DANIEL®
CORIOLIS MASS FLOW METER
PRODUCT GUIDE

ADVANCED MASS METERING TECHNOLOGY

DANIEL®
Decades Proven. Field Chosen.™

TYPICAL APPLICATIONS

- Custody Transfer
- Reactor Feed Ratio
- Control
- Density
- Measurement
- Batch Control

INDUSTRIES

- Chemicals
- Minerals
- Oil & Gas
- Power Generation
- Water

INTRODUCTION

The **Daniel® Coriolis Mass Flow Meter** delivers best-in-class performance for **mass flow, density, and temperature measurement,** while also calculating **volume flow, total flow, and fluid composition in real-time.**

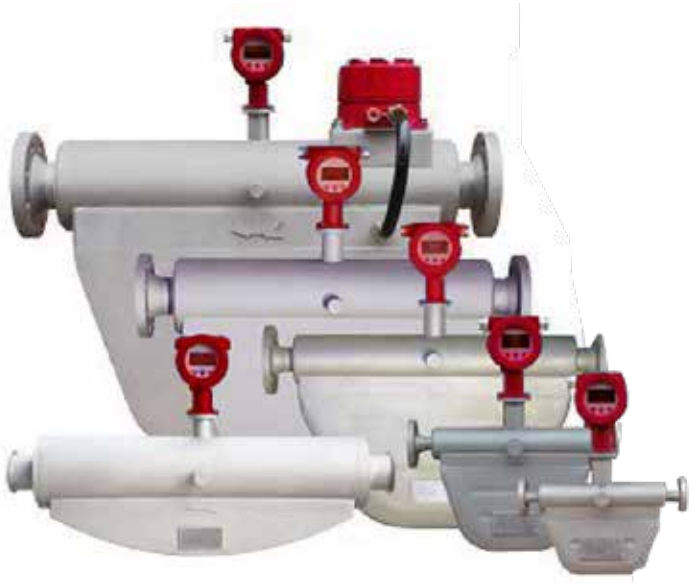
The meter is available in two sensor styles:

- **M-type sensor**
- **S-type sensor**

Each sensor type is offered in both **compact and remote configurations** to suit different installation requirements. A typical mass flow meter consists of a **flow sensor** and a **signal transmitter.**

- The **flow sensor** contains two vibrating flow tubes that generate signals detected by pickoff sensors.
- The **signal transmitter** uses **Digital Signal Processing (DSP)** and a **Dynamic Vibration Balance (DVB) circuit** to ensure **fast response** and **high accuracy.**

Field diagnostics, configuration, and data recording can be easily managed via **HART** or **Modbus RTU communication.**



KEY FEATURES

- No moving parts for enhanced durability and longer service life.
- Customizable flow connectors and installation lengths.
- Excellent repeatability (\u00b10.05% of flow rate).
- Optional **Net Oil** functionality.
- NIST Traceable and NTEP Certified for custody transfer.

KEY BENEFITS

- Increased productivity with reduced maintenance.
- Lower installation costs.
- Improved product quality.
- Simplified **Net Oil** measurement without requiring a PLC or RTU.

CONSTRUCTION MATERIALS

- **Tubes:** SS316L (Hastelloy C optional).
- **Flow Splitter:** SS304 (SS316L and Hastelloy C optional).
- **Flanges:** SS304 (SS316L and Hastelloy C optional).
- **Housing Case (Non-Wetted Parts):** SS304 (SS316L optional).
- **Compliance:** NACE MR 0175/0103 compliant.

APPLICATIONS

Daniel's mass flowmeter is designed to perform reliably in the most complex and challenging environments, handling liquid, gas, and slurry applications across multiple industries.

APPLICATION		
Process Fluids	**Typical Applications**	**Industries**
Liquid, Gas, Slurry	• Custody Transfer • Reactor Feed Ratio • Density Measurement • Batch Control	• Chemicals • Machinery • Minerals • Oil & Gas • Power Generation • Water

APPLICATION

MEASUREMENT PRINCIPLE

The **Daniel® Coriolis Mass Flow Meter** operates using two parallel flow tubes vibrating at their **resonant frequency.** As fluid flows through the tubes, **Coriolis forces** cause slight deformation, detected by sensors.

- The **phase shift** between tube oscillations is proportional to **mass flow rate**.
- The **resonant frequency change** allows for **density measurement.**
- Integrated temperature sensors provide real-time **temperature compensation** for maximum accuracy.

TECHNICAL SPECIFICATIONS

FLOW RATE:

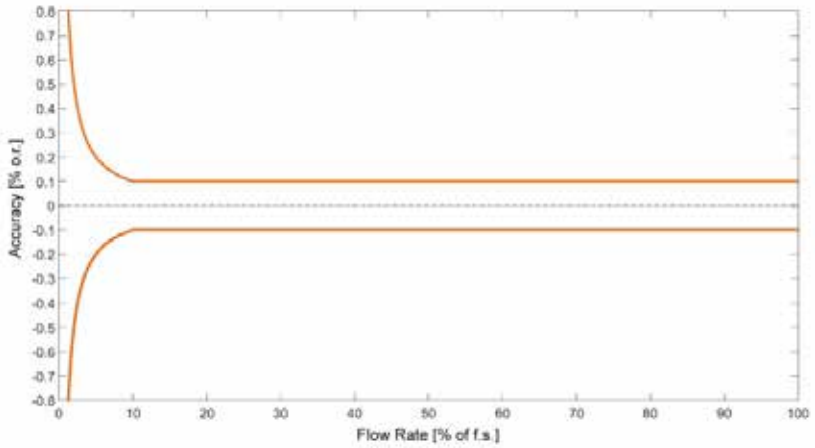
- **Mass Flow Rate (Max):** 3,307,000 lb/h (1,500,000 kg/h)
- **Volumetric Flow Rate (Max):** 6,604 GPM | 9,434 BPD | 1,500,000 L/h

PRESSURE:

- **Maximum Pressure:** 3,705 PSI (26 MPa) | Optional: 5,800 PSI (40 MPa)

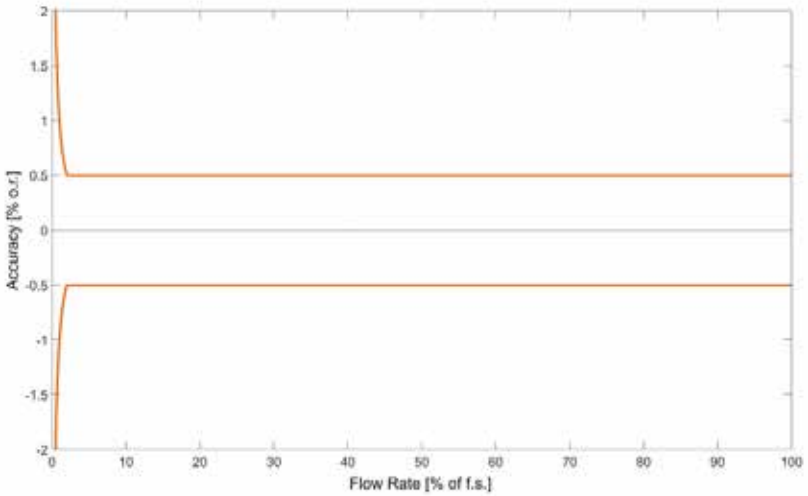
ACCURACY FOR LIQUIDS:

(FIVE-POINT CALIBRATION, BASIC ACCURACY: ±0.1 %)



ACCURACY FOR GAS:

(FIVE-POINT CALIBRATION, BASIC ACCURACY: ±0.5%)



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0.1%	0.2%	0.5%
$\pm 0.1\% \pm (\frac{\text{Stability of Zero Point}}{\text{Instantaneous Flow}} \times 100\%)$	$\pm 0.2\% \pm (\frac{\text{Stability of Zero Point}}{\text{Instantaneous Flow}} \times 100\%)$	$\pm 0.5\% \pm (\frac{\text{Stability of Zero Point}}{\text{Instantaneous Flow}} \times 100\%)$
Accuracy is calculated based on the water measurement under the condition of +20°C ~ 25°C and 0.1 MPa ~ 0.2 MPa.		

ACCURACY (LIQUIDS)	
Basic Accuracy (Mass flow)[2]:	±0.1%, ±0.2% or ±0.5%
Mass Flow Repeatability:	± 0.05% (for 0.1% accuracy), ± 0.1% (for 0.2% accuracy) or ±0.25% (for 0.5% accuracy)
Basic Accuracy (Volume flow)[2]:	±0.4 % (option: up to ±0.15 %) of flow rate
Repeatability (Volume Flow):	±0.05 %, ±0.1 %
Zero Stability:	±0.01 % of full scale

ACCURACY (GASES)	
Basic Accuracy (Mass flow)[2]:	±1% (option: up to ±0.5 %) of flow rate
Mass Flow Repeatability:	±0.25 % of flow rate
DENSITY	
Density Range:	up to 2500 kg/m³, 2.5 g/cm³
Density Accuracy:[2]	±1.0 kg/m³, ±0.001 g/cm³
Density Repeatability:	±0.5 kg/m³, ±0.0005 g/cm³
TEMPERATURE	
Process Temperature Range:	-50 °C ... +250 °C (-40 °F ... +212 °F)
Option:	-196 °C ... +55°C (-320.8...131°F)
Temperature Accuracy:	±1 °C ±0.5 % of reading (±1.8 °F ± 0.5% of reading)
Temperature Repeatability:	±0.2 °C (±0.36 °F)
Ambient Temperature	-40 to 131°F (-40 to +55°C)
Output	4-20 mA and Pulse/Frequency , Optional: HART or Modbus RS485
	Pulse Output: 0 to 10 kHz, 0.001%F.S; Current Output: 4 to 20mA, 0.005%F.S
Electronics	Direct Mount or Remote Mount
Graphic Display	OLED
Operating Elements	3 optical keys for operator
Electromagnetic compatibility	Criteria A, complied with IEC 61000-4-2
Power Supply	85 to 265 VAC, 18 to 36 VDC
IP	Standard IP65, IP67 for options

- Stated flow accuracy combines the effects of repeatability, linearity and hysteresis.
- The specifications refer to standard conditions (for further information see Series Manual).

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FLOW RANGE

FLOW RANGE FOR LIQUIDS (METRIC UNIT IN KG/HR)

Model: Daniel® M Series Micro Bend

Size: from 1/8 to 10 inches

FLOW RANGE FOR LIQUIDS (METRIC UNITS IN KG/HR) TABLE 1.1

Size(inch)	Full flow range, kg/hr	Accuracy flow range, kg/hr		Zero stability, kg/hr
		+/-0.1%	+/-0.2% and +/-0.5%	
1/8”	1.2–120	10–120	6–120	0.004
3/8”	10 – 1,000	100 – 1,000	50 – 1,000	0.045
1/2”	20 – 3,000	300 – 3,000	150 – 3,000	0.09
1”	80 – 8,000	600 – 8,000	300 – 8,000	0.25
1 ½”	240 – 32,000	2,400 – 32,000	1,000 – 32,000	1
2”	500 – 50,000	5,000 – 50,000	2,000 – 50,000	2
3”	800 – 120,000	10,000 – 120,000	6,000 – 120,000	3.5
4”	1,500 – 200,000	20,000 – 200,000	10,000 – 200,000	7
6”	5,000 – 500,000	50,000 – 500,000	30,000 – 500,000	23
8”	10,000 – 1,000,000	70,000 – 1,000,000	50,000 – 1,000,000	45
10”	15,000 – 1,500,000	150,000 – 1,500,0000	75,000 – 1,500,000	70

FLOW RANGE FOR LIQUIDS (US UNIT IN LB/HR)

Model: Daniel® M Series Micro Bend

Size: from 1/8 to 10 inches

FLOW RANGE FOR LIQUIDS (US UNITS IN LB/HR) TABLE 1.2

Size(inch)	Full flow range, lb/hr	Accuracy flow range, lb/hr		Zero stability, lb/hr
		+/-0.1%	+/-0.2% and +/-0.5%	
1/8”	2 – 265	22 – 265	13 – 265	0.0088
3/8”	22 – 2,204	220.40 – 2,204	110 – 2,204	0.099
1/2”	44 – 6,613	661.30 – 6,613	330 – 6,613	0.2
1”	176 – 17,636	1322 – 17,636	661 – 17,636	0.55
1 ½”	529 – 52,910	5,291– 52,910	2,204 – 52,910	2.2
2”	1,102 – 110,231	11,023 – 110,231	4,409 – 110,231	4.41
3”	1,767 – 264,555	22,046 – 264,555	13,227 – 264,555	7.72
4”	3306 – 440,925	44,092 – 440,925	22,046 – 440,925	15.43
6”	11,023 – 1,102,311	110,231– 1,102,311	6,6138 – 1,102,311	50.71
8”	22,046 – 2,204,622	220,462 – 2,204,622	110,231– 2,204,622	99.21
10”	33,069 – 3,307,000	330,693 – 3,307,000	165,346 – 3,307,00	154.32

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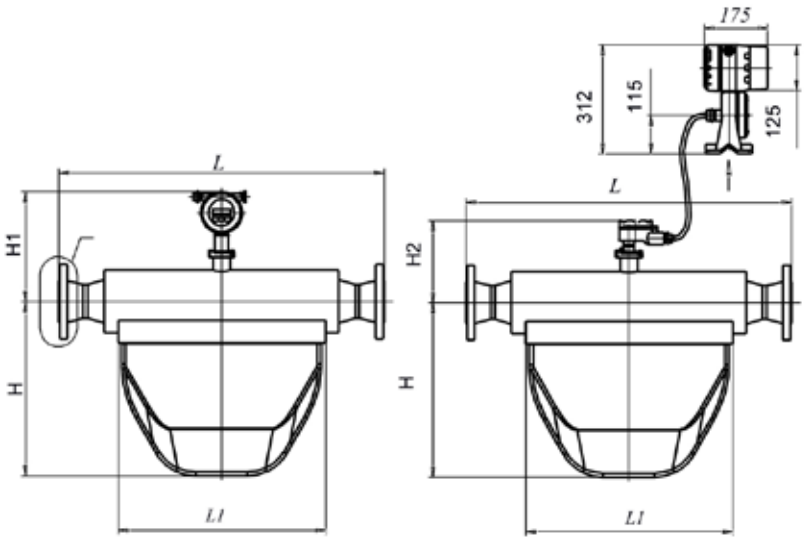
M TYPE SENSOR INSTALLATION DIMENSIONS (A.2.1 AND A.2.2)



Compact version - Figure A.2.1 (Daniel® - M series) Remote version - Figure A.2.2 (Daniel® - M series)

TABLE 1.3 – OUTLINE DIMENSIONS AND WEIGHTS

Process connection size	L, in MM		L1, in mm	H, in mm	H1, in mm	H2, in mm	Cmax, in мм*	Weight, lb KG	
	≤300# (4 MPA)	≥600# (6.3 MPa)						A.2.1	A.2.2
1/8" (Dn3mm)	12.64 321	13.58 345	88.98 2260	4.53 115	9.84 250	6.69 170	3.23 82	11.02 5	17.64 8
3/8" (Dn10mm)	16.69 424	19.06 484	11.89 302	6.06 154	10.63 270	7.28 185	4.33 110	22.05 10	28.66 13
½" (Dn15mm	15.75 400	16.30 414	11.02 280	7.52 191	11.73 298	8.39 213	4.53 115	24.25 11	30.86 14
1" (Dn25mm)	19.69 500	21.1 536	14.17 360	10.16 258	11.89 302	8.58 218	5.91 150	33.07 15	39.68 18
1 ½" (Dn40mm)	23.62 600	24.96 634	18.11 460	12.05 306	12.4 315	9.06 230	6.5 165	61.73 28	68.34 31
2" (Dn50mm)	31.5 800	31.6 828	25.2 640	16.14 410	12.8 325	9.45 240	8.07 205	105.82 48	112.44 51
3" (Dn80mm)	35.43 900	36.54 928	27.56 700	19.49 495	13.78 350	10.43 265	16.38 416	213.85 97	220.46 100
4" (Dn100mm)	44.49 1130	45.51 1156	33.86 860	26.18 665	14.57 370	11.22 285	17.32 440	586.43 266	593.04 269
6" (Dn150mm)	57.09 1450	58.66 1490	47.24 1200	35.63 905	15.75 400	12.44 316	21.06 535	1014.13 460	1020.74 463
8" (Dn200mm)	70.87 1800	72.64 1845	57.09 1450	46.25 1175	16.77 426	13.46 342	22.83 580	1146.4 520	1153.02 523
10" (Dn250)	77.4 1966	78.98 2006	60.24 1530	51.18 1300	18.43 468	15.08 383	23.62 600	1278.68 580	1285.29 583

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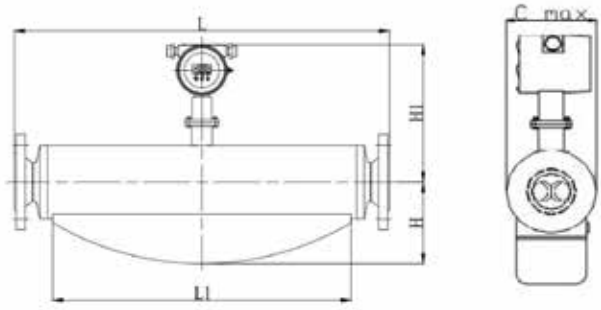
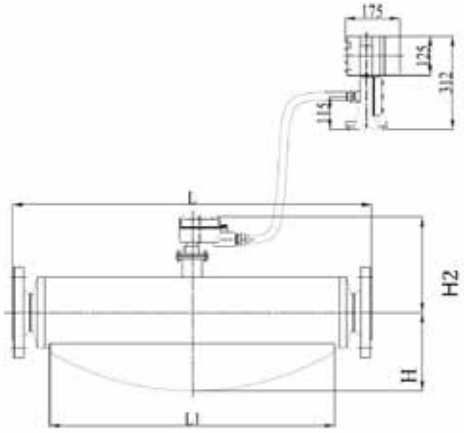


Compact version - Figure A.3.1 (Daniel® S series)



Remove version - Figure A.3.2 (Daniel® S series)

size	L, in MM		L1, in mm	H, in mm	H1, in mm	H2, in mm	Cmax, in мм*	Weight,lb KG
	≤300# (4 MPA)	≥600# (6.3 MPa)						A.3.1 A3.2
2" (Dn50mm)	31.5 800	32.83 834	23.15 588	7.87 200	12.99 330	9.84 250	8.07 205	103.62 47
3" (Dn80mm)	36.81 935	38.31 973	28.74 730	7.87 200	13.98 355	10.63 270	16.38 416	176.37 80

REMOTE TRANSMITTER INSTALLATION DIMENSIONS

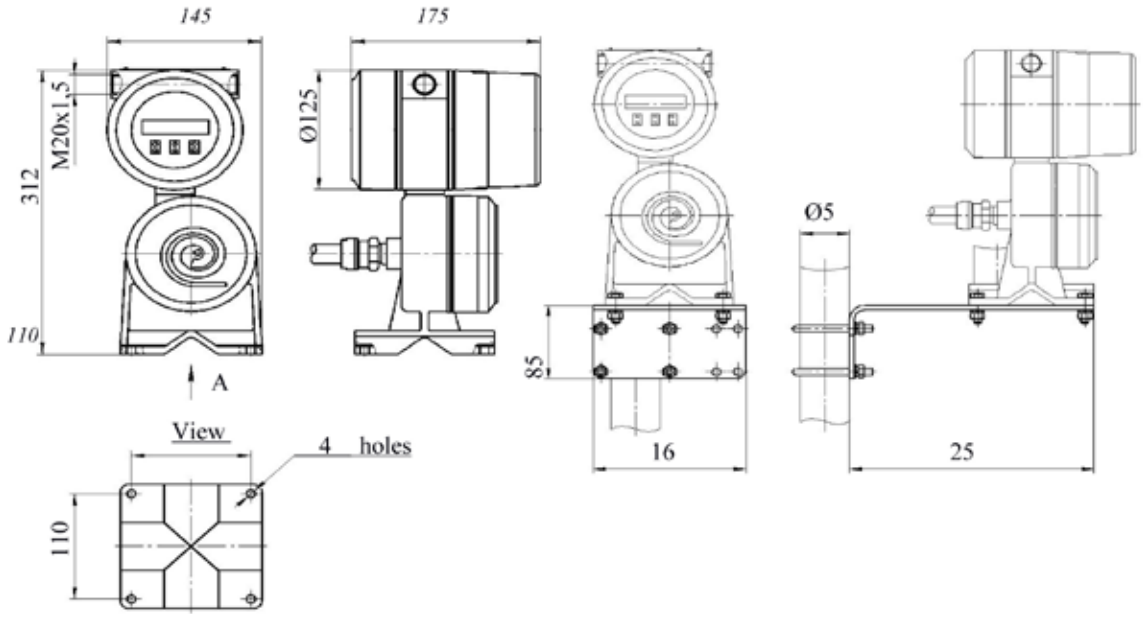


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FIGURE A.4 OVERALL DIMENSIONS AND CONNECTION SIZE OF ELECTRONIC UNIT OF REMOTE TYPE

FIGURE A.5 BRACKET FOR FIXING REMOTE TYPE ELECTRONIC UNIT ON THE ASSEMBLY STAND

TRANSMITTER OPTIONS

- Direct Mount or Remote Mount
- OLED Display with 3 Optical Keys
- Power Supply: 85-265 VAC or 18-36 VDC
- Outputs: 4-20 mA & Pulse/Frequency
- Optional Communication: HART or Modbus RS485

AVAILABLE SENSOR TYPES

M type Micro Bend Sensor

Size from 1/8” to 10”

The **M Type Micro Bend Sensor** features two V-shaped tubes housed in a casing with a significantly smaller radius compared to conventional U-shaped Coriolis sensors. This compact design reduces pressure loss and provides a space-saving installation footprint, making it ideal for applications where low-pressure drop and minimal space are critical.

S Type Super Bend Sensor

Size: 2” to 3”

The **S Type Super Bend Sensor** features two tubes with reduced curvature, resulting in a significantly smaller radius compared to conventional M-shaped Coriolis sensors. This compact design reduces installation space requirements, making it ideal for processes where footprint is a critical factor.

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ORDERING CODES

Please provide the following information when placing your order:

Ordering Model	Fluid Name	Flange Type	Temperature	Process Pressure

MODEL SELECTION

Daniel® Series Coriolis mass flow meter						
COR	-					Description
1/8”	18					Sensor Size
3/8”	38					
1/2”	05					
1”	01					
1 ½”	15					
2”	02					
2 ½”	25					
3”	03					
4”	04					
6”	06					
8”	08					
10”	10					
M-type sensor		M	Size from 1/8” to 10”			Sensor Type
S-type sensor		S	Size from 2” to 3”			
Liquid			L			Medium
Gas			G			
DIN PN16 16 BAR MWP				D16		Flange Rating / Maximum Working Pressure
DIN PN25 25 BAR MWP				D25		
DIN PN40 40 BAR MWP				D40		
DIN PN63 63 BAR MWP				D63		
DIN PN100 100 BAR MWP				D10		
DIN PN160 160 BAR MWP				D60		
DIN PN250 250 BAR MWP				D50		
ANSI 150#RF 285 PSI MWP				A15		
ANSI 300#RF 740 PSI MWP				A30		
ANSI 600#RF 1,480 PSI MWP				A60		
ANSI 900#RF 2,220 PSI MWP				A90		
ANSI 1500#RF 3,705 PSI MWP				A50		
JIS 10K				10K		
JIS 30K				30K		
Sanitary fitting connection				SFC		
Customized connection				CSC		

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MODEL SELECTION (CONTINUED)

Daniel® Series Coriolis mass flow meter									
Compact version -58°F to +257°F (-50°C to +125°C)	COM								Structures
Remote version -58°F to +392°F (-50°C to +200°C)	REM								
Remote version -58°F to +572°F (-50°C to +300°C)	RXM								
Not for hazadous application		NX							Explosion Proof
DC18 to 36V			1						Power Supply
AC85 to 265V			2						
Modbus RTU(RS485) + one active 4-20mA + one active pulse/frequency, standard				R					Signal Output
HART + one active 4-20mA + one active pulse/frequency				H					
2* active 4-20mA + active pulse				S					
Modbus RTU(RS485) + 2* active 4-20mA + one active pulse/frequency				D					
+/- 0.1% of RD					1				Accuracy
+/- 0.2% of RD					2				
+/- 0.5% of RD					5				
Metric unit programming						M			Software Version
US unit programming						U			

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With over 90 years of experience, Daniel® is the only manufacturer that has the knowledge and experience to engineer and offer superior products that are trusted to provide the most reliable and accurate measurements in the global oil and gas industry.

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Decades Proven. Field Chosen.™