

Model DL

Mass Flow and Density Sensors



Micro Motion

FISHER-ROSEMOUNT™ Managing The Process Better.™



Model DL sensors

Micro Motion® Model DL sensors are designed to meet 3A Sanitary Standards for Milk and Milk products, and are USDA-accepted.

Model DL sensors feature a single, continuous 316L stainless steel flow tube, a design that makes the sensor self-draining, and allows it to be cleaned in place and withstand sterilization. The single flow path also resists plugging, and can be pigged.

Three sizes of Model DL sensors offer direct mass flow, volume flow, density, and temperature measurement of liquids and slurries — all in real time, without the need for additional equipment, manual calculations or estimations.

Model DL sensors have no moving parts, and no special mounting or flow conditioning requirements. Additionally, Model DL sensors require no maintenance — saving you money over the course of their lifetime.

A hermetically sealed 304 stainless steel case protects these sensors from the adverse effects of harsh environments. Each model is also available with optional purge connections.

Micro Motion is known worldwide for increasing plant efficiency, production, and profitability. More than 250,000 Micro Motion meters are installed and working in processes just like yours. Contact us, and learn more about Model DL sensors.

Performance specifications

Flow specifications

| | | | | | |
|---|--------|---|-------------|----------------|-------------|
| Accuracy⁽¹⁾ | liquid | $\pm 0.15\% \pm [(zero\ stability / flow\ rate) \times 100]\%$ of rate | | | |
| | gas | $\pm 0.65\% \pm [(zero\ stability / flow\ rate) \times 100]\%$ of rate | | | |
| Repeatability⁽¹⁾ | liquid | $\pm 0.05\% \pm [1/2(zero\ stability / flow\ rate) \times 100]\%$ of rate | | | |
| | gas | $\pm 0.30\% \pm [(zero\ stability / flow\ rate) \times 100]\%$ of rate | | | |
| Nominal flow range⁽²⁾ | | lb/min | kg/h | gal/min | l/h |
| | DL65 | 0 to 125 | 0 to 3400 | 0 to 15 | 0 to 3400 |
| | DL100 | 0 to 500 | 0 to 13,600 | 0 to 60 | 0 to 13,600 |
| | DL200 | 0 to 2500 | 0 to 68,040 | 0 to 300 | 0 to 68,040 |
| Maximum flow rate | DL65 | 250 | 6780 | 30 | 6780 |
| | DL100 | 800 | 21,780 | 96 | 21,780 |
| | DL200 | 3500 | 95,250 | 420 | 95,250 |
| | | | | | |
| Zero stability | DL65 | 0.025 | 0.66 | 0.0030 | 0.66 |
| | DL100 | 0.08 | 2.16 | 0.0096 | 2.16 |
| | DL200 | 0.35 | 9.6 | 0.042 | 9.6 |
| | | | | | |

| Density specifications — liquid only | | with Model 3500, 3700, RFT9739, Model 5300, or RFT9709 transmitter | | with IFT9701 transmitter | | with RFT9712 transmitter⁽³⁾ | |
|---|------------|---|-------------------------|---------------------------------|-------------------------|---|-------------------------|
| | | g/cc | kg/m³ | g/cc | kg/m³ | g/cc | kg/m³ |
| Accuracy | DL65 | ± 0.001 | ± 1.0 | ± 0.002 | ± 2.0 | ± 0.002 | ± 2.0 |
| | DL100 | ± 0.0005 | ± 0.5 | ± 0.002 | ± 2.0 | ± 0.001 | ± 1.0 |
| | DL200 | ± 0.0005 | ± 0.5 | ± 0.002 | ± 2.0 | ± 0.001 | ± 1.0 |
| Repeatability | DL65 | ± 0.0005 | ± 0.5 | ± 0.001 | ± 1.0 | ± 0.001 | ± 1.0 |
| | DL100 | ± 0.0002 | ± 0.2 | ± 0.001 | ± 1.0 | ± 0.0005 | ± 0.5 |
| | DL200 | ± 0.0002 | ± 0.2 | ± 0.001 | ± 1.0 | ± 0.0005 | ± 0.5 |
| Range | All models | 0 to 5 | 0 to 5000 | 0 to 5 | 0 to 5000 | 0 to 5 | 0 to 5000 |

Temperature specifications

| | | | |
|----------------------------|------------|--|------------------------------------|
| Accuracy | All models | $\pm 1\text{ }^\circ\text{C} \pm 0.5\%$ of reading in $^\circ\text{C}$ | |
| Repeatability | All models | $\pm 0.2\text{ }^\circ\text{C}$ | |
| Range⁽⁴⁾ | | $^\circ\text{F}$ | $^\circ\text{C}$ |
| | DL65 | -400 to 350 | -240 to 177 |
| | DL100 | -400 to 350 | -240 to 177 |
| | DL200 | -400 to 400 | -240 to 204 |

⁽¹⁾ Flow accuracy includes the combined effects of repeatability, linearity, and hysteresis. All specifications for liquids are based on reference conditions of water at 68 to 77°F (20 to 25°C) and 15 to 30 psig (1 to 2 bar), unless otherwise noted.

⁽²⁾ Micro Motion has adopted the terminology "nominal flow range." The upper limit of this range is the flow rate at which water at reference conditions causes approximately 15 psid (1 bar) of pressure drop for DL sensors.

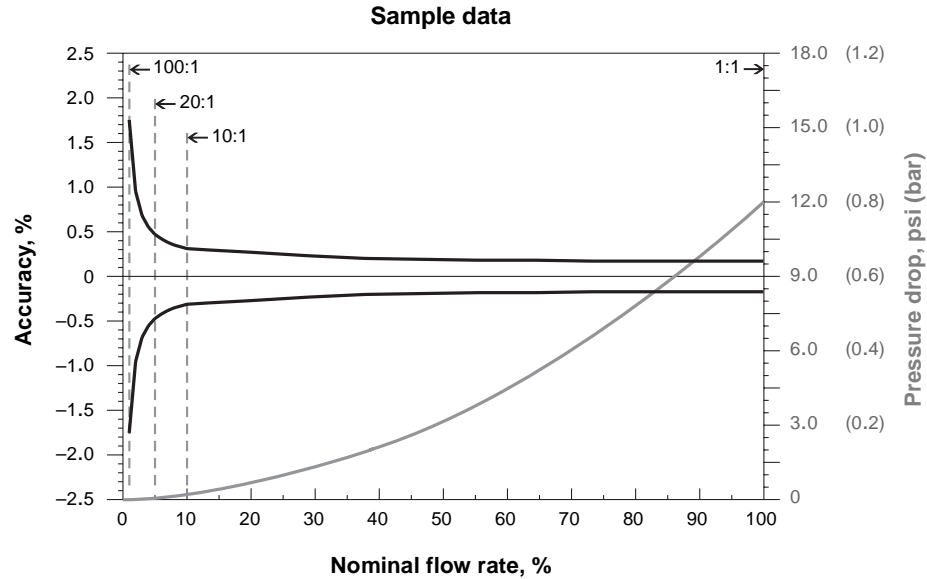
⁽³⁾ When used with an RFT9712 and a DMS, NFC, or NOC, density specifications are the same as when used with a Model 3500.

⁽⁴⁾ For CENELEC-compliant sensors, ambient temperature limits are $-20\text{ }^\circ\text{C}$ and $55\text{ }^\circ\text{C}$. If the process fluid remains at or above $0\text{ }^\circ\text{C}$, the ambient temperature may be below $-20\text{ }^\circ\text{C}$. Use of the sensor at ambient temperature above $55\text{ }^\circ\text{C}$ is acceptable, provided the ambient temperature does not exceed the maximum process fluid temperature or the CENELEC "T" rating listed on page 5.

Performance specifications *continued*

Typical accuracy, turndown, and pressure drop — standard sensors

To determine accuracy, turndown, and pressure drop using your process variables, use the Micro Motion flowmeter selection guide. Download a free copy from our Web site at www.micromotion.com, or contact your local Micro Motion representative.



| Accuracy | Accuracy, ±% | | | |
|----------|----------------|---------------|---------------|--------------|
| | 100:1 turndown | 20:1 turndown | 10:1 turndown | 1:1 turndown |
| DL65 | 2.15 | 0.55 | 0.35 | 0.17 |
| DL100 | 1.75 | 0.47 | 0.31 | 0.17 |
| DL200 | 1.55 | 0.43 | 0.29 | 0.16 |

| Pressure drop | Pressure drop, psi (bar) | | | |
|---------------|--------------------------|---------------|---------------|--------------|
| | 100:1 turndown | 20:1 turndown | 10:1 turndown | 1:1 turndown |
| DL65 | ~0 | 0.1 (0.01) | 0.2 (0.01) | 11.3 (0.78) |
| DL100 | ~0 | 0.1 (0.01) | 0.2 (0.01) | 12.0 (0.83) |
| DL200 | ~0 | 0.1 (0.01) | 0.2 (0.01) | 11.9 (0.82) |

Pressure ratings

| Flow tube rating ⁽¹⁾ | psi | bar |
|---------------------------------|------|-----|
| DL65 | 1500 | 103 |
| DL100 | 900 | 62 |
| DL200 | 740 | 51 |

Housing All models Housing is not rated for pressure containment.

⁽¹⁾ Flow tube pressure rating at 77°F (25°C), according to ASME B31.3. For operating temperatures of 301 to 400°F (149 to 204°C), tube pressure needs to be derated 7.2%.

Functional specifications

Environmental influences

Temperature effect on zero Process temperature effect on zero is defined as the worst-case zero offset due to process fluid temperature change away from the zeroing temperature.

| | Effect on zero ⁽¹⁾ % of nominal flow rate per °C |
|-------|--|
| DL65 | ±0.001 |
| DL100 | ±0.002 |
| DL200 | ±0.004 |

Pressure effect Pressure effect is defined as the change in sensor flow sensitivity due to process pressure change away from the calibration pressure. Pressure effect can be corrected. Only the sensors listed below are affected.

| | Effect on flow accuracy | | Effect on density accuracy | |
|-------|--------------------------------|------------------------------|-----------------------------------|-------------------------------------|
| | % of rate per psi | % of rate per bar | g/cc per psi | kg/m³ per bar |
| DL65 | none | none | none | none |
| DL100 | -0.005 | -0.073 | -0.000001 | -0.015 |
| DL200 | -0.009 | -0.131 | -0.000001 | -0.015 |

Hazardous area classifications

Intrinsically safe when properly connected to an approved transmitter. Approval agency on sensor approval tag must match agency on transmitter approval tag.

UL is a U.S.A. approvals agency, CSA is a Canadian approvals agency, CENELEC is a European standards organization, and SAA is an Australian approvals agency.

UL and CSA All models Class I, Div. 1, Groups C and D
Class I, Div. 2, Groups A, B, C, and D
Class II, Div. 1, Groups E, F, and G

| | | Maximum fluid temperature, °C | | | | | |
|-------|--------------------|--------------------------------------|-----------|-----------|-----------|-----------|-----------|
| | | T1 | T2 | T3 | T4 | T5 | T6 |
| DL65 | EEx ib IIC T1...T6 | 177 | 177 | 177 | 120 | 85 | 70 |
| DL100 | EEx ib IIB T1...T6 | 177 | 177 | 177 | 120 | 85 | 70 |
| DL200 | EEx ib IIB T1...T6 | 204 | 204 | 185 | 120 | 85 | 70 |

SAA⁽³⁾ DL100 Ex ib IIB T4
DL200 Ex ib IIB T4

⁽¹⁾ Nominal flow rate is the upper limit of the nominal flow range.

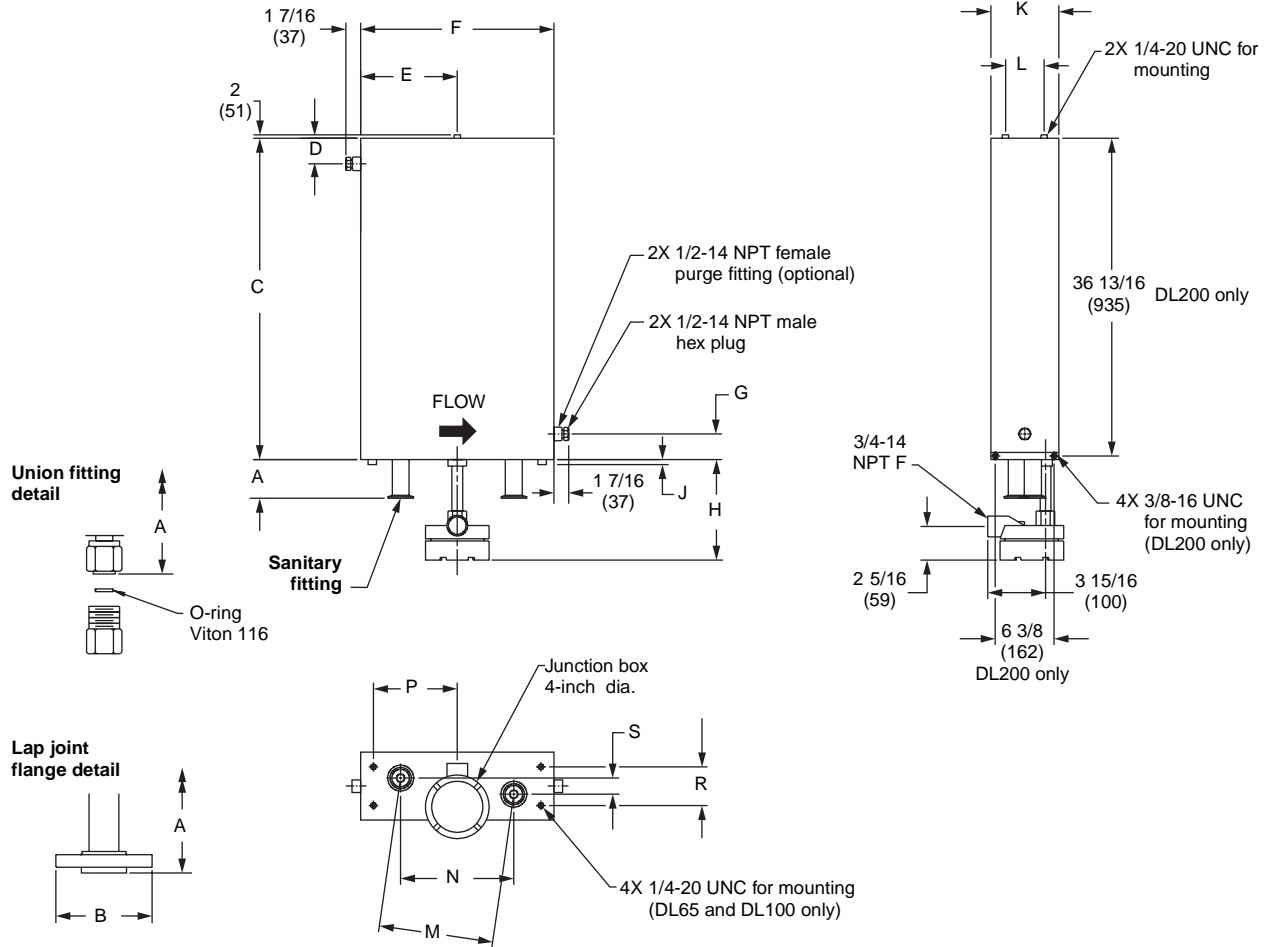
⁽²⁾ The CENELEC "T" rating is defined as the maximum surface temperature of the flowmeter. The "T" rating and the ambient temperature restrict the maximum allowable temperature of the process fluid (listed above). Ambient temperature limits for CENELEC-compliant sensors are listed on page 3.

⁽³⁾ At time of printing, DL65 sensors are not SAA approved.

Physical specifications

Dimensions

Dimensions in inches (mm)



Dimensions⁽¹⁾

| Sensor | | C | D | E | F | G | H | J |
|--------|----------------|-----------------|---------------|-----------------|------------------|---------------|----------------|-------------------|
| DL65 | inches (mm) | 19 (483) | 1 1/2 (38) | 7 5/64 (180) | 14 5/32 (360) | 1 1/2 (38) | 4 1/2 (114) | 1/4 (6) |
| DL100 | inches (mm) | 25 (635) | 2 (51) | 7 1/2 (191) | 15 (381) | 2 (51) | 8 1/2 (216) | not applicable |
| DL200 | inches (mm) | 37 1/8 (943) | 2 (51) | 8 1/2 (216) | 17 (432) | 2 7/8 (73) | 4 1/2 (114) | not applicable |

Dimensions⁽¹⁾

| | | K | L | M | N | P | R | S |
|-------|----------------|-----------------|-----------------|------------------|------------------|------------------|-------------------|---------------|
| DL65 | inches (mm) | 3 13/16 (97) | 2 29/32 (74) | 11 1/16 (281) | 11 (279) | 6 11/16 (170) | 2 29/32 (74) | 1 1/8 (29) |
| DL100 | inches (mm) | 5 9/32 (134) | 3 (76) | 8 7/8 (226) | 8 25/32 (223) | 6 1/2 (165) | 3 (76) | 1 1/4 (32) |
| DL200 | inches (mm) | 7 1/4 (184) | 6 5/32 (156) | 12 1/4 (311) | 12 (305) | 8 1/2 (216) | not applicable | 2 1/2 (64) |

⁽¹⁾ For dimensions A and B, see process fitting options on page 7.

Physical specifications *continued*

Process fitting options⁽¹⁾

| | | Fitting code | Dim. A inches (mm) | Dim. B, diam. inches (mm) |
|--------------|-----------------------------------|--------------|-----------------------|------------------------------|
| DL65 | 3/4-inch NPT female union fitting | 245 | 3 (76) | --- |
| | 1-inch sanitary fitting | 242 | 3 (76) | 1 63/64 (50) |
| | 1-inch 150 lb lap joint flange | 243 | 3 (76) | 4 1/4 (108) |
| | 1-inch 300 lb lap joint flange | 244 | 3 (76) | 4 7/8 (124) |
| DL100 | 1-inch sanitary fitting | 202 | 3 (76) | 1 63/64 (50) |
| | 1-inch 150 lb lap joint flange | 223 | 3 (76) | 4 1/4 (108) |
| | 1-inch 300 lb lap joint flange | 224 | 3 (76) | 4 7/8 (124) |
| DL200 | 2-inch sanitary fitting | 226 | 2 7/8 (73) | 2 1/2 (64) |
| | 2-inch 150 lb lap joint flange | 227 | 2 7/8 (73) | 6 (152) |
| | 2-inch 300 lb lap joint flange | 228 | 2 7/8 (73) | 6 1/2 (165) |

Materials of construction

| | | |
|-----------------------------------|------------|-----------------------|
| Wetted parts⁽²⁾ | All models | 316L stainless steel |
| Housing | All models | 304L stainless steel |
| Junction box | All models | Epoxy-coated aluminum |

Sensor weight

Approximate weight of sensors with noted fittings.

| | Sanitary fittings | | Union fittings | | 150 lb lap joint | | 300 lb lap joint | |
|-------|-------------------|----|----------------|----|------------------|----|------------------|----|
| | lb | kg | lb | kg | lb | kg | lb | kg |
| DL65 | 26 | 12 | 26 | 12 | 30 | 14 | 32 | 15 |
| DL100 | 49 | 22 | not applicable | | 53 | 24 | 55 | 25 |
| DL200 | 90 | 41 | not applicable | | 100 | 45 | 104 | 47 |

⁽¹⁾ Fittings listed here are standard options. Other types of fittings are available. Contact your local Micro Motion representative.

⁽²⁾ General corrosion guides do not account for cyclical stress, and therefore should not be relied upon when choosing a wetted material for your Micro Motion flowmeter. Please refer to Micro Motion's corrosion guide for material compatibility information.

Ordering Information

Model DL sensors model number matrix

| Code | Sensor model | | |
|--------|----------------------|--|--|
| DL065S | DL65 1/2-inch sensor | | |
| DL100S | DL100 1-inch sensor | | |
| DL200S | DL200 2-inch sensor | | |

| Code | Process connections | | |
|------|---------------------------------------|--|--|
| ### | See process fitting options on page 7 | | |

| Code | Case option | | |
|------|--|--|--|
| S | Standard pressure containment | | |
| P | Purge fittings — Two 1/2-inch NPT female | | |

| Code | Approvals | | |
|------|--------------------------------------|--|--|
| M | Micro Motion standard — no approvals | | |
| U | UL — U.S.A. approvals agency | | |
| C | CSA — Canadian approvals agency | | |
| B | CENELEC — European approvals agency | | |

| Example* | | | |
|----------|-----|---|---|
| DL100S | 202 | S | U |

*Example: DL100S 202 S U = Model DL100 1-inch sensor; 1-inch sanitary fittings; standard pressure containment; UL approved

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