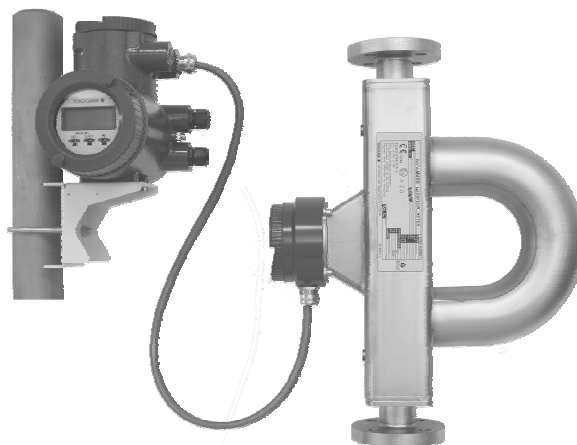
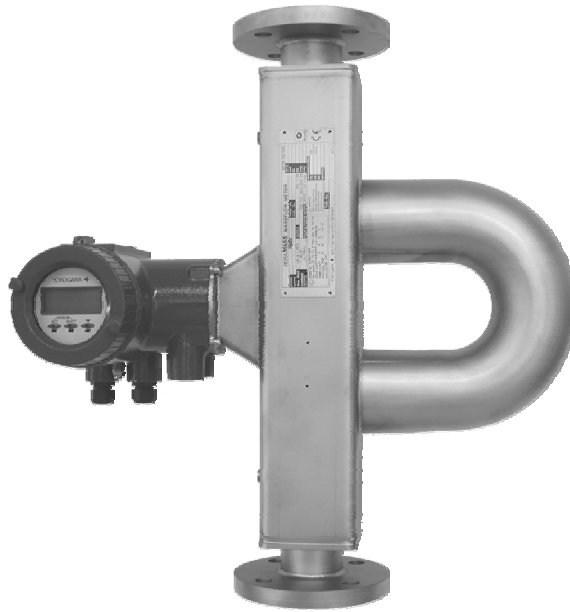


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Instruction  
Manual

ROTAMASS 3-Series  
Coriolis-Massflowmeter  
Integral Type RCCT3  
Remote Type RCCF31 + RCCS3

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# **1 Safety Instructions**

## **1.1 General**

These Safety instructions describe all necessary safety items to handle the flowmeter ROTAMASS RCCT3, RCCF31 and RCCS3 without threatening lives and environment. Before use of the instrument, read this manual thoroughly and familiarise yourself fully with the features, operations and handling of ROTAMASS to have the instrument deliver its full capabilities and to ensure its efficient and correct use.

In the case of misuse Yokogawa will not take any liability.

ROTAMASS may only be operated by persons who have been trained, briefed and authorised. These persons must be familiar with the operating manual and act in accordance with it. The respective areas of authority of the operating personnel must be clearly defined.

### **Notices regarding this manual**

This manual should be passed to the end user.

The contents of this manual are subject to change without prior notice.

All rights reserved. No part of this document may or be reproduced transmitted in any form or by any means without the written permission of Yokogawa.

This manual neither does warrant the marketability of this instrument nor does it warrant that the instrument will suit a particular purpose of the user.

Every effort has been made to ensure accuracy in the contents of this manual.

However, should any questions arise or errors come to your attention, please contact your nearest Yokogawa sales office that appears on the back of this manual or the sales representative from which you purchased the product. This manual is not intended to cover all aspects of models with custom specifications. Revisions may not always be made in this manual in conjunction with changes in specifications, constructions and/or components if such changes are not deemed to interfere with the instrument's functionality or performance.

## SAFETY INSTRUCTIONS

---

### Notices regarding safety and modification

The above listed products developed according EN 61010 ' Protection measures for electronic equipment for measurement, control, regulation and laboratory procedures '. For the protection and safety of personnel, the instrument and the system comprising the instrument, be sure to follow the instructions on safety described in this manual when handling the product. If you handle the instrument in a manner contrary to these instructions, Yokogawa does not guarantee safety.

If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.

As for explosion proof models, if you repair or modify the instrument by yourself and fail to return it to its original form, the explosion-protected design of the instrument may be effected, creating a hazardous condition. Be sure to consult Yokogawa for repairs and modifications.

**The following safety symbols and cautionary notes are used on the product and in this manual .**



#### **WARNING**

This symbol is used to indicate that a hazardous condition will result which, if not avoided, may lead to loss of life or serious injury. This manual describes how the operator should exercise care to avoid such a risk.



#### **CAUTION**

This symbol is used to indicate that a hazardous condition will result which, if not avoided, may lead to minor injury or material damage. This manual describes how the operator should exercise care to avoid a risk of bodily injury or damage to the instrument.



#### **IMPORTANT**

This symbol is used to call your attention to a condition that must be observed in order to avoid the risk of damage to the instrument or system problems.

**NOTE**

This symbol is used to call your attention to information that should be referred to in order to know the operations and functions of the instrument.

**Warranty**

- The warranty of this instrument 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.
- Please contact with our sales office when this instrument is damaged
- If the instrument has trouble, please inform us model code, serial number, and concrete substances or situations. It is preferable to be attached a outline or data.
- Please consent to the followings for causes of damages that are not available as free repair, even if it occurred during the guaranteed term.

A : Unsuitable or insufficient maintenance by the customer.

B : The handling, using, or storage that ignore the design and specifications of the instrument.

C : Unsuitable location that ignore the description in this manual.

D : Remaking or repair by a person except whom we entrust.

E : Unsuitable removing after delivered.

F : A natural disaster (ex. a fire, earthquake, storm and flood, thunderbolt) and external causes.

## SAFETY INSTRUCTIONS

---

### For the safety using



#### **WARNING**

- The flowmeters are heavy instruments. Please give attention to prevent that persons are injured by carrying or installing. It is preferable for carrying the instrument to use a cart and be done by two or more persons.
- In wiring, please confirm voltages between the power supply and the instrument before connecting the power cables. And also, please confirm that the cables are not powered before connecting.
- When removing the instrument from hazardous processes, avoid contact with the fluid and the interior of the meter.
- In case of Explosion proof type instrument, further requirements and differences are described in chapter "Instruction for Explosion Protected Instruments".  
The description this chapter is prior to other description in this instruction manual.

### **Storage Precautions**

In case the instrument is expected to be stored over a long term, please give attention to the followings ;

- The instrument should be stored in its original packing condition.
- The storage location should be selected according to the following conditions:
  - 1) The location where it is not exposed to rain or water.
  - 2) The location where there is few vibration or shock.
  - 3) Temperature and humidity should be as described in the technical data of the IM.

### **Installation Location Precautions**

Please select the installation location considering the following items to ensure long term stable operation of the flowmeter.

- Ambient Temperature : Please avoid to install the instrument at the location where temperature changes continuously. If the location receives radiant heat from the plant, provide heat insulation or improve ventilation.
- Atmospheric Condition : Please avoid to install the instrument in an corrosive atmosphere. In case of installing in the corrosive atmosphere, please keep ventilating sufficiently and prevent rain from entering the conduit.



## Installation



### **WARNING**

The instruments must be installed by expert engineer or skilled personnel according to the procedures described in the chapter „Installation„. The procedures described in the chapter „Installation„ of the IM are not permitted for operators.



### **CAUTION**

Please design the correct piping referring to the followings to prevent damage for flowmeter and to keep correct measuring.



### **CAUTION**

Please install the flowmeter to the location where it is not exposed to direct sunlight. Ambient temperature range is given in the technical data.

## **Cleaning Precautions**

Care should be taken to prevent the build-up of dirt, dust or other material on the display glass. Such build-up may interfere with the operation of programming keys.

## SAFETY INSTRUCTIONS

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### Wiring precautions



#### CAUTION

- The wiring must be executed by expert engineer or skilled personnel according the procedures described in the IM.
- Please do not connect cables outdoors in case of rain to prevent damages from dew formation and to keep insulation inside the terminal box of the flowmeter.
- Power cables and signal wire ends are to be provided with round crimp-on terminal.
- Power cable and output signal cables must be routed separate.
- When waterproof glands or union equipped waterproof glands are used, the glands must be properly tightened to keep the box watertight.
- Please install a external switch or circuit breaker as a means of power off (capacitance:15A, conform to IEC 947-1 and IEC 947-3). The preferable location is either near the instrument or other places to easy operation. Furthermore, please indicate "power off equipment" on those external switch or circuit breaker.



#### CAUTION

- Please be sure to fully tighten the covers before the power is turned on. After tightening the covers, please be sure to fix it with the special screw using a hexagonal wrench attached, if necessary
- Please be sure to turn off the power before opening the covers.

### Hints for Unit Safety (according DIN EN 61010)

- Heed the nominal voltage indicated on the nameplate.
- The electrical connections have to be executed according to VDE0100 "Errichten von Starkstromanlagen mit Nennspannungen bis 1000V" (Installation of high current assemblies with nominal voltages up to 1000V) or equivalent national regulations.
- For units with a nominal voltage of 115 V or 230 V the correspondingly marked terminal has to be connected to protective earth (PE).
- Units with a nominal voltage of 24 V may only be connected to a protected low voltage circuit (SELV-E according to VDE0100/VDE 0106 or IEC 364/IEC 536). The function ground terminal has to be connected to ensure electro-magnetic interference protection.

## 1.2 Instruction for explosion protected instruments

This procedure 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 käyttöohjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä.

Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellänne, 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 αντιπροσωπο της.

## SAFETY INSTRUCTIONS

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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.

### Prohibition of specification changes and modifications






### WARNING

Users are prohibited from making any modifications of specifications or physical configuration, such as adding or changing the configuration of external wiring ports.

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

Integral types RCCT34, RCCT36, RCCT38 and RCCT39  
are certified as:

Certificate No. : KEMA 02 ATEX2183 X  
Group II, category 2

Marking    II 2 GD T 150°C

Remote detector RCCS3x is certified as:

Certificate No. : KEMA 01 ATEX1075 X  
Group II, category 2

Marking    II 2 G

Remote converter RCCF31 is certified as:

Certificate No. : KEMA 02 ATEX2183 X  
Group II, category 2

Marking    II 2 GD T 70°C



## SAFETY INSTRUCTIONS

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### Technical Data of RCCF31

Degree of protection : IP67  
Ambient temperature : -20°C to +50°C  
Ambient humidity : 0 to 95% RH  
Power supply : 90 to 250V AC, 50 / 60 Hz  
20.5 to 28.8V DC

Power consumption : max. 25VA / 10W

Data for intrinsic safe (ia) outputs (/KF2) :

Output	Term.	Ui	Ii	Pi	Ci	Li
Current (analog)	Iout1+ / Iout1-	30V	165mA	1.25W	6.91nF	negligible
Pulse	Pout1+ / Pout1-	30V	100mA	0.75W	4.51nF	negligible

Output data for detector connection ( barrier type 1):

Circuit	Term.	Uo	Io	Po	Lo	Co
Drive	D+/D-	14.5V	47mA	171mW	15mH	0,65µF
Sensor 1	S1+/S1-	14.5V	47mA	171mW	15mH	0,65µF
Sensor 1	S2+/S2-	14.5V	47mA	171mW	15mH	0,65µF
Temperature	TP1/TP2 /TP3	13.3V	40mA	133mW	20mH	0,91µF

Output data for detector connection ( barrier type 2):

Circuit	Term.	Uo	Io	Po	Lo	Co
Drive	D+/D-	11.4V	52.3mA	150mW	12mH	1.71µF
Sensor 1	S1+/S1-	11.4V	52.3mA	150mW	12mH	1.71µF
Sensor 1	S2+/S2-	11.4V	52.3mA	150mW	12mH	1.71µF
Temperature	TP1/TP2 /TP3	10.2V	30mA	77mW	39mH	2,75µF

The type of barrier, which is installed, is written on the name plate.

**Technical Data RCCS3**Specification standard version:

Ambient temperature range :	-50°C ... +80°C
Medium temperature range :	-40°C ... +220°C
Temperature range of heat carrier fluid :	-50°C ... +220°C

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

Temperature class	RCCS30 to RCCS33		RCCS34 to RCCS39	
	Max. ambient temperature	Max. medium temperature / temp. of heat carrier fluid	Max. ambient temperature	Max. medium temperature / temp. of heat carrier fluid
T6	≤ 50°C	≤ 60°C	≤ 40°C	≤ 40°C
T5	≤ 50°C	≤ 80°C	≤ 55°C	≤ 55°C
T4	≤ 80°C	≤ 100°C	≤ 80°C	≤ 100°C
	≤ 50°C	≤ 120°C	≤ 40°C	≤ 120°C
T3	≤ 80°C	≤ 150°C	≤ 80°C	≤ 160°C
			≤ 40°C	≤ 180°C
T2	≤ 80°C	≤ 150°C	≤ 80°C	≤ 220°C

Specification High-temperature-version (Option HT):

Ambient temperature range:	-50°C ... +75°C
Medium temperature range:	0°C ... +350°C
Temperature range of heat carrier fluid :	0°C ... +350°C

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

Temperature class	Max. ambient temperature	Max. medium temperature / temperature of heat carrier fluid
T6	≤ 65°C	≤ 65°C
T5	≤ 75°C	≤ 75°C
T4	≤ 70°C	≤ 115°C
T3	≤ 70°C	≤ 180°C
T2	≤ 65°C	≤ 275°C
T1	≤ 45°C	≤ 350°C

## SAFETY INSTRUCTIONS

### Electrical Data: (safety relevant maximum values)

Circuit	Term.	Detector	Ex group	Ui	Ii	Pi	Li	Ci
Drive	D+/D-	RCCS30...33	IIB	16V	153mA	612mW	4.2mH	Negli- gible
			IIC	16V	53mA	212mW	4.2mH	
		RCCS34...39	IIB	16V	153mA	612mW	3.2mH	Negli- gible
			IIC	16V	53mA	212mW	3.2mH	
Sensor 1	S1+/S1-	RCCS30...33	IIC	16V	80mA	320mW	4.2mH	Negli- gible
		RCCS34...39	IIC	16V	80mA	320mW	2.1mH	
Sensor 2	S2+/S2-	RCCS30...33	IIC	16V	80mA	320mW	4.2mH	Negli- gible
		RCCS34...39	IIC	16V	80mA	320mW	2.1mH	
Temperature	TP1/TP2/TP3	RCCS30...33	IIC	16V	50mA	200mW	Negli- gible	Negli- gible
		RCCS34...39		16V	50mA	200mW		

### Installation precautions of Integral type RCCT3



#### WARNING

1. EEx type RCCT3x 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 EEx e use. For EEx 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.

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

RCCT3x-x xx M : EEx e types are enclosed. These cable glands can also be used for “dust application” (D).

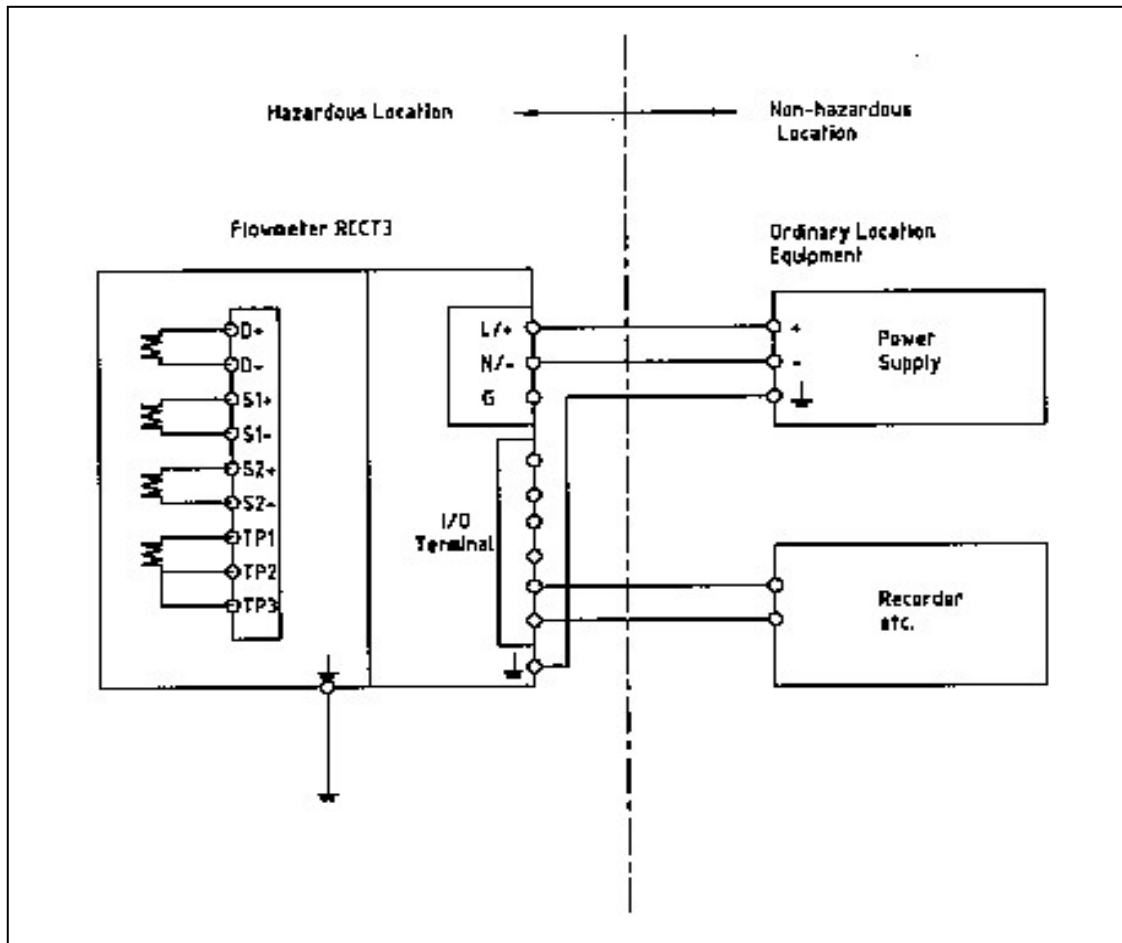
Use ATEX-certified EEx d cable glands for EEx d condition.

RCCT3x-xxx A : No cable glands are enclosed. Use the ATEX-certified cable glands, suitable for the conditions of use (EEx de or EEx d or dust application).

For “dust application” (D) use cable glands with minimum IP67 protection !



## Installation diagram RCCT3

**WARNING**

Converter case must have connection to a suitable IS earthing system.

### Installation precautions of Remote type RCCF31 with RCCS3



#### WARNING

1. EEx 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

RCCF31x-x xx M : EEx e types are enclosed. These cable glands can also be used for “dust application” (D).

Use ATEX-certified EEx d cable glands for EEx d condition.

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

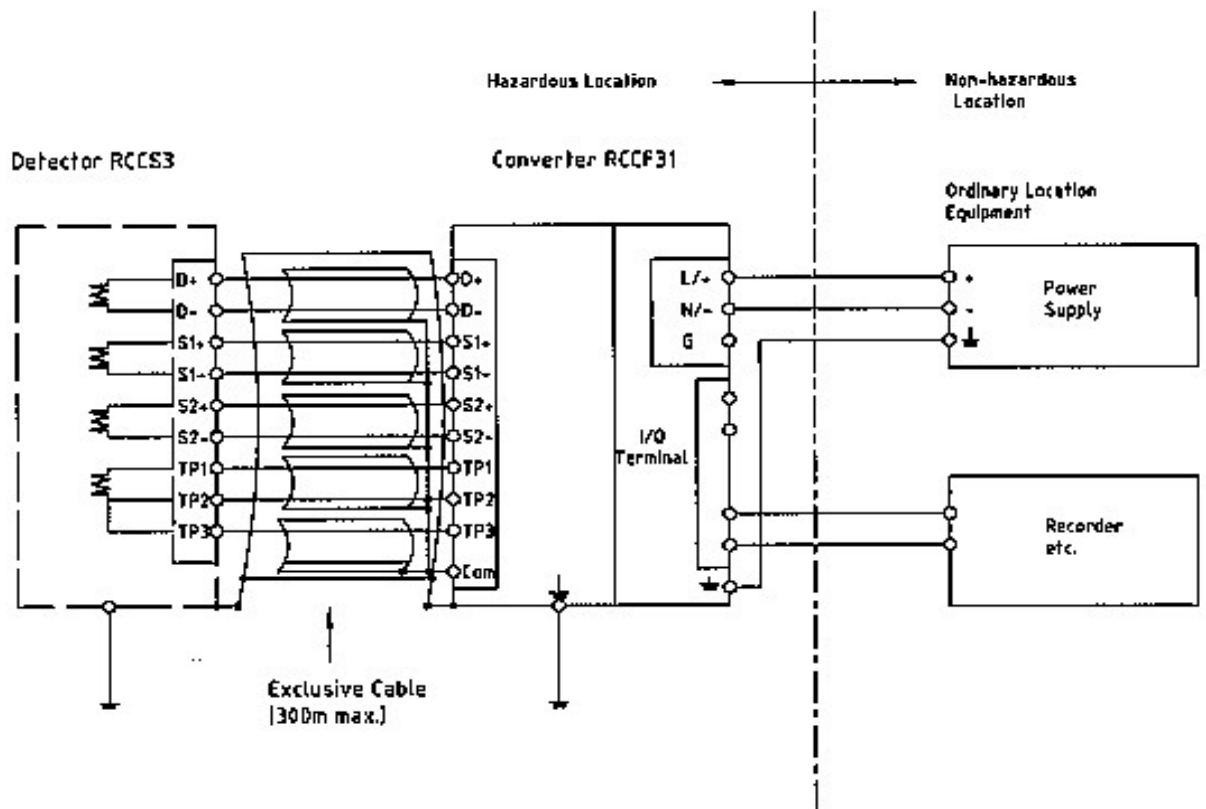
For “dust application” (D) use cable glands with minimum IP67 protection !

#### Cable glands for detector connection terminal

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

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

**Installation diagram RCCF31 with RCCS3**



**CAUTION**

Converter and detector case must have connection to a suitable IS earthing system.

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.

# SAFETY INSTRUCTIONS

## Name plates :

RCCT3 Option /KF1 :

ROTAMASS MASSFLOW METER		METER FACTORS	
MODEL		SK 20	
SERIAL- No.		SKT	
AMB. TEMP.	-20 to +50°C	RV	
CURRENT OUTPUT	4 - 20mA = (20 - 600 Ω)	KD	
SUPPLY	VDC = 10W	FTC 1	
		VAC ~ 47-63Hz 10W	
		PULSE : STATUS OUTPUT 30VDC = 200mA max.	
CE 0344	Ex II 2 GD T150°C	MANUFACTURED	N200
KEMA02ATEX2183X		PS	
EEx d [Ib] IIC T6...T3 or EEx de [Ib] IIC T6...T3		TS	
DIODE SAFETY BARRIER Um : 250Voc/dc - BARRIER TYPE 1		PT	
TEMP. CLASS T6 T5 T4 T3 ENCLOSURE: IP67		MATERIAL	
PROCESS TEMP. 65 80 115 150°C SEE CERTIFICATE FOR DATA		TAG. No.	
YOKOGAWA Made in Germany by ROTA YOKOGAWA, RheinstraÙe 8, D-79664 Wehr			22-5479.31/B

RCCT3 Option /KF2 :

ROTAMASS MASSFLOW METER		METER FACTORS	
MODEL		SK 20	
SERIAL- No.		SKT	
AMB. TEMP.	-20 to +50°C	RV	
CURRENT OUTPUT	4 - 20mA = (20 - 600 Ω)	KD	
SUPPLY	VDC = 10W	FTC 1	
		VAC ~ 47-63Hz 10W	
		PULSE : STATUS OUTPUT 30VDC = 200mA max.	
CE 0344	Ex II 2 GD T150°C	MANUFACTURED	N200
KEMA02ATEX2183X		PS	
EEx d [Ia][Ib] IIC T6...T3 or EEx de [Ia][Ib] IIC T6...T3		TS	
DIODE SAFETY BARRIER Um : 250Voc/dc - BARRIER TYPE 1		PT	
TEMP. CLASS T6 T5 T4 T3 ENCLOSURE: IP67		MATERIAL	
PROCESS TEMP. 65 80 115 150°C SEE CERTIFICATE FOR DATA		TAG. No.	
YOKOGAWA Made in Germany by ROTA YOKOGAWA, RheinstraÙe 8, D-79664 Wehr			22-5479.32/B

RCCF31 Option /KF1 :




ROTAMASS MASSFLOW CONVERTER		METER FACTORS	
MODEL		SK 20	
SERIAL- No.		SKT	
MANUFACTURED	AMB. TEMP. -20 to +50°C	RV	
CE 0344	Ex II 2 GD T70°C	KD	
KEMA02ATEX2183X		FTC 1	
EEx d [Ia][Ib] IIC T6 or EEx de [Ia][Ib] IIC T6		MANUFACTURED	N200
DIODE SAFETY BARRIER U : 250V		PS	
ENCLOSURE: IP67		TS	
SEE CERTIFICATE FOR DATA		PT	
BARRIER TYPE 1		MATERIAL	
YOKOGAWA Made in Germany by ROTA YOKOGAWA, RheinstraÙe 8, D-79664 Wehr		TAG. No.	
			30-0220.1/B

RCCF31 Option /KF2 :




ROTAMASS MASSFLOW CONVERTER		METER FACTORS	
MODEL		SK 20	
SERIAL- No.		SKT	
MANUFACTURED	AMB. TEMP. -20 to +50°C	RV	
CE 0344	Ex II 2 GD T70°C	KD	
KEMA02ATEX2183X		FTC 1	
EEx d [Ia][Ib] IIC T6 or EEx de [Ia][Ib] IIC T6		MANUFACTURED	N200
DIODE SAFETY BARRIER U : 250V		PS	
ENCLOSURE: IP67		TS	
SEE CERTIFICATE FOR DATA		PT	
BARRIER TYPE 1		MATERIAL	
YOKOGAWA Made in Germany by ROTA YOKOGAWA, RheinstraÙe 8, D-79664 Wehr		TAG. No.	
			30-0220.2/B

□ beside CE-mark : number of certified body according PED, only for sizes greater than DN 25

RCCS30 ... 33 Option /KS1 :

ROTAMASS MASSFLOW METER		METER FACTORS	N200
MODEL			
SERIAL-No.		SKT	
  0344 II 2 G KEMA 01 ATEX 1075 X EEx ib IIC / IIB Bitte Bescheinigung beachten Certification kindly to be noticed Veuillez faire attention au certificat	MANUFACTURED	RV	
	PS	KD	
	TS	fI 20	
	PT	FTC1	
	MATERIAL		
TAG. No.			
YOKOGAWA  Made in Germany by ROTA YOKOGAWA, Rheinstraße 8, D-79664 Wehr		22-7017.1/a	

RCCS34 ... 39 Option /KS1 :

ROTAMASS MASSFLOW METER		METER FACTORS	N200
MODEL			
SERIAL-No.	COM-No.	SKT	
  0344 II 2 G KEMA 01 ATEX 1075 X EEx ib IIC / IIB Bitte Bescheinigung beachten Certification kindly to be noticed Veuillez faire attention au certificat	MANUFACTURED	RV	
	PS	KD	
	TS	fI 20	
	PT	FTC1	
	MATERIAL		
TAG. No.			
YOKOGAWA  Made in Germany by ROTA YOKOGAWA, Rheinstraße 8, D-79664 Wehr		22-5479.41/a	

beside CE-mark : number of certified body according PED, only for sizes greater than DN 25

## Operating instructions

If the cover of the converter case has to be opened, following instructions must be followed.



### CAUTION

1. Confirm that the power cables to the instrument are disconnected.
2. The covers of display side and terminal box are fixed with special screws, please use Hexagonal Wrench to open the covers.
3. Be sure to lock the cover with special screw using the Hexagonal Wrench after tightening the cover. (see drawing chapter 4.3)
4. When opening the cover of the converter case, wait more than 15 minutes after disconnecting the power.
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.

### 1.3 Instructions according EMC

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

#### 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 it 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.

ROTAMASS was developed according EMC Directive 89/336/EEC for electromagnetic compatibility.

ROTAMASS conforms with the following standards :

EN 55011 : 2000-05, class A group 1

EN 61326-1 : 2002-03

EN 61000-3-2 : 1998-10

EN 61000-3-3 : 1998-11

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 "INSTRUCTION FOR EXPLOSION PROTECTED INSTRUMENT". The description in this chapter is prior to other descriptions in this instruction manual.

## 1.4 Instructions according PED

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.

### Information of potential hazardous situations:

Note	In the following only the dangers ,which may appear with the pressure load of the unit , are considered. In connection with the accompanying electronics additional risks may appear, which requires corresponding precautions. Also precautions to reach the measuring precision are not considered.			
	Endangering by:	*)	Description	Remarks
<b>Medium</b>	max. / min temperature	Y	See instruction manual	retention by the operator
	Permitted pressure	Y	See instruction manual	
	Tightness of the unit	N	test before delivering	
	Corrosion resistance	Y	Retention of the user, materials for medium wetted parts see instruction manual	
	Abrasive components in the medium (e.g. sand)	Y	Because of functional reasons not allowed (see instruction manual)	
<b>Installation</b>	Tightness of installation	N	Retention of the user (see instruction manual)	
	Choice of the gaskets and tightness of the screws	N	Retention of the user (see instruction manual)	
	Forces of the pipe on unit	Y	To prevent by functional reasons, therefore not to consider (see instruction manual)	
	Water blow	Y	To prevent by functional reasons, therefore not to consider (see instruction manual)	
	Take care of remaining medium in the unit at removal	N	Retention of the user (see instruction manual)	
	Flow direction in the unit	N	see instruction manual and marking on the unit	After installation with wrong flow direction only indication error ( wrong sign)
	Installation position of the unit	N	see instruction manual	At wrong installation position only measuring disturbances
<b>Outer influence</b>	Permitted ambient conditions (temperature, humidity)	Y	see instruction manual	
	External fire	Y	Danger of: - Rise in pressure by temperature - - Damage of gaskets	Check by user
	Earthquake resistance	Y	Danger of: - Damage of the mounting screws	Check by user
	*) Endangering potential acc. PED: Y = Yes N = No			

## SAFETY INSTRUCTIONS

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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))

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 Stoomwezen; Weena-Zuid 168; NL-3012 NC Rotterdam

ID-No. **0343**

Number is printed on name plates (see chapter 1.2).

For the application the following notes have to be noticed :

Permitted maximum operating temperatures:

The pressure relevant temperature limits of the detector are : -200 to 400°C

These limits are reduced by measuring boundary conditions :

    Generall : -40 to 150°C

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 <sup>1)</sup>		Medium temperature								
		to 30°C	50°C	100°C	150°C	200°C	250°C	300°C	350°C	
<b>A1</b>	Flange acc. ASME B16.5 Class 150	<b>15.9 bar</b>	15.3 bar	13.2 bar	12.0 bar	11.0 bar	10.2 bar	9.7 bar	8.4 bar	
<b>A2</b>	Flange acc. ASME B16.5 Class 300	<b>41.4 bar</b>	40.0 bar	34.5 bar	31.2 bar	28.7 bar	26.7 bar	25.2 bar	24.0 bar	
<b>D2</b>	Flange acc. EN1092-1 PN16	<b>16 bar</b>	15.6 bar	14.2 bar	12.8 bar	11.7 bar	10.9 bar	10.3 bar	9.9 bar	
<b>D4</b>	Flange acc. EN1092-1 PN40	<b>40 bar</b>	39.1 bar	35.6 bar	32.0 bar	29.3 bar	27.2 bar	25.8 bar	24.7 bar	
<b>F4</b>	Internal thread G1/4" (RCCS30-33)	see Fig.11 "pressure/temperature rating"								
		Medium temperature								
		to 120°C			220°C		300°C		350°C	
<b>J1</b>	Flange acc. JIS B 2220 10K	<b>14 bar</b>			12 bar		10 bar		-----	
<b>J2</b>	Flange acc. JIS B 2220 20K	<b>34 bar</b>			31 bar		29 bar		26 bar	
		Medium temperature								
		to 140°C *)								
<b>S2</b>	Pipe connection acc. to DIN11851	to DN40		<b>40 bar</b>		*) under the restriction using suitable gasket materials				
		DN50 to DN100		<b>25 bar</b>						
		above DN100		<b>16 bar</b>						
		Medium temperature								
		to 150°C **)								
<b>S4</b>	Clamp connection acc. DIN32676	to DN50		<b>16 bar</b>		**) under the restriction using suitable clamp and gasket materials				
		above DN50		<b>10 bar</b>						
<b>S8</b>	Clamp connection for Sanitary OD-Tubing	to 2 in (2")		<b>16 bar</b>						
		above 2 in (2")		<b>10 bar</b>						

<sup>1)</sup> all process connections made of AISI 316L (1.4404 / 1.4435)

**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).

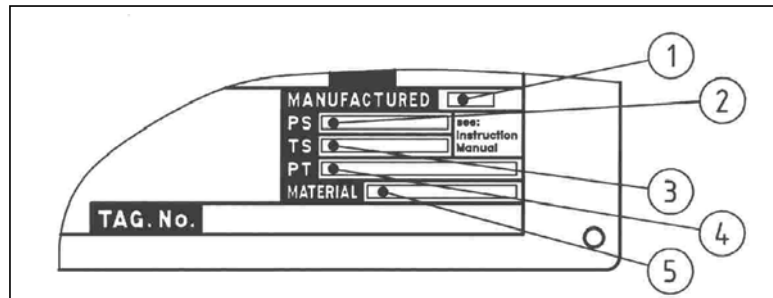
Special connections	Medium temperature								
	-200°C	RT	50°C	100°C	150°C	200°C	250°C	300°C	350°C
Flange ASME >300	100%	<b>100%</b>	94,2%	83,3%	75,8%	69,5%	64,3%	60,8%	58,0%
Flange DIN PNxxx	100%	<b>100%</b>	96,5%	55,5%	80,5%	74,3%	69,8%	64,5%	61,8%
other connections **)	100%	<b>100%</b>	96,5%	55,5%	80,5%	74,3%	69,8%	64,5%	61,8%
		<b>PS *)</b>							

\*) 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.

## SAFETY INSTRUCTIONS

PED-data on the name plate of RCCT3x



- 1) Year of manufacturing
- 2) Max. permitted pressure at room temperature, for other temperatures see table
- 3) Max. permitted temperature
- 4) Test pressure, for standard units without value, because in this case generally  $PT=1.43 \times PS$
- 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.

## 1.5 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 for 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 not 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, Na = not applicable,

Name of Product	Body		Converter housing		Cap with window		Electronics
Rotamass	SS	<b>R</b>	Al	<b>R</b>	Al + glass	<b>D</b>	<b>Sd</b>

In case of return of flowmeters to Yokogawa for testing or repair purposes please fillout the following form and send it with the equipment to YOKOGAWA.

## SAFETY INSTRUCTIONS

### FORM

Your flowmeter

has been carefully manufactured and tested by a company with ISO 9001 certification and volumetrically calibrated in one of the world's most accurate test rigs.

If installed and operated in accordance with the operating instructions, your flowmeter will rarely present any problems.

Should you nevertheless need to return a flowmeter for testing or repair, we kindly ask you to observe following imperative prerequisites:

Due to statutory regulations concerning protection of the environment and the health and safety of our personnel, Yokogawa may only handle, test and repair returned flow meters that have been in contact with liquids - if it is possible to do so - without any risk to personnel and environment. This means that Yokogawa can only service your flowmeter if it is accompanied by a certificate in line with the following confirmation that the flowmeter is safe to handle.

If the flowmeter has been operated with toxic, caustic, flammable or water-endangering liquids, you are kindly requested:

to check and ensure, if necessary by rinsing or neutralising, that all cavities in the flowmeter are free from such dangerous substances. (Directions on how to do you can get from Yokogawa on request) to enclose a certificate with the flowmeter confirming that the flowmeter is safe to handle and stating the instrument is free from liquid used. Yokogawa regrets that they cannot service your flow meters unless accompanied by such a certificate.

#### SPECIMEN Certificate

Company:

Address:

Department:

Name:

Telephone:

Fax:

The enclosed flowmeter:

Type:

Order or Series No.:

has been operated with following liquids:

Because this liquid is      water-endangering      toxic      caustic      flammable,  
we have checked that all cavities in the flowmeter are free from such substances  
flushed out and neutralised all cavities in the flowmeter

Please check applicable description.

We confirm that there is no risk to man or environment through any residual liquid contained in this flowmeter.

Date :

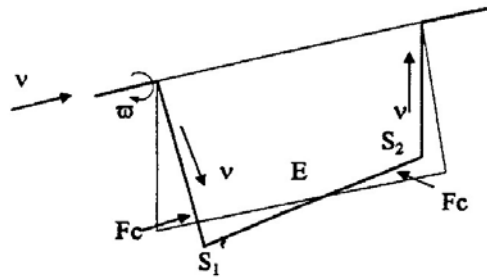
Signature :

Company stamp :

## 2 Product description

### 2.1 The Coriolis 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  $v$  through a tube that is rotating around an axis perpendicular to the direction of flow at angular velocity  $\omega$ .



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 slows down 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:

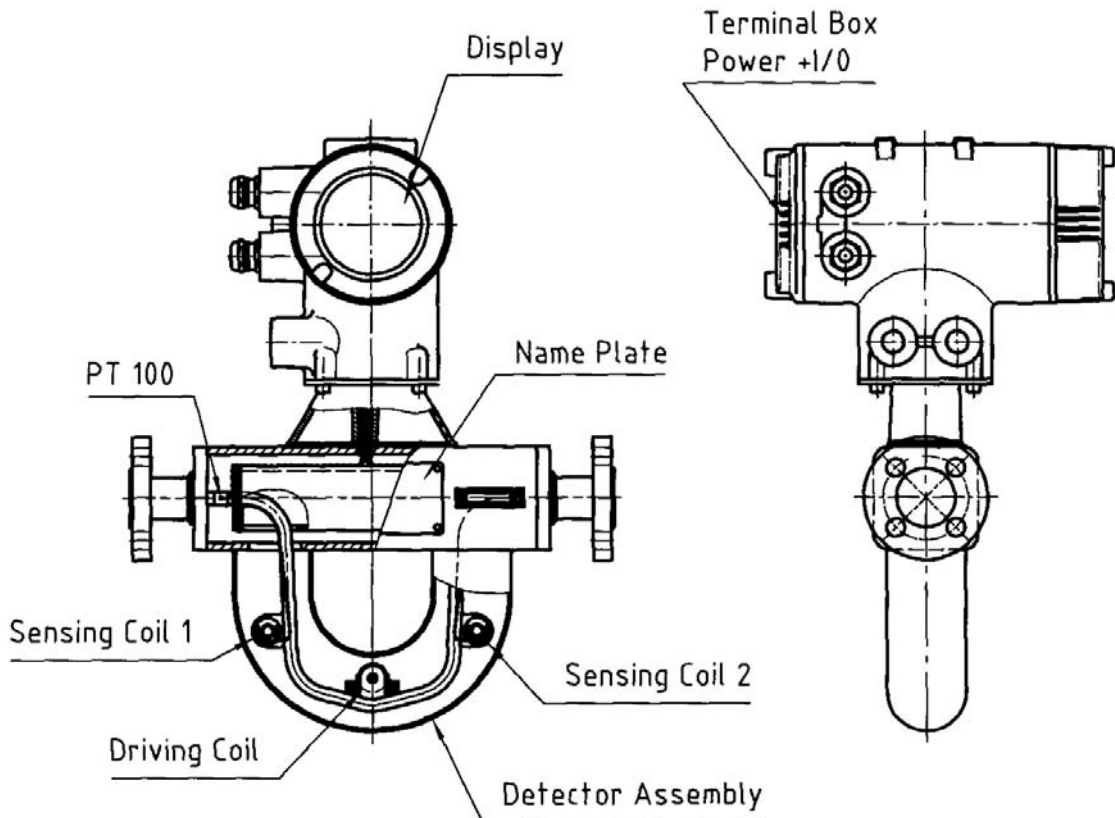
$$\vec{F}_c = -2 m (\vec{\omega} \times \vec{v})$$

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  $S_2$ .

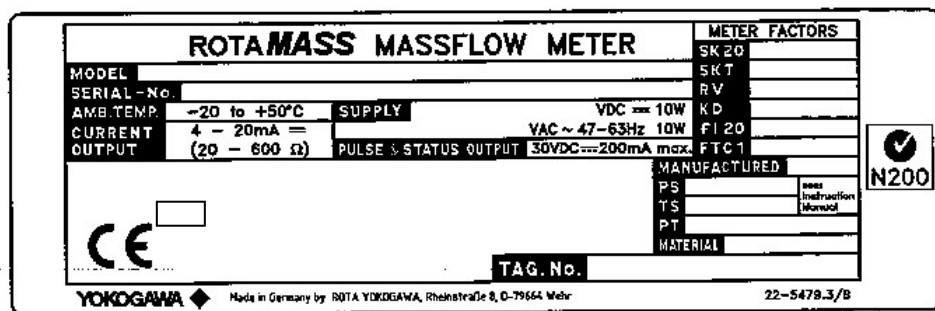
For practical exploitation of this physical principle, it is sufficient for the tube to perform sympathetic oscillations on a small section of a circular path. This is achieved by exciting the measurement tube at point  $E$  by means of an electromagnetic exciter.

## 2.2 The Integral Type RCCT3

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



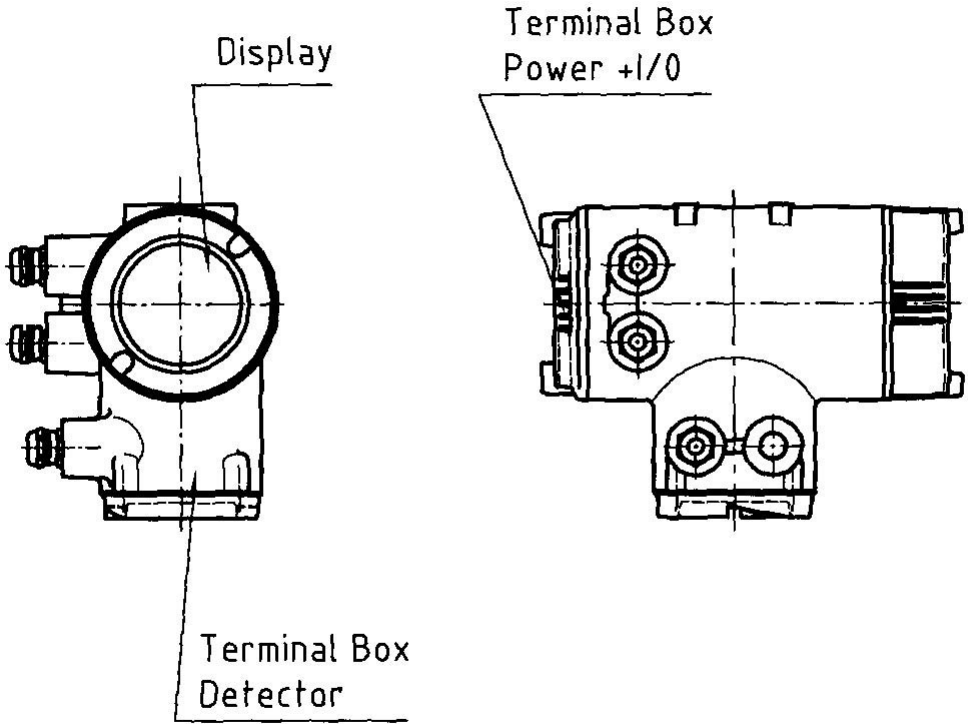
Name plate standard version :



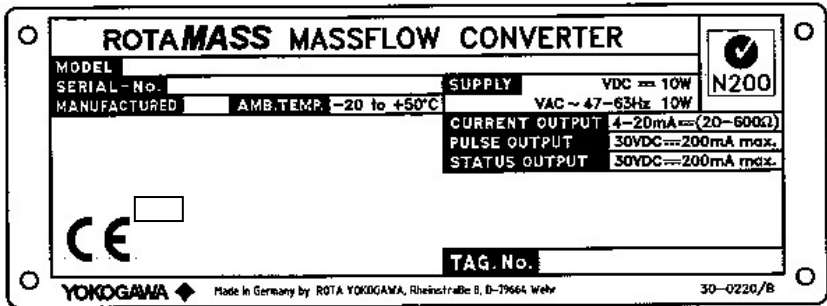
beside CE-mark : number of certified body according PED, only for sizes greater than DN 25

### 2.3 The Remote Converter RCCF31

The following drawing shows the general construction of remote converter.



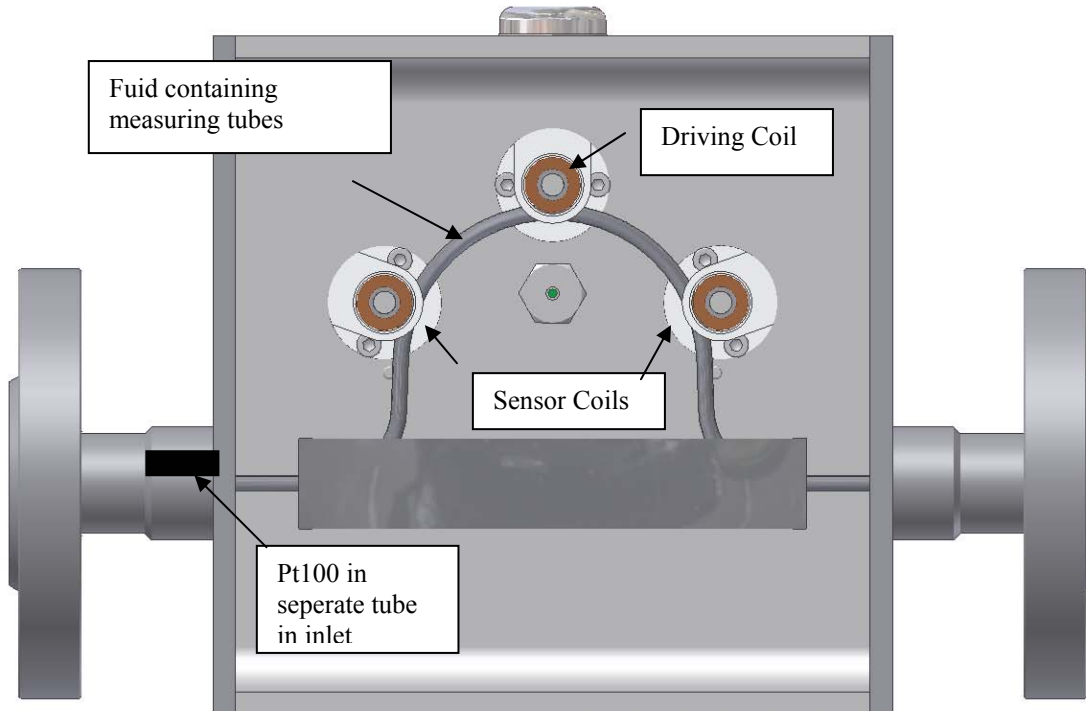
Name plate standard version :



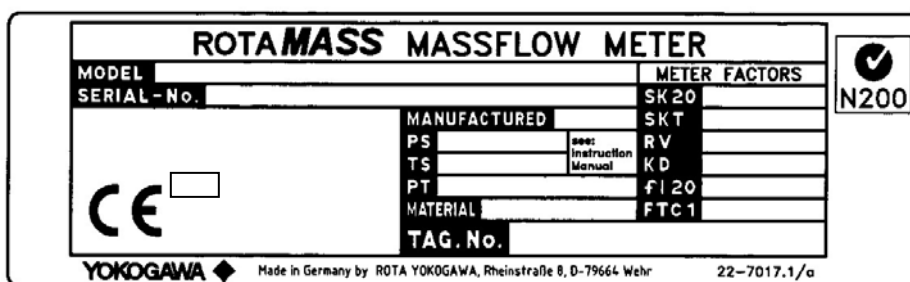
beside CE-mark : number of certified body according PED, only for sizes greater than DN 25

## 2.4 The Remote Detector RCCS30 to 33

The following drawing shows the general construction of remote detector RCCS30 to 33.



Name plate standard version

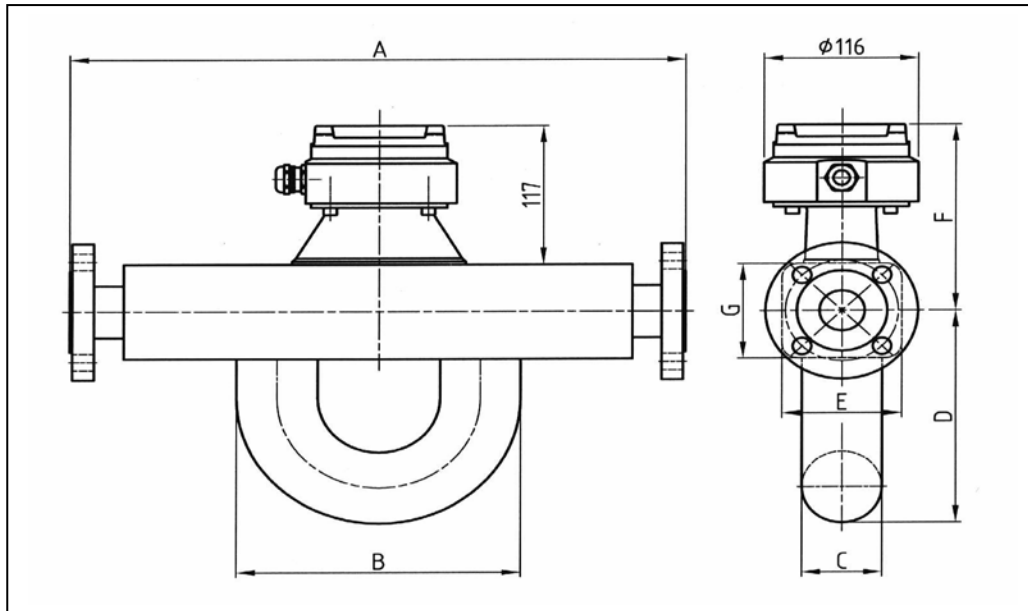


beside CE-mark : number of certified body according PED, only for sizes greater than DN 25

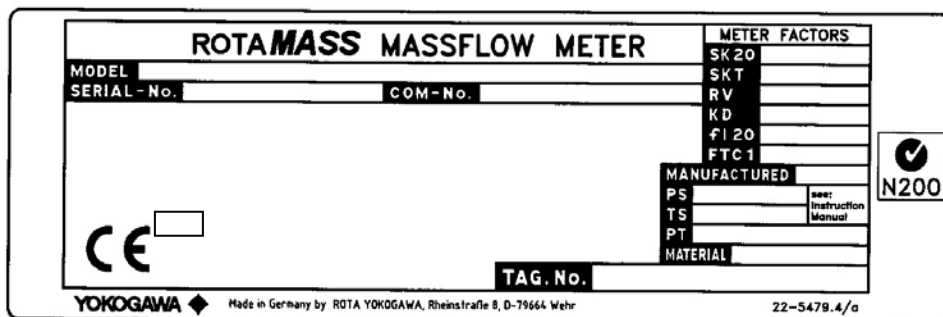


## 2.5 The Remote Detector RCCS34 to 39

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



Name plate standard version :



beside CE-mark : number of certified body according PED, only for sizes greater than DN 25

### 2.6 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 flow mass directly and converts it into electrical signals.

The converter evaluates the electrical signals and outputs the following values

- mass flow, independent of media properties, such as density, temperature, viscosity
- medium density
- medium temperature

The values are displayed or output as electrical values for use by other systems.

The converter is operated with the help of three infra-red keys and a 4-line display and is 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)
- measuring the substance concentrations in mixtures of substances;
- simultaneous measurement of mass flow, density, temperature, volume flow and cumulated mass and volume;
- 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 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 EN50227 (NAMUR)

optional (/KF2) :

- 1 analog output (EEx ia)
- 1 passive pulse output (EEx ia) / status output

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

### 3 Transportation and Storage

#### Transport instructions

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 the chapter "Safety instructions".
- To avoid any damages, unpack the flowmeter only at the installation site.
- Mechanical shocks are to be avoided.



#### **WARNING**

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

#### 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
- Temperature between -20°C to 50°C (RCCT3 / RCCF31)  
-50°C to 80°C (RCCS3)
- Atmospheric humidity ranging from 5 to 100% (not condensing)

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

# 4 Installation



### 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 explosion protected instruments see chapter „Instruction for Explosion Protected Instruments”.

## 4.1 Piping

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 gasses: Measuring tube upwards so that no liquid can collect if “no flow”.

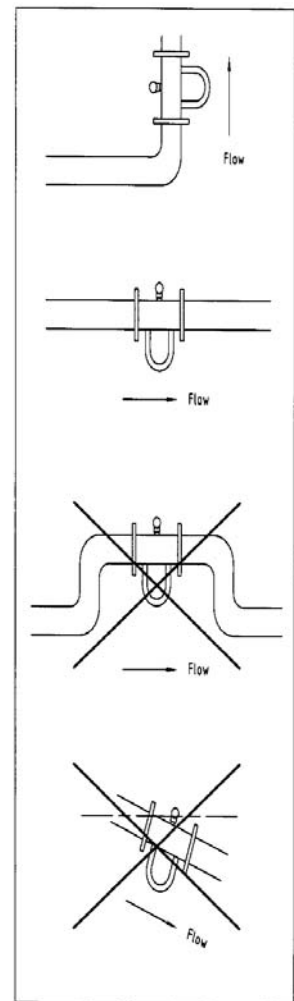
**Installation at highest point of a piping system:**

Avoid it, as this can lead to collection of gas bubbles.

**Installation with pressure below 1 bar**

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.



**CAUTION Gas Flow Measurement**

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 bent 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.

### 4.2 Installing of the flowmeter

Although ROTAMASS is designed essentially stable against the static and dynamic outer forces, the following matters should be noticed.

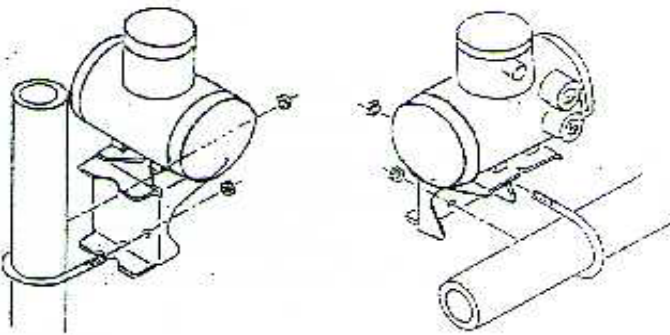
1. Do not stress the detector mechanically. Fix the pipe not on both ends of the detector but only at one side. Let the other side run free for minimum mechanical stress on the detector.
2. Please use the standard reducers if the piping's cross- section differs at the inlet or outlet point of the flowmeter.
3. 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. 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.
5. Keep protection sheet on the flanges attached until the flowmeter is installed to piping.
6. Don't open the terminal box until the wiring procedure. Leaving the box opened can result in insulation deterioration.



#### **IMPORTANT**

For the installation of EEx version, be sure to refer to chapter “Instruction for Explosion Protected Instruments”.

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

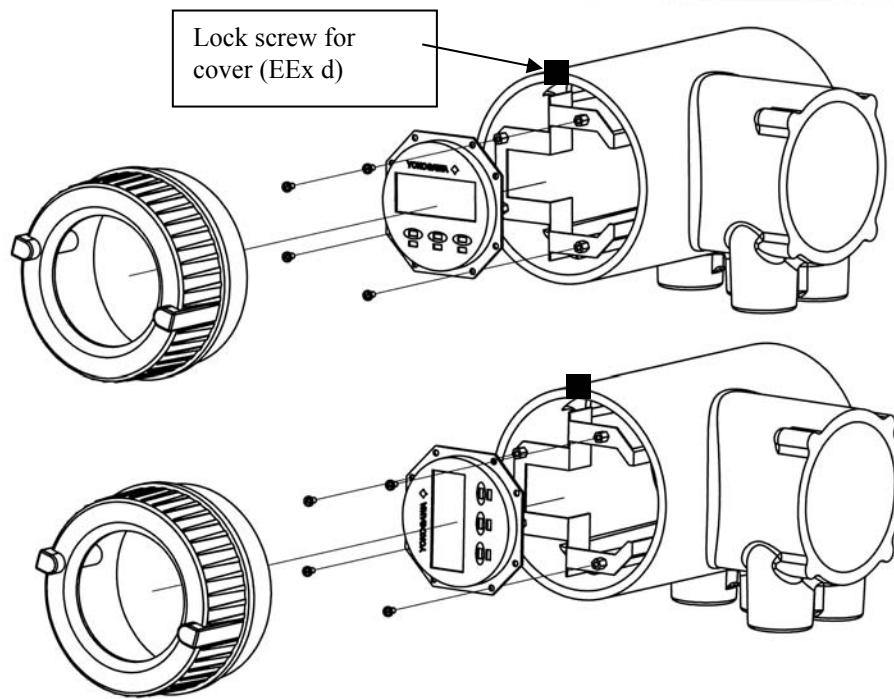


**NOTE for Option /NC**

Before operation RCCF31, please do not forget to set the coupled detector meter factors to converter according chapter 'Operation via HART'. Meter factors are typed on the nameplate of detector. If the instrument was not ordered with the option /NC (no combination), meter factors are already set in factory and this setting is not necessary.

### 4.3 Alteration of display

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.



#### **WARNING**

Fix the lock screw for use in hazardous area.



## 4.4 Wiring



### IMPORTANT

Do external electrical connection in conformity with EN 61010-1 or equivalent national regulations.

### 4.4.1 Assembling and connecting the Remote Cable RCCY031

Remote type Converter RCCF31 is used with Remote type detector RCCS3. To connect these instruments use a pair-shielded, pair-twisted cable with overall shielding type Li2Y(st) + CY 6x2AWG24 exclusive cable RCCY031. The maximum length is 300m.

For RCCY031-1-L□□□□ the cable is complete terminated.

For RCCY031-0-L□□□□ the termination set is attached and the customer has to terminate the cable by his own.

For explosion proof application use cable RCCY021-1-□□□□ /KS1.

The termination set contains:

- 0.4m shrink down plastic tube ,  $\varnothing$  3.2mm
- 18 conductor markers
- 18 terminal sleeves 0.25mm<sup>2</sup>
- 1 terminal sleeve 1.5mm<sup>2</sup>



### NOTE

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

## INSTALLATION

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Termination procedure :

### Cable end detector

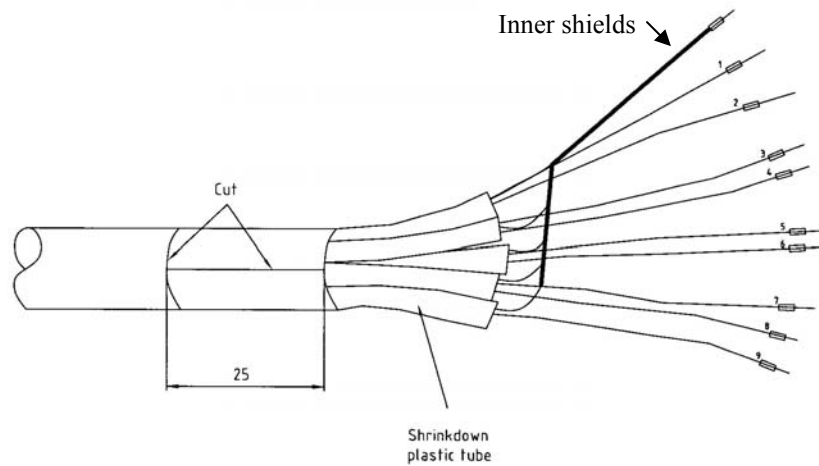
- Remove PVC outer sheeting and full shielding 80mm from the end.
- Insulate the wire endings.
- Cut off one pair of wires and one additional wire and the core wire (black).
- Cut the layers of shielding and the filler flexes down to 15mm.
- Slide a shrink down plastic tube ( $\varnothing$  3.2mm, l=20mm) over each of the five pairs of wires, push it to its limits and heat with hot air.
- Attach the terminal sleeves ( $0.25\text{mm}^2$ ) to the wire endings.
- Make a radial cut into the PVC outer sheeting 25mm from the end and cut lengthways. <sup>1)</sup>

### Cable end converter

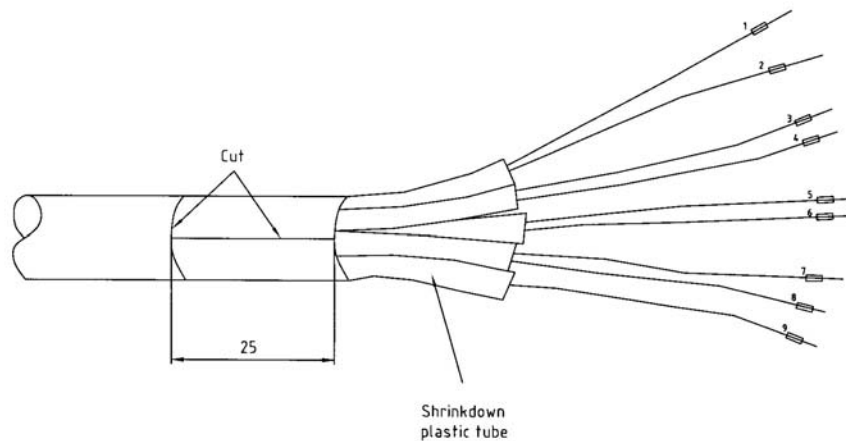
- Remove PVC outer sheeting and full shielding 100mm from the end.
- Insulate the wire endings.
- Cut off short the same 3 wires as at the detector end and the core wire (black).
- Slide a shrink down plastic tube ( $\varnothing$  3.2mm, l=20mm) over each of the five pairs of wires, push it to its limits and heat with hot air.
- Cut the layers of shielding (but not the filler flexes).
- Attach the terminal sleeves ( $0.25\text{mm}^2$ ) to the wire endings.
- Twist the 5 filler flexes together and attaches a terminal sleeve ( $1.5\text{mm}^2$ ).
- Make a radial cut into the PVC outer sheeting 25mm from the end and cut lengthways.

Slide the conductor markers onto the pairs of wires on both sides of the cable, so that the pairs are numbered 1-2,3-4,5-6,7-8,9. Each cable must have the same number on detector and on converter side.

Cable end converter :

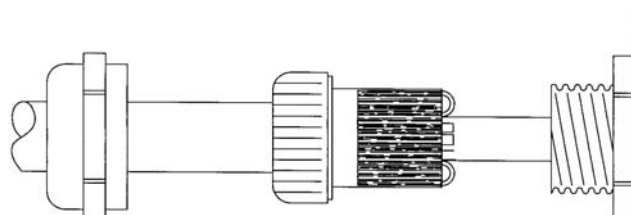


Cable end detector :



Cable Connection :

1. Remove connection box cover and unscrew the upper part of the cable gland.
2. Slide the upper part and the plastic clamp onto the cable end.
3. Remove the 25mm section of PVC outer sheathing from the cable and pull the shielding harness over the plastic clamp of the cable gland.
4. Insert the prepared cable into the cable gland and 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.



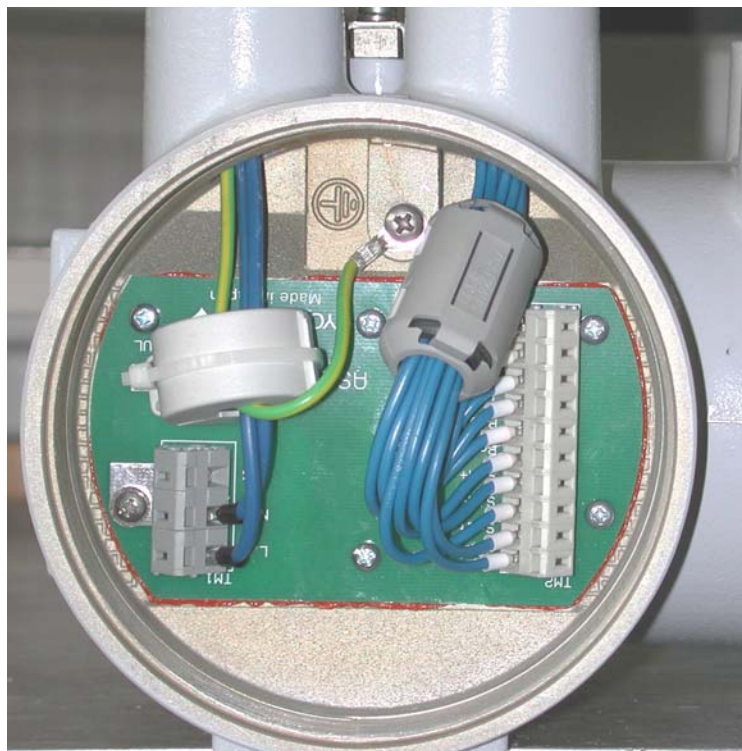
## INSTALLATION

Detector		Cable		Converter
RCCS3□			RCCF31	
D+	=>	1 -----	1	=> D+
D-	=>	2 -----	2	=> D-
S1+	=>	3 -----	3	=> S1+
S1-	=>	4 -----	4	=> S1-
S2+	=>	5 -----	5	=> S2+
S2-	=>	6 -----	6	=> S2-
TP1	=>	7 -----	7	=> TP1
TP2	=>	8 -----	8	=> TP2
TP3	=>	9 -----	9	=> TP3
		----- Shields		=> COM

6. Screw the connection box cover.

### 4.4.2 Power supply wiring

- Connect the power supply cable to the terminals inside of the converter terminal box.
- When the cover is removed, the connection terminal appears (see Fig. below). Confirm two ferrite core sets are attached in it.
- Connect the power cables to the terminals according to the Figure below.
- Insert the cable into ferrite cores before connecting to the terminals. Fix the ferrite core to the cable with clamping wire.
- For the connection of protective ground conductor to PE terminal use a crimp-on ring type terminal.





**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. 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. An exclusive external circuit breaker must be placed near each flowmeter.
4. Check the external circuit breaker's rating conforms to the requirements specified in the specification of this instrument.
5. Wire the power supply cable keeping the distance of 1 cm or more from other signal wires.
6. Confirm the operating voltage of the converter before operation.
7. Please lock the cover of the converter with hexagon lock screw before operation.



**CAUTION**

Special connections for EEx 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 "Instruction for Explosion Protected 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 10.5mm in diameter

Nominal cross section of conductive wire : 0.5 to 2.5 mm<sup>2</sup>

Outer diameter of cores insulation part : < 3.6 mm

Connecting length of conductive wire part : 9 mm

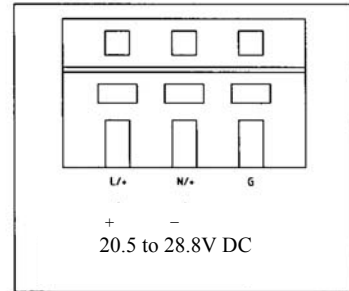
# INSTALLATION

## 24V DC connections

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

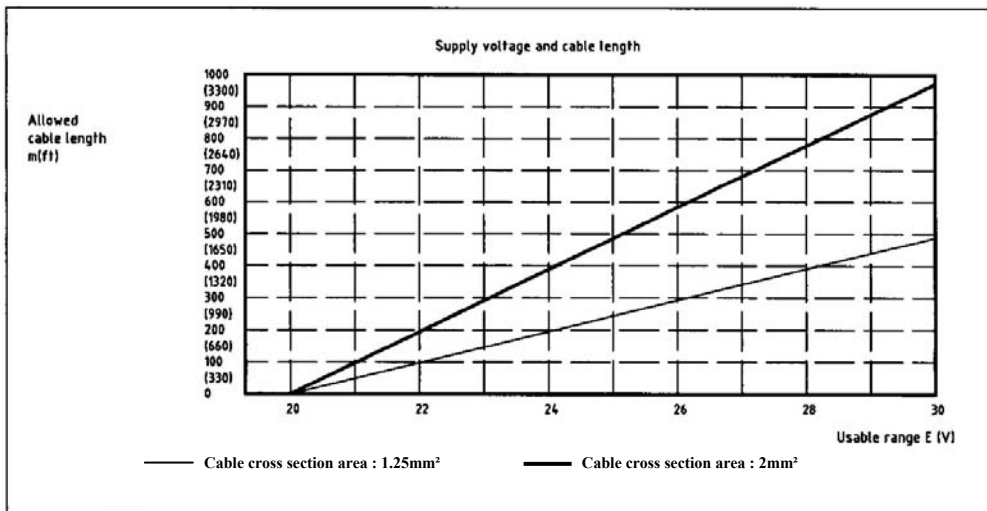
### 1. Connecting Power Supply

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



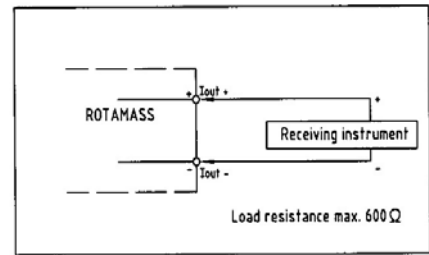
### 2. Supply Voltage Rating

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

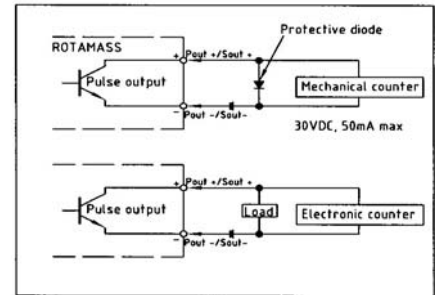


### 4.4.3 Connecting to external instruments

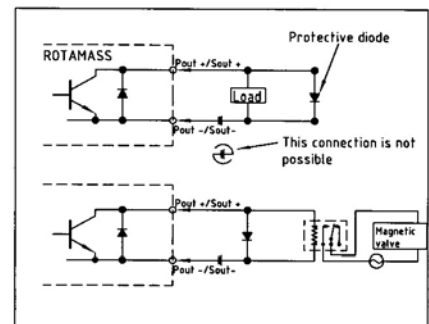
1. Analog signal output (Iout 1 and Iout 2)  
 ROTAMASS RCCT3 / RCCF31 has 2 analog outputs, 4 to 20mA DC. Load resistance 20- 600Ω.  
 (/KF2 has only one analog output, which is intrinsic safe)



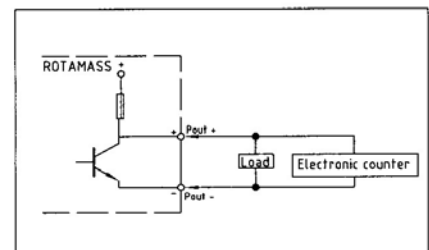
2. Pulse Output passive (Pout / Sout)  
 ROTAMASS RCCT3□ has 2 pulse output (isolated transistor contact). Attention must be paid to voltage and polarity when wiring.  
 (/KF2 has one passive pulse output, which is intrinsic safe)



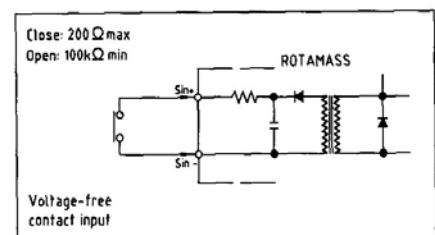
3. Status Output passive (Pout / Sout)  
 The pulse outputs can be set to status outputs by menu item.  
 Since this is an isolated transistor contact, attention must be paid to voltage and polarity when wiring.  
 This output cannot switch an AC load. To switch an AC load, an intermediate relay (see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



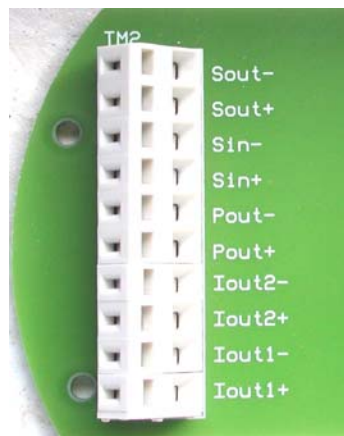
5. Status input (Sin)  
 Status input is designed for use with voltage-free ("dry") contact (activate source current to detect the contact state). Be careful not to connect to any signal source carrying any voltage. Applying voltage may damage the input circuit.



## INSTALLATION

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I/O-Terminal Overview :



Pulse / Status output 2 (Sout )

Status input (Sin)

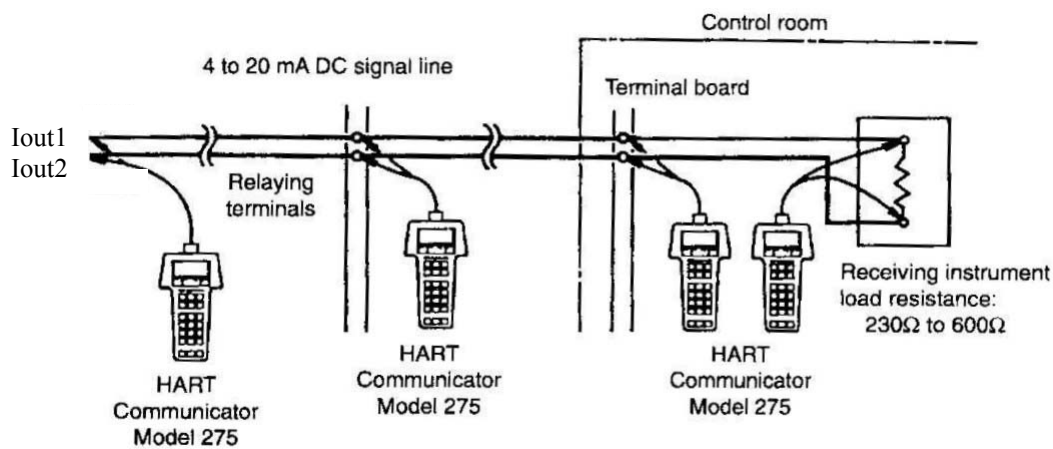
Pulse / Status output 1 (Pout)

Analog output 2 (Iout2)

Analog output 1 (Iout 1)

### 4.4.4 Connecting HART communication

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





## 4.5 Setting parameters in converter with option /NC

If remote converter RCCF31 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 SK20, KD, fl20 must be set. These constants are printed on the name plate of the detector.

In Parameter *Basic setup / Tag* or *Basic setup / Long tag* the tag number must be set if necessary.



### CAUTION

Because the real *Factory Zero Value* and *Autozero Fluctuation* are not set, warnings W06 or W07 may appear after autozero. These warnings can be ignored.

## 5 Flowmeters with intrinsic safe outputs (/KF2)

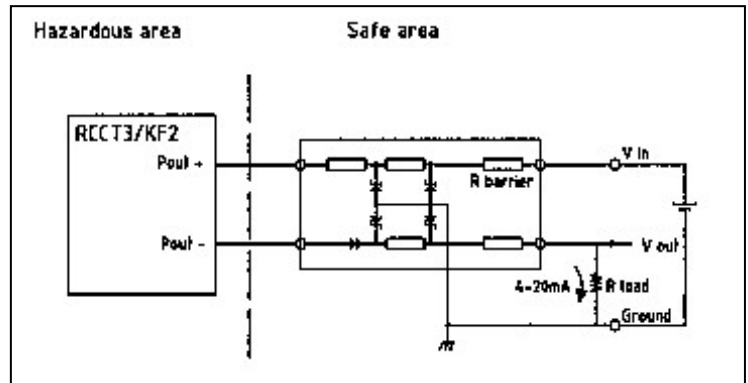
Rotamass with option /KF2 has one intrinsic safe current output and one intrinsic safe pulse / status output. The Ex-data of this output can be found in chapter 1.2.

The second current output, the second 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 may be connected.

Example of installation :



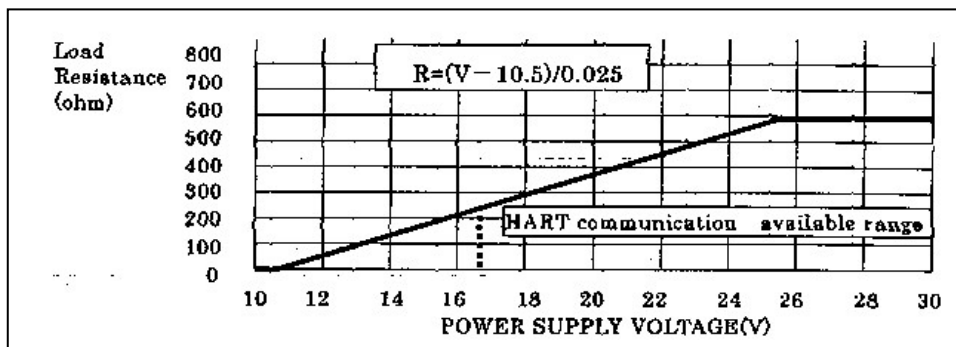
Power supply range : 10.5V ... 30V DC for Not-HART application

Power supply range : 16.75V ... 30V DC for HART application

Load resistance : 20 ... 600 Ω for Not-HART application

Load resistance : 230 ... 600 Ω for HART application

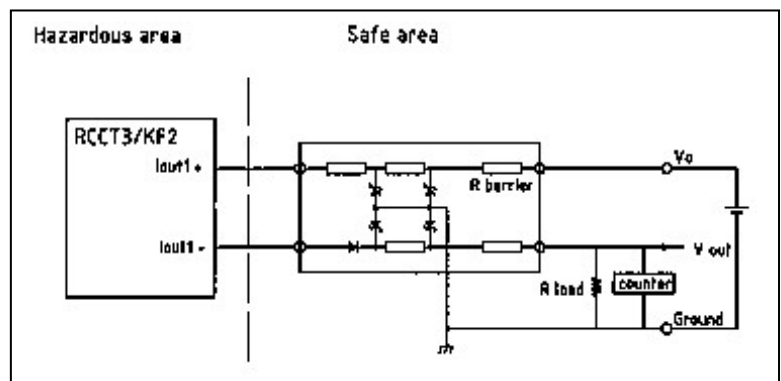
Load resistance vs Power supply voltage :



### Pulse output :

The intrinsic safe pulse output is passive and an external power supply with Shunt-Diode type barrier or isolation type barrier may be connected.

Example of installation :



Maximum voltage : 30V DC

Maximum current : 100mA

## 6 Basic operating procedures

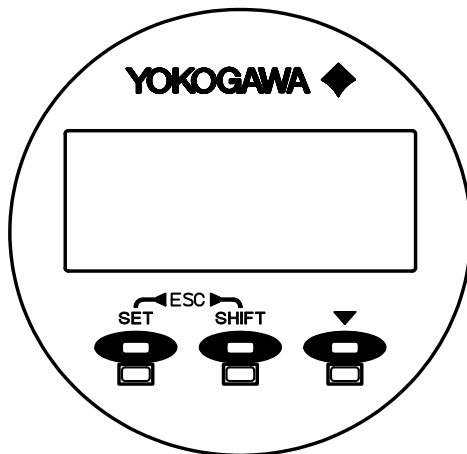
Data setting can be done by HART-Communication (see chapter 7) or with the 3 keys on the front panel. The following section describes how to use the three panel keys.

### 6.1 Liquid crystal display

Construction of ROTAMASS display :

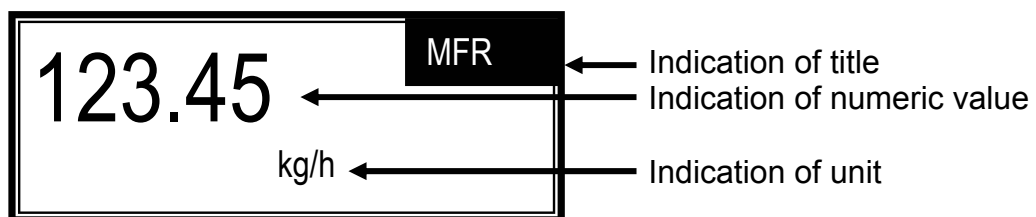
LCD dot matrix (32 x 132 dots)  
 - 1 line indication or  
 - 2 line indication or  
 - 3 line indication or  
 - 4 line indication

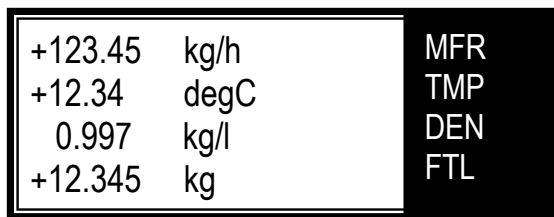
3 infrared switches **SET** ; **SHIFT** ; **▼**



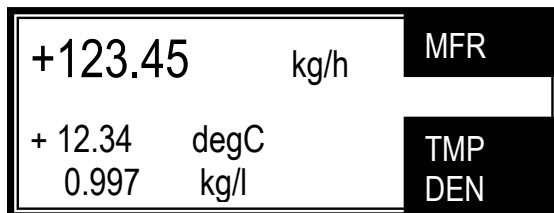
SET:	confirm data setting or entry data setting or confirm parameter
SHIFT:	move cursor right to next position
SET + SHIFT :	return to higher menu level
▼:	move to lower parameter or increment value
SHIFT + ▼:	move to higher parameter

General display indication :

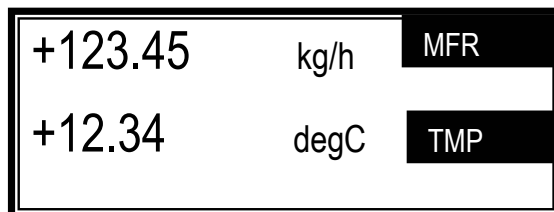




4 line indication



3 line indication



2 line indication.



1 line indication



**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 just above 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".

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 title indication the following abbreviations are used. :

MASS FLOW RATE:	MFR
VOLUME FLOW RATE :	VFR
FORWARD TOTAL :	FTL
REVERSE TOTAL :	RTL
DIFFERENTIAL TOTAL :	DTL
DENSITY :	DEN
TEMPERATURE :	TMP
CONCENTRATION :	CON
NET FLOW :	NET

Number of figures :

totalizer :	8 figures
measured value :	5 figures + 1 sign + 1 decimal point
unit :	9 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* .

### 6.2 Display modes

The display can show the following indication modes :

1	Display 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 : <ul style="list-style-type: none"><li>- Select type (not blinking)</li><li>- Numerical type (blinking)</li><li>- Numerical type with sign (blinking)</li><li>- Character type (blinking)</li></ul>
2d	Data confirming mode	Mode to confirm new value of selected parameter
2e	Data determining 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 <i>Self Test/Status</i> .

In display mode the actual measured values according the display select parameters are indicated as shown in chapter 6.1. How to set display settings see chapter 6.4.

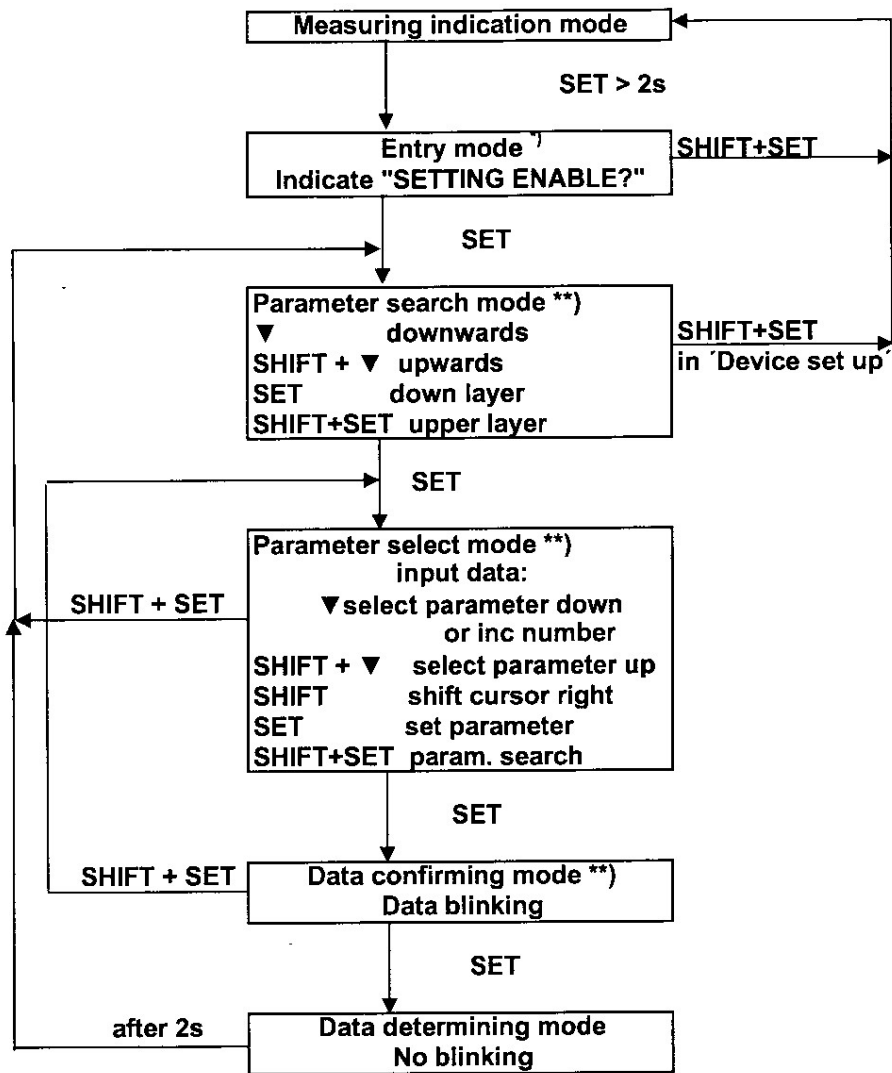
Parameter setting mode is described in chapter 6.3.

The language of the parameter setting mode can be selected in parameter *Language / or Detailed setup / Display config / language* .  
English, German or French can be selected.

### 6.3 Setting via display

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 10.1 shows the display parameter list and chapter 10.2 shows the parameter tree.



- \*) Back to measuring indication mode if no key is pressed for 10 s.
- \*\*) Back to measuring indication mode if no key is pressed for 60 s.



### IMPORTANT

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

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 concerning chapters.



## 6.4 Examples of parameter settings via keys

### 6.4.1 Display configuration, set volume flow to line 1

123.45	kg/h	MFR
0.997	kg/l	DEN
12.34	degC	TMP
12.345	kg	FTL

Set > 2s

Setting Enable?

Set

Main Menu  
 Language  
 Process variables  
 ▼ Diag/Service

3x ▼

Main Menu  
 ▲ Basic Setup  
 Detailed Setup  
 ▼ Review device info

Set

Basic Setup  
 Tag  
 Long Tag  
 ▼ Display config

2x ▼

Basic Setup  
 ▲ Display Config  
 Mass flow  
 ▼ Density

Set

Display config  
 Display select 1  
 Display select 2  
 ▼ Display select 3

Set

Display select 1  
 Mass flow  
 Mass flow  
 ▼ Volume flow  
 Density  
 Temperature  
 F-Total  
 R-Total  
 D-Total

select

Display select 1  
 Mass flow  
 ▲ Volume flow  
 ▼ Density

Set

Shift + Set, Shift + Set

12.34	Cum/h	VFR
0.997	kg/l	DEN
12.34	degC	TEMP
12.345	kg	FTL

**6.4.2 Setting Temperature 20-120°C to Analog Output 2**

123.45	kg/h	MFR
0.997	kg/l	DEN
12.34	degC	TMP
12.345	kg	FTL

Set > 2s

Setting Enable?

Set

Main Menu
<b>Language</b>
Process variables
▼ Diag/Service

3x ▼

Main Menu
<b>▲ Basic Setup</b>
Detailed Setup
▼ Review device info

Set

Basic Setup
<b>Tag</b>
Long Tag
▼ Display config

5x ▼

Basic Setup
<b>▲ Temperature</b>
Analog 1 select
▼ Analog 2 select

Set

Temperature
<b>Temperature unit</b>
Temperature LRV
▼ Temperature URV



Temperature
<b>▲ Temperature LRV</b>
Temperature URV
Temperature damping

Set

Temperature LRV
000.00 degC
000.00 degC

Shift and ▼

Temperature LRV
000.00 degC
020.00 degC

Set

Temperature
<b>▲ Temperature LRV</b>
Temperature URV
Temperature damping



Temperature
<b>▲ Temperature URV</b>
Temperature damping

Set

Temperature URV  
100.00 degC  
000.00 degC

Shift and ▼

Temperature URV  
100.00 degC  
120.00 degC

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

Set

Basic Setup  
▲ Analog 2 select  
Pulse/Status out 1  
▼ Pulse/Status out 2

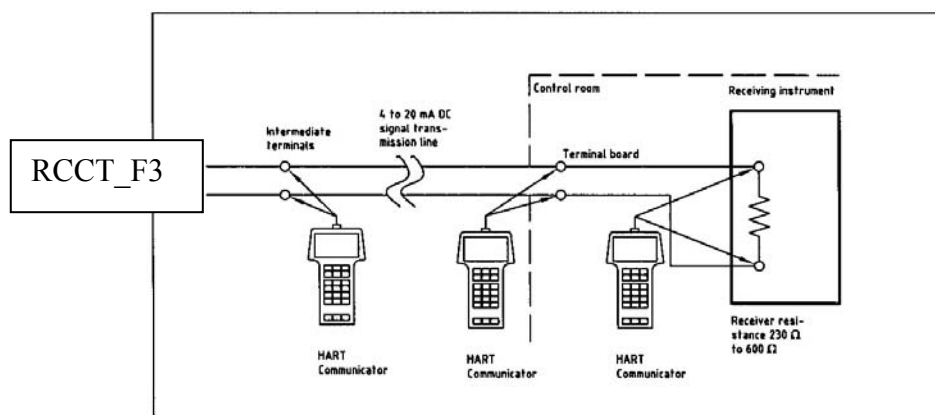
Shift + Set, Shift + Set

123.45	kg/h	MFR
0.997	kg/l	DEN
12.34	degC	TMP
12.345	kg	FTL

## 7 Operation via HART

### 7.1 Conditions of Communication Line

The HART-communicator can communicate with the ROTAMASS RCCT\_F3 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 receiving instrument. To communicate, it must be connected in parallel with the ROTAMASS RCCT\_F3, the connections are not polarized. The figure below shows the wiring connections for direct interface at the ROTAMASS RCCT\_F3.



Specifications of communication line :

Load resistance : 230 to 600Ω, For multidrop mode see figure below  
 Minimum cable size : 24AWG (0.51mm diameter)  
 Cable type . single pair shielded or multiple pair with overall shield

Maximum twisted pair length : 6,500 ft (2,000m)

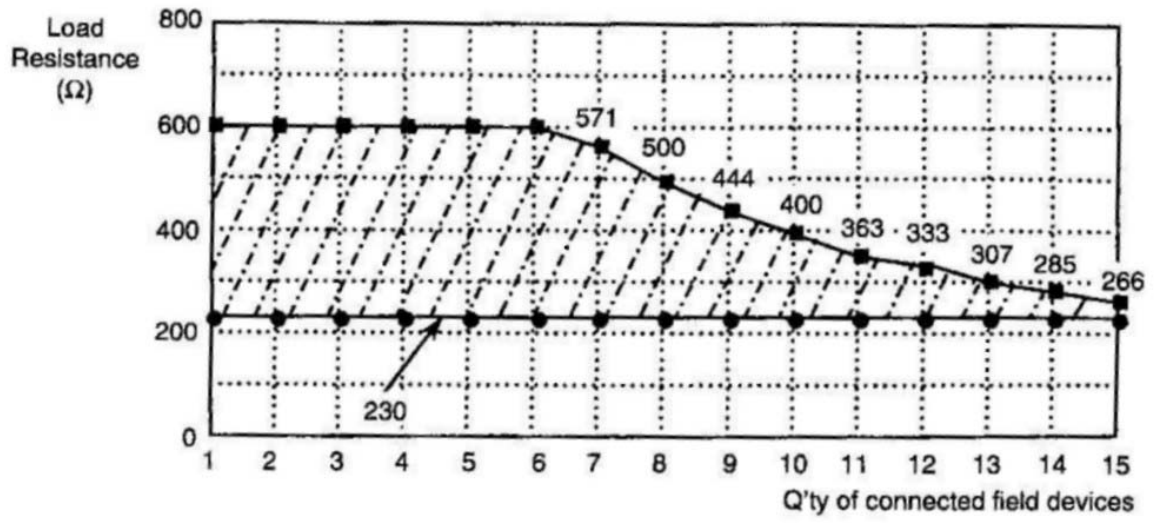
Maximum multiple twisted pair length : 3,200 ft (1,000m)

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

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

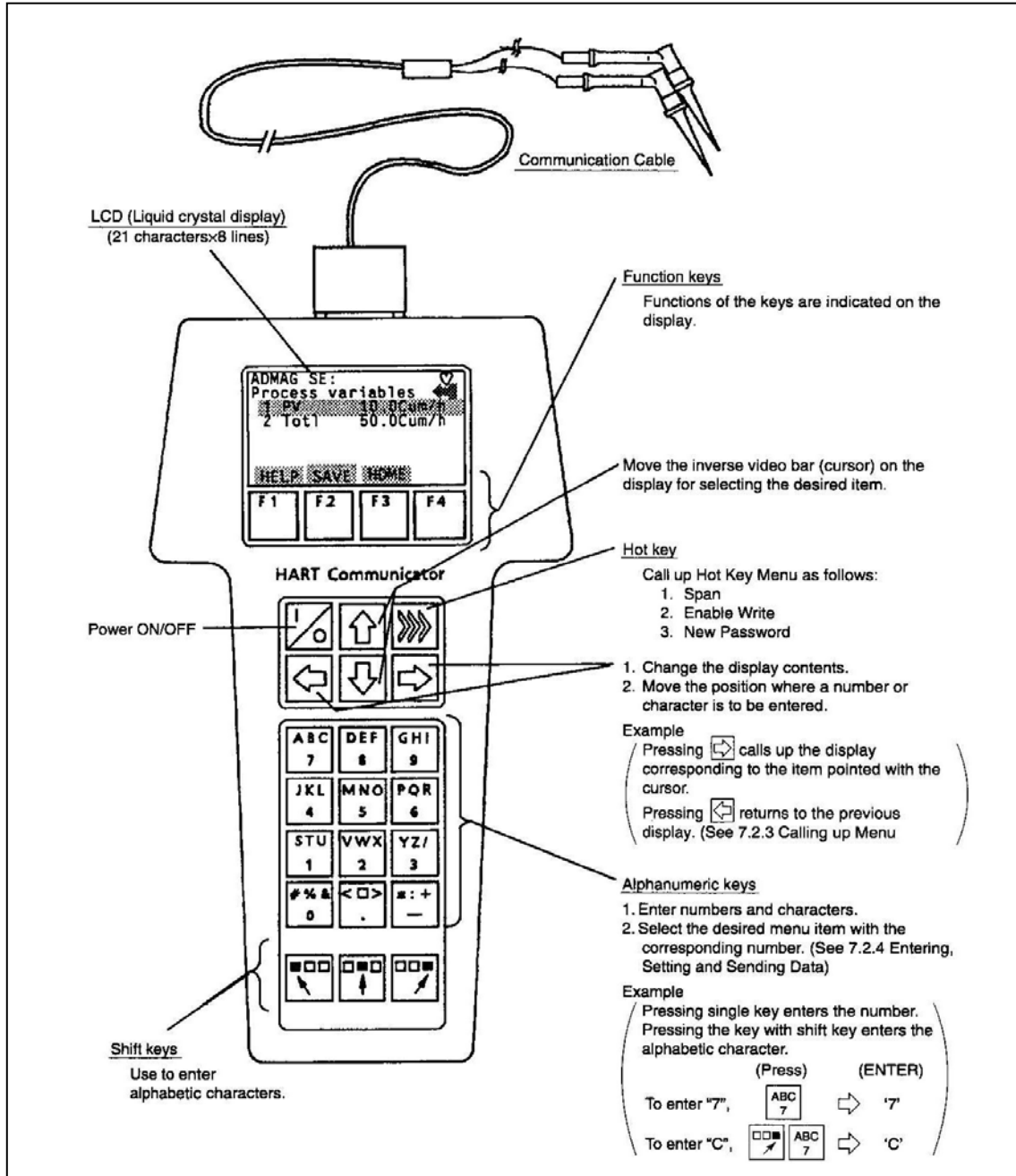
Where :  
 L = length in feet or meters  
 R = resistance in ohms, current sense resistance  
 C = cable capacitance in pF/ft or pF/m  
 C<sub>i</sub> = 50,000pF

Load resistance and quantity of devices in multidrop mode :



## 7.2 Basic Operation of the HART Communicator

Keys and functions:



The HART-communicator automatically searches for ROTAMASS RCCT\_F3 on the 4-20mA loop, when it is turned on. When HART-communicator is connected to RCCT\_F3, it displays the online menu. (If RCCT\_F3 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 RCCT\_F3).

**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 analogue output in mA.
4	Review	Review parameters for Rotamass
5	Service	Not open

The menu tree in chapter 10.2.2 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, **EXIT (F4)**, **ESC(F3)** or **ABORT(F3)**.

Entering, setting and sending data:

The data, which are input with the keys are set in the HART-communicator by pressing **ENTER(F4)**. Then, by pressing **SEND(F2)**, the data are send to RCCT\_F3. Note that the data are not send to ROTAMASS if **SEND(F2)** is not pressed. All the data set with the HART-communicator is held in memory unless power is turned off, so every data can be sending to RCCT\_F3 at 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.

### 7.3 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 20mA output and turns it to 4mA .

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 able to write, is changed during it is in "Enable wrt 10min", releasing 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 RCCT\_F3 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 RCCT\_F3 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.

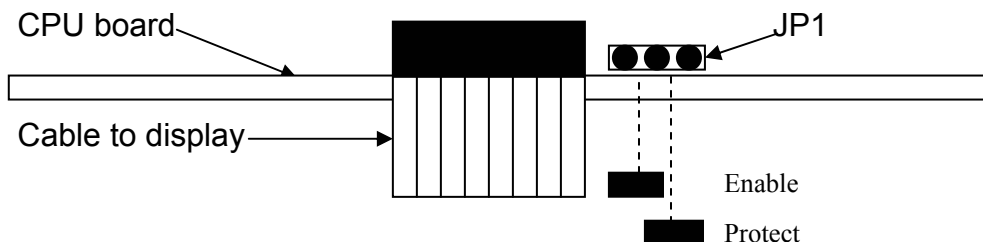
## 7.4 Hardware Write Protect

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 as shown in the following picture.



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.

## 8 Functions

### 8.1 Overview

The table on the following page shows an overview of functions of Rotamass RCCT3 /RCCF31.

In Brackets the related chapters in this manual are indicated.

## FUNCTIONS

<b>Hot key (7.3)</b>	Write Protect HART	Enable wrt 10min. HART	New Password HART	Software seal HART	Key Status HART		Hardware Write Protect (7.4)						
<b>Mass flow (8.2)</b>	Mass flow unit	Mass flow format	Mass flow LRV	Mass flow URV	Mass flow damping	Mass flow lowcut	Mass flow alm 1 sel	Mass flow alm 1 crit	Mass flow alm 2 sel	Mass flow alm 2 crit	MF fix val sel	MF fixed value	
<b>Volume flow (8.3)</b>	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			
<b>Density (8.4)</b>	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	Density fix val sel	Density fixed value	
<b>Temperature (8.5)</b>	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	
<b>Analog output 1 (8.6)</b>	Analog 1 select	Analog 1 alarm out	Analog 1 low LMT	Analog 1 high LMT	Analog 1 rev mode								
<b>Analog output 2 (8.7)</b>	Analog 2 select	Analog 2 alarm out	Analog 2 low LMT	Analog 2 high LMT	Analog 2 rev mode								
<b>Pulse/Status out 1 (8.8)</b>	Pulse/Stat 1 select	Pulse 1 select	Pulse 1 unit	Pulse 1 rate	Pulse 1 active mode	Pulse 1 width	Pulse1 at alarm	SO1 function	SO1 active mode				
<b>Pulse/Status out 2 (8.9)</b>	Pulse/Stat 2 select	Pulse 2 select	Pulse 2 unit	Pulse 2 rate	Pulse 2 active mode	Pulse 2 width	Pulse2 at alarm	SO2 function	SO2 active mode				
<b>Status input (8.10)</b>	SI function	SI active mode											
<b>Totalizer (8.11)</b>	Total select	Total unit	Total switch	Total at alarm	Total reset cntrl	Total reset							
<b>Display (6)</b>	Display config	Language	Disp.contrast	Disp.period	Key Status								
<b>Diag/Service (9)</b>	Self test/status (9.3)	Input/Output Test (9.4)	Autozero check (8.19)	Autozero (8.19)	Output trim (9.5)	History overview (9.2)	Error history (9.2)						
<b>Special functions</b>	Flow direction (8.12)	Concentration measurement (8.13)	Net flow (8.14)	Slug detection (8.15)	Empty pipe detection (8.16)	Corrosion detection (8.17)	Fluid max. Temp. (8.20)	Gas measurement (8.21)					
<b>Detector data (8.18)</b>	Sensor model	Sensor constants	Sensor S/N										
<b>Device data</b>	Distributor	Tag	Descriptor	Message	Date	Dev id	Universal rev	Fld dev rev	Software rev	Hardware rev			
<b>HART data (7.3)</b>	Poll address	Num req preams	Num resp preams	Master reset									

## 8.2 Mass flow functions (Basic or Detailed setup)

<b>Mass flow</b>	To set the functions of mass flow measurement.
<b>Mass flow unit</b>	Select : g/s, g/min, g/h, kg/s, kg/min, kg/h, t/min,t/h, lb/s, lb/min, lb/h
<b>Mass flow format</b>	Select : xxxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX
<b>Mass flow LRV (low range value)</b>	Set a mass flow value to the 4mA or 0 Hz
<b>Mass flow URV (upper range value)</b>	Set a mass flow value to the 20mA or xxxxx = Hz
<b>Mass flow damping</b>	Set the damping time in s. Damping time effects outputs and display. After 5 times damping time the given value is displayed ( $\tau=63\%$ ).
<b>Mass flow lowcut</b>	Set the low cut. Low cut effects output and display. A hysteresis of 0.05% of Q nom is given by the system.
<b>Mass flow alm 1 sel</b>	Select : no function, more than, less than
<b>Mass flow alm 1 crit</b>	Select a mass flow alarm level. What happens in case of an alarm has to be defined in Status out (8.8, 8.9).
<b>Mass flow alm 2 sel</b>	Select : no function, more than, less than
<b>Mass flow alm 2 crit</b> <b>Restrictions:</b> 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 (8.8, 8.9).
<b>Mass flow fix val sel</b>	Select: Inhibit, Enable
<b>Mass flow fixed value</b>	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.

### 8.3 Volume flow functions (Basic or Detailed setup)

<b>Volume flow</b>	<p>To set the functions of volume flow measurement.</p> <p><b>Notice:</b> Volume flow is derived from density and mass flow measurement. Errors in density measurement (e.g. by gas bubbles) will fully arrive in volume flow. For liquid it is recommended to use mass flow as original measurement. Below <math>\rho_{oh} = 0.3\text{kg/l}</math> Volume flow is set to zero (for liquids).</p>
<b>Vol flow unit</b>	<p>Select:</p> <p>Cucm/s, Cucm/min, Cucm/h, l/s, l/min, l/h, Cum/s, Cum/min, Cum/h, gal/s, gal/min, gal/h, Cuft/s, Cuft/min, Cuft/h, bbl/s, bbl/min, bbl/h, Impgal/s, Impgal/min, Impgal/h</p>
<b>Vol flow format</b>	<p>Select : xxxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX</p>
<b>Vol flow LRV (low range value)</b>	<p>Set a volume flow value to the 4mA or 0 Hz.</p>
<b>Vol flow URV (upper range value)</b>	<p>Set a volume flow value to the 20mA or xxxxx = Hz</p>
<b>Vol flow damping</b>	<p>Set the damping time in s. Damping time effects outputs and display. After 5 times damping time the given value is displayed (<math>\tau=63\%</math>).</p>
<b>Vol flow lowcut</b>	<p>Set the low cut. Low cut effects output and display. A hysteresis of 0.05% of Q nom (mass flow) is given by the system.</p>
<b>Vol flow alm 1 sel</b>	<p>Select: no function, more than, less than</p>
<b>Vol flow alm 1 crit</b>	<p>Select a volume flow alarm level. What happens in case of an alarm has to be defined in Status out (8.8, 8.9).</p>
<b>Vol flow alm 2 sel</b>	<p>Select: no function, more than, less than</p>
<b>Vol flow alm 2 crit</b>	<p>Select a volume flow alarm level. What</p>

## FUNCTIONS

<p><b>Restrictions:</b> All alarms have to be in 0-110% of URV-LRV. Alarm criteria 2 must always be larger than alarm criteria 1.</p>	<p>happens in case of an alarm has to be defined in Status out (8.8, 8.9).</p>
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### 8.4 Density functions (Basic or Detailed setup)

<p><b>Density</b></p>	<p>To set the functions of density measurement.</p> <p><b>Notice:</b> Density measurement is only reliable if there is no gas in the liquid. For liquid measurement a density lower 0,3kg/l is displayed as 0.0kg/l for gas measurement set a fixed density value.</p>
<p><b>Density unit</b></p>	<p>Select</p> <p>g/ml, kg/l, kg/Cum, lb/gal, lb/Cuft</p>
<p><b>Density format</b></p>	<p>Select : xxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX</p>
<p><b>Density LRV (low range value)</b></p>	<p>Set a density value to the 4mA or 0 Hz</p>
<p><b>Density URV (upper range value)</b></p>	<p>Set a density value to the 20mA or xxxxx = Hz</p>
<p><b>Density damping</b></p>	<p>Set the damping time in s. Damping time effects outputs and display. After 5 times damping time the given value is displayed (<math>\tau=63\%</math>).</p>
<p><b>Density lowcut</b></p>	<p>Set the low cut. Low cut effects output and display. A hysteresis of 50g/l is given by the system.</p>
<p><b>Density alm 1 sel</b></p>	<p>Select: no function, more than, less than</p>
<p><b>Density alm 1 crit</b></p>	<p>Select a density flow alarm level. What happens in case of an alarm has to be defined in Status out (8.8, 8.9)</p>
<p><b>Density alm 2 sel</b></p>	<p>Select: no function, more than, less than</p>

<b>Density alm 2 crit</b>  <b>Restrictions:</b> 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 flow alarm level. What happens in case of an alarm has to be defined either in Status out (8.8, 8.9).
<b>Density fix val sel</b>	Select: Inhibit, Enable
<b>Density fixed value</b>	Select a density value. In liquid use this is only necessary in case of density disturbances. In gas measurement set here your standard or normal gas density to get standard or normal volume flow.

## 8.5 Temperature functions (Basic or Detailed setup)

<b>Temperature</b>	To set the functions of temperature measurement.  <b>Notice:</b> Standard range: -200 – 200°C, High temp. range: 0-400°C
<b>Temperature unit</b>	Select  degC, degF, K
<b>Temperature format</b>	Select : xxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX
<b>Temperature LRV (low range value)</b>	Set a temperature value to the 4mA or 0 Hz
<b>Temperature URV (upper range value)</b>	Set a temperature value to the 20mA or xxxxx = Hz
<b>Temperature damping</b>	Set the damping time in s. Damping time effects outputs and display. After 5 times damping time the given value is displayed ( $\tau=63\%$ ).
<b>Temperature alm 1 sel</b>	Select: no function, more than, less than
<b>Temperature alm 1 crit</b>	Select a temperature flow alarm level. What happens in case of an alarm has to be defined in Status out (8.8, 8.9).

## FUNCTIONS

<b>Temperature alm 2 sel</b>	Select: no function, more than, less than
<b>Temperature alm 2 crit</b>  <b>Restrictions:</b> 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 flow alarm level. What happens in case of an alarm has to be defined in Status out (8.8, 8.9).
<b>Temperature fix val select</b>	Select: Inhibit, Enable
<b>Temperature fixed value</b>	Select a temperature value in case of male function of the inbuilt temperature sensor.
<b>Temperature gain</b>	The Rotamass temperature sensor is installed outside at the measuring tubes. So at high or low fluid temperature the temperature measurement may show larger errors as a function of the quality of heat insulation. This function allows to correct the temperature measurement for better accuracy in mass flow and density.



## 8.6 Analog output 1 functions (Basic or Detailed setup)

<b>Analog output 1</b>	To set the current output 1. This output provides HART communication.
<b>Analog 1 select</b>	Select: None, Mass flow, Volume flow, Density, Temperature, Concentration meas, Net flow  If <i>None</i> is selected, output is 4mA, HART communication is available.
<b>Analog 1 alarm out</b> <b>(Detailed setup, Configure output/input)</b>	If <i>NAMUR</i> is selected (default) <3.6mA, >21mA, Hold, Measured value  If <i>Not NAMUR</i> is selected  <2.4mA, <3.6mA, <4mA, >21mA, >21.6mA
<b>Analog 1 low LMT (low limit)</b> <b>(Detailed setup, Configure output/input)</b>  The alarm is active if the measured value is lower than the low limit.	If <i>NAMUR</i> is selected (default) Measuring range from 3.8-20.5mA, Alarm level: <3.6mA or >21.0mA  If <i>Not NAMUR</i> is selected: Measuring range from 2.7- 21.3mA Alarm level: <2.4mA, >21.0mA
<b>Analog 1 high LMT (high limit)</b> <b>(Detailed setup, Configure output/input)</b>  The alarm is active if the measured value is higher than the high limit.	If <i>NAMUR</i> is selected (default) Measuring range from 3.8-20.5mA, Alarm level: <3.6mA or >21.0mA  If <i>Not NAMUR</i> is selected: Measuring range from 2.7- 21.3mA Alarm level: <2.4mA, >21.0mA
<b>Analog 1 rev mode</b>	Select : 4 mA, Measured value  This parameter selects the value of analog output 1, if flow is in reverse direction (see also chapter 8.12)

## 8.7 Analog output 2 functions (Basic or Detailed setup)

<b>Analog output 2</b>	To set the current output 2.
<b>Analog 2 select</b>	Select: None, Mass flow, Volume flow, Density, Temperature, Concentration meas, Net flow  If <i>None</i> is selected, output is 4mA, HART communication is available.
<b>Analog 2 alarm out</b> <b>(Detailed setup, Configure output/input)</b>	If <i>NAMUR</i> is selected (default) <3.6mA, >21mA, Hold, Measured value  If <i>Not NAMUR</i> is selected  <2.4mA, <3.6mA, <4mA, >21mA, >21.6mA
<b>Analog 2 low LMT (low limit)</b> <b>(Detailed setup, Configure output/input)</b>  The alarm level is set if the measured value is lower than the low limit.	If <i>NAMUR</i> is selected (default) Measuring range from 3.8-20.5mA, Alarm level: <3.6mA or >21.0mA  If <i>Not NAMUR</i> is selected: Measuring range from 2.7- 21.3mA Alarm level: <2.4mA, >21.0mA
<b>Analog 2 high LMT (high limit)</b> <b>(Detailed setup, Configure output/input)</b>  The alarm level is set if the measured value is higher than the high limit.	If <i>NAMUR</i> is selected (default) Measuring range from 3.8-20.5mA, Alarm level: <3.6mA or >21.0mA  If <i>Not NAMUR</i> is selected: Measuring range from 2.7- 21.3mA Alarm level: <2.4mA, >21.0mA
<b>Analog 2 rev mode</b>	Select : 4 mA, Measured value  This parameter selects the value of analog output 1, if flow is in reverse direction (see also chapter 8.12)

## 8.8 Pulse / Status output 1 functions (Basic/ Detailed setup)

<b>Pulse/Status out 1</b>	To set the pulse /status output 1.
<b>Pulse/Stat 1 select</b>	<p>Select: Pulse, Status out, No function</p> <p>If <i>Pulse</i> is selected, Status out 1 (SO) is not available.</p> <p>If <i>Status out</i> is selected, Pulse parameters are not available.</p>
<b>Pulse 1 select</b>	<p>Select : None, Mass forward, Mass reverse, Volume forward Volume reverse, Mass flow, Volume flow, Density, Temperature, Concentration meas, Net forward, Net reverse, Net flow</p> <p>If <i>Mass forward</i>, <i>Volume forward</i> or Net forward are selected, pulse output only works at forward flow.</p> <p>If <i>Mass reverse</i>, <i>Volume reverse</i> or Net reverse are selected, pulse output only works at reverse flow.</p>
<b>Pulse 1 unit</b>	<p>Select : Hz, g/P, kg/P, t/P, lb/P, Cucm/P, l/P, Cum/P, gal/P, kgal/P, Cuft/P, bbl/P, Impgal/P, klmpgal/P</p> <p>If <i>Pulse 1 select</i> is Mass flow, Volume flow, Density, Temperature or Concentration meas, only Hz can be selected.</p> <p>If <i>Pulse 1 select</i> is Mass forward, Mass reverse, Volume forward, Volume reverse, Net forward or Net reverse reverse, only unit/P can be selected.</p>
<b>Pulse 1 rate</b>	<p>The Pulse rate can be set according to the unit set in <i>Pulse 1 unit</i>.</p> <p>Maximum pulse rate is 10000Hz.</p>
<b>Pulse 1 active mode</b>	<p>Select : On Active, Off Active</p> <p>If <i>On Active</i> is selected, the pulses are active high.</p> <p>If <i>Off Active</i> is selected, the pulses are</p>

## FUNCTIONS

	active low.
<b>Pulse 1 width</b>	Select : 0.05ms, 0.1ms, 0.5ms, 1ms, 5ms, 10ms, 50ms and 100 msec
<b>Pulse 1 at alarm</b>	Select : 0 Hz, Measured value  If 0 is selected, in case of alarm the pulse output is stopped.  If <i>Measured value</i> is selected, the pulse output keeps on measuring.
<b>SO 1 function</b>	Select : No Function, Bi-direction, Total 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  If <i>Bi-direction</i> is selected, status output becomes active at forward flow and not active at reverse flow if parameter <i>flow direction</i> is set to <i>forward</i> . It is the other way round, if parameter <i>flow direction</i> is set to <i>reverse</i> . (see 8.12)  If <i>Total switch</i> is selected, status output becomes active, if the totalizer reaches the value set to parameter <i>Total switch</i> (see 8.11).  If an alarm function (x alm ) is selected, status output becomes active, if the concerning alarm occurs.
<b>SO1 active mode</b>	Select : On Active, Off Active  If <i>On Active</i> is selected, the status output is active high.  If <i>Off Active</i> is selected, the status output is active low.

## 8.9 Pulse / Status output 2 functions (Basic/ Detailed setup)

<b>Pulse/Status out 2</b>	To set the pulse /status output 2.
<b>Pulse/Stat 2 select</b>	<p>Select: Pulse, Status out, No function</p> <p>If <i>Pulse</i> is selected, Status out 2 (SO) is not available.</p> <p>If <i>Status out</i> is selected, Pulse parameters are not available.</p>
<b>Pulse 2 select</b>	<p>Select : None, Mass forward, Mass reverse, Volume forward Volume reverse, Mass flow, Volume flow, Density, Temperature, Concentration meas, Net forward, Net reverse, Net flow</p> <p>If <i>Mass forward</i>, <i>Volume forward</i> or Net forward are selected, pulse output only works at forward flow.</p> <p>If <i>Mass reverse</i>, <i>Volume reverse</i> or Net reverse are selected, pulse output only works at reverse flow.</p>
<b>Pulse 2 unit</b>	<p>Select : Hz, g/P, kg/P, t/P, lb/P, Cucm/P, l/P, Cum/P, gal/P, kgal/P, Cuft/P, bbl/P, Impgal/P, klmpgal/P</p> <p>If <i>Pulse 1 select</i> is Mass flow, Volume flow, Density, Temperature or Concentration meas, only Hz can be selected.</p> <p>If <i>Pulse 1 select</i> is Mass forward, Mass reverse, Volume forward, Volume reverse, Net forward or Net reverse reverse, only unit/P can be selected.</p>
<b>Pulse 2 rate</b>	<p>The Pulse rate can be set according to the unit set in <i>Pulse 2 unit</i>.</p> <p>Maximum pulse rate is 2000Hz.</p>
<b>Pulse 2 active mode</b>	<p>Select : On Active, Off Active</p> <p>If <i>On Active</i> is selected, the pulses are active high.</p> <p>If <i>Off Active</i> is selected, the pulses are</p>

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	active low.
<b>Pulse 2 width</b>	Select : 0.05ms, 0.1ms, 0.5ms, 1ms, 5ms, 10ms, 50ms and 100 msec
<b>Pulse 2 at alarm</b>	Select : 0 Hz, Measured value  If 0 is selected, in case of alarm the pulse output is stopped.  If <i>Measured value</i> is selected, the pulse output keeps on measuring.
<b>SO 2 function</b>	Select : No Function, Bi-direction, Total 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, Concentartion meas alm 1, Concentartion meas alm 2, Concentartion meas alm 1+2, Net flow alm 1, Net flow alm 2, Net flow alm 1+2, Slug alarm, Empty alarm, Corrosion alarm  If <i>Bi-direction</i> is selected, status output becomes active at forward flow and not active at reverse flow if parameter <i>flow direction</i> is set to <i>forward</i> . It is the other way round, if parameter <i>flow direction</i> is set to <i>reverse</i> . (see 8.12)  If <i>Total switch</i> is selected, status output becomes active, if the totalizer reaches the value set to parameter <i>Total switch</i> (see 8.11).  If an alarm function (x alm ) is selected, status output becomes active, if the concerning alarm occurs.
<b>SO2 active mode</b>	Select : On Active, Off =Active  If <i>On Active</i> is selected, the status output is active high.  If <i>Off Active</i> is selected, the status output is active low.

## 8.10 Status input functions (Basic or Detailed setup)

<b>Status input</b>	To set the status input.
<b>SI function</b>	<p>Select : No function, Autozero, Total reset, 0% signal lock</p> <p>If <i>Autozero</i> is selected, active status input starts autozero.</p> <p>If <i>Total reset</i> is selected, active status input sets totalizer to zero, if parameter <i>Total reset cntrl</i> is enabled.</p> <p>If <i>0% signal lock</i> is selected, analog output 1 and 2 are fixed to 4mA while status input is active.</p>
<b>SI active mode</b>	<p>Select : On Active, Off Active</p> <p>If <i>On Active</i> is selected, the status input is closed active.</p> <p>If <i>Off Active</i> is selected, the status input is open active.</p>

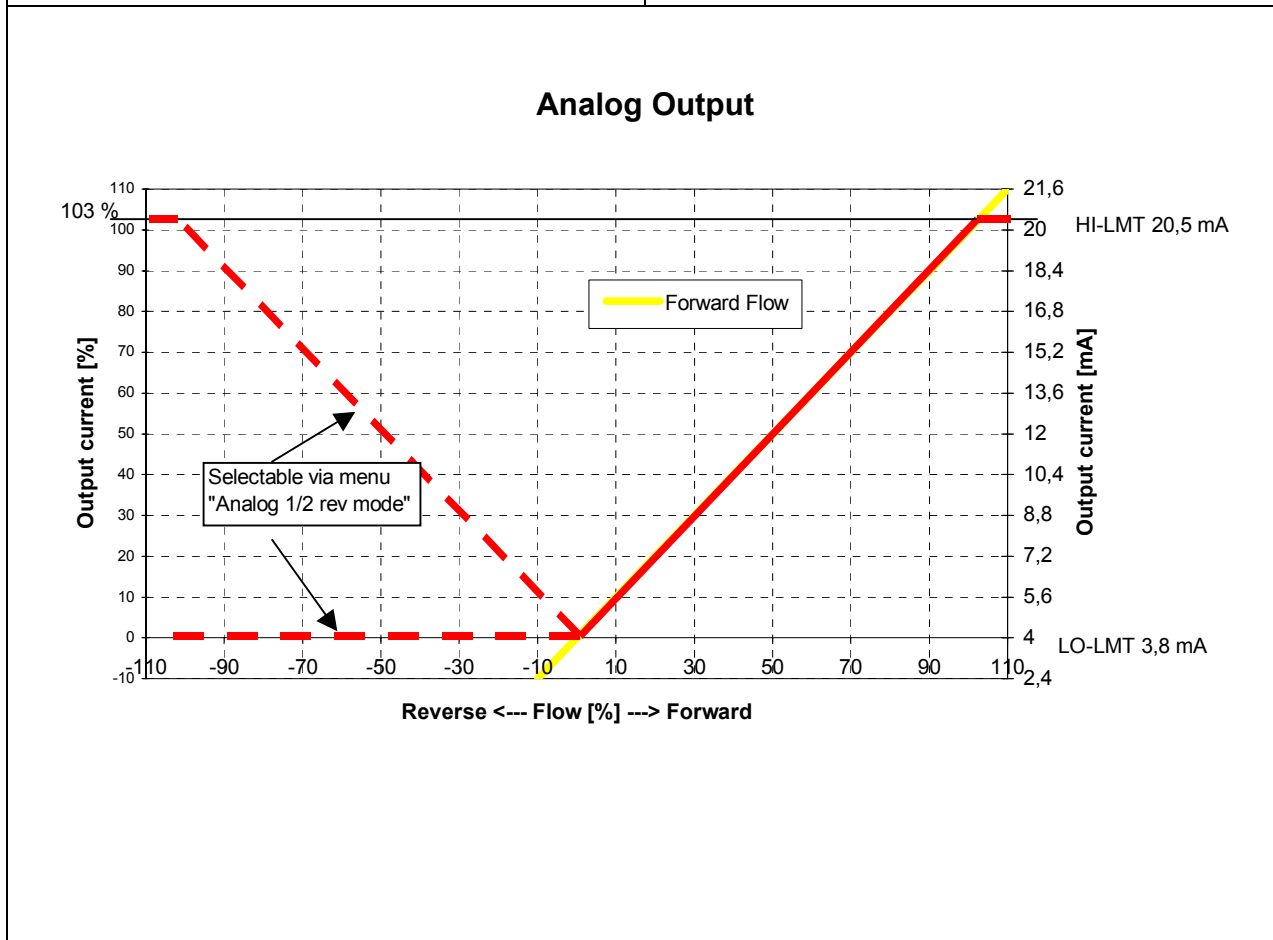
## 8.11 Totalizer functions (Basic or Detailed setup)

<b>Totalizer</b>	<p>To set totalizer function.</p> <p>Totalizer increments for forward flow and decrements for reverse flow.</p>
<b>Total select</b>	<p>Select : Mass, Volume, Net</p>
<b>Total unit</b>	<p>Select : g, kg, t, lb, Cucm, l, Cum, gal, kgal, Cuft, bbl, Impgal. klmpgal</p> <p>If <i>Mass</i> is selected, only g, kg, t, lb can be selected.</p> <p>If <i>Volume</i> is selected, only Cucm, l, Cum, gal, kgal, Impgal. klmpgal, Cuft, bbl can be selected.</p>
<b>Total switch</b>	<p>A totalizer limit can be set only to the forward totalizer. If status output is set to <i>Total switch</i>, status output is set active, if the totalizer reaches this value.</p> <p>Total switch is not active if set to 0.0.</p>
<b>Total at alarm</b>	<p>Select : Hold, Continue, Total</p> <p>Characteristic of totalizer in case of the Total switch is active. If <i>hold</i> is selected, forward and reverse totalising stops.</p>
<b>Total reset cntrl</b>	<p>Select : Inhibit, Enable</p> <p>Enables or inhibits total reset.</p>
<b>Total reset</b>	<p>Select : Execute, Not Execute</p> <p>Execution of total reset. Forward and reverse total will be set to zero.</p>



## 8.12 Flow direction function (Detailed Setup)

<p><b>Flow direction</b></p>	<p>Select : Forward, Reverse</p> <p>See 8.8. and 8.9 according influence on status output (SO 1/2 function = Bi-direction).</p> <p>If <i>Reverse</i> is selected, the flow direction in the other direction of the arrow on the detector is used as “forward”.</p> <p>The pictures below show the characteristic of analog and frequency (pulse) outputs depending on flow direction.</p>
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### 8.13 Concentration measurement (Detailed Setup)

<b>Concentration meas</b>	To set the functions of concentration measurement.  A customer specific or defined table is stored in the converter and concentration measurement is enabled in factory for option /Cxx.
<b>Concentration meas format</b>	Select : xxxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX
<b>Concentration meas LRV (low range value)</b>	Set a concentration value to the 4mA or 0 Hz
<b>Concentration meas (upper range value)</b>	Set a concentration value to the 20mA or xxxxx = Hz
<b>Concentration meas damping</b>	Set the damping time in s. Damping time effects outputs and display. After 5 times damping time the given value is displayed ( $\tau=63\%$ ).
<b>Concentration meas lowcut</b>	Set the low cut. Low cut effects output and display. A hysteresis of 0.05% of Q nom is given by the system.
<b>Concentration meas alm 1 sel</b>	Select : no function, more than, less than
<b>Concentration meas alm 1 crit</b>	Select a concentration alarm level. What happens in case of an alarm has to be defined in Status out (8.8, 8.9).
<b>Concentration meas alm 2 sel</b>	Select : no function, more than, less than
<b>Concentration meas alm 2 crit</b>  <b>Restrictions:</b> 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 (8.8, 8.9).

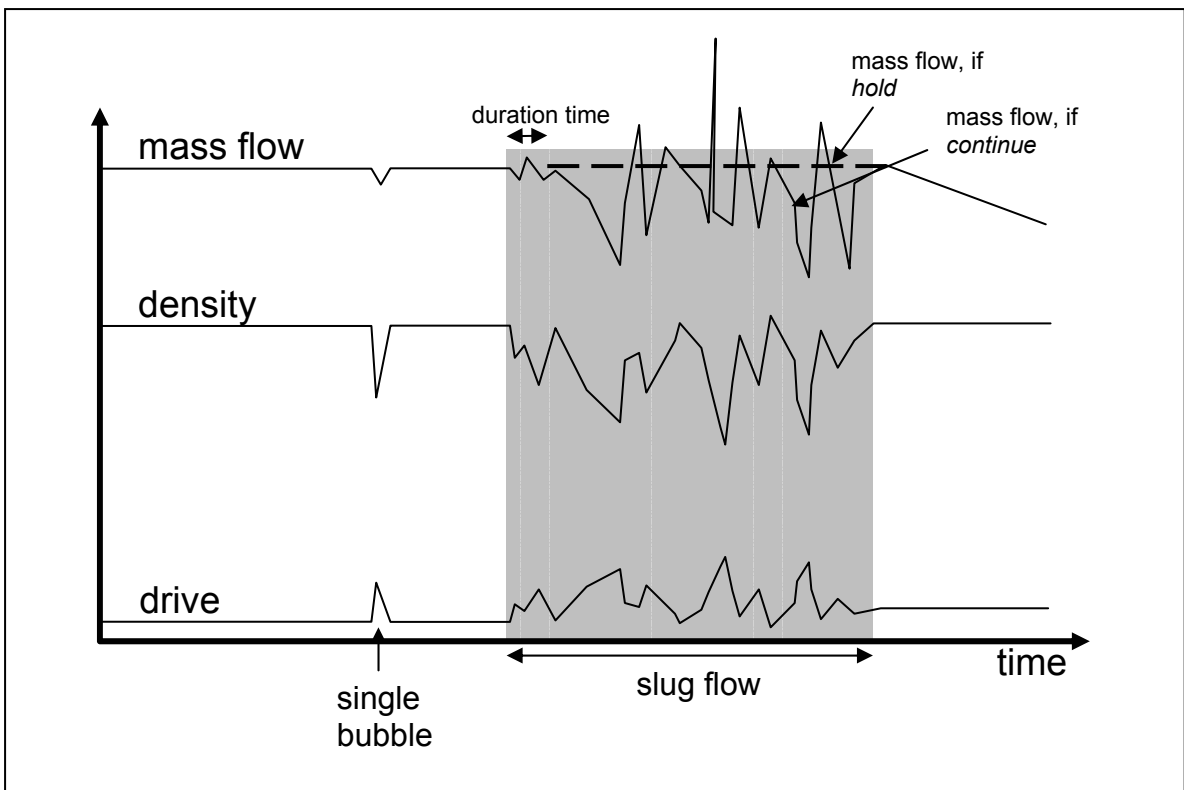
## 8.14 Net flow (Detailed Setup)

<b>Net flow</b>	To set the functions of net flow measurement.  Net flow is only available if concentration measurement is activated (option /Cxx).
<b>Net flow unit</b>	Select : kg/h, t/min,t/h, lb/s, lb/min, lb/h
<b>Net flow format</b>	Select : xxxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX
<b>Net flow LRV (low range value)</b>	Set a net flow value to the 4mA or 0 Hz
<b>Net flow URV (upper range value)</b>	Set a net flow value to the 20mA or xxxxx = Hz
<b>Net flow damping</b>	Set the damping time in s. Damping time effects outputs and display. After 5 times damping time the given value is displayed ( $\tau=63\%$ ).
<b>Net flow lowcut</b>	Set the low cut. Low cut effects output and display. A hysteresis of 0.05% of Q nom is given by the system.
<b>Net flow alm 1 sel</b>	Select : no function, more than, less than
<b>Net flow alm 1 crit</b>	Select a net flow alarm level. What happens in case of an alarm has to be defined in Status out (8.8, 8.9).
<b>Net flow alm 2 sel</b>	Select : no function, more than, less than
<b>Net flow alm 2 crit</b>  <b>Restrictions:</b> 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 (8.8, 8.9).

## 8.15 Slug detection (Detailed Setup)

<p><b>Slug detection</b></p> <p>Not available if gas measurement is ordered.</p>	<p>Detection of bubble flow.</p> <p>After <i>slug criteria</i> is reached, slug is supervised during <i>slug duration</i>. If slug is still detected after <i>slug duration</i>, the selected item in <i>after slug</i> is executed. See below table.</p>
<p><b>Slug alarm select</b></p>	<p>Select : Not apply, Apply</p>
<p><b>Drive gain</b></p>	<p>To read drive gain.</p> <p>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.</p>
<p><b>Slug criteria</b></p>	<p>Set the level of drive gain when an alarm should happen.</p>
<p><b>Slug duration</b></p>	<p>After <i>slug criteria</i> is detected, slug alarm and/or Measured value is not active during duration time. Duration time is designed to ignore short gas bubbles. In normal slug application set slug duration to zero.</p>
<p><b>After slug</b></p>	<p>Select : Measured value, Hold</p> <p>If <i>hold</i> is selected the output mass flow is the value before the slug alarm happened, as long as slug alarm is active.</p>
<p>Drive gain damping</p>	<p>Set drive gain damping time to get a constant drive gain level.</p>

Gas selected ?			
Yes	No		
	Alarm select = Apply ?		
Slug Detect OFF	Yes		No
	Drive gain > Criteria value ?		
	Yes		No
	Duration active ?		
	Yes	after duration,	
Function active Alarm off measurement continue	Slug detect ON  Alarm ON measurement continue or value hold	Slug detect OFF  Alarm Off	



### 8.16 Empty pipe detection (Detailed Setup)

<p><b>Empty pipe detect</b></p> <p>Not available if gas measurement (option /GA) is ordered.</p>	<p>Detection of empty pipe.</p> <p>After <i>Empty pipe crit</i> is reached, alarm output is activated if selected.</p>
<p><b>Empty pipe alm sel</b></p>	<p>Select : Not apply, Apply</p>
<p><b>Empty pipe crit</b></p>	<p>Set density value up to <i>Density URV</i> when <i>empty pipe</i> should happen.</p>
<p><b>After empty pipe</b></p>	<p>Select the behaviour of the outputs after <i>empty pipe</i> has happen.</p> <p>Select : Massflow = Zero, MeasuredValue, Hold</p> <p>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 cases please install the detector vertically.</p>

Gas selected ?		
Yes	No	
	Alarm select = Apply ?	
	Yes	No
	Density < Criteria value ?	
	Yes	No
EMPTY PIPE OFF	EMPTY PIPE ON Alarm On  Outputs either "measured value" "hold" or "4mA/0Hz"	EMPTY PIPE OFF Alarm Off

## 8.17 Corrosion detection (Detailed Setup)

<p><b>Corrosion detection</b></p> <p>Not available if gas measurement is ordered. Not working if a fixed density value is set. 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 manually.</p>	<p>Detection of corrosion in pipe.</p> <p>After <i>Corrosion crit</i> is reached, alarm output is activated if selected.</p> <p>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.</p>
<p><b>Corrosion alm sel</b></p>	<p>Select : Not apply, Apply</p>
<p><b>Corrosion crit</b></p>	<p>Set density value up to <i>Density URV</i>.</p>
<p><b>Corrosion damp</b></p>	<p>Set damping on density for comparison with <i>Corrosion crit</i> , up to 10h.</p>

### 8.18 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 used 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 first part of the commission number is stored in *Detailed setup / Device information / Sensor S/N*.

The second part of the commission number is stored in *Detailed setup / Device information / Assembly number*.

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

For integral type RCCT3x and remote type RCCF31 combined ordered with RCCS3 the detector data are factory stored in the concerning parameters. For not combined remote type (RCCF31 with option /NC) see chapter 4.5 .

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.



## 8.19 Autozero (Diag/Service)

<b>Autozero</b>	<p>Mass flow Zero setting.</p> <p>Please set Zero under process conditions after warming up the converter.</p>
<b>Zero tuning</b>	Select : Inhibit, Enable
<b>Autozero time</b>	<p>Select : 3 min , 30 sec</p> <p>Select the duration of autozero performing. Recommended: 3 min</p>
<b>Autozero Exe</b>	<p>Select : Execute, Not Execute.</p> <p>If <i>Execute</i> is selected Autozero is started. After autozero execution the autozero value is indicated and the actual date can be entered (format : mm/dd/yyyy). Pressing SET stores value, date, temperature and density in autozero history.</p>
<b>Autozero value</b>	Result of autozero
<b>Autozero check: Autozero history</b>	<p>Indicates 5 latest autozero values with date of execution, temperature and density during execution.</p> <p>This function allows checking the quality of autozero condition and long terming zero drift, if happen.</p>
<b>Autozero check : Autozero initial</b>	Indicated the 'factory autozero value'
<b>Autozero check: Autozero range</b>	<p>Indicates the typical max. autozero range. If this range is exceeded during autozero the warning W06 is generated. Check the detector installation! If the latest 3 autozero values are within +/- 0.05% of Q nom, the installation is ok and the warning can be ignored.</p>
<p><b>Autozero check: Autozero fluctuation</b></p> <p>Warning: If the sensor model is changed Autozero fluctuation is zero. Then always a warning is generated after performing Autozero.</p>	<p>Indicates the factory autozero fluctuation range. If this range is exceeded during autozero the warning W07 is generated. Check the electrical installation, the plant vibration and the density (is the</p>

## FUNCTIONS

detector fully filled?)



### IMPORTANT

- **Stop flow before starting autozero.**
- During autozero time
  - Analog outputs are fixed to 4mA
  - Pulse outputs are fixed to zero.
  - Totalizer stops counting.
  - Display switches do not work.
  - In HART communication write- and exe-commands are not accepted.
  - Status input does not work.

### Reading Autozero history :

123.45	kg/h	MFR
0.997	kg/l	DEN
12.34	degC	TMP
12.345	kg	FTL

Set > 2s

Diag/Service
Δ Autozero check
Autozero
Output trim

Set

Setting Enable?
-----------------

Set

Autozero check
Δ Autozero history
Autozero initial
▼ Autozero range

Set

Main Menu
Language
Process variables
▼ Diag/Service

2x ▼

Autozero history
05/05/2003
10/06/2003
▼ 15/07/2003

Set

Main Menu
Δ Diag/Service
Basic Setup
▼ Detailed Setup

Set

AZ hist : 05/05/2003
+ 0000.00 kg/h
+ 00.0000 kg/l
+ 0030.00 degC

Shift + Set

Diag/Service
Selftest/Status
Input/Output test
▼ Autozero check

2 x ▼

Autozero history
05/05/2003
10/06/2003
▼ 15/07/2003

**Performing Autozero :**

123.45	kg/h	MFR
0.997	kg/l	DEN
12.34	degC	TMP
12.345	kg	FTL

Set > 2s

Setting Enable?

Set

Main Menu  
**Language**  
 Process variables  
 ▼ Diag/Service

2x ▼

Main Menu  
**▲ Diag/Service**  
 Basic Setup  
 ▼ Detailed Setup

Set

Diag/Service  
**▲ Seftest/Status**  
 Input/Output test  
 ▼ Autozero check

2x ▼

Diag/Service  
**▲ Autozero check**  
 Autozero  
 Output trim

▼

Diag/Service  
**▲ Autozero**  
 Output trim

Set

Autozero  
**Zero tuning**  
 Autozero time  
**▲ Autozero exe**

2x ▼

Autozero  
**▲ Autozero exe**  
 Autozero value

Set

Auto zero exe  
**Not Execute**  
**▲ Execute**

▼

Auto zero exe  
**▲ Execute**

Set

Autozero  
 Auto zero exe  
 Doing Autozero 180sec

After 30s /180s

Autozero  
 Auto zero exe  
 000.00 kg/h

Set

Autozero  
 Date (mm/dd/yyyy)  
 00/00/2000

Set date with Shift + ▼ . Then press Set. → Autozero data is written in autozero history.

### 8.20 Reading maximum fluid temperature (Detailed Setup)

<b>Fluid max temp.</b>	The ever measured most high medium temperature can be read in this parameter.  This parameter can not be reset or changed by the user.
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### 8.21 Option /GA for Gas Measurement

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

- Density measurement will not work; always the *Density fix value* is used and displayed. If volume flow is needed the correct density value has to be implemented in the menu. To measure flow in normal units the normal density has to be set in the submenu *density*. Then the display shows flow in normal units, although not extra indicated (e.g. display shows m<sup>3</sup>/h and not Nm<sup>3</sup>/h).
- Corrosion detection will not work.
- Empty pipe detection will not work.
- Slug detection will not work.

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

## 9 Self diagnostic and Troubleshooting

### 9.1 Error descriptions and countermeasure

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.

Warnings W-01 to W-04 are indicated in the 4<sup>th</sup> display line .Warning W-06 and W-07 are indicated directly after autozero if generated. 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	Density; Temp	Totalizer	Analog outputs	Frequ./Pulse outputs	Status outputs *)
		nc = no change					
A-01	Mass flow L Alarm	nc	nc	nc	nc	nc	Mass flow alm 1 <sup>1)</sup>
A-02	Mass flow H Alarm	nc	nc	nc	nc	nc	Mass flow alm 2 <sup>1)</sup>
A-03	Vol flow L Alarm	nc	nc	nc	nc	nc	Vol flow alm 1 <sup>1)</sup>
A-04	Vol flow H Alarm	nc	nc	nc	nc	nc	Vol flow alm 2 <sup>1)</sup>
A-05	Density L Alarm	nc	nc	nc	nc	nc	Density alm 1 <sup>1)</sup>
A-06	Density H Alarm	nc	nc	nc	nc	nc	Density alm 2 <sup>1)</sup>
A-07	Temperature L Alarm	nc	nc	nc	nc	nc	Temp alm 1 <sup>1)</sup>
A-08	Temperature H Alarm	nc	nc	nc	nc	nc	Temp alm 2 <sup>1)</sup>
A-09							
A-10							
A-11							
A-12							
A-13	Total threshold exceed	nc	nc	hold; continue <sub>1)</sub>	nc	nc	Total switch <sup>1)</sup>
A-14	Slug Detection	MFL: meas.; hold <sup>4)</sup>	nc	nc	nc	nc	Slug alarm <sup>1)</sup>
A-15	Empty Pipe Detection	MFL: meas.; hold; 0 <sup>2)</sup>	nc	nc	nc	nc	Empty pipe alm <sup>1)</sup>
A-16	Corrosion Detection	nc	nc	nc	nc	nc	Corrosion alm <sup>1)</sup>
W-01	Density lower 0.3kg/l	nc	DEN: 0.3 kg/l <sub>5)</sub>	nc	nc	nc	nc
W-02	Fixed Dens selected	nc	DEN: fix value	nc	nc	nc	nc
W-03	Fixed Temp selected	nc	TEM: fix value	nc	nc	nc	nc
W-04	Fixed Mass flow selected	MFL: fix value + act. zero	nc	nc	nc	nc	nc
W-05	Autozero running	nc	nc	nc	nc	nc	nc

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W-06	Autozero value out of range.	nc	nc	nc	nc	nc	nc
W-07	Autozero fluctuation out of range.	nc	nc	nc	nc	nc	nc
W-08	Simulation active	nc	nc	nc	nc	nc	nc
W-09	Analog output 1 fixed	nc	nc	nc	4 mA	nc	nc
W-10	Analog output 1 saturated	nc	nc	nc	nc	nc	nc
W-11	Analog output 2 saturated	nc	nc	nc	nc	nc	nc
W-12	Pulse/Status output 1 saturated	nc	nc	nc	nc	nc	nc
W-13	Pulse/Status output 2 saturated	nc	nc	nc	nc	nc	nc
E-01	Frequency Fault			nc	3,6 mA;... <sup>3)</sup>	nc	nc
E-02	Signal Fault			nc	3,6 mA;... <sup>3)</sup>	nc	nc
E-03	EEPROM Fault			nc	3,6 mA;... <sup>3)</sup>	nc	nc
E-04	CPU Fault			nc	3,6 mA;... <sup>3)</sup>	nc	nc
E-05	DSP Fault			nc	3,6 mA;... <sup>3)</sup>	nc	nc
E-06	Sensor 1 Signal Fault			nc	3,6 mA;... <sup>3)</sup>	nc	nc
E-07	Sensor 2 Signal Fault			nc	3,6 mA;... <sup>3)</sup>	nc	nc
E-08	Temperature Sensor fault			nc	3,6 mA;... <sup>3)</sup>	nc	nc

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)

\*) status outputs acc. SO 1/2 function and SO 1/2 active mode

The following table shows possible countermeasures :

<b>Alarm (A); Warning (W); Error (E)</b>	<b>Name</b>	<b>Description</b>	<b>Countermeasure</b>
A-01	Mass flow L Alarm	Mass flow below Mass flow LRV	Increase mass flow / Change setting
A-02	Mass flow H Alarm	Mass flow above Mass flow URV	Reduce mass flow / Change setting
A-03	Vol flow L Alarm	Volume flow below Vol flow LRV	Increase volume flow / Change setting
A-04	Vol flow H Alarm	Volume flow above Vol flow URV	Reduce flow / Change setting
A-05	Density L Alarm	Density below Density LRV	Increase density / Change setting
A-06	Density H Alarm	Density above Density URV	Reduce density / Change setting
A-07	Temperature L Alarm	Temp. Below Temp LRV	Increase temperature / Change setting
A-08	Temperature H Alarm	Temp. Above Temp URV	Reduce temperature / Change setting
A-09			
A-10			
A-11			
A-12			
A-13	Total threshold exceed	Totalizer value exceeds total threshold	Reset totalizer / Change setting
A-14	Slug Detection	Slug criterion is reached	Reduce gas bubbles in medium
A-15	Empty Pipe Detection	Empty pipe criterion is reached	Fill pipe
A-16	Corrosion Detection	Corrosion criterion is reached	Change detector
W-01	Density lower 0.3kg/l	Density lower than 0.3 kg/l	Fill the detector with fluid
W-02	Fixed Dens selected	Parameter Dens fix val sel is enable	Set Parameter Dens fix val sel to inhibit
W-03	Fixed Temp selected	Parameter Temp fix val sel is enable	Set Parameter Temp fix val sel to inhibit
W-04	Fixed Mass flow selected	Parameter MF fix val sel is enable	Set Parameter MF fix val sel to inhibit
W-05	Autozero running .....		
W-06	Autozero value out of range	Autozero value is out of the internal detector depending range	Stop flow during auto zero. Check detector installation.
W-07	Autozero fluctuation out of range	Autozero fluctuation is out of the internal detector depended range	Stop flow during auto zero Check electrical installation, vibrations and density.
W-08	Sensor Simulation active	Fixed frequency or fixed phase difference is enabled	Set sensor simulation to inhibit
W-09	Analog output 1 fixed	Analog output 1 fixed at 4 mA for multidrop operation	Set HART polling address to 0 (Multidrop operation stops)
W-10	Analog output 1 saturated	Analog output 1 reaches less than 3.8 mA or more than 20.5 mA	Increase or decrease current level of output 1
W-11	Analog output 2 saturated	Analog output 2 reaches less than 3.8 mA or more than 20.5 mA	Increase or decrease current level of output 2
W-12	Pulse/Status output 1 saturated	Relation between Pulse width and pulse rate of Pulse/Status output 1 is to high	Decrease length of pulse width or increase amount of pulse rate of pulse output 1
W-13	Pulse/Status output 2 saturated	Relation between Pulse width and pulse rate of Pulse/Status output 2 is to high	Decrease length of pulse width or increase amount of pulse rate of pulse output 2
E-01	Frequency Fault	Driving frequency out of range	Check cable (Remote) and detector
E-02	Signal Fault	Phase difference out of range	Check cable (Remote) and detector

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E-03	EEPROM Fault		Contact Yokogawa service
E-04	CPU Fault		Contact Yokogawa service
E-05	DSP Fault		Contact Yokogawa service
E-06	Sensor 1 Signal Fault	Sensor 1 signal to small	Check cable (Remote) and detector
E-07	Sensor 2 Signal Fault	Sensor 2 signal to small	Check cable (Remote) and detector
E-08	Temperature Sensor fault	T<-210°C or T>450°C	Check cable (Remote) and detector Check temperature

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

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



### 9.3 Self test (Diag/Service)

<p><b>Self test/Status</b></p>	<p>Select : Self test, Status</p> <p>If <i>Self test</i> is selected, all error and alarm status are checked.</p> <p>If <i>Status</i> is selected, the existing errors and alarms are indicated in succession.</p>
--------------------------------	--

### 9.4 Signal- and I/O-Test (Diag/Service)

<p><b>Input/Output test</b></p>	<p>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 4.4.3 . With <i>escape</i> the test mode can be left.</p>
<p><b>Analog output 1</b></p> <p><b>Analog output 2</b></p> <p><b>Pulse output 1</b></p> <p><b>Status output 1</b></p> <p><b>Pulse output 2</b></p> <p><b>Status output 2</b></p> <p><b>Status input</b></p>	<p>Setting range : 2.4 to 21.6mA</p> <p>Setting range : 2.4 to 21.6mA</p> <p>Setting range : 0 to 10000Hz</p> <p>Setting range : ON or OFF</p> <p>Setting range : 0 to 2000Hz</p> <p>Setting range : ON or OFF</p> <p>Setting range : OPEN or SHORT</p>

### 9.5 Output trim

<p><b>Output trim</b></p>	<p>With this function the 4mA and the 20mA can be adjusted to compensate aging drifts.</p>
<p><b>AO 1 trim 4mA / AO 1 trim 20mA</b></p> <p><b>AO 2 trim (same as AO 1trim)</b></p>	<p>The analog output 1 is set to the internal 4mA or 20mA value. The measured current must be entered on request on display. The deviation to 4mA is corrected by the converter itself.</p>

### 9.6 Detector cleaning



#### CAUTION

For integral type : Ambient temperature may not exceed 50°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 50°C. Switch power off during cleaning.

### 9.7 Troubleshooting



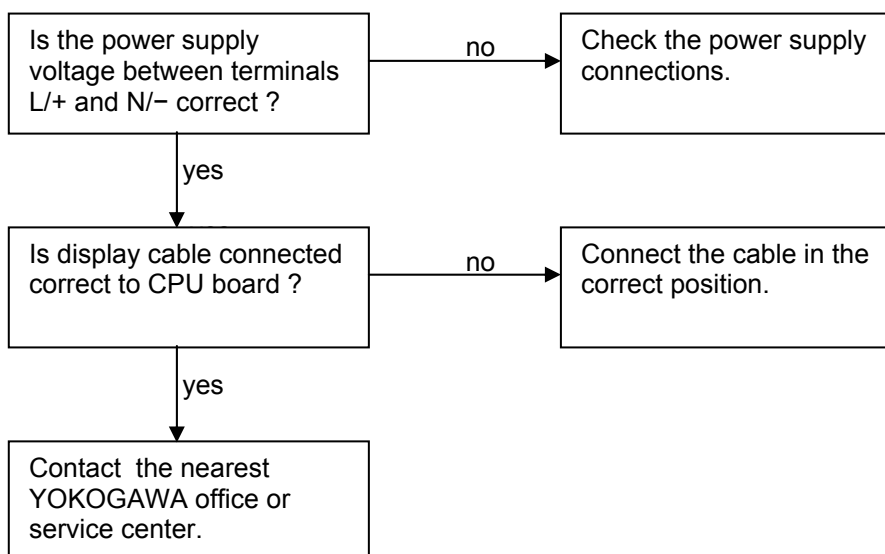
#### IMPORTANT

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.

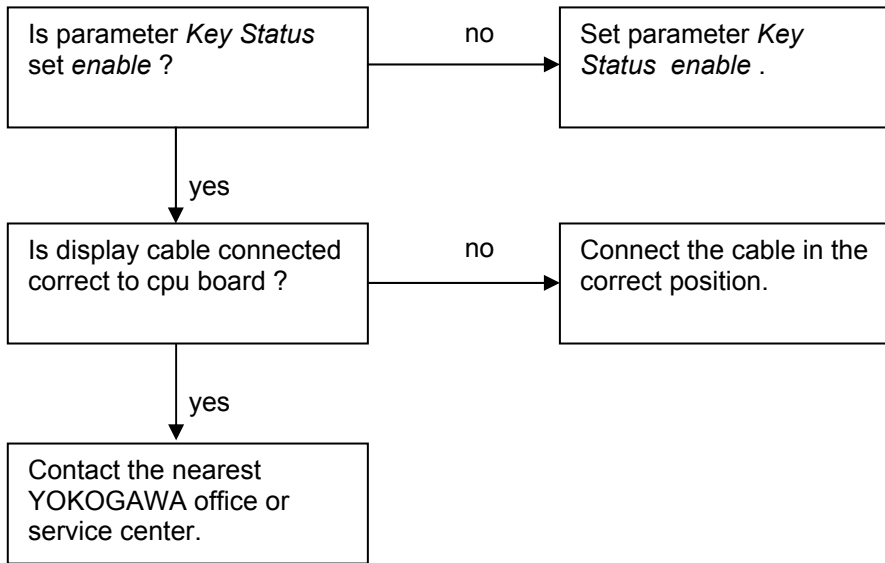
If there is an error, alarm or warning displayed, deal with the error according to 9.1 „Error descriptions and countermeasure“.

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.

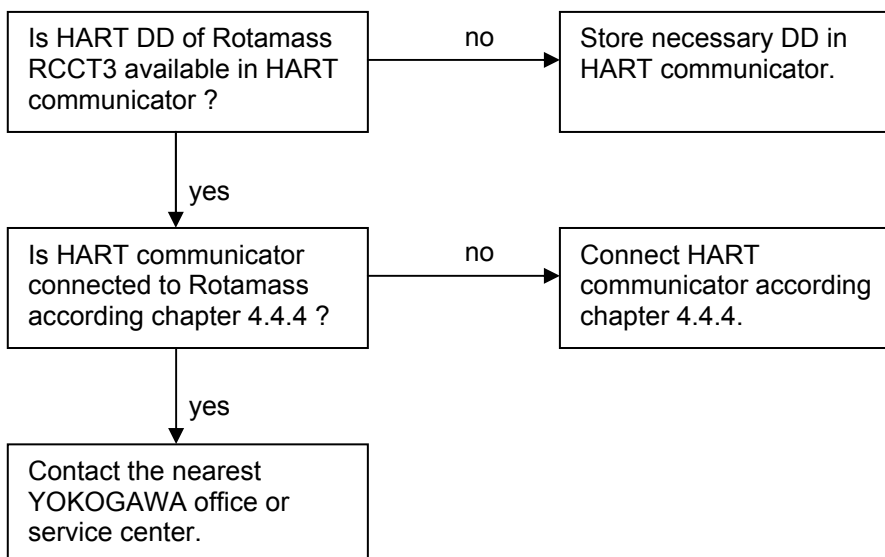
#### 9.7.1 No indication



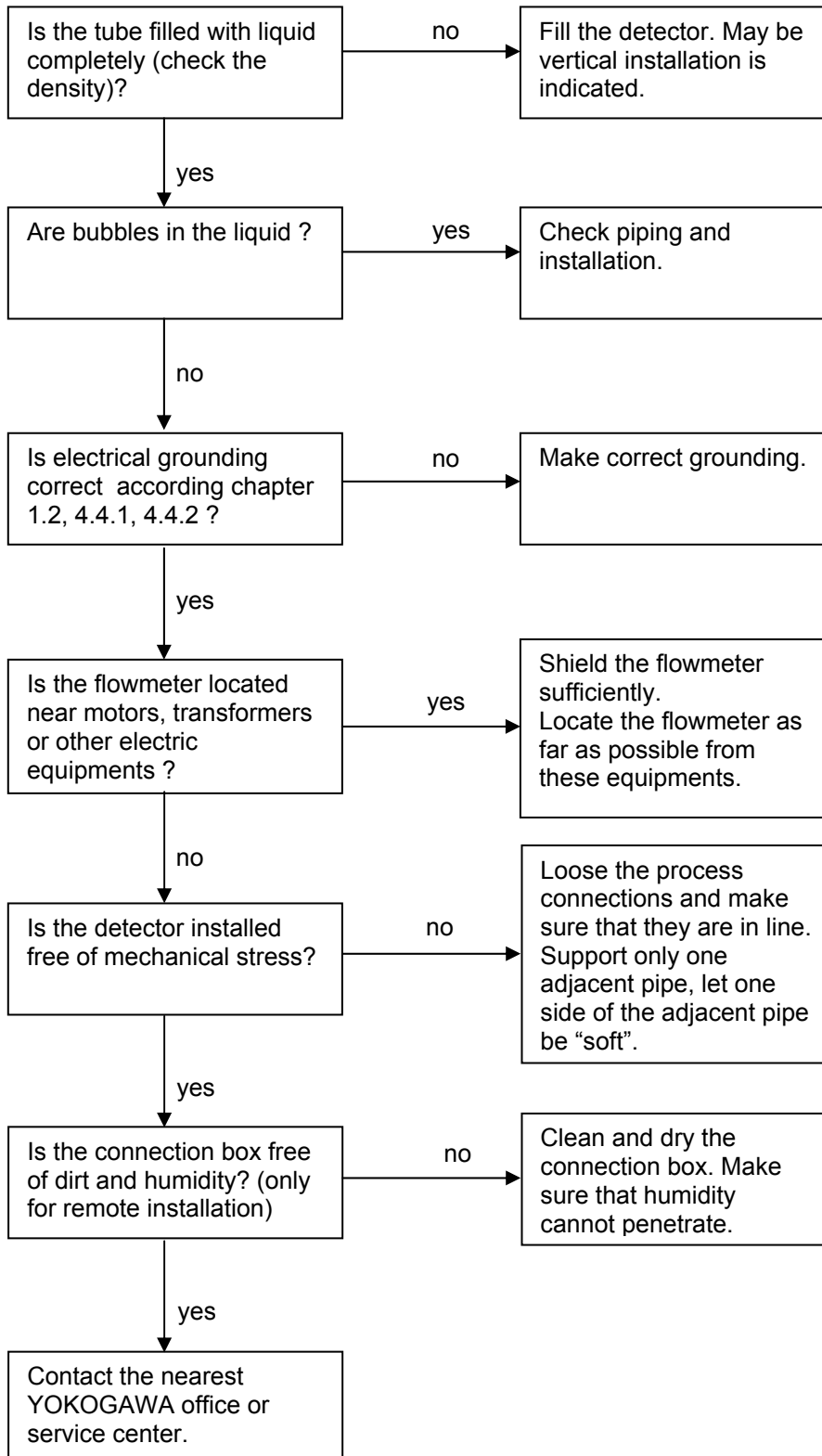
### 9.7.2 No Key-setting possible



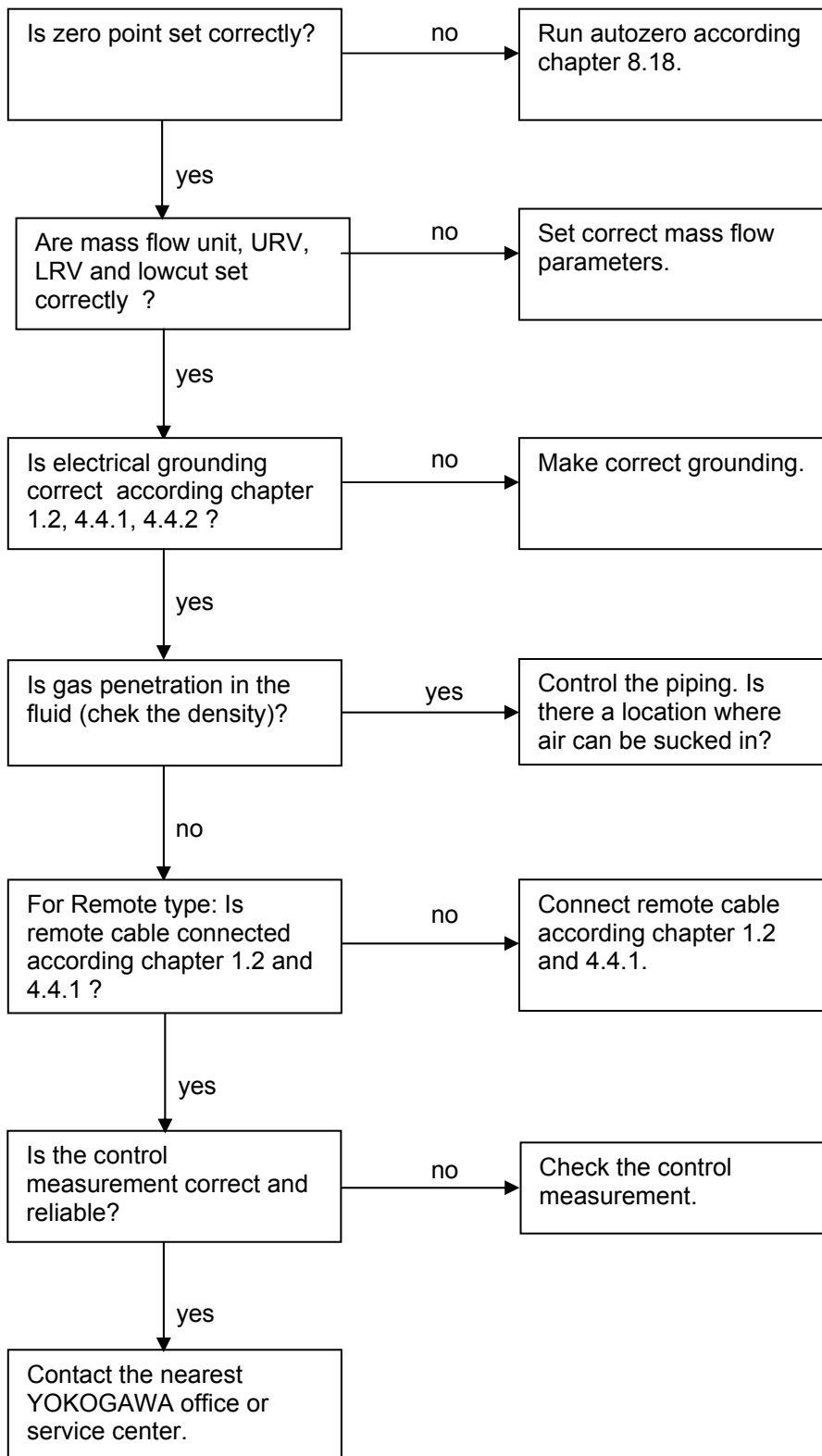
### 9.7.3 No HART communication



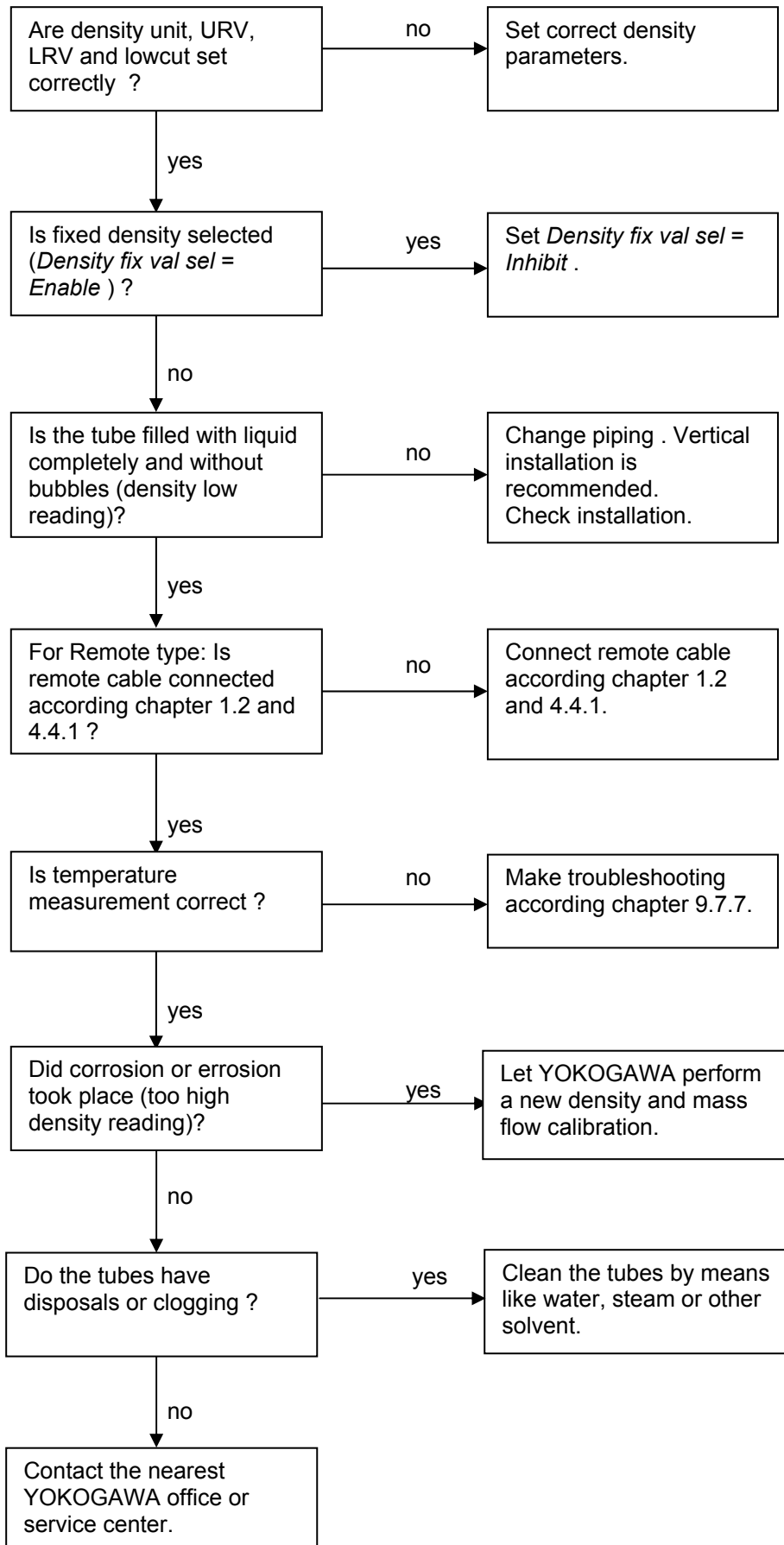
## 9.7.4 Unstable zero



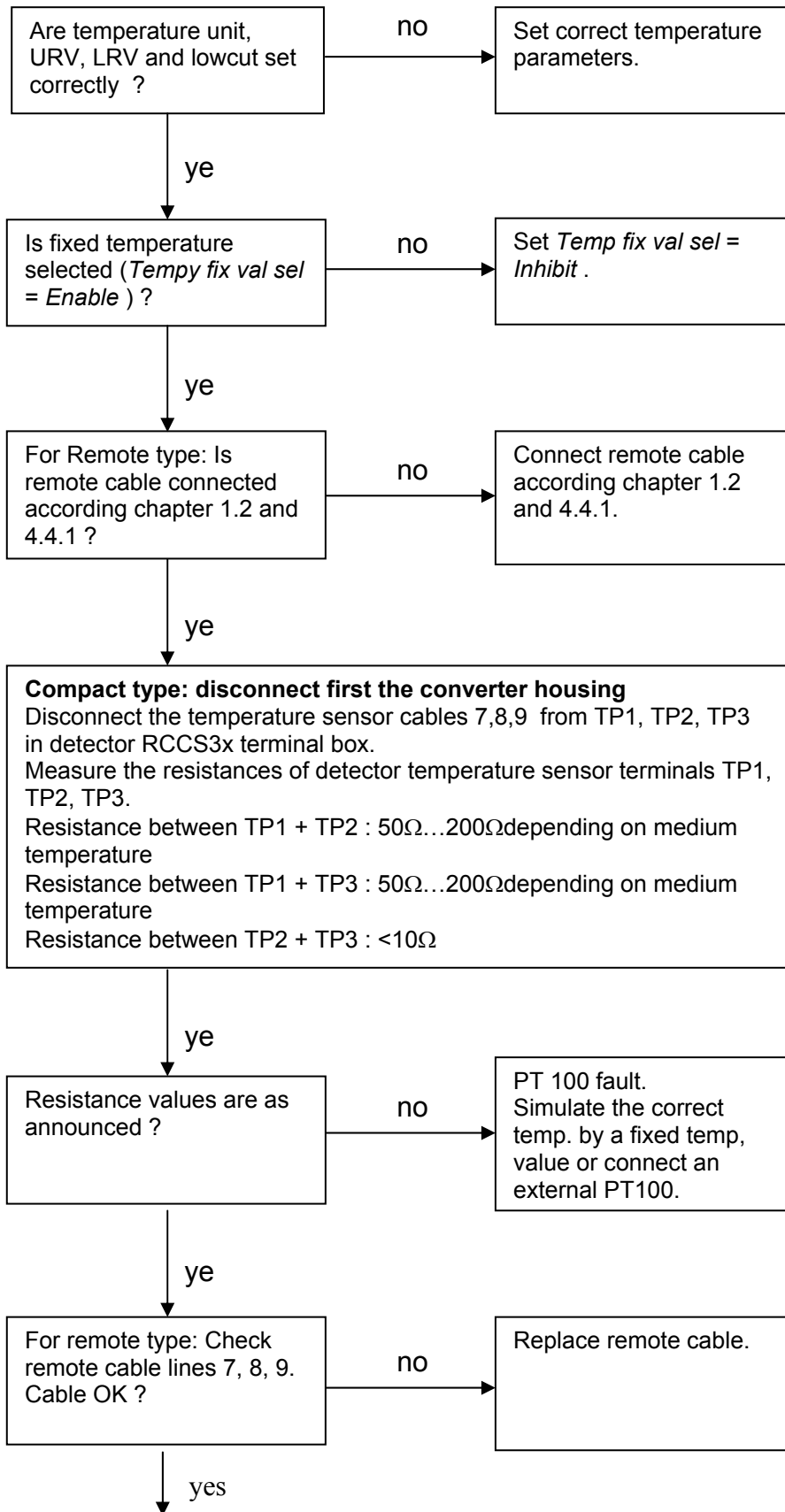
9.7.5 Disagreement of indication with actual flow rate

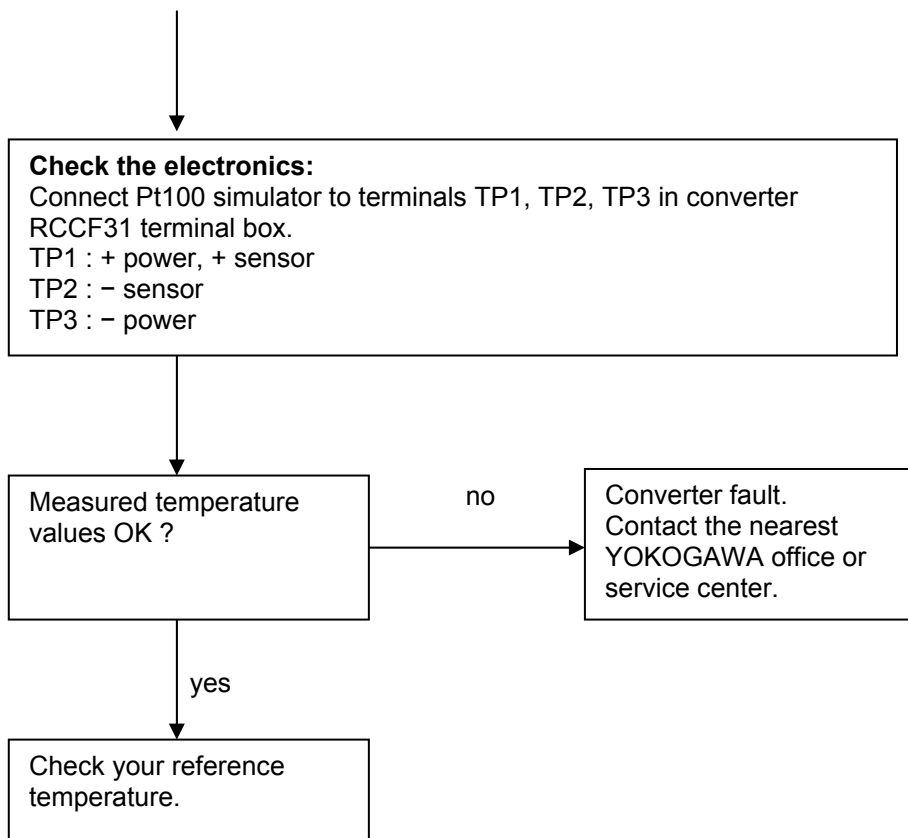


9.7.6 Disagreement of indication with actual density

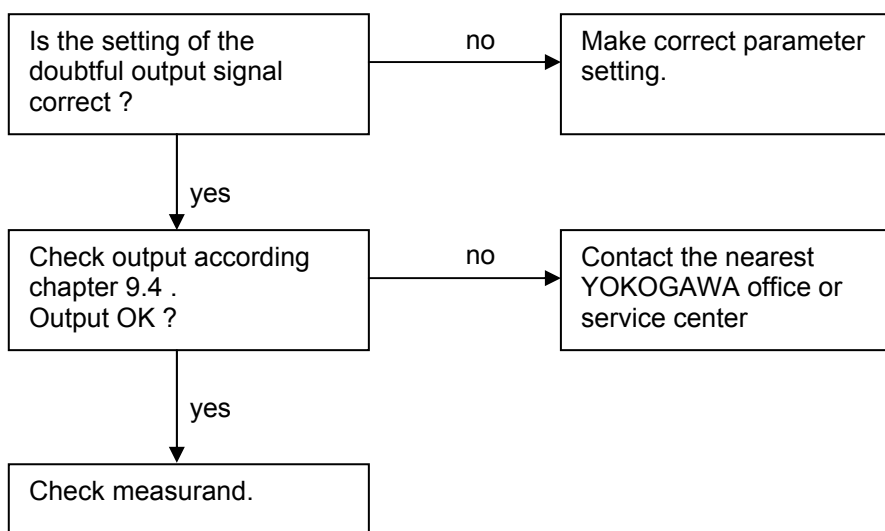


9.7.7 Disagreement of indication with actual temperature





### 9.7.8 Discrepancy of output signals to the assigned measurand





## 10 Appendix

### 10.1 Parameter list

Parameter	Data form	Data range	Dec. Point	Unit	R : read W: write EXE: execute	Reset		Default
						Master	Power on	
Write protect	Select	No Yes	-	-	R/W			-
Enable WRT 10 min		Acc. to HART	-	-	R/W	X		Disable
New Password	ASCII	8 characters	-	-	R/W	X		Space
Software Seal	Select	Break Keep	-	-	R/W			-
Master Reset	Select	OK Abort	-	-	EXE	X		-
Key Status	Select	Enable Inhibit	-	-	R/W	X	X	Enable
Language	Select	English German French	-	-	R/W	X		English
Mass Flow	Decimal	-	0 to 4	Mass flow unit	R		-	-
Volume Flow	Decimal	-	0 to 4	Vol flow unit	R		-	-
Density	Decimal	-	0 to 4	Density unit	R		-	-
Temperature	Decimal	-	1	Temperature unit	R		-	-
F-Total	Decimal	-	0	Total unit	R		-	-
R-Total	Decimal	-	0	Total unit	R		-	-
D-Total	Decimal	-	0	Total unit	R		-	-
Concentration meas	Decimal	-	0 to 4	Customer specific	R		-	-
Net flow	Decimal	-	0 to 4	Mass flow unit	R		-	-
Analog output 1	Decimal	-	as sel. Var.	as sel. Var.	R		-	-
Analog output 1 %	Decimal	-	1	%	R		-	-
Analog output 1 mA	Decimal	-	2	mA	R		-	-
Analog output 2	Decimal	-	as sel. Var.	as sel. Var.	R		-	-
Analog output 2 %	Decimal	-	1	%	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		-	-
Total reset cntrl	Select	Inhibit Enable	-	-	R/W	X	X	Inhibit

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Total reset	Select	Not Execute Execute	-	-	R/W	X	X	Not Execute
Self Test	Select	Not Execute Execute	-	-	R/W		X	Not Execute
Status	ASCII	Results of last self test	-	-	R		-	-
Hist Overview ord	ASCII	-	-	-	R		-	-
Hist Overview abs	ASCII	-	-	-	R		-	-
Error History	ASCII	-	-	-	R		-	-
Test Analog output 1	Decimal	4 to 21	1	mA	R/W	X	X	4.0
Test Analog output 2	Decimal	4 to 21	1	mA	R/W	X	X	4.0
Test Pulse output 1	Decimal	0 to 10000	1	Hz	R/W	X	X	1000.0
Test Status output 1	Select	ON OFF	-	-	R/W	X	X	OFF
Test Pulse output 2	Decimal	0 to 10000	1	Hz	R/W	X	X	1000.0
Test Status output 2	Select	ON OFF	-	-	R/W	X	X	OFF
Test Status input	ASCII	Status SI	-	-	R/W		-	-
Autozero tuning	Select	Inhibit Enable	-	-	R/W	X	X	Inhibit
Autozero Time	Select	3 min. 30 s	-	-	R/W	X	X	3 min.
Autozero Exe	Select	Not Execute Execute	-	-	Exe	X	X	Not Execute
Autozero Value	Decimal	depends on size	3	kg/h or t/h	R/W	X		000.000
Autozero History	ASCII	-	-	-	R		-	-
Autozero initial	Decimal	depends on size	0	kg/h	R		-	-
Autozero range	Decimal	depends on size	0	kg/h	R		-	-
Autozero fluctuation	Decimal	depends on size	0	kg/h	R		-	-
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
Disp select 1	Select	Mass flow Volume flow Density Temperature F-Total R-Total D-Total Concentration meas Net flow	-	-	R/W	X		Mass Flow

Disp select 2	Select	Mass flow Volume flow Density Temperature F-Total R-Total D-Total Concentration meas Net flow None	-	-	R/W	X		Density
Disp select 3	Select	Mass flow Volume flow Density Temperature F-Total R-Total D-Total Concentration meas Net flow None	-	-	R/W	X		Temperature
Disp select 4	Select	Mass flow Volume flow Density Temperature F-Total R-Total D-Total Concentration meas Net flow None	-	-	R/W	X		F-Total
Disp Contrast	Decimal	-5 ... +5	0	-	R/W			0
Disp Period	Select	0.5 s 1.0 s 2.0 s	1	Sec.	R/W	X		0.2 s
Flow direction	Select	Forward Reverse	-	-	R/W	X		Forward
Mass flow unit	Select	g/s g/min g/h kg/s kg/min kg/h	-	-	R/W			t/h

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		t/min t/h lb/s lb/min lb/h						
Mass flow format	Select	xxxxxxx xxxxx.X xxxx.XX xxx.XXX xx.XXXX x.XXXXX	-	-	R/W			xxxx.XX
Mass flow LRV	Decimal	depends on size	0 to 4	Mass flow unit	R/W			0
Mass flow URV	Decimal	depends on size	0 to 4	Mass flow unit	R/W			9
Mass flow damping	Decimal	0.1 to 200	1	Sec.	R/W	X		3
Mass flow lowcut	Decimal	depends on size	0 to 4	Mass flow unit	R/W			0.0315
Mass flow alm1 sel	Select	No Function More Than Less Than	-	-	R/W	X		No Function
Mass flow alm1 crit	Decimal	depends on size	0 to 4	Mass flow unit	R/W	X		0
Mass flow alm 2 sel	Select	No Function More Than Less Than	-	-	R/W	X		No Function
Mass flow alm2 crit	Decimal	depends on size	0 to 4	Mass flow unit	R/W	X		0
Mass flow fix val sel	Select	Inhibit Enable	-	-	R/W	X		Inhibit
Mass flow fixed val	Decimal	0 to Qmax	0 to 4	Mass flow unit	R/W	X		0
Vol flow unit	Select	Cucm/s Cucm/min Cucm/h l/s l/min l/h Cum/s Cum/min Cum/h gal/s gal/min gal/h Cuft/s Cuft/min Cuft/h bbl/s bbl/min bbl/h Impgal/s Impgal/min Impgal/h	-	-	R/W			Cum/h
Vol flow format	Select	xxxxxxx xxxxx.X	-	-	R/W			xxxx.XX

		xxxx.XX xxx.XXX xx.XXXX x.XXXXX						
Vol flow LRV	Decimal	depends on size	0 to 4	Vol flow unit	R/W			0
Vol flow URV	Decimal	depends on size	0 to 4	Vol flow unit	R/W			9
Vol flow Damping	Decimal	0.1 to 200	1	Sec.	R/W	X		3
Vol flow Lowcut	Decimal	depends on size	0 to 4	Vol flow unit	R/W	X		9
Vol flow alm 1 sel	Select	No Function More Than Less Than	-	-	R/W	X		No Function
Vol flow alm 1 crit	Decimal	depends on size	0 to 4	Vol flow unit	R/W	X		0
Vol flow alm 2 sel	Select	No Function More Than Less Than	-	-	R/W	X		No Function
Vol flow alm 2 crit	Decimal	depends on size	0 to 4	Vol flow unit	R/W	X		0
Density unit	Select	g/ml kg/l kg/Cum lb/gal lb/Cuft	-	-	R/W	X		kg/l
Density format	Select	xxxxxx xxxxx.X xxxx.XX xxx.XXX xx.XXXX x.XXXXX	-	-	R/W	X		xxxx.XX
Density LRV	Decimal	0.3 to 5 kg/l	0 to 4	Density Unit	R/W	X		0.0
Density URV	Decimal	0.3 to 5 kg/l	0 to 4	Density Unit	R/W	X		1.5
Density damping	Decimal	0.1 to 200	1	Sec	R/W	X		15.0
Density lowcut	Decimal	0.3 to 5 kg/l	0 to 4	Density Unit	R/W	X		0.0
Density alm 1 sel	Select	No Function More Than Less Than	-	-	R/W	X		No Function
Density alm 1 crit	Decimal	0.3 to 5 kg/l	0 to 4	Density Unit	R/W	X		LRV
Density alm 2 sel	Select	No Function More Than Less Than	-	-	R/W	X		No Function
Density alm 2 crit	Decimal	0.3 to 5 kg/l	0 to 4	Density Unit	R/W	X		LRV
Density fix val sel	Select	Inhibit Enable	-	-	R/W	X	X	Inhibit
Density fixed value	Decimal	0 to 5 kg/l	0 to 4	Density Unit	R/W	X	X	1
Pressure	Decimal	0.01 to 400	2	bar	R/W	X	X	0
Temperature unit	Select	degC degF K	-	-	R/W	X		degC

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Temperature format	Select	Xxxxxx xxxx.X xxx.XX xx.XXX x.XXXX x.XXXXX	-	-	R/W	X		xxxx.XX
Temperature LRV	Decimal	Standard : -200 to 200 °C High Temp. : 0 to 400 °C	1	Temperature unit	R/W	X		0.0
Temperature URV	Decimal	Standard : -200 to 200 °C High Temp. : 0 to 400 °C	1	Temperature unit	R/W	X		150.0
Temperature damping	Decimal	0.1 to 200	1	Sec	R/W	X		15.0
Temp alm 1 sel	Select	No Function More Than Less Than	-	-	R/W	X		No Function
Temp alm 1 crit	Decimal	Standard : -200 to 200 °C High Temp. : 0 to 400 °C	1	Temperature unit	R/W	X		LRV
Temp alm 2 sel	Select	No Function More Than Less Than	-	-	R/W	X		No Function
Temp alm 2 crit	Decimal	Standard : -200 to 200 °C High Temp. : 0 to 400 °C	1	Temperature unit	R/W	X		LRV
Temp fix val select	Select	Inhibit Enable	-	-	R/W	X	X	Inhibit
Temp fixed value	Decimal	Standard : -200 to 200 °C High Temp. : 0 to 400 °C	1	Temperature unit	R/W	X	X	30.0
Temp gain	Decimal	0.8 ... 1.2	3	-	R/W			1.000
Analog 1 select	Select	None Mass flow Volume flow Density Temperature Concentration meas Netflow	-	-	R/W	X		Mass flow
Analog 1 alarm out	Select	2.4mA 3.6mA 4.0mA 21mA 21.6mA Hold Measured Value	-	-	R/W	X		<3.6mA
Analog 1 low LMT	Decimal	Namur : 3.6 to 21	1	mA	R/W	X		3.6 (Namur); 2.4 (Not Namur)

		Not Namur : 2.4 to 21.6						
Analog 1 high LMT	Decimal	Namur : 3.6 to 21 Not Namur : 2.4 to 21.6	1	mA	R/W	X		21 (Namur); 21.6 (Not Namur)
Analog 1 rev mode	Select	4 mA Measured Value	-	-	R/W	X		4 mA
Analog 2 select	Select	None Mass flow Volume flow Density Temperature Concentration meas Netflow	-	-	R/W	X		Density
Analog 2 alarm out	Select	<2.4mA <3.6mA 4.0mA >21mA >21.6mA Hold Measured Value	-	-	R/W	X		<3.6mA
Analog 2 low LMT	Decimal	Namur : 3.6 to 21 Not Namur : 2.4 to 21.6	1	mA	R/W	X		3.6 (Namur); 2.4 (Not Namur)
Analog 2 high LMT	Decimal	Namur : 3.6 to 21 Not Namur : 2.4 to 21.6	1	mA	R/W	X		21 (Namur); 21.6 (Not Namur)
Analog 2 rev mode	Select	4 mA Measured Value	-	-	R/W	X		4 mA
Pulse/Stat 1 select	Select	Pulse Status out No Function	-	-	R/W	X		Pulse
Pulse 1 select	Select	None Mass forward Mass reverse Volume forward Volume reverse Mass flow Volume flow Density Temperature Concentration meas Net forward Net reverse Net flow	-	-	R/W	X		Mass flow

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Pulse 1 unit	Select	Hz g/P kg/P t/P lb/P Cucm/P l/P Cum/P gal/P kgal/P Cuft/P bbl/P Impgal/P kImpgal/P	-	-	R/W	X		Hz
Pulse 1 rate	Decimal	0 to 10000	0 to 4	Pulse 1 unit	R/W	X		1000
Pulse 1 active mode	Select	On Active Off Active	-	-	R/W	X		On active
Pulse 1 width	Select	0.05ms 0.1ms 0.5ms 1ms 5ms 10ms 50ms 100ms	-	-	R/W			1ms
Pulse 1 at alarm	Select	0 Hz Measured Value	-	-	R/W	X		0 Hz
SO 1 function	Select	No Function Bi- Direction Total 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	-	-	R/W	X		No Function



		Net flow alm 1 Net flow alm 2 Net flow alm 1+2 Slug alarm Empty alarm Corrosion alarm						
SO 1 active mode	Select	On Active Off Active	-	-	R/W	X		On active
Pulse/Stat 2 select	Select	Pulse Status out No Function	-	-	R/W	X		Status out
Pulse 2 select	Select	None Mass forward Mass reverse Volume forward Volume reverse Mass flow Volume flow Density Temperature Concentration meas Net forward	-	-	R/W	X		Density
Pulse 2 unit	Select	Hz g/P kg/P t/P lb/P Cucm/P l/P Cum/P gal/P kgal/P Cuft/P bbl/P Impgal/P klmpgal/P	-	-	R/W	X		Hz
Pulse 2 rate	Decimal	0 to 2000	0 to 4	Pulse 2 unit	R/W	X		1000
Pulse 2 active mode	Select	On Active Off Active	-	-	R/W	X		On active
Pulse 2 width	Select	0.05ms 0.1ms 0.5ms 1ms 5ms 10ms 50ms	-	-	R/W			1ms

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		100ms						
Pulse 2 at alarm	Select	0 Hz Measured Value	-	-	R/W	X		0 Hz
SO 2 function	Select	No Function Bi- Direction Total 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	-	-	R/W	X		No Function
SO 2 active mode	Select	On Active Off Active	-	-	R/W	X		On active
SI function	Select	No Function Autozero Total reset 0% Signal lock	-	-	R/W	X		No Function
SI active mode	Select	On Active Off Active	-	-	R/W	X		On active
Total select	Select	Mass Volume Net	-	-	R/W	X		Mass

Total unit	Select	g kg t lb Cucm l Cum gal kgal Cuft bbl Impgal klmpgal	-	-	R/W	X		kg
Total switch	Decimal	0 to 1677215	0	Total unit	R/W	X		0
Total at alarm	Select	Hold Continue Total	-	-	R/W	X		Hold
Total reset cntrl	Select	Inhibit Enable	-	-	R/W	X	X	Inhibit
Total reset	Select	Not Execute Execute	-	-	R/W	X	X	Not Execute
SK20	Decimal	1.000 to 9999.999	3	MHz*kg/h	R/W			130.000
SKT	Decimal	-9.99 to 9.99	2	E-4/K	R/W			-4.95
RV	Decimal	99.99 to 99.99	2	-	R/W			0.26
Qnom	Decimal	0 to 99999	0	Mass flow unit	R/W			9
KD	Decimal	1.000 to 99.999	3	kg/l	R/W			3.700
fl20	Decimal	1.000 to 999.999	3	Hz	R/W			170.000
FTC1	Decimal	-9.999 to 9.999	3	E-4/K	R/W			-2.226
FTCK	Decimal	-10.000 to 10.000	3	E-4(1/K) / (kg/l)	R/W			-0.100
Poll Address	Decimal	0 to 255	0	-	R/W	X		0
Num req pream	Decimal	0 to 255	0	-	R/W			5
Concentration meas format	Select	xxxxxx	-	-	R/W			xxxx.XX
		xxxxx.X						
		xxxx.XX						
		xxx.XXX						
		xx.XXXX						
		x.XXXXX						
Concentration meas LRV	Decimal	depends on size	0 to 4	Customer specific	R/W			0
Concentration meas URV	Decimal	depends on size	0 to 4	Customer specific	R/W			9
Concentration meas Damp	Decimal	0.1 to 200	1	Sec.	R/W	X		10
Concentration meas lowcut	Decimal	depends on size	0 to 4	Concentration meas unit	R/W			0
Conc meas alm 1 Sel	Select	No Function	-	-	R/W	X		No Function
		More Than						
		Less Than						

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Conc meas alm 1 Crit	Decimal	depends on size	0 to 4	Customer specific	R/W	X		0
Conc meas alm 2 Sel	Select	No Function	-	-	R/W	X		No Function
		More Than						
		Less Than						
Conc meas alm 2 Crit	Decimal	depends on size	0 to 4	Customer specific	R/W	X		0
Net flow unit	Select	kg/h						
		t/min						
		t/h						
		lb/s						
		lb/min						
		lb/h						
Net flow format	Select	xxxxxxx	-	-	R/W			xxxx.XX
		xxxxx.X						
		xxxx.XX						
		xxx.XXX						
		xx.XXXX						
		x.XXXXX						
Net flow LRV	Decimal	depends on size	0 to 4	Customer specific	R/W			0
Net flow URV	Decimal	depends on size	0 to 4	Customer specific	R/W			9
Net flow damping	Decimal	0.1 to 200	1	Sec.	R/W	X		3
Net flow lowcut	Decimal	Customer specific	0 to 4	Customer specific	R/W			0
Net flow 1 Sel	Select	No Function	-	-	R/W	X		No Function
		More Than						
		Less Than						
Net flow 1 Crit	Decimal	depends on size	0 to 4	Customer specific	R/W	X		0
Net flow 2 Sel	Select	No Function	-	-	R/W	X		No Function
		More Than						
		Less Than						
Net flow 2 Crit	Decimal	depends on size	0 to 4	Customer specific	R/W	X		0
Measuring range	Select	Namur Not Namur	-	-	R			
Slug alarm select	Select	Not Apply Apply	-	-	R/W	X		Not Apply
Drive gain	Decimal	-	3	V	R			-
Slug criteria	Decimal	0 to 10	1	V	R/W	X		10
Slug duration	Decimal	0 to 120	1	Sec	R/W	X		1
After Slug	Select	Measured value Hold	-	-	R/W	X		Measured value
Empty pipe alm sel	Select	Not Apply Apply	-	-	R/W	X		Not Apply
Empty pipe crit	Decimal	0 to Density URV	0 to 4	Density unit	R/W	X		0

After empty pipe	Select	Massflow = Zero Measured Value Hold	-	-	R/W	X		Massflow = Zero
Corrosion alm sel	Select	Not Apply Apply	-	-	R/W	X		Not Apply
Corrosion criteria	Decimal	0 to Density URV	0 to 4	Density unit	R/W	X		0
Corrosion damp	Decimal	0.1 to 10	1	h	R/W	X		10
Fluid max temp	Decimal	-	1	Temperature unit	R			-
Distributor	ASCII	-	-	-	R			Yokogawa
Descriptor	ASCII	32 characters	-	-	R/W	X		Space
Message	ASCII	32 characters	-	-	R/W	X		Space
Date	ASCII	mm/dd/yy	-	-	R/W	X		Space
Sensor model	Select	RCCS30 RCCS31 RCCS32 RCCS33 RCCS34 RCCS36 RCCS38 RCCS39 RCCS39/IR	-	-	R/W			RCCS36
Sensor S/N	Decimal	7 digits	-	-	R			Comm.no. (1)
Assembly number	Decimal	7 digits	-	-	R			Comm.no. (2)
Universal rev	Decimal	7 digits	-	-	R			fix
Fld. dev rev.	Decimal	-	-	-	R			fix
Software rev	Decimal	-	-	-	R			fix
Hardware rev	Decimal	-	-	-	R			fix
Device id	Decimal	7 digits	-	-	R			7xxxxxx

## 10.2 Parameter tree

### 10.2.1 Display menu

**bold = default**

Main Menu	Language	<b>English</b>		Sel	
		German			
		French			
Process variables	View fld dev vars	Mass flow		R	
		Volume flow		R	
		Density		R	
		Temperature		R	
		F-Total		R	
		R-Total		R	
		D-Total		R	
		Concentration meas		R	
		Net flow		R	
	View Outputs	Analog output 1	Analog output 1		R
			Analog output 1%		R
			Analog output 1 mA		R
		Analog output 2	Analog output 2		R
	Analog output 2%			R	
	Analog output 2 mA			R	
Pulse/Status out 1	Pulse output 1		R		
	Status output1		R		
Pulse/Status out 2	Pulse output 2		R		
	Status output2		R		
View Input			R		
Totalizer	Total reset entrl	<b>Inhibit</b>		Sel	
		Enable			
	Total reset			Exe	
Diag / Service	Self test/Status	Self test		Exe	
		Status	Event overview		R
			Error		R
			Alarm		R
			Warning		R
		Hist Overview ord	Hist Overview ord		R
			Clear History		Exe
		Hist Overview 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				
	Autozero initial		R		
	Autozero range		R		

		Autozero fluctuation		R
Diag / Service	Autozero	Zero tuning	Inhibit	Sel
			Enable	
		Autozero time	3 min	Sel
			30 s	
		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	
			F-Total	
			R-Total	
			D-Total	
			Concentration meas	
			Net flow	
	Disp select 2	Sel	Mass flow	
			Volume flow	
			Density	
Temperature				
F-Total				
R-Total				
D-Total				
Concentration meas				
Net flow				
None				
Disp select 3	Sel	Mass flow		
		Volume flow		
		Density		
		Temperature		
		F-Total		
		R-Total		
		D-Total		
		Concentration meas		
		Net flow		
		None		
Disp select 4	Sel	Mass flow		
		Volume flow		
		Density		
		Temperature		
		F-Total		
		R-Total		
		D-Total		
		Concentration meas		
		Net flow		
		None		
Display contrast			R/W	
Mass flow	Mass flow unit	g/s	Sel	
		g/min		
		g/h		
		kg/s		
		kg/min		
		kg/h		
		t/min		

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Basic Setup		t/h	
		lb/s	
		lb/min	
		lb/h	
	Mass flow LRV		R/W
	Mass flow URV		R/W
	Mass flow damping		R/W
Basic Setup	Density	Density unit	g/ml
			kg/l
			kg/Cum
			lb/gal
			lb/Cuft
		Density LRV	
	Density URV		R/W
	Density damping		R/W
Basic Setup	Temperature	Temperature unit	degC
			degF
			K
		Temperature LRV	
	Temperature URV		R/W
	Temperature damping		R/W
Basic Setup	Analog 1 select	None	Sel
		Mass flow	
		Volume flow	
		Density	
		Temperature	
		Concentration meas	
		Net flow	
Basic Setup	Analog 2 select	None	Sel
		Mass flow	
		Volume flow	
		Density	
		Temperature	
		Concentration meas	
		Net flow	
Basic Setup	Pulse/Status out 1	Pulse/Stat 1 select	Pulse
			Status out
			No function
		Pulse 1 select	None
			Mass forward
			Mass reverse
			Volume forward
			Volume reverse
			Mass flow
			Volume flow
		Density	
		Temperature	
		Concentration meas	
		Net forward	
		Net reverse	
		Net flow	
Basic Setup		Pulse1 unit	Hz
			g/P
			kg/P
			t/P
			lb/P
			Cucm/P
			l/P
			Cum/P
			gal/P
			kgal/P
			Cuft/P
			bbbl/P
			Impgal/P
			Sel



Basic Setup		kImpgal/P																									
	Pulse1 rate		R/W																								
	SO 1 function	<table border="1"> <tr><td><b>No Function</b></td></tr> <tr><td>Bi-directional</td></tr> <tr><td>Total Switch</td></tr> <tr><td>Mass flow alm 1</td></tr> <tr><td>Mass flow alm 2</td></tr> <tr><td>Mass flow alm 1+2</td></tr> <tr><td>Vol flow alm 1</td></tr> <tr><td>Vol flow alm 2</td></tr> <tr><td>Vol flow alm 1+2</td></tr> <tr><td>Density alm 1</td></tr> <tr><td>Density alm 2</td></tr> <tr><td>Density alm 1+2</td></tr> <tr><td>Temp alm 1</td></tr> <tr><td>Temp alm 2</td></tr> <tr><td>Temp alm 1+2</td></tr> <tr><td>Concentr. meas alm 1</td></tr> <tr><td>Concentr. meas alm 2</td></tr> <tr><td>Concentr. meas alm 1+2</td></tr> <tr><td>Net flow alm 1</td></tr> <tr><td>Net flow alm 2</td></tr> <tr><td>Net flow alm 1+2</td></tr> <tr><td>Slug alarm</td></tr> <tr><td>Empty alarm</td></tr> <tr><td>Corrosion alarm</td></tr> </table>	<b>No Function</b>	Bi-directional	Total 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	Sel
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	Slug alarm																										
Empty alarm																											
Corrosion alarm																											
Pulse/Status out 2	Pulse/Stat 2 select	<table border="1"> <tr><td>Pulse</td></tr> <tr><td><b>Status out</b></td></tr> <tr><td>No function</td></tr> </table>	Pulse	<b>Status out</b>	No function	Sel																					
Pulse																											
<b>Status out</b>																											
No function																											
	Pulse 2 select	<table border="1"> <tr><td>None</td></tr> <tr><td>Mass forward</td></tr> <tr><td>Mass reverse</td></tr> <tr><td>Volume forward</td></tr> <tr><td>Volume reverse</td></tr> <tr><td>Mass flow</td></tr> <tr><td>Volume flow</td></tr> <tr><td>Density</td></tr> <tr><td>Temperature</td></tr> <tr><td>Concentration meas</td></tr> <tr><td>Net forward</td></tr> <tr><td>Net reverse</td></tr> <tr><td>Net flow</td></tr> </table>	None	Mass forward	Mass reverse	Volume forward	Volume reverse	Mass flow	Volume flow	Density	Temperature	Concentration meas	Net forward	Net reverse	Net flow	Sel											
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Density																											
Temperature																											
Concentration meas																											
Net forward																											
Net reverse																											
Net flow																											
	Pulse2 unit	<table border="1"> <tr><td>Hz</td></tr> <tr><td>g/P</td></tr> <tr><td>Kg/P</td></tr> <tr><td>t/P</td></tr> <tr><td>lb/P</td></tr> <tr><td>Cucm/P</td></tr> <tr><td>l/P</td></tr> <tr><td>Cum/P</td></tr> <tr><td>gal/P</td></tr> <tr><td>kgal/P</td></tr> <tr><td>Cuft/P</td></tr> <tr><td>bbl/P</td></tr> <tr><td>Impgal/P</td></tr> <tr><td>KImpgal/P</td></tr> </table>	Hz	g/P	Kg/P	t/P	lb/P	Cucm/P	l/P	Cum/P	gal/P	kgal/P	Cuft/P	bbl/P	Impgal/P	KImpgal/P	Sel										
Hz																											
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Impgal/P																											
KImpgal/P																											
	Pulse2 rate		R/W																								
	SO 2 function	<table border="1"> <tr><td><b>No function</b></td></tr> <tr><td>Bi-directional</td></tr> <tr><td>Total switch</td></tr> <tr><td>Mass flow alm 1</td></tr> <tr><td>Mass flow alm 2</td></tr> <tr><td>Mass flow alm 1+2</td></tr> <tr><td>Vol flow alm 1</td></tr> <tr><td>Vol flow alm 2</td></tr> <tr><td>Vol flow alm 1+2</td></tr> <tr><td>Density alm 1</td></tr> <tr><td>Density alm 2</td></tr> <tr><td>Density alm 1+2</td></tr> <tr><td>Temp alm 1</td></tr> <tr><td>Temp alm 2</td></tr> <tr><td>Temp alm 1+2</td></tr> <tr><td>Concentr. meas alm 1</td></tr> <tr><td>Concentr. meas alm 2</td></tr> </table>	<b>No function</b>	Bi-directional	Total 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	Sel							
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Concentr. meas alm 2																											
Basic Setup																											
Basic Setup																											
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Basic Setup																											

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Basic Setup			Concentr. meas alm 1+2	
			Net flow alm 1	
			Net flow alm 2	
			Net flow alm 1+2	
			Slug alarm	
			Empty alarm	
			Corrosion alarm	
	SI function	<b>No function</b>		Sel
		Autozero		
		Total reset		
	0% signal lock			
Totalizer	Total select	<b>Mass</b>	Sel	
		Volume		
		Net		
	Total unit	g	Sel	
		<b>kg</b>		
		t		
		lb		
		Cuem		
		l		
		Cum		
		gal		
		kgal		
		Impgal		
		kImpgal		
		Cuf		
		bbl		
Detailed Setup	Display Config	Disp select 1	<b>Mass flow</b>	Sel
			Volume flow	
			Density	
			Temperature	
			F-Total	
			R-Total	
			D-Total	
			Concentration meas	
			Net flow	
		Disp select 2	Mass flow	Sel
			Volume flow	
			<b>Density</b>	
			Temperature	
			F-Total	
			R-Total	
			D-Total	
			Concentration maeeas	
			Net flow	
			None	
		Disp select 3	Mass flow	Sel
		Volume flow		
		Density		
		<b>Temperature</b>		
		F-Total		
		R-Total		
		D-Total		
		Concentration meas		
		Net flow		
		None		
	Disp select 4	Mass flow	Sel	
		Volume flow		
		Density		
		Temperature		
		<b>F-Total</b>		
		R-Total		
		D-Total		
		Concentration meas		
		Net flow		
		None		
	Disp contrast		R/W	
	Disp period	<b>0.5 s</b>	Sel	
		1.0 s		
		2.0 s		

		Language	English	Sel
			German	
			French	
Detailed Setup	Sensor model	RCCS30		Sel
		RCCS31		
		RCCS32		
		RCCS33		
		RCCS34		
		<b>RCCS36</b>		
		RCCS38		
		RCCS39		
Detailed Setup	Sensor constants	Mass flow	SK20	R/W
			SKT	R/W
			RV	R/W
			Qnom	R/W
			SKP	R/W
		Density	KD	R/W
			f120	R/W
			FTC1	R/W
			FTCK	R/W
	Detailed Setup	Config fld variables	Flow direction	Forward
			Reverse	
Detailed Setup	Mass flow	Mass flow unit	g/s	Sel
			g/min	
			g/h	
			kg/s	
			kg/min	
			kg/h	
			t/min	
			t/h	
			lb/s	
			lb/min	
	lb/h			
Detailed Setup	Mass flow format	xxxxxxx		Sel
		xxxxx.X		
		xxxx.XX		
		xxx.XXX		
		xx.XXXX		
	x.XXXXX			
Detailed Setup	Mass flow	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			
Detailed Setup	Mass flow	Mass flow alm 2 crit		R/W
		Mass flow fix val sel	Inhibit	Sel
			Enable	
	Mass flow fixed val		R/W	

Detailed Setup	Detailed Setup	Detailed Setup	Detailed Setup	Detailed Setup	Detailed Setup	Detailed Setup	Detailed Setup	Detailed Setup	Detailed Setup	Volume flow	Vol flow unit	Cum/s	Sel																
										Cum/min	Cum/h	l/s	l/min	l/h	Cum/s	Cum/min	<b>Cum/h</b>	gal/s	gal/min	gal/h	Cuft/s	Cuft/min	Cuft/h	bbl/s	bbl/min	bbl/h	Impgal/s	Impgal/min	Impgal/h
										Vol flow format	xxxxxxx	Sel																	
											xxxxx.X																		
											xxxx.XX																		
											xxx.XXX																		
											xx.XXXX																		
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										Vol flow LRV		R/W																	
										Vol flow URV		R/W																	
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										Vol flow lowcut		R/W																	
										Vol flow alm 1 sel	No function	Sel																	
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										Vol flow alm 2 crit		R/W																	
										Density	Density unit	g/ml	Sel																
												kg/l																	
												kg/Cum																	
												lb/gal																	
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										Density format	xxxxxxx	Sel																	
											xxxxx.X																		
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Density LRV		R/W																											
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Density alm 1 sel	No function	Sel																											
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Density alm 1 crit		R/W																											
Density alm 2 sel	No function	Sel																											
	More than																												
	Less than																												

Detailed Setup			Density alm 2 crit		R/W			
			Density fix val sel	Inhibit Enable	Sel			
			Density fixed value		R/W			
			Pressure		R/W			
			Temperature	Temperature unit	degC degF degK	Sel		
			Temperature format	xxxxxxx xxxxx.X xxxx.XX xxx.XXX xx.XXXX x.XXXXX	Sel			
			Temperature LRV		R/W			
			Temperature URV		R/W			
			Temperature damping		R/W			
			Temp alm 1 sel	No function More than Less than	Sel			
			Temp alm 1 crit		R/W			
			Temp alm 2 sel	No function More than Less than	Sel			
			Temp alm 2 crit		R/W			
			Temp fix val select	Inhibit Enable	Sel			
			Temp fixed value		R/W			
Temp gain		R/W						
Detailed Setup	Config Output/Input	Analog output 1	Analog 1 select	None Mass flow Volume flow Density Temperature Concentration meas Net flow	Sel			
			Analog 1 alarm Out	<2.4mA <3.6mA <4.0mA >21mA >21.6mA Hold Measured value	Sel			
			Analog 1 low LMT		R/W			
			Analog 1 high LMT		R/W			
			Analog 1 rev mode	4 mA Measured value	Sel			
			Detailed Setup		Analog output 2	Analog 2 select	None Mass flow Volume flow Density Temperature Concentration meas Net flow	Sel

Detailed Setup	Analog 2 alarm Out	<2.4mA	Sel	
		< <b>3.6mA</b>		
		<4.0mA		
		>21.0mA		
		>21.6mA		
		Hold		
		Measured value		
	Analog 2 low LMT		R/W	
	Aanlog 2 high LMT		R/W	
	Analog 2 rev mode	4 mA	Sel	
		Measured value		
Detailed Setup	Pulse/Status out 1	Pulse/Stat 1 select	<b>Pulse</b>	Sel
			Status out	
			No function	
Detailed Setup	Pulse 1 select	None	Sel	
		Mass forward		
		Mass reverse		
		Volume forward		
		Volume reverse		
		<b>Mass flow</b>		
		Volume flow		
		Density		
		Temperature		
		Concentration meas		
		Net forward		
		Net reverse		
		Net flow		
		Pulse 1 unit	<b>Hz</b>	Sel
		g/P		
		kg/P		
		t/P		
		lb/P		
		Cucm/P		
		l/P		
		Cum/P		
		gal/P		
		kgal/P		
		Cuft/P		
		bbl/P		
		Impgal/P		
		kImpgal/P		
	Pulse 1 rate		R/W	
	Pulse 1 active mode	<b>On Active</b>	Sel	
		Off Active		
Detailed Setup	Pulse 1 width	0.05ms	Sel	
		0.1ms		
		0.5ms		
		<b>1ms</b>		
		5ms		
		10ms		
		50ms		
		100ms		
	Pulse 1 at alarm	<b>0 Hz</b>	Sel	
		Measured value		
Detailed Setup	SOI function	<b>No function</b>	Sel	
		Bi-direction		
		Total 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 fklow alm 2	
			Net flow alm 1+2	
			Slug alarm	
			Empty alarm	
			Corrosion alarm	
			SO1 active mode	Sel
			On Active	
			Off Active	
		Pulse/Status out 2	Pulse/Stat 2 select	Sel
			Pulse	
			Status out	
			No function	
			Pulse 2 select	Sel
			None	
			Mass forward	
			Mass reverse	
			Volume forward	
			Volume reverse	
			Mass flow	
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow forward	
			Net flow reverse	
			Net flow	
			Pulse 2 unit	Sel
			Hz	
			g/P	
			Kg/P	
			t/P	
			lb/P	
			Cucm/P	
			l/P	
			Cum/P	
			gal/P	
			kgal/P	
			Cuft/P	
			bbl/P	
			Impgal/P	
			kImpgal/P	
			Pulse 2 rate	R/W
			Pulse 2 active mode	Sel
			On Active	
			Off Active	
			Pulse 2 width	Sel
			0.05ms	
			0.1ms	
			0.5ms	
			1ms	
			5ms	
			10ms	
			50ms	
			100ms	
			Pulse 2 at alarm	Sel
			0 Hz	
			Measured value	
			SO2 function	Sel
			No function	
			Bi-direction	
			Total 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	

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Detailed Setup			<table border="1"> <tr><td>Concentr. meas alm 1+2</td></tr> <tr><td>Net flow alm 1</td></tr> <tr><td>Net flow alm 2</td></tr> <tr><td>Net flow alm 1+2</td></tr> <tr><td>Slug alarm</td></tr> <tr><td>Empty alarm</td></tr> <tr><td>Corrosion alarm</td></tr> </table>	Concentr. meas alm 1+2	Net flow alm 1	Net flow alm 2	Net flow alm 1+2	Slug alarm	Empty alarm	Corrosion alarm							
	Concentr. meas alm 1+2																
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	Corrosion alarm																
			SO2 active mode	<table border="1"> <tr><td><b>On Active</b></td></tr> <tr><td>Off Active</td></tr> </table>	<b>On Active</b>	Off Active	Sel										
	<b>On Active</b>																
Off Active																	
	Status input	SI function	<table border="1"> <tr><td><b>No function</b></td></tr> <tr><td>Autozero</td></tr> <tr><td>Total reset</td></tr> <tr><td>0% signal lock</td></tr> </table>	<b>No function</b>	Autozero	Total reset	0% signal lock	Sel									
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		SI active mode	<table border="1"> <tr><td><b>On Active</b></td></tr> <tr><td>Off Active</td></tr> </table>	<b>On Active</b>	Off Active	Sel											
<b>On Active</b>																	
Off Active																	
	Totalizer	Total select	<table border="1"> <tr><td><b>Mass</b></td></tr> <tr><td>Volume</td></tr> <tr><td>Net</td></tr> </table>	<b>Mass</b>	Volume	Net	Sel										
<b>Mass</b>																	
Volume																	
Net																	
		Total unit	<table border="1"> <tr><td>g</td></tr> <tr><td><b>kg</b></td></tr> <tr><td>t</td></tr> <tr><td>lb</td></tr> <tr><td>Cucm</td></tr> <tr><td>l</td></tr> <tr><td>Cum</td></tr> <tr><td>gal</td></tr> <tr><td>kgal</td></tr> <tr><td>Cuft</td></tr> <tr><td>bbbl</td></tr> <tr><td>Impgal</td></tr> <tr><td>kImpgal</td></tr> </table>	g	<b>kg</b>	t	lb	Cucm	l	Cum	gal	kgal	Cuft	bbbl	Impgal	kImpgal	Sel
g																	
<b>kg</b>																	
t																	
lb																	
Cucm																	
l																	
Cum																	
gal																	
kgal																	
Cuft																	
bbbl																	
Impgal																	
kImpgal																	
		Total switch		R/W													
		Total at alarm	<table border="1"> <tr><td><b>Hold</b></td></tr> <tr><td>Continue</td></tr> <tr><td>Total</td></tr> </table>	<b>Hold</b>	Continue	Total	Sel										
<b>Hold</b>																	
Continue																	
Total																	
		Total reset cntrl	<table border="1"> <tr><td><b>Inhibit</b></td></tr> <tr><td>Enable</td></tr> </table>	<b>Inhibit</b>	Enable	Sel											
<b>Inhibit</b>																	
Enable																	
		Total reset		Exe													
Detailed Setup	HART communication	Poll addr		R/W													
		Num req pream		R/W													
		Master reset		Exe													
	Concentration meas	Concentr. meas format	<table border="1"> <tr><td>xxxxxxx</td></tr> <tr><td>xxxxx.X</td></tr> <tr><td><b>xxxx.XX</b></td></tr> <tr><td>xxx.XXX</td></tr> <tr><td>xx.XXXX</td></tr> <tr><td>x.XXXXX</td></tr> </table>	xxxxxxx	xxxxx.X	<b>xxxx.XX</b>	xxx.XXX	xx.XXXX	x.XXXXX	Sel							
xxxxxxx																	
xxxxx.X																	
<b>xxxx.XX</b>																	
xxx.XXX																	
xx.XXXX																	
x.XXXXX																	
Detailed Setup		Concentr. meas LRV		R/W													
		Concentr. meas URV		R/W													
		Concentr. meas Damp		R/W													
		Concentr. meas Lowcut		R/W													
		Coc meas alm 1 Sel	<table border="1"> <tr><td><b>No function</b></td></tr> <tr><td>More than</td></tr> <tr><td>Less than</td></tr> </table>	<b>No function</b>	More than	Less than	Sel										
	<b>No function</b>																
	More than																
	Less than																
		Conc meas alm 1 Crit		R/W													
		Coc meas alm 1 Sel	<table border="1"> <tr><td><b>No function</b></td></tr> <tr><td>More than</td></tr> <tr><td>Less than</td></tr> </table>	<b>No function</b>	More than	Less than	Sel										
<b>No function</b>																	
More than																	
Less than																	
	Conc meas alm 1 Crit		R/W														



Detailed Setup	Net flow	Net flow unit	kg/h t/min <b>t/h</b> lb/s lb/min lb/h	Sel	
		Net flow format	xxxxxxx xxxxx.X <b>xxxx.XX</b> xxx.XXX xx.XXXX x.XXXXX	Sel	
		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	<b>No function</b> More than Less than	Sel	
		Net flow Alm 1 Crit		R/W	
	Detailed Setup		Net flow Alm 1 Sel	<b>No function</b> More than Less than	Sel
			Net flow Alm 1 Crit		R/W
		Measuring Range			R
	Detailed Setup	Slug detection	Slug alarm select	<b>Not apply</b> Apply	Sel
			Drive gain		R
			Slug criteria		R/W
		Slug duration		R/W	
		After slug	<b>Measured value</b> Hold	Sel	
Detailed Setup		Empty pipe detect	Empty pipe alm sel	<b>Not apply</b> Apply	Sel
		Empty pipe crit		R/W	
		After empty pipe	<b>Massflow = Zero</b> Measured Value Hold	Sel	
	Corrosion detect	Corrosion alm sel	<b>Not apply</b> Apply	Sel	
Detailed Setup		Corrosion crit		R/W	
		Corrosion damp		R/W	
	Fluid max temp			R	
	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	

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		Assembly number	R	
Review device info		Distributor	R	
		Sensor model	R	
		Sensor S/N	R	
		Assembly number	R	
		Tag	R	
		Long Tag	R	
		Descriptor	R	
		Message	R	
		Date	R	
	Review device info		Device id	R
			Universal rev	R
		Fld dev rev	R	
		Software rev	R	
		Hardware rev	R	
Review sensor			SK20	R
		SKT	R	
		RV	R	
		Qnom	R	
		SKP	R	
		KD	R	
		fl20	R	
		FTC1	R	
		FTCK	R	
		Autozero value	R	
	Review FldDev vars 1		Flow direction	R
			Mass flow unit	R
			Mass flow LRV	R
			Mass flow LRV	R
		Mass flow damping	R	
		Mass flow lowcut	R	
		Mass flow alm 1 sel	R	
		Mass flow alm 1 crit	R	
		Mass flow alm 2 sel	R	
		Mass flow alm 2 crit	R	
		MF fixed value	R	
		Vol flow unit	R	
		Vol flow LRV	R	
		Vol flow URV	R	
		Vol flow damping	R	
		Vol flow lowcut	R	

		Vol flow alm 1 sel	R
		Vol flow alm 1 crit	R
		Vol flow alm 2 sel	R
		Vol flow alm 2 crit	R
		Density unit	R
		Density LRV	R
		Density URV	R
		Density damping	R
		Density lowcut	R
		Density alm 1 sel	R
		Density alm 1 crit	R
	Review FlDDev vars 1	Density alm 2 sel	R
		Density alm 2 crit	R
		Density fixed value	R
		Pressure	R
		Temperature unit	R
		Temperature LRV	R
	Review FlDDev vars 1	Temperature URV	R
		Temperature damping	R
		Temp range select	R
		Temp alarm 1 select	R
		Temp alarm 1 crit	R
		Temp alarm 2 select	R
		Temp alarm 2 crit	R
		Temp fixed value	R
	Review FlDDev vars 2	Concentration meas Unit	R
		Concentration meas LRV	R
		Concentration meas URV	R
		Concentration meas Damp	R
		Concentration meas Lowcut	R
		Conc meas alm 1Sel	R
		Conc meas alm 1Crit	R
		Conc meas alm 2Sel	R
		Conc meas alm 2 Crit	R
	Revie FlDDev vars 2	Net flow Unit	R
		Net flow LRV	R
		Net flow URV	R
		Net flow damping	R
		Net flow lowcut	R
		Net flow Alm1 sel	R

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	Net flow Alm 1 crit	R	
	Net flow Alm 2sel	R	
	Net flow Alm 2 crit	R	
Review Outputs/ Input	Analog 1 select	R	
	Analog 1 alarm out	R	
	Analog 1 low LMT	R	
	Analog 1 high LMT	R	
	Analog 1 rev mode	R	
	Analog 2 select	R	
	Analog 2 alarm out	R	
	Analog 2 low LMT	R	
	Analog 2 high LMT	R	
	Analog 2 rev mode	R	
	Review Outputs/ Input	Pulse/Status 1 select	R
		Pulse 1 active mode	R
		Pulse 1 select	R
		Pulse 1 unit	R
		Pulse 1 rate	R
Pulse 1 width		R	
Pulse 1 at alarm		R	
SO 1 function		R	
Review Outputs/ Input		Pulse/Status 2 select	R
		Pulse 2 active mode	R
	Pulse 2 select	R	
	Pulse 2 unit	R	
	Pulse 2 rate	R	
	Pulse 2 width	R	
	Pulse 2 at alarm	R	
	SO 2 function	R	
Review Outputs/ Input	SI function	R	
	SI active mode	R	
	Total select	R	
	Total unit	R	
	Total switch	R	
	Total at alarm	R	
	Total reset cntrl	R	
	Review HART	Poll addr	R
		Num req pream	R

## 10.2.2 HART Menu

**bold = default**

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	Process variables	View fld dev vars		Mass flo	R	
				Volume flo	R	
		Dens	R			
		Temp	R			
		F-Total	R			
		R-Total	R			
		D-Total	R			
		Conc meas	R			
		Net flo	R			
		Process variables	View Outputs		Analog output 1	PV
			PV AO		R	
			% rnge		R	
			Analog output 2	SV	R	
			SV AO		R	
			% rnge		R	
			Pulse/Status out 1	TV Freq	R	
			SO 1 function		R	
			Pulse/Status out 2	TV Freq	R	
			SO 2 function		R	
		View Input	Input function		R	
		Totalizer	Total res cntrl	<b>Inhibit</b>	Sel	
				Enable		
			Total reset		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	Exe
					<b>Not execute</b>	
					Execute	
	Diag / Service	Hist Overview abs		History Set	Abs	R
					Set1	R
					:	
					Set 10	R
				History set menu	History Set	R
					Hist Overview	R
					H. error	R
					H. Alarm	R
					H. Warning	R
				Clear History		Exe

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Diag / Service	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	
	Auto zero check	Autozero history		R	
		AZ range		R	
		AZ fluctuation		R	
	Autozero	Zero tuning	<b>Inhibit</b>		Sel
			Enable		
		Autozero	Autozero duration	3 min	Sel
				30 s	
			Perform auto zero		Exe
		Autozero value		R	
Loop trim		Trim output 1	Exe		
	Trim output 2	Exe			
Basic Setup	Tag		R/W		
	Long Tag		R/W		
	Display config	Disp select 1	<b>Mass flo</b>	Sel	
			Volume flo		
			Dens		
			Temp		
			F-Total		
			R-Total		
			D-Total		
			Conc meas		
			Net flo		
			Disp select 2		Disp select 2
	Volume flo				
	<b>Dens</b>				
	Temp				
F-Total					
R-Total					
D-Total					
Conc meas					
Net flo					
None					
Disp select 3	Disp select 3	Mass flo	Sel		
		Volume flo			
		Dens			
		<b>Temp</b>			
		F-Total			
		R-Total			
		D-Total			
		Conc meas			
		Net flo			
		None			
Disp select 4	Disp select 4	Mass flo	Sel		
		Volume flo			
		Dens			
		Temp			
		<b>F-Total</b>			
		R-Total			
		D-Total			
		Conc meas			
		Net flo			
		None			
	Display contrast		R/W		

Basic Setup	Mass flo	Mass flo unit	g/s	Sel	
			g/min		
			g/h		
			kg/s		
			kg/min		
			kg/h		
			MetTon/min		
			<b>MetTon/h</b>		
			lb/s		
			lb/min		
		lb/h			
Basic Setup		Mass flo LRV		R/W	
		Mass flo URV		R/W	
		Mass flow Damping		R/W	
Basic Setup	Dens	Dens unit	g/ml	Sel	
			<b>kg/l</b>		
			kg/Cum		
			lb/gal		
			lb/Cuft		
Basic Setup		Dens LRV		R/W	
		Dens URV		R/W	
		Dens Damping		R/W	
Basic Setup	Temp	Temp unit	<b>degC</b>	Sel	
			degF		
			K		
		Temp LRV			R/W
		Temp URV			R/W
Basic Setup		Temp Damping		R/W	
Basic Setup	Analog 1 select	None		Sel	
		<b>Mass flo</b>			
		Volume flo			
		Dens			
		Temp			
		Conc meas			
		Net flo			
Basic Setup	Analog 2 select	None		Sel	
		Mass flo			
		Volume flo			
		<b>Dens</b>			
		Temp			
		Conc meas			
		Net flo			
Basic Setup	Pulse/Status out 1	Pulse/Stat 1 select	<b>Pulse</b>	Sel	
			Status out		
			No function		
		Pulse out 1	Pulse 1 select	Sel	
			None		
			Mass totl forw		
			Mass totl rev		
			Vol totl forw		
			Vol totl rev		
			Net totl forw		
		Net totl rev			
		<b>Mass flo</b>			
		Vol flo			
		Dens			
		Temp			
		Conc meas			
		Net flow			

Basic Setup		TV unit	<b>Hz</b>	Sel
			g/P	
			kg/P	
			t/P	
			lb/P	
			Cucm/P	
			l/P	
			Cum/P	
			gal/P	
			kgal/P	
			Cuft/P	
			bbl/P	
			Impgal/P	
			kImpgal/P	
			TV rate	
Basic Setup	Status out 1	SO 1 function	<b>No Function</b>	Sel
			Bi-directional	
			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			
Basic Setup	Pulse/Status out 2	Pulse/Stat 2 select	<b>Pulse</b>	Sel
			Status out	
			No function	
Basic Setup	Pulse out 2	Pulse 2 select	None	Sel
			Mass totl forw	
			Mass totl rev	
			Vol totl forw	
			Vol totl rev	
			Net totl forw	
			Net totl rev	
			<b>Mass flo</b>	
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flow	
Basic Setup		TV unit	<b>Hz</b>	Sel
			g/P	
			kg/P	
			t/P	
			lb/P	
			Cucm/P	
			l/P	
			Cum/P	
			gal/P	
			kgal/P	
			Cuft/P	
			bbl/P	
			Impgal/P	
			kImpgal/P	
			TV rate	



Basic Setup	Status out 1	SO 1 function	<b>No Function</b>	Sel
			Bi-directional	
			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		
	Input function	<b>No function</b>	Sel	
		Autozero		
		Total reset		
		0% signal lock		
	Totalizer	Totalizer sel	<b>Mass</b>	Sel
			Volume	
			Net mass	
		F-Total unit	g	Sel
			kg	
			MetTon	
			lb	
			Cucm	
			l	
			Cum	
			gal	
			kgal	
			Impgal	
			kImpgal	
			Cuf	
			bbl	
Detailed Setup	Display Config	Disp select 1	<b>Mass flo</b>	
			Volume flo	
			Dens	
			Temp	
			F-Total	
			R-Total	
			D-Total	
			Conc meas	
			Net flo	
Detailed Setup	Display Config	Disp select 2	Mass flo	Sel
			Volume flo	
			<b>Dens</b>	
			Temp	
			F-Total	
			R-Total	
			D-Total	
			Conc meas	
			Net flo	
			None	
Detailed Setup	Display Config	Disp select 3	Mass flo	Sel
			Volume flo	
			Dens	
			<b>Temp</b>	
			F-Total	
			R-Total	
			D-Total	
			Conc meas	
			Net flo	
			None	

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Detailed Setup	Disp select 4	Mass flo		Sel
		Volume flo		
		Dens		
		Temp		
		<b>F-Total</b>		
		R-Total		
		D-Total		
		Conc meas		
		Net flo		
		None		
	Display contrast			R/W
	Display period	<b>0.5 s</b>		Sel
		1.0 s		
		2.0 s		
	Sensor model	RCCS30		Sel
		RCCS31		
		RCCS32		
		RCCS33		
		RCCS34		
		<b>RCCS36</b>		
		RCCS38		
		RCCS39		
		RCCS39/IR		
Detailed Setup	Sensor constants	Mass flo	SK20	R/W
			SKT	R/W
			RV	R/W
			Qnom	R/W
			SKP	R/W
		Dens	KD	R/W
			FI20	R/W
			FTC1	R/W
			FTCK	R/W
Detailed Setup	Config fld vars	Flow direction	<b>Forward</b>	Sel
			Reverse	
Detailed Setup	Mass flo	Mass flo Unit	g/s	Sel
			g/min	
			g/h	
			kg/s	
			kg/min	
			kg/h	
			t/min	
			t/h	
			lb/s	
			Lb/min	
	Lb/h			
Detailed Setup	Mass flo	Mass flo Format	xxxxxxx	Sel
			xxxxx.X	
			xxxx.XX	
			xxx.XXX	
			xx.XXXX	
	x.XXXXX			
Detailed Setup	Mass flo	Mass flo LRV		R/W
		Mass flo URV		R/W
		Mass flo damping		R/W
		Mass flo Lowcut		R/W
		Mass flo alm 1 sel	<b>No function</b>	Sel
	More than			
	Less than			

Detailed Setup	Mass flow alm 1 crit		R/W		
	Mass flow alm 2 sel	No function More than Less than	Sel		
	Mass flow alm 2 crit		R/W		
	Mass flo fix sel	Inhibit Enable	Sel		
	Mass flo fix menu	Mass flow fixed val	R/W		
	Vol flo	Vol flo Unit	Cucm/s Cucm/min Cucm/h l/s l/min l/h Cum/s Cum/min <b>Cum/h</b> gal/s gal/min gal/h Cuft/s Cuft/min Cuft/h bbl/s bbl/min bbl/h Impgal/s Impgal/min Impgal/h	Sel	
		Vol flo Format	xxxxxxx xxxxx.X xxxx.XX xxx.XXX xx.XXXX x.XXXXX	Sel	
		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 More than Less than	Sel	
		Vol flo alm 1 crit		R/W	
		Vol flo alm 2 sel	No function More than Less than	Sel	
		Vol flo alm 2 crit		R/W	
		Dens	Dens Unit	g/ml kg/l kg/Cum lb/gal lb/Cuft	Sel
			Dens Format	xxxxxxx xxxxx.X xxxx.XX xxx.XXX xx.XXXX x.XXXXX	Sel
			Dens LRV		R/W
			Dens URV		R/W
			Dens Damping		R/W
Detailed Setup					
Detailed Setup					
Detailed Setup					
Detailed Setup					

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Detailed Setup	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		
	Dens fix val sel	Inhibit	Sel		
		Enable			
	Dens fix menu	Dens fixed value	R/W		
	Pressure		R		
	Detailed Setup	Temp	Temp Unit	degC	Sel
			degF		
Kelvin					
Temp Format		xxxxxxx	Sel		
		xxxxx.X			
		xxxx.XX			
		xxx.XXX			
		xx.XXXX			
		x.XXXXX			
Temp LRV		R/W			
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				
Detailed Setup	Config Out/input	Analog Output 1	Analog 1 select	None	Sel
			Mass flo		
				Volume flo	
				Dens	
				Temp	
				Conc meas	
				Net flo	
			PV Alarm 1 select	<2.4mA	Sel
				<3.6mA	
				<4.0mA	
				>21mA	
				>21.6mA	
				Hold	
				Measured value	
			Analog 1 low LMT		R/W
		Analog 1 high LMT		R/W	
		AO 1 reverse mode	4 mA	Sel	
			Measured value		

Detailed Setup	Detailed Setup	Analog Output 2	Analog 2 select	None	Sel
				Mass flow	
				Volume flow	
				<b>Density</b>	
				Temperature	
				Concentration meas	
				Net flow	
			SV Alarm 2 select	<2.4mA	Sel
				<b>&lt;3.6mA</b>	
				<4.0mA	
			>21.0mA		
			>21.6mA		
			Hold		
			Measured value		
		Analog 2 low LMT		R/W	
		Analog 2 high LMT		R/W	
		AO2 reverse mode	4 mA	Sel	
			Measured value		
		Pulse/Status 1	Pulse/Stat 1 sel	<b>Pulse</b>	Sel
				Status out	
			No function		
		Pulse/freq out 1	Pulse 1 select	Sel	
			None		
			Mass totl forw		
			Mass totl rev		
			Vol totl forw		
			Vol totl rev		
			Net totl forw		
			Net totl rev		
			<b>Mass flo</b>		
			Vol flo		
			Dens		
			Temp		
			Conc meas		
			Net flow		
		Freq /Pulse out 1	TV Pls Unit	Sel	
			<b>Hz</b>		
			g/P		
			kg/P		
			t/P		
			lb/P		
			Cucm/P		
			l/P		
			Cum/P		
			gal/P		
			kgal/P		
			Cuft/P		
			bbbl/P		
			Impgal/P		
			kImpgal/P		
			TV Pls Rate	R/W	
			Pls Mode On Active	Sel	
			<b>On Active</b>		
			Off Active		
			TV Pls Width	Sel	
			0.05ms		
			0.1ms		
			0.5ms		
			<b>1ms</b>		
			5ms		
			10ms		
			50ms		
			100ms		
			TV Pls Alarm	Sel	
			<b>0 Hz</b>		
			Measured value		
	Detailed Setup				
	Detailed Setup				

Detailed Setup		Status out 1	SO1 function	<table border="1"> <tr><td><b>No Function</b></td></tr> <tr><td>Bi-directional</td></tr> <tr><td>Total Switch</td></tr> <tr><td>Mass flo alm 1</td></tr> <tr><td>Mass flo alm 2</td></tr> <tr><td>Mass flo alm 1+2</td></tr> <tr><td>Vol flo alm 1</td></tr> <tr><td>Vol flo alm 2</td></tr> <tr><td>Vol flo alm 1+2</td></tr> <tr><td>Dens alm 1</td></tr> <tr><td>Dens alm 2</td></tr> <tr><td>Dens alm 1+2</td></tr> <tr><td>Temp alm 1</td></tr> <tr><td>Temp alm 2</td></tr> <tr><td>Temp alm 1+2</td></tr> <tr><td>Conc alm 1</td></tr> <tr><td>Conc alm 2</td></tr> <tr><td>Conc alm 1+2</td></tr> <tr><td>Net flo alm 1</td></tr> <tr><td>Net flo alm 2</td></tr> <tr><td>Net flo alm 1+2</td></tr> <tr><td>Slug alarm</td></tr> <tr><td>Empty alarm</td></tr> <tr><td>Corrosion alarm</td></tr> </table>	<b>No Function</b>	Bi-directional	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	Sel
		<b>No Function</b>																											
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			<table border="1"> <tr><td>SO1 active mode</td></tr> <tr><td><b>On Active</b></td></tr> <tr><td>Off Active</td></tr> </table>	SO1 active mode	<b>On Active</b>	Off Active	Sel																						
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Detailed Setup		Pulse/Status 2	<table border="1"> <tr><td>Pulse/Stat 2 sel</td></tr> <tr><td><b>Pulse</b></td></tr> <tr><td>Status out</td></tr> <tr><td>No function</td></tr> </table>	Pulse/Stat 2 sel	<b>Pulse</b>	Status out	No function	Sel																					
		Pulse/Stat 2 sel																											
<b>Pulse</b>																													
Status out																													
No function																													
		Pulse/freq out 2	<table border="1"> <tr><td>Pulse 2 select</td></tr> <tr><td>None</td></tr> <tr><td>Mass totl forw</td></tr> <tr><td>Mass totl rev</td></tr> <tr><td>Vol totl forw</td></tr> <tr><td>Vol totl rev</td></tr> <tr><td>Net totl forw</td></tr> <tr><td>Net totl rev</td></tr> <tr><td><b>Mass flo</b></td></tr> <tr><td>Vol flo</td></tr> <tr><td>Dens</td></tr> <tr><td>Temp</td></tr> <tr><td>Conc meas</td></tr> <tr><td>Net flow</td></tr> </table>	Pulse 2 select	None	Mass totl forw	Mass totl rev	Vol totl forw	Vol totl rev	Net totl forw	Net totl rev	<b>Mass flo</b>	Vol flo	Dens	Temp	Conc meas	Net flow	Sel											
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Detailed Setup			<table border="1"> <tr><td>Freq /Pulse out 2</td></tr> <tr><td>TV Pls Unit</td></tr> <tr><td><b>Hz</b></td></tr> <tr><td>g/P</td></tr> <tr><td>kg/P</td></tr> <tr><td>l/P</td></tr> <tr><td>lb/P</td></tr> <tr><td>Cucm/P</td></tr> <tr><td>l/P</td></tr> <tr><td>Cum/P</td></tr> <tr><td>gal/P</td></tr> <tr><td>kgal/P</td></tr> <tr><td>Cuft/P</td></tr> <tr><td>bbbl/P</td></tr> <tr><td>Impgal/P</td></tr> <tr><td>kImpgal/P</td></tr> </table>	Freq /Pulse out 2	TV Pls Unit	<b>Hz</b>	g/P	kg/P	l/P	lb/P	Cucm/P	l/P	Cum/P	gal/P	kgal/P	Cuft/P	bbbl/P	Impgal/P	kImpgal/P	Sel									
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			<table border="1"> <tr><td>TV Pls Rate</td></tr> </table>	TV Pls Rate	R/W																								
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Detailed Setup			<table border="1"> <tr><td>Pls Mode On Active</td></tr> <tr><td><b>On Active</b></td></tr> <tr><td>Off Active</td></tr> </table>	Pls Mode On Active	<b>On Active</b>	Off Active	Sel																						
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		<table border="1"> <tr><td>TV Pls Width</td></tr> <tr><td>0.05ms</td></tr> <tr><td>0.1ms</td></tr> <tr><td>0.5ms</td></tr> <tr><td><b>1ms</b></td></tr> <tr><td>5ms</td></tr> <tr><td>10ms</td></tr> <tr><td>50ms</td></tr> <tr><td>100ms</td></tr> </table>	TV Pls Width	0.05ms	0.1ms	0.5ms	<b>1ms</b>	5ms	10ms	50ms	100ms	Sel																	
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5ms																													
10ms																													
50ms																													
100ms																													

Detailed Setup			TV Pls Alarm	Sel	
			0 Hz Measured value		
Detailed Setup	Detailed Setup	Status out 2	SO2 function	No Function	Sel
				Bi-directional	
				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			
		SO2 active mode	On Active	Sel	
			Off Active		
Detailed Setup	Detailed Setup	Status input	Input function	No function	Sel
				Autozero	
				Total reset	
				0% signal lock	
		SI active mode	On Active	Sel	
			Off Active		
Detailed Setup	Detailed Setup	Totalizer	Totalizer sel	Mass	Sel
				Volume	
				Net mass	
			F-Total Unit	g	Sel
				kg	
				t	
				lb	
				Cucm	
				l	
				Cum	
				gal	
				kgal	
				Cuft	
				bb1	
				Impgal	
		klmpgal			
	F-Total switch		R/W		
	Total at alarm	Hold	Sel		
		Continue			
	Total res cntrl	Inhibit	Sel		
		Enable			
	Total reset		Exe		
Detailed Setup	Detailed Setup	HART communication	Poll addr	R/W	
			Num req pream	R/W	
			Num resp preams		
			Master reset	Exe	

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Detailed Setup	Conc meas	Conc meas Format	xxxxxxx xxxxx.X <b>xxxx.XX</b> xxx.XXX xx.XXXX x.XXXXX	Sel		
		Conc meas LRV		R/W		
		Conc meas URV		R/W		
		Conc meas Damp		R/W		
		Conc meas Lowcut				
		Coc meas alm 1 sel	<b>No function</b> More than Less than	Sel		
		Conc meas alm 1 crit		R/W		
		Coc meas alm 1 sel	<b>No function</b> More than Less than	Sel		
		Conc meas alm 1 crit		R/W		
		Detailed Setup	Net flo	Net flo Unit	kg/h t/min <b>t/h</b> lb/s lb/min lb/h	Sel
				Net flo Format	xxxxxxx xxxxx.X <b>xxxx.XX</b> xxx.XXX xx.XXXX x.XXXXX	Sel
				Net flo LRV		R/W
				Net flo URV		R/W
				Net flo Damp		R/W
				Net flo Lowcut		R/W
				Net flow alm 1 sel	<b>No function</b> More than Less than	Sel
				Net flow alm 1 crit		R/W
				Net flow alm 1 sel	<b>No function</b> More than Less than	Sel
				Net flow alm 1 crit		R/W
				Measuring Range		R
Detailed Setup	Slug detection			Slug alarm select	<b>Not apply</b> Apply	Sel
		Slug detection	Drive gain	R		
		Slug criteria	R/W			
		Slug duration	R/W			
		After slug	<b>Measured value</b> Hold	Sel		
		Drive gain damping				



Detailed Setup	Empty pipe detect	Empty pipe alm sel	Not apply	Sel	
			Apply		
		Empty pipe detect	Empty pipe crit	R/W	
		After empty pipe	Massflow = Zero	Sel	
			Measured Value		
			Hold		
		Corrosion detect	Corrosion alm sel	Not apply	Sel
			Apply		
		Corrosion detect	Corrosion crit	R/W	
			Corrosion damp	R/W	
		Fluid max temp		R	
		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	
		Revision # 's	Universal rev	R	
		Fld dev rev	R		
		Software rev	R		
		Hardware rev	R		

Review	Review device info	Distributor	R	
		Sensor model	R	
		Sensor S/N	R	
		Final asmbly num	R	
		Tag	R	
		Long Tag	R	
		Descriptor	R	
		Message	R	
		Date	R	
		Device id	R	
	Review device info	Universal rev	R	
		Fld dev rev	R	
		Software rev	R	
		Hardware rev	R	
		Review sensor	SK20	R
			SKT	R
			RV	R
			Qnom	R
			SKP	R
			KD	R

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	FI20	R	
	FTC1	R	
	FTCK	R	
	Autozero value	R	
Rev FIDDev VARS 1	Flow direction	R	
	Mass flo unit	R	
	Mass flo LRV	R	
	Mass flo LRV	R	
	Mass flo damp	R	
	Mass flo lowcut	R	
	Mass flo alm 1 select	R	
	Mass flo alm 1 crit	R	
	Mass flo alm 2 select	R	
	Mass flo alm 2 crit	R	
Rev FIDDev VARS 1	Mass flo fixed val	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 select	R	
	Vol flow alm 1 crit	R	
	Vol flow alm 2 select	R	
	Vol flow alm 2 crit	R	
Rev FIDDev VARS 1	Dens unit	R	
	Dens LRV	R	
	Dens URV	R	
	Dens damp	R	
	Dens lowcut	R	
	Dens alm 1 select	R	
	Dens alm 1 crit	R	
	Dens alm 2 select	R	
	Dens alm 2 crit	R	
	Dens fixed value	R	
Rev FIDDev VARS 1	Pressure	R	
	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
	Flow direction	R
Rev FldDev vars 2	Conc meas unit	R
	Conc meas LRV	R
	Conc meas URV	R
	Conc meas damp	R
	Conc meas lowcut	R
	Conc alm 1select	R
	Conc alm 1crit	R
Rev FldDev vars 2	Conc alm 2 sel	R
	Conc alm 2 crit	R
	Net flo unit	R
	Net flo LRV	R
	Net flo URV	R
	Net flo damping	R
	Net flo lowcut	R
Rev Output/ Input	Net flo alm1 select	R
	Net flo alm 1 crit	R
	Net flo alm 2 select	R
	Net flo alm 2 crit	R
	Analog 1 select	R
	PV Alarm 1 select	R
	PV Analog 1 low LMT	R
Rev Output/ Input	PV Analog1 high LMT	R
	PV Analog 1 reverse mode	R
	Analog 2 select	R
	SV Alarm 2 select	R
	SV Analog 2 low LMT	R
	SV Analog2 high LMT	R
	SV Analog 2 reverse mode	R
Rev Outputs	Pulse/Stat 1 sel	R
	Pulse 1 select	R
	Pls Unit	R
	Pls Rate	R
	Pls Mode	R

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	Pls Width	R
	Pls Alarm	R
	SO 1 function	R
	SO 1 active mode	R
	Pulse/Stat 2 sel	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
	Totalizer sel	R
	F-Total Unit	R
	F-Total switch	R
	Total at alarm	R
	Total res cntrl	R
Review HART	Poll addr	R
	Num req preams	R
	Num resp preams	R

## 10.3 Model Code

### 10.3.1 Integral type RCCT3

Model	Suffix Code	Option Code	Description
RCCT34 RCCT36 RCCT38 RCCT39 RCCT39/IR			Nominal value : 2,7 t/h = 45 kg/min Nominal value : 9 t/h = 150 kg/min Nominal value : 32 t/h = 533 kg/min Nominal value : 85 t/h = 1420 kg/min Nominal value : 250 t/h = 4170 kg/min
Power supply	A D		100 - 240 V AC 24 V DC
Indicator direction	H1 H2 V0 N0		Detector installation horizontal, tubes down Detector installation horizontal, tubes up Detector installation vertical Without indicator
Cable conduit connection	M A		M20 x 1.5 ANSI 1/2" NPT
Process connection size	01 02 04 05 06 08 10 12 15		DN 15, 1/2" DN 25, 1" DN 40, 1 1/2" DN 50, 2" DN 65, 2 1/2" DN 80, 3" DN 100, 4" DN 125, 5" DN 150: 6"
Process connection rating and style	A1 A2 D4 D2 J1 J2 S2 S4 S8		ANSI flange class 150, process connection dim. + facing acc. ASME B16.5 ANSI flange class 300, process connection dim. + facing acc. ASME B16.5 EN flange PN 40, process connection dim. + facing acc. EN1092-1 Form B1 EN flange PN 16, process connection dim. + facing acc. EN1092-1 Form B1 Jis flange 10K, JIS B 2220 Jis flange 20K, JIS B 2220 Thread acc. DIN 11851 Tri-Clamp, DIN inside diameter Tri-Clamp, ANSI inside diameter
Material of measuring tube/wetted parts	SL HC		316L/316L Hastelloy C 22/ Hastelloy C22
Options :			
Hazardous area approvals		/KF1 /KF2	ATEX flame proof (converter) + intrinsic safe (detector) ATEX flame proof (converter) + intrinsic safe (detector) + intrinsic safe outputs
Active Pulse Output		/AP	One active pulse output (not with /KF2)
NAMUR Switch		/NM	One pulse output according EN50227 (NAMUR)
Analogue alarm levels		/NA	Analogue output alarm levels 2.4mA or 21.6mA (Standard is acc. NE43)
Tag number		/BG	With customer specified tag number on name plate
Flange facing		/DN	Flange with safety grooves acc. EN 1092-1 formD. only for EN flanges. not HC
Gas Measurement		/GA	Special adjustment for gas measurement
Special calibration		/K1 /K3 /K5	Massflow : customer specified full scale value (<70% of Qnom) Density : with several liquids 0.7 < ρ < 1.3 kg/l / 43.7 < ρ < 81.15 lb/ft <sup>3</sup> Massflow : with DKD certificate (traceable to German national standard)
Certificates		/P2 /P4 /P6	with compliance of the order : „2.1“ EN 10204 Test report : „2.2“ EN 10204 Material certificate : „3.1B“ EN 10204 for wetted parts
Customer Presetting		/H1	Oil and fat free certificate
Secondary containment		/PS /J1	Customer specific presettings Rupture pressure proof test : 40 bar / 580 psi (RCCT24.26). 25 bar / 362 psi (RCCT28). 10 bar / 145 psi (RCCT29)
Concentration measurement		/Cxx	Detailed description see model code of RCCF31
Special order		/Z	Special design must be specified in an extra text

### 10.3.2 Remote converter RCCF31

Model	Suffix Code	Option Code	Description
RCCF31			Remote converter to be combined with RCCS3
Power Supply	A D		100 – 240V AC 24 V DC
Indicator direction	H2 N0		With indicator Without indicator
Electrical connections	M A		M20 x 1.5 ANSI 1/2" NPT, only cable gland for detector connection
Options :			
Hazardous area approvals		/KF1	ATEX flame proof (converter) + intrinsic safe (detector)
Tag number		/KF2	ATEX flame proof (converter) + intrinsic safe (detector) + intrinsic safe outputs
Active Pulse Output		/BG	With customer specified tag number on name plate
NAMUR Switch		/AP	One active pulse output (not with (KF2))
Analog alarm levels		/NM	One pulse output according EN50227 (NAMUR)
No combination		/NA	Analoge output alarm levels 2.4mA or 21.6mA (Standard is acc. NE43)
Customer Presetting		/NC	No combination with detector
Concentration measurement		/PS	Customer specific presettings
Special order		/Cxx	See table below
		/Z	Special design must be specified in an extra text

**Table Concentration Measurement :**

Option	Display	Components	Concentration range	Temp. range	Source of the concentration / density table
/C01	°Brix	Sugar/water	0-85°Brix	0-80°C	PTB-Messages 100 5/90 : „The density of watery Saccharose solutions after the introduction of the international temperature scale of 1990 (ITS1990)“ Table 5
/C02	WT%	NaOH/water	2-50 WT%	0-100°C	D’Ans-Lax, Handbook for chemists and physicists Vol.1, 3rd Edition, 1967
/C03	WT%	KOH/water	0-60 WT%	54-100°C	D’Ans-Lax, Handbook for chemists and physicists Vol.1, 3rd Edition, 1967
/C04	WT%	NH <sub>4</sub> NO <sub>3</sub> /water	1-50 WT%	0-80°C	Customer specific
/C05	WT%	NH <sub>4</sub> NO <sub>3</sub> /water	20-70 WT%	20 – 100°C	Customer specific
/C06	WT%	HCl/water	22-34 WT%	20 – 60°C	D’Ans-Lax, Handbook for chemists and physicists Vol.1, 3rd Edition, 1967
/C07	WT%	HNO <sub>3</sub> /water	50-67 WT%	10 – 60 °C	Customer specific
/C08	WT%	H <sub>2</sub> SO <sub>4</sub> /water	2–100 WT%	0 – 100°C	D’Ans-Lax, Handbook for chemists and physicists Vol.1, 3rd Edition, 1967
/C09	WT%	H <sub>2</sub> O <sub>2</sub> /water	30-75 WT%	4-44°C	Customer specific
/C10	WT%	Ethylen Glycole/water	10-50 WT%	-20-40°C	Customer specific
/C11	WT%	Amylum = starch/water	33-43 WT%	35-45°C	Customer specific

### 10.3.3 Remote cable RCCY031

Model	Suffix Code	Option Code	Description
RCCY031			Remote converter to be combined with RCCS3
Cable ends	-0 -1		No termination, with termination set Terminated
Cable length	Lxxx		Enter the length (max. 300m if terminated)
Unit of length	M F		Meter [m] Feet [ft]
Options :			
Hazardous area installation		/KS1	Blue cable for Ex indication

## 10.3.4 Remote detector RCCS3

Model	Suffix Code	Option Code	Description
RCCS30 RCCS31 RCCS32 RCCS33 RCCS34 RCCS36 RCCS38 RCCS39 RCCS39/IR			Nominal value : 0.045t/h = 0,75 kg/min Nominal value : 0,17 t/h = 2,8 kg/min Nominal value : 0,37 t/h = 6,2 kg/min Nominal value : 0,9 t/h = 15 kg/min Nominal value : 2,7 t/h = 45 kg/min Nominal value : 9 t/h = 150 kg/min Nominal value : 32 t/h = 533 kg/min Nominal value : 85 t/h = 1420 kg/min Nominal value : 250 t/h = 4170 kg/min
Electrical Connection	-M -A		M20*1,5 ANSI 1/2 NPT
Process connection size	-41 -01 -02 -04 -05 -06 -08 -10 -12 -15		1/4" (only RCCS30 ... 33) DN 15 , 1/2" DN 25 , 1" DN 40 , 1 1/2" DN 50 , 2" DN 65 , 2 1/2" DN 80 , 3" DN 100, 4" DN 125, 5" DN 150: 6"
Process connection rating and style	A1 A2 D4 D2 J1 J2 S2 S4 S8 G9 T9		ANSI flange class 150 , process connection dim. + facing acc. ASME B16.5 ANSI flange class 300 , process connection dim. + facing acc. ASME B16.5 EN flange PN 40, process connection dim. + facing acc. EN1092-1 Form B1 EN flange PN 16, process connection dim. + facing acc. EN1092-1 Form B1 Jis flange 10K. JIS B 2220 Jis flange 20K, JIS B 2220 Thread acc. DIN 11851 Tri-Clamp, DIN inside diameter Tri-Clamp, ANSI inside diameter RP 1/4 female (standard connection for RCCS30 ... 33, pressure rating see Fig.10 ) NPT 1/4 female, adopter in G9 (pressure rating see Fig. 10), laylength: 276mm
Material of measuring tube/wetted parts	-SH -SL -HC		Hastelloy C 22 / 316L, only RCCS30 ... 33 316L / 316L, only RCCS34 ... 39 Hastelloy C 22/ Hastelloy C22, only RCCS34 ... 39
Options :			
Hazardous area installation	/KS1		ATEX intrinsically safe approval
Tag number	/BG		With customer specified tag number on name plate
Extended Measuring range	/IR		Flange with safety grooves acc. EN 1092-1 formD. only for EN flanges.
Flange facing	/DN		not HC
Gas measurement	/GA		Special adjustment for gas measurement
Extended temperature range	/MT		150°C < T <sub>medium</sub> < 230°C (only RCCS34 to 39/IR), always with /S2
High temperature version	/HT		T <sub>medium</sub> up to 350°C. only in combination with /Tx (only RCCS34 to 39)
Special calibration	/K1		Massflow : customer specified full scale value
	/K3		Density : with several liquids 0.7 < ρ < 1.3 kg/l / 43.7 < ρ < 81.15 lb/ft <sup>3</sup>
	/K5		Massflow : with DKD certificate
Certificates	/P2		with compliance of the order : „2.1“ EN 10204
	/P4		Test report : „2.2“ EN 10204 (DIN 50049)
	/P6		Material certificate : „3.1B“ EN 10204 (50049) for wetted parts
	/H1		Oil and fat free certificate
Secondary containment	/J1		Rupture pressure proof test and certificate : RCCT34, RCCT36: 40 bar, RCCT38: 25 bar, RCCT39 and RCCT39/IR: 10 bar, not for RCCS30-33
2 inch pipe mounting set	/PD		Only for RCCS30 -33. recommended for RCCS30
Customer isolation / heating	/S2		Connection box on distance, not with /Tx
Isolation / heating	/T1		Isolation (only RCCS34 to 39)
	/T2		Heat carrier heating (only RCCS34 to 39)
	/T3		Heat carrier heating with ventilation (only RCCS34 to 39)
Special order	/Z		Special design must be specified in an extra text

## 10.4 Technical Data

### STANDARD SPECIFICATIONS DETECTOR

#### MODEL

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

Fluid to be measured: Liquid, gas or slurries

Measurement items: Mass flow, density, temperature and derived from these  
Values : concentration, volume flow and net flow

#### Mass flow measurement :

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

Table 1a

Type		RCCS30	RCCS31	RCCS32	RCCS33
Qmax	t/h	0.1	0.3	0.6	1.5
Qnom	t/h	0.05	0.17	0.37	0.8

Table 1b

Type		RCCS34 RCCT34	RCCS36 RCCT36	RCCS38 RCCT38	RCCS39 RCCT39	RCCS/T 39 /IR
Qmax	t/h	5	15	50	120	300
Qnom	t/h	2.7	9	32	85	250

Qnom is the water flow rate at about 1 bar pressure drop.

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

#### Accuracy :

##### Liquid :

- RCCS3 + RCCF31, : +/-0.1% of measured value
- RCCT3 : +/- zero stability (pulse output)

##### Gas :

- RCCS3 + RCCF31, : ±0.5% of measured value ±
- RCCT3 : zero stability (refer to table 2)

Batch process : above specified accuracy if the batch process is >1min.  
For shorter batch time (dt in s) the accuracy decreases with the square root of 60/dt

Current output : additional error: max. 0.05 of span

Frequency output : additional error of 0.1% may occur below 800Hz



Table 2. Zero Stability

Type	RCCS30	RCCS31	RCCS32	RCCS33
kg/h	0.0025	0.008	0.017	0.04

Type	RCCS34 RCCT34	RCCS36 RCCT36	RCCS38 RCCT38	RCCS39 RCCT39	RCCS/T39 /IR
kg/h	0.095	0.45	1.35	3.8	4

**Density measurement :**

Measuring range : 0.3 to 5 kg/l

No density measurement for gas application

Accuracy (at calibration conditions) :

- RCCS30-33 : ± 4 g/l

- RCCS/T34 : ± 3 g/l

- RCCS/T36 : ± 2.2 g/l

- RCCS/T38, 39 : ± 1.5 g/l

- RCCS/T34-39 : ± 1 g/l (with special calibration option /K3)

- RCCS30-33 : ± 2 g/l (with special calibration option /K3,

good thermal isolation of the detector, fixed temperature or external temperature sensor)

**Temperature measurement :**

Accuracy : ± 1°C ± 0.5% of reading

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

Process temperature limits :

Detector :

Process temperature range (standard type)

RCCS30 to 39 : -180 to 150°C

RCCS34 to 39/MT : -180 to 230°C

(Range 150°C – 230°C recommended with /Tx option)

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

On request : -200 to 150°C

Integral type :

RCCT34 to 39 : -40 to 150°C

Process temperature range (hazardous area application) :

Detector RCCS3 Ex Type :

Standard : -40°C to 150°C

with option /MT : -40°C to 220°C

with option /HT : 0°C to 350°C

## APPENDIX

Table 3. Temperature classification of Ex version

Temp. class	RCCS30 to RCCS33		RCCS34 to RCCS39	
	Max. Ambient temperature	Max. Medium temperature / Temperature of heat carrier	Max. Ambient temperature	Max. Medium temperature / Temperature of heat carrier
T6	≤ 50°C	≤ 60°C	≤ 40°C	≤ 40°C
T5	≤ 50°C	≤ 80°C	≤ 55°C	≤ 55°C
T4	≤ 80°C	≤ 100°C	≤ 80°C	≤ 100°C
	≤ 50°C	≤ 120°C	≤ 40°C	≤ 120°C
T3	≤ 80°C	≤ 150°C	≤ 80°C	≤ 160°C
			≤ 40°C	≤ 180°C
T2	≤ 80°C	≤ 150°C	≤ 80°C	≤ 220°C

Temp. class	RCCS34 /HT to RCCS39 /HT		RCCT34 to RCCT39	
	Max. Ambient temperature	Max. Medium temperature / Temperature of heat carrier	Max. Ambient temperature	Max. Medium temperature / Temperature of heat carrier
T6	≤ 65°C	≤ 65°C	≤ 50°C	≤ 65°C
T5	≤ 75°C	≤ 75°C	≤ 50°C	≤ 80°C
T4	≤ 70°C	≤ 115°C	≤ 50°C	≤ 115°C
T3	≤ 70°C	≤ 180°C	≤ 50°C	≤ 150°C
T2	≤ 65°C	≤ 275°C		
T1	≤ 45°C	≤ 350°C		

### Temperature measuring range of converter :

RCCF31 : -200 to 230°C

RCCF31/HT : 0 to 400°C

### Heat carrier fluid temperature limits: (option /T2 or /T3 only for RCCS34 to 39)

- Non Ex Type:

Standard : -180°C to 150°C

With option /MT : -180°C to 230°C

with option /HT : 0°C to 350°C

- Ex Type:

Standard : -50°C to 150°C

with option /MT : -50°C to 220°C

with option /HT : 0°C to 350°C

### Ambient temperature limits :

- Remote RCCS3 Ex and non-Ex type :

Standard : -50°C to +80°C

Option /HT : -50°C to +65°C (up to 280°C medium)

-50°C to +55°C (up to 350°C medium)

terminal box lower 100°C

- Integral RCCT3 non-Ex type and Ex type :  
: -20°C to +50°C

### Process pressure limits :

According to the flange ratings:

EN PN 40 : max 40 bar

ASME class 150 : max 16 kgf/cm<sup>2</sup>

ASME class 300 : max 42 kgf/cm<sup>2</sup>

JIS 10K : max. 14 bar (1.4 MPa)

JIS 20K : max. 34 bar (3.4 MPa)

Max. tube pressure: up to 400bar, dependent to temperature and tube material.

Pressure equipment directive 97/23/EG :

- Module: H

- Fluid group: 1

- Category: III

Materials :

- Detector : Stainless steel 316

- Terminal box : Stainless steel and aluminium

- Converter: aluminium

Wetted parts :

- RCCS30 to 33 :

Tubes : HC22

Process connections: 316L, on request: HC

- RCCS34 to 39 and RCCT34 to 39 detector :

Tubes and process connection 316L or Hastelloy C (on request)

- Titanium on request (in preparation)

Diameter of measuring tubes

Table 4

Type		RCCS30	RCCS31	RCCS32	RCCS33
Inner diameter	mm	1.2	2.1	3	4.5
Wall thickness	mm	0.2	0.25	0.25	0,25

Type		RCCS34 RCCT34	RCCS36 RCCT36	RCCS38 RCCT38	RCCS39 RCCT39	RCCS39 /IR
Inner diameter	mm	7.6	13.4	22.1	37.2	55.1
Wall thickness	mm	0.9	1.2	1.65	2.6	2.6

### Remote Cable Specification

5 pairs; pair shielded; pair twisted; overall shielding

Li2Y(St) + CY 5x2 AWG24

Temp. range : -40 °C to 80°C

Resistance of loop : 95Ω/km

Capacity wire/wire : 80nF/km

Capacity wire/shield : 118nF/km

## APPENDIX

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Inductance : 0.6mH/km

### Other limits :

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

**Pressure loss** : Pressure loss depends on velocity, viscosity and density of the fluid. For newtonian fluids the pressure loss is shown in table 5 (water,20°C) and figures 1 to 9.

Table 5

Type		RCCS30	RCCS31	RCCS32	RCCS33
Qmax	bar	3.2	2.72	2.34	2.87
Qnom	bar	0.96	1.01	1.0	0.95

Type		RCCS34 RCCT34	RCCS36 RCCT36	RCCS38 RCCT38	RCCS39 RCCT39	RCCS39 /IR
Qmax	bar	2.5	3.01	3.58	2.35	0.65
Qnom	bar	1.03	1.1	1.05	0.95	0.1

### Secondary containment :

Rupture pressure for RCCS34-39 housing is typical about 130bar. However if the detector housing is exposed to this pressure it will deform and measurement will be strongly influenced. So the pressure test of the housing (option /J1) can only be done at the pressure where deformation does not happen.

### Gas content limits :

- RCCS30 to 32 : no limitation
- RCCS34 and RCCT34 : 20% Volume max.
- RCCS36 and 38 : 10% Volume max.
- RCCS39 : 5% Volume max.

### NOTES :

1. With liquid/gas mixtures the specified accuracy will not be achieved
2. Under Ex-condition gas any bubbles should be avoided.

### Calibration for liquids and gases

The ROTAMASS flow meters are factory calibrated with water. Calibration Conditions :

- Water : 22.5°C ± 12.5°C
- Ambient temperature : 22.5°C ± 12.5°C
- Process Pressure : 1 - 2 bar abs

For gas applications please choose option /GA.

All specifications are based on above mentioned calibration reference conditions.

### Installation

The flow meter 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.

**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 diagrams. Check whether the measuring range and accuracy at minimal flow fit the application. The calculations of the pressure loss are based on Newtonian fluids.

**DETECTOR OPTIONAL SPECIFICATIONS****Electrical classification :**

EEx ib IIB/IIC T1.....T6

KEMA 01 ATEX1075 X; Group II, Category 2 G

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

Heating with heat carrier, insulation and protection housing. The max. temperature at the protection housing from inner heating is 40°C. Above 150° process temperature insulation from the manufacturer is recommended. However up to 230°C process temperature the customer can insulate the detector themselves.

Option /T1: only insulation and protection;

Option /T2 insulation, protection and heating line;

Option /T3 like /T2 but with vent. Process connection for the heat carrier fluid is for D-type flanges: EN DN15 PN40 Form B1 and for A-type flanges ANSI ½" 150Lbs.

**Special calibrations :**

- Mass flow: at customer specified flow values between 14 and 70% of nominal flow (option /K1)
- Density: adjustment to the specific converter and check with another fluid with other density, increased accuracy like specified (option /K3)
  - Mass flow: with DKD Certificate (German Calibration Service Certificate: traced to the German legal authorities) (option /K5)
  - other calibrations on request

**Certificates :**

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

**STANDARD SPECIFICATIONS CONVERTER****Model**

- Remote type RCCF31
- Integral type RCCT34 to 39

**Ambient temperature limits :**

-20 to +50°C (for standard and Ex version)

### **Ambient humidity limits :**

5 to 95% R.H. non condensing

### **Power supply and power consumption :**

90 to 264 V AC, 47-63 Hz or

20.5 – 28.8 V DC

For Ex version 250 VAC max.

Consumption max. 10W

Fuse in power unit

- AC (90 ~ 264 V) .... 2 A, T (Time lag)

- DC (20.5 ~ 28.8 V) ... 2 A, T (Time lag)

- External circuit breaker rating : 5A, 250 V (No power switch is mounted in the converter).

### **I/O signal standard**

Two current outputs :

4 to 20 mA DC, galvanic separated from other signals,

Load resistance : 20 to 600 Ohm

Failure current according NAMUR NE43

Two pulse outputs / status outputs :

passive Transistor contact output , 30 V DC, 200 mA

or active output (/AP) 12V, 6mA,  $R_L > 10k\Omega$

Output rate : 0.0001 to 1000 pulses/s

as frequency output:

Output 1 : 12 – 10000Hz

Output 2 : 12 – 2000Hz

Option /NM : passive, according EN50227 (NAMUR)

Status input : Voltage-free contact,

closed :  $< 200 \Omega$  / open :  $> 100 k\Omega$ .)

### **Intrinsic safe outputs (/KF2), a total of 2 outputs :**

- One current output (passive) :

4 to 20 mA DC, galvanic separated from other signals.

10.5-30V DC (without HART communication), 165mA

16.75-30V DC (with HART communication), 165mA.

Load resistance : 20 to 600 $\Omega$

- One Pulse output / status output :

passive Transistor contact output , 30 V DC, 100 mA

Output rate : 0.1 to 10000 Hz

/NM : passive, according EN50227 (NAMUR)

Digital communication :

-HART communication signal, superimposed on 4 -20 mA DC signal (Iout1)

- Load resistance : 230 - 600 Ohm (including cable)

- Power line spacing : 15 cm or more, avoid parallel wiring

- Cable length :  $\leq 2$  km when „CEV“ cables are used

Setting functions : Parameter setting is possible by using the switches on the display or with the HART communication

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

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

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

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

Code	Specifications				
/KF1 flame prove	ATEX Directive (certified KEMA (CENELEC)) Flame proof Approval, Group II, Category 2 GD EEx d(e) [ib] IIC T6...T3 (RCCT3) EEx d(e) [ib] IIC T6 (RCCF31) Tamb : -20 to +50°C For integral type RCCT3 :				
	Temperature class	Ambient temperature		Process temperature	
	T6	≤ 50°C		≤ 65°C	
	T5	≤ 50°C		≤ 80°C	
	T4	≤ 50°C		≤ 115°C	
	T3	≤ 50°C		≤ 150°C	
/KF2 intrins. safe output	Additional specifications for option /KF1 : Intrinsic safe outputs EEx d [ia][ib] IIC T6...T3 (RCCT3) EEx d [ia][ib] IIC T6 (RCCF31) Data for intrinsic safe (ia)outputs :				
		Ui	Ii	Ci	Li
	Current (analog) output	30V	165mA	6.91nF	negligiible
Pulse output	30V	100mA	4.51nF	negligiible	

Protection class : IP67

Materials :

- Detector housing : Stainless Steel
- Converter housing : Aluminium alloy with Polyurethane corrosion-resistant coating

Coating colour :

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

## APPENDIX

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Isolation resistance of converter\* :

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

Dielectric strength\* :

- between power and ground terminal : 1,500 V AC for 1 min.

\*When surge arrestors are removed.

NOTE :

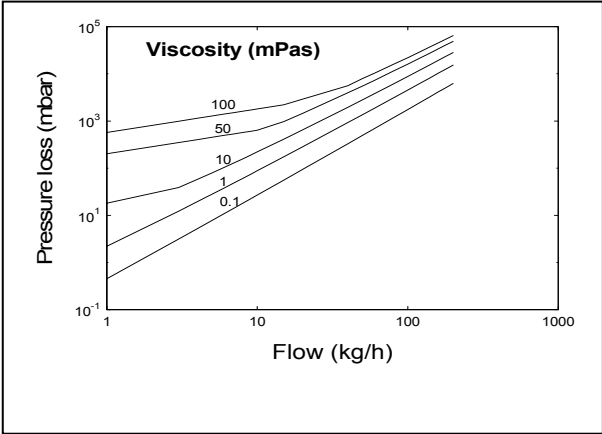
- Figures 1 to 9 show the pressure loss for Newtonian fluids, density is 1kg/l, viscosity as shown.  
Please inquire pressure losses for non-Newtonian fluids from your Yokogawa representative.
- The pressure losses are valid for constant flows. Pulsating flow causes a considerably higher pressure loss on average.
- For all fluids with flow as basis, please proceed as follow :
  - a. Determine the pressure loss from figures. Read the pressure loss for the given mass flow and viscosity on the ordinate. For pastes and slurries (thixotropic liquids), the pressure is often 2 - 4 times lower than the given value.
  - b. Determine measuring uncertainty from fig.2. Take the preferred flow and the sensor type, find the corresponding point in the error curve and read the uncertainty on the ordinate.

Evaluation :

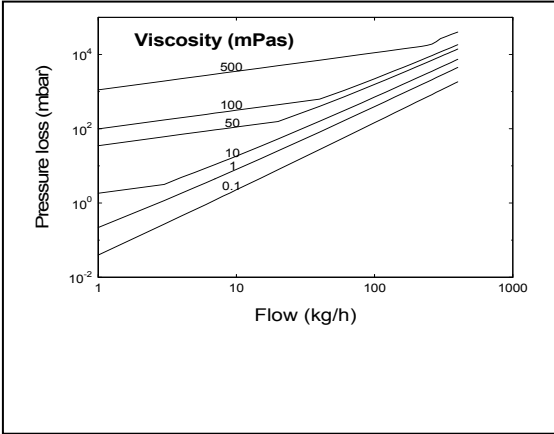
- a. If the pressure loss calculated is too high, take a larger detector size at reduced accuracy.
- b. If the accuracy is too low, take the smaller detector size at higher pressure loss.



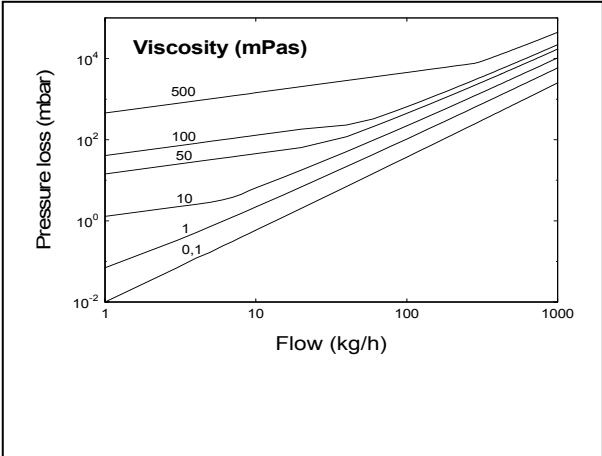
Pressure loss RCCS30



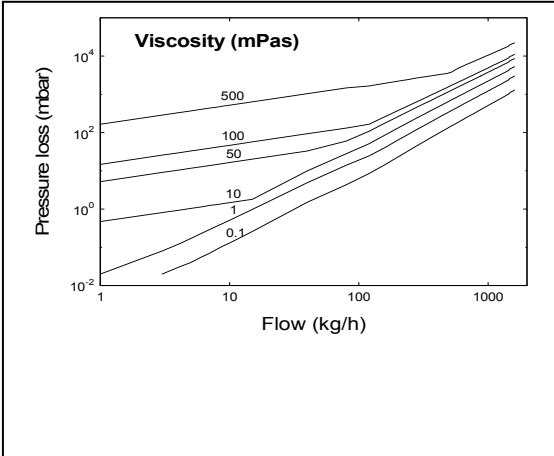
Pressure loss RCCS31



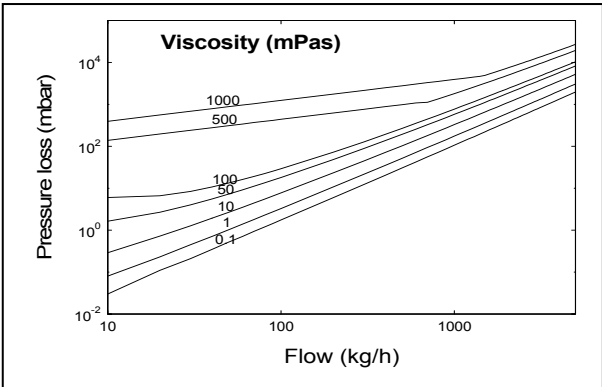
Pressure loss RCCS32



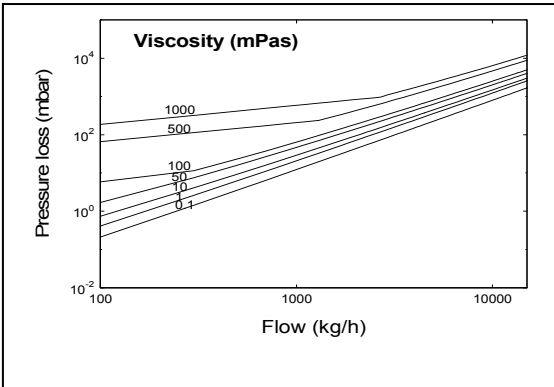
Pressure loss RCCS33



Pressure loss RCCS/T34

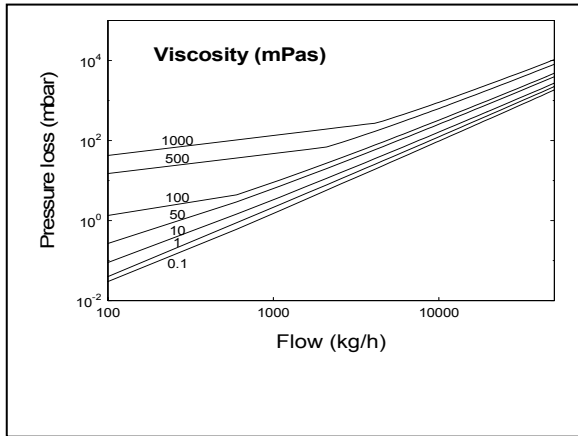


Pressure loss of RCCS/T36

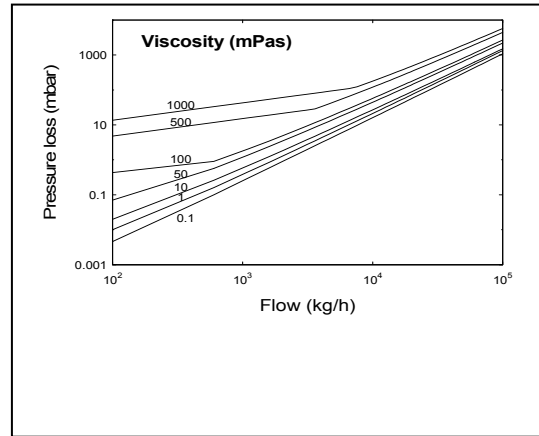


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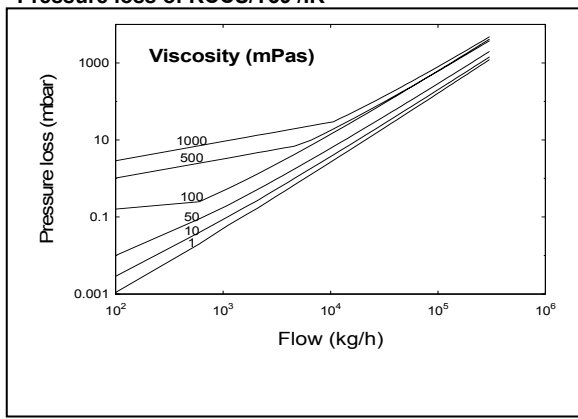
**Pressure loss of RCCS/T38**



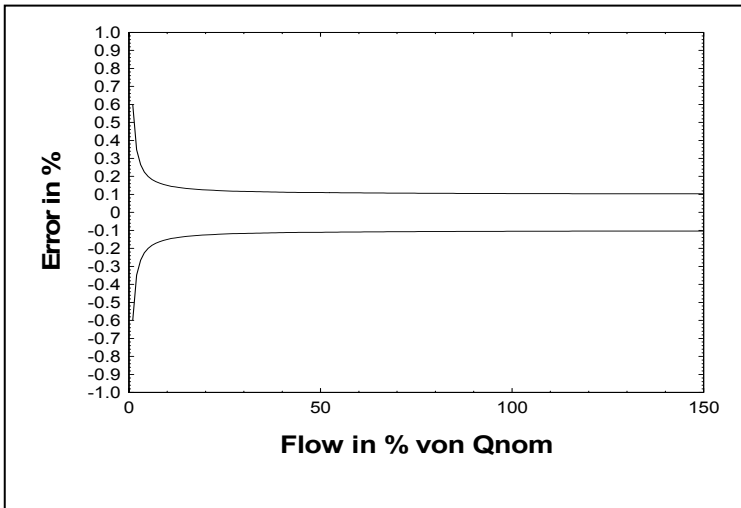
**Pressure loss of RCCS/T39**



**Pressure loss of RCCS/T39 /IR**



**Measuring uncertainty**



Liquid :

- RCCS3 + RCCF31, : ±0.1% of measured value
- RCCT3 : ± zero stability (pulse output)

Gas :

- RCCS3 + RCCF31, : ±0.5% of measured value ±
- RCCT3 : ±zero stability (refer to table 2)

Batch process : above specified accuracy if the batch process is >1min. For shorter batch time (dt in s) the accuracy decreases with the square root of 60/dt

Current output : additional error: max. 0.05 of span

Frequency output : additional error of 0.1% may occur below 800Hz

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## Planning and Installation Hints

### Wetted Materials

In Coriolis meters the Coriolis force bends the tubes. To get stable deflection of the tubes the stiffness and therefore the wall thickness has to be kept constant during the measuring process.

With corrosion or erosion the meter factor is drifting with time and recalibration is necessary. Select the suitable tube material for the process!

### Recalibration Service

Yokogawa offers via its European flow centre (Rota Yokogawa, Germany) full recalibration service, if necessary with a certificate traceable to German national standards. Please contact your Yokogawa affiliate or directly ROTA YOKOGAWA, Germany.

### Pressure loss and sizing

The suitable size is a compromise between pressure loss, accuracy and purchase cost. Please use the Yokogawa sizing program to choose the most suitable size.

### Heat tracing and insulation

Basically the detector can be insulated by the customer. The converter should not be exceeded more than 50°C. Therefore never insulate the converter and keep the neck free from insulation too. To be sure not to overheat the converter or the connection box choose one of /Tx options (insulation or heat tracing from Yokogawa). For temperatures between 150°C and 230°C choose /MT option and remote installation.

### Installation above 100°C process temperature

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

### Installation below 0°C process temperature

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

### 2 phase flow

2 phase flow can generate zero errors and span errors. The errors are proportional to the difference in density between the 2 phases and the amount of the second phase. It is best therefore to avoid 2 phase flow by good installation and good process control

If the presence of gas is not avoidable, the instrument incorporates a density window function to start measurement only if a certain density is reached. Other possibilities to adapt the instrument to users needs are available via a service menu.

### Zero adjustment function

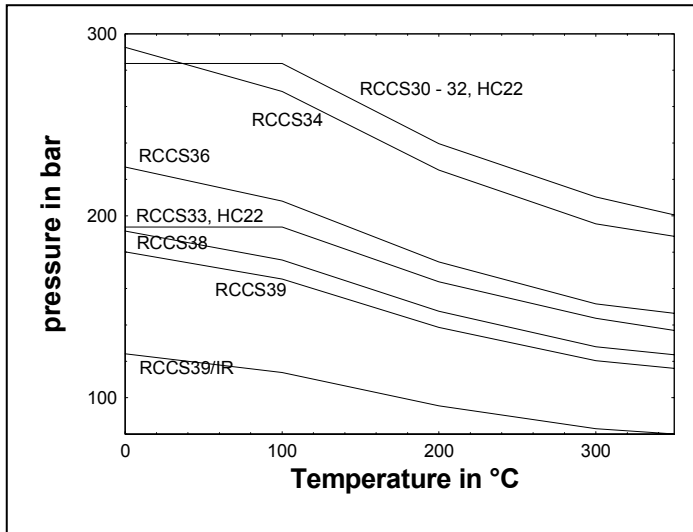
Zero point can be adjusted automatically either by setting the switches on display or with the HART communication or with status input when the fluid is stopped and the detector filled. To ensure no flow conditions stop valves should be installed. To achieve the specified accuracy a zero should be performed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

## APPENDIX

### Pressure/Temperature dependencies

The RCCS30 to RCCS33 have as standard process connection ¼ NPT F. Please find the pressure/temperature dependency :

#### Pressure/Temperature rating



Type of process connection <sup>1)</sup>		Medium temperature							
		to 30°C	50°C	100°C	150°C	200°C	250°C	300°C	350°C
<b>A1</b>	Flange acc. ASME B16.5 Class 150	<b>15.9 bar</b>	15.3 bar	13.2 bar	12.0 bar	11.0 bar	10.2 bar	9.7 bar	8.4 bar
<b>A2</b>	Flange acc. ASME B16.5 Class 300	<b>41.4 bar</b>	40.0 bar	34.5 bar	31.2 bar	28.7 bar	26.7 bar	25.2 bar	24.0 bar
<b>D2</b>	Flange acc. EN1092-1 PN16	<b>16 bar</b>	15.6 bar	14.2 bar	12.8 bar	11.7 bar	10.9 bar	10.3 bar	9.9 bar
<b>D4</b>	Flange acc. EN1092-1 PN40	<b>40 bar</b>	39.1 bar	35.6 bar	32.0 bar	29.3 bar	27.2 bar	25.8 bar	24.7 bar
<b>F4</b>	Internal thread G1/4" (RCCS30-33)	see Fig.11 "pressure/temperature rating"							
		Medium temperature							
		to 120°C			220°C	300°C	350°C		
<b>J1</b>	Flange acc. JIS B 2220 10K	<b>14 bar</b>			12 bar	10 bar	-----		
<b>J2</b>	Flange acc. JIS B 2220 20K	<b>34 bar</b>			31 bar	29 bar	26 bar		
		Medium temperature							
		to 140°C *)							
<b>S2</b>	Pipe connection acc. to DIN11851	to DN40		<b>40 bar</b>		*) under the restriction using suitable gasket materials			
		DN50 to DN100		<b>25 bar</b>					
		above DN100		<b>16 bar</b>					
		Medium temperature							
		to 150°C **)							
<b>S4</b>	Clamp connection acc. DIN32676	to DN50		<b>16 bar</b>		**) under the restriction using suitable clamp and gasket materials			
		above DN50		<b>10 bar</b>					
<b>S8</b>	Clamp connection for Sanitary OD-Tubing	to 2 in (2")		<b>16 bar</b>					
		above 2 in (2")		<b>10 bar</b>					

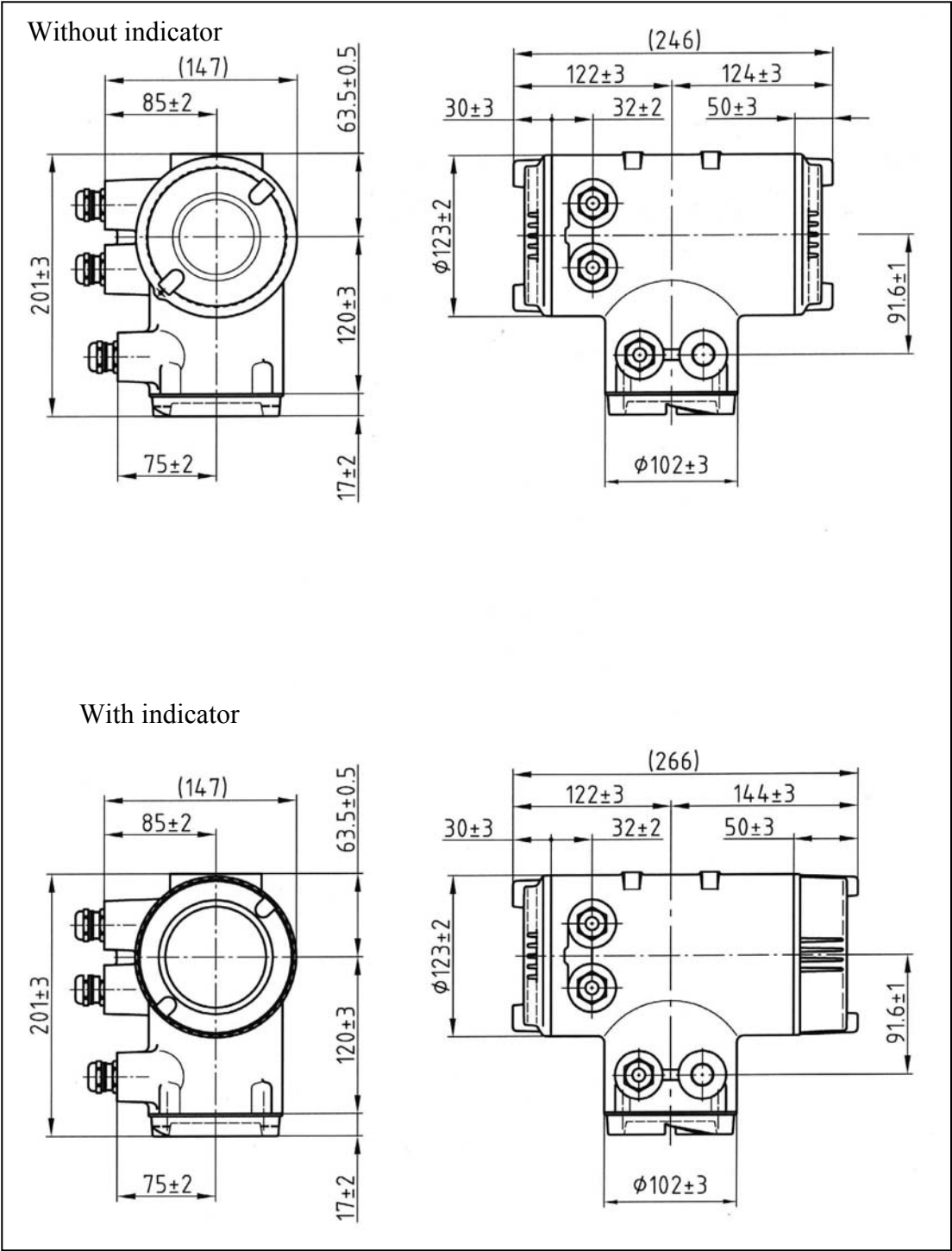
<sup>1)</sup> all process connections made of AISI 316L (1.4404 / 1.4435)

### Density Measurement RCCS30-33

For precise density measurement, a precise temperature measurement is mandatory. Due to the small flows the heat transfer to the temperature sensor is low and the temperature reading may be insufficient to reach the required density accuracy. Either insulate the detector sufficient or set a fixed temperature (if constant) or use "Temp. gain adjust" to correct the insufficient temperature reading.

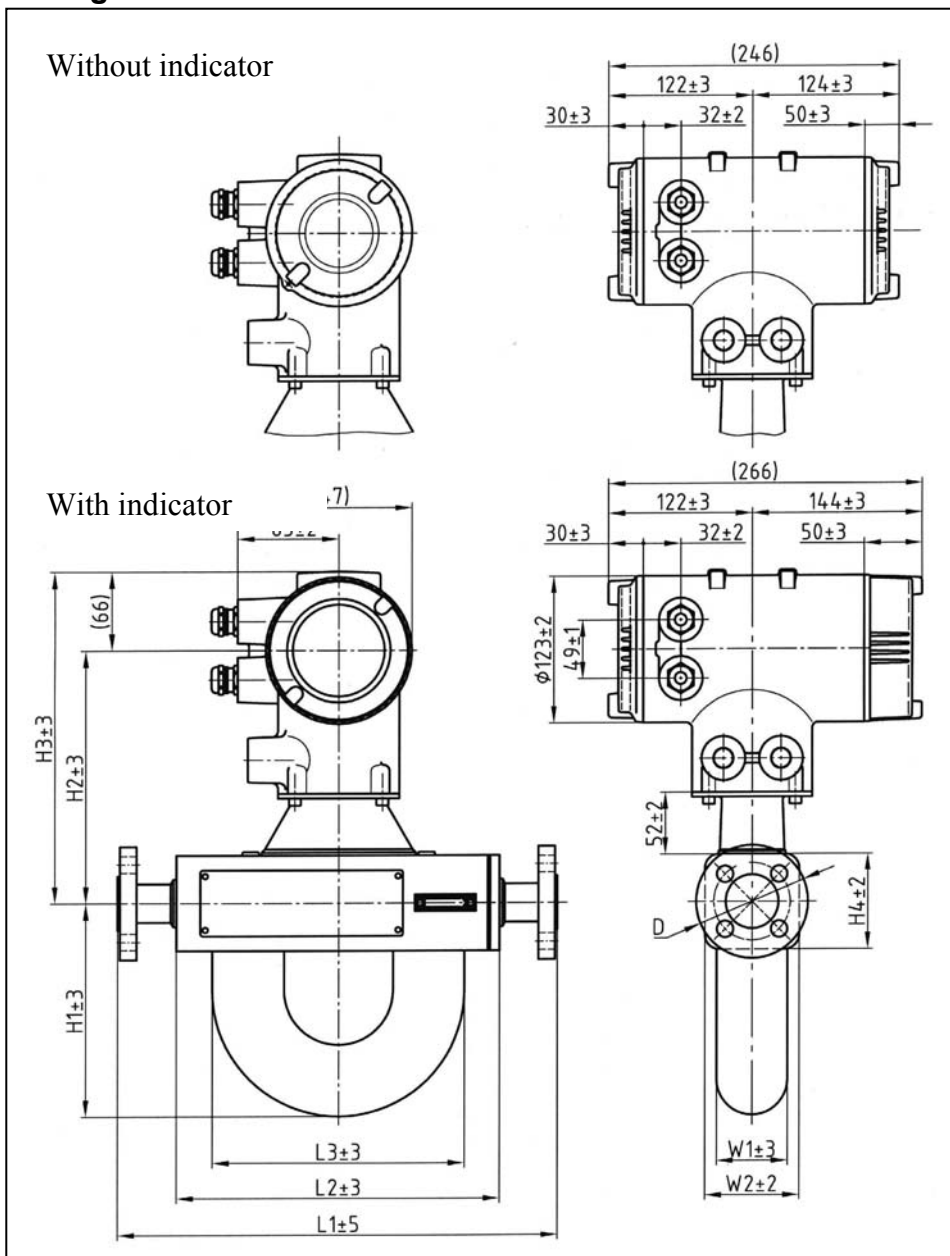
Weight and dimensions

CONVERTER RCCF31



Weight: standard type: 4kg  
Explosion proof type: 4,5kg

RCCT3 Integral version



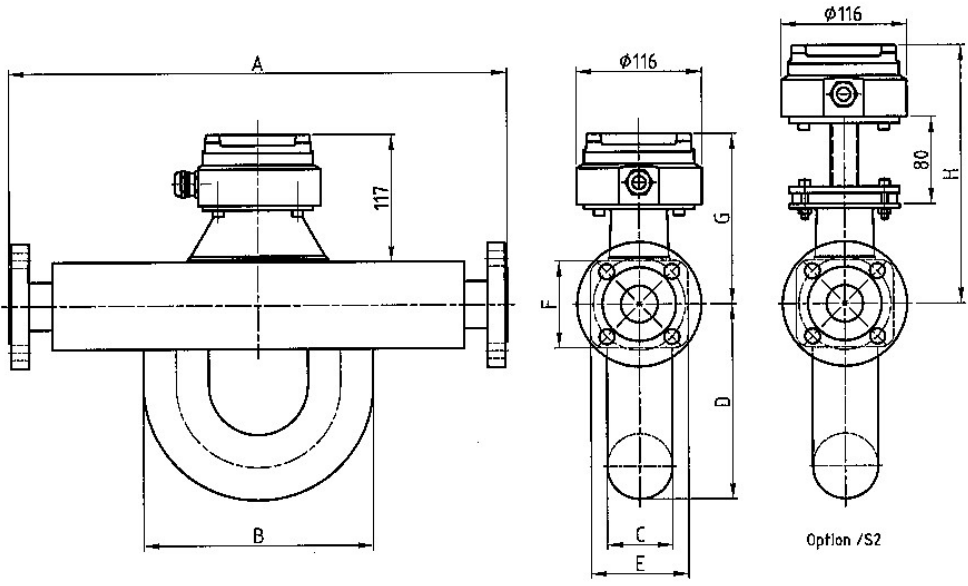
Note : the flange dimensions depend on size and pressure rating of the flange

Model		L1	L21	L3	H1	H2	H3	H4	W1	W2	Weight
RCCT34	[mm]	370	272	212	180	182	246	80	60	80	13 kg
RCCT36	[mm]	500	400	266	233	182	246	80	76	90	17 kg
RCCT38	[mm]	600	490	267	265	192	256	100	89	110	26 kg
RCCT39	[mm]	1000	850	379	430	210	274	135	129	160	64 kg
RCCT39/IR	[mm]	1100	870	455	453	242	306	200	155	200	92 kg

Installation length (Dimension A) for process connections S2, S4 and S8 (in mm)

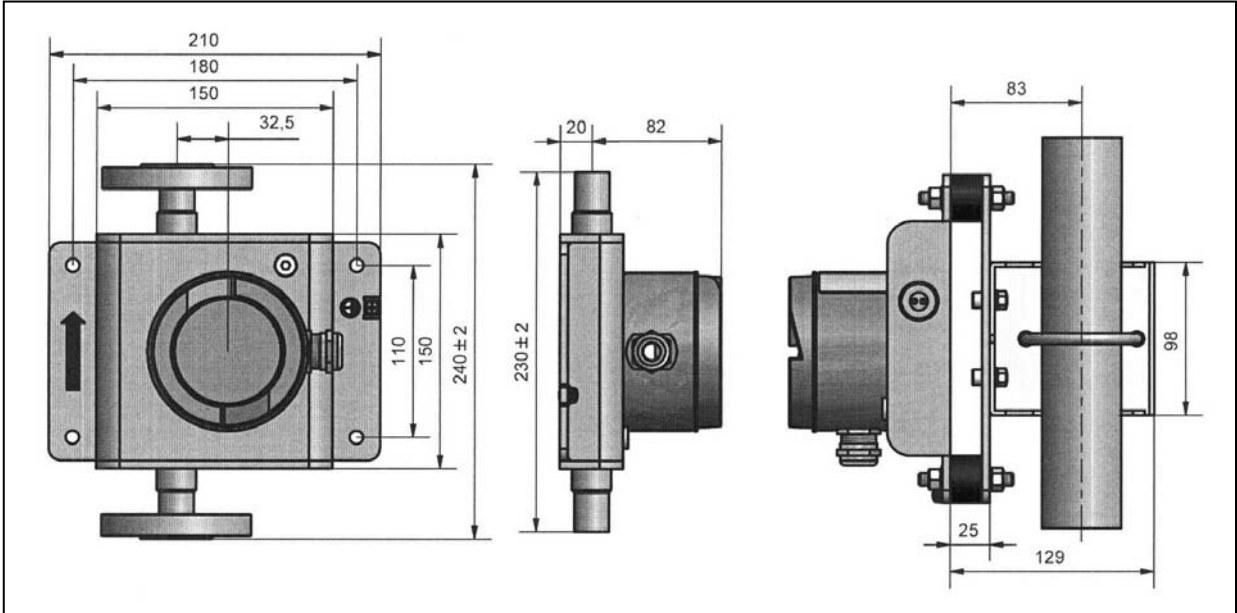
Type	S2	S4	S8
RCCT34	408	385	385
RCCT36	540	520	530
RCCT38	625	610	600
RCCT39	1050	1020	1020

**RCCS34-39, Remote version**



Model		A	A/S2	A/S4	A/S8	B	C	D	E	F	G	H	Weight
RCCT34	[mm]	370	408	385	385	212	60.3	180	80	80	157	237	9.5 kg
RCCT36	[mm]	500	540	520	530	266	76.1	233	90	80	157	237	13 kg
RCCT38	[mm]	600	625	610	600	267	88.9	265	110	100	167	247	22 kg
RCCT39	[mm]	1000	1050	1020	1020	379	129	430	160	135	185	265	60 kg
RCCT39/IR	[mm]	1100	---	---	---	455	155	453	200	200	217	297	88 kg

**RCCS30-33, Remote version**

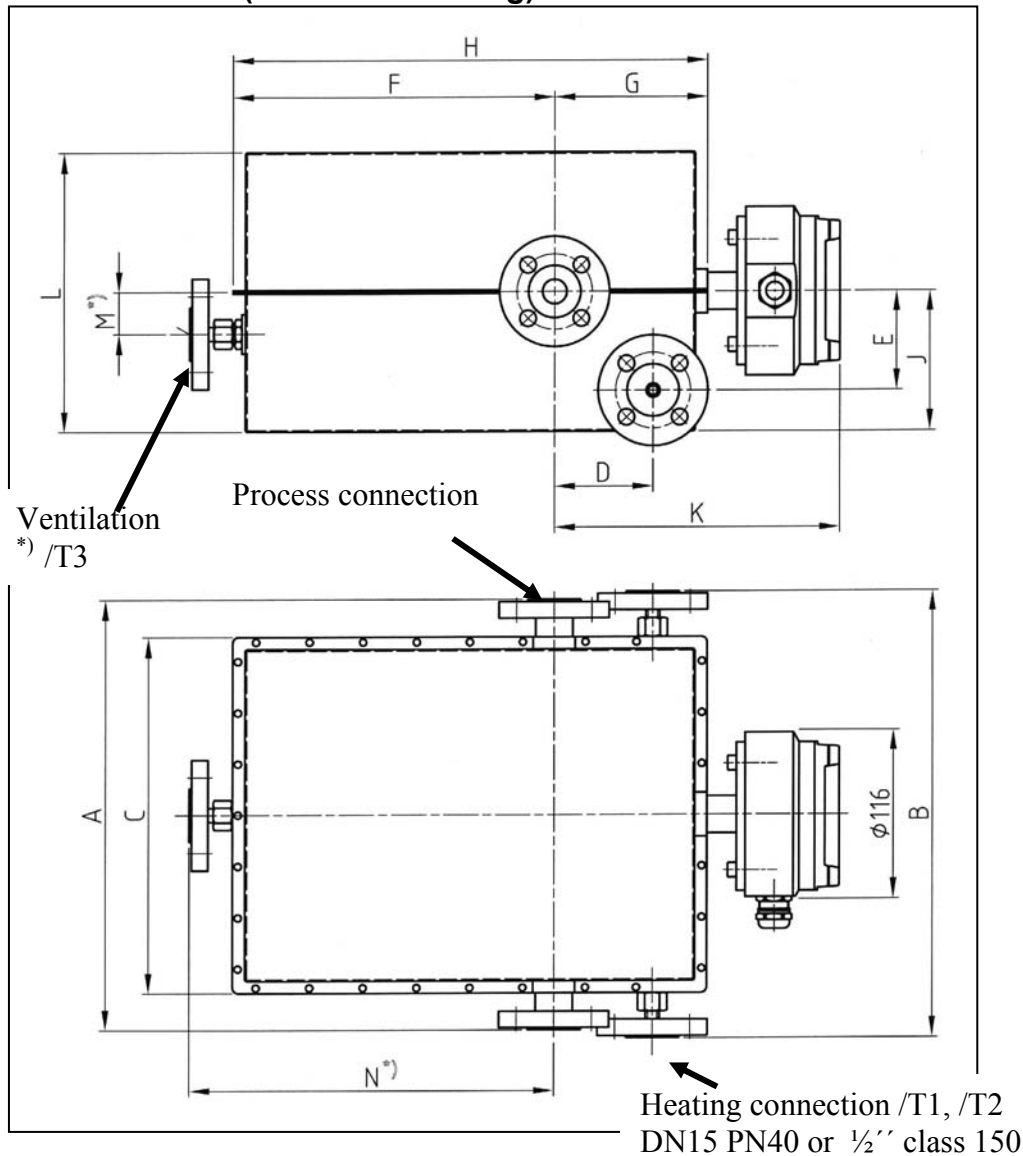


Weight (without flanges): 3.5kg

with 2'' pipe mounting s

# APPENDIX

## RCCS34...39 with /Tx (Isolation / heating)



Model		A	B	C	D	E	F	G	H	J	K	L	M	N	weigh t
RCCS34	[mm]	370	385	306	85	85	277	132	409	120	237	240	37	317	18 kg
RCCS36	[mm]	500	530	444	95	95	322	142	464	130	237	260	44	362	25 kg
RCCS38	[mm]	600	602 <sup>a)</sup>	524	100	100	382	142	524	130	247	260	52	422	37 kg
RCCS39	[mm]	1000	1000 <sup>b)</sup>	884	130	120	512	162	684	152	265	304	72	553	95 kg

a) B = 722mm for process connection 08D4 and 08A2

b) B = 1150mm for process connection 12D4 and 12A2

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