

Liquid Turbine Flow Meters



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Halliburton Liquid Turbine Flow Meters

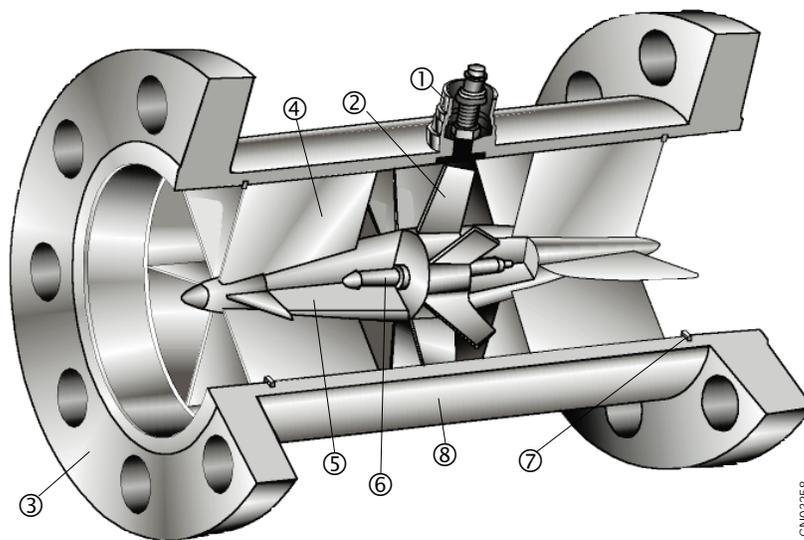
Halliburton developed its first flow meter for oilfield applications in 1957. The meter incorporated a tungsten-carbide shaft and bearing to withstand the rugged conditions of the oilfield environment. Over the years, this flow meter has built an unsurpassed reputation for withstanding severe punishment while maintaining operational and measurement integrity.

Halliburton turbine flow meters indicate flow rate

and measure total throughput of a liquid line. As liquid flows through the meter and over the rotor, the rotor turns at a speed that is directly proportional to the flow rate. A magnetic pickup senses the rotor blades as they pass and generates an electrical (sine wave) signal, then these electrical pulses are transmitted to the flow measurement readout equipment.

Inside Story Reveals First Class Design for First Class Performance

- (1) Permanent conduit connection is standard.
- (2) ROTOR is pitched and pre-calibrated for maximum accuracy.
- (3) END CONNECTIONS available, flanged or threaded, standard or special.
- (4) FLOW VANES increase performance at low rates.
- (5) FLOW VANE HUB supports rotor assembly.
- (6) ROTOR SHAFT, BEARINGS, AND THRUST BALL are tungsten carbide for long service without lubrication other than by the liquid being measured.
- (7) RETAINING RINGS make disassembly easy.
- (8) FLOW METER BODY is sturdy, one-piece construction, precision finished.



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Applications

Halliburton offers turbine flow meters for applications in a variety of end connections and accuracy levels.

Typical applications are

- Water-injection measurement
- Heater Treaters
- Test and production separators
- Disposal wells
- CO₂ injection
- Steam generator fuel and feed water
- Food and beverage industry
- Metering liquid fertilizer
- Water, fuel, and chemical measurement in plant settings
- Chemical tank loading and unloading
- Measuring liquid propane
- Insitu mining and leaching

Specifications

Accuracy

Halliburton meters are classified as Standard Grade and Industrial Grade, based on the accuracy of the meter. The Standard Grade meter provides a cost-effective measurement solution for applications where higher accuracy is not required. For higher accuracy, an Industrial Grade meter can be used. Such meters can achieve even greater accuracy if the range of the flow through the meter is specified.

- Standard Grade ± 1% of reading
- Industrial Grade ± 0.5% of reading
- Enhanced Accuracy (Consult Factory)

Note: ³/₈-in. Meters

- Standard Grade ± 2% of reading
- Industrial Grade ± 1% of reading

Repeatability

- Standard Grade ± 0.05%
- Industrial Grade ± 0.02%

(Based on water calibration)

Temperature Range (magnetic pickup)

- Standard -67 to 250° F (-55 to 121° C)
- Medium -67 to 450° F (-55 to 232° C)
(Requires high temperature magnetic pickup)
- High -67 to 850° F (-55 to 454° C)
(Requires special pickup and pickup adapter.
Shaft and bearings must be silver-soldered.)

Mating Output Connection AN3106A-10SL-4S Compliances

- CSA Certified Hazardous Locations Class I, Group A,B,C,D, Div. 1
- NACE MR01-75 (NACE traceability available on pressure containing components - on request)

Materials of Construction

Meter Body and Vanes Grade 316L stainless steel

Rotor CD-4MCu

Shaft and Bearings Tungsten Carbide

Optional Materials

- Shaft Binderless carbide for enhanced corrosion resistance to selected chemicals
Silver brazing to withstand temperatures to 550°F and chemicals that attack epoxy bonding bearing materials
- Rotor Duplex electroless nickel plating for enhanced corrosion resistance to selected chemicals (especially acids that corrode ferrous materials)

Benefits

- Accurate and repeatable measurement.
- An economical solution for turbine flow meter applications.
- Easy installation and a variety of end connections.
- Minimum maintenance required.
- Long service life even in severe applications.

Meter Size Selection

Flow meter size selection should be based on the instantaneous flow rate of the line into which the meter will be mounted. Meter size should not be based only on the nominal piping size of the installation. Refer to Linear Flow Range Chart for meter size selection.

The meter will remain accurate at flow rates higher than its rating, but bearing wear and pressure drop across the meter can shorten the life span of the meter. Halliburton flow meters can be over-ranged by 10% for short periods without significant damage.

Installation

- The meter should be installed with the arrow on the meter body corresponding to flow direction of the line.
- A 10-diameter length of straight pipe must be upstream and a five-diameter length of straight pipe must be downstream of the flow meter. Both pipe sections should be the same nominal pipe size as the flow meter.
- Both pipe sections should be the same nominal pipe size as the flow meter end connections.
- Throttling/Control valves should be located downstream of the flow meter.

Halliburton Turbine Flow Meter Conduit Thread Data

Temp. Rating	250°F(121°C)	450°F(232°C)	850°F(454°C)
Thread Size	1" NPT	1" NPT	1.5" NPT

End Connections

Halliburton flow meters are available in a variety of end connections.

Threaded (NPT) Connections

Threaded meter sizes range from 3/8-in. to 2-in. Meter sizes from 3/8-in. to 1-in. pipe all have 1-in. NPT end connections to simplify meter size changes. All meter sizes other than the 2-in. have male threads. The 2-in. meter is available in a 5,000-psi standard model and a 10,000-psi high-pressure model.

Grooved Connections

Flow meters with grooved end connections are available in 7/8-in. through 8-in.

Flanged Connections

Turbine flow meters with flanged end connections are available in both raised-face (RF) models and ring-type joint (RTJ) models. Flanged materials can be carbon steel or stainless steel. All flanged Halliburton meters are equipped with slip-on flanges, which are then welded to the outside of the meter rather than being welded to the end of the meter body. Thus, the flange never comes into contact with the fluid being measured.

EZ-IN™ Connections

Series BF Turbine Flow meters with EZ-IN connections provide a cost-effective alternative to typical flanged-meter applications. Series BF meters with EZ-IN connections offer the accuracy, rugged construction, and maintenance-free operation of conventional Halliburton flow meters plus the following advantages:

- Lower installation cost.
- Less expensive than a conventional, flanged meter.
- Spreader nuts enable easy removal and inspection.
- The raised-face EZ-IN meter will mate to any flange rated ANSI 150# to 1500#. The new ring-joint (RTJ) version will mate to ANSI 900#, 1500# or 2500# RTJ flange. Specify flange type when ordering.

Tri-Clover Industrial Flow Meter

Tri-clover end connections enable fast, easy removal of the meter from the line for cleaning and routine maintenance.

Applications

- Dairy industry
- Food processing
- Pharmaceutical industry

Specifications Accuracy

- $\pm 0.5\%$ of reading
- $\pm 0.25\%$ of reading (limited flow range)

Materials of Construction

Body and vanes	316L Stainless steel with electro-polished finish
Rotor	Alloy CD-4MCu with nickel-plated finish
Shaft	Tungsten carbide or 316 SS (user-specified)
Bearings	Tungsten carbide

*Vanes in 3/8-in. through 3/4-in. size are nickel-plated.

Specialized Flow Meters

- High-pressure
- Nitrogen
- CO₂
- Cement-Slurry
- Corrosive-Service
- Drilling Fluids

Contact Halliburton Product Support for application assistance.

Linear Flow Range ^(1,2,3)

Flow Meter Size ⁽³⁾	mm	GPM	m ³ /HR	BPD	Nominal ^(2,3) Calibration Factor		Maximum Output Frequency (Pulses/Sec)	ΔP at Maximum Flow ⁽³⁾	
					Pulses/Gallon	Pulses x 1000/m ³		psi	kPa
3/8	10	.3 - 3	0.068 - 0.68	10 - 100	22000	(5812)	1100	4.0	28
1/2	13	.75 - 7.5	0.17 - 1.70	25 - 250	14500	(3830)	1815	12.0	83
3/4	19	2 - 15	0.45 - 3.41	68 - 515	2950	(780)	740	18.0	124
7/8	22	3 - 30	0.68 - 6.81	100 - 1000	2350	(621)	1175	20.0	138
1	25	5 - 50	1.14 - 11.36	170 - 1700	900	(238)	750	20.0	138
1-1/2	38	15 - 180	3.41 - 40.88	515 - 6000	325	(86)	975	16.0	110
2	51	40 - 400	9.09 - 90.85	1300 - 13000	55	(14.5)	365	22.0	152
3	76	60 - 600	13.63 - 136.28	2100 - 21000	57	(15.2)	570	10.0	69
4	102	100 - 1200	22.71 - 272.55	3400 - 41000	30	(7.9)	600	10.0	69
6	152	200 - 2500	45.43 - 567.82	6800 - 86000	7	(1.8)	290	10.0	69
8	203	350 - 3500	79.49 - 794.94	12000 - 120000	3	(.8)	175	6.0	41

(1) The linear flow range of liquids with non-lubricating characteristics is limited to the upper 60% of rating.

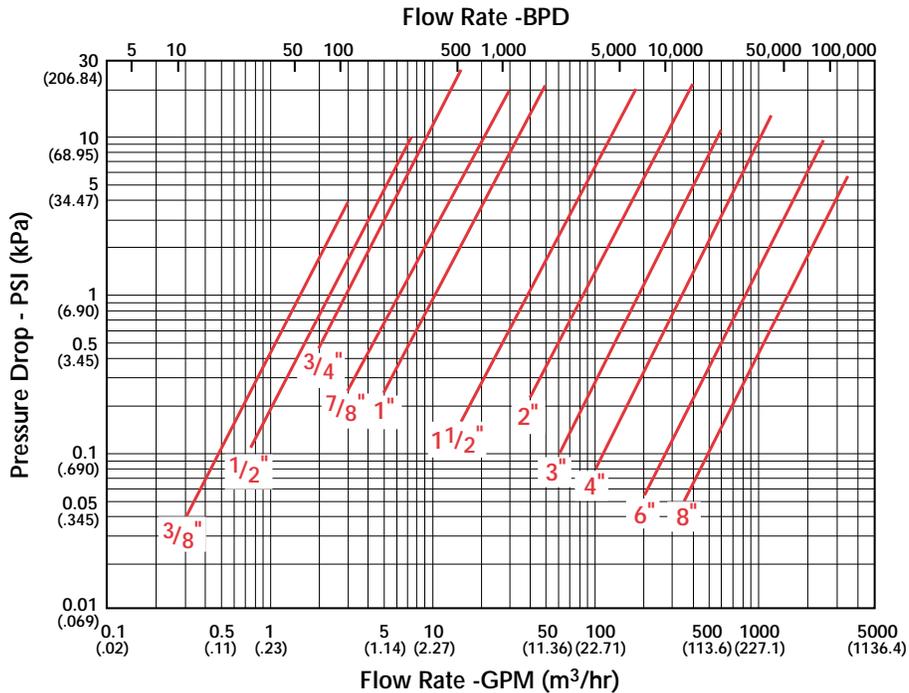
(2) Based on water.

(3) Consult factory for application involving liquids with viscosity above 5 centistokes.

Face to Face Dimensions

Flanged Meters		Threaded	Grooved	EZ-IN 1" Flg 2" Flg		EZ-IN 2" Ring Joint Flanged 1500/2500	3A Sanitary	Weco High Pressure
3/8	5.00 (127.0)	4.0 (102)	N/A	4.0 (102)	2.5 (63.5)	N/A	3.5 (88.9)	N/A
1/2	5.00 (127.0)	4.0 (102)	N/A	4.0 (102)	2.5 (63.5)	N/A	3.5 (88.9)	N/A
3/4	5.00 (127.0)	4.0 (102)	N/A	4.0 (102)	2.5 (63.5)	N/A	3.5 (88.9)	N/A
7/8	6.00 (152.4)	4.0 (102)	4.0 (102)	4.0 (102)	2.5 (63.5)	N/A	4.0 (102)	N/A
1	6.00 (152.4)	4.0 (102)	4.0 (102)	4.0 (102)	2.5 (63.5)	3.5 (88.9)	4.0 (102)	8.00 (203.3)
1-1/2	7.00 (177.8)	6.0 (152)	6.0 (152)	N/A	2.5 (63.5)	3.5 (88.9)	5.5 (139.7)	8.60 (218.4)
2	8.50 (215.9)	10.0 (254)	10.0 (254)	N/A	2.5 (63.5)	3.5 (88.9)	8.5 (215.9)	9.00 (228.6)
3	10.00 (254.0)	N/A	12.5 (318)	N/A	4.25 (108)	4.25 (108)	N/A	13.0 (330.2)
4	12.00 (304.8)	N/A	12.0 (304.8)	N/A	5.0 (127)	5.0 (127)	N/A	N/A
6	12.00 (304.8)	N/A	12.0 (304.8)	N/A	5.75 (146.1)	5.75 (146.05)	N/A	N/A
8	12.00 (304.8)	N/A	12.0 (304.8)	N/A	6.25 (158.8)	6.25 (158.75)	N/A	N/A

Pressure Drop Curve for Halliburton Turbine Flow Meters



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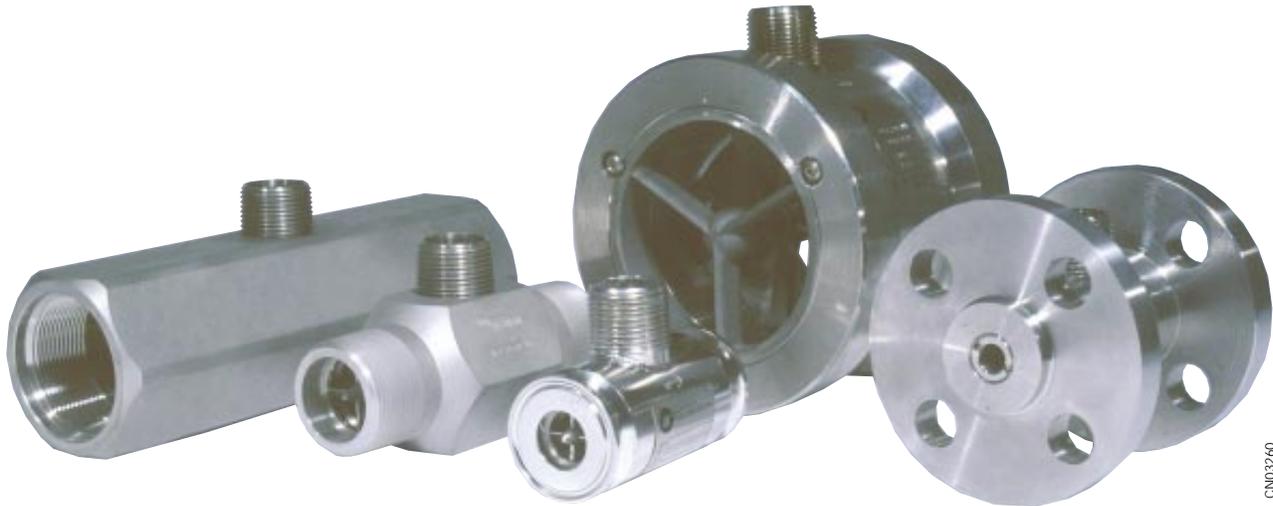
Flanged End Connection Flow meters - ANSI B16.5 Pressure Ratings

ANSI B16.5 Flange Rating	150*		300*		600*		900*		1500*		2500*	
ANSI B16.5 Flange Rating	1.1	2.2	1.1	2.2	1.1	2.2	1.1	2.2	1.1	2.2	1.1	2.2

Design-Operating Temperature Range

-20 to 100°F (-28.8 to 37.7°C)	Max Working Pressure	psi	285	275	740	720	1480	1440	2220	2160	3705	3600	6170	6000
		mPa	1.96	1.89	5.10	4.96	10.2	9.92	15.3	14.9	25.5	24.8	42.5	41.3
-20 to 200°F (-28.8 to 93.3°C)	Max Working Pressure	psi	260	240	675	620	1350	1240	2025	1860	3375	3095	5625	5160
		mPa	1.79	1.65	4.65	4.27	9.31	8.54	13.9	12.8	23.2	21.3	38.8	35.5
-20 to 400°F (-28.8 to 204.4°C)	Max Working Pressure	psi	200	195	635	515	1270	1030	1900	1540	3170	2570	5280	4280
		mPa	1.38	1.34	4.38	3.96	8.76	7.09	13.1	10.6	21.8	17.7	36.4	29.5
-20 to 600°F (-28.8 to 315.5°C)	Max Working Pressure	psi	140	140	550	450	1095	905	1640	1355	2735	2255	4560	3760
		mPa	0.96	0.96	3.79	3.10	7.55	6.23	11.3	9.33	18.8	15.5	31.4	25.9
Test Pressure	1.5 times maximum working pressure at -20 to 100°F (28.8 to 37.7°C)													

*Flange Rating 1.1 References Carbon Steel Flanges. Flange Rating 2.2 References Stainless Steel Flanges



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For the name of your local Halliburton representative, call 800-654-3760 or USA 580-251-3442.
Visit our website at <http://www.halliburton.com/flowproducts.htm>.



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