



**Solartron
Metrology**

**SCIENCE
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Your Automation Partner



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S-SERIES DISPLACEMENT TRANSDUCERS



user manual

AMETEK[®]
ULTRA PRECISION TECHNOLOGIES

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1.0: Introduction

Solartron's new 'S-Series' range of displacement transducers forms a wide range of transducers offering measurement ranges from ± 2.5 mm to ± 150 mm. The S-Series offers the advantage of a shorter body than traditional displacement transducers. Furthermore, four electrical output types are provided; these are standard LVDT, 4-20 mA, isolated DC voltage and digital outputs.

All models in the S-Series can be configured with guided or unguided core for frictionless operation. The wide bore to core clearance of the S-Series makes installation and alignment a very easy process. The guided versions are provided with polymer bearings for high rigidity and are available with special tips, universal joint fittings and return springs. The universal joints are useful in applications where lever movements induce variations in the motion straightness.

The rugged construction of the S-Series and the options of IP65, IP67, IP68 and submersible (100 bar) rating makes these transducers a cost-effective product suitable for use in harsh environments.

GENERAL SPECIFICATION

Storage Temperature	LVDT Variants	-40 °C to +120 °C
	4-20 mA, DC and Digital Variants	-20 °C to +85 °C
Operating Temperature	LVDT Variants	-40 °C to +120 °C
	4-20 mA and DC Variants	0 °C to +65 °C
	Digital variants (Transducer only)	-40 °C to +120 °C
Linearity	0.2% FSO	

For full specification please refer to the Product Datasheet, catalogue or www.solartronmetrology.com

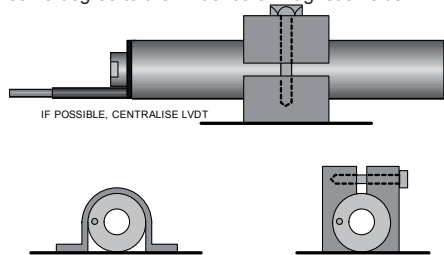
Typical Mechanical Configurations

2.0: Installation

2.1: Mounting the Transducer

LVDT based transducers are a reliable and proven technology that is well established in all areas of manufacturing and control industries. The majority of the associated problems experienced with their application and use are totally avoidable, particularly if sufficient thought is given during the initial design stages of equipment to the positioning and clamping methods employed for these feedback elements.

LVDT's, being of inductive nature, are susceptible to some degree to the influence of magnetic fields.



2.0: Installation

The S-Series transducers contain an integral magnetic screen that reduces these effects. However, the transducer should be positioned well away from electric motors, relays and permanent magnets. If this is not possible checks should be made on the influence of such items.

Clamping of the coil assembly should be carefully considered. Some example methods are shown below. Ideally the body of the transducers should be clamped centrally in a pinch or yoke type clamp, manufactured from a low conductivity, non-magnetic material.

Irrespective of clamping method, care must be taken not to over-tighten retaining screws as distortion of the body may prove damaging to the integrity of the transducer and adversely affect the geometry of the installation.

If the LVDT is to be mounted on equipment subject to high "g" then, dependent on the direction of these forces, it may be advantageous to consider end to end clamping in preference to over body clamping.

For Universal Joint fittings maximum tightening torque on the ball = 2.5 Nm.

2.0: Installation (continued)

2.2: Cores

The standard core supplied is a $\varnothing 6.35$ mm Core with M4 x 0.7 x 12 mm female thread at both ends for mounting onto a carrier. The magnetic core has been manufactured to achieve optimum performance and any subsequent handling of the core which results in stress being imparted will render the calibration void. This includes over-tightening of the core during installation onto its carrier. Hand tightening and retention by means of a suitable thread locking anaerobic retainer is the recommended procedure.

2.3: Carriers

A standard length carrier is available for each model of transducer, manufactured from 316 stainless steel and incorporating an M4 x 0.7 x 10 mm long male thread for attachment to the standard core and an M6 x 1.0 x 17 mm male thread for attachment to the fixture.

2.3.1: Guided Carriers

Mounting: Normal mounting methods apply (see Installation). Careful consideration should be given to alignment; the carrier must be able to move freely within the transducer core. Side force should be kept to a minimal level.

Maintenance: Check for free movement of the carrier when in the vertical plane. The polymer guide bearing is maintenance free.

2.3.2: Ball Tips

This option is for use with the Guided Carrier and is attached via an adapter fitted to the threaded end of the core carrier. Side forces that may exert undue pressure and flex the carrier must be avoided.

2.0: Installation (continued)

2.3.3: Springs

A spring may be fitted externally in conjunction with a guided carrier and also with a ball tip. Please refer to S-Series datasheet to choose an appropriate spring.

2.3.4: Universal Joints

Mounting: All S-Series transducers up to 300 mm total measurement range (± 150 mm) may be mounted in any axis; it is recommended that the rear rod end bearing (near cable exit) is mounted on the static component. (The larger transducers, because of the increase in weight, may exhibit bowing of the carrier and therefore mounting in the horizontal plane should either be avoided or additional support given to the body. This option is used with the guided core.)

Maintenance: Periodic inspection of locking screws and nuts etc. is advisable depending upon the Customer's application. Rod end bearings should be able to move freely and have minimal side play.

2.0: Installation (continued)

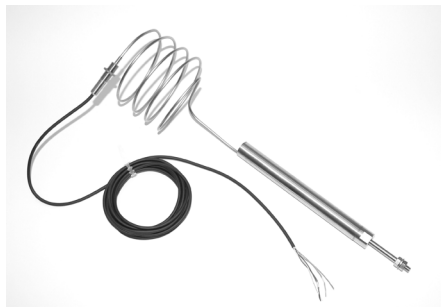
2.3.5: Thread Mount Option



2 Mounting Nuts 1/2"-
20 UNF-2A

2.3.6: Submersible Option

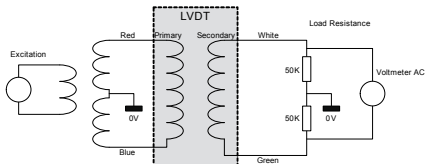
The submersible transducer has a mineral insulated cable terminated in a bulk head connection.



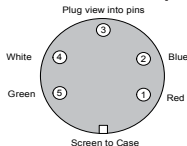
3.0: Electrical Interfaces

3.1: Standard LVDT

The S-Series LVDT output transducer is designed to operate with an excitation voltage of 3 ± 1 V rms, an excitation frequency of 5 ± 0.5 kHz into a $100 \text{ k}\Omega$ load as detailed below. Operation in different configurations may mean the optimum performance is degraded.



Standard LVDT Connector 5 pin 240° DIN



The S-Series range of LVDT transducers operate on the principal that movement of a core inside the transducer body is detected by a differential change in output on two secondary coils, the primary coil(s) being energised by an appropriate AC excitation signal. With the core in a central position, the coupling from the primary to each secondary is equal and opposite and therefore cancel out, thus the resultant output voltage is zero. As the core is displaced further into one secondary, its voltage increases proportionally and the other secondary voltage decreases hence the output changes in magnitude and phase in proportion to movement in either direction from null.

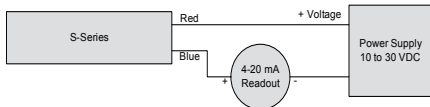
The red and white connections are in phase for inward movement (i.e. towards the cable end).

The output signal depends on both core movement and energisation voltage and is expressed as a sensitivity in $\text{mV}_{\text{output}} / \text{V}_{\text{energising}} / \text{mm travel}$.

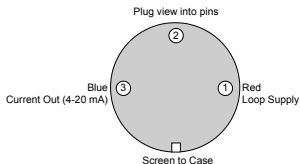
3.0: Electrical Interfaces (continued)

3.2: 4-20 MA

Configured as a two wire 4-20 mA loop device, the transducer provides a current between 4 mA (fully out) and 20 mA (fully in). The transducer requires an excitation voltage between 10 VDC and 30 VDC.



Note 1: Standard 4-20 mA Connector 3 pin 180°DIN
Note 2: 4-20 mA products are designed to operate with a maximum loop resistance of 600 Ω .



3.0: Electrical Interfaces
(continued)

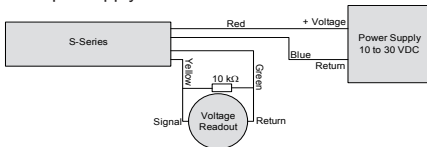
3.3: DC Voltage

The S-Series can be configured to provide a DC voltage output as shown below;

Measurement Range	Output	Output
0-d mm	0-5 VDC	0-10 VDC
-d/2 to +d/2 mm	-5 VDC to +5 VDC	-10 VDC to +10 VDC

The transducer requires an excitation voltage between 10 VDC and 30 VDC.

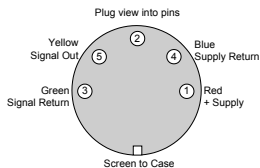
The transducer output is electrically isolated from the input supply.



Note: to achieve calibrated accuracy the load must be 10 k Ω between Yellow and Green,

3.0: Electrical Interfaces (continued)

Standard DC Voltage Connector 5 pin 180° DIN



3.4: DIGITAL

Digital versions of the S-Series transducer are supplied with an integral PIE module. This module is fully compatible with Solartron's Orbit Network system. For details of Orbit Interface see Digital Probe User Leaflet.

4.0: Conditioning

The 4-20 mA and DC output version of the S-Series transducer require no signal conditioning other than being connected to an appropriate receiver such as a voltmeter, A/D converter or current meter. The digital version requires connection to a suitable Orbit Network or Orbit Digital Readout.

LVDT transducers usually require the signal to be conditioned either by end user amplifiers or with Solartron conditioning circuits. Information on these products can be obtained from Solartron and the Solartron Website, www.solartronmetrology.com.

5.0: Marking

Products with integrated electronics are CE marked. Digital probes are CE marked.