



Installation and Operating Instructions

Variable area flow meter RA 65 / FA 65





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1. Foreword

These Installation and Operating Instructions are applicable to devices of Series RA 65 and FA 65. 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. Intended use

The RA 65/FA 65 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.



2.4. 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. 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. Work preparatory to installation

Preparation of the installation point:

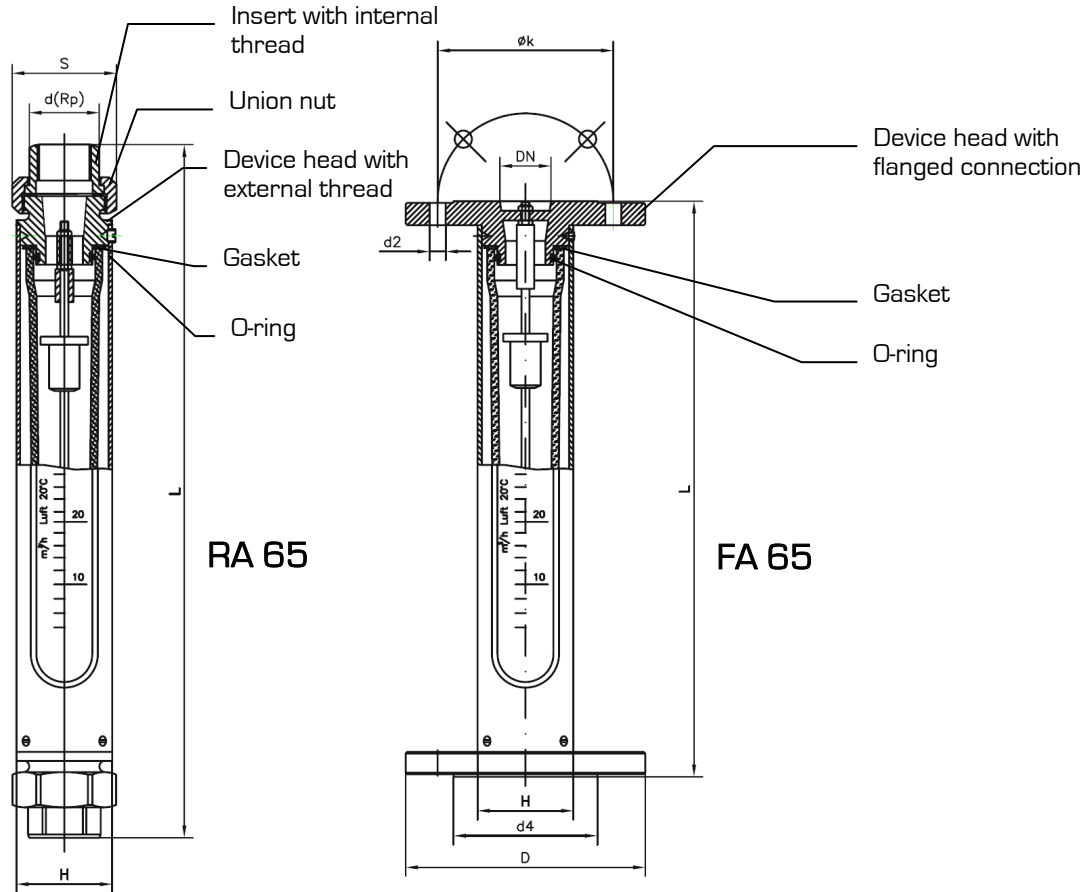
- Check the pipe run at the point of installation. Variable area flow meters are only suitable for vertical installation and an upward flow direction (from bottom to top). For all other installation situations, appropriate pipe bends need to be fitted in the existing pipeline to ensure upward vertical flow through the device.
- 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 pipeline on both sides of the flow meter to prevent vibration from being transferred to the device.
- Before connecting, clean the pipelines leading to the device by blowing out or flushing.
- Prepare the installation point for the measuring device with appropriate pipe threads (RA 65) or flanges (FA 65) before beginning installation work. Pay attention to the correct spacing of the sealing faces and to exact alignment.
- Under no circumstances should the variable area flow meter be used to draw the pipe ends together (install free of stresses!). Do not over-tighten the union nuts.

4.2. Preparation of the measuring device:

1. Remove the device from the transport packing.
2. Remove the transport protection stoppers from the ends of the device.
3. Pull the float securing rod out of the device (PVC red or grey).
4. Check that the float can move freely in the device.
5. Have ready: flat gaskets (FA 65) or packing material such as hemp (RA 65). These are not included with the supply.



RA 65 / FA 65





4.3. Installation RA 65

1. Dismantle the inserts and the union nuts from the device.
2. Slip the union nuts over the ends of the pipeline at the installation point.
3. Screw the inserts on to the pipe ends together with packing material.
4. Slide the device with the gaskets at both ends into the installation point.
5. Screw the union nuts back on to the device heads and tighten them down such that the device is seated in the pipeline without stresses.

4.4. Installation FA 65

1. Slide the device together with the gaskets (not included with flow meter) at both ends into the installation point.
2. Check that the gaskets are in alignment and make sure they do not project into the pipeline.
3. Attach bolts and nuts loosely to the flanged connection.
4. Tighten bolts on the flanged connection in diagonally opposed sequence so that the device is fastened in the pipeline without stresses.

5. Start-up

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

1. Test all device connections.
2. To set the flow: pressurize the pipelines by slowly opening the shut-off valves. On liquid service: carefully evacuate the pipeline.
3. 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.



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 10.2.



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 10.4.

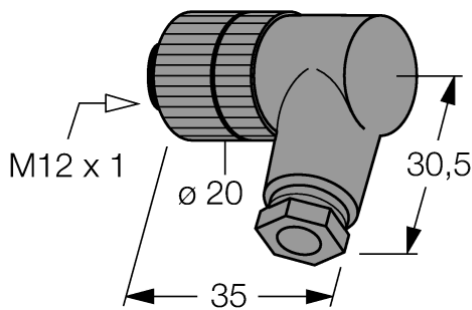
7.2. Setting the limit contacts

1. Loosen the lock nut M8 on the neck of the contact.
2. Slide the contact to the flow value required to be monitored.
3. Please make sure the contact never touches the measuring glass and the clearance between contact and glass is always approx. 1 mm. This clearance can be obtained by turning the contact in the sliding block.
4. Test the switching characteristic by moving the float over and beyond the switching position.
5. Retighten the lock nut. **Maximum fastening torque is 2 Nm.**

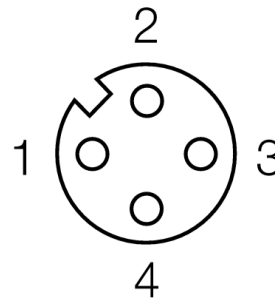


7.3. Right angle plug

| | |
|--------------------------------------|--|
| Connector | field-wireable female connector, M12 x 1, angled |
| Number of poles | 4-pole |
| Contacts | metal, CuZn, optalloy-plated |
| Contact carriers | plastic, PA, black |
| Grip | plastic, PBT, black |
| Seal | plastic, FPM |
| Degree of protection | IP67, only tightened with screws |
| External diameter of the cable | 4...6mm |
| Core cross-section /Clamping ability | max. 0.75 mm. |
| Screw-in thread | PG 7 |
| Connection mode | screw clamp |
| Mechanical lifespan | min. 50 contact durability |
| Pollution degree | 3 |
| Rated voltage | max. 250 V |
| Insulation resistance | $\geq 10^8 \Omega$ |
| Ampacity | 4 A |
| Forward resistance | $\leq 8 \text{ m}\Omega$ |
| Ambient temperature Connector | -25... +85°C |



dimensions



pin configuration



8. Linear displacement sensor 4-20mA / 0-10V

Operating principle:

The linear displacement sensor based on the Hall principle delivers an output signal proportional to the height setting of the flow meter.
The can be displayed in 4-20mA or 0-10V.

The sensor is connected via the enclosed M12 x 1mm connector.

Please notice that the sensor has a blind zone in the range of 3.7mA to around 4 mA and performs stable operation only after approx. 4mA.

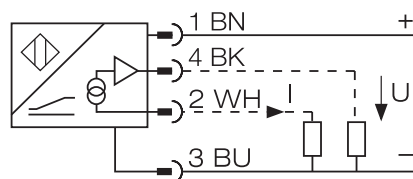
8.1. Connection of the linear displacement sensor



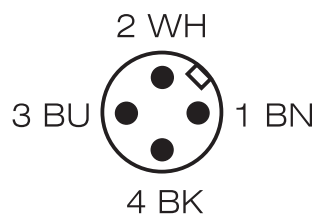
The electrical connection of the device must be performed according to the pertinent VDE regulations, as well as the regulations of the local power company.

1. Disconnect electric power from the system before connecting the sensor.
2. Provide a protective circuit of the sensor corresponding to its output.
3. Connect the protective elements suitable for use upstream.
4. The cable connection is done on the enclosed angle connector. The circuit diagram for the sensor is in the following illustration:

circuit diagram:



pin assignment:





8.2. Setting the sensor

Normally the linear displacement sensor is delivered set on the lowest measurement range point. This corresponds in this condition to 4mA.

The other measurement range or mA values can be found in the enclosed protocol.

If you want to set the 4 mA value to another measurement range point, slide the sensor or the 4mA value to the desired point.

To do this, loosen the two outer nuts with their toothed washers. Next loosen the two setscrews by approx. one revolution. Now you can put the sensor in the desired position, and retighten the setscrews and the nuts.

Next move to each following scale mark to determine the mA value belonging to it.



8.3. Technical data

| | |
|---|--|
| Measurement range [A...B] | 160 mm |
| Repeatability | < 0.1 % from measurement range IA-BI < dependent upon position sensor |
| Linearity deviation | <1 % v. E. |
| Temperature drift | <±0.006%/K |
| Ambient temperature | -25...+ 70 °C |
| Operating voltage | 15 – 30 VDC |
| Residual ripple | < 10 % U_{ss} |
| Idle current I_0 | < 15 mA |
| Rated insulation voltage | < 0.5 kV |
| Short circuit protection | yes |
| Fail-safe circuit / reverse polarity protection | yes/ complete |
| Output function | four-wire, analogue output |
| Voltage output | 0... 10V |
| Current output | 4 – 20 mA |
| Load resistor voltage output | >4.7 k Ω |
| Load resistor current output | <0.4 k Ω |
| Recovery time at output | < 15 ms |
| Sampling rate | 200 Hz |
| Type | Quader, Q25L |
| Dimensions | 201 x 35 x 25 mm |
| Housing material | Aluminium |
| Material of active surface | Plastic, PC-GF20 |
| Connection | Plug connector, M12x1 |
| Vibration resistance | 55 Hz(1 mm) |
| Shock resistance | 30g (11 ms) |
| Protection class | IP67 |
| Operating voltage display | LED green |
| Measurement range display | LED, yellow, position sensor in detection range |



9. 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.

9.1. 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 (detach 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 stops. Before installing, inspect all gaskets (see Figure on page 6) for signs of damage, and replace if necessary.

9.2. Replacement of measuring glass

Refer to Figure on page 6.

1. Remove the device from the installation point. Detach the lateral retaining screws and remove the device heads by simultaneously twisting and pulling them out of the glass. On devices with a 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. Carefully screw the float stops (helical springs made of VA steel) using pliers into the ends of the glass (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 through the viewing window on the case.
9. Slide the second head with wetted O-ring by twisting and pushing it simultaneously into the upper opening of the measuring glass, or steel case, as the case may be. 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, and slightly loosen the M5 screw at the opposite end).
11. Reinstall the device in the installation point.



10. 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 2065-96090.

10.1. Disposal

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



RA 65 / FA 65

11. Technical data

| | |
|-------------------------|--|
| Nominal pressure rating | FA 65: PN 10 at 20 °C RA 65: PN 10 at 20 °C |
| Max. operating pressure | See table measuring ranges |
| Thermal endurance | 80°C, optionally: 100°C |
| Ambient temperature | 90°C |
| Turn-down ratio | 1:10 |
| Accuracy class | 1.6 to VDI/VDE 3513 |
| Connection RA 65 | two-part pipe union: insert with cylindrical internal thread to ISO 7- |
| Connection FA 65 | Flanges PN 10 to DIN 2501, others (ANSI, JIS, ...) on request |

¹⁾ Diameter H according to Dimension Tables for FA65 and RA65

11.1. Materials

| | |
|----------------------------------|---|
| Heads RA 65 | steel S355 |
| Threaded joint | Malleable cast iron, galvanized |
| Flanges FA 65 | Grey cast iron, size 9.5 steel |
| Measuring glass | Borosilicate glass |
| splinter shield | Plexiglas XT |
| Gaskets | Standard: NBR; optionally: Viton, EPDM, silicone |
| Floats for liquids ¹⁾ | Standard: 1.4571 (stainless steel); optionally: PVC, PP, PVDF or PTFE with lead core |
| Floats for gases ¹⁾ | Standard: aluminium; optionally: PVC, PP, PTFE, PVDF or 1.4571 (stainless steel) |
| Limit contacts ¹⁾ | 1.4571 (stainless steel) with magnetic core (liquids) PVC with magnetic core (gases) |

¹⁾ Floats up to size 19 are nonguided; size 30 and larger: with guided float. Optionally, sizes 9.5 (but only without limit switches) and 19 also available as guided floats.



11.2. Measuring ranges

| Size | Measuring range m ³ /h H ₂ O | | | Measuring range m ³ /h at STP ¹⁾ | | | max. operating pressure [bar] at 20 °C |
|------|---|---|-------|---|---|------|--|
| 9,5 | 0,5 | - | 5/h | 0,006 | - | 0,06 | 10 |
| | 20 | - | 200/h | 0,3 | - | 3,3 | |
| 19 | 0,012 | - | 0,12 | 0,15 | - | 1,5 | 10 |
| | 0,12 | - | 1,2 | 1,6 | - | 16 | |
| 30 | 0,1 | - | 1 | 1,3 | - | 13 | 10 |
| | 0,3 | - | 3 | 3,6 | - | 36 | |
| 36 | 0,4 | - | 4 | 4 | - | 40 | 8 |
| | 0,8 | - | 8 | 8 | - | 80 | |
| 43 | 0,9 | - | 9 | 5 | - | 50 | 8 |
| | 1,6 | - | 16 | 16 | - | 160 | |

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

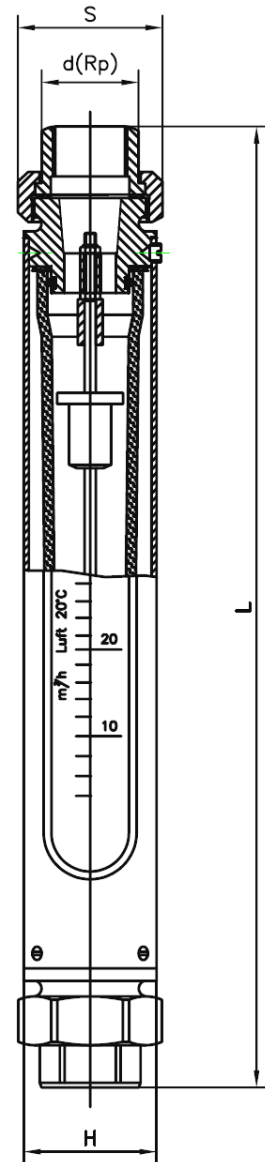


RA 65 / FA 65

11.3. Dimensions

| Size | Pipe union | RA 65 | | | |
|------|------------|-------|-----|------|----|
| | | S | L | d 1) | H |
| 9.5 | Rp 1/4 | 28 | 308 | 12 | 25 |
| | Rp 3/8 | 32 | 310 | 16 | |
| | Rp 1/2 | 39 | 312 | 20 | |
| 19 | Rp 1/2 | 39 | 413 | 20 | 45 |
| | Rp 3/4 | 48 | 420 | 25 | |
| | Rp 1 | 55 | 424 | 32 | |
| 30 | Rp 1 | 55 | 424 | 32 | 60 |
| | Rp 1 1/4 | 67 | 428 | 40 | |
| | Rp 1 1/2 | 74 | 430 | 50 | |
| 36 | Rp 1 1/4 | 67 | 428 | 40 | 70 |
| | Rp 1 1/2 | 74 | 430 | 50 | |
| | Rp 2 | 90 | 445 | 63 | |
| 43 | Rp 1 1/2 | 74 | 430 | 50 | 90 |
| | Rp 2 | 90 | 445 | 63 | |
| | Rp 2 1/2 | 111 | 446 | 75 | |
| | Rp 3 | 131 | 450 | 90 | |

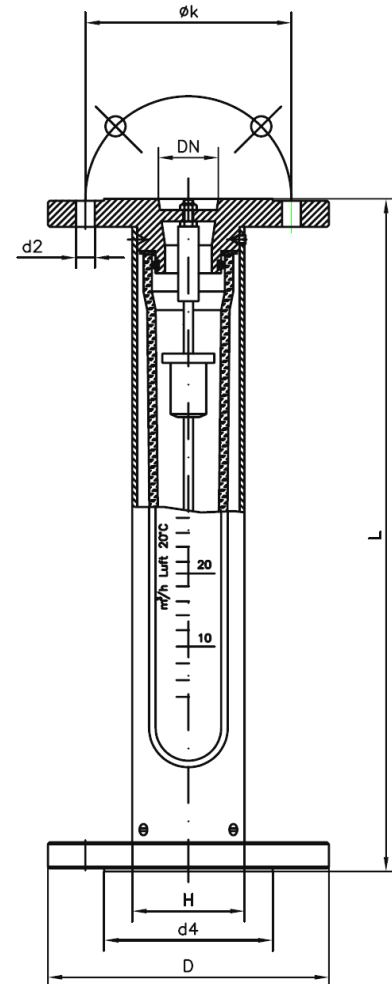
¹⁾ d for bonding and welding





RA 65 / FA 65

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





11.4. 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 to +90°C | -20 to +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 to +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

11.5. 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 applicable CE-regulations of the European Community.

The respective declaration of conformity is available on request.

Technical data supplied without liability. The current valid version of our documents can be found under this URL: www.kt-web.de

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.

