



**Assembly and operating Instructions**  
**Variable Area Flow Meters**  
**RA 87 / FA 87**



Kirchner und Tochter



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## 1. Foreword

These Installation and Operating Instructions are applicable to devices of Series RA 87 and FA 87. Please follow all instructions and information given for installation, operation, inspection and maintenance. The Instructions form a component part of the device, and should be kept in an appropriate place accessible to the personnel in the vicinity of the location. Where various plant components are operated together, the operating instructions pertaining to the other devices should also be observed.

## 2. Safety

### 2.1. Symbol and meaning



Safety notice

This symbol is placed against all directions/information relating to occupational health and safety in these Installation and Operating Instructions, and draws attention to danger to life and limb. Such notices should be strictly observed.

### 2.2. General safety directions and exemption from liability

This document contains basic instructions for the installation, operation, inspection and maintenance of the variable area flow meter. Non-observance of these directions can lead to hazardous situations for man and beast and also to damage to property, for which Kirchner und Tochter disclaims all liability.

The operator is required to rule out potentially hazardous situations through voltage and released media energy.

### 2.3. Intended use

The Series RA 87 / FA 87 device is a variable area flow meter designed for liquids and gases, and for installation in vertical pipe runs. Installation in the pipeline should be carried out solely in accordance with these Instructions. The required version of variable area flow meter should be selected on the basis of the pipe diameter at the point of use of the device. The limit values pertaining to the device are given in Section 10 and should not be exceeded. Modifications or other alterations to the flow meter may only be carried out by Kirchner und Tochter. Installation in horizontal pipe runs is possible using appropriate pipe bends. The direction of flow must always be from bottom to top. Details of the process product and the operating conditions are marked on the measuring glass.



## 2.4. Special safety instructions concerning glass devices



For safety reasons, we recommend fitting a protective shield in front of the measuring tube when starting up flow meters fitted with glass measuring tubes. The devices should not be operated where there is a risk of pressure surges (water hammer)!

To avoid glass breakage, all fitting work between measuring glass and heads inside the glass should be carried out by twisting and simultaneously pressing after having wetted the packing rings/gaskets.

## 2.5. Safety information for Operator and operating personnel

Authorized installation, operating, inspection and maintenance personnel should be suitably qualified for the jobs assigned to them, and should receive appropriate training and instruction.

## 2.6. Regulations and guidelines

In addition to the directions given in these Installation and Operating Instructions, observe the regulations, guidelines and standards, such as DIN EN, and, for specific applications, the codes of practice issued by DVGW (gas and water) and VdS (underwriters), or the equivalent national codes, and applicable national accident prevention regulations.

## 2.7. Notice as required by the hazardous materials directive

In accordance with the law concerning handling of waste (critical waste) and the hazardous materials directive (general duty to protect), we would point out that all flow meters returned to Kirchner und Tochter for repair are required to be free from any and all hazardous substances (alkaline solutions, acids, solvents, etc.).



Make sure that devices are thoroughly rinsed out to neutralize hazardous substances.

## 3. Transport and storage

Always use the original packing for transport, handling and storage. Protect the device against rough handling, impact, jolts, etc.

## 4. Installation

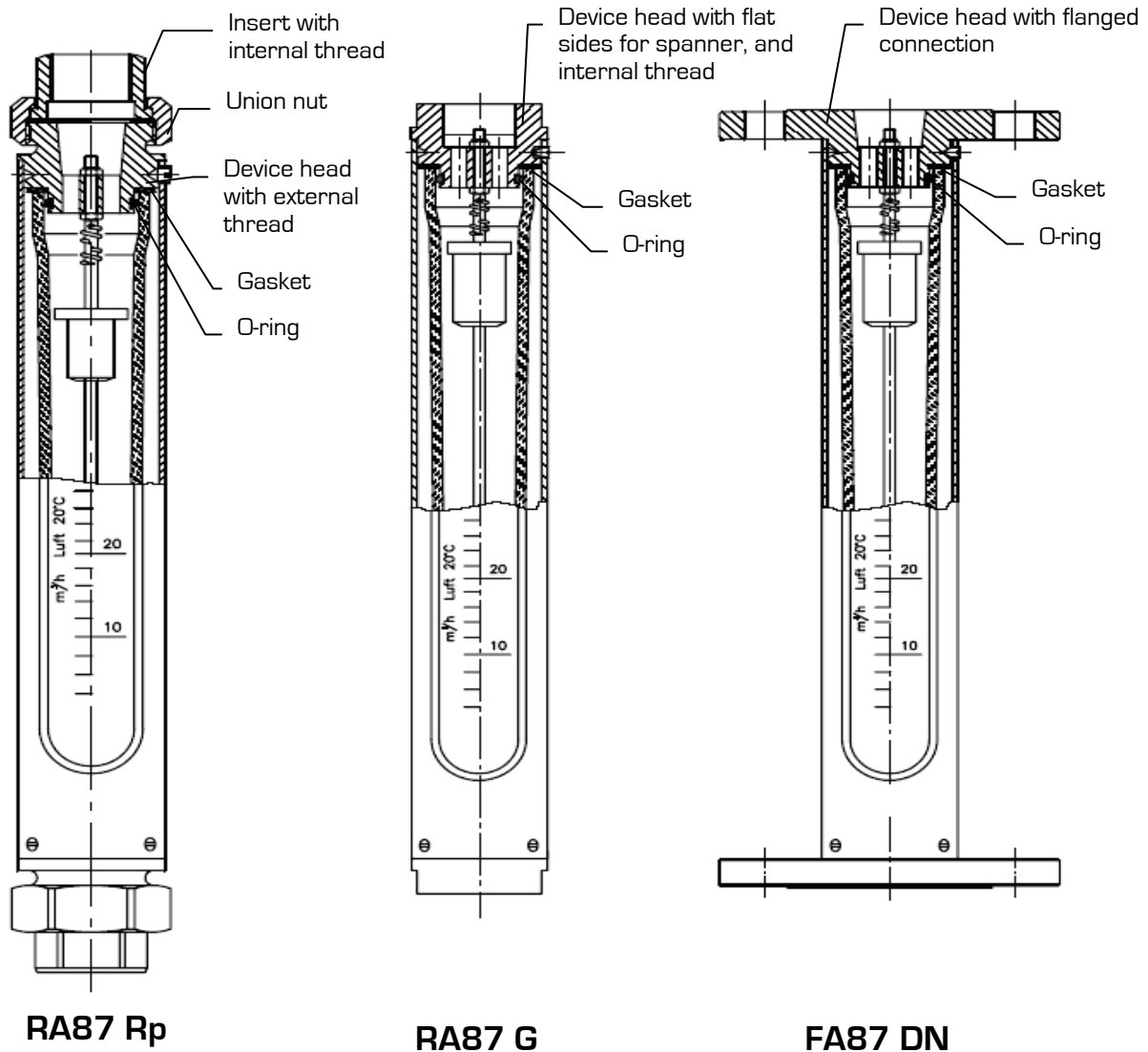
Variable area flow meters are only suitable for vertical installation, where the direction of flow is from bottom to top. For all other installation situations, appropriate pipe bends need to be fitted in the existing pipeline in order to ensure vertical flow through the device from below.

Before installing, remove all protective caps, transport locks and any foreign bodies found. Pay regard to the correct spacing and exact alignment of the pipes at the point of installation. For Type RA 87 Rp with external pipe thread, additionally fit both free ends of the pipe with the pipe unions on the flow meter before installation.



# RA 87 / FA 87

Unimpeded straight inlet and outlet runs should each have a length of 5 x DN. Control equipment for gaseous media in particular should be located downstream of the flow meter. The measuring device is inserted either by using appropriate gaskets with the union nuts at the ends of the pipe (RA 87 Rp) or direct on the ends of the pipe or screw-in connection with a suitable open-end spanner at the device head (RA 87 G). The RA 87 Rp meter is sealed off from the pipeline by means of the supplied gaskets, and the RA 87 G meter using appropriate packing material or screw-in connections. After it has been installed, the measuring device should not be turned any more. Avoid pulling the ends of the pipes together and do not excessively tighten down the device.





## **RA 87 / FA 87**

### **4.1. Installation RA 87 G**

When screwing in adjacent fittings, use the flat sides at the ends of the device for counter-holding with a suitable open-end spanner. Use suitable packing material.

### **4.2. Installation RA 87 Rp**

- Dismantle the inserts and the union nuts from the device.
- Slide the union nuts over the ends of the pipeline at the installation point.
- Screw the inserts using packing material on to the pipe ends.
- Slide the device with the gaskets at both ends into the installation point.
- Screw the union nuts back on the device heads and tighten down such that the device is seated in the pipeline without stresses.

### **4.3. Installation FA 87 DN**

- Slide the device with the flat gaskets (not included with supply) at both ends into the installation point.
- Check that the gaskets are in alignment and make sure they do not project into the pipeline.
- Attach bolts and nuts loosely to the flanged connection.
- Tighten bolts on the flanged connection in diagonally opposite sequence so that the device is fastened in the pipeline without stresses.

## **5. Start-up**

The device must be properly installed before it is started up.

- Check all device connections.
- To set the flow: pressurize the pipelines by slowly opening the shut-off valves (risk of glass breakage!). On liquid service: carefully evacuate the pipeline.
- Check the leak-tightness of all components and, if necessary, tighten down threaded joints or screw connections.

## **6. Readings in operation**

The flow value is read off from the scale on the glass cone at the top edge of the float. The measured-value readings are only correct when the operating condition at the measuring point (flowing medium, operating pressure and temperature) corresponds to the values marked on the measuring glass. If operating conditions should differ, the measured value must be corrected with the aid of the general float equation, which you will find in our technical documents.

You can also do the recalculation with the help of our conversion program given on our homepage: [www.kt-web.de](http://www.kt-web.de), Section "Physical Basics".



## 7. Limit switches MSK1 / MSK12 / MSKW

The flow meter can be equipped with limit switches to provide local indication with monitoring function.

The limit switches consist of a limit switch (reed switch) that is switched over by the magnet integrated in the float.

The limit switch is guided in a guide slot in the protective case and can be adjusted over the full measuring range. The reed switches have a bistable characteristic.

Uncontrolled current and voltage peaks can occur in the case of inductive or capacitive loads, e.g. from contactors or solenoid valves. Such peaks will also occur, depending on cable geometry, where cables exceed a certain length.

We therefore recommend using an MSR contact protection relay, which is additionally available. This will increase the contact rating and prevent occurrence of inductive and capacitive peaks, thus ensuring long service life of the contacts.

Electrical data and limit values are specified in Section 10.2.

### 7.1. Connection of limit switches



- Electrical connection of the device must be carried out in conformity with the relevant VDE regulations (or equivalent national standards) and in accordance with the regulations issued by the local power supply utility.
- Disconnect the plant from supply before connecting the limit switch.
- Provide a protective circuit for the switches in keeping with their capacity.
- Connect line-side fuse elements matched to consumption.
- Connect the cable using the supplied right-angle plug. Assigned are terminals 1 and 2. Earth and terminal 3 are not assigned. The circuit diagram for limit switches is shown in the Technical Data, Section 10.2 on page 13.

### 7.2. Setting the limit switches

- Loosen the lock nut M10 on the neck of the switch.
- Slide the switch to the flow value required to be monitored.
- Test the switching characteristic by moving the float over and beyond the switching position.
- Retighten the lock nut.

## 8. Maintenance and cleaning of the flow meter

The device is maintenance-free. Should the glass cone become fouled, the device can be removed from the pipeline as follows.

### 8.1. Dismantling and installation

Remove the flow meter out of the system by detaching the union nuts or, as the case may be, the screw connections and/or pipe unions. After dismantling the upper head (detaching the radial retaining screw), remove the measuring glass from the device and clean the individual parts. Reassemble in reverse order. Pay special attention to correct installation of the appropriate gaskets and the float/float stop. Before installing, inspect all gaskets (see Figure on page 5) for signs of damage, and replace as and when necessary.



## **8.2. Replacement of measuring glass**

Refer to Figure on page 5.

1. Remove the device from the installation point. Detach the lateral retaining screws and remove the heads from the glass by simultaneously twisting and pulling them out of the glass. On devices with guide rod, leave the rod mounted on the upper head!
2. On devices with non-guided floats, remove the float stops and the float from the old glass and insert them into the new glass. Screw the float stops (helical springs made of VA steel) carefully with a pair of pliers into the glass ends (risk of glass breakage!).
3. Fit the device heads with new O-rings and gaskets.
4. Wet the O-ring before assembling glass and head.
5. Carefully slide the lower device head into the bottom opening of the measuring glass, twisting and pushing simultaneously (risk of glass breakage!).
6. Insert the glass with head into the case, making sure not to knock the glass against the case.
7. Fasten the device head with the retaining screws to the case.
8. Align the glass cone so that the inscriptions can be read off through the viewing window in the case.
9. Slide the second head with wetted O-ring by simultaneously twisting and pushing it into the upper opening of the measuring glass, or steel case. Also lock the head in place on the case.
10. On devices with guide rod, check float mobility. If necessary, correct the position by turning the guide rod (to do this, hold the plain end of the guide rod at the lower head with a pair of engineer's pliers, or similar tool, and slightly loosen the M5 screw on the opposite side).
11. Reinstall the device in the installation point.

## **9. Service**

All devices with defects or deficiencies should be sent direct to our repair department. To enable our customer service facility to deal with complaints and repairs as quickly as possible, you are kindly requested to coordinate the return of devices with our sales department, Tel. +49 (0) 2065-96090.

### **9.1. Disposal**

Please help to protect our environment, and dispose of workpieces in conformity with current regulations or use them for some other purpose.





## 10. Technical data

Nom. pressure rating	FA 87: PN 10 at 20°C RA 87: PN 10 at 20°C
Max. operating pressure	<u>Size according dimension tables</u> <u>pressure [bar]</u> 9,5; 19; 30                                    10 36; 43    8
Thermal endurance	80°C; optionally: 100°C
Ambient temperature	90°C
Turndown ratio	01:10
Accuracy class	1.6 to VDI/VDE 3513
Connection RA 87	1) cylindrical internal fastening thread to ISO 288 2) two-part pipe union Insert with cylindrical internal thread to ISO 7-1
Connection FA 87	Flanges PN 10 to DIN 2501, others (ANSI, JIS, ...) on request

## Materials

Protective case	1.4301 stainless steel
Heads RA 87	1.4571 stainless steel
2-part threaded joint	1.4571 stainless steel
Flanges FA 87	1.4571 stainless steel
Measuring glass	Borosilicate glass (Duran)
Shatterproof glass	Perspex XT
O-ring seals	Standard: Viton, optionally EPDM, FFKM, silicone, Perlast
Gaskets	not wetted: NBR, otherwise Viton (RA 87 Rp)
Float for liquids 1)	Standard: 1.4571; optionally: Hastelloy C4
Floats for gases 1)	Standard: PTFE; optionally: PVC, PVDF, PP, aluminium
with limit contacts 1)	Standard: 1.4571 (stainless steel) with magnetic core For air: PVC with magnetic core, optionally: PP or PVDF with magnetic core
Special version: RA 87 and FA 87	Corrosion protection for all wetted parts PVC, PP, PVDF, PTFE

1) Floats up to size 19 are non-guided, floats from size 30 on are guided. Optional sizes 9,5 (without magnetic core for limit switches) and 19 also available as guided floats.

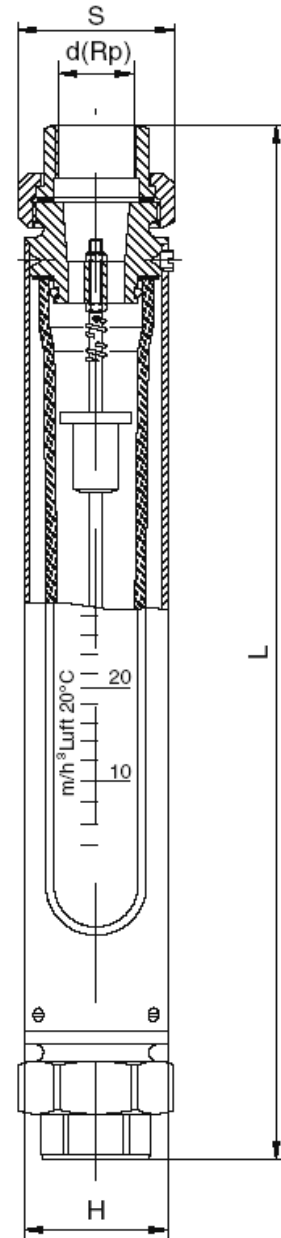


10.1. Dimensions

RA 87 with internal thread						
Size	G	DN	S <sup>2)</sup>	d <sup>1)</sup>	L	H
9,5	1/4	10	20	12	266	25
	3/8	15		16		
19	1/2	15	40	20	366	44,5
	3/4	20		25		
30	1	25	55	32	366	60
	1 1/4	32		40		
36	1 1/4	32	65	40	366	70
	1 1/2	40		50		
43	1 1/2	40	82	50	366	89
	2	50		63		

<sup>1)</sup> only with plastics PVC cemented sleeves and PP, PVDF welding sleeves

<sup>2)</sup> only for 1.4571 version (stainless steel)

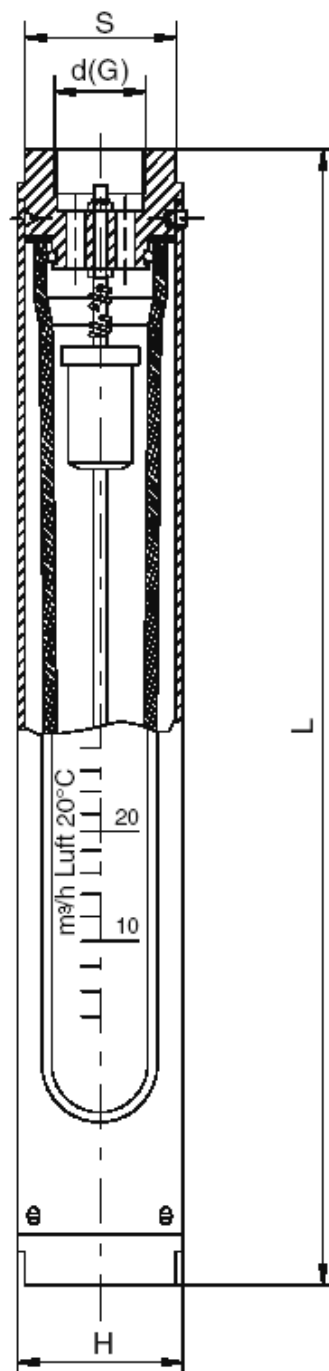




RA 87 / FA 87

RA 87 with screwed pipe connection								
Size	1.4571 Version			plastics version				
	Thread	L	S	DN	d <sup>1)</sup>	L (PVC)	L (PP, PVDF)	H
9,5	Rp 1/4	306	27	10	16	302	304	25
	Rp 3/8	309	32	15	20	305	305	
	Rp 1/2	314	41					
19	Rp 1/2	414	41	15	20	405	405	44,5
	Rp 3/4	416	50	20	25	411	409	
	Rp 1	422	55	25	32	417	413	
30	Rp 1	422	55	25	32	423	419	60
	Rp 1 1/4	428	70	32	40	432	424	
	Rp 1 1/2	429	75	40	50	442	430	
36	Rp 1 1/4	428	70	32	40	432	424	70
	Rp 1 1/2	429	75	40	50	442	430	
43	Rp 2	433	90	50	63	456	438	
	Rp 1 1/2	429	75	40	50	448	436	89
	Rp 2	433	90	50	63	462	444	

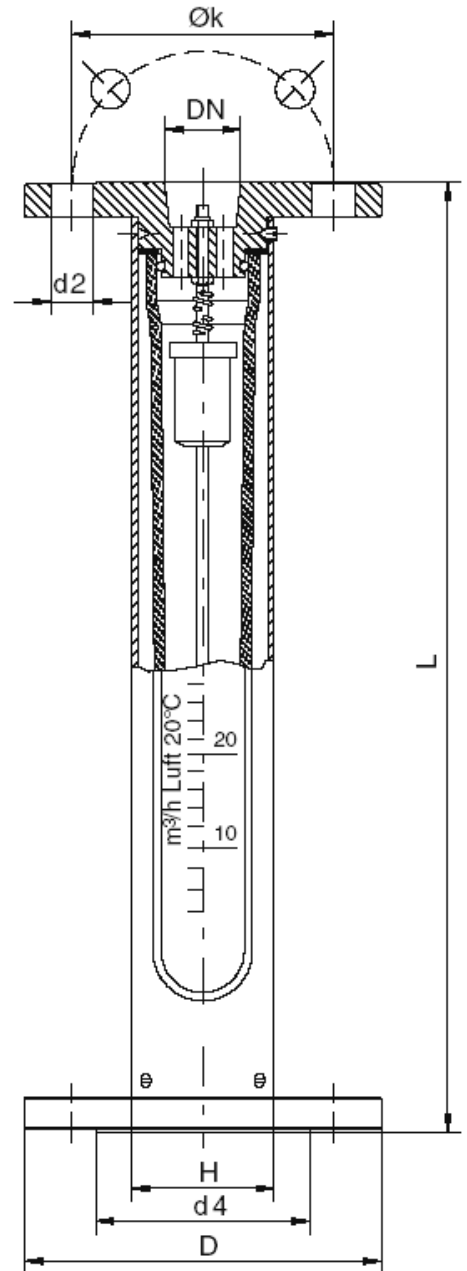
<sup>1)</sup> only with plastics PVC cemented sleeves and PP, PVDF welding sleeves





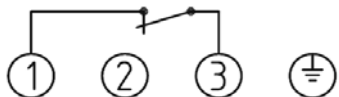
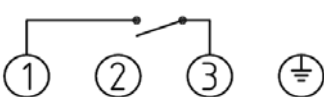

RA 87 / FA 87

Size	DN	L	H	FA 87			Screws		
				D	d4	k	Quantity	Thread	d2
9,5	10	260	25	90	40	60	4	M 12	14
	15			95	45	65	4	M 12	14
19	10	360	44,5	90	40	60	4	M 12	M12
	15			95	45	65	4	M 12	14
20				105	58	75	4	M 12	14
	25			115	68	85	4	M 12	14
30	25	360	60	115	68	85	4	M 12	14
	40			150	88	110	4	M 16	18
36	40	360	70	150	88	110	4	M 16	18
	50			165	102	125	4	M 16	18
43	50	360	89	165	102	125	4	M 16	18
	65			185	122	145	4	M 16	18





## 10.2. Technical data of limit switches

Ausführung	MSK1	MSK12
Voltage switched	50VAC/75VDC	50VAC/75VDC
Current switched	0,5A	0,5A
Contact rating	10W/VA	10W/VA
Dielectric strength	230VAC/400VDC	230VAC/400VDC
Temperature range	-20 bis +90°C	-20 bis +90°C
Switching function	normally closed contact 	normally open contact 
Ausführung	MSKW	
Voltage switched	50VAC/75VDC	
Current switched	0,5A	
Contact rating	5W/VA	
Dielectric strength	110VAC/200VDC	
Temperature range	-20 bis +90°C	
Switching function	change over contact 	

<sup>1)</sup> The deciding factor is the thermal endurance of the flow meter!

Connection via right angle plug (number of contacts 3 +PE) according to DIN 46350 Form A and cable gland M16 (IP65)

### 10.2.1. Low-voltage directive

Above 50 V AC/75 V DC, contacts are subject to the EU Low-Voltage Directive. The user is required to verify their use accordingly.







The equipment from Kirchner und Tochter has been tested in compliance with the applicable CE-regulations of the European Community. The respective declaration of conformity is available on request. The KIRCHNER QM-System will be certified in accordance with DIN-EN-ISO 9001:2000. The quality is systematically adapted to the increasing demands.



**Kirchner und Tochter**