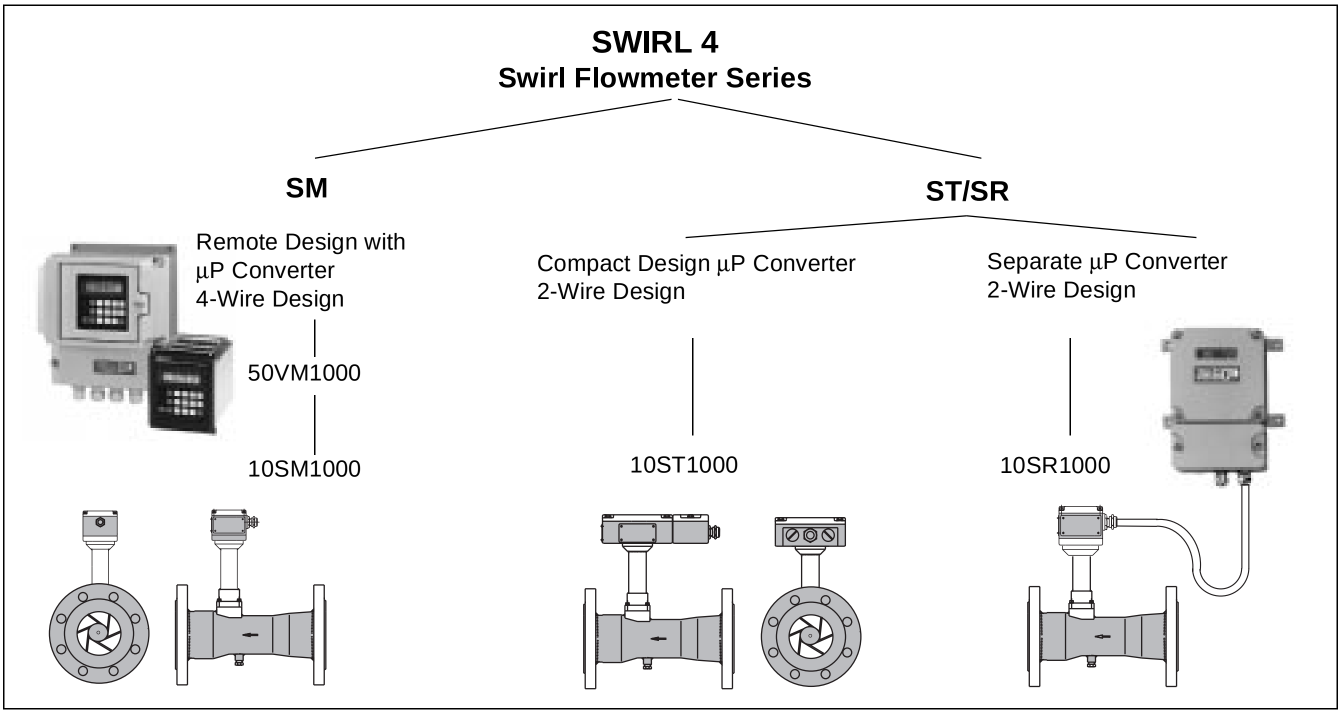
Swirl Flowmeter SWIRL-ST/SR
2-Wire Compact Design Meter with Microprocessor Converter



General

The SWIRL-ST Swirl Flowmeter is a member of the new Bailey-Fischer & Porter Swirl Flowmeter family SWIRL 4.
The flowrate of gases, steam and liquids can be metered over a wide flow range independent of the fluid properties.

SWIRL-ST is characterized by the following **design and application features:**

- No moving parts, no wear, no maintenance.
- No or short flow conditioning sections.
- Wide flow ranges, to 1:25.
- A single sensor and a single converter for all fluids, meter sizes and designs.
- Easiest installation and start-up - simply install in the pipeline and make the electrical connections.
- Ex-Design
- µP controlled converter electronics incorporating modern digital filter technology tested in accordance with EMC-NAMUR-Requirements.
- High reliability achieved through utilization of modern SMD design and high integration, e.g. user specific circuitry.
- High contrast LC-Display, alphanumeric, 2x16 character display with both lines user configurable.
- Separate connection box; the electronic module section need not be opened for installation and start-up..
- Menu guided operation using a 3 button keypad (in the separate connection box).
- SWIRL-SR is a 2-Wire flowmeter with a separately mounted converter, 10 m cable length.
- Accuracy ≤ ±0.5 % of rate.
- Double sensor design with 2 independent converters for safety relevant applications.
- Sensor and electronic modules completely compatible with the Vortex Flowmeter series VORTEX 4.
- Communication: HART or Profibus PA via PC or process control system

Fig.1 SWIRL-ST

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Swirl Flowmeter with Microprocessor Converter

Principle of Operation

The guide body in the inlet forces the axially entering flow stream into a rotational movement. A vortex core, which is forced into a spiral shaped secondary rotation by the backflow, forms in the center of the rotation. (Figs. 2 &.3).
The frequency of this secondary rotation is proportional to the flowrate and is linear over a wide flow range when the internal geometry has been optimized. This frequency is measured by a piezo-sensor.

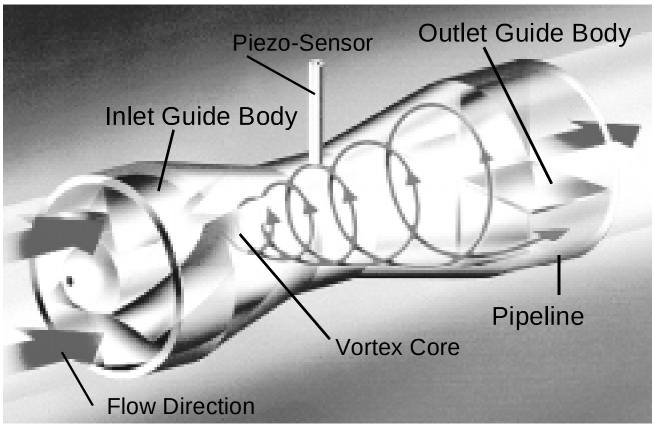


Fig.2 Vortex Formation in the Flowmeter Primary

The flowrate proportional signal generated in the flowmeter primary is processed in the converter into a 4 - 20 mA current output signal.

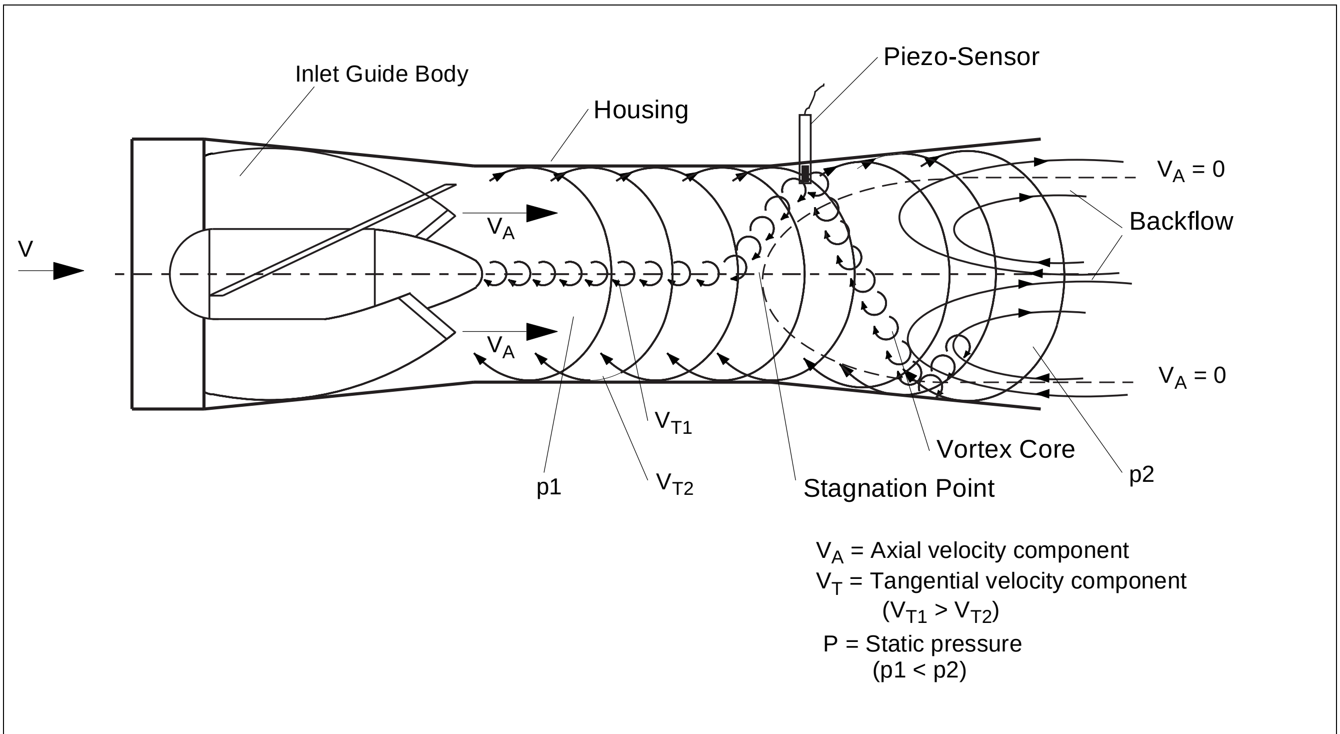


Fig.3 Principle of Operation, Swirl Flowmeter

Specifications
Meter Sizes, Flow Ranges, Pressure Drops

Fluid: Gases

Meter Size Inch	DN	Flow Range [m^3/h] Qvmin	Qv max	Frequency [Hz] at Qvmax
1/2	15	2.5	16	1900
3/4	20	2.5	25	1200
1	25	5	50	1200
1-1/4	32	7	130	1300
1-1/2	40	12	200	1400
2	50	18	350	1200
3	80	60	850	690
4	100	65	1500	700
6	150	150	3600	470
8	200	200	5000	330
12	300	400	10000	160
16	400	1000	20000	150

Table 1 Gas Flow Ranges (Air at 20 °C, 1013 mbar, ρ = 1.205 kg/m^3)

The maximum flowrate range of the flowmeter primary should not be set to less than 0.5 x $Qvmax_{DN}$, if possible, it can however be set as low as 0.15 $Qvmax_{DN}$ when required.

The meter size selection is made based on the **maximum volumetric flowrate (Qv) at operating conditions**. If the desired flowrate value is expressed in normal (normal conditions: temperature = 0 °C, pressure = 1013 mbar) or mass flowrate units, then the desired flowrate value must first be converted to the equivalent actual flowrate at operating conditions before the most suitable meter size can be determined from the Flow Range Table (Table 1).

Qvmin for gases with density <1.2 kg/m^3

The minimum flowrate for gases with low density can be calculated using the following equation:

$$Qvmin' = Qvmin \times \sqrt{\frac{\rho_{tbl}}{\rho}}$$

Qvmin = Min. actual flowrate at reference conditions (see Table 1)
ρ = Density at operating conditions [kg/m^3]
ρ_{tbl} = Density at reference conditions 1.2 kg/m^3

1. Convert normal density (ρn) --> actual density (ρ)

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

2. Convert to actual flowrate (Q_V)

a) Starting with normal flowrate (Q_n) -->

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

b) Starting with 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] (gage pressure)
T = Operating temperature [°C]
Q_V = Actual 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]

Example for Gases:
Find the meter size for metering 1200 Nm^3/h carbon dioxide;
Temperature = 30 °C; pressure = 5 bar; ρ_n = 1.977 kg/m^3

1. Convert ρ_n to ρ : ρ = 10.57 kg/m^3
2. Convert from Nm^3/h to m^3/h: Qv = 224 m^3/h
   -> Flow Range DN 50 (see Table 1): 18 - 350 m^3/h
3. Pressure drop at Qv = 224 m^3/h and ρ = 10.57 kg/m^3
   Δp‘ = 350 mbar

Pressure Drop [mbar]

Se Fig. 4 for air (20 °C, 1013 mbar, ρ = 1.205 kg/m^3).
For other medium densities the pressure drop can be calculated using the following equation:

$$\Delta p' = \frac{\rho}{1{,}205} \times \Delta p$$

$\Delta p'$ = Pressure drop, medium [mbar]
Δp = Pressure drop, air (from Fig. 4) [mbar]
ρ = Medium density (at operating conditions) [kg/m^3]

Product-Selection and Product-Specification Programs

For the selection of a flowmeter suitable for a specific application a program called “FlowSelect” is available from Bailey-Fischer & Porter.
For flowrate conversion calculations and specifications for the selected flowmeter type an additional program, “FlowCalc” is available.
Both are WINDOWS programs and are available at no cost upon request.

SWIRL-ST/SR

Specifications
Meter Sizes, Flow Ranges, Pressure Drops

Normal Density for Selected 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

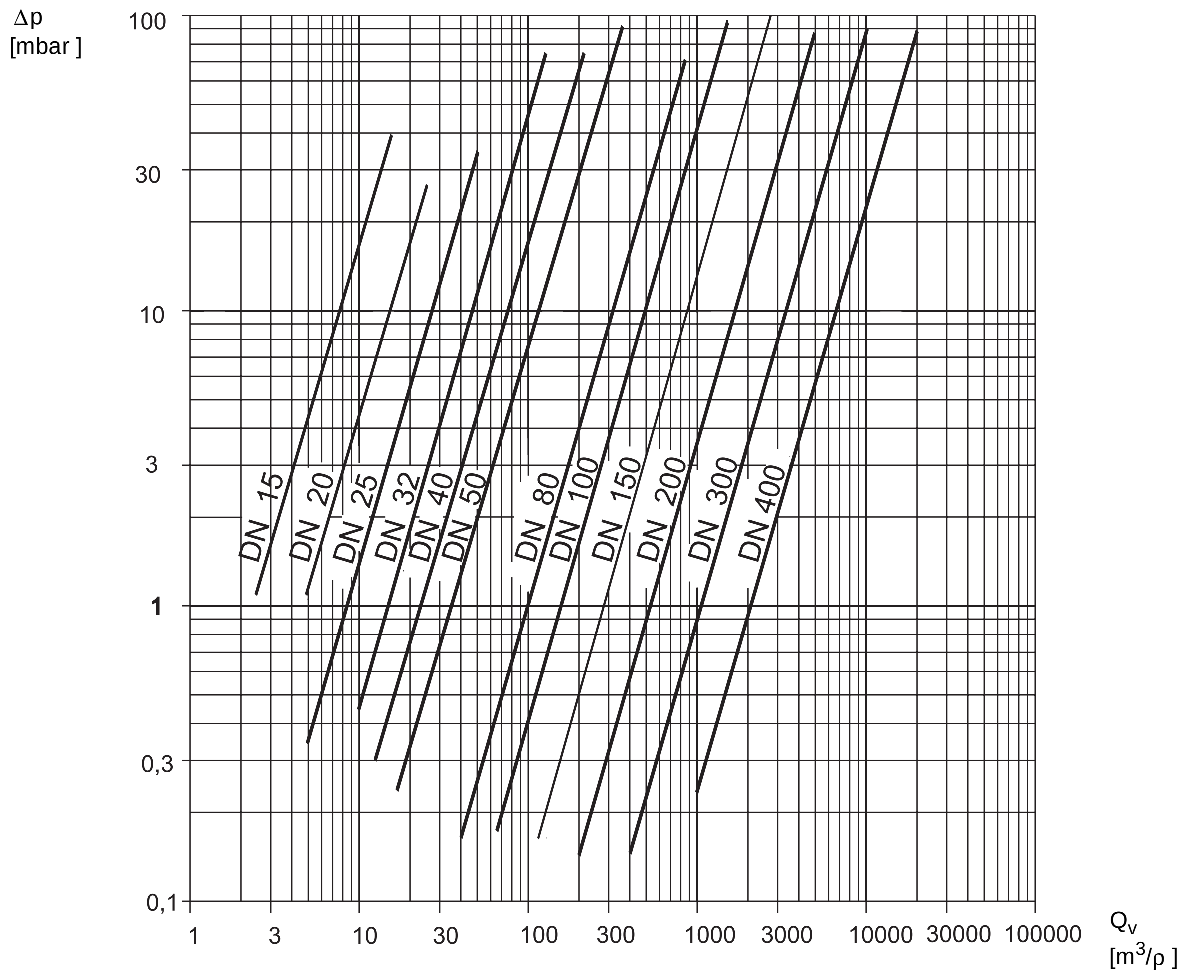


Fig.4 Pressure Drop, Air (20 °C, 1013 mbar, ρ = 1.205 kg/m^3)

Specifications
Meter Sizes, Flow Ranges, Pressure Drop

Fluid: Liquids

Meter Size Inch		Qvmin	Qvmax	Frequency at $Q_V$max [Hz]	Re min
1/2	15	0.1	1.6	185	2100
3/4	20	0.2	2	100	3500
1	25	0.4	6	135	5200
1-1/4	32	0.8	10	107	7600
1-1/2	40	1.6	16	116	13500
2	50	2.5	25	90	17300
3	80	3.5	100	78	15000
4	100	5	150	77	17500
6	150	15	370	50	35000
8	200	25	500	30	44000
12	300	100	1000	16	118000
16	400	180	1800	13	160000

Table 2: Flow Range, Liquids

The maximum flowrate range of the flowmeter primary should not be set to less than 0.5 x Qvmax, if possible, it can however be set as low as 0.15 Qvmax when required.

1. Convert mass flowrate Qm to volume flowrate Qv:

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

ρ = Operating density [kg/m^3]

Q_V = Volume flowrate [m^3/h]

Q_m = Mass flow rate [kg/h]

2. Pressure Drop [mbar]

See Fig. 5 for water (ρ = 1000 kg/m^3)
For other fluid densities the pressure drop can be calculated using the following equation:

$$\Delta p' = \frac{\rho}{1000} \times \Delta p$$

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

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

ρ = Density, fluid (at operating conditions) [kg/m^3]

3. Positive Static Pressure

To prevent cavitation during liquid measurements a positive static pressure (back pressure) is required downstream from the meter. The value can be estimated using the following equation:

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

p_2 = Downstream static pressure [mbar]

p_{Dampf} = Vapor pressure of the liquid at operating temperature [mbar]

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

Example for Liquids:

Find the meter size for metering 45 m^3/h liquid with a density of 850 kg/m^3.

1. Q_V = 45 m^3/h --> 3" [DN 80]: 3.5 - 70 m^3/h (see Tbl. 2)
2. Pressure drop at Qv = 45 m^3/h and ρ = 850 kg/m^3
   $\Delta p'$ = 170 mbar

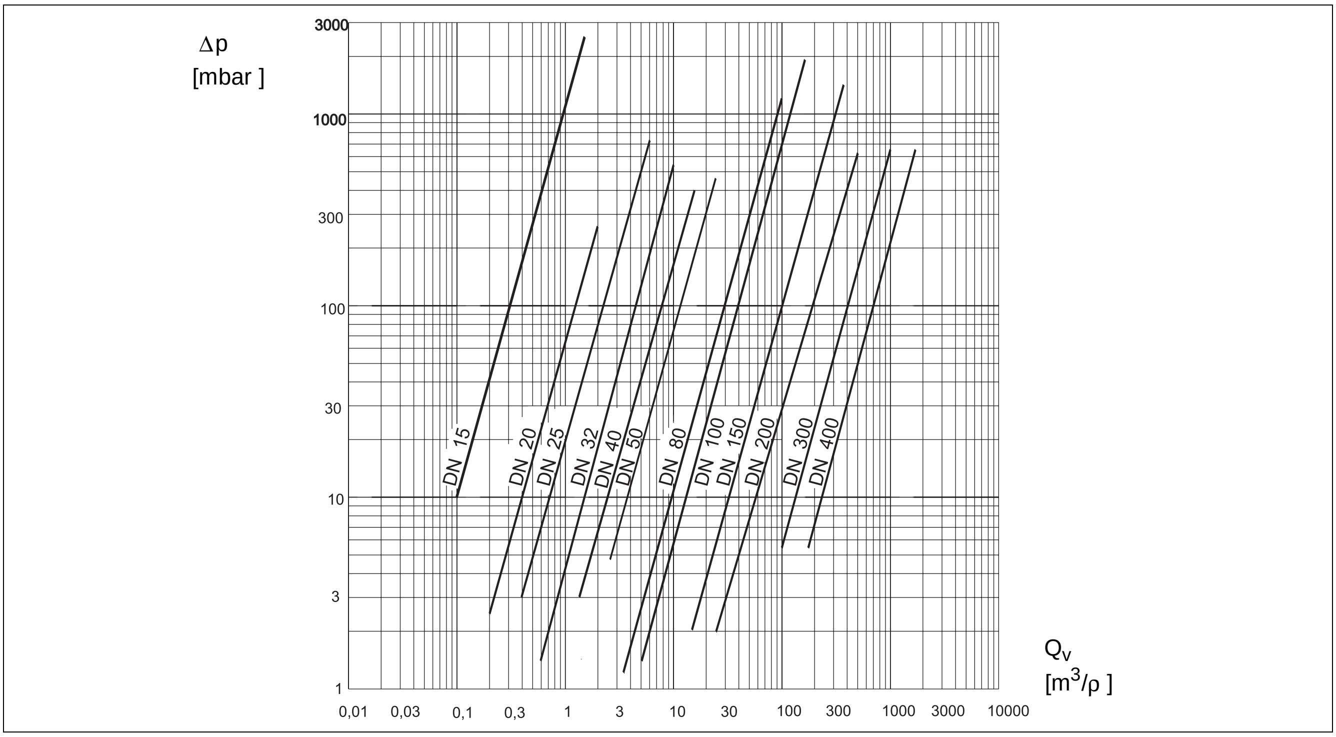


Fig.5 Pressure Drop, Water (ρ = 1000 kg/m^3)

Specifications
Meter Sizes, Flow Ranges, Pressure Drops

Flow Ranges, Saturated Steam [kg/h]

Example for Saturated Steam:
Find the Flow Range for 2” [DN50] at 7 bar a.
--> from Table 3: 2” [DN50]: 66 - 1285 kg/h
Additional information: Sat. steam temp.= 165 °C
Sat. steam density = 3.67 kg/m^3

Size Inch	DN	p[bar a]	0.5	1	1.5	2	3	4	5	6	7	8	9	10	12	15	25	30	35	40
1/2	15	min	2	2	3	3	4	4	4	5	5	6	6	6	7	8	11	13	15	17
		max	5	9	14	18	26	35	43	51	59	67	75	82	98	122	200	240	280	320
3/4	20	min	4.8	3	2.8	3	4	5	7	8	9	10	12	13	15	19	31.5	37.5	43.7	50
		max	7.5	15	21.5	28	41	54	67	79	92	104	117	129	153	190	312.5	375	437.5	500
1	25	min	9.7	7	5.7	6	8	11	13	16	18	21	23	26	31	38	62.5	75	87.5	100
		max	15	30	43	56	83	108	134	159	184	208	233	258	307	380	625	750	875	1000
1-1/4	32	min	31.3	15.2	12.3	12.7	17.8	23.7	29.6	34.7	38.9	54.2	51.6	56.7	67.7	83.8	137.5	165	192.5	220
		max	39	77	111.8	147	215	281	347	412	477	541	606	670	797	988	1625	1950	2275	2600
1-1/2	40	min	6.9	9.7	11.7	13.4	19	24.9	30.7	36.5	42.3	41.9	53.6	59.2	70.5	87.5	143.8	112.5	201.3	230
		max	63	1239	180	237	346	453.6	561	665	770	873	978	1081	1287	1596	2625	3150	3675	4200
2	50	min	34.9	25	20.6	20	30	39	48	57	66	75	84	93	110	137	225	270	315	360
		max	105	207	301	395	578	756	935	1110	1285	1456	1631	1803	1803	2660	4375	5250	6125	7000
3	80	min	77.6	55	45.8	45	66	86	107	127	147	166	186	206	245	304	500	600	700	800
		max	255	502	731	960	1403	1836	2270	2695	3120	3536	3961	4378	5211	6460	10625	12750	14875	17000
4	100	min	126.1	90	74.4	73	107	140	174	206	239	270	303	335	398	494	812.5	975	1137.5	1300
		max	450	885	1290	1694	2475	3240	4005	4755	5505	6240	6990	7725	9195	11400	18750	22500	26250	30000
6	150	min	232.8	166	137.4	135	198	259	320	380	440	499	559	618	736	912	1500	1800	2100	2400
		max	1110	2182	3181	4181	6105	7992	9879	44729	13579	15392	17242	19055	22681	28120	46250	55500	64750	74000
8	200	min	388	277	229	226	330	432	534	634	734	832	932	1030	1226	1520	2500	3000	3500	4000
		max	1500	2950	4300	5645	8250	10800	13350	15850	18350	20800	23300	25750	30650	38000	62500	75000	87500	100000
12	300	min	776	553	458	452	660	864	1068	1268	1468	1664	1864	2060	2452	3040	5000	6000	7000	8000
		max	3000	5900	8600	11290	16500	21600	26700	31700	36700	41600	46600	51500	61300	76000	125000	150000	175000	200000
16	400	min	1940	1383	1146	1129	1650	2160	2670	3170	3670	4160	4660	5150	6130	7600	12500	15000	17500	20000
		max	6000	11800	17200	22580	33000	43200	53400	63400	73400	83200	93200	103000	122600	152000	250000	300000	350000	400000
Density ρ_{sat} [kg/m^3]			0.3	0.59	0.86	1.13	1.65	2.16	2.67	3.17	3.67	4.16	4.66	5.15	6.13	7.6	12.5	15	17.5	20
Temp. Tsat [°C]			81.3	99.6	111.4	120	133	144	152	159	165	170	175	180	188	198	224	234	242	250

Table 3: Saturated Steam, Flow Ranges

Specifications

Fig.6 SWIRL-ST, 10ST1000

Accuracy and Reproducibility

Accuracy

≤ ± 0.5 % of rate (at reference conditions)

Reproducibility

≤ 0.2 % of rate

Overrange:

Gases:
15 % over maximum flowrate

Liquids:
15 % over maximum flowrate
Note: Cavitation may not be present

Operating Pressure:

Flange design: DIN PN 10 to PN 100
ANSI Class 150/300/600
(Meter size dependent)
Additional designs to PN160/CL 1200 upon request.

Connections:

Process Connections
Flanges per DIN or ANSI

Electrical Connections
Screw terminals, connectors PG 13.5

Protection Class:

IP 65

Explosion Proof Design:

TÜV 97 ATEX 1160
II 2G EEx ib IIC T4

Safety specifications for the ambient temperature range of -55 °C to +60 °C.

Ui = 28 V
Li = 110 mA
Pi = 770 mW
(Linear curve)
The effective internal capacitances and inductances are negligible.

Materials:

Meter housing
Stn. stl. 316Ti [No. 1.4571]

Flanges
Stn. stl. 316Ti [No. 1.4571]

Inlet guide body
Stn. stl. 316Ti [No. 1.4571]

Sensor
Stn. stl. 316Ti [No. 1.4571]

Sensor gaskets
Kalrez O-Ring: 0 °C to 280 °C
Viton O-Ring: -55 °C to 230 °C
PTFE O-Ring: -55 °C to 200 °C
Other materials upon request.

Housing, electronic module
Cast light metal, painted

Weights:

See Dimensions, Fig. 15

Fluid Temperatures:

-55 °C to +280 °C (standard)
-55 °C to +280 °C (Ex-Design)
(The allowable temperature range for the gasket materials must be considered.)

Ambient Conditions:

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

Ambient / Fluid Temperature:

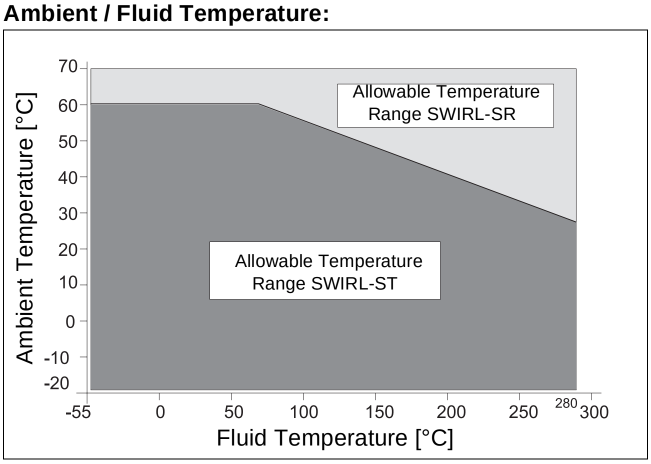


Fig.7 Fluid Temperature / Ambient Temperature Relationship

Specifications Converter

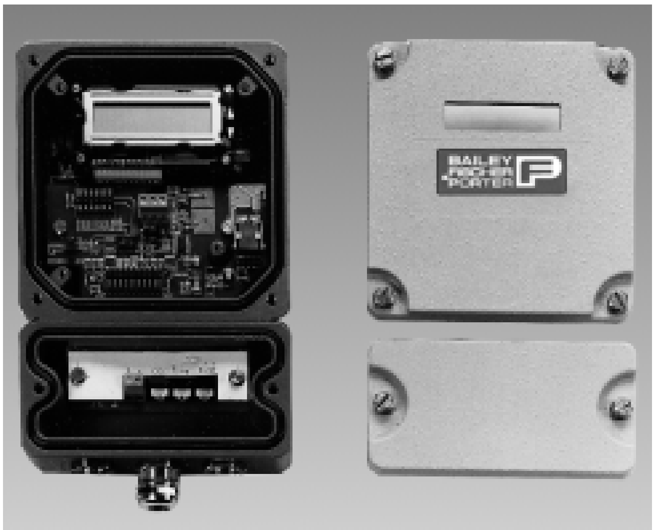


Fig.8 SWIRL-ST, Electronic Module

Flow Ranges
Continuous settings between minimum (0.15 $Qvmax_{DN}$) and maximum flowrate ($Qvmax_{DN}$, for the corresponding meter size).

Parameter Settings
The data can be entered from either the 3 buttons in a clear text dialog with the display or by digital communication utilizing the HART-Protocol.

Data Protection
The totalizer values and the meter location specific parameters are stored in an NV-RAM and EEPROM for a period of 10 years without external power when the power is turned off or during power outage .

Function Tests
The individual internal subassemblies of the converter can be checked using the built-in function tests. Simulated current output values can be entered during start-up or for service (manual process control).

Damping
Can be set between 1 and 100 s.

$Q_v$min (Low Flow Cutoff)
Can be set between 0 and 10 % of $Qvmax_{DN}$ (max. operating flowrate for the meter size).

Supply Power
14 to 46 V DC
Ripple: max. 5 % or. ± 1.5 V_{PP}

Power Consumption
< 1 W

Protection Class
IP 65

Output Signals

Current Output
4 - 20 mA, load ≤ 750 Ω

Pulse Output
Scaled, in conjunction with the Transmitter Power Supply Instrument 55TS1000/55TS2000
Active 24 V or passive optocoupler

Display
High contrast LC-Display, 2 x 16 characters for displaying meter values, e.g. instantaneous flowrate and totalized flow. Both display lines can be user configured. The maximum value may have 8 places. The decimal places for values larger than 99999 are reduced.

Examples:

```
Qv          13.56 m3/h
Qv          50.05 m3
```

1st Line: Actual flowrate
2nd Line: Totalized actual flow

```
Qn ███_________  33 %
Qn          1500 m3
```

1st Line: Normal flowrate, bargraph display
2nd Line: Totalized normal flow

```
Qm          5.00 kg/h
Qm          19.769 kg
```

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

Error Messages in the Display
Automatic system monitoring with error diagnostics indicated by clear text messages in the display and by output alarm signals.

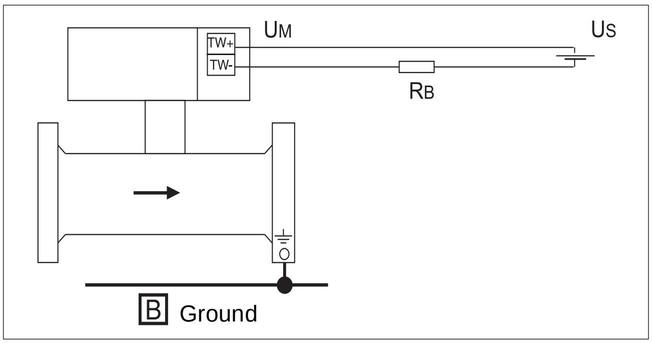
```
Flowrate   >    115 %
Qv       14 550.50 m3
```

Specifications
Converter, Electrical Connections and Communication

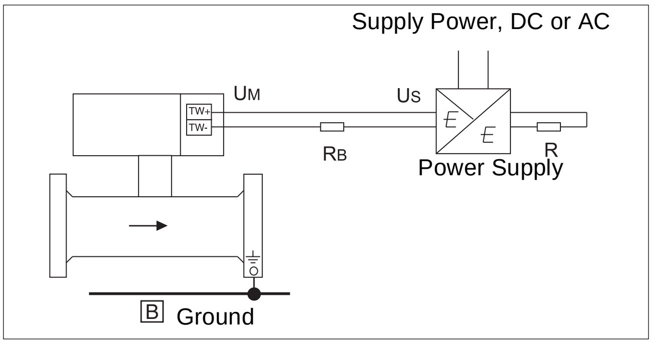
Electrical Connections

The SWIRL-ST converter is designed as a 2-Wire instrument, i.e., the supply power is connected to the output leads (4 - 20 mA).

a) Supply voltage from a central power supply source)

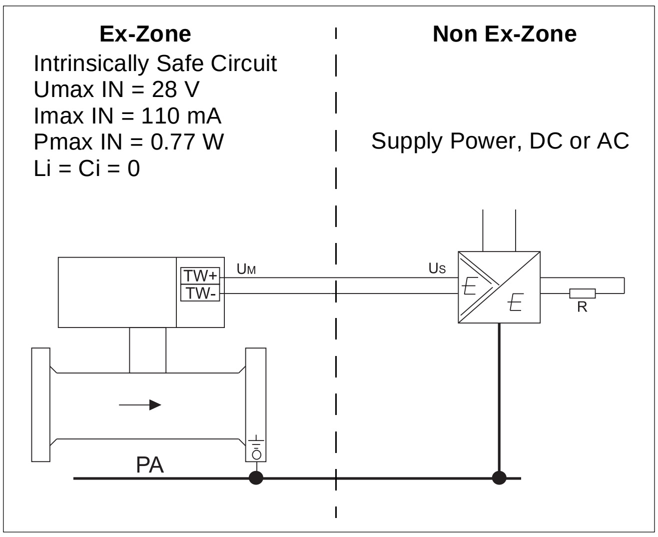


b) Supply voltage for a power supply instrument



c) Electrical Connections, Ex-Design

The Ex-Design SWIRL-ST is an “Intrinsically Safe ib” design. The protection for the supply/signal leads can be provided by using supply isolators or Zener barriers. The limits listed in the diagram for the intrinsically safe circuit may not be exceeded. The detailed requirements listed in the Ex-Certificate are to be observed.



d) Electrical Connections SWIRL-VR

The flowmeter primary and converter of the SWIRL-SR are separated from each other by a 10m long signal cable. The connections to the converter are made as described in a), b) or c) above.

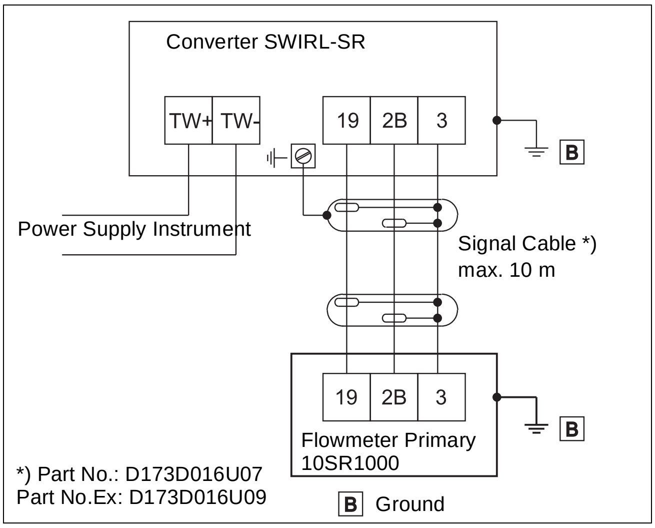


Fig.9 Interconnection Diagram Flowmeter Primary/Converter

U_M = Supply voltage, SWIRL-ST/SR = 14 V DC
U_S = Power supply voltage = 14 - 46 V DC
R_B = Max. allowable load for power supply instrument (e.g. Indicator)
R = Max. allowable load for the output circuit - determined by the power supply instrument (e.g. Indicator)

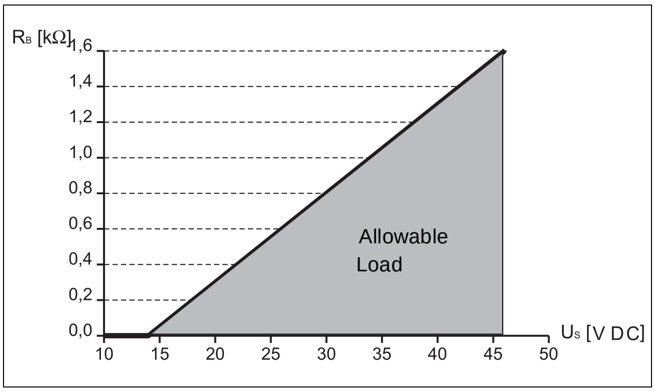
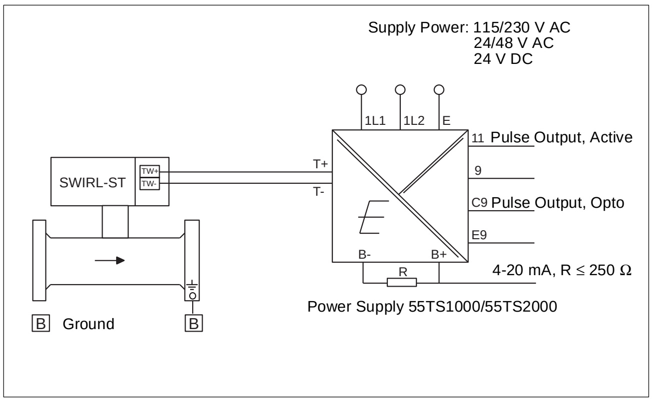


Fig.10 Load Diagram

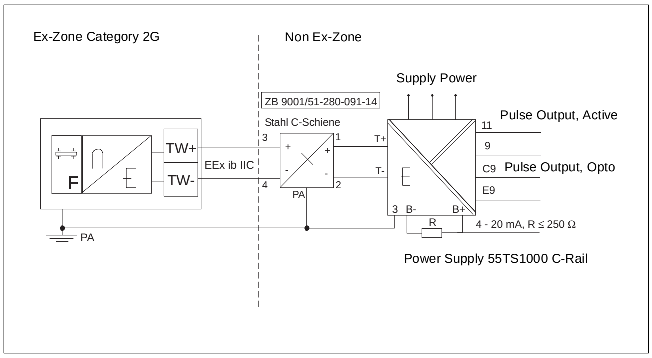
Specifications
Converter, Electrical Connections and Communication

Pulse Transmission (not available for Ex-Design)

In the smart SWIRL-ST converter it is possible to transmit pulses simultaneously with 4 - 20 mA current output in the 2-Wire design. The converter superimposes the scaled pulse output signals on the current output utilizing the Bell 202 Standard. These signals are demodulated in the Bailey-Fischer & Porter Power Supply 55TS1000/55TS2000 Instrument and converted into galvanically isolated pulse output signals. The analog instruments connected to the current output line are not affected by this signal.



Pulse transmission with Power Supply 55TS1000 Instrument for evaluating current and pulse outputs (Ex-Applications):



Communication, HART®-Protocol

The HART-Protocol provides for digital communication between a process control system/PC or handheld terminal and the SWIRL-ST. All parameters - such as meter location specific parameters can be can be transmitted from the converter to the process control system or PC. In the reverse direction it is possible to reconfigure the converter in a similar manner.

The digital communication utilizes an ac signal superimposed on the current output (4 - 20 mA), which does not affect any other instruments connected to the output.

Transmission Mode

FSK-Modulation on the current output 4 - 20 mA per Bell 202 Standard. Max. signal amplitude 1.2 mA_{PP}.
Representation logic 1: 1200 Hz
Representation logic 0: 2200 Hz
The WINDOWS-Software “SMART VISION®“ is used for the HART-Communication. Detailed information is available upon request.

Load, Current Output (R)

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

Baudrate

1200 Baud

Current Output at Alarm (selectable)

High = 22.4 mA
Low = 3.85 mA

The operation of the HART-Protocol is described in a separate Instruction Manual “SWIRL-ST- HART-Communication”, included only when the HART-Option is ordered.

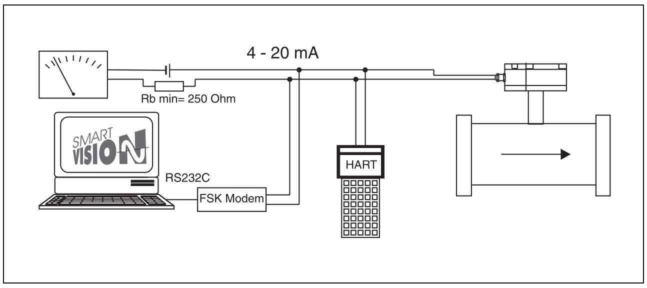


Fig.11 HART-Communication

Installation

The flowmeter primary should be installed in the pipeline after considering the following information.

In- and Outlet Sections

Due to the operating principle of the Swirl Flowmeter nearly no in- or outlet sections are required. Recommended in- and outlet sections are shown in Fig. 12 for a various installations. No in- or outlet sections are required when the radius of single or double elbow up- or downstream of the flowmeter primary exceeds 1.8 x D. Downstream of flanged reducers per DIN 28545 ($\alpha/2 = 8°$) no additional up- or downstream sections are required.

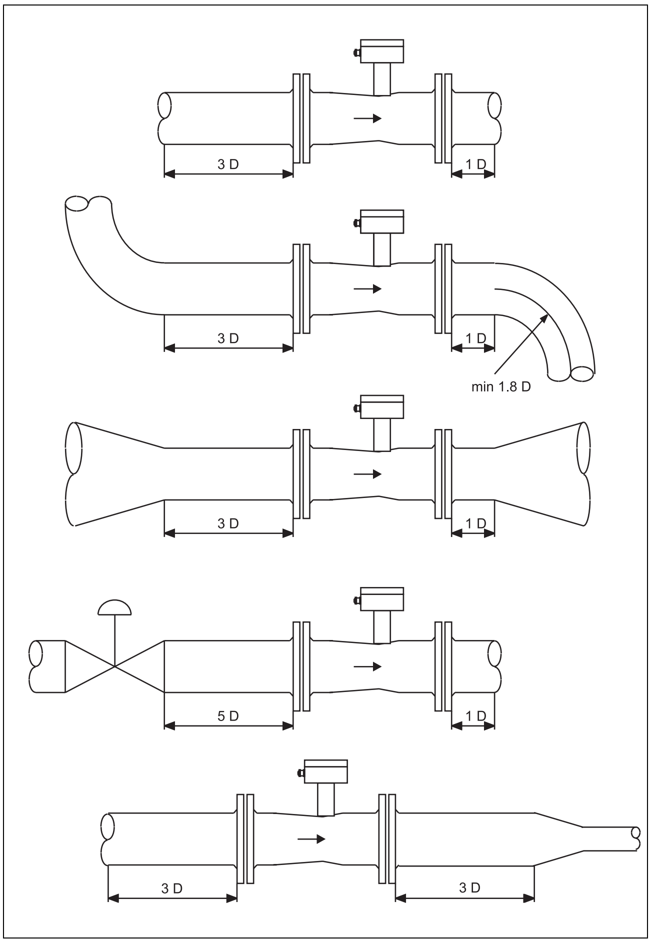


Fig.12 In- and Outlet Sections

Additional Installation Information

- For liquids assure that the flowmeter primary is always completely filled with fluid.
- For installations in horizontal pipelines with fluid temperatures > 150 °C, the installation scheme shown in Fig. 13 is recommended.
- When gas bubble formation is possible, gas separators should be provided.
- For installations in long pipelines in which vibrations are present, the vibrations should be damped by shoring up the pipeline before and behind the instruments.

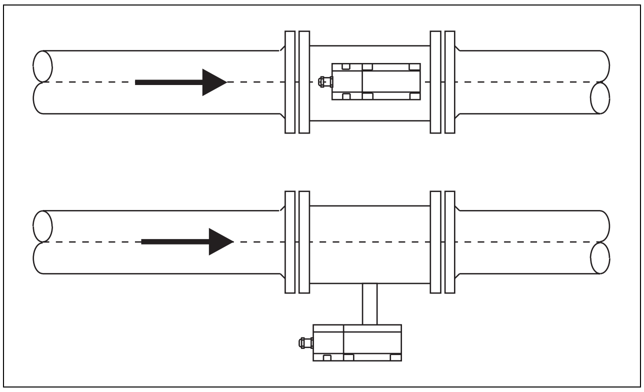


Fig.13 Installations for high temperatures

Pressure and Temperature

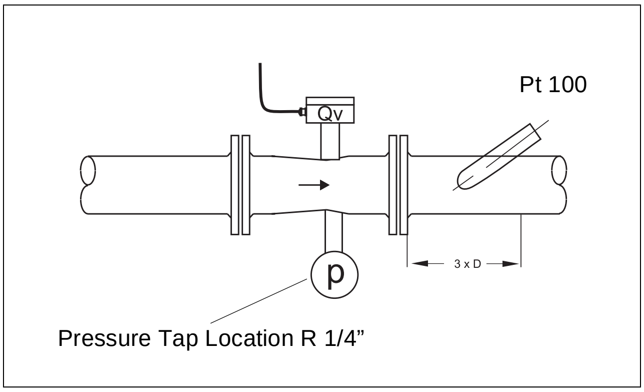
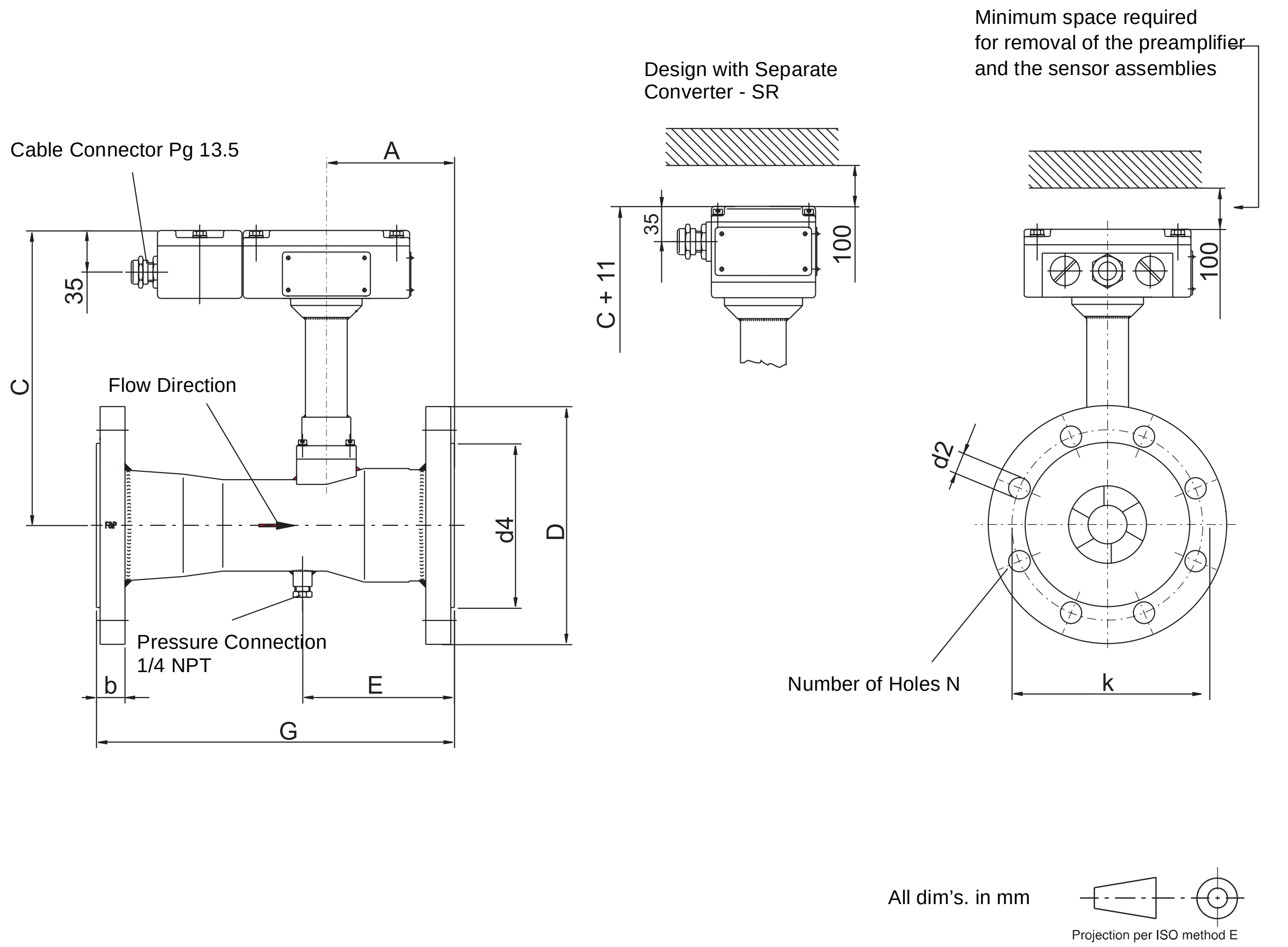


Fig.14 Installation, Pressure and Temperature Measurements

Dimensions
Flowmeter Primary, DIN, DN 20 to 50, ANSI, 3/4” to 2”

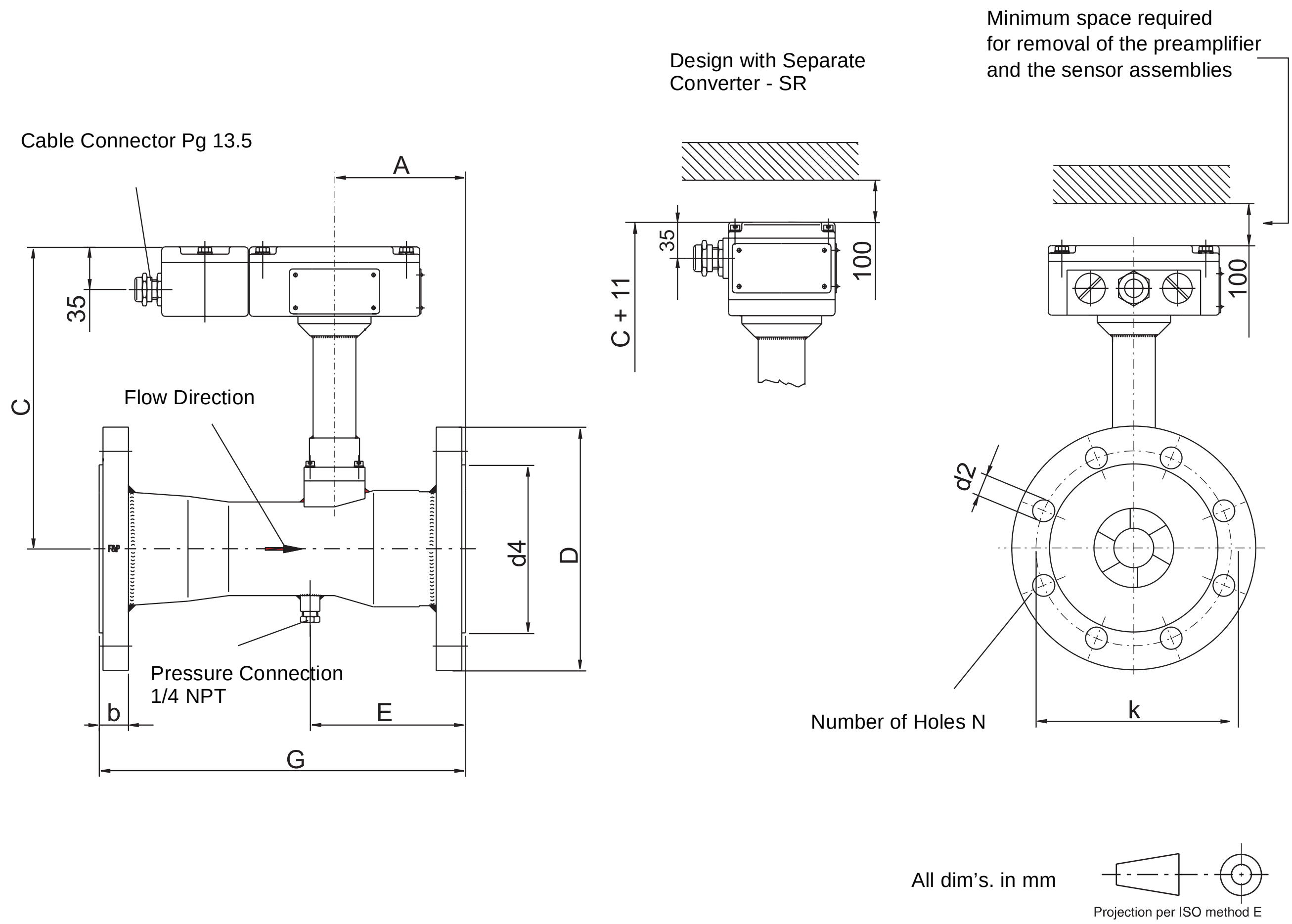


DIN	Meter Dimensions DIN PN 10 - 100				PN 10 - 40							PN 64							PN100						
DN	A	C	E	G	øD	b	k	d2	ød4	N	kg	øD	b	k	d2	ød4	N	kg	øD	b	k	d2	ød4	N	kg
15	117	235	121,5	200	95	16	65	14	45	4	5,8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	52	246	62	120	105	18	75	14	58	4	2,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	55	235	77	150	115	18	85	14	68	4	3,5	140	24	100	18	69	4	6,4	140	24	100	18	69	4	6,4
32	61	243	70	150	140	18	100	18	78	4	4,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
40	90	240	101	200	150	18	110	18	88	4	8,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
50	73	236	87	200	165	20	125	18	102	4	7,2	180	26	135	22	102	4	10,7	-	-	-	-	-	-	-

ANSI	Meter Dimensions ANSI 150/300/600 lb				ANSI CL 150							ANSI CL 300							ANSI CL 600						
DN	A	C	E	G	øD	b	k	d2	ød4	N	kg	øD	b	k	d2	ød4	N	kg	øD	b	k	d2	ød4	N	kg
1/2”	117	235	121,5	200	88,9	11,2	60,5	15,7	35,1	4	5,3	95,2	14,2	66,5	15,7	35	4	5,8	-	-	-	-	-	-	-
3/4”	52	246	62	120	98,6	12,7	69,9	15,7	42,9	4	2,1	117,3	15,7	82,5	19	42,9	4	3	-	-	-	-	-	-	-
1”	55	235	77	150	107,9	14,3	79,4	15,9	50,8	4	3,4	123,8	17,5	88,9	19,1	50,8	4	3,6	124	23,9	88,9	19,1	50,8	4	3,9
1¼”	61	243	70	150	117,5	15,9	88,9	15,9	63,5	4	3,7	133,3	19	98,4	19	63,5	4	5,4	-	-	-	-	-	-	-
1½”	90	240	101	200	127	17,5	98,6	15,7	73,2	4	6,8	155,4	20,6	114,3	22,3	73,1	4	8,9	-	-	-	-	-	-	-
2”	73	236	87	200	152,4	19	120,6	19	92,1	4	7,1	165,1	22,2	127	19	92,1	8	9,8	-	-	-	-	-	-	-

Fig.15 Dimensions, DIN, DN 20 to 50; ANSI, 3/4” to 2”

Dimensions
Flowmeter Primary, DIN, DN 80 - DN 400 ANSI, 3” to 16”



DIN	Meter Dimensions DIN PN 10 - 100				PN 16/40							PN 64							PN100						
DN	A	C	E	G	øD	b	k	d2	ød4	N	kg	øD	b	k	d2	ød4	N	kg	øD	b	k	d2	ød4	N	kg
80	107	245	127	300	200	24	160	18	138	8	12,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	125	257	151	350	220/ 235	20/ 24	180/ 190	18/ 22	158/ 162	8	14,2 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					PN 10/16							PN 25/40							PN 63						
150	152	272	190	480	285	22	240	22	212	8	28,5	300	28	250	26	218	8	34,5	-	-	-	-	-	-	-
					PN 10/16							PN 25							PN 40						
200	164	292	220	600	340	24	295	22	268	8/ 12	50	360	30	310	26	285	12	59	375	34	320	30	285	12	66
					PN 6							PN 10							PN 16						
300	338	326	425	1000	-	-	-	-	-	-	-	445	26	400	22	370	12	171	460	28	410	26	378	12	186
400	433	359	543	1270	-	-	-	-	-	-	-	565	26	515	26	482	16	245	580	32	525	30	490	16	266

ANSI	Meter Dimensions ANSI 150/300/600 lb				ANSI CL 150 lb							ANSI CL 300							ANSI CL 600						
3”	107	245	127	300	190,0	23,8	152,4	19	127,0	4	11,7	209,5	28,6	168,9	22,2	127,0	8	16,2	-	-	-	-	-	-	-
4”	125	257	151	350	228,6	23,8	190,5	19	157,2	8	18,0	254,0	31,7	200,0	22,2	157,2	8	27,5	-	-	-	-	-	-	-
6”	152	272	190	480	279,4	25,4	241,3	22,2	215,9	8	30	317,5	31,7	269,9	22,2	215,9	12	46	355,6	54,2	292,1	28,4	215,9	12	74
8”	164	292	220	600	343,0	28,6	298,4	22,2	270	8	45	381	41,3	330,2	25,4	270	12	75	419	62	349,3	31,8	270	12	116
12”	338	326	425	1000	482,0	31,8	431,8	25,4	381	12	182	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16”	433	359	543	1270	596,9	36,6	539,8	28,4	469,9	16	260	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Fig.16 Dimensions, DIN , DN 80 to DN 400; ANSI, 3” to 16”

Dimensions
Converter SWIRL-SR in Wall Mount Housing

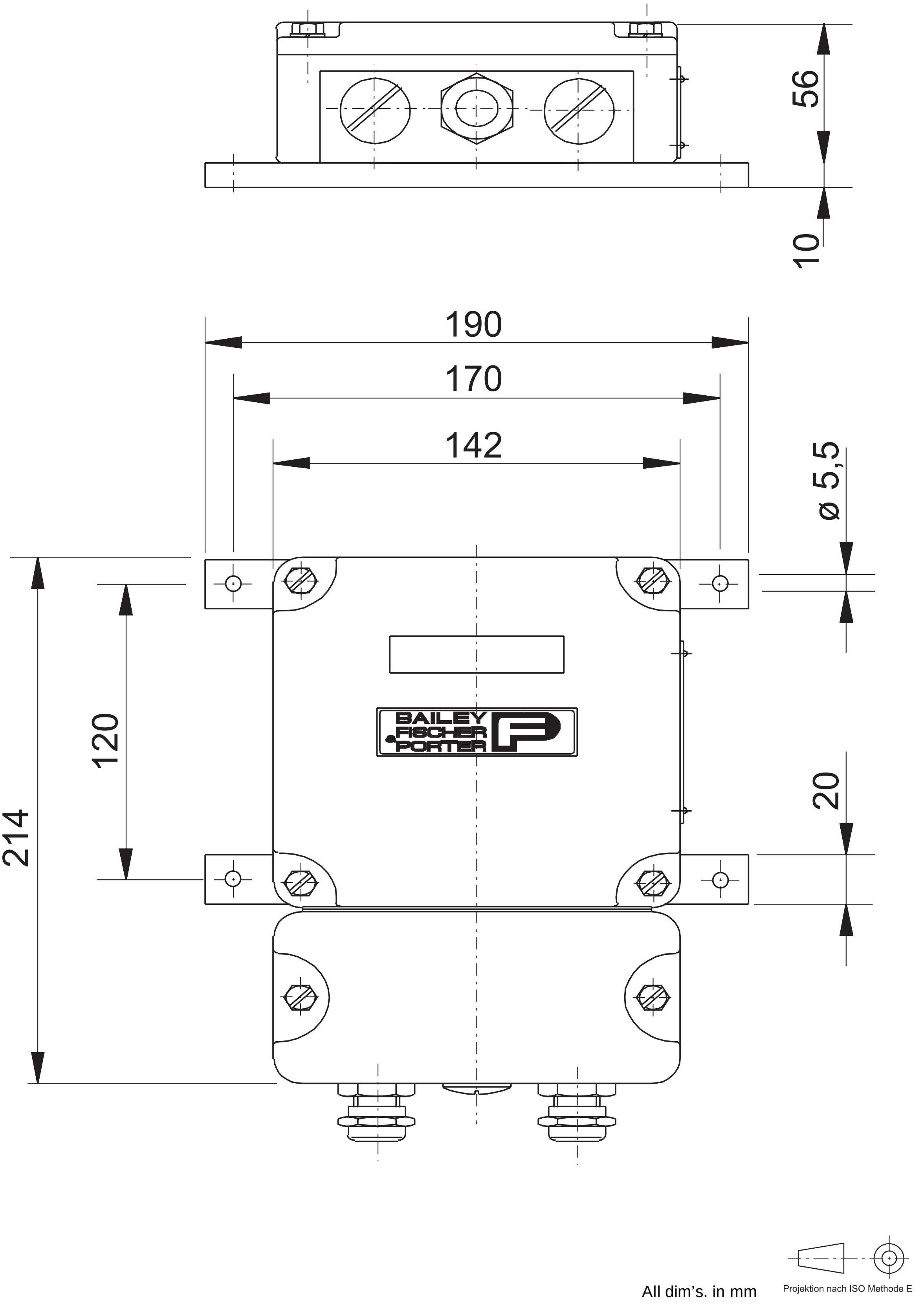


Fig.17 Wall Mount Housing, SWIRL-SR

Ordering Specifications

Ordering Number		**10S**
Instrument Design		
Compact Design		T
Separate converter mounting (10 m cable)		R
Series		
Standard		1
Double sensor		2
Housing, Guide Body Materials		
Stn. Stl. 316Ti [No. 1.4571]		1
Others		9
Fluids		
Liquid		01
Gas		02
Natural gas		03
Steam		04
Superheated steam		05
Oxygen [1]		06
Others		09
Design Level		*
Meter Sizes	**Std. Press. Rating**	
1/2" DN 15"	PN 40	A
3/4" DN 20	PN 40	B
1" DN 25	PN 40	C
1-1/4" DN 32	PN 40	D
1-1/2" DN 40	PN 40	M
2" DN 50	PN 40	E
3" DN 80	PN 40	F
4" 'DN 100	PN 16	G
6" DN 150	PN 16	H
8" DN 200	PN 16	I
10" DN 300	PN 10	K
12" DN 400	PN 10	L
Pressure Rating		
DIN 2501	PN 10	B
	PN 16	C
	PN 25	D
	PN 40	E
DIN 2512	PN 10	H
With groove	PN 16	I
	PN 25	K
	PN 40	L
ANSI	CL 150	P
	CL 300	Q
Others		Z
Certifications		
Standard		1
EEx		2
Certificate per DIN 50049-3.1b		3
EEx +3.1b		4
FM-Approval		5
Custody transfer design for hot water to 180 °C		6
Others		9
Sensor Design		
Standard with groove		A
Others		Z
Sensor Gasket	**Temperature Range**	
Kalrez O-Ring	0 °C to 280 °C	3
Viton O-Ring	-55 °C to 230 °C	4
PTFE O-Ring	-55 to 200 °C	5
Others		9
Calibration		
Gas or liquid calibration		3
Instrument Tag		
German		1
English		2
Software Level		*
Operating Mode		
Continuous flow metering		A
Accessories		
None		0
HART-Protocol		1
Profibus PA		2
Supply Power		
14 - 46 V, DC		A

1) Cleaned and tagged for oxygen service.

Questionnaire
SWIRL-ST/SR

Customer:	**Date:**		
Mr./Mrs. /Ms.:	**Dep't/Div.:**		
Telephone:	**Telefax:**		
Fluid: Composition:	☐ Steam	☐ Gas	☐ Liquid
Flowrate: (Min, Max, at Operating Conditions)	m^3/h		☐ Normal conditions ☐ Actual conditions
Density: (Min, Max, at Operating Conditions)	kg/m^3		☐ Normal conditions ☐ Actual conditions
Viscosity: (Min, Max, at Operating Conditions) (Please specify for liquids)	mPas		
Fluid Temperature: (Min, Max, at Operating Conditions) **Ambient Temperature :**	°C °C		
Pressure: (Min, Max, at Operating Conditions)	bar		
Ex-Protection:	☐ Yes	☐ No	
Effective Inside Pipeline Diameter	mm		

Bailey-Fischer & Porter reserves the right to make changes which serve engineering refinements without notice.

Products :
- Variable Area Flowmeters
- Electromagnetic Flowmeters
- Vortex and Swirlmeters
- Mass Flowmeters
- Converters for Pressure and Differential Pressure
- Dispensing Systems for Gases and Liquids
- Ultrasonic Concentration Measurements

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Elsag Bailey Process Automation

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