

# Daniel™ 1500

## Liquid Turbine Flow Meter





# Reliability in Tough Applications

## Overview

The Daniel 1500 Liquid Turbine Flow Meter is a volumetric flow metering and transmitting device used extensively in the petroleum industry. It is the meter of choice for accurate measurement of liquid hydrocarbons and other process fluids.

The 1500 Liquid Turbine Meter is specifically designed for pipeline operation and for use within the guidelines of API Chapter 5.3 (Measurement of Liquid Hydrocarbons by Turbine Meters) and the test procedures of API Chapter 4 (Proving Systems).

The meter's proven design of rugged internals provides reliability and up-time availability to ensure continuous 24/7 pipeline operation for demanding crude oil and refined product applications. The 1500 Liquid Turbine Meter features a dual-hanger suspension system, offering upstream and downstream support as well as positive rotor centering. The standard journal bearing is tungsten carbide that delivers exceptional longevity.

The 1500 Liquid Turbine Flow Meter includes a Universal Mounting Box (UMB) housing with up to 2 pickoffs and a dual channel preamplifier. It can be configured with dual UMBs, enabling complete measurement redundancy and offering up to four matched pulse outputs to accommodate a wide variety of metering and proving requirements.



Figure 1: Daniel 1500 Turbine Flow Meter

## Typical Applications

- Crude and refined product pipelines
- Custody transfer and check metering
- Inventory control
- Ship and rail car loading and off-loading
- Crude oil production
- FSO (floating storage and offloading)
- FPSO (floating production, storage and offloading)

## Features and Benefits

- Output linear with flow rate
- Rangeability of 10 to 1
- Available in 1 to 18-inch line sizes
- High accuracy and repeatability
- Bi-directional flow models available
- High frequency pulse resolution
- Tungsten carbide bearings
- Universal Mounting Box (UMB) housing, dual channel preamplifier and 2 pickoffs
- Single or dual UMB options
- Up to 4 outputs in 2 pairs, each 90° electrically out of phase
- Improved serviceability allows easy access to pickoffs and reduces installation costs
- Simple, easy to maintain, field mountable pickoffs require no interruption of conduit lines while servicing
- Explosion proof / weatherproof housing
- Stainless steel internals
- Rimmed or bladed rotor options
- Stainless steel or carbon steel body construction
- Light product rotor option

# Standard Specifications<sup>(1)</sup>

## Meter Performance

### Sizes

#### 1" to 2 1/2"

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

#### 3" and Larger

- Linearity:  $\pm 0.15\%$
- Premium Linearity:  $\pm 0.1\%$  and  $\pm 0.07\%$
- Repeatability:  $\pm 0.02\%$

## Process Parameters

**Table 1: Temperature Ratings**

	Carbon Steel	Stainless Steel
<b>Standard</b>	-29°C to 82°C (-20°F to 180°F)	-40°C to 82°C <sup>(4)</sup> (-40°F to 180°F)
<b>High temperature</b>	-29°C to 204°C (-20°F to 400°F)	-40°C to 204°C (-40°F to 400°F)
<b>Ambient Temperature</b>	40°C to 60°C (CE) -40°F to 140°F (UL / C-UL)	

**Table 2: Pressure Ratings<sup>(5)</sup>**

Size (inch)	ANSI Class	Carbon Steel	Stainless Steel
1 to 18	150	285 psi	275 psi
1 to 18	300	740 psi	720 psi
1 to 18	600	1,480 psi	1,440 psi
1 to 18	900	2,250 psi	2,160 psi
1 to 18	1500	3,705 psi	3,600 psi

## Hazardous Area Classifications<sup>(3)</sup>

- 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: 250mH max
- Output: Sinusoidal 40mV p-p minimum @minimum flow with preamplifier load
- Optional: 2, 3 or 4 pickoff coils<sup>(2)</sup>

### Preamplifier Performance (Dual Channel)

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

### Powered Pulse Output

- Output: 0 to 5V 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 Watts

(1) Please consult Daniel if your requirements are outside the specifications noted below. Other product and material offerings may be available depending on the application.

(2) 3 or 4 pickoff coils require Dual UMB.

(3) The Daniel 1500 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.

(4) Remote mount UMB (option) high temperature > 82°C (180°F), low temperature < -29°C (-20°F).

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

# Standard Flow Ranges

Table 3: Flow Rate										
Size (Inches)	BBL/HR			M <sup>3</sup> /HR			USGPM			
	Standard Flow Range		Ext Max Flow Range <sup>(1)</sup>	Standard Flow Range		Ext Max Flow Range <sup>(1)</sup>	Ext Min Flow Range USGPM Linearity 0.75% (1" - 2.5") 0.50% (3" - 18")	Standard Flow Range		Ext Max Flow Range <sup>(1)</sup>
	Min	Max		Min	Max			Min	Max	
1	10	100	115	1.6	16	18	5.6	7	70	81
1.5	21	214	246	3.4	34	39	12	15	150	173
2	43	429	493	6.8	68	78	24	30	300	345
2.5	57	571	657	9.1	91	105	32	40	400	460
3	100	1,000	1,150	15.9	159	183	56	70	700	805
4	185	1,850	2,128	29.4	294	338	104	130	1,295	1,489
6	420	4,200	4,830	66.8	668	768	235	294	2,940	3,381
8	850	8,500	9,775	135	1,351	1,554	476	595	5,950	6,843
10	1,200	12,000	13,800	191	1,908	2,194	672	840	8,400	9,660
12	1,800	18,000	20,700	286	2,862	3,291	1,008	1,260	12,600	14,490
16	2,800	28,000	32,200	445	4,452	5,120	1,568	1,960	19,600	22,540
18	4,000	40,000	46,000	636	6,359	7,313	2,240	2,800	28,000	32,200

Table 4: Linearity		
Size (Inches)	Standard Linearity	Premium Linearity
1-2.5	+/-0.25%	+/-0.15%
3-18	+/-0.15%	+/-0.1%
		+/-0.07%*
* 5:1 Turndown		

Table 5: Nominal K-Factor						
Size (Inches)	Pulses/BBL		Pulses/M <sup>3</sup>		Pulses/US Gal	
	Blade	Rim	Blade	Rim	Blade	Rim
1	21,000	N/A	132,086	N/A	500	N/A
1.5	9,660	N/A	60,760	N/A	230	N/A
2	5,334	N/A	33,550	N/A	127	N/A
2.5	3,150	N/A	19,813	N/A	75.0	N/A
3	2,016	4,620	12,680	29,059	48.0	110
4	1,000	2,999	6,287	18,862	23.8	71.4
6	235	1,000	1,479	6,287	5.6	23.8
8	N/A	500	N/A	3,144	N/A	11.9
10	N/A	252	N/A	1,585	N/A	6.0
12	N/A	202	N/A	1,268	N/A	4.8
16	N/A	101	N/A	634	N/A	2.4
18	N/A	101	N/A	634	N/A	2.4

(1) Extended Flow Range with 20% Duty Cycle not to Exceed 2 Hours per Day.

# Flow Range Adjustments

## Specific Gravity

Table 6A: Specific Gravity = 1 (0.7 to 1)						
Meter Size (Inches)	Minimum Linear Flow Rate			Maximum Linear Flow Rate		
	BBL/HR	M <sup>3</sup> /HR	USGPM	BBL/HR	M <sup>3</sup> /HR	USGPM
1	10	1.6	7	100	15.9	70
1.5	21	3.4	15	214	34.1	150
2	43	6.8	30	429	68.1	300
2.5	57	9.1	40	571	90.9	400
3	100	15.9	70	1,000	159	700
4	186	29.5	130	1,850	294	1,295
6	420	66.8	294	4,200	668	2,940

Table 6B: Specific Gravity = 0.6						
Meter Size (Inches)	Minimum Linear Flow Rate			Maximum Linear Flow Rate		
	BBL/HR	M <sup>3</sup> /HR	USGPM	BBL/HR	M <sup>3</sup> /HR	USGPM
1	17	2.7	12	116	18.4	81
1.5	36	5.7	25	247	39.3	173
2	71	11.4	50	493	78.4	345
2.5	96	15.2	67	657	105	460
3	167	26.6	117	1,150	183	805
4	309	49.1	216	2,127	338	1,489
6	701	112	491	4,830	768	3,381

Table 6C: Specific Gravity = 0.5						
Meter Size (Inches)	Minimum Linear Flow Rate			Maximum Linear Flow Rate		
	BBL/HR	M <sup>3</sup> /HR	USGPM	BBL/HR	M <sup>3</sup> /HR	USGPM
1	23	3.6	16	116	18.4	81
1.5	50	7.9	35	247	39.3	173
2	101	16.1	71	493	78.4	345
2.5	134	21.3	94	657	105	460
3	236	37.5	165	1,150	183	805
4	436	69.3	305	2,127	338	1,489
6	989	157	692	4,830	768	3,381

Table 6D: Specific Gravity = 0.4						
Meter Size (Inches)	Minimum Linear Flow Rate			Maximum Linear Flow Rate		
	BBL/HR	M <sup>3</sup> /HR	USGPM	BBL/HR	M <sup>3</sup> /HR	USGPM
1	29	4.5	20	116	18.4	81
1.5	60	9.5	42	247	39.3	173
2	120	19.1	84	493	78.4	345
2.5	160	25.4	112	657	105	460
3	280	44.5	196	1,150	183	805
4	517	82.2	362	2,127	338	1,489
6	1,173	187	821	4,830	768	3,381

Table 6E: Specific Gravity = 0.3						
Meter Size (Inches)	Minimum Linear Flow Rate			Maximum Linear Flow Rate		
	BBL/HR	M <sup>3</sup> /HR	USGPM	BBL/HR	M <sup>3</sup> /HR	USGPM
1	33	5.2	23	116	18.4	81
1.5	71	11.4	50	247	39.3	173
2	141	22.5	99	493	78.4	345
2.5	190	30.2	133	657	105	460
3	331	52.7	232	1,150	183	805
4	613	97.4	429	2,127	338	1,489
6	1,393	221	975	4,830	768	3,381

## High Viscosity Liquids

Increases in viscosity of the measured liquid will reduce the rangeability of the flow meter. Generally, the minimum flow rate of the meter will have to be increased to maintain the linearity rating of the meter.

The increased flow rate may be determined according to the following ratio:

$$\text{Sizing ratio} = \frac{\text{Liquid Viscosity (Centistokes)}}{\text{Nominal Line Sizes}}$$

Table 7: Minimum Flow	
Sizing Ratio (Inches)	Minimum Flow (% of Normal Maximum Flow Rate)
1	Use Normal Minimum Flow Rate
1.5	20%
2	25%
2.5	30%
3	35%
4	40%
5	45%
6	50%
7	55%
8	60%

### Example:

The sizing ratio of a 4-inch turbine meter measuring a liquid of 8 cSt is 8/4, or 2. The normal maximum flow rate of this size of meter is 1295 GPM. The new minimum flow rate is 25% of 1295, or 324 GPM. The flow rate for this application is now 324-1295 GPM, with standard linearity (+/-0.15%) and repeatability of (+/-0.02%) maintained.

### Note:

Use of the turbine meter on high viscosity liquids at the maximum extended flow range is allowable, but may increase the wear rate of the turbine.

The pressure drop through the meter may be estimated (for low to medium viscosities) according to the following formula:

$$DP = (PD) \times (\mu)^{1/4} \times (SG)^{3/4} \quad \text{or} \quad DP = (PD) \times (v)^{1/4} \times (SG)$$

Where:

DP = Estimated pressure drop

PD = Pressure drop for water at expected flow rate

μ = Absolute viscosity in centipoises

v = Kinematic viscosity in centistokes

SG = Specific gravity

Note: μ = (v) x (SG)

# Product Diagrams

## Electrical

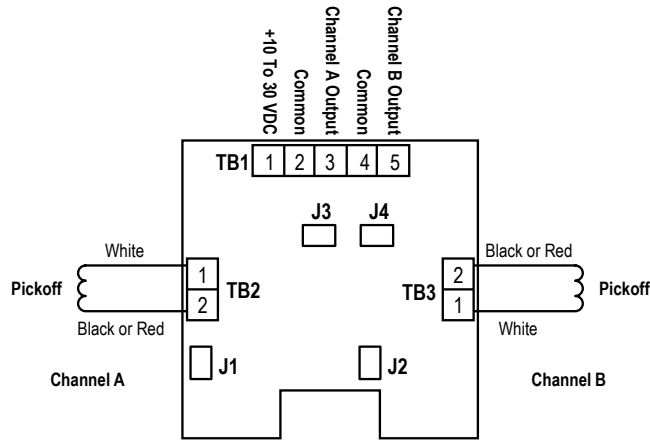
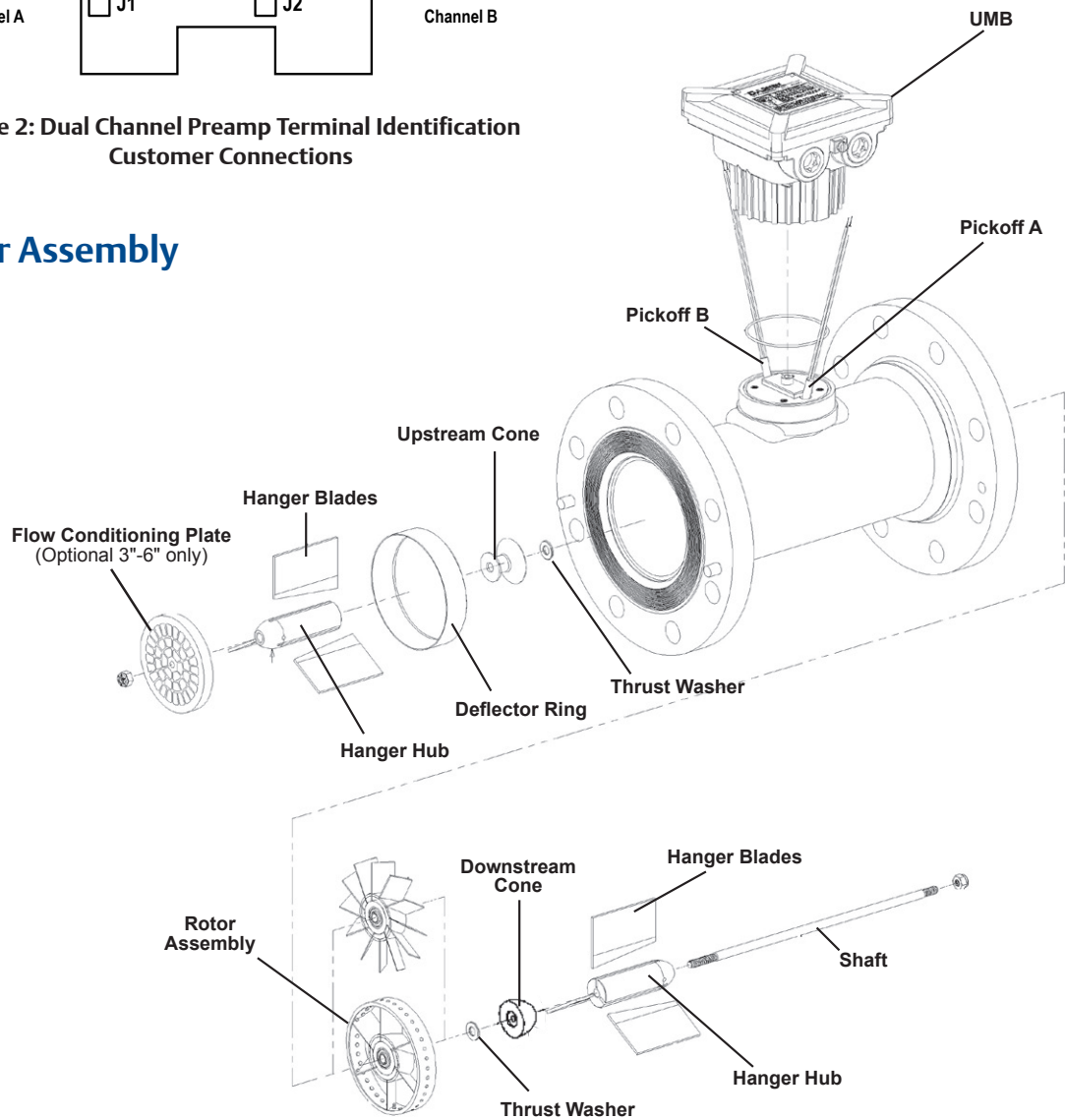


Figure 2: Dual Channel Preamp Terminal Identification Customer Connections

Table 8: Preamp Jumper Configurations			
Jumper	A	B	Out
J1-Chan. A Input	NA	40mV. PP Min	NA
J2-Chan. B Input	NA	40mV. PP Min	NA
J3-Chan. A Output	5v.Pulse	Sup. Volt. Pulse (10-30 VDC)	O.C.
J4-Chan. B Output	5v.Pulse	Sup. Volt. Pulse (10-30 VDC)	O.C.

## Meter Assembly



# Materials of Construction

## Standard Materials

Table 9A: Meter with Bladed Rotor (1" to 6")			
<b>Meter Body and Flanges</b>	Carbon Steel	Stainless Steel (304SS)	Stainless Steel (316SS)
<b>Universal Mounting Box (UMB)</b>	Aluminum 356-T6	Aluminum 356-T6	Aluminum 356-T6
<b>Blades</b>			
1"	430SS / 304SS	430SS / 304SS	NICKEL-200 / 316SS <sup>(1)</sup>
1.5" to 6"	430SS	430SS	NICKEL-200 <sup>(2)</sup>
<b>Rotor Hub</b>			
1" to 6"	430SS	430SS	316SS
<b>Shaft</b>			
1" to 2.5"	316SS	316SS	316SS
3" to 6"	17-4 PH SS HT <sup>(3)</sup>	17-4 PH SS HT <sup>(3)</sup>	17-4 PH SS HT <sup>(3)</sup>
<b>Tolerance Rings (2.5"-24")</b>	K-MONEL	K-MONEL	K-MONEL
<b>Bearing Set</b>	Tungsten Carbide	Tungsten Carbide	Tungsten Carbide
<b>Suspension</b>	304SS	304SS	316SS
<b>Cones</b>	304SS	304SS	316SS

Table 9B: Meter with Rimmed Rotor (3" to 24")			
<b>Meter Body and Flanges</b>	Carbon Steel	Stainless Steel (304SS)	Stainless Steel (316SS)
<b>Universal Mounting Box (UMB)</b>	Aluminum 356-T6	Aluminum 356-T6	Aluminum 356-T6
<b>Blades</b>	304SS	304SS	316SS
<b>Rotor Hub</b>	430SS	430SS	316SS
<b>Rotor Rim</b>			
3" and 4"	316SS	316SS	316SS
6" and 24"	304SS	304SS	316SS
<b>Shaft</b>	17-4 PH SS HT <sup>(3)</sup>	17-4 PH SS HT <sup>(3)</sup>	17-4 PH SS HT <sup>(3)</sup>
<b>Tolerance Rings</b>	K-MONEL	K-MONEL	K-MONEL
<b>Bearing Set</b>	Tungsten Carbide	Tungsten Carbide	Tungsten Carbide
<b>Suspension</b>	304SS	304SS	316SS
<b>Deflector Ring</b>	304SS	304SS	316SS
<b>Rim Buttons</b>	Mu-Metal	Mu-Metal	Mu-Metal
<b>Cones</b>	304SS	304SS	316SS

Table 9C: Meter with Light Weight Rotor (3" to 12")			
<b>Meter Body and Flanges</b>	Carbon Steel	Stainless Steel (304SS)	Stainless Steel (316SS)
<b>Universal Mounting Box (UMB)</b>	Aluminum 356-T6	Aluminum 356-T6	Aluminum 356-T6
<b>Blades</b>			
3" to 4" (Blade Type)	430SS	430SS	430SS
6" to 12" (Rim Type)	304SS	304SS	304SS
<b>Rotor Hub</b>			
3"	430SS	430SS	430SS
4" to 12"	6061-T6 ALUM	6061-T6 ALUM	6061-T6 ALUM
<b>Shroud (6"-12")</b>	430SS	430SS	430SS
<b>Shaft</b>	17-4 PH SS HT <sup>(3)</sup>	17-4 PH SS HT <sup>(3)</sup>	17-4 PH SS HT <sup>(3)</sup>
<b>Tolerance Rings</b>	K-MONEL	K-MONEL	K-MONEL
<b>Bearing Set</b>	Tungsten Carbide	Tungsten Carbide	Tungsten Carbide
<b>Suspension</b>	304SS	304SS	304SS
<b>Deflector Ring</b>	304SS	304SS	316SS
<b>Cones</b>	304SS	304SS	304SS

NOTE: Teflon Coated rotor available for Rim and Blade type.

(1) For full NACE MR0175:2002 compliancy, material will change to 430SS.

(2) Rim type rotor not recommended, use blade type rotor only.

(3) For full NACE MR0175:2002 compliancy, material will change to 316SS with hard chrome or optional full NACE MR175/ISO151: 2003.



## NACE MR0175 2002-Compliant Materials

**Table 9D: Meter with Bladed Rotor (1" to 6")**

Meter Body /Flanges	Carbon Steel	Stainless Steel (304SS)	Stainless Steel (316SS)
Universal Mounting Box (UMB)	Aluminum 356-T6	Aluminum 356-T6	Aluminum 356-T6
<b>Blades</b>			
1"	430SS / 304SS	430SS / 304SS	430SS / 316SS
1.5" to 6"	430SS	430SS	430SS
<b>Rotor Hub</b>	430SS	430SS	316SS
<b>Shaft</b>			
1" to 2.5"	316SS	316SS	316SS
3" to 6"	316SS with Hard Chrome <sup>(2)</sup>	316SS with Hard Chrome <sup>(2)</sup>	316SS with Hard Chrome <sup>(2)</sup>
<b>Tolerance Rings (2.5"-24")</b>	K-MONEL	K-MONEL	K-MONEL
<b>Bearing Set</b>	Tungsten Carbide	Tungsten Carbide	Tungsten Carbide
<b>Suspension</b>	304SS	304SS	316SS
<b>Cones</b>	304SS	304SS	316SS

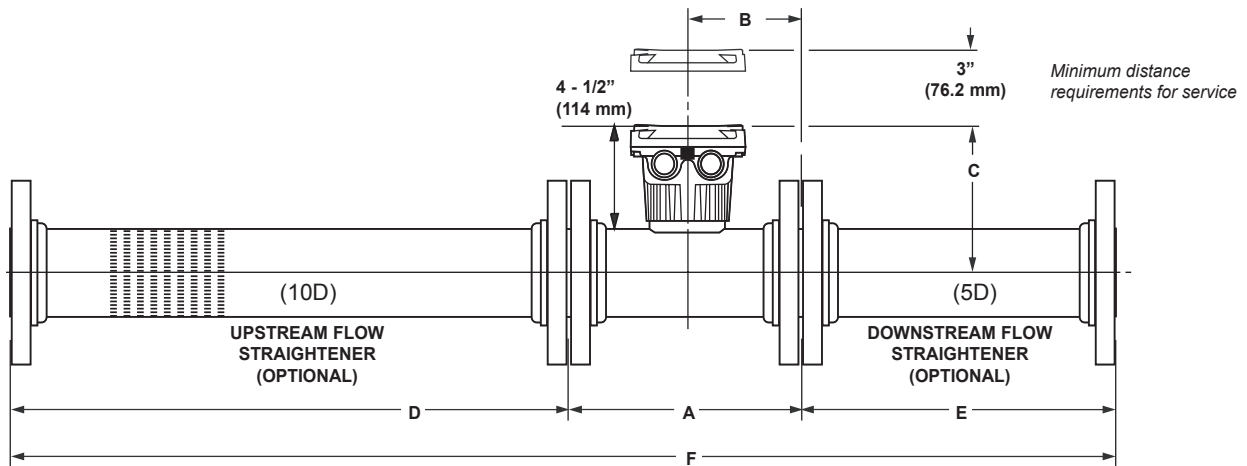
**Table 9E: Meter with Rimmed Rotor (3" to 24")**

Meter Body and Flanges	Carbon Steel	Stainless Steel (304SS)	Stainless Steel (316SS)
Universal Mounting Box (UMB)	Aluminum 356-T6	Aluminum 356-T6	Aluminum 356-T6
<b>Blades</b>	304SS	304SS	316SS
<b>Rotor Hub</b>	430SS	430SS	316SS
<b>Rotor Rim</b>			
3" and 4"	316SS	316SS	316SS
6" and 24"	304SS	304SS	316SS
<b>Shaft</b>	17-4 PH SS HT <sup>(2)</sup>	17-4 PH SS HT <sup>(2)</sup>	17-4 PH SS HT <sup>(2)</sup>
<b>Tolerance Rings</b>	K-MONEL	K-MONEL	K-MONEL
<b>Bearing Set</b>	Tungsten Carbide	Tungsten Carbide	Tungsten Carbide
<b>Suspension</b>	304SS	304SS	316SS
<b>Deflector Ring</b>	304SS	304SS	316SS
<b>Rim Buttons</b>	Mu-Metal	Mu-Metal	Mu-Metal
<b>Cones</b>	304SS	304SS	316SS

NOTE: Teflon coated rotor available for Rim and Blade type.

(2) For full NACE MR0175:2002 compliancy, material will change to 316SS with hard chrome or optional full NACE MR175/ISO151: 2003.

# Weights and Dimensions



**Table 10: Daniel 1500 Liquid Turbine Flow Meter and Flow Straightening Sections**

Sizes (Inches)	A		B		C		D		E		F	
	INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM
1	8	203	4	102	6.75	171	N/A	N/A	N/A	N/A	N/A	N/A
1.5	9	229	4.5	114	7.13	181	N/A	N/A	N/A	N/A	N/A	N/A
2	9	229	4.5	114	7.13	181	21	533	13	330	43	1,092
2.5	10	254	5	127	7.56	192	25	635	15	381	50	1,270
3	10	254	5	127	7.50	191	30	762	15	381	55	1,397
4	12	305	6	152	8.25	210	40	1,016	20	508	72	1,829
6	14	356	7	178	9.31	237	60	1,524	30	762	104	2,642
8	16	406	8	203	10.31	262	80	2,032	40	1,016	136	3,454
10	20	508	10	254	11.38	289	100	2,540	50	1,270	170	4,318
12	24	610	12	305	12.38	314	120	3,048	60	1,524	204	5,182
16	32	813	16	406	14	356	160	4,064	80	2,032	272	6,909
18	36	914	18	457	15	381	180	4,572	90	2,286	306	7,772

N/A = Not Applicable

**Table 11: Approximate Shipping Weight**

Sizes (Inches)	ANSI Class 150		ANSI Class 300		ANSI Class 600		ANSI Class 900		ANSI Class 1500	
	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg
1	11	5.0	13	5.9	15	6.8	29	13.1	29	13.1
1.5	18	8.1	21	9.5	24	10.9	45	20.4	45	20.4
2	20	9.1	22	10.0	26	11.8	66	29.9	66	29.9
2.5	29	13.1	35	15.8	40	18.1	88	39.8	88	39.8
3	32	14.5	42	19.0	46	20.8	88	39.8	133	60.2
4	46	20.8	68	30.8	87	39.4	135	61.1	200	90.5
6	77	34.8	112	50.7	169	76.5	265	120	375	170
8	121	54.8	180	81.5	275	125	426	193	570	258
10	207	93.7	280	127	460	208	658	298	1,020	462
12	321	145	433	196	590	267	896	406	1,560	706
16	730	330	836	378	1,260	570	CF	CF	CF	CF
18	1,093	495	1,160	525	1,660	751	CF	CF	CF	CF

CF = Consult Factory

For ANSI ratings not listed, please consult factory.

# Daniel 1500 Turbine Flow Meter Selection Matrix

Device	T	XX	X	X	X	X	X	X	X	X	X	X	X	X	Other Documentation
Series 1500	T														A None
<b>Line Size / Standard Flow Range</b>															C Material Test Reports (DOC MTR)
1" DN25 (7-70 GPM, 10-100 BHP, 1.6-16 M <sup>3</sup> /H)		01													E NACE with Material Test Report - Compliant with MR0175 2002; Special Order for NACE MR0175 /ISO 151 2003
1.5" DN40 (15-150 GPM, 21-214 BHP, 3.4-34 M <sup>3</sup> /H)		15													
2" DN50 (30-300 GPM, 43-429 BHP, 6.8-68 M <sup>3</sup> /H)		02													
2.5" DN65 (40-400 GPM, 57-571 BHP, 9.1-91 M <sup>3</sup> /H)		25													<b>Approvals / Documentation</b>
3" DN80 (70-700 GPM, 100-1000 BHP, 15.9-159 M <sup>3</sup> /H)		03													J UL / CUL
4" DN100 (130-1295 GPM, 185-1850 BHP, 29.4-294 M <sup>3</sup> /H)		04													K CE (Includes ATEX, PED or SEP and EMC)
6" DN150 (294-2940 GPM, 420-4200 BHP, 66.8-668 M <sup>3</sup> /H)		06													M INMETRO
8" DN200 (595-5950 GPM, 850-8500 BHP, 135-1351 M <sup>3</sup> /H)		08													
10" DN250 (840-8400 GPM, 1200-12000 BHP, 191-1908 M <sup>3</sup> /H)		10													<b>Linearity</b>
12" DN300 (1260-12600 GPM, 1800-18000 BHP, 286-2862 M <sup>3</sup> /H)		12													C 1" - 2.5" (+/- 0.25%), 3" - 18" (+/- 0.15%)
16" DN400 (1960-19600 GPM, 2800-28000 BHP, 445-4452 M <sup>3</sup> /H)		16													D 1" - 2.5" (+/- 0.15%), 3" - 18" (+/- 0.10%)
18" DN450 (2800-28000 GPM, 4000-40000 BHP, 636-6359 M <sup>3</sup> /H)		18													E 3" - 18" (+/- 0.07% with 5:1 Turndown)
<b>Pressure Rating / Flange Type</b>															<b>Display Mounting</b>
150# ANSI, RF (Sizes 1" - 18", 285 psi MWP, 125-250 AARH)			A												A None
300# ANSI, RF (Sizes 1" - 18", 740 psi MWP, 125-250 AARH)			B												B Integral
600# ANSI, RF (Sizes 1" - 18", 1480 psi MWP, 125-250 AARH)			C												C Remote
900# DANIEL, RTJ (Sizes 1" - 4", 2220 psi MWP)			G												
1500# DANIEL, RTJ (Sizes 1" - 2.5", 3705 psi MWP)			H												
2500# DANIEL, RTJ (Sizes 1" - 2.5", 6170 psi MWP)			J												A None
<b>Design Style / Enclosure Style</b>															D MRT-97 Electronic Register
1 Aluminum UMB (Sizes 1" - 18")				D											
2 Aluminum UMBs (Sizes 3" - 18")				Z											<b>Materials of Construction</b>
<b>Meter Output / Temperature Range</b>															
<b>Standard Temperature Options (-29°C to 82°C)</b>															
1 Pick-Off, 1 Dual Channel Preamp					A										1 304 SS / 304 SS / 304 SS
2 Pick-Offs (90° Out of Phase), 2 Dual Channel Preamps					B										2 CS / CS / 304 SS
2 Pick-Offs (90° Out of Phase), 1 Dual Channel Preamp					C										4 316 SS / 316 SS / 316 SS
1 Pick-Off Only					D										5 CS / CS / 316 SS
2 Pick-Offs Only (90° Out of Phase)					E										
4 Pick-Offs (Each Pair 90° Out of Phase), 2 Dual Channel Preamps					L										
<b>High Temperature Options (-29°C to 204°C)</b>															
1 Pick-Off, 1 Dual Channel Preamp					F										
2 Pick-Offs (90° Out of Phase), 2 Dual Channel Preamps					G										
2 Pick-Offs (90° Out of Phase), 1 Dual Channel Preamp					H										
1 Pick-Off Only					J										
2 Pick-Offs (90° Out of Phase), 1 Terminal Block					K										
2 Pick-Offs (90° Out of Phase), 2 Terminal Blocks, RMB with Dual Channel Preamp					M										
1 Pick-Off, 1 Terminal Block, RMB with Dual Channel Preamp					N										
<b>Metrology Approvals</b>															
Unspecified															1 C Rim-Type Rotor, Uni-Directional, Sizes 3" - 18"
OIML (Sizes 3" - 16")															5 H Teflon Coated Rim-Type Rotor, Uni-Directional, Sizes 3" - 16"
															D Rim-Type Rotor, Bi-Directional, Sizes 3" - 18"
															J Teflon Coated Rim-Type Rotor, Bi-Directional, Sizes 3" - 16"
															M Light Product Rotor, Uni-Directional, Sizes 3" - 12"

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.

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