



Installation and Operating Instructions

Variable area flow meter RA 77 / FA 77



Kirchner und Tochter



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1. Foreword

These Installation and Operating Instructions are applicable to devices of Series RA 77 and FA 77. 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. Failure to comply with these instructions 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. 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.



2.4. Intended use

The RA 77/FA 77 Series device is a variable-area flow meter for liquids and gases. It is designed for installation in vertical pipe runs. Installation in the pipeline should be carried out solely in accordance with these Instructions. The required version of the variable-area flowmeter should be selected on the basis of the pipe diameter at the installation location of the device. The limit values pertaining to the device are specified in Section 10 and must be complied with. Any modifications or other alterations to the measuring device may be carried out solely 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 together with the operating conditions are marked on the measuring glass.

2.5. 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

4.1. Preparatory work prior to installation

Check the pipe run at the installation location. VA flow meters are only suitable for vertical installation with the direction of flow being from bottom to top. For all other installation situations appropriate pipe bends need to be fitted in the existing pipeline to ensure vertical flow through the device from below.

The region of steady flow should be 4 to 6 x DN upstream and downstream of the location. Control equipment for gaseous media in particular should be installed downstream of the flow meter.

If necessary, support the ends of the pipeline to prevent vibration from being transmitted to the flow meter.

Clean by blowing out or flushing the pipes leading to the device before connecting up.

Prepare the installation point with the appropriate pipe (RA 77) or flange connection (FA 77) before starting to fit the flow meter. Make sure sealing faces are correctly spaced apart and in true alignment.

On no account should the VA flow meter be used to pull the ends of the pipeline together (stress-free installation!).

4.2. Preparation of the flow meter:

1. Take the device out of the transport packaging.
2. Pull the rod used securing the float out of the device (PVC, red or grey).
3. Check that the float can move freely in the flow meter.
4. Have ready a suitable adhesive for fixing the inserts to the pipe ends at the installation location.

4.3. Installing the RA 77

1. Remove the insert and the union nuts from the device.
2. Slide the union nuts over the pipe ends at the installation location.
3. Stick the inserts using a suitable adhesive on to the pipe ends.
4. Slide the device between the two inserts in the installation location.
5. On meters with a guided float: 2 additional flat gaskets are included with the meter. These should be inserted in the inserts before screwing on the union nuts, or included during assembly. These prevent direct contact between the insert and the glass.
6. Screw the union nuts to the device heads and tighten down so that the device is mounted without stresses in the pipeline. Always tighten the nuts with the aid of a tool. Fingertight fastening of the union nuts is not sufficient to maintain leak tightness! For this purpose both union nuts must be held with a belt gripping tool or other suitable implement. Should the glass have twisted when tightening the nuts, lightly grease the gaskets at the ends of the glass.



4.4. Installing the FA 77

1. Slide the device together with the flat gaskets (not included with the flow meter) at both ends into the installation point.
2. Check that the flat gaskets are in alignment and that they do not project into the pipeline.
3. Loosely attach the nuts and bolts for the flanged connection.
4. Tighten down the flanged connection crosswise so that the device is fastened free of stresses in the pipeline.

5. Start-up

The flow meter must have been properly installed before it is started up.

Test all device connections.

To set the flow: pressurize the pipelines by slowly opening the shut-off valves. On liquid service: carefully evacuate the pipeline.

Check that all components are leak-tight and, if necessary, tighten down threaded joints and 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 home page: www.kt-web.de, Section "Physical Basics".



7. Limit contacts MSK1, MSK12, MSKW

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

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

The limit contact is guided in a guide slot in the protective case and can be adjusted over the full measuring range. The reed contacts 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.

7.1. Connection of limit contacts



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.

1. Disconnect the plant from supply before connecting the limit contact.
2. Provide a protective circuit for the contacts in keeping with their capacity.
3. Connect line-side fuse elements matched to consumption.
4. Connect the cable using the supplied right-angle plug. The circuit diagram for limit contacts is shown in the Technical Data, Section 10.2.

7.2. Setting the limit contacts

1. Loosen the lock nut M10 on the neck of the contact.
2. Slide the contact to the flow value required to be monitored.
3. Test the switching characteristic by moving the float over and beyond the switching position.
4. Retighten the lock nut. **Maximum fastening torque is 2 Nm.**



8. Maintenance and cleaning of RA77/FA77

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

8.1. Dismantling and assembly

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

8.2. Replacement of measuring glass

1. To dismantle the device, detach the union nut and take the device out of the installation point.
2. On devices with non-guided floats, remove the float stop and the float from the old glass and insert these into the new glass.
3. Fit new gaskets to the device heads.
4. Wet the sealing rings before assembling glass and head.
5. Insert the glass into the case, taking care not to knock the glass against the case.
6. Fasten the device head with the union nut to the case.
7. Align the glass cone so that the inscription can be read through the inspection window in the case.
8. Reinstall the flow meter.

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 2065 9 60 90.

9.1. Disposal

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



10. Technical data

Nominal pressure rating and temperature resistance of the device	PVC: PN 10 at 0 to +20°C/ max 6 bar at 40°C PP: PN 10 at 0 to +20°C/ max 1,5 bar at 80°C PVDF: PN 10 at 0 to +20°C/ max 5,5 bar at 80°C	
Max. operating pressure (at 20°Celsius)	Size	Operat. Press. [bar]
	9,5	10
	10	10
	19	10
	30	10
	36	8
	43	8
	100	5
Measuring range	1:10	
Accuracy class	1,6 acc. to VDE/VDI 3513	
Connection RA 77	Union nut and gluing sleeve acc. to DIN 8063, optionally thread acc. to DIN ISO 228 T1	
Connection FA 77	Flange PN 10 acc. to DIN 2501 other (ANSI, JIS, ...) on request	

10.1. Materials

Protective tube	PVC-tube with insp. Window, quality PVC-CAW dark grey
Fittings and inserts RA 77	PVC, optionally PP, PVDF
Flanges FA 77	PVC, optionally PP, UPGF
Measuring cone	Borosilicate glass
Shatter protection	Perspex
Seals	EPDM, optionally Viton
Floats for fluids	PVC rot (lead weighted), optionally 1.4301, 1.4571, PP, PVDF
Floats for gases	PVC red, optionally aluminium anodized, PP, PVDF
With limit switches	PVC with magnetic core



10.2. Measuring ranges

Size	Measuring range m ³ /h H ₂ O	Measuring range m ³ /h HCL 30%	Measuring range m ³ /h NaOH 30%	Measuring range m ³ /h NaOH 50%	Measuring range m ³ /h air ¹⁾
95	0,3/h - 3/h	0,3/h - 3/h	Onrequest	Onrequest	0,002 - 0,02
	10/h - 100/h	10/h - 100/h			0,22 - 2,20
10	0,1/h - 1/h	1/h - 10/h	Onrequest	Onrequest	0,004 - 0,04
	15/h - 150/h	10/h - 100/h			bis 2,20
19	0,012 - 0,12	0,01 - 0,1	0,004 - 0,04	0,002 - 0,04	0,170 - 1,70
	0,200 - 1,60	0,11 - 1,1	0,080 - 0,80	0,020 - 0,20	1,500 - 15,00
30	0,100 - 1,00	0,09 - 0,9	0,100 - 1,00	0,030 - 0,38	1,000 - 10,00
	0,300 - 3,00	0,28 - 2,8	0,200 - 2,00	0,100 - 1,00	3,000 - 30,00
36	0,350 - 3,50	0,30 - 3,0	0,300 - 3,00	0,150 - 1,50	3,600 - 36,00
	0,600 - 6,00	0,55 - 5,5	0,500 - 5,00	0,350 - 3,50	7,000 - 70,00
43	0,600 - 6,00	0,56 - 5,6	0,600 - 6,00	0,450 - 4,50	6,000 - 60,00
	3,000 - 16,00	0,95 - 9,5	1,00 - 10,00	0,800 - 8,00	12,000 - 120,00
100	1,500 - 15,00	-	-	-	13,000 - 130,00
	2,000 - 20,00				20,000 - 200,00

¹⁾ at STP: at standard conditions (0 °C und 1,013 bar abs.)



10.3. Dimensions

Size	Glued DN	RA 77				
		d	G	H	S	L
9,5	10	16	1/4	1	43	250
	15	20	3/8			
10	10	16	1/4	1	43	350
	15	20	3/8			
19	15	20	1/4	1 1/2	60	350
	20	25	3/8			
	25	32	1/2 3/4			
30	25	32	1	2 1/4	80	385
	32	40	1 1/4			
	40	50				
36	32	40	1 1/4	2 3/4	98	385
	40	50	1 1/2			
	50	63				
43	40	50	1 1/2	3 1/2	120	385
	50	63	2			
	65	75				
100	50	63	2	4 1/2	140 ¹⁾	385
	65	75	2 1/2			
	80	90	3			

¹⁾ Union nut: Aluminium hexagonal

Size	DN	FA 77						Screws	
		d2	D	H	L	k	a	Quantity	Threat
9,5	10	14	90	1	284	60	29	4	M 12
	15	14	95		288	65	34	4	M 12
10	10	14	90	1	384	60	29	4	M 12
	15	14	95		388	65	34	4	M 12
19	15	14	95	1 1/2	388	65	34	4	M 12
	20	14	105		394	75	41	4	M 12
	25	14	115		400	85	50	4	M 12
30	25	14	115	2 1/4	435	85	50	4	M 12
	32	18	140		443	100	61	4	M 16
	40	18	150		453	110	73	4	M 16
36	32	18	140	2 3/4	443	100	61	4	M 16
	40	18	150		453	110	73	4	M 16
	50	18	165		467	125	90	4	M 16
43	40	18	150	3 1/2	453	110	73	4	M 16
	50	18	165		467	125	90	4	M 16
	65	18	185		479	145	106	4	M 16
100	50	18	165	4 1/2	467	125	90	4	M 16
	65	18	185		479	145	106	4	M 16
	80	18	200		497	160	125	8	M 16



10.4. Technical data of limit contacts

Design	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
Connection		
Design	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	
Connection		

¹⁾ The deciding factor is the thermal endurance of the flow meter!
 Connection via right angle plug M12x1

10.5. Low-Voltage Directive

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



RA 77 / FA 77

The equipment from Kirchner und Tochter has been tested in compliance with applicable CE-regulations of the European Community.

The respective declaration of conformity is available on request.

The Kirchner und Tochter QM-System is certified in accordance with DIN-EN-ISO 9001:2008. The quality is systematically adapted to the continuously increasing demands.



Kirchner und Tochter