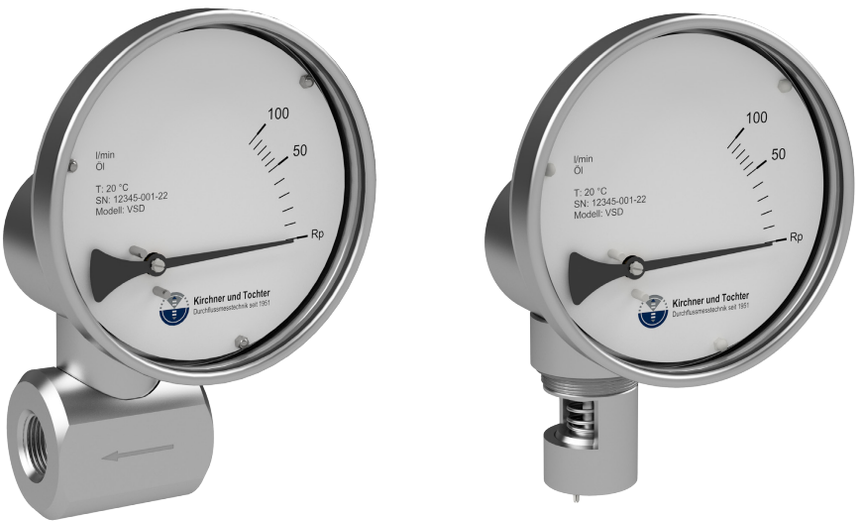
Kirchner und Tochter
Durchflussmesstechnik seit 1951



Assembly and operating Instructions

Valve Seat Flowmeters

VSD

VSD-RK1, VSD-RK2

VSD-IK1, VSD-IK2

VSD-IKS1, VSD-IKS2

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Version 1.1

Contents

1 General

1.1 Foreword

These Installation and Operating Instructions are applicable to devices of Series VSD. 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.

1.2 Exemption from liability

Kirchner und Tochter accepts no liability for any damage or interruptions of operation resulting from human error, failure to comply with these installation and operating instructions, improper performance of installation and repair work, use of spare parts other than those from the original manufacturers or use of the VSD devices other than for the intended purpose.

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

These Installation and Operating Instructions contain basic instructions for the installation, operation, inspection and maintenance of the flow meter. Failure to comply with these Instructions or improperly executed installation, wiring and repair work can lead to serious faults in the plant, giving rise to hazardous situations for "man and beast“ as well as damage to property.

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

2.3 Intended use

The VSD devices are designed and intended for measuring the flow of liquids and gases. They may only be installed between flanges in the pipeline. Select the VSD device model on the basis of the nominal diameter and nominal pressure at the site and also the kind of fluid product concerned; limit values are specified in the sect. 9 "Technical data" and should not be exceeded.

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 Regulations and guidelines

All relevant regulations should be observed in respect of flow meter operation. These include in particular:

- Regulation concerning safe working conditions (BetrSichV , 2009/104/EG)
- If appropriate, regulation concerning hazardous materials
- Accident prevention regulations
- Pressure Equipment Directive PED (2014/68/EU)

2.6 Compliance with the IP degree of protection

Devices have IP66 degree of protection. In the case of maintenance work involving the indicator parts, notes on maintaining the IP degree of protection are given in sect. 5.4.1, 9.1.

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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 Measuring principle of the flap-type flow meter

In the measuring cylinder, a spring-loaded piston plate, is attached to a push rod. Depending on customer requirements, the measuring cylinder is installed directly in a valve block or sits in a housing with female threaded connections for installation in pipelines. The piston plate moves upwards according to the flow rate. A breakproof magnetic coupling transmits the movement to an external pointer. For process control, the meter can be equipped with limit switches.

5 Installation, start-up and maintenance

5.1 Preparatory work

5.1.1 Preparation of the installation site:

- Make sure the installation site is clean and free of contaminants.
- The pipelines leading to the device must be cleaned by blowing out or flushing before connection.
- Measuring medium which is contaminated with solids and particles is not suitable for flowmeters of the VSD type respectively a filter device should be installed upstream.
- Provide the installation location of control devices behind the meter.The installation location for the meter must be prepared with appropriate pipe threads (VSD Gi) before starting the installation. Ensure correct spacing and exact alignment.

5.1.2 Preparation of the measuring device

- Remove the meter from its transport packaging.
- Check, by means of finger pressure, whether the spring plate can be moved nearly without friction and whether the pointer on the scale moves with it.

VSD Gi only:

- Remove the transport protection plugs from the ends of the device (VSD Gi).
- Have sealing materials such as PTFE tape ready (VSD Gi). This is not included in the scope of delivery.

5.1.3 Required tools

- 1x socket spanner SW10
- 1x Allen key 3mm
- 1x strap wrench

  or hook spanner DIN 1810 type A
  NG28 45-50mm
  NG35 58-62mm
  NG45 65-70mm
  NG65 65-70mm

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5.2 Installation of the VSD

- Generally comply with the maximum pressure and temperature permitted for the VSD in your plant at the installation site.
- Drain the lines before installing the device.
- The seals must not protrude into the line.

VSD NG

1. Insert the measuring cylinder into the appropriate opening of your mounting location and turn it until the locking pin engages in the corresponding hole of the mounting location.
2. Separate the gauge incl. adapter block from the screw-in cover by loosening the M6 nut on the top of the adapter block and loosening the M6 grub screw on the back of the adapter block.
3. Slide the screw-in cover incl. O-ring over the measuring cylinder in the installation location and screw in the screw-in cover. When inserting and screwing in the screw-in cover, make sure that the O-ring is not pulled into the thread and does not protrude.
4. Then place the adapter block incl. display gauge on the screw-in cover, align the display and tighten the M6 nut and then the M6 grub screw.

VSD Gi

- The direction of flow must correspond to the flow arrow indicated on the device.
- Use O-ring sealing threaded fittings or use Teflon tape as a thread seal.

5.3 Start-up

1. Check the device connections.
2. Adjusting the flow: pressurize the piping by slowly opening the shut-off valves (risk of glass breakage). In the case of liquids, ensure that the piping is carefully vented.
3. Check the tightness of all components and retighten screwed or bolted connections if necessary.

5.4 Maintenance

The device is maintenance-free. If it becomes dirty, the device must be removed from the pipeline for cleaning. Devices with limit value switches must be disconnected from the mains and switched off..

- Wear personal protective equipment if necessary (goggles, gloves, conductive footwear).
- Depressurize the line.
- Drain the lines.

- Disassemble the device in reverse order as described in section 5.2.
- After disassembly, all parts must be checked for damage, corrosion, wear, etc. and replaced if necessary!
- Clean the inside of the screw-in cover and the entire measuring cylinder assembly. In particular, clean the inside with the spring and the coupling magnet on the top of the measuring cylinder.
- If necessary, clean the display unit with a damp cloth.
- Reassembly is carried out in reverse order.

Before switching on the supply voltage again, make sure that all parts are dried off and connected according to regulations. The devices must be protected against heavy pollution and strong fluctuations of the ambient temperature.

5.4.1 Compliance with IP protection class

When mounting the indicators, in order to maintain the IP protection class, you should use rubber gloves or similar aids to achieve maximum torque when tightening the bayonet lock.

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5.4.2 Rest point adjustment

If the pointer of the indicator is not at the rest point when the flow is switched off, correct the rest point setting. Carry out the adjustment only when the flow is switched off.

You will need the following tools: open-end wrench SW 7, screwdriver 4x 0.6mm.

- Loosen the bayonet ring of the gauge housing and remove it together with the seal and the plexiglass screen.
- Counter the pointer shaft with the open-end wrench SW7, loosen the fastening screw and readjust the pointer on the rest point.
- Mount the display in reverse order.

6 VSD with additional electrical equipment

For installation, start-up and maintenance of the mechanical part, see section 5. Installation may only be carried out by qualified electricians.

6.1 Preparation for installation and maintenance

To connect the switches, have a flathead and Phillips screwdriver as well as tools for cutting and stripping cables ready. According to the electrical specifications of your device, you will also need cable material for connection. To maintain the IP protection class, only cables with an outer diameter of 4.5 - 7mm may be used in conjunction with the M12 right-angle connector (section 9.4).

6.2 Wiring the limit switches

1. Disconnect the cable from the mains of your installation.
2. Disconnect the angled plug on the back of the display.
3. Dismantle the plug from the plug housing and loosen the PG gland elements.
4. Slide the individual parts of the PG gland and the housing of the right-angle plug over the cable.
5. Loosen the insulation of the wires and connect them to the right-angle connector according to the assignment diagrams in the following sections.
6. Mount the right-angle plug back into the housing and tighten the PG gland.
7. Re-establish the connection to the mains.

6.3 Adjusting the switching points

The switching points of the limit switches can be easily adjusted after removing the Plexiglas cover. Use your finger to move the setpoint pointer of the limit switch to the corresponding scale point. Then check the switching point by moving the pointer over the set switching point.

6.3.1 VSD-RK1, VSD-RK2

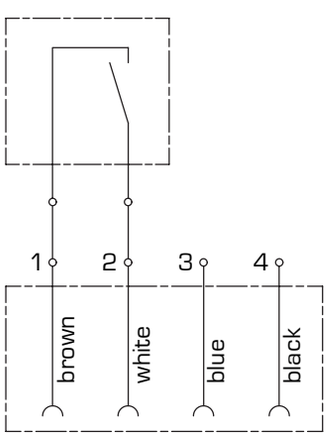
The series RK signal transmitters are mechanically operating, floating reed contacts.

We advise using switch protection relays of the MSR series to increase the switching capacity and reduce the capacitive load. These are available in various versions in terms of voltage supply, sensor output and number of outputs.

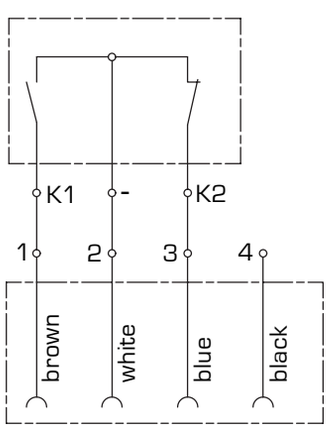
RK1	Version with one switch
RK2	Version with two switches
Switch	Reed switch, floating
Switching function	NC or NO
Switching performance	bistable
Proof voltage	max. 140 V AC/200 V DC
Switching voltage	50 V AC/75 V DC
Current switched	max. 0,25 A
Switch rating	max. 5 VA/3 W
Ambient temperature	-25 ... +105 °C

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

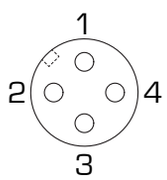
Terminal assignment
Contact RK-1



Terminal assignment
Contact RK-2



Terminal assignment
at right angle plug

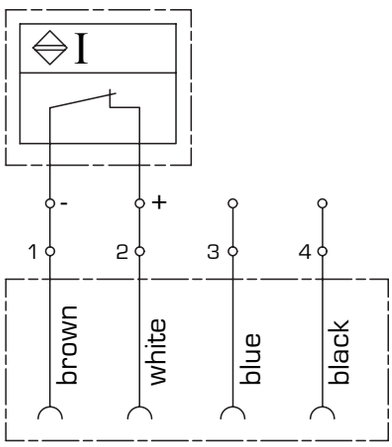


6.3.2 VSD-IK1 , VSD-IK2

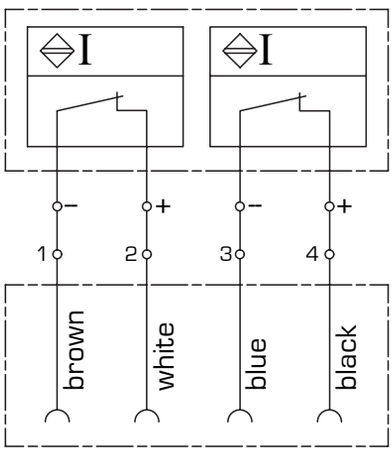
Series IK built-in electrical signal transmitters are non-contacting, inductive make and break contacts which operate when a control vane moved by the setpoint pointer dips into and out of the slot initiator. The change in signal is used for driving a control device via an isolation switching amplifier.

IK1	Version with one inductive limit switch
IK2	Version with two inductive limit switches
Switch data	
Function	Inductive slot initiator acc. to NAMUR DIN 19233, two-wire
Switching function	NC or NO
Slot width	2,0 mm
Hysteresis	1,0 % v. E ... 10 % v.E
Repeat accuracy	≤ 2,0 %
Temperature drift	≤ ± 10 %
Ambient temperature	-25 ... +70° C
Voltage	nom. 8,2 V DC
Switching frequency	≤ 2,5 kHz
Switching performance	bistable
Nominal Voltage	8 V DC via isolation switching amplifier
Power consumption	
Active area uncovered	≥ 2,1 mA
Active area covered	≤ 1,2 mA
Ambient temperature	-25 ... +70 °C
Polarity reversal protection	ja
Certification to	KEMA 02 ATEX 1090 X
Inner inductance (Li) / capacitance (Ci)	266 µH/41 nF * Values for pre-assembled cables up to 10 m
Labelling of slot initiator	II 1G Ex ia IIC T4...T6 Ga (max. Ui = 20 V, Ii = 60 mA, Pi = 130 mW)

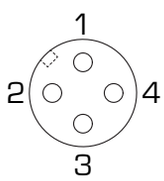
Terminal assignment
Contact IK-1



Terminal assignment
Contact IK-2



Terminal assignment
at right angle plug



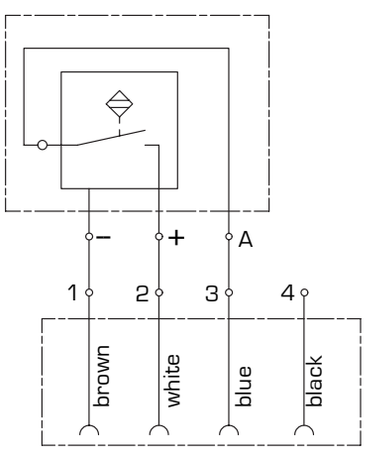
6.3.3 VSD-IKS1, VSD-IKS2

Built-in electrical signal transmitters of the IKS series are non-contacting make and break contacts which operate when a control vane actuated by the setpoint pointer dips into and out of the slot initiator. The signal change can be processed directly in a PLC system.w

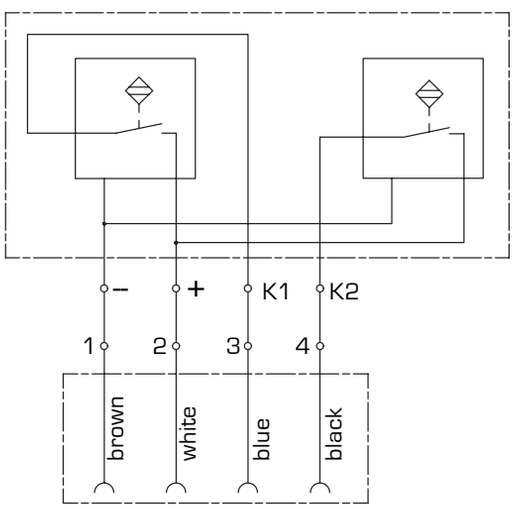
IKS1	version with one switch
IKS2	version with two switches
Switch	inductive slot initiator
Switching function	NC or NO
Switching performance	bistable
Supply voltage	24 V DC
Current switched I_A	≤ 100 mA
Open-circuit power consumption	≤ 10 mA
Ambient temperature	-25 ... +70° C
Explosion protection	no
Voltage drop (at Imax)	≤ 1,2 V

BGiven PNP-switching devices, the switched output 3 forms a connection to 2 (+) .Between 3 and 1 a load RL must be selected so that the max. current switched (100 mA) is not exceeded. For two contacts, this applies analogously to a load RL between 1 and 4 (no direct connection between 1 and 3, or 1 and 4).

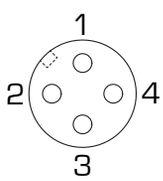
Terminal assignment
Contact IKS-1



Terminal assignment
Contact IKS-2



Terminal assignment
at right angle plug



blue (3) = Limit value switch 1
black (4) = Limit value switch 2

6.4 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.

7 Disposal

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

8 Remaining risks

A risk analysis in accordance with the pressure equipment directive has been carried out for the devices . The residual risk is described as follows:

- The devices are designed according to the valid and applicable rules and standards for static operation and their pressure resistance is tested for the declared maximum pressure and temperature (no tests for cyclical change).
- Responsibility for the use of the measuring devices with regard to corrosion resistance of the used materials against the measured fluid lies solely with the operator.
- Avoid abrasion.
- Avoid pulsation and cavitation.
- Protect devices from vibration and high-frequency oscillation.
- Due to the spring chamber being at a right angle to the measuring line, draining (backflow) may be delayed.
- Implement appropriate measures to counteract external fire hazards

9 Technical Data

9.1 General technical data

Measuring accuracy	5 % FS
Scale	in physical units, z. B.: l/h, m³/h [1)]
Measuring range	min. 1:10
Pressure resistance	10 bar
Max. ambient temperature	70°C
Max. media temperature	75°C
Degree of protection, indicator part	IP66

[1)] other units on request

9.2 Materials

Measuring cylinder	Wetted internal parts	Wetted gasket [1)]	NG
1.4571	1.4571	FKM	28 - 65
Indicator			
scale casing	stainless steel 1.4301		
pointer	aluminium painted		
scale	aluminium coated		
screen	PC, optionally glass		

[1)] other materials on request

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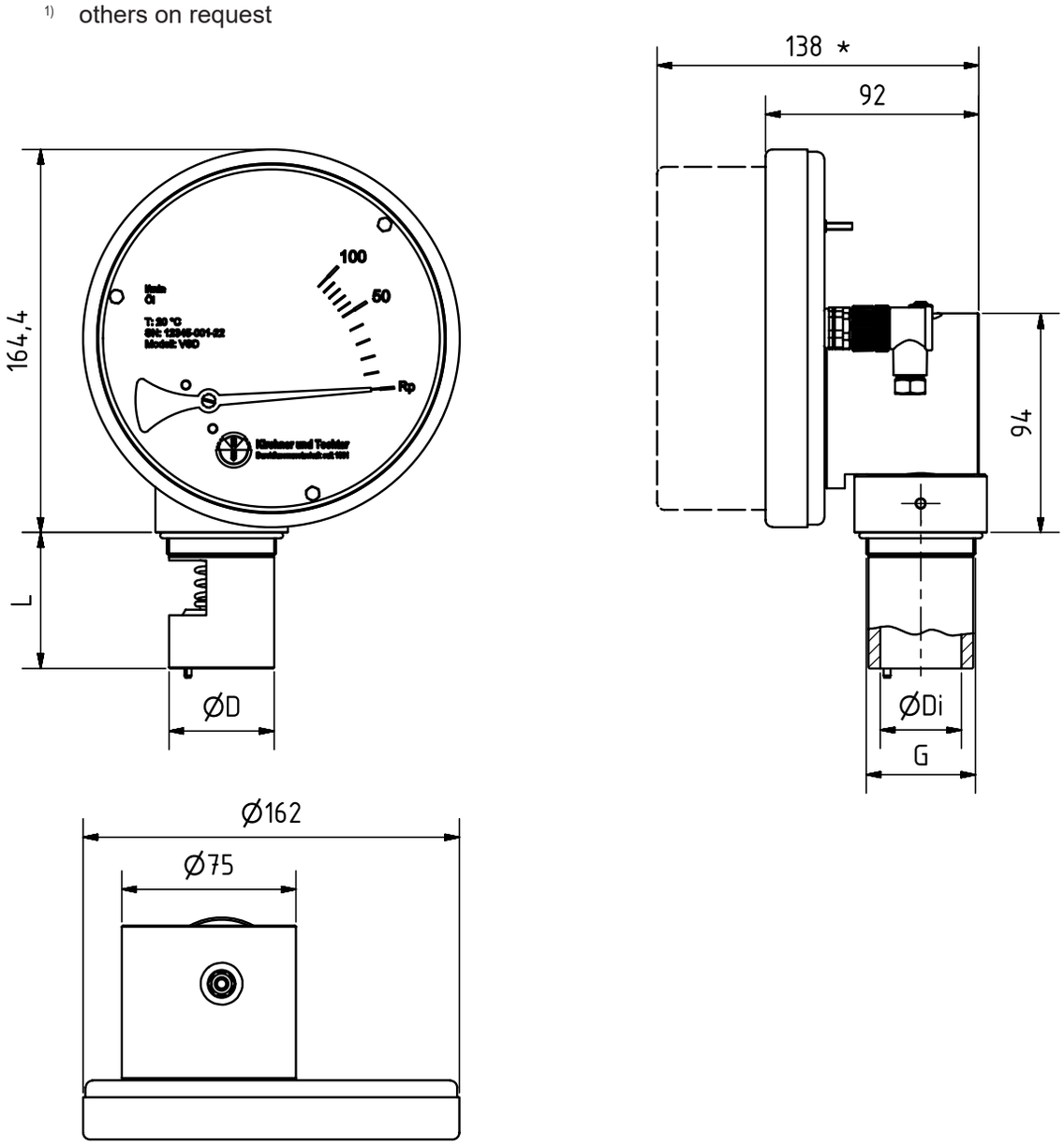
9.3 Dimensions and measuring ranges

9.3.1 VSD NG

NG	G	ØD [mm]	ØDi [mm]	L [mm]	Weight [kg]	Range [l/min] 1)
28	M40 x 1,5	38,1	28	50,3	3,2	10 - 100
35	M47 x 1,5	45,2	35	58,3	3,4	30 - 150
45	M56 x 1,5	54,2	45	67,8	3,7	50 - 250
65	M75 x 1,5	73,1	65	80	4,2	100 - 500
* VSD with RK1/RK2/IK1/IK2/IKS1/IKS2 limit value switch						

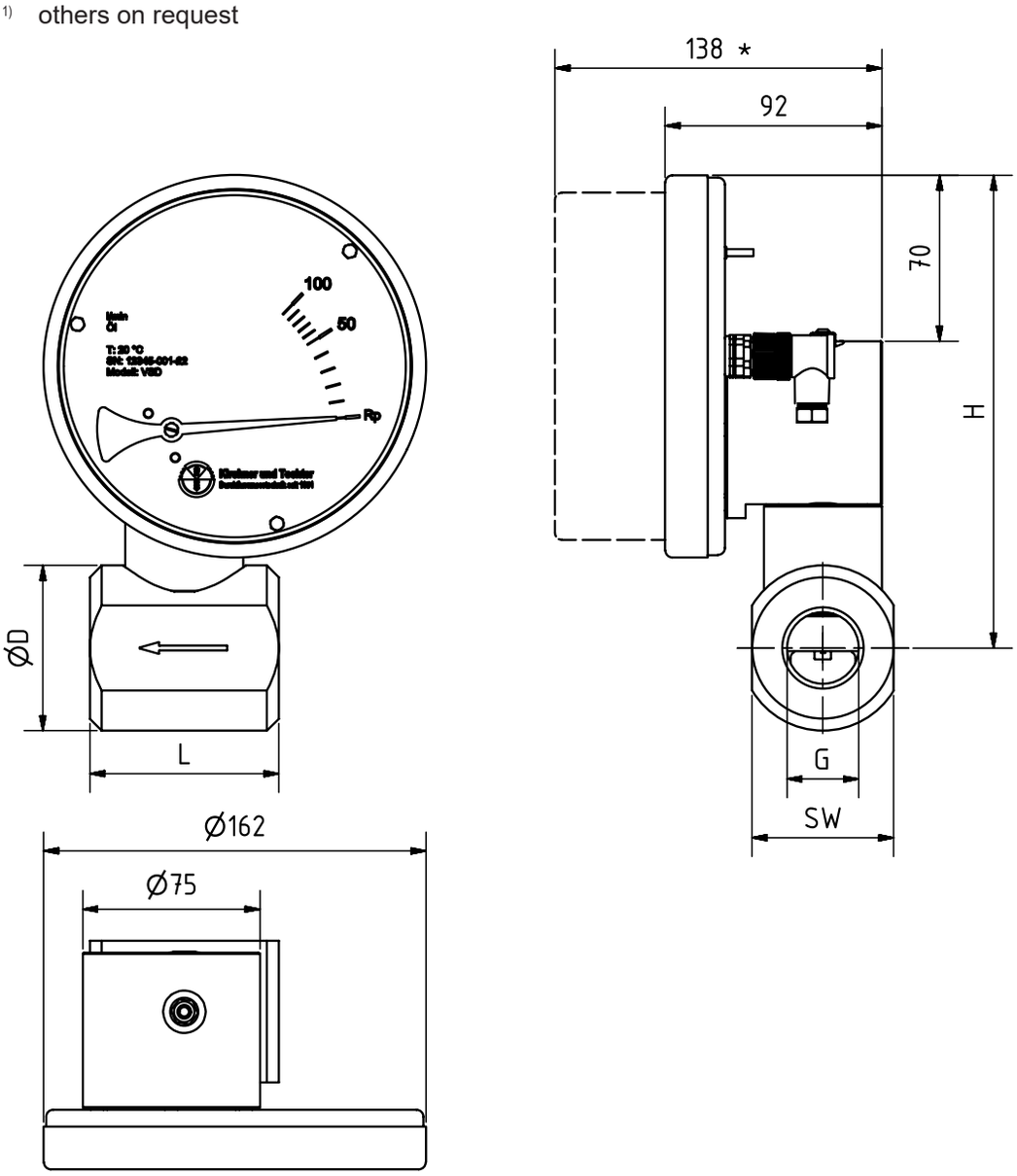
1) others on request



9.3.2 VSD Gi

G	ØD [mm]	SW [mm]	L [mm]	H [mm]	Weight [kg]	Range [l/min] 1)
G ½“	70	60	80	200	3,7	10 - 100
G ¾“	70	60	80	200	3,6	10 - 100
G 1“	70	60	80	200	3,5	10 - 100
G 1¼“	80	70	95	200	4,4	30 - 150
G 1½“	90	80	105	200	5,5	50 - 250
G 2“	105	95	120	200	6,5	100 - 500
* VSD with RK1/RK2/IK1/IK2/IKS1/IKS2 limit value switch						

1) others on request



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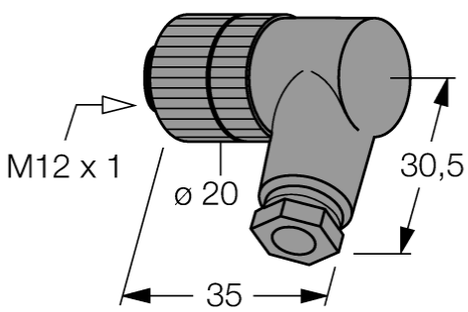
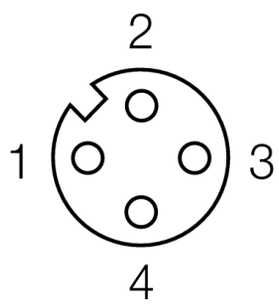
9.4 M12 Right angle plug

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 mm²
Screw-in thread	PG 7
Connection mode	screw clamp
Mechanical lifespan	min. 50 contact durability
Rated voltage	max. 250 V
Insulation resistance	≥ 10^8 Ω
Ampacity	4 A
Forward resistance	≤ 8 mΩ
Ambient temperature Connector	-25 ... +85 °C



Dimensions



pin configuration

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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