General Specifications

GS 01R04B10-00E-E

ROTAMASS 3 Series
Coriolis Mass Flow and Density Meter with Marine Approval

RCCF31 +
RCCS34 - 39/IR +
RCCY038/039

RCCR31

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ROTAMASS is a Coriolis mass flowmeter with highly refined digital signal processing electronics, so that accurate and stable mass flow measurement is achieved.

ROTAMASS employs a flame-proof type converter case suitable for use in the hazardous area together with its intrinsically safety type detector.

ROTAMASS´s signal processing, housing protection and its detector´s special decoupling system against external loads and vibrations, realize high performance in real applications.

PRINCIPLE OF MEASUREMENT

Mass flow measurement according to the Coriolis principle. For abrasive or highly corrosive fluids please contact your Yokogawa representative.

FEATURES

- ROTAMASS is a flowmeter for nearly all fluids, including high viscosity liquids, slurries and multi-phase media with a certain gas content
- Field-mount and rack-mount remote converter available
- Refined digital signal processing enables accurate and stable measurement
- A special detector decoupling system makes the device highly independent from external loads or vibrations.
- Simple flow path means self-draining, simple cleaning.
- High accuracy and high stability over a wide flow range
- Accurate density measurement, up to +/- 0.0005 g/cm³
- Concentration measurement for solutions, suspensions and emulsions (e.g. water cut)
- Volume flow with reference density
- Temperature measurement
- One analog output, two pulse outputs or status-out and one status-in as standard I/O
- Available in explosion proof versions (ATEX, IECEx, INMETRO, NEPSI, KOSHA)
- American NTEP approval for Custody Transfer Measurement (see GS 01R04B07-00E-E)
- Wide process temperature range –200°C to 230°C
- Microprocessor-based multifunction capability
- EEPROM protects parameter settings and totalized values during power failure.
- High visibly LCD display
- HART® communication function is available.
- MODBUS® communication is available
- EN, ASME or JIS flanges as standard, others on request
- Type Approval acc. DNV Rules for classification of ships

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PERFORMANCE SPECIFICATIONS

Model
- Remote detector RCCS34 to 39/IR : 2 tube design
- Remote field-mount converter RCCF31
- Remote rack-mount converter RCCR31

Fluid to be measured : Liquid, gas or slurry

Measurement Items : Mass flow, density, temperature and derived from these values: concentration, volume flow and net flow

Mass Flow Measurement

Table 1: measuring range

Model		RCCS34	RCCS36	RCCS38	RCCS39	RCCS39 /IR
Qmax	t/h	5	17	50	170	300
	lb/h	11023	37478	110231	374785	661386
Qnom	t/h	3	10	32	100	250
	lb/h	6613	22046	70547	220462	551155

Q_{nom} is the water flow rate at about 1 bar pressure drop.
The flowmeter has a default low cut of 0.05% of Q_{nom}.

Liquid RCCS34 - 39/IR:
± 0.1% of flow rate ± zero stability / flow rate *100%

Accuracy of volume flow :
SQRT ((mass flow error in %)² + (density error in %)²)

Accuracy based on the frequency output includes the combined effects of repeatability, linearity and hysteresis.

Repeatability of liquids:
± 0.05% ± (zero stability/2) / flow rate *100%

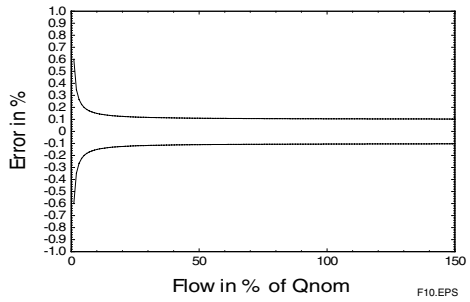


Table 2 : Zero stability

Model	RCCS34	RCCS36	RCCS38	RCCS39	RCCS39 /IR
kg/h	0.15	0.5	1.6	5	13
lb/h	0.33	1.1	3.5	11	28.6

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 menu.

Table 3 : Static pressure effect on mass flow (if not corrected)

Model	RCCS34	RCCS36	RCCS38	RCCS39	RCCS39 /IR
% of rate per bar / (psi)	0.00081 / (0.01175)	0.00346 / (0.05018)	0.00950 / (0.1378)	0.01058 / (0.15345)	0.0047 / (0.0682)

Density Measurement

Adjustment with water and air at calibration temperature.
Measuring range:
RCCS34 - 38 : 0.3 kg/l to 5 kg/l
RCCS39 -39/IR : 0.3 kg/l to 2 kg/l
No density measurement for gas applications.
With option /K4 thermal stabilization is acquired.
For further details about the option /K6 please refer to “special calibrations” on page 3.
Calibration condition standard
Density : 0.9 kg/l ≤ ρ ≤ 1.1 kg/l
Temp. Fluid : 22.5°C ± 12.5°C
Flow Rate : about 0.2 * Qnom as defined for each model
Calibration condition for /K6:
Density : 0.7 kg/l ≤ ρ ≤ 1.65 kg/l
Temp. Fluid : 20°C ≤ T ≤ 80°C
Temp. Ambient : 20°C ± 3K
Flow Rate : about 0.2 * Qnom as defined for each model

Table 4: Accuracy (at calibration conditions):

Type	Standard	Option /K4	Option /K6
RCCS34	0.003 g/cm³	0.001 g/cm³	0.0005 g/cm³
RCCS36	0.0022 g/cm³	0.001 g/cm³	0.0005 g/cm³
RCCS38	0.0015 g/cm³	0.001 g/cm³	0.0005 g/cm³
RCCS39	0.0015 g/cm³	0.001 g/cm³	0.0005 g/cm³
RCCS9/IR	0.0015 g/cm³	------	------

Repeatability:
RCCS34-39/IR : ± 0.0005 g/cm³ (Std, /K4)
Static pressure effect:
Compensated if static pressure is set in the menu.

Specification of high performance density measurement option /K6: Density calibration

Density range : 0.3 to 2.5 kg/l
Ambient temp. range : -10°C to 50°C (14°F to 122°F)
Process temp. range Standard: -50°C to 150°C (58°F to 302°F)
Minimum flow rate for specified accuracy:
- RCCS36 to RCCS39 : 700 kg/h (1543 lb/h)
- RCCS34 : 140 kg/h (308 lb/h)

Maximum flow rate : Q_{nom}
Repeatability : ±0.0002 g/cm³
Temperature measurement:
$\pm(0.5°C+0.002*abs(T_{medium}-20°C))$
Density accuracy : only for liquids, one phase
Process temperature influence :
±0.000015 g/cm³ * $abs(T_{medium}-20°C)$

Temperature Measurement

Temperature measuring range of converter :
Standard, /LT, /MT : -200°C to 230°C (-328°F to 448°F)
Accuracy:
Standard (-70°C to 150°C / -94°F to 302°F)
: $\pm(0.5°C+0.005*abs(T_{medium}-20°C))$
Option /LT (-200°C to 150°C / -328°F to 302°F)
: $\pm(1.0°C+0.008*abs(T_{medium}-20°C))$
Option /MT (-70°C to 230°C / -94°F to 446°F)
: $\pm(0.5°C+0.005*abs(T_{medium}-20°C))$
For process temperatures more than 80°C (176°F) higher

than ambient temperature the detector should be insulated to maintain optimum accuracy.

Calibration for Liquids and Gases :
The ROTAMASS flowmeters are always 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)
- Process pressure : 1 to 2 bar abs
- Installation: RCCS34 to RCCS38 vertical
  RCCS39 to RCCSS39/IR horizontal

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

Special Calibrations
- Mass-/Volume flow calibration with factory certificate (option /K2):
  Calibration with water at customer specified flow values according calibration order sheet.
- Mass-/Volume flow calibration with DAkkS certificate acc. EN17025 (option /K5):
  Calibration with water at customer specified flow values according calibration order sheet.
- Density calibration with factory certificate (option /K6):
  Adjustment and check with 3 different fluids, fluid temperature influence adjustment for low ambient temperature influence and thermal treatment for long term density measurement stability, improved temperature measurement accuracy (see also page 10).

NORMAL OPERATING CONDITIONS

Ambient Temperature Ranges
- Remote detector RCCS3□:
  Standard : -30°C to +70°C (-22°F to 158°F)
  Option /LT : -30°C to +70°C (-22°F to 158°F)
  Option /MT : -30°C to +70°C (-22°F to 158°F)
  Terminal box temperature should not exceed 90°C
- Remote converter RCCF31, RCCR31:
  Display operating range
  : -20°C to +60°C (-4°F to 140°F)
  Electronic operating range
  : -40°C to +60°C (-40°F to 140°F)
  Cold start : above -30°C (-22°F)

Where meters are mounted in direct sunlight, it is recommended to install a sunshade. This is particularly important in countries with high ambient temperatures.

Ambient Humidity Range : 0 to 95% RH

Process Temperature Ranges
Detector :
- RCCS34 to 39/IR : -70°C to 150°C (-94°F to 302°F)
- RCCS34 to 39/IR /LT : -200°C to 150°C (-328°F to 302°F)
- RCCS34 to 39/IR /MT : -70°C to 230°C (-94°F to 446°F)

For use in hazardous area see “Hazardous Area Specifications”

Process Pressure Limit
The process pressure limit depends on the option /MC2, /MC3 as shown in the table below.
Classes of piping systems:

Marine option	/MC2		/MC3	
Piping system for	Class II		Class III	
	p (bar)	t (°C)	p (bar)	t (°C)
Steam	≤ 16	≤ 300 [1)]	≤ 7	≤ 170
Fuel oil, lubricating oil, flammable hydraulic oil	≤ 16	≤ 150	≤ 7	≤ 60
Other media	≤ 40	≤ 300 [1)]	≤ 16	≤ 200

[1)] The specified temperatures are defined by DNV classes for piping systems. The de facto process temperature ranges of ROTAMASS depend on the instrument configuration.

The pressures mentioned in the table above are valid for DNV Type approval. Table 9 shows the maximum possible design pressures. The respectivly lowest pressure must be used.
The maximum temperature and process pressure limits of an instrument are marked on the name plate as TS and PS.
The given temperature/pressure ranges are calculated and approved without corrosion or erosion effects. In case of heavy corrosion and/or erosion the instrument may not withstand the pressure and an incident may happen with human and/or environmental harm. Yokogawa will not take any liability regarding damage caused by corrosion / erosion.
If corrosion / erosion may happen, the user has to check periodically if the necessary wall thickness is still in place.

Gas Content Limits for Liquid / Gas Mixtures
Gas content limit is defined as the amount of gas in a liquid / gas mixture which generates an error in the converter. The gas content limit is dependent on viscosity, surface tension and bubble size of the liquid / gas mixture.
Furthermore it is highly flow rate dependent (the higher the flow rate, the lower the gas content limits). The stated values are for a flow of 50% of Q_{nom} and water / air without /HP:

Model	Gas content limit
RCCS34	no limitation
RCCS36	approx. 50%
RCCS38	approx. 30%
RCCS39	approx. 7%
RCCS39/IR	approx. 3%

With option /HP the gas content limits are improved.
With liquid/gas mixtures the specified mass flow accuracy will not be achieved.
For short time aeration a function can be activated to keep the current outputs constant during the aeration time.

Other 2 Phase Flow, liquid/solid and liquid/liquid
Two phase flow can generate minus span errors. The errors are proportional to the difference in density between the 2 phases and the amount of the second phase. If the particles or droplets are very small no errors will be generated.

Secondary Containment

Model	Typical rupture pressure	Option /J1 pressure test *)
RCCS34-36	120 bar / (1740 psi)	60 bar / (870 psi)
RCCS38	120 bar / (1740 psi)	40 bar / (580 psi)
RCCS39	80 bar / (1160 psi)	10 bar / (145 psi)
RCCS39/IR	50 bar / (725 psi)	---

*) Pressure test with safety factor S=1.1
If the detector housing is exposed to a pressure close to the rupture pressure it will deform and measurement will be strongly influenced. Therefore the pressure test of the housing (option /J1) can only be done as shown in above table.

MECHANICAL SPECIFICATIONS

Protection Class
- RCCF31 : IP66/67
- RCCR31 : IP20
- RCCS3□ : IP66/67

In case of RCCR31 for marine application the customer has to ensure the minimum required IP grade in accordance with the installation area on board.

Materials
- Detector housing : Stainless steel 304/1.4301
- Detector terminal box : 316L/1.4404
- Detector gas filling plug: 1.4305
- Detector insulation housing
  : Stainless steel 304/1.4301
- Field- mount converter housing
  : Aluminium alloy with Polyurethane corrosion-resistant coating or epoxy coating (option /X1)
- Field- mount converter mounting bracket:
  : Stainless steel 304/1.4301
- Rack- mount converter housing
  : Aluminium
- Name plates : Stainless steel 304/1.4301

Coating Color
- Field-mount converter case
  : Mint green

Wetted Parts
- RCCS34 to 39/IR :
  Measuring tubes and process connection
  : 316L/1.4404/~~14435~~

Table 5 : Diameter of measuring tubes

Type		RCCS34	RCCS36	RCCS38	RCCS39	RCCS39 /IR
Inner diameter	mm	7.7	13.4	22.1	37.2	54.5
	inches	0.303	0.528	0.870	1.485	2.146
Wall thickness	mm	0.89	1.24	1.65	2.6	2.9
	inches	0.035	0.049	0.065	0.102	0.114

Chemical composition of wetted materials 316L/1.4404 conform with
ANSI / NACE-MR0175 / ISO15156-2
ANSI / NACE-MR0175 / ISO15156-3
NACE MR0103
For details please see RYG´s declaration about NACE conformity 8660001

Pressure Equipment Directive 2014/68/EU
Detectors comply with Directive 2014/68/EU on Pressure Equipment for fluid group 1 and 2.
Note: PED-compliance is not applicable for Rotamass assembled in the USA that are identifiable by nameplate containing "Assembled in USA with Foreign and Domestic Parts".

CRN : CRN 0F12074.5
Approved process connections see table 12

Vibration Test :
- Acc. IEC 60068-2-64
- Acc. DNV standard for Certification No. 2.4
  Location class:
  Detector: B, accuracy for some frequencies within ±1% of span
  Converter: A, accuracy no impact

ELECTRICAL SPECIFICATIONS

Power Supply
- DC- type : 20.5 V to 28.8 V DC

Power consumption : max. 25 VA / 10 W
External circuit breaker rating : 5 A, 250 V (The converter doesn't feature an installed power switch).

Fuse on Base Board
- DC- type : 2 A, T, breaking capacity 1500A

I/O Signals, including /KF1, /EF1, /UF1, /NF1
- One active current output: Iout1
  4 to 20 mA DC, galvanic separated from other signals,
  Load resistance : 20 Ω to 600 Ω
  Ambient temperature effect : < 0.05% of span/10°C
  Linearity : 0.008 mA = 0.05% of span
  Setting range URV for liquids:
  -Qmax to + Qmax , Abs(URV-LRV) ≥ 5% of Qnom
  Setting range URV for gases:
  -Qmax to + Qmax , Abs(URV-LRV) ≥ 1% of Qnom
- Two pulse outputs / status outputs : Pout, Sout
  Passive transistor contact output, 30 V DC, 200 mA
  Output rate
  Output 1 : 0 to 10000 pulses/s
  Output 2 : 0 to 2000 pulses/s
  Option /NM : passive, according EN 60947-5-6
  Option /AP : active output, 12 V, 6 mA, R_L> 10 kΩ
  As frequency output
  Output 1 : 20 Hz to 10000 Hz
- Status input : Voltage-free contact
  Closed : < 200 Ω
  Open : > 100 kΩ

Digital Communication
- HART® communication protocol rev. 5, superimposed on 4 -20 mA DC signal (Iout1)
  - Load resistance : 230 Ω to 600 Ω (including cable)
  - Power line spacing : >15 cm, avoid parallel wiring
  - Cable length : ≤ 2 km if „CEV" cables are used
- MODBUS® communication (/MB2 + /MB3)
  - Physical interface RS485 as two wire data bus according EIA/TIA-485
  - Maximal bus length is depending from bus topology and communication speed.
  - Addresses: 1 to 247
  - Baud rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200
  - Data formats: E/1, O/1, N/1, N/2 (parity/stop bits)
  - Modes: RTU, ASCII

Setting Functions
Parameter setting is possible by using the infrared switches on the display or with HART® communication. For comfortable setting we recommend to use Yokogawas Field Mate setting tool (DTM based).
The option /MB2 can be set via Modbus and display.
The option /MB3 can be set via Modbus, HART® and display.

Display Function
- Up to 4 lines.
- Language English

Damping Functions
The damping function is adjustable from 0 to 200 seconds and affects the display and outputs.

Isolation Resistance of Converter
When surge arrestors are removed
- between power and ground terminal: >100 MΩ / 500 V DC
- between power and I/O terminals : >20 MΩ / 100 V DC
- between I/O terminals and ground : >20 MΩ / 100 V DC

Dielectric Strength
When surge arrestors are removed
- between power and ground terminal : 1,500 V AC for 1 minute

Lightning Protection
Arresters 2000 A are inside of the converter for power supply lines.

Electromagnetic Compatibility
Acc. IEC 61326-1: Class A, Table 2
IEC 61326-2-3
IEC 61000-3-2
IEC 61000-3-3
DNV standard for Certification No. 2.4, Class A

REMOTE CABLE RCCY03 SPECIFICATION

DNV certified cable
Max. 300m / 900ft may be installed
Table 6 : Cable specifications

Model code	Temperature range	Wire gauge	Resistance of loop	Capacitance wire/wire	Capacitance wire/shield	Inductance of loop
RCCY037	-30°C to +90°C -22°F to +176°F	7x2x0.5mm²	80.8 Ω/km	81 nF/km	63 nF/km	0.63 mH/km

Safety Requirement Standards
Acc. IEC 61010-1
IEC 61010-2-030
Overvoltage category II
Pollution degree 2

CE DECLARATION

Pressure Equipment Directive 2014/68/EU
Detectors comply with Directive 2014/68/EU on Pressure Equipment for fluid group 1 and 2.
Note: PED- compliance is not applicable for Rotamass assembled in the USA that are identifiable by nameplate containing "Assembled in USA with Foreign and Domestic Parts".

Electromagnetic Compatibility
Acc. IEC 61326-1: Class A, Table 2
IEC 61326-2-3
IEC 61000-3-2
IEC 61000-3-3

Safety Requirement Standards
Acc. IEC 61010-1
IEC 61010-2-030
Overvoltage category II
Pollution degree 2

Intended use
Rotamass 3 series Coriolis mass flow and density meter is intended to measure mass flow of fluids and gases while simultaneously also capturing their density and temperature. Yokogawa is not liable for damages or penalties caused by use deemed contrary to the Intended Use of the product.

Rotamass 3 series Coriolis mass flow and density meter is a tailor-made product that is specifically designed to both be installed and function within:
- Large-scale fixed installations
- Means of transport for persons or goods, excluding electric two-wheel vehicles which are not type-approved

The EU Directive 2011/65/EU (RoHS II) does not apply to this product and is not part of its CE-Marking. This product must not be used beyond its Intended Use. Please consider the above if the intended installation location of your device is inside European Economic Area.

HAZARDOUS AREA SPECIFICATIONS

ATEX

Remote detector RCCS34 ... 39/IR (Option /KS1):
- KEMA 01ATEX 1075 X
- Intrinsically safe
- II 2G Ex ib IIB/IIC T1 ... T6 Gb
- II 2D Ex ib IIIC Txxx Db
  (xxx = max. surface temperature see below)
- Max. surface temperature :
  Standard + /LT : 150°C (302°F)
  /MT : 220°C (500°F)
- Degree of protection : IP66/67
- Ambient humidity : 0 to 95% RH
- Ambient temperature range
  Standard , option /LT and option /MT
  : -30°C to +70°C (-22°F to 158°F)
- Process temperature limits :
  Standard : -50°C to 150°C (-58°F to 302°F)
  Option /LT : -200°C to 150°C (-328°F to 302°F)
  Option /MT : -50°C to 220°C (-58°F to 428°F)

Remote converter RCCF31 (Option /KF1) :
- KEMA 02ATEX 2183 X
- Flame proof with Intrinsically safe connection to detector (ib)
- II 2G Ex d [ib] IIC T6 Gb or Ex d e [ib] IIC T6 Gb
- II 2G Ex d [ib] IIB T6 Gb or Ex d e [ib] IIB T6 Gb
  with option /HP
- II 2D Ex tb [ib] IIIC T75°C Db
- Max. surface temperature : 75°C (167°F)
- Degree of protection : IP66/67
- Power supply : 20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -30°C to +55°C (-22°F to 131°F)

Remote converter RCCR31 (Option /KS1) :
- KEMA 02ATEX 2183 X
- Associated apparatus with Intrinsically safe connection
  to detector (ib)
- II (2) G [Ex ib Gb] IIC
- II (2) G [Ex ib Gb] IIB with option /HP
- II (2) D [Ex ib Db] IIIC
- Power supply : 20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -30°C to +55°C (-22°F to 131°F)

WARNING

Remote rack-mount converter RCCR31 must be installed in safe area !

Electrical data remote detector RCCS34 ... 39/IR :
- Driving circuit : terminals D+ and D-
  Ex ib IIC : Ui = 16 V; Ii = 53 mA; Pi = 0.212 W
  Li = 3.2 mH; Ci = negligible small
  Ex ib IIB : Ui = 16 V; Ii = 153 mA; Pi = 0.612 W
  Li = 3.2 mH; Ci = negligible small
- Sensor circuits: terminals S1+ and S1- or S2+ and S2-
  Ex ib IIC : Ui = 16 V; Ii = 80 mA; Pi = 0.32 W
  Li = 2.1 mH; Ci = negligible small
- Temperature sensor circuit : terminals TP1, TP2, TP3
  Ex ib IIC : Ui = 16 V; Ii = 50 mA; Pi = 0.2 W
  Li = negligible small; Ci = negligible small

Electrical data remote converter RCCF31, RCCR31:
- Driving circuit : terminals D+ / D-
  Ex [ib] IIC : Uo = 14.5 V; Io = 47 mA; Po = 0.171 W
  Lo = 15 mH; Co = 0.65 µF
  Ex [ib] IIB : Uo = 11.7 V; Io = 124 mA; Po = 0.363 W
  Lo = 8 mH; Co = 10.3 µF
- Sensor circuits: terminals S1+/ S1- or S2+ / S2-
  Ex [ib] IIB/IIC : Uo = 14.5 V; Io = 47 mA; Po = 0.171 W
  Ex [ib] IIC : Lo = 15 mH; Co = 0.65 µF
  Ex [ib] IIB : Lo = 60 mH; Co = 4.07 µF
- Temperature sensor circuit : terminals TP1, TP2, TP3
  Ex [ib] IIB/IIC : Uo = 13.3 V; Io = 40 mA; Po = 0.133 W
  Ex [ib] IIC : Lo = 20 mH; Co = 0.91 µF
  Ex [ib] IIB : Lo = 80 mH; Co = 5.6 µF

For temperature classification see table 7.

IECEx APPROVAL

Certificate: IECEx KEM 06.0031X

Remote detector RCCS34 ... 39/IR (Option /ES1):

- Intrinsically safe
- Ex ib IIB/IIC T1 ... T6 Gb
- Ex ib IIIC Txxx Db
  (xxx = max. surface temperature see below)
- Max. surface temperature :
  Standard + /LT : 150°C (302°F)
  /MT : 220°C (500°F)
- Degree of protection : IP66/67
- Ambient humidity : 0 to 95% RH
- Ambient temperature range
  Standard , option /LT and option /MT
  : -30°C to +70°C (-22°F to 158°F)
- Process temperature range :
  Standard : -50°C to 150°C (-58°F to 302°F)
  Option /LT : -200°C to 150°C (-328°F to 302°F)
  Option /MT : -50°C to 220°C (-58°F to 428°F)

Remote converter RCCF31 (Option /EF1) :

- Flame proof with Intrinsically safe connection to detector (ib)
- Ex d [ib] IIC T6 Gb or Ex d e [ib] IIC T6 Gb
- Ex d [ib] IIB T6 Gb or Ex d e [ib] IIB T6 Gb with option /HP
- Ex tb [ib] IIIC T75°C Db
- Max. surface temperature : 75°C (167°F)
- Degree of protection : IP66/67
- Power supply : 20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -30°C to +55°C (-22°F to 131°F)

Remote converter RCCR31 (Option /ES1) :

- Associated apparatus with Intrinsically safe connection to detector (ib)
- [Ex ib Gb] IIC
- [Ex ib Gb] IIB with option /HP
- [Ex ib Db] IIIC
- Power supply : 20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -30°C to +55°C (-22°F to 131°F)

WARNING

Remote rack-mount converter RCCR31 must be installed in safe area !

Electrical data remote detector RCCS34 ... 39/IR :

- Driving circuit : terminals D+ and D-
  Ex ib IIC : Ui = 16 V; Ii = 53 mA; Pi = 0.212 W
  Li = 3.2 mH; Ci = negligible small
  Ex ib IIB : Ui = 16 V; Ii = 153 mA; Pi = 0.612 W
  Li = 3.2 mH; Ci = negligible small
- Sensor circuits: terminals S1+ and S1- or S2+ and S2-
  Ex ib IIC : Ui = 16 V; Ii = 80 mA; Pi = 0.32 W
  Li = 2.1 mH; Ci = negligible small
- Temperature sensor circuit : terminals TP1, TP2, TP3
  Ex ib IIC : Ui = 16 V; Ii = 50 mA; Pi = 0.2 W
  Li = negligible small; Ci = negligible small

Electrical data remote converter RCCF31, RCCR31:

- Driving circuit : terminals D+ / D-
  Ex [ib] IIC : Uo = 14.5 V; Io = 47 mA; Po = 0.171 W
  Lo = 15 mH; Co = 0.65 µF
  Ex [ib] IIB : Uo = 11.7 V; Io = 124 mA; Po = 0.363 W
  Lo = 8 mH; Co = 10.3 µF
- Sensor circuits: terminals S1+/ S1- or S2+ / S2-
  Ex [ib] IIB/IIC : Uo = 14.5 V; Io = 47 mA; Po = 0.171 W
  Ex [ib] IIC : Lo = 15 mH; Co = 0.65 µF
  Ex [ib] IIB : Lo = 60 mH; Co = 4.07 µF
- Temperature sensor circuit : terminals TP1, TP2, TP3
  Ex [ib] IIB/IIC : Uo = 13.3 V; Io = 40 mA; Po = 0.133 W
  Ex [ib] IIC : Lo = 20 mH; Co = 0.91 µF
  Ex [ib] IIB : Lo = 80 mH; Co = 5.6 µF

For temperature classification see table 7.

Table 7 : Temperature classification for ATEX, IECEx, INMETRO, NEPSI and KOSHA certified flowmeter

	RCCS34 to RCCS39/IR without insulation	
Temp. class	Max. ambient temperature	Max. process temperature
T6	40°C / 104°F	40°C / 104°F
T5	55°C / 131°F	55°C / 131°F
T4	70°C / 158°F 40°C / 104°F	100°C / 212°F 120°C / 248°F
T3	70°C / 158°F 40°C / 104°F	160°C / 320°F 180°C / 356°F
T2	70°C / 158°F	220°C / 428°F
T1	70°C / 158°F	220°C / 428°F

INMETRO APPROVAL (For Brazil)

Certificate TÜV 11.0419 X
RCCS3□ with option /US1 same as IECEx /ES1
RCCF31 with options /UF1
RCCR31 with option /US1
Same parameters and specifications as IECEx approval.

NEPSI APPROVAL (For China)

Certificate GYJ12.1381X
RCCS3□ with option /NS1
RCCF31 with options /NF1
RCCR31 with option /NS1
Same parameters and specifications as IECEx approval except NEPSI has no dust proof certification.

KOSHA APPROVAL (For Korea)

Same parameters and specifications as IECEx approval.
Meter with IECEx option must be ordered.

TS APPROVAL (For Taiwan)

Certificate ML0412007041H6
Same parameters and specifications as IECEx approval.
Meter with IECEx option must be ordered.
For export to Taiwan please contact your Yokogawa representative regarding Taiwan Safety Mark.

PESO APPROVAL (For India)

Same parameters and specifications as ATEX approval.
Meter with ATEX option must be ordered.

EAC APPROVAL (For Russia, Kazakhstan, Belorussia)

Certificate RU C-DE.ГБ08.В.00208
RCCS3□ with option /GS1
RCCT3□ with options /GF1 or /GF5
RCCF31 with options /GF1 or /GF5
RCCR31 with option /GS1
Same parameters and specifications as IECEx approval.

PLANNING AND INSTALLATION HINTS

Design Limits
It is the responsibility of the user to use the instrument within the given design limits. Erosion and corrosion influence the accuracy and may restrict the temperature / pressure limits. Therefore corrosion and erosion should be avoided.

Installation
The flowmeter can be installed vertically, horizontally or in any other position, as long as the measuring tubes are completely filled with the measured liquid during measurement.

Redundant Installation
If two flowmeters of the same size are installed in series mutual interference called cross talk may take place. Cross talk occurs due to the fact that both meters have the same resonance frequency. If serial installation is planned please contact your Yokogawa representative who can ensure that a frequency adjustment is made to one of the meters at the factory.

Sizing
The measuring range and accuracy are virtually independent of fluid conditions and size of the connecting pipe. Select a suitable nominal size from pressure loss calculation. Check whether the measuring range and accuracy at minimal flow fit the application. The calculations of the pressure loss are based on newtonian fluids. For correct calculation please contact your local Yokogawa representative.

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:
$p_{back} > p_{vapor} + 0.7*\Delta p$
With Δp = pressure loss

Long Term Stability
To get stable deflection of the tubes by the Coriolis forces the stiffness and therefore the wall thickness has to kept constant during measuring. With corrosion or erosion the meter factor is drifting with time and recalibration is necessary.

Recalibration Service
Yokogawa offers full recalibration service, if necessary with a certificate traceable to German national standards. Please contact your Yokogawa affiliate or directly Rota Yokogawa, Germany.

Installation above 100°C (212°F) Process Temperature
To provide enough cooling the instrument should be installed vertically or horizontally with the converter down.

Installation below 0°C (32°F) Process Temperature
The detector can be insulated to prevent ice capping either by the customer or by the manufacturer. Ask your Yokogawa representative for special insulation. If the customer wants to insulate by themselves a closed cell foam as insulation material is recommended to avoid water siphon. In this case option /S2 should be selected. For temperatures below -70°C (-94°F) option /LT is recommended (on request).

Zero Adjustment Function
Zero point can be adjusted either by setting the switches on display, with the HART® communication, with Modbus communication or with status input when the fluid flow is stopped and the detector filled.
To ensure no flow conditions isolation valves should be installed. To achieve the specified accuracy a zero should be performed at process conditions (temperature, pressure).

Pressure / Temperature Dependencies of Process Connections
See also process pressure limits in chapter ”Normal operation conditions”.

Explosion Proof Concept
The detector is intrinsically safe Ex ib, the converter RCCF31 are flame (explosion) proof. The converter RCCR31 is an intrinsically safe associated apparatus. The driving power from converter to detector is limited and protected by an intrinsically safe barrier, which is part of the converter. The barrier is protecting the detector either for gas group IIC or IIB (option /HP).

Batch Process
The specified mass flow accuracy applies if the batch process is >1 minute. For shorter batch time (Δt in s) the accuracy decreases with the square root of $60/\Delta t$.
For short batches the opening and closing times of the valves have to be longer than 2 seconds.

Concentration Measurement for Liquids
The Standard Concentration Measurement (option /CST) is suitable for concentration measurement of emulsions or suspensions, where the density of the solid is assumed to be fix. It can also be used for (mainly low concentration) solutions if the two fluids are not strongly interacting. The density change of the liquid components due to temperature can normally be described with a linear or quadratic function with very high accuracy within the desired measurement range. The coefficients of these function (linear and quadratic thermal expansion coefficients) must be either known or have to be determined prior to using this function.
For interacting liquids the Advanced Concentration Measurement options should be used, these options can be ordered using the appropriate /C□□ concentration measurement option. For more information please see TI 01R04B04-04E-E “Concentration Measurement with ROTAMASS”.

Density Measurement

There are 3 levels of density measurement. The standard adjustment and /K4 delivers an accuracy up to 0.001 g/cm³, if the fluid density is around 1 kg/l. However, at elevated temperatures the density error may increase. For option /K4 the instrument is preheated ensuring long term stability. Option /K6 includes preheating, a full calibration at 3 different densities, increased temperature measurement specification and individual adjustment of the fluid temperature dependency. Multi-phase flow can generate higher deviations. The higher the density differences of the single components are the more likely it is that a negative density error is generated. Aeration has to be avoided fully to receive good density measurement.
For more information please see TI 01R04B04-05E "Density Measurement with ROTAMASS".
Note: Density specification under calibration condition only with flow direction "forward" according the arrow on the meter.
Table 8: Overview density-/volume- flow measurement:

Option	Accuracy	Certificate	Description	Typical Application
Standard	± 0.0015 g/cm³ to ± 0.02 g/cm³	Standard (mass flow) factory calibration certificate	- Standard adjustment with water and air - Density constants given in mass flow certificate	- Process medium and environment are approximately at room temperature, the density range is 0.9 kg/l to 1.1 kg/l
Option /K4	± 0.001 g/cm³	Standard (mass flow) factory calibration certificate	- Thermal treatment of the sensor and special hardware design - Standard adjustment with water and air - Density constants given in mass flow certificate	- Improved volume flow accuracy - Process medium up to 150°C, for higher temperature select option /MT - Density range is 0.9 kg/l to 1.1 kg/l
Option /K6	± 0.0005 g/cm³	Separate factory density calibration certificate	- Thermal treatment of the sensor and special hardware design - Density calibration with 3 different liquids - Individual adjustment of the fluid temperature dependency	- Density and concentration measurement in addition to the mass flow: - Process medium up to 150°C - Density range 0.3 kg/l to 2.5 kg/l - Best volume flow accuracy

Table 9 : Pressure rating

Type of process connection		Process Temperature					
		RT [1]	50°C	100°C	150°C	200°C	250°C
A1	Flange acc. ASME B16.5 Class 150	19 bar	18.4 bar	16.2 bar	14.8 bar	13.7 bar	12.1 bar
A2	Flange acc. ASME B16.5 Class 300	49.6 bar	48.1 bar	42.2 bar	38.5 bar	35.7 bar	33.4 bar
A3	Flange acc. ASME B16.5 Class 600 excl. RCCS39/IR	99.3 bar	96.2 bar	84.4 bar	77 bar	71.3 bar	66.8 bar
A3	Flange acc. ASME B16.5 Class 600 for RCCS39/IR	92 bar	89 bar	80 bar	73 bar	67 bar	62 bar
A4	Flange acc. ASME B16.5 Class 900	127 bar	127 bar	110.5 bar	100.8 bar	93.4 bar	87.4 bar
D2	Flange acc. EN 1092-1 PN 16	16 bar	15.6 bar	15.1 bar	13.7 bar	12.7 bar	11.9 bar
D4	Flange acc. EN 1092-1 PN 40	40 bar	39.0 bar	37.9 bar	34.4 bar	31.8 bar	29.9 bar
D5	Flange acc. EN 1092-1 PN 63	63 bar	61.4 bar	59.7 bar	54.3 bar	50.1 bar	47.1 bar
D6	Flange acc. EN 1092-1 PN 100	100 bar	97.4 bar	94.7 bar	86.1 bar	79.5 bar	74.7 bar
D7	Flange acc. EN 1092-1 PN 160	160 bar	156.9 bar	151.6 bar	137.9 bar	127.2 bar	119.6 bar
G9	Internal thread RCCS34	181 bar	181 bar	164 bar	149 bar	136 bar	126 bar
T9	Internal thread NPT RCCS34	181 bar	181 bar	164 bar	149 bar	136 bar	126 bar
		Process Temperature					
		up to 120°C				220°C	
J1	Flange acc. JIS B 2220 10K	14 bar				12 bar	
J2	Flange acc. JIS B 2220 20K	34 bar				31 bar	

Type of process connection		Process Temperature					
		RT [1]	120°F	210°F	300°F	390°F	480°F
A1	Flange acc. ASME B16.5 Class 150	276 psi	267 psi	235 psi	215 psi	199 psi	175 psi
A2	Flange acc. ASME B16.5 Class 300	719 psi	698 psi	612 psi	558 psi	518 psi	484 psi
A3	Flange acc. ASME B16.5 Class 600 excl. RCCS39/IR	1440 psi	1395 psi	1224 psi	1117 psi	1034 psi	969 psi
A3	Flange acc. ASME B16.5 Class 600 for RCCS39/IR	1331 psi	1291 psi	1160 psi	1059 psi	972 psi	899 psi
A4	Flange acc. ASME B16.5 Class 900	1838 psi	1838 psi	1667 psi	1461 psi	1384 psi	1283 psi
D2	Flange acc. EN 1092-1 PN 16	232 psi	226 psi	219 psi	198 psi	184 psi	172 psi
D4	Flange acc. EN 1092-1 PN 40	580 psi	565 psi	549 psi	499 psi	458 psi	433 psi
D5	Flange acc. EN 1092-1 PN 63	914 psi	890 psi	865 psi	787 psi	726 psi	683 psi
D6	Flange acc. EN 1092-1 PN 100	1450 psi	1412 psi	1373 psi	1248 psi	1152 psi	1083 psi
D7	Flange acc. EN 1092-1 PN 160	2320 psi	2275 psi	2198 psi	1999 psi	1844 psi	1734 psi
G9	Internal thread RCCS34	2620 psi	2620 psi	2375 psi	2159 psi	1972 psi	1828 psi
T9	Internal thread NPT RCCS34	2620 psi	2620 psi	2375 psi	2159 psi	1972 psi	1828 psi
		Process Temperature					
		up to 248°F				428°F	
J1	Flange acc. JIS B 2220 10K	1203 psi				174 psi	
J2	Flange acc. JIS B 2220 20K	493 psi				449 psi	

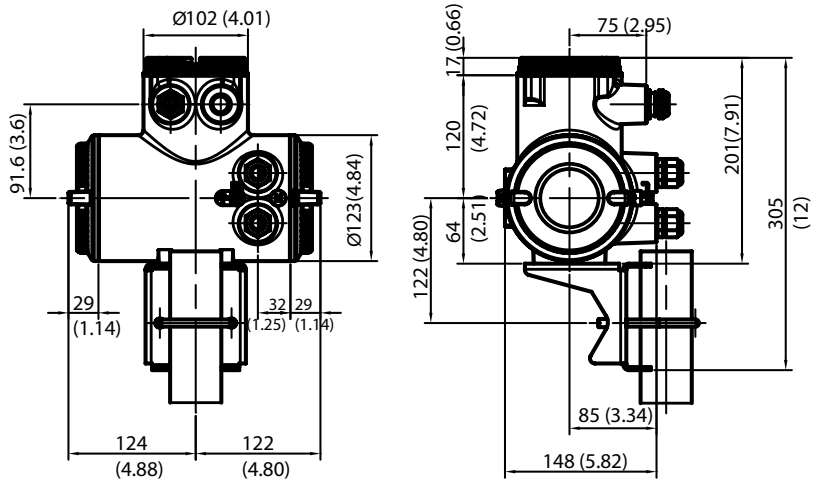
[1] RT = Room Temperature; EN1092: -10°C to 50°C; ASME B16.5: -29°C to 38°C

For marine application acc. DNV Type approval the process pressure is limited according section „Process pressure limit“ (page 3).

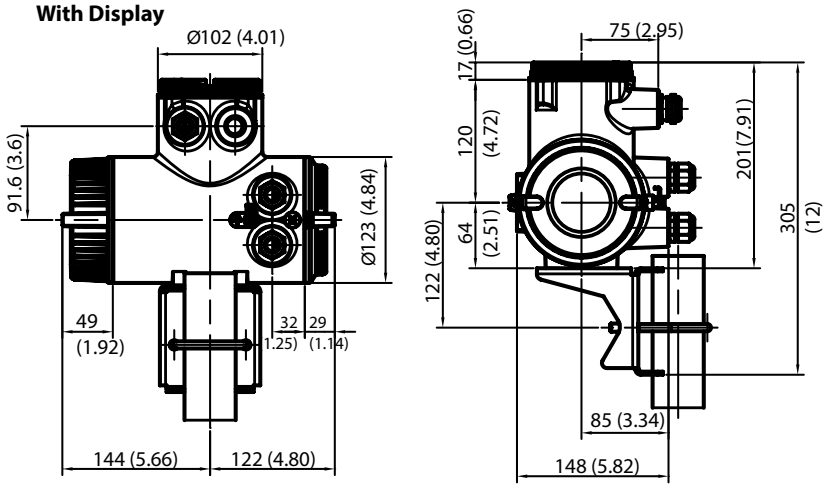
■DIMENSIONS

Remote field-mount Converter RCCF31

Without Display



With Display

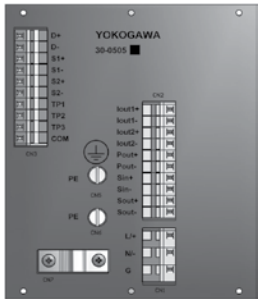


Weight with bracket: 5.5 kg (12.1 lbs) (depends on type)

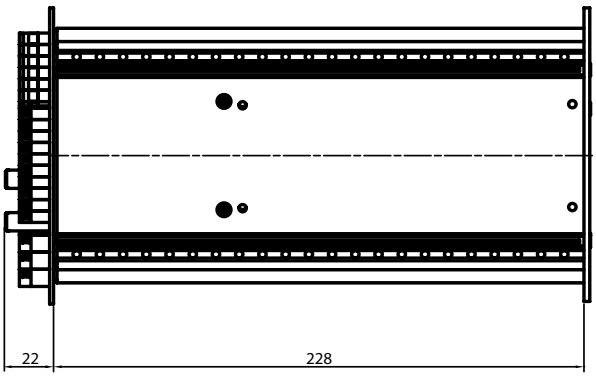
Dimensions in mm (inches)

Remote rack-mount Converter RCCR31

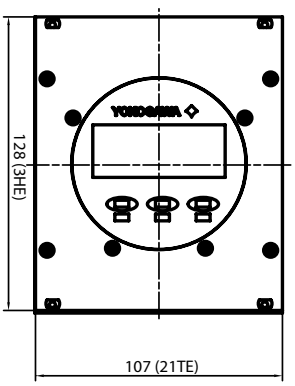
Terminal Board, back view



Cassette, side view

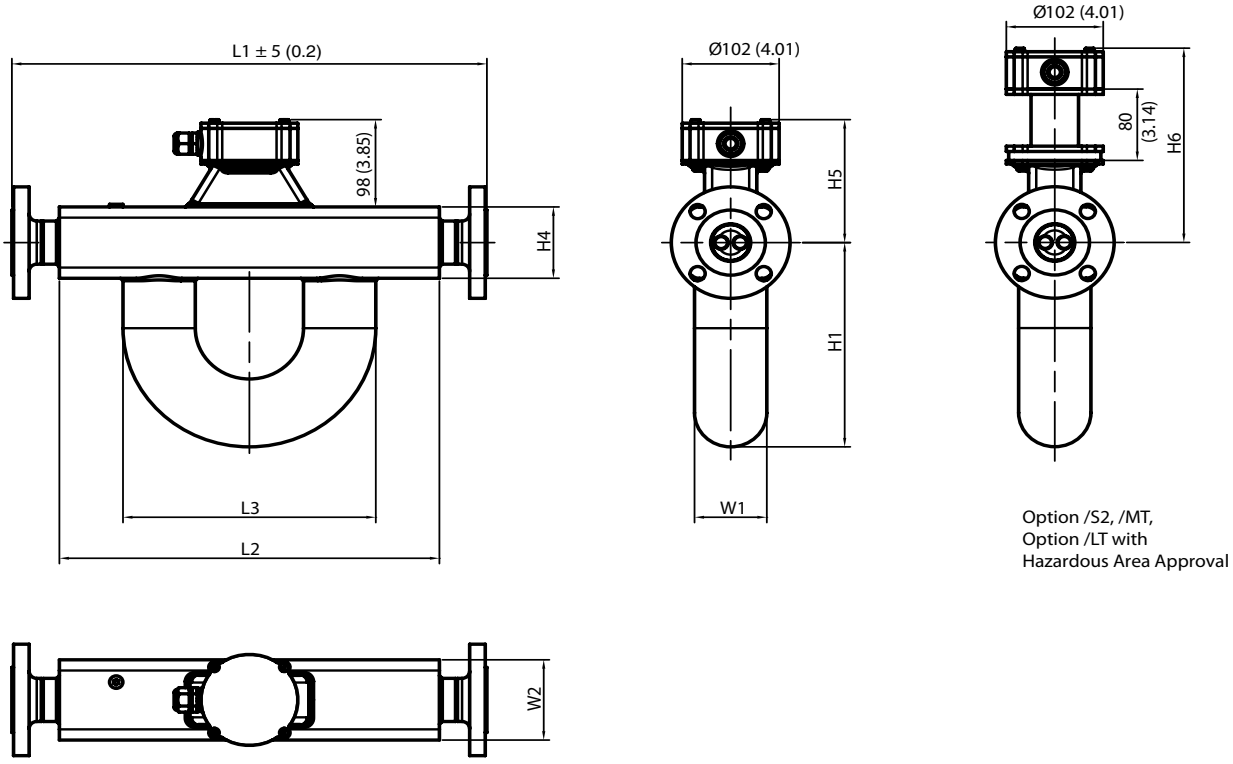


Cassette front view



Dimensios in mm
19-inch rack, acc. IEC / DIN EN 60297-3-101
Weight: 1.5 kg

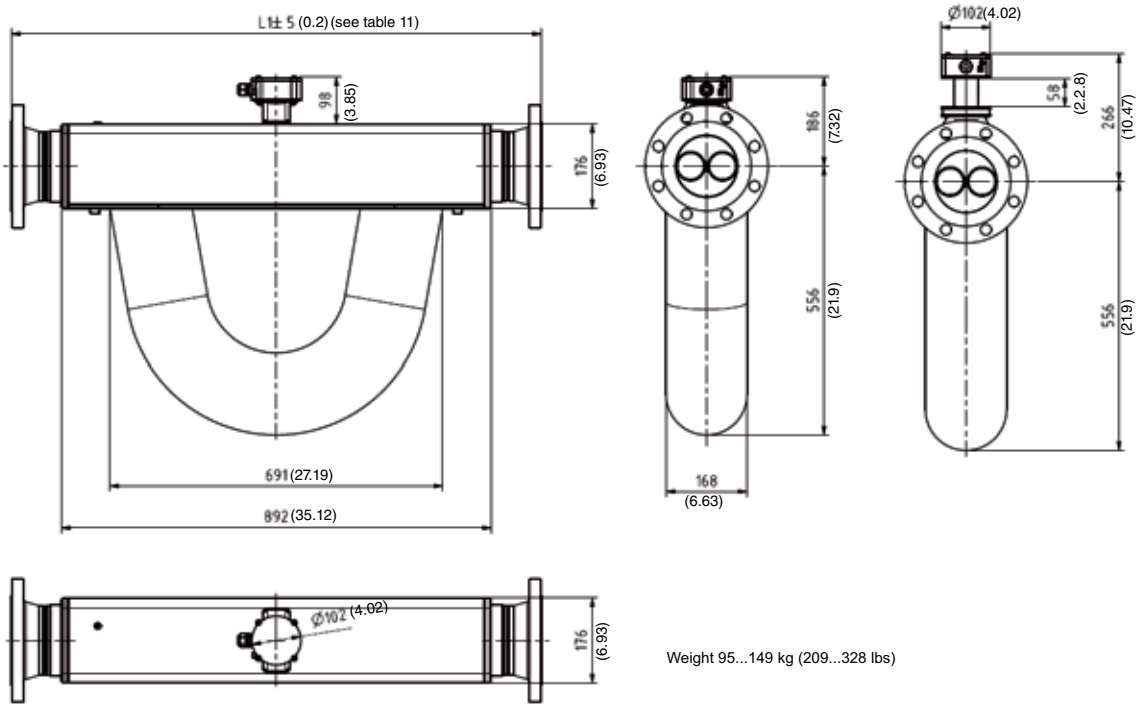
Remote Detector RCCS34, RCCS36, RCCS38, RCCS39



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

Model		L1	L2	L3	H1	W1	W2	H4	H5	H6	Weight
RCCS34	mm (inches)	see table 11	272 (10.7)	212 (8.35)	177 (6.97)	60 (2.36)	80 (3.15)	80 (3.15)	138 (5.43)	218 (8.58)	10-21 kg (22-46 lbs)
RCCS36	mm (inches)	see table 11	400 (15.7)	266 (10.5)	230 (9.06)	76 (2.99)	90 (3.54)	80 (3.15)	138 (5.43)	218 (8.58)	15-35 kg (33-77 lbs)
RCCS38	mm (inches)	see table 11	490 (19.3)	267 (10.5)	269 (10.6)	89 (3.5)	110 (4.33)	100 (3.94)	148 (5.82)	228 (8.97)	25-50 kg (55-110 lbs)
RCCS39	mm (inches)	see table 11	850 (33.5)	379 (14.9)	370 (14.6)	129 (5.08)	160 (6.3)	135 (5.31)	166 (6.53)	245 (9.65)	60-103 kg (132-227 lbs)
Dimensions in mm (inches). Weights with smallest and biggest flanges.											

Remote Detector RCCS39/IR-□□□□□□□□□□ /V2



Weight 95...149 kg (209...328 lbs)

Dimensions in mm (inches). Weights with smallest and biggest flanges

■MODEL, SUFFIX AND OPTION CODES

Remote Detector RCCS3□, Model and Suffix Code

Model	Suffix Code		Description	Restrictions
RCCS34 RCCS36 RCCS38 RCCS39 RCCS39/IR			Nominal Value : 3 t/h = 50 kg/min (110.2 lbs/min) Nominal Value : 10 t/h = 170 kg/min (374.78 lbs/min) Nominal Value : 32 t/h = 533 kg/min (1175 lbs/min) Nominal Value : 100 t/h = 1670 kg/min (3681.72 lbs/min) Nominal Value : 250 t/h = 4170 kg/min (9193.27 lbs/min)	 only with /V2
Cable conduit connection	-M -A		M20 x 1.5, female thread with cable glands ANSI ½" NPT, female thread only with cable gland for detector connection	
Process connection size [1]	41 01 23 02 04 05 06 08 10 12 15 20		¼" DN 15, ½" ¾" DN 25, 1" DN 40, 1½" DN 50, 2" DN 65, 2½" DN 80, 3" DN 100, 4" DN 125, 5" DN 150, 6" DN 200, 8"	see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11
Process connection rating and style [1]	A1 A2 A3 A4 D2 D4 D5 D6 D7 J1 J2 G9 T9		ASME flange class 150, process connection dim. + facing acc. ASME B16.5 ASME flange class 300, process connection dim. + facing acc. ASME B16.5 ASME flange class 600, process connection dim. + facing acc. ASME B16.5 ASME flange class 900, process connection dim. + facing acc. ASME B16.5 EN flange PN 16, process connection dim. + facing acc. EN 1092-1 Form B1 EN flange PN 40, process connection dim. + facing acc. EN 1092-1 Form B1 EN flange PN 63, process connection dim. + facing acc. EN 1092-1 Form B1 EN flange PN 100, process connection dim. + facing acc. EN 1092-1 Form B1 EN flange PN 160, process connection dim. + facing acc. EN 1092-1 Form B1 JIS flange 10K, JIS B 2220 JIS flange 20K, JIS B 2220 G female thread NPT female thread	see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11 see table 11
Material of wetted parts [1]		SL	Stainless steel 316L (1.4404)	

[1] see selection table „Process connection and materials" (table 11)

Remote Detector RCCS3□, Option Code

Options	Option code	Description	Restrictions
Hazardous Area Approvals [1]	/KS1 /ES1 /US1 /NS1	ATEX intrinsically safe approval IECEx intrinsically safe approval INMETRO intrinsically safe approval for Brazil NEPSI intrinsically safe approval for China	
Marine Approval [2]	/MC2 /MC3	Marine approval acc. DNV piping class 2 (see section “Process Pressure limits”) Marine approval acc. DNV piping class 3	not for thermal oil application not for thermal oil application
Custody Transfer Measurement	/Q20 /Q21	NTEP approval 12-080A2, Accuracy class 0.3 acc. NIST Handbook 44 NTEP approval 12-080A2, Accuracy class 0,3 acc. NIST Handbook 44, Heated Products	Only RCCS34 to 39 (Refer to GS 01R04B07-00E) Only RCCS39/IR ; not with /Q01, /Q20 (Refer to GS 01R04B07-00E)
Tag Number	/BG	With customer specified tag number on name plate	max. 16 digits
Flange Facing	/DN /EN /FN /RJ	Flange with safety grooves acc. to EN 1092-1 form D Flange with spigot acc. to EN 1092-1 form E Flange with recess acc. to EN 1092-1 form F Ring Type Joint Flanges	only for D2 to D6 only for D2 to D6 only for D2 to D6 only for A3, A4
Low temperature version	/LT	-200°C ≤ T_{medium} ≤ 150°C (-328°F to 302°F)	not with /MT, in combination with Hazardous Area Approval only with /S2
Extended temperature range	/MT	-70°C ≤ T_{medium} ≤ 230°C (-94°F to 446°F)	for RCCS34 to 39/XR; always with /S2;
Special Calibration	/K2 [4] /K4 /K5 [4] /K6	Custom 5 pts mass-/volume-flow calibration using water with factory certificate (traceable to German national standards) Density adjustment + thermal treatment; (accuracy: 0.001 g/cm³) Custom 10 pts mass-/volume-flow calibration using water with DAkkS certificate (according EN-17025:2005) Density calibration with 3 different fluids incl. individual temperature compensation with certificate (accuracy: 0.0005 g/cm³)	 only RCCS34 to 39 only RCCS34 to 39; not with /LT; not with /MT
Certificates	/P2 /P3 /P6 /P8 /H1 /WP /L2 /L3 /L4	Certificate of compliance with the order acc. to EN 10204:2004 -2.1 Test Report acc. EN10204:2004-2.2(QIC) including the content of option /P2 Material certificate acc to EN 10204: 2004 -3.1 Pressure test report measuring system Oil and fat free for wetted surface acc. ASTM G93-03 level C WPS acc. DIN EN ISO 15609-1 (Welding Procedure Specification) WPQR acc. DIN EN ISO 15614-1 (Welding Procedure Qualification Record) WQC acc. DIN EN 287-1 (Welder Qualification Certificate) Calibration certificate level 2: Declaration and the Calibration Equipment List are issued Calibration certificate level 3: Declaration and the Primary Standard List are issued Calibration certificate level 4: Declaration and the Yokogawa Measuring Instruments Control System are issued	 only for butt weld between process connection and flow divider
Housing Pressure Test	/J1	Rupture pressure proof test and certificate (see page 4)	
Customer insulation / Heating	/S2	Terminal box on extension for high or low process temperature	
X-Ray Examination	/RT	X-ray examination of flange welding	only RCCS34 with /K4, /K6 or /LT only one-sided
PMI Certificate	/PM6	PMI Test on wetted parts RCCS34 to 39/IR	
Dye Penetrant Test	/PT	Dye Penetrant Test acc. DIN EN ISO 3452-1 at the weldings of the process connection, with certificate	
Version IR	/V2	Version 2	always with RCCS39/IR
Delivery to Korea	/KC	With KC-mark for Korea	
Delivery to China	/CN	For meters which are delivered to China	combination with Hazardous Area Approval only with /NS1

[1] Select affiliated converter RCCF31/RCCR31 with the same approval type (e.g. ATEX).
[2] Select affiliated converter RCCF31/RCCR31 with the same approval type (/MC2 or /MC3).
[3] Select affiliated converter RCCF31 with the same approval type (/Q20 or /Q21).
[4] Calibration order sheet must be delivered with the order. This is available on the Flow Center Page at Coriolis/RCCS3/Technical Information.
Volume calibration: Mass flow calibration converted by density to volume flow.

Remote field-mount Converter RCCF31, Model, Suffix and Option Code

Model	Suffix Code	Option Code	Description	Restrictions
RCCF31			Remote field-mount converter to be connected to RCCS3; when ordered without detector combination option /NC must be selected	
Power supply	-D		24 V DC	
Indicator direction	H2 N0		With indicator Without indicator	
Cable conduit connection	M A		M20 x 1.5, female thread with cable glands ANSI ½" NPT, female thread, only cable gland for detector connection	

Hazardous Area Approvals [1]	/KF1 /EF1 /UF1 /NF1	ATEX Flame proof converter + Intrinsically safe detector output IECEx Flame proof converter + Intrinsically safe detector output INMETRO Flame proof converter + Intrinsically safe detector output NEPSI Flame proof converter + Intrinsically safe detector output	with /HP not for gas group IIC with /HP not for gas group IIC with /HP not for gas group IIC with /HP not for gas group IIC
Marine Approval [2]	/MC2 /MC3	Marine approval acc. DNV piping class 2 Marine approval acc. DNV piping class 3	not for thermal oil application not for thermal oil application
Custody Transfer Measurement	/Q20 /Q21	NTEP approval 12-080A2, Accuracy class 0.3 acc. NIST Handbook 44 NTEP approval 12-080A2, Accuracy class 0,3 acc. NIST Handbook 44, Heated Products	Only in combination with RCCS34 to 39 (Refer to GS 01R04B07-00E) Only in combination with RCCS39/IR; not with /Q01, /Q20 (Refer to GS 01R04B07-00E)
High Driving Power	/HP	High Driving Power, recommended for combination with RCCS36 to 39, strongly recommended for combination with RCCS39/IR, Please see „ Hazardous Area Specifications"	
Communication	/MB2	Modbus communication protocol for all parameters and values	not with /Q20, /Q21, /AP, /NM, /MB3
	/MB3	Modbus communication protocol for all parameters and values incl. HART Communication, analogue output, pulse/status output, status input	not with /MB2
NAMUR Switch	/NM	One pulse output acc. EN 60947-5-6 (NAMUR)	not with /AP
Active Pulse Output	/AP	One active pulse output	not with /NM
Tag Number	/BG	With customer specified tag number on name plate	max. 16 characters; the last 8 significant characters are used for HART® Tag; characters acc. Codepage 850 (Multi-lingual)
HART® Tag Number (Software Tag)	/BT1	With customer specified tag number for HART® communication in converter	22 characters for long tag; characters acc. Codepage 850 (Multi-lingual)
No Combination	/NC	No combination with detector	
Epoxy Coating	/X1	Epoxy coating of converter housing	
Delivery to Korea	/KC	With KC-mark for Korea	
Delivery to China	/CN	For delivery to China	combination with Hazardous Area Approval only with /NF**1**
Concentration Measurement [4]	/CST /C□□	Standard concentration measurement Advanced concentration measurement, details see table „Advanced Concentration Measurement Options"	not with /C□□ not with /CST
Certificates	/P2 /P3	Certificate of compliance with the order acc. EN 10204:2004 -2.1 Test Report acc. EN10204:2004-2.2(QIC) including the content of option /P2	
Instruction Manuals	/IE□ /ID□ /IF□	Quantity of instruction manuals in English Quantity of instruction manuals in German Quantity of instruction manuals in French	□ = 1 to 3 selectable [5] □ = 1 to 3 selectable [5] □ = 1 to 3 selectable [5]

[1] Select affiliated RCCS3 with the same approval type (e.g. /KF□ with /KS1).
[2] Select affiliated RCCS3 with the same approval type (/MC2 or /MC3).
[3] Select affiliated converter RCCF31 with the same approval type (/Q20 or /Q21).
[4] For detailed information please see TI 01R04B04-04E-E. Option /K6 of RCCS3 is recommended with concentration measurement.
[5] If no instruction manual is selected, only a DVD with instruction manuals is shipped with the instrument. More than 3 manuals of one language on request available.

Remote rack-mount Converter RCCR31, Model, Suffix and Option Code

Model	Suffix Code	Option Code	Description	Restrictions
RCCR31			Remote converter for 19" rack mounting to be connected to RCCS3 when ordered without detector combination option /NC must be selected	
Power supply	-D		24 V DC	

Hazardous Area Approvals [1]	/KS1 /ES1 /US1 /NS1	ATEX associated apparatus for intrinsically safe detector connection for gas group IIC IECEx associated apparatus for intrinsically safe detector output for gas group IIC INMETRO associated apparatus for intrinsically safe detector output for gas group IIC NEPSI associated apparatus for intrinsically safe detector output for gas group IIC	with /HP not for gas group IIC with /HP not for gas group IIC with /HP not for gas group IIC with /HP not for gas group IIC
Marine Approval [2]	/MC2 /MC3	Marine approval acc. DNV piping class 2 Marine approval acc. DNV piping class 3	not for thermal oil application not for thermal oil application
High Driving Power	/HP	High Driving Power, recommended for combination with RCCS36 to 39, strongly recommended for combination with RCCS39/IR, Please see „ Hazardous Area Specifications"	
Active Pulse Output	/AP	One active pulse output	not with /NM
NAMUR Switch	/NM	One pulse output acc. EN 60947-5-6 (NAMUR)	not with /AP
Tag Number	/BG	With customer specified tag number on name plate	max. 16 characters; the last 8 significant characters are used for HART® Tag; characters acc. Codepage 850 (Multi-lingual)
HART® Tag Number (Software Tag)	/BT1	With customer specified tag number for HART® communication in converter	22 characters for long tag; characters acc. Codepage 850 (Multi-lingual)
Communication	/MB2	Modbus communication protocol for all parameters and values	not with /AP, /NM, /MB3
	/MB3	Modbus communication protocol for all parameters and values incl. HART Communication, analogue output, pulse/status output, status input	not with /MB2
No Combination	/NC	No combination with detector	
Concentration Measurement [3]	/CST /C□□	Standard concentration measurement Advanced concentration measurement, details see table „Advanced Concentration Measurement Options"	not with /C□□ not with /CST
Subrack	/SR2 /SR4	Subrack for 2 converter RCCR31 with mounting Subrack for 4 converter RCCR31 with mounting	
Delivery to Korea	/KC	With KC-mark for Korea	
Delivery to China	/CN	For meters which are delivered to China	combination with Hazardous Area Approval only with /NS1
Certificates	/P2 /P3	Certificate of compliance with the order acc. EN 10204:2004 -2.1 Test Report acc. EN10204:2004-2.2(QIC) including the content of option /P2	
Instruction Manuals	/IE□ /ID□ /IF□	Quantity of instruction manuals in English Quantity of instruction manuals in German Quantity of instruction manuals in French	□ = 1 to 3 selectable [4] □ = 1 to 3 selectable [4] □ = 1 to 3 selectable [4]

[1] Select affiliated RCCS3 with the same approval type (e.g. /KS1 with /KS1).
[2] Select affiliated RCCS3 with the same approval type (/MC2 or /MC3).
[3] For detailed information please see TI 01R04B04-04E-E. Option /K6 of RCCS3 is recommended with concentration measurement.
[4] If no instruction manual is selected, only a DVD with instruction manuals is shipped with the instrument. More than 3 manuals of one language on request available.

Remote Cable RCCY03□, Model, Suffix and Option Code

Model	Suffix Code	Option Code	Description	Restrictions
RCCY037			Length in "meter"	max. ambient temperature 90°C (176°F)
Cable ends	-0		No termination, with one termination kit	
Cable length	L0005 L0010 L0040 L0100 L1000		Available standard length	the following lengths can be ordered (e.g. 15m = L0015): RCCY037-0: 5m; 15m; 40m; 100m; 1000m
Options: Termination kits		/TK001 /TK002 /TK003 /TK004 /TK005 /TK006 /TK007 /TK008 /TK009 /TK010 /TK015 /TK020 /TK025 /TK030 /TK035 /TK040 /TK050 /TK060 /TK070 /TK080 /TK090 /TK099 /TK150 /TK200	Quantity of additional termination kits	
Delivery to China		/CN	For meters which are delivered to China	

Advanced Concentration Measurement Options (others on request), recommended with Option /K6

Option	Display	Components	Concentration range	Temp. range	Source of concentration- / density table
/C00	---	---	---	---	Advanced concentration measurement function. There are no pre-defined concentration setups (coefficients are set to zero). The concentration coefficients will be set by customer making use of either FieldMate or the stand- alone concentration tool and manual entry by HHT. For more information, please contact your regional Yokogawa office.
/C01	°Brix	Sugar / Water	0 - 85 °Brix	0 - 80°C (32 - 176°F)	PTB- Messages 100 5/90: „The density of watery Saccarose solutions after the introduction of the international temperature scale of 1990 (ITS1990)“ Table 5
/C02	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
/C03	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
/C04	WT%	NH_4NO_3 / Water	1 - 50 WT%	0 - 80°C (32 - 176°F)	Data table on request
/C05	WT%	NH_4NO_3 / Water	20 - 70 WT%	20 - 100°C (68 - 212°F)	Data table on request
/C07	WT%	HNO_3 / Water	50 - 67 WT%	10 - 60°C (50 - 140°F)	Data table on request
/C09	WT%	H_2O_2 / Water	30 - 75 WT%	4 - 44°C (39.2 - 111.2°F)	Data table on request
/C10	WT%	Ethylene Glycol / Water	10 - 50 WT%	-20 - 40°C (-4 - 104°F)	Data table on request
/C11	WT%	Amylum = starch / Water	33 - 43 WT%	35 - 45°C (95 - 113°F)	Data table on request
/C12	WT%	Methanol / Water	35 - 60 WT%	0 - 40°C (32 - 104°F)	Data table on request
/C20	VOL%	Alcohol / Water	55 - 100 VOL%	10 - 40°C (50 - 104°F)	Data table on request
/C21	°Brix	Sugar / Water	40 - 80 °Brix	75 - 100°C (167 - 212°F)	Data table on request
/C30	WT%	Alcohol / Water	66 - 100 WT%	15 - 40°C (59 - 104°F)	Standard Copersucar 1967
/C37	WT%	Alcohol / Water	66 - 100 WT%	10 - 40°C (50 - 104°F)	Brazilian Standard ABNT

Table 11 : Selection Table Process Connection and Materials, Installation Length in mm

			RCCS34	RCCS36	RCCS38	RCCS39	RCCS39/IR
Flanges according to ASME B16.5	01A1	½“-150	370	----	----	----	----
	01A2	½“-300	370	----	----	----	----
	01A3	½“-600	380	----	----	----	----
	02A1	1“-150	370	500	----	----	----
	02A2	1“-300	370	500	----	----	----
	02A3	1“-600	390	520	----	----	----
	04A1	1½“-150	380	500	600	----	----
	04A2	1½“-300	380	510	600	----	----
	04A3	1½“-600	400	530	620	----	----
	04A4	1½“-900	470	600	640	----	----
	05A1	2“-150	----	510	600	----	----
	05A2	2“-300	----	510	600	----	----
	05A3	2“-600	----	540	630	----	----
	05A4	2“-900	----	660	720	----	----
	06A1	2½“-150	----	----	610	----	----
	06A2	2½“-300	----	----	610	----	----
	06A3	2½“-600	----	----	640	----	----
	06A4	2½“-900	----	----	760	----	----
	08A1	3“-150	----	----	610	1000	----
	08A2	3“-300	----	----	620	1000	----
	08A3	3“-600	----	----	640	1000	----
	08A4	3“-900	----	----	760	----	----
	10A1	4“-150	----	----	----	1000	1100
	10A2	4“-300	----	----	----	1000	1100
	10A3	4“-600	----	----	----	1030	1100
	12A1	5“-150	----	----	----	1000	1100
	12A2	5“-300	----	----	----	1000	1100
	12A3	5“-600	----	----	----	1040	1160
	15A1	6“-150	----	----	----	----	1100
	15A2	6“-300	----	----	----	----	1100
	15A3	6“-600	----	----	----	----	1200
	20A1	8“-150	----	----	----	----	1140
	20A2	8“-300	----	----	----	----	1140
Flanges according to EN 1092-1	01D4	DN 15 PN 40	370	----	----	----	----
	01D6	DN 15 PN 100	380	----	----	----	----
	02D4	DN 25 PN 40	370	500	----	----	----
	02D6	DN 25 PN 100	390	520	----	----	----
	04D4	DN 40 PN 40	370	500	600	----	----
	04D6	DN 40 PN 100	450	560	620	----	----
	05D4	DN 50 PN 40	----	500	600	----	----
	05D5	DN 50 PN 63	----	520	620	----	----
	05D6	DN 50 PN 100	----	590	660	----	----
	05D7	DN 50 PN 160	----	590	660	----	----
	08D4	DN 80 PN 40	----	----	610	1000	----
	08D5	DN 80 PN 63	----	----	620	1000	----
	08D6	DN 80 PN 100	----	----	730	1000	----
	10D2	DN 100 PN 16	----	----	----	1000	1100
	10D4	DN 100 PN 40	----	----	----	1000	1100
	10D5	DN 100 PN 63	----	----	----	1000	1100
	10D6	DN 100 PN 100	----	----	----	1050	1100
	12D2	DN 125 PN 16	----	----	----	1000	1100
	12D4	DN 125 PN 40	----	----	----	1000	1100
	12D5	DN 125 PN 63	----	----	----	1000	1100
	12D6	DN 125 PN 100	----	----	----	1100	1140
	12D7	DN 125 PN 160	----	----	----	----	1100
	15D2	DN 150 PN 16	----	----	----	----	1100
	15D4	DN 150 PN 40	----	----	----	----	1100
	15D5	DN 150 PN 63	----	----	----	----	1140
	15D6	DN 150 PN 100	----	----	----	----	1180

Table 11 : Selection Table Process Connection and Materials, Installation Length in mm (continued)

			RCCS34	RCCS36	RCCS38	RCCS39	RCCS39/IR
Flanges according to JIS B 2220	01J1	DN 15 10K	370	----	----	----	----
	01J2	DN 15 20K	370	----	----	----	----
	02J1	DN 25 10K	370	500	----	----	----
	02J2	DN 25 20K	370	500	----	----	----
	04J1	DN 40 10K	370	500	600	----	----
	04J2	DN 40 20K	370	500	600	----	----
	05J1	DN 50 10K	----	500	600	----	----
	05J2	DN 50 20K	----	500	600	----	----
	08J1	DN 80 10K	----	----	600	1000	----
	08J2	DN 80 20K	----	----	610	1000	----
	10J1	DN 100 10K	----	----	----	1000	1100
	10J2	DN 100 20K	----	----	----	1000	1100
	12J1	DN 125 10K	----	----	----	1000	1100
	12J2	DN 125 20K	----	----	----	1000	1100
	15J1	DN 150 10K	----	----	----	----	1100
	15J2	DN 150 20K	----	----	----	----	1100
Thread	41G9	G¼“ female	----	----	----	----	----
	01G9	G½“ female	390	----	----	----	----
	23G9	G¾“ female	390	----	----	----	----
	41T9	NPT¼“ female	----	----	----	----	----
	01T9	NPT½“ female	390	----	----	----	----
	23T9	NPT¾“ female	390	----	----	----	----

Table 11 : Selection Table Process Connection and Materials, Installation Length in inch

			RCCS34	RCCS36	RCCS38	RCCS39	RCCS39/IR
Flanges according to ASME B16.5	01A1	½“-150	14.57	----	----	----	----
	01A2	½“-300	14.57	----	----	----	----
	01A3	½“-600	14.96	----	----	----	----
	02A1	1“-150	14.57	19.69	----	----	----
	02A2	1“-300	14.57	19.69	----	----	----
	02A3	1“-600	15.75	20.47	----	----	----
	04A1	1½“-150	14.96	19.69	23.62	----	----
	04A2	1½“-300	14.96	20.08	23.62	----	----
	04A3	1½“-600	15.35	20.87	24.21	----	----
	04A4	1½“-900	18.5	23.62	25.2	----	----
	05A1	2“-150	----	20.08	23.62	----	----
	05A2	2“-300	----	20.08	23.62	----	----
	05A3	2“-600	----	21.26	24.8	----	----
	05A4	2“-900	----	25.98	28.35	----	----
	06A1	2½“-150	----	----	24.02	----	----
	06A2	2½“-300	----	----	24.02	----	----
	06A3	2½“-600	----	----	25.2	----	----
	06A4	2½“-900	----	----	29.92	----	----
	08A1	3“-150	----	----	24.02	39.37	----
	08A2	3“-300	----	----	24.21	39.37	----
	08A3	3“-600	----	----	25.2	39.37	----
	08A4	3“-900	----	----	29.92	----	----
	10A1	4“-150	----	----	----	39.37	43.3
	10A2	4“-300	----	----	----	39.37	43.3
	10A3	4“-600	----	----	----	40.55	43.3
	12A1	5“-150	----	----	----	39.37	43.3
	12A2	5“-300	----	----	----	39.37	43.3
	12A3	5“-600	----	----	----	40.94	45.67
	15A1	6“-150	----	----	----	----	43.3
	15A2	6“-300	----	----	----	----	43.3
	15A3	6“-600	----	----	----	----	47.24
	20A1	8“-150	----	----	----	----	44.9
	20A2	8“-300	----	----	----	----	44.9
Flanges according to EN 1092-1	01D4	DN 15 PN 40	14.57	----	----	----	----
	01D6	DN 15 PN 100	14.96	----	----	----	----
	02D4	DN 25 PN 40	14.57	19.69	----	----	----
	02D6	DN 25 PN 100	15.35	20.47	----	----	----
	04D4	DN 40 PN 40	15.35	19.69	23.62	----	----
	04D6	DN 40 PN 100	17.72	22.05	24.41	----	----
	05D4	DN 50 PN 40	----	19.69	23.62	----	----
	05D5	DN 50 PN 63	----	20.47	24.41	----	----
	05D6	DN 50 PN 100	----	23.23	25.98	----	----
	05D7	DN 50 PN 160	----	23.23	25.98	----	----
	08D4	DN 80 PN 40	----	----	24.02	39.37	----
	08D5	DN 80 PN 63	----	----	24.41	39.37	----
	08D6	DN 80 PN 100	----	----	28.74	39.37	----
	10D2	DN 100 PN 16	----	----	----	39.37	43.31
	10D4	DN 100 PN 40	----	----	----	39.37	43.31
	10D5	DN 100 PN 63	----	----	----	39.37	43.31
	10D6	DN 100 PN 100	----	----	----	41.34	43.31
	12D2	DN 125 PN 16	----	----	----	39.37	43.31
	12D4	DN 125 PN 40	----	----	----	39.37	43.31
	12D5	DN 125 PN 63	----	----	----	39.37	43.31
	12D6	DN 125 PN 100	----	----	----	43.31	44.88
	12D7	DN 125 PN 160	----	----	----	----	43.31
	15D2	DN 150 PN 16	----	----	----	----	43.31
	15D4	DN 150 PN 40	----	----	----	----	43.31
	15D5	DN 150 PN 63	----	----	----	----	44.88
	15D6	DN 150 PN 100	----	----	----	----	46.46

Table 11 : Selection Table Process Connection and Materials, Installation Length in inch (continued)

			RCCS34	RCCS36	RCCS38	RCCS39	RCCS39/IR
Flanges according to JIS B 2220	01J1	DN 15 10K	14.57	----	----	----	----
	01J2	DN 15 20K	14.57	----	----	----	----
	02J1	DN 25 10K	14.57	19.69	----	----	----
	02J2	DN 25 20K	14.57	19.69	----	----	----
	04J1	DN 40 10K	14.57	19.69	23.62	----	----
	04J2	DN 40 20K	14.57	19.69	23.62	----	----
	05J1	DN 50 10K	----	19.69	23.62	----	----
	05J2	DN 50 20K	----	19.69	23.62	----	----
	08J1	DN 80 10K	----	----	23.62	39.37	----
	08J2	DN 80 20K	----	----	24.02	39.37	----
	10J1	DN 100 10K	----	----	----	39.37	43.31
	10J2	DN 100 20K	----	----	----	39.37	43.31
	12J1	DN 125 10K	----	----	----	39.37	43.31
	12J2	DN 125 20K	----	----	----	39.37	43.31
	15J1	DN 150 10K	----	----	----	----	43.31
	15J2	DN 150 20K	----	----	----	----	43.31
Thread	41G9	G¼“ female	----	----	----	----	----
	01G9	G½“ female	15.35	----	----	----	----
	23G9	G¾“ female	15.35	----	----	----	----
	41T9	NPT¼“ female	----	----	----	----	----
	01T9	NPT½“ female	15.35	----	----	----	----
	23T9	NPT¾“ female	15.35	----	----	----	----

Table 12 : CRN approved process connections

			RCCS34	RCCS36	RCCS38	RCCS39	RCCS39/IR
Flanges according to ASME B16.5	01A1	½“-150	X	----	----	----	----
	01A2	½“-300	X	----	----	----	----
	01A3	½“-600	X	----	----	----	----
	01A5	½“-900/1500	X	----	----	----	----
	02A1	1“-150	X	X	----	----	----
	02A2	1“-300	X	X	----	----	----
	02A3	1“-600	X	X	----	----	----
	02A5	1“-900/1500	X	X	----	----	----
	04A1	1½“-150	X	----	X	----	----
	04A2	1½“-300	X	X	X	----	----
	04A3	1½“-600	X	X	X	----	----
	04A4	1½“-900	----	----	X	----	----
	04A5	1½“-900/1500	X	X	----	----	----
	05A1	2“-150	----	X	X	----	----
	05A2	2“-300	----	X	X	----	----
	05A3	2“-600	----	X	X	----	----
	05A4	2“-900	----	----	X	----	----
	05A5	2“-900/1500	----	X	----	----	----
	06A1	2½“-150	----	----	X	----	----
	06A2	2½“-300	----	----	X	----	----
	06A3	2½“-600	----	----	X	----	----
	06A4	2½“-900	----	----	X	----	----
	08A1	3“-150	----	----	X	X	----
	08A2	3“-300	----	----	X	X	----
	08A3	3“-600	----	----	X	X	----
	08A4	3“-900	----	----	X	----	----
	10A1	4“-150	----	----	----	X	X
	10A2	4“-300	----	----	----	X	X
	10A3	4“-600	----	----	----	X	X
	12A1	5“-150	----	----	----	X	X
	12A2	5“-300	----	----	----	X	X
	12A3	5“-600	----	----	----	X	X
	15A1	6“-150	----	----	----	----	X
	15A2	6“-300	----	----	----	----	X
	15A3	6“-600	----	----	----	----	X
	20A1	8“-150	----	----	----	----	----
	20A2	8“-300	----	----	----	----	----

REGISTERED TRADEMARKS

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MODBUS® : Registered trademark of MODBUS Organization

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