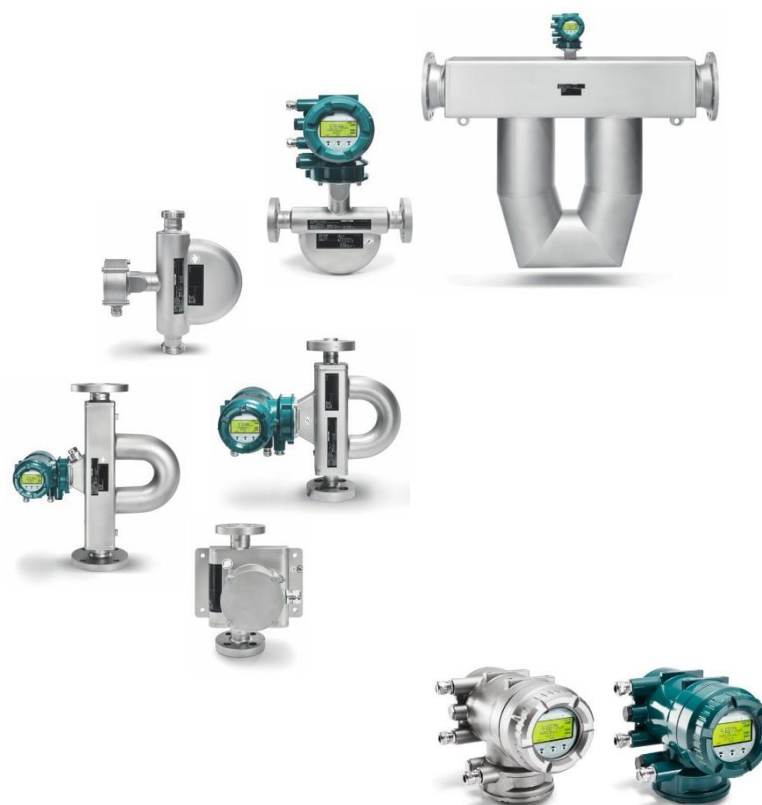


General Specifications

ROTAMASS Total Insight Coriolis Mass Flow and Density Meter Addendum to General Specifications



GS 01U10B00-09EN-R



1. Introduction

1.1. General information

This document is an addendum to the General Specifications. It describes additional specifications and differences of the delivered product compared to the following “General Specifications” of Rotamass Total Insight series:

- General Specifications Rotamass TI series GS 01U10B0_-00_-R
- General Specifications Rotamass TI Spare Transmitter GS 01U10B21-00EN-R
- Addendum to General Specifications for FOUNDATION Fieldbus GS01U10B00-08EN-R

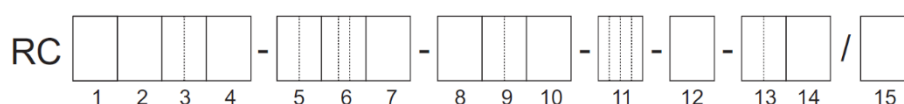
The additional and different specifications can be model code related, design or configuration only and are described on the next pages.

1.2. Other applicable documents

For Ex approval specification, refer to the following documents:

- Explosion Proof Type Manuals IM 01U10X_-00_-R
- Addendum to Explosion Proof Type Manual IM 01U10X10-00_-R

1.3. Overview additional and changed General Specifications



Model code pos.	Category	Model code	Description	Applicable Rotamass TI models							
				RC _N	RC _P	RC _S	RC _T	RC _H	RC _G	RCUXNN	RCU3
Additional model code relevant specifications											
6	Process connection type	HS6	Threaded sanitary connection for SMS 1145	-	-	-	-	•	-	-	-
8	Process fluid temperature range	1	Low: -196 to 150 °C (-320.8 to 302 °F)	-	-	•	-	-	-	-	-
9	Mass flow accuracy	30	Gas: 0.35 % maximum mass flow deviation D _{flat} or D ₀	-	•	-	-	•	•	-	-
15	Country-specific application	CS	CRN (Canadian Registration Number)	-	•	•	•	-	•	-	-
		QR2	Kazakhstan Pattern Approval mark and Primary verification, including certificate	•	•	•	•	•	•	•	-
		QR3	Uzbekistan Pattern Approval and Primary verification	•	•	•	•	•	•	•	-
	Adapter for cable entries	AD2	2 pcs ANSI 1/2" NPT to JIS G1/2 adapter	•	•	•	•	•	•	•	•
	Serial Number Combination	SNC	Serial number bound replacement with same configuration and setting as replaced transmitter	-	-	-	-	-	-	•	-
Additional approvals and declarations of conformity											
ECAS Ex approval for United Arab Emirates				•	•	•	•	•	•	•	•
Ex approval for Ukraine				•	•	•	•	•	•	•	•
EMC and LVD regulations for Morocco				•	•	•	•	•	•	•	•
Changed specifications											
Measuring range for mass flow and volume flow of gases				•	•	•	•	•	•	-	-

meaning of "-": not available

meaning of "•": available

2. Process connection types

Model code pos.	Category	Model code	Description	Applicable Rotamass TI models	Applicable General Specifications
6	Process connection type	HS6	Threaded sanitary connection for SMS 1145	Hygienic	GS 01U10B06-00_--R

Overall length L1 and weight

The overall length of the sensor depends on the selected process connection (type and size). The following table lists the overall length and weight as function of the individual process connection. The weights in the tables are for the remote type. Additional weight for the integral type: 3.5 kg (7.7 lb).

Tab. 01: Overall length L1 and weight of sensor (process connections: SMS 1145 threaded)

Process connections	Model code pos.		Hygienic 25		Hygienic 40		Hygienic 50		Hygienic 80	
	5	6	L1 in mm (inch)	Weight in kg (lb)	L1 in mm (inch)	Weight in kg (lb)	L1 in mm (inch)	Weight in kg (lb)	L1 in mm (inch)	Weight in kg (lb)
SMS1145 DN25	25	HS6	280 (11.0)	5.2 (11)	320 (12.6)	7.2 (16)	-	-	-	-
SMS1145 DN40	40		-	-	330 (13.0)	7.5 (17)	490 (19.3)	14.4 (32)	-	-
SMS1145 DN50	50		-	-	-	-	480 (18.9)	14.3 (32)	610 (24.0)	23.5 (52)
SMS1145 DN65	65		-	-	-	-	-	-	590 (23.2)	23.5 (52)
SMS1145 DN80	80		-	-	-	-	-	-	590 (23.2)	23.7 (52)

Maximum allowed process pressure

The maximum allowed process pressure depends on the selected process connection and its surface temperature. The given process connection temperature and process pressure ranges are calculated and approved without corrosion or erosion effects. The following diagram shows the process pressure as a function of process connection.

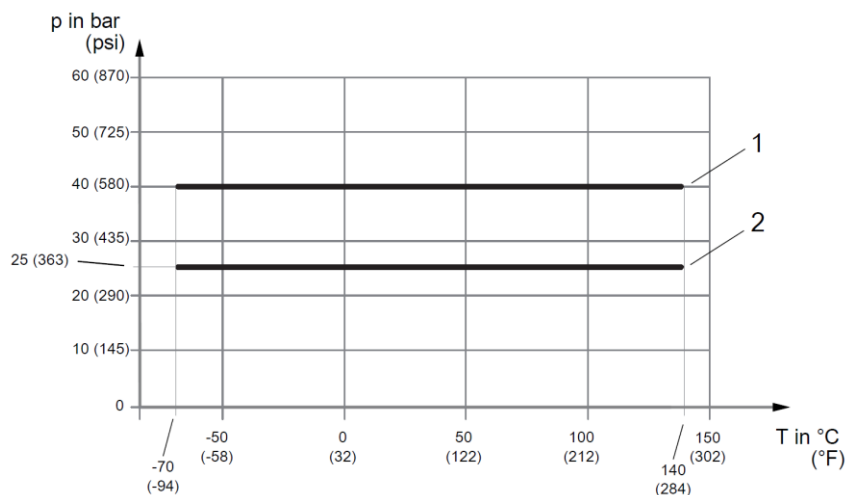


Fig. 1: Allowed process pressure as a function of process connection temperature

- 1 Threaded sanitary connection for SMS 1145 up to DN40
- 2 Threaded sanitary connection for SMS 1145 from DN50 up to DN80

Allowed ambient temperature for sensor

The allowed combinations of process fluid and ambient temperature for the sensor are illustrated as grey areas in the diagrams below.

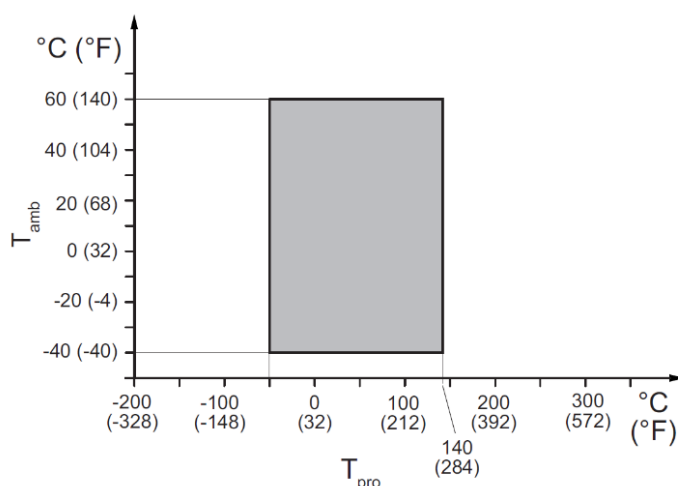


Fig. 2: Allowed process fluid and ambient temperatures, integral type for process connection type HS6

T_{amb} Ambient temperature
 T_{pro} Process fluid temperature

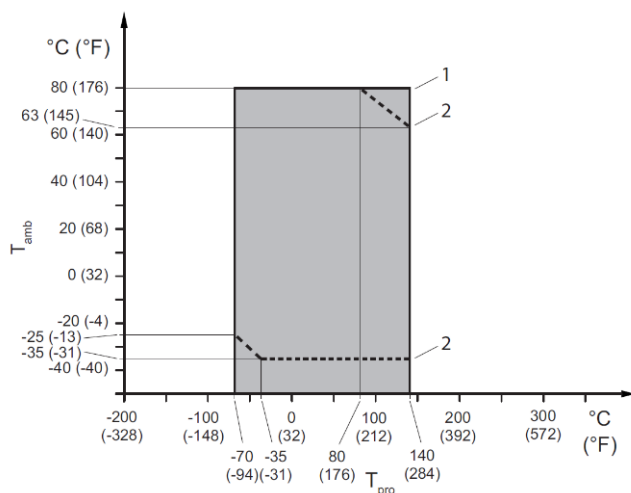
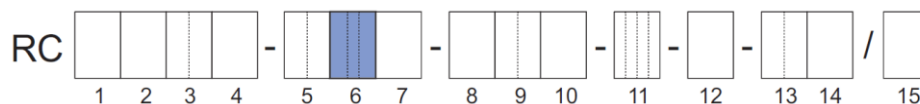


Fig. 3: Allowed process fluid and ambient temperatures, remote type for process connection type HS6

- 1 Standard cable option L_
- 2 Limitation for fire retardant cable option Y_

Allowed process fluid and ambient temperature ranges in hazardous areas depend on classifications defined by applications, refer to the General Specification GS 01U10B06-00_-R, chapter 5.4.2 *Temperature specification in hazardous areas*.

Ordering information and restrictions



Model code position	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	Description	Restriction
Process connection type						HS6									Threaded sanitary connection for SMS 1145	Please find all restrictions in the FlowConfigurator sizing software: www.FlowConfigurator.com

3. Process fluid temperature range

Model code pos.	Category	Model code	Description	Applicable Rotamass TI models	Applicable General Specifications
8	Process fluid temperature range	1	Low: -196 to 150 °C (-320.8 to 302 °F)	Supreme	GS 01U10B02-00_--R

Process fluid temperature range



Allowed process fluid and ambient temperature ranges in hazardous areas depend on classifications defined by applications, please refer to the Addendum to Explosion Proof Type Manual IM 01U10X10-00_--R.

For Rotamass Supreme the following process fluid temperature range is available in addition to the process fluid temperature ranges specified in the General Specifications GS 01U10B02-00_--R:



Temperature range	Model code position 8	Process fluid temperature in °C (°F)	Design type	Model code position 10
Low	1	-196 to 150 (-320.8 to 302)	Remote type	B, F, K

Accuracy of temperature

Accuracy of temperature depends on the sensor temperature range selected. For sensor temperature range “Low”, the accuracy of temperature can be calculated as follows:

Formula for temperature specifications Low

$$\Delta T = 1.0 \text{ °C} + 0.008 \times |T_{pro} - 20 \text{ °C}|$$

ΔT Maximum deviation of temperature
 T_{pro} Process fluid temperature in °C

Process fluid temperature effect on accuracy

For mass flow and density measurement, process fluid temperature effect is defined as the change in sensor flow and density accuracy due to process fluid temperature change away from the calibration temperature.

Temperature effect on Zero

Temperature effect on Zero of mass flow can be corrected by zeroing at the process fluid temperature.

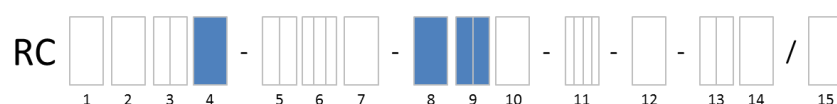
Temperature effect on mass flow

The process fluid temperature is measured, and the temperature effect compensated. However due to uncertainties in the compensation coefficients and in the temperature measurement an uncertainty of this compensation is left. The typical rest error of Rotamass Total Insight temperature effect on mass flow is:

Temperature range	Uncertainty of flow
Low	± 0.0011 % of rate / °C (± 0.0006 % of rate / °F)

The temperature used for calculation of the uncertainty is the difference between process fluid temperature and the temperature at calibration condition.

Temperature effect on density measurement (liquids)



Process fluid temperature influence:

Formula for
metric values

$$D'_{\rho} = \pm k \times \text{abs}(T_{\text{pro}} - 20 \text{ }^{\circ}\text{C})$$

Formula for
imperial values

$$D'_{\rho} = \pm k \times \text{abs}(T_{\text{pro}} - 68 \text{ }^{\circ}\text{F})$$

D'_{ρ} Additional density deviation due to the effect of fluid temperature in g/l (lb/ft³)
 T_{pro} Process fluid temperature in °C (°F)
 k Constant for temperature effect on density measurement in g/l × 1/°C (lb/ft³ × 1/°F)

Tab. 02: Constants for particular meter size and model code position:

Meter Size	Model code position 4	Model code position 8	Model code position 9	k in g/l × 1/°C (lb/ft ³ × 1/°F)
Supreme 34	S	1	C6, D7, E7	0.13 (0.0045)
Supreme 36			C3, C5, D7, E7	0.09 (0.0031)
Supreme 38			C3, C5, D7, E7	0.07 (0.0024)
Supreme 39			C3, C5, D7, E7	0.06 (0.0021)

Maximum allowed process pressure

The maximum allowed process pressure depends on the selected process connection and its surface temperature. The given process connection temperature and process pressure ranges are calculated and approved without corrosion or erosion effects.

For sensor temperature range “Low”, the diagrams shown in GS 01U10B02-00_ _-R are applicable. The pressure ratings at room temperature are valid down to -196 °C (-320.8 °F). Please refer to GS 01U10B02-00_ _-R, *chapter 5.3.3 Pressure*.

Allowed ambient temperature for sensor

The allowed combinations of process fluid and ambient temperature for the sensor are illustrated as grey area in the diagram below.

Temperature specification Low, remote type

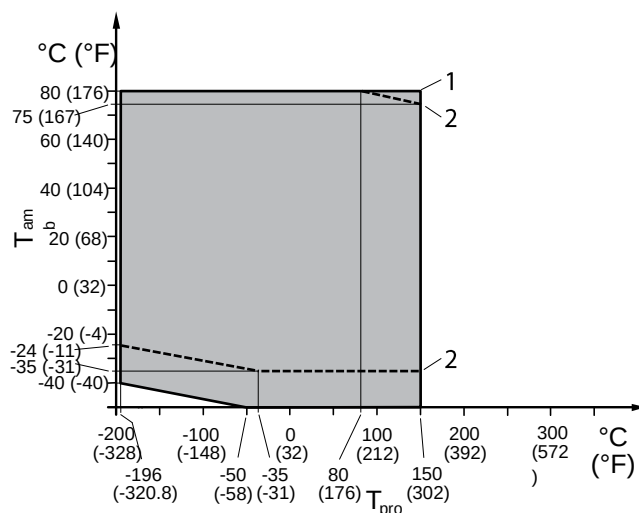


Fig. 4: Allowed process fluid and ambient temperatures, remote type

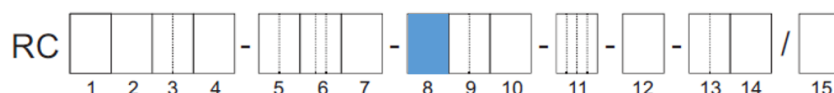
- 1 Standard cable option L_
- 2 Limitation for fire retardant cable option Y_

T_{amb} Ambient temperature
 T_{pro} Process fluid temperature

Temperature specification in hazardous areas

For the maximum ambient and process fluid temperatures for Remote Sensor with process fluid temperature range “Low” in Hazardous areas please see Addendum to Explosion Proof Type Manual IM 01U10X10-00_-R.

Ordering information and restrictions



Model code position	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	Description	Restriction
Process fluid temperature range								1							Low: -196 to 150 °C (-320.8 to 302 °F)	Please find all restrictions in the FlowConfigurator sizing software: www.FlowConfigurator.com

4. Measuring range and accuracy for gases

Model code pos.	Category	Model code	Description	Applicable Rotamass TI models	Applicable General Specifications
9	Mass flow and density accuracy	70	Gas: 0.75 % maximum mass flow deviation D_{flat} or D_0	Nano Prime Supreme	GS 01U10B01-00_ _-R GS 01U10B04-00_ _-R GS 01U10B02-00_ _-R
		50	Gas: 0.50 % maximum mass flow deviation D_{flat} or D_0	Intense Hygienic Giga	GS 01U10B05-00_ _-R GS 01U10B06-00_ _-R GS 01U10B03-00_ _-R
		30	Gas: 0.35 % maximum mass flow deviation D_{flat} or D_0	Prime Hygienic Giga	GS 01U10B04-00_ _-R GS 01U10B06-00_ _-R GS 01U10B03-00_ _-R

Mass flow and volume flow of gases

When using Rotamass for measuring the flow of gases, the flow rate is usually limited by the pressure loss generated and the maximum flow velocity.

Type of gas	Meter size	Maximum flow velocity
Natural gas, Methane	Nano 06, 08, 10, 15, 20 Prime 25, 40, 50, 80, 1H Hygienic 25, 40, 50, 80 Supreme 34, 36, 38, 39 Intense 34, 36, 38 Giga 1F	70 m/s
	Giga 2H	25 m/s

Mass flow accuracy for Rotamass Prime and Rotamass Hygienic

Above mass flow Q_{flat} , maximum deviation is constant and referred to as D_{flat} . It depends on the product version and can be found in the tables in chapter *Accuracy of mass flow and density according to the model*.

Use the following formulas to calculate the maximum deviation D:

$$\begin{array}{l}
 \boxed{Q_m \geq Q_{flat}} \quad \rightarrow \quad \boxed{D = D_{flat}} \\
 \\
 \boxed{Q_m < Q_{flat}} \quad \rightarrow \quad \boxed{D = \frac{a \times 100 \% }{Q_m} + b}
 \end{array}$$

D Maximum deviation in %
 D_{flat} Maximum deviation for high flow rates in %
a, b Constants

Q_m Mass flow in kg/h
 Q_{flat} Mass flow value above which D_{flat} applies, in kg/h

Meter size	Model code position 9	D _{flat} in %	Q _{flat} in kg/h	a in kg/h	b in %
Prime 25, Hygienic 25	30	0.35	80	0.036	0.3056
Prime 40, Hygienic 40	30	0.35	235	0.104	0.3056
Prime 50, Hygienic 50	30	0.35	1000	0.444	0.3056
Prime 80, Hygienic 80	30	0.35	2550	2.833	0.2389
Prime 1H	30	0.35	8500	9.444	0.2389

Mass flow accuracy for Rotamass Giga

Maximum deviation D is made up of zero point stability Z and accuracy D₀, resulting in the following formula:

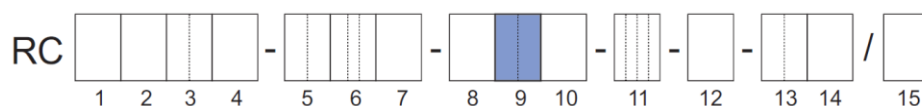
$$D = \frac{Z}{Q} \times 100 \% + D_0$$

D Maximum deviation in %
D₀ Accuracy

Q Mass flow in kg/h
Z Zero point stability

Accuracy of mass flow according to the model code

Accuracy for flow rate as well as density is selected via model code position 9. No accuracy for density measurement is specified for gas measurement devices.



For gases – transmitter U and N / Ultimate transmitter and Spare sensor without transmitter

Model code position 9	Maximum deviation D _{flat} for mass flow in %
30 ¹⁾	0.35

¹⁾ Notice: In case of a spare sensor combined with a transmitter in use, the original accuracy specification may be affected. For calibration services, please contact Yokogawa Service department.

Calibration conditions for gases

Specifications are determined based on evaluation at accredited ISO/IEC17025 calibration at following conditions:

Natural Gas at 20 °C and 16 barg and 50 barg.

All Rotamass are calibrated in accordance with state of the art at Rota Yokogawa.

Each Rotamass device comes with a standard calibration certificate.

Calibration takes place at reference conditions. Specific values are listed in the standard calibration certificate.

	Reference conditions
Fluid	Water
Density	0.9 – 1.1 kg/l (56 – 69 lb/ft³)
Fluid temperature	10 – 35 °C (50 – 95 °F) Average temperature: 22.5 °C (72.5 °F)
Ambient temperature	10 – 35 °C (50 – 95 °F)
Process pressure (absolute)	1 – 2 bar (15 – 29 psi)

The accuracy specified is achieved at as-delivered calibration conditions stated.

Ordering information and restrictions

RC

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5	6	7	

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8	9	10

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11	

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12

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13	14

 /

15

Model code position	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	Description	Restriction
Mass flow and density accuracy									30						Gas: 0.35 % maximum mass flow deviation D_{flat} or D_0	Please find all restrictions in the FlowConfigurator sizing software: www.FlowConfigurator.com

For Spare sensors (model code position 1: value N), the available mass flow and density accuracy for gases is model code 30.

5. Country-specific application

Model code pos.	Category	Model code	Description	Applicable Rotamass TI models	Applicable General Specifications
15	Country-specific application	CS	CRN (Canadian Registration Number)	Prime Supreme Intense Giga	GS 01U10B04-00_--R GS 01U10B02-00_--R GS 01U10B05-00_--R GS 01U10B03-00_--R
		QR2	Kazakhstan Pattern Approval mark and Primary verification, including certificate	Nano Prime Supreme Intense	GS 01U10B01-00_--R GS 01U10B04-00_--R GS 01U10B02-00_--R GS 01U10B05-00_--R
		QR3	Uzbekistan Pattern Approval and Primary verification	Hygienic Giga Spare Transmitter	GS 01U10B06-00_--R GS 01U10B03-00_--R GS 01U10B21-00_--R

Approvals

Canadian Registration Number

The Rotamass Total Insight is compliant to CSA standards and is registered with CRN in Canada. For allowed process connection sizes and types please refer to the FlowConfigurator: www.FlowConfigurator.com

Canadian Registration Numbers:

- Ontario 0F22137.5
- British Columbia 0F22137.51
- Alberta 0F22137.52
- Saskatchewan 0F22137.53
- Manitoba 0F22137.54
- Québec 0F22137.56
- 7 provinces 0F22137.59, 0F22137.58, 0F22137.57, 0F22137.50, 0F22137.5Y, 0F22137.5T, 0F22137.5N

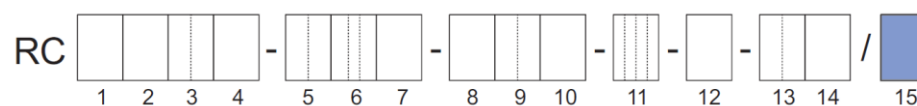
Metrological Regulations

Rotamass Total Insight is registered as a measuring instrument in the following countries:

- Kazakhstan
- Uzbekistan

Please contact your Yokogawa representative regarding respective “Pattern Approval Certificate of Measuring Instruments” and for export to these countries.

Ordering information and restrictions



Option category	Options	Description	Restriction
Country-specific application	CS	CRN (Canadian Registration Number)	Please find all restrictions in the FlowConfigurator sizing software: www.FlowConfigurator.com
	QR2 ¹⁾	Kazakhstan Pattern Approval mark and Primary verification, including certificate	
	QR3 ¹⁾	Uzbekistan Pattern Approval and Primary verification	

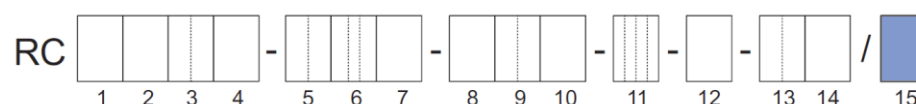
¹⁾ Primary Verification is not applicable to Rotamass TI Spare Transmitter

For Spare Transmitters RCU3_ options /QR2 and /QR3 are not available.

6. Adapter for cable entries

Model code pos.	Category	Model code	Description	Applicable Rotamass TI models	Applicable General Specifications
15	Adapter for cable entries	AD2	2 pcs ANSI 1/2" NPT to JIS G1/2 adapter	Nano Prime Supreme Intense Hygienic Giga Spare Transmitter	GS 01U10B01-00__-R GS 01U10B04-00__-R GS 01U10B02-00__-R GS 01U10B05-00__-R GS 01U10B06-00__-R GS 01U10B03-00__-R GS 01U10B21-00__-R

Ordering information and restrictions



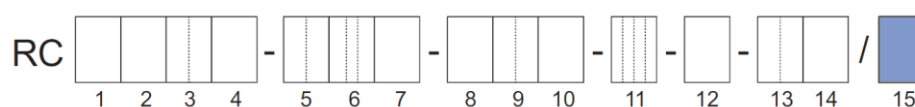
Option category	Options	Description	Restriction
Adapter for cable entries	AD2	2 pcs ANSI 1/2" NPT to JIS G1/2 adapter	Please find all restrictions in the FlowConfigurator sizing software: www.FlowConfigurator.com

For Spare sensors (model code position 1: value N), option /AD2 is not available.

7. Serial Number Combination

Model code pos.	Category	Model code	Description	Applicable Rotamass TI models	Applicable General Specifications
15	Serial Number Combination	SNC	Serial number bound replacement with same configuration and setting as replaced transmitter	Spare Transmitter RCUXNNN	GS 01U10B21-00__-R

Ordering information and restrictions



Option category	Options	Description	Restriction
Serial Number Combination	SNC	Serial number bound replacement with same configuration and setting as replaced transmitter	Not with RCU3__

Ordering Instruction

Specify the following information when ordering option /SNC for a Spare Transmitter RCUXNNN:

Serial number of the transmitter to be replaced.

8. Approvals and declarations of conformity

Description	Applicable Rotamass TI models	Applicable General Specifications
ECAS Ex approval for United Arab Emirates	Nano	GS 01U10B01-00__-R
	Prime	GS 01U10B04-00__-R
Ex approval for Ukraine	Supreme	GS 01U10B02-00__-R
	Intense	GS 01U10B05-00__-R
	Hygienic	GS 01U10B06-00__-R
EMC and LVD Regulations for Morocco	Giga	GS 01U10B03-00__-R
	Spare Transmitter	GS 01U10B21-00__-R

ECAS Ex approval for United Arab Emirates

Rotamass Total Insight is registered under the ECAS Ex scheme based on IECEx certification.

A device with IECEx approval (model code position 11, value: SF2_) must be ordered to comply with ECAS Ex requirements.

Certificate Number: 20-04-10410 / E20-04-000730

The certificate is included in the delivery.

Ex approval for Ukraine

Ex approval for Ukraine is based on ATEX certification.

Certificate Number: DEKRA 15ATEX0023 X

A device with ATEX approval (model code position 11, value: KF2_) must be ordered to comply with Ukraine Ex requirements.

EMC and LVD Regulations for Morocco

Rotamass Total Insight complies with the following provisions of the Moroccan Regulations:

2574-14 (EMC):

- NM EN 61326 1
- NM EN 61326 2 3
- NM EN 61326 2 5

2573-14 (LVD):

- NM EN 61010 1
- NM EN 61010 2 030