ELCMF 200



MASS FLOW, DENSITY, TEMPERATURE MEASUREMENT

Description

ELCMF-200 is a Coriolis mass flow meter offering direct, simultaneous measurement of mass flow rate, density and temperature on a single sensor, independent of the physical properties of the process medium. As a true mass flow measurement principle, ELCMF-200 does not require pressure, temperature or density compensation to report mass flow, unlike volumetric technologies.

The sensor has no moving parts and no obstruction in the flow path, so it is not damaged by particulate or viscous slurries and requires minimal routine maintenance. Standard upstream/downstream straight-pipe runs are not required, easing installation in constrained layouts.

ELCMF-200 is suitable for batching, loading, custody-transfer-grade repeatability, and general process measurement in chemical, oil & gas, marine, pharmaceutical, food & beverage and semiconductor applications.

Operating Principle

The sensor tubes are vibrated at their natural resonant frequency by a drive coil. Mass flow passing through the vibrating tubes generates a Coriolis force that produces a measurable phase shift between the inlet and outlet pickoff sensors; this phase shift is directly proportional to mass flow rate. The resonant frequency of the tubes shifts with the density of the fluid, giving a simultaneous density measurement. Tube deformation under temperature is measured independently and used to compensate both the flow and density outputs.

Features & Applications

Features

- Direct mass flow, density and temperature measurement on a single sensor
- Flow accuracy: For liquid ±0.2% of reading (standard); ±0.1% (optional) —for gas ±0.5%–1%
- No moving parts — low maintenance, no wear-related recalibration
- Insensitive to viscosity, pressure and normal temperature variation
- No straight-run piping requirement upstream or downstream
- Output 4-20mA for mass flow. Optional output: HART for mass flow. Output 420mA for density, pulse/frequency, RS-485 Modbus & upto two relay contacts.

Applications

- Oil, Gas & Marine bunkering and custody-grade transfer
- Chemical processing and reactor feed ratio control
- Pharmaceutical & life science batching
- Food & beverage dosing
- Semiconductor process chemical delivery

Technical Specifications

The table below lists standard ratings. Optional higher-pressure and higher-accuracy variants are available and can be selected via the Ordering Code (see Table — Ordering Information). Optional ratings do not apply unless explicitly specified at the time of order.

Parameter	Standard Rating	Options
Diameter (Line size)	3 NB to 50 NB	–
Flow accuracy — liquid	±0.2% of reading	±0.1%
Flow accuracy — gas	±0.5%–1%	–
Flow repeatability	±0.1% of reading	–
Zero stability	Refer flow range table (per size)	–
Density range	0.3 to 3.000 g/cm³	–
Density accuracy	±0.005 g/cm³	–
Temperature measuring range	–50°C to +200°C (standard model)	−200°C to +300°C (extended / cryogenic)
Temperature Measurement error	±1°C ± 0.5% of reading	–

Technical Specifications

Parameter	Standard Rating	Options
Nominal pressure rating	4.0 MPa (580 psi)	–
Current output 1 (Flow)	4–20 mA	4–20 mA with HART
Current output 2 (Density)	Optional	4–20 mA
Frequency/pulse output	0–10,000 Hz, open-collector	–
Digital communication	RS-485, Modbus RTU	–
Electrical Output (Alarm & Relay)	–	Two Alarm Contact rating 1/CO, 3 Amp
Power supply	18–36 VDC, < 6 W	85–265 VAC — confirm at order
Flow Tube Ingress Protection class	IP-68	–
Material (Wetted material)	Measuring tube: SS316L	–
Housing material	SS-304	–
Ambient temperature	–20°C to +70°C	–
Environment humidity	5% to 95% RH, at 25°C	–

Assembly Overview - Integral

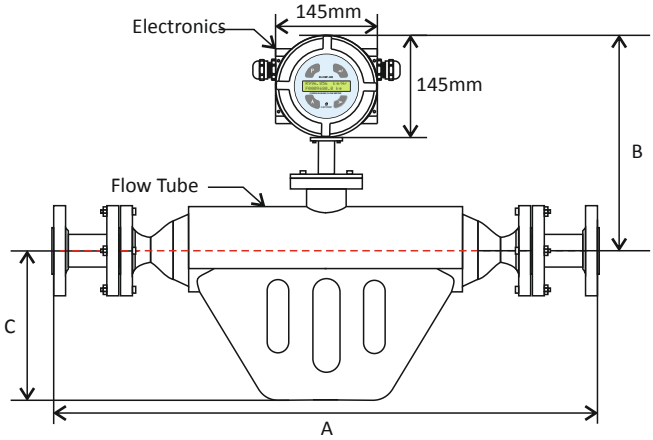


Fig. 1 Front View

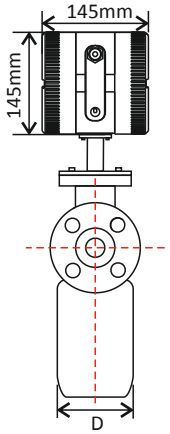


Fig. 2 Side View

Assembly Overview - Remote

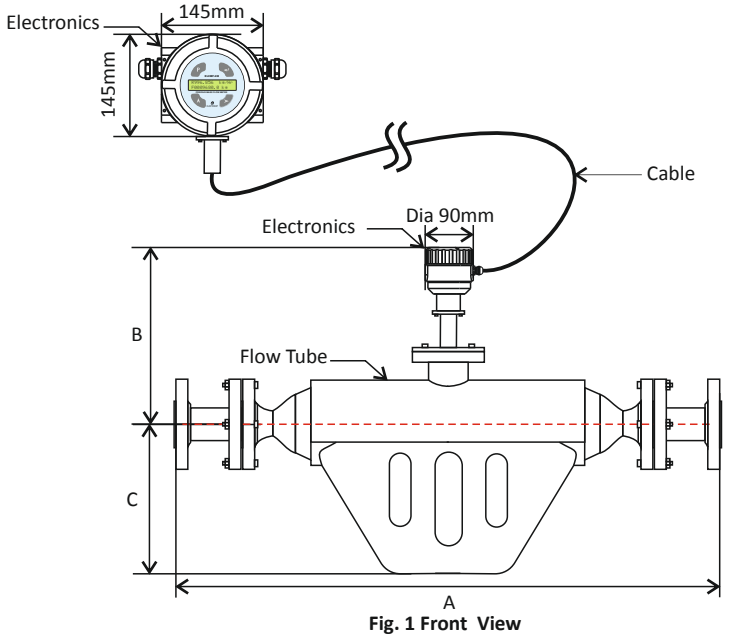


Fig. 1 Front View

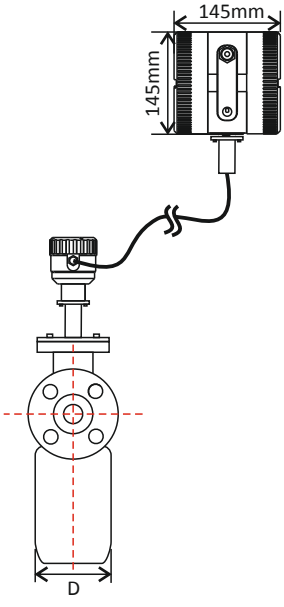


Fig. 2 Side View

Dimensional Details

Dimensions correspond to Fig. 1 (Front View) and Fig. 2 (Side View); A, B, C, D reference the callouts on the assembly drawing. Compact and remote electronics configurations are both listed.

Line Size		Flange Standard	Pressure	A (mm)	B (mm)		C (mm)	D (mm)
Inch	NB				Compact	Remote		
1/8”	3	ANSI 150#	Class 150	321	250	170	115	80
1/4”	6	ANSI 150#	Class 150	404	267	211	140	80
3/8”	10	ANSI 150#	Class 150	404	267	211	140	80
½”	15	ANSI 150#	Class 150	470	267	211	157	80
¾”	20	ANSI 150#	Class 150	470	267	211	157	80
1”	25	ANSI 150#	Class 150	600	276	220	224	106
1¼”	32	ANSI 150#	Class 150	600	276	220	224	106
1½”	40	ANSI 150#	Class 150	830	306	250	296	145
2”	50	ANSI 150#	Class 150	830	306	250	296	145

Installation Guidelines

General Requirements

- Install th Coriolis mass flow meter as per the flow-direction arrow marked on the body.
- Support the process piping independently — the sensor must not act as a pipeline support point.
- Keep flanges parallel and axially aligned to avoid installation stress.
- Isolate from strong mechanical vibration sources (e.g., pumps); use flexible pipe sections where unavoidable.
- Keep at least 5 m from large transformers/generators; ambient magnetic field intensity should remain below 400 A/m.

Orientation by Fluid Type

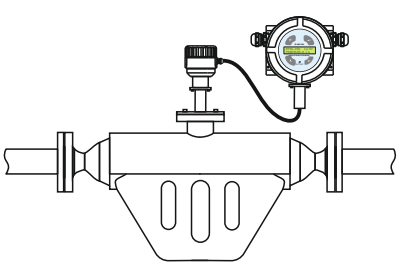
- Liquid: install with sensor oriented downward / flow bottom-to-top, to avoid air entrapment.
- Gas: install with sensor oriented upward, to avoid condensate collection.
- Slurry: install on a vertical pipe run to avoid particulate settling.

Junction box orientation should face downward to prevent water ingress; the box may be rotated up to 180° only — do not over-rotate.

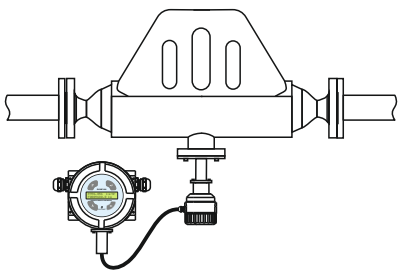
Commissioning

"Before performing zero calibration, allow the unit to warm up for a minimum of 20 minutes under power. Ensure the sensor is completely filled with process fluid and that flow is fully stopped by closing the downstream valve. Zero calibration should be repeated whenever the meter is relocated or as part of routine maintenance, typically every three months or in accordance with site SOP."

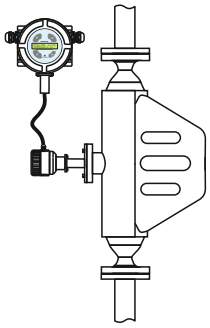
Liquid



Gas



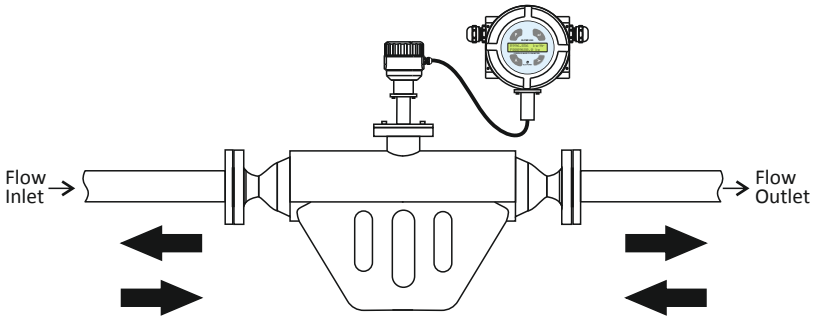
Slurry



Backpressure & cavitation precautions

- The meter may be mounted at an angle; the current guidance recommends uphill flow where practical.
- Avoid downhill flow where it can cause siphoning or loss of required backpressure.
- Where a downhill arrangement is unavoidable, a suitable downstream control arrangement may be required to maintain backpressure.
- Avoid long vertical runs downstream where they may promote cavitation; maintain sufficient downstream pressure for the process.
- The sensor has allowable pipe-end loading limits. Connected pipework must be independently supported and must not impose excessive positive or negative loads.

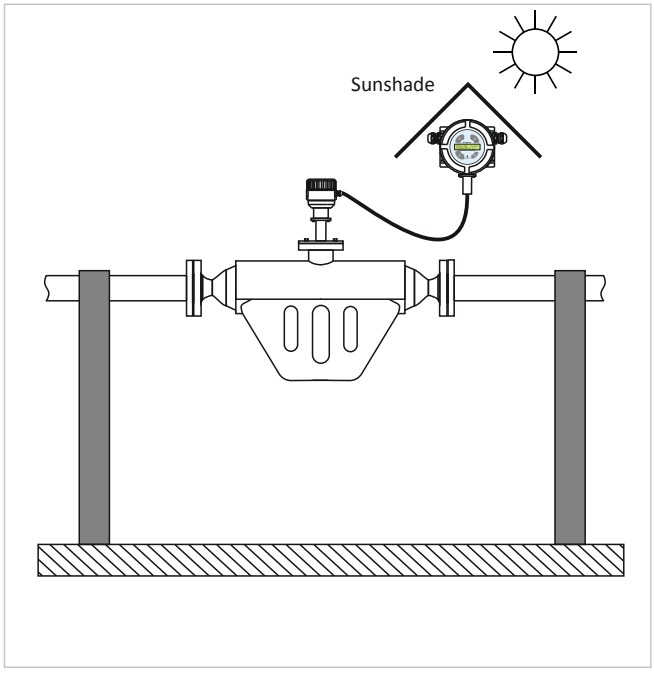
Maximum pipe work forces (end loadings)



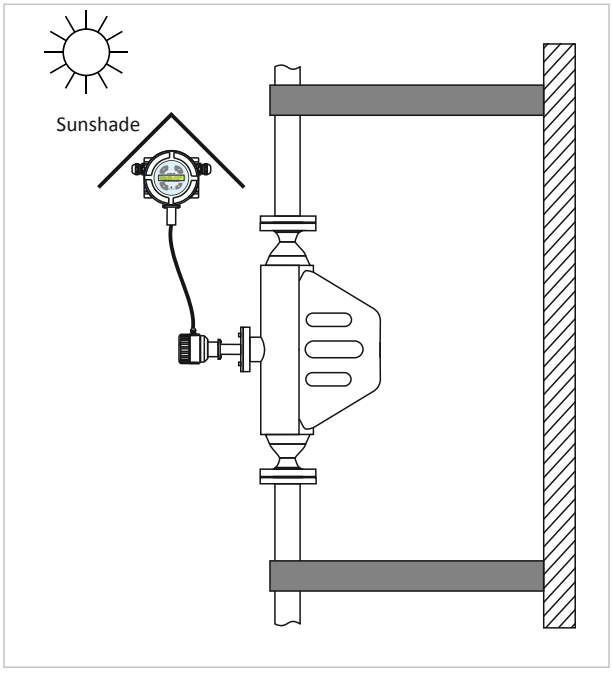
Mass flow meters have a maximum level of force (negative or positive) that can be applied to the ends of the meter.

Protection Against Temperature

NOTE : Make sure that the transmitter is protected against heating by direct sunlight.



Horizontal Installation



Vertical Installation

Flow Range by Line Size

Liquid Flow Rate

Line Size		Full Flow Range (kg/h)	Full Flow Range (lb/min)	Zero Stability (kg/h)
Inch	NB			
1/8"	3	150	5.51	0.05
1/4"	6	900	33.06	0.2
3/8"	10	1600	58.78	0.3
½"	15	3000	110.23	0.5
¾"	20	7000	257.20	1
1"	25	12000	440.92	1.5
1¼"	32	18000	661.38	2
1½"	40	30000	1102.31	3.5
2"	50	60000	2204.62	5

Gas Flow Rate

Line Size		Full Flow Range (kg/h)	Full Flow Range (lb/min)	Zero Stability (kg/h)
Inch	NB			
1/8"	3	32.2	1.18	0.1
1/4"	6	241.2	8.89	0.2
3/8"	10	428.5	15.8	0.3
½"	15	803.9	29.6	0.5
¾"	20	1876.4	69.0	1
1"	25	3215.9	118.9	1.5
1¼"	32	4823.9	178.2	2
1½"	40	8039.9	296.5	3.5
2"	50	16079.8	592.9	5

Formula for Gas Flow Rate

$$\text{Mass max (G)} = \text{Mass max (F)} \times \frac{p(G)}{225\ kg/m^3}$$

Where:
Mass max (G)= Mass max. full scale value for gas (kg/h)
Mass max (F)= Mass max. full scale value for liquid (kg/h)
p(G)= Gas density in (kg/m³) under process conditions
Gas: air with density of 60.3kg/m³ (at 20°C & 50 bar)

Accuracy Performance

Coriolis meters exhibit materially different accuracy behaviour on liquid versus gas service; stating a single blended figure understates gas-service uncertainty and overstates liquid-service capability. The two are reported separately below, consistent with standard industry practice.

Reference conditions:

Calibration fluid : Water
Calibration temperature : +25°C/+77°F (± 5°C)
Calibration pressure : 1...6 barg /14.5...87psig

Accuracy — Liquid Service

Grade	Basic Accuracy (mass flow)	Repeatability
Standard	±0.2% of reading	±0.1% of reading
High accuracy (optional)	±0.1% of reading	±0.05% of reading

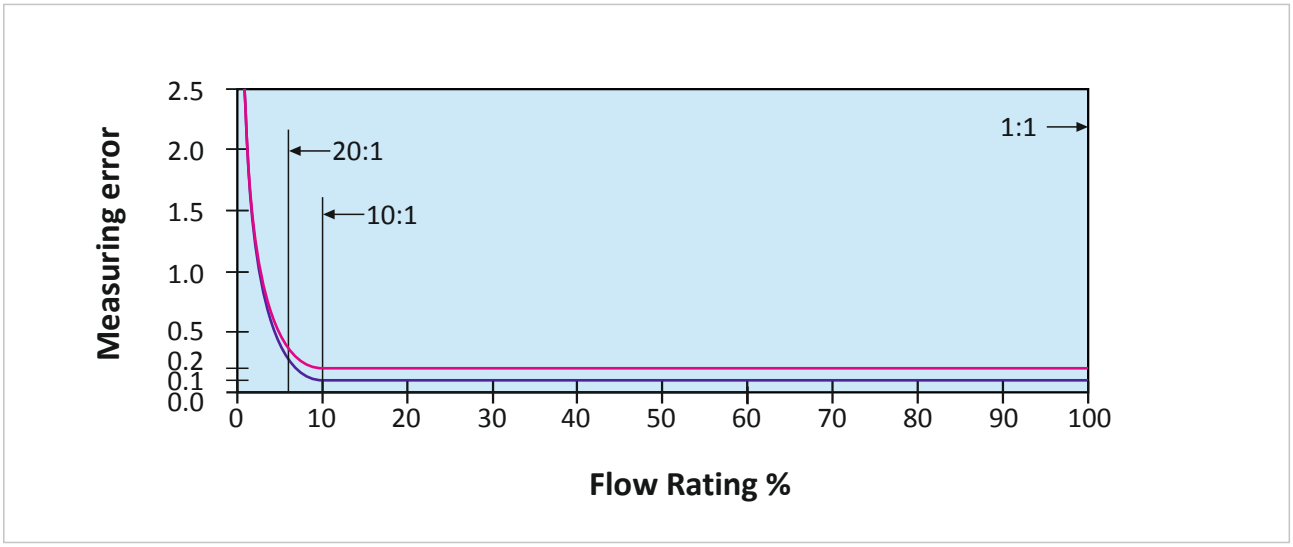
Accuracy — Gas Service

Grade	Basic Accuracy (mass flow)	Repeatability
Standard	±0.75% of reading	±0.4% of reading

Accuracy vs. Flow Rate

"Stated accuracy is specified to the Qflat reference point for each line size (see Table: Flow Range by Line Size). Below Qflat, measurement accuracy follows the standard Coriolis convention, expressed as ± Base Accuracy plus an additional term derived from the ratio of Zero Stability to the measured value.

Flow rate	Applicable accuracy
≥Qflat= Maximum Flow Rate /10	± Basic Accuracy (of reading)
< Qflat= Maximum Flow Rate /10	± Base accuracy ± (Zero Stability / Measured Value) × 100



Wiring & Cable Requirements

Sensor and transmitter are factory-matched; use only the designated interconnecting cable for a given serial pair. Do not mix cables or components between units.

Cable	Specification	Max. Length
Sensor-to-transmitter (remote mount)	Dedicated shielded multi-core cable	1 m as standard, extended on request
Power supply cable	≥ 0.8 mm² cross-section	100 m
RS-485 signal cable	Shielded twisted pair, ≥ 0.35 mm²	Up to 1200 m (per MODBUS RS-485 standard)
Pulse/frequency output cable	Shielded twisted pair	Up to 500 m

Grounding

- Ground the sensor and transmitter to the same electrical potential as the process fluid.
- Use copper grounding conductor, cross-section ≥ 4 mm²; do not share a common ground with motors or other high-current equipment.
- Ground resistance shall be less than 10 Ω.

Ordering Information of Transmitter

Sample Order Code: ELCMF 200-TX-A1-B1-C1-D1-E1-F1-G1-H1-I1-J1-K1

Parameter		Code	Value
A	Transmitter Mounting	A1	Integral (Local)
		A2	Remote (Max 1 mtr)
B	Power Supply	B1	24 VDC
		B2	230 VAC
C	Enclosure MOC	C1	Aluminium Die Cast
		C2	SS316
		CY	Other
D	Enclosure IP Rating	D1	IP54
		D2	IP67
		D3	IP68
E	Hazardous Certification	E1	ATEX
		E2	FF(CMRI 2A ,2B)
		EX	NA
F	Electrical Connection	F1	M20
		F2	1/2 NPT
		FY	Other

Parameter		Code	Value
G	Electrical Output 1 (Flow)	G1	4 to 20 mA
		G2	4 to 20 mA with HART
		GX	NA
H	Electrical Output 2 (Density)Optional	H1	4 to 20 mA
		HX	NA
I	Electrical Output (Alarm & Relay)	I1	One Alarm Contact rating 1/CO, 3 Amp
		I2	Two Alarm Contact rating 1/CO, 3 Amp
		IX	NA
J	Electrical Output (Pulse/Frequency)	J1	Pulse (OC)
		J2	Frequency
		JX	NA
K	Communication Output	K1	RS-485
		KX	NA

(Only For Electronics Enclosure)

Ordering Information for Flow Tube

Sample Order Code : ELCMF 200-FT50-L1-M1-N1-O1-P1-Q1

Parameter		Code	Description	Code	Description
FT	Flow Tube	FT 03	03 NB	FT 25	25 NB
		FT 06	06 NB	FT 32	32 NB
		FT 10	10 NB	FT 40	40 NB
		FT 15	15 NB	FT 50	50 NB
		FT 20	20 NB		
L	Electronics Location	L1	Integral (Local)		
		L2	Remote		
M	Process Connection	M1	Threaded		
		M2	Flanged		
		M3	Triclover		
		M4	SMS Union		
N	Flow Tube MOC	N1	SS-304		
		N2	SS-316		
		NY	Other		

Note :
- Due to our continuous product revisions, design specification & model numbers are subject to change without notice.
- To be used for industrial applications.
- Accuracy defined at Lab Conditions.
- For other requirement please consult factory.
- This product is meant for laboratory/Process application only & not for custody transfer application.

Parameter		Code	Description
O	Flange Standard and Rating	O1	ANSI 150 B16.5
		O2	ANSI 300 B16.5
		O3	ANSI 600 B 16.5
		O4	DIN PN 10 EN 1092-1
		O5	DIN PN 16 EN 1092-1
		O6	DIN PN 25 EN 1092-1
		O7	DIN PN 40 EN 1092-1
		O8	IS 1538
		OY	Other
		OX	NA
P	Nominal Pressure	P1	0.6 MPA
		P2	1 MPA
		P3	1.6 MPA
		PY	Other
Q	Temperature	Q1	–50°C to +200°C (standard model)
		Q2	–200°C to +300°C (extended / cryogenic)
		QY	Other

ELECTRONET

ELECTRONET FLOWMETERS LLP
ASSOCIATE COMPANY OF ELECTRONET EQUIPMENTS PVT. LTD.

Office & Manufacturing Unit
Plot No. 84, Tiny Industrial Estate, Kondhwa Budruk, Pune - 411 048, Maharashtra, India.
+91-20-26931476 / +91-9922442183 sales@electronet.co.in www.electronet.co.in