

## Glass Tube Variable Area Flowmeter

Series 6001/6002



### Flow Measurement of Gases & Clear Liquids with Series 6001 & 6002

#### Measurement Principle

Variable area obtained by the displacement of a float in a tapered borosilicate glass tube.

#### Applications

Commonly used in industry to measure the flow for:

- Water treatment
- Chemical processes
- Industrial refrigeration & air conditioning
- Research laboratories
- Gas burners
- Pilot plants
- Annealing furnaces

#### Benefits

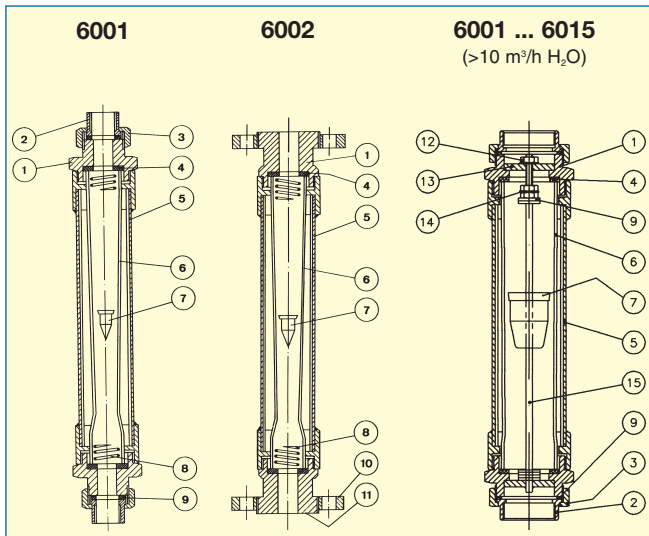
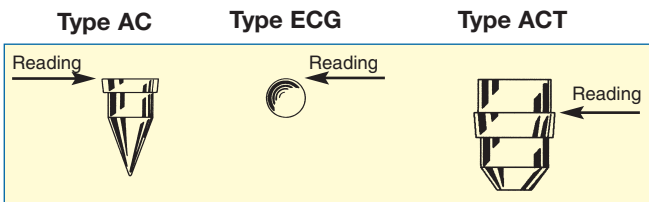
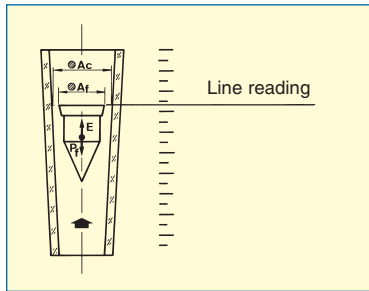
- Easy Installation, no straight pipe required
- Low pressure drop
- Scaled directly in l/h, l/min, kg/h, %, etc.
- Adjustable limit switches, in all scales, operated magnetically or with infrared light
- Flow measuring tube in borosilicate glass
- Steel construction, coated with Polyamide 11
- Connections in steel, EN 1.4404 (SS 316L), PVC, PTFE, etc.



## Operation

The fluid flows up through the tapered tube forcing the float to a position with sufficient free area to enable the flow to pass. This free area is related to the flow rate, the weight of the float and the density and viscosity of the fluid.

The pressure drop across the flow meter remains constant over the entire flow range. This occurs because the pressure drop is related to the fluid velocity and area of flow, the area of flow increases as the flow rate increases.



N°	Item	Materials			
		6001-Fe 6002-Fe	6001-INOX 6002-INOX	6001-PVC 6002-PVC 6009-PVC	6001-PTFE 6002-PTFE
1	End piece	Steel	EN 1.4404	PVC	Steel-PTFE/ PTFE
2	Connector	Steel	EN 1.4404	PVC	PTFE
3	Nut	Steel	Steel / EN 1.4404	PVC	Steel
4	Seal	NBR **	NBR **	NBR **	NBR **
5	Frame	Plastic coated Steel *	Plastic coated Steel / EN 1.4404	Plastic coated Steel *	Plastic coated Steel *
6	Flow Tube	Borosilicate glass	Borosilicate glass	Borosilicate glass	Borosilicate glass
7	Float	EN 1.4404	EN 1.4404	EN 1.4404 / PVDF-Lead / PVC-Lead	PVDF-Lead / PTFE-Lead
8	Float stop	EN 1.4401	EN 1.4401	PVC / PVDF	PTFE / PVDF
9	Seal	NBR **	NBR **	NBR **	NBR **
10	Flange	Steel	Steel / EN 1.4404	Steel / PVC	Steel / PTFE
11	Flange seat	Steel	EN 1.4404	PVC	PTFE
12	Nut	EN 1.4401	EN 1.4401	EN 1.4401 / PVC	EN 1.4401 / PTFE
13	Centering piece	EN 1.4404	EN 1.4404	EN 1.4401 / PVC	EN 1.4401 / PTFE
14	Washer	EN 1.4401	EN 1.4401	EN 1.4401 / PVC	EN 1.4401 / PTFE
15	Float guide	EN 1.4404	EN 1.4404	EN 1.4401 / PVC	EN 1.4401 / PTFE

- Note: EN 1.4404 = SS 316L, EN 1.4401 = SS 316

\* Frame also in EN 1.4404 on order

\*\* Gaskets also available in other materials

## Technical Data

- Connections:
  - 6001 threaded 1/2" to 3" BSP
  - 6002 flanged DN 15 to DN 80  
standard flanges according to DIN 2501, other flange standards and threaded end connections on demand.
- Length:
 

	Minimum	Maximum
6001	410 mm	510 mm
6002	380 mm	420 mm
- Accuracy: Class 1,6 according to VDI / VDE 3513, Sheet 2
- Scales graduated in l/h, l/min, kg/h, %, etc.
- Scale length 200 mm  $\pm 10\%$
- Rangeability 10:1
- Operating temperature:
  - Thermal shock resistance to 150°C
  - Recommended Maximum Differential Temp 80°C
  - Fluid temperature from -10°C ... +70°C
- Materials: according to table
- Frames:
  - Polyamide coated Steel, EN 1.4404 (SS 316L)
- Wetted parts:
  - Painted Steel, EN 1.4404, PVC, PTFE, PVDF, PP, etc.
- Floats:
  - For liquids in EN 1.4404, PVDF-Lead, PTFE-Lead, Titanium, etc.
  - For gases in Aluminium, PTFE, PVC, etc.
- Limit switches and electric transmitter:
  - 60-AMM 1...2 Magnetic actuated micro-switch
  - 60-AMD 1...2 Inductive proximity sensor
  - 60-AMO 1...2 Optical position detector
  - 60-AMR 1...2 Magnetic actuated reed switch
  - 60-AMH 1...2 Magnetic actuated HALL sensor
  - 60-TMUR 18 points Electric transmitter with 4-20 mA analog output. On request with HART, PROFIBUS, FIELDBUS Protocol



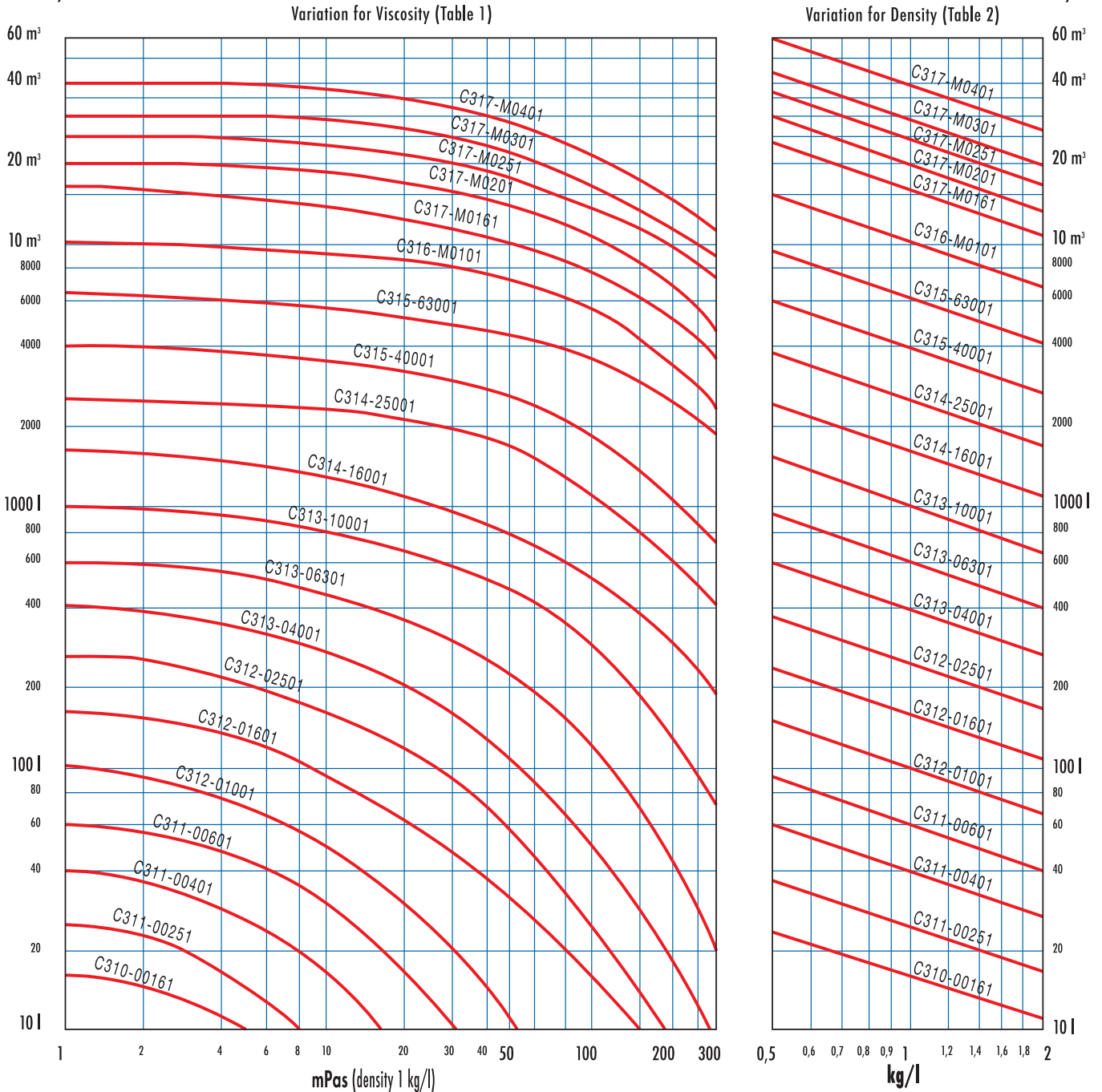
Metering Tube Series C	Measuring Ranges for Float Type AC						Max. Operating Pressure  bar	ΔP mm H <sub>2</sub> O		Tube  Length mm (±1mm)	Series 6001 6002  R" DN
	EN 1.4404 7.95 g/cm <sup>3</sup>			ALUMINIUM 2.85g/cm <sup>3</sup>				Float			
	Water 20°C l/h		Air@STP Nm <sup>3</sup> /h		Air@STP Nm <sup>3</sup> /h			EN 1.4404	ALUM.		
	Min.	Max.	Min.	Max.	Min.	Max.					
C311-0025	2.5	25	0.07	0.7	0.04	0.4	15	55	22	300	1/2" DN 15
C311-0040	4	40	0.11	1.1	0.07	0.7	15	55	22	300	
C311-0060	6	60	0.18	1.8	0.10	1	15	55	22	300	(M <sub>1</sub> )
C312-0100	10	100	0.30	3	0.17	1.7	15	90	35	300	1/2" DN 15
C312-0160	16	160	0.45	4.5	0.25	2.5	15	90	35	300	3/4" DN 20
C312-0250	25	250	0.7	7	0.4	4	15	90	35	300	(M <sub>1</sub> )
C313-04001	40	400	1.1	11	0.7	7	15	125	50	300	3/4" DN 20
C313-06301	60	630	1.8	18	1	10	15	125	50	300	
C313-10001	100	1000	3	30	1.7	17	15	125	50	300	1" DN 25 (M <sub>2</sub> )
C314-1600	160	1600	4.5	45	2.5	25	10	175	75	300	1 1/2" DN 40
C314-2500	250	2500	7	70	4	40	10	175	75	300	
C315-4000	400	4000	11	110	7	70	8	230	95	300	
C315-6300	500	6300	18	180	10	100	8	230	95	300	(M <sub>3</sub> )
C316-M010	1000	10000	30	300	17	170	6	300	125	300	2" DN 50
C316-M014	2000	14000	120	420	45	200	6	300	125	300	(M <sub>4</sub> )
C317-M016	1600	16000	45	450	25	250	5	400	170	300	2 1/2" DN 65
C317-M020	2500	25000	70	700	40	400	5	400	170	300	
C317-M030	3000	30000	90	900	50	500	5	400	170	300	3" DN 80
C317-M040	6000	40000	180	1200	100	712	5	400	170	300	(M <sub>5</sub> )

Metering Tube Series C	Measuring Ranges										Max. Op. Pressure  bar	ΔP mm H <sub>2</sub> O		Tube  Length mm (±1mm)	Series 6001 6002  R" DN
	Float Type AC					Float Type ECG						Float			
	EN 1.4404 7.95 g/cm <sup>3</sup>			GLASS 2.6 g/cm <sup>3</sup>			PLASTIC 1.25 g/cm <sup>3</sup>			EN 1.4404		Glass			
	Water 20°C l/h		Air@ STP NI/h		Water 20°C l/h		Air@ STP NI/h		Air@ STP NI/h						
Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.						
C30-00251	2.5	25	70	700	1	10	40	400	15	150	15	30	15	300	1/2" DN 15
C30-00401	4	40	120	1200	1.6	16	70	700	25	250	15	30	15	300	(M <sub>1</sub> )

## Equivalent flow curves for liquids with a different density or viscosity to water

FLOW /h

FLOW/h



### Examples:

#### Nº. 1 Variation for Viscosity (Table 1)

Flow 1000 l/h, viscosity 50 mPas. Enter the graph at the viscosity value and travel vertically to the point where it cuts the horizontal line at 1000 l/h. This point determines the tube selection and if it coincides with one of the curves, it is the value of maximum flow. If the point lies between two curves, it is optional to select either the upper or lower. The lower (C314-1600) will provide a maximum flow of 800 l/h and the upper (C314-2500) will provide a maximum flow of 1800 l/h.

#### Nº. 2 Variation for Density (Table 2)

Flow 1000 l/h, density 1.4 kg/l. Enter the graph at the 1000 l/h point. Move horizontally across to applicable flow tube line (C313-1000), travel the inclined line to the point of the density of the fluid (1.4 kg/l). Travel horizontally to the vertical axis and read the equivalent flow scale 800 l/h.

#### Nº. 3 Variation for Viscosity and Density

First, follow the steps in example 1, then follow the steps in example 2.

## Adjustable limit switches

**60-AMM ... 60-AMD**

DN	A
15-20	90
20-25	96
40	111
50	117
65-80	130

**60-AMR ... 60-AMO**

DN	B1	B2	B	C
15-20	50	31	81	56
20-25	52	35	87	70
40	60	41	101	96
50	71	45	116	112
65-80	84	52	136	135

## Adjustable limit switches

### Adjustable limit switch 60-AMM

(from 40-400 l/h Water & 0.7-7 Nm<sup>3</sup>/h Air)

Micro-switch contact, mounted in an aluminium enclosure, actuated by a magnetic field from the float.

- 60-AMM 1...2: 1...2 adjustable limit switches
- Ratings: 3(1) A, 250 V (VDE/CEE)
- Hysteresis:  $\pm 10\%$  of full scale value
- Ambient temperature:  $-25^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$
- Mechanical life:  $10^7$  Operations

Gold plated contacts on order.

**60-AMM**

COMMON  
 N.O.  
 N.C.



### Adjustable limit switch 60-AMD

(from 40-400 l/h Water & 0.7-7 Nm<sup>3</sup>/h Air)

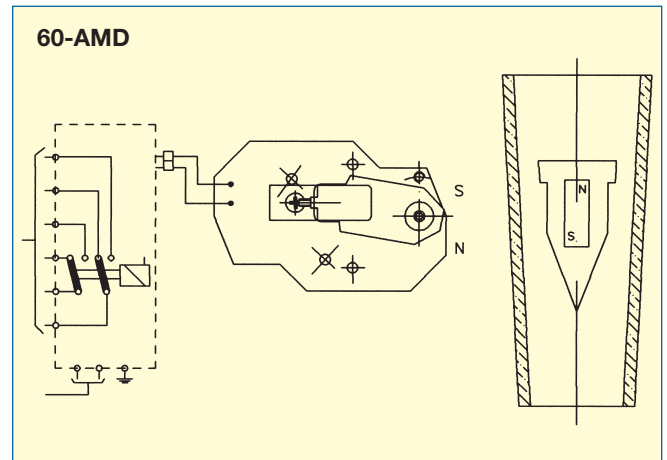
NAMUR (DIN 19234) 3.5 mm slot type inductive detector, activated by vane, mounted in an aluminium enclosure, actuated by a magnetic field from the float.

- 60-AMD 1...2: 1 ... 2 bi-stable limit switches
- Detector power supply: 8 V dc
- Ambient Temperature: -25°C to +70°C

#### Control relay (on demand)

NAMUR (DIN 19234) for 1 or 2 inductive detectors.

- Power Supply: 24...230 V ac 50-60 Hz  
24...250 V dc
- Input: NAMUR EEx ia IIC
- Output: 1 or 2 inductive detectors
- Output Rating: 2...5 A / 40 V dc
- Ambient temperature: -25°C to +70°C

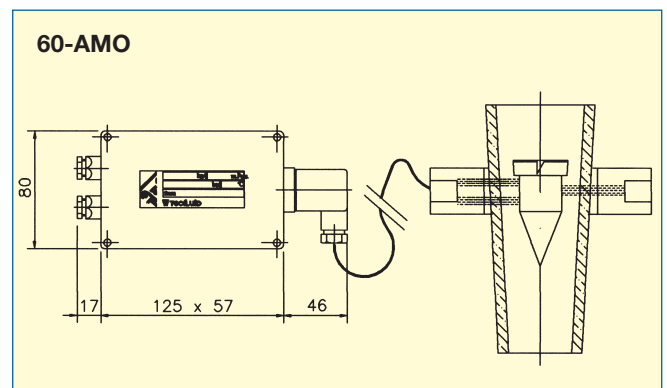


### Optical detector 60-AMO

(max. 6-60 l/h Water & 0.1-1 Nm<sup>3</sup>/h Air)

Optical contact, in infrared light, actuated by interruption of the beam by the float. Mounted in a PVC support, with the relay in a separate aluminium IP65 enclosure. The cable length between the control relay and sensor is 1,5m.

- 60-AMO 1...2: 1 ...2 adjustable detectors
- Power Supply: 24, 110, 220, 240 V, 50/60 Hz
- Load: 250VAC max., 2A max., 500VA max.
- Temperature: -10°C to +60°C
- Hysteresis: ±5% of full scale
- Standard: SPDT - Change Over



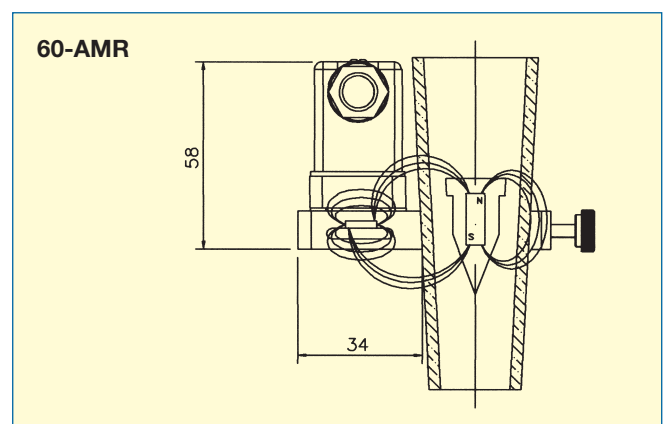
### Adjustable limit switches 60-AMR

(from 10-100 l/h Water & 0.17-1.7 Nm<sup>3</sup>/h Air)

Reed switch contact, mounted in a standard DIN 43650-A plastic connector, actuated by a magnetic field from the float.

- 60-AMR 1...2: 1...2 adjustable alarm contacts
- Load: 0,5A/250 Vdc/12 VA
- Temperature: -15°C to +60°C
- Hysteresis: ± 5% of full scale
- Standard: Normally Open

NOTE: for flow rates 10-100, 16-160 and 25-250 l/h Water and their equivalents in Air, a SS 316L frame must be used.

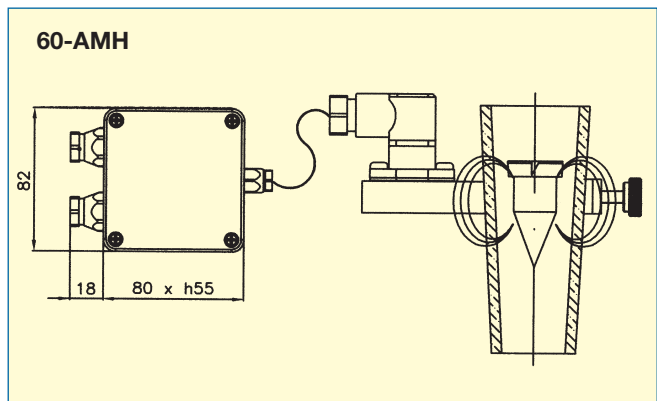


## Adjustable limit switch 60-AMH

HALL sensor, actuated by magnetic field from the float  
Bi-stable system, 4 wires cable (not included).

- 60-AMH 1...2 1 or 2 adjustable bi-stable sensors
- Power Supply: 230 Vac 50/60 Hz  
on request 240, 110, 24 Vac 50/60 Hz
- Load: 3A / 250 V
- Power Consumption: <1VA
- Temperature: -15°C to +60°C
- Hysteresis: ±5% of full scale

NOTE: On preparation



- Plastic IP65 enclosure (60-AMH/65)  
On request IP40 rail DIN46277 (60-AMH/40)

## Electric transmitter 60-TMUR 0 ... 4-20 mA output

(From 40-400 l/h Water and 0.7-7 Nm<sup>3</sup>/h Air)

Electric analog transmitter using a reed chain mounted in a plastic housing which screws onto flowmeter main body. Separate electronics mounted in a DIN 46277 rail mounting plastic case (IP 40).

- Power Supply: 220V, 110V, 24V 50-60 Hz or 24 Vdc
- Output Signal: 0-20 mA, 4-20 mA, 0-5 V, 0-10 V
- Connection: 4 wire, 2 wires on demand
- Number of Steps: 18 maximum for full output range
- Precision: +7% of full scale reading
- On request with HART, PROFIBUS, FIELDBUS Protocol

