

General Specifications

ROTAMASS 3-Series Coriolis Mass Flowmeter



ROTAMASS integral and remote type Coriolis Mass Flowmeters employ highly refined digital signal processing to provide accurate and stable mass flow measurement.

ROTAMASS's converter case is suitable for use in hazardous areas with its intrinsically safe detector.

ROTAMASS employs a special decoupling system to isolate the detector from external stresses and vibrations, providing high performance in real world applications.

FEATURES

- ▶ Mass flow meter for nearly all fluids, including high viscosity liquids, slurries and multiphase media.
- ▶ Refined digital signal processing enables accurate and stable measurement.
- ▶ A special detector decoupling system isolates the detector from external loads or vibrations.
- ▶ Simple flow path means self-draining, sanitary and simple to clean (3A compliance)
- ▶ High accuracy and high stability over a wide range, not just under lab conditions.
- ▶ Accurate density measurement (+/- 1 g/l / .062lb/ft³).
- ▶ Two analog outputs, 2 pulse outputs or status-out and one status-in as standard I/O.
- ▶ Available in Explosion Proof versions.
- ▶ Wide temperature range -200°C to 350°C / -328°F to 662°F.
- ▶ Microprocessor-based multifunction capability.
- ▶ EEPROM protects parameter settings and totalized values during power failure of any duration.
- ▶ High visibility LCD display.
- ▶ HART communication function.
- ▶ Intrinsically safe outputs available.
- ▶ Alternate tube materials available.
- ▶ ANSI or EN flanges as standard.
- ▶ Other process connections on request.

PRINCIPLE OF OPERATION

In 1835, Gustave-Gaspard Coriolis demonstrated that the rotation of the Earth produced a circular motion in the planet's winds and weather patterns. That same principle can be applied to fluids in a moving pipe. The fluid's inertia causes a lag in the movement of the tube on the inlet side, and an acceleration of the tube on the outlet side. Sensors can be placed on the tube to measure fluid's effect on the tube's movement. The magnitude of the change in the tube's movement can therefore be measured, and is directly proportional to the mass flow of the fluid moving through the tube.



Principle of Measurement

STANDARD SPECIFICATIONS

Detector

MODEL

- RCCS30 to 33: 2 tubes, low flow design with RCCF31 converter
- RCCS34 to 39: 2 tube design with RCCF31 converter
- RCCT34 to 39: 2 tube integral design

Fluid to be measured: Liquid, gas or slurries

Measurement items: Mass flow, density, temperature and concentration, volumetric and net flow

Mass Flow Measurement

Measuring range: refer to tables 1a and 1b.

Table 1a

Type		RCCS30	RCCS31	RCCS32	RCCS33
Qmax	t/h	0.1	0.3	0.6	1.5
Qnom	t/h	0.045	0.17	0.37	0.9
Qmax	lb/m	3.6	11.0	22.0	55.1
Qnom	lb/m	1.65	6.2	13.5	33.0

Table 1b

Type		RCCS34 RCCT34	RCCS36 RCCT36	RCCS38 RCCT38	RCCS39 RCCT39	RCCS39R RCCT39R
Qmax	t/h	5	15	50	120	300
Qnom	t/h	2.7	9	32	85	250
Qmax	lb/m	183	551	1837	4409	11023
Qnom	lb/m	99	330.7	1175	3123	9185

Qnom is the water flow rate at 1 bar/14.5 psi pressure drop.

Qmin is factory set to 0.05% of Qnom (flow hysteresis).

Accuracy:

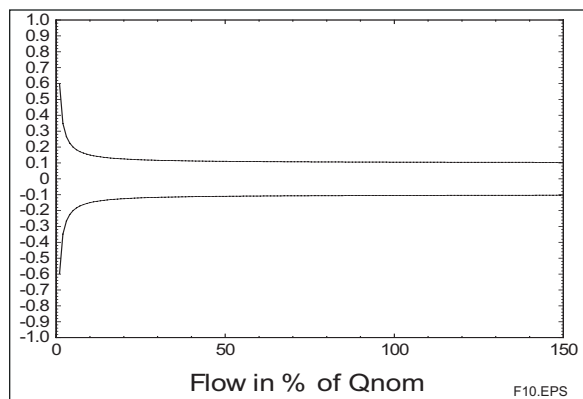
Liquid:

- RCCS3X + RCCF31 : $\pm 0.1\%$ of measured value
- RCCT3X : \pm zero stability (pulse output)

Gas (option /GA):

- RCCS3X + RCCF31 : $\pm 0.5\%$ of measured value
- RCCT3X : \pm zero stability (refer to table 2)

Batch process : Accuracy for batches > 1 min. is standard accuracy as shown above. For batches < 1 min. the accuracy is standard accuracy times the square root of 60/dt. (dt is the batch time in seconds). additional error: max. 0.05 of span additional error of 0.1% may occur below 800Hz



For gas applications please choose option/GA.

All specifications are based on above mentioned calibration reference conditions, a calibration protocol is attached to each instrument.

Table 2. Zero Stability

Type	RCCS30	RCCS31	RCCS32	RCCS33
kg/h	0.0025	0.0085	0.019	0.045
lb/m	0.00009	0.00031	0.0006	0.0016

Type	RCCS34 RCCT34	RCCS36 RCCT36	RCCS38 RCCT38	RCCS39 RCCT39	RCCS39/IR RCCT39/IR
kg/h	0.135	0.45	1.6	4.3	13
lb/m	0.0049	0.016	0.058	0.157	0.477

Pressure Dependency

The stiffness of the Rotamass tubes is slightly line pressure dependent. The static pressure effect of mass flow and density can be corrected by setting the static pressure manually via a menu.

RCCS30-RCCS34: no relevant pressure effect

Table 3: Pressure effect on mass flow

Type		RCCS36 RCCT36	RCCS38 RCCT38	RCCS39 RCCT39	RCCS/T 39 /IR
% of rate per bar	SS	-0.0023	-0.0058	-0.0087	-0.0458
	HC	-0.0036	-0.0092	-0.014	-0.073
	Ti	-0.0038	-0.0095	----	----

T3.EPS

Density Measurement

Measuring range: 0.3 to 5 kg/l / 18.7 to 312 lb/ft³

Accuracy (at calibration conditions):

- RCCS30 : ± 8 g/l / .499 lb/ft³
- RCCS31-33 : ± 4 g/l / .249 lb/ft³
- RCCS/T34 : ± 3 g/l / 0.187 lb/ft³
- RCCS/T36 : ± 2.2 g/l / 0.137 lb/ft³
- RCCS/T38, 39 : ± 1.5 g/l / .093 lb/ft³
- RCCS/T34-39 : ± 1 g/l / 0.062lb/ft³
(with special calibration option /K3)
- RCCS30-33 : ± 2 g/l / 0.124 lb/ft³
(with special calibration option /K3,
good thermal isolation of the
detector, fixed temp. or external
temp. sensor)

Temperature Measurement

Temperature measuring range of converter

Standard and with/MT : -200°C to 230°C/

-328°F to 446°F

With/HT : 0°C to 400°C/

32 to 752°F

Accuracy: : $\pm 1^\circ\text{C}$ / $1.8^\circ\text{F} \pm 0.5\%$ of reading

For operating temperatures more than 80°C / 176°F higher or lower than ambient temperature the detector should be insulated to maintain optimum accuracy.

Heating Tracing (Remote detector RCCS34 to 39, for RCCS30-33 on request)

Heating with heat carrier, insulation and protection housing. The max. surface temperature at the protection housing from inner heating is 40°C / 104°F. Above 150°C / 302°F process temperature insulation from the manufacturer is recommended.

However up to 230°C / 446°F process temperature the customer can insulate the detector themselves.

Option /T1: only insulation and protection;

Option /T2 insulation, protection and heating line;

Option /T3 like /T2 but with ventilation.

Process connection for the heat carrier fluid is ANSI flanges 1/2" 150 lbs.

Protection class: IP54, install roof protected

For temperature fluids below 0°C/32°F ask for special insulation.

Process Temperature Limits

Process temp. range (standard type):

Detector :

RCCS30 to 39 : -180°C to 150°C / -292°F to 302°F

RCCS34 to 39/MT : -180°C to 230°C / -292°F to 446°F
(Range 150°C - 230°C /
302° F - 446° F recommended
with /Tx option)

RCCS34 to 39/HT : 0°C to 350°C / 32°F to 662°F
(only with /Tx option)

On request : -200°C to 150°C / -328°F to 302°F

Integral type :

RCCT34 to 39 : -40°C to 150°C / -40°F to 302°F

Process temp. range (hazardous area application):

Detector RCCS3X Ex Type

Standard : -40°C to 150°C / -40°F to 302°F

with option /MT : -40°C to 220°C / -40°F to 428°F

with option /HT : 0°C to 350°C / 32°F to 662°F

Table 4. Temperature classification

Temp. class	RCCS30 to RCCS33		RCCS34 to RCCS39	
	Max. Ambient Temperature	Max. Medium Temperature/ Temperature of Heat Carrier	Max. Ambient Temperature	Max. Medium Temperature/ Temperature of Heat Carrier
T6	≤50°C/122°F	≤60°C/140°F	≤40°C/104°F	≤40°C/104°F
T5	≤50°C/122°F	≤80°C/176°F	≤55°C/131°F	≤55°C/131°F
T4	≤80°C/176°F	≤100°C/212°F	≤80°C/176°F	≤100°C/212°F
	≤50°C/122°F	≤120°C/248°F	≤40°C/104°F	≤120°C/248°F
T3	≤80°C/176°F	≤150°C/302°F	≤80°C/176°F	≤160°C/320°F
			≤40°C/104°F	≤180°C/356°F
T2	≤80°C/176°F	≤150°C/302°F	≤80°C/176°F	≤220°C/428°F

Temp. class	RCCS34/HT to RCCS39/HT		RCCT34 to RCCT39	
	Max. Ambient Temperature	Max. Medium Temperature/ Temperature of Heat Carrier	Max. Ambient Temperature	Max. Medium Temperature/ Temperature of Heat Carrier
T6	≤65°C/149°F	≤65°C/149°F	≤50°C/122°F	≤65°C/149°F
T5	≤75°C/167°F	≤75°C/167°F	≤50°C/122°F	≤80°C/176°F
T4	≤70°C/158°F	≤115°C/239°F	≤50°C/122°F	≤115°C/239°F
T3	≤70°C/158°F	≤180°C/356°F	≤50°C/122°F	≤150°C/302°F
T2	≤65°C/149°F	≤275°C/527°F		
T1	≤45°C/113°F	≤350°C/662°F		

Converter temperature measuring range:

RCCF31 : -200°C to 200°C / -328°F to 392°F

RCCF31/HT : 0°C to 400°C / 32°F to 752°F

Heat carrier fluid temperature limits:

(option /T2 or /T3 only for remote type RCCS34 to 39)

- Non Ex Type:

Standard : -180°C to 150°C / -292°F to 302°F

with option /MT : -180°C to 230°C / -292°F to 446°F

with option /HT : 0°C to 350°C / 32°F to 662°F

- Ex Type:

Standard : -50°C to 150°C / -58°F to 302°F

with option /MT : -50°C to 220°C / -58°F to 428°F

with option /HT : 0°C to 350°C / 32°F to 662°F

Ambient temperature limits:

- Remote detector RCCS3:

Standard : -50°C to +80°C / -58°F to 176°F

Option /HT : -50°C to +65°C / -58°F to 149°F

(up to 280°C / 536°F medium temp)

-50°C to +55°C / -58°F to 131°F

(up to 350°C / 662°F medium temp)

terminal box lower 100°C / 212°F

- Remote converter RCCF31 and Integral type RCCT3:

Display work range : -20°C to +50°C / -4°F to 122°F

Electronic work

range : -40°C to +50°C / -40°F to 122°F

Cold start : above -30°C / -22°F

Ambient humidity limits: 0 to 100% R.H.

Longer term operation at 95% or more is not recommended.

Process Pressure Limits

According to the flange ratings:

ANSI class 150: max 16 bar/232 psi

ANSI class 300: max 42 bar/609 psi

ANSI class 600: max 83 bar/1203 psi

ANSI class 900: max 124 bar/1798 psi

ANSI class 1500: max 207 bar/3002 psi

Max. tube pressure up to 25°C / 77°F

RCCS30 / 31 / 32 / 34 :210 bar / 3045 psi

RCCS36 :185 bar / 2682 psi

RCCS33 / 38 / 39 :150 bar / 2175 psi

RCCS39 / IR :100 bar / 1450 psi

For higher medium temperatures pressure needs to be derated as follows:

RCCS30/31/32/34/36/39/IR to 150°C / 302°F: None

151 to 230°C / 303 to 446°F: 8% derating

231 to 350°C / 447 to 662°C: 22% derating

RCCS30/33/38/39/ 39/IR to 150°C / 302°F: None

151 to 230°C / 303 to 446°F: 10% derating

231 to 350°C / 447 to 662°F: 23% derating

Higher pressure on request.

Materials

- Detector: Stainless steel 316
- Terminal box: Stainless steel and aluminum
- Converter: Aluminum

Wetted parts

- RCCS30 to 33:
 - Tubes: HC-22/2.4602
 - Process connections: 316L/1.4404
- RCCS34 to 39 and RCCT34 to 39:
 - Tubes and process connection
 - 316L/1.4404 or Hastelloy C-22/2.4602
- RCCS34 to 38 and RCCT34 to 38:
 - Tubes and process connection
 - Titanium B265 Gr.2/3.7035
- RCCS39/IR:
 - Tubes and process connection
 - 316L/1.4404

Diameter of Measuring Tubes

Type		RCCS30	RCCS31	RCCS32	RCCS33
Inner diameter	mm	1.2	2.1	3	4.5
Wall thickness	mm	0.2	0.25	0.25	0.25
Inner diameter	inch	0.047	0.082	0.118	0.177
Wall thickness	inch	0.007	0.009	0.009	0.009

Type		RCCS34 RCCT34	RCCS36 RCCT36	RCCS38 RCCT38	RCCS39 RCCT39	RCCS39/IR RCCT39/IR
Inner diameter	mm	7.6	13.4	22.1	37.2	55.1
Wall thickness	mm	0.9	1.2	1.65	2.6	2.6
Inner diameter	inch	0.299	0.527	0.870	1.46	2.17
Wall thickness	inch	0.035	0.047	0.064	0.102	0.102

Table 5

Gas content limits

Gas content limit is defined as the amount of gas which generates an error (frequency error) in the converter. The gas content limit is dependent on viscosity, surface tension and bubble size of the liquid/gas mixture. It is also dependent on the flow rate (the higher the flow rate, the lower the gas content limits). The given values are for a flow of 50% of Q_{nom} and water/air mixture at room temperature.

- RCCS30 to 33: no limitation
- RCCS/T34: no limitation
- RCCS/T36: larger 50%
- RCCS/T38: approx. 30%
- RCCS/T39: approx. 7%
- RCCS/T39/IR: approx. 3%

With liquid/gas mixtures the specified mass flow accuracy will not be achieved. For the sizes RCCS30-34 the expected error is between 0 to -1% per %gas, for the larger sizes the error is not predictable.

For short time aeration a function can be activated to keep the current outputs constant during the aeration time.

2 phase flow

2 phase flow can generate minus span errors. The errors are proportional to the difference in density between the 2 phases and the ratio of the two components of the process. If the particles (or droplets) are very small no errors will be generated.

Other Limits

Ambient humidity limits: 5 to 95% R.H. non-condensing

Pressure loss: Pressure loss depends on velocity, viscosity and density of the fluid. For Newtonian fluids typical pressure loss is shown in table 6 (water, 20°C / 68°F).

Type		RCCS30	RCCS31	RCCS32	RCCS33
Q_{max}	bar	4.45	2.72	2.34	2.5
Q_{nom}	bar	1.1	1.01	1	1.01
Q_{max}	psi	64.54	39.45	33.93	36.25
Q_{nom}	psi	15.95	14.65	15.95	14.65

Type		RCCS34 RCCT34	RCCS36 RCCT36	RCCS38 RCCT38	RCCS39 RCCT39	RCCS39/IR RCCT39/IR
Q_{max}	bar	2.5	3.01	3.58	2.35	0.94
Q_{nom}	bar	1.03	1.1	1.05	0.95	0.67
Q_{max}	psi	36.25	43.6	51.9	34.1	13.6
Q_{nom}	psi	14.9	15.9	15.2	13.7	9.7

Table 6

Protection class: IP67

Secondary containment:

Rupture pressure for RCCS34-39 housing is typically above 130 bar/1855 psi. If the detector housing is exposed to this pressure it will deform and measurement will degrade. Therefore pressure testing of the housing (option /J1) can only be done at the lower pressures where deformation does not occur.

Calibration for liquids:

ROTAMASS flow meters are factory calibrated with water.

Calibration Conditions:

- Water: 22.5°C ± 12.5°C / 72.5°F ± 22.5°F
- Ambient temperature: 22.5°C ± 12.5°C / 72.5°F ± 22.5°F
- Pressure: 1 - 2 bar/14.5 to 29 psi

All specifications are based on above mentioned calibration reference conditions.

Installation:

The flow meter can be installed in any position, as long as a full pipe is maintained during meter operation.

Sizing:

The measuring range and accuracy are independent of fluid conditions and size of the connecting pipe. Select a suitable nominal size from pressure loss diagrams and the sizing program. Check whether the measuring range and accuracy at minimal flow fit the application. Pressure loss calculations are based on Newtonian fluids.

Heat Tracing (Remote detector RCCS34 to 39, for RCCS30-33 on request):

Heating with heat carrier, insulation and protection housing. The max. temperature at the housing is 40°C / 104°F. Above 150°C / 302°F process temperature insulation from the manufacturer is recommended.

However up to 230°C / 446°F process temp., the customer can insulate the detector themselves.

Option /T1: only insulation and protection;

Option /T2: insulation, protection and heating line;

Option /T3: like /T2 but with vent.

Process connection for the heat carrier fluid is for D-type flanges: EN DN 15 PN 40 Form B1 and for A-type flanges ANSI 150lbs.

Protection class: IP54, must be protected from weather and condensation.

Special calibrations:

- Mass flow: at customer specified flow values between 14 and 70% of nominal flow (option /K1)
- Density: Calibration at density less than 0.7 or greater than 1.3 kg/L.
- Mass flow: with DKD Certificate (German Calibration Service Certificate: traced to the German legal authorities) (option /K5)
- other calibrations on request

Certificates:

- Certificate of compliance per "2.1" EN 10204 (DIN 50049) (option /P2)
- Test report "2.2" EN 10204 (DIN 50049) (option /P4)
- Material inspection certificates for wetted parts "3.1.B" EN 10204 (DIN 50049) (option /P6)
- other certificates on request.

STANDARD SPECIFICATIONS Converter

Model

- Remote type RCCF31
- Integral type RCCT34 to 39

Ambient temperature limits:

-20°C to 50°C / -4°F to 122°F
(for standard and Ex version)

Ambient humidity limits:

5 to 95% R.H. non-condensing

Power supply and power consumption:

90 to 264 V AC, 47-63 Hz or 20.5 – 28.8 V DC
For Ex version 250 V AC max.
Consumption max. 25VA / 10W

Fuse on Base Board:

- AC (90 ~ 264 V) 2 A, T (Slow Blow)
- DC (20.5 ~ 28.8 V) ... 2 A, T (Slow Blow)
- External circuit breaker rating: 5 A, 250 V (No power switch is mounted in the converter). When installing the flowmeter, please provide a switch or circuit breaker. Must conform to IEC 947-1, IEC 947-3 standard or all applicable NEMA and local electrical codes.

I/O signal standard:

- Two current outputs:
 - 4 to 20 mA DC, galvanic separated from other signals,
 - Load resistance: 20Ω to 600Ω
 - Failure current according NAMUR NE43
 - Ambient temperature effect: <0.05% of span/10°C
- Two Pulse output / status outputs:
 - passive transistor contact output, 30V DC, 200 mA
 - Output rate:
 - Output 1: 0 to 10000 pulses/s
 - Output 2: 0 to 2000 pulses/s
 - Active pulse output is not isolated from current output 2
 - Option /NM: passive, according EN50227
 - Option /AP: active output, 12V, 6mA, $R_L > 10k\Omega$
 - As frequency output:
 - Output 1: 20Hz to 10000Hz
 - Output 2: 20Hz to 2000Hz
 - Additional error of 0.1% may occur below 800 Hz
- Status input: Voltage-free contact,
 - Closed: <200Ω
 - Open: >100 kΩ

Two intrinsically safe outputs (/KF2, pending)

- One current output (passive):
 - 4 to 20 mA DC, galvanically isolated from other signals. Load resistance: 20 to 600Ω
- One pulse output / status output:
 - passive transistor contact output, 30 V DC, 200 mA
 - Output rate: 0.1 to 10000 Hz

Digital communication:

- HART communication signal, superimposed on 4 - 20 mA DC signal (I output 1)
- Load resistance: 230 - 600 Ohm (including cable)
- Power line spacing: 15 cm / 6 in or more, avoid parallel wiring
- Cable length: ≤ 1.2 mi.

Setting functions: Programming is possible from the display or with HART communication.

Display function: Up to 4 lines.
3 languages selectable (English, German, French)
Instantaneous flow rate, density, temperature or totalized flow can be displayed.

Damping functions: Set table from 0.4 seconds to 200 seconds (63% response time), controls display and outputs.

Data security during power failure: Data storage by EEPROM, no back-up battery required.

Protection class: IP67

Materials

- Detector housing: SS 1.4301 (304)
- Converter housing: Aluminum alloy with polyurethane corrosion-resistant coating

Coating color

- Converter case: mint green
- Terminal box cover: mint green

Isolation resistance of converter*

- between power and ground terminal: 100M Ω / 500V DC
- between power and I/O terminals: 20M Ω / 100 V DC
- between I/O terminals and ground: 20M Ω / 100 V DC

Dielectric strength*

- between power and ground terminal: 1500 V AC for 1 min.

* When surge arrestors are removed.

NOTES:

For inquiries about pressure losses for non-Newtonian fluids please contact your Yokogawa representative.

Please refer to the RotaMASS Sizing Program for details and for sizing a meter for specific process conditions.

REMOTE CABLE RCCY033 SPECIFICATION

6 pairs; pair shielded; pair twisted; overall shielding
Li2Y (St) + CY 5x2 AWG24

Temp. range (RCCY033): -40°C to 105°C / -40°F to 221°F

Resistance of loop: 59 Ω /mi

Capacity wire/wire: 50 nF/mi

Capacity wire/shield: 73 nF/mi

Inductance: 0.37 mH/mi

Cable with 3 pairs and 1 triple, pair (triple) shielded, twisted, overall shielded can also be used.

HAZARDOUS AREA SPECIFICATIONS

FM

Remote detector RCCS30...39 (option/FS1):

- Intrinsically safe
- Class I, Division 1, Groups A, B, C, D
- Class II, III, Division 1, Groups E, F, G
- IP67 / NEMA 4X

Remote converter RCCF31 (option/FF1):

- Housing explosion proof
- Provides intrinsically safe detector circuits
- Class I, Division 1, Groups A, B, C, D
- Class I, Zone 1, AEx d [ia] IIC
- Class II / III, Division 1, Groups E, F, G
- IP67 / NEMA 4X

Integral type RCCT34 ... 39 (option/FF1):

- Housing explosion proof
- Class I, Division 1, Groups A, B, C, D
- Class I, Zone 1, AEx d [ia] IIC
- Class II / III, Division 1, Groups E, F, G
- IP67 / NEMA 4X

Process temperature limits:

- Standard: -50°C to 150°C / -58°F to 302°F
- with option /MT: -50°C to 220°C / -58°F to 428°F
- with option /HT: 0°C to 350°C / -32°F to 662°F

Heat carrier fluid temperature limits:

- Standard: -50°C to 150°C / -58°F to 302°F
- with option /MT: -50°C to 220°C / -58°F to 428°F
- with option /HT: 0°C to 350°C / -32°F to 662°F

Electrical data of intrinsic safe circuits (output of converter):

- Driving circuit: terminal D+ and D-
EEx ia IIC: $U_o = 14.5 \text{ V}$; $I_o = 47 \text{ mA}$; $P_o = 0.171 \text{ W}$
 $L_o = 15\text{mH}$; $C_o = 0.65\mu\text{F}$
- Sensor circuits: terminals S1+ and S1- or S2+ and S2-
EEx ia IIC: $U_o = 14.5 \text{ V}$; $I_o = 47 \text{ mA}$; $P_o = 0.171 \text{ W}$
 $L_o = 15\text{mH}$; $C_o = 0.65\mu\text{F}$
- Temperature sensor circuit: terminals TP1, TP2, TP3
EEx ia IIC: $U_o = 13.3 \text{ V}$; $I_o = 40 \text{ mA}$; $P_o = 0.133 \text{ W}$
 $L_o = 20\text{mH}$; $C_o = 0.91\mu\text{F}$

Special conditions:

- The flowmeter must be connected to the potential equalization system.
- For AC-version maximum power supply is 250V AC.
- For remote type the maximum cable length is 50m/164ft.
- For remote type at ambient temperature up to 60°C/140°F use cable RCCY032.
- For remote type at ambient temperature up to 80°C/176°F please contact factory.

Explosion Proof: ATEX directive certified:
KEMA 02ATEX 2183 X

Code	Specifications				
/KF1 flame proof	ATEX Directive (certified KEMA (CENELEC) Flame proof Approval, Group II, Category 2 GD EEx d(e) [ib] IIC T6..T3 (RCCT3) EEx d(e) [ib] IIC T6 (RCCF31) Tamb: -20 to +50°C/-4 to 122°F For integral type RCCT3:				
	Temperature class	Ambient temperature	Process temperature		
	T6	≤50°C/122°F	≤ 65°C/149°F		
	T5	≤50°C/122°F	≤ 80°C/176°F		
	T4	≤50°C/122°F	≤115°C/239°F		
	T3	≤50°C/122°F	≤150°C/302°F		
/KF2 intrinsic safe output in prepara- tion	Additional specifications for option /KF2: Intrinsic safe outputs EEx de [ia][ib] IIC T6..T3 (RCCT3) EEx de [ia][ib] IIC T6 (RCCF31) Data for intrinsic safe (ia) outputs:				
		U _i	I _i	C _i	L _i
	Current (analog) output	30V	165mA	5310pF	negligible
	Pulse output	30V	100mA	3110pF	negligible

Table 7: Temperature classification:

Temp. class	RCCS30 to RCCS33		RCCS34 to RCCS39/IR without insulation		RCCS34 to RCCS39/IR with factory insulation /T1.../T3		RCCT34 to RCCT39/IR	
	Max. ambient temperature	Max. medium temperature	Max. ambient temperature	Max. medium temperature / temperature of heat carrier	Max. ambient temperature	Max. medium temperature / temperature of heat carrier	Max. ambient temperature	Max. medium temperature
T6	≤ 50°C / 122°F	≤ 60°C / 140°F	≤ 40°C / 104°F	≤ 40°C / 104°F	≤ 65°C / 149°F	≤ 65°C / 149°F	≤ 50°C / 122°F	≤ 65°C / 149°F
T5	≤ 50°C / 122°F	≤ 80°C / 176°F	≤ 55°C / 131°F	≤ 55°C / 131°F	≤ 75°C / 167°F	≤ 75°C / 167°F	≤ 50°C / 122°F	≤ 80°C / 176°F
T4	≤ 80°C / 176°F	≤ 100°C / 212°F	≤ 80°C / 176°F	≤ 100°C / 212°F	≤ 70°C / 158°F	≤ 115°C / 239°F	≤ 50°C / 122°F	≤ 115°C / 239°F
	≤ 50°C / 122°F	≤ 120°C / 248°F	≤ 40°C / 104°F	≤ 120°C / 248°F				
T3	≤ 80°C / 176°F	≤ 150°C / 302°F	≤ 80°C / 176°F	≤ 160°C / 320°F	≤ 70°C / 158°F	≤ 180°C / 356°F	≤ 50°C / 122°F	≤ 150°C / 302°F
			≤ 40°C / 104°F	≤ 180°C / 356°F				
T2	≤ 80°C / 176°F	≤ 150°C / 302°F	≤ 80°C / 176°F	≤ 220°C / 428°F	≤ 65°C / 149°F	≤ 275°C / 527°F		
T1					≤ 45°C / 113°F	≤ 350°C / 662°F		

T7.EPS

Application and Installation Hints

Wetted Materials:

In Coriolis meters the Coriolis force bends the tubes. To achieve stable deflection of the tubes the stiffness and wall thickness has to be kept constant. With corrosion or erosion the meter factor drifts with time and recalibration is necessary. Selecting the suitable tube material for the process is imperative!

Pressure loss and sizing:

Proper selection of the meter size is based upon pressure loss, accuracy and cost. Please use the RotaMASS sizing program to choose the most suitable size.

Sanitary applications:

For sanitary applications select process connection S4 or S8. The wetted surface will be $Ra \leq 64 \mu\text{inch}$. However, if option /SF is selected the surface roughness will be $Ra < 32 \mu\text{inch}$ and a certificate with a 3-point roughness measurement is provided.

Heat tracing and insulation:

The detector can be insulated. The converter should not exceed more than $50^\circ\text{C} / 122^\circ\text{F}$. Never insulate the converter or the neck. To prevent overheating the converter or the connection box choose one of the /Tx options (insulation or heat tracing from Yokogawa). For temperatures between $150^\circ\text{C} / 302^\circ\text{F}$ and $230^\circ\text{C} / 446^\circ\text{F}$ choose /MT option and remote installation.

Installation above $100^\circ\text{C} / 212^\circ\text{F}$ process temperature:

To provide enough cooling the instrument should be installed vertically or horizontally with the converter down. This is recommended for size RCCT/S36 and larger without /Tx option.

Installation below $0^\circ\text{C} / 32^\circ\text{F}$ process temperature:

To keep the converter or connection box free of ice install it either vertically or horizontally with the converter up.

Two phase flow:

Two phase flow can generate Zero and Span errors. The errors are proportional to the difference in density between the two phases and the amount of the second phase. It is best to avoid two phase flow by good installation and good process control. If the presence of gas is unavoidable, the instrument incorporates a density window function to start measurement only if a certain density is reached. Other possibilities to adapt the instrument to users' needs are available upon request.

Concentration Measurement and Net Flow:

Concentration measurement is available, and must be set up by the factory. Customers must provide a concentration table of their 2 component fluids. Tables exist for Brix, Baume, NaOH/water, KOH/water. Concentration measurement has to be handled as a special order (/Z).

Zero adjustment function:

Zero point can be adjusted automatically either from the display; or with HART communication; or with status input when the fluid is stopped and the detector filled. To ensure no flow conditions stop valves should be installed. To achieve the specified accuracy a zero should be performed at process conditions (temp., pressure). Monitor the amount of air entrainment by checking fluid density.

Pressure/Temperature:

The RCCS30 to RCCS33 have as standard process connection 1/4 NPT F. Please find the pressure/temperature information in table 9.

Cavitation:

To avoid cavitation keep the back pressure of the fluid sufficiently above the vapor pressure of the fluid. For low viscous fluids following condition should be fulfilled at the given temperature:

$$P_{\text{back}} > P_{\text{vapor}} + 0.7 \cdot \Delta p$$

With $\Delta p =$ pressure loss (e.g. given by the sizing program)

Long Term Stability:

To get stable deflection of the tubes by the coriolis forces the stiffness and therefore the wall thickness has to be kept constant during measuring. With corrosion or erosion the meter factor drifts with time and recalibration is necessary. Select the suitable tube material for the process!

Density Measurement RCCS30-33:

Precise density measurement is dependent upon precise temp. measurement and control. Under certain conditions, insulation of the detector may be required. Please consult YCA for further details.

Corrosion and Erosion:

RotaMASS maximum temperature and pressure limits are designed without taking degrading by corrosion or Erosion into account. It is in the sole responsibility of the user to ensure the safety if corrosion or Erosion happens.

PRESSURE LOSS

Pressure loss depends on velocity, viscosity and density of the fluid. For newtonian fluid the pressure loss is shown in table 8 (1kg/l, 1mPas) and figures 1 to 9.

Table 8: Pressure loss

Table 8a

Type		RCCS30	RCCS31	RCCS32	RCCS33
Qmax	psi	64.54	39.45	33.93	36.25
Qnom	psi	15.95	14.65	15.95	14.65

T8a.EPS

Note:

- Figures 1 to 9 show the pressure loss for newtonian fluids, density is 1kg/l, viscosity as shown.

Please inquire pressure losses for non-newtonian fluids from your Yokogawa representative.

- The pressure losses are valid for constant flows. Pulsating flow causes a considerably higher pressure loss on average.

Table 8b

Type		RCCS34 RCCT34	RCCS36 RCCT36	RCCS38 RCCT38	RCCS39 RCCT39	RCCS39 /IR
Qmax	psi	36.25	43.6	51.9	34.1	13.6
Qnom	psi	14.9	15.9	15.2	13.7	9.7

T8b.EPS

Fig. 1: Pressure loss RCCS30

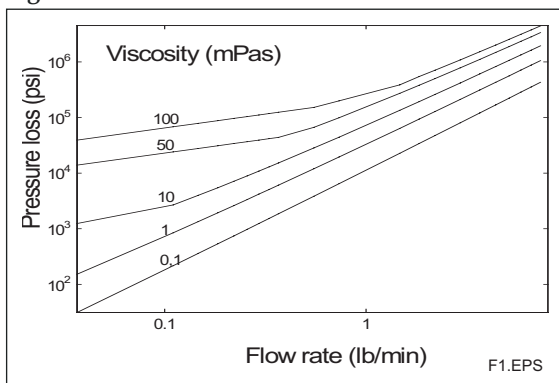


Fig. 4: Pressure loss RCCS33

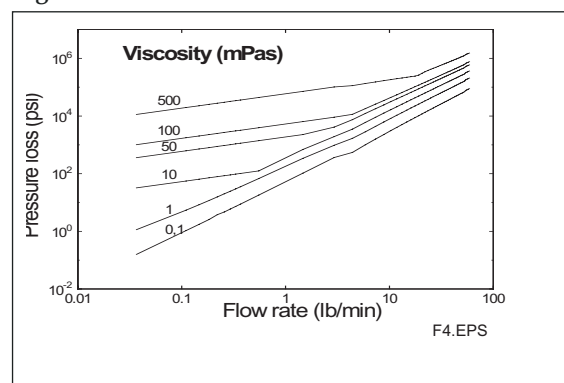


Fig. 2: Pressure loss RCCS31

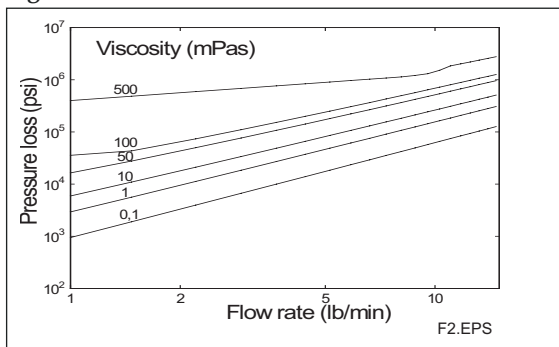


Fig. 5: Pressure loss RCCS34

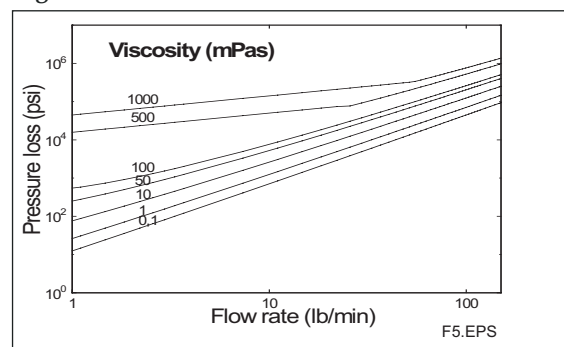


Fig. 3: Pressure loss RCCS32

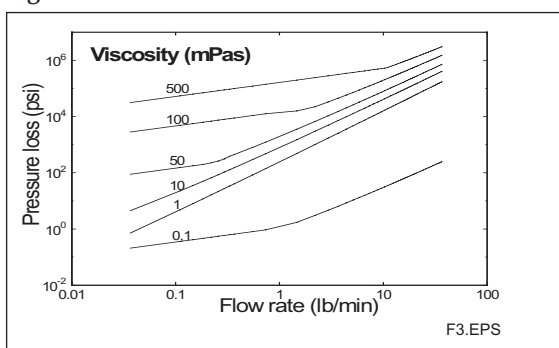


Fig. 6: Pressure loss RCCS36

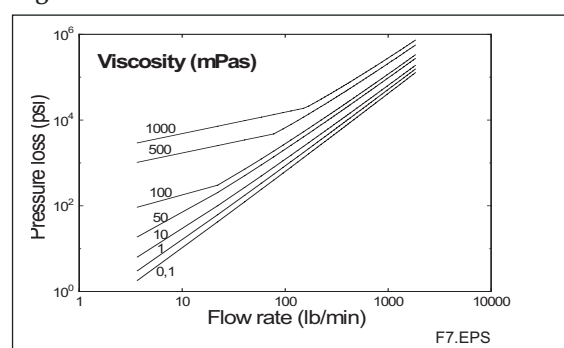


Fig. 7: Pressure loss RCCS38

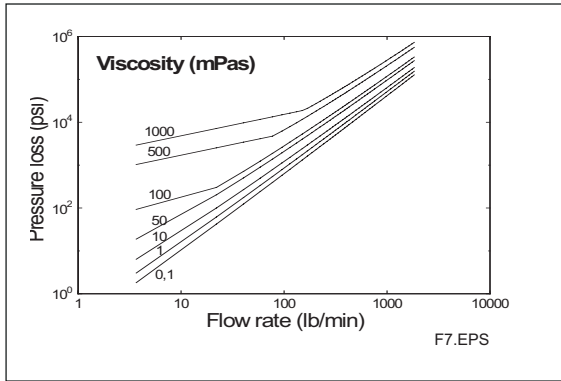


Fig. 9: Pressure loss RCCS39/IR

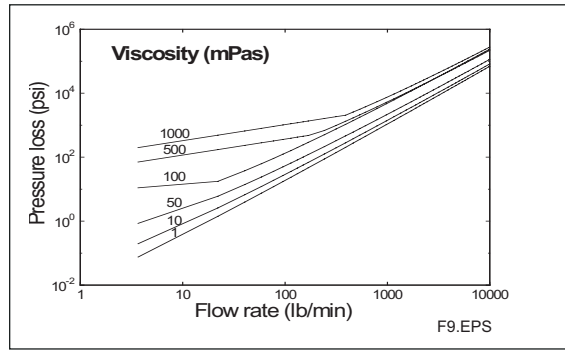


Fig. 8: Pressure loss RCCS39

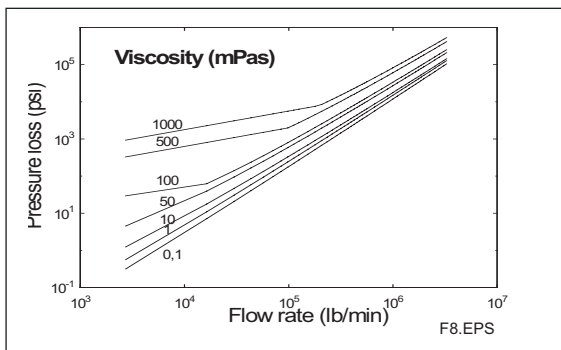


Table 9: Pressure rating

Type of process connection 1)		Medium temperature								
		to 86°F	122°F	212°F	302°F	392°F	482°F	575°F	662°F	
A1	Flange acc. ANSI B16.5 Class 150	230 psi	221 psi	192 psi	174 psi	159 psi	148 psi	140 psi	122 psi	
A2	Flange acc. ANSI B16.5 Class 300	600 psi	580 psi	500 psi	453 psi	417 psi	387 psi	365 psi	348 psi	
A3	Flange acc. ANSI B16.5 Class 600	1200 psi	1188 psi	1008 psi	910 psi	845 psi	795 psi	755 psi	726 psi	
A4	Flange acc. ANSI B16.5 Class 900	1800 psi	1740 psi	1513 psi	1365 psi	1268 psi	1194 psi	1133 psi	1090 psi	
A5	Flange acc. ANSI B16.5 Class 1500	3000 psi	2900 psi	2520 psi	2275 psi	2113 psi	1990 psi	1888 psi	1817 psi	
		Medium temperature								
		to 302°F **)								
S8	Clamp connection for to 2 in (2")	232 psi					**) under the restriction using suitable clamp and gasket materials			
	Sanitary OD-Tubing above 2 in (2")	145 psi								

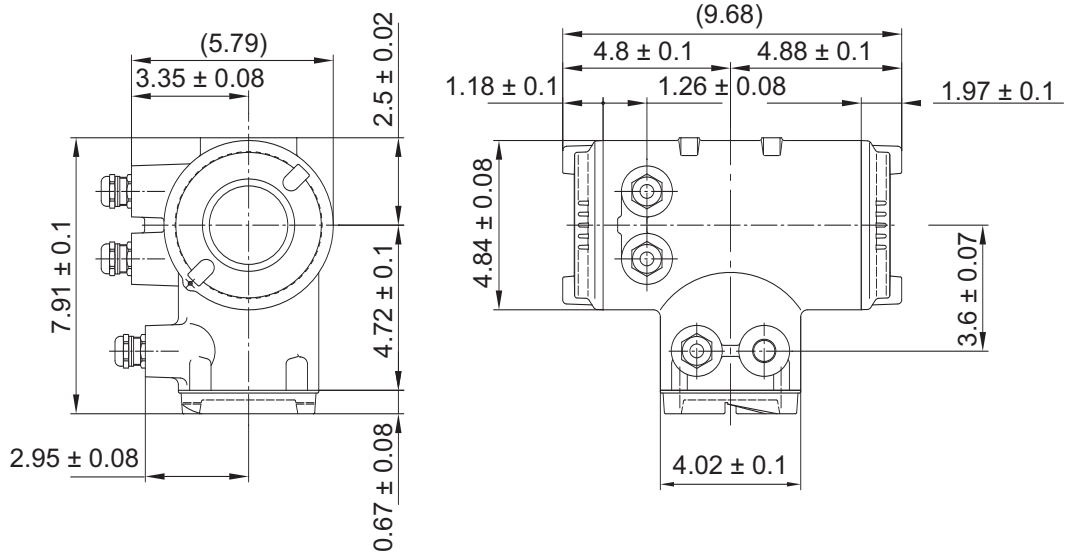
1) all process connections made 316L (1.4404 / 1.4435)

T9.EPS

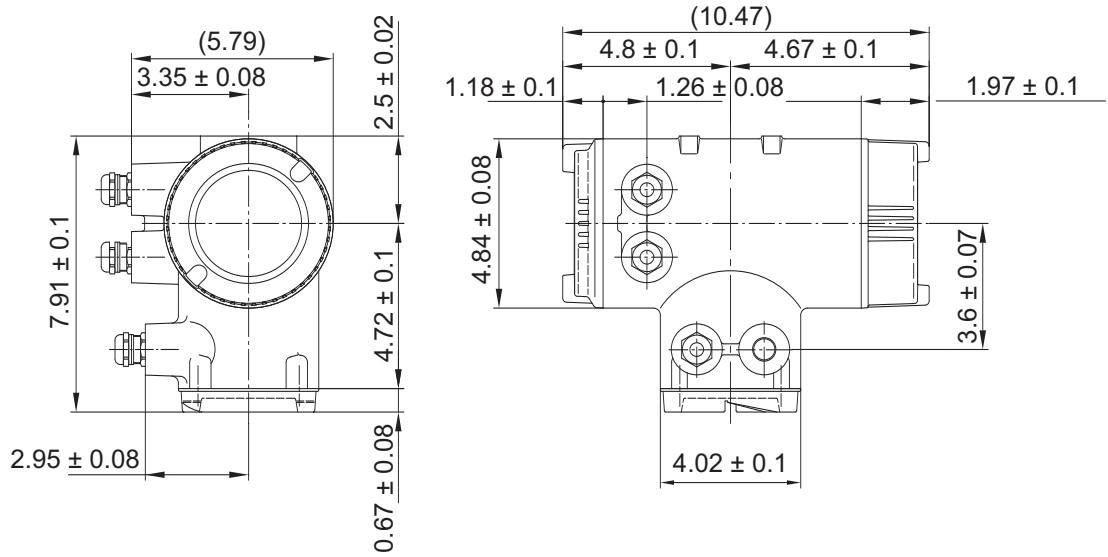
WEIGHT AND DIMENSIONS

Converter RCCF31

Without Indicator



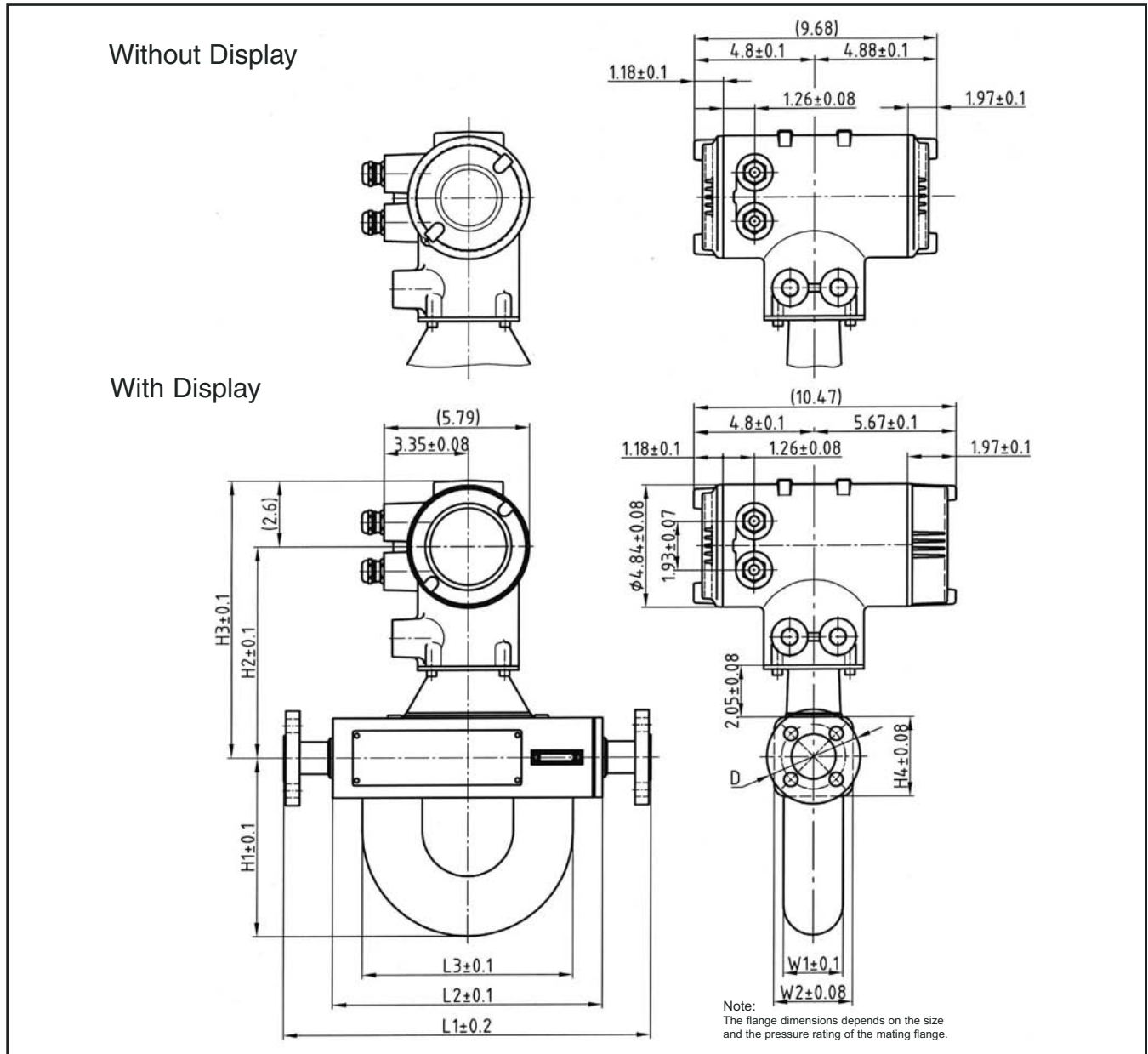
With Indicator



Weight: 10 lbs

Dimensions are given in inches

RCCT3X Integral Version



Note : Flange dimensions depend on size and pressure rating of the flange

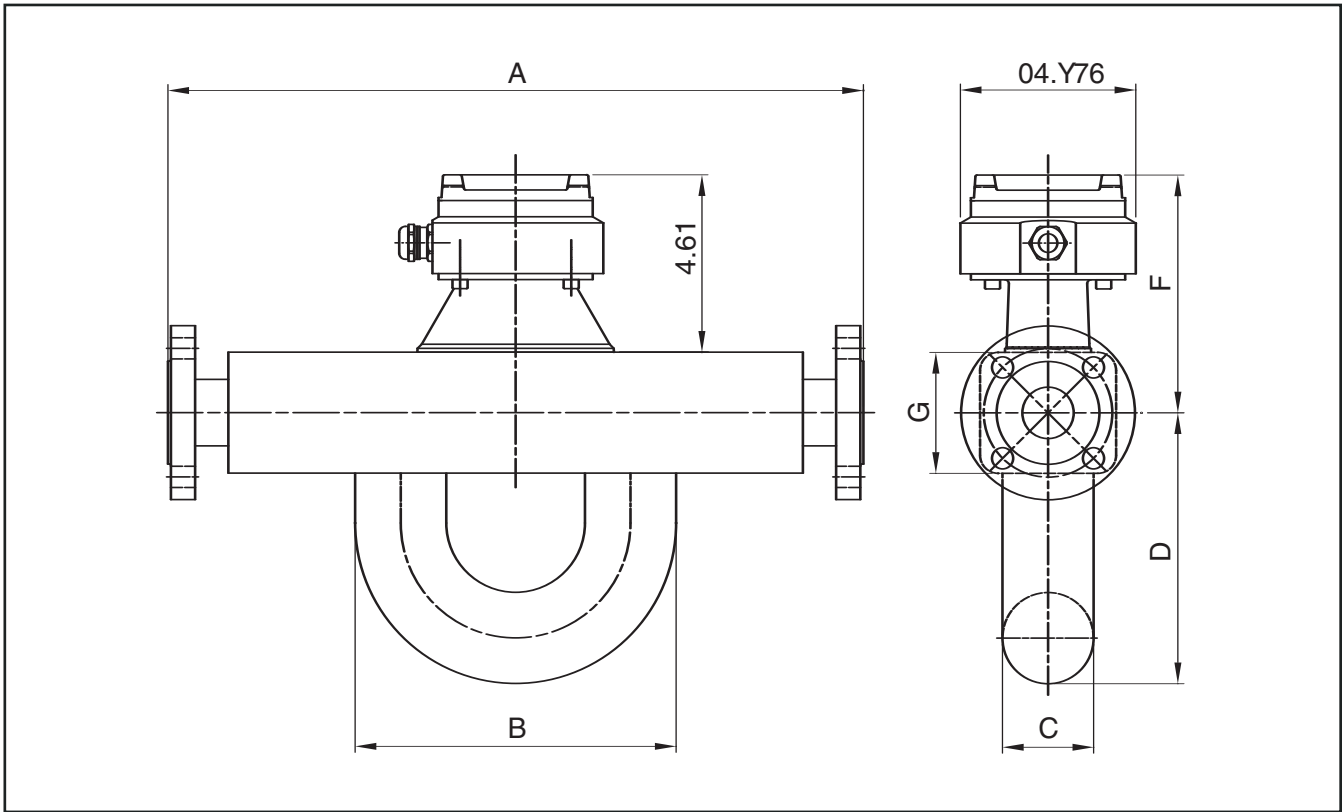
Model		L1*	L2	L3	H1	H2	H3	H4	W1	W2	Weight
RCCT34	[in]	*	10.7	8.3	7.1	7.2	9.7	3.1	2.4	3.1	28.7 lb
RCCT36	[in]	*	15.7	10.5	9.2	7.2	9.7	3.1	3	3.5	37.5 lb
RCCT38	[in]	*	19.3	10.5	10.4	7.6	10.1	3.9	3.5	4.3	57.3 lb
RCCT39	[in]	*	33.5	14.9	16.9	8.3	10.8	5.3	5.1	6.3	141 lb
RCCT39/IR	[in]	*	34.3	17.9	17.8	9.5	12	7.9	6.1	7.9	203 lb

NOTE:

See table 10 for dimensions for S8 option.

* See table 10.

RCCS34-39 Remote version

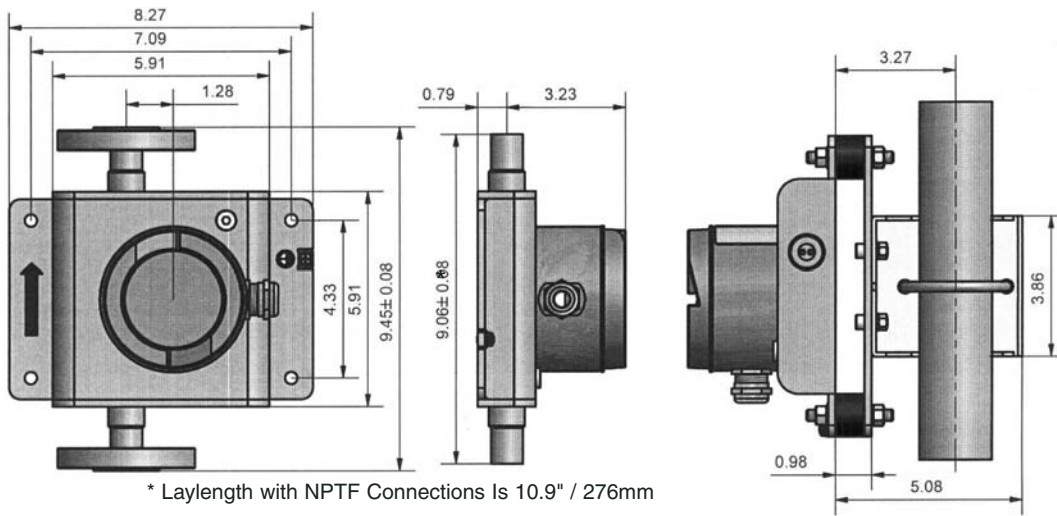


Dimensions are given in inches

Model		A*	B	C	D	E	F	G	Weight
RCCS34	[in]	*	8.3	2.4	7.1	3.1	6.2	3.1	20.9 lb
RCCS36	[in]	*	10.5	3.0	9.2	3.5	6.2	3.1	28.6 lb
RCCS38	[in]	*	10.5	3.5	10.4	4.3	6.6	3.9	48.5 lb
RCCS39	[in]	*	14.9	5.1	16.9	6.3	7.3	5.3	132 lb
RCCS39/IR	[in]	*	17.9	6.1	17.8	7.9	8.5	7.9	194 lb

RCCS30-33

* See table 10.



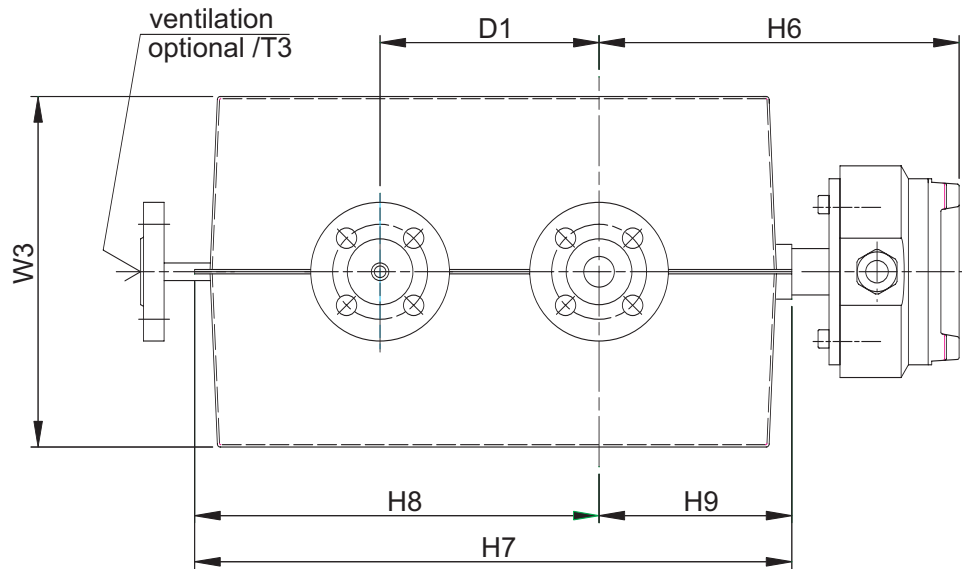
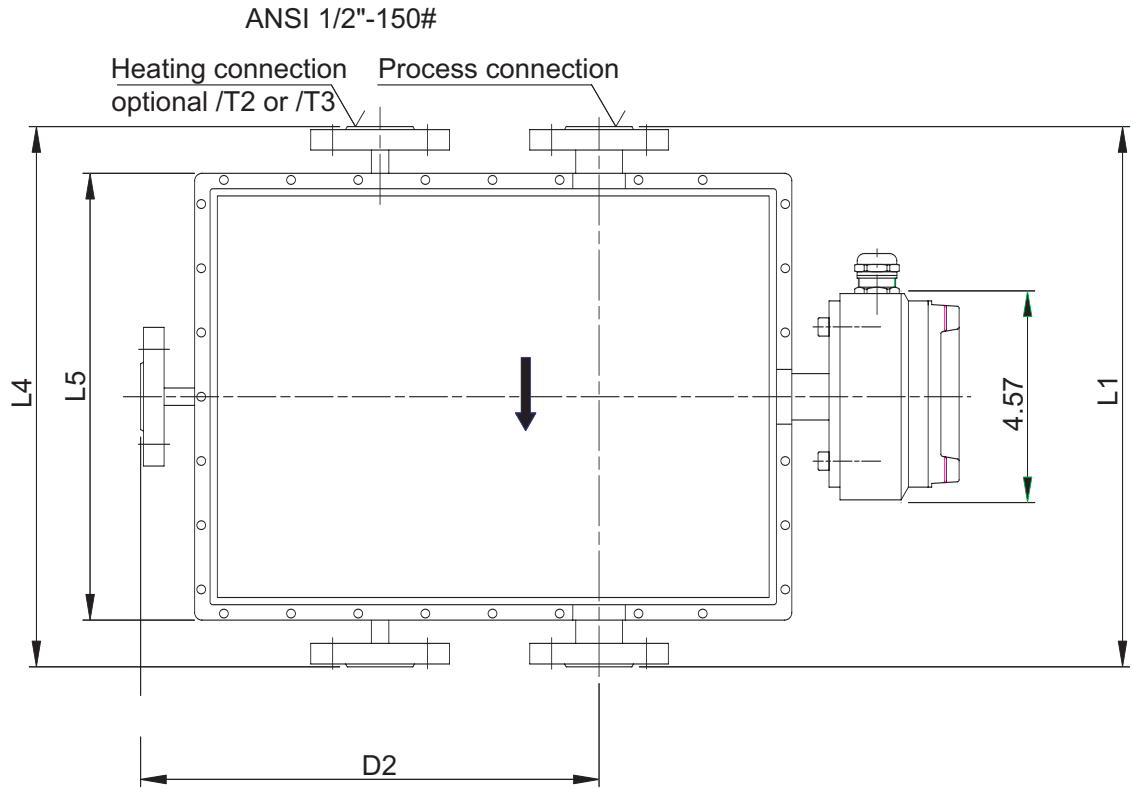
* Laylength with NPTF Connections Is 10.9" / 276mm

Weight (without flanges): 1.6 lb.

with 2" pipe mounting set

NOTE: See table 10 for dimensions for S8 option.

Remote detector RCCS34 -39/IR with option /Tx (Isolation / Heating)



Model		L1	L4	L5	D1	D2	H6	H7	H8	H9	W3	weight
RCCS34	[in]	see table 10	16.53	12.20	7.87	12.99	9.33	16.18	10.75	5.43	9.45	40 lb
RCCS36	[in]	see table 10	21.26	17.28	9.84	14.96	9.33	18.27	12.83	5.43	10.23	55 b
RCCS38	[in]	see table 10	25.20	20.87	9.84	16.93	9.72	20.63	14.80	5.83	10.23	82 lb
RCCS39	[in]	see table 10	39.37	34.80	13.78	22.83	10.43	26.93	20.47	6.50	11.97	211 lb
RCCS39/IR	[in]	see table 10	40.95	36.70	13.78	23.23	11.69	28.74	20.87	7.87	13.50	278 lb

Heating connection : ANSI 1/2 - 150#

F16.EPS

MODEL AND SUFFIX CODES

Integral Type:

Model	Suffix code		Option code	Description
RCCT34 RCCT36 RCCT38 RCCT39 RCCT39/IR				Nominal Flow Rate: 2.7 t/h = 4Y kg/min / 99 lb/m Nominal Flow Rate: 9 t/h = 1Y0 kg/min / 330 lb/m Nominal Flow Rate: 32 t/h = Y33 kg/min / 117Y lb/m Nominal Flow Rate: 8Y t/h = 1420 kg/min / 3123 lb/m Nominal Flow Rate: 2Y0 t/h = 4240 kg/min / 918Y lb/m
Power Supply		-A -D		100 - 240 V AC 24 V DC
Indicator		H1 V0 N0		Detector installation horizontal, tubes down Detector installation vertical Without indicator
Cable conduit connection		A		ANSI 1/2" NPT
Process connection size		01 02 04 0Y 06 08 10 12 1Y		.Y" 1" 1.Y" 2" 2.Y" 3" 4" Y" 6"
Process connection rating and style (see note 1)		A1 A2 A3 A4 AY S8		ANSI flange 1Y0 Lbs ANSI flange 300 Lbs ANSI flange 600 Lbs ANSI flange 900 Lbs ANSI flange 1Y00 Lbs Tri-Clamp, ANSI inside diameter
Material of wetted parts		SL HC TI		Stainless steel 316L (1.4404) Hastelloy C-22 (2.4602) Titanium B26Y Gr 2 (3.703Y)
Options: Hazardous area approvals Tag number Gas measurement Secondary containment test Special calibration Certificates Epoxy paint			/FF1 /CF1 /KF1 /BG /GA /J1 /K1 /K3 /H1 /P6 /SF /SA /X1	FM ExProof CSA ExProof (pending) ATEX FlameProof SS Tag For use on Gas Application Secondary containment pressure test Calibration for span < 70% Q nom Calibration for density 0.7 < p < 1.3 kg/l Degreasing certificate Material certificate per EN 10204 32 Ra surface finish and test report /SF plus 3A declaration and dataplate Epoxy Paint

Note 1: Please see table 10 for possible combinations of process connections and materials.

Remote Detector RCCS3X

Model	Suffix code	Option code	Description
RCCS30 RCCS31 RCCS32 RCCS33 RCCS34 RCCS36 RCCS38 RCCS39 RCCS39/IR			Nominal Flow Rate: 0.0Y t/h = 0.83 kg/min / 1.6Y lb/m Nominal Flow Rate: 0.17 t/h = 2.8 kg/min / 6.2 lb/m Nominal Flow Rate: 0.37 t/h = 6.2 kg/min / 13.Y lb/m Nominal Flow Rate: 0.8 t/h = 13.3 kg/min / 33 lb/m Nominal Flow Rate: 2.7 t/h = 4Y kg/min / 99 lb/m Nominal Flow Rate: 9 t/h = 1Y0 kg/min / 330 lb/m Nominal Flow Rate: 32 t/h = Y33 kg/min / 117Y lb/m Nominal Flow Rate: 8Y t/h = 1420 kg/min / 3123 lb/m Nominal Flow Rate: 2Y0 t/h = 4240 kg/min / 918Y lb/m
Electrical connection	-A		ANSI 1/2" NPT
Process connection size	41 01 02 04 0Y 06 08 10 12 1Y		.2Y" (only RCCS30...33) .Y" 1" 1.Y" 2" 2.Y" 3" 4" Y" 6"
Process connection rating and style (see note 1)	A1 A2 A3 A4 AY S8 T9		ANSI flange 1Y0 Lbs ANSI flange 300 Lbs ANSI flange 600 Lbs ANSI flange 900 Lbs ANSI flange 1Y00 Lbs Tri-Clamp, ANSI inside diameter NPT Female
Material of wetted parts	SH SL HC TI		Hastelloy C-22 (2.4602) Stainless steel 316L (1.4404) Stainless steel 316L (1.4404) Hastelloy C-22 (2.4602) Titanium B26Y Gr 2 (3.703Y)
Options: Hazardous area approvals Tag number Gas measurement Extended temperature range High temperature version Secondary containment test Customer insulation/heating Insulation/heating Special calibration Certificates Epoxy paint		/FS1 /CS1 /KS1 /BG /GA /MT /HT /J1 /S2 /T1 /T2 /T3 /K1 /K3 /H1 /P6 /SF /SA /X1	FM ExProof converter and IS detector CSA ExProof converter and IS detector (pending) ATEX FlameProof converter and IS detector SS Tag For use on Gas Application Process temp between 302°F and 446°F Process temp up to 662°F Secondary containment pressure test Customer insulation/heating Insulation Insulation and steam jacket Insulation, steam jacket and drain/vent Calibration for span < 70% Q nom Calibration for density 0.7 < p < 1.3 kg/l Degreasing certificate Material certificate per EN 10204 32 Ra surface finish and test report /SF plus 3A declaration and dataplate Epoxy Paint

Note 1: Please see table 10 for possible combinations of process connections and materials.

Remote Converter RCCF31

Model	Suffix Code	Option Code	Description
RCCF31			Remote converter to be combined with RCCS30 - 39/IR
Power Supply	-A -D		100 - 240V AC 24 V DC
Indicator direction	H2 VO		Horizontal Display Vertical Display
Electrical connections	A		ANSI 1/2" NPT
Options :			
Hazardous area approvals		/FF1 /CF1 /KF1 /KF2	FMEExProof CSA ExProof - (pending) ATEX flame proof Like /KF1 with intrinsic safe outputs
Tag number		/BG	With Tag number
Active Pulse Output		/AP	One active pulse output (not with /KF2)
NAMUR Switch		/NM	One pulse output according to NAMUR (not with /KF2)
Analog alarm levels		/NA	Analog output alarm levels 2.4mA or 21.6mA (Standard is acc. NE43)
No combination		/NC	No combination with detector
		/X1	Epoxy Paint

Concentration Measurement Options (others on request)

Option	Display	Components	Concentration Range	Temp. Range	Source of the concentration/density table
/CO1	°Brix	Sugar/Water	0-85°Brix	0-80°C/32-176°F	Sugar/Water concentration in degrees Brix
/CO2	WT%	NaOH/Water	2-50 WT%	0-100°C/32-212°F	D'Ans-Lax, Handbook for chemists and physicists Vol. 1, 3rd Edition, 1967
/CO3	WT%	KOH/Water	0-60 WT%	54-100°C/129-212°F	D'Ans-Lax, Handbook for chemists and physicists Vol. 1, 3rd Edition, 1967
/CO4	WT%	NH ₄ NO ₃ /Water	1-50 WT%	0-80°C/32-176°F	Customer Supplied
/CO5	WT%	NH ₄ NO ₃ /Water	20-70 WT%	20-100°C/68-212°F	Customer Supplied
/CO6	WT%	HCl/Water	22-34 WT%	20-60°C/68-140°F	D'Ans-Lax, Handbook for chemists and physicists Vol. 1, 3rd Edition, 1967
/CO7	WT%	HNO ₃ /Water	50-67 WT%	10-60°C/50-140°F	Customer Supplied
/CO8	WT%	H ₂ SO ₄ /Water	2-100 WT%	0-100°C/32-212°F	D'Ans-Lax, Handbook for chemists and physicists Vol. 1, 3rd Edition, 1967
/CO9	WT%	H ₂ O ₂ /Water	30-75 WT%	4-44°C/39-111°F	Customer Supplied
/CO10	WT%	Ethylene Glycol/Water	10-50 WT%	-20-40°C/-4-104°F	Customer Supplied
/CO11	WT%	Alum= Starch/Water	33-43 WT%	35-45°C/95-113°F	Customer Supplied
/CO12	WT%	Methanol/Water	35-60 WT%	0-40°C/32-104°F	Customer Supplied
/CO20	Vol%	Alcohol/Water	55-100 Vol%	10-40°C/50-104°F	Customer Supplied
/CO21	°Brix	Sugar/Water	40-80 °Brix	75-100°C/167-212°F	Customer Supplied

Cable to Connect RCCF31 to RCCS3X

Model	Suffix Code	Option code	Description
RCCY033			
Cable ends	-1L		Terminated ends
Cable length		010F	10 feet
		020F	20 feet
		030F	30 feet
		0Y0F	Y0 feet
		100F	100 feet

TABLE 10: PROCESS CONNECTION AND MATERIALS

			RCCS30-33	RCCS34 RCCT34			RCCS36 RCCT36			RCCS38 RCCT38			RCCS39 RCCT39		RCCS39/IR RCCT39/IR
			SH	SL	HC	TI	SL	HC	TI	SL	HC	TI	SL	HC	SL
Flanges according to ASME B16.5	01A	1/2"-150	9.5	14.6	----	----	----	----	----	----	----	----	----	----	----
	01A2	1/2"-300	9.5	14.6	----	----	----	----	----	----	----	----	----	----	----
	01A3	1/2"-600	9.8	15.0	----	----	----	----	----	----	----	----	----	----	----
	01A5	1/2"-1500	10.6	15.7	----	----	----	----	----	----	----	----	----	----	----
	02A1	1"-150	9.5	14.6	14.6	15.4	19.7	----	----	----	----	----	----	----	----
	02A2	1"-300	9.5	14.6	14.6	15.4	19.7	----	----	----	----	----	----	----	----
	02A3	1"-600	10.2	15.4	----	----	20.5	----	----	----	----	----	----	----	----
	02A5	1"-1500	12.6	17.7	----	----	21.2	----	----	----	----	----	----	----	----
	04A1	1"-150	9.8	15.0	14.6	15.4	19.7	19.7	20.5	23.6	----	----	----	----	----
	04A2	1"-300	9.8	15.0	14.6	15.4	20.1	19.7	20.5	23.6	----	----	----	----	----
	04A3	1"-600	10.6	15.7	----	----	20.9	----	----	24.4	----	----	----	----	----
	04A4	1"-900	----	----	----	----	----	----	----	25.2	----	----	----	----	----
	04A5	1"-1500	13.4	18.5	----	----	23.6	----	----	----	----	----	----	----	----
	05A1	2"-150	----	----	----	----	20.1	19.7	20.5	23.6	23.6	24.4	----	----	----
	05A2	2"-300	----	----	----	----	20.1	19.7	20.5	23.6	23.6	24.4	----	----	----
	05A3	2"-600	----	----	----	----	21.2	----	----	24.8	----	----	----	----	----
	05A4	2"-900	----	----	----	----	----	----	----	28.3	----	----	----	----	----
	05A5	2"-1500	----	----	----	----	26.0	----	----	----	----	----	----	----	----
	06A1	2"-150	----	----	----	----	----	----	----	24.0	23.6	24.4	----	----	----
	06A2	2"-300	----	----	----	----	----	----	----	24.0	23.6	24.4	----	----	----
	06A3	2"-600	----	----	----	----	----	----	----	25.2	----	----	----	----	----
	06A4	2"-900	----	----	----	----	----	----	----	29.9	----	----	----	----	----
	08A1	3"-150	----	----	----	----	----	----	----	24.0	23.6	24.4	39.4	39.4	----
	08A2	3"-300	----	----	----	----	----	----	----	24.4	23.6	24.4	39.4	39.4	----
	08A3	3"-600	----	----	----	----	----	----	----	25.2	----	----	----	----	----
	08A4	3"-900	----	----	----	----	----	----	----	29.9	----	----	----	----	----
10A1	4"-150	----	----	----	----	----	----	----	----	----	----	39.4	39.4	43.3	
10A2	4"-300	----	----	----	----	----	----	----	----	----	----	39.4	39.4	43.3	
12A1	5"-150	----	----	----	----	----	----	----	----	----	----	39.4	39.4	43.3	
12A2	5"-300	----	----	----	----	----	----	----	----	----	----	39.4	39.4	43.3	
15A1	6"-150	----	----	----	----	----	----	----	----	----	----	----	----	43.3	
15A2	6"-300	----	----	----	----	----	----	----	----	----	----	----	----	43.3	
Tri-Clamp	01S8 *)	1/2"	9.4	----	----	----	----	----	----	----	----	----	----	----	----
	02S8	1"	9.4	14.5	----	----	----	----	----	----	----	----	----	----	----
	04S8	1"	9.4	14.5	----	----	19.6	----	----	----	----	----	----	----	----
	05S8	2"	----	----	----	----	19.6	----	----	23.6	----	----	----	----	----
	08S8	3"	----	----	----	----	----	----	----	23.6	----	----	----	----	----
	10S8	4"	----	----	----	----	----	----	----	----	----	40.2	----	----	----
41T9	1/4" NPTF	9.4	----	----	----	----	----	----	----	----	----	----	----	----	
01T9	1/2" NPTF	9.4	----	----	----	----	----	----	----	----	----	----	----	----	
23T9	3/4" NPTF	9.4	----	----	----	----	----	----	----	----	----	----	----	----	

dimensions in [in]

*) not available with option /SF or /SA

T10.EPS

