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# РАСХОДОМЕРЫ УЛЬТРАЗВУКОВЫЕ ALTOSONIC V LNG





## ALTOSONIC V LNG

### 5-Beam ultrasonic flow meter for custody transfer of LNG

- The successor to shore tank and ship tank inventory measurement.
- Provides guaranteed 0.3% OIML-approved accuracy for true custody transfer independent of external influences such as tank geometry, strapping tables, or ambient conditions.
- Automatic LNG flow detection for accurate flow measurement of bill-able product
- Cryogenic design for highest available accuracy



## It's time to consider a good and reliable custody transfer metering system for LNG ...

Now you can rely on an LNG metering system from the inventor of multi-beam custody transfer metering that offers the highest and consistently available accuracy that is independent of unknown and uncorrected variables such as tank geometry and ambient temperatures.

- **Accurate**

Reduces give-away through accurate and correct measurement  
(10 times more accurate than existing tank inventory systems)

- **Universal multi-product**

Multi-beam means you can use one off-loading meter to discharge various ships with varying product of different calorific values from various origins. When used at loading origin and off-loading destination it can reliably measure boil off and loss in transit.

- **Reliable**

Multi-beams not only provide product differentiation, they also provide multiple built-in redundancy ensuring no drop in metering availability.

- **Cost-conscious**

The straight tube internal design causes no pressure drop and therefore lowest discharging costs. Auto detection of LNG as opposed to boil off, with automatic start of measurement for true discharge quantities.

- **Safe**

No chance of flash gasification in meter causing increased gas in receiving tanks.

No other system available provides as many advantages as  
ALTOSONIC V LNG

## The design ensures better accuracy

### ALTOSONIC V LNG

- Custody-transfer ultrasonic flow meter
- The internal design makes the difference

Regular ultrasonic liquid flow meters can measure LNG. But our customers wanted more accuracy, more reliability, more trustability. Features they are accustomed

- Full bore measuring tube to avoid gasification or density changes
- Specially isolated transducers to prevent crosstalk and maximise signal strength
- Special transducer windows to maximize contact with product and reception of transmitted beam, again for better signal quality
- Experience-based algorithms for perfect determination of flow from signals and therefore maximum accuracy
- Redundant beams ensure permanent availability throughout the tanker discharge

### Award-winning technology

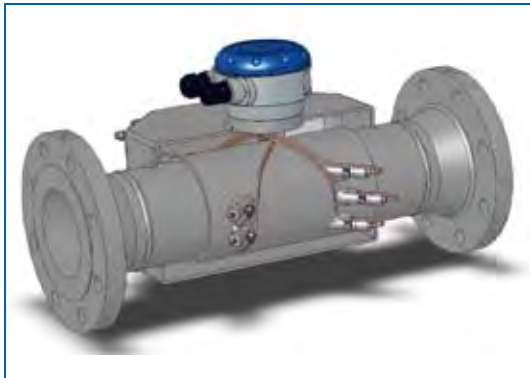
At the 2009 Expogaz exhibition in Lyon, France, ALTOSONIC V LNG was awarded the First Prize in the category of technological advancement. The judges found that the unique transducer construction with its anti-crosstalk feature went further than ever before to ensuring the best possible measurement under cryogenic conditions.





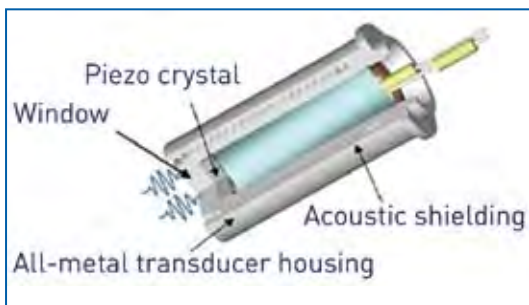


## Design features for better accuracy and reliability.



### Straight body - full-bore metering tube

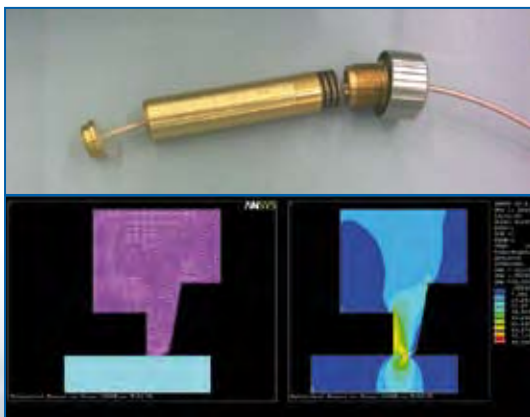
Tankers are discharged as quickly as possible, since time is money. The full-bore design of the ALTOSONIC V LNG ensures absolutely no change in flow conditions from the pipeline through the meter and beyond. There is no pressure loss nor flow rate deviations. The result is consistently accurate metering, without any risk of in-line gasification.



### Anti-crosstalk transducers - higher accuracy

Under severe cryogenic conditions a normal transducer would leak the signal around the meter body to the opposite transducer. This would result in a much higher noise, and make measurement less sensitive.

ALTOSONIC V LNG overcomes this by a unique acoustic shielding that prevents acoustic leakage outside the transducer.



### Ultracontact window - maximum signal

Contact between the LNG and the piezo-generated signal would fall at cryogenic temperatures if you use a normal transducer- The ALTOSONIC V LNG transducers have specially researched laminar window materials whose Young's modulus and conductivity properties are optimized for LNG at  $-163^{\circ}\text{C}$ . There is no signal deterioration, no drop-outs, and no noise.

**The better the signal, the better the measurement.**







## ALTOSONIC V LNG

### From liquefaction to de-gasification

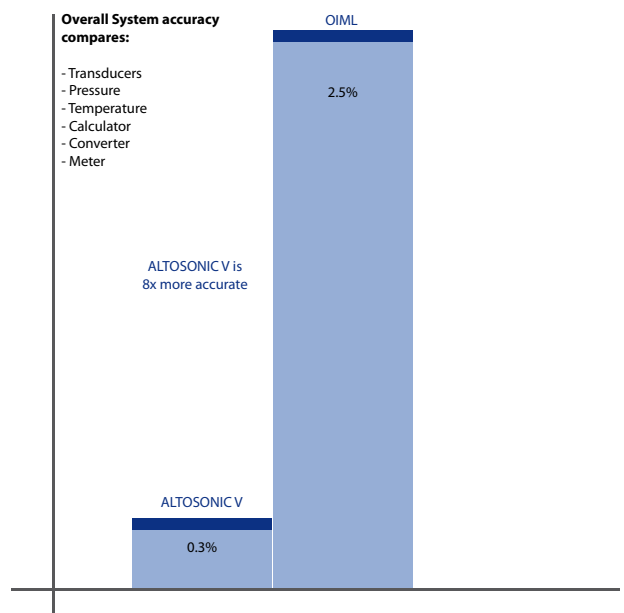
ALTOSONIC V LNG ultrasonic custody-transfer flow meter can be used along the entire chain:

- Liquefaction plant
- LNG Tanker loading
- LNG Tanker off-loading
- De-gasification
- Also as part of a Leak Detection and localisation system

Values obtained at one site are comparable 1:1 with values obtained with any ALTOSONIC V LNG anywhere in the world.

Thus you can obtain an accurate measurement of plant output, accurate boil-off figures, accurate off-loading to intermediate storage and accurate feed to the de-gasification plant - therefore maximum plant efficiency.

There is no variables such as tank geometry, strapping tables, environmental or geographic issues.



# ALTOSONIC V LNG

## Performance that pays off

Numerous authorities have attested the excellent accuracy of ALTOSONIC V LNG. It is more accurate than all currently available standards and a factor of min. 8 times more accurate than standard inventory procedures.

The pay-off is less give-away, more accurate billing, standardised measurement throughout the world from the liquefaction plant to de-gasification.

Years of experience confirm the quality of the ALTOSONIC V and the consistent accuracy that remains stable for decades. (Vigdis field unmanned metering station in the North Sea, data between 1998 and 2009)

ALTOSONIC V LNG Accuracy	
Certificate number	TC7485
MID directive	2004/22/EC
Diameter range	up to 24 inch (higher on request)
Flow range	1:50
Minimum velocity	0.2 m/s
Viscosity range	0.1 to 400 cSt
Minimum temperature	-200 °C
Accuracy	+/- 0.2 % during initial calibration

### Tank inventory versus custody-transfer flow measurement

A typical tanker has a capacity of 125,000 m<sup>3</sup>.

A typical voyage tanker lasts 20 days.

A tanker can do around 10 round-trips per year including the time for waiting and discharge.

Each tanker transports 1.25 million m<sup>3</sup> per year.

### Flow accuracy is 8 times more accurate than inventory accuracy.

Tank inventory 2.5%

ALTOSONIC V LNG 0.3%

**The difference is 27,500 m<sup>3</sup> per tanker per year  
US \$ 3 million at current spot prices!**





## Technical data

Approvals	
Custody transfer	
MID approval	Measuring Instrument Directive, MID 005, 2004/22/EC
OIML	R-117-1 Class 0.3
API	Chapter 5.8 Section 8
National approvals	Over 20 national approvals world wide i.e. ONML (Algeria), BEV (Austria), ANP (Brazil), INMETRO (Brazil), LNE (France), JJG 1030 (China), PTB (Germany), Legal Metrology Dept. (India), Migas (Indonesia), UTIF (Italy), SIRIM (Malaysia), CENAM (Mexico), Justervesne (Norway), DTI (United Kingdom), NMi (Netherlands), DPR (Nigeria), NOC (Libya):
GOST	Gosstandart approval for Russia
ATEX	
UFS-V	PTB 01 ATEX 2012 X (part of the UFS 500 approval) II 2 G EEx ib IIC T6 ...T4
UFC-V	KEMA 02 ATEX 2168 II 2 G EEx [ib] IIB T5

Performance	
Measurement parameters	Actual volume flow rate and totalised volume
Maximum measuring range	-10 m/s < velocity < +10 m/s (-66 ft/s < velocity < +66 ft/s)
Minimum measuring range	0.2 m/s
Diameter range	4 ... 40 inch
Viscosity range	0.1 ... 400 cSt (higher viscosities on request)
Density range	200 ... 1200 kg/m <sup>3</sup>
Zero stability	< 0.2 mm/s
Accuracy	< 0.2 % of measured value for 1 m/s to 10 m/s
Repeatability	OIML ± 0.06 %
Uncertainty	± 0.027 % [95 % confidence level]

Installation requirements	
General	Process conditions are always required and must be forwarded and discussed with specialists.
Position	The flow meter can be installed in a horizontal or vertical position. In a horizontal pipeline the transducers need to be installed in a horizontal plane.
Completely filled sensor	The UFS-V sensor needs to be installed at a location in which a completely filled pipeline is guaranteed.
Flow conditioning	Inlet: Minimum standard requirements are 10D straight inlet pipe section with integrated ISO pipe bundle or if no presence of swirl 20D inlet is sufficient. Outlet: On the outlet a minimum of 3D straight pipe section is required
Bush guides	The UFS-V sensor and inlet pipe section are provided with "bush guides" to guarantee optimum installation on site.
Zero checking	Zero setting is NOT required ultrasonic flow meters.
Cavitation	Sufficient back pressure is required to avoid cavitation.
Water in oil (well mixed)	6 % @ > 1 m/s
Maximum air/gas content	Standard < 2% (Vol.) , for higher content < 15% consult
Maximum solid content	Standard < 5% (Vol.) , for higher content consult
Humidity	Maximum 95 % humidity for all components

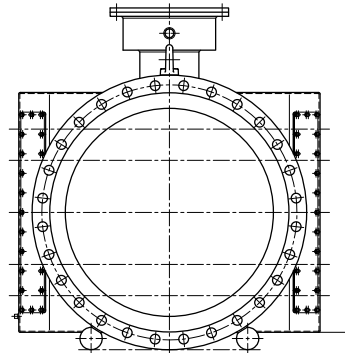
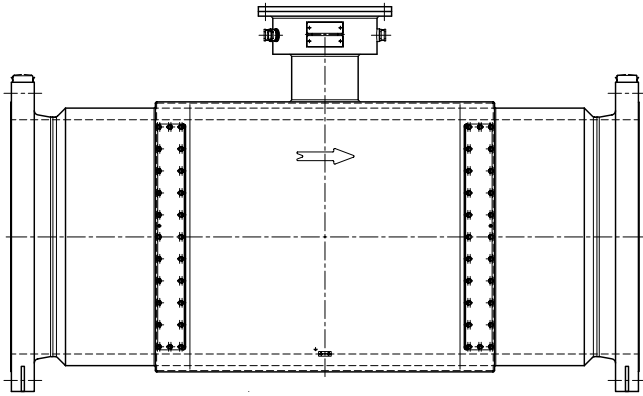
Materials	
UFS	
Flanges	Stainless steel AISI 316 L (1.4404)
Measuring tube	Stainless steel AISI 316 L (1.4404)
Housing	Stainless steel AISI 316 L (1.4404)
Connection box	Stainless steel AISI 316 L (1.4404)
UFC	
Ex-d housing	Copper free aluminium, AISI 12 according to ISO 3522 – 81 (other materials on request)
Inlet & Outlet section	
Flanges/pipe	Carbon steel ASTM A105 / Carbon steel ASTM A106 (other materials on request)
Flow conditioner	Stainless steel
Finish UFS, UFC and in/outlet sections	
Standard	silver
Optional	ffshore paint
Protection category	
UFP	IP 67 equal to NEMA 4/4X/6 to IEC 529
UFC	IP 67 equal to NEMA 4/4X/6 to IEC 529
Sizes	
UFS-V sizes	up to 40"
Pressure class	
Standard	150 lbs, 300 lbs, 600 lbs (higher pressure ratings on request)
Sensor cable	
Connection	M20 x 1,5 or ½" NPT or PF ½
Length (UFS to UFC)	5, 10, 15, 20, 25 or 30 metres

Certified temperature ranges				
	°C		°F	
	minimum	maximum	minimum	maximum
Process				
Standard	-40	150	-40	302
Extended	-200	250	-328	482
Ambient				
UFS-V	-40	60	-40	140
UFC-V ATEX	-40	60	-40	140
UFC-V OIML	-40	70	-40	158
UFC-V FM	-20	60	-40	140
UFC-V LT	-55	60	-67	140
UFP-V	5	40	41	104

Flow ranges	0.2 m/s 0.7 ft/s m <sup>3</sup> /hr	10 m/s 33 ft/s m <sup>3</sup> /hr	0.2 m/s 0.7 ft/s GPM	10 m/s 33 ft/s GPM	0.2 m/s 0.7 ft/s BBL/hr	10 m/s 33 ft/s BBL/hr
Size (inch)						
4	5.6	280	25	1230	35	1760
6	12.6	630	55	2770	80	3960
8	22.6	1130	100	4980	140	7120
10	36	1800	160	7900	225	11300
12	50	2500	220	11000	315	15700
14	70	3500	310	15400	440	22000
16	90	4500	400	19800	565	28280
18	114	5700	500	25100	715	35850
20	140	7000	616	30800	880	44000
24	200	10000	880	44000	1255	62850







Dimensions [metric]								
ASME	ALTOSONIC V Sensor (UFS)					Spool piece		
150 lbs						10 D inlet	5 D outlet	7 D outlet
Size (inch)	Length (inch)	ID (inch)	Height (inch)	Width (inch)	Weight (lbs)	Weight (lbs)	Weight (lbs)	Weight (lbs)
16	1300	388	623	650	600	574	292	367
18	1400	438	668	700	860	759	357	451
20	1500	483	729	750	960	1123	438	555
24	1800	575	813	813	1050	1335	623	792
300 lbs								
Size (inch)	Length (inch)	ID (inch)	Height (inch)	Width (inch)	Weight (lbs)	Weight (lbs)	Weight (lbs)	Weight (lbs)
16	1300	381	648	650	690	668	385	460
18	1400	435	711	700	900	883	481	575
20	1500	483	775	750	1120	1275	589	707
24	1800	575	914	750	1300	1612	901	1070

Dimensions [imperial]								
ASME	ALTOSONIC V Sensor (UFS)					Spool piece		
150 lbs						10 D inlet	5 D outlet	7 D outlet
Size (inch)	Length (inch)	ID (inch)	Height (inch)	Width (inch)	Weight (lbs)	Weight (lbs)	Weight (lbs)	Weight (lbs)
16	512	153	245	256	1320	1263	642	807
18	551	172	263	276	1892	1670	785	992
20	591	190	287	295	2112	2471	964	1221
24	709	226	320	320	2310	2937	1371	1742
300 lbs								
Size (inch)	Length (inch)	ID (inch)	Height (inch)	Width (inch)	Weight (lbs)	Weight (lbs)	Weight (lbs)	Weight (lbs)
16	512	150	255	256	1518	1470	847	1012
18	551	171	280	276	1980	1943	1058	1265
20	591	190	305	295	2464	2805	1296	1555
24	709	226	360	295	2860	3546	1982	2354

Other sizes on request

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