Stormwater Management

THE INFILTRATION RANGE

INFILTRATION MODULES  INFILTRATION FILTERS
RETENTION CISTERNS  SHAFTS AND ACCESSORIES
GRAF – Setting standards in quality

For 50 years, Otto Graf GmbH has been offering high-class plastic products to its customers. In 1974, GRAF developed its first pioneering range of rainwater harvesting products. Today we are market leader in numerous countries for Rainwater Harvesting Systems.

High Quality Manufacturing

Graf is investing continuously in the expansion of the headquarters in Teningen near Freiburg (Breisgau). The facility has now an approximate area of 155,000 m² and is one of the most modern production facilities for plastic products in the world.

Our choice of Germany for the new production site was easy. On the one hand, we feel an obligation to the site because of our history. On the other, we would like to offer our customers products of the highest quality.

Quality is at the forefront

To ensure consistent high product quality, you need optimised production processes and outstanding quality management. Every individual tank at the new production site in Teningen is checked for dimensional accuracy, wall thickness and weight.

All production parameters, e.g. material composition, machine settings and the staff involved in the production process, are documented for each individual product.

Our goal: your satisfaction

More than 100,000 satisfied customers already benefit from the advantages of GRAF rainwater harvesting systems.

High Quality Manufacturing

Our products have to satisfy a huge number of different requirements, which is why GRAF is an expert in all the common procedures for manufacturing plastic products and has access to the optimum manufacturing process for every product.

Ecological products from the technology leader

GRAF uses state-of-the-art production facilities. This is the only way to guarantee superlative quality at attractive prices. GRAF broke new ground by using injection embossing to make the Carat underground tank. To manufacture this tank, the company developed and constructed the world’s largest injection moulding machine.

Durable and 100 % recyclable

Right from the stage of developing its products, GRAF attaches great importance to sustainable product design.

Long product lives ensure that fewer resources are used and the environmental impact is minimised. All products manufactured by GRAF are 100 % recyclable.

Some products are also made from recycled materials – yet another boost to the environmental credentials of the GRAF product range. This means that not only do GRAF products protect the environment during use but their manufacturing process is also ecologically sound.

Sustainable production processes

While GRAF products help protect the environment, they are also manufactured in an environmentally-sound way. For example, the injection moulding process consumes up to 85 % less energy than normal.

The heat generated during manufacturing is processed by a modern heat recovery system and is used to heat the production and logistics building.
Advice, planning and products from one source

What we offer:
- Dimensioning according to DWA-A 138 and DWA-M 253 for infiltration systems
- Sizing for infiltration / retention systems
- Overflow verification according to DIN1986-100
- Assistance with drainage planning proposal
- Assistance with and evaluation of soil survey

On-site support:
If you are planning an infiltration system and need on-site assistance or one-to-one advice from our technical team, then we can help. We work with you to develop customised systems to clean, store, infiltrate, attenuate or harvest rainwater.

Symbols in the catalogue

- Load capacity
  - Suitable for pedestrian loading
  - Suitable for vehicle loading
  - Lorry-bearing

Webcode G4107
The webcode will lead you directly to the required information.

- Installation instructions
- Technical drawings
- Detailed product information
- Downloads

www.graf-water.com
Internationally proven: GRAF infiltration technology

- Business Park, Hradec Králové (CZ)
- Car dealership, Sofia (BG)
- Energy supplier, Warwick (UK)
- Shopping center, Kent (UK)
- Military building, Mazurek (PL)
- Industrial building, Merseburg (DE)
- Football stadium, Le Havre (FRA)
- Production site, Ludwigsfelde (DE)
- City park, Barcelona (ES)
- DIY chain store, Bratislava (SK)
- Recycling centre, Vresová (CZ)
- Industrial building, Tumeltsham (AT)
- City park, Barcelona (ES)
Preserving the natural cycle

With the adoption of the European Water Framework Directive (2000/60/EC), the European Parliament and of the council has set the goal of using water more sustainably and in a more environmentally friendly way. The European states will be responsible for implementing this directive. The Water Resources Acts of most European countries will therefore be amended. The implementations can be found in many current versions – among others:

- "rainwater should be drained away and irrigated locally ... as long as this is not opposed by water legislation, other provisions of public law or water management issues."

The infiltration of rainwater locally offers considerable advantages over the previously customary draining into combined wastewater/separate sewage systems:

- Promotes groundwater recharge
- Reduces costs through lower structural costs – sewers in the separate network and wastewater lifting units can be dimensioned on a smaller scale
- Reduces the effects of surface sealing
- Minimises the hydraulic loads in the sewer system during storms
- Contributes to flooding prevention

Legal change

Internationally proven: GRAF infiltration technology
Dimensioning and planning of infiltration systems

The following parameters are required to evaluate an infiltration system:

- **Determination of the catchment areas**
  Connected roofs, road spaces or other sealed surfaces are evaluated with regard to the actual outflow.

- **Examination of the ground**
  Determination of the permeability of the ground (k_f value in m/s). This value plays a decisive role and a miscalculation can have far-reaching consequences.

- **Return period**
  An infiltration or retention system is designed as a function of heavy rainfall events that are likely to occur over a given period of time. This period of time may vary from 5 to 100 years due to local government laws and regulations. Most of the calculations are done with 5 year rain data.

### Determination of the catchment areas

The collected rainwater can be fed into ditches and drained away from roof surfaces, parking areas, paving and other sealed surfaces. Evaporation and the partially direct infiltration through the collection surfaces result in a reduction of the amount of rain that ends up in the infiltration system. This leads to differing outflow coefficients for the connected surface types (see table below).

The projected surfaces are relevant for the evaluation of the amount of rain and may deviate substantially from the roof surface, particularly in the case of sloping roofs.

The effectively impermeable surface for ditch evaluation can be evaluated using the outflow coefficient and the catchment area.

### Examination of the ground

The ground conditions and the layer structure play an essential role in the planning of an infiltration system. The permeability of the ground and the ground/stratum water define the size and location of the ditch. A soil report should at least include window sampling or trenching near the installation location for the evaluation of the infiltration performance. In addition, information or evaluations for the construction of an infiltration system can be found in most soil reports. However, the ground may display a maximum permeability of $1 \times 10^{-3}$ m/s, since a minimum retention period should be achieved in the soil layers before entry of groundwater.

If the ground properties do not permit infiltration, the required k_f values can be achieved using soil replacement in special cases.

### Recommended permeability values:

<table>
<thead>
<tr>
<th>Soil type</th>
<th>Suitable soil for infiltration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse gravel</td>
<td></td>
</tr>
<tr>
<td>Fine gravel</td>
<td></td>
</tr>
<tr>
<td>Gravel/sand mix</td>
<td></td>
</tr>
<tr>
<td>Medium sand</td>
<td></td>
</tr>
<tr>
<td>Fine sand</td>
<td></td>
</tr>
<tr>
<td>Sand with a loam capacity</td>
<td></td>
</tr>
<tr>
<td>Silt (loam)</td>
<td></td>
</tr>
<tr>
<td>Loam with a clay capacity</td>
<td></td>
</tr>
<tr>
<td>Clay</td>
<td></td>
</tr>
<tr>
<td>Permeability values</td>
<td></td>
</tr>
<tr>
<td>Weak</td>
<td>Medium</td>
</tr>
<tr>
<td>Medium</td>
<td>Strong</td>
</tr>
</tbody>
</table>

### Return period

The size of an infiltration or detention system depends on heavy rainfall events which occur over a given period of time. This period of time may vary from 5 to 100 years due to local government laws and regulations. Most of the calculations are done with 5 year rain data, see picture/table below.

Values given as an example:

<table>
<thead>
<tr>
<th>D [min]</th>
<th>rain flow [l/(s*ha)]</th>
<th>rain volume [l/(100 m²)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>38.0</td>
<td>1147.4</td>
</tr>
<tr>
<td>10</td>
<td>245.6</td>
<td>1473.6</td>
</tr>
<tr>
<td>20</td>
<td>158.9</td>
<td>1906.8</td>
</tr>
<tr>
<td>30</td>
<td>123.6</td>
<td>2238.2</td>
</tr>
<tr>
<td>60</td>
<td>80.3</td>
<td>2890.8</td>
</tr>
<tr>
<td>120</td>
<td>47.8</td>
<td>3441.6</td>
</tr>
<tr>
<td>240</td>
<td>28.4</td>
<td>4089.6</td>
</tr>
<tr>
<td>540</td>
<td>15.5</td>
<td>5022</td>
</tr>
<tr>
<td>720</td>
<td>12.5</td>
<td>5400</td>
</tr>
<tr>
<td>1440</td>
<td>7.3</td>
<td>8302.2</td>
</tr>
<tr>
<td>2880</td>
<td>4.1</td>
<td>7984.8</td>
</tr>
<tr>
<td>4320</td>
<td>2.9</td>
<td>7516.8</td>
</tr>
</tbody>
</table>

In combination with soil type, the critical value (max. value for infiltration system dimensions) could be between 5 minutes (good soil) and 4320 minutes (clay or loam).
The installation depths and maximum fill cover heights are very much dependent on the loading of the finished surface and the type of system material used. When a vehicle makes contact with the surface, its weight is first converted into a point load. The asphalt structure and the soil layers beneath distribute this load according to their mechanical properties. For the soil layers, the angle of friction $\varphi'$ (see page 13) is decisive. To achieve even loading of the infiltration system elements, a suitable minimum soil cover is required. The infiltration system elements are also subject to horizontal loading, resulting from the vertical loading being diverted by the internal rigidity of the filler material in the soil. The horizontal loading limits the maximum depth at which the infiltration system elements can be installed.

### Loads and angles of friction

| Vertical soil pressure | Horizontal load resulting from soil pressure + traffic load
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Point load</td>
<td>Equivalent load</td>
</tr>
</tbody>
</table>

**Traffic loads**

**Point load**

The infiltration system elements can be installed in areas of pedestrian loading (without vehicle traffic) and areas with calmed vehicle traffic up to a maximum total weight of 60 tons. This includes car parks and access roads with low speeds. In areas of pedestrian loading, traffic load is normally assumed to be $0 \text{kN/m}^2$. In areas with traffic loading, a distinction must be made between point loads and distributed loads. Point loads decrease exponentially as depth increases, partly related to the angle of friction. The fill material reduces the point load and causes the traffic load to be evenly distributed.

**Equivalent load**

National standards also require the equivalent load for road surfaces to be taken into account. In theory, the equivalent load is an evenly distributed load (e.g. national standards in Germany use Lorry 60 t $\equiv 33.3 \text{kN/m}^2$ equivalent load, British standards use $10 \text{kN/m}^2$ w/o safety factors for high loading distributed loads) based on the total weight of the vehicle in relation to the projected contact area. For a theoretical load calculation the equivalent load is not dependent on the installation depth and therefore remains constant.

**Result: traffic load**

To assess traffic load, the maximum point load or equivalent load must always be used for design purposes.
Vertical soil pressure

The covering soil layers / soil fill cover produce vertical soil pressure. This is linear and depends on the installation depth / height of the fill cover and the density of the chosen material. The vertical soil pressure is normally estimated to be around 20 kN/m² per metre of fill cover.

Vertical loads

The vertical load comprises the traffic load and soil pressure as described above. The sum of the two loads is therefore dependent on the installation depth. This limits the maximum permitted fill cover on top of the infiltration elements.

Horizontal load

The angle of friction has an important influence on the horizontal loading. Part of this vertical load is converted into a horizontal load by the internal rigidity of the filler material. The horizontal load is also dependent on the height of the fill cover, i.e. the installation depth, and limits the installation window for the infiltration ditch elements.

<table>
<thead>
<tr>
<th>Class</th>
<th>Suitable for</th>
<th>Car</th>
<th>Lorry 12</th>
<th>Lorry 30</th>
<th>Lorry 40</th>
<th>Lorry 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation depth (max.) [m]</td>
<td>φ' = 20°</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>2.75</td>
<td>2.50</td>
</tr>
<tr>
<td>Installation depth (max.) [m]</td>
<td>φ' = 30°</td>
<td>4.25</td>
<td>4.25</td>
<td>4.25</td>
<td>3.75</td>
<td>3.75</td>
</tr>
<tr>
<td>Installation depth (max.) [m]</td>
<td>φ' = 40°</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
</tr>
</tbody>
</table>

If infiltration system elements are to be installed for the storage of rainwater (retention or rainwater harvesting), additional loads caused by the presence / rising of groundwater must be evaluated.

Angle of friction

The fill material used has a significant influence on the horizontal load and therefore the load which the system element must withstand at the sides. The angle of friction $\phi'$ describes the effective angle of internal friction of a material. The effect of the angle of friction can be seen, for example, in a heap of a granular medium (e.g. sand or gravel). The greater the angle of friction $\phi'$, the higher such a medium can be piled up. In addition, the greater the angle of friction and thus the internal rigidity of the material, the lower the horizontal load. A high angle of friction also favours the distribution of the point load into an evenly distributed load. Preference should therefore always be given to a filler material with a high angle of friction.

<table>
<thead>
<tr>
<th>Material</th>
<th>Loam</th>
<th>Loam/sand mix</th>
<th>Sand</th>
<th>Gravel</th>
</tr>
</thead>
</table>
EcoBloc stormwater management system
EcoBloc stormwater management system

Various applications
✓ Rainwater infiltration
✓ Stormwater attenuation
✓ Rainwater harvesting

Fully integrated shaft
The Vario 800 flex shaft system (page 26) can be directly installed in an EcoBloc infiltration or infiltration/attenuation system. The connection surfaces of the inspection channels in the Vario 800 flex shaft system are accurately matched to the EcoBloc system.

Lorry-bearing up to 60 tons
The EcoBloc Inspect flex has a heavy-duty lorry-bearing capacity of 60 tons with an 800 mm (2' 7.5") earth covering.

High pressure jetting possible
EcoBloc Inspect flex can easily resist high pressure jetting.

Easy to install
The modules are fitted simply, at speed and in various ways. They can be installed without heavy machinery – one EcoBloc Inspect flex module weighs just 8 kg (17.6 lbs), even only 7 kg (15.4 lbs) for one EcoBloc light.

High storage volume
GRAF infiltration modules have three times the storage volume of a standard gravel infiltration ditch. Two modules therefore take the place of around 1300 kg (1.4 tons) of gravel or a 5 m (16') drainage pipe. Since you don’t have to excavate so much soil and enjoy great value for money compared with a standard gravel infiltration ditch, the GRAF modules save you hard-earned cash!

Service life of over 50 years
A durable product design ensures sustainability. The EcoBloc system and the Vario 800 flex shaft system is designed for a service life of over 50 years.

Easy to inspect
The standard inspection channel allows the entire infiltration/attenuation system to be monitored effectively. The EcoBloc Inspect flex allows access by commercially available inspection cameras. This has been confirmed by several independent testing authorities.

Optimum connection positions
Optimum connection positions ensure full use of infiltration ditch volume.

Up to 97 % reservoir volume
The EcoBloc light has a gross volume of 225 litres (59.4 US gal.) and a reservoir volume of 219 litres (57.9 US gal.). With a reservoir volume in excess up to 97%, it is a market-leading product. The EcoBloc variants maxx and Inspect flex still offer a reservoir coefficient of 96% despite their high load-bearing capacity.

Installation depth of up to 5 metres (16' 4.8")
Even under very heavy loads, GRAF EcoBloc Inspect flex modules can be installed at a depth of up to 5 metres (16' 4.8"). This means that up to 14 layers are possible. Please consult GRAF when the installation depth is greater than 5 metres.

Installation depth of up to 5 metres (16' 4.8")

Optimum connection positions ensure full use of infiltration ditch volume.

High pressure jetting possible
EcoBloc Inspect flex can easily resist high pressure jetting.

Easy to inspect
The standard inspection channel allows the entire infiltration/attenuation system to be monitored effectively. The EcoBloc Inspect flex allows access by commercially available inspection cameras. This has been confirmed by several independent testing authorities.

Up to 97 % reservoir volume
The EcoBloc light has a gross volume of 225 litres (59.4 US gal.) and a reservoir volume of 219 litres (57.9 US gal.). With a reservoir volume in excess up to 97%, it is a market-leading product. The EcoBloc variants maxx and Inspect flex still offer a reservoir coefficient of 96% despite their high load-bearing capacity.

Installation depth of up to 5 metres (16' 4.8")
Even under very heavy loads, GRAF EcoBloc Inspect flex modules can be installed at a depth of up to 5 metres (16' 4.8"). This means that up to 14 layers are possible. Please consult GRAF when the installation depth is greater than 5 metres.

GRAF EcoBloc Configurator
Please ask your GRAF sales consultant for your login account information to the GRAF EcoBloc Configurator.
The EcoBloc system at a glance

Application and logistics

Eco-friendly product – green logistics

One lorry can transport up to 2700 EcoBloc light modules. That corresponds to a volume of 610 m³ (161,145 US gal.). This reduces carbon emissions during transport by 85%!

1. Stackable
To save space during transport, the EcoBloc maxx and EcoBloc light modules are stacked into each other. This minimizes transport costs, storage space in stock and CO₂ emissions.

2. Easy installation
The EcoBloc base plate forms the foundations of each EcoBloc system. Up to 13 EcoBloc modules can be fitted on one base plate.

3. Ready
The side faces are sealed with EcoBloc end plates. The EcoBloc system can be adapted to match individual requirements.

Infiltration system body
- EcoBloc Inspect flex
  - Page 22
- EcoBloc maxx
  - Page 22
- EcoBloc light
  - Page 23

Infiltration system body accessories
- Deaeration end, geotextile, and connectors
  - Page 23
- EcoBloc Inspect flex end plates
  - Page 22
- EcoBloc maxx end plates
  - Page 22
- EcoBloc light end plates
  - Page 23
- EcoBloc light adapter plate
  - Page 23

Shaft
- Vario 800 flex, type 1
  - Page 26
- Vario 800 flex, type 2
  - Page 26
- Vario 800 flex, base/cover set
  - Page 26

Shaft accessories
- Telescopic dome shaft pedestrian loading
  - Page 27
- Telescopic dome shaft vehicle loading max. load 3.5 t
  - Page 27
- Telescopic dome shaft lorry bearing
  - Page 27

Infiltration inlet module
- DN 600 (24”)
  - Page 27

Infiltration connecting piece
- 1000 DN 600 (24”)
  - Page 27

Choke drain
- Pack 1 DN 100 (4”), pack 2 DN 150 (6”), pack 3 floating choke drains
  - Page 27

CAN HOLD 3 TIMES THE VOLUME OF A CONVENTIONAL GRAVEL DITCH

Stormwater management • EcoBloc System
EcoBloc system

Modules

EcoBloc Inspect flex
- Lorry-bearing 60 tons/HS-25
- 150 m³ (39,600 US gal.)/Truck
- Inspectable
- High pressure jetting possible

**Load ★★★★★**

**Logistics ★★★★★**

EcoBloc Inspect flex base plate
Forms the foundation of the EcoBloc Inspect flex system

**Volume** | **Length** | **Width** | **Height** | **Weight** | **Colour** | **Order no.**
---|---|---|---|---|---|---
205 l | 800 mm | 800 mm | 320 mm | 8 kg | grey | 402005

**Webcode** G4107

EcoBloc Inspect flex end plates
The front ends of an EcoBloc Inspect flex system are sealed by end plates with
DN 100 (4") / 150 (6") / 200 (8") contact surfaces

<table>
<thead>
<tr>
<th>Item</th>
<th>Colour</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EcoBloc Inspect flex end plates (Set 2 units)</td>
<td>grey</td>
<td>402002</td>
</tr>
</tbody>
</table>

EcoBloc maxx
- Lorry-bearing 40 tons/HS-20
- 410 m³ (108,310 US gal.)/Truck

**Load ★★★★★**

**Logistics ★★★★★**

EcoBloc maxx base plate
Forms the foundation of the EcoBloc maxx system

**Volume** | **Length** | **Width** | **Height** | **Weight** | **Colour** | **Order no.**
---|---|---|---|---|---|---
25 l | 800 mm | 800 mm | 40 mm | 4 kg | grey | 402006

**Webcode** G4108

EcoBloc maxx end plates
The outside surface of an EcoBloc maxx system is sealed by end plates with contact
surfaces DN 100 (4") / 150 (6") / 200 (8") / 250 (10")

**Volume** | **Length** | **Width** | **Height** | **Weight** | **Colour** | **Order no.**
---|---|---|---|---|---|---
225 l | 800 mm | 800 mm | 350 mm | 9 kg | black | 402200

**Webcode** G4109

EcoBloc System accessories

EcoBloc connectors
For horizontal connection
- Order no. 402015
  - Set 10 units
- Order no. 402018
  - Set 25 units
- Order no. 402020
  - Set 50 units
- Order no. 402025
  - Set 200 units

Deaeration end
- DN 100 (4")
  - Order no. 369017

EcoBloc adaptor plate
- DN 300 (12") / DN 400 (16") / DN 500 (20")
  - Order no. 402033

GRAF-Tex geotextile
- size of 2.50 x 2.50 m (8’ 2.4” x 8’ 2.4”)
  - Order no. 231006
  - Sold by the metre, roll width 5 m (16’ 4.8”)
- Order no. 231002
  - Sold by the metre, roll width 2.5 m (8’ 2.4”)
  - Order no. 231007

EcoBloc Inspect flex end plates
The outside surface of an EcoBloc Inspect flex system is sealed by end plates with contact
surfaces DN 100 (4") / 150 (6") / 200 (8") / 250 (10")

<table>
<thead>
<tr>
<th>Item</th>
<th>Colour</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EcoBloc Inspect flex end plates (Set 2 units)</td>
<td>grey</td>
<td>402022</td>
</tr>
</tbody>
</table>

EcoBloc max end plates
The outside surface of an EcoBloc maxx system is sealed by end plates with contact
surfaces DN 100 (4") / 150 (6") / 200 (8") / 250 (10")

<table>
<thead>
<tr>
<th>Item</th>
<th>Colour</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EcoBloc max end plates (Set 2 units)</td>
<td>black</td>
<td>402203</td>
</tr>
</tbody>
</table>

EcoBloc light
- Lorry-bearing 12 tons
- 610 m³ (161,145 US gal.)/Truck

**Load ★★★★★**

**Logistics ★★★★★**

EcoBloc light base plate
Forms the foundation of the EcoBloc light system

**Volume** | **Length** | **Width** | **Height** | **Weight** | **Colour** | **Order no.**
---|---|---|---|---|---|---
25 l | 800 mm | 800 mm | 40 mm | 4 kg | green | 402301

**Webcode** G4109

EcoBloc light end plates
The outside surface of an EcoBloc light system is sealed by end plates with contact
surfaces DN 100 (4") / 150 (6") / 200 (8") / 250 (10")

<table>
<thead>
<tr>
<th>Item</th>
<th>Colour</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EcoBloc light end plates (Set 2 units)</td>
<td>green</td>
<td>402303</td>
</tr>
</tbody>
</table>

EcoBloc light end plates
The outside surface of an EcoBloc light system is sealed by end plates with contact
surfaces DN 100 (4") / 150 (6") / 200 (8") / 250 (10")

<table>
<thead>
<tr>
<th>Item</th>
<th>Colour</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EcoBloc light end plates (Set 2 units)</td>
<td>grey</td>
<td>402300</td>
</tr>
</tbody>
</table>

EcoBloc light
- Inspectable
- High pressure jetting possible

**Load ★★★★★**

**Logistics ★★★★★**

EcoBloc light
- Lorry-bearing 60 tons/HS-25
- 150 m³ (39,600 US gal.)/Truck

**Load ★★★★★**

**Logistics ★★★★★**

EcoBloc light
- Lorry-bearing 12 tons
- 610 m³ (161,145 US gal.)/Truck

**Load ★★★★★**

**Logistics ★★★★★**
Flexible use
The Vario 800 shaft provides easy access to all EcoBloc modules. It can be used in many different ways:
- As an inspection shaft
- As an inlet shaft
- As a filter shaft
- As a flow control shaft

Easy to inspect
The Vario 800 shaft allows easy access to the EcoBloc system by commercially available inspection cameras. This has been confirmed by several independent testing authorities.

Lorry-bearing up to 60 tons
The GRAF Vario 800 shaft has a heavy-duty lorry-bearing capacity of 60 tons with an 800 mm (2' 7.5”) earth covering. The fibreglass reinforced material gives the shaft extra strength.

No additional excavation
The Vario 800 flex shaft system can be directly installed in an EcoBloc infiltration or detention system. The connection surfaces of the inspection channels in the Vario 800 flex shaft system are accurately matched to the EcoBloc system.

Connection surfaces up to DN 400 (16”)
The Vario 800 comes with DN200 (8”), DN300 (12”) and DN400 (16”) connection surfaces. The optional, freely rotat- ing inlet module can be connected to pipes of sizes DN150 (6”), DN200 (8”), DN250 (10”) and DN300 (12”).

Wide access
The Vario 800 is terminated at the top by GRAF telescopic dome shafts. With a clear width of 600 mm, it gives easy access to the shaft. The base of the shaft itself is 800 x 800 mm (2' 7.5”) x (2' 7.5”) in size, providing sufficient space for all possible applications.

Can be positioned in any location
The dimensions of the Vario 800 shaft enable free positioning within the EcoBloc system. The corner position enables the connection of large pipe diameters of up to DN400 (16”) on the two side panels. The central position offers ideal access to the inspection camera from all directions. Using the optional inlet module, a connection of up to DN300 (12”) can be made with a freely defined angle.

Alignment of inspection channels
The inspection channels allow complete checking and rinsing of the entire infiltration ditch. The inspection channels must run parallel to the length of the ditch and form a continuous tunnel. Access is normally via the end face DN 200 (8”) connections of the Vario 800 shafts. The inspection camera enters through an inspection shaft. This is ideally created with the Vario 800 shaft system and the two DN 200 (8”) inlets. The open internal structure of the EcoBloc inspect ditch elements permits very good illumination, making the infiltration system easier to inspect.
Vario 800 flex shaft

Vario 800 flex, type 1
shaft body for one or more layer of EcoBloc system

<table>
<thead>
<tr>
<th>Volume</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
<th>Weight</th>
<th>Colour</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>230 l (60.7 US gal.)</td>
<td>800 mm (2' 7.5&quot;)</td>
<td>800 mm (2' 7.5&quot;)</td>
<td>355 mm (1' 2&quot;)</td>
<td>16 kg (35.3 lbs)</td>
<td>grey</td>
<td>450050</td>
</tr>
</tbody>
</table>

Vario 800 flex, type 2
shaft body for two or more layer of EcoBloc system

<table>
<thead>
<tr>
<th>Volume</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
<th>Weight</th>
<th>Colour</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>420 l (109.5 US gal.)</td>
<td>800 mm (2' 7.5&quot;)</td>
<td>800 mm (2' 7.5&quot;)</td>
<td>660 mm (2' 2&quot;)</td>
<td>22 kg (48.5 lbs)</td>
<td>grey</td>
<td>450051</td>
</tr>
</tbody>
</table>

Vario 800 flex, base/cover set
base- and cover for Vario 800 flex shaft

<table>
<thead>
<tr>
<th>Item</th>
<th>Colour</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>set consisting out of Vario base- and cover plate</td>
<td>grey</td>
<td>450052</td>
</tr>
</tbody>
</table>

1. Stackable
To save space during transport and storage, the parts of the Vario 800 are stacked into each other. This minimizes transport costs and CO2 emissions.

2. Easy installation
Groups of four wall elements are connected in a few simple steps and without tools to form a single height unit of the Vario 800. The height can be easily adjusted to the EcoBloc tank depth. A shaft cover and base plate complete the element.

3. Ready
GRAF accessory components can now be added to the Vario 800 shaft as required.

Vario 800 flex shaft – Accessories

Accessories

Shaft components
Infiltration filter strainer DN 600 (24")
Made entirely from stainless steel, mesh width 0.75 mm (0.03")
Order no. 340523

Infiltration inlet module DN 600 (24")
Incl. profile seal for telescopic dome shaft; DN 150 (6")/ DN 200 (8")/ DN 250 (10")/ DN 300 (12") connections
Order no. 330360

Infiltration connecting piece 2000 DN 600 (24")
With DN 200 (8") contact surface, incl. profile seal, length 2000 mm (6' 7.5"), 750 mm (2' 5.5"), 500 mm (1' 7.7")
Order no. 371015

Infiltration connecting piece 2000 DN 600 (24")
With DN 200 (8") pipe connections, incl. profile seal, length 2000 mm (6' 7.5"), 750 mm (2' 5.5"), 500 mm (1' 7.7")
Order no. 371016

Vario 800 film cover – PE
Fitted film for optimum welding of Vario shafts – material PE-LD 3 mm (0.1")
Order no. 450505

Vario 800 film cover – PVC
Fitted film for optimum PVC packaging of Vario shafts – material PVC 3 mm (0.1")
Order no. 450508

Retention accessories

Choke drain 1 DN 100 (4")
Includes emergency overflow, connector seal DN 100 (4") and PE-HD pipe for film welding; adjustable discharge 1.0 l (0.3 US gal.); 2.0 l (0.5 US gal.); 5.0 l (1.3 US gal.) and 6.5 l (1.7 US gal.)/s
Order no. 369005

Choke drain 2 DN 150 (6")
Includes emergency overflow, connector seal DN 150 (6") and PE-HD pipe for film welding; discharge adjustable from 2.0 l (0.5 US gal.) to 16 l (4.2 US gal.)/s
Order no. 369006

Choke drain pack 3 floating choke drains
Includes emergency overflow and PE-HD pipe for film welding; discharge adjustable from 0.05 l (0.01 US gal.) to 2.1 l (0.5 US gal.)/s
Order no. 369007

Tank Covers

Mini telescopic dome shaft
Suitable for pedestrian loading, height adjustable from 140 - 340 mm (5.5" - 13.4")
Order no. 371010

Maxi telescopic dome shaft
Suitable for pedestrian loading, height adjustable from 140 - 440 mm (5.5" - 17.3")
Order no. 371011

Cast iron telescopic dome shaft
Suitable for vehicle loading, height adjustable from 140 - 440 mm (5.5" - 17.3")
Order no. 371020

Telescopic dome shaft lorry
Suitable for lorry bearing loading, height adjustable from 140 - 440 mm (5.5" - 17.3")
Order no. 371021

Vario 800 flex shaft – Stormwater management

1. Stackable
2. Easy installation
3. Ready

Otto Graf GmbH
## Technical data sheet

### Infiltration module

<table>
<thead>
<tr>
<th></th>
<th>Vario 800 flex type 1/ type 2</th>
<th>EcoBloc Inspect flex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross volume</td>
<td>230 l (60.7 US gal.) / 400 l (93.5 US gal.)</td>
<td>A 205 l (54.2 US gal.)</td>
</tr>
<tr>
<td>Net volume</td>
<td></td>
<td>D 195 l (51.5 US gal.)</td>
</tr>
<tr>
<td>Storage coefficient</td>
<td>100 %</td>
<td>D 96 %</td>
</tr>
<tr>
<td>Inspectable</td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>High pressure jetting possible</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Load

<table>
<thead>
<tr>
<th></th>
<th>Short-term</th>
<th>Long-term</th>
</tr>
</thead>
<tbody>
<tr>
<td>min. earth covering</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
</tr>
<tr>
<td>max. earth covering</td>
<td>2750 mm (9&quot;)</td>
<td>2750 mm (9&quot;)</td>
</tr>
<tr>
<td>max. installation depth</td>
<td>5000 mm (16.7&quot;)</td>
<td>5000 mm (16.7&quot;)</td>
</tr>
<tr>
<td>max. number of layers</td>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>

### Vehicle

<table>
<thead>
<tr>
<th></th>
<th>min. earth covering</th>
<th>max. earth covering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lorry 12/H-10/H-15</td>
<td>500 mm (19.7&quot;)</td>
<td>500 mm (19.7&quot;)</td>
</tr>
<tr>
<td>Lorry 30</td>
<td>500 mm (19.7&quot;)</td>
<td>500 mm (19.7&quot;)</td>
</tr>
<tr>
<td>Lorry 40/HS-20</td>
<td>500 mm (19.7&quot;)</td>
<td>500 mm (19.7&quot;)</td>
</tr>
<tr>
<td>Lorry 60/HS-25</td>
<td>500 mm (19.7&quot;)</td>
<td>500 mm (19.7&quot;)</td>
</tr>
</tbody>
</table>

### Connections

| DN 150 (6") | •       |
| DN 200 (8") | • 1)   |
| DN 250 (10")| •       |
| DN 300 (12")| • 2) 1) |
| DN 400 (16")| • 2) 1) |
| DN 500 (20")| •       |

### Measurements

<table>
<thead>
<tr>
<th></th>
<th>800 mm (31.5&quot;)</th>
<th>800 mm (31.5&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>800 mm (31.5&quot;)</td>
<td>800 mm (31.5&quot;)</td>
</tr>
<tr>
<td>Width</td>
<td>800 mm (31.5&quot;)</td>
<td>800 mm (31.5&quot;)</td>
</tr>
<tr>
<td>Height</td>
<td>320 mm (12.6&quot;) / 660 mm (26.2&quot;)</td>
<td>320 mm (12.6&quot;)</td>
</tr>
<tr>
<td>Weight</td>
<td>16 kg (35.3 lbs) / 27 kg (59.5 lbs)</td>
<td>8 kg (17.6 lbs)</td>
</tr>
</tbody>
</table>

1) Optionally available with Vario shaft
2) Optionally available with adaptor plates

### Stormwater management

<table>
<thead>
<tr>
<th>EcoBloc maxx</th>
<th>EcoBloc flex/maxx</th>
<th>EcoBloc light</th>
<th>EcoBloc flex/light</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>235 l (59.4 US gal.)</td>
<td>A + B</td>
<td>225 l (59.4 US gal.)</td>
</tr>
<tr>
<td>E</td>
<td>217 l (53.3 US gal.)</td>
<td>D + E</td>
<td>219 l (57.9 US gal.)</td>
</tr>
<tr>
<td></td>
<td>96 %</td>
<td></td>
<td>97 %</td>
</tr>
<tr>
<td></td>
<td>96 %</td>
<td></td>
<td>97 % – 99 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>max. 100 kN/m²</th>
<th>max. 85 kN/m²</th>
<th>max. 75 kN/m²</th>
<th>max. 53 kN/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without traffic load</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
</tr>
<tr>
<td></td>
<td>2750 mm (9&quot;)</td>
<td>2000 mm (6.6&quot;)</td>
<td>1750 mm (5.8&quot;)</td>
<td>1250 mm (4.1&quot;)</td>
</tr>
<tr>
<td></td>
<td>5000 mm (16.7&quot;)</td>
<td>5000 mm (16.7&quot;)</td>
<td>4000 mm (13.4&quot;)</td>
<td>4000 mm (13.4&quot;)</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>12</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>max. 100 kN/m²</th>
<th>max. 85 kN/m²</th>
<th>max. 75 kN/m²</th>
<th>max. 53 kN/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without traffic load</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
</tr>
<tr>
<td></td>
<td>2750 mm (9&quot;)</td>
<td>2000 mm (6.6&quot;)</td>
<td>1750 mm (5.8&quot;)</td>
<td>1250 mm (4.1&quot;)</td>
</tr>
<tr>
<td></td>
<td>5000 mm (16.7&quot;)</td>
<td>5000 mm (16.7&quot;)</td>
<td>4000 mm (13.4&quot;)</td>
<td>4000 mm (13.4&quot;)</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>12</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>max. 100 kN/m²</th>
<th>max. 85 kN/m²</th>
<th>max. 75 kN/m²</th>
<th>max. 53 kN/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without traffic load</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
</tr>
<tr>
<td></td>
<td>2750 mm (9&quot;)</td>
<td>2000 mm (6.6&quot;)</td>
<td>1750 mm (5.8&quot;)</td>
<td>1250 mm (4.1&quot;)</td>
</tr>
<tr>
<td></td>
<td>5000 mm (16.7&quot;)</td>
<td>5000 mm (16.7&quot;)</td>
<td>4000 mm (13.4&quot;)</td>
<td>4000 mm (13.4&quot;)</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>max. 100 kN/m²</th>
<th>max. 85 kN/m²</th>
<th>max. 75 kN/m²</th>
<th>max. 53 kN/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without traffic load</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
<td>250 mm (9.8&quot;)</td>
</tr>
<tr>
<td></td>
<td>2750 mm (9&quot;)</td>
<td>2000 mm (6.6&quot;)</td>
<td>1750 mm (5.8&quot;)</td>
<td>1250 mm (4.1&quot;)</td>
</tr>
<tr>
<td></td>
<td>5000 mm (16.7&quot;)</td>
<td>5000 mm (16.7&quot;)</td>
<td>4000 mm (13.4&quot;)</td>
<td>4000 mm (13.4&quot;)</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>11</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>
Infiltration with EcoBloc maxx

1. Telescopic dome shaft
   - Choice of pedestrian, car or HGV loading
   - Freely rotatable for optimum alignment to connecting line
   - Connections up to DN 300 (12”)
   - Stainless steel filter (mesh width 0.75 mm (0.03”)
   - Reliably filters out contamination

2. Infiltration inlet module DN 600 (24”)
   - Optimally aligned to EcoBloc Inspect flex
   - Wide range of possible shaft solutions
   - Connections up to DN 400 (16”)

3. Infiltration filter strainer
   - Lorry-bearing 40 tons/HS-20
   - 410 m³ (108,310 US gal.)/Truck

4. Vario 800 flex, type 2
   - For separate ventilation
   - For installation in green spaces

5. EcoBloc maxx
   - Lorry-bearing 40 tons/HS-20
   - 410 m³ (108,310 US gal.)/Truck

6. Deaeration end
   - DN 100 (4”)
   - For greater installation depths

7. Infiltration connecting piece 1000 DN 600 (24”)
   - For separate ventilation
   - For installation in green spaces

Page 27
Page 26
Page 22
Page 23
Page 27
Swale infiltration with EcoBloc light

1. Telescopic filter shaft 600
   - Choice of pedestrian, car or HGV loading
   Upon request

2. Vario 800 flex, type 1
   - Optimally aligned to EcoBloc Inspect flex
   - Wide range of possible shaft solutions
   - Connections up to DN 400 (16”)

3. EcoBloc light
   - Lorry-bearing 12 tons
   - 610 m³ (161,145 US gal.)/Truck

4. Deaeration end
   - DN 100 (4”)
   - For separate ventilation
   - For installation in green spaces

Page 23

Retention and rainwater harvesting with EcoBloc Inspect flex and maxx

1. Telescopic dome shaft lorry
   - Lorry-bearing up to 60 tons
   - Cover and compensating ring to be provided on site

2. Vario 800 flex, type 2
   - Optimally aligned to EcoBloc Inspect flex
   - Wide range of possible shaft solutions
   - Connections up to DN 400 (16”)

3. EcoBloc maxx
   - Lorry-bearing 40 tons/HS-20
   - 410 m³ (108,310 US gal.)/Truck

4. EcoBloc Inspect flex
   - Lorry-bearing 60 tons/HS-25
   - 150 m³ (39,600 US gal.)/Truck
   - Inspectable
   - High pressure jetting possible

5. Choke drain
   - Available from 0.05 l (0.01 US gal.) to 16 l (4.2 US gal.)/s
   - Optimised for use in the Vario 800 shaft

Page 22

6. Submersible pump
   - You can find pumps and other products for rainwater harvesting in our catalogue, “Rainwater harvesting solutions”

Page 27
Firefighting water with EcoBloc Inspect flex

- Telescopic dome shaft lorry
  - Lorry-bearing up to 60 tons
  - Cover and compensating ring to be provided on site
  - Page 27

- Infiltration inlet module DN 600 (24”)
  - Freely rotatable for optimum alignment to connecting line
  - Connections up to DN 300 (12”)
  - Page 27

- Vario 800 flex, type 2
  - Optimally aligned to EcoBloc Inspect flex
  - Wide range of possible shaft solutions
  - Connections up to DN 400 (16”)
  - Page 26

- EcoBloc Inspect flex
  - Lorry-bearing 60 tons/HS-25
  - 550 m³ (19,600 US gal.) Truck
  - Inspectable
  - High pressure jetting possible
  - Page 22

- Firefighting water accessories
  - Suction connection and ventilation integrated in the shaft
  - High-quality stainless steel components
  - Upon request
  - Page 23

- Deaeration end
  - DN 100 (4”)
  - For separate ventilation
  - For installation in green spaces
  - Page 23

- EcoBloc light
  - Lorry-bearing 12 tons
  - 610 m³ (1,645 US gal.) Truck
  - Inspectable
  - High pressure jetting possible
  - Page 23

- EcoBloc Inspect flex
  - Lorry-bearing 60 tons/HS-25
  - 550 m³ (19,600 US gal.) Truck
  - Inspectable
  - High pressure jetting possible
  - Page 22

- Submersible pump
  - You can find pumps and other products for rainwater harvesting in our catalogue, "Rainwater harvesting solutions"
Infiltration Tunnel / twin

The logistical miracle – can be laid in rows

Easy installation
The GRAF Infiltration Tunnels are laid in lines and can be flexibly adapted to specific conditions and to the individual storage volume requested. The installation of the modules is easy, quick and variable. The installation is possible without heavy equipment, as one Infiltration Tunnel only weighs 11 gram (24.3 lbs). The tunnel modules are simply stuck together in one line and equipped with 2 end plates per line.

Infiltration Tunnel twin – Twice the volume with the same space requirement
Upon request, the Infiltration Tunnel twin 600 litres (158 US gal.) offers volume through the connection of two identical Infiltration Tunnel modules.

Up to 12,000 litres infiltration volume per pallet
Thanks to its special design, the GRAF Infiltration Tunnel can be stacked easily. Consequently, the shipment of up to 40 Infiltration Tunnels on one pallet saves considerable transport and storage costs.

300 l Volume
The compact dimensions combined with a storage coefficient of 100 % result in a useful volume of 300 l (79 US gal.).

Lorry-bearing up to 60 tons
In order to enable the free arrangement of surfaces above it, the Infiltration Tunnel features long-term resistance with 59 kN/m² (Infiltration Tunnel twin 35 kN/m²) and is therefore lorry-bearing.

100 % storage volume
The typical shape of the Infiltration Tunnel enables complete utilisation of the available volume for the temporary storage of rainwater.

Connections up to DN 300 (12”)
Large infiltration volumes require large pipe diameters. For the GRAF Infiltration Tunnel, this is not a problem: each end plate features connections in the sizes DN 100 (4”), 150 (6”), 200 (8”) and 300 (12”). In addition, connections in the sizes DN 100 (4”) and 200 (8”) are provided on the upper surface for the connection of a ventilation system or an inspection opening.

Installation depth of over 4 metres (13’ 1.5”)
The GRAF Infiltration Tunnel can be installed at a depth of up to 4.25 metres (13’ 11”), even under heavy loads. The maximum installation depth for the Infiltration Tunnel twin is 2.5 metres (8’ 2.4”).

High infiltration performance
The ditch elements are placed directly upon an even layer of gravel. The sides are then covered with geotextile and the end faces are closed using end plates. This installation and the side slats ensure a permanent high infiltration performance.

Stormwater management ▸ Infiltration Tunnel / twin

CO₂

up to 500,000 litres per lorry
975 items per 40” HC container
Infiltration Tunnel / twin

Infiltration Tunnel lorry

<table>
<thead>
<tr>
<th>Volume</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
<th>Weight</th>
<th>Colour</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 l</td>
<td>1060 mm</td>
<td>800 mm</td>
<td>550 mm</td>
<td>11 kg</td>
<td>black</td>
<td>230040</td>
</tr>
<tr>
<td>(79 US gal.)</td>
<td>(33.1&quot;)</td>
<td>(31.5&quot;)</td>
<td>(21.6&quot;)</td>
<td>(24.2 lbs)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Webcode G4101

Infiltration Tunnel twin car

Consisting of two tunnels and 1 set of click-bolt connectors

<table>
<thead>
<tr>
<th>Volume</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
<th>Weight</th>
<th>Colour</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 l</td>
<td>1160 mm</td>
<td>800 mm</td>
<td>510 mm</td>
<td>22 kg</td>
<td>black</td>
<td>410130</td>
</tr>
<tr>
<td>(158 US gal.)</td>
<td>(45.7&quot;)</td>
<td>(31.5&quot;)</td>
<td>(20&quot;)</td>
<td>(48.8 lbs)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Webcode G4104

End plate for Infiltration Tunnel / twin

<table>
<thead>
<tr>
<th>Item</th>
<th>Colour</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>End plates (Set of 2 units)</td>
<td>black</td>
<td>230004</td>
</tr>
</tbody>
</table>

- Infiltration modules

<table>
<thead>
<tr>
<th>Infiltration module</th>
<th>Infiltration Tunnel lorry</th>
<th>Infiltration Tunnel twin car</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross / net volume</td>
<td>300 litres (79 US gal.)</td>
<td>600 litres (158 US gal.)</td>
</tr>
</tbody>
</table>

- Load

<table>
<thead>
<tr>
<th>Load</th>
<th>Short-term</th>
<th>Long-term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>max. 100 kN/m²</td>
<td>max. 75 kN/m²</td>
</tr>
<tr>
<td>Load</td>
<td>max. 59 kN/m²</td>
<td>max. 35 kN/m²</td>
</tr>
</tbody>
</table>

- Without traffic load

<table>
<thead>
<tr>
<th>Load</th>
<th>min. earth covering</th>
<th>max. earth covering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>250 mm (9.8&quot;)</td>
<td>500 mm (19.7&quot;)</td>
</tr>
<tr>
<td>Load</td>
<td>250 mm (9.8&quot;)</td>
<td>500 mm (19.7&quot;)</td>
</tr>
</tbody>
</table>

- Vehicle

<table>
<thead>
<tr>
<th>Load</th>
<th>max. earth covering</th>
<th>max. installation depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>3750 mm (147&quot;)</td>
<td>4500 mm (177&quot;)</td>
</tr>
<tr>
<td>Load</td>
<td>3750 mm (147&quot;)</td>
<td>4500 mm (177&quot;)</td>
</tr>
</tbody>
</table>

- Lorry 12/H-10/H-15

<table>
<thead>
<tr>
<th>Load</th>
<th>min. earth covering</th>
<th>max. earth covering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>500 mm (19.7&quot;)</td>
<td>1500 mm (59.1&quot;)</td>
</tr>
<tr>
<td>Load</td>
<td>500 mm (19.7&quot;)</td>
<td>1500 mm (59.1&quot;)</td>
</tr>
</tbody>
</table>

- Lorry 30

<table>
<thead>
<tr>
<th>Load</th>
<th>min. earth covering</th>
<th>max. earth covering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>500 mm (19.7&quot;)</td>
<td>2500 mm (98.4&quot;)</td>
</tr>
<tr>
<td>Load</td>
<td>500 mm (19.7&quot;)</td>
<td>2500 mm (98.4&quot;)</td>
</tr>
</tbody>
</table>

- Lorry 40/H-20

<table>
<thead>
<tr>
<th>Load</th>
<th>min. earth covering</th>
<th>max. earth covering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>750 mm (29.5&quot;)</td>
<td>1750 mm (68.9&quot;)</td>
</tr>
<tr>
<td>Load</td>
<td>750 mm (29.5&quot;)</td>
<td>1750 mm (68.9&quot;)</td>
</tr>
</tbody>
</table>

- Lorry 60/H-25

<table>
<thead>
<tr>
<th>Load</th>
<th>min. earth covering</th>
<th>max. earth covering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>2550 mm (99.6&quot;)</td>
<td>3250 mm (128&quot;)</td>
</tr>
<tr>
<td>Load</td>
<td>2550 mm (99.6&quot;)</td>
<td>3250 mm (128&quot;)</td>
</tr>
</tbody>
</table>

- Connections on front

| DN 100 (4") | 2 x | 4 x |
| DN 150 (6") | 1 x | 2 x |
| DN 200 (8") | 1 x | 2 x |
| DN 300 (12") | 1 x | 2 x |

- Connections on top

| DN 100 (4") | 1 x |
| DN 200 (8") | 1 x |

- Measurements

| Length (incl. end plates) | 1160 mm (45.7") | 1220 mm (48") |
| Width (incl. end plates)  | 800 mm (31.5") | 1020 mm (40.2") |
| Height (incl. end plates) | 510 mm (20")  | 1020 mm (40.2") |
| Weight                   | approx. 11 kilos (24.2 lbs) | approx. 2 x 11 kilos (2 x 24.2 lbs) |

- GRAF-Tex geotextile

For one Infiltration Tunnel

Size of 2.50 x 2.50 m (8’ 2.4” x 8’ 2.4”)

Order no. 231006

- GRAF click-bolt connectors

Connector for Infiltration Tunnel twin (set of 6 for one Infiltration Tunnel twin car)

Order no. 410094

- Stormwater management

Infiltration Tunnel / twin

Stormwater management

▸ Infiltration Tunnel / twin
Infiltration Tunnel / twin

Areas of application

Ditch infiltration with Infiltration Tunnel

- Telescopic dome shaft
  - Choice of pedestrian, car or HGV loading
  - Can be laid in rows

- Infiltration shaft DN 400 (16’)
  - 2 x DN 150 (6’)
  - For connections of up to DN 150 (6’)

- Infiltration Tunnel
  - The logistical miracle – can be laid in rows

- Inspection end
  - DN 200 (8’)

Combined rainwater harvesting and infiltration with Infiltration Tunnel

- Rainwater harvesting
  - You can find more information about our Carat S Rainwater tank in our catalogue, “Rainwater harvesting solutions”

- Infiltration Tunnel
  - The logistical miracle – can be laid in rows

- Inspection end
  - DN 200 (8’)

- Deaeration end
  - DN 100 (4’)
  - For separate ventilation
Infiltration Tunnel / twin

Areas of application

Ditch infiltration with Infiltration Tunnel twin

1. Telescopic dome shaft
   - Choice of pedestrian, car or HGV loading
   - Page 51

2. Infiltration shaft DN 600 (24”)
   - 2 x DN 150 (6”)
   - For connections of up to DN 150 (6”)
   - Page 51

3. Infiltration Tunnel twin
   - Twice the volume with the same space requirement
   - Page 42

4. Deaeration end
   - DN 100 (4”)
   - For separate ventilation
   - Page 42

Combined wastewater treatment and infiltration with Infiltration Tunnel

1. Wastewater treatment
   - You can find more information about wastewater treatment in our catalogue, “Wastewater Treatment Solutions”
   - Page 42

2. Infiltration Tunnel
   - The logistical miracle – can be laid in rows
   - Page 42

3. Inspection end
   - DN 200 (8”)
   - Page 42

4. Deaeration end
   - DN 100 (4”)
   - For separate ventilation
   - Page 42
Infiltration and Multi shaft system

<table>
<thead>
<tr>
<th>Filter type</th>
<th>Material</th>
<th>Mesh width</th>
<th>Soil volume</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber type A</td>
<td>PP</td>
<td>0.35 mm (0.01&quot;)</td>
<td>15 l (4 US gal.)</td>
<td>with lifting device</td>
</tr>
<tr>
<td>Fiber type B</td>
<td>Stainless steel</td>
<td>0.75 mm (0.03&quot;)</td>
<td>25 l (6.6 US gal.)</td>
<td>with lifting device</td>
</tr>
<tr>
<td>Fiber type C</td>
<td>galvanised PP</td>
<td>&lt; 0.50 mm (0.02&quot;)</td>
<td>20 l (5.3 US gal.)</td>
<td>Coarse filter with lifting device, Fine filter</td>
</tr>
<tr>
<td>Fiber type D</td>
<td>PP</td>
<td>0.35 mm (0.01&quot;)</td>
<td>17 l (4.5 US gal.)</td>
<td>with lifting device</td>
</tr>
</tbody>
</table>
Infiltration shaft system
DN 400 (16”)

Covers

Telescopic dome shaft 400
With PE cover, suitable for pedestrian loading, colour: grass green
Order no. 340053

Retaining accessories

Telescopic dome shaft 400
With cast iron cover, suitable for vehicle loading max. load 3.5 t, colour: black
Order no. 340054

Telescopic filter shaft 400
With slotted cast iron cover, suitable for vehicle loading max. load 3.5 t, incl. coarse filter insert and fine filter basket (0.35 mm (0.01”) mesh width), colour: black
Order no. 340126

Individual components

Infiltration distributor module DN 400 (16”)
Incl. profile seal for infiltration connecting piece and/or inlet module; 2 x DN 150 (6”) connections; mounting surface for connections of up to DN 150 (6”)
Order no. 330340

Infiltration choke drain
Infiltration DN 100 (4”); delayed drain of 1.0 (0.3 US gal.)/sec. up to 6.5 l (1.7 US gal.)/sec.
Order no. 330547

Infiltration connecting piece DN 400 (16”)
To produce greater installation depths, effective length: 500 mm (19.7”), can be shortened to 250 mm (9.8”)
Order no. 330341

Infiltration inlet module DN 400 (16”)
Incl. profile seal for telescopic dome shaft; DN 150 (6”)/DN 200 (8”) connections
Order no. 330339

Infiltration filter basket
DN 400 (16”)
Mesh width 0.35 mm (0.01”)
Order no. 340524

Infiltration distributor module DN 600 (24”)
Incl. profile seal for infiltration connecting piece and/or inlet module; 2 x DN 150 (6”) connections; mounting surface for connections of up to DN 150 (6”)
Order no. 330340

Infiltration choke drain
Infiltration DN 100 (4”); delayed drain of 2 l (0.5 US gal.)/sec. up to 16 l (4.2 US gal.)/sec.
Order no. 330561

Individual components

Infiltration filter strainer DN 600 (24”)
Made entirely from stainless steel, mesh width 0.75 mm (0.03”)
Order no. 340523

Infiltration connecting piece 1000 DN 600 (24”)
With DN 200 (8”) pipe connections, incl. profile seal, length 1000 mm (3’ 3.3”), 750 mm (2’ 5.5”), 500 mm (1’ 7.7”)
Order no. 371016

Infiltration inlet module DN 600 (24”)
Incl. profile seal for telescopic dome shaft; DN 150 (6”)/DN 200 (8”)/DN 250 (10”)/DN 300 (12”) connections
Order no. 330360

Infiltration choke drain
Connection DN 150 (6”); delayed drain of 2 l (0.5 US gal.)/sec. up to 16 l (4.2 US gal.)/sec.
Order no. 330598

Retention accessories

Infiltration choke drain
Connection DN 150 (6”); delayed drain of 2 l (0.5 US gal.)/sec. up to 16 l (4.2 US gal.)/sec.
Order no. 330598
Universal filter

Universal filter 3 external
- Suitable for pedestrian loading
  Order no. 340020
- Suitable for vehicle loading
  Order no. 340021

Universal industrial filter 3 external
- For maximum flow rate of up to 29.5 l/sec.
- Continuously variable installation depth of 703 – 1270 mm (26.7 – 50.0") using the telescopic dome shaft
- Maximum flow rate of 16 l/sec. with DN 150 (6") connections
- Only 229 mm (9") height offset between the inlet and outlet

Universal industrial filter 3 external
- Suitable for pedestrian loading
  Order no. 340550
- Suitable for vehicle loading
  Order no. 340551

Infiltration filter strainer DN 600 (24")
- Made entirely from stainless steel, mesh width 0.25 mm (0.01")
- Order no. 340523

Connection dimensions

<table>
<thead>
<tr>
<th>Connection</th>
<th>DN 150 (6&quot;)/100 (4&quot;)</th>
<th>DN 200 (8&quot;)/150 (6&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet</td>
<td>DN 150 (6&quot;)</td>
<td>DN 200 (8&quot;)</td>
</tr>
<tr>
<td>Outlet</td>
<td>DN 150 (6&quot;)</td>
<td>DN 200 (8&quot;)</td>
</tr>
<tr>
<td>Emergency overflow</td>
<td>DN 150 (6&quot;)/200 (8&quot;)</td>
<td>DN 150 (6&quot;)/200 (8&quot;)</td>
</tr>
</tbody>
</table>

All dimensions from middle of connection to ground level

Replacement filter basket
Filter insert with practical lift-out device

Order no. 340524

Infiltration filter shaft / settling filter shaft

Infiltration filter shaft
- 3-stage cleaning process
  - Coarse filter insert
  - Fine filter basket 0.35 mm (0.01") mesh width
- Sedimentation zone
  - Retains contaminants which may affect infiltration performance
- Ideal as a courtyard inlet structure or a trough-trench overflow element
- Suitable for vehicle loading with cast iron cover 3.5 t
- Continuously variable installation depth of 570 – 1050 mm (22.4" – 41.3") using telescopic dome shaft Ø 400 mm
- Maximum flow rate of 5.5 l/sec. with DN 100 (4") and DN 150 (6") connections

Order no. 340245

Infiltration connecting piece DN 400 (16")
To produce greater installation depths, effective length: 500 mm (19.7"), can be shortened to 250 mm (9.8")

Order no. 330341

Infiltration filter shaft
- Suitable for vehicle loading
- To produce greater installation depths, all dimensions from middle of connection to ground level

Order no. 340026

Settling filter shaft
- 3-stage cleaning process
  - Coarse filter basket 0.35 mm (0.01") mesh width
- Immersion pipe as separator
- Continuously variable installation depth of 500 – 1600 mm (20” – 63") using telescopic dome shaft Ø 600 mm
- Pedestrian loading with plastic cover, or suitable for vehicle loading with cast iron cover 3.5 t
- Lockable childproof cover
- Sealed to top edge of ground
- Maximum flow rate of 16 l/sec. with DN 150 (6")
- DN 150 (6") connections

Order no. 340277

Infiltration connecting piece DN 400 (16")
With DN 200 (8") contact surface, incl. profile seal, length 1000 mm (3’ 3’’), 750 mm (2’ 5’’), 500 mm (1’ 7’’)

Order no. 330341

Settling filter shaft
- Suitable for vehicle loading
- Order no. 340277

Order no. 34026
Stormwater management

Light fluid separator

Separators for light fluid liquids class I – II
Separators are needed wherever water is contaminated with oils and other light liquids. Separator systems are classified according to NS (nominal size). When you submit an enquiry for a separator system, we calculate the NS you require based on the EN 858 part 2. Operators of the following facilities must ensure that a suitable, functioning separator is installed:

- Car washes, workshops, fuel stations,
- Vehicle fleets, hazardous goods stores,
- Residential properties, commercial buildings,
- Industrial plants.

Coalescence separator and fuel separator
The KLsepa.compact separator systems are coalescence separators of class I. They feature an additional coalescence unit that enables a much higher degree of separation. The KLsepa.compact separator systems are fuel separators of class II. A fuel separator achieves a degree of separation of less than 100 mg residual oil per litre of water. With a coalescence unit, this can be reduced to less than 5 mg/l.

In addition to easily separable drops of oil, a light fluid separator also contains very fine oil droplets whose density is not sufficiently different from water for them to rise to the surface in the available time. These droplets therefore remain in the outflowing water.

To separate out these smaller droplets, a coalescence material is fitted before the discharge to which the droplets stick and form an oil film.

As more oil flows in, the film becomes thicker until it can no longer adhere to the material. Individual drops break off the film, which are large enough to rise to the surface through difference in density and be separated out.

Notice
Warning systems available

Dimensions Saphir

<table>
<thead>
<tr>
<th>NS (l/h)</th>
<th>DN [mm]</th>
<th>Length [mm]</th>
<th>Width [mm]</th>
<th>Height [mm]</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>(6.79 US gal./s)</td>
<td>150 (6&quot; )</td>
<td>1155 (45.3&quot;)</td>
<td>1155 (45.3&quot;)</td>
<td>770 – 1990</td>
</tr>
<tr>
<td>3</td>
<td>(6.79 US gal./s)</td>
<td>150 (6&quot;)</td>
<td>1155 (45.3&quot;)</td>
<td>1155 (45.3&quot;)</td>
<td>2100 – 2310</td>
</tr>
<tr>
<td>3</td>
<td>(2.64 US gal./s)</td>
<td>150 (6&quot;)</td>
<td>1155 (45.3&quot;)</td>
<td>1155 (45.3&quot;)</td>
<td>2100 – 2310</td>
</tr>
<tr>
<td>3</td>
<td>(1.60 US gal./s)</td>
<td>150 (6&quot;)</td>
<td>1155 (45.3&quot;)</td>
<td>1155 (45.3&quot;)</td>
<td>2100 – 2310</td>
</tr>
</tbody>
</table>

Dimensions Diamant

<table>
<thead>
<tr>
<th>NS (l/h)</th>
<th>DN [mm]</th>
<th>Length [mm]</th>
<th>Width [mm]</th>
<th>Height [mm]</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>(3.96 US gal./s)</td>
<td>200 (8&quot;)</td>
<td>1400 (55&quot;)</td>
<td>1400 (55&quot;)</td>
<td>300 – 500</td>
</tr>
<tr>
<td>10</td>
<td>(6.79 US gal./s)</td>
<td>200 (8&quot;)</td>
<td>1400 (55&quot;)</td>
<td>1400 (55&quot;)</td>
<td>300 – 500</td>
</tr>
<tr>
<td>15</td>
<td>(2.64 US gal./s)</td>
<td>200 (8&quot;)</td>
<td>1400 (55&quot;)</td>
<td>1400 (55&quot;)</td>
<td>300 – 500</td>
</tr>
</tbody>
</table>

Effective separation according to EN 858 tested by TÜV Rheinland.
Rainwater detention and retention

Retention

The GRAF retention cistern is a combination of rainwater retention and rainwater harvesting. The detention can be larger if required. In this case, part of the rainwater can also be used in addition to the required detention volume. For example, rainwater can be used for the following applications:
- Watering gardens
- Flushing toilets
- Washing machines
- Cleaning

The use of rainwater means that up to 50% of drinking water can be saved, and up to 85% for commercial properties.

Detention

Detention systems, i.e. rainwater detention, play an important role in the reduction of hydraulic peaks and thus help relieve strain on the public sewer network, particularly in new construction areas. Detention systems usually consist of a volume which is used for the temporary storage of rainwater in the event of heavy rainfall, and a throttling device to limit the draining runoff water. The rainwater is cleaned using a filter before it enters the detention volume in order to avoid compromising the function of the throttling device. The throttled flow of rainfall is fed into the sewer and the excess amount is retained in the detention cistern. This amount accumulates in the detention cistern and is also drained off with the throttled runoff water after the rainfall event. The detention volume is thus discharged and remains available once more as a temporary storage tank for the next rainfall event.

Retention cistern

1. Outflow rate without throttle
2. Outflow rate with static throttle
3. Outflow rate with dynamic throttle

Flow rate in l/sec. | Storage volume holds
--- | ---
1 | 1. Outflow rate without throttle
2 | 2. Outflow rate with static throttle
3 | 3. Outflow rate with dynamic throttle

Detention

Detention systems, i.e. rainwater detention, play an important role in the reduction of hydraulic peaks and thus help relieve strain on the public sewer network, particularly in new construction areas. Detention systems usually consist of a volume which is used for the temporary storage of rainwater in the event of heavy rainfall, and a throttling device to limit the draining runoff water. The rainwater is cleaned using a filter before it enters the detention volume in order to avoid compromising the function of the throttling device. The throttled flow of rainfall is fed into the sewer and the excess amount is retained in the detention cistern. This amount accumulates in the detention cistern and is also drained off with the throttled runoff water after the rainfall event. The detention volume is thus discharged and remains available once more as a temporary storage tank for the next rainfall event.
Carat S underground tank
Detention cistern

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Width W</th>
<th>Length L</th>
<th>Height H</th>
<th>Inlet I1</th>
<th>Inlet I2</th>
<th>Inlet I1*</th>
<th>Inlet I2*</th>
<th>Outlet O1</th>
<th>Outlet O2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,700 l</td>
<td>1755 mm</td>
<td>2280 mm</td>
<td>2200 mm</td>
<td>1590 mm</td>
<td>1590 mm</td>
<td>1590 mm</td>
<td>1590 mm</td>
<td>2040 mm</td>
<td>2040 mm</td>
</tr>
<tr>
<td>(700 US gal.)</td>
<td>(6' 4.9&quot;)</td>
<td>(7' 5.8&quot;)</td>
<td>(7' 8.2&quot;)</td>
<td>(5' 2.6&quot;)</td>
<td>(5' 2.6&quot;)</td>
<td>(5' 2.6&quot;)</td>
<td>(5' 2.6&quot;)</td>
<td>(6' 8.3&quot;)</td>
<td>(6' 8.3&quot;)</td>
</tr>
<tr>
<td>3,750 l</td>
<td>1985 mm</td>
<td>2390 mm</td>
<td>2430 mm</td>
<td>1820 mm</td>
<td>1820 mm</td>
<td>1820 mm</td>
<td>1820 mm</td>
<td>2550 mm</td>
<td>2550 mm</td>
</tr>
<tr>
<td>(1,000 US gal.)</td>
<td>(6' 6.2&quot;)</td>
<td>(7' 10.0&quot;)</td>
<td>(8' 0.7&quot;)</td>
<td>(5' 11.7&quot;)</td>
<td>(5' 11.7&quot;)</td>
<td>(5' 11.7&quot;)</td>
<td>(5' 11.7&quot;)</td>
<td>(8' 4.4&quot;)</td>
<td>(8' 4.4&quot;)</td>
</tr>
<tr>
<td>4,800 l</td>
<td>2190 mm</td>
<td>2500 mm</td>
<td>2430 mm</td>
<td>2100 mm</td>
<td>2100 mm</td>
<td>2100 mm</td>
<td>2100 mm</td>
<td>2465 mm</td>
<td>2465 mm</td>
</tr>
<tr>
<td>(1,250 US gal.)</td>
<td>(7' 2.2&quot;)</td>
<td>(8' 0.9&quot;)</td>
<td>(8' 1.1&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(9' 1&quot;)</td>
<td>(9' 1&quot;)</td>
</tr>
<tr>
<td>6,500 l</td>
<td>2190 mm</td>
<td>2500 mm</td>
<td>2710 mm</td>
<td>2100 mm</td>
<td>2100 mm</td>
<td>2100 mm</td>
<td>2100 mm</td>
<td>2465 mm</td>
<td>2465 mm</td>
</tr>
<tr>
<td>(1,700 US gal.)</td>
<td>(7' 2.2&quot;)</td>
<td>(8' 0.9&quot;)</td>
<td>(8' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(9' 1&quot;)</td>
<td>(9' 1&quot;)</td>
</tr>
</tbody>
</table>

Please refer to the installation instructions for groundwater installation and loading capacity.

Rainwater harvesting solutions
For more information about our Carat S Rainwater tank please refer to our brochure "Rainwater harvesting solutions".

Carat S underground tank retention cistern

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Detention volume</th>
<th>Usage volume</th>
<th>Width W</th>
<th>Length L</th>
<th>Height H</th>
<th>Inlet I1</th>
<th>Inlet I2</th>
<th>Inlet I1*</th>
<th>Inlet I2*</th>
<th>Outlet O1</th>
<th>Outlet O2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,750 l</td>
<td>1,500 l</td>
<td>1,250 l</td>
<td>1755 mm</td>
<td>2280 mm</td>
<td>2200 mm</td>
<td>1590 mm</td>
<td>1590 mm</td>
<td>2040 mm</td>
<td>2040 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(990 US gal.)</td>
<td>(730 US gal.)</td>
<td>(730 US gal.)</td>
<td>(6' 4.9&quot;)</td>
<td>(7' 5.8&quot;)</td>
<td>(7' 8.2&quot;)</td>
<td>(5' 2.6&quot;)</td>
<td>(5' 2.6&quot;)</td>
<td>(6' 8.3&quot;)</td>
<td>(6' 8.3&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,750 l</td>
<td>2,000 l</td>
<td>1,750 l</td>
<td>1985 mm</td>
<td>2390 mm</td>
<td>2430 mm</td>
<td>1820 mm</td>
<td>1820 mm</td>
<td>2550 mm</td>
<td>2550 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1,000 US gal.)</td>
<td>(800 US gal.)</td>
<td>(800 US gal.)</td>
<td>(6' 6.2&quot;)</td>
<td>(7' 10.0&quot;)</td>
<td>(8' 0.7&quot;)</td>
<td>(5' 11.7&quot;)</td>
<td>(5' 11.7&quot;)</td>
<td>(8' 4.4&quot;)</td>
<td>(8' 4.4&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4,800 l</td>
<td>2,500 l</td>
<td>2,300 l</td>
<td>2190 mm</td>
<td>2500 mm</td>
<td>2430 mm</td>
<td>2100 mm</td>
<td>2100 mm</td>
<td>2465 mm</td>
<td>2465 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1,250 US gal.)</td>
<td>(1,200 US gal.)</td>
<td>(1,100 US gal.)</td>
<td>(7' 2.2&quot;)</td>
<td>(8' 0.9&quot;)</td>
<td>(8' 1.1&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(9' 1&quot;)</td>
<td>(9' 1&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6,500 l</td>
<td>3,000 l</td>
<td>2,500 l</td>
<td>2190 mm</td>
<td>2500 mm</td>
<td>2710 mm</td>
<td>2100 mm</td>
<td>2100 mm</td>
<td>2465 mm</td>
<td>2465 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1,700 US gal.)</td>
<td>(1,500 US gal.)</td>
<td>(1,400 US gal.)</td>
<td>(7' 2.2&quot;)</td>
<td>(8' 0.9&quot;)</td>
<td>(8' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(9' 1&quot;)</td>
<td>(9' 1&quot;)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please refer to the installation instructions for groundwater installation and loading capacity.

Figure shows Carat S detention cistern, tank cover on page 51

Carat S underground tank retention cistern

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Detention volume</th>
<th>Usage volume</th>
<th>Width W</th>
<th>Length L</th>
<th>Height H</th>
<th>Inlet I1</th>
<th>Inlet I2</th>
<th>Inlet I1*</th>
<th>Inlet I2*</th>
<th>Outlet O1</th>
<th>Outlet O2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,750 l</td>
<td>1,500 l</td>
<td>1,250 l</td>
<td>1755 mm</td>
<td>2280 mm</td>
<td>2200 mm</td>
<td>1590 mm</td>
<td>1590 mm</td>
<td>2040 mm</td>
<td>2040 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(990 US gal.)</td>
<td>(730 US gal.)</td>
<td>(730 US gal.)</td>
<td>(6' 4.9&quot;)</td>
<td>(7' 5.8&quot;)</td>
<td>(7' 8.2&quot;)</td>
<td>(5' 2.6&quot;)</td>
<td>(5' 2.6&quot;)</td>
<td>(6' 8.3&quot;)</td>
<td>(6' 8.3&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,750 l</td>
<td>2,000 l</td>
<td>1,750 l</td>
<td>1985 mm</td>
<td>2390 mm</td>
<td>2430 mm</td>
<td>1820 mm</td>
<td>1820 mm</td>
<td>2550 mm</td>
<td>2550 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1,000 US gal.)</td>
<td>(800 US gal.)</td>
<td>(800 US gal.)</td>
<td>(6' 6.2&quot;)</td>
<td>(7' 10.0&quot;)</td>
<td>(8' 0.7&quot;)</td>
<td>(5' 11.7&quot;)</td>
<td>(5' 11.7&quot;)</td>
<td>(8' 4.4&quot;)</td>
<td>(8' 4.4&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4,800 l</td>
<td>2,500 l</td>
<td>2,300 l</td>
<td>2190 mm</td>
<td>2500 mm</td>
<td>2430 mm</td>
<td>2100 mm</td>
<td>2100 mm</td>
<td>2465 mm</td>
<td>2465 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1,250 US gal.)</td>
<td>(1,200 US gal.)</td>
<td>(1,100 US gal.)</td>
<td>(7' 2.2&quot;)</td>
<td>(8' 0.9&quot;)</td>
<td>(8' 1.1&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(9' 1&quot;)</td>
<td>(9' 1&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6,500 l</td>
<td>3,000 l</td>
<td>2,500 l</td>
<td>2190 mm</td>
<td>2500 mm</td>
<td>2710 mm</td>
<td>2100 mm</td>
<td>2100 mm</td>
<td>2465 mm</td>
<td>2465 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1,700 US gal.)</td>
<td>(1,500 US gal.)</td>
<td>(1,400 US gal.)</td>
<td>(7' 2.2&quot;)</td>
<td>(8' 0.9&quot;)</td>
<td>(8' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(6' 10.7&quot;)</td>
<td>(9' 1&quot;)</td>
<td>(9' 1&quot;)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please refer to the installation instructions for groundwater installation and loading capacity.

Figure shows Carat S retention cistern, tank cover on page 51
Platin flat tank
Detention cistern

Figure shows Platin detention cistern, tank cover on page 51

<table>
<thead>
<tr>
<th>Volume</th>
<th>Detention volume</th>
<th>Usage volume</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,500 l</td>
<td>1,500 l</td>
<td>2,000 l</td>
<td>390300</td>
</tr>
<tr>
<td>(400 US gal)</td>
<td></td>
<td>(520 US gal)</td>
<td></td>
</tr>
<tr>
<td>3,000 l</td>
<td>3,000 l</td>
<td>4,500 l</td>
<td>390301</td>
</tr>
<tr>
<td>(800 US gal)</td>
<td></td>
<td>(1,200 US gal)</td>
<td></td>
</tr>
<tr>
<td>5,000 l</td>
<td>5,000 l</td>
<td>6,000 l</td>
<td>390312</td>
</tr>
<tr>
<td>(1,350 US gal)</td>
<td></td>
<td>(1,700 US gal)</td>
<td></td>
</tr>
<tr>
<td>7,500 l</td>
<td>7,500 l</td>
<td>9,000 l</td>
<td>390315</td>
</tr>
<tr>
<td>(2,000 US gal)</td>
<td></td>
<td>(2,650 US gal)</td>
<td></td>
</tr>
<tr>
<td>10,000 l</td>
<td>10,000 l</td>
<td>12,000 l</td>
<td>390321</td>
</tr>
<tr>
<td>(2,650 US gal)</td>
<td></td>
<td>(3,200 US gal)</td>
<td></td>
</tr>
</tbody>
</table>

Scope of supply: Platin tank, floating choke drain and hose. Cover has to be ordered separately, page 51

Platin flat tank retention cistern

For combined rainwater detention and rainwater harvesting, including retention accessories

<table>
<thead>
<tr>
<th>Volume</th>
<th>Detention volume</th>
<th>Usage volume</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,000 l</td>
<td>3,000 l</td>
<td>4,000 l</td>
<td>390312</td>
</tr>
<tr>
<td>(800 US gal)</td>
<td></td>
<td>(1,000 US gal)</td>
<td></td>
</tr>
<tr>
<td>5,000 l</td>
<td>5,000 l</td>
<td>6,000 l</td>
<td>390315</td>
</tr>
<tr>
<td>(1,350 US gal)</td>
<td></td>
<td>(1,700 US gal)</td>
<td></td>
</tr>
<tr>
<td>7,500 l</td>
<td>7,500 l</td>
<td>9,000 l</td>
<td>390324</td>
</tr>
<tr>
<td>(2,000 US gal)</td>
<td></td>
<td>(2,650 US gal)</td>
<td></td>
</tr>
<tr>
<td>10,000 l</td>
<td>10,000 l</td>
<td>12,000 l</td>
<td>390321</td>
</tr>
<tr>
<td>(2,650 US gal)</td>
<td></td>
<td>(3,200 US gal)</td>
<td></td>
</tr>
</tbody>
</table>

Scope of supply: Platin tank, floating choke drain and hose. Cover has to be ordered separately, page 51

Please refer to the installation instructions for groundwater installation and loading capacity.

THE VOLUME DISTRIBUTION (DETENTION VOLUME/USAGE VOLUME) CAN BE INDIVIDUALLY MANUFACTURED ACCORDING TO YOUR SPECIFICATIONS.

Rainwater harvesting solutions For more information about our Platin flat tank please refer to our brochure "Rainwater harvesting solutions"
Carat XL underground tank detection / retention cistern

**Carat XL underground tank**

Suitable for vehicle / lorry 12 t

- Suitable for HGV loading up to 12 t
- Can be mounted in groundwater
- Lower weight than concrete and steel
- Various connection surfaces DN 100 (4") / 150 (6")
- Investment security thanks to a 15 year warranty
- Can be used as detention or retention cistern

**Carat XL underground tank detention**

**Total volume / Detention volume**

<table>
<thead>
<tr>
<th>Volume</th>
<th>Weight</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,500 l</td>
<td>380 kg</td>
<td>370544</td>
</tr>
<tr>
<td>(2,242 US gal.)</td>
<td>(838 lbs)</td>
<td></td>
</tr>
<tr>
<td>10,000 l</td>
<td>456 kg</td>
<td>370545</td>
</tr>
<tr>
<td>(2,640 US gal.)</td>
<td>(1,005 lbs)</td>
<td></td>
</tr>
</tbody>
</table>

**Carat XL underground tank retention cistern**

**Total volume**

<table>
<thead>
<tr>
<th>Volume</th>
<th>Weight</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,500 l</td>
<td>380 kg</td>
<td>370523</td>
</tr>
<tr>
<td>(2,242 US gal.)</td>
<td>(838 lbs)</td>
<td></td>
</tr>
<tr>
<td>10,000 l</td>
<td>456 kg</td>
<td>370524</td>
</tr>
<tr>
<td>(2,640 US gal.)</td>
<td>(1,005 lbs)</td>
<td></td>
</tr>
</tbody>
</table>

Scope of supply: Carat XL underground rainwater tank with Maxi tank dome, choke drain and hose.

**Webcode G4307**

**Webcode G4308**

**Figure** shows 10,000 l (2,640 US gal.) tank with cast iron telescopic dome shaft suitable for vehicle loading.

**Figure** shows tank without cover. The total installation height results from the total tank height (Htot) plus the telescopic dome shaft (page 51).

**Carat XL underground tank detention and retention cistern**

**Volume**

<table>
<thead>
<tr>
<th>Volume</th>
<th>Weight</th>
<th>Length L</th>
<th>Height H</th>
<th>Inlet 1</th>
<th>Inlet 1*</th>
<th>Inlet 2</th>
<th>Inlet 2*</th>
<th>Outlet O1</th>
<th>Outlet O2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,500 l</td>
<td>380 kg</td>
<td>2040 mm</td>
<td>3455 mm</td>
<td>1890 mm</td>
<td>435 mm</td>
<td>2285 mm</td>
<td>2785 mm</td>
<td>805 mm</td>
<td>2090 mm</td>
</tr>
<tr>
<td>(2,242 US gal.)</td>
<td>(838 lbs)</td>
<td>(6' 8.3&quot;)</td>
<td>(11' 6.6&quot;)</td>
<td>(6' 10.3&quot;)</td>
<td>(18.7&quot;)</td>
<td>(9' 6.0&quot;)</td>
<td>(9' 1.7&quot;)</td>
<td>(31.7&quot;)</td>
<td>(7' 6.0&quot;)</td>
</tr>
<tr>
<td>10,000 l</td>
<td>456 kg</td>
<td>2240 mm</td>
<td>3520 mm</td>
<td>2090 mm</td>
<td>435 mm</td>
<td>2425 mm</td>
<td>2795 mm</td>
<td>805 mm</td>
<td>2285 mm</td>
</tr>
<tr>
<td>(2,640 US gal.)</td>
<td>(1,005 lbs)</td>
<td>(7' 4&quot;)</td>
<td>(11' 6.6&quot;)</td>
<td>(7' 6.0&quot;)</td>
<td>(18.7&quot;)</td>
<td>(9' 6.0&quot;)</td>
<td>(9' 1.7&quot;)</td>
<td>(31.7&quot;)</td>
<td>(7' 6.0&quot;)</td>
</tr>
</tbody>
</table>

**Technical data**

- Max. axle load: 8 t
- Max. total weight: 12 t
- Earth covering with loading capacity: 800 – 1500 mm (2’ 7” – 4’ 11”)
- Groundwater stability: up to the middle of the tank
- Earth covering with groundwater installation: 800 – 1500 mm (2’ 7” – 4’ 11”)
- Connection options: DN 100 (4") / DN 150 (6") / DN 200 (8") on top
- Tank dome inner Ø: 650 mm (25.6")
Carat XXL underground tank
up to 122,000 litres (32,230 US gal.)

Suitable for vehicle/lorry 40 t

- Can be mounted in groundwater
- Lower weight than concrete and steel
- Various connection surfaces
- Available with DN 300 (12") connection as an option
- Available with a second tank dome as an option
- 122,000 litres (32,230 US gal.)
- Volume possible
- Investment security thanks to a 15 year warranty

Carat XXL underground rainwater tank

- Carat XXL available with DN 300 (12") tank dome as an option
- Carat XXL available with a second tank dome as an option

Carat XXL underground tank
Suitable for vehicle/lorry 40 t

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Tank dome inner Ø</th>
<th>Weight</th>
<th>Order no. detection</th>
<th>Order no. retention</th>
</tr>
</thead>
<tbody>
<tr>
<td>16,000 l</td>
<td>650 mm (25.6&quot;)</td>
<td>815 kg (1,770 lbs)</td>
<td>380500</td>
<td>380520</td>
</tr>
<tr>
<td>22,000 l*</td>
<td>650 mm (25.6&quot;)</td>
<td>1045 kg (2,299 lbs)</td>
<td>380521</td>
<td>380521</td>
</tr>
<tr>
<td>32,000 l*</td>
<td>650 mm (25.6&quot;)</td>
<td>1340 kg (2,954 lbs)</td>
<td>380502</td>
<td>380522</td>
</tr>
<tr>
<td>46,000 l</td>
<td>650 mm (25.6&quot;)</td>
<td>2080 kg (4,580 lbs)</td>
<td>380504</td>
<td>380524</td>
</tr>
<tr>
<td>52,000 l*</td>
<td>650 mm (25.6&quot;)</td>
<td>2285 kg (4,930 lbs)</td>
<td>380506</td>
<td>380525</td>
</tr>
<tr>
<td>66,000 l</td>
<td>650 mm (25.6&quot;)</td>
<td>2735 kg (5,996 lbs)</td>
<td>380507</td>
<td>380527</td>
</tr>
<tr>
<td>72,000 l*</td>
<td>650 mm (25.6&quot;)</td>
<td>3160 kg (6,925 lbs)</td>
<td>380508</td>
<td>380528</td>
</tr>
<tr>
<td>76,000 l*</td>
<td>650 mm (25.6&quot;)</td>
<td>3365 kg (7,418 lbs)</td>
<td>380509</td>
<td>380529</td>
</tr>
</tbody>
</table>

Scope of supply: Carat XL underground rainwater tank with Maxi tank dome, choke drain and hose

Technical data

- max. axle load: 40 t
- max. total weight: 3,550 kg with cast iron cover, 40 t with telescopic dome shaft lorry
- Earth covering with loading capacity: 800 – 1,500 mm (2.7" – 4.9")
- Groundwater stability: up to the middle of the tank
- Earth covering with groundwater installation: 800 – 1,500 mm (2.7" – 4.9")
- Connection options: DN 100 (4") – DN 200 (8")

Carat XXL available with a second tank dome as an option

Carat XXL available with DN 300 (12") connection as an option

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Width W</th>
<th>Length L</th>
<th>Height H</th>
<th>Height Htot</th>
<th>Inlet 1</th>
<th>Inlet 2</th>
<th>Inlet 1*</th>
<th>Outlet 1a</th>
<th>Outlet 2a</th>
</tr>
</thead>
<tbody>
<tr>
<td>16,000 l</td>
<td>2500 mm</td>
<td>3160 mm</td>
<td>2550 mm</td>
<td>2360 mm</td>
<td>800 mm</td>
<td>385509</td>
<td>385520</td>
<td>3070 mm</td>
<td>3070 mm</td>
</tr>
<tr>
<td>22,000 l*</td>
<td>16585 mm</td>
<td>3160 mm</td>
<td>2550 mm</td>
<td>2360 mm</td>
<td>800 mm</td>
<td>385511</td>
<td>385531</td>
<td>3070 mm</td>
<td>3070 mm</td>
</tr>
<tr>
<td>32,000 l*</td>
<td>14200 mm</td>
<td>3160 mm</td>
<td>2550 mm</td>
<td>2360 mm</td>
<td>800 mm</td>
<td>385512</td>
<td>385532</td>
<td>3070 mm</td>
<td>3070 mm</td>
</tr>
<tr>
<td>46,000 l</td>
<td>2095 mm</td>
<td>3160 mm</td>
<td>2550 mm</td>
<td>2360 mm</td>
<td>800 mm</td>
<td>385513</td>
<td>385533</td>
<td>3070 mm</td>
<td>3070 mm</td>
</tr>
<tr>
<td>52,000 l*</td>
<td>1905 mm</td>
<td>3160 mm</td>
<td>2550 mm</td>
<td>2360 mm</td>
<td>800 mm</td>
<td>385514</td>
<td>385534</td>
<td>3070 mm</td>
<td>3070 mm</td>
</tr>
<tr>
<td>66,000 l</td>
<td>2360 mm</td>
<td>3160 mm</td>
<td>2550 mm</td>
<td>2360 mm</td>
<td>800 mm</td>
<td>385515</td>
<td>385535</td>
<td>3070 mm</td>
<td>3070 mm</td>
</tr>
<tr>
<td>72,000 l*</td>
<td>2140 mm</td>
<td>3160 mm</td>
<td>2550 mm</td>
<td>2360 mm</td>
<td>800 mm</td>
<td>385516</td>
<td>385536</td>
<td>3070 mm</td>
<td>3070 mm</td>
</tr>
<tr>
<td>76,000 l*</td>
<td>2550 mm</td>
<td>3160 mm</td>
<td>2550 mm</td>
<td>2360 mm</td>
<td>800 mm</td>
<td>385517</td>
<td>385537</td>
<td>3070 mm</td>
<td>3070 mm</td>
</tr>
</tbody>
</table>

* with a second tank dome

Figure shows tank with Maxi tank dome without cover (Mini tank dome available as an option). The total installation height results from the total tank height (Htot) plus the telescopic dome shaft (page 53).
The detention cistern with unequalled value for money. Thanks to its patented design, the transport of the Herkules Infiltration tank is very easy. The two tank halves can be assembled on site, and the patented quick connection system enables easy, tool-free installation in just a few minutes. By using the interconnecting pipe sets, the system can be extended at will. Patent no. in Europe 0870877 and USA no. 5,878,907

**Technical data**

- **Volume**: 1,600 litres (422 US gal.)
- **Max Ø**: 1,350 mm (53")
- **Height**: 1,600 mm (63")
- **Material**: fibre-glass reinforced PP (UV stable and 100% recyclable)
- **Weight**: approx. 60 kg (132 lbs)
- **Connections**: each 2 x DN 70 (2.8"), DN 100 (4") and DN 200 (8")

**Herkules detention cistern**

1,600 litres (422 US gal.) without support pipe

Order no. 320001

**Cut-out tool (with pilot drill)**

- DN 70 (2.8") Order no. 202002
- DN 100 (4") Order no. 202003

**Interconnecting pipe set**

- (without cut-out tool) DN 70 (2.8") Order no. 202029
- DN 100 (4") Order no. 202028

**Support pipe for Herkules tank** required for underground assembly

- DN 150 (6") Order no. 322014

**Tank dome**

- (with telescopic end 1 m (3.3") to be cut on demand) DN 200 (8") Order no. 322026

**GRAF-Tex geotextile**

For one Herkules Infiltration Tank

Order no. 369015

Material sold by the metre, roll width 5 m (15.2')

Order no. 231002

**Further application possibilities**

- **Above ground**
- **Underground**
- **as a cellar tank**

**Rainwater harvesting solutions**

You can find more information about our Herkules rainwater tank and other products for rainwater harvesting in our catalogue, "Rainwater harvesting solutions"
Wastewater treatment solutions

For more information about our wastewater treatment solutions, ask for our catalogue.

Prices:
A price list with our export conditions is available on request.

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.