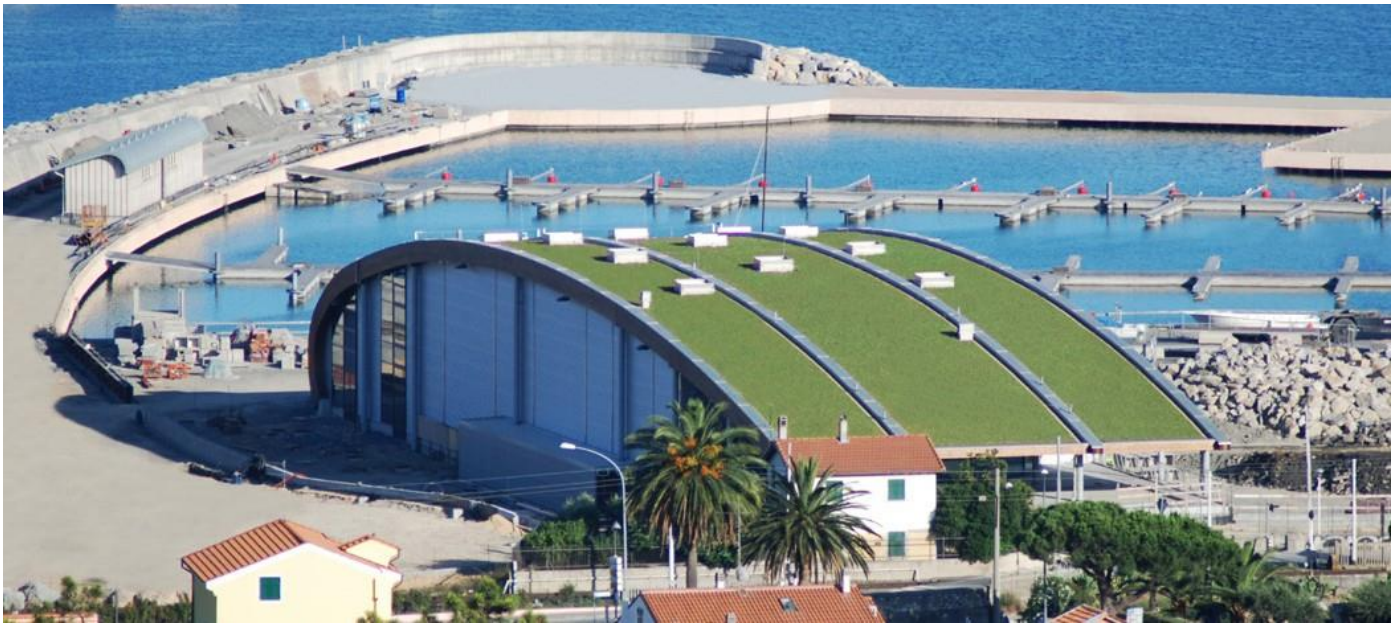
DAKU

LA NATURA SUL TETTO

DAKU INTENSIVE PITCHED INSTALLATION MANUAL

DAKU INTENSIVE ROOFTOP GARDEN

DAKU INTENSIVE PITCHED is a garden designed for pitched rooftops or for rooftops with complex geometrical shapes, while maintaining the same features and performances of a garden on a flat surface. DAKU INTENSIVE PITCHED gardens can be built on surfaces up to 35° steep, planting sedums, vines, small bushes.



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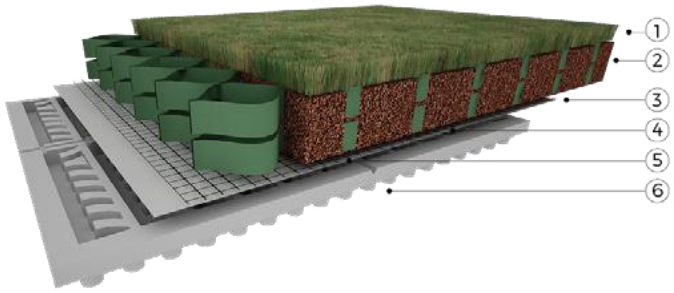
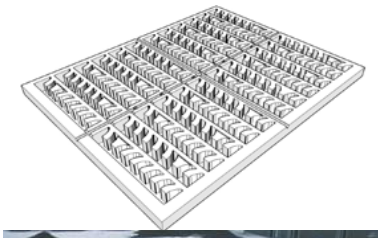
MATERIALS



1.Lawn
2. **DAKU ROOF SOIL Substrate**
3. **DAKU GEO retainment cell**
4. **DAKU GRID confinement grid**
5. **DAKU STABILFILTER filtering component**
6. **DAKU FSD 20 Panels**

Thickness of the system (without plants)	>23 cm
Weight when saturated (without plants)	194 kg/m^2
Total amount of water for the plants	> 69 l/m^2
Air volume at pF1	> 64,50 l/m^2

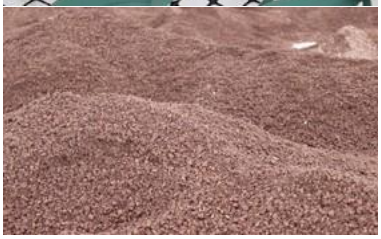


DAKU FSD 20 panels are made of expanded polystyrene, with a size of 1.25x1.00 m. They are used for water storage and drainage.

DAKU STABILFILTER filters are geotextiles in polypropylene and are used as a separation layer between the **DAKU FSD** panels and the **DAKU ROOF SOIL** substrate.

DAKU GRID is a cellular confinement grid. It is made of polypropylene, has a bi-oriented structure, is quadrangular in shape and black in color. The grid is used if the slope is steeper than 5°.

DAKU GEO are retainment components made of polyethylene, with a cellular structure that prevents corrosion. They are green in color and have a three-dimensional ovoid shape. These components are used if the slope is steeper than 18°. They prevent other components from sliding and stopping surface runoffs.



DAKU ROOF SOIL is a light substrate made of volcanic mineral materials, suitably combined with organic substances. Thanks to its features, the substrate is suited for DAKU INTENSIVE gardens with low overall thickness (15 cm minimum).

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There are no specific limitations to what types of plants can be installed in the garden. The chosen plants however must be suited to the climate and to the characteristics of the surface.

DAKU PLUS is an additional nutrition compost for rooftop gardens. It is made of fertilizing granules, covered with a biodegradable polymeric membrane, which gradually releases nutritive substances, depending on the soil temperature.

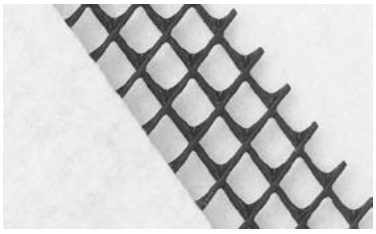
ACCESSORIES

DAKU PRO series is a set of components, made of an aluminum-magnesium alloy, used for separation and containment. These components separate the DAKU ROOF SOIL substrates from the other materials. The components are welded to the roof, without mechanical fixing.

DAKU CONTROLLER components are made for inspecting easily and safely the drainage and ventilation pipes. They are made of aluminum-magnesium, are 25x25 cm wide and 10 cm tall. DAKU CONTROLLER components can be heightened to reach the lawn surface by using the DAKU RING extensions.

DAKU PRO STF components are used as containment elements on pitched gardens. They are made of aluminum-magnesium. To assure their strength, they are connected to the rooftop using mechanical fixings.

DAKU TUFO are curbs made of tuff, having the shape of a parallelepiped. The curbs are available in different sizes and are used on the edges of the garden as a protective element or to delimit flowerbeds.



DAKU DRAIN G450 geo-composites are used as protective and vertical drainage components on the waterproof edges of the garden. They are also used as a drainage element on paved areas, beneath the slabs/gravel/containment walls.

MATERIALS HANDLING

PACKAGING:

During productions, all the materials are packaged. The type of package depends on the dimensions and characteristics of each material.

DAKU FSD 20 panels are usually packaged in pallets made of 2 half-size pallets wrapped in polyethylene packaging film. The pallets are then put on bars made of EPS so that they can be moved with forklifts or cargo nets.

DAKU STABILFILTER geotextiles are made of rolls (dimensions: 200x30x30 cm), wrapped in a single polyethylene package. Each roll can be carried separately or, depending on the quantity needed, a set of rolls can be loaded on a pallet and wrapped in polyethylene.

DAKU GRID is made of rolls (dimensions 4x50 m) wrapped in polyethylene.

DAKU GEO components do not have a specific package. Depending on the quantity needed, they can be carried on pallets to make transport easier.

DAKU ROOF SOIL substrate is usually packaged in a 1 m^3 polypropylene bag, with a drain valve on the bottom. There are 4 loops for lifting and moving the bag. The substrate can be packaged also in smaller bags, with a capacity of 33 l each. Bags can be put on a pallet, wrapped in a polyethylene film. The substrate can also be delivered loose.

DAKU PLUS is packaged in 5-10 kg polyethylene bags.

DAKU CONTROLLER and DAKU PRO accessories are usually packaged in cardboard boxes or in pluriballs and polyethylene films.

SHIPMENT:

All materials are delivered to the construction sites with trucks. All materials must be loaded and unloaded by qualified workers, in compliance with the safety regulations, by using forklifts and cranes.

STORAGE:

Store the materials on plain surfaces, on a dry indoor environment and far away from heat sources or flames. In the construction site, store the materials outdoor only for the time necessary for their installation. Store the materials in a safe area, in compliance with the safety measures of the site. Do not pile pallets or big bags.

LIFTING AND MOVEMENT:

Use forks or cargo nets to lift the materials to the rooftop. Make sure the lifting equipment is compatible with the materials. Lift the big bags by using ALL THE 4 LOOPS that equip the bag. If the lifting is done by using forks, make sure the forks are smooth and rounded ahead, without edges, as they may damage the equipment. All workers must maintain a safe distance from suspended loads when they are being moved.

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INSTALLATION STEPS

1)PREPARING THE ROOFTOP SURFACE

Make sure that there is no debris and no water stagnation on the rooftop surface.



2) LAYING THE DAKU FSD 20 DRAINAGE AND WATER STORAGE PANELS

DAKU FSD 20 panels for drainage and water storage must be laid manually. Lay the panels starting from one side of the rooftop.

Each panel has a rabbet joint on each side to easily lay and connect it with other panels without using glue or other type of fixing.

Lay the panels putting the side with the truncated-cone feet downward, directly on the rooftop surface. The other side, with the storage cells, will be upward (figure 1). Lay the FSD panels so that the upper storage cells have the long side perpendicular to the slope of the roof (figure 2).

If needed, the panels can be shaped to fit the shape of the rooftop. Handsaws and cutters can be used, paying attention not to cut through the storage cells (figure 3). If a panel covers an area above a drain, make a hole on the section of the panel directly above the drain with a handsaw or a cutter. Then fix on the hole the DAKU CONTROLLER inspection component. This will make inspection easier.

figure 1

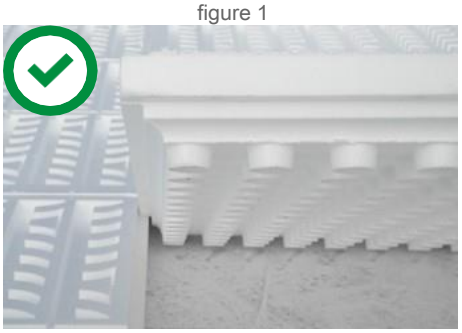
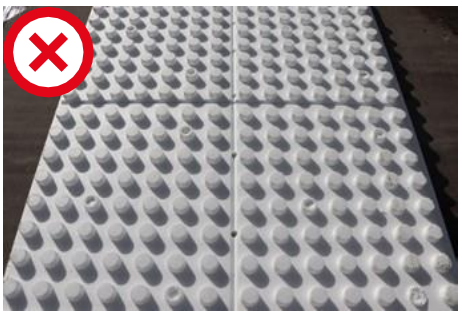



figure 2

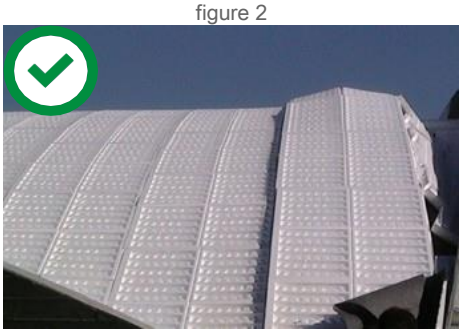
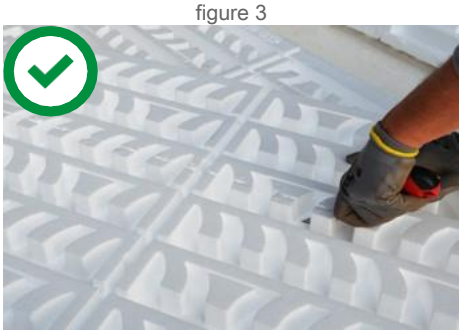



figure 3

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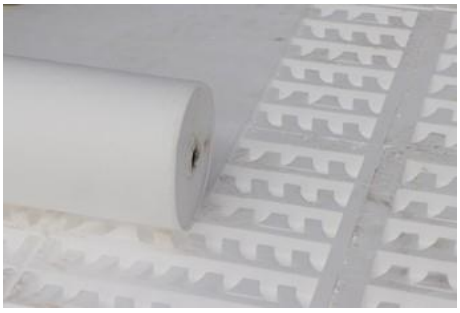
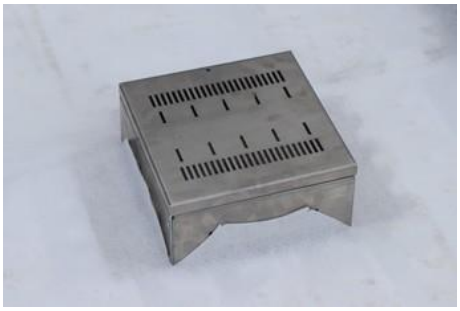
3) LAYING THE DAKU SFI FILTERING SHEET

Unroll and lay the DAKU STABILFILTER filtering sheets, by covering the whole surface of the FSD panels. On the edges of the rooftop, fold the sheets upwards, with a margin of 10-15 cm. Cover with the sheets also all the vertical surfaces (edges, chimneys, et cetera), making sure the height of the vertical cover matches the thickness of the garden's substrate. DAKU STABILFILTER sheets can be cut with

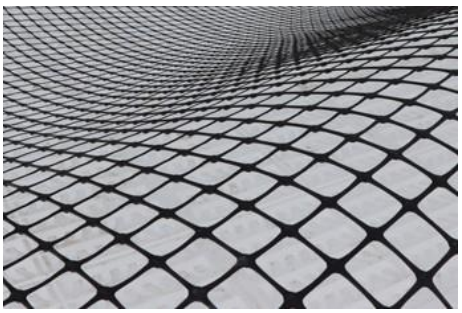
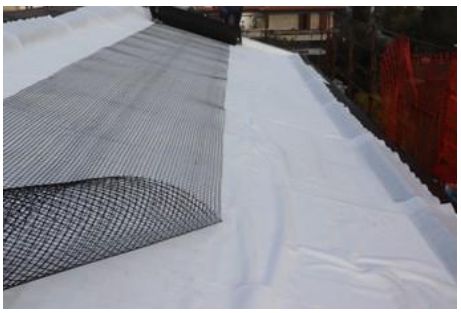


cutters or scissors.

4) LAYING THE DAKU GRID COMPONENT (on slopes > 10°)

DAKU GRID confinement grid is laid on the DAKU STABILFILTER separation layer before the DAKU GEO components (if needed) and the substrate are installed. The grid should be laid starting from the top of the slope. Connect it carefully to the top of the slope or to intermediate supports if present on the surface. Joints, if necessary, can be made my tying together the meshes of the grid. To improve the confinement performance of the grid, irrigate the substrate when the installation has been completed. DAKU GRID can be cut with handsaws or cutters. BE CAREFUL: if the grid is being cut directly on the waterproof surface of the roof, the cut pieces can damage the surface.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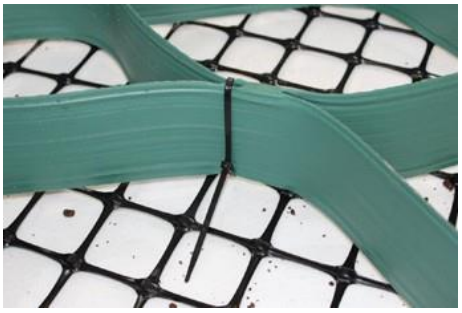
5) LAYING THE DAKU GEO COMPONENT (on slopes > 15°)

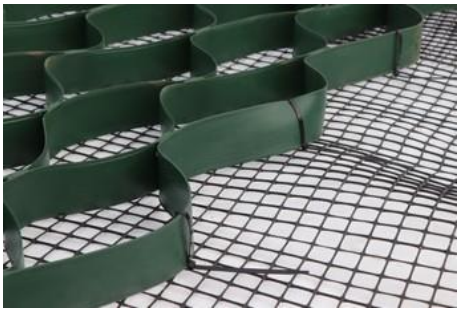
Lay DAKU GEO components directly on the DAKU GRID confinement grid. The components are tied to the grid with nylon zip ties. The dimensions and number of the zip ties depends on the weight they must sustain and need to be calculated (figure 1). If the shape and the steepness of the slope allow it, the components can be lay directly on the DAKU STABILFILTER filters. Start laying the cells from the top of the slope. The cells must be laid following the orientation of the slope. After that, fill gradually each DAKU GEO cell with the DAKU ROOF SOIL substrate. Make sure that each cell if full of substrate (figure 3). Finally, irrigate the substrate to improve its stability. DAKU GEO can be cut with handsaws or cutters.

figure 1

figure 2

figure 3





6) LAYING THE DAKU ROOF SOIL SUBSTRATE

Lay the DAKU ROOF SOIL substrate directly of the DAKU GRID or inside the DAKU GEO cells. The thickness of the substrate will depend on the type of garden and plants to be used. In a standard extensive garden, the thickness of the substrate is of 15 cm. Lay the substrate starting from the top of the slope, so that it is easier to lay it downward. The substrate must be laid using hand tools, such as rakes and shovels. If DAKU GEO components are required, make sure that each single cell is full of substrate. Big bags can be easily emptied by opening the drain valve. DO NOT stand under a big bag while it is being moved.

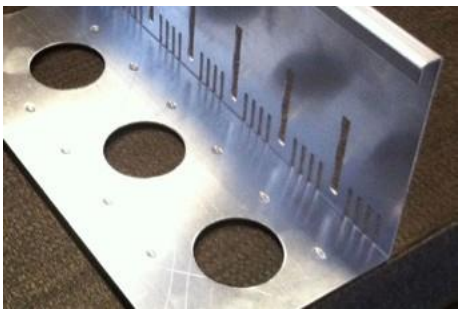
7) LAYING THE DAKU PRO COMPONENTS

Lay the DAKU PRO and DAKU PRO FLEX components directly on the DAKU STABILFILTER filtering sheet. To create a complete separation layer, connect the components by using the DAKU GL internal joints and the DAKU GA angular joints. The version DAKU PRO 170 FOAM of the components can be laid directly on the waterproof surfaces without protective layers. The versions DAKU PRO 170 MBP – TPO of the components can be laid directly on the polymer modified bitumen surface. The components can also be welded on all types of synthetic surfaces (PVC, TPO, EVA).

DAKU PRO - containment component

DAKU PRO TPO - synthetic surface

DAKU PRO MBP - bitumen surface



8) INSTALLING THE DAKU TUFO CURBS

The curbs are installed directly on the DAKU STABILFILTER sheets. They can also be installed while the substrate is being laid or after that. The curbs can be installed both horizontally and vertically.

9) INSTALLING THE SPRINKLER SYSTEM

To guarantee a homogeneous and correct irrigation of the whole garden, the sprinkler system needs to be carefully designed. DAKU uses overhead systems for the lawn and drip systems for the shrubby vegetation. The systems must be designed following the latest norms and regulations. To guarantee that the systems are always efficient and operative, maintenance should be constant.

10) ADDING THE DAKU PLUS FERTILIZER

On gardens with a lawn, spread the DAKU PLUS fertilizer (5 gr/m^2 for each centimeter of thickness of the substrate). Spread the fertilizer on the DAKU ROOF SOIL before adding the DAKU MIX SEMINA or before planting the vegetation. When the garden is complete, each year after the winter, the fertilizer should be spread again on the surface with a density of 40/50 gr/m^2.



11) PLANTING THE VEGETATION

The planting process must be completed ensuring the full safety, integrity, stability of the garden. Do not damage the components by using heavy or sharp tools that are not adequate.

Do not use plants that are not compatible with the substrate. All processes or tools used during the planting must not modify the composition and features of the substrate. Keep in mind that if the plants or pre-cultivated mats may not grow if they come from a substrate not compatible with the one used by DAKU.

During the plantation process, the clods cannot touch directly the DAKU STABILFILTER filtering sheets. There must always be a layer of substrate between the two. In addition to that, the clods must be always inside the substrate. Keep in mind that it is fundamental to have elements of structural support in the garden. The design of the garden must include them. These elements must not compromise the garden's functionality.