Stormwater Management

THE INFILTRATION RANGE

INFILTRATION MODULES

INFILTRATION FILTERS

SHAFTS AND ACCESSORIES

Edition 2008
Brochure V 28 EN

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 m² - 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	☐ Residential	☐ Industrial/Commercial	☐ Local Authority	☐ .....

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

Area type / roof	Type of fixing	Ψ	m² 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	$1*10^{-3}$	
Medium sand	$1*10^{-4}$	
Fine sand	$1*10^{-5}$	
Coarse clay	$1*10^{-6}$	
Clay	$1*10^{-7}$	No infiltration possible

Area available for infiltration (length x width x m)	x	m

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 (Ψ) must be taken into account when sizing the infiltration system.

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

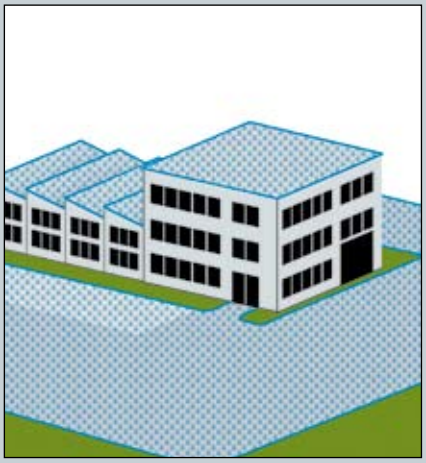
Calculation guideline for smaller properties

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.



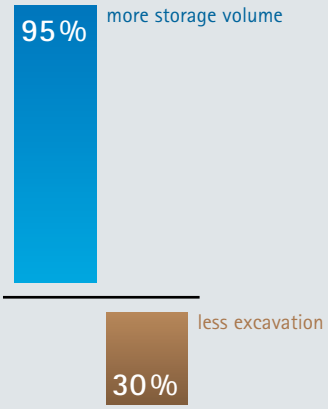
Surfaces of the connected buildings plus roof overhangs (independent of roof pitch) + other connected surfaces.

Type of soil	Percolability						100 m²	150 m²	200 m²
							number GRAF modules		
Gravel	💧	💧	💧	💧	💧	150 litres	3	4	5
						200 litres	5	7	8
Medium sand	💧	💧	💧	💧	○	150 litres	6	8	10
						200 litres	7	11	14
Fine sand	💧	💧	💧	○	○	150 litres	8	12	15
						200 litres	10	15	20
Coarse clay	💧	💧	○	○	○	150 litres	10	15	19
						200 litres	13	19	25
Clay	○	○	○	○	○		No infiltration possible		

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

GRAF infiltration modules

Cost-effective and space-saving

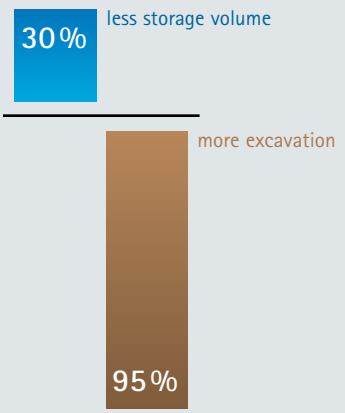


Cost-effective

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.



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

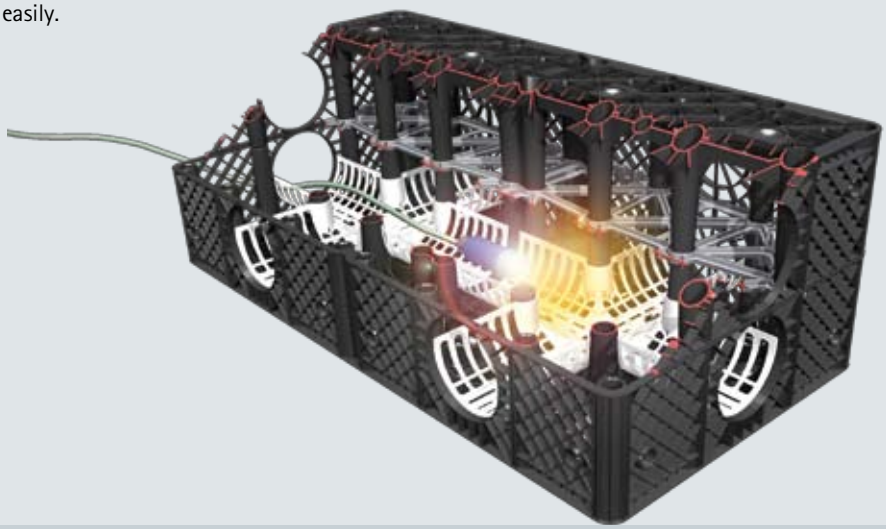
The lorry-bearing design guarantees extreme load capacity thanks to its stable column structure. It facilitates SLW 60-bearability with an 800 mm (31.5 inches) covering. The vehicle loading design can bear a long-term load of approx. 3.5 t per m². There are no limits on the use and design of the surface over the system.

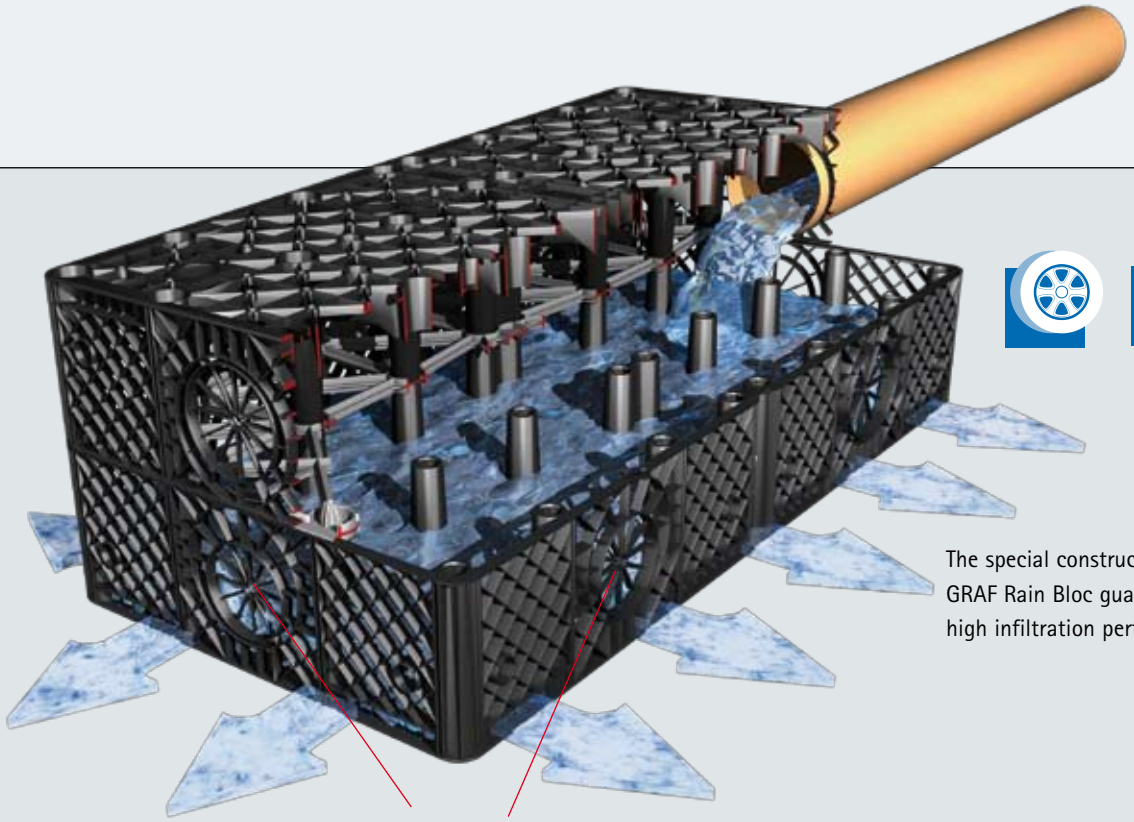
Inspectable

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.





Flexible connection options - length and crossways DN 100/125/200

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

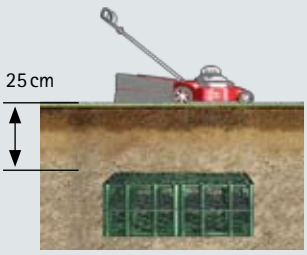
Rain Bloc

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

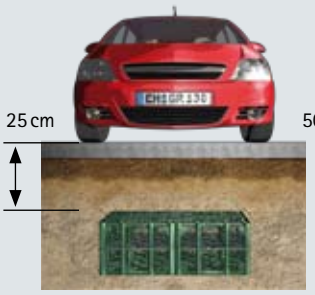
Rain Bloc inspect

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



Pedestrian*



Vehicle loading*

Lorry-bearing*
up to 60 tons total weight

*Details see page 11

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

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

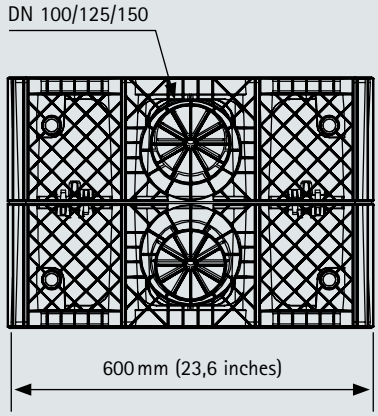
The feed and ventilation pipes will be connected laterally at the designated position. For this purpose, the plastic ribs must be detached. The pipes must extend into the modules approximately 200 mm (7.9 inches). For extensive laying of the modules it is essential to distribute several feeding pipes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

Installation of the Rain Bloc

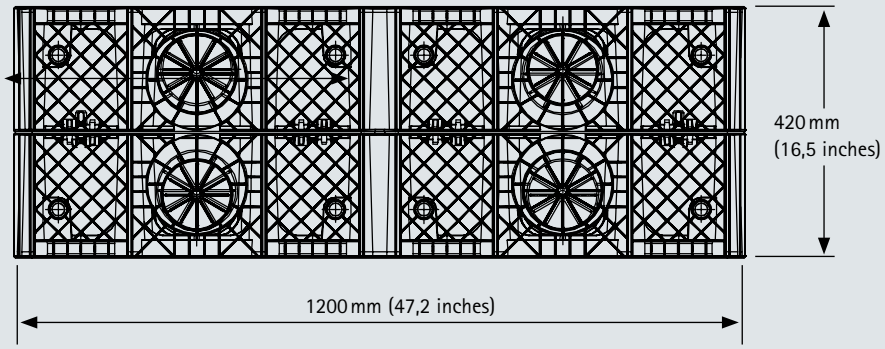
The impermeable membrane is put on the horizontal, flat footprint of the excavation with 500 mm (19.7 inches) overlapping. The modules are positioned horizontally on the membrane and connected with each other by plastic connectors. For lengthwise and crosswise connection each 4 connectors are necessary. 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



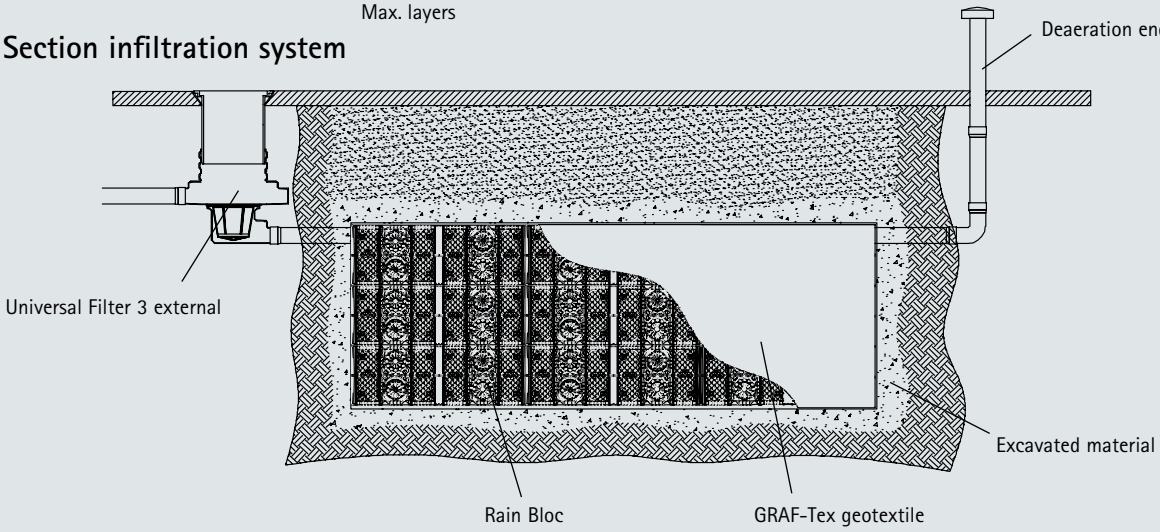
Side view



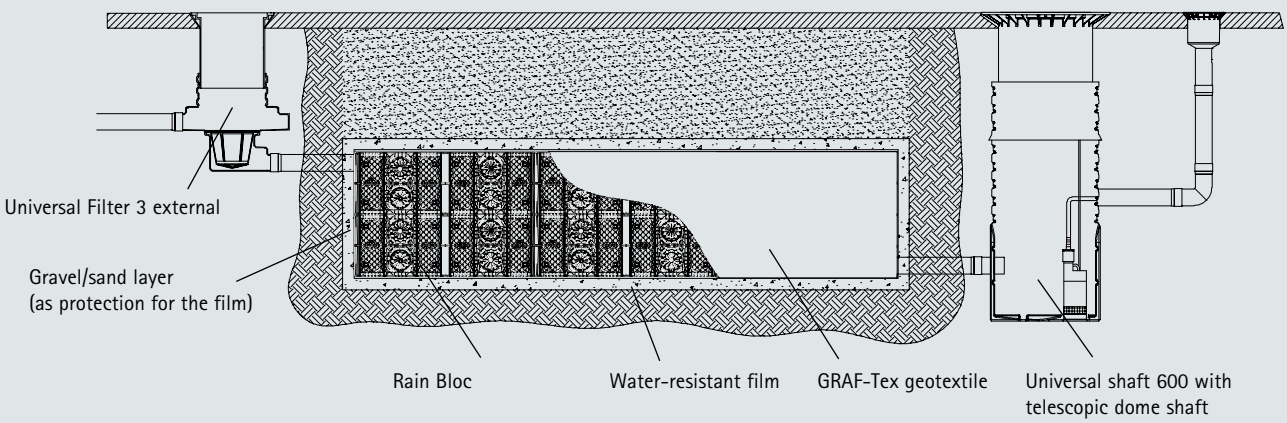
Maximum earth covering and installation depth

Load		Rain Bloc car	Rain Bloc hgv
	Short-term Long-term	max. 7,5 t/m² max. 3,5 t/m²	max. 10 t/m² max. 5 t/m²
Car-loading and without traffic load	Max. earth covering Min. earth covering Max. installation depth (lower edge) Max. layers	1600 mm (63 inches) 400 mm (15.7 inches) 3000 mm (118.1 inches) 6	2750 mm (108.3 inches) 250 mm (9.8 inches) 5000 mm (196.9 inches) 10
Lorry-loading 12 t	Max. earth covering Min. earth covering Max. installation depth (lower edge) Max. layers	-	2750 mm (108.3 inches) 500 mm (19.7 inches) 5000 mm (196.9 inches) 10
SLW 30-loading (lorry 30 t)	Max. earth covering Min. earth covering Max. installation depth (lower edge) Max. layers	-	2500 mm (98.4 inches) 500 mm (19.7 inches) 5000 mm (196.9 inches) 10
SLW 40-loading (lorry 40 t) only possible on low traffic roads	Max. earth covering Min. earth covering Max. installation depth (lower edge) Max. layers	-	2250 mm (88.6 inches) 500 mm (19.7 inches) 5000 mm (196.9 inches) 10
SLW 60-loading (lorry 60 t) only possible on low traffic roads	Max. earth covering Min. earth covering Max. installation depth (lower edge) Max. layers	-	2000 mm (78.7 inches) 500 mm (19.7 inches) 5000 mm (196.9 inches) 10

Section infiltration system



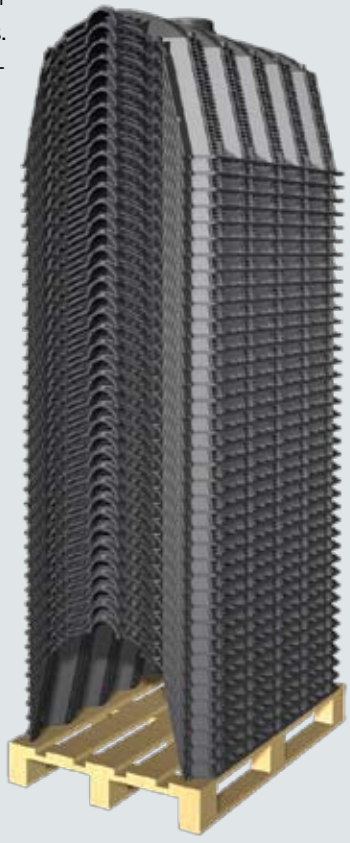
Section rainwater harvesting plant



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.

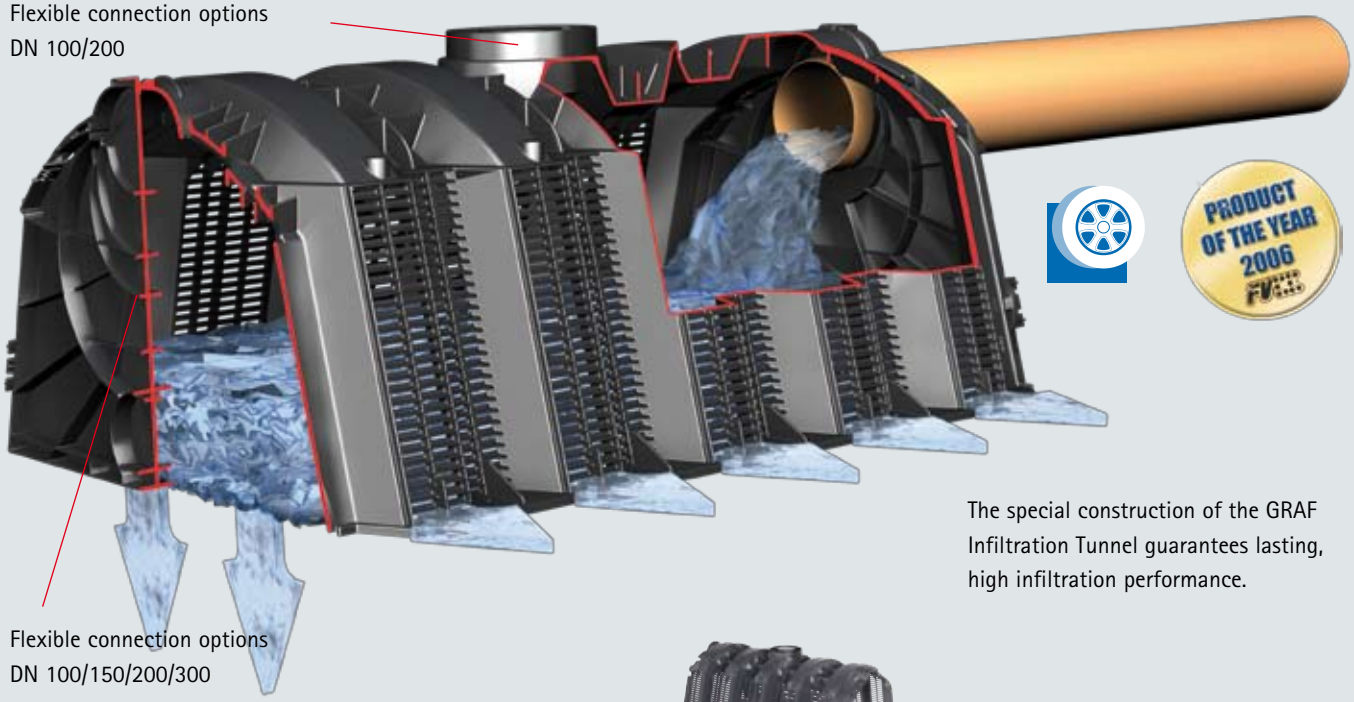
Vehicle loading

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



Flexible connection options
DN 100/150/200/300

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

Infiltration Tunnel car

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

End plate for Infiltration Tunnel car

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

Inspection end

DN 200

Order no. 340527

Deaeration end

DN 100

Order no. 202004

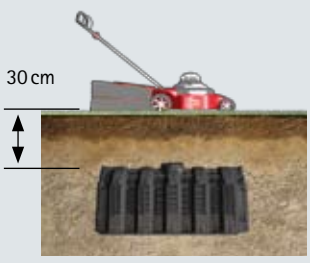
GRAF-Tex geotextile

For an Infiltration Tunnel size of 1.50 x 2.50 m

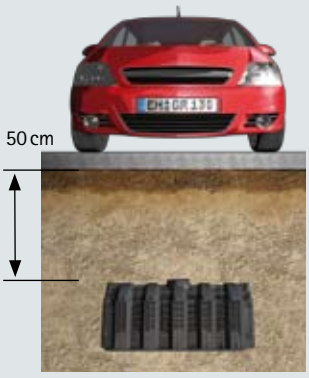
Order no. 369026

Material sold by the metre, roll width 5 m

Order no. 369014



Pedestrian



Vehicle loading*

Details see page 15

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 groundwater. 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:

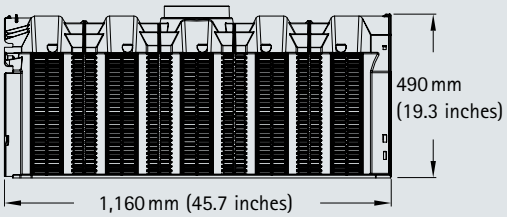
The feed pipes will be connected at the front of the end plates. For this purpose the accordingly perforated and labelled circular cut-outs will be detached. The feed pipes must extend into the tunnel modules approximately 20 cm (7.9 inches). For assuring that the water enters into the modules in a steady 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.

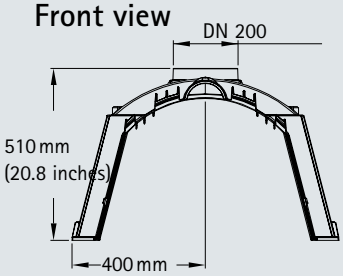
Technical Data	
Volume	300 litres (79 US-Gallons)
Length	1,160 mm (47.2 inches) 1,220 mm (341.0 inches) (incl. end plates)
Width	800 mm (31.5 inches)
Height	510 mm (20 inches)
Connectors	upper side: DN 100, 150 200, 300 lower side: DN 100, 200
Weight	approx. 11 kg
Material	100 % made of recycling material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

Side view

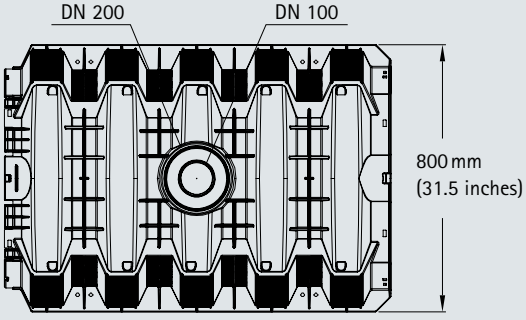


Length incl. end plate 1,220 mm (48 inches)

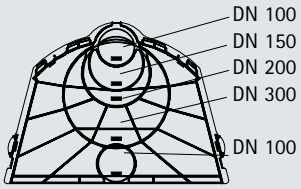
Front view



Plan view



End plate

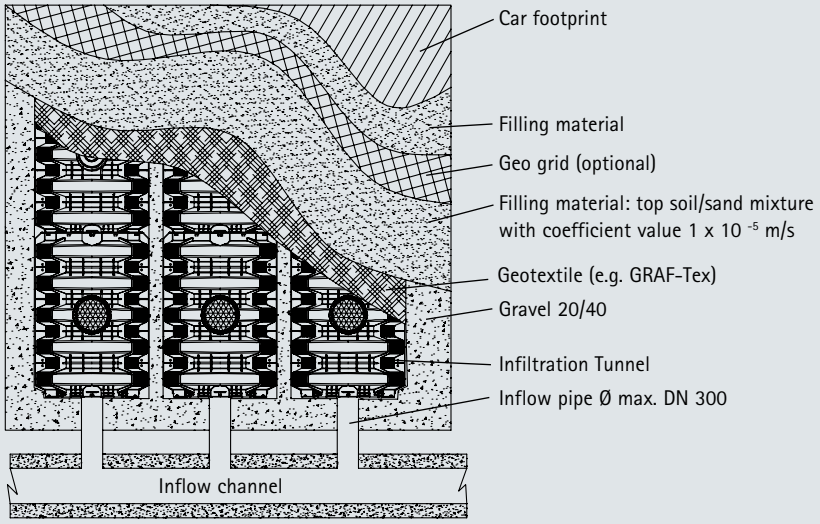


End plate, order no. 231004

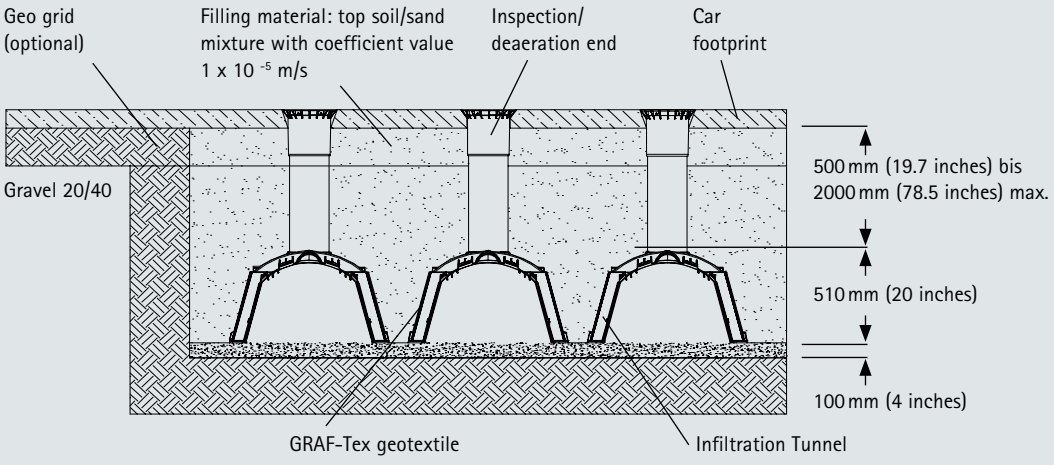
Maximum earth covering and installation depth

	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)

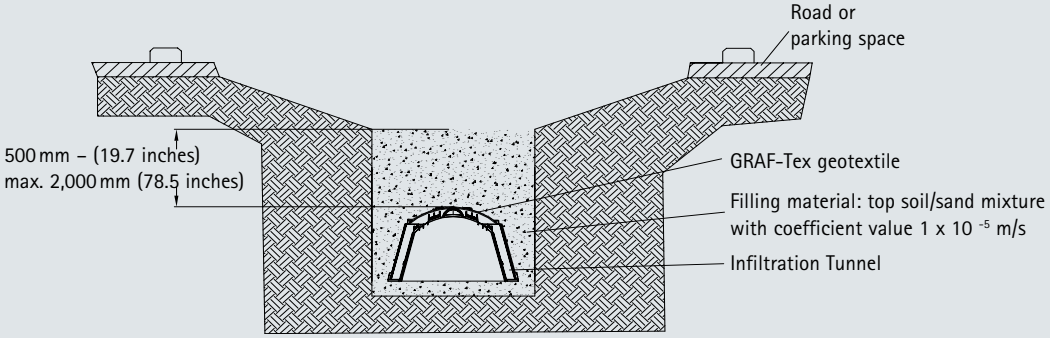
Plan view



Section infiltration system



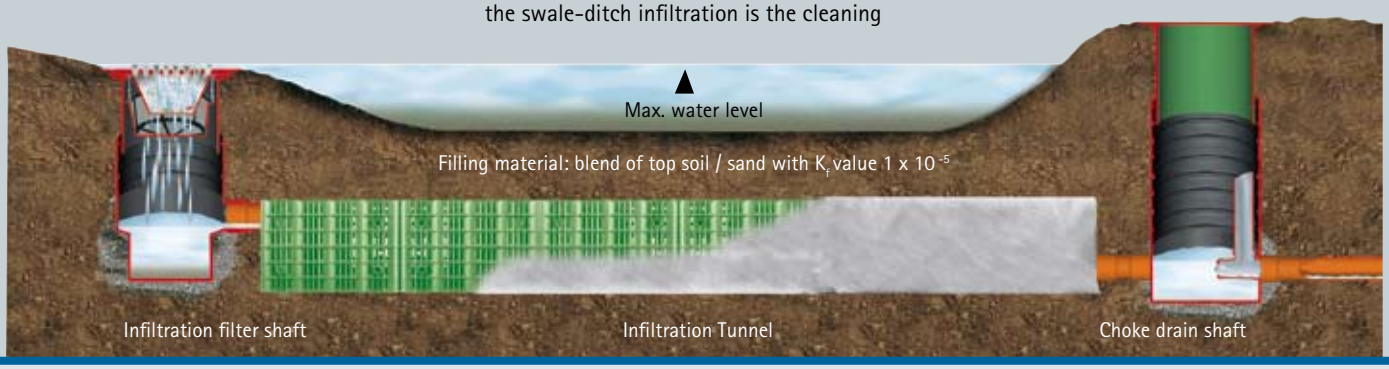
Section open swale infiltration ditch

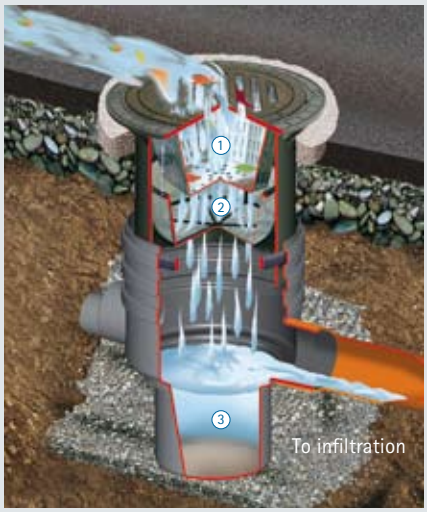


Swale-Ditch infiltration

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.



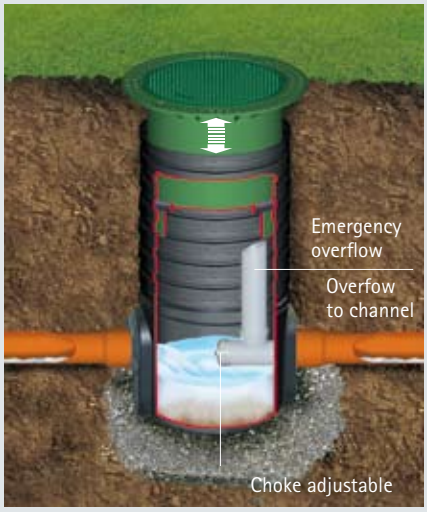


Infiltration filter shaft

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

Infiltration filter shaft
Vehicle loading, colour: black
Order no. 340025



Choke drain shaft

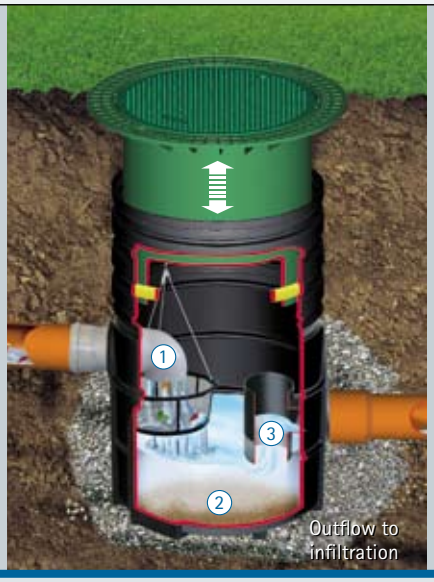
Continuously adjustable mounting depth of 600 mm (23.6 inches) -1,250 mm (49.2 inches) through telescope dome shaft
Plastic cover can be walked on or cast cover can be driven on by car
Cover childproof lockable
Sealed up to earth's surface
No height offset between inlet and outlet
Maximally 350 sqm of sealed area to be connected
Connections DN 100

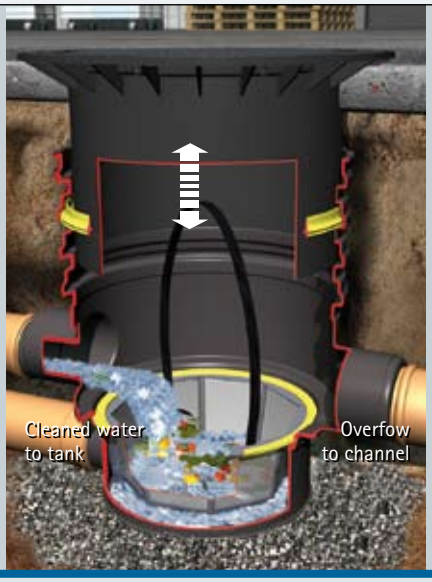
Drain quantity adjustable from 0.5 – 6.5 l/s
Special solution on request

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

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 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

Sedimentation filter shaft
Suitable for pedestrian loading, colour: green
Order no. 340026

Universal Filter 3 external
Suitable for pedestrian loading, colour: green
Order no. 340020

Universal Industrial Filter 3 external
Suitable for pedestrian loading, colour: green
Order no. 340050

Sedimentation filter shaft
Suitable for vehicle loading, colour: black
Order no. 340027

Universal Filter 3 external
Suitable for vehicle loading, colour: black
Order no. 340021

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

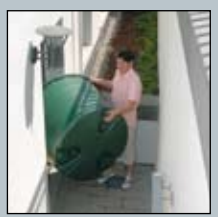
Tank dome
(with telescopic end 1 m (39.3 inches), to be cut on request),
DN 200
Order no. 202033

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

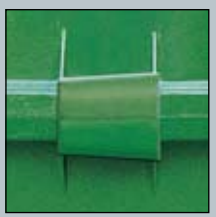
Advantages:

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

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

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)
Hight: 880 mm (34.7 inches)
(can be shortened)
+ Telescopic max. 400 mm (15.8 inches)

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)
Hight: 1200 mm (47.2 inches)
(can be shortened)
+ Telescopic max. 400 mm (15.8 inches)

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
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 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

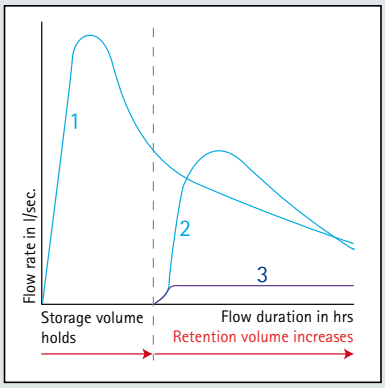
For rainwater retention and sewer relief

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.

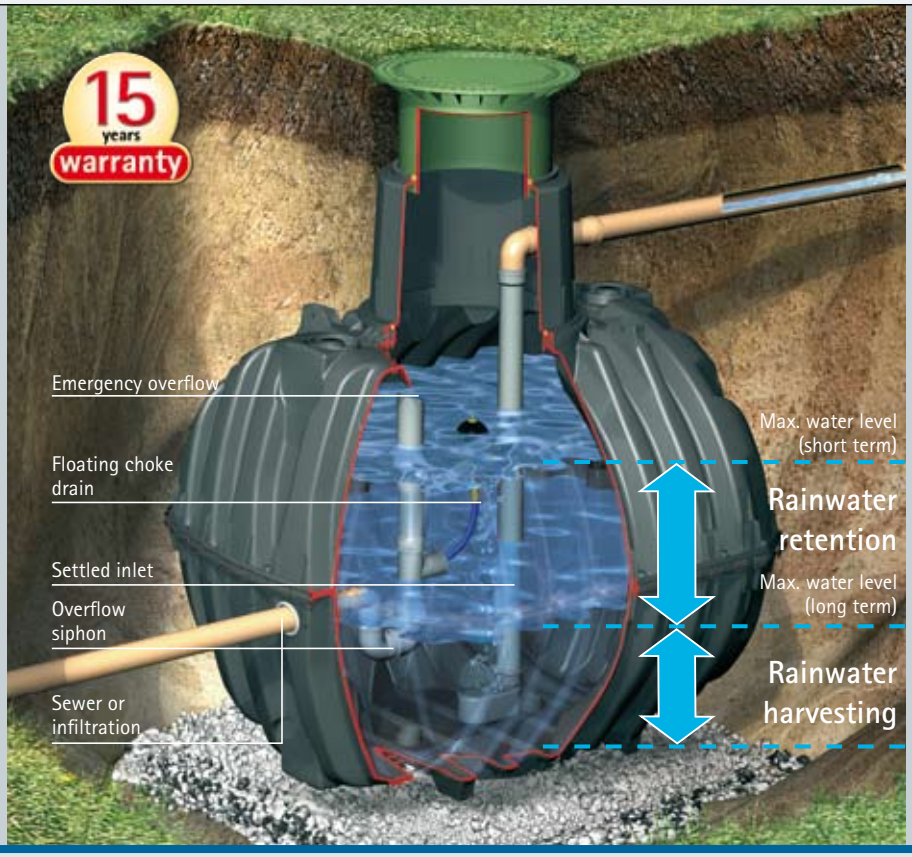


1. Normal rainwater drain (without retention)
2. Rainwater drain with reservoir and reduced drain without float
3. Rainwater drain with reservoir and floating drain choke = constant flow

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

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.

Your expert specialist dealer:

Over 45 years of quality and innovation

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