Countum Group

SATAM

Metering Solutions

Flowmeters

The Satam flowmeter range is used for the custody transfer measurement of liquid hydrocarbons, liquid gas and liquid chemicals.

Consisting of four distinct families, the range is able to meet the needs of most industrial metering applications.

Areas of activity

- Oil depots
- Metering for road tankers
- Aviation
- Transport via pipeline
- FPSO

Content

- Positive Displacement meter
- Coriolis mass flowmeter
- Turbine flowmeter
- Ultrasonic flowmeter

Positive Displacement meter

ZC17

The SATAM Positive Displacement meter (PD meter) is a system with freely-moving blades used to measure "white" petroleum products such as fuels, bio-fuels and refined liquid hydrocarbons.
Its simple design using only two pairs of blades and one moving rotor makes it exceptionally robust and allows the user to make significant savings on maintenance costs.

Sectors of application

- **Oil depots**
  For product reception and loading stations for trucks, wagons and ships
- **Hydrocarbon transportation**
  Distribution of fuel oil or fuel by road tanker
- **Aircraft refuelling**
  Aircraft dispensers and aircraft fuelling tankers
- **Army**
  Depot supplies and loading of trucks
- **Transport companies**
  Refuelling of locomotives, trucks and public transport coaches
- **Marine applications**
  Refuelling of ships
- **Mining sites**
  Refuelling of trucks or site machinery

Key points

> **Reduced pressure loss**
0,3 to 0.5 bar at maximum flow rate

> **Low maintenance costs**
Simple and robust design with mechanical components interchangeable between the different models

> **Stability of measurements**
Accuracy of measurement guaranteed over a period of many years without any drift in the calibration curve

> **Modular design**
Wide range of accessories for performing customized measurement applications

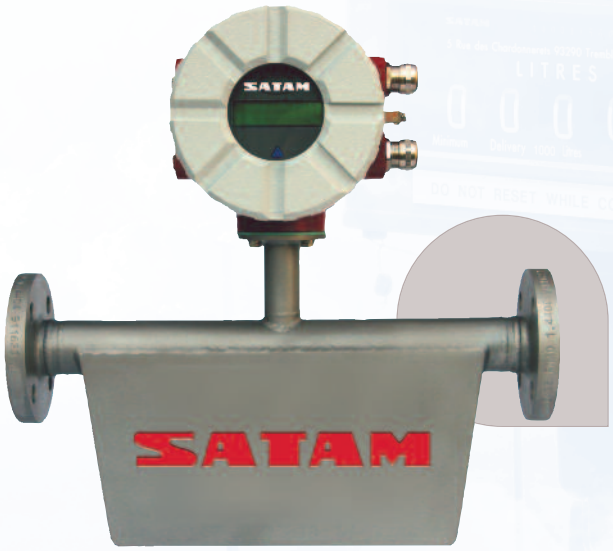
> **Robust construction**
Flowmeter manifold separated from measurement chamber to eliminate any possible influence of external mechanical stresses on measurement.
Few moving parts

Positive Displacement meter

Model		ZC17 12	ZC17 24	ZC17 48	ZC17 80	ZC17 150	ZC17 250	ZC17 330
Max. Flowrate	(m3/h /LPM/USGPM)	12/200/53	24/400/105	48/800/210	80/1333/360	150/2500/660	250/4166/1100	330/5500/1453
Min. Flowrate	(m3/h /LPM/USGPM)	1.2/20/5.3	2.4/40/10.5	4.8/80/21	8/133/36	15/250/66	25/416/110	33/550/145
Application		Multi-product metering						
Connections	Flanges ASA150	2"	2"	2"	3"	4"	6"	8"
	Flanges TW				TW1	TW3		
Materials	Manifold	Aluminium			Steel or Aluminum		Steel	
	Casing	Aluminium	Ductile iron or Ni resist iron					
	Front and back flanges	Nickel steel						
	Rotor	Aluminium						
	Blades	Graphite						
	Gaskets	Viton (option nitrile)						
Operating conditions	Pressure	0 to 10 bar / 0 to 150 PSI						
	Viscosity	Max. : 800 mPa.s						
	Liquid temperature	-10°C (14°F) to +80°C (176°F) Contact us for higher or lower temperatures						
	Ambient temperature	-20°C (-4°F) to +55°C (131°F) Contact us for higher or lower temperatures						
	Pressure drop	Max 0,5 bar						
Internal construction	Cyclic volume (litres/USG)	0,33/0.08	0,40/0.10	0,80/0.21	2,27/0.6	4,54/1.2	6,82/1.8	9.09/2.4
Metrological performance	Accuracy	< 0,15% / Option < 0,1% / For 10 : 1 measuring range						
	Mass repeatability	< 0,02%						
Installation	Straight inlet and outlet sections	Not necessary						
Custody transfer approval		EC Evaluation Certificate N° LNE-11052						-

Dimensions (mm) and weight

Model		ZC17 12	ZC17 24	ZC17 48	ZC17 80	ZC17 150	ZC17 250	ZC17 330
Distance between flanges		180	180	180	356	432	400	400
Width		290	290	290	356	432	400	400
Depth	with mechan.register with pulser	220 186	220 186	246 266	365 272	492 399	620 526	746 653
Height	with mechan.register with pulser	368 260	406 260	406 260	502 502	521 521	568 568	625 625
Weight (kg)		18	22	26	75	95	155	200
Flanges positions	(flanges ASA150)	PH1, PH2	PH1, PH2	PH1, PH2, PV1, PV2, PV3, PV4				PH1, PH2
	(flanges TW)	-	-	-	2"PV5 to PV10	PV5, PV6	-	-



Coriolis mass flow meter

MFMU

The Satam mass flowmeter is used to measure the mass and density of viscous products such as heavy fuel oil, engine oil, bitumen or crude oil. Its excellent pressure resistance qualities combined with its rugged design without any moving mechanical parts means it is capable of providing reliable and accurate measurements for liquid gases such as LPG.

Sectors of application

- **Oil depots**
  For product reception and at loading stations for trucks, wagons and ships
- **Oil production**
  Metering for transfers of products via pipeline
- **Marine applications**
  Loading and unloading of tankers
- **Refineries**
  Internal metering and control of manufacturing processes
- **Fuel storage**
  Metering of heavy fuel oil at mixer intake

Key points

> **Direct measurement of mass**
Direct measurement without any correction for temperature or viscosity

> **Reliability of measurements**
Insensitivity to vibrations and to piping forces due to its robust and stable measuring system

> **Flexibility of installation**
Patented construction allowing the system to be supported by its own housing or on the inlet and outlet pipes

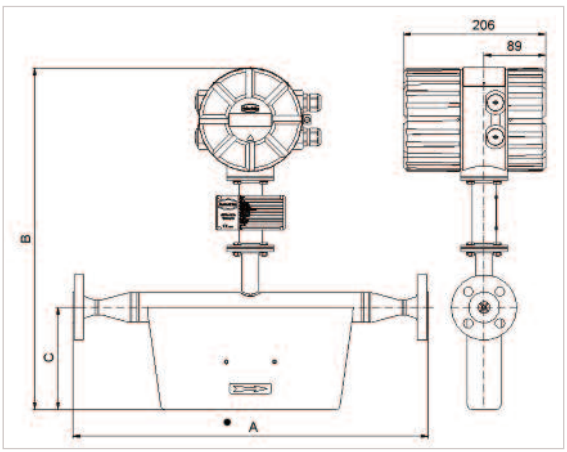
> **Low maintenance costs**
Simple and robust design without any moving mechanical parts

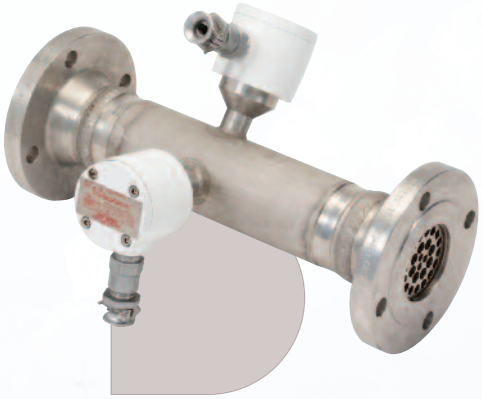
> **Direct measurement of density**
Identification of liquid being measured and detection of any change of product

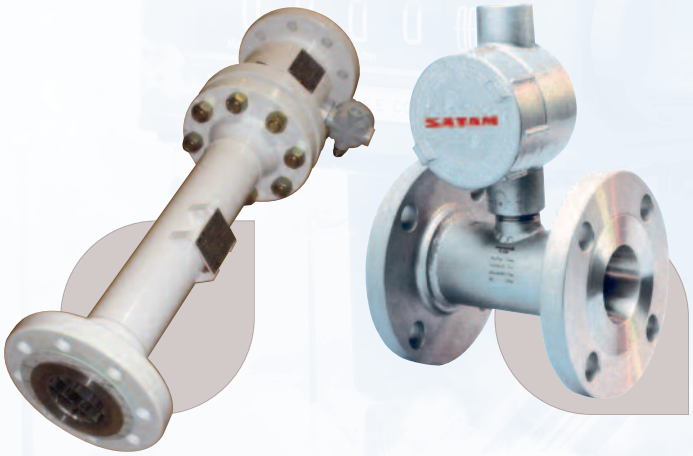
Coriolis mass flow meter

Model		015	025	040	050	080	100	150	200	250	300
Maximum flow rate @ 1bar, 1cP, 1kg/dm³	(t/h)	5. 25	20	55	74	118	200	460	700	1350	1900
	(kg/mn)	88	333	917	1233	1967	3333	7667	11667	22500	31667
Minimum flow rate	(t/h)	0.26	1	2.75	3.7	5.9	10	23	35	67.5	95
	(kg/mn)	4.5	16.5	46	68.3	98.3	166	383	583	1125	1583
Applications		Single and multi-product metering - Measurement of density									
Connection - Flanges	Pressure class	150 lbs RF (standard), 300 lbs, 600 lbs, 900 lbs RF & RTJ (optional)									
	Diameter (inches)	1	2	3	3	3	4	6	6	8	10
Materials	Measurement tube	316 L stainless steel									
	Secondary containment and flanges	304 & ST37.2 stainless steel									
Operating conditions	Pressure	0 to 63 bar									
	Viscosity	Unrestricted									
	Density	20 to 2000 kg/m³									
	Liquid temperature	-40 to + 150°C (compact version) -40 to +260°C (remote version)									
	Ambient temperature	-40 to + 60°C									
	Pressure drop	1 bar (at maximum flowrate, 1mPa.s, 1 kg/dm³)									
Internal construction	Measurement tube	Dual tube									
	Measurement converter	Compact or remote installation									
Metrological performances	Mass accuracy	<±0.1% + zero stability (liquids and liquefied gases) <±0.5% + zero stability (gases)									
	Mass repeatability	<±0.025% + zero stability									
	Density accuracy	<±0.005 g/cm3 / <±0.002 g/cm³ after field calibration									
	Temperature accuracy	<±0.5°C									
	Zero stability (kg/h)	1.2	3	6	8	12	20	46	70	150	220
Installation	Straight inlet and outlet sections	Not necessary									
	Protection class	IP 67, equivalent to NEMA 6									
	Ex approval	II (1) 2G EEx d e [ia] IIC/IIB T6-T3 or II (1) 2G EEx d [ia] IIC/IIB T6-T3									

Model		015	025	040	050	080	100	150	200	250	300
Dimensions (mm)	A	515	632	770	1024	1196	1358	1732	2198	2284	2925
	B	497	562	630	1112	1312	1332	1662	1822	1962	1967
	C	148	200	255	615	800	815	1070	1210	1300	1400
Weight (kg)		7	15	29	140	200	250	470	750	850	900







Turbine flowmeter

LM
TM

The Satam turbine flowmeter is primarily used for high-capacity metering. Its 400 mm measurement tube can accurately measure at flowrates of over 4000 m^3/h. Its excellent pressure and temperature resistance qualities means it is capable of providing reliable and accurate measurements for liquid gases such as LPG, as well as for cryogenic liquids.

The LM and TM models come fitted with a two-bladed helical rotor. This construction ensures low sensitivity to variations in viscosity.

Sectors of application

- **Marine applications**
  Loading and unloading of tankers
- **Oil production**
  Metering for transfers of crude oil and condensate via pipeline
- **Oil depots**
  For product reception and at loading stations for wagons and ships
- **Refineries**
  Internal metering and control of manufacturing processes

Key points

> **Low maintenance costs**
Simple and robust design with interchangeable mechanical components

> **Stability of measurements**
Not sensitive to variations in pressure.
Integrated flow straightener

> **Wide range of uses**
Available for liquids
from 5 to 4000 m3/h

Turbine flowmeter

Model		LM	TM
Flow rate		3 to 300 m³/h	15 to 4000 m3/h
		13 to 1320 USGPM	66 to 17 600 USGPM
Application		Single and multi-product	Single and multi-product
Connection - Flanges	Pressure class	ANSI 150 ANSI 300	ANSI 150 to ANSI600
	Diameter	2" to 4"	3'' to 16''
Materials	Measurement tube & flanges	Carbon steel A106 (flanges) et A105 (measurement tube) / Stainless steel 316L	
	Bearings	Graphite, tungsten carbid	Tungsten carbide
	Turbine rotor	Aluminium / Titanium (optional)	Light alloy (standard) / Stainless steel (option) / Titanium (option)
Operating conditions	Pressure	0 to 40 bar	0 to 63 bar
	Viscosity	0,1 to 15 mPa.s	0,1 to 120 mPa.s
	Liquid temperature without preamplifier	-40 to +180°C	-40 to +80°C
	Liquid temperature with preamplifier	-20 to 80°C	-40 to +80°C
	Pressure drop (1 mPa.s, Qmax)	< 1 bar	< 0.2 bar
Internal construction	Turbine rotor	Helical twin-blade	Helical twin-blade
	Pulser	2	1, 2 (standard) or 3
	Preamplifier	Optional	Included
	Measurement chamber	Removable	Removable
Metrological performance	Volume accuracy	< ± 0.15%	
	Repeatability	< ± 0.02%	
Installation	Straight sections	Inlet 0 DN / Outlet 0 DN	Inlet 10 DN / Outlet 5 DN
	Protection class	IP65	IP66
	EX approval	EEx ia IIC T6 and EEx d ia II C T6	ATEX II 2G, Ex d IIC T6

Measuring range

Nominal diameter	LM model				TM model			
	Min. flowrate		Max. flowrate		Min. flowrate		Max. flowrate	
	m³/h	USGPM	m³/h	USGPM	m³/h	USGPM	m³/h	USGPM
2"	3	13,2	30	132	-	-	-	-
3"	5	22	50	220	15	66	150	660
4"	30	132	300	1320	30	132	300	1320
6"	-		-		60	264	600	2641
8"	-		-		120	528	1200	5283
10"	-		-		200	880	2000	8805
12"	-		-		300	1320	3000	13208
14"	-		-					
16"	-		-		400	1761	4000	17611

Ultrasonic flowmeter

UFM III

The Satam ultrasonic flowmeter is used for measuring refined petroleum liquids. It is capable of measuring high-pressure fluids such as LPG or any other liquid gas. Its measurement tube without any intrusive elements or moving mechanical parts results in very little pressure drop and nearly no maintenance costs at all. Because of the measurement method used, ultrasonic flowmeters are available in diameters of up to 40 inches and provide exceptional accuracy of measurement.

Sectors of application

- **Transport of petroleum products via pipeline**
  Metering stations, leak detection
- **Oil depots**
  For product reception
  and at loading stations for wagons and ships
- **Marine applications**
  Loading and unloading of tankers
- **Chemical industry**
  Metering stations for non-corrosive liquids

Key points

> **Minimum pressure drop**
Measurement tube of same diameter as the flanges
No intrusive element

> **Low maintenance costs**
Totally static measurement system
No need for filtering

> **Exceptional reliable measurements**
Three-channel redundant configuration
for measurement validation

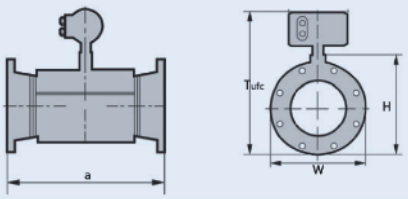
> **Easy installation**
Bi-directional measurement
Reduced weight in a compact design

Ultrasonic flowmeter

Model		UFM III
Flow rate		7 to 29 200 m³/h / 30 to 128 550 USGPM
Application		Single-product metering
Connection - Flanges	Pressure class	150lbs RF (standard), 300lbs, 600lbs, 900lbs RF & RTJ (optional)
	Diameter	2'' to 40''
Material	Flanges, measurement tube, housing	316L stainless steel (other materials available on request)
Operating conditions		
	Operating pressure	0 to 63 bar
	Liquid temperature	+25 to +140°C
	Ambient temperature	-40 to +70°C
	Viscosity	0,1 to 10 mPa.s
	Pressure loss (1 cSt, Qmax)	< 0.1 bar
Internal construction	Ultrasound transmitters	Windows incorporated into wall of measurement tube
	Measurement lines	3 parallel channels
Metrological performance	Measured parameter	Actual volume
	Volume accuracy	< ± 0.15%
	Repeatability	< ± 0.02%
Installation	Straight sections	Inlet 10 DN / Outlet 5 DN
	Protection class	IP 66, equivalent to NEMA 4/4X/6 to IEC 529
	EX approval	EEx d [ib] II C T6 and EEx d e [ib] II C T6

Measuring range

Nominal diameter	Measuring range		Weight and dimensions				
	Min. flowrate	Max. flowrate	a	Di	W	T	Weight
	(m³/h)	(m³/h)	(mm)	(mm)	(mm)	(mm)	(kg)
2"	7	73	290	49,2	150	345	14
3"	16	164	330	73	200	380	26
4"	29	292	380	97,2	220	412	33
6"	66	657	440	154,1	270	466	45
8"	117	1167	600	202,7	370	523	72
10"	182	1824	640	254,4	420	582	105
12"	263	2627	710	304,7	470	645	145
14"	358	3575	770	336,5	500	687	179
16"	467	4670	830	387,3	550	744	221
18"	591	5910	900	438,1	600	788	256
20"	730	7297	950	484	650	845	335
24"	1051	10507					
28"	1430	14301					
32"	1868	18679					
36"	2364	23641					
40"	2919	29196					



Satam meters for oil transport chain

Oil transport chain

		PD meter	Mass flowmeter	Turbine flowmeter	Ultrasonic flowmeter
	Metering station for crude oil on pipeline		○	○	○
	Loading and unloading station for crude oil tankers FPSO	○	○	○	○
	Loading and unloading station for crude oil tanker wagons	○	●	○	○
	Refining and intermediary storage	○	●	○	○
	Road tanker loading station	●	○	○	○
	Delivery of domestic fuel oil by road tanker	●	○	○	
	Aircraft refuelling	●	○		

Flowmeter selection table

By liquid

Type of liquid	PD meter	Mass flowmeter	Turbine flowmeter	Ultrasonic flowmeter
Premium grade fuel, gasoline	●	●	●	●
Ethanol	●	●	○	●
Diesel	●	●	●	●
Fatty Acid Methyl Ester (FAME)	●	●	○	●
Kerosene	●	●	●	●
Bio-diesel	●	●	○	●
E5...E85	●	●	○	●
Heavy fuel oil	○	●		
Bitumen		●		
Pitch		●		
LPG	○	●	○	●
LNG		○	○	●
Light crude oils		●	○	○
Condensates		●	●	●
Industrial oils	○	●		

By application

Type of application	PD meter	Mass flowmeter	Turbine flowmeter	Ultrasonic flowmeter
Truck loading station	●	○	○	○
Wagon loading/unloading station	●	●	●	●
Tanker loading/unloading station	○	○	●	●
Aircraft refuelling	●	○		
On-board metering for road tankers	●	○	○	○
Preparation and metering of bio-fuels	●	○	○	○
Metering for light crude oil on pipeline		○	○	●
Metering for condensate on pipeline		○	○	●
Multi-product metering on pipeline		○	○	○
Product identification on multi-product pipeline		●		○
Control of mixer flowrate for preparation of maritime fuel oils	○	●		

● : Ideally suited ○ : Suitable subject to certain conditions

Countum Group

SATAM

Metering Solutions

World wide Location Chart

- **Headquarters & Sales Department**
  PARIS NORD II
  Bat. le Gauguin - 47 allée des Impressionnistes
  BP 85012 Villepinte
  95931 Roissy CDG Cedex FRANCE
  Tél. : +33 (0)1 48 63 02 11
  Fax : +33 (0)1 49 38 41 01
  E-mail : sales@satam.eu

- **Manufacturing facility**
  Avenue de Verdun - BP 129
  14700 Falaise FRANCE
  Tél. : +33 (0)2 31 41 41 41
  Fax : +33 (0)2 31 40 75 61

As Satam regularly improves its products to ever better respond to evolving market and regulatory requirements, it reserves the right to change any of the specifications of these products, and this without prior notice.

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