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- Heating Cable
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- Cartridge Heaters
- Immersion Heaters
- Tubular & Band Heaters

Operator's Manual

LDX-2
LOOP POWERED TRANSMITTER

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An OMEGA Technologies Company

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SECTION 1 HANDLING
This LVDT Transmitter is subjected to strict quality control procedures throughout manufacture and assembly and is well-protected during transit. We must be advised immediately if it is damaged when received.

The ABS plastics enclosure of the boxed version is impact resistant, ie, it has been designed to withstand knocks in an industrial environment. The electronics require more careful handling. Please avoid dropping the unit or touching the exposed printed circuit board with screwdrivers or fingers during installation.

SECTION 2 UNPACKING
Remove the Packing list and verify that all equipment has been received. If there are any questions about the shipment, please call the OMEGA Customer Service Department at 1-800-622-2378.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE
The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event shipment is necessary.

SECTION 3 STORAGE
If the signal conditioner is not to be installed immediately, we recommend that it be returned to its original packing for storage purposes. The storage environmental temperature should be within the range -40 to +80°C (-40 to 176°F).

SECTION 4 GENERAL DESCRIPTION
The Model LDX-2 Transmitter is designed for use with a inductive-type LVDT displacement transducers. It has a dual function: (1) its onboard oscillator derives power from the supply and produces a sine wave carrier to drive the transducer primary winding; (2) its amplifier, demodulator and filter circuit conditions the transducer output and a voltage-to-current converter provides the dc milliamp current drive.

The transmitter is especially suitable where a readout is required at a substantial distance from the transducer and for interfacing with a controller or computer in automated manufacturing processes.

LDX-2 Transmitters will operate with most of OMEGA's LD200 & 300 transducers. (See Tables 1 and 2 in section 9.0 and 10.0 for a full list). Switches on the printed circuit card are used to set up the conditioner for a specific transducer type and onboard Span/Zero controls are provided for calibration purposes.

A 4-20mA Transmitter is suited to current-driven indicators and provides a direct compatible interface with computerized data acquisition and control systems. The Transmitter (Figure 1) draws 4mA to operate the electronics while the position of the transducer controls a 0-15mA current sink wired in parallel. Thus, the position of the transducer is indicated by the current consumption and a broken cable is identified by zero current. This inherent ability for fault indication, together with its low susceptibility to electrical noise and cable resistance, and the need for only two wires make the 4-20mA Transmitter ideal for use in industrial environments.

4 to 20mA, two wire

<table>
<thead>
<tr>
<th>Primary</th>
<th>1</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transducer</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Green</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A 0-20mA Transmitter (Figure 2) works on the same principle, but without linking the two current drives. It can therefore be used with a simpler indicator although it needs a third wire.

0 to 20mA, three wire

<table>
<thead>
<tr>
<th>Primary</th>
<th>1</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transducer</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Green</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Yellow wire not connected

SECTION 5 PHYSICAL DESCRIPTION
The LDX-2 Transmitter is supplied enclosed in a grey ABS plastic box measuring 4.75 in. x 3.14 x 2.16 deep with sealed cover and cable entries, one for the transducer wire and the other for the supply cable. Cable glands accept wires from 0.04 in. to 0.20 in. diameter.

SECTION 6 MOUNTING
The LDX-2 has 0.185 in. diameter mounting holes on 4.25 in. x 197 in. centers. These mounting holes are segregated from the electronics by partitioning in the box moulding, which may thus be secured to any surface, using only two screws without affecting the sealing.

NOTE
Two securing screws and two nuts for alternative fixing to a DIN46277-1 rail are supplied loose with the transmitter.
SECTION 7 WORKING ENVIRONMENT

Model LDX-2 Transmitters will operate in environmental temperatures from 0 to 70°C (32 to 158°F).

Provided the lid and cable entry seals have been properly applied, the enclosure will withstand low pressure water hosing. This version is therefore ideally suited for installation in dirty or damp industrial environments or in the open where it may be exposed to rain.

SECTION 8 ELECTRICAL SAFETY

Under normal circumstances, you are unlikely to come to any real harm from the low voltages and currents used in the LDX-2 Transmitter. However, the electrical connections should be made with the power off. The switch settings, Span and Zero control adjustments can be undertaken with the power on, but with care to avoid damage to the electronics.

SECTION 9 WIRING

Cable connections are made to the boxed PCB by means of seven screw terminals located as shown in Figure 3.

![Figure 3: Layout of Box](image)

Unscrew and remove the lid. Remove the plastic nuts from the cable entries, taking care not to lose the sealing washers. Insert each cable through holes in one nut, washer and gland body leaving sufficient length inside to make the connections. On completion of wiring, the nuts are replaced and finger tightened to make the seal. For thinner than normal cabling it may be necessary to apply half a turn on the nut after finger tightening.

9.1 POWER SUPPLY

A DC power supply of 13V to 48V and up to 30mA is required. Because the transmitter is frequently installed at a consider-
9.4 0-20mA THREE-WIRE TRANSMITTER

Connect the power supply cables as shown in Figure 2, note that the third wire from pin 6 is now connected to the power supply and not pin 7.

10.0 SELECTABLE GAINS

Switches and adjustment control can be identified using Figure 3 or the internal label of the LDX-2 box. The switches move in the direction of the point for "ON". A ballpoint pen or small screwdriver can be used for this purpose.

The amount of signal amplification will depend upon the sensitivity of the transducer being used with the transmitter. The amplifier gain can be set to two different ranges, selected by means of switch 8. Switch ON gives high gain and switch OFF gives low gain.

The span control provides for fine gain adjustment, it gives a variation of 5:1 and the resultant stroke ranges available for use with each transducer are given in Table 1.

<table>
<thead>
<tr>
<th>TRANSUCER</th>
<th>4-20 MA</th>
<th>0-20 MA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LOW GAIN</td>
<td>HIGH GAIN</td>
</tr>
<tr>
<td>LD200-1.25</td>
<td>0.4 to 2.0</td>
<td>0.3 to 0.6</td>
</tr>
<tr>
<td>LD200-2.5</td>
<td>0.5 to 2.5</td>
<td>0.1 to 0.7</td>
</tr>
<tr>
<td>LD200-5</td>
<td>1.0 to 5.0</td>
<td>0.3 to 1.5</td>
</tr>
<tr>
<td>LD200-7.5</td>
<td>2.1 to 10.4</td>
<td>0.6 to 2.9</td>
</tr>
<tr>
<td>LD200-10</td>
<td>3.9 to 19.3</td>
<td>1.1 to 5.5</td>
</tr>
<tr>
<td>LD300-15</td>
<td>3.1 to 15.6</td>
<td>0.9 to 4.4</td>
</tr>
<tr>
<td>LD300-25</td>
<td>5.3 to 26.5</td>
<td>1.5 to 7.5</td>
</tr>
<tr>
<td>LD300-50</td>
<td>11.4 to 57.0</td>
<td>3.2 to 16.1</td>
</tr>
<tr>
<td>LD300-100</td>
<td>21.2 to 106.0</td>
<td>6.0 to 30.0</td>
</tr>
<tr>
<td>LD300-250</td>
<td>41.4 to 210.0</td>
<td>10.5 to 52.5</td>
</tr>
</tbody>
</table>

**NOTE**

The upper gain limit will be set by the transducer. For example, although the 4-20mA electronics with low gain will allow an LD200-12.5 transducer to be used over the stroke range ± 20mm, it is only a 1.25mm transducer, so ± 1.25mm is the practical limit.

Sufficient zero adjustment is provided so that the minimum range can be used anywhere in the maximum range. For example, with an LD300-100 you can get a 4-20mA signal relative to a 20mm displacement (the minimum range) with a reference point anywhere in the range of + - 10mm (the maximum range).

**SECTION 11 TRANSDUCER CONFIGURATIONS**

Switches numbered 1 to 7 are used to set the LDX-2 to suit the type of transducer being used. The positions are listed in Table 2. SW8 controls the gain and is shown in the best position to achieve full scale output for full transducer displacement.

<table>
<thead>
<tr>
<th>TRANSUCER</th>
<th>SW1</th>
<th>SW2</th>
<th>SW3</th>
<th>SW4</th>
<th>SW5</th>
<th>SW6</th>
<th>SW7</th>
<th>SW8</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD200-1.25</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>LD200-2.5</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>LD200-5</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>LD200-7.5</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>LD200-10</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>LD300-15</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>LD300-25</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>LD300-50</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>LD300-100</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>LD300-250</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
</tbody>
</table>

**SECTION 12 CALIBRATION**

First check that the transducer and power supply cables have been correctly wired to the transmitter as previously described. Using a small screwdriver, turn the Span control fully anti-clockwise (counter-clockwise) and the Zero control fully clockwise.

12.1 4-20 mA TRANSMITTER

Move the transducer to the 4mA end of its required travel and adjust the Zero control to give 4mA. If 4mA cannot be obtained, rotate the Span control clockwise until it can.

Move the transducer to the 20mA end of its required travel and adjust the Span control to give 20mA. If the output stays at 4mA or falls, again the transducer white and green connections are probably reversed. It will prove necessary to adjust the Zero and Span controls more than once to achieve a satisfactory stroke range.

12.2 0-20 mA TRANSMITTER

Move the transducer to the 0mA end of its required travel and adjust the Zero control to give 0mA on an indicator. The control should be set for just 0mA since the current cannot go negative and a wide range of Zero control may produce 0mA. It may be necessary to slightly adjust the Span control clockwise, in association with Zero control, in order to achieve 0mA if the transducer is being operated over a small range at one end of its travel.

Move the transducer to the 20mA end of its required travel and adjust the Span control to give 20mA. If the current stays at 0mA, try reversing the white and green transducer connec-
SECTION 13 SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>13-48V DC up to 30mA</td>
</tr>
<tr>
<td>Supply Protection</td>
<td>Protected internally against reversed connections</td>
</tr>
<tr>
<td>Transducer Drive</td>
<td>0.9V rms at 5kHz nominal, 13kHz switchable</td>
</tr>
<tr>
<td>Non-Linearity</td>
<td>Better than 0.02%</td>
</tr>
<tr>
<td>Frequency Response</td>
<td>25Hz cut off, critically damped</td>
</tr>
<tr>
<td>Output Ripple</td>
<td>0.1% rms maximum</td>
</tr>
<tr>
<td>Effect of Supply Change</td>
<td>Negligible</td>
</tr>
<tr>
<td>Effect of Temperature Change</td>
<td>Zero 0.01% per °C typical</td>
</tr>
<tr>
<td></td>
<td>Span 0.01% per °C typical</td>
</tr>
<tr>
<td>Longterm Stability</td>
<td>Zero 0.2% per year typical</td>
</tr>
<tr>
<td></td>
<td>Span 0.3% per year typical</td>
</tr>
<tr>
<td>Oscillator Protection</td>
<td>Open and short circuit protected</td>
</tr>
<tr>
<td>Transducer Sensitivity Range</td>
<td>30 to 530mV/W in 2 coarse gain positions</td>
</tr>
<tr>
<td>Range of Gain control</td>
<td>3.5:1 switched</td>
</tr>
<tr>
<td></td>
<td>5:1 adjustable</td>
</tr>
<tr>
<td>Range of Zero control</td>
<td>Up to 100% on maximum gain</td>
</tr>
</tbody>
</table>

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