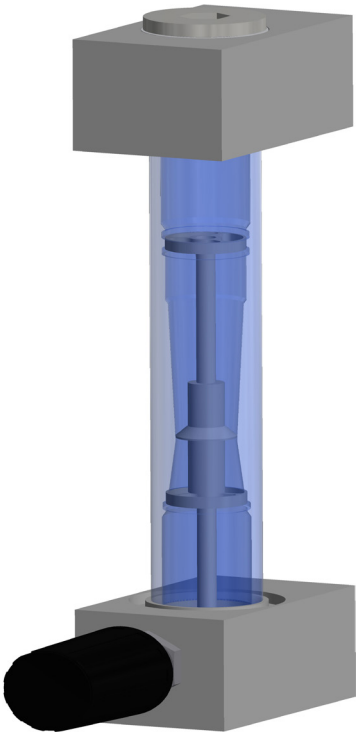
General Specifications

ROTA***METER*** RAKD
Metal Variable Area Flowmeter

GS 01R01B30-00E-E

The short-tube Rotameter is used for measurement of low flow rates of liquids and gases. Its special application is in turbulent, opaque or aggressive mediums and under high pressure.
The instrument is mounted in a vertical pipeline with flow direction upwards and the flow is indicated by a guided magnetic float inside the conical metal tube, which transmits its position to the indicator. The correct flow can be then read on the scale.

Rotameter RAKD without valve



Tube RAKD with valve
(Horizontal process connection also available without valve on request)

FEATURES

- Different process connections like internal threads and flanges
- Available with control valve (horizontal connection) or without valve (vertical connection)
- All wetted parts of stainless steel 1.4571/ 316Ti or 1.4401/1.4404/316/316L
- Measuring accuracy acc. to standard VDI/VDE 3513 sheet 2 (q_G = 50 %) at calibration conditions
- Round, industrial standardized stainless steel housing with degree of protection IP 66/67
- Light, guided floats resulting in low pressure loss and stable float movement
- Max. flow range water: 1 to 250 l/h (0.265 to 66 gph)
- Max. flow range air: 40 to 8000 l/h at +20 °C, 1 bar abs (1.4 to 282.5 cfh at 68 °F, 14.5 psi)
- Turndown ratio: 10:1
- Flow controller up to a maximum flow range of 100 l/h (26.4 gph) water resp. 3250 l/h (114.8 cfh) air
- Electronic µP-controlled transmitter with linearized output
- Electrical connection by fast connection technique (Quickon)
- Limit switches, also available as “fail-safe” version
- Connection of common transformer isolated barriers and transmitter power supplies possible
- Suitable for hazardous area applications
- FMEDA report available for SIL application

♦ 48-hour delivery ex works optionally available

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

GS 01R01B30-00E-E

16th edition, July 2024 (RYG)

STANDARD SPECIFICATIONS

RoHS Directive 2011/65/EU, 2015/863/EU:
RoHS conform according to EN IEC 63000

WEEE
Rota Yokogawa GmbH & Co. KG is registered at „Stiftung EAR“ as manufacturer of electronic devices. WEEE-Reg.Nr. DE 93847364.

Intended use (for UAE):
Rotameter RAKD flow meter is specifically designed to both be installed and function within:
- large scale fixed installations
- means of transport for persons or goods, excluding electric two-wheel vehicles which are not type approved.

MEASURING TUBE

Materials of wetted parts:
- Stainless steel 1.4571/ 316Ti or 1.4401/1.4404/ 316/316L
- Other materials on request
- Process connections: high grade SS
- With flange: PTFE gasket
- With valve: PCTFE seat or silver seat, PTFE gasket

Fluids to be measured:
Liquid or gas

Measuring range:
See pages 9 to 11
The measureable flow rates are depending from density and viscosity of the fluid. To find the fluid specific measuring range please use the Yokogawa Sizing Software: www.FlowConfigurator.com

Measuring turndown ratio:
~ 10:1
For the exact range see the Yokogawa Sizing Software www.FlowConfigurator.com.

Process connections:
- Inner thread: ¼ - 18 NPT; ⅜ -18 NPT G ¼; G ⅜; Rp ¼
- Cutting ring: 6 mm; 8 mm; 10 mm; 12 mm
- Cutting ring (Swagelok): 6 mm; 8 mm; 10 mm; 12 mm
- Nozzle: 6 mm; 8 mm
- Flange adapter (screwed in):
  - Acc. to EN 1092-1: DN15 and DN25, PN40;
  - Acc. to ASME B 16.5: ½ in. and 1 in. Class 150, Class 300
  - Stainless steel AISI 316Ti Gasket PTFE

Process pressure:
Depends on process connection; see model code

Viscosity limit:
max. 6 mPas recommended

Process temperature:
- Without valve: -25 °C to +250 °C (-13 to 482 °F)
- With valve: -25 °C to +150 °C (-13 to 302 °F)

See also fig. 2.
Lower temperatures on request.

Measurement accuracy:
Acc. to standard VDI/VDE 3513 sheet 2 (q_G = 50 %) 4

Calibration conditions:
- Water, 1 to 2 bar, 15 °C to 25 °C (59 °F to 77 °F)
- Air, 18 °C to 25 °C (64 °F to 77 °F), atmospheric pressure

Installation:
- Installation position: vertical
- Flow direction: upwards
- Face to face length: 125 mm, with flange 250 mm (4.92 in., with flange 9.84 in.)

Weight:
See table 8 and 9

MECHANICAL INDICATOR, type -T

Measuring principle
The indication is made by magnetic coupling of a magnet enclosed in the float and a magnet in the indication unit, which follows the movements of the float.

Scale:
Standard: removable aluminum plate with printed scale (double scale as option)

Indicator housing:
- Material: Stainless steel 1.4301/304 316L on request
- Degree of Protection: IP66/67

Process and ambient temperature:
The dependency of the process temperature from the ambient temperature is shown in fig. 2.

Transportation and storage condition:
-40 °C to +110 °C (-40 °F to 230 °F)

ELECTRONIC TRANSMITTER, type -E

Temperature range:
-25 °C to +65 °C (-13 °F to 149 °F)

Transportation and storage condition:
-40 °C to +70 °C (-40 °F to 158 °F)

Process and ambient temperature:
The dependency of the process temperature from the ambient temperature is shown in fig. 2.

Power supply:
14 to 30 V DC

Load resistance:
(U – 14 V) / 20 mA, max. 500 Ω

Analog output:
4 to 20 mA

Linearity:
± 0.25 % of 20 mA

Hysteresis:
± 0.15 % of 20 mA

Repeatability:
± 0.16 % of 20 mA

Influence of power supply:
± 0.1 % of 20 mA

Temp. coefficient of analog output:
± 0.5 % / 10 °C of 20 mA

AC-part of analog output:
± 0.15 % of 20 mA

Long time stability:
± 0.2 % / year

Maximum output current:
21.5 mA

Output current in case of failure:
≤ 3.6 mA (NAMUR NE 43)

Response time (99 %):
Approx. 1 s

Quickon connector:
- Cable diameter: 4 to 6 mm (0.16 to 0.24 in.)
- Cable cross-section: 0.34 to 0.75 mm² (0.0002 to 0.03 in.²)

Pulse output, option /CP:
Electronic switch with galvanic isolation, acc. to EN 60947-5-6
- Pulse length: 200 ms
- Max. frequency: 4 Hz

Electromagnetic compatibility (EMC):
- EN 61326-1: Class A, Table 2
- EN 61326-2-3
- Approval for Morocco:
  Rotameter RAKD complies with the provisions of the Moroccan Regulations:
  - EN 61326 1
  - EN 61326 2 3

  Logo shown on the name plate (scale)

ELECTRICAL CONNECTION, indicator type -E
Type:
- Quickon
- M12, option /A29, /A30

Cable diameter:
4 to 6 mm (0.16 to 0.24 in.)
Maximum cross section of core:
Ø 0.34 to 0.75 mm² (0.0002 to 0.03 in.²)

LIMIT SWITCHES IN STANDARD VERSION, option /K1 to /K3
Type:
Inductive proximity switch SC2-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 /K8
Type:
Inductive proximity switch SJ2-SN acc. EN 60947-5-6
Nominal voltage:
8 V DC
Output signal:
≤ 1 mA or ≥ 3 mA

ELECTRICAL CONNECTION, option /K1 to /K8
Type:
- Quickon
- M12 (option /A29, /A30)

Cable diameter:
4 to 6 mm (0.16 to 0.24 in.)
Maximum cross section of core:
Ø 0.34 to 0.75 mm² (0.0002 to 0.03 in.²)

HYSTERESIS OF LIMIT SWITCHES
Min-contact and Max-contact:
- Pointer movement: ≈ 0.8 mm (0.03 in.)
- Float movement: ≈ 0.8 mm (0.03 in.)

Minimum distance between 2 limit switches:
≈ 8 mm (0.3 in.)

POWER SUPPLY FOR LIMIT SWITCHES, option /W□□
Type:
Acc. to EN 60947-5-6
Standard:
- 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

Alternative for AC types:
- KFU8-SR-Ex*.W (90 to 253 V AC); * = 1 or 2

Fail-safe:
- KFD2-SH-Ex1 (24 V DC), 1 channel

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

Alternative for AC types:
- 90 to 253 V AC 50 to 60 Hz

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

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

SWITCHING LEVELS FOR LIMIT SWITCHES

Table 1 Min, Max, Min-Max, Min-Min and Max-Max-contact as standard version

		Option /K1	Option /K2	Option /K3
Function	Pointer	Signal	Signal	Signal
		SC2-N0	SC2-N0	SC2-N0
MAX	above LV	----	1 mA	1 mA
	below LV	----	3 mA	3 mA
Function	Pointer	Signal	Signal	Signal
		SC2-N0	SC2-N0	SC2-N0
MIN	above LV	3 mA	----	3 mA
	below LV	1 mA	----	1 mA
Note: LV = Limit Value				

Table 2 Min, Max and Min-Max-contact as fail-safe version

		Option /K6	Option /K7	Option /K8
Function	Pointer	Signal	Signal	Signal
		SJ2-SN	SJ2-SN	SJ2-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
		SJ2-SN	SJ2-SN	SJ2-SN
MIN	above LV	3 mA	----	3 mA
	below LV	1 mA	----	1 mA
	fail-safe	1 mA	----	1 mA
Note: LV = Limit Value				

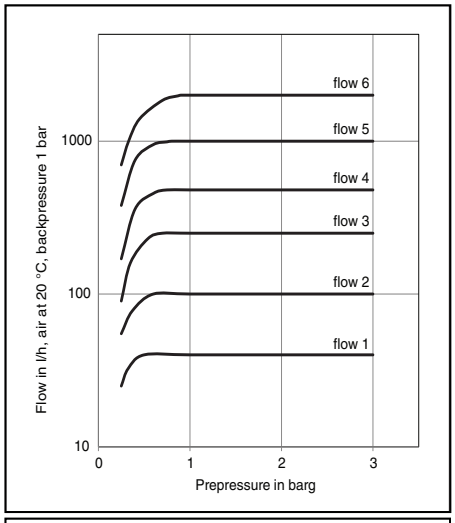
FLOW CONTROLLER, option /R1 and /R3

Flow controller for constant flow in case of variations in process pressure.
These are no valves to reduce the pressure.

- **Flow Controller /R1** for liquids and gases
  The regulator keeps the flow rate constant in case of a variable inlet pressure and constant back pressure. For gases the process conditions are based on the outlet conditions. The inlet pressure should be minimum 400 mbar larger than the outlet pressure (see Fig.1).
- **Flow Controller /R3** for gases with fluctuations of the outlet pressure and constant inlet pressure. The process conditions are the inlet conditions.
  The inlet pressure should be minimum 400 mbar (5.8 psi) larger than the outlet pressure.
  Max. liquid flow: 100 l/h (26.4 gph)
  Max. gas flow: 3250 l/h (858.56 gph)
  Max. pressure: 25 bar (362.6 psi)
  Temperature range: -20 °C to +80 °C (-4 °F to 176 °F)

Table 3 Materials:

	Housing	Diaphragm	Springs
/R1 or /R3	CrNi-Steel	PTFE	CrNi-Steel



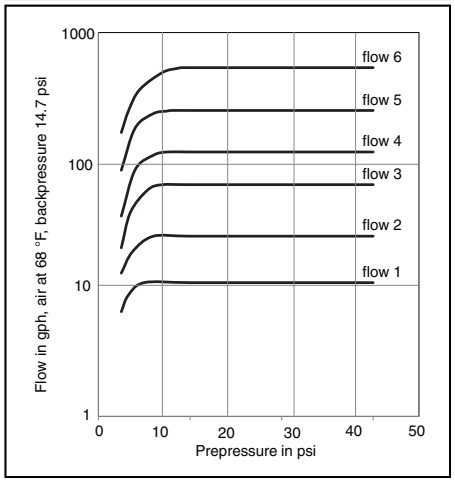


Fig. 1 Control characteristic for /R1
The above curves show the control characteristic of the inlet flow regulator /R1 with air for 6 different flowrates, each with fixed valve position, back pressure 1 bar (14.5 psi) (atmosphere conditions).
As it can be seen for the smallest flowrate, the regulation works best from 0.4 bar (5.8 psi) to 3 bar (43.5 psi) (or more) inlet pressure change, for the largest flowrate from 0.9 bar (13 psi) to 3 bar (43.5 psi) (or more).

FOLLOWING IEC 61508

RAKD with local indicator and standard or fail-safe limit switches
(RAKD□□-□□SS-□□□□□-T□□NNN/K1 to K8):
Suitable for application in safety functions up to and including SIL1.
RAKD with valve and controller with local indicator and standard or fail-safe limit switches
(RAKD□□-□□SS-□□V□□-T□□NNN/R□/K1 to K8):
Suitable for application in safety functions up to and including SIL1.
Details see FMEDA report.

FOLLOWING ISO 13849-1

Safety Metrics available for:
RAKD with local indicator and standard or fail-safe limit switches
(RAKD□□-□□SS-□□□□□-T□□NNN/K1 to K8)
RAKD with valve and controller with local indicator and standard or fail-safe limit switches
(RAKD□□-□□SS-□□V□□-T□□NNN/R□/K1 to K8)
Details see FMEDA report.

APPROVALS IN EAEU AND CIS COUNTRIES

Eurasian Conformity (EAC)
RAKD complies to applicable Technical Regulations valid in EAEU countries , Kazakhstan, Armenia and Kyrgyzstan (option /VE).

- TR CU 004
- TR CU 020
- TR CU 012 can be added for hazardous area applications (options /GS1, /GC1)

Pattern Approval certificate of Measuring Instruments
RAKD has Pattern Approval certificates and is registered as a measuring instrument in Kazakhstan and Uzbekistan.

- Option /QR2 for Kazakhstan
- Option /QR3 for Uzbekistan

HAZARDOUS AREA SPECIFICATIONS

HAZARDOUS AREA APPROVALS FOR INTRINSICALLY SAFE RAKD

Intrinsically safe with ATEX-approval, option /KS1
Certificate:
KEMA 00ATEX 1037X
Explosion proof:
Ex ia IIC T6...T4 Gb
Entity parameter:
Table 4

IS parameter	Analog output	Pulse output	Limit switch			
			Type 2 /K1 to /K3	Type 3 /K1 to /K3	Type 2 /K6 to /K8	Type 3 /K6 to /K8
Ui in V	30	16	16	16	16	16
Ii in mA	100	20	25	52	25	52
Pi in mW	750	64	64	169	64	169
Li in mH	0.73	0	0.15	0.15	0.1	0.1
Ci in nF	2.4	0	150	150	30	30

Temperature specification:
Table 5

Configuration	Max. ambient temperature	Max. process temperature	Temperature class
Transmitter 4 to 20 mA / Pulse	65 °C (149 °F)	65 °C (149 °F)	T6
	50 °C (122 °F)	80 °C (176 °F)	
	45 °C (113 °F)	100 °C (212 °F)	T5
	38 °C (100 °F)	135 °C (267 °F)	T4
Limit switches type 2	65 °C (149 °F)	65 °C (149 °F)	T6
	80 °C (176 °F)	80 °C (176 °F)	T5
	59 °C (138 °F)	100 °C (212 °F)	
	100 °C (212 °F)	100 °C (212 °F)	T4
	73 °C (163 °F)	135 °C (275 °F)	
Limit switches type 3	23 °C (149 °F)	65 °C (149 °F)	T6
	37 °C (73 °F)	80 °C (176 °F)	T5
	34 °C (93 °F)	100 °C (212 °F)	
	57 °C (134 °F)	80 °C (176 °F)	T4
	54 °C (129 °F)	100 °C (212 °F)	
	48 °C (118 °F)	135 °C (275 °F)	

For the configurations where a transmitter is combined with limit switches, the temperature class is determined by the most restrictive combinations of maximum ambient temperature and maximum process temperature.
Description of limit switch type 2 and 3 see ATEX certificates from Pepperl & Fuchs:

- PTB 99 ATEX 2219X (SC2-NO) for /K1 to /K3
- PTB 00 ATEX 2049X (SJ2-SN) for /K6 to /K8

Intrinsically safe RAKD with IECEx-approval, option /ES1
Certificate:
IECEx DEK 12.0003X
Explosion proof:
Ex ia IIC T6...T4 Gb
Entity parameter:
See table 4
Temperature specification:
See table 5

For the configurations where a transmitter is combined with limit switches, the temperature class is determined by the most restrictive combinations of maximum ambient temperature and maximum process temperature. Description of limit switch type 2 and 3 see IECEx certificates from Pepperl & Fuchs:

- IECEx PTB 11.0091X (SC2-NO) for /K1 to /K3
- IECEx PTB 11.0092X (SJ2-SN) for /K6 to /K8

Intrinsically safe RAKD with NEPSI-approval (China), option /NS1
Certificate:
GYJ20.1089X
Explosion proof:
Ex ia IIC T4~T6 Gb
Max. Tamb.:
+65 °C (149 °F)
Limit switches:
Option /K1 to /K8
Entity parameter:
See table 4
Temperature specification:
See table 5

Intrinsically safe RAKD with PESO-approval (India), option /Q11 with /ES1
Same data as ATEX-certified type, option /ES1.
Certificate:
PESO Ref. No.: P567337/1
Explosion proof:
Ex ia IIC T6...T4 Gb
Temperature specification:
See table 5

Intrinsically safe RAKD with KOSHA-approval (Korea),
Option /ES1 with /KC
Same data as for IECEx certification, option /ES1.
Certificate:
12-AV4BO-0522X
Explosion proof:
Ex ia IIC T6...T4
Limit switches:
Option /K1 to /K8
Temperature specification:
See table 5

Intrinsically safe RAKD with KOSHA-approval (Korea),
Option /KS1 with /KC
Same data as for ATEX certification, option /KS1.
Certificate:
12-AV4BO-0720X
Explosion proof:
Ex ia IIC T6...T4
Limit switches:
Option /K1 to /K8
Temperature specification:
See table 5

Intrinsically safe RAKD with EAC-approval (Kazakhstan, Armenia and Kyrgyzstan), option /GS1
For indicator type -E and limit switches
Certificate:
RU C--DE.AA87.B.00398/20
Explosion proof:
1Ex ia IIC T6...T4 Gb X
Limit switches:
Option /K1 to /K8
Entity parameter:
See table 4
Temperature specification:
See table 5

Intrinsically safe RAKD with Taiwan Safety Mark
Registration Document:
ML041200703XN3
Option /ES1 must be selected.
Same data as IECEx-certified type (/ES1).
For export to Taiwan please contact your Yokogawa representative in Taiwan to receive the Taiwan Safety Mark.

Intrinsically safe RAKD with ECAS-approval (UAE)
Same data as for IECEx certification, option /ES1.
Certificate:
24-05-111623/E24-05-115187/NB0010

Intrinsically safe RAKD with Ukraine Ex-approval
Same data as for ATEX certification, option /KS1.
Certificate:
СЦ16.0017X

HAZARDOUS AREA APPROVALS FOR INTRINSICALLY SAFE LIMIT SWITCHES

Intrinsically safe and dust proof limit switches with ATEX-approval for indicator type -T, option /K1 to /K8 with /KS2
Certificate:
- PTB 99 ATEX 2219X (SC2-N0)
- PTB 00 ATEX 2049X (SJ2-SN)

Explosion proof:
- Ex ia IIC T6...T1 Gb, II 2 G
- Ex ia IIIC T_{200}135 °C Db, II 2 D

Entity parameter:
See certificate

Intrinsically safe limit switches with UL-approval (USA + Canada), option /K1 to /K8 with /FS1
Certificates:
- 20190402-E501628 (SC3.5-NO) (/K1 to /K3)
- 20190619-E501628 (SJ 3.5-S.N) (/K6 to /K8)

Explosion proof:
Class I, Division 1, Groups A, B, C, D, T6...T1
Class II, Division 1, Groups E, F, G, T135°C
Class III, Division 1, T135°C
Class I, Zone 0 IIC
USL– Class I, Zone 0, AEx ia IIC T6...T1 Ga
Zone 20, AEx ia IIIC T135°C Da
CNL– Ex ia IIC T6...T1 Ga X
Ex ia IIIC T135°C Da X

Control drawings:
- 116-0453 (/K1 to /K3)
- 116-0454 (/K6 to /K8)

HAZARDOUS AREA APPROVALS FOR COMPLETE MECHANICAL RAKD

ATEX registrated RAKD, option /KC1

Archive No.:
IBExU 137/15

Explosion proof:

- II2G Ex h IIC TX Gb
- II2D Ex h IIIC TX°C Db

Max. surface temperature:
TX°C: max. surface temperature determined by the process temperature

Ambient temperature:
-25 °C to +80 °C (-4 °F bis 176 °F)

Max. process temperature
- Without valve: +250 °C (482 °F)
- With valve: +150 °C (302 °F)

RAKD with EAC-approval, option /GC1

Approval:
RU C-DE.AA87.B.00398/20

Explosion proof:
- II Gb c IIC T** X
- III Db c IIIC T**°C X

Max. surface temperature:
T**°C: corresponding process temperature

Ambient temperature:
-25 °C to +80 °C (-4 °F bis 176 °F)

Max. process temperature:
- Without valve: +250 °C (482 °F)
- With valve: +150 °C (302 °F)

RAKD with UKEx-approval, option /BC1

Approval:
CML 21UKEXT968X

Explosion proof:
- II Gb c IIC T** X
- III Db c IIIC T**°C X

Max. surface temperature:
T**°C: corresponding process temperature

Ambient temperature:
-25 °C to +80 °C (-4 °F bis 176 °F)

Max. process temperature:
- Without valve: +250 °C (482 °F)
- With valve: +150 °C (302 °F)

POWER SUPPLIES FOR INTRINSICALLY SAFE COMPONENTS

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

Type:
Acc. to EN 60947-5-6
Standard:
- 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

Alternative for AC types:
- KFU8-SR-Ex*.W (90 to 253 V AC); * = 1 or 2

Fail-safe:
- KFD2-SH-Ex1 (24 V DC), 1 channel

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

Alternative for AC types:
- 90 to 253 V AC 50 to 60 Hz

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

Approvals:
- KFA5-SR2-Ex*.W:
  - ATEX: PTB 00 ATEX 2081
  - UL: E106378
  - IECEx: IECEx PTB11.0031
  - EAC: RU C-DE.EX01.B.00102/19
  - NEPSI/CCC: 2020322316001423
  - KOSHA: 2009-BO-0223-1
- KFA6-SR2-Ex*.W:
  - ATEX: PTB 00 ATEX 2081
  - UL: E106378
  - IECEx: IECEx PTB11.0031
  - EAC: RU C-DE.EX01.B.00102/19
  - NEPSI/CCC: 2020322316001423
  - KOSHA: 2009-BO-0224-1
- KFU8-SR-Ex*.W:
  - ATEX: FIDI 22 ATEX 0029X
  - IECEx: IECEx FIDI 22.0003X
  - UL: E106378
  - SITIIAS CCC: 2023322316005169
- KFD2-SR2-Ex*.W:
  - ATEX: PTB 00 ATEX 2080
  - UL: E106378
  - IECEx: IECEx PTB11.0034
  - PESO: P574609/1
  - NEPSI/CCC: 2020322316001439
  - KOSHA: 2009-BO-0222-1
- KFD2-SH-Ex1:
  - ATEX: PTB 00 ATEX 2042

Entity parameters and marking:
See certificates

TEMPERATURE SPECIFICATION

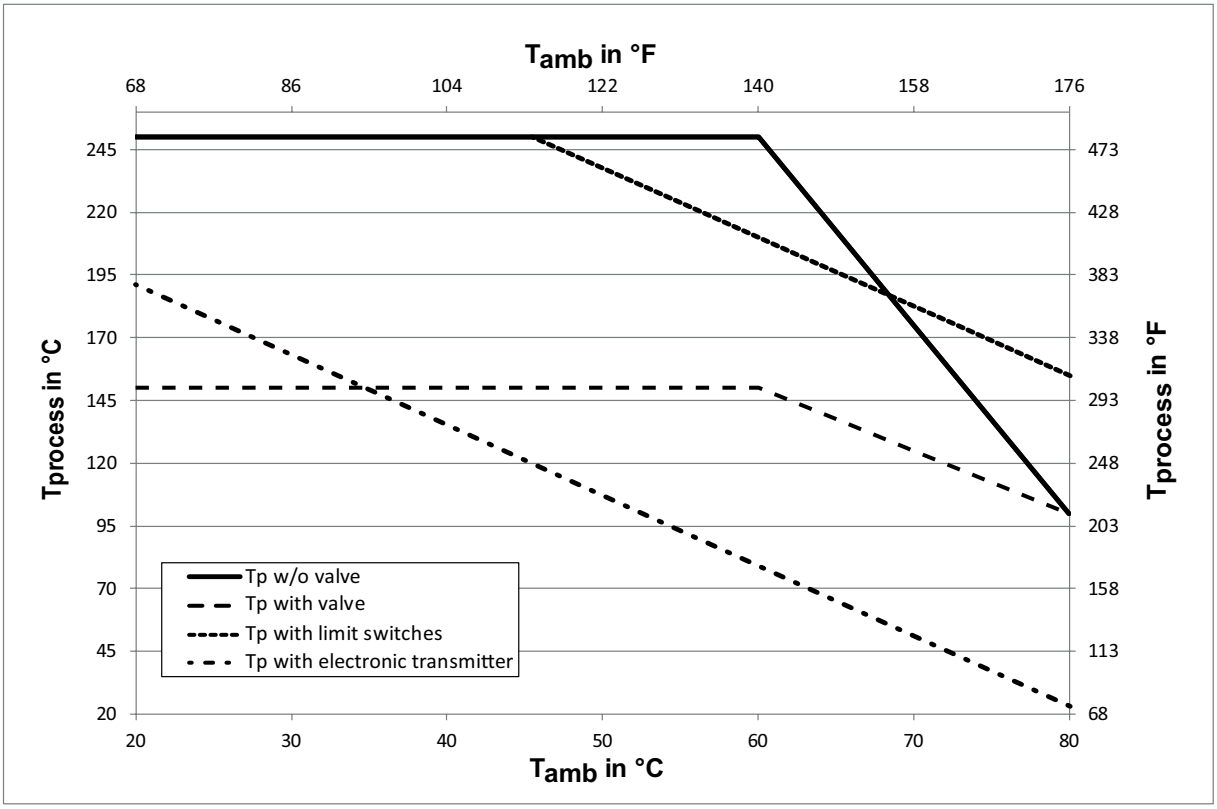


Fig. 2 Maximum allowed process temperature depending on ambient temperature

For units with explosion proof certification the temperature limits according the certificate of conformity must be regarded (see also table 5).
The minimum ambient temperature is -25 °C (-13 °F). Lower temperatures on request.

PLANNING AND INSTALLATION HINTS

- The user is responsible for the use of the flowmeters with regard to suitability and intended use.
- The actual process pressure must be lower as the specified pressure limits.
- Make sure that the wetted parts are resistant to the process fluid.
- Ambient- and process temperature must be between the specified temperature limits.
- If dirt accumulation is to be expected, we recommend to install a bypass pipe.
- To avoid float bouncing in case of gas applications secure that the operating pressure should be at least five times the pressure loss. More recommendations can be found in VDI/VDE 3513, sheet 3.
- To avoid mutual magnetic influence in case of paralleldesign of several Rotameters please make sure that the distance between the tube middle axes is at least 300 mm. The distance to other ferromagnetic materials should be at least 250 mm.
- Avoid static magnetic fields next to the Rotameter.

Specify the following when ordering:
Standard:
- Model, suffix and option code
- Flow conditions
- Temperature
- Pressure
- Viscosity (see viscosity limit)
- Density

For gases:
- Cross reference of the scale
- Option /B□: customer specific markings

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

MODEL SPECIFICATIONS

RAKD are available with valve or without valve. For a RAKD with valve, the flow inlet will be from the rear (see fig. 6). For a RAKD without valve, the flow inlet will be from the bottom (see fig. 3). On the following pages you will be able to configure the matching model for your application.

RAKD without valve

1 to 250 l/h (0.26 to 66 gph) water or 40 to 8000 l/h (1.4 to 282.5 cfh) air at 1 bar and 20 °C (14.5 psi and 68 °F)

Model	Process connection	Description	Restrictions
RAKD01	-D4	EN flange*) DN15 PN40, dimensions + facing acc. to EN 1092 Form B1	
	-A1	ASME flange*) ½ in. class 150, dimension and facing acc. to ASME B 16.5	
	-A2	ASME flange*) ½ in. class 300, dimension and facing acc. to ASME B 16.5	
RAKD02	-D4	EN flange*) DN25 PN40, dimensions + facing acc. to EN 1092 Form B1	
	-A1	ASME flange*) 1 in. class 150, dimension and facing acc. to ASME B 16.5	
	-A2	ASME flange*) 1 in. class 300, dimension and facing acc. to ASME B 16.5	
RAKD41	-G6	Internal thread, G ¼, PN100	Not with cone 52, 53
	-G7	Internal thread, G ¼, PN160	Not with cone 52, 53
	-T6	Internal thread, ¼- 18 NPT, PN100	Not with cone 52, 53
	-T7	Internal thread, ¼ - 18 NPT, PN160	Not with cone 52, 53
RAKD42	-G6	Internal thread, G ⅜, PN100	Only with cone 52, 53
	-G7	Internal thread, G ⅜, PN160	Only with cone 52, 53
	-T6	Internal thread, ⅜ - 18 NPT, PN100	Only with cone 52, 53
	-T7	Internal thread, ⅜ - 18 NPT, PN160	Only with cone 52, 53
RAKD53	-C6	Cutting ring for 6 mm outer diameter tubes, PN100	Not with cone 52, 53
	-C7	Cutting ring for 6 mm outer diameter tubes, PN160	Not with cone 52, 53
	-P1	Nozzle for flexible hoses, inner diamenter 6 mm, PN10	Not with cone 52, 53
	-W6	Swagelok for 6 mm outer diameter tubes, PN100	Not with cone 52, 53
	-W7	Swagelok for 6 mm outer diameter tubes, PN160	Not with cone 52, 53
RAKD54	-C6	Cutting ring for 8 mm outer diameter tubes, PN100	Not with cone 52, 53
	-C7	Cutting ring for 8 mm outer diameter tubes, PN160	Not with cone 52, 53
	-P1	Nozzle for flexible hoses, inner diamenter 8 mm, PN10	Not with cone 52, 53
	-W6	Swagelok for 8 mm outer diameter tubes, PN100	Not with cone 52, 53
	-W7	Swagelok for 8 mm outer diameter tubes, PN160	Not with cone 52, 53
RAKD55	-C6	Cutting ring for 10 mm outer diameter tubes, PN100	Not with cone 52, 53
	-C7	Cutting ring for 10 mm outer diameter tubes, PN160	Not with cone 52, 53
	-W6	Swagelok for 10 mm outer diameter tubes, PN100	Not with cone 52, 53
	-W7	Swagelok for 10 mm outer diameter tubes, PN160	Not with cone 52, 53
RAKD56	-C6	Cutting ring for 12 mm outer diameter tubes, PN100	
	-C7	Cutting ring for 12 mm outer diameter tubes, PN160	
	-W6	Swagelok for 12 mm outer diameter tubes, PN100	
	-W7	Swagelok for 12 mm outer diameter tubes, PN160	
Material	SS	1.4571/316 TI, P1: 1.4408	
Cone	-31	Max flow water: 1 l/h (0.264 gph), air: 40 l/h (1.4 cfh), dp: 6 mbar	
	-32	Max flow water: 1.6 l/h (0.42 gph), air: 60 l/h (2.1 cfh), dp: 6 mbar	
	-33	Max flow water: 2.5 l/h (0.66 gph), air: 100 l/h (3.5 cfh), dp: 6 mbar	
	-34	Max flow water: 4 l/h (1.1 gph), air: 150 l/h (5.3 cfh), dp: 6 mbar	
	-37	Max flow water: 6 l/h (1.58 gph), air: 200 l/h (7.1 cfh), dp: 6 mbar	
	-41	Max flow water: 10 l/h (2.6 gph), air: 325 l/h (11.5 cfh), dp: 8 mbar	
	-42	Max flow water: 16 l/h (4.2 gph), air: 500 l/h (17.7 cfh), dp: 8 mbar	
	-43	Max flow water: 25 l/h (6.6 gph), air: 800 l/h (28.3 cfh), dp: 8 mbar	
	-44	Max flow water: 40 l/h (10.6 gph), air: 1400 l/h (49.4 cfh), dp: 11 mbar	
	-47	Max flow water: 60 l/h (15.8 gph), air: 2000 l/h (70.3 cfh), dp: 11 mbar	
	-51	Max flow water: 100 l/h (26.4 gph), air: 3250 l/h (114.8 cfh), dp: 11 mbar	
	-52	Max flow water: 160 l/h (42 gph), air: 5000 l/h (176.6 cfh), dp: 13 mbar	
	-53	Max flow water: 250 l/h (66 gph), air: 8000 l/h (282.5 cfh), dp: 13 mbar	
Valve	NNN	Without valve	Mandatory
Indicator	-T	Mechanical indicator	
	-E	Indicator with electronic transmitter	
Housing type	80	Stainless steel housing	
Power supply	NNN	Without power supply	Only for indicator T
	424	24V DC, 2 wire, 4 to 20 mA	Only for indicator E

*) All flanges are “slip on”

RAKD with valve

1 to 250 l/h (0.264 to 66 gph) water or 40 to 8000 l/h air (10.6 to 2113 gph) at 1 bar and 20 °C (14.5 psi and 68 °F)

Model	Process connection	Description	Restrictions
RAKD41	-R3	Internal thread, R ¼, PN25	Only with controller
	-T3	Internal thread, ¼ - 18 NPT, PN25	Only with controller
	-G4	Internal thread, G ¼, PN40	Not with controller
	-G6	Internal thread, G ¼, PN100	Not with controller
	-T4	Internal thread, ¼ - 18 NPT, PN40	Not with controller
	-T6	Internal thread, ¼- 18 NPT, PN100	Not with controller
RAKD53	-P1	Nozzle for flexible hoses inner diamenter 6 mm, PN10	
	-C3	Cutting ring for 6 mm outer diameter tubes, PN25	Only with controller
	-W3	Swagelok for 6 mm outer diameter tubes, PN25	Only with controller
	-C4	Cutting ring for 6 mm outer diameter tubes, PN40	Not with controller
	-C6	Cutting ring for 6 mm outer diameter tubes, PN100	Not with controller
	-W4	Swagelok for 6 mm outer diameter tubes, PN40	Not with controller
	-W6	Swagelok for 6 mm outer diameter tubes, PN100	Not with controller
RAKD54	-P1	Nozzle for flexible hoses inner diamenter 8 mm, PN10	
	-C3	Cutting ring for 8 mm outer diameter tubes, PN25	Only with controller
	-W3	Swagelok for 8 mm outer diameter tubes, PN25	Only with controller
	-C4	Cutting ring for 8 mm outer diameter tubes, PN40	Not with controller
	-C6	Cutting ring for 8 mm outer diameter tubes, PN100	Not with controller
	-W4	Swagelok for 8 mm outer diameter tubes, PN40	Not with controller
	-W6	Swagelok for 8 mm outer diameter tubes, PN100	Not with controller
RAKD55	-C3	Cutting ring for 10 mm outer diameter tubes, PN25	Only with controller
	-W3	Swagelok for 10 mm outer diameter tubes, PN25	Only with controller
	-C4	Cutting ring for 10 mm outer diameter tubes, PN40	Not with controller
	-C6	Cutting ring for 10 mm outer diameter tubes, PN100	Not with controller
	-W4	Swagelok for 10 mm outer diameter tubes, PN40	Not with controller
	-W6	Swagelok for 10 mm outer diameter tubes, PN100	Not with controller
RAKD56	-C3	Cutting ring for 12 mm outer diameter tubes, PN25	Only with controller
	-W3	Swagelok for 12 mm outer diameter tubes, PN25	Only with controller
	-C4	Cutting ring for 12 mm outer diameter tubes, PN40	Not with controller
	-C6	Cutting ring for 12 mm outer diameter tubes, PN100	Not with controller
	-W4	Swagelok for 12 mm outer diameter tubes, PN40	Not with controller
	-W6	Swagelok for 12 mm outer diameter tubes, PN100	Not with controller
Material	SS	1.4571/316 TI, P1: 1.4408	
Cone	-31	Max flow water: 1 l/h (0.264 gph), air: 40 l/h (1.4 cfh), dp: 6 mbar	
	-32	Max flow water: 1.6 l/h (0.42 gph), air: 60 l/h (2.1 cfh), dp: 6 mbar	
	-33	Max flow water: 2.5 l/h (0.66 gph), air: 100 l/h (3.5 cfh), dp: 6 mbar	
	-34	Max flow water: 4 l/h (1.1 gph), air: 150 l/h (5.3 cfh), dp: 6 mbar	
	-37	Max flow water: 6 l/h (1.58 gph), air: 200 l/h (7.1 cfh), dp: 6 mbar	
	-41	Max flow water: 10 l/h (2.6 gph), air: 325 l/h (11.5 cfh), dp: 8 mbar	
	-42	Max flow water: 16 l/h (4.2 gph), air: 500 l/h (17.7 cfh), dp: 8 mbar	
	-43	Max flow water: 25 l/h (6.6 gph), air: 800 l/h (28.3 cfh), dp: 8 mbar	
	-44	Max flow water: 40 l/h (10.6 gph), air: 1400 l/h (49.4 cfh), dp: 11 mbar	
	-47	Max flow water: 60 l/h (15.8 gph), air: 2000 l/h (70.3 cfh), dp: 11 mbar	
	-51	Max flow water: 100 l/h (26.4 gph), air: 3250 l/h (114.8 cfh), dp: 11 mbar	
	-52	Max flow water: 160 l/h (42 gph), air: 5000 l/h (176.6 cfh), dp: 13 mbar	Not with controller
	-53	Max flow water: 250 l/h (66 gph), air: 8000 l/h (282.5 cfh), dp: 13 mbar	Not with controller
Valve	VSE	inlet valve, PTFE gasket, silver seat	
	VPE	inlet valve, PTFE gasket, PCTFE seat	
	VSA	outlet valve, PTFE gasket, silver seat	
	VPA	outlet valve, PTFE gasket, PCTFE seat	
Indicator	-T	Mechanical indicator	
	-E	Indicator with electronic transmitter	
Housing type	80	Stainless steel housing 1.4301/304	
Power supply	NNN	Without power supply	Only for indicator T
	424	24V DC, 2 wire, 4 to 20 mA	only for indicator E

OPTIONS

Options	Option code	Description	Restriction
Indicator	/A12	US-engineering units	Only for indicator type E
	/A29	M12-connector acc. to IEC 61076-2-101	Only for indicator type E or T with limit switches
	/A30	M12-connector with plug connector acc. IEC 61076-2-101	Only for indicator type E or T with limit switches
Marking	/B1	Tag plate (SS) fixed by wire and customer specified tag number on scale	Plate 9x40 mm (0.35x1.57 in.); max. 45 digits
	/B4	Neutral version	Not with /VR, /VE, not with hazardous area approval
	/B10	Percentage scale	
	/BG	With customer specified tag number on scale	Max. 30 digits
	/BD	Dual Scale	The current output is adjusted to the conditions of the first scale.
Limit switches	/K1	MIN-contact	
	/K2	MAX-contact	
	/K3	MIN-MAX-contact, MIN-MIN-contact, MAX-MAX-contact	Only for indicator type T
	/K6	MIN-contact fail-safe version	
	/K7	MAX-contact fail-safe version	
	/K8	MIN-MAX-contact fail-safe version	Only for indicator type T
Pulse output	/CP	Pulse output, acc. EN 60947-5-6	Only for indicator type E; not with limit switches
Hazardous area approvals	/KS1	ATEX intrinsically safe “ia”; in combination with /KC: KOSHA intrinsically safe “ia” (Korea)	Not for indicator type T without limit switches
	/KS2	ATEX gas and dust proof limit switches, category 2G 1D	Only for indicator type T with limit switches
	/ES1	IECEx intrinsically safe “ia”; in combination with /KC: KOSHA intrinsically safe “a” (Korea) in combination with /Q11: PESO intrinsically safe “a” (India)	Not for indicator type T without limit switches;
	/FS1	UL intrinsically safe ~~/ non incendive~~ limit switches (USA/Canada)	Only for indicator type T with limit switches
	/NS1	NEPSI intrinsically safe approval (China)	Not for indicator type T without limit switches; only with /CN
	/GS1	EAC-Ex intrinsically safe “ia”	Not for indicator type T without limit switches; only with /VE
	/KC1	ATEX non-electrical type	Only for indicator type T without limit switches
	/GC1	EAC-Ex non-electrical type	Only for indicator type T without limit switches; only with /VE
Country-specific	/VE	EAC-mark for EAEU countries	Not with /Q11, not with /B4
	/KC	KC-mark for Korea	Not with /Q11, not with /B4, for explosion proof see /KS1 or /ES1
	/CN	China RoHS mark	Not with /Q11, not with /B4
Special delivery options	/QD	Quick delivery	On request; Order ready for shipping in 48h on request
Country-specific application	/QR2	Primary verification certificate and Pattern Approval valid in Kazakhstan	See page 4, only with /VE or /VR, not with /B4
	/QR3	Primary verification certificate and Pattern Approval valid in Uzbekistan	See page 4, only with /VE or /VR, not with /B4
	/Q11	PESO intrinsically safe “ia”	Only with option /ES1
Test and certificates	/H1	Oil + fat free for wetted surfaces acc. Yokogawa specification	Only for wetted surfaces, not for /R1 and /R3
	/H4	Oil + fat free acc.Yokogawa specification + add. control with UV lamp	Only for wetted surfaces, not for /R1 and /R3
	/PP	Pressure test report measuring system	
	/P2	Certificate of Compliance with the order acc. to EN 10204: 2004-2.1	
	/P3	As /P2 +Test report acc. to EN 10204: 2004-2.2	
	/P6	Material certificate acc. to EN 10204: 2004-3.1	Only for tube, connection heads, screw sealing plug
	/PM1	PMI test (1 test point: metering tube)	Only for models without valve, not with D4, A1, A2
	/PM4	PMI test (4 test points: metering tube, connection heads, sealing plug)	Only for models with valve
	/PM5	PMI test (5 test points: metering tube, connection pieces, slip on flanges)	Only for models with process connection D4, A1, A2
Accessories	/QC	Colored caps for valve knob (red, blue, yellow, green)	Only with valve, not with /NS1
	/QSA	Float shock absorber	
Controller	/R1	Flow regulator for alternating pre-pressure	Only for process connection R3, T3, C3, W3, P1; only with valve
	/R3	Flow regulator for alternating back-pressure	Only for process connection R3, T3, C3, W3, P1; only with valve
Power supply for limit switches (transmitter relay)	/W1A	115 V AC, 1 channel	Only for limit switches /K1, /K2, /K3 or /CP
	/W1B	115 V AC, 2 channel	Only for limit switches /K1, /K2, /K3
	/W2A	230 V AC, 1 channel	Only for limit switches /K1, /K2, /K3 or /CP
	/W2B	230 V AC, 2 channel	Only for limit switches /K1, /K2, /K3
	/W4A	24 V DC, 1 channel	Only for limit switches /K1, /K2, /K3 or /CP
	/W4B	24 V DC, 2 channel	Only for limit switches /K1, /K2, /K3
	/W4E	24 V DC, 1 channel, fail-safe	Only for limit switches /K6, /K7
	/W4F	2x 24 V DC, 1 channel, fail-safe	Only for limit switches /K8
Instruction manuals	/IEn	Quantity of instruction manuals in English	n = 1 to 9 selectable *)
	/IDn	Quantity of instruction manuals in German	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 instruction manual is selected, only a DVD with instruction manuals is shipped with the flowmeter

DIMENSIONS

Note: The dimensions a, b, c, L1, L2 and L3 are listed in table 6 and 7.

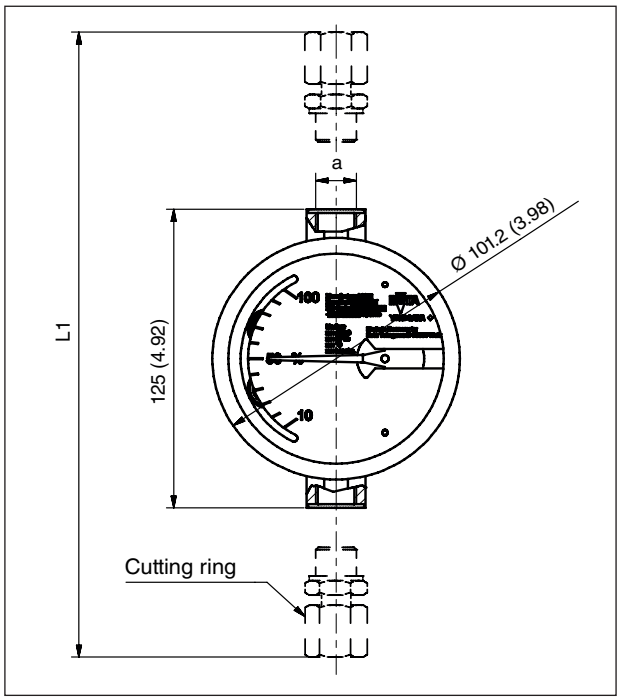


Fig. 3 Version without valve, dimensions in mm (in.)

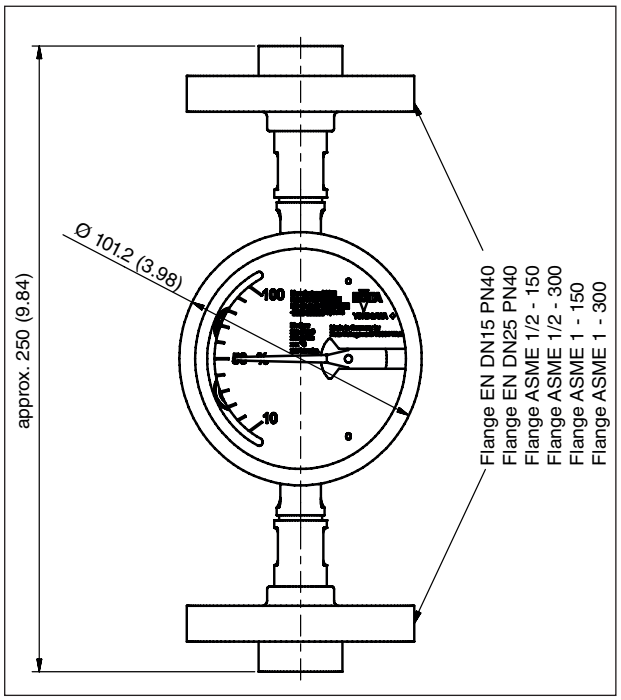


Fig. 4 Version with flange connection, dimensions in mm (in.)

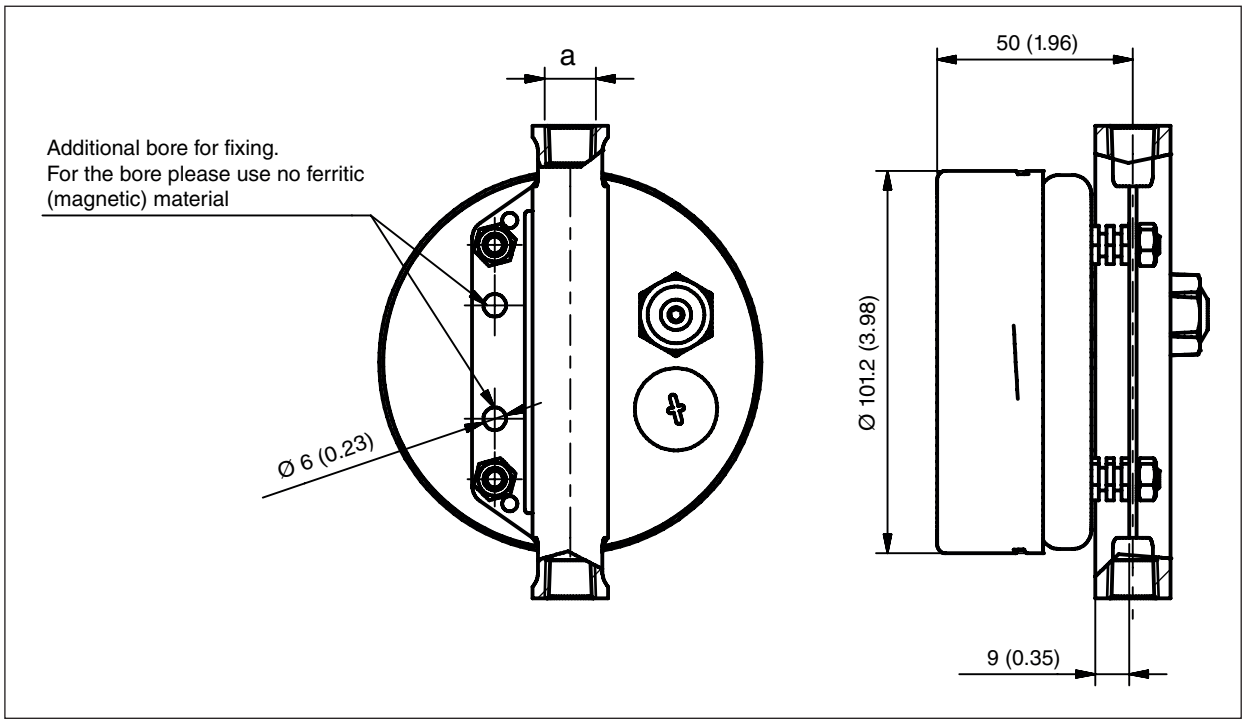


Fig. 5 Back view with mounting bores, dimensions in mm (in.)

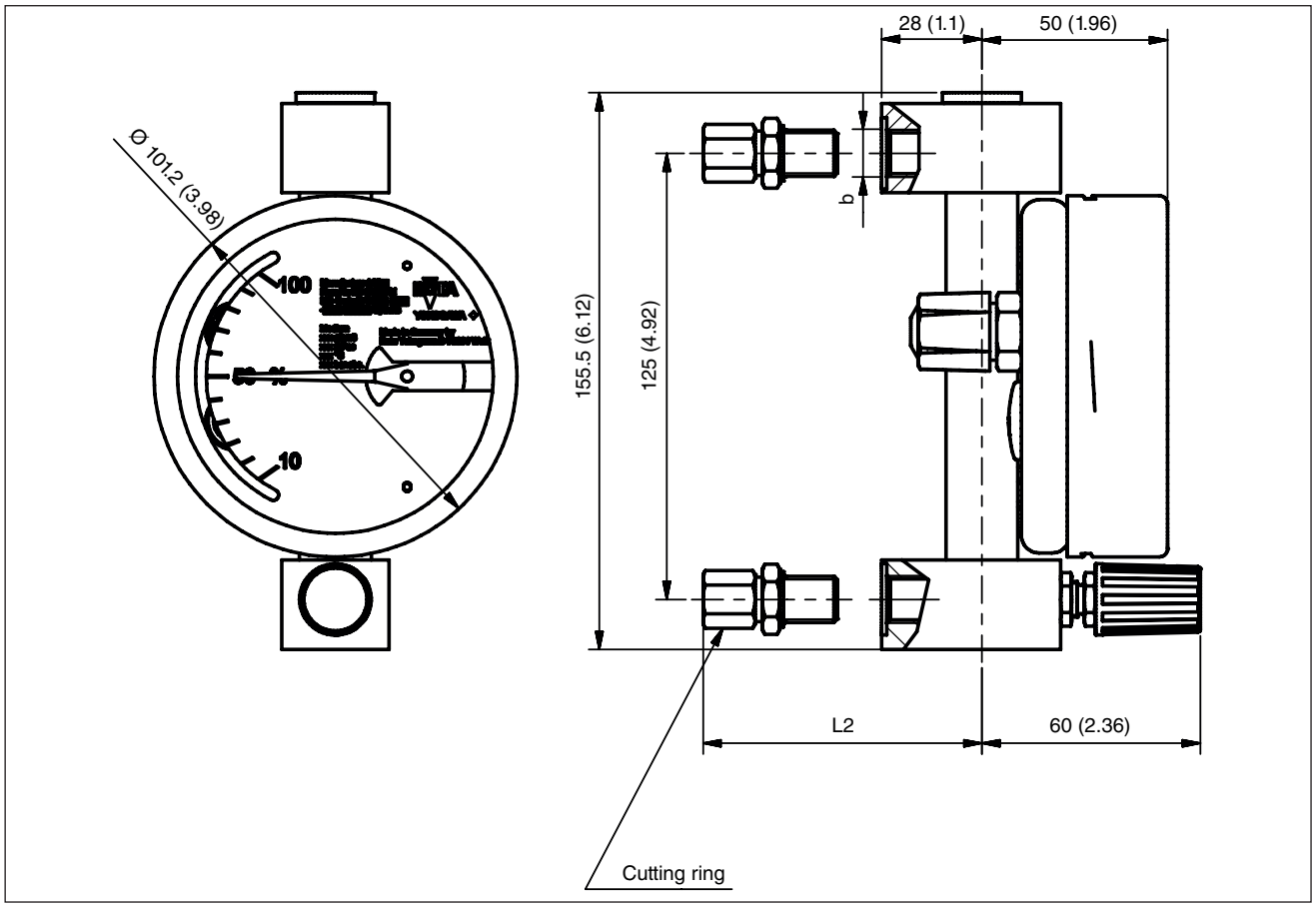


Fig. 6 Version with inlet valve, dimensions in mm (in.)

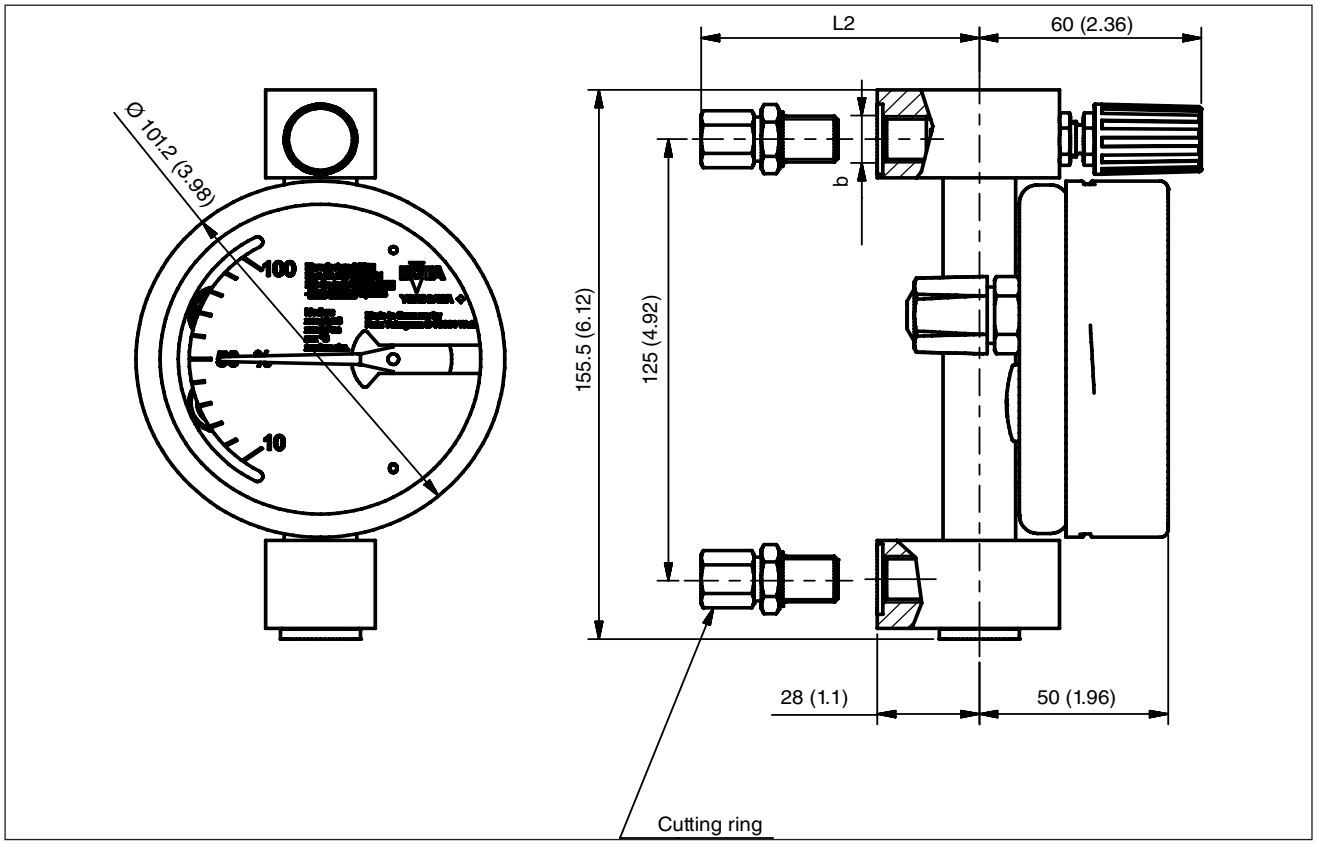


Fig. 7 Version with outlet valve, dimensions in mm (in.)

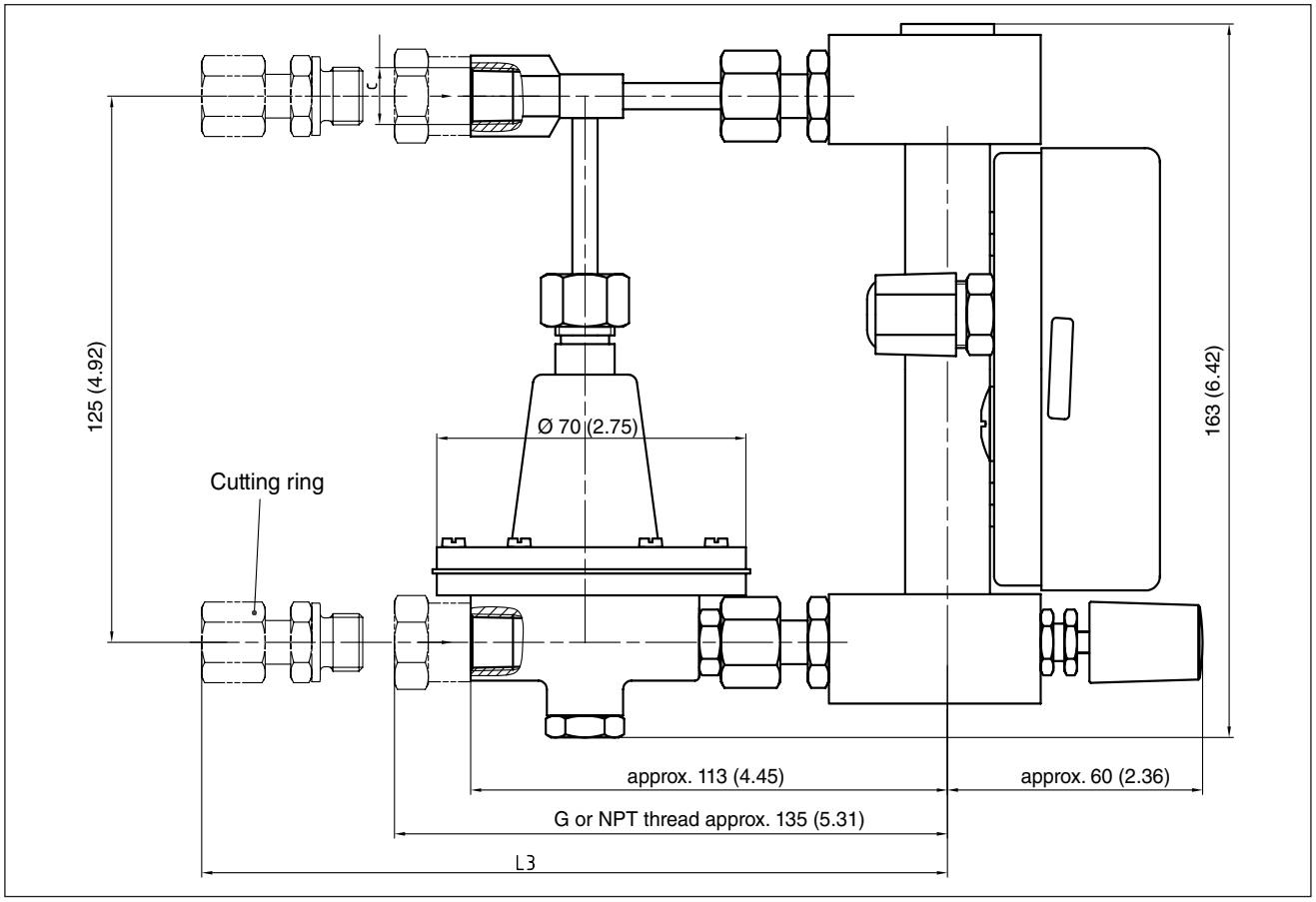


Fig. 8 Version with inlet valve and inlet controller, dimensions in mm (in.)

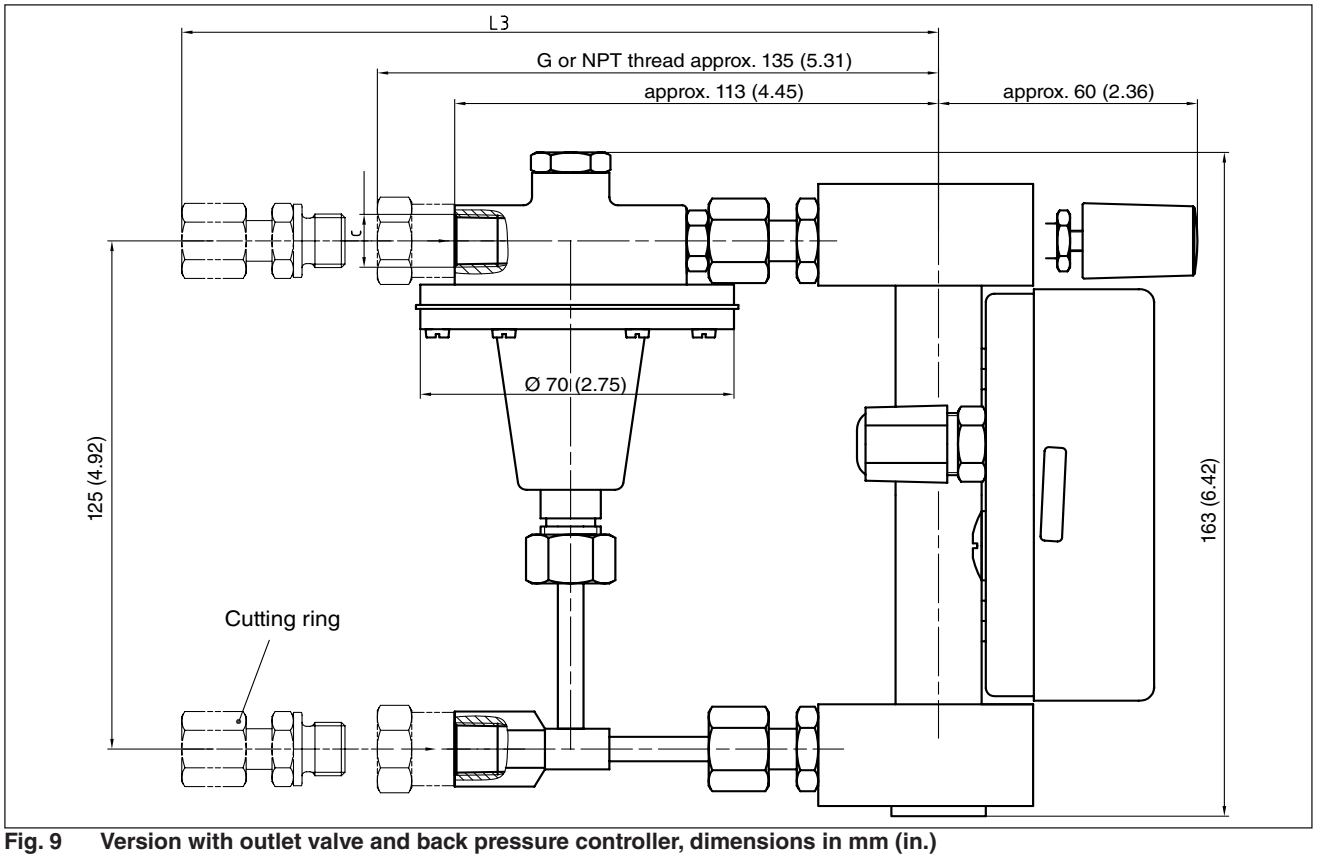


Fig. 9 Version with outlet valve and back pressure controller, dimensions in mm (in.)

TYPES OF PROCESS CONNECTIONS

Table 6

Size	a		b	c
Cone	31 to 51	52 to 53	31 to 53	31 to 51
Thread	G ¼	G ⅜	G ¼	G ¼
	¼ -18 NPT	⅜ -18 NPT	¼ -18 NPT	¼ -18 NPT

INSTALLATION LENGTHS DEPENDING ON PROCESS CONNECTION TYPE AND SIZE

Table 7

		L1		L2	L3
Process connection	**Size**	Cone 31 to 51	Cone 52 to 53	Cone 31 to 53	Cone 31 to 51
Cutting ring	6 (0.24)	178 (7.01)	-	54.5 (2.15)	164 (6.46)
	8 (0.31)	172 (6.77)	-	51.5 (2.03)	161 (6.34)
	10 (0.39)	174 (6.85)	-	52.5 (2.07)	162 (6.38)
	12 (0.47)		174 (6.85)		
Nozzle	6 (0.24)	182 (7.17)	-	56.5 (2.22)	166 (6.54)
	8 (0.31)				
Swagelok	6 (0.24)	178 (7.01)	-	54.5 (2.15)	164 (6.46)
	8 (0.31)	172 (6.77)	-	51.5 (2.03)	161 (6.34)
	10 (0.39)	174 (6.85)	-	52.5 (2.07)	162 (6.38)
	12 (0.47)		177 (6.97)		

dimensions in mm (in.)

WEIGHTS

Table 8
Without flanges:

	Without valve	With valve	With controller
Weight	approx. 600 (1.32)	approx. 1000 (2.20)	approx. 1800 (3.97)

weight in g (lbs)

Table 9
With flanges:

Flange	DN15 PN40	DN25 PN40	ASME ½ in. class 150	ASME ½ in. class 300	ASME 1 in. class 150	ASME 1 in. class 300
Weight	approx. 2480 (5.47)	approx. 3760 (8.29)	approx. 1800 (3.97)	approx. 2300 (5.07)	approx. 3000 (6.61)	approx. 4200 (5.29)

weight in g (lbs)

IDENTIFICATION

The product has a QR Code pasted for efficient plant maintenance work and as-set information management. It enables confirming the specifications of purchased products and user's manuals. For more details, please refer to the following URL.
(https://www.yokogawa.com/qr-code)

REGISTERED TRADEMARKS

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