

## Variable Area Flowmeter

Series 2100/2150  
2300/2340



### Measurement of Low GAS & Liquid Flows

#### The Measurement

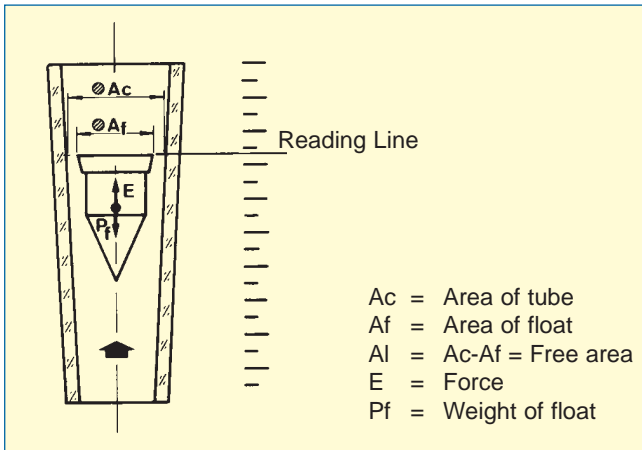
Measurement with a float in a tapered borosilicate glass tube.

- Series 2100 with a 100 mm flow tube
- Series 2150 with a 150 mm flow tube
- Series 2300 and 2340 with a 300 mm flow tube
- Regulating valve with a tapered plug and fine thread for precise flow adjustment
- Compact construction with reduced dimensions to facilitate easy installation and mounting on control panels
- Scales calibrated in flow units of l/h, %, l/min or cc/min
- High & Low flow alarms (Optical, inductive or hall sensor)
- Constant flow regulators RCA or RCD
- A large number of applications in a wide range of manufacturing and laboratory processes, such as:
  - Control panels
  - Pilot plants
  - Measurement & control on machinery
  - Water purification (Osmosis)
  - Control in research laboratories
  - Control of gas burners
  - Chemical / pharmaceutical / cosmetic industry
  - Flow control for industrial refrigeration
  - Heat treatment
  - Level control with the RCD regulator

#### Benefits

- Easy installation
- Short mounting length
- No straight pipe required before or after the flow meter
- Vertical mounting for rising fluid flow
- Horizontal inlet & outlet connections
- Low pressure loss
- Temperatures up to 100°C
- Compact construction





### Operation

A fluid flowing vertically through a tapered tube will provide a lifting force on a weighted float, holding it in a fixed position for a fixed flow.

The float's resting position is a function of; the free area of flow  $A_l$  (annulus between the float and the measuring tube), the weight of the float  $P_f$  and the force  $E$  of the fluid flow. Each position of float height corresponds to a different flow, which is shown by the equivalent scale engraved on the metering tube.



Model 2150 with inductive sensor

### Technical Data

- Connections
  - 2100 / 2150 / 2300 R<sup>1</sup>/<sub>4</sub>" (Female) BSP or NPT
  - 2300 R<sup>1</sup>/<sub>4</sub>" (Female) BSP or NPT
  - 2340 R<sup>1</sup>/<sub>2</sub>" R<sup>3</sup>/<sub>4</sub>" (male only) BSP or NPT  
(BSP parallel according to standard ISO 228-1)  
(NPT according to ANSI B2 1968)
- Length:
 

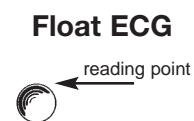
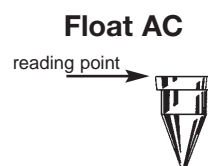
	Flow Tube	Body
- 2100	100 mm	165 mm
- 2150	150 mm	215 mm
- 2300	300 mm	365 mm
- 2340	300 mm	390 mm
- Accuracy, according to VDE / VDI 3513 standards:
 

- 2100	± 3.5%
- 2150	± 3%
- 2300 / 2340	± 1.6 %
- Scales calibrated directly in
  - l/h for water
  - l/h up to 700 NI/h for air
  - Nm<sup>3</sup>/h from 1-17Nm<sup>3</sup>/h for air
  - l/s, cc/min, %, or others on request
- Materials:
 

Ends:	AISI-316L (1.4404)
Body:	AISI-316L (1.4404)
Valve:	AISI-316L (1.4404)
Valve Seat:	PTFE
O-Rings/gaskets	NBR (Viton or EPDM on request)
- Temperature:
 

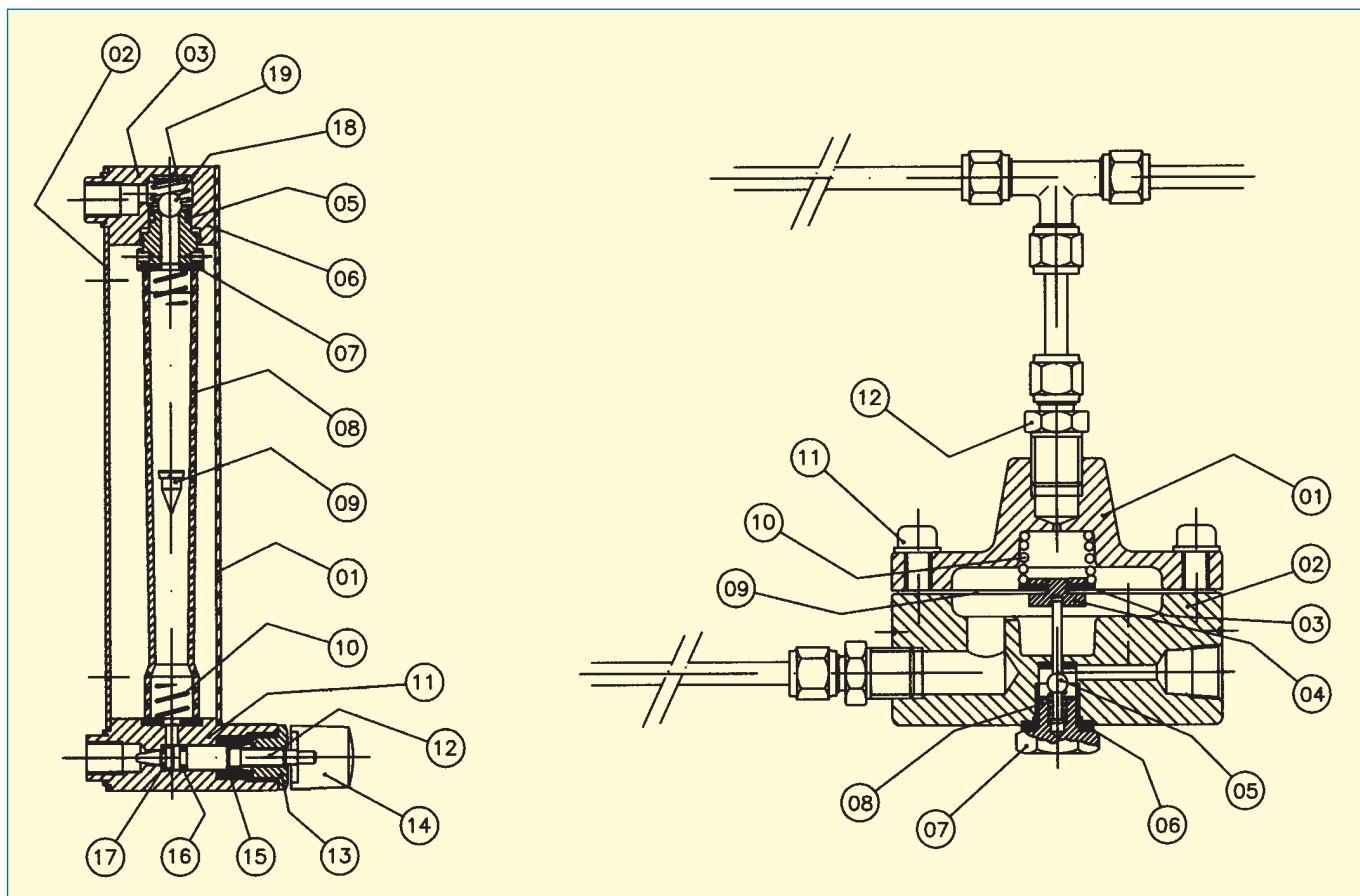
Fluid:	0...+100°C
Ambient:	0...+80°C
- Alarm Options:
  - 20-AMD (1...2): Inductive sensor  
(relay amplifier on request)
  - 20-AMO (1...2): Optical detector  
(relay infrared in Aluminium case)
  - 20-AMH (1...2): HALL effect sensor  
(relay in Aluminium case)
- Constant Flow Regulators:
  - Series RCA: For gases when the inlet pressure varies and the outlet pressure is constant.  
For all liquid applications.
  - Series RCD: For gases when the outlet pressure fluctuates and the inlet pressure is constant.
- Regulator Materials:
 

Body:	AISI-316
Membrane:	NBR (Viton or PTFE on request)
Spring:	AISI-316
- The minimum allowable pressure difference between the inlet and outlet of the regulator is 200 mbar.



## Flow Meters Series 2000

## Constant Flow Regulator



### 2100 / 2150 / 2300 / 2340

Nº.	Item	Material
1	Protection Shield	Polycarbonate*
2	Body	AISI-316
3	End piece	AISI-316
5	O-Ring	NBR / Viton / EPDM
6	Piston	AISI-316
7	End Gasket	NBR / Viton / EPDM
8	Metering tube	Borosilicate Glass
9	Float	AISI-316L / Glass / Ceramic / Plastic / Aluminium
10	Spring	AISI-316
11	Valve body	AISI-316L
12	Valve stem	AISI-316L
13	Guide nut	AISI-316L
14	Valve knob	Plastic
15	Valve guide	PTFE
16	Valve O-ring	NBR / Viton / EPDM
17	Valve seat	PTFE
18	Optional	AISI-316
19	Optional	AISI-316

### RCD / RCA

Nº.	Item	Materials
1	Membrane body	AISI-316L
2	Valve Body	AISI-316L
3	Membrane	NBR / Viton / PTFE
4	Valve Guide	AISI-316L
5	Regulating Valve	AISI-316L
6	Seal	PTFE
7	Spring Support	AISI-316L
8	Valve Spring	AISI-316
9	Membrane disc	AISI-316
10	Membrane spring	AISI-316
11	Screw	AISI-316
12	Connection union	AISI-316

\* 2340 Series, does not fit Protection Shield



Tube N°.	Tube Length (mm)	Measurement Ranges for Float Series AC / ECG										
		WATER 20°C l/h				AIR 20°C 1.013 bar abs NI/h				PRESSURE LOSS mm Water		
		AISI-316	GLASS	AISI-316	GLASS	PLASTIC	AISI-316	GLASS	PLASTIC			

**Series 2100**

C110/0001	100	0.1	1	0.05	0.5	3	30	1	15	0.5	5	20	10	5
C110/0002.5		0.2	2.5	0.1	1	8	80	4	40	1.5	16			
C111/0005		0.5	5	0.2	2	15	160	7	70	3	30			
C111/0010		1	10	0.4	4	30	350	15	180	8	110			
C111/0016		1.6	16	0.6	6	40	450	20	240	10	140			
C112/0025		2.5	25	1	10	80	800	40	400	20	250	35	20	10
C113/0040		4	40	1.6	16	120	1200	70	700	40	400			
C114/0060		6	60	2	20	200	2000	100	1000	70	700			
C115/0100		10	100	4	40	300	3500	150	1600	100	1100	50	25	15

**Series 2150**

C210/0001	150	0.1	1	0.05	0.5	3	30	2	20	0.5	5	20	10	5
C210/0002.5		0.2	2.5	0.1	1	8	80	5	50	1	16			
C211/0005		0.5	5	0.2	2	15	180	10	100	3	30			
C211/0010		1	10	0.4	4	30	300	15	180	10	100			
C211/0016		1.6	16	0.6	6	50	500	30	300	10	150			
C212/0025		2.5	25	1	10	80	800	40	400	20	250	35	20	10
C213/0040		4	40	1.6	16	100	1000	70	700	40	400			
C214/0060		6	60	2	20	150	1500	100	1000	70	700			
C215/0100		10	100	4	40	300	3000	150	1500	100	1100	50	25	15

Tube N°.	Tube Length (mm)	Measurement Ranges for Float Series AC									
		WATER 20°C l/h				AIR 20°C 1.013 bar abs NI/h				PRESSURE LOSS mm Water	
		AISI-316	GLASS	ALUMINIUM	AISI-316	AISI-316	GLASS	ALUMINIUM	AISI-316	GLASS	ALUMINIUM

**Series 2300**

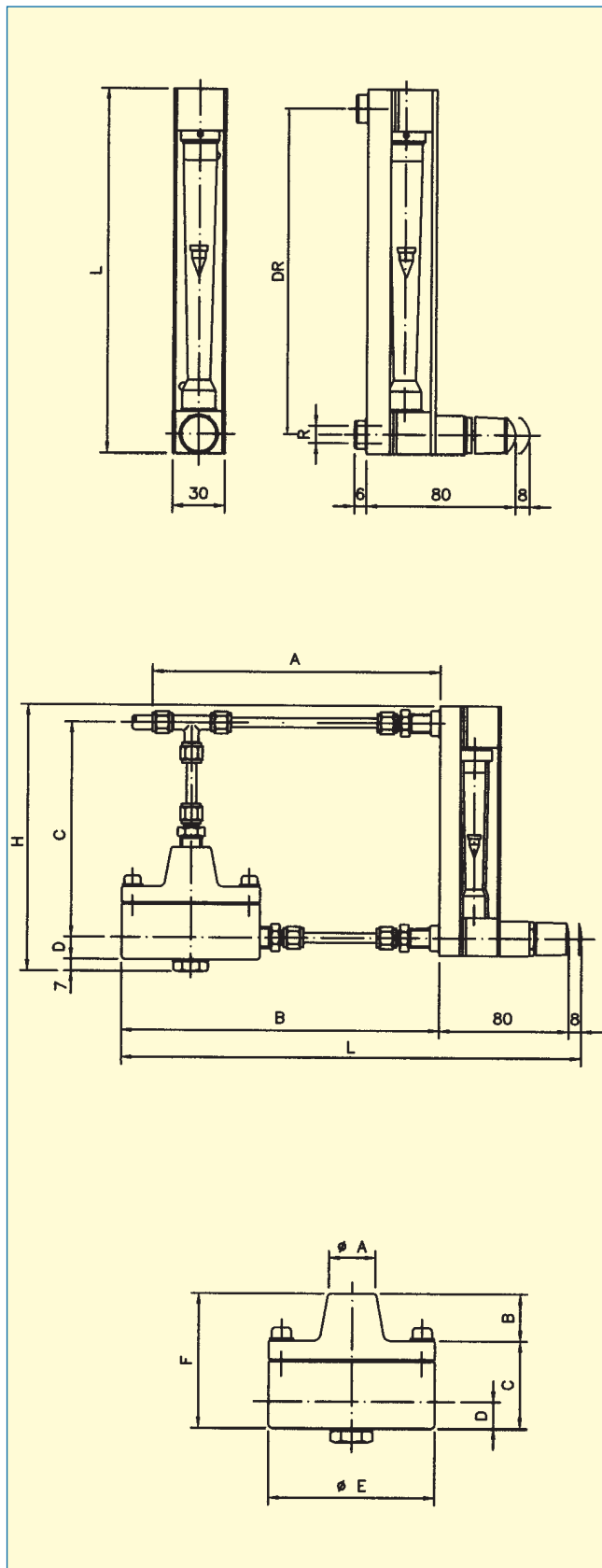
C311/0025	300	2.5	25	1	10	40	400	120	800	55	18	22
C311/0040		4	40	1.6	16	70	700	150	1400			
C311/0060		6	60	2	20	100	1000	150	2000			
C312/0100		10	100			170	1700	300	3000	90	30	35
C312/0160		16	160			250	2500	400	4500			
C312/0250		25	250			400	4000	700	7000			

**Series 2340**

C313/0400	300	40	400			700	7000	1000	10000	125	40	50
C313/0630		60	630			1000	10000	1800	18000			
C313/1000		100	1000			1700	17000	3000	30000			



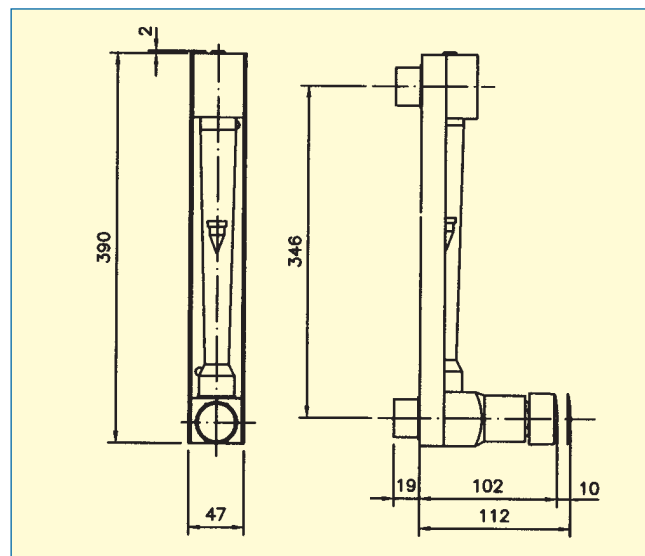
### Series 2100, 2150, 2300



### Dimensions & Weight

Series	DR	L	Connection R"	Wt (kg) Meter + RCA
2100	136	158	1/4"F BSP/NPT	0.700 + 2.5
2150	186	186	1/4"F BSP/NPT	0.850 + 2.5
2300	336	358	1/4"F BSP/NPT	0.850 + 2.5
2340	346	390	1/2"F or 3/4"m BSP/NPT	1.800 + 3

### Series 2340



### Dimensions

Flow Meter + Regulator

Series	Flow				A	B	C	H	L	Connection D
	AIR NI/h Min	WATER I/h Max	Min	Max						
2100			150	170	136	172	266	1/4"BSP/NPT		
2150	10	-4000	1	-250	150	170	186	222	266	1/4"BSP/NPT
2300			150	170	336	372	266	1/4"BSP/NPT		
2340	700	-7000	60	-400	180	200	346	397	320	1/2"BSP/NPT

### Dimensions

Flow Regulator

Series	R"	A	B	C	D	E	F
RCA	1/4" BSP/NPT	35	11	52	13	88	63
RCD							
RA40	1/2" BSP/NPT	40	16	65	18	100	81
RD40							



## Differential Pressure Controller RCA/RCD

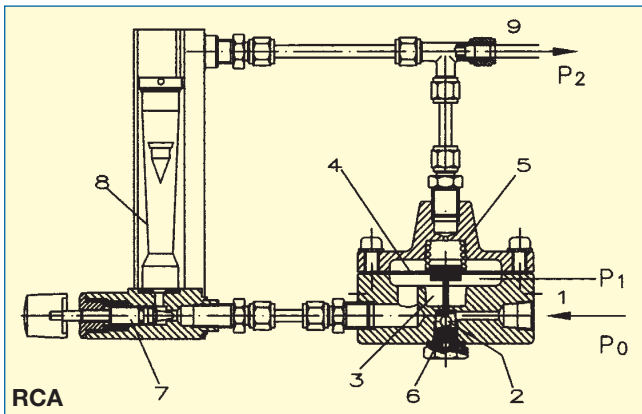
The 2000 Series flow meters are built to incorporate the regulators RCA/RCD that regulate and maintain a constant flow.

The RCA series, for gases and liquids, is used in installations where the pressure at the inlet is variable and the pressure at the outlet is constant.

The RCD series, for gases and liquids, is used in installations where the pressure at the inlet is constant and the pressure at the outlet is variable.

### Operation

The RCA regulator is for variable pressure at the inlet and constant pressure at the outlet. The measured fluid, with variable pressure at the inlet, enters through connection (1), passes the regulating valve to the chamber (3) where a new lower pressure  $P_1$  is created and acts on the membrane (4).

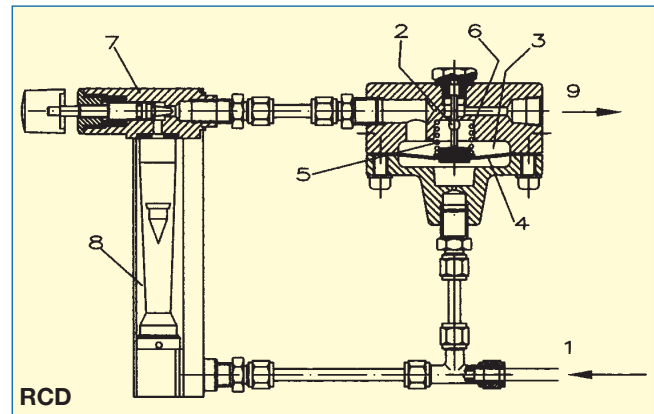


The regulating valve (2) joined to the membrane (4) is initially open by the action of the regulating spring (5). After the fluid has passed through the chamber (3) of the regulator, it passes through the measuring valve (7), and then through the measuring tube (8) and exits through the connection (9), against the pressure of the constant outlet  $P_2$ , which also acts on the membrane (4).

The springs (5+6) are built so that the valve (2) opens when the pressure at the inlet  $P_0$  decreases and the valve closes when  $P_0$  increases. This keeps the pre-set flow through the regulating valve (7) of the flow meter by keeping a constant pressure drop across the valve ( $P_2 - P_1$ ).

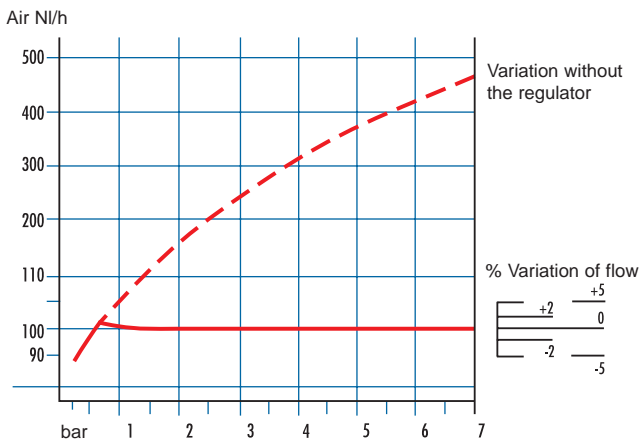
The differential pressure between  $P_0$  and  $P_2$  should always be greater than 200 mbar, in order to ensure the springs (5+6) operate correctly.

The RCD flow regulators act in a similar way, modifying the position of the regulating valve (2) and the measuring valve (7), according to the drawing below.



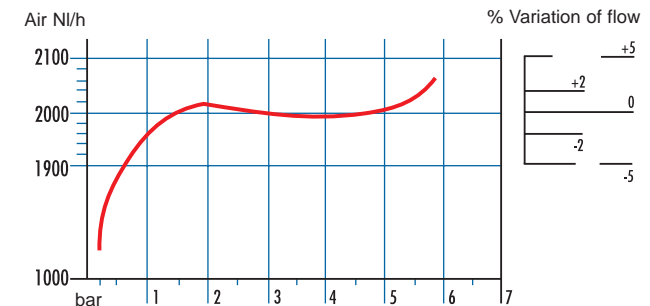
### Flow Curve

The flow curve shows the relationships between the inlet pressure  $P_0$  and the back pressure  $P_2$  in the RCA regulator. The different flows are adjusted by the regulating valve (7). The back pressure,  $P_2$ , in this case is atmospheric pressure. The flow is maintained practically constant when the pressure at the inlet is 200 mbar higher than the back pressure  $P_2$ .

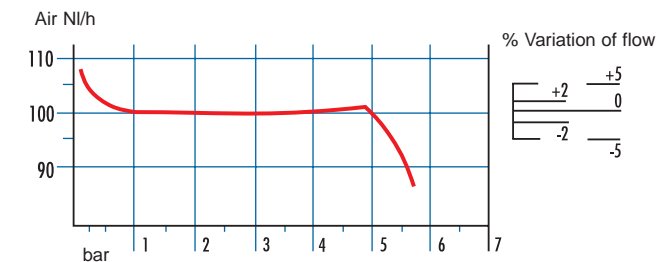


$P_0$  = Pressure at the inlet to the RCA Regulator (Low flow)

The dotted line shows the flow variation without the action of the pressure regulator. With variations of 100% at the inlet  $P_0$ , the variations of the flow are less than 1%. With high flow rates, the precision obtained is lower.



$P_0$  = Inlet pressure to the RCA Regulator (Large flow)



$P_2$  = Outlet pressure from the RCD Regulator (Low flow)

The above curves show the variation in flow and working pressure.

### Hydrostatic Level Meter

The model 2100 is suitable for many hydrostatic level measurement applications, including open tanks and closed, pressurised tanks.

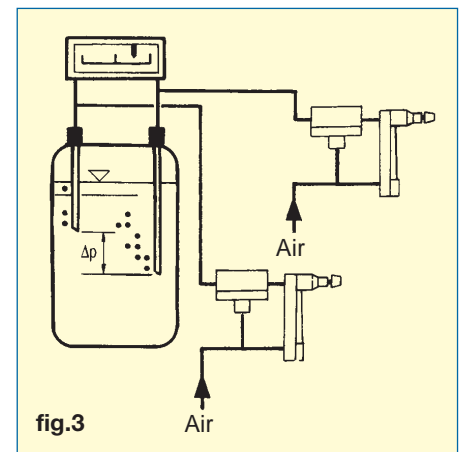
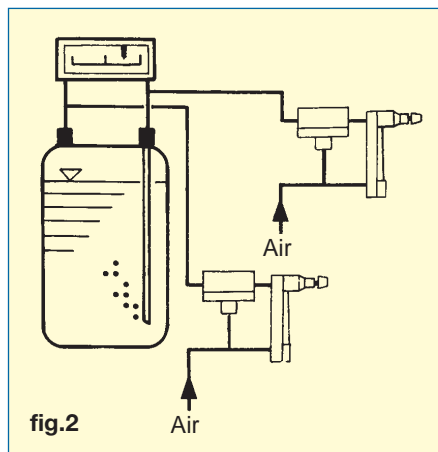
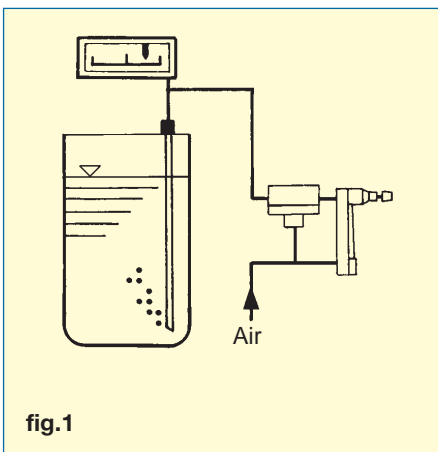
The probe is fed a constant flow of air (or gas) by the 2100/RCD system. The pressure of the air to the tube will always be equal to the hydrostatic head of the fluid. The pressure gauge therefore provides a direct reading of the level.

In the case of closed, pressurised tanks, two constant flow systems are required to provide a pressure difference that is equivalent to the level. This is necessary to compensate for any variations in the tank pressure.

### Open Tanks (fig.1)

The complete measurement system comprises of:

- A probe (tube) open at the bottom of the tank.
- A pressure gauge (or manometer) scaled in mm of water.
- A model 2100 flowmeter with RCD constant flow regulator.



### Closed Pressurised Tanks (fig.2)

The complete measurement system comprises of:

- Two probes, one open at the top of the tank and the other open at the bottom.
- A differential pressure gauge (or manometer) scaled in mm of water.
- Two model 2100 flowmeters with RCD constant flow regulator.

### Measurement of Density (fig.3)

The bubble tube systems described above can also be adapted to other measurements, such as density.

The differential pressure between two tubes with their openings a fixed distance apart will provide a measurement of the fluid density.

A 200mm difference in probe height is most commonly used. This will make a change in density of 0.1 g alter the differential pressure by 20mm Water.

### Adjustable magnetic switch 20 AMH

- From 2.5 - 25 l/h H<sub>2</sub>O, Float AC
- Hall effect detector (for low magnetic fields)
- Actuated by the magnet in the float
- Switch point adjustable over the full scale
- Shielded cable between the sensor and the electronics

### Electronics

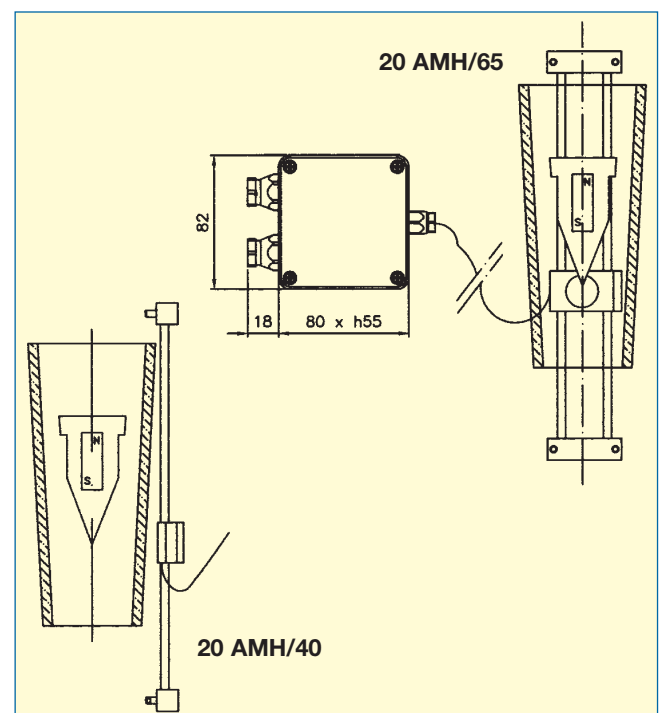
- Power supply: 24 V ac, 110 V ac, 230 V ac, 240 V ac 50-60 Hz, 24 V dc
- Power consumption: less than 1 VA

### Output Relay (switch over contact)

- Maximum voltage: 250 V
- Maximum current: 3 A
- Maximum power: 250 VA

**Series 20 AMH/40** protection (DIN rail 46121)

**Series 20 AMH/65** protection (Plastic housing)





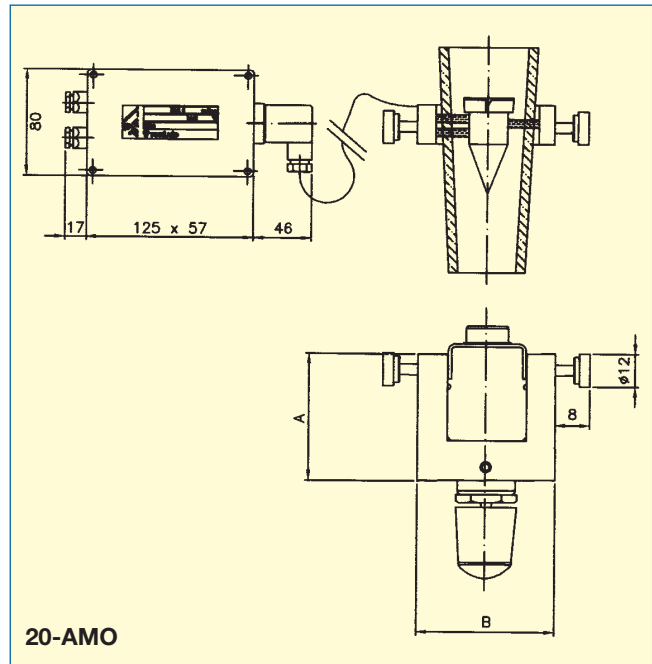
### Adjustable Optical Alarm, Series 20-AMO

Infra-red optical alarm, actuated by the float when it crosses the path of the beam. The sensor is mounted in a PVC support and has a switching relay in a separate aluminium enclosure.

- 20-AMO 1...2: 1...2 Adjustable Alarm contacts
- Power Supply: 220 V ac / 50Hz or 24V dc
- Load: 1A @ 220 V ac / 50Hz
- Temperature: -10°C to +80°C
- Hysteresis:  $\pm 5\%$  of full scale

#### Series 20-AMO

Series	A	B	C	Max Flow	
				NI/h Air	l/h Water
20-AMO	48	52	15	700	60



### Adjustable Inductive sensor, Series 20-AMD

Annular inductive sensor according to NAMUR and DIN 19234, mounted in a plastic box, actuated by the passing of the float.

- 20 AMD 1... 2: 1 or 2 adjustable sensor
- Power Supply: 8 V dc
- Temperature: -25°C to +70°C

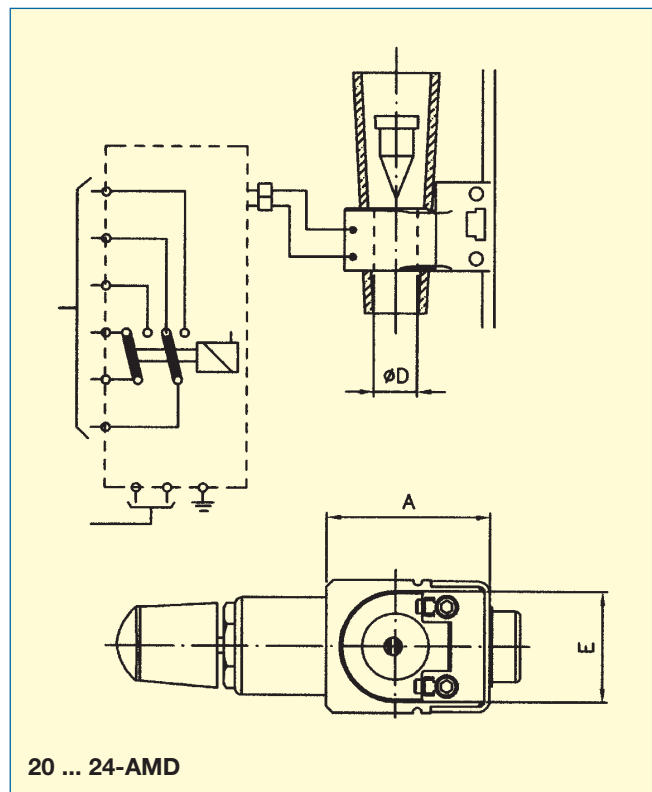
#### Control Relay / NAMUR (DIN 19234)

Model for 1 or 2 inductive alarms

- Power Supply: 24 ... 230 V ac 50-60Hz  
24 ... 250 V dc
- Control circuit is intrinsically safe to EEx ia IIC (Zone 0)
- Load: 2 ... 5 A ac / 40 V dc
- Temperature: -25°C to +70°C.

#### Series 20-AMD / 24-AMD

Series	A	øD	E	Max Flow	
				NI/h Air	l/h Water
20-AMD	37	15	25	300	10
24-AMD	87	21	45	2000	60



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