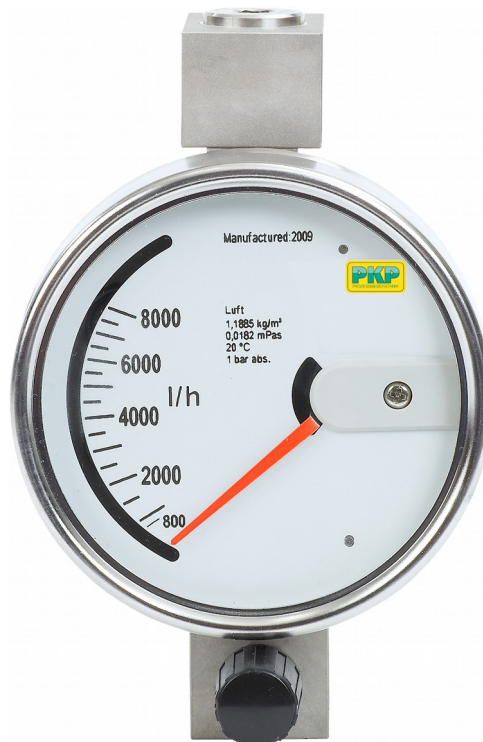




## ***Instruction Manual***

### ***DS20***

***Variable area flowmeter for low volumes,  
compact construction***



PKP Prozessmesstechnik GmbH  
Borsigstraße 24  
D-65205 Wiesbaden-Nordenstadt  
Tel.: ++49-(0)6122-7055-0  
Fax: ++49-(0)6122-7055-50  
Email: [info@pkp.de](mailto:info@pkp.de)

# **Table of Contents**

---

Safety Information.....	2
Installation and Commissioning.....	3
Wiring.....	4
Limit switch (option K1 to K8).....	7
Service and Maintenance.....	7
Removing the measuring tube.....	8
Assembly of the measuring tube.....	8
Explosion drawings.....	9
Electronic transmitter (option).....	11
Limit switch (option).....	11
Controller (option).....	12

## **Safety Information**

---

### **General Instructions**

To ensure safe operation, the device should only be operated according to the specifications in the instruction manual. The requisite Health & Safety regulations for a given application must also be observed. This statement also applies to the use of accessories.

Every person who is commissioned with the initiation or operation of this device must have read and understood the operating instructions and in particular the safety instructions!

The liability of the manufacturer expires in the event of damage due to improper use, non-observance of this operating manual, use of insufficiently qualified personnel and unauthorized modification of the device.

### **Proper Usage**

The devices of the DS20 series are used to monitor the continuous flow of liquids and gases. Any other use is considered improper. Unless otherwise indicated, the scales of the devices refer to water at 20 °C or air at 1.013 bar abs. and 0 °C. In particular, applications in which shock loads occur (e.g. clogged operation) should be discussed and checked beforehand with our technical personnel.

The devices of the DS20 series must not be used as the sole means of preventing dangerous conditions on machines and systems.

Machines and systems must be designed in such a way that faulty conditions cannot lead to a dangerous situation for the operating personnel.

### **Dangerous substances**

For dangerous media such as e.g. Oxygen, Acetylene, flammable or toxic substances as well as refrigeration systems, compressors, etc. must comply with the relevant regulations beyond the general rules.

## **Qualified Personnel**

Devices of the DS20 series may only be installed by suitably trained specialist personnel who are able to install the devices properly. Qualified personnel are defined as those persons who are familiar with the assembly, installation and commissioning of devices of this type and who are appropriately qualified.

## **Inward Monitoring**

Please check directly after delivery the device for any transport damages and deficiencies. Additional with reference to the accompanying delivery note the number of parts must be checked.

Claims for replacement or goods which relate to transport damage can only be considered valid if the delivery company is notified without delay.

## **Installation and Commissioning**

---

### **Mounting position**

Vertical, flow direction up. Avoid vibrations in the pipe!

### **Installation instructions**

- Before installing the DS20, make sure that there are no packaging residues in the device.
- In devices without a valve and with the process connection "female thread", the guide rod of the float moves from cone 44 into the area of the connection thread.
- When screwing in the connection, make sure that the guide rod is not bent.
- The inside diameter of the connection must be at least 8 mm for cones 44-51 and at least 10 mm for cones 52 and 53.
- In order to avoid compression vibrations with gases, VDI/VDE 5313 Part 3 must be observed. For devices without a valve, a restriction (valve) must be placed directly upstream or downstream of the device (on the side where the larger volume is located).
- In order to avoid mutual magnetic interference, the distance between the central axes of the measuring tubes should be at least 120 mm and the distance to other ferritic materials at least 60 mm when several devices are arranged in parallel.
- Foreign magnetic fields should be removed to such an extent that their field strength at the flow meter is close to 0 mT.

## Commissioning

Check the free movement of the float (5)\* by observing the pointer which must follow the change in flow. If this is not the case, the float and measuring tube (1;21) must be cleaned (see removal of measuring tube). The free movement of the pointer is checked by carefully moving it with the finger and observing the settling on the scale value. In the event of a fault, it is recommended that the display unit be replaced (14).

When operating with solenoid valves, the flow must be limited to the maximum measured value of the DS20 (also at the time of switching) in order to avoid damage to the float and the stops. When starting up the system, slowly increase the flow rate to the desired value.

\*Item numbers are shown in the exploded views.

## Wiring

---

Please refer to the connection and wiring drawings in this chapter. Two Quickon connectors are located on the rear of the DS20 for devices with electronic transmitters or limit contacts. The lower one is labeled "S" in the wiring diagrams, the upper one is labeled "T" in the wiring diagrams. Unused connections are sealed with a blind plug.

The following table shows the connections for each device configuration.

	Type T without contacts	Type T with MIN contact / K1 o. K6	Type T with MAX contact / K1 o. K7	Type T with MIN/MAX contact / K3 o. K8	Type E without contact without impulse	Type E with MIN contact / K1 o. K6	Type E with MAX contact / K2 o. K7	Type E with pulse output / CP
Quickon top „T“	-----	-----	MAX contact	MAX contact	Current output	Current output	Current output	Current output
Quickon below „S“	-----	MIN contact	-----	MIN contact	-----	MIN contact	MAX contact	Pulse output

Measuring and display devices connected serially to the current output must not exceed a load resistance of  $RL = (U-13.5 \text{ V}) / 20 \text{ mA}$ .

## Installation

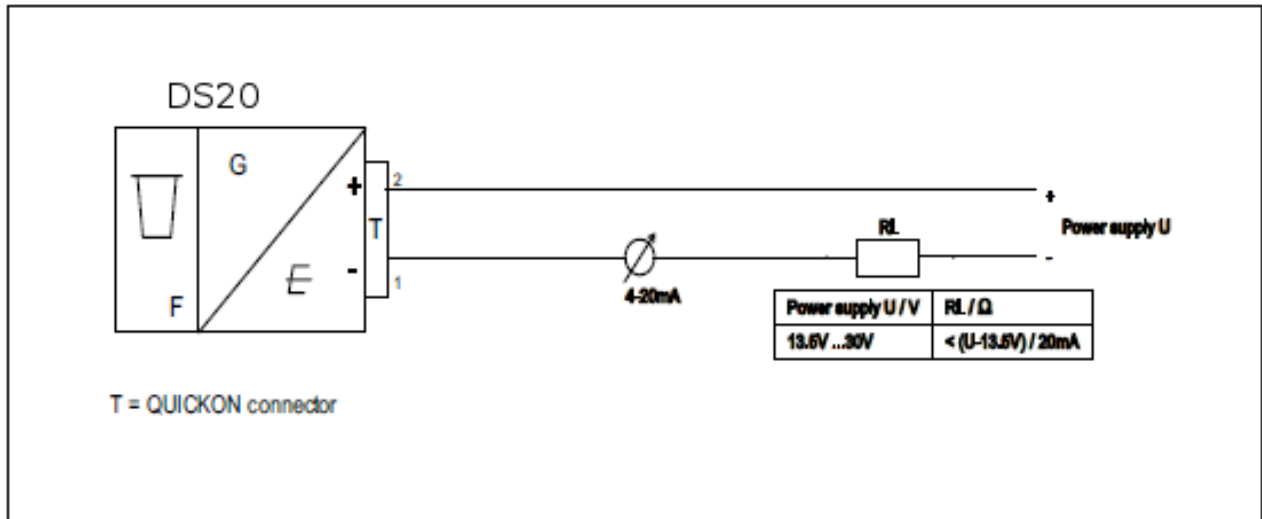


Fig. 3-1 - DS20 with electronic transmitter

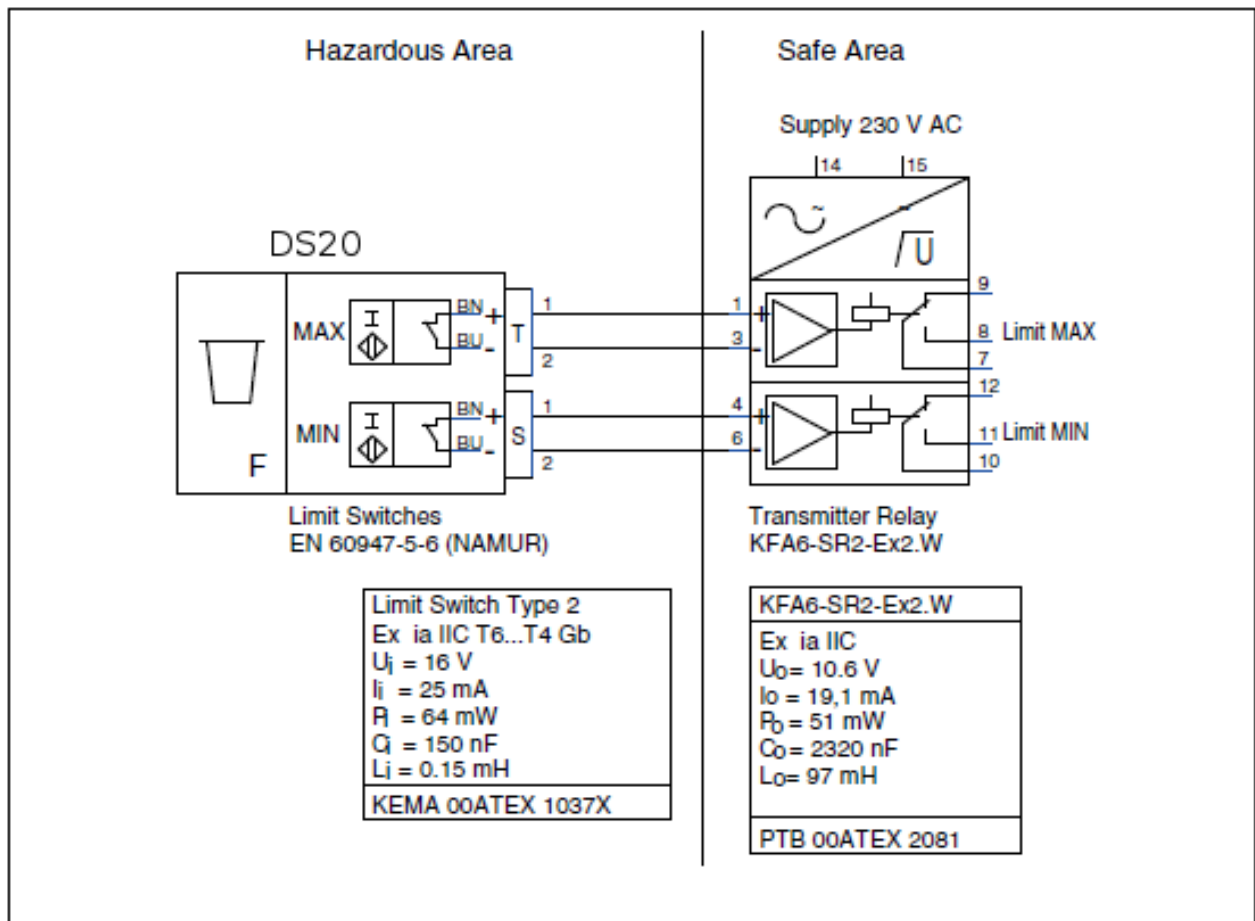


Fig. 3-2 - DS20 with 2 limit switches in conjunction with isolating switch amplifier in Ex version

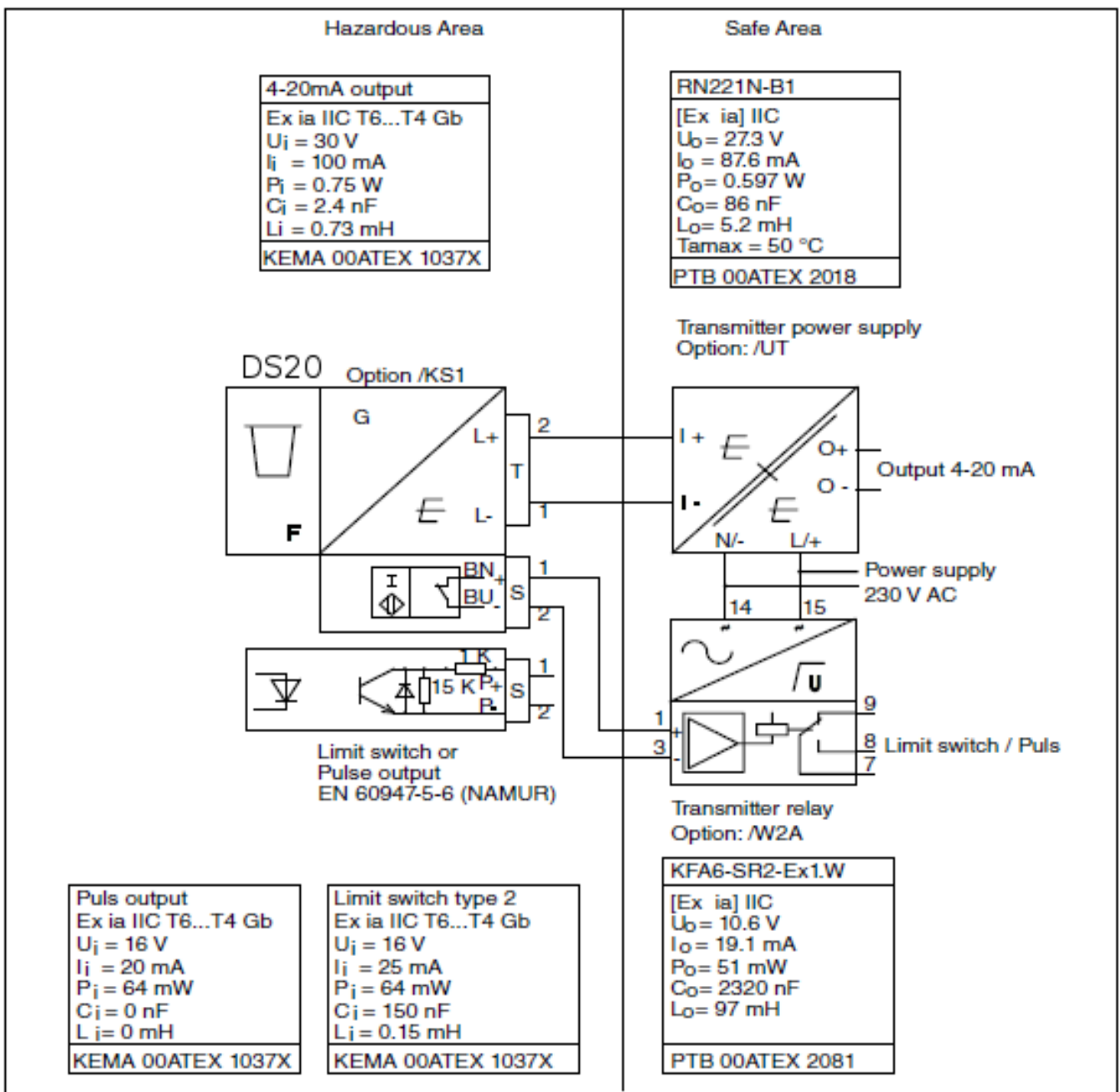


Fig. 3-3 - Ex version of DS20 with electronic transmitter in conjunction with power supply units and additional limit value contact or pulse output with isolating switch amplifier

## **Limit switch (option K1 to K8)**

The optional limit switches are available as limit switches for the maximum value and/or the minimum value. These are proximity switches according to EN 60947-5-6 (NAMUR). A maximum of two switches can be installed.

These switches have been designed for use in potentially explosive atmospheres.

However, the isolating switching amplifiers must be installed outside the hazardous area. The limit switches are connected to the isolating switching amplifiers via the Quickon connections on the rear of the devices (see "Installation instructions").

The MIN-MIN and MAX-MAX functions (see option K3) are integrated in the MIN-MAX switches of the DS20 at the factory. The MIN-MIN or MAX-MAX function is obtained by setting the switching direction of the isolating switching amplifier accordingly.

The following table shows the assignment:

Function		Switching direction of the isolating switching amplifier	
canal 1	canal 2	canal 1	canal 2
MIN	MAX	normal	normal
MIN	MIN	normal	reverse
MAX	MAX	reverse	normal

Hint:

Switching direction "normal" means: Setting "inversion" on the isolating switching amplifier to "OFF".

Switching direction "reverse" means: Setting "inversion" on the isolating switching amplifier to "ON".

If the isolating switching amplifiers are used in safety-relevant applications, the switching direction should be set to "normal" for all combinations (setting "inversion" on the isolating switching amplifier to "OFF").

In order to ensure functional safety, the isolating switching amplifier must be used as a protective device.

## **Service and Maintenance**

The flow meters described here are maintenance free. They do not contain any components that have to be repaired or replaced on site. Repairs are only carried out at the manufacturer's works.

The devices must be installed and commissioned correctly. During operation, the devices are maintenance-free, provided that parameters such as the type of medium, density, temperature and pressure are adhered to. The material of the magnetic float switch must be selected according to the medium.

**Attention: Opening the pressure transmitter will void the warranty**

## ***Removing the measuring tube***

---

The following steps are required to clean the measuring tube and the float:

- Removal from the pipeline
- Unscrew the upper hollow threaded bolt (6) (for cone 31-43) or remove the upper circlip and the sleeve (for cone 44-51) or only the upper circlip (for cone 52-53).
- Removing upper float stop (3)
- Removal of the float - Caution: Float must not be bent!
- For the version with valve at the bottom, the screw plug at the bottom must first be removed and all parts disassembled at the bottom.
- Cleaning of measuring tube and float
- To clean the valve, first loosen the lock nut (10) on the head. The spindle (12) with the PTFE stuffing box seals and the pressure rings (9) can then be unscrewed.

## ***Assembly of the measuring tube***

---

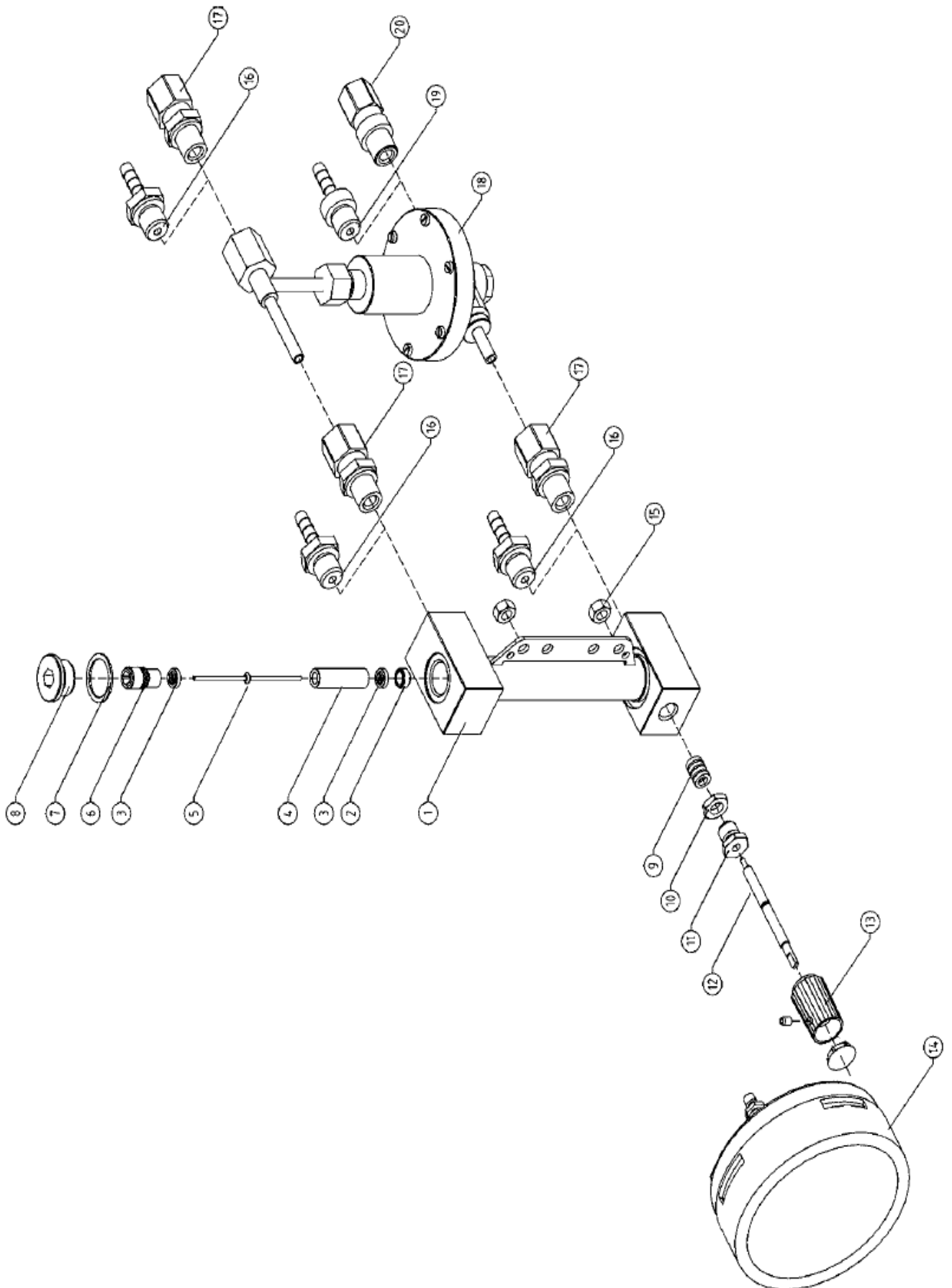
The assembly is carried out in reverse order.

When installing the float, make sure that it is inserted correctly so that the medium flows against the wide side of the measuring edge. The lower guide rod (below the measuring edge) of the float is placed in the center bore of the lower stop. The guide rod must not be bent.

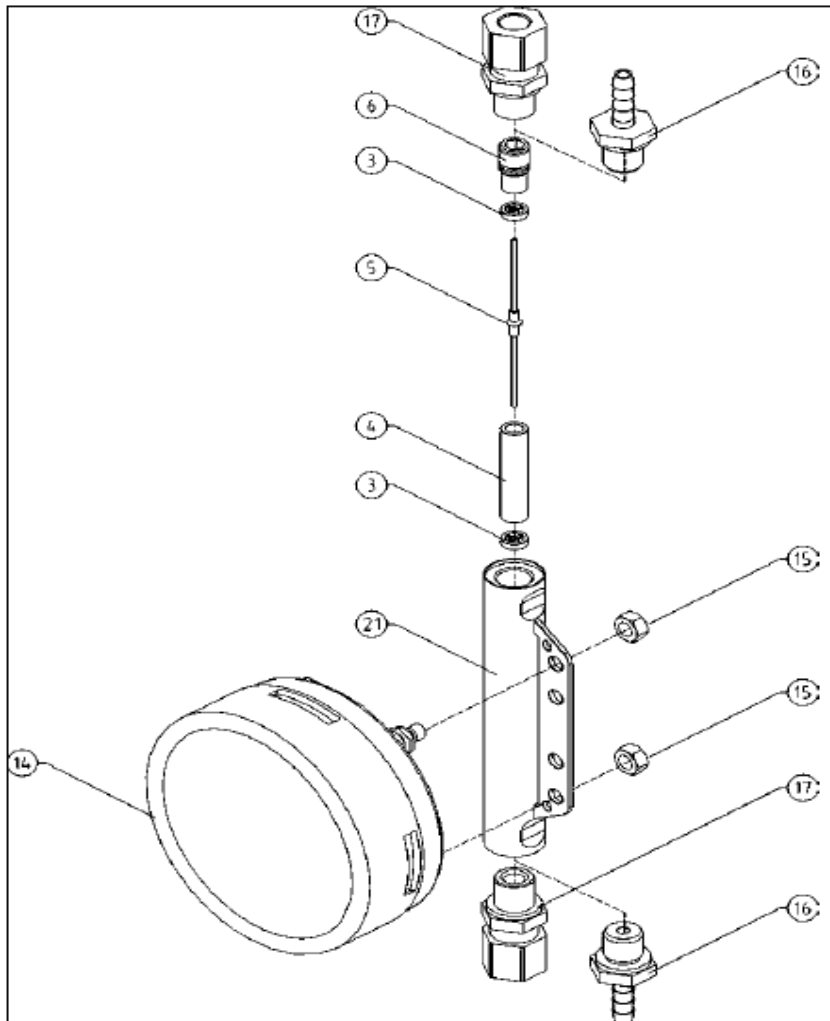


# Explosion drawings

With valve and controller



**Without valve and controller**



Number	Part
1	Tube for unit with valve and controller
2	Socket
3	Float stop
4	Cone
5	Float
6	Threaded bold
7	Gasket
8	Screw sealing plug
9;10;11;12;13	Packing for valve
14	Indicator
15	Nut M5
16;19	Nozzle
17;20	Cutting ring fitting
18	Controller
21	Tube for unit without valve and controller

## ***Electronic transmitter (option)***

---

**Power supply:** 13,5...30 VDC

**Power consumption:**  $\leq 21,5$  mA

Load resistance  $R_i$ : (U-13,5 V) / 20 mA  
Max. voltage:  $U_{\max} = 30$  V

**Output signal:** 4...20 mA

The output signal is not linear to the flow and must be linearized externally if necessary.

**Electrical connection:** Quick connection QUICKON

cable diameter: 4-6 mm  
Max. wire cross-section: 0,34...0,75 mm<sup>2</sup>

## ***Limit switch (option)***

---

Type: Inductive switch

Ambient temperature: -25 °C to +100°C

Nominal voltage: 8 VDC ( $R_i = 1$  kOhm)

Output signal:  $\leq 1$  mA = 0;  $\geq 3$  mA = 1

### **Transistor relay for voltage supply of the limit switches**

Type: Isolating switch amplifier acc. to  
DIN 19234 (NAMUR)

Power supply: 230 VAC, 115 VAC, 24 VDC

Relay output: 1 or 2 potential-free changeover contacts

Switching capacity: Max. 250 VAC, max. 4 A, max. 500 VA

Control circuit: Intrinsically safe [EEx ia] IIC

## **Controller (option)**

---

### **Attention:**

Differential pressure regulators are used to maintain a constant flow when the operating pressure fluctuates. They are **not** pressure reducing valves.

The regulators DS20...1 and DS20...2 (upstream pressure regulators) are used for liquids with variable upstream or downstream pressure and for gases with variable upstream pressure and constant back pressure.

The regulators DS20...3 and DS20...4 (back pressure regulators) can only be used for gases with fluctuating back pressure.


Max. flow rate for liquids:	100 l/h
Max. flow rates for gases:	3250 l/h
Max. pressure:	25 bar
Required differential pressure:	> 400 mbar

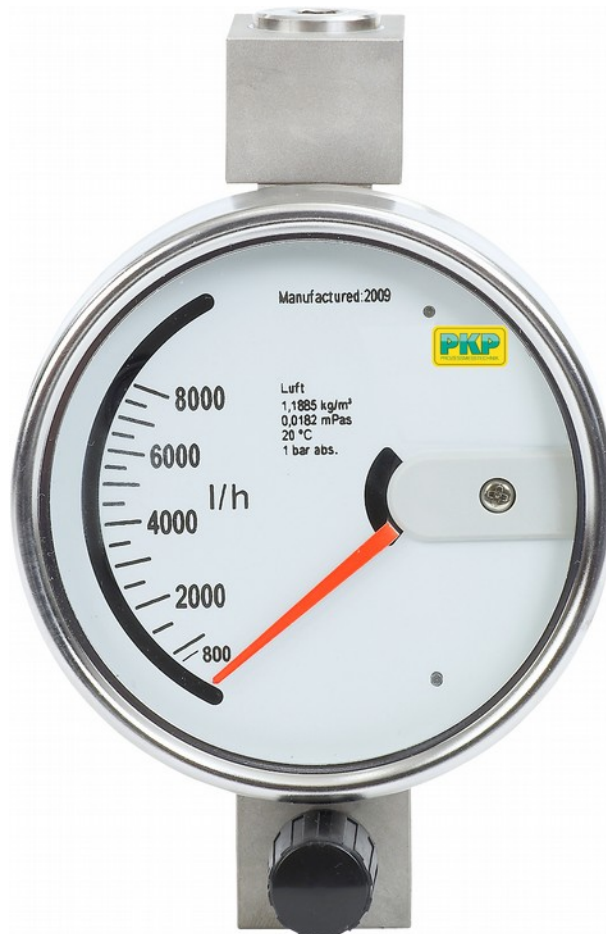
### **Materials:**

<b>Housing</b>	<b>Membranes</b>	<b>Springs</b>
stainless steel	PTFE	stainless steel
brass	Buna	stainless steel

# DS20

## Variable Area Flowmeter for Low Flow Volumes Compact Construction

- for liquids and gases
- measuring range: 0,1...1 up to 25...250 l/h water  
4...40 up to 800...8000 NI/h
- measuring tube completely st. steel 1.4571
- max. pressure: 160 bar, max. temperature: 200 °C
- scales for all operating conditions  
designed as required
- local display, min./max. contacts or  
analogue output
- optional available with valve
-  Ex-Version acc. to ATEX



### Description:

The model series DS20 flow meters work according to the suspended float principle of measurement. The device has a cone-shaped float that moves within a cylindrical measuring tube. The flowing gas or liquid moves the float in the direction of the flow. The movement of the float is transmitted magnetically to a dial indicator mounted outside on the measuring tube. The indicator is fitted with a scale appropriate for the operating range encountered. If necessary, the indicator can also be fitted with contacts or an analogue output.

### Typical applications:

Model series DS20 flow meters are intended to measure and monitor gases or low- viscosity liquids, such as those found in applications like cooling systems for welding machines, laser and tube systems, pump monitoring, compressors, etc. Since all parts coming in contact with the medium being monitored are made of high- quality st. steel 1.4571, this device is also suitable for use with caustic/ corrosive media.

## Models:

- Flowmeter with local dial indicator display
- Dial indicator display, 1 MIN contact
- Dial indicator display, 1 MAX contact
- Dial indicator display, 1 MIN contact, 1 MAX contact
- Dial indicator display, analogue output: 4 to 20 mA

## Process Connection:

### Version without needle valve (connection at top/ bottom):

all threaded connections as per model code, PN 100 (standard) or PN 160, all flange connections

### Version with needle valve (connection at back):

all threaded connections as per model code, PN 40 (standard) or PN 100, flange connections not possible

## Measuring Ranges:

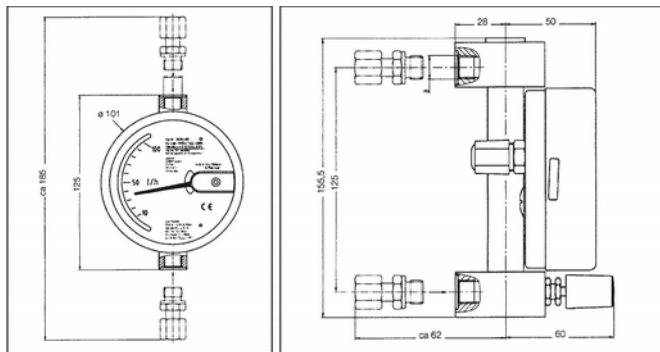
Code (water)	Measuring range water 20 °C [l/h]	Code (air)	Meas. range air, 0 °C, 1,013 bar abs. [NI/h]	Pressure loss [mbar]
W1	0,1...1	L1	4...40	6
W2	0,16...1,6	L2	6...60	6
W3	0,25...2,5	L3	10...90	6
W4	0,4...4	L4	14...140	6
W5	0,6...6	L5	20...200	6
W6	1...10	L6	32,5...325	8
W7	1,6...16	L7	50...500	8
W8	2,5...25	L8	80...800	8
W9	4...40	L9	140...1400	11
W10	6...60	L10	200...2000	11
W11	10...100	L11	325...3250	11
W12	16...160	L12	500...5000	13
W13	25...250	L13	800...8000	13

The indicated measuring ranges -especially for air- serve for orientation. Please specify the following process conditions when making enquiries:

### Medium, pressure and temperature

We create an individual scale for you at no extra charge.

## Dimensions:



## Technical Data:

- Materials:** wetted parts made of st. steel 1.4571  
housing made of 1.4301
- Max. pressure:** PN 100 (standard), PN 10, 40, 160  
acc. to order code
- Max. media-temperature:**  
local display: - 80 °C...+200 °C (+150 °C with valve)  
with contacts: - 40 °C...+150 °C  
with analogue output.: - 40 °C...+150 °C
- Protection class:** IP65
- Accuracy:** ± 4 % of measured range value

## Order Code:

Order number: **DS20. 41G4. 6. 0. 1. 0**

### Float Type Flowmeter

### Process connection:

- 41G4 = G 1/4 female, PN 40
- 41G6 = G 1/4 female, PN 100 (standard)
- 4266 = G 3/8 fem., PN 100 (at meas. ranges 12 + 13)
- 41G7 = G 1/4 female, PN 160
- 41T4 = 1/4" NPT female, PN 40
- 41T6 = 1/4" NPT female, PN 100
- 41T7 = 1/4" NPT female, PN 160
- 53C4 = compression fitting 6 mm, PN 40
- 53C6 = compression fitting 6 mm, PN 100
- 53C7 = compression fitting 6 mm, PN 160
- 53P1 = hose connection 6 mm, PN 10
- 54C4 = compression fitting 8 mm, PN 40
- 54C6 = compression fitting 8 mm, PN 100
- 54C7 = compression fitting 8 mm, PN 160
- 54P1 = hose connection 8 mm, PN 10
- 55C4 = compression fitting 10 mm, PN 40
- 55C6 = compression fitting 10 mm, PN 100
- 55C7 = compression fitting 10 mm, PN 160
- 56C4 = compression fitting 12 mm, PN 40
- 56C6 = compression fitting 12 mm, PN 100
- 56C7 = compression fitting 12 mm, PN 160
- 01D4 = flanges DN 15, PN 40
- 02D4 = flanges DN 25, PN 40
- 01A1 = flanges ANSI 1/2", 150 lbs RF
- 02A1 = flanges ANSI 1", 150 lbs RF
- 01A2 = flanges ANSI 1/2", 300 lbs RF
- 02A2 = flanges ANSI 1", 300 lbs RF

### Measuring range:

- 1...13 = acc. to table
- 99 = special measuring range

### Valve:

- 0 = without
- 1 = valve on input side, valve seat made of silver
- 2 = valve on input side, valve seat made of PCTFE
- 3 = valve on output side, valve seat made of silver
- 4 = valve on output side, valve seat made of PCTFE

### Display:

- 1 = local pointer display
- 2 = local pointer display, 1 MIN-contact
- 3 = local pointer display, 1 MAX-contact
- 4 = local pointer display, 1 MIN-, 1 MAX-contact
- 5 = local pointer display, analogue output 4...20 mA
- 6 = local pointer display, analogue output 4...20 mA, 1 MIN-contact
- 7 = local pointer display, analogue output 4...20 mA, 1 MAX-contact

### Options:

- 0 = without
- 9 = please specify in plain text

## Contacts:

- Type:** Inductive (NAMUR acc. to EN 50227)
- Nominal voltage:** 8 VDC
- Recommended for operating the contacts: Switch amplifier P+F (see Data sheet P+F)

## Analogue Output:

- Power supply:** 24 VDC
- Output:** 4...20 mA, 2-wire
- Load impedance:** (U-13,5 V) / 20 mA
- Electr. connection:** QUIKON quick connection