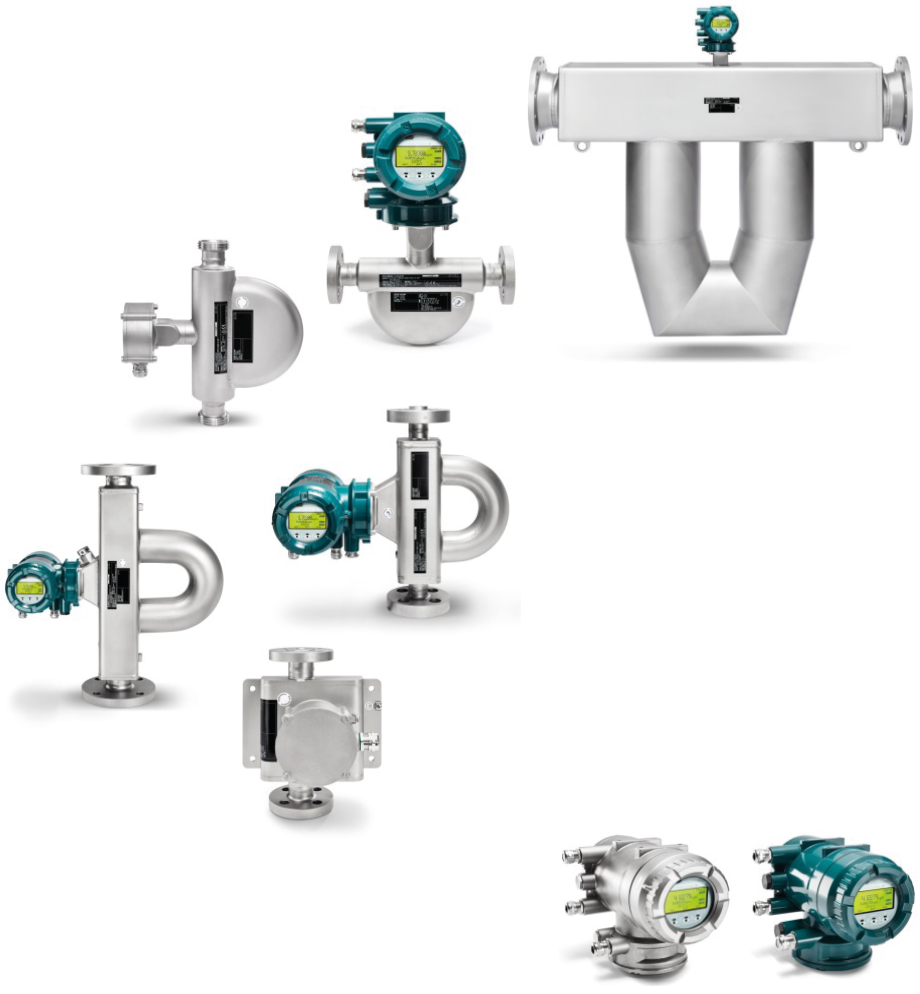
User's Manual

ROTA*MASS* Total Insight

Coriolis Mass Flow and Density Meter

Quick Reference Instruction Manual

IM01U10A00-00EN-R



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1 Introduction

This manual provides printed instruction excerpts for first unpacking, storage, installation, wiring and system configuration and operation. For details refer to chap. 1.3 Applicable documents.

1.1 Scope of application

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

- Rotamass Nano
- Rotamass Supreme
- Rotamass Giga
- Rotamass Prime
- Rotamass Intense
- Rotamass Hygienic

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 complete the following steps:

- Installation
- Configuration (parametrization)
- Integration of the flow meter into a process control system
- Dismantling and disposal

1.3 Applicable documents

The following documents supplement this specification:

Document title	Document number
General Specifications:	
▪ Specification Overview	▪ GS 01U10B00-00␣␣-R[1)]
▪ Nano	▪ GS 01U10B01-00␣␣-R[1)]
▪ Supreme	▪ GS 01U10B02-00␣␣-R[1)]
▪ Giga	▪ GS 01U10B03-00␣␣-R[1)]
▪ Prime	▪ GS 01U10B04-00␣␣-R[1)]
▪ Intense	▪ GS 01U10B05-00␣␣-R[1)]
▪ Hygienic	▪ GS 01U10B06-00␣␣-R[1)]
▪ Spare Transmitter	▪ GS 01U10B21-00␣␣-R[1)]
Instruction Manuals:	
▪ General Instruction Manual	▪ IM 01U10B00-00␣␣-R[1)]
▪ Quick Reference Instruction Manual for Spare	▪ IM 01U10A01-00␣␣-R[1)]
Explosion proof type Manuals:	
▪ Explosion Proof Type Manual ATEX	▪ IM 01U10X01-00␣␣-R[1)]
▪ Explosion Proof Type Manual IECEx	▪ IM 01U10X02-00␣␣-R[1)]
▪ Explosion Proof Type Manual FM	▪ IM 01U10X03-00␣␣-R[1)]
▪ Explosion Proof Type Manual INMETRO	▪ IM 01U10X04-00␣␣-R[1)]
▪ Explosion Proof Type Manual PESO	▪ IM 01U10X05-00␣␣-R[1)]
▪ Explosion Proof Type Manual NEPSI	▪ IM 01U10X06-00␣␣-R[1)]
▪ Explosion Proof Type Manual Korea-Ex	▪ IM 01U10X07-00␣␣-R[1)]
▪ Explosion Proof Type Manual EAC-Ex	▪ IM 01U10X08-00␣␣-R[1)]
▪ Explosion Proof Type Manual Japan Ex	▪ IM 01U10X09-00␣␣-R[1)]
▪ Explosion Proof Type Manual UKEx	▪ IM 01U10X11-00␣␣-R[1)]
▪ Addendum to Explosion Proof Type Manual for Low Temperature	▪ IM 01U10X10-00␣␣-R[1)]
Software Instruction Manuals:	
▪ Software Instruction Manual HART	▪ IM 01U10S01-00␣␣-R[1)]
▪ Software Instruction Manual FOUNDATION Fieldbus	▪ IM 01U10S02-00␣␣-R[1)]
▪ Software Instruction Manual Modbus	▪ IM 01U10S03-00␣␣-R[1)]
▪ Software Instruction Manual PROFIBUS PA	▪ IM 01U10S04-00␣␣-R[1)]
Certificates:	
▪ Dry Verification procedure	▪ MP208-008-2019

[1)] The "␣" symbols are placeholder for the corresponding language version of the document (EN, DE, etc.).

The complete product documentation is stored on the microSD card delivered with the device and is available at:

• Yokogawa Customer Portal (http://myportal.yokogawa.com/s/documents)

• Yokogawa Device Lifecycle Management app

Please enter the serial number of the device or scan the QR code on the device.

1.4 Contact information

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

Additional information available at http://www.yokogawa.com or on the last page of this document.

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
	Indicates a hazard, documentations must be consulted.
	Indicates important information.
IM01U10S01-00␣␣-R	The ␣␣ symbols in the document numbers are placeholders, here, for example, for the corresponding language version (DE, EN, etc.).

Symbols on the nameplates	Meaning
	Warning that requires reading the documentation
	RCM marking
	CE marking
	ATEX explosion protection marking
	EAC and EAC Ex marking
	Korean (KC and KCs) marking
	FM/CSA marking
	NEPSI marking
	INMETRO marking
	DNV type approval marking
	3-A Sanitary approval marking
	China RoHS marking

Symbols on the nameplates	Meaning
	Taiwan Safety (TS) marking
	Russia Pattern approval marking
	Belarus Pattern approval marking
	UKCA marking

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.

⚠ WARNING

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.

⚠ WARNING

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 Software Instruction Manuals IM01U10S␣␣-00␣␣-R).
- 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 GS01U10B␣␣-00␣␣-R, chapter "8.1 Model code description").
- 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.

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

	Integral type	Remote type	Spare sensor	Spare trans-mitter
Sensor	1 unit	1 unit	1 unit	–
Transmitter		1 unit	–	1 unit
Connecting cable	–	Length acc. to model code	–	–
Operating tool for terminals	2 units	2 units	2 units	2 units
2-inch pipe mounting bracket set ▪ Sheet metal console (bracket) ▪ Mounting bracket (U-bracket) ▪ Fixing materials (2 nuts, 2 washers, 4 Allen screws)	-	1 set	–	1 set
Pipe installation set for sensor (with device option PD) ▪ Sheet metal console (bracket) ▪ Mounting bracket (U-bracket) ▪ Fixing plate ▪ Fixing materials (14 nuts, 6 washers, 4 bolts, 8 notched washers, 4 rubber buffers)	–	1 set	1 set	–
Cable glands are included for a device with metric cable entries and without Ex approval. Please note: ▪ No cable glands are included for a device with cable entries other than metric. ▪ For a device with Ex approval the inclusion of cable glands may vary. Please refer to the applicable Explosion Proof Type Manual.	2 units	2 units	–	2 units
Blind plugs to close cables entries when not used (only non-Ex devices). For a device with Ex approval the please refer to the applicable Explosion Proof Type Manual.	1 unit	1 unit	1 unit	1 unit
Cable glands for connecting cable between sensor and transmitter, metal (pre-installed)	–	2 units	–	–
Termination kit for shortening the connecting cable (not with option L000 or Y000), including instruction booklet.)	–	1 set	–	–
Document folder with this content: ▪ microSD card (includes the complete product documentation) ▪ Quick Reference Instruction Manual ▪ Safety Regulations Manual ▪ Further documents like certificates (depending on model code)	1 folder	1 folder	1 folder	1 folder

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.

⚠ WARNING

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).

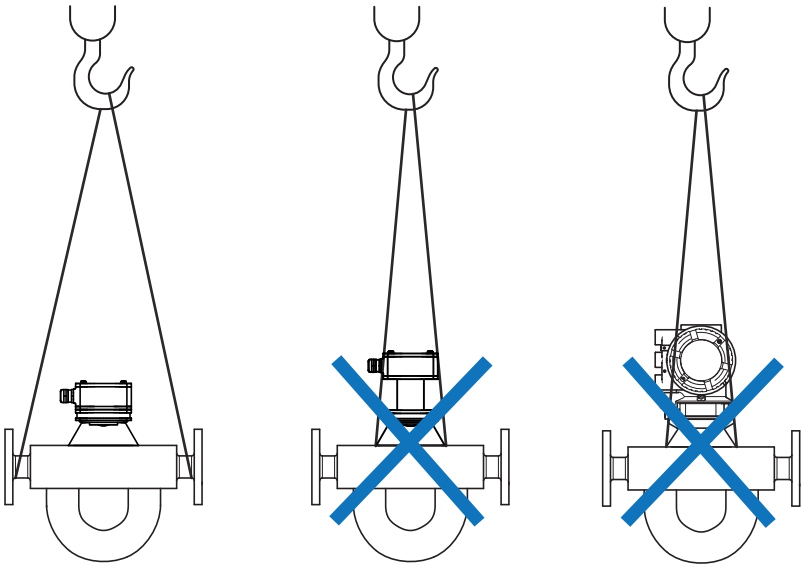


Fig. 1: Attachment of the transport ropes to the sensor independent of the design (impermissible attachment types are crossed out)

NOTICE

In case of integral design sensor might turn in the slopes. This is possible for the following sensor sizes specified in the table below.

Sensor	Sensor size
Supreme / Intense	≤ 38
Prime / Hygienic	≤ 40

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, see *IM General [Chap. 13 Operating Conditions]*.
- 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 heat tracing connections (if applicable), and thoroughly clean the flow meter, see *IM General [Chap. 12 Dismantling and disposal]*.

6 Installation

6.1 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 Installation instructions

⚠ WARNING

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.

6.2.1 Installation dimensions

Dimensions and installation lengths of sensor and transmitter are listed in the General Specifications of the corresponding Rotamass Total Insight family in the chapter *Mechanical specification*.

6.2.2 Installation site

In order to ensure stability while operating the flow meter, the following rules regarding placement must be followed:

⚠ CAUTION

Risk of injury during installation, if space for free movement is insufficient

- Select an installation site that offers enough space for installation, electrical installation, maintenance, etc.

NOTICE

Risk of damage to the flow meter due to extreme environmental conditions

- Do not install flow meter in locations subject to severe temperature fluctuations.
- Do not install flow meter in locations subject to direct insolation or install additional sun protection to avoid exceeding maximum allowed transmitter temperature.

- Avoid installation sites susceptible to cavitation, such as immediately behind a control valve.
- Install flow meter far removed from motors, transformers or other transmitters.
- Avoid installation directly behind rotary and gear pumps to prevent fluctuations in pressure from interfering with the resonance frequency of the Rotamass measuring tubes.
- If the plan calls for installing two sensors of the same kind back-to-back, use a customized design. Contact the responsible Yokogawa sales organization.
- Operate the flow meter below an elevation of 2000 m above sea level.
- If possible, avoid installing the flow meter at the end of a downpipe.
- When installing in a hazardous area, the separate Explosion Proof Type Manual must be considered.
- Install flow meter away from magnetic compasses as it contains no precaution to prevent it from causing compass deviations.
- Density indication of the Coriolis flow meter depends on installation orientation and has to be corrected. For vertical and horizontal orientation (maximum deviation ± 5°) of the sensor this can be done by the transmitter automatically if the appropriate sensor orientation is selected. For other orientations (inclinations to vertical or horizontal orientation ≥ 5°) this can not be automatically corrected and has to be taken into account. For highest density accuracy it is recommended to avoid sensor orientations different to horizontal or vertical installation.

6.2.3 Instructions

Observe the following general installation instructions during installation:

- Install the flow meter avoiding shock and vibration as much as possible.
- Use closing valves and bypass line to facilitate zero point setting.

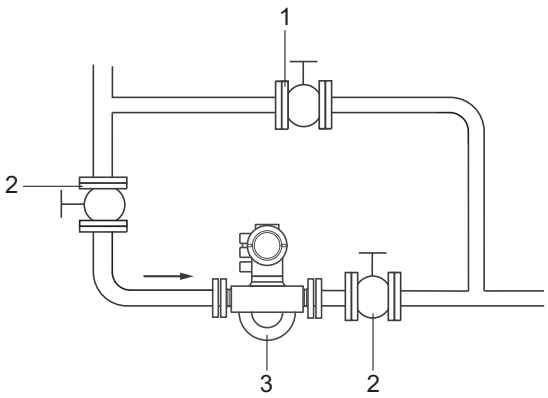


Fig. 2: Closing valves and bypass line

1 Bypass valve
2 Closing valve
3 Coriolis flow meter

- For application involving fluids, avoid installation at highest point of piping. Formation of gas bubbles and accumulation of gas in measuring tube may result in increased measurement uncertainties.
- In case of gas measurements, avoid installation directly in front of lowest point in piping. Accumulation of fluids, such as condensate, may result in lower accuracy.
- Do not install immediately in front of a free pipe outlet in a downpipe.
- Avoid letting the sensor run idle while taking the measurement, e.g. when installed in front of an air gap to containers in case of filling applications. Doing so may result in incorrect measurements. To avoid this, install a restriction in the open downpipe or use an orifice gauge with a diameter smaller than the nominal pipe width.
- Each device is tested for pressure prior to delivery.

6.2.4 Installation position

Rotamass Total Insight Coriolis mass flow and density meters can be mounted horizontally, vertically and at an incline. The measuring tubes should be completely filled with the fluid during this process as accumulations of air or formation of gas bubbles in the measuring tube may result in errors in measurement. Straight pipe runs at inlet or outlet are not required.

Sideways position

The sideways position must be avoided when installing the flow meter, because this may result in a deterioration of accuracy.

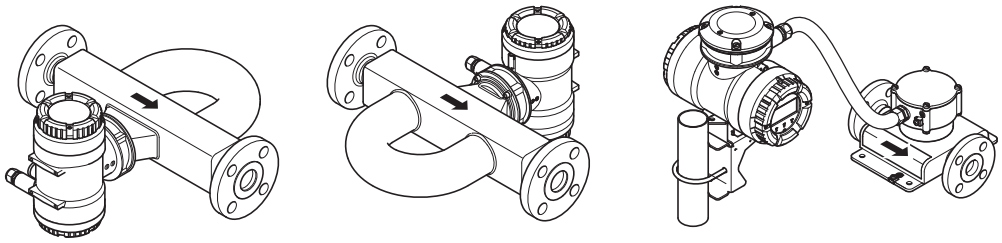


Fig. 3: Installation positions to be avoided: Flow meter in sideways position

Horizontal installation

- In case of fluids, install the measuring tubes downward so as to avoid gas accumulation in case of a low flow rate.
- For gas applications, install the measuring tubes upward so as to avoid fluid accumulation in case of a low flow rate.

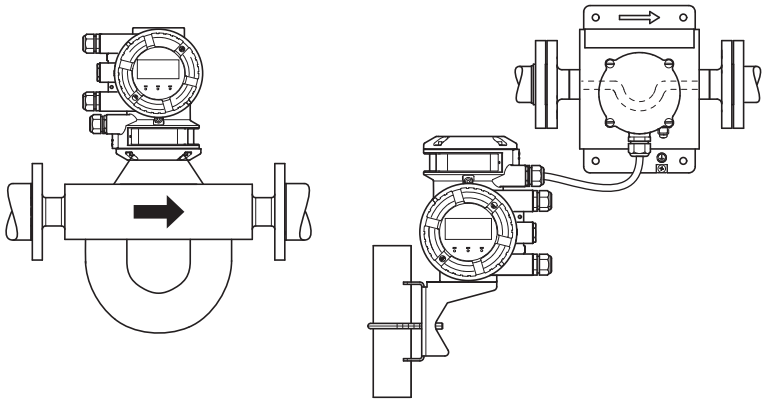


Fig. 4: Horizontal installation, measuring tubes downward

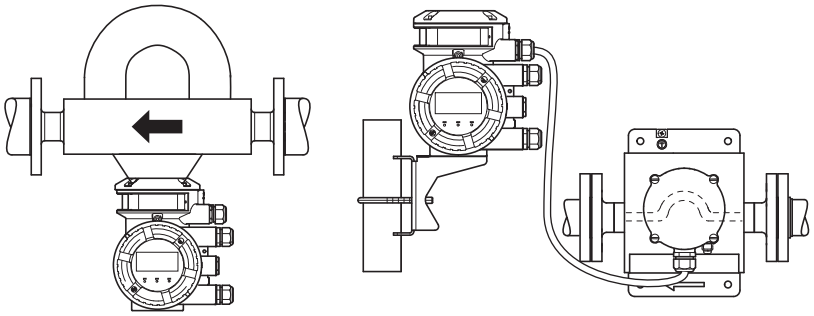


Fig. 5: Horizontal installation, measuring tubes upward

Vertical installation (recommended)

- Draining the pipe is easier in case of maintenance, production start or product change.
- It is also recommended for sanitary installation.
- Allows gas bubbles to escape more easily.
- Only one shut-off valve required to ensure zero flow rate when running autozero.

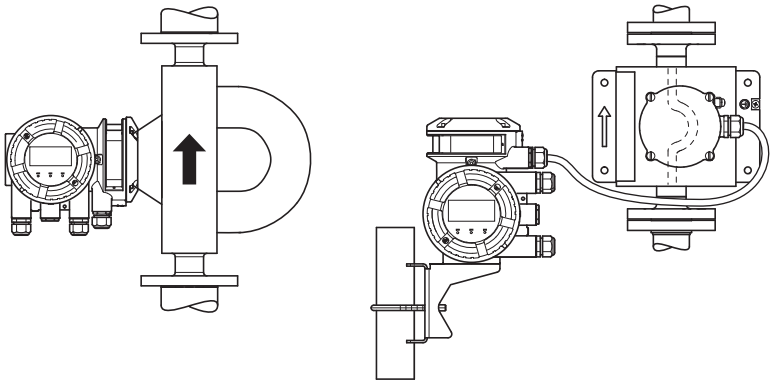


Fig. 6: Vertical Installation

6.3 Sensor installation

6.3.1 General installation rules

⚠ DANGER **Risk of injury due to escaping fluids, if pipe connection is faulty**

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

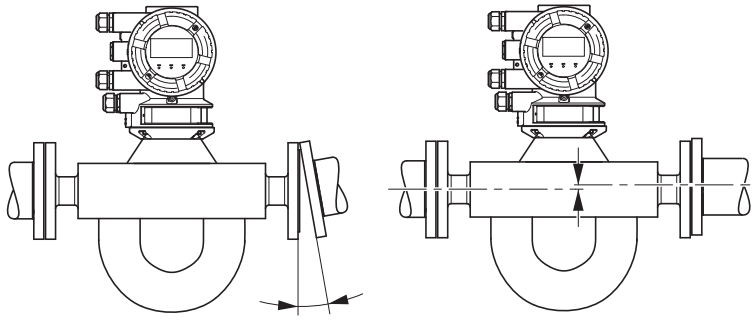


Fig. 7: Avoid: Slope and mismatch

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

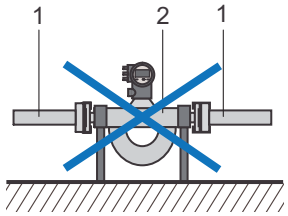


Fig. 8: Installation to be avoided: Fixing the sensor

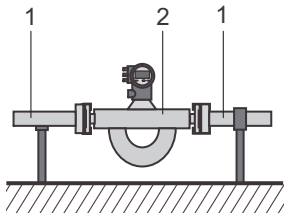


Fig. 9: Recommended installation: use the piping to support the sensor

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.

6.3.1.1 Redundant installation

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

6.3.1.2 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.

6.3.2 Installation in pipe

Depending on process connections, the sensor is connected to the pipe by means of flanges, terminals or thread. The model code provides information on the process connections selected.

⚠ DANGER

Risk of injury due to escaping fluids and damage, if fixing materials are inappropriate or not professionally installed

- Fixing materials (screws, nuts, terminals, terminal connectors, gaskets, etc.) are not included in the delivery and must be provided by the customer. The operator is responsible for selecting suitable gaskets and defining corresponding torque values.

- Protective materials such as protective stickers or caps on process connections must be removed immediately before installation.
- The direction in which the fluid flows through the pipe is indicated by an arrow on the flow meter. The sensor must be installed in accordance with the flow direction indicated to ensure optimal measuring results for density measurements.

  Otherwise, the parameter [*flow direction*] in the transmitter menu must be changed, see applicable Software Instruction Manual.

Clamps

Model codes for process connections	Model code pos. 6
Clamps	HS4, HS8 and HS9

The clamp connection must be installed as shown in the figure below.

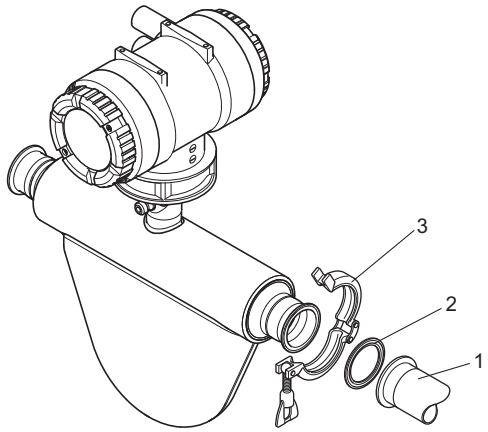


Fig. 10: Clamp connection

1 Terminal
2 Gasket
3 Terminal connector

Flanges

Model codes for process connections	Model code pos. 6
Flanges	B⎵⎵, C⎵⎵, E⎵⎵, F⎵⎵ and G⎵⎵

- Use screws and nuts suitable for the flanges.
- In case the nominal width of the piping deviates from the flow meter, use the appropriate reductions.
- Inner gasket diameters should not fall below the inner diameters of the flange.

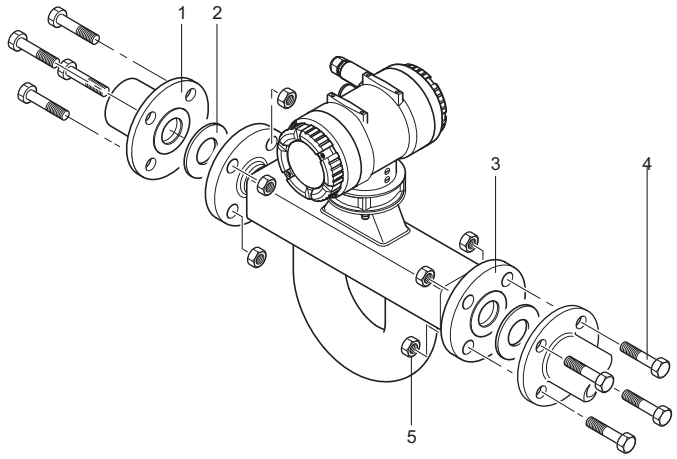


Fig. 11: Fixing the flange

1	Pipe flange	4	Bolt
2	Gasket	5	Nut
3	Sensor flange		

Internal threads

Model codes for process connections	Model code pos. 6
Internal thread	TG9 and TT9

For process connections with an internal thread, the connection must be installed in accordance with the following figure.

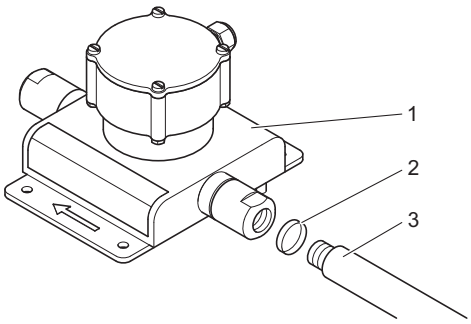


Fig. 12: Internal thread connection

1	Sensor
2	Gasket (not use in case of NPT)
3	Pipe

NOTICE

Use of seal tape for installation

In case of process connection with internal thread NPT you have to use a seal tape for installation.

External threads

Model codes for process connections	Model code pos. 6
External thread	HS2 and HS6

For process connections with an external thread SMS connections and connections according DIN11851 must be installed in accordance with the following figure.

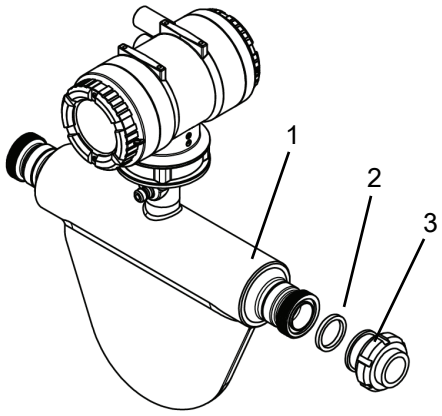


Fig. 13: Hygienic-thread connections

1 Sensor
2 Gasket
3 Coupling with nut

6.4 Transmitter installation

NOTICE

Make sure sensor and transmitter with same serial number are combined (except for spare sensor or universal spare transmitter).

6.4.1 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.

⚠ WARNING

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.

⚠ 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.

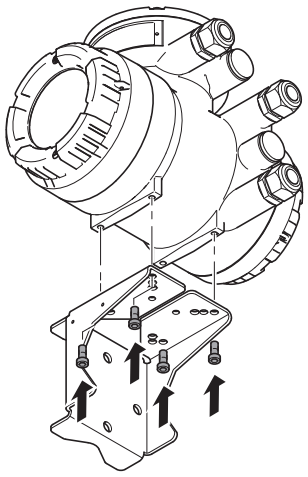
NOTICE

Installation at high vibration levels

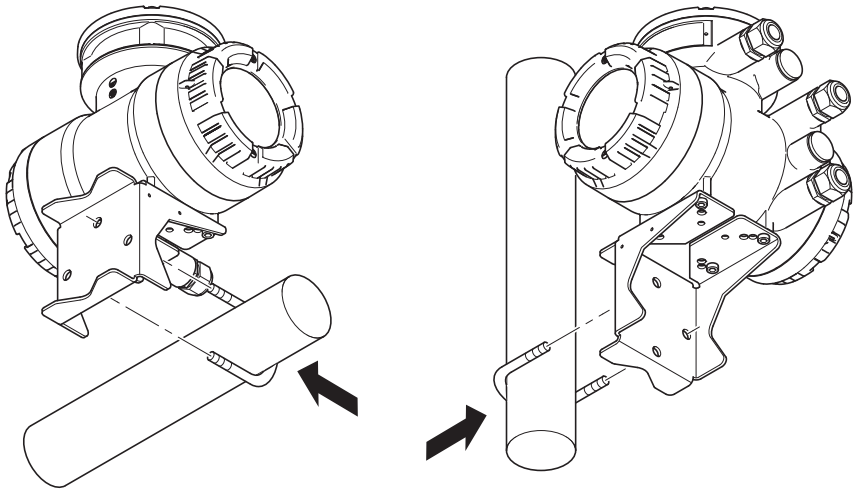
The mounting bracket for the pipe installation of the transmitter may not be suitable for installation environments with very high levels of vibration. In this case the user is advised to employ more rugged methods of fixation using the threaded bottom holes directly.

If it is a remote type transmitter, it can be mounted to a pipe size DN 50 (2") using the angle bracket and retaining clip included in the delivery:

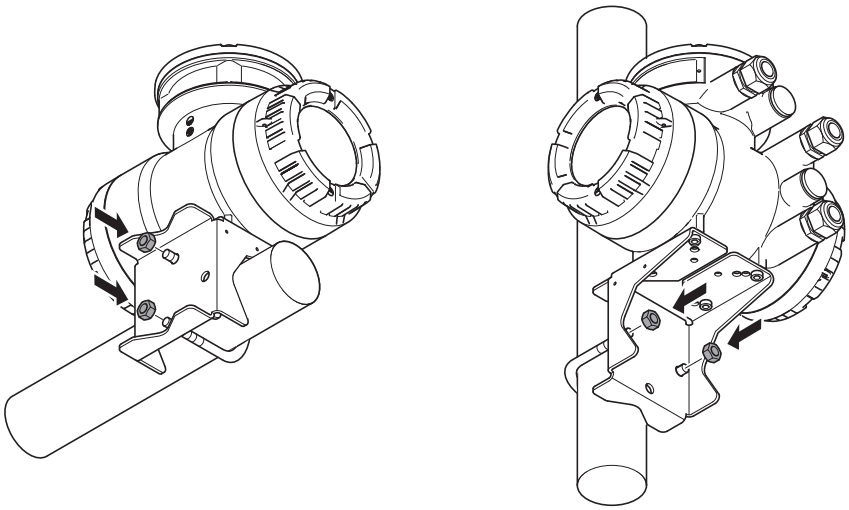
1. Screw angle bracket to bottom of transmitter.



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



3. Fasten retaining clip to bracket using the nuts.



See figure below (Fig. 14) for possible transmitter mounting alternatives (recommended for sanitary applications, then consider appropriate screws like hexagon head).

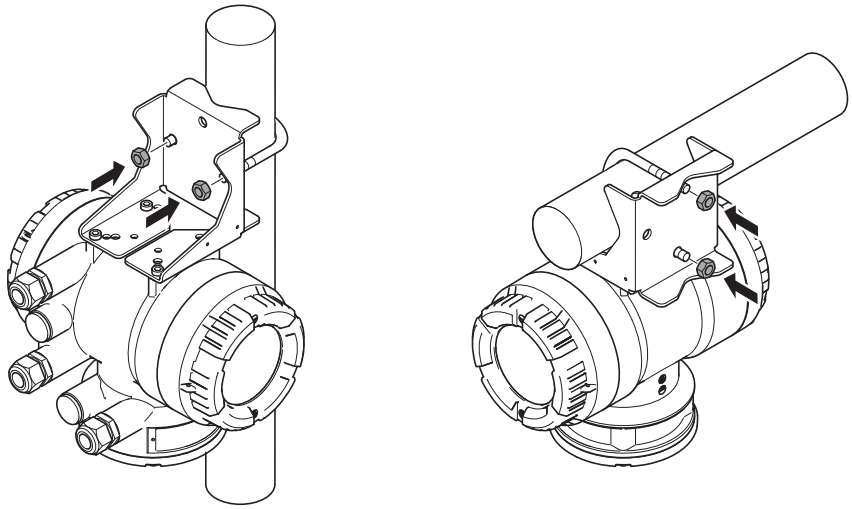


Fig. 14: Hanging installation for remote transmitter

6.5 Installation check list

The following checks must be performed once the flow meter is installed in the pipe:

Check	Performed?
State and specification of device	
▪ Flow meter checked for external damage?	
▪ Does flow meter meet the specifications of the measuring point (process fluid temperature, process pressure, ambient temperature, measuring range, etc.)?	
Installation	
▪ Does flow direction on flow meter correspond to the actual flow direction in the pipe? ▪ If not, has the appropriate parameter in the transmitter menu been switched?	
▪ Do measuring point number and nameplate labeling match the installation site?	
▪ Do mounting position and installation match usage (measurement of gas, liquid) in the process environment and under process conditions?	
▪ Is meeting the permissible ambient temperature for the transmitter ensured?	
Process environment and conditions	
▪ Is the flow meter protected from environmental influences (precipitation, direct insolation)?	

7 Wiring

7.1 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 clothes or by impact.

⚠ 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

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.

⚠ WARNING

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

- Observe connection diagram for the connecting cable according to chapter *IM General [Chap. 7.3.1 Connection terminals]*.

⚠ **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 to prevent cable damage from installation stresses.

NOTICE	Wiring work must only be performed at max. 80 % humidity and temperatures up to 31 °C. Above 31 °C allowable humidity is linearly decreasing to 50 % 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.

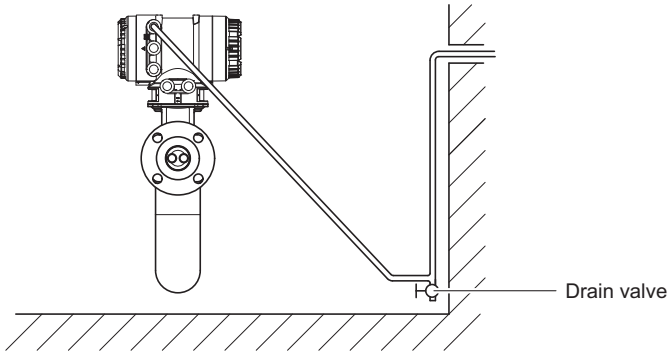


Fig. 15: Installation pipe at an angle

- 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 [▸ 28]*.
- Ensure that housing gaskets are positioned in the lining grooves and not damaged.

7.2 Grounding connections

⚠ WARNING

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”.

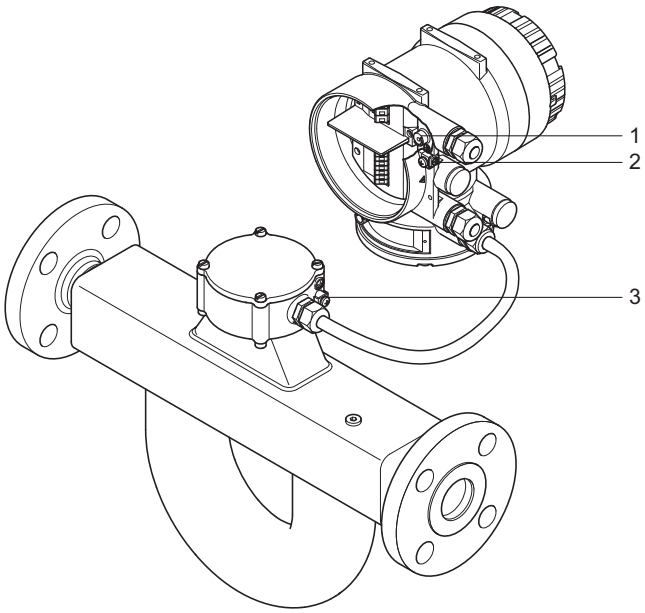


Fig. 16: Grounding connections on transmitter and sensor

1	Grounding screw inside transmitter terminal box for grounding conductor
2	Grounding terminal housing on transmitter for potential equalization
3	Grounding terminal housing on sensor for potential equalization

7.3 Connecting cable installation

With remote type flow meters, sensors and transmitters are connected by means of connecting cables. For figure with Remote type design please see *IM General [Chap. 4.3 Flow meter components]*.

⚠ 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. If necessary, the cable may be shortened using the enclosed termination kit. Refer to the cable termination instructions enclose to each termination kit that is attached to each cable.

Standard cable option L□□□ and the fire retardant cable option Y□□□

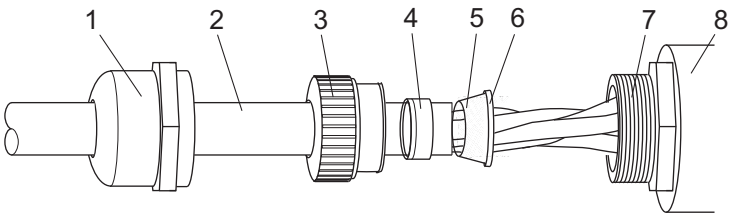


Fig. 17: Cable gland parts mounting

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

Steel armoured cable (option /LAC)

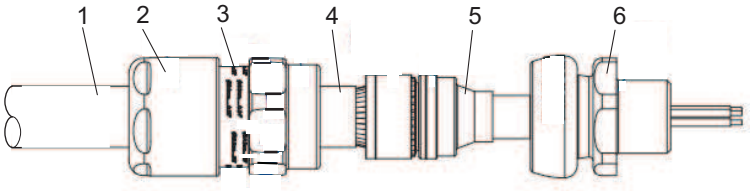


Fig. 18: Cable gland parts mounting

1	Connecting cable	4	Armour (braid) clamp ring
2	Backnut	5	Armour spigot
3	Middlenut	6	Entry

If the connecting cable, included in the delivery, is too short, additional lengths can be procured through the Yokogawa sales organization.

7.4 Transmitter interfaces

⚠ WARNING

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.

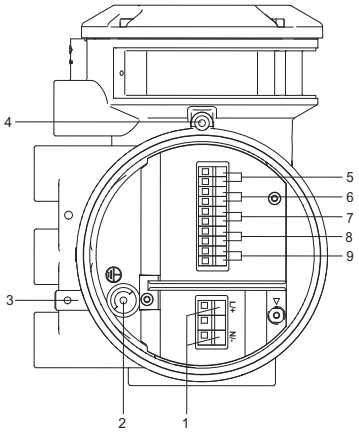
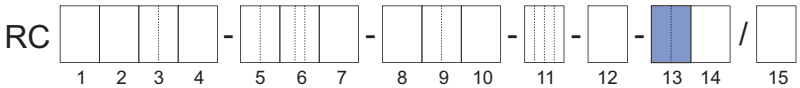


Fig. 19: Terminal for I/O outputs and power supply in transmitter

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

Depending on the selected interface protocol up to 4 in and/or outputs (I/O) are available, partially configurable.



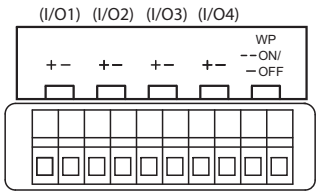


Fig. 20: I/O connection terminal layout

Tab. 2: I/O connection terminal configuration

Model code position 13	**Interface protocol**	**IO1 +/-**	**IO2 +/-**	**IO3 +/-**	**IO4 +/-**
J␣	HART	Active or Passive Analog Output + HART	Passive Pulse or Status Output	*Configurable*	*Configurable*
M␣	Modbus	*Configurable*		Modbus	
G␣ [1)]	PROFIBUS PA	PROFIBUS PA	Passive Pulse Output [2)]	–	–
F␣ [1)]	FOUNDATION Fieldbus	FOUNDATION Fieldbus		–	–

[1)] Only with Ultimate Transmitter

[2)] For calibration purpose only

Details about in and outputs and communication interfaces are specified in the following chapters.

Galvanic isolation

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

Inputs and outputs wiring gauge

For all in- and outputs wire gauge of 0.5 mm² to 2.5 mm² (AWG 20 to AWG 14) is applicable.

7.4.1 HART communication interface

For HART communication devices, it is supplied on the current output Iout1. The current output may be operated in compliance with the NAMUR NE43 standard. HART is available with non-intrinsically and intrinsically safety outputs.

HART I/O

Model code position 13	Connection terminal assignment				
	I/O1 +/-	**I/O2 +/-**	**I/O3 +/-**	**I/O4 +/-**	**WP**
JA	Iout1 Active	P/Sout1 Passive	–	–	Write-protect
JB	Iout1 Active	P/Sout1 Passive	P/Sout2 Passive	Iout2 Active	Write-protect
JC	Iout1 Active	P/Sout1 Passive	Sin	Iout2 Active	Write-protect
JD	Iout1 Active	P/Sout1 Passive	Sout Passive	P/Sout2 Passive	Write-protect
JE	Iout1 Active	P/Sout1 Passive	Sin	P/Sout2 Passive	Write-protect
JF	Iout1 Active	P/Sout1 Passive	Sin	P/Sout2 Active Internal pull-up resistor	Write-protect
JG	Iout1 Active	P/Sout1 Passive	Sin	P/Sout2 Active	Write-protect
JH	Iout1 Active	P/Sout1 Passive	Iout2 Passive	Iin Active	Write-protect
JJ	Iout1 Active	P/Sout1 Passive	P/Sout2 Passive	Iin Active	Write-protect
JK	Iout1 Active	P/Sout1 Passive	Sin	Iin Active	Write-protect
JL	Iout1 Active	P/Sout1 Passive	Iout2 Passive	Iin Passive	Write-protect
JM	Iout1 Active	P/Sout1 Passive	P/Sout2 Passive	Iin Passive	Write-protect
JN	Iout1 Active	P/Sout1 Passive	Sin	Iin Passive	Write-protect

Iout1	Analog current output with HART communication
Iout2	Analog current output
Iin	Analog current input
P/Sout1	Pulse or status output
P/Sout2	Pulse or status output
Sin	Status input
Sout	Status output

HART I/O intrinsically safe

Model code position 13	Connection terminal assignment				
	I/O1 +/-	**I/O2 +/-**	**I/O3 +/-**	**I/O4 +/-**	**WP**
JP	Iout1 Passive	P/Sout1 Passive	Iout2 Passive	–	Write-protect
JQ	Iout1 Passive	P/Sout1 Passive	Iout2 Passive	P/Sout2 Passive	Write-protect
JR	Iout1 Passive	P/Sout1 Passive NAMUR	Iout2 Passive	–	Write-protect
JS	Iout1 Passive	P/Sout1 Passive NAMUR	Iout2 Passive	P/Sout2 Passive NAMUR	Write-protect

Iout1	Analog current output with HART communication
Iout2	Analog current output
P/Sout1	Pulse or status output
P/Sout2	Pulse or status output

Intrinsically safe outputs are only available in combination with selecting Ex approval of the device (see applicable General Specifications GS01U01B␣␣-00␣␣-R, chapter 8.1 Model code description).

HART communication

A load resistance of 230 – 600 Ω at Iout1 is recommended.

7.4.2 Modbus communication interface

Modbus interface is available with configurable I/O option.

Tab. 3: Connection terminal assignment for Modbus

Model code position 13	Connection terminal assignment						
	I/O1 +/-	I/O2 +/-	I/O3 +	I/O3 -	I/O4 +	I/O4 -	WP
M0	–	P/Sout1 Passive	–	Modbus C	Modbus B	Modbus A	Write-protect
M2	Iin Active	P/Sout1 Passive	–	Modbus C	Modbus B	Modbus A	Write-protect
M3	P/Sout2 Passive	P/Sout1 Passive	–	Modbus C	Modbus B	Modbus A	Write-protect
M4	P/Sout2 Active	P/Sout1 Passive	–	Modbus C	Modbus B	Modbus A	Write-protect
M5	P/Sout2 Active Internal pull-up resistor	P/Sout1 Passive	–	Modbus C	Modbus B	Modbus A	Write-protect
M6	Iout1 Active	P/Sout1 Passive	–	Modbus C	Modbus B	Modbus A	Write-protect
M7	Iin Passive	P/Sout1 Passive	–	Modbus C	Modbus B	Modbus A	Write-protect

Iout	Analog current output, no HART
Iin	Analog current input
P/Sout1	Pulse or status output
P/Sout2	Pulse or status output

Modbus connection

Tab. 4: Connection terminal assignment for Modbus

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

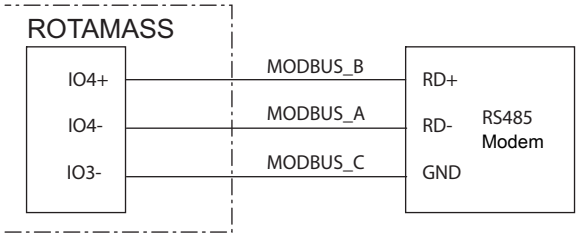


Fig. 21: MODBUS communication

Modbus cable

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

7.4.3 PROFIBUS PA

PROFIBUS PA interface is available with and without intrinsically safety.

Model code position 13	Connection terminal assignment				
	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 applicable General Specifications GS01U01B␣␣-00␣␣-R, chapter 8.1 Model code description).

Cable type and length

Tab. 5: Fieldbus cable and transmissible length

Type of cable	Cable specifications	Max. length of cable (reference value)
Type A: Individually-shielded twisted pair cable	#18 AWG (0.82 mm²)	1,900 m

7.4.4 FOUNDATION Fieldbus

FOUNDATION Fieldbus interface is available with and without intrinsically safety.

Functions overview

Model code position 13	Connection terminal assignment				
	I/O1 +/-	I/O2 +/-	I/O3 +/-	I/O4 +/-	WP
F0	FOUNDATION Fieldbus	Pulse Passive	–	–	Write-protect
F1	FOUNDATION Fieldbus (IS)	Pulse Passive (IS)	–	–	Write-protect

Intrinsically safe (IS) outputs are only available in combination with selecting Ex approval of the device (see applicable General Specifications GS01U01B␣␣-00␣␣-R, chapter 8.1 Model code description).

Cable type and length

Tab. 6: Fieldbus cable and transmissible length

Type of cable	Cable specifications	Max. length of cable (reference value)
Type A: Individually-shielded twisted pair cable	#18 AWG (0.82 mm²)	1,900 m

7.5 Transmitter power supply

Power supply

Alternating-current voltage (rms):

- Power supply[1)]: 24 V_{AC} +20 % -15 % or 100 – 240 V_{AC} +10 % -20 %
- Power frequency: 47 – 63 Hz

Direct-current voltage:

- Power supply[1)]: 24 V_{DC} +20 % -15 % or 100 – 120 V_{DC} +8.3 % -10 %

[1)] for option MC␣ (Marine approval) supply voltage is limited to 24 V; in addition NE21 testing indicates a tolerable area of 24 V_{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.

Wiring gauge

Recommended wire gauge is 0.5 to 2.5 mm² (AWG 20 to 14).

Power supply terminal layout

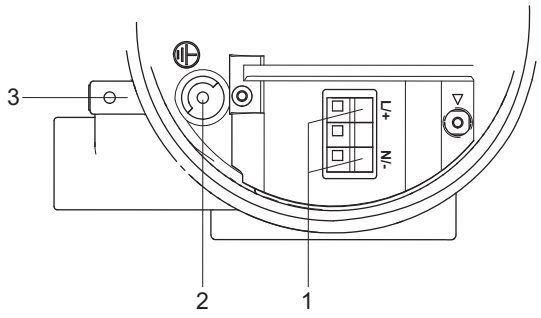


Fig. 22: Power supply terminal layout in transmitter

1 L/+: Phase / DC+
N/-: Neutral/ 0 V
2 Grounding screw in terminal box
3 Grounding screw in transmitter housing

7.6 Connect power supply and I/O or communication wires

⚠ WARNING

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. Recommended wire gauge is 0.5 to 2.5 mm² (AWG 20 to 14).

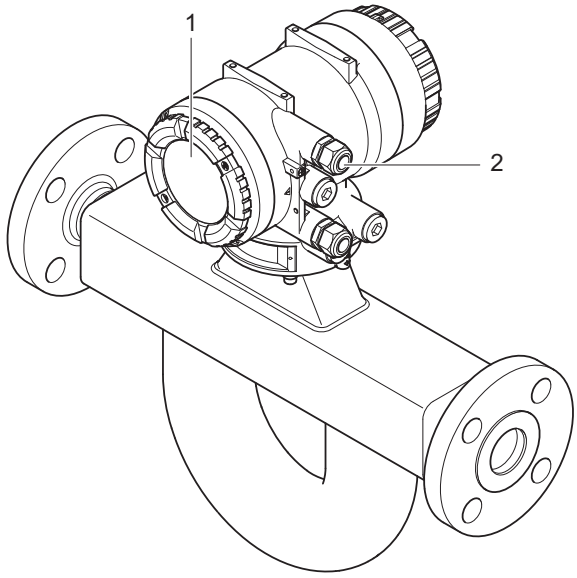


Fig. 23: Illustration for connecting the power supply and I/O or communication cables

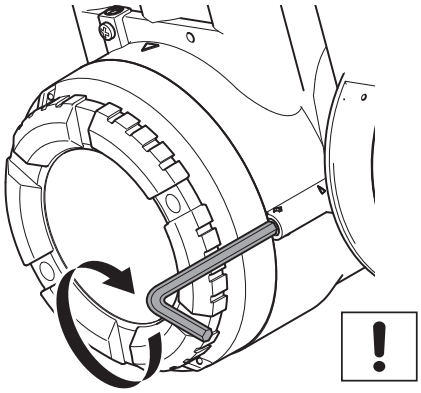
1	Transmitter back cover
2	Power supply cable gland

⚠ WARNING

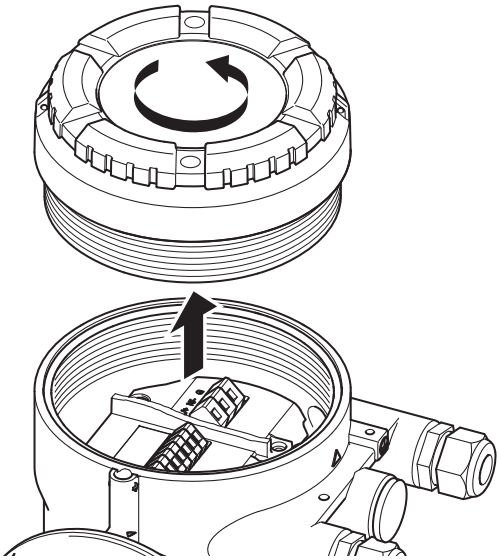
Risk of injury due to electrical shock

- 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.

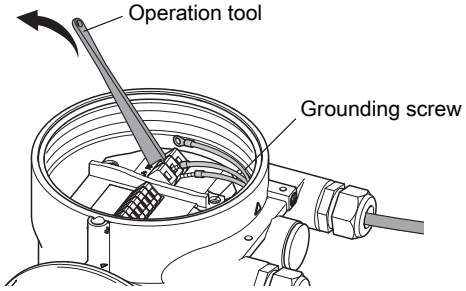


4. Attach cable glands.
5. Connect wires to connection terminals with the operating tool.

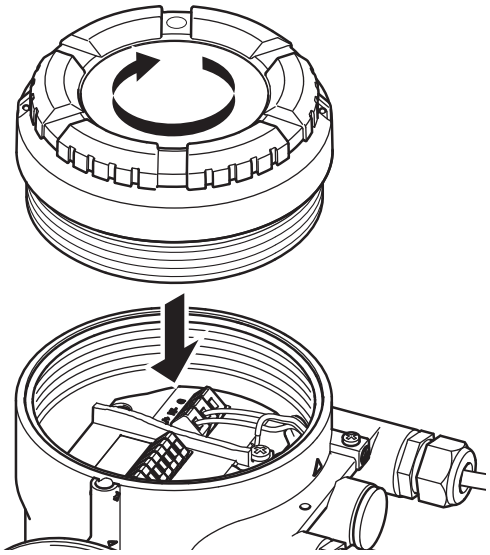
NOTICE	Connect the grounding conductor to the grounding screw.

NOTICE	For the graphic representation of phase and neutral conductor connection, please see chapter 7.5, fig. 22 *Power supply terminal layout in transmitter [▷ 36]*

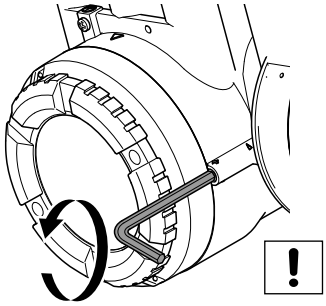
NOTICE	For details about I/O or communication wiring configuration refer to Fig 20 I/O connection terminal layout and in chapter 7.4 Table *Transmitter interfaces [▷ 30]*



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.



7.7 Wiring check list

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

⚠ WARNING

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?	

8 System configuration and operation

8.1 Startup

1. Activate external power switch.
2. Perform check of piping installation.
3. Check flow meter for device errors, warnings or alarms.
4. Configure the transmitter, and perform autozero,
   see chapter 8.4 on *Transmitter basic settings by display menu [▷ 46]*.

⇨ Flow meter is ready for operation.

8.2 Operating options

The Rotamass Total Insight can be operated in different ways:

- IR (Infra-Red) buttons on the display
- Communication interface, e.g. with FDT frame application like FieldMate

ⓘ	The display is a device option and therefore not always available.

For more information on how to operate the transmitter, its functions and communication interface, see applicable Software Instruction Manual IM 01U10S0␣-00␣␣-R.

NOTICE	Be aware that all covers are closed before operating in order to prevent disturbance of other sensitive electrical equipment due to increased electromagnetic emissions.

NOTICE	Avoid writing setting parameters cyclically. The number of writes to the EEPROM is limited. If this limit is exceeded, it may cause data loss and memory failure.

8.3 Display

All of the functions described here are also available via digital communication. Numerical values that are entered via the display are limited to 6 digits.

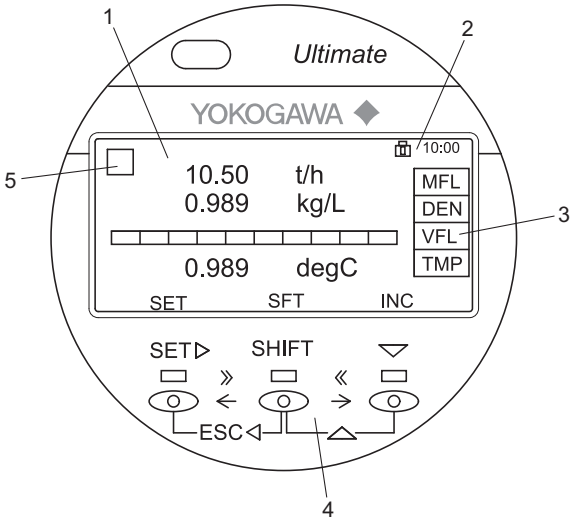


Fig. 24: Display layout

1	Measured quantities and units	4	IR buttons
2	Status icon and time	5	Alarm symbol
3	Measured quantity abbreviation		

The controls on the display are IR buttons. They respond as soon as an object, such as a finger, is in close proximity. It is not necessary to apply pressure to the display surface.

NOTICE

Impairment of the display

If the device is operated for a longer period and is subjected to high temperatures or high humidity in the process, the display may be impaired.

- Replace display unit as described in *IM General [Chap. 6.4.1 Rotating and replacing the display]*.

Observe the following instructions to ensure that the IR buttons are functional:

- Keep the display glass clean.
- Avoid exposure to direct sunlight.
- To increase the reflectivity of fingers (e.g. if they are very dirty) place some white tape on the fingertip.

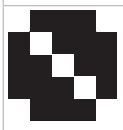
IR button functions

IR button	Display	Function
SET ▶	SET	▪ Apply setting ▪ Enter data ▪ Apply parameter
SHIFT	SFT	▪ Move cursor right or to the next position ▪ Change function and display of SET and ▼
▼	INC	▪ Increment parameter or value. Hold to scroll faster. ▪ Change position of the decimal point ▪ Select next menu item

The IR button function changes as follows when used with the SHIFT key:

Key combinations	Display	Function
SHIFT + SET ▶	ESC	▪ Cancel and switch to parent menu
SHIFT + ▼	DEC	▪ Decrement parameter or number ▪ Select previous menu item

Status icons

Status icon	Description	Status icon	Description
	System alarm tripped		Process alarm tripped
	Settings alarm tripped		Warning tripped
	Write protection disabled		Write protection enabled
	Device error (no write access)		Device busy (no write access)
	microSD card ready		Access to microSD card
	Error accessing microSD card		Process variable has bad status
	Upload parameter enabled		Download parameter enabled

Status icons HART

	Total health result: good (only indicated when display total health result is active)		Total health result: warning (only indicated when display total health result is active)
	Total health result: bad state (only indicated when display total health result is active)		Tube Health Check with result: OK
	Tube Health Check with result: warning		Tube Health Check with result: error
	Stop batch		Resume batch
	Batch running		SIL mode

Status icons Modbus, PROFIBUS PA

	Total health result: good (only indicated when display total health result is active)		Total health result: warning (only indicated when display total health result is active)
	Total health result: bad state (only indicated when display total health result is active)		Tube Health Check with result: OK
	Tube Health Check with result: warning		Tube Health Check with result: error

For status icon placement on the display see figure 24 at *Display [▶ 42]*, No. 1, 2 or 5.

Measured quantities and identifications

List of measured quantity abbreviations and identification on the display

Tab. 7: Regular display

Abbreviation	Measured quantity or identification
MFL	Mass flow
DNS	Density
TMP	Temperature
VFL	Volume flow
RFD	Reference density
RLD	Relative density
CVF	Corrected volume flow
PRS	Pressure
TT1 – TT6	Totalizer 1 – 6

Abbreviation	Measured quantity or identification
TAG	Customer-Device identification
LTG	Customer-Device identification, long version
VEL	Velocity
CNC	Concentration
NM1, NM2	Net mass flow rate 1, 2
NV1, NV2	Net volume flow rate 1, 2
NCV	Corrected net volume flow rate
DRC	Drive current
VSC	Viscosity
HT1	24hours totalizer 1
HT2	24hours totalizer 2
HT3	24hours totalizer 3
GVF	Gas void fraction
VSC	Viscosity

The following values are only available for the trend display to record data on the microSD card. Additional information about data recording can be found in the applicable Software Instruction Manual.

Only use the microSD card included with the Rotamass Total Insight. Functionality of the device cannot be guaranteed if other cards are used.

Tab. 8: Trend display

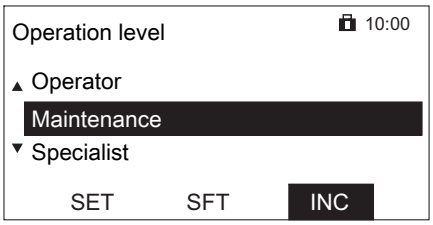
Abbreviation	Measured quantity or identification
MFL	Mass flow
DNS	Density
TMP	Temperature
VFL	Volume flow
PRS	Pressure
CNC	Concentration
NM1	Net mass flow rate 1
NV1	Net volume flow rate 1
PHS	Phase shift
FRQ	Resonance frequency
DRG	Drive gain
DRC	Driving current
MBT	Transmitter temperature
VSC	Viscosity

8.4 Transmitter basic settings by display menu

To limit access to device setup and parameters for configuring the operation of the device, 3 operation levels can be defined. One of them has to be selected and set when a user enters the operation menu to configure the device:

Tab. 9: Operation levels and related user rights

Operation level	User rights	Description
Operator	All parameters can be displayed. The following parameter can be used: Language	No password is required.
Maintenance	All parameters can be displayed. The following parameters can be used: ▪ Language ▪ Autozero ▪ Basic setup for PROFINET ▪ Basic setup for HART/Modbus	▪ Password is required. Default value is 0000. ▪ Password can be changed, see Root menu.
Specialist	All parameters can be displayed and all parameters can be used.	▪ Password is required. Default value is 0000. ▪ Password can be changed, see Root menu.



The following instruction refer to display values. Buttons to press described in table IR buttons, see *Display [▷ 43]*.

8.4.1 Select operation level

1. Press and hold [SET] for 2 seconds.
2. Press [SFT] + [INC] switches to enter [Setting Mode].
   ⇨ Menu [No] is preselected.
3. Press [INC] switch and select [Yes], then press [SET].
4. [Yes] is blinking, then press [SET] switch to enter the menu [Operation level].
5. Press [INC] to select the desired operation level.
6. Press [SET] to confirm.
   ⇨ If the operation level [Operator] has been selected, the following steps are not necessary. Access to the operation menu will be granted.
   ⇨ If the operation levels [Maintenance] or [Specialist] have been selected, a numeric password must be entered, see steps 7 – 11.
7. Press [INC] to choose the first number of the numeric password.
8. Press [SFT] to switch to the remaining numbers of the numeric password.
9. Press [INC] to choose the remaining numbers of the numeric password.
10. Press [SET] to confirm the entered numeric password.
    ⇨ The entered password flashes.
11. Press [SET] to confirm.

⇨ If the password is correct, access to the operation menu will be granted.

⇨ If the password is incorrect, access to the operation menu will be denied and the menu [Operation level] opens again.

8.4.2 Setting display language

1. Access operation level [Operator].
2. Browse to [Lang], Press [INC] to browse and [SET] to enter desired menus/parameters.
3. Press [INC] repeatedly until the desired language appears.
4. Press [SET] to select the desired language.
5. Press [SET] to confirm the language selected.
   ⇨ Display returns to higher menu level after few seconds.

8.4.3 Setting date

1. Access operation level [Maintenance].
2. Browse to [Detailed setup]► [Set date]. Press [INC] to browse and [SET] to enter desired menus/parameters. menu is selected.
   ⇨ Date on display is flashing.
3. To set date press [INC] to increment date digits and [SET] to shift between year, month and day.
4. Press [SET] to apply the date set.
5. Press [SET] to confirm the date set.
   ⇨ Display returns to higher menu level after few seconds.

8.4.4 Setting time

1. Access operation level [Maintenance].
2. Browse to [Detailed setup] ► [Date/Time] ► [Set time]. Press [INC] to browse and [SET] to enter desired menus/parameters.
   ⇨ Time on display is flashing.
3. To set time press [INC] to increment time digits and press [SFT] to shift between hour, minutes and seconds.
4. Press [SET] button to set the minutes.
5. Repeat the two previous steps for minutes and seconds.
6. Press [SET] to apply the time set.
7. Press [SET] to confirm the time set.
   ⇨ Display returns to higher menu level after few seconds.

8.4.5 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.

8.4.6 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. Access operation level [Maintenance].
2. Browse to [Diag/Service] ► [AZ] ► [Exe]. Press [INC] to browse and [SET] to enter desired menus/parameters.
   ⇨ Parameter [Not exe] appears.
3. Press [INC] until [Exe] is selected.
4. Press [SET] .
   ⇨ Parameter [Exe] flashes.
5. Press [SET] to start autozero.
   ⇨ Progress bar appears to indicate status of autozero, after completion display returns to higher menu level after few seconds.

8.4.7 Change operation level passwords

Default passcode for [Maintenance] and [Specialist] operation level should be changed.

1. Access operation level [Maintenance] or [Specialist].
2. Browse to [Detailed setup] ► [Access cfg] ► [Chg Mainte] or [Chg Special]. Press [INC] to browse and [SET] to enter desired menus/parameters.
3. To change passcode press [INC] to increment digits and [SFT] to shift to next digits.
4. Press [SET] to apply the passcode.
   ⇨ Passcode flashes.
5. Press [SET] to confirm the passcode.
   ⇨ Passcode stops flashing, display return to higher menu level after few seconds.

8.5 Transmitter hardware setting

The transmitter is equipped with DIP switches which can be used for specific settings. Some settings can be changed in the transmitter software as well.

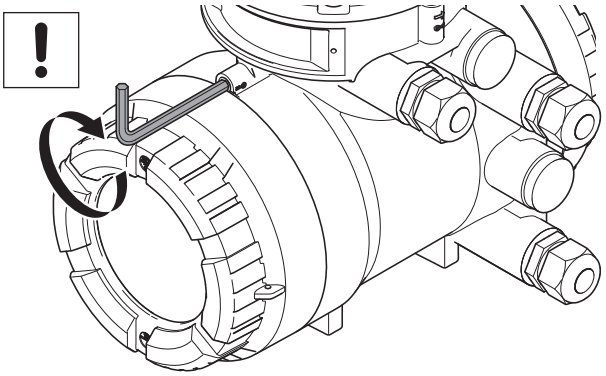
To access the switches follow instructions as below.

⚠ DANGER

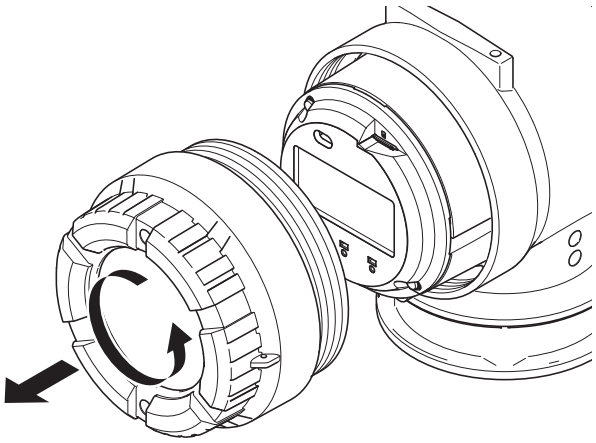
Explosion hazard

- When the housing is opened in hazardous areas, the applicable Explosion Proof Type Manual must be observed, see chapter Maintenance and repair.

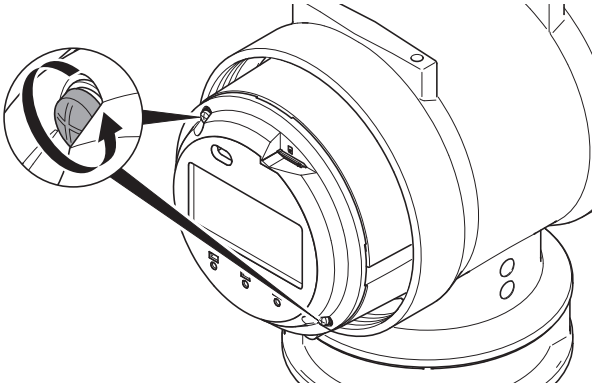
1. Switch off power supply.
2. Loosen the locking screw by turning it clockwise with an Allen wrench (size: 3.0).



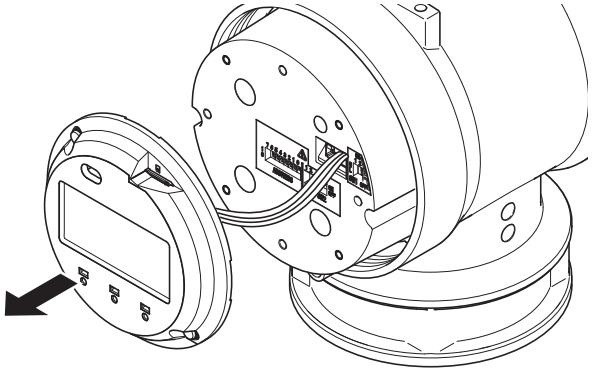
3. Unscrew display cover from transmitter housing.



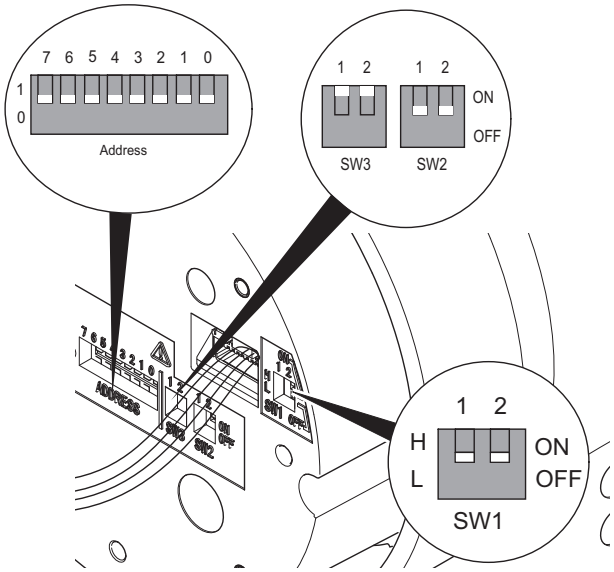
4. Remove 2 screws from the display.



5. Remove the display from housing by slowly pulling forward.
   ⇨ The switch can be seen.



6. Access desired switches.



7. Push display into housing.
8. Fasten the display with 2 screws.
9. Screw display cover back onto transmitter housing.
10. Tighten the locking screw by turning it counterclockwise with an Allen wrench (size: 3.0).

DIP switch functions

SW No.		Function
1	1	Burnout/ Simulation mode
	2	Write protection
2		Bus termination
3		Pull-up /-down resistor for Modbus
Address		Bus address

9 Dismantling and disposal

9.1 Decontamination and return shipment

⚠ 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.

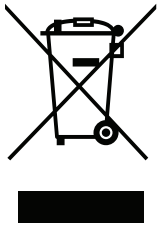
Note the following items before returning the shipment:

- Clean flow meter thoroughly. No harmful chemicals must remain in or on the flow meter. Rota Yokogawa only accepts completely drained and cleaned flow meters.
- The form "Decontamination Declaration" must be filled in completely and sent to Yokogawa along with the flow meter.
- Package flow meter in a shockproof manner for transport. Use original packaging, if possible.

9.2 Disposal

Prior to disposal of the flow meter, please take note of the following:

- Comply with the applicable national regulations in the event of disposal or recycling.
- Do not dismantle flow meter until all fluid residues have been removed and dispose the parts individually.



Devices described in this manual should be recycled. They may not be disposed of in the municipal waste disposal services according to the Directive 2012/19/EC on waste electronic and electrical equipment (WEEE). Devices can be returned to the manufacturer or supplier within the EU and UK, or to a locally approved disposal service for eco-friendly recycling. Observe the specific regulations valid in your country.

TRADEMARKS

HART:	registered trademark of FieldComm Group, Inc., US
Modbus:	registered trademark of SCHNEIDER ELECTRIC USA, INC.
PROFIBUS:	registered trademark of PROFIBUS Nutzerorganisation e.V., Karlsruhe, DE
TRI-CLAMP:	registered trademark of ALFA LAVAL CORPORATE AB, SE
FOUNDATION Fieldbus:	registered trademark of FieldComm Group, Inc., US
ROTAMASS:	registered trademark of Rota Yokogawa GmbH & Co. KG, DE
FieldMate:	registered trademark of YOKOGAWA ELECTRIC CORPORATION
SD:	registered trademark of SD-3C LLC.
QR code:	registered trademark of DENSO WAVE INCORPORATED

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Manufacturer:

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

For the actual manufacturing location of your device refer to the model code and/or serial number.

QUALITY SYSTEM CERTIFICATION
DNV
ISO 14001
ISO 45001
ISO 9001
ISO/IEC 27001