



# Stormwater Management

## THE INFILTRATION RANGE



INFILTRATION MODULES

INFILTRATION FILTERS

SHAFTS AND ACCESSORIES

# GRAF – Setting the standards in quality



Production site at Teningen (Germany) near Freiburg



Production site at Dachstein (France)

For over 45 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.

Now GRAF is recognised as Europe's number one rainwater harvesting brand and also offers a wide variety of products for stormwater management.

## High Quality Manufacturing

GRAF has invested more than € 20 million in a new production site specially set up for the new Carat range. The new facility has an approximate surface area of 155,000 m<sup>2</sup> – that equals 31 football pitches – one of the most modern production facilities for plastic products in the world. Choosing Germany as the location 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.

# Sizing form for infiltration systems

Fax to: +49(0)76 41/5 89-50

Otto Graf GmbH Plastic products Product management Carl-Zeiss-Straße 2-6 D-79331 Teningen www.graf.info Tel.: +49 (0) 7641 589-0 Fax: +49 (0) 7641 589-50	Property adress:	Owner: ..... Name: ..... Street: ..... Post code/city: ..... Tel.: ..... Fax: ..... e-mail: .....		
Type of property	<input type="checkbox"/> Residential	<input type="checkbox"/> Industrial/Commercial	<input type="checkbox"/> Local Authority	<input type="checkbox"/> .....

Recommended median flow values  $\Psi$  according to ATV-DVWK-A 117 and ATV-DVWK-M 153 (German standards)

Area type / roof	Type of fixing	$\Psi$	m <sup>2</sup> surface
Pitched roof	Metal, glass, slate, fibre cement	0,9-1,0	
	Clay brick, felt	0,9-1,0	
Flat roof (Pitch up to 3° or approx. 5%)	Metal, glass, fibre cement	0,9	
	Roofing cardboard	0,7	
	Gravel	0,7	
Green roof (Pitch up to 15° or approx. 25%)	Humus layer < 10 cm build-up	0,5	
	Humus layer > 10 cm build-up	0,3	
Roads, paths and spaces (flat)	Asphalt, jointless cement	0,9	
	Paving with sealed joints	0,75	
	Solid gravel layer	0,6	
	Paving with open joints	0,5	
	Loose gravel layer, gravel garden	0,3	
	Interlocking paving with joints, drain stones	0,25	
	Honeycomb bricks	0,16	
Slopes, verges and ditches with rain outflow in the drainage system	Clayey soil	0,5	
	Loamy sandy soil	0,4	
	Gravelly and sandy soil	0,3	
Gardens, meadows and cultivated land with possible rain outflow in the drainage system	Flat site	0,0-0,1	
	Steep site	0,1-0,3	

Area type / soil	$K_f$ (m/sec)	
Gravel	1*10 <sup>-3</sup>	
Medium sand	1*10 <sup>-4</sup>	
Fine sand	1*10 <sup>-5</sup>	
Coarse clay	1*10 <sup>-6</sup>	
Clay	1*10 <sup>-7</sup>	No infiltration possible

Area available for infiltration (length x width x m)	x	m
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Please send us the completed form. We will calculate your necessary infiltration volume and create a free quotation.

# Internationally proven:

## GRAF infiltration modules



Carrefour shopping centre, Ville de Bois (FR)



Football stadium, Ried (AT)



Europark shopping centre, Salzburg (AT)



Siemens-VDO, Lindau (DE)



Federal Military Library, Berne (CH)



Infiltration system with GRAF infiltration tunnel, Galati (RO)

# Stormwater management know-how of GRAF



The public demand for local stormwater harvesting and management is continually growing due to ever more frequent flood catastrophes. Increasing sealing of areas with buildings, car parks and roads is a particular problem for sewer systems in urban areas and is increasingly raising the risk of flooding. In Germany, an area of approx. 129 hectares or 175 football fields is built on and sealed every day. The consequence is flooding with previously unheard of ecological and economic damage.

Additionally, the groundwater level is also sinking due to surface sealing – the natural cycle is broken. GRAF takes this into account with well thought-out infiltration systems. The infiltration modules Rain Bloc and Infiltration Tunnel combine the requirements of an ecologically-sound approach to rainwater with the chance to save sealing fees. Additionally, sewer systems and purification systems get some relief from local amount of rainwater.

# Planning and sizing

Planning, sizing and installing an infiltration system in Germany is regulated by ATV-DVWK-A 138 (German standard). According to this, infiltration systems must be sized using the local heavy rain figures. As a rule, a 5-year flood frequency ( $n=0.2/a$ ) is required for local plants. This corresponds to a rain event, which statistically occurs every 5 years. Swale infiltration systems can

be sized with a one-year flood frequency ( $n=1/a$  rain event statistically once a year), if there is a ditch emergency overflow. In addition to heavy rain figures, the permeability of the ground ( $K_f$ -value m/s), the area to be connected ( $m^2$ ) and the runoff coefficient ( $\Psi$ ) must be taken into account when sizing the infiltration system.

We would be happy to size your project. Give us a call!

## Calculation guideline for smaller properties

### 1. Specify your soil type



### 2. Specify your rain level



Values on the table correspond to a rain event, which statistically occurs every 5 years.

### 3. Specify your connected surface.



Surfaces of the connected buildings plus roof overhangs (independent of roof pitch) + other connected surfaces.

		number GRAF modules		
Type of soil	Percolability	100 m <sup>2</sup>	150 m <sup>2</sup>	200 m <sup>2</sup>
Gravel		150 litres	3	4
		200 litres	5	7
Medium sand		150 litres	6	8
		200 litres	7	11
Fine sand		150 litres	8	12
		200 litres	10	15
Coarse clay		150 litres	10	15
		200 litres	13	19
Clay		No infiltration possible		

We recommend property-related sizing for infiltration systems in principle.

# GRAF infiltration modules

Cost-effective and space-saving

95 % more storage volume

less excavation

30 %

## Cost-effective

GRAF infiltration modules can hold 3 times the volume of a conventional gravel ditch. 1 module (15 kg) replaces approx. 800 kg of gravel or 36 m of drainage pipe. You will save money with the GRAF modules by saving on ground excavation and labour time and thanks to the good price-performance.

## Easy to install

Installing the module is easy, fast and variable. It can be installed without heavy equipment – a Rain Bloc weighs just 15 kg. The individual modules are connected using practical fast connectors.

30 % less storage volume

more excavation

95 %

## GRAF Rain Bloc – fast and cost-effective



## Conventional ditch – complex and expensive



# GRAF Rain Bloc

## Infiltration and harvesting from one mould



The flexible, high-performance Rain Bloc is ideal for use in public and industrial areas. There are no limits on the use and design of the surface above the system thanks to its extreme load-capacity. Whether it is a parking space, works entrance or storage area – everything is possible.

### High-performance

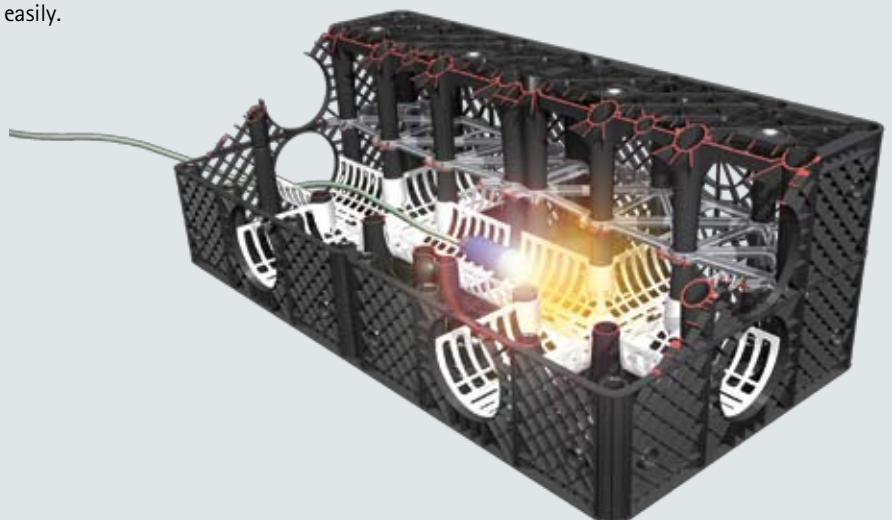
The lorry-bearing design guarantees extreme load capacity thanks to its stable column structure. It facilitates SLW 60-bearability with an 800 mm (31.5 inches) covering. The vehicle loading design can bear a long-term load of approx. 3.5 t per m<sup>2</sup>. There are no limits on the use and design of the surface over the system.

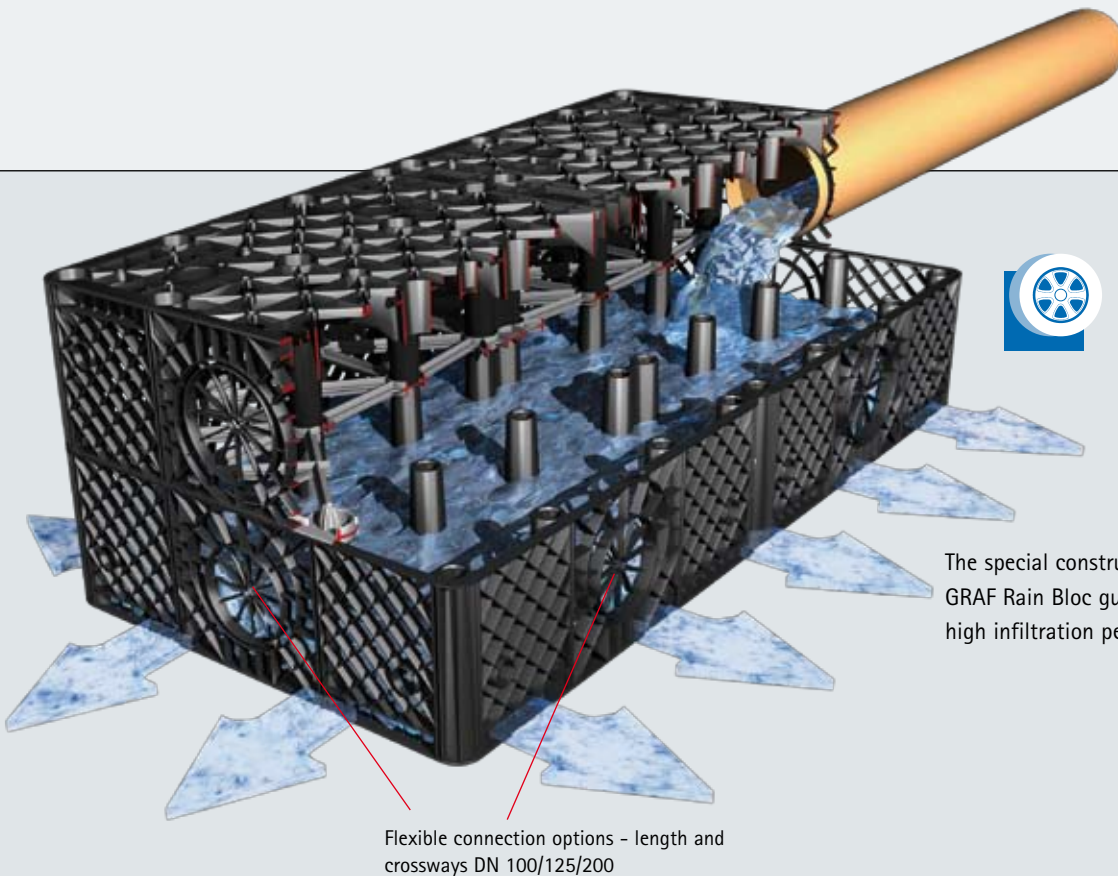
### Inspectable

The unique inspect rim facilitates flexible laying of inspection channels within your ditches. The Rain Bloc Inspect is already completely prefitted and only has to be installed in the tried and tested Rain Bloc system. The Rain Blocs can be inspected easily with a push-rod camera through the opening of diameter DN 150. Crossing inspection channels can also be laid easily.

### Easy to install

The Rain Bloc can be installed in rows or block form, with 1 to a maximum of 10 layers, depending on the local conditions and the desired storage capacity. Installing the module is easy, fast and variable. It can be installed without heavy equipment – a Rain Bloc weighs just 15 kg. The individual modules are connected using practical fast connectors.





The special construction of the GRAF Rain Bloc guarantees lasting, high infiltration performance.

#### Rain Bloc

Item	Length [mm]	Width [mm]	Height [mm]	Colour	Order no.
Vehicle loading	1,200	600	420	green	360011
Lorry-bearing	1,200	600	420	black	360010

#### Rain Bloc inspect

Can be inspected using the inspect maintenance channel

Item	Length [mm]	Width [mm]	Height [mm]	Colour	Order no.
Lorry-bearing	1,200	600	420	black	360013

#### Inspection end

DN 100

Order no. 202004



#### Connecting elements

for all horizontal and vertical connections 10 units

Order no. 369012



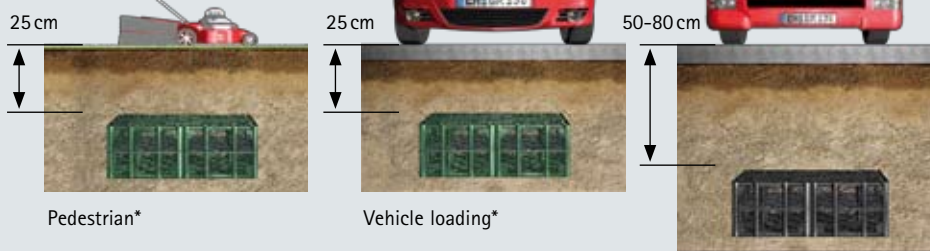
#### GRAF-Tex geotextile

for a Rain Bloc size of 2.50 x 2.50 m

Order no. 369010

Material sold by the metre, roll width 5 m

Order no. 369014



\*Details see page 11

up to 60 tons total weight

# The planning of infiltration ditches/tanks with the GRAF Rain Bloc

The Graf Rain Bloc is a system which has been particularly designed for the rainwater infiltration and retention respectively. The structure of the modules enables a space-saving installation with minimal earth covering. The surface beyond the Rain Bloc can even be used by traffic. An exact calculation according to ATV-DVWK-A 138 or corresponding, country-specific technical regulations in force must be followed. In order to avoid silt accumulation the system must be equipped with an infiltration filter. The installation has to be done in a professional manner.

## Choice of position

The distance of the ditch to adjacent buildings with non-sealed up cellars has to be at least 6 metres (19.7 ft.). For maximum infiltration performance the Graf Rain Bloc requires a distance of at least 1 metre (39.4 inches) to the ground water.

The distance to existing or planned tree population must correspond at least to the (expected) diameter of the crown.

## Installation of the feed and ventilation pipes

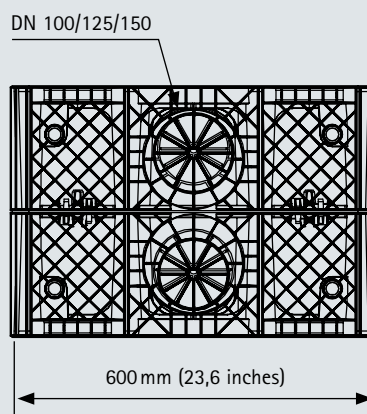
The feed and ventilation pipes will be connected laterally at the designated position. For this purpose, the plastic ribs must be detached. The pipes must extend into the modules approximately 200 mm (7.9 inches). For extensive laying of the modules it is essential to distribute several feeding pipes in a homogenous way so that the water can flow in steadily.

## Installation of the Rain Bloc

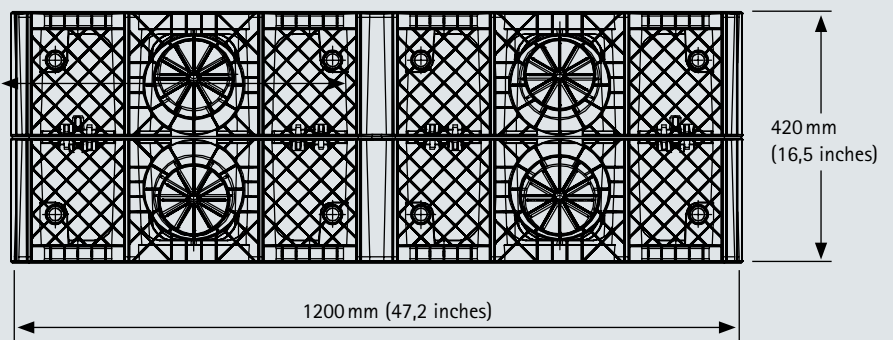
The impermeable membrane is put on the horizontal, flat footprint of the excavation with 500 mm (19.7 inches) overlapping. The modules are positioned horizontally on the membrane and connected with each other by plastic connectors. For lengthwise and crosswise connection each 4 connectors are necessary. For systems with various layers, the different layers must show an alternate arrangement of lengthwise and crosswise layers to obtain maximum stability. Before the excavation is filled with material, all the modules must be wrapped completely with fleece, whereas the ends of each fleece line must have an overlap of at least 500 mm (19.7 inches). After that the excavation is filled in layers and constantly compressed.

Technical data	
Volume	300 Litres (79 US-gallons)
Length	1200 mm (47.2 inches)
Width	600 mm (23.6 inches)
Height	420 mm (16.5 inches)
Connectors	12 x DN 150 6 x DN 125 6 x DN 100
Weight	approx. 15 kilos
Material	Rain Bloc lorry-bearing: 100% polypropylene (PP) Rain Bloc vehicle loading: 100% polypropylene (PP) recycling material

Front view



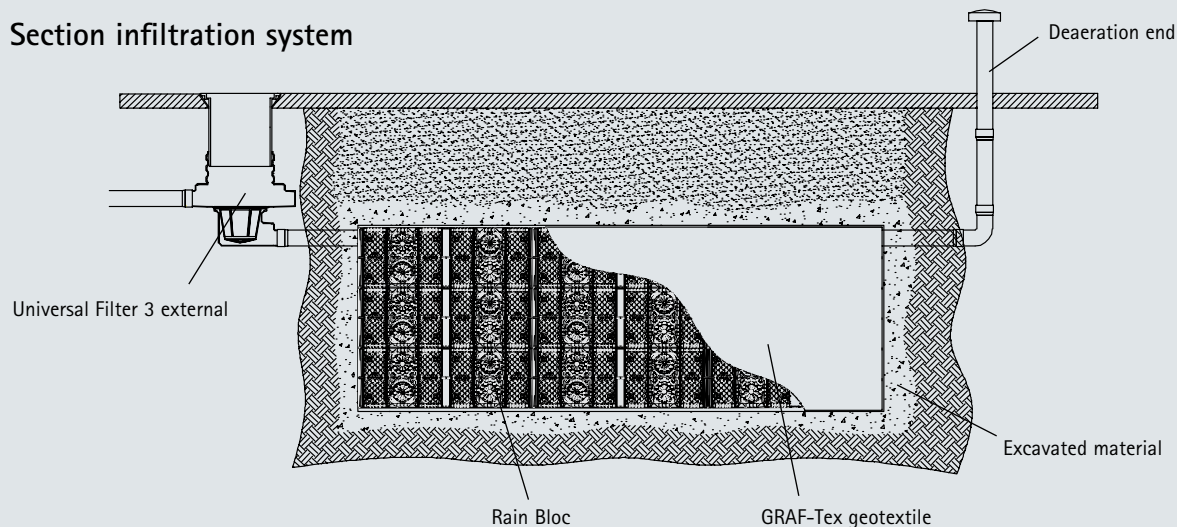
Side view



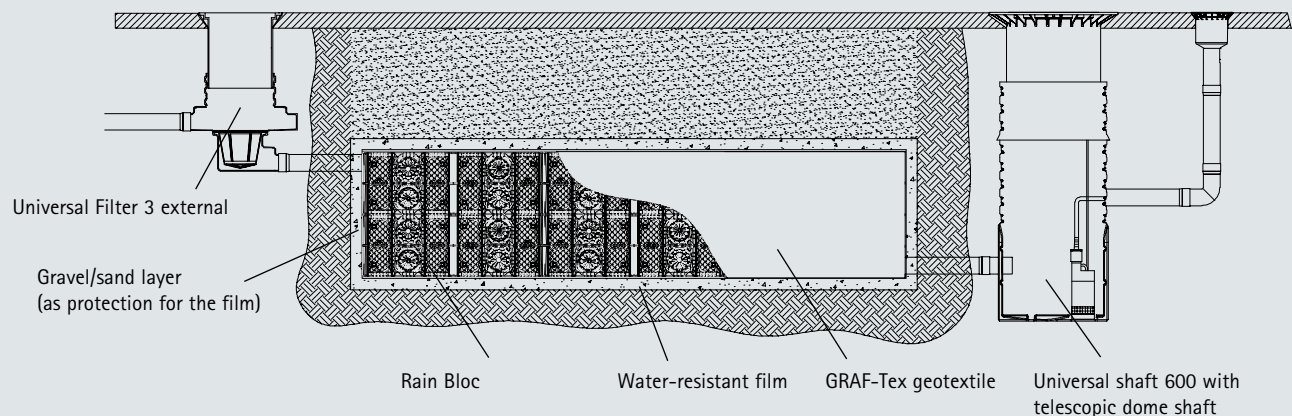
## Maximum earth covering and installation depth

Load		Rain Bloc car	Rain Bloc hgv
	Short-term	max. 7,5 t/m <sup>2</sup>	max. 10 t/m <sup>2</sup>
	Long-term	max. 3,5 t/m <sup>2</sup>	max. 5 t/m <sup>2</sup>
Car-loading and without traffic load	Min. earth covering	400 mm (15.8 inches)	250 mm (9.8 inches)
	Max. installation depth (lower edge)	3000 mm (118.1 inches)	5000 mm (196.9 inches)
	Max. layers	6	10
Lorry-loading 12 t	Min. earth covering	-	500 mm (19.7 inches)
	Max. installation depth (lower edge)	-	5000 mm (196.9 inches)
	Max. layers	-	10
SLW 30-loading (lorry 30 t)	Min. earth covering	-	500 mm (19.7 inches)
	Max. installation depth (lower edge)	-	4600 mm (18.1 inches)
	Max. layers	-	9
SLW 40-loading (lorry 40 t) only possible on low traffic roads	Min. earth covering	-	700 mm (27.6 inches)
	Max. installation depth (lower edge)	-	4100 mm (161.4 inches)
	Max. layers	-	8
SLW 60-loading (lorry 60 t) only possible on low traffic roads	Min. earth covering	-	800 mm (31.5 inches)
	Max. installation depth (lower edge)	-	3700 mm (14.6 inches)
	Max. layers	-	6

## Section infiltration system



## Section rainwater harvesting plant

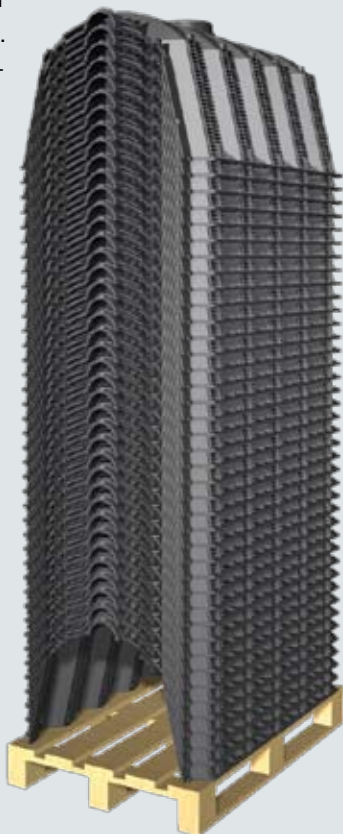


# GRAF Infiltration Tunnel

Space-saving and cost-efficient



The Graf Infiltration Tunnel has been mainly designed for the use in private and rural areas. The system which consists of one or several tunnel modules and two end plates can be extended at will. The laying is realized in one or more lines of the same level. As the weight of one module is only 11 kilos, the handling of the Infiltration Tunnel is excellent. The surface beyond the tunnels is vehicle loading which offers versatile possibilities for utilisation.



## 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.

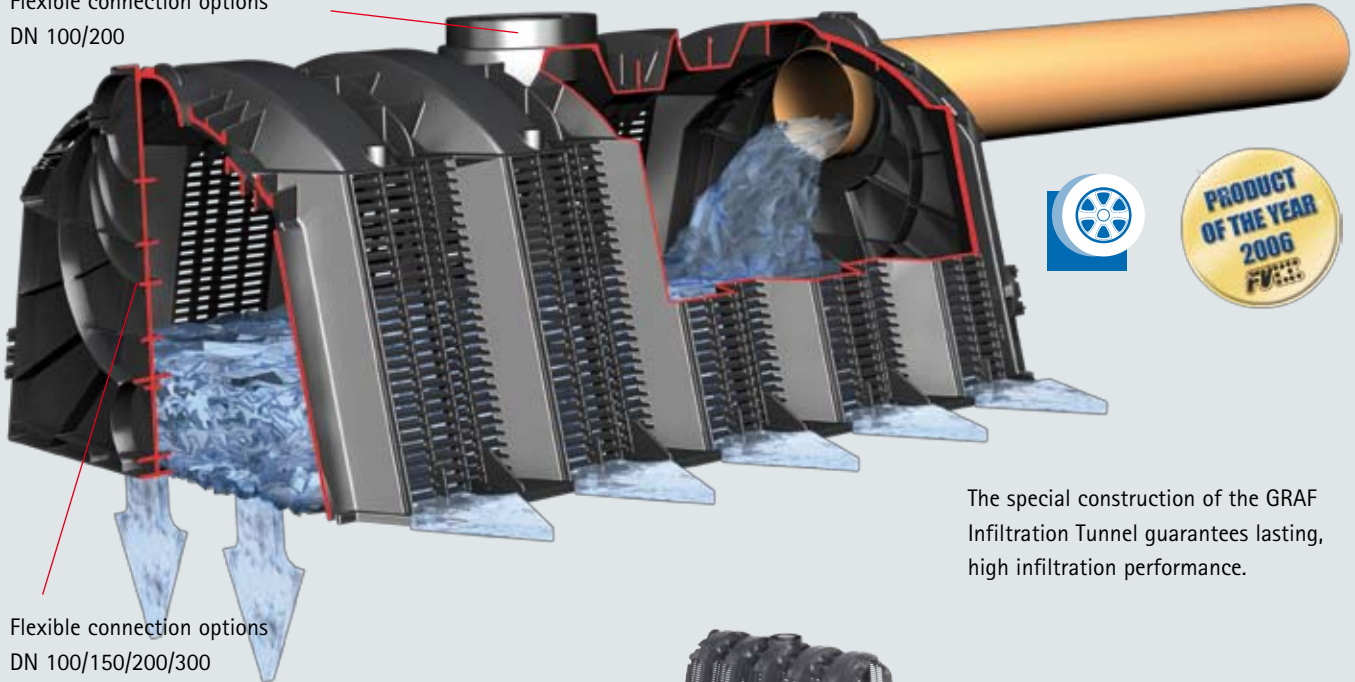
## Vehicle loading

For offering versatile possibilities of utilisation, the surface beyond the infiltration tunnels can be loaded permanently up to 3.5 tons/sqm and thus is also suitable for vehicle loading.

## 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 kilos. The tunnel modules are simply stuck together in one line and equipped with 2 end plates per line.

Flexible connection options  
DN 100/200



The special construction of the GRAF Infiltration Tunnel guarantees lasting, high infiltration performance.

Flexible connection options  
DN 100/150/200/300

#### Infiltration Tunnel car

Item	Length [mm]	Width [mm]	Height [mm]	Colour	Order no.
Vehicle loading	1,220	800	510	black	410097

#### Inspection end

DN 200

Order no. 340527



#### End plate for Infiltration Tunnel car

Item	Colour	Order no.
End plates (Set 2 units)	black	410098

#### Deaeration end

DN 100

Order no. 202004



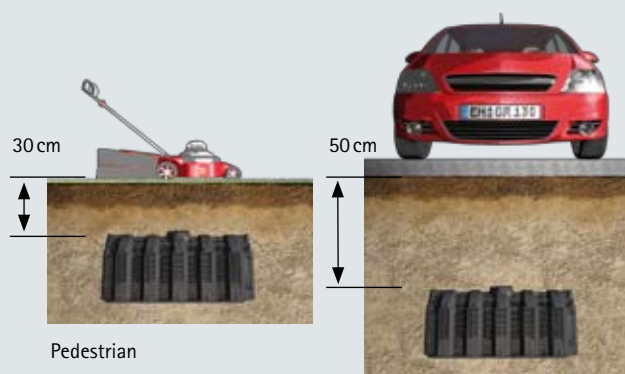
#### GRAF-Tex geotextile

For an Infiltration Tunnel size  
of 1.50 x 2.50 m

Order no. 369026

Material sold by the metre, roll width 5 m

Order no. 369014



\*Details see page 15\*

Vehicle loading\*

# Planning of infiltration ditches

## with the GRAF Infiltration Tunnel

The GRAF Infiltration Tunnel is a system which has been particularly designed for the infiltration of rainwater and retention respectively. The structure of the modules allows a space-saving installation close to the surface, even under footprints used by cars. The calculation according to ATV – A 138 (german standard) or corresponding, country-specific technical regulations in force must be followed for larger projects. In order to avoid silt accumulation a infiltration filter must be installed.

### Choice of position

The distance of the ditch to adjacent buildings for non-sealed up cellars has to be at least 6 metres (236.2 inches). The GRAF Infiltration Tunnel has to be installed with at least 39.4 inches space to the ground-water. The distance to existing or planned tree population must correspond at least to the (expected) diameter of the crown.

### Installation of the feed pipes and deaeration pipes:

The feed pipes will be connected at the front of the end plates. For this purpose the accordingly perforated and labelled circular cut-outs will be detached. The feed pipes must extend into the tunnel modules approximately 20 cm (7.9 inches). For assuring that the water enters into the modules in a steady way, it is essential in case of extensive module laying that every infiltration line is equipped with its own inlet pipe. Use the connection on the upper side of the module for the deaeration / inspection end (1 deaeration / inspection end per line).

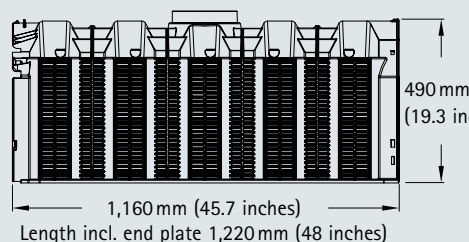
### Installation of the GRAF Infiltration Tunnel

The horizontal, flat footprint of the excavation first has to be filled with a layer of gravel (approx. 10 cm (3.9 inches), grain size 8/16) which serves as granular sub-grade course.

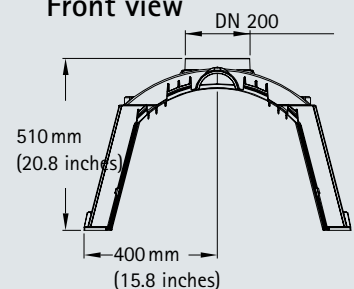
The infiltration tunnels are put on the gravel pit and connected with each other in lines (lengthwise). In order to protect the infiltration tunnel from silt etc. they are wrapped round by filter fleece and thus being separated from the filling material. The filter fleece should overlap the end of the modules by at least 30 cm (11.8 inches). Afterwards the excavation will be filled steadily and in layers.

Technical Data	
Volume	300 litres (79 US-Gallons)
Length	1,160 mm (47.2 inches)
	1,220 mm (341.0 inches) (incl. end plates)
Width	800 mm (31.5 inches)
Height	510 mm (20 inches)
Connectors	upper side: DN 100, 150, 200, 300
	lower side: DN 100, 200
Weight	approx. 11 kg
Material	100 % made of recycling material polypropylene (PP)

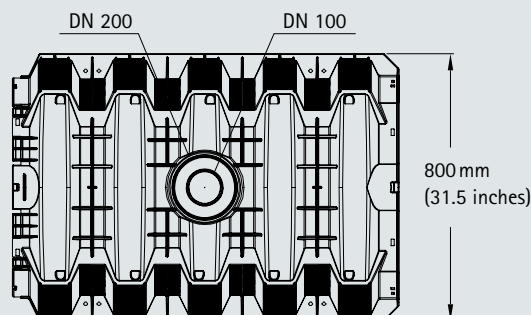
Side view



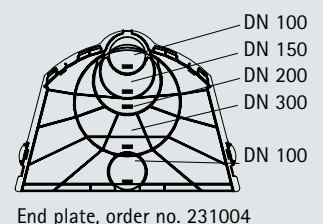
Front view



Plan view



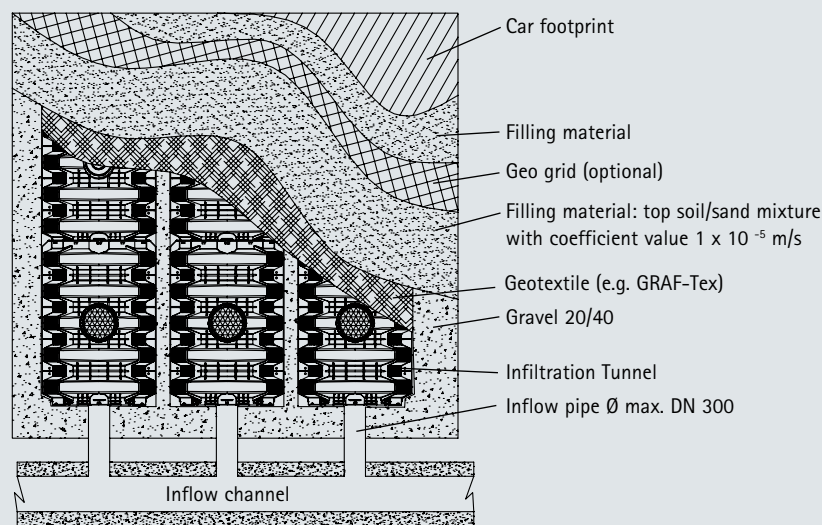
End plate



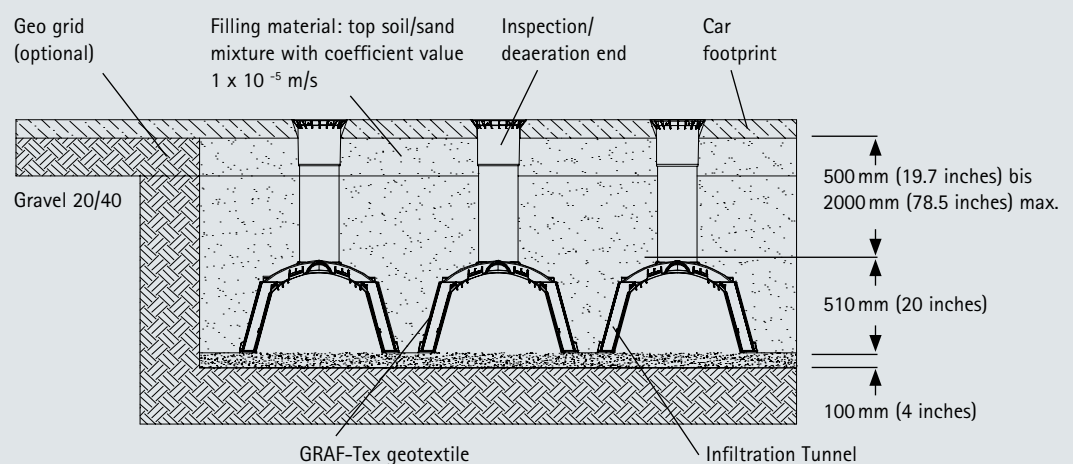
## Maximum earth covering and installation depth

Infiltration Tunnel	
Load	Max. 7.5 to/qm temporarily Max. 3.5 to/qm for long term
Min. earth covering without traffic load	250 mm (9.8 inches)
Min. earth covering with traffic load	500 mm (19.7 inches)
Max. installation depth (lower edge)	2,500 mm (98.4 inches)

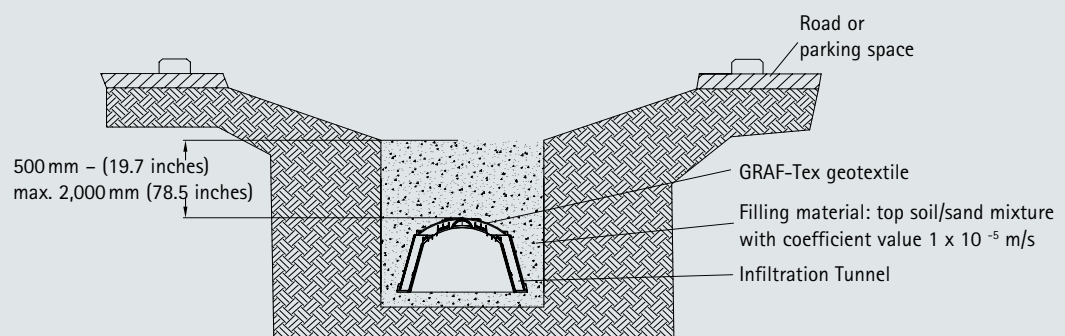
## Plan view



## Section infiltration system



## Section open swale infiltration ditch

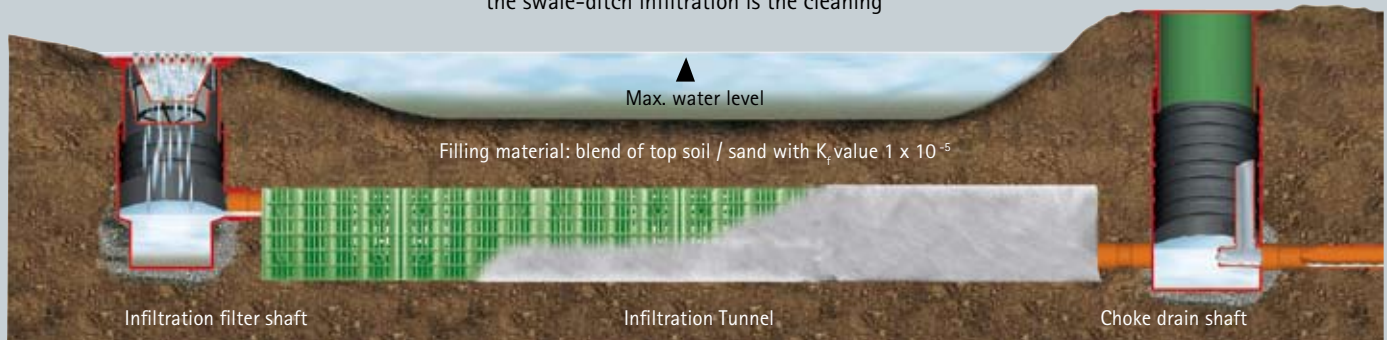


# Swale-Ditch infiltration

The infiltration through swale-ditches can be realised independently from the soil condition. According to the soil's infiltration performance the attention can be either turned on infiltration or on retention.

For the delayed outflow into the drainage the GRAF choke drain shaft is the ideal solution. The GRAF infiltration filter shaft offers the best solution for the emergency overflow of the swale. Another advantage of the swale-ditch infiltration is the cleaning

effect of the soil layer on the rainwater. This characteristic makes it particularly suitable for larger objects with higher polluted surface water as it frequently appears in industrial applications.



## Infiltration filter shaft

3-stage cleaning process

- ① Coarse filter insert
- ② Fine filter basket (0.35 mm mesh width)
- ③ Sedimentation zone

Keeps back dirt that may impair the infiltration performance

Ideal as a yard inlet or as a basin infiltration ditch element

Vehicle loading with cast cover category B  
Continuously adjustable mounting depth of 570 mm (22.4 inches) - 1,050 mm (41.3 inches) through telescope dome shaft

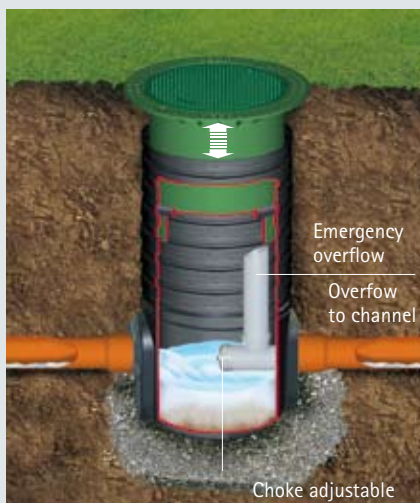
Max. 350sqm sealed surface with DN 100 connections and 500sqm with DN 150 Connections DN 100 / DN 150



### Infiltration filter shaft

Vehicle loading, colour: black

Order no. 340025



## Choke drain shaft

Continuously adjustable mounting depth of 600 mm (23.6 inches) - 1,250 mm (49.2 inches) through telescope dome shaft

Plastic cover can be walked on or cast cover can be driven on by car

Cover childproof lockable

Sealed up to earth's surface

No height offset between inlet and outlet  
Maximally 350sqm of sealed area to be connected

Connections DN 100

Drain quantity adjustable from 0.5 – 6.5 l/s

Special solution on request



### Choke drain shaft

Suitable for pedestrian loading, colour: green

Order no. 340028

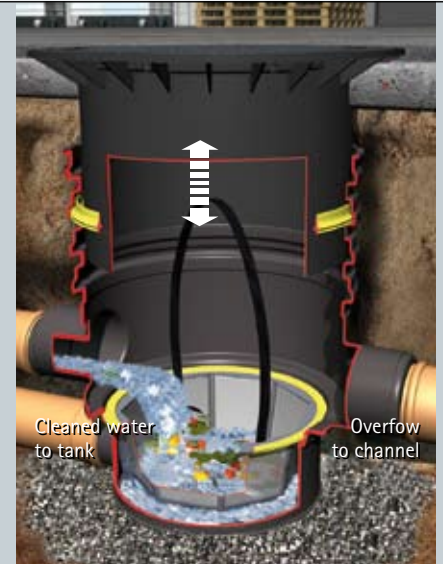
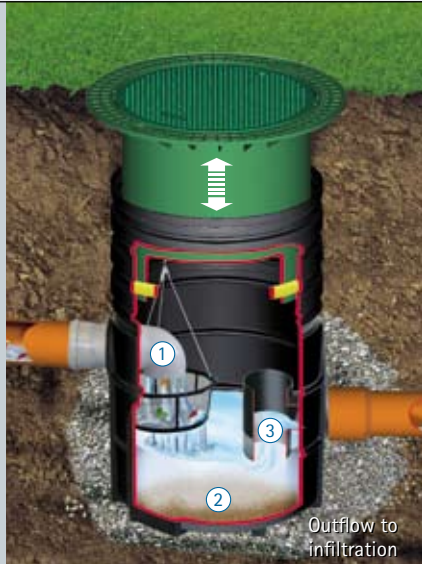


### Flow control shaft

Suitable for vehicle loading, colour: black

Order no. 340029

# Infiltration filters



## Sedimentation filter shaft

- 3-stage cleaning process
- ① fine filter basket (0.35 mm mesh width)
- ② sedimentation zone
- ③ dip tube as oil separator
- Continuously adjustable mounting depth of 900 mm (35.4 inches) - 1,600 mm (63 inches) through telescope dome shaft Ø 600 mm (23.6 inches)
- Plastic cover can be walked on or cast cover can be driven on by car
- Cover childproof lockable
- Sealed up to earth's surface
- Max. 1,000 sqm of sealed area to be connected
- Connections DN 150



### Sedimentation filter shaft

Suitable for pedestrian loading, colour: green

Order no. 340026



### Sedimentation filter shaft

Suitable for vehicle loading, colour: black

Order no. 340027

## Universal Filter 3 external

- 100% water yield
- Continuously adjustable mounting depth of 800 mm (31.5 inches) - 1,200 mm (47.2 inches) through telescope dome shaft
- Plastic cover can be walked on or cast cover can be driven on by car
- Cover childproof lockable
- Little height offset (270 mm / 10.6 inches) between inlet and outlet
- Maximally 350 sqm roof surface with DN 100 connections and 500 sqm with DN 150
- Connections DN 100 and DN 150
- Sieve insert with 0.35 mm (0.14 inches) mesh width



### Universal Filter 3 external

Suitable for pedestrian loading, colour: green

Order no. 340020



### Universal Filter 3 external

Suitable for vehicle loading, colour: black

Order no. 340021

## Universal Industrial Filter 3 external

- Specifications as Universal-Filter 3 external
- For roof surfaces up to 1,200 sqm
- Continuously adjustable mounting depth of 800 mm (31.5 inches) - 1,200 mm (47.2 inches) through telescope dome shaft Ø 600 mm (23.6 inches)
- Maximally 750 sqm roof surface with DN 150 connections and 1,200 sqm with DN 200
- Connections DN 150 and DN 200
- Sieve insert with 0.35 mm mesh width



### Universal Industrial Filter 3 external

Suitable for pedestrian loading, colour: green

Order no. 340050



### Universal Filter 3 external

Suitable for vehicle loading, colour: black

Order no. 340051

# Herkules Infiltration Shaft

The infiltration shaft with the unequalled price/performance ratio. Thanks to its patented design, the transport of the Herkules Infiltration Shaft is very easy. The carried out of the two tank halves can be realized on site, and the patented quick connection system enables the comfortable set-up in only a few minutes without tools. By using the interconnect pipe sets, the system can be extended at will.

## Technical data

Capacity	1,600 Litres (423 US-gallons)
Min. Ø	1,090 mm (43 inches)
Max. Ø	1,350 mm (53 inches)
Height	1,600 mm (63 inches)
Material	fibre-glass reinforced PP (UV stable and 100% recyclable)
Weight	approx. 60 kg
Connections	each 2 x DN 70, DN 100 and DN 200 for standard pipe



## Herkules Infiltration Tank

Including support pipe

Order no. 320010

## Interconnect Pipe Set

(without cut-out tool) DN 70

Order no. 322009

DN 100

Order no. 32008

## Cut-out Tool (with pilot drill)

DN 70

Order no. 332003

DN 100

Order no. 332001

## Tank dome

(with telescopic end 1 m (39.3 inches),  
to be cut on request),  
DN 200

Order no. 202033

## GRAF-Tex geotextile

For one Herkules Infiltration Tank

Order no. 202005

Material sold by the metre, roll width 5 m  
(196.9 inches)

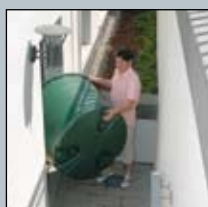
Order no. 322009



## Advantages:

### Ease of transport

Each tank half weighs only 30 kg, which allows for ease of transport and manual assembly. The individual components can fit through any standard doorway. (more than 80 cm/ 31.5 inches)



### Tank combinations

With the use of standard interconnection pipes, multiple tanks can be combined to make up large total storage volumes as required



### Patented quick assembly mechanism

The two tank halves are quickly joined, without screws, using the 24 plug-in connectors supplied. Disassembly is possible at any time.



# Universal shafts



Variable connection options



Variable connection options

## Telescopic dome shafts

Universal use, e.g. as water stop shafts, water meter shafts, etc.  
Pipe feedthroughs can be individually installed by the customer  
Vehicle loading upon request

### Dimensions mm

Shaft	Ø Outside [mm]	Ø Inside [mm]	Height [mm]
T 220	273	206	250
T 400	550	400	500
T 600	850	600	475

**Shaft T 220** (without bottom)  
Suitable for pedestrian loading  
Order no. 340527

**Shaft T 400** (without bottom)  
Suitable for pedestrian loading  
Order no. 330132

**Shaft T 400** (with bottom)  
Suitable for pedestrian loading  
Order no. 330133

**Shaft T 600** (with bottom)  
Suitable for pedestrian loading  
Order no. 330155

## Universal Shaft 400

Many uses, e.g. as inspection shaft, sampling shaft, water meter shaft, etc.  
Continually adjustable installation depths of 600 mm – 1250 mm (23.6 – 49.21 inches) using the telescopic dome shaft  
Variable connection options  
Height loss inlet/outlet 120 mm  
Connections DN 100/150  
Dimensions:  
Ø Outside: 480 mm (18.9 inches)  
Ø Inside: 400 mm (15.6 inches)  
Height: 880 mm (34.7 inches) (can be shortened)  
+ Telescopic max. 400 mm (15.8 inches)

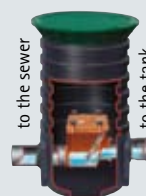
**Universal shaft 400**  
Suitable for pedestrian loading, green  
Order no. 330134

**Universal shaft 400**  
Suitable for vehicle loading, colour: black  
Order no. 330135

### Non-return valve

prevents waste water seeping back into the tank from the sewer

Best.-Nr. 331014



## Universal Shaft

Many uses, e.g. as inspection shaft, sampling shaft, water meter shaft, etc.  
Continually adjustable installation depths of 800 mm – 1600 mm (31.5 – 63 inches) are possible when using the telescopic dome shaft  
Variable connection options  
Dimensions:  
Ø Outside: 730 mm (28.7 inches)  
Ø Inside: 600 mm (23.6 inches)  
Height: 1200 mm (47.2 inches) (can be shortened)  
+ Telescopic max. 400 mm (15.8 inches)

**Universal shaft 600**  
Without cover  
Order no. 330136

**Telescopic dome shaft with PE**  
Cover, suitable for pedestrian loading, colour: green  
Order no. 381502

**Telescopic dome shaft cast iron**  
Suitable for vehicle loading, colour: grey  
Order no. 381504

# Carat S retention cisterns

## For rainwater retention and sewer relief

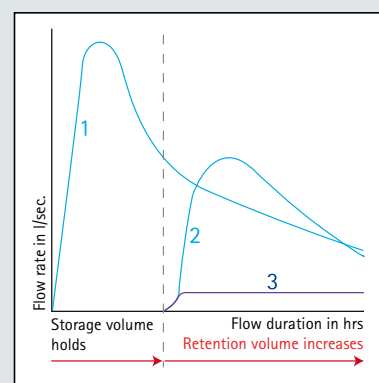
### Retention cisterns

GRAF retention cisterns for rainwater retention and sewer relief. To guarantee retention of rainwater, a delayed drain is fitted in the sewer with 0.05 to 2.0 l/sec. depending on the customer's specifications. In the event of heavy rainfall, the water level in the cistern rises above this level and is drained into the sewer at delayed speed using a floating drain choke. This relieves the sewer and the treatment works. The water level can rise to the emergency overflow and sink slowly back down again after the rain.



Total volume [ltrs]	Total volume [US-gal]	Retention volume [ltrs]	Retention volume [US-gal]	Lorry-bearing Order no.
2,700	700	2,700	700	370500
3,750	1,000	3,750	1,000	370501
4,800	1,250	4,800	1,250	370502
6,500	1,700	6,500	1,700	370503
7,500*	2,000	7,500	2,000	370506
9,600*	2,500	9,600	2,500	370507
13,000*	3,400	13,000	3,400	370508

\* Set consisting of two Carat S underground tanks  
Accessories, e.g. telescopic dome shaft, pipes and calmed inlet, must be ordered separately.

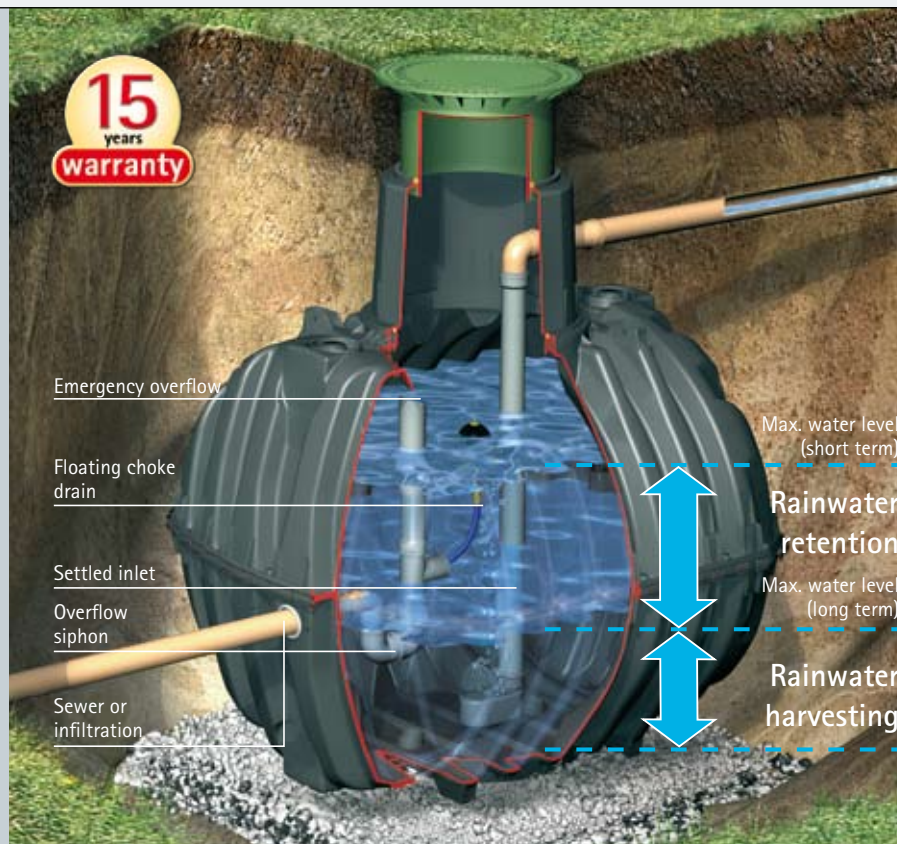


1. Normal rainwater drain (without retention)
  2. Rainwater drain with reservoir and reduced drain without float
  3. Rainwater drain with reservoir and floating drain choke = constant flow
- This special type of rainwater harvesting is prescribed or subsidised by many local authorities.



# Carat S retention cisterns plus

## For combined rainwater retention and harvesting



### Retention cisterns

As an alternative to pure rainwater retention, a retention cistern can also be used for rainwater harvesting. The water level here can also rise to the emergency overflow and sink slowly back down again after the rain to the long-term max. water level. However, the long-term max. water level is chosen so that part of the tank's volume can be used for rainwater harvesting.

Total volume [ltrs]	Total volume [US-gal]	Retention volume [ltrs]	Retention volume [US-gal]	Lorry-bearing Order no.
4,800	1,250	2,000	520	370520
6,500	1,700	3,000	780	370521
6,500	1,700	2,000	520	370522
7,500*	2,000	4,000	1,050	370527
7,500*	2,000	3,000	780	370528
9,600*	2,500	4,000	1,050	370529
9,600*	2,500	3,000	780	370530
13,000*	3,400	4,000	1,050	370531
13,000*	3,400	3,000	780	370532

\* Set consisting of two Carat S underground tanks  
Accessories, e.g. telescopic dome shaft, pipes and calmed inlet, must be ordered separately.

We also construct and deliver your individual special solutions. Sizes between 2,200 and several 100,000 ltrs with corresponding retention volumes are possible. Contact us – we would be happy to assist you!

### Carat S – the advantages

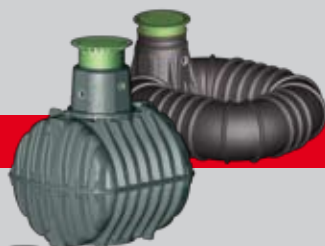
- Tank consisting of two half-shells
- 5–9 tanks per pallet
- This allows up to 8 times more tank volume to be shipped thanks to the unique product design
- High stability
- Long-lasting seal thanks to circumferential profile gasket
- Groundwater stable
- Vehicle loading possible





# Stormwater Management

## RAINWATER HARVESTING



## INFILTRATION



## WASTEWATER TREATMENT SOLUTIONS



## AGRICULTURAL CONTAINERS



### 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.

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 01/01/2003 which we will send to you on request.

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