

**Measures liquids,
gases, and slurries**

Product Data Sheet
PS-00397
May 2000

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	$\pm 1^\circ\text{C} \pm 0.5\%$ of reading in $^\circ\text{C}$	
Repeatability	All models	$\pm 0.2^\circ\text{C}$	
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.

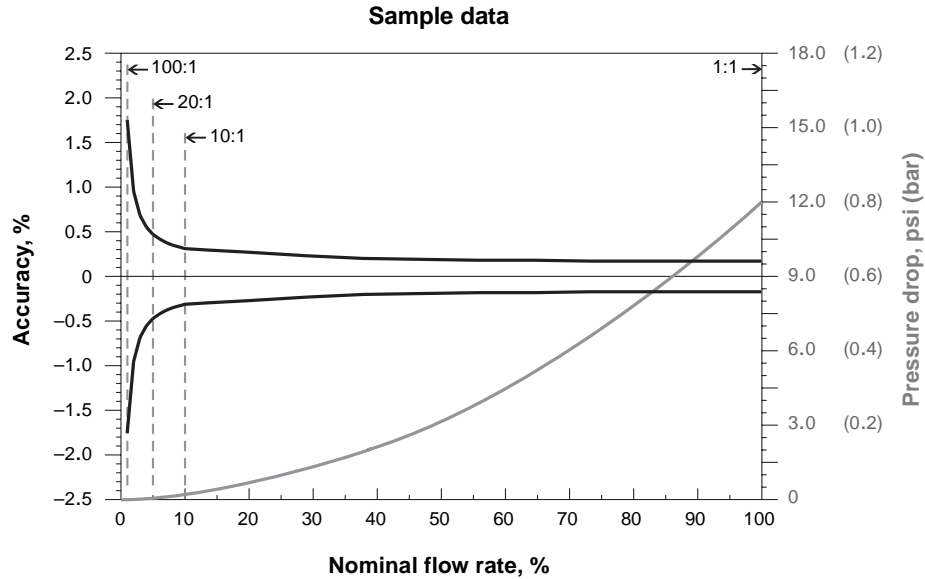
⁽³⁾ When used with an RFT9712 and a DMS, NFC, or NOC, density specifications are the same as when used with a Model 3500.

⁽⁴⁾ For CENELEC-compliant sensors, ambient temperature limits are -20°C and 55°C . If the process fluid remains at or above 0°C , the ambient temperature may be below -20°C . Use of the sensor at ambient temperature above 55°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, $\pm\%$			
	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.

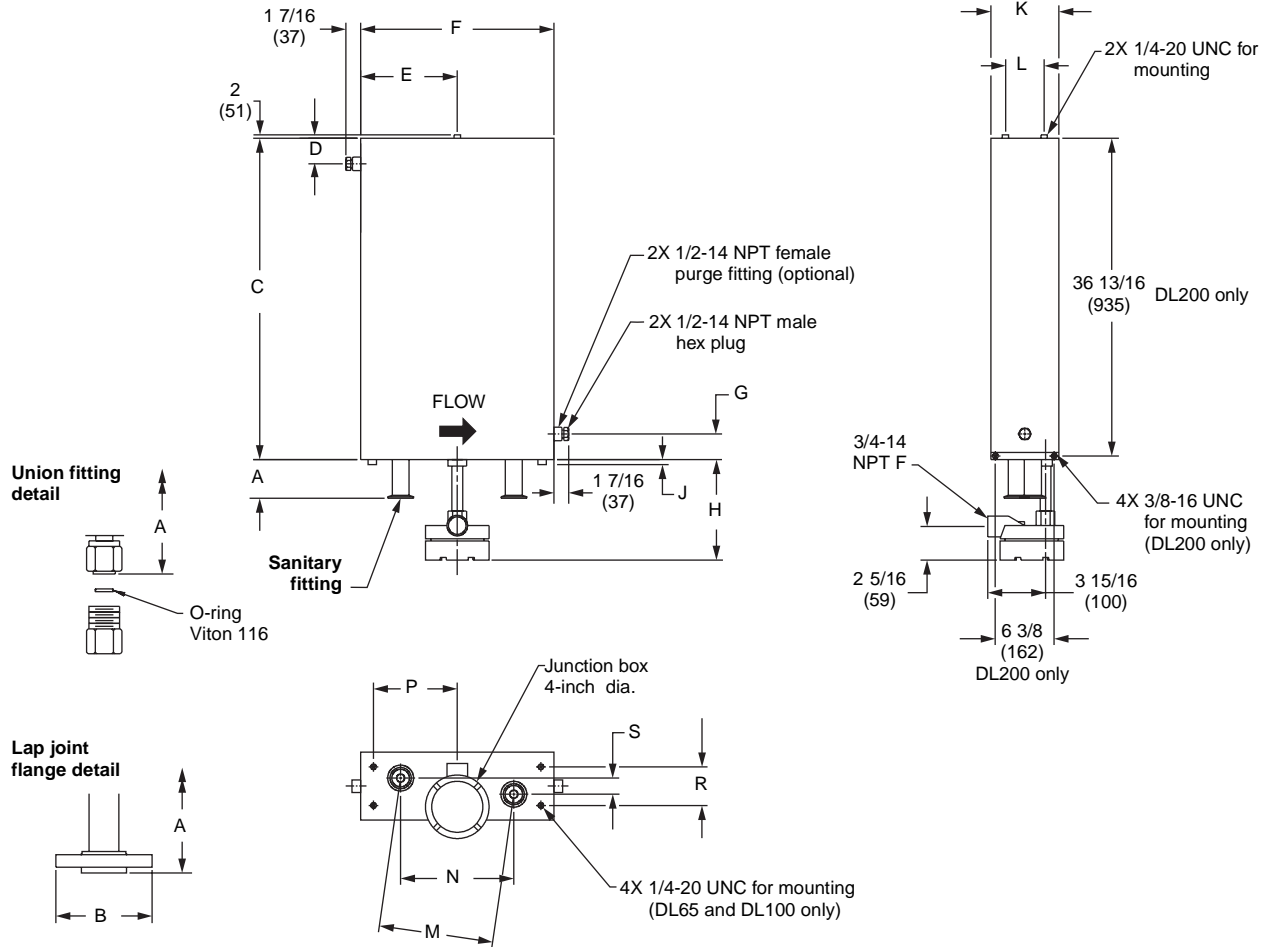
⁽²⁾ The CENELEC "T" rating is defined as the maximum surface temperature of the flowmeter. The "T" rating and the ambient temperature restrict the maximum allowable temperature of the process fluid (listed above). Ambient temperature limits for CENELEC-compliant sensors are listed on page 3.

⁽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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