

## Leaflet PV Mounting System MSP-FR-G on green roofs

### 1. Green roof surfaces

Green roofs supplement thermal insulation, protect the roof seal, provide a habitat for plants and animals, retain rainwater, improve the microclimate and provide compensation and recreation areas. Green roofs reduce the ambient temperature compared to "open" roof surfaces. Roofs made of bituminous or high-polymer roofing membranes can reach surface temperatures of 70 to 80 °C in summer, whereas green roof surfaces only reach temperatures of about 35 °C. The legal aspects of green roofs are mostly regulated at the state or municipal level.

### 2. PV mounting systems on green roofs

While green roofs and the use of photovoltaics on flat roofs were previously considered and evaluated as competing systems, the combination of green roofs and photovoltaics is coming into focus due to synergy effects. In order to efficiently design and use the combination of green roof and flat roof photovoltaics, the cooperation and exchange of experts should be ensured in the planning and implementation phase.

### 3. Normative references

The specifications for green roofs are laid down in SIA Standard 312 "Greening of Roofs" and further specified in the guidelines of the Swiss Green Roof Society (SFG).

There are correspondingly coordinated leaflets and checklists from various cities.

Overall, the SFG has a very positive attitude towards solar systems on green roofs and actively promotes so-called combi-solutions (solar systems on green roofs).

In Germany, the specifications of DIN EN 13948, as well as the green roof guidelines of the FLL, and the planning and implementation instructions and regulations of the BuGG must be adhered to.

In Austria, the requirements of ÖNORM L 1131 on the greening of roofs and ceilings on buildings must be complied with.

### 4. Conditions and recommendations for the dimensioning and execution of the flat roof mounting system MSP-FR-G on existing green roofs:

- Application limit: The mounting system is installed on a stable green roof substrate.
- The green roof surface in the installation area of the PV system must be even so that the PV mounting system can be installed without tension.
- Flatness of the substrate as with the MSP-FR system  $\leq +2.5^\circ$ ,  $\leq -2.5^\circ$ ,  $\leq \pm 1.25^\circ$ , otherwise the base profiles must be underfilled or the surface of the substrate must be straightened before ballasting.
- If different roof pitches come together (e.g. valley), the PV field should be divided into two corresponding fields.
- The evenness and slope should be taken into account around drainage outlets, if necessary allow for a large distance of 1 - 1.5 m.
- Height differences in the substrate should be compensated for, as otherwise a kink may occur in the PV field.
- Plants that cause an unevenness must be pulled out.
- Substrate quality: Substrates with a pH value between 4.5 and 8.5 are harmless. Substrates outside this pH range can lead to surface corrosion on the mounting system.
- Planting: The selection of the green roof planting must be made in such a way that the PV system is not overwhelmed and the PV system operation is not disturbed.
- Coefficient of friction: The coefficient of friction  $\mu$  between the aluminium base profile (without fleece!) and the green roof must be determined by measurements. For an initial calculation, a coefficient of friction  $\mu = 0.35$  is used as a basis, which must be compared with the measured values.

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- Size of the base profile: When the base profile is placed directly on the substrate, it is recommended to use at least the base profile BP300 (dim.: 135 mm x 280 mm) to prevent the profile from sinking in.
- The ballasting must be carried out according to the SPT project dimensioning.
- Width of maintenance aisles: There are no standardised regulations governing this. The binding regulations specify a width of between 60 and 70 cm. Regional building regulations may also stipulate different widths. Please check the current building regulations in advance.
- Potential equalisation: The potential equalisation should be connected outside the green roof to avoid corrosion.
- The cables must be routed on site in such a way that they cannot be damaged by mowing and maintenance work on the green roof.
- Screw connections: The base plate must stand on the substrate to prevent corrosion of the screw connections; standing water must be avoided.
- Maintenance of PV system and green roof: The green roof and the PV system must be professionally maintained on a regular basis (see checklist below).

### 5. Advantages of MSP-FR-EW on the green roof

- Alignment: with the individual base plates, the system can be easily levelled on uneven ground.
- Drainage: there are no continuous profiles that can accumulate surface water.

### Maintenance checklist

Action	Time interval (recommendation)
Checking the PV yield values	Via plant monitoring or every 3 months
Checking the potential equalisation of the PV blocks	annually
Checking the evenness of the PV blocks	annually
Check the position of the base plates (flat and free of tension, avoid screw contact with substrate).	annually
Inspection of the substructure and screw connections	annually
Checking the cables for damage caused by rodents/birds	1 x per year or several times according to local conditions
Checking, maintaining and removing plant growth	According to the growth of the green roof or continuously during the growth period. Requirement: Overgrowth of the PV system must be prevented.
Checking the evenness of the green roof surface in the area of the PV system	approx. every 2-3 months in the first year after installation of the system, then annually