

Daniel™ 1200

Liquid Turbine Flow Meter



Advanced Functionality for Sustained Performance

Overview

The Daniel 1200 Liquid Turbine Flow Meter is a volumetric flow metering and transmitting device, used extensively in the petroleum industry for the accurate measurement of liquid hydrocarbons. It is specifically designed for marketing terminal and fuel blending service where repeatability is a critical requirement.

The meter's proven design of lightweight internals is ideally suited for load rack and terminal applications. Its simple configuration and self-cleaning, flow-through bearing design assure high flow rates, extended flow range and sustained accuracy, with superior repeatability and unmatched reliability.

The 1200 Turbine Flow Meter is versatile and operates in both horizontal and vertical installations, allowing for installation in space-constrained applications. It features an expanding hanger suspension system, offering upstream and downstream support as well as positive rotor centering.

The 1200 turbine meter has an integral flow conditioning plate as a standard feature for sizes 1.5 inch and larger, which has been proven to greatly reduce or even eliminate the need for the traditional flow conditioning methods normally used with turbine meters.

This meter is designed for use within the guidelines of API Standards, Chapter 5.3 (Measurement of Liquid Hydrocarbon by Turbine Meter) and the calibration procedures of API, Chapter 4 (Proving Systems).

Typical Applications

- Refined products loading / unloading
- Batch / blending operations

Features and Benefits

- Output linear with flow rate
- Rangeability of 10 to 1
- Horizontal or vertical installation
- Available in 1 to 4-inch line sizes
- Superior accuracy and repeatability
- High frequency pulse resolution
- Uniform pulse signal output
- Universal Mounting Box (UMB) housing dual-channel preamplifier and 2 pick-offs
- Improved serviceability allows easy access to pick-offs and reduces installation costs
- Simple, easy to maintain, field mountable pick-offs require no interruption of conduit lines
- Explosion proof / weather proof housing
- Optional Teflon coated rotors for reduced buildup
- Integral flow conditioner



Figure 1: Daniel 1200 Turbine Flow Meter

Standard Specifications⁽¹⁾

Meter Performance

Sizes

1", 1.5" and 2"

- Linearity: $\pm 0.25\%$
- Premium Linearity: $\pm 0.15\%$
- Repeatability: $\pm 0.02\%$

3" and 4"

- Linearity: $\pm 0.15\%$
- Repeatability: $\pm 0.02\%$

Process Parameters

Table 1: Temperature Ratings

Carbon Steel	Stainless Steel
-29°C to 82°C (-20°F to 180°F)	-40°C to 82°C (-40°F to 180°F)

Table 2: Pressure Ratings⁽³⁾

Size (Inches)	ANSI Class	Carbon Steel	Stainless Steel
1 to 4	150	285 PSI	275 PSI
1 to 4	300	740 PSI	720 PSI

Hazardous Area Classifications⁽²⁾

- UL / C-UL Class 1, Division 1, Groups C&D
- CE certified Ex d IIB T6 (ATEX)
- NEMA 4 (exceeds IP66)

Electrical Performance

Pickoff Specifications

- Type: 2-wire reluctance
- Resistance: 600 - 900 ohms
- Inductance: 250 mH max
- Output: Sinusoidal 40 mV p-p minimum @minimum flow with preamplifier load
- Optional: 2 pick-off coils

Preamplifier Performance (Dual Channel)

- Input supply voltage: 10 - 30 V dc
- Minimum input signal amplitude: 40 mV p-p minimum

Powered Pulse Output

- Output: 0 to 5 V square wave
- Frequency range: 0 to 5 kHz
- Loading: 1 kilohm internal pull-up

Variable Voltage Output

- Output: 0 to supply voltage square wave
- Frequency range: 0 to 5 kHz
- Loading: 1 kilohm internal pull-up

Open Collector Output

- Output: square wave
- Frequency range: 0 to 5 kHz
- Maximum voltage: 30 V dc
- Maximum current: 125 mA
- Maximum power: 0.5 W

(1) Please consult Daniel if your requirements are outside the list specifications. Improved performance, other product and material offerings may be available.

(2) The Daniel 1200 Turbine flow meter meets US, Canadian and European industry standards for electrical and intrinsic safety certifications and approvals. Please consult Daniel for a complete list of agencies and certifications.

(3) Max Pressure in PSI @ 38°C (100°F).

Standard Flow Ranges

Table 3: Flow Rate									
Size (Inches)	BBL/Hr			M ³ /Hr			USGPM		
	Standard Flow Range		Extended Max Flow Range ⁽¹⁾	Standard Flow Range		Extended Max Flow Range ⁽¹⁾	Standard Flow Range		Extended Max Flow Range ⁽¹⁾
	Min	Max		Min	Max		Min	Max	
1	8.6	86	99	1.36	13.6	16	6	60	69
1.5	18.6	186	214	2.95	29.5	34	13	130	150
2	31.4	314	361	5.00	50.0	58	22	220	253
3	93	929	1,068	14.8	148	170	65	650	748
4	143	1,429	1,785	22.7	227	284	100	1,000	1,250

Table 4: Linearity		
Size (Inches)	Standard Linearity	Premium Linearity
1	+/-0.25%	N/A
1.5	+/-0.25%	+/-0.15%
2	+/-0.25%	+/-0.15%
3	+/-0.15%	N/A
4	+/-0.15%	N/A

Table 5: Nominal K- factor			
Size (Inches)	K-Factor		
	Pulses/BBL	Pulses/M ³	Pulses/US Gal
1	33,600	211,338	800
1.5	16,800	105,669	400
2	7,560	47,551	180
3	2,184	13,737	52
4	966	6,076	23

(1) Extended max range suitable up to 20% of duty cycle not to exceed 2 hours per day.

Product Diagrams

Electrical

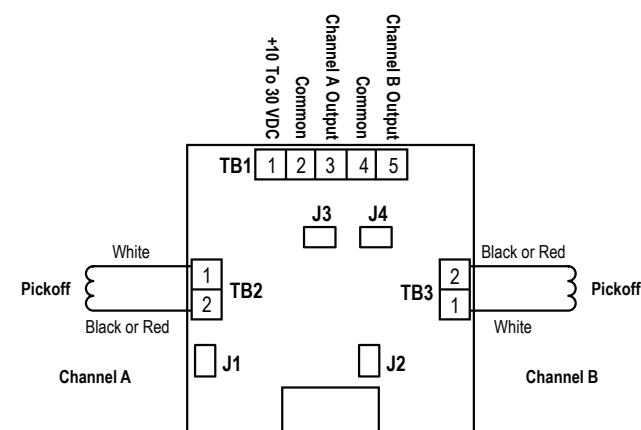


Figure 2: Dual Channel Preamp Terminal Identification Customer Connections

Table 4: Preamp Jumper Configurations			
Jumper	A	B	Out
J1-Chan. A Input	NA	40 mV. PP Min	NA
J2-Chan. B Input	NA	40 mV. PP Min	NA
J3-Chan. A Output	5 V Pulse	Sup. Volt. Pulse (10-30 V dc)	O.C.
J4-Chan. B Output	5 V Pulse	Sup. Volt. Pulse (10-30 V dc)	O.C.

Meter Assembly

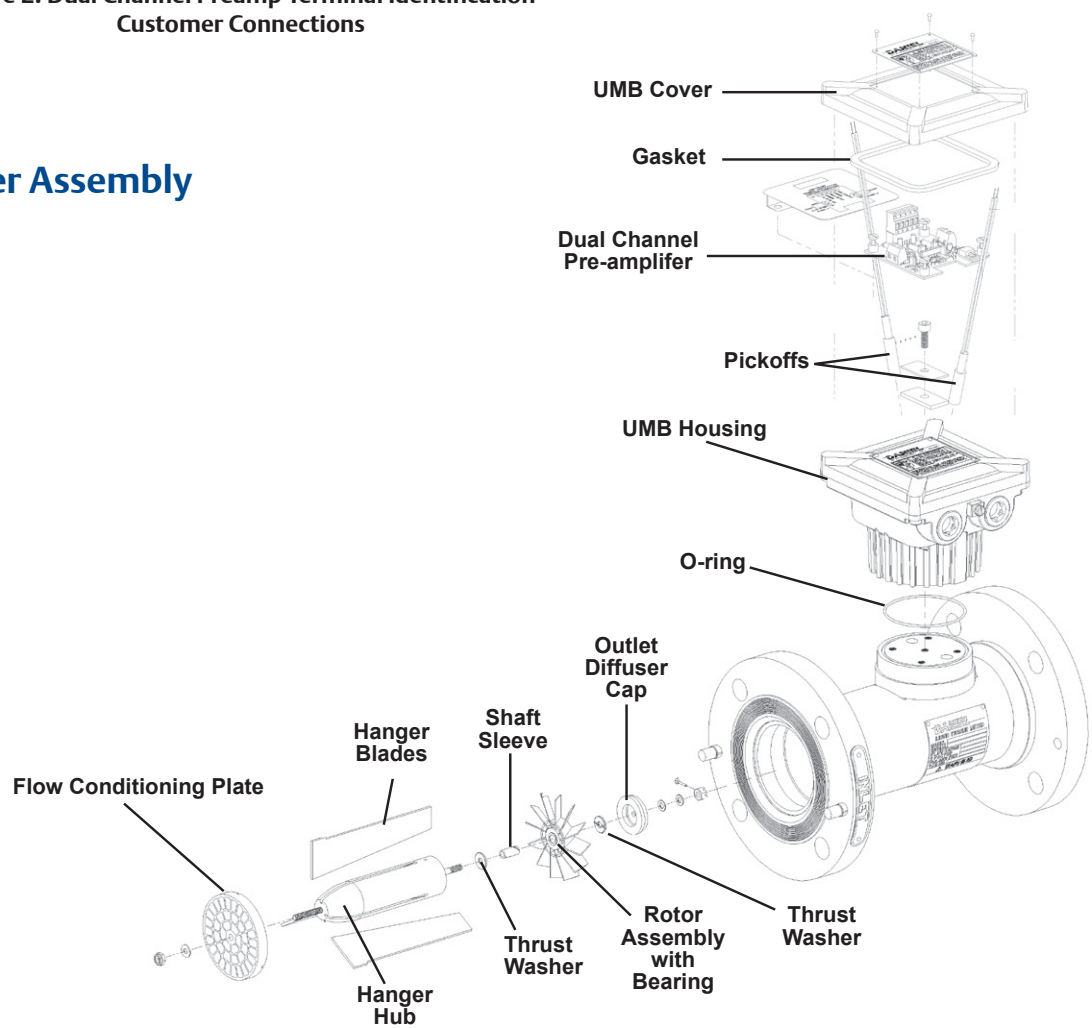


Figure 3: Daniel 1200 Turbine Flow Meter Shown with Tungsten Carbide Bearings

Materials of Construction

Table 5A: Meter with Stainless Steel Bearing (1" to 4")

Description	Standard	NACE MR0175:2002 Compliant
Meter Body and Flanges		
1" to 1.5"	304SS Only	304SS Only
2" to 4"	Carbon Steel or 304SS	Carbon Steel or 304SS
Universal Mounting Box (UMB)	Aluminum 356-T6	Aluminum 356-T6
Rotor Hub/ Rotor Blades		
1" to 1.5"	17-4PH	316SS
2" to 4"	Aluminum 6061-T6 / 430SS	Aluminum 6061-T6 / 430SS
Retaining Ring		
1" to 1.5"	302SS	302SS
2" to 4"		
Bearing Spacer		
1" to 2"	302SS	302SS
3" to 4"		
Shaft		
1"	303SS	303SS
1.5" to 2"	304SS	304SS
3"	Aluminum 6061-T6	Aluminum 6061-T6
4"	Aluminum 2011-T3	Aluminum 2011-T3
Bearing Set	Stainless Steel	Stainless Steel
Suspension Blade		
1"	304SS	304SS
1.5" to 4"	Aluminum 2024-T3	Aluminum 2024-T3
Suspension Diffuser		
1"	316SS	316SS
1.5" to 4"	Aluminum 6061-T6	Aluminum 6061-T6
Downstream Cone		
1"		
1.5" to 4"	303SS	303SS
Sleeve		
1"	304SS	304SS
1.5" to 4"		
Flow Conditioning Plate		
1"		
1.5" to 2"	Delrin	NA
3" to 4"	Delrin/ Aluminum	Aluminum

Table 5B: Meter with Tungsten Carbide Bearings (3" to 4")

Meter Body and Flanges	Carbon Steel or 304SS	Carbon Steel or 304SS
Universal Mounting Box (UMB)	Aluminum 356-T6 / 316 SS	Aluminum 356-T6 / 316 SS
Rotor Hub / Rotor Blades	Aluminum 6061-T6 / 430SS	Aluminum 6061-T6 / 430SS
Shaft	303SS	303SS
Bearing Set	Tungsten Carbide	Tungsten Carbide
Suspension Blade	Aluminum 2024-T3	Aluminum 2024-T3
Suspension Diffuser	Aluminum 6061-T6	Aluminum 6061-T6
Diffuser Washer	Aluminum 6061-T6	Aluminum 6061-T6
Flow Conditioning Plate	Delrin / Aluminum	Aluminum

Weights and Dimensions

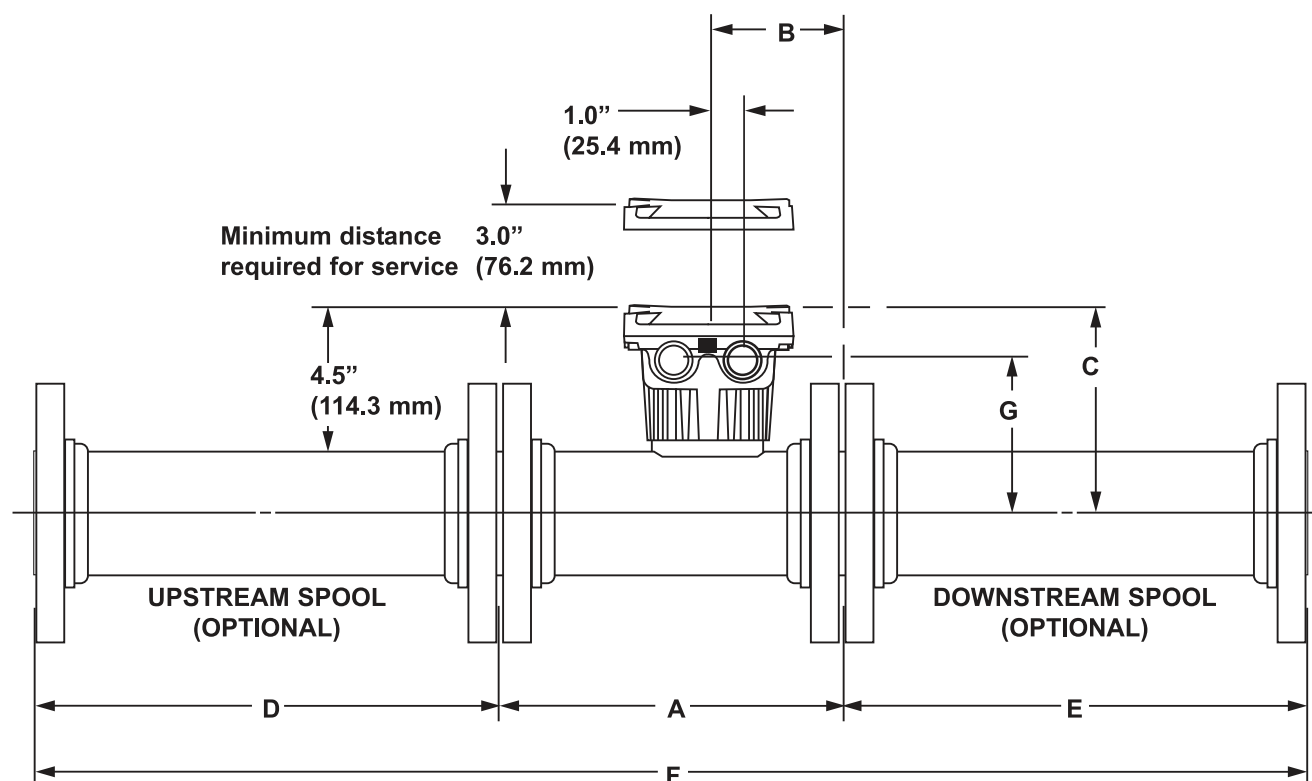


Table 6: Daniel 1200 Liquid Turbine Flow Meter and Flow Straightening Sections

Size	A		B		C		D		E		F		G	
(Inches)	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
1	8	203	4	102	6.75	171	5	127	5	127	18	457	5	127
1.5	9	229	4.5	114	7	178	7.5	191	7.5	191	24	610	5.75	146
2	9	229	4.5	114	7.25	184	10	254	10	254	29	737	6	152
3	10	254	3.88	98	7.25	184	15	381	15	381	40	1,016	6.5	165
4	12	305	4.5	114	8.25	210	20	508	20	508	52	1,321	7	178

Table 7: Approximate Shipping Weight

Size (Inches)	ANSI Class 150		ANSI Class 300	
	lbs	Kg	lbs	Kg
1	13	5.9	13	5.9
1.5	16	7.2	22	10
2	20	9.1	22	10
3	32	14.5	41	18.6
4	47	21.3	64	29

Daniel 1200 Turbine Flow Meter Selection Matrix

Device	T	XX	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Series 1200	T																
Standard Flow Range																	Other Documentation
1" DN25 (6-60 GPM, 8.6-86 BHP, 1.36-13.7 M³/H)	01																None
1.5" DN 40 (13-130 GPM, 18.6-186 BHP, 2.95-29.5 M³/H)	15																Material Test Report (DOC MTR)
2" DN50 (22-220 GPM, 31.5-315 BHP, 5-50 M³/H)	02																NACE with Material Test Report - Compliant with MR0175 2002; Special Order for NACE MR0175 /ISO151 2003 (1" - 4" Sizes)
3" DN 80 (65-650 GPM, 93-930 BHP, 14.8-148 M³/H)	03																
4" DN100 (100-1000 GPM, 143-1430 BHP, 23-230 M³/H)	04																Approvals / Documentation
Pressure Rating / Flange Type																	CCA / UL / CUL (3" & 4" Only)
150# ANSI, RF (285 psi MWP, 125-250 AARH)	A																UL / CUL (CSA covered by UL / CUL)
300# ANSI, RF (740 psi MWP, 125-250 AARH)	B																CE (Includes ATEX, PED or SEP and EMC)
DIN 2501 PN16, RF (16 BAR MWP)	P																INMETRO
DIN 2501 PN40, RF (40 BAR MWP)	Q																Linearity
Design Style / Enclosure Style																	1" - 2" (+/- 0.25%), 3" & 4" (+/- 0.15%)
Alum UMB w/ SS Bearings	E																1" - 2" (+/- 0.15%)
Alum UMB w/ Tungsten Carbide Bearings (3" & 4" Only)	F																Display Mounting
Meter Output / Temperature Range																	None
Standard Temperature Range (-29C to 82C)																	Integral
1 Pick-Off, 1 Dual Channel Preamp	A																Remote
2 Pick-Offs, 1 Dual Channel Preamp	D																Display
Metrology Approvals																	None
Unspecified	1																MRT-97 Electronic Register
NTEP, CC: 90-118, For 1.5" Meter: 6 - 130 GPM (For Extended Flow Ranges See Certificate)	2																Materials of Construction
Measurement Canada, AV-2264, 5:1 Turndown for Diesel Fuel and Stove Oil	3																Body / Flange / Internals
Relative Density (Specific Gravity) of Calibration Fluid																	A CS Body and Flanges, SS/Al/Ball Bearing/Teflon Coated Rotor (2", 3" & 4" Only)
0.78 - 0.79 Mineral Spirits	J																C CS Body and Flanges, SS/Al/Tungsten Carbide / Teflon Coated Rotor (3" & 4" Only)
Flow Direction / Flow Conditioning																	4 CS Body and Flanges, SS/Al/Ball Bearing (2", 3" & 4" Only)
Horizontal, No Flow Conditioning Plate (1" Only)	A																9 CS Body and Flanges, SS/Al/Tungsten Carbide (3" & 4" Only)
Vertical, No Flow Conditioning Plate (1" Only)	B																B 304 SS Body and Flanges, SS/Al/Ball Bearing/Teflon Coated Rotor
Horizontal, Flow Conditioning Plate (1.5" - 4" Only)	D																D 304 SS Body and Flanges, SS/Al/Tungsten Carbide/Teflon Coated Rotor (3" & 4" Only)
Vertical, Flow Conditioning Plate (1.5" - 4" Only/Upward Flow Only)	C																7 304 SS Body and Flanges, SS / Al / Ball Bearing
Horizontal, Aluminum Flow Conditioning Plate (3" & 4" Only)	D																8 304 SS Body and Flanges, SS / Al / Tungsten Carbide (3" & 4" Only)
Vertical, Aluminum Flow Conditioning Plate (3" & 4" Only/Upward Flow Only)	F																
Note: Flow Conditioning Plate is not Applicable for the 1" Meter	G																

This is for informational purposes only. Not every option is listed and some options are contingent on others. Please consult factory for assistance designing your optimal meter.

Emerson Process Management

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