INSTRUCTION MANUAL

ECL202

Eddy-Current Displacement Sensor

Measurement Systems
from
LION PRECISION

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Description

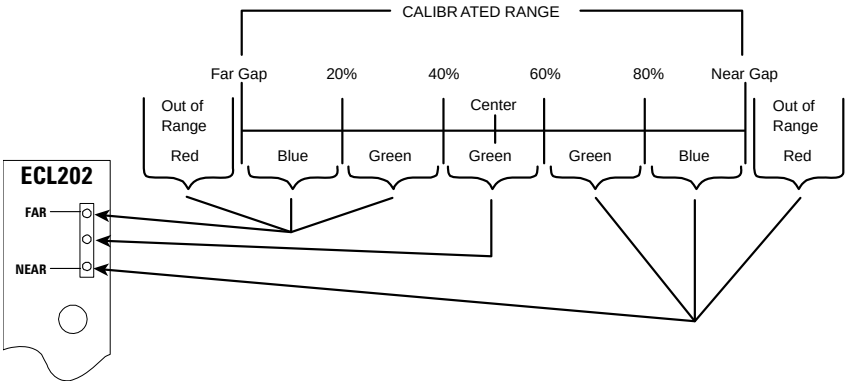
The Lion Precision ECL202 Eddy-Current Displacement Sensor provides high-resolution, noncontact measurement of position changes of a conductive target. The system consists of driver electronics and a probe calibrated for a specific material and range. The calibration information is detailed on a calibration certificate which is shipped with the system.

The ECL202 provides a linear analog voltage proportional to changes in the target position and a digital switched (setpoint) output with a user programmed switching setpoint.

Front Panel Controls and Indicators

LED Range Indicator

The Range Indicator monitors and displays the probe position within its calibrated range. The graphic below shows the indicator condition at various points within the calibrated range.



The LED Range Indicator is independent of the output voltage and not affected by the Offset button. Shifting the output voltage by using the Offset button may allow an apparently valid output voltage to exist while the probe is out of range. When the Near or Far LED is red, the probe is out of range and the output voltage is not a reliable indication of the target position.

Offset Button

Pushing the Offset button shifts the DC level of the output voltage to the center of the voltage range (i.e. 5V for a 0-10V output). The button will only function when the probe is in the center 20% of its calibrated range (center green LED). If the center green LED on the Range Indicator is not on, the Offset button will not function.

This function establishes a repeatable master point for reference measurements.

1. Place good part in the measurement area
2. Position probe to center 20% of range (center LED on indicator)
3. Press Offset button
4. All subsequent measurements indicate deviation from center of range (typically 5V)

Resetting Offset

Hold the Offset button for four seconds to remove any output DC shift.

Setpoint Button 

The ECL202 provides an adjustable setpoint at which a switched output activates. The output switch closes when the output voltage is more positive (larger gap) than the user-adjusted setpoint. Pressing the Setpoint button will set the threshold voltage to the current output voltage. The setpoint includes a 0.085V hysteresis, requiring that the sensor output drop 0.085V below the setpoint voltage before the switched output opens.

Master/Slave Switch (M/S)

When multiple sensors are used with the same target, the sensors must be synchronized for best performance. An interconnecting circuit board connects to the rear of multiple drivers and provides the synchronization signals. When multiple sensors are ordered together, they are shipped with the interconnect board in place and the drivers are pinned together as one unit. When multiple sensors are connected for synchronization, the Master/Slave switch must be in the S position for all of the drivers except *one* of the drivers on the end. Any sensor used independently must have the switch in the M position to function.

Analog Output Signal

The output signal is an analog voltage typically ranging from 0-10VDC. See the included calibration certificate for specific information. The output voltage is proportional to the probe-target gap. As the probe-target gap increases, the voltage becomes more positive.

Interpreting the Output Voltage

Output voltage change for a given change in the probe-target gap is called *sensitivity*. The sensitivity of the sensor is listed on the calibration certificate.

Change in gap calculation:

Gap Change = Voltage Change / Sensitivity

For example: With a sensitivity of 1V/2µm and a voltage change of +3V, the gap change would be +6µm (a positive change in the voltage indicates that the probe-target gap has increased).

Remote Offset and Setpoint

The front panel Offset and Setpoint buttons can be activated remotely. Each remote input connects to an optoisolator. The optoisolator is designed for TTL level operation. 5V activates the function of the button. Exceeding 10V on the input will damage the device.

Note: Because the remote operation mimics front panel operation, activating the Offset function for more than four seconds will restore factory default value for Offset.

Setpoint Switch Output

When the output voltage is more positive than the user adjusted setpoint voltage, the output switch contacts will close. These contacts have a resistance of 50Ω maximum and can conduct up to 100mA. The maximum voltage that can be switched is 30VAC/60VDC. The output is a solid state switch closure and can conduct AC or DC.

Bandwidth Selection

A jumper wire on the bandwidth connector selects sensor bandwidth. To select a bandwidth, connect the desired bandwidth contact to the

Bandwidth Select contact. When no jumper is present, the bandwidth is 15kHz unless stated otherwise on the calibration certificate.

Maximizing Performance

Extension Cables

Sensors which are calibrated with a probe extension cable, must be operated with the extension cable to meet specifications. Operating the sensor without the extension cable will result in inaccurate measurements.

Probe Mounting

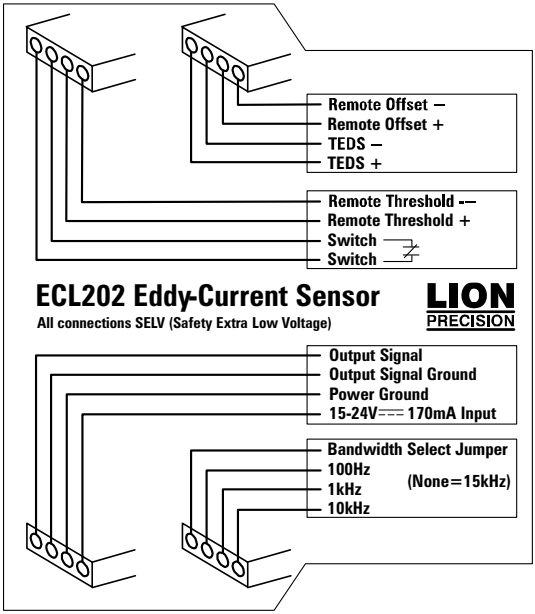
The sensing field around an eddy-current probe is about three times larger than the probe diameter. If multiple probes are mounted together, they must be separated by at least three probe diameters to prevent interference between the channels. Synchronized systems will still exhibit interference if the probes are mounted too close together.

Metal objects such as mounting brackets and panels can also affect the sensor. Probes should be mounted with the flat, end surface of the probe at least 1.5 diameters away from the panel through which it is mounted and at least 3 diameters away from any metallic objects to the side of the probe.

Ungrounded Targets

Ungrounded targets have the potential to inject noise into the sensor. If the output is unusually noisy, be sure the target is grounded. On moving/rotating targets this can be accomplished with a small metal brush or thin piece of metal which is connected to ground.

Connecting to the ECL202



Connection	Description	Notes
TEDS +	TEDS + data connection	
TEDS-	TEDS return/ground connection	
Remote Offset +	+ Optoisolator input for Remote Offset function	5VDC Activates the function
Remote Offset –	– Optoisolator input for Remote Offset function	
Remote Threshold –	– Optoisolator input for Remote Threshold function	5VDC Activates the function
Remote Threshold +	+ Optoisolator input for Remote Threshold function	
Switch	Contact 1 of switched output	Open:

Switch	Contact 2 of switched output	30VAC/60VDC max Closed: 100mA max
Bandwidth Select	Common point for bandwidth selection jumper	
100Hz, 1kHz, 10kHz	Bandwidth selection, connect to Bandwidth Select	None = 15kHz
Power In	Input Power	
Power Ground	Power Ground	
Output Signal Ground	Reference for output signal voltage	Internally grounded
Output Signal	Output signal voltage	See calibration certificate (typically 0-10V)

Specifications

All external connections must be SELV (Safety Extra Low Voltage). Use of this equipment in a manner not specified here may result in impairment of the protection provided by the equipment.

Parameter		**Specification**	**Notes**
Power Requirement		15-24VDC 170mA @15V, 110mA @ 24V	
Resolution (Typical)*	nonferrous	0.006 to 0.008%F.S.	@10kHz
	ferrous	0.007 to 0.1%F.S.	
Linearity*		±0.2%F.S.	
Error Band*		±0.4%F.S.	
Analog Output*		0-10VDC typical 0Ω	
Setpoint Switch Output		Solid state switch closure: On state: 50Ω, 100mA max Off state: 30VAC/60VDC max	
Driver Operating Temperature Range		4°C-50°C	IP40
Probe Operating Temperature Range	Standard Probes	-25°C to +125°C	IP67
	High Temp. Probes	-25°C to +200°C	IP63

* Actual values depend on probe and range and are listed on the calibration certificate shipped with the product. Contact Lion Precision for replacement certificates.

Specifications Continued

Parameter		Specification		Notes
Temperature Coefficient (Driver)	nonferrous	U3 Probe	±0.04% F.S./°C	Over 15°C to 50°C temperature range
		U5 Probe	±0..1% F.S./°C	
		U8 Probe	±0.04% F.S./°C	
		U12 Probe		
		U18 Probe		
		U25 Probe		
		U38 Probe		
		U50 Probe		
	ferrous	U3 Probe	TBD	
		U5 Probe	±0..1% F.S./°C	
		U8 Probe	±0.04% F.S./°C	
		U12 Probe		
		U18 Probe		
		U25 Probe		
		U38 Probe		
		U50 Probe		

Specifications Continued

Parameter		Specification		Notes
Temperature Coefficient (Probe)	nonferrous	U3 Probe	±0.04% F.S./°C	Over 15°C to 65°C temperature range
		U5 Probe	±0.04% F.S./°C	
		U8 Probe	±0.01% F.S./°C	
		U12 Probe	±0.02% F.S./°C	
		U18 Probe	±0.01% F.S./°C	
		U25 Probe		
		U38 Probe		
		U50 Probe		
	ferrous	U3 Probe	TBD	
		U5 Probe	±0.01% F.S./°C	
		U8 Probe	±0.04% F.S./°C	
		U12 Probe	±0.06% F.S./°C	
		U18 Probe	±0.01% F.S./°C	
		U25 Probe	±0.01% F.S./°C	
		U38 Probe	±0.02% F.S./°C	
		U50 Probe	±0.01% F.S./°C	

Mechanical Detail