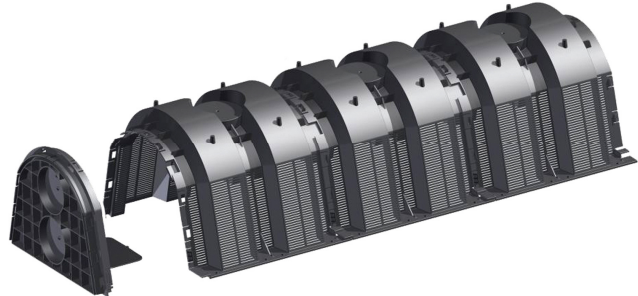


Instructions for installing and maintaining the GRAF Infiltration Tunnel 130

GRAF Infiltration Tunnel 130

Order no. 410200



The points described in these instructions must be observed in all cases. Failure to do so shall invalidate the warranty. For any additional items purchased through GRAF, you will receive separate installation instructions in the transport packaging.

The components must be checked for any damage before the system is transferred to the trench. Damaged components must not be used.

You can download any missing instructions from www.graf.info or request them from GRAF directly.



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1. General information

1. General information

1.1 Safety

All work should be undertaken in compliance with the relevant accident prevention regulations according to BGV C22 or national relevant standards.

Furthermore, relevant specifications and standards, such as DIN 18300 “Earthworks” and DIN 4124 “Excavation pits and trenches”, must be observed during installation, assembly and repairs.

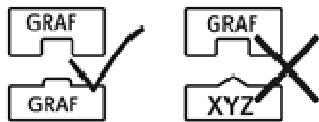
The entire system must always be switched off and secured against unauthorised restarting during any work on the system or system components.



There is an increased risk of slipping on products in the trench during frosty or wet conditions.



Before installation, each element should be checked for damage. Damaged or defective parts must not be installed. If in any doubt, contact GRAF.



GRAF provides an extensive range of accessories, which are all coordinated and can be combined to form complete systems. Using accessory parts not approved by GRAF will render the warranty/guarantee null and void.

1.2 Transport and storage

The GRAF Infiltration Tunnel 130 are packaged in a project-specific manner. The individual parts of the infiltration ditch elements (module and side plate) are usually located on a pallet. The tunnels must be assembled on site.

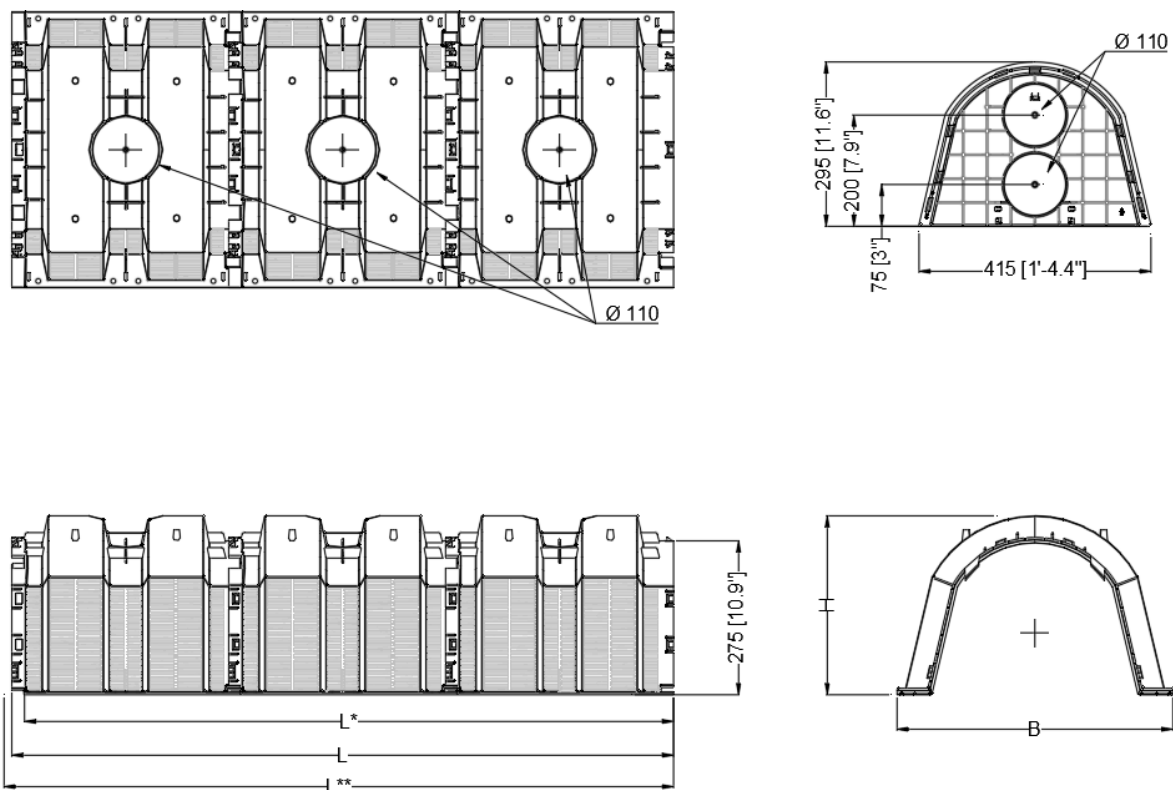
They can be transported to the installation location with a fork lift truck or similar equipment. At the installation location, the infiltration ditch elements can be moved manually or with light-duty equipment.

A suitable surface (level and solid) should be used for intermediate storage. Storage outdoors should not be for any longer than one year. What's more, the impact sensitivity of the elements increases as the temperature falls. Especially in the event of frost, impact may therefore cause damage to the elements.

2. Technical data

2. Technical data

2.1 Technical data



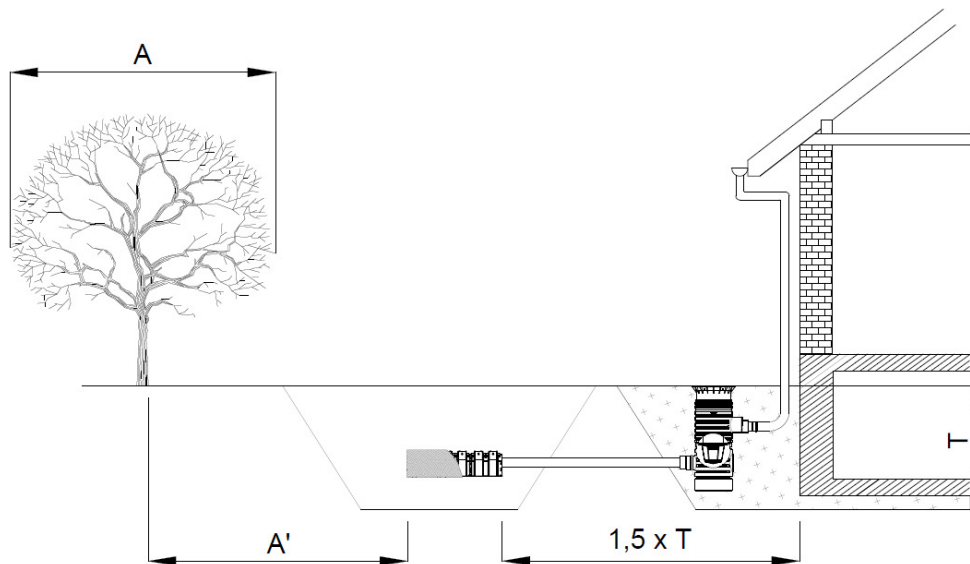
Infiltration Tunnel 130		
Item no.		410200
Volume		130 litres
Weight		5 kg
Height [H]		320 mm
Width [B]		500 mm
Length [L]		1190 mm
Length, including end plates [L**]		1240 mm
Length, connected into tunnel [L*]		1165 mm
Connections	Face end	2x DN 100
	Top	3x DN 100
Loading capacity	Short term	max. 65 kN/m ²
	Long term	max. 30 kN/m ²

3. Selecting the location

3. Selecting the location

3.1 Location

The location of the infiltration system should be selected such that escaping water does not cause damage to buildings or other installations. To avoid erosion and accumulation, infiltration systems should always be located at a distance of at least 1.5 times the trench depth. This distance may be greater depending on the requirements laid down by your local authority. It is advised you check their guidelines before installing.



The depth from the base of the infiltration system to the average highest point of groundwater must be at least 1m. If this is not the case then it must be agreed with the relevant authorities as the system may not function properly.

Distance (A') to existing or planned trees must also be at least the expected crown diameter (A). If this is not possible, a root protection film should be fitted to protect the system from root penetration.

A sufficient distance should be maintained from plot boundaries to avoid damage or interference to neighbouring properties. This distance should be at least 2 metres.

GRAF Infiltration Tunnel 130 are approved for installation under parking areas and private roads. Public roads are subject to substantially greater structural loads so a sufficient distance must be maintained from them. The distance should be selected such that the forces arising (structural and dynamic) from the public roads do not impact on the system.

If a system is installed at a distance of less than 5 m to a slope, mound or embankment with an incline of more than 5°, a statically calculated supporting wall must be constructed to bear the pressure of the soil. The wall must extend beyond the system by at least 0.5 m in all directions and must be at least 1 m away from the system.

In accordance with DIN 1986-100 and national standards, the drainage pipes, which also includes pipes from linked surfaces such as yards and roof areas, should usually be fitted in an area free of frost. However, due to minimum distances from groundwater/standing groundwater, there may be limited installation options. Checks should be undertaken on a case-by-case basis to establish whether a flatter installation would be sensible or, in the case of a swale infiltration ditch, is indispensable.

3. Selecting the location

3.2 Pre-treatment

The rainwater which is supplied to the infiltration system always requires a treatment stage upstream of the supply. This may be a settling basin, filter shafts or simple filter which cleans the incoming water of dirt particles. The ingress of dirt should be avoided because the infiltration performance could fall if the system is clogged with fine particles and this could result in a blockage.

3.3 Trench dimensions

The infiltration system is sized according to work sheet DWA A138. Please contact us for free sizing.

The dimensions of the trench bed based on the above sizing are as follows:

- Infiltration ditch length (sizing) + 1 m working space (all round)
- Infiltration ditch width (sizing) + 1 m working space (all round)

The trench height depends on the product selection, traffic loading and planned connection heights / shafts.

The trench must also be designed in accordance with DIN 4124 "Excavation pits and trenches" or similar standards. In particular, this includes the slope angle. With installation depths ≥ 1.25 m, this must be selected according to the type of soil.

4. Installation conditions

4. Installation conditions

4.1 Green spaces and areas suitable for pedestrian loading

When installing under surfaces suitable for pedestrian loading, vehicles of any kind must be prevented from driving over the surface through structural measures, cordoning off or by using barriers. The structure of layers in green spaces above the infiltration system is different from surfaces with traffic loading, see section 5.5.

If a lawn is planted above the infiltration element, the system should be covered with a water-impermeable film or a layer of clay roughly 100 mm thick because otherwise this lawn area may dry out more quickly than the rest of the lawn.



Min. covering of earth	150 mm
Max. covering of earth	1200 mm
Max. installation depth	1500 mm

4.2 Area suitable for vehicle loading

The minimum and maximum earth coverings differ for the various load classes. Deviating installation situations should always be discussed with Otto GRAF GmbH. Fillers (reused excavated material and/or gravel) with a maximum density of 20 kN/m³ and a friction angle of 40° are needed.



Min. covering of earth	500 mm
Max. covering of earth	1200 mm
Max. installation depth	1500 mm



Note:

During and after installation, ensure that only load classes approved for the construction project drive over or park on the infiltration storage crates. Fences, barrier tape or warning signs may prevent unapproved vehicles from accessing sensitive areas.

5. Installation

5. Installation

5.1 Preparing the trench

The size of the trench depends on the dimensions of the infiltration system, leaving a working space with a width of around one metre all the way round, see section 3.3.

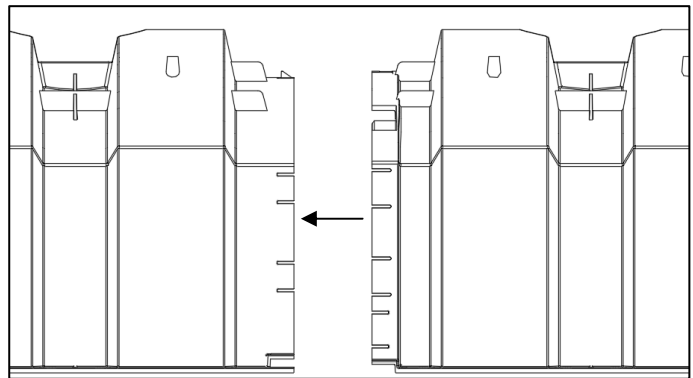
The trench bed must always be prepared as a horizontal, level pit with load-bearing capacity. Sharp objects, larger stones or similar foreign objects should be removed.

A blinding, with a thickness of approx. 80 mm, made from gravel (grain of 8/16 mm) is then placed on top of the bed. This is then drawn out flat and serves as a base for the next stages.

5.2 Positioning the Infiltration Tunnel 130

Before inserting into the trench, all packaging material, such as straps, stickers etc. must be removed from the infiltration storage crates.

The Infiltration Tunnel 130 are then placed on the bed of gravel and connected lengthways. The tunnels are joined with a positive fit without any further attachment elements. To join two tunnel elements, they have to be interconnected by hand. The alignment of the tunnel elements should be noted. The end shape of the infiltration tunnels may provide guidance. Each row of tunnels is then sealed with an end plate. Ensure that the tunnel connections sit tightly against one another and that there are no gaps.



If there are several rows of tunnels, ensure a minimum distance of 1.5 m between the tunnels. A Spacer, such as a short piece of wood can be used to ensure the correct distance. The minimum spacing all the way round the infiltration system must also be ensured.

To avoid particles of dirt entering through the filler material, geotextile is installed directly above the tunnels. The geotextile should overlap by at least 300-500 mm at the faces.

If the grain size of the filler material is sufficient, as an alternative, the geotextile can also be inserted above the first layer of filler material (at roughly the height of the upper edge of the tunnel).

5.3 Connecting the feed and deaeration pipes

The feed pipes are connected to the face ends on the end plates. The appropriately perforated and labelled circular cut-outs are removed for this purpose. The pipes must extend approx. 150 mm into the modules. To ensure an even inflow of water, if the modules are laid over a large area, the feed pipes must be split between each infiltration section. The inspection / deaeration end (order no. 369017) is connected at the top to the connection fitting provided for this purpose. At least one deaeration pipe should be planned per section.

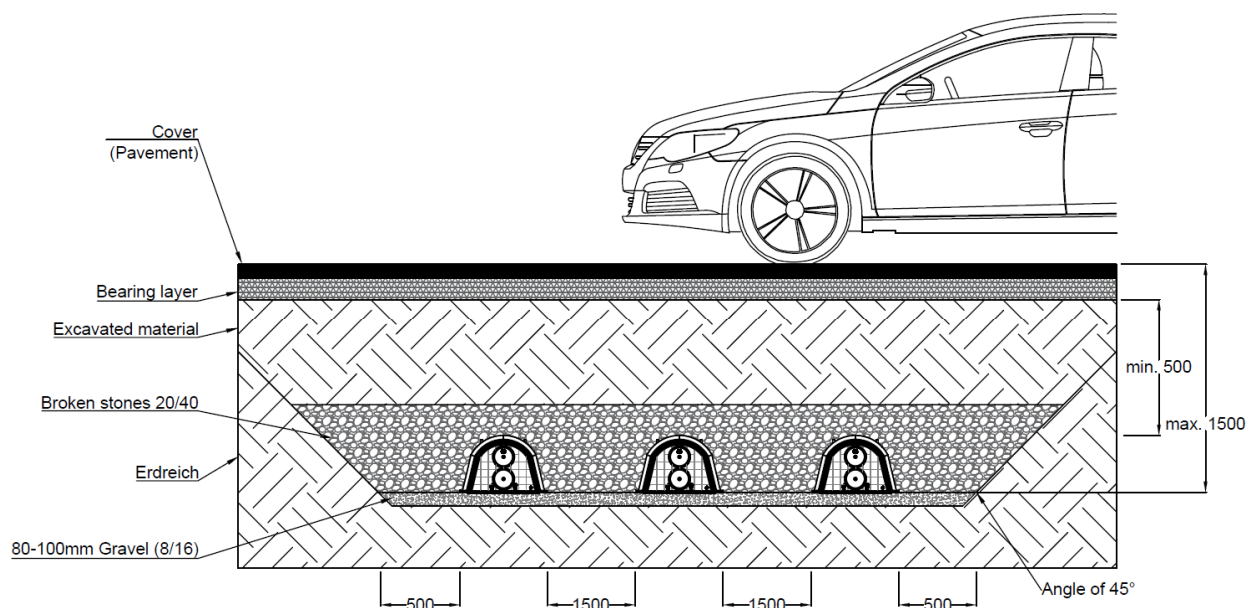
5.4 Filling the infiltration system

Ensure that the filling is tight and even. There must not be any gaps or dead spaces. The first layer comprises 20/40 broken stones and is used to fully cover the top edge of the tunnel. The material dug out during construction can then be used as filler. The pit is then filled evenly in layers.

The terrain surface and subsurface must be prepared according to the anticipated loading.

5. Installation

5.5 Installation under roads suitable for vehicle loading up to max. 3.5t



The infiltration storage crates are installed and connected in accordance with chapter 5. Dearthation ends should be installed in green spaces.

5.6 Use of construction machinery in the installation phase

Various construction devices may be used to fill the trenches. Given the additional dynamic loads they cause, compression equipment must not be driven directly over the infiltration ditch elements and compression equipment with activated vibration motors must not be taken over the area.

By way of example, Table 1 shows the earth covering needed for various compression equipment when using a backfill material with an angle of friction of $\phi \geq 40^\circ$.

Table 1 Compression equipment

Earth covering in [m]	Properties	Max. approvals
min. 0.2	<i>Lightweight walk-behind roller</i> Total weight: Distributed: Dimension:	approx 700 kg evenly, over 2 rollers 0.9 x 0.7
min. 0.3	<i>Lightweight earthwork roller</i> Total weight: Distributed: Dimension:	approx 2.5 t evenly, over 2 rollers 1.2 x 3.2

Please contact GRAF in the event of deviation from the materials and equipment stated here.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

