

- US Patent 8,404,076
- US Patent 8,887,578
- Japanese Patent 5,602,884
- Chinese Patent ZL 201480046308.8
- Other patents pending.

## Key Features

- Accuracy:  $\pm 1\%$  of mass flow rate reading; unaffected by flow regime or variations to the velocity profile
- Multiple size sensors for flow ranges from 10 g/min to 100 kg/min
- Fluid measurement performance is independent of fluid properties
- USP Class VI wetted materials
- PEEK sensor is gamma sterilizable to 50 kGy

# SUMOflo<sup>®</sup>

**SINGLE-USE CORIOLIS MASS FLOW METER**

## Description

The Malema Sensors<sup>®</sup> SumoFlo<sup>®</sup> CPFM-8100-series Single-Use Coriolis Mass Flow Meters are specifically designed for measuring liquids in bio-pharmaceutical and other applications that require all gamma-sterilizable wetted surfaces. The fluid contacting surfaces are made of unreinforced polyether ether ketone (PEEK) that meet USP Class VI, USP 661, and USP 788 standards.

The CE compliant SumoFlo<sup>®</sup> series Coriolis Mass Flow Meters include the single-use sensor assembly, supporting electronics, sensor mounting enclosure, and a graphical user interface (GUI). Optional temperature sensors provide feedback to the electronics that allow temperature compensation to ensure the mass flow accuracy regardless of temperature changes to the application fluid.

## Measurement Principle

Fluid flows into the sensor consisting of two flow sensitive elements which are vibrated relative to one another – similar to the tines of a tuning fork. Fluid interacts with the sensor dynamically in such a way that the sensor's response is immune to the fluid's chemical and physical properties, flow regime, or variations in flow velocity profile. Fluid mass flow rate is determined by measuring the relative motion of the vibrating flow sensitive elements.

## Applications

- Pure water or ultra high purity chemicals
- Chromatography
- Fluids with varying density or viscosity
- Depth Filtration
- Tangential Flow Filtration

Model CSEN-8100-C	-031	-061	-062	-063	-082	-152	-153
Accuracy	±1% of rate for 10% to 100% of full scale rated flow rate ±(1% of rate + Z.O.S) for < 10% of full scale rated flow rate						
Temperature	Ambient: 0°–50°C Fluid: 2°–40°C						
Operating Pressure	30 psig (207 kPa gauge) max.			80 psig (550 kPa gauge) max.			
Flow Range	50 – 1,500 g/min	250 – 3,000 g/min	500 – 5,000 g/min	0.9 – 9 kg/min	2 – 20 kg/min	6 – 60 kg/min	10 – 100 kg/min
Zero Offset Stability (Z.O.S.)	0.75 g/min	1.25 g/min	2 g/min	4 g/min	10 g/min	20 g/min	40 g/min

## Material Specifications

Model CSEN-8100-C	-031	-061	-062	-063	-082	-152	-153
Process Connections *	1/8" barb	1/4" barb	1/4" barb	3/8" barb	1/2" barb	3/4" barb 3/4" Mini TC	1" barb 1"-1.5" TC
Wetted Materials	Unreinforced PEEK (Polyether ether ketone), Polysulfone (for external temperature sensor only), 304 Stainless Steel (for temperature sensor only), Adhesive compliant with ISO 10993. All polymeric wetted materials are USP Class VI compliant.						
Interconnecting Cable Length	Standard 3 m; Maximum up to 30 m						
Ingress Rating For Connectors	IP65						

\* Consult the factory for other types of process connection options.

## Electrical Specifications

Supply Voltage	24 VDC ±10%
Power Consumption	Max 6 W
Programming	Operator Parameter configuration through configuration port with a PC
Analog Output Module	4–20 mA
Digital Input/Output Module	Configurable as Frequency or Digital I/O
Frequency Output	0 to 10 kHz proportional to flow rate
Digital Output over MODBUS *	Mass Flow Rate, Volumetric Flow Rate**, Density**, Temperature ***

\* Requires CELE-8100 model configured for MODBUS communications.

\*\* Requires CELE-8100 and CSEN-8100 models configured for density measurement.

\*\*\* Requires CELE-8100 and CSEN-8100 models configured for temperature compensation.

## Certifications/Compliances

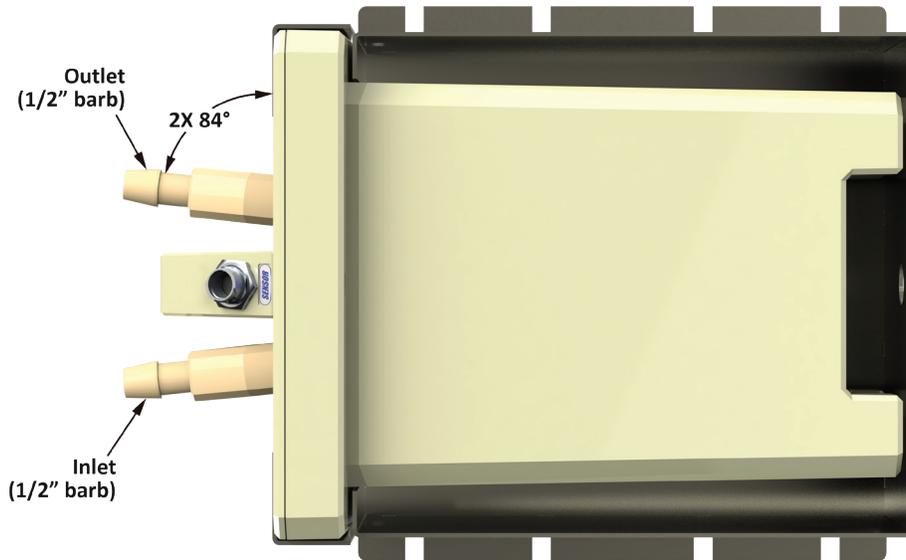
USP Class VI Material Certification	CE Compliance via the following testing: 1. EN61000-4-2: Electrostatic Discharge 2. EN61000-4-3: Radiated Immunity (and Radiated Emissions) 3. EN61000-4-4: Electrical Fast Transients 4. EN61000-4-5: Surge – Power Line 5. EN61000-4-6: Conducted Immunity
USP 661 for Containers/Plastics	
USP 788 for Containers/Plastics	
Directive 2011/65/EU (RoHS)	

# CPFM-8100 Series

## Mounting Orientation

# Coriolis Mass Flow Meter

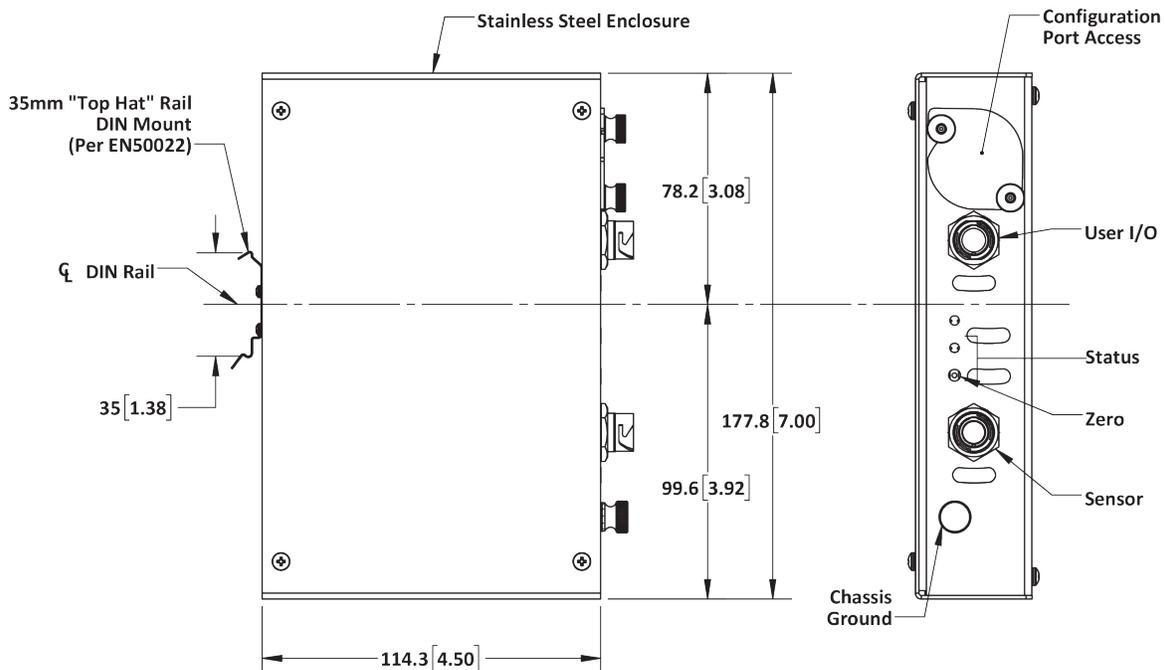
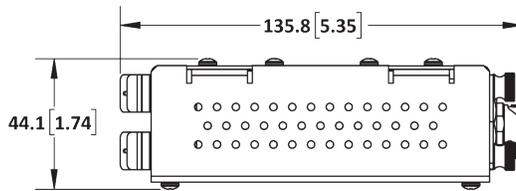
The Malema Sensors® SumoFlo® series Coriolis mass flow meters can be mounted in any orientation. For range codes 062 and larger, when the flow sensor is mounted horizontally — as shown below — the angled fluid inlet and outlet ports allow for self-draining in one direction.



## Dimensional Drawings

For reference only

### Electronics



Dimensional Drawings

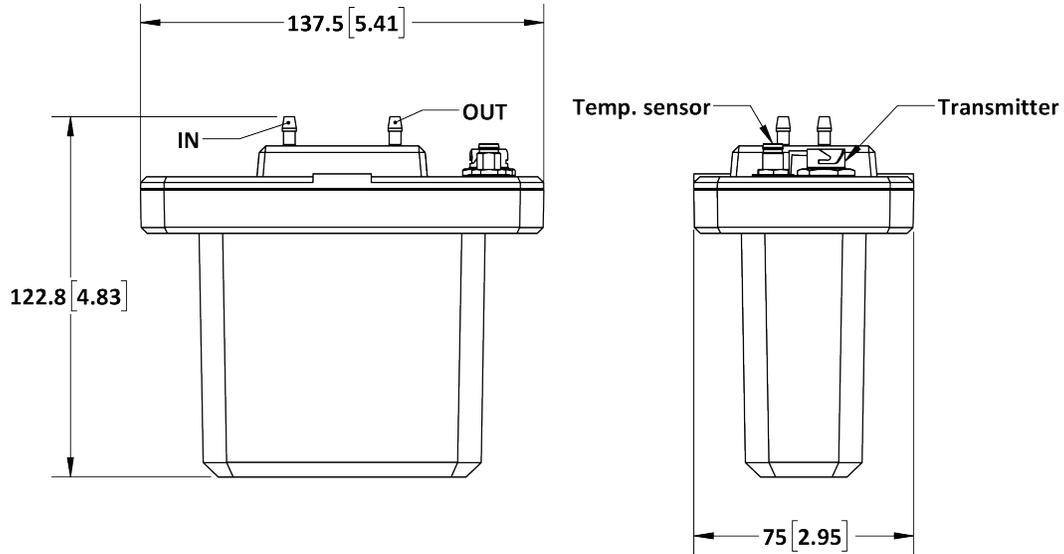
For reference only

Note: Mounting Cradle is required for CE compliance

CSEN 8100-031 Sensor (50 – 1500 g/min, 1/8" barb)

C

1/8" BARB

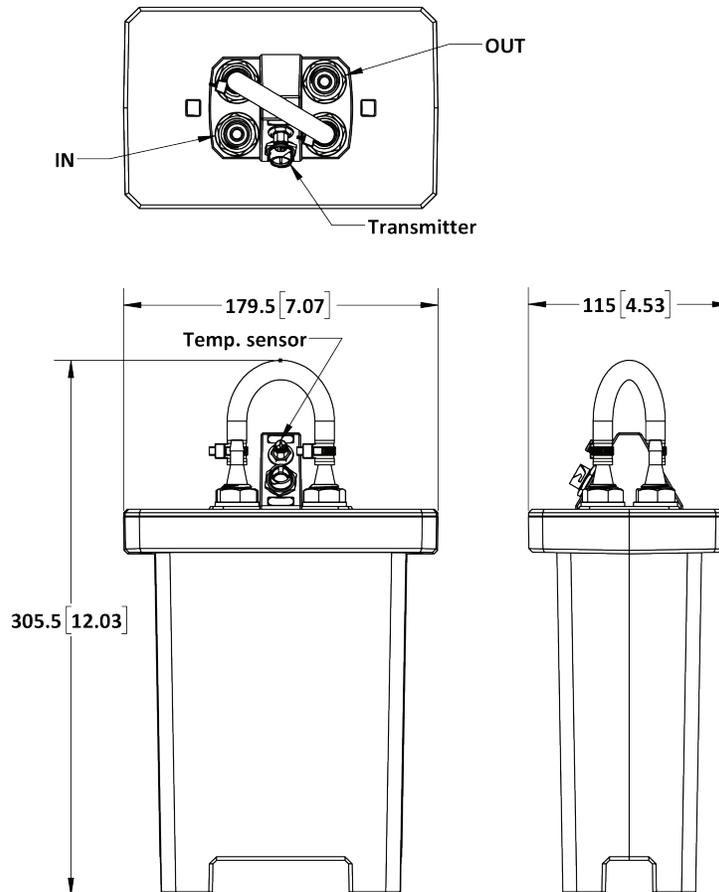


CSEN 8100-061 Sensor (250 – 3000 g/min, 1/4" barb)

Serial Configuration

C

1/4" BARB



Dimensional Drawings

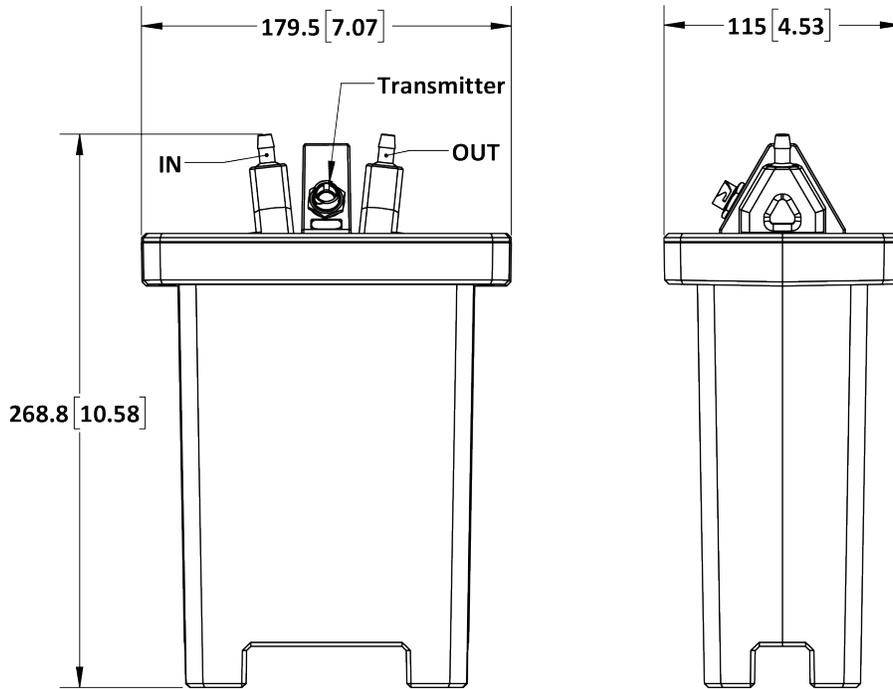
For reference only

Note: Mounting Cradle is required for CE compliance

CSEN 8100-062 Sensor (500 – 5000 g/min, 1/4" barb)  
Parallel Configuration

C

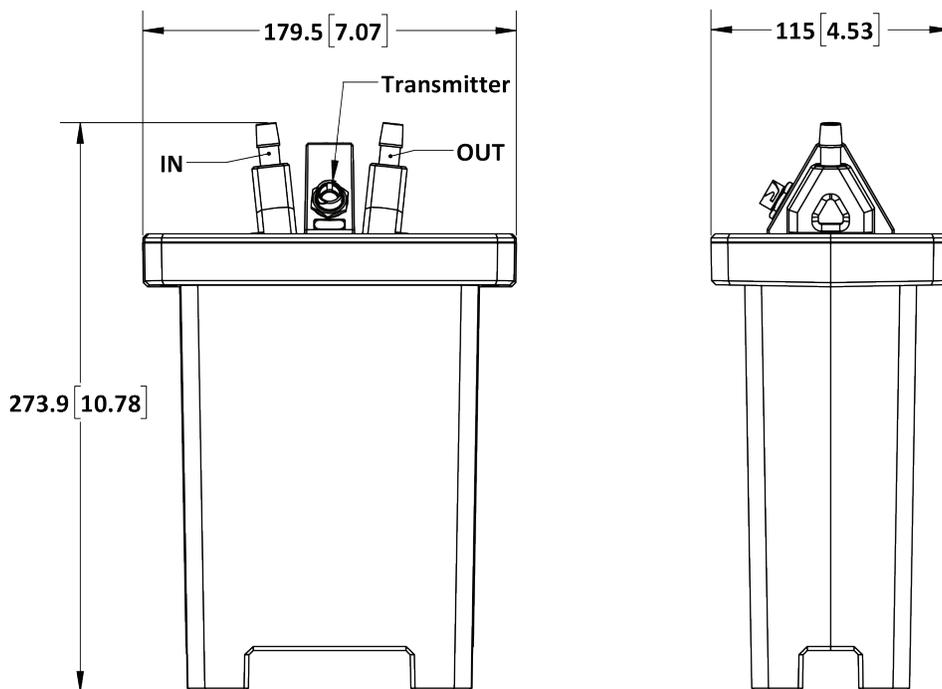
1/4"  
BARB



CSEN 8100-063 Sensor (900 – 9000 g/min, 3/8" barb)  
Parallel Configuration

C

3/8"  
BARB

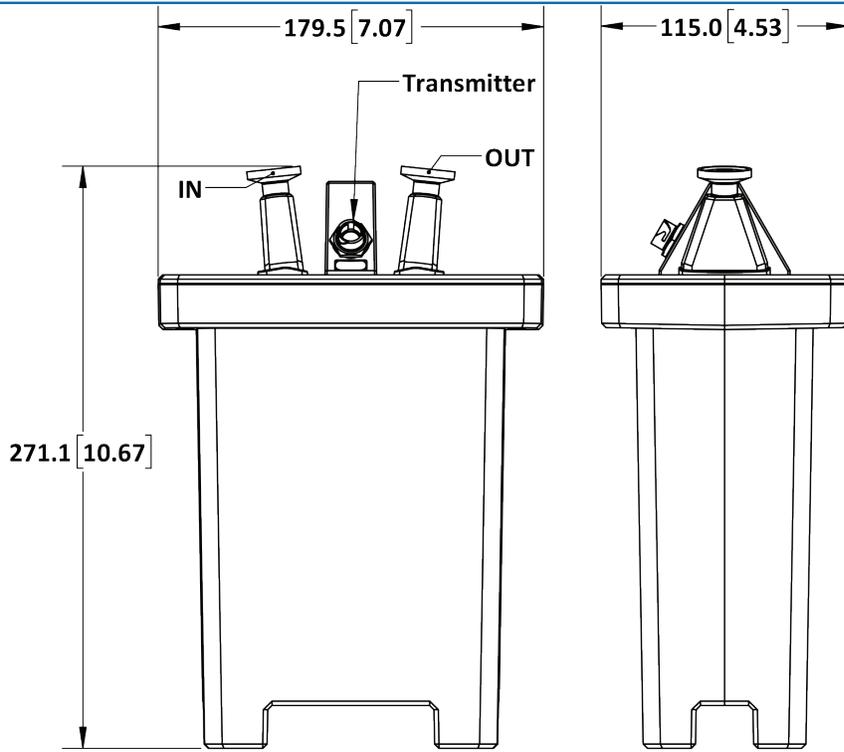


Dimensional Drawings

For reference only

Note: Mounting Cradle is required for CE compliance

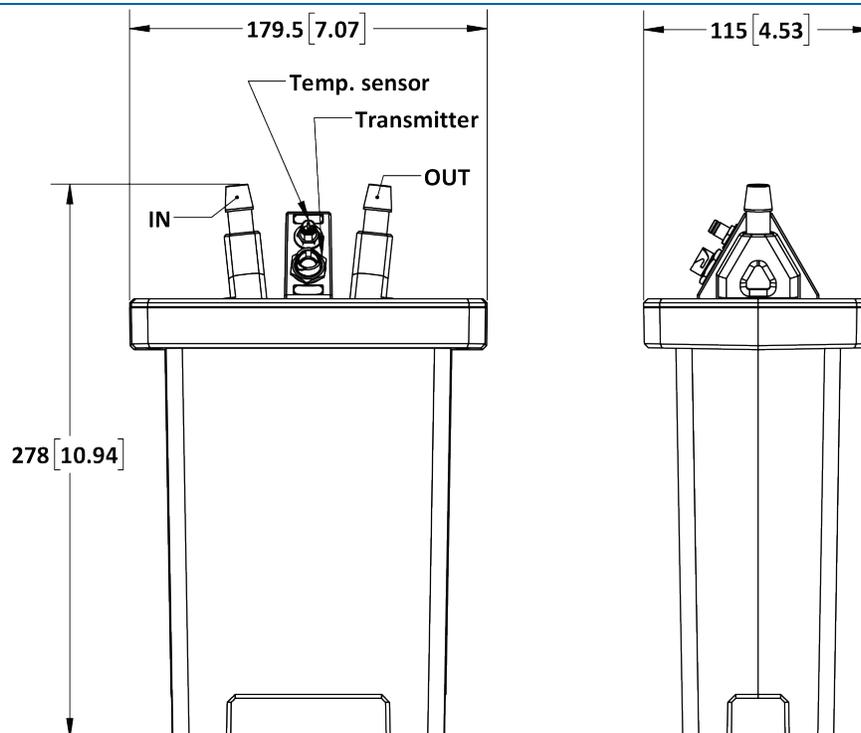
CSEN 8100-082 Sensor (2000 – 20000 g/min, 1/2" Mini TriClamp)  
Parallel Configuration



C

1/2"  
M-TC

CSEN 8100-082 Sensor (2000 – 20000 g/min, 1/2" barb)  
Parallel Configuration



C

1/2"  
BARB

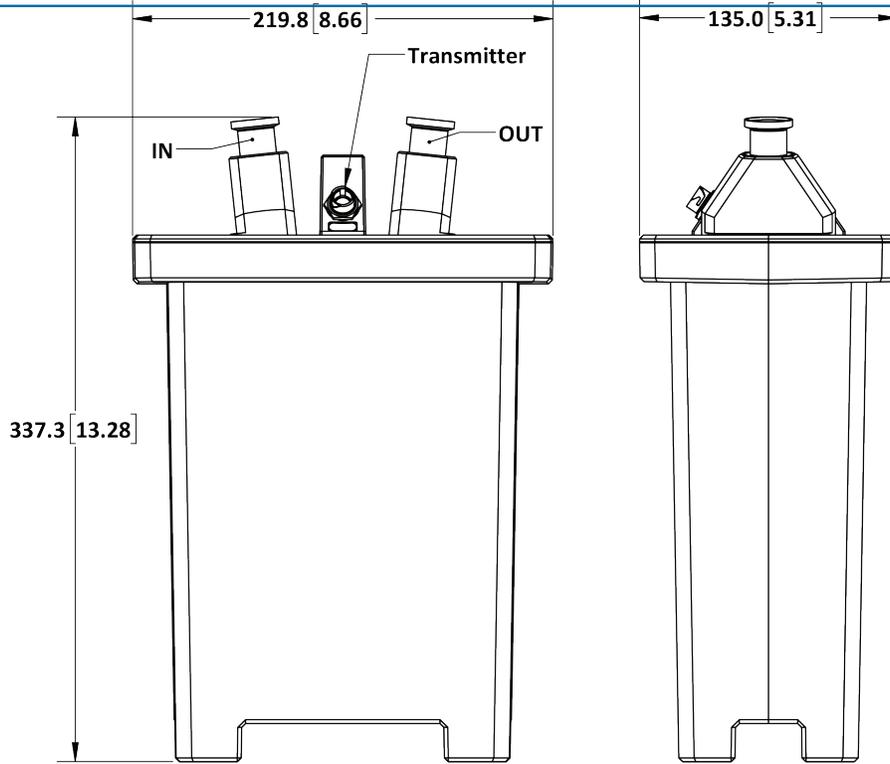
**Dimensional Drawings**

For reference only

Note: Mounting Cradle is required for CE compliance

**CSEN 8100-152 Sensor (6000 – 60000 g/min)**

Parallel Configuration, 3/4" Mini TriClamp Connections

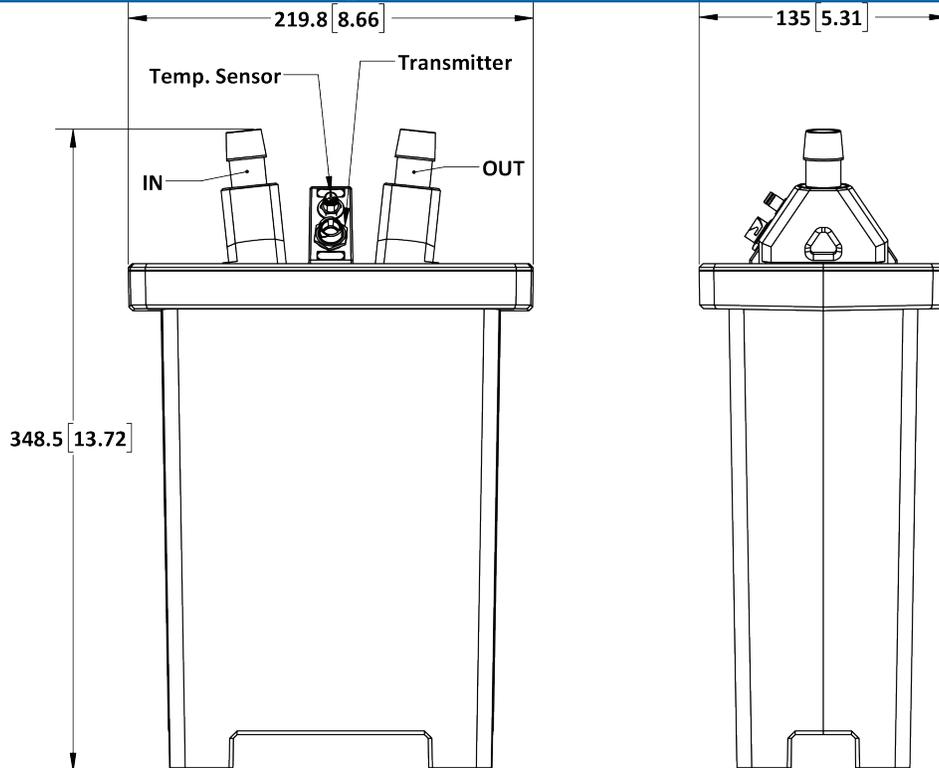


**C**

3/4"  
M-TC

**CSEN 8100-152 Sensor (6000 – 60000 g/min)**

Parallel Configuration, 3/4" ID Barb connections



**C**

3/4"  
BARB

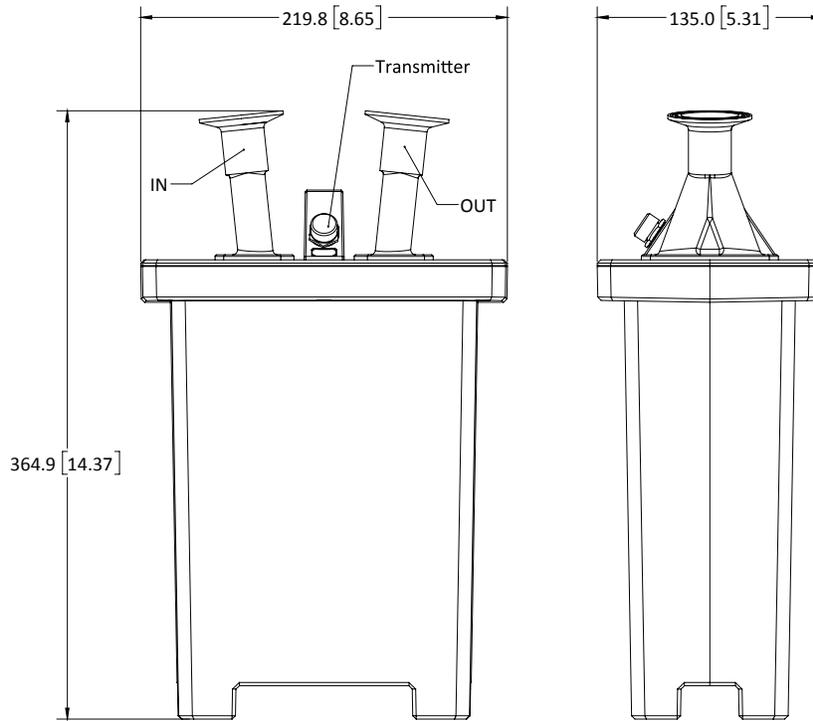
Dimensional Drawings

For reference only

Note: Mounting Cradle is required for CE compliance

CSEN 8100-153 Sensor (10000 – 100000 g/min, 1")

Parallel Configuration, 1" - 1 1/2" TriClamp Connections

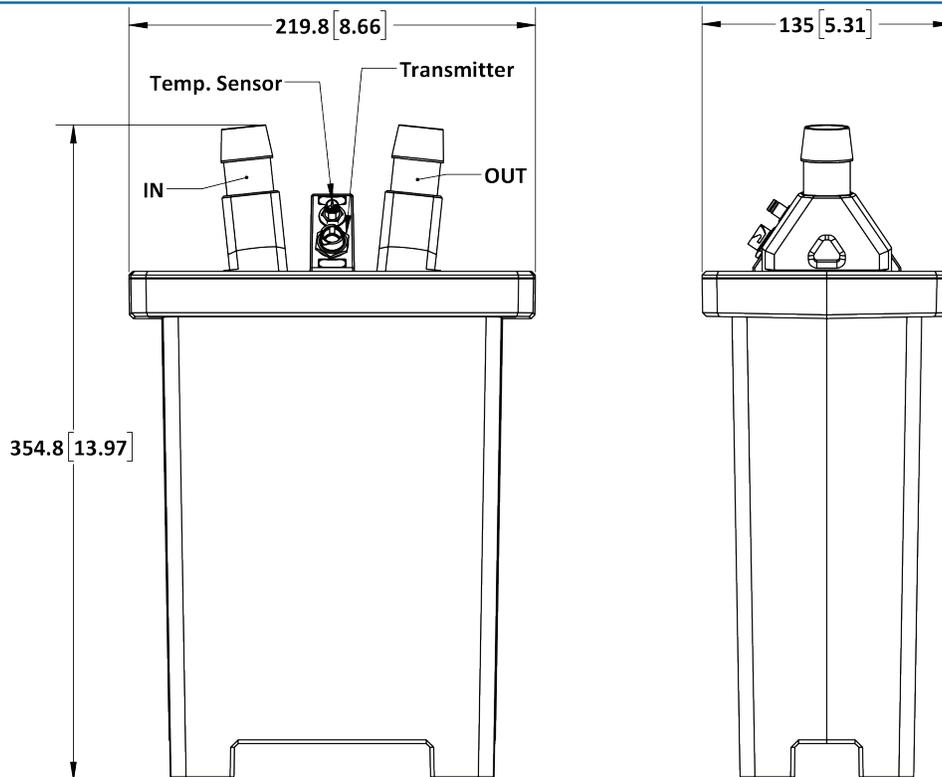


C

1" TC

CSEN 8100-153 Sensor (10000 – 100000 g/min, 1")

Parallel Configuration, 1" ID Barb Connections



C

1" BARB

Pressure Drop in DI Water

Test Conditions: DI Water at 25°C

Sensor Range Code 031 (1/8" barb)	
Flow Rate	Pressure Drop
50 g/min	0.01 psi (0.08 kPa)
150 g/min	0.10 psi (0.69 kPa)
400 g/min	0.71 psi (4.90 kPa)
800 g/min	2.84 psi (19.61 kPa)
1200 g/min	6.40 psi (44.13 kPa)
1500 g/min	10.00 psi (68.95 kPa)

Sensor Range Code 061 (1/4" barb with crossover tube)	
Flow Rate	Pressure Drop
500 g/min	0.10 psi (0.69 kPa)
750 g/min	0.23 psi (1.55 kPa)
1500 g/min	0.90 psi (6.21 kPa)
2500 g/min	2.50 psi (17.24 kPa)
3750 g/min	5.63 psi (38.78 kPa)
5000 g/min	10.00 psi (68.95 kPa)

Sensor Range Code 062 (1/4" barb)	
Flow Rate	Pressure Drop
500 g/min	0.10 psi (0.69 kPa)
750 g/min	0.23 psi (1.55 kPa)
1500 g/min	0.90 psi (6.21 kPa)
2500 g/min	2.50 psi (17.24 kPa)
3750 g/min	5.63 psi (38.78 kPa)
5000 g/min	10.00 psi (68.95 kPa)

Sensor Range Code 063 (3/8" barb)	
Flow Rate	Pressure Drop
900 g/min	0.10 psi (0.69 kPa)
1688 g/min	0.35 psi (2.42 kPa)
3375 g/min	1.40 psi (9.70 kPa)
5063 g/min	3.16 psi (21.82 kPa)
6750 g/min	5.63 psi (38.78 kPa)
9000 g/min	10.00 psi (68.95 kPa)

Sensor Range Code 082 (1/2" barb)	
Flow Rate	Pressure Drop
2000 g/min	0.10 psi (0.69 kPa)
5000 g/min	0.63 psi (4.31 kPa)
7500 g/min	1.41 psi (9.70 kPa)
10000 g/min	2.50 psi (17.24 kPa)
15000 g/min	5.63 psi (38.78 kPa)
20000 g/min	10.00 psi (68.95 kPa)

Sensor Range Code 152 (3/4" barb)	
Flow Rate	Pressure Drop
6000 g/min	0.10 psi (0.69 kPa)
12000 g/min	0.40 psi (2.76 kPa)
21000 g/min	1.23 psi (8.45 kPa)
35000 g/min	3.40 psi (23.46 kPa)
50000 g/min	6.94 psi (47.88 kPa)
60000 g/min	10.00 psi (68.95 kPa)

Sensor Range Code 153 (1" barb)	
Flow Rate	Pressure Drop
10000 g/min	0.10 psi (0.69 kPa)
20000 g/min	0.40 psi (2.76 kPa)
50000 g/min	2.50 psi (17.24 kPa)
75000 g/min	5.63 psi (38.78 kPa)
87000 g/min	7.57 psi (52.19 kPa)
100000 g/min	10.00 psi (68.95 kPa)

**CPFM-8100 Series**  
**Ordering Information - Sensor (CSEN-8100)**

**Coriolis Mass Flow Meter**

Model Ordering Code											Description			
CSEN-8100	-	*	-	***	*	*	*	*	*	-	***	PEEK Sensor		
Sensor Type		C										Standard Vertical inlet and outlet ports		
		P										Panel Mount Vertical inlet and outlet ports		
		H										Oversized Enclosure (ie, RC082 in enclosure normally for RC15X)		
		-												
Range Code		031										50 – 1,500 g/min or 50 - 1,500 ml/min		
		061										250 - 3,000 g/min or 250 - 3,000 ml/min		
		062										500 - 5,000 g/min or 500 - 5,000 ml/min		
		063										900 - 9,000 g/min or 900 - 9,000 ml/min		
		082										2 - 20 kg/min or 2 - 20 L/min		
		152										6 - 60 kg/min or 6 - 60 L/min		
		153										10 - 100 kg/min or 10 - 100 L/min		
Temperature Sensor		W										External Temp. Sensor (Range codes 031 and 061 only)		
		I										Integrated Internal Temp Sensor (Range codes 062, 063, 082, 152, and 153 only)		
Sterilization		0										No Sterilization		
		1										Gamma Irradiated to 50 kGy		
		Z										Other Requests (Consult Factory)		
Fluid Connections		A										1/8" Hose Barb (Range code 031)		
		B										1/8" Hose Barb with Tubing (Range code 031)		
		C										1/4" Barb with PEEK Crossover Tube (Range Code 061)		
		D										1/4" Barb with Tubing and PEEK Crossover Tube (RC 061)		
		E										1/4" Barb (RC 062)		
		F										1/4" Barb with Tubing (RC 062)		
		H										3/8" Barb (RC 063)		
		J										3/8" Barb with Tubing (RC 063)		
		L										1/2" Barb (RC 082)		
		M										1/2" Barb with Tubing (RC 082)		
		N										1/2" to Mini TC (RC 082)		
		P										3/4" Barb (RC 152)		
		Q										3/4" Barb with Tubing (RC 152)		
		R										3/4" to Mini TC (RC 152)		
		S										1" Barb (RC 153)		
		T										1" Barb with Tubing (RC 153)		
U										1" to Laddish TC (RC 153)				
Z										Custom fluid connection (please consult factory)				
Mounting Orientation		H										Horizontal *		
		V										Vertical (flow ports pointing upwards)**		
		A										Angled 45° (flow ports pointing downwards)		
Calibrations and Outputs		1										Calibrated for Mass Flow Rate Only		
		2										Density Measurement Enabled, Analog Output for Volumetric Flow Rate		
		3										Density Measurement Enabled, Analog Output for Density		
		4										Density Measurement Enabled, Analog Output for Mass Flow Rate		
		-	XXX										Unique PN Identifier	

\* Factory recommended option for all sizes except RC 031

\*\* Factory recommended option for RC 031

Ordering Information - Electronics (CELE - 8100)

Model Ordering Code													Description			
CELE-8100	-	*	-	*	*	*	*	*	*	X	X	X	-	***	Transmitter	
		C												DIN Rail Mounting (Non Display Only; CE)		
		Z												Custom (Consult Factory)		
		-														
Temperature Compensation			T												Use with Temperature Comp Sensors	
			Z												Custom (Consult Factory)	
Output			1												4-20mA, 1x D/O	
			2												4-20mA, 2x D/O	
			3												4-20mA, 1x D/O, MODBUS (RS485)	
			Z												Custom (Consult Factory)	
I/O Cable			0												Standard I/O Cable	
			Z												Custom (Consult Factory)	
I/O Cable Length			A												3 m	
			Z												Custom (Consult Factory)	
Interconnecting Cable Length			A												3 m	
			Z												Custom (Consult Factory)	
Measurement			X												For Use with Sensors Calibrated for Mass Flow Rate Only	
			D												For Use with Sensors Calibrated for Density and/or Volumetric Flow Rate	
							X							Reserved for Factory		
								X							Reserved for Factory	
														XXX	Unique PN Identifier	

Ordering Information - Mounting Cradle

Model Ordering Code					Description	
ENCL-MOUNT-8100	-	**	-	***	Mounting Cradle	
Size		03	For use with Sensor Range Code 031			
		08	For use with Sensor Range Code 061, 062, 063, 082			
		15	For use with Sensor Range Code 152, 153			
		-				
			XXX	Unique PN Identifier		

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