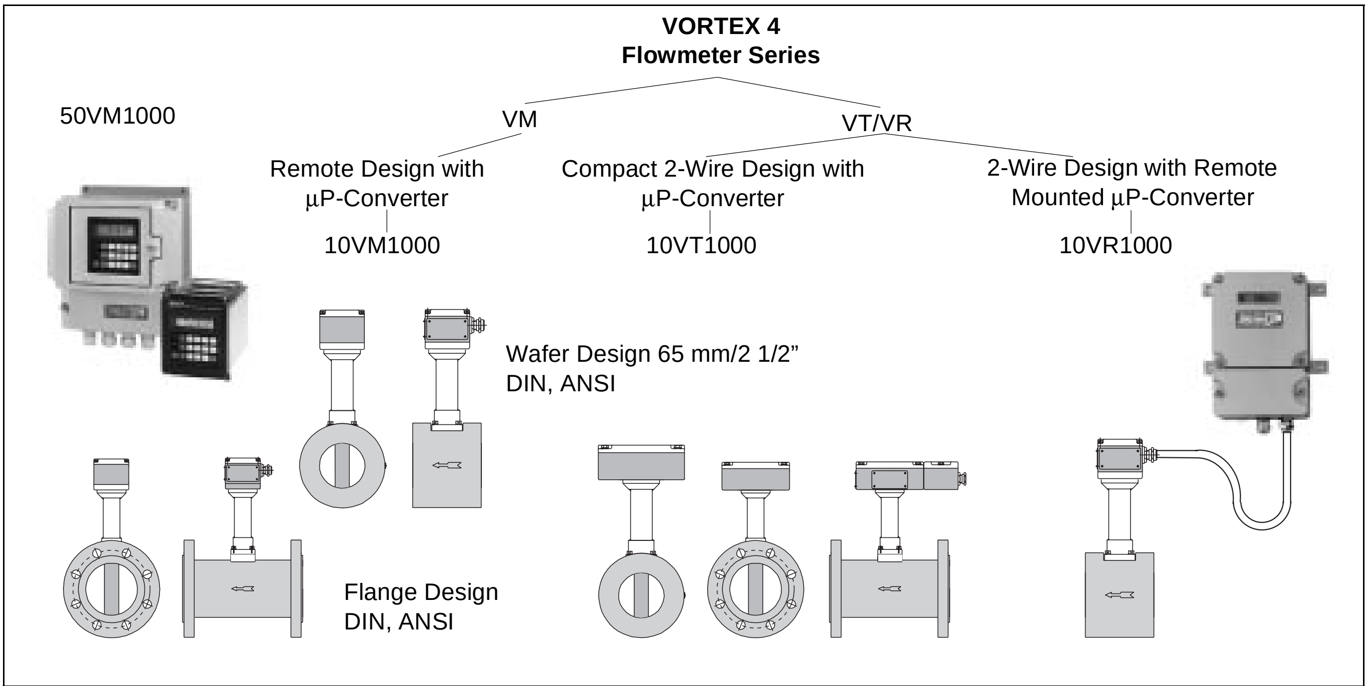
Vortex Flowmeter VORTEX-VT/VR
2-Wire Design with Microprocessor Converter



The Vortex Flowmeter VORTEX-VT is a member of the new Vortex Flowmeter Series VORTEX-4 from Bailey-Fischer & Porter.

The flowrate of steam, gases and liquids can be metered with the VORTEX-VT over a wide range independent of the fluid properties.
VORTEX-VT is characterized by the following **design and application features**:

- No moving parts, no wear, no maintenance.
- Rugged and straight forward flowmeter primary design with rigid welded shedder body in stn. stl. no. 1.4571/316 Ti or Hastelloy-C.
- Same sensor and same converter for all fluids, meter sizes and meter designs.
- Easiest installation and start-up - install in pipe line and complete the electrical connections.
- Ex-Design: II 2G EEx ib IIC T4.
- µP-Controlled converter incorporating the most modern filter technology, tested to EMV-NAMUR Requirements.
- Modern SMD-Technology plus high degree of integration, e.g. customer specific circuits, assures maximum reliability.
- High contrast LC-Display, alphanumeric, 2 x 16 character, user configurable 2 line display.
- Separate connection box, the electronic compartment need not be opened for installation or start-up.
- Menu controlled operation using 3 buttons.
- Accuracy (Re > 20,000/40,000)
  Liquids:: ≤ ± 0.75 % of rate
  Gas/steam: ≤ ± 1 % of rate
- HART-Protocol for digital communication from PC or Process Control System.
- Double sensor design with 2 independent converters for safety related applications.
- VORTEX-VR 2-Wire flowmeter with remote mounted converter, cable length max. 10 m.

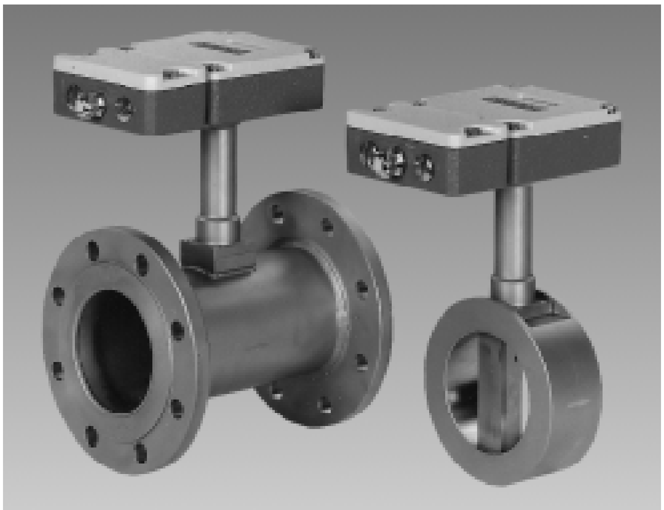


Fig.1 VORTEX-VT, 10VT1000 in Flange and Wafer Designs

Contents **Page**

Vortex Flowmeter with Microprocessor Converter

Principle of Operation

The operation of the VORTEX flowmeter is based on the Karman Vortex Street. As the flow passes the shedder, vortices are formed alternately on both sides of the shedder. The flow causes these vortices to shed forming a vortex street (Karman Vortex Street) (Fig.2).

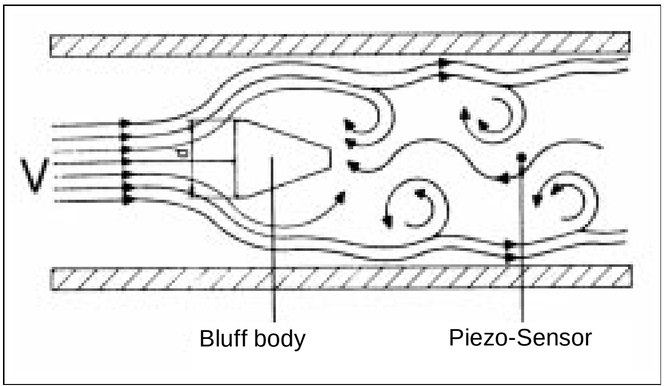


Fig.2 Karman Vortex Street

The frequency **f** of the vortex shedding is proportional to the flow velocity **v** and indirectly proportional to the width of the shedder **d**:

$$f = St \times \frac{v}{d}$$

St, the Strouhal-Number, is a dimensionless number which defines the quality of the vortex flowrate measurements.

The **St** value is constant over wide Reynolds Number **Re** ranges for properly designed shedders. (Fig. 3).

$$Re = \frac{v \times D}{\vartheta}$$

ϑ = Kinematic viscosity

D = Meter size

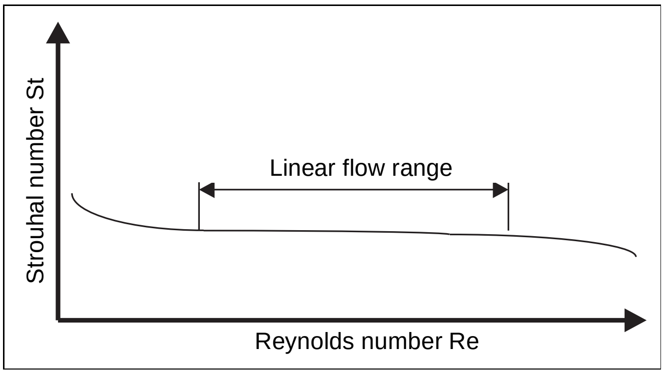


Fig.3 Relationship Strouhal No. vs.Reynolds No.

The vortex shedding frequency which is measured, is a function of the flow velocity alone and is independent of the fluid density and viscosity.

The local pressure fluctuations resulting from the vortex formation are measured by a Piezo-Sensor and converted into electrical impulses which correspond to the vortex shedding frequency.The flowrate calculated from these values is available as a current output signal (4 - 20 mA).

Specifications
Meter Sizes, Flow Ranges and Pressure Drops

Meter Size Selection

The meter size is selected as a function of the maximum volume flowrate Q_V. In order to achieve the maximum flow range, this value should not be less than one half of the maximum flowrate listed for the meter size (Q_V max). The linear flow range (see accuracy specifications) corresponds to a Reynolds No. of 20,000/40,000 (for DN 150/6”) to 7,000,000.

If the flow to be metered is in normal (normal conditions: 0 °C, 1013 mbar) or mass flowrate units, the value must be converted to operating volume flowrate and the appropriate meter size selected from the Flow Range Tables (Table. 1, 2, 3).

1. Convert Normal density (ρn) --> operating density(ρ)

$$\rho = \rho n \times \frac{1{,}013 + p}{1{,}013} \times \frac{273}{273 + T}$$

2. Convert to operating volume flowrate (Q_V)

a) From normal flowrate (Q_n) -->

$$Q_V = Q_n \frac{\rho n}{\rho} = Q_n \frac{1{,}013}{1{,}013 + p} \text{¥} \frac{273 + T}{273}$$

b) From mass flowrate (Qm) -->

$$Q_V = \frac{Q_m}{\rho}$$

3. Dynamic viscosity (η) --> kinematic viscosity (ν)

$$\nu = \frac{\eta}{\rho}$$

ρ = Operating density [kg/m^3]

ρ_N = Normal density [kg/m^3]

p = Operating pressure [bar]

T = Operating temperature [°C]

Q_V = Volume flowrate [m^3/h]

Q_n = Normal flowrate [m^3/h]

Q_m = Mass flowrate [kg/h]

η = Dynamic viscosity [Pas]

ν = Kinematic viscosity [m^2/s]

Product Selection and Flowmeter Sizing Program

A Bailey-Fischer & Porter software program “FlowSelect” is available for selecting the appropriate flowmeter design based on the user’s application specifications.
An additional program “FlowCalc” can be used for the conversion calculations and flowmeter size selection.
Both are WINDOWS program and are available free of charge upon request.

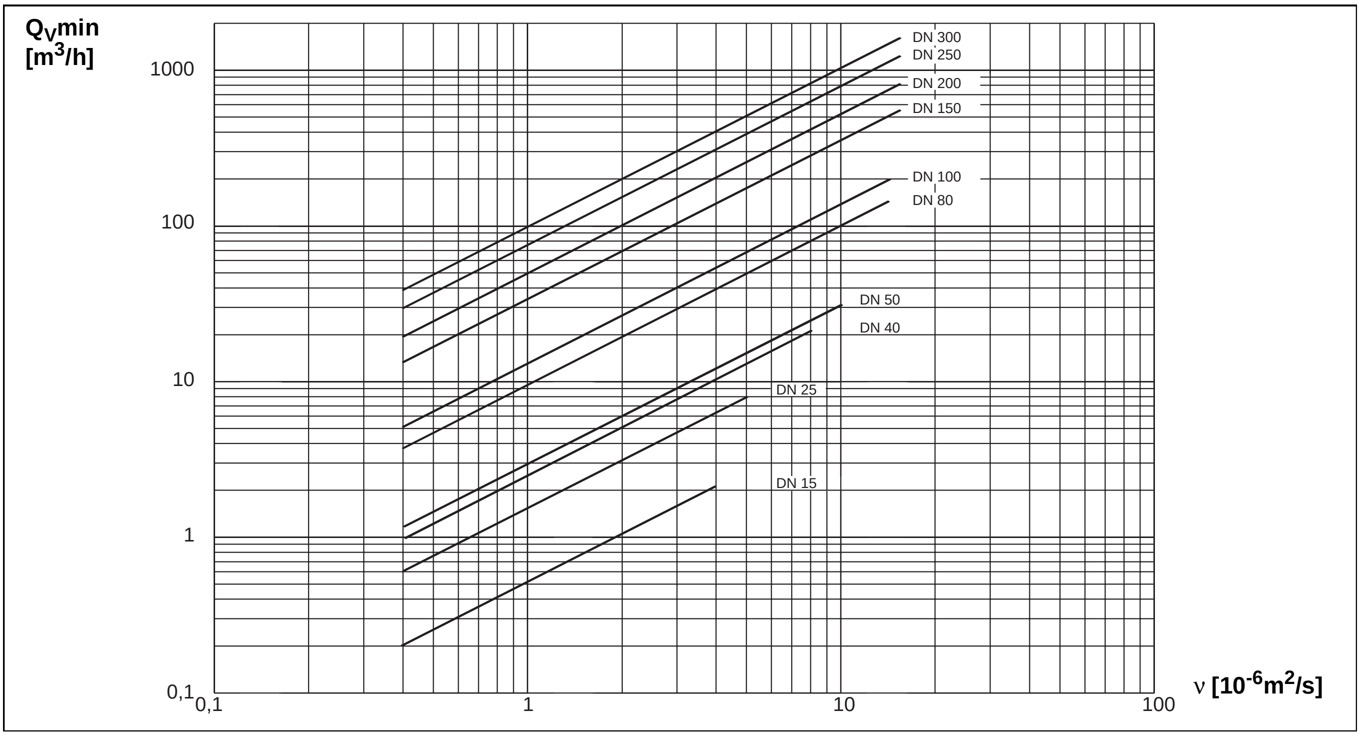


Fig.4 Minimum Flowrate, Liquids as a Function of the Kinematic Viscosity

Specifications
Meter Sizes, Flow Ranges, Pressure Drops

Maximum Flowrate, Liquids

Meter Size DN	inch	$Q_V$max [m^3/h]	Frequency [Hz] at $Q_V$max
15	1/2	6	400
25	1	18	240
40	1-1/2	48	190
50	2	70	150
80	2-1/2	170	100
100	4	270	70
150	6	630	50
200	8	1100	32
250	10	1700	28
300	12	2400	25

Table. 1 Maximum Flowrate, Liquids

Pressure Drop, Liquids

See Fig. 5 for Water (20 °C, 1013 mbar, $\rho = 998$ kg/m^3). For other liquid densities (ρ), the pressure drop can be calculated using the following equation:

$$\Delta p' = \frac{\rho}{998} \times \Delta p$$

$\Delta p'$ = Pressure drop, liquid [mbar]

Δp = Pressure drop, water (from Fig. 5) [mbar]

Static Pressure, Liquids

To prevent cavitation, positive back pressure is required downstream of the flowmeter. Its value can be estimated using the following equation:

$p_2 \geq 1.3 \times p_{vapor} + 2.6 \times \Delta p'$

p_2 = positive static downstream pressure [mbar]

p_{vapor} = liquid vapor pressure at operating temperature [mbar]

$\Delta p'$ = pressure drop, liquid [mbar]

Example for Liquids:

Find the meter size (DN/inch) for metering 55 m^3/h liquid with a density of 850 kg/m^3 and a kinematic viscosity of 2 cSt (=2 x 10^{-6} m^2/s).

1. Q_V = max. 55 m^3/h -> DN50/2" (per Tbl. 1): $Q_V$max = 70 m^3/h
2. Start of linear range, at 2 cSt, (from Fig. 4): $Q_V$min = 6 m^3/h
3. Pressure drop at ρ = 850 kg/m^3: $\Delta p'$ = 425 mbar

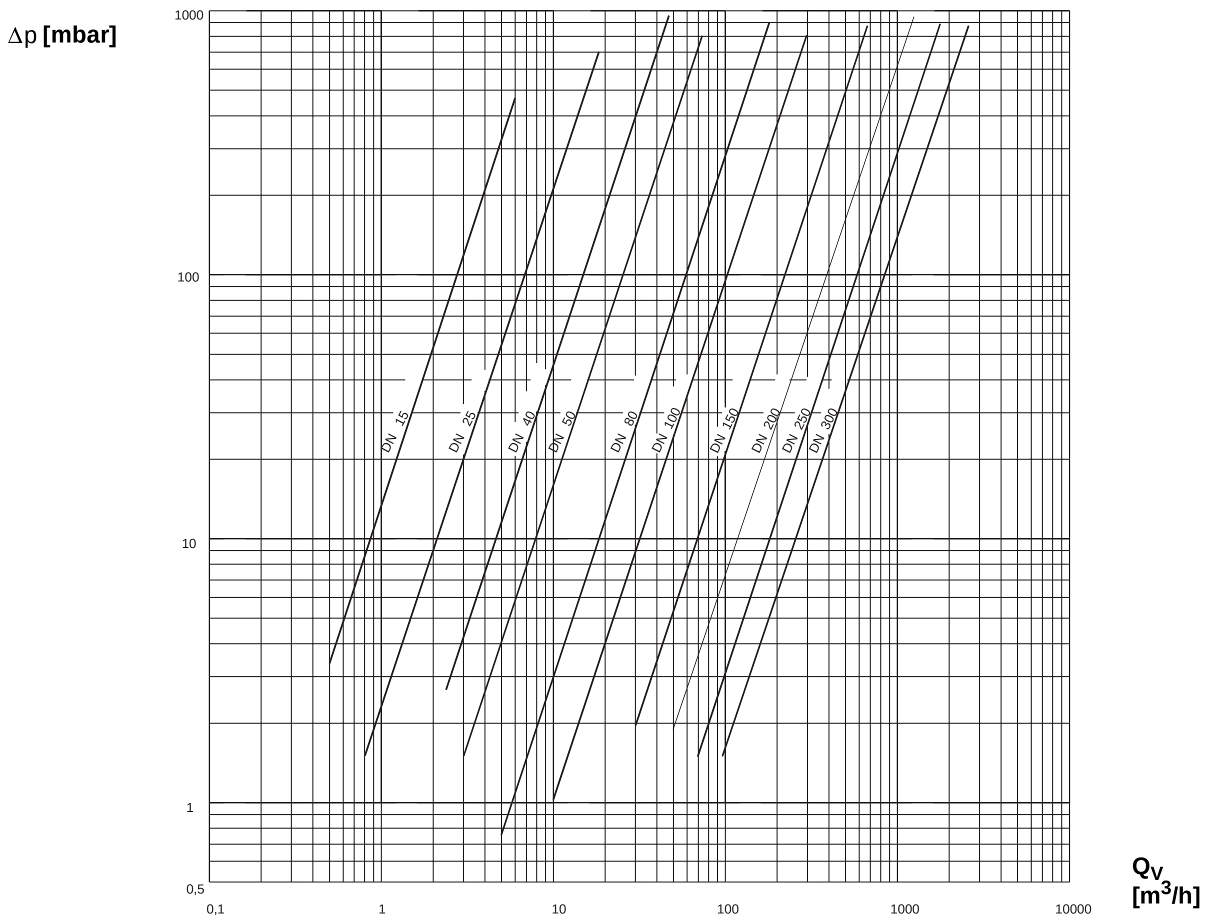


Fig.5 Pressure Drop, Water (20 °C, 1013 mbar, ρ = 998 kg/m^3), DIN-Design

Specifications
Meter Sizes, Flow Ranges, Pressure Drops

Max. Flowrate, Gas/Superheated Steam

Meter Size DN	Inch	$Q_V$max [m3/h]		Frequency [Hz] at $Q_V$max	
		DIN	ANSI	DIN	ANSI
15	1/2	24	24	1620	2080
25	1	150	82	1990	2000
40	1-1/2	390	320	1520	2000
50	2	500	450	1030	1300
80	3	1200	1000	700	870
100	4	1900	1900	500	670
150	6	4500	4050	360	450
200	8	8000	8000	240	240
250	10	14000	14000	260	260
300	12	20000	20000	214	240

Table 2 Max. Flowrate, Gas/Superheated Steam

Example for Gases:
Find the meter size (DN/inch) for metering 2540 Nm^3/h CO_2-gas; temperature = 85 °C, pressure = 5 bar abs.
For details see Page 3 “Meter Size Selection”

$\rho_n = 1.97\ kg/m^3$

1. Convert ρ_n --> ρ : $\rho = 7.4\ kg/m^3$
2. Convert Nm^3/h --> m^3/h: $Q_V = 676\ m^3/h$
   --> Select: DN80/3” ($Q_V$max = 1200 m^3/h)
3. Pressure drop at $\rho = 7.4\ kg/m^3$: $\Delta p' = 100$ mbar
4. Flow range start at $\rho = 7.4\ kg/m^3$ (from Fig. 7):
   $Q_V$min = 45m^3/h,
   Convert m^3/h --> Nm^3/h: $Q_V$min = 169 Nm^3/h

Pressure Drop Gas/Superheated Steam
See Fig. 7 for air (at 20 °C, 1013 mbar, $\rho = 1.2\ kg/m^3$)
for other fluid densities the pressure drop can be calculated using the following equation:

$$\Delta p' = \frac{\rho}{1{,}2} \times \Delta p$$

$\Delta p'$ = Fluid pressure drop [mbar]

Δp = Air pressure drop (from Fig. 7) [mbar]

Normal Densities for Various Gases:

Gas	Normal Density [kg/m3]
Acetylene	1.172
Air	1.290
Ammonia	0.771
Argon	1.780
Butane	2.700
Carbon dioxide	1.970
Carbon monoxide	1.250
Ethane	1.350
Ethylene	1.260
Hydrogen	0.0899
Methane	0.717
Natural gas	0.828
Neon	0.890
Nitrogen	1.250
Oxygen	1.430
Propane	2.020
Propylene	1.915

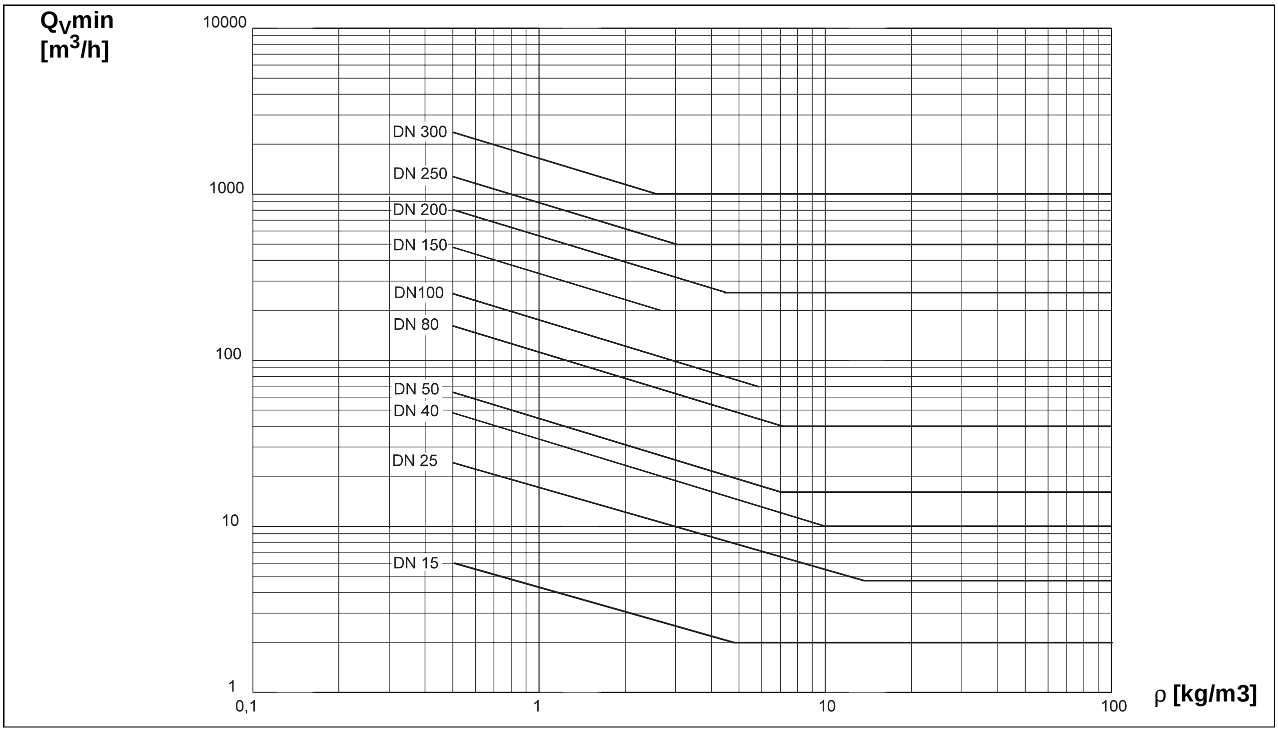


Fig.6 Minimum Flowrate, Gas/Superheated Steam as a Function of Fluid Density, DIN-Design

Specifications
Meter Sizes, Flow Ranges, Pressure Drops

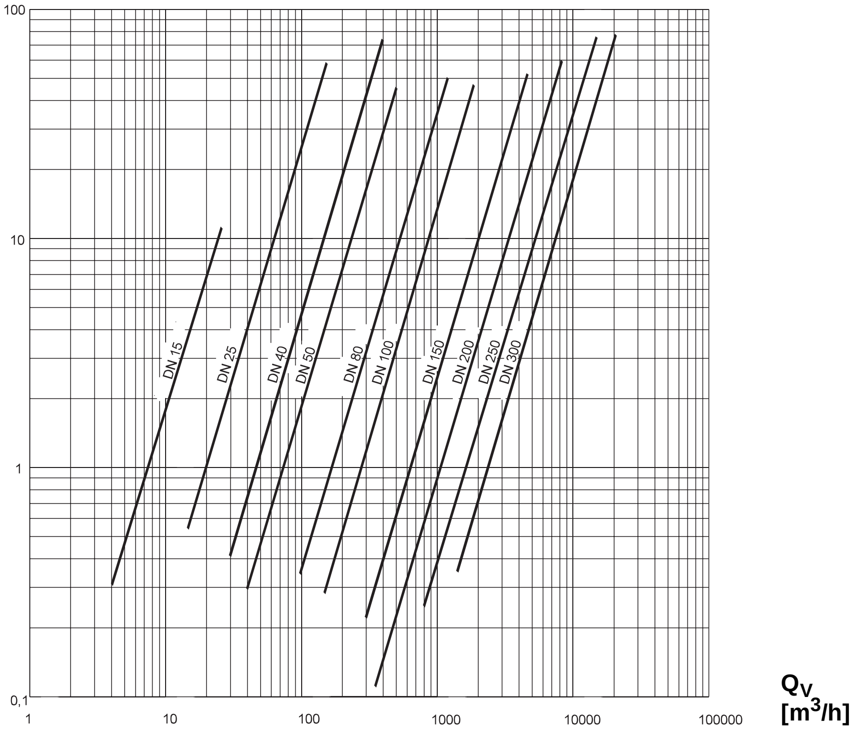


Fig.7 Pressure Drop, Air (20 °C, 1013 mbar, ρ = 1.2 kg/m^3), DIN-Design

Flowrate Saturated Steam [kg/h]

Example for Saturated Steam:

Find the flow range for meter size DN50/2” at 7 bar abs.
--> from Table 3: DN50: 84 - 1835 kg/h
Additional: Saturated steam temp.= 165 °C
Saturated steam density = 3.67 kg/m^3

p[bar a] DN/inch	0.5	1	1.5	2	3	4	5	6	7	8	9	10	12	15	25	30	35	40
15 min 1/2 max	3 7	4 14	5 21	6 27	7 40	8 52	9 64	10 76	10 88	11 100	12 112	12 124	14 147	15 182	21 300	25 360	30 420	34 480
25 min 1 max	9 45	13 89	15 129	17 169	21 248	24 324	27 401	29 476	31 551	33 624	35 699	37 773	41 920	45 1140	58 1875	69 2250	81 2625	92 3000
40 min 1-1/2 max	18 117	25 230	30 335	35 440	42 644	48 842	54 1041	59 1236	63 1431	67 1622	71 1817	75 2009	81 2391	91 2964	131 4875	158 5850	184 6825	210 7800
50 min 2 max	24 150	34 295	41 430	47 565	56 825	64 1080	72 1335	78 1585	84 1835	89 2080	95 2330	95 2575	109 3065	128 3800	210 6250	252 7500	294 8750	336 10000
80 min 3 max	60 360	84 708	102 1032	116 1355	141 1980	161 2592	179 3204	195 3804	210 4404	223 4992	236 5592	249 6180	270 7356	302 9120	481 15000	578 18000	674 21000	770 24000
100 min 4 max	90 570	126 1121	152 1634	175 2145	211 3135	241 4104	269 5073	293 6023	315 6973	335 7904	355 8854	373 9785	407 11647	493 14440	811 23750	974 28500	1136 33250	1298 38000
150 min 6 max	180 1350	252 2655	305 3870	349 5081	422 7425	483 9720	577 12015	685 14265	793 16515	899 18720	1007 20970	1112 23175	1324 27585	1642 34200	2700 56250	3240 67500	3780 78750	4320 90000
200 min 8 max	150 2400	213 4720	311 6880	408 9032	597 13200	781 17280	966 21360	1147 25360	1327 29360	1505 33280	1685 37280	1863 41200	2217 49040	2749 60800	4521 100000	5425 120000	6330 140000	7234 160000
250 min 10 max	480 4200	673 8260	813 12040	931 15806	1126 23100	1288 30240	1517 37380	1801 44380	2086 51380	2363 58240	2647 65240	2926 72100	3482 85820	4318 106400	7101 175000	8622 210000	9942 245000	11362 280000
300 min 12 max	840 6000	1178 11800	1422 17200	1630 22580	1970 33000	2254 43200	2506 53400	2731 63400	2951 73400	3345 83200	3747 93200	4141 103000	4929 122600	6111 152000	100051 250000	12062 300000	14072 350000	16082 400000
Density ρ_{sat} [kg/m^3]	0.30	0.59	0.86	1.13	1.65	2.16	2.67	3.17	3.67	4.16	4.66	5.15	6.13	7.60	12.50	15.00	17.50	20.00
Temp. Tsat [°C]	81.3	99.6	111.4	120.0	133.0	144.0	152.0	159.0	165.0	170.0	175.0	180.0	188.0	198.0	224.0	234.0	242.0	250.0

Table 3: Saturated Steam Flow Ranges, DIN-Design

Specifications

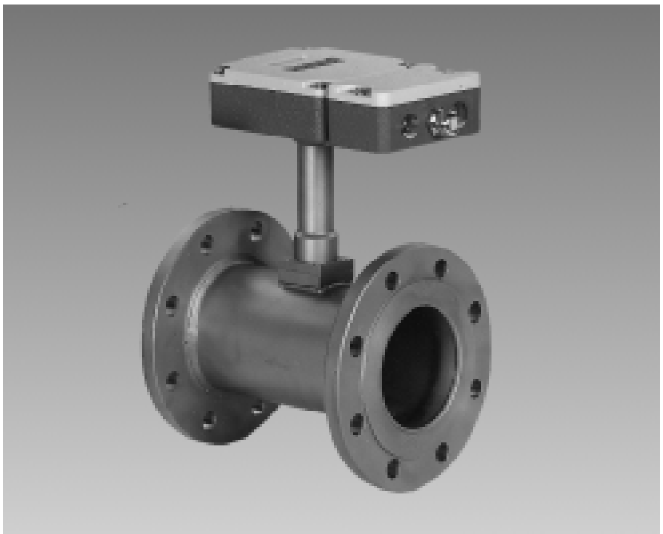


Fig.8 VORTEX-VT, 10VT1000 Flange Design

Accuracy and Reproducibility

Accuracy (incl. converter), linear Flow Range (Re > 20.000/40.000 (> DN150/6")):

Gases/Steam: ≤ ± 1 % of rate

Liquids: ≤ ± 0.75 % of rate

Reproducibility

≤ 0.2 % of rate

Overrange:

Gases:
15 % over max. flowrate

Liquids:
15 %; Note: cavitation may not be present

Operating Pressure:

Flange design: DIN PN 10 to 40, option to PN 160
ANSI Class 150/300, option to Cl 900

Wafer design: DIN PN 10 to 40, option to PN 160,
ANSI Class 150/300, option to Cl 900

Additional designs upon request.

Connections:

Process Connections

Flanges per DIN or ANSI, Wafer Design

Electrical Connections

Screw terminals, cable connector PG 13.5

Protection Class:

IP 65

Explosions Proof Design:

Ex II 2G EEx ib IIC T4

Safety data for the range from
-55 °C to +60 °C

Ui = 28 V
Ii = 110 mA
Pi = 770 mW
Linear curve
The effective internal capacitance and inductance is negligible.

Materials:

Meter Housing
Stn. stl. No. 1.4571[316Ti], option: Hastelloy-C

Flanges
Stn. stl. No. 1.4571[316Ti], option: Hastelloy-C

Shedder Body
Stn. stl. No. 1.4571[316Ti], option: Hastelloy-C

Sensor
Stn. stl. No. 1.4571[316Ti], option: Hastelloy-C

Sensor Seals
Kalrez O-Ring: 0 °C to 280 °C
Viton O-Ring: -55 °C to 230 °C
PTFE O-Ring: -200 °C to 200 °C
HT-Special: -55 °C to 320 °C
Other designs upon request.

Housing, Electronic Assembly
Cast light metal, painted

Weight:

See Dimensions

Fluid Temperature:

-40 °C to +320 °C (Standard)
-40 °C to +280 °C (Ex-Design)
Note allowable temperature range for seals

Ambient Conditions:

Climate resistance
(per DIN 40040): GSG
Relative humidity: max. 85 %, yearly average ≤ 65 %

Ambient-/Fluid Temperature:

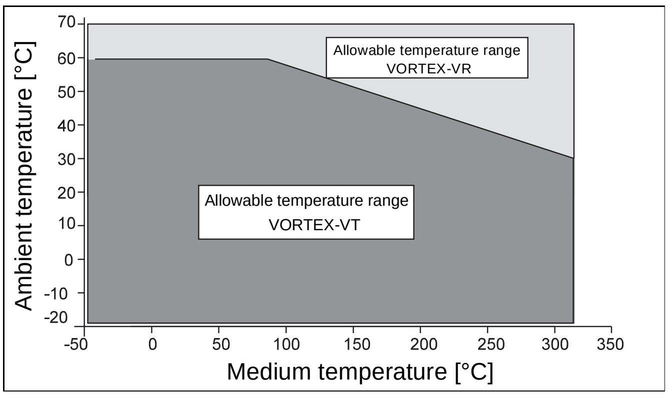


Fig.9 Ambient/Fluid Temperature Relationship

Note: The display is readable down to approx. 0 °C.

Specifications
Converter

Fig.10 VORTEX-VT, Electronic Assembly

Flow Range
The flow range end value can be set anywhere between Q_V max and 0.15 x Q_V max

Parameter Settings
The data can be entered using the 3 buttons in a clear text dialog with the display or over the HART-Protocol (see also “Communication, HART-Protocol”.

Data Security
The totalizer values and meter location parameter settings are stored in the NV-RAM and EEPROM for a period of 10 years without power when the supply voltage is turned off.

Function Tests
The individual subassemblies can be tested using the internal software function tests. The current output can be set to manually selected flowrate values for start-up and checking purposes (manual process control).

Damping
Can be set between 1 to 100 s .

$Q_V$min (Low Flow Cutoff)
Can be set between 0 to 10 % of Q_V max (max. volume flowrate for the meter size).

Supply Power
14 to 46 V DC
Ripple: max. 5 % or ± 1.5 Vpp

Power Consumption
< 1 W

Protection Class
IP 65

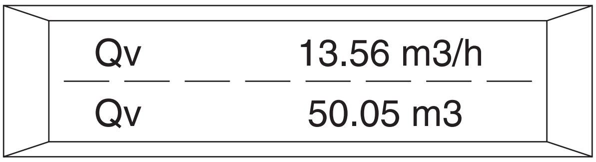
Output Signals

Current Output
4 - 20 mA, load ≤ 750 Ω

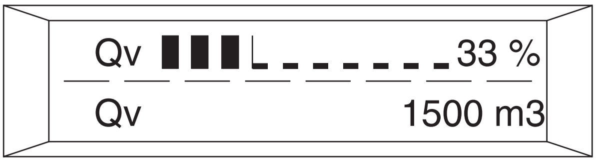
Pulse Output
Scaled, in combination with Transmitter Power Supply 55TS1000/55TS2000
active 24 V or passive optocoupler

Display
High contrast LC-Display, 2 x 16 characters. For display of the Instantaneous flowrate and integrated flow totals. Both lines of the display can be user configured.

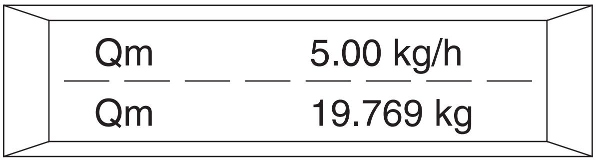
Examples:



1st Line : Volume flowrate
2nd Line: Totalized volume flow

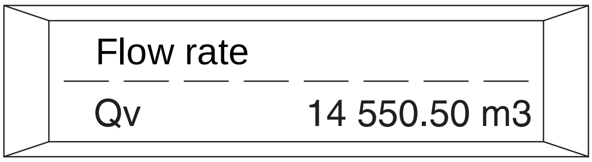


1st Line: Volume flowrate, Bargraph display
2nd Line: Totalized volume flow



1st Line: Mass flowrate
2nd Line: Totalized mass flow

Error Messages in the Display
Automatic system monitoring with error diagnostics in clear text on the display with appropriate error message.

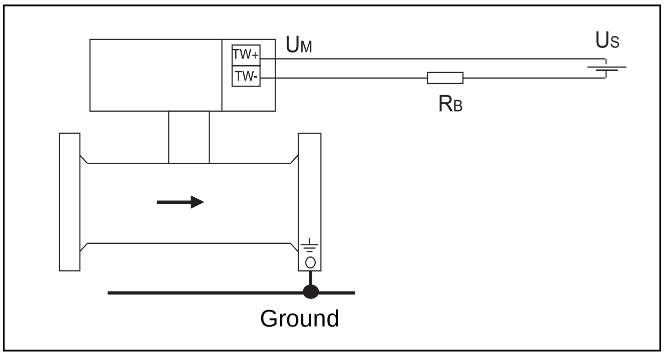


Specifications
Converter - Electrical Connections and Communication

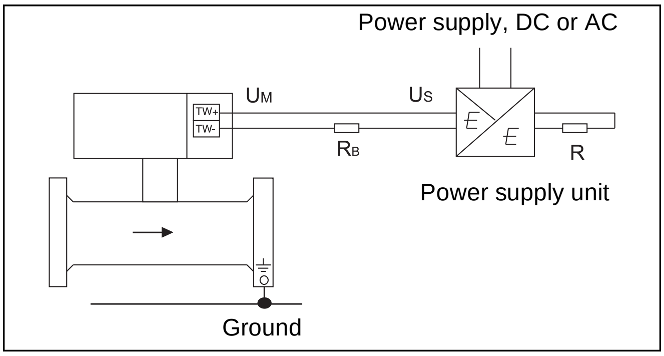
Electrical Connections

The converter of the VORTEX-VT is a 2-Wire design, i.e. the supply voltage and the output signal (4 - 20 mA) are transmitted over the same leads.

a) Supply Voltage from Central Power Supply Source

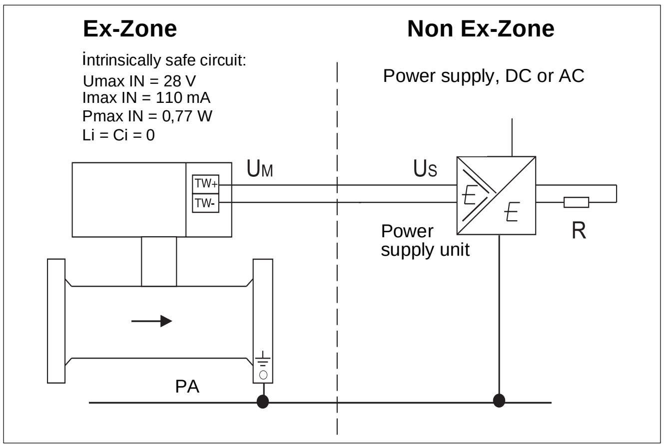


b) Supply Voltage from Power Supply



c) Electrical Connections Ex-Design

The Ex-Version of the VORTEX-VT is an “intrinsic safe ib” design. The protection of the supply/signal leads can be accomplished using supply isolators or Zener barriers. The limit values noted in the figure for the intrinsically safe circuit may not be exceeded. The conditions detailed in the Ex-Certificate are to be observed.



With SMART-capable Zener barriers or Power Supplies, e.g. Hartmann & Braun TZN 128, HART-Communication is possible.

d) Electrical Connections VORTEX-VR

The VORTEX-VR flowmeter primary and converter are installed separate from each other and interconnected by a 10 m long signal cable. The converter is connected as shown in a), b) or c).

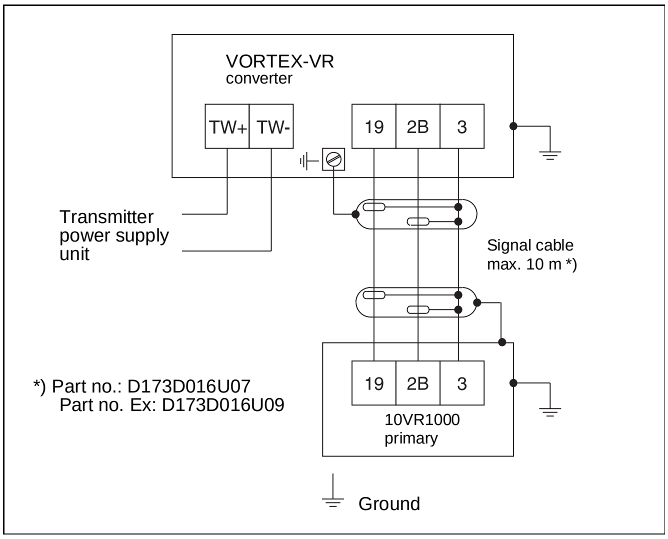


Fig.11 Interconnection Diagram Flowmeter Primary/Converter

U_M = Supply voltage, VORTEX-VT/VR = 14 V DC
U_S = Power supply voltage = 14 - 46 V DC

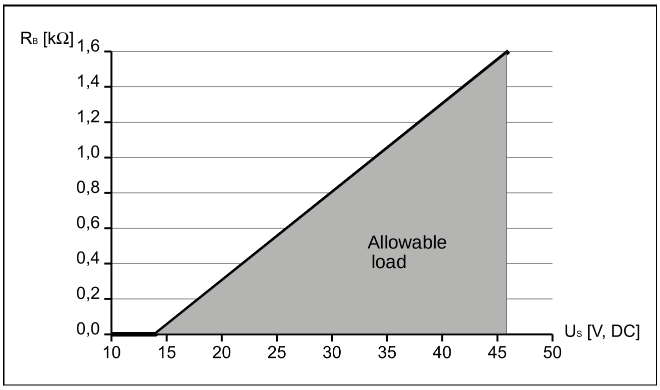
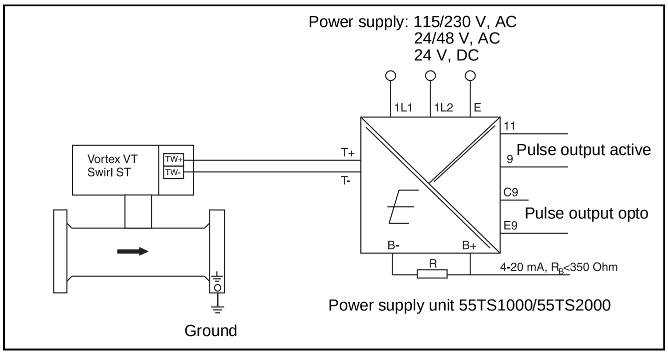


Fig.12 Load Diagram

Specifications
Converter - Electrical Connections and Communication

Pulse Transmission

It is possible, with the intelligent VORTEX-VT, to transmit pulses together with the 4 - 20 mA current output in 2-Wire technology. The converter superimposes the scaled pulse signal on the current output in accordance with the Bell 202 Standard. This signal is demodulated in the Bailey-Fischer & Porter Transmitter Power Supply 55TS1000/55TS2000 and converted to a galvanically isolated pulse output signal. Any other instruments connected to the current output are not affected.



Converter Transmitter Power Supply 55TS1000/55TS2000

Integrated Pulse Output for intelligent 2-Wire Field Instruments

The specifications are contained in the Specification Sheet D184B045U01.

Communication, HART®-Protocol

The HART-Protocol provides for digital communication between a process control system/PC, handheld terminal and the VORTEX-VT. The parameter settings for all instruments can be transmitted from the converter to the process control system/PC. In the reverse direction it is possible to reconfigure the converter

The digital communication is accomplished by superimposing an AC signal on the current output (4-20 mA) which does not affect any other instruments connected to the current output.

Transmission Mode

FSK-Modulation on the current output 4-20 mA per Bell 202 Standard. Max. signal amplitude 1.2 mA_{SS}.
Logic 1: 1200 Hz
Logic 0: 2200 Hz
The SMART VISION ® WINDOWS-Software can be utilized for the HART-Communication. Detailed information will sent upon request.

Load Current Output

Min.>250 Ω, max. 750 Ω
Max. cable length 1500 m AWG 24 twisted and shielded

Baudrate

1200 Baud

Current Output at Alarm

High = 22.4 mA
Low = 3.85 mA

For operation with HART-Protocol (Option) see the separate Instruction Manual "VORTEX 4-HART-Communication" (D184B008U13)

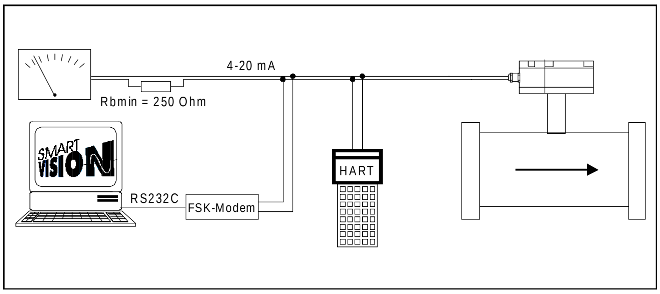


Fig.13 HART-Communication

Installation

The following conditions should be observed when installing the flowmeter primary in the pipeline.

In- and Outlet Sections

In order to assure total functionality, the flow profile should be undisturbed at the inlet of the flowmeter.

An inlet straight section with a length 15 times the nominal diameter of the flowmeter primary should be provided.

When space bends or control valves are installed upstream of the flowmeter the inlet straight section length should be at least 25 times the nominal diameter of the flowmeter primary.

The length of the outlet straight section should be at least 5 times the nominal diameter of the flowmeter primary (Fig. 14).

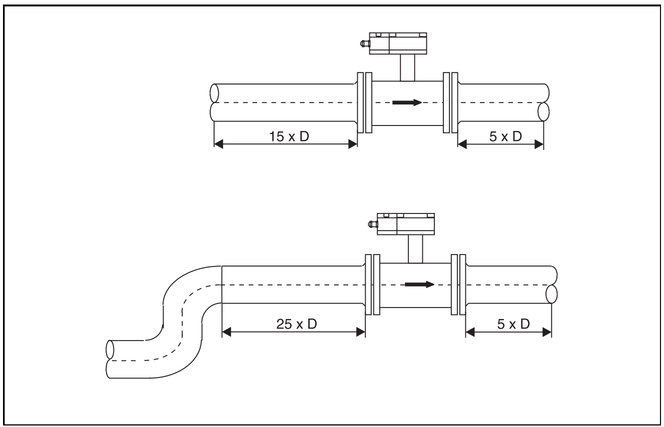


Fig.14

Control valves should be installed downstream from the flowmeter (Fig. 15).

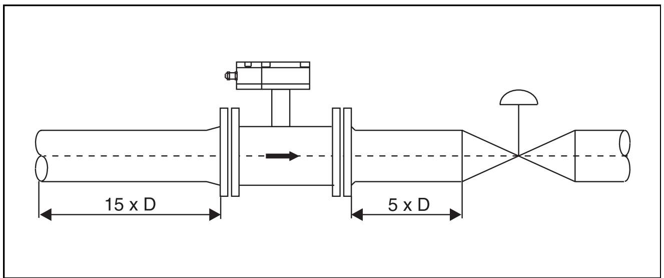


Fig.15 Control Valve Installation

Centering of the Wafer Design Flowmeters

The centering of Wafer Design is accomplished by utilizing the outside diameter of the body of the flowmeter primary and the mounting bolts. Centering sleeves, centering rings (up to DN 80/3") or segments are included as accessories with the shipment whose dimensions are a function of the pressure rating of the flowmeter primary.

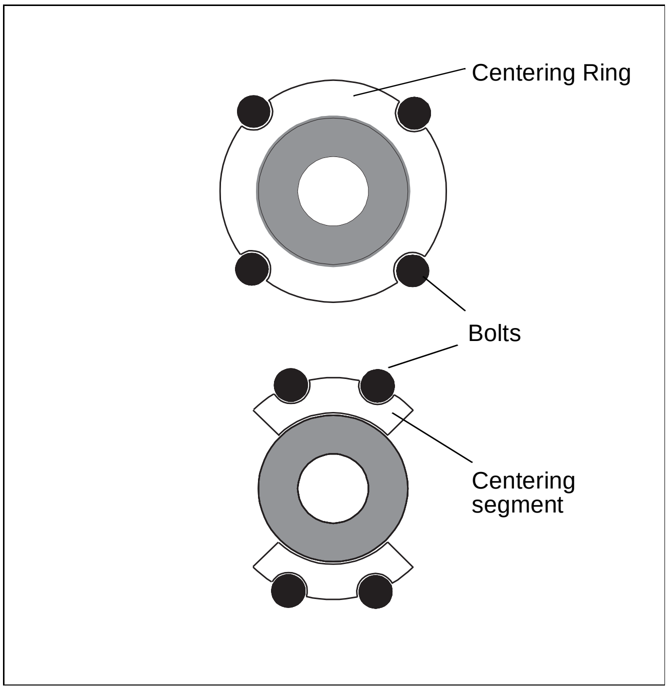


Fig.16 Centering the Wafer Design Flowmeters Using Rings or Segments

Additional Installation Information

- For liquids the flowmeter primary must be completely full at all times.
- In horizontal installations with fluid temperatures > 150 °C installations as shown in Fig. 17 are recommended.
- When gas bubbles may be present a gas separator should be provided.
- In installations in long pipelines, which have a tendency to vibrate, dampeners are to be installed up- and downstream of the flowmeter primary.

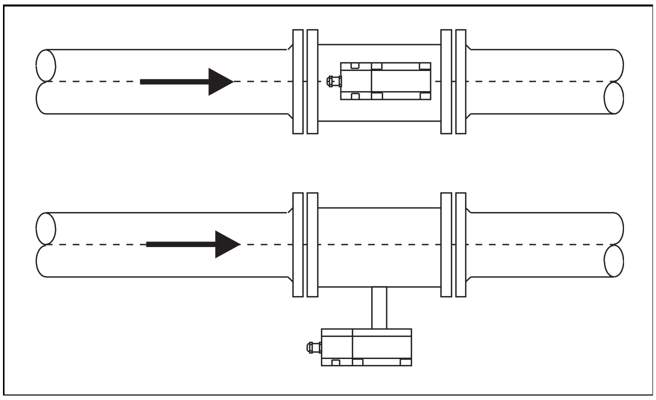
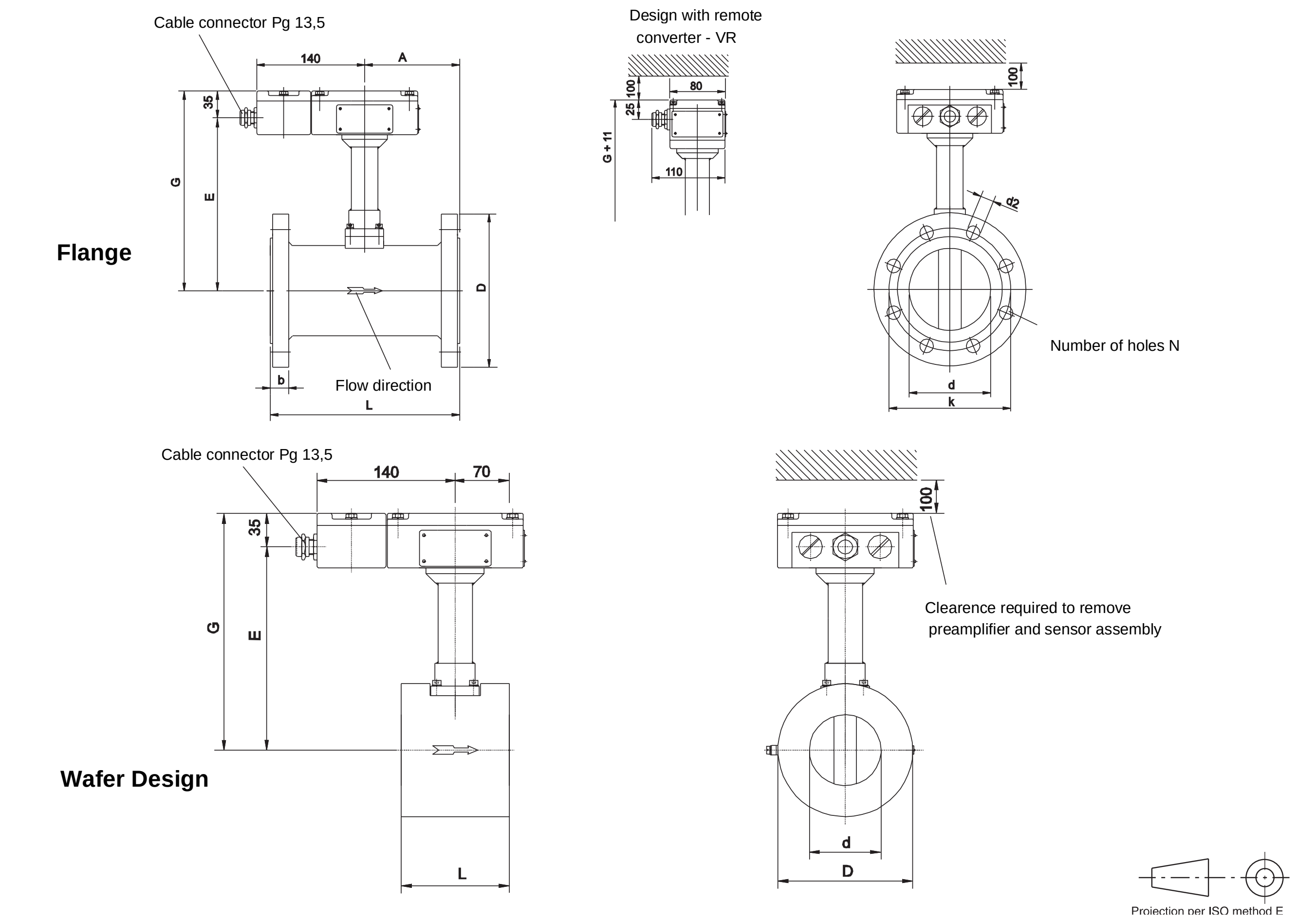


Fig.17 Installations for High Fluid Temperatures

Dimensions, 10VT1000/10VR1000, DIN

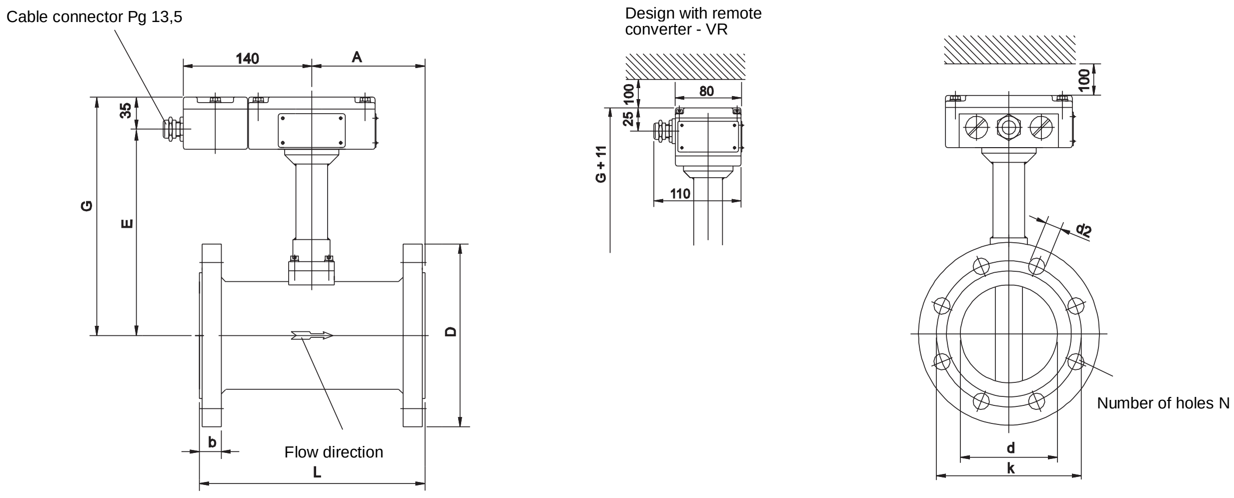


Meter Size Pressure Rating		L	E	D	G	k	d2	d	b	A	N	Weight [kg]
DN	PN	**Flange**										
15	10-40	200	196	95	231	65	14	17.3	16	100	4	
25	10-40	200	195	115	230	85	14	28.5	20	100	4	5.1
40	10-40	200	190	150	225	110	18	43.1	20	100	4	6.6
50	10-40	200	195	165	230	15	18	54.5	22	100	4	8.7
80	10-40	200	215	200	250	160	18	82.5	26	100	8	13.1
100	10-16 25-40	250	225	220 235	260	180 190	18 22	107.1	22 16	125	8	14
150	10-16 25-40	300	250	285 300	285	240 250	22 26	159.3	24 30	150	8	25.4
200	10-16 25-40	350	280	340 360/375	315	295 310/320	22 32/36	206.5	26 32/36	175	8/12 12	45.3
250	10-16 25-40	450	303	395/405 425/450	338	350/355 370/385	23/27 30/33	260.4	26 32/38	225	12	67.4
300	10-16 25-40	500	329	445/460 485/515	364	400/410 430/450	23/27 30/33	309.2	26/28 34/42	250	12 16	77.2
DN	PN	**Wafer Design**										
15	10-40	65	199	55	232	-	-	17.3	-	-	-	4.2
25	10-40	65	198	73	231	-	-	28.5	-	-	-	4.1
40	10-40	65	191	94	224	-	-	43.1	-	-	-	4.8
50	10-40	65	198	105	231	-	-	54.5	-	-	-	5.6
80	10-40	65	212	144	245		-	82.5	-	-	-	7.6
100	10-40	65	221	164	254	-	-	107.1	-	-	-	8.5
150	10-40	65	253	220	286	-	-	159.3	-	-	-	13

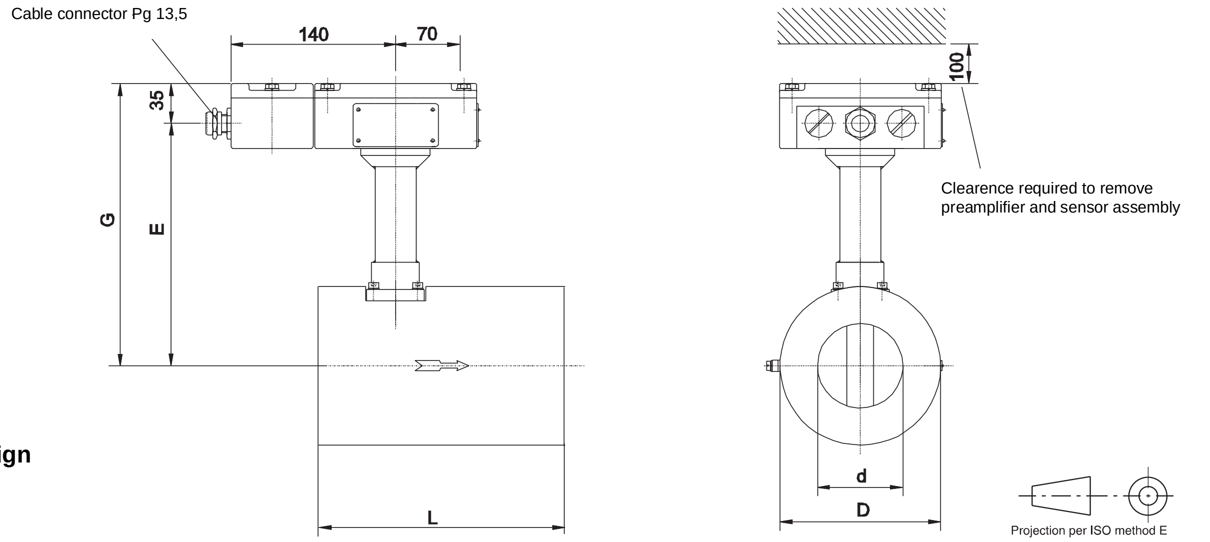
Fig.18 Dimensions 10VT1000/10VR10000, DIN

Dimensions, 10VT1000/10VR1000, ANSI

Flange



Wafer Design



Meter Size / Pressure Rating		L	E	D	G	k	d2	d	b	A	N	Weight [kg]
ANSI	Class	**Flange**										
1”	150/300	200	195	108/124	230	97.4/88.9	15.9/19	24.3	16/19	100	4/4	5.7
1-1/2”	150/300	200	190	127/155.6	225	98.4/144.3	15.9/22.2	38.1	19.5/22.6	100	4/4	8.5
2”	150/300	200	195	152.4/165	230	120.6/127	19	49.2	21/24	100	4/8	10.1
3”	150/300	200	215	190.5/209.5	250	152.4/168.3	19/22.2	73.7	25/30	100	4/8	17.6
4”	150/300	250	225	228.6/254	260	190.5/200	19/22.2	97.2	26/34	125	8/8	20.1
6”	150/300	300	250	279.4/317.5	285	241.3/269.9	22.2	146.4	27/38	150	8/12	32.8
8”	150/300	350	280	343/381	315	289.4/330.2	22.2	194	30/40	175	8/12	
10”	150/300	450	303	496.4/444.5	338	362/387.3	25.4/28.4	255	30.2/47.7	225	12	
12”	150/300	500	329	482.6/520.7	364	431.8/450.8	25.4/31.7	305	31.8/50.8	250	12/16	
ANSI	Class	**Wafer Design**										
1/2”	150/300	112.5	197	52	232	-	-	13.9	-	58.3	-	
1”	150/300	112.5	196.5	70	231.5	-	-	24.3	-	80.5	-	5.1
1-1/2”	150/300	113	189	89.5	224	-	-	38.1	-	81	-	6.1
2”	150/300	112.5	189	106.5	224	-	-	49.2	-	80.5	-	8.4
3”	150/300	111	211	138.5	246	-	-	73.7	-	55.5	-	11.2
4”	150/300	116	225	176.5	260	-	-	97.2	-	58	-	17.2
6”	150/300	137	251	222.2	286	-	-	146.4	-	56	-	25.7

Fig.19 Dimensions 10VT1000/10VR1000, ANSI

Dimensions
Converter VORTEX-VR in Field Mount Housing

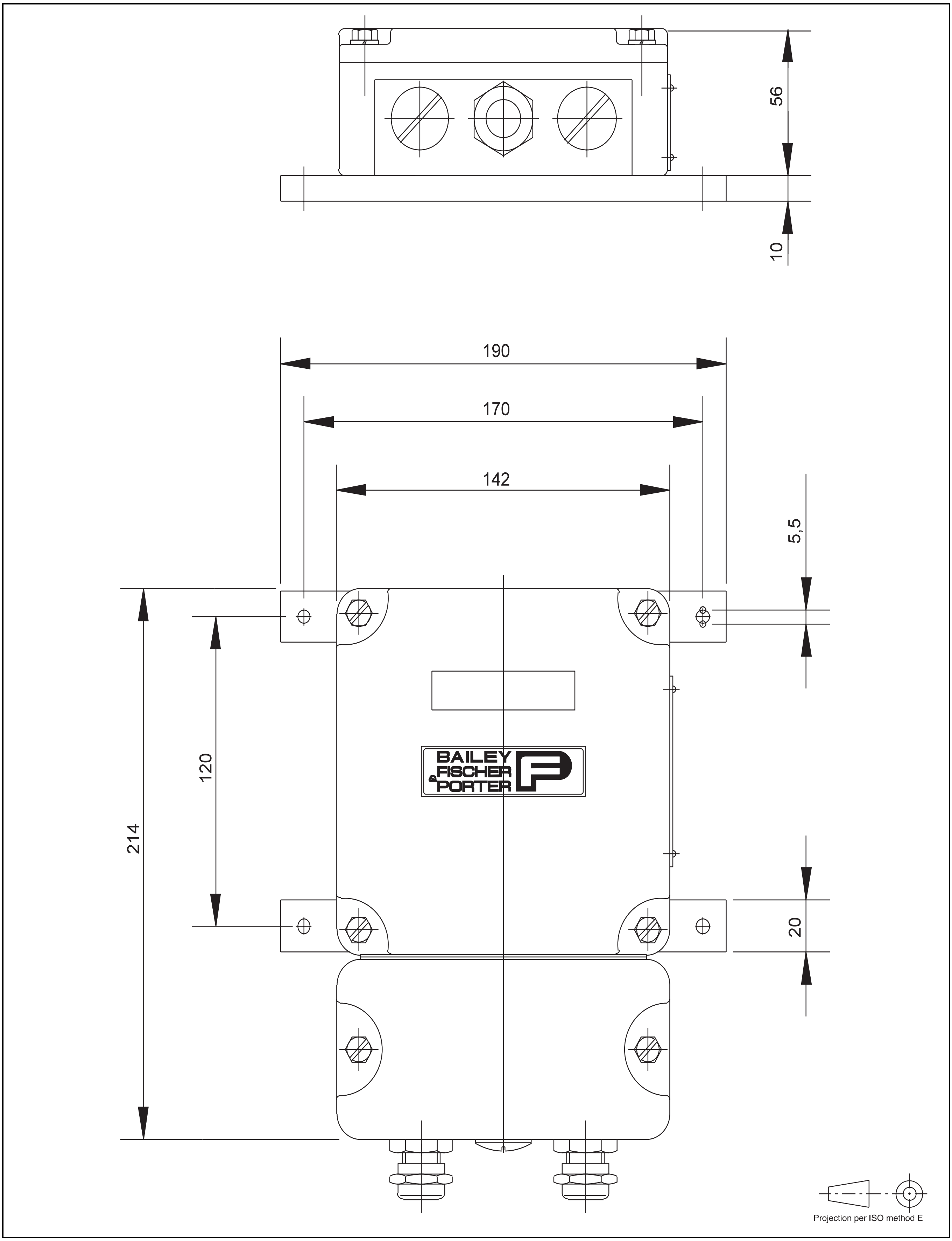


Fig.20 Field Mount Housing, VORTEX-VR

Ordering Information

Ordering Number	10V
Meter Design	
Compact	T
Remote mounted converter(10 m cable)	R
Series	
Standard	1
Double sensor	2
Process Connections	
Flange	1
Wafer Design, DIN	2
Wafer Design, ANSI	3
Fluid	
Liquid	1
Gas	2
Natural gas	3
Steam	4
Superheated steam	5
Oxygen	6
Others	9

Materials

Housing	Shedder Body	Sensor	
SS 1.4571/316TI	SS 1.4571/316TI	SS 1.4571/316TI	1
SS 1.4571/316TI	Hastelloy C	SS 1.4571/316TI	2
Hastelloy C	Hastelloy C	Hastelloy C	3
SS 1.4571/316TI	Hastelloy C	Hastelloy C	4
Others			9

Design Level	*
Meter Sizes	
DN 15 1/2”	A
DN 25 1”	B
DN 40 1-1/2”	C
DN 50 2”	D
DN 80 3”	E
DN 100 4”	F
DN 150 6”	G
DN 200 8”	H
DN 250 10”	J
DN 300 12”	K
Pressure Rating	
DIN PN 10	B
DIN PN 16	C
DIN PN 25	D
DIN PN 40	E
DIN PN 64	F
DIN PN 100	G
ANSI CL150	K
ANSI CL300	L
Others	Z
Sensor Design	
Standard with groove	2
Expanded temperature range (320 °C)	5
Others	9

Sensor SealTemperature Range

Sensor Seal	Temperature Range	
Kalrez O-Ring	0 °C to 280 °C	3
Viton O-Ring	-55 °C to 230 °C	4
PTFE O-Ring	-200 °C to 200 °C	5
HT-Special	-55 °C to 320 °C	6
Others		9

Certifications	
Standard, none	A
EEx ib IIC T4	B
Certificate DIN 50049-3.1B	C
EEx + 3.1B	D
Calibration	
Standard	3
Instrument Tag	
German	1
English	2
Software Level	*
Operating Mode	
Continuous	A
Accessories	
None	0
HART-Protocol	1
Supply Power	
14 - 46 VDC	A

Questionnaire VORTEX-VT/VR

Customer:	**Date:**		
Mr./Mrs./Ms.:	**Dept.:**		
Telephone:	**Telefax:**		
Fluid: Condition:	☐ Steam	☐ Gas	☐ Liquid
Flowrate: (Min, Max, Operating)	m^3/h		☐ Normal conditions ☐ Operating conditions
Density: (Min, Max, Operating)	kg/m^3		☐ Normal conditions ☐ Operating conditions
Viscosity: (Min, Max, Operating) (Please specify for liquids)	mPas		
Fluid Temperature: (Min, Max, Operating) **Ambient Temperature:**	°C °C		
Pressure (Min, Max, Operating)	bar		
Ex-Protection:	☐ Yes	☐ No	
Effective Pipeline Inside Diameter	mm	inches	

Bailey-Fischer & Porter reserves the right to make changes which represent technical improvements without prior notice.

The product program includes: Variable Area Flowmeters ● Electromagnetic Flowmeters
● Vortex-/Swirl Flowmeters ● Mass Flowmeters ● Transmitters for Pressure and Differential Pressure
● Gas-/Liquid Filling Systems ● Ultrasonic Metering Systems for Concentration Measurements

BAILEY FISCHER & PORTER

Certified per DIN EN ISO 9001

Bailey-Fischer & Porter GmbH
37070 Göttingen, Germany
Tel. 0551/905-0 – Fax 90 57 77