



VORTEX FLOWMETER

MODEL EF200

RELIABLE FLOW MEASURING SYSTEM FOR STEAM, AIR AND WATER

Features

High-performance vortex flowmeter with robust sensor for highly accurate volume or mass flow measurements of saturated and superheated steam, air and water.

1. DSC (Differential Switched Capacitance) sensor offers a wide measuring range, with a high resistance to thermal shock, vibration and water hammer.
2. Integrated flow computer calculates mass flow from measured volume flow and temperature variables.
3. Measures steam dryness fraction (80 to 100%) — Optional for EF200F. See page 4 for conditions.
4. Capable of simultaneous pulse (interval) and analog (instantaneous) output.
5. Requires no maintenance, has no moving parts, and experiences no zero point drift.
6. Low pressure drop through body.



Specifications

Meter Body / Sensor

Model	EF200W	EF200F	EF200R
Connection	Between Flanges (Flangeless, Full Bore)	Flanged (Full Bore)	Flanged (Reduced Bore)
Size (mm)	15, 25, 40, 50, 80, 100, 150	15, 25, 40, 50, 80, 100, 150	25, 40, 50, 80, 100, 150
Connection Compatibilities	See details in the Dimensions section		
Operating Press. Range (MPaG)	0 to 4.96 (See the graph to the right for details)		
Temperature Range (°C)	-200 ¹⁾ to +400 (See the graph to the right for details)		
Applicable Fluids ²⁾	Steam, Air, Water		
Accuracy ⁴⁾	Volume Flow	Steam/Air : ± 1% of reading (Re > 20000), ± 10% of reading (Re: 5000 to 20000) Water : ± 0.75% of reading (Re > 20000) ± 10% of reading (Re: 5000 to 20000)	
	Mass Flow	Saturated steam : ± 2% of reading (Re > 20000) ± 10% of reading (Re: 5000 to 20000)	
Repeatability	± 0.2% of reading		
Mounting Position	No restriction with regards to meter accuracy		
Accessories ⁵⁾	Centering rings, threaded bolts, nuts, washers and flange gaskets		

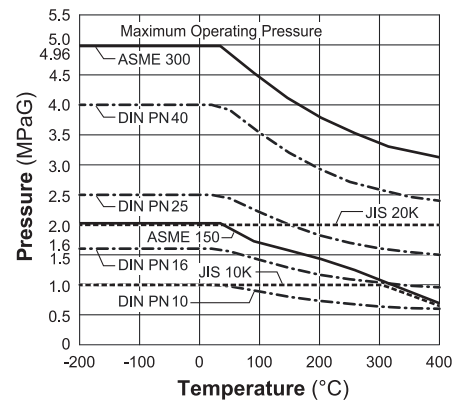
- 1) Subject to the limitations of fluid freezing point
- 2) For superheated steam and air, an external pressure sensor and flow computer may be required if inlet pressure fluctuates
- 3) Do not use for toxic, flammable or otherwise hazardous fluids
- 4) Accuracy may be lower than indicated for wet saturated steam (steam mixed with condensate)
- 5) For flangeless model EF200W only, to ensure concentric installation

Transmitter

Explosion Class	Non-explosion proof
Ambient Temperature	-40 to +80 °C
Protection Class	IP 66/67, Type 4X
Output	1 × Pulse output: Open collector pulse 1 × Analog output: 4 to 20 mA DC Simultaneous output possible
Power Source	13 to 35 V DC (24 V DC recommended)
Power Consumption	Max. 2.77 VA
Power Line Connection	G(PF)½
Field Wiring	2-wire System (2-conductor, shielded, 0.5 to 2.5 mm ²) (AWG 20 to 14)
Load Line Resistance	Maximum 500Ω at 24 V
Accessories*	Connecting Cable (30m)

* Remote version only

Pressure/Temperature Operating Range



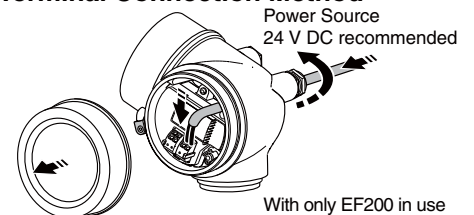
1 MPa = 10.197 kg/cm²

Reynolds Number (Re) Calculation:

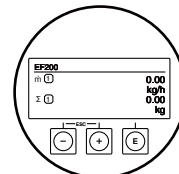
$$Re = \frac{d \times V}{\nu}$$

d = pipe diameter V = velocity
ν = viscosity

Terminal Connection Method



Display



Sample display

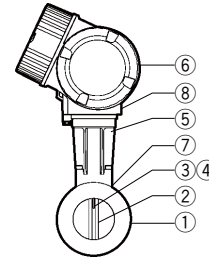


To avoid abnormal operation, accidents or serious injury, DO NOT use this product outside of the specification range. Local regulations may restrict the use of this product to below the conditions quoted.

Specifications

No.	Description	Material	DIN EN	ASTM/AISI
①	Meter Body	Cast Stainless Steel	EN 1.4408*	A351 Gr.CF3M
②	Bluff Body	Cast Stainless Steel	EN 1.4408*	A351 Gr.CF3M
③	DSC Sensor (wetted parts)	Stainless Steel	DIN 1.4435	AISI316L*
④	DSC Sensor (non-wetted parts)	Stainless Steel	DIN/EN 1.4301	AISI304*
⑤	Housing Support	Cast Stainless Steel	EN 1.4408*	A351 Gr.CF3M
⑥	Transmitter Housing	Die-cast Aluminium	—	—
⑦	Gasket	Graphite	—	—
⑧	Nameplate	—	—	—

* Equivalent



Piping Installation

Required Length of Straight Piping

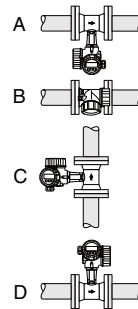
Element	No Flow Conditioner	With Flow Conditioner* (Rectifier)
Control Valve		
Concentric Reducer (Convergent-Pipe)		
Concentric Diffuser (Expansion-Pipe)		
Eccentric Reducer (Convergent-Pipe)		
One 90 Elbow or T-piece		
Two 90 Elbows (2-Dimensional)		
Two 90 Elbows (3-Dimensional)		
Combination Pipe (Elbows & Eccentric Reducer, etc.)		

A = Upstream, B = Downstream, D = Nominal Diameter

* Cannot be used in conjunction with the Steam Dryness Fraction Calculator option

Note: •The installation positions shown are for steam and high temperature fluids
•Minimum required piping length shown. Use longer straight piping where possible.

Mounting Position



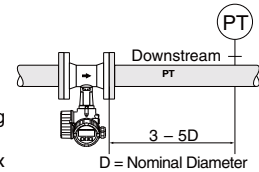
There is no restriction for mounting position (A – D) in regards to meter accuracy. However, special care is recommended for the following flow mediums:

1. High-temperature Fluids
For high-temperature fluids (steam, condensate), positions A, B or C should be selected to protect the transmitter from heat.

2. Water
To make sure the pipes are completely flooded with water, position C is recommended.

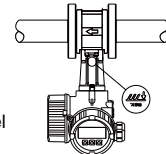
Pressure Measurement Points

If a pressure measuring point is installed after the device, ensure that there is a large enough distance between the device and the measuring point so that there are no negative effects on vortex formation in the sensor.



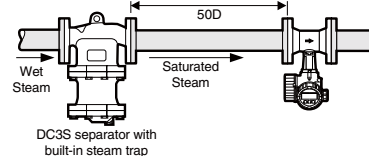
Pipeline Insulation

The pipe stand serves as a radiator and protects the electronics from overheating. Therefore, ensure that sufficient surface area remains exposed. Be sure not to insulate past the level marked "max." on the pipe stand.



Ensuring Steam Quality

Wet steam has a higher density than saturated steam. Since the flowmeter mass flow calculations are based on saturated steam density, the actual mass flow of wet steam will be higher than shown by the flowmeter. The upstream installation of a separator (DC3S) is suggested to ensure steam quality and flowmeter accuracy. The proper separation and drainage of condensate is a recommended practice for all steam applications.



Options

Steam Dryness Fraction Calculator	Enables the measurement of steam dryness fraction of saturated steam between 80 to 100%. This option applies only for Model EF200F (25, 40, 50, 80, 100 mm sizes) and must also satisfy other conditions. See page 4 for further restrictions.
Overvoltage Protection	Protects the circuit from lightning
Flow Conditioner	Compatible with ASME Class 150, 300, JIS 10K/20K, and DIN 2501 PN 10/16, 25/40 flange standards and other optional standards (including flangeless). Cannot be used in conjunction with the Steam Dryness Fraction Calculator option.
Pipe Mounting Kit for Remote Transmitter	Suitable for pipes with 20 to 70 mm outer diameter. (Includes bracket, threaded bolts and nuts.)
Sunshade for Transmitter	Protects the transmitter from temperature rises due to direct sunlight when installed in an external location

Flow Rate for Saturated Steam

● **EF200W** Flangeless

(Unit: kg/h)

Size (mm)	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	28	325	46	527	102	1187	174	2023	389	4531	111.6
0.1	5	40	14	183	32	424	52	689	117	1551	199	2643	445	5919	120.4
0.2	6	58	17	267	39	620	63	1006	141	2263	240	3856	537	8636	133.7
0.3	6.9	76	20	350	45	811	72	1316	161	2962	275	5047	614	11303	143.7
0.4	7.6	94	22	432	49	1000	80	1623	179	3652	305	6223	682	13936	151.9
0.5	8.3	112	24	512	54	1187	87	1927	195	4336	332	7388	743	16545	158.9
0.6	8.9	130	25	593	58	1373	94	2229	210	5015	357	8545	799	19136	165.0
0.7	9.5	147	27	673	62	1558	100	2529	224	5691	381	9697	851	21714	170.5
0.8	10	165	28	752	65	1743	105	2828	236	6364	402	10843	900	24282	175.4
0.9	11	182	30	832	68	1927	111	3126	248	7035	423	11987	947	26843	179.9
1.0	11	199	31	911	72	2110	116	3424	260	7705	443	13128	991	29399	184.1
1.2	12	234	34	1069	78	2476	125	4018	282	9042	479	15406	1073	34500	191.6
1.5	14	286	37	1306	86	3025	139	4909	311	11046	530	18820	1186	42144	201.4
2.0	15	373	42	1702	98	3942	158	6397	355	14394	605	24524	1354	54918	214.9
2.5	17	461	47	2102	108	4867	175	7897	394	17768	671	30274	1504	67791	226.1
3.0	18	549	51	2505	118	5802	191	9413	430	21180	734	36087	1642	80810	235.7

1 MPa = 10.197 kg/cm²

● **EF200F** Flanged

(Unit: kg/h)

Size (mm)	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	3.1	21	10	108	23	267	39	446	86	1001	149	1735	339	3947	111.6
0.1	3.5	27	11 (11)	142 (66)	27 (27)	349 (233)	44 (44)	583 (349)	99 (99)	1308 (872)	171 (171)	2266 (906)	388	5156	120.4
0.2	4.3	40	13 (14)	207 (96)	32 (35)	510 (340)	53 (57)	850 (510)	119 (128)	1909 (1272)	206 (221)	3307 (1323)	468	7523	133.7
0.3	4.9	53	15 (19)	271 (126)	37 (45)	667 (445)	61 (75)	1113 (668)	136 (167)	2498 (1666)	236 (289)	4328 (1731)	535	9846	143.7
0.4	5.4	65	17 (23)	334 (156)	41 (55)	823 (548)	68 (92)	1372 (823)	151 (206)	3080 (2054)	262 (356)	5336 (2135)	594	12140	151.9
0.5	5.9	78	18 (27)	397 (185)	44 (66)	977 (651)	74 (109)	1629 (978)	165 (244)	3657 (2438)	285 (423)	6335 (2534)	648	14412	158.9
0.6	6.3	90	20 (31)	459 (214)	48 (76)	1130 (753)	79 (126)	1885 (1131)	177 (282)	4230 (2820)	306 (489)	7328 (2931)	696	16669	165.0
0.7	6.7	102	21 (35)	521 (243)	51 (86)	1282 (855)	84 (143)	2139 (1283)	189 (320)	4800 (3200)	326 (555)	8315 (3326)	742	18915	170.5
0.8	7.1	114	22 (39)	583 (272)	54 (96)	1434 (956)	89 (160)	2392 (1435)	199 (358)	5368 (3579)	345 (620)	9298 (3720)	784	21152	175.4
0.9	7.5	126	23 (43)	645 (301)	56 (106)	1585 (1057)	94 (177)	2644 (1586)	210 (396)	5934 (3955)	363 (686)	10279 (4111)	825	23383	179.9
1.0	7.8	138	24 (48)	706 (329)	59 (116)	1736 (1158)	98 (194)	2896 (1737)	219 (434)	6499 (4333)	380 (751)	11257 (4503)	863	25609	184.1
1.2	8.5	163	26	829	64	2038	106	3398	238	7626	411	13211	935	30053	191.6
1.5	9.4	199	29	1012	71	2489	117	4151	263	9316	454	16138	1033	36712	201.4
2.0	11	259	33	1319	80	3244	134	5410	300	12140	519	21030	1179	47840	214.9
2.5	12	320	36	1629	89	4005	148	6678	332	14986	576	25960	1310	59054	226.1
3.0	13	382	39	1942	97	4774	162	7961	363	17864	629	30945	1430	70394	235.7

Values in () are the min./max. flow rates possible when used with the optional Steam Dryness Fraction Calculator

1 MPa = 10.197 kg/cm²

● **EF200R** Flanged (Reduced Bore)

(Unit: kg/h)

Size (mm)	25		40		50		80		100		150		Temp (°C)
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
0.05	3.1	21	10	108	23	267	39	446	86	1001	149	1735	111.6
0.1	3.5	27	11	142	27	349	44	583	99	1308	171	2266	120.4
0.2	4.3	40	13	207	32	510	53	850	119	1909	206	3307	133.7
0.3	4.9	53	15	271	37	667	61	1113	136	2498	236	4328	143.7
0.4	5.4	65	17	334	41	823	68	1372	151	3080	262	5336	151.9
0.5	5.9	78	18	397	44	977	74	1630	165	3657	285	6335	158.9
0.6	6.3	90	20	459	48	1130	79	1885	177	4230	306	7327	165.0
0.7	6.7	102	21	521	51	1282	84	2139	189	4800	326	8315	170.5
0.8	7.1	114	22	583	54	1434	89	2392	199	5368	345	9298	175.4
0.9	7.5	126	23	645	56	1585	94	2644	210	5934	363	10279	179.9
1.0	7.8	138	24	706	59	1736	98	2896	219	6499	380	11257	184.1
1.2	8.5	163	26	829	64	2038	106	3398	238	7626	411	13211	191.6
1.5	9.4	199	29	1012	71	2489	117	4151	263	9316	454	16138	201.4
2.0	11	259	33	1319	80	3244	134	5410	300	12140	519	21030	214.9
2.5	12	320	36	1629	89	4005	148	6678	332	14986	576	25960	226.1
3.0	13	382	39	1942	97	4774	162	7961	363	17864	629	30945	235.7

1 MPa = 10.197 kg/cm²

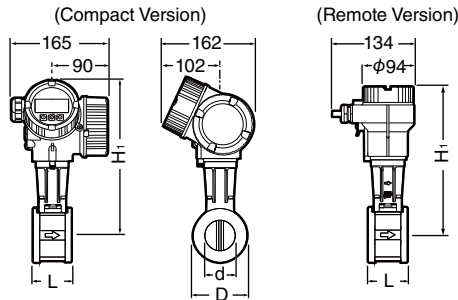
Flow Rate for Air and Water

(Unit: m³/h)

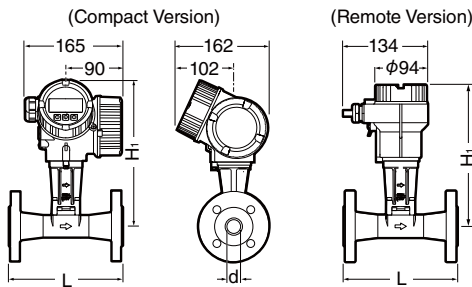
Model	EF200W				EF200F				EF200R			
	Air (0 °C, Atm. Press.)		Water (20 °C)		Air (0 °C, Atm. Press.)		Water (20 °C)		Air (0 °C, Atm. Press.)		Water (20 °C)	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
15	4.1	35	0.23	7	2.9	25	0.20	4.9	—	—	—	—
25	11	162	0.41	19	8.8	125	0.35	15	2.9	25	0.16	4.9
40	26	374	0.95	45	22	308	0.78	37	8.8	125	0.32	15
50	43	606	1.54	73	36	513	1.30	62	22	308	0.78	37
80	96	1365	3.46	164	81	1151	2.92	138	36	513	1.30	62
100	164	2326	5.89	279	140	1995	5.05	239	81	1151	2.92	138
150	367	5210	13.20	625	319	4538	11.49	545	140	1995	5.05	239

Dimensions

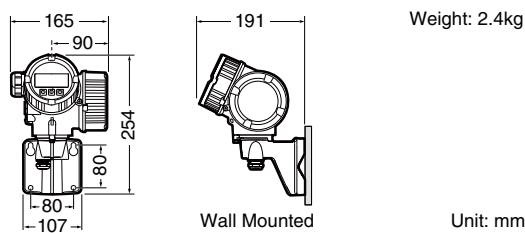
● **EF200W Flangeless**



● **EF200F/EF200R Flanged**



● **EF200W/EF200F/EF200R Remote Transmitter**



EF200W Flangeless* (mm)

Size	L	φD	φd	H ₁		Weight** (kg)
				Compact	Remote	
15	65	45	16.5	253	223	3.1
25		64	27.6	262	232	3.3
40		82	42	271	241	3.9
50		92	53.5	278	248	4.2
80		127	80.3	292	262	5.6
100		157.2	102.3	303	274	6.6
150		215.9	156.8	330	300	9.1

* Compatible with ASME Class 150, 300, JIS 10K/20K, and DIN 2501 PN 10/16, 25/40 flange standards

** Weight is for compact version

EF200F Flanged (mm)

Size	L		φd	H ₁		Weight* (kg)
	ASME Class			Compact	Remote	
	150RF	300RF				
15	200	200	15.7	254	224	5.1
25			26.7	260	231	7.1
40			40.9	269	239	9.1
50			52.6	275	246	11
80			78	288	259	16
100	250	250	102.4	300	270	21
150	300	300	154.2	325	295	37

Other standards available, but weight may vary

* Weight is for compact version

EF200R Flanged (Reduced Bore) (mm)

Size	L		φd	H ₁		Weight* (kg)
	ASME Class			Compact	Remote	
	150RF	300RF				
25	200	200	22	254	224	5.1
40			30	260	231	7.1
50			45	269	239	9.1
80			56.5	275	246	11
100	250	250	87	288	259	16
150	300	300	112	300	270	21

Other standards available, but weight may vary

* Weight is for compact version

Conditions for optional "Steam Dryness Fraction Calculator"

Steam Dryness Fraction

The ratio of steam by mass in wet saturated steam

$$\text{Steam Dryness Fraction (\%)} = \frac{\text{Steam mass flow rate}}{\text{Steam mass flow rate} + \text{Water mass flow rate}} \times 100$$

This function can be used only for the following models and under the following conditions.

Model	Size (mm)	Flow Velocity (m/s)	Temp. Range (°C)	Press. Range (MPaG)
EF200F	25	5 ≤ u ≤ 35	120 < T < 185	0.1 < P < 1.0
	40	5 ≤ u ≤ 50		
	50	5 ≤ u ≤ 45		
	80	5 ≤ u ≤ 50		
	100	5 ≤ u ≤ 30		

Flow Rates

Refer to the EF200F table on page 3 for the measurable flow rates.

Mounting Position

Meter body must be installed in the downward position.

Operating Conditions

Use at a stable pressure and flow rate.

Measurable Dryness Range

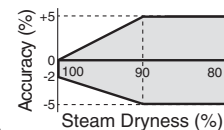
80 to 100%

(When used with superheated steam, steam dryness fraction will be displayed as 100%, the maximum possible reading)

Accuracy for wetted steam

Mass Flow: ± 4% of reading

Dryness: See graph to the right.



Flow Conditioner

Cannot be used in conjunction with a flow conditioner. Ensure the required length straight piping upstream.

Applicable Fluids

When equipped with the Steam Dryness Fraction Calculator function, the EF200F can be used with steam and water, but cannot be used with air.

External Output

Steam dryness fraction output is analog. Flow computer EC351 and an additional compensation signal (for pressure or temperature) are required to display the instantaneous mass flow rate.

Manufacturer

ISO 9001/ISO 14001

TLV CO., LTD.
Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001/14001

