



# ***Instruction Manual***

## ***DS15***

***Plastic Variable Area Flowmeter***



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# ***Safety Information***

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## ***General Instructions***

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 also applies to the use of accessories.

## ***Proper Usage***

The flowmeters model DS15 works according to the proven variable area principle. The float is moved upward by the flowing medium and its upper edge indicates the flow rate by means of a scale affixed onto the measuring tube.

By using a float with an integrated magnet optional alarm contacts or an analogue output transmitter may be operated. All flowmeters have a male thread on the measuring tube and are additionally equipped with PVC glue-in connectors. Also possible are connectors with female thread (BSP) made of PVC, PP, PVDF, brass or st. steel.

## ***Qualified Personnel***

DS15 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.

## ***Mounting***

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Installation Position: vertical, direction of flow from bottom to top

### **WARNING:**

- Ensure that in case of a break in the measuring tube, no hazards result from escaping media.
- Do not use measuring tube made of PVC for gaseous media.
- Use personal protective equipment when carrying out any work on the fitting.

To avoid unstable float conditions (fluttering of float), please include in front of the flow meter and behind it a flow-calming section of 5 to 7 x DN.

### ***Installation:***

1. Ensure that measuring tube and float are clean and free of foreign matter.
2. Remove transport lock (holds the float).
3. Ensure that the float can move freely.
4. Unscrew both union nuts. Secure float (heavy) from falling
5. Push union nuts onto spigot of process pipes. Check mounting direction.
6. Weld union end of device to spigot of process pipes
7. Check fit of O-rings
8. Connect device to the process pipework. Tighten union nuts by hand only.

### ***Performing the hydrostatic test:***

Perform hydrostatic test using neutral medium, e.g. water.

Pressurize the device, ensuring

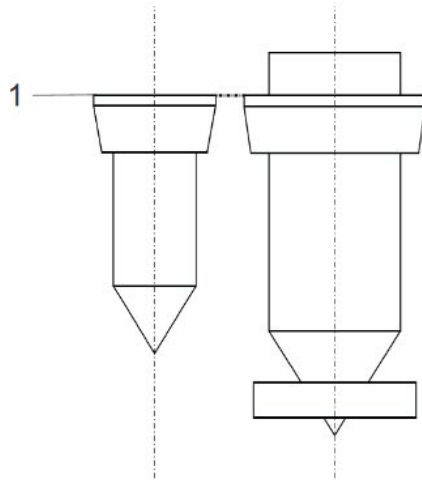
- Test pressure < 1.5 x PN (Nominal pressure)
- Test pressure < PN + 5bar
- Test pressure < permissible system pressure

Check that the device is not leaking.

## ***Read measurement***

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For the measurement range 2,500-25,000, the reading edge is below the float fixture (largest diameter)



1 = Reading edge

read measurement using face (1) of float

## ***Maintenance***

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1. Clean device with a damp cloth as often as necessary (depends on degree of contamination and environmental conditions)
2. Visual and function check (every 6 months):
  - Normal operating conditions unchanged
  - No leaks
  - Measuring tube and float for deposits or changes to surface
  - float is movable
3. To clean the flowmeter, in the most cases you can flush the device with clear water. In some cases some commercial detergents can be used.

## ***Electrical Connection of Reed contacts***

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**Please note:** we recommend to use only shielded cables.

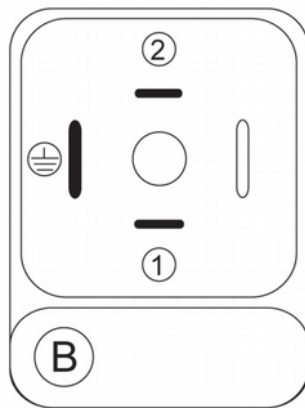
The polarity of the connections has no influence on the function

### **Operating note:**

- Do not exceed the current data or the switching capacity. For this reason, always fit a contact protection relay if a power circuit is intended.
- Prior to commissioning/first start-up it is important that the float passes the switch three times in order to cancel out any possible monostable behaviour.
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## ***Pin Assignment***

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## 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 to 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:

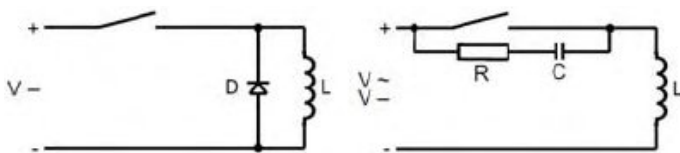
- inductive load
- capacitive load
- lamp load

### 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)



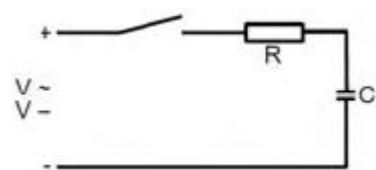
(Flyback diode, e.g. type 1N4007)

### 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)



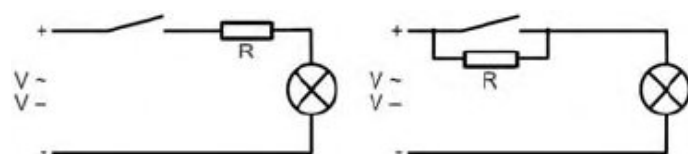
Limitation of current by a resistor

### 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

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

### For Reed switches of 40 – 100 VA

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

# Flow data sensor ZE 3000

micro-processor controlled for accurate flow measurement and evaluation



## Product description

The ZE3000 emits a 4..20 mA signal according to industrial standards, generated in the DS15 by the precise magnet angle detection of the magnetic float.

Existing flowmeters (with magnetic floats) can be easily retrofitted with the ZE3000 to electrically signal the flow and, for instance, to further process the values in a PLC for process control or to directly display the flow rate.

This micro-processor controlled unit is programmed for the DS15 concerned! This guarantees accurate flow measurement and evaluation.

**IMPORTANT:** The DS15 to which the ZE3000 is to be fitted must be known in advance!

## Features:

- 2-wire technology
- 4..20mA analog output
- 8..28VDC input
- Individual programming adapted to the DFM
- 11 point calibration
- non-volatile value storage
- 0 button to compensate for the surrounding magnetic influences
- Factory setting of the lower limit value (low-cutoff) 0..99% according to customer's specifications
- Factory settable time lag (low-pass-filter) 0.1...2.5 sec according to customer's specifications
- Measuring accuracy better than 0.5%

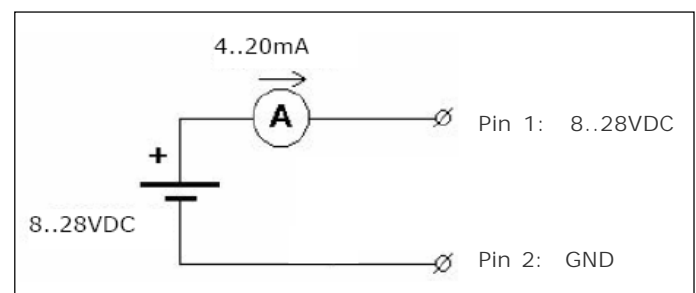
## Installation

Screw clamps are used to fit the ZE3000 on the dovetail guide of the flowmeter. The plug connector is located in the upper section.

During installation, ensure that the notch of the ZE3000 coincides with the 50% mark on the DFM scale.

Following this, proceed with the wiring according to the plug assignment plan.

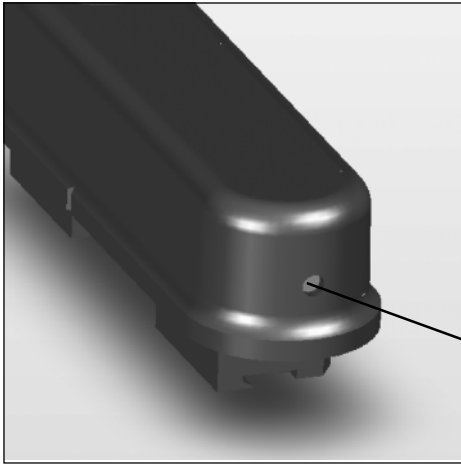
## Plug assignment



## Start-up

Once installed and the voltage is applied, press the 0 button for at least 2 sec to compensate for surrounding magnetic influences. During this phase ensure that the float is in its bottom position, i.e. no flow must take place!





**Note:**

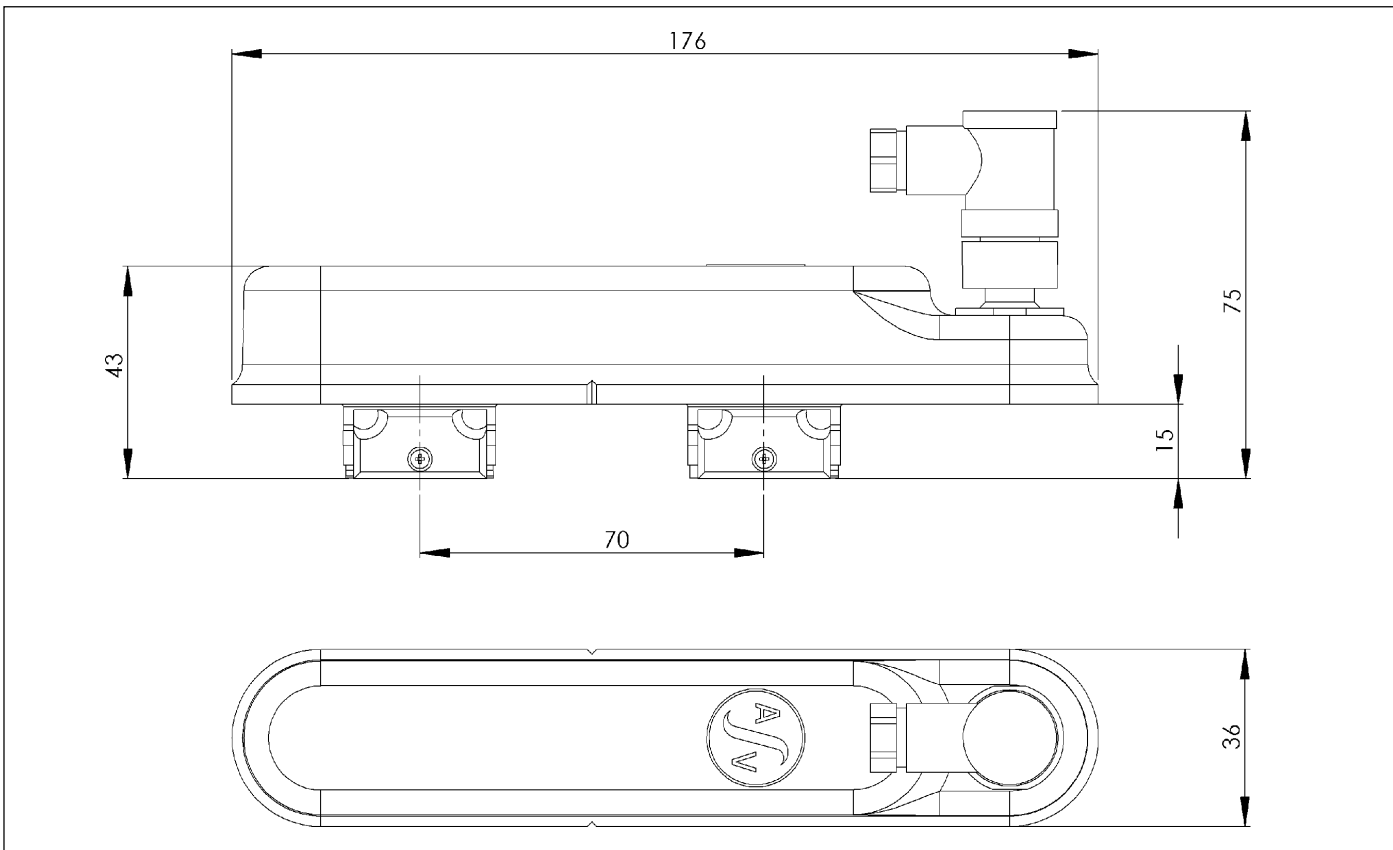
Do not actuate the button during normal operation.

Concealed 0 button

**Electrical/mechanical parameters**

PARAMETERS	MIN.	TYPE	MAX.	Unit
Voltage supply	8		28	Volt DC
Output current 0% -> 100%+overrange				
During normal function (pin 1 – pin2)	4.0 -> 20.1	4.0 -> 21.0	4.0 -> 22.0	mA
Ambient temperature	-30 (-20)		65 (150)	°C (°F)

**Dimensions**



# DS15

## Plastic Variable Area Flowmeter

- for liquid and gaseous media
- simple and robust construction with high reliability
- measuring tubes in PVC, PA, PSU und PVDF
- low pressure drop, simple mounting
- scale with high resolution
- alarm contacts or analogue output optionally
- optional special scales are available depending on medium properties
- ranges air: 0,2...1 Nm<sup>3</sup>/h - 700...2900 Nm<sup>3</sup>/h  
ranges water: 3...24 l/h – 10.000-50.000 l/h
- P<sub>max</sub>: 10 bar, T<sub>max</sub>: 110 °C



### Description:

The flowmeters model DS15 works according to the proven variable area principle. The float is moved upward by the flowing medium and its upper edge indicates the flow rate by means of a scale affixed onto the measuring tube. By using a float with an integrated magnet optional alarm contacts or an analogue output transmitter may be operated.

All flowmeters have a male thread on the measuring tube and are additionally equipped with PVC glue-in connectors. Also possible are connectors with female thread (BSP) made of PVC, PP, PVDF, brass or st. steel.

### Typical applications:

The variety of different materials used and the simple to exchange measuring scales make these meters universally suitable for most liquid and gaseous media, also suitable for very aggressive media. Main applications are in the water treatment industry, in waste water applications, chemical and food industry and many more.

## Models:

<b>Measuring tube:</b>	PVC-U transparent, Polyamid, Polysulfon, or PVDF semi transparent
<b>Float:</b>	PVDF or PVDF with integrated magnet
<b>Gaskets:</b>	EPDM or FPM
<b>Tube connections:</b>	PVC, optionally PP, PVDF, brass GTW, stainless steel

## Technical Data:

**Max. pressure:** PN 10 at 20 °C

### Max. media-temperature:

#### Without threaded connection:

PVC:	60 °C
Polyamid:	75 °C
Polysulfon:	100 °C
PVDF:	110 °C

#### with threaded connection made of:

PVC:	60 °C
PP:	acc. to the temperature ranges for the particular measuring tube, but max. 80 °C

PVDF, brass, stainless steel: acc. to the temperature ranges for the particular measuring tube

**Mounting position:** vertical, flow from bottom to top

**Mounting:** inlet and outlet pipe 5-7 x DN

**Accuracy:** class 4 (VDI/VDE 3513, page. 2)

## Output Signals:

### Limit switch:

N/O, N/C 230 V, 0,5 A, 10 VA, bistable with plug acc. to DIN EN 175301-803  
Ambient temperature 0 °C... +55 °C  
Protection class IP65

### Transmitter type 50 - Hall sensor:

Analogue output 4...20 mA, 2 wire  
11 point calibration is factory set  
Power supply 8...28 VDC  
Ambient temperature: -20 °C...+65 °C  
Protection class IP 67

### Transmitter type 51 - Reed chain:

Analogue output 4...20 mA, 2 wire, for measuring ranges 101 to 404 (corresponds to the height of the float) not linearized  
Power supply 18...30 VDC  
Ambient temperature: -20 °C...+70 °C  
Protection class IP 65

### Note:

Limit switches or transmitters only work in conjunction with a float with integrated magnet.

## Order Code:

<b>Order number:</b> <b>DS15.</b>	<b>2.</b>	<b>1.</b>	<b>202.</b>	<b>102.</b>	<b>1.</b>	<b>0.</b>	<b>E</b>
<b>Plastic Variable Area Flowmeter</b>							
<b>Material (measuring tube):</b> 1 = PVC-U (only with scales for water) 2 = Polyamide 3 = Polysulfon 4 = PVDF							
<b>Scales:</b> <b>1 = Water</b> 2 = Air (0 bar g) 3 = Air (1 bar g) 4 = Air (2 bar g) 5 = Air (3 bar g) 9 = Special scale							
<b>Measuring ranges:</b> 101 ... 612 = acc. to table 1							
<b>Process connection:</b> acc. to table 2							
<b>Float:</b> 1 = PVDF (without magnet for devices without contacts) 2 = PVDF (with magnet for devices with contacts)							
<b>Options:</b> 00 = None 11 = 1 limit switch (N/C) 21 = 2 limit switch (N/C) 12 = 1 limit switch (N/O) 22 = 2 limit switch (N/O) 50 = transmitter, 4 – 20 mA – Hall sensor 51 = transmitter, 4 – 20 mA – Reed chain (non linear)							
<b>Gaskets:</b> 0 = EPDM (standard at DS15.1, -2. or -3.) F = FPM (standard at DS15.4)							

## Scales:

Water scales (in l/h) and air scales (in Nm<sup>3</sup>/h) referenced to 0, 1, 2 and 3 bar are standard.  
For other media, i.e. gases with higher pressures, HCl (30 %), NaOH (30 %), as well as other units of measurement (m<sup>3</sup>/h, l/sec., l/min, USGPM or IGPM) special scales may be supplied.

Also special scales for other media and operating conditions may be calculated if the following data are known:

- Medium
- Operating pressure
- Operating temperature
- Operating density
- Operating viscosity



## Measuring Range (Table 1):

Tube L [mm]	Range No.	Measuring range				
		Water [l/h]	Air at 20 °C [Nm³/h] not for PVC-measuring tubes			
			0 bar rel.	1 bar rel.	2 bar rel.	3 bar rel.
1 (165)	101	3-24	0,2-1	0,2-1,2	0,25-1,55	0,3-1,75
	102	5-60	0,2-2,5	0,4-3,2	0,2-3,8	0,3-4,4
	103	10-100	0,6-3,6	0,6-5,0	0,75-6,0	0,8-7,0
	104	25-250	0,5-9,0	1,0-13,0	1,0-16,0	1,5-19,5
2 (170)	201	5-50	0,4-2,8	0,2-3,2	0,4-3,6	0,3-4,0
	202	15-150	0,8-6,2	1,0-9,0	1,0-11,0	1,5-12,0
	203	25-250	0,9-9,5	1,0-13,0	1,0-16,0	2,0-20,0
	204	40-400	2,0-15,0	2,0-20,0	3,0-26,0	3,0-30,0
3 (185)	301	15-150	0,5-5,5	1,0-9,0	1,0-11,0	1,0-10,5
	302	40-400	2,0-14,0	2,0-20,0	3,0-26,0	3,0-30,0
	303	60-600	2,5-22,0	4,0-31,0	4,0-38,0	5,0-45,0
	304	100-1000	4,0-34,0	5,0-45,0	6,0-58,0	7,5-67,5
4 (200)	401	25-250	1,0-8,0	1,5-13,0	1,5-16,0	1,5-19,5
	402	40-400	2,0-14,0	2,0-20,0	3,0-26,0	3,0-30,0
	403	100-1000	4,0-34,0	5,0-45,0	5,0-55,0	6,0-66,0
	404	150-1500	5,0-50,0	6,0-70,0	7,5-86,0	7,5-98,0
6 (350)	603	60-600	2,5-20	3,5-28	4-35	5-40
	604	100-1000	4-34	5-50	8-60	8-70
	605	150-1500	5-50	7,5-67	9,5-83	11-96
	606	250-2500	8,5-76	10-115	14-131	17-152
	607	400-4000	14-125	10-170	24-210	28-245
	608	600-6000	22-190	30-260	40-380	40-400
	609	1000-10000	35-300	50-420	60-510	70-600
	610	1500-15000	50-500	80-700	85-760	102-880
	611	2500-25000	80-720	115-1050	140-1240	166-1400
	612	10000-50000	400-1500	500-2100	600-2500	700-2900

\*Reference standard: ISO 1217 (20 °C, 1 bar abs.)  
Other scales on special request.

## Limit Switch:

**Model:** reed contact, bistable  
**Contact function:** N/O or N/C with increasing flow  
**Mounting:** adjustable on measuring tube  
**Contact rating:** max. 220 VAC, max. 0,5 A, max. 10 A / 10 VA  
**Operating temperature:** 0...+55 °C  
**Hysteresis:** 3 mm of float height  
**Electrical connection:** 2-wire, independent of polarity

## Analogue output transmitter:

The optional analogue output transmitter mounted on to the measuring tube of the DS15 flowmeter and registers the height of the float by means of an analogue Hall sensor. The integrated electronic converts this signal to a 4-20 mA output. To operate the analogue output transmitter, the standard float must be exchanged with a float with an integrated magnet. The transmitter is equipped with an EPROM which is programmed especially for the application. Therefore it is not possible to change the transmitter without consulting the manufacturer.

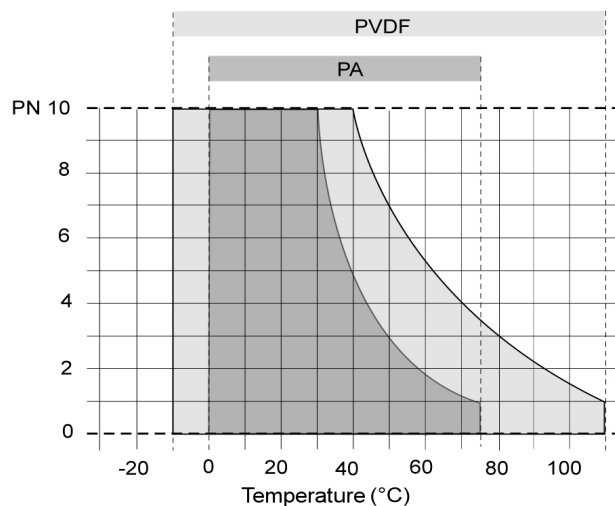
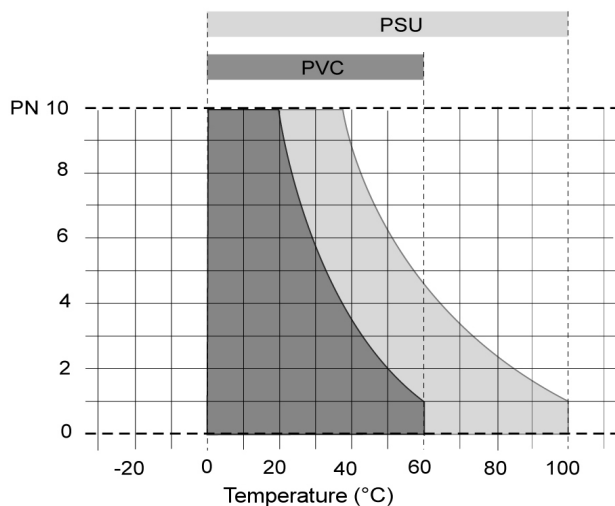
## Features:

- 4...20 mA analogue output, 2-wire, 8...28 VDC
- programmed individually to DS15
- 11 point calibration, non volatile storage of parameters
- 0-push button for compensation of environmental magnetic influences
- factory set low-cutoff value 0-99 % custom specific
- factory set low-pass-filter 0,1...2,5 s custom specific
- accuracy better than 0,5 % F.S.

## Low Cost version with Reed chain

Also a low cost version equipped with a Reed chain is available for the measuring ranges 101 – 404. Output is non linear acc. to flowrate but proportional to height of float.  
Resolution: 3,5 mm

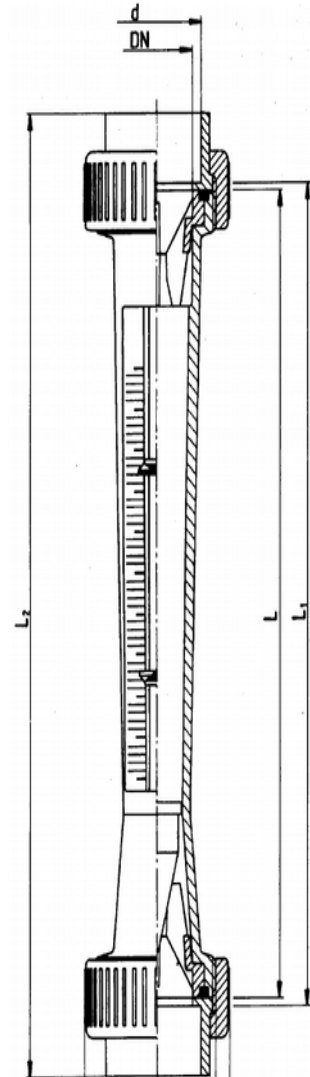
## Pressure- Temperature- Diagram:



## Process Connections (table 2):

Tube L [mm]	Range No.	Male (G)	Process connection					Connec. No.	Pressure loss		
			PVC-Glue in fitting Standard [mm]	Female thread (G)					PVDF weld in fitting (at PVDF tube only)	Water 20°C	Air 20°C
				P	P	M*	V*				
				V	C	S	A			Material No:	
1	2	3	5	6	8	[mbar]					
1 (165)	<b>101</b> <b>102</b> <b>103</b> <b>104</b>	3/4	d: 16 DN: 10 L1: 171	3/8				DN: 10	<b>01</b> 0,8	3,3	4,8
2 (170)	<b>201</b> <b>202</b> <b>203</b> <b>204</b>	1	d: 20 DN: 15 L1: 171	1/2				DN: 15	<b>02</b> 0,10	2,5	4,3
3 (185)	<b>301</b> <b>302</b> <b>303</b> <b>304</b>	1 1/4	d: 25 DN: 20 L1: 191	3/4				DN: 20	<b>03</b> 0,13	6,1	8,3
4 (200)	<b>401</b> <b>402</b> <b>403</b> <b>404</b>	1 1/2	d: 32 DN: 25 L1: 206	1				DN: 25	<b>04</b> 0,25	6,1	8,3
6 (350)	<b>603</b> <b>604</b>	1 1/2	d: 32 DN: 25 L1: 356	1				DN: 25	<b>09</b> 0,48	12,3	15,9
	<b>605</b> <b>606</b>	2	d: 40 DN: 32 L1: 356	1 1/4				DN: 32	<b>10</b> 0,71	12,3	15,9
	<b>691A</b> <b>692A</b>	2 1/4	d: 50 DN: 40 L1: 356	1 1/2				DN: 40	<b>10A</b> 1,05	12,3	15,9
	<b>607</b> <b>608</b> <b>609</b> <b>609A</b>	2 3/4	d: 63 DN: 50 L1: 356	2				DN: 50	<b>11</b> 1,53	22,2	27,1
	<b>610</b> <b>611</b> <b>612</b>	3 1/2	d: 75 DN: 65 L1: 356	2 1/2 nicht in PP				DN: 65	<b>12</b> 2,10	33,7	40,0

## Dimensions Measuring Tube:



PVDF measuring tubes have different dimensions L and L1.

\*For process connection with female thread made of brass or st. st., the union nut is made of malleable cast iron.

\*\*Weight with PVC glue in fitting

The connection code is build from material number and connection number

### Example:

PCV-female thread G1 for measuring tube no. 6:  
Material-No.: 2, Connection-No.: 09  
Connection code: 209