

CS+ GROUND MOUNT – SUMMARY OF REFERENCES

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Cost-efficient, easy, suited for “difficult” ground, removable

CS+ (formerly Console) has been used for a number of ground mounted PV installations across Europe. This short report summarizes the experiences with the system on the ground.

Easy, fast and cost-efficient installation

- + Installation does not require special equipment (such as e.g. ramming equipment).
- + Very fast installation time, high flexibility and security to meet installation deadlines.
- + Very easy to handle and install.
- + As a consequence of the above, low installation cost.
- + Can be ballasted with low- or even no-cost material (e.g. gravel) further lowering total cost.

Stability in operation even on “difficult” ground

- + Consistent positive long-term experience with this system since 2003.
- + Insensitive against later movements/settlements of the ground as each Console is a stand-alone unit. (In contrast to rail-connected systems that would typically not allow for an uneven ground.)
- + Cable management: Due to its intelligent design, good protection of the electric cables from weather and mechanical impacts.
- + Modules are fixed at their best fixing area with screws on the backside of the module frame. Thus, minimum mechanical impact of the modules reducing e.g. microcracks and improving longevity of the modules.
- + Modules are not interconnected, therefore also no impact or tension from e.g. temperature expansion (which can occur in systems connected by rails).
- + Very good water management as Consoles are not interconnected and water can flow without barriers between them.



Highly environment-friendly and suited for sensitive areas

- + No drilling as the Consoles are only fixed by ballast. Especially important on landfill areas or areas with unstable ground.
- + No base plates/concrete left-overs. Easy to remove after use, low dismantling cost and highly environmentally friendly.
- + No point-loads as the load is evenly spread over the entire surface of the Console-bucket.
- + Recyclable materials used.

Total Cost typically lower than rammed systems for small and medium-sized plants

Our analyses reveal that the cost of the mounting system itself is often slightly more expensive than a standard ground mount system. However, installation cost is significantly lower than for a standard ground mount system. Especially for smaller and medium-sized installations, the one-off cost for soil analyses, potentially evening of the ground, rent of ramming, transport and installation equipment needed for standard ground mount systems typically overcompensate play a much greater role than a difference in part cost for the mounting system.

Points of attention:

Grass easier to handle than expected, ballast should be calculated by our PV-Configurator

The by far biggest concern is the question how to manage the grass. Experience tells that in practice the issue can be handled easily and cost-effectively. There are two strategies followed by our customers, both of which the respective customers are happy with:

Using a fleece on the ground avoids growth of grass and plants effectively. Especially when personnel is available anyway (e.g. for facility management and operation), another strategy is to just cut the grass regularly. Experience in middle Europe says that it needs to be cut around 4x per year.



There should be no loose stones next to the Consoles (e.g. it is not advisable to place gravel on the ground to reduce the growing of grass). The reason for this is that the stones could be swirled or lifted by birds and then scratch panels.

In one installation, the Consoles have been ballasted with a relatively high amount loose sand which leads to some deformation (they get a kind of “belly” – see also photo of the installation in Frankfurt Oder). That deformation is no practical issue, no defects occurred from this. Sand in bags or – best solution – blocks are an alternative that avoids a “belly”.

The amount of ballast should be calculated (and can be optimized) by a static calculation based on the local wind loads, which can be provided by the technical service of Renusol.

When use CS+ instead of a standard ground mount system

One of the typical cases is landfill areas, where the ground has been sealed so that drilling into the ground has to be avoided. Furthermore, there are other applications where CS+ is of advantages compared to standard ground mount systems. These cases include

- + small and medium-sized installations,
- + Installations that are (partly) “self-made” (not only small but also larger organizations having their employees do or support the installation and operation),
- + places where the ground is not well suited for being piled into,
- + places where the ground is relatively uneven and difficult to build on.
- + occasions where it is important that the installation can be removed without left-overs after use,
- + installations that should not be “visible”; since the CS+ is relatively low above the ground, it can be made less visible e.g. by placing it behind a low hedge.

