

## Coriolis Quick User Manual



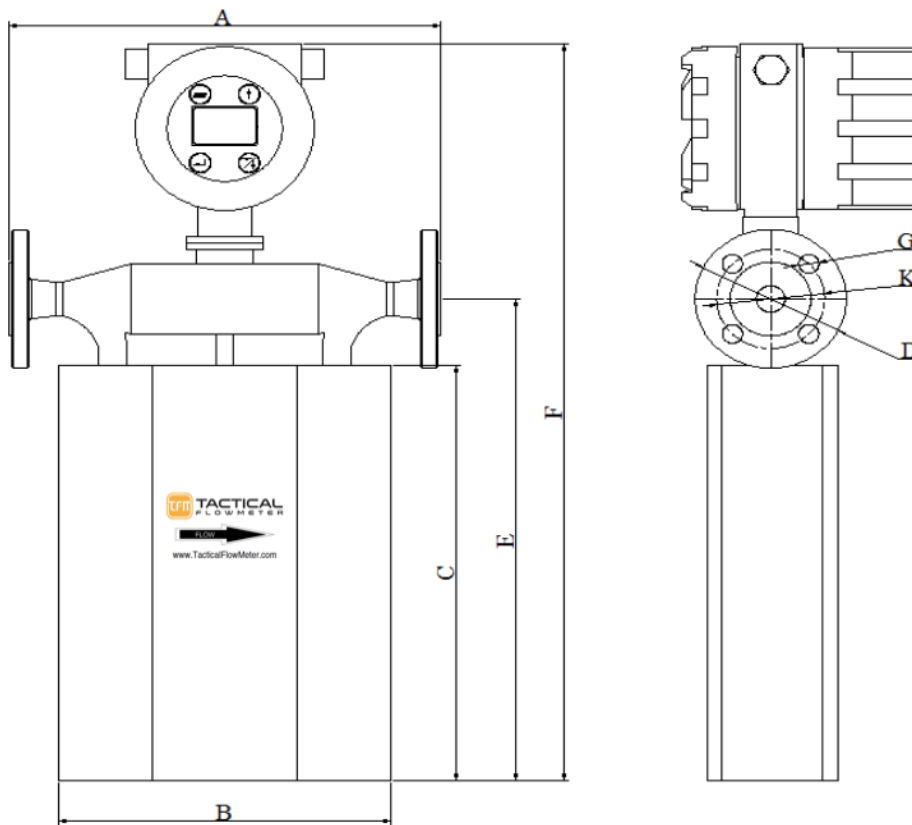
### Flow Meter General Specifications

**Features LARGE LCD display, shows the Instantaneous (Instant) Flow Rate, Total Flow, Temperature, and Density in user selectable units.**

- CORIOLIS MASS FLOW METER SPECIFICATIONS.
- Wetted Materials all 316 SS
- Flows from 100 kg/h to 200,000 kg/h relative to water
- Accuracy: +/- 0.2% of reading in gas or water. 0.1% available on special order.
- Repeatability of +/- 0.02% of reading
- 1/2" to 4" 150# ANSI Flange Connections, up to 6" available custom.
- LCD Display
- Temperature Accuracy +/- 1 Deg C
- Temperature:
  - Gas: -58°F (-50°C) to 257°F (125°C)
  - Ambient: -40°F (-40°C) to 131°F (55°C)

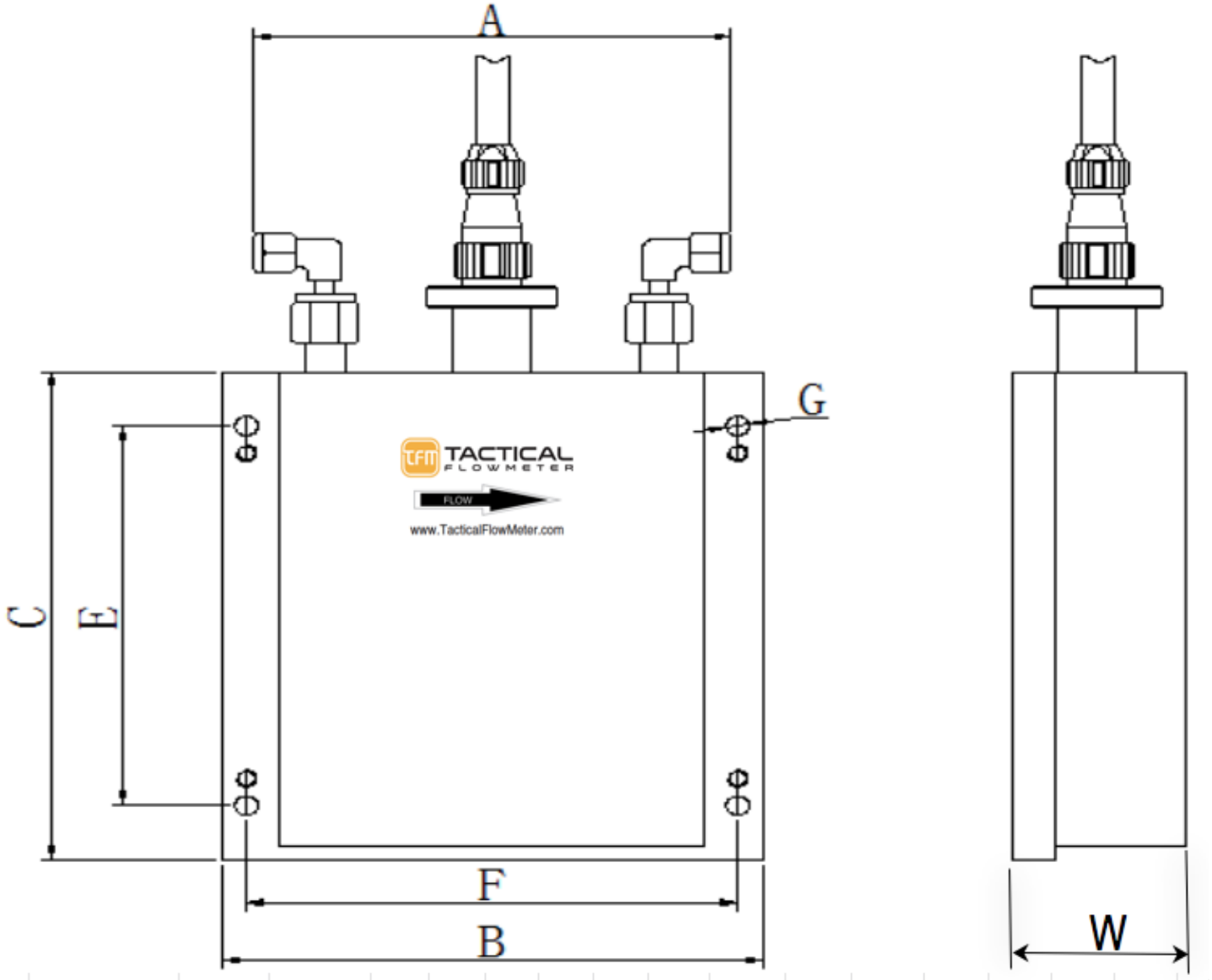
- Power Requirement: 24 VDC or 85-220 VAC, 15 Watts maximum;
- Output signals: Modbus RTU, 4–20 mA, and 0-10 KHz for flow rate indication
- Digital communications: Modbus RTU
- Proof Pressure 4.0 MPa, 580 PSIG.
- Display: Flow rate, Total flow, Temperature, and Density
- Wiring connection to enclosure size: M20 x 1.5
- Factory Final QC Test Certificate
- Integral Electronics installation
- Explosion Proof Rating: ExdiblICT5Gb
- Electronics Enclosure NEMA 4X / IP67

### Coriolis Mass Flow Meter Dimensions- U Series



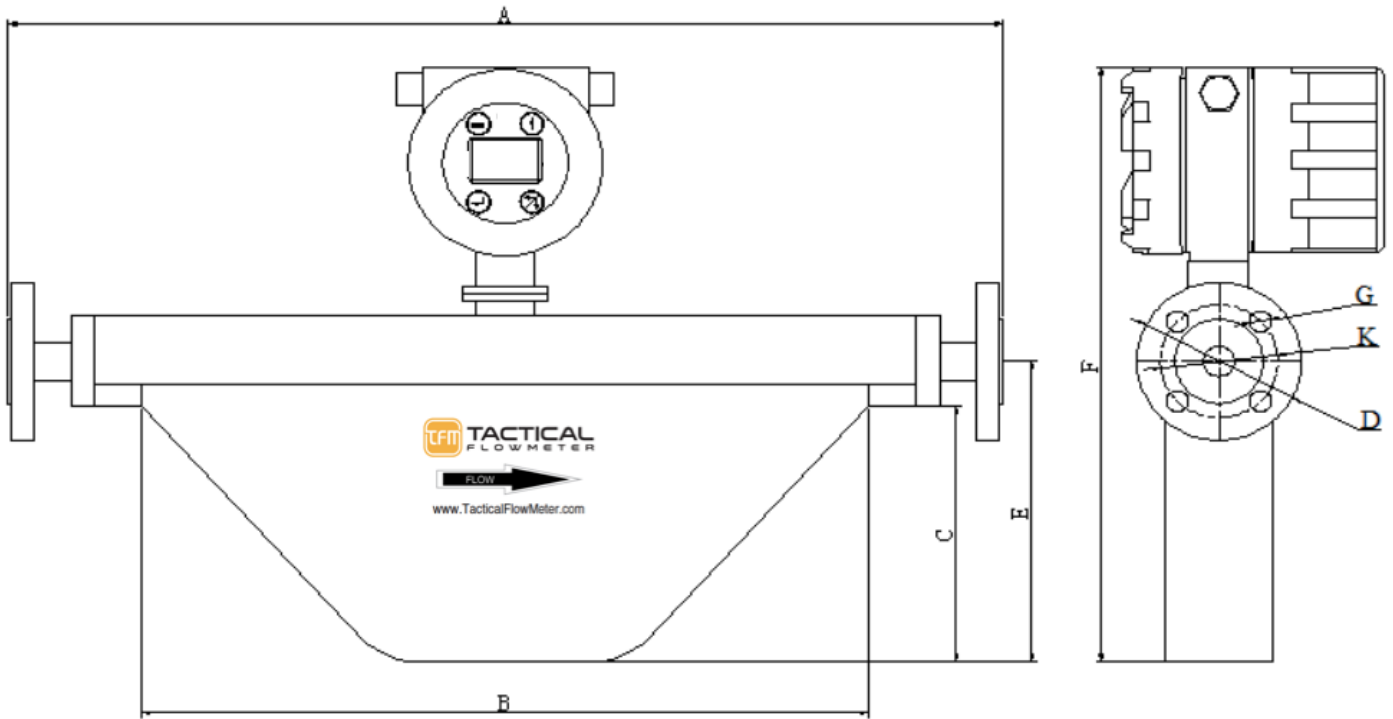
Model	150 Lb Flange Size	DN Size	A		B		C		d		K-Dia		N			F		D		E		Meter Weight		Flow Range	
			Pipe length		Body Width		Body Height		RFF ID		Bolt Dia		N (# Bolts)/ Dia			F Meter height		Flange OD		To C/L		Weight		Max	
			Inch	mm	Inch	mm	Inch	mm	Inch	mm	inch	mm	N	inch	mm	inch	mm	inch	mm	inch	mm	Lb	Kg	lbs/min	kg/h
DMF-1-3-A	3/8"	10	11.42	290	8.27	210	9.25	235	1.38	35	2.38	60.45	4	0.618	15.7	21.06	535	3.50	88.9	11.22	285	24.2	11	18.4	500
DMF-1-3B	1/2"	15	11.42	290	8.27	210	10.83	275	1.38	35	2.38	60.45	4	0.618	15.7	21.06	535	3.50	88.9	12.80	325	24.2	11	36.7	1000
DMF-1-4	3/4"	20	12.01	305	9.06	230	12.80	325	1.69	42.9	2.75	69.85	4	0.618	15.7	23.03	585	3.88	98.6	14.76	375	30.8	14	110.2	3000
DMF-1-5A	1"	25	16.14	410	11.81	300	17.32	440	2.00	50.8	3.12	79.25	4	0.618	15.7	27.80	706	4.25	108	19.69	500	39.6	18	367.4	10000
DMF-1-5B	1 1/2"	40	20.47	520	14.17	360	18.90	480	2.88	73.15	3.88	98.6	4	0.618	15.7	31.50	800	5.00	127	23.03	585	63.8	29	734.9	20000
DMF-1-6A	2"	50	21.65	550	14.57	370	21.57	548	3.62	91.9	4.75	120.7	4	0.752	19.1	34.45	875	6.00	152.4	26.38	670	72.6	33	1102.3	30000
DMF-1-6AB	2 1/2"	65	22.05	560	17.32	440	23.62	600	4.12	104.6	5.50	139.7	4	0.752	19.1	36.85	936	6.98	177.3	28.15	715	96.8	44	1837.2	50000
DMF-1-6B	3"	80	23.62	600	18.50	470	25.59	650	5.00	127	6.00	152.4	4	0.752	19.1	39.57	1005	7.50	190.5	31.38	797	116.6	53	3674.4	100000
DMF-1-6C	4"	100	26.38	670	20.08	510	29.13	740	6.19	157.2	7.50	190.5	8	0.752	19.1	43.78	1112	9.00	228.6	33.78	858	154	70	5511.6	150000
DMF-1-6CD	5"	125	26.38	670	20.08	510	29.13	740	7.31	185.7	8.50	215.9	8	0.882	22.4	43.78	1112	10.00	254	33.78	858	176	80	7348.7	200000
DMF-1-6D	6"	150	33.46	850	26.38	670	37.40	950	8.50	215.9	9.50	241.3	8	0.882	22.4	55.31	1405	11.00	279.4	44.49	1130	396	180	18371.9	500000
DMF-1-6E	8"	200	33.46	850	26.38	670	37.40	950	10.62	269.7	11.75	298.5	8	0.882	22.4	55.31	1405	13.50	342.9	44.49	1130	440	200	29395.0	800000

### Coriolis Mass Flow Meter Dimensions- Micro Flow Series



Model	Tube Size	DN Size	A		B		C		F		D		W		E		Meter Weight		Flow Range	
			Pipe length		Body Width		Body Height		F Meter height		Flange OD		Width Body		To C/L		Weight		Max	
			Inch	mm	Inch	mm	Inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Lb	Kg	lbs/min	kg/h
DMF-1-1-A	1/8"	3 mm OD	6.30	160	6.50	165	7.09	180	5.91	150	X	X	2.09	53.00	5.51	140	24.2	11	1.47	40
DMF-1-1-B	1/4"	6 mm OD	6.30	160	6.50	165	7.09	180	5.91	150	X	X	2.09	53.00	5.51	140	24.2	11	3.67	100
DMF-1-2-A	1/4"	6 mm OD	6.89	175	8.19	208	9.65	245	7.40	188	X	X	2.09	53.00	7.28	185	24.2	11	7.35	200

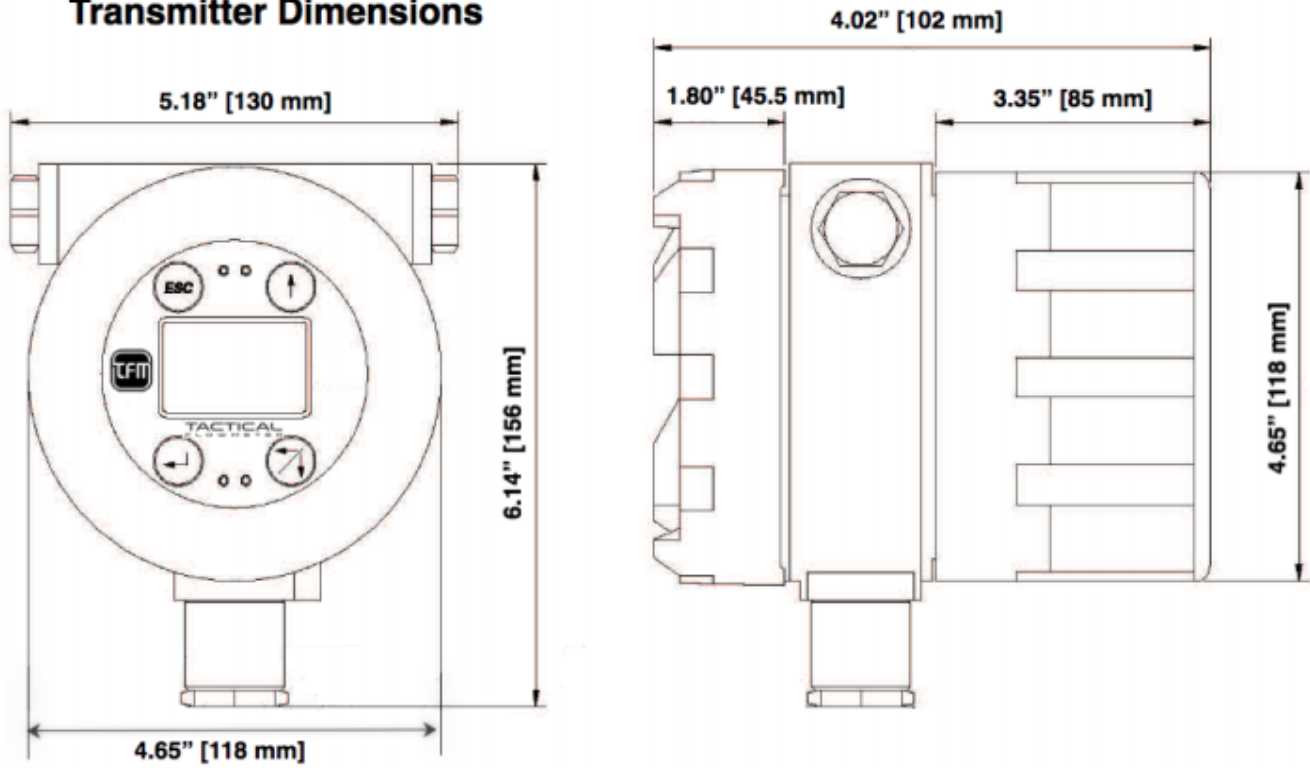
### Coriolis Mass Flow Meter Dimensions- V Series



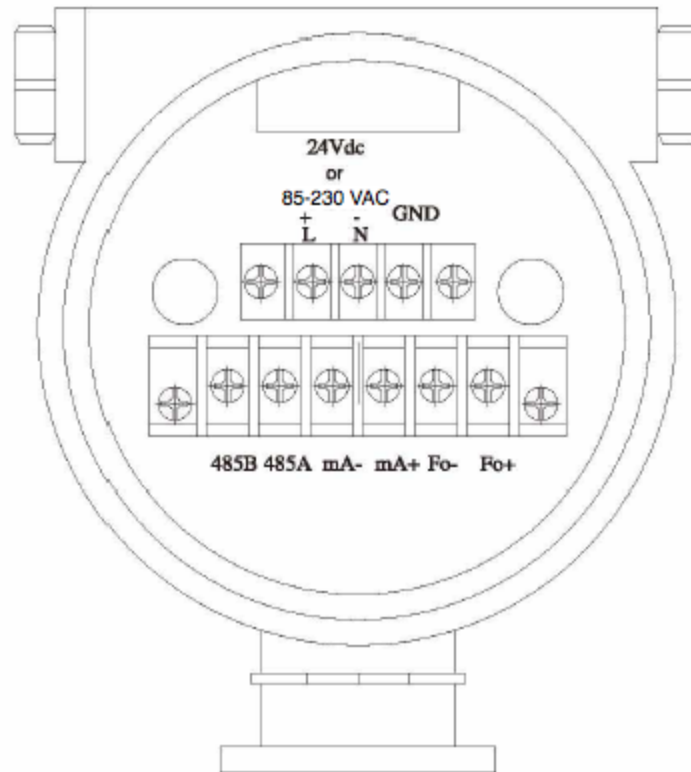
Model	150 Lb Flange Size	DN Size	A		B		C		d		K-Dia		N		F		D		E		Meter Weight		Flow Range		
			Pipe length		Body Width		Body Height		RFF ID		Bolt Dia		N (# Bolts)/ Dia		F Meter height		Flange OD		To C/L		Weight		Max		
			Inch	mm	Inch	mm	Inch	mm	Inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Lb	Kg	lbs/min	kg/h	
DMF-1-3-V10	3/8"	10	20.67	525	14.17	360	5.20	132	1.38	35	2.38	60.45	4	0.62	15.7	14.76	375	3.50	88.9	6.30	160	35.2	16	7.3	200
DMF-1-3-V15	1/2"	15	22.64	575	14.17	360	5.20	132	1.38	35	2.38	60.45	4	0.62	15.7	15.55	395	3.50	88.9	6.69	170	35.2	16	18.4	500
DMF-1-4-V20	3/4"	20	25.98	660	16.14	410	5.98	152	1.69	42.9	2.75	69.85	4	0.62	15.7	16.34	415	3.88	98.6	7.48	190	37.4	17	110.2	3000
DMF-1-5-V25	1"	25	29.53	750	20.28	515	6.22	158	2.00	50.8	3.12	79.25	4	0.62	15.7	16.93	430	4.25	108	8.07	205	55	25	36.7	1000
DMF-1-6-V50	2"	5	35.43	900	19.69	500	6.54	166	3.62	91.9	4.75	120.7	4	0.75	19.1	18.90	480	6.00	152.4	9.06	230	79.2	36	73.5	2000
DMF-1-6-V80	3"	80	41.54	1055	25.20	640	9.17	233	5.00	127	6.00	152.4	4	0.75	19.1	22.64	575	7.50	190.5	12.20	310	132	60	367.4	10000
DMF-1-6-V100	4"	100	49.80	1265	29.92	760	11.42	290	6.19	157.2	7.50	190.5	8	0.75	19.1	25.98	660	9.00	228.6	15.16	385	143	65	734.9	20000
DMF-1-6-V125	5"	125	51.97	1320	31.50	800	11.61	295	7.31	185.7	8.50	215.9	8	0.88	22.4	27.36	695	10.00	254	15.75	400	143	65	1837.2	50000
DMF-1-6-V150	6"	15	53.94	1370	35.43	900	13.98	355	8.50	215.9	9.50	241.3	8	0.88	22.4	29.72	755	11.00	279.4	18.11	460	330	150	18371.9	500000
DMF-1-6-V200	8"	200	66.73	1695	45.28	1150	14.37	365	10.62	269.7	11.75	298.5	8	0.88	22.4	33.46	850	13.50	342.9	20.28	515	440	200	29395.0	800000
DMF-1-6-V250	10"	250	67.32	1710	45.28	1150	14.37	365	12.75	323.8	14.25	362	8	1.00	25.4	33.46	850	16.00	406.4	20.28	515	440	200	36743.7	1000000
DMF-1-6-V300	12"	300	74.80	1900	47.24	1200	17.32	440	15.00	381	17.00	431.8	8	1.00	25.4	39.21	996	19.00	482.6	24.61	625	550	250	55115.6	1500000

## Transmitter Dimensions:

### Transmitter Dimensions



## Wiring guidelines:



### **DISCONNECT POWER BEFORE CONNECTING ANY WIRING !!!**

The voltage must match that indicated in the “Power Supply” nameplate on the enclosure of the transmitter. The ground wire must be well grounded to comply with electrical safety standards.

**Standard power is 24 VDC requiring 500 mA max.**

### **Safety Grounding**

Both the sensor and the transmitter must be grounded correctly or measurement errors will occur and the Coriolis Flowmeter may not properly indicate flow. If the pipeline is grounded, the transmitter can be grounded through the pipeline; if the pipeline is not grounded, the transmitter should be grounded independently.

The transmitter is configured to operate on 24VDC (Standard) unless specially ordered with a universal AC Power Supply. Hook the + of the 24 VDC to the + L terminal and the Ground of the 24 VDC to the - N terminal and the Safety Ground to the GND Terminal.

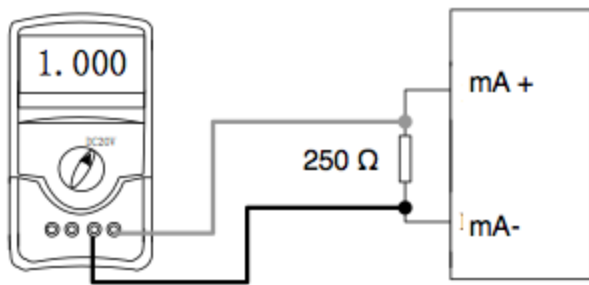
### Terminal names

24V	+ \-	24VDC Power Supply (500mA max)
Fo	+ \-	Frequency Output (Mass Flow or Volume Flow)
mA	+ \-	Current Output (Flow Rate or Density)
485A \485B		ModBus RTU (Baud Rate Defaults: “9600”, Address: “1” Default)
GND		Signal Shielding

## 4-20 mA signal output

The 4-20 mA output is internally tied to 24V to deliver 4-20 mA, it can drive up to 750Ω in resistance. When you first commission your meter you can use a DVM in the Current mode to measure 4 mA at ZERO Flow. To use the 4-20 mA Output as a VOLTAGE source you can install a 250 Ohm resistor across the mA- and mA+ and read 1-5 VDC with your DVM in the DC Voltage mode.

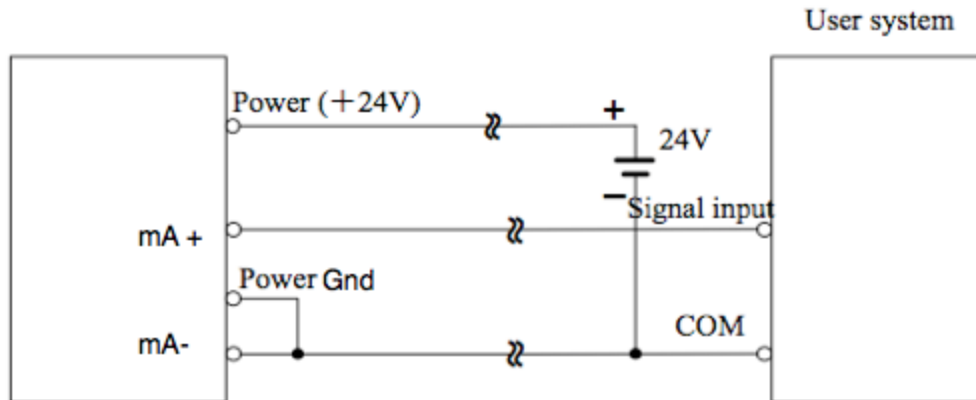
Like this:



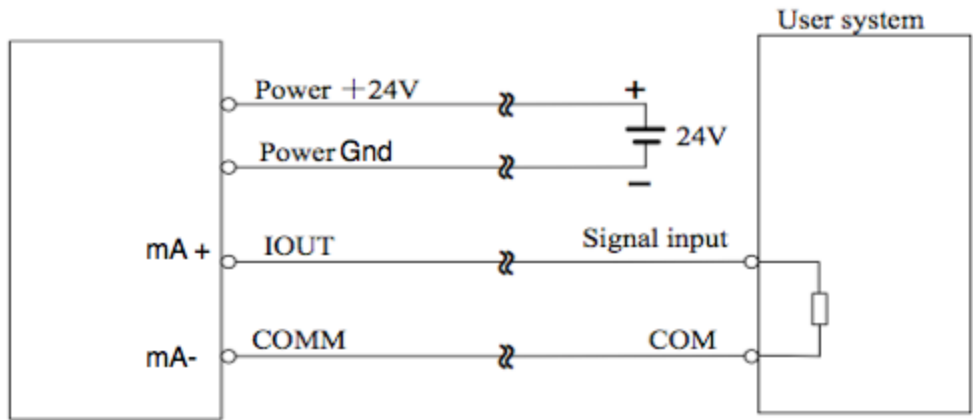
Signal Output equation:

$$I_o = (\text{Measured Value} / \text{Full Scale Value}) * \text{Current FS} + \text{Current 0}$$

For 4-20 Output use the following 2 choices:



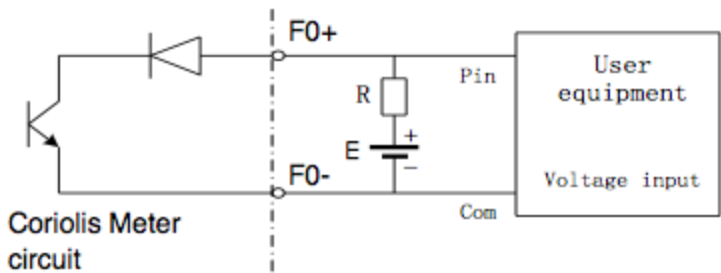
3 Wire 4-20 mA Output connection non-isolated



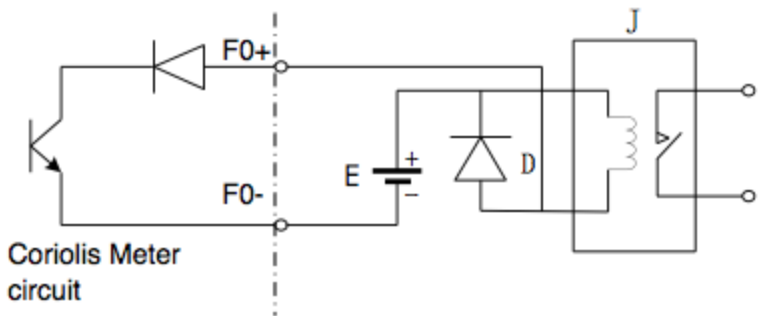
4 Wire 4-20 mA Output isolated wiring

## Frequency signal output:

The terminals FO+ and FO- are connected to an Open Collector transistor and may be wired as follows:



Note: Choose R and E based on 10 mA Current draw,  $E/R=10\text{mA}$ ,  $E=5$  to 24V.



Note: Select a relay for either 12V or 24V. D is an external diode if the relay does not have the diode built in. This is required to protect the circuit from back emf when the coil collapses.

## Installation guidelines:

The TacticalFlowMeter Series Coriolis Flowmeters are very forgiving to inlet and outlet piping conditions.



Since the Coriolis mass flow meter consists of a resonant structure to measure the mass flow it is important to mount the Coriolis meter using a vibration isolator if there are significant vibration energies transmitted to the connecting flow pipe. Most small vibrations are easily compensated for using advanced Digital Signal Processing methods to remove such vibrations. Notice the rigid connections to solid ground in instances where pumps or grinders may be directly attached to the Coriolis mass flow meter.

### **Zero Point Calibration:**

The Zero point calibration process is required before use of the meter. This process is used to determine the density of the fluid to indicate the flow rates in volume and mass flow. This is accomplished by filling the flow meter with the desired fluid, shutting off the inlet and outlet and then running a process that sets the measuring tubes into resonance to determine the mass of the fluid within the measuring chambers. This, along with the factory calibration of the resonant frequency with a known fluid (normally water) allows the VOLUME of the measuring tubes to be determined, and thereby have the ability to determine the density from the relationship between resonant frequency and mass of the system. In this way the Coriolis Meter is a static inertial balance using resonant frequency, versus the calibrated "K" of the tube to indicate mass.

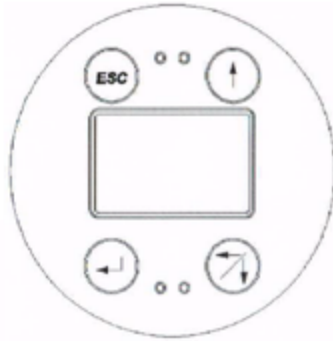
### **NOTE: It is critical to invoke the zero point calibration after installation.**





Make sure the meter has warmed up for at least 15 minutes before invoking the zero function. Make sure the measuring tube is fully filled with liquid. Turn off the stop valves, make sure the liquid is in a stationary state, and enter password 20 to invoke calibrate the zero point. The zero function is in process when the display indicates "Adjust zero" for about 30 seconds and then reverts to the normal display mode, after you hit the bottom left Enter button to start the function. This function is CRITICAL to allow the meter to determine the resonant frequency of the measuring tube is to determine the density of the fluid within it. This step cannot be skipped. Once this step is complete you will want to confirm the measured density is accurate.

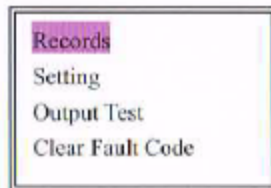
This is done in the main running screen by touching the up arrow (upper right hand corner) and confirm the indicated density agrees with the density of your fluid.


Coriolis mass flow meters directly measure the mass flow and the density of the fluid. The volume flow rate is calculated by mass flow divided by density. If the density measured at the zero point is not accurate, then the flow rates will be affected as well.


We show the process using the touch screen on the next page.




Touch , and the password interface would be shown. Touch , and touch , input 20 (password). Then touch  to enter.

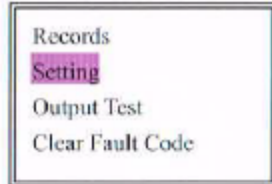


Touch  to enter the next menu.

Touch  to scroll between several interfaces to check the information of the mass flow meters

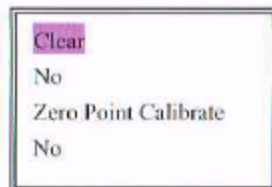
### Setting

touch  to enter the "Setting" interface.







In the setting interface, total flow clearance, zero point calibration, tiny-signal cut, current output could be processed.

Touch  to enter



For Example:

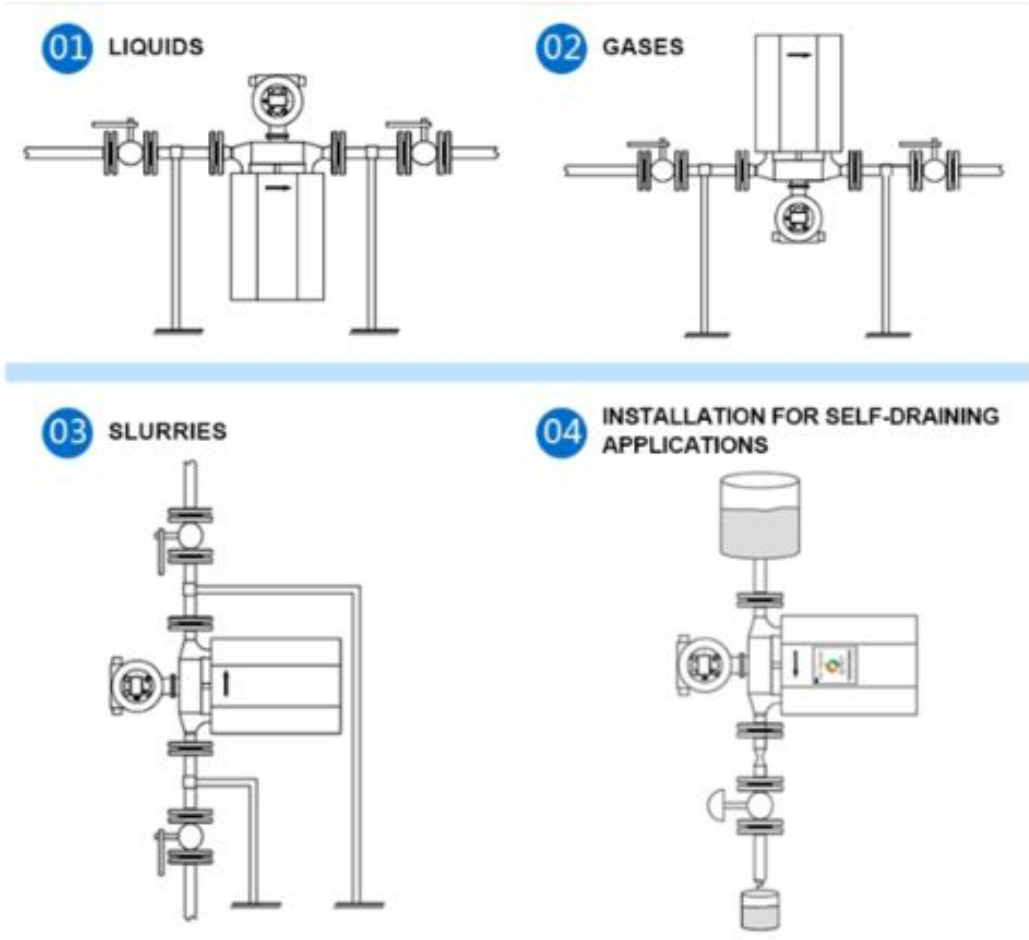
1) when the cursor is at "Clear", touch  to move to "Zero Point Calibrate";

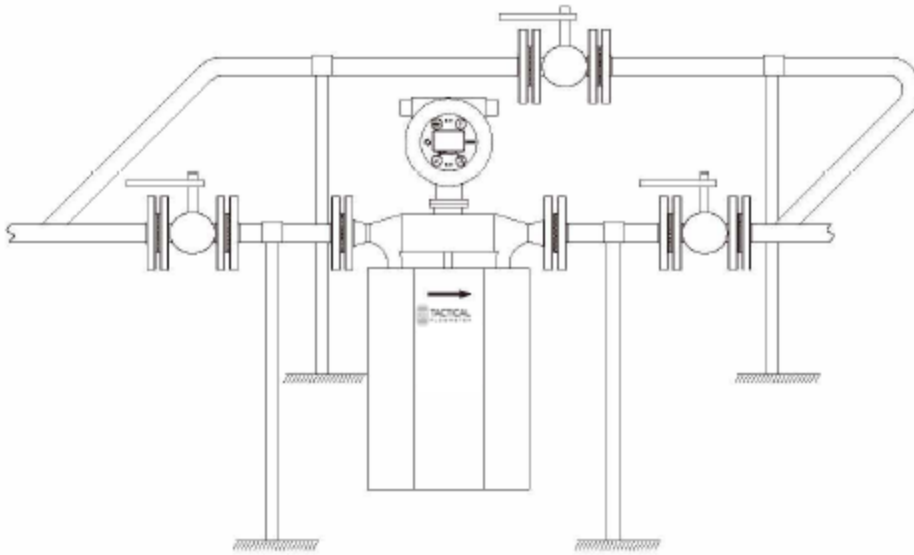
2) Touch  to enter, touch  to choose yes, or no. Touch  to enter. Or touch "ESC" to exit.

The general guidelines are to keep the sensor tubes filled with the fluid the meter is installed to measure. This keeps the sensing tubes fully immersed and capable of determining the mass of the fluid within the tubes. It is the rate of change of the fluid that the Coriolis meter excels at indicating. Follows are some guidelines to assist in understanding the mounting configurations.

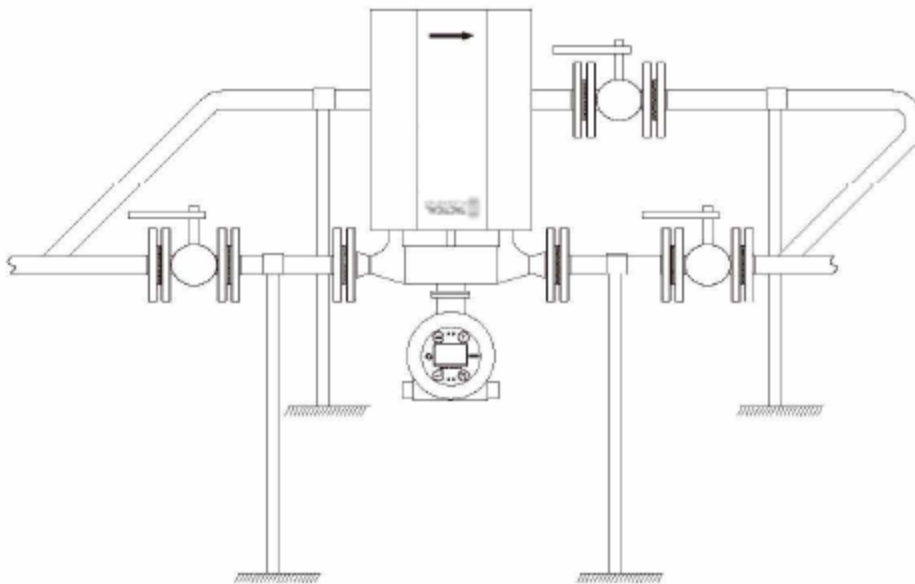
For horizontal installations, the measuring tube should be installed under the pipeline and when the process medium is liquid or slurry and above the pipeline when the process medium is gas as this keeps out any condensation that may have settled in the tubing..

For vertical installations, the measuring tube should be installed parallel to the pipeline when the process medium is either a liquid or slurry or even a gas

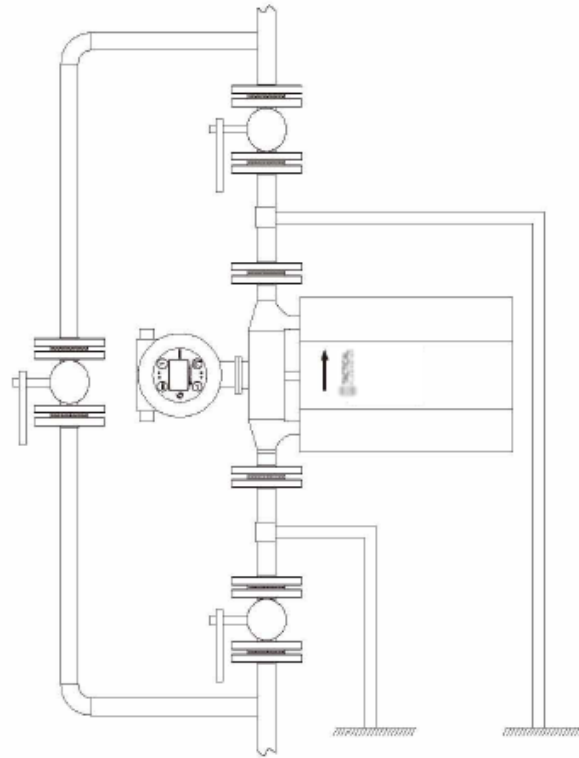




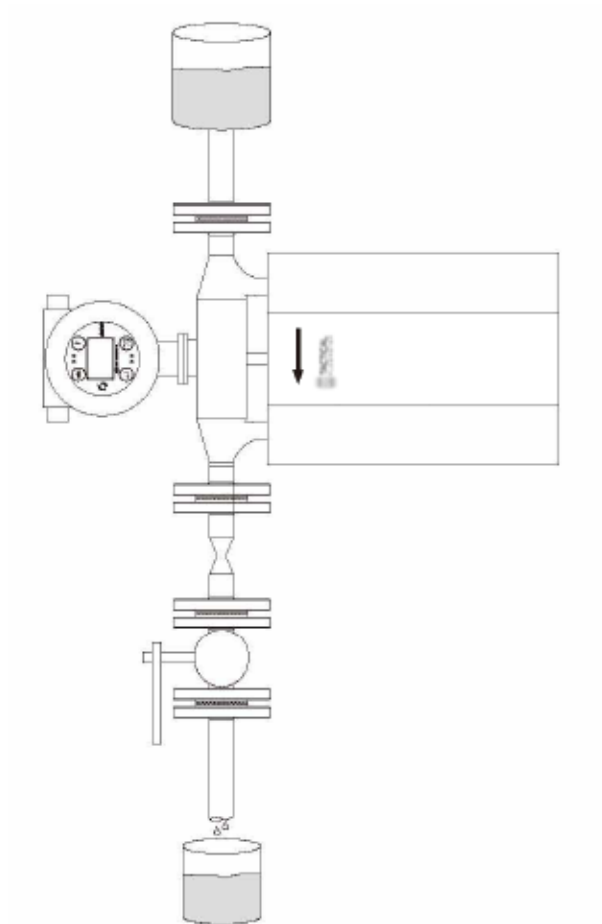
Note solid ground connections on this liquid example.



Notice solid ground connections on this gas installation example.



Note solid ground connections on this gas example.



Note solid ground connections on this self draining liquid example.

## User Interface:



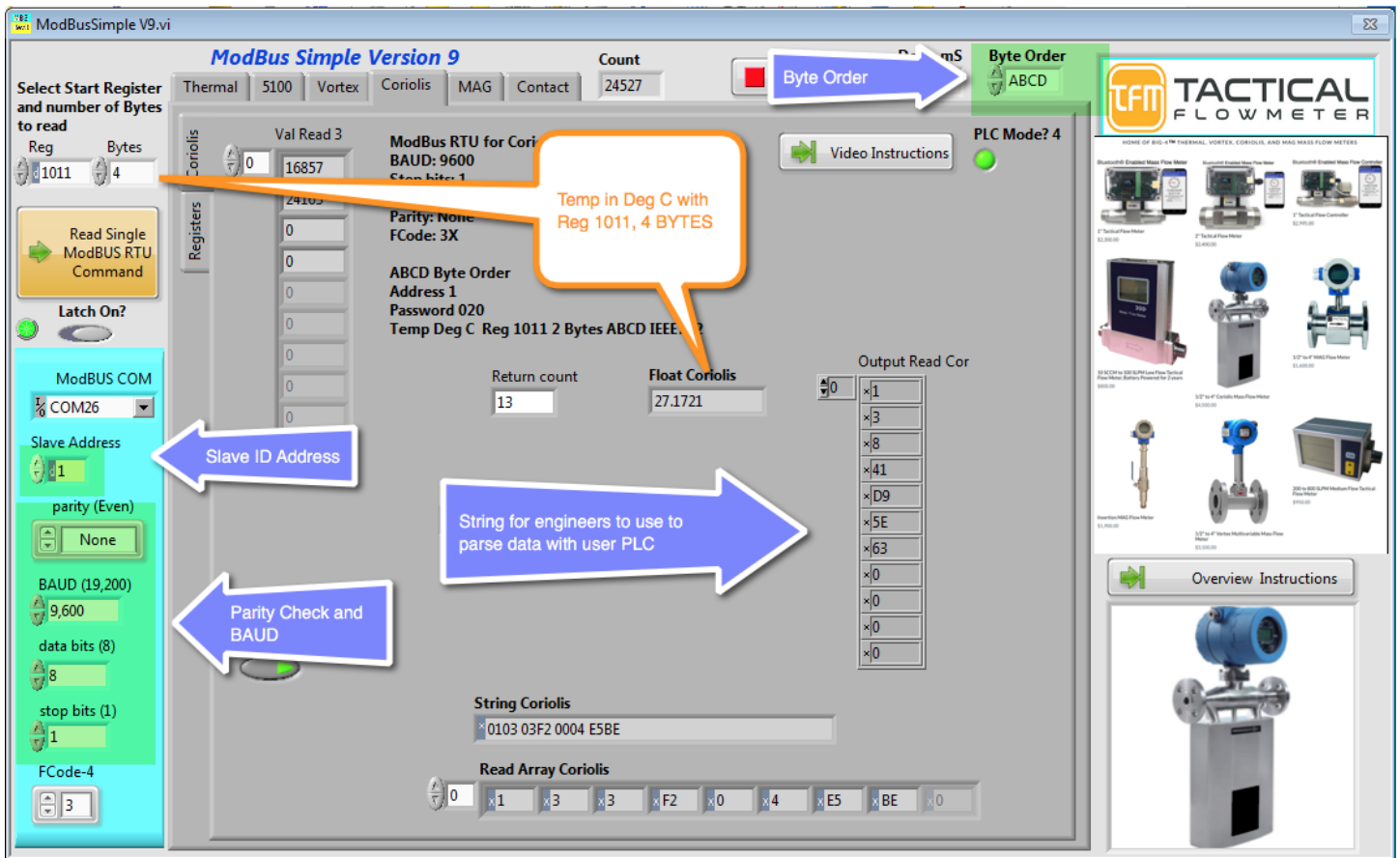
Click video image or QR code above to scroll down and view User Interface video on the website

## ModBus RTU Registers.

Register	Address	Definition	Description	Type
41001	0x03E8 / 1000	Mass Flow Rate	Range: 0 - full range	IEEE752 ABCD
41003	0x03EA / 1002	Total Mass Flow	Range: 0-4000000	IEEE752 ABCD
41005	0x03EC / 1004	Instant Volume	Range: 0 - full range	IEEE752 ABCD
41007	0x03EE / 1006	Total Volume	Range: 0-4000000	IEEE752 ABCD

41009	0x03F0 / 1008	Density	Density lower limit to Density Upper limit	IEEE752 ABCD
41011	0x03F2 / 1010	Temperature	Range: -50 to 200°C	IEEE752 ABCD
41013	0x03F4 / 1012	Subject A Percentage	Range :0-100%	IEEE752 ABCD
41015	0x03F6 / 1014	Sensor Resonant Frequency	80-150 Hz Related to Sensor	IEEE752 ABCD

The screenshot shows the ModBus Simple Version 9 software interface. The main window displays configuration for a Coriolis flow meter. On the left, there are controls for ModBUS COM (COM26), Slave Address (1), parity (None), BAUD (9,600), data bits (8), stop bits (1), and FCode-4 (3). The central area shows a 'Registers' list with values for Coriolis (16857, 24163, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0). Below this, there are fields for 'Return count' (13) and 'Float Coriolis' (27.1721). The 'Register Desc Coriolis' is set to 'Temp, Deg C'. The 'String Coriolis' field contains '0103 03F2 0004 E5BE'. The 'Read Array Coriolis' shows a sequence of values: 0, x1, x3, x3, xF2, x0, x4, xE5, xBE, x0. On the right, there is a 'PLC Mode? 4' indicator and a 'Video Instructions' button. The bottom right corner features a 'TACTICAL FLOW METER' logo and a grid of product images with their respective prices.



The screenshot shows the ModBus Simple Version 9 software interface. Key components and annotations include:

- Top Bar:** "ModBus Simple Version 9", "Count 24527", and "Byte Order" dropdown set to "ABCD".
- Left Panel:** "Select Start Register and number of Bytes to read" with "Reg 1011" and "Bytes 4". Below are "Read Single ModBUS RTU Command", "Latch On?", "ModBUS COM" (COM26), "Slave Address" (1), "parity (Even)" (None), "BAUD (19,200)" (9,600), "data bits (8)" (8), "stop bits (1)" (1), and "FCODE-4" (3).
- Center Panel:** "Registers" list with "Val Read 3" showing "16857". "ModBus RTU for Cori" settings: "BAUD: 9600", "Stop bits: 1", "Parity: None", "FCODE: 3X", "ABCD Byte Order", "Address 1", "Password 020", "Temp Deg C Reg 1011 2 Bytes ABCD IEEE...". "Return count" is 13. "Float Coriolis" is 27.1721.
- Right Panel:** "Output Read Cor" list with values: x1, x3, x8, x41, xD9, x5E, x63, x0, x0, x0, x0.
- Bottom Panel:** "String Coriolis" (0103 03F2 0004 E5BE) and "Read Array Coriolis" (0, x1, x3, x3, xF2, x0, x4, xE5, xBE, x0).
- Annotations:**
  - Blue arrow: "Byte Order" pointing to the dropdown.
  - Orange callout: "Temp in Deg C with Reg 1011, 4 BYTES" pointing to the register value.
  - Blue arrow: "Slave ID Address" pointing to the Slave Address field.
  - Blue arrow: "Parity Check and BAUD" pointing to the parity and baud rate settings.
  - Blue arrow: "String for engineers to use to parse data with user PLC" pointing to the String Coriolis field.
- Right Sidebar:** "TACTICAL FLOW METER" logo and a grid of product images with an "Overview Instructions" button.

We show the FACTORY values to communicate with the Coriolis mass flow meter above.

The ModBusSimple program shown above may be downloaded here:

<https://www.tacticalflowmeter.com/products/modbus-simple>



## Calibration Facility.



All Coriolis Mass Flow Meters are calibrated in a primary standard gravimetric calibration lab as shown above that features high end Mettler Toledo weigh scales and stainless steel collection vessels.

Website: <https://www.tacticalflowmeter.com/products/coriolis-mass-flow-meter>