



## ***Instruction Manual***

### ***DP04***

***Paddle-type flow switch with shortenable paddle***



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## **Safety Information**

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### **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 work safety instructions in this manual as well as the safety, accident prevention and environmental protection regulations generally valid for the work area must be observed. 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 paddle type flow switches of the series DP04 designed to control the float of liquids which do not attack the device materials. All other usage is regarded as being improper and outside the scope of the device.

In particular, applications in which shock loads occur (for example, pulsed operation) should be discussed and checked in advance with our technical staff.

The series DP04 should not be deployed as the sole agents to prevent dangerous conditions occurring in plant or machinery. Machinery and plant need to be designed in such a manner that faulty conditions and malfunctions do not arise that could pose a safety risk for operators.

### **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**

The DP04 devices may only be installed by trained, qualified personnel who are able to mount the devices correctly. Qualified personnel are persons, who are familiar with assembling, installation, placing in service and operating these devices and who are suitably trained and 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.

## **Functional Description**

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The flow switch consists of a paddle system, at the upper end of which there is a permanent magnet . Above the magnet there is the switch unit with a reed contact.

A second, opposite magnet serves for the generation of a reset force. When the flow to be monitored meets the paddle system, it is deflected. The magnet changes its position to the reed contact.

The contact closes or opens depending on the contact type and setpoint range.

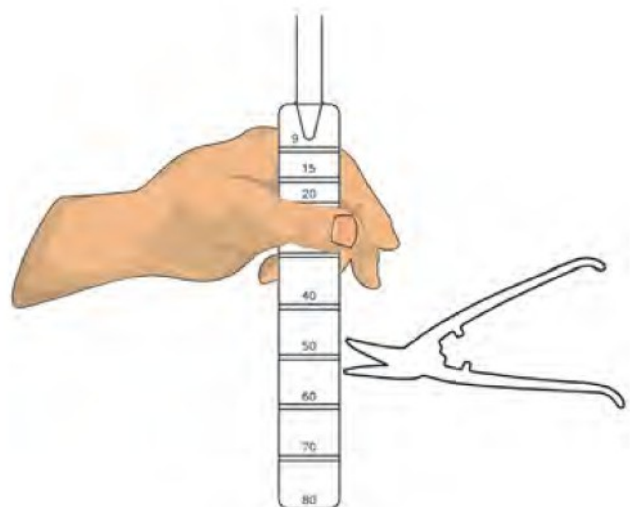
As soon as the flow stops, the paddle moves back to its initial position and the reed contact opens or closes depending on the contact type and setpoint range.

## **Shortening of paddle:**

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Hold the paddle tight above the cut surface

Shorten the paddle with a suitable tool to the required length.



## Technical Data to shorten the paddle:

Plastic paddle, installation into pipe tees according to EN 10242

Paddle to be trimmed to						
	Paddle mark	9	15	20	30	40
	Installation length L <sub>1</sub> [mm]	40	46	51	61	71
Setpoints* / Max. flow rate [m <sup>3</sup> /h]						
DN 20	Increasing flow ON**	1.1				
	Decreasing flow OFF	0.9				
	Max. flow rate	4				
DN 25	Increasing flow ON**	1.7	1,3			
	Decreasing flow OFF	1.5	1.1			
	Max. flow rate	8.5	5			
DN 32	Increasing flow ON**	2.9	2.2	1.9		
	Decreasing flow OFF	2.6	1.9	1.6		
	Max. flow rate	15	10	8		
DN 40	Increasing flow ON**	4.2	3.2	2.8	2.1	
	Decreasing flow OFF	3.8	2.8	2.4	1.8	
	Max. flow rate	25	18	14	10	
DN 50	Increasing flow ON**	6.5	4.9	4.4	3.3	2.7
	Decreasing flow OFF	6	4.5	4	3	2.4
	Max. flow rate	41	29	24	17	13

plastic paddle, installation by welded socket according to EN 10241, G $\frac{1}{2}$  female, length 15 mm

Paddle to be trimmed to									
	Paddle mark	15	20	30	40	50	60	70	80
	Installation length L <sub>1</sub> [mm]	46	51	61	71	81	91	101	111
Setpoints* / Max. flow rate [m <sup>3</sup> /h]									
DN 65	Increasing flow ON**	8.8	7.4	5.6	4.5				
	Decreasing flow OFF	8.5	7	5.2	4.2				
	Max. flow rate	50	45	34	27				
DN 80	Increasing flow ON**	13.8	11.7	9.2	7.5	6.5	5.1		
	Decreasing flow OFF	11.3	9.6	7.7	6.3	5.3	4.7		
	Max. flow rate	80	65	50	40	33	28		
DN 100	Increasing flow ON**		18.8	14.6	12.3	10.2	8	6.9	6.2
	Decreasing flow OFF		16.3	12	10	8	7.1	6.3	5.9
	Max. flow rate		110	80	65	55	50	40	36
DN 150	Increasing flow ON**				27	22.8	19.5	18	15.7
	Decreasing flow OFF				25	19.8	17.8	16	14.3
	Max. flow rate				150	130	110	100	90
DN 200	Increasing flow ON**					45	38	33.5	30
	Decreasing flow OFF					43.5	36	32	29
	Max. flow rate					230	200	175	160

\* Water, 20 °C, horizontal pipe, tolerance  $\pm 15\%$

\*\* Typical value

## Stainless steel paddle, installation into pipe tees according to EN 10242

Paddle to be trimmed to					
	Paddle mark	15	20	30	40
	Installation length L <sub>1</sub> [mm]	46	51	61	71
Setpoints* / Max. flow rate [m <sup>3</sup> /h]					
DN 25	Increasing flow ON**	1.2	1		
	Decreasing flow OFF	1	0.9		
	Max. flow rate	10	6		
DN 32	Increasing flow ON**	2	1.7		
	Decreasing flow OFF	1.7	1.5		
	Max. flow rate	20	15		
DN 40	Increasing flow ON**	3.3	2.7	2	
	Decreasing flow OFF	3	2.5	1.8	
	Max. flow rate	34	26	18	
DN 50	Increasing flow ON**	4.8	4	3.2	2.6
	Decreasing flow OFF	4.6	3.8	2.9	2.4
	Max. flow rate	55	45	32	24

## Stainless steel paddle, installation by welded socket according to EN 10241, G½ female, length 15 mm

Paddle to be trimmed to									
	Paddle mark	15	20	30	40	50	60	70	80
	Installation length L <sub>1</sub> [mm]	46	51	61	71	81	91	101	111
Setpoints* / Max. flow rate [m <sup>3</sup> /h]									
DN 65	Increasing flow ON**	7.2	6.0	4.5	3.6				
	Decreasing flow OFF	6.8	5.7	4.2	3.3				
	Max. flow rate	100	80	65	50				
DN 80	Increasing flow ON**	11.7	10	7.7	6.4	5.3	4.6		
	Decreasing flow OFF	11.4	9.6	7.5	6	4.9	4.2		
	Max. flow rate	150	125	95	75	60	50		
DN 100	Increasing flow ON**		16	12.4	10.3	8.7	7.7	6.7	6.1
	Decreasing flow OFF		15.9	11.9	9.8	8.1	7.1	6.3	5.6
	Max. flow rate		200	150	120	105	90	75	70
DN 150	Increasing flow ON**				24	20.3	18	16.3	14.7
	Decreasing flow OFF				22.7	19	17.3	15.3	13.8
	Max. flow rate				290	250	210	190	170
DN 200	Increasing flow ON**					41	35.7	31.7	26.7
	Decreasing flow OFF					38.7	34	29.7	23.3
	Max. flow rate					450	390	350	310

\* Water, 20 °C, horizontal pipe, tolerance ±15 %

\*\* Typical value

## ***Installation and Commissioning***

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Before installing, check that

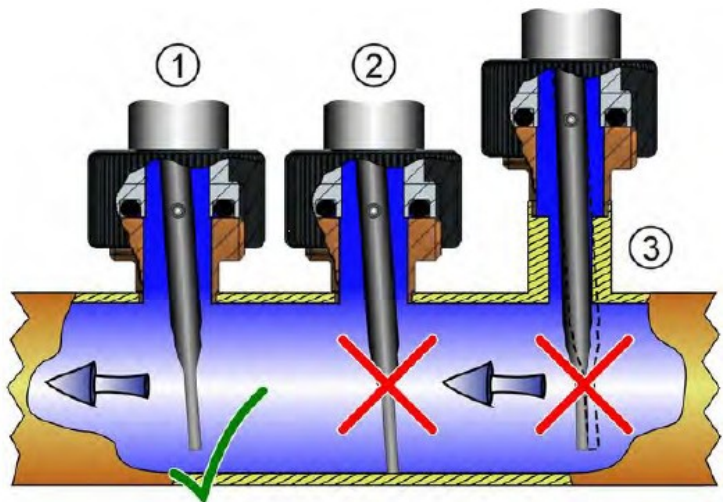
- ◆ the wetted materials of the device are suitable for the liquid being used
- ◆ the equipment is switched off and is in a safe and de-energised state.
- ◆ the equipment is depressurised and has cooled down.

### **General Information:**

- ◆ Choose a mounting position, where the limits are met.
- ◆ Avoid external magnetic fields near the flow switch, since they might impair the function mode of the flow switch.
- ◆ Keep a settling section of at least 5 x DN before and after the flow switch.
- ◆ Clean the pipe before mounting. Remove magnetic particles such as welding residues.
- ◆ Do not use greases, oils, etc. during mounting.
- ◆ Take into account that the nominal mounting position of the flow switches within a horizontal pipe is “upright”.
- ◆ Only mount the flow switch in an upright position and take into account the deviation of a maximal 45°.
- ◆ Take into account that the arrow on the flow switch points into the flow direction and runs parallel to the pipe axis.
- ◆ Tighten the plastic union nut with 7...8 Nm or the metal union nut with 25...30 Nm.

During flow switch installation, ensure that the paddle does not touch the wall of the pipe (2) and can move freely (1).

Ensure that the paddle rod does not bear against the inside of the dome (3).



### ***Installation into pipe tees according to EN 10242***

CAUTION! Malfunction due to fibrous sealants!

If fibrous sealants (e.g. Hemp or Teflon tape) enter the flow, the paddle system can be blocked or obstructed. This leads to a malfunction of the flow switch.

- ◆ During sealing the male thread with fibrous sealants, make sure that no residues of the sealant get into the flow.
- ◆ Use gaskets of the correct size (recommended).
  
- ◆ Seal the thread of the threaded adapter (G $\frac{1}{2}$ ) with a sealing adapter (e. g. hemp or teflon tape) or sealing rings.
- ◆ Screw the threaded adapter into the pipe tee.
- ◆ Insert the O-ring into the groove.
- ◆ Turn the union nut of the flow switch onto the thread (do not tighten yet).
- ◆ Align the flow switch in the flow direction.
- ◆ Tighten the plastic union nut with 7...8 Nm or the metal union nut with 25...30 Nm.

### ***Installation with welding socket according to EN 10241 (G $\frac{1}{2}$ female, length 15 mm)***

- ◆ Weld the welding socket into the prepared pipe.
- ◆ Seal the thread of the threaded adapter (G  $\frac{1}{2}$ ) with a sealing adapter (e. g. hemp or teflon tape) or sealing rings.
- ◆ Screw the threaded adapter into the welding socket.
- ◆ Insert the O-ring into the groove.
- ◆ Turn the union nut of the flow switch onto the thread (do not tighten yet).
- ◆ Align the flow switch in the flow direction.
- ◆ Tighten the plastic union nut with 7...8 Nm or the metal union nut with 25...30 Nm.

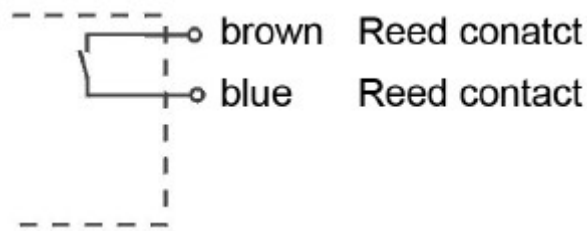
# Electrical Connection

Plug connector EN 175301-803-A (standard version):

- ◆ The electrical connection of the flow switch is made via the connector plug EN 175301-803-A
- ◆ To guarantee the type of protection IP 65 according to EN 60529, the connecting cable has to have a sheathing diameter of between 4.5 and 10 mm.



Fixed connection cable (option):





## Connecting devices equipped with Reed switches

Reed switches are basically designed for small contact ratings. To connect a load with higher power consumption it is indispensable to use a contact protection relay (e.g. our series MSR01)

If you connect directly a load to a Reed contact the following recommendations should be considered.

None of the contact rating values printed on the switching unit must not be exceeded, even momentarily. This is valid for each of the given values individually: voltage, current, power. The Reed contact integrated in the switching unit is very sensible to electrical overload

Danger of overload is given by the following applications:

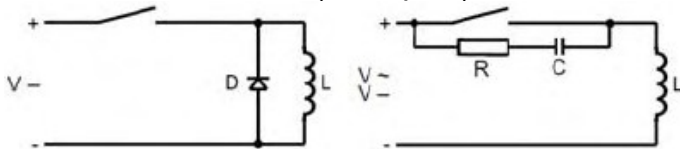
- ◆ inductive load
- ◆ capacitive load
- ◆ lamp load

### Inductive Load

Inductive loads consist e.g. of relay, contactors, solenoid valves, motors, electric engines, etc.

**⚠ WARNING:** Voltage spikes at shut down (up to 10 times of nominal voltage)

Protective measures: (examples)



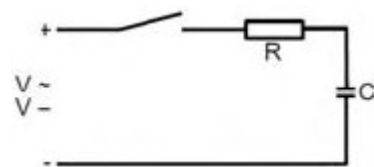
(Flyback diode, e.g. type 1N4007)

### Capacitive Load

Capacitive loads consist e.g. of long connection cables or capacitive consumers.

**⚠ WARNING:** High current spikes at switching on (this will exceed the nominal current)

Protective measures: (examples)



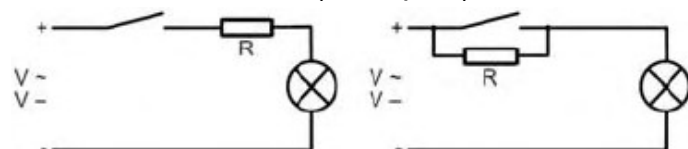
Limitation of current by a resistor

### Lamp Load

Lamp loads consist e.g. by light bulbs, starting motors .

**⚠ WARNING:** High current spikes at switching on, because the glowing spiral has low resistance at low temperature.

Protective measures: (examples)



Limitation of current by a resistor or preheating of the glowing spiral.

### **Connecting to a PLC**

There is no need for protective measures by connecting the Reed switch to a PLC. The Reed contacts are plated by Tunsten, Gold, and Rhodium located in a protective atmosphere. They can be directly connected to the input terminals of a PLC without problems.

### **RC-Circuits as protective measures (Boucherot cell, Snubber)**

In practice the following values of resistor/capacitor cells give good results. Nevertheless, the values given in the following tables are only recommendations for general purposes. But it cannot be guaranteed that for specific applications more adequate Boucherot cells may exist.

#### **For Reed switches of 10 – 40 VA**

<b>Voltage [V]</b>	<b>Resistance [Ohm]</b>	<b>Capacitance [nF]</b>
230	1500	330
115	470	330
48	220	330
24	100	330

#### **For Reed switches of 40 – 100 VA**

<b>Voltage [V]</b>	<b>Resistance [Ohm]</b>	<b>Capacitance [nF]</b>
230	1000	330
115	470	330
48	100	330
24	47	330

# Commissioning and adjusting the switching unit

## Commissioning:

Before switching on for the first time, check that

- ◆ the flow switch has been installed correctly and that all screw connections are sealed.
- ◆ the electrical wiring has been connected properly.
- ◆ the measuring system is vented by flushing.

## Adjusting the switch unit:

The flow switch can be operated as normally open contact or as normally closed contact. The following table explains the two types of contact:

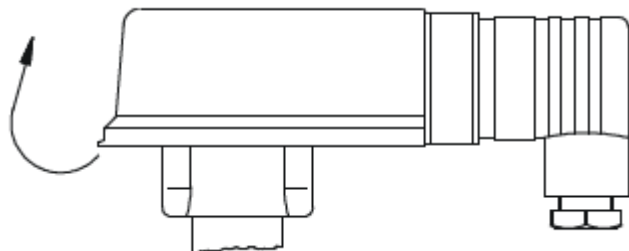
Contact	Setting	Flow	Electric contact
Normally open contact (open without flow)	Red arrow	Increasing	Closed
		Decreasing	Open
Normally closed contact (closed without flow)	White or blue arrow	Increasing	Open
		Decreasing	Closed

If not otherwise agreed with the customer, the switching unit is factory set as a normally open contact.

If there are no arrows on your switching unit, the contact type cannot be altered.

Opening the switch head

Open the lid of the connector plug.

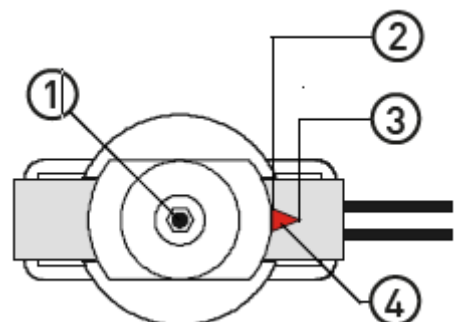


Loosening the locking screw

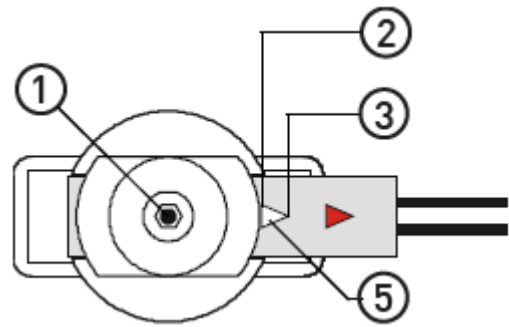
Loosen the locking screw (1)

Setting the normally open contact

Move the switch unit until the red arrow (4) is visible at the starting point of the unit's guide.

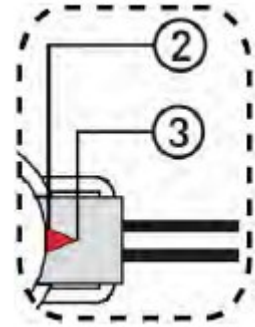


Setting the normally closed contact  
Move the switch unit until the white/blue arrow (5) is visible at the starting point of the unit's guide.



Setting the setpoint for lower flow  
Move the switch unit into the direction of the arrow tip (3).

Setting the setpoint for higher flow  
Move the switch unit into the direction of the arrow end (2).



Tightening the locking screw  
Carefully tighten the locking screw (1).  
If applicable, secure the locking screw of the switching unit using varnish / threadlocking fluid after individually setting the setpoint.

Closing the switch head  
Close the lid until it clicks into place.

## ***Maintenance and cleaning***

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The flow switch is maintenance-free and cannot be repaired by the user. In case of a defect, the device must be replaced or sent back to the manufacturer for repair. It is the responsibility of the operator to test the function periodically and to check the device visually. Periodically perform a functional test or a visual inspection.

### ***Cleaning:***

Clean the flow switch with a dry or slightly damp lint-free cloth. Do not use sharp objects or aggressive agents for cleaning.

# DP04

## Paddle-Type Flow Switch with Shortenable Paddle

- for liquids
- with shortenable paddle universal for DN 20 to DN 200
- screw-in spigot for T-pieces or direct pipe installation
- plastic- or stainless steel paddle
- low pressure loss, instant response
- switching function depends on flow only, not on pressure and temperature of fluid
- with plug connector, optional with jacket cable
- switching ranges: 1,1...45 m<sup>3</sup>/h
- $P_{\max}$ : 25 bar,  $T_{\max}$ : 110 °C



### Description:

The model DP04 flow switches operate according to the paddle principle. The flowing liquid pushes against the surface area of a paddle mounted at the end of a pivoting arm. The dynamic pressure against the plate deflects the arm. This motion causes a permanent magnet attached on the other end of the arm to switch an adjustable reed contact located outside the liquid being monitored. By moving the reed contact, different switching points can be set.

Two repulsive magnets generate the restoring force. This results in better long-term stability and higher tolerance to pressure peaks.

The possibility of installing the flowmeter directly in the pipeline and shortening the paddle individually results in very flexible areas of application.

### Typical applications:

The DP04 paddle flow switch is suitable for monitoring the switching point of low-viscosity liquids.

Typical fields of application:

- Cooling systems
- Heating systems
- Welding systems
- Laser cooling systems

Due to the paddle principle the device is really intensive to dirt.

## Models and switching ranges

**DP04.K. with plastic paddle,**  
(for installation in T-piece acc. to EN 10242)

Nominal-sizes	Cut paddles to			Switching points [m <sup>3</sup> /h] <sup>1)</sup>		Max. flow rate [m <sup>3</sup> /h]
	Mark	Dimensions [mm]	Installation length L <sub>1</sub> [mm]	Switch on at <sup>2)</sup> : rising	Switch off at: falling	
DN 20	9	12 x 9	40	1,1	0,9	4
DN 25	9	12 x 9	40	1,7	1,5	8,5
	15	12 x 15	46	1,3	1,1	5
DN 32 <sup>3)</sup>	9	12 x 9	40	2,9	2,6	15
	20	12 x 20	51	1,9	1,6	8
DN 40 <sup>3)</sup>	9	12 x 9	40	4,2	3,8	25
	30	12 x 30	61	2,1	1,8	10
DN 50 <sup>3)</sup>	9	12 x 9	40	6,5	6	41
	40	12 x 40	71	2,7	2,4	14

<sup>1)</sup> water, 20 °C, horizontal pipeline, tolerance +/-15 %

<sup>2)</sup> typical values

<sup>3)</sup> values for min. and max. paddle lengths are given. Values for intermediate paddle lengths see operating instructions

**DP04.E. with stainless steel paddle,**  
(for installation in T-piece acc. to EN 10242)

Nominal-sizes	Cut paddles to			Switching points [m <sup>3</sup> /h] <sup>1)</sup>		Max. flow rate [m <sup>3</sup> /h]
	Mark	Dimensions [mm]	Installation length L <sub>1</sub> [mm]	Switch on at <sup>2)</sup> : rising	Switch off at: falling	
DN 25 <sup>3)</sup>	15	12 x 15	46	1,2	1,0	10
	20	12 x 20	51	1,0	0,9	6
DN 32 <sup>3)</sup>	15	12 x 15	46	2,0	1,7	20
	20	12 x 20	51	1,7	1,5	15
DN 40 <sup>3)</sup>	15	12 x 15	46	3,3	3,0	34
	30	12 x 30	61	2,0	1,8	18
DN 50 <sup>3)</sup>	15	12 x 15	46	4,8	4,6	55
	40	12 x 40	71	2,6	2,4	24

<sup>1)</sup> water, 20 °C, horizontal pipeline, tolerance +/-15 %

<sup>2)</sup> typical values

<sup>3)</sup> values for min. and max. paddle lengths are given. Values for intermediate paddle lengths see operating instructions

**DP04.K. with plastic paddle,**  
(for direct installation by means of weld-in socket acc. to EN 10241, G 1/2 female thread, 15 mm long)

Nominal-sizes	Cut paddles to			Switching points [m <sup>3</sup> /h] <sup>1)</sup>		Max. flow rate [m <sup>3</sup> /h]
	Mark	Dimensions [mm]	Installation length L <sub>1</sub> [mm]	Switch on at <sup>2)</sup> : rising	Switch off at: falling	
DN 65	15	12 x 15	46	8,8	8,5	50
	40	12 x 40	71	4,5	4,2	27
DN 80 <sup>3)</sup>	15	12 x 15	46	13,8	11,3	80
	60	12 x 60	91	5,1	4,7	30
DN 100 <sup>3)</sup>	20	12 x 20	51	18,8	16,3	110
	80	12 x 80	111	6,4	5,8	40
DN 150 <sup>3)</sup>	40	12 x 40	71	27	25	160
	80	12 x 80	111	15,5	14,2	100
DN 200 <sup>3)</sup>	50	12 x 50	81	45	43,5	250
	80	12 x 80	111	30	29	180

<sup>1)</sup> water, 20 °C, horizontal pipeline, tolerance +/-15 %

<sup>2)</sup> typical values

<sup>3)</sup> values for min. and max. paddle lengths are given. Values for intermediate paddle lengths see operating instructions

**DP04.E. with stainless steel paddle,**  
(for direct installation by means of weld-in socket acc. to EN 10241, G 1/2 female thread, 15 mm long)

Nominal-sizes	Cut paddles to			Switching points [m <sup>3</sup> /h] <sup>1)</sup>		Max. flow rate [m <sup>3</sup> /h]
	Mark	Dimensions [mm]	Installation length L <sub>1</sub> [mm]	Switch on at <sup>2)</sup> : rising	Switch off at: falling	
DN 65	15	12 x 15	46	7,2	6,8	100
	40	12 x 40	71	3,6	3,3	50
DN 80 <sup>3)</sup>	15	12 x 15	46	11,7	11,4	150
	60	12 x 60	91	4,6	4,2	50
DN 100 <sup>3)</sup>	20	12 x 20	51	16,0	15,9	200
	80	12 x 80	111	6,1	5,6	70
DN 150 <sup>3)</sup>	40	12 x 40	71	24,0	22,7	290
	80	12 x 80	111	14,7	13,8	170
DN 200 <sup>3)</sup>	50	12 x 50	81	41,0	38,7	450
	80	12 x 80	111	23,3	26,7	310

<sup>1)</sup> water, 20 °C, horizontal pipeline, tolerance +/-15 %

<sup>2)</sup> typical values

<sup>3)</sup> values for min. and max. paddle lengths are given. Values for intermediate paddle lengths see operating instructions

## Technical Data:

### Switching

**function:** brass

### Pressure rating:

Plug connector: PN 25

Jacket cable: PN 10

### Temperature:

Plug connector: Medium: -25...+110 °C

Ambient: -25...+80 °C

Jacket cable: Medium: -25...+100 °C

Ambient: -25...+70 °C

## Electrical Data:

### Electrical connection:

Plug connector DIN EN 175301-803-A  
incl. cable socket (standard)  
cable connection, 1,5 m PVC  
jacket cable (optional)

**Reed contact:** N/O, N/C

**Switching current:** max. 1 A

**Switching voltage:** max. 230 V<sub>AC</sub>, 45 V<sub>DC</sub>

**Rating:** max. 26 VA, 20 W

**Protection:** IP65

**Protection class:** Class II (EN 60730-1)

## Order Code:

**Order number:**

DP04. K. 0

**Paddle-type flow switch  
(paddle can be cut individually)**

### Paddle:

K = plastic

E = stainless steel

### Options:

0 = without

K = cable connection (jacket cable, 1,5 m PVC-cable)

1 = please specify in plain text

## Materials:

### Body:

Plug connector: brass

Jacket cable: PPE+PS Noryl™ 30 % glass fibre reinforced

**Paddle:** PPE+PS Noryl™ 30 % glass fibre reinforced / stainless steel or stainless steel 1.4310 / brass

**Pin:** stainless steel 1.4571

### Process connection:

Brass CW614N, G 1/2 AG

### Magnet:

hard ferrite

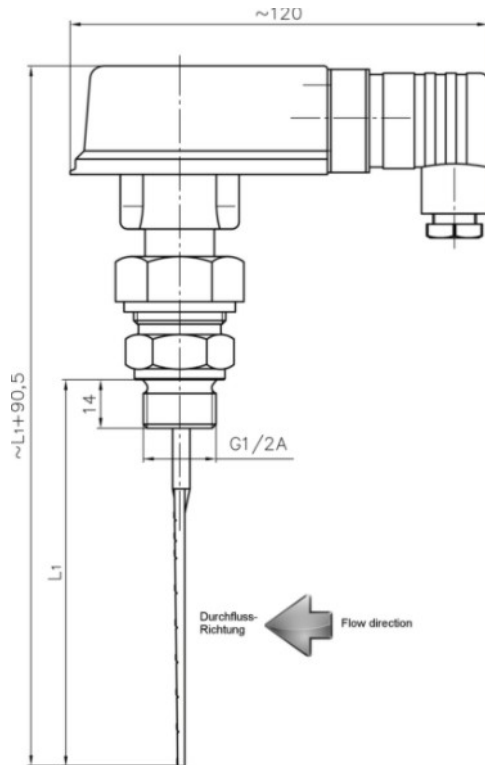
### Gasket:

NBR

## Dimensions:

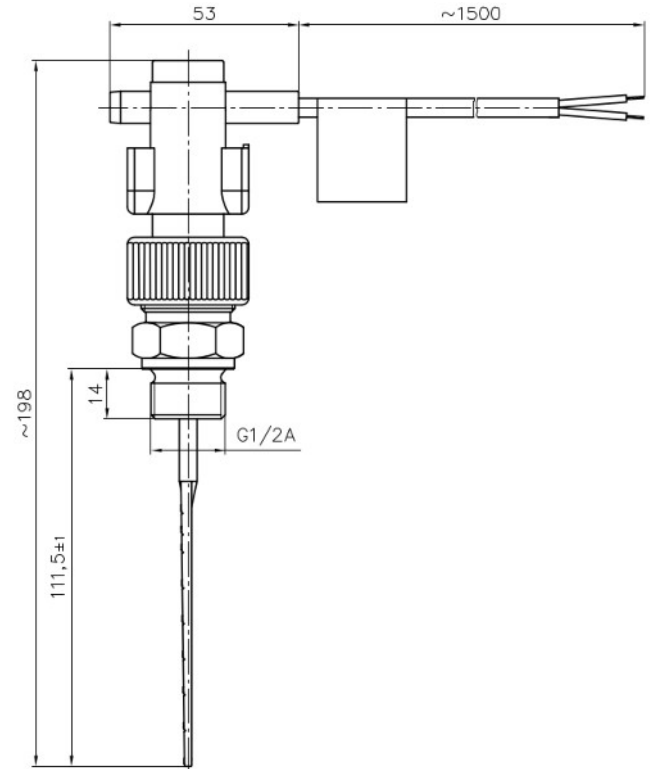
Version with plug connector (standard)

DP04.K. with plastic paddle

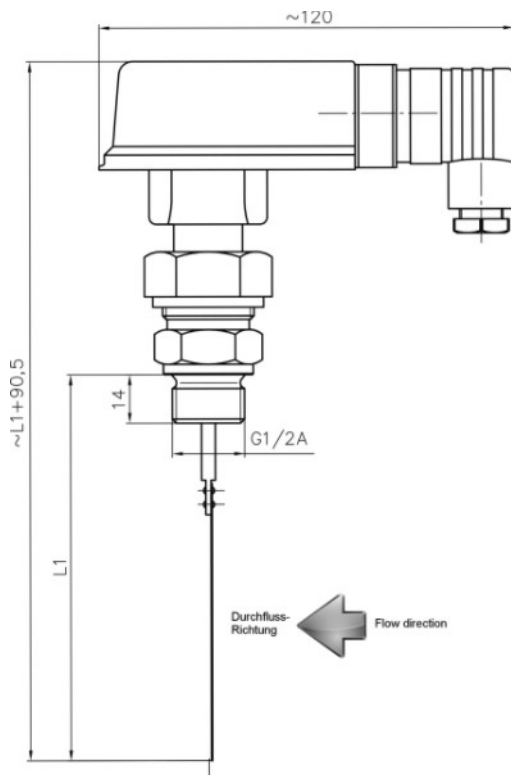


Version with jacket cable (option)

DP04.K. with plastic paddle



DP04.E. with stainless steel paddle



DP04.E. with stainless steel paddle

