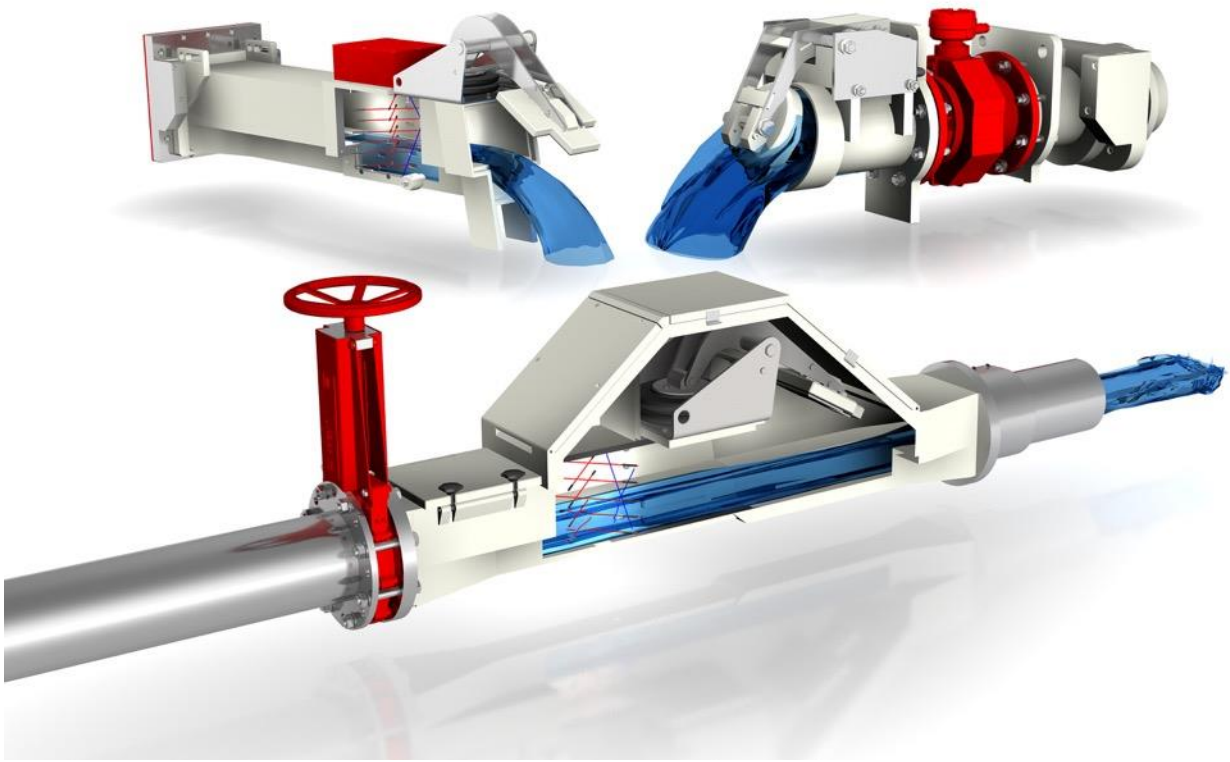
STEBATEC®
Messen - Steuern - Regeln

Technical Bulletin

Pneumatic Outflow Control

Pneumatially powered controls for the precise limitation of the volumes of waste water and rain water

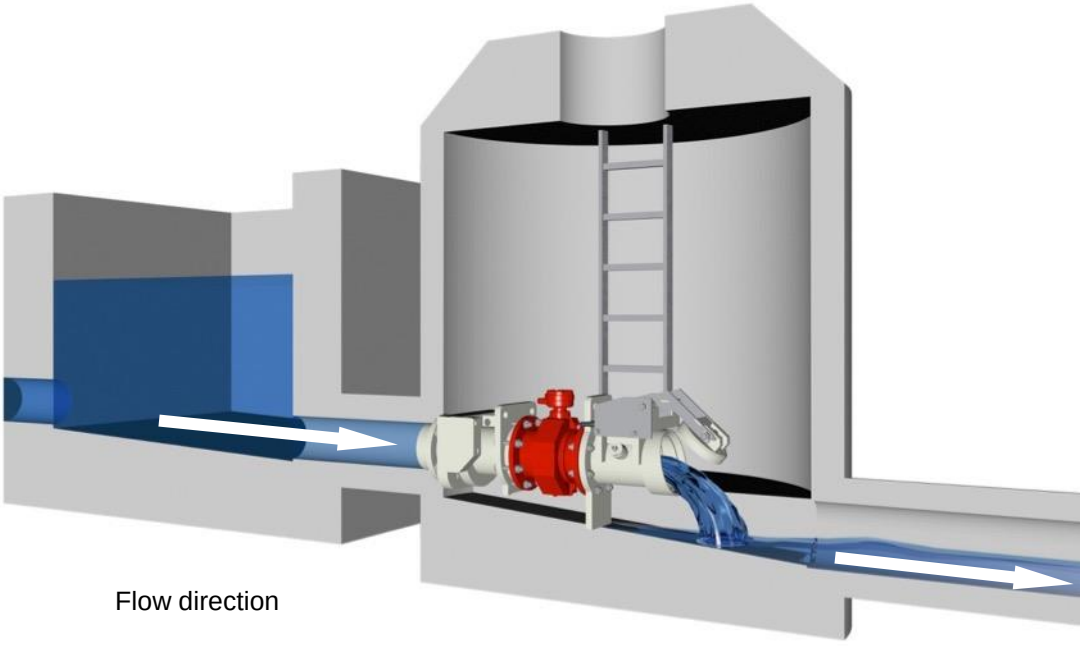


Contents

Applications

Two different types if equipment are used for the pneumatic outflow control. One for fully filled and one for partly filled outflows. Both are mainly used:

- at the outflow end of sorm-water basins and storm-water overflows for limiting the outflow to the sewage treatment plant.
- at the outflow end of road runoff treatment plants (SABA) for limiting the flow rate.
- Self-cleaning flow measurement with 40 % less pondage when compared with conventional flow meters.



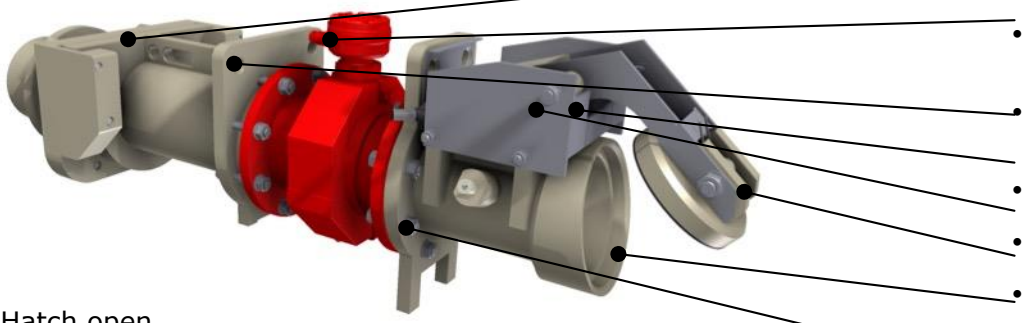
Success features

Pneumatic outflow controls are important components of an integral control system of the sewerage and a 'must' for future intelligent storm-water basin controls.

- The throttling level parameters can be set / are variable across the entire outflow range
- The system can be remote-controlled and is compatible with all conventional process control systems in the market
- Supports water-holding management
- Measures the flow with a maximum deviation of 1% of the measuring value, controls with high precision, with shortest integral-action time and without limitation of the operating time
- Combined flow metering and control system, including stilling section, on the smallest possible footprint area
- Detects pollutions and eliminates them systematically (flushing surge, debris elimination)
- Continues operating on an emergency program during a power failure
- Admits part-filled operation and prevents deposits
- Is easy to maintain and can be removed/opened without tools
- Works with a standardized, fully mature control program
- Can be installed in wet or dry environment

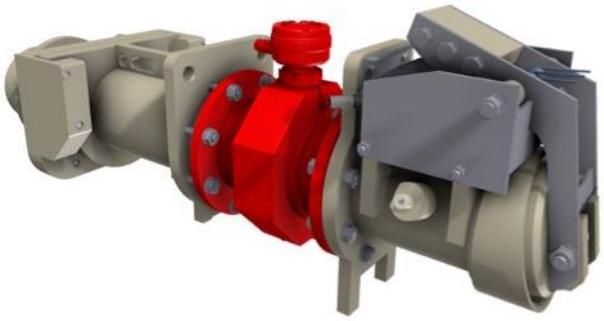
Technical design

Control with fully filled flow measurement



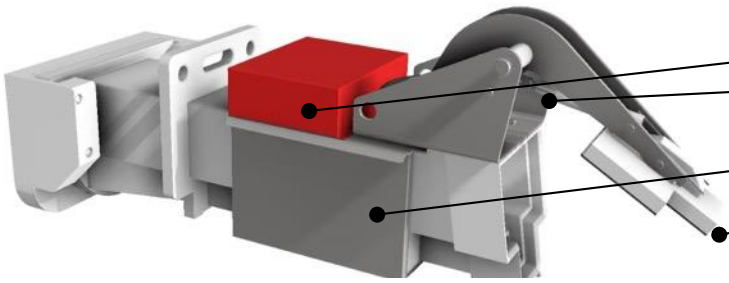
- Example of a suspended type adaption
- Cable with protective hose
- Rope suspension point
- Spring
- Lifting cushion
- Hatch
- Runoff collar splash guard
- Flanged bolts

Hatch open



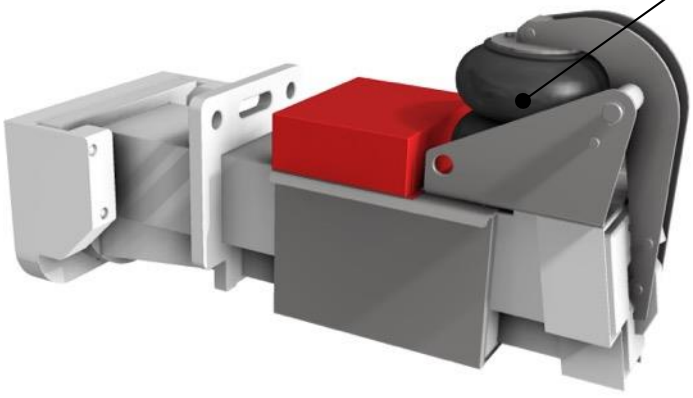
Hatch closed

Control with part-filled flow measurement



- Electronics box
- Gaspressure spring
- Sensor box
- Hatch
- Double bellows

Hatch open



Hatch closed

Wet installed pneumatic outflow control

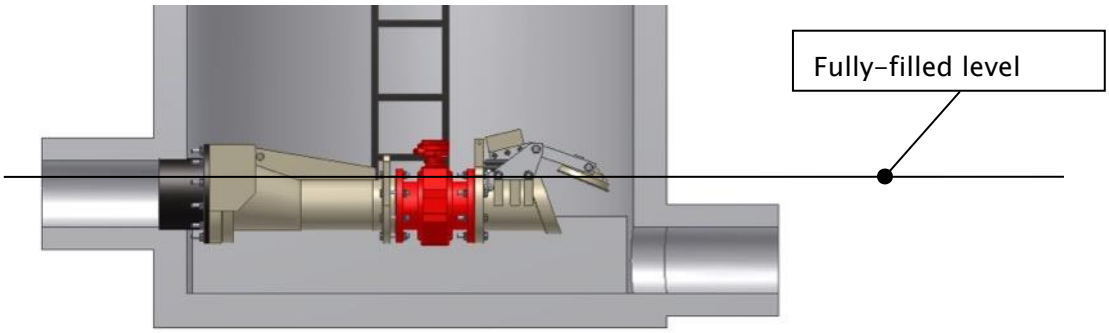
Dry installed pneumatic outflow control

Function

The pneumatically controlled hatch ensures that the MID (if installed) is fully filled and restricts the flow to a pre-settable maximum value.
The hatch is controlled by a pneumatic pressure cushion; when the cushion inflates, the hatch is closed by a lever axis. In deflated state the hatch remains open without backpressure.

Fully-filled control

In dry weather and when the flow is less than the throttled flow, the system switches to automatic fully-filled control (provided this function is enabled). Controlled by the signal of the integrated pressure sensor, the hatch opens wide enough that the fully-filled state of the measuring sensor is maintained.
This ensures highest mesuring accuracy by the measuring sensor (magnetic-inductive flow measurement for fully-filled state).



Quantity control

When the preset flow rate is exceeded, the plant switches to quantity control in which the flow is controlled by the signal of the flow measurement and limits the outflow quantity accordingly.

Emergency operation during power failure and equipment fault

The pneumatic outflow control features several possible reactions to an emergency situation; these will be defined together with the responsible sales engineer.

Emergency throttle
In standard versions of the plants, the hatch is normally open when no power is supplied. This may not be suitable for some applications because the pre-set flow level may not be maintained when power fails.
In the event of power failure, the emergency throttle shortens the pressure cushion at the controller with the pressure reservoir at the compressor by a pressure reducer. The setting of the pressure reducer defines the cushion pressure in emergencies. The setting depends on the situation – we will be glad to advise you.

Flushing surge to prevent deposits

To prevent deposits which may occur during basic full-filling or also to improve the "dynamic" behavior of the sewer system, the plant has a self-cleaning function (flushing surge). The surge is produced by closing the hatch in controlled intervals and then opening it to produce a controlled surge flushing.

Part-filled mode

In systems with part-filled flow measurement, the part-filled mode is enabled permanently. The system switches to quantity control automatically when the maximum amount is obtained.

In the version with magnetic-inductive (MID) flow measurement the control hatch maintains the system in fully filled state. This causes basic filling in the upstream line. In part-filled mode, the control hatch remains open in dry weather and only changes to fully-filled or quantity control mode when the water level rises. Without basic filling the risk of deposits everywhere in the sewerage decreases. If the MID is to be used again later, the part-filled mode can be disabled by a simple mouse-click.

Self-control

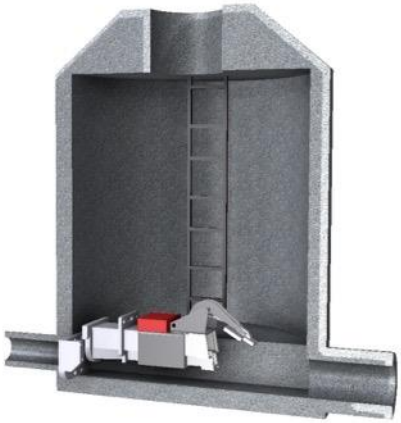
The pneumatic outflow control operates on three reference signals, viz. flow (flow measurement), water level, and pneumatic backpressure in the pressure cushion.
The relations among these three reference signals must always be within defined limits; otherwise the system changes its state:

- If the water level in proportion to the flow and the backpressure in the cusion is too high, deposits in the area of the control hatch are assumed = the hatch opens briefly.
- If the pressure in the cushion increases whereas flow and water level remain constant, the hatch may be jammed by debris = the hatch opens briefly.

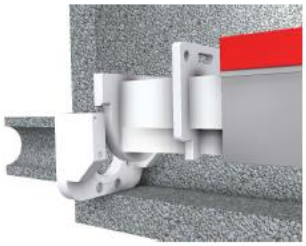
Typical assembly process

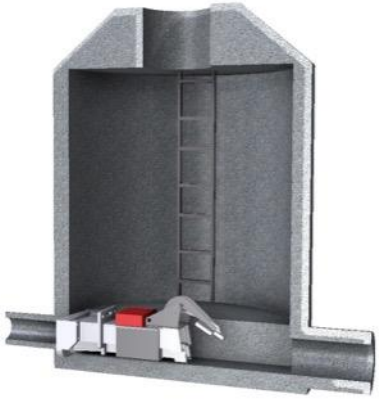
The assembly process of the part-filled pneumatic outflow control described below by way of example applies analogously also to the fully-filled pneumatic ourtflow control.

Lower the pneumatic outflow control unit down the manhole into the shaft on ropes.



Align the unit horizontally in the previously installed adaption for suspended installation … and lower the unit until the top edge of the wedge plate is flush with the adaption.





During initial installation, the feet supporting the unit have been adapted to the canal in such a way that the unit is horizontal when positioned finally.

Advantages

Reliability

The uncomplicated system design and the use of sutable materials ensure reliable operation of the system for many years.

Control accuracy

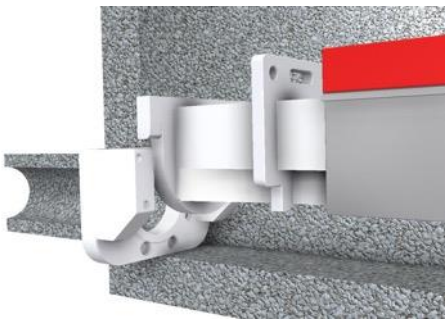
The control hatch is located immediately downstream the flow measurement so it reacts quickly to changes and also can maintain the programmed control value with only minutest deviations.

For comparisons with knife gate valves flow controls the hard-and-fast rule is 1 to 10: Whereas a knife gate valve can 100 individual positions in steps, the pneumatic outflow control with its stepless pressure control, by comparison, covers at least 1000 individual positions – which is the basis for the high control accuracy.

Ease of maintenance

The flow inside the unit is a laminar flow so that solids and debris are eliminated systematically. As a consequence of this, the maintenance intervals are longer.

The STEBATEC adaption for suspended installation of the unit makes installation and removal a lot easier. The unit, which has no bolts or screws, is positioned exactly so that no alignment is necessary after installation.



Cost cutting

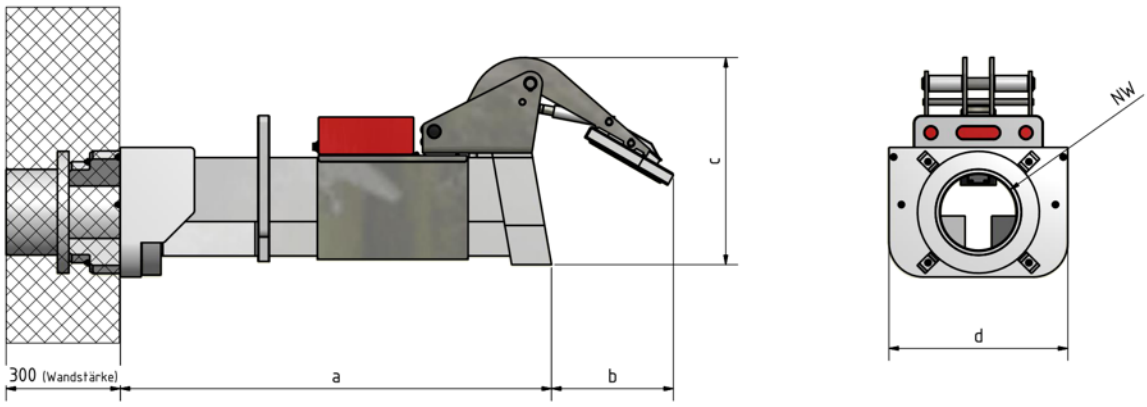
In many applications the pneumatic outflow control does not require or – when compared with other systems – requires fewer modifications of the existing building structure, which cuts the overall cost.

Technical specifications

Measuring range:	0.2 – 5000 l/s (depends on the system nominal size)
Control range:	0.2 l/s and more
Nominal sizes:	100 mm – 1500 mm
Materials:	Polypropylene; metal V4A or as required
Seals/gaskets:	EPDM
Temperature:	0 – 45 °C
pH range:	6 – 9
Protection class:	IP 68
Compressed-air supply:	Compressor with automatic water drainage
Voltage supply:	230 V / 50 Hz / 10 A

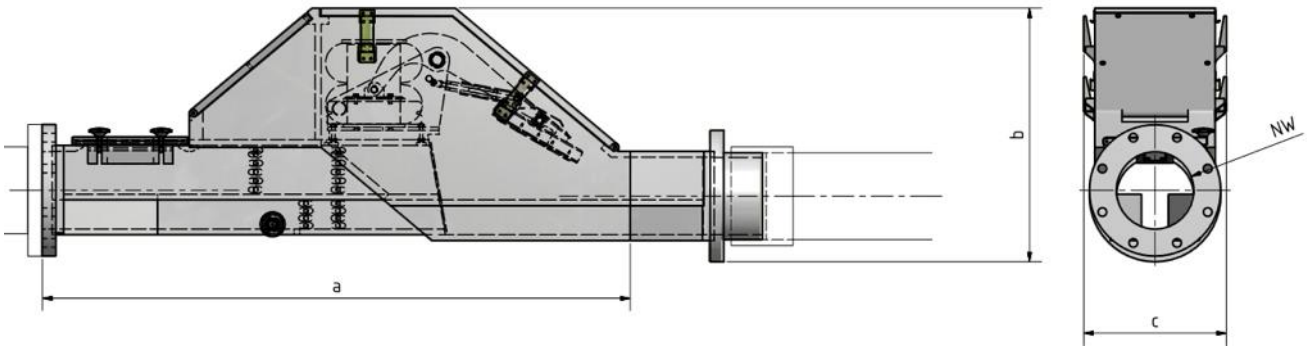
Theoretical construction lengths

Wet installed version



NW	a	b	c	d
200 mm	1140 mm	320 mm	560 mm	470 mm
250 mm	1430 mm	450 mm	700 mm	525 mm
300 mm	1710 mm	540 mm	840 mm	575 mm
350 mm	2000 mm	630 mm	980 mm	645 mm
400 mm	2280 mm	720 mm	1120 mm	720 mm
500 mm	2850 mm	900 mm	1400 mm	850 mm
600 mm	3420 mm	1080 mm	1680 mm	1020 mm
700 mm	3990 mm	1260 mm	1960 mm	1190 mm
800 mm	4560 mm	1440 mm	2240 mm	1360 mm

Dry installed version



NW	a	b	c
200	1520	670	380
250	1900	840	450
300	2280	1000	510
350	2660	1150	570
400	3040	1300	630
500	3800	1640	750

Communication interfaces

Standard with GPRS modem, fixnet internet link and VPN technology

Signal outputs: 4–20 mA: momentary flow rate and set control value
digital (active/passive): quantity meter and 2x fault

Signal inputs: 4–20 mA: setpoint control value
digital (floating): OPEN (remote); CLOSE (remote);
AUTOMATIC; MANUALL START CLEANING;

Communication: RS485 (Modbus RTU/ASCII), RS232, ethernet (Modbus TCP)
Linkup via GPS possible.

VPN links for remote maintenance by STEBATEC
(internet link via GPRS required)

Terminal connections diagram on request

Contact data

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