



VORTEX FLOWMETER

MODEL EF77

Benefits

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 (in)	1/2, 1, 1 1/2, 2, 3, 4, 6	1/2, 1, 1 1/2, 2, 3, 4, 6 6, 8, 10, 12
Connection Compatibilities	See details in the Dimensions section	
Operating Pressure Range (psig)	0 – 725 (See the graph to the right for details)	
Temperature Range (°F)	-330** – +750 (See the graph to the right for details)	
Accuracy	See table $\left(Re = \frac{d \times v}{\nu} \right)$ at right $\left(Re = \text{Reynolds No. } v = \text{velocity} \right)$ $d = \text{pipe diameter } \nu = \text{viscosity}$	
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

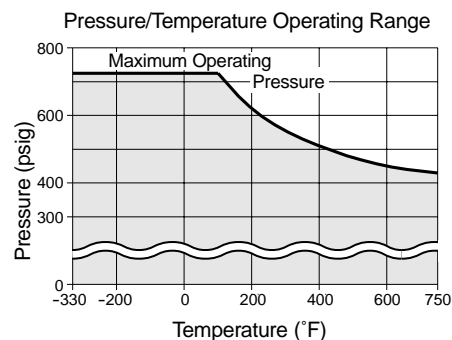
** Subject to the limitations of fluid freezing point



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.

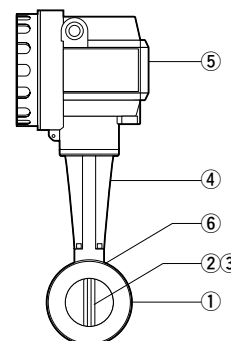
No.	Description	Material	ASTM/AISI*	JIS
①	Meter Body	Cast Stainless Steel	A351 Gr. CF3M	SCS16A
②	Bluff Body	Cast Stainless Steel	A351 Gr. CF3M	SCS16A
③	Sensor (wetted parts)	Stainless Steel	AISI316L	SUS316L
	Sensor (non-wetted parts)	Cast Stainless Steel	CF3	SCS19A
④	Pipe Stand	Cast Stainless Steel	A351 Gr. CF8	SCS13A
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)



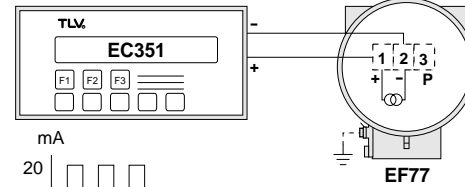
Specifications

• 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 – +140 °F	
Ingress Resistance	IP 67/ NEMA 4X (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 ² 3-wire System: 3-conductor, shielded, at least 1.25 mm ²	
Load Line Resistance	Dependent on supply voltage (maximum 550 Ω at 24 V)	

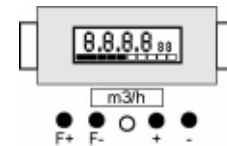
• Wiring Terminals

Connection to Flow Computer EC351
(Other connections possible)



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

• Integrated Indicator (optional)



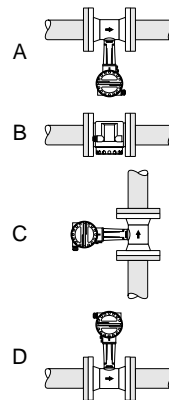
Piping Installation

• Required Straight Piping

Piping Element	Piping Example** and Required Length of Straight Piping	Remarks
Reducer	15 x DN upstream, 5 x DN downstream	When there is a concentric reducer upstream of meter Expansion Pipe
Expansion Pipe	18 x DN upstream, 5 x DN downstream	When there is a concentric expansion pipe upstream of meter
Elbow	20 x DN upstream, 5 x DN downstream	When there is an elbow upstream of meter
	25 x DN upstream, 5 x DN downstream	When there are two elbows horizontally upstream of meter
	40 x DN upstream, 5 x DN downstream	When there are two elbows vertically (3-dimensional) upstream of meter
Control Valve, Globe Valve, etc.	50 x DN upstream, 5 x DN downstream	When there is a factor that suddenly disturbs flow upstream of meter
With Flow Conditioner*	2 x DN upstream, 8 x DN between conditioner and meter, 5 x DN downstream	When a flow conditioner is installed upstream of meter
Pressure and Temperature Measurement Points	3-5 x DN between meter and PT, 4-8 x DN between meter and TT	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



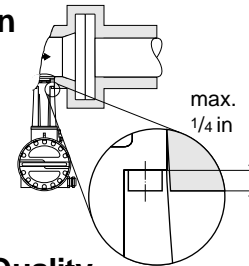
There is no restriction for mounting position (A – D) in regards to meter accuracy. However, special care is recommended for the following flow mediums:

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.

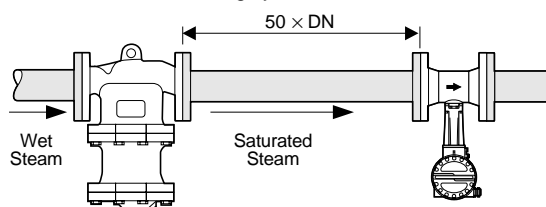
• Pipeline Insulation

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



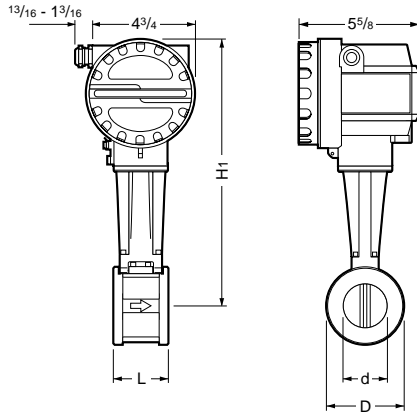
• Ensuring Steam Quality

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

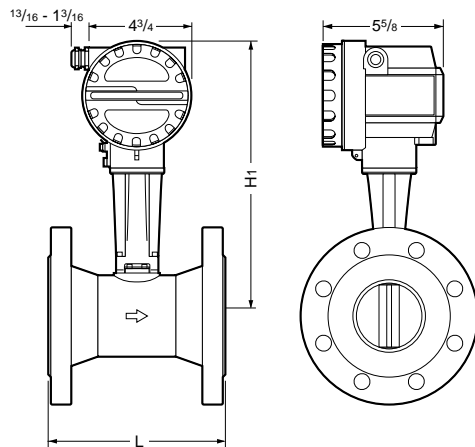


● **EF77 Flangeless*** (in)

Size	L	φD	φd	H ₁	Weight (lb)
1/2	2 9/16	1 3/4	5/8	11 5/16	8.1
1		2 1/2	1 1/16	11 3/4	8.1
1 1/2		3 1/4	1 5/8	12	9.1
2		3 5/8	2 1/8	12 1/4	10
3		5	3 3/16	12 7/8	11
4		6 3/16	4 1/8	13 3/8	15
6	8 1/2	6 3/16	14 3/8	21	

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

● **EF77**
Flanged



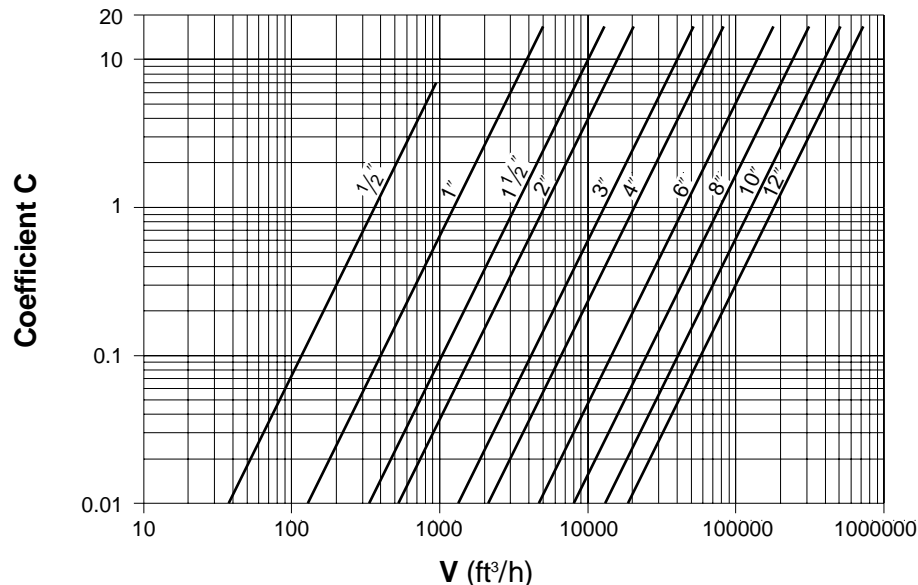
● **EF77 Flanged** (in)

Size	L		H ₁	Weight* (lb)
	ASME Class 150RF	ASME Class 300RF		
1/2	7 7/8	7 7/8	11 5/16	12
1			11 9/16	16
1 1/2			12	23
2			12 3/16	28
3	9 13/16	9 13/16	12 3/4	45
4			13 3/16	61
6	11 13/16	11 13/16	14 1/8	113
8			15 1/4	169
10			15 5/16	241
12	17 3/4	17 3/4	17 1/4	358

Other standards available, but length and weight may vary
* Weight is for Class 300 RF

Blind transmitter shown. Integrated indicator transmitter housing is 1/4" longer.

Pressure Loss



Dependent on nominal diameter and fluid: ΔP (psi) = coefficient C × density ρ (lb/ft³)

Flow Rate For Saturated Steam

● **EF77 Flangeless** (Unit: lb/h)

Size (in)	1/2		1		1 1/2		2		3		4		6		Temperature (°F)
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
10	10.1	54.5	28.1	321	75.9	760	124	1252	277	2756	472	4753	1057	10785	239
20	11.8	74.9	32.9	442	88.9	1045	145	1721	325	3789	554	6535	1239	14828	259
30	13.3	95.0	37.1	560	101	1324	163	2182	366	4805	623	8286	1395	18802	274
40	14.6	114	40.8	677	111	1601	179	2638	402	5807	685	10015	1534	22726	287
50	15.8	134	44.2	793	120	1875	194	3089	435	6801	742	11728	1660	26612	298
60	16.9	153	47.2	907	128	2146	207	3537	466	7786	794	13428	1776	30470	307
80	18.9	192	52.8	1136	143	2685	232	4424	521	9741	888	16799	1987	38119	324
100	20.7	230	57.8	1362	157	3220	254	5305	571	11680	972	20143	2175	45706	338
150	24.6	326	68.7	1923	186	4545	302	7489	678	16489	1155	28436	2585	64524	366
200	27.9	420	78.1	2481	211	5865	342	9664	770	21276	1311	36692	2936	83258	388
250	30.9	515	86.4	3039	234	7186	379	11839	852	26067	1451	44954	3249	102004	406
300	33.6	610	94.0	3600	254	8511	412	14023	927	30875	1580	53246	3536	120820	422
350	36.2	706	101	4164	274	9844	443	16220	9977	35712	1699	61587	3803	139746	436

● **EF77 Flanged** (Unit: lb/h)

Size (in)	1/2		1		1 1/2		2		3		4		6		8		10		12		Temp. (°F)
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
10	7.2	53.3	21.8	268	62.5	659	105	1099	234	2466	405	4271	921	9717	1767	18654	2786	29404	3995	41903	239
20	8.4	73.2	25.6	368	73.2	906	123	1510	274	3390	475	5872	1080	13359	2072	25645	3266	40428	4683	57635	259
30	9.5	92.9	28.8	467	82.5	1148	138	1915	309	4298	535	7446	1216	16939	2333	32517	3678	51260	5275	73135	274
40	10.4	112	31.6	564	90.7	1388	152	2315	340	5195	588	9000	1336	20474	2565	39304	4043	61959	5799	88400	287
50	11.2	131	34.2	661	98.1	1626	164	2711	367	6084	636	10540	1446	23976	2776	46026	4375	72556	6274	103450	298
60	12.0	150	36.6	757	105	1861	175	3104	393	6966	681	12067	1547	27452	2970	52698	4682	83074	6715	118508	307
80	13.4	188	41.0	947	118	2329	196	3884	440	8715	761	15097	1731	34344	3322	65929	5236	103932	7511	148117	324
100	14.7	225	44.9	1136	129	2792	215	4657	481	10450	833	18103	1895	41181	3638	79053	5734	124621	8224	177643	338
150	17.5	318	53.3	1603	153	3942	255	6574	572	14753	990	25556	2252	58136	4322	111601	6813	175928	9772	250844	366
200	19.8	411	60.5	2069	174	5087	290	8483	649	19036	1125	32975	2558	75011	4909	143996	7738	226995	11099	323588	388
250	21.9	504	67.0	2535	192	6232	321	10392	719	23320	1245	40396	2831	91894	5433	176404	8565	278085	12285	396732	406
300	23.9	597	72.9	3002	209	7381	349	12309	782	27620	1355	47845	3081	108838	5913	208930	9321	329359	13370	469782	422
350	25.7	690	78.4	3472	225	8537	375	14236	841	31945	1457	55336	3313	125880	6359	241645	10024	380930	14378	538924	436

Flow Rate For Air and Water

(Unit: Air: SCFM Water: GPM)

Model	EF77 Flangeless				EF77 Flanged			
	Air (68°F, atmospheric pressure)		Water (68°F)		Air (68°F, atmospheric pressure)		Water (68°F)	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1/2	2.5	20.4	0.9	30.5	1.8	14.4	0.7	21.6
1	6.9	93.4	1.9	85.3	5.4	72.4	1.4	66.1
1 1/2	18.6	216	4.9	198	15.3	178	4.1	162
2	30.0	351	7.9	320	25.5	296	6.7	271
3	67.7	790	17.8	721	57.1	666	15.0	608
4	115	1346	30.3	1229	98.9	1154	26.0	1054
6	258	3014	67.8	2752	225	2625	59.1	2398
8	-	-	-	-	432	5040	114	4603
10	-	-	-	-	681	7946	179	7256
12	-	-	-	-	977	11397	257	10408

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TLV CO., LTD.
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 is approved by LRQA Ltd. to ISO 9001/14001

ISO 9001/ISO 14001

