

Suitability of D-/S-Dome Systems on flat roofs

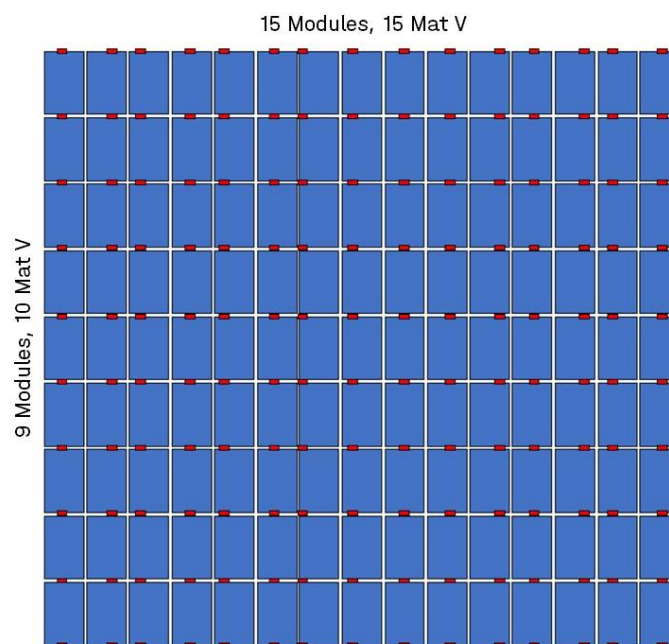
Regarding to the compatibility of Mat V & Mat S

Whether a PV installation is suitable for a flat roof depends on several parameters. The most critical factor is the leak tightness of the roof. Therefore, K2 Systems developed a solution that reduces the loads which are transferred to the roofing.

To assure leak tightness it's important to respect the mechanical tensile strength of the roof membrane (PVC; FPO; Bitumen etc.). The D-/S-Dome Systems have a significantly reduced load transfer to the roofing. A most unlikely conservative scenario shows this effect impressively.

Conservative scenario Mat V:

- Module field arrangement 9 modules/row with 10 Mat V
- Module layout:



- Snow load: 2,0 kN/m² Wind load: 1,3 kN/m²
- The total loads of the PV installation (including components, wind, snow and ballast) are in this case 6.7 kN
- Roof covering: Sikaplan G15 [transversal tensile strength: 900N/50mm]
- **Assumption:** The whole loads will be transferred just by 1 single Mat V/module row [Mat V = 0,67kN]
- **Additional assumption:** Loads will be transferred just on the short side of the Mat

Results of the conservative scenario:

- The loads transferred through the short side of the Mat V to the roof covering is only 290N/50mm. The Sikaplan G15 has 900N/50mm tensile strength (transversal).
- In fact, the Dome Systems utilize only 32% of the possible tensile strength of the PVC foil.

Mat V + Mat S and the softener/plasticizers:

K2 Systems is with the leading roof manufacturers in contact. The roof manufacturers and K2 Systems tested independently the Mat V on many different PVC types. According to the standard testing parameters of the roof manufacturers the tests were executed (at 70°C for 4 weeks in the oven). This represents approx. a service life of 5 years.

Conclusion:

The Dome Systems provide a solution that reduces the load effect to a minimum. Also, the utilization of the tensile strength of the PVC foil is by far not reached.

General product information about Mat V und Mat S:



The Mat V / Mat S can withstand the tolerances (unevenness, thermal expansion, roof pitch etc.) as well as balance them out much better than conventional protection mats. Positive effects are on shear and compressive forces through higher degree of structural load (horizontally and vertically).

The geometry of honeycomb-like structure and trapezoids as well as grooves on mat's bottom side, provides greater protection of the roofing membrane (applying the force and temperature expansions). As a result, there will be maximum friction with minimum load applied on the roofing membrane, as well as lower water accumulation and greater position stability.

The Mat V / Mat S are very resistant and possess great deformation capability against external influences without the surface of the roofing membrane getting heavily compromised. The Mat V / Mat S are in comparison with other mats also watertight. Summing up, the formation of microorganism will be therefore impeded.

The Mat V / Mat S consists of a synthetic mixture made of EPDM and allows in comparison with other protection mat-materials for a very low migration of softeners. For that reason, Mat V / Mat S disclaim the aluminum coated rear side.

Here is the recap of the properties of the EPDM of the Mat V / Mat S:

- Hardness and stiffness are optimized through geometry and rubber compound
- Very high friction coefficients enable safe application
- There is no proportion of migration-active additives
- No chemical interaction with the roofing membrane substances
- Resistant against numerous acids and alkaline solutions and polar solvents
- Resistant against hot damp up to 130°C
- Very high friction coefficient enables a low need of additional weights (ballasting) to secure position stability.

Releases of Mat V and Mat S with roofing membranes:

| No. | Brand of roofing membrane | Material / tested type | Producers approval |
|------------------|---------------------------|------------------------|------------------------------|
| Sika | | | |
| 1.1 | Sarnafil TG 66-XX | FPO / (1) | Manufacturer release granted |
| 1.2 | Sarnafil TS 77-XX | FPO / (0) | Manufacturer release granted |
| Alwitra | | | |
| 2.1 | Evalastic | EPDM / (2) | Manufacturer release granted |
| Protan | | | |
| 3.1 | PVC-Folien / PVC-foil | PVC / (0) | Manufacturer release granted |
| Wolfen | | | |
| 4.1 | Cosmofin GG Plus | PVC / (1) | Manufacturer release granted |
| 4.2 | Inofin | FPO / (1) | Manufacturer release granted |
| Firestone | | | |
| 5.1 | RubberGard | EPDM / (0) | Manufacturer release granted |

| Polyfin | | | |
|---------|-------------------------------|---------------|------------------------------|
| 6.1 | Polyfin | FPO+TPO / (0) | Manufacturer release granted |
| 6.2 | O.C.-Plan | ECB / (0) | Manufacturer release granted |
| Bauder | | | |
| 7.1 | BauderTHERMOPLAN T 15/18/20 | FPO-PP / (0) | Manufacturer release granted |
| 7.2 | BauderTHERMOPLAN T 15/18/20 V | FPO-PP / (0) | Manufacturer release granted |
| 7.3 | BauderTHERMOPLAN T TL | FPO-PP / (0) | Manufacturer release granted |
| 7.4 | BauderTHERMOPLAN SK 15/18 | FPO-PP / (0) | Manufacturer release granted |
| 7.5 | BauderTHERMOFIN F | FPO-PP / (0) | Manufacturer release granted |
| 7.6 | BauderTHERMOFIN F 15 V | FPO-PP / (0) | Manufacturer release granted |
| 7.7 | BauderTHERMOFIN F TL | FPO-PP / (0) | Manufacturer release granted |

Table 1: Roofing membranes with high compatibility with the Mat V und Mat S
 Testing method: (0) no test; (1) 4 weeks, 70°C; (2) 6 weeks, 40°C/60°C subject to alterations