User's Manual

ROTAMASS 3 Series
Coriolis Mass Flow and Density Meter
Integral Type RCCT3
Remote Type RCCF31 + RCCS3
Remote Type RCCR31 + RCCS3

IM 01R04B04-00E-E

vigilantplant.™

YOKOGAWA

Rota Yokogawa GmbH & Co. KG
Rheinstr. 8
D-79664 Wehr
Germany

IM 01R04B04-00E-E

11th edition, April 2015 (Rü)

Blank Page

Contents

1. INTRODUCTION

This instrument has been adjusted at the factory before shipment.

To ensure correct use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it.

NOTE

This manual describes the hardware and software configurations of the ROTAMASS Coriolis Massflowmeter.

Regarding This User's Manual

- This manual should be provided to the end user.
- Before use, read this manual thoroughly to comprehend its contents.
- The contents of this manual may be changed without prior notice.
- All rights are reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of merchantability and suitability for a particular purpose.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if any errors or omissions are found, please inform Yokogawa.
- Yokogawa assumes no responsibilities for this product except as stated in the warranty.
- Please note that this user's manual may not be revised for any specification changes, construction changes or operating part changes that are not considered to affect function or performance.
- If the customer or any third party is harmed by the use of this product, Yokogawa assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.

Safety and Modification Precautions

- The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Yokogawa assumes no liability for the customer's failure to comply with these requirements. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.
- The following safety symbol marks are used in this user's manual and instrument.

WARNING

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.

CAUTION

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

IMPORTANT

An IMPORTANT sign denotes that attention is required to avoid damage to the instrument or system failure.

NOTE

A NOTE sign denotes information necessary for essential understanding of operation and features.

This sign on the instrument denotes information in the instruction manual.

IM 01R04B04-00E-E 11th edition April 01, 2015 -00

⏚ Protective grounding terminal

⏚ Functional grounding terminal
(This terminal should not be used as a protective grounding terminal.)

~ Alternating current

⎓ Direct current

1.1 Using the Coriolis Flowmeter Safely

⚠ **WARNING**

(0) General
- Avoid working with bare skin.
- Avoid touching the device with wet hands

(1) Installation
- Installation of the Coriolis flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.
- The Coriolis flowmeter is a heavy instrument. Be careful that no damage is caused to personnel through accidentally dropping it, or by exerting excessive force on the Coriolis flowmeter. When moving the Coriolis flowmeter, always use a trolley and have at least two people carry it (see also chapter 2).
- All procedures relating to installation must comply with the electrical code of the country where it is used.

(2) Wiring
- The wiring of the Coriolis flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.
- When connecting the wiring, check that the supply voltage is within the range of the voltage specified for this instrument before connecting the power cable. In addition, check that no voltage is applied to the power cable before connecting the wiring.
- The protective grounding must be connected securely at the terminal with the ⏚ mark to avoid danger to personnel.

(3) Operation
- Do not open the cover until the power has been off for at least 10 minutes because of electric shock and hot temperatures inside. Only expert engineer or skilled personnel are permitted to open the cover.
- When the Coriolis flowmeter is processing hot fluids, the instrument itself may become extremely hot. Take sufficient care not to get burnt. If the fluid temperature is above 65°C it has to be made sure, that an easy touch by humans is prohibited (e.g. by installation, by a barrier, by a warning).
- Where the fluid being processed is a toxic substance, avoid contact with the fluid and avoid inhaling any residual gas, even after the instrument has been taken off the line for maintenance and so forth.

(4) Maintenance
- Maintenance on the Coriolis flowmeter should be performed by expert engineer or skilled personnel. No operator shall be permitted to perform any operations relating to maintenance.
- Always conform to maintenance procedures outlined in this manual. If necessary, contact Yokogawa.
- Care should be taken to prevent the build up of dirt, dust or other substances on the display panel glass or data plate. If these surfaces do get dirty, wipe them clean with a soft dry cloth.
- Don't open the cover in the rain.
- Don't open the cover during power is connected because of electric shock.
- The amplifier assembly contains sensitive parts. Take care so as not to directly touch the electronic parts or circuit patterns on the board, and by preventing static electrification using grounded wrist straps when handing the assembly.
- While removing the instrument should be fixed or hung (see also chapter 2 "Transportation").

(5) European Pressure Equipment Directive (PED)
- When using the instrument as a PED-compliant product, be sure to read Chapter 10 before use.

(6) Hazardous Duty Type Instruments
- For explosion proof type instruments the description in chapter 9 "EXPLOSION PROTECTED TYPE INSTRUMENT" has priority to the other descriptions in this instruction manual.
- All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you should contact your nearest Yokogawa office or representative.
- Only trained personal should install and maintain instruments in hazardous areas.
- The protective grounding terminal ⏚ must be connected to a suitable IS grounding system.
- Avoid mechanical generated sparks while working on the equipment and peripheral devices in hazardous areas.

1.2 Warranty

- The warranty terms of this instrument that are guaranteed are described in the quotation. We will make any repairs that may become necessary during the guaranteed term free of charge.
- Please contact our sales office if this instrument requires repair.
- If the instrument is faulty, contact us with complete details about the problem and the length of time it has been faulty, and state the model and serial number. We would appreciate the inclusion of drawings or additional information.
- The results of our examination will determine whether the meter will be repaired free of charge or on an at-cost basis.

The guarantee will not apply in the following cases:

- Damage due to negligence or insufficient maintenance on the part of the customer.
- Problems or damage resulting from handling, operation or storage that violates the intended use and specifications.
- Problems that result from using or performing maintenance on the instrument in a location that does not comply with the installation location specified by Yokogawa.
- Problems or damage resulting from repairs or modifications not performed by Yokogawa or someone authorized by Yokogawa.
- Problems or damage resulting from inappropriate installation after delivery.
- Problems or damage resulting from disasters such as fires, earthquakes, storms, floods, or lightning strikes and external causes.

1.3 Instruction according EMC

The ROTAMASS Coriolis flowmeter is conform to the European EMC Guideline and fulfills the following standards:

EN 61326-1: 2006;

EN 61326-2-3: 2006;

EN 61000-3-2: 2006;

EN 61000-3-3: 1995+A1+A2

ROTAMASS is a class A product and should be used and installed properly according to the EMC Class A requirements

Restriction on Use of Radio Transceiver:

IMPORTANT

Although the products has been designed to resist high frequency electrical noise, if a radio transceiver is used near the flowmeter or its external wiring, the transmitter may be affected by high frequency noise pickup. To test for such effects, bring the transceiver in use slowly from a distance of several meters from the flowmeter, and observe the measurement loop for noise effects. Thereafter, always use the transceiver outside the area affected by noise.

Installation

CAUTION

The function ground terminal or the PE- terminal have to be connected to protective ground to ensure electro-magnetic interference protection.

To ensure the EMC specifications the following measures must be carried out :

1. Put the power cables through the ferrite core clamp before connecting to the terminals as shown in chapter "Installation" (Power supply wiring).
2. Put the I/O- cables through the ferrite core clamp before connecting to the terminals as shown in chapter "Installation" (Power supply wiring).
3. Connect protective ground conductor of power supply to PE- terminal in the terminal box (see chapter "Installation" (Power supply wiring).
4. In case of Explosion proof type instrument, further requirements are described in chapter 9 “EXPLOSION PROTECTED TYPE INSTRUMENTS”. The description in this chapter is prior to other descriptions in this instruction manual.

1.4 Confirmation of accessories

When you received the instrument, please check the following accessories.

RCCF31 remote type converter
- 1x ferrite cores for power line
- 1x ferrite core for I/O lines
- 1x band for fixing the ferrite cores on power line
- 1x 2-inch pipe mounting bracket set
  - 1x bracket
  - 1x U-bracket
  - 2x nuts
  - 2x washers
  - 4x bolts with hexagon socket
- 1x terminal wiring auxiliary tool
- 1x cable gland for wiring port detector signal
  - M20 cable gland (metal) (for RCCF31-□□□M...)
  - NPT 1/2´´ cable gland (metal) (for RCCF31-□□□A...)
- 2x cable gland for power supply and I/O signal wiring port
  - M20 cable gland (plastic) (for RCCF31-□□□M...)
  - NPT 1/2´´ (for RCCF31-□□□A...) cable glands for power supply and I/O signal wiring port are not attached.

Remote type detector RCCS3
- 1x cable gland for wiring port detector signal
  - 1x M20 cable gland (for RCCS3□-M□□□□□□)
  - 1x NPT 1/2´´ cable gland + 1x adapter M20 to NPT (for RCCS3□-A□□□□□□)

Integral RCCT3
- 1x ferrite cores for power line
- 1x ferrite core for I/O lines
- 1x band for fixing the ferrite cores on power line
- 1x terminal wiring auxiliary tool
- 2x cable gland for power supply and I/O signal wiring port
  - M20 Cable gland (plastic) (for RCCT3□-□□□M□□□□□□)
  - 1x NPT 1/2´´ cable gland + 1x adapter M20 to NPT (for RCCS3□-A□□□□□□)

2. TRANSPORTATION AND STORAGE

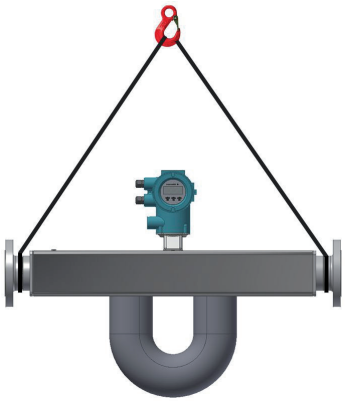
Transport instructions

WARNING
ROTAMASS is a heavy instrument. Please be careful to prevent persons from injuring when it is handled.

When transporting the instrument, you must observe the following safety instructions in order to avoid lethal injury, damage to the instrument and other material damage.
The steps involved in transport may only be carried out by qualified persons taking into account the safety instructions.

- Observe the transport instructions on the packaging.
- Observe the below mentioned storage conditions.
- Use only the original packaging.
- The packaging material must be disposed of in accordance with the regulations.
- The transport braces must not be removed until installation.
- Read chapter 1.1. "Using the Coriolis Flowmeter safety".
- To avoid any damages, unpack the flowmeter only at the installation site.
- Mechanical shocks are to be avoided.
- Using a sling to lift and carry the meter. The instruments must be hanged by a lift at the tubes between the detector housing and the process connections.

  WARNING
  Center of gravity of the instrument is higher than the suspension points of the sling. Risk of injury if the instruments slips.
  The lift must fulfill the local safety instructions.



Do not lift the instrument
-using the flange bolt holes.
-on the converter housing
-on the detector neck.

Storage conditions

Please note the following for storage purposes :
The detector and converter should be stored in its transport packaging.
Choose a storage place that meets the following requirements:

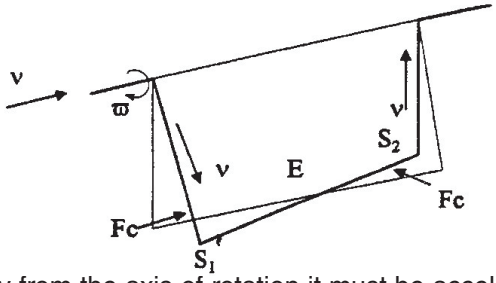
- Protection from rain and humidity
- Free of mechanical vibration and shocks
- Ambient temperature between -40°C to 55°C (RCCT3 / RCCF31 / RCCR31)
  -50°C to 80°C (RCCS3)
- Atmospheric humidity ranging from 0 to 100%. Operation above 95% for longer times is not recommended.

Before storing a used flowmeter remove any fluid from the flowmeter line completely.
Properties of the instrument can change when stored outdoors.

3. PRODUCT DESCRIPTION

3.1 The functional principle

The ROTAMASS instrument measures the mass flow with the help of the so-called Coriolis force. This force occurs, when the medium being measured is flowing at velocity ν through a tube that is rotating around an axis perpendicular to the direction of flow at angular velocity ϖ.



When the medium moves away from the axis of rotation it must be accelerated to an increasingly high peripheral velocity. The force required for this is called Coriolis force, after its discoverer. The Coriolis force reduces the rotation. The opposite effect occurs, when the medium flows towards the axis of rotation. Then the Coriolis force amplifies the rotation.

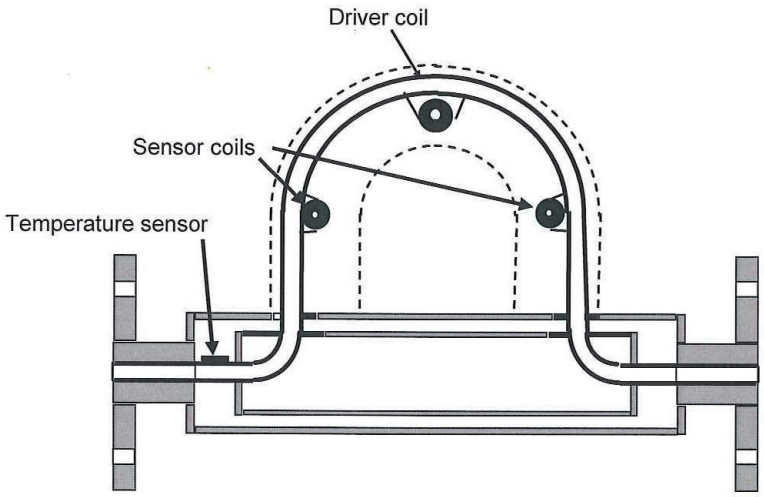
The formula for the Coriolis force is as follows:

$$\vec{Fc} = -2m(\vec{\varpi} \times \vec{\nu})$$

The entire measurement tube is deformed slightly by the Coriolis forces, in the way shown. This deformation is registered by movement sensors at points S_1 and S_2.

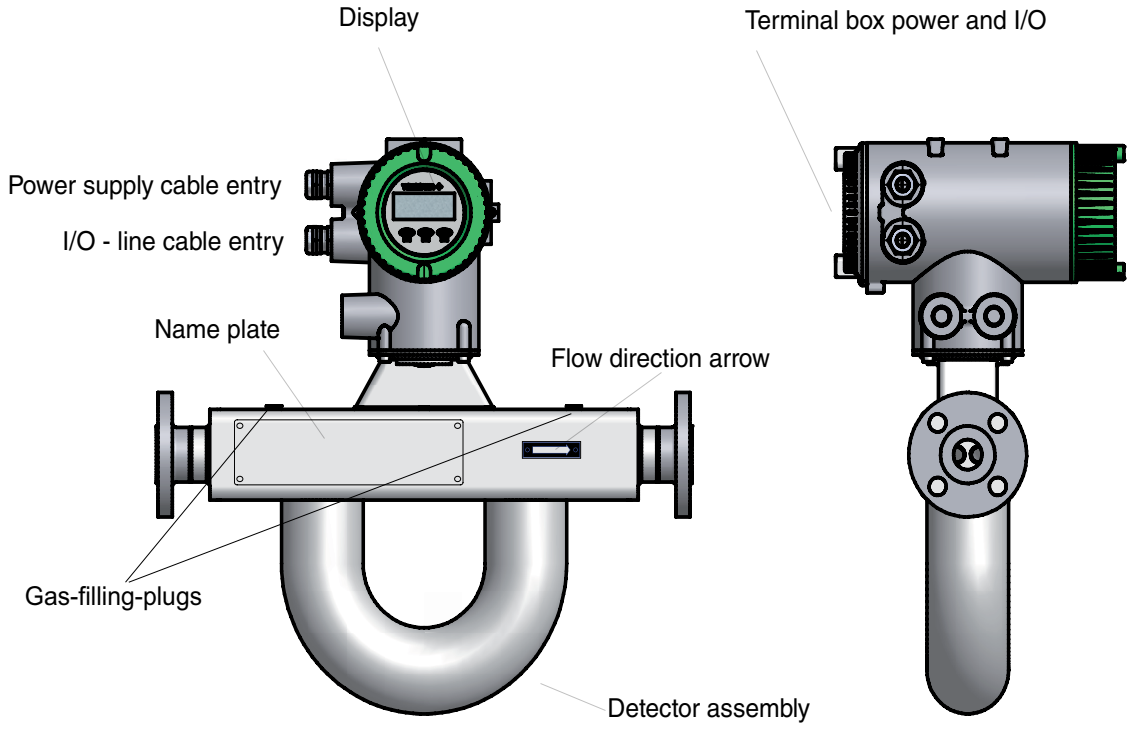
For practical exploitation of this physical principle, it is sufficient for the tube to perform sympathetic oscillations on a small section of a circular path. This is achieved by exciting the measurement tube at point **E** by means of an electromagnetic exciter.

The general construction of a Coriolis mass flowmeter looks as followed:



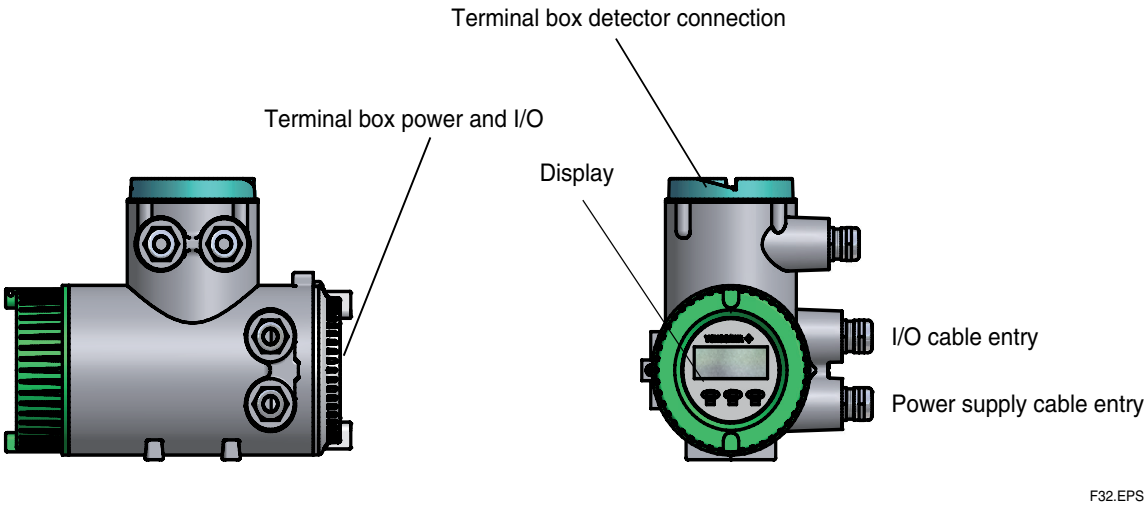
3.2 The Integral Type RCCT34 to 39/IR

The following drawing shows the general construction of the integral type ROTAMASS



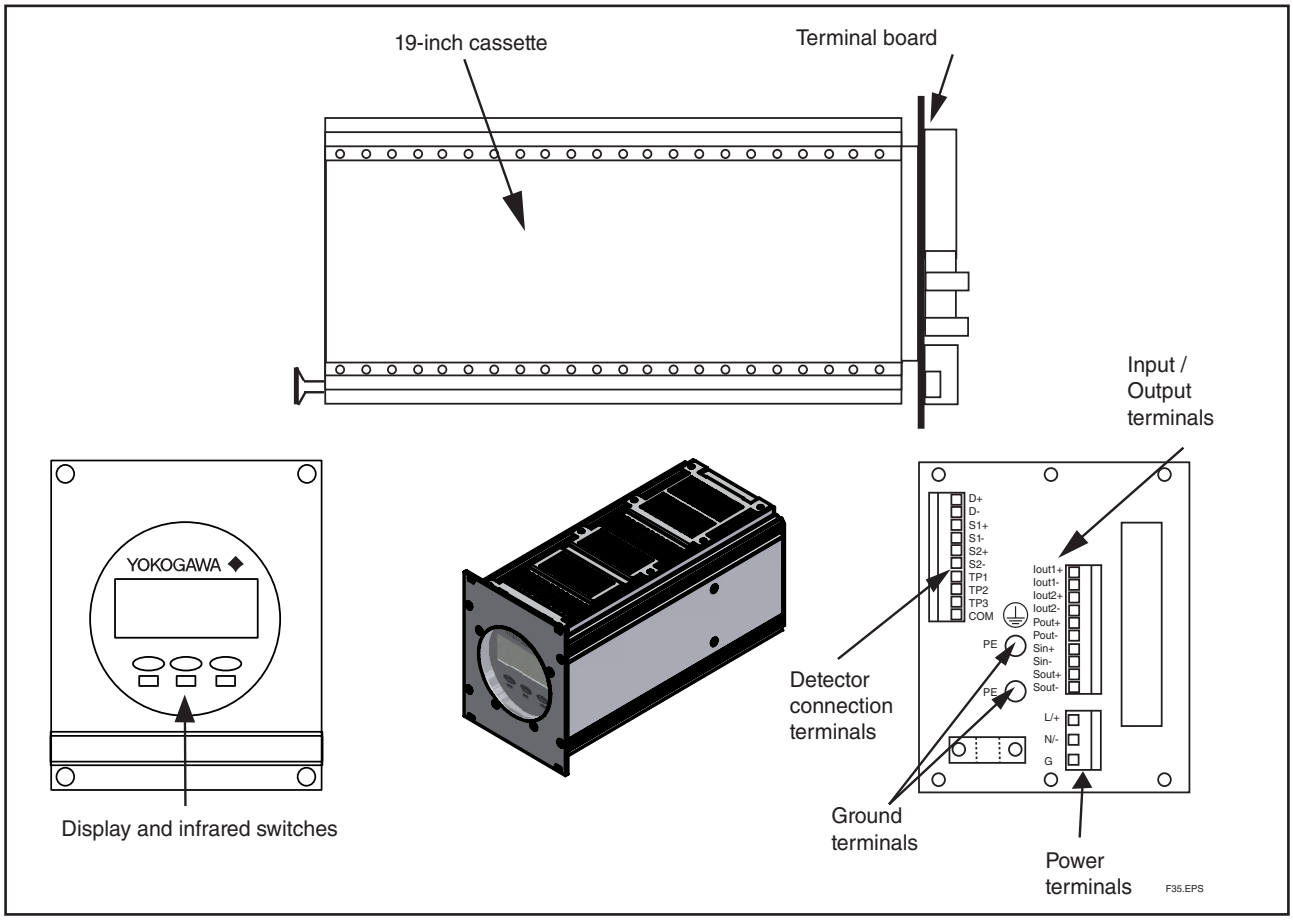
3.3 The Remote Field-Mount Converter RCCF31

The following drawing shows the general construction of the remote field-mount converter.



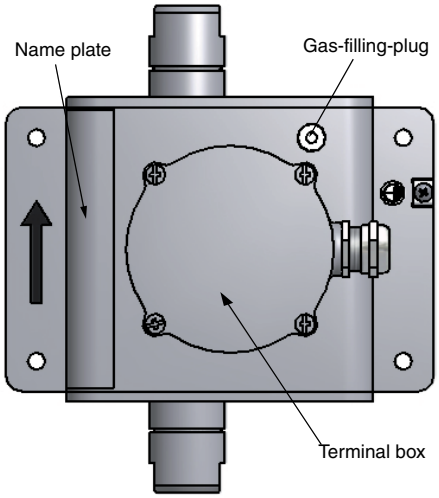
3.4 The Remote Rack-Mount Converter RCCR31

The following drawing shows the general construction of the remote rack-mount converter.



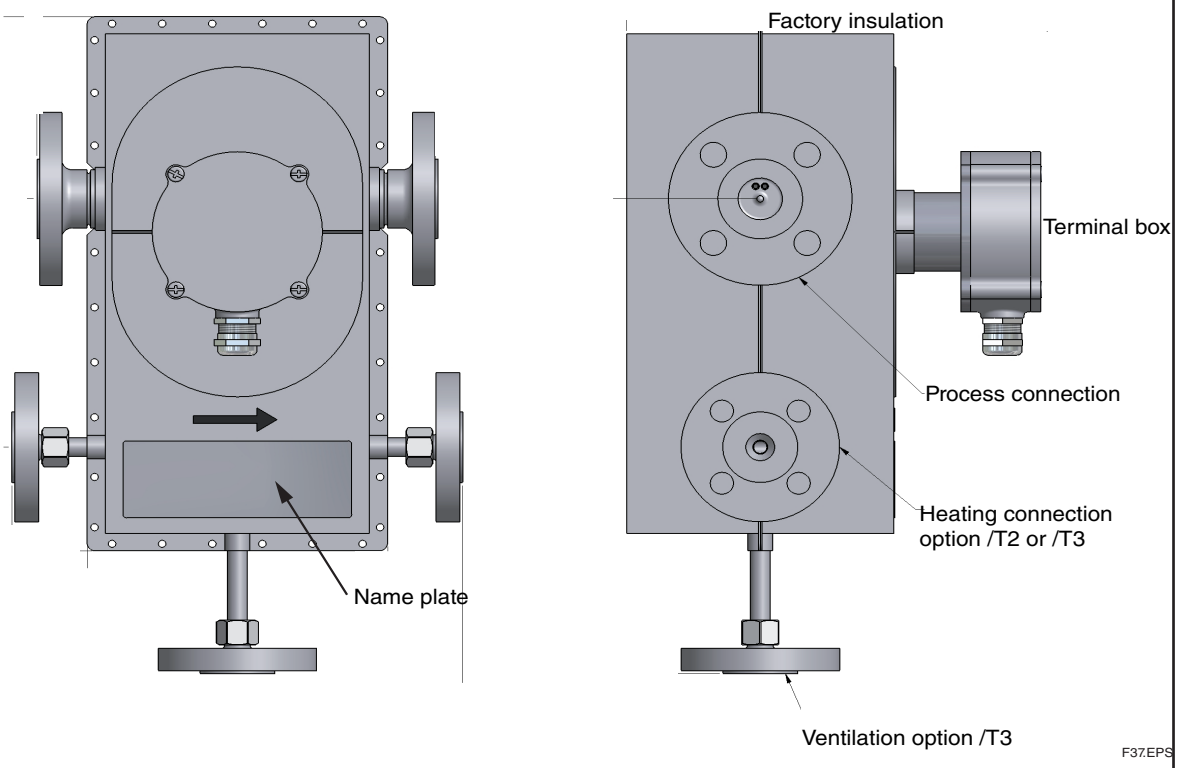
3.5 The Remote Detector RCCS30LR to 33

The following drawing shows the general construction of the remote detector RCCS30LR to 33.



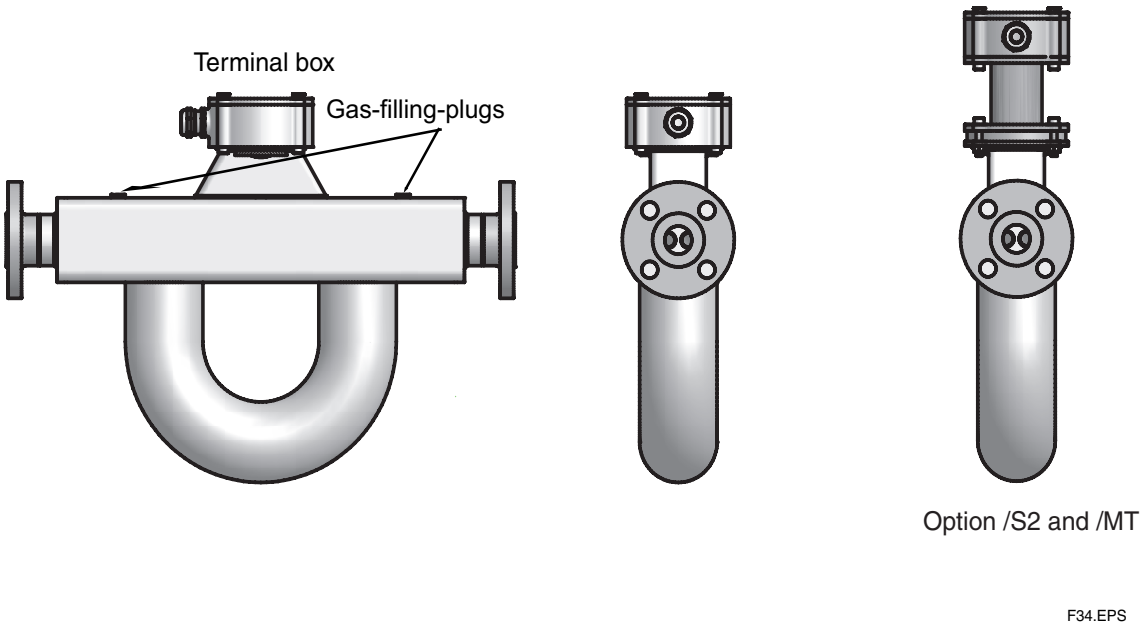
3.6 The Remote Detector RCCS30LR to 33 /T□

The following drawing shows the general construction of the remote detector RCCS30LR to 33 /Tx□



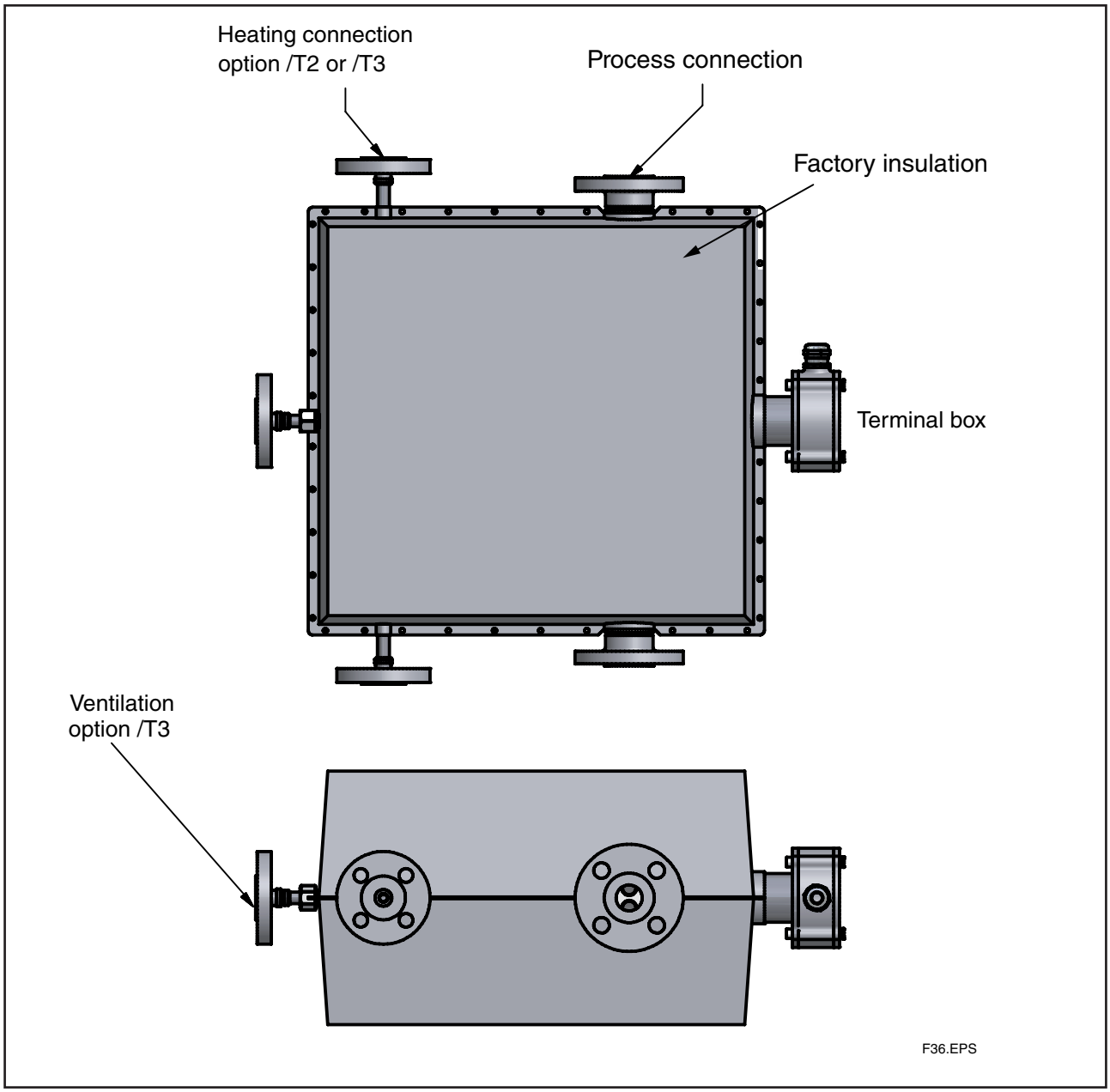
3.7 The Remote Detector RCCS34 to 39/IR

The following drawing shows the general construction of the remote detector RCCS34 to 39/IR.



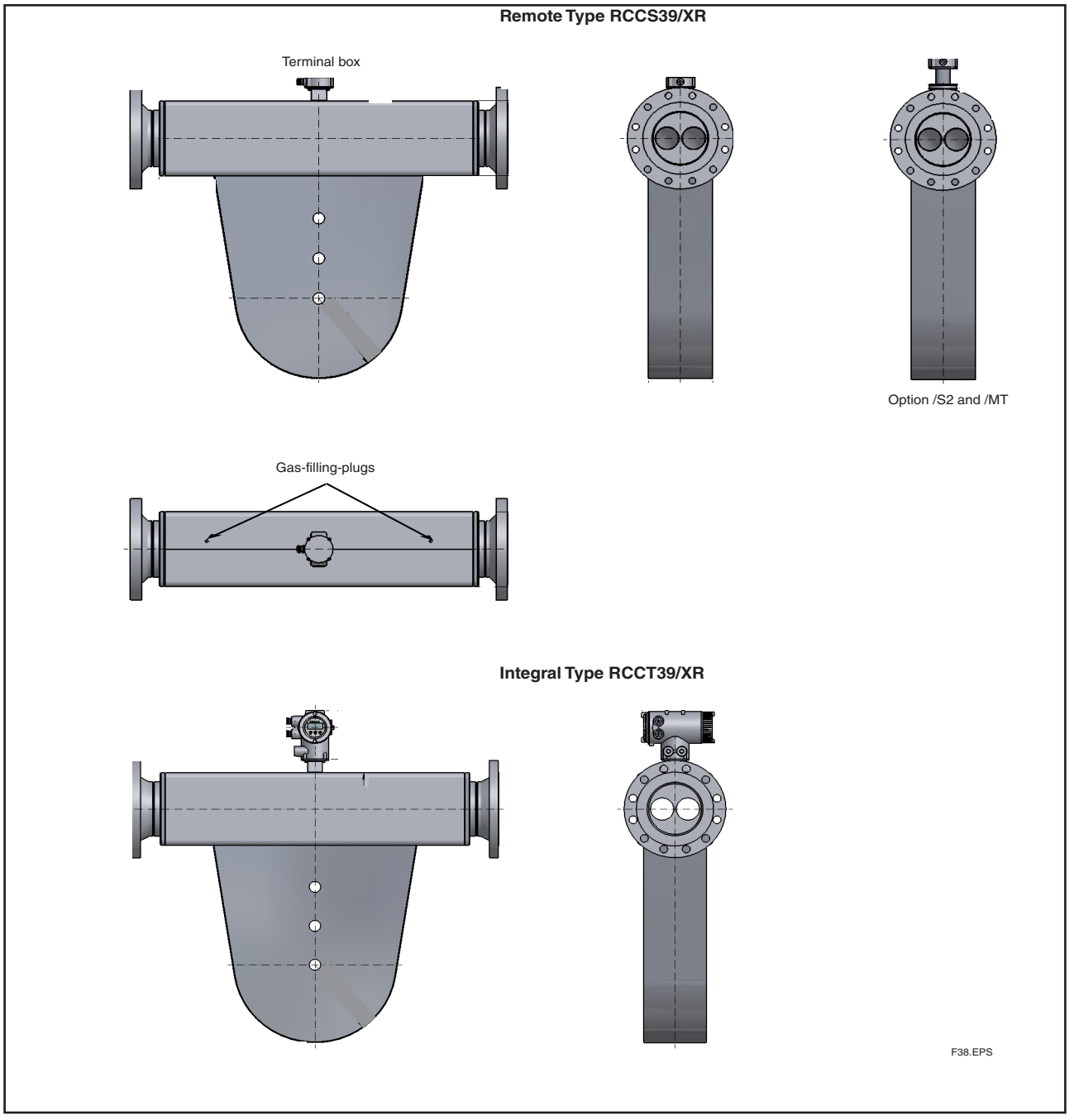
3.8 The Remote Detector RCCS34 to 39/IR /T□

The following drawing shows the general construction of the remote detector RCCS34 to 39/IR /T□.



3.9 The Remote and Integral Type RCC□39/XR

The following drawing shows the general construction of the RCC□39/XR.



3.10 Measurement system and applications

ROTAMASS measures the mass flow of fluids directly.
The measurement system uses the Coriolis principle and is suitable for a wide range of continuous flow measurement applications in all branches of process technology.
ROTAMASS has two components: the detector and the converter.
The detector measures the mass flow directly and converts it into electrical signals.
The converter evaluates the electrical signals and outputs the following values:

- mass flow, independent from media properties, such as density, temperature, viscosity
- fluid density
- fluid temperature

The values are displayed and output as electrical values for use by other systems.
The converter is operated by three infra-red keys and a 4- line display and is standard equipped with HART-communication protocol.
ROTAMASS is suitable for

- measuring liquids, liquids with solid content, multi-phase mixtures
- measuring gases (restricted by density and pressure loss)
- simultaneous measurement of mass flow, density, temperature, volume flow and cumulated mass and volume
- measuring of concentrations of liquid mixtures, solutions and suspensions
- connection to controllers and process control systems

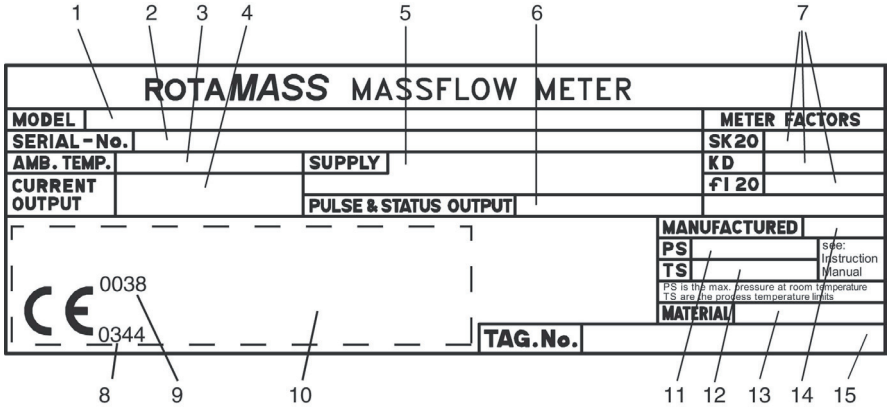
ROTAMASS provides the following I/O-connections and can be configured for a wide variety of different measurement applications (controlling, checking, monitoring, metering, mixing, filling).

- 2 active analog outputs
- 2 passive pulse outputs / status outputs
- 1 status input
- optional /AP:
  - 1 active pulse output / status output
- optional /NM:
  - 1 pulse output / status output according EN 60947-5-6 (NAMUR)
- optional /□F2 :
  - 1 passive analog output Ex ia
  - 1 passive pulse output / status output Ex ia
- optional /□F5 :
  - 2 passive analog outputs Ex ia
  - 1 passive pulse output / status output Ex ia
- optional /FB see IM 01R04B05-00E-E :
  - 1 Foundation Fieldbus communication line
- optional /FB and /□F4 see IM 01R04B05-00E-E :
  - 1 intrinsic safe Ex ia Foundation Fieldbus communication line
- optional /MB2 see IM 01R04B08-00E-E :
  - 1 MODBUS communication line
- optional /MB3 see IM 01R04B08-00E-E :
  - 1 MODBUS communication line
  - 1 current output
  - 1 pulse / status output
  - 1 status input

These capabilities make ROTAMASS ideal for the increasing demand of requirements for automation and the growing trend towards batch processes.

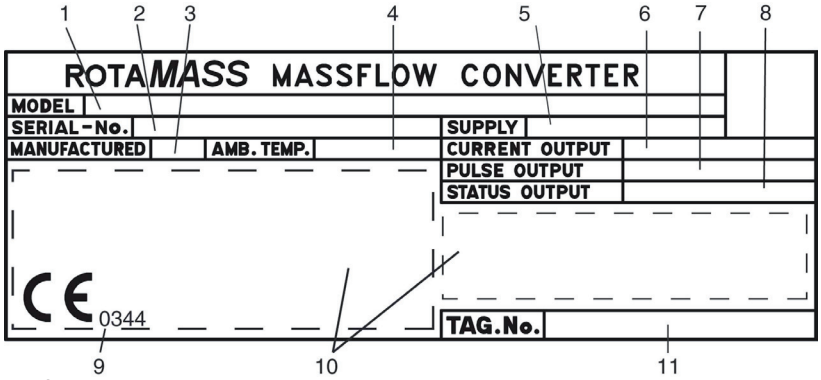
3.11 Name Plates

Name plate of Integral type RCCT3:



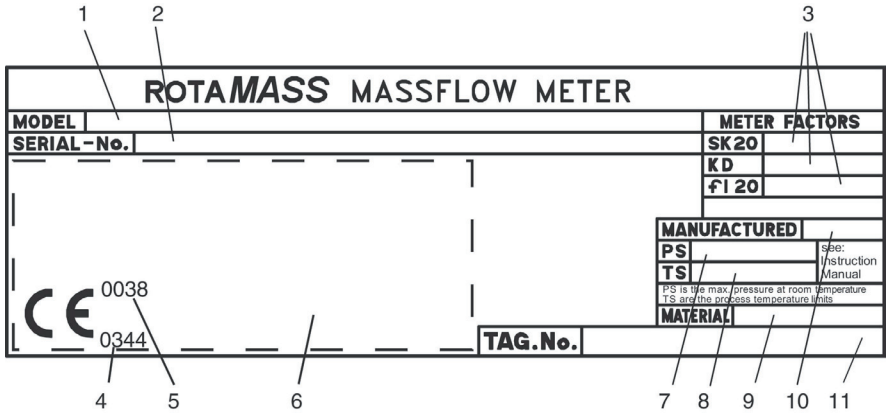
1 Model code
2 Serial number
3 Ambient temperature range
4 Current output range and load resistance range
5 Power supply range
6 Maximum supply voltage and maximum current for passive pulse- and status- output
7 Calibration constants of detector (see also on calibration certificate)
8 Number of notified body according ATEX (only for ATEX certified flowmeters)
9 Number of notified body according PED (only for units with process connections more than DN25)
10 Area for Ex- relevant marking (see chapter 9). The CE-mark is not present for FM-approved units.
11 PS = maximum permissible pressure
12 TS = maximum permissible process temperature
13 Material of metering tubes
14 Year of manufacturing
15 Customer specified tag number if option /BG was ordered

Name plate of Remote Converter RCCF31 / RCCR31:



1 Model code
2 Serial number
3 Year of manufacturing
4 Ambient temperature range
5 Power supply range
6 Current output range and load resistance range
7 Maximum supply voltage and maximum current for passive pulse output
8 Maximum supply voltage and maximum current for passive status output
9 Number of notified body according ATEX (only for ATEX certified flowmeters)
10 Area for Ex- relevant marking (see chapter 9). The CE-mark is not present for FM-approved units.
11 Customer specified tag number if option /BG was ordered

Name plate of Remote Detector RCCS3:



1 Model code
2 Serial number
3 Calibration constants of detector (see also on calibration certificate)
4 Number of notified body according ATEX (only for ATEX certified flowmeters)
5 Number of notified body according PED (only for units with process connections greater than DN25)
6 Area for Ex- relevant marking (see chapter 9). The CE-mark is not present for FM-approved units.
7 PS = maximum permissible pressure
8 TS = maximum permissible process temperature
9 Material of metering tubes
10 Year of manufacturing
11 Customer specified tag number if option /BG was ordered

Name plate of RCCT3 and RCCS3 with option /DS (Dual Seal approval):

In general the name plates of these units are the same as shown above.
The difference is as followed:

PS is named as "Working pressure range"
TS is named as "Process temperature range"
"Dual Seal" is additionally stated on the name plate

4. INSTALLATION

4.1 General

WARNING

This instrument must be installed by an expert engineer or skilled personal. The procedures described in this chapter are not permitted for operators.
For the installation of explosion protected instruments see chapter 9 „Explosion protected type instruments".
If the detector is not insulated, the surface of detector may be very hot according to the process temperature.

WARNING

IMPORTANT

An exclusive external circuit breaker must be placed near each flowmeter. It must be marked as the disconnecting device of this meter and must be easily accessible. Check the external circuit breaker's rate conforms to the requirements specified in the specification of this instrument.

IMPORTANT

- Keep protection sheet on the flanges attached until the flowmeter is installed to piping.
- Don't open the terminal box until the wiring procedure. Leaving the box opened can result in insulation deterioration.
- A newly installed piping-line often contains foreign matters (such as welding scrap and wood chips). Remove them by flushing the piping before installing the flowmeter. This will help to prevent not only damaging the flowmeter, but making erroneous signal generated by foreign matters.
- For RCCT3 or RCCF31 at ambient temperature above 50°C a sunshade is recommended. This is particularly important in countries with high ambient temperatures.

About the site

To stabilize the instrument, please consider the following items where to place the instrument for your long-term use.

- **Ambient Temperature**
  Please avoid installing in a place which has a large temperature gradient and variation as possible. And if the meter is subjected to radiant heat from plant, please use heat insulation measure or please set up so that is well ventilated.
- **Atmospheric conditions**
  Please avoid to place in a corrosive atmosphere as possible. When used in corrosive atmosphere, allow better ventilation.
- **Shock and vibration**
  Please install in a place without shock and vibration as possible.
- **Explosion-proof equipment installations**
  If the product is installed in hazardous areas please notice the installation hints in chapter 9.
- **Space**
  Select locations where there is adequate space to service installing, wiring, overhauling, etc.

Sequence of installation:

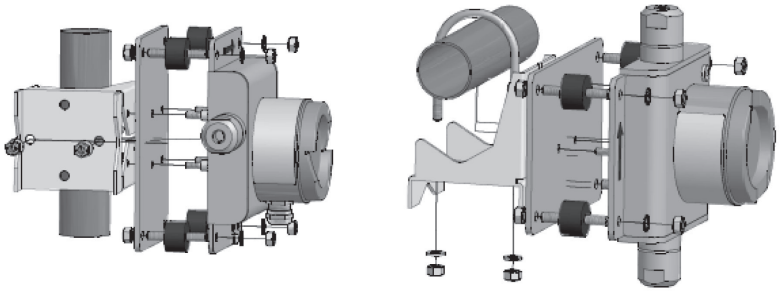
- Mounting of detector RCCS30 to 33 on a 2-inch pipe if option /PD was ordered (see chapter 4.2)
- Piping of the detector or integral flowmeter in the line (see chapter 4.3)
- Customer insulation of detector if necessary (see chapter 4.4)
- Mounting of converter RCCF31 on a 2-inch pipe (see chapter 4.5)
- Mounting of converter RCCR31 in a subrack (see chapter 4.6)
- Alteration of converter display of converter RCCF31 if necessary (see chapter 4.7)
- Wiring of converter (see chapter 4.8)
- After installation an autozero according chapter 5.6 must be executed. When carrying out the zero-adjustment, the measuring tube should be filled with the liquid at "no flow". It is therefore recommended to have shut-off valves at appropriate points of the upstream (vertical installation) and downstream (horizontal installation) of the flowmeter.

4.2 Mounting of detector RCCS30LR to 33 option /PD

The detector RCCS30LR to 33 can be mounted on a 2-inch pipe (option /PD) with a bracket and U-bolt assy.

NOTE

Improper fixing is subject to cause injury and to damage instrument.



4.3 Piping

IMPORTANT

When the following notes are not observed, flow measurements may not be correct and can damage the instrument. Please make correct piping design in accordance with the present guidelines.

IMPORTANT

Please be careful to install the flowmeter not too close to motors, transformers, inverters and other power source, induction failure may occur.

IMPORTANT

Use bolts and nuts in compliance with the flange ratings. Be sure to choose a gasket with an inner diameter that does not protrude inside the piping. If the inner diameter of the gasket is too large, however, fluid leakage may result.

1. The upstream and downstream piping length has no influence on the functioning of the instrument.
2. Piping requirements for proper operation :

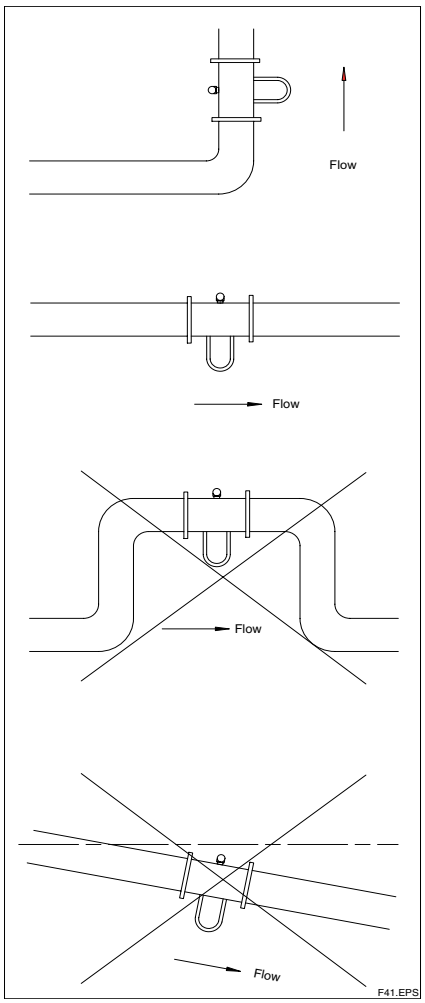
- A Coriolis mass flowmeter can be installed vertically, horizontally or at any angle from the horizontal position.
- However, the piping must be installed to ensure that the measuring tube is always filled with liquid.
- The position of installation of the detector is arbitrary. A vertical mounting is recommended however.

Vertical installation (recommended):
Makes pipe easier to empty (in case of maintenance, start-up, product change). Helps gas bubbles to escape.
Only one shut-off valve is required to ensure “no flow” for setting Autozero.

Horizontal installation :
For liquids: Measuring tube downwards so that no gas can collect if “no flow”. For process temperatures above 100°C measuring tubes upwards are recommended.
For gases: Measuring tube upwards so that no liquid can collect if “no flow”.

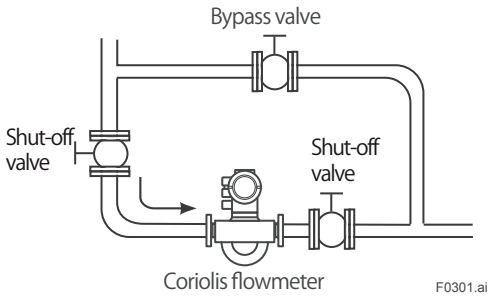
Installation at highest point of a piping system:
Avoid it, as this can lead to collection of gas bubbles.

Installation with pressure below 1 bar abs:
Avoid it, as suction can draw air into the measuring tube, leading to incorrect measurements. Free outlets to containers or vessels can generate low pressure by earth gravity acceleration.



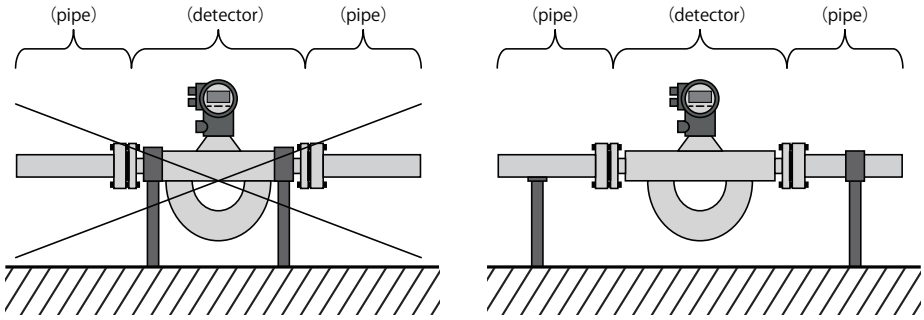
- Do not stress the detector mechanically. Fix the pipe not on both ends of the detector but only at one side. Let the other side run free for minimum mechanical stress on the detector.
- Please use the standard reducers if the piping’s cross- section differs at the inlet or outlet point of the flowmeter.

Use shut-off valve and bypass line
To facilitate zero adjustment and maintenance, providing a bypass line is recommended.



Supporting the Coriolis flowmeter

WARNING
- Please prevent the detector from pipeline stretching, vibration or shock.
- Please prevent the detector from direct fixing. (See figure below.)
- Please fix the pipe at first and support the detector with piping. (See figure below.)
- Please fix only one side of the detector instead of both sides so as to minimize mechanical stress to the detector.



Please avoid direct fixing at detector.
This causes measurement errors.

Please use the piping to support the detector.
In addition, to secure the support of only one side of the pipe detector.

F0302.ai

IMPORTANT

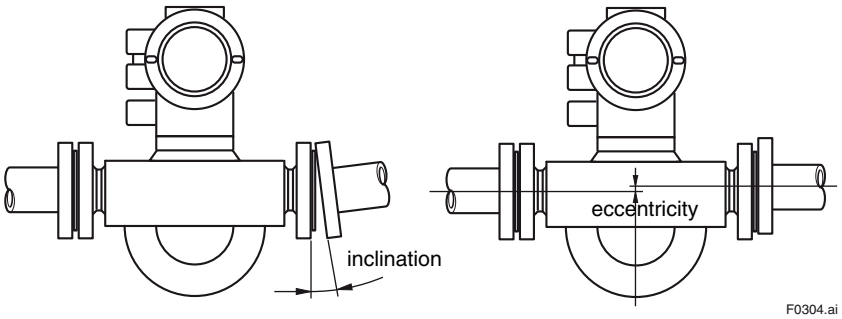
When density measurement is used and the instrument is set up horizontally, you will need to set a predetermined correction factor into the converter. Please see chapter 7.7.

Check the adjacent pipe

WARNING

Eccentricity and inclination are dangerous and may cause leakage in the piping. This may cause damage to the pipe flanges.

If the dimensions are not in tolerance or you have incline or eccentric pipes, please correct before installing detectors.



F0304.ai

If a new pipeline is provided, it may have other foreign materials such as wood chips and welding trash. Before installing, please remove them by flushing.

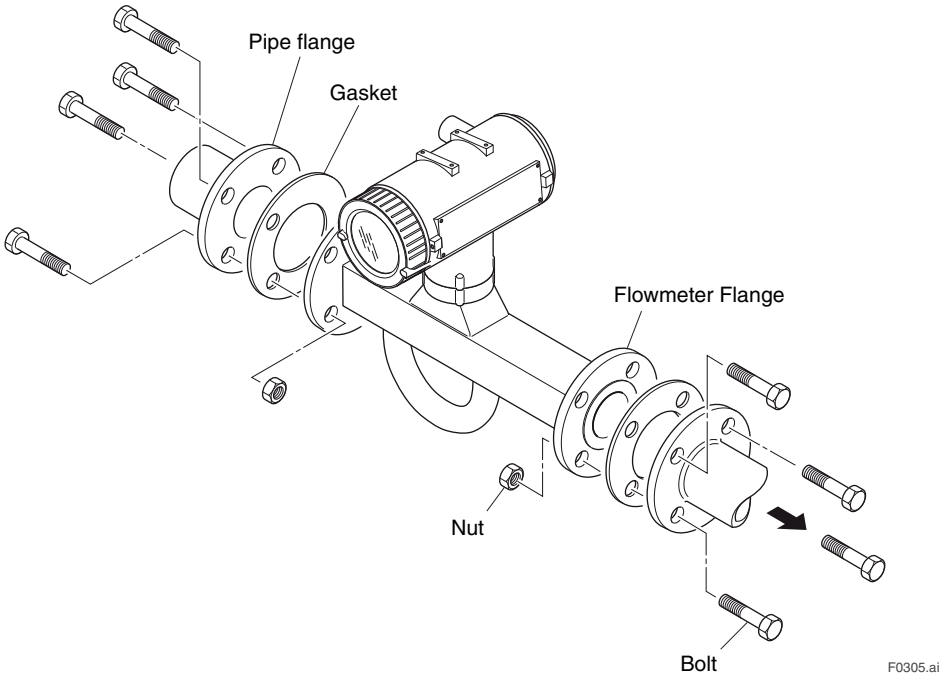
Mounting of integral and remote type detector

IMPORTANT

Please prepare your flange bolts and nuts. Please provide a gasket in the piping. However, if the gasket diameter is too large or too small.

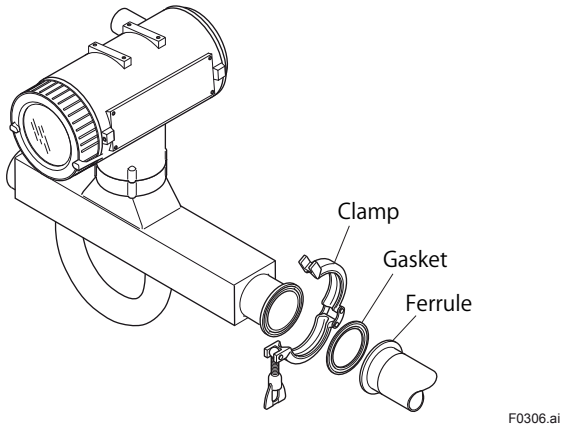
(1) Mounting direction
Please note the flow direction according the arrow on the instrument. If flow is opposite to the direction of the arrow change parameter "Flow Direction" (see chapter 7.17).

(2) Mounting Flange
Install piping by using bolts, nuts and gaskets.
Bolts, nuts and gaskets are not included. Please prepare those according the flanges.



(3) Mounting Clamp

Clamp and gasket must be mounted to fit into the groove of the ferrules of the pipe, fitted to cover the taper portion of the ferrule to the Coriolis flowmeter.
The ferrules, clamps, gaskets are not included and must be provided on site.



Gas flow measurement

CAUTION

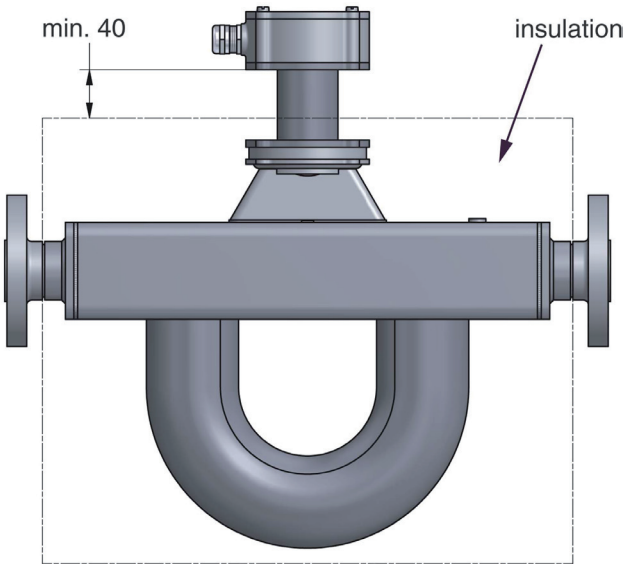
A stable zero is mandatory for a good mass flow measurement. Mechanical installation stress and flow noise influence zero stability. Action has to be taken to avoid any generation of sound.

Recommendations:

- Support the weight of the detector by soft coupling (silicon or other kind of rubber support.
- Do not bend or stress the detector via the adjacent pipe. This is achieved by supporting the pipe 10D or more away from the detector.
- Pipe reduction or extension should be avoided directly before or after the meter.
- Avoid any control valves or orifices or any other sound generator near the detector.

4.4 Customer insulation

Customer insulation is only possible for remote detector RCCS3□ with option /S2 (terminal box on distance). The upper line of the insulation must be minimum 40 mm below the terminal box.

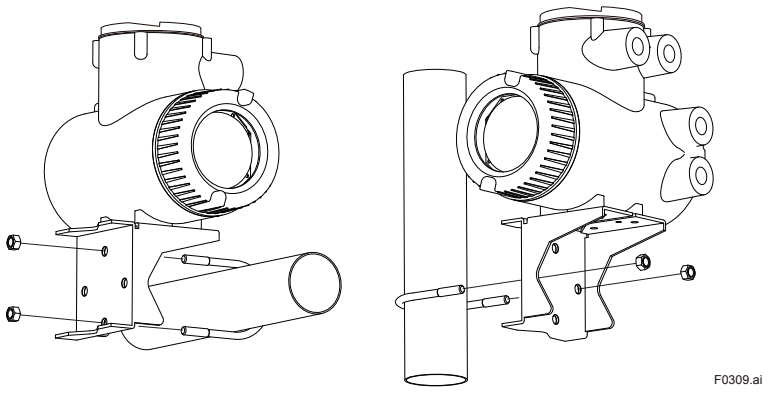


IMPORTANT

For explosion proof types see tables "Temperature classification" in chapter 9.

4.5 Mounting of converter RCCF31 to 2-inch pipe

The field-mount converter RCCF31 can be mounted on a 2-inch pipe. Therefore use the delivered bracket and U-bolt assy.

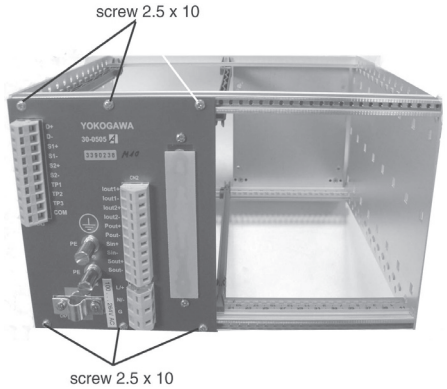


NOTE

Improper fixing is subject to cause injury and to damage instrument.

4.6 Mounting of converter RCCR31 in a subrack

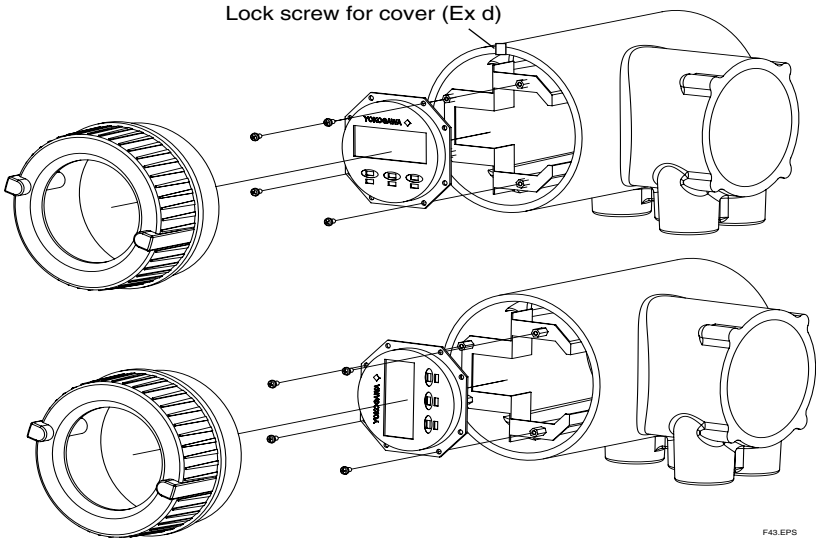
If the remote rack mount converter RCCR31 was not ordered with option /SR1 or /SR2, the customer has to mount it to an own 19´´ subrack. The terminal board must be fixed by 6 screws (M2.5x10) to the rear side of the subrack.



The RCCR31 rack cassette must be inserted into the subrack.

4.7 Alteration of display (RCCT3 / RCCF31)

LCD display can be turned its direction with respect to piping configurations.
Removing four screws, adjusting display's orientation and fixing the screws tightly again as shown in figure below.



IMPORTANT

Fix the lock screw for use in hazardous area. After modification the user must ensure that the cover is screwed down tightly to maintain the IP rating of the housing, failure to do so may allow moisture ingress and failure of electronic components.

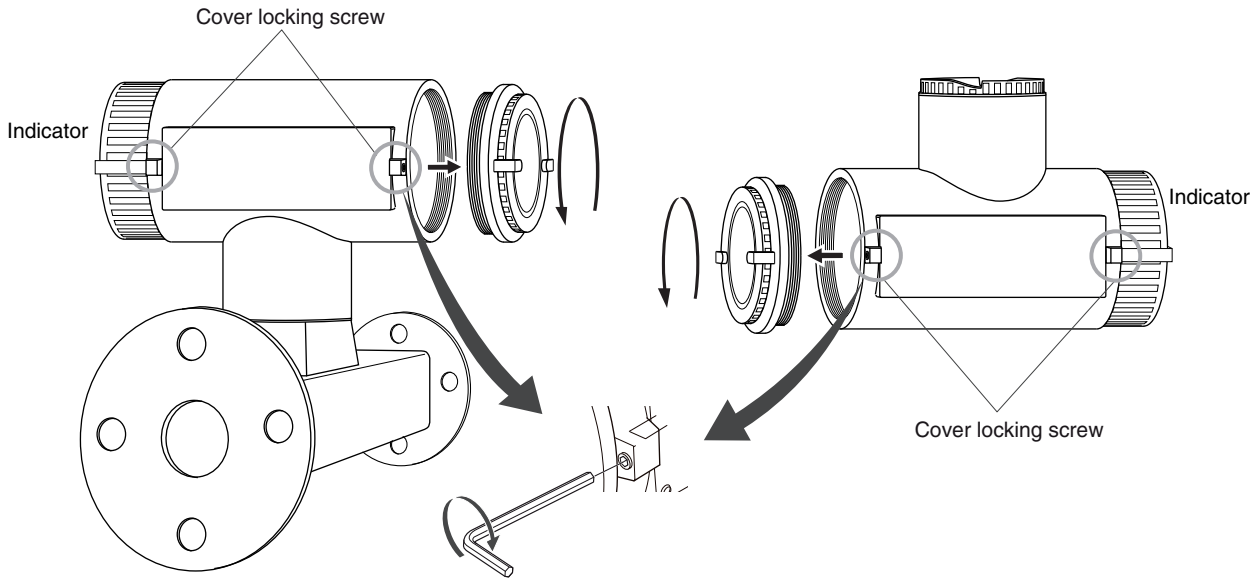
4.8 Wiring

4.8.1 General items

Notes concerning the wiring
When wiring, please observe the following precautions.

WARNING

- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation, e.g. inside the terminal box of the flowmeter.
- In case of conduit wiring, prevent rainwater from flowing or remain into the wiring pipe byusing a seal tape.
- Use the cables which fulfill specification and check before wiring.
- Before opening the terminal box, be sure to turn off the power.
- Please fully tighten the terminal box cover.
- When removing the cover, please unlock the locking screw clockwise. (See figure below).
- After mounting the cover, please lock the cover by turning the locking screw counterclockwise. (See figure below).
- For explosion proof wiring please see chapter 9.
- Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

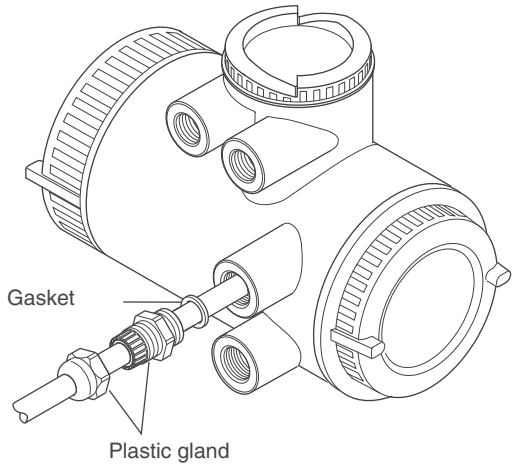


RCCT3 Integral type

RCCF31 Remote type converter F0400 .ai

Wiring port handling

(1) When waterproof property is unnecessary
For meters with NPT 1/2´´ threads the wiring port is sealed with a cap (not water-proof) that must be removed before wiring. For the unused wiring port, please prepare plug by the customer. For explosion proof, please refer to Chapter 9.



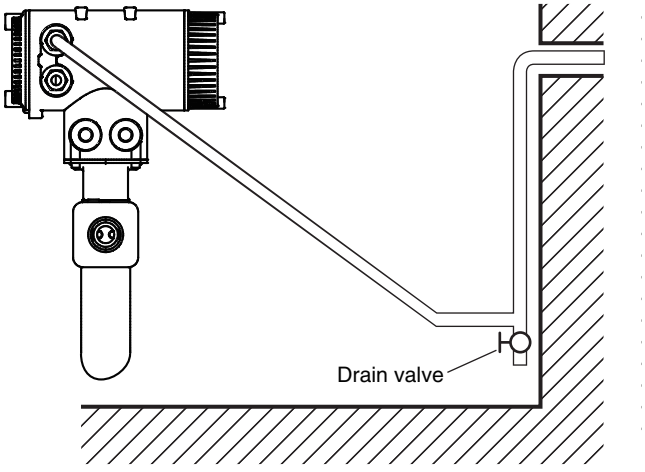
F0401 .ai

(2) When waterproof property is necessary (Wiring using waterproof glands)

IMPORTANT
To prevent water or condensation from entering the converter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

(3) Conduit Wiring

When wiring the conduits, utilize the waterproof gland to prevent water from flowing into wiring connection port. Place the conduit pipe on an angle as shown in Figure below. Install a drain valve at the low end of the vertical pipe, and open the valve regularly.



F0402.ai

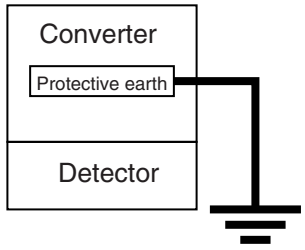
4.8.2 Ground (earth) connections

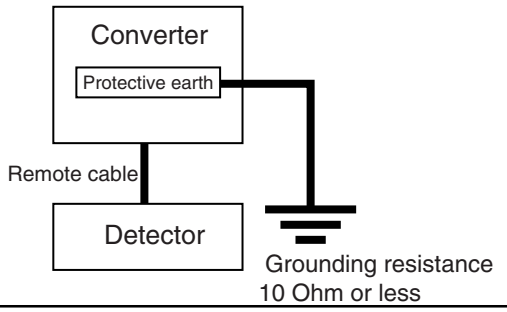
IMPORTANT

Grounding resistance of 10 Ω or less is necessary. For explosion proof type follow the domestic electrical requirements as regulated in each country.

The following table shows the grounding:

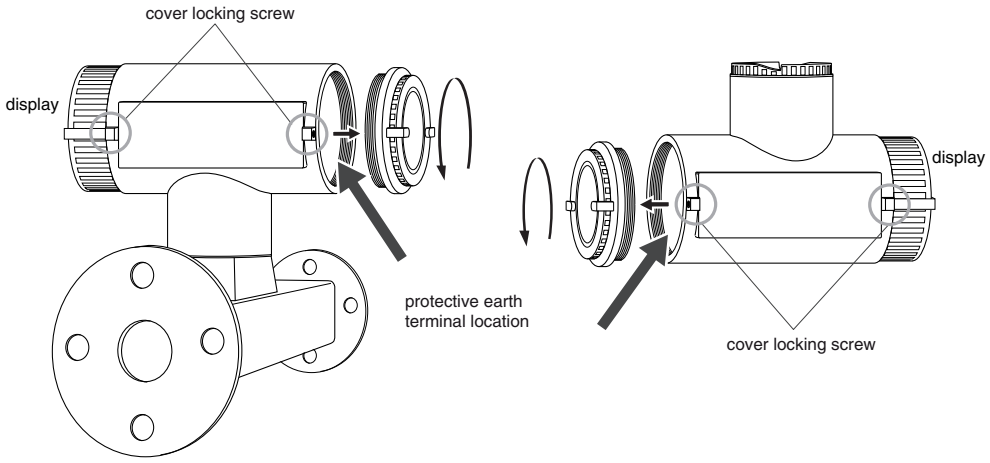
Integral type	Remote type
• Protective earth terminal connected as below	• Detector connected to converter via remote cable • Protective earth terminal connected as below





F0431.ai

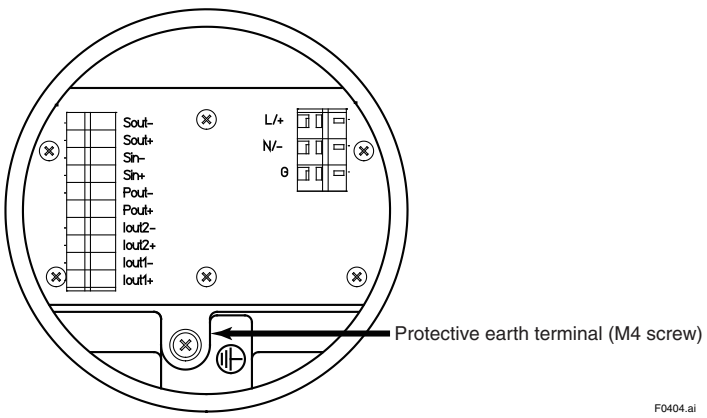
- The location of the protective earth terminal is at the terminal box of converter as shown in figure below.
- In case of remote type, the detector is grounded at the converter. (See figure above.)
- Use insulated PVC wire for 600 V for grounding wire.



RCCT3 integral type

RCCF31 remote converter

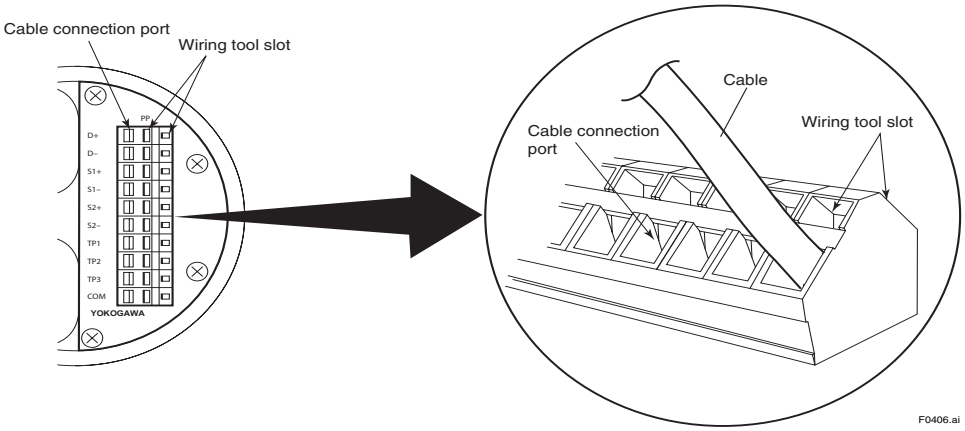
F0403 .ai



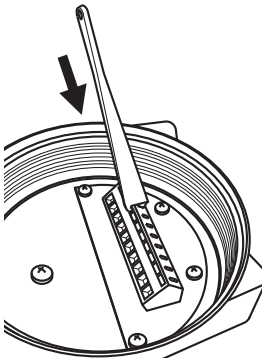
F0404.ai

4.8.3 Wiring technique

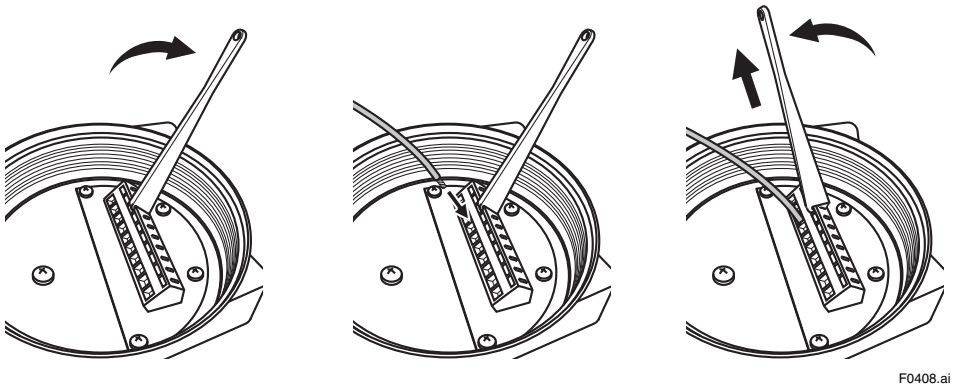
Cable connection on terminal block:
For connecting the cables to power-, I/O- and remote cable connection terminals a special tool is attached to the instrument. The terminal looks as follows:



Insert the auxiliary tool from the top into the terminal block.



Tilt the tool until it opens the cable port and insert the cable. Tilt the tool back and the opening is closed and the cable is fixed. Remove the tool. Fix the wires one at a time, please make sure that is secured to the wiring terminal block.



IMPORTANT

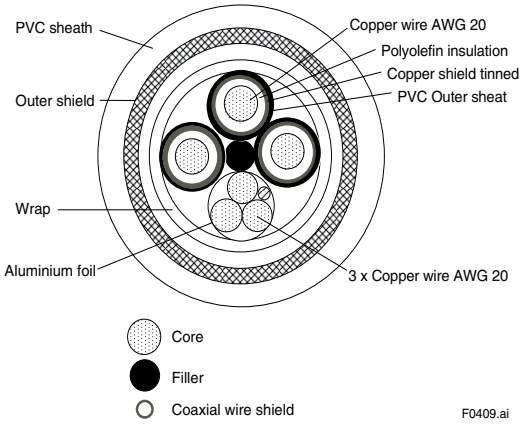
- Do external electrical connection in conformity with EN 61010-1 or equivalent national regulations. For hazardous area installation in Europe (ATEX) use standard EN 60079-14 as a guideline.
- Do not switch power supply on before all wiring is finished.

4.8.4 Assembling and connecting the Remote Cable RCCY03

IMPORTANT

Remote detector RCCS3 may only be connected to remote converter RCCF31/RCCR31 by remote cable RCCY03. By using other cables the specifications are not guaranteed by Yokogawa!

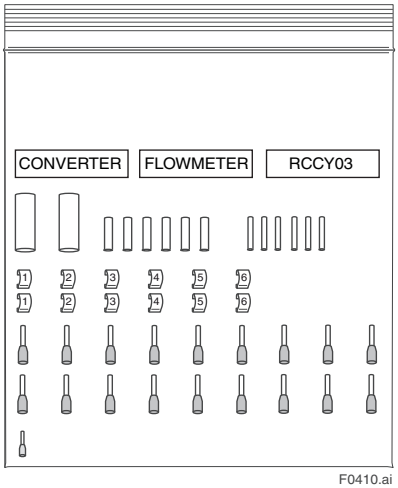
Remote type converter RCCF31 / RCCR31 are used with remote type detector RCCS3. To connect these instruments use shielded, twisted with overall shielding type 3 x Coax + 1x3 AWG20 exclusive cable RCCY03. The maximum length is 300 m / 984 ft; 50 m/164 ft for FM-applications:
For explosion proof application cable RCCY03-xL□□□ /KS1 or /NS1 (blue sheath color for intrinsic saftey marking) is recommended.
For cables Li2Y(St)/CY 3x2 AWG24 + 1x3 AWG20, which were delivered before, please see assembling instruction which is attached to the cable.
Cross-sectional view of remote cable RCCY03:



For RCCY03□-1-L the cable is completely terminated.
For RCCY03□-0-L the termination set is attached and the customer has to terminate the cable by his own.

The termination set contains:

- Instruction
- 2 x 20mm shrink down tube, Ø 4.8mm
- 6 x 10mm shrink down tube
- 6 x tube di = 1mm, length 10mm
- 6 markers (2 x 1–3)
- 6 markers (2 x 4–6)
- 18 sleeves 0.5mm² orange
- 1 sleeves 0.25mm² light blue
- 1 label “CONVERTER”
- 1 label “FLOWMETER”
- 1 label “RCCY03”



NOTE

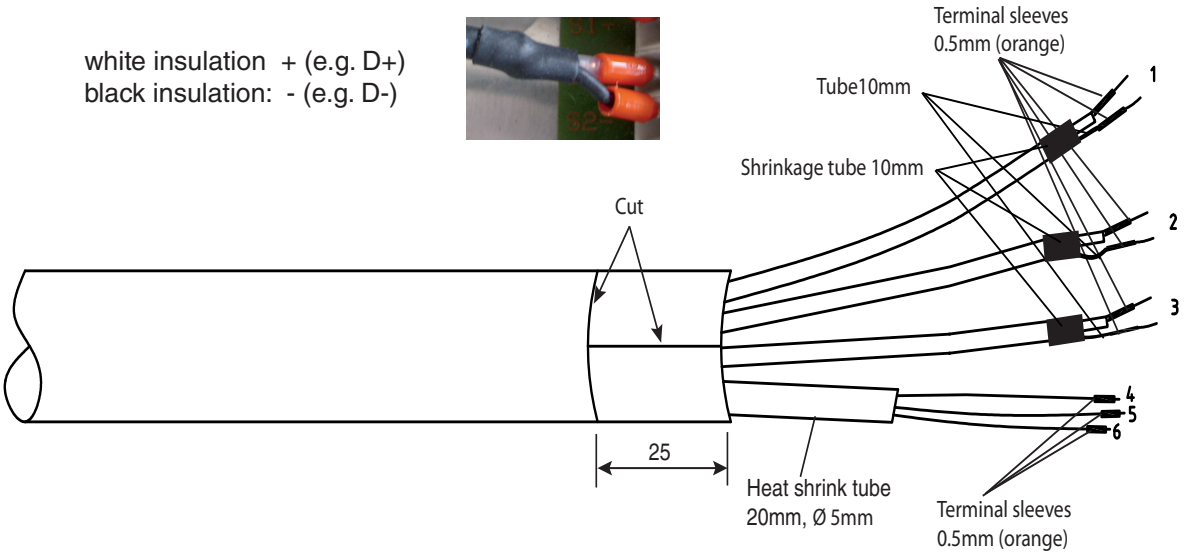
Careful assembly of the cable is indispensable for correct connection between the detector and the converter. This ensures good measuring results.

Termination procedure:

Termination of cable end detector

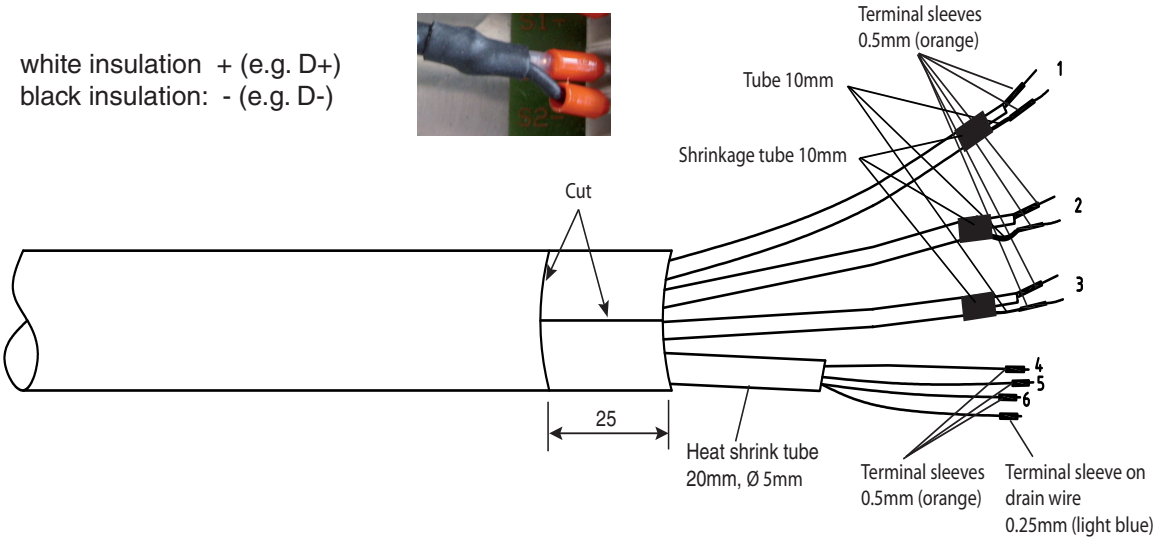
- Remove PVC outer sheath and outer shielding 100mm from the end.
- Remove the clear wrap and the filler material, the foil that is around the isolated wires and drain wire close to the cable jacket.
- Termination of the 3 single wires:
- Slide a shrink down plastic tube (Ø 4.8mm, l=20mm) over the 3 wires, push it to the cable jacket and heat with hot air.
- Strip 8mm of the wire ends.
- Crimp the orange terminal sleeves (0.5mm²) to the ends of the 3 wires.
- Termination of the 3 Coax cables:
- Remove the PVC sheath 25mm from the end.
- Unbraid the copper wire mesh and twist it.
- Cut the wire 5mm and strip 8mm of the end.
- Cut the copper wire mesh to match the wire length and slip a tube (10mm) over it.
- Slip a 10mm shrink down tube over wire and shield to the transition to the cable and shrink it (s. photo).
- Crimp an orange terminal sleeve (0.5mm²) to the end of the wire and to the drilled wire mesh.
- Make a radial cut into the PVC outer sheeting 25mm from the end and cut lengthwise. [1)]

white insulation + (e.g. D+)
black insulation: - (e.g. D-)



Termination of cable end converter

- Remove PVC outer sheath and outer shielding 100mm from the end.
- Remove the clear wrap and the filler material.
- Remove the foil that is around the isolated wires.
- Do not clip off the drain wire!
- Termination of the 3 single wires:
- Slide a shrink down plastic tube (Ø 4.8mm, l=20mm) over the 3 wires, push it to the cable jacket and heat with hot air.
- Strip 8mm of the wire ends.
- Crimp the orange terminal sleeves (0.5mm²) to the ends of the 3 wires.
- Crimp the light blue terminal sleeves (0.25mm2) to the end of the drain wire.
- Termination of the 3 Coax cables:
- Remove the PVC sheath 25mm from the end.
- Unbraid the copper wire mesh and twist it.
- Cut the wire 5mm and strip 8mm of the end.
- Cut the copper wire mesh to match the wire length and slip a tube (10mm) over it.
- Slip a 10mm shrink down tube over wire and shield to the transition to the cable and shrink it (s. photo).
- Crimp an orange terminal sleeve (0.5mm²) to the end of the wire and to the drilled wire mesh.
- Make a radial cut into the PVC outer sheeting 25mm from the end and cut lengthwise. [1)]



Slide the conductor markers onto the wire ends on both sides, so that the Coax with printed “1” gets marker “1”, the Coax with printed “2” gets marker “2” and the Coax with printed “3” gets marker “3”. The 3 single wires get the markers “4” (white), “5” (brown) and “6” (yellow).
Each wire must have the same number on detector and on converter side.

1)

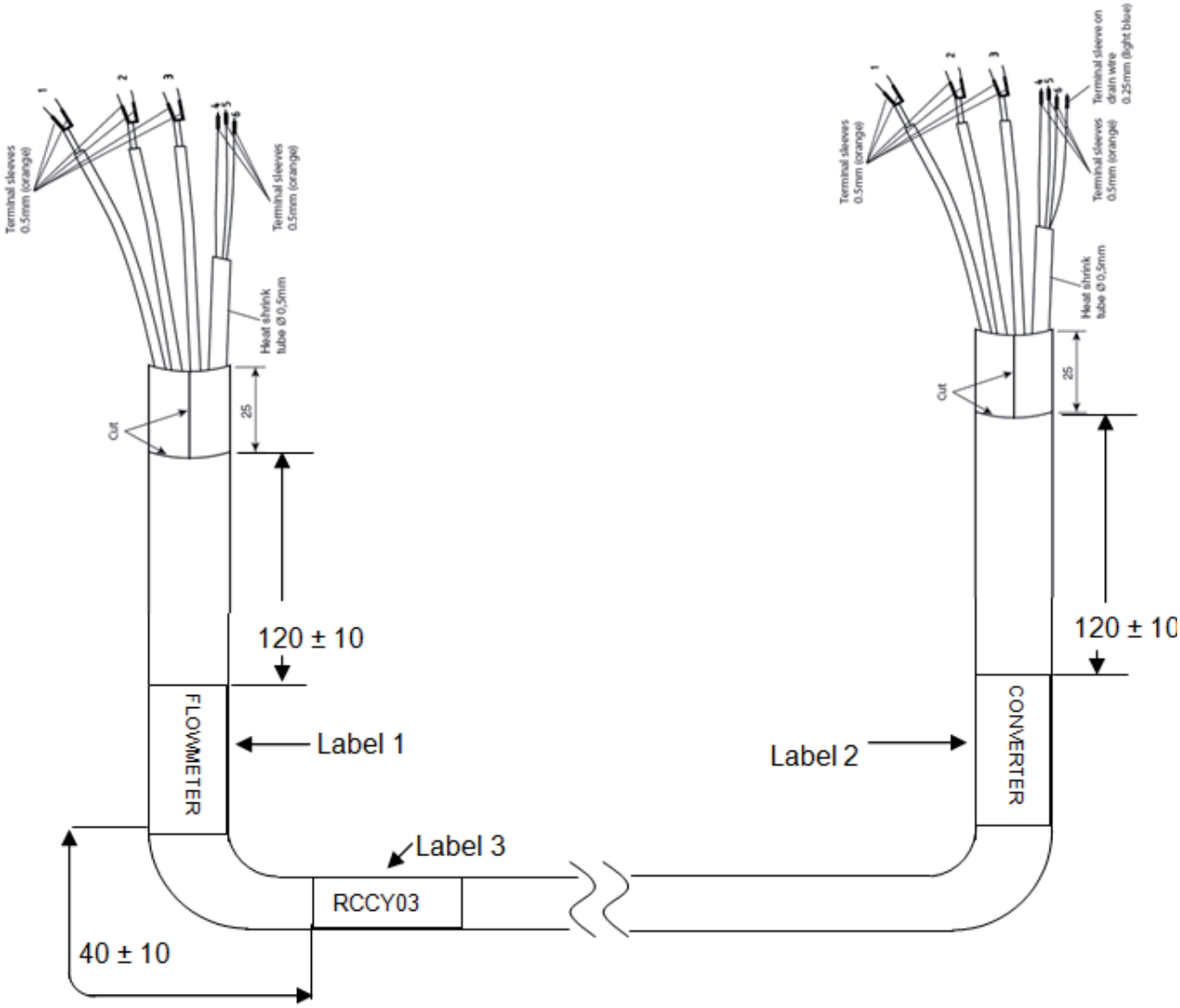
NOTE

These sections of the outer sheating are removed only when connecting the cable at both cable ends and the outer shielding harness is connected electrically to the detector and converter housings via the metal PU-cable glands.

Fix labels

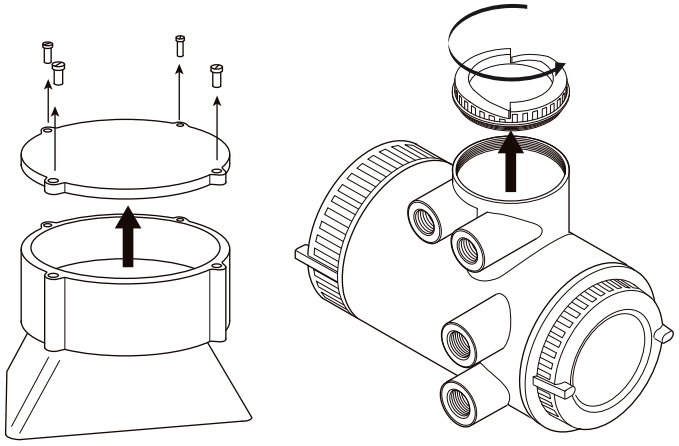
Cable end detector

Cable end converter



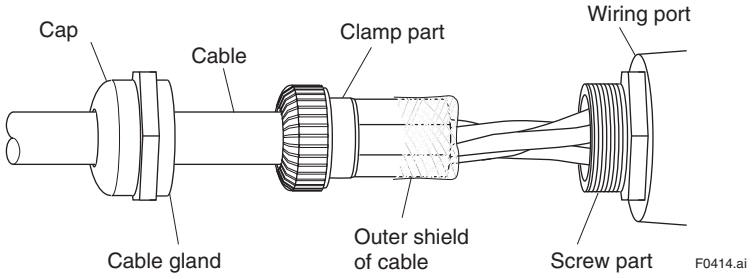
Cable connection to detector RCCS3 and field-mount converter RCCF31:

1. Remove connection box cover detector and converter (see figure below).

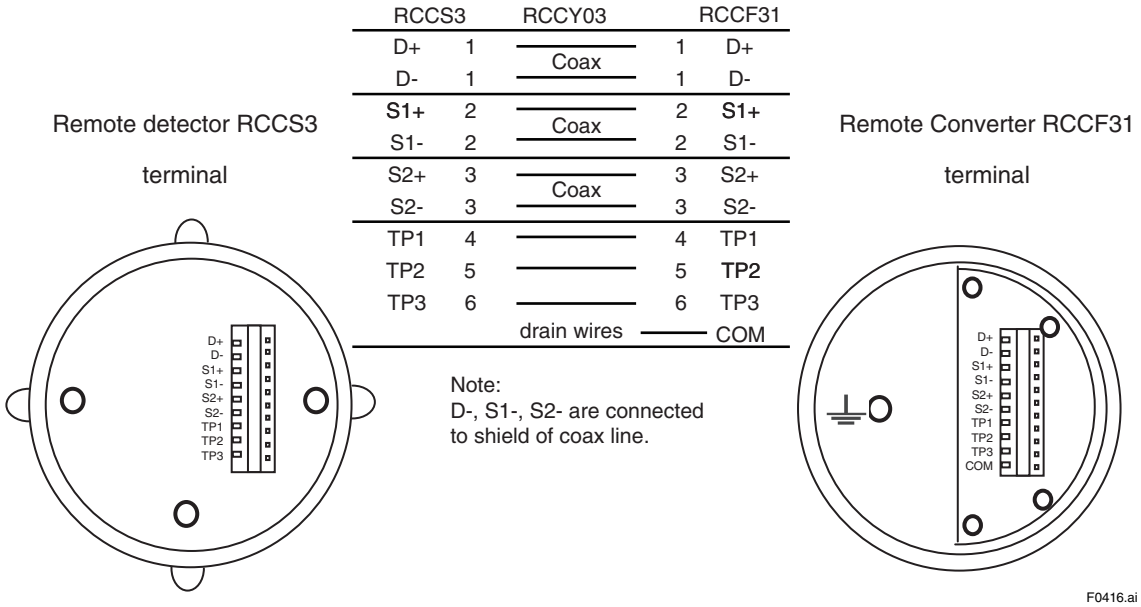


F0413.ai

2. Loosen the thread of cable gland and insert the cable into the cap and the clamp part. (See figure below.)
3. Remove the PVC outer sheathing 25 mm from the end and fold back outer shield over the clamp part. (See figure below.)



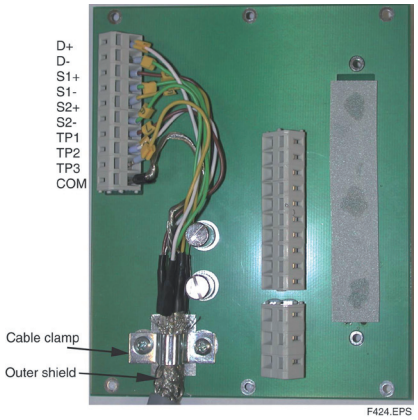
4. Tighten the cable gland.
5. Connect the numbered leads to the terminals as shown in the figure below.
6. Connect inner shields to terminal COM.



7. Close the connection box covers.

Cable connection to rack-mount converter RCCR31:

1. Loose the cable clamp on terminal board
2. Remove the 25 mm section of PVC outer sheathing from the cable and fix the outer ring of the cable with the cable clamp on terminal board. (see left figure below).
3. Connect the numbered leads to the terminals as shown in the right figure below.
4. Connect inner shields to terminal COM.

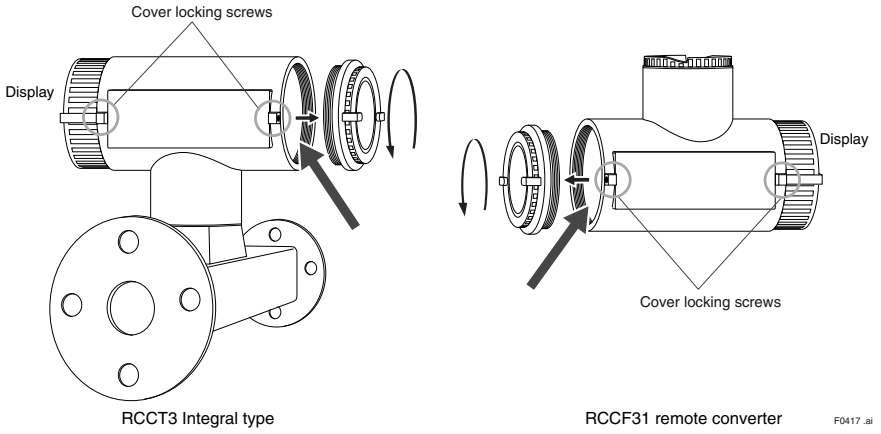


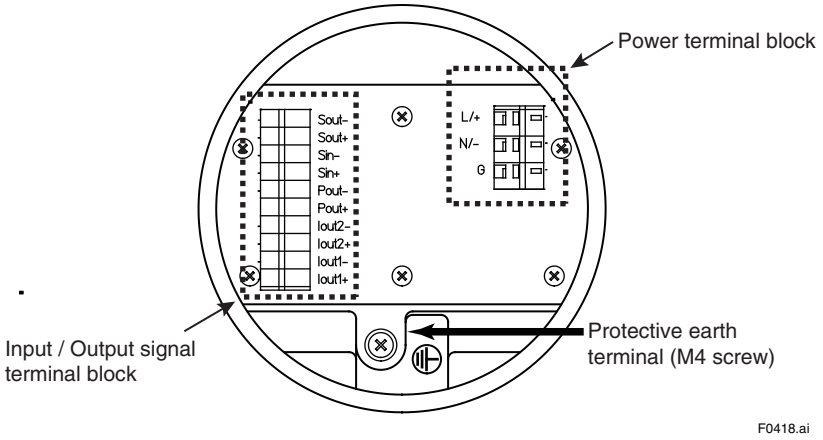
RCCS3		RCCY03		RCCR31
D+	1	Coax	1	D+
D-	2		1	D-
S1+	3	Coax	2	S1+
S1-	4		2	S1-
S2+	5	Coax	3	S2+
S2-	6		3	S2-
TP1	7		4	TP1
TP2	8		5	TP2
TP3	9		6	TP3
		drain wires		COM

Note:
D-, S1-, S2- are connected to shield of coax line.

4.8.5 Power supply wiring

The terminals for the power supply and for the I/O ports are in a separate terminal box as shown in the figures below.

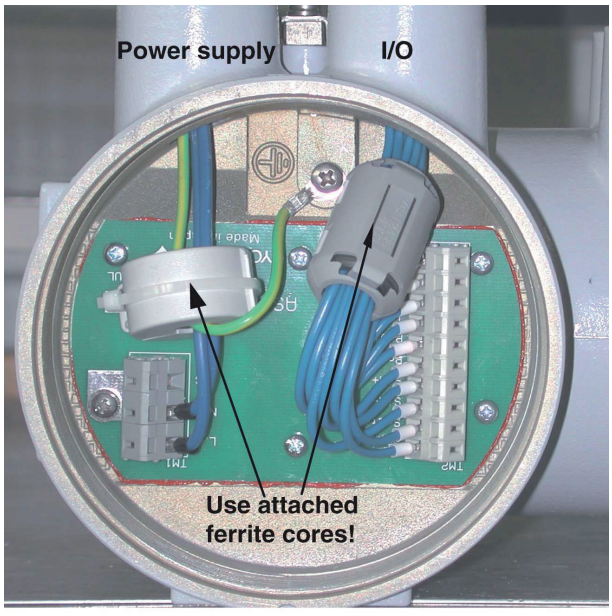




CAUTION

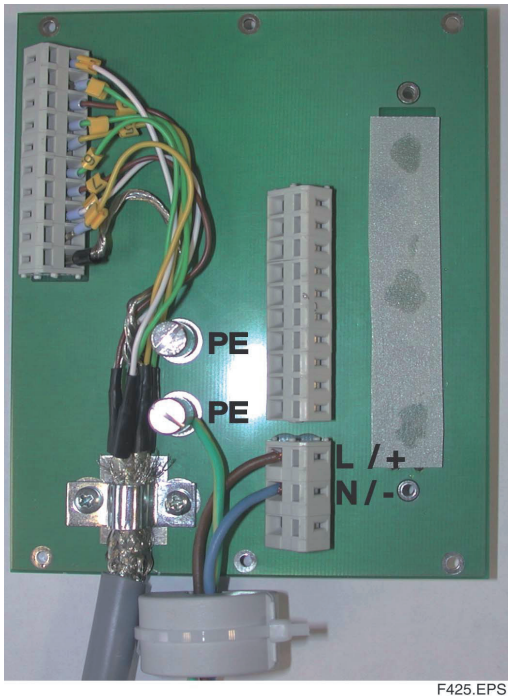
1. Before starting the wiring, turn off the source of the supply power and check with the tester that there is no voltage at the cable.
2. For RCCT3 / RCCF31 the protective ground conductor must be connected to the separate PE terminal in the terminal box with Crimp-on ring-type terminal in order to avoid personal shock hazard.
3. For RCCR31 the protective ground conductor must be connected to the separate PE terminal on the terminal board in order to avoid personal shock hazard.
4. An exclusive external circuit breaker must be placed near each flowmeter. It must be marked as the disconnecting device of this meter and must be easily accessible.
5. Check the external circuit breaker's rating conforms to the requirements specified in the specification of this instrument.
6. Wire the power supply cable keeping the distance of 1 cm or more from other signal wires.
7. Confirm the operating voltage of the converter before operation.
8. Please lock the cover of the converter with hexagon lock screw before operation (only RCCT3 /RCCF31)

- Cable terminals should not be naked. Proper terminals should be used for Power and I/O.
- Connect the power supply cable to the terminals inside of the converter terminal box (RCCT3 /RCCF31) or on terminal board (RCCR31).
- Confirm two ferrite core sets are attached to the flowmeter.
- Insert the cables into ferrite core before connecting to the terminals. Fix the ferrite core to the cable with a cable strap.
- Connect the power cables to the terminals according to the figure below.
- For the connection of protective ground conductor to PE terminal of RCCF31 / RCCT3 use a crimp-on ring type terminal. For RCCR31 connect the protective ground conductor to PE terminal of terminal board.



F48.EPS

RCCT3 / RCCF31



F425.EPS

RCCR31

CAUTION

Special connections for Ex version :

The converter case must be connected to the potential equalisation facility of the hazardous area , e.g. to the U-clamp PA terminal on the outside at the converter. Please refer to chapter 9 "EXPLOSION PROTECTED TYPE INSTRUMENTS".

Power supply cable

Cable : Use cables acc. to VDE 0250, VDE 0281 or equivalents.

Outer diameter : DIN and NPT cable gland: 6.5 to 10.5 mm in diameter

Nominal cross section of conductive wire : 0.5 to 2.5 mm²

Outer diameter of cores insulation part : < 3.6 mm

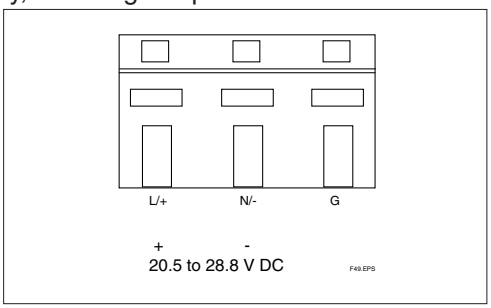
Connecting length of conductive wire part : < 9 mm

24V DC connections

For the DC power supply type, connect a 24 V DC power supply, following the precautions below.

1. Connecting Power Supply

Please refer to the Figure in right. AC power supplies can not be connected. Confirm the polarity of DC power supply.

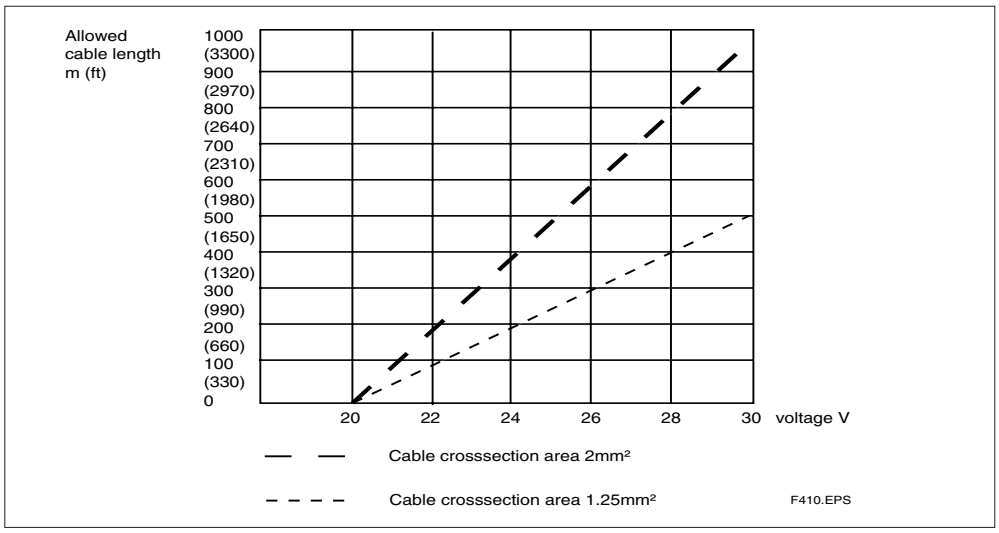


2. Supply voltage rating

The specification for the supply voltage is 20.5 – 28.8 V DC. But because the input voltage of the converter drops due to cable resistance, it should be used within the following range.

3. Ground connection

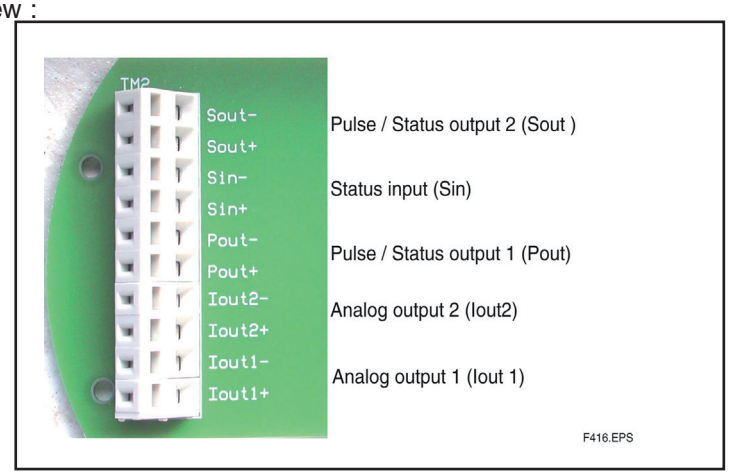
Connect ground as shown on page 4-8 due to EMC protection.



4.8.6 Connecting to external instruments

- Use cables with cross section 0.08 to 2.5 mm²
- Connect the cables from the external instruments to the terminals inside of the converter terminal box (RCCT3 / RCCF31 or on terminal board (RCCR31).
- Confirm two ferrite core sets are attached to the flowmeter.
- Insert the cable into ferrite core before connecting to the terminals. Fix the ferrite core (see figure on page 4-16)
- Connect the cables to the terminals according to the figure below.

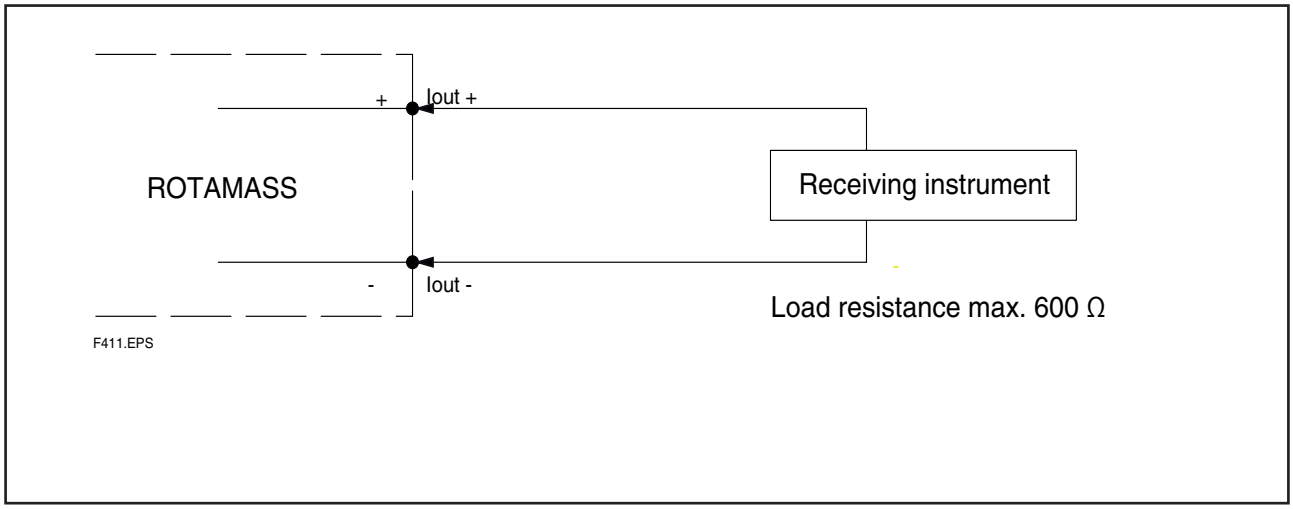
I/O-Terminal Overview :



1. Analog signal output (Iout 1 and Iout 2)

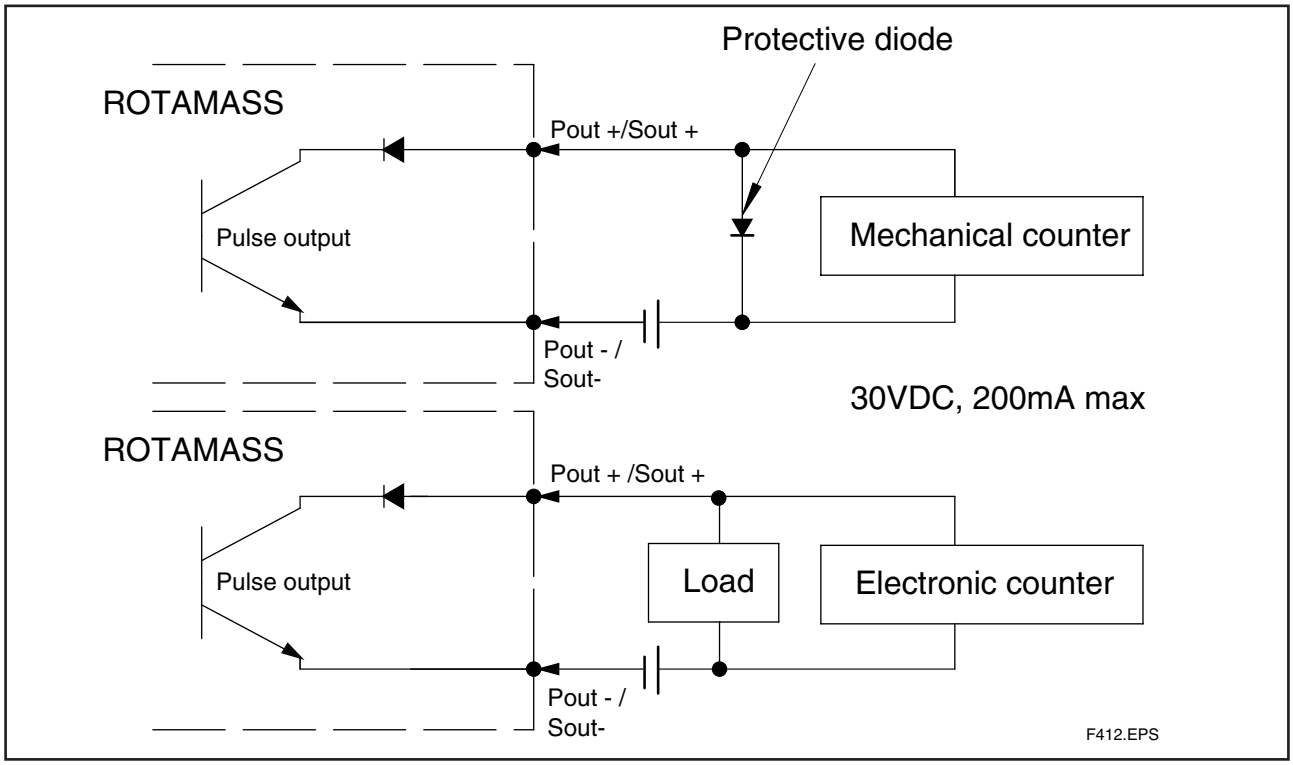
ROTAMASS has 2 analog outputs, 4 to 20 mA DC.

Load resistance 20- 600 Ω (/KF2 has only one analog output, which is intrinsic safe. See chapter 4.8.8).



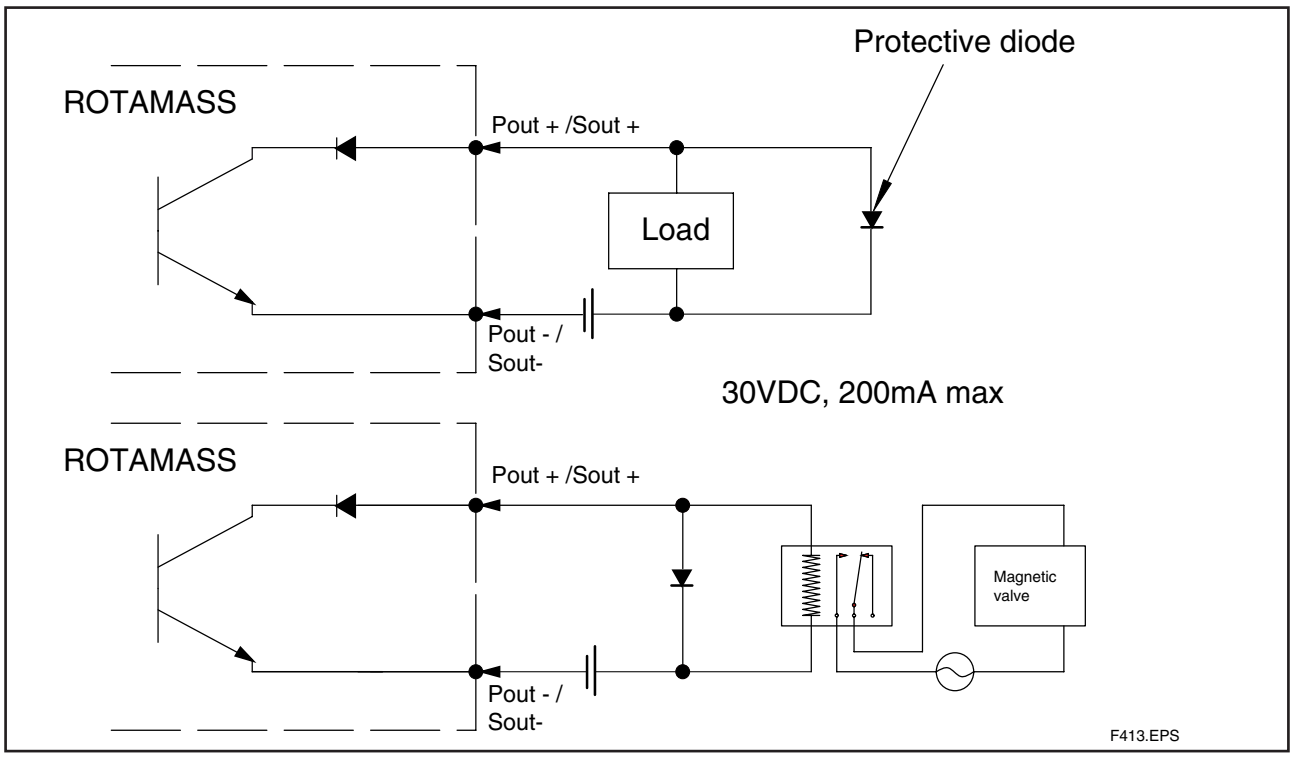
2. Pulse Output passive (Pout / Sout)

ROTAMASS has 2 pulse outputs (isolated transistor contact).
Attention must be paid to voltage and polarity when wiring (/KF2 has one passive pulse output, which is intrinsic safe. See chapter 4.8.8)



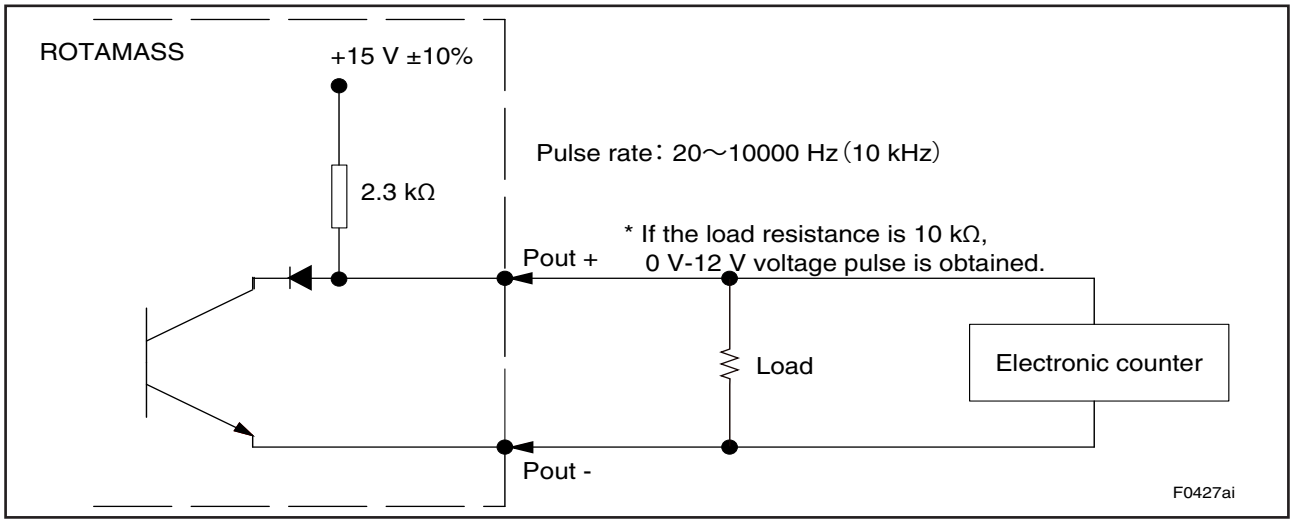
3. Status Output passive (Pout / Sout)

The pulse outputs can be set to status outputs by menu item. Since this is an isolated transistor contact, attention must be paid to voltage and polarity when wiring. This output cannot switch an AC load. To switch an AC load, an intermediate relay (see the figure below) is required.



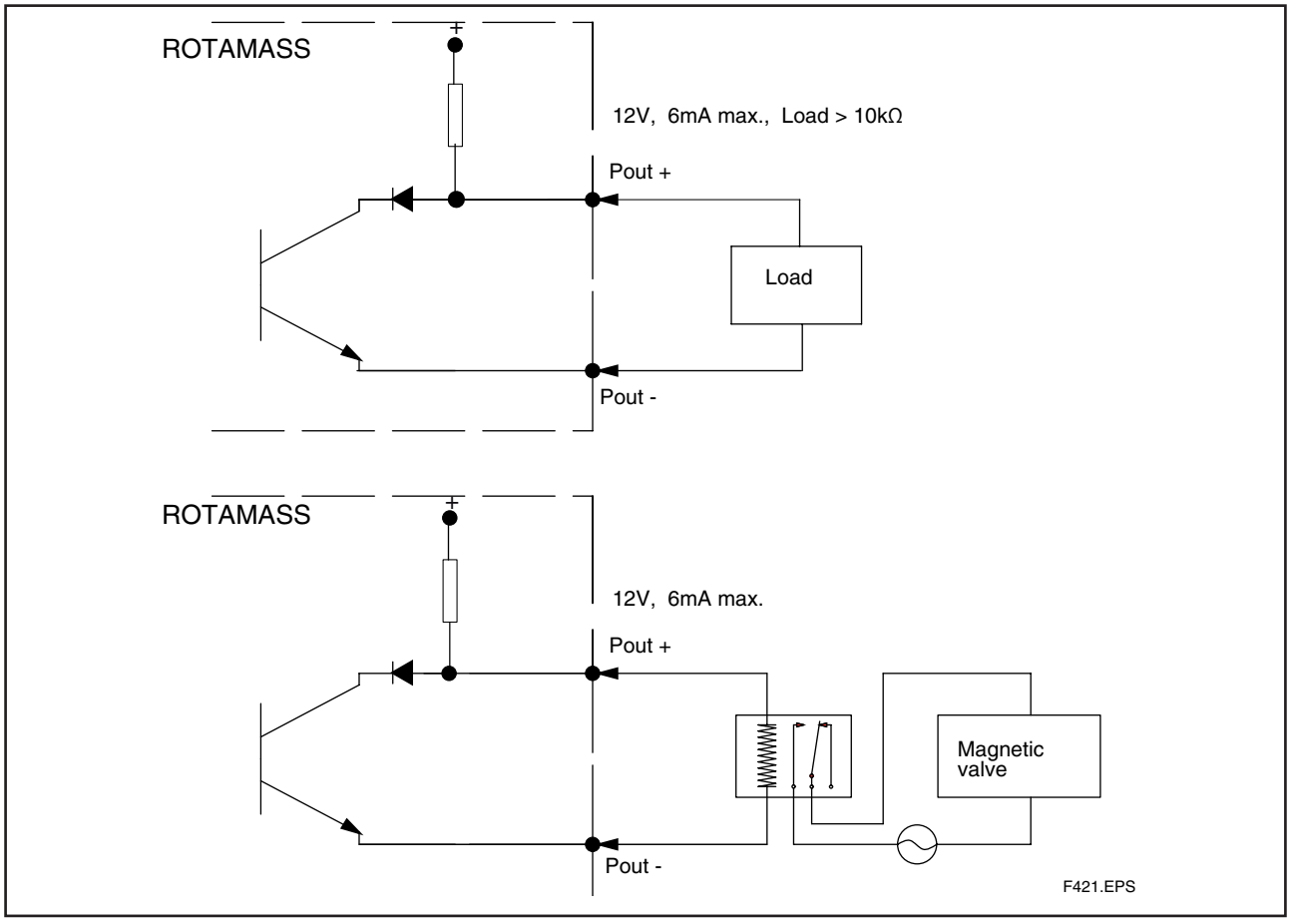
4. Pulse Output active (option /AP)

Pulse output 1 (Pout) can be ordered as active output. Not possible with intrinsic safe outputs option /KF2.



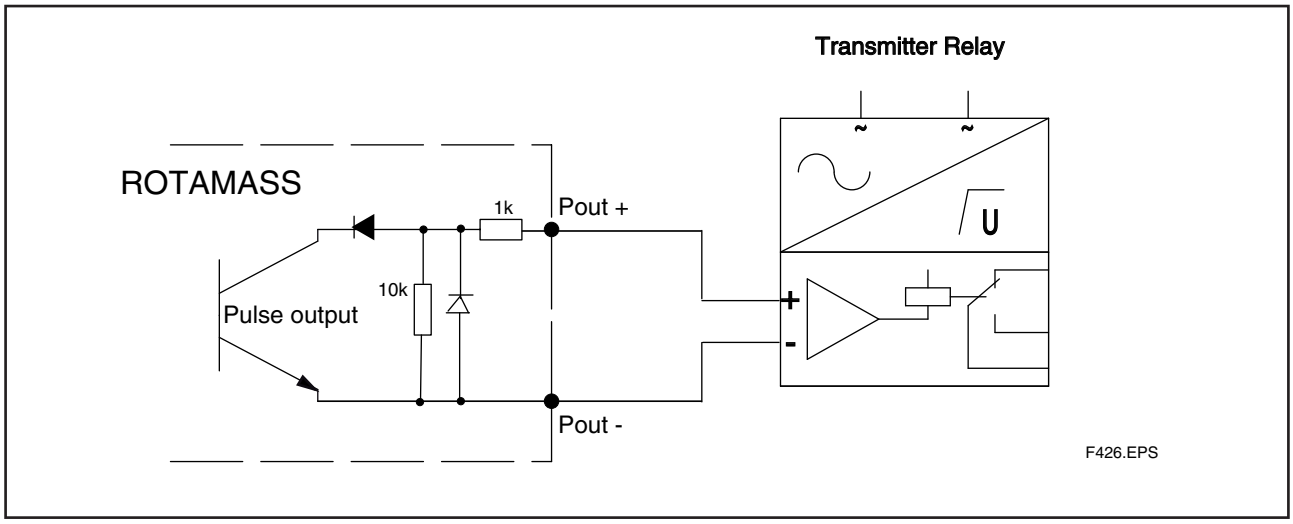
5. Status Output active (option /AP)

Status output 1 (Pout) can be ordered as active output. Not possible with intrinsic safe outputs option /KF2.



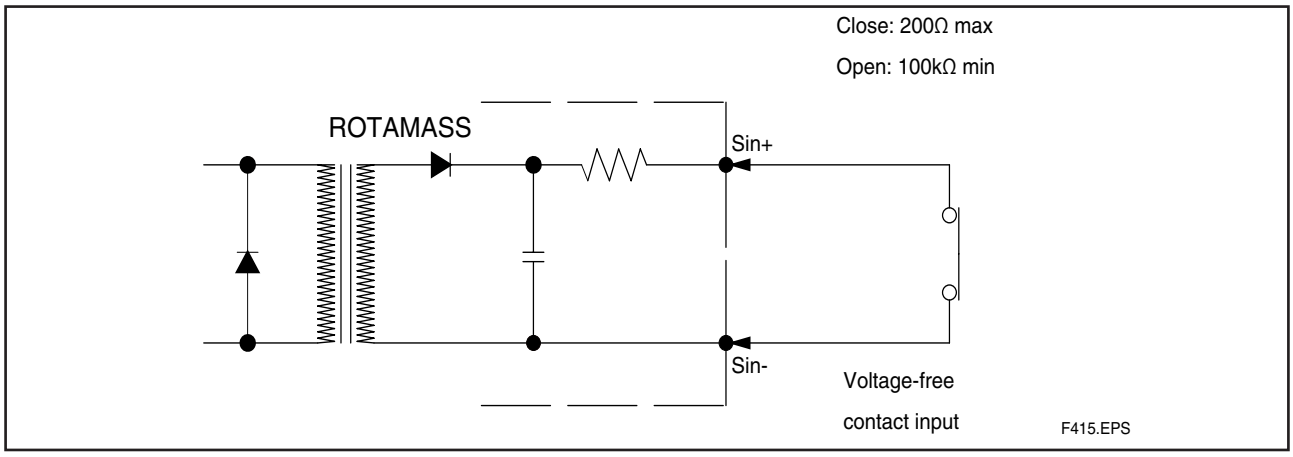
6. Pulse / Status Output according EN 60947-5-6 (NAMUR) (option /NM)

Pulse output 1 (Pout) can be ordered as NAMUR output.



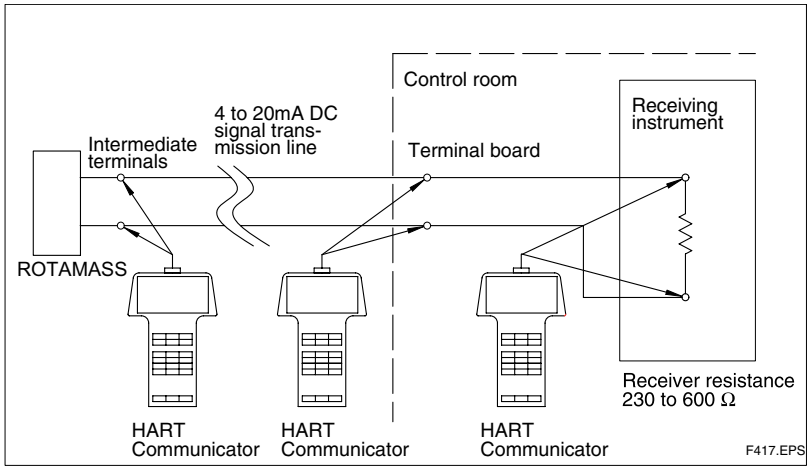
7. Status input (Sin)

Status input is designed for use with voltage-free (“dry”) contact (activate source current to detect the contact state). Be careful not to connect to any signal source carrying any voltage. Applying voltage may damage the input circuit.



4.8.7 Connecting HART- Communication

HART communication is available on analog output 1 and the HART-communicator is connected via load resistance (230 ... 600 Ω) as shown on the figure below.

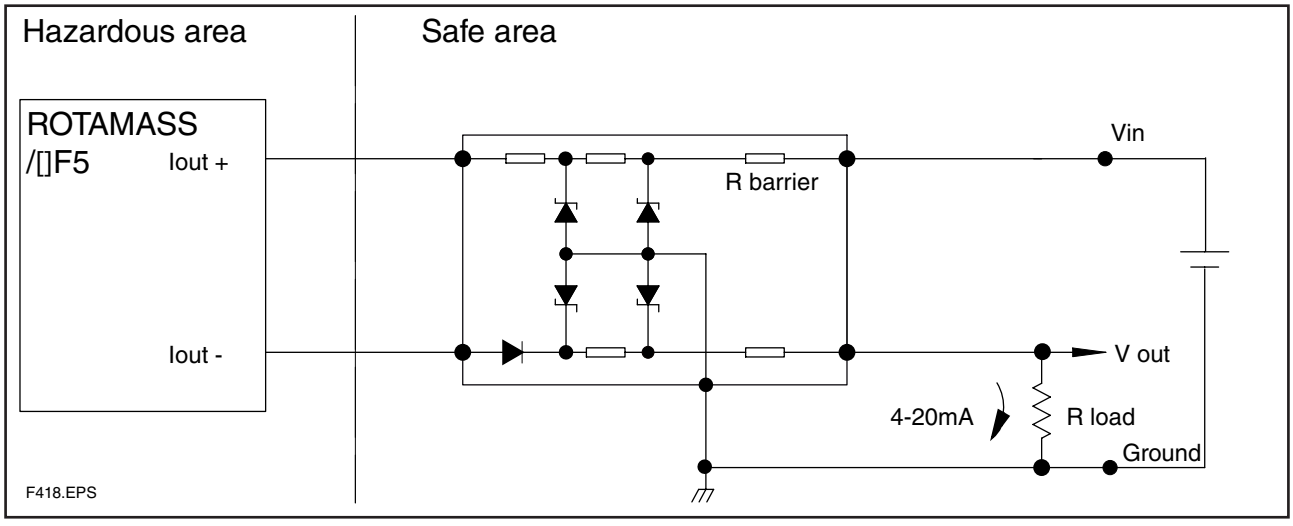


4.8.8 Flowmeters with intrinsic safe outputs

ROTAMASS with option /□F2 (not /FF2) has one intrinsic safe current output and one intrinsic safe pulse / status output. The Ex-data of this output can be found in chapter 9.
ROTAMASS with option /□F5 (not /FF5) has two intrinsic safe current outputs and one intrinsic safe pulse / status output. The Ex-data of this output can be found in chapter 9.
The second current output (only /□F2), pulse, status output and the status input are not available.
The concerning parameters in the menu are not visible.

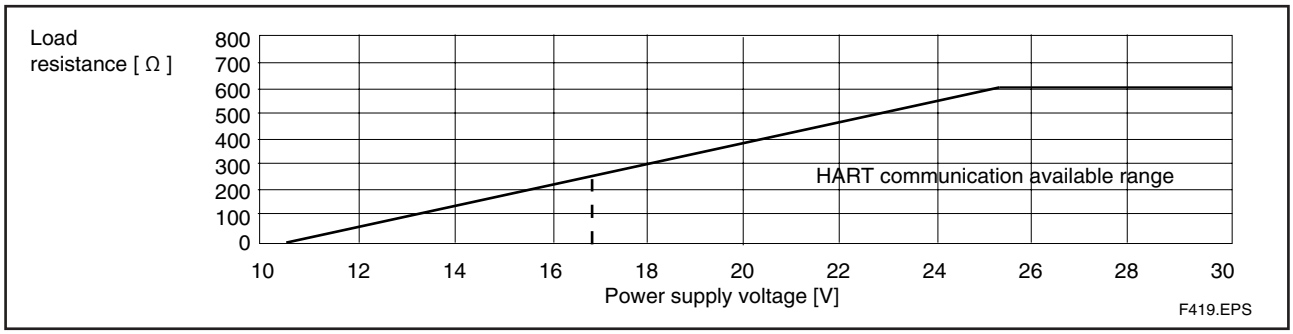
Current output : The intrinsic safe current output is passive and an external power supply with shunt-diode type barrier or isolation type barrier should be connected.

Example of installation :



Power supply range : 10.5 V … 30 V DC for Not-HART application
Power supply range : 16.75 V … 30 V DC for HART application
Load resistance : 20 … 600 Ω for Not-HART application
Load resistance : 230 … 600 Ω for HART application

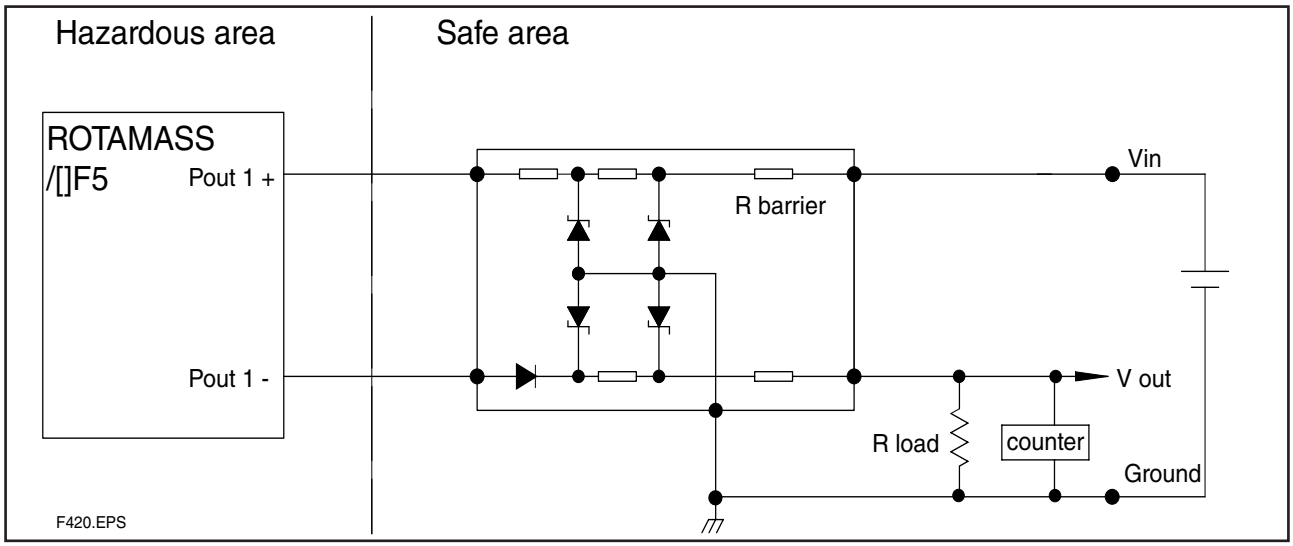
Load resistance vs Power supply voltage :



Pulse output :

The intrinsic safe pulse output is passive and an external power supply with shunt-diode type barrier or isolation type barrier should be connected.
Maximum voltage : 30 V DC
Maximum current : 100 mA

Example of installation :



Blank Page

5. BASIC OPERATING PROCEDURES

Data setting can be done by HART-Communication (see chapter 6) or with the 3 keys on the front panel. The following section describes how to use the three panel keys.

IMPORTANT

Direct sunlight may disturb the functionality of the setting switches.

NOTE

(1) Always use the setting switches with the cover of the ROTAMASS closed.
(2) Use these switches when covered by the glass window.
(3) If dirt, dust or other substances surfaces on the display panel glass, wipe them clean with a soft dry cloth.
(4) The operation with dirty gloves may cause a switch response error.

5.1 Liquid crystal display

Construction of ROTAMASS display :

LCD dot matrix (32 x 132 dots)
- 1 line indication or
- 2 line indication or
- 3 line indication or
- 4 line indication

3 infrared switches SET , SHIFT , ▼

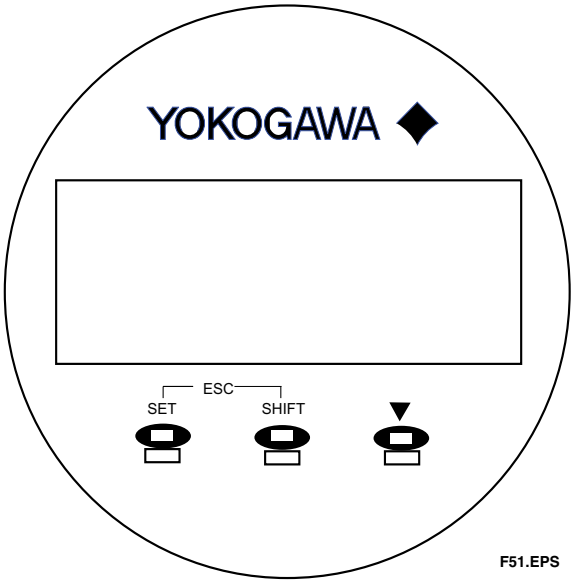
SET : confirm data setting
or entry data setting
or confirm parameter

SHIFT : move cursor right to next position

SET + SHIFT : return to higher menu level

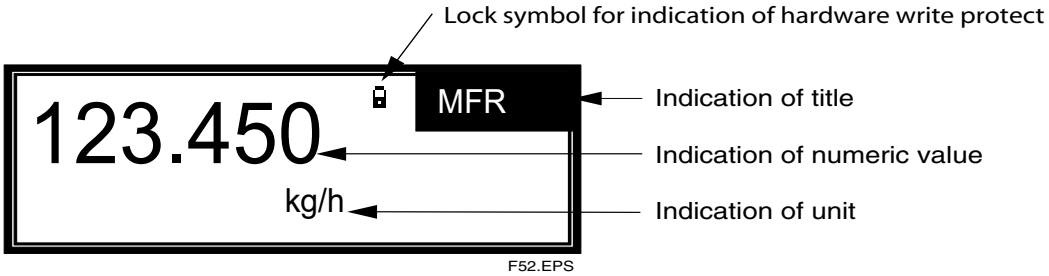
▼ : move to lower parameter
or increment value

SHIFT + ▼ : move to upper parameter

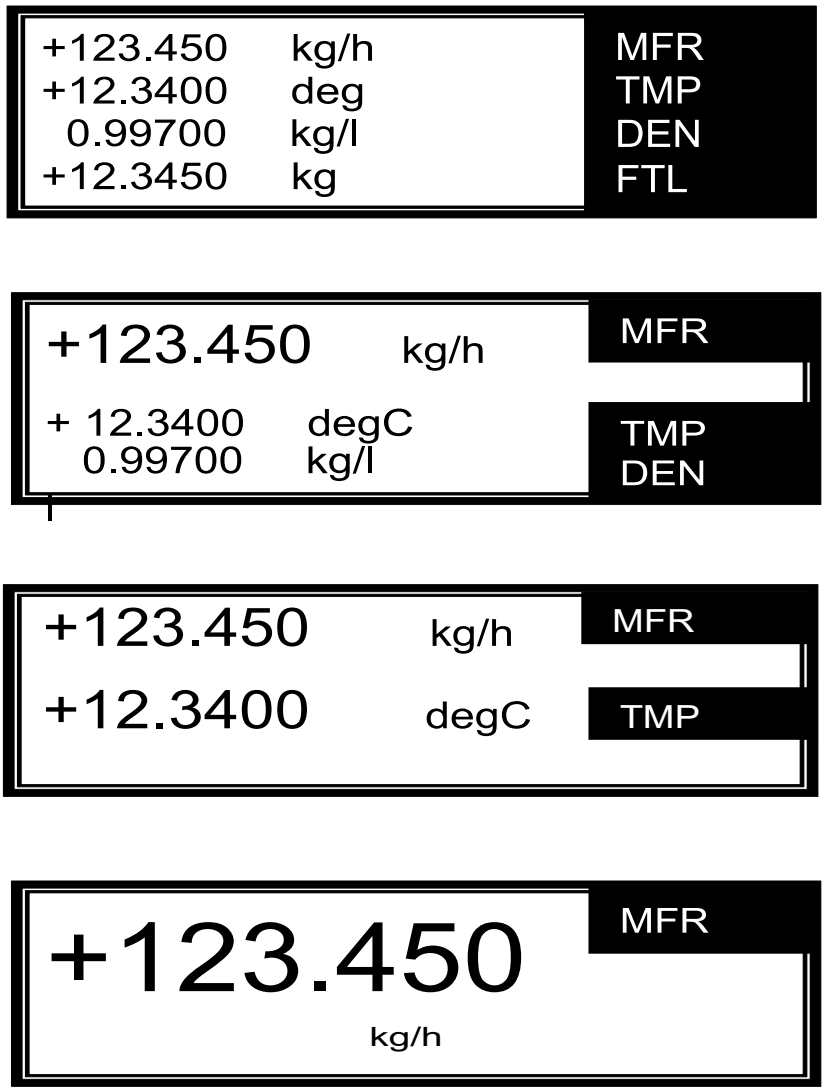


F51.EPS

General display indication :



F52.EPS



NOTE

The infrared switches operate as ON status by detecting the infrared ray reflection from a finger put over the switches through the glass plate of the cover. Switches are just below the printed letters SET, SHIFT, ▼ on the faceplate.

When you touch the switches, please note the following :

The switches may operate even when you do not touch the glass plate, if your fingers come near the glass plate, so please touch the switches sliding with your finger from the lower part of the glass plate. Also be sure not to touch more than one switch at one time by covering your other fingers over the faceplate, unless you would like to push “SHIFT+SET” or "SHIFT+ ▼.

You can increase the sensitivity of the infrared switches by sticking a white piece of tape on your finger tip.

Setting via the infrared buttons can be blocked via the HART protocol. If HART protocol is not used the infrared buttons can be blocked by a black tape glued behind the window.

In the title indication the following abbreviations are used :

MASS FLOW RATE	: MFR	Additional with option /Cx :	
VOLUME FLOW RATE	: VFR	CONCENTRATION	: CON
FORWARD TOTAL MASS	: FTM	NET FLOW	: NET
REVERSE TOTAL MASS	: RTM	FORWARD TOTAL NET	: FTN
DIFFERENTIAL TOTAL MASS	: DTM	REVERSE TOTAL NET	: RTN
FORWARD TOTAL VOLUME	: FTV	DIFFERENTIAL TOTAL NET	: DTN
REVERSE TOTAL VOLUME	: RTV		
DIFFERENTIAL TOTAL VOLUME	: DTV		
DENSITY	: DEN		
TEMPERATURE	: TMP		
FORWARD TOTAL ENERGY	: FTE		
VELOCITY	: VEL		
FORWARD TOTAL FLEX	: FTL		
REVERSE TOTAL FLEX	: RTL		
DIFFERENTIAL TOTAL FLEX	: DTL		
DRIVE GAIN	: DGN		

Number of figures :

totalizer ≤ 999999	: 1 sign + 6 figures (e.g. +123456)
totalizer ≤ 9999999	: 1 sign + 7 figures (e.g. +1234567)
totalizer > 9999999	: Exponential view (e.g. +1.23E12)
measured value	: 7 figures + 1 sign (e.g. +1234567) or 6 figures + 1 sign + 1 decimal point (e.g. +123.456)
unit	: 10 figures
title	: 3 figures

The contrast of the display can be adjusted with parameter

Detailed setup / Display Config / Disp contrast

The indication period of the display can be adjusted with parameter

Detailed setup / Display Config / Disp period

5.2 Display modes

The display can show the following indication modes :

1	Measuring mode	Actual selected measuring values are shown
2	Parameter setting mode	
2a	Entry mode	A confirmation, that setting via the infrared buttons should really happen
2b	Parameter search mode	Mode to search the parameter, which should be changed
2c	Parameter select mode	Mode to rewrite data. There are 4 types of data : - Select type (not blinking) - Numerical type (blinking) - Numerical type with sign (blinking) - Character type (blinking)
2d	Data confirmation mode	Mode to confirm new value of selected parameter
2e	Data determination mode	Parameter setting is completed
3	Alarm mode	Alarm or Error Code is displayed alternating with measuring mode (2s Alarm / 4s Measure). Warnings are not displayed. Access to Warnings via Self Test/Status.

In measuring mode the actual measured values according the display select parameters are indicated as shown in chapter 5.1. How to set display settings see chapter 5.4.

Parameter setting mode is described in chapter 5.3.

The language of the parameter setting mode can be selected in parameter

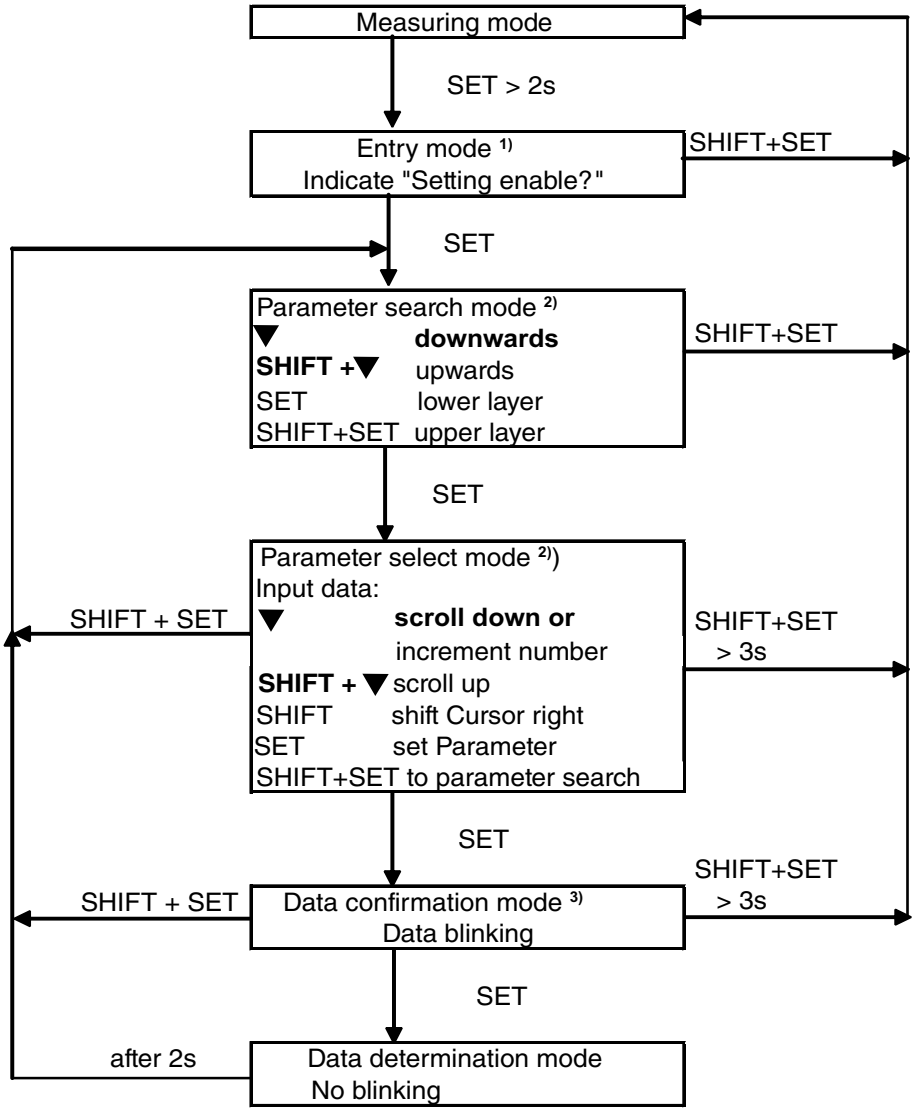
Language / or Detailed setup / Display config / language .

English, German, French or Russian can be selected.

5.3 Setting via keys

The three keys SET , SHIFT , ▼ are used to set parameters via display menu.
The following flowchart shows how to reach the modes by using the keys :

Chapter 7.2 shows the display parameter list and chapter 7.3 shows the parameter tree.



1) Back to measuring mode if no key is pressed within 10s.
2) Back to measuring mode if no key is pressed within 120s.
3) Back to Parameter search mode if no key is pressed within 10s.

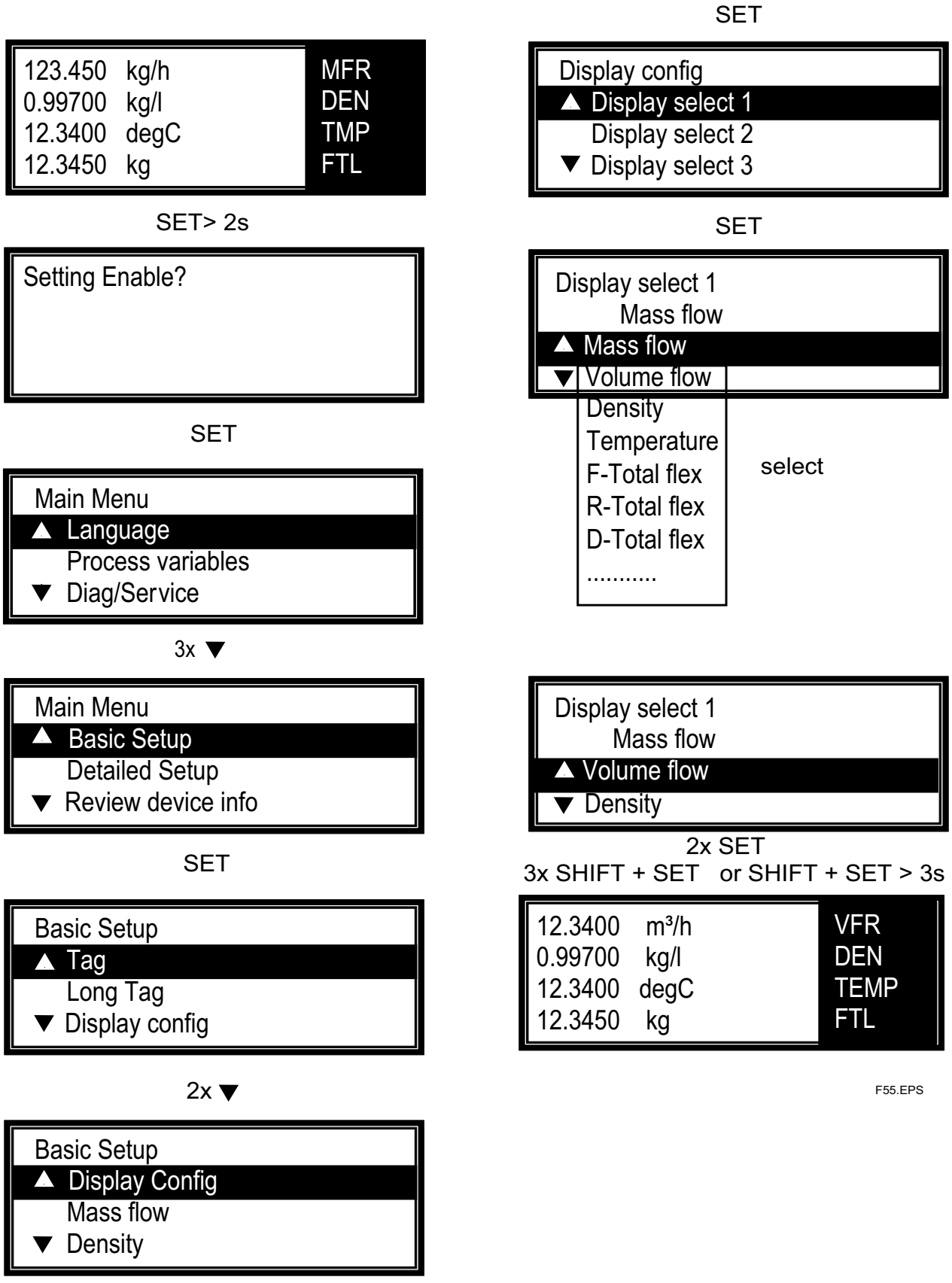
F54.EPS

IMPORTANT
The infrared keys can be locked via HART by Hot Key / Key Status.

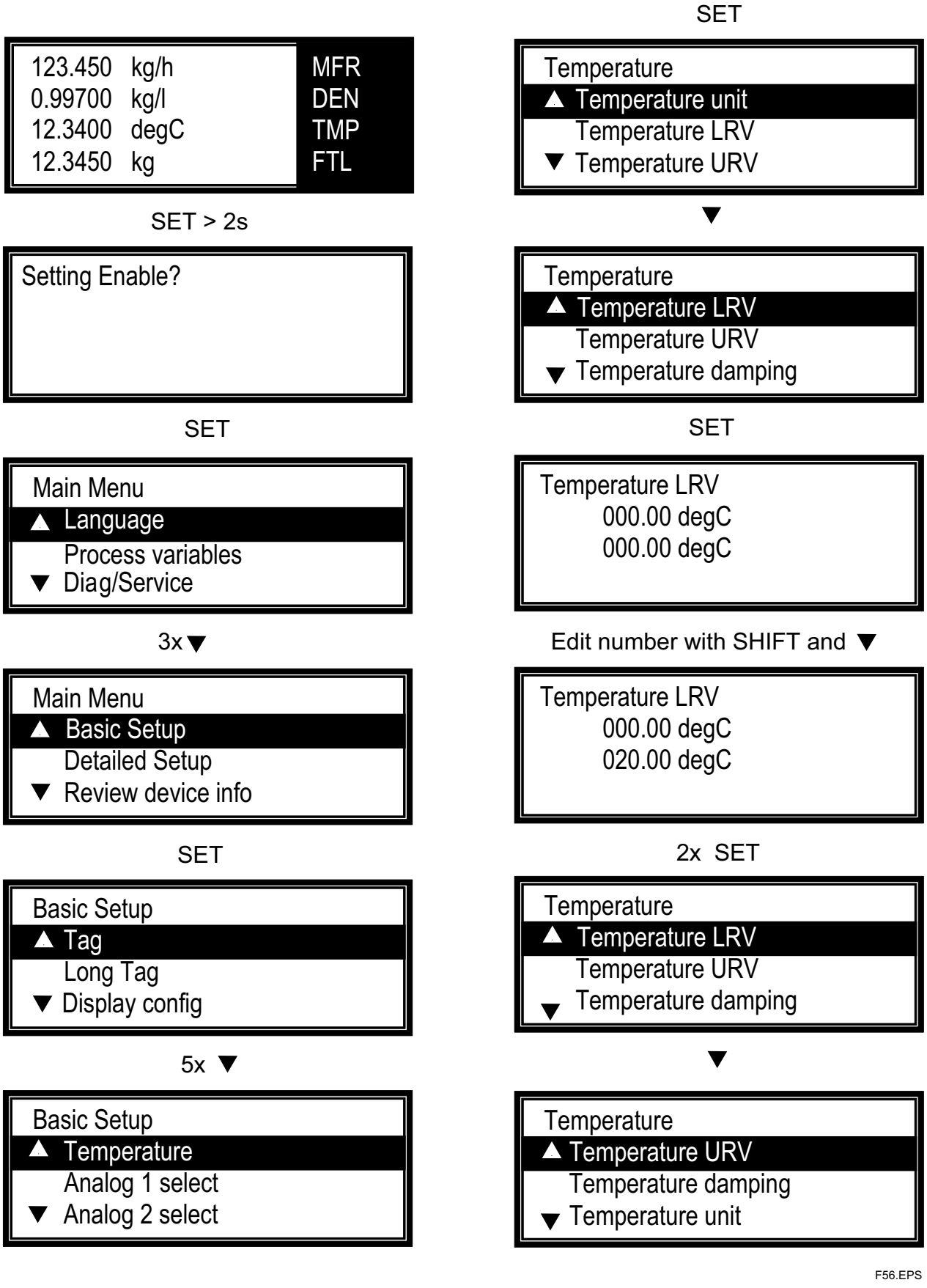
IMPORTANT
Depending on parameter setting, only relating parameters are visible in the menu. E.g., if Pulse/Stat 1 select is set to Pulse, the parameters concerning status out 1 (SO1) do not appear in the menu.
Such dependences are described later in the related chapters.

5.4 Examples of parameter settings via keys

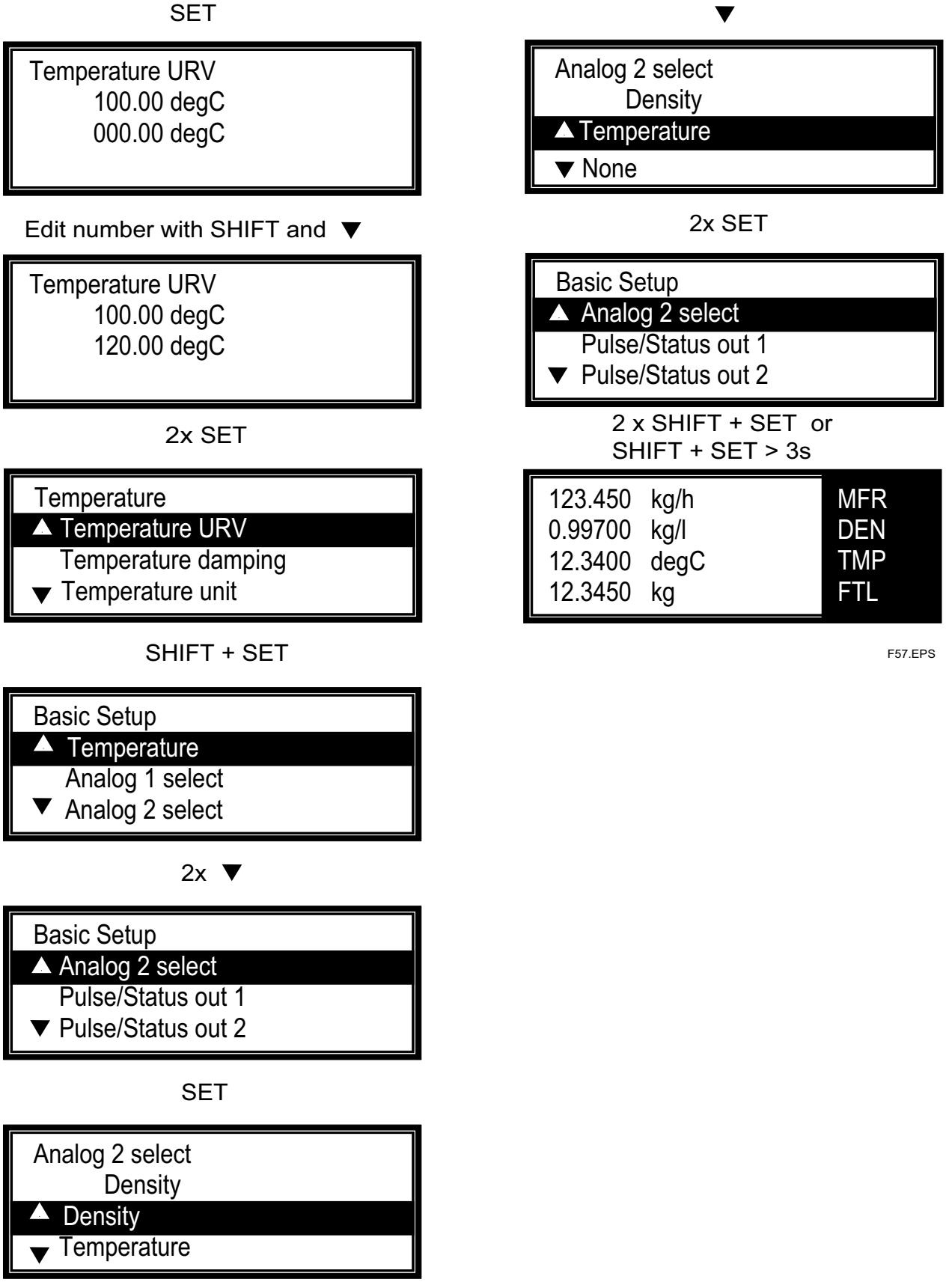
5.4.1 Display configuration, set volume flow to line 1



5.4.2 Setting Temperature 20-120°C to Analog Output 2



F56.EPS


SET
Temperature URV
100.00 degC
000.00 degC
Edit number with SHIFT and ▼
Temperature URV
100.00 degC
120.00 degC
2x SET
Temperature
▲ Temperature URV
Temperature damping
▼ Temperature unit
SHIFT + SET
Basic Setup
▲ Temperature
Analog 1 select
▼ Analog 2 select
2x ▼
Basic Setup
▲ Analog 2 select
Pulse/Status out 1
▼ Pulse/Status out 2
SET
Analog 2 select
Density
▲ Density
▼ Temperature
▼
Analog 2 select
Density
▲ Temperature
▼ None
2x SET
Basic Setup
▲ Analog 2 select
Pulse/Status out 1
▼ Pulse/Status out 2
2 x SHIFT + SET or
SHIFT + SET > 3s
123.450 kg/h MFR
0.99700 kg/l DEN
12.3400 degC TMP
12.3450 kg FTL

F57.EPS

5.5 Setting parameters in converter with option /NC

If remote converter RCCF31 / RCCR31 was ordered with option /NC (no combination), the customer must set the parameters of the connected detector by himself.

In parameter Detailed Setup / Sensor model the sensor model must be selected. Then, the sensor model depending parameters are set automatically to default value :
Qnom, Mass flow unit, Mass flow LRV, Mass flow URV, Vol flow unit, Vol flow LRV, Vol flow URV, Autozero range, Autozero fluctuation range.

In parameter Detailed Setup / Sensor constants the sensor constants from calibration certificate must be set.
If material of wetted parts is HC see instruction TI 01R04B04-03E-E or TI 01R04B04-05E-E attached to the converter.
In Parameter Basic setup / Tag or Basic setup / Long tag the tag number must be set if necessary.

5.6 Detectors RCCS39/IR with option /V2 which are ordered without combined converter

The user has to set the following detector parameters in combined converter himself.

Parameter	Factor	Unit	RCCx39/IR/V2
Mass Flow			
SK20	1	MHz*kg/h	acc. calibration certificate
SKT	1E-04	1/K	-4.6
SKTK	1E-07	$(1/K)^2$	-4.27
RV	1	%/(kg/l)	-0.27
SKP	1E-04	1/bar	0.47
SKPT	1E-07	1/(bar*K)	0
Density			
KD	1	kg/l	acc. calibration certificate
FI20	1	Hz	acc. calibration certificate
FTC1	1E-04	1/K	-2.252
FTCK	1E-07	$(1/K)^2$	-0.748
FPC	1E-04	1/bar	0.235
FPTC	1E-07	1/(bar*K)	0
FQC1	1E-10	s/g	0
FQC2	1E-13	(s/g)^2	-0.171

With HC wetted parts:

Parameter	Factor	Unit	RCCx39/IR/V2
Mass Flow			
SK20	1	MHz*kg/h	acc. calibration certificate
SKT	1E-04	1/K	-2.87
SKTK	1E-07	$(1/K)^2$	-1.18
RV	1	%/(kg/l)	-0.22
SKP	1E-04	1/bar	0.287
SKPT	1E-07	1/(bar*K)	0
Density			
KD	1	kg/l	acc. calibration certificate
FI20	1	Hz	acc. calibration certificate
FTC1	1E-04	1/K	-1.426
FTCK	1E-07	$(1/K)^2$	-0.183
FPC	1E-04	1/bar	0.143
FPTC	1E-07	1/(bar*K)	0
FQC1	1E-10	s/g	0
FQC2	1E-13	(s/g)^2	-0.171

5.7 Zero adjustment (Autozero)

After the flow meter is installed into the process pipe work, set up the parameter corresponding to calibration certificate (generally set up in the factory) and perform the pre-operation zero adjustment.

IMPORTANT

Zero adjustment is required before beginning operation in order to obtain the output signals are accurately proportional to the flow.
Zero adjustment is performed to set the instrument to 0% when the flow rate is 0.

IMPORTANT

- Stop flow before starting autozero (valve on outputs)**.**
- During autozero time
  - Flow is fixed to zero
  - Totalizer stops counting.
  - Display switches do not work.

Following procedure should be executed after installation but before starting measurement to get best measuring results:

- Flush the meter with the fluid under process conditions.
- Stop flow, the best way is closing valves upstream and downstream.
- Wait 2 minutes in which density, temperature and pressure should stabilize.
- Density check:
  - for measurement of liquids control via expected medium density reading that the measuring tubes are gas free (density not lower than expected. Do not forget to insert the process pressure and pressure unit for the pressure compensation via Detailed Setup / Config Fld vars / Dens).
  - for measurement of gases there is no possibility to check the density reading as the density value of gases is lower than 0.3 kg/l and the ROTAMASS switches automatically to 0 kg/l, see chapter 7.7.
- Perform Autozero.
- Store the Autozero value in Autozero History if required. (Only if you enter the date the values will be stored).
- Flow measurement can start.

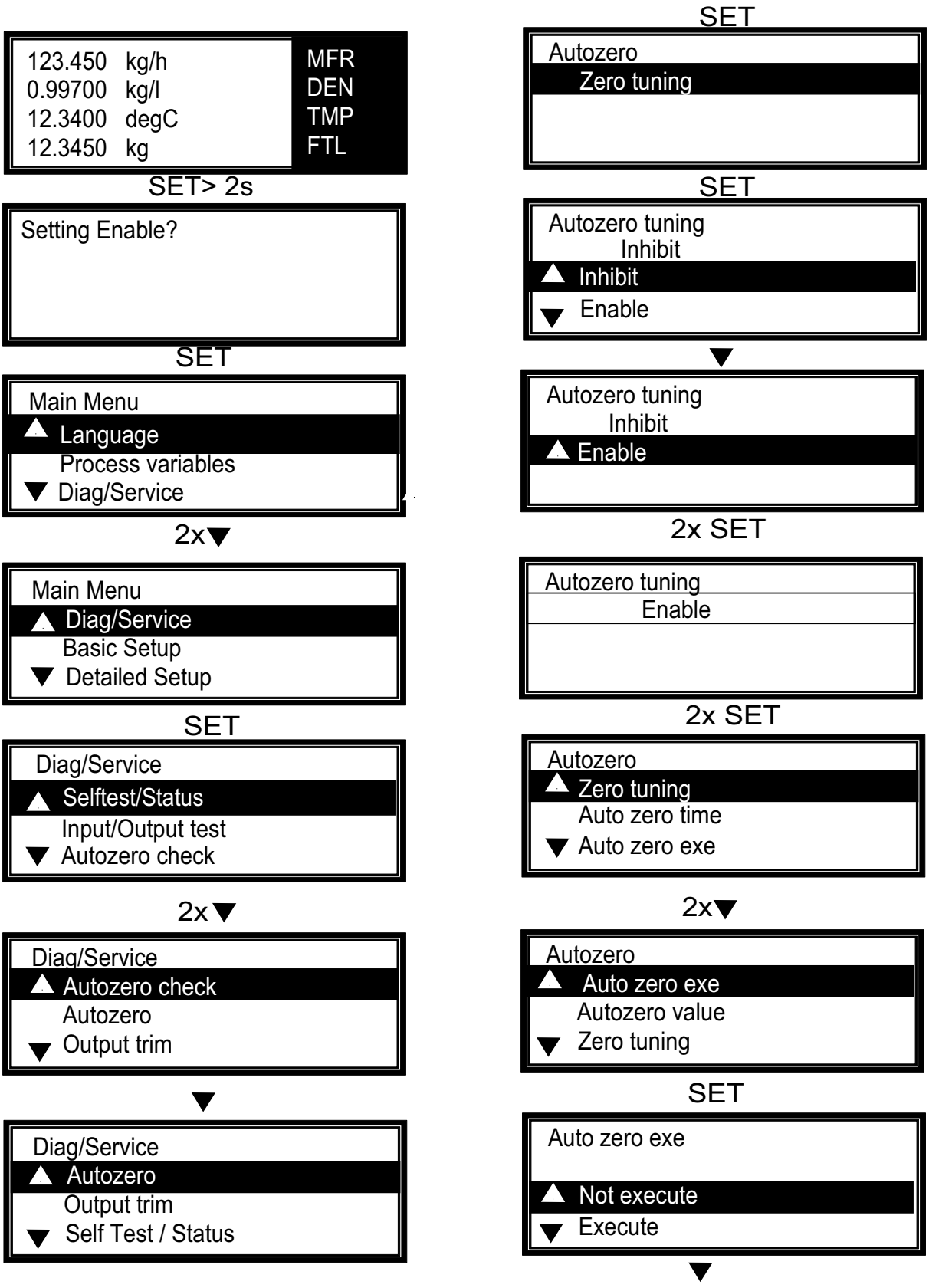
CAUTION

For setting a proper Autozero the conditions have to be well defined. Under certain circumstances it is recommended not to perform Autozero but use the Autozero value set during flow calibration in the factory:
- zero flow condition cannot be guarantied while valves may be not tight
- two or multi phase medium whether the phases separates under no flow condition
- two phase medium whether there is gas contained in the fluid phase or liquid particles in the gas phase

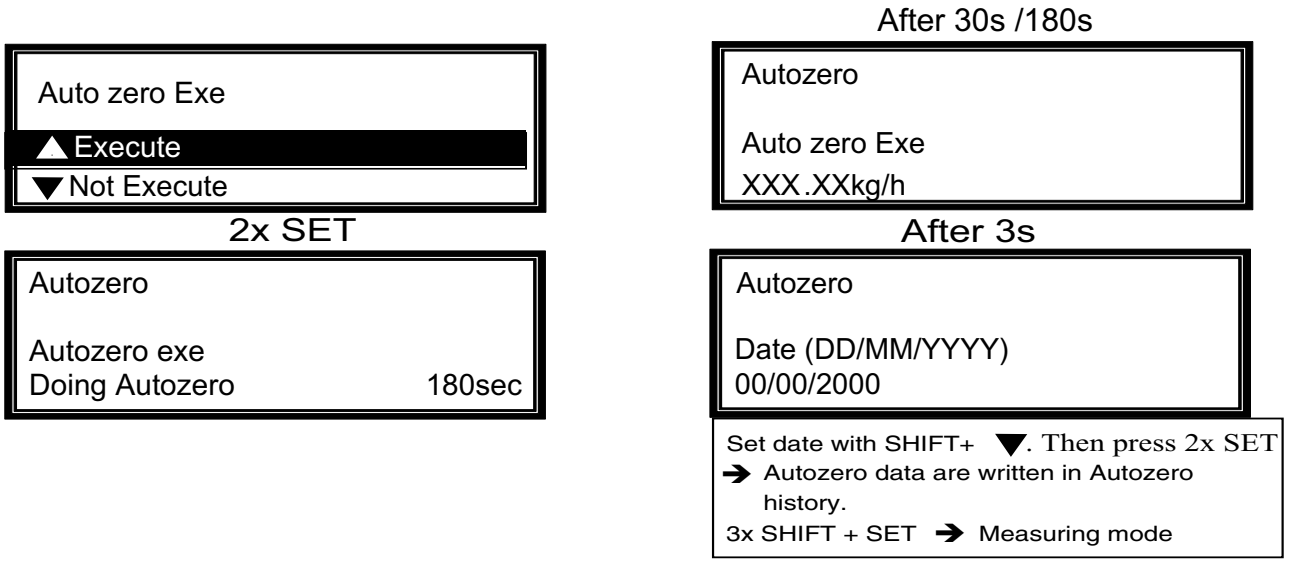
WARNING

ROTAMASS incorporates two measuring tubes which vibrates at a resonance frequency between 100 Hz and 200 Hz. Under certain circumstances there is a similar resonance frequency in the pipe work or fixture which might be excited. In this case high zero fluctuation may occur and Autozero value can't be executed properly. Changes in the mechanical support of the detector should be done to decouple the detector from the vibrating structures.

How to perform Autozero via keys :

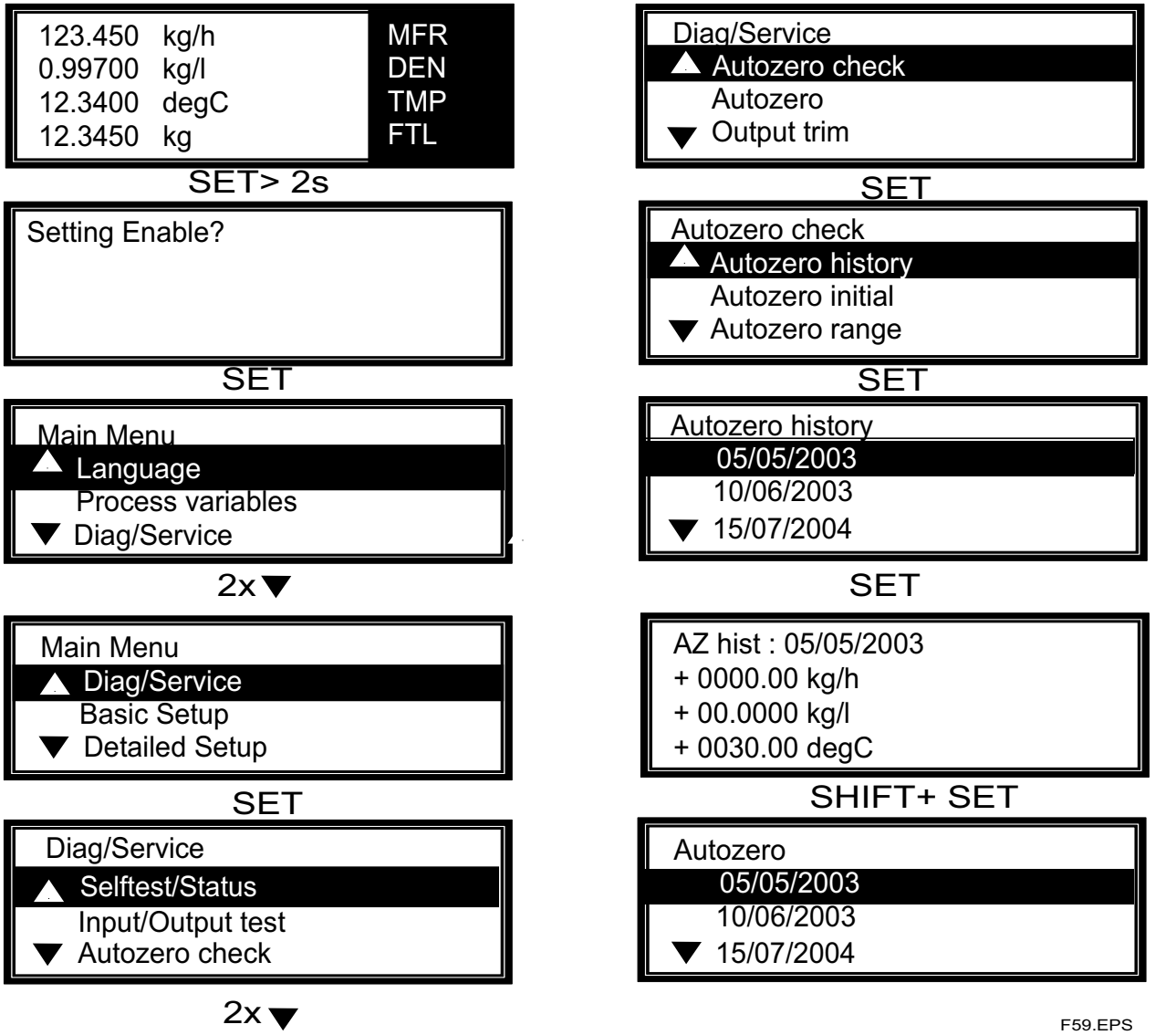


F58.EPS



F58a.EPS

Reading Autozero history (see also chapter 7.24) :



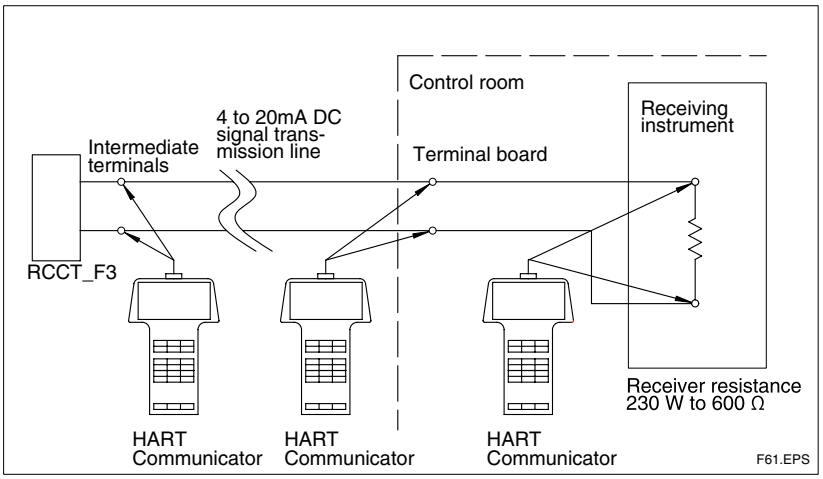
F59.EPS

Blank Page

6. OPERATION VIA HART

6.1 Conditions of communication line

A HART-communicator can communicate with the ROTAMASS RCC□3 from the control room, the ROTAMASS site or any other wiring termination point in the loop, provided there is a minimum load resistance of 230Ω between the connection and the instrument. To communicate, it must be connected in parallel with the ROTAMASS RCC□3, the connections are not polarized. The figure below shows the wiring connections for direct interface at the ROTAMASS RCC□3.



Specifications of communication line :

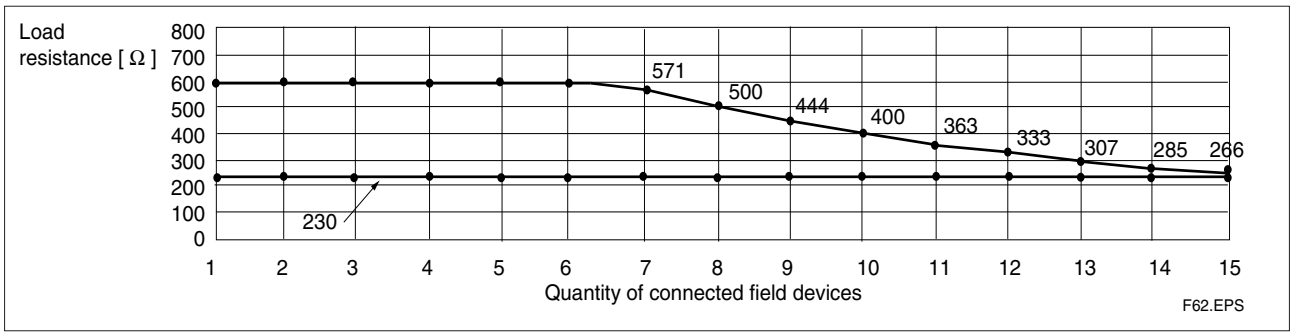
Load resistance	:	230 to 600 Ω, for multidrop mode see figure below
Minimum cable size	:	24 AWG (0.51 mm diameter)
Cable type	:	single pair shielded or multiple pair with overall shield
Maximum twisted pair length	:	6,500 ft (2,000 m)
Maximum multiple twisted pair length	:	3,200 ft (1,000 m)

Use the following formula to determine cable length for a specific application :

$$L = \frac{65 \times 10^6}{(R \times C)} - \frac{(C_i + 10{,}000)}{C}$$

Where : L = length in feet or meters
R = resistance in ohms, current sense resistance
C = cable capacitance in pF/ft or pF/m
C_i = 50,000 pF

Load resistance and quantity of devices in multidrop mode :



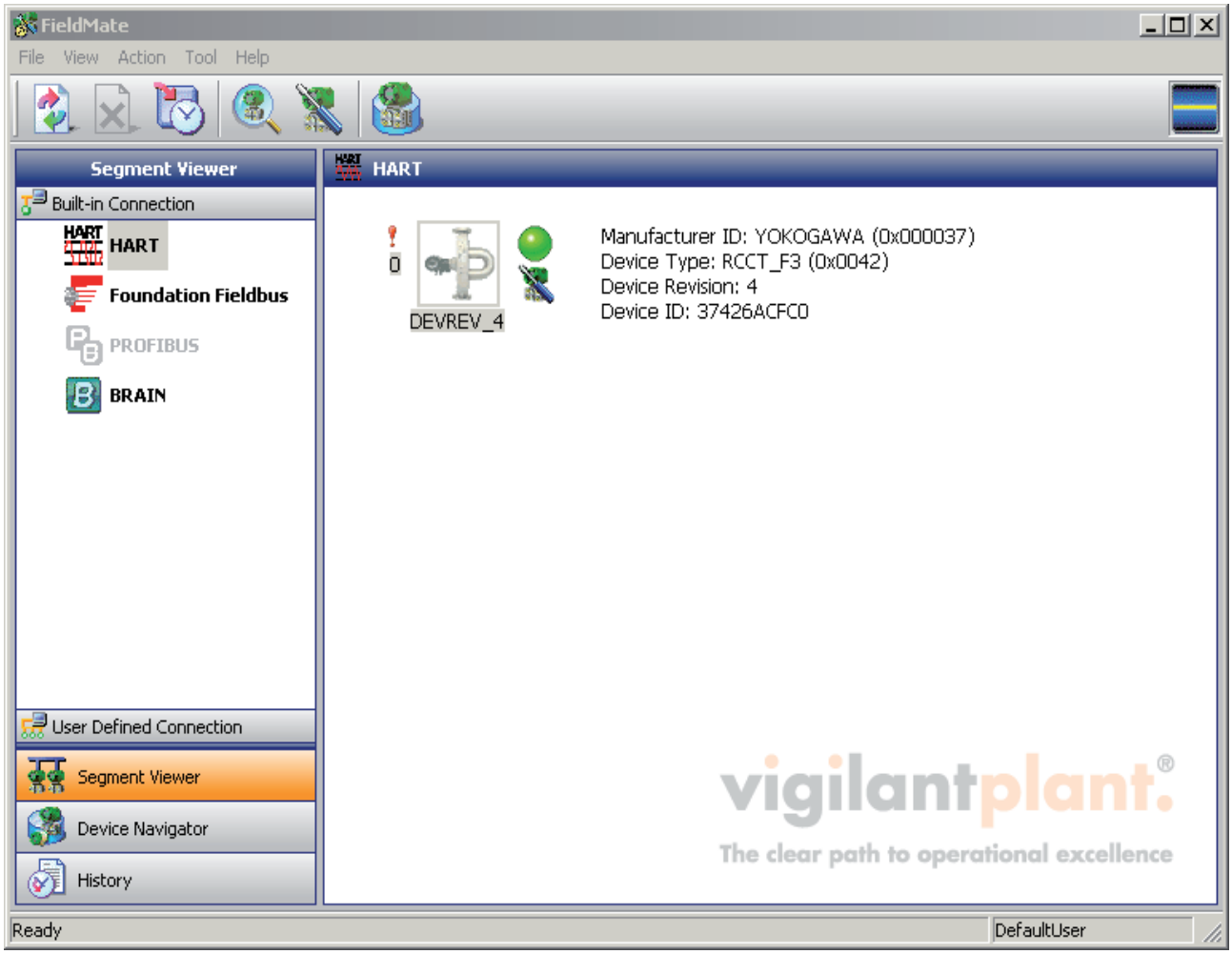
6.2 Communication via FieldMate

FieldMate is a PC-based flexible field device management tool from Yokogawa.
Features:

- Instant device recognition upon connection for HART, FF, Profibus and BRAIN devices
- Support of both FDT/DTM and EDDL technologies
- Database support for offline maintenance
- Full history and audit trail
- Synchronization with PRM

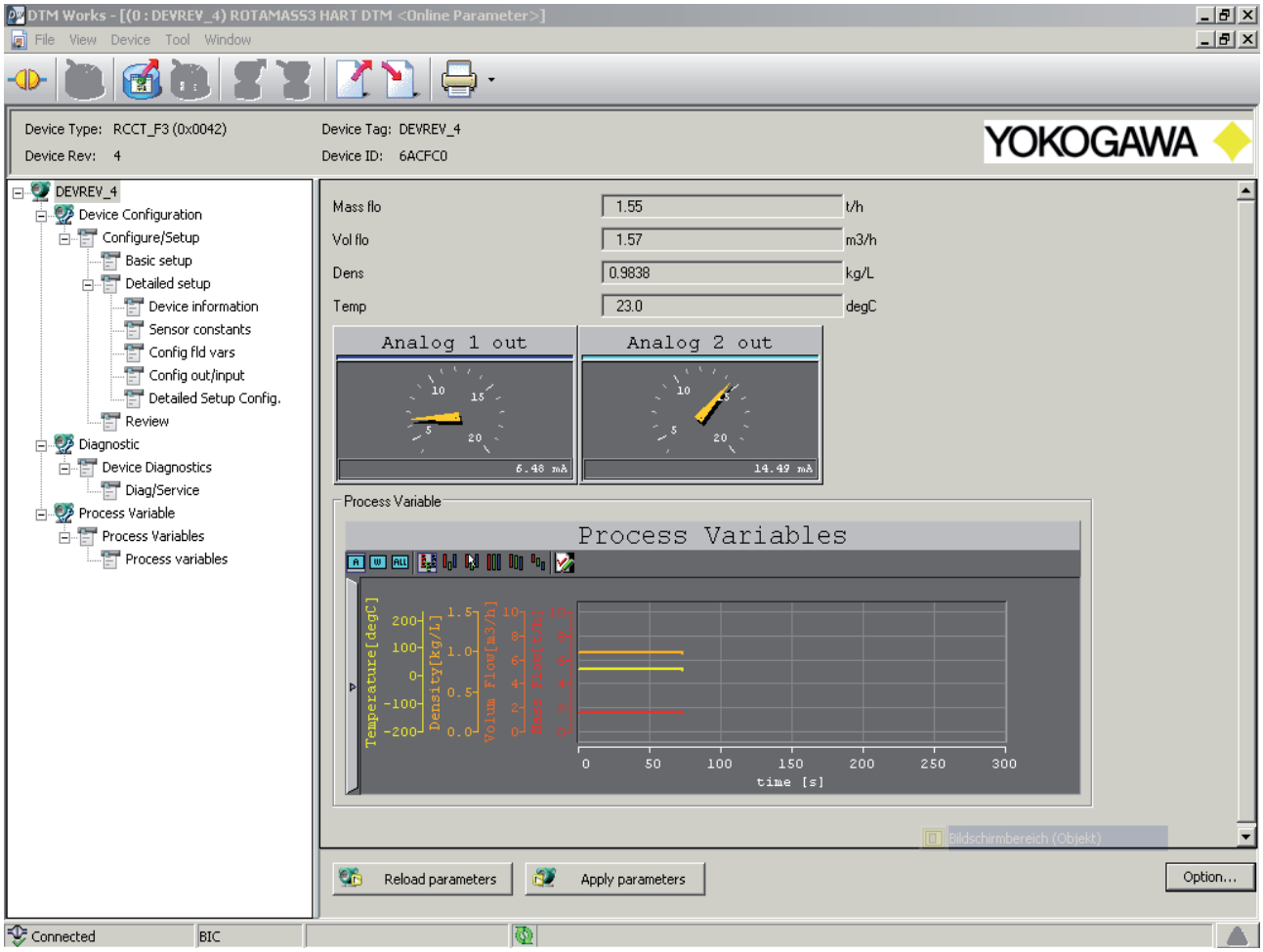
The segment viewer will automatically scan the bus and will list your devices.

FieldMate start window

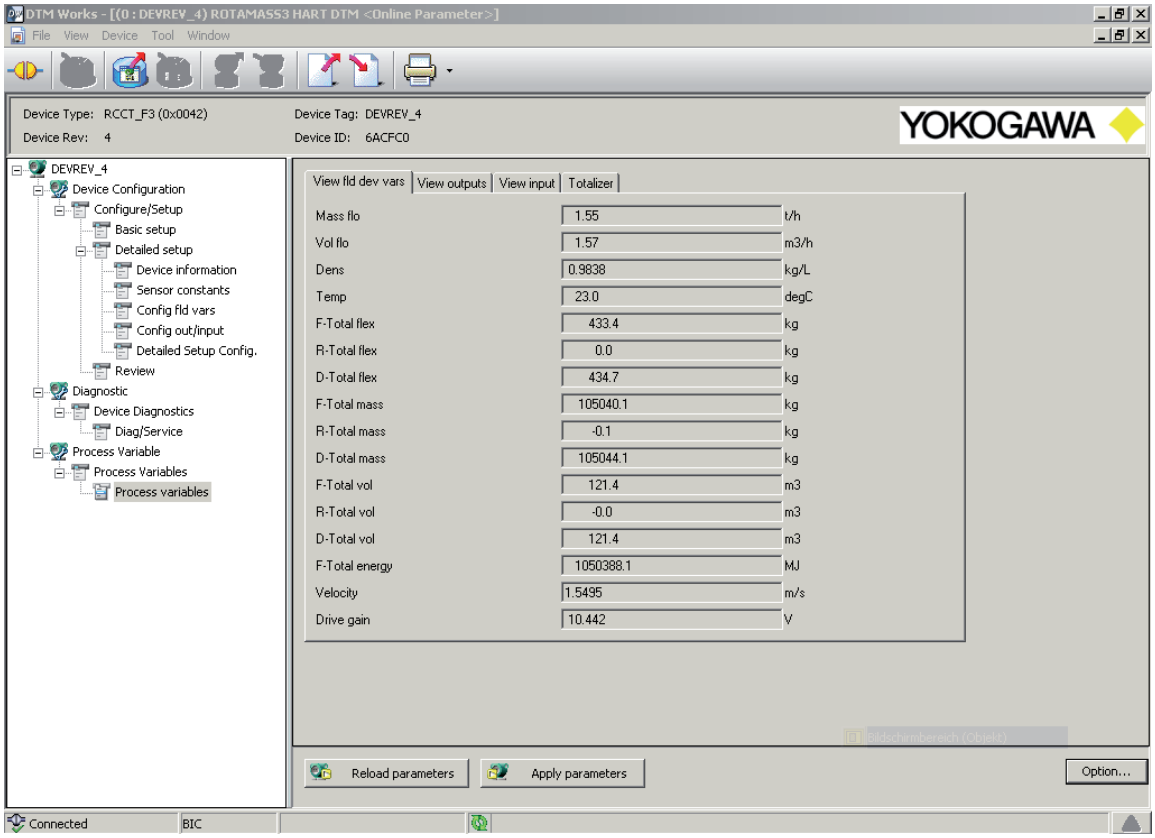


All Yokogawa device DTM's can be downloaded for free from the web site:
http://downloads.yokogawa-europe.com

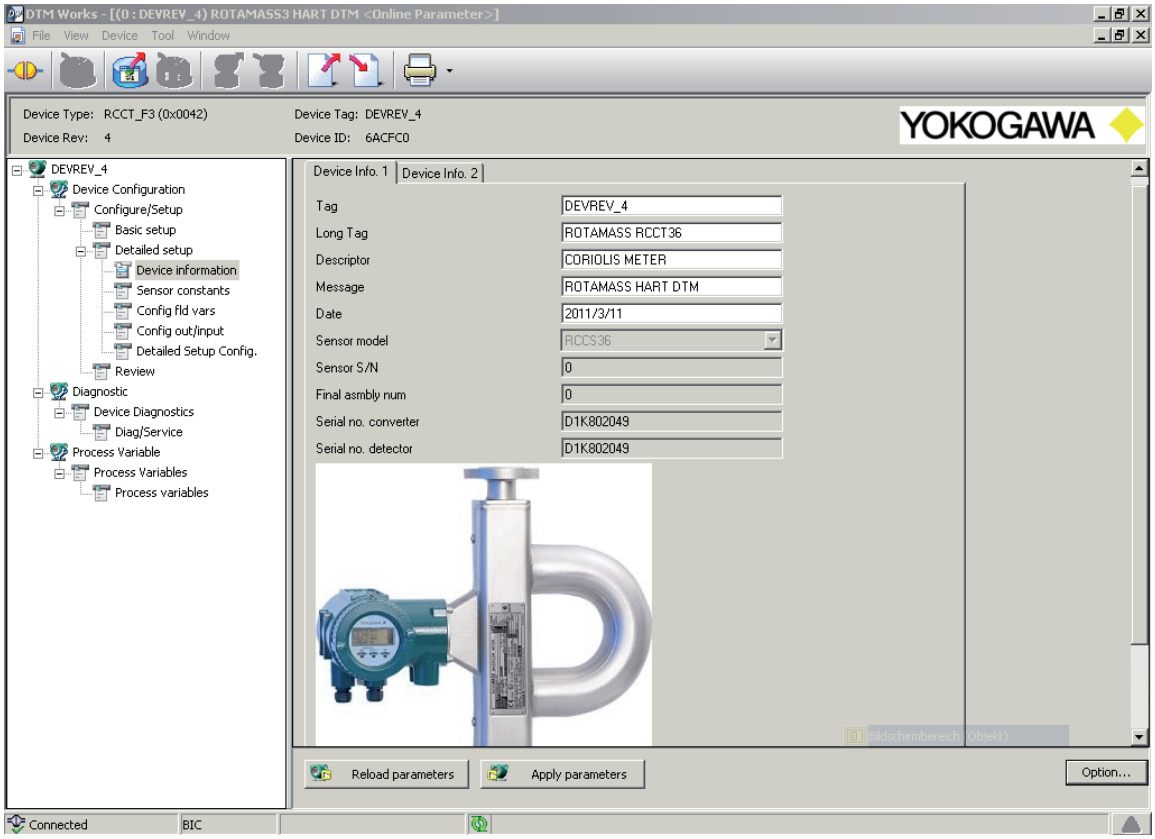
RCC□3 DTM: Start window



RCC□3 DTM: Process variables



RCC□3 DTM: Device information



6.3 Communication via HART Communicator

Keys and functions of HHT 375/475:

The HART communicator automatically searches for ROTAMASS RCC□3 on the 4-20mA loop, when it is turned on. When HART communicator is connected to RCC□3, it displays the online menu.
(If RCC□3 is not found, it displays “No device found. Press OK…”. Press OK ´F4´ function key and the main menu appears. Please retry after confirming the connection with RCC□3).
If there is no device specific DD installed in the HHT 375/475 (RCC□, Dev v4, DD v1), the functionality of the HART Menu as listed in chapter 7.4 is not total supported.
In this case the HHT 375/475 works in the “Generic Mode”, which allows configuring the ROTAMASS with limited functionality.
For upgrading your HHT 375/475 please use "Easy Upgrade" programming utility which is available from EMERSON.

Online Menu Summary

No.	Display item	Contents
1	Device Setup	Set parameters for ROTAMASS
2	PV	Display process value in engineering unit
3	PV AO	Display analog output in mA
4	Review	Review parameters for ROTAMASS
5	Service	Not open

The HART menu in chapter 7.4 shows the configuration of the online menu, which is needed for the operation with HART communicator. Select ´Device Setup´ to call up the desired item as follows:
There are two choices to select the desired menu item:
1. Use the ↓ or ↑ key to select the desired item, and then press the → key.
2. Press the number key displayed for the desired item.
To return to the previous display, press the ← key
Entering, setting and sending data:
The data, which is input with the keys is set in the HART-communicator by pressing **ENTER**. Then, by pressing **SEND**, the data is sent to RCC□3. Note that the data is not sent to ROTAMASS if **SEND** is not pressed. All the data set with the HART-communicator is held in memory unless power is turned off, so all data can be send to RCC□3 in one lot.

IMPORTANT
Parameter setting on the display with the infrared keys is prohibited during HART communication.

IMPORTANT
Do not turn power off just after HART-Communicator settings (sending) have been made. If ROTAMASS is turned off less than 30 seconds after parameters have been set, the set data will not be stored and the data returns to previous settings.

6.4 Unique functions of HART Communicator

Check on communication error:
When over run error, framing error, parity error or buffer overflow error is detected, the data including the information of errors is returned, and the error message is indicated on HHT.
Time recording:
Online → Device setup → Detailed setup → Device information → Date
Month and day can be set in a number of 2 figures, Year in 4 figures.
Multi-drop communication:
Field devices in multi-drop mode refer to the connection of several field devices on a communication single line. Up to 15 field devices can be connected when set in the multi-drop mode.
To activate multi-drop communication, the field device address must be changed to a number from 1 to 15. This change deactivates the 4 to 20 mA output and turns it to 4 mA.
Online → Device setup→ Detailed setup → HART Communication → Poll address
Write protect:
Write protect function is provided to inhibit parameter change. That becomes active by entering a password in “New password”. Write protect status is released for 10 minutes by entering the password in “Enable wrt 10 min”.
Setting the password:
Hotkey → New password
Enter new password to change state of write.
Hotkey → Enable wrt 10 min
“Enable Write” release write protect status for 10 minutes.

While write protect status is released, enter a new password twice, within 30 sec in “New Password”.
It will not be possible to set a new password when 10 minutes have elapsed.
If a parameter, which is write enabled , is changed while the device is in “Enable wrt 10min”, release time is extended for further 10 minutes.

NOTE

• When the write protect function is active (its menu bar shows “Yes”), data setting changes in all parameters of RCC□3 are inhibited and cannot be changed using the HART communicator. Also the setting via the infrared pushbuttons is prohibited.
• If 8 characters are input as “space”, the Write protect function is in release status irrespective of time.
• If both RCC□3 and HART Communicator power off and on again within 10 minutes after releasing of write protect status, “Enable Write” becomes unavailable.

Software seal :
The “Software seal” menu is reserved as evidence so that user is able to confirm whether the Joker password is used or not. This evidence is saved.
Hotkey → Software seal
The first indication in Software seal menu is "keep".
After the joker password setting it shows "break".
After setting a new password and release via “Enable wrt 10 min”, the Software seal shows “keep” again.
Key Status :
Enable: Infrared keys are activated. Inhibit: Infrared keys are deactivated.
Master Reset :
Default : all parameters set to default except board constants, calibration constants, detector depending parameter and Concentration measuring settings in service menu.

6.5 Transmitting device variables via HART

While current output 1 is connected to a HART master it is possible to transmit up to 4 device variables named primary (PV), secondary (SV), tertiary (TV) and quaternary variable (QV). To select which measurement value will be transmitted in which place there are basically two ways.

• Setting via output configuration

The 4 device variables are linked to the settings of the corresponding output according to the table:

Device variable	Corresponding output (not option /KF2)	Corresponding output (option /KF2)
PV	Current output 1 (Iout 1)	Current output 1 (Iout 1)
SV	Current output 2 (Iout 2)	Not available [1)]
TV	Pulse output 1 (Pout) [1)]	Pulse output 1 (Pout) [1)]
QV	Pulse output 2 (Sout) [1)]	Not available v

The unit, in which the device variable is transmitted, is taken from the unit of the corresponding measurement value as shown on the display. To change the order of the device variables, the output configuration has to be changed.

[1)] If one of the outputs is not available (option /KF2) or Pulse output 1/2 is configured as Status output or No Function, the corresponding device variable can be freely selected via HART output configuration menu (see Chapter 7.15).

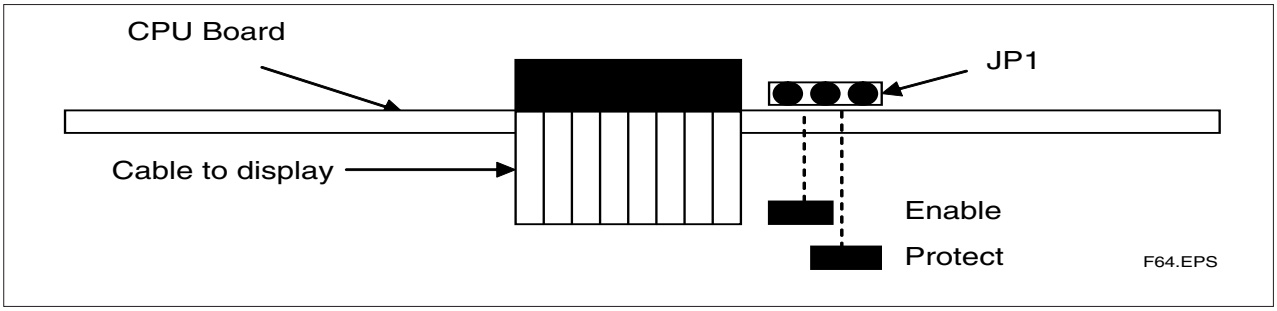
• Setting via HART

For setting the device variables there are the two common practice commands #51 (assignment of device variables) and #53 (unit of device variables). These commands are typically used by other HART devices like multiplexers.
Since the device variables are linked to the output configuration sending one of this commands will change the output configuration of ROTAMASS!

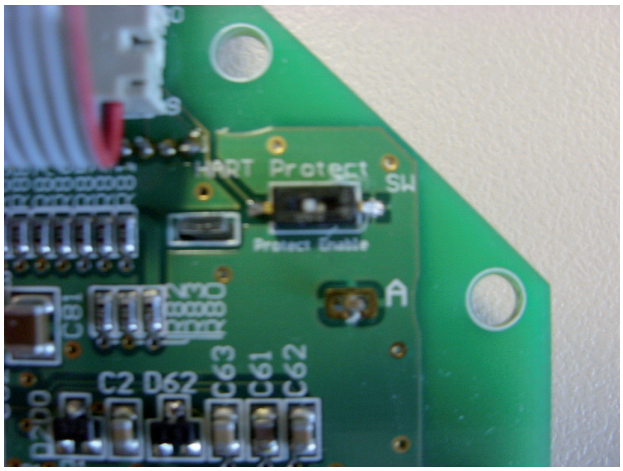
6.6 Hardware Write Protect

If software write protection via password is not suitable to protect the access to the converter, a hardware write protection can be set:

- Open the cover of the converter.
- Unscrew the 4 screws of the display and move the display aside.
- Set the jumper on JP1 of CPU-board to "Protect" as shown in the following picture.



Additionally the protect switch on display board must be set to "Protect":



The activated hard write protection is indicated on display via a lock symbol in the upper right corner (see Chapter 5.1 General display indication).

Screw the display and close the cover.
The hardware write protection is prior to any other write protection, and cannot be released by HART or other software means.

7. PARAMETER DESCRIPTION

7.1 Overview

The table below shows an overview of functions of ROTAMASS RCCT3/RCCF31/RCCR31.
In brackets the related chapters in this manual are indicated.

Topic	Parameters													
Hot key (6.3)	Write Protect HART	Enable wrt 10min. HART	New Password HART	Software seal HART	Key Status HART		Hardware Write Protect (6.4)							
Mass flow (7.5)	Mass flow unit	Mass flow format	Mass flow LRV	Mass flow URV	Mass flow damping	Mass flow lowcut	Mass flow alm 1sel	Mass flow alm1 crit	Mass flow alm 2 sel	Mass flow alm 2 crit	MF fix val sel	MF fixed value		
Volume flow (7.6)	Vol flow unit	Vol flow format	Vol flow LRV	Vol flow URV	Vol flow damping	Vol flow lowcut	Vol flow alm 1 sel	Vol flow alm 1 crit	Vol flow alm 2 sel	Vol flow alm 2 crit				
Density (7.7))	Density unit	Density format	Density LRV	Density URV	Density damping	Density lowcut	Density alm 1 sel	Density alm 1 crit	Density alm 2 sel	Density alm 2 crit	Ref. Density sel	Reference density	Density offset	Static pressure control
Temperature (7.8)	Temperature unit	Temperature format	Temperature LRV	Temperature URV	Temperature damping	Temperature alm 1 sel	Temperature alm 1 crit	Temperature alm 2 sel	Temperature alm 2 crit	Temperature fix val select	Temperature fixed value	Temperature Gain adjust		
Velocity (7.9)	Velocity unit													
Analog Output 1 (7.10)	Analog 1 select	Analog 1 alarm out	Analog 1 low LMT	Analog 1 high LMT										
Analog Output 2 (7.11)	Analog 2 select	Analog 2 alarm out	Analog 2 low LMT	Analog 2 high LMT										
Pulse/Status out 1 (7.12)	Pulse/Stat 1 select	Pulse 1 select	Pulse 1 unit	Pulse 1 rate	Pulse 1 active mode	Pulse 1 width	Pulse 1 at alarm	SO1 function	SO1 active mode					
Pulse/Status out 2 (7.13)	Pulse/Stat 2 select	Pulse 2 select	Pulse 2 unit	Pulse 2 rate	Pulse 2 active mode	Pulse 2 width	Pulse 2 at alarm	SO2 function	SO2 active mode					
Status input (7.14)	SI function	SI active mode												
HART Output (7.15)	PV is	SV is	TV is	QV is										
Totalizer (7.16)	Total flex select	Total flex unit	Total mass unit	Total volume unit	Total net unit	Total energy unit	Heat of combustion	Heat of combustion unit	Total switch select	Total limit switch	Total at alarm	Total reset cntrl	Total reset	
Display (5)	Display select	Disp. contrast	Dips. period	Language										
Diag/Service (8)	Self test/ status (8.3)	Input/ Output Test (8.4)	Zero adjustment (5.6)	Autozero (7.24)	Output trim (8.5)	History overview (8.2)	Error history (8.2)							
Special functions	Flow direction (7.17)	Concentration measurement (7.18)	Net flow (7.19)	Slug detection (7.20)	Empty pipe detection (7.21)	Corrosion detection (7.22)	Fluid max. Temp. (7.25)	Gas measurement (7.26)						
Detector data (7.23)	Sensor model	Sensor constants	Sensor S/N											
Device data	Distributor	Tag	Long Tag	Descriptor	Message	Date	Dev id	Universal rev	Fld dev rev	Software rev	Hardware rev	Device S/W version	Device S/W date	
HART data	Poll address	Num req preams	Num resp preams	Master reset										

Differences between display and HART setting

The ROTAMASS software is continuously improved. This leads to functions, which are different in HART (DD version 0402) and display setting (software version from 1.08.20)

NOTE

For ROTAMASS with software version 1.08.xx (xx < 20) the parameters marked with "*)" are not available. Parameters marked with "**)" are not available in software version from 1.08.20.

7.2 Parameter list

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Write protect	Select	No	-	-	R/W			-
		Yes						
Enable WRT 10 min		Acc. To HART	-	-	R/W	X		Disable
New Password	ASCII	8 characters	-	-	R/W	X		Space
Software Seal	Select	Break	-	-	R/W			-
		Keep						
Master reset	Select	Not Execute	-	-	R/W	X		Not Execute
		Execute						
Key Status	Select	Enable	-	-	R/W			Enable
		Inhibit						
Language	Select	English	-	-	R/W	X		English
		German						
		French						
		Russian						
Mass Flow	Decimal	-	0 to 5	Mass flow unit	R		-	-
Volume Flow	Decimal	-	0 to 5	Vol flow unit	R		-	-
Density	Decimal	-	0 to 5	Density unit	R		-	-
Temperature	Decimal	-	0 to 5	Temperature unit	R		-	-
F-Total flex	Decimal	-	Auto	Total flex unit	R	X	-	-
R-Total flex	Decimal	-	Auto	Total flex unit	R	X	-	-
D-Total flex	Decimal	-	Auto	Total flex unit	R	X	-	-
F-Total mass	Decimal	-	Auto	Total mass unit	R	X	-	-
R-Total mass	Decimal	-	Auto	Total mass unit	R	X	-	-
D-Total mass	Decimal	-	Auto	Total mass unit	R	X	-	-
F-Total vol	Decimal	-	Auto	Total volume unit	R	X	-	-
R-Total vol	Decimal	-	Auto	Total volume unit	R	X	-	-
D-Total vol	Decimal	-	Auto	Total volume unit	R	X	-	-
F-Total net	Decimal	-	Auto	Total net unit	R	X	-	-
R-Total net	Decimal	-	Auto	Total net unit	R	X	-	-
D-Total net	Decimal	-	Auto	Total net unit	R	X	-	-
Concentration meas	Decimal	0 to 110	0 to 5	Concentration meas unit	R		-	-
Net flow	Decimal	-	0 to 5	Mass flow unit	R		-	-
F-Total energy	Decimal	-	Auto	Total unit energy	R	X	-	-
Velocity	Decimal	-	Auto	Velocity unit	R		-	-
Drive gain	Decimal	0 to 11 (typ.)	3	V	R		-	-
Analog output 1	Decimal	-	As sel. Var.	As sel. Var.	R		-	-
Analog output 1%	Decimal	-	2	%	R		-	-

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Analog output 1 mA	Decimal	-	2	mA	R		-	-
Analog output 2	Decimal	-	as sel. Var.	as sel. Var.	R		-	-
Analog output 2%	Decimal	-	2	%	R		-	-
Analog output 2 mA	Decimal	-	2	mA	R		-	-
Pulse output 1	Decimal	-	1	Hz	R		-	-
Status output 1	ASCII	-	-	-	R		-	-
Pulse output 2	Decimal	-	1	Hz	R		-	-
Status output 2	ASCII	-	-	-	R		-	-
View input	ASCII	-	-	-	R		-	-
Self Test	Select	Not Execute	-	-	R/W		X	Not Execute
		Execute						
Status	ASCII	Results of last self test	-	-	R		-	-
Hist Overview ord	ASCII	-	-	-	R		-	-
Hist Overview abs	ASCII	-	-	-	R		-	-
Error History	ASCII	-	-	-	R		-	-
Analog output 1 (Test)	Decimal	2.0 to 22.0	2	mA	W	X	X	4
Analog output 2 (Test)	Decimal	2.0 to 22.0	2	mA	W	X	X	4
Pulse output 1 (Test)	Decimal	0 to 10000	1	Hz	W	X	X	1000
Status Output 1 (Test)	Select	On Active	-	-	W	X	X	On Active
		Off Active						
Pulse output 2 (Test)	Decimal	0 to 2000	1	Hz	W	X	X	1000
Status Output 2 (Test)	Select	On Active	-	-	W	X	X	On Active
		Off Active						
Status input (Test)	ASCII	Open/Short	-	-	R		-	-
Autozero tuning	Select	Inhibit	-	-	R/W	X	X	Inhibit
		Enable						
Autozero Time	Select	3 min	-	-	R/W	X	X	3 min
		30 s						
Autozero Exe	Select	Not Execute	-	-	Exe	X	X	Not Execute
		Execute						
Autozero Value	Decimal	depends on size	3	kg/h	R	X		0
Autozero History	ASCII	-	-	-	R	X	-	-
Autozero initial	Decimal	depends on size	3	kg/h	R	X	-	-
Autozero range	Decimal	depends on size	3	kg/h	R		-	-
Autozero fluctuation range	Decimal	depends on size	3	kg/h	R	X	-	-
Output Trim AO 1 trim 4mA	Decimal	ACC To HART	-	-	R/W		-	0
Output Trim AO 2 trim 4mA	Decimal	ACC To HART	-	-	R/W		-	0
Output Trim AO 1 trim 20mA	Decimal	ACC To HART	-	-	R/W		-	0
Output Trim AO 2 trim 20mA	Decimal	ACC To HART	-	-	R/W		-	0
Tag	ASCII	8 characters	-	-	R/W			Space
Long Tag	ASCII	22 characters	-	-	R/W			Space

IM 01R04B04-00E-E 11th edition April 01, 2015 -00

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Disp select 1	Select	Mass flow	-	-	R/W	X		Mass flow
		Volume flow						
		Density						
		Temperature						
		Concentration						
		Net flow						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						
Disp select 2	Select	Mass flow	-	-	R/W	X		Density
		Volume flow						
		Density						
		Temperature						
		Concentration						
		Net flow						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						
		None						

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Disp select 3	Select	Mass flow	-	-	R/W	X		Temperature
		Volume flow						
		Density						
		Temperature						
		Concentration						
		Net flow						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						
		None						
Disp select 4	Select	Mass flow	-	-	R/W	X		F-Total mass
		Volume flow						
		Density						
		Temperature						
		Concentration						
		Net flow						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						
		None						

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Disp contrast	Select	-5	-	-	R/W	X		0
		-4						
		-3						
		-2						
		-1						
		0						
		1						
		2						
		3						
		4						
		5						
Disp Period	Select	0.5 s	-	-	R/W	X		1.0 s
		1.0 s						
		2.0 s						
Flow direction	Select	Forward	-	-	R/W	X		Forward
		Reverse						
Mass flow unit	Select	g/s	-	-	R/W	X		RCCS30LR …33: kg/h
		g/min						
		g/h						RCCS34…39/ XR: t/h
		kg/s						
		kg/min						
		kg/h						
		kg/d						
		t/min						
		t/h						
		t/d						
		lb/s						
		lb/min						
		lb/h						
		lb/d						
Mass flow format	Select	xxxxxxx	-	-	R/W	X		xxxx.XX
		xxxxx.X						
		xxxx.XX						
		xxx.XXX						
		xx.XXXX						
		x.XXXXX						
Mass flow LRV	Decimal	-Qmax to Qmax	0 to 5	Mass flow unit	R/W	X		0
Mass flow URV	Decimal	-Qmax to Qmax	0 to 5	Mass flow unit	R/W	X		Qnom
Mass flow damping	Decimal	0 to 200	1	Sec.	R/W	X		3
Mass flow lowcut	Decimal	0 to Qmax	0 to 5	Mass flow unit	R/W	X		0
Mass flow alm 1 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Mass flow alm 1 crit	Decimal	-110% to 110% of URV	0 to 5	Mass flow unit	R/W	X		0
Mass flow alm 2 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Mass flow alm 2 crit	Decimal	-110% to 110% of URV	0 to 5	Mass flow unit	R/W	X		10
Mass flow fix val sel	Select	Inhibit	-	-	R/W	X		Inhibit
		Enable						
Mass flow fixed val	Decimal	-Qnom to Qnom	0 to 5	Mass flow unit	R/W	X		0

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Vol flow unit	Select	cm^3/s	-	-	R/W	X		RCCS30LR …33: l/h
		cm^3/min						
		cm^3/h						RCCS34…39/ XR: m^3/h
		l/s						
		l/min						
		l/h						
		l/d						
		m^3/s						
		m^3/min						
		m^3/h						
		m^3/d						
		gal/s						
		gal/min						
		gal/h						
		gal/d						
		Cuft/s						
		Cuft/min						
		Cuft/h						
		Cuft/d						
		bbl/s						
		bbl/min						
		bbl/h						
		bbl/d						
		Impgal/s						
		Impgal/min						
		Impgal/h						
		Impgal/d						
		l(N)/s						
		l(N)/min						
		l(N)/h						
		l(N)/d						
		$m^3(N)/s$						
		$m^3(N)/min$						
		$m^3(N)/h$						
		$m^3(N)/d$						
		Sl/s						
		Sl/min						
		Sl/h						
		Sl/d						
		Scuft/s						
		Scuft/min						
		Scuft/h						
		Scuft/d						
		Sm^3/s						
		Sm^3/min						
		Sm^3/h						
		Sm^3/d						
Vol flow format	Select	xxxxxxx	-	-	R/W	X		xxxx.XX
		xxxxx.X						
		xxxx.XX						
		xxx.XXX						
		xx.XXXX						
		x.XXXXX						

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Vol flow LRV	Decimal	-Qvmax to Qvmax	0 to 5	Vol flow unit	R/W	X		0
Vol flow URV	Decimal	-Qvmax to Qvmax	0 to 5	Vol flow unit	R/W	X		Qvnom
Vol flow damping	Decimal	0 to 200	1	Sec.	R/W	X		3
Vol flow lowcut	Decimal	-Qvmax to Qvmax	0 to 5	Vol flow unit	R/W	X		0
Vol flow alm 1 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Vol flow alm 1 crit	Decimal	-110% to 110% of URV	0 to 5	Vol flow unit	R/W	X		0
Vol flow alm 2 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Vol flow alm 2 crit	Decimal	-110% to 110% of URV	0 to 5	Vol flow unit	R/W	X		10
Density unit	Select	g/ml	-	-	R/W	X		kg/l
		kg/l						
		kg/m³						
		lb/gal						
		lb/Cuft						
		g/cm³						
		g/l						
		°Bé hv						
		°Bé lt						
		°API						
Density format	Select	xxxxxxx	-	-	R/W	X		xx.XXXX
		xxxxx.X						
		xxxx.XX						
		xxx.XXX						
		xx.XXXX						
		x.XXXXX						
Density LRV	Decimal	0 to 5 kg/l	0 to 5	Density unit	R/W	X		0.0
Density URV	Decimal	0 to 5 kg/l	0 to 5	Density unit	R/W	X		1.5
Density damping	Decimal	0 to 200	1	Sec.	R/W	X		15.0
Density lowcut	Decimal	0 to 5 kg/l	0 to 5	Density unit	R/W	X		0.0
Density alm 1 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Density alm1 crit	Decimal	0 to 5 kg/l	0 to 5	Density unit	R/W	X		LRV
Density alm 2 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Density alm 2 crit	Decimal	0 to 5 kg/l	0 to 5	Density unit	R/W	X		URV
Ref. Density sel *)	Select	Inhibit	-	-	R/W	X		Inhibit
		Fixed						
		Calculated						
Density fix val sel **)	Select	Inhibit	-	-	R/W	X		Inhibit
		Enable						
Reference Density	Decimal	0 to 5 kg/l	0 to 5	Density unit	R/W	X		1.0
Density offset	Decimal	-9999.99 to +9999.99	2	g/l	R/W	X		0
Pressure	Decimal	0 to 400	2	bar	R/W			0
Pressure unit	Select	bar	-	-	R/W			bar
		psi						
		MPa						

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Temperature unit	Select	degC	-	-	R/W	X		degC
		degF						
		K						
Temperature format	Select	xxxxxxx	-	-	R/W	X		xxxxxx.X
		xxxxx.X						
		xxxx.XX						
		xxx.XXX						
		xx.XXXX						
		x.XXXXX						
Temperature LRV	Decimal	Standard: -200 to 230°C	0 to 5	Temperature unit	R/W	X		-200
		High Temp.: 0 to 400°C						
Temperature URV	Decimal	Standard: -200 to 230°C	0 to 5	Temperature unit	R/W	X		230
		High Temp.: 0 to 400°C						
Temperature damping	Decimal	0 to 200	1	Sec.	R/W	X		3
Temp alm 1 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Temp alm 1 crit	Decimal	Standard: -200 to 200°C	0 to 5	Temperature unit	R/W	X		LRV
Temp alm 2 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Temp alm 2 crit	Decimal	Standard: -200 to 230°C	0 to 5	Temperature unit	R/W	X		URV
		High Temp.: 0 to 400°C						
Temp fix val select	Select	Inhibit	-	-	R/W	X	X	Inhibit
		Enable						
Temp fixed val	Decimal	Standard: -200 to 230°C	1	Temperature unit	R/W	X	X	30
		High Temp.: 0 to 400°C						
Temp gain	Decimal	0.8 to 1.2	3	-	R/W			1
Velocity unit	Select	m/s	-	-	R/W	X		m/s
		ft/s						
Analog 1 select	Select	Mass flow	-	-	R/W	X		Mass flow
		Volume flow						
		Density						
		Temperature						
		Concentration meas						
		Net flow						
		None						
Analog 1 alarm out	Select	<2.4mA	-	-	R/W	X		>21.6mA
		<3.6mA						
		4.0mA						
		>21mA						
		>21.6mA						
		Hold						
		Measured Value						
Analog 1 low LMT	Decimal	2.4 to 21.6 mA	2	mA	R/W	X		2.4
Analog 1 high LMT	Decimal	2.4 to 21.6 mA	2	mA	R/W	X		21.6
Analog 2 select	Select	Mass flow	-	-	R/W	X		Density
		Volume flow						
		Density						
		Temperature						
		Concentration meas						
		Net flow						
		None						

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Analog 2 alarm out	Select	<2.4mA	-	-	R/W	X		>21.6mA
		<3.6mA						
		4.0mA						
		>21mA						
		>21.6mA						
		Hold						
		Measured Value						
Analog 2 low LMT	Decimal	2.4 to 21.6 mA	2	mA	R/W	X		2.4
Analog 2 high LMT	Decimal	2.4 to 21.6 mA	2	mA	R/W	X		21.6
Pulse/Stat 1 select	Select	Pulse	-	-	R/W	X		Pulse
		Status out						
		No function						
Pulse 1 select	Select	Mass flow	-	-	R/W	X		F-Total mass
		Volume flow						
		Density						
		Temperature						
		Concentration						
		Net flow						
		None						
		F-Total mass						
		R-Total mass						
		F-Total volume						
		R-Total volume						
		F-Total net						
		R-Total net						
Pulse 1 unit	Select	Hz	-	-	R/W	X		kg/P
		g/P						
		kg/P						
		t/P						
		lb/P						
		cm^3/P						
		l/P						
		m^3/P						
		gal/P						
		kgal/P						
		Cuft/P						
		bbl/P						
		Impgal/P						
		klmpgal/P						
		l(N)/P						
		$m^3(N)/P$						
		Sl/P						
		Scuft/P						
		Sm^3/P						
Pulse 1 rate	Decimal	0 to 11000 Unit/ P 0 to 10000 Hz	0 to 5 0	Pulse 1 unit	R/W	X		1 kg/P
Pulse 1 active mode	Select	On Active	-	-	R/W	X		On Active
		Off Active						

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Pulse 1 width	Select	0.05ms	-	-	R/W	X		1ms
		0.1ms						
		0.5ms						
		1ms						
		5ms						
		10ms						
		50ms						
		100ms						
		500ms						
		1000ms						
Pulse 1 at alarm	Select	0P/0Hz	-	-	R/W	X		0P/Hz
		Measured Value						
		Hold						
SO 1 function	Select	No function	-	-	R/W	X		No function
		Flow-Direction						
		Total limit switch						
		Mass flow alm 1						
		Mass flow alm 2						
		Mass flow alm 1+2						
		Vol flow alm 1						
		Vol flow alm 2						
		Vol flow alm 1+2						
		Density alm 1						
		Density alm 2						
		Density alm 1+2						
		Temp alm 1						
		Temp alm 2						
		Temp alm 1+2						
		Concentr. meas alm 1						
		Concentr. meas alm 2						
		Concentr. meas alm 1+2						
		Net flow alm 1						
		Net flow alm 2						
		Net flow alm 1+2						
		Slug alarm						
		Empty alarm						
		Corrosion alarm						
		All alarms						
		All errors						
		All alarms & errors						
SO 1 active mode	Select	On Active	-	-	R/W	X		On Active
		Off Active						
Pulse/Stat 2 select	Select	Pulse	-	-	R/W	X		Status out
		Status out						
		No function						

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Pulse 2 select	Select	Mass flow	-	-	R/W	X		Temperature
		Volume flow						
		Density						
		Temperature						
		Concentration						
		Net flow						
		None						
		F-Total mass						
		R-Total mass						
		F-Total volume						
		R-Total volume						
		F-Total net						
		R-Total net						
Pulse 2 unit	Select	Hz	-	-	R/W	X		Hz
		g/P						
		kg/P						
		t/P						
		lb/P						
		cm^3/P						
		l/P						
		m^3/P						
		gal/P						
		kgal/P						
		Cuft/P						
		bbl/P						
		Impgal/P						
		klmpgal/P						
		l(N)/P						
		m^3(N)/P						
		Sl/P						
		Scuft/P						
		Sm^3/P						
Pulse 2 rate	Decimal	0 to 11000 Unit/P 0 to 2000 Hz	0 to 5 0	Pulse 2 unit	R/W	X		2000 Hz
Pulse 2 active mode	Select	On Active	-	-	R/W	X		On Active
		Off Active						
Pulse 2 width	Select	0.05ms	-	-	R/W			1ms
		0.1ms						
		0.5ms						
		1ms						
		5ms						
		10ms						
		50ms						
		100ms						
		500ms						
		1000ms						
Pulse 2 at alarm	Select	0P/0Hz	-	-	R/W	X		0P/0Hz
		Measured Value						
		Hold						

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
SO 2 function	Select	No function	-	-	R/W	X		No Function
		Flow-Direction						
		Total limit switch						
		Mass flow alm 1						
		Mass flow alm 2						
		Mass flow alm 1+2						
		Vol flow alm 1						
		Vol flow alm 2						
		Vol flow alm 1+2						
		Density alm 1						
		Density alm 2						
		Density alm 1+2						
		Temp alm 1						
		Temp alm 2						
		Temp alm 1+2						
		Concentr. meas alm 1						
		Concentr. meas alm 2						
		Concentr. meas alm 1+2						
		Net flow alm 1						
		Net flow alm 2						
		Net flow alm 1+2						
		Slug alarm						
		Empty alarm						
		Corrosion alarm						
		All alarms						
		All errors						
		All alarms & errors						
SO 2 active mode	Select	On active	-	-	R/W	X		On active
		Off active						
PV is	Select	Mass flow	-	-	R/W	X		Mass flow
		Volume flow						
		Density						
		Temperature						
		Concentration meas						
		Net flow						
		None						

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
SV is	Select	Mass flow	-	-	R/W	X		Density
		Volume flow						
		Density						
		Temperature						
		Concentration meas						
		Net flow						
		None						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						
TV is	Select	Mass flow	-	-	R/W	X		F-Total mass
		Volume flow						
		Density						
		Temperature						
		Concentration meas						
		Net flow						
		None						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
QV is	Select	Mass flow	-	-	R/W	X		Temperature
		Volume flow						
		Density						
		Temperature						
		Concentration meas						
		Net flow						
		None						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						
SI function	Select	No function	-	-	R/W	X		No function
		Autozero						
		Reset flex totals						
		Reset mass totals						
		Reset volume totals						
		Reset net totals						
		Reset all totals						
		0% Signal lock						
SI Active mode	Select	On active	-	-	R/W	X		On Active
		Off active						
Total switch select	Select	Flex total	-	-	R/W	X		Flex total
		Mass total						
		Volume total						
		Net total						

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Total flex unit	Select	g	-	-	R/W	X		kg
		kg						
		t						
		lb						
		cm^3						
		l						
		m^3						
		gal						
		kgal						
		Cuft						
		bbl						
		Impgal						
		klmpgal						
		l(N)						
		m^3(N)						
		Sl						
		Scuft						
		MMscuft						
		Sm^3						
Total mass unit	Select	g	-	-	R/W	X		kg
		kg						
		t						
		lb						
Total volume unit	Select	cm^3	-	-	R/W	X		l
		l						
		m^3						
		gal						
		kgal						
		Cuft						
		bbl						
		Impgal						
		klmpgal						
		l(N)						
		m^3(N)						
		Sl						
		Scuft						
		MMscuft						
		Sm^3						
Total net unit	Select	g	-	-	R/W	X		kg
		kg						
		t						
		lb						
		cm^3						
		l						
		m^3						
		gal						
		kgal						
		Cuft						
		bbl						
		Impgal						
		klmpgal						
Total flex select	Select	Mass	-	-	R/W	X		Mass
		Volume						
		Net						

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Total limit switch	Decimal	0 to 9999999	0 to 5	Total unit	R/W	X		0
Total unit energy	Select	MJ	-	-	R/W	X		MJ
		Btu						
Energy factor/ heat of combustion	Decimal	0 to 100000	0 to 5	heat of combust unit	R/W			10
Energy factor/ heat of combust unit	Select	MJ/kg	-	-	R/W	X		MJ/kg
		Btu/lb						
		MJ/m³(N)						
		Btu/Scuft						
Total at alarm	Select	Hold	-	-	R/W	X		Hold
		Continue Total						
Total reset cntrl	Select	Inhibit	-	-	R/W	X		Enable
		Enable						
Total reset	Select	Not Execute	-	-	R/W	X	X	Not Execute
		Reset flex totals						
		Reset mass totals						
		Reset volume totals						
		Reset net totals						
		Reset all totals						
SK20	Decimal		0 to 5	MHz×kg/h	R/W			124
SKT	Decimal		0 to 5	E-4×1/K	R/W			-7,34
SKTK	Decimal		0 to 5	E-7×1/K²	R/W			19,6
RV	Decimal		0 to 5	%/(kg/l)	R/W			0,24
Qnom	Decimal		auto	Mass flow unit	R			10
KD	Decimal		0 to 5	kg/l	R/W			4,4
fl20	Decimal		0 to 5	Hz	R/W			177,1
FTC1	Decimal		0 to 5	E-4×1/K	R/W			-2,179
FTCK	Decimal		0 to 5	E-7×1/K²	R/W			-0,539
SKP	Decimal		0 to 5	E-4×1/bar	R/W			-0,346
SKPT	Decimal		0 to 5	E-7×1/(bar×K)	R/W			0
FPC	Decimal		0 to 5	E-4×1/bar	R/W			0,173
FPTC	Decimal		0 to 5	E-7×1/(bar×K)	R/W			0,02
FQC1	Decimal		0 to 5	E-10×s/g	R/W			0
FQC2	Decimal		0 to 5	E-13×(s/g)²	R/W			-40,8
Poll Adress	Decimal	0 to 15	0	-	R/W			0
Num req pream	Decimal		0	-	R			5
Num resp pream	Decimal	5 to 20	0	-	R/W			5
Reference temperature	Decimal		1	Temperature unit	R/W	X		25
Ref. density carrier	Decimal		0 to 5	Density unit	R/W	X		0,997
Temp. coeff. a carrier	Decimal		0 to 5	E-3×(1/Temp unit)	R/W	X		-0,261
Temp. coeff. b carrier	Decimal		0 to 5	E-5×(1/Temp unit²)	R/W	X		-0,36
Ref. density product	Decimal		0 to 5	Density unit	R/W	X		0
Temp. coeff. a product	Decimal		0 to 5	E-3×(1/Temp unit)	R/W	X		0
Temp. coeff. b product	Decimal		0 to 5	E-5×(1/Temp unit²)	R/W	X		0
Temp. coeff. a *)	Decimal		0 to 5	E-3×(1/Temp unit)	R/W	X		0
Temp. coeff. b *)	Decimal		0 to 5	E-5×(1/Temp unit²)	R/W	X		0
Concentration meas unit	Select	°Brix	-	-	R/W	X		Wt-%
		Wt -% sol				X		
		Vol % sol				X		
		Wt -%				X		
		Vol %				X		

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Concentration meas format	Select	xxxxxxx	-	-	R/W	X		xxxx.XX
		xxxxx.X				X		
		xxxx.XX				X		
		xxx.XXX				X		
		xx.XXXX				X		
		x.XXXXX				X		
Concentration meas LRV	Decimal	0 to 110	0 to 5	Concentration meas unit	R/W	X		0
Concentration meas URV	Decimal	0 to 110	0 to 5	Concentration meas unit	R/W	X		100
Concentration meas Damp	Decimal	0 to 200	1	Sec	R/W	X		10
Concentration meas lowcut	Decimal	0 to 10%	0 to 5	Concentration meas unit	R/W			0
Conc meas alm 1 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Conc meas alm 1 crit	Decimal	0 to 110% of URV	0 to 5	Concentration meas unit	R/W	X		LRV
Conc meas alm 2 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Conc meas alm 2 crit	Decimal	0 to 110% of URV	0 to 5	Concentration meas unit	R/W	X		URV
Net flow select	Select	Mass	-	-	R/W	X		Mass
		Volume						

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Net flow unit	Select	g/s	-	-	R/W	X		RCCS30LR-33:
		g/min						kg/h
		g/h						RCCS34-39/ XR: t/h
		kg/s						
		kg/min						
		kg/h						
		t/min						
		t/h						
		lb/s						
		lb/min						
		lb/h						
		cm^3/s						
		cm^3/min						
		cm^3/h						
		l/s						
		l/min						
		l/h						
		l/d						
		m^3/s						
		m^3/min						
		m^3/h						
		m^3/d						
		gal/s						
		gal/min						
		gal/h						
		gal/d						
		Cuft/s						
		Cuft/min						
		Cuft/h						
		Cuft/d						
		bbl/s						
		bbl/min						
		bbl/h						
		bbl/d						
		Impgal/s						
		Impgal/min						
		Impgal/h						
		Impgal/d						
Net flow format	Select	xxxxxxx	-	-	R/W	X		xxxx.XX
		xxxxx.X						
		xxxx.XX						
		xxx.XXX						
		xx.XXXX						
		x.XXXXX						
Net flow LRV	Decimal	-Qmax to Qmax	0 to 5	Net flow unit	R/W	X		0
Net flow URV	Decimal	-Qmax to Qmax	0 to 5	Net flow unit	R/W	X		Qnom
Net flow damping	Decimal	0 to 200	1	Sec	R/W	X		3
Net flow lowcut	Decimal	-Qmax to Qmax	0 to 5	Net flow unit	R/W	X		0.0
Net flow alm 1 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Net flow alm 1 crit	Decimal	-110% to 110% of URV	0 to 5	Net flow unit	R/W	X		LRV

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Net flow alm 2 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Net flow alm 2 crit	Decimal	-110% to 110% of URV	0 to 5	Net flow unit	R/W	X		URV
Measuring range	Select	Namur	-	-	R			Not Namur
		Not Namur						
Slug alarm select	Select	Not Apply	-	-	R/W	X		Not Apply
		Apply						
Drive gain	Decimal	0 to 11 (typ.)	3	V	R			-
Slug criteria	Decimal	0 to 13.3	3	V	R/W	X		11
Slug duration	Decimal	0 to 120	0	Sec.	R/W	X		1
After slug	Select	Measured value	-	-	R/W	X		Measured value
		Hold						
Drive gain damping	Decimal	0 to 200	1	Sec.	R/W	X		1
Empty pipe alm sel	Select	Not Apply	-	-	R/W	X		Not Apply
		Apply						
Empty pipe crit	Decimal	0 to Density URV	0 to 5	Density unit	R/W	X		0
After empty pipe	Select	Massflow=Zero	-	-	R/W	X		Massflow=
		Measured value						Zero
		Hold						
Corrosion alm sel	Select	Not Apply	-	-	R/W	X		Not Apply
		Apply						
Corrosion criteria	Decimal	0 to Density URV	0 to 5	Density unit	R/W	X		1,5
Corrosion damp	Decimal	0 to 10	1	h	R/W	X		10
Fluid max temp	Decimal	-	1	Temperature unit	R			-
Distributor	ASCII	-	-	-	R			Yokogawa
Descriptor	ASCII	16 characters	-	-	R/W			Space
Message	ASCII	32 characters	-	-	R/W			Space
Date	ASCII	dd/mm/yyyy	-	-	R/W			01/01/2011
Sensor model	Select	RCCS30LR	-	-	R/W			RCCS36
		RCCS30						
		RCCS31						
		RCCS32						
		RCCS33						
		RCCS34						
		RCCS36						
		RCCS38						
		RCCS39						
		RCCS39/IR						
		RCCS39/XR						
Sensor S/N	Decimal	7 digits	-	-	R			0 (not used)
Assembly number	Decimal	7 digits	-	-	R			0 (not used)
Serial no. Converter	ASCII	16 char.	-	-	R			fix
Serial no. Detector	ASCII	16 char.	-	-	R			fix
Universal rev	Decimal	7 digits	-	-	R			fix
Fld. dev rev.	Decimal	3 digits	-	-	R			fix
Software rev	Decimal	3 digits	-	-	R			fix
Hardware rev	Decimal	3 digits	-	-	R			fix
Device id	Decimal	7 digits	-	-	R			7xxxxxx
Device S/W version	ASCII	20 char.	-	-	R			RCCT3 Vx.xx.xx Rx-x-x
Device S/W date	ASCII	dd/mm/yyyy	-	-	R			xx/xx/xxxx

7.3 Parameter tree, Display menu

Language	English				
	German				
	French				
	Russian				

Process Variables	View fld dev vars	Mass flow			R
		Volume flow			R
		Density			R
		Temperature			R
		Concentration meas			R
		Net flow			R
		F-Total flex			R
		R-Total flex			R
		D-Total flex			R
		F-Total mass			R
		R-Total mass			R
		D-Total mass			R
		F-Total volume			R
		R-Total volume			R
		D-Total volume			R
		F-Total net			R
		R-Total net			R
		D-Total net			R
		F-Total energy			R
		Velocity			R
		Drive gain			R
	View outputs	Analog output 1	Analog Output 1		R
			Analog Output 1%		R
			Analog Output 1mA		R
		Analog output 2	Analog Output 2		R
			Analog Output 2%		R
			Analog Output 2mA		R
		Pulse/Status out 1	Pulse output 1		R
			Status output 1		R
		Pulse/Status out 2	Pulse output 2		R
			Status output 2		R
	View input				R
	Totalizer	Total reset cntrl	Inhibit		Sel
			Enable		
			Total reset	Not Execute	
				Reset flex totals	EXE
				Reset mass totals	EXE
				Reset volume totals	EXE
				Reset net totals	EXE
				Reset all totals	EXE

Diag/Service	Self test/Status	Self Test	LCD Test	EXE
			Self Test	EXE
			Key Test	EXE
		Status	Event Overview	R
			Error	R
			Alarm	R
			Warning	R
		Hist Overfiew ord	Hist Overview ord	R
			Clear History	EXE
		Hist Overfiew abs	Hist Overview abs	R
			Error	R
			Alarm	R
			Warning	R
			Clear History	EXE
		Error History		R
	Input/Output test	Analog output 1		R/W
		Analog output 2		R/W
		Pulse output 1		R/W
		Status output 1		R/W
		Pulse output 2		R/W
		Status output 2		R/W
		Status input		R
	Auto zero check	Autozero history		R
		Autozero initial		R
		Autozero range		R
		Autozero fluctuation range		R
	Autozero	Zero tuning	**Inhibit**	Sel
			Enable	
		Autozero time	**3min**	Sel
			30s	
		Autozero Exe		EXE
		Autozero value		R
	Output trim	AO 1 trim 4mA		EXE
		AO 1 trim 20mA		EXE
		AO 2 trim 4mA		EXE
		AO 2 trim 20mA		EXE

Basic Setup	Tag			R/W
	Long Tag			R/W
	Display config	Disp select 1	**Mass flow**	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
		Disp select 2	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
			None	

Basic Setup		Disp select 3	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
			None	
		Disp select 4	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
			None	

Basic Setup		Display contrast	-5	Sel
			-4	
			-3	
			-2	
			-1	
			0	
			+1	
			+2	
			+3	
			+4	
			+5	
	Mass flow	Mass flow unit	g/s	Sel
			g/min	
			g/h	
			kg/s	
			kg/min	
			kg/h	
			kg/d	
			t/min	
			t/h	
			t/d	
			lb/s	
			lb/min	
			lb/h	
			lb/d	
		Mass flow LRV		R/W
		Mass flow URV		R/W
		Mass flow damping		R/W
	Density	Density unit	g/ml	Sel
			kg/l	
			kg/m³	
			lb/gal	
			lb/Cuft	
			g/cm³	
			g/l	
			°Bé hv	
			°Bé lt	
			°API	
		Density LRV		R/W
		Density URV		R/W
		Density damping		R/W

Basic Setup	Temperature	Temperature unit	**degC**	Sel
			degF	
			K	
		Temperature LRV		R/W
		Temperature URV		R/W
		Temperature damping		R/W
	Analog 1 select	Mass flow		Sel
		Volume flow		
		Density		
		Temperature		
		Concentration meas		
		Net flow		
		None		
	Analog 2 select	Mass flow		Sel
		Volume flow		
		Density		
		Temperature		
		Concentration meas		
		Net flow		
		None		
	Pulse/Status out 1	Pulse/Stat 1 select	**Pulse**	Sel
			Status Out	
			No Function	
		Pulse 1 select	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			None	
			F-Total mass	
			R-Total mass	
			F-Total volume	
			R-Total volume	
			F-Total net	
			R-Total net	

Basic Setup		Pulse 1 unit	Hz	Sel
			g/P	
			kg/P	
			t/P	
			lb/P	
			cm^3/P	
			l/P	
			m^3/P	
			gal/P	
			kgal/P	
			Cuft/P	
			bbl/P	
			Impgal/P	
			kImpgal/P	
			I(N)/P	
			$m^3(N)/P$	
			Sl/P	
			Scuft/P	
			Sm^3/P	
		Pulse 1 rate		R/W
		SO 1 function	**No Function**	Sel
			Flow direction	
			Total limit switch	
			Mass flow alm 1	
			Mass flow alm 2	
			Mass flow alm 1+2	
			Vol flow alm 1	
			Vol flow alm 2	
			Vol flow alm 1+2	
			Density alm 1	
			Density alm 2	
			Density alm 1+2	
			Temp alm 1	
			Temp alm 2	
			Temp alm 1+2	
			Concentr. meas alm 1	
			Concentr. meas alm 2	
			Concentr. meas alm 1+2	
			Net flow alm 1	
			Net flow alm 2	
			Net flow alm 1+2	
			Slug Alarm	
			Empty alarm	
			Corrosion Alarm	
			All alarms	
			All errors	
			All alarms & errors	

Basic Setup	Pulse/Status out 2	Pulse/Stat 2 select	Pulse	Sel
			Status Out	
			No Function	
		Pulse 2 select	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			None	
			F-Total mass	
			R-Total mass	
			F-Total volume	
			R-Total volume	
			F-Total net	
			R-Total net	
		Pulse 2 unit	**Hz**	Sel
			g/P	
			kg/P	
			t/P	
			lb/P	
			cm^3/P	
			l/P	
			m^3/P	
			gal/P	
			kgal/P	
			Cuft/P	
			bbl/P	
			Impgal/P	
			klmpgal/P	
			I(N)/P	
			$m^3(N)/P$	
			SI/P	
			Scuft/P	
			Sm^3/P	
		Pulse 2 rate		R/W

Basic Setup		SO 2 function	**No Function**	Sel
			Flow direction	
			Total limit switch	
			Mass flow alm 1	
			Mass flow alm 2	
			Mass flow alm 1+2	
			Vol flow alm 1	
			Vol flow alm 2	
			Vol flow alm 1+2	
			Density alm 1	
			Density alm 2	
			Density alm 1+2	
			Temp alm 1	
			Temp alm 2	
			Temp alm 1+2	
			Concentr. meas alm 1	
			Concentr. meas alm 2	
			Concentr. meas alm 1+2	
			Net flow alm 1	
			Net flow alm 2	
			Net flow alm 1+2	
			Slug Alarm	
			Empty alarm	
			Corrosion Alarm	
			All alarms	
			All errors	
			All alarms & errors	
	SI function	**No function**		Sel
		Autozero		
		Reset flex totals		
		Reset mass totals		
		Reset volume totals		
		Reset net totals		
		Reset all totals		
		0% signal lock		
	Totalizer	Total flex select	**Mass**	Sel
			Volume	
			Net	

Basic Setup		Total flex unit	g	Sel
			kg	
			t	
			lb	
			cm³	
			l	
			m³	
			gal	
			kgal	
			Cuft	
			bbl	
			Impgal	
			Klmpgal	
			l(N)	
			m³(N)	
			Sl	
			Scuft	
			MMscuft	
			Sm³	
		Total mass unit	g	Sel
			kg	
			t	
			lb	
		Total volume unit	cm³	Sel
			l	
			m³	
			gal	
			kgal	
			Cuft	
			bbl	
			Impgal	
			Klmpgal	
			l(N)	
			m³(N)	
			Sl	
			Scuft	
			MMscuft	
			Sm³	

Basic Setup		Total net unit	g	
			kg	
			t	
			lb	
			cm^3	
			l	
			m^3	
			gal	
			kgal	
			Cuft	
			bbl	
			Impgal	
			KImpgal	
		Total switch select	**Flex total**	Sel
			Mass total	
			Volume total	
			Net total	
Detailed Setup	Display config	Disp select 1	**Mass flow**	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	

Detailed Setup		Disp select 2	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
			None	
		Disp select 3	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
			None	

Detailed Setup		Disp select 4	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
			None	
		Display contrast	-5	Sel
			-4	
			-3	
			-2	
			-1	
			0	
			+1	
			+2	
			+3	
			+4	
			+5	
		Disp period	0.5s	Sel
			1.0s	
			2.0s	
		Language	**English**	Sel
			German	
			French	
			Russian	

Detailed Setup	Sensor model	RCCS30LR		Sel
		RCCS30		
		RCCS31		
		RCCS32		
		RCCS33		
		RCCS34		
		RCCS36		
		RCCS38		
		RCCS39		
		RCCS39/IR		
		RCCS39/XR		
	Sensor constants	Mass flow	SK20	R/W
			SKT	R/W
			SKTK	R/W
			RV	R/W
			Qnom	R
			SKP	R/W
			SKPT	R/W
		Density	KD	R/W
			fl20	R/W
			FTC1	R/W
			FTCK	R/W
			FPC	R/W
			FPTC	R/W
			FQC1	R/W
			FQC2	R/W
	Config fld variables	Flow direction	**Forward**	Sel
			Reverse	

Detailed Setup		Mass flow	Mass flow unit	g/s	Sel
				g/min	
				g/h	
				kg/s	
				kg/min	
				kg/h	
				kg/d	
				t/min	
				t/h	
				t/d	
				lb/s	
				lb/min	
				lb/h	
				lb/d	
			Mass flow format	xxxxxxx	Sel
				xxxxx.X	
				xxxx.XX	
				xxx.XXX	
				xx.XXXX	
				x.XXXXX	
			Mass flow LRV		R/W
			Mass flow URV		R/W
			Mass flow damping		R/W
			Mass flow lowcut		R/W
			Mass flow alm 1 sel	**No function**	Sel
				More than	
				Less than	
			Mass flow alm 1 crit		R/W
			Mass flow alm 2 sel	**No function**	Sel
				More than	
				Less than	
			Mass flow alm 2 crit		R/W
			Mass flow fix val sel	**Inhibit**	Sel
				Enable	
			Mass flow fixed val		R/W

Detailed Setup		Volume flow	Vol flow unit	cm^3/s	Sel
				cm^3/min	
				cm^3/h	
				l/s	
				l/min	
				l/h	
				l/d	
				m^3/s	
				m^3/min	
				m^3/h	
				m^3/d	
				gal/s	
				gal/min	
				gal/h	
				gal/d	
				Cuft/s	
				Cuft/min	
				Cuft/h	
				Cuft/d	
				bbl/s	
				bbl/min	
				bbl/h	
				bbl/d	
				Impgal/s	
				Impgal/min	
				Impgal/h	
				Impgal/d	
				l(N)/s	
				l(N)/min	
				l(N)/h	
				l(N)/d	
				$m^3(N)/s$	
				$m^3(N)/min$	
				$m^3(N)/h$	
				$m^3(N)/d$	
				Sl/s	
				Sl/min	
				Sl/h	
				Sl/d	
				Scuft/s	
				Scuft/min	
				Scuft/h	
				Scuft/d	
				Sm^3/s	
				Sm^3/min	
				Sm^3/h	
				Sm^3/d	

Detailed Setup			Vol flow format	xxxxxxx	Sel
				xxxxx.X	
				xxxx.XX	
				xxx.XXX	
				xx.XXXX	
				x.XXXXX	
			Vol flow LRV		R/W
			Vol flow URV		R/W
			Vol flow damping		R/W
			Vol flow lowcut		R/W
			Vol flow alm 1 sel	**No function**	Sel
				More than	
				Less than	
			Vol flow alm 1 crit		R/W
			Vol flow alm 2 sel	**No function**	Sel
				More than	
				Less than	
			Vol flow alm 2 crit		R/W
		Density	Density unit	g/ml	Sel
				kg/l	
				kg/m³	
				lb/gal	
				lb/Cuft	
				g/cm³	
				g/l	
				°Bé hv	
				°Bé lt	
				°API	
			Density format	xxxxxxx	Sel
				xxxxx.X	
				xxxx.XX	
				xxx.XXX	
				xx.XXXX	
				x.XXXXX	
			Density LRV		R/W
			Density URV		R/W
			Density damping		R/W

Detailed Setup			Density lowcut		R/W
			Density alm 1 sel	**No function**	Sel
				More than	
				Less than	
			Density alm 1 crit		R/W
			Density alm 2 sel	**No function**	Sel
				More than	
				Less than	
			Density alm 2 crit		R/W
			Ref. Density sel *)	**Inhibit**	Sel
				Fixed	
				Calculated	
			Reference density		R/W
			Reference density setup *)	Reference Temperature	R/W
				Temp. coeff. a	R/W
				Temp. coeff. b	R/W
			Density fix val sel **)	Inhibit	Sel
				Enable	
			Density offset		R/W
			Pressure Unit	**bar**	Sel
				psi	
				MPa	
			Pressure		R/W
		Temperature	Temperature unit	**degC**	Sel
				degF	
				K	
			Temperature format	xxxxxxx	Sel
				xxxxx.X	
				xxxx.XX	
				xxx.XXX	
				xx.XXXX	
				x.XXXXX	
			Temperature LRV		R/W

Detailed Setup			Temperature URV		R/W
			Temperature damping		R/W
			Temp alm 1 sel	**No function**	Sel
				More than	
				Less than	
			Temp alm 1 crit		R/W
			Temp alm 2 sel	**No function**	Sel
				More than	
				Less than	
			Temp alm 2 crit		R/W
			Temp fix val select	**Inhibit**	Sel
				Enable	
			Temp fixed value		R/W
			Temp gain		R/W
		Velocity unit	**m/s**		Sel
			ft/s		
	Config Output/Input	Analog output 1	Analog 1 select	**Mass flow**	Sel
				Volume flow	
				Density	
				Temperature	
				Concentration meas	
				Net flow	
				None	
			Analog 1 alarm Out	<2.4 mA	Sel
				<3.6 mA	
				<4.0 mA	
				>21.0 mA	
				>21.6 mA	
				Hold	
				Measured value	
			Analog 1 low LMT		R/W
			Analog 1 high LMT		R/W

Detailed Setup		Analog output 2	Analog 2 select	Mass flow	Sel
				Volume flow	
				Density	
				Temperature	
				Concentration meas	
				Net flow	
				None	
			Analog 2 alarm Out	<2.4 mA	Sel
				<3.6 mA	
				<4.0 mA	
				>21.0 mA	
				>21.6 mA	
				Hold	
				Measured value	
			Analog 2 low LMT		R/W
			Analog 2 high LMT		R/W
		Pulse/Status out 1	Pulse/Stat 1 select	**Pulse**	Sel
				Status out	
				No function	
			Pulse 1 select	Mass flow	Sel
				Volume flow	
				Density	
				Temperature	
				Concentration meas	
				Net flow	
				None	
				F-Total mass	
				R-Total mass	
				F-Total volume	
				R-Total volume	
				F-Total net	
				R-Total net	

Detailed Setup			Pulse 1 unit	Hz	Sel
				g/P	
				kg/P	
				t/P	
				lb/P	
				cm^3/P	
				l/P	
				m^3/P	
				gal/P	
				kgal/P	
				Cuft/P	
				bbl/P	
				lmpgal/P	
				klmpgal/P	
				I(N)/P	
				m^3(N)/P	
				SI/P	
				Scuft/P	
				Sm^3/P	
			Pulse 1 rate		R/W
			Pulse 1 active mode	**On Active**	Sel
				Off Active	
			Pulse 1 width	0.05ms	Sel
				0.1ms	
				0.5ms	
				1ms	
				5ms	
				10ms	
				50ms	
				100ms	
				50ms	
				1000ms	
			Pulse 1 at alarm	**0P/0Hz**	Sel
				Measured value	
				Hold	

Detailed Setup			SO 1 function	**No Function**	Sel
				Flow direction	
				Mass flow alm 1	
				Mass flow alm 2	
				Mass flow alm 1+2	
				Vol flow alm 1	
				Vol flow alm 2	
				Vol flow alm 1+2	
				Density alm 1	
				Density alm 2	
				Density alm 1+2	
				Temp alm 1	
				Temp alm 2	
				Temp alm 1+2	
				Concentr. meas alm 1	
				Concentr. meas alm 2	
				Concentr. meas alm 1+2	
				Net flow alm 1	
				Net flow alm 2	
				Net flow alm 1+2	
				Slug Alarm	
				Empty alarm	
				Corrosion Alarm	
				All alarms	
				All errors	
				All alarms & errors	
			SO1 active mode	**On Active**	Sel
				Off Active	
		Pulse/Status out 2	Pulse/Stat 2 select	Pulse	Sel
				Status out	
				No function	
			Pulse 2 select	Mass flow	Sel
				Volume flow	
				Density	
				Temperature	
				Concentration meas	
				Net flow	
				None	
				F-Total mass	
				R-Total mass	
				F-Total volume	
				R-Total volume	
				F-Total net	
				R-Total net	

Detailed Setup			Pulse 2 unit	**Hz**	Sel
				g/P	
				kg/P	
				t/P	
				lb/P	
				cm^3/P	
				l/P	
				m^3/P	
				gal/P	
				kgal/P	
				Cuft/P	
				bbl/P	
				lmpgal/P	
				klmpgal/P	
				I(N)/P	
				m^3(N)/P	
				SI/P	
				Scuft/P	
				Sm^3/P	
			Pulse 2 rate		R/W
			Pulse 2 active mode	**On Active**	Sel
				Off Active	
			Pulse 2 width	0.05ms	Sel
				0.1ms	
				0.5ms	
				1ms	
				5ms	
				10ms	
				50ms	
				100ms	
				50ms	
				1000ms	
			Pulse 2 at alarm	**0P/0Hz**	Sel
				Measured value	
				Hold	

Detailed Setup			SO2 function	**No Function**	Sel
				Flow direction	
				Total limit switch	
				Mass flow alm 1	
				Mass flow alm 2	
				Mass flow alm 1+2	
				Vol flow alm 1	
				Vol flow alm 2	
				Vol flow alm 1+2	
				Density alm 1	
				Density alm 2	
				Density alm 1+2	
				Temp alm 1	
				Temp alm 2	
				Temp alm 1+2	
				Concentr. meas alm 1	
				Concentr. meas alm 2	
				Concentr. meas alm 1+2	
				Net flow alm 1	
				Net flow alm 2	
				Net flow alm 1+2	
				Slug Alarm	
				Empty alarm	
				Corrosion Alarm	
				All alarms	
				All errors	
				All alarms & errors	
			SO2 active mode	**On Active**	Sel
				Off Active	
		Status input	SI function	**No function**	Sel
				Autozero	
				Reset flex totals	
				Reset mass totals	
				Reset volume totals	
				Reset net totals	
				Reset all totals	
				0% signal lock	
			SI active mode	**On Active**	Sel
				Off Active	

Detailed Setup		HART output	PV is	**Mass flow**	Sel
				Volume flow	
				Density	
				Temperature	
				Concentration meas	
				Net flow	
				None	
			SV is	Mass flow	Sel
				Volume flow	
				Density	
				Temperature	
				Concentration meas	
				Net flow	
				None	
				F-Total mass	
				R-Total mass	
				F-Total volume	
				R-Total volume	
				F-Total net	
				R-Total net	
				F-Total flex	
				R-Total flex	
				D-Total mass	
				D-Total volume	
				D-Total net	
				D-Total flex	
				F-Total energy	
				Velocity	
				Drive gain	
			TV is	Mass flow	Sel
				Volume flow	
				Density	
				Temperature	
				Concentration meas	
				Net flow	
				None	
				F-Total mass	
				R-Total mass	
				F-Total volume	
				R-Total volume	
				F-Total net	
				R-Total net	
				F-Total flex	
				R-Total flex	
				D-Total mass	
				D-Total volume	
				D-Total net	
				D-Total flex	
				F-Total energy	
				Velocity	
				Drive gain	

Detailed Setup			QV is	Mass flow	Sel
				Volume flow	
				Density	
				Temperature	
				Concentration meas	
				Net flow	
				None	
				F-Total mass	
				R-Total mass	
				F-Total volume	
				R-Total volume	
				F-Total net	
				R-Total net	
				F-Total flex	
				R-Total flex	
				D-Total mass	
				D-Total volume	
				D-Total net	
				D-Total flex	
				F-Total energy	
				Velocity	
				Drive gain	
	Totalizer	Total flex select	**Mass**		Sel
			Volume		
			Net		
		Total flex unit	g		Sel
			kg		
			t		
			lb		
			cm^3		
			l		
			m^3		
			gal		
			kgal		
			Cuft		
			bbl		
			Impgal		
			KImpgal		
			l(N)		
			m^3(N)		
			Sl		
			Scuft		
			MMscuft		
			Sm^3		
		Total mass unit	g		Sel
			kg		
			t		
			lb		

Detailed Setup		Total volume unit	cm³		Sel
			l		
			m³		
			gal		
			kgal		
			Cuft		
			bbl		
			Impgal		
			kimpgal		
			l(N)		
			m³(N)		
			Sl		
			Scuft		
			MMscuft		
			Sm³		
		Total net unit	g		
			kg		
			t		
			lb		
			cm³		
			l		
			m³		
			gal		
			kgal		
			Cuft		
			bbl		
			Impgal		
			kimpgal		
		Total unit energy	**MJ**		Sel
			Btu		
		Energy factor	Heat of combustion		R/W
			Heat of combustion unit	**MJ/kg**	Sel
				Btu/lb	
				MJ/m³(N)	
				Btu/Scuft	
		Total switch select	**Flex total**		Sel
			Mass total		
			Volume total		
			Net total		
		Total limit switch			R/W
		Total at alarm	**Hold**		Sel
			Continue total		
		Total reset cntrl	**Inhibit**		Sel
			Enable		

Detailed Setup		Total reset	Not Execute	
			Reset flex totals	Exe
			Reset mass totals	Exe
			Reset volume totals	Exe
			Reset net totals	Exe
			Reset all totals	Exe
	HART communication	Poll addr		R/W
		Num req pream		R/W
		Num resp pream		R/W
		Master reset		Exe
	Concentration setup	Reference Temperature		R/W
		Ref. density carrier		R/W
		Temp. coeff. a carrier		R/W
		Temp. coeff. b carrier		R/W
		Ref. density product		R/W
		Temp. coeff. a product		R/W
		Temp. coeff. b product		R/W
	Concentration meas	Concentr. meas unit	°Brix	Sel
			Wt-% sol	
			Vol% sol	
			Vol%	
			Wt-%	
		Concentr. meas format	xxxxxxx	Sel
			xxxxx.X	
			xxxx.XX	
			xxx.XXX	
			xx.XXXX	
			x.XXXXX	
		Concentr.meas LRV		R/W
		Concentr. meas URV		R/W
		Concentr. meas Damp		R/W
		Concentr. meas Lowcut		R/W

Detailed Setup		Conc meas alm 1 Sel	**No function**	Sel
			More than	
			Less than	
		Conc meas alm 1 Crit		R/W
		Conc meas alm 2 Sel	**No function**	Sel
			More than	
			Less than	
		Conc meas alm 2 crit		R/W
	Net flow	Net flow select	**Mass**	Sel
			Volume	
		Net flow unit	g/s	Sel
			g/min	
			g/h	
			kg/s	
			kg/min	
			kg/h	
			kg/d	
			t/min	
			t/h	
			t/d	
			lb/s	
			lb/min	
			lb/h	
			lb/d	
			cm^3/s	
			cm^3/min	
			cm^3/h	
			l/s	
			l/min	
			l/h	
			l/d	
			m^3/s	
			m^3/min	
			m^3/h	
			m^3/d	
			gal/s	
			gal/min	
			gal/h	
			gal/d	
			Cuft/s	
			Cuft/min	
			Cuft/h	
			Cuft/d	
			bbl/s	
			bbl/min	
			bbl/h	

Detailed Setup			bbl/d	
			Impgal/s	
			Impgal/min	
			Impgal/h	
			Impgal/d	
		Net flow format	xxxxxxx	Sel
			xxxxx.X	
			xxxx.XX	
			xxx.XXX	
			xx.XXXX	
			x.XXXXX	
		Net flow LRV		R/W
		Net flow URV		R/W
		Net flow damping		R/W
		Net flow lowcut		R/W
		Net flow Alm 1 Sel	**No function**	Sel
			More than	
			Less than	
		Net flow Alm 1 Crit		R/W
		Net flow Alm 2 Sel	**No function**	Sel
			More than	
			Less than	
		Net flow Alm 2 Crit		R/W
	Measuring range			R
	Slug detection	Slug alarm select	**Not apply**	Sel
			Apply	
		Drive gain		R
		Slug criteria		R/W
		Slug duration		R/W
		After slug	**Measured value**	Sel
			Hold	
		Drive gain damping		

Detailed Setup	Empty pipe detect	Empty pipe alm sel	**Not apply**	Sel
			Apply	
		Empty pipe crit		R/W
		After empty pipe	**Massflow=Zero**	Sel
			Measured Value	
			Hold	
	Corrosion detect	Corrosion alm sel	**Not apply**	Sel
			Apply	
		Corrosion crit		R/W
		Corrosion damp		R/W
	Fluid max temp			R
	Device information	Distributor		R
		Tag		R/W
		Long Tag		R/W
		Descriptor		R/W
		Message		R/W
		Date		R/W
		Sensor model		R
		Sensor S/N		R
		Assembly number		R
		Serial no. converter		R
		Serial no. detector		R
		Device S/W	Device S/W version	R
			Device S/W date	R
		Device id		R
		Universal rev		R
		Fld dev rev		R
		Software rev		R
		Hardware rev		R

7.4 Parameter tree, HART menu

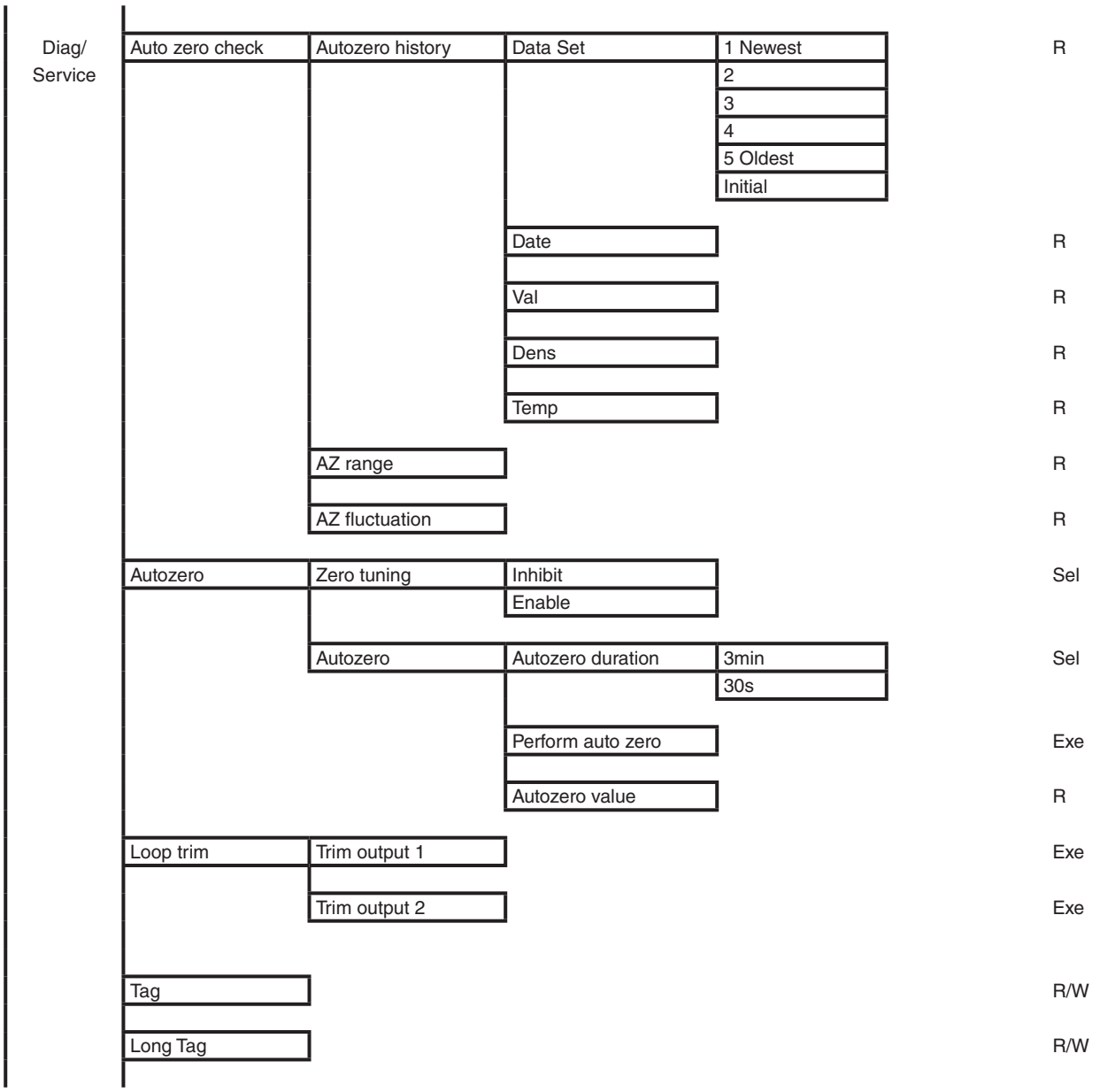
Online	Device setup	Set parameters for Rotamass (see below)
	PV	Display process value in engineering unit
	PV AO	Display analogue output in mA
	Review	Review parameters for Rotamass (see below)
	Service	Not open

Device setup

		Sel
Language	English	
	German	
	French	
	Russian	

Process variables	View fld dev vars	Mass flo		R
		Volume flo		R
		Dens		R
		Temp		R
		Conc meas		R
		Net flo		R
		F-Totl flex		R
		R-Totl flex		R
		D-Totl flex		R
		F-Totl mass		R
		R-Totl mass		R
		D-Totl mass		R
		F-Totl vol		R
		R-Totl vol		R
		D-Totl vol		R
		F-Totl net		R
		R-Totl net		R
		D-Totl net		R
		F-Totl energy		R
		Velocity		R
		Drive Gain		R
	View Outputs	Analog output 1	Analog 1 select	R
			PV	R
			PV AO	R
			% rnge	R
		Analog output 2	Analog 2 select	R
			SV	R
			SV AO	R
			% rnge	R
		Pulse/Status out 1	Pulse 1 select	R
			TV	R
			TV Freq	R
			SO 1 function	R
			SO 1 mode	R
			No function	R

		Pulse/Status out 2	Pulse 2 select		R
			QV		R
			QV Freq		R
			SO 2 function		R
			SO 2 mode		R
			No function		R
	View Input	Input function			R
	Totalizer	Total res cntrl	Inhibit		Sel
			Enable		
		Total reset	Not execute		Exe
			Reset flex totals		Exe
			Reset mass totals		Exe
			Reset volume totals		Exe
			Reset net totals		Exe
			Reset all totals		Exe
Diag/ Service	Self test/Status	Self test	LCD/Key Test		Exe
			Self Test		Exe
		Status	Event overview		R
			Error		R
			Alarm		R
			Warning		R
		Hist Overview ord	Hist Overview ord		R
			Clear History ord	Not execute	Sel
				Execute	
		Hist Overview abs	History Set	Abs	R
				Set 1	R
				:	
				Set 10	R
			History Set menu	History Set	R
				Hist overview	R
				H. error	R
				H. Alarm	R
				H. Warning	R
			Clear History abs		Exe
	Input/Output test	Analog Out 1			R/W
		Analog Out 2			R/W
		Pulse Out 1			R/W
		Status Out 1			R/W
		Pulse Out 2			R/W
		Status Out 2			R/W
		Status Input			R



Basic Setup	Display config	Disp select 1	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	
		Disp select 2	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	
			None	

Basic Setup		Disp select 3	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	
			None	
		Disp select 4	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	
			None	
	Display contrast	-5		Sel
		-4		
		-3		
		-2		
		-1		
		0		
		+1		
		+2		
		+3		
		+4		
		+5		

Basic Setup	Mass flo	Mass flo unit	g/s	Sel
			g/min	
			g/h	
			kg/s	
			kg/min	
			kg/h	
			kg/d	
			t/min	
			t/h	
			t/d	
			lb/s	
			lb/min	
			lb/h	
			lb/d	
		Mass flo LRV		R/W
		Mass flo URV		R/W
		Mass flo Damping		R/W
	Dens	Dens unit	g/mL	Sel
			kg/L	
			kg/m3	
			lb/gal	
			lb/Cuft	
			g/cm3	
			g/L	
			°Bé hv	
			°Bé lt	
			°API	
		Density LRV		R/W
		Density URV		R/W
		Density damping		R/W
	Temp	Temp unit	degC	Sel
			degF	
			K	
		Temp LRV		R/W
		Temp URV		R/W
		Temp Damping		R/W
	Analog 1 select	Mass flo		Sel
		Vol flo		
		Density		
		Temperature		
		Conc meas		
		Net flo		
		None		

Basic Setup	Analog 2 select	Mass flo			Sel
		Vol flo			
		Density			
		Temperature			
		Conc meas			
		Net flo			
		None			
	Pulse/Status out 1	Pulse/Stat 1 select	Pulse		Sel
			Status out		
			No function		
		Pulse out 1	Pulse 1 select	Mass flo	Sel
				Vol flo	
				Dens	
				Temp	
				Conc meas	
				Net flo	
				None	
				F-Totl mass	
				R-Totl mass	
				F-Totl vol	
				R-Totl vol	
				F-Totl net	
				R-Totl net	
			TV Pls unit	Hz	Sel
				g/P	
				kg/p	
				t/P	
				lb/P	
				cm3/P	
				L/P	
				m3/P	
				gal/P	
				kgal/P	
				Cuft/P	
				bbl/P	
				Impgal/P	
				klmpgal/P	
				L(N)/P	
				m3(N)/P	
				L(Std)/P	
				StdCuft/P	
				m3(Std)/P	
			TV Pls rate		R/W

Basic Setup		Status out 1	SO 1 function	No Function	Sel
				Flow direction	
				Total Switch	
				Mass flo alm 1	
				Mass flo alm 2	
				Mass flo alm 1+2	
				Vol flo alm 1	
				Vol flo alm 2	
				Vol flo alm 1+2	
				Dens alm 1	
				Dens alm 2	
				Dens alm 1+2	
				Temp alm 1	
				Temp alm 2	
				Temp alm 1+2	
				Conc alm 1	
				Conc alm 2	
				Conc alm 1+2	
				Net flo alm 1	
				Net flo alm 2	
				Net flo alm 1+2	
				Slug Alarm	
				Empty Alarm	
				Corrosion Alarm	
				All Alarms	
				All Errors	
				All Alarms & Errors	
	Pulse/Status out 2	Pulse/Stat 2 select	Pulse		Sel
			Status out		
			No function		
		Pulse out 2	Pulse 2 select	Mass flo	Sel
				Vol flo	
				Dens	
				Temp	
				Conc meas	
				Net flo	
				None	
				F-Totl mass	
				R-Totl mass	
				F-Totl vol	
				R-Totl vol	
				F-Totl net	
				R-Totl net	

Basic Setup			QV Pls unit	Hz	Sel
				g/P	
				kg/p	
				t/P	
				lb/P	
				cm3/P	
				L/P	
				m3/P	
				gal/P	
				kgal/P	
				Cuft/P	
				bbl/P	
				Impgal/P	
				klmpgal/P	
				L(N)/P	
				m3(N)/P	
				L(Std)/P	
				StdCuft/P	
				m3(Std)/P	
			QV Pls rate		R/W
		Status out 2	SO 2 function	No Function	Sel
				Flow direction	
				Total Switch	
				Mass flo alm 1	
				Mass flo alm 2	
				Mass flo alm 1+2	
				Vol flo alm 1	
				Vol flo alm 2	
				Vol flo alm 1+2	
				Dens alm 1	
				Dens alm 2	
				Dens alm 1+2	
				Temp alm 1	
				Temp alm 2	
				Temp alm 1+2	
				Conc alm 1	
				Conc alm 2	
				Conc alm 1+2	
				Net flo alm 1	
				Net flo alm 2	
				Net flo alm 1+2	
				Slug Alarm	
				Empty Alarm	
				Corrosion Alarm	
				All Alarms	
				All Errors	
				All Alarms & Errors	

Basic Setup	Input function	No function		Sel
		Autozero		
		Reset flex totals		
		Reset mass totals		
		Reset volume totals		
		Reset net totals		
		Reset all totals		
		0% Signal lock		
	Totalizer	Total flex select	Mass	Sel
			Volume	
			Net	
		F-Totl flex Unit	g	
			kg	
			t	
			lb	
			cm3	
			L	
			m3	
			gal	
			kgal	
			Cuft	
			bbl	
			Impgal	
			klmpgal	
			L(N)	
			m3(N)	
			L(Std)	
			StdCuft	
			MMscuft	
			m3(Std)	
		F-Totl mass Unit	g	Sel
			kg	
			t	
			lb	
		F-Totl vol Unit	cm3	Sel
			L	
			m3	
			gal	
			kgal	
			Cuft	
			bbl	
			Impgal	
			klmpgal	
			L(N)	
			m3(N)	
			L(Std)	
			StdCuft	
			MMscuft	
			m3(Std)	

Basic Setup		F-Totl net Unit	g	Sel
			kg	
			t	
			lb	
			cm3	
			L	
			m3	
			gal	
			kgal	
			Cuft	
			bbl	
			Impgal	
			klmpgal	
			L(N)	
			m3(N)	
			L(Std)	
			StdCuft	
			MMscuft	
			m3(Std)	
		Total switch select	Flex total	Sel
			Mass total	
			Volume total	
			Net total	

Detailed Setup	Display config	Disp Select 1	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	

Detailed Setup		Disp Select 2	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	
			None	
		Disp Select 3	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	
			None	

Detailed Setup		Disp Select 4	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	
			None	
		Display contrast	-5	R/W
			-4	
			-3	
			-2	
			-1	
			0	
			+1	
			+2	
			+3	
			+4	
			+5	
		Display period	0.5s	Sel
			1.0s	
			2.0s	
		Language	English	Sel
			German	
			French	
			Russian	
	Sensor model	RCCS30LR		Sel
		RCCS30		
		RCCS31		
		RCCS32		
		RCCS33		
		RCCS34		
		RCCS36		
		RCCS38		
		RCCS39		
		RCCS39/IR		
		RCCS39/XR		

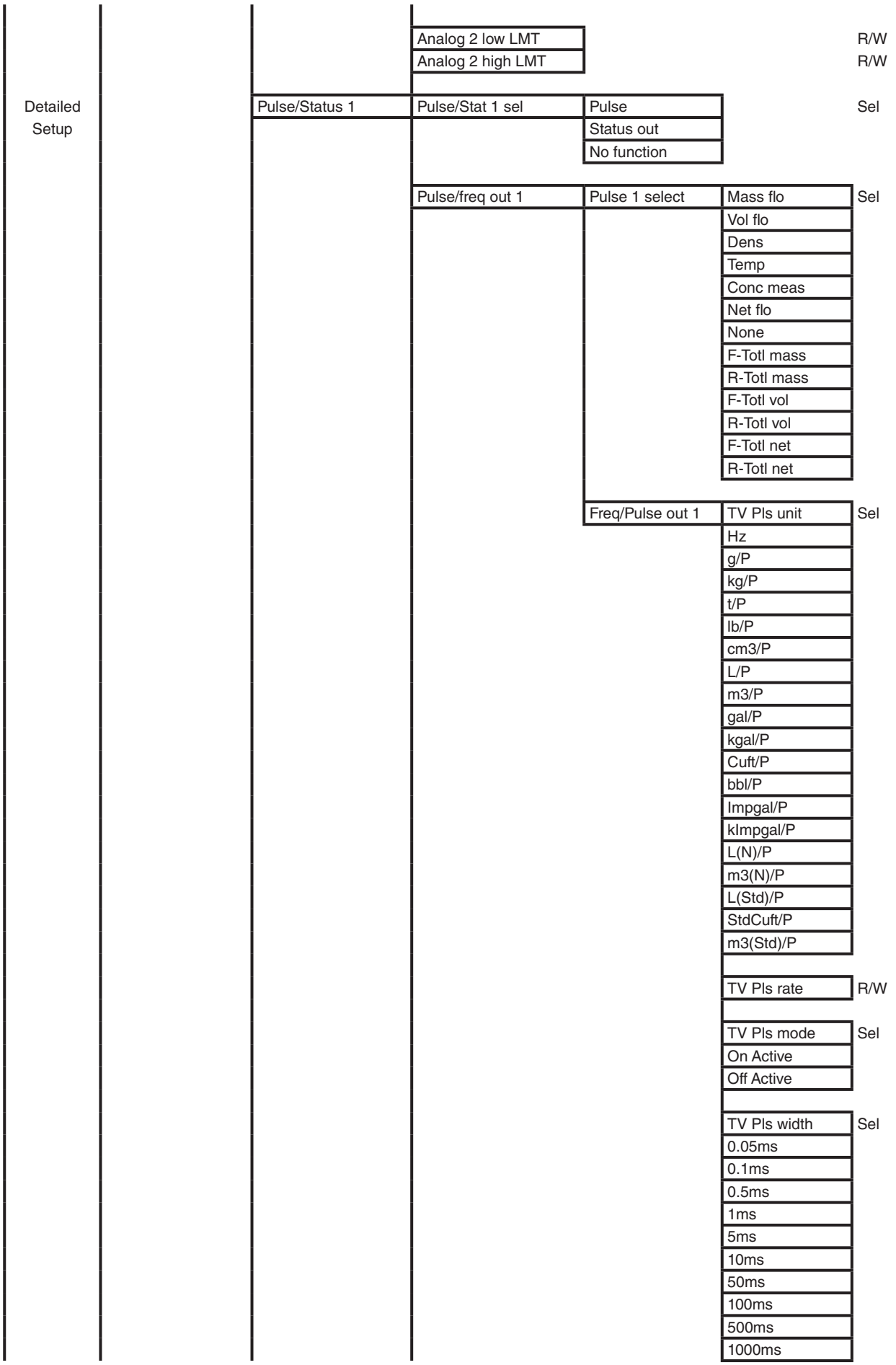
Detailed Setup	Sensor constants	Mass flo	SK20		R/W
			SKT		R/W
			SKTK		R/W
			RV		R/W
			Qnom		R
			SKP		R/W
			SKPT		R/W
		Density	KD		R/W
			FI20		R/W
			FTC1		R/W
			FTCK		R/W
			FPC		R/W
			FPTC		R/W
			FQC1		R/W
			FQC2		R/W
	Config fld var	Flow direction	Forward		Sel
			Reverse		
		Mass flo	Mass flo unit	g/s	Sel
				g/min	
				g/h	
				kg/s	
				kg/min	
				kg/h	
				kg/d	
				t/min	
				t/h	
				td	
				lb/s	
				lb/min	
				lb/h	
				lb/d	
			Mass flo format	xxxxxxx	Sel
				xxxxx.X	
				xxxx.XX	
				xxx.XXX	
				xx.XXXX	
				x.XXXXX	
			Mass flo LRV		R/W
			Mass flo URV		R/W

Detailed Setup			Mass flo damping		R/W
			Mass flo lowcut		R/W
			Mass flo alm 1 sel	No function	Sel
				More than	
				Less than	
			Mass flo alm 1 crit		R/W
			Mass flow alm 2 sel	No function	Sel
				More than	
				Less than	
			Mass flo alm 2 crit		R/W
			Mass flo fix sel	Inhibit	Sel
				Enable	
			Mass flo fix menu	Mass flo fixed val	R/W
		Vol flo	Vol flo Unit	cm3/s	Sel
				cm3/min	
				cm3/h	
				L/s	
				L/min	
				L/h	
				L/d	
				m3/s	
				m3/min	
				m3/h	
				m3/d	
				gal/s	
				gal/min	
				gal/h	
				gal/d	
				Cuft/s	
				Cuft/min	
				Cuft/h	
				Cuft/d	
				bbl/s	
				bbl/min	
				bbl/h	
				bbl/d	
				Impgal/s	
				Impgal/min	
				Impgal/h	
				Impgal/d	
				L(N)/s	
				L(N)/min	
				L(N)/h	
				L(N)/d	
				m3(N)/s	
				m3(N)/min	
				m3(N)/h	
				m3(N)/d	

Detailed Setup				L(Std)/s	
				L(Std)/min	
				L(Std)/h	
				L(Std)/d	
				StdCuft/s	
				StdCuft/min	
				StdCuft/h	
				StdCuft/d	
				m3(Std)/s	
				m3(Std)/min	
				m3(Std)/h	
				m3(Std)/d	
			Vol flo Format	xxxxxxx	Sel
				xxxxx.X	
				xxxx.XX	
				xxx.XXX	
				xx.XXXX	
				x.XXXXX	
			Vol flo LRV		R/W
			Vol flo URV		R/W
			Vol flo damping		R/W
			Vol flo Lowcut		R/W
			Vol flo alm 1 sel	No function	Sel
				More than	
				Less than	
			Vol flo alm 1 crit		R/W
			Vol flow alm 2 sel	No function	Sel
				More than	
				Less than	
			Vol flo alm 2 crit		R/W
		Dens	Dens Unit	g/mL	Sel
				kg/L	
				kg/m3	
				lb/gal	
				lb/Cuft	
				g/cm3	
				g/L	
				°Bé hv	
				°Bé lt	
				°API	
			Dens Format	xxxxxxx	Sel
				xxxxx.X	
				xxxx.XX	
				xxx.XXX	
				xx.XXXX	
				x.XXXXX	

Detailed Setup			Dens LRV		R/W
			Dens URV		R/W
			Dens damping		R/W
			Dens lowcut		R/W
			Dens alm 1 sel	No function	Sel
				More than	
				Less than	
			Dens alm 1 crit		R/W
			Dens alm 2 sel	No function	Sel
				More than	
				Less than	
			Dens alm 2 crit		R/W
			Ref. Density sel *)	Inhibit	Sel
				Fixed	
				Calculated	
			Fixed ref dens menu *)	Reference density	R/W
			Ref density setup *)	Ref. temperature	R/W
				Temp. coeff a	R/W
				Temp. coeff b	R/W
			Dens fix val sel **)	Inhibit	Sel
				Enable	
			Dens fix menu **)	Reference density	R/W
			Density offset		R/W
			Pressure Unit	bar	Sel
				psi	
				MPa	
			Pressure		R/W
		Temp	Temp Unit	degC	Sel
				degF	
				K	
			Temp Format	xxxxxxx	Sel
				xxxxx.X	
				xxxx.XX	
				xxx.XXX	
				xx.XXXX	
				x.XXXXX	
			Temp LRV		R/W

Detailed Setup			Temp URV		R/W
			Temp damping		R/W
			Temp alm 1 sel	No function	Sel
				More than	
				Less than	
			Temp alm 1 crit		R/W
			Temp alm 2 sel	No function	Sel
				More than	
				Less than	
			Temp alm 2 crit		R/W
			Temp fix val sel	Inhibit	Sel
				Enable	
			Temp fix menu	Temp fixed value	R/W
				Temp gain adjust	
		Velocity unit	m/s		Sel
			ft/s		
	Config Output/Input	Analog output 1	Analog 1 select	Mass flo	Sel
				Vol flo	
				Dens	
				Temp	
				Conc meas	
				Net flo	
				None	
			Analog 1 alarm Out	<2.4mA	Sel
				<3.6mA	
				<4.0mA	
				>21.0mA	
				>21.6mA	
				Hold	
				Measured value	
			Analog 1 low LMT		R/W
			Analog 1 high LMT		R/W
		Analog output 2	Analog 2 select	Mass flo	Sel
				Vol flo	
				Dens	
				Temp	
				Conc meas	
				Net flo	
				None	
			SV Analog 2 alarm Out	<2.4mA	Sel
				<3.6mA	
				<4.0mA	
				>21.0mA	
				>21.6mA	
				Hold	
				Measured value	



Detailed Setup					TV Pls alarm	Sel
					0 Hz / 0 Pulses	
					Hold	
					Measured value	
			Status out 1	SO 1 function	No function	Sel
					Flow direction	
					Total switch	
					Mass flo alm 1	
					Mass flo alm 2	
					Mass flo alm 1+2	
					Vol flo alm 1	
					Vol flo alm 2	
					Vol flo alm 1+2	
					Dens alm 1	
					Dens alm 2	
					Dens alm 1+2	
					Temp alm 1	
					Temp alm 2	
					Temp alm 1+2	
					Conc alm 1	
					Conc alm 2	
					Conc alm 1+2	
					Net flo alm 1	
					Net flo alm 2	
					Net flo alm 1+2	
					Slug Alarm	
					Empty Alarm	
					Corrosion Alarm	
					All alarms	
					All errors	
					All alarms & errors	
				SO 1 active mode	On Active	Sel
					Off Active	
		Pulse/Status 2	Pulse/Stat 2 sel	Pulse		Sel
				Status out		
				No function		
			Pulse/freq out 2	Pulse 2 select	Mass flo	Sel
					Vol flo	
					Dens	
					Temp	
					Conc meas	
					Net flo	
					None	
					F-Totl mass	
					R-Totl mass	
					F-Totl vol	
					R-Totl vol	
					F-Totl net	
					R-Totl net	

Detailed Setup				Freq/Pulse out 2	QV Pls unit	Sel
					Hz	
					g/P	
					kg/P	
					t/P	
					lb/P	
					cm3/P	
					L/P	
					m3/P	
					gal/P	
					kgal/P	
					Cuft/P	
					bbl/P	
					Impgal/P	
					kImpgal/P	
					L(N)/P	
					m3(N)/P	
					L(Std)/P	
					StdCuft/P	
					m3(Std)/P	
					QV Pls rate	R/W
					QV Pls mode	Sel
					On Active	
					Off Active	
					QV Pls width	Sel
					0.05ms	
					0.1ms	
					0.5ms	
					1ms	
					5ms	
					10ms	
					50ms	
					100ms	
					500ms	
					1000ms	
					QV Pls alarm	Sel
					0 Hz / 0 Pulses	
					Hold	
					Measured value	

Detailed Setup		Status out 2	SO 2 function	No function	Sel
				Flow direction	
				Total switch	
				Mass flo alm 1	
				Mass flo alm 2	
				Mass flo alm 1+2	
				Vol flo alm 1	
				Vol flo alm 2	
				Vol flo alm 1+2	
				Dens alm 1	
				Dens alm 2	
				Dens alm 1+2	
				Temp alm 1	
				Temp alm 2	
				Temp alm 1+2	
				Conc alm 1	
				Conc alm 2	
				Conc alm 1+2	
				Net flo alm 1	
				Net flo alm 2	
				Net flo alm 1+2	
				Slug alarm	
				Empty alarm	
				Corrosion alarm	
				All alarms	
				All errors	
				All alarms & errors	
			SO 2 active mode	On Active	Sel
				Off Active	
		Status input	Input function	No Function	Sel
				Autozero	
				Reset flex totals	
				Reset mass totals	
				Reset volume totals	
				Reset net totals	
				Reset all totals	
				0% signal lock	
			SI active mode	On Active	Sel
				Off Active	

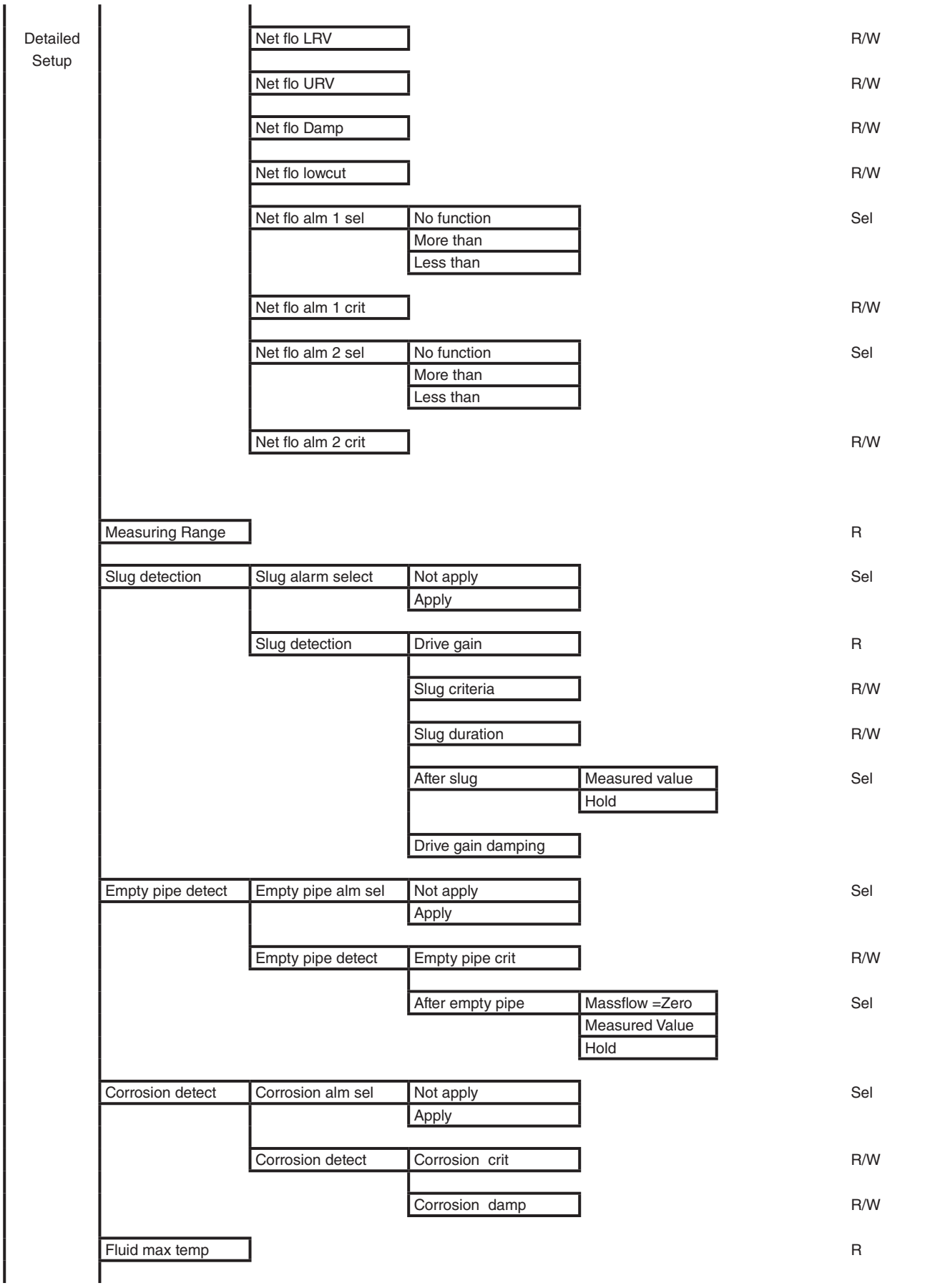
Detailed Setup	HART Output	PV is	Mass flo
			Vol flo
			Dens
			Temp
			Conc meas
			Net flo
			None
		SV is	Mass flo
			Vol flo
			Dens
			Temp
			Conc meas
			Net flo
			None
			F-Totl mass
			R-Totl mass
			F-Totl vol
			R-Totl vol
			F-Totl net
			R-Totl net
			F-Totl flex
			R-Totl flex
			D-Totl mass
			D-Totl vol
			D-Totl net
			D-Totl flex
			F-Totl energy
			Velocity
			Drive Gain
		TV is	Mass flo
			Vol flo
			Dens
			Temp
			Conc meas
			Net flo
			None
			F-Totl mass
			R-Totl mass
			F-Totl vol
			R-Totl vol
			F-Totl net
			R-Totl net
			F-Totl flex
			R-Totl flex
			D-Totl mass
			D-Totl vol
			D-Totl net
			D-Totl flex
			F-Totl energy
			Velocity
			Drive Gain

Detailed Setup			QV is	Mass flo	
				Vol flo	
				Dens	
				Temp	
				Conc meas	
				Net flo	
				None	
				F-Totl mass	
				R-Totl mass	
				F-Totl vol	
				R-Totl vol	
				F-Totl net	
				R-Totl net	
				F-Totl flex	
				R-Totl flex	
				D-Totl mass	
				D-Totl vol	
				D-Totl net	
				D-Totl flex	
				F-Totl energy	
				Velocity	
				Drive Gain	
	Totalizer	Total flex select	Mass		Sel
			Volume		
			Net		
		F-Totl flex Unit	g		
			kg		
			t		
			lb		
			cm3		
			L		
			m3		
			gal		
			kgal		
			Cuft		
			bbl		
			Impgal		
			klmpgal		
			L(N)		
			m3(N)		
			L(Std)		
			StdCuft		
			MMscuft		
			m3(Std)		
		F-Totl mass Unit	g		
			kg		
			t		
			lb		

Detailed Setup		F-Totl vol Unit	cm3		Sel
			L		
			m3		
			gal		
			kgal		
			Cuft		
			bbl		
			Impgal		
			klmpgal		
			L(N)		
			m3(N)		
			L(Std)		
			StdCuft		
			MMscuft		
			m3(Std)		
		F-Totl net Unit	g		Sel
			kg		
			t		
			lb		
			cm3		
			L		
			m3		
			gal		
			kgal		
			Cuft		
			bbl		
			Impgal		
			klmpgal		
			L(Std)		
			StdCuft		
			MMscuft		
			m3(Std)		
		F-Totl energy Unit	MJ		Sel
			Btu		
		Energy factor	Heat of combust unit	MJ/kg	Sel
				Btu/lb	
				MJ/Nm3	
				Btu/Scuft	
			Heat of combustion		R/W
		Total switch select	Flex		Sel
			Mass		
			Volume		
			Net		
		Total limit switch			R/W
		Total at alarm	Hold		Sel
			continue		
		Total res cntrl	Inhibit		Sel
			Enable		

Detailed Setup		Total reset	Not execute	Exe
			Reset flex total	Exe
			Reset mass total	Exe
			Reset volume total	Exe
			Reset net total	Exe
			Reset all totals	Exe
	HART communication	Poll addr		R/W
		Num req pream		R/W
		Num resp preams		R/W
		Master reset		Exe
	Conc meas setup	Ref. temperature		R/W
		Ref. dens. carrier		R/W
		Coeff. a carrier		R/W
		Coeff b carrier		R/W
		Ref. dens. product		R/W
		Coeff. a product		R/W
		Coeff. b product		R/W
	Conc meas	Conc meas unit	degBrix	Sel
			% sol-wt	
			% sol-vol	
			Wt-%	
			Vol-%	
		Conc meas Format	xxxxxxx	Sel
			xxxxx.X	
			xxxx.XX	
			xxx.XXX	
			xx.XXXX	
			x.XXXXX	
		Conc meas LRV		R/W
		Conc meas URV		R/W
		Conc meas Damp		R/W
		Conc meas Lowcut		R/W
		Conc meas alm 1 sel	No function	Sel
			More than	
			Less than	
		Conc meas alm 1 crit		R/W

Detailed Setup		Conc meas alm 2 sel	No function	Sel
			More than	
			Less than	
		Conc meas alm 2 crit		R/W
	Net flo	Net flow select	Mass	Sel
			Volume	
			Not applicable	R
		Net flo Unit	g/s	Sel
			g/min	
			g/h	
			kg/s	
			kg/min	
			kg/h	
			kg/d	
			t/min	
			t/h	
			t/d	
			lb/s	
			lb/min	
			lb/h	
			lb/d	
			cm3/s	
			cm3/min	
			cm3/h	
			L/s	
			L/min	
			L/h	
			L/d	
			m3/s	
			m3/min	
			m3/h	
			m3/d	
			gal/s	
			gal/min	
			gal/h	
			gal/d	
			Cuft/s	
			Cuft/min	
			Cuft/h	
			Cuft/d	
			bbl/s	
			bbl/min	
			bbl/h	
			bbl/d	
			Impgal/s	
			Impgal/min	
			Impgal/h	
			Impgal/d	
		Net flo Format	xxxxxxx	Sel
			xxxxx.X	
			xxxx.XX	
			xxx.XXX	
			xx.XXXX	
			x.XXXXX	



Detailed Setup	Device information	Tag		R/W
		Long Tag		R/W
		Descriptor		R/W
		Message		R/W
		Date		R/W
		Sensor model		R
		Sensor S/N		R
		Final asmbly num		R
		S/N Converter		R
		S/N Detector		R
		Revision #‘s	Universal rev	R
			Fld dev rev	R
			Software rev	R
			Hardware rev	R
		Device S/W	Device S/W version	R
			Device S/W date	R
Review Device info	Distributor			R
	Sensor model			R
	Sensor S/N			R
	Final asmbly num			R
	Tag			R
	Long Tag			R
	Describtor			R
	Message			R
	Date			R
	Dev id			R
	Universal rev			R
	Fld dev rev			R
	Software rev			R
	Hardware rev			R
	Device S/W version			R
	Device S/W date			R
	S/N Converter			R
	S/N Detector			R

Review Sensor	SK20	R
	SKT	R
	SKTK	R
	RV	R
	Qnom	R
	SKP	R
	SKPT	R
	KD	R
	fl20	R
	FTC1	R
	FTCK	R
	FPC	R
	FPTC	R
	FQC1	R
	FQC2	R
	Autozero value	R
Rev Fld Dev vars 1	Flow direction	R
	Mass flo unit	R
	Mass flo LRV	R
	Mass flo URV	R
	Mass flo damp	R
	Mass flo lowcut	R
	Mass flo alm 1 sel	R
	Mass flo alm 1 crit	R
	Mass flo alm 2 sel	R
	Mass flo alm 2 crit	R
	Mass flo fixed value	R
	Vol flo unit	R
	Vol flo LRV	R
	Vol flo URV	R
	Vol flo damp	R
	Vol flo lowcut	R
	Vol flo alm 1 sel	R
	Vol flo alm 1 crit	R
	Vol flo alm 2 sel	R
	Vol flo alm 2 crit	R
	Dens unit	R
	Dens LRV	R
	Dens URV	R
	Dens damp	R
	Dens lowcut	R
	Dens alm 1 sel	R
	Dens alm 1 crit	R
	Dens alm 2 sel	R
	Dens alm 2 crit	R
	Reference density	R
	Density offset	R
	Pressure	R
	Pressure unit	R

Rev Fld Dev vars 1	Temperature unit	R
	Temp LRV	R
	Temp URV	R
	Temp damp	R
	Temp range select	R
	Temp alm 1 select	R
	Temp alm 1 crit	R
	Temp alm 2 select	R
	Temp alm 2 crit	R
	Temp fixed value	R
	Velocity unit	R
Rev Fld Dev vars 2	Conc meas Unit	R
	Conc meas LRV	R
	Conc meas URV	R
	Conc meas damp	R
	Conc meas lowcut	R
	Conc alm 1 select	R
	Conc alm 1 crit	R
	Conc alm 2 sel	R
	Conc alm 2 crit	R
	Net flo select	R
	Net flo unit	R
	Net flo LRV	R
	Net flo URV	R
	Net flo damping	R
	Net flo lowcut	R
	Net flo alm 1 sel	R
	Net flo alm 1 crit	R
	Net flo alm 2 sel	R
	Net flo alm 2 crit	R
Rev Outputs /Input	Analog 1 select	R
	PV Alarm 1 select	R
	PV Analog 1 low LMT	R
	PV Analog 1 high LMT	R
	Analog 2 select	R
	SV Alarm 2 select	R
	SV Analog 2 low LMT	R
	SV Analog 2 high LMT	R
	Pulse/Stat 1 sel	R
	Pulse 1 select	R
	Pls Unit	R
	Pls Rate	R
	Pls Mode	R
	Pls Width	R
	Pls Alarm	R
	SO 1 function	R
	SO 1 active mode	R
	Pulse/Stat 2 select	R
	Pulse 2 select	R
	Pls Unit	R
	Pls Rate	R

	Pls Mode	R
	Pls Width	R
	Pls Alarm	R
	SO 2 function	R
	SO 2 active mode	R
	Input function	R
	SI active mode	R
	PV is	R
	SV is	R
	TV is	R
	QV is	R
	Total flex select	R
	F-Totl flex Unit	R
	F-Totl mass Unit	R
	F-Totl vol Unit	R
	F-Totl net Unit	R
	F-Totl energy Unit	R
	Heat of combust unit	R
	Heat of combustion	R
	Total switch sel	R
	Total limit switch	R
	Total at alarm	R
	Total res cntrl	R
Rev HART	Poll addr	R
	Num req pream	R
	Num resp pream	R

7.5 Mass flow functions (Basic or Detailed Setup)

Mass flow	To set the functions of mass flow measurement.
Mass flow unit	Select: **g/s, g/min, g/h, kg/s, kg/min, kg/h, kg/d, t/min, t/h, t/d, lb/s, lb/min, lb/h, lb/d**
Mass flow format	Select: **xxxxxxx,xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX**
Mass flow LRV (low range value)	Set a mass flow value to the 4 mA or 0 Hz. LRV can also be negative to measure reverse flow.
Mass flow URV (upper range value)	Set a mass flow value to the 20 mA or xxxxxHz. Abs(URV-LRV) ≥ 5% of Qnom for liquids and 1% for gases
Mass flow damping	Set the damping time in s. Damping time affects outputs and display. After 5 times damping time the given value is displayed (t=63%).
Mass flow lowcut	Set the low cut. Low cut affects outputs and display and applies to negative and positive flow. A hysteresis of 0.05% of Qnom is given by the system.
Mass flow alm 1 sel	Select: **No function, More than, Less than**
Mass flow alm 1 crit	Select a mass flow alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Mass flow alm 2 sel	Select: **No function, More than, Less than**
Mass flow alm 2 sel Restrictions: All alarms have to be in 0-110% of URV-LRV. Alarm criteria 2 must always be larger than alarm criteria 1.	Select a mass flow alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Mass flow fix val sel	Select: **Inhibit, Enable**
Mass flow fixed value	Select a fix Mass flow value (only for test purpose or in case of maintenance). The set value is added to the actual value. In case of no flow it will vary with the zero fluctuation.

7.6 Volume flow functions (Basic or Detailed Setup)

Volume flow	To set the functions of volume flow measurement. Notice: Volume flow is derived density and mass flow measurement. Errors in density measurement (e.g. from gas bubbles) effects the accuracy of volume flow. For liquid it is recommended to use mass flow as original measurement. Density below roh = 0.3 kg/l volume flow is set to zero (for liquids)
Vol flow unit	Select: **cm³/s, cm³/min, cm³/h, l/s, l/min, l/h, l/d, m³/s, m³/min, m³/h, m³/d, gal/s, gal/min, gal/h, gal/d, Cuft/s, Cuft/min, Cuft/h, Cuft/d, bbl/s, bbl/min, bbl/h, bbl/d, Impgal/s, Impgal/min, Impgal/h, Impgal/d, l(N)/s, l(N)/min, l(N)/h, l(N)/d, m³(N)/s, m³(N)/min, m³(N)/h, m³(N)/d, Sl/s, Sl/min, Sl/h, Sl/d, Scuft/s, Scuft/min, Scuft/h, Scuft/d, Sm³/s, Sm³/min, Sm³/h, Sm³/d** **l(N)/s, l(N)/min, l(N)/h, l(N)/d, m³(N)/s, m³(N)/min, m³(N)/h, m³(N)/d** only for gas application. **Sl/s, Sl/min, Sl/h, Sl/d, Scuft/s, Scuft/min, Scuft/h, Scuft/d, Sm³/s, Sm³/min, Sm³/h, Sm³/d** only for gas application or if Reference density value is selected.
Vol flow format	Select; **xxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX**
Vol flow LRV (low range value)	Set a volume flow value to the 4 mA or 0 Hz. LRV can also be negative to measure reverse flow.
Vol flow URV (upper range value)	Set a volume flow value to the 20 mA or xxxxx Hz. Abs(URV-LRV) ≥ 5% of Qvnom for liquids. For gas application Abs(URV-LRV) ≥ 1%
Vol flow damping	Set the damping time in s. Damping time affects outputs and display. After 5 times damping time the given value is displayed (t=63%)
Vol flow lowcut	Set the low cut. Low cut affects outputs and display. Any low cut on mass flow will affect volume flow also. A hysteresis of 0.05% of Qnom on mass flow is given by the system.
Vol flow alm 1 sel	Select: **No function, More than, Less than**
Vol flow alm 1 crit	Select a volume flow alarm level. What happens in case of an alarm has to be defined in Status (7.12, 7.13).
Vol flow alm 2 sel	Select: **No function, More than, Less than**
Vol flow alm 2 crit Restrictions: All alarms have to be in 0-110% of URV-LRV. Alarm criteria 2 must always be larger than alarm criteria 1.	Select a volume flow alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).

7.7 Density functions (Basic or Detailed Setup)

Density	To set the functions of density measurement. Notice: Density measurement is only reliable if there is no gas in the liquid. For liquid measurement a density lower 0.3 kg/l is displayed as 0.0 kg/l. For gas measurement set a fixed density value.
Density unit	Select: **g/ml, kg/l, kg/m³, lb/gal, lb/Cuft, g/cm³, g/l, °Bé hv, °Bé lt, °API** **°Bé hv, °Bé lt, °API** only with option /CST
Density format	Select: **xxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX**
Density LRV (low range value)	Set a density value to the 4 mA or 0 Hz.
Density URV (upper range value)	Set a density value to the 20 mA or xxxxx Hz. Abs(URV-LRV) ≥ 0.05 kg/l
Density damping	Set the damping time in s. Damping time affects outputs and display. After 5 times damping time the given value is displayed (t=63%)
Density lowcut	Set the low cut. Low cut affects outputs and display.
Density alm 1 sel	Select: **No function, More than, Less than**
Density alm 1 crit	Select a density alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Density alm 2 sel	Select: **No function, More than, Less than**
Density alm 2 crit Restrictions: All alarms have to be in 0-110% of URV-LRV Alarm criteria 2 must always be larger than alarm criteria 1.	Select a density alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Density Fix val sel **(only software revision lower than 1.8.20)**	Select: **Inhibt**, **Enable**
Ref. Density sel **(from software revision 1.8.20)**	Select: Inhibit, Fixed, Calculated If Fixed or Calculated is selected, reference density and corrected volume flow is output. Otherwise measured density and volume flow is output. Calculated reference density is not available if concentration measurement (option /C□□) or gas measurement (option /GA) is activated.
Reference density	Set a fixed reference density value. For gas measurement (option /GA) set here your actual density for output of volume flow. For output of standard or normal volume flow set the standard or normal density of your gas accordingly. For liquid measurement this parameter can also be used to enter the standard density of your liquid for output of standard volume flow or for the actual density in case of density disturbances.

<table>
<tr><td>Reference density setup
(from software revision 1.8.20)</td><td>To setup the coefficients used for calculating the reference density.

$\rho ref = \rho (1 + a \Delta t + b \Delta t^2)$; $\Delta t = t - tref$

ρref : density at reference temperature
ρ : measured density
t : measured temperature
tref : reference temperature
a : linear thermal expansion coefficient
b : quadratic thermal expansion coefficient</td></tr>
<tr><td>Reference temperature
(from software revision 1.8.20)</td><td>Set the reference temperature for the reference density calculation.</td></tr>
<tr><td>Temp. coeff. a
(from software revision 1.8.20)</td><td>Set the linear thermal expansion coefficient of the liquid for the reference density calculation.</td></tr>
<tr><td>Temp. coeff. b
(from software revision 1.8.20)</td><td>Set the quadratic thermal expansion coefficient of the liquid for the reference density calculation.</td></tr>
<tr><td>Density offset</td><td>If the Rotamass detector is installed horizontally (bend down) the value from the following table must be entered according to the concerning sensor model.
<table>
<tr><td>RCCS30LR</td><td>5.25 g/l</td></tr>
<tr><td>RCCS30</td><td>2.70 g/l</td></tr>
<tr><td>RCCS31</td><td>1.80 g/l</td></tr>
<tr><td>RCCS32</td><td>2.00 g/l</td></tr>
<tr><td>RCCS33</td><td>0.60 g/l</td></tr>
<tr><td>RCCx34</td><td>0.90 g/l</td></tr>
<tr><td>RCCx36</td><td>0.35 g/l</td></tr>
<tr><td>RCCx38 to 39/XR</td><td>0 g/l (default)</td></tr>
</table>
ROTAMASS is density-calibrated vertically. If the ROTAMASS detector is installed horizontal an density
offset value from the above table has to be entered to the parameter reference density. As positive values if the tubes are down and as negative value if the tubes are up.</td></tr>
<tr><td>Pressure</td><td>Set the average static line pressure.
Static pressure effect on density and mass flow will be corrected automatically.</td></tr>
<tr><td>Pressure unit</td><td>Select: bar, psi, MPa</td></tr>
</table>

7.8 Temperature functions (Basic or Detailed Setup)

Temperature	To set the functions of temperature measurement. Notice: Standard range: -200 to 230°C High temp. range (/HT): 0 to 400°C
Temperature Unit	Select: **degC, degF, K**
Temperature format	Select: **xxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX**
Temperature LRV (low range value)	Set a temperature value to the 4 mA or 0 Hz
Temperature URV (upper range value)	Set a temperature value to the 20 mA or xxxxx Hz. Abs(URV-LRV) ≥ 10K
Temperature damping	Set the **damping time** in s. Damping time affects outputs and display. After 5 times damping time the given value is displayed (t=63%).
Temperature alm 1 sel	Select: **No function, More than, Less than**
Temperature alm 1 crit	Select a **temperature alarm** level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Temperature alm 2 sel	Select: **No function, More than, Less than**
Temperature alm 2 crit Restrictions: All alarms have to be in 0-110% of URV-LRV Alarm criteria 2 must always be larger than alarm criteria 1.	Select a **temperature alarm** level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Temperature fix val select	Select: **Inhibit, Enable**
Temperature fixed value	Select a temperature value in case of malfunction of the built in temperature sensor.
Temperature gain	Change the gain by setting a factor different from 1. The ROTAMASS temperature sensor is installed outside of the measuring tubes. So at high or low fluid temperature the temperature measurement may show a deviation as a function of the quality of heat insulation. This function allows correcting temperature measurement for better accuracy in mass flow and density. Note: It is not recommended to use this function unless correct measurement over the complete process temperature range can be confirmed. It is not sufficient to proof correct measurement at one temperature or in a very narrow temperature range unless the process operates exclusively within this range.

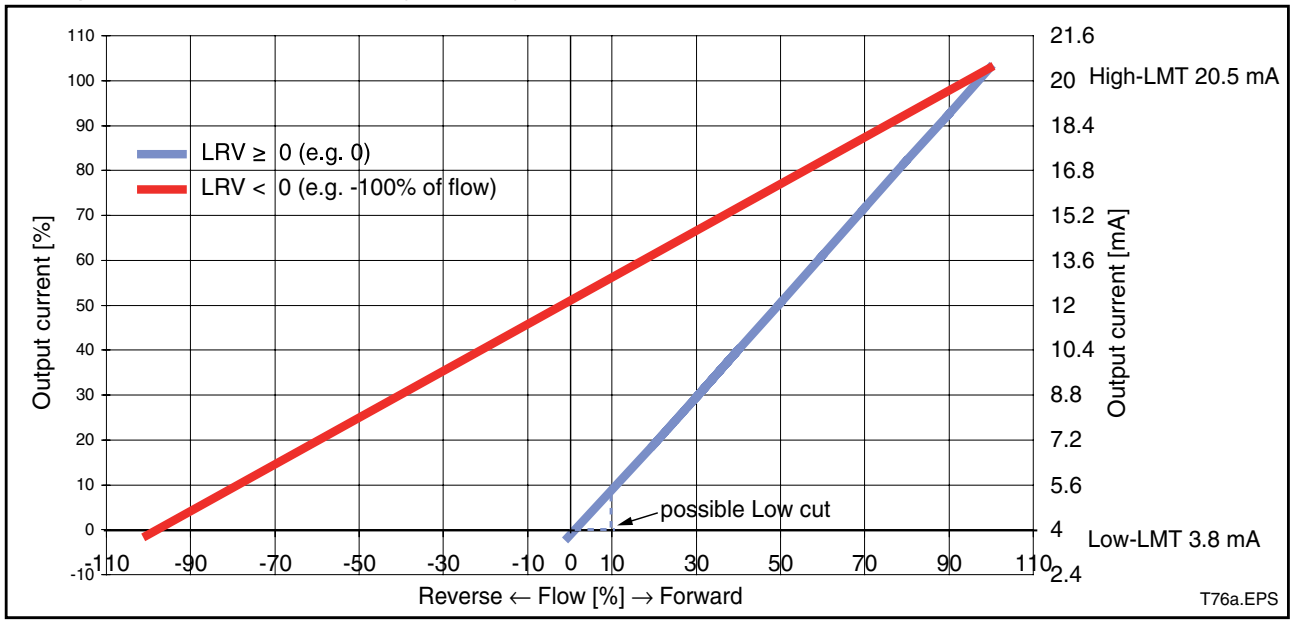
7.9 Velocity functions (Detailed Setup)

Velocity	To set the function of the medium velocity. Not available for gas measurement (/GA) Velocity is not calculated if reference density is enabled.
Velocity unit	Select: **m/s, ft/s**

7.10 Analog 1 functions (Basic or Detailed Setup)

Analog output 1	To set the current output 1. This output provides HART communication.
Analog 1 select	Select: **Mass flow (0), Volume flow (1), Density (2), Temperature (3), Concentration meas (4), Net flow (5), None (6)** Numbers may be displayed if selected via HART. If **None** is selected, output is 4 mA, HART communication is available.
Analog 1 alarm out (Detailed setup, configure output/input)	Default: 21.6mA **Select: <2.4 mA, <3.6 mA, <4 mA, >21 mA, >21.6 mA, Hold, Measured Value**
Analog 1 low LMT (low limit) (Detailed setup, configure output/ input) The alarm is active if the measured value is lower than the low limit.	Default: 2.4mA Setting range: 2.4 - 21.6 mA
Analog 1 high LMT (high limit) (Detailed setup, Configure output/ input) The alarm is active if the measured value is higher than the high limit.	Default: 21.6mA Setting range: 2.4 - 21.6 mA

Example for Bi-directional flow (NAMUR):



7.11 Analog 2 functions (Basic or Detailed Setup)

Analog output 2	To set the current output 2.
Analog 2 select	Select: **Mass flow (0), Volume flow (1), Density (2), Temperature (3), Concentration meas (4), Net flow (5), None (6)** Numbers may be displayed if selected via HART. If **None** is selected, output is 4 mA.
Analog 2 alarm out (Detailed setup, configure output/input)	Default: 21.6mA **Select: <2.4 mA, <3.6 mA, <4 mA, >21 mA, >21.6 mA, Hold, Measured Value**
Analog 2 low LMT (low limit) (Detailed setup, configure output/input) The alarm is active if the measured value is lower than the low limit.	Default: 2.4mA Setting range: 2.4 - 21.6 mA
Analog 2 high LMT (high limit) (Detailed setup, Configure output/input) The alarm is active if the measured value is higher than the high limit.	Default: 21.6mA Setting range: 2.4 - 21.6 mA

7.12 Pulse/Status output 1 functions (Basic or Detailed Setup)

Pulse/Status out 1	To set the pulse/status output 1.
Pulse/Stat 1 select	Select: **Pulse out, Status out, No function** If Pulse is selected, Status out 1 (SO) is not available. If **Status out** is selected, pulse parameters are not available.
Pulse 1 select	Select: **Mass flow (0), Volume flow (1), Density (2), Temperature (3), Concentration meas (4), Net flow (5), None (6), F-Total mass (7), R-Total mass (8), F-Total volume (9), R-Total volume (10), F-Total net (11), R-Total net (12)** Numbers may be displayed if selected via HART. If **F-Total mass, F-Total volume** or **F-Total net** are selected, pulse output only works at forward flow. If **R-Total mass, R-Total volume** or **R-Total net** are selected, pulse output only works at reverse flow.
Pulse 1 unit **NOTE** To select the pulse output mass or volume has to be selected. If mass flow or volume flow is selected the output delivers only frequency.	Select: **Hz, g/P, kg/P, t/P, lb/P, cm³/P, l/P, m³/P, gal/P, kgal/P, Cuft/P, bbl/P, Impgal/P, klmpgal/P, l(N)/P, m³(N)/P, Sl/P, Scuft/P, Sm³/P** If **Pulse 1 select** is **Mass flow, Volume flow, Density, Temperature** or **Concentration meas**, only **Hz** can be selected. If **Pulse 1 select** is **F-Total mass, R-Total mass, F-Total volume, R-Total volume, F-Total net** or **R-Total net** only **unit/P** can be selected. **l(N)/P, m³(N)/P** only for gas application. **Sl/P, Scuft/P, Sm³/P** only for gas application or if reference density value is selected.
Pulse 1 rate	The Pulse rate can be set according to the unit set in **Pulse 1 unit.** Pulse rate is 0 to 10000 Hz. Minimum output 20 Hz.
Pulse 1 active mode	Select: **On Active, Off Active** The output levels depending on this parameter are shown on page 7-91.
Pulse 1 width	Select: **0.05ms, 0.1ms, 0.5ms, 1ms, 5ms, 10ms, 50ms, 100ms, 500ms, 1000ms**
Pulse 1 at alarm	Select: **0P/0Hz, Measured value, Hold** If **0P/0Hz** is selected, in case of alarm the pulse output is stopped. If **Measured value** is selected, the pulse output keeps on measuring. If **Hold** is selected, the pulse output keeps the value before entering the alarm/error state.

SO 1 function	Select: **No Function, Flow direction, Total limit switch, Mass flow alm 1, Mass flow alm 2, Mass flow alm 1+2, Vol flow alm 1, Vol flow alm 2, Vol flow alm 1+2, Density alm 1,Density alm 2, Density alm 1+2, Temp alm 1, Temp alm 2, Temp alm 1+2, Concentration meas alm 1, Concentration meas alm 2, Concentration meas alm 1+2, Net flow alm 1, Net flow alm 2, Net flow alm 1+2, Slug alarm, Empty alarm, Corrosion alarm, All alarms, All errors, All alarms & errors** If **Flow direction** is selected, status output becomes active for forward flow and not active for reverse flow, if parameter **flow direction** set to **forward**. It is the other way round, if parameter **flow direction** is set to **reverse** (see 7.17). If **Total limit switch** is selected, status output becomes active, when the totalizer reaches the value set to parameter **Total limit switch** (see 7.17). If an alarm function is selected, status output becomes active, if the concerning alarm occurs. If **All alarms** is selected, status output becomes active, if at least one alarm occurs. The same applies for errors with the setting All errors. For **All alarms & errors** the status output becomes active, if at least one alarm or one error occurs.
SO1 active mode	Select: **On Active, Off Active** The output levels depending on this parameter are shown on page 7-94.

How to set status, pulse or frequency output (using the display keys, equivalent via HART)

Status

Basic Setup or **Detailed Setup**
Pulse/Status out 1
Pulse/Stat 1 select
Select : **Status out**

Pulse or Frequency

Basic Setup or **Detailed Setup**
Pulse/Status out 1
Pulse/Stat 1 select
Select : **Pulse**
Pulse 1 select

F-Total mass	→	**Pulse**
R-Total mass	→	**Pulse**
F-Total volume	→	**Pulse**
R-Total volume	→	**Pulse**
F-Total net	→	**Pulse**
R-Total net	→	**Pulse**
Mass Flow	→	**Frequency**
Volume Flow	→	**Frequency**
Net Flow	→	**Frequency**
Density	→	**Frequency**
Temperature	→	**Frequency**
Concentration meas.	→	**Frequency**

Notice : By selecting a variable (mass or volume) which can be totalized automatically the pulse output is selected.

If **Pulse** is selected, under **Basis Setup** the
Pulse unit and
Pulse rate
have to be defined.
Under "Detailed Setup"
Pulse unit
Pulse rate
Pulse active mode and
Pulse width
have to be defined.
If the pulse output is set under **Basic Setup**, the pulse width is the width set under **Detailed Setup**
If the pulse width is not configured under **Detailed Setup** menu the **pulse width** will be set default to 1ms.
If "frequency" is selected the frequency generated at URV (upper range value) has to be defined.
Default is URV = 1000Hz.

Differences between Pulse and Frequency output

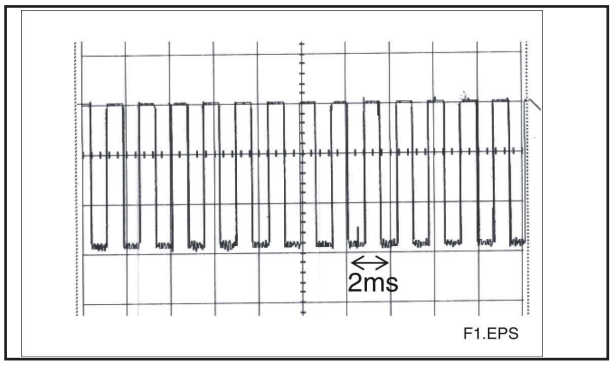
For pulse output the mass (or volume) is internally totalized and if the increment is reached, one pulse is sent.
For a frequency output the measured value is calculated in actual frequency according to the definition of the user (e.g. 10000 Hz = 54321 kg/h) with 50% duty cycle.
Set as frequency output the pulse length is changing with the change of the measured value.

NOTE

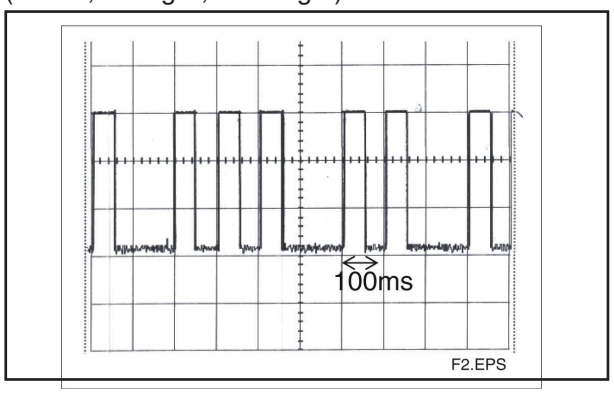
At frequencies above 500 Hz, frequency output 1 inserts gaps in the pulse train. Therefore it is required to use a minimum pulse integration time of 10 sec. to get accurate frequency measurements. If shorter pulse integration time is necessary e.g. for batching applications, it is recommended to use frequency output 1 up to max. 500 Hz.

Set as a pulse output the pulse length is constant but the time between the pulses varies. Even at constant flow the time between the pulses might vary because the microprocessor has to find a suitable gap in its timing to send the pulse.

Typical pattern for frequency output :



Typical pattern for pulse output
(50 ms; 0.1 kg/P; 2580 kg/h) :



Setting the pulse output

Because the duty cycle of pulses is max. 50%, the max. flowrate is restricted by the pulse width, the unit and the pulse rate :

Max. flow rate =
1s/(pulse width*2) *pulse rate *time factor

Example :

Max. Q should be calculated in kg/min
Pulse width = 50 ms
Pulse rate = 0.1 kg/P
Time factor (related to s) = 60 P/min
Max. Q = 1s/(0.05s *2) *0.1kg/P * 60P/min = 60kg/min

If the flow is higher than max.Q pulses will be lost. Therefore it is mandatory to choose the pulse width/rate so, that the calculated max.Q is always 10% higher than the maximum expected flowrate.

10% higher is recommended because the duty cycle is not always exact 50%. For certain pulse widths the duty cycle at max.Q is larger than 50% so fewer pulses can be generated. These pulses are delivered later when the flowrate is again below max.Q minus 10%. To avoid this situation it is recommended to keep the flowrate always 10% below max.Q.

Example :

Flowrate : 11 t/h
Pulse unit : kg
Pulse rate : 0.1 kg/P
Time factor (related to s) = 3600 P/h

Check :

Lowest pulse width
= 0.5 s*pulse rate* time factor/ max. flow rate
= 0.5 s*0.1 kg/P *3600 P/h /(11000 kg/h)
= 16.4 ms

→ customer should select 10 ms pulse width or lower.

Max. Q = 18000 kg/h
11000 kg/h < 18000 kg/h - 10%

Result :

Pulse width = 10 ms
Pulse rate = 0.1 kg/P

For a first orientation the max. Q for certain pulse widths and units for a pulse rate of 0.1, 1 and 10 are given in the table 7-1.

Max. flow restriction :

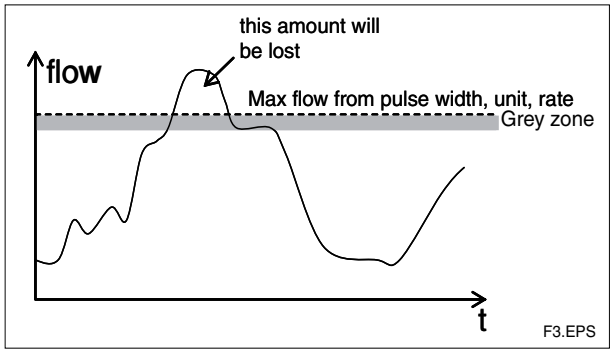


Table 7-1: Max. flowrate for different pulse settings reduced by 10%:

		Pulse Width in ms									
		1000	500	100	50	10	5	1	0.5	0.1 [2]	0.05 [2]
		Max. pulse sending frequency for the different pulse settings in P/s									
		0.45	0.9	4.5	9	45	90	450	900	4500	9000
Pulse Unit	Pulse rate	Maximum Flow Rate [1]									
g	0.1	162 g/h	324 g/h	1.62 kg/h	3.24 kg/h	16.2 kg/h	32.4 kg/h	162 kg/h	324 kg/h	1.62 t/h	3.24 t/h
g	1	1.62 kg/h	3.24 kg/h	16.2 kg/h	32.4 kg/h	162 kg/h	324 kg/h	1.62 t/h	3.24 t/h	16.2 t/h	32.4 t/h
g	10	16.2 kg/h	32.4 kg/h	162 kg/h	324 kg/h	1.62 t/h	3.24 t/h	16.2 t/h	32.4 t/h	162 t/h	324 t/h
kg	0.1	162 kg/h	324 kg/h	1.62 t/h	3.24 t/h	16.2 t/h	32.4 t/h	162 t/h	324 t/h	1620 t/h	3240 t/h
kg	1	1.62 t/h	3.24 t/h	16.2 t/h	32.4 t/h	162 t/h	324 t/h	1620 t/h	3240 t/h	16200 t/h	---
kg	10	16.2 t/h	32.4 t/h	162 t/h	324 t/h	1620 t/h	3240 t/h	16200 t/h	---	---	---
t	0.1	162 t/h	324 t/h	1620 t/h	3240 t/h	16200 t/h	---	---	---	---	---
t	1	1620 t/h	3240 t/h	16200 t/h	---	---	---	---	---	---	---
t	10	16200 t/h	---	---	---	---	---	---	---	---	---

[1] Maximum Flow rate is also limited by sensor size

[2] Note for pulse output 2: Pulse width 0.1 ms & 0.05 ms are only implemented for convenience. Due to the limited bandwidth proper function can not be guaranteed.

The following tables show the physical output levels of the pulse / status outputs depending on the setting of parameter Pulse 1/2 active mode or SO 1/2 active mode.

On active				
Output	Situation	Output transistor	Level Pout+	Level Pout+
			Passive	Active (/AP)
Pulse/Status out 1	No Alarm/No Pulse	open (OFF)	High (Us) [1]	High (15 VDC)
	Alarm/Pulse	closed (ON)	Low (≤ 1 V)	Low (≤ 1 V)
			Level Sout+	
Pulse/Status out 2	No Alarm/No Pulse	open (OFF)	High (Us) [1]	
	Alarm/Pulse	closed (ON)	Low (≤ 1 V)	

Off active				
Output	Situation	Output transistor	Level Pout+	Level Pout+
			Passive	Active (/AP)
Pulse/Status out 1	No Alarm/No Pulse	closed (ON)	Low (≤ 1 V)	Low (≤ 1 V)
	Alarm/Pulse	open (OFF)	High (Us) [1]	High (15 VDC)
			Level Sout+	
Pulse/Status out 2	No Alarm/No Pulse	closed (ON)	Low (≤ 1 V)	
	Alarm/Pulse	open (OFF)	High (Us) [1]	

[1] Us is the external power supply voltage of the pulse / status output

7.13 Pulse/Status output 2 functions (Basic or Detailed Setup)

Pulse/Status out 2	To set the pulse/status output 2.
Pulse/Stat 2 select	Select: **Pulse out, Status out, No function** If Pulse is selected, Status out 2 (SO) is not available. If **Status out** is selected, pulse parameters are not available.
Pulse 2 select	Select: **Mass flow (0), Volume flow (1), Density (2), Temperature (3), Concentration meas (4), Net flow (5), None (6), F-Total mass (7), R-Total mass (8), F-Total volume (9), R-Total volume (10), F-Total net (11), R-Total net (12)** Numbers may be displayed if selected via HART. If **F-Total mass, F-Total volume** or **F-Total net** are selected, pulse output only works at forward flow. If **R-Total mass, R-Total volume** or **R-Total net** are selected, pulse output only works at reverse flow.
Pulse 2 unit **NOTE** To select the pulse output mass or volume has to be selected. If mass flow or volume flow is selected the output delivers only frequency.	Select: **Hz, g/P, kg/P, t/P, lb/P, cm³/P, l/P, m³/P, gal/P, kgal/P, Cuft/P, bbl/P, Impgal/P, kImpgal/P, l(N)/P, m³(N)/P, Sl/P, Scuft/P, Sm³/P** If **Pulse 2 select** is **Mass flow, Volume flow, Density, Temperature** or **Concentration meas**, only **Hz** can be selected. If **Pulse 2 select** is **F-Total mass, R-Total mass, F-Total volume, R-Total volume, F-Total net** or **R-Total net** only **unit/P** can be selected. **l(N)/P, m³(N)/P** only for gas application. **Sl/P, Scuft/P, Sm³/P** only for gas application or if Reference density value is selected.
Pulse 2 rate	The Pulse rate can be set according to the unit set in **Pulse 2 unit.** Pulse rate is 0 to 2000 Hz. Minimum output 20 Hz.
Pulse 2 active mode	Select: **On Active, Off Active** The output levels depending on this parameter are shown on page 7-91.
Pulse 2 width	Select: **0.05ms, 0.1ms, 0.5ms, 1ms, 5ms, 10ms, 50ms, 100ms, 500ms, 1000ms**
Pulse 2 at alarm	Select: **0P/0Hz, Measured value, Hold** If **0P/0Hz** is selected, in case of alarm the pulse output is stopped. If **Measured value** is selected, the pulse output keeps on measuring. If **Hold** is selected, the pulse output keeps the value before entering the alarm/error state.

SO 2 function	Select: **No Function, Flow direction, Total limit switch, Mass flow alm 1, Mass flow alm 2, Mass flow alm 1+2, Vol flow alm 1, Vol flow alm 2, Vol flow alm 1+2, Density alm 1,Density alm 2, Density alm 1+2, Temp alm 1, Temp alm 2, Temp alm 1+2, Concentration meas alm 1, Concentration meas alm 2, Concentration meas alm 1+2, Net flow alm 1, Net flow alm 2, Net flow alm 1+2, Slug alarm, Empty alarm, Corrosion alarm, All alarms, All errors, All alarms & errors** If **Flow direction** is selected, status output becomes active for forward flow and not active for reverse flow, if parameter **flow direction** set to **forward**. It is the other way round, if parameter **flow direction** is set to **reverse** (see 7.17). If **Total limit switch** is selected, status output becomes active, when the totalizer reaches the value set to parameter **Total limit switch** (see 7.17). If an alarm function is selected, status output becomes active, if the concerning alarm occurs. If **All alarms** is selected, status output becomes active, if at least one alarm occurs. The same applies for errors with the setting All errors. For **All alarms & errors** the status output becomes active, if at least one alarm or one error occurs.
SO2 active mode	Select: **On Active, Off Active** The output levels depending on this parameter are shown on page 7-94.

Detailed information about using the pulse and status output see chapter 7.12.

7.14 Status input functions (Basic or Detailed Setup)

Status input	To set the **status input**.
SI function	Select: **No function, Autozero, Reset flex totals, Reset mass totals, Reset volume totals, Reset net totals, Reset all totals, 0% signal lock** If **Autozero** is selected, active status input starts autozero procedure. If **0% signal lock** is selected, analog outputs 1 and 2 are fixed to 4 mA while status input is active. If parameter **Total reset cntrl** is enabled: - If **Reset flex totals** is selected, active status input sets **flex totalizer** to zero. - If **Reset mass totals** is selected, active status input sets mass totalizer to zero. - If **Reset volume totals** is selected, active status input sets volume totalizer to zero. - If **Reset net totals** is selected, active status input sets net totalizer to zero. - If **Reset all totals** is selected, active status input sets all totalizer to zero.
SI active mode	Select: **On Active, Off Active** If **On Active** is selected, the status input is closed active. If **Off Active** is selected, the status input is open active.

7.15 HART output (Detailed Setup)

HART output	To set the assignments of HART device variables which are reported via HART Universal Command 3.
PV is	Set the assignment of Primary variable (PV). PV is linked to Analog output 1. Changing of PV will change the assignment of Analog output 1 and vice versa. Select: **Mass flow, Volume flow, Density, Temperature, Concentration meas, Net flow, None**
SV is	Set the assignment of Secondary variable (SV). SV is linked to Analog output 2. Changing of SV will change the assignment of Analog output 2 and vice versa. Select: **Mass flow, Volume flow, Density, Temperature, Concentration meas, Net flow, None** If Analog output 2 is not available (option /KF2) an extended selection is available, see “HART Variable list” below.
TV is	Set the assignment of Tertiary variable (TV). TV is linked to Pulse output 1 if **Pulse/Stat 1 sel** is set to **Pulse.** In this case changing of TV will change the assignment of Pulse output 1 and vice versa. Select: **Mass flow, Volume flow, Density, Temperature, Concentration meas, Net flow, None, F-Total mass, R-Total mass, F-Total volume, R-Total volume, F-Total net, R-Total net** If **Pulse/Stat 1 sel** is set to **Status out** or **No function** an extended selection is available, see “HART Variable list” below . This selection is stored separately from the selection for “Pulse”.
QV is	Set the assignment of Quaternary variable (QV). QV is linked to Pulse output 2 if **Pulse/Stat 2 sel** is set to **Pulse.** In this case changing of QV will change the assignment of Pulse output 2 and vice versa. Select: **Mass flow, Volume flow, Density, Temperature, Concentration meas, Net flow, None, F-Total mass, R-Total mass, F-Total volume, R-Total volume, F-Total net, R-Total net** If Pulse output 2 is not available (option /KF2) or **Pulse/Stat 2 sel** is set to **Status out** or **No function** an extended selection is available, see “HART Variable list” below. This selection is stored separately from the selection for “Pulse”.
HART Variable list **(For HART- communication: Variables which are not allowed will be rejected by "Invalid Selection")**	**Mass flow, Volume flow, Density, Temperature, Concentration meas, Net flow, None, F-Total mass, R-Total mass, F-Total volume, R-Total volume, F-Total net, R-Total net, F-Total flex, R-Total flex, D-Total mass, D-Total volume, D-Total net, D-Total flex, F-Total energy, Velocity, Drive Gain**

7.16 Totalizer functions (Basic or Detailed Setup)

Totalizer	To set totalizer function. Totalizer increments the forward flow if flow direction is forward or the reverse flow if flow direction is reverse.
Total flex select	Flex totalizer is available as a secondary total for mass, volume or net. Select: **Mass, Volume, Net** If assignment is changed Flex totalizer will be set to zero, **Total flex unit** will be set to default.
Total flex unit	When **Total flex select** is set to **Mass** or **Net**, the **Total flex unit g, kg, t, lb** can be selected. When **Total flex selec**t is set to **Volume** or **Net**, the **Total flex unit cm³, l, m³, gal, kgal, Cuft, bbl, Impgal, kImpgal, l(N), m³(N), Sl, Scuft, MMscuft, Sm³** can be selected. **l(N), m³(N)** only for gas application. **Sl, Scuft, MMscuft, Sm³** only for gas application or if Reference density value is selected.
Total mass unit	Select: **g, kg, t, lb**
Total volume unit	For **Total volume uni**t **cm³, l, m³, gal, kgal, Cuft, bbl, Impgal, kImpgal, l(N), m³(N), Sl, Scuft, MMscuft, Sm³** can be selected. **l(N), m³(N)** only for gas application. **Sl, Scuft, MMscuft, Sm³** only for gas application or if **Reference density value** is selected.
Total net unit	For option /CST: When **Net flow select** is set to **Mass**, the **Total net unit g, kg, t, lb** can be selected. When **Net flow selec**t is set to **Volume**, the **Total net unit cm³, l, m³, gal, kgal, Cuft, bbl, Impgal, kImpgal** can be selected. For option /C□□: Selection depends from concentration unit.
Total energy unit	Select: **MJ, Btu**
Energy factor/Heat of combustion	Set the calorific value of the medium with the unit Energy factor/ Heat of combust. unit. The totalized energy of the medium can be indicated on display by F-Total energy. Heat of combust. unit **MJ/kg, Btu/lb, MJ/m³(N)** and **Btu/Scuft** can be selected.
Total switch select	Select: **Flex Total, Mass Total, Volume Total, Net Total**
Total limit switch	A totalizer limit can be set only to the forward totalizer selected in **Total select**. If status output is set to **Total switch**, status output is set active, if the totalizer reaches this value. Total switch is not active if set to 0.0.
Total at alarm	Select: **Hold, Continue Total** Characteristic of totalizer selected in **Total select** in case of the **Total switch** is active. If **Hold** is selected forward and reverse totalising stops.
Total reset cntrl	Select: **Inhibit, Enable** Enables or inhibits total reset.

Total reset	Select: **Not Execute, Reset flex totals,** **Reset mass totals, Reset volume totals,** **Reset net totals, Reset all totals** After execution of reset totals, forward and reverse total of the selected totalizer will be set to zero.
If the total value 9999999 is reached, the indication changes to exponential type. During exponential indication the resolution is lower. If full accuracy is needed, total reset must be executed to reach precise indication.	

7.17 Flow direction function (Detailed Setup)

Flow direction	Select: **Forward, Reverse** See 7.12 and 7.13 according influence on status output (**SO 1/2 functio**n = **Flow direction**) If **Reverse** is selected, the flow direction in the other direction of the arrow on the detector is used as positive values of flow.

7.18 Concentration measurement (Detailed Setup)

Concentration meas (only for option/CST or /Cxx)	To set the functions of concentration measurement. For xx=00 to 99 a customer specific or defined table is stored in the converter in factory. For /CST temperature coefficients have to be determined by the customer.
Concentration meas unit (only available for option/CST)	Select: °**Brix, Wt-% sol, Vol% sol, Wt-%, Vol%**
Concentration meas format	Select: **xxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX**
Concentration meas LRV (low range value)	Set a concentration value to the 4 mA or 0 Hz
Concentration meas URV (upper range value)	Set a **concentration value** to the 20 mA or xxxxx = Hz. **Abs(URV-LRV) ≥ 1%**
Concentration meas damping	Set the damping time in s. Damping time affects outputs and display. After 5 times damping time the given value is displayed (t=63%).
Concentration meas lowcut	Set the low cut. Low cut affects outputs and display.
Concentration meas alm 1 sel	Select: **No function, More than, Less than**
Concentration meas alm 1 crit	Select a concentration alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Concentration meas alm 2 sel	Select: **No function, More than, Less than**
Concentration meas alm 2 crit Restrictions: All alarms have to be in 0-110% of URV-LRV Alarm criteria 2 must always be larger than alarm criteria 1.	Select a concentration alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Concentration meas setup (only for option /CST)	To setup the coefficients used for calculation of concentration using the Standard Concentration Measurement.
Reference temperature	Set the temperature where the reference density of both components of the mixture has been determined.
Ref. density carrier	Set the density of the carrier liquid determined at the reference temperature.
Temp. coeff. a carrier	Set the linear temperature coefficient of the density of the carrier liquid.
Temp. coeff. b carrier	Set the squared temperature coefficient of the density of the carrier liquid.
Ref. density product	Set the density of the product determined at the reference temperature.
Temp. coeff. a product	Set the linear temperature coefficient of the density of the product.
Temp. coeff. b product	Set the squared temperature coefficient of the density of the product.
For more information on concentration measurement see TI "Concentration Measurement" TI 01R04B04-04E-E.	

7.19 Net flow (Detailed Setup)

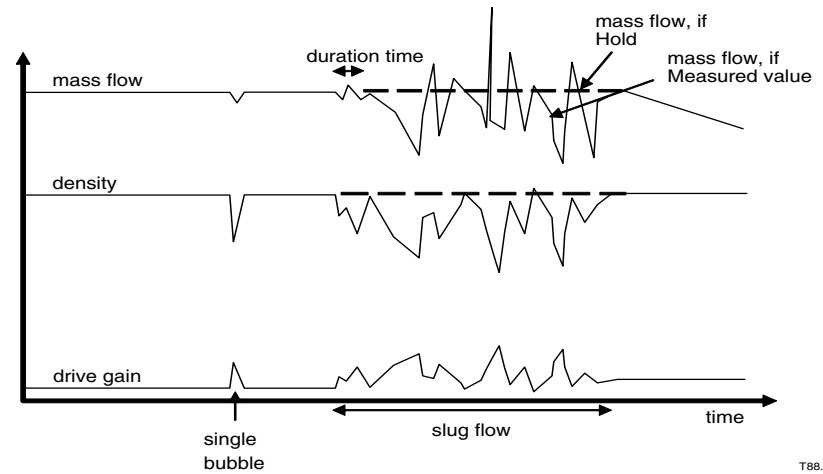
Net flow	To set the functions of net flow measurement. Net flow is only available if concentration measurement is activated (option /Cxx or /CST). The actual flow is multiplied with the concentration).
Net flow select (only available for option /CST)	Select: **Mass, Volume**
Net flow unit	When **Net flow select** is set to **Mass**: **g/s, g/min, g/h, kg/s, kg/min, kg/h, kg/d, t/min, t/h, t/d, lb/s, lb/min, lb/h, lb/d** can be selected When **Net flow select** is set to **Volume**: **cm³/s, cm³/min, cm³/h, l/s, l/min, l/h, l/d, m³/s, m³/min, m³/h, m³/d, gal/s, gal/min, gal/h, gal/d, Cuft/s, Cuft/min, Cuft/h, Cuft/d, bbl/s, bbl/min, bbl/h, bbl/d, Impgal/s, Impgal/min, Impgal/h, Impgal/d** can be selected
Net flow format	Select: **xxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX**
Net flow LRV (low range value)	Set a net flow value to the 4 mA or 0 Hz.
Net flow URV (upper range value)	Set a net flow value to the 20 mA or xxxxx = Hz. Abs(URV-LRV) ≥ 5% of Qnom.
Net flow damping	Set the damping time in s. Damping time effects outputs and display. After 5 times damping time the given value is displayed (t=63%).
Net flow lowcut	Set the low cut effects output and display. A hysteresis of 0.05% of Qnom is given by the system.
Net flow alm 1 sel	Select: **No function, More than, Less than**
Net flow alm 1 crit	Select a net flow alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13)
Net flow alm 2 sel	Select: **No function, More than, Less than**
Net flow alm 2 crit Restrictions: All alarms have to be in 0-110% of URV-LRV Alarm criteria 2 must always be larger than alarm criteria 1.	Select a net flow alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13)

7.20 Slug detection (Detailed Setup)

Slug detection Not available if gas measurement is ordered.	Detection of bubble flow. After slug criteria has been reached, slug is supervised during slug duration. If slug is still detected after slug duration has expired, the selected action in **After slug** is taken. See below table.
Slug alarm select	Select: **Not apply, Apply**
Drive gain	To read drive gain. To set a suitable slug criteria the customer must know the drive gain level of normal flow condition and of slug flow condition. This function is suitable to evaluate this level.
Slug criteria	Above this drive gain level slug flow is assumed.
Slug duration	Duration time is designed to ignore short gas bubbles. Only after Slug duration has expired the setting in After slug will be taken in account. In normal slug application set slug duration to zero.
After slug	Select: **Measured value, Hold** If **Hold** is selected mass flow and density keep their value before occurrence of the slug alarm and as long as slug alarm is detected.
Drive gain damping	Set drive gain damping time to get a constant drive gain level.

<table>
<tr><td colspan="5">Gas application?</td></tr>
<tr><td>Yes</td><td colspan="4">No</td></tr>
<tr><td rowspan="6">Slug detection off</td><td colspan="4">Slug alarm select = Apply?</td></tr>
<tr><td colspan="3">Yes</td><td>No</td></tr>
<tr><td colspan="3">Drive gain > Slug criteria?</td><td rowspan="5">Slug detection off</td></tr>
<tr><td colspan="2">Yes</td><td rowspan="3">No</td></tr>
<tr><td colspan="2">Duration active?</td></tr>
<tr><td>Yes</td><td>After duration</td></tr>
<tr><td>Function active
Alarm off
Measurement continued</td><td>Slug detection On
Alarm on
Measurement continued
or value hold</td><td>Slug detection off
Alarm off</td></tr>
</table>

Influence of slug on mass flow, density and drive gain :



7.21 Empty pipe detection (Detailed Setup)

Empty pipe detection Not available if gas measurement (option /GA) is ordered. Not working if fixed reference density is enabled.	Detection of empty pipe After **Empty pipe crit** has been reached, alarm output is activated if selected. This function can also be used to detect tube failure (see chapter 8.8).
Empty pipe alm sel	Select: **Not apply, Apply**
Empty pipe crit	Set density value as criteria when empty pipe alarm should happen. If **Empty pipe crit** is smaller than **Density URV** (or LRV, whichever is higher), alarm appears if density is lower than **Empty pipe crit**. If **Empty pipe cri**t is equal or greater than **Density URV** (or LRV, whichever is higher), alarm appears if density is higher than **Empty pipe crit.**
After empty pipe	Select the behaviour of the outputs after empty pipe has happened. Select: **Massflow = Zero, Measured Value, Hold** With this function the outputs can be set to zero if the detector runs empty during maintenance. It is also useful for batching if the batch starts with an empty pipe. In such case please install the detector vertically.

Gas application?					
Yes	No				
	Empty pipe alm sel = Apply?				
	Yes				No
	Empty pipe crit < Density URV? (or LRV, whichever is higher)		Empty pipe crit ≥ Density URV? (or LRV, whichever is higher)		
	Yes	No	Yes	No	
Empty pipe OFF Alarm off	Empty pipe ON Alarm On if density < empty pipe crit Outputs either Measured Value, Hold or 4mA/0Hz	Empty pipe OFF Alarm off	Empty pipe ON Alarm On if density ≥ empty pipe crit Outputs either Measured Value, Hold or 4mA/0Hz	Empty pipe OFF Alarm off	Empty pipe OFF Alarm off

7.22 Corrosion detection (Detailed Setup)

Corrosion detection Not available if gas measurement is ordered. Not working if fixed reference density is enabled. This function is useful if the max. density of the fluid is known and corrosion may happen. As alternative to this function the user can watch density periodically.	Detection of corrosion in pipe. After density value stored in **Corrosion crit** has been reached, alarm output is activated if selected. This function is only good for liquids with relative constant density. Set an upper density level. If this density level is reached permanently, a warning occurs.
Corrosion alm sel	Select: **Not apply, Apply**
Corrosion crit	Set density value up to **Density URV** or **Density LRV** (whichever is higher)
Corrosion damp	Set damping on density for comparison with **Corrosion crit,** up to 10h.

7.23 Detector data (Detailed Setup)

The sensor model is defined in Parameter Detailed Setup / Sensor model :

WARNING
The function Sensor model is only for changing a converter in case of maintenance.
Never change the sensor model if the sensor is not changed.

The sensor constants for the selected detector are stored in parameters Detailed Setup / Sensor constants. You find the main sensor constants on the name plate. In case of doubt of the measured value please confirm that the proper sensor constants are stored.

The serial number of the converter is stored in ´Detailed Setup / Device Information / Serial no. Converter´.
The serial number of the detector is stored in ´Detailed Setup / Device Information / Serial no. Detector´.
For compact version RCCT3 there is only one serial number.

The tag number, if provided by the customer (option /BG), is stored in Basic setup / Tag.

For integral type RCCT3□ and remote type RCCF31 / RCCR31 combined ordered with RCCS3□ the detector data are factory stored in the concerning parameters. For not combined remote type RCCF31 or RCCR31 with option /NC see chapter 5.5.

If the parameter Detailed setup / Sensor model is changed to another type, the following parameters are changed to new default values corresponding to the selected model :
Qnom, Mass flow unit, Mass flow LRV, Mass flow URV, Vol flow unit, Vol flow LRV,
Vol flow URV, Autozero range, Autozero fluctuation range and the sensor constants.
In this case the sensor constants, the detector serial number and, if available, the tag number must be set to the values corresponding to the used detector as described above.

7.24 Autozero (Diag/Service)

Autozero	**Mass flow zero setting**. Please set zero under process conditions after warming up the converter.
Zero tuning	Select: **Inhibit, Enable**
Autozero time	Select: **3 min, 30 sec** Select the duration of autozero performing. Recommended: 3 min
Autozero Exe	Select: **Execute, Not Execute** If **Execute** is selected Autozero is started. After autozero execution the autozero value is indicated for 3 seconds and the date should be entered (format: dd/mm/yyyy). Pressing SET stores value, date, temperature and density in autozero history. Note: Autozero function can't be terminated. Autozero value will be calculated and used once the function has been started!
Autozero value	Result of **Autozero Exe**
Autozero check: Autozero history	Indicates 5 latest autozero values with date of execution, temperature and density during execution (only if date has been entered). This function allows checking the quality of autozero condition and long term zero drift.
Autozero check: Autozero initial	Indicates the factory autozero value
Autozero check: Autozero range	Indicates the typical maximum autozero range. If this range is exceeded during autozero the warning W06 is generated. Check the detector installation!
Autozero check: Autozero fluctuation range Warning: If the sensor model is changed Autozero fluctuation range is zero.	Indicates the factory Autozero fluctuation range determined during calibration. If this range is exceeded during autozero the warning W07 is generated. Check the electrical installation, the plant vibration and the density (is the detector fully filled?).

IMPORTANT

- Stop flow before starting autozero (valve on output)**.**
- During autozero time
 - Flow is fixed to zero
 - Totalizer stops counting
 - Display keys do not work

Additional information and how to start autozero and how to read autozero history is described in chapter 5.6 "Zero adjustment".

7.25 Reading maximum fluid temperature (Detailed Setup)

Fluid max. temp	The highest measured medium temperature ever reached can be read in this parameter. This parameter can not be reset or changed by the user.

7.26 Option /GA for Gas Measurement

This option is factory set by order. If this function is selected find the following restrictions:

- Density measurement is not available; the reference density value is always used and displayed.
  - Normal volume flow:
    - Set reference density to normal density.
    - Select normal volume (flow) units for volume, total volume, pulse output.
  - Standard volume flow (for ROTAMASS with software version 1.08.xx (xx < 20) "Density Fix Val" instead of "reference density" must be set):
    - Set reference density to standard density.
    - Select standard volume (flow) units for volume, total volume, pulse output.
  - Volume flow:
    - Set reference density to actual density.
    - Select volume (flow) units for volume, total volume, pulse output.
- Corrosion detection is not available.
- Empty pipe detection is not available.
- Slug detection is not available

The instrument is mass balanced with air at normal pressure. It can be used for liquids with reduced accuracy.

The minimum URV-LRV range for mass flow, volume flow and net flow is 1% of Qnom.

If Heat of Combustion unit is changed between mass related units (MJ/kg, Btu/lb) and volume related units ($MJ/m^3(N)$, Btu/Scuft), there is no conversion of Heat of Combustion value.
In this case, Heat of Combustion has to be set manually to the correct value.

8. SELF-DIAGNOSTIC AND TROUBLE-SHOOTING

8.1 Error descriptions and countermeasures

The self check function displays instrument errors, warnings and alarms.
When an alarm or error occurs, the code (e.g. E-01) and the name (e.g. Frequency fault) appear on the display during display mode, alternating with measuring value indication. This does not happen in parameter setting mode.
The alarms, errors and warnings are written into history, see chapter 9.2.
The following table shows the possible alarms, warnings and error with the concerning influences on outputs and fields variables.

Alarm (A); Warning (W) Error (E)	Name	Flow on Display	Density/Temp. on Display	Totalizer on Display	Analog outputs	Frequ./Pulse-outputs	Status outputs *)
		nc = no change, nd = not defined					
A-01	MF 1 criteria	nc	nc	nc	nc	6)	Mass flow alm 1 *)
A-02	MF 2 criteria	nc	nc	nc	nc	6)	Mass flow alm 2 *)
A-03	VF 1 criteria	nc	nc	nc	nc	6)	Vol flow alm 1 *)
A-04	VF 2 criteria	nc	nc	nc	nc	6)	Vol flow alm 2 *)
A-05	Dens. 1 criteria	nc	nc	nc	nc	6)	Density alm 1 *)
A-06	Dens. 2 criteria	nc	nc	nc	nc	6)	Density alm 2 *)
A-07	Temp. 1 criteria	nc	nc	nc	nc	6)	Temp alm 1 *)
A-08	Temp. 2 criteria	nc	nc	nc	nc	6)	Temp alm 2 *)
A-09	Conc. 1 criteria	nc	nc	nc	nc	6)	Conc meas alm 1*)
A-10	Conc. 2 criteria	nc	nc	nc	nc	6)	Conc meas alm 2*)
A-11	Netflow 1 crit.	nc	nc	nc	nc	6)	Net flow alm 1 *)
A-12	Netflow 2 crit.	nc	nc	nc	nc	6)	Net flow alm 2 *)
A-13	Total thr exceed	nc	nc	hold;continue 1)	nc	6)	Total switch *)
A-14	Slug detection	MFL: meas.; hold 4)	DEN: meas.; hold 4)	nc	nc	6)	Slug alarm *)
A-15	Empty pipe det.	MFL: meas.; hold 2)	nc	nc	nc	6)	Empty pipe alm *)
A-16	Corrosion det.	nc	nc	nc	nc	6)	Corrosion alm *)
W-01	Density low	nc	DEN: 0 kg/l 5)	nc	nc	nc	nc
W-02	Fixed dens act.	nc	DEN: fix value	nc	nc	nc	nc
W-03	Fixed temp act.	nc	TEMP: fix value	nc	nc	nc	nc
W-04	Fixed MF active	MFL: fix value + act. zero	nc	nc	nc	nc	nc
W-05	Autozero running	nc	nc	nc	nc	nc	nc
W-06	AZ val error	nc	nc	nc	nc	nc	nc
W-07	AZ fluct error	nc	nc	nc	nc	nc	nc
W-08	Sensor simul.	nc	nc	nc	nc	nc	nc
W-09	Fixed Prim Out	nc	nc	nc	4mA	nc	nc
W-10	Prim Out sat.	nc	nc	nc	nc	nc	nc
W-11	Sec Out sat.	nc	nc	nc	nc	nc	nc
W-12	Tert Out sat.	nc	nc	nc	nc	nc	nc
W-13	Quart Out sat.	nc	nc	nc	nc	nc	nc
E-01	Frequency fault	nd	Dens = nd Temp = nc	hold	3,6mA;… 3)	6)	7)
E-02	Signal fault	nd	nc	hold	3,6mA;… 3)	6)	7)
E-03	EEPROM fault	nd	nd	hold	3,6mA;… 3)	6)	7)
E-04	CPU fault	nd	nd	nd	3,6mA… 8)	nd	nd
E-05	DSP fault	nd	nd	hold	3,6mA… 8)	6)	7)
E-06	Sensor 1 fault	nd	Dens = nd Temp = nc	hold	3,6mA;… 3)	6)	7)
E-07	Sensor 2 fault	nd	nc	hold	3,6mA;… 3)	6)	7)
E-08	Temp sens fault	nc	Density = nd Temp = 30°C	hold	3,6mA;… 3)	6)	7)

1) Choice of “Total at alarm” (Detailed Setup / Totalizer)
2) Choice of “Output after Empty pipe” (Detailed Setup / Empty pipe detect)
3) Choice of “Analog 1/2 alarm out” (Detailed Setup / Config Output) and NAMUR/NOT NAMUR (Measuring range)
4) Choice of “After Slug” (Detailed Setup / Slug detection)
5) Only if “Liquid” is selected (Detailed Setup / Liquid/gas selection)
6) Choice of “Pulse 1 at alarm” or “Pulse 2 at alarm” (Detailed Setup / Pulse/Status out 1/2)
7) Status outputs active if “All Errors” or “All Alarms & Errors” is selected (Detailed Setup / Pulse/Status out 1/2)
8) Choice of jumper “Burn-out” (See chapter 8.7.9 Setting “Burn-out” Mode)
*) Status outputs acc. SO 1/2 function and SO 1/2 active mode

The following table shows possible countermeasures :

Alarm (A); Warning (W) Error (E)	Name	Meaning	Description	Countermeasure
A-01	MF 1 criteria	Mass flow L Alarm	Mass flow below MF 1 criteria	Increase mass flow / Change setting
A-02	MF 2 criteria	Mass flow H Alarm	Mass flow above MF 2 criteria	Reduce mass flow / Change setting
A-03	VF 1 criteria	Volume flow L Alarm	Volume flow below VF 1 criteria	Increase volume flow / Change setting
A-04	VF 2 criteria	Volume flow H Alarm	Volume flow above VF 2 criteria	Reduce volume flow / Change setting
A-05	Dens. 1 criteria	Density L Alarm	Density below Dens. 1 criteria	Increase density / Change setting
A-06	Dens. 2 criteria	Density H Alarm	Density above Dens. 2 criteria	Reduce density / Change setting
A-07	Temp. 1 criteria	Temperature L Alarm	Temperature below Temp. 1 criteria	Increase temperature / Change setting
A-08	Temp. 2 criteria	Temperature H Alarm	Temperature above Temp. 2 criteria	Reduce temperature / Change setting
A-09	Conc. 1 criteria	Concentration L Alarm	Concentration below Conc. 1 criteria	Increase concentration / Change setting
A-10	Conc. 2 criteria	Concentration H Alarm	Concentration above Conc. 2 criteria	Reduce concentration / Change setting
A-11	Netflow 1 crit.	Net flow L Alarm	Net flow below Net flow 1 crit.	Increase net flow / Change setting
A-12	Netflow 2 crit.	Net flow H Alarm	Net flow above Net flow 2 crit.	Reduce net flow / Change setting
A-13	Total thr exceed	Total threshold exceed	Totalizer value exceeds total threshold	Reset totalizer / Change setting
A-14	Slug detection	Slug flow detected	Slug criterion is reached	Reduce gas bubbles in medium
A-15	Empty pipe det.	Empty pipe detectd	Empty pipe criterion is reached	Fill pipe
A-16	Corrosion det.	Corrosion detected	Corrosion criterion is reached	Change detector
W-01	Density low	Density lower 0.3 kg/l	Density lower than 0.3 kg/l	Fill the detector with fluid
W-02	Fixed dens act.	Fixed Dens selected	Parameter Density fix val sel or Ref. Density sel is set to fixed	Set parameter Density fix val sel or Ref. Density sel to inhibit
W-03	Fixed temp act.	Fixed Temp selected	Parameter Temp fix val sel is enabled	Set parameter Temp fix val sel to inhibit
W-04	Fixed MF active	Fixed MF selected	Parameter MF fix val sel is enabled	Set parameter MF fix val sel to inhibit
W-05	Autozero running	Autozero is running …	Autozero process is performed, started by user action or status input	Wait until process stops (30sec or 180sec max)
W-06	AZ val error	Autozero value out of range	Auto zero value is out of the internal detector depending range	Stop flow during auto zero. Check detector installation
W-07	AZ fluct error	Autozero fluctuation out of range	Auto zero fluctuation is out of the internal detector depending range	Stop flow during auto zero. Check electrical installation, vibrations and density.
W-08	Sensor simul.	Sensor simulation active	Fixed frequency or fixed phase difference is enabled	Set Sensor simulation to inhibit
W-09	Fixed Prim Out	Analog output 1 fixed	Analog output 1 fixed at 4mA for multidrop operation	Set HART polling address to 0 (Multidrop operation stops)
W-10	Prim Out sat.	Analog output 1 saturated	Analog output 1 reaches less than 3.8mA or more than 20.5mA	Increase or decrease current level of output 1
W-11	Sec Out sat.	Analog output 2 saturated	Analog output 2 reaches less than 3.8mA or more than 20.5mA	Increase or decrease current level of output 2
W-12	Tert Out sat.	Pulse/Status output 1 saturated	Relation between pulse width and pulse rate of Pulse/Status output 1 is too high	Decrease length of pulse width or increase amount of pulse rate of pulse output 1
W-13	Quart Out sat.	Pulse/Status output 2 saturated	Relation between pulse width and pulse rate of Pulse/Status output 2 is too high	Decrease length of pulse width or increase amount of pulse rate of pulse output 2
E-01	Frequency fault	Frequency fault detected	Driving frequency out of range	Check cable (Remote) and detector
E-02	Signal fault	Signal fault detected	Phase difference out of range	Check cable (Remote) and detector
E-03	EEPROM fault	EEPROM fault detected	CRC-Error	Contact Yokogawa service
E-04	CPU fault	CPU fault detected	Micro processor is not working	Contact Yokogawa service
E-05	DSP fault	DSP fault detected	Micro processor is not working	Contact Yokogawa service
E-06	Sensor 1 fault	Sensor 1 Signal fault detected	Sensor 1 signal below 7% for 3 min	Check cable (Remote) and detector
E-07	Sensor 2 fault	Sensor 2 Signal fault detected	Sensor 2 signal below 7% for 3 min	Check cable (Remote) and detector
E-08	Temp sens fault	Temperature Sensor Fault detected	T<-220°C or T>550°C	Check cable (Remote) and detector Check temperature

8.2 Reading Event + Error History (Diag/Service, Self test/Status)

Event Overview/ Error Alarm Warning	Reads the actual errors, alarms and warnings (EAW). In Event Overview the number of the actual EAWs is shown. In **Error, Alarm** or **Warning** the description of the actual events can be found.
Hist Overview in Order	Shows the latest 10 EAWs. By comparing this with **Hist Overview abs** it can be checked if certain EAWs have vanished.
Hist Overview in Order/ Clear History	Select: **Execute, Not execute** If **Execute** is selected the latest 10 EAWs are cleared.
Hist Overview abs/ Error Alarm Warning	In **Hist Overview abs** the number of EAWs after the last clearance can be viewed. In **Error**, **Alarm** or **Warning** the description of the events after the last clearance can be found.
Hist Overview abs/ Clear History	Select: **Execute, Not Execute** If **Execute** is selected the user is asked to fill in a date (mm/dd/yyyy). If a date is set the errors and warnings are stored in the **Error history** with this date.
Error History	In **Error History** the number of EAWs of the last clearance of the **Hist Overview abs** can be viewed. In **Error** or **Warning** the description of the events can be found. The last 10 entries can be selected by date.

8.3 Self test (Diag/Service)

Self test/ Status	Select: **Self test, Status** If **Self tes**t is selected, all error and alarm status are checked. If **Status** is selected, the existing errors and alarms are indicated in succession.

8.4 Signal- and I/O-Test (Diag/Service)

Input/Output test	These functions enable you to simulate the I/O signals (loop test). The outputs can be checked with a multimeter. Refer to the connecting diagrams in chapter 4.8.6. The test can be cancelled by pressing any key.
Analog output 1 **Analog output 2** **Pulse output 1** **Status output 1** **Pulse output 2** **Status output 2** **Status input**	Setting range: 2 to 22 mA Setting range: 2 to 22 mA Setting range: 20 to 10000 Hz Setting range: On Active or Off Active Setting range: 20 to 2000 Hz Setting range: On Active or Off Active Indication range: Open or Short

8.5 Output trim

Output trim	With this function the 4 mA and the 20 mA can be adjusted if required
AO 1 trim 4mA / AO 1 trim 20mA	The analog output 1 is set to the 4 mA or 20 mA. Connect a load resistor between 20 and 600 Ω and measure the output current. This current value must be entered on request on display. The deviation to 4 mA is corrected by the converter itself.
AO 2 trim 4mA / AO 2 trim 20mA	The analog output 2 is set to the internal 4 mA or 20 mA value. Connect a load resistor between 20 and 600 Ω and measure the output current. This current value must be entered on request on display.

8.6 Detector cleaning

CAUTION

For integral type : Ambient temperature may not exceed 55°C !

The equipment can be CIP-cleaned. Steam below 230°C is not a problem. However, you should take care that the cleaning operation does not last so long that the converter temperature exceed 55°C.
Switch power off during cleaning.

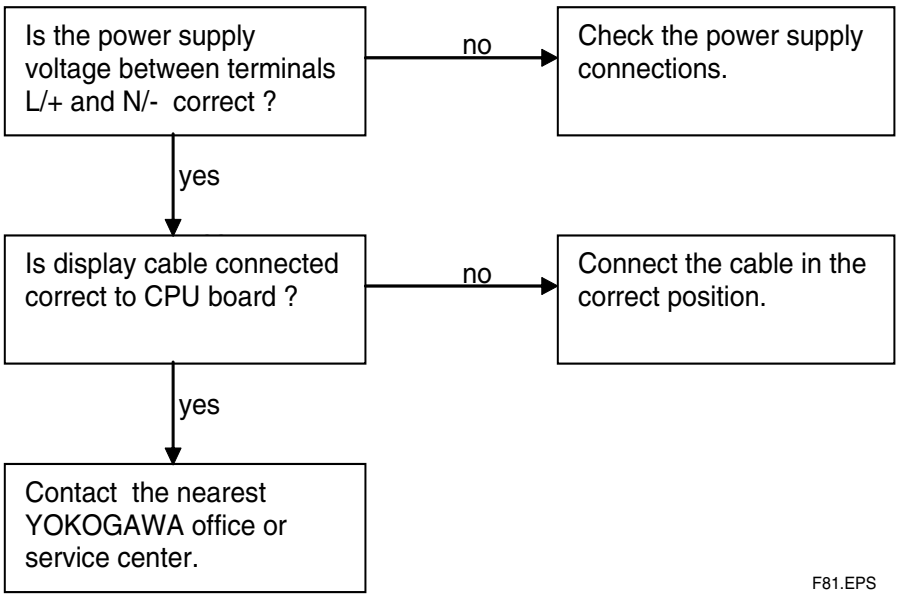
8.7 Troubleshooting

IMPORTANT

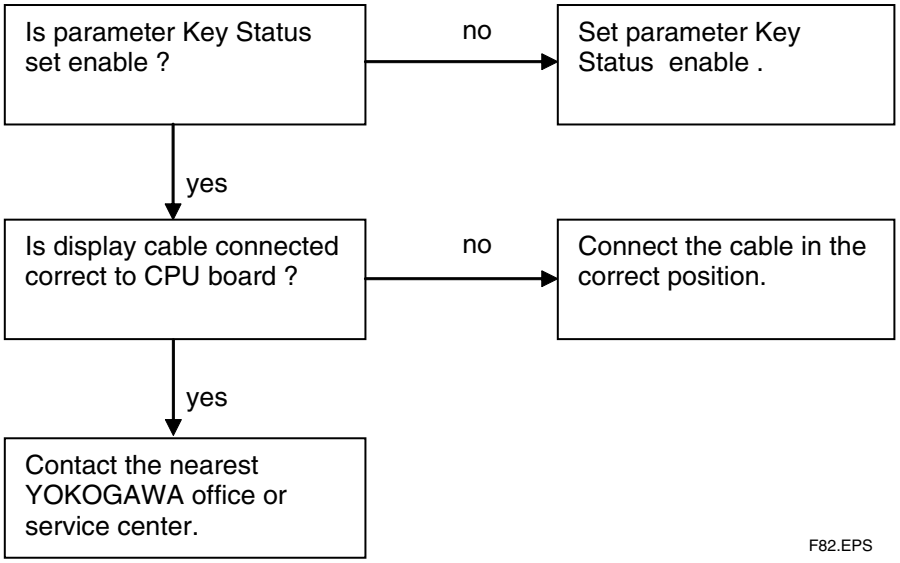
If the indicated countermeasures do not remedy the fault or in case of troubles which can not be remedied by the user, please contact your Yokogawa service centre.

If there is an error, alarm or warning displayed, deal with the error according to 8.1 „Error descriptions and countermeasure".
In the following some problems are listed which may not be indicated as error, alarm or warning. First make sure, that no error, alarm or warning is displayed.

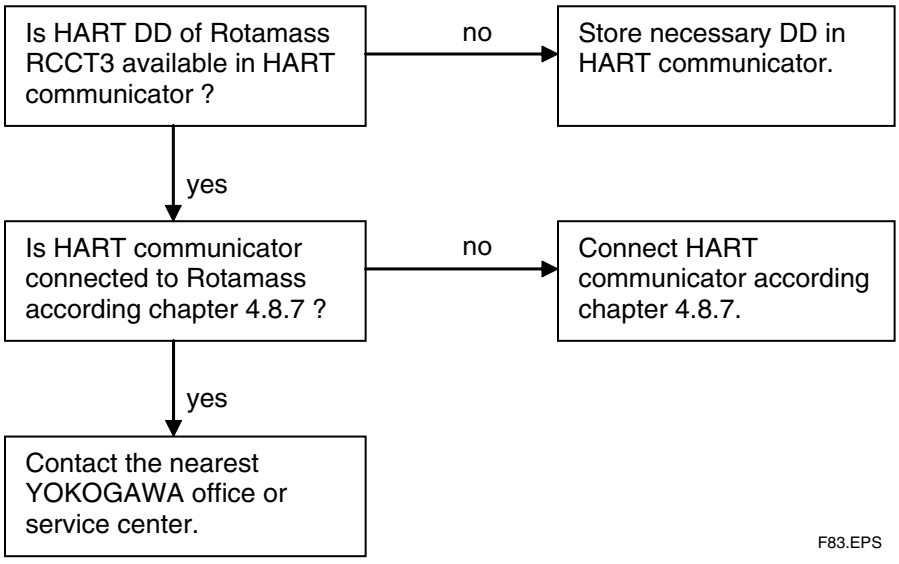
8.7.1 No indication



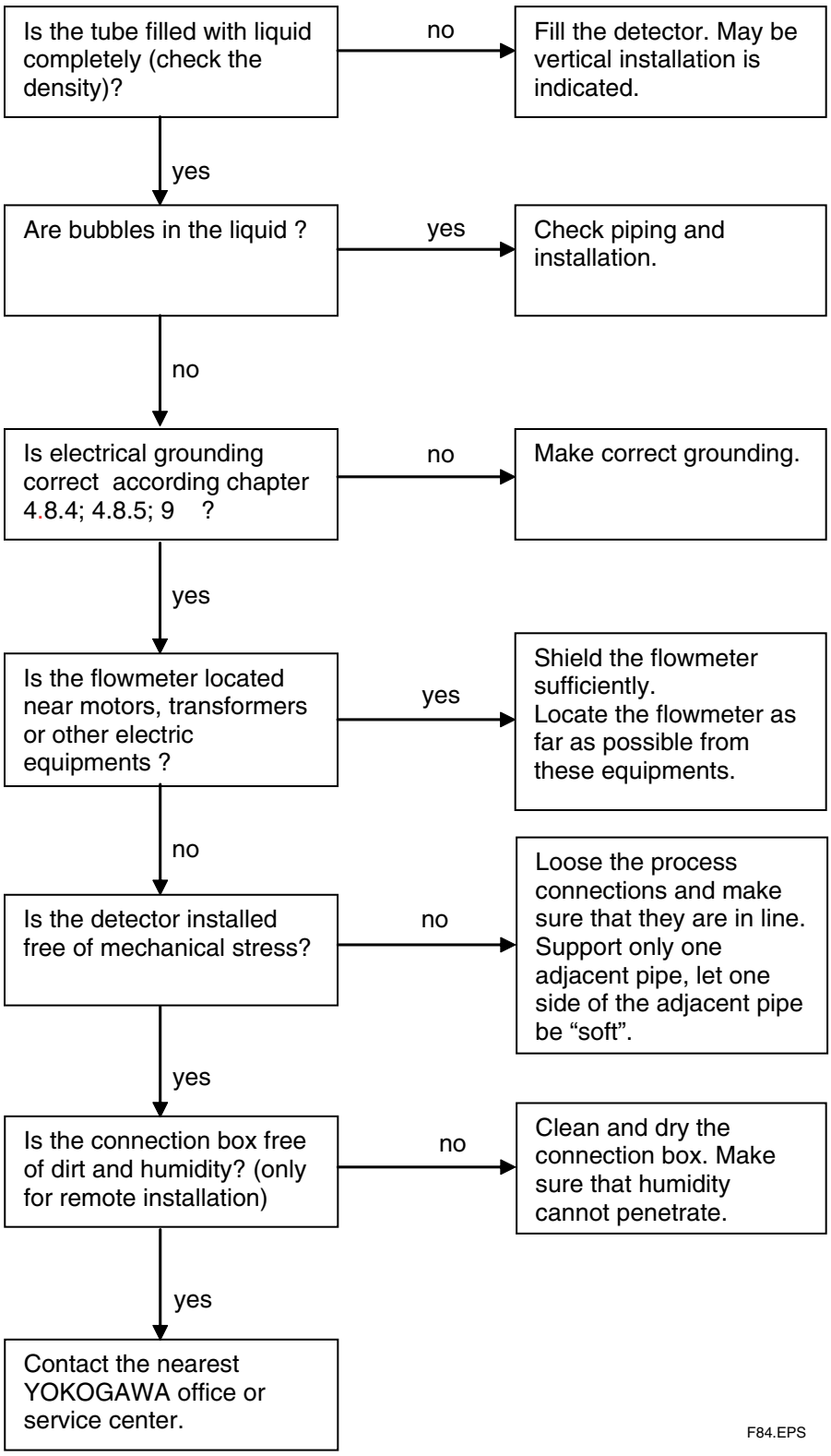
8.7.2 No key-setting possible



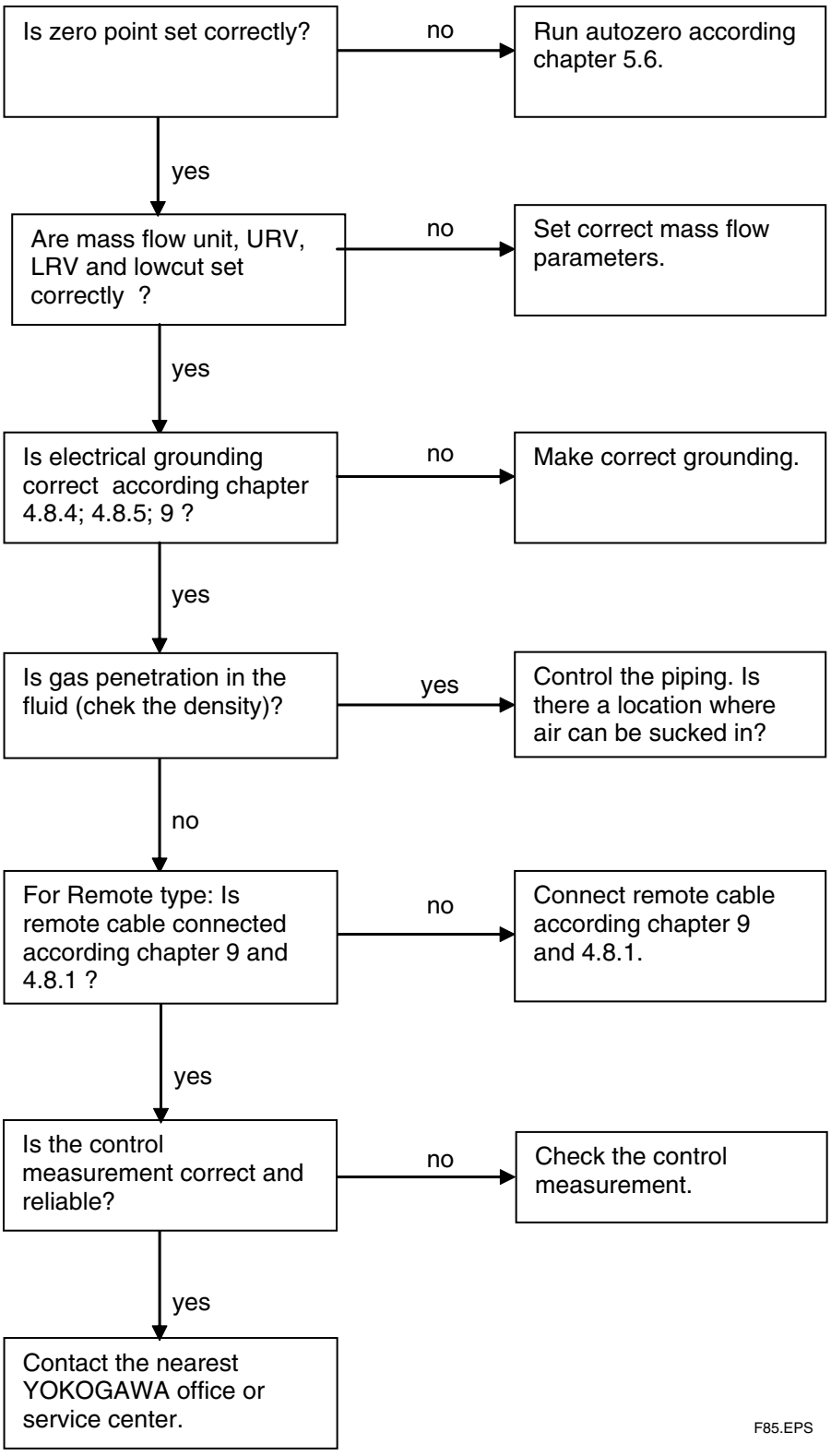
8.7.3 No HART communication



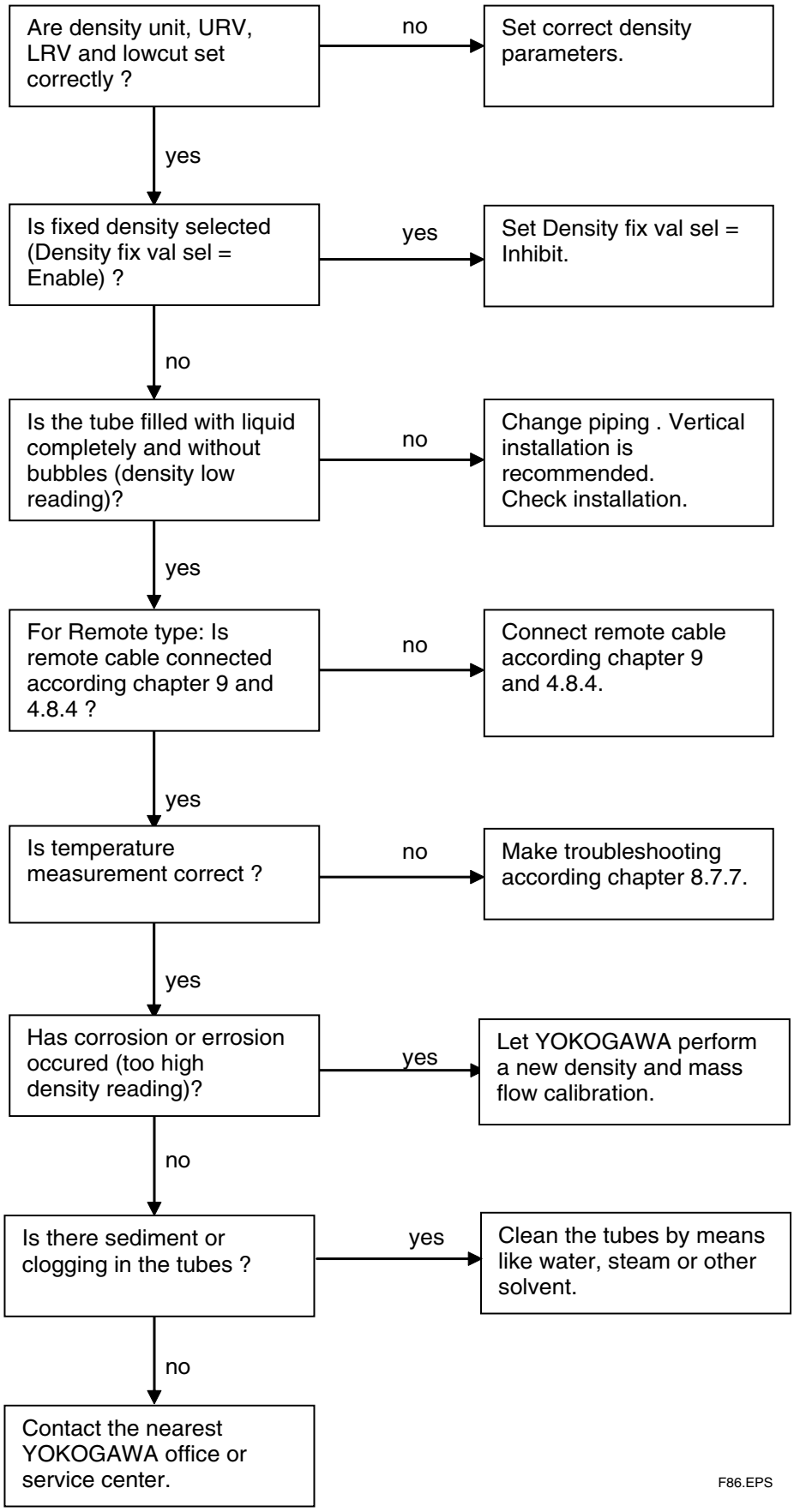
8.7.4 Unstable zero



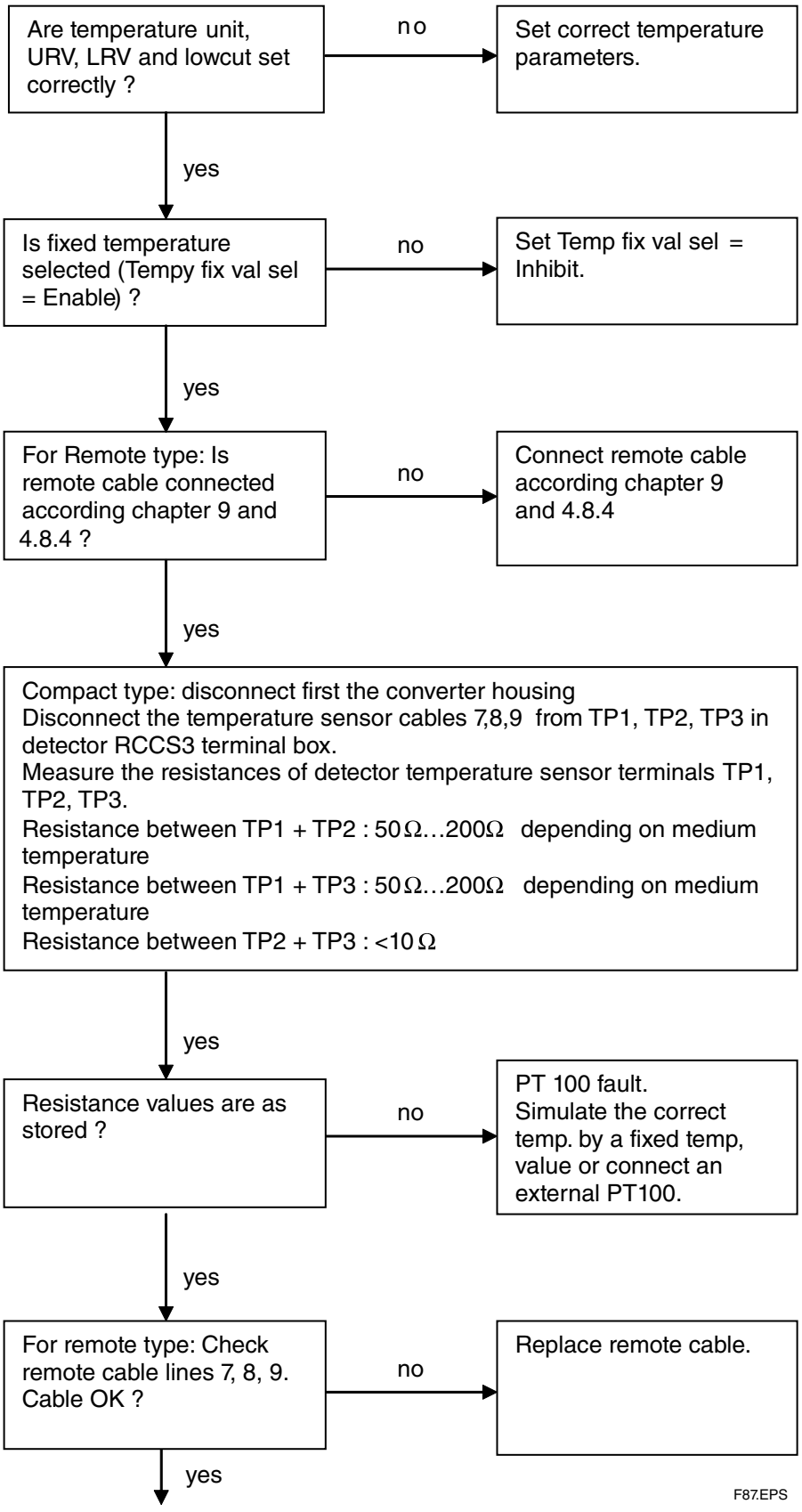
8.7.5 Disagreement of indication with actual flow rate

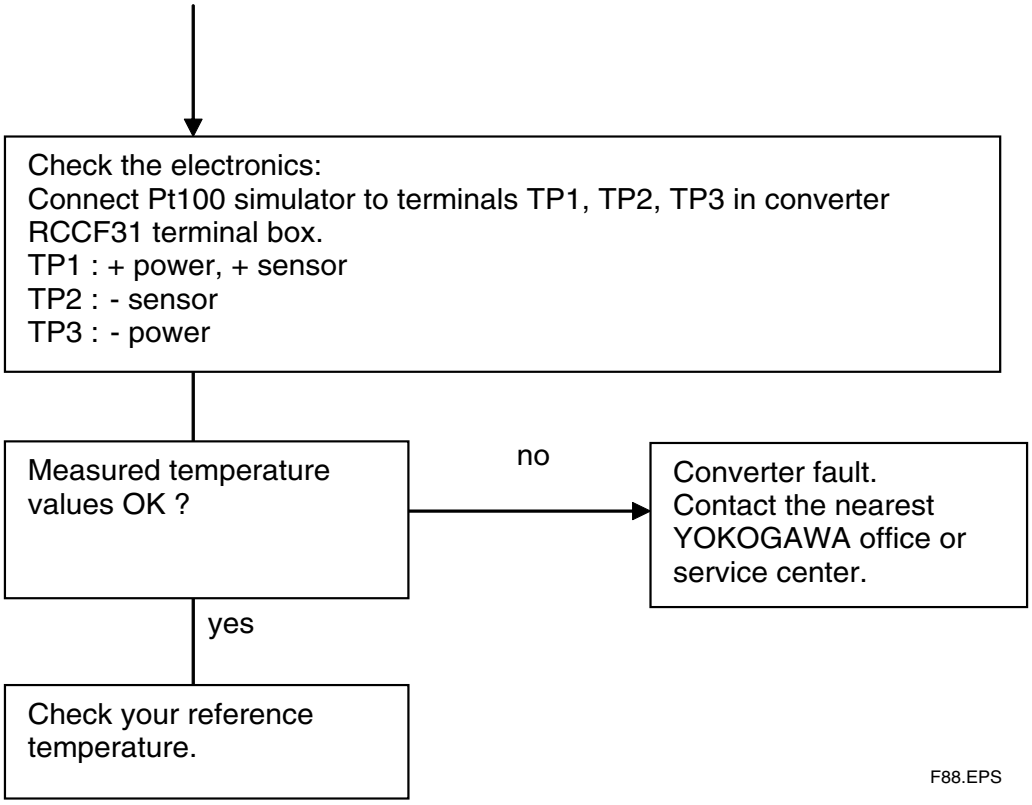


8.7.6 Disagreement of indication with actual density

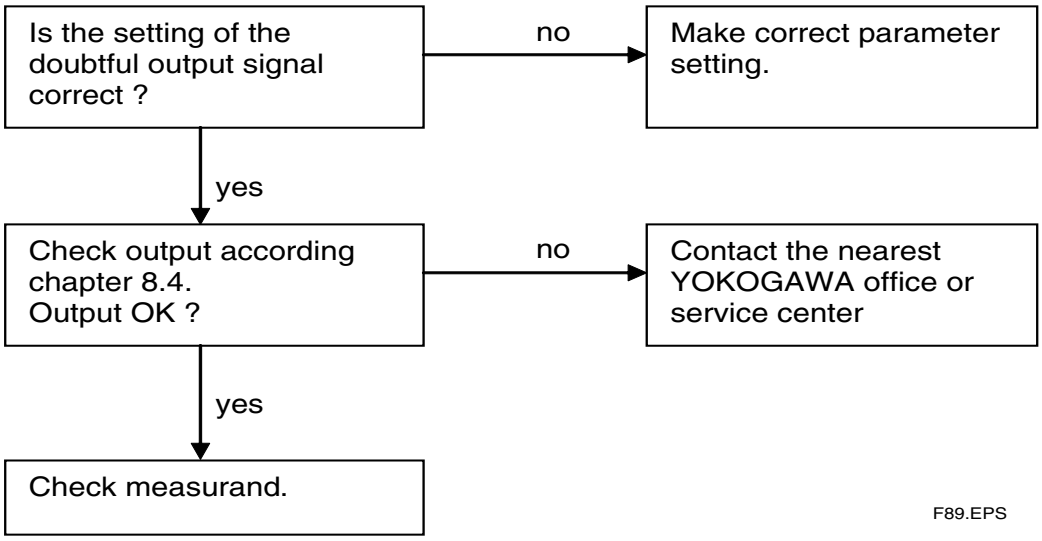


8.7.7 Disagreement of indication with actual temperature





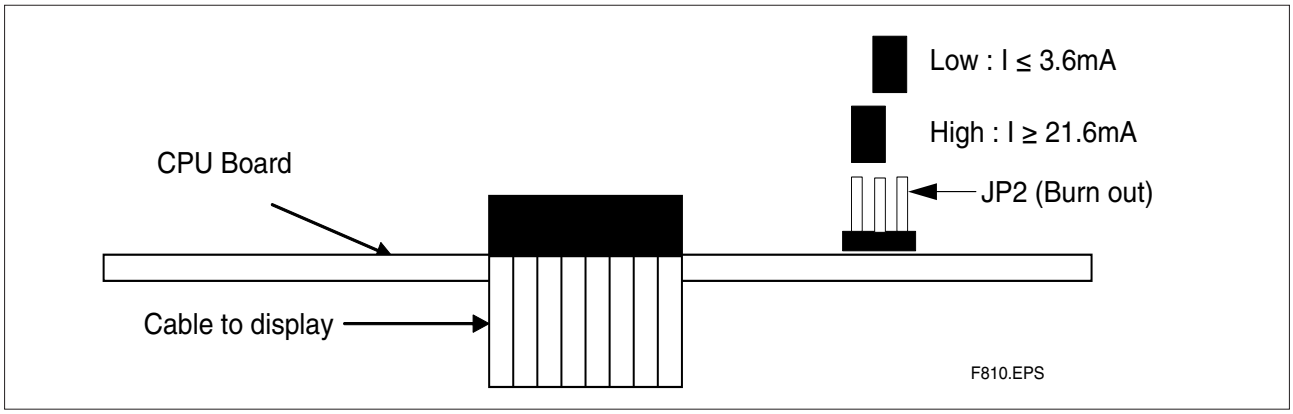
8.7.8 Discrepancy of output signals to the assigned measurand



8.7.9 Setting "Burn-out" mode

The flowmeter is equipped with a CPU error burn-out function used to set the analog output direction upon CPU error. When factory-shipment the output of CPU error burn-out is set to HIGH. The setting of the direction of analog output from burn-out can be changed.

To change the direction of output arising from burn-out, switch the jumper J2 on the CPU Board (see figure below).



8.8 Detection of metering tube failure

The ROTAMASS RCC□34 ... 39/XR was tested and FM- approved according to ANSI/ISA – 12.27.01 – 2003 for Canadian Dual Seal Approval. For units with option /DS this is stated on the name plate.

NOTE

If ROTAMASS flowmeter is not used in Canada this functionality can also be used without Dual Seal approval.

The primary seal (metering tube) withstands the maximum test pressures forced for the maximum flange pressure of 12.41 MPas / 1800 psi (Flange A4, ASME 900). However the enclosure do not withstand this pressure. For details see GS 01R04B04-00E-E.

When the metering tube fails, the detector enclosure is filled with process medium and the density reading of ROTAMASS increases rapidly. This can be used for detecting a primary seal failure by the following annunciation methods:

A) Via too high density reading, preferable with liquid application

- Set “Basic setup / Density / Density URV about 0.3 kg/l above the highest possible process density.
- Set an output (current or frequency) to density transmission.
- If the URV is reached (e.g. 20 mA) the primary seal failed.
- Set **Status output** to **Density alm 1** and status output will be active in case of tube failure.

B) Via Status output and “Empty pipe detection”

Only for liquid (only possible with software version 1.7 or higher):

- Check parameter "Basic Setup / Density / Density URV" (Default value is 1.5 kg/l).
  URV should be about 0.3 kg/l higher than any density the process can provide.
- Set parameter "Detailed Setup / Empty pipe detect / Empty pipe alm sel / Apply".
- Set parameter "Detailed Setup / Empty pipe detect / Empty pipe crit / ..." to a value
  which is a little bit higher than Density URV.
- For detection with e.g. status output 1:
  Set "Detailed Setup / Config Output/Input / Pulse/Status out 1 / Pulse/Stat 1 select / Status out".
  Set "Detailed Setup / Config Output/Input / Pulse/Status out 1 / SO1 function / Empty alarm"
- When the metering tube fails, the detector housing is filled with the process medium and the density increases. Alarm A15 "Empty pipe detection" appears, display is blinking and the status output is set active.

C) Via rupture disk (option /RD), preferable with gas application

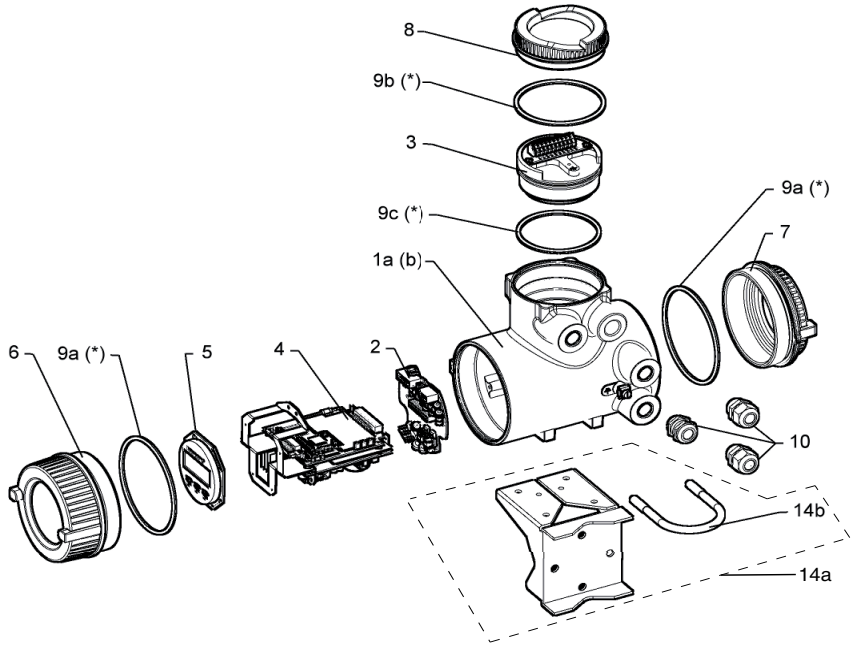
- When the metering tube fails, the installed rupture disk bursts at about 20 bar (290 psi).
- For gas application the result will be a whistle by the gas blowing out.
- Rupture disk is only for annunciation.

WARNING

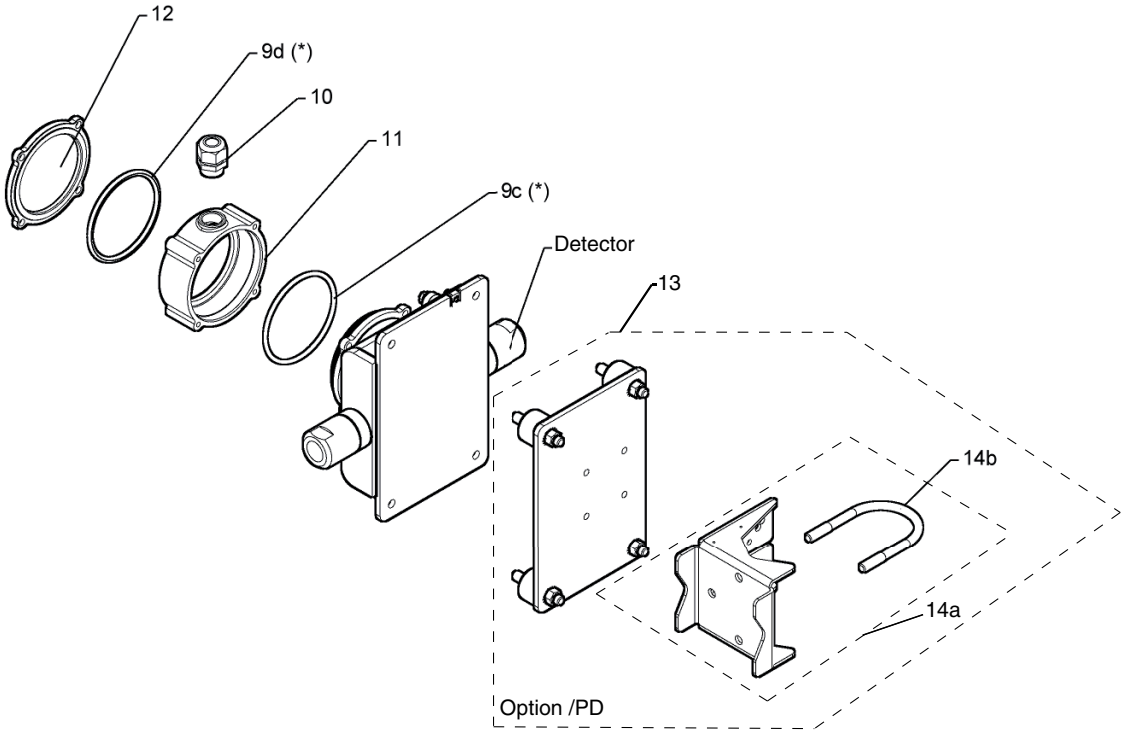
If rupture disk bursts, the hazardous process medium is pressed out of the detector housing to the environment. Take care that no worker gets contact to the medium.

8.9 Customer Maintenance Part List

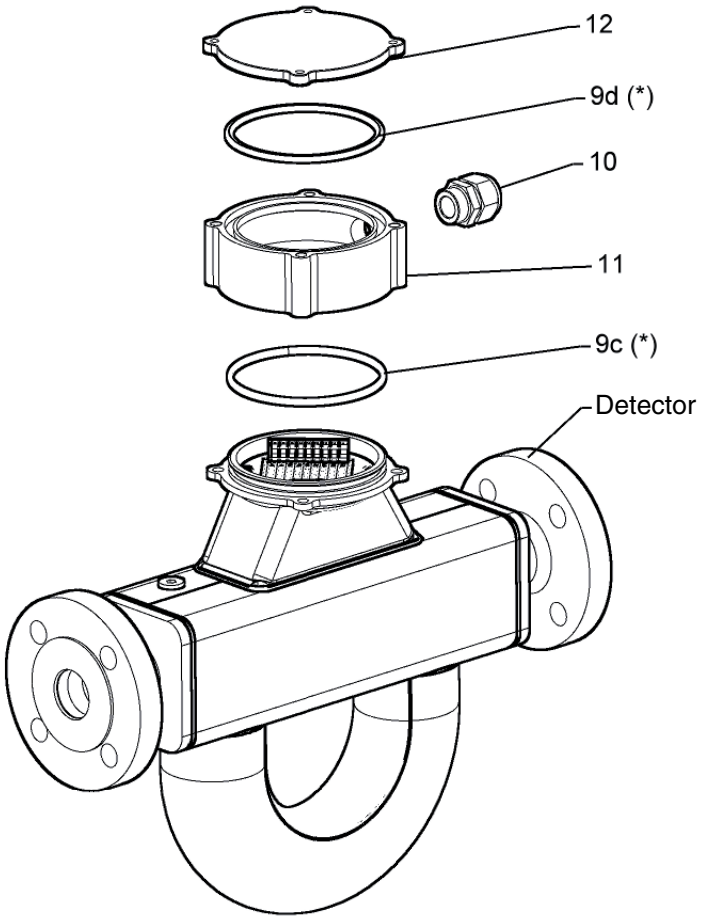
Converter RCCF31 (RCCT3)



Detector RCCS30 ... 33



Detector RCCS34 ... 39/XR



Item	Part-No.	Descriptions	RCCT34..39/XR	RCCF31	RCCS34..39/XR	RCCS30LR..33
1a	M3808PA-SP	Complete CF-M20 Converter Housing PU		x		
	M3808PC-SP	Complete CF-M20 Converter Housing Epoxy		x		
	M3808PE-SP	Complete CF-NPT Converter Housing PU		x		
	M3808PG-SP	Complete CF-NPT Converter Housing Epoxy		x		
1b	M3808NL-SP	Complete CT-M20 Converter Housing PU	x			
	M3808NN-SP	Complete CT-M20 Converter Housing Epoxy	x			
	M3808NQ-SP	Complete CT-NPT Converter Housing PU	x			
	M3808NS-SP	Complete CT-NPT Converter Housing Epoxy	x			
2	M3810DD-SP	CF/CT Base Board Set Std	x	x		
	M3810DE-SP	CF/CT Base Board Set /FB	x	x		
	M3811QF-SP	CF/CT Base Board Set /MB1, /MB2, /MB3	x	x		
3	M3810DF-SP	CF/CT Cap Assy Std (/HP)	x	x		
4	M3810DS-SP	CF/CT Amplifier AC Std	x	x		
	M3810DT-SP	CF/CT Amplifier AC Std /NM	x	x		
	M3810DW-SP	CF/CT Amplifier AC Std /XR	x	x		
	M3810DX-SP	CF/CT Amplifier AC Std /XR /NM	x	x		
	M3810DY-SP	CF/CT Amplifier DC Std	x	x		
	M3810DZ-SP	CF/CT Amplifier DC Std /NM	x	x		
	M3810EA-SP	CF/CT Amplifier DC Std /XR	x	x		
	M3810EB-SP	CF/CT Amplifier DC Std /XR /NM	x	x		
	M3810EC-SP	CF/CT Amplifier AC Std /FB	x	x		
	M3810ED-SP	CF/CT Amplifier AC Std /XR /FB	x	x		
	M3810EE-SP	CF/CT Amplifier DC Std /FB	x	x		
	M3810EF-SP	CF/CT Amplifier DC Std /XR /FB	x	x		
	M3815BN-SP	CF/CT Amplifier AC Std /MB2, /MB3	x	x		
	M3815BP-SP	CF/CT Amplifier AC Std /XR /MB2, /MB3	x	x		
	M3815BQ-SP	CF/CT Amplifier DC Std /MB2, /MB3	x	x		
	M3815BR-SP	CF/CT Amplifier DC Std /XR /MB2, /MB3	x	x		
5	M3808TC-SP	CF/CT Display Set	x	x		
	M3808TD-SP	CF/CT Display Set /FB	x	x		
6	M3810DJ-SP	CF/CT Cover with Window PU (not Ex)	x	x		
	M3810DK-SP	CF/CT Cover with Window Epoxy (not Ex)	x	x		
7	M3810DL-SP	CF/CT Short Cover PU	x	x		
	M3810DM-SP	CF/CT Short Cover Epoxy	x	x		
8	M3810DN-SP	CF/CT Small Cover PU		x		
	M3810DP-SP	CF/CT Small Cover Epoxy		x		
9	M3808TB-SP	CF/CT/CS Complete O-Ring Set Conv./Sens.	x	x	x	x
9a	M3809EF-SP	10pcs O-Ring Set 109,4x3,1 NBR70 N7S33-59	x	x		
9b	M3809EG-SP	10pcs O-Ring Set 89,4x3,3 NBR70 N7S33-59		x		
9c	M3809EH-SP	10pcs O-Ring Set 84x3 NBR70 N7S33-59	x	x	x	x
9d	M3809EJ-SP	10pcs O-Ring Set 81x4 NBR70 N7S33-59			x	x
10	M3810EH-SP	Cable Gland M20x1,5 Black	x	x		
	M3810EK-SP	Cable Gland M20x1,5 Nickel-plated Brass			x	x
	M3810FB-SP	Cable Gland M20x1,5 Stainless Steel			x	x
	M3810EJ-SP	Cable Gland NPT1/2-14 Nickel-plated Brass	x	x		

Item	Part-No.	Descriptions	RCCT34..39/XR	RCCF31	RCCS34..39/XR	RCCS30LR..33
	M3810FC-SP	CS Cable Gland SetNPT Nickel-plated Brass			x	x
	M3810FD-SP	CS Cable Gland-Set NPT Stainless Steel			x	x
	M3810EM-SP	Adapter NPT½-14 => G1/2	x	x		
11	M3808SZ_SP	CS Connection Housing- 316L Set			x	x
12	M3808TA-SP	CS Connection Housing Cover- 316L Set			x	x
13	M3806JA-SP	2“ Pipe Mounting Set (Option /PD)				x
14a	M3810DR-SP	CF Mounting Bracket+Bracket Mounting Set		x		
14b	M3808TE-SP	CF Bracket Mounting Set		x		
	M3810EP-SP	CT Wiring Loom	x			
	M3806ZZ-SP	CF/CT Connection Part-Set	x	x		
	M3810DQ-SP	CY Cable Termination Set for 9 wire cable				
	M3813WJ-SP	CY Cable Termination Set for cable with coaxial lines				
	M3810EP-SP	CT Wiring Loom	x			
	M3806ZZ-SP	CF/CT Connection Part-Set	x	x		
	M3810DQ-SP	CY Cable Termination Set for 9 wire cable				
	M3813WJ-SP	CY Cable Termination Set for cable with coaxial lines				

8.10 Disposal, Cleaning and Return

For safe use

WARNING

If the process fluid is harmful to personnel, handle the instrument carefully even after it has been removed from the process line for maintenance or other purposes. Exercise extreme care to prevent the fluid from coming into contact with human skin and to avoid inhaling any residual gas. Before sending it to the Seller for examination and/or repair please clean the instrument thoroughly and make sure, that no harmful chemicals are in or at the meter. If the instrument contains unknown fluids the Seller will send it back to the Purchaser for cleaning on their cost.

WARNING

ROTAMASS might be heavy instruments. Please give attention to prevent that persons are not injured by carrying or installing. It is preferable when carrying the instrument to use a cart and be done by two or more persons. When removing the instrument from hazardous processes, avoid contact with the fluid and the interior of the meter.

Warranty

The warranty of the instruments shall cover the period noted on the quotation presented to the purchaser at the time of purchase. The Seller shall repair the instrument free of charge when the failure occurred during the warranty period.
All inquiries on instrument failure should be directed to the Seller's sales representative from whom you purchased the instrument or your nearest sales office of the Seller.
Should the instrument fail, contact the Seller, specifying the model and instrument number of the product in question. Be specific in describing details on the failure and the process in which the failure occurred. It will be helpful if schematic diagrams and/or records of data are attached to the failed instrument. Whether or not the failed instrument should be repaired free of charge shall be left solely to the discretion of the Seller as a result of an inspection by the Seller.
The Purchaser shall not be entitled to receive repair services from the Seller free of charge, even during the warranty period, if the malfunction or damage is due to improper and/or inadequate maintenance of the instrument in question by the Purchaser handling, use or storage of the instrument in question beyond the design and/or specifications requirements, use of the instrument in question in a location no conforming to the conditions specified in the Seller's General Specification or Instruction Manual retrofitting and/or repair by an other party than the Seller or a party to whom the Seller has entrusted repair services. improper relocation of the instrument in question after delivery reason of force measure such as fires, earthquakes, storms/ floods, thunder/lightning, or other reasons not attributable to the instrument in question.

For disposal and recycling please refer to your national regulations.
Please find following help. After remove of all products rests the instruments can be disassembled and the parts treated different.

Naming: R = recycling, D = disposal,
Sd = special disposal

Name of product	Body		Converter housing		Cover with window		Electronics
Rotamass	SS	R	Al	R	Al + Glass	D	Sd

In case of return of flow meters to Yokogawa for testing or repair purposes please fill out the following form and send it with the equipment to YOKOGAWA.

ROTA YOKOGAWA GmbH & Co. KG
Service & Repair Department
Rheinstraße 8; D - 79664 Wehr
Phone no.: +49 (0)7761-567-190
Fax no.: +49 (0)7761-567-285
e-Mail: services.flow@de.yokogawa.com

YOKOGAWA

Declaration of Decontamination

Legal regulations for the safety of our employees and operating equipment determine that we need the declaration of decontamination before your order can be handled.
Please make sure to include it with the shipping documents, attached to the outside of the packaging you use for shipment.

Customer data		
Company:		
Address:		
Contact person:		E-Mail:
Phone no.:		Fax no.:
Reference/Order no.:		
Instrument data*		
Type:		Serial no.:
Type:		Serial no.:
*If not enough, note on separate sheet		
Process data		
Process medium:		
Medium is:	[ ] toxic [ ] corrosive [ ] explosive [ ] biological hazardous [ ] unknown if dangerous [ ] non hazardous	Remarks:
Cleaning agent:		
Kind of cleaning :		
Other remarks / Reason of return:		

We hereby confirm that this statement is filled in completely and truthfully. The returned instruments were carefully cleaned and are thus free from product residue and dirt. I agree that if this arrangement does not match with the instruments, they will be sent back to the above mentioned customer address at our expenses.

Blank Page

9. EXPLOSION PROTECTED TYPE INSTRUMENTS

9.1 ATEX Documentation

This is only applicable to the countries in European Union.

GB

All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

DK

Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

I

Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

E

Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

NL

Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

SF

Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöhjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellännne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

P

Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

F

Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

D

Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.

S

Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

GR

Όλα τα εγχειρίδια λειτουργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά. Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.

SK

Všetky návody na obsluhu pre prístroje s ATEX Ex sú k dispozícii v jazyku anglickom, nemeckom a francúzskom. V prípade potreby návodu pre Ex-prístroje vo Vašom národnom jazyku, skontaktujte prosím miestnu kanceláriu firmy Yokogawa.

CZ

Všechny uživatelské příručky pro výrobky, na něž se vztahuje nevýbušné schválení ATEX Ex, jsou dostupné v angličtině, němčině a francouzštině. Požadujete-li pokyny týkající se výrobků s nevýbušným schválením ve vašem lokálním jazyku, kontaktujte prosím vaši nejbližší reprezentační kancelář Yokogawa.

LT

Visos gaminiø ATEX Ex kategorijos Eksploatavimo instrukcijos teikiami anglø, vokieèiø ir prancûzø kalbomis. Norëdami gauti prietaisø Ex dokumentacijà kitomis kalbomis susisiekite su artimiausiu bendrovës "Yokogawa" biuru arba atstovu.

LV

Visas ATEX Ex kategorijas izstrâdâjumu Lietoðanas instrukcijas tiek piegâdâtas angïu, vâcu un franèu valodâs. Ja vçlaties saòemt Ex ierîèu dokumentâciju citâ valodâ, Jums ir jâsazinâs ar firmas Jokogava (Yokogawa) tuvâko ofisu vai pârstâvi.

EST

Kõik ATEX Ex toodete kasutamisjuhendid on esitatud inglise, saksa ja prantsuse keeles. Ex seadmete muukeelse dokumentatsiooni saamiseks pöörduge lähima lokagava (Yokogawa) kontori või esindaja poole.

PL

Wszystkie instrukcje obsługi dla urządzeń w wykonaniu przeciwwybuchowym Ex, zgodnych z wymaganiami ATEX, dostępne są w języku angielskim, niemieckim i francuskim. Jeżeli wymagana jest instrukcja obsługi w Państwa lokalnym ję zyku, prosimy o kontakt z najbliższym biurem Yokogawy.

SLO

Vsi predpisi in navodila za ATEX Ex sorodni pridelki so pri roki v angliščini, nemščini ter francoščini. Če so Ex sorodna navodila potrebna v vašem tukejnjem jeziku, kontaktirajte vaš najbliši Yokogawa office ili predstaunika.

H

Az ATEX Ex mûszerek gépkönyveit angol, német és francia nyelven adjuk ki. Amennyiben helyi nyelven kérik az Ex eszközök leírásait, kérjük keressék fel a legközelebbi Yokogawa irodát, vagy képviseletet.

BG

Всички упътвания за продукти от серията ATEX Ex се предлагат на английски, немски и френски език. Ако се нуждаете от упътвания за продукти от серията Ex на родния ви език, се свържете с най-близкия офис или представителство на фирма Yokogawa.

RO

Toate manualele de instructiuni pentru produsele ATEX Ex sunt in limba engleza, germana si franceza. In cazul in care doriti instructiunile in limba locala, trebuie sa contactati cel mai apropiat birou sau reprezentant Yokogawa.

M

Il-manwali kollha ta' l-istruzzjonijiet għal prodotti marbuta ma' ATEX Ex huma disponibbli bl-Ingliż, bil-Ġermaniż u bil-Franċiż. Jekk tkun teħtieġ struzzjonijiet marbuta ma' Ex fil-lingwa lokali tiegħek, għandek tikkuntattja lill-eqreb rappreżentan jew uffiċċju ta' Yokogawa.

IM 01R04B04-00E-E 11th edition April 01, 2015 -00

9.2 ATEX

In this section, further requirements and differences for explosion proof type instrument are described. For explosion proof type instrument, the description in this chapter is prior to other description in this Instruction Manual.

WARNING

- Only trained persons may use the instrument in industrial location.
- The instrument modification or parts replacement by other than an authorized Representative of Yokogawa is prohibited and will void the certification.
- Electrostatic charge may cause an exlosion hazard. Avoid any actions that cause the gerenation of eletrostatic charge, such as rubbing with a dry cloth on coating face of the converter.
- If it is mounted in an area where the use of category 2D apparatus is required, it shall be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust is avoided.

ROTAMASS is produced by
Rota Yokogawa
Rheinstr. 8
D-79664 Wehr
Germany

9.2.1 Technical Data

Applicable standards:
RCCS3:
EN 60079-0: 2012; EN 60079-11: 2012;
EN 60079-31: 2009
RCCT3/RCCF31/RCCR31:
EN 60079-0: 2012; EN 60079-1: 2007;
EN 60079-7: 2007; EN 60079-11: 2012;
EN 60079-31: 2009

Remote detector RCCS30LR ... 33 (option /KS1):
- KEMA 01ATEX 1075 X
- Intrinsically safe
- II 2G Ex ib IIB/IIC T6...T1 Gb
- II 2D Ex ib IIIC T□□□ Db
  (□□□ = max. surface temperature see below)
- Max. surface temperature :
  Standard : 150°C
  /MT : 260°C
  /MT, not /T□ : 260°C
- Degree of protection: IP66/67
- Ambient humidity : 0 to 95% RH
- Ambient temperature range:
  -50°C to +80°C
- Process temperature limits :
  Standard : -50°C to 150°C
  /MT : -50°C to 260°C
  /MT, not /T□ : -50°C to 260°C
- Heat carrier fluid temperature limits :
  Standard : 0°C to 150°C
  Option /MT : 0°C to 200°C

Remote detector RCCS34 ... 39/XR (option /KS1):
- KEMA 01ATEX 1075 X
- Intrinsically safe
- II 2G Ex ib IIB/IIC T6...T1 Gb
- II 2D Ex ib IIIC T□□□ Db
  (□□□ = max. surface temperature see below)
-Max. surface temperature :
  Standard + /LT : 150°C
  /MT : 220°C
  /HT : 350°C
- Degree of protection: IP66/67
- Ambient humidity : 0 to 95% RH
- Ambient temperature range:
  -50°C to +80°C
  Option /HT (process temperature < 280°C):
  -50°C to +65°C
  Option /HT (process temperature < 350°C):
  -50°C to +55°C
- Process temperature limits :
  Standard : -50°C to 150°C
  Option /MT: : -50°C to 220°C
  Option /HT : 0°C to 350°C
  Option /LT : -200°C to 150°C
- Heat carrier fluid temperature limits :
  Standard : 0°C to 150°C
  Option /MT : 0°C to 220°C
  Option /HT : 0°C to 350°C

Remote converter RCCF31 (option /KF1):
- KEMA 02ATEX 2183 X
- Flame proof with intrinsic 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
- Degree of protection : IP66/67
- Power supply : 90 to 250 V AC, 50/60 Hz
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C

Remote converter RCCF31 (option /KF5):
- KEMA 02ATEX 2183 X
- Flame proof with intrinsic safe connection to detector (ib)
- Additional intrinsic safe outputs (ia).
- II 2 (1) G Ex d [ia Ga] [ib] IIC T6 Gb or Ex d e [ia Ga] [ib] IIC T6 Gb
- II 2 (1) G Ex d [ia IIC Ga] [ib] IIB T6 Gb or Ex d e [ia IIC Ga] [ib] IIB T6 Gb with option /HP
- II 2 (1) D Ex tb [ia Da] [ib] IIIC T75°C Db
- Max. surface temperature: 75°C
- Degree of protection : IP66/67
- Power supply : 90 to 250 V AC, 50/60 Hz
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range : -40°C to +55°C

Remote converter RCCR31 (option /KS1) :
- KEMA 02ATEX 2183 X
- Associated apparatus with intrinsic 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 : 90 to 250 V AC, 50/60 Hz
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity: 0 to 95% RH
- Ambient temperature range: -40°C to +55°C

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

Integral type RCCT34 ... 39/XR (option /KF1):
- KEMA 02ATEX 2183 X
- Flame proof with intrinsic safe connection to detector (ib)
- II 2G Ex d ib IIC T6...T3 Gb or Ex d e ib IIC T6...T3 G
- II 2G Ex d ib IIB T6...T3 Gb or Ex d e ib IIB T6...T3 Gb with option /HP
- II 2G Ex d ib op is IIC T6...T3 Gb
- II 2D Ex ib tb IIIC T150°C Db
- Max. surface temperature : 150°C
- Degree of protection : IP66/67
- Power supply : 90 to 250 V AC, 50/60 Hz
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range : -40°C to +55°C
- Process temperature limits : -50°C to 150°C

Integral type RCCT34 ... 39/XR (option /KF5):
- KEMA 02ATEX 2183 X
- Flame proof with intrinsic safe connection to detector (ib)
- Additional intrinsic safe outputs (ia).
- II 2 (1) G Ex d ib [ia Ga] IIC T6...T3 Gb or Ex d e ib [ia Ga] IIC T6...T3 Gb
- II 2 (1) G Ex d ib [ia IIC Ga] IIB T6...T3 Gb or Ex d e ib [ia IIC Ga] IIB T6...T3 Gb with option /HP
- II 2 (1) D Ex ib tb [ia Da] IIIC T150°C Db
- Max. surface temperature : 150°C
- Degree of protection : IP66/67
- Power supply: 90 to 250 V AC, 50/60 Hz
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range : -40°C to +55°C
- Process temperature limits : -50°C to 150°C

The electronics of RCCT3 and RCCF31 are placed in a pressure tight section of the converter housing Ex d.
The kind of protection of the terminal enclosure is “e”, but can become “d” by using Ex-d certified cable glands.

Electrical data remote detector RCCS30LR ... 33:
- Driving circuit : terminals D+ / D-
  Ex ib IIC : Ui = 16 V; Ii = 53 mA; Pi = 0.212 W
  Li = 4.2 mH; Ci = negl. small
  Ex ib IIB : Ui = 16 V; Ii = 153 mA; Pi = 0.612 W
  Li = 4.2 mH; Ci = negl. small
- Sensor circuits: terminals S1+/ S1- or S2+ / S2-
  Ex ib IIC : Ui = 16 V; Ii = 80 mA; Pi = 0.32 W
  Li = 4.2 mH; Ci = negl. small
- Temp. 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 detector RCCS34 ... 39/XR :

- Driving circuit : terminals D+ / 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+/ S1- or S2+ / S2-
  Ex ib IIC : Ui = 16 V; Ii = 80 mA; Pi = 0.32 W
  Li = 2.1 mH; Ci = negligible small
- Temp. 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 and converter of Intergral type RCCT3:

- 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 IIC : Uo = 14.5 V; Io = 47 mA; Po = 0.171 W
  Lo = 15 mH; Co = 0.65 µF
- Temperature sensor circuit : terminals TP1,TP2, TP3
  Ex ib IIC : Uo = 13.3 V; Io = 40 mA; Po = 0.133 W
  Lo = 20 mH; Co =0.91 µF
- Current output (only option /KF2) :
  Ex ia IIC : Ui = 30 V; Ii = 165 mA; Pi = 1.25 W
  Li = negligible small; Ci = 6.9 nF
- Pulse output (only option /KF2) :
  Ex ia IIC : Ui = 30 V; Ii = 100 mA; Pi = 0.75 W
  Li = negligible small; Ci = 4.5 nF
- Current output (only option /KF5) :
  Ex ia IIC : Ui = 30 V; Ii = 300 mA; Pi = 1.25 W
  Li = 4 µH; Ci = 5.5 nF
- Pulse output (only option /KF5) :
  Ex ia IIC : Ui = 30 V; Ii = 300 mA; Pi = 1.25 W
  Li = 4 µH; Ci = 13.1 nF

Coherence between temperature class, ambient- and medium temperature/ temperature of heat carrier :

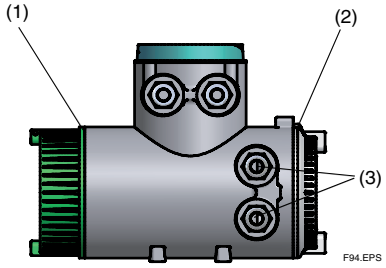
	RCCS30LR to RCCS33 without insulation		RCCS30LR to RCCS33 with factory insulation	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	50°C / 122°F	60°C / 140°F	60°C / 140°F	60°C / 140°F
T5	50°C / 122°F	80°C / 176°F	80°C / 176°F	90°C / 194°F
T4	80°C / 176°F 50°C / 122°F	100°C / 212°F 120°C / 248°F	80°C / 176°F	130°C / 266°F
T3	80°C / 176°F	180°C / 356°F	80°C / 176°F	180°C / 356°F
T2	80°C / 176°F	260°C / 500°F	80°C / 176°F	260°C / 500°F
T1	80°C / 176°F	260°C / 500°F	80°C / 176°F	260°C / 500°F

	RCCS34 to RCCS39/XR without insulation		RCCS34 to RCCS39/XR with factory insulation		RCCT34 to RCCT39/XR	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	40°C / 104°F	40°C / 104°F	65°C / 149°C	65°C / 149°F	+55°C / 131°F	65°C / 149°C
T5	55°C / 131°F	55°C / 131°F	75°C / 167°F	75°C / 167°F	+55°C / 131°F	80°C / 176°F
T4	80°C / 176°F 40°C / 104°F	100°C / 212°F 120°C / 248°F	70°C / 158°F	115°C / 239°F	+55°C / 131°F	115°C / 239°F
T3	80°C / 176°F 40°C / 104°F	160°C / 320°F 180°C / 356°F	70°C / 158°F	180°C / 356°F	+55°C / 131°F	150°C / 302°F
T2	80°C / 176°F	220°C / 428°F	65°C /149°F	275°C / 527°F	+55°C / 131°F	150°C / 302°F
T1	80°C / 176°F	220°C / 428°F	45°C / 113°F	350°C / 662°F	+55°C / 131°F	150°C / 302°F

NOTE
For customer insulation of RCCS30LR to 39/XR the following must be regarded :
The table "with factory insulation" is calculated with 80 mm insulation and k-factor = 0.4 W/m²K.
If your insulation data are worse than these use table "without insulation" !

NOTE
If a Rotamass with option /LT is used without factory insulation option /T1, it must be ensured that the temperature at the O-rings of the terminal box does not decrease below -50°C !

Flame proof (Ex d) relevant threads at converter housing and covers:



No.	Position of thread	Pitch	Thread form + quality of pitch	Threads engaged	Depth of engagement
(1) case	Thread on electronic/display side	2 mm	medium, 6H [1)]	≥ 6	12 mm
(1) cover	Thread on electronic/display side	2 mm	medium, 6g [1)]	≥ 6	12 mm
(2) case	Thread on terminal box side	2 mm	medium, 6H [1)]	≥ 6	12 mm
(2) cover	Thread on terminal box side	2 mm	medium, 6g [1)]	≥ 6	12 mm
(3) M	Thread for cable glands M20 x 1.5	1.5 mm	medium, 6H [1)]	≥ 10	17 mm
(3) A/F	Thread for cable glands 1/2 ´´ NPT	1.814 mm	[2)]	6.5 ± 1	13.605 mm

[1)] acc. ISO 965-1 and ISO 965-3 [2)] acc. ANSI B 1.20.1

If terminal enclosure is used as Ex e, the threads (2) and (3) in above table must be not be regarded.

Marking of Ex d covers

The cover with glass window is marked inside with an "Ex"- label as shown below:

9.2.2 Installation

Integral type RCCT3

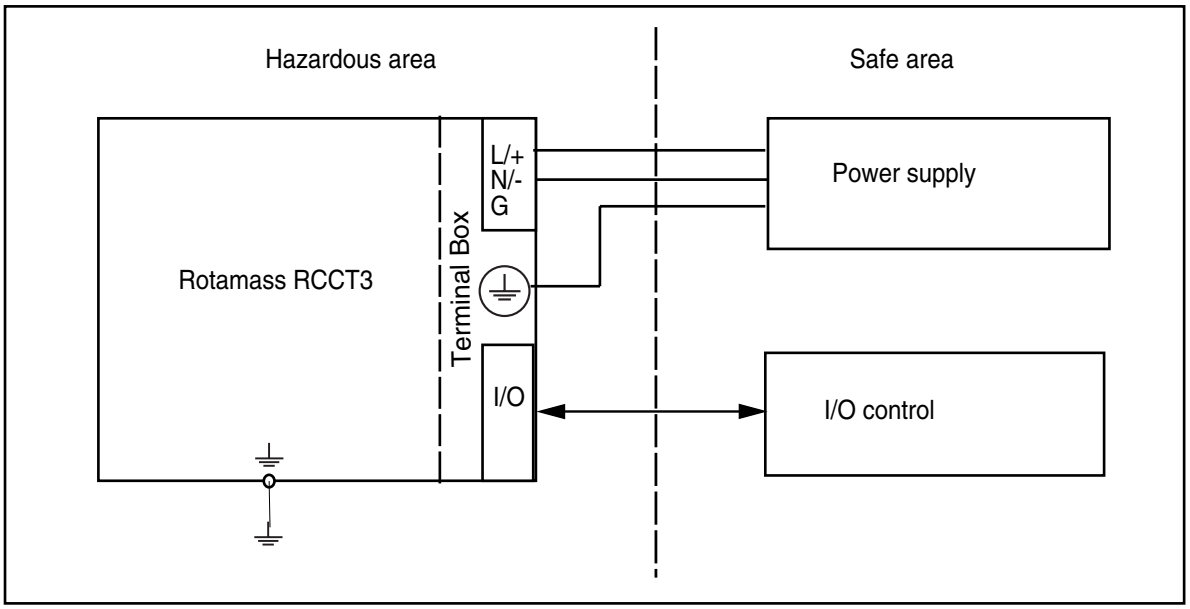
WARNING

1. Ex type of ROTAMASS must be connected to the suitable IS earthing system (see installation diagram). Converter case must have connection to the potential equalisation facility. If the connecting process tubing is part of the potential equalisation, no additional connection is required .
2. Use the certified cable glands, suitable for the conditions of use. The delivered cable glands are only for Ex e use. For Ex d use d-type cable glands.
3. Please confirm that the ground terminal (inside the terminal enclosure) is firmly connected by means of a clip-on eye-let.
4. Ex-e terminals for power supply and I/O-lines are designed for cables with cross section of 0.08 mm² (AWG 28) to 2.5 mm² (AWG 22). The strip length must be 5 to 6 mm (0.2 to 0.24 in).

Cable glands for power- and I/O-cables :
RCCT3-□□□M : Ex e types are enclosed. These cable glands can also be used for “dust application” (D). Use ATEX-certified Ex d cable glands for Ex d condition.
RCCT3□-□□□A : No cable glands are enclosed. Use the ATEX-certified cable glands, suitable for the conditions of use (Ex de or Ex d or dust application).

For “dust application” use cable glands with minimum IP66/67 protection !

Installation diagram (option /KF1):



F91.EPS

Detailed information for connection intrinsic safe outputs (option /KF2 and /KF5) see chapter 4.8.8.

Remote field-mount type RCCF31 with RCCS3

WARNING

1. Ex-type RCCF31 and RCCS3 must be connected to the suitable IS earthing system (see installation diagram). Converter and detector case must have connection to the potential equalisation facility.
2. Use the certified cable glands, suitable for the conditions of use.
3. Please confirm that the ground terminal (inside the terminal enclosure) is firmly connected by means of a clip-on eye-let.
4. Ex-e terminals for power supply and I/O-lines are designed for cables with cross section of 0.08 mm² (AWG 28) to 2.5 mm² (AWG 22). The strip length must be 5 to 6 mm (0.2 to 0.24 in).
5. For EMC technical reasons the case of the detector is connected to the case of the converter via the shielding of the interconnecting cable.

Cable glands for power- and I/O-cables :

RCCF31-□□□M : Ex e types are enclosed. These cable glands can also be used for “dust application” (D). Use ATEX-certified Ex d cable glands for Ex d condition.

RCCF31-□□□A : No cable glands are enclosed. Use the ATEX-certified cable glands, suitable for the conditions of use (Ex de or Ex d or dust application)

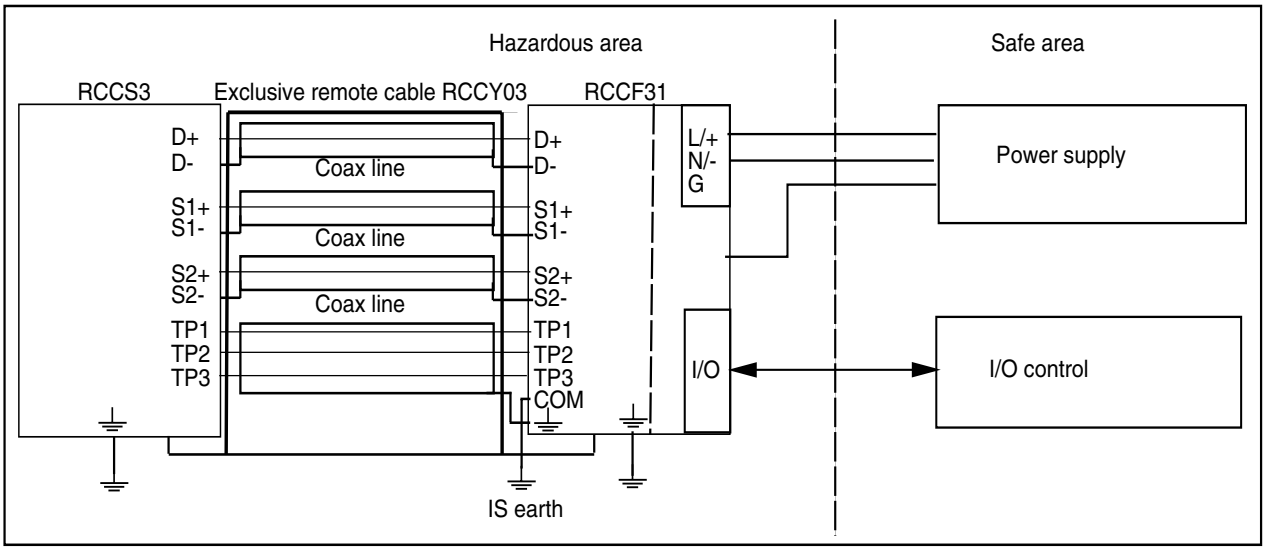
For “dust application” (D) use cable glands with minimum IP66/67 protection !

Cable glands for detector connection terminal :

RCCF31-□□□M : Cable glands are fitted in the concerning thread. This cable gland can be used for “dust application” (D).

RCCF31-□□□A : Cable glands are enclosed. This cable gland can also be used for “dust application” (D).

Installation diagram (option /KF1) :



The inner shields (shields of the cable pairs) are connected together to COM – terminal on converter side. The outer shield of the cable is connected on both sides to the cases by cable gland.

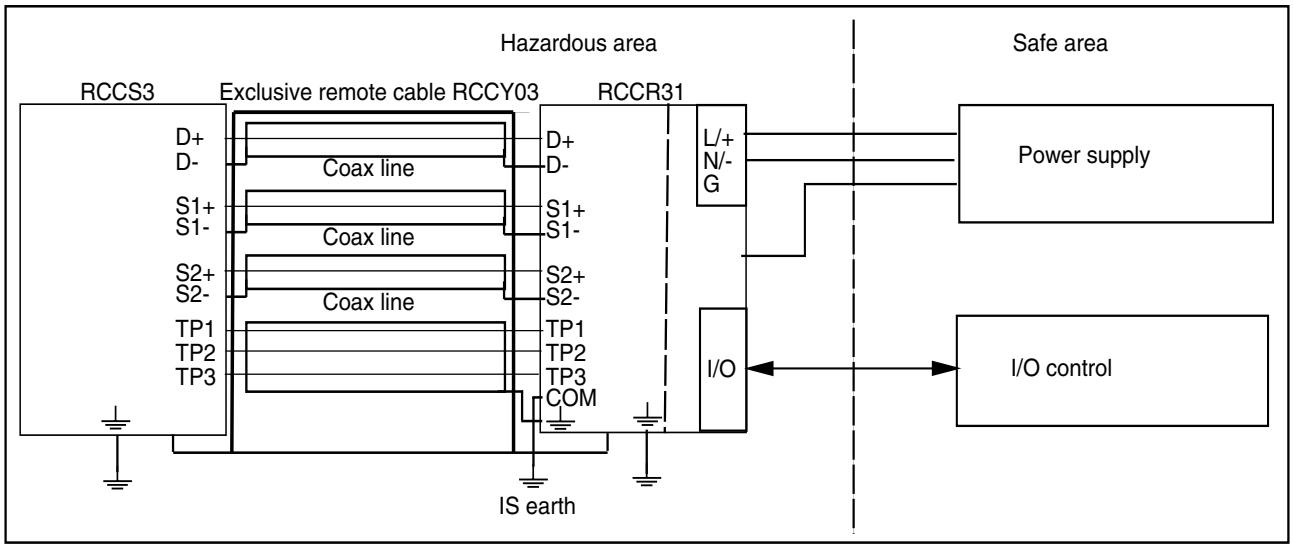
Detailed information for connection intrinsic safe outputs (option /KF2 and /KF5) see chapter 4.8.8

Remote rack-mount type RCCR31 with RCCS3

WARNING

1.. Remote rack-mount converter RCCR31 may only be installed in safe area !
2. Ex-type RCCR31 and RCCS3 must be connected to the suitable IS earthing system (see installation diagram). Converter and detector case must have connection to the potential equalisation facility.
3. Please confirm that the ground terminal on terminal board is firmly connected.
4. For EMC technical reasons the case of the detector is connected to the case of the converter via the shielding of the interconnecting cable.

Installation diagram :



9.2.3 Operation

If the cover of the converter RCCF31 / RCCT3 has to be opened, following instructions must be followed.

CAUTION

1. Confirm that the power cables to the instrument are disconnected.
2. Wait 15 minutes after power is turned off before opening the covers.
3. The covers of display side and terminal box are fixed with special screws, please use Hexagonal Wrench to open the covers.
4. Be sure to lock the cover with special screw driver using the Hexagonal Wrench after tightening the cover.
5. Before starting the operation again, be sure to lock the cover with the locking screws.
6. Prohibition of specification changes and modifications. Users are prohibited from making any modifications of specifications or physical configuration, such as adding or changing the configuration of external wiring ports.

9.2.4 Maintenance and repair

WARNING

The instrument modification of parts replacement by other than authorized representatives of YOKOGAWA is prohibited and will void the certification.

9.2.5 Ex-relevant marking on name plates (refer to chapter 3.11)

RCCT3 option /KF1:
KEMA 02 ATEX 2183X
II 2 G Ex d ib IIC T6...T3 Gb or
II 2 G Ex d e ib IIC T6...T3 Gb
II 2 D Ex ib tb IIIC T150°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc

TEMP. CLASS	T6	T5	T4	T3
PROCESS TEMP.	65	80	115	150°C

ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCT3 option /KF1 + /HP:
KEMA 02 ATEX 2183X
II 2 G Ex d ib IIB T6...T3 Gb or
II 2 G Ex d e ib IIB T6...T3 Gb
II 2 D Ex ib tb IIIC T150°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc

TEMP. CLASS	T6	T5	T4	T3
PROCESS TEMP.	65	80	115	150°C

ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCT3 option /KF2 or /KF5:
KEMA 02 ATEX 2183X
II 2 (1) G Ex d ib [ia Ga] IIC T6...T3 Gb or
II 2 (1) G Ex d e ib [ia Ga] IIC T6...T3 Gb
II 2 (1) D Ex ib tb [ia Da] IIIC T150°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc

TEMP. CLASS	T6	T5	T4	T3
PROCESS TEMP.	65	80	115	150°C

ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCT3 option /KF2 or /KF5 + /HP:
KEMA 02 ATEX 2183X
II 2 (1) G Ex d ib [ia IIC Ga] IIB T6...T3 Gb or
II 2 (1) G Ex d e ib [ia IIC Ga] IIB T6...T3 Gb
II 2 (1) D Ex ib tb [ia Da] IIIC T150°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc

TEMP. CLASS	T6	T5	T4	T3
PROCESS TEMP.	65	80	115	150°C

ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCF31 option /KF1:
KEMA 02 ATEX 2183X
II 2 G Ex d [ib] IIC T6 Gb or
II 2 G Ex d e [ib] IIC T6 Gb
II 2 D Ex tb [ib] IIIC T75°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc
ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.

RCCF31 option /KF2 or /KF5:
KEMA 02 ATEX 2183X
II 2 (1) G Ex d [ia Ga] [ib] IIC T6 Gb or
II 2 (1) G Ex d e [ia Ga] [ib] IIC T6 Gb
II 2 (1) D Ex tb [ia Da] [ib] IIIC T75°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc
ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.

RCCR31 option /KS1:
KEMA 02 ATEX 2183X
II (2) G [Ex ib Gb] IIC
II (2) D [Ex ib Db] IIIC
DIODE SAFETY BARRIER Um : 250Vac/dc
SEE CERTIFICATE FOR DATA

RCCS34 to 39/XR option /KS1:
KEMA 01 ATEX 1075X
II 2 G Ex ib IB/IIC T6...T1 Gb
II 2 D Ex ib IIIC T150°C Db IP66/67
SEE CERTIFICATE FOR DATA

RCCS34 to 39/XR option /KS1 + /MT:
KEMA 01 ATEX 1075X
II 2 G Ex ib IB/IIC T6...T1 Gb
II 2 D Ex ib IIIC T220°C Db IP66/67
SEE CERTIFICATE FOR DATA

RCCS34 to 39/XR option /KS1 + /HT:
KEMA 01 ATEX 1075X
II 2 G Ex ib IB/IIC T6...T1 Gb
II 2 D Ex ib IIIC T350°C Db IP66/67
SEE CERTIFICATE FOR DATA

RCCF31 option /KF1 + /HP:
KEMA 02 ATEX 2183X
II 2 G Ex d [ib] IIB T6 Gb or
II 2 G Ex d e [ib] IIB T6 Gb
II 2 D Ex tb [ib] IIIC T75°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc
ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.

RCCF31 option /KF2 or /KF5 + /HP:
KEMA 02 ATEX 2183X
II 2 (1) G Ex d [ia IIC Ga] [ib] IIB T6 Gb or
II 2 (1) G Ex d e [ia IIC Ga] [ib] IIB T6 Gb
II 2 (1) D Ex tb [ia Da] [ib] IIIC T75°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc
ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.

RCCR31 option /KS1 + /HP:
KEMA 02 ATEX 2183X
II (2) G [Ex ib Gb] IIB
II (2) D [Ex ib Db] IIIC
DIODE SAFETY BARRIER Um : 250Vac/dc
SEE CERTIFICATE FOR DATA

RCCS30LR to 33 option /KS1:
KEMA 01 ATEX 1075X
II 2 G Ex ib IB/IIC T6...T1 Gb
II 2 D Ex ib IIIC T150°C Db IP66/67
SEE CERTIFICATE FOR DATA

RCCS30LR to 33 option /KS1 + /MT:
KEMA 01 ATEX 1075X
II 2 G Ex ib IB/IIC T6...T1 Gb
II 2 D Ex ib IIIC T260°C Db IP66/67
SEE CERTIFICATE FOR DATA

9.3 FM (USA + Canada)

Applicable standards:
FM3600: 2011, FM3610: 2010, FM 3615: 2006;, FM3810: 2005, ANSI/NEMA 250: 1991, IEC 60529: 1999, ANSI/ISA 60079-0: 2009, ANSI/ISA 60079-11: 2009, CSA-C22.2 No.157,: 1992 CSA-C22.2 No.25: 1992, CSA-C22.2 No.30: 1988, CSA-C22.2 No.0.5: 1982, CSA-C22.2 No.142: 1987, CSA-C22.2 No.0.4: 1982, CSA-C22.2 No.94: 1991

9.3.1 Technical Data

Remote detector RCCS30LR ... 39/XR (option /FS1):
- Intrinsically safe
- AEx ia IIC, Class 1, Zone 0
- IS Class I, Division 1, Groups A,B,C,D T6
- DIP Class II / III, Division 1, Groups E,F,G
- IP67 / NEMA 4X

Remote converter RCCF31 (option /FF1, /FF2 or /FF5:
- Housing explosion proof
- Provides intrinsically safe detector circuits
- AEx [ia] IIC, Class I, Zone 1, T6
- AEx [ia] IIB, Class I, Zone 1, T6 with option /HP
- Class I, Division 1, Groups A,B,C,D
- Class I, Division 1, Groups C,D with option /HP
- Class II / III, Division 1, Groups E,F,G
- AIS Class I / II / III, Division 1, Groups A,B,C,D, E,F,G
- AIS Class I / II / III, Division 1, Groups C,D,E,F,G with /HP
- IP67 / NEMA 4X

Remote converter RCCR31 (option /FS1):
- Intrinsic safe associated apparatus
- Provides intrinsically safe detector circuits
- [AEx ia] IIC, Class I, Zone 1
- [AEx ia] IIB, Class I, Zone 1 with option /HP
- AIS Class I, Division 1, Groups A,B,C,D
- AIS Class I, Division 1, Groups C,D with option /HP

Integral type RCCT34 .. 39/XR (option /FF1, /FF2 or /FF5):
- Housing explosion proof
- AEx d [ia] IIC, Class I, Zone 1, T6
- AEx [ia] IIB, Class I, Zone 1, T6 with option /HP
- Class I, Division 1, Groups A,B,C,D
- Class I, Division 1, Groups C,D with option /HP
- Class II / III, Division 1, Groups E,F,G
- IP67 / NEMA 4X

Temperature classification :
The remote converter RCCF31 has a T6 temperature class rating for operation at ambient temperature up to +50°C / +122°F.

Process temperature limits / Heat carrier fluid temperature limits :
- Standard : -50°C to 150°C / -58°F to 302°F
- with option /LT : -200°C to 150°C / -328°F to 302°F
- with option /MT (RCCS30LR...33) : -50°C to 260°C / -58°F to 500°F
- with option /MT (RCCx34...39/XR) : -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 remote converter RCCF31, RCCR31 and converter of integral type RCCT3 :
- Driving circuit : terminals D+ / D-
  Uo = 14.5 V; Io = 47 mA; Po = 0.171 W
  Lo = 15 mH; Co = 0.65 µF
- Driving circuit : terminals D+ / D- with option /HP
  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-
  Uo = 14.5 V; Io = 47 mA; Po = 0.363 W
  Lo = 15 mH; Co = 0.65 µF
- Temperature sensor circuit : terminals TP1,TP2, TP3
  Uo = 13.3 V; Io =40 mA; Po = 0.133 W
  Lo = 20 mH; Co =0.91 µF

Electrical data remote detector RCCS30LR ... 33:
- Driving circuit : terminals D+ and D
  Ui = 16 V; Ii = 53 mA; Pi = 0.212 W
  Li = 4.2 mH; Ci = negligible small
- Driving circuit : terminals D+ / D- with option /HP
  Ui = 16 V; Ii = 153 mA; Pi = 0.612 W
  Li = 4.2 mH; Ci = negligible small
- Sensor circuits: terminals S1+ / S1- or S2+ /S2-
  Ui = 16 V; Ii = 80 mA; Pi = 0.32 W
  Li = 4.2 mH; Ci = negligible small
- Temperature sensor circuit : terminals TP1, TP2, TP3
  Ui = 16 V; Ii =50 mA; Pi = 0.2 W
  Li = negligible small; Ci = negligible small

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

	RCCS30LR to RCCS33 without insulation		RCCS30LR to RCCS33 with factory insulation	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	50°C / 122°F	60°C / 140°F	60°C / 140°F	60°C / 140°F
T5	50°C / 122°F	80°C / 176°F	80°C / 176°F	90°C / 194°F
T4	80°C / 176°F 50°C / 122°F	100°C / 212°F 120°C / 248°F	80°C / 176°F	130°C / 266°F
T3	80°C / 176°F	180°C / 356°F	80°C / 176°F	180°C / 356°F
T2	80°C / 176°F	260°C / 500°F	80°C / 176°F	260°C / 500°F
T1	80°C / 176°F	260°C / 500°F	80°C / 176°F	260°C / 500°F

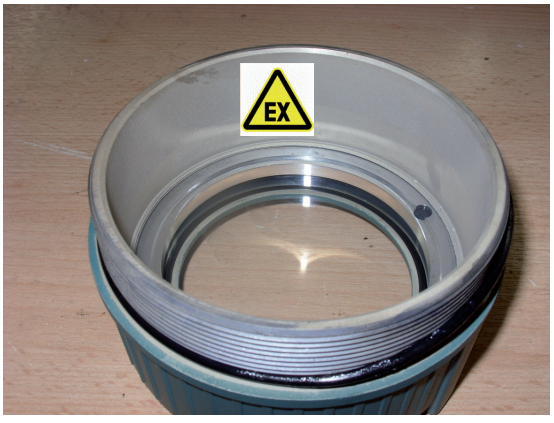
	RCCS34 to RCCS39/XR without insulation		RCCS34 to RCCS39/XR with factory insulation		RCCT34 to RCCT39/XR	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	40°C / 104°F	40°C / 104°F	65°C / 149°C	65°C / 149°F	50°C / 122°F	65°C / 149°C
T5	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 40°C / 104°F	100°C / 212°F 120°C / 248°F	70°C / 158°F	115°C / 239°F	50°C / 122°F	115°C / 239°F
T3	80°C / 176°F 40°C / 104°F	160°C / 320°F 180°C / 356°F	70°C / 158°F	180°C / 356°F	50°C / 122°F	150°C / 302°F
T2	80°C / 176°F	220°C / 428°F	65°C /149°F	275°C / 527°F	50°C / 122°F	150°C / 302°F
T1	80°C / 176°F	220°C / 428°F	45°C / 113°F	350°C / 662°F	50°C / 122°F	150°C / 302°F

NOTE
For customer insulation of RCCS30LR to 39/XR the following must be regarded :
The table "with factory insulation" is calculated with 80 mm insulation and k-factor = 0.4 W/m^{2}K.
If your insulation data are worse than these use table "without insulation" !

NOTE
If a Rotamass with option /LT is used without factory insulation option /T1, it must be ensured that the temperature at the O-rings of the terminal box does not decrease below -50°C !

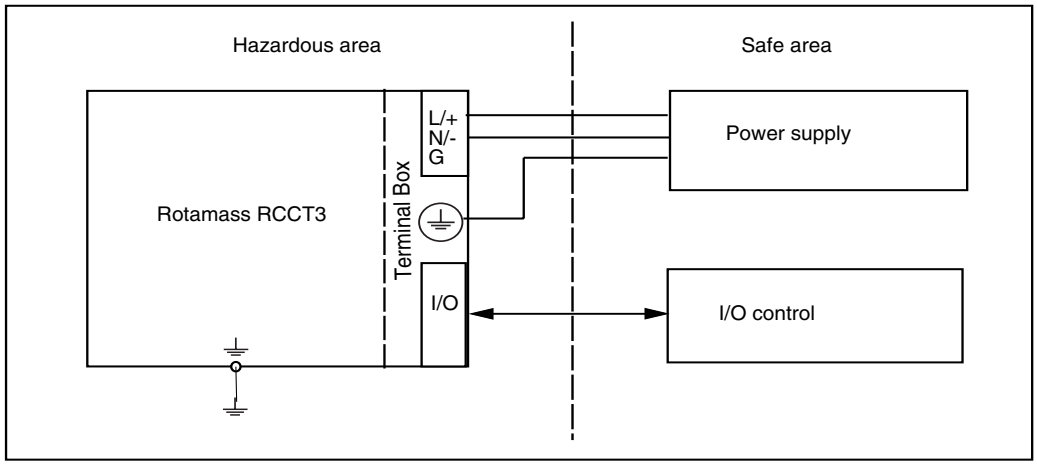
Marking of Ex d covers

The cover with glass window is marked inside with an "Ex"- label as shown below:

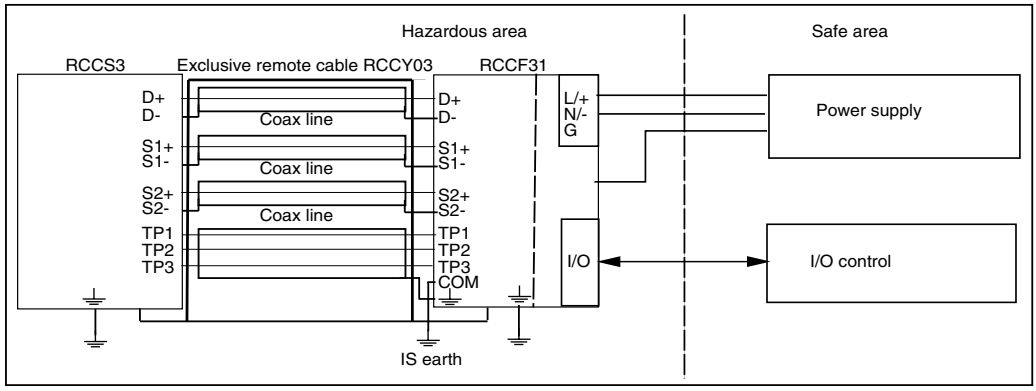


9.3.2 Installation

Integral type RCCT3 :



Remote field-mount type RCCF31 with RCCS3 :



CAUTION

- The flowmeter must be connected to the potential equalization system. For remote type converter and detector case must have connection to the potential equalisation facility.
- For remote type at ambient temperature up to 60°C / 140°F use remote cable RCCY031 or RCCY032.
- For remote type at ambient temperature up to 80°C / 176°F use remote cable RCCY033.
- Maximum length of remote cable is 300 m/999 ft.
- Specified maximum ambient temperature of cables (power supply-, I/O- and remote cable) must be 20°C / 41°F above maximum ambient temperature of flowmeter.
- For AC-version maximum power supply is 250 V AC.
- Install according National Electrical Code. Intrinsically safe circuits must be installed according NEC ANSI / NPFA 70 amd ISA RP 12.6.
- Use certified XP (explosion proof) cable glands for power supply and I/O.
- Please confirm that the ground terminal (inside the terminal enclosure) is firmly connected by means of a clip-on eye-let.
- For EMC technical reasons the case of the detector is connected to the case of the converter via the shielding of the interconnecting cable.

Installation of separate intrinsic safe ground for remote type RCCS3 with RCCF31 (see Control Drawing 8300027) :

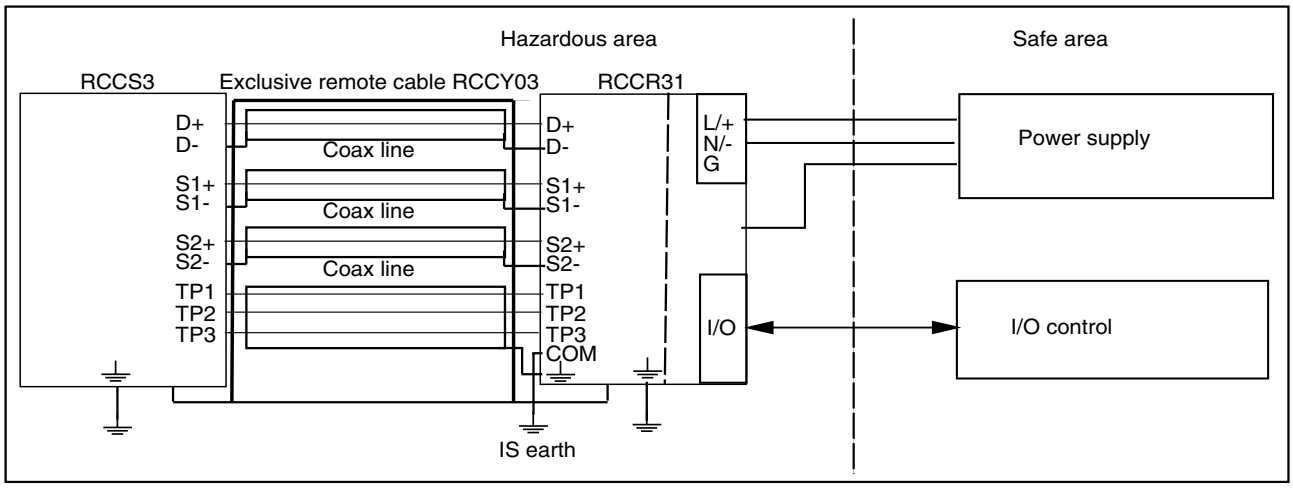
- Remove the stopping plug on detector connecting side and replace it by a dust proofed cable gland.
- Open the cover on detector connecting side of RCCF31.
- Remove the cable between COM- terminal and the ground screw.
- Put the intrinsic safe ground cable through the new installed cable gland.
- Connect the IS-ground cable to the COM- terminal.
- Install the remote cable between detector RCCS3 and converter RCCF31 as shown in this chapter.

Remote rack-mount type RCCR31 with RCCS3

WARNING

1. Remote rack-mount converter RCCR31 must only be installed in safe area !
2. Ex-type RCCR31 and RCCS3 must be connected to the suitable IS earthing system (see installation diagram). Converter and detector case must have connection to he potential equalisation facility.
3. Please confirm that the ground terminal on terminal board is firmly connected.
4. For EMC technical reasons the case of the detector is connected to the case of the converter via the shielding of the interconnecting cable.

Installation diagram :



9.3.3 General warnings

WARNING

- Substitution of components may impair intrinsic safety !
- Only trained persons may use the instrument in industrial location.
- The instrument modification of parts replacement by other than authorized representatives of YOKOGAWA is prohibited and will void the certification.
- If the cover of the converter case has to be opened, following instructions must be followed:
  - Confirm that the power cables to the instrument are disconnected.
  - Wait 15 minutes after power is turned off before opening the covers.
  - The covers of display side and terminal box are fixed with special screws, please use Hexagonal Wrench to open the covers.
  - Be sure to lock the cover with special screw using the Hexagonal Wrench after tightening the cover (see drawing chapter 4.3).
  - Prohibition of specification changes and modifications. Users are prohibited from making any modifications of specifications or physical configuration, such as adding or changing the configuration of external wiring ports.

9.3.4 Ex-relevant marking on name plates (refer to chapter 3.11)

RCCT3 option /FF1, /FF2 or /FF5:
Control Drawing No. 8300026
Class I, Division 1; Group A, B, C, D
Class II / III, Division 1, Group E, F, G
AEx d [ia] IIC, Class I, Zone 1, T6
Conduit Seals required within 18 inches.
Use Conductors rated 70°C
TYPE NEMA 4X, IP67

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCT3 option /FF1, /FF2 or /FF5 + /HP:
Control Drawing No. 8300026
Class I, Division 1; Group C, D
Class II / III, Division 1, Group E, F, G
AEx d [ia] IIB, Class I, Zone 1, T6
Conduit Seals required within 18 inches.
Use Conductors rated 70°C
TYPE NEMA 4X, IP67

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCF31 option /FF1, /FF2 or /FF5:
Control Drawing No. 8300027
Class I, Division 1; Group A, B, C,D
AIS Class I / II / III, Division 1, Group A, B, C, D, E, F, G
Class II / III, Division 1, Group E, F, G
AEx d [ia] IIC, Class I, Zone 1, T6
Conduit Seals required within 18 inches.
Use Conductors rated 70°C
TYPE NEMA 4X, IP67

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCF31 option /FF1, /FF2 or /FF5 + /HP:
Control Drawing No. 8300027
Class I, Division 1; Group C, D
AIS Class I / II / III, Division 1, Group C, D, E, F, G
Class II / III, Division 1, Group E, F, G
AEx d [ia] IIB, Class I, Zone 1, T6
Conduit Seals required within 18 inches.
Use Conductors rated 70°C
TYPE NEMA 4X, IP67

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCR31 option /FS1:
Control Drawing No. 8300028
AIS Class I , Division 1, Group A, B, C, D
AEx [ia] IIC, Class I, Zone 1

RCCR31 option /FS1 + /HP:
Control Drawing No. 8300028
AIS Class I , Division 1, Group C, D
AEx [ia] IIB, Class I, Zone 1

RCCT3 option /FF1 + /DS:
Control Drawing No. 8300026
Class I, Division 1; Group A, B, C, D
Class II / III, Division 1, Group E, F, G
AEx d [ia] IIC, Class I, Zone 1, T6
Conduit Seals required within 18 inches.
Use Conductors rated 70°C
TYPE NEMA 4X, IP67

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.
Dual Seal

RCCT3 option /FF1 + /HP + /DS:
Control Drawing No. 8300026
Class I, Division 1; Group C, D
Class II / III, Division 1, Group E, F, G
AEx d [ia] IIB, Class I, Zone 1, T6
Conduit Seals required within 18 inches.
Use Conductors rated 70°C
TYPE NEMA 4X, IP67

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.
Dual Seal

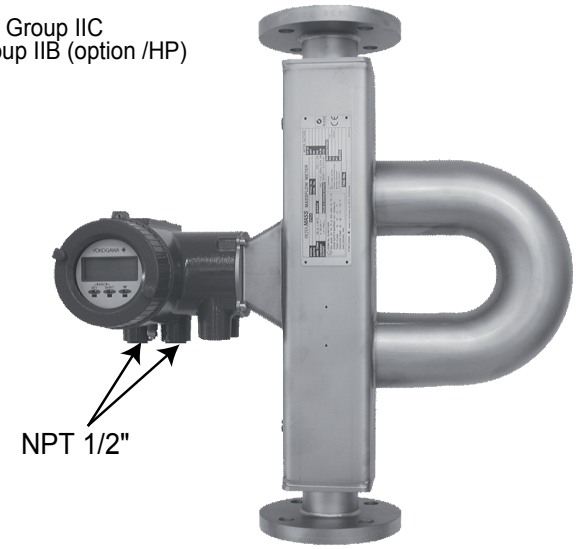
RCCS3 option /FS1:
Control Drawing No. 8300027
IS Class I, Division 1; Group A, B, C, D, T6
Class II / III, Division 1, Group E, F, G
AEx ia IIC, Class I, Zone 0
Use Conductors rated 20°C above max. ambient temperature
TYPE NEMA 4X, IP67
Temperature Class see Control Drawing

RCCS3 option /FS1 + /DS:
Control Drawing No. 8300027
IS Class I, Division 1; Group A, B, C, D, T6
Class II / III, Division 1, Group E, F, G
AEx ia IIC, Class I, Zone 0
Use Conductors rated 20°C above max. ambient temperature
TYPE NEMA 4X, IP67
Temperature Class see Control Drawing
Dual Seal

9.3.5 Control drawings

Hazardous Locations :

Class I Division 1 Groups A,B,C,D or Class I Zone 1 Group IIC
Class I Division 1 Groups C,D or Class I Zone 1 Group IIB (option /HP)
and Class II and III Division 1 Groups E,F,G

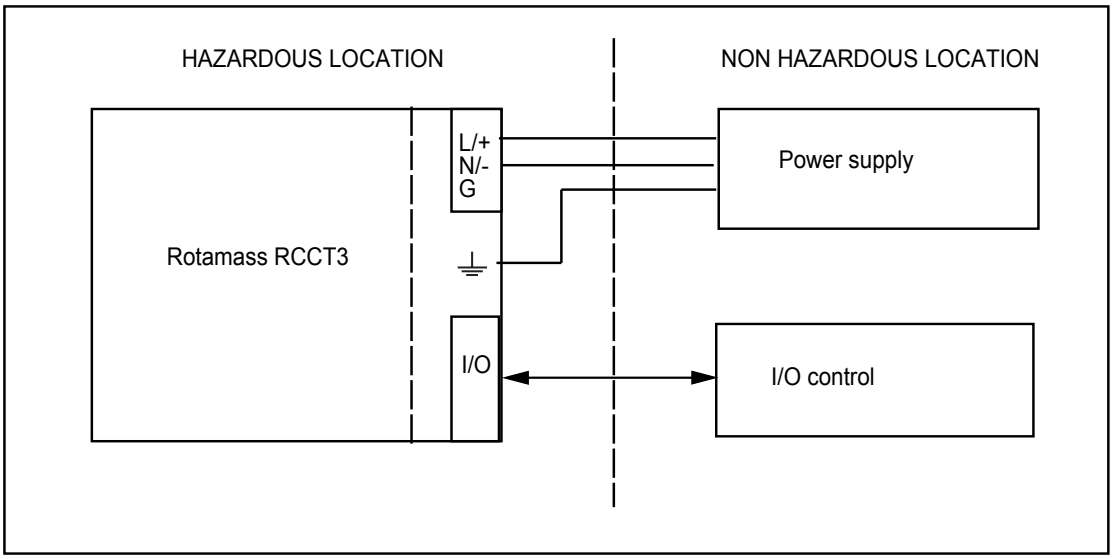


Temperature classification :

Temp. class	RCCT34 to RCCT39/XR	
	Max. Ambient temperature	Max. Medium temperature or temperature of heat carrier
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

The minimum ambient temperature is -40°C / -40°F

Installation :



Note :

- For AC-version maximum power supply is 250V AC.
- For DC-version maximum power supply is 28.8V DC.
- The installation must be in accordance with the national electrical code, NFPA70, article 504 to 510 and ANSI/ISA RP 12.06.01.
- The non intrinsically safe terminals must not be connected to any device that uses or generates more than 250Vrms or dc unless it has been determined that the voltage was adequately isolated.
- Installation must be in accordance with the Canadian Electrical Code, when installed in Canada.

WARNING : Substitution of components may impair intrinsic safety.

						DATE	NAME	TITEL:
					DRAWED	09.02.2005	Butz	FM/CSA CONTROL DRAWING ROTAMASS RCCT3
					CKECKED	09.02.2005	Rü	
c	----------	5.3.07	Butz	Rü	ROTA YOKOGAWA 79664 WEHR GERMANY			DWG. No.: 8300026
b	----------	1.9.05	Butz	Rü				1/1
a								
Rev.	UPDATE No.	DATE	EDITOR	CHECKED				

Hazardous Locations:

Remote Detector RCCS3: Class I Division 1 Groups A,B,C,D
Class II and III Division 1 Groups E,F,G

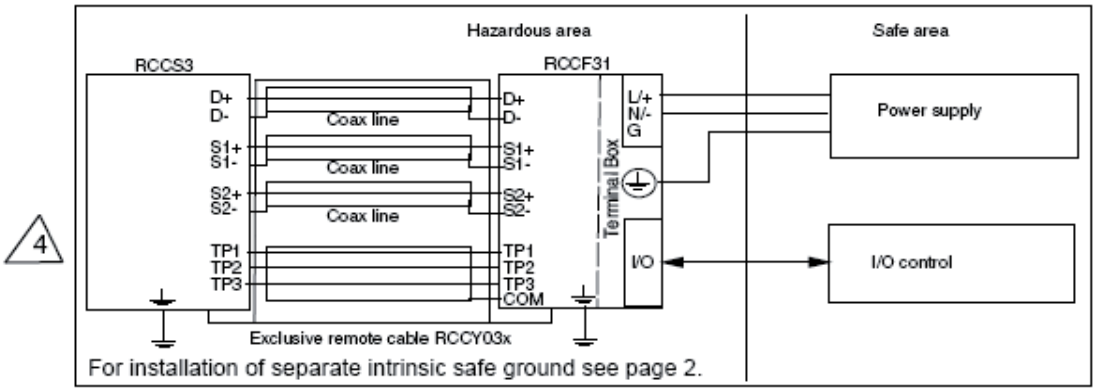
Remote Converter RCCF31: Class I Division 1 Groups A,B,C,D or Class 1 Zone 1 Group IIC
Class I Division 1 Groups C,D or Class 1 Zone 1 Group IIB (option /HP)
Class II and III Division 1 Groups E,F,G

Temperature Classification:

	RCCS30LR to RCCS33 without insulation		RCCS30LR to RCCS33 with factory insulation	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	50°C / 122°F	60°C / 140°F	60°C / 140°F	60°C / 140°F
T5	50°C / 122°F	80°C / 176°F	80°C / 176°F	90°C / 194°F
T4	80°C / 176°F 50°C / 122°F	100°C / 212°F 120°C / 248°F	80°C / 176°F	130°C / 266°F
T3	80°C / 176°F	180°C / 356°F	80°C / 176°F	180°C / 356°F
T2	80°C / 176°F	280°C / 600°F	80°C / 176°F	280°C / 600°F
T1	80°C / 176°F	320°C / 608°F	80°C / 176°F	280°C / 600°F

	RCCS34 to RCCS39/XR without insulation		RCCS34 to RCCS39/XR with factory insulation	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	40°C / 104°F	40°C / 104°F	65°C / 149°C	65°C / 149°F
T5	55°C / 131°F	55°C / 131°F	75°C / 167°F	75°C / 167°F
T4	80°C / 176°F 40°C / 104°F	100°C / 212°F 120°C / 248°F	70°C / 158°F	115°C / 239°F
T3	80°C / 176°F 40°C / 104°F	160°C / 320°F 180°C / 356°F	70°C / 158°F	180°C / 356°F
T2	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

The maximum ambient temperature for remote converter RCCF31 is 50°C / 122°F.
The minimum ambient temperature for remote converter RCCF31 is -40°C / -40°F.
The minimum ambient temperature for remote detector RCCS3 is -50°C / -58°F.



For installation of separate intrinsic safe ground see page 2.

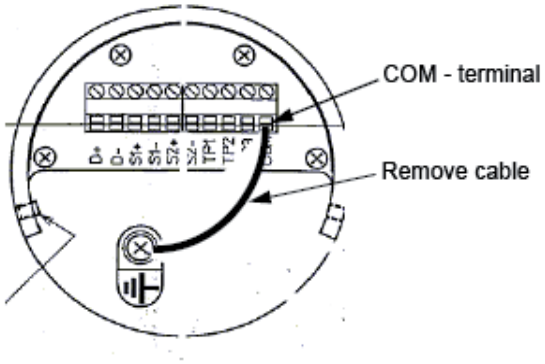
YOKOGAWA D-79664 Wehr (Germany)

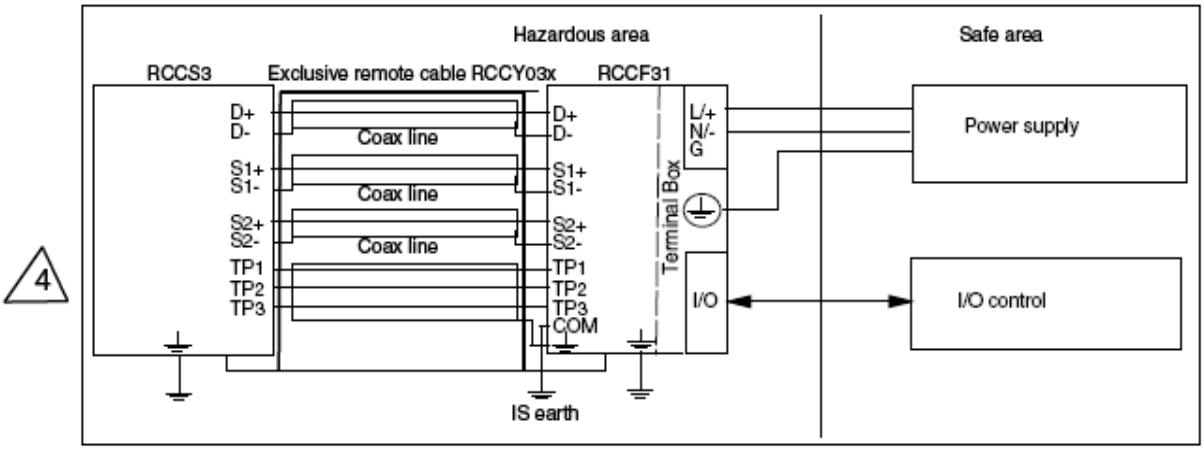
Document No.	Description:	
8300027	FM(US/C) Control Drawing, Rotamass Remote Type RCCF31 + RCCS3	**WARNING: Substitution of components may impair intrinsic safety**

Rev.	Rev.-No.	Date	Edited	Checked	Approved	Remarks
4	FZ2-512-03771	23.07.2013	Rüchel	Schm	Schmidt	
		Note: Ex related document !		Rü		
Original		Replaced for		Replaced by		ENG-028944 Page 1/2

Installation of intrinsic safe ground:

- Remove the stopping plug on detector connecting side of RCCF31 and replace it by a dust proofed cable gland.
- Open the cover on detector connecting side of RCCF31.
- Remove the cable between COM - terminal and the ground screw (see below picture).
- Put the intrinsic-safe-ground-cable through the new installed cable gland.
- Connect the IS-ground cable to the COM - terminal.
- Install the remote cable between Detector RCCS3 and Converter RCCF31 as shown below.





Note :

- For AC-version of RCCF31 maximum power supply is 250V AC.
- For DC-version maximum power supply is 28.8V DC.
- Install in accordance with NFPA 70
- Max. cable length of remote cable 300m / 999ft.
- Connect inner shield of remote cable together to COM-terminal on converter side.
- Connect outer shield of remote cable on both sides to case by cable gland.
- The installation must be in accordance with the national electrical code, NFPA70, article 504 to 510 and ANSI/ISA RP 12.06.01.
- The non intrinsically safe terminals must not be connected to any device that uses or generates more than 250Vrms or dc unless it has been determined that the voltage was adequately isolated.
- Installation must be in accordance with the Canadian Electrical Code, when installed in Canada

YOKOGAWA			D-79664 Wehr (Germany)			
Document No. 8300027		Description: FM(US/C) Control Drawing, Rotamass Remote Type RCCF31 + RCCS3		**WARNING: Substitution of components may impair intrinsic safety**		
4	FZ2-512-03771	23.07.2013	Rüchel	Schm	Schmidt	
Rev.	Rev.-No.	Date	Edited	Checked	Approved	Remarks
		Note: Ex related document !		Rü		
Original		Replaced for		Replaced by		ENG-028944 Page 2/2

Hazardous Locations:

Remote Detector RCCS3: Class I Division 1 Groups A,B,C,D
Class II and III Division 1 Groups E,F,G

Remote Converter RCCR31: AIS / I / ABCD (option /HP only CD)
Intrinsic safe associated apparatus, must be installed in safe area!

Temperature Classification:

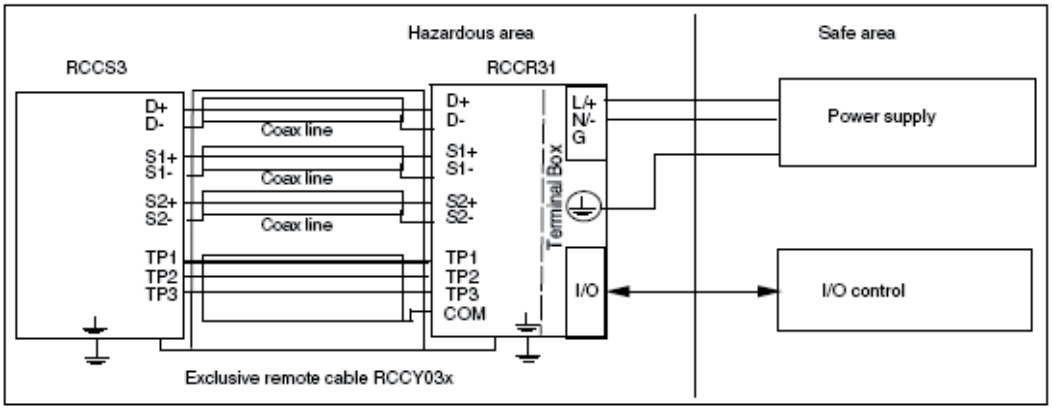
	RCCS30LR to RCCS33 without insulation		RCCS30LR to RCCS33 with factory insulation	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	50°C / 122°F	60°C / 140°F	60°C / 140°F	60°C / 140°F
T5	50°C / 122°F	80°C / 176°F	80°C / 176°F	90°C / 194°F
T4	80°C / 176°F 50°C / 122°F	100°C / 212°F 120°C / 248°F	80°C / 176°F	130°C / 266°F
T3	80°C / 176°F	180°C / 356°F	80°C / 176°F	180°C / 356°F
T2	80°C / 176°F	260°C / 500°F	80°C / 176°F	260°C / 500°F
T1	80°C / 176°F	320°C / 608°F	80°C / 176°F	260°C / 500°F

3

	RCCS34 to RCCS39/XR without insulation		RCCS34 to RCCS39/XR with factory insulation	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	40°C / 104°F	40°C / 104°F	65°C / 149°C	65°C / 149°F
T5	55°C / 131°F	55°C / 131°F	75°C / 167°F	75°C / 167°F
T4	80°C / 176°F 40°C / 104°F	100°C / 212°F 120°C / 248°F	70°C / 158°F	115°C / 239°F
T3	80°C / 176°F 40°C / 104°F	160°C / 320°F 180°C / 356°F	70°C / 158°F	180°C / 356°F
T2	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

The maximum ambient temperature for remote converter RCCR31 is 50°C / 122°F.
The minimum ambient temperature for remote converter RCCR31 is -40°C / -40°F.
The minimum ambient temperature for remote detector RCCS3 is -50°C / -58°F.

3



For installation of separate intrinsic safe ground see page 2.

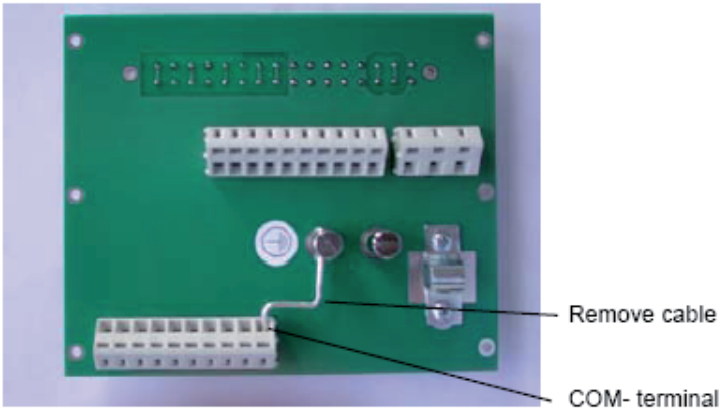
YOKOGAWA ◆ D-79664 Wehr (Germany)

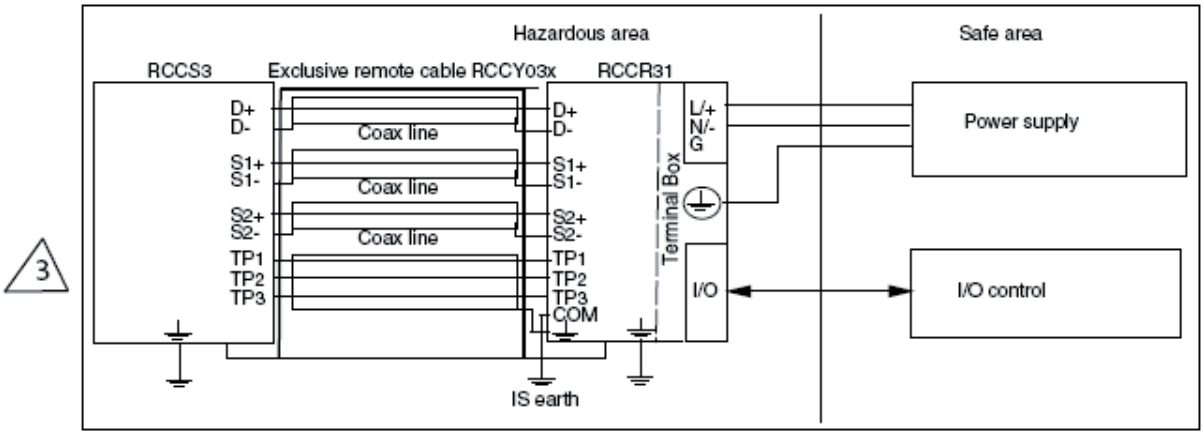
Document No.	Description:	
8300028	FM(US/C) Control Drawing, Rotamass Remote Type RCCR31 + RCCS3	**WARNING: Substitution of components may impair intrinsic safety**

3	FZ2-512-03771	23.07.2013	Rüchel	Schm	Schmidt	
Rev.	Rev.-No.	Date	Edited	Checked	Approved	Remarks
		Note: Ex related document !		Rü		
Original		Replaced for		Replaced by		ENG-028944 Page 1/2

Installation of intrinsic safe ground :

- Remove the cable between COM - terminal and the ground terminal (see below picture).
- Connect the IS-ground cable to the COM - terminal.
- Install the remote cable between Detector RCCS3 and Converter RCCR31 as shown below.





- For AC-version of RCCR31 maximum power supply is 250V AC.
- For DC-version maximum power supply is 28.8V DC.
- Install in accordance with NFPA 70
- Max. cable length of remote cable 300m / 999ft.
- Connect inner shield of remote cable together to COM-terminal on converter side.
- Connect outer shield of remote cable on both sides to case by cable gland (RCCS3) and clamp on terminal board (RCCR31).
- The installation must be in accordance with the National Electrical Code, NFPA70, article 504 to 510 and ANSI/ISA RP 12.06.01.
- The non intrinsically safe terminals must not be connected to any device that uses or generates more than 250Vrms or dc unless it has been determined that the voltage was adequately isolated.
- Installation must be in accordance with the Canadian Electrical Code, when installed in Canada

YOKOGAWA			D-79664 Wehr (Germany)			
Document No. 8300028		Description: FM(US/C) Control Drawing, Rotamass Remote Type RCCR31 + RCCS3		**WARNING: Substitution of components may impair intrinsic safety**		
3	FZ2-512-03771	23.07.2013	Rüchel	Schm	Schmidt	
Rev.	Rev.-No.	Date	Edited	Checked	Approved	Remarks
		Note: Ex related document !		Rü		
Original		Replaced for		Replaced by		ENG-028944 Page 2/2

9.4 IECEx

In this section, further requirements and differences for explosion proof type instrument are described. For explosion proof type instrument, the description in this chapter is prior to other description in this Instruction Manual.

WARNING

- Only trained persons may use the instrument in industrial location.
- The instrument modification or parts replacement by other than an authorized Representative of Yokogawa is prohibited and will void the certification.
- Electrostatic charge may cause an exlosion hazard. Avoid any actions that cause the gerenation of eletrostatic charge, such as rubbing with a dry cloth on coating face of the converter.
- If it is mounted in an area where the use of category 2D apparatus is required, it shall be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust is avoided.

ROTAMASS is produced by
Rota Yokogawa
Rheinstr. 8
D-79664 Wehr
Germany

9.4.1 Technical Data

Applicable Standards:
IEC 60079-0: 2011; IEC 60079-1: 2007,
IEC 60079-7: 2006; IEC 60079-11: 2011;
IEC 60079-31:2008
Certificate: IECEx KEM 06.0031X

Remote detector RCCS30LR ... 33 (option /ES1):
- Intrinsically safe
- Ex ib IIB/IIC T6...T1 Gb
- Ex ib IIIC T□□□ Db
  (□□□ = max. surface temperature see below)
- Max. surface temperature :
  Standard : 150°C
  /MT : 260°C
  /MT, not /T□ : 320°C
- Degree of protection: IP66/67
- Ambient humidity : 0 to 95% RH
- Ambient temperature range:
  -50°C to +80°C
- Process temperature limits :
  Standard : -50°C to 150°C
  /MT : -50°C to 260°C
  /MT, not /T□ : -50°C to 260°C
- Heat carrier fluid temperature limits :
  Standard : 0°C to 150°C
  Option /MT : 0°C to 260°C

Remote detector RCCS34 ... 39/XR (option /ES1):
- Intrinsically safe
- Ex ib IIB/IIC T6...T1 Gb
- Ex ib IIIC T□□□ Db
  (□□□ = max. surface temperature see below)
-Max. surface temperature :
  Standard + /LT : 150°C
  /MT : 220°C
  /HT : 350°C
- Degree of protection: IP66/67
- Ambient humidity : 0 to 95% RH
- Ambient temperature range:
  -50°C to +80°C
  Option /HT (process temperature < 280°C):
  -50°C to +65°C
  Option /HT (process temperature < 350°C):
  -50°C to +55°C
- Process temperature limits :
  Standard : -50°C to 150°C
  Option /MT: : -50°C to 220°C
  Option /HT : 0°C to 350°C
  Option /LT : -200°C to 150°C
- Heat carrier fluid temperature limits :
  Standard : 0°C to 150°C
  Option /MT : 0°C to 220°C
  Option /HT : 0°C to 350°C

Remote converter RCCF31 (option /EF1):
- Flame proof with intrinsic 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
- Degree of protection : IP66/67
- Power supply : 90 to 250 V AC, 50/60 Hz
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C

Remote converter RCCF31 (option /EF5):
- Flame proof with intrinsic safe connection to detector (ib)
- Additional intrinsic safe outputs (ia).
- Ex d [ia Ga] [ib] IIC T6 Gb or Ex d e [ia Ga] [ib] IIC T6 Gb
- Ex d [ia IIC Ga] [ib] IIB T6 Gb or Ex d e [ia IIC Ga] [ib] IIB T6 Gb with option /HP
- Ex tb [ia Da] [ib] IIIC T75°C Db
- Max. surface temperature: 75°C
- Degree of protection : IP66/67
- Power supply : 90 to 250 V AC, 50/60 Hz
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range : -40°C to +55°C

Remote converter RCCR31 (option /ES1) :
- Associated apparatus with intrinsic safe connection to detector (ib)
- [Ex ib Gb] IIC
- [Ex ib Gb] IIB with option /HP
- [Ex ib Db] IIIC
- Power supply : 90 to 250 V AC, 50/60 Hz
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity: 0 to 95% RH
- Ambient temperature range: -40°C to +55°C

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

Integral type RCCT34 ... 39/XR (option /EF1):
- Flame proof with intrinsic safe connection to detector (ib)
- Ex d ib IIC T6...T3 Gb or Ex d e ib IIC T6...T3 Gb
- Ex d ib IIB T6...T3 Gb or Ex d e ib IIB T6...T3 Gb with option /HP
- Ex ib tb IIIC T150°C Db
- Max. surface temperature : 150°C
- Degree of protection : IP66/67
- Power supply : 90 to 250 V AC, 50/60 Hz
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range : -40°C to +55°C
- Process temperature limits : -50°C to 150°C

Integral type RCCT34 ... 39/XR (option /EF5):
- Flame proof with intrinsic safe connection to detector (ib)
- Additional intrinsic safe outputs (ia).
- Ex d ib [ia Ga] IIC T6...T3 Gb or Ex d e ib [ia Ga] IIC T6...T3 Gb
- Ex d ib [ia IICGa] IIB T6...T3 Gb or Ex d e ib [ia IIC Ga] IIB T6...T3 Gb with option /HP
- Ex ib tb [ia Da] IIIC T150°C Db
- Max. surface temperature : 150°C
- Degree of protection : IP66/67
- Power supply: 90 to 250 V AC, 50/60 Hz
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range : -40°C to +55°C
- Process temperature limits : -50°C to 150°C

The electronics of RCCT3 and RCCF31 are placed in a pressure tight section of the converter housing Ex d.
The kind of protection of the terminal enclosure is “e”, but can become “d” by using Ex-d certified cable glands.

Electrical data remote detector RCCS30LR ... 33:
- Driving circuit : terminals D+ / D-
  Ex ib IIC : Ui = 16 V; Ii = 53 mA; Pi = 0.212 W
  Li = 4.2 mH; Ci = negl. small
  Ex ib IIB : Ui = 16 V; Ii = 153 mA; Pi = 0.612 W
  Li = 4.2 mH; Ci = negl. small
- Sensor circuits: terminals S1+/ S1- or S2+ / S2-
  Ex ib IIC : Ui = 16 V; Ii = 80 mA; Pi = 0.32 W
  Li = 4.2 mH; Ci = negl. small
- Temp. 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 detector RCCS34 ... 39/XR :

- Driving circuit : terminals D+ / 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+/ S1- or S2+ / S2-
  Ex ib IIC : Ui = 16 V; Ii = 80 mA; Pi = 0.32 W
  Li = 2.1 mH; Ci = negligible small
- Temp. 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 and converter of Intergral type RCCT3:

- 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 IIC : Uo = 14.5 V; Io = 47 mA; Po = 0.171 W
  Lo = 15 mH; Co = 0.65 µF
- Temperature sensor circuit : terminals TP1,TP2, TP3
  Ex ib IIC : Uo = 13.3 V; Io = 40 mA; Po = 0.133 W
  Lo = 20 mH; Co =0.91 µF
- Current output (only option /EF2) :
  Ex ia IIC : Ui = 30 V; Ii = 165 mA; Pi = 1.25 W
  Li = negligible small; Ci = 6.9 nF
- Pulse output (only option /EF2) :
  Ex ia IIC : Ui = 30 V; Ii = 100 mA; Pi = 0.75 W
  Li = negligible small; Ci = 4.5 nF
- Current output (only option /EF5) :
  Ex ia IIC : Ui = 30 V; Ii = 300 mA; Pi = 1.25 W
  Li = 4 µH; Ci = 5.5 nF
- Pulse output (only option /EF5) :
  Ex ia IIC : Ui = 30 V; Ii = 300 mA; Pi = 1.25 W
  Li = 4 µH; Ci = 13.1 nF

Coherence between temperature class, ambient- and medium temperature/ temperature of heat carrier :

	RCCS30LR to RCCS33 without insulation		RCCS30LR to RCCS33 with factory insulation	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	50°C / 122°F	60°C / 140°F	60°C / 140°F	60°C / 140°F
T5	50°C / 122°F	80°C / 176°F	80°C / 176°F	90°C / 194°F
T4	80°C / 176°F 50°C / 122°F	100°C / 212°F 120°C / 248°F	80°C / 176°F	130°C / 266°F
T3	80°C / 176°F	180°C / 356°F	80°C / 176°F	180°C / 356°F
T2	80°C / 176°F	260°C / 500°F	80°C / 176°F	260°C / 500°F
T1	80°C / 176°F	260°C / 500°F	80°C / 176°F	260°C / 500°F

	RCCS34 to RCCS39/XR without insulation		RCCS34 to RCCS39/XR with factory insulation		RCCT34 to RCCT39/XR	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	40°C / 104°F	40°C / 104°F	65°C / 149°C	65°C / 149°F	+55°C / 131°F	65°C / 149°C
T5	55°C / 131°F	55°C / 131°F	75°C / 167°F	75°C / 167°F	+55°C / 131°F	80°C / 176°F
T4	80°C / 176°F 40°C / 104°F	100°C / 212°F 120°C / 248°F	70°C / 158°F	115°C / 239°F	+55°C / 131°F	115°C / 239°F
T3	80°C / 176°F 40°C / 104°F	160°C / 320°F 180°C / 356°F	70°C / 158°F	180°C / 356°F	+55°C / 131°F	150°C / 302°F
T2	80°C / 176°F	220°C / 428°F	65°C /149°F	275°C / 527°F	+55°C / 131°F	150°C / 302°F
T1	80°C / 176°F	220°C / 428°F	45°C / 113°F	350°C / 662°F	+55°C / 131°F	150°C / 302°F

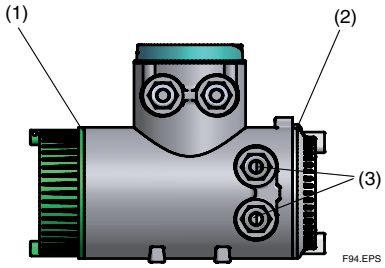
NOTE

For customer insulation of RCCS30LR to 39/XR the following must be regarded :
The table "with factory insulation" is calculated with 80 mm insulation and k-factor = 0.4 W/m²K.
If your insulation data are worse than these use table "without insulation" !

NOTE

If a Rotamass with option /LT is used without factory insulation option /T1, it must be ensured that the temperature at the O-rings of the terminal box does not decrease below -50°C !

Flame proof (Ex d) relevant threads at converter housing and covers:



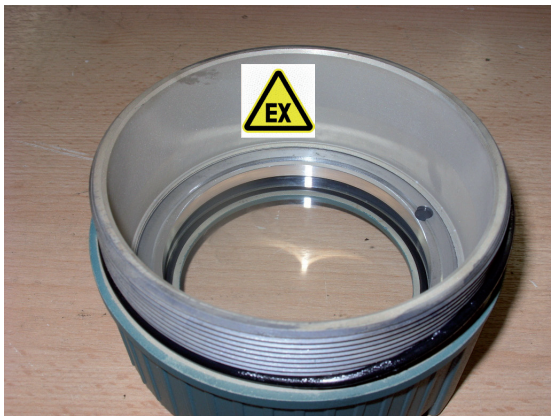
No.	Position of thread	Pitch	Thread form + quality of pitch	Threads engaged	Depth of engagement
(1) case	Thread on electronic/display side	2 mm	medium, 6H [1)]	≥ 6	12 mm
(1) cover	Thread on electronic/display side	2 mm	medium, 6g [1)]	≥ 6	12 mm
(2) case	Thread on terminal box side	2 mm	medium, 6H [1)]	≥ 6	12 mm
(2) cover	Thread on terminal box side	2 mm	medium, 6g [1)]	≥ 6	12 mm
(3) M	Thread for cable glands M20 x 1.5	1.5 mm	medium, 6H [1)]	≥ 10	17 mm
(3) A/F	Thread for cable glands 1/2 ´´ NPT	1.814 mm	[2)]	6.5 ± 1	13.605 mm

[1)] acc. ISO 965-1 and ISO 965-3 [2)] acc. ANSI B 1.20.1

If terminal enclosure is used as Ex e, the threads (2) and (3) in above table must be not be regarded.

Marking of Ex d covers

The cover with glass window is marked inside with an "Ex"- label as shown below:



9.4.2 Installation

Integral type RCCT3

WARNING

1. Ex type of ROTAMASS must be connected to the suitable IS earthing system (see installation diagram). Converter case must have connection to the potential equalisation facility. If the connecting process tubing is part of the potential equalisation, no additional connection is required.
2. Use the certified cable glands, suitable for the conditions of use. The delivered cable glands are only for Ex e use. For Ex d use certified d-type cable glands.
3. Please confirm that the ground terminal (inside the terminal enclosure) is firmly connected by means of a clip-on eye-let.
4. Ex-e terminals for power supply and I/O-lines are designed for cables with cross section of 0.08 mm² (AWG 28) to 2.5 mm² (AWG 22). The strip length must be 5 to 6 mm (0.2 to 0.24 in).

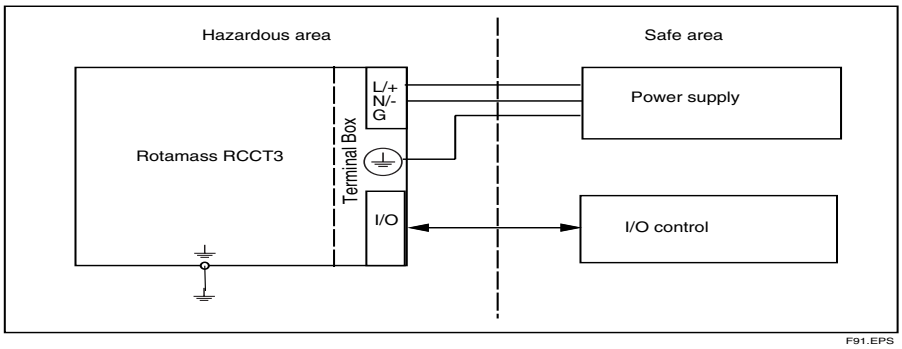
Cable glands for power- and I/O-cables :

RCCT3□-□□□M : Ex e types are enclosed. These cable glands can also be used for “dust application” tD. Use IECEx- certified Ex d cable glands for Ex d condition.

RCCT3□-□□□A : No cable glands are enclosed. Use the IECEx- certified cable glands, suitable for the conditions of use (Ex de or Ex d or tD).

For “dust application” use cable glands with minimum IP66/67 protection !

Installation diagram (option /EF1) :



Detailed information for connection intrinsic safe outputs (option /EF2 and /EF5 see chapter 4.8.8.

Remote field-mount type RCCF31 with RCCS3

WARNING

1. Ex type RCCF31 and RCCS3 must be connected to the suitable IS earthing system (see installation diagram). Converter and detector case must have connection to the potential equalisation facility.
2. Use the certified cable glands, suitable for the conditions of use.
3. Please confirm that the ground terminal (inside the terminal enclosure) is firmly connected by means of a clip-on eye-let.
4. For EMC technical reasons the case of the detector is connected to the case of the converter via the shielding of the interconnecting cable.

Cable glands for power- and I/O-cables :

RCCF31-□□□M : Ex e types are enclosed. These cable glands can also be used for “dust application” tD. Use IECEx- certified Ex d cable glands for Ex d condition.

RCCF31-□□□A : No cable glands are enclosed. Use the IECEx- certified cable glands, suitable for the conditions of use (Ex de or Ex d or tD)

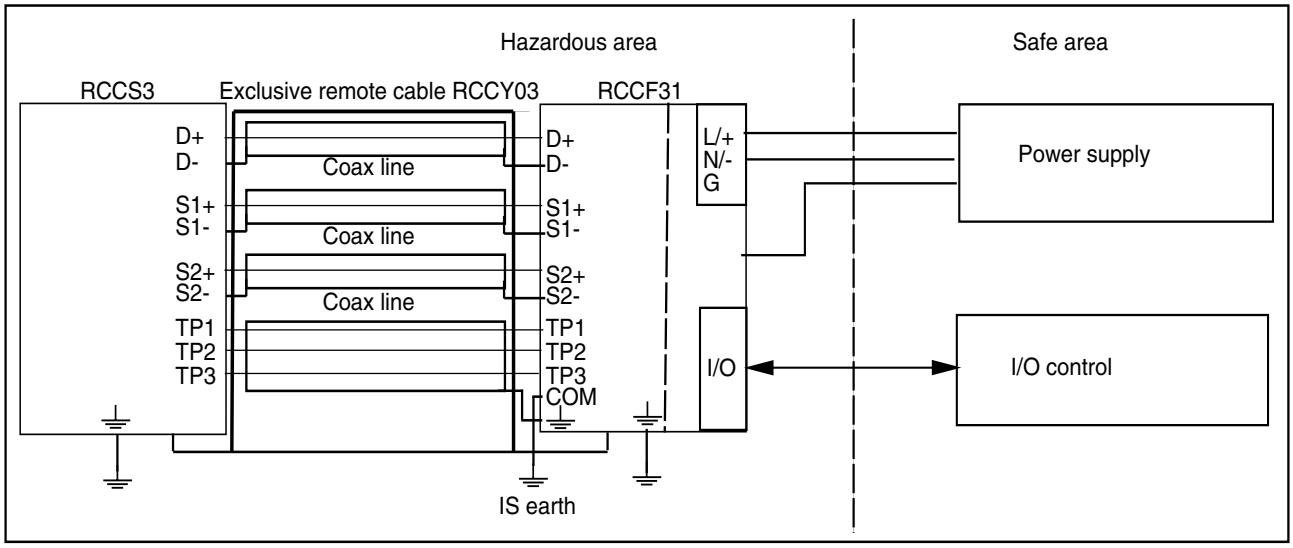
For “dust application” tD use cable glands with minimum IP66/67 protection !

Cable glands for detector connection terminal :

RCCF31-□□□M : Cable glands are fitted in the concerning thread. This cable gland can also be used for “dust application” tD.

RCCF31-□□□A : Cable glands are enclosed. This cable gland can also be used for dust application” tD.

Installation diagram (option /EF1) :



The inner shields (shields of the cable pairs) are connected together to COM –terminal on converter side.
The outer shield of the cable is connected on both sides to the cases by cable gland.

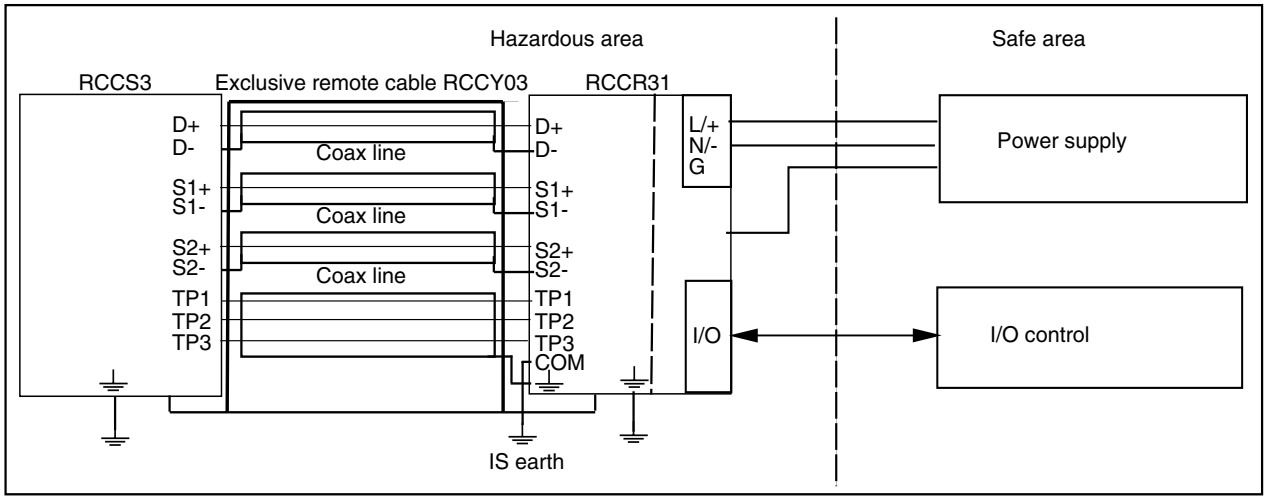
Detailed information for connection intrinsic safe outputs (option /EF2 and /EF5) see chapter 4.8.8.

Remote rack-mount type RCCR31 with RCCS3

WARNING

1. Remote rack mount converter RCCR31 must only be installed in safe area !
2. Ex-type RCCR31 and RCCS3□ must be connected to the suitable IS earthing system (see installation diagram). Converter and detector case must have connection to the potential equalisation facility.
3. Please confirm that the ground terminal on terminal board is firmly connected.
4. Ex-e terminals for power supply and I/O-lines are designed for cables with cross section of 0.08 mm² (AWG 28) to 2.5 mm² (AWG 22). The strip length must be 5 to 6 mm (0.2 to 0.24 in).
5. For EMC technical reasons the case of the detector is connected to the case of the converter via the shielding of the interconnecting cable.

Installation diagram :



9.4.3 Operation

If the cover of the converter RCCF31 / RCCT3□ has to be opened, following instructions must be followed.

CAUTION

1. Confirm that the power cables to the instrument are disconnected.
2. Wait 15 minutes after power is turned off before opening the covers.
3. The covers of display side and terminal box are fixed with special screws, please use Hexagonal wrench to open the covers.
4. Be sure to lock the cover with special screw using the Hexagonal Wrench after tightening the cover (see drawing chapter 4.3).
5. Before starting the operation again, be sure to lock the cover with the locking screws.
6. Prohibition of specification changes and modifications. Users are prohibited from making any modifications of specifications or physical configuration, such as adding or changing the configuration of external wiring ports.

9.4.4 Maintenance and repair

WARNING

The instrument modification of parts replacement by other than authorized representatives of YOKOGAWA is prohibited and will void the certification.

9.4.5 Ex-relevant marking on name plates (refer to chapter 3.11)

RCCT3 option /EF1:
IECEx KEM 06.0031X
Ex d ib IIC T6...T3 Gb or
Ex d e ib IIC T6...T3 Gb
Ex ib tb IIIC T150°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc

TEMP. CLASS	T6	T5	T4	T3
PROCESS TEMP.	65	80	115	150°C

ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCT3 option /EF1 + /HP:
IECEx KEM 06.0031X
Ex d ib IIB T6...T3 Gb or
Ex d e ib IIB T6...T3 Gb
Ex ib tb IIIC T150°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc

TEMP. CLASS	T6	T5	T4	T3
PROCESS TEMP.	65	80	115	150°C

ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCT3 option /EF2 or /EF5:
IECEx KEM 06.0031X
Ex d ib [ia Ga] IIC T6...T3 Gb or
Ex d e ib [ia Ga] IIC T6...T3 Gb
Ex ib tb [ia Da] IIIC T150°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc

TEMP. CLASS	T6	T5	T4	T3
PROCESS TEMP.	65	80	115	150°C

ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCT3 option /EF2 or /EF5 + /HP:
IECEx KEM 06.0031X
Ex d ib [ia IIC Ga] IIB T6...T3 Gb or
Ex d e ib [ia IIC Ga] IIB T6...T3 Gb
Ex ib tb [ia Da] IIIC T150°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc

TEMP. CLASS	T6	T5	T4	T3
PROCESS TEMP.	65	80	115	150°C

ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCF31 option /EF1:
IECEx KEM 06.0031X
Ex d [ib] IIC T6 Gb or
Ex d e [ib] IIC T6 Gb
Ex tb [ib] IIIC T75°C Db
ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCF31 option /EF2 or /EF5:
IECEx KEM 06.0031X
Ex d [ia Ga] [ib] IIC T6 Gb or
Ex d e [ia Ga] [ib] IIC T6 Gb
Ex tb [ia Da] [ib] IIIC T75°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc
ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCR31 option /ES1:
IECEx KEM 06.0031X
[Ex ib Gb] IIC
[Ex ib Db] IIIC
DIODE SAFETY BARRIER Um : 250Vac/dc
SEE CERTIFICATE FOR DATA

RCCS34 to 39/XR option /ES1:
IECEx KEM 06.0031X
Ex ib IIB/IIC T6...T1 Gb
Ex ib IIIC T150°C Db IP66/67
SEE CERTIFICATE FOR DATA

RCCS34 to 39/XR option /ES1 + /MT:
IECEx KEM 06.0031X
Ex ib IIB/IIC T6...T1 Gb
Ex ib IIIC T220°C Db IP66/67
SEE CERTIFICATE FOR DATA

RCCS34 to 39/XR option /ES1 + /HT:
IECEx KEM 06.0031X
Ex ib IIB/IIC T6...T1 Gb
Ex ib IIIC T350°C Db IP66/67
SEE CERTIFICATE FOR DATA

RCCF31 option /EF1 + /HP:
IECEx KEM 06.0031X
Ex d i[b[IIB T6 Gb or
Ex d e [ib] IIB T6 Gb
Ex tb [ib] IIIC T75°C Db
ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCF31 option /EF2 or /EF5 + /HP:
IECEx KEM 06.0031X
Ex d [ia IIC Ga] [ib] IIB T6 Gb or
Ex d e [ia IIC Ga] [ib] IIB T6 Gb
Ex tb [ia Da] [ib] IIIC T75°C Db
DIODE SAFETY BARRIER Um : 250Vac/dc
ENCLOSURE: IP66/67
SEE CERTIFICATE FOR DATA

WARNING
WAIT 15 MIN. AFTER POWER-DISCONNECTION BEFORE OPENING THE ENCLOSURE.

RCCR31 option /ES1 + /HP:
IECEx KEM 06.0031X
[Ex ib Gb] IIB
[Ex ib Db] IIIC
DIODE SAFETY BARRIER Um : 250Vac/dc
SEE CERTIFICATE FOR DATA

RCCS30LR to 33 option /ES1:
IECEx KEM 06.0031X
Ex ib IIB/IIC T6...T1 Gb
Ex ib IIIC T150°C Db IP66/67
SEE CERTIFICATE FOR DATA

RCCS30LR to 33 option /ES1 + /MT:
IECEx KEM 06.0031X
Ex ib IIB/IIC T6...T1 Gb
Ex ib IIIC T260°C Db IP66/67
SEE CERTIFICATE FOR DATA

9.5 INMETRO (Brazil)

Certificate TÜV 11.0419
RCCS3□ with option /US1 same as IECEx /ES1
RCCT3□ with options /UF1 ... /UF5 same as IECEx EF1 ... /EF5
RCCR31 with options /UF1 ... /UF5 same as IECEx EF1 ... /EF5
RCCR31 with option /US1 same as IECEx /ES1
Same parameters and specifications as IECEx approval.

9.6 NEPSI (China)

Certificate GYJ12.1381X
RCCS3□ with option /NS1, RCCT3□ with options /NF1 ... /NF5,
RCCF31 with options /NF1 ... /NF5 , RCCR31 with option /NS1
Same parameters and specifications as IECEx approval except NEPSI has no dust proof certification.

9.7 EAC (Russia, Kazakhstan, Belorussia)

Certificate RU C-DE.ГБ08.B.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 with the exception that EAC approval does not cover dust proof.

Blank Page

10. APPROVALS

10.1 PED (Pressure Equipment Directive)

All materials containing pressure (process connections, flow divider and tubes) are traced back to the original manufacturer with a material certificate. The PED limits the pressure and temp, which can be found below.

> ⚠ **WARNING**
>
> The given temperature /pressure ranges are calculated and approved without corrosion or erosion. The customer is fully responsible to select proper materials to withstand his corrosive or erosive conditions. 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.

ROTAMASS is produced according the determinations of directive 97/23/EG (Directive for Pressure Equipment / PED).The units are classified as pipe according item 3, number 1, 3. letter, a) first dash or according diagram 6 after appendix II :

Classification as pipe
For Fluid Group 1 and 2 (article 9 chapter (2)); For fluid group 2 with a max. partial pressure of 1.5bar at $T_{max.}$.
Medium liquid and gas

The basic safety requests (for design, production and testing) for all units according to category I to III are generally determined for the requests of category III. The units, which are not included by PED, article 3 paragraph 3, are checked by a conformity-valuation–methode according appendix III "module H".

The complete quality assurance system according PED appendix III module H was
certified by the notified body :
Lloyd's Register Verification Limited, 71 Fenchurch Street London EC3M 4BS UK
ID-No. 0038
Number is printed on name plates (see chapter 3.11).

The risk assessment was made acc. DIN CEN/TS 764-6.

⚠ **WARNING**

Do not open the gas-filling-plugs in the drawings in chapter 3.2, 3.5, 3.7, 3.9, filling with protective gas!

For the application the following notes have to be noticed :

Permitted maximum process temperatures:
The process temperature limits of the detector are : -200 to 350°C
These limits are reduced depending on the selected design and the selected temperature range.
Additional reductions for the use of special connections (clamp, pipe screwing ...) have to be noticed according the concerning standards.

Dependence of the max. permitted effective pressure of the operating temperature:

a) for Standard process connections

Type of process connection		Process Temperature							
		RT [3]	50°C	100°C	150°C	200°C	250°C	300°C	350°C
A1 [2]	Flange acc. ASME B16.5 Class 150	19 bar	18.4 bar	16.2 bar	14.8 bar	13.7 bar	12.1 bar	10.2 bar	8.4 bar
A2 [2]	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	31.6 bar	30.3 bar
A3 [2]	Flange acc. ASME B16.5 Class 600 excl. RCC 39/XR	99.3 bar	96.2 bar	84.4 bar	77 bar	71.3 bar	66.8 bar	63.2 bar	60.7 bar
A3 [2]	Flange acc. ASME B16.5 Class 600 for RCC 39/XR	95 bar	89 bar	80 bar	73 bar	67 bar	62 bar	59 bar	58 bar
A4 [2]	Flange acc. ASME B16.5 Class 900	148.9 bar	144.3 bar	126.6 bar	115.5 bar	107 bar	100.1 bar	94.9 bar	91 bar
A5 [2]	Flange acc. ASME B16.5 Class 1500 excl. RCC 36	248.2 bar	240.6 bar	211 bar	192.5 bar	178.3 bar	166.9 bar	158.1 bar	151.6 bar
A5 [2]	Flange acc. ASME B16.5 Class 1500 for RCC 36	210 bar	203 bar	176 bar	160 bar	148 bar	140 bar	133 bar	128 bar
D2 [1]	Flange acc. EN 1092-1 PN 16	16 bar	15.6 bar	14.2 bar	12.8 bar	11.7 bar	10.9 bar	10.3 bar	9.9 bar
D4 [1]	Flange acc. EN 1092-1 PN 40	40 bar	39.1 bar	35.6 bar	32.0 bar	29.3 bar	27.2 bar	25.8 bar	24.7 bar
D5 [1]	Flange acc. EN 1092-1 PN 63	63 bar	61.6 bar	56.0 bar	50.4 bar	46.2 bar	42.8 bar	40.6 bar	38.9 bar
D6 [1]	Flange acc. EN 1092-1 PN 100	100 bar	97.7 bar	94.7 bar	80.0 bar	73.3 bar	68.0 bar	64.4 bar	61.8 bar
G9 [1]	Internal thread RCCS30LR ... 33	285 bar	271 bar	247 bar	227 bar	208 bar	183 bar	----------	-------
T9 [1]	Internal thread NPT RCCS30LR ... 33	285 bar	271 bar	247 bar	227 bar	208 bar	183 bar	----------	-------
G9 [1] [4]	Internal thread RCCS34	260 bar	251 bar	231 bar	208 bar	190 bar	178 bar	167 bar	160 bar
T9 [1] [4]	Internal thread NPT RCCS34	260 bar	251 bar	231 bar	208 bar	190 bar	178 bar	167 bar	160 bar

		Process Temperature			
		up to 120°C	220°C	300°C	350°C
J1 [1]	Flange acc. JIS B 2220 10K	14 bar	12 bar	10 bar	------
J2 [1]	Flange acc. JIS B 2220 20K	34 bar	31 bar	29 bar	26 bar

		Process Temperature	
		up to 140°C [*]	
S2 [1]	Pipe connection acc. DIN 11851 up to DN 40	40 bar	[*] under the restriction using suitable gasket materials
	Pipe connection acc. DIN 11851 DN 50 to DN 100	25 bar	
	Pipe connection acc. DIN 11851 above DN 100	16 bar	

		Process Temperature	
		up to 150°C [**]	
S4 [1]	Clamp connection acc. DIN 32676 up to DN 50	16 bar	[**] under the restriction using suitable gasket materials
	Clamp connection acc. DIN 32676 above DN 50	10 bar	
S8 [1]	Clamp acc. Mini-Clamp up to 1/2"	16 bar	
	Clamp acc. Tri-Clamp® up to 2"	16 bar	
	Clamp acc. Tri-Clamp® above 2"	10 bar	

[1] process connection material: 1.4404 / 1.4435 (equivalent to group 2.3 material AISI 316L acc. ASME B16.5)
[2]) process connection material: 1.4401/1.4404 AISI 316/316L
[3] RT = Room Temperature; EN1092: -10°C to 50°C; ASME B16.5: -29°C to 38°C
[4] for option /DS max. pressure according A4. ASME class 900

b) for special process connections

For customer-built models with Z-No. (Option /Z) different values may be valid.

These details are written on the name plate (field 13).

Special connections	Medium temperature								
	-200°C	RT	50°C	100°C	150°C	200°C	250°C	300°C	350°C
Flange ASME >300	100%	100%	94.2%	83.3%	75.8%	69.5%	64.3%	60.8%	58.0%
Flange DIN PN	100%	100%	96.5%	55.5%	80.5%	74.3%	69.8%	64.5%	61.8%
Other connections	100%	100%	96.5%	55.5%	80.5%	74.3%	69.8%	64.5%	61.8%
		PS [1]							

[1] Details see name plate (item (2)).

The statements only refer to the connection at the unit, further reductions by gaskets and customer-sided connection parts have to be considered separately.

Rating of flange connections

The user must dimension bolts and nuts as depending of pressure, temperature, flange material and seal, so that the flange connection remains tight in the expected operating conditions.

The basic of calculation may be:

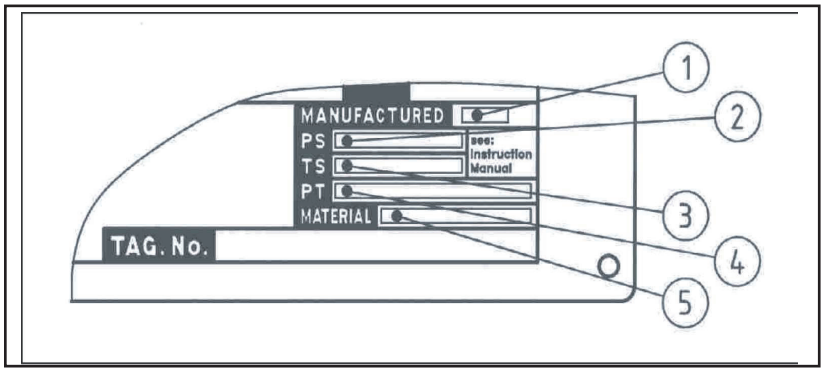
- EN 1515 part 1+2 (bolts and nuts)
- EN 1591 part 1+2 (flanges and seals)

For certain sealing materials it may occur that the sheet thickness of the flange at utilization of the full pressure range (eg, PN) is no longer of sufficient size.

The user is responsible to take necessary measures before ordering, for example:

- selection of flanges with higher pressure rate
- selection of flanges with a flange face which is more thick as according standard

PED-data on the name plate of RCCT3



1) Year of manufacturing
2) Max. permitted pressure at room temperature, for other temperatures see table
3) Max. permitted temperature range
4) Test pressure, for standard units without value, because in this case generally
   PT=1.5 x PS
5) Material of medium wetted parts with pressure load

Operation restriction:

The operator is responsible that no corrosion and/or erosion is caused by the medium, which reduces the safety of the unit as pressure vessel. Corrosion and erosion can make the unit fail and can lead to the endangering of persons and facilities. If corrosion and erosion are possible, the integrity of the tubes has to be checked periodically.

The following usages of the instruments are not permitted:

- use as climbing aid (e.g during assembling work on pipe system)
- use as support for external load (e.g. support for piping) or tray surface for heavy tools (e.g. during piping work)
- Material removal by any kind of machining (e.g. drilling, sawing etc.)
- Painting of the name-plate
- Brazing or welding of parts to the instrument
- Any repair, modification or supplements or the installation of spare-parts is only permitted if it is done in accordance to this instruction manual. Other work must be agreed by YOKOGAWA beforehand. YOKOGAWA will not take over any liability for damages caused by unauthorized work on the instrument or prohibited usage of the instrument.

Information of potential hazardous situations:

	Endangering by:	Description	Remarks
Medium	Surface temperature	Surface temperature is hot in case of high process temperature. It is the sole responsibility of the user to establish proper means to prevent touching of the detector (see also chapter 11.1).	
	Max. / Min process temperature	See chapter 11.1	
	Max. process pressure	See chapter 11.1	
	Tightness of the wetted, PED relevant volume	A factory test is done before delivery	
	Corrosion and erosion effects	It is the sole responsibility of the user to select proper wetted materials for the medium intended to use (see chapter 10).	
	Life time evaluation	Experience shows that the lifetime of the detector within the allowed operation conditions is more than 10 years.	Without erosion and corrosion.
	Temperature shock	Permanent temperature cycles of more than 100°C temp. difference have to be avoided. Tube failure can occur because of material wearing.	
	Instable fluids	If instable fluids are transported it is the sole responsibility of the user that in case of decomposition the design limits are not exceeded.	
Installation	Process pressure/temp. relation	See chapter 10	
	Piping and support forces	See chapter 4.3	
	Choice of gaskets and pre- stress of the process connections	It is the sole responsibility of the user to select suitable gaskets and to screw the process connections with the necessary torques.	Refer to EN 1591-1
	Use of closing and openings	Do not open the ¼ NPT plugs in the body after tube failure before it is ensured that the housing is pressure free and free of hazardous substances.	
	Pressure shock, water hammer and pressure surges	Dynamical exceeding of the given max. pressure at process temp. has to be avoided.	Water hammer can lead to tube failures.
	Filling and emptying of the pipe work	The detector is part of a pipe work. It has to be taken into account that fluid can remain in the measuring tubes.	
	Disposal, cleaning and return	See chapter 1.5	
	Flow direction of the unit	See chapter 4.1 and marking on the detector.	After installation with wrong flow direction only indication error (wrong sign, can be corrected via software)
	Installation position of the unit	See chapter 4.3	A wrong installation position gives only measuring disturbances
	Pipe stress by weight of the instrument	See chapter 4.3	
Outer influence	Permitted ambient conditions (temperature, humidity)	See chapter 11.1	
	External fire	External fire can result in - Rise in pressure by temperature - Damage of gaskets It is in the sole responsibility of the user to implement suitable means to prevent large damage in the case of fire.	The instrument itself does not contain flammable materials.
	Earthquake resistance	Damage of the mounting screws	Check by user

T101.EPS

10.2 Safety Requirement Standards

Acc. EN 61010-1
EN 61010-2-030
Overvoltage category II
Pollution degree 2

10.3 EMC

Acc. EN 61326-1, Class A, Table 2 (For use in industrial locations)
EN 61326-2-3
EN 61000-3-2
EN 61000-3-3

CAUTION

This instrument is a class A product, and it is designed for use in the industrial environment.
Please use this instrument in the industrial environment only.

10.4 METROLOGICAL REGULATION IN CIS AND EAC COUNTRIES

Russia, Kazakhstan, Uzbekistan, Ukraine and Belorussia are members of CIS.
ROTAMASS has “Pattern Approval Certificate of Measuring Instruments” and is registered as a measuring instrument in Russia, Kazakhstan, Uzbekistan.
Option /QR1 is for Russia.
Option /QR2 is for Kazakhstan.
Option /QR3 is for Uzbekistan.
For the Ukraine the test certificate of Rota Yokogawa is sufficient. Therefore no special option exists.
For Belorussia Rota Yokogawa has no “Pattern Approval Certificate”, that means devices which need primary verification should be calibrated in Belorussia by Belorussian special bodies. Therefore no special option exists.

Blank Page

11. TECHNICAL DATA

PERFORMANCE SPECIFICATIONS

Model

- Remote detector RCCS30LR to 33: 2 tubes, low flow design
- Remote detector RCCS34 to 39/XR : 2 tube design
- Remote field-mount converter RCCF31
- Remote rack-mount converter RCCR31
- Integral type RCCT34 to 39/XR: 2 tube design

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		RCCS30 LR	RCCS30	RCCS31	RCCS32	RCCS33
Qmax	t/h	0.04	0.094	0.3	0.6	1.5
	lb/h	88	207	661	1322	3307
Qnom	t/h	0.021	0.045	0.17	0.37	0.95
	lb/h	46	99	374	815	2094

Model		RCC□34	RCC□36	RCC□38	RCC□39	RCC□39 /IR	RCC□39 /XR
Qmax	t/h	5	17	50	170	300	600
	lb/h	11023	37478	110231	374785	661386	1322773
Qnom	t/h	3	10	32	100	250	500
	lb/h	6613	22046	70547	220462	551155	1102311

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

Accuracy of mass flow (refer to table 2)**:**

Liquid RCCS30LR:
± 0.15% of flow rate ± zero stability / flow rate *100%
Liquid RCCS30 - 39/XR:
± 0.1% of flow rate ± zero stability / flow rate *100%
Gas (option /GA):
± 0.5% 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%

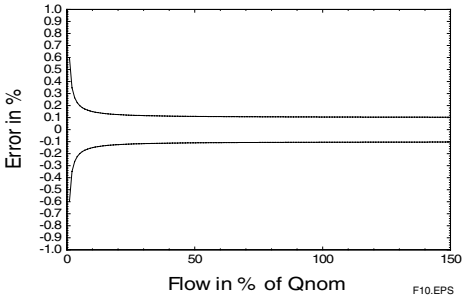


Table 2 : Zero stability

Model	RCCS30 LR	RCCS30	RCCS31	RCCS32	RCCS33
kg/h	0.003	0.005	0.0085	0.019	0.048
lb/h	0.006	0.011	0.018	0.04	0.105

Model	RCC□34	RCC□36	RCC□38	RCC□39	RCC□39 /IR	RCC□39 /XR
kg/h	0.15	0.5	1.6	5	13	25
lb/h	0.33	1.1	3.5	11	28.6	55

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		RCCS30 LR	RCCS30	RCCS31	RCCS32	RCCS33
% of rate per bar / (psi)	SH	0.00000 / (0.0)	0.00000 / (0.0)	0.00012 / (0.0017)	0.00246 / (0.0356)	0.0035 / (0.105)
	HC	----	----	----	----	----
Model		**RCC□34**	**RCC□36**	**RCC□38**	**RCC□39**	**RCC□39 /IR**
% of rate per bar / (psi)	SL	0.00081 / (0.011)	0.00346 / (0.050)	0.00950 / (0.137)	0.01058 / (0.153)	0.0047 / (0.068)
	HC	0.00084 / (0.012)	0.00336 / (0.048)	0.00896 / (0.129)	0.00808 / (0.117)	0.00287 / (0.041)
Model		**RCC□39 /XR**				
% of rate per bar / (psi)	SL	0.00740 / (0.107)				
	HC	----				

Density Measurement

Adjustment with water and air at calibration temperature.
Measuring range:
RCCS30LR - 38 : 0.3 kg/l to 5 kg/l
RCC□39 -39/XR : 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
RCCS30LR	0.02 g/cm³ *)	------	------
RCCS30	0.008 g/cm³ *)	------	------
RCCS31	0.004 g/cm³	0.001 g/cm³	------
RCCS32	0.004 g/cm³	0.001 g/cm³	0.0005 g/cm³
RCCS33	0.004 g/cm³	0.001 g/cm³	0.0005 g/cm³
RCC□34	0.003 g/cm³	0.001 g/cm³	0.0005 g/cm³
RCC□36	0.0022 g/cm³	0.001 g/cm³	0.0005 g/cm³
RCC□38	0.0015 g/cm³	0.001 g/cm³	0.0005 g/cm³
RCC□39	0.0015 g/cm³	0.001 g/cm³	0.0005 g/cm³
RCC□39//IR	0.0015 g/cm³	------	------
RCC□39//XR	0.0015 g/cm³	------	------

*) 0.003 g/cm³ on request

Repeatability:
RCCS32-33, RCC□34-39/XR : ± 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)
Process temp. range /HT: 150°C to 350°C (302°F to 662°F)
Minimum flow rate for specified accuracy:
- RCC□36 to RCC□39 : 700 kg/h (1543 lb/h)
- RCC□34 : 140 kg/h (308 lb/h)
- RCCS33 : 90 kg/h (198 lb/h)
- RCCS32 : 37 kg/h (81 lb/h)

Maximum flow rate : Q_{nom}
Repeatability : ±0.0002 g/cm³
Temperature measurement:
±(0.5°C+0.002*abs(T_{medium}-20°C)) (not /HT)
±(0.5°C+0.008*abs(T_{medium}-20°C)) (/HT)
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)
Option /HT : 0°C to 350°C (32°F to 662°F)
Accuracy:
Standard (-70°C to 150°C / -94°F to 302°F)
: ±(0.5°C+0.005*abs(T_{medium}-20°C))
Option /LT (-200°C to 150°C / -328°F to 302°F)
: ±(1.0°C+0.008*abs(T_{medium}-20°C))
Option /MT (-70°C to 260°C / -94°F to 500°F)
: ±(0.5°C+0.005*abs(T_{medium}-20°C))
Option /HT (0°C to 350°C / 32°F to 662°F)
: ±(1.0°C+0.008*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.

Heat Tracing

Heating with heat carrier, insulation and protection housing. Typically the max. surface temperature at the protection housing from inner heating is 40°C (at Tamb = 20°C). 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 himself. For this case order option /S2.
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 (see table 10):
for D-type flanges : EN DN 15 PN 40 Form B1
for A-type flanges : ANSI ½ - 150 lbs.
for J-type flanges : JIS DN15 10K
Max. pressure : PN 40
Protection class : IP54, install roof protected
For fluid temperatures below -70°C select option /LT.

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: RCCS30LR to RCC□38 vertical
RCC□39 to RCCS□39/XR 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 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 12).

Dual Seal Approval (option /DS):

- Conform with ANSI/ISA-12.27.01.
- To be ordered if compliance with ANSI/ISA 12.27.01 is required.
- Up to ANSI class 900 line pressure.
- Only with FM approval option.
- For liquid application the leakage detection is realized by software in the converter.
- For gas application options /GA and /RD (rupture disk) are mandatory.
- Rupture disk is only for annunciation.

NORMAL OPERATING CONDITIONS

Ambient Temperature Ranges

- Remote detector RCCS3□:
  - Standard : -50°C to +80°C (-58°F to 176°F)
  - Option /LT : -50°C to +80°C (-58°F to 176°F)
  - Option /MT : -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 temperature)
    -50°C to +55°C (-58°F to 131°F)
    (up to 350°C (662°F) medium temperature)
  - Terminal box temperature should not exceed 100°C
- Remote converter RCCF31, RCCR31 and integral type RCCT3□:
  - Display operating range
    : -20°C to +55°C (-4°F to 131°F)
  - Electronic operating range
    : -40°C to +55°C (-40°F to 131°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 :
- RCCS30LR to 33 : -50°C to 150°C (-58°F to 302°F)
- RCCS30LR to 33 /MT : -50°C to 260°C (-58°F to 500°F)
- RCCS34 to 39/XR : -70°C to 150°C (-94°F to 302°F)
- RCCS34 to 39/XR /LT : -200°C to 150°C (-328°F to 302°F)
- RCCS34 to 39/XR /MT : -70°C to 230°C (-94°F to 446°F)
  (Range 150°C - 230°C (302°F to 446°F) recommended with /T□ option)
- RCCS34 to 39/IR /HT : 0°C to 350°C (32°F to 662°F)
  (only with /T□ option or with /S2 and customer insulation)
- RCCS39/XR /HT : 0°C to 350°C (32°F to 662°F)
  (only with /S2 and customer insulation)

Integral type :
- RCCT34 to 39/XR : -50°C to 150°C (-58°F to 302°F)

For use in hazardous area see “Hazardous Area Specifications”

Heat Carrier Fluid Temperature Ranges

(Option /T2 or /T3 only for remote type RCCS30LR to 39/IR)
- Standard : 0°C to 150°C (32°F to 302°F)
- With option /MT (RCCS30LR to 33) :
  0°C to 200°C (32°F to 392°F)
- With option /MT (RCCS34 to 39/IR) :
  0°C to 230°C (32°F to 446°F)
- With option /HT : 0°C to 350°C (32°F to 662°F)

Process Pressure Limit

In dependence of the process connections s. table 9.
On request following maximum pressure up to 27°C (RT=Room Temp.):

Material wetted parts	SH [bar] / (psi)	SL [bar] / (psi)	HC [bar] / (psi)
RCCS30LR	400 / (5801)	----	----
RCCS30	400 / (5801)	----	----
RCCS31	350 / (5076)	----	----
RCCS32	285 / (4183)	----	----
RCCS33	285 / (4183)	----	----
RCCS34 / RCCT34	----	260 / (3770)	385 / (5583)
RCCS36 / RCCT36	----	210 / (3045)	315 / (4568)
RCCS38 / RCCT38	----	175 / (2538)	260 / (3770)
RCCS39 / RCCT39	----	135 / (1958)	260 / (3770)
RCCS39/IR / RCCT39/IR	----	110 / (1595)	180 / (2610)
RCCS39/XR / RCCT39/XR	----	95 / (1377)	----

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

up to	50°C (122°F)	: 4% derating
51 to	100°C (123.8°F to 212°F)	: 11% derating
101 to	150°C (213.8°F to 302°F)	: 20% derating
151 to	230°C (303.8°F to 446°F)	: 30% derating
231 to	350°C (447.8°F to 662°F)	: 38% derating

Higher pressure on request.
The maximum process pressure of a single instrument is given by the lower value either of the process connections (table 9) or tubes. 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. The customer is fully responsible of selecting proper materials which withstand corrosive or erosive conditions. 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
RCCS30LR to RCCS32	no limitation
RCCS33 non-Ex type	no limitation
RCCS33 Ex type	approx. 35%
RCC□34	no limitation
RCC□36	approx. 50%
RCC□38	approx. 30%
RCC□39	approx. 7%
RCC□39/IR	approx. 3%
RCC□39/XR (with /HP)	approx. 2%

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.

IM 01R04B04-00E-E 11th edition April 01, 2015 -00

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 *)
RCCS30LR-33	65 bar / (942 psi)	---
RCC□34-36	120 bar / (1740 psi)	60 bar / (870 psi)
RCC□38	120 bar / (1740 psi)	40 bar / (580 psi)
RCC□39	80 bar / (1160 psi)	10 bar / (145 psi)
RCC□39/IR	50 bar / (725 psi)	---
RCC□39/XR	on request	---
RCC□39/XR/HT	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
- RCCT3□ : IP66/67
- RCCF31 : IP66/67
- RCCS3□ : IP66/67
- RCCR31 : IP20

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
- Detector rupture disk (/RD) : 316L
- 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
- RCCS30LR to 33 :
  Measuring tubes : Ni-Alloy C-22/2.4602
  Process connections : 316L/1.4404
- RCC□34 to 39/IR :
  Measuring tubes and process connection : 316L/1.4404/1.4435 or
  Measuring tubes and flange face : Ni-Alloy C-22/2.4602
- RCC□39/XR :
  Measuring tubes and process connection : 316L/1.4404/1.4435

Table 5 : Diameter of measuring tubes

Type		RCCS30 LR	RCCS30	RCCS31	RCCS32	RCCS33
Inner diameter	mm	0.9	1.2	2.1	3	4.5
	inches	0.035	0.047	0.083	0.118	0.177
Wall thickness	mm	0.15	0.2	0.25	0.25	0.4
	inches	0.006	0.008	0.009	0.009	0.016

Type		RCC□34	RCC□36	RCC□38	RCC□39	RCC□39 /IR	RCC□39 /XR
Inner diameter	mm	7.7	13.4	22.1	37.2	54.5	82.50
	inches	0.303	0.528	0.870	1.485	2.146	3.248
Wall thickness	mm	0.89	1.24	1.65	2.6	2.9	3.2
	inches	0.035	0.049	0.065	0.102	0.114	0.126

Pressure Equipment Directive 97/23/EC
Detectors comply with Directive 97/23EC on Pressure Equipment for fluid group 1 and 2.

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

Vibration Test : Acc. IEC 60068-2-64

REMOTE CABLE RCCY03 SPECIFICATION

3 x Coaxial + 1 x 3 AWG20, shielded, twisted; overall shielding; flame propagation acc. IEC 60332-1.
We recommend to use only the original cable provided by Yokogawa. In case of local cable purchasing, please contact Yokogawa for specification.
Table 6 : Cable specifications

Model code	Temperature range	Wire gauge	Resistance of loop	Capacitance wire/wire	Capacitance wire/shield	Inductance wire/wire
RCCY031	-50 to +105°C -58°F to 221°F	Coaxial AWG 20	37 Ω/km 70 Ω/km	120 nF/km 145 nF/km	132 nF/km 290 nF/km	0.175 mH/km 0.70 mH/km
RCCY032	-50 to +105°C -58°F to 221°F	Coaxial AWG 20	37 Ω/km 70 Ω/km	120 nF/km 145 nF/km	132 nF/km 290 nF/km	0.175 mH/km 0.70 mH/km
RCCY033	-50 to +105°C -58°F to 221°F	Coaxial AWG 20	37 Ω/km 70 Ω/km	120 nF/km 145 nF/km	132 nF/km 290 nF/km	0.175 mH/km 0.70 mH/km
RCCY034	-50 to +105°C -58°F to 221°F	Coaxial AWG 20	37 Ω/km 70 Ω/km	120 nF/km 145 nF/km	132 nF/km 290 nF/km	0.175 mH/km 0.70 mH/km

ELECTRICAL SPECIFICATIONS

Power Supply

- AC- type : 90 V to 264 V AC
- AC- Ex-type : 90 V to 250 V AC
- 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

- AC- type : 2 A, T, breaking capacity 1500A
- DC- type : 2 A, T, breaking capacity 1500A

I/O Signals, including /KF1, /EF1, /UF1, /NF1, /GF1

- Two active current outputs: Iout1, Iout2
  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
  Active pulse output is not isolated from current output 2
  As frequency output
  Output 1 : 20 Hz to 10000 Hz
  Output 2 : 20 Hz to 2000 Hz
- Status input : Voltage-free contact
  Closed : < 200 Ω
  Open : > 100 kΩ

Option /KF5, /EF5, /UF5, /NF5, /GF5: 3 intrinsically safe outputs

- Two passive current outputs (additional power supply needed) : Iout1, Iout2, 4 to 20 mA DC, galvanically separated from other signals.
  Supply voltage : 10.5 V to 30 V DC (without HART®), 165 mA
  Supply voltage : 16.75 V to 30 V DC (with HART®), 165 mA
  Load resistance : 20 Ω ... 600 Ω
  Ambient temperature effect : < 0.05% of span/10°C
- One pulse output / status output : Pout
  Passive transistor contact output, 30 V DC, 100 mA
  Output rate : 0 to 2000 pulses/s
  As frequency output : 20 Hz to 2000 Hz
- No status input

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
- FOUNDATION™ Fieldbus communication (/FB)
  - see GS 01R04B05-00E
- 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.
- 4 selectable languages (English, German, French, Russian)
- Option /MB□ only available 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. EN 61326-1: 2006, Class A, Table 2
EN 61326-2-3: 2006
EN 61000-3-2: 2006
EN 61000-3-3: 2008

Safety Requirement Standards

Acc. EN 61010-1: 2010
EN 61010-2-030: 2011
Overvoltage category II
Pollution degree 2

Hazardous area specifications

ATEX

Remote detector RCCS30LR ... 33 (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 : 150°C (302°F)
  /MT : 260°C (500°F)
- Degree of protection : IP66/67
- Ambient humidity : 0 to 95% RH
- Ambient temperature range
  : -50°C to +80°C (-58°F to 176°F)
- Process temperature limits :
  Standard : -50°C to 150°C (-58°F to 302°F)
  Option /MT : -50°C to 260°C (-58°F to 500°F)
- Heat carrier fluid temperature limits
  Standard : 0°C to 150°C (32°F to 302°F)
  Option /MT : 0°C to 200°C (32°F to 392°F)

Remote detector RCCS34 ... 39/XR (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)
  /HT : 350°C (662°F)
- Degree of protection : IP66/67
- Ambient humidity : 0 to 95% RH
- Ambient temperature range
  Standard , option /LT and option /MT
  : -50°C to +80°C (-58°F to 176°F)
  Option /HT (process temperature < 280°C (536°F)
  : -50°C to +65°C (-58°F to 149°F)
  Option /HT (process temperature < 350°C (662°F)
  : -50°C to +55°C (-58°F to 131°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)
  Option /HT : 0°C to 350°C (32°F to 662°F)
- Heat carrier fluid temperature limits
  Standard : 0°C to 150°C -32°F to 302°F)
  Option /MT : 0°C to 220°C (32°F to 428°F)
  Option /HT : 0°C to 350°C (32°F to 662°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 : 90 to 250 V AC, 50/60 Hz or 20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C (-40°F to 131°F)

Remote converter RCCF31 (Option /KF5) :
- KEMA 02ATEX 2183 X
- Flame proof with Intrinsically safe connection to detector (ib)
- Additional Intrinsically safe outputs.
- II 2 (1) G Ex d [ia Ga] [ib] IIC T6 Gb or Ex d e [ia Ga] [ib] IIC T6 Gb
- II 2 (1) G Ex d [ia IIC Ga] [ib] IIB T6 Gb or Ex d e [ia IIC Ga] [ib] IIB T6 Gb with option /HP
- II 2 (1) D Ex tb [ia Da] [ib] IIIC T75°C Db
- Max. surface temperature : 75°C (167°F)
- Degree of protection : IP66/67
- Power supply : 90 to 250 V AC, 50/60 Hz or 20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C (-40°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 : 90 to 250 V AC, 50/60 Hz or 20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C (-40°F to 131°F)

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

Integral type RCCT34 ... 39/XR (Option /KF1) :
- KEMA 02ATEX 2183 X
- Flame proof with Intrinsically safe connection to detector (ib)
- II 2G Ex d ib IIC T6...T3 Gb or Ex d e ib IIC T6...T3 Gb
- II 2G Ex d ib IIB T6...T3 Gb or Ex d e ib IIB T6...T3 Gb with option /HP
- II 2D Ex ib tb IIIC T150°C Db
- Max. surface temperature : 150°C (302°F)
- Degree of protection : IP66/67
- Power supply : 90 to 250 V AC, 50/60 Hz or 20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C (-40°F to 131°F)

Integral type RCCT34 ... 39/XR (option /KF5) :
- KEMA 02ATEX 2183 X
- Flame proof with Intrinsically safe connection to detector (ib)
- Additional Intrinsically safe outputs.
- II 2 (1) G Ex d ib [ia Ga] IIC T6...T3 Gb or Ex d e ib [ia Ga] IIC T6...T3 Gb
- II 2 (1) G Ex d ib [ia IIC Ga] IIB T6...T3 Gb or Ex d e ib [ia IIC Ga] IIB T6...T3 Gb with option /HP
- II 2 (1) D Ex ib tb [ia Da] IIIC T150°C Db
- Max. surface temperature : 150°C (302°F)
- Degree of protection : IP66/67
- Power supply : 90 to 250 V AC, 50/60 Hz or 20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C (-40°F to 131°F)
- Process temperature range : -50°C to 150°C (-58°F to 302°F)

Electrical data remote detector RCCS30LR ... 33 :
- Driving circuit : terminals D+ and D
  Ex ib IIC : Ui = 16 V; Ii = 53 mA; Pi = 0.212 W
  Li = 4.2 mH; Ci = negligible small
  Ex ib IIB : Ui = 16 V; Ii = 153 mA; Pi = 0.612 W
  Li = 4.2 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 = 4.2 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 detector RCCS34 ... 39/XR :
- 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 and Converter of integral type RCCT3□ :
- 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
- Current outputs (only option /KF5) :
  Ex ia IIC : Ui = 30 V; Ii = 300 mA; Pi = 1.25 W
  Li = 4 µH; Ci = 5.5 nF
- Pulse output (only option /KF5) :
  Ex ia IIC : Ui = 30 V; Ii = 300 mA; Pi = 1.25 W
  Li = 4 µH; Ci = 13.1 nF

For temperature classification see table 7.

FM (For USA and Canada)

Remote detector RCCS30LR ... 39/XR (Option /FS1) :
- Intrinsically safe
- AEx ia IIC, Class 1, Zone 0
- IS Class I, Division 1, Groups A, B, C, D T6
- DIP Class II / III, Division 1, Groups E, F, G
- IP67 / NEMA 4X
- Ambient temperature range : -50°C to +80°C (-58°F to 176°F)

Remote converter RCCF31 (Option /FF1, /FF5) :
- Housing explosion proof
- Provides Intrinsically safe detector circuits
- AEx d [ia] IIC, Class I, Zone 1, T6
- AEx d [ia] IIB, Class I, Zone 1, T6 with option /HP
- Class I, Division 1, Groups A, B, C, D
- Class I, Division 1, Groups C, D with option /HP
- Class II / III, Division 1, Groups E, F, G
- AIS Class I / II / III, Division 1, Groups A, B, C, D, E, F, G
- AIS Class I / II / III, Division 1, Groups C, D, E, F, G with /HP
- IP67 / NEMA 4X
- Ambient temperature range : -40°C to +50°C (-40°F to 122°F)

Remote converter RCCR31 (Option /FS1) :
- Intrinsically safe associated apparatus
- Provides Intrinsically safe detector circuits
- [AEx ia] IIC, Class I, Zone 1
- [AEx ia] IIB, Class I, Zone 1, T6 with option /HP
- AIS Class I, Division 1, Groups A, B, C, D
- AIS Class I, Division 1, Groups C, D with option /HP
- Ambient temperature range : -40°C to +50°C (-40°F to 122°F)

Integral type RCCT34 ... 39/XR (Option /FF1, /FF5) :
- Housing explosion proof
- AEx d [ia] IIC, Class I, Zone 1, T6
- AEx d [ia] IIB, Class I, Zone 1, T6 with option /HP
- Class I, Division 1, Groups A, B, C, D
- Class I, Division 1, Groups C, D with option /HP
- Class II / III, Division 1, Groups E, F, G
- IP67 / NEMA 4X
- Ambient temperature range : -40°C to +50°C (-40°F to 122°F)

Process temperature range :
- Standard : -50°C to 150°C / (-58°F to 302°F)
- with option /LT : -200°C to 150°C / (-328°F to 302°F)
- with option /MT (RCCS30LR...33)
  : -50°C to 260°C / (-58°F to 500°F)
- with option /MT (RCC□34...39/XR)
  : -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 range :
- Standard : 0°C to 150°C / 32°F to 302°F
- with option /MT (RCCS30LR...33)
  : -50°C to 200°C (-58°F to 392°F)
- with option /MT (RCC□34...39/XR)
  : -50°C to 220°C (-58°F to 428°F)
- with option /HT : 0°C to 350°C (32°F to 662°F)

IM 01R04B04-00E-E 11th edition April 01, 2015 -00

Electrical data remote converter RCCF31, RCCR31 and Converter of Integral Type RCCT3□ :
- Driving circuit : terminals D+ / D-
  Uo = 14.5 V; Io = 47 mA; Po = 0.171 W
  Lo = 15 mH; Co = 0.65 µF
- Driving circuit : terminals D+ / D- with option /HP
  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-
  Uo = 14.5 V; Io = 47 mA; Po = 0.171 W
  Lo = 15 mH; Co = 0.65 µF
- Temperature sensor circuit : terminals TP1, TP2, TP3
  Uo = 13.3 V; Io = 40 mA; Po = 0.133 W
  Lo = 20 mH; Co = 0.91 µF

Electrical data remote detector RCCS30LR ... 33 :
- Driving circuit : terminals D+ and D
  Groups A-D: Ui = 16 V; Ii = 53 mA; Pi = 0.212 W
  Li = 4.2 mH; Ci = negligible small
  Groups C,D: Ui = 16 V; Ii = 153 mA; Pi = 0.612 W
  Li = 4.2 mH; Ci = negligible small
- Sensor circuits: terminals S1+ and S1- or S2+ and S2-
  Ui = 16 V; Ii = 80 mA; Pi = 0.32 W
  Li = 4.2 mH;Ci = negligible small
- Temperature sensor circuit : terminals TP1, TP2, TP3
  Ui = 16 V; Ii = 50 mA; Pi = 0.2 W
  Li = negligible small; Ci = negligible small

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

The remote converter RCCF31 has a T6 temperature class rating for operation at ambient temperature up to +50°C / +122°F.

Special conditions :
- ROTAMASS with FM approval is only available with ANSI 1/2" NPT cable conduit connection "A".
- The flowmeter must be connected to the potential equalization system.
- For AC-version maximum power supply is 250V AC.
- Use conduit seals within 18 inches for power supply- and IO- cable entries at RCCT3□ / RCCF31.

For temperature classification see table 7.

IECEx APPROVAL

Certificate: IECEx KEM 06.0031X

Remote detector RCCS30LR ... 33 (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 : 150°C (302°F)
  /MT : 260°C (500°F)
- Degree of protection : IP66/67
- Ambient humidity : 0 to 95% RH
- Ambient temperature range
  : -50°C to +80°C (-58°F to 176°F)
- Process temperature range :
  Standard : -50°C to 150°C (-58°F to 302°F)
  Option /MT : -50°C to 260°C (-58°F to 500°F)
- Heat carrier fluid temperature rangev
  Standard : 0°C to 150°C (32°F to 302°F)
  Option /MT : 0°C to 200°C (32°F to 392°F)

Remote detector RCCS34 ... 39/XR (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)
  /HT : 350°C (662°F)
- Degree of protection : IP66/67
- Ambient humidity : 0 to 95% RH
- Ambient temperature range
  Standard , option /LT and option /MT
  : -50°C to +80°C (-58°F to 176°F)
  Option /HT (process temperature < 280°C (536°F)
  : -50°C to +65°C (-58°F to 149°F)
  Option /HT (process temperature < 350°C (662°F)
  : -50°C to +55°C (-58°F to 131°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)
  Option /HT : 0°C to 350°C (32°F to 662°F)
- Heat carrier fluid temperature range
  Standard : 0°C to 150°C (32°F to 302°F)
  Option /MT : 0°C to 220°C (32°F to 428°F)
  Option /HT : 0°C to 350°C (32°F to 662°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 : 90 to 250 V AC, 50/60 Hz or 20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C (-40°F to 131°F)

Remote converter RCCF31 (Option /EF5) :
- Flame proof with intrinsically safe connection to detector (ib)
- Additional Intrinsically safe outputs.
- Ex d [ia Ga] [ib] IIC T6 Gb or
  Ex d e [ia Ga] [ib] IIC T6 Gb
- Ex d [ia IIC Ga] [ib] IIB T6 Gb or
  Ex d e [ia IIC Ga] [ib] IIB T6 Gb with option /HP
- Ex tb [ia Da] [ib] IIIC T75°C Db
- Max. surface temperature : 75°C (167°F)
- Degree of protection : IP66/67
- Power supply : 90 to 250 V AC, 50/60 Hz or
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C (-40°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 : 90 to 250 V AC, 50/60 Hz or
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C (-40°F to 131°F)

WARNING

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

Integral type RCCT34 ... 39/XR (Option /EF1) :
- Flame proof with Intrinsically safe connection to detector (ib)
- Ex d ib IIC T6...T3 Gb or
  Ex d e ib IIC T6...T3 Gb
- Ex d ib IIB T6...T3 Gb or
  Ex d e ib IIB T6...T3 Gb with option /HP
- Ex ib tb IIIC T150°C Db
- Max. surface temperature : 150°C (302°F)
- Degree of protection : IP66/67
- Power supply : 90 to 250 V AC, 50/60 Hz or
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C (-40°F to 131°F)

Integral type RCCT34 ... 39/XR (option /EF5) :
- Flame proof with Intrinsically safe connection to detector (ib)
- Additional Intrinsically safe outputs.
- Ex d ib [ia Ga] IIC T6...T3 Gb or
  Ex d e ib [ia Ga] IIC T6...T3 Gb
- Ex d ib [ia IIC Ga] IIB T6...T3 Gb or
  Ex d e ib [ia IIC Ga] IIB T6...T3 Gb with option /HP
- Ex ib tb [ia Da] IIIC T150°C Db
- Max. surface temperature : 150°C (302°F)
- Degree of protection : IP66/67
- Power supply : 90 to 250 V AC, 50/60 Hz or
  20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C (-40°F to 131°F)
- Process temperature range : -50°C to 150°C (-58°F to 302°F)

Electrical data remote detector RCCS30LR ... 33 :
- Driving circuit : terminals D+ and D
  Ex ib IIC : Ui = 16 V; Ii = 53 mA; Pi = 0.212 W
  Li = 4.2 mH; Ci = negligible small
  Ex ib IIB : Ui = 16 V; Ii = 153 mA; Pi = 0.612 W
  Li = 4.2 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 = 4.2 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 detector RCCS34 ... 39/XR :
- 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 and converter of integral type RCCT3□ :
- 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
- Current output (only option /EF5) :
  Ex ia IIC : Ui = 30 V; Ii = 300 mA; Pi = 1.25 W
  Li = 4 µH; Ci = 5.5 nF
- Pulse output (only option /EF5) :
  Ex ia IIC : Uo = 30 V; Io = 300 mA; Po = 1.25 W
  Lo = 4 µH; Co = 13.1 nF

For temperature classification see table 7.

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

	RCCS30LR to RCCS33 without insulation		RCCS30LR to RCCS33 with factory insulation	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	50°C / 122°F	60°C / 140°F	60°C / 140°F	60°C / 140°F
T5	50°C / 122°F	80°C / 176°F	80°C / 176°F	90°C / 194°F
T4	80°C / 176°F 50°C / 122°F	100°C / 212°F 120°C / 248°F	80°C / 176°F	130°C / 266°F
T3	80°C / 176°F	180°C / 356°F	80°C / 176°F	180°C / 356°F
T2	80°C / 176°F	260°C / 500°F	80°C / 176°F	260°C / 500°F
T1	80°C / 176°F	260°C / 500°F	80°C / 176°F	260°C / 500°F

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

For customer insulation of RCCS30LR to 39/XR the following must be regarded :
The table "with factory insulation" is calculated with 80 mm insulation and k-factor = 0.4 W/m²K.
If your insulation data are worse than these use table "without insulation" !

INMETRO APPROVAL (For Brazil)

Certificate TÜV 11.0419
RCCS3□ with option /US1.same as IECEx /ES1
RCCT3□ with options /UF1 or /UF5 same as IECEx /EF1 or /EF5
RCCF31 with options /UF1 or /UF5 same as IECEx /EF1 or /EF5
RCCR31 with option /US1 same as IECEx /ES1
Same parameters and specifications as IECEx approval.

NEPSI APPROVAL (For China)

Certificate GYJ12.1381X
RCCS3□ with option /NS1, RCCT3□ with options /NF1 + /NF5,
RCCF31 with options /NF1 + /NF5, 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.

EAC APPROVAL (For Russia, Kazakhstan, Belorussia)

Certificate RU C-DE.ГБ08.B.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.

METROLOGICAL REGULATION IN CIS AND EAC COUNTRIES

Russia, Kazakhstan, Uzbekistan, Ukraine and Belorussia are members of CIS.
ROTAMASS has “Pattern Approval Certificate of Measuring Instruments” and is registered as a measuring instrument in Russia, Kazakhstan, Uzbekistan.
Option /QR1 is for Russia.
Option /QR2 is for Kazakhstan.
Option /QR3 is for Uzbekistan.
For the Ukraine the test certificate of Rota Yokogawa is sufficient. Therefore no special option exists.
For Belorussia Rota Yokogawa has no “Pattern Approval Certificate”, that means devices which need primary verification should be calibrated in Belorussia by Belorussian special bodies. Therefore no special option exists.

Russia, Kazakhstan and Belorussia are covered by EAC.
For export to CIS and EAC countries please contact your Yokogawa representative.

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.

Sanitary Applications
For sanitary applications select process connection S2, S4 or S8. The wetted surface will be Ra ≤ 1.6 µm. However, if option /SF□ is selected the surface roughness will be Ra < 0.8µm and with /SF2 a certificate with a 3- point roughness measurement certificate is delivered. The EHEDG certificate shows that ROTAMASS conforms to the EHEDG criteria regarding the capability to be cleaned by a CIP process. The evaluation does not include the process connections and seals.

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. Select the suitable resistant tube material for the process!

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.

Heat Tracing and Insulation
Basically the detector can be insulated by the customer.
To be sure not to overheat the connection box choose one of /T□ options (insulation or heat tracing from Yokogawa) or /S2.
For process temperatures between 150°C (302°F) and 230°C (446°F) (RCCS34 - 39/XR) or 260°C (500°F) (RCCS30LR - 33) choose /MT option and remote installation. If ROTAMASS detector with /MT or /HT is not insulated, the accuracy specification can not be guaranteed. The converter should not be exceeded more than 50°C (122°F). Therefore never insulate the converter and keep the neck free from insulation too. Yokogawa will not take any liability regarding customer insulation.

Relations between Options /MT, /HT, /S2 and /T□ (/T1, /T2, /T3)
The meters with high temperature options (/MT, /HT) can be insulated either by the customer by using option /S2 (prolonged neck) or by the factory through options /T□.
The /T□ options already include the option /S2 so that the /S2 option can not be selected in case of the /T□ options.
If the meter is not properly insulated by the customer, the accuracy specification can not be guaranteed.

Installation above 100°C (212°F) Process Temperature
To provide enough cooling the instrument should be installed vertically or horizontally with the converter down. This is recommended for size RCC□36 and larger without /T□ option.

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 or with the HART® 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”.

Rupture Disk
The rupture disk is used as annunciation method in the case of tube rupture (Dual Seal) preferable for high pressure gas service. Practically a tube rupture of ROTAMASS is not known to the manufacturer. For large sizes it cannot be expected that the full line pressure can be released via the rupture disk. If this is requested please contact Yokogawa for a special execution.

IM 01R04B04-00E-E 11th edition April 01, 2015 -00

Explosion Proof Concept
The detector is intrinsically safe Ex ib, the converter RCCT and 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).
Option /KF5 delivers two passive intrinsically safe current and one pulse output, however the converter is flame (explosion) proof.

Option /HP
With option /HP the detector driving power is higher which is benefit to 2 phase flow. This is also true for non hazardous applications.

Gas Measurement
For gas applications please choose the option /GA.
Density reading below 0.3 kg/l is not possible. Volume flow is calculated by using the fix density value stored in „Reference density:“
Based on the selection of the gas density, the following volume flow rates can be calculated; standard, reference, normal.
Besides, the corresponding volume flow rate units can be selected. Some functions are unavailable for gas measurement, including concentration measurement, empty pipe, slug or corrosion detection.
Good and stress free installation is mandatory for a stable Zero.
Attention to resonance phenomenons has to be taken if gas compressors are used in the pipe. Flow noise has to be avoided.

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/Δt.
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. However, if high density stability is needed at high temperatures option /HT is recommended.
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 or /HT - 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, for higher temperature select option /HT - 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 [3]	50°C	100°C	150°C	200°C	250°C	300°C	350°C
A1 [2]	Flange acc. ASME B16.5 Class 150	19 bar	18.4 bar	16.2 bar	14.8 bar	13.7 bar	12.1 bar	10.2 bar	8.4 bar
A2 [2]	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	31.6 bar	30.3 bar
A3 [2]	Flange acc. ASME B16.5 Class 600 excl. RCC□39/XR	99.3 bar	96.2 bar	84.4 bar	77 bar	71.3 bar	66.8 bar	63.2 bar	60.7 bar
A3 [2]	Flange acc. ASME B16.5 Class 600 for RCC□39/XR	95 bar	89 bar	80 bar	73 bar	67 bar	62 bar	59 bar	58 bar
A4 [2]	Flange acc. ASME B16.5 Class 900 without /DS	148.9 bar	144.3 bar	126.6 bar	115.5 bar	107 bar	100.1 bar	94.9 bar	91 bar
A4 [2] [4]	Flange acc. ASME B16.5 Class 900 with /DS	130 bar	126 bar	110.5 bar	100.8 bar	93.4 bar	87.4 bar	82.9 bar	79.4 bar
A5 [2]	Flange acc. ASME B16.5 Class 1500 excl. RCC□36	248.2 bar	240.6 bar	211 bar	192.5 bar	178.3 bar	166.9 bar	158.1 bar	151.6 bar
A5 [2]	Flange acc. ASME B16.5 Class 1500 for RCC□36	210 bar	203 bar	176 bar	160 bar	148 bar	140 bar	133 bar	128 bar
D2 [1]	Flange acc. EN 1092-1 PN 16	16 bar	15.6 bar	14.2 bar	12.8 bar	11.7 bar	10.9 bar	10.3 bar	9.9 bar
D4 [1]	Flange acc. EN 1092-1 PN 40	40 bar	39.1 bar	35.6 bar	32.0 bar	29.3 bar	27.2 bar	25.8 bar	24.7 bar
D5 [1]	Flange acc. EN 1092-1 PN 63	63 bar	61.6 bar	56.0 bar	50.4 bar	46.2 bar	42.8 bar	40.6 bar	38.9 bar
D6 [1]	Flange acc. EN 1092-1 PN 100	100 bar	97.7 bar	94.7 bar	80.0 bar	73.3 bar	68.0 bar	64.4 bar	61.8 bar
G9 [1]	Internal thread RCCS30LR ... 33	285 bar	271 bar	247 bar	227 bar	208 bar	183 bar	----------	
T9 [1]	Internal thread NPT RCCS30LR ... 33	285 bar	271 bar	247 bar	227 bar	208 bar	183 bar	----------	
G9 [1] [4]	Internal thread RCCS34	260 bar	251 bar	231 bar	208 bar	190 bar	178 bar	167 bar	160 bar
T9 [1] [4]	Internal thread NPT RCCS34	260 bar	251 bar	231 bar	208 bar	190 bar	178 bar	167 bar	160 bar

		Process Temperature			
		up to 120°C	220°C	300°C	350°C
J1 [1]	Flange acc. JIS B 2220 10K	14 bar	12 bar	10 bar	------
J2 [1]	Flange acc. JIS B 2220 20K	34 bar	31 bar	29 bar	26 bar

		Process Temperature	
		up to 140°C *)	
S2 [1]	Pipe connection acc. DIN 11851 up to DN 40	40 bar	*) under the restriction using suitable gasket materials
	Pipe connection acc. DIN 11851 DN 50 to DN 100	25 bar	
	Pipe connection acc. DIN 11851 above DN 100	16 bar	

		Process Temperature	
		up to 150°C **)	
S4 [1]	Clamp connection acc. DIN 32676 up to DN 50	16 bar	**) under the restriction using suitable gasket materials
	Clamp connection acc. DIN 32676 above DN 50	10 bar	
S8 [1]	Clamp acc. Mini-Clamp up to 1/2"	16 bar	
	Clamp acc. Tri-Clamp® up to 2"	16 bar	
	Clamp acc. Tri-Clamp® above 2"	10 bar	

Type of process connection		Process Temperature							
		RT [3]	120°F	210°F	300°F	390°F	480°F	570°F	660°F
A1 [2]	Flange acc. ASME B16.5 Class 150	276 psi	267 psi	235 psi	215 psi	199 psi	175 psi	148 psi	122 psi
A2 [2]	Flange acc. ASME B16.5 Class 300	719 psi	698 psi	612 psi	558 psi	518 psi	484 psi	458 psi	439 psi
A3 [2]	Flange acc. ASME B16.5 Class 600 excl. RCC□39/XR	1440 psi	1395 psi	1224 psi	1117 psi	1034 psi	969 psi	917 psi	880 psi
A3 [2]	Flange acc. ASME B16.5 Class 600 for RCC□39/XR	1378 psi	1291 psi	1160 psi	1059 psi	972 psi	899 psi	856 psi	841 psi
A4 [2]	Flange acc. ASME B16.5 Class 900 without /DS	2160 psi	2093 psi	1836 psi	1675 psi	1552 psi	1452 psi	1376 psi	1320 psi
A4 [2] [4]	Flange acc. ASME B16.5 Class 900 with/DS	1885 psi	1827 psi	1602 psi	1461 psi	1354 psi	1267 psi	1202 psi	1151 psi
A5 [2]	Flange acc. ASME B16.5 Class 1500 excl. RCC□36	3600 psi	3490 psi	3060 psi	2792 psi	2586 psi	2421 psi	2293 psi	2199 psi
A5 [2]	Flange acc. ASME B16.5 Class 1500 for RCC□36	3046 psi	2944 psi	2553 psi	2321 psi	2147 psi	2031 psi	1929 psi	1856 psi
D2 [1]	Flange acc. EN 1092-1 PN 16	232 psi	226 psi	206 psi	186 psi	170 psi	158 psi	149 psi	144 psi
D4 [1]	Flange acc. EN 1092-1 PN 40	580 psi	567 psi	516 psi	464 psi	425 psi	394 psi	374 psi	358 psi
D5 [1]	Flange acc. EN 1092-1 PN 63	914 psi	893 psi	812 psi	731 psi	670 psi	621 psi	589 psi	564 psi
D6 [1]	Flange acc. EN 1092-1 PN 100	1450 psi	1417 psi	1417 psi	1160 psi	1063 psi	986 psi	934 psi	896 psi
G9 [1]	Internal thread RCCS30LR ... 33	4133 psi	3930 psi	3582 psi	3292 psi	3016 psi	2653 psi	----------	
T9 [1]	Internal thread NPT RCCS30LR ... 33	4133 psi	3930 psi	3582 psi	3292 psi	3016 psi	2653 psi	----------	
G9 [1] [4]	Internal thread RCCS34	3770 psi	3640 psi	3350 psi	3016 psi	2755 psi	2581 psi	2422 psi	2320 psi
T9 [1] [4]	Internal thread NPT RCCS34	3770 psi	3640 psi	3350 psi	3016 psi	2755 psi	2581 psi	2422 psi	2320 psi

		Process Temperature			
		up to 248°F	428°F	572°F	662°F
J1 [1]	Flange acc. JIS B 2220 10K	1203 psi	174 psi	145 psi	------
J2 [1]	Flange acc. JIS B 2220 20K	493 psi	449 psi	420 psi	377 psi

		Process Temperature	
		up to 284°F) *)	
S2 [1]	Pipe connection acc. DIN 11851 up to DN 40	580 psi	*) under the restriction using suitable gasket materials
	Pipe connection acc. DIN 11851 DN 50 to DN 100	362 psi	
	Pipe connection acc. DIN 11851 above DN 100	232 psi	

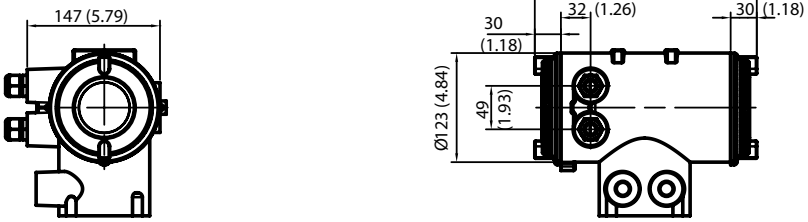
		Process Temperature	
		up to 302°F **)	
S4 [1]	Clamp connection acc. DIN 32676 up to DN 50	232 psi	**) under the restriction using suitable gasket materials
	Clamp connection acc. DIN 32676 above DN 50	145 psi	
S8 [1]	Clamp acc. Mini-Clamp up to 1/2"	232 psi	
	Clamp acc. Tri-Clamp® up to 2"	232 psi	
	Clamp acc. Tri-Clamp® above 2"	145 psi	

[1] process connection material: 1.4404 / 1.4435 (equivalent to group 2.3 material AISI 316L acc. ASME B16.5)
[2]) process connection material: 1.4401/1.4404 AISI 316/316L
[3] RT = Room Temperature; EN1092: -10°C to 50°C; ASME B16.5: -29°C to 38°C
[4] for option /DS max. pressure according A4. ASME class 900 13% derated

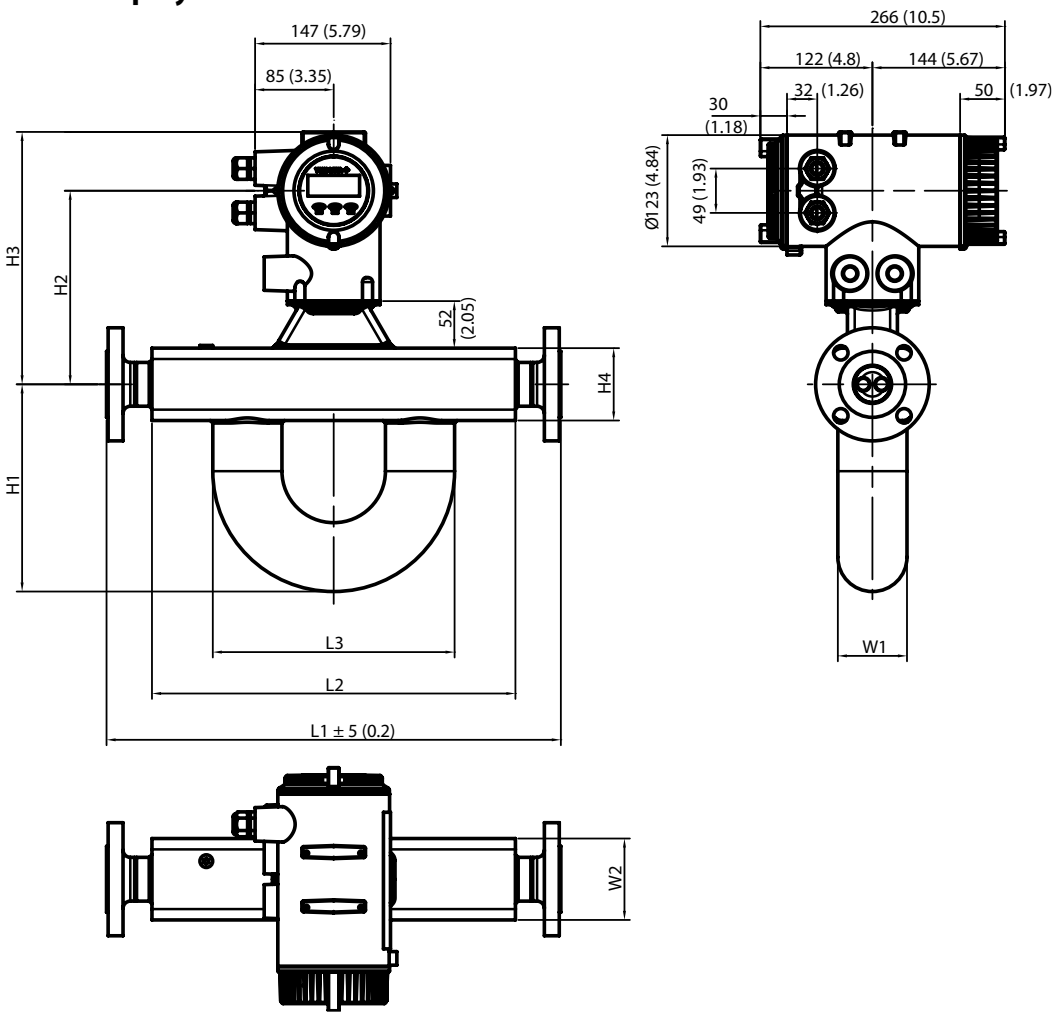
DIMENSIONS

Integral Type RCCT34, RCCT36, RCCT38, RCCT39

Without Display



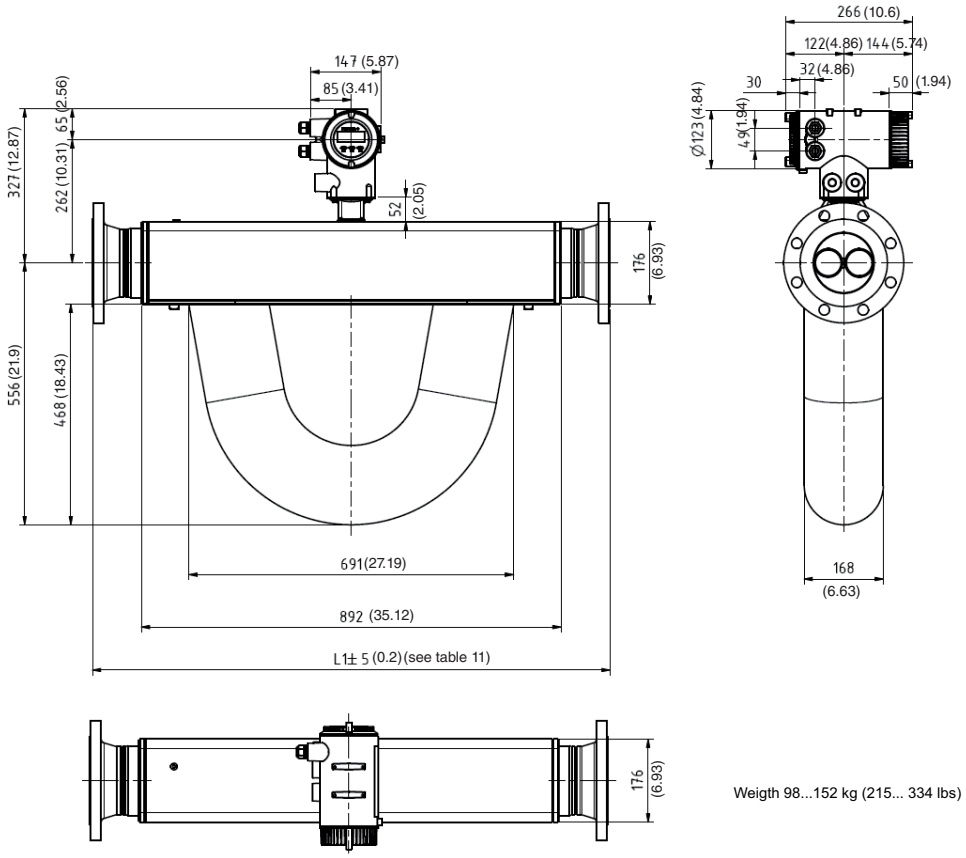
With Display



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

Model		L1	L2	L3	H1	H2	H3	H4	W1	W2	Weight
RCCT34	mm (inches)	see table 11	272 (10.7)	212 (8.35)	177 (6.97)	214 (8.43)	279 (11)	80 (3.15)	60 (2.36)	80 (3.15)	13-24 kg (29-53 lbs)
RCCT36	mm (inches)	see table 11	400 (15.7)	266 (10.5)	230 (9.06)	214 (8.43)	279 (11)	80 (3.15)	76 (2.99)	90 (3.54)	18-38 kg (40-84 lbs)
RCCT38	mm (inches)	see table 11	490 (19.3)	267 (10.5)	269 (10.6)	224 (8.82)	289 (11.4)	100 (3.94)	89 (3.5)	110 (4.33)	28-53 kg (62-117 lbs)
RCCT39	mm (inches)	see table 11	850 (33.5)	379 (14.9)	370 (14.6)	242 (9.54)	307(12.1)	135 (5.31)	129 (5.08)	160 (6.3)	63-106 kg (139-233 lbs)
Dimensions in mm (inches)..Weights with smallest and biggest flanges.											

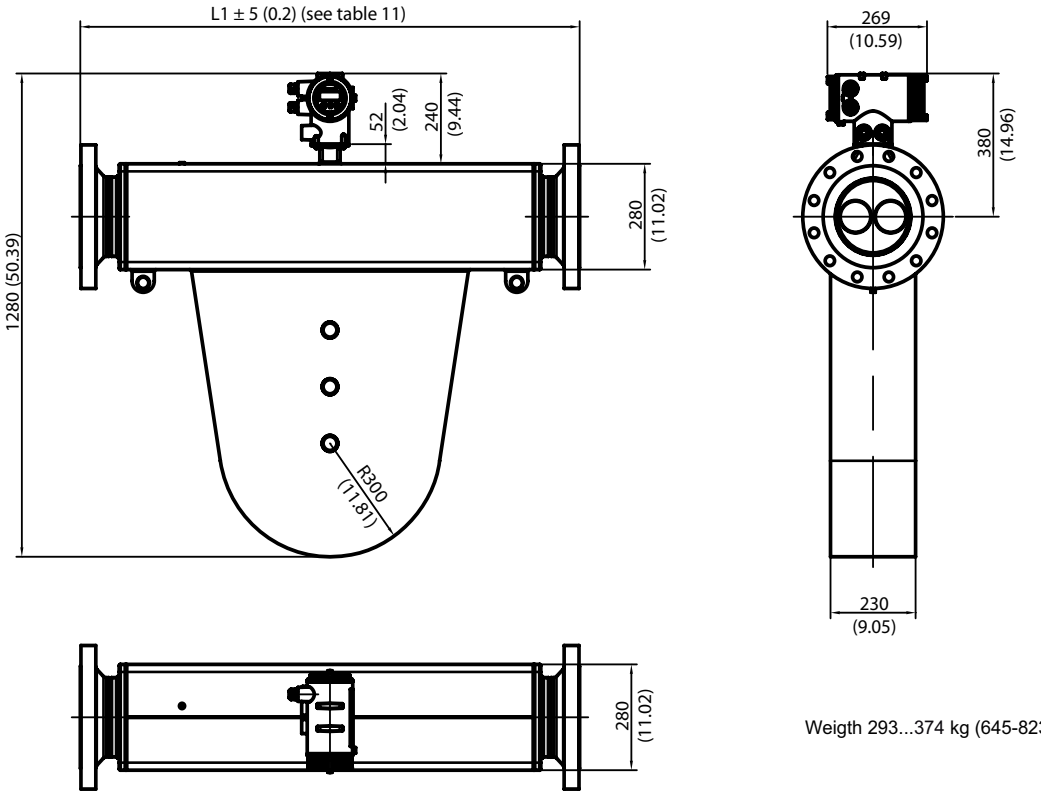
Integral Type RCCT39/IR-□□□□□□□□□□/V2



Weigth 98...152 kg (215... 334 lbs)

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

Integral Type RCCT39/XR

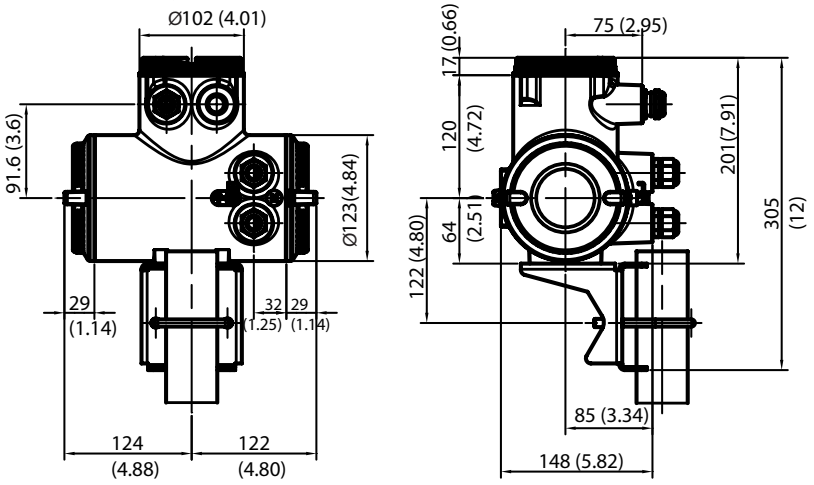


Weigth 293...374 kg (645-823 lbs)

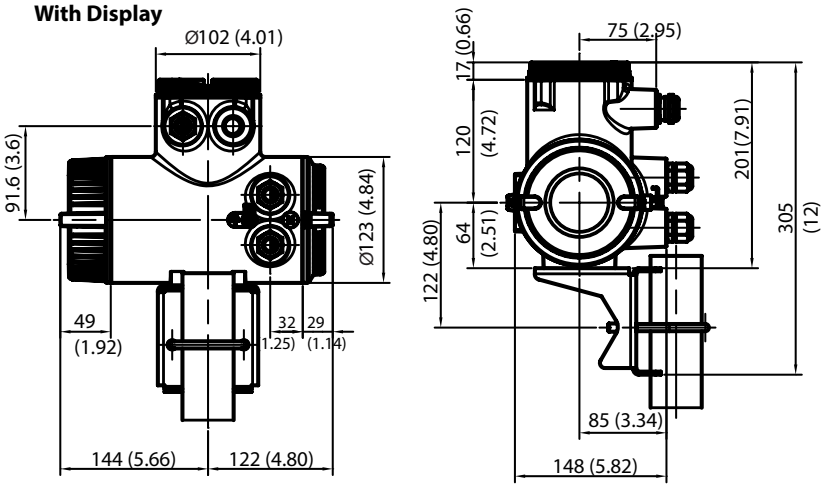
Dimensions in mm (inches). Weights with smallest and biggest flanges

Remote field-mount Converter RCCF31

Without Display



With Display

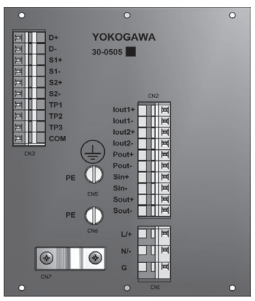


Weight with bracket: 5.5 kg (12.1 lbs) (depends on type)

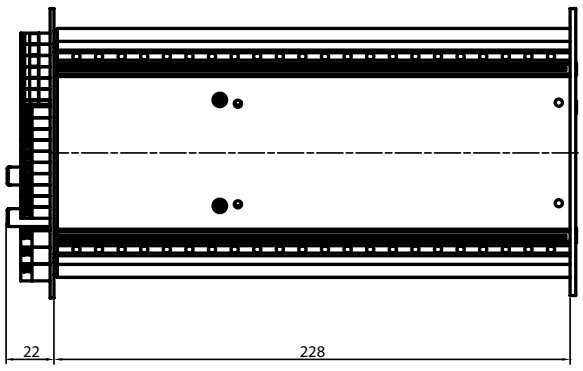
Dimensions in mm (inches)

Remote rack-mount Converter RCCR31

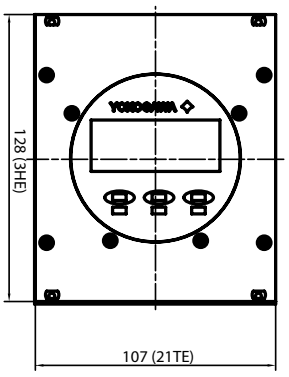
Terminal Board, back view



Cassette, side view



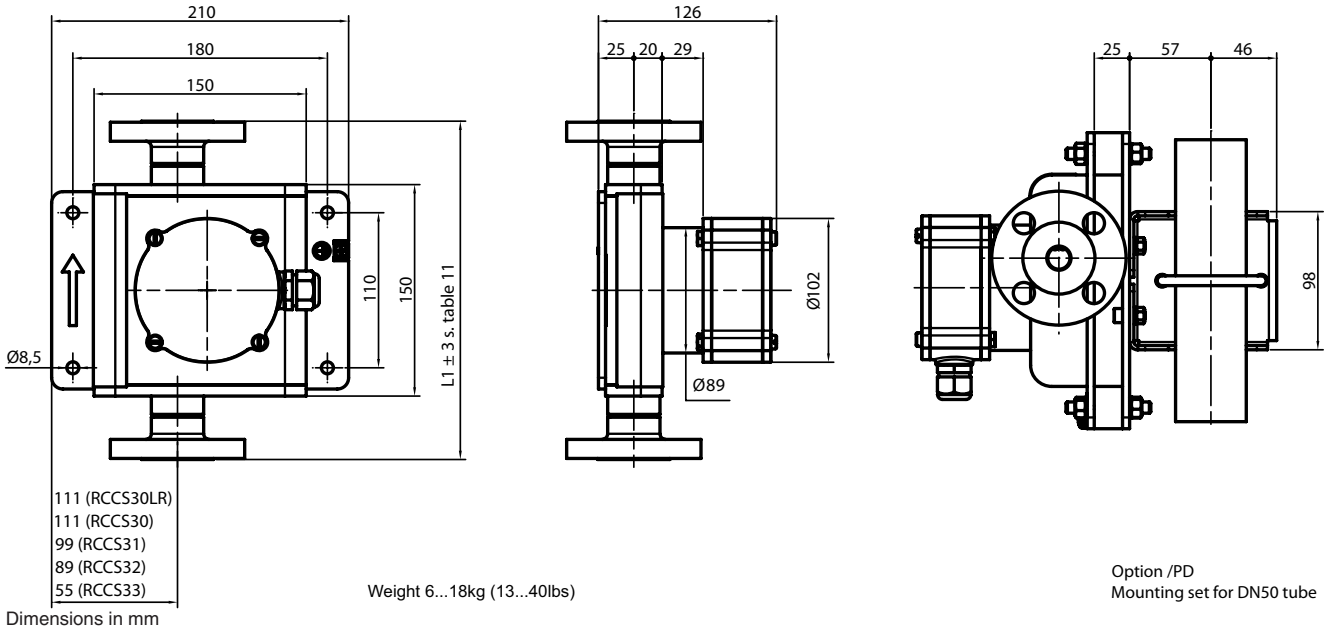
Cassette front view



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

Dimensions in mm (inches)

Remote Detector RCCS30LR, RCCS30, RCCS31, RCCS32, RCCS33

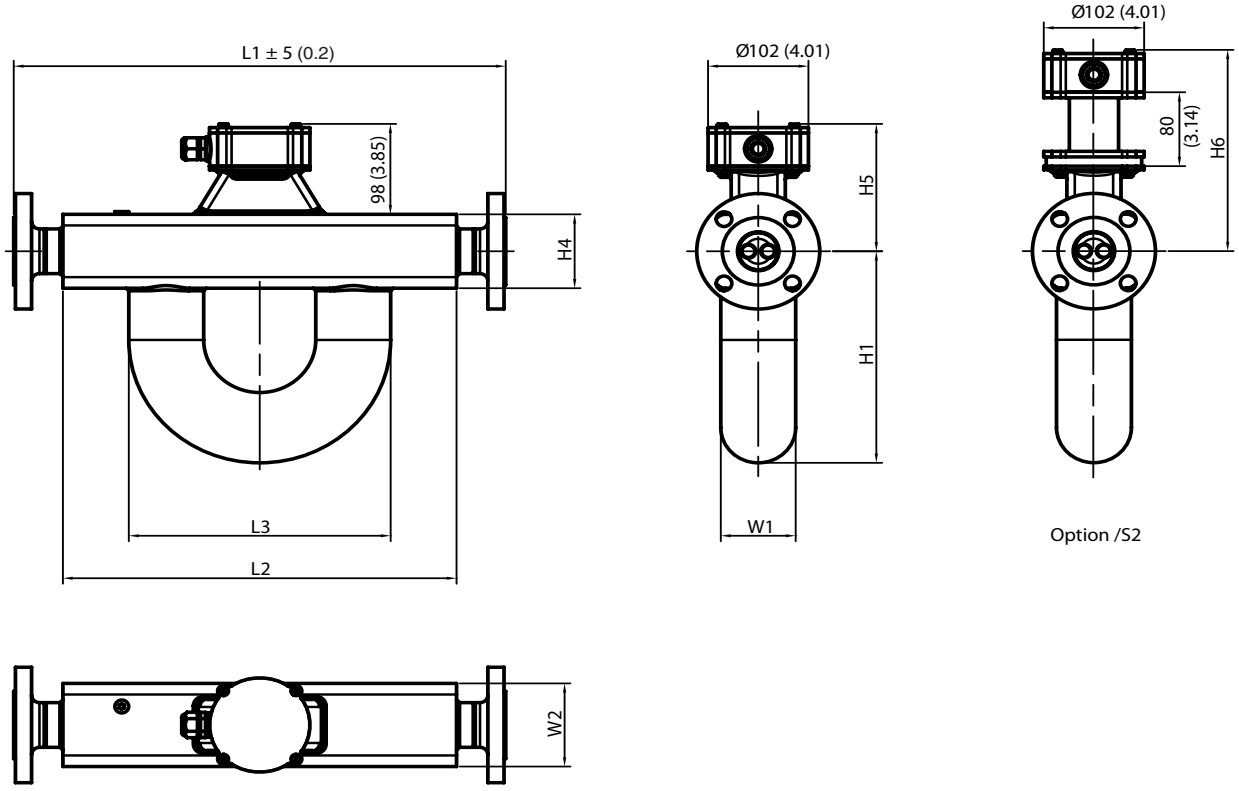


Dimensions in mm

Weight 6...18kg (13...40lbs)

Option /PD
Mounting set for DN50 tube

Remote Detector RCCS34, RCCS36, RCCS38, RCCS39

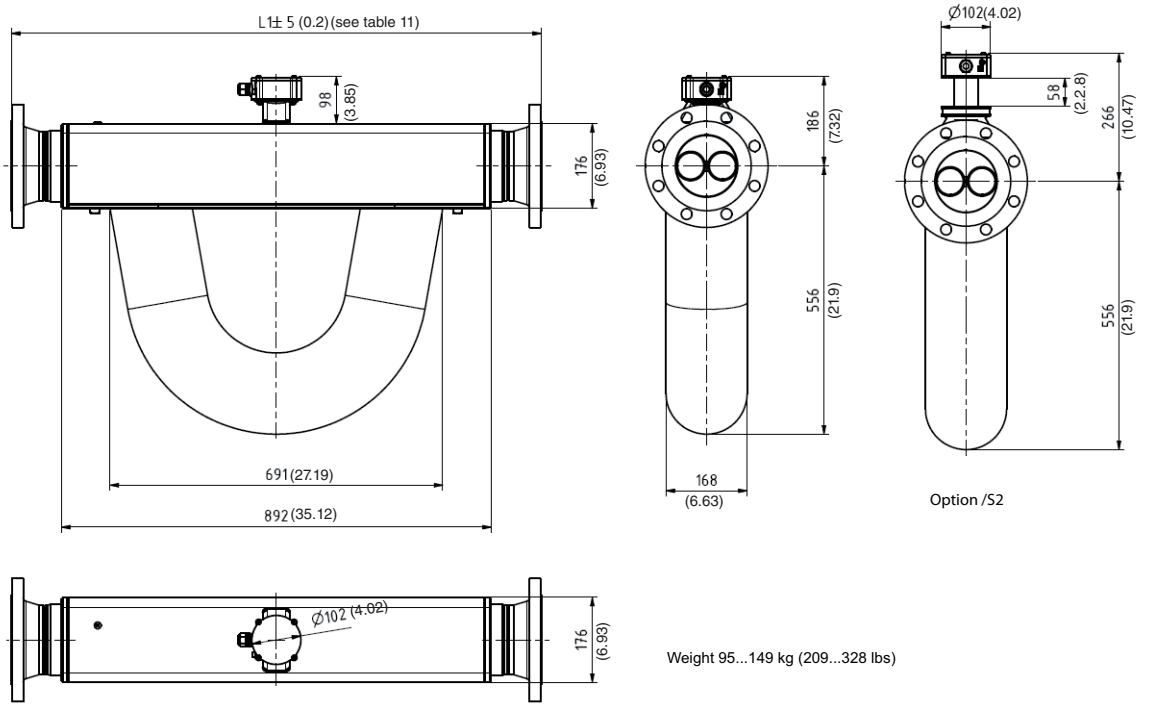


Option /S2

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.											

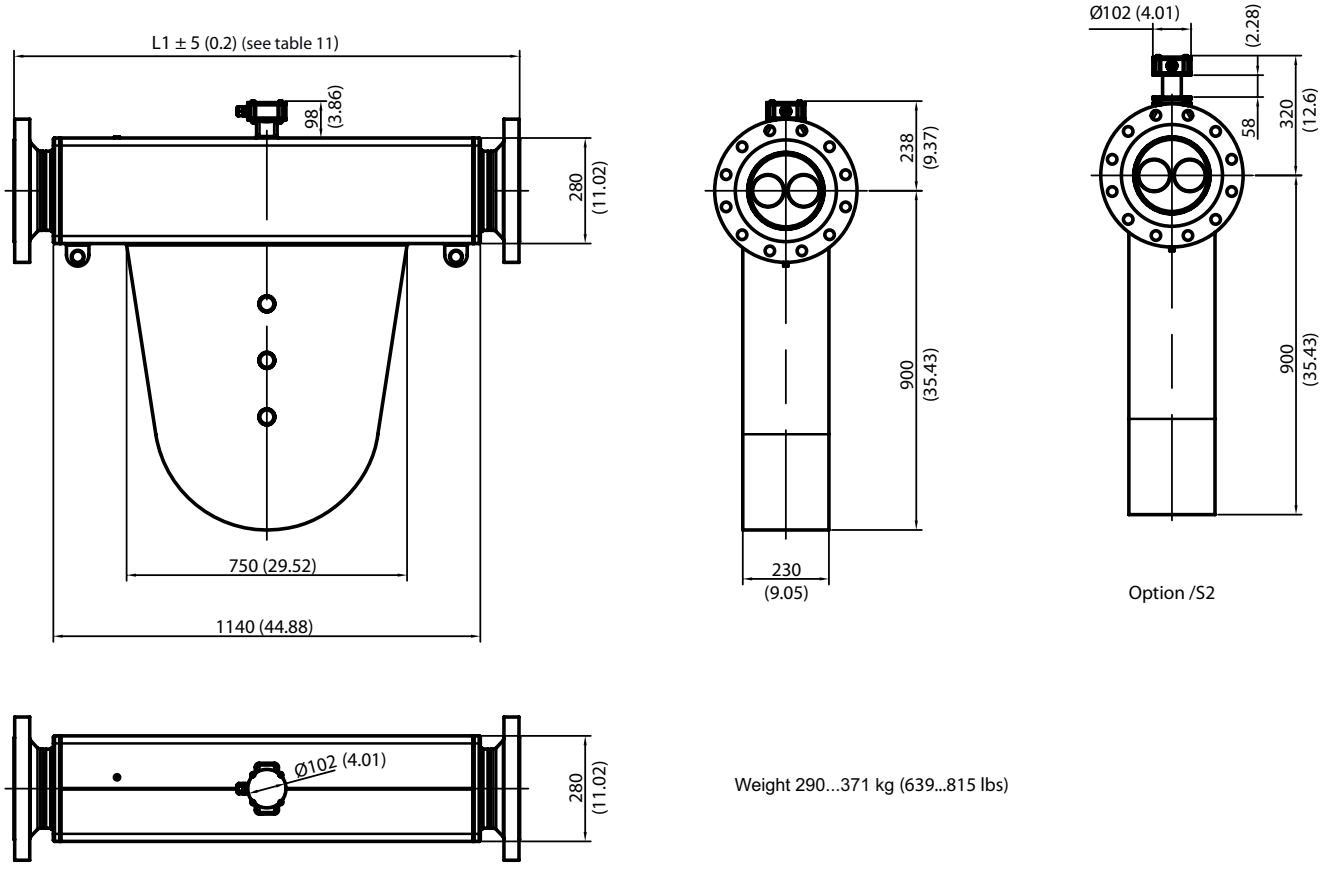
Remote Detector RCCS39/IR-□□□□□□□□□□ /V2



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

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

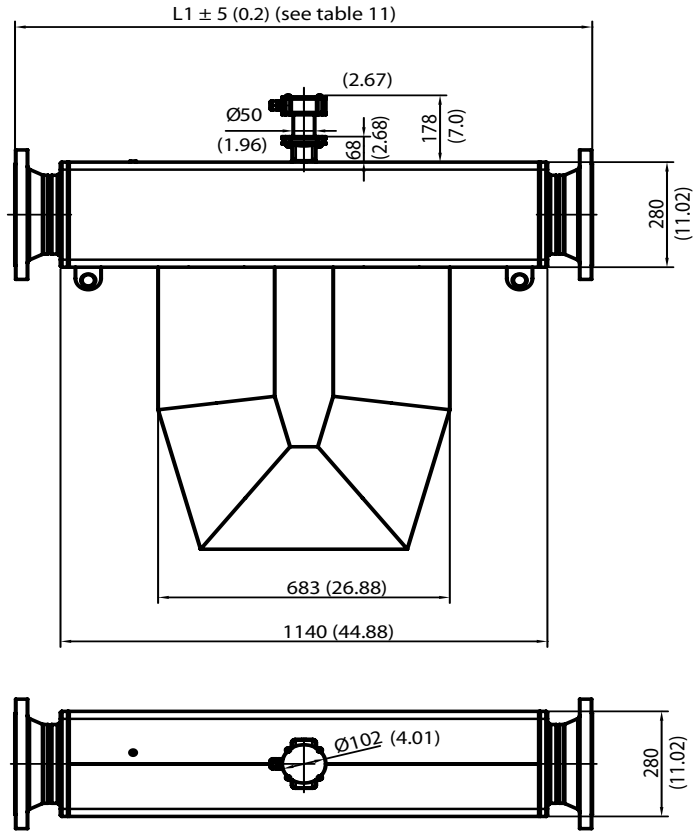
Remote Detector RCCS39/XR

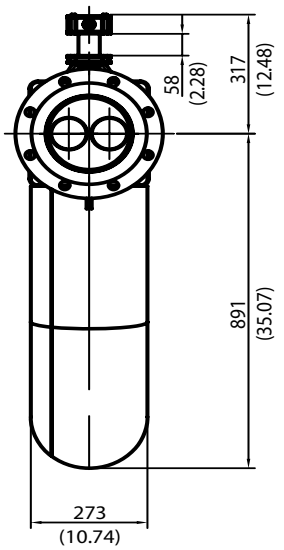


Weight 290...371 kg (639...815 lbs)

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

Remote Detector RCCS39/XR with option /HT



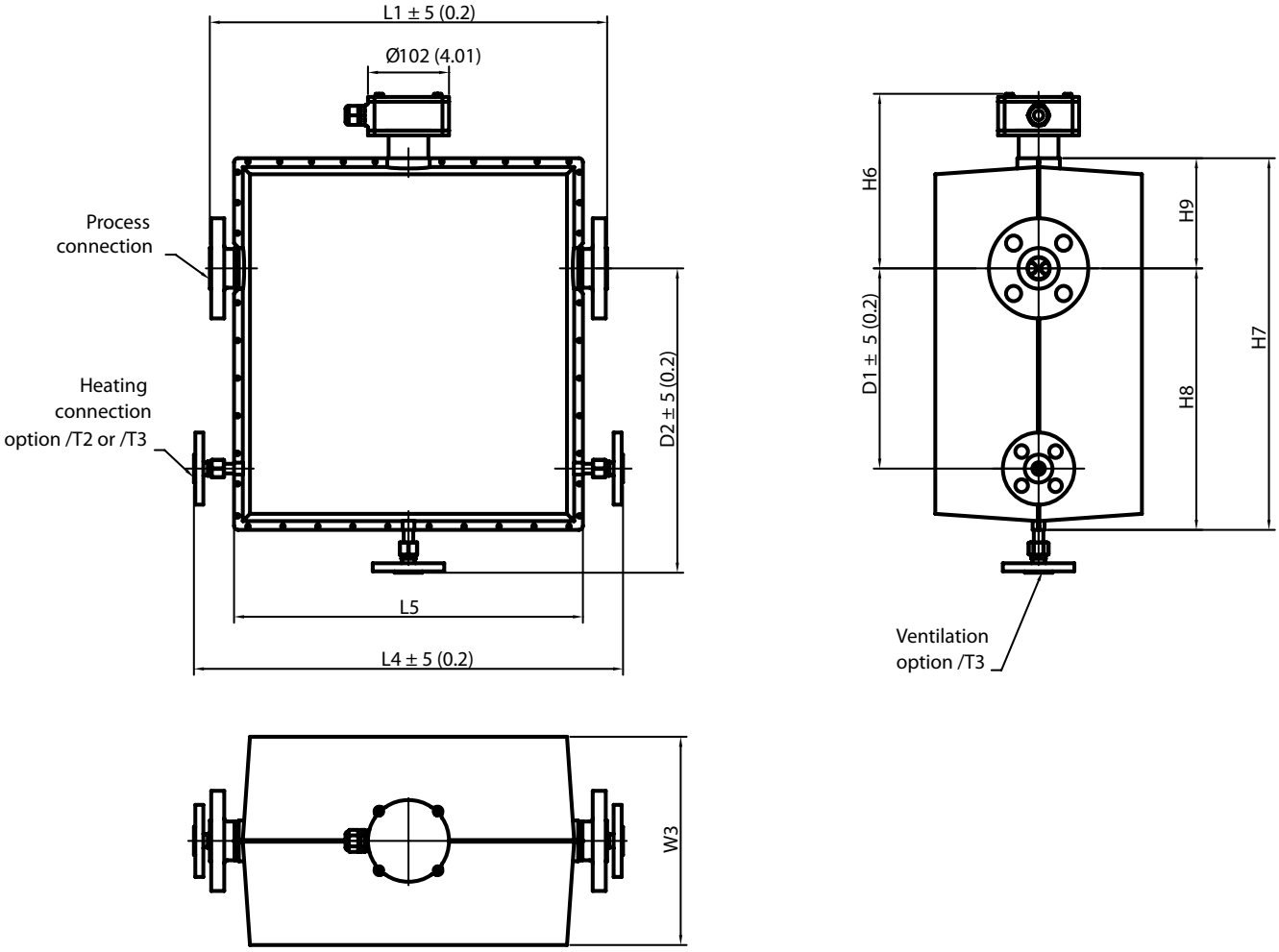


Option /S2

Weight 290...370 kg
(639...815 lbs)

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

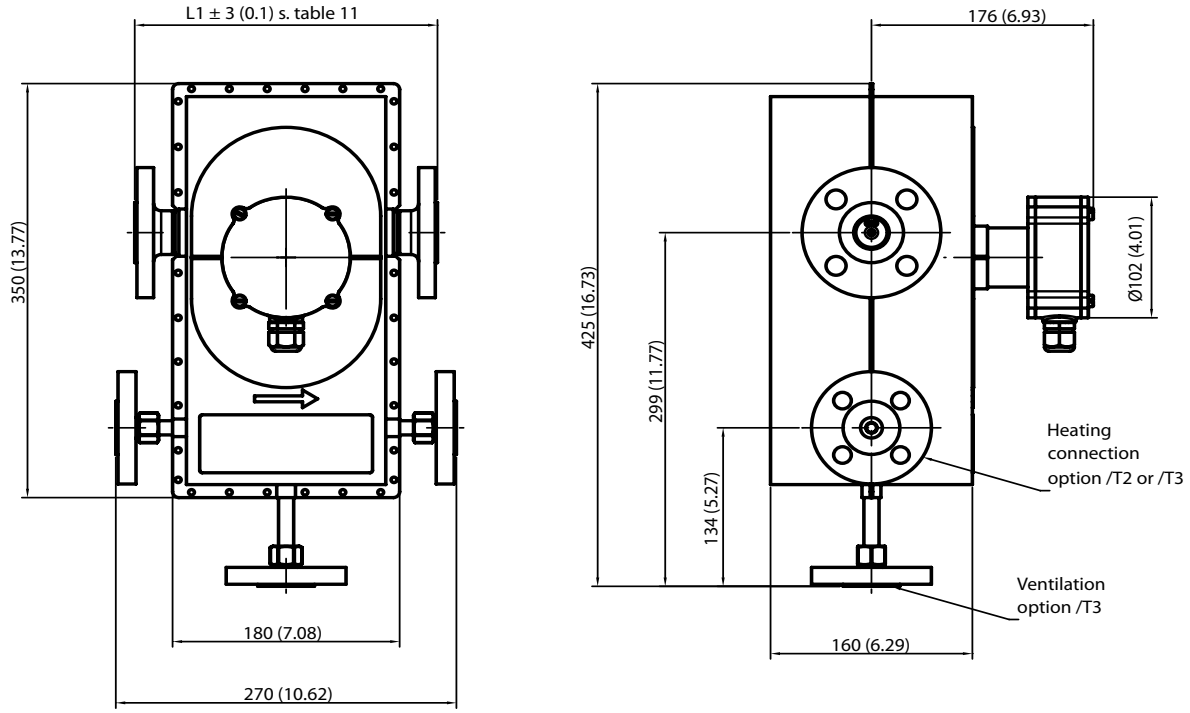
Remote Detector RCCS34, RCCS36, RCCS38, RCCS39, RCCS39/IR-□□□□□□□□□□ /V2 with option /T□ (Insulation / Heating)



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

Model		L1	L4	L5	D1	D2	H6	H7	H8	H9	W3	Weight
RCCS34	mm (inches)	see table 11	420 (16.53)	310 (12.20)	200 (7.87)	330 (12.99)	218 (8.58)	411 (16.81)	273 (10.74)	138 (5.43)	240 (9.44)	19-33 kg (42-73 lbs)
RCCS36	mm (inches)	see table 11	540 (21.25)	439 (17.28)	250 (9.84)	380 (14.96)	218 (8.58)	464 (18.26)	326 (12.83)	138 (5.43)	260 (10.23)	27-50 kg (59-110 lbs)
RCCS38	mm (inches)	see table 11	640 (25.19)	530 (20.86)	250 (9.84)	430 (16.92)	228 (8.97)	524 (20.62)	376 (14.80)	148 (5.82)	260 (10.23)	39-67 kg (86-147 lbs)
RCCS39	mm (inches)	see table 11	1000 (39.37)	894 (35.19)	350 (13.77)	545 (21.45)	245 (9.65)	668 (26.29)	503 (19.80)	165 (6.49)	302 (11.88)	96-142 kg (211-312 lbs)
RCCS39/IR	mm (inches)	see table 11	1050 (41.34)	944 (37.16)	350 (13.77)	677 (26.65)	266 (10.47)	944 (37.16)	625 (24.61)	193 (7.6)	342 (13.46)	138-195 kg (303-429 lbs)
Dimensions in mm (inches)..Weights with smallest and biggest flanges including insulation cover and heat tracing. Standard heating connection according table 10.												

Remote Detector RCCS30LR, RCCS30, RCCS31, RCCS32, RCCS33 with option /T□ (Insulation / Heating)



Dimensions in mm (inches)

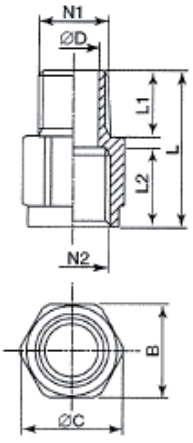
Weight in kg (lbs) without flange			Weight in kg (lbs) with flange (01A1)		
/T1	/T2	/T3	/T1	/T2	/T3
8.7 (19.2)	11.5 (25.3)	12.5 (27.5)	9.5 (21)	12.3 (27.1)	13.3 (29.3)

Table 10: Heat tracing connection types depending on process connection type

Process connection	Standard heating connection *)
A□	ASME ½" - 150
D□	EN DN 15 PN 40
J□	JIS 10K DN15
S2 ; S4	EN DN 15 PN 40
S8	ASME ½" - 150
G9	EN DN 15 PN 40
T9	ASME ½"- 150

*) others on request

Adapter 1/2" NPT - G1/2 (option /AD2)



N1	N2	ØD [mm (in.)]	B [mm (in.)]	ØC [mm (in.)]	L1 [[mm (in.)]	L2 [mm (in.)]	L [mm (in.)]	Weight [kg (lbs)]
1/2´´ NPT	G1/2´´	15 (0.59)	27 (1.06)	30 (1.18)	19 (0.74)	23 (0.90)	45 (1.77)	0.07 (0.003)

MODEL, SUFFIX AND OPTION CODES

Integral Type RCCT3□, Model and Suffix Code

Model	Suffix Code	Description	Restrictions
RCCT34		Nominal Value : 3 t/h = 50 kg/min (110,2 lbs/min)	
RCCT36		Nominal Value : 10 t/h = 170 kg/min (374.78 lbs/min)	
RCCT38		Nominal Value : 32 t/h = 533 kg/min (1175 lbs/min)	
RCCT39		Nominal Value : 100 t/h = 1670 kg/min (3681.72 lbs/min)	
RCCT39/IR		Nominal Value : 250 t/h = 4170 kg/min (9193.27 lbs/min)	only with /V2
RCCT39/XR		Nominal Value : 500 t/h = 8340 kg/min (18386.55 lbs/min)	only with /HP
Power supply	-A	90 - 264 V AC	
	-D	24 V DC	
Indicator direction	H1	Detector installation horizontal, tubes down, recom. for liquid service	
	H2	Detector installation horizontal, tubes up, recommended for gas service /GA	
	V0	Detector installation vertical	
	N0	Without indicator	
Cable conduit connection	M	M20 x 1.5, female thread with cable glands	not with /FF1, /FF5
	A	ANSI ½" NPT, female thread without cable glands	
Process connection size [1]	23	¾"	see table 11
	01	DN 15, ½"	see table 11
	02	DN 25, 1"	see table 11
	04	DN 40, 1½"	see table 11
	05	DN 50, 2"	see table 11
	06	DN 65, 2½"	see table 11
	08	DN 80, 3"	see table 11
	10	DN 100, 4"	see table 11
	12	DN 125, 5"	see table 11
	15	DN 150, 6"	see table 11
	20	DN 200, 8"	see table 11
Process connection rating and style [1]	A1	ASME flange class 150, process connection dim. + facing acc. ASME B16.5	see table 11
	A2	ASME flange class 300, process connection dim. + facing acc. ASME B16.5	see table 11
	A3	ASME flange class 600, process connection dim. + facing acc. ASME B16.5	see table 11
	A4	ASME flange class 900, process connection dim. + facing acc. ASME B16.5	see table 11
	A5	ASME flange class 1500, process connection dim. + facing acc. ASME B16.5	see table 11
	D2	EN flange PN 16, process connection dim. + facing acc. EN 1092-1 Form B1	see table 11
	D4	EN flange PN 40, process connection dim. + facing acc. EN 1092-1 Form B1	see table 11
	D5	EN flange PN 63, process connection dim. + facing acc. EN 1092-1 Form B1	see table 11
	D6	EN flange PN 100, process connection dim. + facing acc. EN 1092-1 Form B1	see table 11
	J1	JIS flange 10K, JIS B 2220	see table 11
	J2	JIS flange 20K, JIS B 2220	see table 11
	S2	Thread acc. DIN 11851	see table 11
	S4	Clamp, process connection dimensions acc. DIN 32676	see table 11
	S8	Clamp, process connection dim. acc. Tri-Clover® (Tri-Clamp®) and ½" Mini Clamp	see table 11
	G9	G, female thread	see table 11
	T9	NPT female thread	see table 11
Material of wetted parts [1]	SL	Stainless steel 316L (1.4404)	
	HC	Hastelloy C-22 (2.4602)	only RCCT34 to 39/IR

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

Integral Type RCCT3□, Option Code :

Options	Option code	Description	Restrictions
Hazardous Area Approvals	/KF1	ATEX Flame proof converter + Intrinsically safe detector	with /HP not for gas group IIC
	/KF5	ATEX Flame proof converter + Intrinsically safe detector + Intrinsically safe outputs 2 passive analog output + 1 passive pulse output	with /HP not for gas group IIC
	/FF1	FM approval for USA+Canada, Flame proof converter + Intrinsically safe detector + 2 active analog outputs + 2 passive pulse outputs + 1 status input	only with cable conduit "A"; with /HP not for groups A and B
	/FF5	FM approval for USA+Canada, Flame proof converter + Intrinsically safe detector + 2 passive analog outputs + 1 passive pulse output	only with cable conduit "A"; with /HP not for groups A and B
	/EF1	IECEx Flame proof converter + Intrinsically safe detector	with /HP not for gas group IIC
	/EF5	IECEx Flame proof converter + Intrinsically safe detector + Intrinsically safe outputs 2 passive analog output + 1 passive pulse output	with /HP not for gas group IIC
	/UF1	INMETRO Flame proof converter + Intrinsically safe detector	with /HP not for gas group IIC
	/UF5	INMETRO Flame proof converter + Intrinsically safe detector + Intrinsically safe outputs 2 passive analog output + 1 passive pulse output	with /HP not for gas group IIC
	/NF1	NEPSI Flame proof converter + Intrinsically safe detector	with /HP not for gas group IIC
	/NF5	NEPSI Flame proof converter + Intrinsically safe detector + Intrinsically safe outputs 2 passive analog output + 1 passive pulse output	with /HP not for gas group IIC
	/GF1	EAC Flame proof converter + Intrinsically safe detector	with /HP not for gas group IIC; only with /VE
	/GF5	EAC Flame proof converter + Intrinsically safe detector + Intrinsically safe outputs 2 passive analog output + 1 passive pulse output	with /HP not for gas group IIC; only with /VE
Custody Transfer Measurement acc. OIML R 117-1	/Q01	European MID Approval (fluids other than water)	Only RCCT34 to 39 (Refer to GS 01R04B07-00E); not with /NM
	/Q20	NTEP approval 12-080A2, Accuracy class 0.3 acc. NIST Handbook 44	Only RCCT34 to 39 (Refer to GS 01R04B07-00E);
	/Q21	NTEP approval 12-080A2, Accuracy class 0,3 acc. NIST Handbook 44, Heated Products	Only RCCT39/IR and RCCT39/XR; not with /Q01, /Q20 (Refer to GS 01R04B07-00E)

Integral Type RCCT3□, Option Code (continued)

Options	Option code	Description	Restrictions
GOST	/QR1 /QR2 /QR3	Primary Calibration and Test Confirmation valid in Russia Primary Calibration and Test Confirmation valid in Kazakhstan Primary Calibration and Test Confirmation valid in Uzbekistan	see page 11; not with /Q20, /Q21; only with /VE see page 11; not with /Q20, /Q21; only with /VE see page 11; not with /Q20, /Q21
Dual Seal Approval	/DS /RD	Dual Seal approval (conform with ANSI/ISA-12.27.01) Rupture disk, rupture pressure 20 bar, nominal diameter 8 mm	only with /FF1; not with process connection A5; preferable with /GA, mandatory if /DS+/GA is selected
High Driving Power	/HP	High Driving Power; recommended for RCCT36 to 39, strongly recommended for RCCT39/IR [1], Please see „ Hazardous Area Specifications“	mandatory for RCCT39/XR
Communication	/FB	Digital communication (FOUNDATION™ Fieldbus protocol)	Refer to GS 01R04B05-00E
	/MB2	Modbus communication protocol for all parameters and values	not with /KF5, /EF5, /UF5, /GF5, /NF5, /FF5, /Q01, /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 /KF5, /EF5, /FF5, /UF5, /NF5, /GF5, /Q01, /MB2
Active Pulse Output	/AP	One active pulse output	not with /KF5, /EF5, /FF5, /UF5, /NF5, /GF5, /NM
NAMUR Switch	/NM	One pulse output acc. to EN 60947-5-6 (NAMUR)	not with /AP, not with /KF5, /EF5, /UF5, /NF5, /GF5
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)
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; not HC only for D2 to D6; not HC only for D2 to D6; not HC only for A3, A4, A5; not HC
Gas Measurement	/GA	Gas measurement, special factory adjustments and settings	to be conform with ANSI/ISA-12.27.01 select /RD; not with /Q20, /Q21
Special Calibration	/K2 [2] /K4 / K5 [2] /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 RCCT34 to 39; not with /GA only RCCT34 to 39; not with /GA
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. to 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. to 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; not for material HC
Sanitary Type	/SF1 /SF2 /SA /SE	Surface roughness Ra = 0.8 µm As /SF1 + Test report roughness of wetted parts As /SF2 + 3A- declaration of conformity and 3A- mark As /SF2 + EHEDG certificate	only RCCT34 to 39; not with RCCT34 /K4 and RCCT34 /K6; only process connections S2, S4, S8; as /SF1 as /SF1, but not with process connection S2 as /SF1, but not with process connection S2
Customer Presetting	/PS	Presetting sheet with customer data	has to be issued with the order
Housing Pressure Test	/J1	Rupture pressure proof test and certificate (see page 4)	not for RCCT39/XR
X-Ray Examination	/RT	X-ray examination of flange welding	RCCT34 with /K4 or /K6 only one-sided; not with HC
PMI Certificate	/PM6	PMI Test on wetted parts	
Dye Penetrant Test	/PT	Dye Penetrant Test acc. DIN EN ISO 3452-1 at the weldings of the process connection, with certificate	
Epoxy Coating	/X1	Epoxy coating of converter housing	
Concentration Measurement [3]	/CST /C□□	Standard concentration measurement Advanced concentration measurement, details see table „Advanced Concentration Measurement Options“	not with /GA, /C□□ not with /GA, /CST
Delivery to Japan	/PJ	For meters which are delivered to Japan, with SI-unit preset	
Delivery to Korea	/KC	With KC-mark for Korea	
Eurasian Conformity	/VE	With EAC- mark	with hazardous area approval only with /GF□
Version IR	/V2	Version 2	always with RCCT39/IR
Cable glands	/AD2	2 pcs ANSI 1/2“ NPT / G1/2 adapter	only with cable conduit “A”
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]
Quick Delivery	/QD	Delivery within 24 hours from factory	Delivery scope please refer to “Quick Delivery Possibilities” or contact Yokogawa sales office.
Special order	/Z	Special design must be specification an extra sheet	

[1] For gas application /GA RCCT39/XR can also be ordered without /HP.

[2] Calibration order sheet must be delivered with the order. This is available on the Flow Center Page at Coriolis/RCC□3/Technical Information.
Volume calibration: Mass flow calibration converted by density to volume flow.

[3] For detailed information please see TI 01R04B04-04E-E. Concentration measurement is recommended with option /K6.

[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 Detector RCCS3□, Model and Suffix Code

Model	Suffix Code		Description	Restrictions
RCCS30LR			Nominal Value : 0.021 t/h = 0.35 kg/min (0.77 lbs/min)	
RCCS30			Nominal Value : 0.045 t/h = 0.75 kg/min (1.65 lbs/min)	
RCCS31			Nominal Value : 0.17 t/h = 2.8 kg/min (6.17 lbs/min)	
RCCS32			Nominal Value : 0.37 t/h = 6.2 kg/min (13.66 lbs/min)	
RCCS33			Nominal Value : 0.95 t/h = 16 kg/min (35.27 lbs/min)	
RCCS34			Nominal Value : 3 t/h = 50 kg/min (110,2 lbs/min)	
RCCS36			Nominal Value : 10 t/h = 170 kg/min (374.78 lbs/min)	
RCCS38			Nominal Value : 32 t/h = 533 kg/min (1175 lbs/min)	
RCCS39			Nominal Value : 100 t/h = 1670 kg/min (3681.72 lbs/min)	
RCCS39/IR			Nominal Value : 250 t/h = 4170 kg/min (9193.27 lbs/min)	only with /V2
RCCS39/XR			Nominal Value : 500 t/h = 8340 kg/min (18386.55 lbs/min)	select affiliated RCCF31 or RCCR31 with /HP
Cable conduit connection	-M		M20 x 1.5, female thread with cable glands	not with /FS1
	-A		ANSI ½" NPT, female thread only with cable gland for detector connection	
Process connection size [1]	41		¼"	see table 11
	01		DN 15, ½"	see table 11
	23		¾"	see table 11
	02		DN 25, 1"	see table 11
	04		DN 40, 1½"	see table 11
	05		DN 50, 2"	see table 11
	06		DN 65, 2½"	see table 11
	08		DN 80, 3"	see table 11
	10		DN 100, 4"	see table 11
	12		DN 125, 5"	see table 11
	15		DN 150, 6"	see table 11
	20		DN 200, 8"	see table 11
Process connection rating and style [1]	A1		ASME flange class 150, process connection dim. + facing acc. ASME B16.5	see table 11
	A2		ASME flange class 300, process connection dim. + facing acc. ASME B16.5	see table 11
	A3		ASME flange class 600, process connection dim. + facing acc. ASME B16.5	see table 11
	A4		ASME flange class 900, process connection dim. + facing acc. ASME B16.5	see table 11
	A5		ASME flange class 1500, process connection dim. + facing acc. ASME B16.5	see table 11
	D2		EN flange PN 16, process connection dim. + facing acc. EN 1092-1 Form B1	see table 11
	D4		EN flange PN 40, process connection dim. + facing acc. EN 1092-1 Form B1	see table 11
	D5		EN flange PN 63, process connection dim. + facing acc. EN 1092-1 Form B1	see table 11
	D6		EN flange PN 100, process connection dim. + facing acc. EN 1092-1 Form B1	see table 11
	J1		JIS flange 10K, JIS B 2220	see table 11
	J2		JIS flange 20K, JIS B 2220	see table 11
	S2		Thread acc. DIN 11851	see table 11
	S4		Clamp, process connection dimensions acc. DIN 32676	see table 11
	S8		Clamp, process connection dim. acc. Tri-Clover® (Tri-Clamp®) and ½" Mini Clamp	see table 11
	G9		G female thread	see table 11
	T9		NPT female thread	see table 11
Material of wetted parts [1]		SH	316L (1.4404) and Hastelloy C-22 (2.4602) for tube	only RCCS30LR to 33
		SL	Stainless steel 316L (1.4404)	only RCCS34 to 39/XR
		HC	Hastelloy C-22 (2.4602)	only RCCS34 to 39/IR

[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	ATEX intrinsically safe approval	
	/FS1	FM intrinsically safe approval for USA + Canada	only with cable conduit "A"
	/ES1	IECEx intrinsically safe approval	
	/US1	INMETRO intrinsically safe approval for Brazil	
	/NS1	NEPSI intrinsically safe approval for China	
	/GS1	EAC intrinsically safe approval	only with /VE
Custody Transfer Measurement acc. OIML R 117-1 [2]	/Q01	European MID Approval (fluids other than water)	Only RCCS34 to 39 (Refer to GS 01R04B07-00E)
	/Q20	NTEP approval 12-080A2, Accuracy class 0.3 acc. NIST Handbook 44	Only RCCS33 to 39 (Refer to GS 01R04B07-00E);
	/Q21	NTEP approval 12-080A2, Accuracy class 0,3 acc. NIST Handbook 44, Heated Products	Only RCCS39/IR and RCCS39/XR; not with /Q01, /Q20, /GA (Refer to GS 01R04B07-00E);
GOST [1]	/QR1	Primary Calibration and Test Confirmation valid in Russia	see page 11; not with /Q20, /Q21; only with /VE
	/QR2	Primary Calibration and Test Confirmation valid in Kazakhstan	see page 11; not with /Q20, /Q21; only with /VE
	/QR3	Primary Calibration and Test Confirmation valid in Uzbekistan	see page 11; not with RCCS30LR; not with /Q20, /Q21
Dual Seal Approval	/DS	Dual Seal approval (conform with ANSI/ISA-12.27.01)	only RCCS34 to 39/XR; only with /FS1; not with process connection A5
	/RD	Rupture disk, rupture pressure 20 bar, nominal diameter 8 mm	only RCCS34 to 39/XR, preferable with /GA, not with /T1, /T2, /T3, mandatory if /DS + /GA is selected
Tag Number	/BG	With customer specified tag number on name plate	max. 16 digits
Flange Facing	/DN	Flange with safety grooves acc. to EN 1092-1 form D	only for D2 to D6; not HC, for RCCS30LR only for 01D4 or 01D6
	/EN	Flange with spigot acc. to EN 1092-1 form E	only for D2 to D6; not HC, for RCCS30LR only for 01D4 or 01D6
	/FN	Flange with recess acc. to EN 1092-1 form F	only for D2 to D6; not HC, for RCCS30LR only for 01D4 or 01D6
	/RJ	Ring Type Joint Flanges	only for A3, A4, A5; not HC, for RCCS30LR only for 01A3 or 01A5
Gas Measurement	/GA	Gas measurement, special factory adjustments and settings	select affiliated RCCF31 or RCCR31 with /GA; to be conform with ANSI/ISA-12.27.01 select /RD; not with /Q20
Low temperature version	/LT	-200°C ≤ T_{medium} ≤ 150°C (-328°F to 302°F)	for RCCS34 to 39/XR; not with /MT, /HT, /Q01, /T1, /T2, /T3 ; in combination with Hazardous Area Approval only with /S2
Extended temperature range	/MT	-70°C ≤ T_{medium} ≤ 230°C (-94°F to 446°F) -50°C ≤ T_{medium} ≤ 260°C (-58°F to 500°F)	for RCCS34 to 39/XR; always with /S2 or /T1, /T2, /T3 ; for RCCS30LR to 33, always with /S2 or /T1, /T2, /T3
High temperature version	/HT	T_{medium} up to 350°C (662°F)	RCCS34 to 39/XR; only with/T1, /T2, /T3 or /S2 (customer insulation required); RCCS39/XR only with /S2;
Special Calibration	/K2 [3]	Custom 5 pts mass-/volume-flow calibration using water with factory certificate (traceable to German national standards)	only in combination with converter RCCF31/RCCR31
	/K4	Density adjustment + thermal treatment; (accuracy: 0.001 g/cm³)	only RCCS31 to 39; not with /GA
	/K5 [3]	Custom 10 pts mass-/volume-flow calibration using water with DAkkS certificate (according EN-17025:2005)	only in combination with converter RCCF31/RCCR31
	/K6	Density calibration with 3 different fluids incl. individual temperature compensation with certificate (accuracy: 0.0005 g/cm³)	only RCCS32 to 39; not with /GA; not with /LT; not with /MT; only available if converter is also ordered
Certificates	/P2	Certificate of compliance with the order acc. to EN 10204:2004 -2.1	
	/P3	Test Report acc. to EN10204:2004-2.2(QIC) including the content of option /P2	
	/P6	Material certificate acc to EN 10204: 2004 -3.1	
	/P8	Pressure test report measuring system	
	/H1	Oil and fat free for wetted surface acc. to ASTM G93-03 level C	
	/WP	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)	only for butt weld between process connection and flow divider; not for HC
	/L2	Calibration certificate level 2: Declaration and the Calibration Equipment List are issued	
	/L3	Calibration certificate level 3: Declaration and the Primary Standard List are issued	
	/L4	Calibration certificate level 4: Declaration and the Yokogawa Measuring Instruments Control System are issued	
Sanitary Type	/SF1	Surface roughness Ra = 0.8 µm	only RCCS34 to 39; not with RCCS34 /K4, RCCS34 / K6 and RCCS34 /LT ; only process connections S2, S4, S8;
	/SF2	As /SF1 + Test report roughness of wetted parts	as /SF1
	/SA	As /SF2 + 3A- declaration of conformity and 3A- mark	as /SF1, but not with process connection S2
	/SE	As /SF2 + EHEDG- certificate	as /SF1, but not with process connection S2
Mounting set	/PD	2 inch pipe mounting set, recommended for RCCS30LR and RCCS30	only RCCS30LR to 33; not with /T□
Housing Pressure Test	/J1	Rupture pressure proof test and certificate (see page 4)	not for RCCS30LR to 33 + RCCS39/XR
Customer insulation / Heating	/S2	Terminal box on extension for high or low process temperature	not with /T1, /T2, /T3
Factory Insulating / Heating	/T1	Insulation	not for RCCS39/XR
	/T2	Insulation + Heat carrier heating	not for RCCS39/XR
	/T3	Insulation + Heat carrier heating with ventilation (purge)	not for RCCS39/XR
X-Ray Examination	/RT	X-ray examination of flange welding	RCCS30LR to 33 and RCCS34 with /K4, /K6 or /LT only one-sided; not with HC
PMI Certificate	/PM4	PMI Test on wetted parts RCCS30LR to 33 [4]	not RCCS34 to 39/XR
	/PM6	PMI Test on wetted parts RCCS34 to 39/XR	not RCCS30LR to 33
Dye Penetrant Test	/PT	Dye Penetrant Test acc. DIN EN ISO 3452-1 at the weldings of the process connection, with certificate	
Stainless steel cable gland	/BS	Cable gland stainless steel	
Version IR	/V2	Version 2	always with RCCS39/IR
Delivery to Japan	/PJ	For meters which are delivered to Japan	
Delivery to Korea	/KC	With KC-mark for Korea	
Eurasian Conformity	/VE	With EAC- mark	with hazardous area approval only with /GS1
Quick Delivery	/QD	Delivery within 24 hours from factory	Delivery scope please refer to "Quick Delivery Possibilities" or contact Yokogawa sales office.
Special order	/Z	Special design must be specification an extra sheet	

[1] Select affiliated converter RCCF31/RCCR31 with the same approval type (e.g. ATEX).
[2] Select affiliated converter RCCF31 with the same approval type (/Q01, /Q20 or /Q21).
[3] Calibration order sheet must be delivered with the order. This is available on the Flow Center Page at Coriolis/RCC□3/Technical Information.
Volume calibration: Mass flow calibration converted by density to volume flow.
[4] Measuring tube PMI test is performed per delivery batch.

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	-A -D		90 - 264 V AC 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	not with /FF1, /FF5

Hazardous Area Approvals [1]	/KF1	ATEX Flame proof converter + Intrinsically safe detector output	with /HP not for gas group IIC
	/KF5	ATEX Flame proof converter + Intrinsically safe detector output + Intrinsically safe outputs 2 passive analog output + 1 passive pulse output	with /HP not for gas group IIC
	/FF1	FM approval for USA+Canada, Flame proof converter + Intrinsically safe detector output + 2 active analog outputs + 2 passive pulse outputs + 1 status input	only with cable conduit "A"; with /HP not for groups A and B
	/FF5	FM approval for USA+Canada, Flame proof converter + Intrinsically safe detector output + 2 passive analog outputs + 1 passive pulse output	only with cable conduit "A"; with /HP not for groups A and B
	/EF1	IECEx Flame proof converter + Intrinsically safe detector output	with /HP not for gas group IIC
	/EF5	IECEx Flame proof converter + Intrinsically safe detector output + Intrinsically safe outputs 2 passive analog output + 1 passive pulse output	with /HP not for gas group IIC
	/UF1	INMETRO Flame proof converter + Intrinsically safe detector output	with /HP not for gas group IIC
	/UF5	INMETRO Flame proof converter + Intrinsically safe detector output + Intrinsically safe outputs 2 passive analog output + 1 passive pulse output	with /HP not for gas group IIC
	/NF1	NEPSI Flame proof converter + Intrinsically safe detector output	with /HP not for gas group IIC
	/NF5	NEPSI Flame proof converter + Intrinsically safe detector output + Intrinsically safe outputs 2 passive analog output + 1 passive pulse output	with /HP not for gas group IIC
	/GF1	EAC Flame proof converter + Intrinsically safe detector output	with /HP for gas group IIB; only with /VE
	/GF5	EAC Flame proof converter + Intrinsically safe detector output + Intrinsically safe outputs 2 passive analog output + 1 passive pulse output	with /HP for gas group IIB; only with /VE
Custody Transfer Measurement acc. OIML R 117-1	/Q01	European MID Approval (fluids other than water)	Only in combination with RCCS34 to 39 (Refer to GS 01R04B07-00E); not with /NM
	/Q20	NTEP approval 12-080A2, Accuracy class 0.3 acc. NIST Handbook 44	Only in combination with RCC□33 to 39 (Refer to GS 01R04B07-00E)
	/Q21	NTEP approval 12-080A2, Accuracy class 0,3 acc. NIST Handbook 44, Heated Products	Only in combination with RCCS39/IR to 39/XR (Refer to GS 01R04B07-00E); not with /Q01, /Q20
GOST [1]	/QR1	Primary Calibration and Test Confirmation valid in Russia	see page 11; not with /Q20, /Q21; only with /VE
	/QR2	Primary Calibration and Test Confirmation valid in Kazakhstan	see page 11; not with /Q20, /Q21; only with /VE
	/QR3	Primary Calibration and Test Confirmation valid in Uzbekistan	see page 11; not with /Q20, /Q21
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"	mandatory for combination with RCCS39/XR [5]
Communication	/FB	Digital communication (FOUNDATION™ Fieldbus protocol)	refer to GS 01R04B05-00E
	/MB2	Modbus communication protocol for all parameters and values	not with /KF5, /EF5, /UF5, /GF5, /NF5, /FF5, /Q01, /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 /KF5, /EF5, /FF5, /UF5, /NF5, /GF5, /Q01, /MB2
Active Pulse Output	/AP	One active pulse output	not with /KF5, /EF5, /FF5, /UF5, /NF5, /GF5, /NM
NAMUR Switch	/NM	One pulse output acc. to EN 60947-5-6 (NAMUR)	not with /AP, not with /KF5, /EF5, /UF5, /NF5, /GF5
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)
Gas Measurement	/GA	Gas measurement, special factory adjustments and settings	select affiliated RCCS3 □ with /GA; not with /Q20, /Q21
Combination with RCCS39/XR	/XR	Special converter adjustment with RCCS39/XR	mandatory for combination with RCCS39/XR
No Combination	/NC	No combination with detector	
Customer Presetting	/PS	Presetting sheet with customer data	has to be issued with the order
Epoxy Coating	/X1	Epoxy coating of converter housing	
Delivery to Japan	/PJ	For meters which are delivered to Japan with SI-unit preset	
Delivery to Korea	/KC	With KC-mark for Korea	
Eurasian Conformity	/VE	With EAC- mark	with hazardous area approval only with /GF□
Cable glands	/AD2	2 pcs ANSI 1/2" NPT / G1/2 adapter	only with cable conduit "A"
Concentration Measurement [3]	/CST	Standard concentration measurement	not with /GA, /C□□
	/C□□	Advanced concentration measurement, details see table „Advanced Concentration Measurement Options"	not with /GA, /CST
Certificates	/P2	Certificate of compliance with the order acc. to EN 10204:2004 -2.1	
	/P3	Test Report acc. to EN10204:2004-2.2(QIC) including the content of option /P2	
Instruction Manuals	/IE□	Quantity of instruction manuals in English	□ = 1 to 3 selectable [4]
	/ID□	Quantity of instruction manuals in German	□ = 1 to 3 selectable [4]
	/IF□	Quantity of instruction manuals in French	□ = 1 to 3 selectable [4]
Quick Delivery	/QD	Delivery within 24 hours from factory	Delivery scope please refer to "Quick Delivery Possibilities" or contact Yokogawa sales office.
Special order	/Z	Special design must be specification an extra sheet	

[1] Select affiliated RCCS3 with the same approval type (e.g. /KF□ with /KS1).
[2] Select affiliated RCCS3 with the same approval type (/Q01, /Q20 or /Q21).
[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.
[5] RCCF31 in combination with RCCS39/XR with gas application /GA can also be ordered without /HP.

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	
Power supply	-A -D		90 - 264 V AC 24 V DC	

Hazardous Area Approvals [1]	/KS1 /FS1 /ES1 /US1 /NS1 /GS1	ATEX associated apparatus for intrinsically safe detector connection for gas group IIC FM associated apparatus for intrinsically safe detector output 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 EAC associated apparatus for intrinsically safe detector connection for gas group IIC	with /HP not for gas group IIC with /HP not for gas groups A and B 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; only with /VE
GOST [1]	/QR1 /QR2	Primary Calibration and Test Confirmation valid in Russia Primary Calibration and Test Confirmation valid in Kazakhstan	see page 11; only with /VE see page 11; only with /VE
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"	mandatory for combination with RCCS39/XR
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
Gas Measurement	/GA	Gas measurement, special factory adjustments and settings	select affiliated RCCS3 with /GA
Combination with RCCS39/XR	/XR	Special converter adjustment with RCCS39/XR	mandatory for combination with RCCS39/XR
No Combination	/NC	No combination with detector	
Customer Presetting	/PS	Presetting sheet with customer data	has to be issued with the order
Concentration Measurement [2]	/CST /C□□	Standard concentration measurement Advanced concentration measurement, details see table „Advanced Concentration Measurement Options"	not with /GA, /C□□ not with /GA, /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	
Eurasian Conformity	/VE	With EAC- mark	
Certificates	/P2 /P3	Certificate of compliance with the order acc. to EN 10204:2004 -2.1 Test Report acc. to 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]
Special order	/Z	Special design must be specification an extra sheet	

[1] Select affiliated RCCS3 with the same approval type (e.g. /KS1 with /KS1).
[2] For detailed information please see TI 01R04B04-04E-E. Option /K6 of RCCS3 is recommended with concentration measurement.
[3] 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.
[4] RCCR31 in combination with RCCS39/XR with gas application /GA can also be ordered without /HP.

Remote Cable RCCY03□, Model, Suffix and Option Code

Model	Suffix Code	Option Code	Description	Restrictions
RCCY031 RCCY032 RCCY033 RCCY034			Length in "meter" Length in "feet" Length in "meter" Length in "feet"	max. ambient temperature 70°C (158°F); with /FF□ or /FS1: 50°C (122°F) max. ambient temperature 70°C (158°F); with /FF□ or /FS1: 50°C (122°F) max. ambient temperature 105°C (221°F); with /FF□ or /FS1: 85°C (185°F) max. ambient temperature 105°C (221°F); with /FF□ or /FS1: 85°C (185°F)
Cable ends	-0 -1		No termination, with one termination kit Terminated	
Cable length	L□□□		Enter the length	max. 300m / 999ft, the following lengths can be ordered (e.g. 3m = L003): RCCY031-0: 3m, 5m, 10m, 15m, 30m, 50m, 100m, 150m, 200m, 250m, 300m RCCY031-1: 3m, 5m, 10m, 15m, 30m, 50m RCCY032-0: 10ft, 15ft, 30ft, 50ft, 100ft, 150ft, 300ft, 500ft, 1000ft RCCY032-1: 10ft, 15ft, 30ft, 50ft, 100ft, 150ft RCCY033-0: 3m, 5m, 10m, 15m, 30m, 50m, 100m, 150m, 300m RCCY033-1: 3m, 5m, 10m, 15m, 30m, 50m RCCY034-0: 10ft, 15ft, 30ft, 50ft, 100ft, 150ft, 300ft, 500ft, 1000ft RCCY034-1: 10ft, 15ft, 30ft, 50ft, 100ft, 150ft
Options: Hazardous area installation Termination kits Quick delivery		/KS1 /NS1 /TK□□ /QD	Blue cable for Ex-i indication Blue cable for Ex-i indication (China) Quantity of additional termination kits Delivery within 24 hours from factory	 □□ = 01 to 99 only L003, L005, L010

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
/C06 [1)]	WT%	HCl / Water	22 - 34 WT%	20 - 40°C (68 - 104°F)	D´Ans-Lax, Handbook for chemists and physicists Vol.1, 3rd edition, 1967
/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
/C38	VOL%	Alcohol / Water	73 - 100 VOL%	10 - 40°C (50 - 104°F)	Brazilian Standard ABNT

[1)] only with material HC

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

			RCCS 30LR	RCCS 30-33	RCCS34 RCCT34		RCCS36 RCCT36		RCCS38 RCCT38		RCCS39 RCCT39		RCCS39/IR RCCT39/IR		RCCS39/XR RCCT39/XR	
			SH	SH	SL	HC	SL	HC	SL	HC	SL	HC	SL	HC	SL	HC
Flanges according to ASME B16.5	01A1	½"-150	240	240	370	----	----	----	----	----	----	----	----	----	----	----
	01A2	½"-300	240	240	370	----	----	----	----	----	----	----	----	----	----	----
	01A3	½"-600	250	250	380	----	----	----	----	----	----	----	----	----	----	----
	01A5	½"-900/1500	270	270	400	----	----	----	----	----	----	----	----	----	----	----
	02A1	1"-150	----	240	370	390	500	----	----	----	----	----	----	----	----	----
	02A2	1"-300	----	240	370	390	500	----	----	----	----	----	----	----	----	----
	02A3	1"-600	----	260	390	390	520	----	----	----	----	----	----	----	----	----
	02A5	1"-900/1500	----	320	450	400	540	----	----	----	----	----	----	----	----	----
	04A1	1½"-150	----	250	380	390	500	520	600	----	----	----	----	----	----	----
	04A2	1½"-300	----	250	380	390	510	520	600	----	----	----	----	----	----	----
	04A3	1½"-600	----	270	400	400	530	530	620	----	----	----	----	----	----	----
	04A4	1½"-900	----	----	----	----	----	----	640	----	----	----	----	----	----	----
	04A5	1½"-900/1500	----	340	470	----	600	----	----	----	----	----	----	----	----	----
	05A1	2"-150	----	----	----	390	510	520	600	620	----	----	----	----	----	----
	05A2	2"-300	----	----	----	390	510	520	600	620	----	----	----	----	----	----
	05A3	2"-600	----	----	----	400	540	540	630	630	----	----	----	----	----	----
	05A4	2"-900	----	----	----	----	----	----	720	----	----	----	----	----	----	----
	05A5	2"-900/1500	----	----	----	----	660	----	----	----	----	----	----	----	----	----
	06A1	2½"-150	----	----	----	----	----	----	610	620	----	----	----	----	----	----
	06A2	2½"-300	----	----	----	----	----	----	610	620	----	----	----	----	----	----
	06A3	2½"-600	----	----	----	----	----	----	640	640	----	----	----	----	----	----
	06A4	2½"-900	----	----	----	----	----	----	760	----	----	----	----	----	----	----
	08A1	3"-150	----	----	----	----	----	----	610	620	1000	1020	----	----	----	----
	08A2	3"-300	----	----	----	----	----	----	620	620	1000	1020	----	----	----	----
	08A3	3"-600	----	----	----	----	----	----	640	640	1000	1025	----	----	----	----
	08A4	3"-900	----	----	----	----	----	----	760	----	----	----	----	----	----	----
	10A1	4"-150	----	----	----	----	----	----	----	----	1000	1020	1100	----	----	----
	10A2	4"-300	----	----	----	----	----	----	----	----	1000	1020	1100	----	----	----
	10A3	4"-600	----	----	----	----	----	----	----	----	1030	1030	1100	----	----	----
	12A1	5"-150	----	----	----	----	----	----	----	----	1000	1020	1100	1100	----	----
	12A2	5"-300	----	----	----	----	----	----	----	----	1000	1020	1100	1100	----	----
	12A3	5"-600	----	----	----	----	----	----	----	----	1040	1040	1160	1110	----	----
	15A1	6"-150	----	----	----	----	----	----	----	----	----	----	1100	1100	1350	----
	15A2	6"-300	----	----	----	----	----	----	----	----	----	----	1100	1100	1350	----
	15A3	6"-600	----	----	----	----	----	----	----	----	----	----	1200	1120	1390	----
	20A1	8"-150	----	----	----	----	----	----	----	----	----	----	1140	1100	1350	----
	20A2	8"-300	----	----	----	----	----	----	----	----	----	----	1140	1100	1350	----
	20A3	8"-600	----	----	----	----	----	----	----	----	----	----	----	----	1440	----
Flanges according to EN 1092-1	01D4	DN 15 PN 40	240	240	370	----	----	----	----	----	----	----	----	----	----	----
	01D6	DN 15 PN 100	250	250	380	----	----	----	----	----	----	----	----	----	----	----
	02D4	DN 25 PN 40	----	240	370	390	500	520	----	----	----	----	----	----	----	----
	02D6	DN 25 PN 100	----	260	390	----	520	----	----	----	----	----	----	----	----	----
	04D4	DN 40 PN 40	----	240	370	390	500	520	600	----	----	----	----	----	----	----
	04D6	DN 40 PN 100	----	320	450	----	560	----	620	----	----	----	----	----	----	----
	05D4	DN 50 PN 40	----	----	----	----	500	520	600	620	----	----	----	----	----	----
	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	620	1000	1020	----	----	----	----
	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	1020	1100	----	----	----
	10D5	DN 100 PN 63	----	----	----	----	----	----	----	----	1000	----	1100	----	----	----
	10D6	DN 100 PN 100	----	----	----	----	----	----	----	----	1050	----	1100	----	----	----
	12D2	DN 125 PN 16	----	----	----	----	----	----	----	----	1000	1020	1100	1100	----	----
	12D4	DN 125 PN 40	----	----	----	----	----	----	----	----	1000	1020	1100	1100	----	----
	12D5	DN 125 PN 63	----	----	----	----	----	----	----	----	1000	----	1100	1100	----	----
	12D6	DN 125 PN 100	----	----	----	----	----	----	----	----	1100	----	1140	1100	----	----
	12D7	DN 125 PN 160	----	----	----	----	----	----	----	----	----	----	----	1100	----	----
	15D2	DN 150 PN 16	----	----	----	----	----	----	----	----	----	----	1100	1100	1350	----
	15D4	DN 150 PN 40	----	----	----	----	----	----	----	----	----	----	1100	1100	1350	----
	15D5	DN 150 PN 63	----	----	----	----	----	----	----	----	----	----	1140	----	1350	----
	15D6	DN 150 PN 100	----	----	----	----	----	----	----	----	----	----	1180	----	----	----
	20D2	DN 200 PN 16	----	----	----	----	----	----	----	----	----	----	----	----	1350	----
	20D4	DN 200 PN 40	----	----	----	----	----	----	----	----	----	----	----	----	1350	----
	20D5	DN 200 PN 63	----	----	----	----	----	----	----	----	----	----	----	----	1350	----

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

			RCCS 30LR	RCCS 30-33	RCCS34 RCCT34		RCCS36 RCCT36		RCCS38 RCCT38		RCCS39 RCCT39		RCCS39 RCCT39/IR		RCCS39 RCCT39/XR	
			SH	SH	SL	HC	SL	HC	SL	HC	SL	HC	SL	HC	SL	HC
Flanges according to JIS B 2220	01J1	DN 15 10K	240	240	370	----	----	----	----	----	----	----	----	----	----	----
	01J2	DN 15 20K	240	240	370	----	----	----	----	----	----	----	----	----	----	----
	02J1	DN 25 10K	----	240	370	390	500	----	----	----	----	----	----	----	----	----
	02J2	DN 25 20K	----	240	370	390	500	----	----	----	----	----	----	----	----	----
	04J1	DN 40 10K	----	240	370	390	500	520	600	----	----	----	----	----	----	----
	04J2	DN 40 20K	----	240	370	390	500	520	600	----	----	----	----	----	----	----
	05J1	DN 50 10K	----	----	----	----	500	520	600	620	----	----	----	----	----	----
	05J2	DN 50 20K	----	----	----	----	500	520	600	620	----	----	----	----	----	----
	08J1	DN 80 10K	----	----	----	----	----	----	600	620	1000	1020	----	----	----	----
	08J2	DN 80 20K	----	----	----	----	----	----	610	620	1000	1020	----	----	----	----
	10J1	DN 100 10K	----	----	----	----	----	----	----	----	1000	1020	1100	----	----	----
	10J2	DN 100 20K	----	----	----	----	----	----	----	----	1000	1020	1100	----	----	----
	12J1	DN 125 10K	----	----	----	----	----	----	----	----	1000	1020	1100	1100	----	----
	12J2	DN 125 20K	----	----	----	----	----	----	----	----	1000	1020	1100	1100	----	----
	15J1	DN 150 10K	----	----	----	----	----	----	----	----	----	----	1100	1100	----	----
	15J2	DN 150 20K	----	----	----	----	----	----	----	----	----	----	1100	1100	----	----
Clamp DIN	01S4	DN 15	240	240	----	----	----	----	----	----	----	----	----	----	----	----
	02S4	DN 25	----	240	370	----	----	----	----	----	----	----	----	----	----	----
	04S4	DN 40	----	240	370	----	500	----	----	----	----	----	----	----	----	----
	05S4	DN 50	----	----	----	----	500	----	600	----	----	----	----	----	----	----
	06S4	DN 65	----	----	----	----	----	----	600	----	----	----	----	----	----	----
	10S4	DN 100	----	----	----	----	----	----	----	----	1000	----	----	----	----	----
Tri-Clamp	01S8	½“	240	240	----	----	----	----	----	----	----	----	----	----	----	----
	02S8	1“	----	240	370	----	----	----	----	----	----	----	----	----	----	----
	04S8	1½“	----	240	370	----	500	----	----	----	----	----	----	----	----	----
	05S8	2“	----	----	----	----	500	----	600	----	----	----	----	----	----	----
	08S8	3“	----	----	----	----	----	----	600	----	----	----	----	----	----	----
	10S8	4“	----	----	----	----	----	----	----	----	1000	----	----	----	----	----
DIN11851	02S2	DN 25	----	240	370	----	----	----	----	----	----	----	----	----	----	----
	04S2	DN 40	----	----	----	----	500	----	----	----	----	----	----	----	----	----
	05S2	DN 50	----	----	----	----	----	----	600	----	----	----	----	----	----	----
	10S2	DN 100	----	----	----	----	----	----	----	----	1000	----	----	----	----	----
Thread	41G9	G¼“ female	260	260	----	----	----	----	----	----	----	----	----	----	----	----
	01G9	G½“ female	260	260	390	----	----	----	----	----	----	----	----	----	----	----
	23G9	G¾“ female	260	260	390	----	----	----	----	----	----	----	----	----	----	----
	41T9	NPT¼“ female	260	260	----	----	----	----	----	----	----	----	----	----	----	----
	01T9	NPT½“ female	260	260	390	----	----	----	----	----	----	----	----	----	----	----
	23T9	NPT¾“ female	260	260	390	----	----	----	----	----	----	----	----	----	----	----

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

			RCCS 30LR	RCCS 30-33	RCCS34 RCCT34		RCCS36 RCCT36		RCCS38 RCCT38		RCCS39 RCCT39		RCCS39/IR RCCT39/IR		RCCS39/XR RCCT39/XR	
			SH	SH	SL	HC	SL	HC	SL	HC	SL	HC	SL	HC	SL	HC
Flanges according to ASME B16.5	01A1	½"-150	9.45	9.45	14.57	----	----	----	----	----	----	----	----	----	----	----
	01A2	½"-300	9.45	9.45	14.57	----	----	----	----	----	----	----	----	----	----	----
	01A3	½"-600	9.84	9.84	14.96	----	----	----	----	----	----	----	----	----	----	----
	01A5	½"-900/1500	10.63	10.63	15.75	----	----	----	----	----	----	----	----	----	----	----
	02A1	1"-150	----	9.45	14.57	15.35	19.69	----	----	----	----	----	----	----	----	----
	02A2	1"-300	----	9.45	14.57	15.35	19.69	----	----	----	----	----	----	----	----	----
	02A3	1"-600	----	10.24	15.35	15.35	20.47	----	----	----	----	----	----	----	----	----
	02A5	1"-900/1500	----	12.6	17.72	15.75	21.26	----	----	----	----	----	----	----	----	----
	04A1	1½"-150	----	9.84	14.96	15.35	19.69	20.47	23.62	----	----	----	----	----	----	----
	04A2	1½"-300	----	9.84	14.96	15.35	20.08	20.47	23.62	----	----	----	----	----	----	----
	04A3	1½"-600	----	10.63	15.75	15.75	20.87	20.87	24.21	----	----	----	----	----	----	----
	04A4	1½"-900	----	----	----	----	----	----	25.2	----	----	----	----	----	----	----
	04A5	1½"-900/1500	----	13.39	18.5	----	23.62	----	----	----	----	----	----	----	----	----
	05A1	2"-150	----	----	----	15.35	20.08	20.47	23.62	24.21	----	----	----	----	----	----
	05A2	2"-300	----	----	----	15.35	20.08	20.47	23.62	24.21	----	----	----	----	----	----
	05A3	2"-600	----	----	----	15.75	21.26	21.26	24.8	24.8	----	----	----	----	----	----
	05A4	2"-900	----	----	----	----	----	----	28.35	----	----	----	----	----	----	----
	05A5	2"-900/1500	----	----	----	----	25.98	----	----	----	----	----	----	----	----	----
	06A1	2½"-150	----	----	----	----	----	----	24.02	24.21	----	----	----	----	----	----
	06A2	2½"-300	----	----	----	----	----	----	24.02	24.21	----	----	----	----	----	----
	06A3	2½"-600	----	----	----	----	----	----	25.2	25.2	----	----	----	----	----	----
	06A4	2½"-900	----	----	----	----	----	----	29.92	----	----	----	----	----	----	----
	08A1	3"-150	----	----	----	----	----	----	24.02	24.21	39.37	40.16	----	----	----	----
	08A2	3"-300	----	----	----	----	----	----	24.21	24.21	39.37	40.16	----	----	----	----
	08A3	3"-600	----	----	----	----	----	----	25.2	25.2	39.37	40.35	----	----	----	----
	08A4	3"-900	----	----	----	----	----	----	29.92	----	----	----	----	----	----	----
	10A1	4"-150	----	----	----	----	----	----	----	----	39.37	40.16	43.31	----	----	----
	10A2	4"-300	----	----	----	----	----	----	----	----	39.37	40.16	43.31	----	----	----
	10A3	4"-600	----	----	----	----	----	----	----	----	40.55	40.55	43.31	----	----	----
	12A1	5"-150	----	----	----	----	----	----	----	----	39.37	40.16	43.31	43.31	----	----
	12A2	5"-300	----	----	----	----	----	----	----	----	39.37	40.16	43.31	43.31	----	----
	12A3	5"-600	----	----	----	----	----	----	----	----	40.94	40.94	45.67	43.31	----	----
	15A1	6"-150	----	----	----	----	----	----	----	----	----	----	43.31	43.31	53.15	----
	15A2	6"-300	----	----	----	----	----	----	----	----	----	----	43.31	43.31	53.15	----
	15A3	6"-600	----	----	----	----	----	----	----	----	----	----	47.2	43.31	54.72	----
	20A1	8"-150	----	----	----	----	----	----	----	----	----	----	44.9	43.31	53.15	----
	20A2	8"-300	----	----	----	----	----	----	----	----	----	----	44.9	43.31	53.15	----
	20A3	8"-600	----	----	----	----	----	----	----	----	----	----	----	----	56.69	----
Flanges according to EN 1092-1	01D4	DN 15 PN 40	9.45	9.45	14.57	----	----	----	----	----	----	----	----	----	----	----
	01D6	DN 15 PN 100	9.84	9.84	14.96	----	----	----	----	----	----	----	----	----	----	----
	02D4	DN 25 PN 40	----	9.45	14.57	15.35	19.69	20.47	----	----	----	----	----	----	----	----
	02D6	DN 25 PN 100	----	10.24	15.35	----	20.47	----	----	----	----	----	----	----	----	----
	04D4	DN 40 PN 40	----	9.45	14.57	15.35	19.69	20.47	23.62	----	----	----	----	----	----	----
	04D6	DN 40 PN 100	----	12.6	17.72	----	22.05	----	24.41	----	----	----	----	----	----	----
	05D4	DN 50 PN 40	----	----	----	----	19.69	20.47	23.62	24.41	----	----	----	----	----	----
	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	24.41	39.37	40.16	----	----	----	----
	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	40.16	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	40.16	43.31	43.31	----	----
	12D4	DN 125 PN 40	----	----	----	----	----	----	----	----	39.37	40.16	43.31	43.31	----	----
	12D5	DN 125 PN 63	----	----	----	----	----	----	----	----	39.37	----	43.31	43.31	----	----
	12D6	DN 125 PN 100	----	----	----	----	----	----	----	----	43.31	----	44.88	43.31	----	----
	12D7	DN 125 PN 160	----	----	----	----	----	----	----	----	----	----	----	43.31	----	----
	15D2	DN 150 PN 16	----	----	----	----	----	----	----	----	----	----	43.31	43.31	53.15	----
	15D4	DN 150 PN 40	----	----	----	----	----	----	----	----	----	----	43.31	43.31	53.15	----
	15D5	DN 150 PN 63	----	----	----	----	----	----	----	----	----	----	44.88	----	53.15	----
	15D6	DN 150 PN 100	----	----	----	----	----	----	----	----	----	----	46.46	----	----	----
	20D2	DN 200 PN 16	----	----	----	----	----	----	----	----	----	----	----	----	53.15	----
	20D4	DN 200 PN 40	----	----	----	----	----	----	----	----	----	----	----	----	53.15	----
	20D5	DN 200 PN 63	----	----	----	----	----	----	----	----	----	----	----	----	53.15	----

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

			RCCS 30LR	RCCS 30-33	RCCS34 RCCT34		RCCS36 RCCT36		RCCS38 RCCT38		RCCS39 RCCT39		RCCS39 RCCT39/IR		RCCS39 RCCT39/XR	
			SH	SH	SL	HC	SL	HC	SL	HC	SL	HC	SL	HC	SL	HC
Flanges according to JIS B 2220	01J1	DN 15 10K	9.45	9.45	14.57	----	----	----	----	----	----	----	----	----	----	----
	01J2	DN 15 20K	9.45	9.45	14.57	----	----	----	----	----	----	----	----	----	----	----
	02J1	DN 25 10K	----	9.45	14.57	15.35	19.69	----	----	----	----	----	----	----	----	----
	02J2	DN 25 20K	----	9.45	14.57	15.35	19.69	----	----	----	----	----	----	----	----	----
	04J1	DN 40 10K	----	9.45	14.57	15.35	19.69	20.47	23.62	----	----	----	----	----	----	----
	04J2	DN 40 20K	----	9.45	14.57	15.35	19.69	20.47	23.62	----	----	----	----	----	----	----
	05J1	DN 50 10K	----	----	----	----	19.69	20.47	23.62	24.41	----	----	----	----	----	----
	05J2	DN 50 20K	----	----	----	----	19.69	20.47	23.62	24.41	----	----	----	----	----	----
	08J1	DN 80 10K	----	----	----	----	----	----	23.62	24.41	39.37	40.16	----	----	----	----
	08J2	DN 80 20K	----	----	----	----	----	----	24.02	24.41	39.37	40.16	----	----	----	----
	10J1	DN 100 10K	----	----	----	----	----	----	----	----	39.37	40.16	43.31	----	----	----
	10J2	DN 100 20K	----	----	----	----	----	----	----	----	39.37	40.16	43.31	----	----	----
	12J1	DN 125 10K	----	----	----	----	----	----	----	----	39.37	40.16	43.31	43.31	----	----
	12J2	DN 125 20K	----	----	----	----	----	----	----	----	39.37	40.16	43.31	43.31	----	----
	15J1	DN 150 10K	----	----	----	----	----	----	----	----	----	----	43.31	43.31	----	----
	15J2	DN 150 20K	----	----	----	----	----	----	----	----	----	----	43.31	43.31	----	----
Clamp DIN	01S4	DN 15	9.45	9.45	----	----	----	----	----	----	----	----	----	----	----	----
	02S4	DN 25	----	9.45	14.57	----	----	----	----	----	----	----	----	----	----	----
	04S4	DN 40	----	9.45	14.57	----	19.69	----	----	----	----	----	----	----	----	----
	05S4	DN 50	----	----	----	----	19.69	----	23.62	----	----	----	----	----	----	----
	06S4	DN 65	----	----	----	----	----	----	23.62	----	----	----	----	----	----	----
	10S4	DN 100	----	----	----	----	----	----	----	----	39.37	----	----	----	----	----
Tri-Clamp	01S8	½“	9.45	9.45	----	----	----	----	----	----	----	----	----	----	----	----
	02S8	1“	----	9.45	14.57	----	----	----	----	----	----	----	----	----	----	----
	04S8	1½“	----	9.45	14.57	----	19.69	----	----	----	----	----	----	----	----	----
	05S8	2“	----	----	----	----	19.69	----	23.62	----	----	----	----	----	----	----
	08S8	3“	----	----	----	----	----	----	23.62	----	----	----	----	----	----	----
	10S8	4“	----	----	----	----	----	----	----	----	39.37	----	----	----	----	----
DIN11851	02S2	DN 25	----	9.45	14.57	----	----	----	----	----	----	----	----	----	----	----
	04S2	DN 40	----	----	----	----	19.69	----	----	----	----	----	----	----	----	----
	05S2	DN 50	----	----	----	----	----	----	23.62	----	----	----	----	----	----	----
	10S2	DN 100	----	----	----	----	----	----	----	----	39.37	----	----	----	----	----
Thread	41G9	G¼“ female	10.24	10.24	----	----	----	----	----	----	----	----	----	----	----	----
	01G9	G½“ female	10.24	10.24	15.35	----	----	----	----	----	----	----	----	----	----	----
	23G9	G¾“ female	10.24	10.24	15.35	----	----	----	----	----	----	----	----	----	----	----
	41T9	NPT¼“ female	10.24	10.24	----	----	----	----	----	----	----	----	----	----	----	----
	01T9	NPT½“ female	10.24	10.24	15.35	----	----	----	----	----	----	----	----	----	----	----
	23T9	NPT¾“ female	10.24	10.24	15.35	----	----	----	----	----	----	----	----	----	----	----

Table 12 : CRN approved process connections

			RCCS34 RCCT34		RCCS36 RCCT36		RCCS38 RCCT38		RCCS39 RCCT39		RCCS39/IR RCCT39/IR
			SL	HC	SL	HC	SL	HC	SL	HC	SL
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	X	----	----	----	----	----	----
	02A2	1“-300	X	X	X	----	----	----	----	----	----
	02A3	1“-600	X	----	X	----	----	----	----	----	----
	02A5	1“-900/1500	X	----	X	----	----	----	----	----	----
	04A1	1½“-150	X	X	X	X	X	----	----	----	----
	04A2	1½“-300	X	X	X	X	X	----	----	----	----
	04A3	1½“-600	X	----	X	----	X	----	----	----	----
	04A4	1½“-900	----	----	X	----	X	----	----	----	----
	04A5	1½“-900/1500	X	----	X	----	----	----	----	----	----
	05A1	2“-150	----	----	X	X	X	X	----	----	----
	05A2	2“-300	----	----	X	X	X	X	----	----	----
	05A3	2“-600	----	----	X	----	X	----	----	----	----
	05A4	2“-900	----	----	----	----	X	----	----	----	----
	05A5	2“-900/1500	----	----	X	----	----	----	----	----	----
	06A1	2½“-150	----	----	----	----	X	X	----	----	----
	06A2	2½“-300	----	----	----	----	X	X	----	----	----
	06A3	2½“-600	----	----	----	----	X	----	----	----	----
	06A4	2½“-900	----	----	----	----	X	----	----	----	----
	08A1	3“-150	----	----	----	----	X	X	X	X	----
	08A2	3“-300	----	----	----	----	X	X	X	X	----
	08A3	3“-600	----	----	----	----	X	----	----	----	----
	08A4	3“-900	----	----	----	----	X	----	----	----	----
	10A1	4“-150	----	----	----	----	----	----	X	X	X
	10A2	4“-300	----	----	----	----	----	----	X	X	X
	10A3	4“-600	----	----	----	----	----	----	----	----	----
	12A1	5“-150	----	----	----	----	----	----	X	X	X
	12A2	5“-300	----	----	----	----	----	----	X	X	X
	12A3	5“-600	----	----	----	----	----	----	----	----	----
	15A1	6“-150	----	----	----	----	----	----	----	----	X
	15A2	6“-300	----	----	----	----	----	----	----	----	X

Blank Page

APPENDIX 1. SOFTWARE CHANGE HISTORY

Table A1-1 Converter Software Change History

Release date	Label	SW Rev	Dev Rev	Changes	Instruction Manual
14.08.2003	1.02.xx	2	1	HART communication added	IM 01R04B04-00E-E ed. 1
06.07.2004	1.03.xx	3		Correction constants introduced	IM 01R04B04-00E-E ed. 4
14.12.2005	1.04.xx	4		„All alarms“ for status out introduced, new density unit introduced, negative LRV value allowed	IM 01R04B04-00E-E ed. 5
14.06.2006	1.05.xx	5		Standard and normal volume (flow) units introduced, energy totalizer and flow velocity introduced	IM 01R04B04-00E-E ed. 5
20.07.2007	1.06.xx	6	2	7 digits for values, new correction constants introduced, new sensor model 39/XR introduced	IM 01R04B04-00E-E ed. 6
07.02.2008	1.07.xx	7	3	Standard concentration measurement added, temperature offset compensation and sensor correction constants introduced	IM 01R04B04-00E-E ed. 7
24.03.2011	1.08.xx	8	4	Additional totalizer with free assignment, new handling for non-SI units, improved scrolling in menu and input of numbers	IM 01R04B04-00E-E ed. 8
01.10.2012	1.08.20	8	4	Additional data for RCCS30LR	IM 01R04B04-00E-E ed. 9
17.14.2014	1.08.40	9	4	Improved reaction time of slug flow detection function	IM 01R04B04-00E-E ed. 11

Blank Page

APPENDIX 2. Safety Instrumented Systems Installation

WARNING

The contents of this appendix are cited from exida.com safety manual on the Rotamass 3 series Coriolis Mass Flow and Density meter specifically observed for the safety transmitter purpose. When using the Rotamass 3 for Safety Instrumented Systems (SIS) application, the instructions and procedures in this section must be strictly followed in order to preserve the transmitter for that safety level.

A2.1 Scope and Purpose

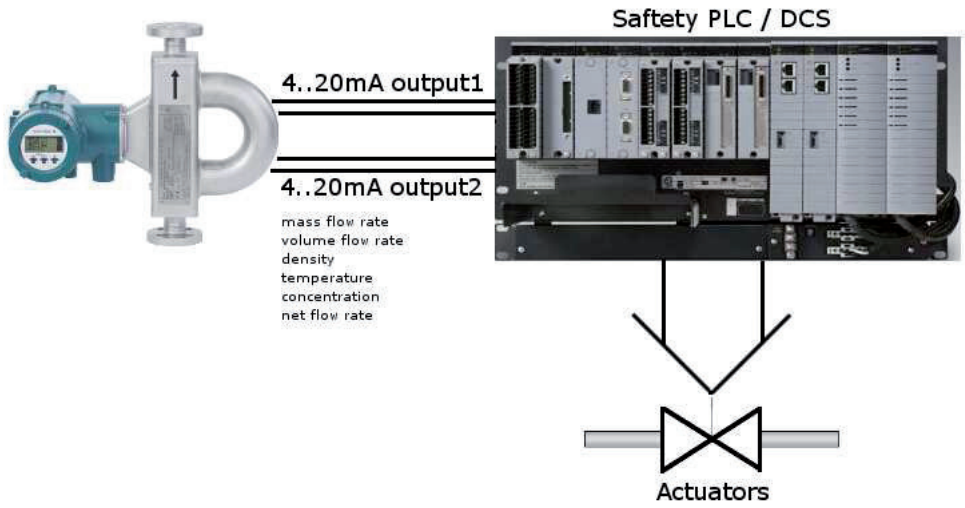
This document provides an overview of the user responsibilities for installation and operation of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter in order to maintain the designed safety level. Items that will be addressed are proof testing, repair and replacement of the flowmeter, reliability data, lifetime, environmental and application limits, and parameter settings.

A2.2 Using Rotamass 3 for a SIS Application

A2.2.1 Safety Function

This flowmeter is intended for use as a mass flow, fluid density and fluid temperature measurement component in a Safety Instrumented System. It has two 4-20 mA analog outputs, two passive pulse outputs/ status outputs and one status input. The flowmeter may be used with the two 4 – 20 mA outputs to feed signals to a logic solver that is part of the safety instrumented function (SIF) as shown in Figure A2-1. The fault annunciation mechanism is an out of range analog current. In order to take credit for the automatic diagnostics in the flowmeter, this annunciation mechanism must be connected.

Figure A2-1 Example Safety Instrumented Function



A2.2.2 Safety Accuracy

The flowmeter has a specified safety accuracy of 2%. This means that internal component failures are listed in the device failure rate if they will cause an error of 2% or greater.

A2.2.3 Diagnostic Response Time

The flowmeter will report an internal failure within 3 minutes of fault occurrence for amplitude errors and within 1 second of fault occurrence for all other errors (e. g. frequency error, signal fault).

A2.2.4 Setup

During installation the flowmeter must be setup with engineering unit parameters. This is typically done with a handheld device. These parameters must be verified during the installation to insure that the correct parameters are in the flowmeter. Engineering range parameters can be verified by reading these parameters from the optional local display or by checking actual calibration of the flowmeter.
Calibration of the flowmeter must be done after parameters are set.

A2.2.5 Proof Testing

The objective of proof testing is to detect failures within the flowmeter that are not detected by the diagnostics of the flowmeter. Of main concern are undetected failures that prevent the safety instrumented function from performing its intended function. The frequency of the proof tests (or the proof test interval) is to be determined in the reliability calculations for the safety instrumented functions for which the flowmeter is applied. The actual proof tests must be performed more frequently or as frequently as specified in the calculation in order to maintain required safety integrity of the safety instrumented function. The following tests need to be specifically executed when a proof test is performed. The results of the proof test need to be documented and this documentation should be part of a plant safety management system. Failures that are detected should be reported to Yokogawa.

Step	Action
1.	Bypass the safety function and take appropriate action to avoid a false trip
2.	Verify current output with flow tube filled and zero flow rate within stated accuracy
3.	Verify reasonability of current output with flow tube filled at two different flow rates able to be independently estimated to approximately 10% accuracy
4.	Use display or digital communications to retrieve process temperature measurement and verify against independent measurement
5.	Use display or digital communications to retrieve any diagnostics and take appropriate action.
6.	Use display or digital communications to send the flowmeter to the high and low alarm level output state current and verify that the analog current reaches these values [1].
7.	Remove the bypass and otherwise restore normal operation

[1] This tests low loop voltage and high loop impedance related failures.

When all the tests listed above are executed a proof test coverage of 71.8% can be claimed.
This proof test in combination with automatic diagnostics will detect 94% of possible DU failures.
The following tools need to be available to perform proof testing.
- Flowmeter display or alternatively for digital communication: HART Handheld, PRM or FieldMate
- Measurement instrument to verify output current
- Reference temperature measurement as close as possible to the meter under test.

The person(s) performing the proof test of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter should be trained in SIS operations including bypass procedures, flowmeter maintenance and company management of change procedures.

A2.2.6 Repair and Replacement

Maintenance information can be found in section 8, Self-diagnostic and Troubleshooting of the User's Manual ROTAMASS 3 Series Coriolis Mass Flow and Density Meter Integral Type RCCT3, Remote Type RCCF31 + RCCS3, Remote Type RCCR31 + RCCS3, IM 01R04B04-00E-E.
If repair is to be performed with the process online the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter will need to be bypassed during the repair. The user should setup appropriate bypass procedures for that.
Contact the Yokogawa sales office if this instrument requires repair
The person(s) performing the repair and / or replacement of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter should have a sufficient skill level.

A2.2.7 Startup Time

The flowmeter will generate a valid signal within 35 seconds of power-on startup with the default 3 second dampening time. Increasing the configurable dampening time adds to the startup time.

A2.2.8 Firmware Update

In case firmware updates are required they will be performed at factory. The replacement responsibilities are then in place. The user will not be required to perform any firmware updates.

A2.2.9 Reliability Data

A detailed Failure Mode, Effects, and Diagnostics Analysis (FMEDA) report is available from Yokogawa with all failure rates and failure modes. The Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter is intended for use in a Low Demand Mode. Low Demand Mode means the average interval between dangerous conditions occurs infrequently.
The Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter is certified up to SIL2 for use in a simplex (1oo1) configuration, depending on the PFDavg calculation of the entire Safety Instrumented Function. The development process of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter is certified up to SIL3, allowing redundant use, with hardware fault tolerance of 1, of the flowmeter up to this Safety Integrity Level, depending the PFDavg calculation of the entire Safety Instrumented Function. When using the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter in a redundant configuration, the use of a common cause factor (β-factor) of 2% is suggested.

A2.2.10 Lifetime Limits

The expected lifetime of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter is 10 years. The reliability data listed in A2.2.9 is only valid for this period. The failure rates of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter may increase sometime after this period. Reliability calculations based on the data listed in A2.2.9 for Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter lifetimes beyond 10 years may yield results that are too optimistic, i.e. the calculated Safety Integrity Level will not be achieved.

A2.2.11 Required Parameter Settings

The following parameters need to be set in order to maintain the designed safety integrity.

High – Low (Burn-out) jumper	To specify if the output should go high ($\geq$ 21.6 mA) or low ($\leq$ 3.6 mA) upon detection of an internal failure.
Write Protect (Security)	The write function should be disabled.

A2.2.12 Environmental Limits

The environmental limits of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter are specified in the User's Manual, ROTAMASS 3 Series Coriolis Mass Flow and Density Meter, Integral Type RCCT3, Remote Type RCCF31 + RCCS3, Remote Type RCCR31 + RCCS3, IM 01R04B04-00E-E.

A2.2.13 Application Limits

The application limits of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter are specified in the User's Manual, ROTAMASS 3 Series Coriolis Mass Flow and Density Meter, Integral Type RCCT3, Remote Type RCCF31 + RCCS3, Remote Type RCCR31 + RCCS3, IM 01R04B04-00E-E. If the flowmeter is used outside of the application limits the reliability data listed in A2.2.9 becomes invalid.

A2.3 Definitions and Abbreviations

A2.3.1 Definitions

Safety	Freedom from unacceptable risk of harm
Functional Safety	The ability of a system to carry out the actions necessary to achieve or to maintain a defined safe state for the equipment / machinery / plant / apparatus under control of the system
Basic Safety	The equipment must be designed and manufactured such that it protects against risk of damage to persons by electrical shock a other hazards and against resulting fire and explosion. The protection must be effective under all conditions of the nominal operation and under single fault condition
Verification	The demonstration for each phase of the life-cycle that the (output) deliverables of the phase meet the objectives and requirements specified by the inputs to the phase. The verification is usually executed by analysis and / or testing
Validation	The demonstration that the safety-related system(s) or the combination of safety-related system(s) and external risk reduction facilities meet, in all respects, the Safety Requirements Specification. The validation is usually executed by testing
Safety Assessment	The investigation to arrive at a judgment - based on evidence - of the safety achieved by safety-related systems

Further definitions of terms used for safety techniques and measures and the description of safety related systems are given in IEC 61508-4.

A2.3.2 Abbreviations

FMEDA	Failure Mode, Effects and Diagnostic Analysis
SIF	Safety Instrumented Function
SIL	Safety Integrity Level
SIS	Safety Instrumented System
SLC	Safety Lifecycle

IM 01R04B04-00E-E 11th edition April 01, 2015 -00

REGISTERED TRADEMARKS

HART® : Registered trademark of HART Communication Foundation, Austin, TX, USA
MODBUS® : Registered trademark of MODBUS Organization
FOUNDATION™ Fieldbus : Registered trademark of the Fieldbus FOUNDATION, Austin, TX, USA
TRI-CLAMP® : Registered trademark of Ladish & Co., Inc., Kenosha, USA

YOKOGAWA ELECTRIC CORPORATION
World Headquarters
9-32, Nakacho 2-chome, Musashino-shi
Tokyo 180-8750
Japan
www.yokogawa.com

YOKOGAWA CORPORATION OF AMERICA
2 Dart Road
Newnan GA 30265
USA
www.yokogawa.com/us

YOKOGAWA EUROPE B.V.
Euroweg 2
3825 HD AMERSFOORT
The Netherlands
www.yokogawa.com/eu

YOKOGAWA ELECTRIC ASIA Pte. LTD.
5 Bedok South Road
Singapore 469270
Singapore
www.yokogawa.com/sg

YOKOGAWA CHINA CO. LTD.
3F Tower D Cartelo Crocodile Building
No.568 West Tianshan Road Changing District
Shanghai, China
www.yokogawa.com/cn

YOKOGAWA MIDDLE EAST B.S.C.(c)
P.O. Box 10070, Manama
Building 577, Road 2516, Busaiteen 225
Muharraq, Bahrain
www.yokogawa.com/bh

Yokogawa has an extensive sales and distribution network.
Please refer to the European website (www.yokogawa.com/eu) to contact your nearest representative.

YOKOGAWA ◆

IM 01R04B04-00E-E 11th edition April 01, 2015-00