

## Metal tube flowmeters Series M21



**Variable area flowmeter for low flows of liquids, gases and steam**

- Metallic tube with a robust construction
- Indication by means of magnetic coupling
- Scales calibrated in l/h, m<sup>3</sup>/h, kg/h, t/h, %, etc.
- High performance measurement in extreme working conditions and high resistance to corrosion
- Low pressure drop
- Regulating valve optional
- Vertical or horizontal connections
- Damping mechanism to avoid float bounces in gas and steam applications
- Flow rate:
  - Water: 0.4 l/h ... 1000 l/h
  - Air: 12 Nm<sup>3</sup>/h ... 30 Nm<sup>3</sup>/h
- Accuracy: 4% (q<sub>G</sub>=50%)
- Connections:
  - 1/4" ... 3/4" BSP / NPT
  - Sanitary connections according to ISO 2852, SMS 1145, DIN 11851, TRI-CLAMP®
- Materials: EN 1.4404 (AISI 316L)
- Local indication
- Options:
  - 1 or 2 limit switches
  - Electronic transmitter with 4-20 mA output for safe or hazardous area (Ex ia IIC T4...T6 Ga / Ex ia IIIC T85°C Da protection, ATEX certified). HART protocol available on request
  - Constant flow regulator RCD / RCA



**HART**  
COMMUNICATION PROTOCOL

## Working principle

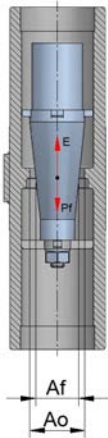
The M21 flowmeter is a metal tube variable area flowmeter for low flows.

It is based in the principle of variable area, which is obtained by a float that moves up and down inside a calibrated orifice. The force from the fluid, as it flows from the bottom to the top, displaces the float until it reaches an equilibrium point that is a function of:

- E = force of the fluid flow
- Pf = weight of the float
- Al = free area of flow

(Al = Ao, calibrated orifice area, - Af, float area)

Each float position corresponds to a flow rate value. The float magnetic field moves the needle inside the housing by means of magnetic coupling to the flow rate point on a graduated scale.



Ao= calibrated orifice area  
Af= float area  
Pf= weight of the float  
E= force of the fluid flow  
Al= Ao-Af= free area of flow

## Applications

- Control panels and pilot plants
- Control and measurement in machinery
- Control and research laboratories
- Water treatment
- Heating-cooling industrial processes
- Control of gas burners and treatment ovens
- Chemical, pharmaceutical and cosmetic industries
- Level control with RCD regulators

## Models

- **M21-R / N** Vertical connections BSP / NPT
- **M21-HR / HN** Horiz. conn. BSP / NPT, without valve
- **M21-HRA / HNA** Horiz. conn. BSP / NPT + valve
- **M21-1 / 3 / 7 / 30** Sanitary vertical connections

## Technical data

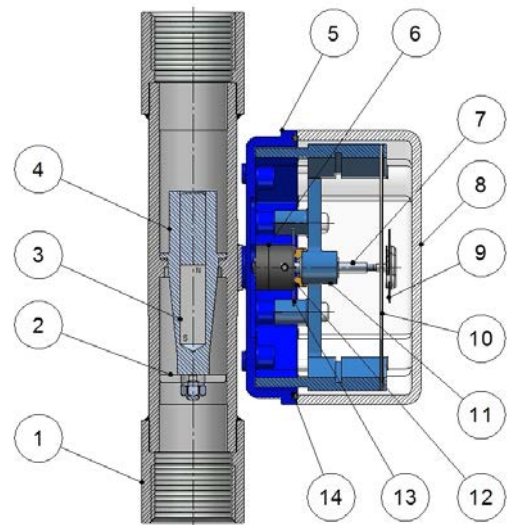
- **Accuracy** acc. to VDI/VDE 3513 sheet 2 ( $q_G=50\%$ ): 4%
- **Direct scales in engineering units or %**
- **Scale range:** 10:1
- **Fluid temperature:**
  - Without switches: -80°C ... +250°C
  - With switches and/or transmitter: -20°C ... +200°C

- **Ambient temperature:** -20°C ... +80°C
- **Working pressure:**
  - PN16 (with regulating valve)
  - PN40 (without regulating valve)
 (others on request)
- **Sanitary connections** according to ISO 2852, SMS 1145, DIN 11851, TRI-CLAMP®.
- **Housing:** IP65 - coated aluminium, polycarbonate window. IP67 - EN 1.4404 (AISI 316L) with glass window, on request.
- **ATEX certificate** Ex ia IIC T4...T6 Ga / Ex ia IIIC T85°C Da

## Limit switches and transmitters

- **M1-AMD1 ... 2:** 1 ... 2 adjustable inductive detectors (Relay EN 60947-5-6 or NAMUR, on request)
  - **TH6 ... TH6H:** 4-20 mA 2-wire system transmitter. HART protocol with model TH6H
- All switches and transmitters available with ATEX certification Ex ia IIC T4...T6 Ga / Ex ia IIIC T85°C Da

## Materials



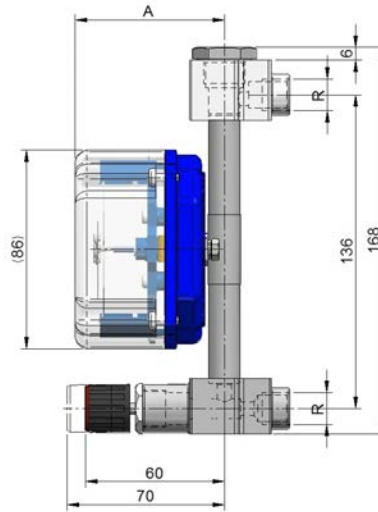
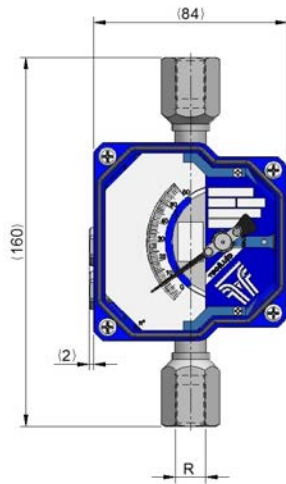
N°	Description	Materials
1	Connection	EN 1.4404 (AISI 316L)
2	Lower float guide	EN 1.4404 (AISI 316L)
3	Float magnet	AlNiCo
4	Float	EN 1.4404 (AISI 316L)
5	Housing base	Coated aluminium
6	Needle magnet	Neodymium
7	Needle shaft	AISI 316
8	Housing cover	Polycarbonate
9	Needle	Aluminium
10	Graduated scale / dataplate	Aluminium
11	Support	Polycarbonate
12	Bearing holder	Brass
13	Brake disk	Aluminium
14	Gasket	NBR

# Metal tube flowmeters

## Series M21

### Dimensions

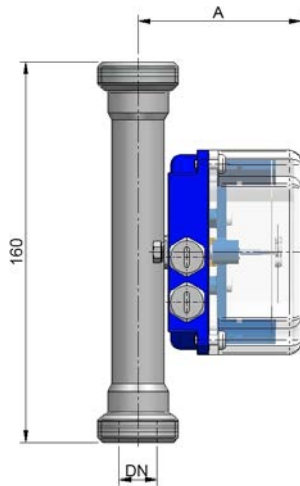
M21-R (BSP thread)  
M21-N (NPT thread)



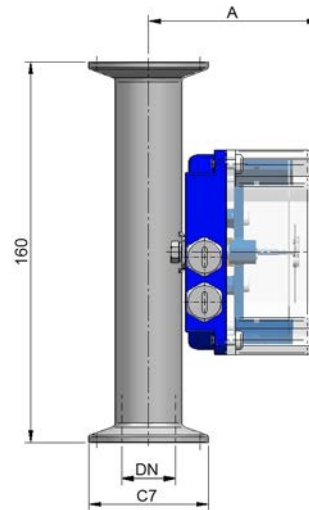
M21-HR (BSP thread)  
M21-HN (NPT thread)  
M21-HRA (BSP with valve)  
M21-HNA (NPT with valve)

R	A
1/4"	65
1/2"	69
3/4"	72

M21-1 (DIN 11851)  
M21-7 (SMS ISO 1145)



DN	A
10	66
15	68
20 / 25	69



M21-3 (CLAMP ISO 2852)  
M21-30 (TRI-CLAMP®)

DN		A	C7
CLAMP	TRI-CLAMP®		
12	3/4"	65	34
21.3	1"	69	34
22.6	1"	72	50.5

### Flow ranges

Model N°	Flow scales AISI 316L float 7.95 g/cm³		Δp mbar	DN				BSP / NPT
	l/h water	NI/h air 1.013 bar abs 20°C		DIN 11851	TRI-CLAMP®	CLAMP ISO 2852	SMS ISO 1145	
M21004	0.4-4	12-120	28					
M21006	0.6-6	18-180						
M21010	1-10	30-300	30					
M21016	1.6-16	50-490		DN10	3/4"	DN12 /	-	1/4"
M21025	2.5-25	80-770		Rd28 x 1/8"	Ø15.7 / 25	C7=34		
M21040	4-40	120-1200	32					
M21060	6-60	160-1800						
M21100	10-100	300-3000						
M21160	16-160	500-4900						
M21250	25-250	800-7700	34			DN21.3 /		
M21400	40-400	1200-12000		DN20	1"	C7=34	DN25	1/2"
M21630	60-630	1800-18000		Rd44 x 1/6"	Ø22.1 / 50,5		Rd40 x 1/6"	
M21M01	100-1000	3000-30000	40			DN22,6 /		3/4"
							C7=50.5	

Other flow ranges on request

## Limit switches and transmitters

### Adjustable limit switch M1-AMD

NAMUR (EN 60947-5-6) 3.5 mm slot type inductive detector activated by vane, mounted in the indicator housing.

- M1-AMD1 ... 2: 1 ... 2 adjustable limit switches
- Power supply: 8 VDC
- Ambient temperature: -25°C ... +70°C
- ATEX certification Ex ia IIC T4...T6 Ga / Ex ia IIIC T85°C Da

### Control relay (on request)

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

- Power supply: 24 ... 253 VAC 50-60 Hz  
24 ... 300 VDC
- Input: NAMUR Ex ia IIC
- Output: 1 or 2 relay contacts
- Output rating: 2 A 250 VAC 100 VA / 1 A 24 VDC
- Ambient temperature: -20°C ... +60°C

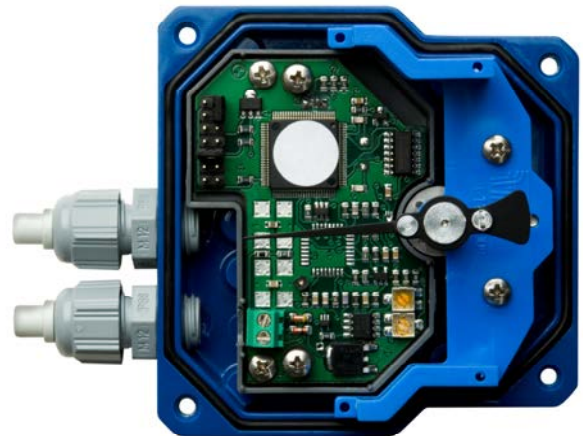
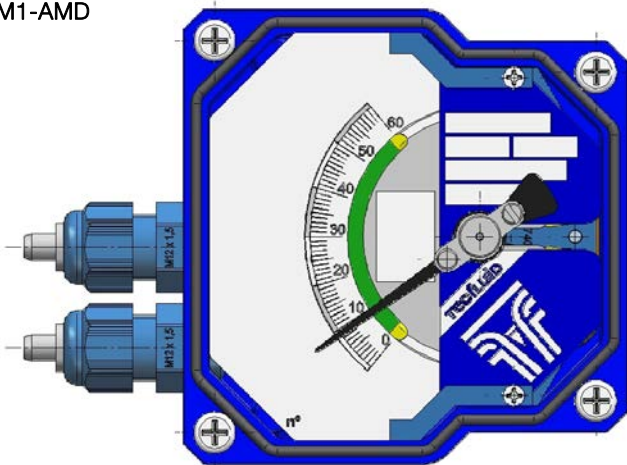


### Transmitter TH6

- Power supply: 2-wire system, 12 ... 36 VDC
- Power consumption: max. 20 mA
- Analog output (4-20 mA):
  - Error: < 0,6% of the magnet position
  - Maximum load in 4-20 mA loop: 1,1 kΩ (with 36 VDC power supply)
- Ambient temperature: -5°C ... +70°C
- Transmitter connector: Packing gland M12x1,5
- Optional: ATEX certification Ex ia IIC T4...T6 Ga / Ex ia IIIC T85°C Da , with model TH6 Ex
- Optional: HART protocol, with model TH6H



M1-AMD

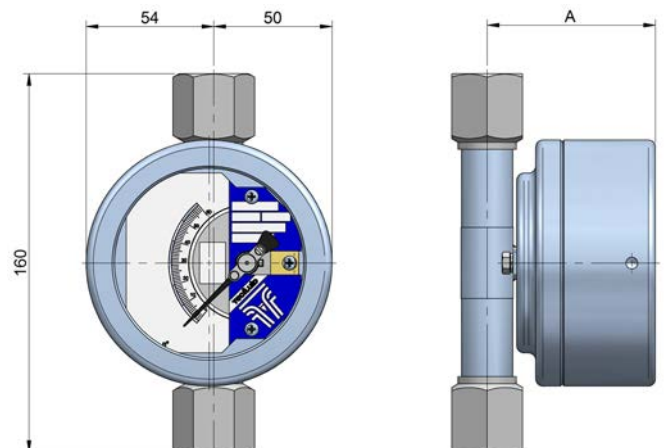


## Accessories

### Stainless steel housing

- Specially indicated for working within sanitary or sterile installations, saline atmospheres (marine platforms), etc.
- All stainless steel construction EN 1.4404 (AISI 316L), with glass window
- Can fit standard limit switches and Halltec transmitters
- Ingress protection: IP67

Rp	¼"	½"	¾"
A	67	71	74



# Metal tube flowmeters

## Series M21

### Float damping system (for gas and steam applications)

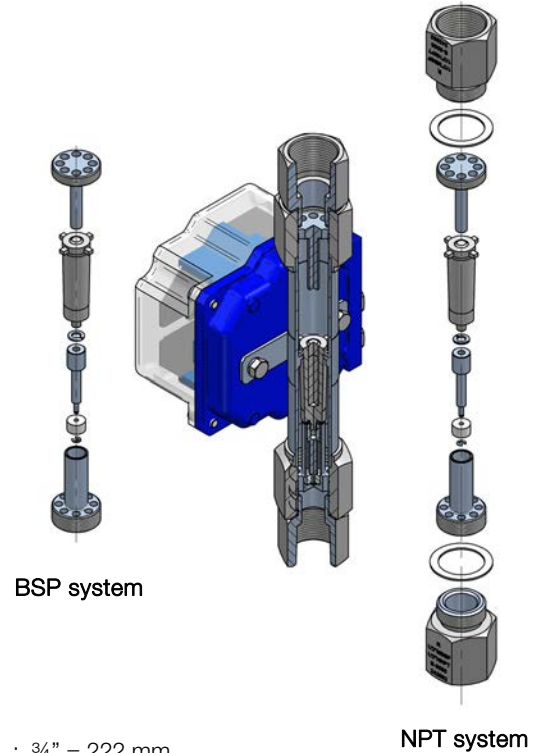
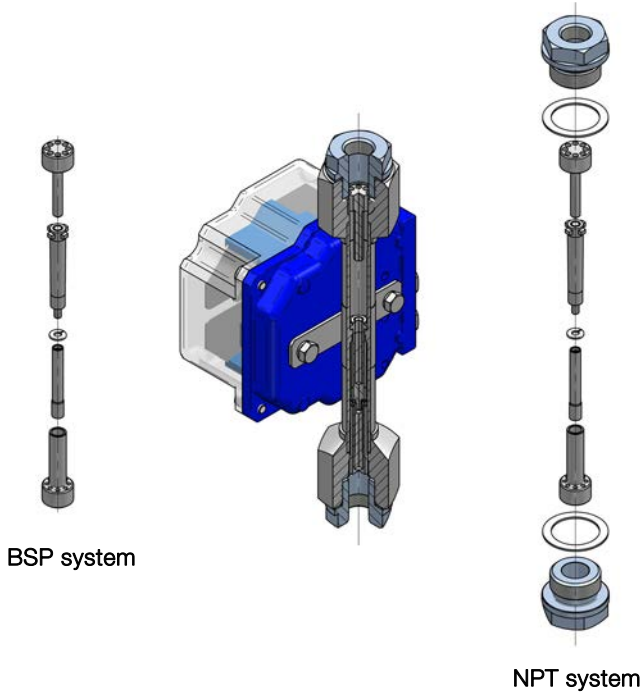
Ceramic, PEEK or metallic piston system for avoiding float oscillations in flowmeters for gas and steam service, obtaining stable readings even with very low working pressures and low gas densities.

Available for 1/4" ... 3/4". Components:

- Upper float stop
- Float
- Piston
- Piston locking circlip
- Guide cylinder

### Damping system for M21 1/4"

### Damping system for M21 1/2" y 3/4"



Total length M21 with damping system NPT: 1/4" = 186 mm ; 1/2" = 212 mm ; 3/4" = 222 mm

### Constant flow regulators RCA / RCD

The M21 flowmeters are designed to incorporate the RCA and RCD constant flow regulators, which can make flow rate to be constant when inlet or outlet pressures are variable.

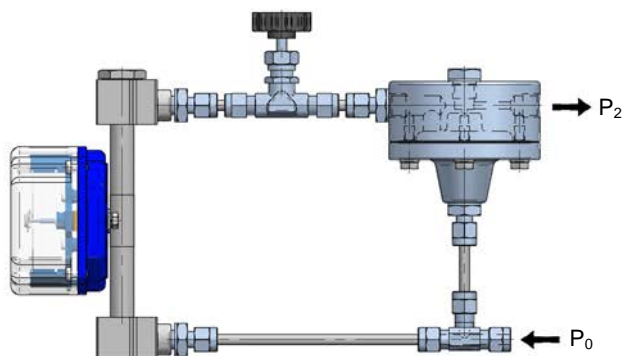
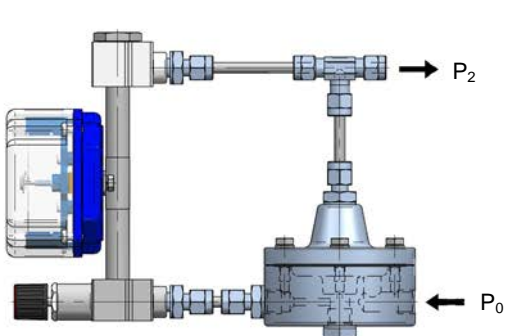
In gas applications, RCA model is used when inlet pressure is variable and outlet pressure or counterpressure is constant; RCD model is used in installations where inlet pressure is constant and outlet pressure or counterpressure is variable.

In applications for liquids RCA model is used in all cases.

The differential pressure between  $P_0$  and  $P_2$  must always be higher than 350-450 mbar depending on the model. This is necessary to guarantee a correct performance of the flow regulator.

### RCA for model M21-HRA, M21-HNA

### RCD for model M21-HR, M21-HN



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