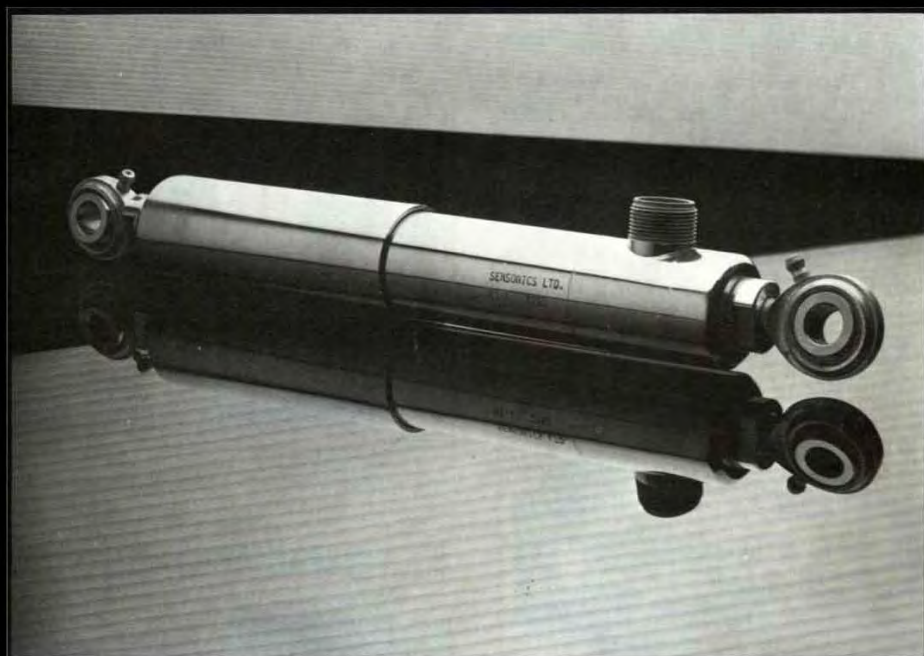


**PREDICTIVE
MAINTENANCE
SYSTEMS**

PROTECTING
YOUR
INVESTMENT

**DISPLACEMENT
PRODUCT GUIDE**



LVDT TRANSDUCERS FOR INDUSTRY



SENSORTEC

CHOOSING AN LVDT

Questions frequently arise concerning the choice of LVDT. Our applications engineers are always willing and able to make recommendations as to the correct LVDT for your application. However the following notes are offered as a guide.

There are two main categories of LVDT, namely AC input, AC output; and DC input, DC output. Within these two categories the choice of LVDT will be dependent on a number of factors and can be summarised as follows: 1) Environmental considerations; 2) Mechanical fixing; 3) Output from transducer required; 4) Linear range required.

Consideration of the above will ultimately define the LVDT for the application.

ENVIRONMENTAL CONSIDERATIONS

The main environmental conditions encountered are elevated temperatures and contact with fluids. The LVDT upper operating temperature is determined by the components used in its construction. LVDTs with built in electronics are limited to 90°C. LVDTs with NYLATRON bushes are limited to 120°C and LVDTs with standard connector outlets are limited to 125°C.

As a general rule all LVDTs with integral cable and not containing integral electronics are suitable for all but submersible applications. For submersible applications precautions are mainly taken to prevent captivated cores having a piston effect. This is easily overcome by hydraulic venting. Water ingress into cable terminations is prevented either by the provision of a gland or by attachment of integral flexible conduit.

MECHANICAL FIXING

LVDTs are mainly attached to the two relative moving elements by a) clamping the LVDT body and clamping the LVDT core; b) by clamping the LVDT body and spring loading the core onto the other element; c) by fixing the body and core (via an extension) by means of universally jointed rod end bearings.

Many LVDTs can be configured to incorporate any of the above fixtures but sometimes the choice of fixture will determine the LVDT to be used.

ADVANTAGES OF LVDT'S

FRICTIONLESS MOVEMENT

The LVDT can be and often is, operated where there is no physical contact between the core and extension rod and the main body of the LVDT housing the transformer coils. This makes it ideal for measurements where friction loading cannot be tolerated but can tolerate the addition of a low mass core. Examples of this are fluid level detection with the core mounted on a float and creep tests on fibres or other elastic materials.

INFINITE MECHANICAL LIFE

The LVDT by virtue of its frictionless measurement has no elements that wear out. This essentially means that the LVDT has infinite mechanical life. This makes the LVDT particularly valuable in applications such as fatigue life testing of materials and structures.

RUGGEDNESS OF CONSTRUCTION

The principle of operation of the LVDT enables the sensing elements not only to be friction free but to be housed in a variety of housings depending on the degree of mechanical protection required. The use of rod end bearings, linear rolling element bearings and flexible conduit helps the LVDT to survive even the most severe abuse.

INPUT/OUTPUT ISOLATION

The fact that the LVDT is a transformer means there is complete isolation between input and output. This makes the LVDT easily isolated to prevent ground loops and obviates the need for buffer amplifiers.

AC EXCITATION

Advantages:

(i) External signal conditioning permits more sophisticated electronics to be used with variable gain, zero offset, current outputs, etc.

(ii) Long cable lengths (3 core screened) may be used between transducer and electronics — typically 100 metres or so.

(iii) The transducer may be located in an area which would be hostile to electronics.

(iv) The transducer is less expensive to replace than a DC excited one of similar characteristics.

Disadvantages:

(i) Initial cost of system is higher than with DC LVDT.

DC EXCITATION

Advantages:

(i) Generally a lower initial cost for a system than with AC excitation.

(ii) A simpler system to install and set up.

(iii) May be operated in the field from dry batteries.

Disadvantages:

(i) Transducer itself is generally more expensive to replace than a similar AC one.

(ii) No control over sensitivity or zero offset without external electronics.

(iii) Long cable lengths (4 core screened) may introduce volts drop problems unless external electronics is involved.

(iv) Unsuitable for hostile environments due to limits imposed by internal electronics.

OUTPUT FROM TRANSDUCER REQUIRED

LVDTs provided with their own integral electronics produce a voltage output which goes from positive to negative corresponding to the two extremes of the LVDT core position.

If other signal outputs are required then the signal has to be further conditioned or alternatively the entire signal conditioning carried out separately from the LVDT. This approach can often be simpler and more versatile if current outputs or zero and span control is required.

In summary a review as to whether an AC or DC LVDT is required will often clarify all of the above points.

INFINITE RESOLUTION

The principle of operation of the LVDT, based on the mutual inductance between primary and secondary coils, gives the LVDT the characteristic of truly infinite resolution. The readability of the external display represents the only limitation.

NULL REPEATABILITY

The inherent symmetry of the LVDT construction provides the LVDT with the feature of an extremely stable and repeatable null. The LVDT can thus be employed in high gain closed loop control systems.

LOW CROSS AXIS SENSITIVITY

The output of an LVDT is predominantly dependent on the axial movement of the core within the LVDT body. Radial movement produces very little change in output. This makes the LVDT useful for measurements even when the core moves with a short arc inside the LVDT windings.

CORE AND BODY SEPARATION

The separation between LVDT core and coil means that a sealed non magnetic barrier can be placed between them. This enables the core to be placed inside a pressurised or corrosive environment with the LVDT body outside. Only a static seal is required to seal the coil and eliminates the need for dynamic seals on the moving member. LVDTs used in this manner are actually mounted inside hydraulic actuators.

PRINCIPLE OF OPERATION

The LVDT is an electromechanical device that produces an electrical signal whose amplitude is proportional to the displacement of the transducer core.

The LVDT consists of a primary coil and two secondary coils symmetrically spaced on a cylindrical former, Fig. 1.

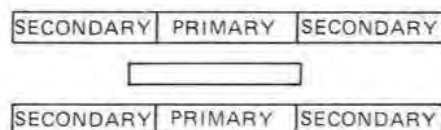


FIG. 1

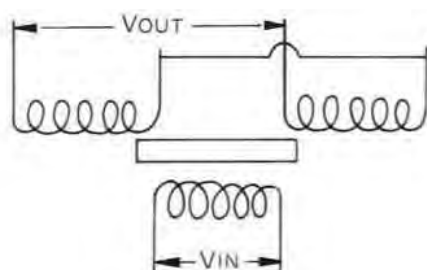


FIG. 2

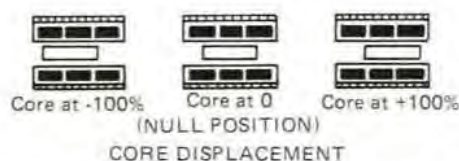
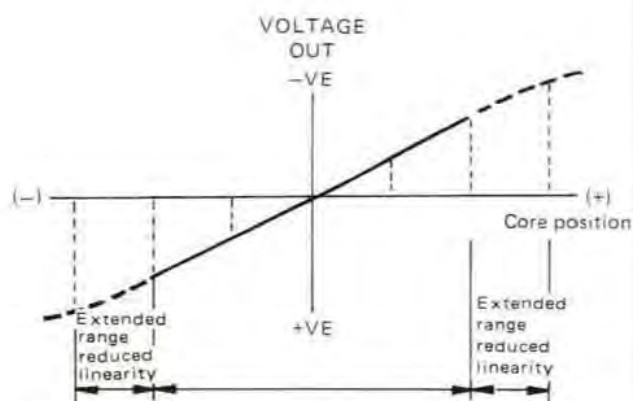


FIGURE 3. LVDT OUTPUT VS CORE POSITION.

A magnetic core inside the coil assembly provides a path for the magnetic flux linking the coils. The electrical circuit is configured as in Fig. 2 with the secondary coils in series opposition. When an alternating voltage is introduced into the primary coil and the core is centrally located then an alternating voltage is mutually induced in both secondary coils. The resultant output is zero as the voltages are equal in amplitude and in 180° opposition to each other. When the core is moved away from the null position the voltage in the coil, toward which the core is moved, increases due to the greater flux linkage and the voltage in the other primary coil decreases due to the lesser flux linkage. The net result is that a differential voltage is produced across the secondary windings which varies linearly with change in core position. An equal effect is produced when the core is moved from null in the other direction but the voltage is 180° different in phase.

METHOD OF LINEARITY MEASUREMENT

1 The core is adjusted mechanically to the electrical null, i.e. the position where the AC output from the secondary windings is a minimum.

2 The core is then displaced to the full range at one end of the stroke and a DC reading taken. The core is then moved in pre-selected steps until it reaches full range at the other end of the stroke, a DC reading being taken at each step. It is arranged by setting the excitation/demodulator circuit, that the mid position (i.e. electrical null as in (1) above) is zero.

3 The maximum and minimum readings are added and divided by the number of steps taken in order to determine the straight increments. Thus a straight line is obtained which passes through zero and which deviates from the actual curve by the same amount at each full range.

4 The actual readings are now taken from the theoretical straight line taking care of sign, i.e. reverse on passing through zero. This is because the error changes sign on passing through zero.

5 The linearity is now calculated as shown beneath.

Typical Results

Stroke $\pm 1.0''$, 10 steps of $.200'' = 2.0''$ overall

Chart

A	B	C	D
Stroke	Actual Readings	Theoretical Line	Difference
+1''	1492	1489	3
+8''	1195	1191	4
+6''	898	893	5
+4''	598	595	3
+2''	300	298	2
0	0	0	0
-2''	299	298	-1
-4''	597	595	-2
-6''	894	893	-1
-8''	1188	1191	3
-1.0''	1485	1489	4

$D = B - C$ to zero then $C - B$

Maximum difference is between 5 and -2 i.e. 7

Therefore percentage error is $\frac{7}{1489} \times 100 = 0.235\%$

As this may be either side of line it is normal to quote it as plus or minus.

Thus it becomes percentage error = $\pm 0.117\%$ or $\pm 0.12\%$.

If a more careful calibration were carried out and notice taken of decimal points column D could become 6.0 instead of 7.0.

Percentage error in this case $\pm 0.10\%$.

From hundreds of observations using different measuring techniques and different operators it has been realised that percentage errors can be made to vary by up to 2% with the same instrument. Since the majority of LVDTs fall well inside our specific limit of $\pm 0.5\%$ FS the actual recorded figure is taken as a genuine approximation although strictly speaking the result should be recorded: —

Percentage error = $\pm 0.12\% \pm 0.10\%$.

It should be noted that these linearities take no account of any errors in position measurements, electronic circuit or recording instrument linearities, i.e. it is total system linearity.

Other techniques such as root mean square deviations will give results up to factors of 4 to 6 better but we do not consider that these methods are as practical for the installation engineer.

LVDT Selection Chart. DS1159

TYPE	USE	AC or DC	RANGE	CORE TYPE	SIGNAL CONNECTION	MECHANICAL CONNECTION	SERIES	SPECIAL CONSIDERATIONS
LINEAR	OEM	AC	2.5mm to 500mm	FREE	END CABLE	FREE CORE	'E' FREE CORE	GENERAL
			2.5mm to 500mm	GUIDED	END CABLE	BALL END	'E' GUIDED CORE	GENERAL
			2.5mm to 25mm	FREE	END CABLE	BALL END	SLF	SLIMLINE
			2.5mm to 25mm	GUIDED	END CABLE	BALL END	SLG	SLIMLINE
			2.5mm to 25mm	SPRING	END CABLE	BALL END	SLS	SLIMLINE
			5mm to 300mm	FREE	END CABLE	FREE CORE	DEF	GENERAL
		DC	5mm to 300mm	GUIDED	END CABLE	THREADED	DEG	GENERAL
			2.5mm to 50mm	FREE	END CABLE	FREE CORE	DMF	GENERAL
			2.5mm to 50mm	GUIDED	END CABLE	THREADED	DMG	GENERAL
			2.5mm to 50mm	SPRING	END CABLE	BALL END	DMS	GENERAL
			2.5mm to 50mm	FREE	SIDE CABLE	FREE CORE	DMFW	WATERPROOF
			2.5mm to 50mm	GUIDED	SIDE CABLE	THREADED	DMGW	WATERPROOF
			2.5mm to 50mm	SPRING	SIDE CABLE	BALL END	DMSW	WATERPROOF
			25mm to 150mm	SPRING	END CONNECTOR	BALL END	SR/1	GENERAL
			25mm to 150mm	SPRING	END CABLE	BALL END	SR/2	GENERAL
			25mm to 150mm	SPRING	END CONDUIT	BALL END	SR/3	GENERAL
			25mm to 150mm	SPRING	SIDE CONNECTOR	BALL END	SR/4	GENERAL
			25mm to 150mm	SPRING	SIDE CABLE	BALL END	SR/5	GENERAL
			25mm to 150mm	SPRING	SIDE CONDUIT	BALL END	SR/6	GENERAL
			25mm to 600mm	GUIDED	SIDE CONNECTOR	ROD END BEARINGS	SR/7	GENERAL
			25mm to 600mm	GUIDED	SIDE CABLE	ROD END BEARINGS	SR/8	GENERAL
			25mm to 600mm	GUIDED	SIDE CONDUIT	ROD END BEARINGS	SR/9	GENERAL
		AC	25mm to 600mm	GUIDED	ANY	ANY	SR/10	SPECIAL
			25mm to 150mm	FREE CORE	SIDE CABLE	FREE CORE	SR/P	GENERAL
			25mm to 600mm	GUIDED	SIDE CONDUIT	ROD END BEARINGS	SR/W	WATERPROOF
			25mm to 100mm	SPRING	SIDE CONNECTOR	BALL END	SB/1	SHORT BODY
			25mm to 100mm	SPRING	SIDE CABLE	BALL END	SB/2	SHORT BODY
			25mm to 100mm	SPRING	SIDE CONDUIT	BALL END	SB/3	SHORT BODY
			25mm to 150mm	GUIDED	SIDE CONNECTOR	ROD END BEARINGS	SB/4	SHORT BODY
			25mm to 150mm	GUIDED	SIDE CABLE	ROD END BEARINGS	SB/5	SHORT BODY
			25mm to 150mm	GUIDED	SIDE CONDUIT	ROD END BEARINGS	SB/6	SHORT BODY
			25mm to 150mm	SPRING	END CONNECTOR	BALL END	DR/1	GENERAL
	LIGHT INDUSTRIAL	DC	25mm to 150mm	SPRING	END CABLE	BALL END	DR/2	GENERAL
			25mm to 150mm	SPRING	END CONDUIT	BALL END	DR/3	GENERAL
			25mm to 150mm	SPRING	SIDE CONNECTOR	BALL END	DR/4	GENERAL
			25mm to 150mm	SPRING	SIDE CABLE	BALL END	DR/5	GENERAL
			25mm to 150mm	SPRING	SIDE CONDUIT	BALL END	DR/6	GENERAL
			25mm to 150mm	GUIDED	SIDE CONNECTOR	ROD END BEARINGS	DR/7	GENERAL
			25mm to 150mm	GUIDED	SIDE CABLE	ROD END BEARINGS	DR/8	GENERAL
			25mm to 150mm	GUIDED	SIDE CONDUIT	ROD END BEARINGS	DR/9	GENERAL
			25mm to 150mm	GUIDED	ANY	ANY	DR/10	SPECIAL
			25mm to 150mm	FREE CORE	SIDE CABLE	FREE CORE	DR/P	GENERAL
			25mm to 150mm	GUIDED	SIDE CONDUIT	ROD END BEARINGS	DR/W	WATERPROOF
		AC	-10mm to -75mm	SPRING	END CONNECTOR	BALL END	TD/1	GENERAL
			-10mm to -75mm	SPRING	END CABLE	BALL END	TD/2	GENERAL
			-10mm to -75mm	SPRING	END CONDUIT	BALL END	TD/3	GENERAL
			-10mm to -75mm	SPRING	SIDE CONNECTOR	BALL END	TD/4	GENERAL
			-10mm to -75mm	SPRING	SIDE CABLE	BALL END	TD/5	GENERAL
			-10mm to -75mm	SPRING	SIDE CONDUIT	BALL END	TD/6	GENERAL
			-10mm to -75mm	SPRING	END CONNECTOR	BALL END	HTD/1	HIGH TEMP
			-10mm to -75mm	SPRING	END CABLE	BALL END	HTD/2	HIGH TEMP
			-10mm to -75mm	SPRING	END CONDUIT	BALL END	HTD/3	HIGH TEMP
			-10mm to -75mm	SPRING	SIDE CONNECTOR	BALL END	HTD/4	HIGH TEMP
			-10mm to -75mm	SPRING	SIDE CABLE	BALL END	HTD/5	HIGH TEMP
			-10mm to -75mm	SPRING	SIDE CONDUIT	BALL END	HTD/6	HIGH TEMP
ROTARY	HEAVY INDUSTRIAL	AC	25mm to 150mm	GUIDED	SIDE CONDUIT OR CONNECTOR	ROD END BEARINGS	HI	GENERAL
			50mm to 600mm	GUIDED	SIDE CONDUIT OR CONNECTOR	ROD END BEARINGS	SHI	SHORT BODY
	LIGHT INDUSTRIAL	AC			END CABLE		R40	GENERAL
					END CABLE		R30	GENERAL
					SIDE CABLE		R50A	GENERAL
	HEAVY INDUSTRIAL	AC			END CABLE OR CONNECTOR		R40AP	SPECIAL

SL SERIES LVDT DISPLACEMENT TRANSDUCER



■ AC OPERATION

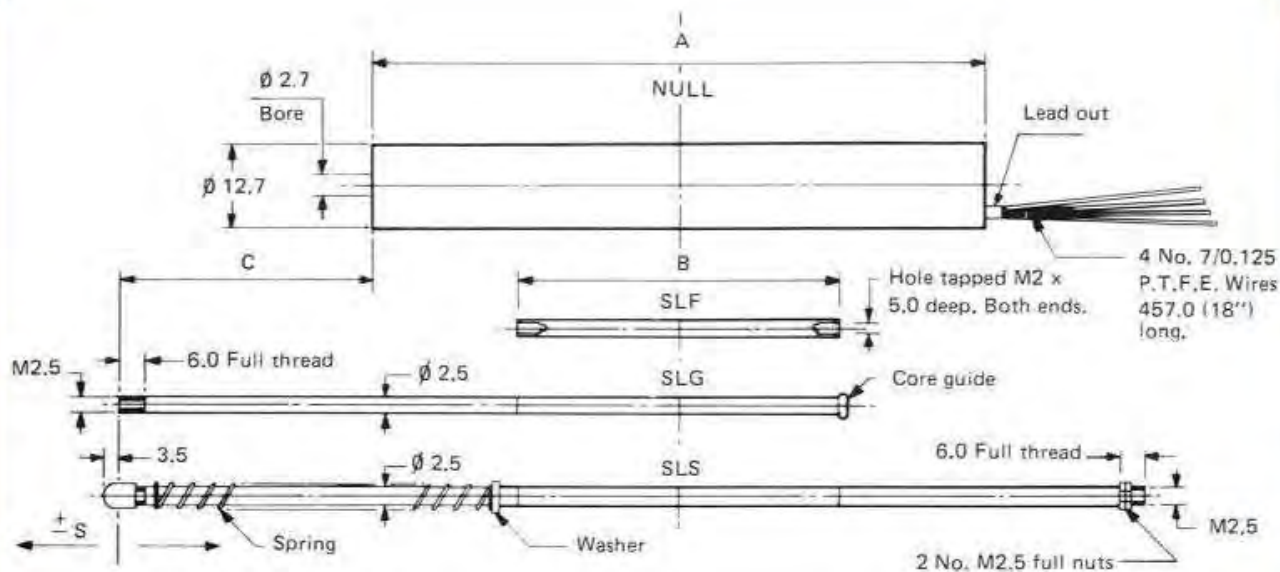
■ SPRUNG, GUIDED OR FREE
CORE

■ SMALL DIAMETER BODY

■ LOW COST

These Linear Variable Differential Transformer Displacement Transducers feature a 12.5mm (0.5") diameter body for OEM applications and use in restricted spaces. They are designed for operation on low voltage AC supplies at frequencies from 50Hz to 5KHz and are supplied complete with a free core and extension rod assembly. The stainless-steel body, bore tube and extension rod permit corrosion-free operation in most environments. Colour-coded flexible PTFE lead-out wires of 0.5mm (18") length emerge through one end face of the body.

The moving core is normally fitted with an integral extension shaft which is threaded for attachment to the source of movement. If required, the core may be supplied without the extension rod, the core then having a plain or threaded hole according to requirements.



SPECIFICATION

Input voltage	From less than 1v to 10v RMS, 50Hz to 5KHz
Maximum primary current	10mA
Temperature range	From 0°C to 90°C
Linearity	Better than $\pm 0.5\%$
Mounting arrangement	By clamp around the body (clamp not supplied)

Type No.	Stroke ± 5 m.m.	A	B	C	Individual specification no.			Output at Full range (3KHz)
					SLF Free core	SLG Guided core	SLS Sprung core	
SL-2.5	2.5	33.5	20.3	33.5	I.S. 132	I.S. 136	I.S. 140	50mv/v
SL-5	5.0	48.0	22.86	36.0	I.S. 133	I.S. 137	I.S. 141	90mv/v
SL-12.5	12.5	78.0	38.1	43.5	I.S. 134	I.S. 138	I.S. 142	400mv/v
SL-25	25.0	122.0	60.96	56.0	I.S. 135	I.S. 139	I.S. 143	600mv/v

ORDERING INFORMATION/OPTIONS

OPTIONS

Different lengths of integral lead out wires

Ordering Information

When ordering request unit by Type No. and IS No. or state requirements by specifying options.

We reserve the right to alter the specification without notification

DISPLACEMENT TRANSDUCERS

DC/DC-L.V.D.T. DM SERIES

- INFINITE RESOLUTION
- 12v or 24v MODELS
- CONFIGURATION OPTIONS
- LIGHTWEIGHT CORES
- HIGH ACCURACY



The DM series of DC/DC linear transducers cover the range $\pm 2.5\text{mm}$ to $\pm 50\text{mm}$ and are intended as a general purpose instrument. As with all other Sensonics LVDT's they are robustly housed with impregnated coils and internally potted so that they are suitable for use in the majority of industrial applications.

Uses include extensometers, hydraulic actuators, float positions, thickness measurements, geophysical parameters, earth movements . . .

The series is available with the lightweight core supplied as a basic unattached item (DMF) or with the core attached to an extension rod (DMG) or with the core and extension rod captive and spring loaded (DMS).

Other DC-DC series in the Sensonics range are:

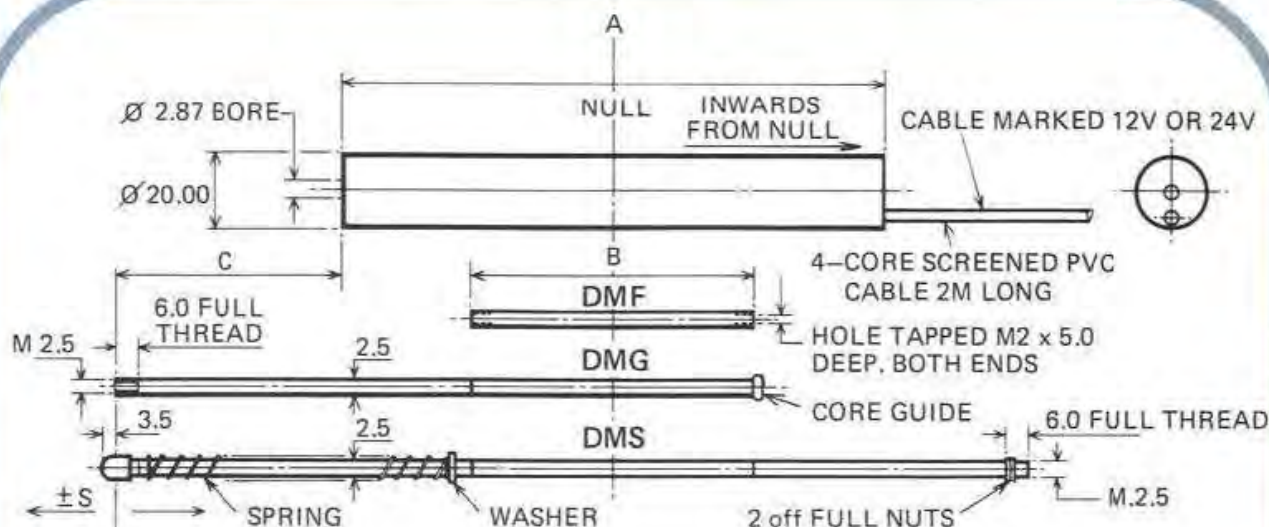
DF Series $\pm 15\text{mm}$ to $\pm 50\text{mm}$

DE Series $\pm 25\text{mm}$ to $\pm 300\text{mm}$

The DF Series has a larger bore to core clearance, but a heavier core and the DE series has a heavier core and extension assembly which makes it more robust for its longer stroke capabilities.

12v or 24v models in the DM series are available in any of the three configurations giving 30 standard options.

SENSONICS



Connections

RED INPUT +VE 12V OR 24V D.C.

BLUE INPUT -VE

GREEN OUTPUT +VE GOING WITH CORE DISPLACED INWARDS FROM NULL

YELLOW OUTPUT -VE

SCREEN ISOLATED FROM INSTRUMENT

FREECORE = DMF SERIES

GUIDED CORE = DMG SERIES

SPRUNG LOADED = DMS SERIES

SPECIFICATION

			DM - 2.5	DM - 5	DM - 12.5	DM - 25	DM - 50
Stroke	S	± mm	2.5	5	12.5	25	50
	A	mm	44.0	57.0	87.0	153.0	222.0
	B	mm	20.3	20.0	30.15	76.2	94.0
	C	mm	23.5	31.0	46.5	63.0	90.0
Core weight		gms	0.8	0.8	1.2	3.1	3.8
Core + extension		gms	2.5	3.0	4.2	6.8	9.5
12V Excitation	DMF	Free Core	IS 021	IS 023	IS 025	IS 027	IS 029
	DMG	Guided Core	IS 022	IS 024	IS 026	IS 028	IS 030
	DMS	Sprung Loaded	IS 066	IS 067	IS 068	IS 069	IS 070
	Sensitivity ±15%		± 2V	± 2.5V	± 3.0V	± 3.5V	± 5V
24V Excitation	DMF	Free Core	IS 031	IS 033	IS 035	IS 037	IS 039
	DMG	Guided Core	IS 032	IS 034	IS 036	IS 038	IS 040
	DMS	Sprung Loaded	IS 071	IS 072	IS 073	IS 074	IS 075
	Sensitivity ±15%		± 4.5V	± 5V	± 5.8V	± 7V	± 10V
Output Impedance		ohms	9 K 4				
Output Load		ohms	50 K				
Thermal zero shift		FRO/°C	Better than 0.005%				
Thermal span shift		FRO/°C	Better than 0.10%				
Output Ripple		FRO	Less than 0.20%				
Frequency Response		Hz	DC to 75				
Input Current		mA	30 ± 15%				
Temp. range		°C	0 to 80°C				
Linearity			Better than ± 0.5% standard to ± 0.25% by selection				

TYPE NUMBERS

The 'IS' Numbers above indicate a unique transducer, e.g. IS 067 is a Spring loaded ±5mm stroke 12 Volt excitation unit, or DMS 5 12 Volt.

SENSONICS LIMITED



DM-W SERIES WATERPROOF LVDT DISPLACEMENT TRANSDUCER



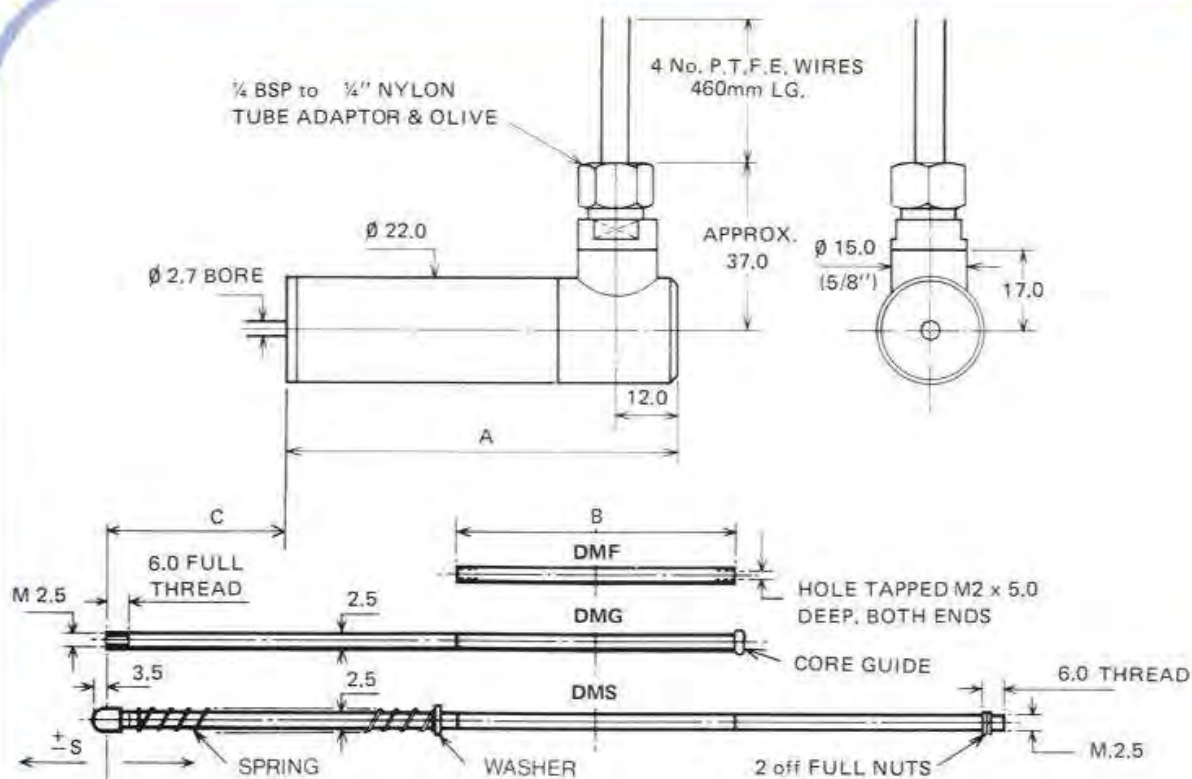
- FULLY SEALED
- FULLY SUBMERSIBLE
- DC OPERATION
- SPRUNG, GUIDED OR FREE CORES
- HIGH ACCURACY

The DM-W series waterproof linear variable differential transformers are designed for applications requiring total submersion or for use in situations where high humidity or condensation may be expected.

The DM-W series of DC input DC output LVDTs consist of a fully sealed body housing the impregnated coils and internally potted electronics such that these units are suitable for the majority of submersible applications.

For submersion in liquids up to approximately 20m depth (or equivalent pressure of 30 PSI or 2 atmospheres), a suitable sealing compound should be used within the compression fitting. For higher pressures (or greater depths) the use of Araldite AY18 and Hz 18 hardener is recommended and the manufacturer's instructions on cleaning surfaces and mixing should be followed.

The series is available with the lightweight core supplied as a basic unattached item (DMF-W) or with the core attached to an extension rod and fitted with core guides (DMG-W) or with the core and extension rod captive and spring loaded (DMS-W).



SPECIFICATION

			DM - 5W	DM - 12.5W	DM - 25W	DM - 50W
Stroke	S	\pm mm	5	12.5	25	50
	A	mm	81	110	117	244
	B	mm	20	30.15	76.2	94
	C	mm	34.5	50.5	67	87.25
Core weight		gms	0.8	1.2	3.1	3.8
Core + extension		gms	3.0	4.2	6.8	9.5
12V Excitation	DMF-W	Free core	IS214	IS215	IS216	IS217
	DMG-W	Guided core	IS222	IS223	IS224	IS225
	DMS-W	Sprung loaded	IS230	IS231	IS232	IS233
	Sensitivity $\pm 15\%$		$\pm 2.5V$	$\pm 3.0V$	$\pm 3.5V$	$\pm 5V$
24V Excitation	DMF-W	Free core	IS218	IS219	IS220	IS221
	DMG-W	Guided core	IS226	IS227	IS228	IS229
	DMS-W	Sprung loaded	IS234	IS235	IS236	IS237
	Sensitivity $\pm 15\%$		$\pm 5V$	$\pm 5.8V$	$\pm 7V$	$\pm 10V$
Output Impedance		ohms	9 K 4			
Output Load		ohms	50 K			
Thermal zero shift		FRO/ $^{\circ}C$	Better than 0.005%			
Thermal span shift		FRO/ $^{\circ}C$	Better than 0.10%			
Output Ripple		FRO	Less than 0.20%			
Frequency Response		Hz	DC to 75			
Input Current		mA	$30 \pm 15\%$			
Temp. range		$^{\circ}C$	0 to $80^{\circ}C$			
Linearity			Better than $\pm 0.5\%$ standard to $\pm 0.25\%$ by selection			

Ordering Information

Order units by specifying Type No. and IS No.

SENSONICS LIMITED





E SERIES AC LVDT DISPLACEMENT TRANSDUCER



■ LOW COST

■ ACCURATE

■ IDEAL FOR OEM

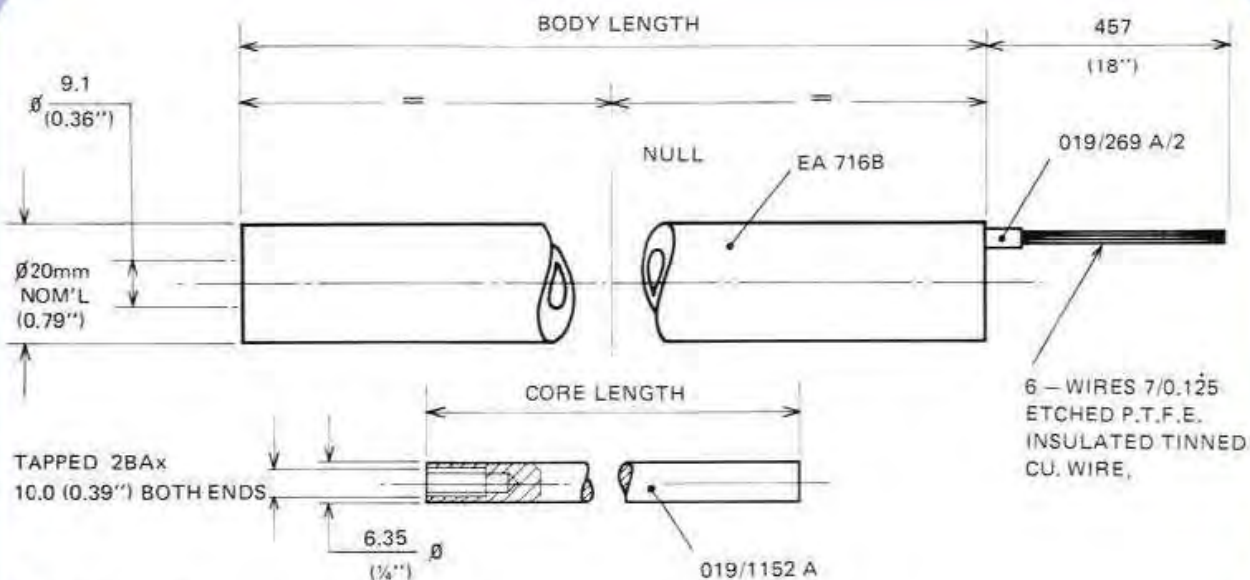
■ RELIABLE

■ LARGE LINEAR RANGES

The economy E Series LVDT displacement transducers are basic Linear Variable Differential Transformers intended for O E M applications or similar low cost requirements. The straight cylindrical body, flying lead out wires, large bore and free unguided/unrestrained core facilitate the incorporation of the device into other assemblies which may be unique to the user, e.g. force or pressure transducers, mechanical, hydraulic or pneumatic actuators, tensile testers etc.

Similarly, because of these versatile characteristics, these LVDTs form the heart of many of the specialised displacement transducers in our range, the outer bodies of which may be provided with electrical connectors, mounting flanges or end fittings to suit a variety of environments and applications.

These transducers are designed for operation on low voltage AC supplies at frequencies within the range 50Hz to 5KHz. The 20mm nominal diameter body is manufactured from stainless steel. A bore tube of nominal internal diameter 9.1mm extends through the length of the cylindrical body. A free, unguided core of 6.35mm nominal diameter is internally threaded 2BA at each end for mechanical connection by the user to the source of motion. Alternatively, the LVDT may be supplied with a fitted extension rod threaded at the free end. Flying leads of 450mm length emerge through the outer edge of one body end disc.



SPECIFICATION

Input Voltage		From less than 1 volt to 10v RMS, 50 Hz to 5KHz												
Maximum recommended input current		20 mA												
Temperature range		From 0 ^o to 150 ^o C Standard												
Linearity		± 0.5												
Type Numbers		E.01	E.02	E.05	E.075	E.1	E.2	E.3	E.4	E.5	E.6	E.8	E.10	E.12
IS Numbers		IS320	IS321	IS322	IS323	IS324	IS325	IS326	IS327	IS328	IS329	IS330	IS331	IS332
Displacement ranges	inches	±0.1"	±0.2"	±0.5"	±0.75	±1.0"	±2.0"	±3.0"	±4.0"	±5.0"	±6.0"	±8.0"	±10.0	±12.0
	mm	±2.5	±5.0	±12.5	±20	±25	±50	±75	±100	±125	±150	±200	±250	±300
Output at full range (mV/√3KHz)		35	42	200	200	230	350	380	400	500	350	250	200	200
Primary Inductance (mH) approx		80	80	70	55	70	80	100	130	140	100	285	400	400
Primary impedance at 3KHz (ohms)		460	700	1.3K	200	1.4K	1.5K	2.5K	2.4K	2.0K	2.1K	5.4K	7.0K	6.0K
Primary resistance (ohms)		150	200	110	100	130	190	250	330	300	180	500	500	250
Secondary resistance (total) ohms		100	180	150	125	240	330	440	570	640	390	800	860	400
Zero phase frequency (KHz) approx		4	4		3.5							5		
Body length (inches)		1.25	1.8	3.6	4.7	6.4	9.8	12.6	14.9	17.1	20.2	24.7	29.3	33.7
Core size 0.25" dia. x length inches		0.8	1.0	1.8	2.5	3.0	4.5	5.6	5.6	6.0	6.5	7.2	7.75	9.0
Body diameter		20mm (0.79")												
Mounting arrangement		By clamp around the body (not supplied)												

ORDERING INFORMATION/OPTIONS

OPTIONS

Additional displacement ranges: including up to ± 20 inches

Different lengths of integral lead out wires

Fitted extension rod and core guides

± 0.3 linearity by selection.

Ordering Information

When ordering request unit by type No. and IS No. or state requirements by specifying options.

We reserve the right to alter the specification without notification.

SENSONICS LIMITED



DISPLACEMENT TRANSDUCERS | DC/DC-L.V.D.T. DE SERIES

- WIDE MEASUREMENT RANGE
- INFINITE RESOLUTION
- HIGH ACCURACY
- MAXIMUM LIFE
- OPERATES FROM 10v - 24v UNSTABILISED SUPPLY
- FREE OR GUIDED CORES



The Sensonics DE series of DC input-DC output transducers offer a simple, inexpensive solution to many applications involving linear displacement measurement or monitoring.

These include displacement monitoring and control functions in industrial processes, position feedback elements in servo hydraulic control systems; measuring elements in extensometers in materials testing systems.

This DE Series extends from ± 25 mm to ± 300 mm and is the standard Sensonics DC-DC economy range offering those parameters most commonly required, e.g. reasonable bore to core clearance, substantial extension rods, etc.

Other DC-DC Series available are

DF Series ± 15 mm to ± 50 mm

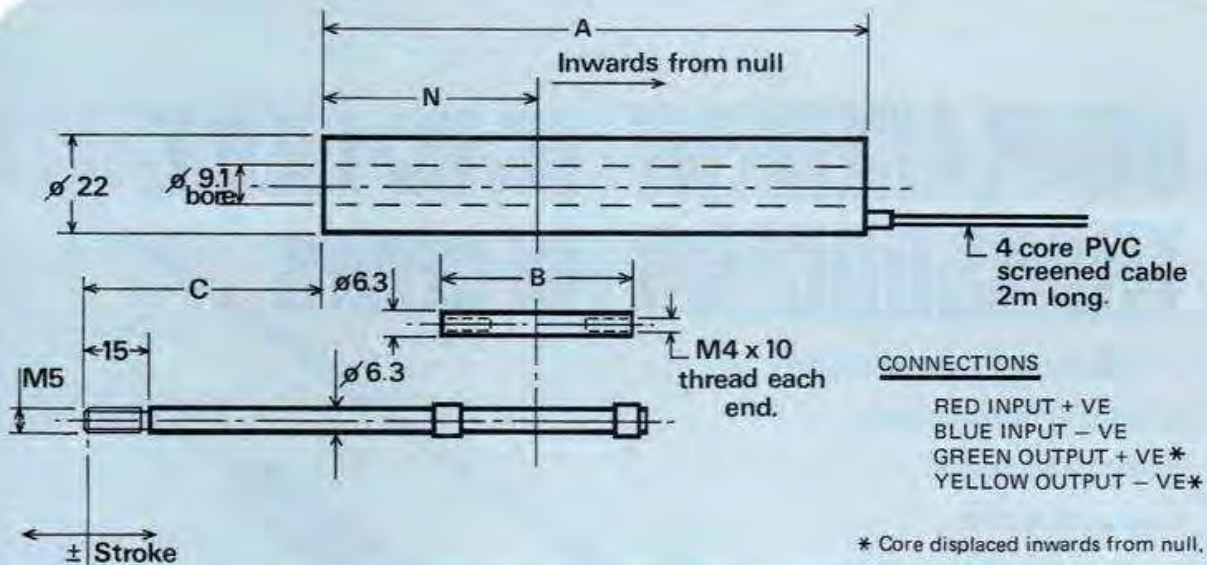
DM Series ± 2.5 mm to ± 50 mm

Free cores (Type DEF) or guided cores with extensions (Type DEG) are available to provide versatile units for applications involving additional packaging for the more vigorous environments.

Units will operate from unstabilised input supplies of 10v to 24v (DE.300 10v to 15v). Units are of sealed construction suitable for operation in normal industrial environments.

SENSONICS

DC/DC L.V.D.T. Displacement Transducers DE SERIES



REECORE DE SERIES

UIDED CORE DE SERIES

SPECIFICATION

Mechanical

FREE CORE	GUIDED CORE	DEF 25	50	75	100	125	150	200	300
		DEG 25	50	75	100	125	150	200	300
Stroke \pm mm		25	50	75	100	125	150	200	300
A mm		220	299	371	502	502	502	695	924
B mm		64	76	79	152	119	102	142	189
C mm		72	108	143	160	176	190	265	355
N mm		82	124	149	215	215	215	313	428
Core Wt. Gms.		15	18	19	37	29	17	34	49
Extn. Wt. Gms.		32	50	68	75	85	95	129	170

Electrical

Supply Volts	10-24 VDC unstabilized (40 mA)							10V-16V
Output	$\pm 2V_{DC}$							
Sensitivity mV/mm	80	54	48	25	16	16	10	12
Output Impedance ohms	3K4	3K4	3K4	3K4	3K4	3K4	3K4	3K4
Output Load ohms	50K	50K	50K	50K	50K	50K	50K	50K
Frequency Response	400 Hz				250 Hz			
Response time constant	0.3 m sec.				0.5 m sec.			
Output Ripple	Less than 0.2% FSD PK, PK.							
Thermal zero shift	Better than 0.02% FRO/ $^{\circ}C$.							
Thermal span "	" " 0.05% FRO/ $^{\circ}C$							
Linearity	$\pm 0.5\%$ Standard $\pm 0.3\%$ by selection.							

SENSONICS LIMITED



SR SERIES LVDT DISPLACEMENT TRANSDUCER



- INDUSTRIAL FORMAT
- AC INPUT, AC OUTPUT
- SIDE OR END EXIT
- PHOSPHOR BRONZE OR PTFE BUSHES
- PLUG, CABLE OR FLEXIBLE CONDUIT OUTLETS
- 150° OPERATION
175° OPERATION (CABLE OUTLETS)
- SPRING LOADED OR ROD END BEARINGS
- WEATHERPROOF OR SUBMERSIBLE VERSIONS

The SR Series LVDT Displacement Transducer consists of a magnetically shielded liner variable differential transformer contained within the outer stainless steel body. The robust construction makes the SR series ideal for applications requiring a durable, accurate, industrial position feedback transducer.

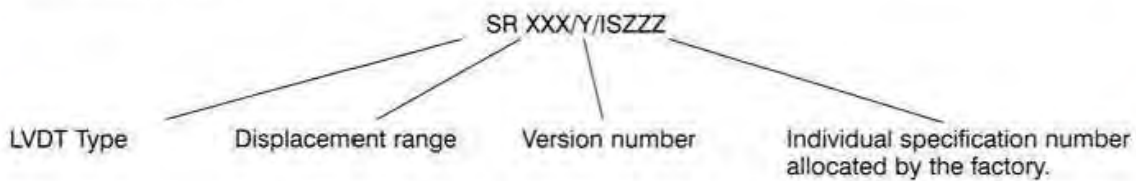
Various configurations are available to accommodate most applications. Spring loaded or guided core, connector or integral cable. Spring loaded versions are available with either side or end exit, whilst non spring loaded versions, complete with rod end bearings on body and probe, are only available as a side exit outlet.

The LVDTs are designed to operate from low voltage AC supplies at frequencies from 50HZ to 5KHz.

SPECIFICATION

Input voltage	From less than 1V to 10V RMS
Input frequency	50Hz to 5KHz
Maximum recommended primary current	20mA
Working temperature range	- 40°C to + 150°C (spring loaded & connector versions) (175°C integral cable & non spring loaded versions)
Survival temperature range	- 50°C to + 150°C (180°C integral cable)
Linearity	Better than 0.5% of reading
Body material	EN 58 (Non-magnetic stainless steel)
Core material	EN 56 (Magnetic stainless steel)
Calibration I/P signal	5V RMS @ 3KHz

ORDERING INFORMATION

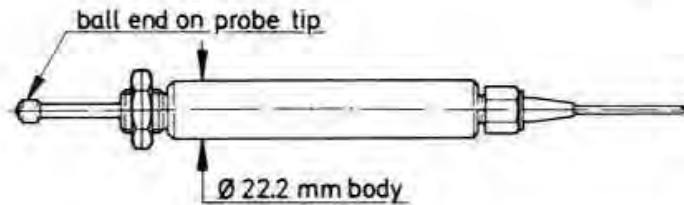
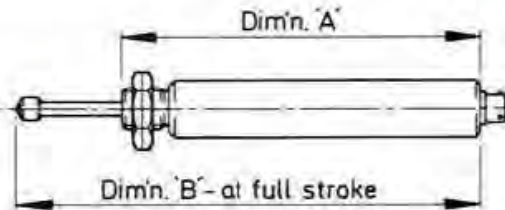


TRANSDUCER TYPE:-	SR25	SR50	SR100	SR150	SR200	SR250	SR300	SR400	SR500	SR600
TOTAL DISPLACEMENT RANGE (mm)	25	50	100	150	200	250	300	400	500	600
FULL RANGE OUTPUT (mv/v at 3 KHz)	350	460	720	780	880	1000	720	480	400	432
NULL VOLTAGE (% F.R.O.)	0.6	0.4	1.2	1.6	0.7	0.5	0.2	0.6	0.8	0.2
PRIMARY IMPEDANCE (at 3KHz) (Ω)	540	200	550	550	420	570	370	340	390	350
PRIMARY RESISTANCE (Ω)	120	120	180	260	260	260	200	480	300	250
SECONDARY IMPEDANCE (Ω)	240	200	350	560	470	700	500	610	670	410
SECONDARY RESISTANCE (Ω)	160	190	340	470	460	580	450	800	400	390
ZERO PHASE FREQUENCY (KHz)	2.4	3.8	3.7	4.0	3.7	2.5	3.0	5.0	4.1	4.5
WEIGHT EXC. CABLE (GRMS)	310	420	560	660	760	840	980	1000	1100	1200
SENSITIVITY (mV/V/mm)	14	9.2	7.2	5.2	4.4	4	2.4	1.2	0.8	0.72

We reserve the right to alter the specification without notification.

VERSION 1 (SRXXX/1)

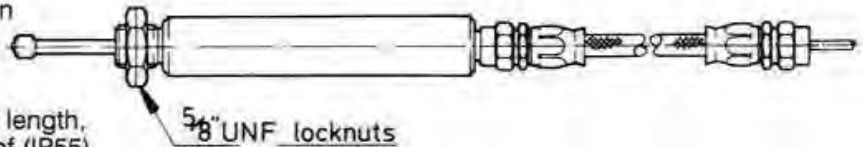
Spring loaded, captive core and extension rod. Ball end on extension rod. End exit with 6 pin connector. Weatherproof. (IP55).

**VERSION 2 (SRXXX/2)**

Spring loaded, captive core and extension. Ball end on extension rod. End exit via 6 core PTFE cable 2m in length. Other lengths optional. Weatherproof. (IP55).

VERSION 3 (SRXXX/3)

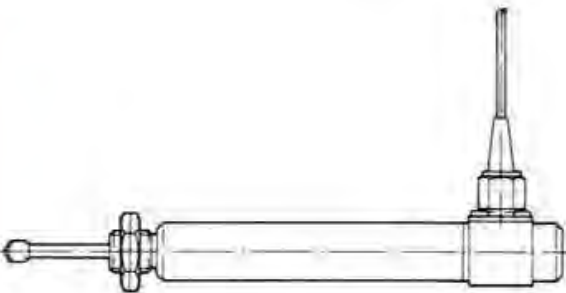
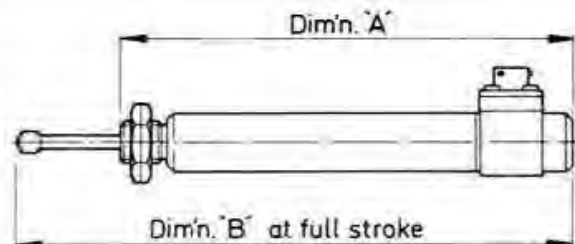
Spring loaded, captive core and extension rod. Ball end on extension rod. End exit via 6 core PTFE cable in stainless steel braided flexible conduit, ending in 1/4 BSP re-usable coupling, 2m in length, other lengths optional. Weatherproof (IP55).



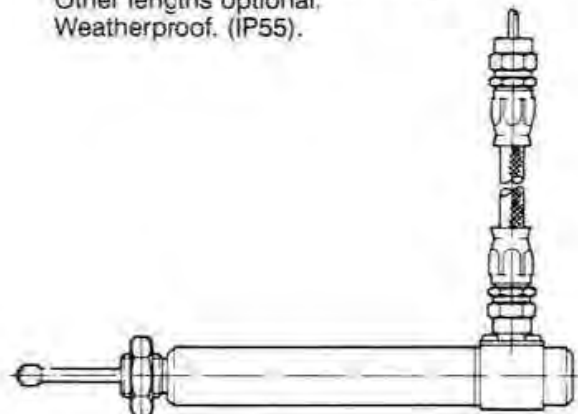
TRANSDUCER TYPE:- (VERSIONS 1, 2 & 3)	SR25	SR50	SR100	SR150
TOTAL DISPLACEMENT RANGE (mm)	25	50	100	150
DIMENSION 'A' (mm)	132	204	290	361
DIMENSION 'B' (mm)	170	269	405	526
OVERTRAVEL AT EACH END AT LEAST 5% OF TOTAL RANGE				

VERSION 4 (SRXXX/4)

Spring loaded, captive core and extension rod. Ball end on extension rod. Side exit with 6 pin connector Weatherproof. (IP55).

**VERSION 5 (SRXXX/5)**

Spring loaded, captive core and extension rod. Ball end on extension rod. Side exit via 6 core PTFE cable 2m in length. Other lengths optional. Weatherproof. (IP55).

**VERSION 6 (SRXXX/6)**

Spring loaded, captive core and extension rod. Ball end on extension rod. Side exit via 6 core PTFE cable in stainless steel flexible conduit, ending in 1/4 BSP re-usable coupling, 2m in length. Other lengths optional. Weatherproof or submersible versions available.

DR SERIES LVDT DISPLACEMENT TRANSDUCER



- DC INPUT - DC OUTPUT
- ROBUST CONSTRUCTION
- WEATHERPROOF AND SUBMERSIBLE VERSIONS
- SPRING LOADED OR GUIDED CORES
- STAINLESS STEEL BODY
- CONNECTOR, CABLE OR CONDUIT OUTLET

The DR series of LVDTs are designed for heavy industrial environments where a quick and easy to install displacement transducer is required.

The DR LVDT consists of a stainless steel body enclosing the transducer windings and signal conditioning.

The voltage input and output is via a connector, cable or conduit depending on the application and environment.

If moisture is a problem then a connector or cable version only gives limited protection whilst the conduit version enables the transducer to be fully submersed.

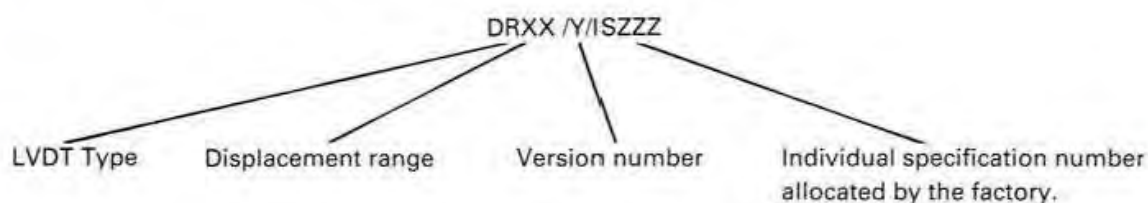
The SR series transducer can be supplied in a spring loaded format with either end exit or side exit or supplied with rod end (universal) bearings.

If temperatures are likely to exceed 90°C or zero and gain controls are required then a Sensonics AC input AC output transducer should be used.

SPECIFICATION

Input	10 - 24v dc. stabilised
Operating temperature range	-20°C to +90°C
Survival temperature range	-55°C to +95°C
Null voltage	0 V DC
Ripple	Less than 25 mV rms
Linearity	± 0.5% full range (0.3% by selection)
Stability	0.125% full scale
Temperature	
Coefficient of/ Scale factor	0.08%/°C
Shock survival	200 g for 20 milliseconds
Vibration tolerance	10 g up to 2 kHz
Housing material	Non magnetic stainless steel (EN58)
Frequency response	200 Hz
Output load	50K ohms
Output voltage	As below ± 20%

ORDERING INFORMATION

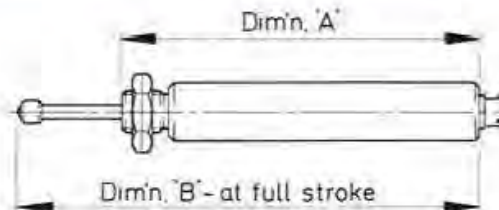
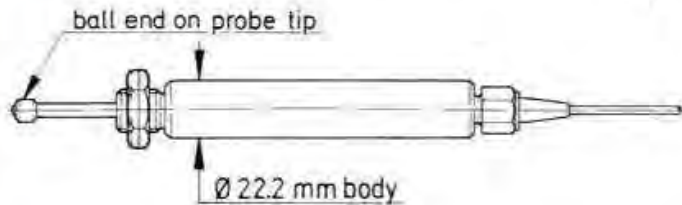


TRANSDUCER TYPE:-	DR25	DR50	DR100	DR150
TOTAL DISPLACEMENT RANGE (mm)	25	50	100	150
FULL RANGE OUTPUT (VOLTS)	2.8	3.1	3.0	2.9
WEIGHT EXC. CABLE (GRMS)	370	440	620	720

We reserve the right to alter the specification without notification.

VERSION 1 (DRXXX/1)

Spring loaded, captive core and extension rod. Ball end on extension rod. End exit with 4 pin connector. Weatherproof. (IP55).

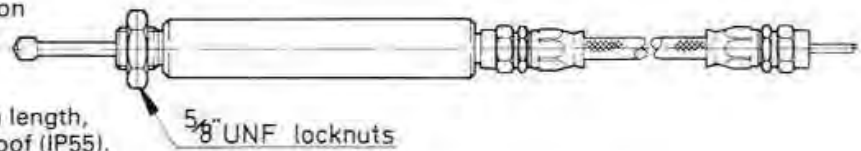


VERSION 2 (DRXXX/2)

Spring loaded, captive core and extension. Ball end on extension rod. End exit via 4 core PTFE cable 2m in length. Other lengths optional. Weatherproof. (IP55).

VERSION 3 (DRXXX/3)

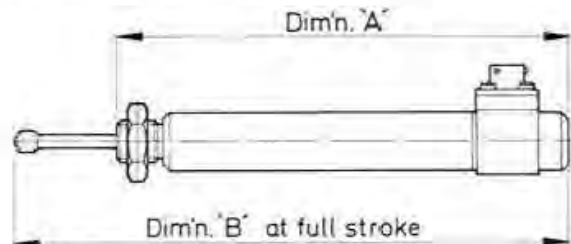
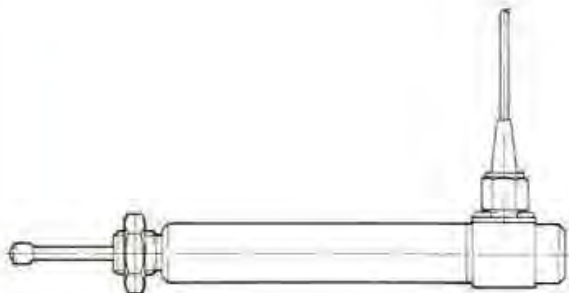
Spring loaded. Captive core and extension rod. Ball end on extension rod. End exit via 4 core PTFE cable in stainless steel braided flexible conduit, ending in 1/4 BSP re-usable coupling, 2m in length, other lengths optional. Weatherproof (IP55).



TRANSDUCER TYPE-(VERSIONS 1,2&3)	DR25	DR50	DR100	DR150
TOTAL DISPLACEMENT RANGE (mm)	25	50	100	150
DIMENSION 'A' (mm)	183	255	341	412
DIMENSION 'B' (mm)	251	356	511	659
OVERTRAVEL AT EACH END AT LEAST 5% OF TOTAL RANGE				

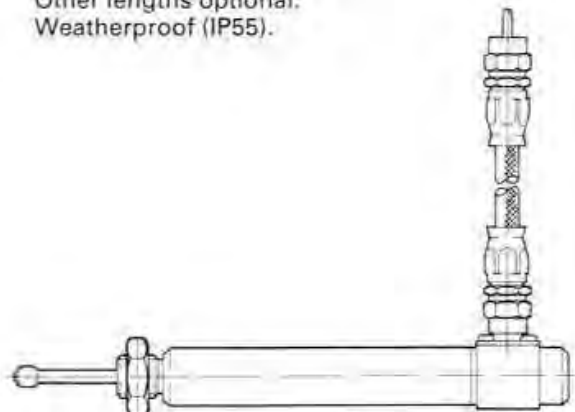
VERSION 4 (DRXXX/4)

Spring loaded, captive core and extension rod. Ball end on extension rod. Side exit with 4 pin connector. Weatherproof (IP55).



VERSION 5 (DRXXX/5)

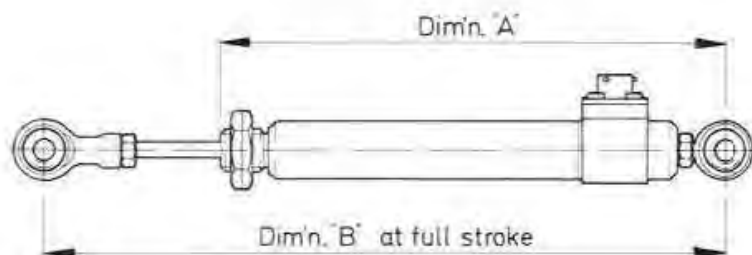
Spring loaded, captive core and extension rod. Ball end on extension rod. Side exit via 4 core PTFE cable 2m in length. Other lengths optional. Weatherproof (IP55).



VERSION 6 (DRXXX/6)

Spring loaded, captive core and extension rod. Ball end on extension rod. Side exit via 4 core PTFE cable in stainless steel flexible conduit, ending in 1/4 BSP re-usable coupling, 2m in length. Other lengths optional. Weatherproof or submersible versions available.

TRANSDUCER TYPE- (VERSIONS 4,5 & 6)	DR25	DR50	DR100	DR150
TOTAL DISPLACEMENT RANGE (mm)	25	50	100	150
DIMENSION 'A' (mm)	215	294	372	444
DIMENSION 'B' (mm)	283	388	542	690
OVERTRAVEL AT EACH END AT LEAST 5 % OF TOTAL RANGE				

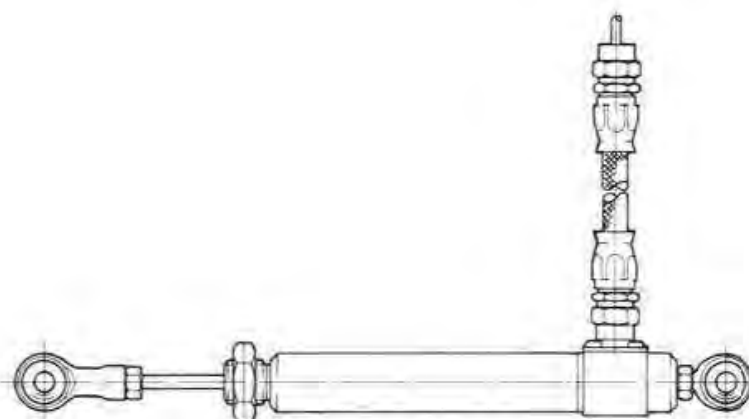
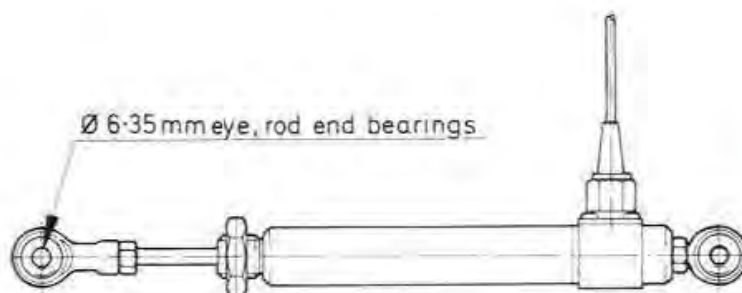


VERSION 7 (DRXXX/7)

Captive core and extension rod.
Rod end bearings on body and
extension rod. Side exit with
4 pin connector.
Weatherproof (IP55).

VERSION 8 (DRXXX/8)

Captive core and extension rod.
Rod end bearings on body and
extension rod. Side exit via
4 core PTFE cable, 2m in length,
other lengths optional. Weatherproof.
(IP55).



VERSION 9 (DRXXX/9)

Captive core and extension rod.
Rod end bearings on body and
extension rod. Side exit via
4 core PTFE cable in stainless
steel braided flexible conduit,
ending in 1/4 BSP re-usable
coupling, 2m in length, other
lengths optional. Weatherproof
or submersible versions available.

TRANSDUCER TYPE- (VERSIONS 7,8 & 9)	DR 25	DR 50	DR100	DR150
TOTAL DISPLACEMENT RANGE (mm)	25	50	100	150
DIMENSION 'A' (mm)	234	313	391	463
DIMENSION 'B' (mm)	302	407	561	709
OVERTRAVEL AT EACH END AT LEAST 5% OF TOTAL RANGE				

SB SERIES LVDT AC DISPLACEMENT TRANSDUCER



- SHORT BODY TO STROKE RATIO
- INDUSTRIAL FORMAT
- AC INPUT, AC OUTPUT
- PTFE BUSHES
- PLUG, CABLE OR FLEXIBLE CONDUIT OUTLETS
- 150°C OPERATION
180°C OPERATION (CABLE OUTLETS)
- SPRING LOADED OR ROD END BEARINGS
- WEATHERPROOF

The SB series LVDT displacement transducer features a large displacement range in a comparatively short and rugged stainless steel body. The robust construction makes the SB series ideal for applications where a short bodied, accurate, durable position feedback transducer is required. Electrical connections are made via a 2m length of integral cable or 4 pin connector.

The rugged stainless steel body consists of a magnetically shielded linear variable differential transformer. These are designed for operation from low voltage AC supplies at frequencies between 50Hz and 5KHz.

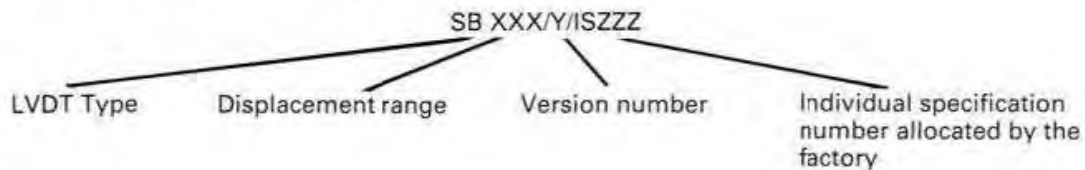
The transducer housing consists of a non-magnetic stainless steel body of 31.75mm diameter and in lengths according to the stroke length. An inner housing of magnetically permeable material shields the transformer from the effects of external fields. The 6.35mm diameter core extension shaft is guided by means of a PTFE bearing bush. On spring loaded versions the force required for full compression of the extension shaft varies from approximately 280 grms for the 25mm range to approximately 790 grms for the 150mm range.

Various configurations are available to accommodate most industrial applications. The SB series can be supplied with a spring loaded core or captive core with rod end bearings.

SPECIFICATION

Input voltage	From less than 1V to 10V RMS
Input frequency	50Hz to 5KHz
Max. recommended primary current	20mA
Working temperature range	- 40°C to + 150°C (180°C integral cable)
Survival temperature range	- 50°C to + 150°C (180°C integral cable)
Linearity	Better than 0.5% of reading
Body material	EN 58 (Non-magnetic stainless steel)
Core material	EN 56 (Magnetic stainless steel)
Calibration I/P signal	5V RMS @ 3KHz

ORDERING INFORMATION



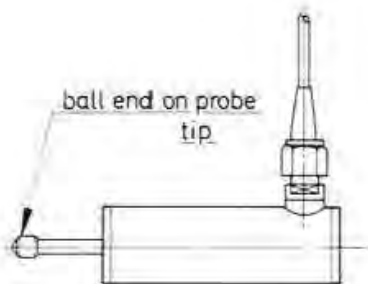
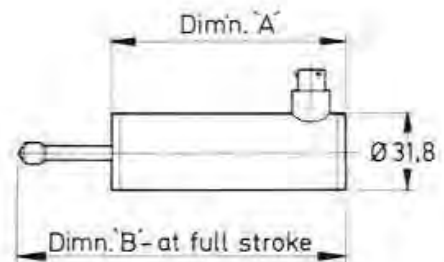
TRANSDUCER TYPE >	SB25	SB50	SB75	SB100	SB150
TOTAL DISPLACEMENT RANGE (mm)	25	50	75	100	150
OUTPUT AT FULL RANGE (mv/v at 3 KHz)	350	460	430	720	780
NULL VOLTAGE (% F.R.O.)	0.6	0.4	1.0	1.2	1.6
PRIMARY IMPEDANCE (Ω at 3KHz)	540	200	490	550	550
PRIMARY RESISTANCE (Ω)	120	120	130	180	260
SECONDARY IMPEDANCE (Ω)	240	200	210	350	560
SECONDARY RESISTANCE TOTAL (Ω)	160	190	205	340	470
ZERO PHASE FREQUENCY (KHz)	2.4	3.8	3.0	3.75	4.0
WEIGHT EXC. CABLE (GRMS.)	400	510	600	650	750

We reserve the right to alter the specification without notification.

SPRING LOADED VERSIONS

VERSION 1 (SBXXX/1)

Spring loaded, captive core and extension rod. Ball end on extension rod. Side exit with 4 pin connector. Weatherproof (IP55).

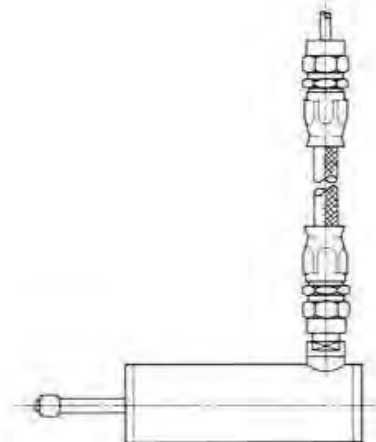


VERSION 2 (SBXXX/2)

Spring loaded, captive core and extension rod. Ball end on extension rod. Side exit via 4 core PTFE cable, 2m in length. Other lengths optional. Weatherproof (IP55).

VERSION 3 (SBXXX/3)

Spring loaded, captive core and extension rod. Ball end on extension rod. Side exit via 4 core PTFE cable in stainless steel flexible conduit, ending in 1/4 BSP re-usable coupling, 2m in length. Other lengths optional. Weatherproof (IP55).

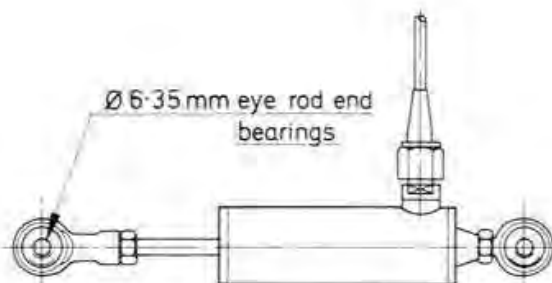
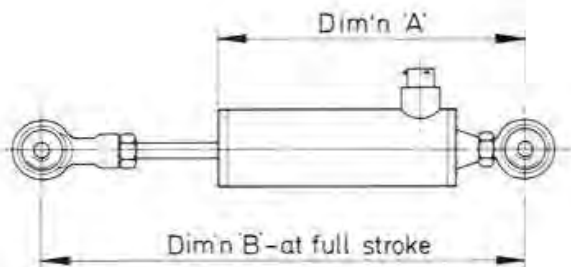


TRANSDUCER TYPE - (SPRING LOADED VERSIONS)	SB 25	SB 50	SB 75	SB 100
TOTAL DISPLACEMENT RANGE (mm)	25	50	75	100
DIMENSION 'A' (mm)	84	126	168	212
DIMENSION 'B' (mm)	117	185	253	322
OVERTRAVEL AT EACH END AT LEAST 5 % OF TOTAL RANGE				

NON SPRING LOADED VERSIONS

VERSION 4 (SBXXX/4)

Captive core and extension rod. Rod end bearings on body and extension rod. Side exit with 4 pin connector. Weatherproof (IP55).

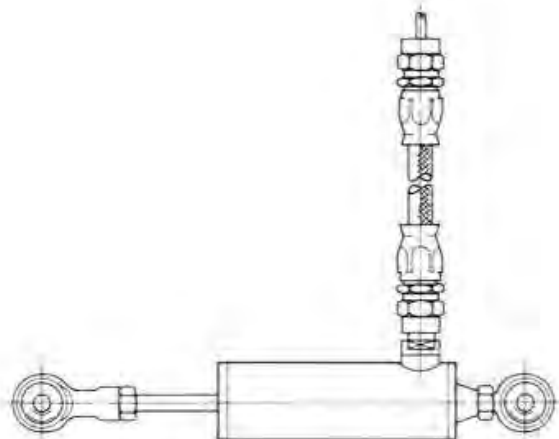


VERSION 5 (SBXXX/5)

Captive core and extension rod. Rod end bearings on body and extension rod. Side exit via 4 core PTFE cable, 2m in length, other lengths optional. Weatherproof (IP55).

VERSION 6 (SBXXX/6)

Captive core and extension rod. Rod end bearings on body and extension rod. Side exit via 4 core PTFE cable in stainless steel braided flexible conduit, ending in 1/4 BSP re-usable coupling, 2m in length. Other lengths optional. Weatherproof (IP55).



TRANSDUCER TYPE-(NON SPRING LOADED VERSIONS)	SB 25	SB 50	SB 75	SB 100	SB 150
TOTAL DISPLACEMENT RANGE (mm)	25	50	75	100	150
DIMENSION 'A' (mm)	105	148	190	234	277
DIMENSION 'B' (mm)	174	242	308	377	470
OVERTRAVEL AT EACH END AT LEAST 5% OF TOTAL RANGE					

TD SERIES LVDT DISPLACEMENT TRANSDUCER



- DESIGNED FOR SEVERE ENVIRONMENTS
- SPRING LOADED DESIGN
- AC INPUT - AC OUTPUT
- CONNECTOR CABLE OR CONDUIT OUTLETS
- STAINLESS STEEL BODY
- -20 TO + 150°C (220°C VERSION AVAILABLE)

The TD series LVDTs are designed to severe environments where only a very robust displacement transducer will survive.

The TD series LVDT has a stainless steel body and a heavy duty stainless steel spring loaded core.

The transducer input and output connections are via either a connector, cable or conduit.

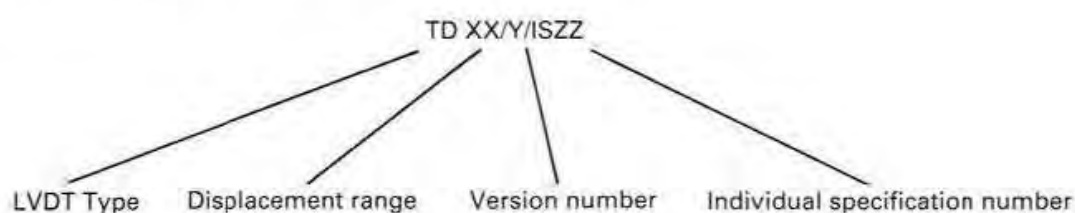
If moisture is present then a connector or cable version only gives limited protection whilst the conduit version enables the transducer to be fully submersed.

If the TD is to be submersed please indicate the depth and fluid the LVDT is to be used in so that tests (with the appropriate safety factors) can be carried out on the unit prior to despatch.

SPECIFICATION

Input voltage	From less than 1V to 10V RMS
Input frequency	50Hz to 5KHz
Maximum recommended primary current	20mA
Working temperature range	-40°C to + 150°C (220° integral cable)
Survival temperature range	-50°C to + 150°C (220°C integral cable)
Linearity	Better than 0.5% of reading
Body material	EN 58 (non-magnetic stainless steel)
Core material	EN 56 (Magnetic stainless steel)
Calibration I/P signal	5V RMS @ 3KHz
Spring rate	0.53 to 1.75 N/mm

ORDERING INFORMATION

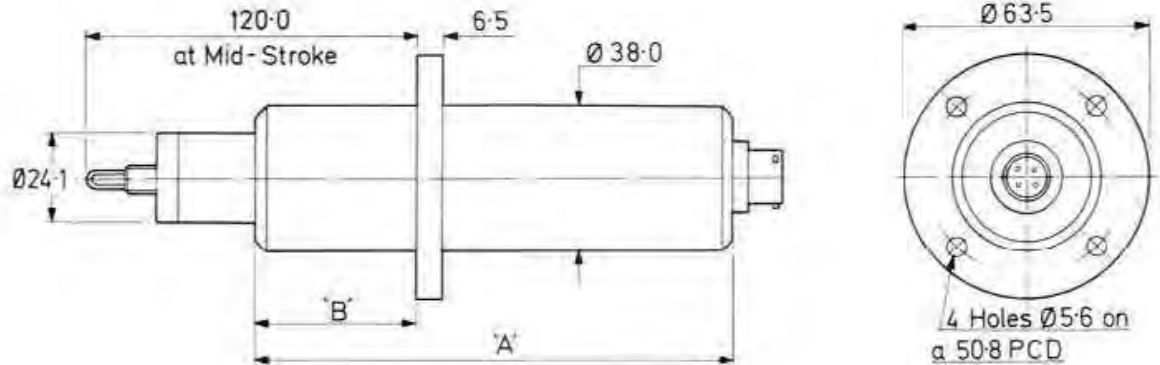


TRANSDUCER TYPE:- TD-XX	-10	-25	-50	-75
TOTAL DISPLACEMENT RANGE (mm)	10	25	50	75
FULL RANGE OUTPUT (mv/v at 3KHz)	1110	710	740	780
PRIMARY RESISTANCE (Ω)	70	70	70	130
SECONDARY RESISTANCE (Ω)	500	110	150	230
WEIGHT EXC. CABLE (GRMS)	1000	1250	1477	1810

We reserve the right to alter the specification without notification.

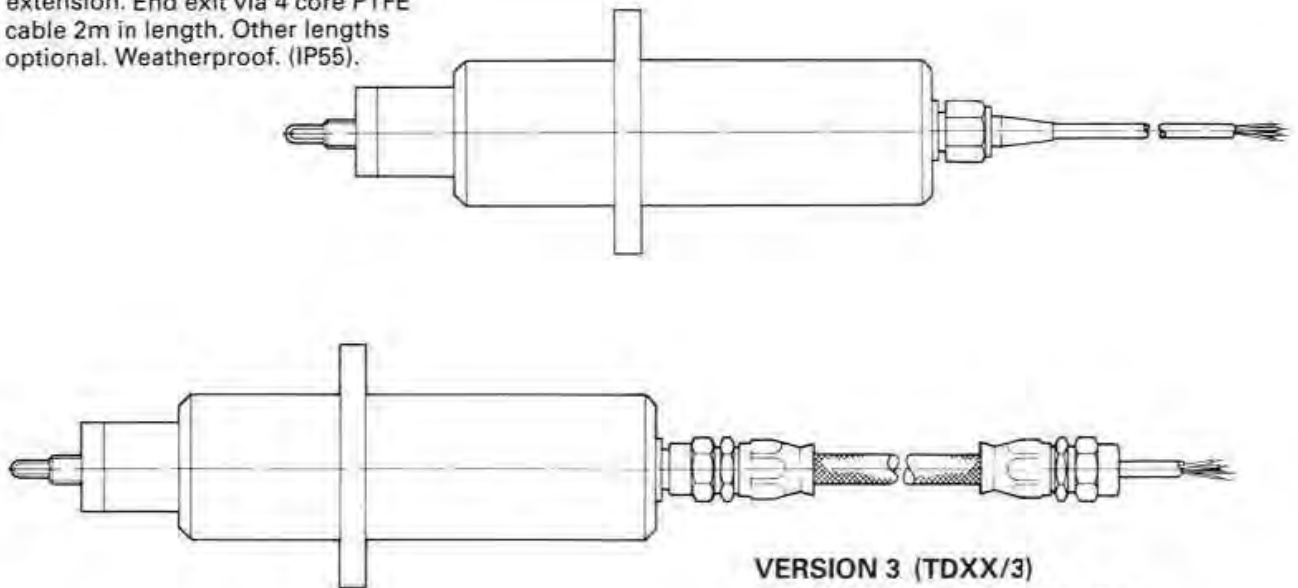
VERSION 1 (TDXX/1)

Spring loaded, captive core and extension rod.
End exit with 4 pin connector. Weatherproof. (IP55).



VERSION 2 (TDXX/2)

Spring loaded, captive core and extension. End exit via 4 core PTFE cable 2m in length. Other lengths optional. Weatherproof. (IP55).



VERSION 3 (TDXX/3)

Spring loaded. Captive core and extension rod. End exit via 4 core PTFE cable in stainless steel braided flexible conduit, ending in 1/4BSP re-usable coupling, 2m in length, other lengths optional. Weatherproof (IP55). or submersible version.

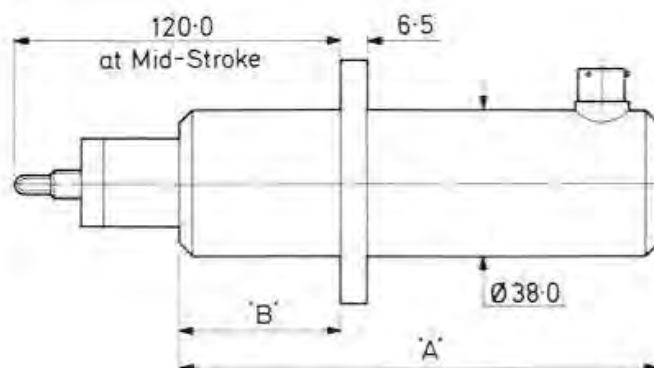
Type No: TD-XX	-10	-25	-50	-75
Stroke mm	10	25	50	75
Dimension A	123.8	197	235	252
Dimension B	90.5	79.4	63.5	54

RIES

VERSION 4 (TDXX/4)

Spring loaded, captive core and extension rod.

Side exit with 4 pin connector. Weatherproof (IP55)



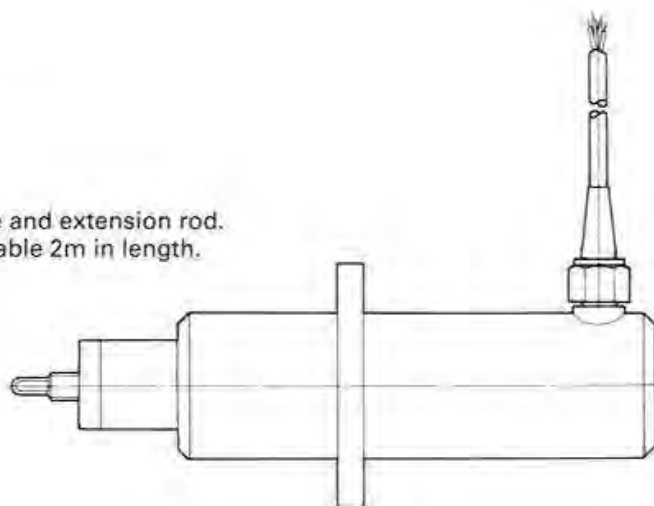
VERSION 5 (TDXX/5)

Spring loaded, captive core and extension rod.

Side exit via 4 core PTFE cable 2m in length.

Other lengths optional.

Weatherproof (IP55).

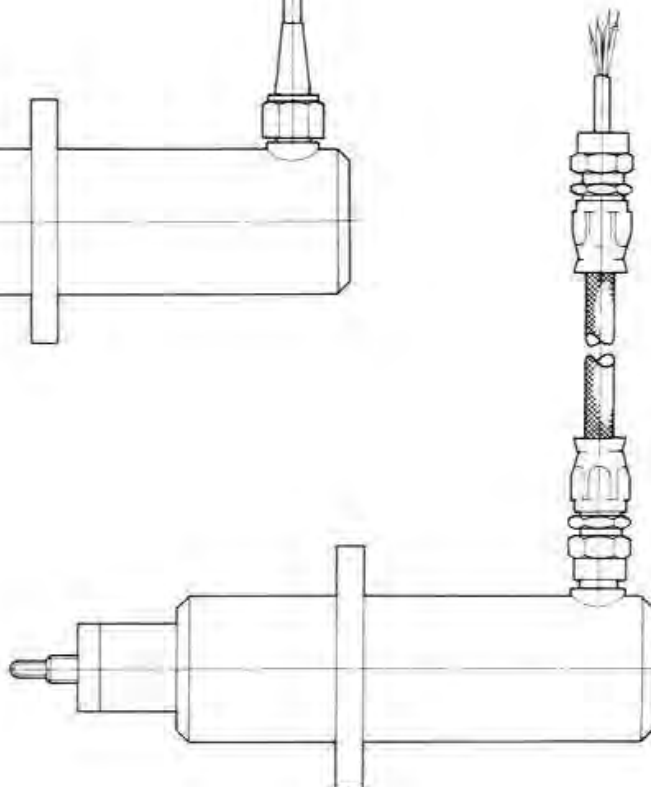


VERSION 6 (TDXX/6)

Spring loaded, captive core and extension rod.

Side exit via 4 core PTFE cable in stainless steel flexible conduit, ending in 1/4 BSP re-usable coupling, 2m in length. Other lengths optional.

Weatherproof or submersible versions available.



HI SERIES LVDT DISPLACEMENT TRANSDUCER

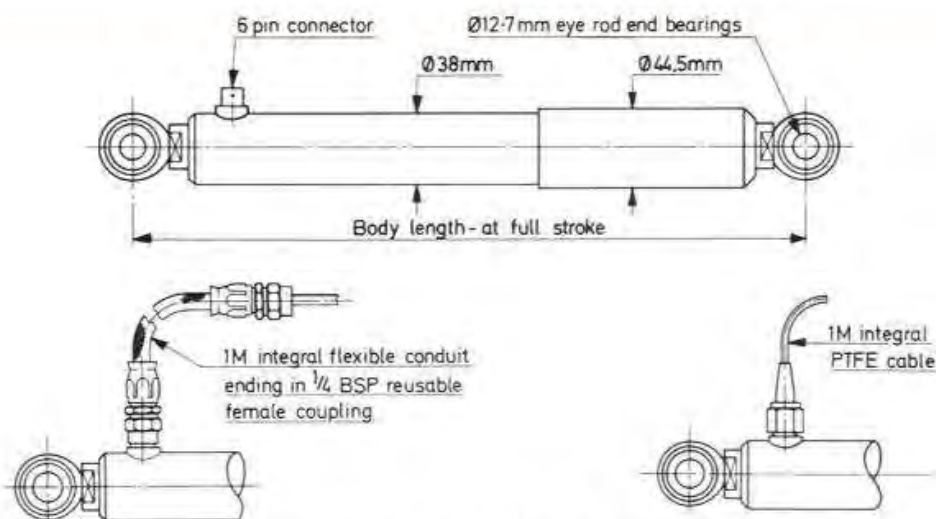


- HEAVY INDUSTRIAL
- STAINLESS STEEL CONSTRUCTION
- CONNECTOR OR INTEGRAL CABLE
- UP TO 180° OPERATION

The HI Heavy Industrial LVDT displacement transducer consists of a standard linear variable differential transformer housed within a robust stainless steel body. The concentric tubes of the telescopic assembly are guided by means of a linear bearing and are retained by rigid end stops within the body. The fixed and moving ends of the transducer are fitted with rod end bearings for mounting purposes.

The rugged and reliable construction of this series makes it particularly suited to Heavy Industrial applications and 'uncomfortable' environments. Of conventional LVDT principle these transducers are designed for use on low voltage AC supplies at frequencies between 50Hz and 5KHz.

The rod end bearings are screwed into the two body end sections and are fitted with lock nuts. The length of thread on one end bearing permits an adjustment of $\pm 6\text{mm}$ (± 0.25 inches) to provide a fine control of mechanical zero position.



Note: Other cable and conduit lengths available.

SPECIFICATION

Input voltage	From less than 1V to 10V RMS
Input frequency	5Hz to 5KHz
Max. recommended primary current	20mA
Working temperature range	- 40°C to + 150°C (180°C integral cable)
Survival temperature range	- 50°C to + 150°C (180°C integral cable)
Linearity	Better than 0.5% full scale
Repeatability	Better than 0.02% reading
Body material	EN 56 AM (Non magnetic stainless)
Core material	EN 56 AM (Magnetic stainless)
Calibration I/P signal	5V RMS @ 3KHz

TRANSDUCER TYPE-	HI25	HI50	HI100	HI150
TOTAL DISPLACEMENT RANGE	25	50	100	150
OUTPUT AT FULL RANGE mv/v @ 3KHz	350	450	720	780
NULL VOLTAGE (% F.R.D.)	0.6	0.4	1.2	1.6
PRIMARY IMPEDANCE at 3 KHz	540	200	550	550
PRIMARY RESISTANCE (OHMS)	120	120	180	260
SECONDARY IMPEDANCE	240	200	350	560
SECONDARY RESISTANCE TOTAL (OHMS)	160	190	340	470
ZERO PHASE FREQUENCY (KHz)	2.4	3.6	3.75	4.0
WEIGHT (EXC. CABLE) GRMS.	1.9	2.4	3.0	3.3
BODY LENGTH (mm)	351	474	661	834

OPTIONS

Cable length PTFE oversheath on flexible conduit

We reserve the right to alter the specification without notification.

SHI SERIES LVDT DISPLACEMENT TRANSDUCER

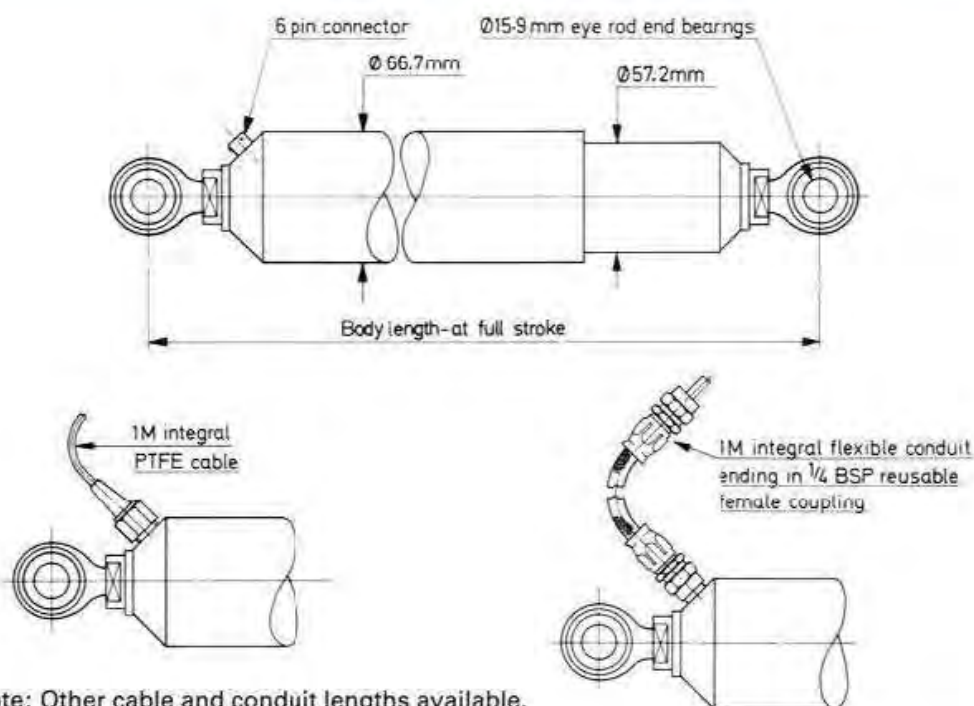


- AC OPERATION
- SHORT HEAVY INDUSTRIAL
- CONNECTOR OR INTEGRAL CABLE
- ROD END BEARINGS
- STAINLESS STEEL BODY
- UP TO 180° OPERATION

The SHI 'Short Heavy Industrial' LVDT displacement transducer consists of a standard linear variable differential transformer housed within a robust stainless steel body. The concentric tubes of the telescopic assembly are guided by means of a linear bearing and are retained by rigid end stops within the body. The fixed and moving ends of the transducer are fitted with rod end bearings for mounting purposes.

The version was introduced to provide long working strokes within minimum length bodies. The rugged and reliable construction of the series makes it particularly suited to Heavy Industrial applications and 'uncomfortable' environments. Of conventional LVDT principle these transducers are designed for use on low voltage AC supplies at frequencies between 50Hz and 5KHz.

The rod end bearings are screwed into the two body end sections and are fitted with lock nuts. The length of thread on one end bearing permits an adjustment of $\pm 6\text{mm}$ (± 0.25 inches) to provide a fine control of mechanical zero position.



Note: Other cable and conduit lengths available.

SPECIFICATION

Input voltage	From less than 1V to 10V RMS
Input frequency	5Hz to 5KHz
Max. recommended primary current	20mA
Working temperature range	-40°C to +150°C (180°C integral cable)
Survival temperature range	-50°C to +150°C (180°C integral cable)
Linearity	Better than 0.5% full scale
Repeatability	Better than 0.02% reading
Body material	EN 58 (Non magnetic stainless)
Core material	EN 56 (Magnetic stainless)
Calibration I/P signal	5V RMS @ 3KHz

TRANSDUCER TYPE:-	SHI 50	SHI 100	SHI 150	SHI 200	SHI 300	SHI 400	SHI 500	SHI 600
TOTAL DISPLACEMENT RANGE (mm)	50	100	150	200	300	400	500	600
OUTPUT AT FULL RANGE (mV/V at 3 KHz)	460	720	780	880	720	480	400	432
NULL VOLTAGE (% F.R.O.)	0.4	1.2	1.6	0.7	0.2	0.6	0.8	0.2
PRIMARY IMPEDANCE (OHMS at 3KHz)	200	550	550	420	320	340	390	350
PRIMARY RESISTANCE (OHMS)	120	180	260	260	200	480	300	250
SECONDARY IMPEDANCE (OHMS)	200	350	560	470	500	610	670	410
SECONDARY RESISTANCE TOTAL (OHMS)	190	340	470	460	450	800	400	390
ZERO PHASE FREQUENCY (KHz)	3.8	3.75	4.0	3.75	3.0	5.0	4.1	4.5
WEIGHT (EXC. CABLE) (KG)	4.5	5.0	5.5	6.0	7.0	8.0	9.0	10.0
BODY LENGTH (mm)	381	508	610	965	1194	1200	1397	1626

We reserve the right to alter the specification without notification.

R40A SERIES ANGULAR POSITION TRANSDUCER

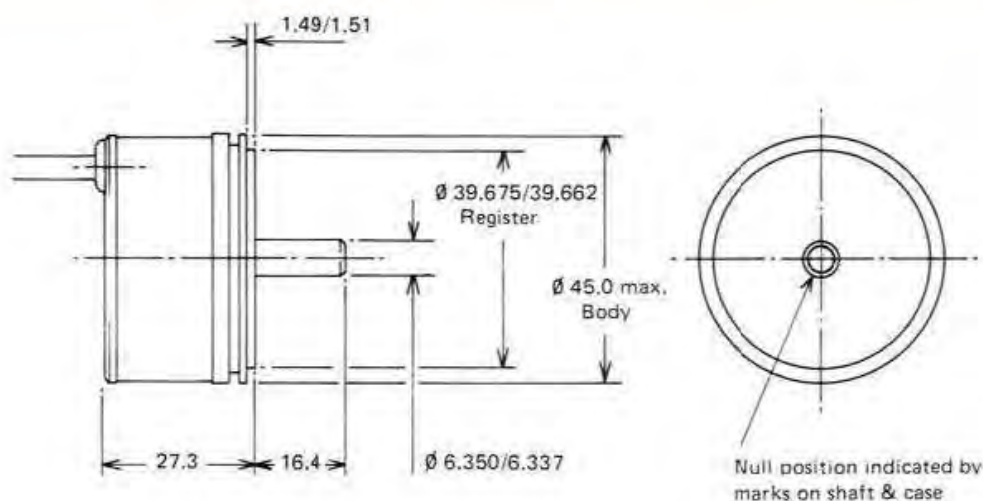


- RVDT TYPE
- ± 60 DEGREES RANGE
- SMALL AND ROBUST
- EXCELLENT LINEARITY

The Sensonics R40A Series angular position transducer uses the principle of the Rotary Variable Differential Transformer (RVDT) to convert the rotation of a shaft into a proportional electrical output signal. The RVDT primary winding is energised with AC from an external source and induces in the secondary windings an AC signal, the magnitude and phase of which are determined by the angular position of a specially shaped rotor attached to the operating shaft. Separate external signal conditioning is necessary to produce a DC signal proportional to shaft position.

The R40A is housed within a stainless steel case to the format of a size 18 synchro. The 6.35mm dia. x 15.4mm long operating shaft is internally supported by a pair of miniature, precision ball races which permit continuous rotation and minimum friction. The rear face of the unit supports the cable outlet and optional stainless steel flexible armouring to the specified length.

Although the transducer is capable of continuous rotation, a plot of angular rotation against magnitude and phase of output signal over 360° would result in one complete sine wave (and therefore two positions, separated by 180° of rotation, where the output signal is zero). To avoid ambiguity, just one of the null positions is chosen during final test and a calibration is made over the most linear range either side of this null. Both the shaft and the case are marked to show the alignment at the null point selected. Individual calibration certificates are provided.



SPECIFICATION

Input Supply	Up to 10v rms according to frequency (400Hz to 10KHz)
Input Current	Up to 20mA
Maximum measuring range	$\pm 60^\circ$ (max. non-linearity = $\pm 2\%$)
Linearity within $\pm 0.5\%$ over	$\pm 40^\circ$
Linearity within $\pm 0.3\%$ over	$\pm 30^\circ$
Sensitivity at 3KHz excitation	0.68 mV/degree/volt applied
Sensitivity at 5KHz excitation	0.69 mV/degree/volt applied
Primary winding resistance	575 ohms
Primary winding impedance at 3KHz	4.25 Kohms (7Kohms at 5KHz)
Secondary winding resistance	530 ohms
Secondary winding impedance at 3KHz	4.25 Kohms (7 Kohms at 5KHz)
Typical output at null position	10mV (3KHz), 15mV (5KHz)
Temperature range	0 to 90°C
Dimensions	
Diameter	45mm
Depth	27.3mm
Shaft Extension	16.4mm
Weight	225 grams

ORDERING INFORMATION/OPTIONS

R40A/IS400	Standard: 1m integral cable
R40A/F/IS401	As R40A/IS400 but with 1m integral armoured cable.

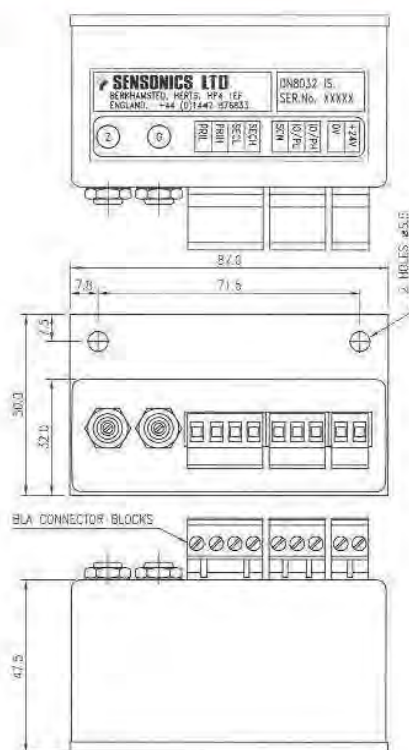
OPTIONS

Various integral cable and armoured cable lengths.

Ordering Information

Please order unit by specific type No, or by specifying the options as listed above.

We reserve the right to alter the specification without notification



Features

- 24V DC input
- 4-20mA current output
- For use with AC LVDTs
- Zero and Gain controls.
- Din Rail Mount

The DN 8032 is one of a range of LVDT signal conditioning units offered by Sensonics providing oscillator & demodulator functionality for AC LVDTs.

The unit provides a sinusoidal output at 3kHz for excitation of the transducer, amplification, phase sensitive demodulation and a low pass active filter to give a 4 to 20mA output signal proportional to displacement.

Driven from a +24V power supply, the Din Rail mountable unit provides two miniature multi-turn potentiometers for the setting of the gain and zero point parameters.

Specification

Oscillator:	Amplitude voltage	7V rms \pm 5%
	Frequency	3kHz \pm 5%
	Amplitude Stability	\pm 0.05% per $^{\circ}$ C
Demodulator:	Type	Full wave, phase sensitive
	Linearity error	Less than 0.1%
Amplifier:	Gain	Adjustable, High & Low ranges
	Stability	\pm 0.02% per $^{\circ}$ C
	Long term stability	\pm 0.2%
	Zero Adjustment	\pm 2V ref input
	Stability of Zero	Less than 50 μ V per $^{\circ}$ C
	Frequency Response	DC to 100Hz \pm 2%, 250 Hz - 3dB
	Residual Carrier	Less Than 0.2% Full Scale
Module:	Loop Resistance	300 Ohms
	Input Voltage	18V - 36V dc
	Power Consumption	2W max (Isolated input)
	Controls	Screwdriver - adjusted, multi-turn potentiometer accessible only from outside case.
	Temperature Range	-10 to 60 $^{\circ}$ C
	Weight	250 grams
Connections:	PRIH - Primary Coil (+)	PRIL - Primary Coil (-)
	SECH - Secondary Coil (+)	SECL - Secondary Coil (-)
	IO/PH - 4-20mA Current Output High	
	IO/PL - 4-20mA Current Output Low	
	SCN - Cable Screen (Instrument Ov)	

DC8042 SERIES LVDT SIGNAL CONDITIONING



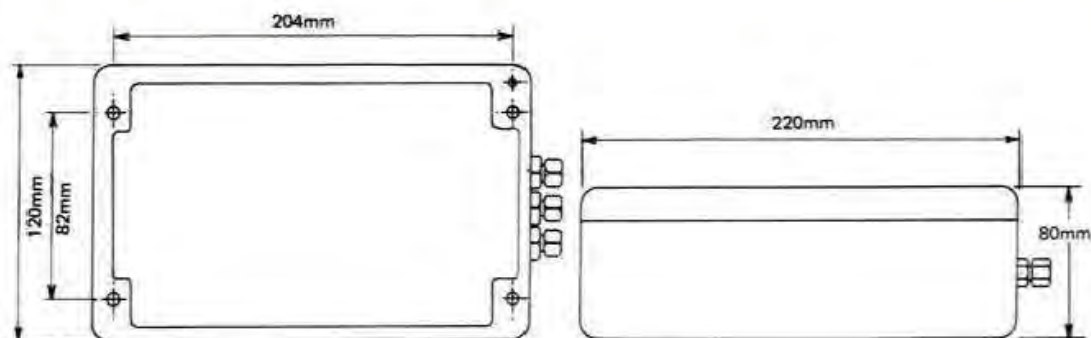
- MAINS OR DC INPUT
- VOLTAGE OR CURRENT OUTPUT
- FOR USE WITH AC LVDTs
- ZERO AND GAIN CONTROLS
- SEALED TO IP55

The DC8042 series of LVDT drivers are oscillator/demodulators for LVDT transducers.

The units consist of Sensonics standard printed circuit cards housed together with a power supply unit in a weatherproof die cast box. The input and output connections to the internal terminal blocks is via fitted cable glands.

The internal card assembly is formed from discrete components mounted on a resin-bonded glass fibre laminate with tinned copper printed circuit conductors and gold plated edge contacts. The card has miniature multi-turn potentiometers for the setting of gain and zero.

The unit provides a sinusoidal output at 3KHz for excitation of the transducer, amplification, phase sensitive demodulation, a low pass active filter to give a DC voltage output signal and has, in addition, a current output stage.



SPECIFICATION

Oscillator

Amplitude current	12mA RMS max.
Frequency	3KHz \pm 10%
Amplitude Stability	\pm 0.05% per $^{\circ}$ C

Demodulator

Type	Full wave, phase sensitive
Linearity Error	Less than 0.1%
Max. input	6V RMS

Amplifier

Gain	Variable from 0 to X10
Temperature Stability of Gain	\pm 0.02% per $^{\circ}$ C
Long Term Stability	\pm 0.2%
Zero Adjustment Range	\pm 2V at input
Temperature Stability of Zero	Less than 50 μ V per $^{\circ}$ C
Frequency Response	DC to 100 Hz \pm 2%, 250 Hz - 3dB
Residual Carrier	Less than 0.2% Full Scale

Recorder output drive voltage 8 volts

Input Voltage 110V/240V 50Hz, pre-set by internal transformer tap or DC as below

Internal stabilised voltage \pm 12V DC at 100mA max.

Signal input facility) Specify size and

Signal output facility.) type of gland to be

Mains input facility) fitted (1/4 BSP is STD)

Controls Screwdriver — adjusted, multi-turn potentiometer accessible only from inside case

Temperature range -10 to 60 $^{\circ}$ C

Total weight (approx.) 2Kg (about 4 1/2 lbs.)

ORDERING INFORMATION/OPTIONS

	Input Voltage	Output Signal
DC8042/A	110/240V A.C.	4-20 mA
DC8042/B	8-30V D.C.	4-20 mA
DC8042/C	110/240V A.C.	0-5V
DC8042/D	8-30V D.C.	0-5V

We reserve the right to alter the specification without notification.

PREDICTIVE MAINTENANCE SYSTEMS

KEEPING
INDUSTRY
TURNING



OTHER PRODUCTS IN THE SENSONICS RANGE

- Velocity Transducers
- Accelerometers
- LVDT's & RVDT's
- Portable predictive maintenance systems
- Signal conditioning systems
- On line vibration monitoring
- Seismic Sensors

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- Installation and commissioning (turnkey projects)
- System integration
- Condition monitoring surveys and contracts
- Diagnostic services

Local Representation:

Sensonics Ltd
Northbridge Road
Berkhamsted
Hertfordshire
HP4 1EF
England

Telephone:
+44 (0)1442 876833
Facsimile:
+44 (0)1442 876477
Email:
sales@sensonics.co.uk
www.sensonics.net

 **SENSONICS**

If you are at all unsure about any application of Eddy Current Probes please do not hesitate to call our technical sales department, who will be delighted to offer advice without obligation.



Cert. No. FM26920