



# VORTEX FLOWMETER

## MODEL EF77

### Features

**High-performance vortex flowmeter with robust capacitive sensor for highly accurate volumetric flow rate measurements of gasses, liquids, saturated and superheated steam.**

1. Capacitive sensor offers a wide measuring range, high resistance to thermal shock and water hammer, and an unsurpassed immunity to pipeline vibration.
2. Measurements are accurate to within  $\pm 1\%$  for gases and steam,  $\pm 0.75\%$  for liquids.
3. No age-induced deterioration of accuracy.
4. Simple design with no moving parts contributes to long service life.
5. Low pressure drop through body.
6. Easy connection to and full compatibility with the EC351 flow computer.



### Specifications

#### Meter Body / Sensor

Model	EF77	
Connection	Flangeless	Flanged*
Size (mm)	15, 25, 40, 50, 80, 100, 150	15, 25, 40, 50, 80, 100, 150, 200, 250, 300
Connection Compatibilities	See details in the Dimensions section	
Operating Pressure Range (MPaG)	0 — 5.0 (See the graph to the right for details)	
Temperature Range (°C)	-200** — +400 (See the graph to the right for details)	
Accuracy	See table $\left( Re = \frac{d \times V}{\nu} \right)$ $Re = \text{Reynolds No. } V = \text{velocity}$ at right $d = \text{pipe diameter } \nu = \text{viscosity}$	
Repeatability	Within 0.25% of amount shown	
Vibration Resistance	At least 1g, 20 — 500 Hz in all directions	
Mounting Position	No restriction with regards to meter accuracy	

\* Optional connection and may require longer delivery times

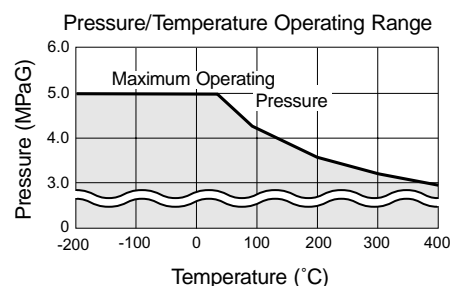
1 MPa = 10.197 kg/cm<sup>2</sup>

\*\* Subject to the limitations of fluid freezing point

**CAUTION** To avoid abnormal operation, accidents or serious injury, DO NOT use this product outside of the specification range. Local regulations may restrict the use of this product to below the conditions quoted.

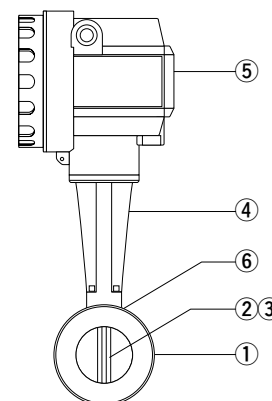
No.	Description	Material	JIS	ASTM/AISI*
①	Meter Body	Cast Stainless Steel	SCS16A	A351 Gr. CF3M
②	Bluff Body	Cast Stainless Steel	SCS16A	A351 Gr. CF3M
③	Sensor (wetted parts)	Stainless Steel	SUS316L	AISI316L
	Sensor (non-wetted parts)	Cast Stainless Steel	SCS19A	CF3
④	Pipe Stand	Cast Stainless Steel	SCS13A	A351 Gr. CF8
⑤	Transmitter Housing	Die-cast Aluminum	—	—
⑥	Gasket	Graphite**	—	—
⑦	Mounting Kit***	—	—	—

\* Equivalent \*\* Other materials available \*\*\* Flangeless model only, to ensure concentric installation; includes centering rings, threaded bolts, nuts, washers and flange gaskets



Note: Maximum operating pressure and temperature may be further restricted by the flange rating

Accuracy	
Steam/ Gas	$\pm 1\%$ of reading ( $Re > 20000$ ) $\pm 1\%$ of full scale ( $Re: 4000 - 20000$ )
Liquids	$\pm 0.75\%$ of reading ( $Re > 20000$ ) $\pm 0.75\%$ of full scale ( $Re: 4000 - 20000$ )



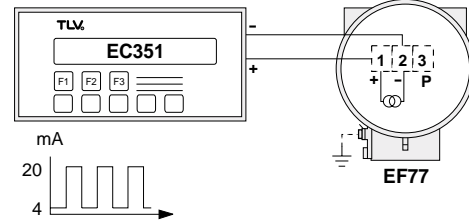
**Specifications**

**Transmitter**

Transmitter Type	Blind	Integrated Indicator
Local Operation	–	4 multi-function programming buttons
Display	–	LCD: 4-figure with 2-digit exponential Bar graph as flow indicator in %
Explosion Class	Non-explosion-proof	
Ambient Temperature	–40 – +60°C	
Ingress Resistance	IP 67 (dust tight, water immersion resistant)	
Output	2-wire current pulse: 4 mA (0), 20 mA (1), 0.18 ms pulse width 2-wire analog output: 4 – 20 mA DC 3-wire scaleable pulse: open collector or voltage pulse	
Power Source	12 – 30 V DC (24 V DC recommended)	
Power Consumption	Less than 1 W DC (including sensor)	
Power Line Connection	G1/2	
Field Wiring	2-wire System: 2-conductor, shielded, at least 1.25 mm <sup>2</sup> 3-wire System: 3-conductor, shielded, at least 1.25 mm <sup>2</sup>	
Load Line Resistance	Dependent on supply voltage (maximum 550 Ω at 24 V)	

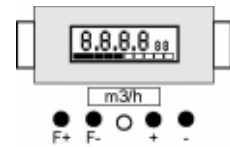
**Wiring Terminals**

**Connection to Flow Computer EC351**  
(Other connections possible)



Unscaled vortex frequency: 0.5 – 2850 Hz  
Pulse width: 0.18 ms

**Integrated Indicator**  
(optional)



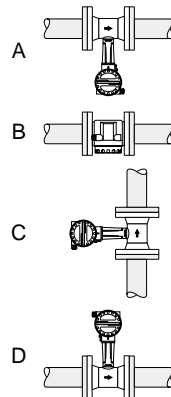
**Piping Installation**

**Required Straight Piping**

Piping Element	Piping Example** and Required Length of Straight Piping	Remarks
Reducer		When there is a concentric reducer upstream of meter
Expansion Pipe		When there is a concentric expansion pipe upstream of meter
Elbow		When there is an elbow upstream of meter
		When there are two elbows horizontally upstream of meter
		When there are two elbows vertically (3-dimensional) upstream of meter
Control Valve, Globe Valve, etc.		When there is a factor that suddenly disturbs flow upstream of meter
With Flow Conditioner*		When a flow conditioner is installed upstream of meter
Pressure and Temperature Measurement Points		If used, pressure and temperature measurement points are to be mounted downstream of the meter as shown

\* Flow conditioners are available from TLV  
\*\* Installation orientation shown is for steam and other high temperature fluids  
DN = Nominal Diameter

**Mounting Position**

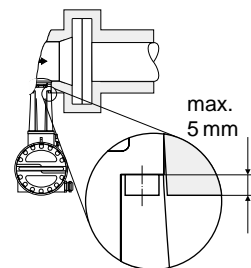


There is no restriction for mounting position (A – D) in regards to meter accuracy. However, special care is recommended for the following flow mediums:

- 1. High-temperature Fluids**  
For high-temperature fluids (steam, condensate), positions A or B should be selected to protect the transmitter from heat.
- 2. Liquids**  
To make sure the pipes are completely flooded with liquid, position C is recommended.

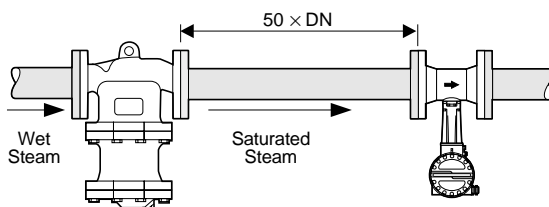
**Pipeline Insulation**

The pipe stand serves as a radiator and protects the electronics from overheating. Therefore, ensure that sufficient surface area remains exposed.



**Ensuring Steam Quality**

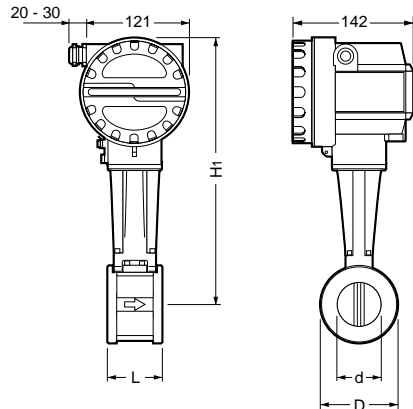
If the moisture content of steam increases, the flow of saturated steam decreases. The flowmeter is not capable of measuring the moisture content and therefore no correction to the flow can be made. Accurate flow data can only be achieved with saturated steam. The installation of a separator (DC series) before the flowmeter is therefore highly recommended.



Dimensions

EF77

Flangeless



EF77 Flangeless\*

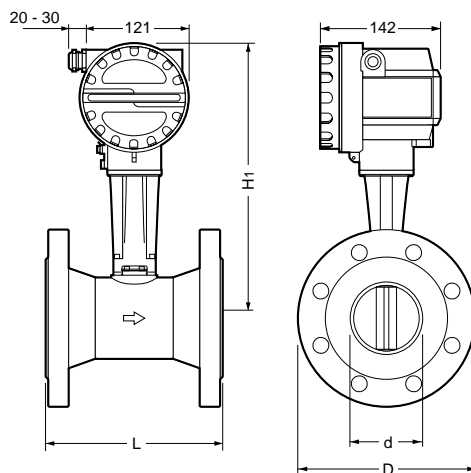
(mm)

Size	L	φD	φd	H <sub>1</sub>	Weight (kg)
15	65	45	17	287	3.5
25		64	28	297	3.7
40		82	42	305	4.3
50		92	54	312	4.6
80		127	80	326	6.0
100		157	105	339	7.0
150		216	157	365	9.5

\* Compatible with ASME Class 150, 300, JIS 10K/20K flange and DIN PN 10-40 flange standards

EF77

Flanged



EF77 Flanged\*

(mm)

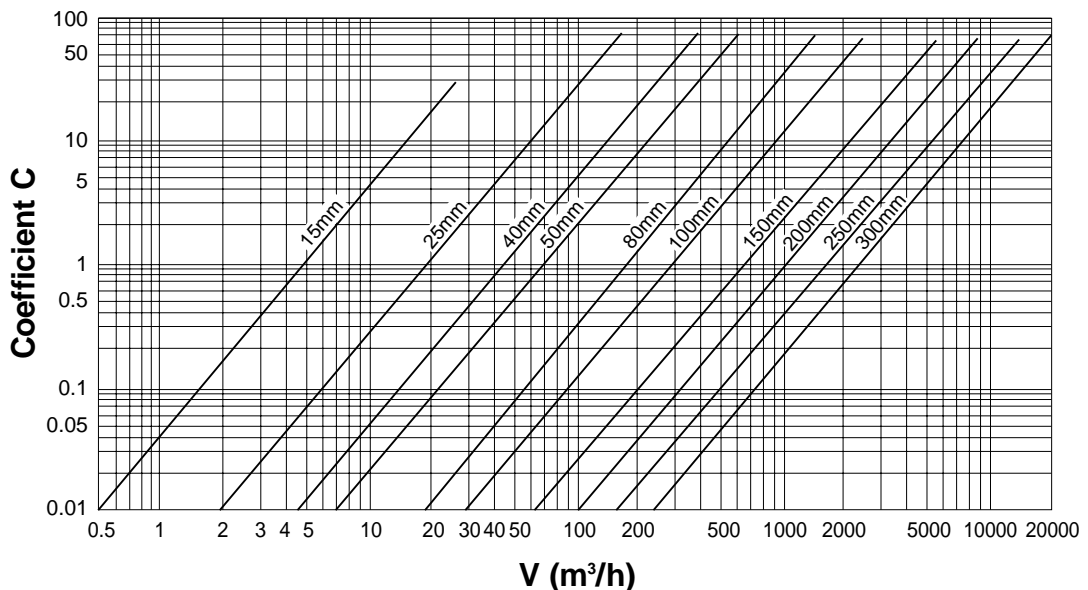
Size	L (ASME Class)		H <sub>1</sub>	Weight (kg)
	150RF	300RF		
15	200	200	288	5.5
25			295	7.5
40			303	10
50			310	12
80			323	20
100	250	250	335	27
150	300	300	359	51
200			398	64 (76)
250			415	92 (109)
300	450	450	438	143 (162)

Other standards available, but weight may vary

\* Optional connection and may require longer delivery times  
( ) ASME Class 300RF

Blind transmitter shown. Integrated indicator transmitter housing is 7 mm longer.

Pressure Loss



Dependent on nominal diameter and fluid:  $\Delta P$  (mbar) = coefficient C  $\times$  density  $\rho$  (kg/m<sup>3</sup>)

### Flow Rate For Saturated Steam

● EF77 Flangeless

(Unit: kg/h)

Size Pressure (MPaG)	15		25		40		50		80		100		150		Temp. (°C)
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
0.05	4.4	30	13	140	33	325	53	527	119	1187	203	2023	454	4531	111.6
0.1	5.0	40	14	183	38	424	61	689	136	1551	232	2643	519	5919	120.4
0.2	6.0	58	17	267	45	620	73	1006	165	2263	280	3856	627	8636	133.7
0.3	6.9	76	20	350	52	811	84	1316	188	2962	320	5047	717	11303	143.7
0.4	7.6	94	22	432	58	1000	93	1623	209	3652	356	6223	796	13936	151.9
0.5	8.3	112	24	512	63	1187	101	1927	228	4336	387	7388	867	16545	158.9
0.6	8.9	130	25	593	67	1373	109	2229	245	5015	417	8545	932	19136	165.0
0.7	9.5	147	27	673	72	1558	116	2529	261	5691	444	9697	993	21714	170.5
0.8	10	165	28	752	76	1743	123	2828	276	6364	469	10843	1050	24282	175.4
0.9	11	182	30	832	80	1927	129	3127	290	7035	493	11987	1104	26843	179.9
1.0	11	199	31	911	83	2110	135	3424	303	7705	516	13128	1156	29398	184.1
1.2	12	234	34	1069	90	2476	146	4018	328	9042	559	15406	1252	34499	191.6
1.5	14	286	37	1306	100	3025	162	4909	363	11046	618	18820	1384	42143	201.4
2.0	15	373	42	1702	114	3942	184	6397	414	14394	706	24525	1579	54918	214.9
2.5	17	460	47	2101	126	4866	205	7897	460	17768	784	30274	1755	67791	226.1

● EF77 Flanged

(Unit: kg/h)

Size Pressure (MPaG)	15		25		40		50		80		100		150		200		250		300		Temp. (°C)
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
0.05	3.1	21	9.4	108	27	267	45	446	101	1001	174	1735	396	3947	759	7577	1196	11945	1715	17133	111.6
0.1	3.5	28	11	142	31	349	52	583	115	1308	199	2266	452	5156	867	9897	1367	15603	1960	22380	120.4
0.2	4.3	41	13	207	37	510	62	850	139	1909	240	3307	546	7523	1047	14442	1651	22767	2368	32655	133.7
0.3	4.9	54	15	271	43	667	71	1113	159	2498	275	4328	624	9846	1198	18901	1889	29796	2709	42738	143.7
0.4	5.4	66	17	334	47	823	79	1372	176	3080	305	5336	693	12140	1330	23304	2097	36737	3008	52694	151.9
0.5	5.9	79	18	397	52	977	86	1629	192	3657	332	6335	755	14412	1450	27667	2285	43614	3277	62558	158.9
0.6	6.3	91	20	459	56	1130	92	1885	207	4230	357	7328	812	16669	1559	32000	2457	50445	3524	72356	165.0
0.7	6.7	103	21	521	59	1282	98	2139	220	4800	381	8315	865	18915	1661	36311	2618	57241	3754	82103	170.5
0.8	7.1	116	22	583	63	1434	104	2392	233	5368	403	9298	915	21152	1756	40605	2768	64010	3970	91813	175.4
0.9	7.5	128	23	645	66	1585	109	2644	245	5934	423	10279	962	23383	1846	44887	2910	70761	4174	101496	179.9
1.0	7.8	140	24	706	69	1736	114	2896	256	6499	443	11257	1007	25609	1932	49160	3046	77497	4368	111158	184.1
1.2	8.5	164	26	829	74	2038	124	3398	277	7626	480	13211	1091	30053	2093	57690	3299	90944	4732	130446	191.6
1.5	9.4	201	29	1012	82	2489	137	4151	306	9316	530	16138	1205	36712	2313	70473	3646	111095	5230	159349	201.4
2.0	11	262	33	1319	94	3244	156	5410	350	12140	605	21030	1376	47839	2641	91835	4162	144769	5970	207649	214.9
2.5	12	323	37	1629	104	4005	173	6678	388	14986	672	25960	1529	59054	2934	113363	4625	178705	6633	256326	226.1

### Flow Rate For Air and Water

(Unit: m³/h)

Model Fluide	EF77 Flangeless				EF77 Flanged			
	Air (0°C, atmospheric pressure)		Water (20°C)		Air (0°C, atmospheric pressure)		Water (20°C)	
	Size	Min.	Max.	Min.	Max.	Min.	Max.	Min.
15	4.1	35	0.19	6.9	2.9	24	0.16	4.9
25	12	161	0.41	19	8.9	125	0.32	15
40	31	374	1.11	44	26	307	0.91	36
50	50	606	1.80	72	43	513	1.52	61
80	113	1365	4.04	163	95	1151	3.41	138
100	191	2326	6.88	279	164	1995	5.90	239
150	428	5210	15.4	625	373	4538	13.5	544
200	-	-	-	-	715	8712	25.8	1045
250	-	-	-	-	1127	13735	40.6	1648
300	-	-	-	-	1617	19700	58.3	2364

Manufacturer

ISO 9001/ISO 14001

**TLV**® CO., LTD.  
Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001/14001

