## **User's Manual**

ROTA**MASS** Total Insight
Coriolis Mass Flow and Density Meter
Quick Reference Instruction Manual
for Spare



IM01U10A01-00EN-R





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Introduction Scope of application

#### 1 Introduction

#### 1.1 Scope of application

These instructions apply to the following Rotamass Total Insight product families:

Rotamass Total Insight Spare transmitter and Spare sensor.

#### 1.2 Target group

The following persons are the target group of this manual:

- Technicians
- Engineers

This manual along with its applicable documents enables the target group to replace an existing Rotamass Total Insight sensor or transmitter by completing the following steps:

- Dismantling
- Installation
- Configuration (parametrization)
- Wiring
- Commissioning

For general installation instructions please refer to the General Instruction Manual IM 01U10B00-00\_\_-R.

#### 1.3 Applicable documents

The following documents supplement this manual:

- Explosion Proof Type Manual (Ex-IM) IM01U10X\_\_-00\_\_-R
- Software Instruction Manual (SW-IM) IM01U10S\_\_-00\_\_-R
- General Specifications (GS) GS01U10B\_\_-00\_\_-R
- Dry Verification procedure MP 208-008-2019
- General Instruction Manual IM 01U10B00-00\_\_-R

#### 1.4 Contact information

For more information or questions, contact your local Yokogawa sales organization.

#### 1.5 Explanation of safety instructions and symbols

#### Signal words

Warning notices are intended to alert users to potential hazards when working with the flow meter. There are four hazard levels that can be identified by the signal word:

Signal word	Meaning	
DANGER	Identifies a high-risk hazard resulting in death or severe injury unless avoided.	
WARNING	Identifies a fluid-risk hazard that may lead to death or severe injury unless avoided.	
CAUTION	Identifies a low-risk hazard that may lead to minor or moderate injury unless avoided.	
NOTICE	Identifies a hazard resulting in property damage.	



# Explanation of symbols

Symbols in this document	Meaning
<u>^</u>	Indicates a hazard, documentations must be consulted.
(i)	Indicates important information.
IM01U10S01-00R	The symbols in the document numbers are placeholders, here, for example, for the corresponding language version (DE, EN, etc.).

Symbols on the nameplates	Meaning
<u></u>	Warning that requires reading the documentation
	RCM marking
C€	CE marking
(Ex)	ATEX explosion protection marking
EHE, EHE Ex	EAC and EAC Ex marking
[C] [Cs	Korean (KC and KCs) marking
C FM US APPROVED	FM/CSA marking
NEPSI)	NEPSI marking
INMETRO	INMETRO marking
PAPER DE LA CONTRACTION DE LA	DNV GL type approval marking
28–05	3-A Sanitary approval marking
10	China RoHS marking
	Taiwan Safety (TS) marking
	Russia Pattern approval marking
	Belarus Pattern approval marking

Safety Intended use

#### 2 Safety

#### 2.1 Intended use

The flow meter described in this User's Manual is intended to measure mass flow of fluids and gases while simultaneously also capturing their density and temperature. These values form the basis for calculating additional measured quantities, such as volume flow and concentration of fluids.

The flow meter uses the Coriolis principle and can be used in process automation for a wide range of flow rate measurements. It allows for measuring various fluids, e.g.:

- Oils, grease
- Gases, liquid gases
- Acids, solutions, solvents
- Emulsions and suspensions

Use of the flow meter is limited primarily by the necessary homogeneity of the fluid and chemical resistance of the wetted parts. Details can be obtained from the responsible Yokogawa sales organization. Operational safety cannot be ensured in the event of any improper or not intended use. Rota Yokogawa is not liable for damage arising from such use.

The flow meter described in this User's Manual is a class A device according to EN 61326-1 and may only be used in an industrial environment.

#### 2.2 Technical conditions

At normal conditions, the flow meter does not release any poisonous gases or substances.

If the flow meter is operated in faulty conditions, its safety and function may be impaired.

For this reason, the following must be observed:

- ► Operate the flow meter only when in good working order.
- If its operational performance changes unexpectedly, check flow meter for faults.
- ▶ Do not undertake unauthorized conversions or modifications on the flow meter.
- Eliminate faults immediately.
- Use only original spare parts.



#### 2.3 General safety instructions

## **⚠** DANGER

# Use of fluids that are a health hazard may result in caustic burns or poisoning

- When removing the flow meter, avoid touching the fluid and breathing gas residues left in the sensor.
- Wear protective clothing and a breathing mask.

## **⚠** DANGER

# Use of unproper materials through the customer may result in heavy corrosion and/or erosion

- The medium 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.

## **⚠** DANGER

#### Improper installation in hazardous area

The following basic safety instructions must be observed when handling the flow meter:

When using the flow meter in areas at risk of explosion, compliance with the Explosion Proof Type Manual is mandatory.

## **MARNING**

# High fluid temperatures may result in hot surfaces and therefore a risk of burns

- Apply thermal insulation to sensor.
- Attach warning labels to the sensor.
- Wear protective gloves.

## **⚠** WARNING

#### Risk of injury from electrical shock due to inadequate clothing

Wear protective clothing as required by regulations.

## **MARNING**

#### Risk of injury from electrical shock at the transmitter

- Avoid handling the transmitter with wet hands.
- Wear protective gloves.

The following basic safety instructions must be observed when handling the flow meter:

- Carefully read the User's Manual prior to operating the flow meter.
- Only qualified specialist personnel must be charged with the tasks described in this User's Manual.
- Ensure that personnel complies with locally applicable regulations and rules for working safely.
- ▶ Do not remove or cover safety markings and nameplates from flow meter.
- Replace soiled or damaged safety markings on the flow meter. For replacing please contact the Yokogawa Service Center.

- ► If Rotamass Total Insight is used to measure safety-related quantities, ensure that the transmitter does not display any error messages and, if applicable, the Total Health Check function is performed at regular intervals (see applicable General Specifications GS01U01B....-00....-R, chapter "Options").
- Avoid erosion and corrosion as they reduce accuracy and resistance to temperature and pressure. Over time, calibration constants change as a result of erosion and corrosion, therefore requiring recalibration. Rota Yokogawa does not assume any guaranty or liability with respect to corrosion resistance of wetted parts in any specific process. The user is responsible for selecting the appropriate materials. Rota Yokogawa provides support in clearing up the question of corrosion resistance of the materials used (special fluids but also cleaning agents). Minor changes in temperature, concentration or pollution degree in the process may result in differences in terms of corrosion resistance. In case of corrosion or erosion, the pipes must be checked periodically to ensure necessary wall thickness. This can be accomplished by using, for example, the Tube Health Check function (see applicable General Specifications GS01U01B\_\_-00\_\_-R, chapter "Options").
- When performing welding tasks on the pipe, it is important not to ground the welding equipment by way of the flow meter. Soldering and welding work on parts of the flow meter is prohibited.
- ► Continuous temperature fluctuations in excess of 100 °C may result in tube failure due to material fatigue and therefore must be avoided.
- ► The operator is responsible for ensuring that design limits (pressure, temperature) are not exceeded in the event unstable fluids decay.
- External influences may result in failure of threaded connections. The operator is responsible for providing suitable protective measures.
- Compression and shock waves in pipes can cause damage to the sensor. For this
  reason it is important to avoid exceeding the design limits (pressure, temperature).
- Fires may result in increased process pressure (caused by temperature-related volume changes) and failure of gaskets. The operator is responsible for taking suitable measures to prevent fire-related damage.
- Manufacturing methods and technologies have been successfully field-tested for decades. Erosion and/or corrosion are not taken into account.
- Removal of material from the flow meter with power tools such as drills or saws is not permitted.
- Any repair, modification, replacement or installation of replacement parts is permitted only if it's complying with this User's Manual. Other work must be first authorized by Rota Yokogawa. Rota Yokogawa does not assume liability for damage caused by unauthorized work on the flow meter or by improper use.



#### 3 Warranty



Please contact the Yokogawa sales organization if the device needs to be repaired.

The warranty terms for this device are described in the quotation.

If a defect for which Yokogawa is responsible occurs in the device during the warranty period, Yokogawa will repair that defect at its own cost.

If you believe that the device is defective, please contact us and provide a detailed description of the problem. Please also tell us how long the defect has already occurred and list the model code and serial number. Additional information, such as drawings, simplifies the identification of the cause and repair of the defect.

Based on our test results, we determine whether the device can be repaired at Yokogawa's expense or at the expense of the customer. If, for example, the Yokogawa calibration device for the water flow rate confirms a deviation of the output signal from the stated flow rate accuracy of the device, the device is deemed defective.

The warranty does not apply in the following cases:

- If the adhesion, blockage, deposit, abrasion or corrosion is the result of the device's actual use.
- If the device is mechanically damaged through solids in the fluid, hydraulic shock, or similar influences.
- If the instructions in the corresponding General Specifications or User's Manual that must be met have not been followed.
- In case of problems, errors or damage that result from unprofessional installation by the customer, for example due to insufficient tightness of the pipe fittings.
- In case of problems, errors or damage that result from operation, handling or storage in rough ambient conditions that are beyond the specifications of the device.
- In case of problems, errors or damage that result from unprofessional or insufficient maintenance by the customer, for example, if water or foreign particles enter the device due to opening the device cover.
- In case of problems, errors or damage that result from use or from performing maintenance work on the device in a location other than the installation location specified by Yokogawa.
- In case of problems, errors or damage that result from modification or repair work that was not performed by Yokogawa or by a person authorized by Yokogawa.
- In case of problems, errors or damage that result from unprofessional installation, if the location of the device has been changed.
- In case of problems, errors or damage that result from external factors, such as other devices that are connected to this device.
- In case of problems, errors or damage that result from catastrophic external influences, such as fire, earthquake, storm, flooding or lightning.



Product specification Scope of delivery

## 4 Product specification

#### 4.1 Scope of delivery

The scope of delivery of the flow meter must be checked for completeness using the following list:

Tab. 1: Overview: Scope of delivery of the flow meter

	Spare sensor	Spare trans- mitter
Sensor	1 unit	_
Transmitter	_	1 unit
Connecting cable	_	_
Operating tool for terminals	2 units	2 units
2-inch pipe mounting bracket set for remote type devices		
<ul> <li>Sheet metal console (bracket)</li> </ul>	1 set	1 set
<ul> <li>Mounting bracket (U-bracket)</li> </ul>	1 301	1 301
<ul> <li>Fixing materials (2 nuts, 2 washers, 4 Allen screws)</li> </ul>		
Pipe installation set for sensor (with device option PD)		
<ul> <li>Sheet metal console (bracket)</li> </ul>		
<ul> <li>Mounting bracket (U-bracket)</li> </ul>	1 set	_
<ul> <li>Fixing plate</li> </ul>	1 000	
<ul> <li>Fixing materials (14 nuts, 6 washers, 4 bolts, 8 notched washers, 4 rubber buf- fers)</li> </ul>		
Cable glands are included for a device with metric cable entries and without Ex approval.		
Please note:		0
<ul> <li>No cable glands are included for a device with cable entries other than metric.</li> </ul>	_	2 units
<ul> <li>For a device with Ex approval the inclusion of cable glands may vary. Please refer to the applicable Explosion Proof Type Manual.</li> </ul>		
Document folder with this content:		
<ul> <li>Product CD/DVD (includes the complete product documentation)</li> </ul>		
<ul> <li>Quick Reference Instruction Manual</li> </ul>	1 folder	1 folder
<ul> <li>Safety Regulations Manual</li> </ul>		
<ul> <li>Further documents like certificates (depending on model code)</li> </ul>		

## 5 Transport and storage

#### 5.1 Transport

The following rules apply when transporting the flow meter:

- Observe the transport-related instructions on packaging.
- ▶ In order to avoid damage, do not unpack the flow meter until it is at the installation site.
- ▶ Do not remove protective materials, such as protective stickers or covers from process connections during transport.
- Starting at a weight of 15 kg, have at least two persons and/or use suitable tools (shoulder straps, lifting device, cart) to lift and transport the flow meter.

## **MARNING**

#### Risk of injury from slipping or falling flow meter

- Ensure that suspension points of the ropes are located above the flow meter's center of gravity.
- Use a lifting device meeting local regulations.
- Attach lifting ropes to process connections.
- Do not suspend flow meter from transmitter housing, neck of sensor or flange holes.

The lifting ropes must always be attached to the sensor at the process connections (except for the Rotamass Nano). The depictions that are crossed out in the figure below show impermissible attachment types. This applies to the remote type, the remote type with long neck and the integral type, independent of the design. If the process connections are others than flanges, the holding ropes must be secured against slipping, if necessary (for example, for the Rotamass Hygienic).

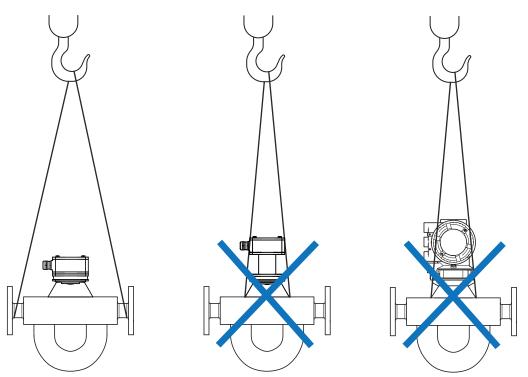


Fig. 1: Attachment of the transport ropes to the sensor independent of the design (impermissible attachment types are crossed out)

#### 5.2 Storage

Please note the following rules apply when storing the flow meter:

#### NOTICE

#### Risk of damage to the flow meter due to storage in a damp environment

- Protect flow meter from rain and humidity.
- Ensure that a relative humidity of 95 % is not exceeded.

#### NOTICE

#### Risk of damage to the flow meter due to mechanical wear during storage

- ▶ Store flow meter in a location that is secured against mechanical influences.
- ▶ Ensure compliance with the allowed storage temperature according to specification.
- Protect flow meter against direct insolation to prevent exceeding the allowed storage temperature.
- Protect flow meter from rain and inappropriate humidity.
- Keep protective materials such as protective stickers or covers on process connections or re-apply them.
- ▶ Prior to storing a used flow meter, completely drain all fluids from the measuring tube, as well as from the process and heating connections (if applicable), and thoroughly clean the flow meter, please see *General Instruction Manual IM01U10B*\_\_-00\_\_-R.

## 6 Sensor replacement

#### 6.1 Dismantling of the defective sensor

The defective Rotamass Total Insight sensor has to be dismantled. The dismantling flow depends on the flow meter type (integral or remote).

The rules according to the Explosion Proof Type Manual IM 01U10X0\_-00\_\_-R apply, especially the chapter "Operation, maintenance and repair".

#### 6.1.1 Connecting interfaces

#### Remote type

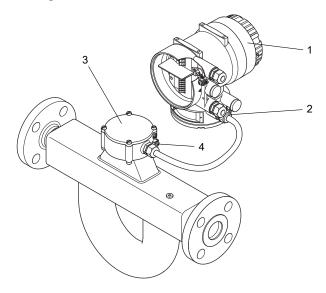


Fig. 2: Connecting interfaces on sensor remote type

- 1 Display (if available)
- 2 Communication cable entry
- 3 Terminal cover
- 4 Grounding terminal for external potential equalization (sensor)

#### Integral type

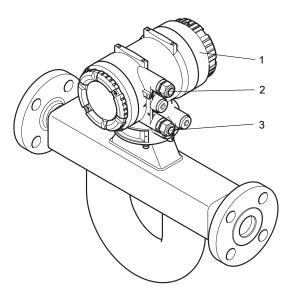


Fig. 3: Connecting interfaces on sensor integral type

- 1 Display (if available)
- 2 Power supply cable entry
- 3 Communication cable entry

Transmitter housing back cover

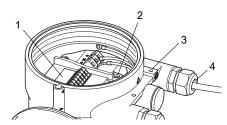


Fig. 4: Connecting interfaces on transmitter housing back cover

- 1 Terminal box power and I/O
- 2 Grounding screw for connecting grounding conductor
- 3 Grounding terminal for external potential equalization (transmitter)
- 4 Power supply cable entry

#### 6.1.2 Disconnect remote type sensor



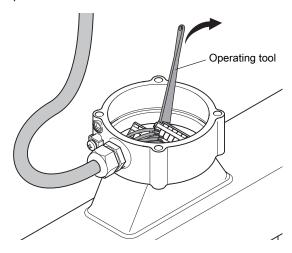
#### Life-threatening injuries from electric shock

- Switch off power supply and communication.
- Secure against inadvertent switch-on.

Disconnecting power, communication and grounding

After power down and breaking all power cable connections from L/+ N/- and grounding for the power circuit (except potential equalization connection of external grounding terminal) the sensor has to be disconnected by the following procedure:

1. Open the terminal cover.



- 2. Disconnect all cables with the operating tool.
- 3. Remove the cable gland and cable.
- 4. Disconnect the sensor potential equalization.

#### 6.1.3 Disconnect integral type sensor



#### Life-threatening injuries from electric shock

- Switch off power supply and communication.
- ► Secure against inadvertent switch-on.

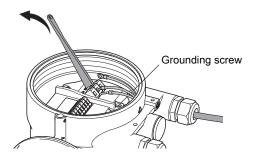
Disconnecting power, communication and grounding

After power down and breaking all power cable connections from L/+ N/- and grounding for the power circuit (except potential equalization connection of external grounding terminal) the sensor has to be disconnected by the following procedure:

- Remove locking screw of the "Terminal box power and I/O connection" and remove the back cover.
- 2. Disconnect the communication and I/O cables (avoid short circuit!).
- 3. Remove the cable gland and cable.



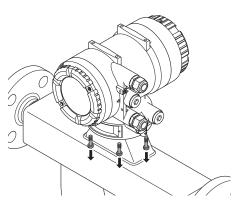
4. Disconnect the power cables from L/+ and N/- "Power supply connection terminals".



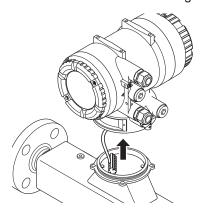
- 5. Remove "Grounding screw for connecting grounding conductor".
- 6. Remove potential equalization from "Grounding terminal for potential equalization" (if used).

Remove transmitter and disconnect from defective sensor

1. After disconnection the transmitter is removed by unscrewing the four clamping bolts.



2. Lift the transmitter housing:



- 3. Turn the transmitter housing around for disconnection.
- 4. Disconnect all wires from the sensor with the operating tool.

#### 6.1.4 Remove defective sensor

After disconnection the sensor has to be dismantled.

#### 6.2 Installation of the Spare sensor

#### 6.2.1 Unpacking

Note the following rules prior to installation:

- Check packaging and contents for damage.
- ▶ Do not remove protective materials such as protective stickers or caps on process connections until the start of the installation process.
- ▶ Dispose packaging materials in compliance with country-specific regulations.

#### 6.2.2 General installation instructions

⚠ DANGER	When installing in hazardous areas, the applicable Explosion Proof Type Manual must be considered.
<b>⚠</b> WARNING	Risk of injury during installation due to insufficiently trained personnel
Z-S WARNING	Only have skilled personnel install the flow meter.
NOTICE	Risk of damage to the flow meter due to excessive mechanical stress
	► The flow meter must not be used as a support for climbing (e.g. during installation work on the tube system). The flow meter must not be used to support external loads (e.g. as a support for pipes) or as a surface for depositing heavy tools (e.g. during installation work on the pipe system).
	The weight of the flow meter may generate additional mechanical forces on the piping that might lead to tensions at process connections. Design measures must be taken to prevent the above.
NOTICE	Risk of damage to the flow meter due to mechanical influences
	<ul><li>Protect the flow meter from vibration, shocks and mechanical strain.</li></ul>
NOTICE	Meet the environmental conditions of the respective General Specifications (see GS01U10B000R) to prevent disturbance of other sensitive electrical equipment due to increased electromagnetic emissions.

For general installation instructions please refer to General Instruction Manual IM 01U10B00-00\_\_-R.



#### 6.2.3 Sensor installation

## **⚠** DANGER

#### Risk of injury due to escaping fluids, if pipe connection is faulty

► Correct slope and mismatch of pipe connections before inserting the sensor.

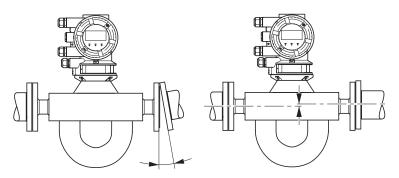


Fig. 5: Avoid: Slope and mismatch

Avoid fixing anything directly to the sensor. Doing so may result in increased deviations.

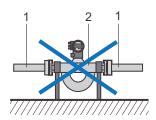


Fig. 6: Installation to be avoided: Fixing the sensor

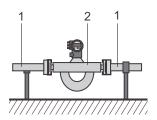


Fig. 7: Recommended installation: use the piping to support the sensor

- 1 Pipe
- 2 Sensor
- Secure pipes before installing the flow meter.
- Avoid damaging the process connections.
- ► Flush new pipes before installing the flow meter to remove foreign matter, such as shavings or other residues.

#### Avoiding creation of noise

Zero point stability is a prerequisite for exact mass flow measurement. Insufficient installation may lead to mechanical tensions or flow noise which impact zero point stability.

Countermeasures to help avoid noise creation:

- Support sensor weight by using soft coupling (silicone or other types of cushioning materials).
- Avoid bending or tensioning the sensor while aligning the pipe.
- Avoid reductions or expansions in pipe directly up- or downstream of flow meter.
- Avoid placing control valves, apertures or other devices generating noise near the sensor.

#### 6.3 Parameter setting

#### 6.3.1 Relevant settings and parameter storage

#### Relevant settings

For the exchange of the sensor two kinds of parameters are relevant to ensure a proper operation of the flowmeter:

- sensor related parameters (liquid or gas select, mass flow- or volume flow unit, temperature unit...)
- sensor specific parameters (SK20, KD, fl20)

The sensor exchange has no impact on system related setting (e.g. device ID, device tag).

## Delivered parameters

The Spare sensor is delivered with parameters according to the ordered model code and as documented on the calibration certificate.

# Storage location of parameters

Both parameter types, sensor related parameters and sensor specific parameters, are stored on the microSD card and product DVD in the file "Factory.PAR".

In addition, the sensor specific parameters can be found on:

• the calibration certificate of the sensor:

# Results: Flow Calibration Sensor Coefficient SK20: 103,0 Auto Zero Value: - 0,0 kg/h Density Calibration Density Coefficient KD: 2,7933 kg/l Frequency FL20: 383,305 Hz

Fig. 8: calibration certificate

• the additional nameplate of the sensor:

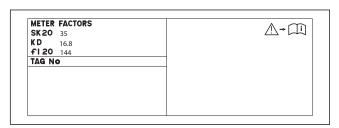


Fig. 9: additional nameplate

# Communication possibilities

There are two possibilities to configure the transmitter with all relevant settings to ensure a possibilities proper operation:

- Parameter setting via communication tool like 475 Configurator or DTM
- Parameter setting via transmitter display, if available

Sensor replacement Wiring

#### 6.3.2 Parameter setting procedure

The coupling of the existing transmitter with the spare sensor can be executed with the following procedure:

- Set the process parameter units to standard units.
   Please refer to chapter 7.3.3 Set up process variable units [▶ 44].
- 2. Copy and rename the file "Factory.PAR", available on the delivered microSD card or product DVD, to the microSD card of the existing transmitter.



The use of the microSD card is possible only for transmitters with display (indicated on model code position 14 = 1)

3. Run the function "Download sensor constants from microSD card". Please refer to chapter 7.3.4 Set up sensor relevant and sensor specific parameters [ 45].

#### 6.4 Wiring

#### 6.4.1 General wiring rules

Be sure to handle the transmitter cover carefully so that there are no damages and foreign matter adhesion at its thread and O-ring when it is opened or attached.

## **⚠** DANGER

#### Life-threatening injuries from electric shock

- Switch off power supply.
- Secure power supply against inadvertent switch-on.
- Check that power supply is free of voltage.

## **⚠** DANGER

#### Life-threatening injuries from ignition of explosive atmospheres

- Wait 20 minutes before opening the housing until the capacitors have discharged and components have cooled off.
- Avoid electrostatically charging the device, e.g. by rubbing it with dry cloths.

## **⚠** DANGER

# Explosion hazard in hazardous areas from electrostatic discharge or brush discharge

Life-threatening injuries or ignition of explosive atmospheres.

Avoid actions that could lead to electrostatic discharges. For example, do not wipe the coated surface of the transmitter using a piece of cloth.

## **⚠** DANGER

#### Improper wiring in hazardous areas

When connecting flow meters in hazardous areas, the applicable Explosion Proof Type Manual must be observed.

## **⚠** WARNING

#### Risk of injury due to electrical shock

- Only have skilled personnel to connect the flow meter.
- Do not perform wiring outdoors if it is raining.



## **⚠** WARNING

Wiring

#### Risk of injury due to electrical shock, as well as sparking and damage to the flow meter, if an inappropriate connecting cable is used

- It is imperative that an original connecting cable and original glands from Rota Yokogawa are used.
- Install cables tension-free.

## **MARNING**

#### Risk of sparking and damage to the flow meter due to incorrect wiring

► Observe connection diagram for the connecting cable according to chapter Connection terminals of connecting cable.

## **A** WARNING

# Risk of injury due to electrical shock, as well as damage to the flow meter due to insufficient clamping of the connecting wires

- Completely open connection terminal by using the operating tool.
- Insert connecting wires with wire end ferrules into the corresponding connection terminal up to the stop.
- Close connection terminal.

# **⚠** CAUTION

Don't install the connecting cable at ambient temperatures below -10 °C.

#### NOTICE

Wiring work must only be performed at max. 80 % humidity and temperatures up to 31 °C, linearly decreasing to 50 % relative humidity at 40 °C.

#### NOTICE

Although Rota Yokogawa considers the guidelines of EMC, please be aware that conducted and radiated electromagnetic emission may effect the EMC of adjacent areas.

#### NOTICE

Be aware that improper earthing, false wiring and use of cable out of specification may lead to instrument damage and/or disturbance of other sensitive electrical equipment due to increased electromagnetic emissions/immunity.

#### **NOTICE**

Be aware that wrong input voltage may lead to disturbance of other sensitive electrical equipment due to increased electromagnetic emissions.

- ► The applicable national standards must be considered for installation.
- Only sensors and transmitters with compatible model codes may be interconnected. If these instructions are not observed, flawless function of the flow meter cannot be guaranteed.



Sensor replacement Wiring

In case of cabling in pipes (Conduit), guide the pipe through the opening in the wiring and use watertight gaskets to avoid that water runs in. Install the installation pipe at an angle, as shown in the figure below. Install a drain valve in the bottom end of the vertical pipe and regularly open that valve.

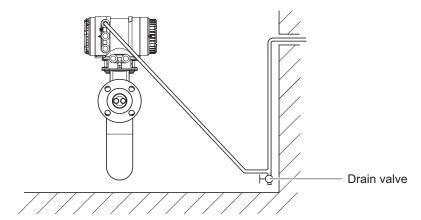


Fig. 10: Installation of the installation pipe

- Unused cable entries must be closed using blind plugs.
- Install cables hanging down to prevent water from flowing along the cable into the flow meter.
- ► The electrical connection between potential equalization system and grounding connection must be safe, see *Grounding connections* [ ≥ 22].
- Ensure that housing gaskets are positioned in the lining grooves and not damaged.

#### 6.4.2 Grounding connections



#### Risk of injury from electrical shock due to inadequate grounding

Perform potential equalization at the grounding terminals provided for this purpose according to the figure "Grounding connections on transmitter and sensor".

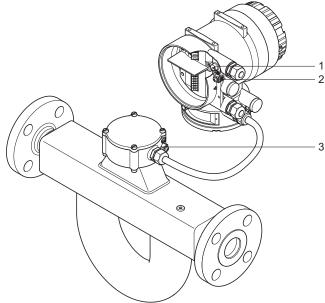


Fig. 11: Grounding connections on transmitter and sensor

- 1 Grounding screw in transmitter terminal box for grounding conductor
- 2 Grounding terminal on transmitter for potential equalization
- 3 Grounding terminal on sensor for potential equalization

#### 6.4.3 Connection of sensor and transmitter

With remote type flow meters, sensors and transmitters are connected by means of connecting cables.

## **A** CAUTION

#### Risk of damage to the flow meter due to incorrect sealing

In case of metric cable entry ensure appropriate IP rating and suitability of O-ring of used accessory (e.g. cable glands).

In case of NPT cable entry ensure appropriate sealing measures (e.g. use of sealing tape).

In order to obtain optimum measuring results and ensure compliance with the specification, it is imperative that an original connecting cable and original glands from Rota Yokogawa are used. In order to ensure the IP code, the cable must be professionally installed at the entries.

#### NOTICE

For integral flow meters the same connecting terminals are used and the connection is done with the help of the exisiting 8 wires.

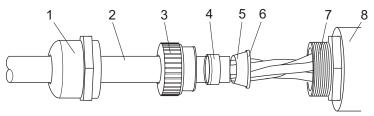


Fig. 12: Cable gland parts mounting

1	Cap nut	5	Outer cable shield
2	Connecting cable	6	Outer cone part
3	Plastic part	7	Mounting thread
4	Inner cone part	8	Housing cable entry

Sensor replacement Wiring

#### 6.4.3.1 Connection terminals

The delivery includes an operating tool for connecting the connecting cable to the connection terminals.

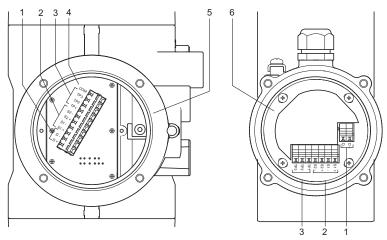


Fig. 13: Connection terminal circuits (transmitter on the left side, sensor on the right side)

- 1 Driver circuit (D+/D-)
- 2 Sensor circuits (S1+/S1-, S2+/S2-)
- Temperature measurement circuit (TP1, TP2, TP3)
- 4 Signal grounding
- 5 Transmitter
- 6 Sensor

Installation of standard connecting cable option L\_\_\_

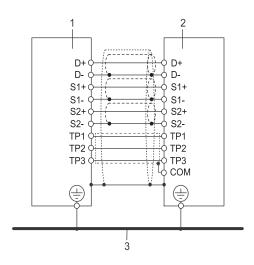


Fig. 14: Transmitter and sensor interconnection diagram

- 1 Sensor
- 2 Transmitter
- 3 Potential equalization system

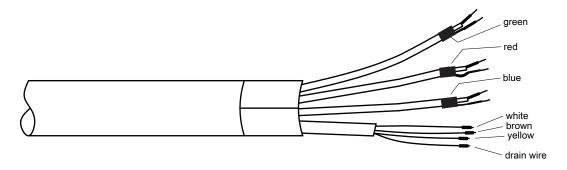


Fig. 15: Terminated standard connecting cable  $L_{\_\_\_}$ , transmitter side

Connection scheme of standard connecting cable option  $\mathsf{L}_{\_\_\_}$ 

Tab. 2: Version coaxial wire

Standard connecting cable option L			
Signal Coaxial wire			
	Coaxial wire pair colour	Wire type	Wire colour
D+	groon	Core wire	transparent
D-	green	Shield	black
S1+	red	Core wire	transparent
S1-	led	Shield	black
S2+	blue	Core wire	transparent
S2-	blue	Shield	black

Tab. 3: Version single wire

rab. 6. Volcion chigie who			
Standard connecting cable option L			
Signal	Single wire		
	Wire type	Wire colour	
TP1		white	
TP2	Conductor	brown	
TP3		yellow	
COM <sup>1)</sup>	Drain wire <sup>1)</sup>	_	

<sup>1)</sup> Present only at transmitter side

Sensor replacement Wiring

Installation of fire retardant connecting cable option Y\_\_\_

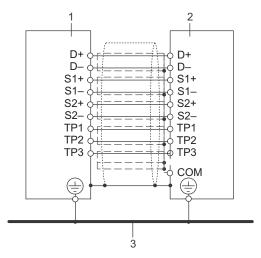


Fig. 16: Transmitter and sensor interconnection diagram

- 1 Sensor
- 2 Transmitter
- 3 Potential equalization system

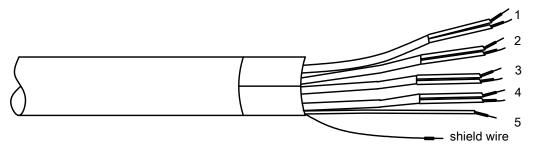


Fig. 17: Terminated fire retardant connecting cable Y\_\_\_, transmitter side

Connection scheme of fire retardant connecting cable option Y\_\_\_

Tab. 4: Version Y\_\_\_

Ycable				
Signal	Conductor pair number <sup>1)</sup>	Conductor colour		
D+	1	white		
D-	ı	blue		
S1+	2	white		
S1-	2	blue		
S2+	3	white		
S2-	3	blue		
TP1	4	white		
TP2	4	blue		
TP3	5	white		
COM <sup>2)</sup>	Shield wire <sup>2)</sup>	_		

<sup>1)</sup> Conductor pair number refers to the numbers printed on the single conductors

<sup>&</sup>lt;sup>2)</sup> Present only at transmitter side

#### 6.5 Commissioning

- 1. Activate external power switch.
- 2. Perform check of piping installation.
- 3. Check flow meter for device errors, warnings or alarms, see chapter on *Troubleshooting* [> 74]
- 4. Configure the transmitter, and perform autozero, see chapter on *System configuration and operation* [▶ 73].
- ⇒ Flow meter is ready for operation.



## 7 Transmitter replacement

#### 7.1 Dismantling of the defective transmitter

The defective Rotamass Total Insight transmitter has to be dismantled. The dismantling flow depends on the flow meter type (integral or remote).

The rules according to the Explosion Proof Type Manual IM 01U10X0 \_ -00 \_ \_ -R apply, especially the chapter "Operation, maintenance and repair".

#### 7.1.1 Connecting interfaces

#### **Transmitter**

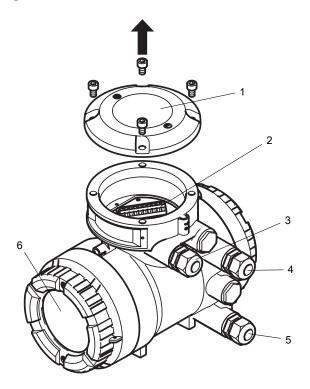


Fig. 18: Connecting interfaces on transmitter

- 1 Terminal box cover (remote type only)
- 2 Terminal box sensor connection
- 3 Sensor communication cable entry (remote type only)
- 4 Communication cable entry
- 5 Power supply cable entry
- 6 Display, if available

# Transmitter housing back cover

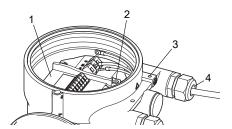


Fig. 19: Connecting interfaces on transmitter housing back cover

- 1 Terminal box power and I/O
- 2 Grounding screw for connecting grounding conductor
- 3 Power supply cable entry
- 4 Grounding terminal for external potential equalization

#### 7.1.2 Disconnect remote type transmitter



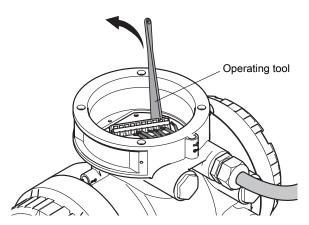
#### Life-threatening injuries from electric shock

- Switch off power supply and communication.
- Secure against inadvertent switch-on.

Disconnecting power, communication and grounding

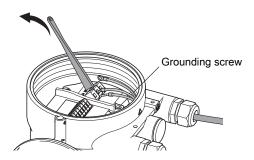
After power down and breaking all power cable connections from L/+ N/- and grounding for the power circuit (except potential equalization connection of external grounding terminal) the transmitter has to be disconnected by the following procedure:

- 1. Open the terminal box sensor connection.
- 2. Disconnect all cables with the operating tool.



- 3. Remove the cable gland and cable.
- 4. Remove locking screw of the "Terminal box power and I/O connection" and re-move the back cover.
- 5. Disconnect the communication and I/O cables (Avoid short circuit!).
- 6. Remove the cable gland and cable.

7. Disconnect the power cables from L/+ and N/- "power supply connection terminals".



- 8. Remove "Grounding screw for connecting grounding conductor".
- 9. Remove potential equalization from "Grounding terminal for potential equalization".

#### 7.1.3 Remove defective transmitter

After disconnection the transmitter has to be removed by unscrewing the four clamping bolts.

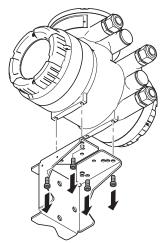


Fig. 20: Removal of defective transmitter from the mounting bracket

The mounting bracket (U-bracket) remains for the installation of the spare transmitter.

#### 7.1.4 Disconnect integral type transmitter



#### Life-threatening injuries from electric shock

- Switch off power supply and communication.
- Secure against inadvertent switch-on.

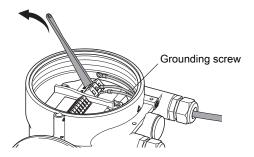
Disconnecting power, communication and grounding

After power down and breaking all power cable connections from L/+ N/- and grounding for the power circuit (except potential equalization connection of external grounding terminal) the transmitter has to be disconnected by the following procedure:

- 1. Remove locking screw of the "Terminal box power and I/O connection" and remove the back cover.
- 2. Disconnect the communication and I/O cables (avoid short circuit!).
- 3. Remove the cable gland and cable.

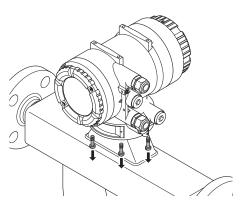


4. Disconnect the power cables from L/+ and N/- "Power supply connection terminals".

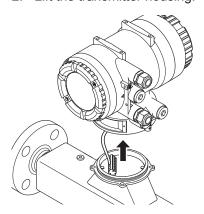


- 5. Remove "Grounding screw for connecting grounding conductor".
- 6. Remove potential equalization from "Grounding terminal for potential equalization" (if used).
- 1. After disconnection the transmitter is removed by unscrewing the four clamping bolts.

Remove defective transmitter and disconnect from sensor

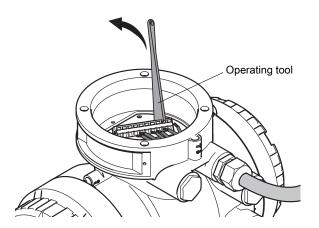


2. Lift the transmitter housing:



3. Turn the transmitter housing around for disconnection.

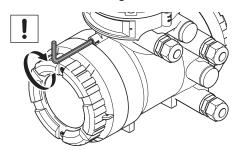
4. Disconnect all wires from the transmitter with the operating tool.



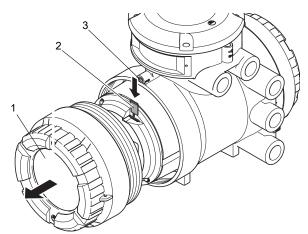
#### 7.1.5 Remove microSD card (transmitter with display only)

In case of defective transmitter with display the microSD card can be used to set up the Spare transmitter by following the procedure after removal of transmitter:

1. Remove locking screw of the front cover



2. Unscrew the front cover and remove the microSD card



- 1 Front cover
- 2 microSD card
- 3 Locking screw

#### 7.2 Installation of the Spare transmitter

#### 7.2.1 Unpacking

Note the following rules prior to installation:

- Check packaging and contents for damage.
- ▶ Do not remove protective materials such as protective stickers or caps on process connections until the start of the installation process.
- ▶ Dispose packaging materials in compliance with country-specific regulations.

#### 7.2.2 General installation instructions

## **MARNING**

#### Risk of injury during installation due to insufficiently trained personnel

Only have skilled personnel install the flow meter.

#### NOTICE

#### Risk of damage to the flow meter due to excessive mechanical stress

- The flow meter must not be used as a support for climbing (e.g. during installation work on the tube system). The flow meter must not be used to support external loads (e.g. as a support for pipes) or as a surface for depositing heavy tools (e.g. during installation work on the pipe system).
- ► The weight of the flow meter may generate additional mechanical forces on the piping that might lead to tensions at process connections. Design measures must be taken to prevent the above.

#### NOTICE

#### Risk of damage to the flow meter due to mechanical influences

▶ Protect the flow meter from vibration, shocks and mechanical strain.

#### NOTICE

Meet the environmental conditions of the respective General Specifications (see GS01U10B0\_\_-00\_\_-R) to prevent disturbance of other sensitive electrical equipment due to increased electromagnetic emissions.

For general installation instructions please refer to General Instruction Manual IM 01U10B\_\_-00\_\_-R.

#### 7.2.3 Transmitter installation

#### 7.2.3.1 Rotating and replacing the display

The transmitter display can be oriented in line with the flow meter installation position.

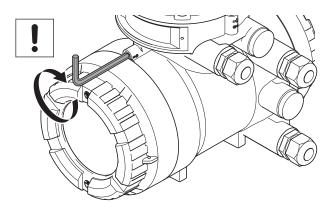
#### NOTICE

The following instruction must only be performed at the following ambient conditions:

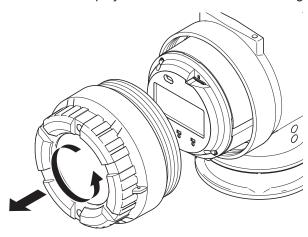
- at temperatures up to 31 °C: relative humidity maximum 80 %
- ► at temperatures between 31 °C and 40 °C: from 80 % linearly decreasing to 50 % of maximum relative humidity



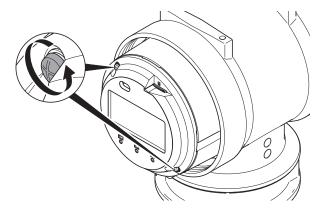
- 1. Switch off power supply.
- 2. Using an Allen wrench (size: 3.0), turn the locking screw on display screw plug clockwise to remove.



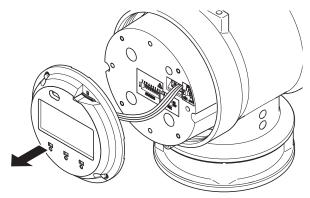
3. Unscrew display cover from transmitter housing.



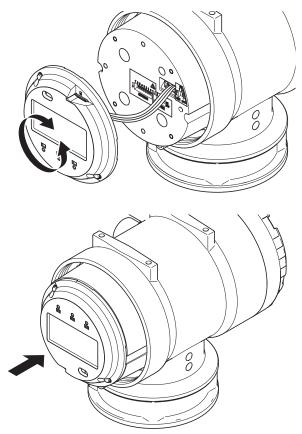
4. Remove the two screws from the display.



5. Remove the display from housing by pulling forward.



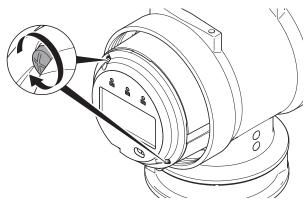
6. Rotate display and push back into housing in the orientation desired.



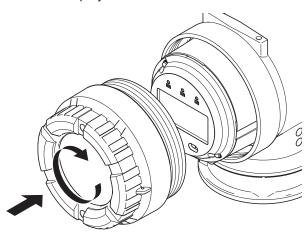
**NOTICE** 

The display can be removed and replaced by loosening the connector.

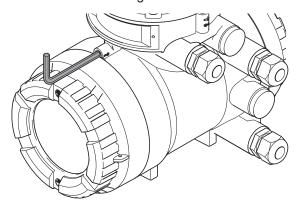
7. Tighten screws.



8. Screw display cover back onto transmitter housing.



9. Using an Allen wrench (size: 3.0), turn the locking screw on display screw plug counter-clockwise to tighten.



### 7.2.3.2 Rotating transmitter housing (integral type)

The transmitter housing can be installed in any one of four orientations.

### **MARNING**

### Short-circuit hazard caused by penetrating water

Failure of measuring electronics

In order to prevent any water from penetrating the flow meter by way of the cable, install the transmitter in a way so that the cable gland is not pointed upward.

### ⚠ WARNING

### Insufficient sensor grounding connection

Electric shock and ignition in hazardous areas

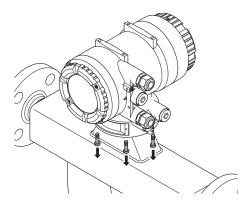
Use a minimum torque of 4.3 Nm when tightening the screws.

### NOTICE

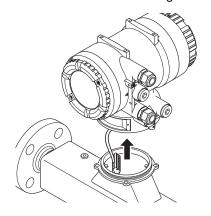
### Damage to flow meter

Rotating the transmitter housing several times in the same direction may damage the connection between sensor and transmitter.

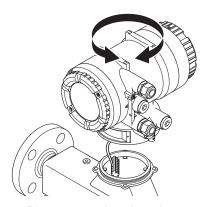
- ▶ Do not turn transmitter housing more than 270° in the same direction.
- 1. By using an Allen wrench, remove the four fixing screws.



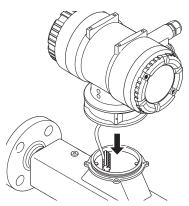
2. Lift transmitter housing.



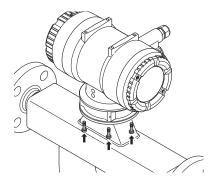
3. Rotate transmitter housing at angles of 90°, 180° or 270°.



4. Place transmitter housing.



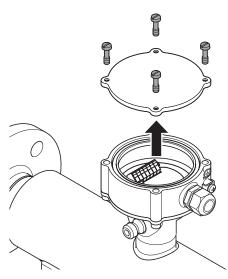
5. Tighten the four fixing screws.



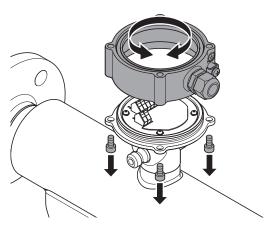
### 7.2.3.3 Rotating the terminal box (remote type)

The terminal box can be installed in any one of four orientations.

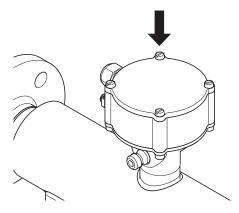
1. Loosen the four fixing screws and remove the cover.



- 2. Remove the cables so that none of the cables inside can accidentally become trapped and damaged.
- 3. By using an Allen wrench, remove the bottom fixing screws and rotate the terminal box at an angle of 90°, 180° or 270°.



- 4. Place the terminal box and tighten the bottom fixing screws using a minimum torque of 7.4 Nm.
- 5. Attach the cover and tighten the fixing screws using a minimum torque of 7.4 Nm.



### 7.2.3.4 Installing transmitter on pipe (remote type)

### **⚠** WARNING

### Risk of overheating the transmitter due to increased ambient temperature

Failure of measuring electronics

- ▶ Observe the maximum allowable ambient temperature for the transmitter.
- Install the transmitter at a sufficient distance from heat sources. Also note the temperature of the fixing pipe.

### **MARNING**

### Short-circuit hazard caused by penetrating water

Failure of measuring electronics

In order to prevent any water from penetrating the flow meter by way of the cable, install the transmitter in a way so that the cable gland is not pointed upward.

### **A** CAUTION

## Risk of injury and damage to the flow, meter if it is insufficiently attached to the pipe

- Observe the installation notes below.
- Tighten screws by using a minimum torque of 7.4 Nm.

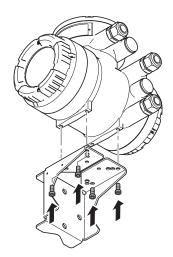
### NOTICE

### Installation at high vibration levels

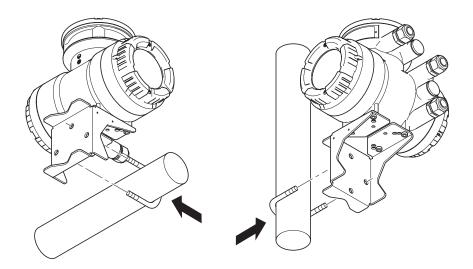
The mounting bracket for the pipe installation of the transmitter may not be suitable for installation environments with very high levels of vibration. In this case the user is advised to employ more rugged methods of fixation using the threaded bottom holes directly.

If it is a remote type transmitter, it can be mounted to a pipe size DN50 (2") using the angle bracket and retaining clip included in the delivery.

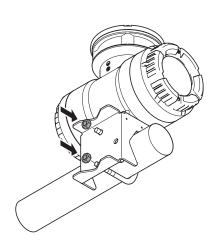
1. Screw angle bracket to bottom of transmitter.

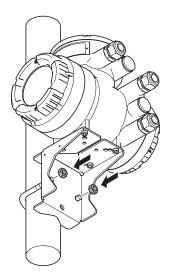


2. Place retaining clip around pipe and slide through drill holes on angle bracket.



3. Fasten retaining clip to bracket using the nuts.





### 7.3 Parameter setting

### 7.3.1 Relevant settings and parameter storage

## Relevant settings

The Rotamass Total Insight transmitter has four kinds of relevant parameters which must be adjusted to ensure a proper operation of the flowmeter:

- System relevant parameters a device can be identified in one of the three following ways:
  - device identifier (ID) fixed value by manufacturer
  - device (HART) tag
  - address (HART, Modbus, PROFIBUS PA)
- sensor related parameters (liquid or gas select, mass flow- or volume flow unit, temperature unit...)
- sensor specific parameters (SK20, KD, fl20)
- customer specific parameters (lowcut and URV)

Storage location of parameters

**System relevant parameters** are stored on the microSD card and product DVD of the Spare transmitter in the file "Factory.PAR".

**Sensor relevant parameters** and **sensor specific parameters** are available on the microSD card and product DVD of the defective transmitter in the file "Factory.PAR".

Delivered parameter setting

The default setting of sensor specific and sensor related parameters in the spare transmitter is based on Nano 06 sensor made of stainless steel for standard process fluid temperature range.

Model Code: RCUN06K - 50NNNN -0NN \_ - \_ \_ \_ \_ \_ / \_

### 7.3.2 Setting methods

Configuring the Spare transmitter with the sensor settings always needs a backup file of the defective transmitter.

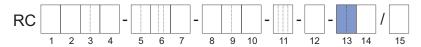
- If the microSD card from the defective transmitter is available, insert it into the Spare transmitter.
- If it is not available, copy the "Factory.PAR" file from the product DVD to the microSD card of the Spare transmitter and insert this one.

**①** 

The factory backup file of the defective transmitter is stored on the DVD in the directory "YOKOGAWA" attached to the defect Rotamass Total Insight at delivery time. Please make sure to use a differing file name in case of coping to  $\mu$ SD of the Spare transmitter

The method to set up the Spare transmitter properly depends on the following model code positions of the defective Rotamass Total Insight in comparison to the Spare Transmitter:

### **Inputs and Outputs**



1. Position 13: Communication type and I/O Configuration

EXAMPLE: JE = HART with I/O1 – 4 defined (defined acc. to GS)



### **Display**



### 1. Position 14: Display

Model code Position 14 – possible values	Mapping
0	Without display
1	With display

Only Essential transmitters can be delivered without a display (value E in MS code position 1). Transmitter without a display don't have a microSD card.

EXAMPLE: Defective transmitter MS-Code is "RCUS36S-25BD40-0D70-NN00-2-JB1/Z" and means for position 13 HART communication with I/O assignments for I/O 1 – 4 (JB) and with a display (1), position 14.

Setting method has to follow table 15.

Tab. 5: Method overview to set the spare transmitter in dependency of defective transmitter's model code

Defective transmitter	Setting method for sensor parameters			
model code:	Se	tup with backup file		
Pos. 13 values:	By display <sup>1)</sup>	By FieldMate		
J(HART_)	Possible	Recommended from Rev.3		
M_(Modbus)	Possible	Recommended		
G_(PROFIBUS PA)	Possible	Recommended		

<sup>&</sup>lt;sup>1)</sup> Before using the display the factory backup file of the DVD has to be copied to the microSD of the Spare Transmitter.

The "Recommended" setting method should be used.



Transmitter replacement

### 7.3.3 Set up process variable units

For Spare transmitter:

Set the Spare transmitter measurement units to the values from the file "Customer\_Settings YourDeviceSerialNumber.csv" found on the DVD of Spare transmitter.

For Spare sensor:

Set the existing transmitter measurement units to the values from the file "Customer\_Settings YourDeviceSerialNumber.csv" found on the DVD of Spare sensor.

EXAMPLE, see table below:

MASS_FLOW	MASS flow unit	R/W3	5	0:g/s 1:g/min 2:g/h 3:kg/s 4:kg/min 5:kg/h 6:kg/d 7:t/min 8:t/h 9:t/d 10:lb/s 11:lb/min 12:lb/h 13:lb/d 14:User unit
-----------	----------------	------	---	--

For this device, configured for mass flow measurement, all relevant parameters like Qnom, Qmax are saved in kg/h in the factory-backup file.

To change the mass flow unit over the display, please execute the following sequence:

- 1. Set user level "Specialist"
- 2. Go to menu item "[Easy setup wizard] ▶ [Std dev var] ▶ [Mass] ▶ [Unit]"
- 3. Choose unit corresponding to the saved value in the Customer\_Settings file, for example "[kg/h]"
- 4. Set chosen Unit "[kg/h]"
- 5. Check process unit of the exchange transmitter

This parameter is also available in additional menus. The values can be set in each of these menus:

- Basic setup
- Detailed setup

Execute this procedure for all other relevant process parameter units in your device corresponding described in the *IM 01U10S0\_-00\_\_-R*.



If the units for the measurement parameters aren't adjusted the measurement will be faulty and the transmitter may show configuration error.



Please note your user settings of the units down before you change it. After the pairing process you should set the units back to your origin settings!



### 7.3.4 Set up sensor relevant and sensor specific parameters

For Spare transmitter:

Set the Spare transmitter sensor parameters to the values from microSD card of the defective transmitter by display.

For Spare sensor:

Set the sensor parameters in the existing transmitter to the values from microSD card of the Spare sensor by display.

- 1. Set user level "Specialist"
- 2. Go to menu item "[Diag/Service] ▶ [Param bkup/restore] ▶ [Restore]"
- 3. Choose sub menu item "[Bkup name]". Put in the backup name of the defective transmitter user configuration file; for example "UsrPlant"
- 4. Go to menu item "[Diag/Service] ▶ [Param bkup/restore] ▶ [Restore]"
- 5. Execute "[Download sensor constant from microSD]"
- 6. Check all sensor relevant settings of the exchange transmitter

### 7.3.5 Set up customer specific parameters

The default setting for customer specific parameters is as follows:

Tab. 6: Assignment: default setting for customer specific parameters

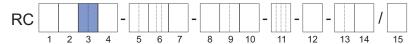
Parameter name:	Default Setting:		Parameter adjustment:
	Value	Unit	
[Mass flow lowcut]			
[Net mass flow 1 lowcut] 1)	0.0405	lear/la	Recommended
[Net mass flow 2 lowcut] 1)	0.0105	kg/h	if meter size is >06
[Mass flow URV]		kg/h	
[Net mass flow 1URV] 1)	24.000		_
[Net mass flow 2URV] 1)	21.000		Recommended if meter size is >06
[Volume flow URV]	21.000	L/h	ii meter size is 700
[Liquid gas select]	Liquid	None	Needed if sensor is a gas device
[Max permissible pressure]	10.000	Bar	Automated with restoration flow

<sup>1)</sup> Relevant only if options AC are available for the Spare transmitter



Depending on the model code of the defective transmitter these parameters should be adjusted:

### **Meter size**



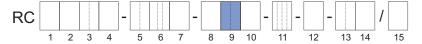
The following parameter values are recommended to set, if needed:

Tab. 7: Overview: setting values for parameters [... lowcut] and [... URV]

	Recommend RMTI parameter setting values:				
Parameter name:	[ lowcut]¹)		[ URV] <sup>1)</sup>		
Meter size:	Setting	value:	Setting	value:	
	Value	Unit	Value	Unit	
06	0.0105		21.0		
08	0.0225		45.0		
10	0.0850		170.0		
15	0.1850		370.0		
20	0.4750		950.0		
25	0.0800		1600.0		
34	1.5000		3000.0		
40	2.3500	lsa/b	4700.0	lea/b	
36	5.0000	kg/h	10000.0	kg/h	
50	10.0000		20000.0		
38	16.0000		32000.0		
80	25.5000		51000.0		
39	50.0000		100000.0		
1H	85.0000		170000.0		
1F	125.0000		250000.0		
2H	250.0000		500000.0		

<sup>1) &</sup>quot;..." Mass flow low cut and URV values compared to parameter values in table 7.

### Mass flow and density accuracy



The parameter [Liquid gas select] has to be set to "Gas" if the mass flow and density accuracy value is 50 or 70.



### 7.3.6 Set up system related parameters

It is necessary for usage in the plant that the system related parameters like TAGs and communication Address fit to the system settings. Therefore these settings have to be adapted in the Universal Spare Transmitter. The Address and TAGs for the exchange device should be the same as for the defective device in the plant.

# Adapt TAG and Address [HART] by display:

- 1. Set user level "Specialist"
- Go to menu item "[Detailed setup] ► [Dev info] ► [Order info] ► [Tag]"
- 3. Choose sub menu item "[Tag]". Put in TAG of the defective transmitter Choose sub menu item "[Long tag]". Put in Long TAG of the defective transmitter<sup>1)</sup>
- 4. Set "[Tag]" and "[Long tag]"
- 5. Go to menu item "[Detailed setup] ▶ [Dev info] ▶ [HART info] ▶ [Poll addr]"
- 6. Set "[Poll addr]"

<sup>1)</sup> The TAG and Long TAG are stored in the "Customer\_Setting\_...csv"-file attached to the DVD, microSD of the defective transmitter.



For hardware settings, please refer to the General Instruction Manual IM 01U10B00-00\_\_-R, chapter 9.4 Advanced settings.

### 7.4 Wiring

### 7.4.1 General wiring rules

Be sure to handle the transmitter cover carefully so that there are no damages and foreign matter adhesion at its thread and O-ring when it is opened or attached.

### **⚠** DANGER

### Life-threatening injuries from electric shock

- Switch off power supply.
- Secure power supply against inadvertent switch-on.
- Check that power supply is free of voltage.

### ⚠ DANGER

### Life-threatening injuries from ignition of explosive atmospheres

- Wait 20 minutes before opening the housing until the capacitors have discharged and components have cooled off.
- ► Avoid electrostatically charging the device, e.g. by rubbing it with dry cloths.

### **⚠** DANGER

## Explosion hazard in hazardous areas from electrostatic discharge or brush discharge

Life-threatening injuries or ignition of explosive atmospheres.

Avoid actions that could lead to electrostatic discharges. For example, do not wipe the coated surface of the transmitter using a piece of cloth.

### ⚠ DANGER

### Improper wiring in hazardous areas

When connecting flow meters in hazardous areas, the applicable Explosion Proof Type Manual must be observed.

### **⚠** WARNING

### Risk of injury due to electrical shock

- Only have skilled personnel to connect the flow meter.
- Do not perform wiring outdoors if it is raining.

Transmitter replacement

### **MARNING**

### Risk of injury due to electrical shock, as well as sparking and damage to the flow meter, if an inappropriate connecting cable is used

- ▶ It is imperative that an original connecting cable and original glands from Rota Yokogawa are used.
- Install cables tension-free.

### **M** WARNING

### Risk of sparking and damage to the flow meter due to incorrect wiring

Observe connection diagram for the connecting cable according to chapter Connection terminals of connecting cable.

### **⚠** WARNING

## Risk of injury due to electrical shock, as well as damage to the flow meter due to insufficient clamping of the connecting wires

- Completely open connection terminal by using the operating tool.
- Insert connecting wires with wire end ferrules into the corresponding connection terminal up to the stop.
- Close connection terminal.

## **A** CAUTION

Don't install the connecting cable at ambient temperatures below -10 °C.

### NOTICE

Wiring work must only be performed at max. 80 % humidity and temperatures up to 31 °C, linearly decreasing to 50 % relative humidity at 40 °C.

### NOTICE

Although Rota Yokogawa considers the guidelines of EMC, please be aware that conducted and radiated electromagnetic emission may effect the EMC of adjacent areas.

#### NOTICE

Be aware that improper earthing, false wiring and use of cable out of specification may lead to instrument damage and/or disturbance of other sensitive electrical equipment due to increased electromagnetic emissions/immunity.

#### **NOTICE**

Be aware that wrong input voltage may lead to disturbance of other sensitive electrical equipment due to increased electromagnetic emissions.

- ► The applicable national standards must be considered for installation.
- Only sensors and transmitters with compatible model codes may be interconnected. If these instructions are not observed, flawless function of the flow meter cannot be guaranteed.



In case of cabling in pipes (Conduit), guide the pipe through the opening in the wiring and use watertight gaskets to avoid that water runs in. Install the installation pipe at an angle, as shown in the figure below. Install a drain valve in the bottom end of the vertical pipe and regularly open that valve.

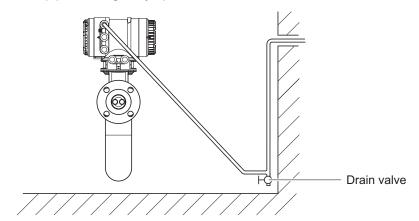


Fig. 21: Installation of the installation pipe

- Unused cable entries must be closed using blind plugs.
- Install cables hanging down to prevent water from flowing along the cable into the flow meter.
- ► The electrical connection between potential equalization system and grounding connection must be safe, see Grounding connections and sensor circuits.
- Ensure that housing gaskets are positioned in the lining grooves and not damaged.

### 7.4.2 Grounding connections



### Risk of injury from electrical shock due to inadequate grounding

▶ Perform potential equalization at the grounding terminals provided for this purpose according to the figure "Grounding connections on transmitter and sensor".

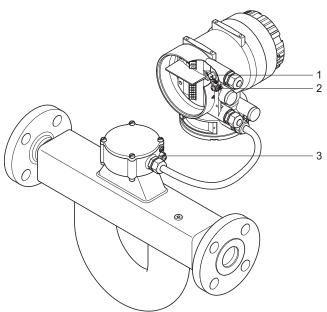


Fig. 22: Grounding connections on transmitter and sensor

- 1 Grounding screw in transmitter terminal box for grounding conductor
- 2 Grounding terminal on transmitter for potential equalization
- 3 Grounding terminal on sensor for potential equalization

### 7.4.3 Connection of sensor and transmitter

With remote type flow meters, sensors and transmitters are connected by means of connecting cables.

### **A** CAUTION

### Risk of damage to the flow meter due to incorrect sealing

In case of metric cable entry ensure appropriate IP rating and suitability of O-ring of used accessory (e.g. cable glands).

In case of NPT cable entry ensure appropriate sealing measures (e.g. use of sealing tape).

In order to obtain optimum measuring results and ensure compliance with the specification, it is imperative that an original connecting cable and original glands from Rota Yokogawa are used. In order to ensure the IP code, the cable must be professionally installed at the entries.

### NOTICE

For integral flow meters the same connecting terminals are used and the connection is done with the help of the exisiting 8 wires.

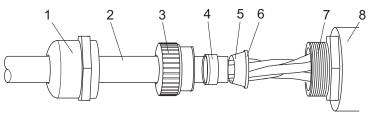


Fig. 23: Cable gland parts mounting

1	Cap nut	5	Outer cable shield
2	Connecting cable	6	Outer cone part
3	Plastic part	7	Mounting thread
4	Inner cone part	8	Housing cable entry

### 7.4.3.1 Connection terminals

The delivery includes an operating tool for connecting the connecting cable to the connection terminals.

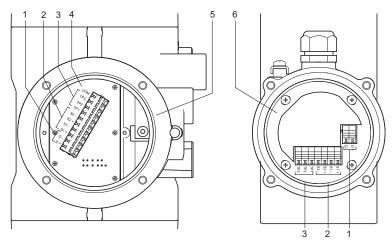


Fig. 24: Connection terminal circuits (transmitter on the left side, sensor on the right side)

- 1 Driver circuit (D+/D-)
- 2 Sensor circuits (S1+/S1-, S2+/S2-)
- Temperature measurement circuit (TP1, TP2, TP3)
- 4 Signal grounding
- 5 Transmitter
- 6 Sensor

Installation of standard connecting cable option L\_\_\_

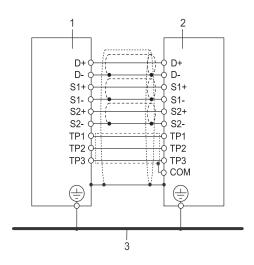


Fig. 25: Transmitter and sensor interconnection diagram

- 1 Sensor
- 2 Transmitter
- 3 Potential equalization system

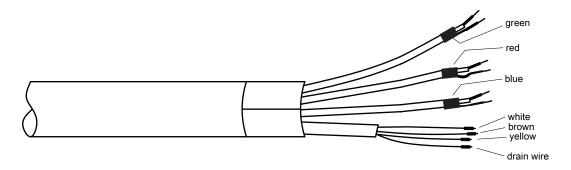


Fig. 26: Terminated standard connecting cable  $L_{\_\_\_}$ , transmitter side

Connection scheme of standard connecting cable option  $L_{\_\_}$ 

Tab. 8: Version coaxial wire

Standard connecting cable option L								
Signal		Coaxial wire						
	Coaxial wire pair colour	Coaxial wire pair colour Wire type Wire colour						
D+	aroon	Core wire	transparent					
D-	green	Shield	black					
S1+	red	Core wire	transparent					
S1-	red	Shield	black					
S2+	bluc	Core wire	transparent					
S2-	blue	Shield	black					

Tab. 9: Version single wire

7 GD. 0. V CI OIC	in onigic wite				
Standard connecting cable option L					
Signal	S	Single wire			
	Wire colour				
TP1		white			
TP2	Conductor	brown			
TP3		yellow			
COM <sup>1)</sup>	Drain wire <sup>1)</sup>	-			

<sup>1)</sup> Present only at transmitter side

Installation of fire retardant connecting cable option Y\_\_\_

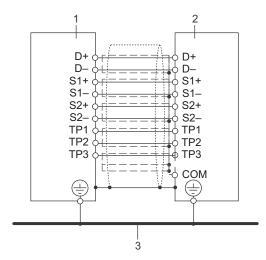


Fig. 27: Transmitter and sensor interconnection diagram

- 1 Sensor
- 2 Transmitter
- 3 Potential equalization system

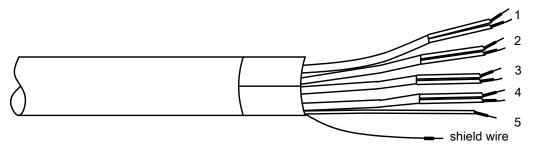


Fig. 28: Terminated fire retardant connecting cable Y\_\_\_, transmitter side

Connection scheme of fire retardant connecting cable option Y\_\_\_

Tab. 10: Version Y\_\_\_

Ycable					
Signal	Conductor pair number <sup>1)</sup>	Conductor colour			
D+	1	white			
D-	l	blue			
S1+	2	white			
S1-	2	blue			
S2+	3	white			
S2-	3	blue			
TP1	4	white			
TP2	4	blue			
TP3	5	white			
COM <sup>2)</sup>	Shield wire <sup>2)</sup>	_			

<sup>1)</sup> Conductor pair number refers to the numbers printed on the single conductors

<sup>&</sup>lt;sup>2)</sup> Present only at transmitter side

### 7.4.4 Transmitter

### 7.4.4.1 Connection terminals

### **MARNING**

### Risk of injury from electrical shock due to inadequate grounding

- ▶ Use grounding screw to connect the grounding conductor.
- Use an M4 ring-type or forked cable lug for the grounding conductor of the power supply cable.

### Terninal box for I/O

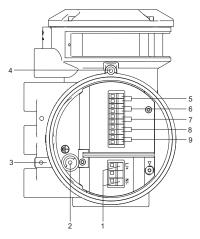


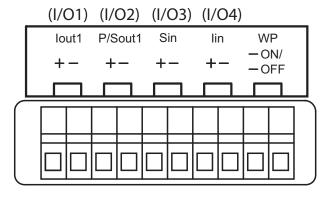
Fig. 29: Terminal for I/O outputs and power supply in transmitter

- 1 Power supply connection terminals
- 2 Grounding screw in terminal box
- 3 Grounding terminal
- 4 Locking screw
- 5 Connection terminals for I/O1 +/-
- 6 Connection terminals for I/O2 +/-
- 7 Connection terminals for I/O3 +/-
- 8 Connection terminals for I/O4 +/-
- 9 WP: Write-protection terminal

### 7.4.4.2 HART and Modbus connection terminals

Depending on the flow meter specification, there are different configurations of the connection terminal. Following are configuration examples of the connection terminal (value JK and M7 on model code position 13 - see Inputs and outputs for details):

**HART** 



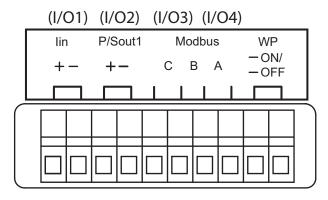
I/O1: Iout1 Current output (active/passive)I/O2: P/Sout1 Pulse or status output (passive)

I/O3: Sin Status input

I/O4: lin Current input (active/passive)

WP: Write-protect bridge

#### Modbus



I/O1: Iin Current input (passive)

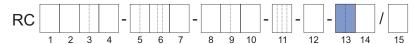
I/O2: P/Sout1 Pulse or status output (passive)

I/O3-I/O4: Modbus RS485 input/output WP: Write-protect bridge

### 7.4.4.3 Assignment of HART and Modbus

The table below shows possible connection terminal assignments for I/O outputs depending on model code position 13.

The following figure shows the relevant position of the model code:



Configuration of input/output terminals for HART communication

### HART I/O

Tab. 11: Connection terminal assignment for HART

Model code	Connection terminal assignment						
Position 13	I/O1 +/-	I/O2 +/-	I/O3 +/-	I/O4 +/-	WP		
JA	lout1	P/Sout1			Mrita protect		
JA	Active	Passive	_	_	Write-protect		
JB	lout1	P/Sout1	P/Sout2	lout2	Mrita protect		
JD	Active	Passive	Passive Active		Write-protect		
IC	lout1	P/Sout1	Cim	lout2	\\/rito protoct		
JC	Active	Passive	Sin	Active	Write-protect		
JD	lout1	P/Sout1	Sout	P/Sout2	Mrita protect		
JD	Active	Passive	Passive	Passive	Write-protect		
ır	lout1	P/Sout1	Sin	P/Sout2	Mrita protect		
JE	Active	Passive	SIII	Passive	Write-protect		
				P/Sout2			
JF	lout1	P/Sout1	Sin	Active	Write-protect		
01	Active	Passive	Oiii	Internal pull-	Wille-protect		
				up resistor			
JG	lout1	P/Sout1	Sin	P/Sout2	Write-protect		
	Active	Passive	Active		ville protect		
JH	lout1	P/Sout1	lout2	lin	Write-protect		
011	Active	Passive	Passive	Active	Wille protect		
JJ	lout1	P/Sout1	P/Sout2	lin	Write-protect		
	Active	Passive	Passive	Active	Willo protoct		
JK	lout1	P/Sout1	Sin	lin	Write-protect		
	Active	Passive	Olli	Active	Wille-protect		
JL	lout1	P/Sout1	lout2	lin	Write-protect		
<u> </u>	Active	Passive	Passive	Passive	Wille-protect		
JM	lout1	P/Sout1	P/Sout2	lin	Write-protect		
OIVI	Active	Passive	Passive	Passive	Wille-protect		
JN	lout1	P/Sout1	Sin	lin	Write-protect		
014	Active	Passive	OIII	Passive	Wille-protect		
JP	Iout1	P/Sout1	lout2	_	Write-protect		
UI	Passive	Passive	Passive		Willo-protect		
JQ	lout1	P/Sout1	lout2	P/Sout2	Write-protect		
JQ	Passive	Passive	Passive	Passive	vviite-protect		

Model code	Connection terminal assignment					
Position 13	I/O1 +/-	I/O2 +/-	I/O3 +/-	I/O4 +/-	WP	
JR	lout1 Passive	P/Sout1 Passive NAMUR	lout2 Passive	_	Write-protect	
JS	lout1 Passive	P/Sout1 Passive NAMUR	lout2 Passive	P/Sout2 Passive NAMUR	Write-protect	

lout1 Analog current output with HART communication

Iout2Analog current outputlinAnalog current inputP/Sout1Pulse or status outputP/Sout2Pulse or status output

Sin Status input Sout Status output

Configuration of input/output terminals for Modbus communication

### Modbus I/O

Tab. 12: Connection terminal assignment for Modbus

Model code		Connection terminal assignment						
position 13	I/O1 +/-	I/O2 +/-	I/O3 +	I/O3 -	I/O4 +	I/O4 -	WP	
MO	_	P/Sout1	_	Modbus	Modbus	Modbus	Write-	
		Passive		С	В	Α	protect	
M2	lin	P/Sout1	_	Modbus	Modbus	Modbus	Write-	
IVIZ	Active	Passive		С	В	Α	protect	
M3	P/Sout2	P/Sout1	- Mo	Modbus	Modbus	Modbus	Write-	
IVIO	Passive	Passive		С	В	Α	protect	
M4	P/Sout2	P/Sout1	_	Modbus	Modbus	Modbus	Write-	
101-7	Active	Passive		С	В	Α	protect	
	P/Sout2							
N 4.5	Active	P/Sout1		Modbus	Modbus	Modbus	Write-	
M5	Internal pull-up resistor	Passive	_	С	В	A	protect	
M6	lout1	P/Sout1	_	Modbus	Modbus	Modbus	Write-	
IVIO	Active	Passive	_	С	В	Α	protect	
M7	lin	P/Sout1	_	Modbus	Modbus	Modbus	Write-	
IVI7	Passive	Passive	_	С	В	Α	protect	

lout Analog current output, no HART

Iin Analog current input
P/Sout1 Pulse or status output
P/Sout2 Pulse or status output

#### 7.4.4.4 HART and Modbus communication

#### **HART** communication

## HART interface

For devices with HART communication, the HART interface, along with the analog signal, is available at the output *lout1*. A load resistance of 230 – 600  $\Omega$  at *lout1* is recommended.

How to connect to the communication tools is described in the applicable Software Instruction Manual (SW-IM) IM01U10S01-00....-R.

### Modbus communication

## Modbus interface

Modbus interface of Rotamass Total Insight is implemented in accordance with "MOD-BUS over serial line specification and implementation guide V1.02", for details of instrumentation see website of the Modbus organization (http://www.modbus.org/).

## Modbus connections

Tab. 13: Connection terminal assignment for Modbus

Terminal	Description
I/O3 -	Modbus C (Common)
I/O4 +	Modbus B (D1)
I/O4 -	Modbus A (D0)

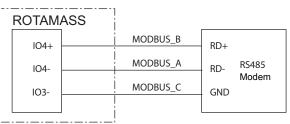


Fig. 30: MODBUS communication

## Modbus cable

3-Wire cable (twisted pair (D0, D1) and Common) with shield should be used. Wire gauge should be AWG24 or wider.

Rotamass Total Insight has a RS485 electrical interface, operating in slave mode and communicating with the following default specification:

### Default Modbus setting

Modbus baud rate: 19200 bpsModbus transfer mode: RTU

Modbus parity: EvenModbus stop bit: 1 stop bit

For further details, see applicable Software Instruction Manual (SW-IM) IM01U10S03-00\_\_-R.

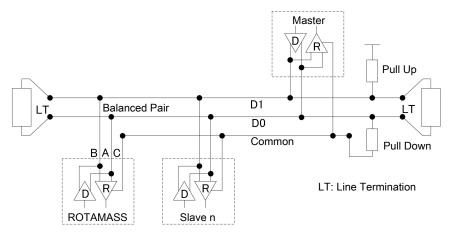


Fig. 31: Modbus connection

### Output signals

### **Galvanic** isolation

Active current output lout

All circuits for inputs, outputs and power supply are galvanically isolated from each other.

One or two current outputs are available depending on model code position 13.

Depending on the measured value, the active current output delivers 4 – 20 mA.

It may be used for output of the following measured values:

- Flow rate (mass, volume, net partial component flow of a mixture)
- Density
- Temperature
- Pressure
- Concentration

For HART communication devices, it is supplied on the current output *lout1*. The current output may be operated in compliance with the NAMUR NE43 standard.

	Value
Nominal output current	4 – 20 mA
Maximum output current range	2.4 – 21.6 mA
Load resistance	≤ 750 Ω
Load resistance for secure HART communication	230 – 600 Ω

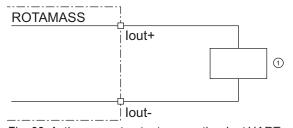


Fig. 32: Active current output connection lout HART

① Receiver

Transmitter replacement

Passive current output *lout* 

	Value
Nominal output current	4 – 20 mA
Maximum output current range	2.4 – 21.6 mA
External power supply	10.5 – 32 V <sub>DC</sub>
Load resistance for secure HART communication	230 – 600 Ω
Load resistance at current output	≤ 911 Ω

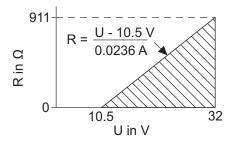


Fig. 33: Maximum load resistance as a function of an external power supply voltage

R Load resistance

U External power supply voltage

The diagram shows the maximum load resistance R as a function of voltage U of the connected voltage source. Higher load resistances are allowed with higher power supply values. The usable zone for passive power output operation is indicated by the hatched area.

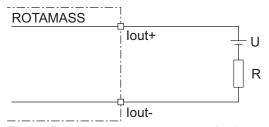


Fig. 34: Passive current output connection lout

## Active pulse output P/Sout

### Connection of an electronic counter

Maximum voltage and correct polarity must be observed for wiring.

	Value
Load resistance	> 1 kΩ
Internal power supply	24 V <sub>DC</sub> ±20 %
Maximum pulse rate	10000 pulses/s
Frequency range	0 – 12.5 kHz

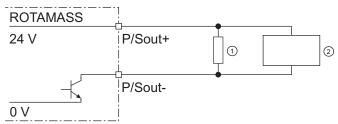


Fig. 35: Active pulse output connection P/Sout

- Load resistance
- ② Electronic counter

### Connection of an electromechanical counter

	Value
Maximum current	150 mA
Average current	≤ 30 mA
Internal power supply	24 V <sub>DC</sub> ±20 %
Maximum pulse rate	2 pulses/s
Pulse width	20, 33, 50, 100 ms

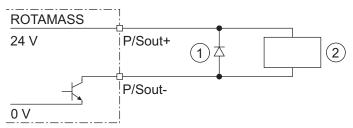


Fig. 36: Active pulse output P/Sout connection with electromechanical counter

- ① Protective diode
- ② Electromechanical counter

Active pulse output *P/Sout* with internal pull-up resistor

	Value
Internal power supply	24 V <sub>DC</sub> ±20 %
Internal pull-up resistor	2.2 kΩ
Maximum pulse rate	10000 pulses/s
Frequency range	0 – 12.5 kHz

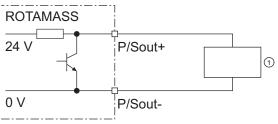


Fig. 37: Active pulse output P/Sout with internal pull-up resistor

### Electronic counter

## Passive pulse output

	Value
Maximum load current	≤ 200 mA
Power supply	≤ 30 V <sub>DC</sub>
Maximum pulse rate	10000 pulses/s
Frequency range	0 – 12.5 kHz

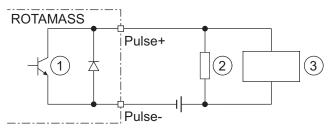


Fig. 38: Passive pulse output connection with electronic counter

- ① Passive pulse
- 2 Load resistance
- ③ Electronic counter

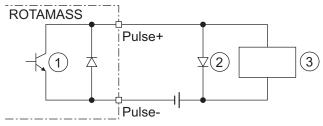


Fig. 39: Passive pulse output connection with electromechanical counter

- Passive pulse
- ② Protective diode
- ③ Electromechanical counter

Active status output P/Sout

Since this is a transistor contact, maximum allowed current as well as polarity and level of output voltage must be observed during wiring.

	Value
Load resistance	> 1 kΩ
Internal power supply	24 V <sub>DC</sub> ±20 %

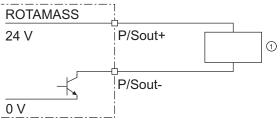


Fig. 40: Active status output connection P/Sout

### ① External device with load resistance

Active status output *P/Sout* with internal pull-up resistor

	Value
Internal pull-up resistor	2.2 kΩ
Internal power supply	24 V <sub>DC</sub> ±20 %

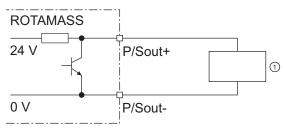


Fig. 41: Active status output P/Sout with internal pull-up resistor

### External device

Passive status output P/Sout or Sout

	Value
Output current	≤ 200 mA
Power supply	≤ 30 V <sub>DC</sub>

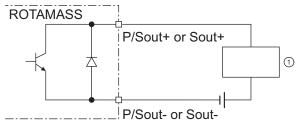


Fig. 42: Passive status output connection P/Sout or Sout

① External device

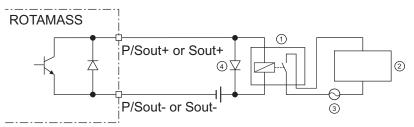


Fig. 43: Passive status output connection P/Sout or Sout for solenoid valve circuit

- ① Relay
- ② Solenoid valve
- 3 Magnetic valve power supply
- 4 Protective diode

A relay must be connected in series to switch alternating voltage.

Passive pulse or status output P/Sout (NAMUR) Output signals according to EN 60947-5-6 (previously NAMUR, worksheet NA001):

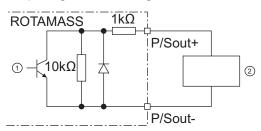


Fig. 44: Passive pulse or status output with switching amplifier connected in series

- Passive pulse or status output
- ② Switching amplifier

### Input signals

Active current input *lin* 

An individual analog power input is available for external analog devices.

The active current input lin is provided for connecting a two-wire transmitter with an output signal of 4-20 mA.

	Value
Nominal input current	4 – 20 mA
Maximum input current range	2.4 – 21.6 mA
Internal power supply	24 V <sub>DC</sub> ±20 %
Internal load resistance Rotamass	≤ 160 Ω

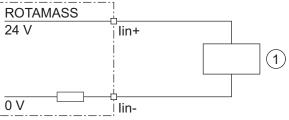


Fig. 45: Connection of external device with passive current output

External passive current output device

## Passive current input *lin*

The passive current input lin is provided for connecting a four-wire transmitter with an output signal of 4 - 20 mA.

	Value
Nominal input current	4 – 20 mA
Maximum input current range	2.4 – 21.6 mA
Maximum input voltage	≤ 32 V <sub>DC</sub>
Internal load resistance Rotamass	≤ 160 Ω

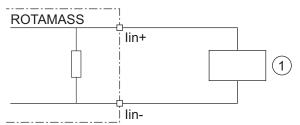


Fig. 46: Connection of external device with active current output

① External active current output device

### Status input Sin



Do not connect a signal source with electric voltage.

The status input is provided for use of voltage-free contacts with the following specification:

Switching status	Resistance
Closed	< 200 Ω
Open	> 100 kΩ

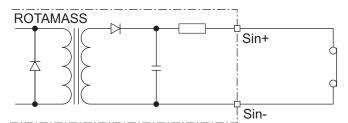
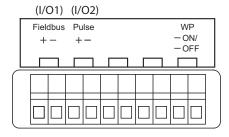


Fig. 47: Status input connection

#### 7.4.4.5 PROFIBUS PA connection terminals

For the PROFIBUS PA version there is only one configuration of the connection terminal. Following is the configuration of the connection terminal (value G0 and G1 on model code position 13, see Inputs and outputs for details):

#### **PROFIBUS PA**

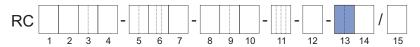


I/O1: Fieldbus PROFIBUS PA communicationI/O2: Pulse Pulse / Frequency outputWP: Write-protect bridge

### 7.4.4.6 Assignment of PROFIBUS PA

The table below shows possible connection terminal assignments for I/O outputs depending on model code Position 13.

The following figure shows the relevant position of the model code:



Tab. 14: Connection terminal assignment for PROFIBUS PA

Model code	Connection terminal assignment				
position 13	I/O1 +/-	I/O2 +/-	I/O3 +/-	I/O4 +/-	WP
G0	PROFIBUS PA	Pulse Passive	_	_	Write-protect
G1	PROFIBUS PA (IS)	Pulse Passive (IS)	_	_	Write-protect

PROFIBUS PA: PA communication
Pulse Passive: Pulse / Frequency output

Intrinsically safe (IS) outputs are only available in combination with selecting Ex approval of the device, see General Specifications (GS) GS01U10B\_\_-00\_\_-R, chapter Ex approval.

### 7.4.4.7 PROFIBUS PA communication

### Output signals PROFIBUS PA

Digital communication signal based on PROFIBUS PA protocol.

## PROFIBUS PA output signals

Maximum voltage and correct polarity must be observed for wiring.

	Value
Power supply	$9-32 V_{DC}$
Current draw	15 mA (maximum)

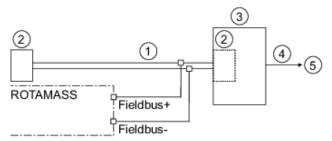


Fig. 48: PROFIBUS PA connection

- ① PROFIBUS PA
- ② Terminator
- ③ DP/PA-Coupler
- PROFIBUS DP
- ⑤ Host

## PROFIBUS PA cable

Tab. 15: PROFIBUS PA cable and transmissible length

Type of cable	Cable specifications	Max. length of cable (reference value)
Type A: Individually-shielded twisted pair cable	#18AWG (0.82 mm²)	1.900 m

Default PROFIBUS PA setting

Passive pulse output (only for calibration)

For further details, see applicable Software Instruction Manual (SW-IM) IM01U10S04-00....-R.

	Value
Maximum load current	≤ 200 mA
Power supply	≤ 30 V <sub>DC</sub>
Maximum pulse rate	10000 pulses/s
Frequency range	0 – 12.5 kHz

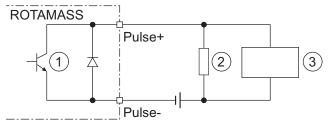


Fig. 49: Passive pulse output connection with electronic counter

- Passive pulse
- ② Load resistance
- ③ Electronic counter

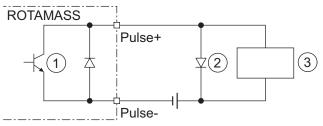


Fig. 50: Passive pulse output connection with electromechanical counter

- Passive pulse
- 2 Protective diode
- ③ Electromechanical counter

### PROFIBUS PA communication

## PROFIBUS PA interface

PROFIBUS PA interface of Rotamass Total Insight is based on PROFIBUS PA protocol (Profile Revision R3.02 Compliant) and standard IEC61158, for details of instrumentation see website of the PROFIBUS/PROFINET organization (<a href="https://www.profibus.com/">https://www.profibus.com/</a>).

### 7.4.4.8 Power supply

## Power supply

Alternating-current voltage (rms):

- Power supply<sup>1)</sup>: 24  $V_{AC}$  +20 % -15 % or 100 240  $V_{AC}$  +10 % -20 %
- Power frequency: 47 63 Hz

Direct-current voltage:

- $\bullet$  Power supply  $^{1)}$ : 24  $V_{DC}$  +20 % -15 % or 100 120  $V_{DC}$  +8,3 % -10 %
- $^{1)}$  for option MC\_ (DNV GL approval) supply voltage is limited to 24 V; in addition NE21 testing indicates a tolerable area of 24 V $_{\rm DC}$  ±20 % under NE21 test conditions.

## Power consumption

P ≤ 10 W (including sensor)

Power supply failure

In the event of a power failure, the flow meter data are backed up on a non-volatile internal memory. In case of devices with display, the characteristic sensor values, such as nominal diameter, serial number, calibration constants, zero point, etc. and the error history are also stored on a microSD card.

### 7.4.4.9 Connecting power supply and external devices

### **MARNING**

### Risk of sparking and damage to the flow meter due to incorrect sealing

- ▶ In case of metric cable entry ensure appropriate IP rating and suitability of O-ring of used accessory (e.g. cable glands).
- ► In case of NPT cable entry ensure appropriate sealing measures (e.g. use of sealing tape).

#### NOTICE

### Risk of damage to the flow meter due to incorrect power supply

- The specified power supply must be observed (see General Specifications).
- ► The power-supply cable must be designed for the power supply used with a minimum diameter of 0.5 mm.

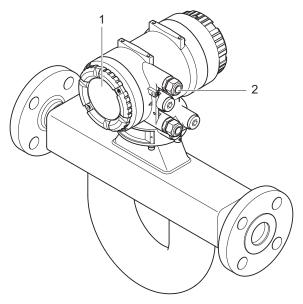


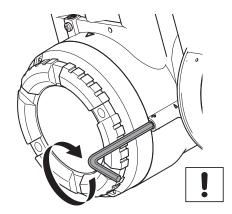
Fig. 51: Connecting of power supply and external devices

- 1 Transmitter back cover
- 2 Power supply cable gland

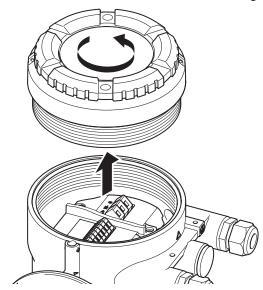
### **MARNING**

### Risk of injury due to electrical shock

- ► The transmitter must be assigned an external, fixed-mount power switch or automatic circuit breaker in order to disconnect the transmitter from the power grid (compliant with IEC60947-1 and IEC60947-3). Power switch or automatic circuit breaker must disconnect all lines under current, but cannot disconnect the grounding conductor under any circumstances.
- ► The power switch of automatic circuit breaker must be installed near the transmitter and easily accessible. The "OFF" switch position must be clearly recognizable.
- 1. Switch off power supply.
- 2. Using an Allen wrench (Size: 3.0), tighten the locking screw on the back cover in clockwise direction.



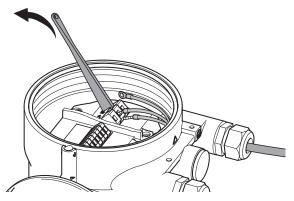
3. Unscrew back cover from transmitter housing in counter-clockwise direction.



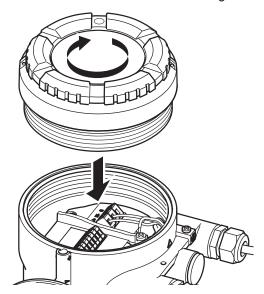
- 4. Attach cable glands.
- 5. Connect wires to connection terminals.

**NOTICE** 

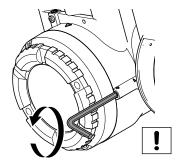
Connect the grounding conductor to the grounding screw (see chapter Connection terminals, figure 30, point 2).



- 6. Fit grounding conductor with a terminal lug and affix to grounding conductor.
- 7. Screw cable gland on tightly.
- 8. Screw back cover onto transmitter housing in clockwise direction.



9. Using an Allen wrench (Size: 3.0), loosen the locking screw in counter-clockwise direction.



### 7.4.5 Wiring check list

The following checks must be performed once the flow meter is connected electrically:

### **MARNING**

### Risk of injury from electrical shock due to insufficiently closed housing

▶ Before switching on the power supply, check that the housing covers of the transmitter have been properly installed.

### **⚠** WARNING

## Risk of sparking and damage to the flow meter due to missing locking screw

After wiring work, check that the housing cover has been installed and the locking screws have been tightened.

### **NOTICE**

### Risk of damage to the flow meter due to insufficiently secured cable inlets

- Install cables tension-free.
- Fit any unused cable entries with blind plugs.
- Completely install cable glands and screw together tightly.

### NOTICE

Be aware that improper treatment of cable entry and/or cable terminal may lead to disturbance of other sensitive electrical equipment due to increased electromagnetic emissions.

Check	Performed?
Are cables intact?	
Are power-supply and signal cables connected correctly?	
Do the cables have a lower point where liquid can drip immediately before they enter the cable glands?	
Are the cables installed tension-free?	
Is the power supply within the range specified on the nameplate?	
Are any unused cable entries fitted with blind plug?	
Are cable glands installed completely, tightly secured and watertight?	
Are housing covers installed and locking screws tightened?	

### 7.5 Commissioning

- 1. Activate external power switch.
- 2. Perform check of piping installation.
- 3. Check flow meter for device errors, warnings or alarms, see chapter *Troubleshooting* [▶ 74].
- 4. Configure the transmitter, and perform autozero, see chapter System configuration and operation [▶ 73].
- ⇒ Flow meter is ready for operation.

### 8 System configuration and operation

### 8.1 Default settings

### 8.1.1 Setting zero point

In order to avoid systematic flow rate measurement deviations, performance of a zero point adjustment is recommended before starting measuring operations. For two- or multiphase fluids, the factory-set zero point value is preferable to a manual zero point adjustment

- 1. Flush flow meter with fluid and check valves for tightness.
- 2. Close valves in front of and after the flow meter and stop the flow.
- 3. Wait until density, temperature and pressure are stabilized.
- 4. In case of fluids, compare the density displayed on the Rotamass Total Insight with the fluid density in order to rule out gas accumulations in the measuring tube.
- 5. In applications with increased process pressure, ensure that the process pressure and its unit of measurement are set correctly.
- 6. Perform autozero.

### 8.1.2 Performing autozero



To ensure ideal measuring results, performance of a second autozero process is recommended after several days of operation and stabilization of the installation conditions.

- 1. Press [SET] switch for 2 seconds to enter [Operation level].
- 2. Press [▼] switch until the [Maintenance] menu is selected.
- 3. Press [SET] switch to enter [Device setup].
- 4. Press [▼] switch until the [Diag/Service] menu is selected.
- 5. Press [SET] switch to enter [Diag/Service].
- 6. Press [▼] switch until the [AZ] menu is selected.
- 7. Press [SET] switch to enter [AZ].
  - ⇒ Menu [Exe] is preselected.
- 8. Press [SET] switch to enter [Exe].
  - ⇒ Parameter [Not exe] appears.
- 9. Press [▼] switch until [Exe] is selected.
- 10. Press [SET] switch.
  - ⇒ Parameter [Exe] flashes.
- 11. Press [SET] switch to start autozero.
  - ⇒ Progress bar appears to indicate status of autozero, after completion display switches to next higher menu level.



### 9 Troubleshooting

All error messages and error codes that may appear in operation are described in the Software Instruction Manual. Possible malfunctions that may occur during commissioning are explained in the General Instruction Manual IM 01U10B\_\_-00\_\_-R. If you cannot remedy the malfunction using these explanations, contact the Yokogawa service center.





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