

High accuracy ( $\pm 0.5^{\circ}$  F) temperature measurement

Temperature averaging

Temperature conversions

## The L&J Engineering MCG 350, 351, 2350 Temperature Probes

### Averaging Temperature Probe

The MCG 350 (ATP) represents state-of-the-art temperature measurement, and is accepted worldwide to use as a standard for custody transfer inventory and corrected volumes. The MCG 350 Averaging Temperature Probe (ATP) allows gauges and transmitters to sense temperature through the change of resistance in the probe. The MCG 350 possesses a series of temperature sensitive elements which all extend to the bottom of the probe. In the MCG 350 the resistors terminate at various levels so that the average temperature of the product within the tank may be measured. The MCG 350 multiple element probe allows the gauge to select the longest element covered by the product, providing the most accurate temperature reading. In the MCG 351 the resistors are at various levels so that the average temperature of the product within the tank may be measured. The MCG 351 multiple element probe allows the gauge to select the submerged elements and average their reading.

### Averaging Temperature Converter

The MCG 2350 is a stand-alone average temperature converter. Accepting its input from an average temperature probe with up to 14 elements, the unit multiplexes these inputs to give a digital output that corresponds to the product temperature. The MCG 2350 is available in two resolution ranges ( $0.1^{\circ}$  C and  $0.01^{\circ}$  C). The housing is an explosion proof enclosure and includes a critical intrinsic safety (I.S.) barrier, allowing for the use of either explosion proof probes or I.S. probes. The MCG 2350 is normally connected directly to other L&J Engineering models via a serial connection, to give the transmitter average temperature capabilities. The MCG 2350 is UL and ATEX/CENELEC Approved.

## Applications

Temperature measurement for inventory process control

Volume correction for custody transfer applications

Corrected volumes

### SPECIFICATIONS

#### MCG 350

|                              |   |
|------------------------------|---|
| <b>Resistors:</b>            | Copper, loop wound, platinum characterized 100 ohms @ 25° C (77° F) cu, 100 ohms @ 0° C (32° F) |
| <b>Accuracy:</b>             | 0.5° from 0-200° F, 1.0° above 200° F.  |
| <b>Standard Connections:</b> | 3/4" NPS, other NPS, NPT and flanged connections available                                      |
| <b>Maximum Temperature:</b>  | 212° F for standard unit, high temperature unit available                                       |
| <b>Lead Wires:</b>           | No. 20 AWG vinyl insulated wire in PVC Jacket   |
| <b>Flexible Hose:</b>        | 316 SS standard. Nylon hose also available.   |
| <b>Hose Assemble Test:</b>   | 125 Psig  |
| <b>Insulation Test:</b>      | 600 V RMS, Resistors to housing   |
| <b>Approvals:</b>            | ABS Approved  |

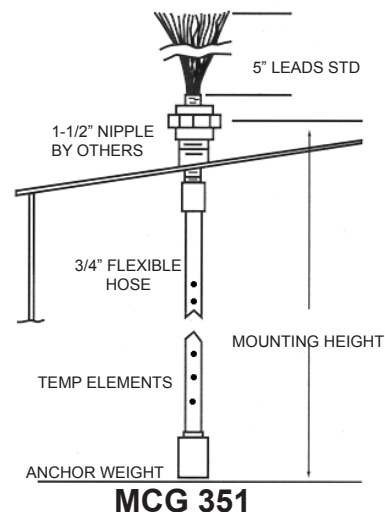
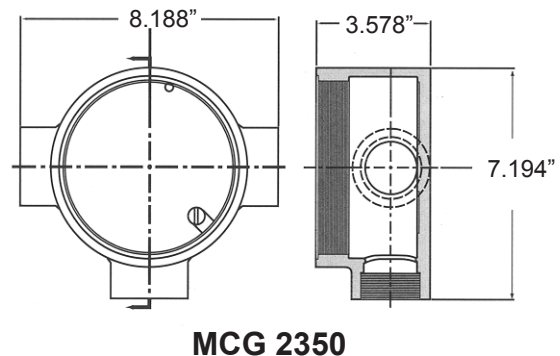
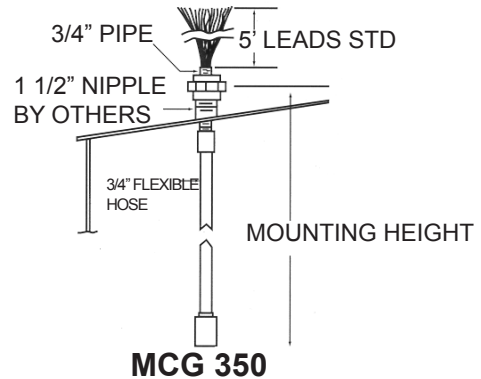
#### MCG 351

|                            |  |
|----------------------------|--|
| <b>Accuracy:</b>           | +/-0.25° C   |
| <b>Std. Connections:</b>   | 3/4" or 1" NPS, other NPS, NPT and flanged connections available                               |
| <b>Temperature Range:</b>  | -50° to 102° C for standard unit, -50° to 204° C for high temperature unit                     |
| <b>Flexible Hose:</b>      | 316 SS standard, Nylon hose also available   |
| <b>Hose Assemble Test:</b> | 171 psig   |
| <b>Insulation Test:</b>    | 600 V RMS, Resistors to housing<br>Intrinsically safe with MCG 2350 (MCG 2350 sold separately) |

Note: all lead wires are hermetically sealed at the top hose fitting. Units furnished in 5' lead wires, Longer lengths are available.

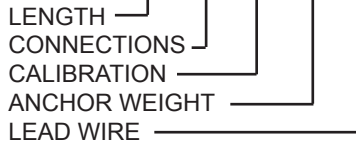
All designs subject to change. Certified dimensions and specifications available upon request.

### DIMENSIONS

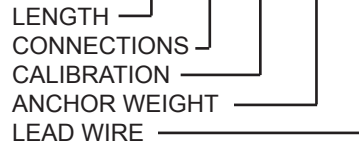


#### INFORMATION REQUIRED TO ORDER:

**MCG 350 - AB - CD - EF - GH - IJ**



**MCG 351 - AB - CD - EF - GH - IJ**



**MCG 2350 - AB**



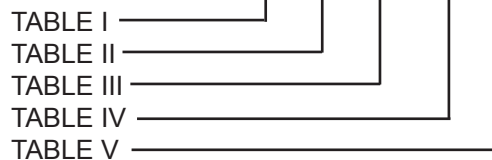
#### MCG 350 AVERAGING TEMPERATURE PROBE

Includes: Standard connection - 3/4" M.S.S. flange,  
 no anchor bar, 5 feet of Lead Wire.

#### MODEL NUMBER SELECTION:

The model number will have a base number, **MCG 350**, followed by 10 digits. These digits will represent 5 sets of option tables.

**MCG 350 - AB - CD - EF - GH - IJ**



#### TABLE I - ELEMENTS / LENGTH

| AB |                |                             |                   |
|----|----------------|-----------------------------|-------------------|
| 01 | - 1 Element,   | 4' 6" - 6' 5.99" ft. tank   | (1.37 - 1.98 m)   |
| 02 | - 2 Elements,  | 6' 6" - 8' 5.99" ft. tank   | (1.99 - 2.58 m)   |
| 03 | - 3 Elements,  | 8' 6" - 11' 5.99" ft. tank  | (2.59 - 3.50 m)   |
| 04 | - 4 Elements,  | 11' 6" - 15' 5.99" ft. tank | (3.51 - 4.71 m)   |
| 05 | - 5 Elements,  | 15' 6" - 21' 5.99" ft. tank | (4.72 - 6.54 m)   |
| 06 | - 6 Elements,  | 21' 6" - 27' 5.99" ft. tank | (6.55 - 8.37 m)   |
| 07 | - 7 Elements,  | 27' 6" - 33' 5.99" ft. tank | (8.38 - 10.20 m)  |
| 08 | - 8 Elements,  | 33' 6" - 41' 5.99" ft. tank | (10.21 - 12.64 m) |
| 09 | - 9 Elements,  | 41' 6" - 51' 5.99" ft. tank | (12.65 - 15.69 m) |
| 10 | - 10 Elements, | 51' 6" - 65" ft. tank       | (15.70 and up)    |

\*Required probe height is from point of probe insertion to tank floor. Specify exact height on order.

#### TABLE II - CONNECTIONS

| CD |   |
|----|---|
| 01 | - Standard Connection, 3/4" M.S.S. FLANGE.  |
| 02 | - 2" 150 # ANSI R.F. Carbon Steel flange    |
| 03 | - 2" 150 # ANSI R.F. Stainless Steel flange |
| 04 | - 2" 300 # ANSI R.F. Stainless Steel flange |

- 05 - 4" 150 # ANSI R.F. Carbon Steel flange
- 06 - 4" 150 # ANSI R.F. Stainless Steel flange
- 07 - 4" 300 # ANSI R.F. Stainless Steel flange
- 08 - 3" 150 # ANSI R.F. Carbon Steel flange
- 13 - 8" 150 # ANSI R.F. Carbon Steel flange

#### TABLE III - TEMPERATURE RANGE / CALIBRATION

##### E

- 0 - Normal Temp 212° F Max
- 1 - High Temp 400° F Max

##### F

- 1 - Copper (Cu)
- 2 - Platinum (Pt)

#### TABLE IV - BS&W / ANCHOR WEIGHT

##### G

- 1 - No BS & W
- 2 - BS & W

##### H

- 1 - With Anchor Weight
- 2 - Without Anchor Weight

#### TABLE V - LEAD WIRE

##### IJ

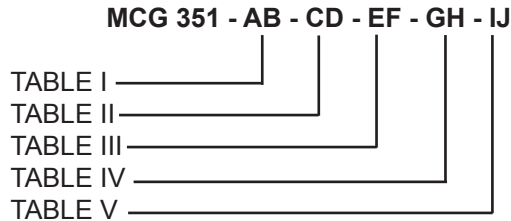
- 00 - No Lead Wire, (Top Condulet HSG supplied w/ terminal blocks)
- 01 - 5 ft.(1.5 m) lead wire length (Standard)
- 02 - 15 ft.(4.6 m) lead wire length
- 03 - 35 ft.(10.6 m) lead wire length
- 04 - 50 ft.(15.2 m) lead wire length
- 05 - 75 ft.(22.7 m) lead wire length
- 06 - 100 ft.(30.3 m) lead wire length
- 07 - 150 ft.(45.5 m) lead wire length
- 08 - 200 ft.(60.6 m) lead wire length
- 09 - 250 ft.(75.7 m) lead wire length
- 10 - 300 ft.(90.9 m) lead wire length

### MCG 351 MULTI-POINT AVERAGING TEMPERATURE PROBE

Includes: Standard connection - 3/4" M.S.S. flange, no anchor bar, 5 feet of Lead Wire.

### MODEL NUMBER SELECTION:

The model number will have a base number, **MCG 351**, followed by 10 digits. These digits will represent 5 sets of option tables.



### TABLE I - ELEMENTS / LENGTH

| <b>AB</b>                |                    |                   |
|--------------------------|--------------------|-------------------|
| <b>01</b> - 1 Element,   | 2' - 7' ft. tank   | (.61 - 2.13 m)    |
| <b>02</b> - 2 Elements,  | 7' - 12' ft. tank  | (2.14 - 3.66 m)   |
| <b>03</b> - 3 Elements,  | 12' - 17' ft. tank | (3.67 - 5.18 m)   |
| <b>04</b> - 4 Elements,  | 17' - 22' ft. tank | (5.19 - 6.71 m)   |
| <b>05</b> - 5 Elements,  | 22' - 27' ft. tank | (6.72 - 8.23 m)   |
| <b>06</b> - 6 Elements,  | 27' - 32' ft. tank | (8.24 - 9.75 m)   |
| <b>07</b> - 7 Elements,  | 32' - 37' ft. tank | (9.76 - 11.28 m)  |
| <b>08</b> - 8 Elements,  | 37' - 42' ft. tank | (11.29 - 12.80 m) |
| <b>09</b> - 9 Elements,  | 42' - 47' ft. tank | (12.81 - 14.33 m) |
| <b>10</b> - 10 Elements, | 47' - 52' ft. tank | (14.34 - 15.85 m) |
| <b>11</b> - 11 Elements, | 52' - 57' ft. tank | (15.86 - 17.37 m) |
| <b>12</b> - 12 Elements, | 57' - 62' ft. tank | (17.38 - 18.90 m) |
| <b>13</b> - 13 Elements, | 62' - 67' ft. tank | (18.91 - 20.42 m) |
| <b>14</b> - 14 Elements, | 67' - 72' ft. tank | (20.43 - 21.95 m) |

\*Required probe height is from point of probe insertion to tank floor. Specify exact height on order.

### TABLE II - CONNECTIONS

| <b>CD</b>   |  |
|---|--|
| <b>01</b> - Standard Connection, 3/4" M.S.S. FLANGE.  |  |
| <b>02</b> - 2" 150 # ANSI R.F. Carbon Steel flange    |  |
| <b>03</b> - 2" 150 # ANSI R.F. Stainless Steel flange |  |
| <b>04</b> - 2" 300 # ANSI R.F. Stainless Steel flange |  |
| <b>05</b> - 4" 150 # ANSI R.F. Carbon Steel flange    |  |
| <b>06</b> - 4" 150 # ANSI R.F. Stainless Steel flange |  |
| <b>07</b> - 4" 300 # ANSI R.F. Stainless Steel flange |  |
| <b>08</b> - 3" 150 # ANSI R.F. Carbon Steel flange    |  |
| <b>13</b> - 8" 150 # ANSI R.F. Carbon Steel flange    |  |

### TABLE III - TEMPERATURE RANGE / CALIBRATION

| <b>E</b>                          |  |
|-----------------------------------|--|
| <b>0</b> - Normal Temp 212° F Max |  |
| <b>1</b> - High Temp 400° F Max   |  |
| <b>F</b>                          |  |
| <b>1</b> - Copper (Cu)            |  |
| <b>2</b> - Platinum (PI)          |  |

### TABLE IV - BS&W / ANCHOR WEIGHT

| <b>G</b>                         |  |
|----------------------------------|--|
| <b>1</b> - No BS & W             |  |
| <b>2</b> - BS & W                |  |
| <b>H</b>                         |  |
| <b>1</b> - With Anchor Weight    |  |
| <b>2</b> - Without Anchor Weight |  |

### TABLE V - LEAD WIRE

- IJ**
- 00** - No Lead Wire, (Top Condulet HSG supplied w/ terminal blocks)
  - 01** - 5 ft.(1.5 m) lead wire length (Standard)
  - 02** - 15 ft.(4.6 m) lead wire length
  - 03** - 35 ft.(10.6 m) lead wire length
  - 04** - 50 ft.(15.2 m) lead wire length
  - 05** - 75 ft.(22.7 m) lead wire length
  - 06** - 100 ft.(30.3 m) lead wire length
  - 07** - 150 ft.(45.5 m) lead wire length
  - 08** - 200 ft.(60.6 m) lead wire length
  - 09** - 250 ft.(75.7 m) lead wire length
  - 10** - 300 ft.(90.9 m) lead wire length

### MCG 2350 AVERAGING TEMPERATURE CONVERTER

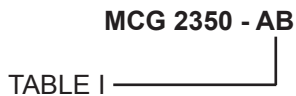
Includes: Explosion Proof Housing with intrinsically safe outputs for MCG 350/351.  
 Compatible with the following MCG Series gauges and transmitters:

- MCG 1000 - Digital Level Gauge
- MCG 1001 - Digital Level Gauge (High Accuracy)
- MCG 1020 - Bottom Sediment and Water Gauge
- MCG 1500 - Servo Gauge
- MCG 1600 - Radar Level Gauge
- MCG 2000 - Transmitter

*\* The gauges, transmitters, and probes must be ordered separately.*

### MODEL NUMBER SELECTION:

The model number will have a base number, **MCG 2350** , followed by 2 digits. These digits will represent an option table.



### TABLE I - APPROVAL TYPE

- AB**
- 00** - None
  - 01** - UL - Class I, Groups C & D
  - 02** - CENELEC/ATEX II 2G, EEx d [ia] IIB T6