

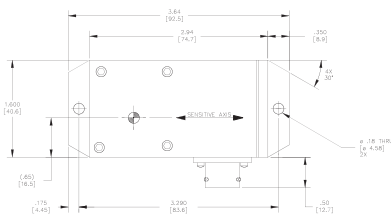
## LSO

### Single-Axis Analog Inclinometer

The Jewell LSO Series fluid damped, flexure suspension, servo inclinometer is a precision internal grade sensing instruments and it is Jewell's most 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.

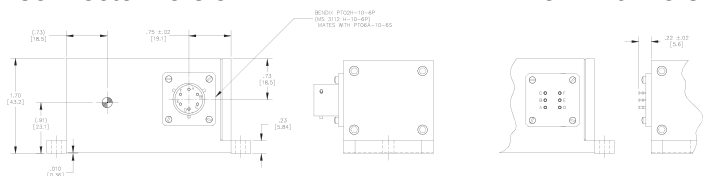
#### FEATURES:

- 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 $\mu V$ /Sq. Root HZ
- RoHS compliant version available



Connector Version

Pin-Terminal Version



Dimensions: in [mm]



#### APPLICATIONS:

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

## APPLICATIONS:

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

## PERFORMANCE SPECIFICATIONS

### STATIC/DYNAMIC

INPUT RANGE (°)	$\pm 1$	$\pm 3$	$\pm 14.5$	$\pm 30$	$\pm 45$	$\pm 90$
FULL RANGE OUTPUT (VDC) $\pm 1\%^1$	$\pm 5$					
NONLINEARITY (% FRO) <sup>2</sup> max	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)	$\pm 0.1$	$\pm 0.04$	$\pm 0.02$	$\pm 0.02$	$\pm 0.02$	$\pm 0.02$
0° OUTPUT TEMP. SENSITIVITY (Volts/°C) max	0.005	0.003	0.001	0.0005	0.0004	0.0003
RESOLUTION & THRESHOLD ( $\mu$ radians) 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

<b>NUMBER OF AXES</b>	1
<b>INPUT VOLTAGE RANGE (VDC)</b>	±12 to ±18
<b>INPUT CURRENT (mA, max)</b>	15
<b>OUTPUT IMPEDANCE (Ohms) nominal</b>	100
<b>NOISE (Vrms, max)</b>	0.002

## ENVIRONMENTAL

<b>OPERATING TEMP. RANGE</b>	-18° to +71°C
<b>STORAGE TEMP. RANGE</b>	-40° to +71°C
<b>VIBRATION</b>	20 grms
<b>SHOCK</b>	1500g, 0.5 msec, ½ sine

## ENCLOSURE

<b>HOUSING MATERIAL</b>	Anodized Aluminum
<b>WEIGHT</b>	13 oz (368.5 g)
<b>PROTECTION CLASS (per IEC 529)</b>	IP68
<b>FASTENER SIZE<sup>3</sup></b>	#8-32 (M4X0.7)
<b>TORQUE FOR STEEL FASTENERS<sup>4</sup></b>	10 inch-lbs (1.0nM)
<b>JEWELL CONNECTOR PART #</b>	62101011-000
<b>SURFACE FLATNESS<sup>3</sup></b>	0.003 (0.0765mm)

### NOTES:

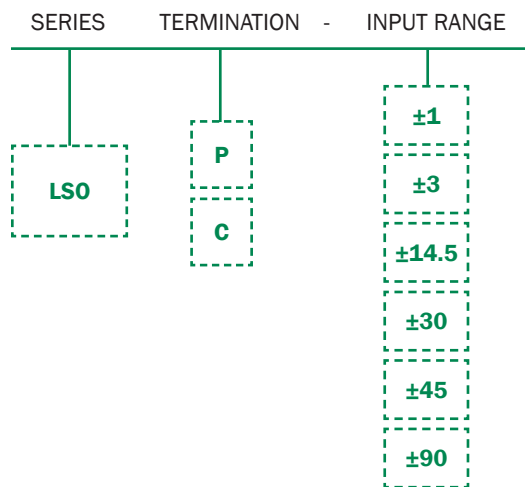
- 3. Jewell Instruments recommendations
- 4. Manufacture is Amphenol or equivalent

## 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
- 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

**HOW TO ORDER** Model Numbers are comprised of the series, the connector option, and the input range.



	TERMINATION	MODEL #	PART #
±1	PIN	LSOP-1	02550278-201
	CONNECTOR	LSOC-1	02550278-206
±3	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	PIN	LSOP-30	02550278-204
	CONNECTOR	LSOC-30	02550278-209
±45	PIN	LSOP-45	02550278-2XX
	CONNECTOR	LSOC-45	02550278-211
±90	PIN	LSOP-90	02550278-205
	CONNECTOR	LSOC-90	02550278-210



# LSO-L: 4-20mA OUTPUT

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

## APPLICATIONS:

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

## PERFORMANCE SPECIFICATIONS

### STATIC/DYNAMIC

INPUT RANGE (°) <sup>1</sup>	±1	±3	±14.5	±30	±90
FULL RANGE OUTPUT (FRO) mA ±1.0%	4-20				
NONLINEARITY (% FRO) <sup>2</sup> max	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				

### PIN OUTS

<b>A</b>	RED	+VDC POWER
<b>B</b>	WHITE	POWER/SIGNAL COMMON
<b>C</b>	BLACK	N/C
<b>D</b>	ORANGE	4-20 mA SIGNAL OUTPUT
<b>E</b>	N/C	SELF TEST RETURN
<b>F</b>	BLUE	SELF TEST

#### 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

# PRODUCT SPECIFICATIONS: LSO-L

## ELECTRICAL

<b>INPUT VOLTAGE RANGE (VDC)</b>	20 to 30 (24 nominal)
<b>INPUT CURRENT (mA, max)</b>	40
<b>NOISE (Vrms, max)</b>	0.01

## ENVIRONMENTAL

<b>OPERATING TEMP. RANGE</b>	-18° to +71°C
<b>SURVIVAL TEMP. RANGE</b>	-40° to +71°C
<b>VIBRATION</b>	20 grms
<b>SHOCK</b>	1500g, 0.5 msec, ½ sine

## ENCLOSURE

<b>HOUSING MATERIAL</b>	Anodized Aluminum
<b>WEIGHT</b>	13 oz (368.5 g)
<b>PROTECTION CLASS (per IEC 529)</b>	IP68
<b>FASTENER SIZE<sup>3</sup></b>	#8-32 (M4X0.7)
<b>TORQUE FOR STEEL FASTENERS<sup>4</sup></b>	10 inch-lbs (1.0nM)
<b>JEWELL CONNECTOR PART #</b>	62101011-000
<b>SURFACE FLATNESS<sup>3</sup></b>	0.003 (0.0765mm)

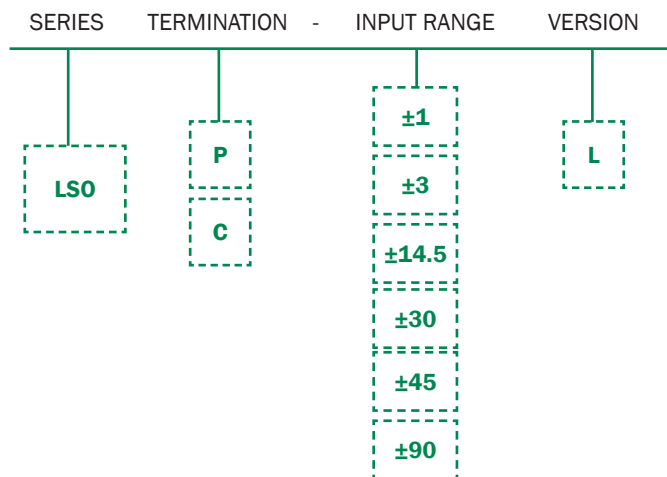
## CUSTOM CAPABILITIES

- 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
- 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

## HOW TO ORDER

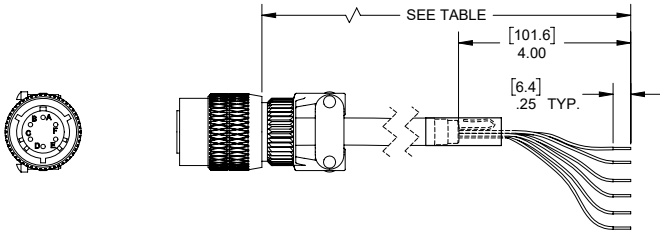
Model Numbers are comprised of the series, the connector option, and the input range.



	TERMINATION	MODEL #	PART #
±1	PIN	LSOP-1L	02550278-501
	CONNECTOR	LSOC-1L	02550278-506
±3	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	PIN	LSOP-30L	02550278-504
	CONNECTOR	LSOC-30L	02550278-509
±45	PIN	LSOP-45L	02550278-5XX
	CONNECTOR	LSOC-45L	02550278-5XX
±90	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)

# LSO SERIES ORDERING INFORMATION

	VERS	TERMINATION	MODEL	PART
±1	±5V	PIN	LSOP-1	02550278-201
		CONNECTOR	LSOC-1	02550278-206
	L	PIN	LSOP-1L	02550278-501
		CONNECTOR	LSOC-1L	02550278-506
±3	±5V	PIN	LSOP-3	02550278-202
		CONNECTOR	LSOC-3	02550278-207
	L	PIN	LSOP-3L	02550278-502
		CONNECTOR	LSOC-3L	02550278-507
±14.5	±5V	PIN	LSOP-14.5	02550278-203
		CONNECTOR	LSOC-14.5	02550278-208
	L	PIN	LSOP-	02550278-503
		CONNECTOR	LSOC-	02550278-508

	VERS	TERMINATION	MODEL	PART
±30	±5V	PIN	LSOP-30	02550278-204
		CONNECTOR	LSOC-30	02550278-209
	L	PIN	LSOP-30L	02550278-504
		CONNECTOR	LSOC-30L	02550278-509
±45	±5V	PIN	LSOP-45	02550278-2XX
		CONNECTOR	LSOC-45	02550278-211
	L	PIN	LSOP-90L	02550278-5XX
		CONNECTOR	LSOC-90L	02550278-5XX
±90	±5V	PIN	LSOP-90	02550278-205
		CONNECTOR	LSOC-90	02550278-210
	L	PIN	LSOP-90L	02550278-505
		CONNECTOR	LSOC-90L	02550278-510

NOTE: RoHS compliant parts are available upon request.

850 Perimeter Road Manchester, NH 03103 USA

SENSORS: 800.227.5955 | METERS & AVIONICS: 800.638.3771  
 www.jewellinstruments.com | sensors@jewellinstruments.com

FI20A  
 © Jewell Instruments 2020

