Stormwater retention with limited discharge

Stormwater retention systems make a particularly important contribution in relieving the strain on the public sewer networks in new construction and industrial areas. They reduce hydraulic peaks caused by heavy rainfall, and therefore also contribute to providing local flooding protection. Retention systems consist of a retention compartment which is used for the temporary storage of rainwater during heavy rainfall, and a throttling device for limiting the discharged runoff water. The water flows are restricted and allowed into the sewer at a delayed rate. The retention system empties itself completely after the heavy rainfall, and is fully available again as temporary storage.

Comparison between static and dynamic throttling

With static throttles, the flow rate is limited by a defined narrowing of the line diameter. The outflow value then depends on the hydrostatic pressure resulting from the retention height upstream of the orifice.

Method of operation of VS-Control External

- **Free discharge**
  - Low water level in the upstream retention system.
  - The water flows tangentially out of the upstream retention system into the vortex flow controller. The discharge takes place freely through the discharge cross-section of the replaceable orifice.

- **Controlled discharge with choke**
  - High water level in the upstream retention system.
  - If the water level in the upstream retention system increases, more water flows tangentially into the shaft unit of the vortex flow controller. This results in a vortex flow with an internal air core. Because of the air core, part of the discharge cross-section of the replaceable panel is blocked, and a constant choked discharge is realised. At the same time, the inflow is limited by the counter-pressure generated by centrifugal force along the shaft body wall. The vortex flow that is produced also prevents the threat of blockages. Contamination which is bigger than the opening in the orifice is easily accessible and can be removed from above.

Summary

Compared with the static choke (red curve), the GRAF VS-Control External (blue curve) has the benefit of a high discharge capacity with a low retention height. This allows the retention volume needed to be reduced by up to 30% compared with static chokes.

Sizing of retention systems

The retention volume is determined both in standard DIN 1986-100 and work sheet DWA-A 117. Statistical rainfall data from the Local Weather Service is used to measure the retention volume. The permissible discharge volume flows in l/s or l/(s*ha) and other parameters for measurement are normally specified by the responsible authority.

- **VS-Control External**  ➤ page 4
- **Retention systems**  ➤ see technical catalogue
- **Accessories**  ➤ page 8/9
- **VS-Control External**  ➤ page 4
- **Inspect channel**
- **Geotextile – outer layer**
- **Sealing membrane**
- **VS-Control External**
- **Discharge with choke**
- **GRAF EcoBloc**
- **Inlet**
- **Ventilation**
VS-Control External

Can be combined
- With well-tried GRAF shaft components

Project-specific design
- Flexible adaptation to the local conditions using GRAF shaft components
- Prefabricated replaceable orifice for a project-specific discharge value
- Different shaft sizes for individual requirements

High discharge capacity
- The provided choke discharge is almost already reached, even at low installation heights

Suitable for lorry loading
- With GRAF covers for any required load

Versatile use
- With channel elements, welded into waterproof plastic liners
- With GRAF underground tanks
- With retention tanks provided by the customer

Dependable
- No wear because there are no moving parts
- Requires little maintenance because the vortex effect results in self-cleaning
- Extremely good revision capability and replaceable orifice

Optional emergency overflow
- Realisation of various emergency overflow sizes, max. DN 300 (12") by means of GRAF shaft components

VS-Control External S
With individually measured orifice DN 400 (16"); discharge quantity on request, inlet DN 150 (6"), discharge DN 200 (8")
Order no. 340150

VS-Control External M
With individually measured panel DN 600 (24"); max. discharge quantity 50 l/s; inlet DN 200 (8”), discharge DN 250 (10")
Order no. 340151

VS-Control External L
With individually measured panel DN 600 (24"); max. discharge quantity 65 l/s; inlet DN 200 (8”), discharge DN 300 (12")
Order no. 340152
VS-Control External

- Infinitely variable total installation depth of 985 mm – 6400 mm (38.8” – 21’ 4”)
- Minimal height loss: 315 mm (12.4”) VS-Control External S; 445 mm (17.5”) VS-Control External M; 505 mm (19.9”) VS-Control External L
- Individually adjustable throttle discharge capacity
- Project-specified measurement of the replaceable orifice
- Basic housing can be shortened

### Technical data

**Vortex flow control**

<table>
<thead>
<tr>
<th>Vortex flow control</th>
<th>Inlet/Discharge DN (in.)</th>
<th>Max. option emergency overflow DN (in.)</th>
<th>Max. discharge value [l/s]</th>
<th>Colour</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VS-Control External S</td>
<td>150 (6&quot;)/200 (8&quot;)</td>
<td>200 (8&quot;)</td>
<td>On request</td>
<td>grey</td>
<td>340150</td>
</tr>
<tr>
<td>VS-Control External M</td>
<td>200 (8&quot;)/250 (10&quot;)</td>
<td>300 (12&quot;)</td>
<td>50</td>
<td>grey</td>
<td>340151</td>
</tr>
<tr>
<td>VS-Control External L</td>
<td>200 (8&quot;)/300 (12&quot;)</td>
<td>300 (12&quot;)</td>
<td>65</td>
<td>grey</td>
<td>340152</td>
</tr>
</tbody>
</table>

**VS-Control External**

- Infinitely variable total installation depth
- Minimal height loss: 315 mm (12.4”) VS-Control External S; 445 mm (17.5”) VS-Control External M; 505 mm (19.9”) VS-Control External L
- Individually adjustable throttle discharge capacity
- Project-specified measurement of the replaceable orifice
- Basic housing can be shortened

**Technical data**

<table>
<thead>
<tr>
<th>Vortex flow control</th>
<th>Length L</th>
<th>Height H</th>
<th>Height H1</th>
<th>Height H2</th>
<th>Total entry E</th>
<th>Telescopic height T</th>
<th>Inlet depth Z</th>
<th>Discharge depth A</th>
</tr>
</thead>
<tbody>
<tr>
<td>VS-Control External S</td>
<td>615 mm (24.2&quot;)</td>
<td>1135 mm (44.6&quot;)</td>
<td>600 mm (23.6&quot;)</td>
<td>1385 mm (54.6&quot;)</td>
<td>885 mm (34.8&quot;)</td>
<td>400 mm (15.7&quot;)</td>
<td>585 mm (23&quot;)</td>
<td>650 mm (25.6&quot;)</td>
</tr>
<tr>
<td>VS-Control External M</td>
<td>730 mm (28.7&quot;)</td>
<td>1880 mm (73.9&quot;)</td>
<td>1630 mm (63.8&quot;)</td>
<td>1435 mm (56.3&quot;)</td>
<td>1480 mm (58.1&quot;)</td>
<td>600 mm (23.6&quot;)</td>
<td>1050 mm (41.3&quot;)</td>
<td>6030 mm (19'9&quot;)</td>
</tr>
<tr>
<td>VS-Control External L</td>
<td>820 mm (32.3&quot;)</td>
<td>1935 mm (76.1&quot;)</td>
<td>1685 mm (66.1&quot;)</td>
<td>1335 mm (52.5&quot;)</td>
<td>1535 mm (60.5&quot;)</td>
<td>600 mm (23.6&quot;)</td>
<td>1010 mm (39.8&quot;)</td>
<td>5975 mm (19'7&quot;)</td>
</tr>
</tbody>
</table>

**Webcode**

G4331
Accessories

VS-Control External S

Covers

Telescopic dome shaft 400
With plastic cover, can be walked on,
Colour: lawn green
Order no. 340053

Telescopic dome shaft 400, class D
With cast iron cover, can be driven
over by trucks, Class D, colour: black
Order no. 340049

VS-Control External M/L

Covers

Mini telescopic dome shaft
With plastic cover, can be walked on,
Colour: lawn green
Order no. 371210

Cast iron telescopic dome shaft
With cast iron cover, can be driven
on by cars
Class B, colour: black
Order no. 371220

Maxi telescopic dome shaft lorry
For normal commercial concrete rings,
can be driven over by trucks class D,
colour: black, concrete rings/covers
supplied by customer
Order no. 371221

Telescopic ventilation shaft
Car DN 600 (24")
Incl. cast concrete covers, Class B
Support ring and dirt trap
Order no. 340149

Telescopic ventilation shaft
Truck DN 600 (24")
Incl. cast concrete cover, Class D
Support ring and dirt trap
Order no. 340148

Shaft components

VS inlet module DN 400 (16")
Incl. profile seal; for realising an emergency
overflow; connection DN 150 (6")/DN 200 (8")
Order no. 330339

VS intermediate piece 500 DN 400 (16")
Incl. profile seal;
for realising large installation depths, useful length:
500 mm (19.7"), can be shortened to 250 mm (9.8")
Order no. 330341

Spare part set VS-Control External S
For adapting the throttle discharge
capacity at a later date
Order No. 340053

VS inlet module DN 600 (24")
Incl. profile seal; for realising an emergency
overflow; connection DN 150 (6")/DN 200 (8")/DN 250 (10")/DN 300 (12")
Order no. 371260

VS intermediate piece 1000 DN 600 (24")
With DN 200 (8") contact surface, incl. profile
seal; for realising greater installation depths,
useful length 1000 mm (39.4"), can be shortened to
750 (29.5")/500 mm (19.7")
Order no. 371015

Spare part set VS-Control External M/L
For adapting the throttle discharge
capacity at a later date
Order No. 340054
Dimensioning sheet for vortex flow control shafts

Otto Graf GmbH
Kunststoffverzeugnisse
Product management
Carl-Zeiss-Strasse 2 – 6
DE-79331 Teningen, Germany
Tel.: +49 7641 589-0
Fax: +49 7641 589-50

Project address:

Owner
Name: ...................................................
Street: ...................................................
Postcode, city/town: ..............................
Tel.: .......................................................
Fax: .......................................................
E-mail: ...................................................

If you send the form to projekte@graf.info or by fax, we will calculate the required choke device for you and produce a quotation free of charge.

Installation situation

Distance from groundwater (top edge of ground to max. groundwater level) ①  m

Loading capacity

Suitable for pedestrian loading
Car
Truck 12
SLW 30
SLW 40
SLW 60

Retention system installation depth (top edge of ground to bottom edge of tank) ②  m

Height of retention system ③  m

Size of discharge from retention system ④  DN

Depth of discharge from retention system (Top edge of ground to pipe bottom of discharge) ⑤  m

Size of connection to transfer shaft ⑥  DN

Depth of connection to transfer shaft (Top edge of ground to pipe bottom of connection) ⑦  m

Throttling device measurement

Retention height (retention system measurement water level) ⑧ = ⑤ – (② – ③)  m

Discharge volume flow (throttled max. outflow with measurement water level) ⑨  l/s

The permissible discharge volume flow is normally specified by the local water authority.

Note: The inlet line to the vortex flow control shaft must have a minimum length of 1.0 m in a straight line. The supply line and the discharge line must slope downwards slightly by ~0.5%. The positioning of fittings or other equipment which have a hydraulic effect on the free flow of water downstream of the vortex flow control shaft are not permissible. Backing up must be ruled out at all times.

Stormwater Management

For more information about our stormwater management, ask for our catalogue.
Warranty clause:
The warranty mentioned in this brochure only refers to the tank in question and not to the accessories. Within the warranty period we grant free replacement of the material. Further benefits are excluded. Pre-condition for warranty benefits are proper handling, assembly and installation according to the mounting guidelines.

Over and above the statutory regulation, GRAF is lengthening the warranty period for a number of underground tanks. This relates to proper handling, assembly and installation in accordance with the installation manual, as well as leakproofness, usability and static safety. The prerequisites of this are competent assembly and operation in accordance with the requirements, namely the currently valid installation and operating instructions and the prevailing standards.

N.B. Protect tanks from frost when installed aboveground!
In case of groundwater installation, please contact us for further information previous to the purchase!

For all indications of measurements in this brochure we reserve a tolerance of +/- 3%. The useful volume of the tanks may be up to 10% lower than the tank capacity, according to the connecting option.

Technical modifications and further development of the different products are subject to change. Errors excepted.

For all our offers and conclusions of contract are only valid our General Terms and Conditions of Business dated 01/10/2012 which we will send to you on request.