General Specifications

Model RAMC
Metal Short-stroke Rotameter

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

FEATURES

- Different process connections like flanges according EN and ASME
- All wetted parts in stainless steel or PTFE
- Different linings for aggressive fluids
- Maximum flow 0.025 - 130 m³/h water resp. 0.75 - 1400 m³/h air (20 °C / 1.013 bar abs)
- Accuracy class 1.6 resp. 2.5 with lining acc. VDI/VDE 3513
- Float damping to avoid float bouncing with gas applications
- Optional heat tracing (with steam or fluid heat carrier)
- Indicator in stainless steel, aluminium or plastic, protection class IP65 or IP66/67
- Local indicator without additional power supply
- Microprocessor controlled transmitter with 24 V, 115 V or 230 V power supply
- Intrisically safe version (Ex-i) and flame proof version (Ex-d)
- Dust explosion proof
- Suitable for SIL application, SIL report on request
- Limit switches

Electronic transmitter as standard with local-controlling display with the following features :

- Flow indication (totalize, actual, percent)
- Indication of different volume- and massflow units
- Second (manual) calibration storing
- Patented float blocking indication function
- Signal output damping
- Error message indication
- Temperature measurement in the electronic transmitter
- HART- communication

CONTENTS

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STANDARD SPECIFICATIONS

METERING TUBES

Materials of wetted parts :
- Stainless steel AISI 316L (1.4404)
- PTFE
- other materials on request

Fluids to be measured :
suitable for a variety of liquids, gas and steam

Measuring range :
see table 13 and 14

Measuring range ratio :
10:1

Process connections / Stainless steel :
- Flanges : - acc. EN1092-1
  DN100 – DN150 PN16
  DN15 – DN100 PN40
  DN50 – DN80 PN63
  DN15 – DN50 PN100
  - acc. ASME B 16.5
  ½" – 6" Class 150 raised face
  ½" – 6" Class 300 raised face
  ½" – 3" Class 600 raised face
  - Roughness of sealing
  Form B1 : RA 3.2 - 6.3
  Form B2 : RA 0.8 - 3.2
  ASME : RA 3.2 - 6.3
- Threated connection :
  - male acc. DIN 11851
  - NPT- female
  - G- female
  - Clamp acc. DN25 / 1" – DN100 / 4"

Process pressure :
depends on process connection, see table 12 to 14
higher pressure (up to 700 bar) on request

Process temperature :
- medium wetted parts made of stainless steel
  : -180 …+370 °C
- medium wetted parts made of PTFE
  : -80 … +130 °C

Accuracy class :
Table 1

Material of wetted parts	Size	Accuracy class acc. VDE/VDI 3513 edition 12/1978	Standard flow accuracy: full scale
SS	DN 15 - 100	1.6	± 1.6%
SS	DN 125 - 150	2.5	± 2.5%
PTFE	DN 15 - 100	2.5	± 2.5%

T0.EPS

Pressure Equipment Directive (PED) Directive 97/23/EG :
Tubes :
- Modul : H
- Fluid Group : 1 (dangerous fluids)
- Produced acc. to category
  : III
- Classification : Table 6 (piping)

Heating (options /T1 to /T6) :
- Art. 3 section 3 : (Volume < 1L)
- Fluid Group : 2 (non-dangerous fluids)
- Classification : Table 2 (vessels)

Installation :
- Mounting direction : vertical
- Flow direction : upwards
- Mounting length : see tables 12 to 15
- Straight pipe inlet length
  : DN 80/100 at least 5D, not necessary for smaller sizes

Transportation- and Storage condition :
- Local indicator : -40°C to +110°C
- Electronic transmitter : -40°C to +70°C

Weight :
see table 17

LOCAL INDICATOR

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.

Indicator housing :
- Materials : - Stainless steel (1.4301)
  - painted aluminium casting
  - painted Polyamid with fiberglass each with safety-glass window
- Degree of protection :
  - IP65 (housing type 66 and 90)
  - IP66/67 (housing type 91)

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

Process-/ Ambient temperature :
see fig. 6a to 6d

ELECTRONIC TRANSMITTER
(Indicator/Transmitter Code –E and -H)

Digital display :
8-digits 7-segment-LC-display character height 6 mm

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 = 13.5 V... 30 V DC

Output signal :
- 4-wire units : - 0 - 20 mA, 4 – 20 mA
  - pulse output (option /CP) max. frequency 4 Hz see fig. 3
- 3-wire units : 0 - 20 mA, 4 - 20 mA
- 2-wire units : 4 - 20 mA

The 20mA point is selectable between 60% and 100% of Qnom.

HART-communication :
- 2-wire units : 4 – 20 mA

Load resistance :
- 4-wire units : ≤ 500 Ω
- 2/3-wire unit : ≤ (U-13.5 V)/20 mA
- HART-version : 250 … 500 Ω

Process-/ Ambient temperature :
The dependency of the process temperature from the ambient temperature is shown in fig. 6a to fig. 6d.
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

Storage temperature :
-40 °C to +70 °C

Linearity : :
± 0.2 % f.s.

Hysteresis 1) :
± 0.1 % f.s.

Repeatabillity 1) :
± 0.1 % f.s.

Influence of power supply 1) :
± 0.1 % f.s.

Temperature coefficient of the output signal 1) :
± 0.5 %/10 K f.s.

AC-part of output signal 1) :
± 0.15 % f.s.

Long-time stability 1) :
± 0.2 % /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 (damping 1s)

Electromagnetic compatibility (EMC) :
- Emission acc. EN 55011: 2003 : class A, group 1
- EN 61000-3-2 : 2001
- EN 61000-3-3 : 2002
- Immunity acc. EN 61326 : 2002 : Criterion A, restriction :HF-immunity between 500 MHz and 750 MHz : criterion B

Unit safety acc. DIN EN61010-1 : 2002
- Overvoltage category : II (acc, VDE 0110 or IEC 664)
- Pollution degree : I
- Safety class : I (with 115 / 230V AC power supply)
  III (with 24V DC power supply)

1) referenced to 20°C ambient temperature

POWER SUPPLY FOR ELECTRONIC TRANSMITTER
(Option /U__)

Type :
power supply with galvanically separated input and output
- SINEAX B811, HART- compatible type available

Supply voltage :
- 24 V to 60 V AC/DC
- 85 V to 230 V AC

Maximum load :
750 Ω

Output signal :
0/4 mA - 20 mA

CABLE GLAND (for transmitter –E and –H) :

Size :
- M16x1.5 (standard)
- M20x1.5 (option /A13; standard for option /KF1)
- ½" NPT (option /A5)

Cable diameter :
6 – 9 mm

Maximum cross section of core :
Ø 1.5 mm²

LIMIT SWITCHES IN STANDARD VERSION
(option /K1 to /K3)

Type :
Inductive proximity switch S 3.5-NO acc. DIN 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. DIN EN 60947-5-6 (NAMUR)

Nominal voltage :
8 V DC

Output signal :
≤ 1 mA or ≥ 3 mA

HYSTERESIS OF LIMIT SWITCHES

Min-contact :
- pointer movement : ≈ 0.5 mm
- float movement : ≈ 0.8 mm

Max-contact :
- pointer movement : ≈ 0.5 mm
- float movement : ≈ 0.6 mm

CABLE GLAND (option /K1 to /K10)

Size :
- M16x1.5 (standard)
- M20x1.5 (option /A13; standard for option /KF1)
- ½" NPT (option /A5)

Cable diameter :
6 – 9 mm

Maximum cross section of core :
Ø 1.5 mm²

POWER SUPPLY FOR LIMIT SWITCHES

(Option /W__)

Type :

Transmitter relay acc. DIN EN 50227 (NAMUR)
- KFA6-SR2-Ex1-W (230 V AC)
- KFA5-SR2-Ex1-W (115 V AC)
- KFD2-SR2-Ex1-W (24 V DC)

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

Relay output :

1 or 2 potential-free changeover contact(s)

Switching capacity :

max. 250V AC, max. 2 A

SWITCHING LEVELS FOR LIMIT SWITCHES

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

		SC 3,5-N0		SJ 3,5-SN		
Function	Pointer	Switch	Signal	Switch	Signal	Fail safe
MAX	above LV below LV	on off	1mA 3mA	on off	1mA 3mA	1mA
MIN	above LV below LV	off on	3mA 1mA	off on	3mA 1mA	1mA

Note : LV = Limit value T2.EPS

Table 3 Limit switch as Min-Min-contact in standard and fail-safe version.

		SJ 3,5-SN		SJ 3,5-S1N		
Function	Pointer	Switch	Signal	Switch	Signal	Fail safe
upper MIN	above LV below LV	----- -----	----- -----	off on	3mA 1mA	1mA
lower MIN	above LV below LV	off on	3mA 1mA	----- -----	----- -----	1mA

Note : LV = Limit value T3.EPS

Table 4 Limit switch as Max-Max-contact in standard and fail-safe version.

		SJ 3,5-SN		SJ 3,5-S1N		
Function	Pointer	Switch	Signal	Switch	Signal	Fail safe
upper MAX	above LV below LV	on off	1mA 3mA	---- ----	---- ----	1mA
lower MAX	above LV below LV	---- ----	---- ----	on off	1mA 3mA	1mA

Note : LV = Limit value T4.EPS

Note :
If 2 Fail-Safe limit switches option /K6 ... /K10 are used in a RAMC also 2 power supplies option /W2E or /W4E are necessary.

HAZARDOUS AREA SPECIFICATIONS

INTRINSIC SAFETY

Attention :

The maximum ambient temperature of the transmitter or of the limit switches according to the temperature class may not be exceeded because of heat transmission from the medium.

Table 5 Entity parameters of electronic transmitter

	Ui [V]	Ii [mA]	Pi [W]	Ci [nF]	Li [mH]	Ta max [°C]
KS1	30	101	1.4	4.16	0.15	70
KN1	30	152	1.4	4.16	0.15	70
SS1	30	186	1.4	3.6	0.73	65*)
NS1	30	101	1.4	4.16	0.15	70

*) with limit switches : 40°C T1.EPS

Intrinsically safe electronic transmitter with ATEX-certification (option /KS1) :

Certificate :

PTB 96 ATEX 2160X

Output signal :

4–20 mA (2-wire unit, 3-wire unit) ; 0-20mA (3-wire unit)

Explosion proof :

EEx ia IIC T6; group II ; category 2G

Entity parameter :

see table 5

Electronic transmitter for category 3 (option /KN1) :

Output signal :

4–20 mA (2-wire unit, 3-wire unit) ; 0-20mA (3-wire unit)

Explosion proof :

EEx nL IIC T6 protection „nL"; group II ; category 3G

Dust proof :

EEx II 3D; group II ; category 3D

Max. surface temperature : 80°C

Entity parameter :

see table 5

Intrinsically safe RAMC with SAA -certification (Australia) (option /SS1) :

Certificate :

AUS Ex3777X

Output signal :

4–20 mA (2-wire unit)

Explosion proof :

Ex ia IIC T5

Max. Tamb. :

65°C (with limit switches 40°C)

Degree of protection :

IP54

Entity parameter of electronic transmitter :

see table 5

Limit switches :

option /K6 to /K10

Entity parameter of limit switches :

see certificate AUS Ex 02.3839X

Intrinsically safe RAMC with NEPSI -certification (China) (option /NS1) :
Certificate :
GYJ05152
Output signal :
4–20 mA (2-wire unit, 3-wire unit) ; 0-20mA (3-wire unit)
Explosion proof :
Ex ia IIC T6
Max. Tamb. :
70°C
Entity parameter of electronic transmitter :
see table 5
Limit switches :
option /K1 to /K10
Entity parameter of limit switches :
see certificate NEPSI GYJ03201X

Power Supply for the intrinsically safe electronic transmitter (option /U__)
Type :
Intrinsically safe power supply with galvanically separated input and output
- SINEAX B811, HART- compatible type available
Certificate :
PTB 97 ATEX 2083
Supply voltage :
- 24 V to 60 V AC/DC
- 85 V to 230 V AC
Maximum load impedance :
750 Ω
Output signal :
0/4 mA - 20 mA
Control circuit :
Intrinsically safe [EEx ia] IIC group II, category (1)G
Entity parameters :
see fig 4

Intrinsically safe and dust proof limit switches with ATEX-certification (option /K1 .. /K10 with /KS1) :
Certificate :
- PTB 99 ATEX 2219X (SC3.5-NO)
- PTB 00 ATEX 2049X (SJ 3.5-S.N)
- ZELM 03 ATEX 0128X (for dust proof)
Explosion proof :
EEx ia IIC T6, group II category 2G
Dust proof (only indicator "T") :
EEx iaD 20 T 108 °C, group I I category 1D
Max. surface temperature : T108°C
Entity parameter :
see certificate of conformity

Limit switches for category 3 (option /K1 .. /K10 with /KN1) :
Explosion proof :
EEx nL IIC T6 X protection „nL"; group II ; category 3G
Dust proof :
EEx II 3D; group II ; category 3D
Max. surface temperature : T112°C
Entity parameter :
see specification of SC3,5-N0 Blue (P&F)* (/K1 ... /K3)
see specification of SJ3,5-SN (P&F)* (/K6 ... /K10)
see specification of SJ3,5-S1N (P&F)* (/K6 ... /K10)
* P&F = Pepperl & Fuchs

Power supply for intrinsically safe limit switches (option W__) :
Type :
- KFA6-SR2-Ex1-W (230 V AC)
- KFA5-SR2-Ex1-W (115 V AC)
- KFD2-SR2-Ex1-W (24 V DC)
Certificate :
- PTB 00 ATEX 2081 (115/230 V AC)
- PTB 00 ATEX 2080 (24 V DC)
Control circuit :
[EEx ia] IIC; group II ; category (1)GD
Entity parameter :
see fig. 4

FLAME PROOF AND DUST PROOF RAMC

Flame proof and dust proof RAMC with ATEX-certificate (option /KF1) :
Certificate :
IBExU 05 ATEX 1086
Flame proof :
EEx d IIC T1 ... T6 ; group II ; category 2G
Dust proof :
Group II ; category 1D
Max. surface temperature TX :corresponding process temperature
Housing :
Painted aluminium casting, type 91
Output signal :
4–20 mA (2-wire unit, 3-wire unit) ; 0-20mA (3-wire unit)
Power supply :
2- or 3- wire unit
Ambient temperature :
-20 °C to 60 °C (category 2G / 2D)
-20 °C to 55 °C (category 1D)
Minimum process temperature :
-20°C
Threads for cable glands :
- M20x1.5 (standard)
- ½" NPT (option /A5)

Temperature classification :

Table 6 For RAMC with limit switch

Temp. class	Max. ambient temperature [°C]	Max. process temperature [°C]
T6	60	85
T5	60	100
T4 … T1	60	120

T1Ex.EPS

Table 7 For RAMC with electronic transmitter

Temp. class	Max. ambient temperature [°C]	Max. process temperature [°C]
T6	60	70
T5 … T1	60	70
	40	100

T2Ex.EPS

Table 8 For RAMC with limit switch with extension (option /A16) :

Temp. class	Max. ambient temperature [°C]	Max. process temperature [°C]
T6	60	85
T5	60	100
T4	60	135
T3	60	200
T2	60	300
T1	60	370

T3Ex.EPS

Table 9 For RAMC with electronic transmitter with extension (option /A16)

Temp. class	Max. ambient temperature [°C]	Max. process temperature [°C]
T6	60	85
T5	60	100
T4	60	135
T3	60	200
T2 … T1	60	300

T4Ex.EPS

Table 10 For RAMC with limit switch with extension (option /A16) and insulation (rock wool between tube and back side of indicator)

Temp. class	Max. ambient temperature [°C]	Max. process temperature [°C]
T6	60	85
T5	60	100
T4	60	135
T3	60	200
T2	60	300
T1	60	350

T5Ex.EPS

Table 11 For RAMC with electronic transmitter with extension (option /A16) and insulation (rock wool between tube and back side of indicator)

Temp. class	Max. ambient temperature [°C]	Max. process temperature [°C]
T6	60	85
T5	60	100
T4	60	135
T3	60 40	150 200
T2 … T1	60 40	150 250

T6Ex.EPS

INSTALLATION

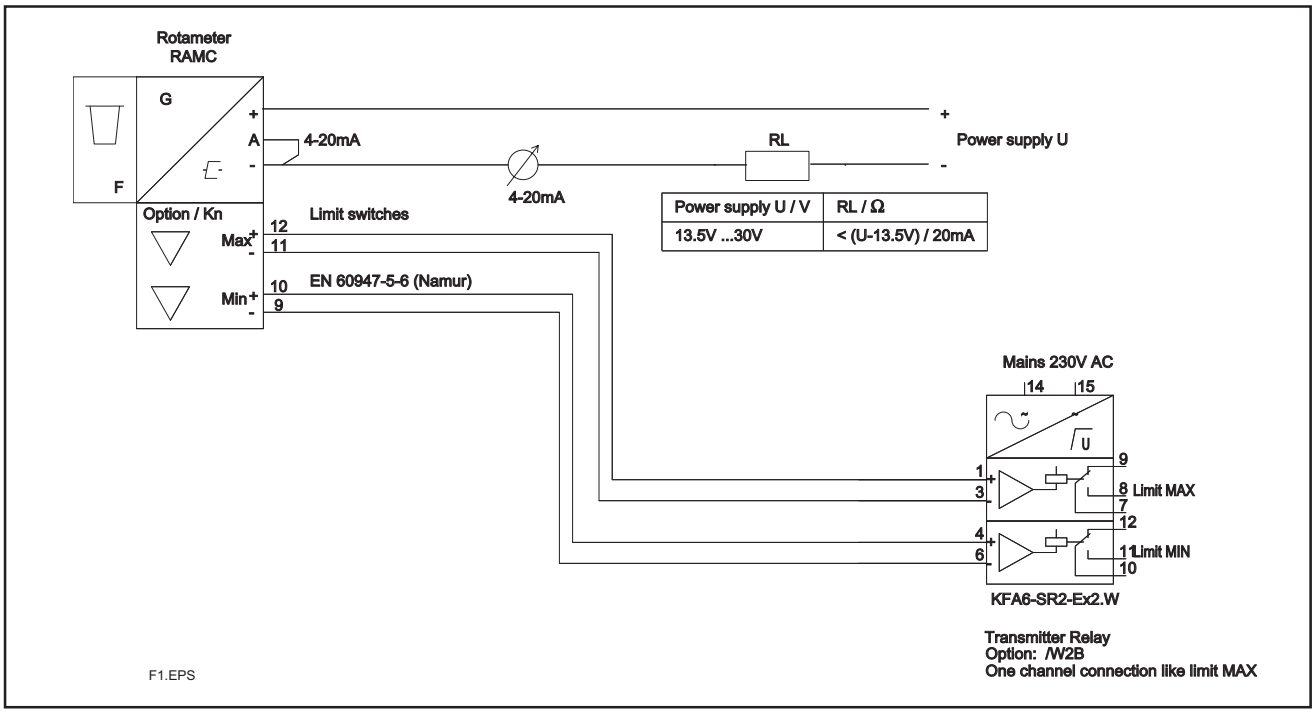

fig. 1 RAMC 2-wire unit with inductive limit switches and transmitter relay.

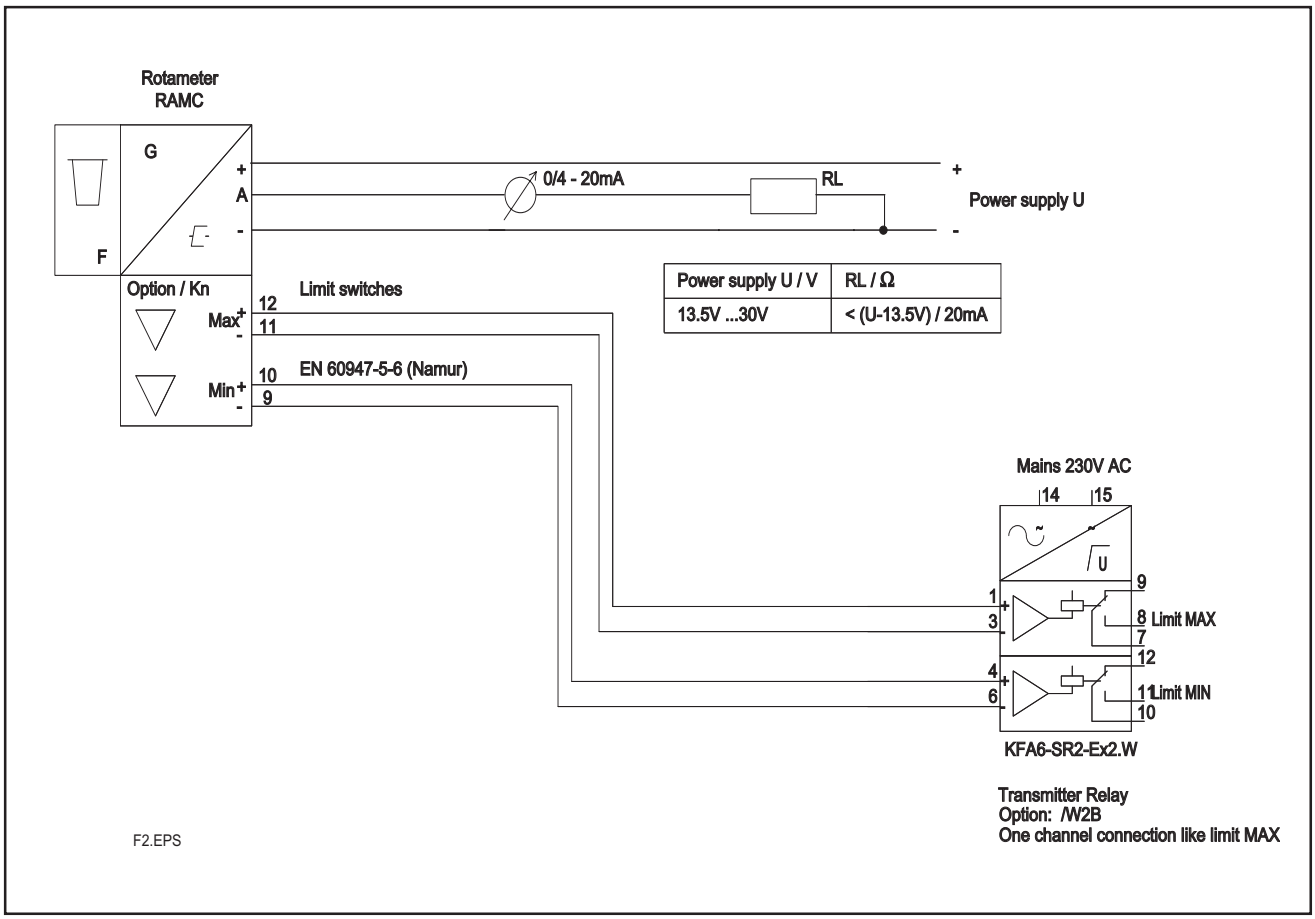

fig. 2 RAMC 3-wire unit with inductive limit switches and transmitter relay.

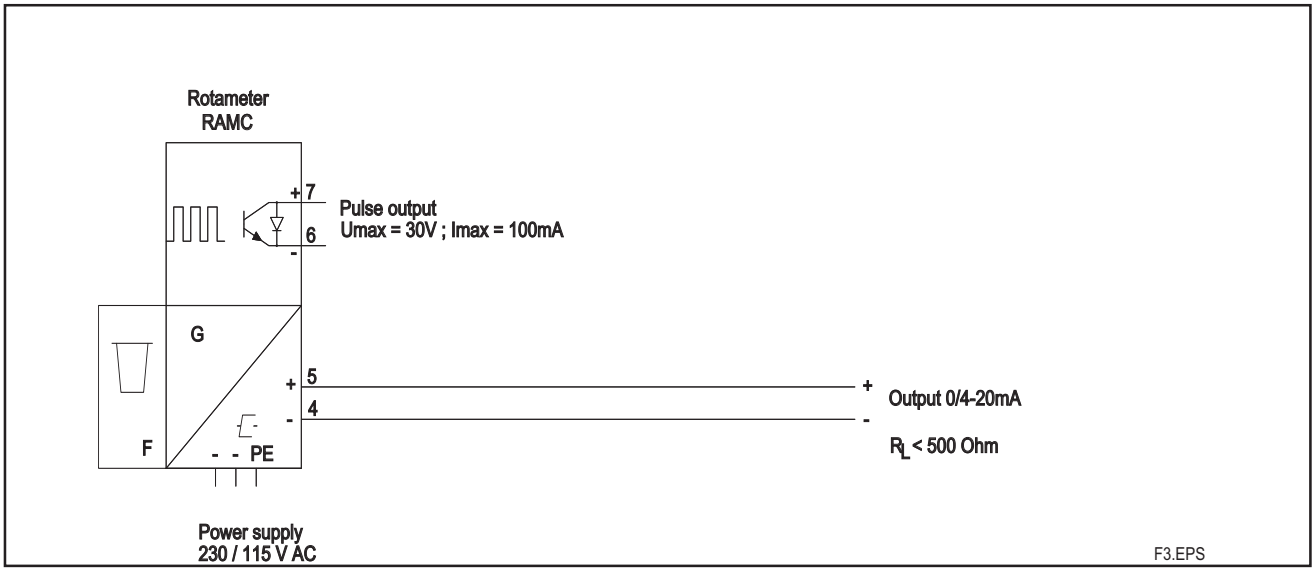

fig. 3 RAMC 4-wire unit with pulse output

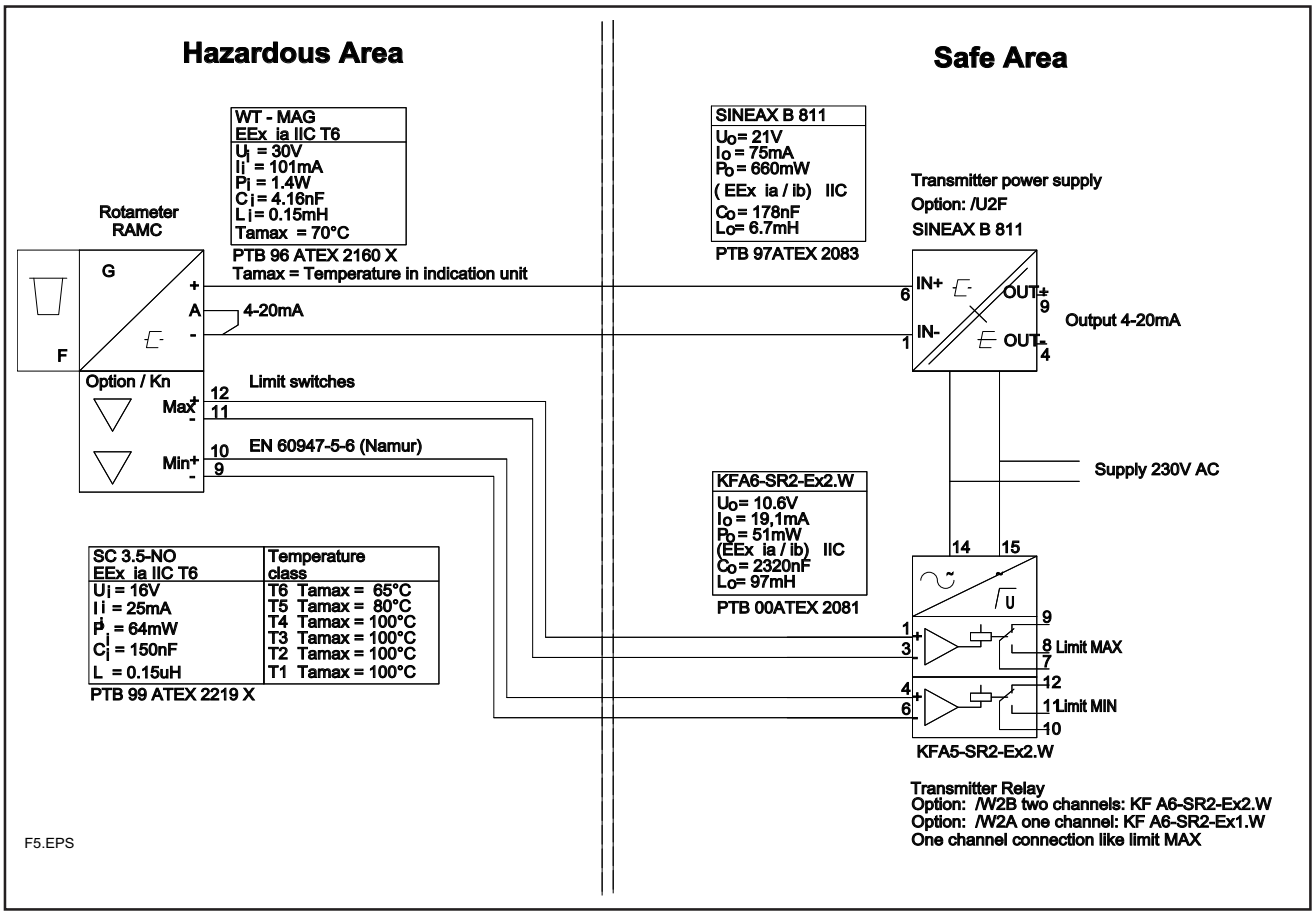

fig. 4 Intrinsic safe version according ATEX (option /KS1) : RAMC 2-wire unit with power supply, inductive limit switches and transmitter relay.

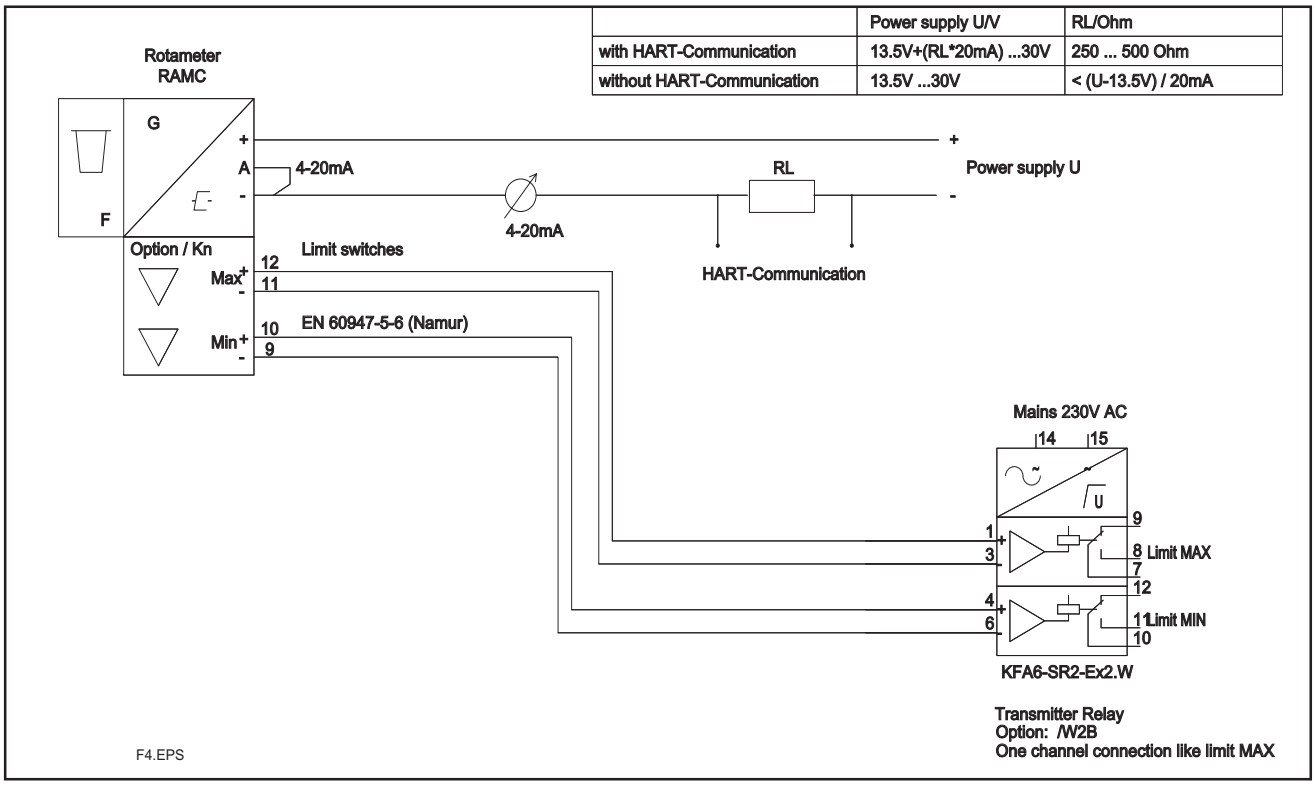

fig. 5 RAMC 2-wire unit with HART-communication, inductive limit switches and transmitter relay.

Planning and Installation Hints

- The user is responsible for the use of our flowmeters regarding suitability and use as agreed.
- 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 medium.
- Ambient- and process temperature must be lower than the specified maximum values.
- If dirt accumulation is to be expected, we recommend to install a bypass pipe
- To avoid float bouncing in case of gas application notice the recommandations of VDI/VDE 3513 Sheet 3.
- To avoid mutual magnetic influence in case of parallel design of several Rotameters take care that the distance between the tube middle axes is not less than 300 mm. The distance to other ferric materials should not be less than 250 mm.
- Avoid static magnetic fields next to the Rotameter.

MODEL SPECIFICATIONS

Model	Suffix code	Option code	Description	Restrictions
RAMC01	.....	.....	Size DN 15 (½ inch)	for D4, D6, A1, A2, A3, T4, R4, T6, G6
RAMC23	.....	.....	Size DN 20 (¾ inch)	for D4, D6, A1, A2, A3, T4, R4, T6, G6
RAMC02	.....	.....	Size DN 25 (1 inch)	for D4, D6, A1, A2, A3, S2, S4, S5, T4, R4, T6, G6
RAMC03	.....	.....	Size DN 32 (1 ¼ inch	for D4, D6, A1, A2, A3, S4, T6, G6
RAMC04	.....	.....	Size DN 40 (1 ½ inch	for D4, D6, A1, A2, A3, S4, S5, T6, G6
RAMC05	.....	.....	Size DN 50 (2 inch)	for D4, D5, D6, A1, A2, A3, S2, S4, T4, R4
RAMC06	.....	.....	Size DN 65 (2 ½ inch)	for D4, D5, A1, A2, A3, S2, S4, T4, R4, T6, G6
RAMC08	.....	.....	Size DN 80 (3 inch)	for D4, D5, A1, A2, A3, S2, S4
RAMC09	.....	.....	3 ½ inch	for A1, A2
RAMC10	.....	.....	Size DN 100 (4 inch)	for D2, D4, A1, A2, S2, S4
RAMC12	.....	.....	Size DN 125 (5 inch)	for D2, A1, A2, S2
RAMC15	.....	.....	Size DN 150 (6 inch)	for D2, A1, A2
RAMCNN	.....	.....	Without measuring tube	
Process connection	-D2	.....	EN flange PN 16, process connection dimensions + facing acc. EN1092 - 1 Form B1	
	-D4	.....	EN flange PN 40, process connection dimensions + facing acc. EN1092 - 1 Form B1	
	-D5	.....	EN flange PN 63, process connection dimensions + facing acc. EN1092 - 1 Form B2	
	-D6	.....	EN flange PN 100, process connection dimensions + facing acc. EN1092 - 1 Form B2	
	-A1	.....	ASME flange class 150, process connection dimensions + facing acc. ASME B16.5	
	-A2	.....	ASME flange class 300, process connection dimensions + facing acc. ASME B16.5	
	-A3	.....	ASME flange class 600, process connection dimensions + facing acc. ASME B16.5	
	-T6	.....	Thread female NPT - PN40	
	-G6	.....	Thread female G : PN40	
	-R4	.....	Thread female Rp : removable	
	-S2	.....	Thread male DIN 11851	
	-S4	.....	Triclamp PN10 ; PN16	
	-T4	.....	Thread female NPT : removable	
	-S5	.....	Flanges Rosista 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 14 and 15	
	-NNNN.....	.....	Without measuring tube / without float	Only with RAMCNN
Indicator / Transmitter	-T	.....	Indicator local	
	-E	.....	Indicator electronic	
	-H	.....	Indicator electronic HART	
	-N	.....	Without indicator	Only with housing NN
Housing type	66	.....	Housing rectangular : Polyamid	Must be selected with option /A14 or /A15
	90	.....	Housing round : SS	
	91	.....	Housing round : Al	Must be selected with option /A14 or /A15
	NN	.....	Without housing	Only with indicator N
Power supply / Output	240	.....	230 V AC : 4-wire : 0-20 mA	Not for indicator H. Not with limit switches
	244	.....	230 V AC : 4-wire : 4-20 mA	Not for indicator H. Not with limit switches
	140	.....	115V AC : 4-wire : 0-20 mA	Not for indicator H. Not with limit switches
	144	.....	115V AC : 4-wire : 4-20 mA	Not for indicator H. Not with limit switches
	430	.....	24V DC : 3-wire : 0-20 mA	Not for indicator H
	434	.....	24V DC : 3-wire : 4-20 mA	Not for indicator H
	424	.....	24V DC : 2-wire : 4-20 mA	
	NNN ...	.....	Without power supply	Only with indicator T or N
Options		/[]	See separate table on next page	

T5.EPS

Specify the following when ordering :

1) Model, suffix code and option code
2) Fluid name ; Process temperature ; Process density ; Process pressure ; Process viscosity
3) For gases : Condition of the scale (st. or actual)
4) Options : Tag No. ; Customer specific notes

OPTIONS

Options	Option code	Description	Restrictions
Indicator	/A5	Cable gland ASME 1/2" NPT female	Not with option /A13
	/A8	With scale for indicator	Only without indicator; Not with options /KS1, /KF1, /KN1, /SS1, /NS1
	/A12	US-engineering units	Only for indicator E + H
	/A13	Cable gland ISO M20 x 1.5 female	Not with option /KF1; not with option /A5
	/A14	Housing colour green	Not with option /A15
	/A15	Housing colour yellow	Not with option /A14
	/A16	Indicator on 95mm extension	Only for housing 90 + 91
Marking	/B0	Tag plate on flange stainless steel	Maximum 24 digits; plate 12 x 40 mm
	/B1	Tag plate fixed by wire stainless steel	Maximum 24 digits; plate 12 x 40 mm
	/B4	Neutral version	Not with option /P6,/KS1,/KN1,/SS1,/KF1
	/B8	Customer provides marking on label	
	/BG	Customer specific notes on scale	Maximum 45 digits
	/BD	Dual Scale	Adjustment only for 1 fluid possible
Limit switches	/K1	MIN-contact	Not for power supply 14n + 24n
	/K2	MAX-contact	Not for power supply 14n + 24n
	/K3	MIN-MAX-contact; MIN-MIN-contact; MAX-MAX-contact	Not for power supply 14n + 24n
	/K6	MIN-contact "Fail Safe"- version	Not for power supply 14n + 24n
	/K7	MAX-contact "Fail Safe"- version	Not for power supply 14n + 24n
	/K8	MIN-MAX-contact "Fail Safe"- version	Not for power supply 14n + 24n
	/K9	MIN-MIN contact "Fail Safe"- version	Not for power supply 14n + 24n
	/K10	MAX-MAX-contact "Fail Safe"- version	Not for power supply 14n + 24n
Pulse output	/CP	Pulse output, isolated	Only for power supply 14n + 24n
Facing (process connection)	/D10	EN raised face B2 : Ra 0.8 - 3.2	Only for EN-flanges (D2;D4)
	/D11	EN groove	Only for EN-flanges (D2;D4)
Ex-proof type	/KS1	ATEX intrisically safe "ia"	Only for power supply 434+430+424; for indicator T only with limit switches
	/KN1	ATEX category 3G "nL" / 3D	Only for power supply 434+430+424; for indicator T only with limit switches
	/SS1	SAA approval (Australia)	Only for power supply 424; for indicator T only with limit switches /K6 to /K10; only for housing 90
	/NS1	NEPSI approval (China)	Only for power supply 424, 430, 434; only for indicator E + H; only for housing 90
	/KF1	ATEX flame proof "d" / dust proof	Only for housing 91; only for power supply 434+430+424
Test and certificates	/H1	Certificate oil + fat free wetted parts	
	/H3	Certificate pure water application	
	/P2	Certificate order compliance 2.1	
	/P3	Test report 2.2 (EN 10204)	
	/P6	Certificate material 3.1 (EN 10204)	Only for metallic pressurized parts
	/PP	Certificate hydro static pressure	
	/PT	Flowtable for conversion	
Damping	/SD	Float damping system	Only for stainless steel; not for cone 81 + 82; only for gas application
Heat tracing	/T1	Heat tracing, process connection R 1/4"	Only for SS material of wetted parts
	/T2	Heat tracing, process connection DN15 PN40	Only for SS material of wetted parts
	/T3	Heat tracing, process connection DN25 PN40	Only for SS material of wetted parts
	/T4	Heat tracing, process connection ASME 1/2" 150#	Only for SS material of wetted parts
	/T5	Heat tracing, process connection ASME 1" 150#	Only for SS material of wetted parts
	/T6	Heat tracing, process connection 1/4" NPT	Only for SS material of wetted parts
Power supply for electronic transmitter	/U2F	SINEAX B811, 85 - 250 V AC, EEx i	Only for indicator E + H
	/U3F	SINEAX B811, 24 V AC/DC, EEx i	Only for indicator E + H
	/U2K	SINEAX B811, 85 - 250 V AC, EEx i, HART compatible	Only for indicator E + H
	/U3K	SINEAX B811, 24 V AC/DC, EEx i , HART compatible	Only for indicator E + H
Power supply for limit switch(es) (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 channels	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 channels	Only for limit switches /K1 + /K2 + /K3
	/W2E	KHA6-SH-Ex1 / 230 V AC, 1 channel, Fail Safe	Only for limit switches /K6 to /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 channels	Only for limit switches /K1 + /K2 + /K3
	/W4E	KHD2-SH-Ex1 / 24 V DC, 1 channel, Fail Safe	Only for limit switches /K6 to /K10
Flange protection	/QK	Flange covers (flange EN)	Only for flange EN
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 *)
	/IFn	Quantity of instruction manuals in French	n = 1 to 9 selectable *) *) if no instruction manual is selected, only a CD with instruction manuals is shipped with the flowmeter

T6.EPS

PROCESS CONNECTION TABLE FOR METAL TUBES

Table 12

Pos	Process connection																															Cone
	EN-Flange													ASME-Flange						Male thread		Calmp		Female thread			Female thread			Flange		Float
	Form B1			Form B2				with groove(Opt.: D11)			Form B2 (Opt.: D10)									DIN11851		Clamp		PN10-PN25			PN40			Rosista PN10		combination
	PN16	PN40		PN63		PN100		PN16	PN40		PN16	PN40		150lbs		300lbs		600lbs		PN16/PN25/PN40		PN10/PN16		NPT	Rp		NPT	G				
	Code	Code	L[1]	Code	L[1]	Code	L[1]	Code	Code	L[1]	Code	Code	L[1]	Code	L[1]	Code	L[1]	Code	L[1]	Code	L[1]	Code	L[1]	Code	Code	L[1]	Code	Code	L[1]	Code	L[1]	Code
	D2	D4	mm	D5	mm	D6	mm	D2	D4	mm	D2	D4	mm	A1	mm	A2	mm	A3	mm	S2	mm	S4	mm	T4	R4	mm	T6	G6	mm	S5	mm	
1	-	DN15 DN20 DN25 DN32 DN40 DN50	250	-	-	DN15 DN20 DN25	250 260	-	DN15 DN20 DN25 DN32 DN40 DN50	250	-	DN15 DN20 DN25 DN32 DN40 DN50	250	1/2" 3/4" 1"	250	1/2" 3/4" 1"	250	1/2" 3/4" 1"	250 260	DN25 PN40	275	DN25 / 1" DN32 DN40 / 1 1/2" PN16	250	1/2" 3/4" PN25		295	1/2" PN40		295	DN25 PN10	250	43 S0 44 S0 47 S0 51 S0
2	-	DN15 DN20 DN25 DN32 DN40 DN50	250	-	-	DN15 DN20 DN25	250 260	-	DN15 DN20 DN25 DN32 DN40 DN50	250	-	DN15 DN20 DN25 DN32 DN40 DN50	250	1/2" 3/4" 1" 1 1/4" 1 1/2" 2"	250	1/2" 3/4" 1" 1 1/4" 1 1/2" 2"	250	1/2" 3/4" 1" 1 1/4" 1 1/2"	260 270 280	DN25 PN40	275	DN25 / 1" DN32 DN40 / 1 1/2" PN16	250	1/2" 3/4" PN25		295	3/4" 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
3	-	DN25 DN32 DN40 DN50	250	DN50	270	DN25 DN32 DN40 DN50	270 280	-	DN25 DN32 DN40 DN50	250	-	DN25 DN32 DN40 DN50	250	1" 1 1/4" 1 1/2" 2"	250	1" 1 1/4" 1 1/2" 2"	250	1" 1 1/4" 1 1/2" 2"	270 280	DN50 PN25	275	DN50 / 2" PN16	250	1" PN16		310	1 1/4" 1 1/2" PN40		310	DN40 PN10	250	63 L2 ; 64 L2 63 M2 ; 64 M2 63 S2 ; 64 S2 64 V2
4	DN100	DN50 DN65 DN80 DN100	250	DN50 DN65 DN80	260 270	– –	– –	DN100	DN50 DN65 DN80 DN100	250	DN100	DN50 DN65 DN80 DN100	250	2" 2 1/2" 3"	250	2" 2 1/2" 3"	250 260	2 1/2" 3"	280 290	DN65 DN80 PN25	275	DN65 / 3" PN10	300	2" 2 1/2" PN10		325	2 1/2" PN40		325	-	-	67 L5 ; 67 M5 67 S5 ; 71 L5 71 M5 ; 71 S5 72 L5 ; 72 M5 72 S5 ; 72V5
5	DN100 DN125[2] DN150[2]	DN80 DN100	250	DN80	270	–	–	DN100 DN125[2] DN150[2]	DN80 DN100	250	DN100 DN125[2] DN150[2]	DN80 DN100	250	3" 3 1/2" 4" 5"[2] 6"[2]	250 260	3" 3 1/2" 4" 5"[2] 6"[2]	260 270 280	–	–	DN100 PN25	300	DN100 / 4" PN10	250	-		-	-		-	-	-	73 L8 ; 73 V8 74 L8 ; 74 V8 77 L8 ; 77 V8
6	DN100 DN125[2] DN150[2]	DN100	250	-	-	-	-	DN100 DN125[2] DN150[2]	DN100	250	DN100 DN125[2] DN150[2]	DN100	250	4" 5"[2] 6"	250 260	4" 5"[2] 6"[2]	260 280	–	–	DN125 PN16	300	-	-	-		-	-		-	-	-	81 11 82 11

(1) L = face to face length

(2) Accuracy class 2,5 instead 1,6

FLOW TABLES FOR METAL TUBES

Table 13

Pos.	Measuring ranges for water and liquids							
	recommended combination					Alternative combination		
	Max. Flow		Cone / Float combination	pressure loss a)	viscosity b)	Cone / Float combination	pressure loss a)	viscosity b)
	m^3/h c)	gpm d)	Code	mbar	mPa*s	Code	mbar	mPa*s
1	0.025	0.11	43 S0	40	10	-	-	-
	0.04	0.18	44 S0	40	80	-	-	-
	0.063	0.28	47 S0	40	80	-	-	-
	0.1	0.45	51 S0	40	80	-	-	-
2	0.13	0.55	53 L1	12	50	-	-	-
	0.16	0.7	-	-	-	53 M1	15	100
	0.22	0. 5	54 L1	12	50	-	-	-
	0.25	1.12	53 S1	40	100	54 M1	15	50
	0.32	1.4	-	-	-	57 L1	12	50
	0.4	1.8	54 S1	40	50	57 M1	15	50
	0.5	2.2	-	-	-	61 L1	12	50
	0.63	2.8	57 S1	40	50	61 M1	15	100
	0.8	3.5	-	-	-	62 L1	12	50
	1.0	4.5	61 S1	40	100	62 M1	15	100
	1.6	7.0	62 S1	40	100	-	-	-
	2.3	10.4	-	-	-	62 V1	45	50
3	1.3	5.7	63 L2	17	50	-	-	-
	2.1	9.2	-	-	-	64 L2	17	50
	2.5	11.2	63 S2	42	30	64 M2	17	10
	4	18	64 S2	42	10	-	-	-
	6	27	-	-	-	64 V2	43	20
4	3,2	14	67 L5	13	20			
	5,0	22	-	-	-	71 L5	13	30
	6,3	28	67 S5	47	30	-	-	-
	8,5	37	-	-	-	72 L5	13	30
	10	45	71 S5	47	5	72 M5	19	5
	16	70	72 S5	47	5	-	-	-
	25	110	-	-	-	72 V5	63	5
5	25	110	73 V8	60	10	-	-	-
	40	180	74 V8	60	10	-	-	-
	63	280	77 V8	60	10	-	-	-
6	100	450	81 11	70	10	-	-	-
	130	570	82 11	70	10	-	-	-

T8.EPS

Measuring ranges for air and gases						
recommended combination					Alternative combination	
Max. Flow			Cone / Float combination	pressure loss a)	Cone / Float combination	pressure loss a)
m^3/h c)	m^3/h i. N. e)	scfm f)	Code	mbar	Code	mbar
0.75	0.7	0.44	43 S0	45	-	-
1.2	1.1	0.7	44 S0	45	-	-
1.8	1.7	1,05	47 S0	45	-	-
3	2.8	1.75	51 S0	45	-	-
4	3.6	2.3	53 L1	13	-	-
5.5	5.0	3.2	-	-	53 M1	21
-	-	-	-	-	-	-
6.5	6.0	3.8	54 L1	13	-	-
9	8.5	5.0	-	-	54 M1	21
10	9.0	5.7	57 L1	13	-	-
14	13	8.0	-	-	57 M1	21
16	15	9.0	61 L1	13	-	-
22	20	12	-	-	61 M1	21
25	23	14	62 L1	13	-	-
34	32	20	-	-	62 M1	21
50	45	28	-	-	62 S1	45
40	36	23	63 L2	19	-	-
50	47	29	-	-	63 M2	23
60	55	35	64 L2	19	-	-
85	80	50	-	-	64 M2	23
120	110	70	-	-	64 S2	47
100	90	57	67 L5	16	-	-
130	120	75	-	-	67 M5	25
160	150	90	71 L5	16	-	-
200	180	115	-	-	71 M5	25
250	230	140	72 L5	16	-	-
340	320	200	-	-	72 M5	25
500	470	290	-	-	72 S5	54
550	500	320	73 L8	30	-	-
850	800	500	74 L8	30	-	-
1400	1300	800	77 L8	30	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

a) Pressure loss at the float with water or air.
b) For higher viscosity the specified precision is no more garanteed.
c) Flow is referred to 20°C and 1 bar abs
d) Flow in US Galonen per minute at 70°F
e) Flow referred to 0°C and 1.013 bar abs at operation conditions of 20°C and 1,013 bar abs
f) Flow in Standard cubicfeet per minute referred to 60°F and 14,7PSI at operation conditions of 70°F und 14,7 PSI abs

For your special application please use the Rota Yokkgawa Sizing-Program

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

Table 14

Pos.	Process connection									Measuring range for Water / Liquids					Measuring range for Air / Gases				
	EN-Flange				ASME-Flange					Max. Flow		Cone / Float combination	Pressure Loss a)	Viscosity b)	Max. Flow			Cone /Float combination	Pressure loss a)
	PN 16	PN40			150 lbs			300 lbs											
	Code	Code	L (1)		Code	L (1)		Code	L (1)	m^3/h c)	gpm d)	Code	mbar	mPa*s	m^3/h c)	m^3/h i. N. e)	scfm f)	Code	mbar
	D2	D4	[mm]		A1	[mm]		A2	[mm]										
2	-	DN15 DN25	250		¾“ 1“	250		¾“ 1“	250	0,1	0,45	51 A1	16	50	3,5	3,3	2,0	51 A1	20
										0,16	07	52 A1	16	50	5,0	4,7	2,9	52 A1	20
										0,25	1,12	53 A1	16	50	8,5	8,0	5,0	53 A1	20
										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
										1,0	4,5	61 V1	18	50	34	32	20	61 V1	22
3	-	DN25 DN40 DN50	250		1¼“ 1½“	250		1¼“ 1½“	250	1,6	7,0	62 A2	20	30	50	47	29	62 A2	25
										2,5	11,2	63 A2	20	30	85	80	50	63 A2	25
										4,0	18	63 V2	22	20	-	-	-	-	-
4	-	DN50 DN65 DN80	250		2½“ 3“	260		2½“ 3“	270	4,0	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	30	350	330	200	71 A5	25
										16	70	71 V5	22	10	-	-	-	-	-
5	DN100	DN80	250		3½“ 4“	270		3½“ 4“	270	16	70	72 V8	25	10	500	470	290	72 V8	27
										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	-	-	-	-	-

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Bold = recommended

(1) L = Mounting length
a) Pressure loss at the float with water or air.
b) As from this viscosity the specified precision is no more garanteed.
c) Flow is referred to 20°C and 1 bar abs
d) Flow in US Galonen per minute at 70°F
e) Flow referred to 0°C and 1.013 bar abs at operation conditions of 20°C and 1,013 bar abs
f) Flow in Standard cubicfeet per minute referred to 60°F and 14,7PSI at operation conditions of 70°F und 14,7 PSI abs

For your special application please use the Rota Yokkgawa Sizing-Program

TEMPERATURE GRAPHS FOR RAMC METAL DESIGN, STANDARD AND Ex-i

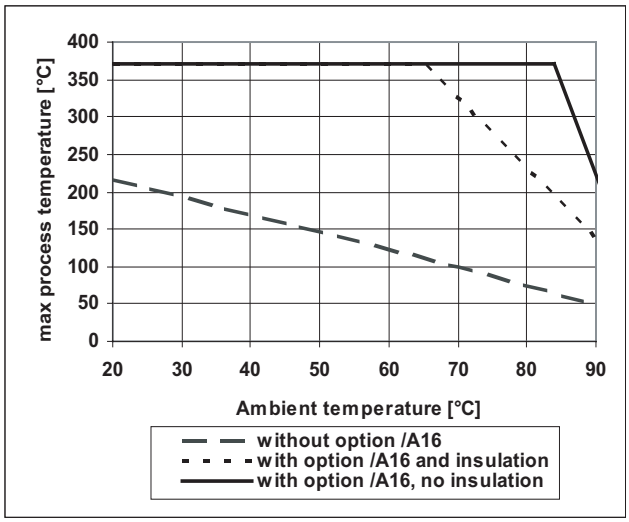

fig. 6a RAMC : - type 90 / 91
- only with indicator

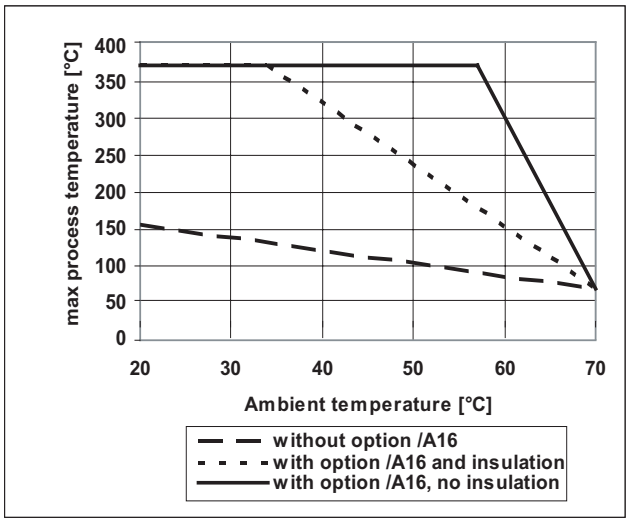

fig. 6b RAMC : - type 90 / 91
- with limit switches
- with electronic transmitter

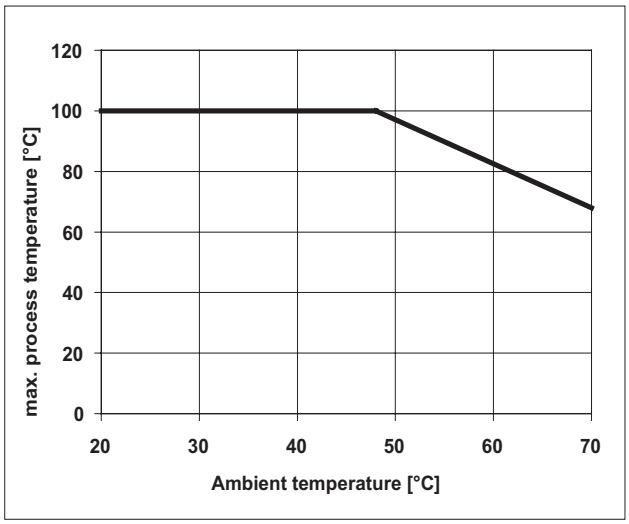

fig. 6c RAMC : - type 66
- with or without limit switches
- with or without electronic transmitter

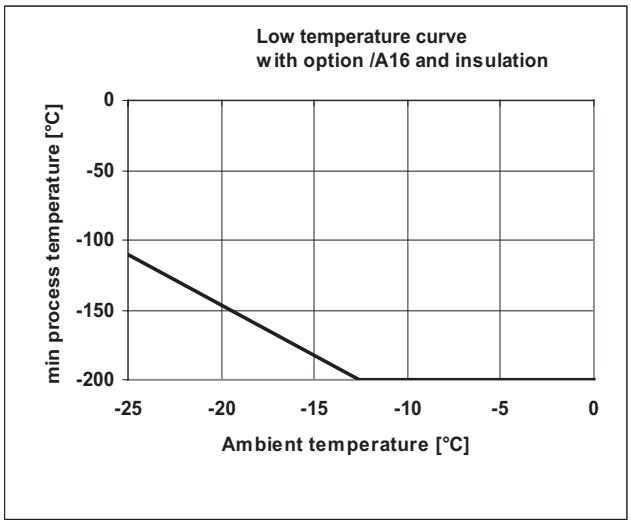

fig. 6d RAMC : - type 90 / 91
- with or without limit switches
- with or without electronic transmitter

T10.EPS

The temperature graphs are reference values for size DN100. They may be influenced negative by dammed heat, external heat sources or radiated heat and influenced positive for smaller sizes.
Insulation means rock wool between tube and indicator.
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 4 and 5).
The minimum ambient temperature for indicators is -25°C except units with option /KF1 (lower temperatures on request).

DIMENSIONS AND WEIGHTS

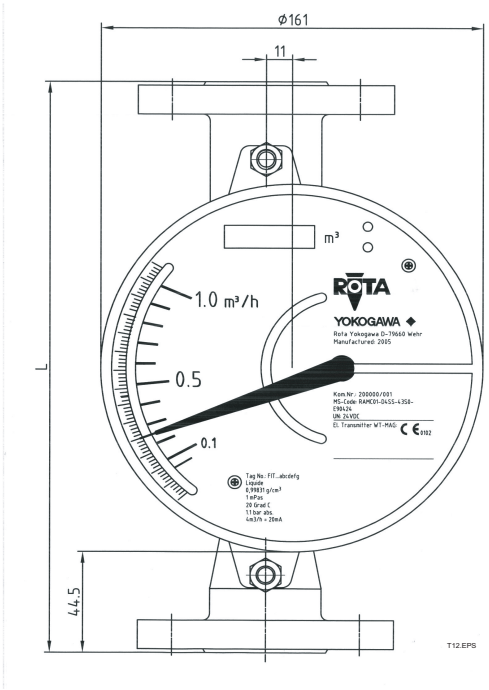

fig. 7a Front view housing type 90

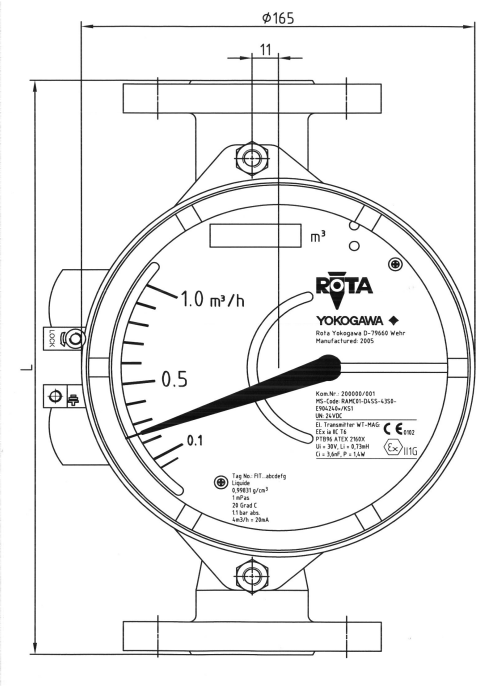

fig. 7b Front view housing type 91

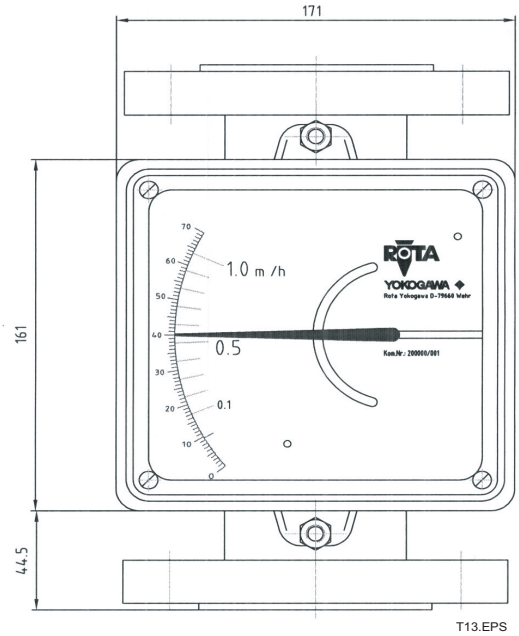

fig. 7c. Front view housing type 66

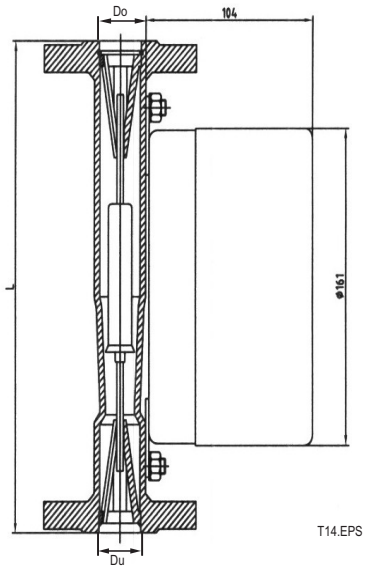

fig. 8 Metal version

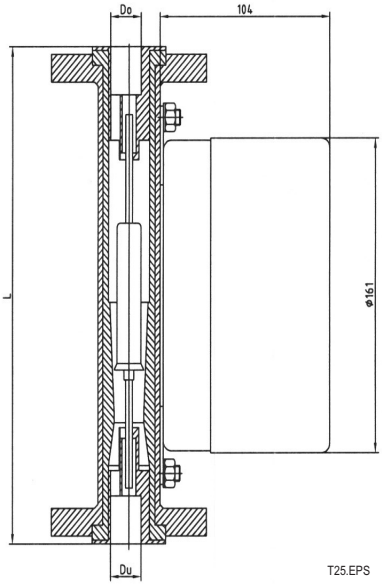

fig. 9 Metal version with lining

Table 15

Inner diameter of stainless steel flanges								Inner diameter of flanges with PTFE-lining			
Pos.*)	EN- flange without groove			ASME- flange			Rosista- flange	Pos.*)	EN- flange	ASME- flange	
	Size	Du	Do	Size	Du	Do	Du = Do		Size	Size	Du = Do
		mm	mm		mm	mm	mm				mm
1	DN15 - DN50	20.7	20.7	½"- 1"	20.7	20.7	20.7				
2	DN15 - DN50	29.5	29.5	½"	20.7	20.7	29.5	2	DN15 - DN25	¾"- 1"	23.5
				¾"- 2"	29.5	29.5					
3	DN25 - DN50	45.2	45.2	1"	32.2	32.2	45.2	3	DN25 - DN50	1¼"- 1½"	36.0
				1¼"- 2"	45.2	45.2					
4	DN50 - DN100	62.0	76.0	2"	62.0	65.5	-	4	DN50 - DN80	2½" - 3"	66.0
				2½" - 3"	62.0	76.0					
5	DN80 - DN150	94.0	94.0	3" - 6"	94.0	94.0	-	5	DN80 - DN100	3½" - 4"	82.0
6	DN100 - DN150	116.0	116.0	4" - 6"	116.0	116.0	-	6	DN100	4"	110.0

*) see table 12; 13; 14

T23.EPS

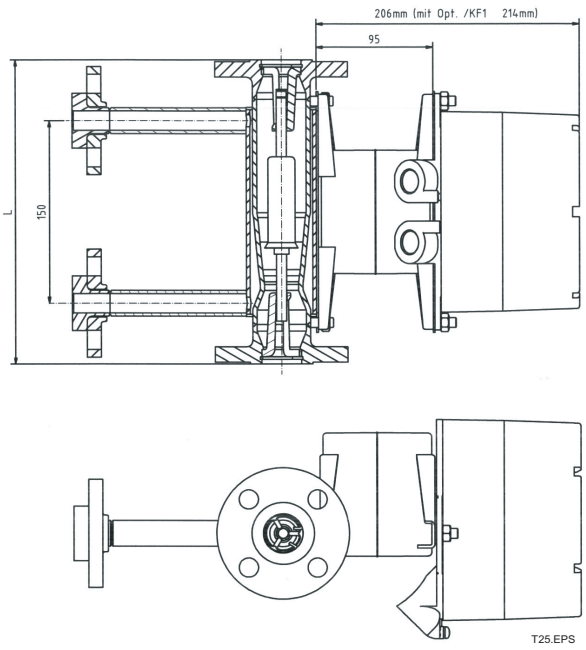

fig. 10 RAMC type 91 and Option /A16 and T2

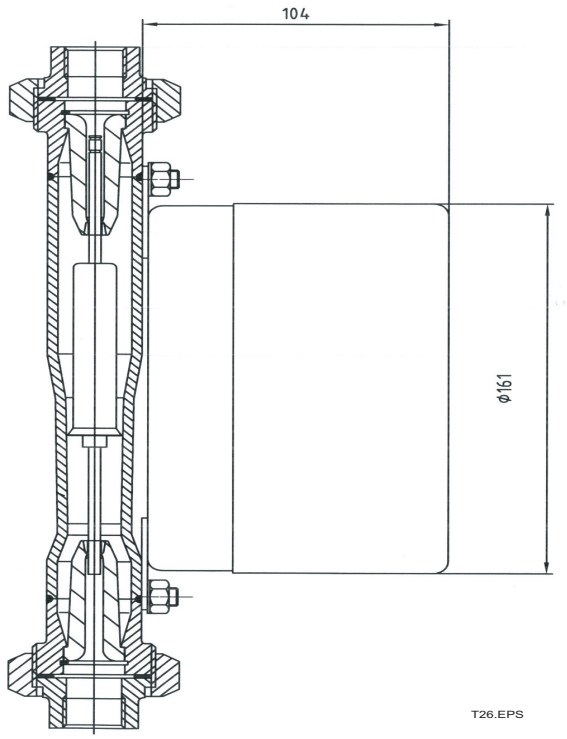

fig. 11 RAMC with connection R4/ T4

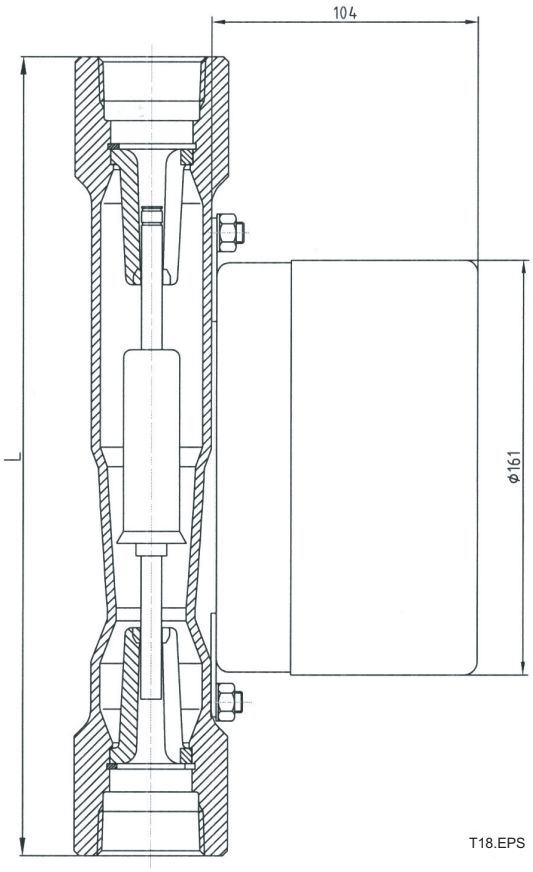

fig. 12 RAMC with connection T6/ G6

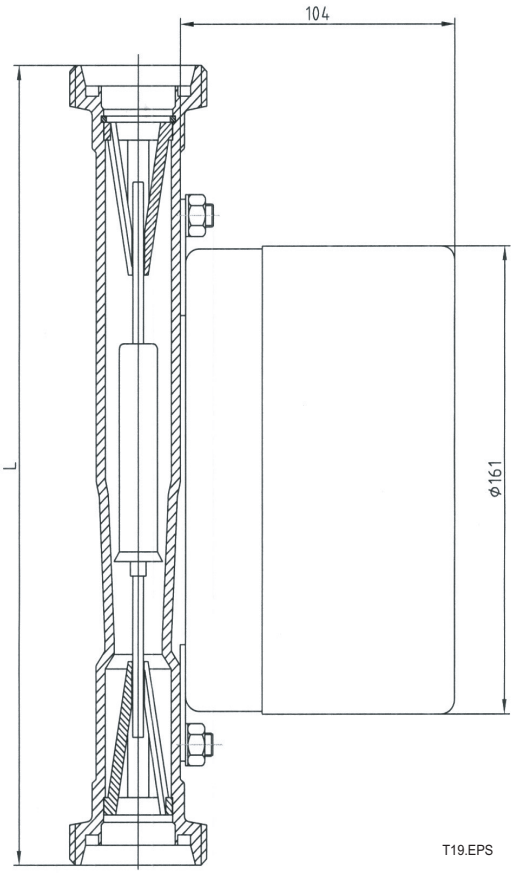

fig. 13 RAMC with connection S2

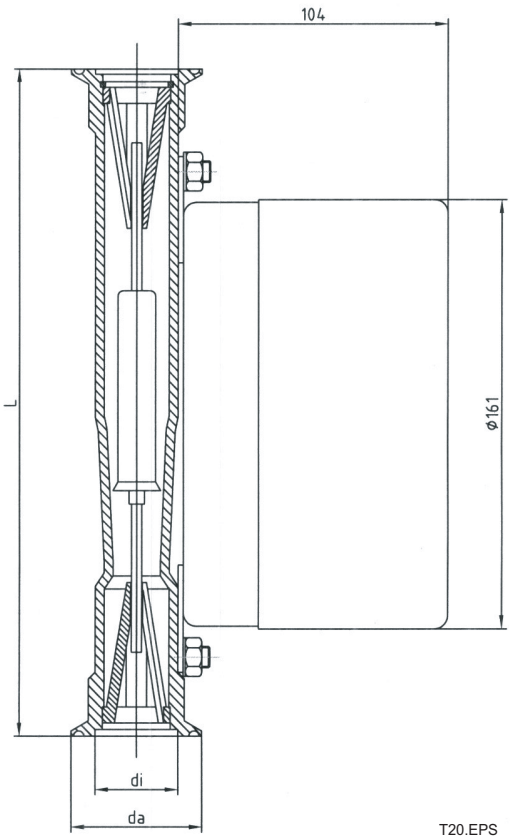

fig. 14 RAMC with connection S4

Table 16 Diameter for connection sizes S4

Position *)	Size [mm]	di [mm]	da [mm]
1	DN25 / 1´´ DN32 DN40 / 1-1/2´´	36 36 36	50.5 50.5 50.5
2	DN25 / 1´´ DN32 DN40 / 1-1/2´´	36 36 36	50.5 50.5 50.5
3	DN50 / 2´´	47,8	64
4	DN65 3´´	72.1 72.1	91 91
5	DN100 / 4´´	97.6	119

*) see table 12;13,14 T21.EPS

Table 17 Weights

Position *)	Weight / kg
1	3 - 5
2	3 - 5
3	6.5 - 8
4	8.6 - 11
5	13 - 16
6	17 - 20

*) see table 12;13,14 T22EPS