

Glass tube flowmeters Series 6000



Variable area flowmeter for liquids and gases

- Easy installation
- Local indication by means of direct reading
- Low pressure drop
- Scales directly in l/h, m³/h, kg/h, l/min, %, etc.
- Plastic protection against accidental breakage of the glass tube
- Flow rate:
 - Water: 2.5 l/h ... 50 m³/h
 - Air: 45 NI/h ... 1500 Nm³/h
- Accuracy: 1.6% (q₀=50%)
- Connections:
 - BSP or NPT threaded connections: ½" ... 3"
 - EN 1092-1 or ASME B16.5 flanges: DN15 ... DN80 / ½" ... 3"

Other flange standards on request

 - PVC solvent weld socket connections or EN 1.4404 (AISI 316L) connections for welding
 - Sanitary couplings according to ISO 2852, SMS 1145, DIN 11851, TRI-CLAMP®
- Materials:
 - Measuring tube: borosilicate glass
 - Frame: galvanized and coated steel, EN 1.4301 (AISI 304)
 - Protection shield: polycarbonate (UV resistant)
 - Wetted parts: galvanized and coated steel, EN 1.4404 (AISI 316L), PVC, PP, PTFE, PVDF
 - Float: EN 1.4404 (AISI 316L), aluminium, PVC, PP, PTFE, PVDF
- Local indication
- Options:
 - 1 or 2 limit switches
 - Electronic transmitter with 4-20 mA analog output for safe or hazardous area (Ex ia IIC T6 protection, ATEX certified). HART, FIELDBUS, PROFIBUS, MODBUS RTU protocol available on request



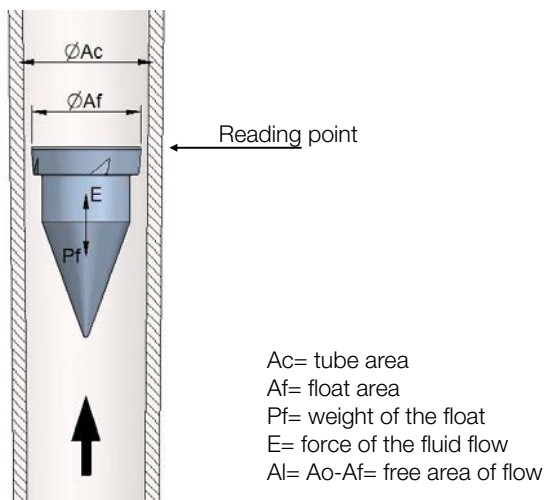
Working principle

The 6000 series flowmeters work according to variable area principle, which is obtained by a float that moves inside a borosilicate glass tapered tube.

The fluid flows up through the tapered tube forcing the float to a position with sufficient free area to enable the flow to pass, where there is an equilibrium of forces:

- E = force of the fluid flow
 - Pf = weight of the float
 - Al = free area of flow
- (Al = Ac, tube area, - Af, float area)

Each position of the float corresponds to a value of flow rate.



Applications

- Water treatment
- Heating-cooling circuits
- Laboratories
- Control of gas burners
- Chemical industry and heat treatment ovens
- Flow rigs

Models

- 6001 BSP / NPT threaded connection or PVC solvent socket or EN 1.4404 for welding
- 6002 EN 1092-1 flange connection. Others on request
- 6011 DIN 11851 sanitary coupling
- 6013 CLAMP ISO 2852, TRI-CLAMP® sanitary coupling
- 6015 SMS 1145 sanitary coupling
- 6000-Fe all components in galvanized and coated steel
- 6000-SS wetted parts in EN 1.4404 (AISI 316L). Other components in galvanized and coated steel
- 6000-FULLY SS all components in EN 1.4404 (AISI 316L), except frame in EN 1.4301 (AISI 304)

- 6000-PVC wetted parts in PVC. Other components in galvanized and coated steel
- 6000-PP wetted parts in PP. Other components in galvanized and coated steel
- 6000-PTFE wetted parts in PTFE. Other components in galvanized and coated steel
- 6000-PVDF wetted parts in PVDF. Other components in galvanized and coated steel

Technical data

- Accuracy, acc. to VDI/VDE 3513 sheet 2 ($q_G=50\%$): 1.6%
- Direct scales in engineering units or %
- Scale range: 10:1
- Fluid temperature: -20°C ... +80°C
- Ambient temperature: -20°C ... +60°C
- Working pressure: from 5 to 15 bar max., depending on flowmeter size
- Connections:
 - BSP or NPT threaded connections: 1/2" ... 3"
 - EN 1092-1 or ASME B16.5 flanges: DN15 ... DN80 / 1/2" ... 3"
 - Other standards on request
 - Sanitary couplings according to ISO 2852, SMS 1145, DIN 11851, TRI-CLAMP®
- Measuring tube length: 300 mm

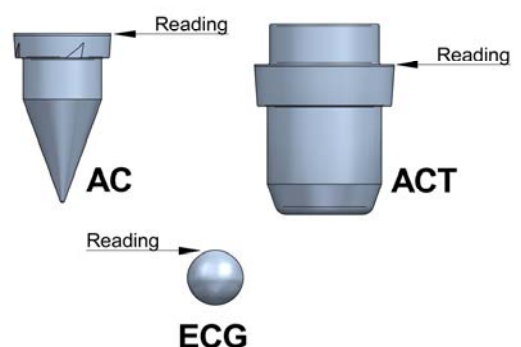
Operation

- Vertical with upwards flow

Limit switches and transmitters

- 60-AMM1 ... 2: 1 or 2 adjustable micro-switches. Available from 40-400 l/h
- 60-AMD1 ... 2: 1 or 2 adjustable inductive switches. Available from 40-400 l/h
- PT-AMR1 ... 2: 1 or 2 adjustable reed switches. Available from 10-100 l/h
- 60-TMUR: resistive sensor with remote 4-20 mA transmitter (18 points), 24 VDC 2-wire system. Ex intrinsically safe version and HART, FIELDBUS, PROFIBUS protocol on request. Available from 40-400 l/h

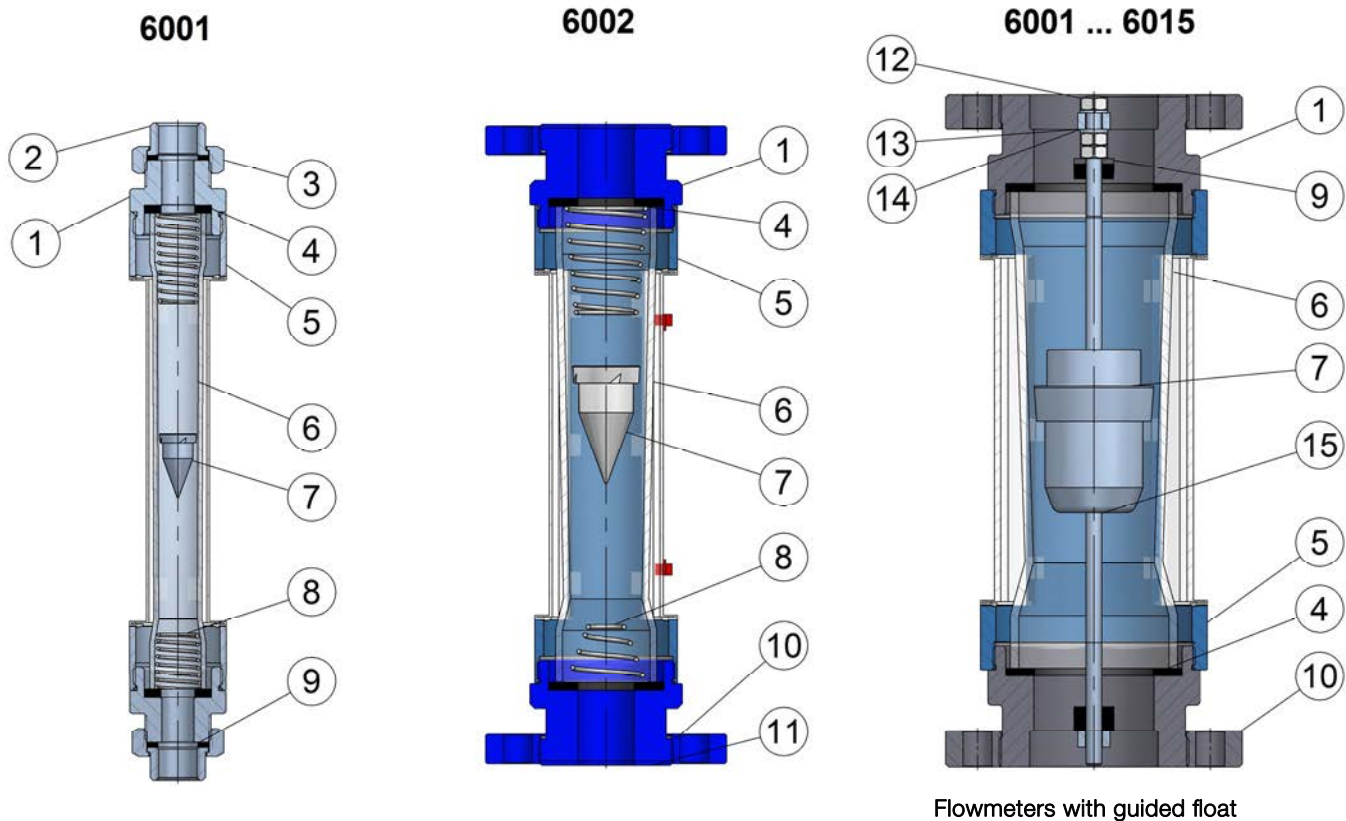
Float types



Glass tube flowmeters

Series 6000

Materials



N°	Description	Materials				
		6000-Fe	6000-SS	6000-FULLY SS	6000-PVC / PP	6000-PTFE
1	End piece	Steel	EN 1.4404	EN 1.4404	PVC / PP	Steel + PTFE
2	End connector	Steel	EN 1.4404	EN 1.4404	PVC / PP	PTFE
3	Union nut	Steel	Steel	EN 1.4404	PVC / PP	Steel
4	Frame gasket	NBR, VITON®, EPDM				PTFE+NBR, NBR, VITON®, EPDM
5	Frame	Steel	Steel	EN 1.4301	Steel	Steel
6	Measuring tube	Borosilicate glass				
7	Float *	EN 1.4404 / Aluminium	EN 1.4404 / Aluminium	EN 1.4404 / Aluminium	EN 1.4404 / Aluminium / PVDF-Pb / PVC-Pb / PP-Pb	PTFE-Pb, PVDF-Pb
8	Springs / Stops	EN 1.4310	EN 1.4310	EN 1.4310	EN 1.4310 / PVDF	PTFE
9	Connector gasket	NBR, VITON®, EPDM				PTFE+NBR, NBR, VITON®, EPDM
10	Flange	Steel	Steel / EN 1.4404	EN 1.4404	Steel / PVC / PP	Steel
11	Flange seat	Steel	EN 1.4404	EN 1.4404	PVC / PP	PTFE
12	Nut	EN 1.4401	EN 1.4401	EN 1.4401	EN 1.4401, PVC, PP	PTFE
13	Centering ring	EN 1.4401 (PP, PVDF) **	EN 1.4401 (PP, PVDF) **	EN 1.4401 (PP, PVDF) **	EN 1.4401, PVC, PP	PTFE
14	Washer	EN 1.4401	EN 1.4401	EN 1.4401	EN 1.4401, PVC, PP	PTFE
15	Guide	EN 1.4401	EN 1.4401	EN 1.4401	EN 1.4401, PVC, PP	PTFE

In all cases, galvanized and coated steel

EN 1.4404 = AISI 316L ; EN 1.4401 = AISI 316 ; EN 1.4301 = AISI 304 ; EN 1.4310 = AISI 302

* Only the most usual are shown. Float material might change depending on application requirements

** For low flows

Dimensions

Model 6001 (BSP / NPT) (socket / welding)

	R" / NPT	DN	A	HR	L	Weight kg
M1	1/2"	15	50	17	405	2
M1	3/4"	20	50	19	410	2
M2	3/4"	20	60	19	418	2
M2	1"	25	60	20	423	3
M3	1 1/2"	40	90	20	445	6
M4	2"	50	103	22	455	10
M5	2 1/2"	65	140	24	502	13
M5	3"	80	140	26	512	17

Model 6002 (EN 1092-1)

	DN	D	k	g	b	l x n°	L	Weight kg
M1	15	95	65	45	16	14x4	380	2.5
M1	20	105	75	58	18	14x4	380	3.3
M2	20	105	75	58	18	14x4	390	3.3
M2	25	115	85	68	18	14x4	390	4.8
M3	40	150	110	88	18	18x4	400	8
M4	50	165	125	102	18	18x4	410	11
M5	65	185	145	122	18	18x4	420	15.3
M5	80	200	160	138	20	18x4	420	19.3

Model 6002 (ASME B16.5 150#)

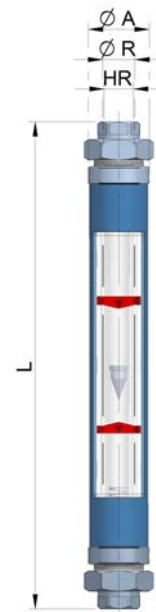
	NPS	D	k	g	b	l x n°	L	Weight kg
M1	1/2"	88.9	60.3	34.9	11.1	15.9x4	380	2.5
M1	3/4"	98.4	69.8	42.9	12.7	15.9x4	380	3.3
M2	3/4"	98.4	69.8	42.9	12.7	15.9x4	390	3.3
M2	1"	107.9	79.4	50.8	14.3	15.9x4	390	4.8
M3	1 1/2"	127	98.4	73	17.5	15.9x4	400	8
M4	2"	152.4	120.6	92.1	19.1	19x4	410	11
M5	2 1/2"	177.8	139.7	104.8	22.2	19x4	420	15.3
M5	3"	190.5	152.4	127	23.8	19x4	420	19.3

Model 6011 (DIN 11851)

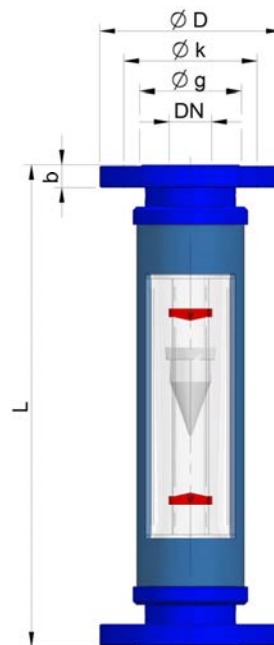
NW	15(M1)	25(M2)	40(M3)	50(M4)	65(M5)	80(M5)	100(M5)
Rd	Rd 34	Rd 52	Rd 65	Rd 78	Rd 95	Rd 110	Rd 130
Ø C7	x 1/8"	x 1/6"	x 1/6"	x 1/6"	x 1/6"	x 1/4"	x 1/4"
Ø C6	16	26	38	50	66	81	100
Ø d2	21.3	30	42	51	73	88.9	108
L	395	400	405	425	425	425	425

Model 6013 (CLAMP ISO 2852:1993)

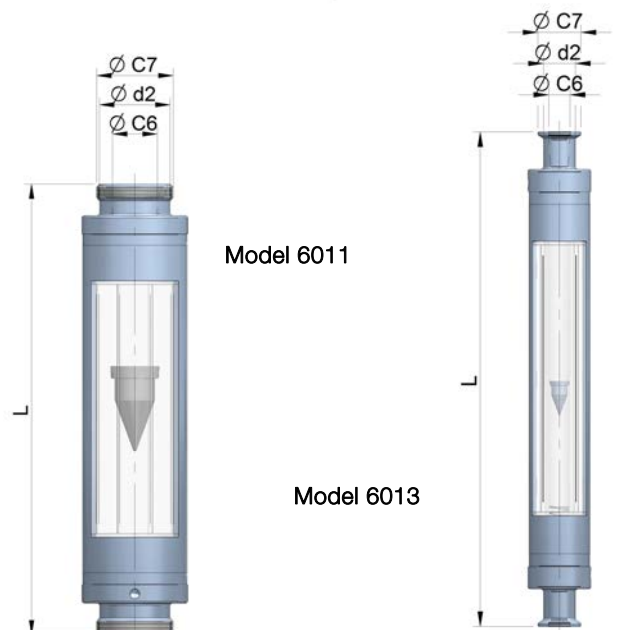
NW	15(M1)	25(M2)	40(M3)	50(M4)	65(M5)	80(M5)	100(M5)
Ø C7	34	50.5	50.5	64	77.5	91	119
Ø C6	14	22.6	35.6	50	60.3	72.9	97.6
Ø d2	25.3	42.4	42.4	55.8	68	81	106
L	395	400	405	425	425	425	425



Model 6001



Model 6002



Model 6011

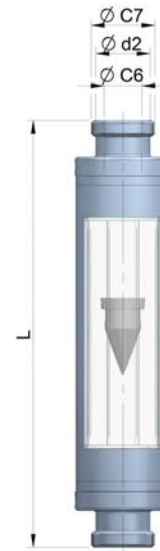
Model 6013

All dimensions in mm (L±1,5 mm)

Model 6015 (SMS 1145)

NW	15(M1)	25(M2)	40(M3)	50(M4)	65(M5)	80(M5)	100(M5)
	Rd	Rd	Rd	Rd	Rd	Rd	Rd
Ø C7	40-6	48-6	60-6	70-6	85-6	120-4	140-4
Ø C6	22.5	29.4	35.5	48.5	60.5	86	104
Ø d2	25	42	51	63.5	73	93	108
L	395	400	405	425	425	425	425

Model 6015



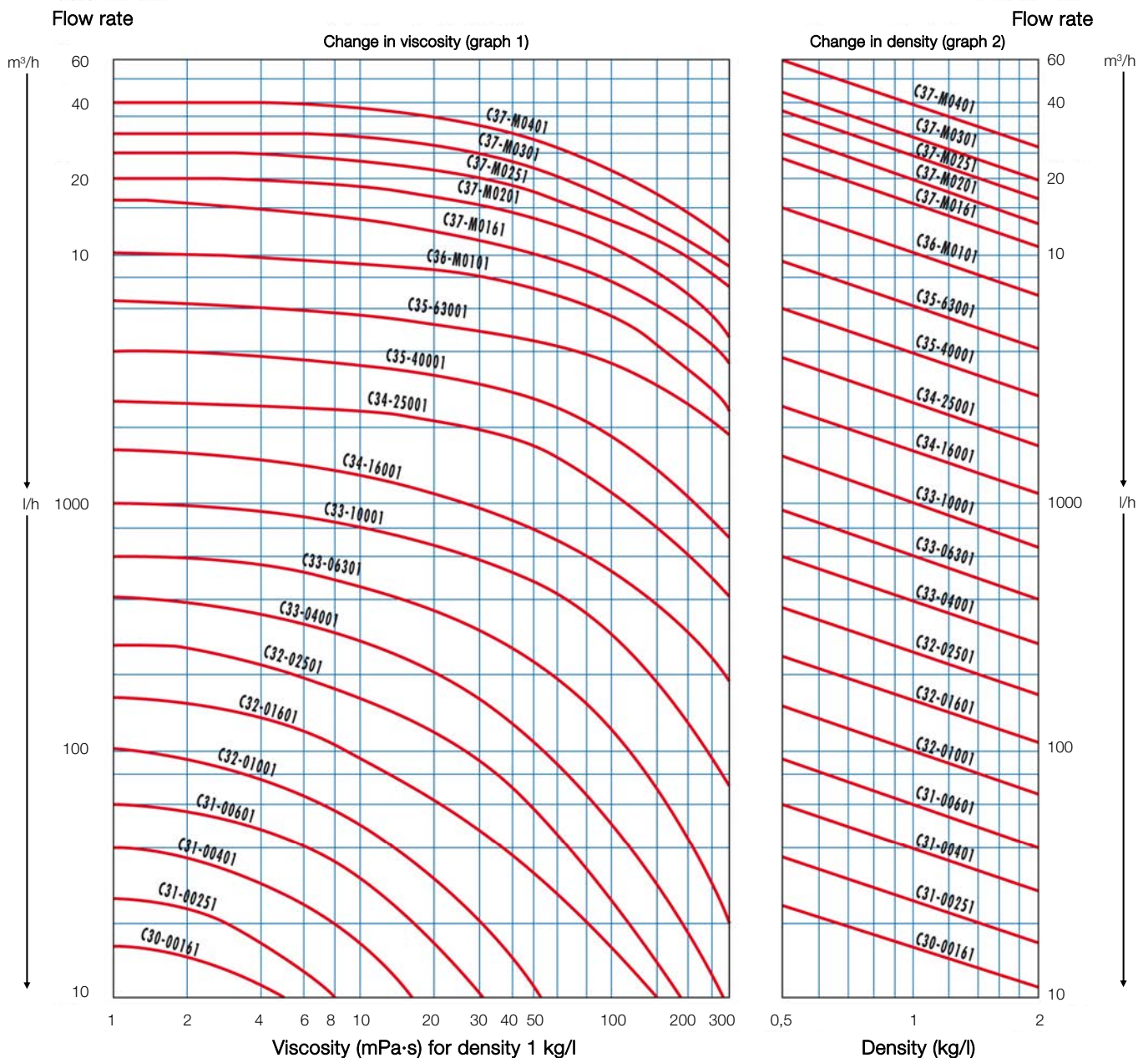
All dimensions in mm (L±1,5 mm)

Flow ranges

Model N°	Flow scales EN 1.4404 float 7.95 g/cm³			Flow scales Aluminium float 2.85 g/cm³		Max. pressure bar	Frame	R" (DN)
	l/h water	Nm³/h air 1.013 bar abs 20°C	ΔP mbar	Nm³/h air 1.013 bar abs 20°C	ΔP mbar			
C31-00251	2.5-25	0.07-0.7		0.04-0.4				
C31-00401	4-40	0.11-1.1	6	0.07-0.7	2			
C31-00601	6-60	0.18-1.8		0.1-1			M1	½" (DN15) ¾" (DN20)
C32-01001	10-100	0.3-3		0.17-1.7				
C32-01601	16-160	0.45-4.5	9	0.25-2.5	4	15		
C32-02501	25-250	0.7-7		0.4-4				
C33-04001	40-400	1.1-11		0.7-7				
C33-06301	60-630	1.8-18	12	1.1-11	5		M2	¾" (DN20) 1" (DN25)
C33-10001	100-1000	3-30		1.8-18				
C34-16001	160-1600	4.5-45	18	2.5-25	8	10	M3.1	
C34-25001	250-2500	7-70		5-45				1 ½" (DN40)
C35-40001	400-4000	11-110	23	7-70	10	8	M3.2	
C35-63001	500-6300	18-180		10-110				
C36-M0101	1000-10000	30-300	30	20-180	12	6	M4	2" (DN50)
C36-M0141	2000-14000	120-420		40-250				
C37-M0161	1600-16000	45-450		30-290				
C37-M0201	2000-20000	60-600		40-360				
C37-M0251	2500-25000	70-700	40	50-460	17	5	M5	2 ½" (DN65) 3" (DN80)
C37-M0301	3000-30000	90-900		60-550				
C37-M0401	6000-40000	180-1200		110-730				
C37-M0501	8000-50000	250-1500		170-920				

Model N°	AC float EN 1.4404 float 7,95 g/cm³			ECG float				Max. pressure bar	R" (DN)
	l/h water	NI/h air 1.013 bar abs 20°C	ΔP mbar	Glass float 2.60 g/cm³		Plastic float 1.30 g/cm³			
				l/h water	NI/h air 1.013 bar abs 20°C	NI/h air 1.013 bar abs 20°C	ΔP mbar		
C30-00251	2.5-25	70-700	3	1-10	40-400	15-150	2	15	½"
C30-00401	4-40	120-1200		1.6-16	70-700	25-250			(DN15)

Flow rate equivalent curves water-liquids (with different density and viscosity)



Examples of calculation

N° 1. Changes in density (graph 2)

Flow rate to be measured: 1000 l/h Liquid density: 1.4 kg/l

Enter the graph at the 1000 l/h point and move horizontally to the left until the thick line that determines the proper flow tube (C33-10001). Follow the inclined line until crossing the 1.4 kg/l vertical line. From this point, move horizontally to the right until reaching the flow scale axis, where we can determine that the maximum flow rate we can measure with this tube is 800 l/h .

N° 2. Changes in viscosity (graph 1)

Flow rate to be measured: 1000 l/h Liquid viscosity: 50 $mPa-s$

Enter the graph 1 by the 50 $mPa-s$ value on the lower scale, and move vertically until crossing with the horizontal 1000 l/h flow rate line.

Since this point is between two curves, we can:

- Choose the lower curve:

Move downwards along the 50 $mPa-s$ line until the lower curve (tube C34-16001) and then move horizontally to the left until reaching the flow scale axis. We can determine that the maximum flow rate we can measure with this tube is 800 l/h .

- Choose the upper curve:

Move upwards along the 50 $mPa-s$ line until the upper curve (tube C34-25001) and then move horizontally to the left until reaching the flow scale axis. We can determine that the maximum flow rate we can measure with this tube is 1800 l/h . In case that the viscosity and the flow tube lines meet, that would directly be the maximum flow rate value we can measure.

N° 3. Changes in viscosity and density (graphs 1 and 2)

Follow example n° 2 first and then n° 1.

Limit switches

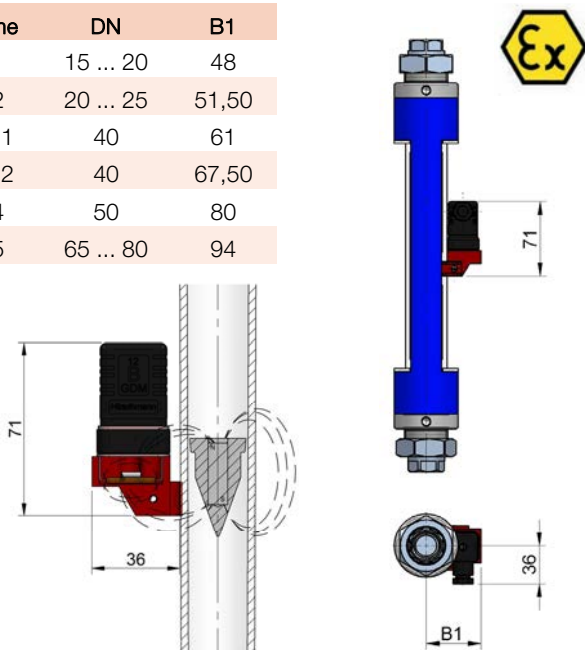
Adjustable limit switch PT-AMR

(Flow rate from 10-100 l/h water and equivalent air ranges. EN 1.4301 (AISI 304) frame is required for flow ranges 10-100, 16-160 and 25-250 l/h water and equivalent air ranges)

Bi-stable SPST reed switch, actuated by a magnet inside the float and mounted in a PVC enclosure.

- PT-AMR1 ... 2: 1 ... 2 adjustable limit switches
- Contact rating: 0.5 A / 250 V / 12 VA
- Hysteresis: $\pm 5\%$ of full scale value
- Ambient temperature: -25°C ... $+80^{\circ}\text{C}$
- DIN 43650-A connector, PG9 cable gland
- Suitable for ATEX hazardous area "Simple apparatus"

Frame	DN	B1
M1	15 ... 20	48
M2	20 ... 25	51,50
M3.1	40	61
M3.2	40	67,50
M4	50	80
M5	65 ... 80	94



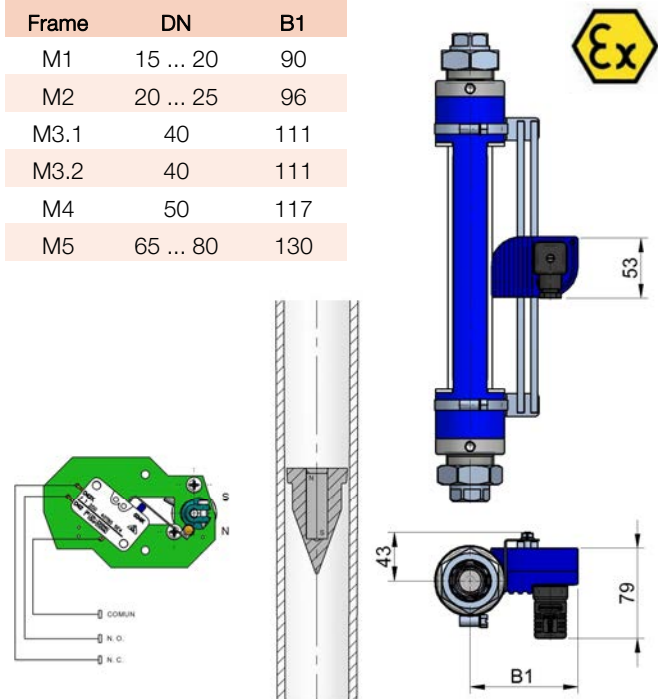
Adjustable limit switch 60-AMM

(Flow rate from 40-400 l/h water and equivalent air ranges)

Electrical bi-stable SPDT micro-switch, mounted in an aluminium housing, actuated by a magnet inside the float.

- 60-AMM1 ... 2: 1 ... 2 adjustable limit switches
- Contact rating: 3(1) A, 250 V (VDE/CEE)
- Hysteresis: $\pm 10\%$ of full scale value
- Ambient temperature: -25°C ... $+80^{\circ}\text{C}$
- Mechanical life: 10^7 operations
- Suitable for ATEX hazardous area "Simple apparatus"

Frame	DN	B1
M1	15 ... 20	90
M2	20 ... 25	96
M3.1	40	111
M3.2	40	111
M4	50	117
M5	65 ... 80	130



Adjustable limit switch 60-AMD

(Flow rate from 40-400 l/h water and equivalent air ranges)

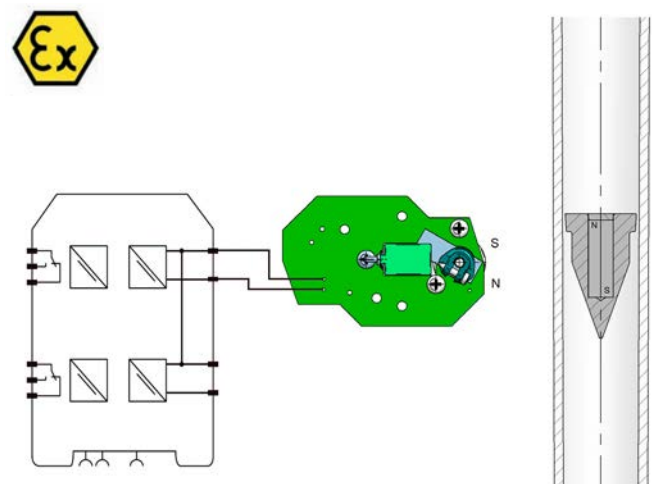
NAMUR (EN 60947-5-6) 3.5 mm slot type bi-stable inductive detector, mounted in an aluminium enclosure, with vane actuated by a magnet inside the float.

- 60-AMD1 ... 2: 1 ... 2 adjustable limit switches
- Nominal voltage: 8.2 V / Operating voltage: 5 ... 25 V
- Ambient temperature: -25°C ... $+100^{\circ}\text{C}$
- ATEX certificate Ex ia IIC T6...T1 Ga / Ex ia IIIC T85°C Da

Control relay (on request)

NAMUR input (EN 60947-5-6) for 1 or 2 inductive detectors.

- Power supply: 20 ... 30 VDC
- Consumption: < 1.3 W
- Relay output:
 - V_{max} : 253 VAC / 2A // 40 VDC / 2A resistive load
- Ambient temperature: -20°C ... $+60^{\circ}\text{C}$
- Ingress protection: IP20



Dimensions identical to 60-AMM

All dimensions in mm ($\pm 1,5$ mm)

Transmitters

Transmitter 60-TMUR 4-20 mA

(Flow rate from 40-400 l/h water and equivalent air ranges)

The TMUR resistive sensor consists of a reed chain which is mounted inside a plastic enclosure IP65 rated. Installation on the flowmeter frame by means of two screws or SS straps. By means of a transmitter, the resistance signal is converted into current 4-20 mA.

Technical data TMUR

- Working temperature: -20°C ... +80°C
- Resolution: 10 mm

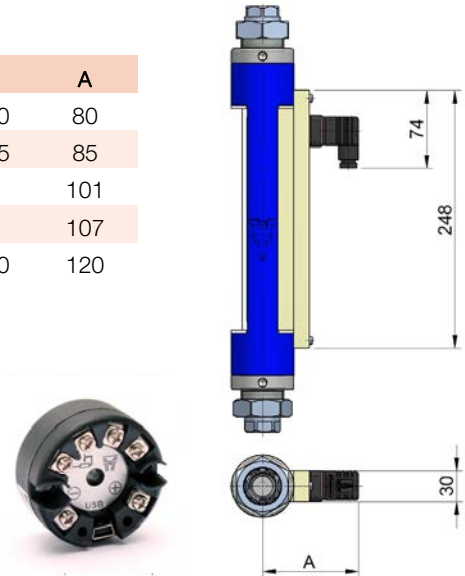


Transmitters TR series

- 2-wire system with 4-20 mA output
- **TR3420** safe area version
 - Power supply: 12 ... 36 VDC
 - Consumption: 0.8 W
 - Configuration by means of USB connection and Winsmeter TR software, available for download at www.tecfluid.com

- **TR2420Ex** ATEX Ex ia IIC T6 certified version
 - Power supply: 8 ... 30 VDC
- **TR2420H** (HART protocol), **TR2420FP** (Fieldbus/Profibus protocol). Also available in combination with their Ex versions

DN	A
15 ... 20	80
20 ... 25	85
40	101
50	107
65 ... 80	120



TR3420

Electronic converter

Model MT03A

- Electronic converter for flow applications
- Resistance and current inputs
- Programmable via USB cable by means of Tecfluid S.A. Winsmeter MT03 software or by means of keyboard and graphic display with intuitive menus
- Panel mounting with dimensions 96 x 96 mm DIN 43700
- Power supply: 90 ... 265 VAC 50 / 60 Hz // 18 ... 36 VDC
- Full diagnosis. User selectable password protection
- 5 digits local flow rate indication and 8 digits totalizer and partial totalizer. Possibility of remote reset
- Programmable 4-20 mA analog output
- 2 x relay outputs programmable as flow rate alarms

- Mass flow rate can be measured programming the product density
- Ingress protection: IP50 front, IP30 back (Optional IP65 front with silicone cover)
- Ambient temperature: -20°C ... +60°C
- MODBUS RTU RS485 protocol on request



MT03A



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Pressure Equipment Directive certified by



ATEX European Directive certified by



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