



Daniel™ 3812 Liquid Ultrasonic Flow Meter

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A RELIABLE AND ECONOMICAL SOLUTION FOR LIQUID PRODUCTS MEASUREMENT

Daniel 3812 Liquid Ultrasonic Flow Meter sets new standards for accuracy and cost efficiency in your non-custody transfer applications. Using innovative electronics and digital signal processing, you can expect high-accuracy and repeatability of liquid measurements for petrochemical, oil, water and wastewater industries. Available in nominal line sizes 4" - 36", the Daniel 3812's superior design has no moving parts, therefore eliminating wear, drift and pressure loss, and is easy to install and operate.

Daniel 3812 is an in-line ultrasonic meter that measures transit times of sound pulses traveling diagonally in two parallel planes across the pipe, downstream with the flow and upstream against the flow. Each path has two integrally mounted ultrasonic transducers. Each pair of transducers acts alternately as transmitter and receiver. The difference in transit times is proportional to the average flow velocity along the acoustic paths, and is converted into an output signal and display of volumetric flowrate.

Integrated MeterLink™ advanced diagnostics allow you to access expert flow analysis and have an intuitive view of meter health. Calibration cycles can be extended to minimize your operating and maintenance costs. Daniel 3812 Ultrasonic Meter is part of Emerson's broad range of intelligent field devices that power the PlantWeb® digital plant architecture. The 3812 communicates predictive diagnostics and process variable information via the HART protocol - this allows plant personnel to quickly detect and respond to abnormal situations, avoiding process upsets and unscheduled downtime.



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Typical Applications

This Daniel 3812 Liquid Ultrasonic Meter is for many non-custody transfer applications such as:

- Oil and Gas Industry
 - Allocation measurement
 - Effluent flow measurement
 - Loading and unloading
- Industrial Processes
 - Batch and blending processes
 - Cooling water measurement
 - Plant utilities and offtake measurement
- Pipelines
 - Leak detection
 - Crude and refined product flow measurement
- Terminal
 - Loading and offloading
 - Tank farms/ storage measurement

Features and Benefits

- No incremental pressure drop increases energy savings
- No moving parts reduce maintenance costs
- Field replaceable transducers simplify maintenance
- Measurement Stability
- Wide flow range
- Bi-directional flow capabilities
- Integrated advanced diagnostics
- Easy to install and operate reduces start-up time and lowers capital costs
- Wireless HART® support

SPECIFICATIONS

Standard performance parameters and materials of construction. Should the required performance parameters or material of construction for your application fall outside of the specifications listed below, please consult Daniel.

Meter Type

- **Number of paths:**
 - Two-path (four transducer) chordal design
- **Ultrasonic type:**
 - Transit-time based measurement
 - Spool piece with integral mount transducers

Meter Performance

- **Linearity:**
 - $\pm 0.30\%$ of measured value over a 40 to 4 ft/s (12.2 to 1.2 m/s) range
- **Repeatability:**
 - $\pm 0.10\%$ of measured value
- **Velocity range:**
 - Nominal 40 to 2 ft/s (12.2 to 0.6 m/s) with over-range of up to 48 ft/s (14.6 m/s)
- **Calibration:**
 - All meters are functionally flow tested at the Daniel Flow Facility
 -

Process Parameters

- **Process product temperature:**
 - -58°F to +302°F (-50°C to +150°C)
- **Specific gravity range:**
 - 0.30 to 1.5 units

Meter Capabilities

- **Line sizes:**
 - 4" to 36" nominal bore
- **Operating pressure range:**
 - 0 to 2,250 psig (0 to 155 Bar)
- **Flanges*:**
 - Raised face and Ring Type Joint (RTJ) for ANSI Classes 150, 300, 600, 900 (PN 20, 50, 100, 150)
- **NACE compliant:**
 - Designed for NACE compliance**
- **Humidity:**
 - Up to 95%, non-condensing

* ANSI rating to 2500 Class, consult factory.

** It is the equipment user's responsibility to select the materials suitable for the intended services.

Product Datasheet

July 2011

Materials of Construction

- **Body and flange material:**
 - ASTM A352 Gr LCC Carbon Steel
 - ASTM A351 Gr CF8M 316 Stainless Steel
 - ASTM A995 Gr 4A Duplex Stainless Steel
 - ASTM A350 Gr LF2 Carbon Steel
 - ASTM A182 Gr F316 SST
 - ASTM A182 Gr F51 Duplex SST
 - ASTM A350 Gr LF2 Carbon Steel
 - ASTM A105 Carbon Steel
- **Transducer housing material:**
 - ASTM A479 316L Stainless Steel with proprietary matching layer material
- **Transducer cover material:**
 - ASTM A240 316 Stainless Steel
- **Transducer cable gland material:**
 - Chloroprene/Nitrile Rubber
- **Electronic housing material:**
 - ASTM B26 Gr A356.0 T6 Aluminum
 - ASTM A351 Gr CF8M Stainless Steel
- **Meter body paint specification:**
 - Carbon Steel Body material:
 - 2 Coat Paint - Inorganic Zinc Primer and Acrylic Top Coat
 - Stainless Steel or Duplex Body material:
 - Unpainted
 - Electronic housing:
 - Aluminum is Powder Coated
 - Stainless Steel is not painted

Table 1A: Daniel 3812 Body and Flange Pressure Ratings - English Units*

Nominal Meter Size (in)	ANSI	Maximum Pressure Rating - psi	
		Carbon Steel	316 SS
4 to 36	150	290	275
	300	750	720
	600	1500	1440
	900	2250	2160

* Pressure rating information is for -20°F to 100°F. Other temperatures may reduce the maximum pressure rating of the materials.

Table 1B: Daniel 3812 Body and Flange Pressure Ratings - Metric Units*

Nominal Meter Size (DN)	PN	Maximum Pressure Rating - bar	
		Carbon Steel	316 SS
100 to 900	20	20.0	19.0
	50	51.7	49.6
	100	103.4	99.3
	150	155.1	148.9

* Pressure rating information is for -29°C to 38°C. Other temperatures may reduce the maximum pressure rating of the materials.

STANDARD FLOW RANGES

Table 2A: Daniel 3812 Flow Range Table - English Units											
Nominal Meter Size (in)	Meter I.D. (in)	Pipe Schedule	Fluid Velocity (ft/s)			Flow rate (BPH)			Flow Rate (GPM)		
			Min	Max	Over-Range	Min	Max	Over-Range	Min	Max	Over-Range
4	4.026	Sch 40	2	40	48	113	2,267	2,721	79	1,587	1,905
6	6.065	Sch 40	2	40	48	257	5,146	6,175	180	3,602	4,322
8	7.981	Sch 40	2	40	48	446	8,910	10,692	312	6,237	7,485
10	10.020	Sch 40	2	40	48	702	14,045	16,853	492	9,831	11,797
12	11.938	Sch 40	2	40	48	997	19,936	23,923	698	13,955	16,746
14	13.124	Sch 40	2	40	48	1,205	24,094	28,912	843	16,866	20,239
16	15.000	Sch 40	2	40	48	1,574	31,474	37,769	1,102	22,032	26,438
18	16.876	Sch 40	2	40	48	1,992	39,839	47,807	1,394	27,887	33,465
20	18.812	Sch 40	2	40	48	2,475	49,504	59,405	1,733	34,653	41,583
24	22.624	Sch 40	2	40	48	3,580	71,599	85,919	2,506	50,120	60,144
30	29.25	STD	2	40	48	5984	119,680	143,616	4189	83,776	100,531
36	35.25	STD	2	40	48	8691	173,816	208,579	6084	121,671	146,005

Table 2B: Daniel 3812 Flow Range Table - Metric Units								
Nominal Meter Size (DN)	Meter I.D. (mm)	Pipe Schedule	Fluid Velocity (m/s)			Flow Rate (m ³ /hr)		
			Min	Max	Over-Range	Min	Max	Over-Range
100	102.3	Sch 40	0.61	12.2	14.6	18	360	433
150	154.1	Sch 40	0.61	12.2	14.6	41	818	982
200	202.7	Sch 40	0.61	12.2	14.6	71	1,417	1,700
250	254.5	Sch 40	0.61	12.2	14.6	112	2,233	2,679
300	303.2	Sch 40	0.61	12.2	14.6	158	3,170	3,803
350	333.4	SCh 40	0.61	12.2	14.6	192	3,831	4,597
400	381.0	Sch 40	0.61	12.2	14.6	250	5,004	6,005
450	428.65	Sch 40	0.61	12.2	14.6	317	6,334	7,601
500	477.82	Sch 40	0.61	12.2	14.6	394	7,871	9,445
600	574.65	Sch 40	0.61	12.2	14.6	569	11,383	13,660
750	742.95	STD	0.61	12.2	14.6	951	19,028	22,833
900	895.35	STD	0.61	12.2	14.6	1,382	27,634	33,161


Product Datasheet

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Electronics Platform

- **Power:** 10.4 VDC – 36 VDC
 - 8 watts typical
 - 11 watts maximum
- **Ambient temperature range:** -40°F to +140°F
(-40°C to +60°C)
- **Storage temperature range:** -58°F to +185°F
(-50°C to +85°C)
- **Operating relative humidity:** up to 95% non-condensing
- Four conduit ports (3/4" NPT or M20)
 - Plugs provided
- Electronic housing options
 - Integral (standard)
 - Remote mount
 - required when process temperature exceeds 140°F (+60°C)
 - 15ft (4.6 m) transducer cables
- Weather proof to UL50/50E Type 4X

Safety Classifications

- UL / c-UL Class I, Division 1, Group C,D UL file – E152246
- CE Marked to Directives
 - 94/9/EC – Explosive Atmospheres (ATEX)
 - Marking –  II 2G Ex d ia IIB T4
(-40° C ≤ T_a ≤ +60° C)
 - 97/23/EC – Pressure Equipment Directive (PED)
 - 92004/108/EC – Electromagnetic Compatibility (EMC)
- IECEx
 - Marking – Ex d ia IIB T4

Electronics Functionality

- Meter body expansion correction
 - Fixed or live analog inputs for pressure and temperature
- Configuration write protection
 - Hardware security switch
 - Wire seal security available
- Archive logging
 - Hourly and daily logs
 - Audit log
 - Alarm log
- Field-upgradeable firmware
 - Via Serial or Ethernet Port

Transducer Assembly

- Transducer capsule
 - Field replaceable
 - Intrinsically safe
- Transducer housing O-ring material:
 - NBR(Nitrile Butadiene Rubber) (standard)
 - other materials available

Input/Output

- **One (1) Ethernet Port (TCP/IP)**
 - Up to 100 Mbps
 - Modbus TCP
- **One (1) RS-232 /RS-485 Serial Port**
 - 2 or 4 wire
 - 1.2 to 115 kbps baud rate
 - Modbus RTU/ASCII
- **Maximum cable length (with Beldon wire No. 9940 or equivalent)**
 - RS-232 communications: 250 ft. (88.3 m) at 9600 bps
 - RS-485 communications: 1970 ft. (600 m) at 57600 bps
- **Up to three (3) Frequency Output for volumetric flow rate**
 - Individually configurable frequency range as 0-1000 Hz or 0-5000 Hz frequency range (frequency over-range 150% of full scale)
 - Individually configurable as forward, reverse absolute, or bi-directional flow
 - Individually configurable via software for Open Collector or TTL
 - Pair capable of API level B security
 - Physical signal lines shared by digital outputs. Each line is independently configurable to function as a frequency output or digital output allowing for a combination of output types
- **Two (2) Analog Outputs for volumetric flow rates**
 - One 4-20 mA HART output
 - One 4-20 mA conventional output
 - Internally powered and magnetically isolated to 1500V
- **Two (2) Analog Inputs (16 bit) for pressure and temperature**
 - Two 4-20 mA conventional inputs
 - Magnetically isolated to 1500V
- **Up to three (3) Digital Outputs for data validity or flow direction**
 - Individually configurable via software for Open Collector or TTL
 - Physical signal lines shared by frequency outputs. Each line is independently configurable to function as a frequency output or digital output allowing for a combination of output types
- **One (1) Digital Input**
 - Requires a contact type closure

Operation / Configuration Software

- Daniel MeterLink™, Windows®-based software (required for transmitter configuration)
- Requires RS-232, RS-485 full duplex, or Ethernet
- Configurable with AMS™ Device Manager or 375 or 475 Field Communicator if HART® is used

MeterLink™ Features

- **Powerful analysis**
 - View, analyze and save waveforms
 - Daily and hourly Logs Alarms and Audit history retrieval in Excel® or CSV files
 - Daily and hourly log graphing
 - Reverse flow alert display
 - Alarms listed primary cause first
 - Separate latched alarm display
 - Trend maintenance logs
 - Compare meter configurations stored in Excel logs
 - Calibrate analog inputs
- **Quick startup**
 - Easy upgrade of meter firmware
 - Modbus and HART protocol configuration
 - Zero calibration wizard
 - Field setup wizard
 - Flow calibration wizard and Meter factor adjustment
- **Intuitive Interface**
 - Summarized and detailed views for meter performance information
 - Built in maintenance logs and inspection reports
 - Meter directory support
 - View multiple graphs simultaneously
 - Automatic file naming and organized saving, supports hundreds of meters
- **Versatile connectivity**
 - Ethernet
 - Serial Port
 - Modem

Figure 1A: Pressure Drop Chart - English Units - Meter Only

3812 USM Pressure Loss

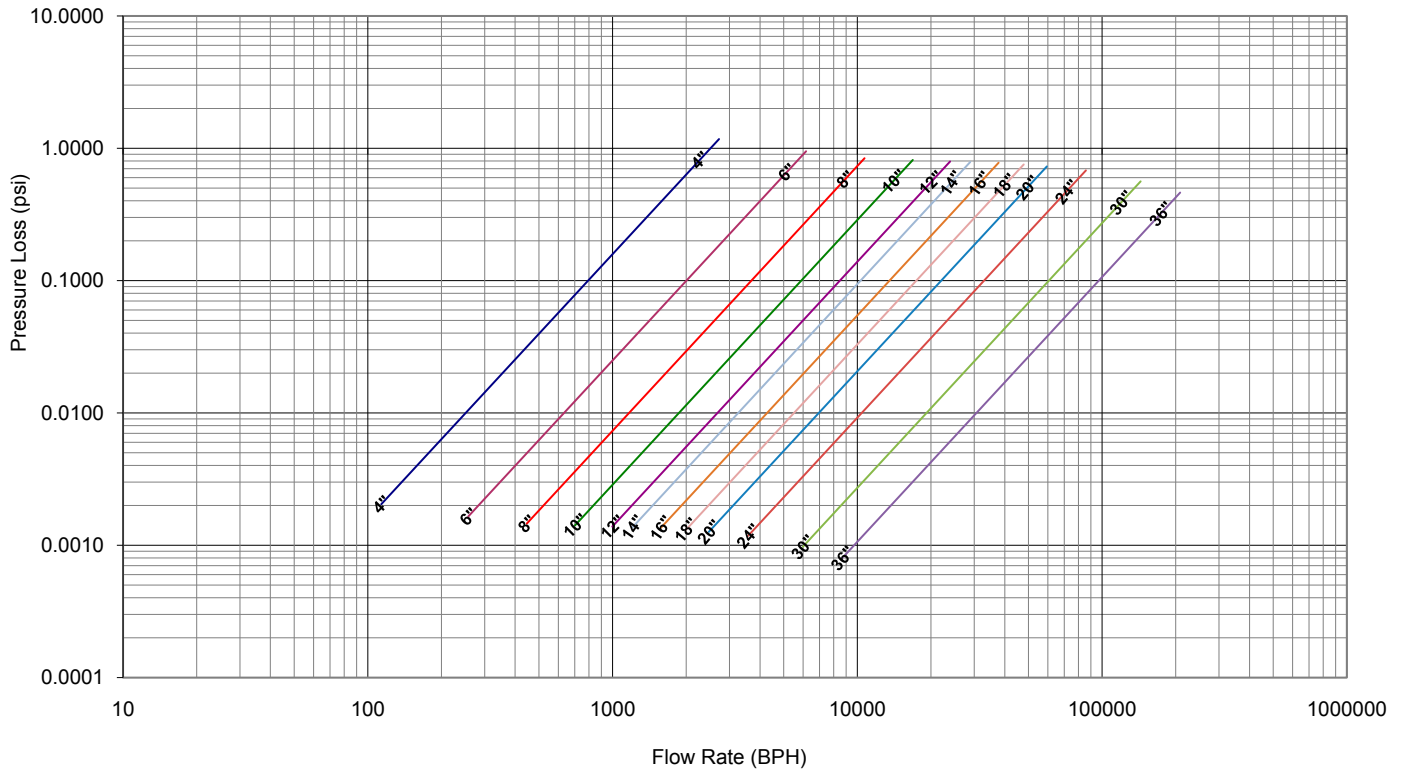
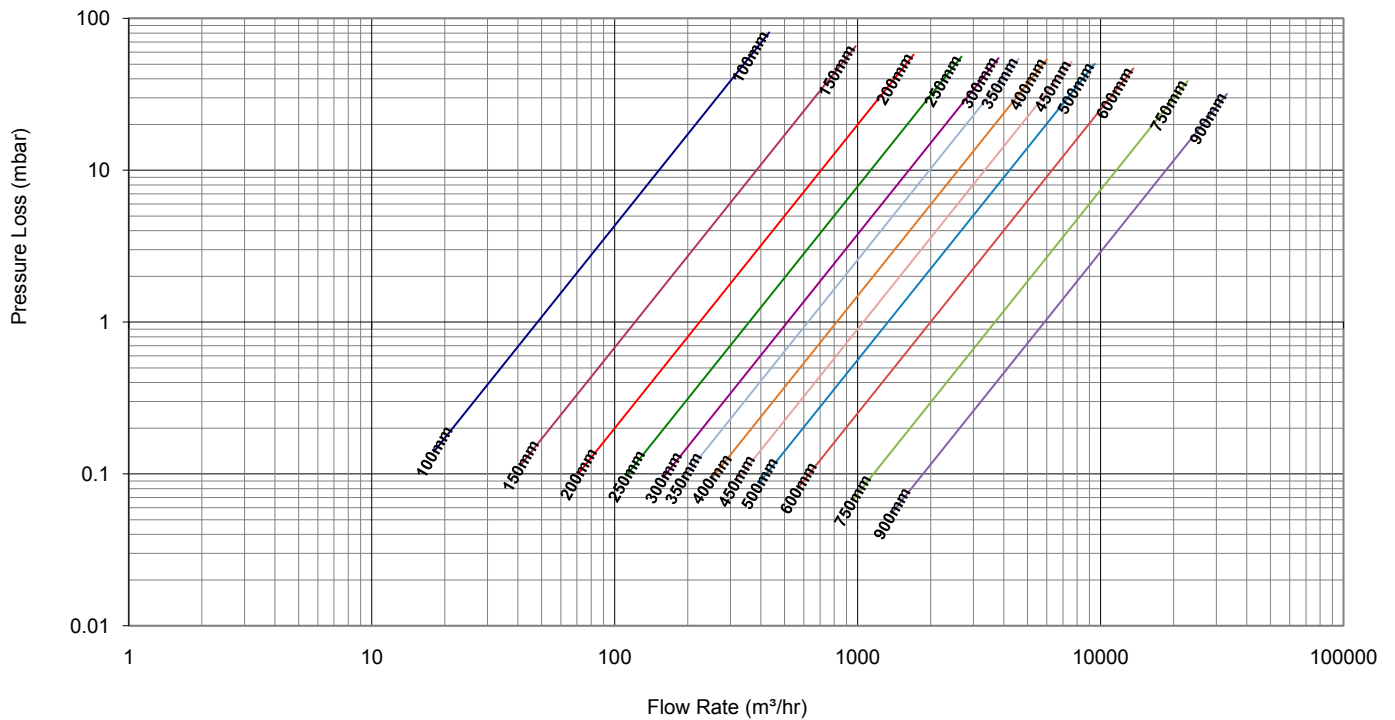


Figure 1B: Pressure Drop Chart - Metric Units - Meter Only

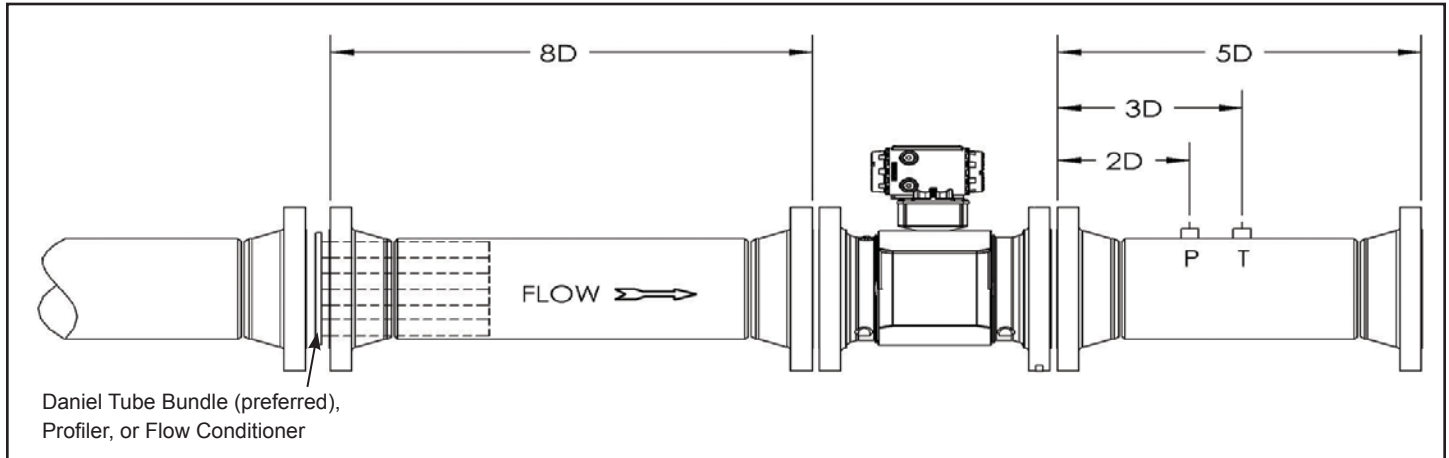
3812 USM Pressure Loss



RECOMMENDED INSTALLATION

The drawings below represent minimum recommended pipe lengths for the installation of the Daniel 3812 Liquid Ultrasonic Flow Meter. If shorter lengths are used, there may be an increase in flow measurement uncertainty. Please consult Daniel for installation recommendations of your application.

Figure 2: Daniel Piping Recommendation for Liquid Ultrasonic Meter with a Flow Conditioner



Notes:

1. For best results flow conditioning is recommended
2. All pipe lengths are minimum.
3. D = Nominal pipe size in inches (i.e. 6" pipe size; 10 D = 60 in)
4. P = Pressure measurement location
5. T = Temperature measurement location

**Emerson Process Management
Daniel Measurement and Control, Inc.**
www.daniel.com

**North America / Latin America:
Headquarters
USA - Houston, Texas**
T +1.713.467.6000
F +1.713.827.3880
USA Toll Free 1.888.FLOW.001

Europe: Stirling, Scotland, UK
T +44.1786.433400
F +44.1786.433401

Middle East, Africa: Dubai, UAE
T +971.4.811.8100
F +971.4.886.5465

Asia Pacific: Singapore
T +65.6777.8211
F +65.6777.0947

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