



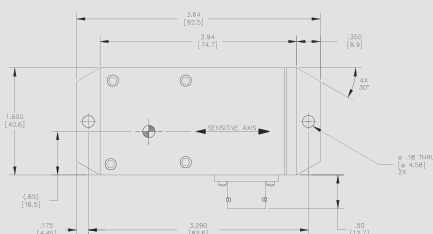
LSO Analog Inclinometer

Introduction

The LSO Series fluid damped, flexure suspension, servo inclinometer is a precision internal grade sensing instruments and it is a robust solution designed to meet the needs of a variety of commercial, industrial and aerospace applications. LSO Series is a fluid damped design. Units are available with a 6-pin connector, or pin-terminals and in $\pm 5V$ and 4-20mA outputs.

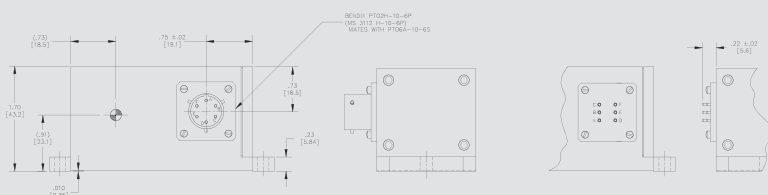
Features

- Extremely high resolution and low hysteresis of less than 0.0005% of full range output.
- Extremely robust designed to withstand shocks in excess of 1500g and vibration of 20 grms.
- Responds to changes of slope as small as 0.000006" /ft.
- High accuracy closed-loop force balanced sensor technology.
- Low white noise spectral density of better than 0.15 μV /Sq. Root HZ
- RoHS compliant version available

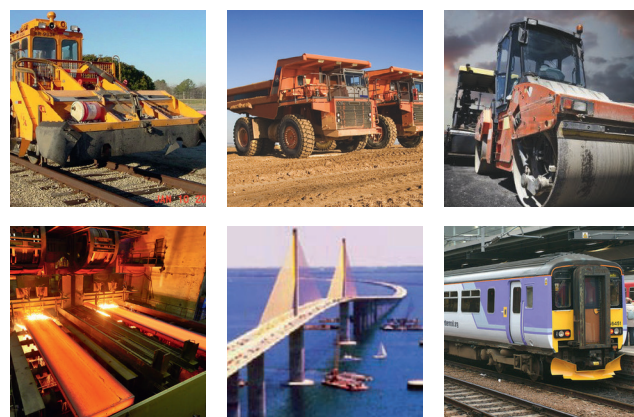


Connector Version

Pin-Terminal Version



Dimensions in [mm]



Application

- Steel Processing
- Continuous Casting
- Electric Arc Furnace
- Idle Control
- Heavy construction
- Paving
- Grading
- Mining
- Tunneling
- Overturn Detection
- Structural Monitoring
- Automated Train Controls
- Rail Leveling and Grinding
- Rail Bed Analysis



LSO: $\pm 5V$ output

The LSOC/LSOP Series fluid damped, flexure suspension, servo inclinometer is a precision inertial grade sensing instrument and is a robust solution designed to meet the needs of a variety of commercial, industrial, and aerospace applications.

Application

- Steel Processing
- Heavy Construction
- Structural Monitoring
- Railway Control & Analysis

Performance specifications

Input range (°)	± 1	± 3	± 14.5	± 30	± 45	± 90
Full range output (VDC) $\pm 1\%$ ¹	± 5					
Non linearity (%fso) max ²	0.05	0.05	0.02	0.02	0.02	0.05
Scale factor (V/g, nominal)	286.5	95.5	20.0	10.0	7.071	5.0
Scale factor temp. Sensitivity (ppm/°C, max)	400	300	100	60	60	60
Bandwidth (-3db Hz, nominal)	0.5	2	15	20	20	40
Transverse axis misalignment (° max)	0.1	0.15	0.25	0.5	1.00	1.00
Output at 0° tilt (V)	± 0.1	± 0.04	± 0.02	± 0.02	± 0.02	± 0.02
0° output temp. Sensitivity (Volts/°C, max)	0.005	0.003	0.001	0.0005	0.0004	0.0003
Resolution & threshold (μ radian) max	1					

Notes

1. Full Range is defined "from negative full input angle to positive full input angle."
2. Nonlinearity is specified as deviation of output referenced to theoretical sine function value, independent of misalignment.

*Specifications subject to change without notice on account of continued product development

Pin outs

A	Red	Supply +15VDC
B	White	Power/signal common
C	Black	Supply -15VDC
D	Orange	$\pm 5V$ output
E	N/C	Self test return
F	Blue	Self test



Product specifications LSO

Electrical

Number of axes	1
Input voltage range (VDC)	±12 to ±18
Input current (mA, max)	15
Output impedance (Ohms, nominal)	100
Noise (Vrms max)	0.002

Environmental

Operating temp. Range	-18° to +71°C
Storage temp. Range	-40° to +71°C
Vibration	20 grms
Shock	1500g, 0.5 msec, ½ sine

custom capabilities

- Internal temperature sensor and thermal modeling for the highest levels of accuracy over a wide temperature range
- Available in LSR Series package configuration for applications requiring a more compact solution
- Factory set zero biasing for non-horizontal measurements

Enclosure

Housing material	anodized aluminum
Seal	IP65
Weight	13 oz (368.5 G)
Protection class (per iec 529)	IP68
Fastener size ³	#8-32 (m4x0.7)
Torque for steel fasteners ⁴	10 inch-lbs (1.0nm)
Prop. connector part #	62101011-000
Surface flatness ³	0.003 (0.0765mm)

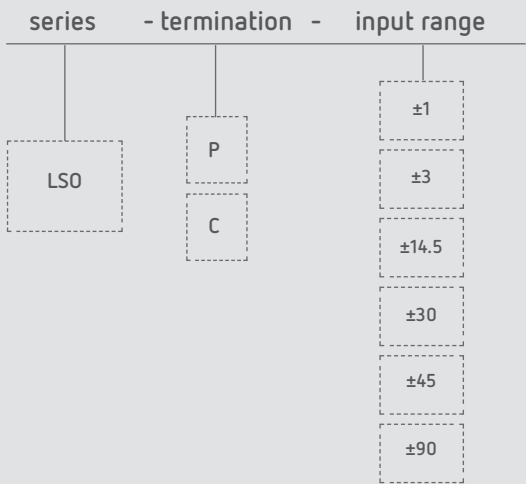
Notes

3. Instruments recommendations
4. Manufacture is Amphenol or equivalent

- Solder terminals and flying leads in place of military connector
- Custom input ranges from ±0.5° to ±90° available
- Custom output impedances available
- Custom bandwidths available on certain ranges

Ordering information

Model Numbers are comprised of the series, the connector option, and the input range.



±1.0	PIN	LSOP-1	02550278-201
	Connector	LSOC-1	02550278-206
±3.0	PIN	LSOP-3	02550278-202
	Connector	LSOC-3	02550278-207
±14.5	PIN	LSOP-14.5	02550278-203
	Connector	LSOC-14.5	02550278-208
±30.0	PIN	LSOP-30	02550278-204
	Connector	LSOC-30	02550278-209
±45.0	PIN	LSOP-60	02550278-2XX
	Connector	LSOP-60	02550278-211
±90.0	PIN	LSOP-90	02550278-205
	Connector	LSOC-90	02550278-210



LSO-L: 4-20mA output

The LSOC/LSOP "L" Series 4-20 mA Output Flexure Suspension Servo Fluid Damped Inclinometer is designed for applications where high levels of shock, vibration and electrical noise are present and/or long cable runs are required.

Application

- Steel Processing
- Heavy Construction
- Structural Monitoring
- Railway Control & Analysis
- Military Applications

Performance specifications

Input range (°) ¹	±1	±3	±14.5	±30	±90
Full range output (FRO) mA ±1.0%	4-20				
Non linearity (%FRO) max ²	0.05	0.05	0.10	0.10	0.05
Scale factor (mA/g, nominal)	458.4	152.6	32.00	16.0	8.0
Scale factor temp. Sensitivity (ppm/°C, max)	400	300	100	100	100
Bandwidth (-3db Hz) nominal	0.3	2.0	15	20	30
Transverse axis misalignment (° max)	0.15	0.25	0.50	1.00	1.00
0° output (mA)	12 ±0.6	12 ±0.6	12 ±0.3	12 ±0.3	12 ±0.3
Output at 0° tilt temp. Sensitivity (mA/°C) max	0.015	0.01	0.0032	0.0032	0.0016
Resolution & threshold (µrad) max	1				

Notes

1. Full range is defined as "from negative full input angle to positive full input angle." The inclinometer output is proportional to the sine of the tilt angle.
2. Referenced to theoretical sine value independent of misalignment.

*Specifications subject to change without notice on account of continued product development

Pin outs

A	Red	+VDC power
B	White	Power/signal common
C	Black	N/C
D	Orange	4-20 mA signal output
E	N/C	Self test return
F	Blue	Self test



Product specifications LSO-L

Electrical

Input voltage range (VDC)	20 to 30 (24 nominal)
Input current (mA, max)	40
Noise (Vrms max)	0.01

Environmental

Operating temp. Range	-18° to +71°C
Survival temp. Range	-40° to +71°C
Vibration	20 grms
Shock	1500g, 0.5 msec, ½ sine

custom capabilities

- Internal temperature sensor and thermal modeling for the highest levels of accuracy over a wide temperature range
- Factory set zero biasing for non-horizontal measurements

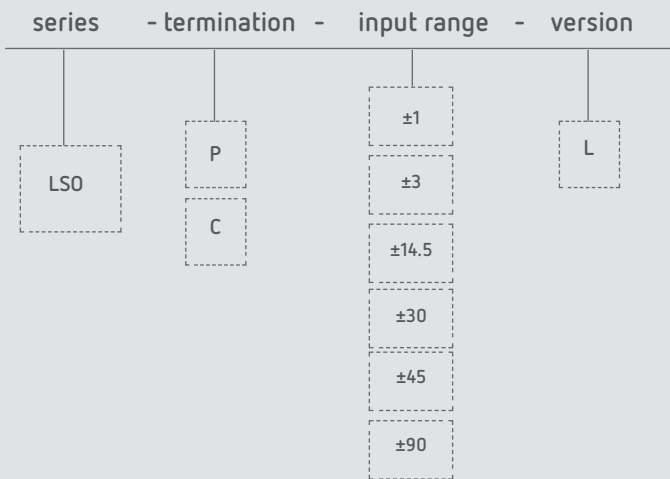
Enclosure

Housing material	anodized aluminum
Weight	13 oz (368.5 g)
Protection class (per IEC 529)	IP68
Fastener size ³	#8-32 (M4X0.7)
Torque for steel fasteners ⁴	10 inch-lbs (1.0nM)
Prop. connector part #	62101011-000
Surface flatness ³	0.003 (0.0765mm)

- Solder terminals and flying leads in place of military connector
- Custom input ranges from $\pm 0.5^\circ$ to $\pm 90^\circ$ available
- Custom bandwidths available on certain ranges

Ordering information

Model Numbers are comprised of the series, the connector option, and the input range.

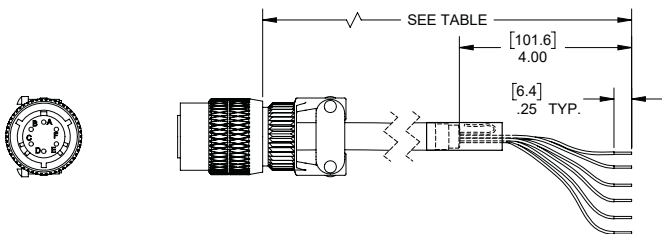


± 1.0	PIN	LSOP-1L	02550278-501
	Connector	LSOC-1L	02550278-506
± 3.0	PIN	LSOP-3L	02550278-502
	Connector	LSOC-3L	02550278-507
± 14.5	PIN	LSOP-14.5L	02550278-503
	Connector	LSOC-14.5L	02550278-508
± 30.0	PIN	LSOP-30L	02550278-504
	Connector	LSOC-30L	02550278-509
± 45.0	PIN	LSOP-60L	02550278-5XX
	Connector	LSOP-60L	02550278-5XX
± 90.0	PIN	LSOP-90L	02550278-505
	Connector	LSOC-90L	02550278-510



Accessories

Connector cable



PART #	MODEL #	LENGTH m (ft)
62101011-001	6-Pin Mating Connector	-
879605-007	DSI-CBL-02M-1	2 (6.56)
879605-008	DSI-CBL-03M-1	3 (9.84)
879605-020	DSI-CBL-05M-1	5 (16.4)
879605-027	DSI-CBL-10M-1	10 (32.8)
879605-015	DSI-CBL-15M-1	15 (49.21)
879605-016	DSI-CBL-24M-1	24 (78.75)
879605-026	DSI-CBL-40M-1	40 (131.2)
879605-024	DSI-CBL-68M-1	68 (228.1)
879605-021	DSI-CBL-100M-1	100 (325.1)

Ordering information

±1.0	±5V	PIN	LSOP-1	02550278-201	±30	±5V	PIN	LSOP-30	02550278-204
		Connector	LSOC-1	02550278-206			Connector	LSOC-30	02550278-209
	L	PIN	LSOP-1L	02550278-501		L	PIN	LSOP-30L	02550278-504
		Connector	LSOC-1L	02550278-506			Connector	LSOC-30L	02550278-509
±3.0	±5V	PIN	LSOP-3	02550278-202	±45	±5V	PIN	LSOP-45	02550278-2XX
		Connector	LSOC-3	02550278-207			Connector	LSOC-45	02550278-211
	L	PIN	LSOP-3L	02550278-502		L	PIN	LSOP-45L	02550278-5XX
		Connector	LSOC-3L	02550278-507			Connector	LSOC-45L	02550278-5XX
±14.5	±5V	PIN	LSOP-14.5	02550278-203	±90	±5V	PIN	LSOP-90	02550278-205
		Connector	LSOC-14.5	02550278-208			Connector	LSOC-90	02550278-210
	L	PIN	LSOP-14.5L	02550278-503		L	PIN	LSOP-90L	02550278-505
		Connector	LSOC-14.5L	02550278-508			Connector	LSOC-90L	02550278-510

NOTE: RoHS compliant parts are available upon request.