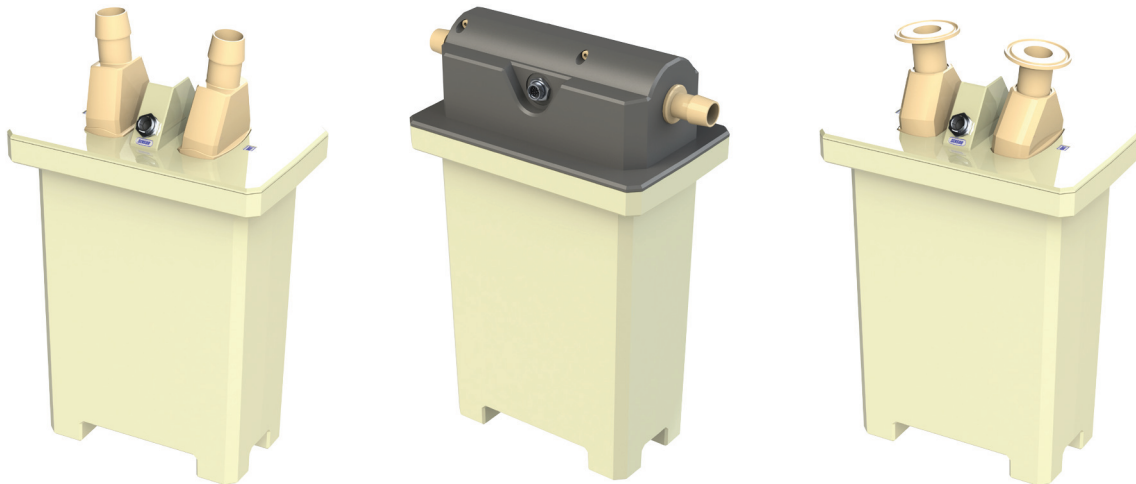# MALEMA

Malema Sensors® SumoFlo® Single-Use Coriolis Flow Meter
CPFM-8103 Series

Advancements

- Advanced electronics offering better accuracy at lower flow rates of each flow range
- Multiple signal output options available
- Multiple fluid connection options (including right angle barb, Tri-Clamp)

Installation and Operation Manual

SUMO*flo* ®
SINGLE-USE CORIOLIS MASS FLOW METER

TABLE OF CONTENTS

Introduction

Malema's SumoFlo® CPFM-8103 series Single-Use Coriolis Flow Meter is specifically designed for measuring liquids in biopharmaceutical and other applications that require all gamma-stable wetted surfaces. The fluid contacting surfaces are made of unreinforced polyether ether ketone (PEEK) that meets USP Class VI, USP 661, and USP 788 standards.

A SumoFlo® Coriolis flow meter consists of three components: the single-use Coriolis flow sensor, the durable transmitter, and the durable mounting cradle. When properly installed in the mounting cradle, the SumoFlo® flow meter meets CE specifications.

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.

Inlet and outlet of the tubes vibrate in phase when there is no flow present.
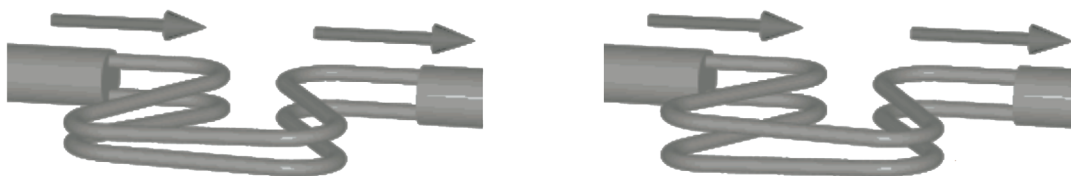
When flow is present, the inlet and outlet ends of the tube vibration is out of phase. The degree of phase shift is proportional to mass flow rate.

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IM.SUMOFLO:S3/024150

Storage and Handling

Storage conditions

Store the product under packed conditions in an anti-static bag. The storage place should be free from moisture, mechanical shock and vibration. The storage temperature should be between 10°C and 35°C and the humidity between 5% and 80% R.H. without condensation.

If the sensor has been gamma irradiated, do not open the inner bag until ready to install in the single-use assembly.

Unpacking and Product Inspection

Upon delivery, inspect the product for damage. Confirm that the model code on the label matches the specification in the purchase order.

Installation Instructions

Selecting location:

The following must be considered when selecting the installation location of the flow sensor:

1. Ambient temperature: 0°C to 50°C (32°F to 122°F), protected from direct sunshine.

2. Free from electromagnetic interference. Keep away from such heavy inductive devices as motors, pumps, power-relays and solenoid valves.

3. Free from vibrational interference. Keep away from sources of vibration such as motors, pumps, actuators, or vehicular traffic.

4. The location must be protected from water jets or corrosive gases.

5. The location should allow easy access for maintenance.

Mounting of Flow Sensor:

Consider the following when selecting and installing the Flow Sensor for accurate measurement.

1. Flow sensor can be installed vertically or horizontally. For sensors with range code 062, 063, 082, 152, or 153, mounting the sensor horizontally with inlet on bottom and outlet on top will allow for gravity draining of the sensor. Do not install sensor upside down to avoid air traps.

2. Flow sensor needs to be installed inside a mounting cradle that holds the sensor securely and helps isolate it from external vibrations. Malema can provide a mounting cradle if requested. The mounting cradle should be installed on the tool, or can be mounted to a cradle stand, also available from Malema. See image at right.

3. If using a Malema-provided mounting cradle and stand, attach the cradle to the stand using the

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included screws. If installing on a tool, matching hole patterns for the cradle need to exist on the tool surface to attach the cradle. Securely mount the cradle to the desired location.

4. Place the sensor inside the cradle and close the cradle lid. Use the clamps to secure the sensor.

5. For cradle selection, please refer to the datasheet.
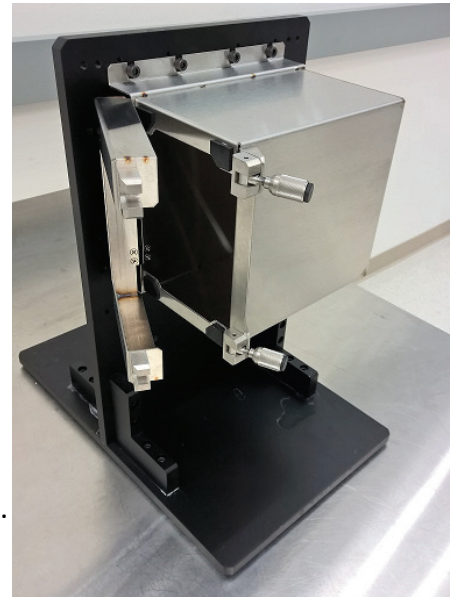
Plumbing Connections

1. Attach tubing to the inlet and outlet barbs on the sensor. Make sure that the barb size on the sensor matches the tubing. Typical sizes are 1/8", 1/4", 3/8", 1/2", 3/4", and 1".

2. Tighten the fluid connections with either cable ties or hose clamps. Note, cable ties may not be sufficient at system pressures above 1 bar(g).

3. Secure the inlet and outlet tubes a few inches from the inlet and outlet barb, to prevent external vibration from degrading the performance of the flow meter.

Caution

To avoid stress on the flow tube/housing interface, follow the precautions below:

1. Tube should be held firmly while working on the hose barb fittings during installation.

2. There should not be any relative displacement/ movement between the tube and the housing at any point in time.

3. Do not overtighten hose clamps, as this may cause damage.
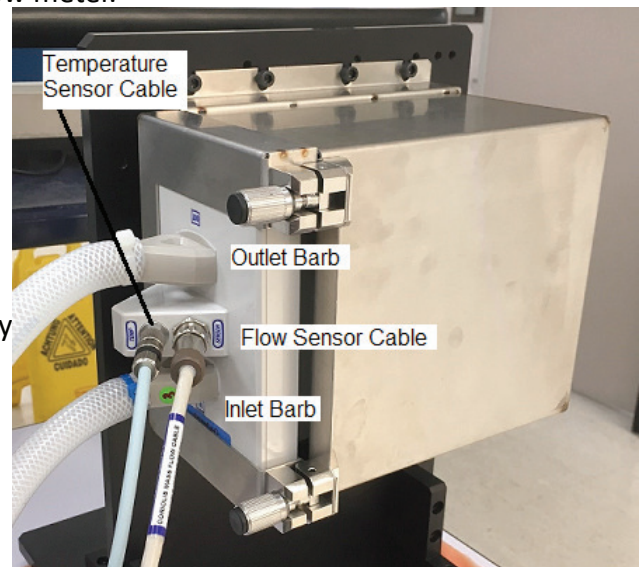
Electrical Connections

1. Connect the red and black wires of the User I/O cable, CABLE-CMETER 046, to +24 V DC and Ground, respectively.

2. If monitoring the analog 4-20 mA output, connect the violet (pin 12, Flow Rate 4-20mA+) and green (pin 11, Flow Rate GND) wires to a multimeter or analog input module.

3. Connect the flow sensor cable, CABLE-CMETER 047. The female end on the cable goes to the sensor. The male end on the cable goes to the electronics. Follow the connector labels on both the sensor and electronics.

4. For sensors with an internal temperature sensor, please move to step 5. For sensors with an external temperature sensor, connect the appropriate temperature sensor cable. This cable must be connected for the Temperature Compensation algorithm to work properly. This cable is reusable and not single-use.

5. If using the Malema Coriolis PC GUI, connect the communication cable, CBL-CS2-006. The stereo jack inserts into the PC Configuration Port on the electronics, and the USB adapter is plugged into the PC. PC must include appropriate drivers, available on Installation CD or from Malema.

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6. Turn power ON to the flow meter (i.e. the electronics) after priming to ensure the sensor is filled with liquid. The red and green status LEDs will blink during initialization. When initialization is complete, the green LED will remain ON while the red LED will turn OFF.

   NOTE: Allow 45 minutes for the sensor and transmitter to warm-up.
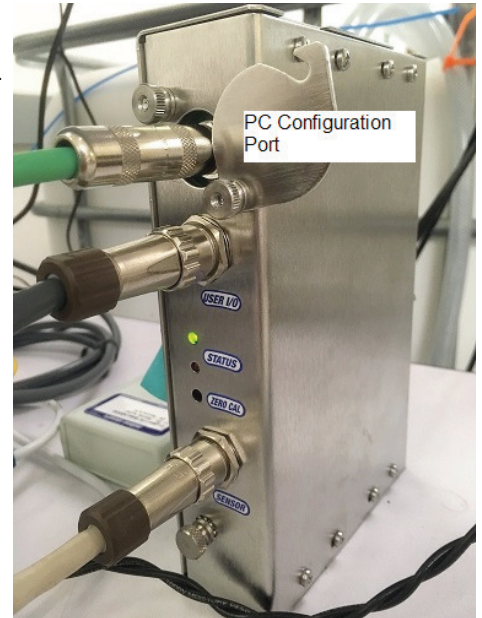
PC Software / GUI Communication

If using the Malema Coriolis GUI to monitor or log flow meter performance, follow the following steps:

1. Make sure the converter is installed on the PC by checking its COM port in Device Manager. If there is a yellow exclamation mark on the device in Device Manager, install the proper driver from the device manufacturer. The driver package for CBL-CS2-006 is available on the CD that comes with the cable. If you have any difficulty, please contact the factory.

2. Copy the Malema software GUI (an .exe executable file) to a folder on the local drive. The software GUI is on the provided CD that came with the transmitter, and also available from the factory.

3. Double-click the .exe to open the GUI. A COM port should appear in the upper-right box.

4. Double-click the COM port to connect to the flow meter. If the connection is successful, various fields on the left side and tabs in the middle of the GUI will appear.

5. Click the "Collect Data" checkbox to start monitoring the flow rate.

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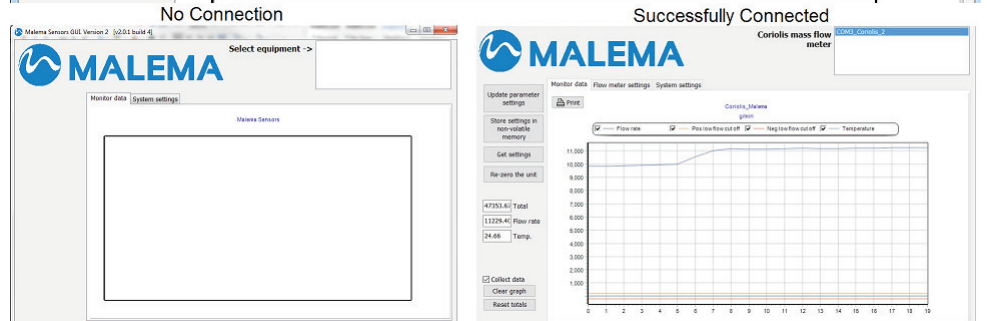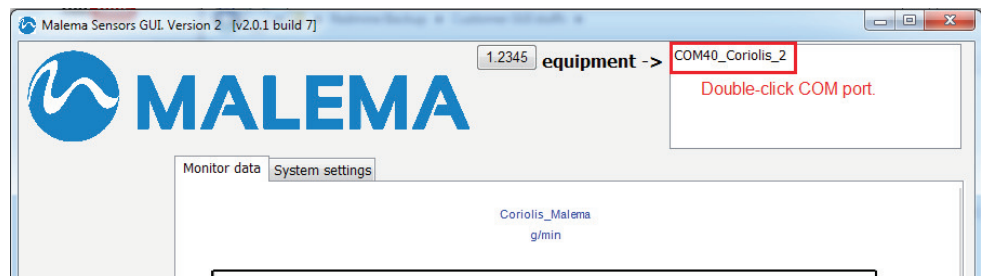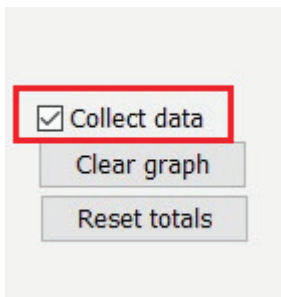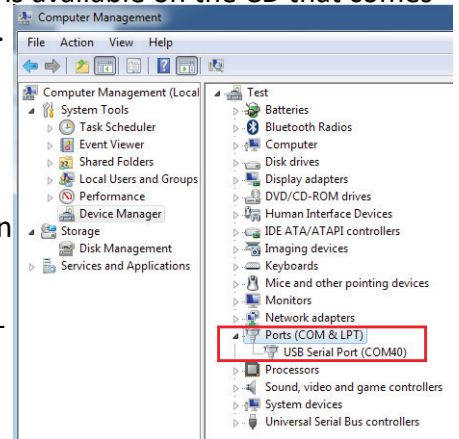
RS-485 / MODBUS Communication

If communicating via MODBUS over RS-485, make the following connections at the tool:

1. Connect pin 7 (red/black) of the User I/O cable to the TDB+ terminal of your RS-485 module.
2. Connect pin 8 (white/black) of the User I/O cable to the GND terminal of your RS-485 module.
3. Connect pin 9 (yellow) of the User I/O cable to the TDA- terminal of your RS-485 module.

    If using a multi-converter, make sure all switches are on RS-485

Start Up

The SumoFlo® series Coriolis flow meter system requires a full tube of liquid medium at rest before a successful startup can be completed.

Preliminary Checks:

1. Make all the necessary electrical connections as per the connection details above.
2. Ensure that the power supply rating is 24 V DC ± 10%, 300 mA.
3. Confirm that the inlet and outlet ports are connected to the tubing reflecting the physical flow direction.

Start up Process:

1. Turn on the power. The instrument will go through initialization process and start measuring flow.
   Note: It is not necessary to power cycle the transmitter after changing a single-use sensor.
2. Please allow the instrument to warm up for about 45 minutes only on initial startup or when starting cold.
3. Verify that the flow tube is full of stationary liquid without bubbles in the flow sensor.
4. Perform a ZERO RESET if necessary (see next section)
5. The flow meter is now ready for making valid measurements.

NOTE: To read valid flow rates, a ZERO reset needs to be performed whenever the installation set-up is different than the one used for the previous ZERO setting. Zeroing the meter before each use is advisable.

Zero Reset

1. Purge all air <u>OUT</u> of the flow sensor and the hoses by running the pump at a high flow rate (ex. 50% of flow range).
2. Turn off the pump and, if possible, close all valves to ensure no actual flow.
   Note: Fluid flowing through the sensor (or air pockets in the sensor) while performing a zero reset will result in an inaccurate zero setting and therefore, inaccurate flow rate readings. Make sure there is no fluid flow in the sensor during zeroing.
3. Perform a zero reset by pressing the "zero cal" button on the electronics or clicking the "Re-zero the unit" button in the left side of the GUI (shown at right). Zero reset may also be performed remotely by momentarily contacting the pink wire (pin 3) to +24 V (pin 1).
4. This zero reset procedure will take 10 seconds to complete. During zeroing, the red status LED on the electronics will be blinking. The red LED will turn off when zeroing is complete.

SumoFlo® CPFM-8103   SINGLE-USE CORIOLIS FLOW METER
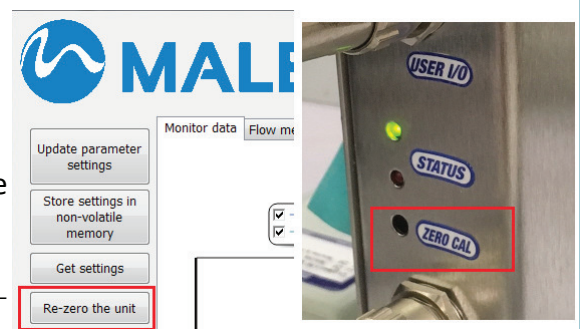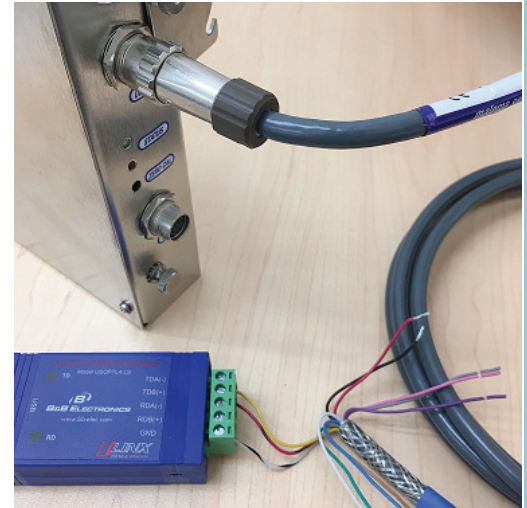
Measurement Specifications

Model CSEN-8103-*	-031	-062	-063	-082	-152	-153
Accuracy	±1% of rate for 5% to 100% of full scale rated flow rate ±(1% of rate + Z.O.S) for < 5% 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 *	0.05 – 1.5 kg/min (l/min)	0.25 – 5 kg/min (l/min)	0.45 – 9 kg/min (l/min)	1 – 20 kg/min (l/min)	3 – 60 kg/min (l/min)	5 – 100 kg/min (l/min)
Zero Offset Stability (Z.O.S.)	0.75 g/min	2 g/min	4 g/min	10 g/min	20 g/min	40 g/min

*   Check page 20 for special flow ranges for R & T style sensors

Material Specifications

Model CSEN-8103-*	-031	-062	-063	-082	-152	-153
Process Connections *	1/8" barb	1/4" barb	3/8" barb 3/8" Mini TC	1/2" barb 1/2" Mini TC	3/4" barb 3/4" Mini TC	1" barb 1"-1.5" TC
Wetted Materials	Unreinforced PEEK (Polyether ether ketone), 316L Stainless Steel (for temperature sensor only), Silicone. 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 V DC ±10%
Power Consumption	Max 6 W
Programming	Operator Parameter configuration through configuration port with a PC
Analog Output Module	1x 4–20 mA, 2x 4–20 mA, or 4x 4–20 mA
Digital Input/Output Module	0x D/O, 1x D/O, or 2x D/O; 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-8103 model configured for MODBUS communications.
**   Requires CELE-8103 and CSEN-8103 models configured for density measurement.
***   Requires CELE-8103 and CSEN-8103 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)	

Electrical Connections of Transmitter (Pin-outs)

Analog Output: Analog output for flow rate is 4-20 mA by default and on pins 12 and 11.

Remote Zero: To zero the meter remotely, momentarily connect, or short, pin 3 (ZERO) to pin 1 (24V+). Wait 10 seconds for this procedure to complete and for the LEDs to stop blinking before continuing operation. PLC digital outputs can be used to perform remote zeroing.

PC GUI: The Configuration Port is for GUI communication via CBL-CS2-006.

Chassis Ground: CE Compliance requires the transmitter chassis be connected to earth ground. The screw near the bottom of the transmitter is available for this purpose.
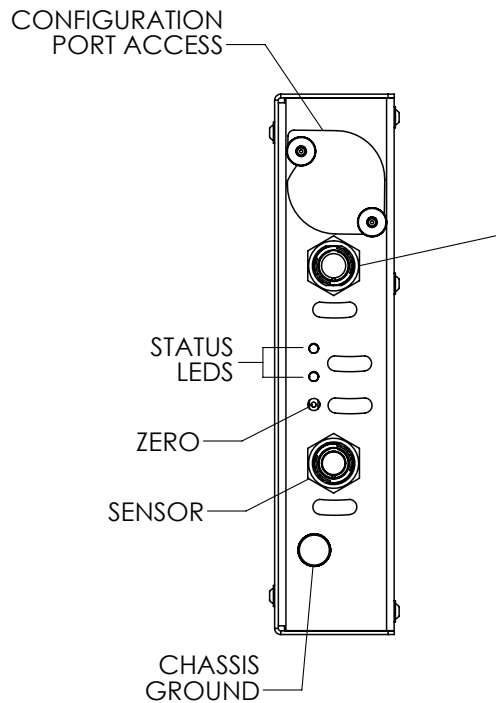
Maintenance Note

Single-Use Coriolis flow sensor requires no daily maintenance since it has no moving parts that can be subject to wear and tear. However, we recommend the following checks to ensure smooth and reliable operation.

Connection of Flow Detector
- Check for leakage around pipe connections or liquid penetration into Flow Detector tube.
- Check for any loose nuts.
- Make sure that the connection ports are leak free.

Connecting pipe
- Check for mechanical stress to the single-use flow sensor caused by possible warping of connecting pipes or loose connections caused by heavy pipe vibration.
- Check to ensure tube movement caused by pumps or other equipment is not transferred to the flow sensor.

CONFIGURATION PORT ACCESS

STATUS LEDS

ZERO

SENSOR

CHASSIS GROUND

CONNECTION DETAIL [1 ANALOG, 1 or 2 D/O]

CELE-8103-C-T1
CELE-8103-C-T2

PIN	WIRE COLOR	FUNCTION
1	RED	POWER +24V
2	BLACK	POWER GND
3	PINK	REMOTE ZERO
4	GRAY	DIO OUT 1
5	BLUE	DO NOT CONNECT
6	WHITE	DIO GND
7	RED/BLACK	DIO IN 1+
8	WHITE/BLACK	DIO OUT 2
9	YELLOW	DIO IN 1-
10	BROWN	ALARM OUT O/C
11	GREEN	CL-
12	VIOLET	CL+

LABEL-CMETER 022

CONNECTION DETAIL [1x ANALOG, 1x D/O, MODBUS]

CELE-8103-C-T3

PIN	WIRE COLOR	FUNCTION
1	RED	POWER +24V
2	BLACK	POWER GND
3	PINK	REMOTE ZERO
4	GRAY	DIO OUT 1
5	BLUE	DO NOT CONNECT
6	WHITE	DIO GND
7	RED/BLACK	RS485 A+
8	WHITE/BLACK	RS485 GND
9	YELLOW	RS485 B-
10	BROWN	ALARM OUT O/C
11	GREEN	CL-
12	VIOLET	CL+

LABEL-CMETER 021

CONNECTION DETAIL [4x ANALOG OPTION]

CELE-8103-C-T7

PIN	WIRE COLOR	FUNCTION
1	RED	POWER +24V
2	BLACK	POWER GND
3	PINK	REMOTE ZERO
4	GRAY	ALARM OUT O/C
5	BLUE	VOL FLOW 4-20 mA (-)
6	WHITE	VOL FLOW 4-20 mA (+)
7	RED/BLACK	DENSITY 4-20 mA (-)
8	WHITE/BLACK	DENSITY 4-20 mA (+)
9	YELLOW	TEMP 4-20 mA (-)
10	BROWN	TEMP 4-20 mA (+)
11	GREEN	MASS FLOW 4-20 mA (-)
12	VIOLET	MASS FLOW 4-20 mA (+)

GL1-CS1-003

CONNECTION DETAIL [2x ANALOG, 1x D/O, MODBUS]

CELE-8103-C-T8

PIN	WIRE COLOR	FUNCTION
1	RED	POWER +24V
2	BLACK	POWER GND
3	PINK	REMOTE ZERO
4	GRAY	ALARM OUT O/C
5	BLUE	ANALOG 1 4-20mA (-)
6	WHITE	ANALOG 1 4-20mA (+)
7	RED/BLACK	RS485 A+
8	WHITE/BLACK	RS485 GND
9	YELLOW	RS485 B-
10	BROWN	DIO 1 (REF PWR GND)
11	GREEN	ANALOG 0 4-20mA (-)
12	VIOLET	ANALOG 0 4-20mA (+)

GL1-CS3-003

CONNECTION DETAIL [3x ANALOG, 1x DIGITAL]

CELE-8103-C-T9

PIN	WIRE COLOR	FUNCTION
1	RED	POWER +24V
2	BLACK	POWER GND
3	PINK	REMOTE ZERO
4	GRAY	ALARM OUT O/C
5	BLUE	ANALOG 1 4-20mA (-)
6	WHITE	ANALOG 1 4-20mA (+)
7	RED/BLACK	ANALOG 2 4-20mA (-)
8	WHITE/BLACK	ANALOG 2 4-20mA (+)
9	YELLOW	DO NOT CONNECT
10	BROWN	DIO 1 (REF PWR GND)
11	GREEN	ANALOG 0 4-20mA (-)
12	VIOLET	ANALOG 0 4-20mA (+)

GL1-CS2-003

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Wiring Examples

Analog 4-20 mA active current output:

CELE-8103	4–20 mA Signal OUT	(+)
	Ground	Receiving Device (-)
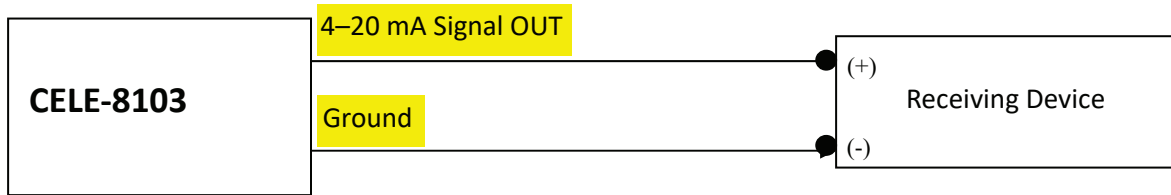
Digital output (Alarm or Pulse):

Ext. V DC IN (+) 30 V DC max

R. ext

CELE-8103	Alarm or Pulse Out	(+)
	Output ground	Receiving Device (-)

V DC Gnd
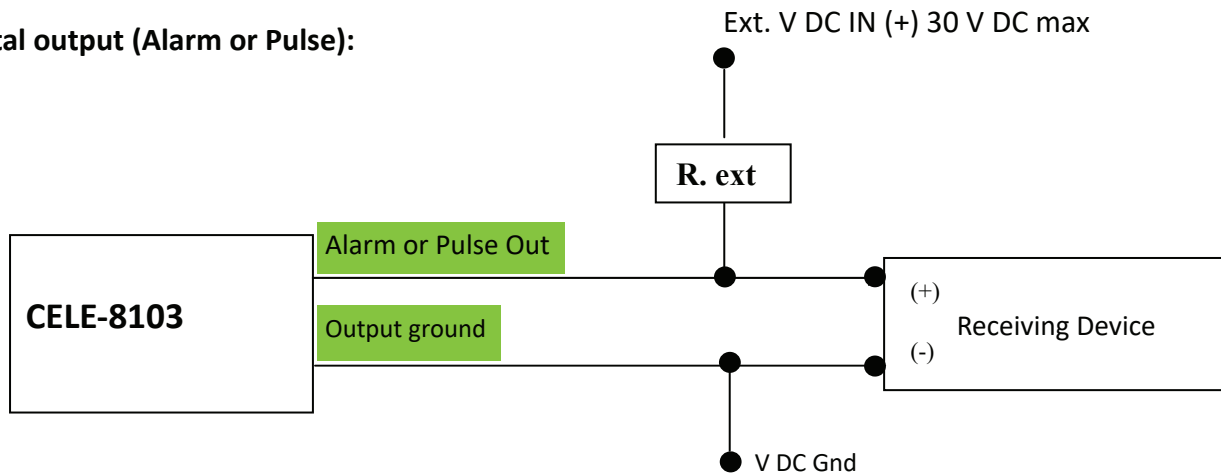
R. ext is an external resistor that may be needed for some installations.

Choose R. ext so that the maximum current through the terminal does not exceed 200 mA.

R. ext can be calculated as follows:

R. ext (kΩ) = Ext. V DC IN / Max. current (mA)

Remote Zero IN:

CELE-8103	Remote Zero IN

Momentary contact (or pull-up)

24 V DC IN (+)
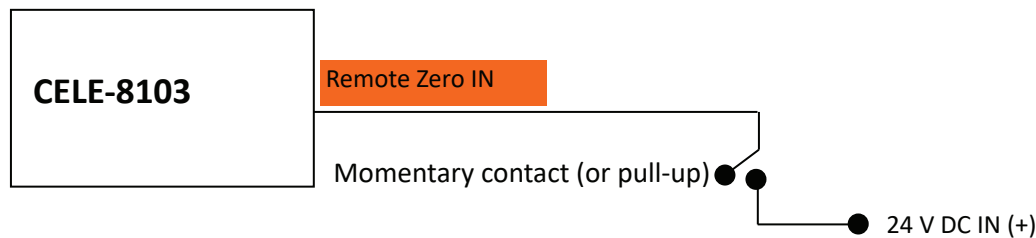
Typical Block Diagram
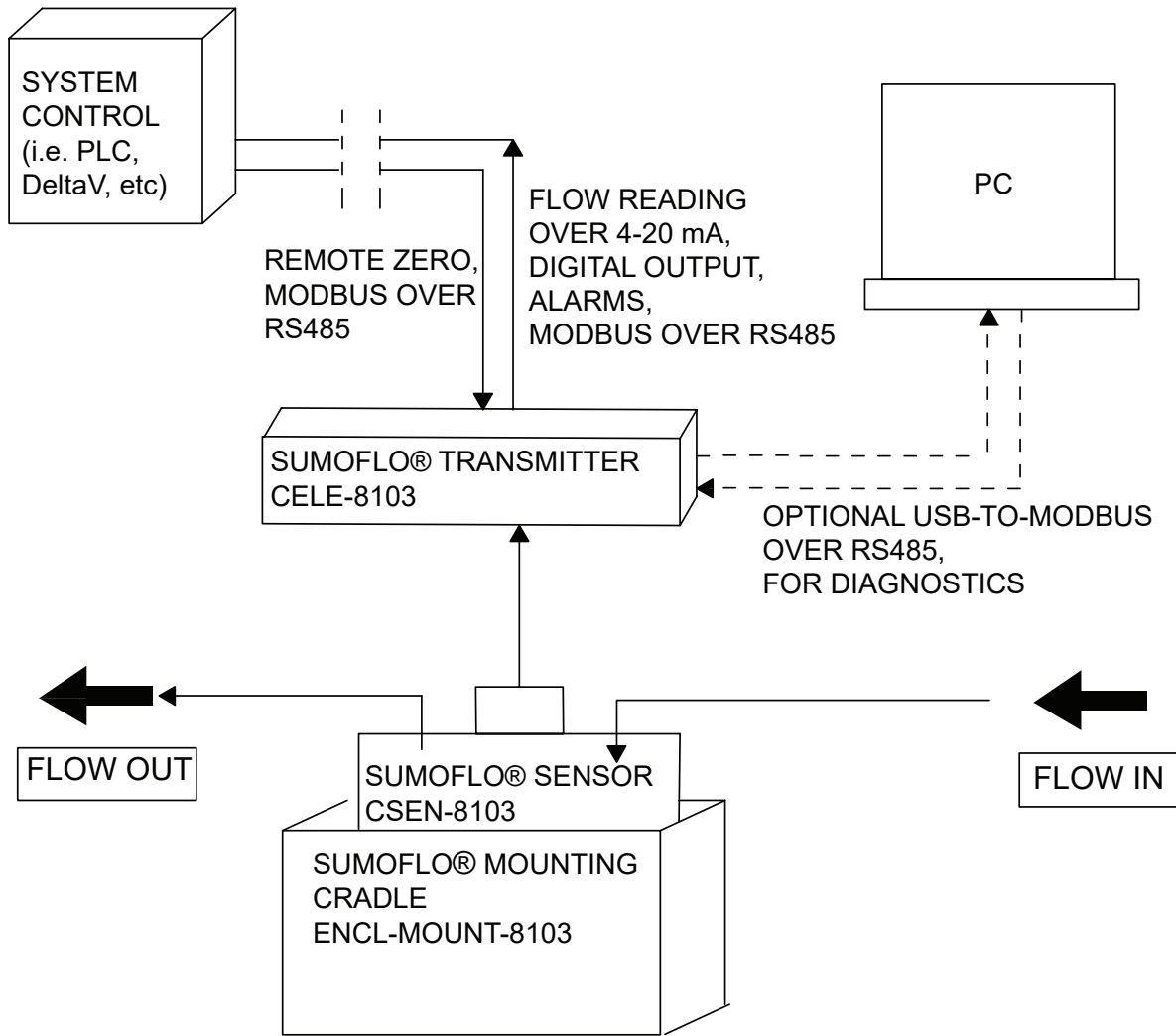
A SumoFlo® CPFM-8103-series Coriolis flow meter consists of three components: the single-use Coriolis flow sensor, the durable transmitter, and the durable mounting cradle, as well as the durable cables to connect the transmitter to the sensor and the transmitter to the system control device. When properly installed in the mounting cradle, the SumoFlo® flow meter meets CE specifications.

Optional durable components include a stand to mount the cradle for stand alone installation, an RS485-to-USB connecter, and a Windows 10 Pro Laptop Computer running Malema's Coriolis GUI. Stand-alone remote displays are also available. Contact Malema for additonal information if needed.

Sensor Style	Description	Electrical Connections	Fluid Connections
C-031	1/8" Cradle-Mount Sensor	Top (same side as fluid connections)	Vertical
C other	Cradle-Mount Sensor	Top (same side as fluid connections)	6º from vertical
P	Panel-Mount Sensor	Bottom (opposite side as fluid connections)	6º from vertical
R	Standard Inline Sensor	Either top or bottom	Inline (90º from vertical)
T	Tall Inline Sensor	Bottom	Inline (90º from vertical)

Transmitter Dimensions
FOR REFERENCE ONLY

CELE-8103 Transmitter
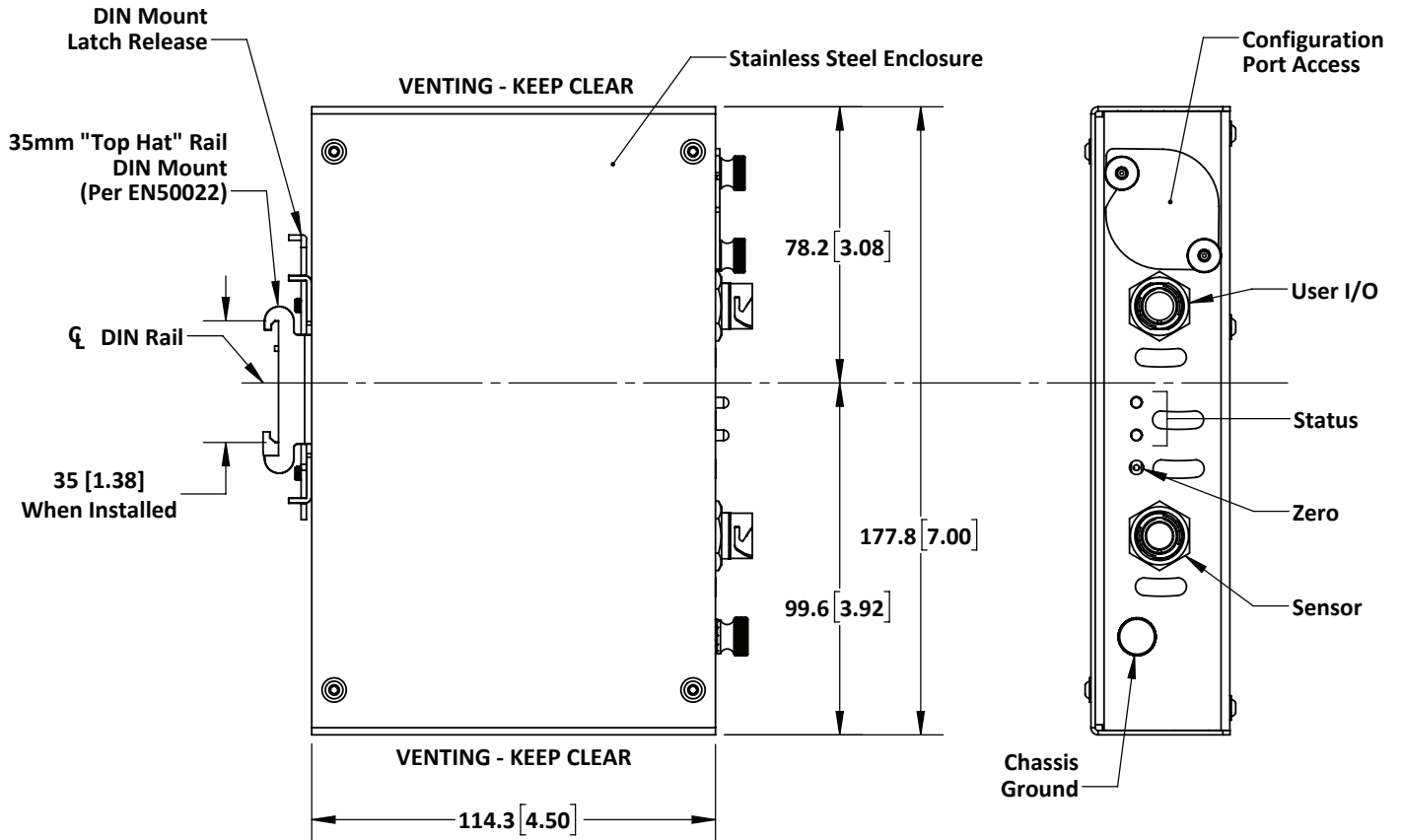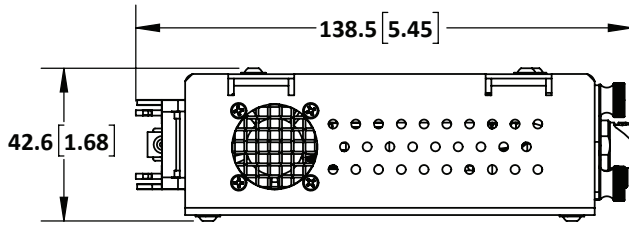
138.5 [5.45]

42.6 [1.68]

DIN Mount
Latch Release

Stainless Steel Enclosure

VENTING - KEEP CLEAR

Configuration
Port Access

35mm "Top Hat" Rail
DIN Mount
(Per EN50022)

78.2 [3.08]

User I/O

℄ DIN Rail

Status

35 [1.38]
When Installed

Zero

177.8 [7.00]

99.6 [3.92]

Sensor

VENTING - KEEP CLEAR

Chassis
Ground

114.3 [4.50]

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Single-Use Sensor Dimensions

FOR REFERENCE ONLY

Note: Mounting Cradle is required for CE compliance

CSEN-8103-R-062 Sensor (0.15 – 5 kg/min or l/min, 1/4")

1/4" Barb Connections, Inline Configuration

216.0 [8.50]

179.6 [7.07]

1/4" Barb In

1/4" Barb Out

2X 26.8 [1.05]

Power & I/O Connection

115.0 [4.53]

275.8 [10.86]

Millimeters [Inches]
Not to scale

R
1/4"
BARB
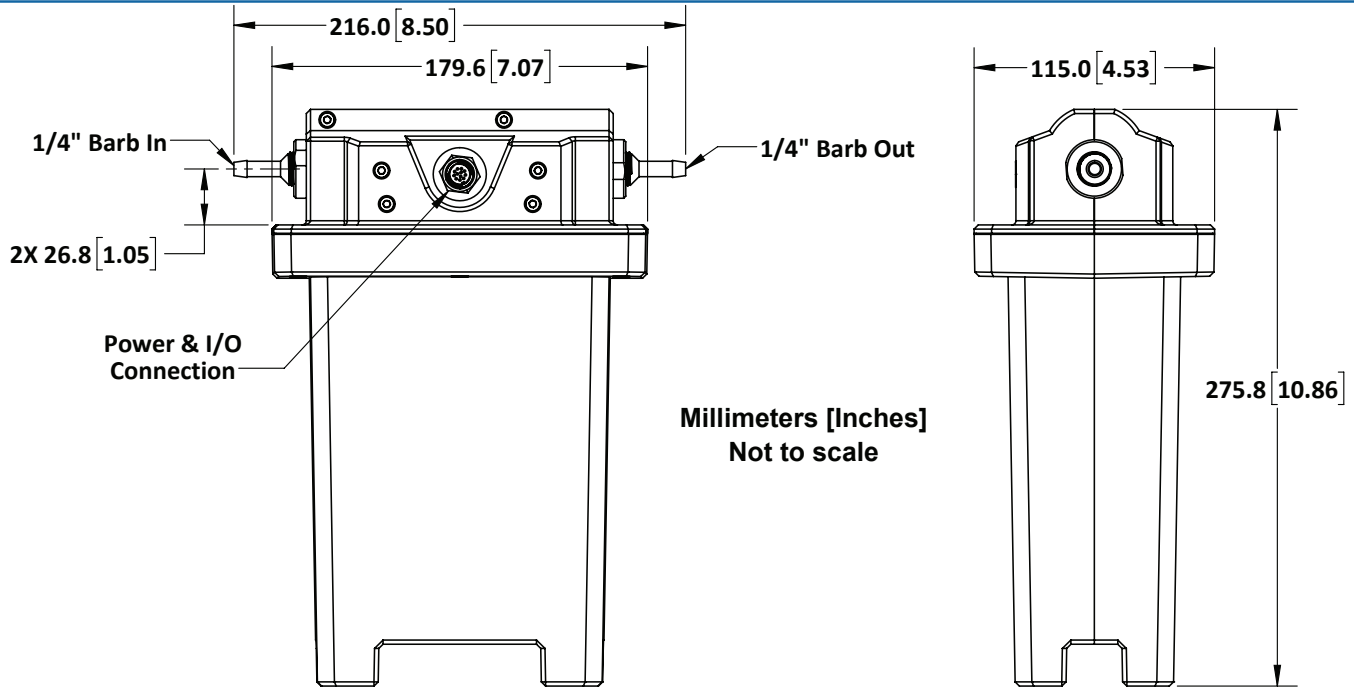
CSEN-8103-R-063 Sensor (0.18 – 9 kg/min or l/min, 3/8")

3/8" Barb Connections, Inline Configuration

212.0 [8.35]

179.6 [7.07]

3/8" Barb In

3/8" Barb Out

2X 26.8 [1.05]

Power & I/O Connection

115.0 [4.53]

275.8 [10.86]

Millimeters [Inches]
Not to scale

R
3/8"
BARB

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Singapore 739257
P: (65) 6482-3533   F: (65) 6484-4231

Single-Use Sensor Dimensions (Continued)

FOR REFERENCE ONLY

Note: Mounting Cradle is required for CE compliance

R
1/2"
BARB

CSEN-8103-R-082 Sensor (0.4 – 20 kg/min or l/min, 1/2")
1/2" Barb Connections, Inline Configuration

213.4 [8.40]

179.6 [7.07]

1/2" Barb In

1/2" Barb Out

2X 26.7 [1.05]

Power & I/O Connection

115.0 [4.53]

275.8 [10.86]

Millimeters [Inches]
Not to scale

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R
3/4"
BARB

CSEN-8103-R-152 Sensor (3 – 60 kg/min or l/min, 3/4")
3/4" Barb Connections, Inline Configuration

277.8 [10.94]

220.3 [8.67]

3/4" Barb In

3/4" Barb Out

36.6 [1.44]

Power & I/O Connection

135.0 [5.31]

348.5 [13.72]

Millimeters [Inches]
Not to scale

Single-Use Sensor Dimensions (Continued)

FOR REFERENCE ONLY

Note: Mounting Cradle is required for CE compliance

CSEN-8103-R-153 Sensor (5 – 100 kg/min or l/min, 1")
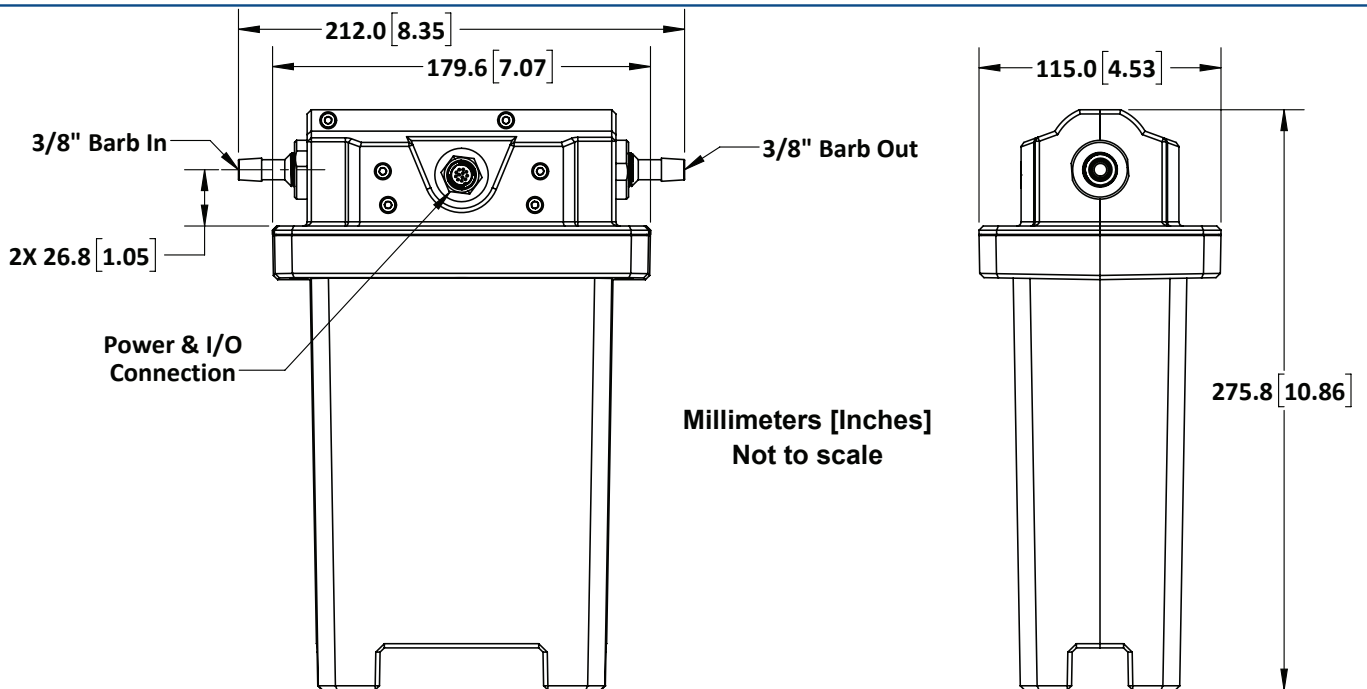1" Barb Connections, Inline Configuration

R
1"
BARB

288.6 [11.36]

220.3 [8.67]

1" Barb In

1" Barb Out

36.6 [1.44]

Power & I/O Connection

135.0 [5.31]

348.5 [13.72]

Millimeters [Inches]
Not to scale

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Single-Use Sensor Dimensions (Continued)
FOR REFERENCE ONLY
Note: Mounting Cradle is required for CE compliance

C
**1/8"
BARB**

CSEN-8103-C-031 Sensor (0.05 – 1.5 kg/min or l/min, 1/8" barb)
1/8" Barb Connections, Standard Vertical Inlets Configuration

(137.4[5.41])

(74.9[2.95])

MALEMA

1/8" BARB IN

1/8" BARB OUT

(208.5[8.21])

(149[5.87])

(19.3[.76])

(83[3.27])

OPTIONAL TEMPERATURE SENSOR

(94.8[3.73])

(39.8[1.57])

C
**1/4"
BARB**

CSEN-8103-C-062 Sensor (0.25 – 5 kg/min or l/min, 1/4" barb)
1/4" Barb Connections, Standard Vertical Inlets Configuration
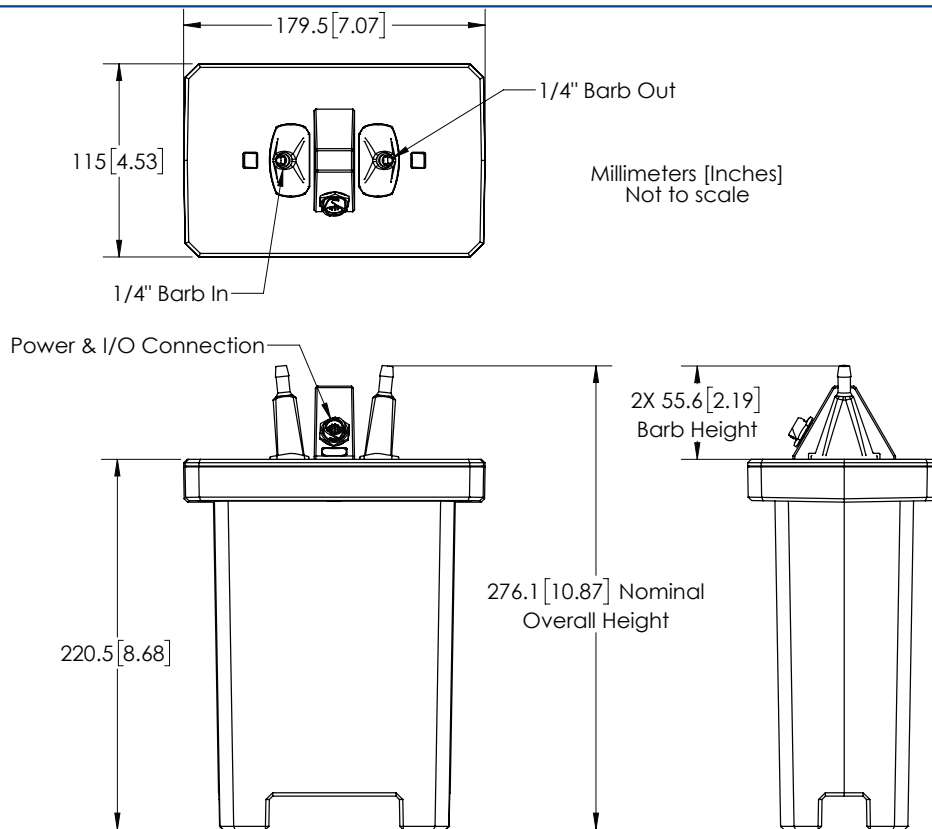
179.5[7.07]

1/4" Barb Out

115[4.53]

Millimeters [Inches]
Not to scale

1/4" Barb In

Power & I/O Connection

2X 55.6[2.19]
Barb Height

276.1[10.87] Nominal
Overall Height
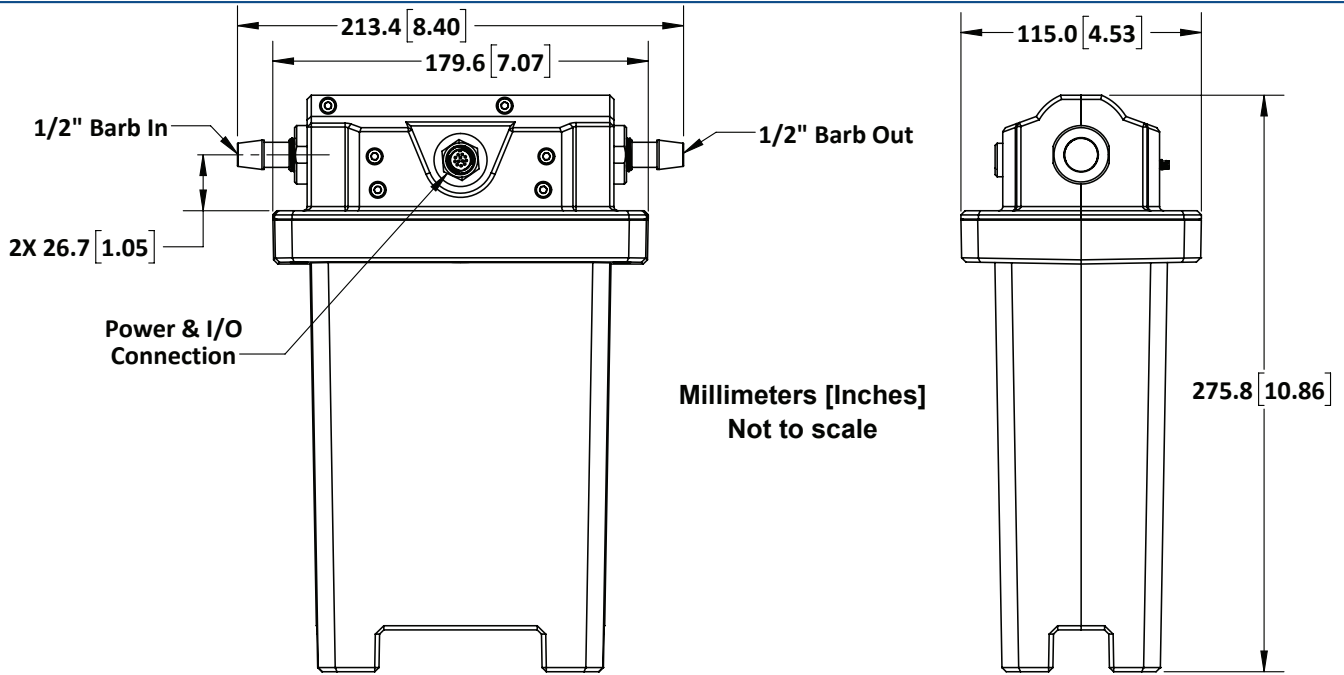
220.5[8.68]

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Single-Use Sensor Dimensions (Continued)
FOR REFERENCE ONLY
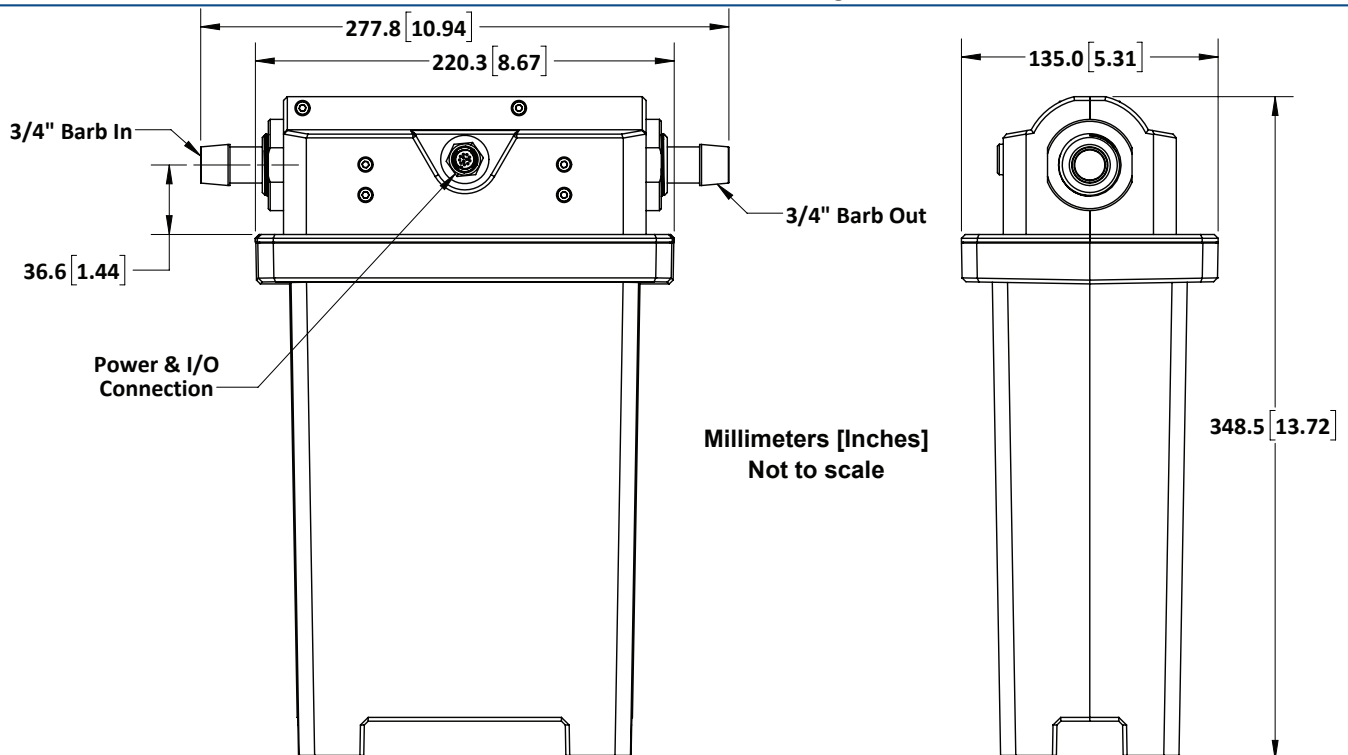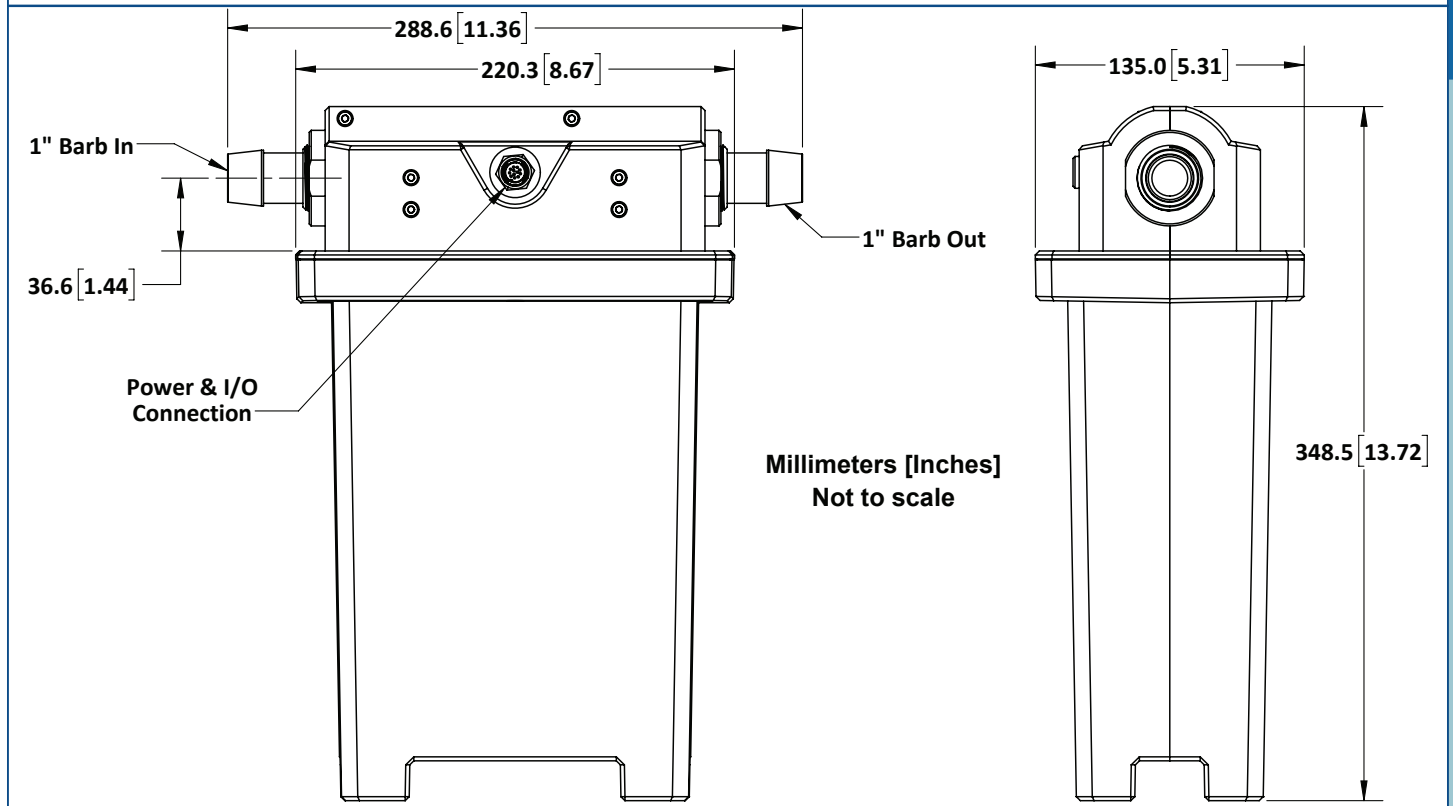
Note: Mounting Cradle is required for CE compliance

CSEN-8103-C-063 Sensor (0.45 – 9 kg/min or l/min, 3/8" barb)
3/8" Barb Connections, Standard Vertical Inlets Configuration

C

**3/8"
BARB**

179.5 [7.07]

3/8" Barb Out

115.0 [4.53]

Millimeters [Inches]
Not to scale

3/8" Barb In

Power & I/O Connection

60.1 [2.37]

280.7 [11.05]
Overall Height

220.5 [8.68]

CSEN-8103-C-082 Sensor (1 – 20 kg/min or l/min, 1/2" MiniTC)
1/2" Mini-Tri-Clamp Connections, Standard Vertical Inlets Configuration

C

**1/2"
M-TC**

179.5 [7.07]

115.0 [4.53]

Transmitter

OUT

IN

271.1 [10.67]

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SumoFlo® CPFM-8103   SINGLE-USE CORIOLIS FLOW METER
Single-Use Sensor Dimensions (Continued)
FOR REFERENCE ONLY
Note: Mounting Cradle is required for CE compliance

C
1/2"
BARB

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CSEN-8103-C-082 Sensor (1 – 20 kg/min or l/min, 1/2" barb)
1/2" Barb Connections, Standard Vertical Inlets Configuration

179.5[7.07]

115.0[4.53]

1/2" Barb Out

Millimeters [Inches]
Not to scale

1/2" Barb In

Power & I/O Connection

62.7[2.47]

283.2[11.15]
Overall Height

220.5[8.68]

C
3/4"
M-TC

CSEN-8103-C-152 Sensor (3 – 60 kg/min or l/min, 3/4" MiniTC)
3/4" Mini-Tri-Clamp Connections, Standard Vertical Inlets Configuration

219.8[8.66]

135.0[5.31]

Transmitter

IN
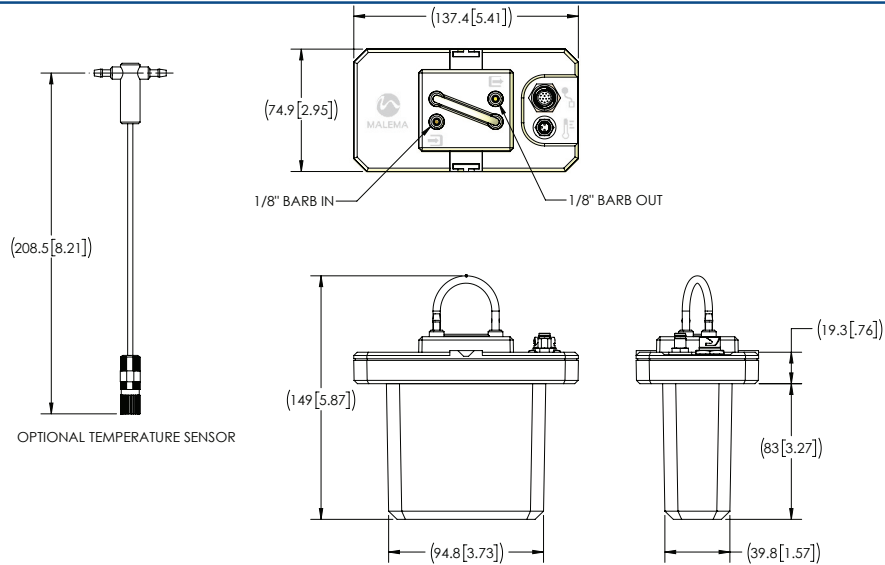
OUT

337.3[13.28]

IM.SUMOFLO:S3/024150

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Single-Use Sensor Dimensions (Continued)

FOR REFERENCE ONLY
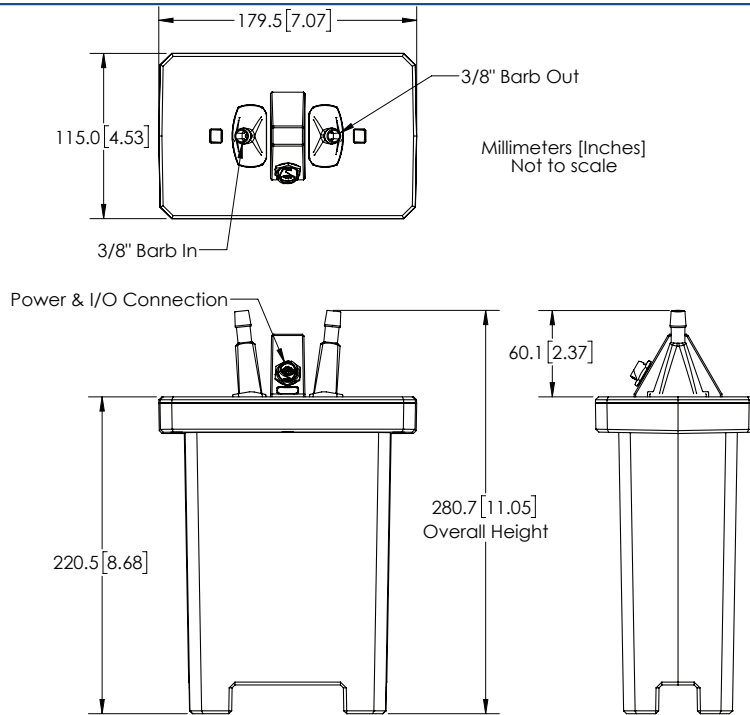
Note: Mounting Cradle is required for CE compliance

CSEN-8103-C-152 Sensor (3 – 60 kg/min or l/min, 3/4" Barb)

3/4" Barb Connections, Standard Vertical Inlets Configuration

219.8 [8.66]

135.0 [5.31]

3/4" Barb Out

3/4" Barb In

Power & I/O Connection

Millimeters [Inches]
Not to scale

87.6 [3.45]

363.1 [14.30]
Overall Height

275.5 [10.85]

C

**3/4"
BARB**

CSEN-8103-C-153 Sensor (5 – 100 kg/min or l/min, 1" TC)

1" - 1 1/2" Tri-Clamp Connections, Standard Vertical Inlets Configuration
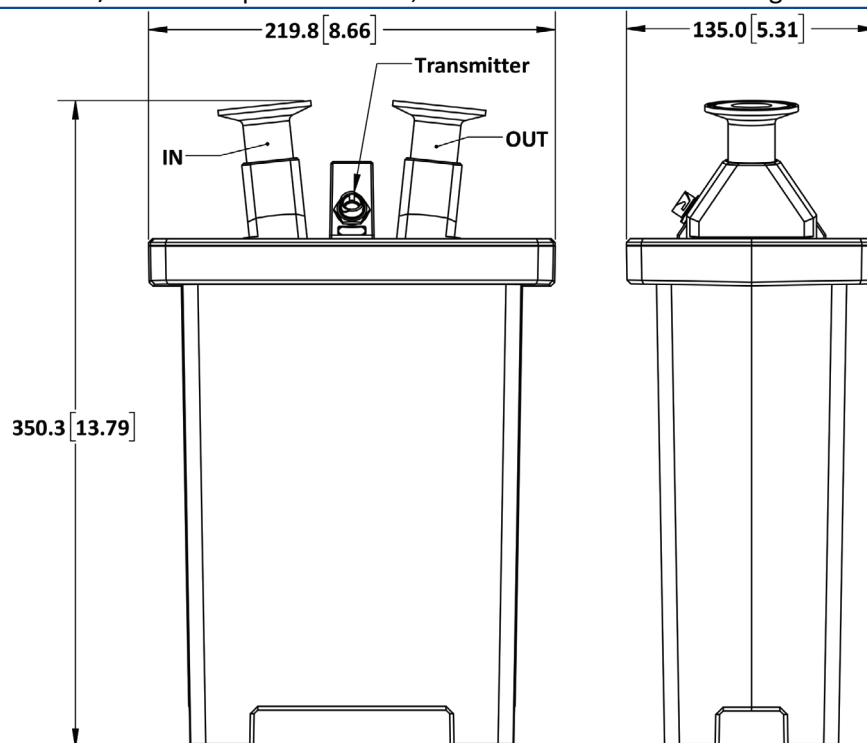
219.8 [8.66]

135.0 [5.31]

Transmitter

IN

OUT

350.3 [13.79]

C

**1"
TC**

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IM.SUMOFLO.S3/024150

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Single-Use Sensor Dimensions (Continued)
FOR REFERENCE ONLY
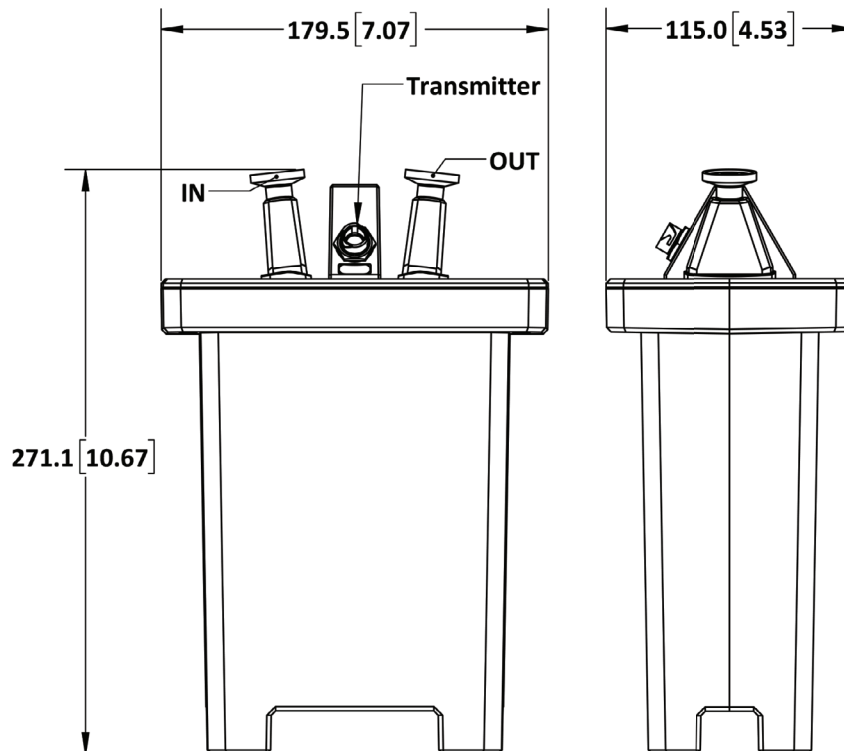Note: Mounting Cradle is required for CE compliance

C
1"
BARB

CSEN-8103-C-153 Sensor (5 – 100 kg/min or l/min, 1" Barb)
1" Barb Connections, Standard Vertical Inlets Configuration

1" Barb Out

Millimeters [Inches]
Not to scale

1" Barb In

Power & I/O Connection

88.4 [3.48]

363.9 [14.33]
Overall Height

275.5 [10.85]

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Singapore 739257
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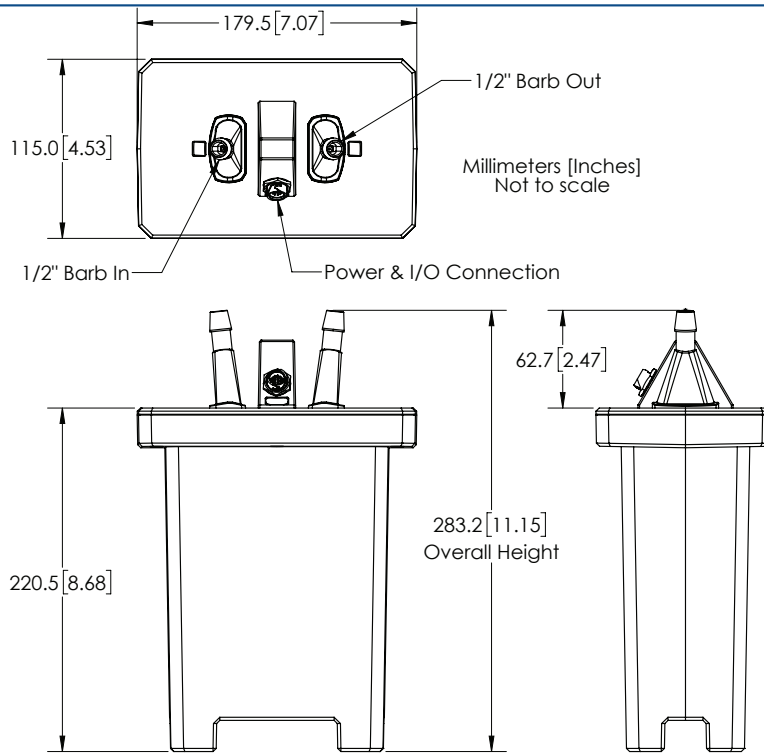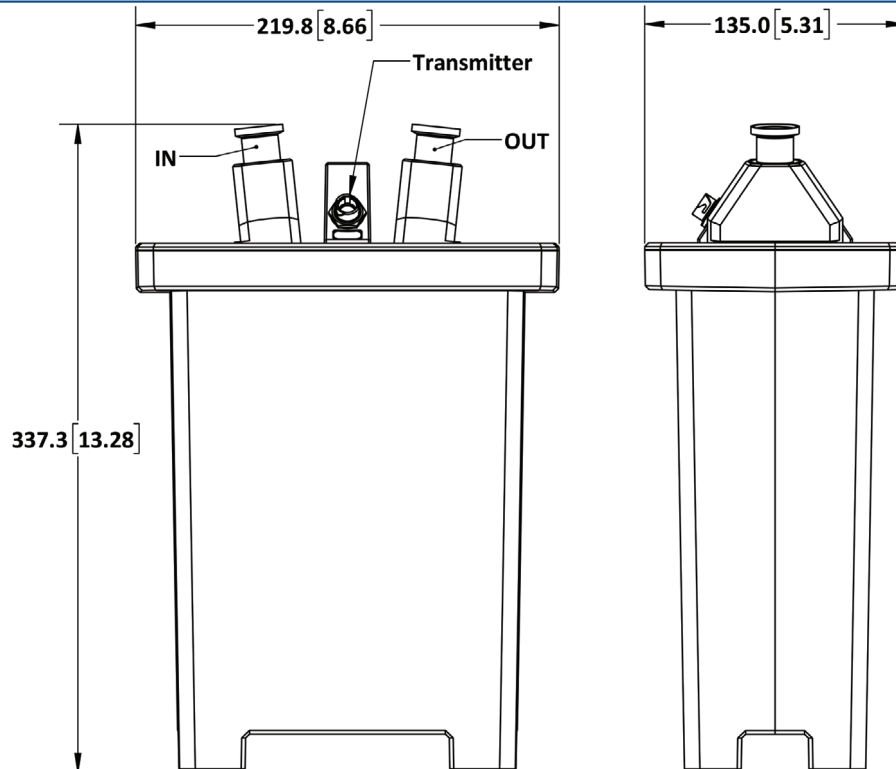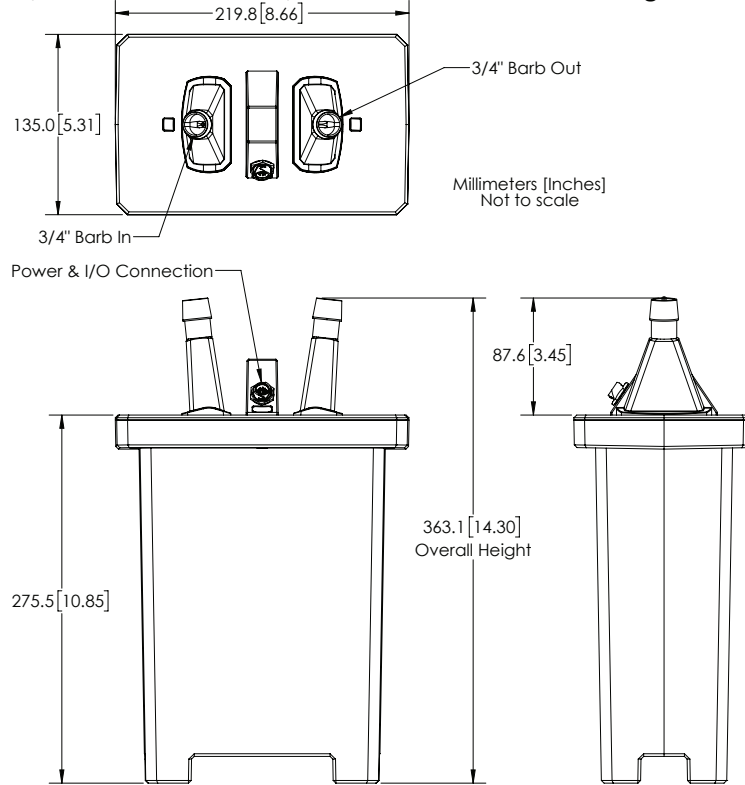## Single-Use Sensor Dimensions (Continued)
FOR REFERENCE ONLY
Note: Mounting Cradle is required for CE compliance

CSEN-8103-P-062 Sensor (0.25 – 5 kg/min or l/min, 1/4")
1/4" Barb Connections, Panel Mount Configuration

179.5 [7.07]
115 [4.53]
1/4" Barb Out
1/4" Barb In
Millimeters [Inches]
Not to scale
2X 55.6 [2.19] Barb Height
276.1 [10.87] Nominal Overall Height
220.5 [8.68]
Power & I/O Connection

CSEN-8103-P-063 Sensor (0.45 – 9 kg/min or l/min, 3/8")
3/8" Barb Connections, Panel Mount Configuration

179.5 [7.07]
115 [4.53]
3/8" Barb Out
3/8" Barb In
Millimeters [Inches]
Not to scale
2X 60.1 [2.37] Barb Height
280.7 [11.05] Nominal Overall Height
220.5 [8.68]
Power & I/O Connection

P
**1/4"
BARB**

P
**3/8"
BARB**

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Single-Use Sensor Dimensions (Continued)
FOR REFERENCE ONLY
Note: Mounting Cradle is required for CE compliance

P
1/2"
BARB

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CSEN-8103-P-082 Sensor (1 – 20 kg/min or l/min, 1/2")
1/2" Barb Connections, Panel Mount Configuration

- 179.5[7.07]
- 115.0[4.53]
- 1/2" Barb Out
- 1/2" Barb In
- Millimeters [Inches] Not to scale
- 62.7[2.47]
- 283.2[11.15] Overall Height
- 220.5[8.68]
- Power & I/O Connection

P
3/4"
BARB
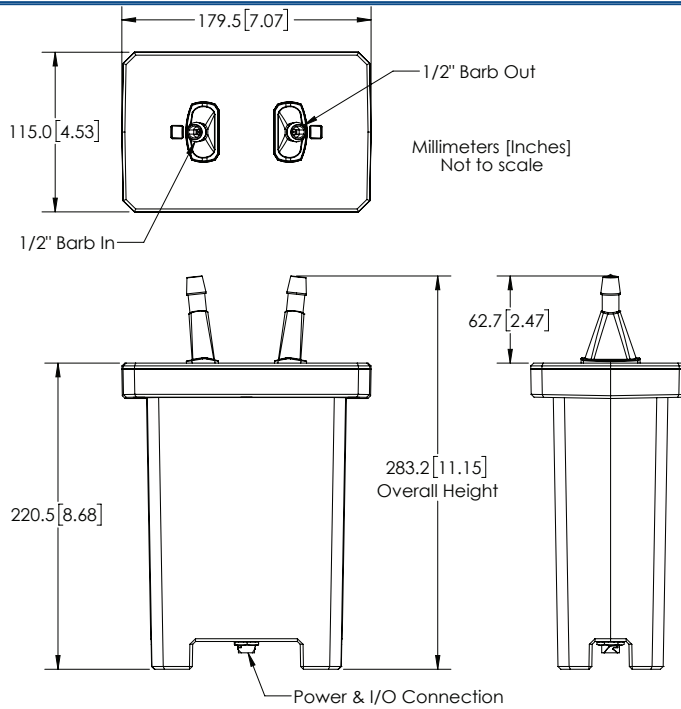
CSEN-8103-P-152 Sensor (3 – 60 kg/min or l/min, 3/4")
3/4" Barb Connections, Panel Mount Configuration

- 219.8[8.66]
- 135.0[5.31]
- 3/4" Barb Out
- 3/4" Barb In
- Millimeters [Inches] Not to scale
- 87.6[3.45]
- 363.1[14.30] Overall Height
- 275.5[10.85]
- Power & I/O Connection
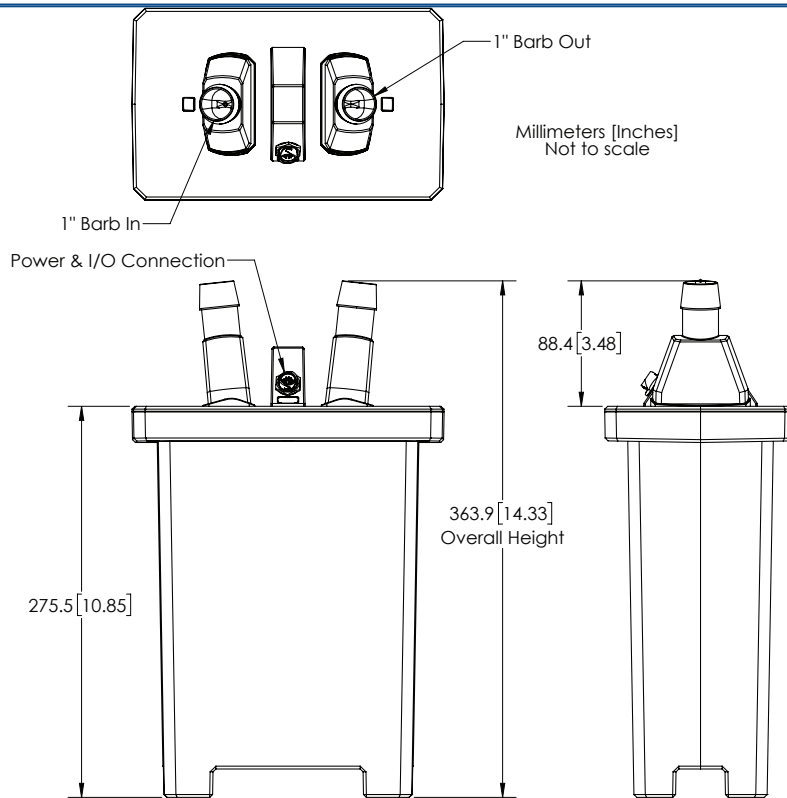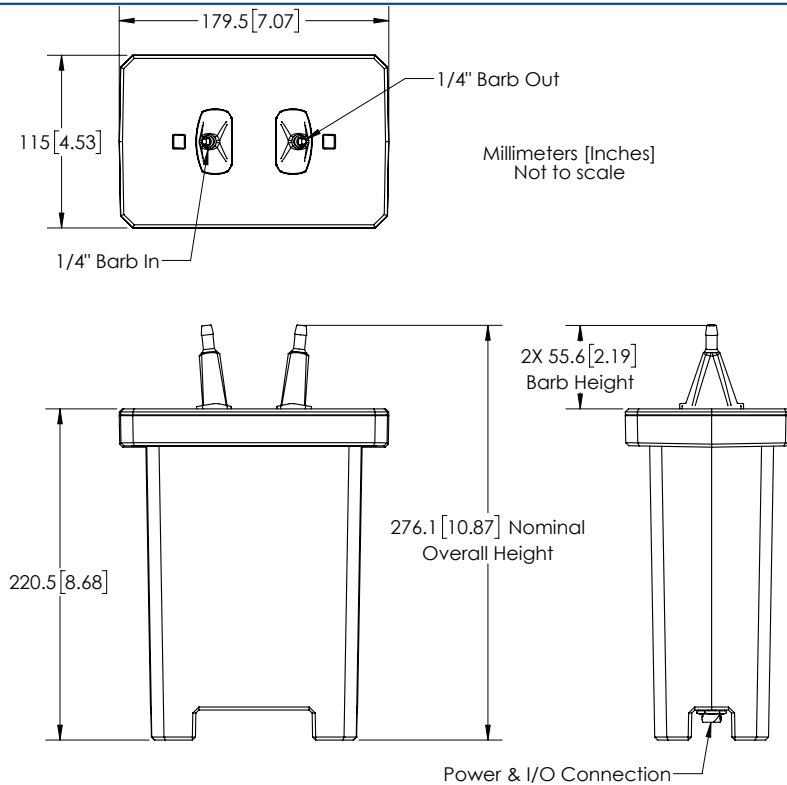
IM.SUMOFLO:S3/024150

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Single-Use Sensor Dimensions (Continued)
FOR REFERENCE ONLY

Note: Mounting Cradle is required for CE compliance

CSEN-8103-P-153 Sensor (5 – 100 kg/min or l/min, 1")
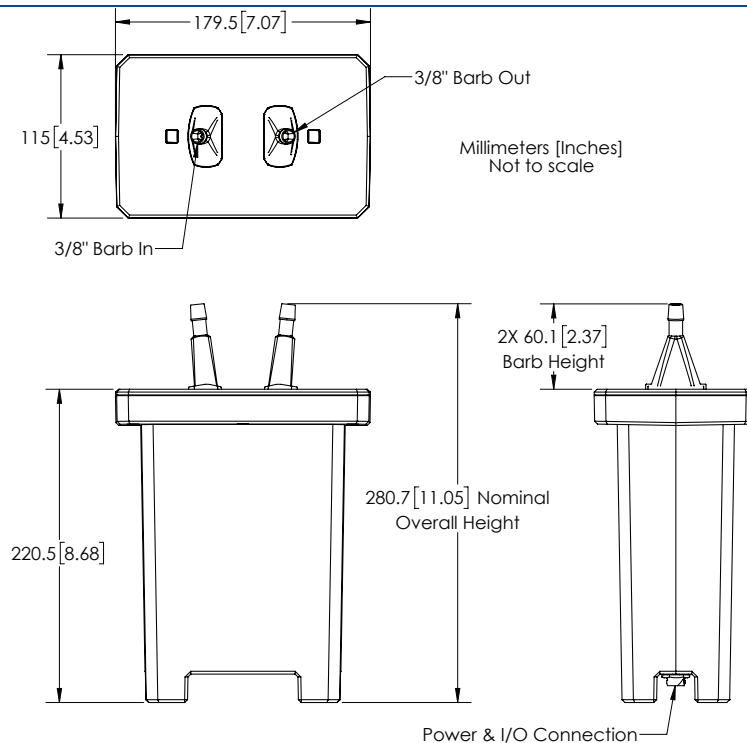1" Barb Connections, Panel Mount Configuration
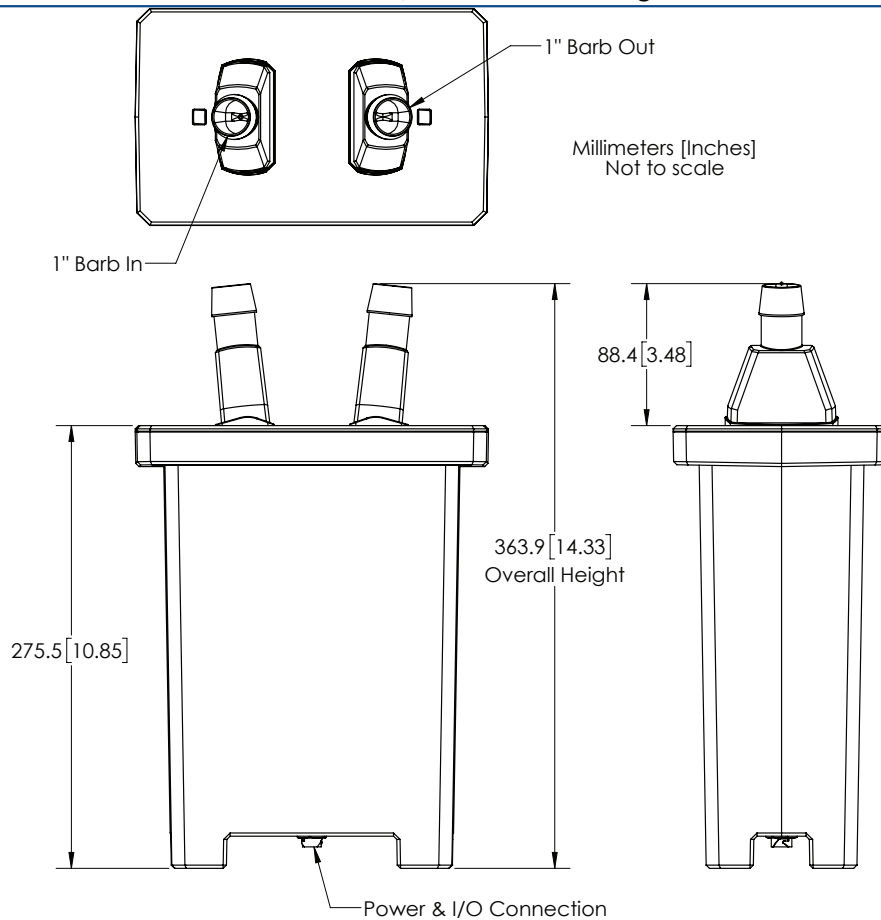
1" Barb Out

1" Barb In

Millimeters [Inches]
Not to scale

88.4 [3.48]

363.9 [14.33]
Overall Height

275.5 [10.85]

Power & I/O Connection

P
1"
BARB

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Single-Use Sensor Dimensions (Continued)

FOR REFERENCE ONLY
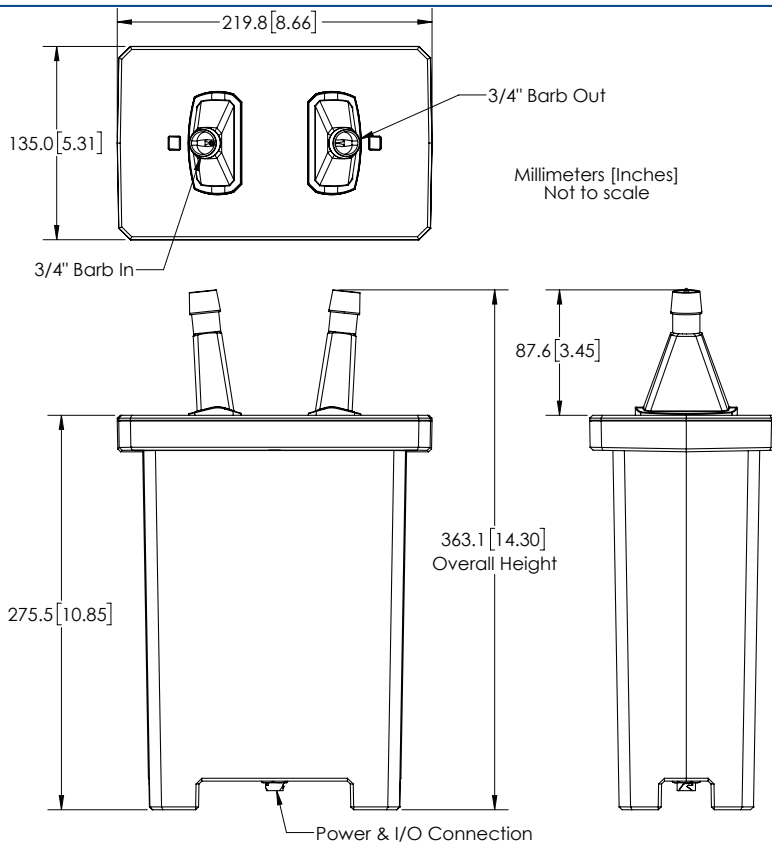
Note: Mounting Cradle is required for CE compliance

T
3/8"
BARB

CSEN-8103-T-063 Sensor (0.18 – 9 kg/min or l/min, 3/8")

3/8" Barb Connections, Added height Inline Configuration

179.6 [7.07]

3/8" Barb Out

115.0 [4.53]

Millimeters [Inches]
Not to scale

3/8" Barb In

56.7 [2.23]

85.2 [3.36]

305.7 [12.04]
Overall Height

220.5 [8.68]

Power & I/O Connection

T
1/2"
BARB
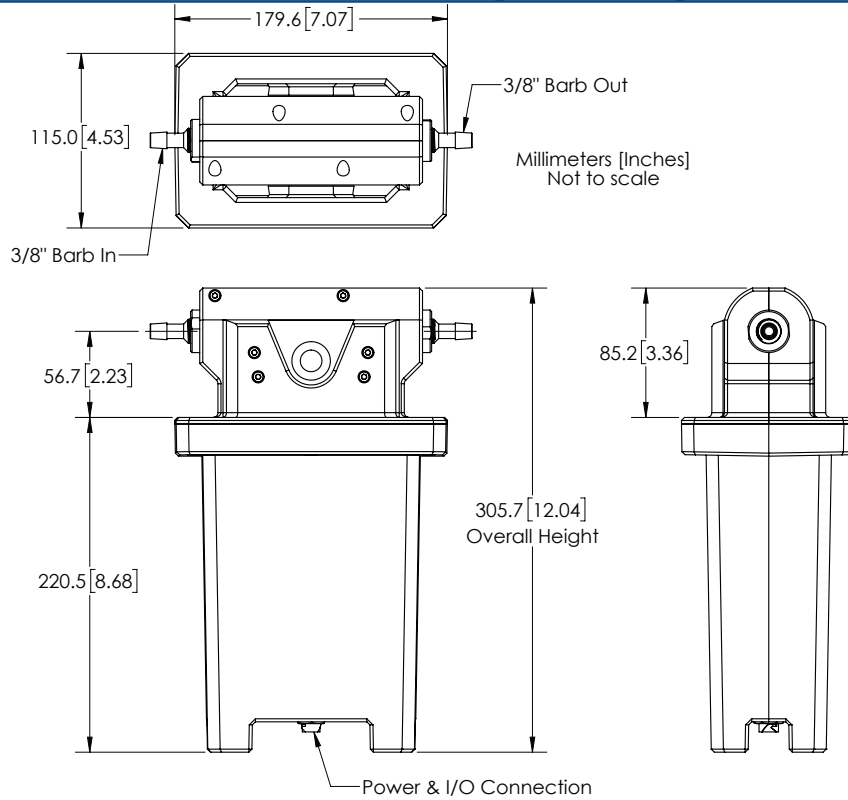
CSEN-8103-T-082 Sensor (0.4 – 20 kg/min or l/min, 1/2")
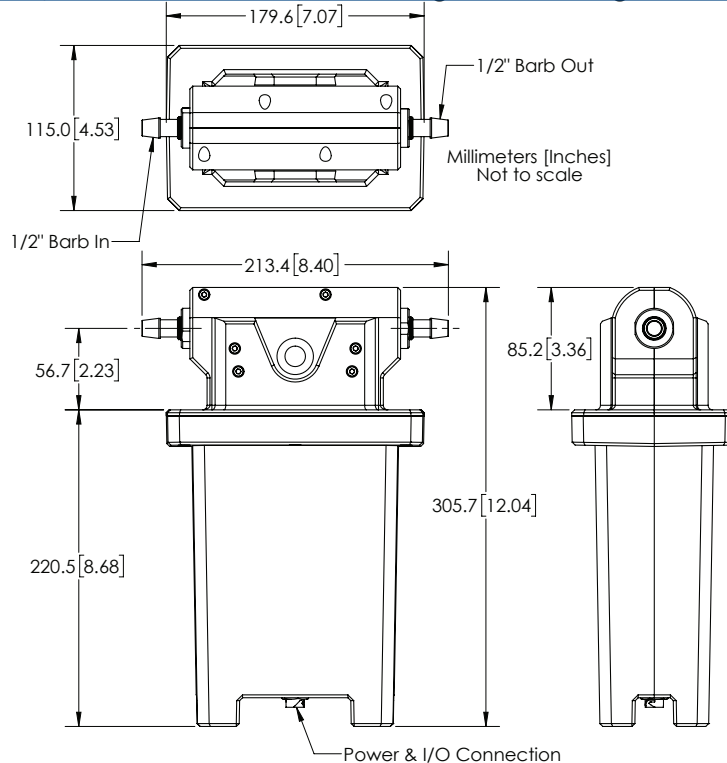
1/2" Barb Connections, Added height Inline Configuration

179.6 [7.07]

1/2" Barb Out

115.0 [4.53]

Millimeters [Inches]
Not to scale

1/2" Barb In

213.4 [8.40]

56.7 [2.23]

85.2 [3.36]

305.7 [12.04]

220.5 [8.68]

Power & I/O Connection

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Mounting Cradle Dimensions
FOR REFERENCE ONLY

Note: Mounting Cradle is required for CE compliance

ENCL-MOUNT-8103-U08-001
Mounting Cradle for 1/8" sensors

86.9[3.42]

84.0 +6.0/0.0 [3.31 +.24/-.00]

Millimeters [Inches]
Not to scale

4X 8.0[.31]

115.3[4.54]

96.5[3.80]

125.0[4.92]

104.0[4.09]

2X R44.7[1.76] LATCH CLEARANCE
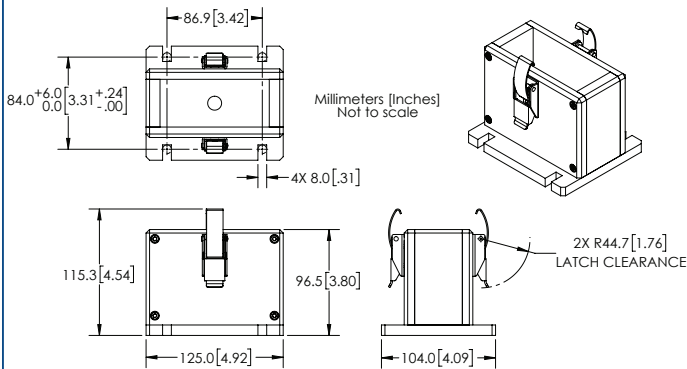
ENCL-MOUNT-8103-08-007
Standard Mounting Cradle for 1/4, 3/8, and 1/2" sensors

223.6[8.80]

111.8[4.40]

6X Ø6.4[.25]

165.8[6.53]

193.8[7.63]

251.6[9.91]

Millimeters [Inches]
Not to scale

R218.9[8.62] LID CLEARANCE

46.2[1.82]

10.3[.40]

349.8[13.77]
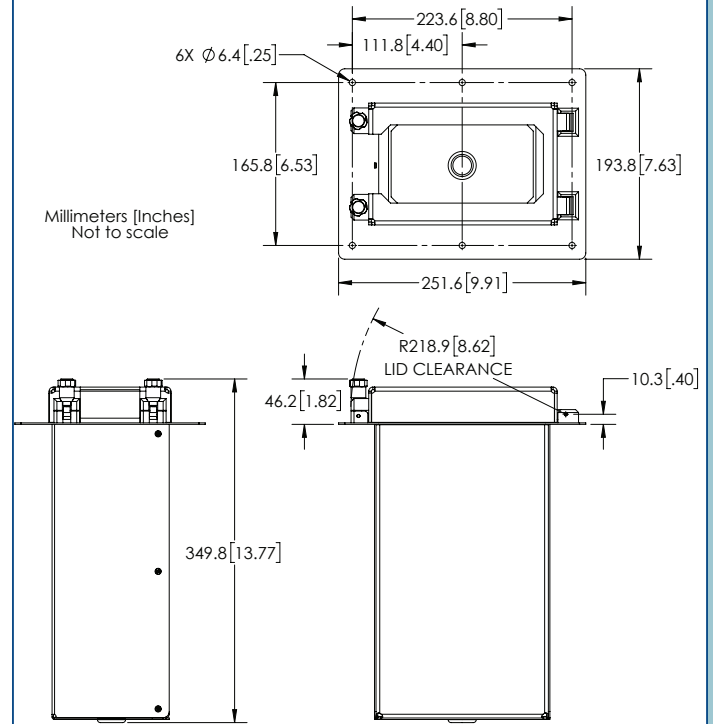
ENCL-MOUNT-8103-08-003
Special Mounting Cradle for 1/4", 3/8", and 1/2" sensors

4X 6.6[0.26] X 40.0[1.57] THRU ALL

188.1[7.41]

144.0[5.67]

170.0[6.69]

Millimeters [Inches]
Not to scale

286.0[11.26]

R218.9[8.62] LID CLEARANCE

83.4[3.28]

42.8[1.68]

2X SPACERS REQ'D 10.0[.39] THICK EA.

294.5[11.59]
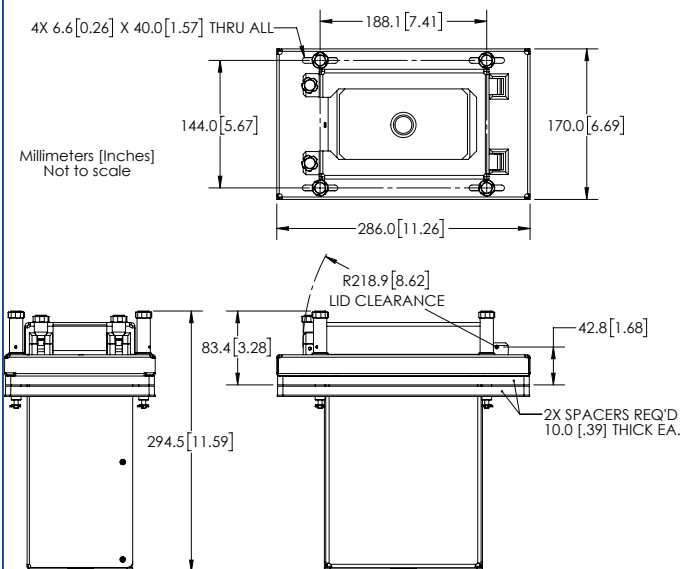
ENCL-MOUNT-8103-08-005
Mounting Flange for 1/4", 3/8", and 1/2" sensors
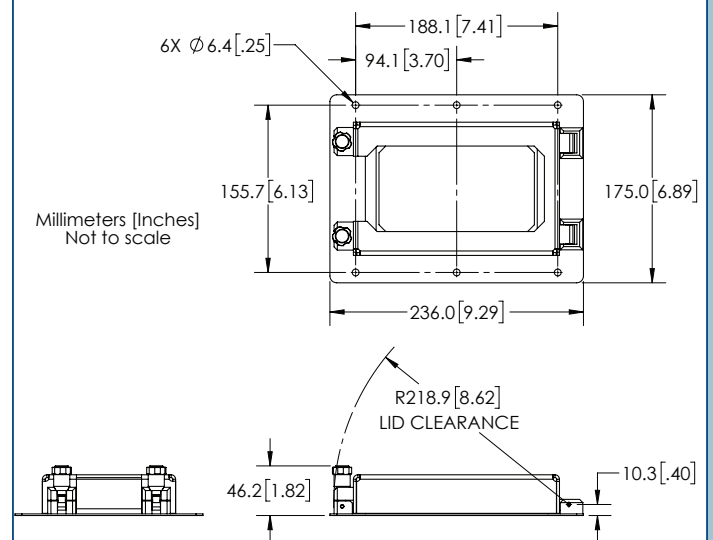
188.1[7.41]

6X Ø6.4[.25]

94.1[3.70]

155.7[6.13]

175.0[6.89]

Millimeters [Inches]
Not to scale

236.0[9.29]

R218.9[8.62] LID CLEARANCE

46.2[1.82]

10.3[.40]

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Mounting Cradle Dimensions (Continued)

FOR REFERENCE ONLY

Note: Mounting Cradle is required for CE compliance

ENCL-MOUNT-8103-15-001
Mounting Flange for 3/4" and 1" sensors

228.5 [9.00]
6X ⌀ 5.1 [.20]
114.3 [4.50]
175.8 [6.92]
189.0 [7.44]

Millimeters [Inches]
Not to scale

275.5 [10.85]

R256.4 [10.09]
LID CLEARANCE

46.2 [1.82]
10.3 [.40]
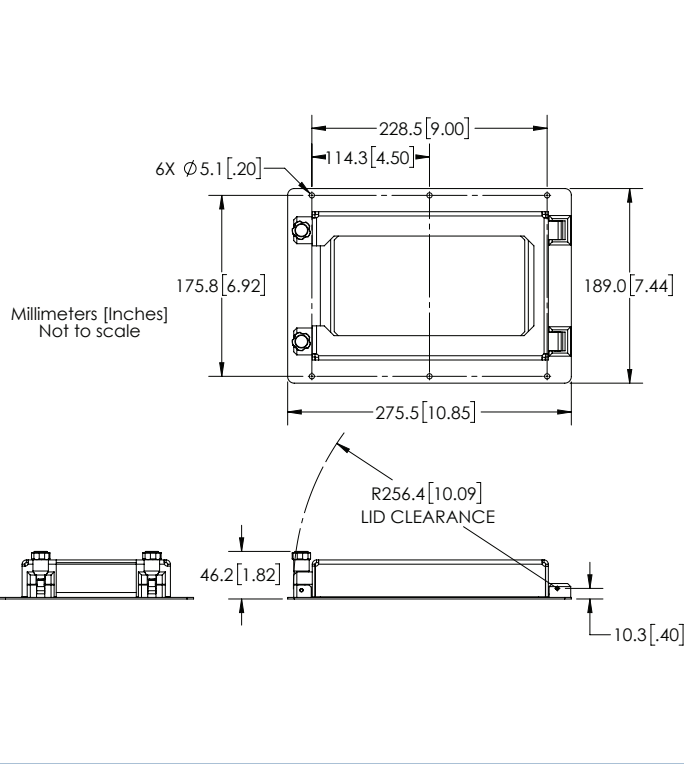
ENCL-MOUNT-8103-15-002
Mounting Cradle for 3/4" and 1" sensors
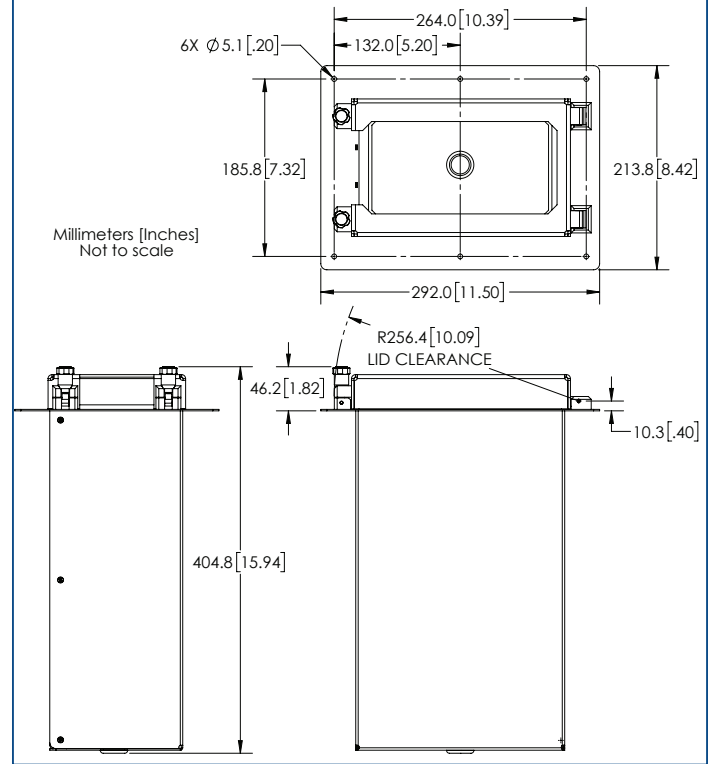
264.0 [10.39]
6X ⌀ 5.1 [.20]
132.0 [5.20]
185.8 [7.32]
213.8 [8.42]

Millimeters [Inches]
Not to scale

292.0 [11.50]

R256.4 [10.09]
LID CLEARANCE
46.2 [1.82]
10.3 [.40]

404.8 [15.94]

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IM.SUMOFLO:S3/024150

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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 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)

Problem Statement: No analog flow output even with physical flow running		
Noted Symptom	**Possible Cause**	**Follow up checks and possible fix**
Flow readings on Malema GUI are zero	Incorrect flow direction.	Ensure physical flow direction is in accordance with the labels on the flowmeter.
	Huge zero offset	Zeroing must be done properly - zeroing should be done with any liquid (DI Water or WFI for example), preferably without bubbles in the line. See page 7 for zeroing procedure.
	Incorrect parameters	Ensure sensor parameters have not been accidentally changed. If needed, contact Malema for factory parameters and reset the parameters.
	Faulty Electronics	Open Malema GUI and monitor Flow readings. If readings drop to zero sporadically (intermittent readings), check and record a sequence of events how such drop occurs and how it recovers, e.g. flow rate change, pump speed change, liquid temperature change, power cycle, etc. and communicate to Malema for further guidance.
Flow readings on Malema GUI shows valid and stable flow rates	Analog output wiring connection is incorrect	Check analog output wiring to tool's input/output interface. Make sure wiring is connected correctly and all terminals are clean and secured. Please note - if the analog output is wired incorrectly, permanent damage can be caused to the Malema sensor circuit board.
	Load resistance or impedance of input/output terminal not within specification	Confirm if load resistance or impedance of external input/output terminal is within specification. Max. Load < 900 ohms in case of current output and min. impedance > 10 K Ohm in case voltage output.
	Analog output of the transmitter is bad	Check analog signal directly on analog output wires of the transmitter (with the wires not connected to tool's input/output interface). Please consult factory if the analog output is bad or incorrect.

Flow readings on Malema GUI shows an unstable flow rate	Bubbles in the line.	Check for large bubbles in the line (in excess of 30% by volume) and if needed purge the line.
	Actual flow is unstable	Check flow and pressure stability and take necessary actions to fix it
	Electrical noise in tool analog input/output board	Check signal with oscilloscope; if noisy, find source of noise and repair
	Issues with Power supply	Make sure power supply is able to supply required current; 24 V DC supplied is stable and clean; if required repair or replace power supply

Problem Statement: Accuracy is off - unacceptable difference between flow readings and observed flow rate

Noted Symptom	Possible Cause	Follow up checks and possible fix
Flow readings on GUI are different from what's transmitted to tool software interface	Analog output wiring connection is incorrect	Check analog output wiring to tool's input/output interface. Make sure wiring is connected correctly and all terminals are clean and secured. Please note - if the analog output is wired incorrectly, permanent damage can be caused to the Malema sensor circuit board.
	Load resistance or impedance of input/output terminal not within specification	Confirm if load resistance or impedance of external input/output terminal is within specification. Max. Load< 900 ohms in case of current output and min. impedance> 10 K Ohm in case voltage output.
	Analog output of the flowmeter is bad	Check analog signal directly on analog output wires of the meter (with the wires not connected to tool's input/output interface).Please consult factory if the analog output is bad or incorrect.
	Wrong parameter settings	Check parameter settings of the meter such as full scale and flow unit, flow meter analog output specification (e.g. voltage vs. current outputs), scaling setting on tool's software, etc.
Flow readings on GUI are identical to what's transmitted to tool software interface	Huge Zero offset	Zero must be done properly - zeroing should be done with any liquid (DI Water or WFI for example), preferably without bubbles in the line. See page 7 for zeroing procedure.

Service Contacts

For service support or technical assistance, please contact the Malema Engineering Corp. Technical Support Team at:

TEL: +1 (800) 637-6418
+1 (408) 970-3419
E-mail: technicalsupport@malema.com

Service and Repair

To return the products, please obtain an RMA number for the product by contacting the Malema Sensors Life Sciences Division, San Jose, California, USA, at +1 (800) 637-6418 or +1 (408) 970-3419, or email bio@malema.com.

Unless otherwise specified with the RMA number, all equipment must be returned to the following address:

Malema Sensors
2329 Zanker Road
San Jose, CA 95131, USA

Kindly note: Flow sensors cannot be returned once exposed to gamma radiation.

Warranty

Malema Sensors warrants to the buyer that its products are free from defects in materials and workmanship at the time of shipment and during the WARRANTY PERIOD. Malema Sensors's obligation under this warranty is limited to the replacement of the product(s) by same product(s) manufactured by Malema Sensors or repair of the product(s) at the Malema Sensors's facility.

Malema Sensors products are sold with the understanding that the buyer has determined the applicability of the product(s) to its intended use. It is the responsibility of the buyer to verify acceptability of performance to the actual conditions of use. Performance may vary depending upon these actual conditions.

Warranty Period

This warranty is in effect for twelve (12) months from the date of shipment from Malema Sensors's place of business.

Warranty Claim

If Malema Sensors® products are found to be defective in materials or workmanship within twelve (12) months of the date of shipment, they will be repaired or replaced with same product at the discretion of Malema Sensors at its place of business at no charge to the buyer.

SumoFlo® CPFM-8103 — SINGLE-USE CORIOLIS FLOW METER

Ordering Information - Electronics

Category	**													Description
CELE-8103	-	*	-	*	*	*	*	*	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									1x 4-20mA, 1x D/O
					2									1x 4-20mA, 2x D/O
					3									1x 4-20mA, 1x D/O, MODBUS (RS485)
					7									4x 4-20mA, 0x D/O
					8									2x 4-20mA, 1x D/O, MODBUS (RS485)
					9									3x 4-20mA, 1x D/O
					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-8103	-	**	-	***	**Mounting Cradle**
Size		U08		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

Ordering Information - Sensor

Model Ordering Code											Description
CSEN-8103	-	*	-	***	*	*	*	*	*	-	***	PEEK Sensor

Sensor Type												Description
Sensor Type	C											CE Compliant Sensor
		-										

Range Code						Description
	031					20 – 1,500 g/min
	061					35 - 3,000 g/min
	062					50 - 5,000 g/min
	063					180 - 9,000 g/min
	082					0.25 - 20 kg/min
	152					1.5 - 60 kg/min
	153					3 - 100 kg/min

Temperature Sensor		Description
	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		Description
	0	No Sterilization
	1	Gamma Irradiated to 50 kGy
	Z	Other Requests (Consult Factory)

Fluid Connections		Description
	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		Description
	H	Horizontal *
	V	Vertical (flow ports pointing upwards)**
	A	Angled 45° (flow ports pointing downwards)

Calibrations and Outputs		Description
	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

		Description
	- XXX	Unique PN Identifier

*   Factory recommended option for all sizes except RC 031   **   Factory recommended option for RC 031

www.malema.com

IM.SUMOFLO:S3/024150