions

Fig. LT.7(b)  
Dimensions for Models DS2000PSEGA, DS5000PSEGA and DS10000PSEGA

LVDT Model	Linear Range (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Dimension "B" (mm / in.)	Weight* (g / oz.)	Maximum Spring Force (g / oz.)
DS1000PSEGA	±0.5 / ±0.02	26 / 1.02	7.25 / 0.285	5.5 / 0.216	7 / 0.25	100 / 3.5
DS2000PSEGA	±1.0 / ±0.04	53 / 2.09	14 / 0.55	14 / 0.55	16 / 0.56	101 / 3.56
DS5000PSEGA	±2.5 / ±0.1	57 / 2.26	20 / 0.79	18 / 0.71	18 / 0.63	118 / 4.16
DS10000PSEGA	±5.0 / ±0.2	82 / 3.23	22 / 0.87	30 / 1.18	22 / 0.78	150 / 5.29

\* Excluding cable.

(cont'd)

# "PSEGA" PRECISION LVDT SERIES *(cont'd)*

## AC-OPERATED SHORT-STROKE SPRING-EXTENDED ARMATURE

LVDT'S

LOAD CELLS

PRESSURE  
TRANSDUCERSOTHER  
TRANSDUCERS

### GENERAL "PSEGA" SPECIFICATIONS

**Excitation:**

**Voltage:** 1 to 7 V-AC (RMS) at 2 to 10 kHz; calibrated at 5 V-AC at 5 kHz

**Current:**

**DS1000PSEGA:** 14 mA nominal at 5 kHz

**DS2000PSEGA:** 25 mA nominal at 5 kHz

**DS5000PSEGA:** 25 mA nominal at 5 kHz

**DS10000PSEGA:** 8 mA nominal at 5 kHz

**Armature:** [Spring-extended](#)

**Resolution:** Infinite

**Linearity:**  $\pm 0.25\%$  of full scale

**Sensitivity:**

**DS1000PSEGA:** 240 mV/V/mm (6 mV/V/0.001"), typical

**DS2000PSEGA:** 150 mV/V/mm (4 mV/V/0.001"), typical

**DS5000PSEGA:** 150 mV/V/mm (4 mV/V/0.001"), typical

**DS10000PSEGA:** 120 mV/V/mm (4 mV/V/0.001"), typical

**Repeatability:** 0.15 micron (6 microinches)

**Temperature Coefficient (Zero and Span):** 0.01% of full scale/ $^{\circ}\text{C}$  (0.005% of full scale/ $^{\circ}\text{F}$ )

**Operating Temperature Range:**  $-40^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$  to  $+212^{\circ}\text{F}$ )

# AC "SEM" SEALED LVDT SERIES

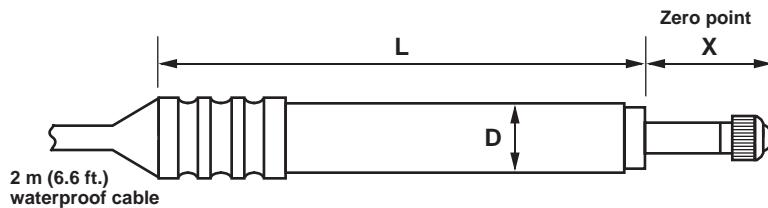
## AC-OPERATED SHORT-STROKE SPRING-EXTENDED ARMATURE

Designed for use while submerged under fresh water and most other non-corrosive liquids and gases, these LVDT's are extensively used in industrial and R&D applications.

The stainless-steel body is **hermetically sealed** and has a cable exit which is double-sealed using an internal rubber gland plus a poly-

olefin shrink tube covering the cable and transducer body. An alternative MI stainless-steel sheathed cable option is available for use under high liquid pressures (as in soil testing apparatus, hydraulics, vessel studies, etc.)

**Fig. LT.8**  
**AC "SEM" Series Dimensions**



**NOTE:** All dimensions nominal, except Diameter ("D"), which is  $\pm 0.13$  mm /  $\pm 0.005$  in.

LVDT Model	Linear Range (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Dimension "D" (mm / in.)
DS80SEM	$\pm 1.0 / \pm 0.04$	52.0 / 2.04	11.5 / 0.45	8.0 / 0.31
DS200SEM	$\pm 2.5 / \pm 0.1$	66.0 / 2.60	12.5 / 0.5	9.5 / 0.37
DS400SEM	$\pm 5.0 / \pm 0.2$	72.6 / 2.86	13.7 / 0.54	9.5 / 0.37
DS600SEM	$\pm 7.5 / \pm 0.3$	92.3 / 3.63	15.2 / 0.6	9.5 / 0.37
DS800SEM	$\pm 10.0 / \pm 0.4$	103.5 / 4.07	21.6 / 0.85	9.5 / 0.37
DS1000SEM	$\pm 12.5 / \pm 0.5$	126.0 / 4.96	24.0 / 0.94	9.5 / 0.37

## GENERAL AC "SEM" SPECIFICATIONS

**Excitation:** 5 V-AC (RMS) at 5 kHz\*; 20 - 30 mA at 5 kHz

**Armature:** [Spring-extended](#)

**Linearity:** Better than  $\pm 0.5\%$  of full scale\*\*

**Sensitivity:** 80 mV/V/mm (2 mV/V/0.001"), typical

**Repeatability:** 1.0 micron (40 microinches)

**Temperature Coefficient of Sensitivity:** 0.01% of full scale/ $^{\circ}$ C (0.005% of full scale/ $^{\circ}$ F), typical

**Operating Temperature Range:**  $-20^{\circ}$  C to  $+125^{\circ}$  C ( $-4^{\circ}$  F to  $+257^{\circ}$  F)

**Spring Force (maximum):** 150 g (5 oz.)

\* Will operate equally well over the range of 2 to 10 kHz, and down to 1 V-AC (RMS).

\*\*  $\pm 0.25\%$  and  $\pm 0.1\%$  linearity are available as options (contact the factory for details).

See [LVDT Model-Numbering System](#).  
See [General LVDT Categories](#).

# "LOCKING NUT" LVDT SERIES

## AC-OPERATED SHORT-STROKE SPRING-EXTENDED ARMATURE



Model DS200B

The **Models DS200B and DS500** each have a threaded mounting shank and locking nut to allow secure, precise positioning in a simple mounting fixture. The coil is epoxy-encapsulated and magnetically shielded, and the spring-loaded probe terminates in a hardened steel tip, rounded and polished, which is readily replaceable (see the optional [Model 106 Contact Tip](#)). An optional rubber boot is also available, for protection of the probe shaft from fluids and abrasive materials.

Combining optimal electrical properties with rugged stainless-steel construction, these instruments can tolerate years of hard industrial use with no appreciable loss of precision. Typical applications include in-process gaging control, creep test recording, structural deflection measurement, actuator and tool position feedback, dilatometry, strip thickness measurement, and much more (see [Fig. LT3](#)).

Fig. LT.9  
Model DS200B  
Dimensions  
(in./cm)

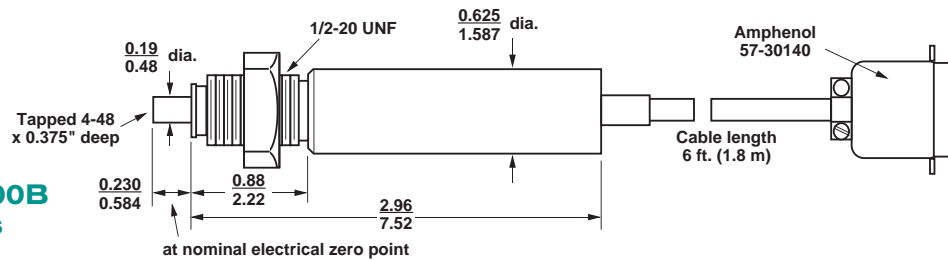
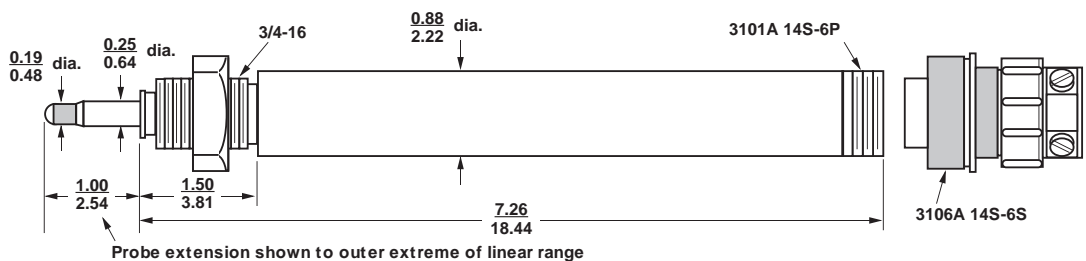


Fig. LT.10  
Model DS500  
Dimensions  
(in./cm)



### SHORT-STROKE "LOCKING NUT" SPECIFICATIONS

**Linear Range:**

**DS200B:** ±0.10 in. (±2.5 mm)

**DS500:** ±0.250 in. (±6.35 mm)

**Excitation:**

**DS200B:** 1 to 5 V-AC (RMS) at 2 to 10 kHz

**DS500:** 2 to 10 V-AC (RMS) at 0.06 to 10 kHz\*

\* With excitation below 0.4 kHz, primary voltage should not exceed 3 V.

\*\* Minimum characteristics at 5 kHz excitation for DS200B; at 3 kHz for DS500.

**Armature:** [Spring-extended](#)

**Linearity\*\*:**

**DS200B:** ±0.2% of full scale

**DS500:** ±0.25% of full scale

**Sensitivity:**

**DS200B:** 1.8 mV/V/0.001", nominal

**DS500:** 1.0 mV/V/0.001", nominal

**Operating Temperature Range:**

**DS200B:** -20° C to +125° C (-4° F to +257° F)

**DS500:** -40° C to +100° C (-40° F to +212° F)

(cont'd)

# "LOCKING NUT" LVDT SERIES *(cont'd)*

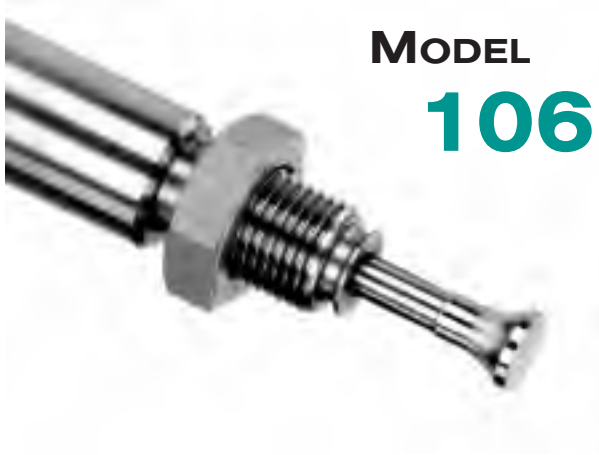
**AC-OPERATED  
SHORT-STROKE  
SPRING-EXTENDED ARMATURE**

LVDT'S

LOAD CELLS

PRESSURE  
TRANSDUCERS

OTHER  
TRANSDUCERS



## MODEL **106 CONTACT TIP**

Replacing the standard rounded tip on the **DS200B**, **DS500**, or **DS2000**, this tip provides a precision ground-flat surface, 3/8" in diameter, for contacting rounded objects.

See also the [Model 115C Calibration Kit](#), which may be used with the short-stroke "LOCKING NUT" LVDT's.

See [LVDT Model-Numbering System](#).  
See [General LVDT Categories](#).

# AC "LU" LVDT SERIES

## AC-OPERATED LONG-STROKE UNGUIDED ARMATURE

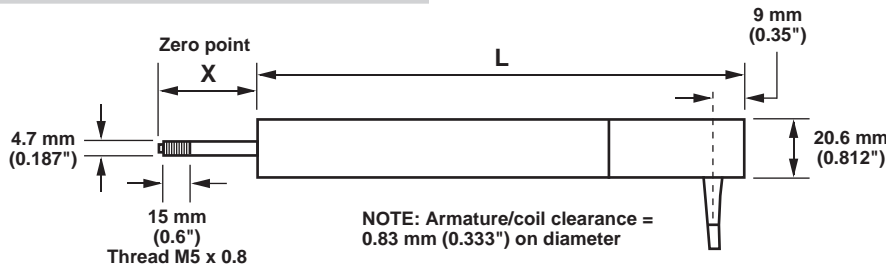
These high-performance transducers are the standard AC-EXCITED LONG-STROKE LVDT models with UNGUIDED ARMATURE. They are ideal for harsh applications under conditions of high ambient temperature and/or vibration.

Each model requires separate signal conditioning, and will deliver its

best performance when energized between 0.5 and 7 V-AC (RMS) at 5 kHz, using a high-quality carrier amplifier.

Compact size allows use where physical space is limited. All models are fitted with 2 meters (6.6 ft.) of shielded cable.

**Fig. LT.11**  
**AC "LU" Series Dimensions**



**NOTE:** All dimensions nominal, except diameters, which are  $\pm 0.125$  mm /  $\pm 0.005$  in.

LVDT Model	Linear Range (Nom.) (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Armature Weight (Approx.) (g / oz.)	Total Weight (Approx.) (g / oz.)	Electrical Output (V/V)
DS1000LU	$\pm 12.5 / \pm 0.5$	127 / 5.0	43 / 1.7	35 / 1.25	170 / 6	0.8
DS2000LU	$\pm 25.0 / \pm 1.0$	155 / 6.1	68 / 2.7	50 / 1.75	227 / 8	0.9
DS4000LU	$\pm 50.0 / \pm 2.0$	270 / 10.6	81 / 3.2	57 / 2.0	369 / 13	1.6
DS6000LU	$\pm 75.0 / \pm 3.0$	381 / 15.0	120 / 4.7	63 / 2.2	454 / 16	1.5
DS8000LU	$\pm 100 / \pm 4.0$	427 / 16.8	132 / 5.2	71 / 2.5	568 / 20	3.2
DS12000LU	$\pm 150 / \pm 6.0$	617 / 24.3	183 / 7.2	114 / 4.0	824 / 29	2.4
DS16000LU	$\pm 200 / \pm 8.0$	808 / 31.8	259 / 10.2	145 / 5.1	1193 / 42	1.5

## GENERAL AC "LU" SPECIFICATIONS

**Excitation:** 0.5 to 7 V-AC (RMS), regulated\*

**Armature:** [Unguided](#)

**Linearity:**  $\pm 0.5\%$  of full scale\*\*

**Output (full-scale RMS):** See table, above

\* Factory calibration is at 5 V-AC (RMS) at 5 kHz (50 mA maximum), with output load of 100 k $\Omega$ .

\*\*  $\pm 0.25\%$  and  $\pm 0.1\%$  linearity are available as options on some ranges (contact the factory for details).

\*\*\*  $-50^{\circ}$  C to  $+200^{\circ}$  C ( $-58^{\circ}$  F to  $+392^{\circ}$  F) optional.

**Residual Null Output:** 0.1% of full-scale output (quadrature and harmonic)

**Phase Shift:** Typically  $10^{\circ}$  (depends on frequency)

**Output Load (optimum):** 100 k $\Omega$

**Temperature Coefficient (Zero and Span):** 0.01% of full scale/ $^{\circ}$ C (0.005% of full scale/ $^{\circ}$ F)

**Operating Temperature Range:**  $-50^{\circ}$  C to  $+125^{\circ}$  C ( $-58^{\circ}$  F to  $+257^{\circ}$  F)\*\*\*

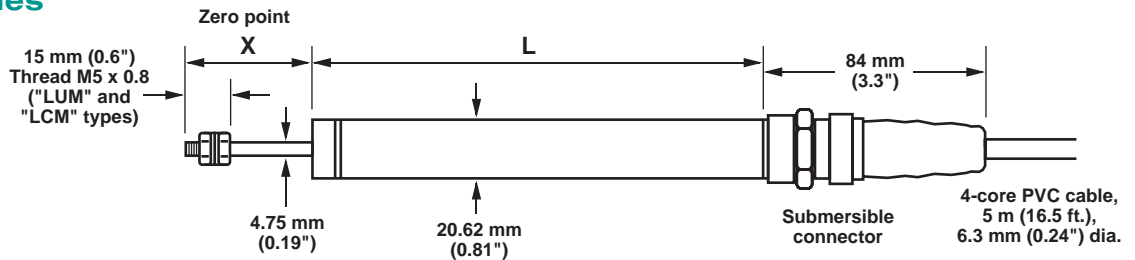
# AC "LUM" SEALED LVDT SERIES

## AC-OPERATED LONG-STROKE UNGUIDED ARMATURE

These units are ideal for industrial use in most fluids and gases. The standard cable connection is by means of a submersible connector, but several other optional versions

are available, providing different cable lengths and temperature/pressure ratings (contact the Daytronic factory for details).

**Fig. LT.12**  
**AC "LUM" Series Dimensions**



LVDT Model	Linear Range (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Armature Weight (g / oz.)
DS1000LUM	±12.5 / ±0.5	153 / 6.0	38 / 1.5	21 / 0.7
DS2000LUM	±25.0 / ±1.0	181 / 7.13	63 / 2.48	28 / 1.0
DS4000LUM	±50.0 / ±2.0	304 / 11.97	76 / 3.0	30 / 1.0
DS6000LUM	±75.0 / ±3.0	420 / 16.54	114 / 4.48	55 / 1.9
DS8000LUM	±100 / ±4.0	453 / 17.83	127 / 5.0	67 / 2.4
DS12000LUM	±150 / ±6.0	666 / 26.2	183 / 7.2	104 / 3.7

## GENERAL AC "LUM" SPECIFICATIONS

**Excitation:** 1 to 7 V-AC (RMS) at 5 kHz

**Armature:** Unguided

**Linearity:** ±0.5% of full scale\*

**Output (full-scale RMS):** 0.8 to 3 V/V (dependent on range)

\* ±0.25% and ±0.1% linearity are available as options (contact the factory for details).

\*\* Higher temperature/pressure ratings available with cable options (contact factory for details).

**Phase Shift:** Typically 10° (depends on frequency)

**Output Load (recommended):** 100 kΩ

**Temperature Coefficient (Zero and Span):** 0.01% of full scale/°C (0.005% of full scale/°F)

**Operating Temperature Range:** -40° C to +90° C (-40° F to +194° F)\*\*

**Pressure Rating:** 10 bar (150 psi)\*\*

See [LVDT Model-Numbering System](#).  
See [General LVDT Categories](#).



# AC "LC" LVDT SERIES

## AC-OPERATED LONG-STROKE CAPTIVE ARMATURE

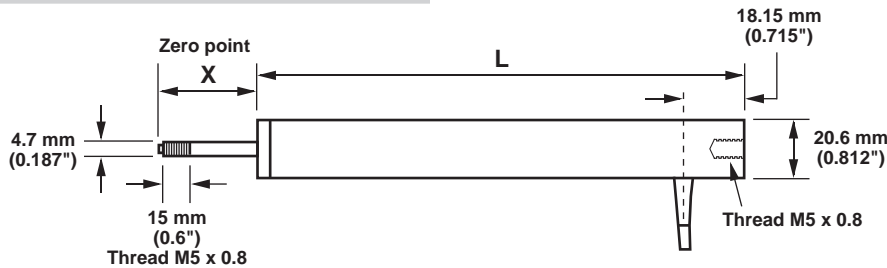
These high-performance transducers are the standard AC-EXCITED LONG-STROKE LVDT models with CAPTIVE ARMATURE. They are ideal for harsh applications under conditions of high ambient temperature and/or vibration.

Each model requires separate signal conditioning, and will deliver its

best performance when energized between 0.5 and 7 V-AC (RMS) at 5 kHz, using a high-quality carrier amplifier.

Compact size allows use where physical space is limited. All models are fitted with 2 meters (6.6 ft.) of shielded cable.

**Fig. LT.13**  
**AC "LC" Series Dimensions**



**NOTE:** All dimensions nominal, except diameters, which are  $\pm 0.125 \text{ mm} / \pm 0.005 \text{ in.}$

LVDT Model	Linear Range (Nom.) (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Total Weight (Approx.) (g / oz.)	Electrical Output (V/V)
DS1000LC	$\pm 12.5 / \pm 0.5$	152 / 6.0	38 / 1.5	284 / 10	0.8
DS2000LC	$\pm 25.0 / \pm 1.0$	180 / 7.1	63 / 2.5	340 / 12	0.9
DS4000LC	$\pm 50.0 / \pm 2.0$	295 / 11.6	76 / 3.0	511 / 18	1.6
DS6000LC	$\pm 75.0 / \pm 3.0$	406 / 16.0	114 / 4.5	653 / 23	1.5
DS8000LC	$\pm 100 / \pm 4.0$	452 / 17.8	127 / 5.0	710 / 25	3.2
DS12000LC	$\pm 150 / \pm 6.0$	643 / 25.3	178 / 7.0	1022 / 36	2.4
DS16000LC	$\pm 200 / \pm 8.0$	833 / 32.8	254 / 10.0	1420 / 50	1.5
DS20000LC	$\pm 250 / \pm 10.0$	1030 / 40.5	305 / 12.0	1590 / 56	2.0
DS30000LC	$\pm 375 / \pm 15.0$	1435 / 56.5	406 / 16.0	2130 / 75	3.0
DS37000LC	$\pm 470 / \pm 18.5$	1702 / 67.0	508 / 20.0	2528 / 89	3.7

## GENERAL AC "LC" SPECIFICATIONS

**Excitation:** 0.5 to 7 V-AC (RMS), regulated\*

**Armature:** Captive

**Linearity:**  $\pm 0.5\%$  of full scale\*\*

**Output (full-scale RMS):** See table, above

\* Factory calibration is at 5 V-AC (RMS) at 5 kHz (50 mA maximum), with output load of 100 k $\Omega$ .

\*\*  $\pm 0.25\%$  and  $\pm 0.1\%$  linearity are available as options on some ranges (contact the factory for details).

\*\*\*  $-50^\circ \text{C}$  to  $+200^\circ \text{C}$  ( $-58^\circ \text{F}$  to  $+392^\circ \text{F}$ ) optional.

**Residual Null Output:** 0.1% of full-scale output (quadrature and harmonic)

**Phase Shift:** Typically  $10^\circ$  (depends on frequency)

**Output Load (optimum):** 100 k $\Omega$

**Temperature Coefficient (Zero and Span):** 0.01% of full scale/ $^\circ \text{C}$  (0.005% of full scale/ $^\circ \text{F}$ )

**Operating Temperature Range:**  $-50^\circ \text{C}$  to  $+125^\circ \text{C}$  ( $-58^\circ \text{F}$  to  $+257^\circ \text{F}$ )\*\*\*

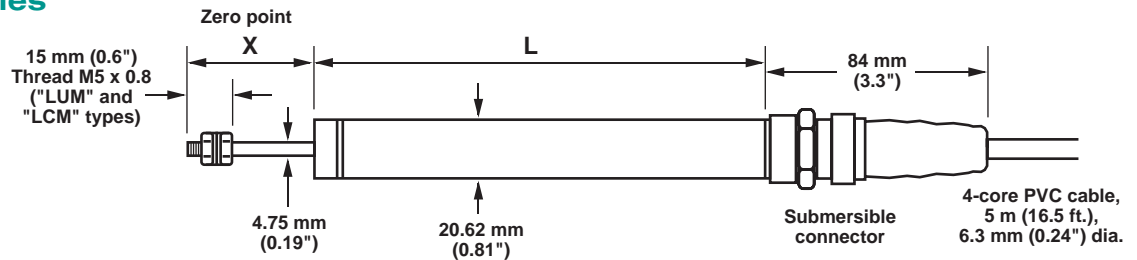
# AC "LCM" SEALED LVDT SERIES

## AC-OPERATED LONG-STROKE CAPTIVE ARMATURE

These units are ideal for industrial use in most fluids and gases. The standard cable connection is by means of a submersible connector, but several other optional versions

are available, providing different cable lengths and temperature/pressure ratings (contact the Daytronic factory for details).

**Fig. LT.14**  
**AC "LCM" Series Dimensions**



LVDT Model	Linear Range (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Armature Weight (g / oz.)
DS1000LCM	±12.5 / ±0.5	153 / 6.0	38 / 1.5	21 / 0.7
DS2000LCM	±25.0 / ±1.0	181 / 7.13	63 / 2.48	28 / 1.0
DS4000LCM	±50.0 / ±2.0	304 / 11.97	76 / 3.0	30 / 1.0
DS6000LCM	±75.0 / ±3.0	420 / 16.54	114 / 4.48	55 / 1.9
DS8000LCM	±100 / ±4.0	453 / 17.83	127 / 5.0	67 / 2.4
DS12000LCM	±150 / ±6.0	666 / 26.2	183 / 7.2	104 / 3.7

## GENERAL AC "LCM" SPECIFICATIONS

**Excitation:** 1 to 7 V-AC (RMS) at 5 kHz

**Armature:** [Captive](#)

**Linearity:** ±0.5% of full scale\*

**Output (full-scale RMS):** 0.8 to 3 V/V (dependent on range)

\* ±0.25% and ±0.1% linearity are available as options (contact the factory for details).

\*\* Higher temperature/pressure ratings available with cable options (contact factory for details).

**Phase Shift:** Typically 10° (depends on frequency)

**Output Load (recommended):** 100 kΩ

**Temperature Coefficient (Zero and Span):** 0.01% of full scale/°C (0.005% of full scale/°F)

**Operating Temperature Range:** -40° C to +90° C (-40° F to +194° F)\*\*

**Pressure Rating:** 10 bar (150 psi)\*\*

See [LVDT Model-Numbering System](#).  
See [General LVDT Categories](#).

# AC "LE" LVDT SERIES<sup>1</sup>

## AC-OPERATED LONG-STROKE SPRING-EXTENDED ARMATURE

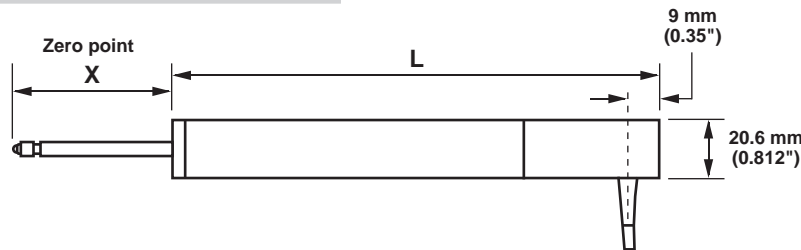
These high-performance transducers are the standard AC-EXCITED LONG-STROKE LVDT models with SPRING-EXTENDED ARMATURE. They are ideal for harsh applications under conditions of high ambient temperature and/or vibration.

Each model requires separate signal conditioning, and will deliver its

best performance when energized between 0.5 and 7 V-AC (RMS) at 5 kHz, using a high-quality carrier amplifier.

Compact size allows use where physical space is limited. All models are fitted with 2 meters (6.6 ft.) of shielded cable.

**Fig. LT.15**  
**AC "LE" Series Dimensions**



**NOTE:** All dimensions nominal, except diameters, which are  $\pm 0.125$  mm /  $\pm 0.005$  in.

LVDT Model	Linear Range (Nom.) (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Total Weight (Approx.) (g / oz.)	Spring Rate <sup>2</sup> (g/cm / oz/in)	Electrical Output (V/V)
DS1000A	$\pm 12.5 / \pm 0.5$	133 / 5.25	38 / 1.5	184 / 6.5	22 / 2	0.8
DS2000A	$\pm 25.0 / \pm 1.0$	161 / 6.35	63 / 2.5	227 / 8.0	26 / 2.3	0.9
DS4000A	$\pm 50.0 / \pm 2.0$	276 / 10.85	75 / 3.0	398 / 14.0	37 / 3.3	1.6
DS6000A	$\pm 75.0 / \pm 3.0$	387 / 15.25	114 / 4.5	483 / 17.0	39 / 3.5	1.5

## GENERAL AC "LE" SPECIFICATIONS

**Excitation:** 0.5 to 7 V-AC (RMS), regulated <sup>3</sup>

**Armature:** [Spring-extended](#)

**Linearity:**  $\pm 0.5\%$  of full scale <sup>4</sup>

**Output (full-scale RMS):** See table, above

**Residual Null Output:** 0.1% of full-scale output (quadrature and harmonic)

**Phase Shift:** Typically 10° (depends on frequency)

**Output Load (optimum):** 100 k $\Omega$

**Temperature Coefficient (Zero and Span):** 0.01% of full scale/ $^{\circ}$ C (0.005% of full scale/ $^{\circ}$ F)

**Operating Temperature Range:** -50° C to +125° C (-58° F to +257° F) <sup>5</sup>

<sup>1</sup> Note that all of the AC "LE" Series LVDT's have retained their "traditional" Daytronic model numbers.

<sup>2</sup> Other spring rates can be accommodated.

<sup>3</sup> Factory calibration is at 5 V-AC (RMS) at 5 kHz (50 mA maximum), with output load of 100 k $\Omega$ .

<sup>4</sup>  $\pm 0.25\%$  and  $\pm 0.1\%$  linearity are available as options on some ranges (contact the factory for details).

<sup>5</sup> -50° C to +200° C (-58° F to +392° F) optional.

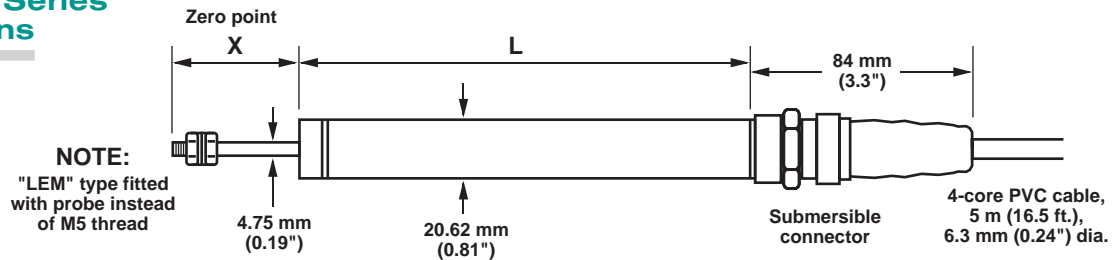
# AC "LEM" SEALED LVDT SERIES

## AC-OPERATED LONG-STROKE SPRING-EXTENDED ARMATURE

These units are ideal for industrial use in most fluids and gases. The standard cable connection is by means of a submersible connector, but several other optional versions

are available, providing different cable lengths and temperature/pressure ratings (contact the Daytronic factory for details).

**Fig. LT.16**  
**AC "LEM" Series Dimensions**



LVDT Model	Linear Range (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Armature Weight (g / oz.)	Spring Rate (g/cm / oz/in)
DS1000LEM	±12.5 / ±0.5	153 / 6.0	38 / 1.5	21 / 0.7	45 / 4
DS2000LEM	±25.0 / ±1.0	181 / 7.13	63 / 2.48	28 / 1.0	45 / 4
DS4000LEM	±50.0 / ±2.0	304 / 11.97	76 / 3.0	30 / 1.0	45 / 4
DS6000LEM	±75.0 / ±3.0	420 / 16.54	114 / 4.48	55 / 1.9	45 / 4

## GENERAL AC "LEM" SPECIFICATIONS

**Excitation:** 1 to 7 V-AC (RMS) at 5 kHz

**Armature:** [Spring-extended](#)

**Linearity:** ±0.5% of full scale\*

**Output (full-scale RMS):** 0.8 to 3 V/V (dependent on range)

\* ±0.25% and ±0.1% linearity are available as options (contact the factory for details).

\*\* Higher temperature/pressure ratings available with cable options (contact factory for details).

**Phase Shift:** Typically 10° (depends on frequency)

**Output Load (recommended):** 100 kΩ

**Temperature Coefficient (Zero and Span):** 0.01% of full scale/°C (0.005% of full scale/°F)

**Operating Temperature Range:** -40° C to +90° C (-40° F to +194° F)\*\*

**Pressure Rating:** 10 bar (150 psi)\*\*

See [LVDT Model-Numbering System](#).  
See [General LVDT Categories](#).

# "LOCKING NUT" LVDT



**Model DS2000**

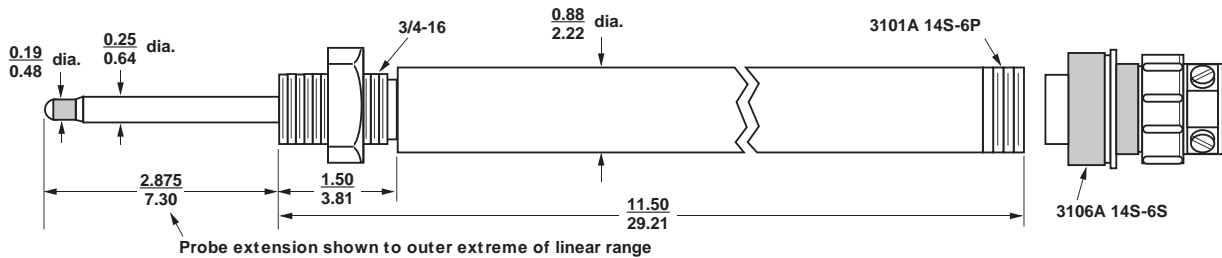
## AC-OPERATED LONG-STROKE SPRING-EXTENDED ARMATURE

The **Model DS2000** has a threaded mounting shank and locking nut to allow secure, precise positioning in a simple mounting fixture. The coil is epoxy-encapsulated and magnetically shielded, and the spring-loaded probe terminates in a hardened steel tip, rounded and polished, which is readily replaceable.\* An optional rubber boot is available, for protection of the probe shaft from fluids and abrasive materials.

Combining optimal electrical properties with rugged stainless-steel construction, this instrument can tolerate years of hard industrial use with no appreciable loss of precision. Typical applications include in-process gaging control, creep test recording, structural deflection measurement, actuator and tool position feedback, dilatometry, strip thickness measurement, and much more (see [Fig. LT3](#)).

\* See the [Model 106 Contact Tip](#).

**Fig. LT.17**  
**Model DS2000 Dimensions (in./cm)**



## LONG-STROKE "LOCKING NUT" (DS2000) SPECIFICATIONS

**Linear Range:**  $\pm 1.000$  in. ( $\pm 25.40$  mm)  
**Excitation:** 2 to 6 V-AC (RMS) at 0.4 to 10 kHz  
**Armature:** [Spring-extended](#)

**Linearity\*\*:**  $\pm 0.5\%$  of full scale  
**Sensitivity:** 1.0 mV/V/0.001", nominal  
**Operating Temperature Range:**  $-40^{\circ}$  C to  $+100^{\circ}$  C  
 ( $-40^{\circ}$  F to  $+212^{\circ}$  F)

\*\* Minimum characteristics at 3 kHz excitation.

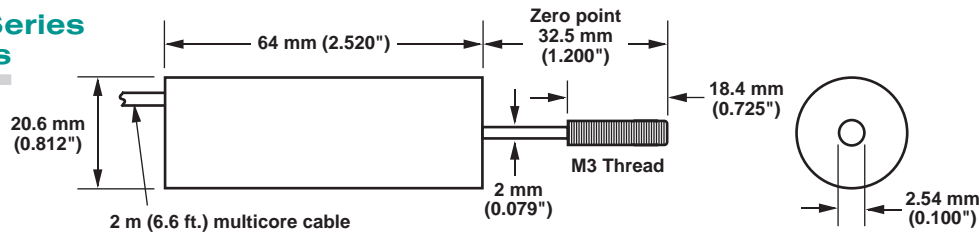
# DC "SU5" HIGH-VOLTAGE LVDT SERIES

## DC-OPERATED SHORT-STROKE UNGUIDED ARMATURE

These DC-EXCITED SHORT-STROKE LVDT models with UNGUIDED ARMATURE operate from a simple unregulated power supply to generate two high-level output signals: **±5 V-DC** and **0-10 V-DC**. For standard-output versions, see the [DC "SU" LVDT Series](#).

Each model includes high-quality electronics for energization and signal conditioning. Encapsulated, integrated electronics are suitable for operation in harsh industrial environments. All models are fitted with 2 meters (6.6 ft.) of shielded cable.

**Fig. LT.18**  
**DC "SU5" Series**  
**Dimensions**



## GENERAL DC "SU5" SPECIFICATIONS

**Linear Range:**

- DSD200SU5:** ±0.1 in. (±2.5 mm)
- DSD400SU5:** ±0.2 in. (±5.0 mm)
- DSD600SU5:** ±0.3 in. (±7.5 mm)
- DSD800SU5:** ±0.4 in. (±10.0 mm)

**Excitation:**

- Using ±5 V-DC Output:** Unregulated ±10 to ±20 V-DC\* or +20 to +40 V-DC; 30 mA typical
- Using 0-10 V-DC Output:** Unregulated ±12 to ±20 V-DC\* or +24 to +40 V-DC; 30 mA typical

**Armature:** [Unguided](#)

**Linearity:** ±0.5% of full scale\*\*

**Outputs:**

**Voltage:**

- Output 1:** 0 to 10 V-DC (+0%, -5%)
- Output 2:** -5 to +5 V-DC (+0%, -5%)

\* Must be floating with respect to output. Factory calibration is at ± 15 V-DC.

\*\* ±0.25% and ±0.1% linearity are available as options for some models (contact the factory for details).

\*\*\* 10 kΩ when power supply is less than 26 V.

**Fluctuation with Supply Fluctuation:**

- Output 1:** 5 mV/V, typical
- Output 2:** 1.25 mV/V, typical

**Load (minimum):**

- Output 1:** 2 kΩ\*\*\*
- Output 2:** 2 kΩ

**Ripple:** 30 mV peak-to-peak

**Bandwidth:** 200 Hz (flat)

**Impedance:** 2 Ω

**Zero Temperature Coefficient:** 0.01% of full scale/°C (0.005% of full scale/°F)

**Span Temperature Coefficient:** 0.03% of full scale/°C (0.015% of full scale/°F)

**Operating Temperature Range:** -50° C to +80° C (-58° F to +176° F)

**Armature Weight:** 2.9 g

**Body Weight:** 83 g

See [LVDT Model-Numbering System](#).  
See [General LVDT Categories](#).

# DC "SE" LVDT SERIES

## DC-OPERATED SHORT-STROKE SPRING-EXTENDED ARMATURE

The **Models DSD200SE and DSD400SE** are the standard DC-EXCITED SHORT-STROKE LVDT models with SPRING-EXTENDED ARMATURE.

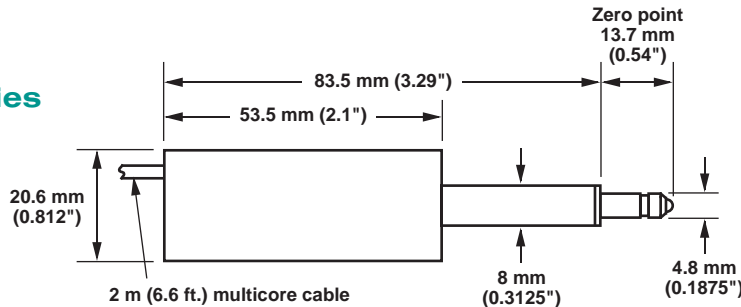
They have integral electronics for operation from simple, well regulated DC power supplies of between 6 and 12 V, without the need for external instrumentation. These units use the same [linear variable differential transformer \(LVDT\)](#) principle as the AC-excited transducers, but include an oscillator to

energize the primary winding. The resulting signal from the secondary windings then passes through a demodulator, converting it to a DC output. A simple RC filter is also included, to remove most of the noise from the demodulated output.<sup>1</sup> Also, an internal load resistor can be introduced into the LVDT circuit for calibration purposes.<sup>2</sup>

For "SE" models with  $\pm 5$  or 0-10 V-DC output, see the [DC "SE5" High-Voltage LVDT Series](#).

- <sup>1</sup> Further noise reduction can be achieved through simple capacitance connections, although this will slow down the response of the transducer to fast-changing mechanical inputs. For optimum speed, the filter may be bypassed entirely.
- <sup>2</sup> Factory calibration of the small DC-DC transducers is carried out with the internal 22-k $\Omega$  load connected and the output voltage measured across the filtered output. If it is required to make direct use of the calibration value quoted for a particular transducer, then the same conditions have to be met and a high-impedance measuring device should be used (DVM, oscilloscope, etc.).

**Fig. LT.20**  
**DC "SE" Series Dimensions**



## GENERAL DC "SE" SPECIFICATIONS

**Linear Range:**

**DSD200SE:**  $\pm 0.1$  in. ( $\pm 2.5$  mm)

**DSD400SE:**  $\pm 0.2$  in. ( $\pm 5.0$  mm)

**Excitation:** 6 to 12 V-DC; 50 mA at 6 V<sup>3</sup>

**Internal Oscillator Frequency:** 17 to 20 kHz

**Armature:** [Spring-extended](#)

**Linearity:** Better than 0.5% of full scale<sup>4</sup>

**Output Sensitivity:** 0.16 V/mm (4 V/in), nominal

**Temperature Coefficient of Sensitivity:**  $\pm 0.02\%$  of full scale/ $^{\circ}\text{C}$  ( $\pm 0.01\%$  of full scale/ $^{\circ}\text{F}$ ), typical

**Zero Temperature Coefficient:**  $\pm 0.05\%$  of full scale/ $^{\circ}\text{C}$  ( $\pm 0.025\%$  of full scale/ $^{\circ}\text{F}$ ), typical

**Noise (Filter Output):** 2 mV RMS at zero; 5 to 10 mV RMS at full travel

**Filtered Output (Bandwidth):** DC to 75 Hz (3 dB)

**Unfiltered Output Impedance:** 100  $\Omega$

**Load (recommended):** 20 k $\Omega$

**Operating Temperature Range:**  $-10^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  ( $+12^{\circ}\text{F}$  to  $+122^{\circ}\text{F}$ )

**Total Weight:** 75 g (2.75 oz)

**Spring Rate:** 112 g/cm (4 oz/in)

<sup>3</sup> Calibrated at 6 V.

<sup>4</sup>  $\pm 0.25\%$  and  $\pm 0.1\%$  linearity are available as options (contact the factory for details).

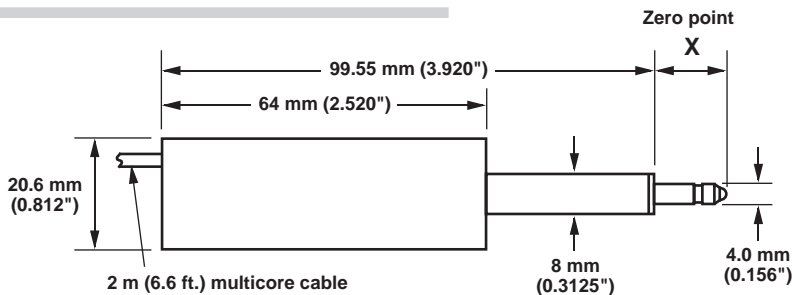
# DC "SE5" HIGH-VOLTAGE LVDT SERIES

## DC-OPERATED SHORT-STROKE SPRING-EXTENDED ARMATURE

These DC-EXCITED SHORT-STROKE LVDT models with SPRING-EXTENDED ARMATURE operate from a simple unregulated power supply to generate two high-level output signals: **±5 V-DC** and **0-10 V-DC**. For standard-output versions, see the [DC "SE" LVDT Series](#).

Each model includes high-quality electronics for energization and signal conditioning. Encapsulated, integrated electronics are suitable for operation in harsh industrial environments. All models are fitted with 2 meters (6.6 ft.) of shielded cable.

**Fig. LT.21**  
**DC "SE5" Series Dimensions**



LVDT Model	Dimension "X" (mm / in.)	Spring Force (nominal) (g)
DSD200SE5	11.5 / 0.45	120
DSD400SE5	12.7 / 0.50	120
DSD600SE5	17.7 / 0.70	245
DSD800SE5	22.25 / 0.875	250

## GENERAL DC "SE5" SPECIFICATIONS

**Linear Range:**

- DSD200SE5:** ±0.1 in. (±2.5 mm)
- DSD400SE5:** ±0.2 in. (±5.0 mm)
- DSD600SE5:** ±0.3 in. (±7.5 mm)
- DSD800SE5:** ±0.4 in. (±10.0 mm)

**Excitation:**

- Using ±5 V-DC Output:** Unregulated ±10 to ±20 V-DC\* or +20 to +40 V-DC; 30 mA typical
- Using 0-10 V-DC Output:** Unregulated ±12 to ±20 V-DC\* or +24 to +40 V-DC; 30 mA typical

**Armature:** [Spring-extended](#)

**Linearity:** ±0.5% of full scale\*\*

**Outputs:**

**Voltage:**

- Output 1:** 0 to 10 V-DC (+0%, -5%)
- Output 2:** -5 to +5 V-DC (+0%, -5%)

**Fluctuation with Supply Fluctuation:**

- Output 1:** 5 mV/V, typical
- Output 2:** 1.25 mV/V, typical

**Load (minimum):**

- Output 1:** 2 kΩ\*\*\*
- Output 2:** 2 kΩ

**Ripple:** 30 mV peak-to-peak

**Bandwidth:** 200 Hz (flat)

**Impedance:** 2 Ω

**Zero Temperature Coefficient:** 0.01% of full scale/°C (0.005% of full scale/°F)

**Span Temperature Coefficient:** 0.03% of full scale/°C (0.015% of full scale/°F)

**Operating Temperature Range:** -50° C to +80° C (-58° F to +176° F)

**Body Weight:** 74 g

\* Must be floating with respect to output. Factory calibration is at ± 15 V-DC.

\*\* ±0.25% and ±0.1% linearity are available as options for some models (contact the factory for details).

\*\*\* 10 kΩ when power supply is less than 26 V.



# DC "LU5" LVDT SERIES

## DC-OPERATED LONG-STROKE UNGUIDED ARMATURE

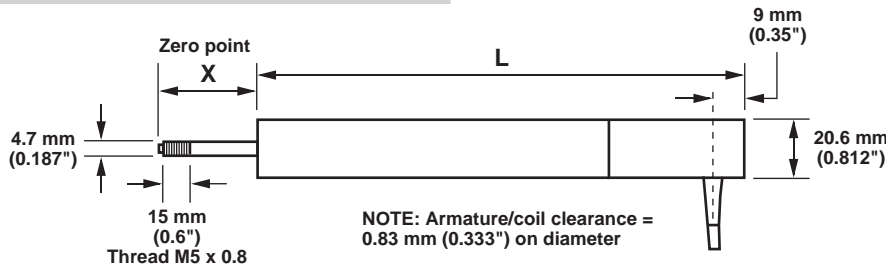
These are the standard DC-EXCITED LONG-STROKE LVDT models with UNGUIDED ARMATURE. Operating from a simple unregulated power supply of +20 to +40 V-DC (or dual  $\pm 10$  to  $\pm 20$  V-DC), each LVDT generates two standard  $\pm 5$  V-DC antiphase output signals.

These two outputs can be used individually, or they can be combined to yield a high-level  $\pm 10$  V-DC "differential output signal." For low-output ( $\pm 2$  V) versions, see the [DC "LU2" LVDT Series](#).\*

Each model includes high-quality electronics for energization and sig-

nal conditioning. Encapsulated, integrated electronics are suitable for operation in harsh industrial environments. All models are fitted with 2 meters (6.6 ft.) of shielded cable.

**Fig. LT.22**  
**DC "LU5" Series Dimensions**



**NOTE:** All dimensions nominal, except diameters, which are  $\pm 0.125$  mm /  $\pm 0.005$  in.

LVDT Model	Linear Range (Nom.) (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Armature Weight (Approx.) (g / oz.)	Total Weight (Approx.) (g / oz.)
DSD1000LU5	$\pm 12.5 / \pm 0.5$	175 / 6.9	43 / 1.7	28 / 1.0	213 / 7.5
DSD2000LU5	$\pm 25.0 / \pm 1.0$	203 / 8.0	69 / 2.7	57 / 2.0	270 / 9.5
DSD4000LU5	$\pm 50.0 / \pm 2.0$	317 / 12.5	81 / 3.2	71 / 2.5	369 / 13.0
DSD6000LU5	$\pm 75.0 / \pm 3.0$	430 / 16.9	119 / 4.7	85 / 3.0	497 / 17.5
DSD8000LU5	$\pm 100 / \pm 4.0$	475 / 18.7	132 / 5.2	99 / 3.5	625 / 22.0
DSD12000LU5	$\pm 150 / \pm 6.0$	666 / 26.2	183 / 7.2	114 / 4.0	852 / 30.0
DSD16000LU5	$\pm 200 / \pm 8.0$	856 / 33.7	259 / 10.2	142 / 5.0	1250 / 44.0

## GENERAL DC "LU5" SPECIFICATIONS

**Excitation:** Unregulated  $\pm 10$  to  $\pm 20$  V-DC or +20 to +40 V-DC; 25 mA maximum\*\*

**Armature:** [Unguided](#)

**Linearity:**  $\pm 0.5\%$  of full scale\*\*\*

**Outputs:**

**Voltage:** Two antiphase outputs,  $\pm 5$  V-DC (nominal), for working stroke (s/c proof)

\* 2-wire 4-20 mA output is also available as an option.

\*\* Factory calibration is at  $\pm 15$  V-DC.

\*\*\*  $\pm 0.25\%$  and  $\pm 0.1\%$  linearity are available as options on some ranges (contact the factory for details).

**Load (minimum):** 2 k $\Omega$  for  $\pm 10$  to  $\pm 20$  V-DC power; 20 k $\Omega$  to +20 to +40 V-DC power

**Ripple:** 30 mV peak-to-peak

**Bandwidth:** 200 Hz (flat)

**Impedance:** 2  $\Omega$

**Zero Temperature Coefficient:** 0.01% of full scale/ $^{\circ}$ C (0.005% of full scale/ $^{\circ}$ F)

**Span Temperature Coefficient:** 0.03% of full scale/ $^{\circ}$ C (0.015% of full scale/ $^{\circ}$ F)

**Operating Temperature Range:**  $-50^{\circ}$  C to  $+70^{\circ}$  C ( $-58^{\circ}$  F to  $+158^{\circ}$  F)

# DC "LU2" Low-Voltage LVDT Series

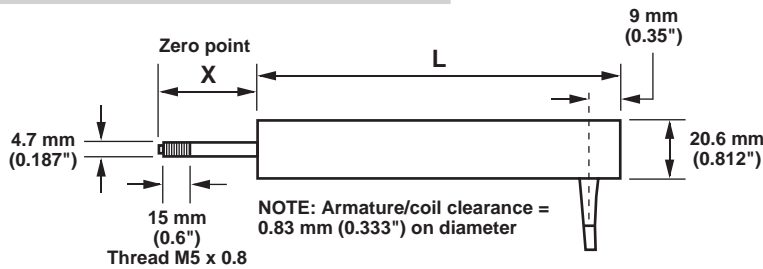
## DC-OPERATED LONG-STROKE UNGUIDED ARMATURE

These are DC-EXCITED LONG-STROKE LVDT models with UNGUIDED ARMATURE, for use in low-voltage applications. They may be used, for example, with digital panelmeters to form a complete readout system.

Unlike the standard [DC "LU5" LVDT Series](#), the DC "LU2" LVDT's operate from either a +5 V-DC *regulated* supply or a +6 to +18 V-DC *unregulated* supply. Each LVDT generates a single output signal of  $\pm 2$  V-DC that is *electrically isolated from the input voltage*.

All models are fitted with 2 meters (6.6 ft.) of shielded cable.

**Fig. LT.23**  
**DC "LU2" Series Dimensions**



**NOTE:** All dimensions nominal, except diameters, which are  $\pm 0.125$  mm /  $\pm 0.005$  in.

LVDT Model	Linear Range (Nom.) (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Armature Weight (Approx.) (g / oz.)	Total Weight (Approx.) (g / oz.)
DSD1000LU2	$\pm 12.5 / \pm 0.5$	175 / 6.9	43 / 1.7	28 / 1.0	213 / 7.5
DSD2000LU2	$\pm 25.0 / \pm 1.0$	203 / 8.0	69 / 2.7	57 / 2.0	270 / 9.5
DSD4000LU2	$\pm 50.0 / \pm 2.0$	317 / 12.5	81 / 3.2	71 / 2.5	369 / 13.0
DSD6000LU2	$\pm 75.0 / \pm 3.0$	430 / 16.9	119 / 4.7	85 / 3.0	497 / 17.5
DSD8000LU2	$\pm 100 / \pm 4.0$	475 / 18.7	132 / 5.2	99 / 3.5	625 / 22.0
DSD12000LU2	$\pm 150 / \pm 6.0$	666 / 26.2	183 / 7.2	114 / 4.0	852 / 30.0
DSD16000LU2	$\pm 200 / \pm 8.0$	856 / 33.7	259 / 10.2	142 / 5.0	1250 / 44.0

### GENERAL DC "LU2" SPECIFICATIONS

**Excitation:** Regulated +5 V-DC  $\pm 10\%$  or unregulated +6 to +18 V-DC; 100 mA, typical\*

**Armature:** [Unguided](#)

**Linearity:**  $\pm 0.5\%$  of full scale\*\*

**Output:**

**Voltage:** Isolated 2.2 V-DC nominal for working stroke (s/c proof)

\* Factory calibration is at  $\pm 12$  V-DC.

\*\*  $\pm 0.25\%$  and  $\pm 0.1\%$  linearity are available as options on some ranges (contact the factory for details).

**Load (minimum):** 2 k $\Omega$

**Ripple:** 30 mV peak-to-peak

**Bandwidth:** 200 Hz (flat)

**Impedance:** 2  $\Omega$

**Zero Temperature Coefficient:** 0.01% of full scale/ $^{\circ}$ C (0.005% of full scale/ $^{\circ}$ F)

**Span Temperature Coefficient:** 0.03% of full scale/ $^{\circ}$ C (0.015% of full scale/ $^{\circ}$ F)

**Operating Temperature Range:**  $-50^{\circ}$  C to  $+70^{\circ}$  C ( $-58^{\circ}$  F to  $+158^{\circ}$  F)

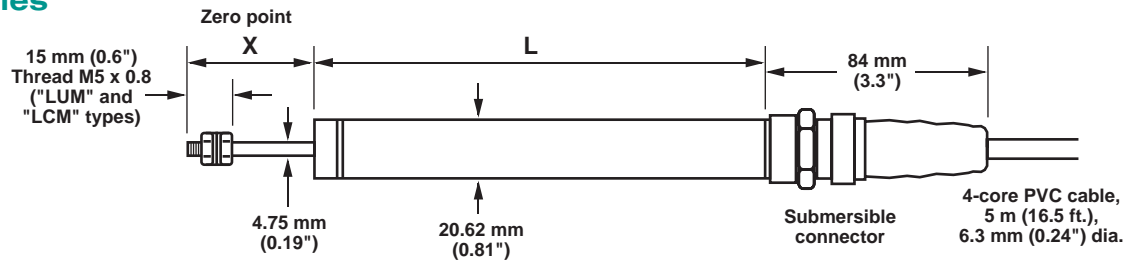
# DC "LUM" SEALED LVDT SERIES

## DC-OPERATED LONG-STROKE UNGUIDED ARMATURE

These units are ideal for industrial use in most fluids and gases. The standard cable connection is by means of a submersible connector, but several other optional versions

are available, providing different cable lengths and pressure ratings (contact the Daytronic factory for details).

**Fig. LT.24**  
**DC "LUM" Series**  
**Dimensions**



LVDT Model	Linear Range (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Armature Weight (g / oz.)
DSD1000LUM	±12.5 / ±0.5	203 / 8.0	38 / 1.5	21 / 0.7
DSD2000LUM	±25.0 / ±1.0	231 / 9.1	63 / 2.48	28 / 1.0
DSD4000LUM	±50.0 / ±2.0	354 / 13.9	76 / 3.0	30 / 1.0
DSD6000LUM	±75.0 / ±3.0	470 / 18.5	114 / 4.48	55 / 1.9
DSD8000LUM	±100 / ±4.0	503 / 19.8	127 / 5.0	67 / 2.4
DSD12000LUM	±150 / ±6.0	707 / 27.8	178 / 7.0	104 / 3.7

## GENERAL DC "LUM" SPECIFICATIONS

**Excitation:** Unregulated ±10 to ±20 V-DC or +20 to +40 V-DC; 45 mA maximum

**Armature:** Unguided

**Linearity:** ±0.5% of full scale\*

**Output Options:** ±5 V-DC; ±10 V-DC; 4-20 mA

**Output Bandwidth:** 200 Hz (flat)

**Zero Temperature Coefficient:** 0.01% of full scale/°C (0.005% of full scale/°F)

**Span Temperature Coefficient:** 0.03% of full scale/°C (0.015% of full scale/°F)

**Operating Temperature Range:** -40° C to +70° C (-40 F to +158° F)

**Pressure Rating:** 10 bar (150 psi)\*\*

\* ±0.25% and ±0.1% linearity are available as options (contact the factory for details).

\*\* Up to 200 bar (3000 psi) available with cable options (contact factory for details).

# DC "LC5" LVDT SERIES

## DC-OPERATED LONG-STROKE CAPTIVE ARMATURE

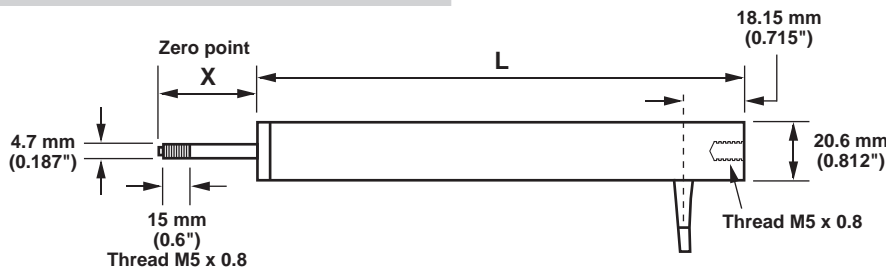
These are the standard DC-EXCITED LONG-STROKE LVDT models with CAPTIVE ARMATURE. Operating from a simple unregulated power supply of +20 to +40 V-DC (or dual ±10 to ±20 V-DC), each LVDT generates two standard ±5 V-DC antiphase output signals.

These two outputs can be used individually, or they can be combined to yield a high-level ±10 V-DC "differential output signal." For low-output (±2 V) versions, see the [DC "LC2" LVDT Series](#).\*

Each model includes high-quality electronics for energization and sig-

nal conditioning. Encapsulated, integrated electronics are suitable for operation in harsh industrial environments. All models are fitted with 2 meters (6.6 ft.) of shielded cable.

**Fig. LT.25**  
**DC "LC5" Series Dimensions**



**NOTE:** All dimensions nominal, except diameters, which are ±0.125 mm / ±0.005 in.

LVDT Model	Linear Range (Nom.) (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Total Weight (Approx.) (g / oz.)
DSD1000LC5	±12.5 / ±0.5	194 / 7.65	38 / 1.5	340 / 12.0
DSD2000LC5	±25.0 / ±1.0	222 / 8.75	63 / 2.5	398 / 14.0
DSD4000LC5	±50.0 / ±2.0	336 / 13.25	76 / 3.0	511 / 18.0
DSD6000LC5	±75.0 / ±3.0	448 / 17.65	114 / 4.5	625 / 22.0
DSD8000LC5	±100 / ±4.0	494 / 19.45	127 / 5.0	767 / 27.0
DSD12000LC5	±150 / ±6.0	686 / 26.95	178 / 7.0	1022 / 36.0
DSD16000LC5	±200 / ±8.0	875 / 34.45	254 / 10.0	1448 / 51.0
DSD20000LC5	±250 / ±10.0	1067 / 42.0	305 / 12.0	1676 / 59.0
DSD30000LC5	±375 / ±15.0	1473 / 58.0	406 / 16.0	2215 / 78.0
DSD37000LC5	±470 / ±18.5	1740 / 68.5	508 / 20.0	2613 / 92.0

## GENERAL DC "LC5" SPECIFICATIONS

**Excitation:** Unregulated ±10 to ±20 V-DC or +20 to +40 V-DC; 25 mA maximum\*\*

**Armature:** [Captive](#)

**Linearity:** ±0.5% of full scale\*\*\*

**Outputs:**

**Voltage:** Two antiphase outputs, ±5 V-DC (nominal), for working stroke (s/c proof)

\* 2-wire 4-20 mA output is also available as an option.

\*\* Factory calibration is at ±15 V-DC.

\*\*\* ±0.25% and ±0.1% linearity are available as options on some ranges (contact the factory for details).

**Load (minimum):** 2 kΩ for ±10 to ±20 V-DC power; 20 kΩ to +20 to +40 V-DC power

**Ripple:** 30 mV peak-to-peak

**Bandwidth:** 200 Hz (flat)

**Impedance:** 2 Ω

**Zero Temperature Coefficient:** 0.01% of full scale/°C (0.005% of full scale/°F)

**Span Temperature Coefficient:** 0.03% of full scale/°C (0.015% of full scale/°F)

**Operating Temperature Range:** -50° C to +70° C (-58° F to +158° F)

LVDT'S  
LOAD CELLS  
PRESSURE TRANSDUCERS  
OTHER TRANSDUCERS

# DC "LC2" Low-Voltage LVDT Series

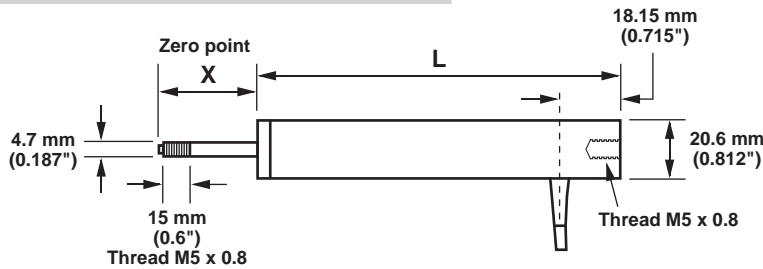
## DC-OPERATED LONG-STROKE CAPTIVE ARMATURE

These are DC-EXCITED LONG-STROKE LVDT models with CAPTIVE ARMATURE, for use in low-voltage applications. They may be used, for example, with digital panelmeters to form a complete readout system.

Unlike the standard [DC "LC5" LVDT Series](#), the DC "LC2" LVDT's operate from either a +5 V-DC *regulated* supply or a +6 to +18 V-DC *unregulated* supply. Each LVDT generates a single output signal of  $\pm 2$  V-DC that is *electrically isolated from the input voltage*.

All models are fitted with 2 meters (6.6 ft.) of shielded cable.

**Fig. LT.26**  
**DC "LC2" Series Dimensions**



**NOTE:** All dimensions nominal, except diameters, which are  $\pm 0.125$  mm /  $\pm 0.005$  in.

LVDT Model	Linear Range (Nom.) (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Total Weight (Approx.) (g / oz.)
DSD1000LC2	$\pm 12.5 / \pm 0.5$	194 / 7.65	38 / 1.5	340 / 12.0
DSD2000LC2	$\pm 25.0 / \pm 1.0$	222 / 8.75	63 / 2.5	398 / 14.0
DSD4000LC2	$\pm 50.0 / \pm 2.0$	336 / 13.25	76 / 3.0	511 / 18.0
DSD6000LC2	$\pm 75.0 / \pm 3.0$	448 / 17.65	114 / 4.5	625 / 22.0
DSD8000LC2	$\pm 100 / \pm 4.0$	494 / 19.45	127 / 5.0	767 / 27.0
DSD12000LC2	$\pm 150 / \pm 6.0$	686 / 26.95	178 / 7.0	1022 / 36.0
DSD16000LC2	$\pm 200 / \pm 8.0$	875 / 34.45	254 / 10.0	1448 / 51.0
DSD20000LC2	$\pm 250 / \pm 10.0$	1067 / 42.0	305 / 12.0	1676 / 59.0
DSD30000LC2	$\pm 375 / \pm 15.0$	1473 / 58.0	406 / 16.0	2215 / 78.0
DSD37000LC2	$\pm 470 / \pm 18.5$	1740 / 68.5	508 / 20.0	2613 / 92.0

## GENERAL DC "LC2" SPECIFICATIONS

**Excitation:** Regulated +5 V-DC  $\pm 10\%$  or unregulated +6 to +18 V-DC; 100 mA, typical\*

**Armature:** [Captive](#)

**Linearity:**  $\pm 0.5\%$  of full scale\*\*

**Output:**

**Voltage:** Isolated 2.2 V-DC nominal for working stroke (s/c proof)

\* Factory calibration is at  $\pm 12$  V-DC.

\*\*  $\pm 0.25\%$  and  $\pm 0.1\%$  linearity are available as options on some ranges (contact the factory for details).

**Load (minimum):** 2 k $\Omega$

**Ripple:** 30 mV peak-to-peak

**Bandwidth:** 200 Hz (flat)

**Impedance:** 2  $\Omega$

**Zero Temperature Coefficient:** 0.01% of full scale/ $^{\circ}$ C (0.005% of full scale/ $^{\circ}$ F)

**Span Temperature Coefficient:** 0.03% of full scale/ $^{\circ}$ C (0.015% of full scale/ $^{\circ}$ F)

**Operating Temperature Range:**  $-50^{\circ}$  C to  $+70^{\circ}$  C ( $-58^{\circ}$  F to  $+158^{\circ}$  F)

LVDT'S  
LOAD CELLS  
PRESSURE TRANSDUCERS  
OTHER TRANSDUCERS

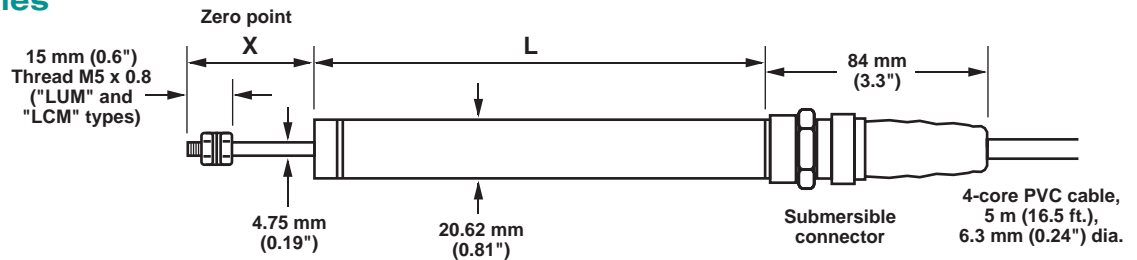
# DC "LCM" SEALED LVDT SERIES

## DC-OPERATED LONG-STROKE CAPTIVE ARMATURE

These units are ideal for industrial use in most fluids and gases. The standard cable connection is by means of a submersible connector, but several other optional versions

are available, providing different cable lengths and pressure ratings (contact the Daytronic factory for details).

**Fig. LT.27**  
**DC "LCM" Series**  
**Dimensions**



LVDT Model	Linear Range (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Armature Weight (g / oz.)
DSD1000LCM	±12.5 / ±0.5	203 / 8.0	38 / 1.5	21 / 0.7
DSD2000LCM	±25.0 / ±1.0	231 / 9.1	63 / 2.48	28 / 1.0
DSD4000LCM	±50.0 / ±2.0	354 / 13.9	76 / 3.0	30 / 1.0
DSD6000LCM	±75.0 / ±3.0	470 / 18.5	114 / 4.48	55 / 1.9
DSD8000LCM	±100 / ±4.0	503 / 19.8	127 / 5.0	67 / 2.4
DSD12000LCM	±150 / ±6.0	707 / 27.8	178 / 7.0	104 / 3.7

## GENERAL DC "LCM" SPECIFICATIONS

**Excitation:** Unregulated ±10 to ±20 V-DC or +20 to +40 V-DC; 45 mA maximum

**Armature:** [Captive](#)

**Linearity:** ±0.5% of full scale\*

**Output Options:** ±5 V-DC; ±10 V-DC; 4-20 mA

**Output Bandwidth:** 200 Hz (flat)

**Zero Temperature Coefficient:** 0.01% of full scale/°C (0.005% of full scale/°F)

**Span Temperature Coefficient:** 0.03% of full scale/°C (0.015% of full scale/°F)

**Operating Temperature Range:** -40° C to +70° C (-40 F to +158° F)

**Pressure Rating:** 10 bar (150 psi)\*\*

\* ±0.25% and ±0.1% linearity are available as options (contact the factory for details).

\*\* Up to 200 bar (3000 psi) available with cable options (contact factory for details).

See [LVDT Model-Numbering System](#).  
See [General LVDT Categories](#).

# DC "LE5" LVDT SERIES

## DC-OPERATED LONG-STROKE SPRING-EXTENDED ARMATURE

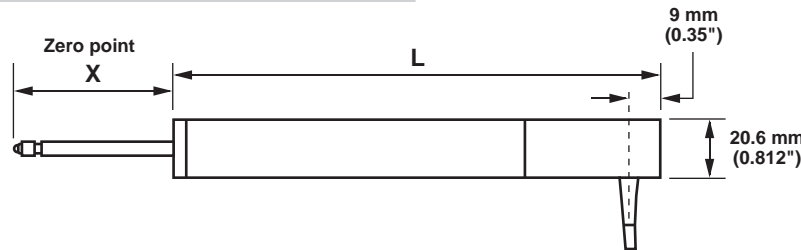
These are the standard DC-EXCITED LONG-STROKE LVDT models with SPRING-EXTENDED ARMATURE. Operating from a simple unregulated power supply of +20 to +40 V-DC (or dual  $\pm 10$  to  $\pm 20$  V-DC), each LVDT generates two standard  $\pm 5$  V-DC antiphase output

signals. These two outputs can be used individually, or they can be combined to yield a high-level  $\pm 10$  V-DC "differential output signal." For low-output ( $\pm 2$  V) versions, see the [DC "LE2" LVDT Series](#).<sup>1</sup>

Each model includes high-quality electronics for energization and sig-

nal conditioning. Encapsulated, integrated electronics are suitable for operation in harsh industrial environments. All models are fitted with 2 meters (6.6 ft.) of shielded cable.

**Fig. LT.28**  
**DC "LE5" Series Dimensions**



**NOTE:** All dimensions nominal, except diameters, which are  $\pm 0.125$  mm /  $\pm 0.005$  in.

LVDT Model	Linear Range (Nom.) (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Total Weight (Approx.) (g / oz.)	Spring Rate <sup>2</sup> (g/cm / oz/in)
DSD1000LE5	$\pm 12.5 / \pm 0.5$	182 / 7.15	38 / 1.5	227 / 8.0	22 / 2
DSD2000LE5	$\pm 25.0 / \pm 1.0$	210 / 8.25	63 / 2.5	284 / 10.0	26 / 2.3
DSD4000LE5	$\pm 50.0 / \pm 2.0$	324 / 12.75	76 / 3.0	398 / 14.0	37 / 3.3
DSD6000LE5	$\pm 75.0 / \pm 3.0$	436 / 17.15	114 / 4.5	511 / 18.0	39 / 3.5

## GENERAL DC "LE5" SPECIFICATIONS

**Excitation:** Unregulated  $\pm 10$  to  $\pm 20$  V-DC or +20 to +40 V-DC; 25 mA maximum<sup>3</sup>

**Armature:** [Spring-extended](#)

**Linearity:**  $\pm 0.5\%$  of full scale<sup>4</sup>

**Outputs:**

**Voltage:** Two antiphase outputs,  $\pm 5$  V-DC (nominal), for working stroke (s/c proof)

**Load (minimum):** 2 k $\Omega$  for  $\pm 10$  to  $\pm 20$  V-DC power; 20 k $\Omega$  to +20 to +40 V-DC power

**Ripple:** 30 mV peak-to-peak

**Bandwidth:** 200 Hz (flat)

**Impedance:** 2  $\Omega$

**Zero Temperature Coefficient:** 0.01% of full scale/ $^{\circ}$ C (0.005% of full scale/ $^{\circ}$ F)

**Span Temperature Coefficient:** 0.03% of full scale/ $^{\circ}$ C (0.015% of full scale/ $^{\circ}$ F)

**Operating Temperature Range:**  $-50^{\circ}$  C to  $+70^{\circ}$  C ( $-58^{\circ}$  F to  $+158^{\circ}$  F)

<sup>1</sup> 2-wire 4-20 mA output is also available as an option.

<sup>2</sup> Other spring rates can be accommodated.

<sup>3</sup> Factory calibration is at  $\pm 15$  V-DC.

<sup>4</sup>  $\pm 0.25\%$  and  $\pm 0.1\%$  linearity are available as options on some ranges (contact the factory for details).

# DC "LE2" Low-Voltage LVDT Series

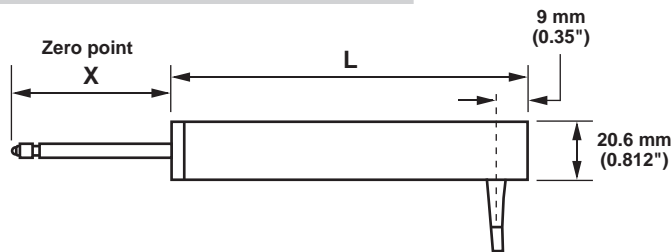
## DC-OPERATED LONG-STROKE SPRING-EXTENDED ARMATURE

These are DC-EXCITED LONG-STROKE LVDT models with SPRING-EXTENDED ARMATURE, for use in low-voltage applications. They may be used, for example, with digital panelmeters to form a complete readout system.

Unlike the standard [DC "LE5" LVDT Series](#), the DC "LE2" LVDT's operate from either a +5 V-DC *regulated* supply or a +6 to +18 V-DC *unregulated* supply. Each LVDT generates a single output signal of  $\pm 2$  V-DC that is *electrically isolated from the input voltage*.

All models are fitted with 2 meters (6.6 ft.) of shielded cable.

**Fig. LT.29**  
**DC "LE2" Series Dimensions**



**NOTE:** All dimensions nominal, except diameters, which are  $\pm 0.125$  mm /  $\pm 0.005$  in.

LVDT Model	Linear Range (Nom.) (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Total Weight (Approx.) (g / oz.)	Spring Rate* (g/cm / oz/in)
DSD1000LE2	$\pm 12.5 / \pm 0.5$	182 / 7.15	38 / 1.5	227 / 8.0	22 / 2
DSD2000LE2	$\pm 25.0 / \pm 1.0$	210 / 8.25	63 / 2.5	284 / 10.0	26 / 2.3
DSD4000LE2	$\pm 50.0 / \pm 2.0$	324 / 12.75	76 / 3.0	398 / 14.0	37 / 3.3
DSD6000LE2	$\pm 75.0 / \pm 3.0$	436 / 17.15	114 / 4.5	511 / 18.0	39 / 3.5

## GENERAL DC "LE2" SPECIFICATIONS

**Excitation:** Regulated +5 V-DC  $\pm 10\%$  or unregulated +6 to +18 V-DC; 100 mA, typical\*\*

**Armature:** [Spring-extended](#)

**Linearity:**  $\pm 0.5\%$  of full scale\*\*\*

**Output:**

**Voltage:** Isolated 2.2 V-DC nominal for working stroke (s/c proof)

\* Other spring rates can be accommodated.

\*\* Factory calibration is at  $\pm 12$  V-DC.

\*\*\*  $\pm 0.25\%$  and  $\pm 0.1\%$  linearity are available as options on some ranges (contact the factory for details).

**Load (minimum):** 2 k $\Omega$

**Ripple:** 30 mV peak-to-peak

**Bandwidth:** 200 Hz (flat)

**Impedance:** 2  $\Omega$

**Zero Temperature Coefficient:** 0.01% of full scale/ $^{\circ}$ C (0.005% of full scale/ $^{\circ}$ F)

**Span Temperature Coefficient:** 0.03% of full scale/ $^{\circ}$ C (0.015% of full scale/ $^{\circ}$ F)

**Operating Temperature Range:**  $-50^{\circ}$  C to  $+70^{\circ}$  C ( $-58^{\circ}$  F to  $+158^{\circ}$  F)

See [LVDT Model-Numbering System](#).  
See [General LVDT Categories](#).



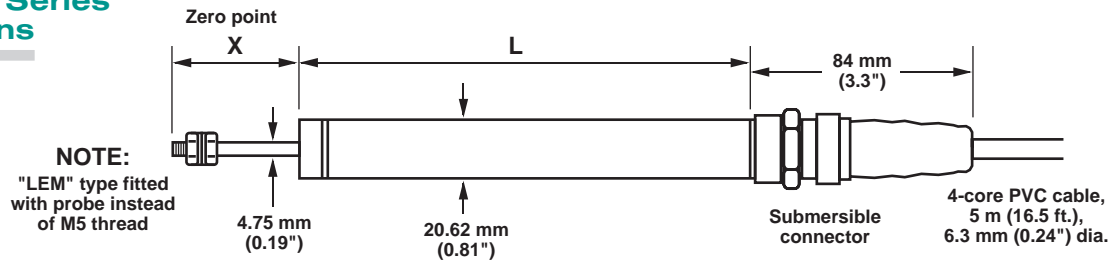
# DC "LEM" SEALED LVDT SERIES

## DC-OPERATED LONG-STROKE SPRING-EXTENDED ARMATURE

These units are ideal for industrial use in most fluids and gases. The standard cable connection is by means of a submersible connector, but several other optional versions

are available, providing different cable lengths and pressure ratings (contact the Daytronic factory for details).

**Fig. LT.30**  
**DC "LEM" Series Dimensions**



LVDT Model	Linear Range (mm / in.)	Dimension "L" (mm / in.)	Dimension "X" (mm / in.)	Armature Weight (g / oz.)	Spring Rate (g/cm / oz/in)
DSD1000LEM	±12.5 / ±0.5	203 / 8.0	38 / 1.5	21 / 0.7	45 / 4
DSD2000LEM	±25.0 / ±1.0	231 / 9.1	63 / 2.48	28 / 1.0	45 / 4
DSD4000LEM	±50.0 / ±2.0	354 / 13.9	76 / 3.0	30 / 1.0	45 / 4
DSD6000LEM	±75.0 / ±3.0	470 / 18.5	114 / 4.48	55 / 1.9	45 / 4

## GENERAL DC "LEM" SPECIFICATIONS

**Excitation:** Unregulated ±10 to ±20 V-DC or +20 to +40 V-DC; 45 mA maximum

**Armature:** [Spring-extended](#)

**Linearity:** ±0.5% of full scale\*

**Output Options:** ±5 V-DC; ±10 V-DC; 4-20 mA

\* ±0.25% and ±0.1% linearity are available as options (contact the factory for details).

\*\* Up to 200 bar (3000 psi) available with cable options (contact factory for details).

**Output Bandwidth:** 200 Hz (flat)

**Zero Temperature Coefficient:** 0.01% of full scale/°C (0.005% of full scale/°F)

**Span Temperature Coefficient:** 0.03% of full scale/°C (0.015% of full scale/°F)

**Operating Temperature Range:** -40° C to +70° C (-40 F to +158° F)

**Pressure Rating:** 10 bar (150 psi)\*\*



# STRAIN GAGE LOAD CELLS

*For precise electrical measurement of weight, torque, tension, and other mechanical forces*

Using 4-arm, 350-Ω bonded foil or 500-Ω bonded semiconductor bridges, these tough stainless-steel load cells yield high accuracy and linearity in any number of industrial and research applications, with exceptional structural resistance to off-axis loading, side-loading, and other extraneous forces (see [Fig. LC.3](#)), and with safe overload protection for up to 50% over capacity. Daytronic provides three basic types of general-purpose DC-excited strain gage load cells:

- [Low-profile \(400 Series\)](#)
- [Miniature \(431, 431M, 434A, and 434AM Series\)](#)
- ["Pancake-thin" \(441 Series\)](#)

Load buttons and other [load cell accessories](#) are also offered.

## HOW THEY WORK

### Strain Gages

The **resistance strain gage** is an electrical sensing device that varies its resistance as a linear function of the strain experienced by the structural surface to which it is bonded. "Strain" is the deformation of a solid material as the result of applied forces (internal or external), and is normally expressed in units of *microinches per inch* (or "micro-strain").

A typical strain gage consists of a conductive grid pattern of etched metallic foil, mounted on a thin base of epoxy or fiberglass. It can then

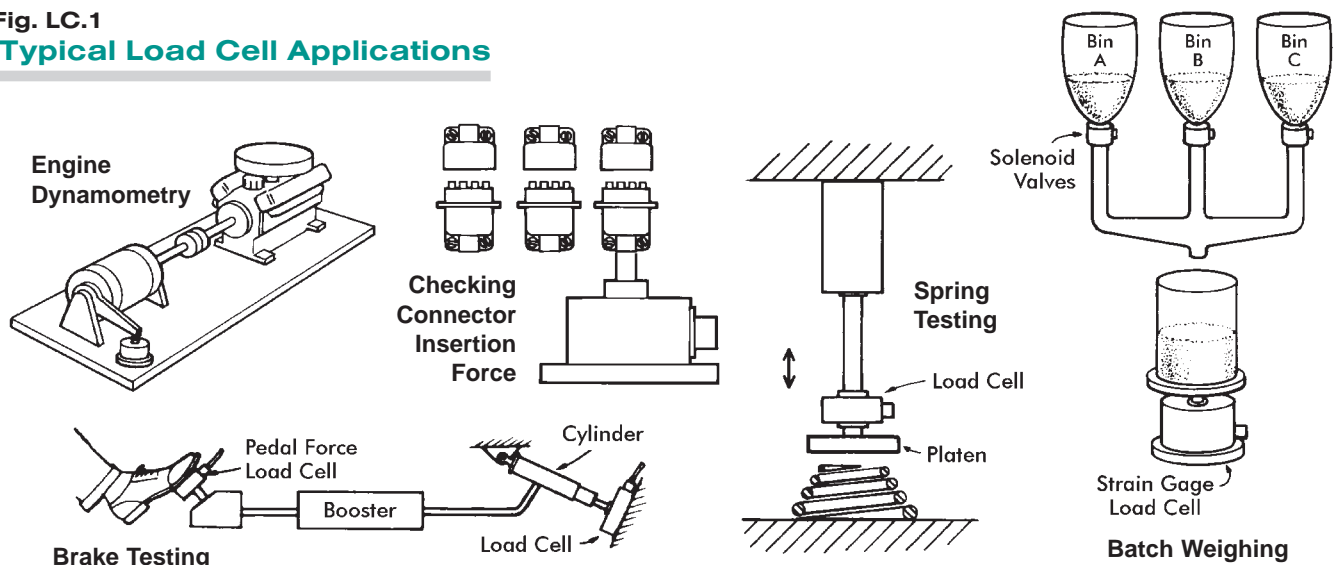
be bonded to a surface in such a way that any subsequent deformation of the surface produces a like deformation of the gage.

When the gage is deformed, its electrical resistance changes. This fact is explained partly by simple geometry. That is, when a conductor is stretched lengthwise, its cross-sectional area decreases, with a consequent increase in resistance. It is also partly explained by changes in the actual *resistivity* of the gage material when subjected to strain.

For a given amount of unit strain ( $\Delta L/L$ ), the gage will undergo a corresponding change in resistance

(cont'd)

**Fig. LC.1**  
**Typical Load Cell Applications**



( $\Delta R/R$ ). The ratio of the unit change in resistance to the unit change in length is known as the *gage factor* ( $F_g$ ) of the gage:

$$F_g = (\Delta R/R)/(\Delta L/L)$$

Conventional foil gages have standardized nominal resistance values of 120 and 350 ohms, and typically exhibit gage factors between 1.5 and 3.5. In typical transducer applications, they are subjected to full-scale design strain levels ranging from 500 to 2000 microstrain.

### Strain Gage Transducers

In transducers, strain gage configurations are employed to measure **weight, pressure, torque**, and similar phenomena, by sensing the deformation of calibrated beams, diaphragms, or other flexures to which *mechanical force* is applied. Strain gage transducers can be rugged, compact, linear, highly accurate, and readily compensated for wide temperature ranges. They can be operated with many types of available AC and DC instruments, and are widely used in industrial and research measurement and control systems.

Through proper flexure design and gage placement, a linear relationship can be achieved between the applied force and the sensed strain. The **Wheatstone Bridge** circuit shown in Fig. LC.2 is almost universally used in load cells and other strain gage transducers, because it facilitates cancellation of unwanted temperature effects.\*

If the gages within a load cell are connected in a balanced Wheatstone Bridge circuit, and are excited by a source of AC or DC voltage, the transducer will produce an electrical output which is a direct linear function of the excitation voltage and the magnitude of the applied mechanical input:

$$E_{out}(mV) = E_{in}(V) \cdot K \cdot F/100$$

where

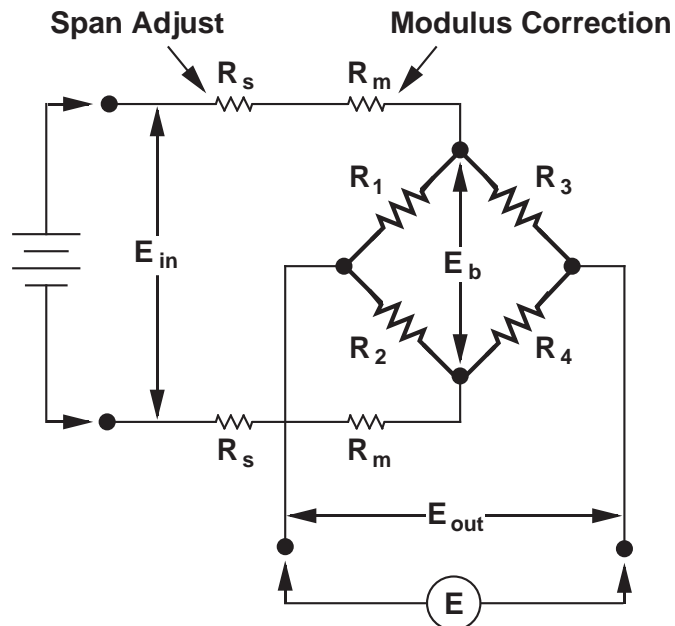
K = Calibration Factor (mV/V, full scale)

F = Input variable (% of full scale)

Transducer sensitivity is expressed in terms of *millivolts per volt*. The exact value of "K" for each instru-

ment is determined by measurement at the time of manufacture and is furnished as part that instrument's calibration data. For conventional transducers, this value usually falls between 0.5 and 3.0

Excitation voltage can be either AC or DC, and is usually limited by heating considerations to a maximum of 10 volts for 120-ohm bridges and 20 volts for 350-ohm bridges (although good practice dictates somewhat lower values).



**Fig. LC.2**  
**Schematic Diagram of a Typical Strain Gage Transducer**

\* In any reliable load cell, thermal expansion and temperature resistance effects must be made to cancel. In particular, temperature effects on the *modulus of elasticity* of the flexure material must be compensated, using carefully trimmed temperature-sensitive resistors ( $R_m$  in Fig. LC.2).

# 400 SERIES GENERAL-PURPOSE LOW-PROFILE LOAD CELLS


**25-300 lb.**

**500-5000 lb.**

These load cells are environmentally sealed, temperature-compensated strain gage sensors capable of highly accurate, highly reliable force measurement under the toughest laboratory and industrial conditions. They demonstrate exceptional structural resistance to damage or measurement error ("crosstalk") from off-axis loading, side loading, and other extraneous forces and bending moments (see Fig. LC.3; "eccentric" loading can also arise from unlevel mounting or thermal expansion of supporting structures).\*

Unique flexure designs, using low deflection values and premium alloy materials, give exceptional fatigue life, plus excellent linearity and hysteresis characteristics. Optional dual bridge is available on request.

All 400 Series transducers may be used in both tension and compression. Standard models in stock

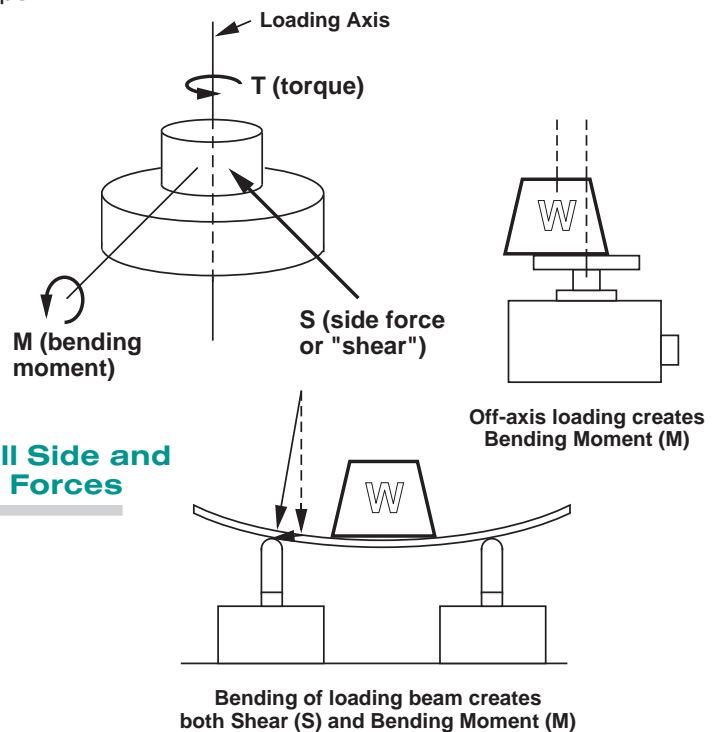
\* [Table LC.1](#) lists 400 Series **Limit Load Values** for static application. These are maximum extraneous forces and moments that can be applied *singly* and simultaneously with *half* the nominal load capacity without causing transducer damage or a permanent shift of zero or calibration. Actual measurement errors ("crosstalk") for each of the limit values tabulated are typically less than 0.2% of the rated (full-scale) output. NOTE: Load cells are designed to respond only to the force component parallel to the loading axis.

cover nominal ranges from  $\pm 25$  through  $\pm 5000$  pounds, with smaller or larger ranges available on special order. All models incorporate sealed barometrically compensated construction, and exhibit a typical zero shift of less than 0.2% of full scale for ambient pressure changes of  $\pm 2$  psi.

Individually tested and calibrated in both tension and compression, each 400 Series transducer is supplied with both "mV/V" and shunt-resistor calibration data, traceable to the National Bureau of Standards.

See [400 Series Specifications](#) and [Load Cell Accessories](#).

(cont'd)



**Fig. LC.3**  
**Load Cell Side and Bending Forces**

# 400 SERIES GENERAL-PURPOSE LOW-PROFILE LOAD CELLS *(cont'd)*

**Table LC.1**  
**400 Series Models**

Load Cell Model	Nominal Load Capacity* (lb. / N)	Ringing Frequency** (Hz)	Limit Loads		
			Bending Moment (M)*** (lb.-in. / N-m)	Shear (S)*** (lb. / N)	Torque (T)*** (lb.-in. / N-m)
400-25	±25 / ±125	2100	150 / 17	150 / 667	40 / 4.5
400-50	±50 / ±200	2800	150 / 17	150 / 667	40 / 4.5
400-100	±100 / ±500	3800	180 / 20	250 / 1100	40 / 4.5
400-200	±200 / ±1000	5400	180 / 20	250 / 1100	40 / 4.5
400-300	±300 / ±1500	7000	180 / 20	250 / 1100	40 / 4.5
400-500	±500 / ±2000	1600	2800 / 316	1400 / 6200	1100 / 124
400-1K	±1000 / ±5000	2000	3900 / 441	2000 / 8900	1100 / 124
400-2K	±2000 / ±10000	3200	5000 / 565	2800 / 12500	1100 / 124
400-3K	±3000 / ±15000	4100	5500 / 621	3400 / 15100	1100 / 124
400-5K	±5000 / ±20000	5000	5500 / 621	4200 / 18700	1100 / 124

## GENERAL 400 SERIES SPECIFICATIONS

**Dimensions:** See [Fig. LC.4](#)

**Deflection at Nominal Load Limit:**

**Models 400-25 through 400-300:** ±0.003 in. (±0.008 cm)

**Models 400-500 through 400-5K:** ±0.005 in. (±0.013 cm)

**Bridge:** Four-arm bonded foil gages, 350 ohms nominal

**Number of Bridges:** 1 or 2

**Insulation Resistance, Bridge/Case:** Greater than 5000 MΩ at 50 V-DC

**Excitation:** 20 V maximum, DC or AC (RMS)

**Output (nominal):**

**Models 400-25 through 400-300:** 2 mV/V ± 0.25% of full scale

**Models 400-500 through 400-5K:** 3 mV/V ± 0.25% of full scale

**Zero Balance:** ±1.0% of full scale

**Linearity and Hysteresis:**

**Models 400-25 through 400-300:** ±0.05% of full scale, maximum

**Models 400-500 through 400-5K:** ±0.10% of full scale, maximum

**Repeatability:**

**Models 400-25 through 400-300:** ±0.02% of full scale

**Models 400-500 through 400-5K:** ±0.05% of full scale

**Overload Capacity:** 150% of nominal rating (*static*)

**Temperature Coefficient (Zero and Span):** Less than 0.002% of full scale/°F

**Compensated Temperature Range:** +70° F to +170° F (+21° C to +77° C)

**Operating Temperature Range:** -65° F to +200° F (-54° C to +93° C)

**Fatigue Life:** 100 million cycles at 0 to 50% of nominal rating (minimum); 50 million cycles at +50% to -50% of nominal rating (minimum)

*(cont'd)*

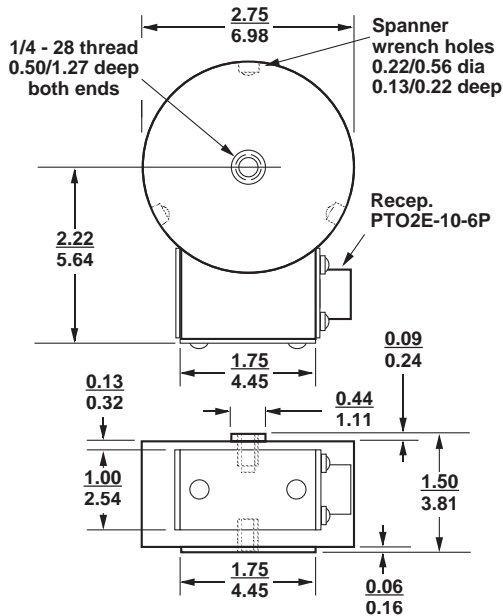
\* Metric rating approximate only.

\*\* Calculated or determined by test with no external force or load.

\*\*\* See [Fig. LC-3](#).

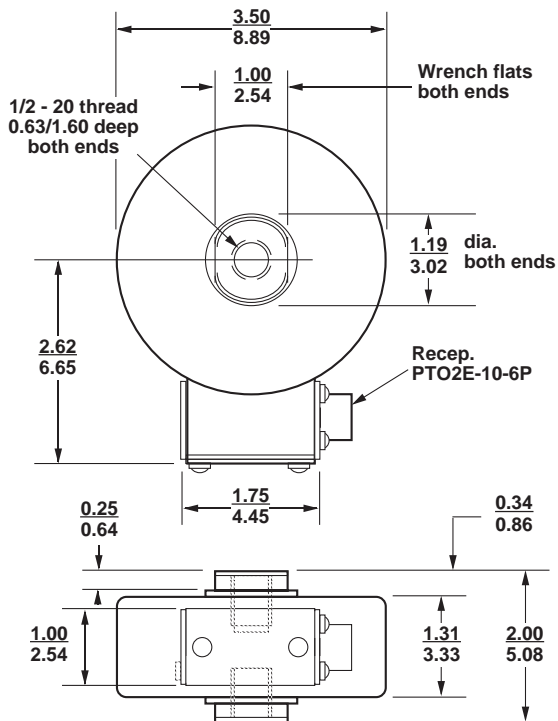
# 400 SERIES GENERAL-PURPOSE LOW-PROFILE LOAD CELLS (cont'd)

**Fig. LC.4**  
400 Series Dimensions (in./cm)

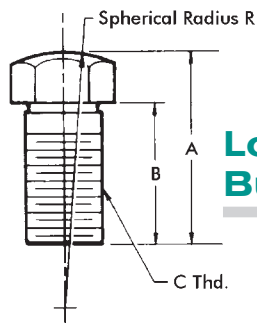


**Fig. LC.4(a)**  
Dimensions for Models  
400-25 through 400-300

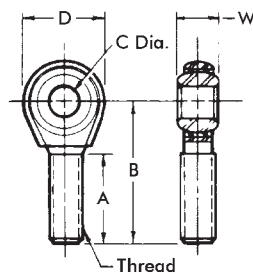
**Fig. LC.4(b)**  
Dimensions for Models  
400-500 through 400-5K



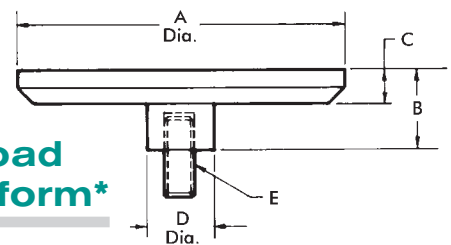
## LOAD CELL ACCESSORIES



**Load Buttons**



**Rod Ends**



**Load Platform\***

All dimensions in inches

A	B	C	R	A	B	C	D	W	Thread	A	B	C	D	E
17/32	3/8	1/4-28	1.0	1	1.562	0.2500	3/4	0.375	1/4-28	2.652	0.625	0.250	0.500	1/4-28 UNF
3/4	3/8	1/2-20	2.0	1 1/2	2.438	0.500	1 5/16	0.625	1/2-20	3.125	0.937	0.312	0.750	1/2-20 UNF

\* May be used with all models of the [400 Series](#), [434A Series](#), and [434AM Series](#).

# 431(M), 434A(M) SERIES

## MINIATURE GENERAL-PURPOSE LOAD CELLS

**434A/434AM  
Series**

**431/431M  
Series**


The **431, 431M, 434A, and 434AM Series** offer the smallest-size strain gage force transducers where good specification can still be maintained. Operating in both tension and compression from forces of 50 grams to 10,000 pounds, these precision miniature load cells have a rugged stainless-steel weld construction with a "tripled" stack design to eliminate or minimize the off-axis loading effects shown in [Fig. LC.3](#). And the internal construc-

tion assures excellent long-term stability for ranges of 1 kg and up.

All the basic engineering concepts of larger load cells are built into these instruments, including precision calibration, stabilizing diaphragms, pressure compensation, etc. Each bonded strain gage unit is built of welded 17-4 PH stainless steel for additional ruggedness.

Models in the **431 and 431M Series** have *male* threads, while the **434A and 434AM Series** have *female* threaded load attachments which can accommodate the Platform shown under [Load Cell Accessories](#).

See [431\(M\), 434A\(M\) Series Specifications](#).

(cont'd)

**Table LC.2**  
**431(M), 434A(M) Series Models**

Load Cell Model	Nominal Load Capacity	Load Cell Model	Nominal Load Capacity	Load Cell Model	Nominal Load Capacity	Load Cell Model	Nominal Load Capacity
<b>431-5</b>	±5 lb.	<b>431M-50</b>	±50 grams	<b>434A-5</b>	±5 lb.	<b>434AM-50</b>	±50 grams
<b>431-10</b>	±10 lb.	<b>431M-150</b>	±150 grams	<b>434A-10</b>	±10 lb.	<b>434AM-150</b>	±150 grams
<b>431-25</b>	±25 lb.	<b>431M-250</b>	±250 grams	<b>434A-25</b>	±25 lb.	<b>434AM-250</b>	±250 grams
<b>431-50</b>	±50 lb.	<b>431M-500</b>	±500 grams	<b>434A-50</b>	±50 lb.	<b>434AM-500</b>	±500 grams
<b>431-100</b>	±100 lb.	<b>431M-1K</b>	±1 kilogram	<b>434A-100</b>	±100 lb.	<b>434AM-1K</b>	±1 kilogram
<b>431-250</b>	±250 lb.			<b>434A-250</b>	±250 lb.		
<b>431-500</b>	±500 lb.			<b>434A-500</b>	±500 lb.		
<b>431-1K</b>	±1000 lb.			<b>434A-1K</b>	±1000 lb.		
<b>431-2K</b>	±2000 lb.						
<b>431-3K</b>	±3000 lb.						
<b>431-4K</b>	±4000 lb.						
<b>431-5K</b>	±5000 lb.						
<b>431-7500</b>	±7500 lb.						
<b>431-10K</b>	±10000 lb.						

**NOTE:** Maximum torque for installation of 431M Series units and of 431 Series units with ranges of less than 25 lb. is 12 lb.-in.

# 431(M), 434A(M) SERIES MINIATURE GENERAL-PURPOSE LOAD CELLS (cont'd)

Fig. LC.5  
431(M), 434A(M) Series Dimensions

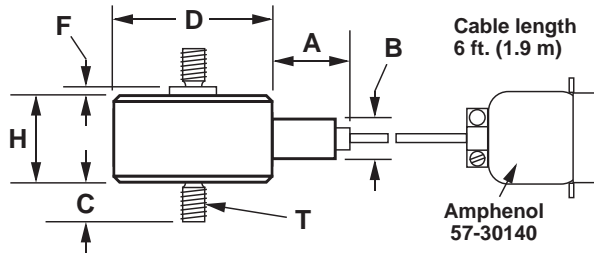


Fig. LC.5(a)  
431/431M Dimensions

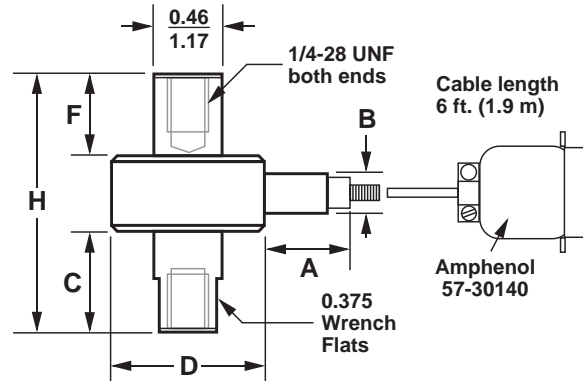


Fig. LC.5(b)  
434A/434AM Dimensions

Load Cell Model	Dimension "A" (in. / cm)	Dimension "B" (in. / cm)	Dimension "C" (in. / cm)	Dimension "D" (in. / cm)	Dimension "F" (in. / cm)	Dimension "H" (in. / cm)	Thread "T"
431-5, 431-10	0.31 / 0.79	0.19 / 0.48	0.25 / 0.64	0.75 / 1.91	0.05 / 0.13	0.45 / 0.11	#6-32 UNC
431-25, 431-50, 431-100	0.50 / 1.27	0.25 / 0.64	0.25 / 0.64	1.00 / 2.54	0.03 / 0.76	0.52 / 1.32	#10-32 UNF
431-250, 431-500, 431-1K	0.50 / 1.27	0.25 / 0.64	0.38 / 0.97	1.00 / 2.54	0.03 / 0.76	0.52 / 1.32	1/4-28 UNF
431-2K, 431-3K	0.50 / 1.27	0.38 / 0.97	0.50 / 1.27	1.00 / 2.54	0.03 / 0.76	0.72 / 1.83	3/8-24 UNF
431-4K, 431-5K	0.50 / 1.27	0.38 / 0.97	0.63 / 1.60	1.25 / 3.18	0.03 / 0.76	0.94 / 2.39	1/2-20 UNF
431-7500, 431-10K	0.50 / 1.27	0.38 / 0.97	0.88 / 2.24	1.38 / 3.51	0.03 / 0.76	1.10 / 2.79	3/4-16 UNF
431M-50 through 431M-500	0.50 / 1.27	0.38 / 0.97	0.25 / 0.64	1.00 / 2.54	0.11 / 0.28	0.75 / 1.91	#6-32 UNC
431M-1K	0.31 / 0.79	0.19 / 0.48	0.25 / 0.64	0.75 / 1.91	0.05 / 0.13	0.45 / 0.11	#6-32 UNC
434A-5, 434A-10	0.31 / 0.79	0.19 / 0.48	0.72 / 1.83	0.75 / 1.91	0.60 / 1.52	1.75 / 4.45	—
434A-25, 434A-50, 434A-100	0.50 / 1.27	0.25 / 0.64	0.72 / 1.83	1.00 / 2.54	0.52 / 1.32	1.75 / 4.45	—
434A-250, 434A-500, 434A-1K	0.50 / 1.27	0.25 / 0.64	0.75 / 1.91	1.00 / 2.54	0.75 / 1.91	2.00 / 5.08	—
434AM-50 through 434AM-500	0.50 / 1.27	0.38 / 0.97	0.52 / 1.32	1.00 / 2.54	0.52 / 1.32	1.75 / 4.45	—
434AM-1K	0.31 / 0.79	0.19 / 0.48	0.72 / 1.83	0.75 / 1.91	0.60 / 1.52	1.75 / 4.45	—

(cont'd)



# 431(M), 434A(M) SERIES MINIATURE GENERAL-PURPOSE LOAD CELLS *(cont'd)*

## GENERAL 431(M), 434A(M) SERIES SPECIFICATIONS

**Dimensions:** See [Fig. LC.5](#)

**Full-Scale Deflection:** 0.0005" to 0.0020"

**Bridge:**

**431 and 434A Series:** Four-arm bonded foil gages, 350 ohms nominal

**431M and 434AM Series (50 through 500 g):** Four-arm bonded semiconductor gages, 500 ohms nominal

**431M and 434AM Series (1 kg):** Four-arm bonded foil gages, 350 ohms nominal

**Insulation Resistance:** 5000 MΩ at 50 V-DC

**Excitation (calibration):**

**431 and 434A Series (5 and 10 lb.):** 5.0 V-DC

**431 and 434A Series (25 lb. and greater):** 10.0 V-DC

**431M and 434AM Series:** 5.0 V-DC\*

**Output (standard)\*\*:**

**431 and 434A Series:** 2 mV/V

**431M and 434AM Series (50 through 150 g):** 0.1 mV/V/g, maximum

**431M and 434AM Series (250 through 500 g):** 20 mV/V

**431M and 434AM Series (1 kg):** 1.5 mV/V, nominal

**Resolution:** Infinite

\* Series 431M and 434AM load cells require *factory adjustment* of excitation voltage when used with Daytronic Strain Gage Conditioners.

\*\* Optional 0-5 V-DC or 4-20 mA output is available. Shunt calibration data is included with the transducer. Standard calibration is in *tension* only.

**Linearity and Hysteresis:**

**431 and 434A Series (5 through 250 lb.):** ±0.15% of full scale

**431 and 434A Series (500 through 10000 lb.):** ±0.2% of full scale

**431M and 434AM Series (50 g through 1 kg):** ±0.15% of full scale

**Repeatability:**

**431 and 434A Series:** ±0.05% of full scale

**431M and 434AM Series (50 g through 1 kg):** ±0.1% of full scale

**Overload Capacity:** 150% of nominal rating (*static*)

**Temperature Coefficient (Zero and Span):**

**431 and 434A Series:** ±0.005% of full scale/°F

**431M and 434AM Series (50 through 500 g):** ±0.015% of full scale/°F

**431M and 434AM Series (1 kg):** ±0.005% of full scale/°F

**Compensated Temperature Range:** +60° F to +160° F (+16° C to +71° C)

**Operating Temperature Range:** -65° F to +250° F (-54° C to +121° C)

**Weight (nominal):**

**431 and 431M Series:** 1.6 oz.

**434A and 434AM Series:** 2.5 oz.

# 441 SERIES

## "PANCAKE-THIN" GENERAL-PURPOSE LOAD CELLS



With ranges of  $\pm 5$  through  $\pm 50000$  pounds\*, the tension/compression load cells of the **441 Series** employ two stabilizing diaphragms which are welded to the sensing member to reduce off-axis and side-loading effects.\*\* Cased in 17-4 PH stainless steel, they have a threaded hole running completely through

the center of the cell. *These models must be used on a flat, smooth surface to achieve rated specifications.*

An optional 1"-thick *Center Pull Plate* is available for attachment to any Series 441 unit. This allows the applied force to be directed along the load axis. *Separate load but-*

*tons* (similar to the one shown under [Load Cell Accessories](#)) may also be obtained, to be threaded directly into the center hole. If required, any Series 441 load cell can be supplied with a *clearance hole* instead of a thread.

(cont'd)

**Table LC.3**  
**441 Series Models\***

Load Cell Model	Nominal Load Capacity	Load Cell Model	Nominal Load Capacity
441-5	$\pm 5$ lb.	441-3K	$\pm 3000$ lb.
441-10	$\pm 10$ lb.	441-4K	$\pm 4000$ lb.
441-25	$\pm 25$ lb.	441-5K	$\pm 5000$ lb.
441-50	$\pm 50$ lb.	441-7500	$\pm 7500$ lb.
441-100	$\pm 100$ lb.	441-10K	$\pm 10000$ lb.
441-250	$\pm 250$ lb.	441-15K	$\pm 15000$ lb.
441-500	$\pm 500$ lb.	441-20K	$\pm 20000$ lb.
441-1K	$\pm 1000$ lb.	441-30K	$\pm 30000$ lb.
441-2K	$\pm 2000$ lb.	441-50K	$\pm 50000$ lb.

\* Ranges above 50000 pounds are available on request.

\*\* Allowable extraneous forces without damage, as % of load capacity, are as follows (see [Fig. LC.3](#)):

	Bending Moment (lb.-in.)	Shear (lb.)	Torque (lb.-in.)	Total Extraneous Force
5 - 500 lb.	40%	50%	25%	100%
1000 - 7500 lb.	25%	30%	25%	100%
10000 - 50000 lb.	20%	20%	15%	100%

## GENERAL 441 SERIES SPECIFICATIONS

**Dimensions:** See [Fig. LC.6](#)

**Full-Scale Deflection:** 0.003"

**Bridge:** Four-arm bonded foil gages, 350 ohms nominal

**Insulation Resistance:** 5000 M $\Omega$  at 50 V-DC

**Excitation:** 10 V-DC (calibration); up to 15 V-DC or AC acceptable

**Output (standard)\*\*\*:**

**Models 441-5 through 441-25:** 2 mV/V, full scale

**Models 441-50 through 441-50K:** 3 mV/V, full scale

**Resolution:** Infinite

\*\*\* Optional 0-5 V-DC or 4-20 mA output is available. Shunt calibration data is included with the transducer. Standard calibration is in *tension* only.

**Linearity:**

**Models 441-5 through 441-25:**  $\pm 0.2\%$  of full scale

**Models 441-50 through 441-50K:**  $\pm 0.1\%$  of full scale

**Hysteresis:**

**Models 441-5 through 441-25:**  $\pm 0.1\%$  of full scale

**Models 441-50 through 441-50K:**  $\pm 0.08\%$  of full scale

**Repeatability:**

**Models 441-5 through 441-25:**  $\pm 0.1\%$  of full scale

**Models 441-50 through 441-50K:**  $\pm 0.03\%$  of full scale

**Overload Capacity:** 150% of nominal rating (*static*)

**Temperature Coefficient (Zero and Span):**  $\pm 0.002\%$  of full scale/ $^{\circ}$ F

**Compensated Temperature Range:**  $+60^{\circ}$  F to  $+160^{\circ}$  F ( $+16^{\circ}$  C to  $+71^{\circ}$  C)

**Operating Temperature Range:**  $-65^{\circ}$  F to  $+250^{\circ}$  F ( $-54^{\circ}$  C to  $+121^{\circ}$  C)

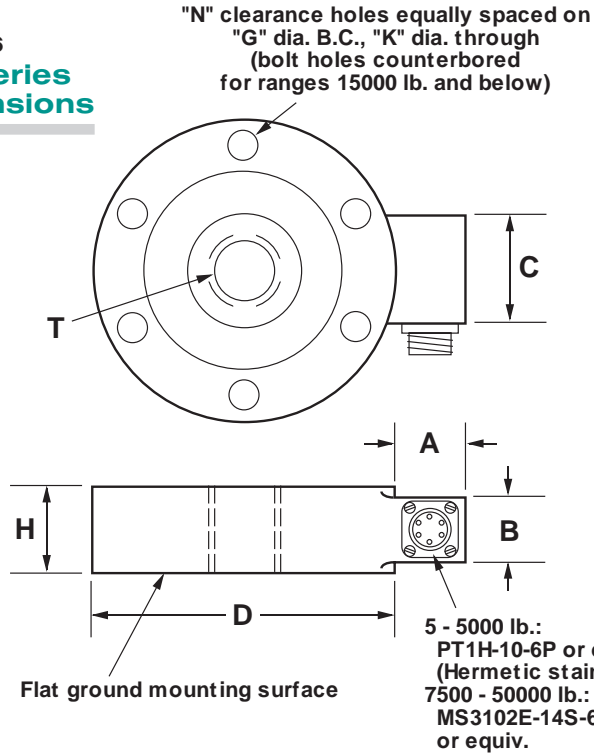
**Daytronic Corporation**

Dayton, OH 45439 • (800) 668-4745

Tel: (937) 866-3300 • Fax: (937) 866-3327 • [www.daytronic.com](http://www.daytronic.com)

# 441 SERIES "PANCAKE-THIN" GENERAL-PURPOSE LOAD CELLS *(cont'd)*

**Fig. LC.6**  
**441 Series**  
**Dimensions**



Load Cell Model	No. of Holes "N"	Thread "T"
441-5 through 441-25	6	1/4-28 UNF
441-50 through 441-1K	6	3/8-24 UNF
441-2K through 441-5K	6	1/2-20 UNF
441-7500 through 441-15K	8	1-14 UNS
441-20K through 441-50K	8	1 1/2-12 UNF

Load Cell Model	Dimension "A" (in. / cm)	Dimension "B" (in. / cm)	Dimension "C" (in. / cm)	Dimension "D" (in. / cm)	Dimension "G" (in. / cm)	Dimension "H" (in. / cm)	Dimension "K" (in. / cm)
441-5 through 441-25	0.82 / 2.08	0.75 / 1.91	1.25 / 3.18	2.50 / 6.35	2.000 / 5.080	0.80 / 2.03	0.19 / 0.48
441-50 through 441-1K	0.82 / 2.08	0.75 / 1.91	1.25 / 3.18	3.00 / 7.62	2.250 / 5.715	1.00 / 2.54	0.28 / 0.71
441-2K through 441-5K	0.82 / 2.08	0.75 / 1.91	1.25 / 3.18	3.50 / 8.89	2.625 / 6.668	1.00 / 2.54	0.34 / 0.86
441-7500 through 441-15K	1.25 / 3.18	1.50 / 3.81	2.00 / 5.08	5.50 / 13.97	4.500 / 11.43	1.80 / 4.57	0.40 / 1.02
441-20K through 441-50K	1.25 / 3.18	1.50 / 3.81	2.00 / 5.08	6.00 / 15.24	4.875 / 12.38	1.80 / 4.57	0.53 / 1.35



# STRAIN GAGE PRESSURE TRANSDUCERS

*For gage, absolute, and differential pressure measurement in industrial and scientific applications*

Using 4-arm, 350-Ω bonded foil **strain gage** bridges, these tough stainless-steel transducers are designed for safe, accurate, and reliable electrical measurement of gas or fluid pressure in any number of industrial and research applications. Daytronic provides the following pressure transducers:

- [Precision Gage/Absolute \(502A Series\)](#)
- [General-Purpose Gage/Absolute \(512 Series\)](#)
- [Low-Cost Gage \(515A Series\)](#)
- [Wet/Wet Differential \(513 Series\)](#)

## THREE TYPES OF PRESSURE MEASUREMENTS

### Gage Pressure

**Gage pressure ("psig")** is pressure measured relative to ambient atmospheric pressure (approximately 14.7 psi). That is, a gage pressure measurement *does not include atmospheric pressure itself*.

For a gage pressure transducer, one side of the pressure-sensing diaphragm must be vented to the local environment. The transducer will then indicate a pressure of "zero" when it is not connected to

the process pressure of interest, but while the sensing element is still exposed to atmospheric pressure.

Gage pressure is actually a kind of differential pressure. It always equals the *difference* between the local absolute pressure and the local atmospheric pressure.

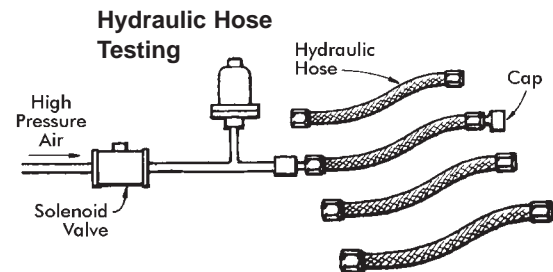
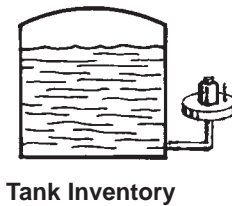
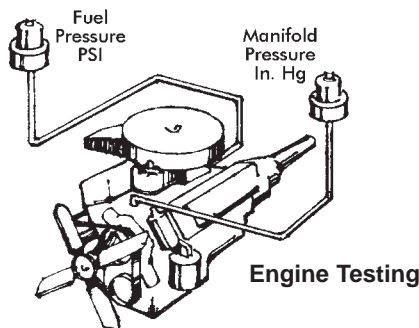
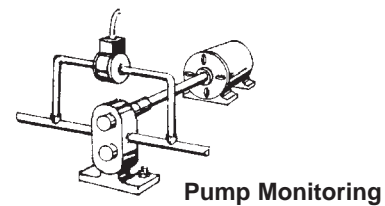
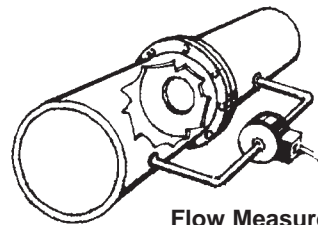
### Absolute Pressure

**Absolute pressure ("psia")** *does include atmospheric pressure*, and is measured relative to vacuum (0 psi).

For an absolute pressure transducer, the reference side of the pressure-sensing diaphragm is isolated

*(cont'd)*

**Fig. PT.1**  
**Typical Pressure Transducer Applications**



from the local environment, being hermetically sealed in a vacuum.\* The transducer will then indicate a pressure of 14.696 pounds per square inch at sea level, when it is not connected to the process pressure of interest, but with the sensing element exposed to atmospheric pressure.

Absolute pressure is always the *sum* of the local "gage" pressure (induced by some source) and the

atmospheric pressure at the location of the measurement.

#### Differential Pressure

**Differential pressure ("psid")** is pressure measured relative to a reference pressure. If the reference pressure is one atmosphere, the differential pressure equals the gage pressure.

Normally, a differential pressure transducer will have two pressure ports, and its pressure reading is

generated by subtracting the pressure at the low port from that at the high port.\*\* Differential pressure may be either absolute or gage, as long as pressure is being measured in the same units at both ports.

\* Absolute pressure sensors are thus not only isolated from environmental contaminants, but (theoretically) have better thermal performance than sealed gage units, because there is no trapped volume of gas to expand and contract with ambient temperature changes.

\*\* One port may be "dry" and the other "wet," or both may be "wet," as with the [513 Series](#), or both may be "dry."

**1 - 1500 psi**


# 502A SERIES

## PRECISION GAGE/ABSOLUTE PRESSURE TRANSDUCERS

**2000 - 15000 psi**

The **502A Series** are rugged transducers designed for industrial applications requiring high-accuracy gas or liquid pressure measurements—within 0.1% of full scale—ranging from 1 to 15000 psi (70 mbar to 1000 bar).\*

All units have welded stainless-steel construction and excellent long-

term stability. **Gage** units employ a special "True Gage" design with a second welded diaphragm that hermetically seals the strain gage circuitry while allowing the transducer to reference atmospheric pressure. Models for **absolute** pressure measurement have an internal sealed "zero" reference.

### GENERAL 502A SERIES SPECIFICATIONS

**Standard Full-Scale Ranges:** See table to [Fig. PT.2](#)

**Type:** Absolute or True Gage\*\*

**Measured Fluids:** Gas, liquid

**Wetted Parts Material:** 17-4 PH Stainless/15-5 PH Stainless

**Case Material:** 17-4 PH Stainless

**Dimensions:** See [Fig. PT.2](#)

**Bridge:** Four-arm bonded foil gages, 350 ohms nominal

**Insulation Resistance to Ground:** 5000 MΩ at 50 V-DC

**Excitation:** 10 V-DC (calibration); up to 12 V-DC or AC acceptable

**Output (standard)\*\*\*:**

**Models 502A-1G and 502A-2G:** 1 mV/V

**All Other Models:** 3 mV/V

**Resolution:** Infinite

**Accuracy:** ±0.1% of full scale

\* Gage and absolute ranges above 15000 psi are available on request.

\*\* Gage pressure units greater than 500 psi (35 bar) are sealed at atmospheric pressure.

\*\*\* Optional 0-5 V-DC or 4-20 mA output is available.

**Overload (safe):** 50% over capacity

**Burst Pressure:**

**Models 502A-1G through 502A-5000(G,A):** 300% over capacity

**Models 502A-7500(G,A) through 502A-10000(G,A):** 200% over capacity

**Model 502A-15000(G,A):** 170% over capacity

**Dead Volume:**

**Models 502A-1G through 502A-5(G,A):** 0.32 in<sup>3</sup>

**Models 502A-10(G,A) and 502A-15(G,A):** 0.25 in<sup>3</sup>

**Models 502A-25(G,A) through 502A-1500(G,A):** 0.17 in<sup>3</sup>

**Models 502A-2000(G,A) through 502A-15000(G,A):** 0.12 in<sup>3</sup>

**Temperature Coefficient (Zero and Span):** ±0.0025% of full scale/°F (±0.0045% of full scale/°C)

**Compensated Temperature Range:** +60° F to +160° F (+16° C to +71° C)

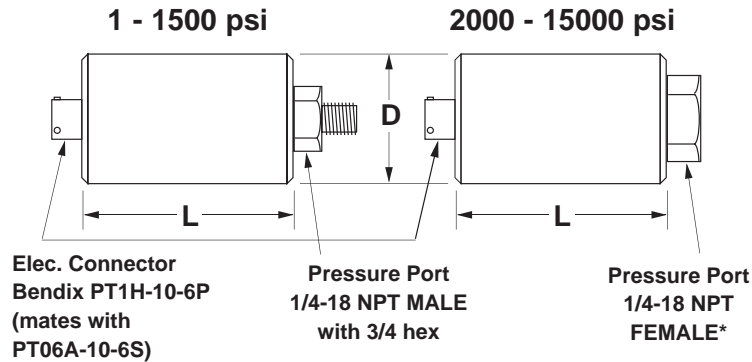
**Operating Temperature Range:** -100° F to +325° F (-73° C to +163° C)

**Weight (nominal):** 10 oz. (283 g)

(cont'd)

# 502A SERIES PRECISION GAGE/ABSOLUTE PRESSURE TRANSDUCERS (cont'd)

**Fig. PT.2**  
**502A Series Dimensions**



Pressure Transducer Model	Full-Scale Range	Dimension "L" (in. / cm)	Dimension "D" (in. / cm)	Pressure Transducer Model	Full-Scale Range	Dimension "L" (in. / cm)	Dimension "D" (in. / cm)
502A-1G	1 psig	1.93 / 4.90	2.25 / 5.72	502A-500G	500 psig	2.00 / 5.08	1.50 / 3.81
502A-2G	2 psig	1.93 / 4.90	2.25 / 5.72	502A-500A	500 psia	2.35 / 5.97	1.50 / 3.81
502A-5G	5 psig	1.93 / 4.90	2.25 / 5.72	502A-750G	750 psig	2.13 / 5.41	1.50 / 3.81
502A-5A	5 psia	2.54 / 6.45	2.25 / 5.72	502A-750A	750 psia	2.35 / 5.97	1.50 / 3.81
502A-10G	10 psig	2.00 / 5.08	1.75 / 4.45	502A-1000G	1000 psig	2.13 / 5.41	1.50 / 3.81
502A-10A	10 psia	2.35 / 5.97	1.50 / 3.81	502A-1000A	1000 psia	2.35 / 5.97	1.50 / 3.81
502A-15G	15 psig	2.00 / 5.08	1.75 / 4.45	502A-1500G	1500 psig	2.13 / 5.41	1.50 / 3.81
502A-15A	15 psia	2.35 / 5.97	1.50 / 3.81	502A-1500A	1500 psia	2.35 / 5.97	1.50 / 3.81
502A-25G	25 psig	2.00 / 5.08	1.50 / 3.81	502A-2000G	2000 psig	2.13 / 5.41	1.50 / 3.81
502A-25A	25 psia	2.35 / 5.97	1.50 / 3.81	502A-2000A	2000 psia	2.35 / 5.97	1.50 / 3.81
502A-50G	50 psig	2.00 / 5.08	1.50 / 3.81	502A-3000G	3000 psig	1.90 / 4.83	1.50 / 3.81
502A-50A	50 psia	2.35 / 5.97	1.50 / 3.81	502A-3000A	3000 psia	1.90 / 4.83	1.50 / 3.81
502A-75G	75 psig	2.00 / 5.08	1.50 / 3.81	502A-5000G	5000 psig	1.90 / 4.83	1.50 / 3.81
502A-75A	75 psia	2.35 / 5.97	1.50 / 3.81	502A-5000A	5000 psia	1.90 / 4.83	1.50 / 3.81
502A-100G	100 psig	2.00 / 5.08	1.50 / 3.81	502A-7500G	7500 psig	1.90 / 4.83	1.50 / 3.81
502A-100A	100 psia	2.35 / 5.97	1.50 / 3.81	502A-7500A	7500 psia	1.90 / 4.83	1.50 / 3.81
502A-150G	150 psig	2.00 / 5.08	1.50 / 3.81	502A-10000G	10000 psig	1.90 / 4.83	1.50 / 3.81
502A-150A	150 psia	2.35 / 5.97	1.50 / 3.81	502A-10000A	10000 psia	1.90 / 4.83	1.50 / 3.81
502A-200G	200 psig	2.00 / 5.08	1.50 / 3.81	502A-15000G	15000 psig	1.90 / 4.83	1.50 / 3.81
502A-200A	200 psia	2.35 / 5.97	1.50 / 3.81	502A-15000A	15000 psia	1.90 / 4.83	1.50 / 3.81
502A-300G	300 psig	2.00 / 5.08	1.50 / 3.81				
502A-300A	300 psia	2.35 / 5.97	1.50 / 3.81				

\* Autoclave AE F250-C for 15000-psi version.

**10 - 1500 psi**


# 512 SERIES

## GENERAL-PURPOSE GAGE/ABSOLUTE PRESSURE TRANSDUCERS

**2000 - 10000 psi**

Cased in 17-4 PH stainless steel, these general industrial transducers offer high reliability for both **gage** and **absolute** pressure measurements from 10 to 10000 psi (700 mbar to 700 bar)\*.

Gage models for ranges of 500 psig and below are drift-free "true

gage" design, with a second welded diaphragm to hermetically seal the gage reference from moisture or corrosive gases. A small hole vents the second diaphragm to ambient pressure.

All absolute models have an internal sealed 0-psia reference.

### GENERAL 512 SERIES SPECIFICATIONS

**Standard Full-Scale Ranges\*:** See table to [Fig. PT.3](#)

**Type:** Absolute or True Gage\*\*

**Measured Fluids:** Gas, liquid

**Case and Wetted Parts Material:** 17-4 PH Stainless

**Dimensions:** See [Fig. PT.3](#)

**Bridge:** Four-arm bonded foil gages, 350 ohms nominal

**Insulation Resistance to Ground:** 5000 MΩ at 50 V-DC

**Excitation:** 10 V-DC (calibration); up to 12 V-DC or AC acceptable

**Output (standard)\*\*\*:** 3 mV/V

**Resolution:** Infinite

**Accuracy:** ±0.25% of full scale

**Linearity:** ±0.15% of full scale

**Hysteresis:** ±0.10% of full scale

**Repeatability:** ±0.05% of full scale

**Overload (safe):** 50% over capacity

**Burst Pressure:**

**Models 512-10(G,A) through 512-5000(G,A):** 300% over capacity

**Models 512-7500(G,A) through 512-10000(G,A):** 200% over capacity

**Dead Volume:**

**Models 512-10(G,A) and 512-15(G,A):** 0.25 in<sup>3</sup>

**Models 512-25(G,A) through 512-1500(G,A):** 0.17 in<sup>3</sup>

**Models 512-2000(G,A) through 512-10000(G,A):** 0.12 in<sup>3</sup>

**Temperature Coefficient (Zero and Span):** ±0.005% of full scale/°F (±0.009% of full scale/°C)

**Compensated Temperature Range:** +60° F to +160° F (+16° C to +71° C)

**Operating Temperature Range:** -100° F to +325° F (-73° C to +163° C)

**Weight (nominal):** 10 oz. (283 g)

\* Gage and absolute ranges below 10 psi and above 10000 psi are available on request.

\*\* Gage pressure units greater than 500 psi (35 bar) are sealed at atmospheric pressure.

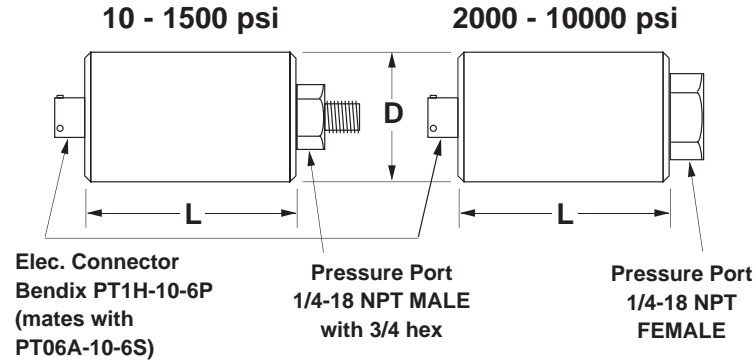
\*\*\* Optional 0-5 V-DC or 4-20 mA output is available.

(cont'd)



# 512 SERIES GENERAL-PURPOSE GAGE/ ABSOLUTE PRESSURE TRANSDUCERS (cont'd)

**Fig. PT.3**  
**512 Series Dimensions**



Pressure Transducer Model	Full-Scale Range	Dimension "L" (in. / cm)	Dimension "D" (in. / cm)	Pressure Transducer Model	Full-Scale Range	Dimension "L" (in. / cm)	Dimension "D" (in. / cm)
<b>512-10G</b>	10 psig	2.00 / 5.08	1.75 / 4.45	<b>512-500G</b>	500 psig	2.00 / 5.08	1.50 / 3.81
<b>512-10A</b>	10 psia	2.35 / 5.97	1.50 / 3.81	<b>512-500A</b>	500 psia	2.35 / 5.97	1.50 / 3.81
<b>512-15G</b>	15 psig	2.00 / 5.08	1.75 / 4.45	<b>512-750G</b>	750 psig	2.13 / 5.41	1.50 / 3.81
<b>512-15A</b>	15 psia	2.35 / 5.97	1.50 / 3.81	<b>512-750A</b>	750 psia	2.35 / 5.97	1.50 / 3.81
<b>512-25G</b>	25 psig	2.00 / 5.08	1.50 / 3.81	<b>512-1000G</b>	1000 psig	2.13 / 5.41	1.50 / 3.81
<b>512-25A</b>	25 psia	2.35 / 5.97	1.50 / 3.81	<b>512-1000A</b>	1000 psia	2.35 / 5.97	1.50 / 3.81
<b>512-50G</b>	50 psig	2.00 / 5.08	1.50 / 3.81	<b>512-1500G</b>	1500 psig	2.13 / 5.41	1.50 / 3.81
<b>512-50A</b>	50 psia	2.35 / 5.97	1.50 / 3.81	<b>512-1500A</b>	1500 psia	2.35 / 5.97	1.50 / 3.81
<b>512-75G</b>	75 psig	2.00 / 5.08	1.50 / 3.81	<b>512-2000G</b>	2000 psig	2.13 / 5.41	1.50 / 3.81
<b>512-75A</b>	75 psia	2.35 / 5.97	1.50 / 3.81	<b>512-2000A</b>	2000 psia	2.35 / 5.97	1.50 / 3.81
<b>512-100G</b>	100 psig	2.00 / 5.08	1.50 / 3.81	<b>512-3000G</b>	3000 psig	1.90 / 4.83	1.50 / 3.81
<b>512-100A</b>	100 psia	2.35 / 5.97	1.50 / 3.81	<b>512-3000A</b>	3000 psia	1.90 / 4.83	1.50 / 3.81
<b>512-150G</b>	150 psig	2.00 / 5.08	1.50 / 3.81	<b>512-5000G</b>	5000 psig	1.90 / 4.83	1.50 / 3.81
<b>512-150A</b>	150 psia	2.35 / 5.97	1.50 / 3.81	<b>512-5000A</b>	5000 psia	1.90 / 4.83	1.50 / 3.81
<b>512-200G</b>	200 psig	2.00 / 5.08	1.50 / 3.81	<b>512-7500G</b>	7500 psig	1.90 / 4.83	1.50 / 3.81
<b>512-200A</b>	200 psia	2.35 / 5.97	1.50 / 3.81	<b>512-7500A</b>	7500 psia	1.90 / 4.83	1.50 / 3.81
<b>512-300G</b>	300 psig	2.00 / 5.08	1.50 / 3.81	<b>512-10000G</b>	10000 psig	1.90 / 4.83	1.50 / 3.81
<b>512-300A</b>	300 psia	2.35 / 5.97	1.50 / 3.81	<b>512-10000A</b>	10000 psia	1.90 / 4.83	1.50 / 3.81



# 515A SERIES

## LOW-COST GAGE

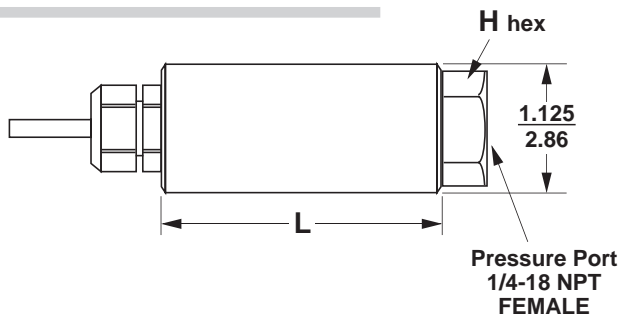
## PRESSURE

## TRANSDUCERS

These pressure transducers offer an economical alternative with good performance for high-volume **gauge** requirements from 300 to 10000 psi (21 to 700 bar)\*. Each unit is constructed of welded stain-

less steel for durability in dry rugged environments. Both gas and liquid pressure overloads of up to 50% over capacity are safely accepted.

**Fig. PT.4**  
**515A Series Dimensions**



Pressure Transducer Model	Full-Scale Range	Dimension "L" (in. / cm)	"H" Hex (in.)
515A-300G	300 psig	2.00 / 5.08	0.875
515A-500G	500 psig	2.00 / 5.08	0.875
515A-750G	750 psig	2.00 / 5.08	0.875
515A-1000G	1000 psig	1.78 / 4.52	0.750
515A-1500G	1500 psig	1.78 / 4.52	0.750
515A-2000G	2000 psig	1.78 / 4.52	0.750
515A-3000G	3000 psig	1.78 / 4.52	0.750
515A-5000G	5000 psig	1.78 / 4.52	0.750
515A-7500G	7500 psig	1.78 / 4.52	0.750
515A-10000G	10000 psig	1.78 / 4.52	0.750

### GENERAL 515A SERIES SPECIFICATIONS

**Type:** Gage

**Measured Fluids:** Gas, liquid

**Case and Wetted Parts Material:** Stainless steel

**Bridge:** Four-arm bonded foil gages, 350 ohms nominal

**Excitation:** 10 V-DC

**Output (nominal):** 2 mV/V

**Resolution:** Infinite

**Accuracy:** ±0.5% of full scale

**Overload (safe):** 50% over capacity

**Zero Temperature Coefficient:** ±0.01% of full scale/°F

**Span Temperature Coefficient:** ±0.02% of full scale/°F

**Compensated Temperature Range:** +60° F to +160° F  
(+16° C to +71° C)

**Operating Temperature Range:** -65° F to +250° F  
(-54° C to +121° C)

**Electrical Termination (standard):** 3-ft. cable

\* Ranges below 300 psig are available on request.

# 513 SERIES

## WET/WET DIFFERENTIAL PRESSURE TRANSDUCERS

**0.5 - 25 psid**

**2000 - 10000  
psid**
**50 - 750 psid**

**Series 513** Pressure Transducers are bi-directional wet-wet (BDWW) sensors designed for a wide range of **differential** measurements where both pressure sources can involve wet or corrosive fluids, each port having a welded, stainless-steel diaphragm. Typical applications include flow measurement, depth sensing, pressure equalization, and liquid level.

Series 513 models are constructed of stainless-steel, and come in three sizes, depending on nominal range (see the table below). All units feature mechanical stops to prevent damage when infrequently overloaded. The diaphragm will hit the stops at about 50% above full-scale range, thus minimizing the possibility of damage from depressurization of one input line. Low- and middle-range units include viton O-ring

seals (metal seals optional). All high-range units have metal seals.

See [513 Series Specifications](#).

**Table PT.1**  
**513 Series Models\***

Low Ranges		Middle Ranges		High Ranges	
Pressure Transducer Model	Full-Scale Range	Pressure Transducer Model	Full-Scale Range	Pressure Transducer Model	Full-Scale Range
<b>513-.5D</b>	0.5 psid	<b>513-50D</b>	50 psid	<b>513-2000D</b>	2000 psid
<b>513-1D</b>	1 psid	<b>513-75D</b>	75 psid	<b>513-3000D</b>	3000 psid
<b>513-2D</b>	2 psid	<b>513-100D</b>	100 psid	<b>513-5000D</b>	5000 psid
<b>513-5D</b>	5 psid	<b>513-150D</b>	150 psid	<b>513-7500D</b>	7500 psid
<b>513-10D</b>	10 psid	<b>513-200D</b>	200 psid	<b>513-10000D</b>	10000 psid
<b>513-15D</b>	15 psid	<b>513-300D</b>	300 psid		
<b>513-25D</b>	25 psid	<b>513-500D</b>	500 psid		
		<b>513-750D</b>	750 psid		

(cont'd)

\* Transducers with exceptionally high differential pressure (up to 30000 psid) or extremely high line pressure (up to 50000 psi) are available on request.

# 513 SERIES WET/WET DIFFERENTIAL PRESSURE TRANSDUCERS (cont'd)

LVDT'S

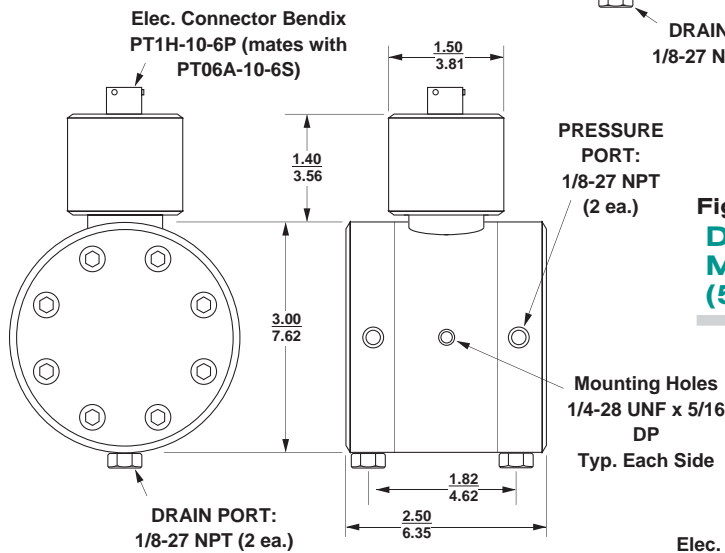
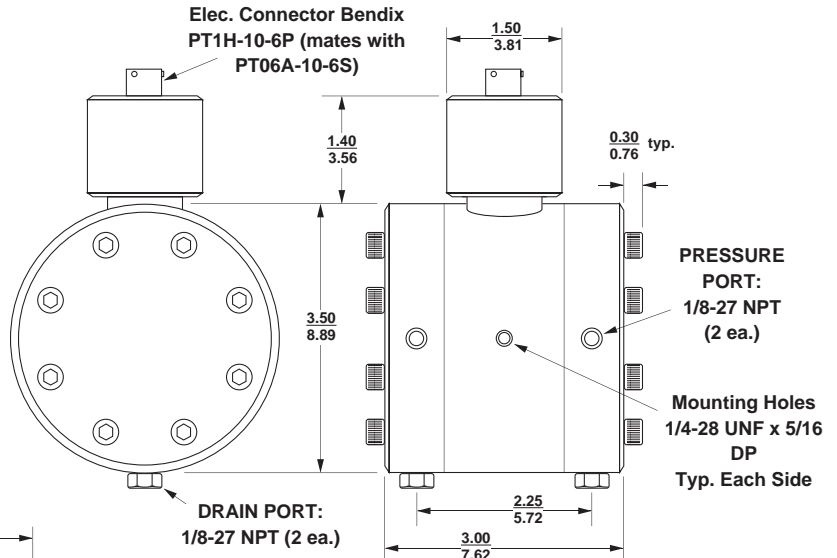
LOAD CELLS

PRESSURE TRANSDUCERS

OTHER TRANSDUCERS

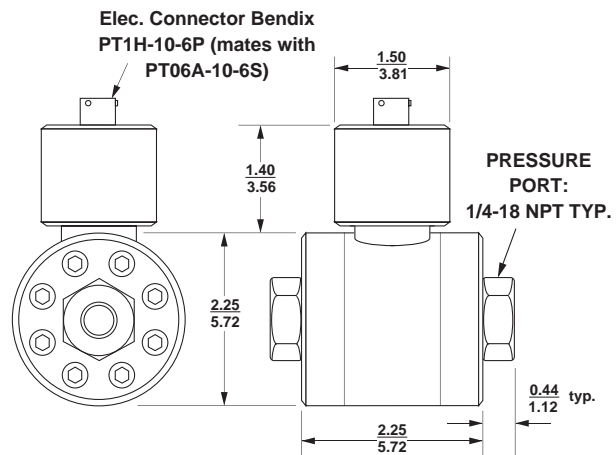
**Fig. PT.6**  
**513 Series Dimensions (in./cm)**

**Fig. PT.6(a)**  
**Dimensions for Low-Range Models (513-5D through 513-25D)**



**Fig. PT.6(b)**  
**Dimensions for Middle-Range Models (513-50D through 513-750D)**

**Fig. PT.6(c)**  
**Dimensions for High-Range Models (513-2000D through 513-10000D)**



(cont'd)

# 513 SERIES WET/WET DIFFERENTIAL PRESSURE TRANSDUCERS *(cont'd)*

## GENERAL 513 SERIES SPECIFICATIONS

**Standard Full-Scale Ranges:** See [Table PT.1](#)

**Type:** Differential

**Measured Fluids:** Gas, liquid

**Case Material:**

- Models 513-.5D through 513-25D:** 316 Stainless
- Models 513-50D through 513-750D:** 17-4 Stainless
- Models 513-2000D through 513-10000D:** 17-4 PH Stainless

**Wetted Parts Material:**

- Models 513-.5D through 513-25D:** 316 Stainless
- Models 513-50D through 513-750D:** 17-4 PH Stainless
- Models 513-2000D through 513-10000D:** 17-4 PH Stainless

**O-Ring Seals:**

- Models 513-.5D through 513-750D:** Viton
- Models 513-2000D through 513-10000D:** Metal

**Dimensions:** See [Fig. PT.6](#)

**Bridge:** Four-arm bonded foil gages, 350 ohms nominal

**Insulation Resistance to Ground:** 5000 MΩ at 50 V-DC

**Excitation:** 10 V-DC (calibration); up to 10 V-DC or AC acceptable

**Output (standard)\*:**

- Model 513-.5D:** 1.0 mV/V
- Models 513-1D and 513-2D:** 1.5 mV/V
- All Other Models:** 2 mV/V

**Resolution:** Infinite

**Accuracy:** ±0.25% of full scale

**Linearity:** ±0.15% of full scale

**Hysteresis:** ±0.10% of full scale

**Repeatability:** ±0.05% of full scale

**Line Pressure (maximum):**

- Models 513-.5D through 513-750D:** 1500 psi
- Models 513-2000D through 513-10000D:** 2000 psi

**Overload (safe, either side):**

- Models 513-.5D through 513-750D:** 1500 psi
- Models 513-2000D and 513-3000D:** 100% over capacity
- Models 513-5000D through 513-10000D:** 50% over capacity

**Dead Volume:**

- Models 513-.5D through 513-25D:** 0.4 in<sup>3</sup>
- Models 513-50D through 513-750D:** 0.25 in<sup>3</sup>
- Models 513-2000D through 513-10000D:** 0.06 in<sup>3</sup>

**Temperature Coefficient (Zero and Span):** ±0.5% of full scale/100°F

**Compensated Temperature Range:**

- Models 513-.5D through 513-25D:** +30° F to +130° F (-1° C to +54° C)
- Models 513-750D through 513-10000D:** +60° F to +160° F (+16° C to +71° C)

**Operating Temperature Range:**

- Models 513-.5D through 513-25D:** +30° F to +190° F (-1° C to +88° C)
- Models 513-750D through 513-10000D:** -65° F to +250° F (-54° C to +121° C)

**Weight (nominal):**

- Models 513-.5D through 513-25D:** 8.3 lb.
- Models 513-50D through 513-750D:** 5.0 lb.
- Models 513-2000D through 513-10000D:** 4.0 lb.

\* Optional 0-5 V-DC or 4-20 mA output is available. Shunt calibration data is included for all models.



# MODEL MP1A

## HIGH-SENSITIVITY MAGNETIC PICKUP



*For reliable measurement of flow and rpm, or for other tachometric, counting, or accumulating applications*

### How It Works

A **magnetic pickup** is essentially a coil wound around a permanently magnetized probe. When discrete ferromagnetic objects—such as gear teeth, turbine rotor blades, slotted discs, or shafts with keyways—are passed through the probe's magnetic field, the flux density is modulated. This induces AC voltages in the coil. One complete cycle of voltage is generated for each object passed. If the objects are evenly spaced on a rotating shaft, the total *number of cycles* will be a measure of the *total rotation*, and the *frequency* of the AC voltage will be directly proportional to the *rotational speed* of the shaft.\*

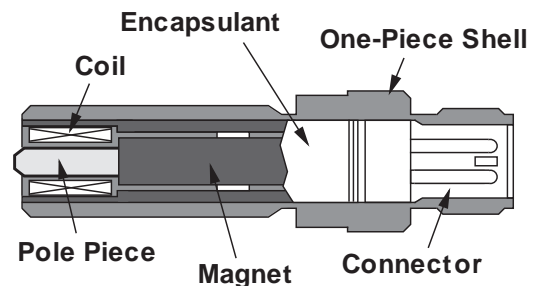
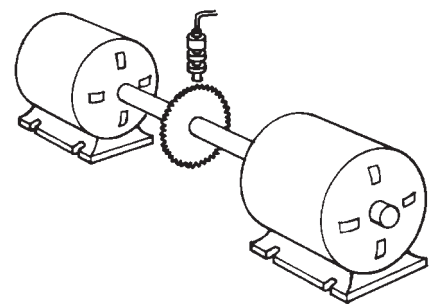
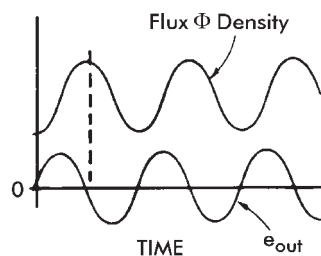
Fig. OT.3 shows a magnetic pickup used in conjunction with a *60-tooth gear* to measure the rpm of a rotating shaft. Such a gear is often selected because the output frequency (in Hz) is numerically equal to *rpm*—a situation that allows frequency meters to be employed without calibration. For very high

rotational speeds, a smaller number of teeth may be called for.

Illustrating a similar principle, [Fig. OT.4](#) shows how a turbine flowmeter can measure the *volumetric flow* of a fluid. The fluid flow exerts a force on the turbine blades, causing the meter to rotate. In properly designed flowmeters, the output

*(cont'd)*

**Fig. OT.3**  
**Typical Magnetic Pickup**



\* Output waveform is a function not only of rotational speed, but also of gear-tooth dimensions and spacing, pole-piece diameter, and the air gap between the pickup and the gear-tooth surface. The pole-piece diameter should be less than or equal to both the gear width and the dimension of the tooth's top (flat) surface; the space between adjacent teeth should be approximately three times this diameter. Ideally, the air gap should be as small as possible—typically 0.005". A number of steel or cast-iron gears, precisely manufactured to AGMA standards, are available for use with the Model MP1A. The standard solid gear comes with various dimensions and with 48, 60, 72, 96, or 120 teeth. For assistance in selecting proper gear type and size, contact the factory.

# MODEL MP1A HIGH-SENSITIVITY MAGNETIC PICKUP (cont'd)

frequency produced by the magnetic pickup is a linear function of the volumetric flow rate. Each output cycle therefore represents the passage of a known volume of fluid, and the flowmeter can be accordingly calibrated in *cycles per gallon* or similar units. This rating is known as the "K factor" of the flowmeter. It will vary somewhat with viscosity and flow rate, but is usually quite predictable, with repeatability to within 0.1% in many units.

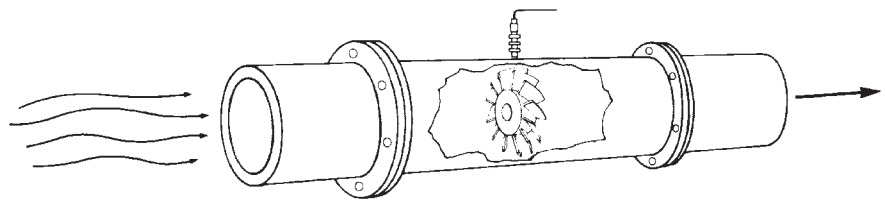
A magnetic pickup may also be used as a timing or synchronization device—as, for example, in ignition timing of gasoline engines, angular positioning of rotating parts, or stroboscopic triggering of mechanical motion.

### The Model MP1A

The **Model MP1A Magnetic Pickup** is a fast, general-purpose sensor, providing an effective, accurate means of measuring the speed and frequency of mechanical rotary motion without the necessity of

**Fig. OT.4**

### Use of Magnetic Pickup in Flow Measurement



mechanical linkage—and the contact, wear, cabling, and alignment problems such linkage entails. It is recommended for *maximum-sensitivity applications with low speed and/or large air gaps*.

The MP1A is a "passive" or "self-generating" device, requiring no external excitation. When mounted in proximity to the teeth (or blades) of a conventional rotating gear (or turbine), it produces an approximately sinusoidal AC voltage-signal output with a frequency directly proportional to RPM. The amplitude of the voltage is also generally

proportional to the speed of rotation (see [Fig. OT.6](#)).

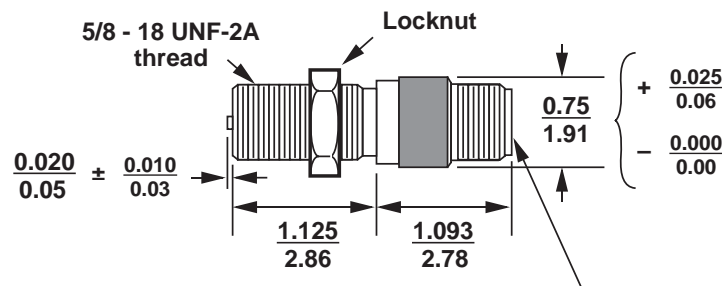
Housed in a stainless-steel shell, the MP1A is reliable over a wide temperature range, at repetition rates exceeding one megahertz, and under severe environmental conditions of mechanical shock, vibration, humidity, immersion in water or oil, salt spray, sand and dust, radiation, and pressure. It has a threaded mounting shank and locking nut.

See [Model MP1A Specifications](#).

(cont'd)

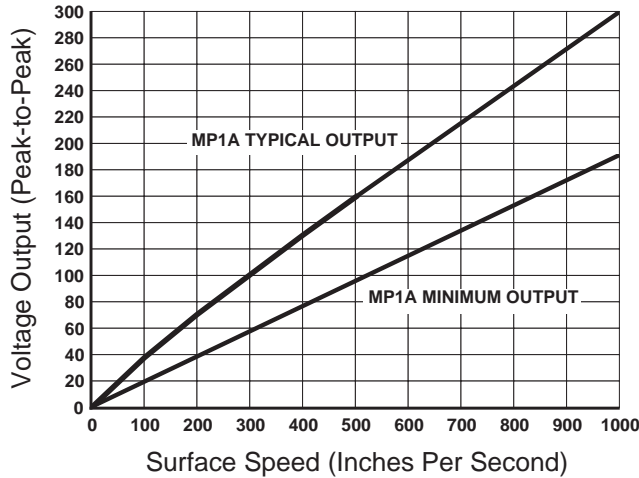
**Fig. OT.5**

### Model MP1A Dimensions (in./cm)



Mates with MS3106A-10SL-4S Connector  
with MS3057-4 cable clamp

# MODEL MP1A HIGH-SENSITIVITY MAGNETIC PICKUP (cont'd)



**Fig. OT.6**  
**MP1A Performance**

## MODEL MP1A SPECIFICATIONS\*

**Dimensions:** See [Fig. OT.5](#)

**Pole-Piece Dimension:** 0.106 in. (0.27 cm)

**Gear Pitch (optimum):** 20 DP\*\*

**Gear Pitch Range:** 24 DP or coarser

**Output Voltage (peak-to-peak):** See Fig. OT.6, above;  
190 V-AC minimum output at 1000 in/sec, with 20-pitch,  
30-tooth gear at 0.005" pole-piece clearance and  
100-k $\Omega$  load

**DC Resistance:** 1200  $\Omega$ , maximum

**Inductance:** 450 mH, maximum

**Output Polarity:** When ferrous metal is introduced into the  
magnetic field, Pin B will be positive with respect to Pin A

**Operating Temperature Range:** -100° F to +225° F  
(-73° C to +107° C)

\* At +75° F (+18° C).

\*\* Optimum gear pitch is a compromise between waveform purity  
and voltage output.





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