



Applications

These time proven, rugged, metal tube flowmeters are suitable for a wide spectrum of installations. They can be utilized for metering the flow of liquids, gases and steam in the process industries, in the Chemical, Pharmaceutical and the Food industries especially when aggressive or opaque fluids are to be metered or in those applications where glass meter tube flowmeters cannot be installed because of safety considerations. They are indispensable where high pressure and/or high temperature operating conditions exist. The flowmeter operation is based on the variable area principle. The flowmeter primary section consists of a tapered metal meter tube and a float. A magnet embedded in the float transmits the instantaneous float position in the meter tube, which is a measure of the flowrate, over a decouple proof magnet follower system. The flowrate value can be read on the scale from the position of the pointer, which is mounted on a shaft (indicator section).

Flowmeter Primary Designs

- Standard design with stainless steel flanges, meter tube and float
- Steam jacket and food industry designs
- Sanitary design with threaded fittings per DIN 11851
- PTFE-design for all fluid wetted parts

Secondary Instrument Designs

- | | |
|---------|-----------------------------------------------|
| AM54_31 | Indicator with 4-20 mA output without display |
| AM54_32 | Indicator with 4-20 mA output with display |
| AM54_71 | Indicator without alarm signal |
| AM54_72 | Indicator with min. alarm signal |
| AM54_73 | Indicator with max. alarm signal |
| AM54_74 | Indicator with min. and max. alarm signal |

Armored Variable Area Flowmeter

Float Shapes

Float Shape "S":

Basic float shape with a "S" - float head.
 Low flowrates, minimum pressure drops, essentially viscosity immune, low upstream pressure requirements for gas metering.

Float Shape "N":

Basic float shape with a "N" - float head.
 Higher flow ranges, intermediate pressure drops, some viscosity sensitivity, higher upstream pressure requirements for gas metering.

Float Shape "X":

Basic float shape with a "X" - float head.
 Highest flowrates, highest pressure drops, strong viscosity sensitivity, highest upstream pressure requirements for gas metering.

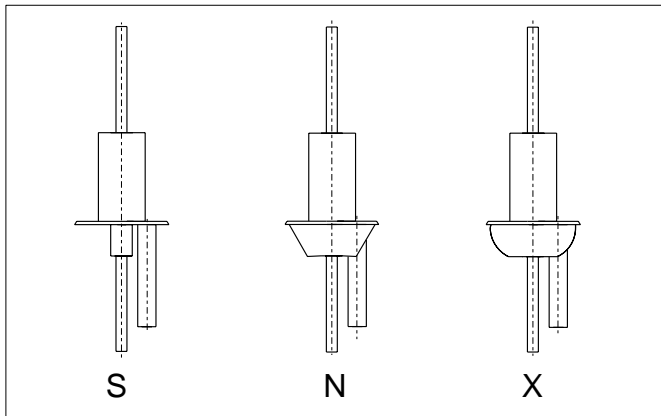


Fig. 1 Float Shape Overview

The flow range limits for the flowmeter sizes and various float shapes are listed in the Flow Range Tables beginning on Page 4.

The scales required for the user desired flowrates are created by using the original calibration data for the basic instrument together with the correction factor data from the ABB software program **Scales 54**.

Installation Recommendations

See also VDI/VDE-Guideline 3513 Sheet 3, Selection and Installation Recommendations for Variable Area Flowmeters.

Installation of the Flowmeter

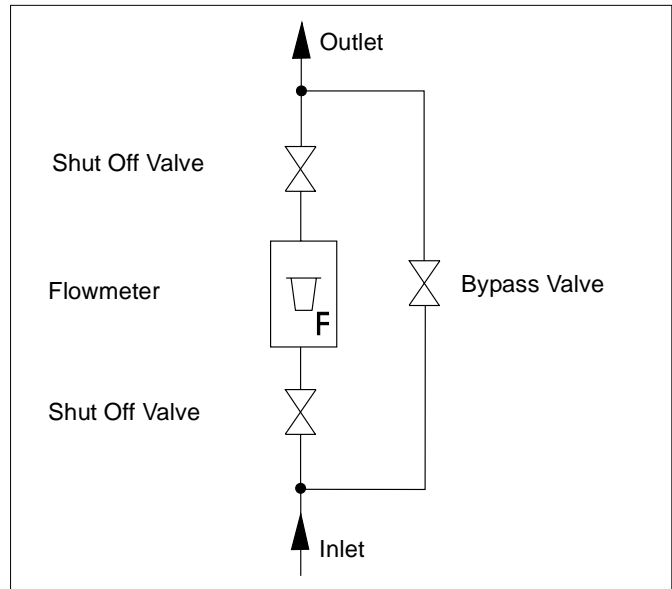


Fig. 2 Installation of a Flowmeter

The Variable Area Flowmeters AM54 are installed vertically in a pipeline. The flowmeter should be shielded from pipeline vibrations and strong magnetic fields. The pipeline size should correspond to the flowmeter connection sizes. In and outlet straight sections are not required.

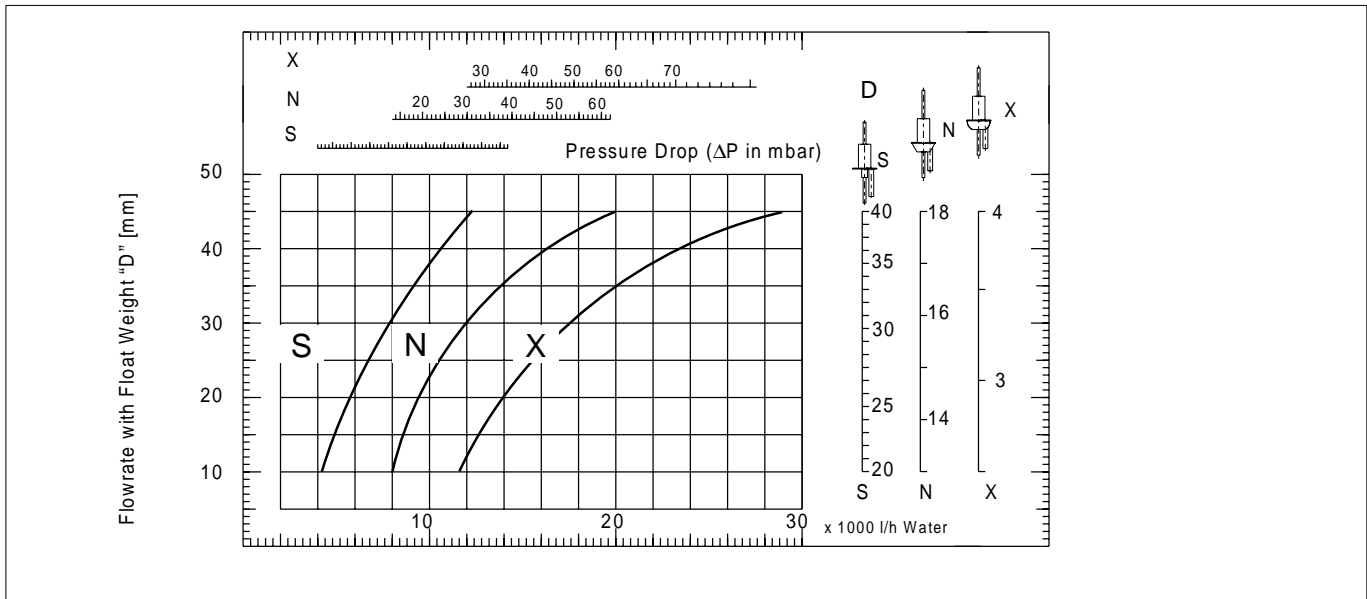


Fig. 3 Example, Flowrates as a Function of the Float Shape and Float Weight

Armored Variable Area Flowmeter

Accuracy and Operating Requirements

A variable area flowmeter is sized for specific operating conditions of the fluid. For liquids and gases these include the pressure and temperature related density and viscosity values at the operating conditions. For gases especially, this means a defined operating pressure and operating temperature. The accuracy specified for the instrument is always based on the values at the specified operating conditions.

Pressure Drop

The pressure in the flowmeter at the metering location must be greater than the pressure drop listed in the Flow Range Tables. The pressure drops due to the pipeline and any devices installed downstream from the flowmeter must be taken into consideration.

Damping of Float Bounce when Metering Gases

If the volume between the nearest throttling locations up and downstream of the flowmeter exceeds a specific critical volume, compression oscillations (float bounce) may occur. If the minimum required upstream pressure listed in the Flow Range Tables cannot be achieved, it is possible to add a gas damping option. See Fig. 4

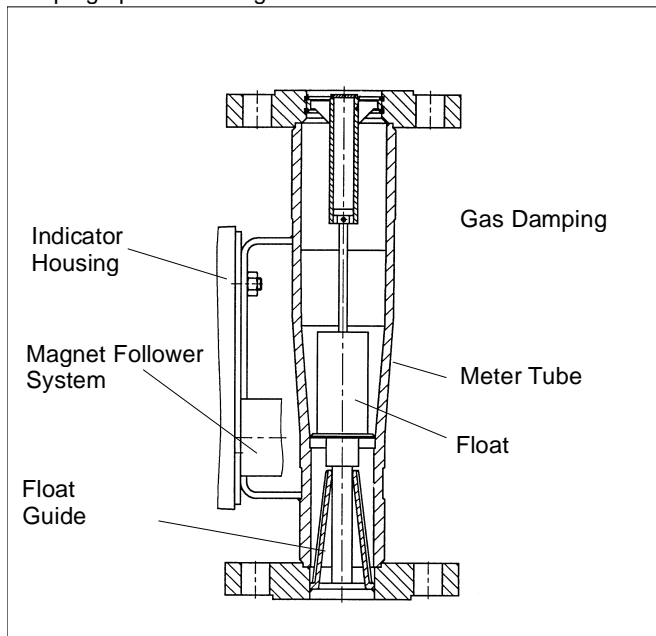


Fig. 4 Flowmeter with Gas Damping

To avoid self generated compression oscillations (float bounce) the following measures should be considered:

- Select a flowmeter with the lowest pressure drop.
- Keep the pipeline distance between the flowmeter and the nearest throttling locations to a minimum.
- Increase the operating pressure while taking into account the effect on the flowrate values due to the change in the operating conditions and the resulting density change of the gas.

Pressure Shocks

When metering gases the use of fast opening magnetic valves with unthrottled pipeline sections or when gas bubbles are present in liquids, pressure shocks or pulsations may result. The float may be accelerated forcibly against the upper float stop due to the sudden expansion of the gas in the pipeline. In certain situations the flowmeter may be damaged as a result. The gas damping option is not designed to compensate for pressure shocks.

Solid Particles in the Fluid

Variable area flowmeters are only suitable to a limited degree when solids are present in the fluid. As a function of the concentration of the solids, the particle size and the type of solids increased wear of the sensitive metering edge of the float may occur. Additionally, deposits which adhere to the float can change its weight and shape. These effects, dependent on the type of float installed, can lead to inaccuracies of the measurements. Generally a suitable filter is recommended for such applications.

When metering fluids which contain magnetic particles the installation of a magnetic separator upstream of the flowmeter is recommended. There are two designs available which are a function of the flowmeter size. During the installation of the flowmeter, they are placed between the inlet flange of the flowmeter and the mating flange on the pipeline.

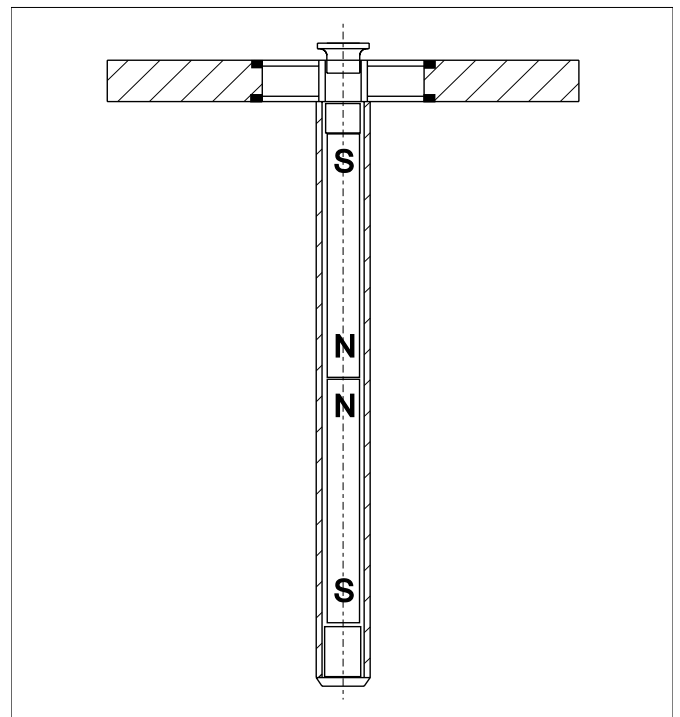


Fig. 5 Magnetic Separator (1/2" - 1" / DN 15 - DN 25)

Armored Variable Area Flowmeter

Flow Range Tables

| Installation Length 250 mm | | | | | | | | | | | | | | | |
|----------------------------|-----------------------------------------------------------------------------------|----|---------------|-----------------|-------------------------------------------------------------|------------------|-----------|-------|------------------------------------------|-------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----|--|--|
| Size | Flow Range End Value ¹⁾ l/h Water 1 kg/dm ³ , 1 mPa s | | | | Qn m ³ /h Air at 0°C; 1013 mbar ²⁾ | | | | Meter Tube /Float Identification Code | VIC ³⁾ | Pressure Drop ⁴⁾ [mbar] | Min. Required Upstream Press. for Gas Metering ⁵⁾ Damping [bar] w/o w/ ⁶⁾ w/ ⁷⁾ | | | |
| Inch (DN) | (GPM) | | | | (SCFM air 14.7psia, 70F) | | | | | | | | | | |
| 1/2" (15) | 28 (0.12) | to | 32 (0.15) | 0.83 (0.53) | to | 0.95 (0.60) | 15-250-K | 30 | 6 | 80 | 4.0 | 1.2 | 1.0 | | |
| | 37 (0.17) | to | 43 (0.19) | 1.10 (0.70) | to | 1.28 (0.81) | | 40 | 6 | 80 | 4.0 | 1.2 | 1.0 | | |
| | 44 (0.19) | to | 55 (0.24) | 1.30 (0.80) | to | 1.63 (1.00) | | 50 | 6 | 80 | 4.0 | 1.2 | 1.0 | | |
| | 56 (0.24) | to | 64 (0.29) | 1.66 (1.05) | to | 1.90 (1.20) | | 60 | 6 | 80 | 4.0 | 1.2 | 1.0 | | |
| 1/2" (15) | 77 (0.34) | to | 83 (0.37) | 2.29 (1.45) | to | 2.47 (1.57) | 15-250-L | 80 | 16 | 40 | 3.0 | 1.6 | 1.0 | | |
| | 96 (0.42) | to | 104 (0.46) | 2.85 (1.81) | to | 3.09 (1.96) | | 100 | 16 | 45 | 3.2 | 1.6 | 1.0 | | |
| | 115 (0.51) | to | 125 (0.55) | 3.42 (2.17) | to | 3.72 (2.36) | | 120 | 16 | 50 | 3.5 | 1.6 | 1.0 | | |
| | 144 (0.63) | to | 156 (0.69) | 4.28 (2.71) | to | 4.64 (2.94) | | 150 | 16 | 60 | 3.8 | 1.6 | 1.0 | | |
| | 188 (0.83) | to | 212 (0.93) | 5.59 (3.54) | to | 6.30 (3.99) | 15-250-S | 200 | 16 | 60 | 4.0 | 1.6 | 1.0 | | |
| | 235 (1.03) | to | 265 (1.17) | 6.98 (4.43) | to | 7.88 (5.00) | | 250 | 16 | 65 | 4.2 | 1.8 | 1.0 | | |
| | 282 (1.24) | to | 318 (1.40) | 8.38 (5.31) | to | 9.45 (5.99) | | 300 | 16 | 70 | 4.4 | 1.8 | 1.0 | | |
| | 376 (1.66) | to | 424 (1.87) | 11.17 (7.08) | to | 12.60 (7.99) | | 400 | 16 | 75 | 4.6 | 2.0 | 1.0 | | |
| | 470 (2.07) | to | 530 (2.33) | 13.97 (8.86) | to | 15.75 (9.99) | | 500 | 16 | 75 | 4.8 | 2.1 | 1.0 | | |
| | 565 (2.49) | to | 635 (2.80) | 16.79 (10.65) | to | 18.87 (11.96) | | 600 | 16 | 80 | 5.0 | 2.2 | 1.0 | | |
| | 750 (3.30) | to | 850 (3.74) | 22.29 (14.13) | to | 25.26 (16.02) | | 800 | 16 | 85 | 5.4 | 2.4 | 1.0 | | |
| 1" (25) | 280 (1.2) | to | 656 (2.9) | 8.32 (5.3) | to | 19.50 (12.4) | 250-1.050 | -S | 13 - 21 | 20 - 76 | 2.9-3.1 | 3.0-2.4 | | | |
| | 393 (1.7) | to | 870 (3.8) | 11.70 (7.4) | to | 25.85 (16.4) | | -N | 7 - 10 | 27 - 76 | 3.0-3.4 | 2.5-2.3 | | | |
| | 660 (2.9) | to | 1600 (7.5) | 19.38 (12.3) | to | 50.80 (32.2) | 250-1.113 | -S | 16 - 22 | 20 - 76 | 3.3-4.3 | 2.4-1.6 | | | |
| | 975 (4.3) | to | 2370 (10.4) | 28.98 (19.0) | to | 70.44 (44.7) | | -N | 8 - 10 | 27 - 82 | 3.3-5.3 | 2.1-1.9 | | | |
| 1" | 1650 (7.3) | to | 4020 (17.7) | 49.04 (31.1) | to | 119.50 (75.8) | 250-1.263 | -S | 17 - 26 | 20 - 76 | 4.2-6.4 | 1.9-1.7 | | | |
| | 2585 (11.4) | to | 6170 (27.2) | 76.83 (48.7) | to | 183.50 (116.3) | | -N | 8 - 10 | 27 - 82 | 5.2-8.0 | 1.8-1.6 | | | |
| 2" (50) | 4220 (18.6) | to | 12130 (53.4) | 125.40 (79.5) | to | 360.50 (228.6) | 250-1.330 | -S | 21 - 38 | 11 - 62 | 3.1-4.5 | 1.6-1.8 | | | |
| | 7940 (35.0) | to | 18460 (81.3) | 236.00 (149.6) | to | 548.60 (347.8) | | -N | 13 - 17 | 24 - 74 | 3.8-6.2 | 1.8-2.2 | | | |
| | 11760 (51.8) | to | 24200 (106.6) | 349.50 (221.6) | to | 720.00 (456.5) | | -X | 3 - 4 | 28 - 72 | 4.4-7.5 | 2.0-2.6 | | | |
| 3" (80) | 7000 (30.8) | to | 21010 (92.5) | 208.00 (131.9) | to | 624.40 (395.9) | 250-1.315 | -S | 22 - 54 | 6 - 48 | 3.4-5.4 | 1.4-2.0 | | | |
| | 18090 (79.7) | to | 35010 (154.2) | 537.70 (340.9) | to | 1040.00 (659.4) | | -N | 18 - 25 | 24 - 65 | 4.8-7.4 | 1.6-3.2 | | | |
| | 26750 (117.8) | to | 53810 (236.9) | 795.00 (504.1) | to | 1600.00 (1014.5) | | -X | 4 - 5 | 26 - 68 | 6.0-9.2 | 2.4-4.0 | | | |
| 4" (100) | 25000 | to | 50000 | 743.00 | to | 1486.00 () | 250-1.310 | -S | 60-81 | 28 - 74 | 4.0-6.0 | | | | |
| | 50000 | to | 120000 | 1486.0 | to | 3566.00 | 250-1.310 | -N | 24 | 42 - 95 | 7.0-9.0 | | | | |
| Installation Length 375 mm | | | | | | | | | | | | | | | |
| 2" (50) | 8000 (35.2) | to | 11000 (48.4) | 238.00 (145.0) | to | 327.00 (198.0) | 50-375-S- | 11000 | 36 | 40 - 80 | 3.0 | 1.6 | | | |
| | 11000 (48.4) | to | 15000 (66.1) | 327.00 (198.0) | to | 446.00 (260.0) | | 13000 | 36 | 80 - 100 | 4.0 | 1.6 | | | |
| | 15000 (66.1) | to | 21000 (92.5) | 446.00 (261.0) | to | 624.00 (365.2) | 50-375-N- | 18000 | 10 | 80 - 120 | 6.0 | 1.8 | | | |
| | 21000 (92.5) | to | 30000 (132.1) | 624.00 (365.2) | to | 892.00 (500.0) | | 26000 | 10 | 110 - 180 | 7.0 | 1.8 | | | |
| 3" (80) | 15000 (66.1) | to | 22000 (96.9) | 446.00 (270.0) | to | 654.00 (395.8) | 80-375-S- | 19000 | 40 | 30 - 60 | 5.0 | 1.6 | | | |
| | 22000 (96.9) | to | 34000 (149.7) | 654.00 (395.8) | to | 1011.00 (590.0) | | 28000 | 40 | 50 - 100 | 5.5 | 1.6 | | | |
| | 34000 (149.7) | to | 50000 (220.2) | 1011.00 (600.0) | to | 1485.00 (900.0) | 80-375-N- | 42000 | 12 | 60 - 100 | 7.0 | 2.0 | | | |
| | 50000 (220.2) | to | 75000 (330.3) | 1486.00 (900.0) | to | 2229.00 (1200.0) | | 62000 | 12 | 100 - 200 | 8.0 | 2.2 | | | |

Armored Variable Area Flowmeter

| Size Inch (DN) | Flow Range End Value ¹⁾ l/h Water 1 kg/dm ³ , 1 mPa s (GPM) | Qn m ³ /h Air at 0°C; 1013 mbar ²⁾ (SCFM air, 14,7psia, 70F) | Meter Tube /Float Identification Code | VIC ³⁾ | Pressure Drop ⁴⁾ [mbar] | Min. Required Upstream Press. for Gas Metering ⁵⁾ Damping [bar] w/o w/ ⁶⁾ w/ ⁷⁾ |
|------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------|-------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Installation Length 260 mm PTFE-Liner and PTFE-Float | | | | | | |
| 1 (25) | 270 (1.19) to 370 (1.63) | 8.02 (5.09) to 11.00 (6.97) | 25-250-ST-300 | 18 | 30 - 55 | 3.0 |
| | 370 (1.63) to 530 (2.33) | 11.00 (6.97) to 15.75 (9.99) | 500 | 18 | 35 - 60 | 3.2 |
| | 530 (2.33) to 750 (3.30) | 15.75 (10.0) to 22.29 (14.1) | 600 | 18 | 40 - 65 | 3.2 |
| | 750 (3.30) to 1050 (4.62) | 22.29 (14.1) to 31.21 (19.8) | 900 | 18 | 45 - 70 | 3.4 |
| | 1050 (4.62) to 1500 (6.61) | 31.21 (19.8) to 44.58 (28.3) | 1300 | 18 | 55 - 80 | 3.5 |
| | 1500 (6.61) to 2100 (9.25) | 44.58 (28.3) to 62.41 (39.6) | 1800 | 18 | 65 - 90 | 4.0 |
| | 2100 (9.25) to 3000 (13.21) | 62.41 (39.6) to 89.16 (56.5) | 2500 | 18 | 75 - 100 | 5.0 |
| Installation Length 375 mm | | | | | | |
| 2 (50) | 2850 (12.5) to 3550 (15.6) | 84.70 (53.7) to 105.50 (66.9) | 50-375-ST- 3200 | 26 | 40 - 80 | 4.0 |
| | 3550 (15.6) to 4450 (19.6) | 105.50 (66.9) to 132.20 (83.8) | 4000 | 26 | 45 - 85 | 4.2 |
| | 4450 (19.6) to 5450 (24.0) | 132.20 (83.8) to 162.00 (102.7) | 5000 | 26 | 50 - 90 | 4.5 |
| | 5450 (24.0) to 6750 (29.7) | 162.00 (102.7) to 200.60 (127.2) | 6000 | 26 | 60 - 100 | 4.8 |
| | 6750 (29.7) to 8250 (36.6) | 200.60 (127.2) to 245.20 (155.5) | 7500 | 26 | 70 - 110 | 5.2 |
| | 8250 (36.6) to 10000 (44.0) | 245.20 (155.5) to 297.20 (188.4) | 50-375-NT- 9100 | 16 | 90 - 130 | 6.4 |
| 3 (80) | 10000 (44.0) to 14000 (61.6) | 294.20 (186.5) to 416.10 (263.8) | 80-375-NT-12000 | 36 | 40 - 70 | 4.0 |
| | 14000 (61.6) to 19000 (83.7) | 416.10 (263.8) to 564.70 (358.0) | 16500 | 36 | 60 - 90 | 5.0 |
| | 19000 (83.7) to 27000 (118.9) | 564.70 (358.0) to 802.40 (508.8) | 23000 | 20 | 80 - 110 | 6.0 |

Armored Variable Area Flowmeter

Flow Range Tables Food Industry Design

The stringent cleaning requirements of the Food and Beverage industries, relative to biological concerns, resulted in a special design with connection fittings.

All fluid wetted parts are welded pore free and are polished. Gaps or other dead spaces do not exist. The instrument is suitable for cleaning or sterilization using steam, acids or caustics. Therefore the instrument is CIP-Capable.

Installation Length 250 mm

| Size | Maximum Flowrate l/h Water ²⁾ 1 kg/dm ³ , 1 mPa s | VIC ³⁾ | Pressure Drop ⁴⁾ [mbar] |
|-------|-------------------------------------------------------------------------------|-------------------|---------------------------------------|
| DN 50 | 3000 | 36 | 20 |
| SC 50 | 4000 | 36 | 30 |
| | 6000 | 36 | 50 |
| | 10000 | 10 | 70 |
| | 15000 | 10 | 100 |
| | 20000 | 12 | 60 |
| | 30000 | 12 | 100 |

Installation Length 375 mm

| | | | |
|-------|----------------|----|-----------|
| DN 80 | 34000 to 50000 | 12 | 60 to 100 |
| SC 80 | | | |

- 1) The flow range end values can be selected anywhere between the limits listed on the tables. The flow range is 10:1.
Example: Flow range end value 12 m³/h Water, flow range of the instrument 1.2 to 12 m³/h Water.
- 2) Conversion factor (reference value) for l/h Water to m³/h Air at 0 °C and 1013 mbar = 0.02972
- 3) Viscosity Immunity Ceiling (VIC), see Chapter "Flowmeter Size Selection".
- 4) The pressure drop values listed are based on the flow range end values in the tables.
- 5) Minimum required static pressure (abs) in the meter tube to avoid compression oscillations (float bounce).
The specifications of the minimum required pressure with and without damping are based on average installation conditions.
The values may be lower in favorable installations. In these installations the pressure drop can be considered to be the same as the minimum required pressure. In unfavorable installations these values may be higher.
See Chapter "Installation of the Flowmeter".
- 6) Damping with twisted guide rod: For flowmeter sizes 1/2" and 1" / DN 15 and DN 25.
- 7) Cylinder/piston damping: For flowmeter sizes 1/2" to 3" / DN 15 to DN 80.

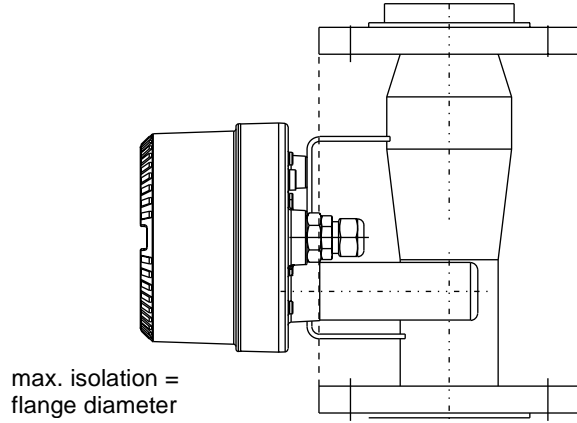
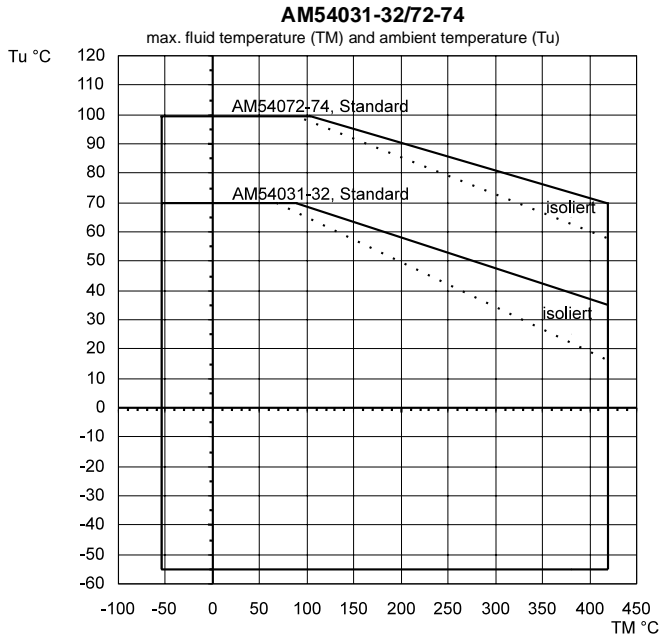
Specifications, Flowmeter Primary

| | |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Design | <ul style="list-style-type: none"> Standard Stainless Steel Design PTFE-Design Food Industry Design, Steam Jacket Design and High Temperature Design |
| Flow Range | <p>See Flow Range Tables</p> <ul style="list-style-type: none"> Water at 20 °C: 28 l/h to 120 m³/h (0,12 GPM to 528,4 GPM) Air at 0 °C and 1013 mbar: 0.83 to 3566 m³/h Qn (Air 14,7psia, 70deg F0,53-2261 SCFM) |
| Flow Span | 10:1 |
| Scales | <ul style="list-style-type: none"> Percent scale Direct reading scale (user selectable flowrate units) (for model AM54_71/74) |
| Accuracy | <ul style="list-style-type: none"> Standard ±1,6% of full scale (VDI 3513 class 1,6) With PTFE-Liner: ±2,5% of full scale (VDI 3513 class 2,5) |
| Connections | <ul style="list-style-type: none"> Standard: <ul style="list-style-type: none"> Flanged DIN 2501 (DN15 - DN100) Flanged DIN 2512 (DN15 - DN100) ANSI (1/2 - 4") Steam jacket: <ul style="list-style-type: none"> Flanged DIN 2501 (DN25 - DN100) ANSI (1/2 - 4") Threaded fittings DIN 11851 (SC 25 - SC 80) |
| Steam Jacket Connections | Internal threads R 1/4 ", on rear of flowmeter primary |
| Pressure Rating | <ul style="list-style-type: none"> Standard pressure rating: PN 40 (PN16 for U") Flanged per DIN 2501: PN 40, PN 63 (PN 16, DN100 for installation length 250 mm) Flanged per DIN 2512: PN 40, PN 63 Flanged per ANSI B 16.5: CL 150 RF, CL 300 RF |
| Max. Allow. Pressure | <p>64 bar (600 lb)</p> <p>Higher pressures upon request</p> |
| Installation Lengths | <ul style="list-style-type: none"> Standard: <ul style="list-style-type: none"> 250 mm (1/2" - 4" / DN 15 - 100) 375 mm (2" and 3" / DN 55 and DN 80) Steam jacket: <ul style="list-style-type: none"> 250 mm (1/2" - 3" / DN 15 - 80) PTFE-Liner: <ul style="list-style-type: none"> 260 mm (1" / DN 25) 375 mm (2" and 3" / DN 50 and 80) Threaded fittings DIN 11851 <ul style="list-style-type: none"> 270/272 mm (2" - 3" / DN 50 - 80), 1/2" & 1" / DN 15 + DN 25 upon request Food Industry design with threaded fittings DIN 11851(suitable for CIP-Cleaning) <ul style="list-style-type: none"> 315 mm (2" / DN 50) 451 mm (3" / DN 80) |
| Materials | <ul style="list-style-type: none"> Meter tube: <ul style="list-style-type: none"> SS 316 Ti / No. 1.4571 (Standard) PTFE Meter tube: <ul style="list-style-type: none"> SS 316 Ti / No. 1.4571 (Standard) PTFE Flange: <ul style="list-style-type: none"> SS 316 Ti / No. 1.4571 Float: <ul style="list-style-type: none"> SS 316 Ti / No. 1.4571 (Standard) SS 316 Ti / No. 1.4571 / Hastelloy C float head PTFE PTFE / Hastelloy C float Gas damping: <ul style="list-style-type: none"> SS 316 Ti / No. 1.4571 Indicator housing: <ul style="list-style-type: none"> Aluminum powder coated Housing gasket: (O-Ring) <ul style="list-style-type: none"> Buna N Sight window: <ul style="list-style-type: none"> Safety glass |

Armored Variable Area Flowmeter

Temperature Ranges

- Allowable fluid temperature: (T_F)
-55% to +420 °C Standard (-67°F to 788°F)
-20 to +125 °C for PTFE-Liner (-4°F to 260°F)
- Allowable ambient temperature: (T_A)
-40 to +100 °C (-40°F to 212°F) (for Ex data see page 14)



Gas Damping

Used for pulsating or unstable flows and to avoid compression oscillations (float bounce) when metering gases at low pressures

Protection Class per DIN EN 60529

IP 67

Weight [kg]

Standard

| Model | Design | Flowmeter Primary Size | | | | |
|---------|--------------|------------------------|-------------|-------------|-------------|--------------|
| | | 1/2" DN 15 | 1" DN 25 | 2" DN 50 | 3" DN 80 | 4" DN 100 |
| AM54_7 | Standard | 3.9 | 5.8 | 10.7 | 15.7 | 34 |
| | Steam Jacket | 3.9 | 5.8 | 10.7 | 15.7 | 34 |
| AM54_31 | Standard | 4.5 | 5.8 | 10.7 | 15.7 | 34.1 |
| | Steam Jacket | 4.5 | 5.8 | 10.7 | 15.7 | 34.1 |
| AM54_32 | Standard | 4.6 | 5.9 | 10.8 | 15.8 | 34.2 |
| | Steam Jacket | 4.6 | 5.9 | 10.8 | 15.8 | 34.2 |

Certifications

- Pressure test
- Welder, dye penetrant and process tests
- Material Certificates EN 10204-3.1B

Ex-Ausführung

- II 2G EEx ib IIC T6 or II 3G EEx n [L] IIC T6 TÜV 00 ATEX 1576 (see page 13)
- II 2G EEx d IIC T6 and FM/CSA in preparation

AM54_7_ Indicator with/without Alarm Signal



Fig. 6 AM54_7_

Description

The secondary for the Variable Area Flowmeter AM54_7_ is available with a mechanical indicator with/without alarms. The following design options are offered:

- AM54_71; Indicator without additional features
- AM54_72; Indicator with min. alarm signal
- AM54_73; Indicator with max. alarm signal
- AM54_74; Indicator with min./max. alarm signal

Design Features

- Two housing designs:
 - Non-Ex- and Ex-Design (II 2G EEx ib IICT6) or (II 3G EEx n [L] IIC T6)
 - Ex-Pressure tight housing design (II 2G EEx d IIC & FM,-CSA-Approvals) in preparation
- Alarm signal as a compact subassembly for later upgrade.
- Indication of the alarm settings visible from the outside.
- Alarm settings made at the scale.
- Ball bearing, decouple proof and hysteresis free magnet follower system.
- Instrument satisfies the NAMUR-Recommendations for Compatibility of Equipment in Processes and Laboratory Technology 5/93 and EMC-Guideline 89/EWG.
- Difference between min.- and max. alarm signals < 5 %.
- Assembly and disassembly of the secondary and the primary is possible without opening the indicator housing.
- Reproducibility +/- 0.25 % of max.
- Round indicator housing.

Alarm Signal Output for AM54_72/74

The alarm is actuated by the movement of a contact disc into the slit initiator (active surface is covered). The contact opens. The alarm setting can be adjusted without shifting or removing the scale. The switch settings are visible from the outside.

| | |
|---------------------|------------------------------|
| Operating mode | Bistable |
| Reproducibility | +/- 0.5 % of scale end value |
| Nominal voltage | 8 V DC (Ri approx. 1 kΩ) |
| Operating voltage | 5 - 25 V |
| Switching frequency | 3 kHz |

A Transmitter Power Supply is required for the Alarm Signal Output - Examples

| Amplifier | Supply Power | Channel |
|-----------------------------------|--------------|---------|
| KFD2-SR2-Ex1.W No. D163A011U03 | 24 V, DC | 1 |
| KFA5-SR2-Ex1.W No. D163A011U01 | 115 V, AC | 1 |
| KFA6-SR2-Ex1.W No. D163A011U02 | 230 V, AC | 1 |
| KFD5-SR2-Ex2.W No. D163A011U06 | 24 V, DC | 2 |
| KFA5-SR2-Ex2.W No. D163A011U04 | 115 V, AC | 2 |
| KFA6-SR2-Ex2.W No. D163A011U05 | 230 V, AC | 2 |

Armored Variable Area Flowmeter

Indicator with electrical transmitter without/with display AM54_31/AM554_32



Fig. 7 AM54_31/AM54_32

Description

The suspension flowmeter AM54_31/_32 is fitted on its secondary side with an indicator in the form of an intelligent 2-wire microprocessor transmitter. The following design versions are available:

- AM54_31; indicator with 4-20 mA electrical transmitter, without display
- AM54_32; indicator with 4-20 mA electrical transmitter, with display

Design features

- Flow indicator or flow total (AM54_32 unit).
- Display can be fitted as add-on.
- Electronic Min./Max. device alarm
- Menu-guided parameter setting (AM 54_32 unit).
- Parameter setting by means of HART communication via hand-held terminal or SMART-VISION.
- Electronics as compact module. Interchangeable.
- Electronic linearization of flow characteristic.
- Menu-guided parameter setting of the device by magnetic pin with housing closed (AM54_32 unit).
- Freely configurable display (AM54_32 unit).
- For connection to all primary device design models.
- Two housing versions:
 - For non-hazardous and hazardous environments (II 2G EEx ib IIC T4) or II (3G EEx n [L] IIC T4)
 - Explosion-proof housing version for hazardous environments (II 2G EEx d IIC T6 & FM/CSA Approval) in preparation.
- 1 unit for intrinsically safe and non-intrinsically safe installation.

Communication by HART protocol

The HART protocol provides digital communication between a process control system/PC, a hand-held terminal and the TRIO-WIRL. It can be used to transfer all device and measuring point parameters from the transmitter to the process control system or PC. In the opposite direction, it can also be used to reconfigure the transmitter.

The digital communication is effected by means of an alternating current superimposed on the analog output (4-20 mA) which does not affect the connected evaluation units. The SMART-VISION program can be used for operator control and configuration.

SMART-VISION is a universal communications software program for intelligent field devices which utilizes various communication channels, thereby permitting data exchange with a full range of field devices. The main targets for application are in parameter display, configuration, diagnostics, documentation and data management for all intelligent field devices which themselves conform to the communication requirements.

The following communication options and channels can be realized:

HART communication

1. via FSK modem in point-to-point- or multidrop mode.
2. via ABB Automation Products HART multiplexer.

SMART-VISION runs on standard modern PCs or notebooks under MS Windows version 3.1, MS Windows 95/98 or MS Windows NT.

Transmission mode

FSK modulation to 4 - 20 mA current output to Bell 202 Standard. max. signal amplitude 1.2 mA_{SS}.

Current output load

Min. >250 Ω, max. 750 Ω

Max. cable length 1500 m AWG 24 twisted and shielded

Baud rate

1200 Baud

Display log. 1: 1200 Hz

Display log. 0: 2200 Hz

Current output in case of alarm

high = 21 - 23 mA. Adjustable

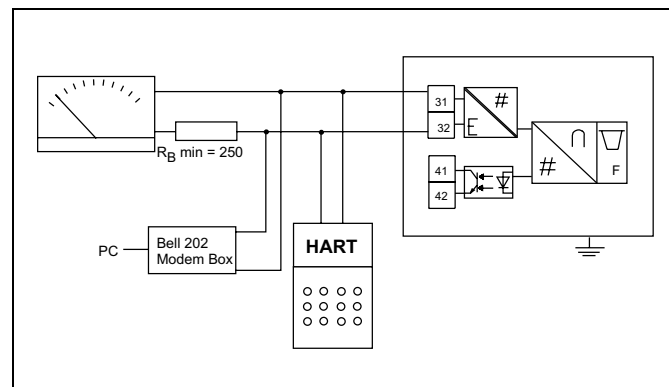


Fig. 8 HART communication

Indicator with electrical transmitter without/with display AM54_31/AM54_32

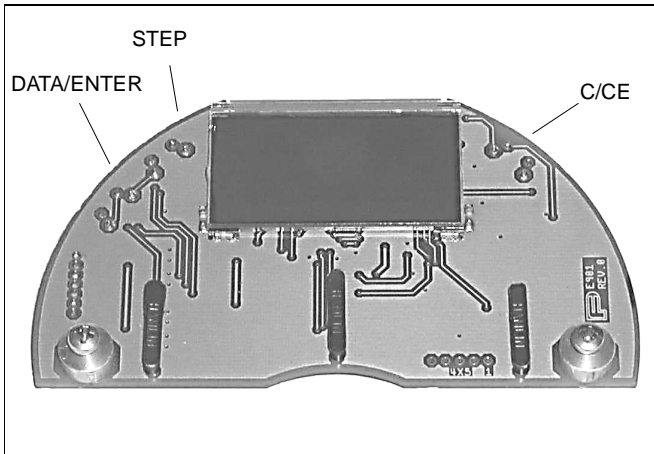


Fig. 9 Keypad and display of transmitter (AM54_32).



Important note

When the transmitter housing is open EMC protection is limited!

Data backup

Storage of counts and measuring point-specific parameters by EEPROM (over 10 years without auxiliary power), in case of shutdown or failure of power supply.

Function tests

Internal software function tests can be used to test individual internal modules. For commissioning and checking, the current output can be simulated according to self-selected flow rates (manual process control). The binary output can also be activated directly for function checking.

Damping

Adjustable from 1 to 100 s, acc. to 5τ .

Creep feed shutoff

0 - 5 % for current and pulse output

Auxiliary power

Standard: 14 to 28 V DC

Hazardous environments version: 14 to 28 V DC

Residual ripple: max. 5 % or $\pm 1.5 V_{SS}$

Power consumption

< 1 W

Replacement of electronics

The electronics can be replaced in the event of a fault.

Settings are immediately updated when the unit is switched on.

Output signals

Current output for flow signal
4-20 mA, load $\leq 750 \Omega$

Binary output

The function of the binary output is selectable by way of the software:

- Flow limit alarm: Min, Max or Min-Max
- System alarm
- Pulse output: fmax 50 Hz;
Pulse width: 5 ms - 256 ms
- Standard: Optocoupler $U_H = 16-30 V$,
 $I_L = 2-15 mA$
- Hazardous environment „ib“: Configured as NAMUR contact

Display (version AM54_32)

High-contrast LC display. For display of instantaneous flow rate and total flow.

By way of the multiplex function it is possible to display 2 values (e.g. flow rate and total flow) in effect in parallel.

Data is entered by 3 keys or directly from the outside with the housing closed using a magnetic pin.

Data is entered in plain text dialog with the display or by digital communication via the HART protocol.

Error message on display

Automatic system monitoring with plain-text error diagnosis on the display and an error message.

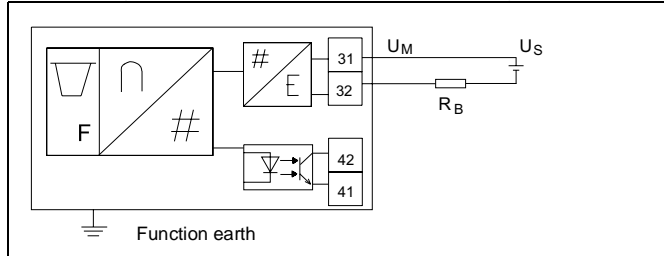
Armored Variable Area Flowmeter

Technical data

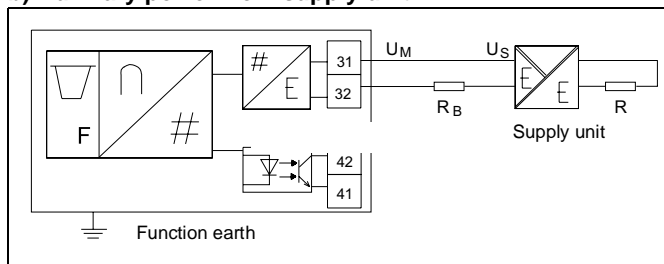
Transmitter - Electrical connection of standard design version

The transmitter is of 2-wire design, which means the power supply and measurement signal (4-20 mA) are sent over the same wires.

a) Auxiliary power from central power supply



b) Auxiliary power from supply unit



U_M = Supply voltage = min. 14 V DC

U_S = Feed voltage = 14-28 V DC

R_B = Max. permissible load for supply unit (e.g. indicator, load)

R = Max. permissible load for output circuit, determined by supply unit

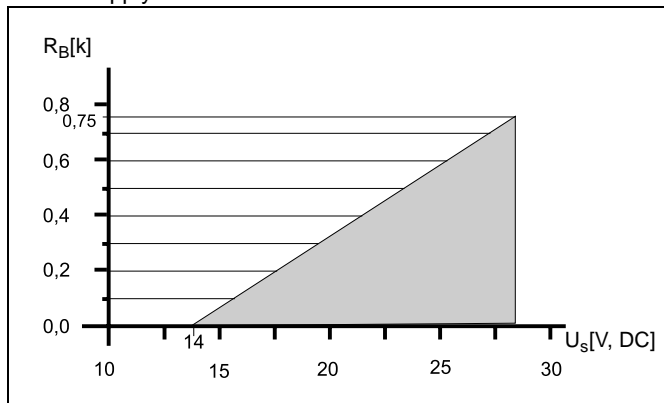


Fig. 10 Loading diagram, current output Load over auxiliary power

Programmable output

Terminals 41/42 can be freely programmed.

The following options can be programmed by way of the „Prog output“ software:

1. Pulse output

The standardized pulse output (passive) is executed as a Namur contact (to DIN 19234). The internal resistance with the contact open is $> 10 \text{ k}\Omega$. The pulse width is adjustable in another menu from 5 to 256 ms. Max. frequency $f_{\text{max}} = 50 \text{ Hz}$.

2. Collective alarm

Error states of the device and Min-Max alarms are collected for output.

3. Min-Max alarm

The Min-Max alarm can be programmed as NC or NO.

4. No function

The output has no function. (standard factory adjusted)

The following limits apply:

Max. permissible switching current = 15 mA

Min. output voltage = $U_H - 2V$

U_H = Voltage of auxiliary power source

Current output terminals: Terminals 31/32

At these terminals a 4 - 20 mA output signal is delivered. The supply voltage (14 - 28 VDC) is also connected to them. Fig.a

The digital communication (HART protocol or SMART-Vision) is via terminals 31/32, with an AC signal superimposed on the 4 - 20 mA output signal. For more details refer to the section titled „Communication: HART protocol/SMART-Vision“. (Fig. 8)

Armored Variable Area Flowmeter

Technical data, AM54171-74 hazardous environments version:

EC type sample test certificate:
TÜV 00 ATEX 1576

Marking:



II 2G EEx ib IIC T6 bzw.
II 3G EEx n [L] IIC T6

Ambient temperature:

The correlation between the temperature class, permissible ambient temperature and maximum measurement material temperature is shown in diagrams on page 14:

For details of the correlation between the temperature class, permissible ambient temperature and maximum measurement material temperature refer to the EC type sample test certificate.

Safety data

Limit value contacts terminals 41/42, 51/52

Terminals 41, 51 → +

The permissible maximums of protection type

II 2G EEx ib IIC T6:

U_i = 16 V
I_i = 25 mA
P_i = 64 mW
C_i = 50 nF
L_i = 250 µH

II 3G EEx n [L] IIC T6:

U_m = 16 V
I_m = 25 mA

Suspension flowmeters operated in guaranteed conformance with the maximums in category 3 (zone 2) may subsequently be operated unmodified in category 2 (zone 1), in conformance with the applicable maximums.

Technical data

Hazardous environments version AM 54131/32

EC type sample test certificate:
TÜV 00 ATEX 1576

Marking:



II 2G EEx ib IIC T6 bzw.
II 3G EEx n [L] IIC T6

Model AM5413__ can only be used in temperature classes T1 to T4.

Hazardous environments approval data II 2G EEx ib IIC T4 Terminals 31/41

| | |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power supply Terminals 31/32 U _m = 60 V | U _i = 28 V I _i = 110 mA P _i = 770 mW C _i = 4,2 nF C _i /P _A = 6 nF L _i = 270 µH |
| Switching output Terminals 41/42 U _m = 60 V | U _i = 15 V I _i = 30 mA P _i = 115 mW C _i = 3,6 nF C _i /P _A = 3,6 nF L _i = 133 µH |

Hazardous environments approval data II 3G EEx n [L] IIC T4

| | |
|-------------------------------------|------------------------------------------------|
| Power supply Terminals 31/32 | U _m = 60 V I _m = 35 A |
| Switching output Terminals 41/42 | U _m = 60 V I _m = 35 A |

Suspension flowmeters operated in guaranteed conformance with the maximums in category 3 (zone 2) may subsequently be operated unmodified in category 2 (zone 1), in conformance with the applicable maximums.

Armored Variable Area Flowmeter

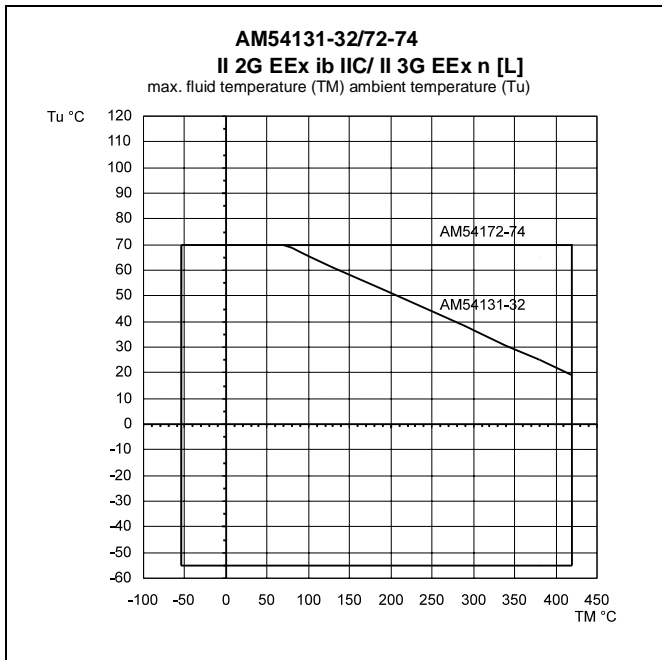


Abb. 11

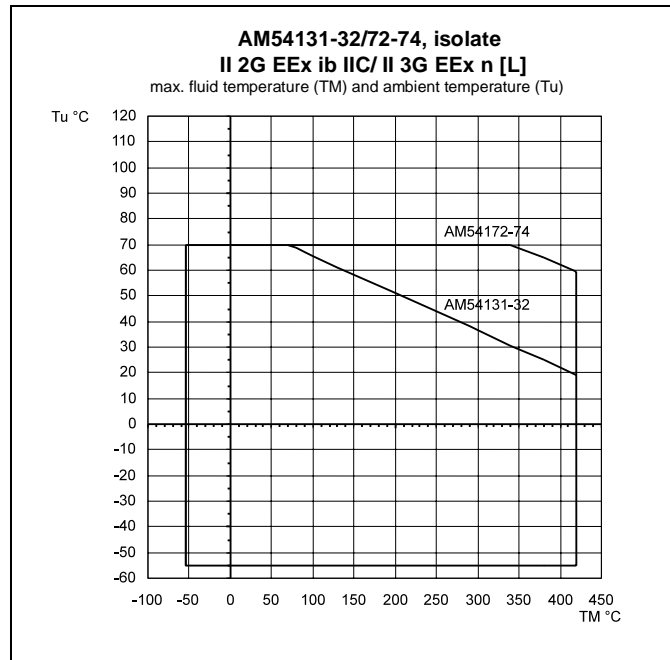


Abb. 13

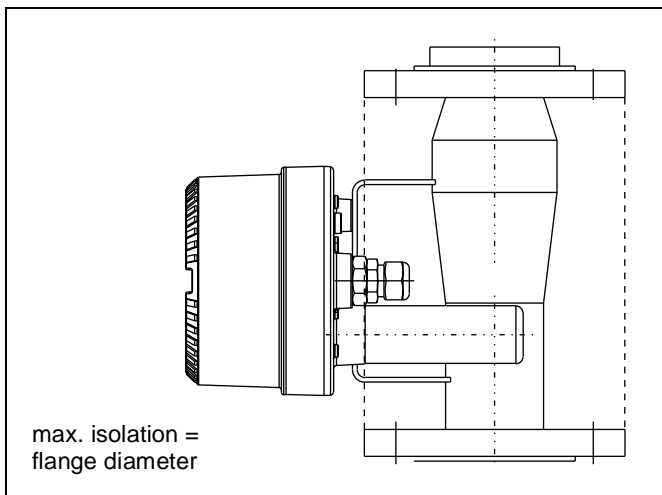


Abb. 12

Fluid temperature

| temperature classes | 5413_ | 5417_ |
|---------------------|--------|--------|
| T1 | 420 °C | 420 °C |
| T2 | 290 °C | 290 °C |
| T3 | 195 °C | 195 °C |
| T4 | 130 °C | 130 °C |
| T5 | - | 95 °C |
| T6 | - | 80 °C |

Fluid temperatures at therm. isolated Aufnehmer see EC type sample test certificate:

Ordering Information Armored Flowmeter AM54

Please supply the following information: Flowmeter Model Number, Ordering Number, flowmeter size, scale design, fluid, max. flowrate, density and viscosity at operating temperature, operating and maximum pressure and temperature

| Ordering Number | AM54 | | | | | | |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--|--|--|--|---|---|
| Equipment Approvals (04) | | | | | | | |
| None | 0 | | | | | | |
| Intrinsic Safety, Zone 1, Non Sparking Zone 2 | 1 | | | | | | |
| Pressure Tight or Intrinsic Safety, Zone 1, Non Sparking Zone 2* | 2 | | | | | | |
| FM/CSA-Approval, Class I Div 1* | 3 | | | | | | |
| Secondary Instrument (Indicator) (05) | | | | | | | |
| Indicator with electronic converter 4-20 mA, without display | 31 | | | | | | |
| Indicator with electronic converter 4-20 mA, with display | 32 | | | | | | |
| Indicator without alarm signal | 71 | | | | | | |
| Indicator with min. alarm signal | 72 | | | | | | |
| Indicator with max. alarm signal | 73 | | | | | | |
| Indicator with min. and max. alarm signal | 74 | | | | | | |
| Connectors for Secondary Instrument (06) | | | | | | | |
| M20 x 1.5 + connector. (not (04) 2 and 3) | | | | | | 1 | |
| 1/2" NPT (for (04) 2 with „d“-connectors) | | | | | | 2 | |
| Others | | | | | | 9 | |
| Design Level (07) | | | | | | | |
| Flowmeter primary instrument | | | | | | | F |
| Design Level (08) | | | | | | | |
| Secondary instrument | | | | | | | A |
| Material, Indicator Housing – Meter Tube (09) | | | | | | | |
| Aluminum – 316 Ti / 1.4571 | | | | | | | 1 |
| Other materials | | | | | | | 9 |
| Meter Tube Design (10) | | | | | | | |
| Standard, | Installation length 250 mm, 1/2" - 4" / DN 15 - 100 | | | | | | A |
| | 375 mm, 2" and 3" / DN 50 and DN 80 | | | | | | B |
| Steam Jacket, | Installation length 250 mm, 1" - 4" / DN 25 - 100 (not for (01), 1, 2, 3); meter size 1/2" to 3" | | | | | | D |
| PTFE-Liner | Installation length 260 mm, 1" / DN 25 | | | | | | T |
| | 375 mm, 2" & 3" / DN 50 + 80 | | | | | | S |
| Food Ind. Dsg. Std. | Installation length 250 mm, 1" - 3" / DN 25 - 80 | | | | | | U |
| Food Ind. CIP-Capable | Installation length 250 mm, 1" - 3" / DN 25 - 80 | | | | | | F |

* in preparation

Armored Variable Area Flowmeter

Ordering Information Armored Flowmeter AM54

Please supply the following information: Flowmeter Model Number, Ordering Number, flowmeter size, scale design, fluid, max. flowrate, density and viscosity at operating temperature, operating and maximum pressure and temperature

| Ordering Number | | AM54 | | | | | | |
|-----------------------------------------------------------------|----------------------------------------|------|--|--|--|--|---|---|
| Meter Connection Size / Meter Tube – Orifice Size (11) | | | | | | | | |
| Standard | 1/2" DN 15 / 1/2"- DN 15 meter tube | | | | | | | A |
| | 1/2" DN 15 / 1/2"- DN 15 meter orifice | | | | | | | Q |
| | 1" DN 25 / 1/2"- DN 15 meter tube | | | | | | | P |
| | 1" DN 25 / 1/2"- DN 15 meter orifice | | | | | | | R |
| | 1" DN 25 / 1" - DN 25 meter tube | | | | | | | B |
| | 1-1/2" DN 40 / 2" - DN 50 meter tube | | | | | | | N |
| | 2" DN 50 / 2" - DN 50 meter tube | | | | | | | C |
| | 3" DN 80 / 3" - DN 80 meter tube | | | | | | | D |
| | 4" DN 100 / 4" - DN 100 meter tube | | | | | | | E |
| Steam Jacket (not for 04, 1, 2, 3) | | | | | | | | |
| | 1" DN 25 / 1/2" - DN 15 meter tube | | | | | | | F |
| | 1" DN 25 / 1/2" - DN 15 meter orifice | | | | | | | S |
| | 2" DN 50 / 1" - DN 25 meter tube | | | | | | | T |
| | 3" DN 80 / 2" - DN 50 meter tube | | | | | | | U |
| | 4" DN 100, / 3" - DN 80 meter tube | | | | | | | V |
| Threaded Fittings DIN 11851, | | | | | | | | |
| | SC 25 / 1/2" - DN 15 meter orifice | | | | | | | I |
| | SC 25 / 1/2" - DN 15 meter tube | | | | | | | J |
| | SC 40 / 1" - DN 25 meter tube | | | | | | | K |
| | SC 50 / 2" - DN 50 meter tube | | | | | | | L |
| | SC 80 / 3" - DN 80 meter tube | | | | | | | M |
| Other flowmeter sizes | | | | | | | | Z |
| Meter Connection Type (12) | | | | | | | | |
| Flanges per DIN 2501, PN 16 (DN 100) | | | | | | | | K |
| | PN 40 | | | | | | | A |
| | PN 63 | | | | | | | B |
| Flanges per DIN 2512, PN 16 (DN 100) | | | | | | | | L |
| | PN 40 | | | | | | | C |
| | PN 63 | | | | | | | D |
| Flanges per ANSI, RF CL 150 | | | | | | | | E |
| | CL 300 | | | | | | | F |
| Threaded fittings, DIN 11851 | | | | | | | | H |
| Other connection types | | | | | | | | Z |
| Certification, Flowmeter Primary (13) | | | | | | | | |
| None | | | | | | | 0 | |
| Pressure test only | | | | | | | 1 | |
| Test package: Pressure, welder, dye penetrant and process tests | | | | | | | 2 | |
| Other certifications | | | | | | | 9 | |
| Material Certification, Flowmeter Primary (14) | | | | | | | | |
| None | | | | | | | | A |
| Material certification EN 10204-3.1B | | | | | | | | B |
| Other material certifications | | | | | | | | Z |
| Float Design (15) | | | | | | | | |
| Cylindrical guide rod, without gas damping | | | | | | | | 1 |
| Twisted guide rod for gas damping (only 1/2" / DN 15) | | | | | | | | 2 |
| Cylindrical guide rod with piston gas damping | | | | | | | | 3 |
| Other designs | | | | | | | | 9 |
| float Material (16) | | | | | | | | |
| Standard meter, 316Ti / No. 1.4571 | | | | | | | | A |
| 316Ti / No. 1.4571 / Hast C float head | | | | | | | | B |
| PTFE-Design, Hastelloy C float head | | | | | | | | C |
| PTFE | | | | | | | | D |
| Other materials | | | | | | | | Z |

Ordering Information Armored Flowmeter AM54

Please supply the following information: Flowmeter Model Number, Ordering Number, flowmeter size, scale design, fluid, max. flowrate, density and viscosity at operating temperature, operating and maximum pressure and temperature

| | | | | | |
|------------------------------------------------------------|-------------|---|---|--|---|
| Ordering Number | AM54 | | | | |
| Temperature Design (17) | | | | | |
| Standard temperature | 1 | | | | |
| Low temperature (<-20 °C) | 2 | | | | |
| Other designs | 9 | | | | |
| AM54_31/32: Supply Power, Secondary Instrument (18) | | | | | |
| 14 - 28 V DC | | A | | | |
| AM54_31/32: Design-Level, Software (19) | | | | | |
| | | | A | | |
| Accuracy (20) | | | | | |
| Class 2.5 US 2,5 of full scale | | | | | 1 |
| Class 1.6 | | | | | 2 |
| +/- 4 % of max.(calculation of the viscosity effects) | | | | | 3 |
| Other accuracy requirements | | | | | 9 |
| Instrument Tag(21) | | | | | |
| Stn.stl. tag, riveted | | | | | |
| German | | | | | D |
| English | | | | | E |
| US -version (for FM/CSA - approval) | | | | | U |
| Cemented foil tag | | | | | |
| German | | | | | A |
| English | | | | | B |
| Other designs | | | | | Z |

Armored Variable Area Flowmeter

Dimensions and Connections, Installation Length 250 mm Standard Design

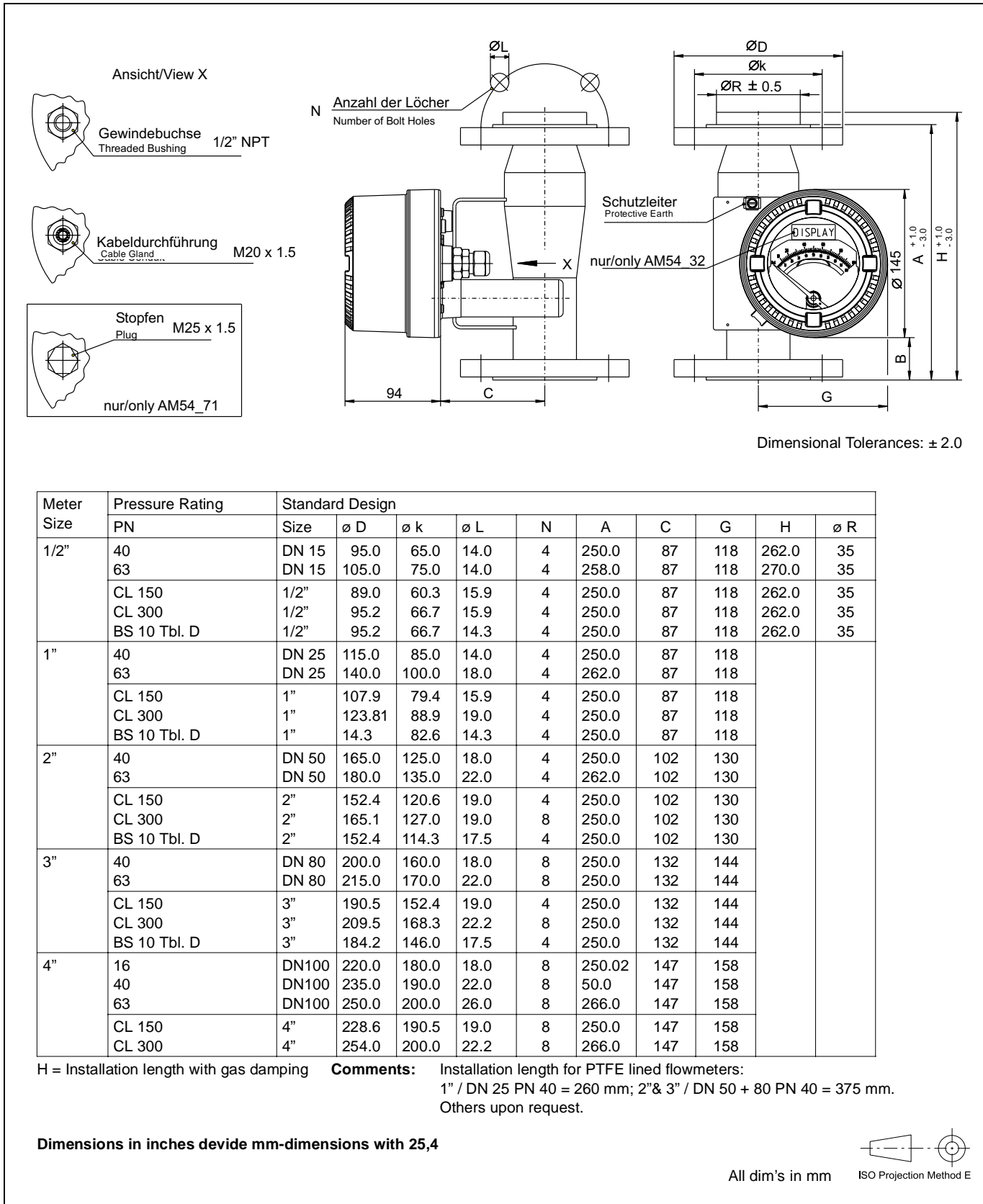


Fig. 14 Dimensions and Connections for Installation Length 250 mm (Standard Design)

Dimensions and Connections, Installation Length 250 mm Steam Jacket Design

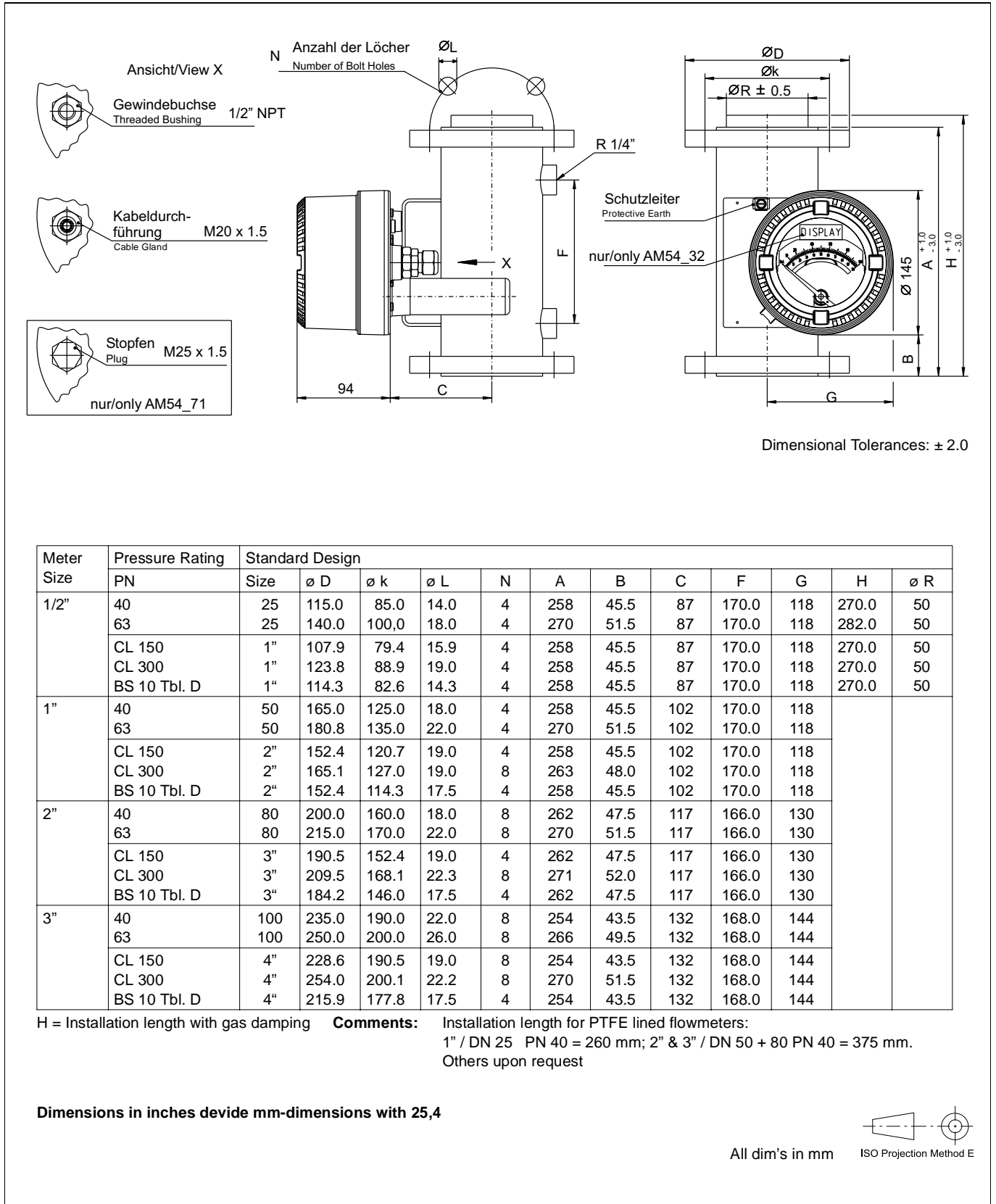


Fig. 15 Dimensions and Connections for Installation Length 250 mm (Steam Jacket Design)

Armored Variable Area Flowmeter

Dimensions and Connections, Installation Length 375 mm Standard Design

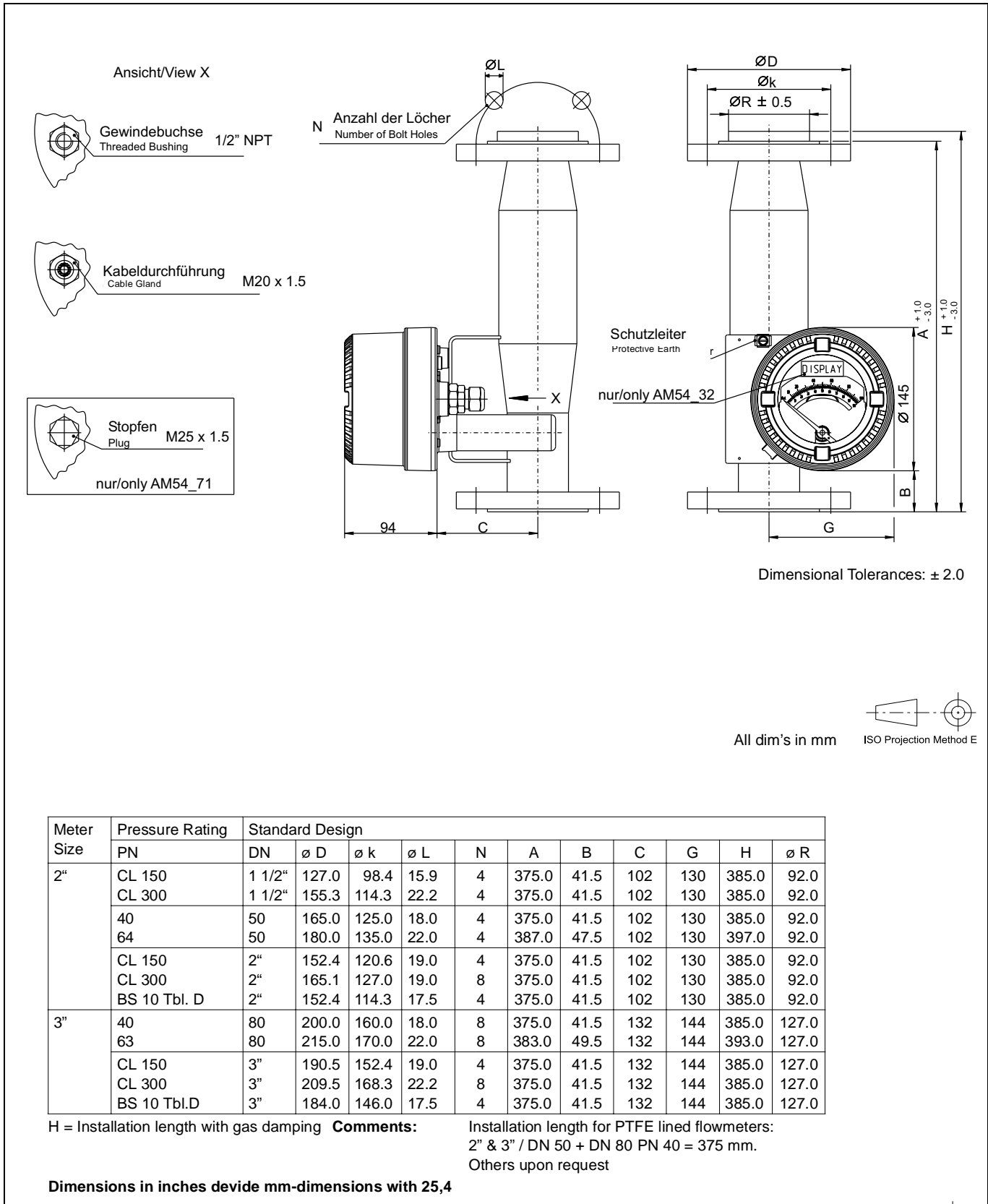


Fig. 16 Dimensions and Connections for Installation Length 375 mm (Standard Design)t

Dimensions and Connections Food Industry Design

Dimension Drawing will be available 1.10.2000

| Meter Size | DN | ø D | 10A5400E*U | | | | | | 10A5400E*V | | | | | | |
|------------|-------|---------------|------------|---|---|---|---|-------|------------|---|---|---|---|----|-------|
| | | | A* | B | C | E | G | M* | A* | B | C | E | G | M* | |
| 2" | SC 50 | Rd 87 x 1/6" | 270.0 | | | | | 315.0 | 395.0 | | | | | | 440.0 |
| 3" | SC 80 | Rd 110 x 1/4" | 272.0 | | | | | 326.0 | 397.0 | | | | | | 451.0 |

*) Dimension A: Design with threaded fittings DIN 11851
 Dimension M: Food Industry design with threaded fittings per DIN 11851

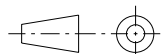

 All dim's in mm ISO Projection Method E

Fig. 17 Dimensions and Connections for Installation Length 375 mm (Food Industry Design)

Armored Variable Area Flowmeter



ABB Automation Products GmbH
D-37070 Göttingen, Germany
Tel. 0551/90 5 - 0
Fax 0551/90 57 77
<http://www.abb.com/automation>

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