

DESCRIPTION

The RCT1000 Coriolis mass flow meter identifies flow rate by directly measuring mass flow and density of fluids over a wide range of process temperatures with a high degree of accuracy. The unobstructed, open flow design makes it suitable for a variety of fluids such as slurries and other viscous, nonconductive fluids that are difficult to measure with other technologies.

APPLICATIONS

The Coriolis design and measurement principle allows the meter to be an exceptional device in measuring:

- Oil and fuels
- Homogeneous suspensions and slurries
- Adhesives, glues or binding materials
- Coatings and hardeners
- Dyes, fragrances, vitamins and other additives
- Vegetable oils and fats

OPERATION

Coriolis flow meters simultaneously measure mass flow rate, density and temperature. As fluid flows through the vibrating sensor tube, forces induced by the flow cause the tube to twist slightly. These small deflections are measured by carefully placed detectors. A phase shift occurs between detector signals that is directly proportional to mass flow rate. As the fluid density varies, the resonant frequency at which the tube vibrates changes, which is also measured by the detectors. These larger sensors have two tubes that are vibrated in opposing directions in order to reduce the effect of process vibration on the flow measurement. Temperature is measured by an internal RTD in order to calculate thermal effects on the tube vibrating frequency and can be used as a measurement output.

CONTROLS SYSTEM INTEGRATION

RCT1000 transmitters provide a variety of means to integrate the meter's output into new and existing operations. The batch and PID functionality enables direct control of devices, such as valves, by use of digital or analog outputs. Additionally, programmable digital outputs can indicate low and high alarm conditions. Network options are available including EtherNet/IP, Modbus TCP/IP and Modbus RTU.



MAINTENANCE

With no internal moving parts, the vibrating tube design has little impact on mechanical wear, resulting in a longer life expectancy and in fewer repairs than many other flow technologies.

FLUID DIAGNOSTICS

RCT Console software offers much more than configuration features. Users can obtain advanced data logging and performance trending analysis, as well as system verification provided by the unique HealthTrack feature, which captures critical operation parameters.

ADVANTAGES

- Highly accurate direct measurement of:
 - ◊ Mass flow
 - ◊ Density
- Derive concentration of homogenous liquids containing two components
- Open flow path
- No straight-run requirements
- Low maintenance operation
- Flexible integration options
- Advanced fluid diagnostic software

SPECIFICATIONS

The complete remote mount metering system consists of a sensor, a transmitter, and a cable assembly. Each component must be purchased separately:

System Specifications

Uncertainty	Mass Flow Rate (Liquids)	RCS018, RCS025, RCS050 (option 2)	±0.2% of reading ±0.05% of full scale
		RCS100, RCS200, RCS300 (option 1)	±0.1% of reading ±0.025% of full scale
		RCS018...300 (option 6)	±0.1% of reading*
Density	RCS018, RCS025, RCS050	±0.12486 lb/ft ³ (0.002 g/cm ³)	
	RCS100, RCS200, RCS300	±0.03121 lb/ft ³ (0.0005 g/cm ³)	
Repeatability	RCS018, RCS025, RCS050, RCS100, RCS200, RCS300	±0.05% of reading ± zero stability	
Zero Stability	RCS018, RCS025, RCS050	±0.05% of full scale	
	RCS100, RCS200, RCS300 (option 1)	±0.025% of full scale	
	RCS100 (option 6)	±0.123 lb/min (3.35 kg/hr)	
	RCS200 (option 6)	±0.360 lb/min (9.79 kg/hr)	
	RCS300 (option 6)	±0.356 lb/min (9.68 kg/hr)	
Safety Certifications	Ordinary Location	Remote mount	CAN/CSA C22.2 No. 61010-1-12
		Integral mount	CI I, Zn 1 AEx/Ex db ia IIB T4 Gb Explosion-proof for CI I Div 1 Grp CD with Intrinsically Safe Sensor for CI I Div 1 Grp CD
		Remote transmitter	CI I, Zn 1 AEx/Ex db [ia Ga] IIB T6...T3 Gb Explosion-proof for CI I Div 1 Grp CD
		Remote sensor	CI I, Zn 0 AEx/Ex ia IIB T6...T3 Ga Intrinsically Safe for CI I Div 1 Grp CD
	ATEX / IECEx	Integral mount	II 2 G Ex db ia IIB T4 Gb
		Remote transmitter	II 2 (1) G Ex db [ia Ga] IIB T6...T3 Gb
		Remote sensor	II 1 G Ex ia IIB T6...T3 Ga
Density Measurement	Flowing, referenced, API, Brix, Baume and net oil		

* When flow rate is less than zero stability (lb/min) * 1000, accuracy = zero stability / flow rate.

Flow Rate Specifications

Model	Nominal Line and Equivalent Pipe Size	Number of Flow Tubes	Flow Range		Volumetric Equivalent 1g/cm ³	
			lb/min	kg/hr	gal/min	l/h
RCS018	1/2 in., 3/16 in.	2	0...20	0...544	2.4	544
RCS025	1/2 in., 1/4 in.	2	0...40	0...1088	4.8	1088
RCS050	1/2 in., 1/2 in.	2	0...220	0...5987	26	5987
RCS100	1 in.	2	0...1000	0...27,216	120	27,716
RCS200	2 in.	2	0...1700	0...46,266	204	46,266
RCS300	3 in.	2	0...5200	0...141,520	623	141,520

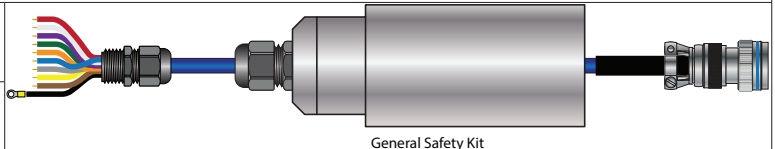
Sensor Specifications

Sensor Specifications		Maximum Allowable Pressure (by Connection Type)					
Pressure	Model	NPT	Class 150 Flange	Class 300 Flange	Class 600 Flange	DN PN40	Tri-Clamp
	RCS018	3450 psi (238 bar)	275 psi (19 bar)	720 psi (49.6 bar)	995 psi (68.6 bar)	40 bar (580 psi)	200 psi (14 bar)
	RCS025	3450 psi (238 bar)	275 psi (19 bar)	720 psi (49.6 bar)	995 psi (68.6 bar)	40 bar (580 psi)	200 psi (14 bar)
	RCS050	3320 psi (229 bar)	275 psi (19 bar)	720 psi (49.6 bar)	995 psi (68.6 bar)	40 bar (580 psi)	200 psi (14 bar)
	RCS100	2150 psi (148 bar)	275 psi (19 bar)	720 psi (49.6 bar)	995 psi (68.6 bar)	40 bar (580 psi)	200 psi (14 bar)
	RCS200	2200 psi (152 bar)	275 psi (19 bar)	720 psi (49.6 bar)	995 psi (68.6 bar)	40 bar (580 psi)	200 psi (14 bar)
	RCS300	—	275 psi (19 bar)	720 psi (49.6 bar)	—	40 bar (580 psi)	200 psi (14 bar)
Wetted Materials	Standard	316L stainless steel					
Temperature	Fluid Range	General Safety: -40...392° F (-40...200° C) Hazardous Location Sensor with Integral Mount Transmitter: -4...140° F (-20...60° C) Hazardous Location Sensor with Remote Mount Transmitter: -4...359° F (-20...182° C) as follows:					
		TEMP CODE		FLUID TEMP (MAX)			
		T6 (85° C)		67° C			
		T5 (100° C)		82° C			
		T4 (135° C)		117° C			
Accuracy	Repeatability	T3 (200° C)		182°C			
		±1.8° F (1° C)					
		±0.54° F (0.3° C)					
Process Connections	NPT (RCS018...200), Class 150 Flange, Class 300 Flange, DN PN40, Tri-Clamp						
Conformance	NACE MR0175/ISO 15156						
Pressure Standards/Approvals	Canadian Registration Number (CRN); ATEX and general area sensors: PED 2014/68/EU, Group 1, Category II, Module D1 for line sizes 2 in. (60.3mm) and up, and Sound Engineering Practice (SEP) for other sizes						

Transmitters

Feature		Model		
		RCTN	RCTX	RCTX with Display
Enclosure		NEMA 4 (IP65); powder coated aluminum, polycarbonate, urethane and stainless steel	NEMA 4X (IP66); powder coated aluminum, polycarbonate, urethane and stainless steel without glass window	NEMA 4X (IP66); powder coated aluminum, polycarbonate, urethane and stainless steel with glass window
Power Requirements		115/230V AC; ±15% 50/60 Hz 25W maximum	—	—
		20...28V DC; 15W maximum	18...28V DC; 15W maximum	
Ambient Temperature		14...158° F (–10...70° C)	– 4...140° F (–20...60° C)	– 4...140° F (–20...60° C)
Configuration		Four–button HMI or RCT Console configuration	RCT Console configuration	Four–Optical button HMI or RCT Console configuration
Display		4 line × 20 character; alpha-numeric; dot matrix; LED backlighting	—	4 line × 20 character; alpha-numeric; dot matrix; LED backlighting
RTD Input	Standard (1 input)	Built–in 100 Ohm Platinum RTD within the sensor body		
	Optional (1 auxiliary input)	Additional 100 Ohm 3–wire Platinum RTD input for the secondary RTD is used by customers who want to be able to calibrate their RTD	—	—
Analog I/O	Outputs	Three 4...20 mA (0...22 mA capable), maximum load 500 Ohms, approximately 16 bit resolution outputs; assignable to mass flow, volume, density, temperature, concentration, PID and similar measurements. User defined fault condition output value anywhere in the 0...22 mA range	Two (three with HART Option) 4...20 mA (0...22 mA capable), maximum load 500 Ohms, approximately 16 bit resolution outputs; assignable to mass flow, volume, density, temperature, concentration, PID and similar measurements. User defined fault condition output value anywhere in the 0...22 mA range	
	Inputs	Two 0...5V DC inputs. 20k Ohms input impedance, approximately 12 bit resolution	One 0...5V DC input. 20k Ohms input impedance, approximately 12 bit resolution	
Auxiliary Power		Internal 24V DC supply, 100 mA max. (for batching functions, frequency output channel and like applications)	—	—
Frequency/Pulse Output		One open collector transistor, user configurable as rate (3 kHz max output), accumulator 0...10 Hz; 5...28V DC carrier. User assignable to rate, any totalizer, PID, temperature, density, concentration or other similar measurements		
Digital I/O	Outputs	Four 5...28V DC, 50 mA maximum current draw (external pullup resistor required)	Two 5...28V DC, 50 mA maximum current draw (external pullup resistor required)	
	Inputs	Four 5...24V DC, 1k Ohms impedance	Three 5...24V DC, 1k Ohm impedance	
Industrial Communications Modular Port	Standard	Modbus RTU (EIA–485/RS485)		
	Optional Module	Modbus TCP/IP & EtherNet/IP		
	Optional Module	—	HART 7	
Standard Configuration Port		USB 2.0 interface (through a Mini–B receptacle) for RCT Console software		
Alarms		Six Hi/Lo Alarms; Alarm status on display by default, assignable to digital Output 2 or 4 and available via digital communications	Six Hi/Lo Alarms; Alarm status on display by default, assignable to digital Output 2 and available via digital communications	
Transmission Distance		Up to 100 ft (30 meters); contact factory if longer length is needed		
Measurements		Forward and reverse mass flow and total, density, temperature; concentration, volumetric flow and total (derived)		
Other Functions		Batch control, PID control. User configuration of all I/O functions		

CABLE KITS

The kits include the cable assembly, cable protector and sensor cable connection cover.			
RC820476-XX	Kit, PVC jacketed cable XX=length in ft; 20, 35, 50, 70, 100	Temp range: –40...176° F (–40...80° C)	 General Safety Kit
RC820477-XX	Kit, FEP jacketed cable XX=length in ft; 20, 35, 50, 70, 100	Temp range: –94...392° F (–70...200° C)	
RC830054-XX	FEP jacketed cable XX=length in ft; 20, 35, 50, 70, 100	Temp range: –94...392° F (–70...200° C)	
			 Hazardous Location Cable

DIMENSIONS

RCTX Transmitter, Integral Mount Electronics Enclosure Dimensions

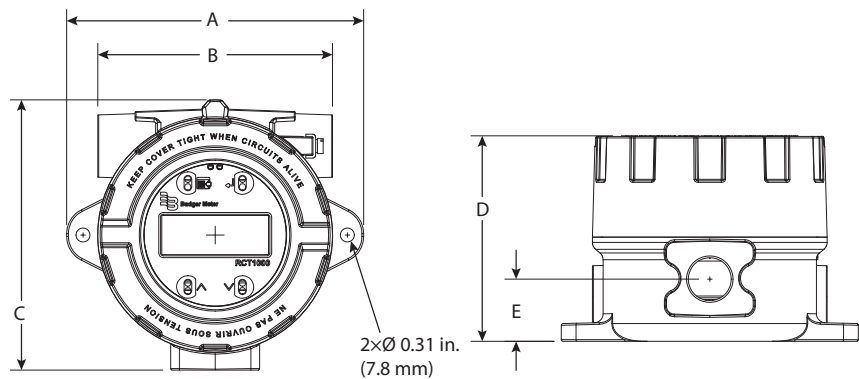


Figure 1: RCTX dimensions

A	B	C	D	E
6.57 in. (167 mm)	5.20 in. (132 mm)	5.98 in. (152 mm)	4.57 in. ± 0.12 in. (116 mm ± 3 mm)	1.37 in. (35 mm)

RCTX Transmitter, Remote Mount Electronics Enclosure Dimensions

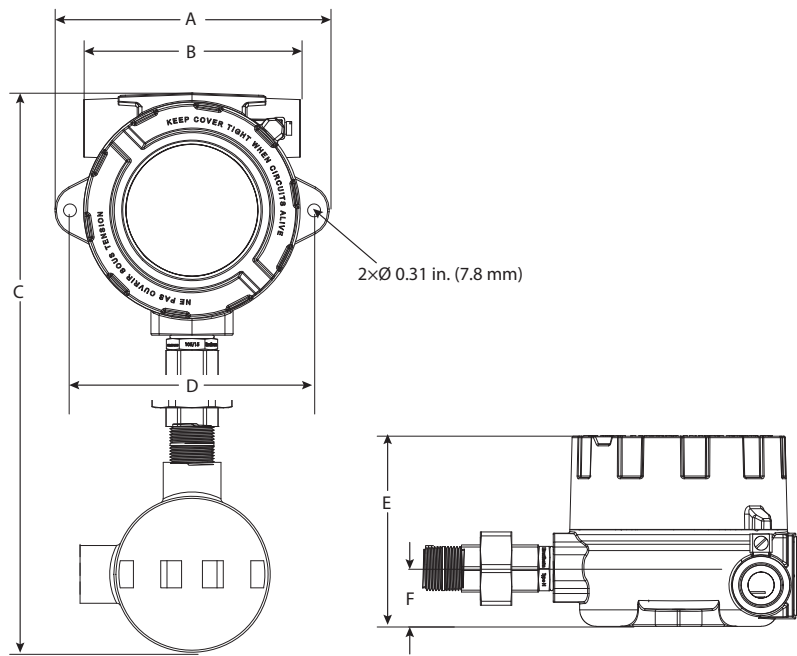


Figure 2: RCTX remote mount dimensions

A	B	C	D	E
6.57 in. (167 mm)	5.20 in. (132 mm)	13.43 in. (341 mm)	4.57 in. ± 0.12 in. (116 mm ± 3 mm)	1.37 in. (35 mm)

RCTN Transmitter Electronics Enclosure Dimensions

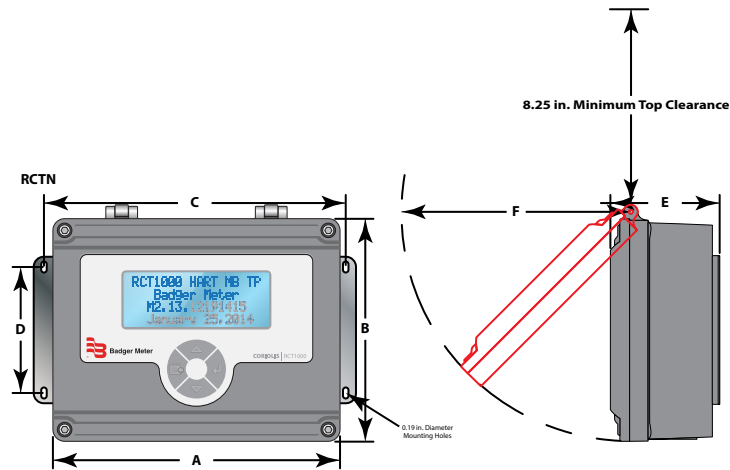


Figure 3: RCTN transmitter electronics dimensions

A	B	C	D	E	F
9.80 in. (249.9 mm)	8.00 in. (203.2 mm)	10.30 in. (261.6 mm)	4.30 in. (109.2 mm)	3.66 in. (93.0 mm)	8.32 in. (211.2 mm)

RCTN Transmitter, Pipe Mounting Options

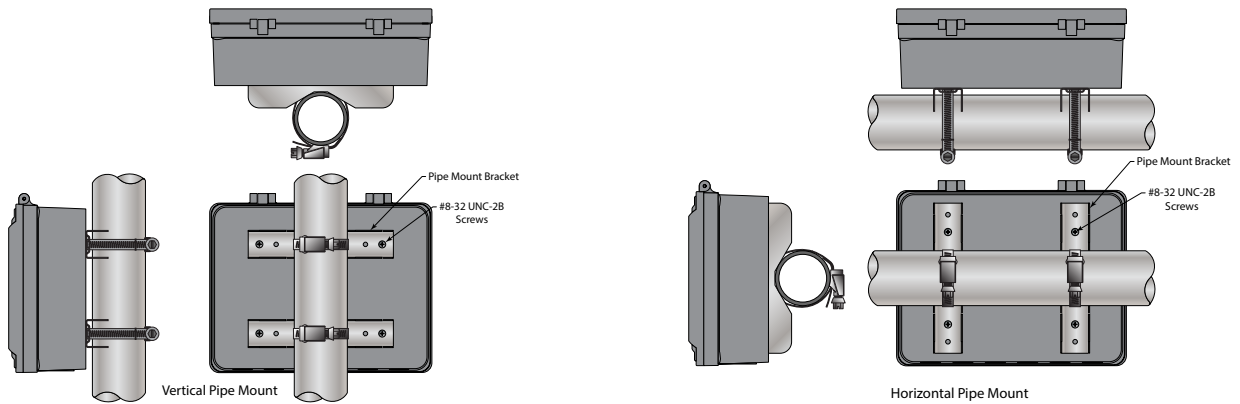


Figure 4: RCTN pipe mounting options

RCTN Transmitter Only, Pipe Bracket Dimensions

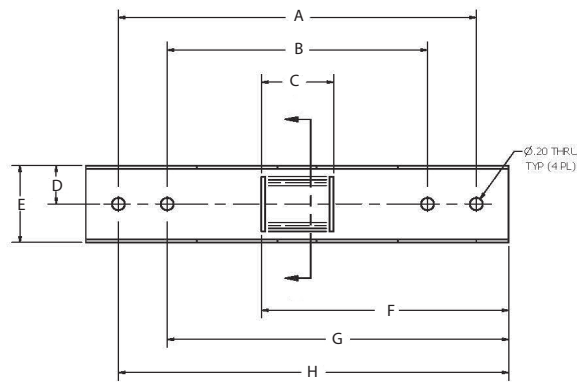


Figure 5: RCTN pipe bracket dimensions

A	B	C	D	E	F	G	H
5.50 in. (139.7 mm)	4.00 in. (101.6 mm)	1.11 in. (28.2 mm)	0.625 in. (15.9 mm)	1.25 in. (31.8 mm)	3.80 in. (96.5 mm)	5.25 in. (133.6 mm)	6.00 in. (152.4 mm)

Sensor Dimensions, RCS018...RCS300

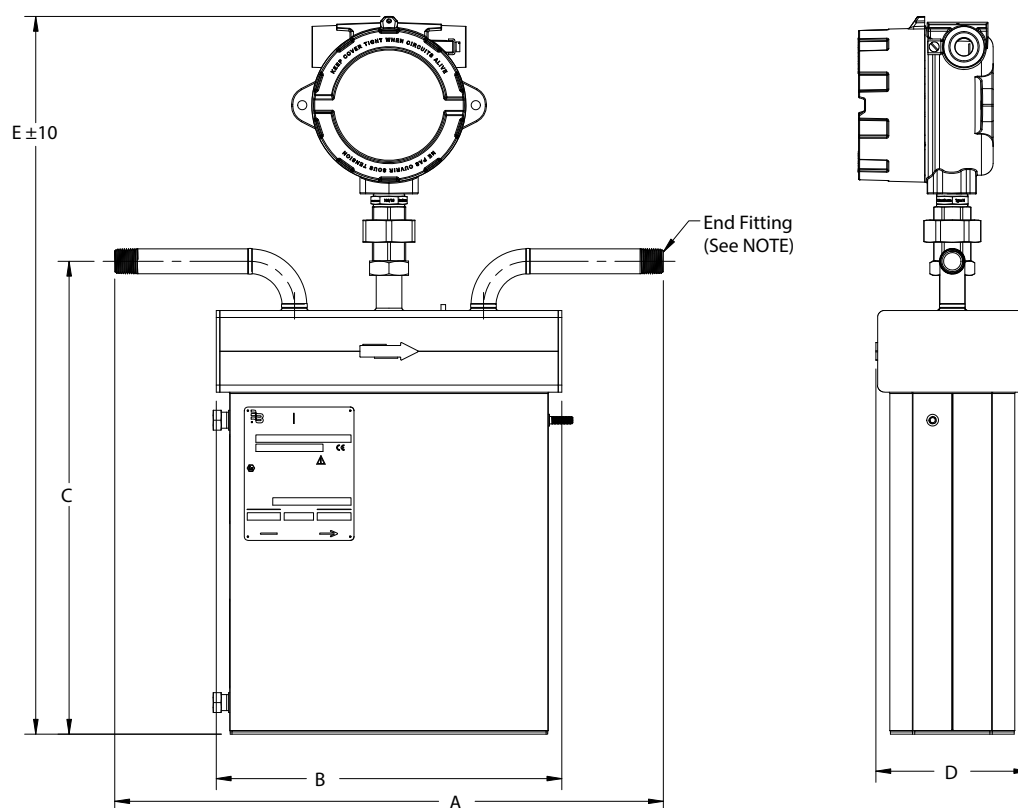


Figure 6: Large sensor dimensions

Sensor	Nominal Size	A ¹	B	C	D	E (Standard)	E (Remote)
RCS018	1/2 in.	13.6 in. (346 mm) ¹	7.1 in. (180 mm) ¹	8.5 in. (217 mm) ²	4.4 in. (113 mm) ²	19.3 in. (489 mm)	18.3 in. (464 mm)
RCS025	1/2 in.	16.0 in. (406 mm) ¹	9.0 in. (228 mm) ¹	9.9 in. (253 mm) ²	4.4 in. (113 mm) ²	20.7 in. (525 mm)	19.7 in. (500 mm)
RCS050	1/2 in.	18.5 in. (470 mm) ¹	11.6 in. (296 mm) ¹	15.9 in. (405 mm) ²	5.1 in. (131 mm) ²	24.2 in. (615 mm)	23.2 in. (590 mm)
RCS100	1 in.	23.2 in. (590 mm) ¹	16.8 in. (426 mm) ¹	27.6 in. (700 mm) ²	6.4 in. (163 mm) ²	34.3 in. (870 mm)	33.3 in. (845 mm)
RCS200	2 in.	26.4 in. (670 mm) ²	18.5 in. (472 mm) ²	28.6 in. (726 mm) ³	7.9 in. (203 mm) ³	33.4 in. (848 mm)	32.4 in. (823 mm)
RCS300	3 in.	40.9 in. (1040 mm) ²	28.7 in. (728 mm) ²	40.4 in. (1028 mm) ³	9.5 in. (243 mm) ³	45.3 in. (1150 mm)	44.3 in. (1125 mm)

¹ ± 0.12 in (3 mm)² ± 0.15 in (4 mm)³ ± 0.24 in (6 mm)

NOTE: End fittings can be NPT (shown), Class 150 or Class 300 ANSI flanges, or other; dimensions A and C do not change.

APPROXIMATE SHIPPING WEIGHTS

Sensor Only			Transmitter Only			Cables Only		
RCS018	15 lb	6.8 kg	RCTN	6.4 lb	2.9 kg	RC820***-20	6 lb	2.7 kg
RCS025	16 lb	7.3 kg	RCTX	3.4 lb	1.8 kg	RC820***-35	8 lb	3.6 kg
RCS050	26 lb	11.8 kg	RCTX-K Integral	4.9 lb	2.2 kg	RC820***-50	10 lb	4.5 kg
RCS100	47 lb	21.3 kg	RCTX-K Remote	8.2 lb	3.7 kg	RC820***-70	13 lb	5.9 kg
RCS200	90 lb	40.8 kg				RC820***-100	17 lb	7.7 kg
RCS300	219 lb	99.3 kg						

Vertical Mounting with Tubes to the Side, Flow Going Down

The mounting orientation shown in *Figure 7* is recommended for installation in an open vertical pipeline. If you **MUST** use this configuration, make sure to use an isolation valve or other pipe restriction to prevent the sensor from running empty while measurement is being taken.

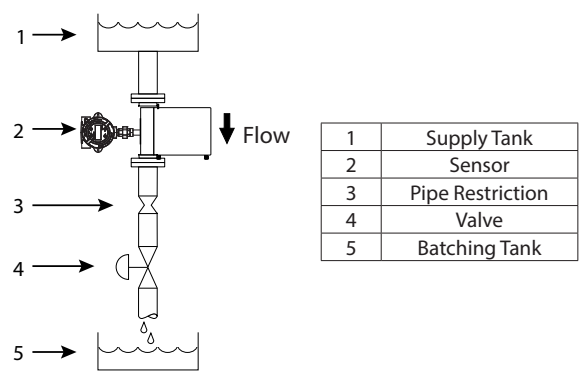


Figure 7: Tubes to the side with flow going down)

Horizontal Mounting with Tubes Down

The mounting orientation shown in *Figure 8* is recommended for liquid applications.

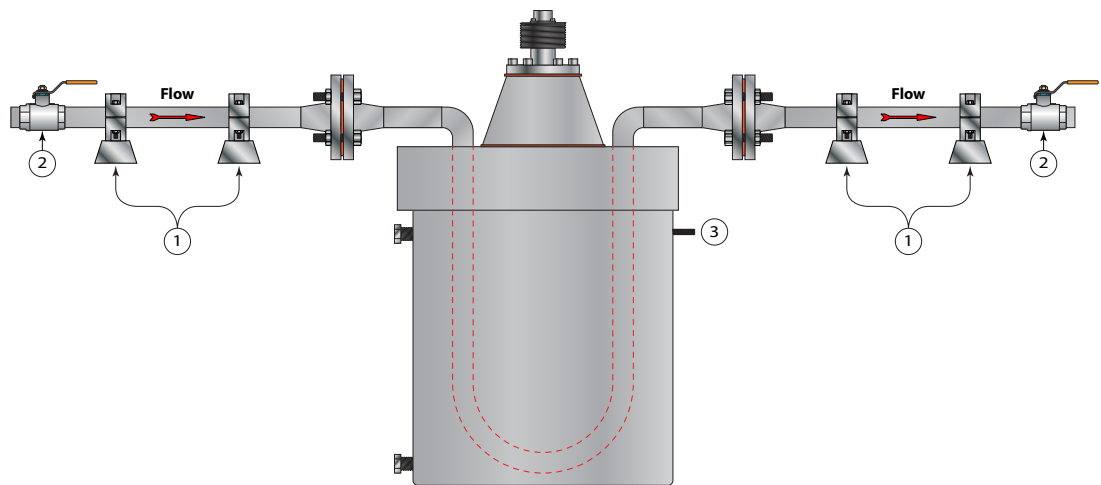


Figure 8: Tubes down (liquids)

1	Supports— Customer supplied	Rigid pipe supports approximately 3 and 6 pipe diameters from the end of the sensor
2	Isolation Valves— Customer supplied	Full port ball
3	Ground	Protective (earth), 10 AWG (4 mm²) minimum

Vertical Mounting with Tubes to the Side, Flow Going Up

The mounting orientation shown in *Figure 10* is recommended for self-draining configurations.

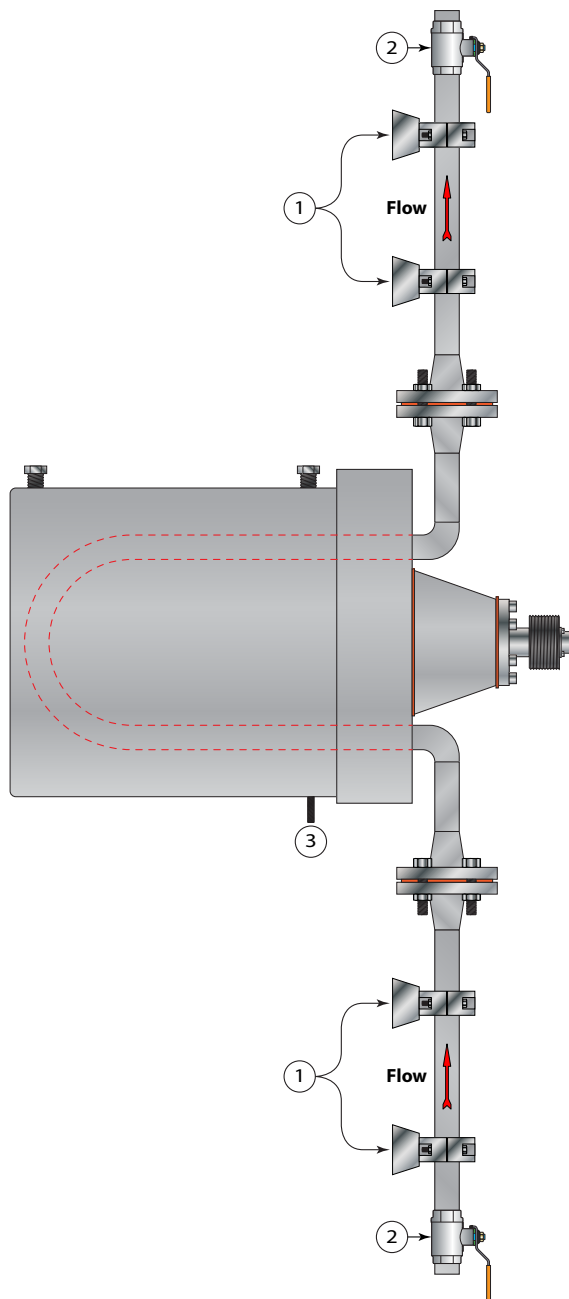


Figure 9: Tubes to the side with flow going up (self-draining)

1	Supports— Customer supplied	Rigid pipe supports approximately 3 and 6 pipe diameters from the end of the sensor
2	Isolation Valves— Customer supplied	Full port ball
3	Ground	Protective (earth), 10 AWG (4 mm ²) minimum

Horizontal Mounting with Tubes Up

The mounting orientation shown in *Figure 10* is recommended for slurry applications where particulates may drop out and plug the tubes.

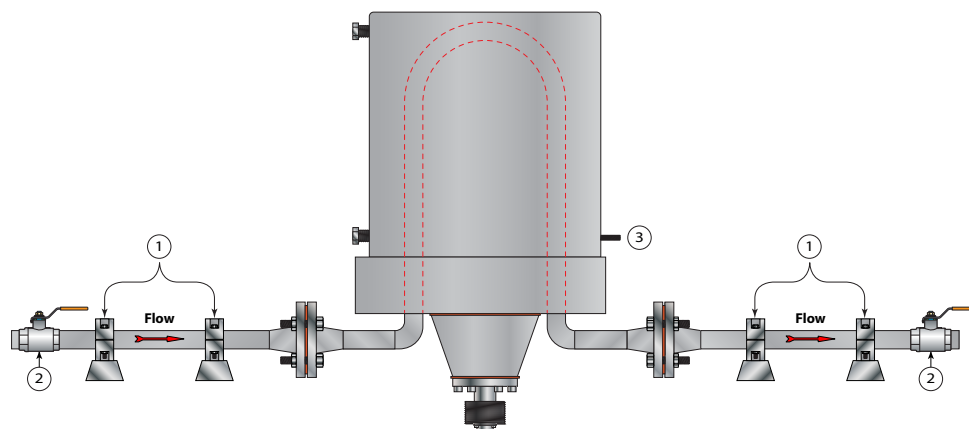


Figure 10: Tubes up (slurries)

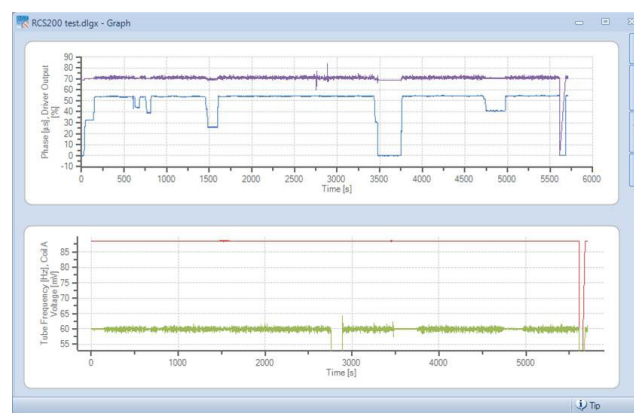
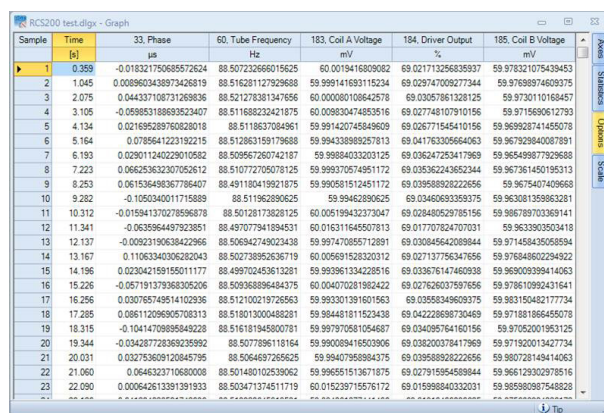
1	Supports— Customer supplied	Rigid pipe supports approximately 3 and 6 pipe diameters from the end of the sensor
2	Isolation Valves— Customer supplied	Full port ball
3	Ground	Protective (earth), 10 AWG (4 mm ²) minimum

NETWORK OPTIONS

RS-485 Network	All RCT1000 meters come equipped an EIA-485 port with Modbus RTU
Ethernet	An optional Ethernet module allows communications via Modbus TCP/IP or EtherNet/IP
HART	An optional HART module, with RCTX transmitter

SOFTWARE UTILITY

RCT Console software is a PC-based software that can be used to configure, operate and diagnose the RCT1000 Coriolis meter. Additionally, the software can log and graph fluid characteristics and parameters for historical comparisons. RCT Console software is included with the RCT1000 Coriolis meter.



ACCESSORIES

Description	Part Number
USB Cable; Mini-B; 10 ft	RC820648
3/4 in. NPT to M20 adapter; hazardous location	RC820103

General Safety Transmitter Part Number (Remote Mount)

RCT N - K - D2 R - -

Power

24V DC, 115/230V AC (preset for 115V)

D2

24V DC, 115/230V AC (preset for 230V)

G2

Communication Protocol

Modbus RTU & Ethernet (Modbus TCP/IP, EtherNet/IP)

E

Modbus RTU (Standard on all models)

M

Sensor Connection

Ordinary Areas (RCTN only)

N

Hazardous Location Transmitter Part Number (Remote Mount)

RCT X - K - R - -

Certifications

cCSAus Class I, Div 1; Class I, Zone 1

H1

ATEX/IECEx Zone 1

Y1

Communication Protocol

Modbus RTU & Ethernet (Modbus TCP/IP, EtherNet/IP)

E

Modbus RTU (Standard on all models)

M

Modbus RTU & HART

H

Sensor Connection

Hazardous location (RCTX only)

B

