
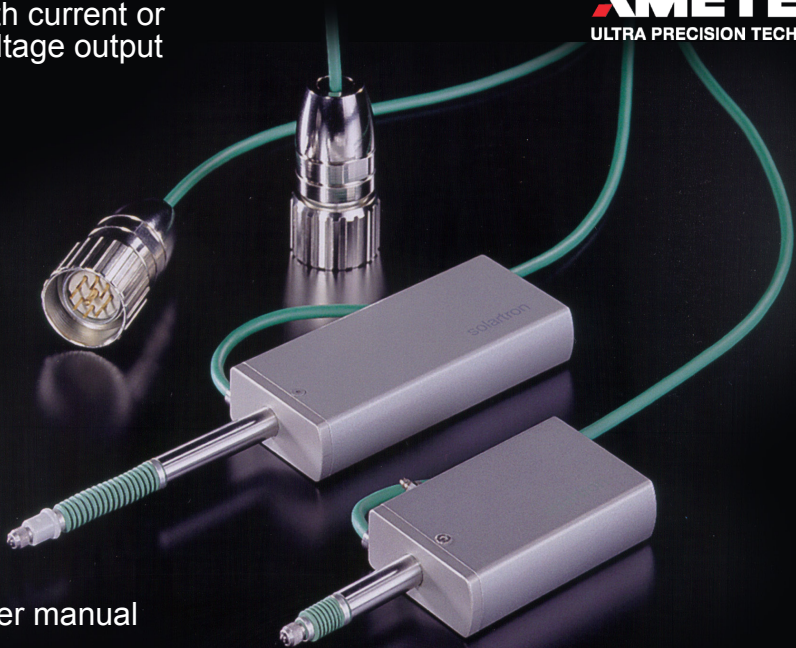


linear encoders  
with current or  
voltage output

 Solartron  
Metrology  
**AMETEK**<sup>®</sup>  
ULTRA PRECISION TECHNOLOGIES



user manual



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# 1.0: Introduction

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## Introduction

The LE12/25 Linear Encoder with current or voltage output, when used with suitable interfacing electronics, provide a precision linear measurement system. The current version (designated I) provides industrial standard current in-phase and quadrature-phase signals. The voltage version (designated V) provides equivalent voltage signals.

model no. LE/12/SV  
LE/12/SI  
LE/25/SV  
LE/25/SI  
LE/12/PV  
LE/12/PI  
LE/25/PV  
LE/25/PI

Solartron also produce a digital version of the Linear Encoders, which can be used with Solartron DRO's or the Orbit network to create measuring systems.

## This Manual

Describes the Linear Encoder types LE12/25 both pneumatic and spring versions with either current or voltage output.

This manual details the handling, installation and operation of the encoder and describes the electrical interfaces.

# 2.0: Safety Summary

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## Terms in this manual

**WARNING** statements identify conditions or practices that could result in personal injury or loss of life.

**CAUTION** statements identify conditions or practices that could result in damage to the equipment or other property.

## Symbols in this manual



This symbol indicates where applicable cautionary or other information is to be found.

## WARNINGS:

### **Do not operate in an explosive atmosphere**

To avoid explosion, do not operate this equipment in an explosive atmosphere.

### **Air Pressure**

On LE/12/P and LE/25/P variants under no circumstances should the recommended maximum overpressure of 1.0 bar be exceeded.

## NOTES:

### **This equipment contains no user serviceable parts**

This equipment must be returned to your Solartron dealer for all servicing and repair (see section 10.0).

### **Low Voltage**

This equipment operates at below the SELV and is therefore outside the scope of the Low Voltage Directive.

## 3.0: Designation of Parts

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### Items Supplied

Linear Encoder Probe in packaging case.

Standard tip (measuring contact) fitted.

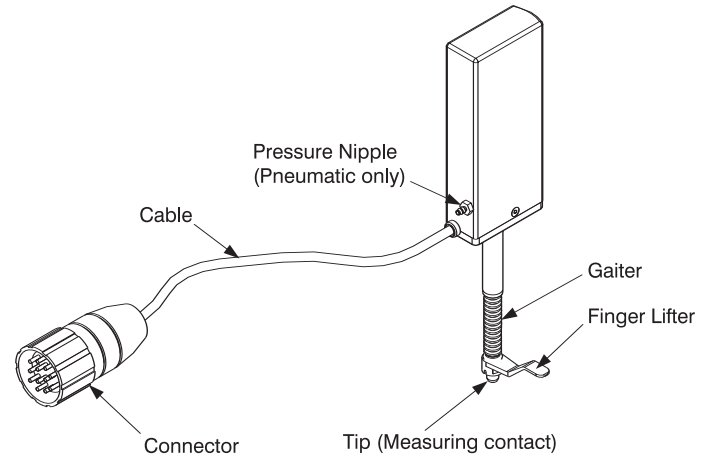
Finger lift lever.

Locking tool.

Operating instructions.

Calibration chart.

Plus other accessories as ordered.



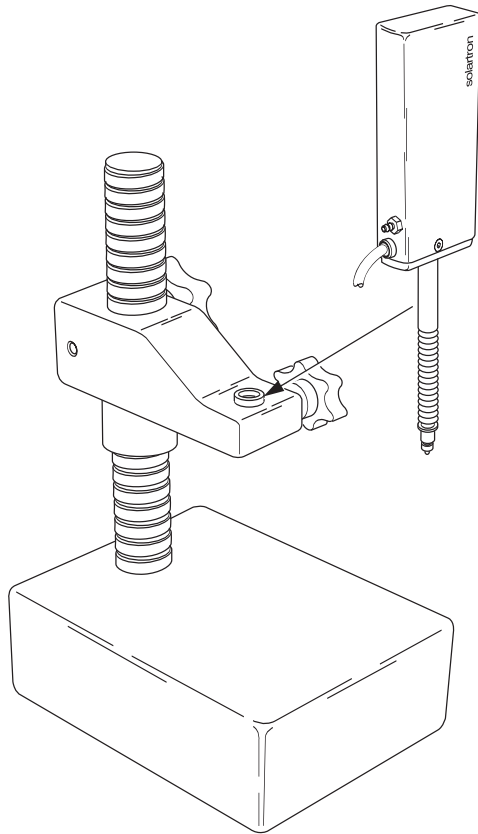
## 4.0: Handling & Maintenance

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The Solartron range of Linear Encoders are precision instruments and should be handled with care. Where possible, the Linear Encoder should be stored in its protective box when not being used.

These Linear Encoders are designed to be maintenance free; additional periodic lubrication is unnecessary. Contacts with solvents should be avoided. Any attempt to dismantle the Linear Encoder will invalidate the warranty.

## 5.0: Mechanical Installation



### CAUTIONS



Ensure that the probe is not subjected to excessive over-travel, or side loading at the tip greater than that corresponding to a 0.5mm lift on a  $\varnothing 3$  ball.

When mounting the Linear Encoder avoid the risk of distortion of the bearing assembly by over-tightening of the mounting screws around the clamping shank.

### Notes:

It is important to ensure that the probe is perpendicular to the measuring table to avoid introducing cosine errors.

Do not use excessive torque when tightening gauge stand clamp screws (see next section).

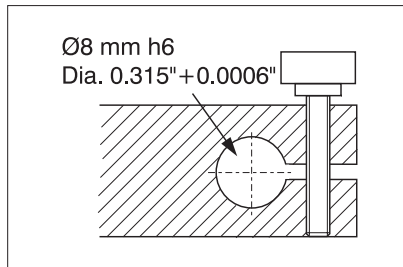
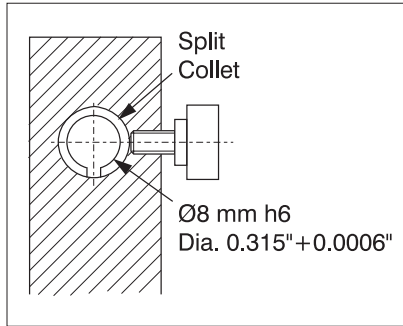
Keep cable away from moving parts to avoid potential damage.

Protect probe against shock loading or impact!

# 5.0: Mechanical Installation (continued)

## 5.1 Clamping Configurations

When mounting Linear Encoder do not over tighten clamp screws.



Recommended maximum tightening torque

$$= \frac{0.28d \left( \left( \frac{P}{\pi d} \right) + 0.15 \right)}{1 - \left( 0.15 \frac{P}{\pi d} \right)}$$

Where  $d$  = screw dia mm

$P$  = screw pitch mm

assuming a 'V' form thread and 0.15 coefficient of friction.

**Note:** A clearance hole in the fixturing of Ø9.5mm is advisable around the gaiter for satisfactory operation.

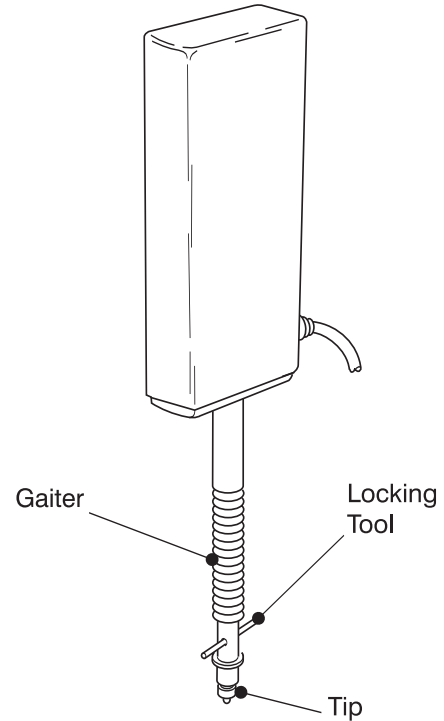


# 5.0: Mechanical Installation (continued)

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## 5.2 Replacing the probe tip

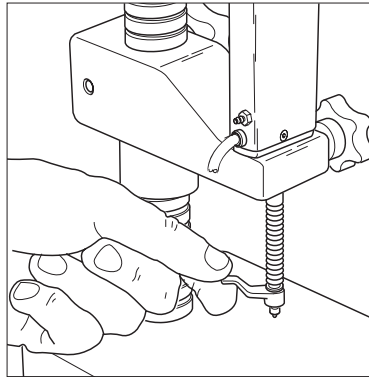
1. Slide back gaiter (fitted to IP65 and pneumatic versions only) to reveal the hole in the shaft.
2. Insert locking tool (supplied) in the hole.
3. Unscrew tip while holding locking tool to prevent any damage to the read head.
4. Install new tip while holding locking tool.
5. Torque tip to 18-22 cNm.
6. Slide down gaiter, (IP65 and pneumatic versions only).



# 6.0: Operation

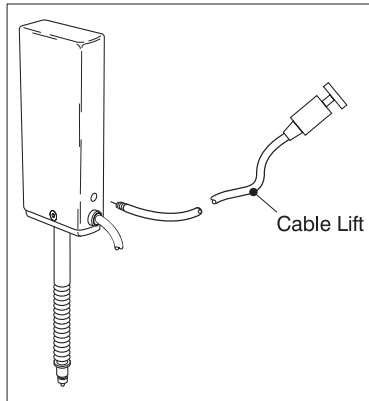
## 6.1 Finger lift lever

Snaps over probe tip enabling tip to be lifted without transferring heat to shaft.



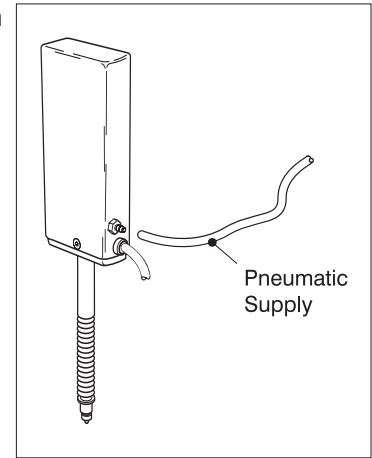
## 6.2 Cable lift

Allows tip to be retracted without touching Linear Encoder. Cable retract screws into probe body after removal of blanking screw.



## 6.3 Pneumatic operation

A Pneumatic nozzle is fitted as standard to LE/12/P & LE/25/P. By applying air between 0.5 & 0.8 bar, measuring tip will extend to meet component under test. On no account should a pressure exceeding 1.0 bar be applied.



**WARNING:** Damage/injury could be caused if the maximum recommended air pressure is exceeded.

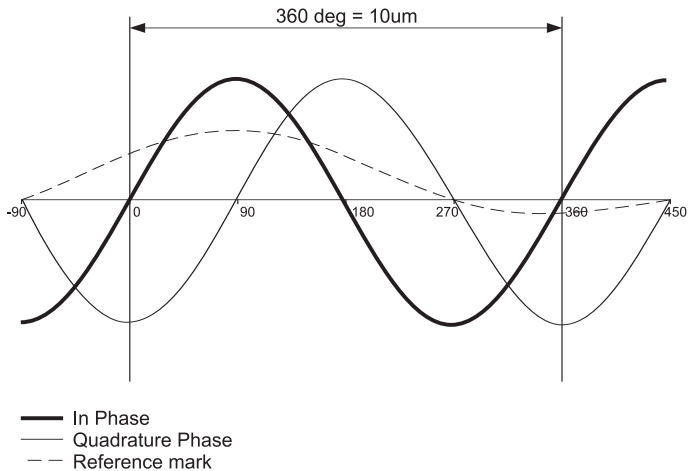
## CAUTION



Ensure that the air supply for pneumatic operation is clean, dry and oil free.

# 7.0: Electrical Interface

The Linear Encoder provides either a current output or a voltage output corresponding to the format below. The signals are differential. These signals are designed to be compatible with industry standard electronics.

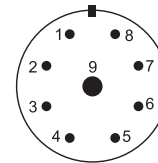
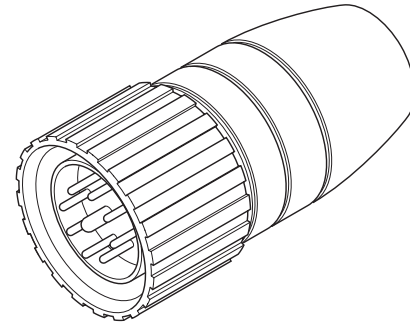


Signals	Current	Voltage
In Phase	7 - 16 $\mu$ App	0.6 to 1.2Vpp
Quadrature Phase	7 - 16 $\mu$ App	0.6 to 1.2Vpp
Reference Mark	5 $\mu$ Ap nominal	0.5Vp nominal into 120 ohm load

# 7.0: Electrical Interface (continued)

## 7.1 Current probe

Pin Number	Signal	Description
1	$I_1$	In Phase current +
2	$/I_1$	In Phase current -
3	+ 5 Vdc	Probe power supply
4	0 Vdc	Probe power return
5	$I_2$	Quadrature phase current +
6	$/I_2$	Quadrature phase current -
7	$I_0$	Reference current +
8	$/I_0$	Reference current -
9		Not connected to probe



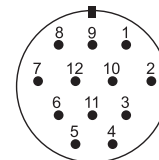
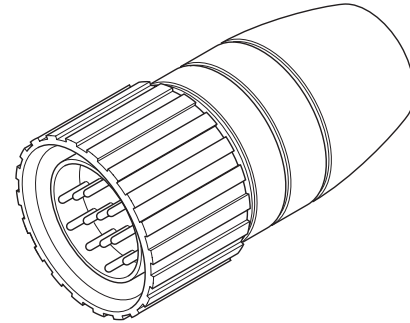
**Note:** Connector housing is connected to cable screen and therefore probe body.

# 7.0: Electrical Interface (continued)

## 7.2 Voltage probe

Pin Number	Signal	Description
1	$\sqrt{V}_2$	Quadrature phase voltage -
2	5V dc	Sense
3	$V_0$	Reference voltage +
4	$\sqrt{V}_0$	Reference voltage -
5	$V_1$	In Phase voltage +
6	$\sqrt{V}_1$	In Phase voltage -
7		No connection
8	$V_2$	Quadrature phase voltage +
9		No connection
10	0V dc	Probe power return
11	0V dc	Sense
12	5V dc	Probe power supply

**Note:** Connector housing is connected to cable screen and therefore probe body.



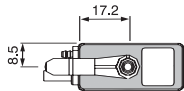
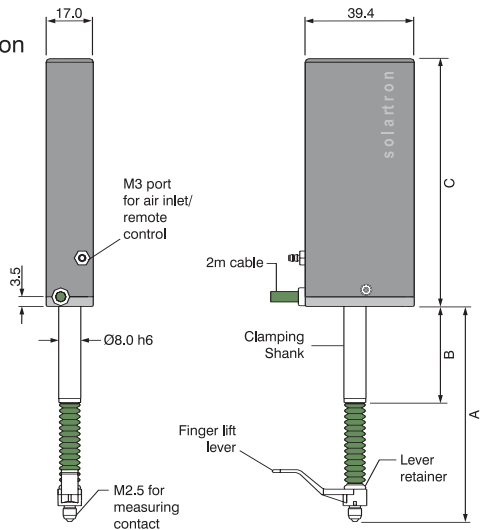
## 8.0: Specification

Model	LE12	LE25
Stroke	12mm (0.5")	25mm(1.0")
Resolution	Dependant on subsequent electronics	
Accuracy	± 0.5µm (20 millionths inch)	
Reference temp	20°C (68°F)	
Slew rate	0.5 m/sec (1.5 ft/sec)	
Operating attitude	ANY	
Gauging forces: (typical at mid stroke)		
Downwards	0.6N (60gm) (2.1 oz)	
Upwards	0.01N (10gm) (0.3 oz)	
Horizontal	0.5N (50gm) (1.7 oz)	
Max side load	0.1N (100gm) (3.5 oz)	
Shock	100g (6ms)	
Vibration	10g (50-2000 Hz)	
Cable length	2m	

Temp range - Operating - Storage	0° to 50°C (32° to 122°F) -20° to +70°C (-4° to 158°F)
IP Rating Probe:	IP50 (IP65 optional)
Mounting	8mm h6
Tip thread size	M2.5x6 deep
Supply Voltage	5V ± 0.25VDC
Supply Current (max)	20mA
EMC	EN50081-1 & EN50082-2

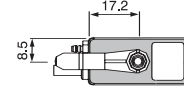
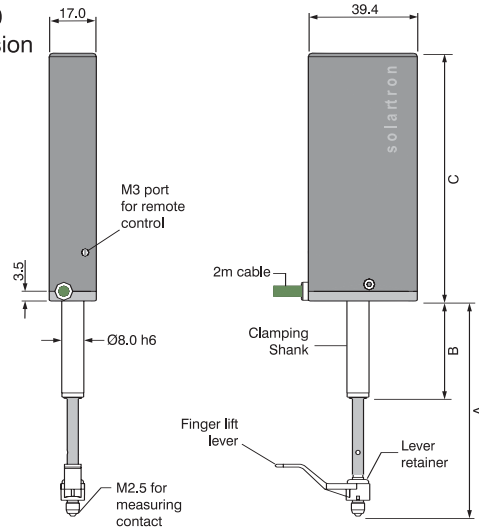
# 9.0: Outline Drawings

IP65  
Version



	LE/12/S	LE/12/P	LE/25/S	LE/25/P
A	56.0	43.0	92.0	66.0
B	20.5	20.5	33.0	33.0
C	66.0	66.0	89.5	89.5

IP50  
Version



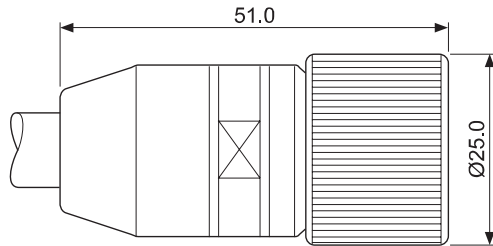
	LE/12/S	LE/25/S
A	50.5	76.0
B	20.5	33.0
C	66.0	89.5

Note:  
All dimensions in mm  
All dimensions stated  
are nominal

## 9.0: Outline Drawings (continued)

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### Connector



**Note:**

All dimensions in mm  
All dimensions stated  
are nominal



## ADDENDUM - Electrical Interface

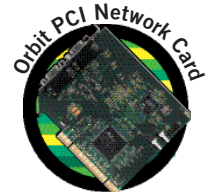
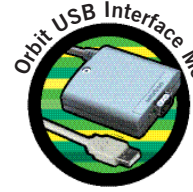
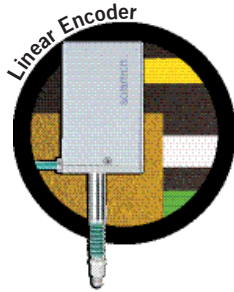
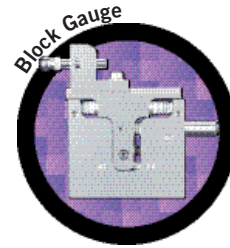
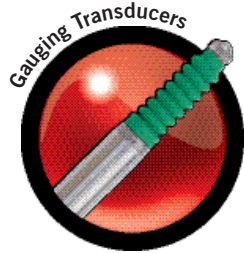
### Voltage Probe 15 way D Type Plug

Pin Number	Signal	Description
1	$V_1$	In Phase Voltage +
2	0V	Power Supply Return
3	$V_2$	Quadrature Voltage +
4	+5V	Power
5	Not Connected	
6	Not Connected	
7	$V_0$	Reference Voltage -
8	Not Connected	
9	$V_1$	In Phase Voltage -
10	0V	Power Supply Return
11	$V_2$	Quadrature Voltage -
12	+5V	Power
13	Not Connected	
14	$V_0$	Reference Voltage +
15	Not Connected	
SHELL	Screen	Cable Screen/shield

Note Pin 2 and Pin 10 connected internally.

Note Pin 4 and Pin 12 connected internally.

# Also Available at Solartron Metrology



# Return of Goods

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Devices returned for service/repair/calibration should be shipped prepaid to your distributor or, if purchased directly from Solartron Metrology, to the relevant Sales Office.

The shipping container should be marked:  
'For the Attention of the Customer Services Department'

The following information should accompany the device(s):

1. Contact details of company/person returning device, including return shipping instructions.
2. A statement of service required.
3. Description of the device fault and the circumstances of the failure, including application environment and length of time in service.

Alternatively there is a returns form available on our web site, follow the link to "Service Repair and Recalibration".

Please note:

A standard assessment charge is applicable on all non-warranty devices returned for repair. Customer damage and any device found, upon inspection, to have no fault will be considered non-warranty.

Please contact the Sales Office or Distributor for warranty terms, service options and standard charges.

Adherence to these procedures will expedite handling of the returned device and will prevent unnecessary additional charges for inspection and testing to determine the condition.

Solartron Metrology reserves the right to repair or replace goods returned under warranty.

All repairs are guaranteed for 3 months (unless otherwise stated).

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