Kirchner und Tochter
Durchflussmesstechnik seit 1951

Assembly and operating Instructions

Bypass Flow Meter
DST

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Version 1.5

Contents

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1 Foreword

These Installation and Operating Instructions apply to series DST bypass flow meters. Please follow and observe all instructions and information 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 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 DST bypass flow meters are designed and intended for measuring the flow of compressible and incompressible fluids. They may only be installed in the pipeline between flanges. Select the DST device model on the basis of the nominal diameter and nominal pressure at the site and also the kind of medium concerned; limit values are specified in the section 11 and should not be exceeded. Special safety instructions concerning glass devices.

2.4 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.

2.5 Special safety information 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.

2.6 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.

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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

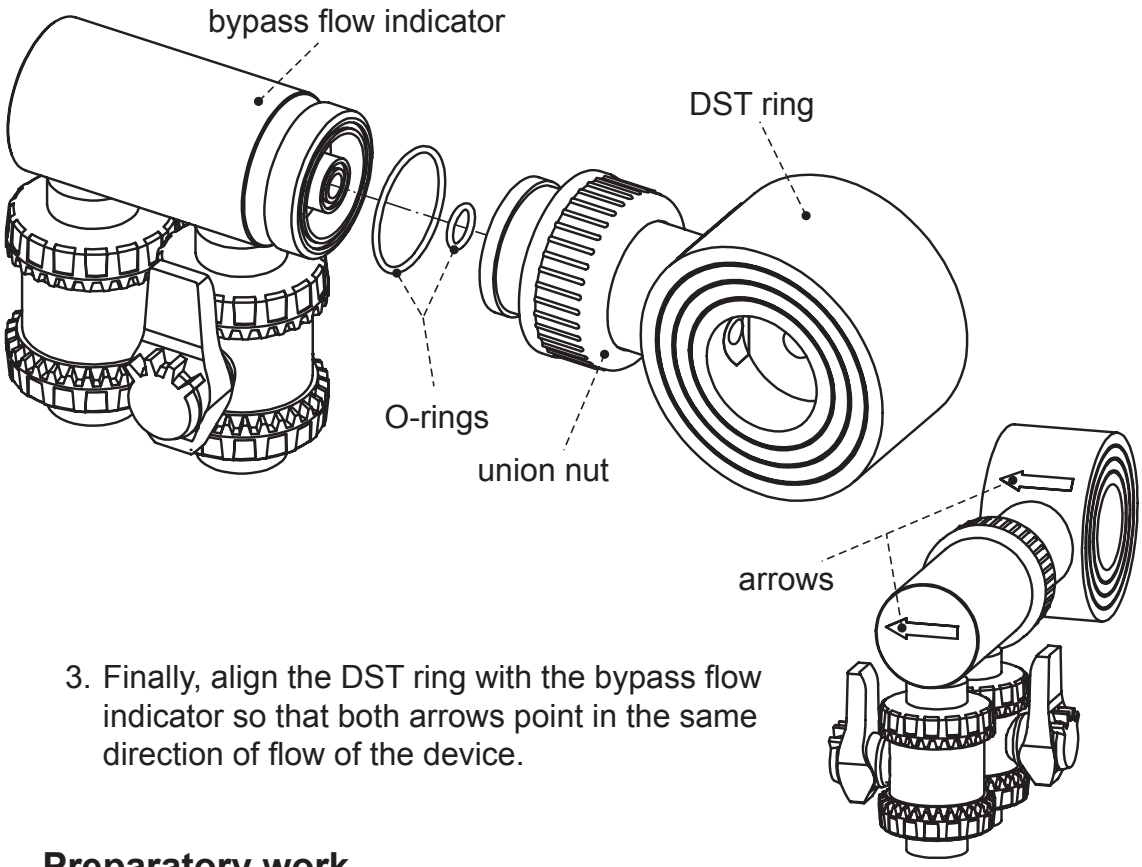
Always use the original packing for transport, handling and storage. Protect the device against rough handling, coarse impact, jolts etc.

4 Installation

4.1 Pre-assembly

Make sure that the nameplate on the metering orifice has the same number as that on the bypass flow indicator.

1. Place the O-rings in the O-ring groove.
2. As the next step, screw the bypass flow indicator to the DST ring.



3. Finally, align the DST ring with the bypass flow indicator so that both arrows point in the same direction of flow of the device.

4.2 Preparatory work

Make preparations for inter-flange mounting by having ready the flanges and assembly materials. Provide for a distance between the mounting flanges that is equivalent to the ring thickness plus 2 x the thickness of the gaskets you intend using. The unimpeded straight pipe inlet/outlet runs (A) should be 4 – 6 x DN upstream and downstream of the installation point. The direction of flow through the variable-area flow meter must be from bottom to top. On water service, the indicator is installed in suspended arrangement and on air service in standing arrangement to avoid accumulation of air and condensation of water. To avoid errors, the orifice plate ring is marked with an arrow pointing in the direction of flow (the arrow is punched into metal rings and stuck on to plastic rings).

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4.3 Installation

- Before installing the device, drain the pipes.
- Observe the maximum pressure and maximum temperature levels.
- The direction of flow must be the same as the direction indicated by the arrow on the orifice plate ring of the device.
- Use gaskets made of rubber or SIL; for plastic devices use only gaskets made of rubber with a Shore hardness A of approx. 65°.
- The gaskets should not project into the pipe and the measuring device must be fitted in line with the pipe axis, as otherwise measurement results would be falsified.
- For orifice plate rings made of PVC, PP and PVDF, tighten screw connections only with a maximum torque of 75 Nm, the device ring could break otherwise.
- Mount the orifice plate ring for the device between the flanges at the point of installation

Venting the devices

- The devices must be completely vented: at the maximum possible volume rate of flow in the main pipe, open and then close the ball cock in the bypass behind the outlet of the VA flow meter.
- Slacken the 1½“ union nut on the square head of the bypass line (making sure that both O-rings remain securely in the head) until water flows and the air escapes. If possible, operate the flow meter at full power or more. Should this not prove to be possible, continue the procedure for some time until it is quite certain that all air has been evacuated.

5 Start-up

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

- Pressurize the measuring line and avoid pressure surges.
- Check the leak-tightness of the inter-flange connection and, if necessary, tighten down the screw connection.
- With varying volume rates of flow, starting at maximum value, test the local indicator on the device.

6 Readings in operation

The flow value is read off from the scale on the glass cone against the top edge of the float. Readings are only correct when flowing conditions at the measuring point (flowing medium, operating pressure and temperature) correspond to the values marked on the measuring glass. If conditions should differ, the device will need to be recalibrated by Kirchner und Tochter.

Information on theoretical basics can be found on our website: www.kt-flow.de, section physics and calculations.

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7 Limit switches MSK-1 / MSK-12 / 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.

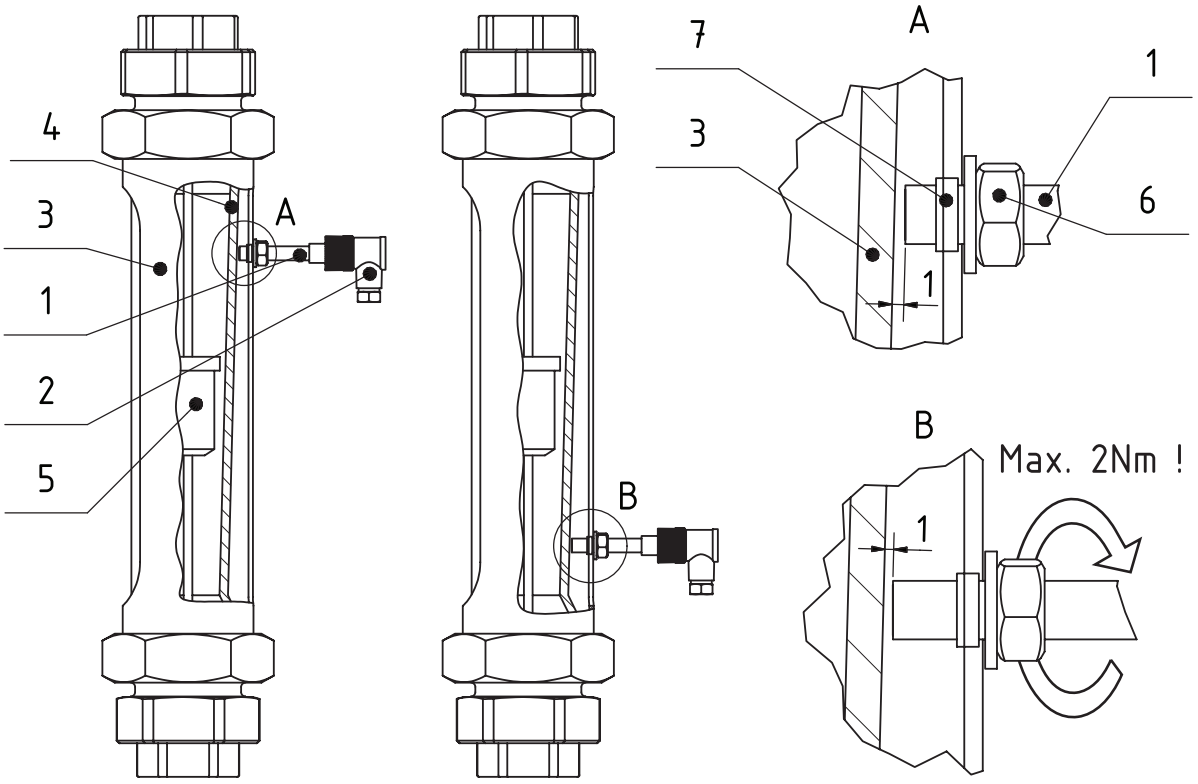
7.1 Connection of limit switches

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 to the supplied right-angle plug. Assigned are terminals 1 and 2. Earth and terminal 3 are not assigned. The circuit diagram for the limit switches is shown in section 11, “Technical Data”.

7.2 Setting the limit switches

1. Loosen the lock nut ⑥ SW13 (M8 x 1) on the neck of the switch ①.
2. Slide the switch ① to the flow value required to be monitored.
3. Please make sure the contact ① never touches the measuring glass ④ and the clearance between contact ① and glass ④ is always approx. 1 mm. This clearance can be obtained by turning the contact in the sliding block ⑦.
4. Test the switching characteristic by moving the float ⑤ over and beyond the switching position.
5. Retighten the lock nut ⑥. **Maximum fastening torque is 2 Nm!**



① MSK limit value switch
② M12 right angle plug
③ flow meter
④ measuring glass
⑤ float
⑥ lock nut
⑦ sliding block

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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.

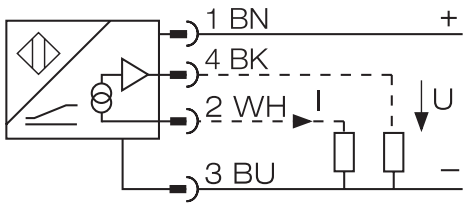
The signal can be displayed in 4 ... 20 mA or 0 ... 10 V and is used for remote flow rate observation. The sensor is connected via the enclosed M12 x 1 mm connector.

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.

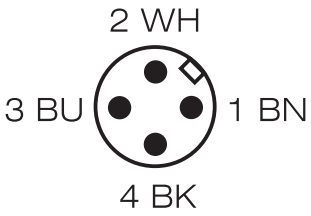
8.1 Connection of the linear displacement sensor

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 linear displacement sensor

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

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 4 mA value to the desired point.

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

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

9 Maintenance

The device is maintenance-free

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) 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.

10.1 Disposal

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

11 Technical Data

11.1 Materials and technical data

Model	DST-PVC	DST-PP	DST-PVDF	DST-½	DST-V4A
Ring	PVC	PP	PVDF	S355 [2]	1.4571
Orifice plate	PVC	PP	PVDF	1.4571	1.4571
Valves	PVC	PP	polysulphone/ PVDF can be supplied without valves	brass, nickel-plated	1.4571
Bypass line	PVC	PP	PVDF	steel, zinc plated	1.4571
Indicator[1]	RA77/PSU	RA77/PSU	RA87/PSU	RA65	RA87
Glass measuring tube	borosilicate glass, optionally polysulphone	borosilicate glass, optionally polysulphone	borosilicate glass, optionally polysulphone	borosilicate glass	borosilicate glass
Float	PVC, optionally 1.4571, PTFE	PP, optionally 1.4571, PTFE	PVDF, optionally 1.4571, PTFE	water: 1.4571 air: anodized aluminium	water: 1.4571 air: PTFE
Gaskets	EPDM, optionally FKM	EPDM, optionally FKM	FKM, optionally EPDM	NBR	FKM
max. temperature / pressure (gauge)	20 °C at 10 bar 40 °C at 6 bar	20 °C at 10 bar 70 °C at 2,5 bar 80 °C at 1,5 bar	20 °C at 10 bar 80 °C at 5 bar 100 °C at 4 bar	20 °C at 10 bar special design: 80 °C at 5 bar	20 °C at 10 bar special design: 80 °C at 5 bar

[1] see data sheet for the indicating devices

[2] corrosion protection: epoxy paint, kiln-dried, traffic blue (RAL 5017), satin finished; corrosion class: C2

11.2 Type series

DST-PVC	device in PVC
DST-PP	device in PP
DST-PVDF	device in PVDF
DST-½	device in steel
DST-V4A	device in stainless steel
DST-...-MSK1	with limit value switch (normally open)
DST-...-MSK12	with limit value switch (normally closed)
DST-...-MSKW	with limit value switch (change over)
DST-...-EM	with 4 ... 20 mA/0 ... 10 V analogue output

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11.3 Measuring ranges

DN[2]	measuring range [1] H_2O	max. pressure loss in mbar	measuring range [1] air at STP*	max. pressure loss in mbar
32	20 - 160 l/h	150	8 - 18 m³/h	68
	3,5 - 25 m³/h	300	35 - 200 m³/h	38
40	20 - 160 l/h	150	8 - 18 m³/h	68
	4 - 30 m³/h	350	35 - 200 m³/h	38
50	20 - 160 l/h	150	8 - 18 m³/h	68
	4,5 - 40 m³/h	550	49 - 300 m³/h	38
65	1,2 - 2,7 m³/h	36	12,5 - 30 m³/h	6
	7 - 60 m³/h	550	78 - 535 m³/h	55
80	1,2 - 3,3 m³/h	51	14 - 30 m³/h	6
	13 - 100 m³/h	350	150 - 1010 m³/h	50
100	3 - 7 m³/h	58	30 - 70 m³/h	6
	25 - 200 m³/h	430	280 - 1750 m³/h	60
125	8 - 15 m³/h	30	95 - 200 m³/h	6
	40 - 300 m³/h	350	470 - 2850 m³/h	60
150	14 - 30 m³/h	42	185 - 400 m³/h	7
	55 - 380 m³/h	500	640 - 3850 m³/h	53
200	30 - 75 m³/h	60	380 - 790 m³/h	6
	90 - 650 m³/h	500	1125 - 6000 m³/h	69
250	43 - 140 m³/h	90	390 - 800 m³/h	7
	150 - 830 m³/h	354	1200 - 6000 m³/h	70
300	75 - 250 m³/h	84	390 - 800 m³/h	7
	185 - 1100 m³/h	378	1200 - 6000 m³/h	70
400	130 - 500 m³/h	150	– - – –	–
	300 - 1800 m³/h	280	– - – –	–

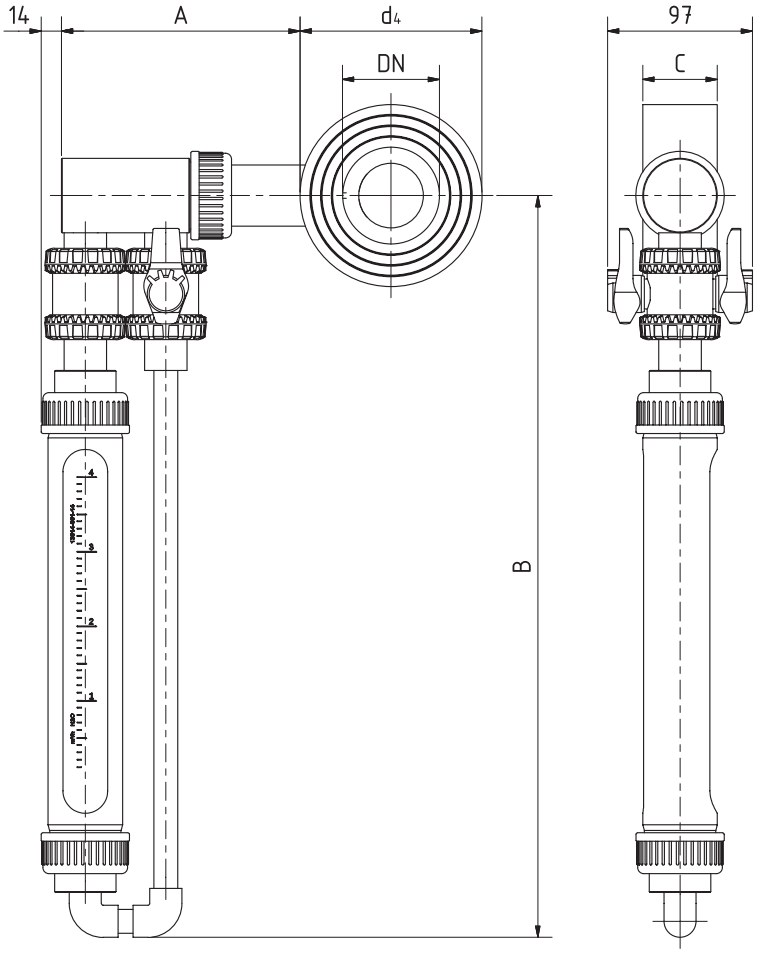
[1] The minimum and maximum measuring range is specified for each nominal diameter.

[2] The inner diameter is made as prescribed by the pipe inner diameter.

Measuring ranges for other process fluids and operating conditions will be supplied on request.

* at STP: at normal temperature and pressure (0 °C and 1013 mbar abs.)

11.4 Dimensions



DN	d_4	A	B	C[1)]
32	78	160	[2)]	50
40	88	160	[2)]	50
50	102	160	[2)]	50
65	122	160	[2)]	50
80	138	160	[2)]	50
100	158	160	[2)]	50
125	188	160	[2)]	50
150	212	160	[2)]	50
200	268	160	[2)]	50
250	320	160	[2)]	50
300	370	160	[2)]	50
400	482	160	[2)]	50

all dimensions in mm

[1)] optionally: special overall lengths possible

[2)] DST-PVC 500 mm, DST-PP 528 mm, DST-PVDF 555 mm, DST-½ + DST-V4A 543 mm

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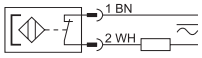
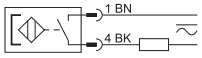
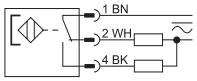
11.5 Technical data of the limit value switches

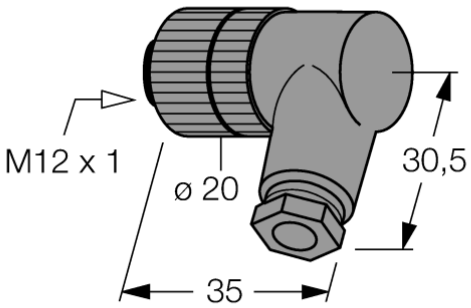
Design	MSK1	MSK12
Switching voltage	50 V AC/75 V DC	50 V AC/75 V DC
Switching current	max. 0,5 A	max. 0,5 A
Switching capacity	max. 10 W/VA	max. 10 W/VA
Dielectric strength	230 V AC/400 V DC	230 V AC/400 V DC
Temperature range[1)]	-20 ... +90 °C	-20 ... +90 °C
Switching function	normally closed	normally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

[1)] The thermal endurance of the flow meter is crucial.

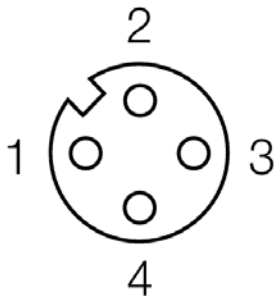
Connection via freely configurable right angle plug M12 x 1

11.6 Right angle plug M12 x 1

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 mm²
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 Connector	-25 ... +85 °C



Dimensions



Connection

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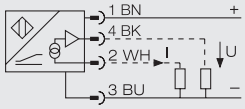
11.7 Technical data of the Linear displacement sensor

Measurement range	160 mm
Repeatability	≤ 0,1 % from measurement range ≤ dependent upon position sensor
Linearity deviation	≤ 1 % v.E.
Temperature drift	≤ ± 0,006 %/K
Ambient temperature [1)]	-25 ... +70 °C
Operating voltage	15 ... 30 V DC
Residual ripple	< 10 % Uss
Idle current	≤ 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 → Load resistor	0 ... 10 V ≥ 4,7 kΩ
Current output → Load resistor	4 ... 20 mA ≤ 0,4 kΩ
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, 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	

[1)] The thermal endurance of the flow meter is crucial.

11.8 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.

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.

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.

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