Instruction Manual

DP07

Electronic paddle-bellows flowmeter, counter and switch with analogue output

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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 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 flow meters DP07 are designed to monitor continuous flow rates 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 DP07 flow meter devices 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 DP07 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.

Position of Mounting

It is advantageous to install the unit in a straight piece of pipe and to choose a place of mounting which has the biggest possible distance from elbows, valves etc.
It is especially important to have the biggest possible distance from magnet valves and ball valves.

Please make sure that they are opened as slow as possible, and that the valve is mounted after DP07 unit. These measures prevent the measuring system from flow shocks and turbulences which can cause damages and inaccuracy.

We recommend a straight length of 10 x d at input side and 5 x d at the output side (d = diameter of pipe).
The apparatus provides a stable signal when installed at closer distances, but depending on flow conditions it may be less accurate.

Mounting position on electronic view:

Please take in consideration that the mounting has to be done EMI conform in order to avoid interruptions of operations.

Especially the following points have to be attended:
- The provided ferrites have to be mounted as described.
- Signal and supply cable of the DP07 may not directly taken close to 230 V or 380 V wirings.
- The device should not be installed close to inductance, switching loads, engines or similar sources of inductive fields.

Direction of Flow:

It is essential that the unit is mounted so that flow is as indicated by the arrow on the body. The unit will not operate unless installed correctly in this way and the possibility of damage to the unit cannot be excluded.

Mounting Orientation:

If the display has to be changed to a new position, it is possible to turn it relative to the housing. To do this, remove the front and back of the housing and remove the screw retaining the electronic board to the housing.

Rotate the electronic board to the new desired position taking care not to damage the cable link, refit and secure the retaining screws. In a similar way, the window on the front of the access cover can also be turned.

Mounting at the Tube

Items with THREAD CONNECTION:
We recommend sealing all threads with PTFE sealing tape. Ensure no excess of tape is left protruding into the pipe.
When screwing the unit into a pipe, take care to ensure that the housing is not damaged or impacted during the process.

Items with FLANGE CONNECTION:
An approved flange seal or gasket must be used. Neither this nor the required fixing bolts are included in the delivery. Ensure the transmitter is not damaged when tightening the flange bolts.

Items with welded socket:

The welding socket is included in the delivery. Remove by loosening union nut (A). The dimensions shown in the drawing (right) must be adhered to strictly to.
Drill a ridge less hole in the pipe. Weld the socket to the pipe. Mount the flow transmitter to the socket ensuring that the pendulum is not damaged during this procedure. Align the transmitter into the final desired position before tightening the union nut (A). Please do not forget to keep the flow direction in consideration before weld on the socket. (groove)
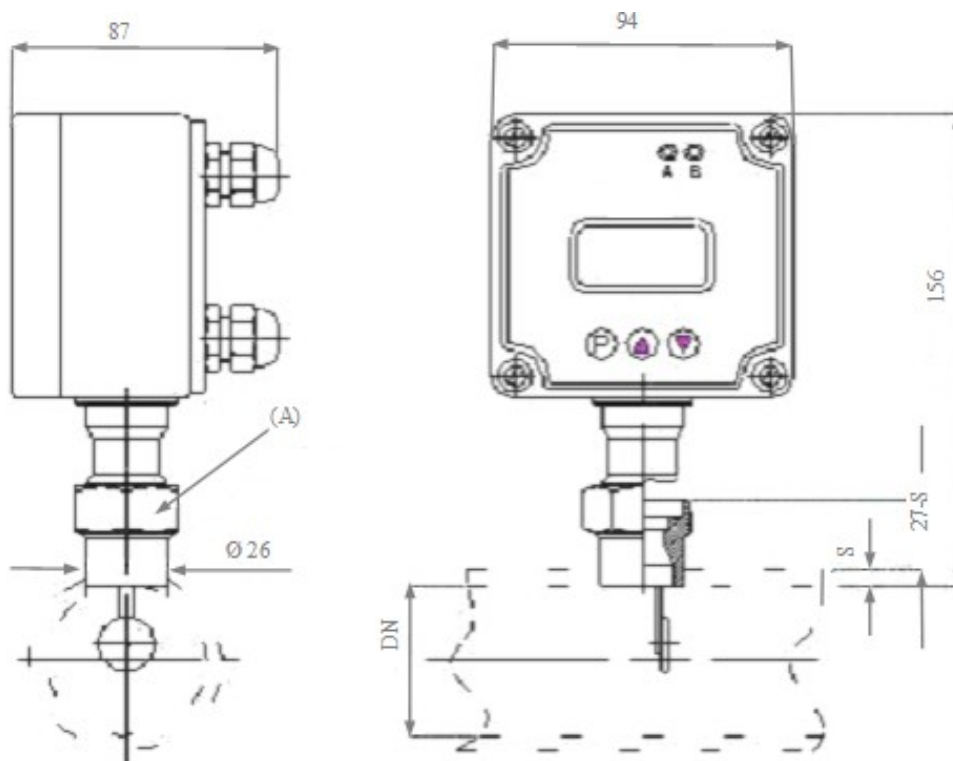
Torsional moment of the union nut:
If the device shall be divided from the t-piece or the welding socket, the union nut has to be disconnected and the device carefully taken out of the housing.
If both pieces are assembled, please take care that the nut is tightened with a torsional moment of 40 Nm.
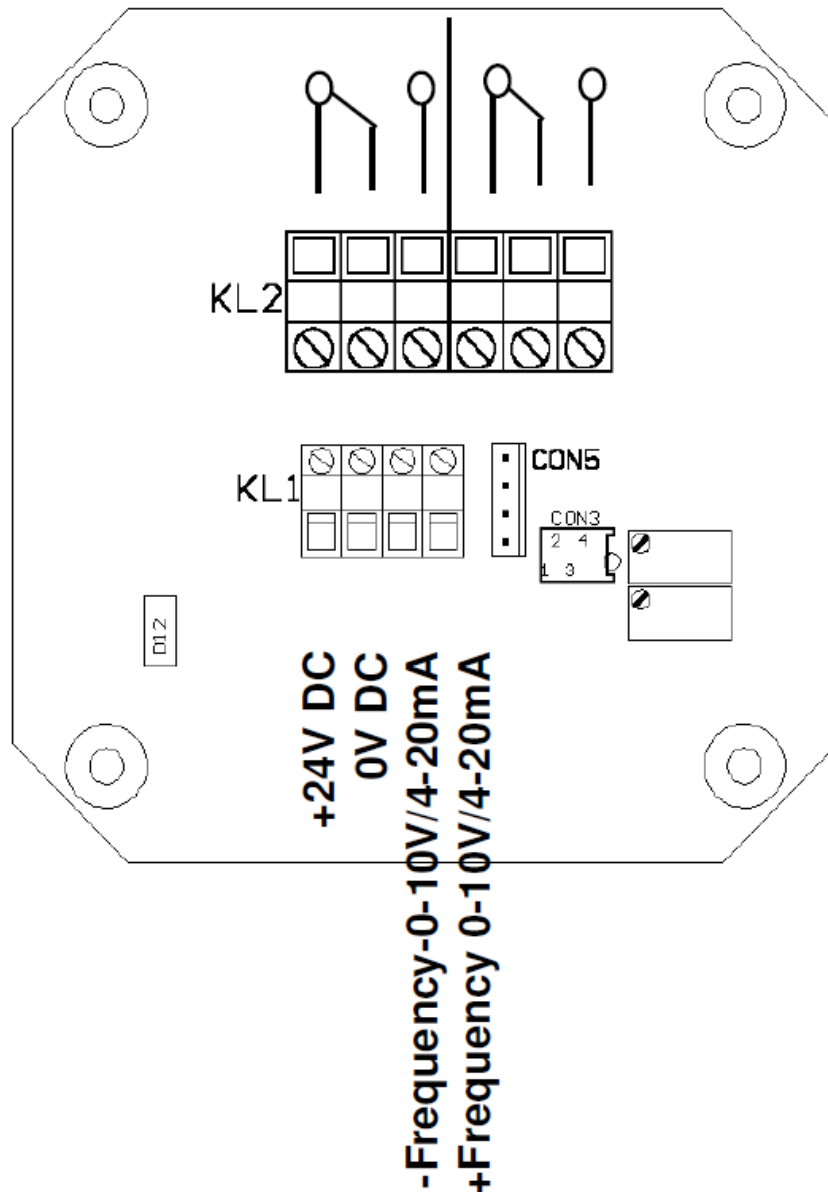
Electrical Connection

Remove the rear access cover to gain access the connector blocks.
(see drawing)
Block KL 2 is for connecting the relays.
Block KL 1 is for connecting power supply and output signals.
The switching position is shown in the idle state (flow is less than the set switching points).
The cables must first be pulled through the corresponding gland of the cover.

KL2

KL1   CON5
       CON3
       2 4
       1 3

DI 2

+24V DC
0V DC
-Frequency-0-10V/4-20mA
+Frequency 0-10V/4-20mA

Power Supply

The supply-voltage is 24 $V_{DC}\pm10\%$. Connection is to block KL 1 like described at drawing. In order to prevent the electronic from impermissible potential between pipe and device, the power supply device must be connected with earth. The connection is prevented from mixing the poles.
At the connection cable a ferrite must be fixed with one coil. The ferrite is included in delivery.

Analogue output (4-20 mA)

Connection is to block KL 1 according to the drawing (see also "Setting the output assignment"). At the connection cable a ferrite must be fixed. The ferrite is included in delivery.

Voltage output (0-10 V)

Connection is to block KL 1 according to the drawing (see also "Setting the output assignment"). At the connection cable a ferrite must be fixed. The ferrite is included in delivery.

Frequency output

Connection is to block KL 1 according to the drawing (see also "Setting the output assignment"). At the connection cable a ferrite must be fixed. The ferrite is included in delivery.

Connecting the relais

Relays can be connected via block KL 2 as shown on the drawing. At the connection cable a ferrite must be fixed. The ferrite is included in delivery.

Interface

The DP07 is available to special order with RS232C interface. The special connection cable is just connected with the device. (See reference "Programming the interface")

Settings

The device is equipped by 3 buttons on the front side of the enclosure. The button P has the function to choose a point of the menu and to take over the wished values. With the buttons ⇑ and ⇓ you can set a value. Button ⇑ increases value. Button ⇓ decreases the value. Pressing this button one time the value changes for one digit.

If you keep the buttons on hold the value is changing continuously. After some time velocity is increasing. At some points of the menu the DP07 informs you which buttons have to be pressed as next step.
For example PIN [+/-], whereby + corresponds to button ⇑ and – to button ⇓.

The device returns back automatically after some time to the modus set under MODE (point Analogue output) if no button is pressed. The actual point of the menu is always shown in the first line, the chosen value in the second line.

Function BATT CHECK

The BATT CHECK function is used for giving the user information that the device was not in use for a certain time due to power interruption and therefore the amounts of flow could not get accumulated during that time by the totalizer. Therefore the device should always be on (ON) when using the totalizer function.
If the totalizer is not used, we would advise to switch-off this function (OFF), as otherwise the device will only work after restart in case of power loss.
The menu can be operated with P and the functions with ⇑ or ⇓. To take over the requested adjustment please push P again.

Adjusting the relays

Press button P until RELAIS 1 appears. Line 2 shows the actual switch point.
Pressing ⇧ or ⇩ the wished switch point can be adjusted. For setting the switch point P has to be actuated * is appearing. After some time the sigh is disappearing. Adjusting the switch point of RELAIS 1 is now completed. Actuate P button once more causes changing to RELAIS 2. Adjustment is like described under RELAIS 1.
When the adjusted value is reached, a lamp glows for control. The green one (A) is assigned to RELAIS 1 the red one to RELAIS 2 (B)

Setting the output assignment

The DP07 comes with current, voltage and frequency output. The different output types only can be used alternatively. It is only one pair of connector existing for all functions. Connection is to block KL1 (see drawing of the board). At menu OUTPUT analogue, voltage or frequency output can be activated. With the buttons ⇧ and ⇩ you can set the wished function. Button P takes over the adjustment.
At the option frequency output the max. frequency can be adjusted between 125-32000 Hz. Therefore button P must be pressed after entering the frequency function. Then the max. frequency can be adjusted with the buttons ⇧ and ⇩. Now the adjusted max. frequency corresponds to the upper range value.

Adjusting of standard indication mode

It is possible to choose between 2 different indication modes.
At the point in the menu MODE you can select the modes. In the second line the valid mode is shown. FLOW means indication of momentous flow. TOTAL means that the value of totalizer is shown. You can choose the required indication by using button ⇧ or ⇩. Button P takes over the adjustment.
Only the selected standard indication is permanent visible. All other points of the menu turn back to the standard indication after some time automatically.

Adjusting of integration time

The DP07 Flow transmitter makes 18870 measurements pro minute. If the result of each measurement would be shown on the display, the indication would change it's worth continuously and it would be very difficult to read off the indication. Therefore it is possible to program an integration time between 0 and 3,4 s. Then the average value of the values measured within the programmed time is shown. A long integration time causes a slowly changing indication which is easy to read. We recommend to maintain the standard adjustment of 1 s. For changing the integration time you can choose the wished time with help of the buttons ⇧ and ⇩ in menu INT.[s]. Button P takes over the adjustment.

The totalizer

The device is equipped by a totalizer, which adds the flow quantity. (Menu point TOT: X.) X corresponds to the respective quantity. The unity results from flow unity. (for example l/min corresponds to l). Actuating button ⇧ push down the memory to zero.
PRESS <+> to reset appears (+ = ⇧). Now actuate ⇧ as long as the appearing counter is executed (20 s).
In case of power failure or too low current the actual amount will be ensured. If necessary voltage is back again the device notifies POWER LOW / PRESS P & ⇧ respectively PRESS P & ⇧. Pressing P and ⇧ (at same time) DP07 changes back to standard modus. After that the device starts counting from the amount has been present at the time of power failure. This guarantees that the operator is aware of that power supply was interrupted and so the amount indicated perhaps not corresponds to the real quantity.

Attention:
The power failure supervising function only works if at menu point BATT CHECK the function is activated (ON)
The device has a 8 digit display so a big capacity is available. Nevertheless depending on unity, flow quantity and time of flow the capacity may be quite different. If the max. indication value is reached, DP07 starts with zero again. At the totalizer menu you see the actual value in the moment of switch over to the totalizer function. That means always when the totalizer menu is actuated the indication is updated.
The actual value only is indicated if the totalizer is defined as standard indication.

Restriction of access by code number

In order to restrict of access of not authorizes persons to the programmed dates it is possible to activate a code number. In the point of menu PIN [+/-] it is possible to adjust any code number between 1 and 999 by help of the buttons ⇧ and ⇩. By pressing P and ⇧ at the same time the programmed code number is activated. ENABLE is appearing. If an adjustment in any menu now should be changed the operator is asked for the code number. The number can be entered liked described above. After that PIN OK! Is appearing. Now the adjustment can be changed. If PIN NOT OK! is appearing input was wrong. You now can repeat entering the code number.

Attention:
Should the number be forgotten the adjustments can not be changed any more.

At point of menu PIN [+/-] restriction of access can be switched off. Therefore code number has to be entered as described above. PIN OK! and thereafter DISABLE is appearing.

Programming the interface

Under point of menu ADR: the address of each device can be programmed (selection by ⇩, input by P). For more details please see our data sheet for devices with interface. It is only added to devices which are equipped with this option.

Mounting the ferrite

The flow transmitter DP07 is EMI certified and comes up to the corresponding norm. The EMI directive will only be achieved, if the provided ferrites are mounted as mentioned under "Power Supply", "Analogue output", "Voltage output", "Frequency output", "Connecting the relays". If not, serious malfunctions can be appeared depending on the mounting position.
IMPORTANT: Always mount the ferrite

Protection on data loss

If your device is operated on incorrect EMI conditions, it could come to data loss respectively damages of coded data in extreme cases.
As the item need these data for a correct function there hereby is an anticipate protection. In this case the item is showing K DATA MISSING.
So that this information is available for the occupant, even in case of a use of the analogue-voltage or frequency output, impermissible values will normally be transferred.

These are 1 mA, 20 V, respectively 0 Hz.

In order to re-establish the function of the item in such a case, the necessary software is saved additionally for safety reasons. The software can be load again with the menu item FACTORY RESET.

Therefore push the button ⇧ or ⇩ in the menu FACTORY RESET. You will be asked to start the action (Y) button ⇧ or to break up (N) button ⇩.

ATTENTION!
When starting the application, all adjusted data as switch points, totalizer value etc. will be lost. (Reset to the original factory setting)
Please consider this and keep the data before starting the procedure in mind.

After the reestablishment has been started, you will get informed about the status of the procedure. When the flow indication on the display appears, the operation is over. The device is working as usual again. Please consider that e.g. the switch points have to be new installed again.

We would like to point out, that the data loss occurs only if the item is used under forbidden conditions.
Therefore it is really necessary to open corresponding arrangements in order to avoid a new data loss.

This could be:
- mounting the provided ferrites
- installation of the device at another position
- changing the cabling within the installation (no measure or feed lines of the transmitter near high voltage feed cable).
- Reducing of radiation or magnetic field
- installation of suitable electrostatic shields

Maintenance

The DP07 is essentially maintenance-free. However, depending on the degree of pollution in the medium, it is recommended that the sensor system be inspected and cleaned as necessary from time to time.
Under no circumstances attempt to remove the pendulum from the unit as this will destroy the calibration. Clean the pendulum system before re-installing into the pipe.

IMPORTANT!
If the DP07 must be separated from the tee loosen nut (A) and cant the unit a little opposed to direction of flow. Then lift the DP07 with pendulum rectangular out of the tee.
Please perform all disassembly/reassembly operations with great care. Avoid damage!
Especially to the pendulum system.

Technical data

- Power supply : 24 V_{DC} ± 10 %
- Current drain: 200 mA max.
- Contacts: 2 x 230 V, 1 A max
- Analogue output: 4-20 mA
- Voltage output: 0-10 V
- Display: LCD DOT-Matrix-Module 2 x 8 digits (illuminated)
- Medium temperature: -20 ... +100 °C (special versions dissonant)
- Max. pressure: 25 bar (special versions dissonant)

DP07

Electronic Paddle-Bellows Flowmeter, Counter and Switch with Analogue Output

- **for liquids**

- **2-line LCD-display for flow rate or total quantity**

- **linearised analogue output signal 4...20 mA or 0...10 V**

- **2 independent limit switches**

- **optional RS-232-interface**

- **intensitive to dirty / contaminated media**

- **easy installation, for piping up to DN 600**

- **measuring ranges: 1,5...600 l/min to 420...4500 m³/h**

- **P_{max}: 25 bar, T_{max}: 130 °C**

Description:

The DP07 flowmeter work according to the paddle-bellows principle. By the flow of the liquid the paddle arm is moved in the direction of the flow against the force of a spring. This motion is transferred to a magnet and its position is detected by a Hall sensor. A microprocessor based electronic unit calculates according to a calibration curve the actual flow of the medium.

A two chamber system assures that even in the case of a device fault no medium can ingress the electronic housing.

Typical applications:

The DP07 flow transmitters are used to supervise the flow of low viscosity media up to large flows.

Especially in the case of pipes bigger than DN 50 there is an unchallenged price performance ratio due the use of a weld on nozzle.

Models:

The flow monitors DP07 are available in 3 versions each and different materials combinations:

DP07.R…   **with T-fitting and pipe thread connection**
…A: brass: with female thread from R 3/8 to R 1 1/2
                 with male thread from R 1 to R 2
…B: st. steel: with female thread from R 3/8 to R 3/4
                 with male thread from R 1 to R 2

DP07.R…   **with T-fitting and pipe thread connection**

DP07.F…   **with T-fitting and DIN-flange from DN 10 up to DN 50**

Material-combination A: housing made of brass
                 T-piece made of brass
                 pivoting system made of st. steel 1.4310
                 flange of galvanized carbon steel

Material-combination B: housing made of st. steel 1.4301
                 T-fitting made of st. steel 1.4571
                 pivoting system made st. steel 1.4310
                 flange made of st. steel 1.4571

DP07.A…   **with weld-on flange for nominal pipe size DN 65 to DN 600**

Material-combination A: housing made of brass
                 pivoting system made of st. steel 1.4310
                 weld-on flange made of st. steel 1.4301

Material-combination B: housing made of st. steel 1.4301
                 pivoting system made of st. steel 1.4310
                 bellows made of st. steel 1.4571
                 weld-on flange made of st. steel 1.4301

Technical Data:

Max. pressure:
DP07.R and DP07.A: 25 bar
DP07.F: 16 bar

Max. med.-temperature: 130 °C
                 high temperature version:
                 250 °C

Accuracy: ± 2 % of full scale

Outputs: 4...20 mA, 0...10 V
                 Frequency output (programmable, max 32 kHz)
                 2 x relays SPDT, 230 V, 1 A

Totalisator: with EPROM – memory board

Power supply: 24 V_{DC} +/- 10 %

Protection class: IP65

Order Code:

Order number:	DP07.	R025.	B.	1.	20-100.	0

Electronic paddle bellows flowmeter, counter and switch, with analogue output

Process connection (xx=nominal pipe size):
R0xx = with female or male thread*
F0xx = with flange (DN 10 to DN 50 only)
Axxx = with weld-on nozzle
        (from DN 65 to DN 600)

Material combination:
A = brass / st. steel (galvanized steel)
B = complete stainless steel
PVC version (threaded socket, flange etc.) on request

Output signals:
0 = universal output for current, voltage and frequency (adjustable on site)
    2 relays, SPDT

Switching range:
xxxx-xxxx = min. - max. flow (see table „Measuring ranges")

Options:
0 = without
1 = please specify in plain text
HT = high temperature version (only for material combination B) up to 250 °C
HTF = high temperature version for flange connection (only for material combination B) up to 250 °C

*female thread DP07...A: R 3/8 bis R 1 1/2;
DP07...B: R 3/8 up to R 3/4
male thread DP07...A: R 2; DP07...B: R 1 bis R 2

Additional specifications:

- **medium density and viscosity (if different from water)**
- **operating pressure and temperature**
- **mounting position and flow direction**

Accessories:

DP07-Z.SK: RS232 Interface cable
DP07-Z.BS: Cap set

Measuring Ranges:

Devices with thread or flange connection (T-piece):

Process connection DP07.R... DP07.F...	Flow rate [l/min]		Flow ratio
	min	**max**	
3/8"/DN 10	1,5	25	1:10
1/2"/DN 15	1,5	45	1:10
3/4"/DN 20	5	100	1:10
1"/DN 25	6	150	1:10
1 1/4"/DN 32	10	250	1:10
1 1/2"/DN 40	20	400	1:10
2"/DN 50	50	600	1:10

Devices with weld-on nozzle:

Process connection DP07.A...	Flow rate [m³/h]		Flow ratio
	min	**max**	
DN 65	4,8	60	1:10
DN 80	7,2	90	1:10
DN 100	12	144	1:10
DN 125	18	255	1:10
DN 150	24	330	1:10
DN 200	42	600	1:10
DN 250	72	900	1:10
DN 300	102	1.200	1:10
DN 350	150	1.800	1:10
DN 400	180	2.400	1:10
DN 500	300	3.600	1:10
DN 600	420	4.500	1:10

Switching ranges apply to water at 20°C. Within the specified limits, all switching ranges can be achieved, provided that the max./min. ratio for the switching point is not exceeded.
Example in the event of 1/2": 1-5, 2-10 or 11-55 possible.

Dimensions:
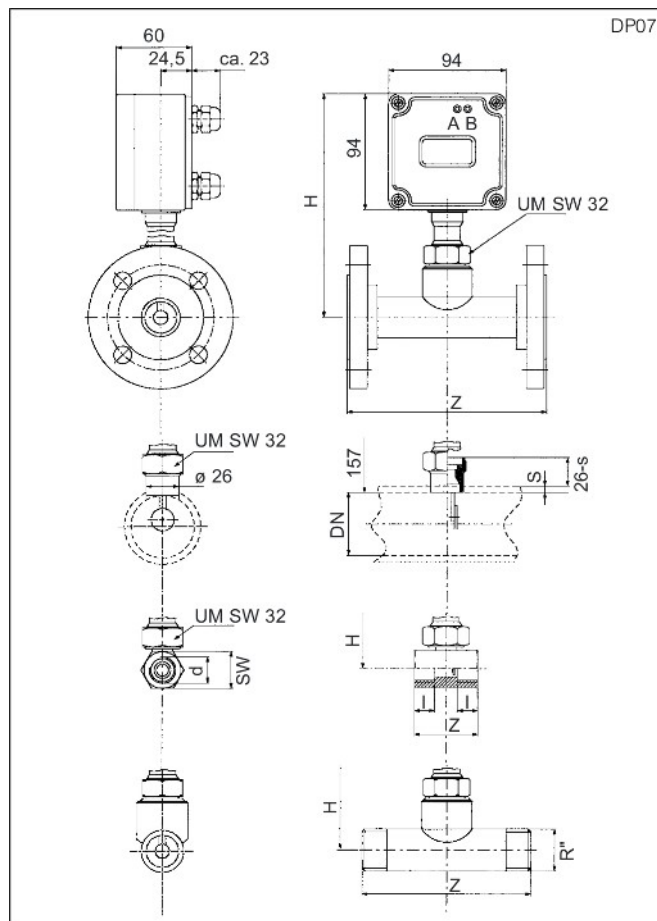
Nominal size	Installation length Z [mm]		Installation height H [mm]
	DP07.R...	**DP07.F...**	
3/8"/DN 10	50	155	157
1/2"/DN 15	50	155	157
3/4"/DN 20	50	155	157
1"/DN 25	135	155	DP07.x.A: 162 DP07.x.B: 178
1 1/4"/DN 32	170	190	DP07.x.A: 167 DP07.x.B: 178
1 1/2"/DN 40	170	190	DP07.x.A: 171 DP07.x.B: 178
2"/DN 50	170	190	DP07.x.A: 179 DP07.x.B: 188