General Specifications

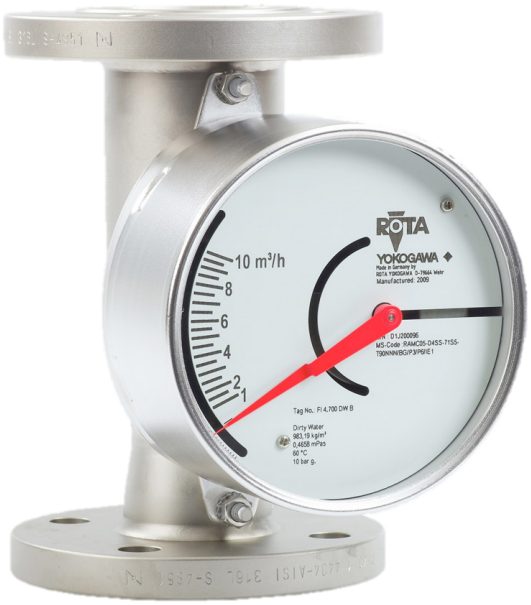
Model RAMC
Metal Short-stroke ROTAMETER

GS 01R01B02-00E-E

The short-tube Rotameter is used for measurement of flow rates of liquids and gases. Its special application is in turbulent, opaque or aggressive fluids. The instrument is mounted in a vertical pipeline with flow direction upwards. Inside the special shaped conical metal tube, a float is guided concentrically. The position of this float is magnetically transmitted to the indicator. The indicators are exchangeable without influencing the accuracy.

FEATURES

- Different process connections like flanges according to EN and ASME
- All wetted parts in stainless steel or PTFE
- Flow range water: 0.0025 to 130 m³/h
- Flow range air: 0.075 to 1400 m³/h (+20 °C, 1.013 bar abs)
- Measuring accuracy acc. standard VDI/VDE 3513 sheet 2 (q_G = 50 %) at calibration conditions
- Float damping to avoid float bouncing with gas applications
- Optional heat tracing (with steam or fluid heat carrier)
- Indicator in steel or aluminum, protection class IP66/67
- Mechanical indicator without additional power supply
- Microprocessor controlled transmitter with 24 V, 115 V or 230 V power supply
- Intrinsically safe version (Ex i): ATEX, IECEx, FM (C/US), NEPSI, PESO, EAC
- Flame proof version (Ex d): ATEX, IECEx, NEPSI, PESO, KOSHA, EAC, TS
- Dust explosion proof: ATEX, IECEx, NEPSI, TS
- Ex for non-electrical RAMC: ATEX, EAC
- FMEDA report available for SIL application
- Limit switches, also available as “fail-safe” version
- Electronic transmitter as standard with digital display with the following features:
  - Flow indication (totalizer, actual, percent)
  - Indication of different volume- and mass flow units
  - Possibility of user calibration in the field
  - Float blocking indication function
  - Adjustable signal output damping
  - Error message indication
  - Temperature measurement in the electronic transmitter
  - HART® 5/7-Communication



RAMC with housing type 90

RAMC with housing type 91

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STANDARD SPECIFICATIONS

RoHS Directive 2011/65/EU:
RoHS conform according to EN 50581

MEASURING TUBE

Materials of wetted parts:
- Stainless steel AISI 316L (1.4404)
- PTFE (if selected)
- Gasket for process connection R4 or T4: Aramide fibres with NBR binder
- Other materials on request

Fluids to be measured:
Clean liquids, gas and steam

Measuring range:
See table 10 and 11

Measuring turndown ratio:
10:1

Process connections/ Stainless steel:
Flanges:
- Acc. to EN 1092-1
  - DN100 to DN150 PN16
  - DN15 to DN100 PN40
  - DN50 to DN80 PN63
  - DN15 to DN50 PN100
- Acc. to ASME B 16.5 (AISI 316/316L dual certified)
  - ½" to 6" Class 150 raised face
  - ½" to 6" Class 300 raised face
  - ½" to 3" Class 600 raised face
- Flange facing roughness
  - Form B1: RA 3.2 to 6.3
  - Form B2: RA 0.8 to 3.2
  - ASME: RA 3.2 to 6.3
- Threaded connection:
  - Male acc. to DIN 11851
  - NPT-female
  - G-female
  - Clamp acc. to DN25, 1" to DN100, 4"

Process pressure:
Depends on process connection, see table 9 and 11
higher pressure (up to 700 bar) on request

Process temperature:
- Wetted parts made of stainless steel:
  -196 °C to +370 °C
- Wetted parts made of PTFE:
  -80 °C to +130 °C

See fig. 1a to fig. 1c

Measuring accuracy at calibration conditions:
Table 1

Material of wetted parts	**Size**	**Measuring accuracy** acc. standard VDI/VDE 3513 sheet 2 (q_G=50 %)
SS	DN15 to DN100	1.6 %
SS	DN125 to DN150	2.5 %
PTFE	DN15 to DN100	2.5 %

Calibration conditions:
Water, 1 to 2 bar, +15 °C to +25 °C

Pressure Equipment Directive (PED):
- Tubes:
  - Modul: H
  - Fluid Group: 1 (dangerous fluids)
  - Produced acc. to category: III
  - Classification: Table 6 of PED directive (piping)
- Heating (options /T1 to /T6):
  - Art. 4 section 3: (Volume < 1 L)
  - Fluid Group: 2 (non-dangerous fluids)
  - Classification: Table 2 of PED directive (vessels)

Installation:
- Mounting direction:
  vertical
- Flow direction:
  upwards
- Mounting length:
  see table 9 and 11
- Straight pipe inlet length:
  DN80/100 at least 5D, not necessary for smaller sizes

Weight:
See table 17

Canadian Registration Numbers (CRN)
Available upon request

MECHANICAL INDICATOR, type -T

Principle:
The flow values is indicated by a pointer with the aid of a magnet enclosed in the float and a magnet in the indicator unit which follows the movements of the float.

Indicator housing:
- Materials:
  - Housing type 90: stainless steel 1.4404/316L
  - Housing type 91: aluminum, Polyurethane, yellow, RAL 1021 acc. to EN 13195 material: AC 44200
  - Both housing types with safety-glass window
- Degree of protection:
  - IP66/67
  - NEMA 4, 4X, 6 (not for Ex d housing)

Scales:
- Standard:
  removable aluminium plate with scale
  (double scale as option)
- Marking:
  direct readable units or percentage of Qmax.

Transportation- and Storage condition:
-40 °C to +110 °C

ELECTRONIC TRANSMITTER, type -E, -H, -J

Standard type -E:
- **Power supply:**
  - 4-wire units with galvanic isolation:
    - 230 V AC +10 %/ -15 %, 50/60 Hz, fuse 0.063 A, time lag, (5x20) mm
    - 115 V AC +10 %/ -15 %, 50/60 Hz, fuse 0.125 A, time lag, (5x20) mm
  - 2/3-wire units: U = 14 to 30 V DC
- **Output signal:**
  - 4-wire units:
    - 0 to 20 mA
    - 4 to 20 mA
    - Pulse output (option /CP): max. frequency 4 Hz
  - 3-wire units:
    - 0 to 20 mA
    - 4 to 20 mA
  - 2-wire units: 4 to 20 mA

  The 20 mA point is selectable between 60 % and 100 % of scale end value.
- **Load resistance:**
  - 4-wire units: ≤ 500 Ω
  - 2/3-wire unit: ≤ (U - 14 V)/ 20 mA, max. 500 Ω

HART®-communication type (Code -H, -J):
- **Power supply:**
  2-wire units: U = 14 to 30 V DC
- **Output signal:**
  2-wire units: 4 to 20 mA
- **Load resistance:**
  HART®-version: 250 to 500 Ω

Digital display:
8 digits, 7 segment LC-display character height 6 mm
Process-/ Ambient temperature:
The dependency of the process temperature from the ambient temperature is shown in fig. 1a to fig. 1c.
The internal temperature of the electronic transmitter can be indicated on the display or checked via HART® communication.
Measurement of the internal transmitter temperature:
- Range: -25 °C to +70 °C
- Accuracy: ± 5 °C

Transportation- and Storage condition:
-40 °C to +70 °C
Linearity[1]:
± 0.2 % of 20 mA
Hysteresis[1]:
± 0.1 % of 20 mA
Repeatability[1]:
± 0.1 % of 20 mA
Influence of power supply[1]:
± 0.1 % of 20 mA
Temperature coefficient of the output signal[1]:
± 0.5 % /10 °C of 20 mA
AC-part of output signal[1]:
± 0.15 % of 20 mA
Long-term stability[1]:
± 0.2 % per year
Max. output signal:
21.5 mA
Output signal in case of failure:
≤ 3.6 mA (acc. NE 43)
Response time (99 %):
About 1.5 s with damping 1 s
Electromagnetic compatibility (EMC):
Acc. EN 61326-1, Class A, Table 2 and EN 61326-2-3: Criterion A, restriction: HF-immunity between 500 MHz and 750 MHz: criterion B

Device safety acc. EN 61010-1:
- Over voltage category: II (acc. to EN 60664-1)
- Pollution degree: I
- Safety class: 115 V, 230 V AC power supply, safety class I
  24V DC power supply, safety class III

POWER SUPPLY FOR ELECTRONIC TRANSMITTER, option /UT

Type:
Power supply with galvanically separated input and output; RN221N-B1, HART®-compatible
Supply voltage:
20 to 250 V DC/ AC 50/60 Hz
Maximum load:
700 Ω
Output signal:
4 to 20 mA

CABLE GLAND for transmitter -E, -H, -J

Size:
- Standard: M16x1.5 for housing type 90
- Standard: M20x1.5 for housing type 91
- Option /A13: thread M20x1.5
- Option /A5: thread NPT ½"

Cable diameter:
6 to 9 mm
Maximum cross section of core:
Ø 1.5 mm²

[1] referenced to 20 °C ambient temperature

LIMIT SWITCHES IN STANDARD VERSION, option /K1 to /K3

Type:
Inductive proximity switch SC3.5-N0
acc. to EN 60947-5-6
Nominal voltage:
8 V DC
Output signal:
≤ 1 mA or ≥ 3 mA

LIMIT SWITCHES IN FAIL-SAFE VERSION, option /K6 to /K10

Type:
Inductive proximity switch SJ3.5-SN; SJ3.5-S1N
acc. to EN 60947-5-6
Nominal voltage:
8 V DC
Output signal:
≤ 1 mA or ≥ 3 mA

HYSTERESIS OF LIMIT SWITCHES

Min-contact/ Max-contact:
- Pointer movement: ≈ 0.8 mm
- Float movement: ≈ 0.8 mm

Minimum distance between 2 contacts:
≈ 2 mm

CABLE GLAND, option /K1 to /K10

Size:
- Standard: M16x1.5 for housing type 90
- Standard: M20x1.5 for housing type 91
- Option /A13: thread M20x1.5
- Option /A5: thread NPT ½"

Cable diameter:
6 to 9 mm
Maximum cross section of core:
Ø 1.5 mm²

POWER SUPPLY FOR LIMIT SWITCHES, option /W□□

Type:
Acc. to EN 60947-5-6
- KFA5-SR2-Ex*-W (115 V AC); * = 1 or 2
- KFA6-SR2-Ex*-W (230 V AC); * = 1 or 2
- KFD2-SR2-Ex*-W (24 V DC); * = 1 or 2

Fail-safe
- KHA6-SH-Ex1 (115/230 V AC), 1 channel
- KFD2-SH-Ex1 (24 V DC), 1 channel

Power supply:
- 230 V AC ± 10 %, 45 to 65 Hz
- 115 V AC ± 10 %, 45 to 65 Hz
- 24 V DC ± 25 %

Relay output:
1 or 2 potential-free changeover contact(s)
Switching capacity:
Max. 250 V AC, max. 2 A

Note:
If fail-safe limit switch option /K6 or /K7 is ordered, for the power supply option /W2E or /W4E must be selected.
If fail-safe limit switch option /K8, /K9 or /K10 is ordered, for the power supply option /W2F or /W4F must be selected.

SWITCHING LEVELS FOR LIMIT SWITCHES

Table 2 Limit switch as Min, Max, Min-Max, Min-Min and Max-Max contact in standard version

		Option /K1	Option /K2	Option /K3
Function	Pointer	Signal	Signal	Signal
		SC3,5-N0	SC3,5-N0	SC3,5-N0
MAX	above LV	----	1 mA	1 mA
	below LV	----	3 mA	3 mA
Function	Pointer	Signal	Signal	Signal
		SC3,5-N0	SC3,5-N0	SC3,5-N0
MIN	above LV	3 mA	----	3 mA
	below LV	1 mA	----	1 mA
Note: LV = Limit Value				

Table 3 Limit switch as Min, Max and Min-Max contact in fail-safe version

		Option /K6	Option /K7	Option /K8
Function	Pointer	Signal	Signal	Signal
		SJ3,5-SN	SJ3,5-SN	SJ3,5-SN
MAX	above LV	----	1 mA	1 mA
	below LV	----	3 mA	3 mA
	fail-safe	----	1 mA	1 mA
Function	Pointer	Signal	Signal	Signal
		SJ3,5-SN	SJ3,5-SN	SJ3,5-SN
MIN	above LV	3 mA	----	3 mA
	below LV	1 mA	----	1 mA
	fail-safe	1 mA	----	1 mA
Note: LV = Limit Value				

Table 4 Limit switch as Min-Min contact in fail-safe version

		Option /K9
Function	Pointer	Signal
		SJ3,5-S1N
MIN	above LV	3 mA
	below LV	1 mA
	fail-safe	1 mA
Function	Pointer	Signal
		SJ3,5-SN
MIN	above LV	3 mA
	below LV	1 mA
	fail-safe	1 mA
Note: LV = Limit Value		

Table 5 Limit switch as Max-Max contact in fail-safe version

		Option /K10
Function	Pointer	Signal
		SJ3,5-SN
MAX	above LV	1 mA
	below LV	3 mA
	fail-safe	1 mA
Function	Pointer	Signal
		SJ3,5-S1N
MAX	above LV	1 mA
	below LV	3 mA
	fail-safe	1 mA
Note: LV = Limit Value		

FOLLOWING IEC 61508

RAMC with fail-safe limit switches (/K6 to /K10):
Suitable for application in safety functions up to and including SIL2.
RAMC with standard limit switches (/K1 to /K3):
Suitable for application in safety functions up to and including SIL1.
Details see FMEDA report.

FOLLOWING ISO 13849-1

Safety Metrics available for:
- RAMC with fail-safe limit switches (/K6 to /K10)
- RAMC with standard limit switches (/K1 to /K3)

Details see FMEDA report.

APPROVALS IN EAEU AND CIS COUNTRIES

Eurasian Conformity (EAC)

RAMC complies to applicable Technical Regulations valid in EAEU countries Russia, Belarus, Kazakhstan, Armenia and Kyrgyzstan, option /VE.
- TR CU 004
- TR CU 020
- TR CU 032
- TR CU 012 can be added for hazardous area applications (options /GF1, /GS1, /GC1).

Pattern Approval certificate of Measuring Instruments

RAMC has Pattern Approval certificates and is registered as a measuring instrument in Kazakhstan, Uzbekistan and Russia.
- Option /QR2 for Kazakhstan
- Option /QR3 for Uzbekistan
- Option /VR for Russia

An additional Primary verification certificate is available for Russia with option /QR, only in combination with option /VR.

HAZARDOUS AREA SPECIFICATIONS

Table 6 Overview hazardous area certified instruments:

Location	Europe				Global			USA / Canada	India	Korea	China		Russia, Belarus, Kazakhstan, Armenia, Kyrgyzstan		Taiwan
Certificate	**ATEX**				**IECEx**			**FM**	**PESO**	**KOSHA**	**NEPSI**		**EAC**		**TS**
Electronic transmitter, Code -E, -H, -J															
Protection	ia	ic	ia/tb	-	ia	-	ia/tb	IS/NI	ia	-	-		ia	-	-
Option	/KS1	/KS3	/KS2	-	/ES1	-	/ES2	/FS1	/KS1+/Q11	-	-		/GS1	-	-
Comments	-	2)	1)	-	-	-	1)	3)	-	-	-		-	-	-
See page	6	6	9	-	6	-	9	6	-	-	-		6	-	-
Limit switches															
Protection	ia	ic	ia/tb	-	ia	-	ia/tb	IS/NI	-	-	-		ia	-	-
Option	/KS1	/KS3	/KS2	-	/ES1	-	/ES2	/FS1	-	-	-		/GS1	-	-
Comments	-	2)	1)	-	-	-	1)	-	-	-	-		-	-	-
See page	7	7	9	-	7	-	9	7	-	-	-		7	-	-
Complete RAMC															
Protection	d/tb	-		-	db/tb	-		-	d	d	ia	d/DIP	d	-	d/tb
Option	/KF1	-		/KC1	/EF1	-		-	/KF1+/Q11	/EF1+/KC	/NS1	/NF1	/GF1	/GC1	/EF1
Comments	5)	-		6)	5)	-		-	5)	5)	-	5)	5)	6)	5)
See page	7	-		10	8	-		-	8	8	7	8	8	10	7
Power supplies for intrinsically safe components (see page 9)															
Option /UT	yes			-	-			-	-	-	-		-	-	-
Option /W1A,B	yes			-	yes			yes	yes	yes	no		yes	-	-
Option /W2A,B	yes			-	yes			yes	yes	yes	no		yes	-	-
Option /W4A,B	yes			-	yes			yes	yes	yes	yes		yes	-	-
Option /W2E,F	yes			-	yes			no	no	no	no		yes	-	-
Option /W4E,F	yes			-	yes			no	no	no	yes		yes	-	-

Notation	IS = Intrinsically Safe; NI = Nonincendive; DIP = Dust Ignition Proof
Comment 1)	Dust proof by RAMC housing
Comment 2)	For use in category 3G
Comment 3)	Same certification for USA and Canada
Comment 4)	Only for USA; power supply free selectable
Comment 5)	Only with housing 91
Comment 6)	Only indicator type -T without limit switches

HAZARDOUS AREA APPROVALS FOR ELECTRONIC TRANSMITTER, type -E, -H, -J

Attention:
The approvals for hazardous areas only apply to the defined conditions according to the temperature class. The maximum ambient temperature of the transmitter or limit switches must not be exceeded by the heat transfer of the liquid.

Table 7 Entity parameters of electronic transmitter

Option	Ui in V	Ii in mA	Pi in W	Ci in nF	Li in mH	max. Ta in °C
/KS1/2/3	30	101	1.4	4.16	0.15	70
/ES1/2	30	101	1.4	4.16	0.15	70
/FS1	30	100	1.4	40	0.15	70
/NS1	30	101	1.4	4.16	0.15	70
/GS1	30	101	1.4	4.16	0.15	70

Intrinsically safe electronic transmitter with ATEX-approval, option /KS1

Certificate:
PTB 12 ATEX 2003 X
Output signal:
- 4 to 20 mA (2-/3-wire unit)
- 0 to 20 mA (3-wire unit)

Explosion proof:
Ex ia IIC T6 Gb; group II; category 2G
Entity parameter:
See table 7

Intrinsically safe electronic transmitter with IECEx-approval, option /ES1

Certificate:
IECEx PTB 12.0020 X
Output signal:
- 4 to 20 mA (2-/3-wire unit)
- 0 to 20 mA (3-wire unit)

Explosion proof:
Ex ia IIC T6 Gb; group II; category 2G
Entity parameter:
See table 7

Intrinsically safe electronic transmitter with ATEX-approval for use in category 3G, option /KS3

Output signal:
- 4 to 20 mA (2-/3-wire unit)
- 0 to 20 mA (3-wire unit)

Explosion proof:
Ex ic IIC T6 Gc; group II; category 3G
Entity parameter:
See table 7

Intrinsically safe/ nonincendive electronic transmitter with FM-approval (USA + Canada), option /FS1

Certificate:
No.: 3027471-/3027471C
Output signal:
4 to 20 mA (2-wire unit)
Explosion proof:
- Intrinsically safe Cl. I, Div. 1, GP. A, B, C, D T6
- Intrinsically safe Cl. 1, Zone 0, AEx ia IIC T6
- Nonincendive Cl. I, Div. 2, GP. A, B, C, D T6

Entity parameter of electronic transmitter:
See table 7

Intrinsically safe electronic transmitter with PESO-approval (India), option /KS1 with /Q11

Same data as ATEX-certified type, option /KS1.
Certificate:
PESO Ref. No.: P3339351/1

Intrinsically safe electronic transmitter with EAC-approval Russia, Belarus, Kazakhstan, Armenia and Kyrgyzstan, option /GS1

Certificate:
RU C-DE.ГБО8.B.01183
Output signal:
- 4 to 20 mA (2-/3-wire unit);
- 0 to 20 mA (3-wire unit)

Explosion proof:
0ExiaIICT6 X
Entity parameter:
See table 7

HAZARDOUS AREA APPROVALS FOR INTRINSICALLY SAFE LIMIT SWITCHES, option /K1 to /K10

Intrinsically safe limit switches with ATEX-approval, option /K1 to /K10 with /KS1
Certificate:
- PTB 99 ATEX 2219X (SC3.5-NO), /K1 to /K3
- PTB 00 ATEX 2049X (SJ 3.5-S.N), /K6 to /K10

Explosion proof:
Ex ia IIC T6, group II category 2G
Entity parameter:
See certificate

Intrinsically safe limit switches with ATEX-approval for use in category 3G, option /K1 to /K10 with /KS3
Explosion proof:
Ex ic IIC T6 X, group II category 3G
Entity parameter:
- See specification of SC3,5-N0 Blue (P&F)* (/K1 to /K3)
- See specification of SJ3,5-SN (P&F)* (/K6 to /K10)

* P&F = Pepperl & Fuchs

Intrinsically safe limit switches with IECEx-approval, option /K1 to /K10 with /ES1
Certificate:
- IECEx PTB11.0091 (SC3.5-NO) (/K1 to /K3)
- IECEx PTB11.0092 (SJ 3.5-S.N) (/K6 to /K10)

Explosion proof:
Ex ia IIC T6 Gb
Entity parameter:
See certificate

Intrinsically safe/nonincendive limit switches with FM-approval (USA), option /K1 to /K10 with /FS1
Explosion proof:
- IS: Cl. I, II, III, Div. 1, Gp. ABCDEFG, T6, Ta = +60 °C,
- NI: Cl. I, Div. 2, Gp. ABCD, T5, Ta = +50 °C,
  Cl. II, Div. 1, Gp. EFG
  Cl. III, Div. 1

Entity parameter:
- See FM-control drawing 116-0165 for IS
- See FM-control drawing 116-0155 for NI

Intrinsically safe limit switches with EAC-approval Russia, Belarus, Kazakhstan, Armenia and Kyrgyzstan, option /K1 to /K10 with /GS1
Certificate:
RU C-DE.ГБО8.B.01183
Explosion proof:
0Ex ia IIC T6...T1 X
Entity parameter:
See certificate

Intrinsically safe limit switches with NEPSI-approval (China), option /K1 to /K10 with /NS1
Certificate:
- GYJ16.1391X (/K1 to /K3)
- GYJ16.1392X (/K6 to /K10)

HAZARDOUS AREA APPROVALS FOR COMPLETE ELECTRICAL RAMC

Intrinsically safe RAMC with NEPSI-approval (China), option /NS1
Certificate:
GYJ15.1064
Electronic transmitter:
- Output signal:
  - 4 to 20 mA (2-/3-wire unit);
  - 0 to 20 mA (3-wire unit)
- Explosion proof: Ex ia IIC T6

Ambient temperature:
-40 °C to +70 °C
Entity parameter:
See table 7
Limit switches:
- Option /K1 to /K3 acc. to certificate GYJ16.1391X
- Option /K6 to /K10 acc. to certificate GYJ16.1392X

Flame proof and dust proof RAMC with ATEX-approval, option /KF1
Certificate:
IBExU 05 ATEX 1086
Flame proof:
Ex db IIC T1...T6 Gb; group II; category 2G
Dust proof:
Ex tb IIIC TX Db IP6X; group III; category 2D
Max. surface temperature TX: corresp. process temperature
Housing:
Painted aluminium casting, type 91
Output signal with electronic transmitter -E, -H, -J:
- 4 to 20 mA (2-/3-wire unit);
- 0 to 20 mA (3-wire unit)

Power supply with electronic transmitter -E, -H, -J:
2- or 3-wire unit
Limit switches:
Options /K1 to /K10 possible
Ambient temperature:
-20 °C to +60 °C
Minimum process temperature:
-20 °C
Threads for cable glands:
- Standard: M20x1.5
- Option /A5: NPT ½"

Temperature classification:
See table 8

Flame proof and dust proof RAMC with IECEx-approval, option /EF1
Certificate:
IECEx IBE12.0007
Flame proof:
Ex db IIC T1...T6 Gb
Dust proof:
Ex tb IIIC TX Db IP6X
Max. surface temperature TX: corresp. process temperature
Housing:
Painted aluminium casting, type 91
Output signal (with electronic transmitter -E, -H, -J):
- 4 to 20 mA (2- or 3-wire unit);
- 0 to 20 mA (3-wire unit)

Power supply (with electronic transmitter -E, -H, -J):
2- or 3-wire unit
Limit switches:
Options /K1 to /K10 possible
Ambient temperature:
-20 °C to +60 °C
Minimum process temperature:
-20 °C

Threads for cable glands:
- Standard: M20x1.5
- Option /A5: NPT ½"

Temperature classification:
See table 8

Flame proof and dust proof RAMC with PESO-approval (India), option /KF1 with /Q11

Same data as ATEX-certified certified type, option /KF1.

Certificate:
PESO Ref. No.: P432024/1

Flame proof RAMC with KOSHA-approval (Korea), option /EF1 with /KC

Certificate:
12-AV4BO-0721X

Flame proof:
Ex d IIC T1...T6
Option /EF1 in combination with /KC must be selected.

Temperature classification:
See table 8

Flame proof RAMC with EAC-approval (Russia, Belarus, Kazakhstan, Armenia and Kyrgyzstan), option /GF1

Certificate:
RU C-DE.ГБО8.B.01183

Flame proof:
1Ex d IIC T1...T6

Housing:
Painted aluminium casting, type 91

Output signal with electronic transmitter -E, -H, -J:
- 4 to 20 mA (2-/3-wire unit)
- 0 to 20 mA(3-wire unit)

Power supply with electronic transmitter -E, -H, -J:
2- or 3-wire unit

Limit switches:
Options /K1 to /K10 possible

Ambient temperature:
-40 °C to +60 °C

Minimum process temperature:
-20 °C

Threads for cable glands:
- Standard: M20x1.5
- Option /A5: NPT ½"

Temperature classification:
See table 8

Flame proof and dust proof RAMC with NEPSI-approval (China), option /NF1

Certificate:
GYJ18.1039X

Flame proof:
Ex d IIC T1~T6 Gb

Dust proof:
Ex tD A21 IP67 T80°C

Housing:
Painted aluminium casting type 91

Output signal with electronic transmitter -E, -H, -J:
- 4 to 20 mA (2-/3-wire unit)
- 0 to 20 mA (3-wire unit)

Power supply with electronic transmitter -E, -H, -J:
2- or 3-wire unit

Limit switches:
Options /K1 to /K10 possible

Ambient temperature:
-20 °C to +60 °C

Minimum process temperature:
-20 °C

Threads for cable glands:
- Standard: M20x1.5
- Option /A5: NPT ½"

Temperature classification:
See table 8

Flame proof and dust proof RAMC with Taiwan Safety Mark

Registration Document:
ML041200702782

Option /EF1 must be selected.
Same data as IECEx-certifiied type (/EF1)
For export to Taiwan please contact your Yokogawa representative regarding Taiwan Safety Mark.

Table 8 Temperatur rating for Ex d devices

Temp. class	Max. Process temperature		
	No extension	On extension	On extension with insulation
T6	85 °C	85 °C	85 °C
T5	100 °C	100 °C	100 °C
T4	120 °C	135 °C	135 °C
T3	120 °C	200 °C	200 °C
T2	120 °C	300 °C	300 °C
T1	120 °C	370 °C	350 °C

INTRINSICALLY SAFE COMPONENTS WITH DUST-PROOF

Intrinsically safe electronic transmitter with/without limit switches in dust proof indicator ATEX-certified, option /KS2

Approval:
- PTB 12 ATEX2003X (Intrinsically safe electronic transmitter)
- PTB 99 ATEX2219X (Intrinsically safe limit switch SC3.5-N0)
- PTB 00 ATEX2049X (Intrinsically safe limit switch SJ 3.5-S.N)
- IBExU 05 ATEX1086 (Dust proof)

Output signal electronic transmitter:
- 4 to 20 mA (2-/3-wire unit)
- 0 to 20 mA (3-wire unit)

Explosion proof:
Ex ia IIC T6 Gb; group II; category 2G

Dust proof:
Ex tb IIIC TX Db IP6X; group III; category 2D
Max. surface temperature TX: corresponding process temperature

Entity parameter:
- See table 7 for electronic transmitter (/KS1)
- See certificates for limit switches

Housing:
Painted aluminium casting, type 91

Ambient temperature:
-20 °C to +60 °C

Minimum process temperature:
-20 °C

Threads for cable glands:
- Standard: M20x1.5
- Option /A5: NPT ½"

Intrinsically safe electronic transmitter with/without limit switches in dust proof indicator IECEx-certified, option /ES2

Approval:
- IECEx PTB12.0020X (Intrinsically safe electronic transmitter)
- IECEx PTB11.0091X (Intrinsically safe limit switch SC3.5-N0)
- IECEx PTB11.0092X (Intrinsically safe limit switch SJ 3.5-S.N)
- IECEx IBE12.0007 (Dust proof)

Output signal electronic transmitter:
- 4 to 20 mA (2-/3-wire unit)
- 0 to 20 mA (3-wire unit)

Explosion proof:
Ex ia IIC T6 Gb; group II; category 2G

Dust proof:
Ex tb IIIC TX Db IP6X; group II; category 2D
Max. surface temperature TX: corresponding process temperature

Entity parameter:
- See table 7 for electronic transmitter (/ES1)
- See certificates for limit switches

Housing:
Painted aluminium casting, type 91

Ambient temperature:
-20 °C to +60 °C

Minimum process temperature:
-20 °C

Threads for cable glands:
- Standard: M20x1.5
- Option /A5: NPT ½"

POWER SUPPLIES FOR INTRINSICALLY SAFE COMPONENTS

Power Supply for the intrinsically safe electronic transmitter, option /UT

Type:
Power supply with galvanically separated input and output RN221N-B1, HART®-compatible

Approval:
- ATEX: PTB 00 ATEX 2018
- Other certificates available on request.

Supply voltage:
20 to 250 V DC/AC 50/60 Hz

Maximum load impedance:
700 Ω

Output signal:
4 to 20 mA

Control circuit:
Intrinsically safe [Ex ia] IIC; group II; category (1)GD

Entity parameters:
See certificate

Power supply for intrinsically safe limit switches, option W□□

Type:
Acc. to EN 60947-5-6:
- KFA5-SR2-Ex*-W (115 V AC), * = 1 or 2
- KFA6-SR2-Ex*-W (230 V AC), * = 1 or 2
- KFD2-SR2-Ex*-W (24 V DC), * = 1 or 2

Fail-safe:
- KHA6-SH-Ex1 (115/230 V AC), fail-safe, 1 channel
- KFD2-SH-Ex1 (24 V DC), fail-safe, 1 channel

Approvals:
- KFA5-SR2-Ex*-W: ATEX: PTB 00 ATEX 2081
  FM: ID 3011578
  IECEx: PTB11.0031
  EAC: RU C-П.ГБ05.В.00718
  NEPSI:GYJ17.1283
- KFA6-SR2-Ex*-W: ATEX: PTB 00 ATEX 2081
  FM: ID 3011578
  IECEx: PTB11.0031
  EAC: RU C-П.ГБ05.В.00718
  NEPSI:GYJ17.1283
- KHA6-SH-Ex1: ATEX: PTB 00 ATEX 2043
  EAC: RU C-П.ГБ05.В.00718
- KFD2-SR2-Ex*-W: ATEX: PTB 00 ATEX 2080
  FM: ID 3011578
  IECEx: PTB11.0034
  EAC: RU C-П.ГБ05.В.00718
  NEPSI:GYJ17.1284
- KFD2-SH-Ex1: ATEX: PTB 00 ATEX 2042
  EAC: RU C-П.ГБ05.В.00718

Control circuit (ATEX):
[Ex ia] IIC; group II; category (1)GD

Entity parameter:
See certificate

HAZARDOUS AREA APPROVALS FOR COMPLETE MECHANICAL RAMC

ATEX registrated RAMC, option /KC1

Archive No.:
IBExU 099/15
Explosion proof:
II 2GD IIC TX
Max. surface temperature:
TX: corresponding process temperature
Ambient temperature:
-40 °C to +90 °C
Max. process temperature
- Standard: +220 °C
- Indicator on distance: +370 °C

RAMC with EAC-approval, option /GC1

Approval:
RU C-DE.ГБО8.B.01183
Explosion proof:
- II Gb IIC T* X
- III Db IIIC T* °C X

Max. surface temperature:
TX: corresponding process temperature
Ambient temperature:
-40 °C to +90 °C
Max. process temperature:
- Standard: +220 °C
- Indicator on distance: +370 °C

PLANNING AND INSTALLATION HINTS

- The user is responsible for the use of the flowmeters regarding suitability and use as designed.
- The actual operation pressure must be lower as the specified pressure limits of the Rotameter.
- Make sure that the wetted parts are resistant against the process fluid.
- Ambient- and process temperature must be lower than the specified maximum values.
- If dirt accumulation is to be expected, we recommend installing a bypass pipe.
- To avoid float bouncing in case of gas application notice the recommendations of VDI/VDE 3513 Sheet 3.
- To avoid mutual magnetic influence in case of parallel design of several Rotameters please make sure that the distance between the tube middle axes is at least 300 mm. The distance to other ferric materials should be at least 250 mm.
- Avoid static magnetic fields next to the Rotameter.

Specify the following when ordering:
- Model, suffix code and option code
- Fluid name, process temperature, fluid density, process pressure, fluid viscosity
- For gases: condition of the scale (st. or actual)
- Options: Tag No.: customer specific notes

For your special application please use the Yokogawa Sizing Software FlowConfigurator.

MODEL SPECIFICATIONS

Model	Suffix code	Description	Restrictions
RAMC01		Size DN15 (½")	for D4, D6, A1, A2, A3, T4, R4, T6, G6
RAMC23		Size DN20 (¾")	for D4, D6, A1, A2, A3, T4, R4, T6, G6
RAMC02		Size DN25 (1")	for D4, D6, A1, A2, A3, S2, S4, S5, T4, R4, T6, G6
RAMC03		Size DN32 (1¼")	for D4, D6, A1, A2, A3, S4, T6, G6
RAMC04		Size DN40 (1½")	for D4, D6, A1, A2, A3, S4, S5, T6, G6
RAMC05		Size DN50 (2")	for D4, D5, D6, A1, A2, A3, S2, S4,T4, R4
RAMC06		Size DN65 (2½")	for D4, D5, A1, A2, A3, S2, S4, T4, R4, T6, G6
RAMC08		Size DN80 (3")	for D4, D5, A1, A2, A3, S2, S4
RAMC09		Size 3½"	for A1, A2
RAMC10		Size DN100 (4")	for D2, D4, A1, A2, S2, S4
RAMC12		Size DN125 (5")	for D2, A1, A2, S2
RAMC15		Size DN150 (6")	for D2, A1, A2
RAMCNN		Without measuring tube	
Process connection	-D2	EN flange PN16, process connection dimension + facing acc. to EN 1092-1 Form B1	
	-D4	EN flange PN40, process connection dimension + facing acc. to EN 1092-1 Form B1	
	-D5	EN flange PN63, process connection dimension + facing acc. to EN 1092-1 Form B1	
	-D6	EN flange PN100, process connection dimension + facing acc. to EN 1092-1 Form B1	
	-A1	ASME flange class 150, process connection dimension + facing acc. to ASME B 16.5	
	-A2	ASME flange class 300, process connection dimension + facing acc. to ASME B 16.5	
	-A3	ASME flange class 600, process connection dimension + facing acc. to ASME B 16.5	
	-T6	NPT PN40 female thread	
	-G6	G PN40 female thread	
	-R4	Rp removable female thread	
	-S2	Thread acc. to DIN 11851	
	-S4	TRI-CLAMP® PN10, PN16 acc. to DIN 32676	
	-T4	NPT removable female thread	
	-S5	Rosista flange PN10	
	-NN	Without process connection	
Material of wetted parts	SS	Stainless steel	
	PF	Teflon lining	
	NN	Without wetted parts	Only with RAMCNN
Cone/Float	-nnnn	See tables 10 and 11	
	-NNNN	Without measuring tube/without float	Only with RAMCNN
Indicator/Transmitter	-T	Mechanical indicator	
	-E	Indicator with transmitter	
	-H	Indicator with transmitter, HART® 5	Only with output 424
		(includes Software Tag HART® 5)	8 digits for tag; 24 digits for long tag;
	-J	Indicator with transmitter, HART® 7	Only with output 424
		(includes Software Tag HART® 7)	8 digits for tag; 32 digits for long tag;
	-N	Without indicator	Only with housing NN
Housing type	90	Housing SS	
	91	Housing Al, yellow painted	
	NN	Without housing	Only with indicator -N
Power supply/Output	240	230 V AC; 4-wire; 0 to 20 mA	Only with indicator -E; not with limit switches
	244	230 V AC; 4-wire; 4 to 20 mA	Only with indicator -E; not with limit switches
	140	115 V AC; 4-wire; 0 to 20 mA	Only with indicator -E; not with limit switches
	144	115 V AC; 4-wire; 4 to 20 mA	Only with indicator -E; not with limit switches
	430	24 V DC; 3-wire; 0 to 20 mA	Only with indicator -E
	434	24 V DC; 3-wire; 4 to 20 mA	Only with indicator -E
	424	24 V DC; 2-wire; 4 to 20 mA	Only with indicator -E, -H, -J
	NNN	Without power supply	Only with indicator -T or -N

OPTIONS

Options	Code	Description	Restriction
Indicator	/A5	Thread for cable gland ASME NPT ½" female	Not with /A13
	/A12	US-engineering units	Only for indicator -E and -H; not with -J because already available as standard
	/A13	Thread for cable gland ISO M20x1.5 female	Only for housing 90
	/A16	Indicator on 95 mm extension	Only for housing 90, 91
	/A20	Scale for type T66	Not with hazardous approval type; not with indicator
	/A21	Scale and EEPROM for type E66, H66, G66	Not with hazardous approval type not with indicator; not with /A16
	/A22	Scale for type T90, T91	Not with hazardous approval type; not with indicator
	/A23	Scale and EEPROM for type E90, H90, G90, J90, E91 H91, G91, J91	Not with hazardous approval type; not with indicator; not with /A16
	/A25	Pressure balance element	Not with /KS2, /ES2, /KF1, /EF1, /NF1, /GF1 and housing 91 with /A5 or /A13
	/A26	Indicator for -40 °C ambient temperature	Not with /K1, /K2, /K3, /K9, /K10, /KF1, /EF1, /NF1, /KS2, /ES2, power supply 14□ + 24□; /FS1
Marking	/B0	Tag plate (1.4404/316L) on flange and marking on scale	Plate 9x40 mm; max. 45 digits
	/B1	Tag plate (1.4404/316L) fixed by wire and marking on scale	Plate 9x40 mm; max. 45 digits
	/B4	Neutral version	Not with hazardous approval type
	/B8	Customer provided marking on label	
	/B10	Percent scale	
	/BG	Customer specific notes on scale	Max. 45 digits
	/BD	Dual scale	Adjustment only for the first mentioned fluid
Limit switches	/K1	MIN-contact	Not for power supply 14□ + 24□
	/K2	MAX-contact	Not for power supply 14□ + 24□
	/K3	MIN-MAX-contact, MIN-MIN-contact, MAX-MAX-contact	Not for power supply 14□ + 24□
	/K6	MIN-contact “fail-safe” version	Not for power supply 14□ + 24□
	/K7	MAX-contact “fail-safe” version	Not for power supply 14□ + 24□
	/K8	MIN-MAX-contact “fail-safe” version	Not for power supply 14□ + 24□
	/K9	MIN-MIN-contact “fail-safe” version	Not for power supply 14□ + 24□
	/K10	MAX-MAX-contact “fail-safe” version	Not for power supply 14□ + 24□
Pulse output	/CP	Pulse output isolated	Only for power supply 140, 144, 240, 244; not with limit switches
Flange Facing	/D10	Form B2 acc. to EN 1092-1	Only for EN-flanges (D2, D4)
	/D11	Form D acc. to EN 1092-1	Only for EN-flanges (D2, D4)
Damping	/SD	Float damping system	Only for SS; not for cone 81, 82; only for gas application
Flange protection	/QK	Flange covers	Only for flanges A1, A2, A3, D2, D4, D5, D6
Heat tracing	/T1	Heat trace connection female thread G ¼" PN40	Heating is only for metallic instruments "SS" available
	/T2	Heat trace connection EN flange DN15 PN40 Form B1	Heating is only for metallic instruments "SS" available
	/T3	Heat trace connection EN flange DN25 PN40 Form B1	Heating is only for metallic instruments "SS" available
	/T4	Heat trace connection ASME flange ½" Class 150RF	Heating is only for metallic instruments "SS" available
	/T5	Heat trace connection ASME flange 1" Class 150 RF	Heating is only for metallic instruments "SS" available
	/T6	Heat trace connection female thread NPT ¼" PN40	Heating is only for metallic instruments "SS" available
Housing Coating	/X1	Single layer epoxy coating system for housing type 91; Cover green RAL 6001, Bottom green RAL 6001	Not for housing 90; not with /KC1 or /GC1
	/X2	High Anti Corrosion coating (3 layers) for housing type 91; /A16 will also be coated; Cover yellow RAL 1021, Bottom white RAL 9001	Not for housing 90; not with /KC1 or /GC1
Power supply for electronic transmitter	/UT	RN221N-B1, 20 to 250 V DC/AC, Ex i, HART® compatible	Only for indicator -E, -H, -J, only ATEX or standard, only for output 424
Power supply for limit switches (transmitter relay)	/W1A	KFA5-SR2-Ex1.W/ 115 V AC, 1 channel	Only for limit switches /K1, /K2, /K3
	/W1B	KFA5-SR2-Ex2.W/ 115 V AC, 2 channel	Only for limit switches /K1, /K2, /K3
	/W2A	KFA6-SR2-Ex1.W/ 230 V AC, 1 channel	Only for limit switches /K1, /K2, /K3
	/W2B	KFA6-SR2-Ex2.W/ 230 V AC, 2 channel	Only for limit switches /K1, /K2, /K3
	/W2E	KHA6-SH-Ex1/ 115/230 V AC, 1 channel, fail-safe	Only for limit switches /K6, /K7
	/W2F	2x KHA6-SH-Ex1/ 115/230 V AC, 1 channel, fail-safe	Only for limit switches /K8, /K9, /K10
	/W4A	KFD2-SR2-Ex1.W/ 24 V DC, 1 channel	Only for limit switches /K1, /K2, /K3
	/W4B	KFD2-SR2-Ex2.W/ 24 V DC, 2 channel	Only for limit switches /K1, /K2, /K3
	/W4E	KFD2-SH-Ex1/ 24 V DC, 1 channel, fail-safe	Only for limit switches /K6, /K7
	/W4F	2x KFD2-SH-Ex1/ 24 V DC, 1 channel, fail-safe	Only for limit switches K8, /K9, /K10

Options	Code	Description	Restriction
Test and certificates	/H1	Oil + fatfree for wetted surfaces acc. to ASTM G93-03 level B	
	/P2	Certificate of compliance with the order acc. to EN 10204-2.1	
	/P3	Similar to /P2 + Test report acc. to EN 10204-2.2	
	/P6	Material certificate acc. to EN 10204-3.1	Only for metallic pressurized parts
	/PM3	PAMI test (3 points: Process connection inlet, measuring tube, process connection outlet)	
	/PP	Pressure test report flow tube acc. to EN 12266-1	
	/PT	Flow table for conversion to other fluids	
	/P9	Dye penetration test acc. to EN ISO 3452-1 at the welding of the process connection, with certificate	Not for connection RAMC01-T6SS-□ □ S0-…, RAMC01-G6SS-□ □ S0-…; not for /T□; not with /P15 or /P16
	/P10	Combination of /P3 + /P6 + /PP	See individual options
	/P11	Combination of /P3 + /P6 + /PM3	See individual options
	/P12	Combination of /P3 + /P6 + /P9 + /PP	See individual options; not with /P15 or /P16
	/P13	Combination of /P3 + /P6 + /P9 + /PM3 + /PP + /WP	See individual options; not with /P15 or /P16
	/P14	Dye penetrant test of flange welding acc. to ASME V	Only for SS wetted part material; not for connection RAMC01-T6SS-□ □ S0-…, RAMC01-G6SS-□ □ S0-…; not for /T□
	/P15	ASME B31.3 compliance NORMAL FLUID SERVICE	Only RAMC□-A1SS, RAMC□-A2SS, RAMC□-A3SS; not for /T□
	/P16	ASME B31.3 compliance Category M FLUID SERVICE	Only RAMC□-A1SS, RAMC□-A2SS, RAMC□-A3SS; not for /T□; only with /RTA or /P20
	/P20	Combination of ASME package /P14, /WPA, /RTA	See individual options; only with /P15 or /P16
	/WP	Welding documentation acc. to ISO 3834-2	Not for /T□; not with /P15 or /P16
	/WPA	Welding and certificates acc. to ASME BPVC, IX,	
	/RTA	X-ray test acc. to ASME BPVC V	
Hazardous area approvals	/KS1	ATEX intrinsically safe “ia”	Only for power supply 424, 430, 434, 429; for indicator -T Only with limit switches
	/KS2	ATEX intrinsically safe “ia” + dust proof “tb”	Only for power supply 424, 430, 434; for indicator -T only with limit switches; only for housing 91
	/KS3	ATEX intrinsically safe “ic” for use in category 3G	Only for power supply 424, 430, 434; for indicator -T only with limit switches
	/ES1	IECEx intrinsically safe “ia”	Only for power supply 424, 430, 434; for indicator -T only with limit switches
	/ES2	IECEx intrinsically safe “ia” + dust proof “tb”	Only for power supply 424, 430, 434; for indicator -T only with limit switches; only for housing 91
	/FS1	FM intrinsically safe/ nonincendive electr. transmitter (USA/ Canada), FM intrinsically safe/ nonincendive limit switches (USA)	Only for power supply 424 (electronic transmitter); for indicator -T only with limit switches
	/NS1	NEPSI intrinsically safe approval (China)	Only for power supply 424, 430, 434; for indicator -T only with limit switches; not with indicator -J; only with /CN
	/GS1	EAC intrinsically safe “ia”	Only for power supply 424, 430, 434; only with /VE or /VR; for indicator -T only with limit switches
	/KF1	ATEX flame proof “d”/ dust proof “tb”	Only for power supply 424, 430, 434; for indicator -T only with limit switches; only with housing 91
	/EF1	IECEx flame proof “d” / dust proof “tb” in combination with /KC: KOSHA flame proof “d” (Korea)	Only for power supply 424, 430, 434; for indicator -T only with limit switches; only with housing 91; only in combination with /KC
	/NF1	NEPSI flame proof “d”/ dust proof approval (China)	Only for power supply 424, 430, 434; for indicator -T only with limit switches; only for housing 91; only with /CN
	/GF1	EAC flame proof “d”	Only for power supply 424, 430, 434; for indicator -T only with limit switches; only for housing 91; only with /VE or /VR
	/KC1	ATEX non-electrical type	Only for indicator -T without limit switches
	/GC1	EAC non-electrical type	Only for indicator -T without limit switches; only with /VE or /VR
	/Q11	PESO intrinsically safe “ia“ or PESO flame proof “d”	Only with option /KS1 or /KF1
Country-specific delivery	/VE	EAC-mark for EAEU countries	Not with /Q11
	/VR	EAC-mark and Pattern Approval marking for Russia	Not with /Q11
	/KC	KC-mark for Korea	Not with /Q11; for explosion proof see /EF1
	/CN	China RoHS mark	Not with /Q11
Country-specific application	/QR	Primary verification certificate valid in Russia	Only with /VR
	/QR2	Primary verification certificate and Pattern Approval valid in Kazakhstan	see page 4, only with /VE
	/QR3	Primary verification certificate and Pattern Approval valid in Uzbekistan	

Options	Code	Description	Restriction
User's Manuals	/IEn /IDn	Quantity of instruction manuals in English Quantity of instruction manuals in German	n = 1 to 9 selectable*) n = 1 to 9 selectable*)
Special order	/Z	Special design must be specified separately. If /Z is selected, several Suffix of Model-Suffix Code can be changed to Z.	
*) If no User's Manual is selected, only a DVD with User's Manuals is shipped with the flowmeter.			

PROCESS CONNECTION TABLE FOR METAL TUBES

Table 9

Pos.	EN-Flange incl. option /D10 & /D11										ASME-Flange RF										Male thread		Clamp			Female thread			Female thread			Flange			Measuring tube/ Float combination
	Form B1					Form B2					Class 150			Class 300			Class 600				DIN11851		Clamp			NPT/ Rp			NPT/ G			Rosista			
	Code	L[1]	Code	L[1]		Code	L[1]	Code	L[1]		Code	L[1]		Code	L[1]		Code	L[1]			Code	L[1]	Code	L[1]		Code	L[1]		Code	L[1]		Code	L[1]		Code
	D2	in mm	D4	in mm		D5	in mm	D6	in mm		A1	in mm		A2	in mm		A3	in mm			S2	in mm	S4	in mm		T4/R4	in mm		T6/G6	in mm		S5	in mm		
1	-	-	DN15	250		-	-	DN15	250		½"	250		½"	250		½"	250			DN25 PN40	275	DN25, 1" DN32 DN40, 1½" PN16	250		½" ¾" PN25	295		½" PN40	295		DN25 PN10	250		43 S0 44 S0 47 S0 51 S0
			DN20					DN20	260		¾"			¾"			¾"																	
			DN25					DN25			1"			1"			1"	260																	
			DN32					-	-		-			-			-	-																	
			DN40					-	-		-			-			-	-																	
			DN50					-	-		-			-			-	-																	
2	-	-	DN15	250		-	-	DN15	250		½"	250		½"	250		½"	250			DN25 PN40	275	DN25, 1" DN32 DN40, 1½" PN16	250		½" ¾" PN25	295		¾" 1" PN40	295		DN25 PN10	250		53 L1; 53 M1 53 S1; 54 L1 54 M1; 54 S1 57 L1; 57 M1 57 S1; 61 L1 61 M1; 61 S1 62 L1; 62 M1 62 V1
			DN20					DN20	260		¾"			¾"			¾"																	
			DN25					DN25			1"			1"			1"	260																	
			DN32					-	-		1¼"			1¼"			1¼"	-																	
			DN40					-	-		1½"			1½"			1½"	280																	
			DN50					-	-		2"			2"			2"	-																	
3	-	-	DN25	250		-	-	DN25	270		1"	250		1"	250		1"	270			DN50 PN25	275	DN50, 2" PN16	250		1"	310		1¼" 1½"	310		DN25 DN40 PN10	250		63 L2; 64 L2 63 M2; 64 M2 63 S2; 64 S2 64 V2
			DN32					DN32			1¼"			1¼"			1¼"									PN16			PN40					
			DN40					DN40			1½"			1½"			1½"																	
			DN50					DN50	280		2"			2"			2"																	
4	-	-	DN50	250		DN50	260	-	-		2"	250		2"	250		2"	280			DN65 DN80	275	DN65, 3" PN10	300		2" 2½" PN10	325		2½" PN40	325		-	-		67 L5; 67 M5 67 S5; 71 L5 71 M5; 71 S5 72 L5; 72 M5 72 S5; 72V5
			DN65			DN65	270				2½"			2½"	260		2½"	280																
			DN80			DN80					3"			3"			3"	290																
	DN100	250	DN100			-	-				-	-		-	-		-	-			PN25													
	-	-	DN80	250 [3]		DN80	270				3"			3"	260																			
			-	-							3½"			3½"																				
5	DN100		DN100	250 [3]		-	-	-	-		4"	250 [3]		4"	270		-	-			DN100 PN25	300	DN100, 4" PN10	250									-	-		73 L8; 73 V8 74 L8; 74 V8 77 L8; 77 V8
	DN125 [2]	250									5" [2]			5" [2]	280																			
	DN50 [2]		-	-							6" [2]	260		6" [2]																				
6	DN100	250	DN100	250 [3]		-	-	-	-		4"	250 [3]		4"	270		-	-			DN125 PN16	300	-	-									-	-		81 11 82 11
	DN25 [2]										5" [2]			5" [2]	280																			
	DN150 [2]		-	-							6"	260		6" [2]																				

[1] L = face to face length
[2] Accuracy 2.5 % instead of 1.6 % (q_G= 50 %)
[3] Only with option /A16 available

FLOW TABLES FOR METAL TUBES

Table 10

Pos.	Measuring range for water and liquids										Measuring range for air and gases									
	Recommended combination					Alternative combination					Recommended combination							Alternative combination		
	Max. flow		Cone-Float-combin.	Pressure loss[1]	Viscosity[2]	Cone-Float-combin.	Pressure loss[1]	Viscosity[2]			Max. flow			Cone-Float-combin.	Pressure loss[1]			Cone-Float-combin.	Pressure loss[1]	
	m³/h[3]	gpm[4]	Code	mbar	mPa*s	Code	mbar	mPa*s			m³/h[3]	m³/h i.N.[5]	scfm[6]	Code	mbar			Code	mbar	
1	0.025	0.11	43 S0	40	10	-	-	-			0.75	0.7	0.44	43 S0	45			-	-	
	0.04	0.18	44 S0	40	80	-	-	-			1.2	1.1	0.7	44 S0	45			-	-	
	0.063	0.28	47 S0	40	80	-	-	-			1.8	1.7	1.05	47 S0	45			-	-	
	0.1	0.44	51 S0	40	80	-	-	-			3	2.8	1.75	51 S0	45			-	-	
2	0.13	0.57	53 L1	12	50	-	-	-			4	3.6	2.3	53 L1	13			-	-	
	0.16	0.7	-	-	-	53 M1	15	100			5.5	5	3.2	-	-			53 M1	21	
	0.22	1.0	54 L1	12	50	-	-	-			-	-	-	-	-			-	-	
	0.25	1.1	53 S1	40	100	54 M1	15	50			6.5	6	3.8	54L1	13			-	-	
	0.32	1.4	-	-	-	57 L1	12	50			9	8.5	5	-	-			54 M1	21	
	0.4	1.8	54 S1	40	50	57 M1	15	50			10	9	5.7	57 L1	13			-	-	
	0.5	2.2	-	-	-	61 L1	12	50			14	13	8	-	-			57 M1	21	
	0.63	2.8	57 S1	40	50	61 M1	15	100			16	15	9	61 L1	13			-	-	
	0.8	3.5	-	-	-	62 L1	12	50			22	20	12	-	-			61 M1	21	
	1.0	4.4	61 S1	40	100	62 M1	15	100			25	23	14	62 L1	13			-	-	
	1.6	7.0	62 S1	40	100	-	-	-			34	32	20	-	-			62 M1	21	
	2.2	10.1	-	-	-	62 V1	45	50			50	45	28	-	-			62 S1	45	
3	1.3	5.7	63 L2	17	50	-	-	-			40	36	23	63 L2	19			-	-	
	2.1	9.2	-	-	-	64 L2	17	50			50	47	29	-	-			63 M2	23	
	2.5	11.0	63 S2	42	30	64 M2	17	10			60	55	35	64 L2	19			-	-	
	4	17.6	64 S2	42	10	-	-	-			85	80	50	-	-			64 M2	23	
	6	26.4	-	-	-	64 V2	43	50			120	110	70	-	-			64 S2	47	
4	3.2	14	67 L5	13	50	-	-	-			100	90	57	67 L5	16			-	-	
	5.0	22	-	-	-	71 L5	13	50			130	120	75	-	-			67 M5	25	
	6.3	28	67 S5	47	30	-	-	-			160	150	90	71 L5	16			-	-	
	8.5	37	-	-	-	72 L5	13	50			200	180	115	-	-			71 M5	25	
	10	44	71 S5	47	5	72 M5	19	5			250	230	140	72 L5	16			-	-	
	16	70	72 S5	47	5	-	-	-			340	320	200	-	-			72 m5	25	
	25	110	-	-	-	72 V5	63	5			500	470	290	-	-			72 S5	54	
5	25	110	73 V8	60	10	-	-	-			550	500	320	73 L8	30			-	-	
	40	176	74 V8	60	10	-	-	-			850	800	500	74 L8	30			-	-	
	63	277	77 V8	60	10	-	-	-			1400	1300	800	77 L8	30			-	-	
6	100	440	81 11	70	10	-	-	-			-	-	-	-	-			-	-	
	130	572	82 11	70	10	-	-	-			-	-	-	-	-			-	-	

1) Pressure loss at the float with water or air.
2) For higher viscosity the specified precision is no more guaranteed.
3) Flow is referred to +20 °C and 1.013 bar abs.
4) Flow in US Gallons per minute at +70 °F.
5) Flow referred to 0 °C and 1.013 bar abs at operation conditions of +20 °C and 1.013 bar abs.
6) Flow in Standard cubic feet per minute referred to +60 °F and 14.7 PSI at operation conditions of +70 °F und 14.7 PSI abs.

For your special application please use the Yokogawa Sizing Software "FlowConfigurator".

PROCESS CONNECTION- AND FLOW-TABLE FOR TUBES WITH PTFE-LINING

Table 11

Process connection																Measuring range for water and liquids								Measuring range for air and gases					
Pos.	EN-Flange				ASME-Flange RF											Max. Flow								Max. flow					
	PN16	PN40		L [7]	Class 150		L [7]	Class 300		L [7]																			
	Code	Code		mm	Code		mm	Code		mm						m³/h [3]	gpm [4]	Cone-Float-combination	Pressure loss [1]	Viscosity [2]	m³/h [3]	m³/h i.N. [5]	scfm [6]	Cone-Float-combination	Pressure loss [1]					
																		Code	mbar	mPa*s				Code	mbar				
2	D2	-		250	-		250	¾" 1"		250						0.1	0.45	51 A1	16	50	3.5	3.3	2	51 A1	20				
		-			-											0.16	0.7	52 A1	16	50	5	4.7	2.9	52 A1	20				
		-	DN15		¾"											0.25	1.12	53 A1	16	50	8.5	8	5	53 A1	20				
		-	DN25		1"											0.4	1.8	54 A1	16	50	13	12	7.5	54 A1	20				
		-	-		-											0.63	2.8	57 A1	16	50	20	18	11	57 A1	20				
		-	-		-											1	4.5	61 V1	18	50	34	32	20	61 V1	22				
3		-	DN25	250	1¼" 1½"		250	1¼" 1½"		250						1.6	7	62 A2	20	30	50	47	29	62 A2	25				
		-	DN40													2.5	11.2	63 A2	20	10	85	80	50	63 A2	25				
		-	DN50													4	18	63 V2	22	50	-	-	-	-	-				
4		-	DN50 DN65 DN80	250	2½" 3"		260	2½" 3"		270						4	18	64 A5	20	30	130	120	75	64 A5	25				
		-														6.3	28	67 A5	20	30	200	180	115	67 A5	25				
		-														10	45	71 A5	20	5	350	330	200	71 A5	25				
		-														16	70	71 V5	22	10	-	-	-	-	-				
5	DN100	-		250	3½" 4"		270	3½" 4"		270						16	70	72 V8	25	10	500	470	290	72 V8	27				
		DN80														25	110	73 V8	25	10	850	800	500	73 V8	27				
		-														40	180	74 V8	25	10	-	-	-	-	-				
6	DN100	DN100		250	4"		270	4"		270						63	280	77 10	30	10	-	-	-	-	-				

1) Pressure loss at the float with water or air.
2) As from this viscosity the specified precision is no more guaranteed.
3) Flow is referred to +20 °C and 1 bar abs.
4) Flow in US Gallons per minute at +70 °F.
5) Flow referred to 0 °C and 1.013 bar abs at operation conditions of +20 °C and 1.013 bar abs.
6) Flow in Standard cubic feet per minute referred to +60 °F and 14.7 PSI at operation conditions of +70 °F and 14.7 PSI abs.
7) L = mounting length

For your special application please use the Yokogawa Sizing Software "FlowConfigurator".

TEMPERATURE LIMITATIONS, STANDARD AND INTRINSICALLY SAFE

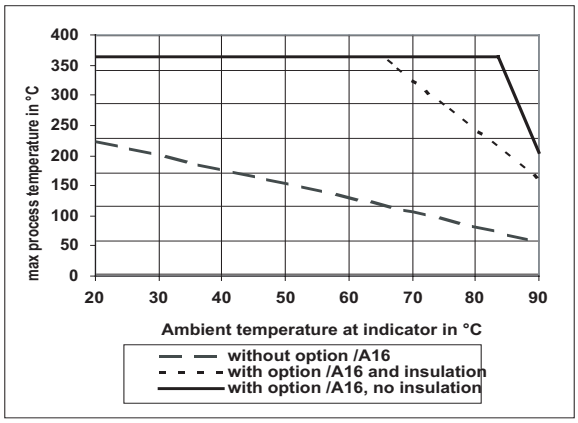


fig. 1a RAMC: • Type 90 / 91 without limit switch

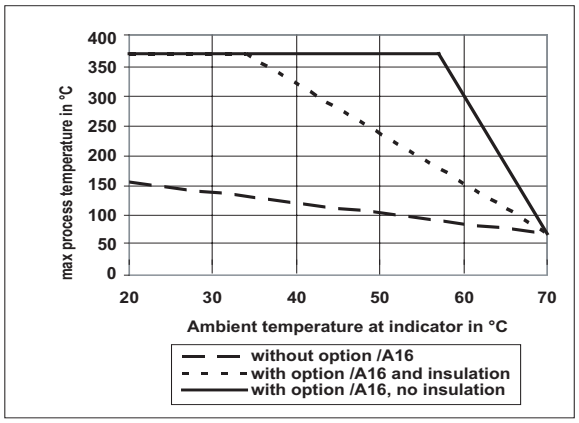


fig. 1b RAMC: • Type E90, H90, J90, E91, H91, J91 and limit switches (in case of intrinsic safe limit switches the maximum ambient temperature is limited by the temperature class according to the certificate or for option /FS1by the control drawing).

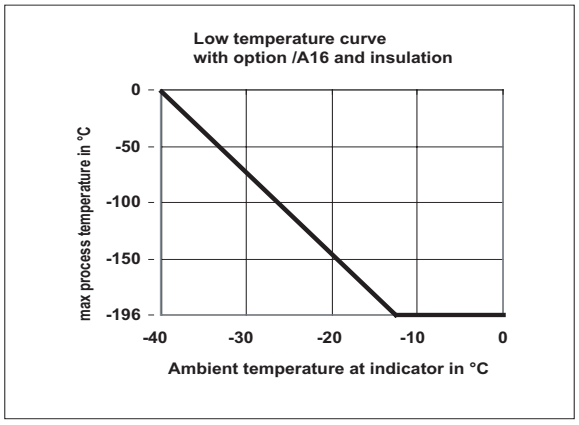


fig. 1c RAMC: • All indicator types

The temperature graphs are reference values for size DN100. They may be influenced negative by trapped heat, external heat sources or radiated heat and influenced positive for smaller sizes.
Insulation means stone wool between tube and indicator, not touching the indicator. The indicator shall not be insulated.
Units with electronic transmitter can show the temperature of the internal transmitter on the display or HART®-type can show and supervise the internal temperature by HART®-communication.
Units with PTFE-lining are usable up to +130 °C.
For units with explosion proof certification the temperature limits according the certificate of conformity must be regarded (see also page 5 to 10).

MINIMUM AMBIENT TEMPERATURE

Table 12

Flowmeter	Model code	Minimum ambient temperature
RAMC with mechanical indicator	RAMC□□-□□□□-□□□□-T□□NNN	-25 °C; -40 °C with option /A26[1)]
RAMC with standard limit switches /K1, /K2, /K3	RAMC□□-□□□□-□□□□-□□□□□□ /K1, /K2, /K3	-25 °C
RAMC with fail-safe limit switches /K6, /K7, /K8	RAMC□□-□□□□-□□□□-□□□□□□ /K6, /K7, /K8	-25 °C; -40 °C with option /A26[1)]
RAMC with fail-safe limit switches /K9, /K10	RAMC□□-□□□□-□□□□-□□□□□□ /K9, /K10	-25 °C
RAMC with electronic transmitter	RAMC□□-□□□□-□□□□-E□□1□□ RAMC□□-□□□□-□□□□-E□□2□□ RAMC□□-□□□□-□□□□-E□□4□□ RAMC□□-□□□□-□□□□-H□□4□□ RAMC□□-□□□□-□□□□-J□□4□□	-25 °C -25 °C -25 °C; -40 °C with option /A26[1)] -25 °C; -40 °C with option /A26[1)] -25 °C; -40 °C with option /A26[1)]
RAMC intrinsically safe type	RAMC□□-□□□□-□□□□-□□□□□□ /KS1 RAMC□□-□□□□-□□□□-□□□□□□ /KS1, /K1, /K2, /K3 RAMC□□-□□□□-□□□□-□□□□□□ /KS1, /K6, /K7, /K8 RAMC□□-□□□□-□□□□-□□□□□□ /KS1, /K9, /K10 RAMC□□-□□□□-□□□□-□□□□□□ /KS3 RAMC□□-□□□□-□□□□-□□□□□□ /KS3, /K1, /K2, /K3 RAMC□□-□□□□-□□□□-□□□□□□ /KS3, /K6, /K7, /K8 RAMC□□-□□□□-□□□□-□□□□□□/KS3, /K9, /K10 RAMC□□-□□□□-□□□□-□□□□□□ /ES1 RAMC□□-□□□□-□□□□-□□□□□□ /ES1, /K1, /K2, /K3 RAMC□□-□□□□-□□□□-□□□□□□ /ES1, /K6, /K7, /K8 RAMC□□-□□□□-□□□□-□□□□□□ /ES1, /K9, /K10 RAMC□□-□□□□-□□□□-T□□□□□ /FS1, /K1, /K2, /K3, /K9, /K10 RAMC□□-□□□□-□□□□-T□□□□□ /FS1, /K6, /K7, /K8 RAMC□□-□□□□-□□□□-E□□□□□ /FS1, /... RAMC□□-□□□□-□□□□-H□□□□□ /FS1, /... RAMC□□-□□□□-□□□□-J□□□□□ /FS1, /... RAMC□□-□□□□-□□□□-□□□□□□ /NS1, /... RAMC□□-□□□□-□□□□-□□□□□□ /GS1 RAMC□□-□□□□-□□□□-□□□□□□ /GS1, /K1, /K2, /K3, K6, /K7, /K8, /K9, /K10	-25 °C; -40 °C with option /A26[1)] -25 °C -25 °C; -40 °C with option /A26[1)] -25 °C -25 °C; -40 °C with option /A26[1)] -25 °C -25 °C; -40 °C with option /A26[1)] -25 °C -25 °C; -40 °C with option /A26[1)] -25 °C -25 °C; -40 °C with option /A26[1)] -25 °C -25 °C -25 °C; -40 °C with option /A26[1)] -25 °C -25 °C -25 °C -25 °C; -40 °C with option /A26[1)] -25 °C; -40 °C with option /A26[1)] -25 °C; -40 °C with option /A26[1)]
RAMC flame proof or dust proof type	RAMC□□-□□□□-□□□□-□□□□□□ /KF1, /... RAMC□□-□□□□-□□□□-□□□□□□ /EF1, /... RAMC□□-□□□□-□□□□-□□□□□□ /NF1, /... RAMC□□-□□□□-□□□□-□□□□□□ /KS2, /... RAMC□□-□□□□-□□□□-□□□□□□ /ES2, /...	-20 °C
RAMC flame proof type	RAMC□□-□□□□-□□□□-□□□□□□ /GF1, /...	-40 °C
RAMC non-electrical type	RAMC□□-□□□□-□□□□-T□□NNN /KC1, /... RAMC□□-□□□□-□□□□-T□□NNN /GC1, /...	-40 °C

[1)] Below -25 °C the LC-display will not work. Also the push buttons should not be used below -25 °C!

PRESSURE TEMPERATURE (PT)-RATING

The pressure relevant temperature limits of the RAMC are:
-196 to +370 °C for units with SS wetted parts
-80 to +130 °C for units with PTFE wetted parts.
These limits are reduced by metrological boundary conditions (see temperature curves and table).

Table 13

Process connection		Process pressure p(T) in bar									
Code	**Description**	**-196 °C**	**RT(20 °C)**	**50 °C**	**100 °C**	**150 °C**	**200 °C**	**250 °C**	**300 °C**	**350 °C**	**370 °C**
A1[1)]	Flange ASME Class 150 RF	19	19	18.4	16.2	14.8	13.7	12.1	10.2	8.4	7.4
A2[1)]	Flange ASME Class 300 RF	49.6	49.6	48.1	42.2	38.5	35.7	33.4	31.6	30.3	24.8
A3[1)]	Flange ASME Class 600 RF	99.3	99.3	96.2	84.4	77	71.3	66.8	63.2	60.7	49.5
D2	Flange EN PN16	16	16	15.6	15.1	13.7	12.7	11.9	11.0	10.5	10.2
D4	Flange EN PN40	40	40	38.9	37.9	34.4	31.8	29.9	27.6	26.4	25.7
D5	Flange EN PN63	63	63	61.5	59.7	54.3	50.1	47.1	43.5	41.7	40.5
D6	Flange EN PN100	100	100	97.8	94.7	86.1	79.5	74.7	69.0	66.1	64.2
T4/R4	Internal thread ½" (RAMC01-...)	25	25	25	25	20	20	20	20		
T4/R4	Internal thread ¾" (RAMC23-...)	25	25	25	25	20	20	20	20		
T4/R4	Internal thread 1" (RAMC02-...)	16	16	16	16	16	16	16	16		
T4/R4	Internal thread 2" (RAMC05-...)	10	10	10	10	10	10	10	10		
T4/R4	Internal thread 2½" (RAMC06-...)	10	10	10	10	10	10	10	10		
T6/R6	Internal thread ½" (RAMC01-...)	40	40	40	40	40	40	40	40		
T6/R6	Internal thread ¾" (RAMC23-...)	40	40	40	40	40	40	40	40		
T6/R6	Internal thread 1" (RAMC02-...)	40	40	40	40	40	40	40	40		
T6/R6	Internal thread 1¼" (RAMC03-...)	40	40	40	40	40	40	40	40		
T6/R6	Internal thread 1½" (RAMC04-...)	40	40	40	40	40	40	40	40		
T6/R6	Internal thread 2½" (RAMC06-...)	40	40	40	40	40	40	40	40		
Code	**Description**	**-**	**RT(20 °C)**	**50 °C**	**100 °C**	**140 °C**	**-**	**-**	**-**	**-**	**-**
S2	Fitting DIN 11851 (RAMC02-...)		40	40	40	40					
S2	Fitting DIN 11851 (RAMC05-...)		25	25	25	25					
S2	Fitting DIN 11851 (RAMC06-...)		25	25	25	25					
S2	Fitting DIN 11851 (RAMC08-...)		25	25	25	25					
S2	Fitting DIN 11851 (RAMC10-...)		25	25	25	25					
S2	Fitting DIN 11851 (RAMC12-...)		16	16	16	16					
S4	TRI-CLAMP® DIN 32676 (RAMC02-...)		25	25	25	25					
S4	TRI-CLAMP® DIN 32676 (RAMC03-...)		25	25	25	25					
S4	TRI-CLAMP® DIN 32676 (RAMC04-...)		25	25	25	25					
S4	TRI-CLAMP® DIN 32676 (RAMC05-...)		16	16	16	16					
S4	TRI-CLAMP® DIN 32676 (RAMC08-...)		10	10	10	10					
S4	TRI-CLAMP® DIN 32676 (RAMC10-...)		10	10	10	10					
S5	Flange Rosista (RAMC02-...)		10								
S5	Flange Rosista (RAMC04-...)		10								

[1)] Dual certified AISI 316/316L

DIMENSIONS AND WEIGHTS

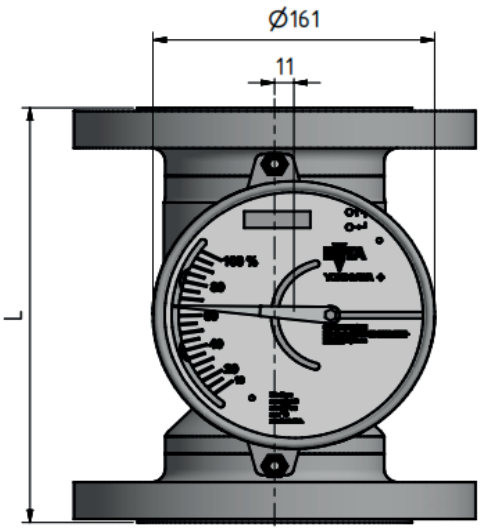


fig. 2a Front view housing type 90 (SS)

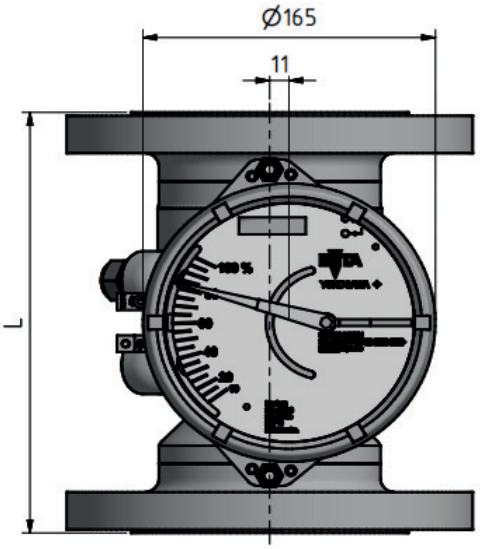


fig. 2b Front view housing type 91 (Al)

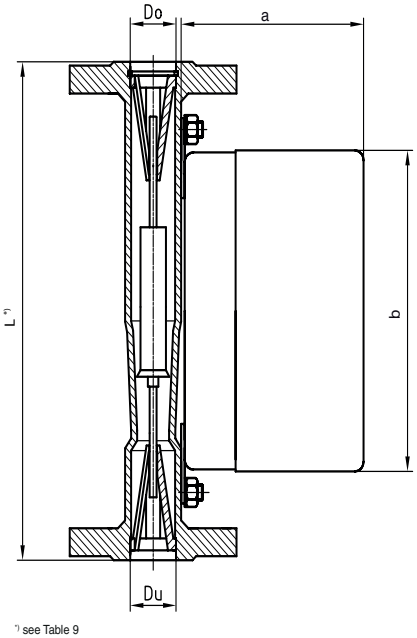


fig.3 SS metering tube

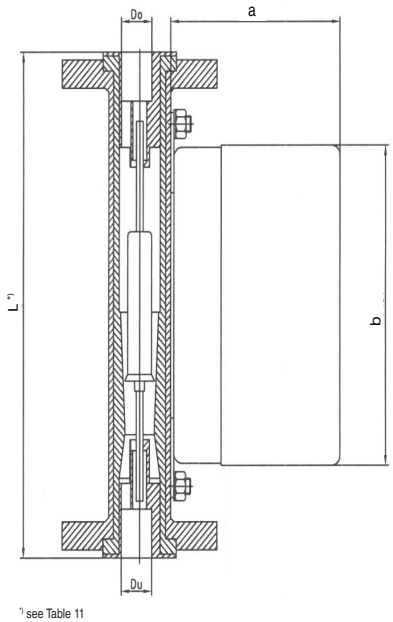


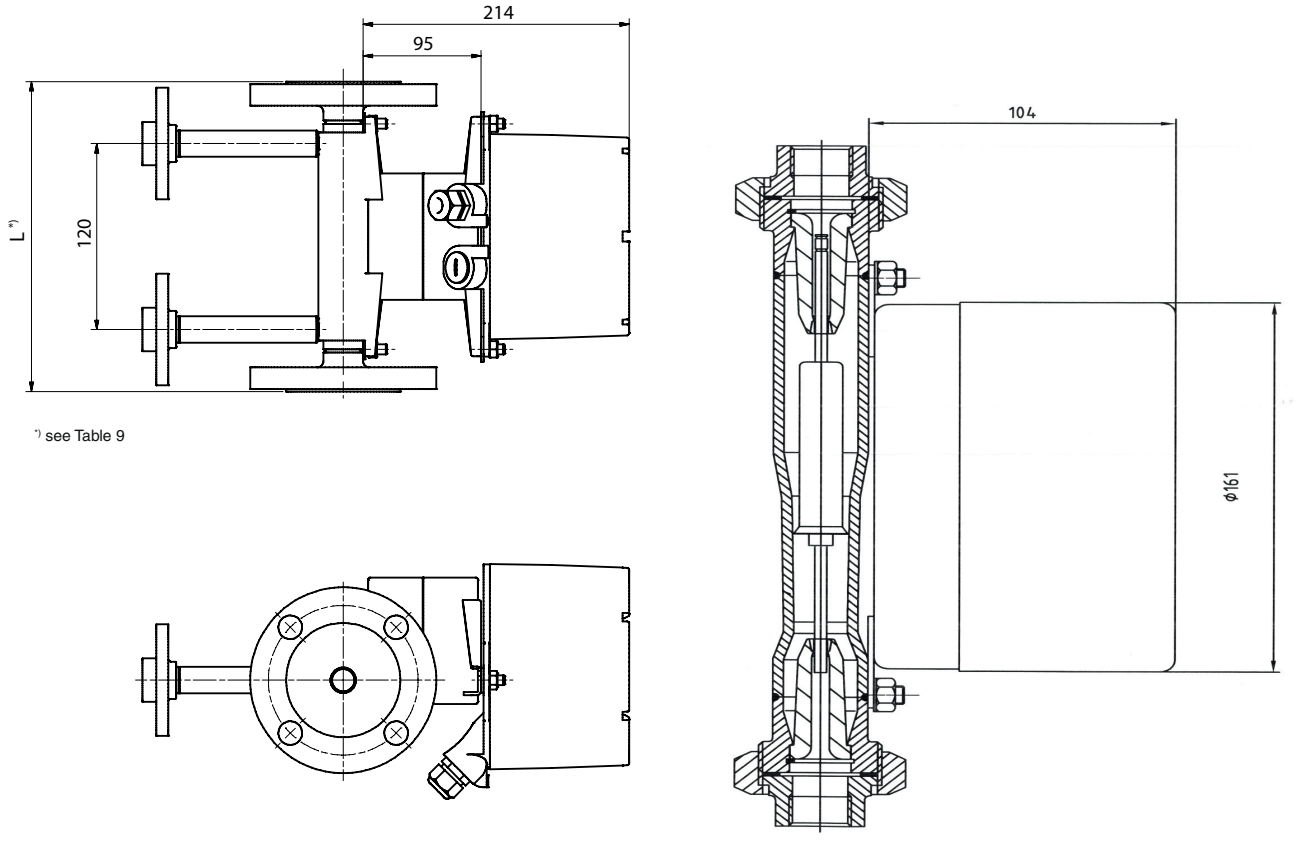
fig.4 SS metering tube with PTFE-lining

Table 14 Housing types

	a in mm	**b** in mm
Housing type 90	104	161
Housing type 91 standard	110	165
Housing type 91 flame proof, option /□F1	118	165

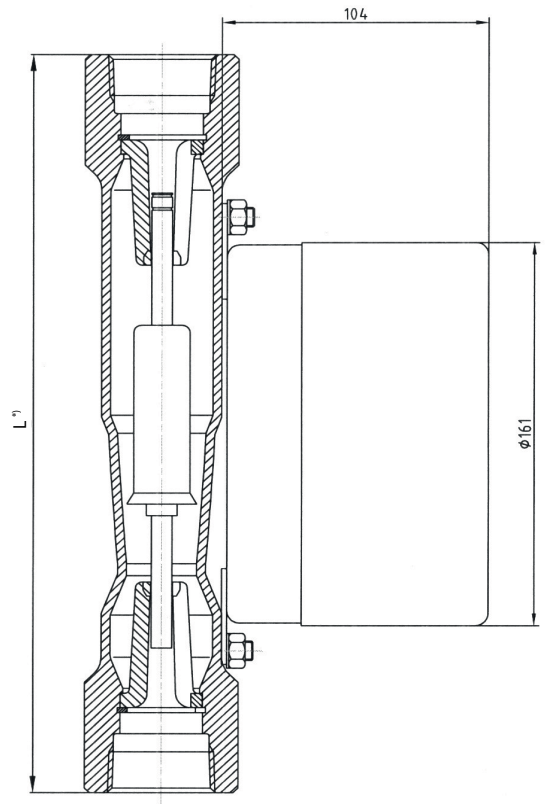
Table 15

Inner diameter of stainless steel flanges				Inner diameter of flanges with PTFE-lining			
Pos.[1)]	Size		Du = Do in mm	**Pos.**[1)]	Size		Du = Do in mm
1	DN15 to DN50	½" to 1"	20.7	**----**	----	----	----
2	DN15 to DN50	½" to 2"	20.7	**2**	DN15 to DN25	¾" to 1"	23.5
3	DN25 to DN50	1" to 2"	29.5	**3**	DN25 to DN50	1¼" to 1½"	36.0
4	DN50 to DN100	2" to 3"	65.5	**4**	DN50 to DN80	2½" to 3"	66.0
5	DN80 to DN150	3" to 6"	88.2	**5**	DN80 to DN100	3½" to 4"	92.0
6	DN100 to DN150	4" to 6"	110.0	**6**	DN100	4"	110.0
[1)] See table 9, 10, 11							



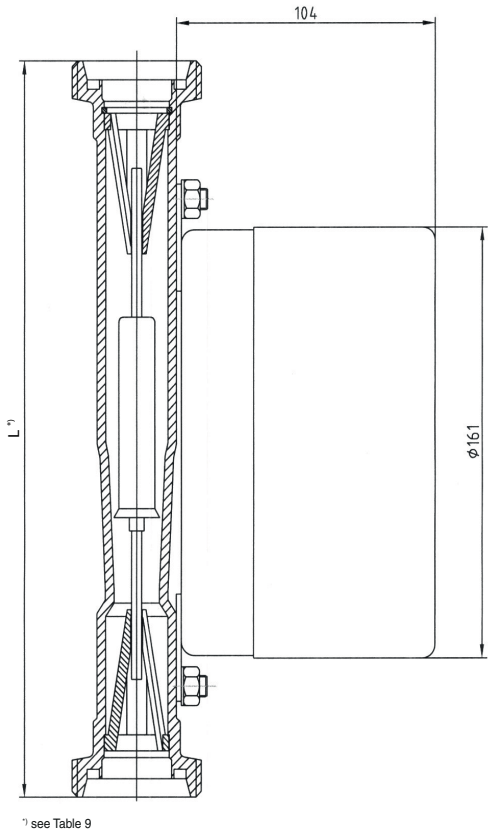
*) see Table 9

fig. 5 RAMC with connection B4/T4, /T16 and /T2



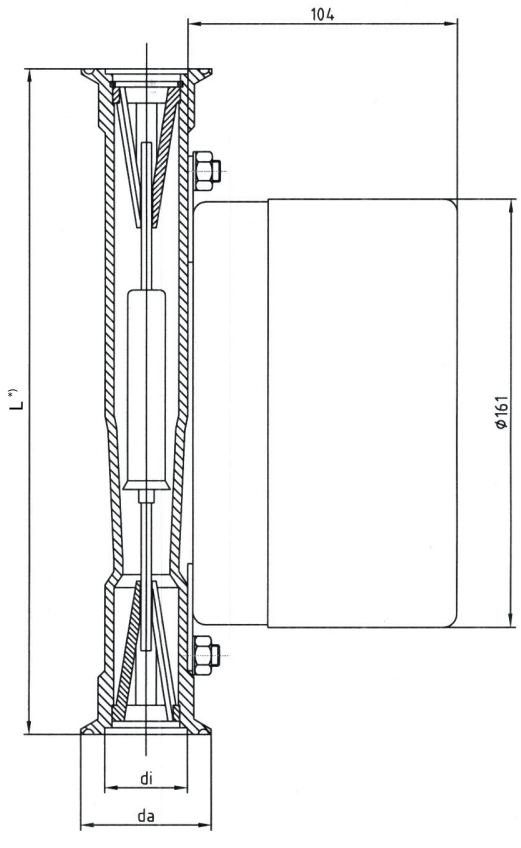
*) see Table 9

fig. 7 RAMC with connection T6/G6



*) see Table 9

fig. 8 RAMC with connection S2



*) see Table 9

fig. 9 RAMC with connection S4

Table 16 Diameter for connection sizes S4

Pos. 1)	Size	di in mm	da in mm
1	DN25, 1"	36	50.5
	DN32	36	50.5
	DN40, 1½"	36	50.5
2	DN25, 1"	36	50.5
	DN32	36	50.5
	DN40, 1½"	36	50.5
3	DN50, 2"	47.8	64
4	DN65, 3"	72.1	91
5	DN100, 4"	97.6	119
1) See table 9 and 11			

Table 17 Weights

Pos.1)	Weight in kg
1	3 to 5
2	3 to 5
3	6.5 to 8
4	8.6 to 11
5	13 to 16
6	17 to 20
1) See table 9, 10, 11	
Indicator on distance (option /A16) additional 1 kg	

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