



Coriolis
Mass Flow Meters

Coriolis Flow Meter

RCT1000 with RCS005 and RCS008 Sensors

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. For homogenous fluids consisting of two components like sugar and water, the RCT1000 Coriolis system can derive the concentration and mass of each component based on fluid properties and density measurement. Furthermore, 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:

- Adhesives, glues or binding materials
- Coatings and hardeners
- Dyes, fragrances, vitamins and other additives
- Homogeneous suspensions
- 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. 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



Badger Meter

CRL-DS-01550-EN-01 (April 2016)

Product Data Sheet

SPECIFICATIONS

The complete remote mount metering system consists of the following; each component must be purchased separately:

- Sensor
- Transmitter
- Cable assembly

System with RCS005/RCS008 Sensors

Uncertainty	Mass Flow Rate (Liquids)	RCS005	± 0.1% for flow rate > 0.05 lb/min ± 0.00005 lb/min for flow rate ≤ 0.05 lb/min
		RCS008	± 0.1% for flow rate > 0.2 lb/min ± 0.0002 lb/min for flow rate ≤ 0.2 lb/min
Density	±0.12486 lb/ft ³ (0.002 g/cm ³)		
Repeatability	±0.05% of reading ± zero stability		
Zero Stability	RCS005	±0.00005 lb/min	
	RCS008	± 0.0002 lb/min	
Safety Certifications	Ordinary Location	UL61010-1/CSA C22.2 No. 61010-1:2010	
Density Measurement	Flowing, referenced, API, Brix, Baume and net oil		
Conformance	CE		

Flow Rate Specifications

Model	Nominal Line and Equivalent Pipe Size	Number of Flow Tubes	Flow Range		Volumetric Equivalent 1 g/cm ³	
			lb/min	kg/hr	gal/min	l/h
RCS005	1/4 in., 1/16 in.	1	0...1.25	0...34	0.124	34
RCS008	1/4 in., 3/32 in.	1	0...2.75	0...74.8	0.274	74.8

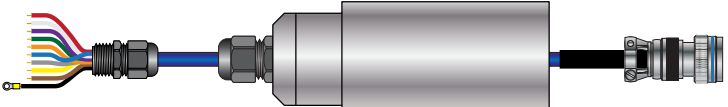
Sensors

Pressure	Model	Maximum Allowable Pressure
	RCS005	2755 psi (190 bar)
	RCS008	1800 psi (124 bar)
Wetted Materials	Standard	316L stainless steel
Temperature	Fluid Range	-40...392° F (-40...200° C)
	Accuracy	±1.8° F (1° C)
	Repeatability	±0.54° F (0.3° C)
Process Connections	1/4 in. O-ring face sealing; NPT	
Conformance	ASME B31.3 Pressure Piping Hydro Test NACE MR0175/ISO 15156	

Transmitter

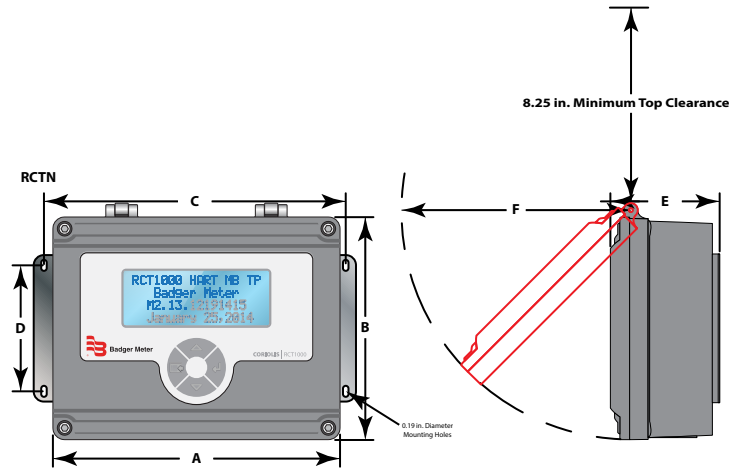
Enclosure	NEMA 4 [IP-65]; powder coated aluminum, polycarbonate, urethane and stainless steel	
Power Requirements (Standard with Every RCTN Transmitter)	115/230V AC	±15% 50/60 Hz 25 W maximum
	20...28V DC	15 W maximum
Ambient Temperature	14...158° F (-10...70° C)	
Configuration	Four-button HMI or RCT Console configuration	
Display	4 line × 20 character; alpha-numeric; dot matrix; LED backlighting	
RTD Input	Standard (1 input)	Built-in 100 Ω Platinum RTD within the sensor body
	Optional (1 auxiliary input)	Additional 100 Ω 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 Ω, 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 Ω input impedance, approximately 12 bit resolution
Auxiliary Power	Internal 24V DC supply, 100 mA maximum (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; PWM with 1 kHz 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)
	Inputs	Four 5...24V DC, 1 k Ω impedance
Industrial Communications Modular Port	Standard	Modbus RTU (EIA-485/RS485)
	Optional Module	Modbus TCP/IP & EtherNet/IP
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 I/O (limit 2 or 4) and available via digital communications	
Transmission Distance	Up to 100 ft (30 meters); contact factory if longer length is needed	
Other Functions	Batch control, PID control. User configuration of all I/O functions	
Measurements	Forward and reverse mass flow and total, density, temperature; concentration, volumetric flow and total (derived)	

CABLE KITS

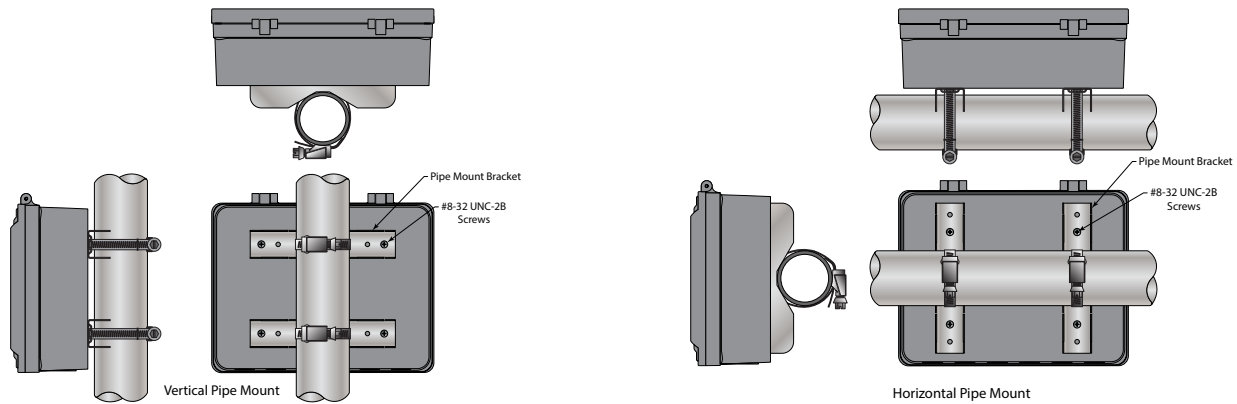
The kits include the cable assembly, cable protector and sensor cable connection cover.			
RC820476-20	Kit, PVC jacketed cable 20 ft	Temp range: -40...176° F (-40...80° C)	
RC820476-35	Kit, PVC jacketed cable 35 ft		
RC820476-50	Kit, PVC jacketed cable 50 ft		
RC820476-70	Kit, PVC jacketed cable 70 ft		
RC820476-100	Kit, PVC jacketed cable 100 ft	Temp range: -94...392° F (-70...200° C)	
RC820477-20	Kit, FEP jacketed cable 20 ft		
RC820477-35	Kit, FEP jacketed cable 35 ft		
RC820477-50	Kit, FEP jacketed cable 50 ft		
RC820477-70	Kit, FEP jacketed cable 70 ft		
RC820477-100	Kit, FEP jacketed cable 100 ft		

DIMENSIONS

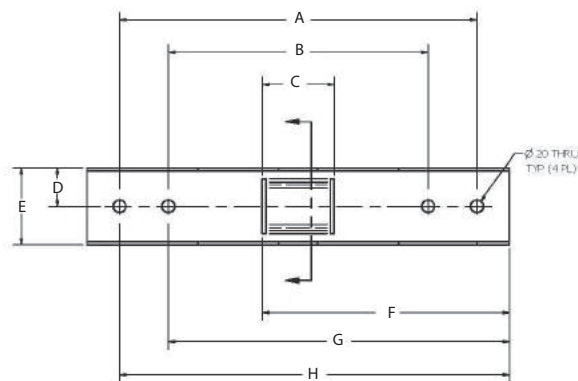
Electronics Enclosure



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)



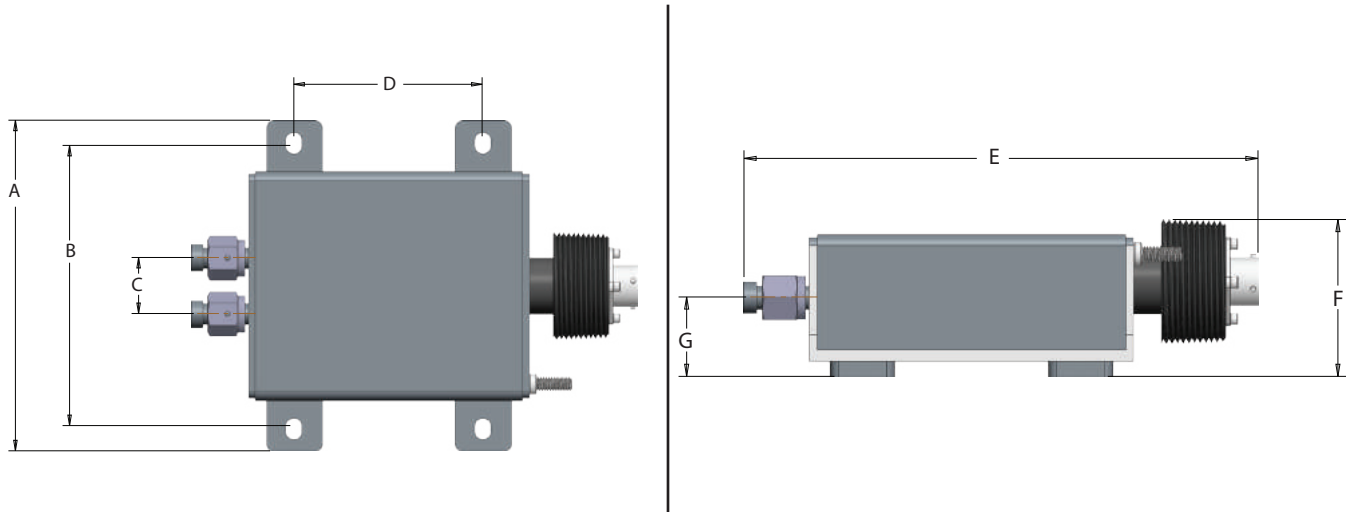
RCTN Pipe Mounting Options



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, RCS005



Sensor	Nominal Size	A	B	C	D	E	F	G
RCS005	1/4 in.	5.90 in. (149.9 mm)	5.00 in. (127 mm)	1.00 in. (25.4 mm)	3.60 in. (85.3 mm)	7.93 in. (201.7 mm)	2.42 in. (61.6 mm)	1.23 in. (31.2 mm)

Sensor Dimensions, RCS008

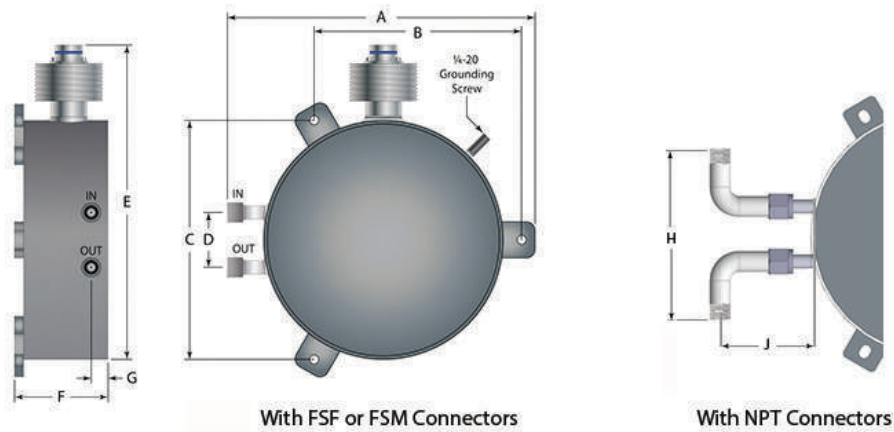


Figure 1: RCS008 dimensions

Sensor	Nominal Size	A	B	C	D	E	F	G	H	J
RCS008	1/4 in.	8.48 in. (215.3 mm)	5.72 in. (145.3 mm)	6.60 in. (167.7 mm)	1.50 in. (38.1 mm)	8.70 in. (221 mm)	2.67 in. (67.8 mm)	0.98 in. (24.9 mm)	4.65 in. (118 mm)	2.48 in. (63 mm)

APPROXIMATE SHIPPING WEIGHTS

Model	Sensor Only		Model	Cables Only		
	lb	kg		lb	kg	
RCS005	5.5 lb	2.49 kg	RC820***-20	6 lb	2.7 kg	
RCS008	9.7 lb	4.4 kg	RC820***-35	8 lb	3.6 kg	
Model	Transmitter Only		Model	Cables Only		
RCTN	6.5 lb	2.95 kg		RC820***-50	10 lb	4.5 kg
				RC820***-70	13 lb	5.9 kg
			RC820***-100	17 lb	7.7 kg	

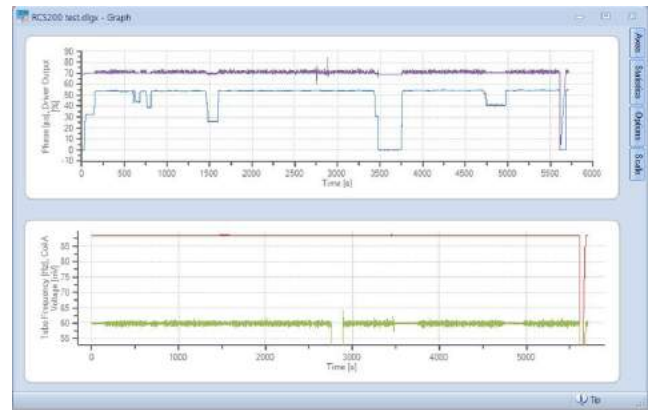
NETWORK OPTIONS

RS-485 Network	All RCT1000 meters come equipped an EIA-485 port with Modbus RTU..
10/100 Base-T Network	An optional Ethernet module allows communications via Modbus TCP/IP or EtherNet/IP.

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.

Sample	Time [s]	33 Phase µs	60 Tube Frequency Hz	183 Coil A Voltage mV	184 Driver Output %	185 Coil B Voltage mV
1	0.359	-0.019311750589572624	88.50712666015625	60.0019416009062	69.021713256625997	69.978921075436453
2	1.045	0.008960438973426119	88.5162151127329689	59.999141699115234	69.029747036277344	69.97891914699375
3	2.075	0.044337108791289836	88.521278381347856	60.00000109642676	69.030576913281125	69.97931101616457
4	3.105	-0.05965318863362367	88.511618232421875	60.028630474881616	69.0277148197910156	69.9715480612793
5	4.134	0.02189528976028018	88.5118637054961	59.991420742849469	69.024771545410156	69.969928741435079
6	5.164	0.0786412221392218	88.512963159179688	59.99433898257813	69.041763305664063	69.967928640087891
7	6.193	0.0290124022810562	88.50967260742187	59.99884033201125	69.036247253417969	69.965499877929688
8	7.223	0.06625362307052612	88.510772705078125	59.9980709749951172	69.035362243682344	69.967361450196313
9	8.253	0.061536488367286407	88.491180419921875	59.990581512451172	69.03688932222656	69.96754074594668
10	9.282	-0.1056340011715869	88.5119628902625	59.99462890625	69.03460683329375	69.963001325863281
11	10.312	-0.019941370278596878	88.5012817326125	60.005199432317047	69.028480529785156	69.986789703389141
12	11.341	-0.0639864497923891	88.497077941894931	60.016311649907813	69.017707624707891	69.9833903503418
13	12.371	-0.0029192639422965	88.50942714922498	59.99747805712891	69.00945842089844	69.971454420505094
14	13.401	0.11963340362620463	88.502136836302719	60.006591528320312	69.027137786347856	69.975844822246922
15	14.431	0.023042159195011177	88.499702453613281	59.993961334220516	69.0336761474820936	69.969004399414063
16	15.461	-0.057191379380325206	88.500648086484375	60.004070201982422	69.027426037897856	69.978610992431641
17	16.491	0.030765749514102936	88.512100219728563	59.9933071891601563	69.038583486209375	69.98319482177734
18	17.521	0.06611208905708113	88.518013000488281	59.98448181823438	69.04222868730469	69.971881866486079
19	18.551	-0.10414708989848228	88.51611845800781	59.989797081054687	69.034095784160156	69.97002001937125
20	19.581	-0.034287726369235952	88.5077896118164	59.990008418503806	69.0320020378417969	69.971920013477234
21	20.611	0.032783609126845796	88.5064697268625	59.9840798984375	69.03858983222656	69.980728148414063
22	21.641	0.0646323710680008	88.501480100253962	59.995951513671875	69.0279159545899644	69.96612932978516
23	22.671	0.000426183919391933	88.503471374511719	60.016239718576172	69.015986840330091	69.989808675482828



ACCESSORIES

Please consult the factory for the availability, pricing and delivery estimates of additional accessories.

SENSORS PART NUMBER CONSTRUCTION

Sensors RCS005 and RCS008 ONLY

Model	Badger Meter Coriolis Flow Meter								
	RCS								
Nominal Line and Equivalent Pipe Size	1/4 in., 1/16 in.								
	005								
	1/4 in., 3/32 in.								
	008								
Wetted Material	316L Stainless Steel								
	S								
Process Connection Type	NPT								
	NPT								
	O-Ring, Face Sealing Body, 9/16-18 Threads								
	FSM								
	O-Ring, Face Sealing Gland								
	FSF								
Electronic Mounting Options	Remote Mount Transmitter								
	R								
Certifications	General/Ordinary Area								
	G								
Calibration/Meter Uncertainty	Liquids (Gases)								
	Mass Flow: 0.1% (0.5%) ± 0.05% of FS zero stability; Density: ± 0.002 g/cm3								
	3								
Reserved	None (Reserved)								
	N								
Specials	Special Code (leave blank for non-custom orders)								
	XXX								

TRANSMITTER PART NUMBER CONSTRUCTION

Model	Badger Meter Coriolis Transmitter								
	RCT								
Enclosure Type	NEMA 4 [IP 65]								
	N								
Transmitter Options	Display and Keyboard								
	K								
Area Classification	General Area								
	D2								
Electronic Mounting Option	Remote Mount Transmitter								
	R								
Communication Protocol	Modbus RTU & Modbus TCP/IP								
	E								
	Modbus RTU (Standard on all models)								
	M								
Sensor Connection	Ordinary Areas								
	N								
Specials	3-Digit Special Code (leave blank for non-custom orders)								
	XXX								

Control. Manage. Optimize.

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Legacy Document Number: CRL-DS-00128-EN