

## **Assembly and operating Instructions**

### **Short-tube VA flow meter SGK 1-3**



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## 1 Foreword

These Installation and Operating Instructions are applicable to devices of series SGK. 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 SGK 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 12 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 gaskets.

## 2.5 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. All persons charged with assembly, mounting, operation, inspection and maintenance duties must have read and understood the operating instructions. Gaskets in contact with the fluid product must be replaced after all maintenance and repair work.

## 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, coarse 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 SGK: before installation, both free ends of the pipe additionally need to be provided with pipe fittings.

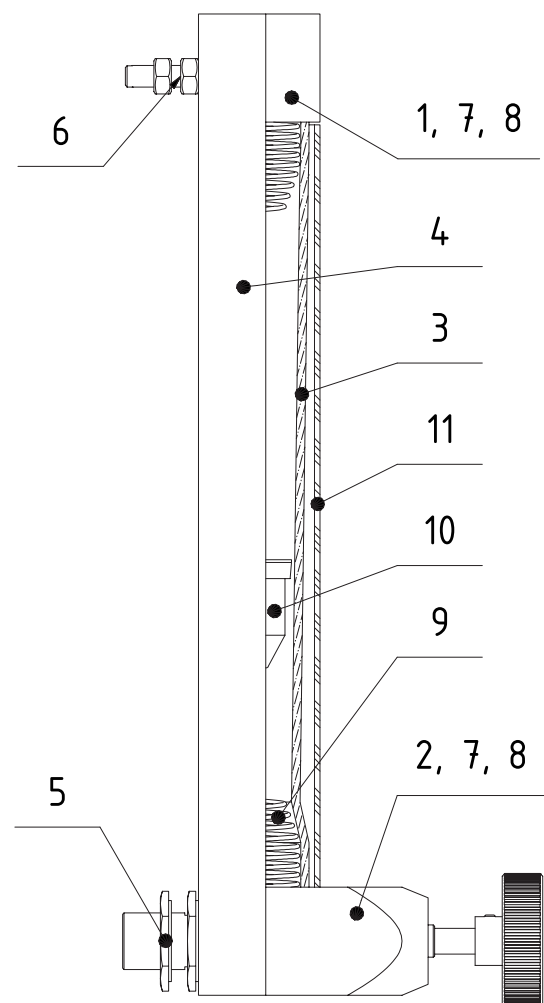
Installation of the SGK requires a hole pattern on the switch panel in accordance with the Table, section 12.3, that matches the selected model (to take up thread G and/or M on items 5 and 6).

### 4.1 Components

(Example SGK, model B1)

1. Head (here: for vertically outflowing medium, device model B1)
2. Batching valve (here: at bottom, Model B1)
3. Glass cone
4. Channel section for fastening the heads or batching valve, with glass cone, item 3, fitted
5. G1/4" or G1/2" nut for fastening, for horizontally in- and outflowing medium
6. Nut M5 or M8 for fastening the heads, for vertically in- and outflowing medium
7. O-ring in item 1 and 2 (not shown) <sup>1)</sup>
8. Flat gaskets in items 1 and 2 (not shown) <sup>1)</sup>

<sup>1)</sup> The glass cone is sealed off internally at either end by an O-ring and additionally protected against breakage by flat gaskets inserted in items 1 and 2.





### 4.2 Preparations for assembly

The SGK flow meter consists of a channel section in which the tapered measuring glass is firmly held in place by the two connecting heads with or without integrated batching valve.

Preparatory work at the point of installation:

1. Shut off and secure the pipe system in accordance with regulations and drain the pipeline.
2. Any control equipment, particularly in the case of gaseous media, should be located downstream of the measuring device.
3. If necessary, support the pipeline to prevent vibration from being transmitted to the measuring device.
4. Clean the pipelines leading to the device by blowing or flushing them out before connecting up the device.
5. Before installing, fit the two free ends of the pipe with appropriate connecting threaded joints (see section 12.3). The heads with vertical pipe connection on the front of the switch panel are provided with internal threads.

### 4.3 Installation SGK

1. Remove the nuts (items 5 and 6) on the back of the channel section and position the device on the switch panel in the holes provided.
2. Then fasten the device to the switch panel by fitting the nuts on the back of the channel.
3. Connect the ends of the pipe at the installation point to the SGK device using appropriate sealing material.

### 4.4 Type series

SGK-1	measures smallest air- and water volumes
SGK-2	measures medium small air- and water volumes
SGK-3	measures small air- and water volumes
...-MSK1	with limit value switch (Normally closed)
...-MSK12	with limit value switch (Normally open)
...-MSKW	with limit value switch (Change over)
...-RC	with inductive limit value switch
...-EM	with analog output 0 ... 10 V / 4 ... 20 mA
... Ex	explosion-proof variant



## 5 Start-up

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

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

Information on theoretical basics and an conversion program can be found on our website: [www.kt-flow.de](http://www.kt-flow.de), section physics and calculations.





## 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 reed switch that is switched over by the magnet integrated in the float. The switching behaviour is bistable.

Mounted in a contact holder, the limit value switch can be adjusted over the full measuring range at the housing rail.

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 12.5.

### 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.

1. Disconnect the plant from supply before connecting the limit switch.
2. Provide a protective circuit for the switches 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 the limit switches is shown in section 12.5, Technical Data.



## 7.2 Setting the limit switches

The contact with the right angle plug is fixed to the U-profile of the device.

1. Loosen the M4-grub screw on the neck of the switch.
2. Slide the switch on the U-profile 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 M4-grub screw.

## 7.3 Limit switches RC10-14-N3 / RC15-14-N3

The limit switches, designed in the form of a ring, are located on the glass cone and can be shifted along the cone and locked in the required position.



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.

- Be aware of the safety information given in section 7.1.
- The connection is made on the cable of the contact. The circuit diagram for the limit switches is shown in section 12.5, Technical Data.



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

The linear displacement sensor, based on the Hall effect, delivers an output signal proportional to the height setting of the flow meter.

The signal can be displayed in 4 ... 20 mA or 0 ... 10 V and is used for remote flow rate observation. The sensor is connected via the enclosed M12 x 1 mm connector.

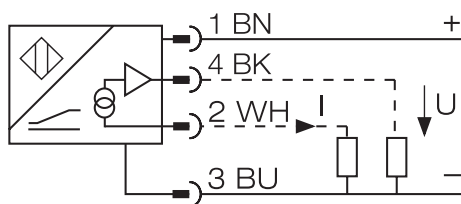
Please notice, that the sensor has a blind zone in the range of 3.7 mA to around 4 mA and performs stable operation only after approx. 4 mA.

### 8.1 Connection of the linear displacement sensor

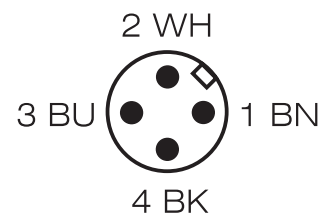


The electrical connection of the device must be performed according to the pertinent VDE regulations, as well as the regulations of the local power company.

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

The linear position sensor is delivered adjusted to the lowest measuring range point. This corresponds to an output signal of 4 mA.

The remaining measuring range or mA values can be taken from the supplied protocol.

If you want to move the 4 mA value to another measuring range point, move the sensor or the 4 mA value to the requested point.

To do this, loosen the two outer nuts with their lock washers. Next loosen the two stud screws by approximately one turn. Now you can move the sensor to the desired position and tighten the stud bolts and nuts again.

To record the new mA values, move the float to the desired scale lines and note the mA values.

## 9 Maintenance

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

### 9.1 Cleaning the device

1. Detach the device from the pipe ends at the installation location.
2. Detach the nuts, items 6 and 5.
3. Remove the device from the switch panel.
4. Detach the channel section, item 4, from the heads, items 1 and 2, with the glass item 3.
5. Remove by simultaneously twisting the heads, items 1 and 2 and pulling them out of the glass cone.
6. Remove the float stop (helical springs), item 9, from the glass cone. To avoid glass breakage and scratches, use pliers to simultaneously twist and pull the springs in the coiling direction.
7. Then proceed to clean the glass cone. Do not use aggressive cleaning agents (wire brush, scouring agent, alkaline solutions, acids etc.).
8. When reinstalling, make sure the O-rings, item 7, are undamaged. Replace if necessary.
9. Assembling the device and installing it in the switch panel are carried out in reverse order.



## 9.2 Replacement of measuring glass

To dismantle the device, proceed as described under section 9.1.

1. The new measuring glass contains the appropriate float including the stops at the ends of the cone.
2. Replace the old cone with stops and float and re-install the device on the switch panel.

## 9.3 Replacement of the glass cone SGK

Proceed as described in section 9.1.

## 10 Service

All devices with defects or deficiencies should be sent directly to our repair department. In the service area of the Kirchner und Tochter homepage ([www.kt-flow.de](http://www.kt-flow.de)) you will find the declaration of decontamination as download and more information about returns.

To avoid risks to our employees and the environment, we can only process devices, for which we get a declaration of decontamination certifying that they are safe due to legal regulations. For questions, please contact our sales department, Tel. +49 2065-96090.

## 11 Disposal

Please help to protect our environment and dispose workpieces in conformity with current regulations resp. continue using them.



## 12 Technical data

Device body	
Connection	external-/internal thread to DIN EN ISO 228 T1, optionally tube grommet
Designs	A – Do, see table “Designs”
Thermal endurance	80 °C with NBR gaskets 100 °C with FKM gaskets
Tampered measuring glass	
Scale	burnt-in scale
Length of scale SGK 1-2	approx. 150 mm
Length of scale SGK 3	approx. 220 mm
Accuracy class	VDE/VDI 3513 page 2 (08/2008)
Error limit (G)	1,6 %
Linear limit (qG)	50 %
Calibration	according to customer requirements

### 12.1 Materials

Bracket	aluminium, black anodized
Connections	standard: anodized aluminium or PVC optionally: 1.4571, PVDF
Gaskets	standard: NBR (for Aluminium devices) FKM (for 1.4571 devices) optionally: EPDM, Perlast ® (FFKM)
Measuring glass	borosilicate glass
Float	aluminium anodized, PVC, 1.4571, optionally PP
Valve	1.4571

other materials on request

### 12.2 Measuring ranges

	measuring range air at STP <sup>1)</sup>				measuring range l/h H <sub>2</sub> O			
SGK-1	0,3	-	3	l/h	0,1	-	1	l/h
	0,25	-	2,5	m <sup>3</sup> /h	15	-	150	l/h
SGK-2	6	-	60	l/h	0,5	-	5	l/h
	0,58	-	5,8	m <sup>3</sup> /h	20	-	200	l/h
SGK-3	0,15	-	1,5	m <sup>3</sup> /h	12	-	120	l/h
	1,6	-	16	m <sup>3</sup> /h	0,12	-	1,2	m <sup>3</sup> /h

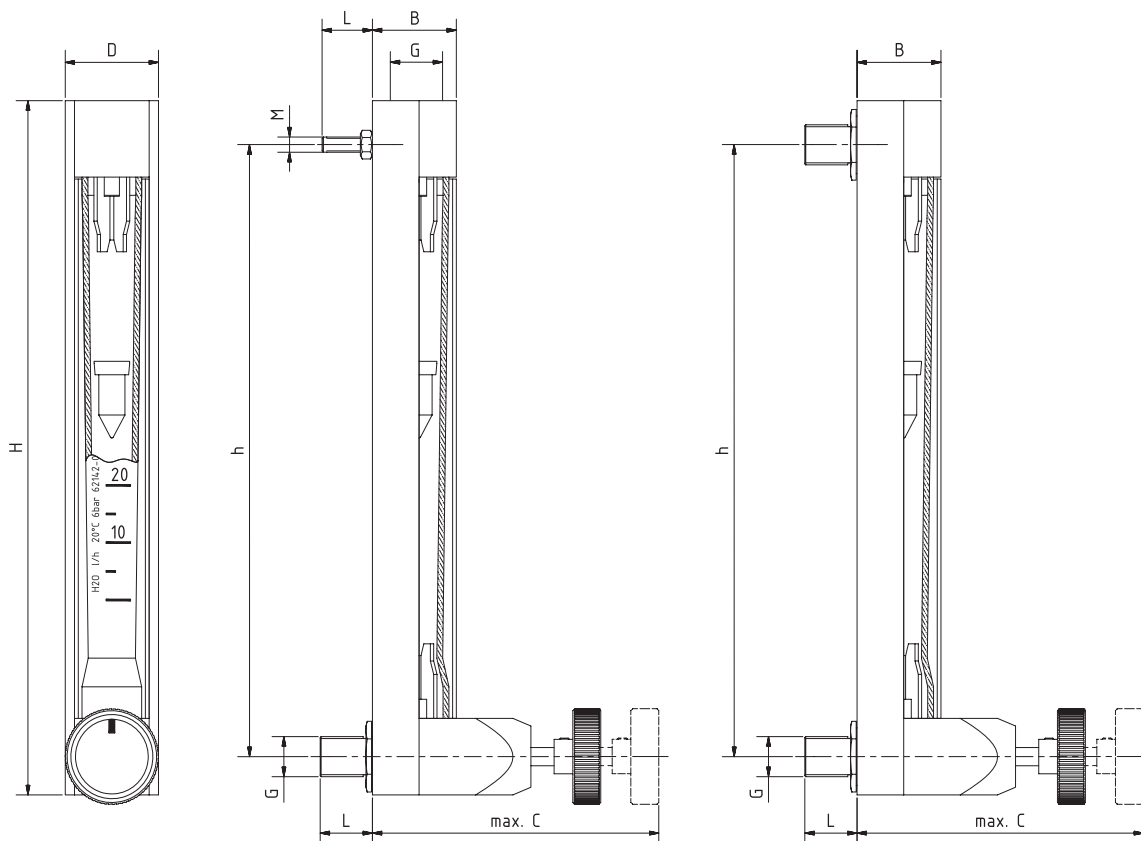
measuring ranges for other substances and operating conditions on request

<sup>1)</sup> at STP: at standard conditions (0 °C and 1013 mbar abs.)



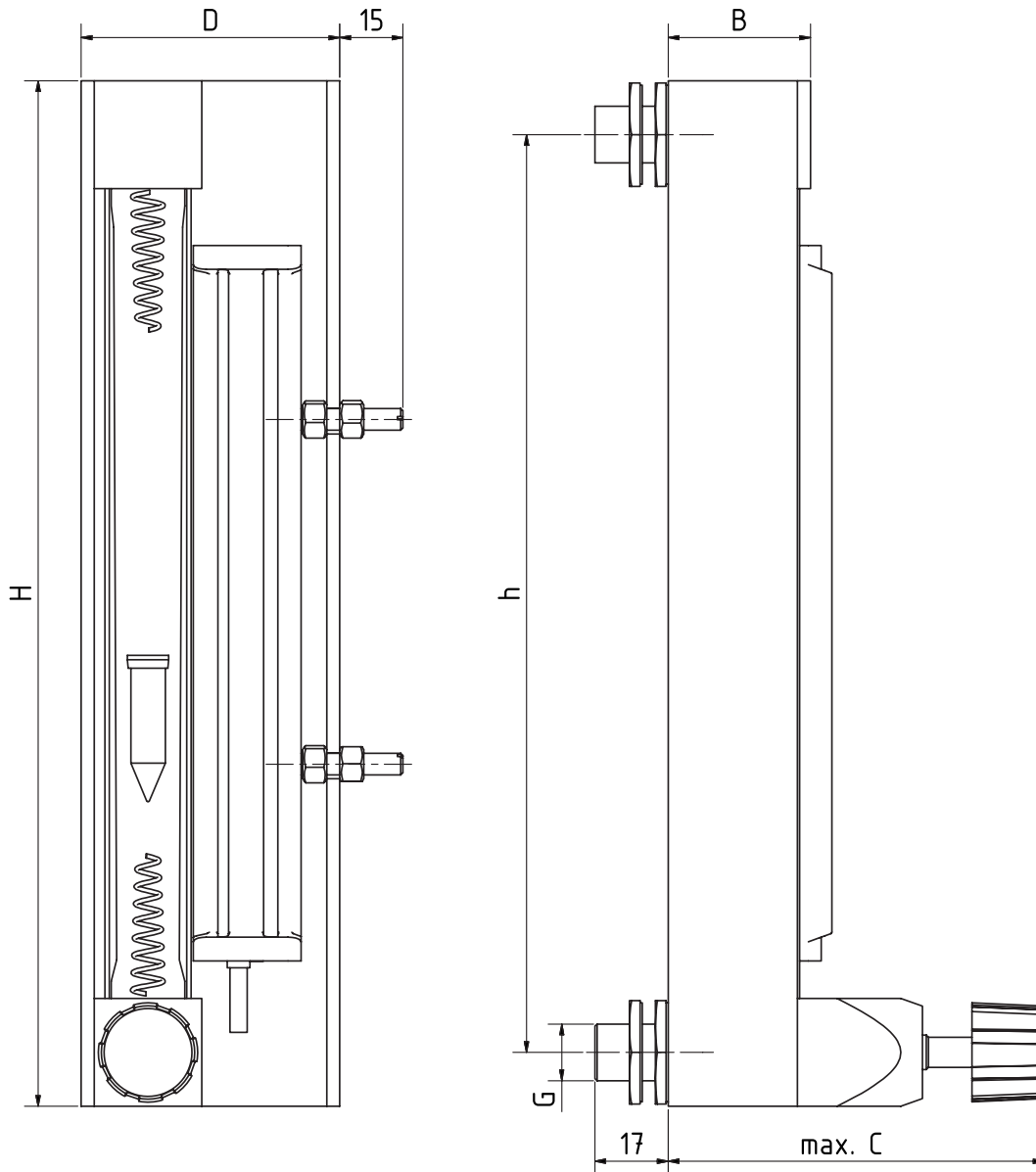
### 12.3 Dimensions

	G [inch]	shape	H [mm]	h [mm]	M	L [mm]	B [mm]	D [mm]	C [mm]
SGK-1	¼	A <sub>1</sub> , A <sub>2</sub> , A <sub>0</sub>	238	213	–	ca. 22,5	27,5	30	80 (only A <sub>1</sub> , A <sub>2</sub> )
SGK-2	¼	A <sub>1</sub> , A <sub>2</sub> , A <sub>0</sub>	238	213	–	ca. 22,5	27,5	30	80 (only A <sub>1</sub> , A <sub>2</sub> )
	¼	B, B <sub>0</sub> , C, C <sub>0</sub>	242	211	M5	ca. 22,5	27,5	30	80 (only B, C)
	¼ i	D <sub>0</sub>	246	209	M5	ca. 22,5	27,5	30	–
SGK-2-EM	¼	A <sub>1</sub> , A <sub>2</sub> , A <sub>0</sub>	238	213	–	ca. 17	33	60	85 (nur A <sub>1</sub> , A <sub>2</sub> )
SGK-3	½	A <sub>1</sub> , A <sub>2</sub> , A <sub>0</sub>	363	323	–	ca. 27	45	50	135 (only A <sub>1</sub> , A <sub>2</sub> )
	½	B, B <sub>0</sub> , C, C <sub>0</sub>	363	320	M8	ca. 27	45	50	135 (only B, C)
	½ i	D <sub>0</sub>	363	317	M8	ca. 27	45	50	–

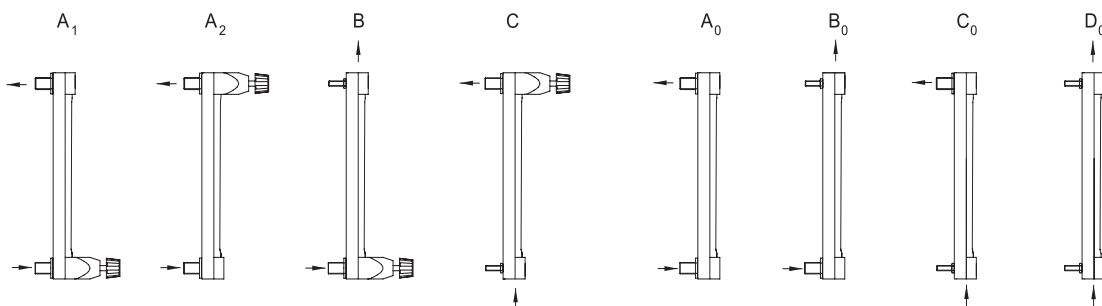




## SGK-2-EM



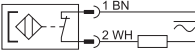
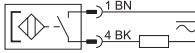
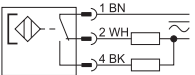
## 12.4 Designs





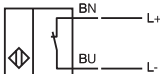


### 12.5 Technical data of the limit value switches

Design	MSK1	MSK12
Switching voltage	50 V AC/75 V DC	50 V AC/75 V DC
Switching current	max. 0,5 A	max. 0,5 A
Switching capacity	max. 10 W/VA	max. 10 W/VA
Dielectric strength	230 V AC/400 V DC	230 V AC/400 V DC
Temperature range <sup>1)</sup>	-20 ... +90 °C	-20 ... +90 °C
Switching function	normally closed	normally open
Connection		
Design	MSKW	
Switching voltage	50 V AC/75 V DC	
Switching current	0,5 A	
Switching capacity	5 W/VA	
Dielectric strength	110 V AC/200 V DC	
Temperature range <sup>1)</sup>	-20 ... +90 °C	
Switching function	change over	
Connection		

<sup>1)</sup> The thermal endurance of the flow meter is crucial.

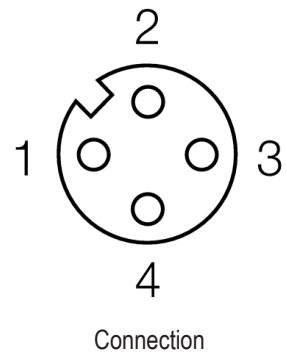
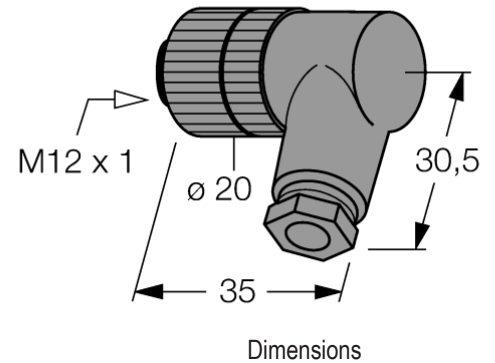
Connection via freely configurable right angle plug M12 x 1

Design	RC 10-14-N3	RC 15-14-N3
Inner diameter	10 mm	15 mm
Rated voltage	8 V DC	
Current consumption	1 mA/3 mA	
Sweep rate	≤ 10 m/s	
Self-inductance	≤ 120 mH	
Self-capacitance	≤ 90 nF	
Temperature range	-20 ... +70 °C	
Switching function	NAMUR bistable	
Connection		



## 12.6 Right angle plug

M12 x 1 Right angle plug	
Connector	field-wireable female connector, M12 x 1, angled
Number of poles	4-pole, A-coding
Contacts	metal, CuZn, optalloy-plated
Contact carriers	plastic, PA, black
Grip	plastic, PBT, black
Seal	plastic, FKM
Degree of protection	IP67 only tightened with screws
External diameter of the cable	4 ... 6 mm
Core cross-section/ Clamping ability	max. 0,75 mm <sup>2</sup>
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	≥ 108 Ω
Ampacity	4 A
Forward resistance	≤ 8 mΩ
Ambient temperature	-25 ... +85 °C
Connector	





### 12.7 Linear displacement sensor

Measurement range	125 mm / 160 mm
Repeatability	$\leq 0,1$ % from measurement range $\leq$ dependent upon position sensor
Linearity deviation	$\leq 1$ % v.E.
Temperature drift	$\leq \pm 0,006$ %/K
Ambient temperature <sup>1)</sup>	-25 ... +65 °C
Operating voltage	15 ... 30 V DC
Residual ripple	$< 10$ % U <sub>ss</sub>
Idle current	$\leq 15$ mA
Rated insulation voltage	$< 0.5$ kV
Short circuit protection	yes
Fail-safe circuit/reverse polarity protection	yes/complete
Output function <sup>2)</sup>	Four-wire, analogue output
Voltage output / $\rightarrow$ Load resistor	0 ... 10 V / $\geq 4,7$ k $\Omega$
Current output / $\rightarrow$ Load resistor	4 ... 20 mA / $\leq 0,4$ k $\Omega$
Recovery time at output	$< 15$ ms
Sampling rate	200 Hz
Type	Rectangular, Q25L
Dimensions	166 / 201 x 35 x 25 mm
Housing material	Aluminium
Material of active surface	Plastic, PC-GF20
Connection	Plug Connector, M12 x 1
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
Connection diagram <sup>2)</sup>	

<sup>1)</sup> The thermal endurance of the flow meter is crucial.

<sup>2)</sup> A two-wire version is also available on request.

### 12.8 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.



# Kirchner und Tochter

Durchflussmesstechnik seit 1951



The devices from **Kirchner und Tochter** have been tested in compliance with applicable EC/EU CE-regulations of the European Community.

The respective declaration of conformity is available on request. Subject to change without notice. The current valid version of our documents can be found at [www.kt-flow.de](http://www.kt-flow.de).

The **Kirchner und Tochter** QM-System is certified in accordance with DIN EN ISO 9001:2015. The quality is systematically adapted to the continuously increasing demands.