MAG-SM

Electromagnetic Flowmeter with AC Field Excitation in a Remote Mounted Design

D184S034U02 Rev. 02 / 08.2001

Fig. 1 Remote Mounted Design Flowmeters

Electromagnetic Flowmeters can be used to accurately measure the flowrate of liquids, pulps, slurries and sludges which have an electrical conductivity greater than 0.5 µS/cm. The MAG-SM metering system consists of a flowmeter primary and a remote mounted µP-Converter.

- The MAG-SM is especially well suited for measuring fast changing processes, two phase fluids, continuous or pulsating flows (piston pump operation).
- The flowmeter size range extends from 1/10”-40” / DN 3-1000 and from 1/25”-4” / DN 1-100 in a stainless steel design.
- Weighting factor adapted magnetic field distribution for linear and accurate flowrate metering independent of the velocity profile.
- Long term accuracy stability in both flow directions using digital signal processing with zero stablility.
- Straightforward menu controlled operating structure. Parameters can be configured directly at the converter.
- System monitoring with error diagnostics displayed in clear text and signaled over an alarm contact.
- Flowmeter primary available with a variety of process connections:
  Flanges DIN/ANSI/BS/JIS
  Flanges APV FAB1 DIN 11864-2
  1/8”-Sanitary Connections
  Wafer Design
  Tri-Clamp DIN 32676, ISO 2852
  Aseptic Connections DIN 11851, SMS
  Food Industry Fittings DIN 11864-1
  Weld Stubs ISO 2037, DIN 2463/11850
  External Threads
  Internal Threads
  PVC-Cement Sleeve
  Hose Connections
- Fluid temperatures standard -40 °C/ -25 °C to 130 °C, (-40 °F/-13 °F to 266 °F)
  High temperature design to 180 °C (356 °F)
  Ambient temperature -25 °C to 60 °C (-13 °F to 140 °F)
- Certificates: EHEDG, FML, 3A

Accuracy, Reference Conditions and Principles of Operation

Reference Conditions per EN 29104

Fluid Temperature
20 °C ± 2 K

Ambient Temperature
20 °C ± 2 K

Supply Power
Nominal voltage per Instruemnt Tag U_N ± 1 %

Installation Requirements, Straight Pipe Sections
Upstream > 10 x DN,
Downstream > 5 x DN,
DN = Flowmeter primary size

Warm up time
30 min

Effect on Current Output
Same as pulse output plus ± 0.1 % of rate

Principle of Operation

The Faraday's Laws of Induction form the basis for the electromagnetic flowrate measurements. A voltage is generated in a conductor when it moves through a magnetic field.

This measurement principle is applied to a conductive fluid which flows in a pipe through which a magnetic field is generated perpendicular to the flow direction (see Schematic).

The voltage which is induced in the fluid is measured at two electrodes mounted diametrically opposite to each other. This signal voltage $\mathbf{U_E}$ is proportional to the magnetic induction **B**, the electrode spacing **D** and the average flow velocity **v**.

Noting that the magnetic induction **B** and the electrode spacing **D** are both constant values indicates that a proportionality exists between the signal voltage $\mathbf{U_E}$ and the average flow velocity **v**. The equation for calculating the volumetric flowrate shows that the signal voltage $\mathbf{U_E}$ is linearly proportional to the volume flowrate.

The induced signal voltage is processed into scaled analog and digital signals in the converter.

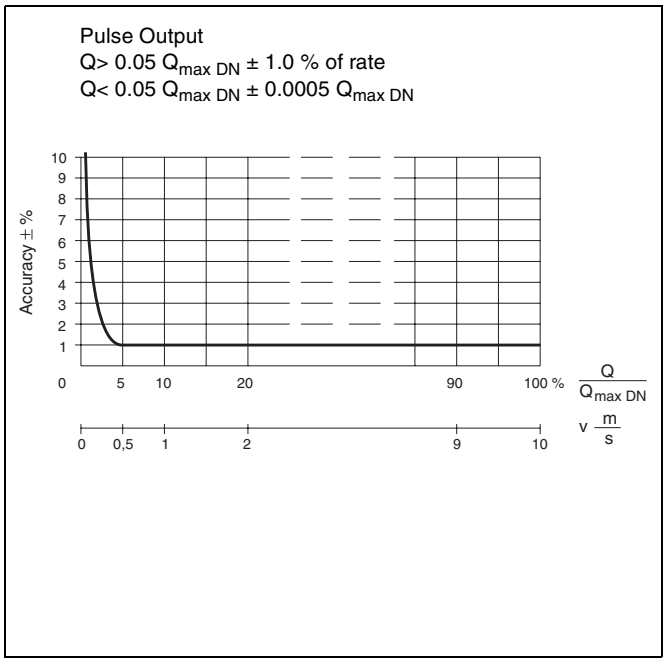


Fig. 2 Accuracy

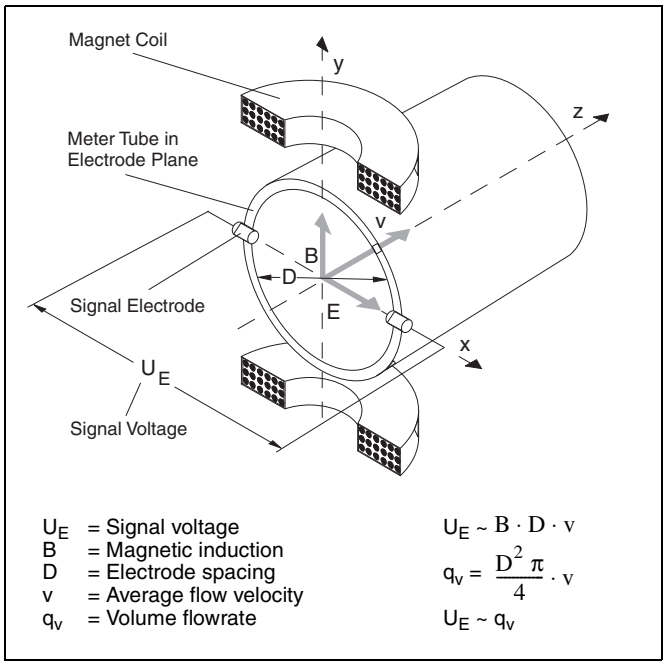
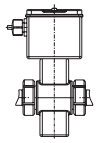


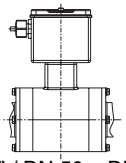
Fig. 3 Electromagnetic Flowmeter Schematic

Overview, Flowmeter Primary and Converter Designs

Variable Connections

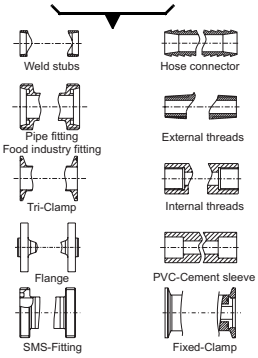


1/10”–1½” / DN 3–DN 40



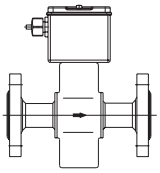
2” – 4” / DN 50 – DN 100

Connector Types

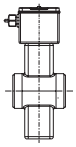


See Dimensions for add’l types, others upon request

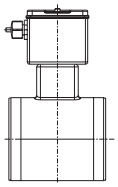
Fixed Flange



Wafer Design

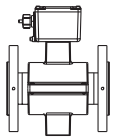


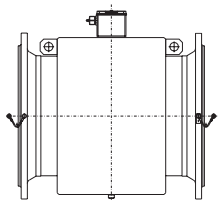
1/10”–1½” / DN3–DN40



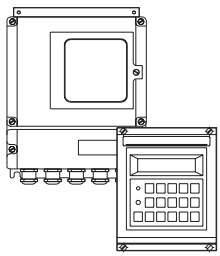
2”– 4” / DN50 – DN100

Fixed Flange





Accuracy	1 % of rate									
Flowmeter primary housing mat’l	**Complete Stainless Steel Housing for Series 2000**									**Alum. Hsg. Series 4000**
Flowmeter Primary										
Model Number	DS21*			DS21F		DS21W		DS41F		
Process Connections	Inch / DN		PN (bar)*	Size	PN (bar)	DN	PN (bar)	DN	PN (bar)	
Wafer Design	–	W		–		3–100	10–40	–		
Flanges DIN 2501	–	F		DN3–100	10–40	–		3–1000	10–40	
Flanges ANSI B16.5	1/10-4 / 3-100	10	F	1/10”–4”	CL150–300	–		1/10”–40”	CL150–300	
Flanges FAB1B DIN 11864-2B	1/10-4 / 3-100	16	L	–		–		–		
Aseptic Conn. DIN 11864-1B	1/10-4 / 3-100	10-40	A	–		–		–		
Food Ind. Fittings. DIN 11851	1-4 / 25-100	16	S	–		–		–		
Pipe Fittings SMS 1145	1-4 / 25-100	16	D	–		–		–		
Weld Stubs DIN 11850	1/10-4 / 3-100	10	R	–		–		–		
Weld Stubs DIN 2463	1/10-4 / 3-100	10	Q	–		–		–		
Weld Stubs ISO 2037	1-4 / 25-100	40	P	–		–		–		
Tri-Clamp DIN 32676	1-4 / 25-100	10	T	–		–		–		
Tri-Clamp ISO 2852	1/10-4 / 3-100	10–40	U	–		–		–		
Fixed Clamp	3/8-1½ / 10–40	10	C	–		–		–		
External Threads ISO 228	1/10-1 / 3–25	10	E	–		–		–		
Internal Threads ISO 228	1/10-1 / 3–25	10	I	–		–		–		
PVC-Cement sleeve	1/10-1 / 3–25	10	G	–		–		–		
Hose Connectors	1/10-1/2 / 3–15	10	H	–		–		–		
1/8” Sanitary Connectors	1/25-1/12 / 1–2	10	B	–		–		–		
Liner	PEEK, Torlon (<1/10”/DN 3) PFA (>1/12”/DN 2)			PFA		PFA		Hard/Soft Rubber, PTFE, PFA, others		
Conductivity	≥ 20 µ S/cm Option ≥ 0.5 µS/cm									
Electrodes	SS 316Ti/1.4571, SS No. 1.4539, Hastelloy B-2/C-4, Platinum-Iridium, Tantalum, Titanium									
Process Connection Material	SS 316L/1.4404, 304/1.4301			SS 316Ti/1.4571		–		Steel, SS 316Ti/1.4571		
Protection Class per EN 60529	IP 67/ IP 68			IP 67 / IP 68		IP 67/ IP 68		IP 67 / IP 68		
Fluid Temperature	-25 to 130 °C (-13 to 266 °F)			-40 to 130 °C (-40 to 266 °F)		-25 to 130 °C		-25 to 130 °C / 180 °C (-13 to 266 °F/356 °F)		
Approvals										
Hygienic & Sterile Requirements	CIP/SIP-qualified FML, 3A, EHEDG (Cleanability)							CIP-qualified		
Converter										
Model Number	50SM1000									
Supply Power	24 V, 115 V, 230 V AC, 50/60 Hz									
Current Output, standard	0/2–10 mA, 0–5 mA, 0/4–20 mA, 0/4–10/12–20 mA									
Pulse Output, 2-channel, std.	active, 24 V, Optocoupler									
Ext. Zero Return	yes									
Ext. Totalizer Reset	yes									
Forward-/Reverse Flow Metering	yes									
Data Link	RS485, Profibus DP									
Communication	ASCII-Protocol, Profibus DP, HART-Protocol®									
Fluid Monitor, std.	yes, ≥ 3/8” / DN 10 and ≥ 20 µ S/cm									
Self Monitoring	yes									
Local Display/Totalization	yes									
Automatic Density Correction	yes, manual entry (Totals and display in weight units)									
Protection Class per EN 60529	Field mount housing IP 65, 19“-plug-in unit IP 00									
Housing Design	Field mount housing or 19”-plug-in unit									



Specifications: Flowmeter Primary

Flow Ranges, Meter Sizes and Pressure Ratings

Meter Size Inch	DN	Std. Press Rating PN	Min. Flow Range Flow Velocity 0 to 0.5 m/s	Max. Flow Range Flow Velocity 0 to 10 m/s	Max. Flow Range Flow Velocity 0 to 15 m/s
1/25	1	10	0 to 0.03 l/min	0 to 0.6 l/min	0 to 0.9 l/min
1/17	1.5	10	0 to 0.06 l/min	0 to 1.2 l/min	0 to 1.8 l/min
1/12	2	10	0 to 0.1 l/min	0 to 2 l/min	0 to 3 l/min
1/10	3	40	0 to 0.2 l/min	0 to 4 l/min	0 to 6 l/min
5/32	4	40	0 to 0.4 l/min	0 to 8 l/min	0 to 12 l/min
1/4	6	40	0 to 1 l/min	0 to 20 l/min	0 to 30 l/min
5/16	8	40	0 to 1.5 l/min	0 to 30 l/min	0 to 45 l/min
3/8	10	40	0 to 2.25 l/min	0 to 45 l/min	0 to 67.5 l/min
1/2	15	40	0 to 5 l/min	0 to 100 l/min	0 to 150 l/min
3/4	20	40	0 to 7.5 l/min	0 to 150 l/min	0 to 225 l/min
1	25	40	0 to 10 l/min	0 to 200 l/min	0 to 300 l/min
1¼	32	40	0 to 20 l/min	0 to 400 l/min	0 to 600 l/min
1½	40	40	0 to 30 l/min	0 to 600 l/min	0 to 900 l/min
2	50	40	0 to 3 m^3/h	0 to 60 m^3/h	0 to 90 m^3/h
2½	65	40	0 to 6 m^3/h	0 to 120 m^3/h	0 to 180 m^3/h
3	80	40	0 to 9 m^3/h	0 to 180 m^3/h	0 to 270 m^3/h
4	100	16	0 to 12 m^3/h	0 to 240 m^3/h	0 to 360 m^3/h
5	125	16	0 to 21 m^3/h	0 to 420 m^3/h	0 to 630 m^3/h
6	150	16	0 to 30 m^3/h	0 to 600 m^3/h	0 to 900 m^3/h
8	200	10/16	0 to 54 m^3/h'	0 to 1080 m^3/h	0 to 1620 m^3/h
10	250	10/16	0 to 90 m^3/h	0 to 1800 m^3/h	0 to 2700 m^3/h
12	300	10/16	0 to 120 m^3/h	0 to 2400 m^3/h	0 to 3600 m^3/h
14	350	10/16	0 to 165 m^3/h	0 to 3300 m^3/h	0 to 4950 m^3/h
16	400	10/16	0 to 225 m^3/h	0 to 4500 m^3/h	0 to 6750 m^3/h
20	500	10	0 to 330 m^3/h	0 to 6600 m^3/h	0 to 9900 m^3/h
24	600	10	0 to 480 m^3/h	0 to 9600 m^3/h	0 to 14400 m^3/h
28	700	10	0 to 660 m^3/h	0 to 13200 m^3/h	0 to 19800 m^3/h
32	800	10	0 to 900 m^3/h	0 to 18000 m^3/h	0 to 27000 m^3/h
36	900	10	0 to 1200 m^3/h	0 to 24000 m^3/h	0 to 36000 m^3/h
40	1000	10	0 to 1350 m^3/h	0 to 27000 m^3/h	0 to 40500 m^3/h

! Note:
The flow range end value can be set from 0.5 to 15 m/s even though the ranges shown in the Flowrate Nomograph on Page 5 only extend from 0.5 to 10 m/s. (For higher end values see table above “Flow Ranges”). When a preamplifier is installed and the fluid conductivity is low, the flow velocity for fluids with a high ε_r (e.g. demineralized water $\varepsilon_r = 78$) must be limited to < 1 m/s.

Flange Designs

Max. Allow. Fluid Temperature and Pressure

Liner	Meter Size Inch	DN	$P_{Operate}$ bar	$P_{Operate}$ at mbar abs	$T_{Operate}$ °C
Hard Rubber	1/2–10	15–250	40	0	< 90
KTW approved	12	300	25	0	< 90
Soft Rubber	14–40	350–2000	25	0	< 90
			16	0	< 90
PTFE	3/8–12	10–300	40	270	< 20
			25	550	< 130/180
PFA	1/10–4	3–100	40	270	< 20
			25	550	< 130/180

Other meter sizes, pressure ratings and Temperature Classes upon request.

Designs

Meter Tube
Stn. stl. 304/ No. 1.4301

1/10” to 12” / DN 3 to DN 300
Two piece housing: Cast Aluminum, painted[1)]

Flanges
Steel Zinc plated, standard
Stn. stl. 316Ti/No. 1.4571 (≤ 1/2” / DN15, standard)

14” to 40” / DN 350 to DN 1000
Welded steel design, painted[1)]

Flanges
Steel painted, standard, Stn. stl. 316Ti/No. 1.4571 option

1) Paint coat 60 µm thick, RAL 9002

Connection Box
Frame: RAL 7012
Cover: RAL 9002

Installation Lengths, Flange Design (Short Design)
Meter sizes 3/8”–16” / DN10–DN400 in accordance with the installation lengths defined in DIN Flange Design VDE/VDI 2641 and DVGW Working Paper W420 (Water Totalizers, Design WP ISO 4064 Short as well as ISO 13359).

ANSI CL 150/CL 300
Installation Length Series 1000
Protection flanges available for Series 1000 installation lengths: L + 20 mm ≤ 3”/DN 80, L + 25 mm ≥ 4”/DN 100.

Pipeline Vibrations
Max. allow. 15 m/s^2 (10 – 150 Hz)

Temperature Diagram

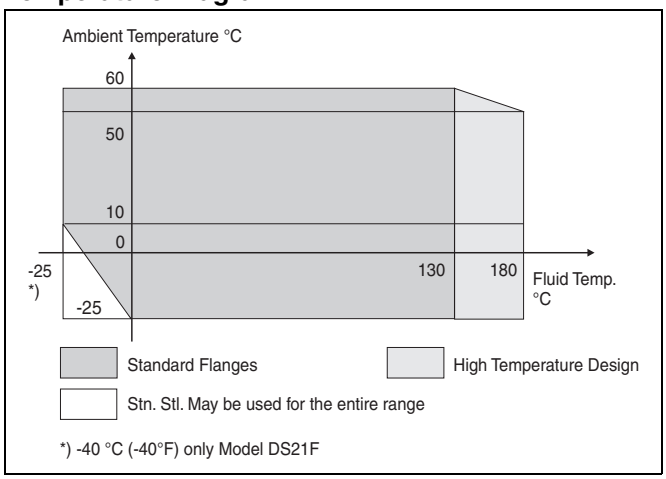


Fig. 4 Fluid Temperature as a Function of the Ambient Temperature

Max. Allowable Cleaning Temperatures

CIP-Cleaning	Flowmeter Primary Liner	T_{max} °C	t_{max} minutes	$T_{Amb.}$ °C
Steam Cleaning	PTFE, PFA, PEEK, Torlon	150 (302 °F)	60 (140 °F)	25 (77 °F)
Liquid Cleaning	PTFE, PFA, PEEK, Torlon	140 (284 °F)	60 (140 °F)	25 (77 °F)

If the ambient temperature >25 °C, the max. cleaning temperature must be reduced by the difference. $T_{max} - \Delta$ °C where Δ °C = ($T_{Ambient.}$ -25 °C)

Specifications: Flowmeter Primary, Flowrate Nomographs

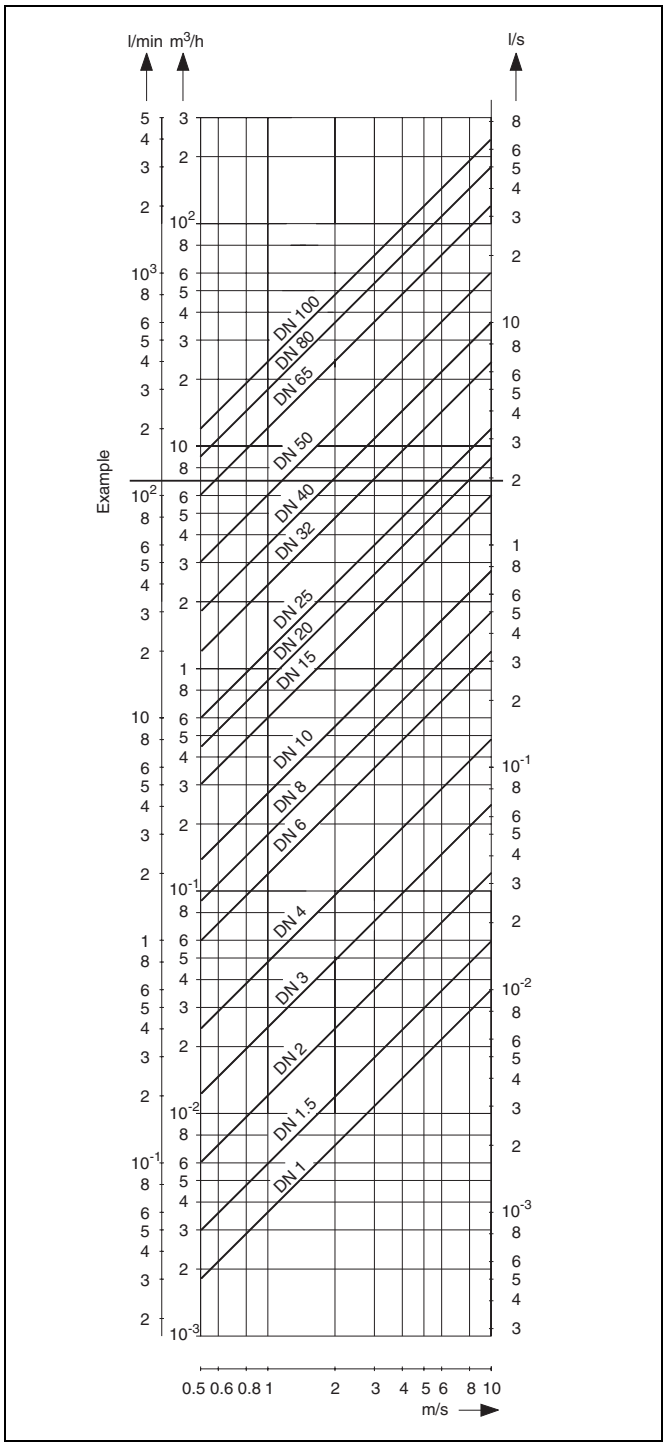


Fig. 5 Flowrate Nomograph 1/25" to 4" / DN 1 to DN 100

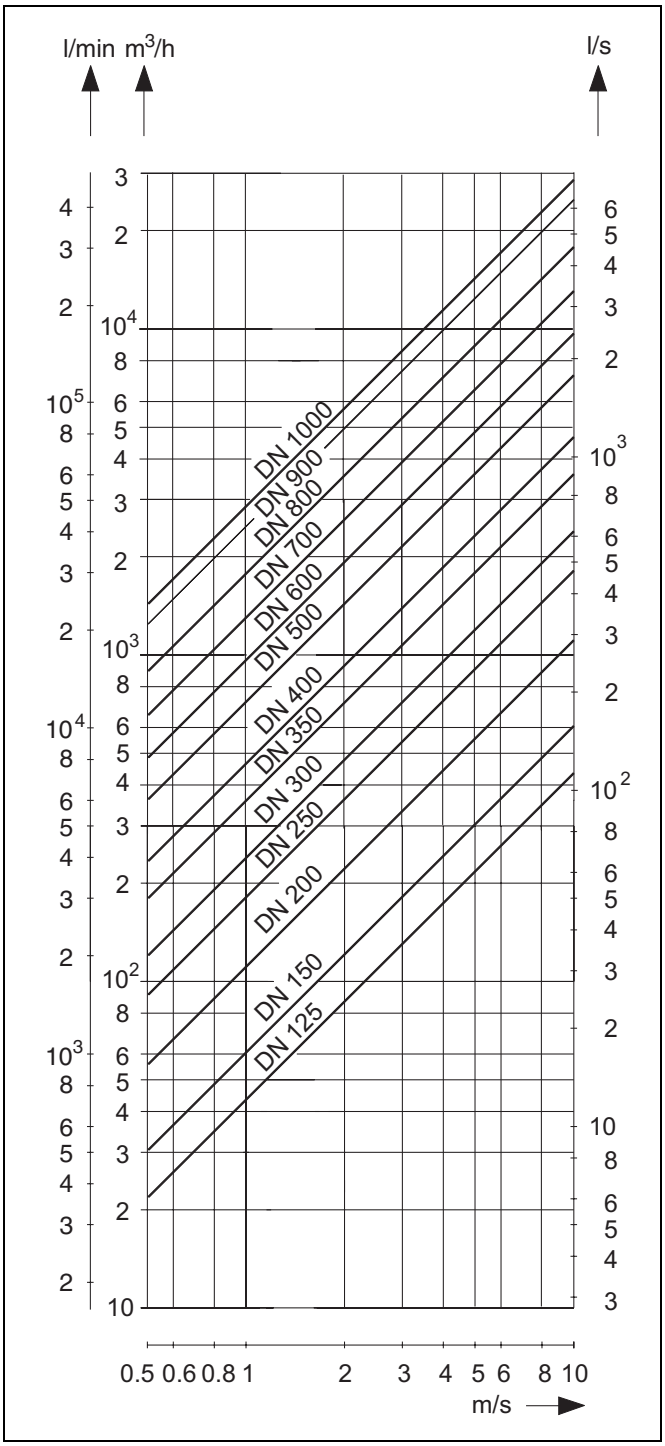


Fig. 6 Flowrate Nomograph 5" to 40" / DN 125 to DN 1000

Flowrate Nomograph
The volumetric flowrate is a function of the flow velocity and the flowmeter size. The Flowrate Nomographs Fig. 5 and Fig. 6 show the flowrate range which can be metered with a specific flowmeter size and the flowrate sizes which are suitable for a specific flowrate range.

Example:
Flowrate = 7 m^3/h (maximum flowrate = flow range end value). Suitable are flowmeter primary meter sizes 3/4" to 2½" / DN 20 to DN 65 for flow velocities between 0.5 to 10 m/s.

Specifications: Flowmeter Primary, Installation Requirements and Grounding

In- and Outlet Straight Sections
The metering principle is independent of the flow profile as long as standing eddies do not extend into the metering section, such as may exist after double elbows, tangential inflow or partially open gate valves directly upstream of the flowmeter. In such installations it is recommended that measures be taken to normalize the flow profile. Flow control devices should be installed downstream of the flowmeter primary.

Grounding
The grounding of the flowmeter primary is not only essential for safety reasons but also of importance to assure trouble free operation of the electromagnetic flowmeter. The ground screws on the flowmeter primary are to be connected to the ground potential in accordance with VDE 0100, Section 540. For technical reasons, this should be identical to the potential of the metering fluid if possible.

For plastic or insulated lined pipelines the fluid is grounded by utilizing a grounding plate or grounding electrodes. When there are stray potentials present in the pipeline a grounding plate is recommended at both ends of the meter primary.

Electrode Axis
When installing the flowmeter in horizontal pipelines assure that neither of the two electrodes is at the highest point. Gas bubbles which may be present in the fluid could interrupt the electrical connection between the electrodes and the fluid. An ideal installation is shown in Fig. 7. It is essential that the metering tube always be completely filled with fluid. Meter designs with removable electrodes for cleaning are available upon request.

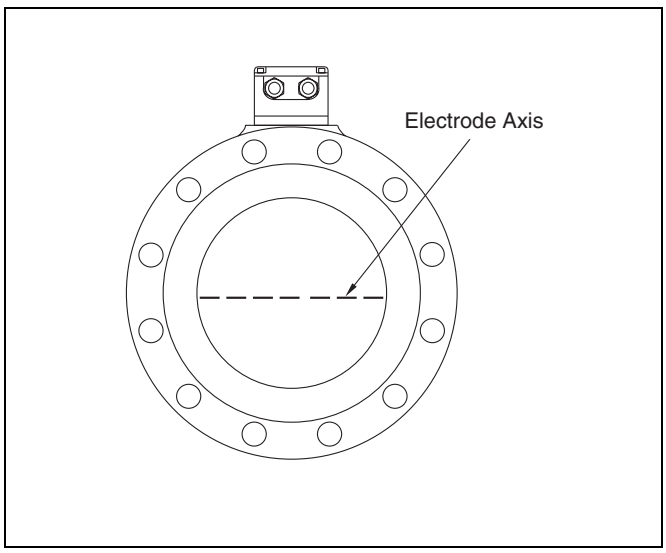


Fig. 7 Electrode Axis

Installations in Larger Size Pipelines
The flowmeter primary can readily be installed in larger pipeline sizes by utilizing reducers (e.g. flanged reducers DIN 28545). The pressure drop which results from the reduction can be determined from the Nomograph Fig. 8. The pressure drop is determined in the following manner:

1. Calculate the diameter ratio d/D.
2. Determine the flow velocity as a function of the flowmeter size and the instantaneous flowrate:
   $v = \frac{Q \text{ (instantaneous flowwrate)}}{\text{Flowmeter Primary Constant}}$
   The flow velocity can also be determined from the Flowrate Nomographs Fig. 5 and Fig. 6.
3. Read the pressure drop on the Y-Axis in Fig. 8 at the intersection of the “Diameter Ratio d/D” x-axis value and the flow velocity line.

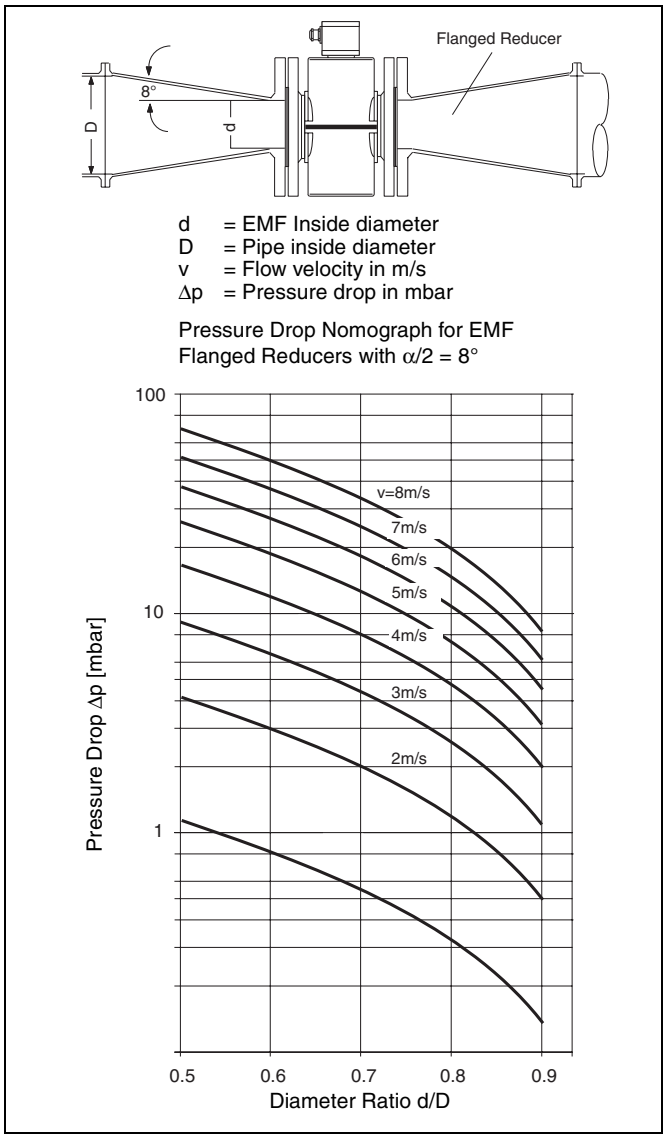
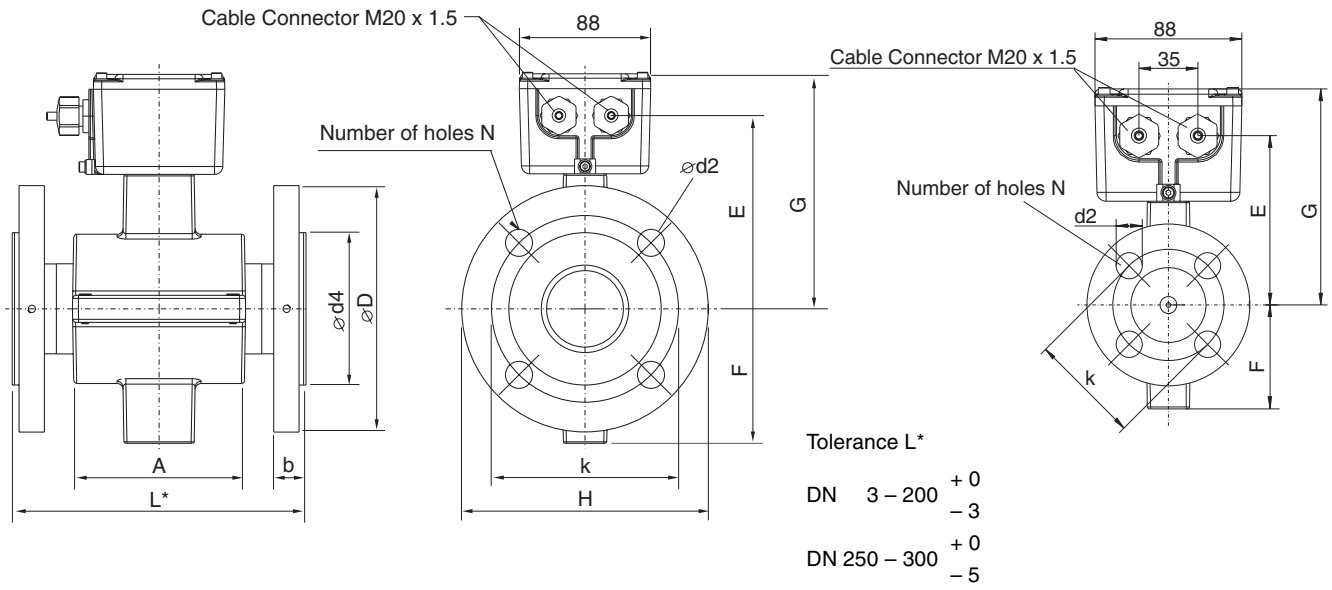


Fig. 8 Nomograph for Pressure Drop Determinations

Dimensions: Flowmeter Primary, DN 3 to DN 300, Flanges per DIN

Model DS41F



Flange Dimensions								Instrument Dimensions							Weight kg
DN	PN[1)]	D	d4	b	k	d2	N	A	L*	L[2)]	L[3)]	E[4)]	F	G[4)]	
3-8	10-40	90	40	18	60	14	4	67	130	133	136	101	62	129	2.5
10	10-40	90	40	18	60	14	4	67	200	203	206	101	62	129	3
15	10-40	95	45	18	65	14	4	67	200	203	206	101	62	129	3
20	10-40	105	58	20	75	14	4	87	200	203	206	112	73	140	3.5
25	10-40	115	68	20	85	14	4	87	200	203	206	112	73	140	4
32	10-40	140	78	20	100	18	4	95	200	203	206	117	78	145	5
40	10-40	150	88	20	110	18	4	100	200	203	206	121	82	149	6
50	10-40	165	102	21	125	18	4	116	200	203	206	129	90	157	8
65	10-16	185	122	21	145	18	4	100	200	203	206	153	104	171	12
	25-40	185	122	25	145	18	8	100	200	203	206	153	104	171	12
80	10-40	200	138	27	160	18	8	100	200	203	206	159	110	177	16
100	10-16	220	158	23	180	18	8	130	250	253	256	179	130	197	15
	25-40	235	162	27	190	22	8	130	250	253	256	179	130	197	15
125	10-16	250	188	25	210	18	8	124	250	255	260	170	127	195	23
	25-40	270	188	29	220	26	8	124	250	255	260	170	127	195	30
150	10-16	285	212	25	240	22	8	170	300	305	310	190	148	216	28
	25-40	300	218	31	250	26	8	170	300	305	310	190	148	216	34
200	10	340	268	28	295	22	8	195	350	355	360	222	179	248	54
	16	340	268	28	295	22	12	195	350	355	360	222	179	248	54
250	10	395	320	30	350	22	12	250	450	455	460	250	207	276	80
	16	405	320	30	355	26	12	250	450	455	460	250	207	275	80
300	10	445	370	31	400	22	12	250	500	505	510	293	250	318	83
	16	460	378	33	410	26	12	250	500	505	510	293	250	318	92

1) Other pressure ratings upon request.
2) Standard with a grounding plate attached to flange at one end SS 316Ti / 1.4571. Other materials upon request. See also Note “Grounding”.
3) With protection flange. Protection flange provides the ground function, grounding plates not required. Also available with the Series 1000 protection flanges, for dimensions see Notes on Page 12.
4) For high temperature design + 10 mm.

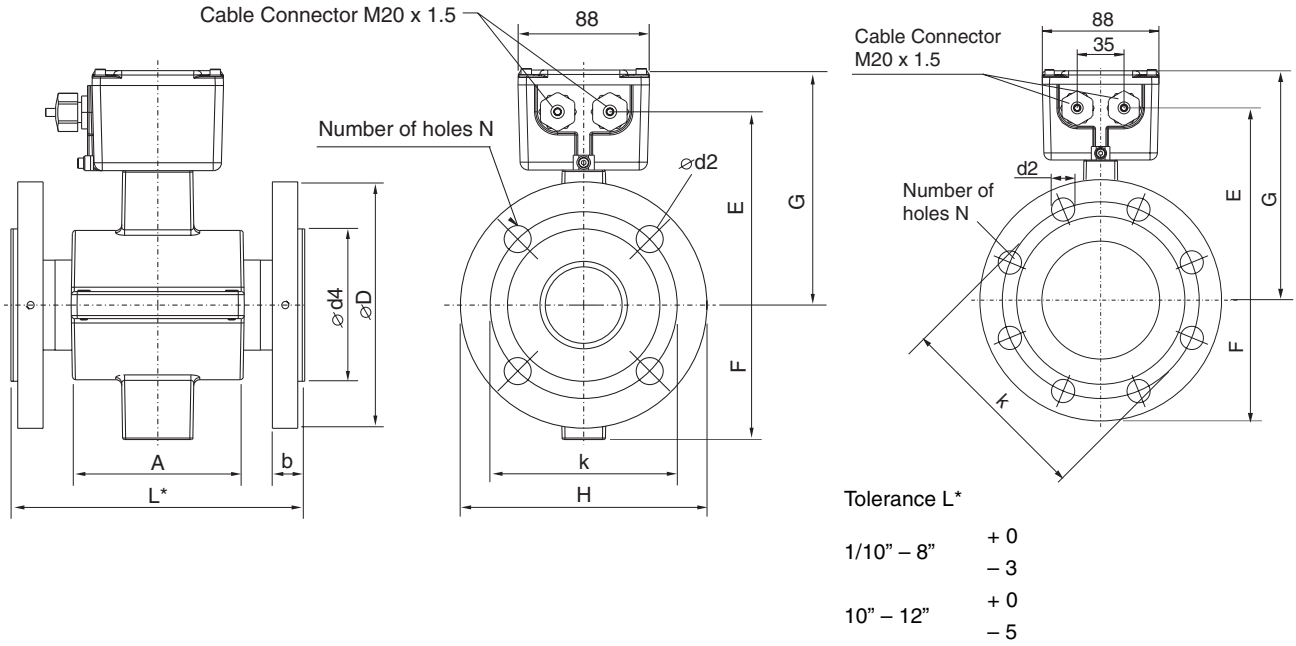
All dim’s in mm

ISO Projection Method E

Fig. 9 Flowmeter Primaries DN 3 to DN 300

Dimensions: Flowmeter Primary, 1/10“ to 12“, Flanges per ANSI

Model DS41F



Tolerance L*

1/10” – 8” + 0 / – 3

10” – 12” + 0 / – 5

Meter Size	Instrument Dimensions ANSI CL 150/CL 300							Flange Dimensions ANSI CL 150						Flange Dimensions ANSI CL 300						
Inch	A	L	L[1)]	L[2)]	E[3)]	F	G	D	d4	b	k	d2	N	D	d4	b	k	d2	N	Weight kg
1/10-5/16	67	130	133	136	101	62	129	89	35	13	60	16	4	95	35	16	67	16	4	2.5
3/8, 1/2	67	270	273	276	101	62	129	89	35	13	60	16	4	95	35	16	67	16	4	3
3/4	87	270	273	276	112	73	140	99	43	14	70	16	4	117	43	18	83	19	4	3.5
1	87	270	273	276	112	73	140	108	51	16	80	16	4	124	51	20	89	19	4	4
1 1/4	95	280	283	286	117	78	145	117	64	18	89	16	4	134	64	21	99	19	4	5
1 1/2	100	280	283	286	121	82	149	127	73	20	99	16	4	156	73	23	115	23	4	6
2	116	280	283	286	129	90	157	152	92	21	121	19	4	165	92	24	127	19	8	8
2 1/2	100	330	333	336	153	104	171	178	105	25	140	19	4	191	105	27	150	23	8	12
3	100	340	343	346	159	110	177	191	127	26	153	19	4	210	127	30	168	23	8	16
4	130	400	403	406	179	130	197	229	157	26	191	19	8	254	157	34	200	22	8	15
5	124	450	455	460	169	127	195	254	186	28	216	22	8	280	186	39	235	22	8	36/38
6	170	450	455	460	190	148	216	279	216	30	241	22	8	318	216	41	270	22	12	38
8	195	500	505	510	222	179	248	343	270	34	298	22	8	381	270	47	330	25	12	66
10	250	550	555	560	250	207	276	406	324	35	362	25	12	445	324	53	387	28	16	98
12	250	620	625	630	293	250	319	483	381	37	432	26	12	–	–	–	–	–	–	124

1) Standard with a grounding plate attached to flange at one end SS 316Ti / 1.4571. Other materials upon request. See also Note “Grounding”.

2) With protection flange. Protection flange provides the ground function, grounding plates not required. Also available with the Series 1000 protection flanges, for dimensions see Notes on Page 12.

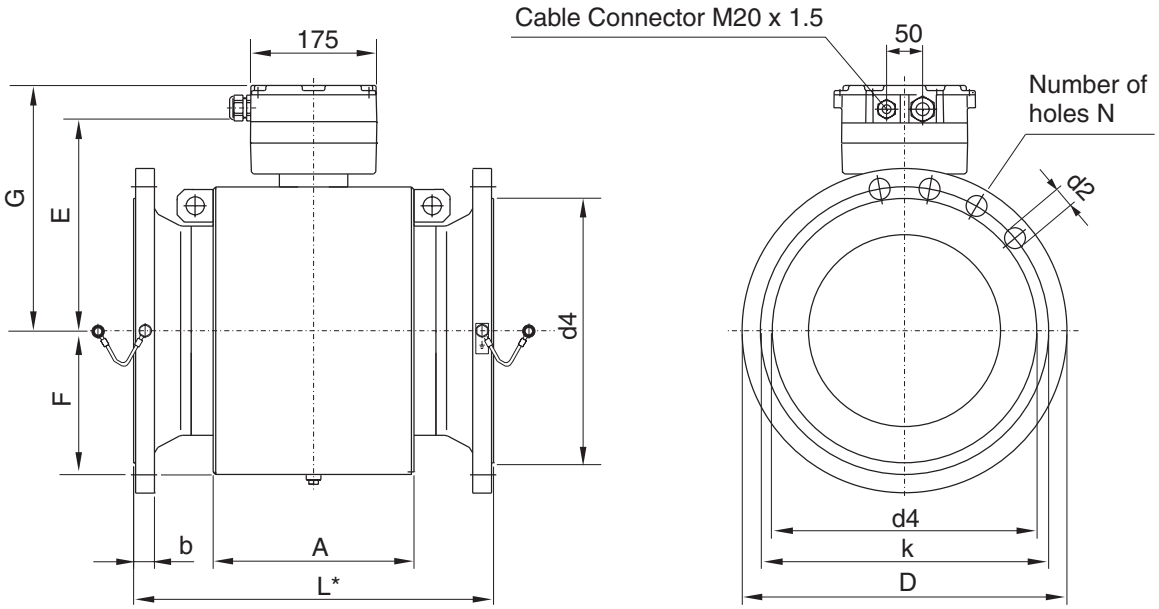
.3) For high temperature design + 10 mm.

All dim’s in mm ISO Projection Method E

Fig. 10 Flowmeter Primaries 1/10” to 12” , Flanges per ANSI

Dimensions: Flowmeter Primary, DN 350 to DN 1000, Flanges per DIN

Model DS41F



Tolerance L*

DN 350 – 500 $^{0}_{-5}$

DN 600 – 1000 $^{0}_{-10}$

Flange Dimensions per DIN								Instrument Dimensions							Weight
DN	PN[1)]	D	k	d4	d2	N	b	A	L	L[2)]	L[3)]	G	E	F	ca. kg
350	10	505	460	430	22	16	31	322	550	555	560	387	354	249	153
350	16	520	470	438	26	16	35	322	550	555	560	387	354	249	162
400	10	565	515	482	26	16	31	370	600	605	610	412	380	275	166
400	16	580	525	490	30	16	37	370	600	605	610	412	380	275	173
500	10	670	620	585	26	20	33	407	650	655	660	448	415	311	232
500	16	715	650	610	33	20	39	407	650	655	660	448	415	311	277
600	10	780	725	685	30	20	33	469	780	785	790	500	466	361	283
600	16	840	770	725	36	20	41	469	780	785	790	500	466	361	313
700	10	895	840	800	30	24	35	537	910	915	920	543	510	405	394
700	16	910	840	795	36	24	41	537	910	915	920	543	510	405	408
800	10	1015	950	905	33	24	37	605	1040	1045	1050	593	560	455	441
800	16	1025	950	900	39	24	43	605	1040	1045	1050	593	560	455	458
900	10	1115	1050	1005	33	28	39	671	1170	1175	1180	643	610	505	757
900	16	1125	1050	1000	39	28	45	671	1170	1175	1180	643	610	505	772
1000	6	1175	1120	1080	30	28	31	739	1300	1305	1310	693	660	555	907
1000	10	1230	1160	1110	36	28	39	739	1300	1305	1310	693	660	555	960
1000	16	1255	1170	1115	42	28	47	739	1300	1305	1310	693	660	555	1007

1) Other pressure ratings upon request.
2) Grounding plate attached to flange at one end SS 316Ti / 1.4571. Other materials upon request. L + 5 mm.
3) With protection plates attached to flanges at both ends. Grounding plate not required L + 10 mm.
Also available with Series 1000 protection flanges. For dimensions see Notes on Page 12.

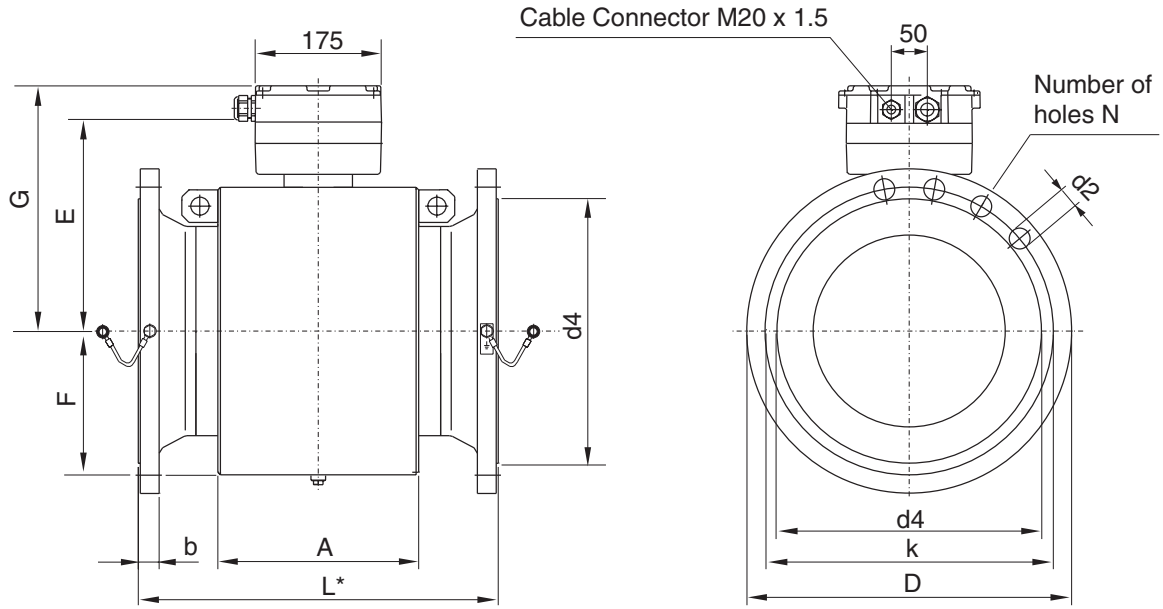
All dim's in mm

ISO Projection Method E

Fig. 11 Flowmeter Primaries DN 350 to DN 1000, Flanges per DIN

Dimensions: Flowmeter Primary, 14“ to 36“, Flanges per ANSI

Model DS41F



Tolerance L*

14” – 20” $^{0}_{-5}$

24” – 36” $^{0}_{-10}$

Meter Size	Instrument Dimensions ANSI CL 150/CL 300							Flange Dimensions ANSI CL 150						Weight ca. kg
Inch	A	L	L[2)]	L[3)]	E	F	G	D	k	d4	d2	N	b	
14	322	650	655	660	354	250	387	534	476	413	28.6	12	40	144
16	370	700	705	710	380	275	412	597	540	470	28.6	16	42	174
20	416	780	785	790	419	310	452	699	635	584	31.7	20	48	292
24	469	850	855	860	466	361	500	813	749	692	34.9	20	53	371
28	537	910	915	920	510	405	543	837	749	762	34.9	20	50	343
32	605	1040	1045	1050	560	455	593	942	900	864	22.2	48	51	355
36	671	1170	1175	1180	610	505	643	1057	1010	972	25.4	44	57	680

1) Other pressure ratings upon request.
2) Grounding plate attached to flange at one end SS 316Ti / 1.4571. Other materials upon request. L + 5 mm.
3) With protection plates attached to flanges at both ends. Grounding plate not required L + 10 mm.
Also available with Series 1000 protection flanges. For dimensions see Notes on Page 12.

All dim’s in mm ISO Projection Method E

Fig. 12 Flowmeter Primaries 14” to 36”, Flanges per ANSI

Ordering Information: Flanged Flowmeters, Models DS41F and DS44F

In addition to the Ordering Number please supply the following information: Fluid, fluid temperature, operating pressure, flow range, pipeline type (grounding plate, grounding electrodes)[1)]

Ordering Number																		
Conductivity	from 20 µS/cm 3/8”-40” / DN10–1000**DS41F** from 5 µS/cm 1/10”–5/16” / DN3–8**DS44F** from 0.5 µS/cm 3/8”–40”/DN10–1000**DS44F**																	
Liner Material																		
Hard rubber	(1/2”–40” / DN15–DN1000) KTW approved				**H**													
Soft rubber	(2”–40” / DN50–DN1000)				**S**													
PTFE	(3/8”–12” / DN10–DN300) FDA approved				**T**													
PFA	(1/10”–4” / DN3 – DN100) FDA approved				**P**													
Others					**Z**													
Meter Size																		
1/10”	DN	3				**03**												
5/32”	DN	4				**04**												
1/4”	DN	6				**06**												
5/16”	DN	8				**08**												
3/8”	DN	10				**10**												
1/2”	DN	15				**15**												
3/4”	DN	20				**20**												
1”	DN	25				**25**												
1-1/4”	DN	32				**32**												
1-1/2”	DN	40				**40**												
2”	DN	50				**50**												
2-1/2”	DN	65				**65**												
3”	DN	80				**80**												
4”	DN	100				**1H**												
5”	DN	125				**1Q**												
6”	DN	150				**1F**												
8”	DN	200				**2H**												
10”	DN	250				**2F**												
12”	DN	300				**3H**												
14”	DN	350				**3F**												
16”	DN	400				**4H**												
20”	DN	500				**5H**												
24”	DN	600				**6H**												
28”	DN	700				**7H**												
32”	DN	800				**8H**												
36	DN	900				**9H**												
40”	DN	1000				**1T**												
Signal/Ground Electrode Material [2)]																		
316Ti SS No. 1.4571	none						**S**											
Hastelloy B-2	none						**B**											
Hastelloy C-4	none						**H**											
Titanium	none						**M**											
Tantalum	none						**T**											
SS No. 1.4539[3)]	none						**F**											
Platinum-Iridium	none						**P**											
316Ti SS No. 1.4571	with						**E**											
Hastelloy B-2	with						**N**											
Hastelloy C-4	with						**O**											
Titanium	with						**I**											
Tantalum	with						**Q**											
SS No. 1.4539[3)]	with						**R**											
Platinum-Iridium	with						**G**											
Others							**Z**											
Pressure Rating																		
DIN PN 10								**C**										
DIN PN 16								**D**										
DIN PN 25								**E**										
DIN PN 40								**F**										
JIS K10								**K**										
ANSI CL 150 (installation length Series 1000)								**P**										
ANSI CL 300 (installation length Series 1000)								**Q**										
Others								**Z**										
Flange Material																		
Steel (standard from 3/4” / DN 20)									**1**									
SS316Ti / 1.4571 (standard for 1/10”-1/2”/DN3-DN15, option ≥ 3/4”/DN20)									**3**									
Others upon request									**9**									

Continued on next page

1) When a grounding plate is specified (see Ordering No.), the standard grounding plate mat'l is SS316Ti/1.4571. Others upon request.

2) ≥ 5”/DN125 a grounding surface is incorporated in the hard-/soft rubber liners, standard.

3) For Food Industry applications.

In addition to the Ordering Number please supply the following information: Fluid, fluid temperature, operating pressure, flow range, pipeline type (grounding plate, grounding electrodes)[1)]

Ordering Number												
Flange Accessories												
None							**A**					
Protection plate SS 316Ti / 1.4571 (mounted on both ends)							**B**					
Grounding plate SS 316Ti / 1.4571 (mounted on one end)							**C**					
Protection flange SS 316Ti / 1.4571 (mounted on both ends)[4)]							**D**					
Temperature Range												
Standard (see Specifications - Liner Materials) ≤ 130 °C (≤ 266 °F)								**S**				
High temperature design ≤ 180 °C (≤ 356 °F)								**H**				
Certifications												
None									**A**			
Inspection Certificate per EN 10204 Paragraph 3.1B 1/10"–12" / DN 3 – 300									**D**			
Others									**Z**			
Calibration Certificates												
Standard										**A**		
Others										**Z**		
Protection Class per EN 60529												
IP 67	(Connection box with M20 x 1.5 cable connector)										**2**	
IP 68	(Connection box with Hose PG connector)										**3**	
IP 67	(Connection box with NPT-threads)										**4**	
IP 67	(Connection box with PT-threads)										**5**	
IP 67	(Connection box with PG connector)										**6**	
Others											**9**	

4) Only for installation length Series 1000 and ANSI/DIN-Flanges. Installation length ≤ 3" / DN 80 L + 20 mm, ≥ 4" / DN 100 L + 25 mm.

The following supplemental Ordering Information should be included in writing:

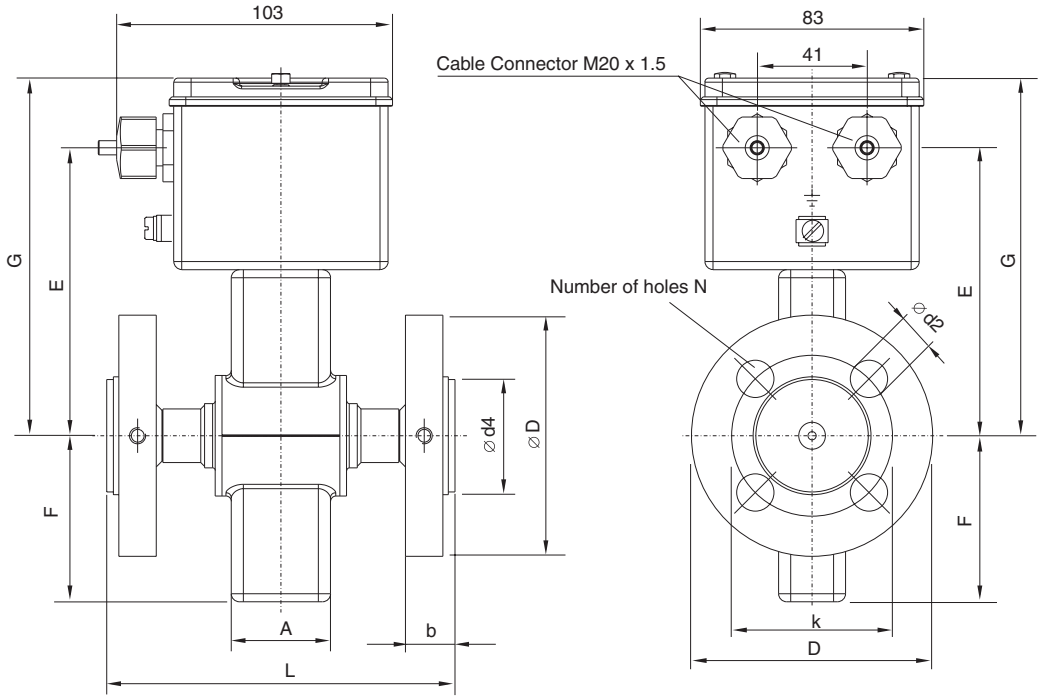
Instrument Tag Language
German
English
French

Electrode Design
Standard
Conical head (≥ 3/8" / DN 10 Stn. stl. No. 1.4539
(for high grease content fluids)

Supply Power Line Frequency
50 Hz
60 Hz

Dimensions: Stainless Steel Flowmeters, 1/10“ to 1 1/2“/DN 3 to DN 40, Flanged

Model DS21F



DIN Flange Dimensions

PFA Liner												Weight approx. kg
DN	PN	L[1)]	A	D	k	d4	d2	b	E	F	G	
3-8	10-40	130	37	90	60	42	14	18	108	62	134	3.5
10,15		200	37	95	65	36	14	18	108	62	134	3.5
20		200	42	105	75	41	14	20	120	66	136	3.5
25		200	54	115	85	54	14	20	127	73	143	4
32		200	62	140	100	64	14	20	132	78	148	5
40		200	67	150	110	74	14	20	136	82	152	5.5

ANSI Flange Dimensions

PFA Liner												Weight approx. kg
Meter Size	PN	L[1)]	A	D	k	d4	d2	b	E	F	G	
1/10”-5/16”	CL 150	130	37	88.9	60.3	42	15.9	18	108	62	134	3.5
3/8”, 1/2”		200	37	88.9	60.3	34.8	15.9	12.6	108	62	134	3.5
3/4“		200	42	98.4	69.8	42.9	15.9	14.2	120	66	136	3.5
1“		200	54	108	79.2	50.8	15.9	15.8	127	73	143	4
1 1/4“		200	62	117.5	88.9	63.5	15.9	17.4	132	78	148	5
1 1/2“		200	67	127	98.6	73.0	15.9	19	136	82	152	5.5
1/10”-5/16”	CL 300	130	37	95.2	66.7	42	15.9	18	108	62	134	3.5
3/8”, 1/2”		200	37	95.2	66.7	34.9	15.9	15.8	108	62	134	3.5
3/4“		200	42	117.5	82.5	42.9	19	17.4	120	66	136	3.5
1“		200	54	123.8	88.9	50.8	19	19.0	127	73	143	4
1 1/4“		200	62	133.3	98.4	63.5	19	20.5	132	78	148	5
1 1/2“		200	67	155.6	114.3	73.0	22.2	22.1	136	82	152	5.5

1) If a grounding plate is installed, L + 3 mm, material upon request.
With 2 grounding plates (protection plates) L + 6 mm, material upon request.

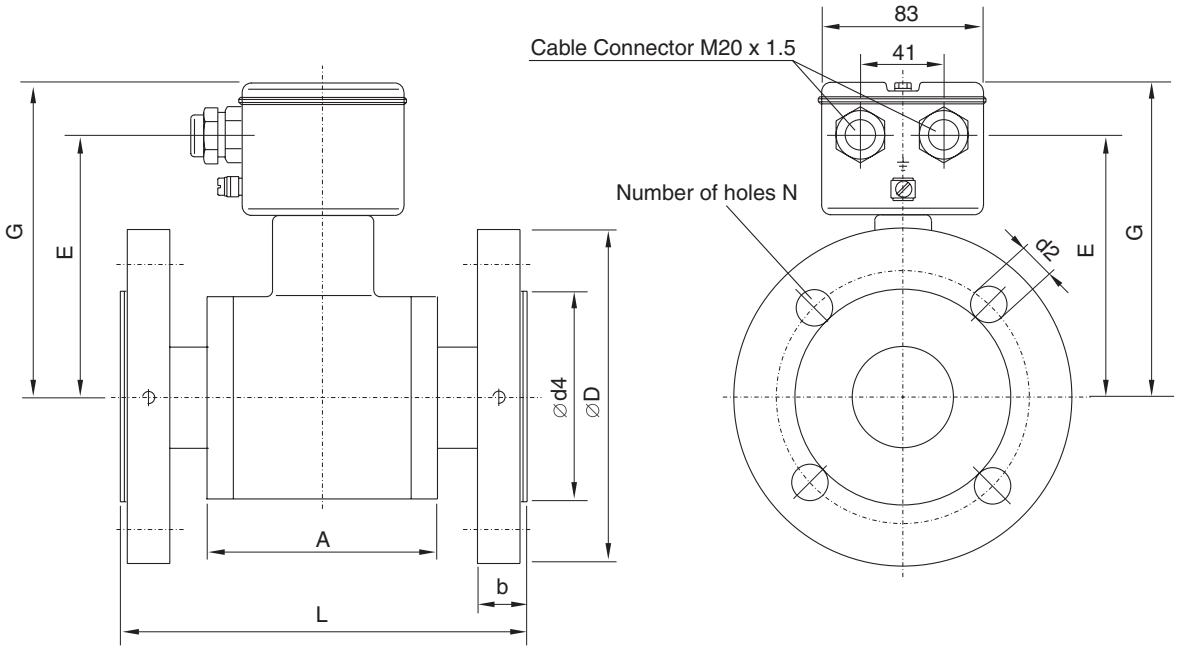
All dim’s in mm

ISO Projection Method E

Fig. 13 Stainless Steel Flowmeters 1/10” to 1½” / DN 3 to DN 40

Dimensions: Stainless Steel Flowmeters, 2“ to 4“/DN 50 to DN 100, Flanged

Model DS21F



DIN Flange Dimensions

PFA Liner												Weight approx. kg
DN	PN	L[1)]	A	D	k	d4	d2	N	b	E	G	
50	10-40	200	100	165	125	104	18	4	24	135	161	8
65	10-16	200	107	185	145	124	18	4	26	149	175	10
	25-40	200	107	185	145	124	18	8	26	149	175	10
80	10-40	200	107	200	160	139	18	8	28	155	181	12
100	10-16	250	159	220	180	161	18	8	24	175	201	18
	25-40	250	159	235	190	167	22	8	28	175	201	18

ANSI Flange Dimensions

PFA Liner												Weight approx. kg
Meter Size	PN	L[1)]	A	D	k	d4	d2	N	b	E	G	
2”	CL 150	200	100	152	121	99	19	4	23	135	163	8
2 1/2”		200	107	178	140	118	19	4	26	149	177	10
3”		200	107	191	152	131	19	4	28	155	183	12
4”		250	159	229	190	171	19	8	28	175	203	18
2”	CL 300	200	100	165	127	102	19	8	26	135	163	8
2 1/2”		200	107	191	149	124	22	8	29	149	177	10
3”		200	107	210	168	143	22	8	32	155	183	12
4”		250	159	254	200	177	22	8	36	175	203	18

1) When a grounding plate is installed L + 6 mm, material upon request.
With 2 grounding plates (protection plates) L + 6 mm, material upon request.

All dim’s in mm

ISO Projection Method E

Fig. 14 Stainless Steel Flowmeters 2” to 4” / DN 50 to DN 100

Ordering Information: Stainless Steel Flowmeters, 1/10“ to 4“/DN 3 to DN 100, Flanged

In addition to the Ordering Number please supply the following information: Fluid, fluid temperature, operating pressure, flow range, pipeline type (grounding plate, grounding electrodes)[1)]

Ordering Number		DS21F							
Liner Material: PFA			P						
Meter Size									
1/10”	DN 3			03					
5/32”	DN 4			04					
1/4”	DN 6			06					
5/16”	DN 8			08					
3/8”	DN 10			10					
1/2”	DN 15			15					
3/4”	DN 20			20					
1”	DN 25			25					
1-1/4”	DN 32			32					
1-1/2”	DN 40			40					
2”	DN 50			50					
2-1/2	DN 65			65					
3”	DN 80			80					
4”	DN 100			1H					
Signal Electrode Material/ Ground Electrode Material									
SS 316Ti / 1.4571	/ none				S				
Hastelloy B-2	/ none				B				
Hastelloy C-4	/ none				H				
Titanium	/ none				M				
Tantalum	/ none				T				
SS No. 1.4539	/ none (Food Ind. applications)				F				
Platinum-Iridium	/ none				P				
SS 316Ti / 1.4571	/ with				E				
Hastelloy B-s	/ with				N				
Hastelloy C-4	/ with				O				
Titanium	/ with				I				
Tantalum	/ with				Q				
SS No. 1.4539	/ with (Food Ind. applications)				R				
Platinum-Iridium	/ with				G				
Others					Z				
Pressure Rating									
PN 10						C			
PN 16	Standard 4” / DN 100					D			
PN 25						E			
PN 40	Standard 1/10”–3” / DN 3–80					F			
JIS K10						K			
ANSI CL 150						P			
ANSI CL 300						Q			
Others						Z			
Process Connection Material									
SS 316Ti / 1.4571							3		
Others							9		
Conductivity	**/ Flange Acces.[1)]**								
≥ 20 µS/cm 3/8”-4”/DN10-100/none								A	
≥ 5 µS/cm≤5/16”/DN8,≥0.5µS/cm 3/8”-4”/DN10-100 /none								E	
≥ 20 µS/cm 3/8”-4”/DN10-100/protection flange								Q	
≥ 20 µS/cm 3/8”-4”/DN10-100/grounding plate								R	
≥ 5 µS/cm ≤5/16”/DN8,≥0.5µS/cm 3/8”-4”/DN10-100/protection flange								U	
≥ 5 µS/cm ≤5/16”/DN8,≥0.5µS/cm 3/8”-4”/DN10-100/grounding plate								V	
Temperature Range									
Standard design ≤ 130 °C (≤ 266 °F)									S
High temperature design ≤ 180 °C (≤ 356 °F)									H

Continued on next page

1) Protection plates (2 grounding plates) mounted on both flanges or a grounding plate mounted on one flange, material SS 316Ti / 1.4571. Others upon request.

Ordering Information: Stainless Steel Flowmeters, 1/10“ to 4“/DN 3 to DN 100, Flanged

In addition to the Ordering Number please supply the following information: Fluid, fluid temperature, operating pressure, flow range, pipeline type (grounding plate, grounding electrodes)[1)]

Ordering Number	DS21F												
Certifications													
None										A			
Inspection Certificate per EN 10204 Paragraph 3.1B										D			
Others										Z			
Calibration Certificates													
Standard											A		
Others											Z		
Protection Class													
IP 67												2	
IP 68												3	

The following supplemental Ordering Information should be included in writing.

Instrument Tag Language
German
English
French

Electrode Design
Standard
Conical head (≥ 3/8” / DN 10 (for high grease content fluids)

Supply Power Line Frequency
50 Hz
60 Hz

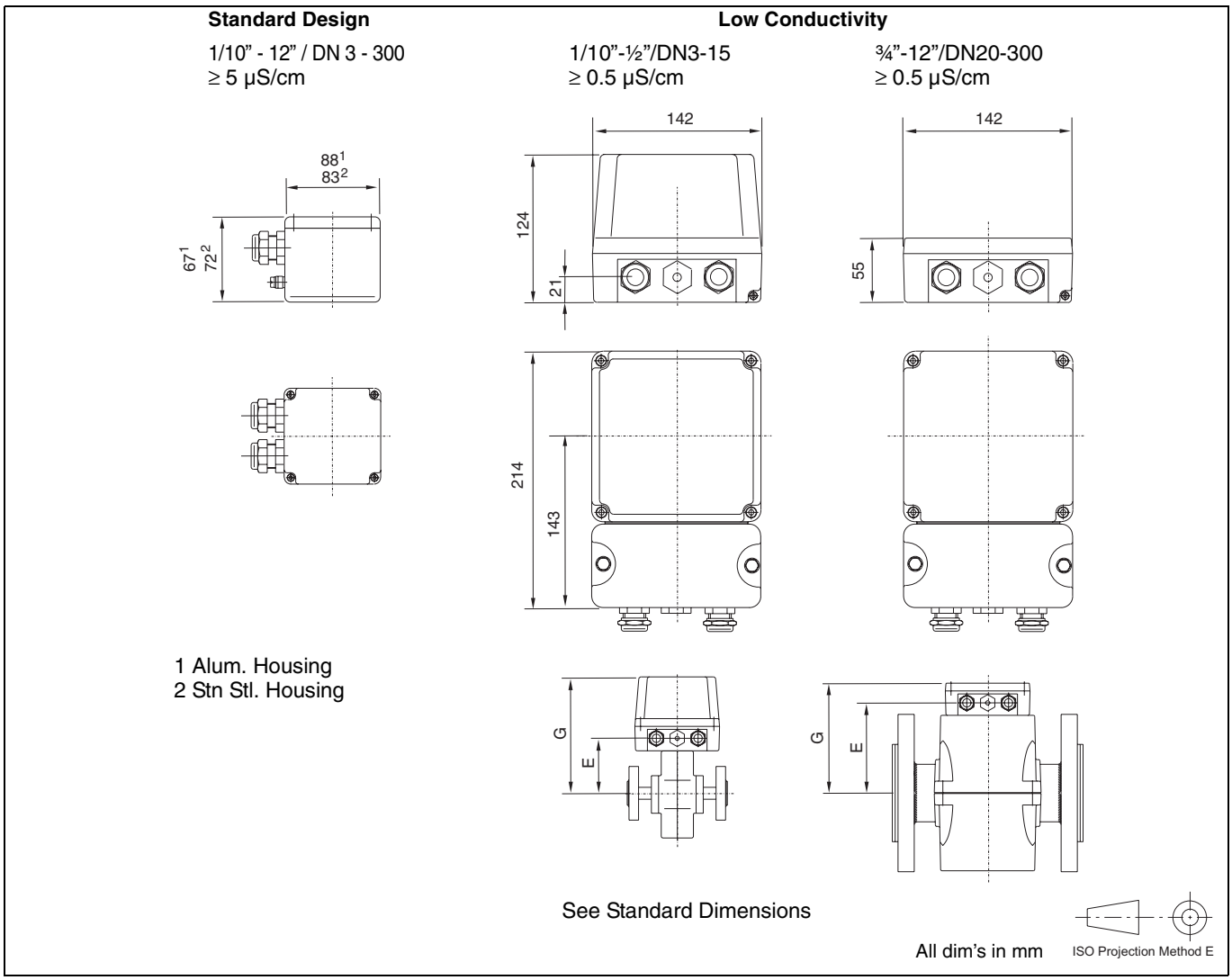


Fig. 15 Dimensions, Flowmeters for Low Conductivity ≤ 5 µS/cm

Specifications: Stainless Steel Flowmeters, 1/25“ to 4“/DN 1 to DN 100, Flanged, Model DS21_

Ambient Conditions

Ambient Temperature
-25 °C to + 60 °C (-13 °F to +140 °F)

Fluid Temperature
- 40 °C to + 130 °C (-40 °F to +266 °F), CIP-qualified, see Temperature Diagram and Max. Allowable Cleaning Temperatures.

Maximum allowable ambient temperature as a function of the fluid temperature for stainless steel process connections and Wafer Design flowmeters

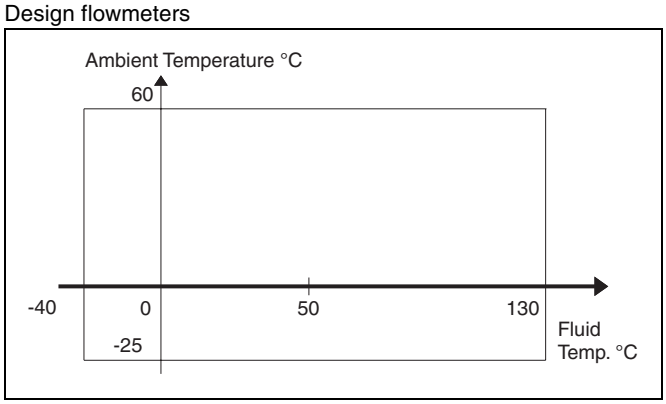


Fig. 16 Temperature Diagram

Storage Temperature
- 25 °C to + 70 °C (-13 °F to +158 °F)

Minimum Allowable Absolute Pressure

Liner	Meter Size Inch	DN	$P_{Operate}$ mbar abs	at	$T_{Operate}$ °C
PFA	1/10–4	3–100	0	≤	130
Peek/Torlon	1/25–1/12	1–2	0	≤	130

Maximal Allowable Fluid Temperature and Pressure

Process Connection Liner PFA	Meter Size Inch	DN	$P_{Operate}$ bar	at	$T_{Operate}$ °C
Wafer Design, Weld Stubs Flanges DIN 2501/ANSI	1/10–4	3–100	40 30	≤ ≤	20 130
Flanges FAB1 DIN 11864-2B	1/10–4	3–100	10	≤	130
Aseptic Connection DIN 11864-1B	1/10–4	3–100	16	≤	130
Food Industry Fitting DIN 11851	1/10–1½ 2–4	3–40 50–100	40 25	≤ ≤	130 130
Tri-Clamp DIN 32676	1/10–4	3–100	10	≤	130
Ext.-/Internal Thds. ISO 228	1/10–1	3 – 25	10	≤	130
PVC-Cement Sleeve	1/10–1	3 – 25	10 1	≤ ≤	20 60
Hose Connectors	1/10–1	3 – 25	10	≤	130
SMS Fittings	1–4	25 – 100	10 16	≤ ≤	130 20
1/8”-Sanitary Connection	1/25–1/12	1–2	10	≤	130

Process Connections
1/25”–1/12” / DN 1 – 2
1/8“-Sanitary connections with 2 grounding electrodes in the same material as the electrodes, standard

1/10”–4” / DN 3 – 100
Wafer Design, Flanges, Tri-Clamp, Pipe Connections, Internal-/External Threads, PVC-Cement Sleeve, Hose Connectors, others upon request

Maximum Allowable Cleaning Temperatures

CIP-Cleaning	Liner	T_{max} °C	T_{max} Minutes	$T_{Amb.}$ °C
Steam or liquid cleaning	PFA/Peek	150	60	25
	PFA/Peek/Torlon	140	60	25

If the ambient temperature >25 °C, the max. cleaning temperature must be reduced by the difference Tmax - Δ °C, where Δ °C = ($T_{Ambient}$ -25 °C).

Maximum Allowable Temperature Shock

Liner	Temp. Shock max. Temp.-Diff. °C	Temp. Gradient °C/min
PFA, Peek, Torlon	arbitrary	arbitrary

Specifications, Flowmeter Primary

Materials, Flowmeter Primary

Liner Material	Electrode Material		Electrode Design	
	Standard	Others	Standard	Others
PFA, Peek, Torlon	Hast.-C4 (1.4539 for Pipe Fittings and Tri-Clamp)	Hast.-B2 SS No. 1.4539 SS 316Ti/1.4571 Tantalum, Titanium, Platinum-Iridium	Nail head	Conical head (≥ 3/8”/ DN 10)

Process Connection Materials	Standard	Option
Wafer Design	none	
Flanges APV-Flanges	SS 316Ti / 1.4571 SS 316L / 1.4404	– –
Weld Stubs	SS 304 / 1.4301	SS 316L / 1.4404
Pipe Fittings	SS 304 / 1.4301	SS 316L / 1.4404
SMS Fittings	SS 304 / 1.4301	SS 316L / 1.4404
Tri-Clamp	SS 304 / 1.4301	SS 316L / 1.4404
External/Internal Threads	SS 304 / 1.4301	SS 316L / 1.4404
Hose Connectors	SS 304 / 1.4301	SS 316L / 1.4404
1/8”-Sanitary Connections	SS 316Ti / 1.4571	POM, Brass, PVC
PVC-Cement Sleeve	PVC	–
Connection Box	Stainless steel	–
Meter Tube	SS 304 / 1.4301	–
Cable Connector	Polyamide	PVDF
Primary Housing	Deep drawn housing SS 304 / 1.4301	

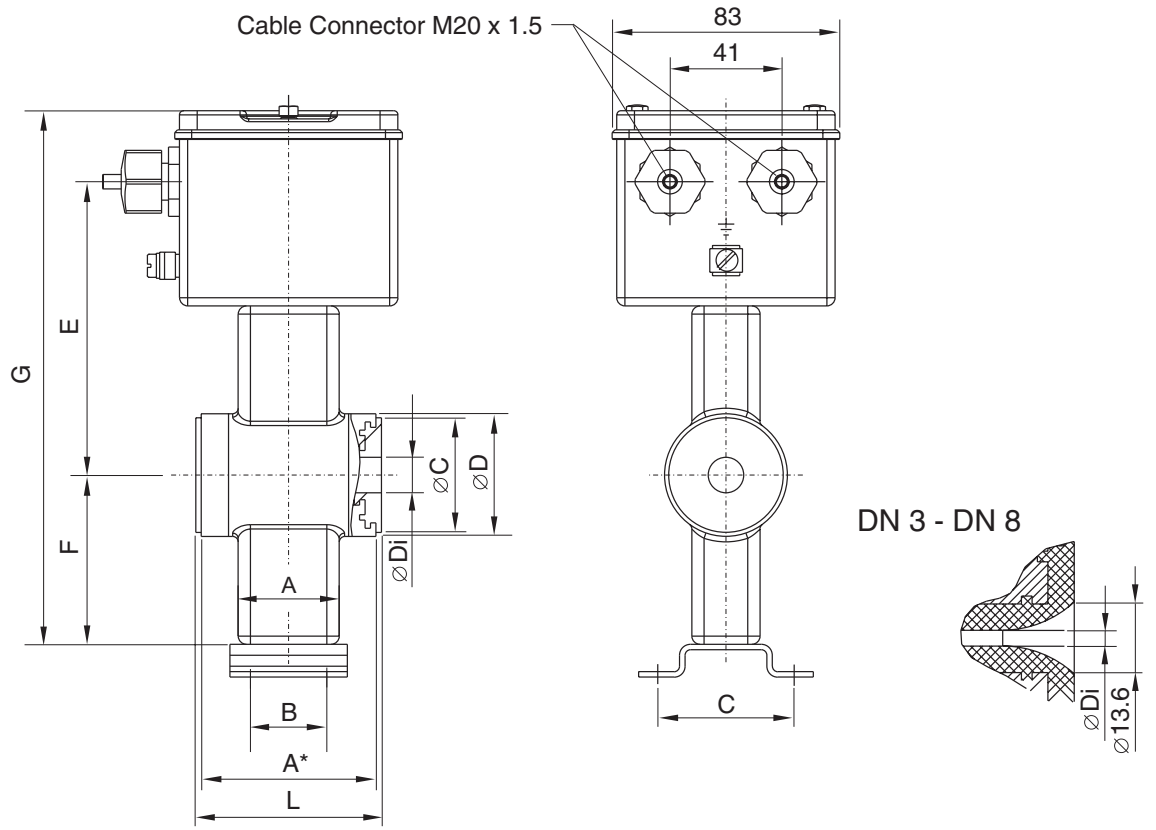
Process Connections	Gasket Materials
Wafer Design,	none
Weld Stubs, Flanges, Pipe Fittings Tri-Clamp External/Internal Threads, Hose Connectors, PVC-Cement Sleeve	EPDM (Ethylene-Propylene) std. with FDA-Approvals Silicone with FDA-Approvals (Option)
Flat Housing Gasket	Silicone

Protection Class
IP 67 Standard
IP 68 with Hose Connector Pg

Pipeline Vibration
Maximum allowable 15 m/s^2 (10-150 Hz)

Dimensions: Stainless Steel Flowmeters, 1/10“ to 4“/DN 3 to DN 100, Wafer Design

Model DS21W



Meter Size Inch	DN	PN	L[1)]	A*	A	B	C	∅ C	∅Di	∅D	E	F	G	Weight approx. kg
1/10 5/32 1/4 5/16 3/8 1/2	3 4 6 8 10 15	10–40 CL 150/ CL 300	68	64	37	28	50	42	3 4 6 8 10 15	45	108	62	197	1.5
3/4	20		78	74	42	28	50	50	20	54	112	66	205	2.0
1	25		90	86	54	46	70	59	25	63	119	73	219	2.0
1-1/4	32		98	94	62	46	70	69	32	73	124	78	229	2.5
1-1/2	40		103	99	67	46	70	77	40	82	128	82	237	3.0
2	50		117	112	–	60	110	95	47	100	136	50	213	4.0
2-1/2	65		103	99	–	60	110	111	62	116	150	58	235	4.5
3	80		103	99	–	60	110	128	74	133	157	66.5	250	6.5
4	100		133	129	–	60	110	155	96	160	176	80	283	8.5

1) installation length with 2 grounding plates L + 3 mm

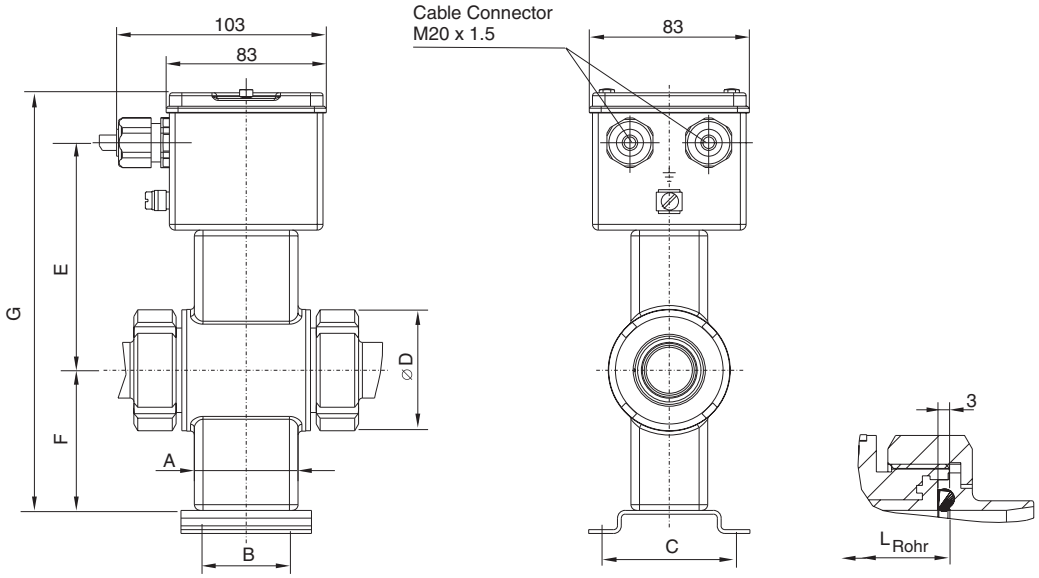
All dim’s in mm ISO Projection Method E

Fig. 17 Flowmeter Primaries 1/10” to 4” / DN 3 to DN 100, Wafer Design

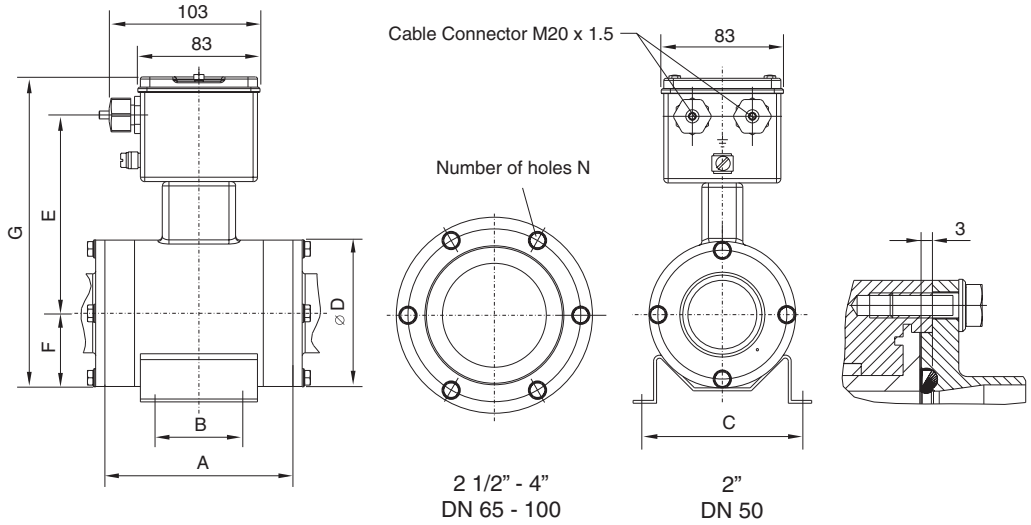
Dimensions: Flowmeter Primary, Variable Process Connections

Model DS21_

1/10" – 1½"
DN 3 – DN 40



2" – 4"
DN 50 – DN 100



2 1/2" - 4"
DN 65 - 100

2"
DN 50

Meter Size Inch	DN	A	∅D	B	C	E	F[2)]	G[2)]	N	Weight ca. kg[1)]
1/10–3/8	3–10	37	44	28	50	108	62	197	–	1.5
1/2	15	37	44	28	50	108	62	197	–	1.5
3/4	20	42	63	28	50	112	66	205	–	2.0
1	25	54	63	46	70	119	73	219	–	2.0
1-1/4	32	62	78	46	70	124	78	229	–	2.5
1-1/2	40	67	78	46	70	128	82	237	–	3.0
2	50	128	100	60	110	136	50	213	4	4.0
2-1/2	65	114	116	60	110	150	58	235	6	4.5
3	80	114	133	60	110	157	66.5	250	6	6.5
4	100	144	160	60	110	176	80	283	6	9.0

installation length including process connections see Pages 20 - 21.
1) Plus process connection weights see Pages 20 - 21.
2) With mounting support G and F + 10.5 mm

All dim's in mm

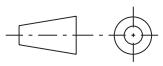


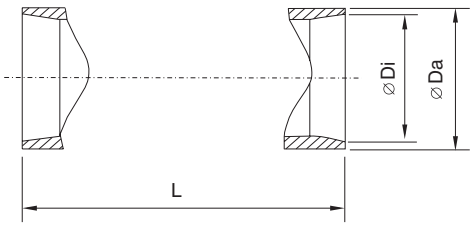
Fig. 18 Flowmeter Primaries 1/10" to 4" / DN 3 to DN 100, Variable Process Connections

Dimensions: Stainless Steel Flowmeters, Adapters for Variable Process Connections

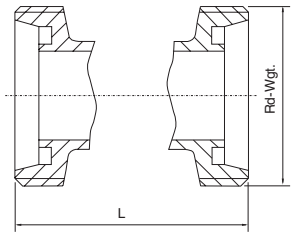
Model DS21_

Meter Size		Weld Stubs											
		ISO 2037				DIN 11850				DIN 2463			
Inch	DN	∅ Di	∅ Da	L	Wgt./kg	∅ Di	∅ Da	L	Wgt./kg	∅ Di	∅ Da	L	Wgt./kg
1/10-3/8	3-10	-	-	-	-	10.0	13.0	127	0.4	10.3	13.5	127	0.4
1/2	15	-	-	-	-	16.0	19.0	127	0.4	18.1	21.3	127	0.4
3/4	20	-	-	-	-	20.0	23.0	132	0.7	23.7	26.9	132	0.7
1	25	22.6	25.0	149	0.7	26.0	29.0	149	0.7	25	28	149	0.7
1-1/4	32	31.3	33.7	166	1.0	32.0	34.0	166	1.0	32	35	166	1.0
1-1/2	40	35.6	38.0	171	1.0	38.0	41.0	171	1.0	36.8	40	171	1.0
2	50	48.6	51.0	173	1.0	50.0	54.0	173	1.0	49	52	173	1.0
2-1/2	65	60.3	63.5	165	1.4	66.0	70.0	165	1.4	66	70	165	1.4
3	80	72.9	76.1	169	2.0	81.0	85.0	169	2.0	81	85	169	2.0
4	100	97.6	101.6	199	2.6	100.0	104.0	199	2.6	100	104	227	3.0

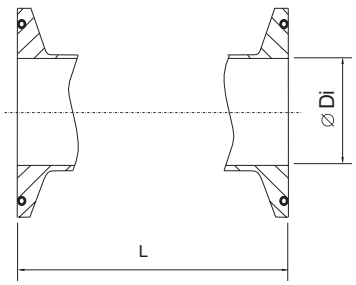
Meter Size		Pipe Fittings						Tri-Clamp						SMS Fittings		
		DIN 11851			DIN11864-1 (Form B)			DIN 32676			ISO 2852			1145		
Inch	DN	Rd. Wgt.	L	Wgt/kg	Rd. Wgt	L	Wgt/kg	∅ Di	L	Wgt/kg	∅ Di	L	Wgt/kg	Rd. Wgt	L	Wgt/kg
1/10-3/8	3-10	28 x 1/8”	169	0.5	34 x 1/8”	161	0.5	10.0	163	0.5	-	-	-	-	-	-
1/2	15	34 x 1/8”	169	0.5	44 x 1/6”	161	0.5	16.0	163	0.5	-	-	-	-	-	-
3/4	20	44 x 1/6”	180	0.9	44 x 1/6”	170	0.9	20.0	168	0.7	-	-	-	-	-	-
1	25	52 x 1/6”	207	0.9	52 x 1/6”	197	0.9	26.0	192	0.8	22.6	192	0.8	40 x 1/6”	180	0.7
1-1/4	32	58 x 1/6”	230	1.4	58 x 1/6”	220	1.4	32.0	209	1.5	-	-	-	48 x 1/6”	201	1.0
1-1/2	40	65 x 1/6”	237	1.4	65 x 1/6”	227	1.4	38.0	214	1.4	35.6	214	1.4	60 x 1/6”	212	1.0
2	50	78 x 1/6”	243	1.4	78 x 1/6”	233	1.4	50.0	216	1.2	48.6	216	1.2	70 x 1/6”	214	1.0
2-1/2	65	95 x 1/6”	245	2.2	95 x 1/6”	233	2.2	66.0	221	1.6	60.3	221	1.6	85 x 1/6”	226	1.4
3	80	110 x 1/4”	259	3.2	110 x 1/4”	245	3.2	81.0	225	2.4	72.9	225	2.4	98 x 1/6”	230	2.0
4	100	130 x 1/4”	307	4.4	130 x 1/4”	291	4.4	100.0	255	3.1	97.6	255	3.1	132 x 1/6”	282	3.0



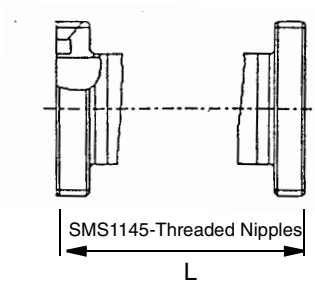
Weld Stubs per DIN 11850,
ISO 2037 and DIN 2463



Pipe Fittings per
DIN 11851 and 11864-1 Form B



Tri-Clamp per
DIN 32676 and ISO 2852



SMS Fittings

All dim’s in mm

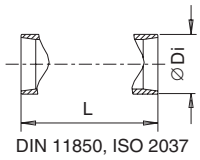
ISO Projection Method E

Fig. 19 Dimensions, 1/10” to 4” / DN 3 to DN 100, Adapters for Variable Process Connections

Dimensions: Stainless Steel Flowmeters, Adapters for Variable Process Connections

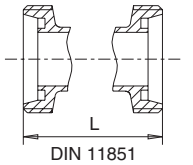
Model DS21

Meter Size Inch	DN	Weld Stubs DIN11850 L	Wgt. kg[1)]	Pipe Fittings DIN 11851 L	Wgt. kg[1)]	Pipe Fittings DIN 11864-1-B L	Wgt. kg[1)]
1/10–3/8	3–10	127	0.4	169	0.5	161	0.5
1/2	15	127	0.4	169	0.5	161	0.5
3/4	20	132	0.7	180	0.9	170	0.9
1	25	149	0.7	207	0.9	197	0.9
1-1/4	32	166	1.0	230	1.4	220	1.4
1-1/2	40	171	1.0	237	1.4	227	1.4
2	50	173	1.0	243	1.4	233	1.4
2-1/2	65	165	1.4	245	2.2	233	2.2
3	80	169	2.0	259	3.2	245	3.2
4	100	199	2.6	307	4.4	291	4.4



Weld Stubs

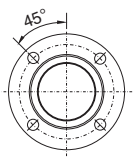
DIN 11850, ISO 2037



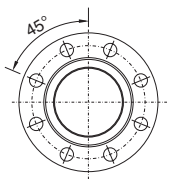
Pipe Fittings

DIN 11851
DIN 11864-1-B

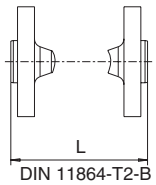
Flanges DIN 11864-T2-B		
DN	L	Weight kg[1)]
10	183	0.9
15	183	1.0
20	188	1.3
25	207	1.6
40	229	1.8
50	231	2.2
65	223	3.0
80	227	4.0
100	257	5.0



Flanges
DN 3 - DN 65
1/10" - 2 1/2"

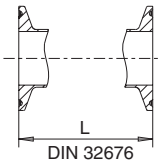


Flanges
DN 80 - DN 100
3" - 4"



Flanges

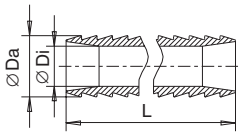
DIN 11864-T2-B



Tri-Clamp

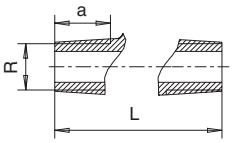
DIN 32676

Meter Size Inch	DN	Hose Connectors Di	Da	L	Weight kg[1)]
1/10–3/8	3–10	10	14.5	159	0.4
1/2	15	16	21	159	0.4



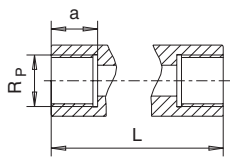
Hose Connector

Meter Size Inch	DN	External Threads ISO 228 / DIN 2999 R	a	L	Weight kg[1)]
1/10–3/8	3–10	3/8"	18	139	0.4
1/2	15	1/2"	18	139	0.4
3/4	20	3/4"	25	164	0.8
1	25	1"	25	179	0.8



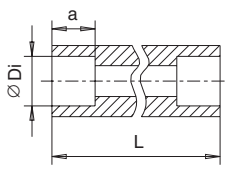
External Threads

Meter Size Inch	DN	Internal Threads ISO 228 / DIN 2999 R_p	a	L	Weight kg[1)]
1/10–3/8	3–10	3/8"	15	139	0.5
1/2	15	1/2"	15	139	0.5
3/4	20	3/4"	22	164	0.9
1	25	1"	22	179	0.8



Internal Threads

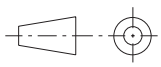
Meter Size Inch	DN	PVC-Cement sleeve Di	a	L	Weight kg[1)]
1/10–3/8	3–10	16	14	143	0.4
1/2	15	20	16	159	0.4
3/4	20	25	19	164	0.6
1	25	32	22	199	0.6



PVC-Solvent Weld Stubs

1) Weight per pair

All dim's in mm

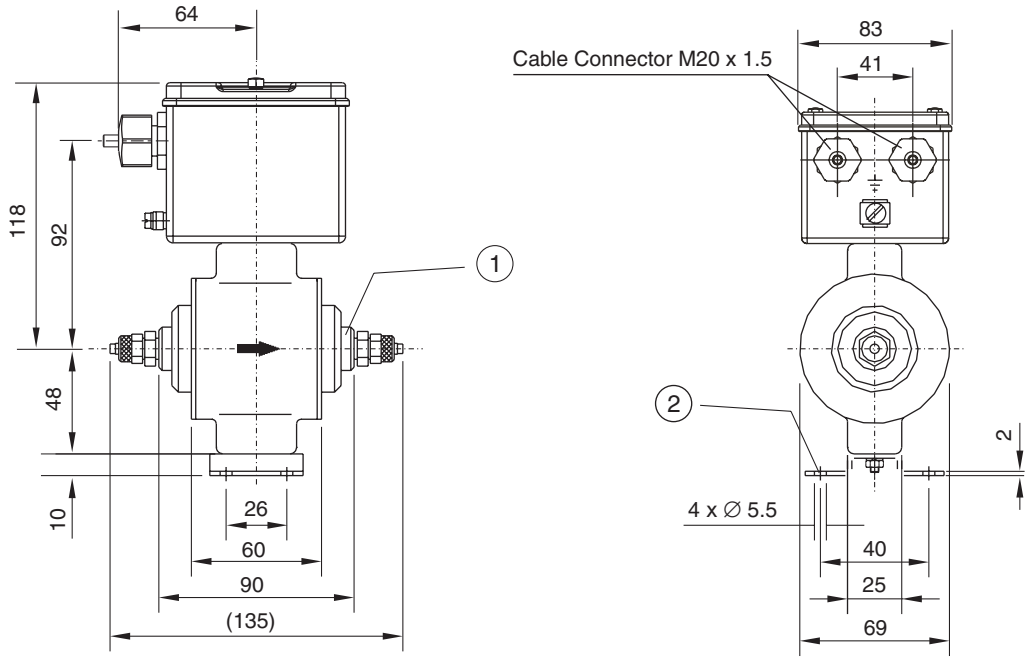


ISO Projection Method E

Fig. 20 Dimensions, Model DS21, 1/10" to 4" / DN 3 to DN 100, Adapters for Variable Process Connections

Dimensions: Stainless Steel Flowmeters, 1/8“-Sanitary Connections, 1/25“ to 1/12“/DN 1 to DN 2

Model DS21B



Note:

① Connection dimensions for connections with G 1/8” internal threads

② Mounting support optional

! Note:

The flowmeter primary includes ground electrodes made of the same material as the signal electrodes, standard.

Process Connection	Inch	DN	PN	Weight kg
1/8” Sanitary Connectors	1/25 - 1/12	1 - 2	10	1.5

All dim’s in mm

ISO Projection Method E

Fig. 21 Dimensions, Flowmeter Sizes 1/25” to 1/12” / DN 1 to DN 2

Ordering Information: Stainless Steel Flowmeters

In addition to the Ordering Number please supply the following information: Fluid, fluid temperature, operating pressure, flow range, pipeline type (grounding plate, grounding electrodes)[1)]

Ordering Number			DS21														
Process Connection																	
Wafer Design				W													
Flanges Type APV FAB1 DIN 11864-2				L													
Aseptic Connection DIN 11864-1				A													
1/8"-Sanitary Connection 1/25"–1/12" / DN 1–2				B													
Weld Stubs DIN 11850				R													
Food Industry Fitting DIN 11851				S													
Tri-Clamp DIN 32676				T													
External Threads ISO 228/DIN 2999			1/10"– 1" / DN 3–25	E													
Internal Threads ISO 228/DIN 2999			1/10"– 1" / DN 3–25	I													
PVC-Cement Sleeve			1/10"– 1" / DN 3–25	G													
Hose Connectors			1/10"– ½" / DN 3–15	H													
Others				Z													
Liner Material																	
PFA (1/10"–4" / DN 3– 100)					P												
Peek (1/25"–1/12" / DN 1-2)					K												
Torlon (1/25"–1/12" / DN 1-2)					N												
Meter Size																	
1/25"	DN	1				01											
1/17"	DN	1.5				1S											
1/12"	DN	2				02											
1/10"	DN	3				03											
5/32"	DN	4				04											
1/4"	DN	6				06											
5/16"	DN	8				08											
3/8"	DN	10				10											
1/2"	DN	15				15											
3/4"	DN	20				20											
1"	DN	25				25											
1-1/4"	DN	32				32											
1-1/2"	DN	40				40											
2"	DN	50				50											
2-1/2	DN	65				65											
3"	DN	80				80											
4"	DN	100				1H											
Signal Electrode Material/Ground Electrode Material [2)]																	
SS 316Ti / 1.4571	/none						S										
Hastelloy B-2	/none						B										
Hastelloy C-4	/none standard						H										
Titanium	/none						M										
Tantalum	/none						T										
SS No. 1.4539	/none (Food Ind. applications)						F										
Platinum-Iridium	/none						P										
SS 316Ti / 1.4571	/with						E										
Hastelloy B-2	/with						N										
Hastelloy C-4	/with Standard						O										
Titanium	/with						I										
Tantalum	/with						Q										
SS No. 1.4539	/with (Food Ind. applications.)						R										
Platinum-Iridium	/with						G										
Others							Z										
Pressure Rating	Standard for flanges																
PN 10	Tri-Clamp, External-/Internal Threads, PVC-Cement Sleeve, Hose Connectors							C									
PN 16								D									
PN 25	Only Wafer Design, Pipe Fittings, and Weld Stubs							E									
PN 40								F									
JIS K10								K									
ANSI CL 150								P									
ANSI CL 300								Q									
Others								Z									

Continued on next page

1) Only required for Wafer Design process connections, pipelines with insulating liners and PVC-Cement Sleeves.

2) 1/25"–1/12" / DN 1-2 always specify ground electrode material, standard.

Ordering Number	DS21														
Process Connection Material															
None	(only Wafer Design)								**0**						
SS 316Ti / 1.4571	(only fixed flanges, sanitary connections)								**3**						
SS 316L / 1.4404	Standard for APV-Flanges, Aseptic Connections., Weld Stubs DIN 2463								**4**						
SS 304 / 1.4301	Standard								**6**						
PVC	(only PVC-Cement Sleeve)								**7**						
POM	(1/25"–1/12" / DN 1–2)								**8**						
Others									**9**						
Conductivity		**/Instrument Mounting Support**													
≥ 20 µS/cm 3/8"–4" / DN 10–100		/none								**A**					
≥ 20 µS/cm 3/8"–4" / DN 10–100		/with								**C**					
≥ 5 µS/cm ≤ 5/16" / DN 8; ≥ 0.5 µS/cm 3/8"–4" / DN 10–100		/none								**E**					
≥ 5 µS/cm ≤ 5/16" / DN 8; ≥ 0.5 µS/cm 3/8"–4" / DN 10–100		/with								**F**					
Temperature Range															
Standard design ≤ 130 °C (≤ 266 °F)											**S**				
Certifications															
None												**A**			
Inspection Certificate per EN 10204 Paragraph 3.1B												**D**			
Calibration Certificate															
Standard													**A**		
Others													**Z**		
Protection Class															
IP 67															**2**
IP 68															**3**

The following supplemental Ordering Information should be included in writing.

Instrument Tag Language
German
English
French

Gasket Materials
EPDM with FDA-Approval
EPDM
Silicone
PTFE (Teflon)
None

Electrode Design
Standard
Conical head (≥ 3/8" / DN 10), for high grease content fluids
Others

Supply Power Line Frequency
50 Hz
60 Hz

Specifications: Converter

Fig. 22 Converter MAG-SM

Flow Range
Any flow range whose 100% value lies between an equivalent flow velocity of 0.5 m/s and 15 m/s can be selected.

Minimum Conductivity

≥ 20 µS/cm standard	3/8"–40" / DN 10–1000
≥ 5 µS/cm with preamplifier	1/25"–5/16" / DN 1–8
≥ 0.5 µS/cm with preamplifier	3/8"–40" / DN 10–1000

Reproducibility
≤ ± 0.2 % of rate

Response Time
20 ms for 50 Hz

Supply Power
230/120/115/24 V AC ±10 %
50/60 Hz ± 6 %

Magnetic Field Supply

≤ 16" / DN 400:	Supply Power 50/60 Hz from converter approx. 60 V AC
≥ 20" / DN 500:	Supply Power 115/230 V AC, 50/60 Hz

Power
≤ 30 VA (flowmeter primary including converter)

Ambient Temperature
-25 to +60 °C (-13 °F to +140 °F)

Protection Class per EN 60529
IP 65 for Field mount housing
IP 00 for 19"-Plug-in unit
IP 65 for Stainless steel panel mount housing

Construction
Field mount housing made of cast light metal, painted. Paint coat 60 µm thick. Lower section (RAL 7012), upper section (RAL 9002). Dimensions Page 33. Weight approx. 4.2 kg.

19"-Plug-in Unit, 28TE (21TE converter and 7TE control box), 3HE, 157 mm deep, for 3 units per rack mount assembly. Dimensions Page 33. Weight approx. 1.8 kg.
Ordering Information for the Rack Mount Frame see Page 35.

Panel Mount Housing
3 section housing, door with window, center section with 2x2 clamp brackets, hinged rear section (material SS 304/1.4301) for mounting a 19"-Insert cassette. Dimensions see Page 33. Empty weight approx. 3.7 kg.

Electrical Connections
Wall mount housing:
Cable entry M20x1.5, screw terminals
19"-Design screw terminals, plugable

Damping
Can be set between 0.1 and 99.999 s

Zero Cutoff
Can be set between 0 and 10 % of end value

Signal Cable
Maximum cable length between flowmeter primary and converter is 50 m for the standard version when the automatic empty pipe detector is installed, ≥ 3/8" / DN 10 and ≥ 20 µS/cm. Maximum cable length is 200 m for designs with a preamplifier. A 10 m long signal cable is included with each flowmeter shipment. If more than 10 m are required, see the Foot Note to Ordering Information, Converter on Page 34.

Forward-/Reverse Flow Metering
A direction arrow indicates the direction in the display and a relay contact can be actuated for a remote indication.

Display
2 x 16 character, dot-matrix display. The instantaneous flowrate is displayed in the 1st line in %, m/s or in direct reading engineering units for the selected flow range. The integrated volume flow is displayed in the 2nd line (with units). The display includes LED background lighting.

In multiplex operation two additional values can be displayed in the 1st and 2nd lines. The values alternate every 20 seconds.

The automatic system monitor displays a diagnostic message when an error condition is detected. An alarm signal is also transmitted on the alarm output.

Data Security
All data is stored in an NV-RAM for up to 10 years when the supply power is turned off or there is a power outage.
Additional security is provided by serial EEPROMs installed in the converter and on the external connection board which automatically exchange and store all process information. This facilitates an easy exchange of the converter – no data need be reentered – the data is automatically uploaded from the external EEPROM.

Flow Totalization
The flow is totalized in engineering units. A pulse factor can be selected in the range from 0.001 to 1000 pulses per engineering unit. Using the „Multiplex Mode“ it is possible to display the forward and reverse flow totalizer values in a 20 second cycle.

Parameter Settings
Entries are made from a foil keypad (16 keys) in a dialog with the display or by communication over the data link from a PC, HART-Protocol or Profibus DP.

Operating Mode
The converter has been designed for a number of different operating modes which can be selected in the software.
This permits customizing to the existing process requirements: Continuous flow metering of e.g. multi phase fluids. Flow metering in piston pump applications (pulsating flow).

Software Filter
Especially for pulsating flow applications or for very noisy flow signals a digital filter has been incorporated. It smooths the instantaneous flowrate display and smooths the current output. When the filter is turned on the damping values may be reduced. The response time of the converter is not affected.

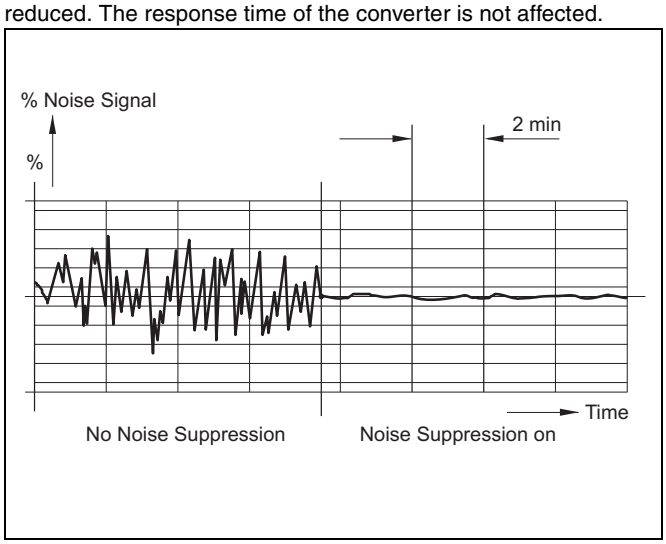


Fig. 23 Converter Output Signal w/wo Filter

Alarm Signals
The converter can be ordered with a max-/min alarm. The max. and min. alarm limits can be set in anywhere within the range of 0-130 % flowrate When the flowrate is outside of the alarm settings an indication is displayed in the upper line and the alarm contact is actuated.

Upgrading
This converter can be also be used to operate the older Electromagnetic Flowmeter Primaries Model 10D1422 .
A converter upgrade is possible for sizes 1/10” to 40” / DN 3 to DN 1000.

In-/Output Isolation
The current output and the pulse output are galvanically isolated from the input circuit and from each other.

Output Signal Standard

Current Output, selectable
0 to 5 mA load ≤ 2000 Ohm
0/4 to 20 mA load ≤ 550 Ohm
0/2 to 10 mA load ≤ 1000 Ohm
Forward and reverse flow measurements
0–10–20 mA zero at 10 mA
4–12–20 mA zero at 12 mA
Terminals: +/–

Contact Output
Flowrate alarms (max. or min.) and alarm output. System monitor can be ordered option by specifying the option
Relay Contact ≤ 3 W, ≤ 250 mA, ≤ 28 V or
Optocoupler $U_{CE} \leq 25$ V, $I_{CE} \leq 7.5$ mA .

Input Signal Standard

External Zero Cutoff
Passive, over contact (closer). When the meter tube drains all outputs can be turned off. The current output e.g. can be set to 0 mA or 2/4 mA dependent on the current range selected. An optocoupler can be used to provide galvanic isolation.

External Totalizer Reset
Passive, over contact (closer). To reset both the forward and reverse internal totalizers whose values appear in the display and their overflow counters . An optocoupler can be used to provide galvanic isolation.

Output Signals

Scaled Pulse Output
Maximum count frequency 10 kHz. A pulse factor per engineering unit can be set between 0.001 and 1000.
Pulse width can be set between 0.100 ms and 2000 ms.

Active
Voltage pulses 24 V square wave, load ≥ 150 Ω,
Pulse width ≤ 50 ms, count frequency ≤ 3 Hz,
load ≥ 500 Ω, pulse width ≥ 0.1 ms
max. count frequency 10 kHz.
Terminals V1, V2; Function 9 and 11 Forward
Terminals V3, V4; Function 9 and 11R Reverse

Passive
Optocoupler, $5\text{ V} < U_{CE} < 25\text{ V}$, $5\text{ mA} < I_{CE} < 30\text{ mA}$,
max. count frequency 10 kHz.
Terminals V1, V2; Function 55 and 56 Forward
Terminals V3, V4; Function 57 and 58 Reverse

Forward-/Reverse Direction Signal
Passive, relay contact (bipolar) ≤ 3 W, ≤ 250 mA, ≤ 28 V
Terminals 44, 45, 46

Serial Data Link

The serial data link is available in a RS 485 design. If a serial data link option is ordered the active scaled pulse output is not available. If a scaled pulse output is required see „Data Link and Scaled Pulse Output Passive“. Then the alarm contact is not available.

RS 485

Vpp = 5 V. Input impedance: ≥ 12 kOhm, cable length ≤ 1200 m. The following baud rates can be selected: 110, 300, 600, 1200, 2400, 4800, 9600, 14400, 28800 Baud. A maximum of 32 field instruments can be connected in parallel on a single bus. A shielded data cable with individually twisted pairs is recommended.
Terminals: V1, V2, V3, V4; Function T-, T+, R-, R+

Data Link and Pulse Output Passive

If the data link option is selected then an active scaled pulse output is no longer available. If a scaled pulse output is required the combination data link option and passive scaled pulse output can be specified. The passive scaled pulse output is only available for the forward flow direction.

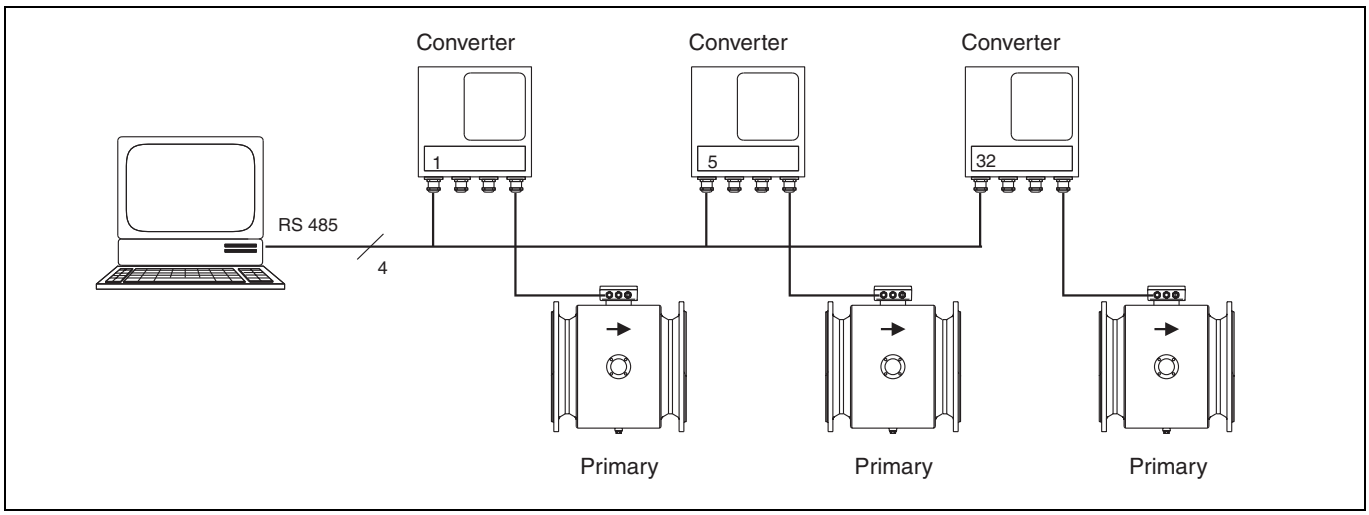


Fig. 24 RS 485 Installation. Max. 32 Instruments on a Single Bus

Automatic Empty Pipe Detector
(Standard ≥ 3/8” / DN 10 and ≥ 20 µS/cm)

The Empty Pipe Detector automatically shuts off the outputs when the meter tube drains, activates the contact output and displays a message, max. signal cable length is 50 m. If the detector is turned on and the meter tube drains the current output can be set to either 0 % (3.6 or 4 mA for 4-20 mA) or 130 % of its end valued as desired and the pulse totalization is interrupted.

Profibus DP per DIN 19245

Terminals: V1, V2, V4, G2

Terminal	Function	Reference
V1	B RxD/TxD-P	Receive/send data-P
V2	A RxD/TxD-N	Receive/send data-N
V4	VP	Supply voltage -Plus P5V
G2	C DGND	Data reference potential-M5V

A shielded data cable with individually twisted pairs is recommended.
Max. cable length 1200 m (Cable Type A)
Characteristic impedance 135-165 Ohm
Max. 32 Instruments on one bus
Baudrate: 9.6-1500 kbit/s
Distributed capacitance <30 pF/m, loop resistance 110 Ω/km
Max. tap line length 1 m.
Incoming and outgoing cables on the same terminals.

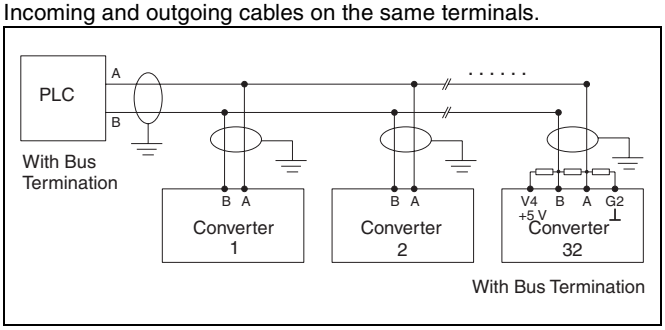


Fig. 25 Bus Connections

Instrument Data Base (GSD File)

The name of the Instrument Data Base file is ABB_6666.GSD and is included with the shipment. For a detailed description of the Data Link see the document ABB Part. No. D184B093U06.

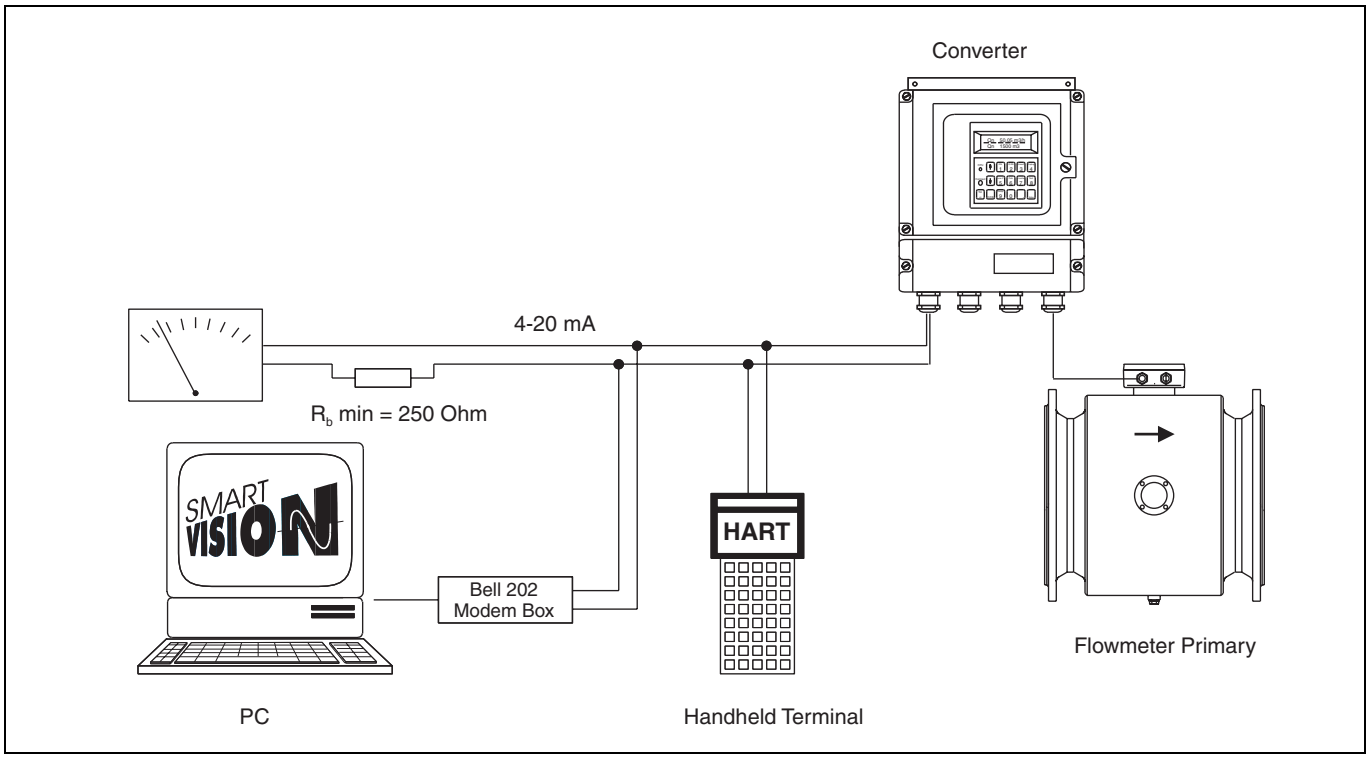


Fig. 26 HART-Protocol

HART®-Protocol

The HART®-Protocol provides for communication between a process control system, handheld terminal and the EMF field instrument. When communication using the HART-Protocol is desired, the serial data link is not available. The digital communication occurs through an alternating current signal superimposed on the current output which does not affect any instruments connected to the output. This option is only available with 4-20 mA current output option.

Transmission Mode
FSK-Modulation on the current output 4-20 mA per Bell 202 Standard.

Baudrate
1200 Baud

Representation
Logic 1: 1200 Hz
Logic 0: 2200 Hz

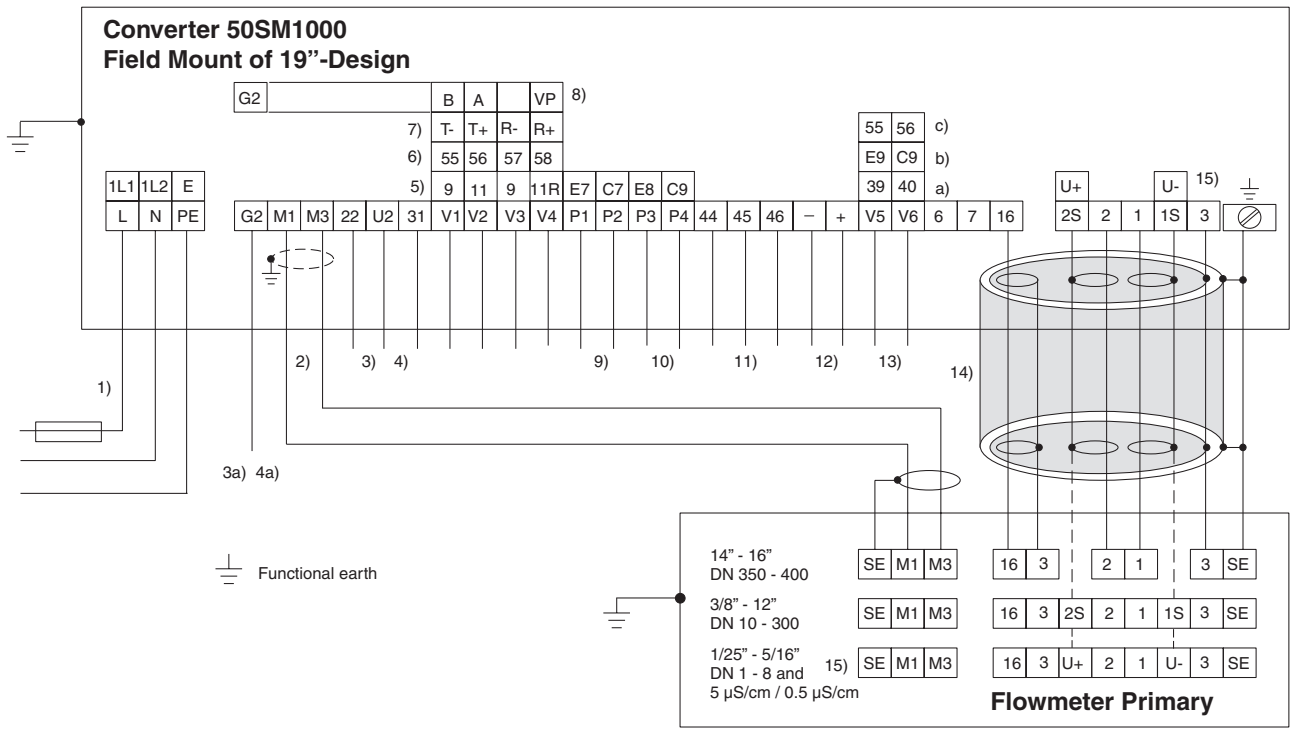
Cable
AWG 24 twisted

Max. Cable Length
1500 m AWG 24 twisted and shielded

Max. Signal Amplitude
1.2 mA_{PP}

Current Output Load
Min.: 250 Ω,
Max.: 550 Ω

Interconnection Diagram Flowmeter Primary 1/25“ - 16“, Converter in Field Mount Housing or 19“-Design



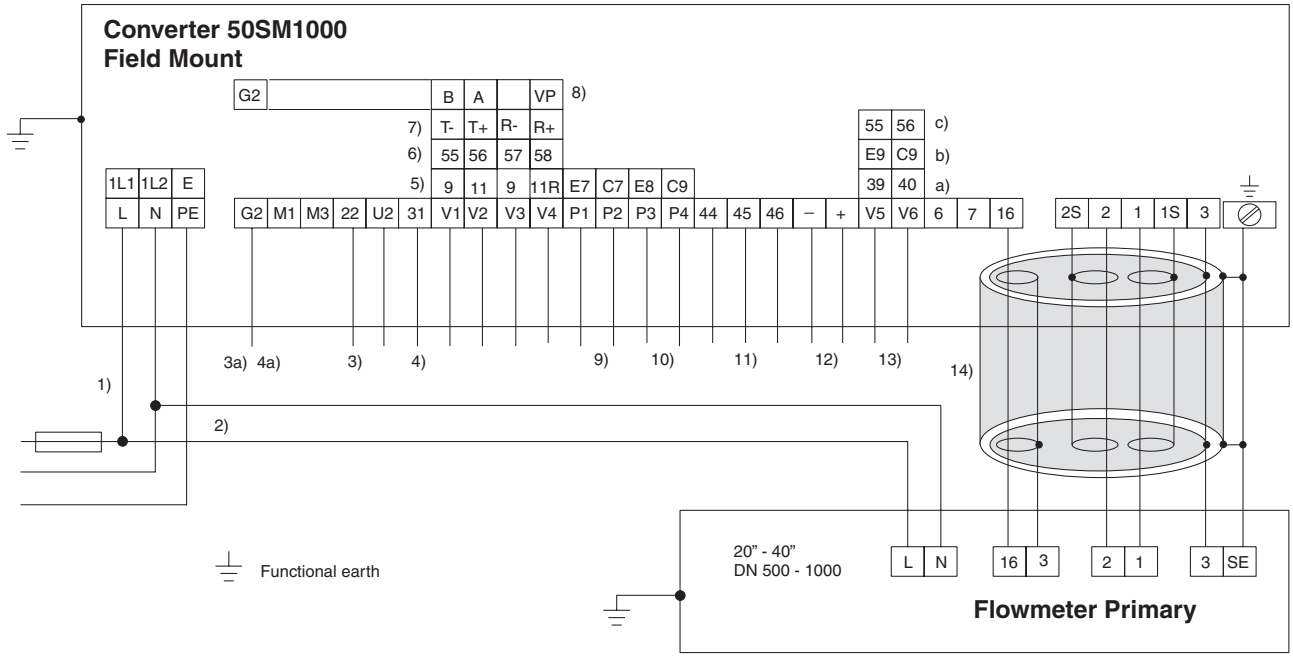
1) Supply Power, see Instrument Tag
2) Excitation current cable, e.g. shielded 2x1.5 mm^2.
3) External low flow cutoff passive over contact with int. voltage supply Terminals U2 (+24 V) and 22. Switch S902 closed.
3) a) With external voltage supply (for galvanic isolation) Terminals G2 (–) and 22 (+24 V), Switch S902 on the connection board must be opened.
4) External totalizer reset, passive over contact with int. voltage supply Terminals U2 (+24V) and 31. Switch S902 closed.
4) a) With external voltage supply (for galvanic isolation) Terminals G2 (–) and 31 (+24 V), Switch S902 on the connection board must be opened.
5) *) Scaled pulse output, 24 V active,load ≥ 150 Ω, pulse width ≤ 50 ms, fmax ≤ 3 Hz
load ≥ 500 Ω, pulse width ≥ 0.1 ms, fmax ≤ 10 Hz
Terminals V1, V2; Function 9, 11 Forward
Terminals V3, V4; Function 9, 11R Reverse
6) *) Scaled pulse output, passive, optocoupler, 5 V < U_{CE} ≤ 25 V, 5 mA < I_{CE} ≤ 30 mA, fmax 10 kHz
Terminals V1, V2; Function 55, 56 Forward
Terminals V3, V4; Function 57, 58 Reverse
7) Option, Data Link RS 485. Terminals V1, V2, V3, V4; Function T–, T+, R–, R+
8) Option, Data Link Profibus DP, Terminals V1, V2, V3, V4, G2, Function [RxD/TxD–P(B), RxD/TxD–N(A)] +5 V (VP), DGND (G2) for bus termination
9) Alarm max., relay contact ≤ 3 W, ≤ 250 mA, ≤ 28 V DC, passive or optocoupler U_{CE} ≤ 25 V, I_{CE} ≤ 7.5 mA. Terminals P1, P2; Function E7, C7
10) Alarm min., relay contact ≤ 3 W, ≤ 250 mA, ≤ 28 V DC, passive or optocoupler U_{CE} ≤ 25 V, I_{CE} ≤ 7.5 mA. Terminals P3, P4; Function E8, C8
11) Forward-reverse direction signal, relay contact ≤ 3 W, ≤ 250 mA, ≤ 28 V DC. Terminals 44, 45, 46
12) Current output, R_B ≤ 550 Ω: 0/4-20 mA, 0-10-20 mA, 4-12-20 mA, R_B ≤ 1000 Ω: 0/2-10 mA R_B ≤ 2000 Ω: 0-5 mA. Terminals –/+
13) a) Alarm Output, relay contact opens at alarm, ≤ 3 W, ≤ 250 mA, ≤ 28 V DC, Terminals V5, V6; Function 39, 40 or
b) Alarm Output, Optocoupler, U_{CE} ≤ 25 V, I_{CE} ≤ 7.5 mA. Terminals V5, V6; Function E9, C9
When in addition to the serial data link a passive scaled pulse output is specified, the alarm output is no longer available.
c) Scaled pulse output optocoupler, U_{CE} ≤ 25 V, I_{CE} ≤ 7.5 mA
Terminals V5, V6; Function 55, 56 Forward
14) Shielded signal cable ABB Part No. D173D018U02, 10 m included with shipment.
15) voltage supply for flowmeter primary with preamplifier, Terminals +U, -U

*) Scaled pulse output, active or passive, pulse width selectable from 0.100 to 2000 ms.

Note: A shielded output cable is recommended with the shield connected at one end to ground.

Fig. 27 Interconnection Diagram Converter 50SM1000, Flowmeter Primaries 1/25” to 16” / DN 1 to DN 400

Interconnection Diagram Flowmeter Primary 20“ - 40“, Converter in Field Mount Housing



1) Supply Power, see Instrument Tag
2) Magnet coil supply from Supply Power
3) External low flow cutoff passive over contact with int. voltage supply Terminals U2 (+24 V) and 22. Switch S902 closed.
3) a) With external voltage supply (for galvanic isolation) Terminals G2 (–) and 22 (+24 V), Switch S902 on the connection board must be opened.
4) External totalizer reset, passive over contact with int. voltage supply Terminals U2 (+24V) and 31. Switch S902 closed.
4) a) With external voltage supply (for galvanic isolation) Terminals G2 (–) and 31 (+24 V), Switch S902 on the connection board must be opened.
5) *) Scaled pulse output, 24 V active,load ≥ 150 Ω, pulse width ≤ 50 ms, fmax ≤ 3 Hz
load ≥ 500 Ω, pulse width ≥ 0.1 ms, fmax ≤ 10 Hz
Terminals V1, V2; Function 9, 11 Forward
Terminals V3, V4; Function 9, 11R Reverse
6) *) Scaled pulse output, passive, optocoupler, 5 V < U_{CE} ≤ 25 V, 5 mA < I_{CE} ≤ 30 mA, fmax 10 kHz
Terminals V1, V2; Function 55, 56 Forward
Terminals V3, V4; Function 57, 58 Reverse
7) Option, Data Link RS 485. Terminals V1, V2, V3, V4; Function T–, T+, R–, R+
8) Option, Data Link Profibus DP, Terminals V1, V2, V3, V4, G2, Function [RxD/TxD–P(B), RxD/TxD–N(A)]
+5 V (VP), DGND (G2) for bus termination
9) Alarm max., relay contact ≤ 3 W, ≤ 250 mA, ≤ 28 V DC,
passive or optocoupler U_{CE} ≤ 25 V, I_{CE} ≤ 7.5 mA. Terminals P1, P2; Function E7, C7
10) Alarm min., relay contact ≤ 3 W, ≤ 250 mA, ≤ 28 V DC,
passive or optocoupler U_{CE} ≤ 25 V, I_{CE} ≤ 7.5 mA. Terminals P3, P4; Function E8, C8
11) Forward-reverse direction signal, relay contact ≤ 3 W, ≤ 250 mA, ≤ 28 V DC. Terminals 44, 45, 46
12) Current output, R_B ≤ 550 Ω: 0/4-20 mA, 0-10-20 mA, 4-12-20 mA, R_B ≤ 1000 Ω: 0/2-10 mA
R_B ≤ 2000 Ω: 0-5 mA. Terminals –/+
13) a) Alarm Output, relay contact opens at alarm, ≤ 3 W, ≤ 250 mA, ≤ 28 V DC, Terminals V5, V6; Function 39, 40 or
b) Alarm Output, optocoupler, U_{CE} ≤ 25 V, I_{CE} ≤ 7.5 mA. Terminals V5, V6; Function E9, C9
When in addition to the serial data link a passive scaled pulse output is specified, the alarm output is no longer available.
c) Scaled pulse output optocoupler, U_{CE} ≤ 25 V, I_{CE} ≤ 7.5 mA
Terminals V5, V6; Function 55, 56 Forward
14) Shielded signal cable ABB Part No. D173D018U02, 10 m included with shipment.

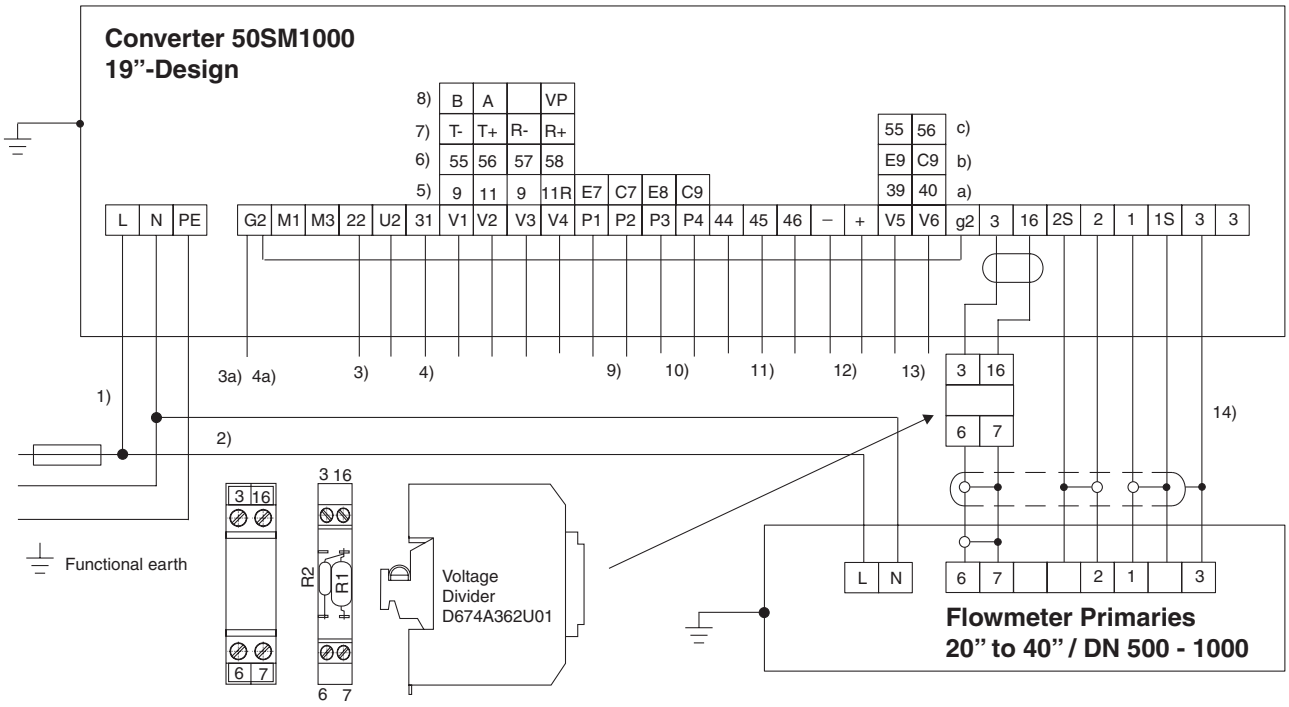
*) Scaled pulse output, active or passive, pulse width selectable from 0.100 to 2000 ms.

Note: A shielded output cable is recommended with the shield connected at one end to ground.

Fig. 28 Interconnection Diagram Converter 50SM1000, Flowmeter Primaries 20” to 40” / DN 500 to DN 1000

Interconnection Diagram Flowmeter Primary 20“ - 40“, Converter 19“-Design for Upgrade

Models 10D1422, 10DI1422, 10DS3111A-C



1) Supply Power, see Instrument Tag
2) Magnet coil supply from Supply Power
3) External low flow cutoff passive over contact with int. voltage supply Terminals U2 (+24 V) and 22. **Jumper G2 to g2.**
3) a)With external voltage supply for galvanic isolation) Terminals G2 (–) and 22 (+24 V ext.), **Remove jumper!**
4) External totalizer reset, passive over contact with int. voltage supply Terminals U2 (+24V) and 31. **Jumper G2 to g2.**
4) a)With external voltage supply (for galvanic isolation) Terminals G2 (–) and 31 (+24 V ext.), **Remove jumper!**
5) *) Scaled pulse output, 24 V active,load ≥ 150 Ω, pulse width ≤ 50 ms, fmax ≤ 3 Hz
load ≥ 500 Ω, pulse width ≥ 0.1 ms, fmax ≤ 10 Hz
Terminals V1, V2; Function 9, 11 Forward
Terminals V3, V4; Function 9, 11R Reverse
6) *) Scaled pulse output, passive, optocoupler, 5 V < U_{CE} ≤ 25 V, 5 mA < I_{CE} ≤ 30 mA, fmax 10 kHz
Terminals V1, V2; Function 55, 56 Forward
Terminals V3, V4; Function 57, 58 Reverse
7) Option, Data Link RS 485. Terminals V1, V2, V3, V4; Function T–, T+, R–, R+
8) Option, Data Link Profibus DP, Terminals V1, V2, V3, V4, G2, Function [RxD/TxD–P(B), RxD/TxD–N(A)]
+5 V (VP), DGND (G2) for bus termination
9) Alarm max., relay contact ≤ 3 W, ≤ 250 mA, ≤ 28 V DC,
passive or optocoupler U_{CE} ≤ 25 V, I_{CE} ≤ 7.5 mA. Terminals P1, P2; Function E7, C7
10) Alarm min., relay contact ≤ 3 W, ≤ 250 mA, ≤ 28 V DC,
passive or optocoupler U_{CE} ≤ 25 V, I_{CE} ≤ 7.5 mA. Terminals P3, P4; Function E8, C8
11) Forward-reverse direction signal, relay contact ≤ 3 W, ≤ 250 mA, ≤ 28 V DC. Terminals 44, 45, 46
12) Current output, R_B ≤ 550 Ω: 0/4-20 mA, 0-10-20 mA, 4-12-20 mA, R_B ≤ 1000 Ω: 0/2-10 mA
R_B ≤ 2000 Ω: 0-5 mA. Terminals –/+
13) a)Alarm Output, relay contact opens at alarm, ≤ 3 W, ≤ 250 mA, ≤ 28 V DC, Terminals V5, V6; Function 39, 40 or
b)Alarm Output, optocoupler, U_{CE} ≤ 25 V, I_{CE} ≤ 7.5 mA. Terminals V5, V6; Function E9, C9
When in addition to the serial data link a passive scaled pulse output is specified, the alarm output is no longer available.
c)Scaled pulse output optocoupler, U_{CE} ≤ 25 V, I_{CE} ≤ 7.5 mA
Terminals V5, V6; Function 55, 56 Forward
14) Shielded signal cable ABB Part No. D173D018U02, 10 m included with shipment.

*) Scaled pulse output, active or passive, pulse width selectable from 0.100 to 2000 ms.

Note: A shielded output cable is recommended with the shield connected at one end to ground.

Fig. 29 Interconnection Diagram Converter 50SM1000, Upgrade, Flowmeter Primaries 20” to 40” / DN 500 to DN 1000

Interconnection Examples for Peripherals

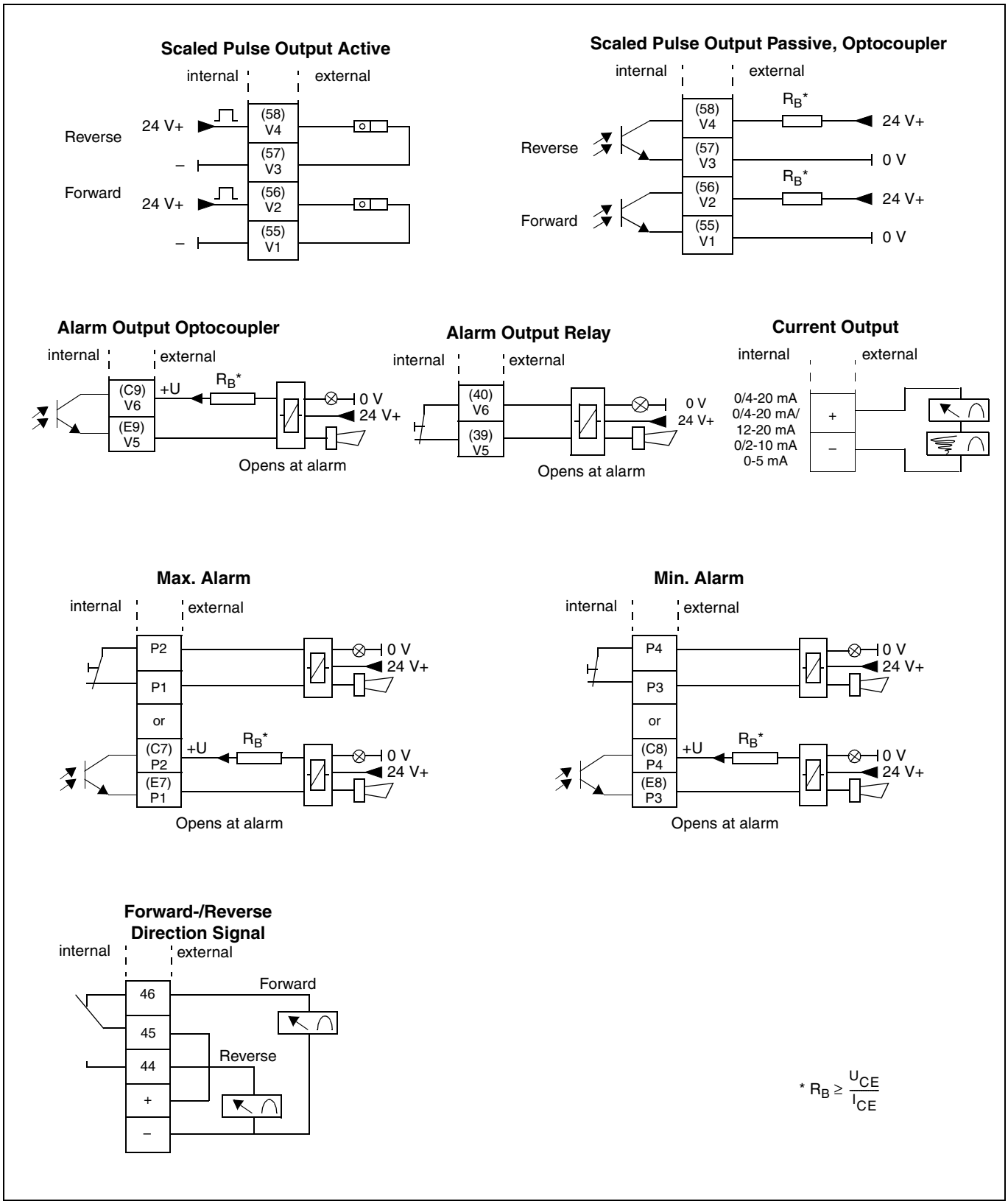
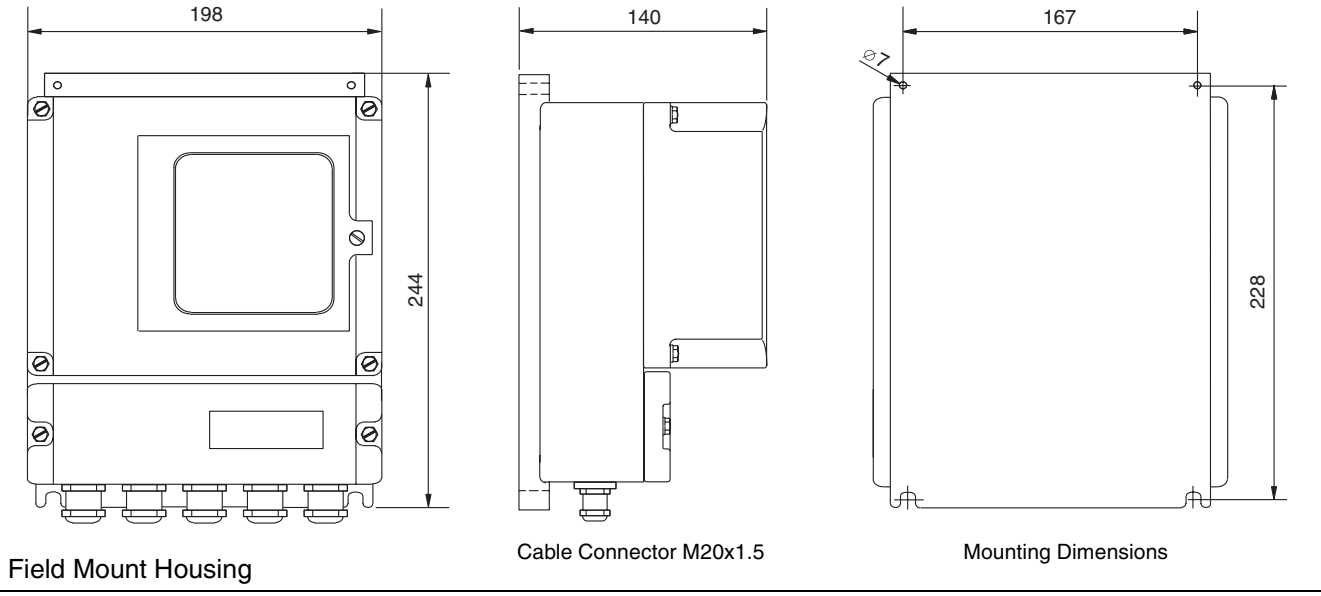


Fig. 30 Interconnection Examples for Peripherals

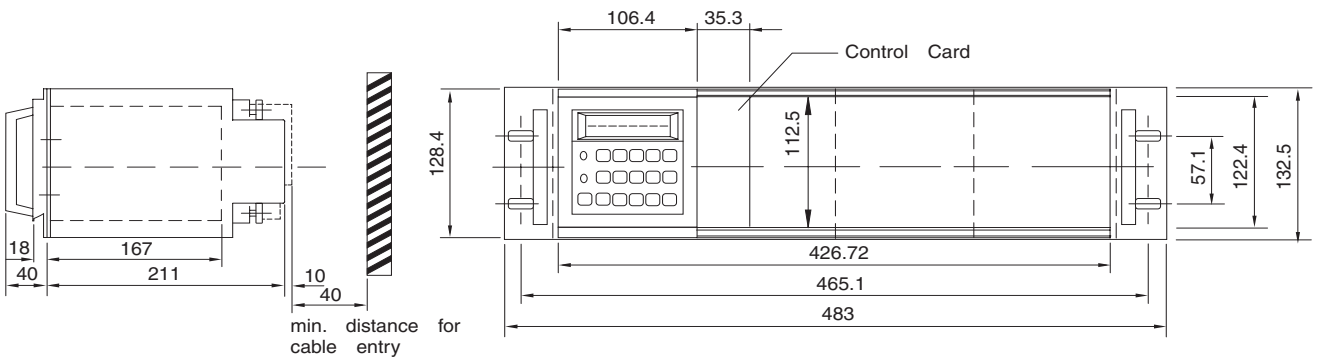
Dimensions: Converter and Panel Mount Housing



Field Mount Housing

Cable Connector M20x1.5

Mounting Dimensions



19“-Plug-in Unit with Rack Mount Frame

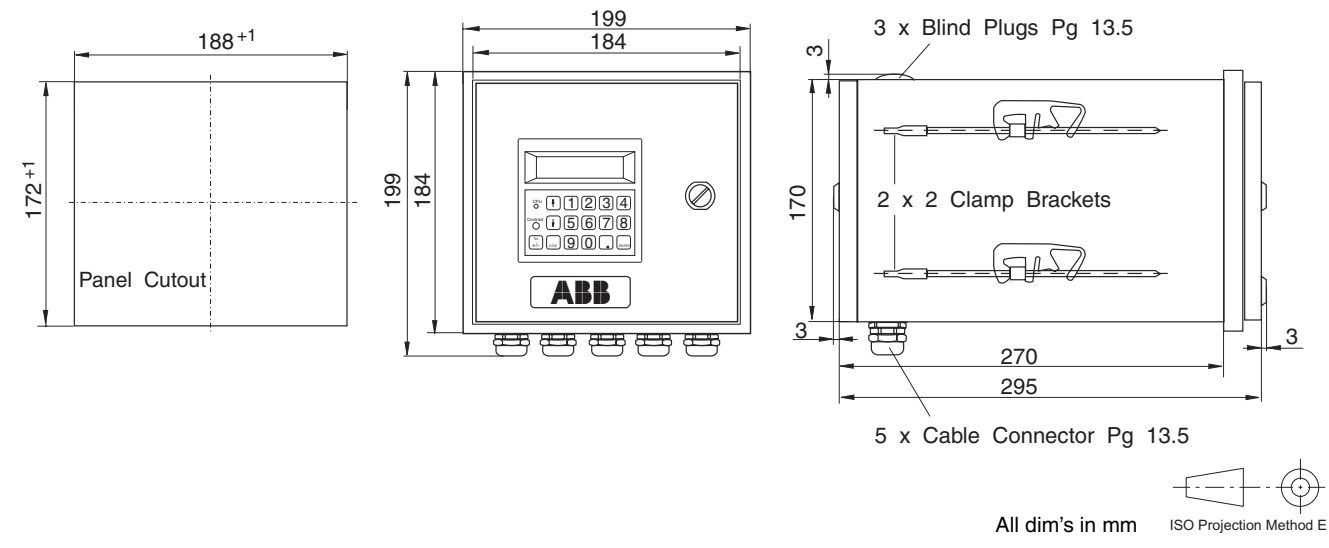


Fig. 31 Dimensions, Converter MAG-SM

Ordering Information: Converter

In addition to the Ordering Number please include the following information:
Flow range, the designation of the stainless steel protection housing or panel mount housing if required.

Ordering Number	50SM1										
Remote Converter											
Excitation Frequency											
50 Hz		**10**									
60 Hz		**30**									
Flowmeter Primary											
3/8” to 40” / DN 10 to DN 1000			**1**								
1/25” to 5/16” / DN 1 to DN 8 and for conductivity 5 µS/cm; 0.5 µS/cm			**4**								
Others			**9**								
Design Level (specified by ABB)				*****							
Software Level (specified by ABB)					*****						
Housing											
Field mount housing with hinged window						**G**					
19“-Plug-in unit[1)]						**M**					
Contact Output											
Passive, optocoupler							**1**				
Passive, relay							**2**				
Others							**9**				
Pulse Output	**/Data Link**										
Active	/none							**1**			
Optocoupler	/none							**3**			
Optocoupler2)	/RS 485							**6**			
None	/Profibus DP							**9**			
Output Signals											
F/R-direction signal and 2 alarms									**AC**		
Others									**ZZ**		
Accessories											
None										**A**	
Automatic empty pipe detector[3)]										**E**	
HART-Protocol										**G**	
HART-Protocol and automatic empty pipe detector[3)]										**H**	
Others										**Z**	
Supply Power											
230 V, 50/60 Hz											**B**
115/120 V, 50/60 Hz											**C**
24 V, 50/60 Hz[4)]											**F**
Instrument Tag											
German											**1**
English											**2**
French											**3**
Others upon request											**9**

1) When a rack mount frame is required, see Ordering Number Rack Mount Frame Page 35.
   To order a Panel Mount Housing the following ABB-Order designation is required.
   Panel Mount Housing Part No. D612A103U01 Material: stainless steel
2) Only the forward flow direction is totalized. The alarm output is not available.
3) Not available for flowmeter primaries with a preamplifier, see Page 27.
4) Not available for >16” / DN 400. Not available for Upgrade version for 10D1422.

Signal Cable: A 10 m long signal cable is included with the shipment. For longer cables request Part No. D173D018U02.

Ordering Information: Rack Mount Frame

Rack Mount Frame for MAG-SM – 19”, Contact Relay Design (with separate control card)

Ordering Number	55BT1				
Rack Mount Frame 19“-Design					
Model 50SM1000					
3 HE, 84 TE		**10**			
Layout for 3 Inserts (21 TE + 7 TE)					
None			**0**		
3 Inserts			**1**		
2 Inserts with blind plate			**2**		
1 Insert with blind plates			**3**		
Design Level				**BA**	

Rack Mount Frame for MAG-SM – 19”, Contact Relay Design (without separate control card)

Ordering Number	55BT1				
Model 50SM1000					
3 HE, 84 TE		**11**			
Layout for 4 Inserts (21 TE)					
4 Inserts			**1**		
3 Inserts with blind plate			**2**		
2 Inserts with blind plates			**3**		
1 Insert with blind plates			**4**		
Design Level				**B**	
Accessories: None					**A**

Test Simulator for MAG-SM

Ordering Number	D55CX4						
Flowrate Signal Settings							
3-Digit switch with 1000 steps		**1**					
Others		**9**					
Supply Power[1]							
Schuko plug 115 V - 230 V 50/60 Hz			**1**				
Banana plug (4 mm) 24 V AC			**2**				
USA plug for 115 V - 230 V 60 Hz			**3**				
Others			**9**				
Accessories							
None				**0**			
Design Level (specified by ABB)					*****		
Instrument Tag							
German						**1**	
English						**2**	
Others						**9**	

1) Supply power also provides voltage for the converter

Software

HART-Operator-, Monitor- and Configuration-Software
Smart Vision®
The PC-Operator level for HART-Communication for single systems or field multiplexers.
Prices upon request

Instrument Selection Program
FlowSelect the selection program for all flowmeter types including **FlowCalc** (flow conversion and calculation program)
PC-Requirements 486, 8 MB RAM, 7 MB free hard drive, 256 colors, Windows 3.1, Windows 95/98 or Windows NT, CD-ROM at no charge.

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