

FlatFix Fusion

Instructions for protective earthing and
equipotential bonding

Inhoudsopgave

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1. Terminology

There is some confusion in the market when it comes to “earthing” (grounding) of PV modules. Where protective earthing is meant to create a conductive path to discharge electric fault currents, equipotential bonding is meant to avoid electric potential differences between the different components of a system. Potential differences can be caused by static electricity, leak currents or faulty installation. So:

Protective earthing = discharge electric current (current can be high)

Equipotential bonding = equalize electric potential difference (current is low)

2. Requirements for protective earthing and equipotential bonding

Protective earthing

According to NEN 1010:2015 PV modules are Class II devices and therefore shall not be earthed separately.

Equipotential bonding (short: bonding)

Because of the capacitive coupling in the inverter the frame of the PV module could be charged. The voltage itself is not dangerous but it could cause a shock reaction. This could lead to dangerous situations on a roof. To avoid this the frames of the PV modules have to be bonded if they can be touched. Micro inverters and DC-DC converters (Optimizers) in combination with inverters without transformer also have to be bonded.

3. How to bond? (General)

To connect the bonding to earth an earth point can be created at the inverters. The bonding wires have to be parallel and as close as possible to the string cables. For bonding a multi strand copper cable of at least 6mm² must be used (aluminium: min 16mm²). The sleeve must be made of a UV resistant yellow-green insulation or bare wire.

When a lightning protection installation is in place and any of the components of the PV array are within its safety area then all metal components have to be bonded to the lightning protection installation. In this case it is not allowed to bond to ground of the electrical installation.

The diameter of the bonding cables has to be at least the same as the diameter of cables of the lightning protection installation.

When bonding to a lightning protection installation a surge protection device shall be placed at the DC side.

The decision tree below shows how bonding must be applied.

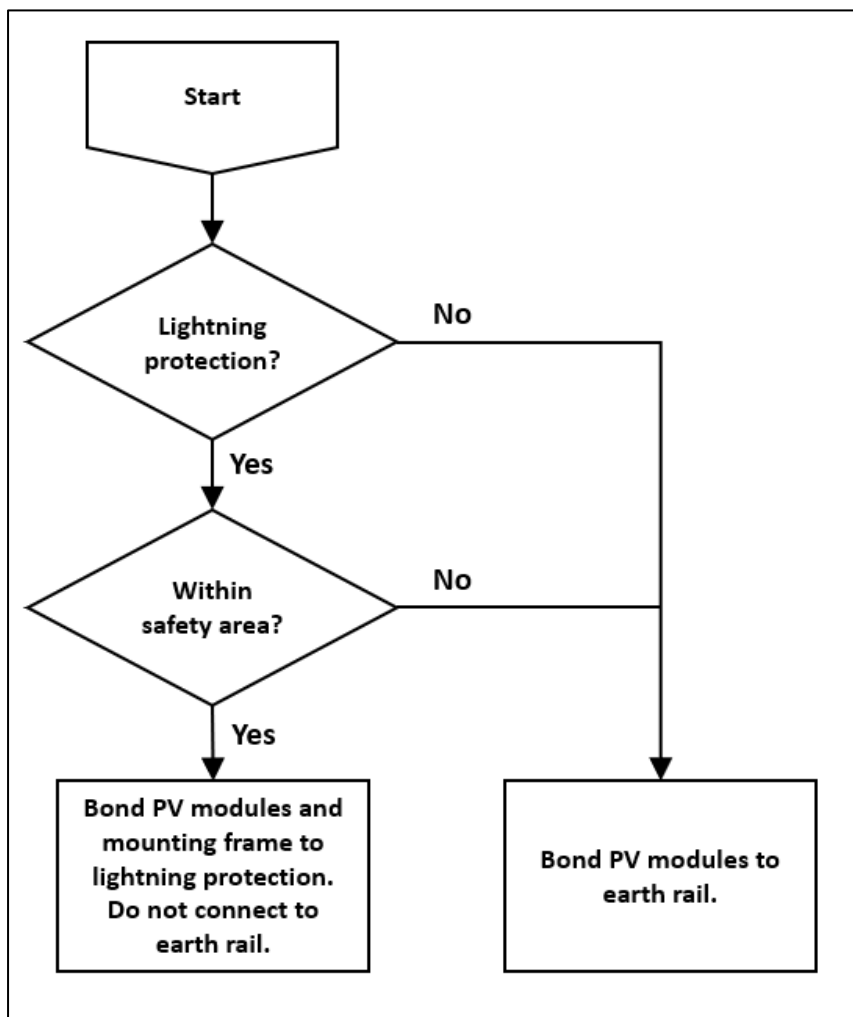


Figure 1, Bonding decision tree

4. Bonding of FlatFix Fusion – without lightning protection installation

General approach

FlatFix Fusion consists both of metal components and plastics components. According to NEN 1010:2015 (and IEC 60364-7-712_2017) the metallic structures supporting the PV modules shall be bonded.

The components that support the PV modules in FlatFix Fusion are the Base element high and Base element low, which are made of glass reinforced plastic. The other metallic parts in the system do not support and are not connected to the PV modules. Therefore it is sufficient to only equipotential bond the PV modules itself and not any of the components of the supporting system.

Bonding of PV modules

When none of the components of the PV system are within the safety area of a lightning protection installation, it is sufficient to equipotential bond the frames of PV modules.

Bonding of all PV modules in a row can be done by the following two options:

1. Place the Grounding rings (**100-7501**) in the Low Base and High Base before placing the modules, OR
2. Preassemble Bonding clips (**100-5069**) to the Module clamps before installing the them.

The Grounding ring as well as the Bonding clip are designed to make a proper durable electrical connection between two adjacent PV modules. The sharp edges of either the Grounding rings or Bonding clips will cut through the hard anodization layer of the PV module frame. By applying them between all PV modules in a row all PV modules are bonded. The tightening torque of the Mounting screw is 4,5 Nm.

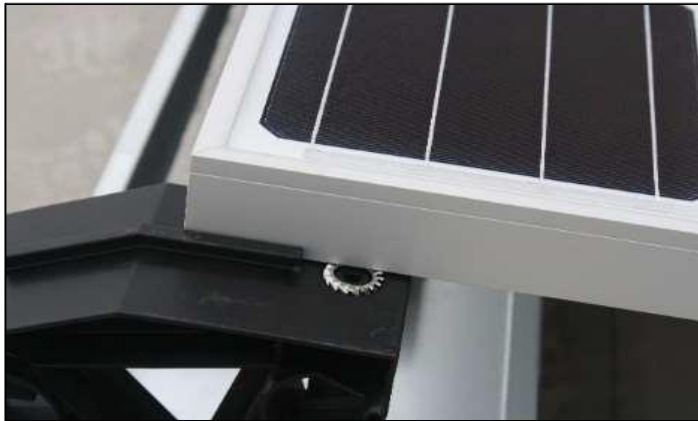


Figure 2, Option 1- Grounding ring

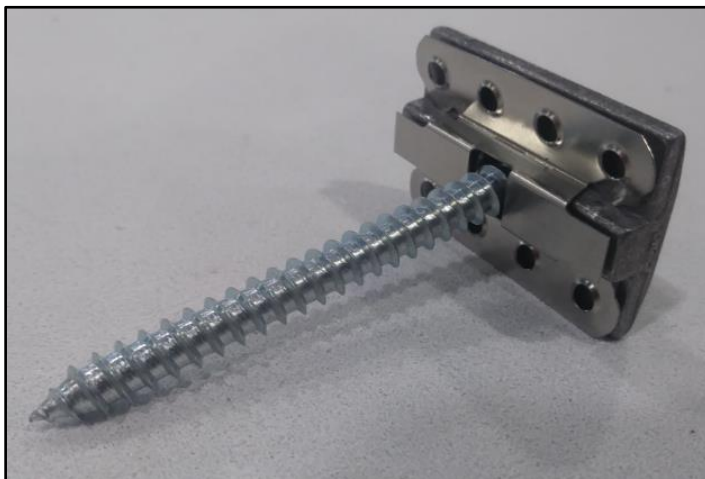


Figure 3, Option 2 - Bonding clip

Bonding of one row to the earth rail

Single row

Use the special Grounding clip to connect a multi strand copper cable of 6mm² to the first PV module in a row. Insert the cable into the Grounding clip and securely clamp the Grounding clip (**100-7505**) to the frame using pliers. The design of the Grounding clips allows for a proper durable electrical connection between the multi strand cable and the PV module. Finally connect the multi strand cable to the earth rail.



Figure 4, Multi strand copper cable of 6mm²

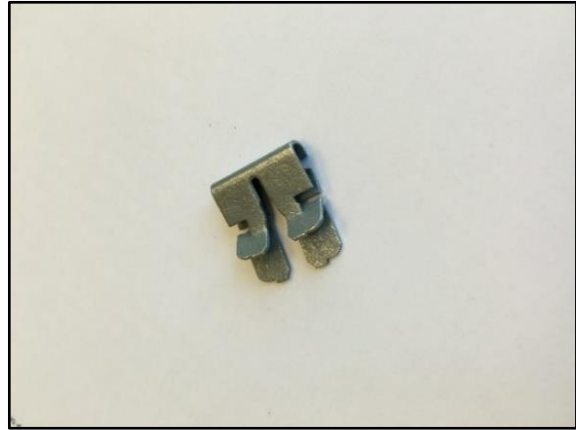


Figure 5, Grounding clip

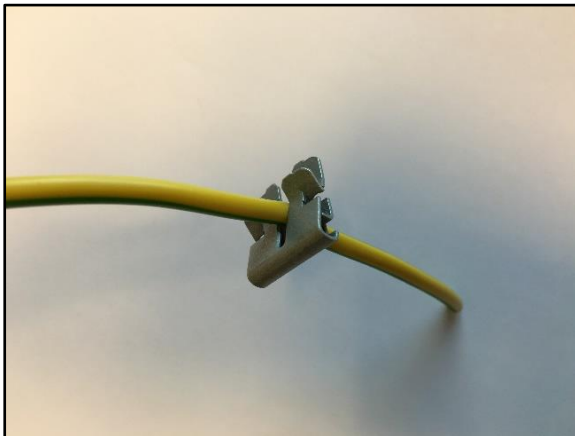


Figure 6, Multi strand cable assembled into the Grounding clip

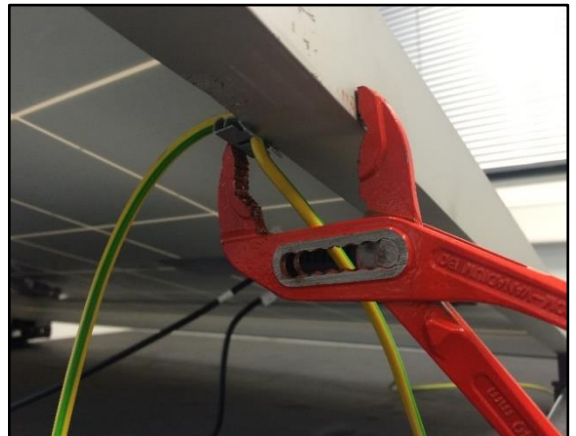


Figure 7, Installation of Grounding clip

Multiple rows

When an array consists of multiple rows it is easy to bond all rows using the 6mm² multi strand copper cable. To do so, mutually connect all rows by connecting every first module in the row by using the multi strand cable. Make a loop to each module and use the cable clip to connect the cable. Finally connect the multi strand cable to the earth rail. Refer to the bonding schematic in

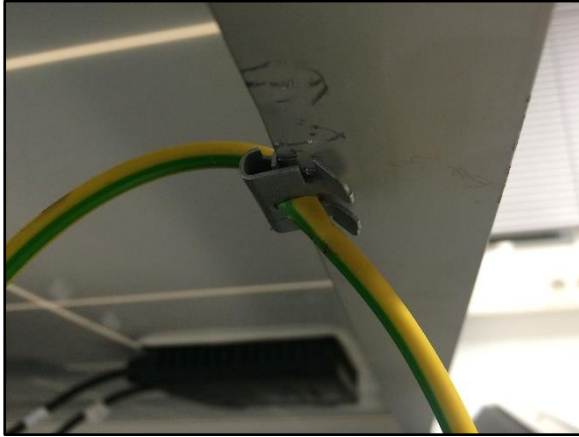


Figure 9, Grounding clip installed

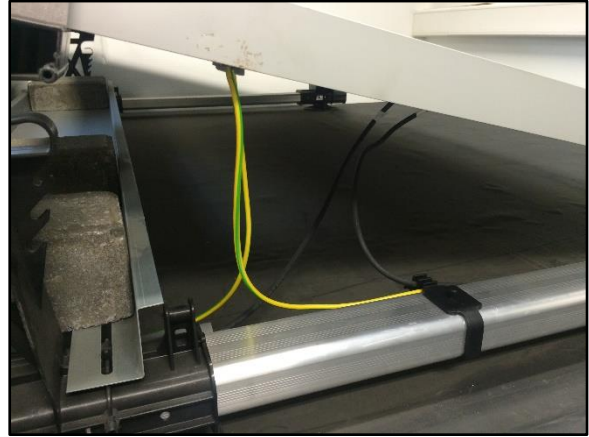


Figure 10, Grounding clip with loop

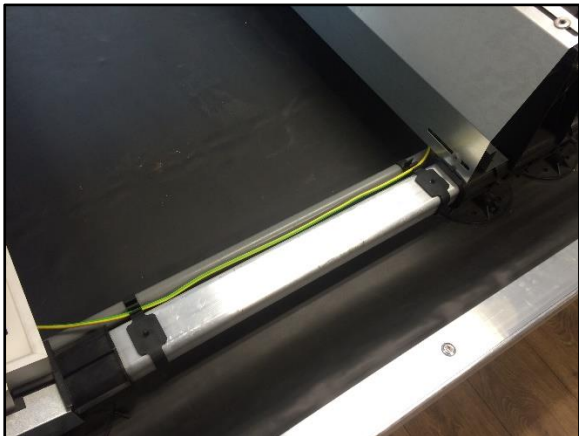


Figure 11, Multi strand cable connected with cable clip

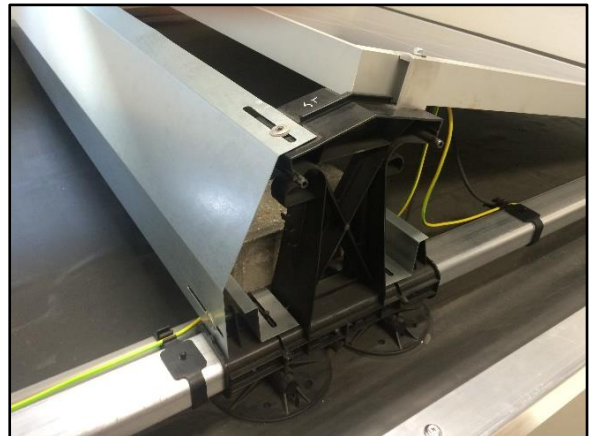


Figure 12, Connecting multiple rows

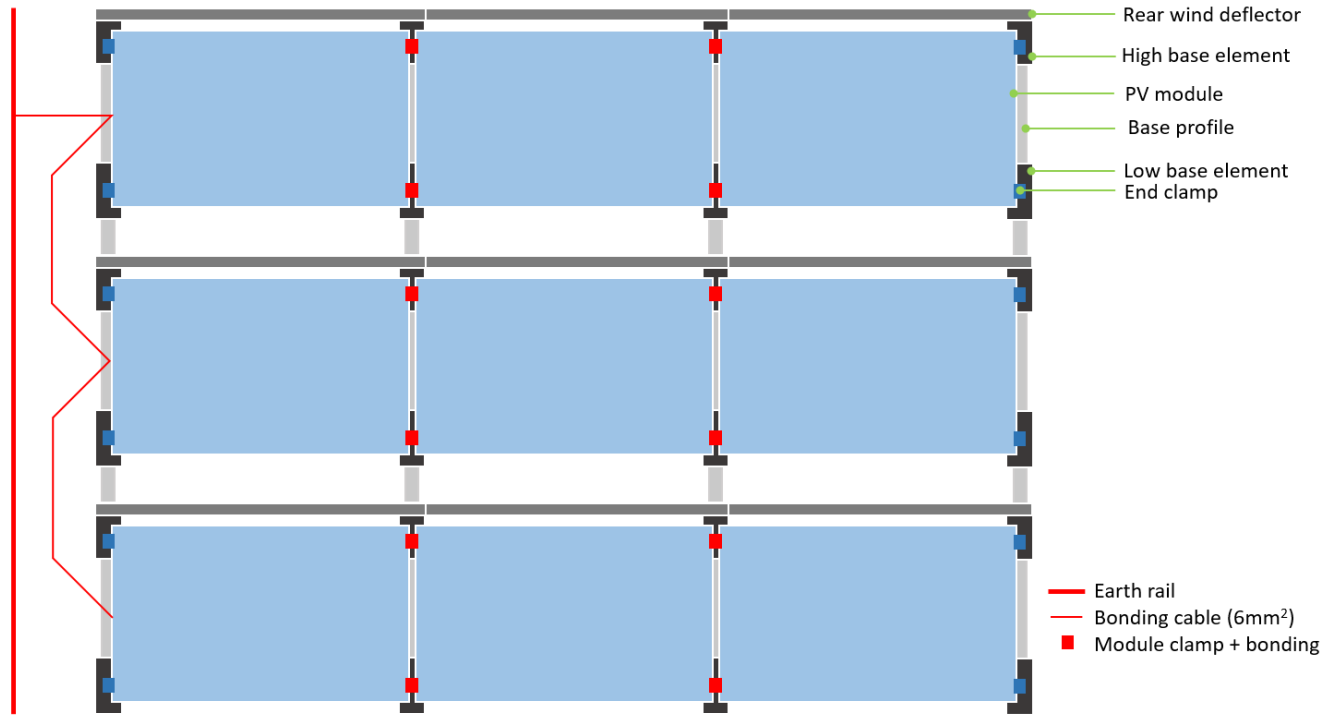


Figure 8, Bonding schematic for multiple rows



Figure 9, Grounding clip installed

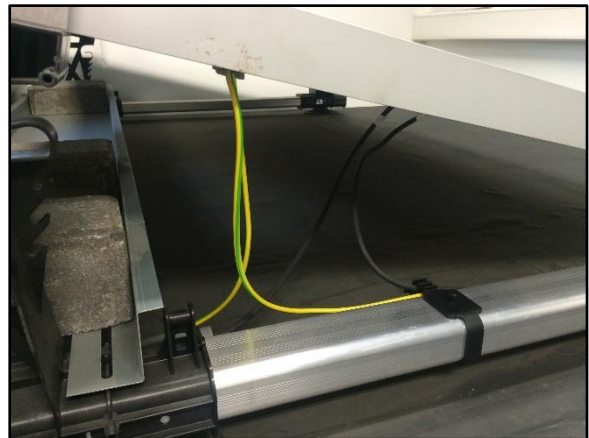


Figure 10, Grounding clip with loop

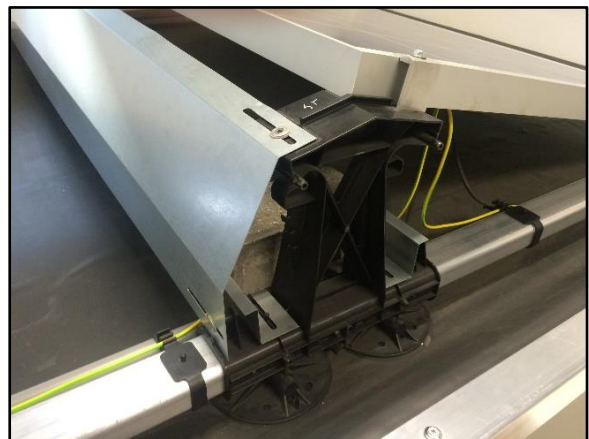
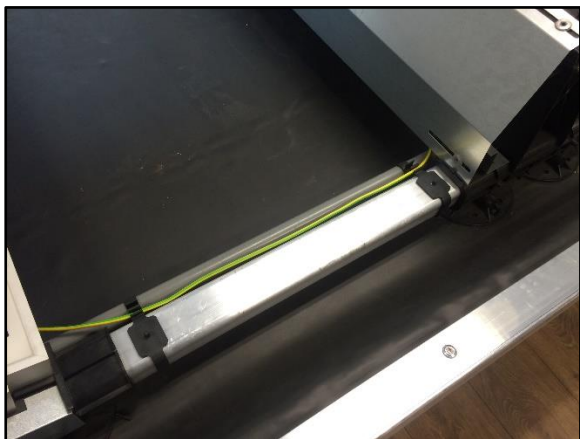


Figure 12, Connecting multiple rows

Figure 11, Multi strand cable connected with cable clip

5. Bonding of FlatFix Fusion – with lightning protection installation

When a lightning protection installation is in place and any of the components of the PV array are within its safety area, additional installation steps must be taken.

Bonding of Base profiles

The Base profiles (**100-71XX**) will be snapped into the Low base and High base element. The Low and High base are made of a high grade polymer composite. The Base profiles are insulated when installed because they are not connected to other metal components. To connect them, a special Grounding spring (**100-7502**) will be used.

Place the two Grounding springs into the slots of the High and Low base element before snapping in the Base profiles. The sharp teeth of the Grounding spring will bite into the Base profiles allowing for a proper durable electrical connection.



Figure 13, High base element with Grounding spring



Figure 14, Grounding spring

Bonding of Rear wind deflector

Bonding of the Rear wind deflectors (**100-7XXX**) can be achieved by connecting them to the Base profiles. On one side, mount the Grounding bracket (**100-7503**) onto the Base profile using Mounting screw 6,5 x 19 (**100-6519**) (refer to Figure 16). On the other side mount the Grounding bracket to the Rear wind deflector by driving Mounting screw 6,5 x 19 through the slotted hole into the High base element. The tightening torque is 4,5 Nm.

The Rear wind deflectors of the last row (north) must be connected using the 6mm² multi strand cable. The Rear wind deflectors of the first row (south) can be connected to the 6mm² multi strand cable to connect the PV modules to the rest of the system.

Refer to the bonding schematic in Figure 15 for bonding of the PV modules, Base profiles and Rear wind deflectors.

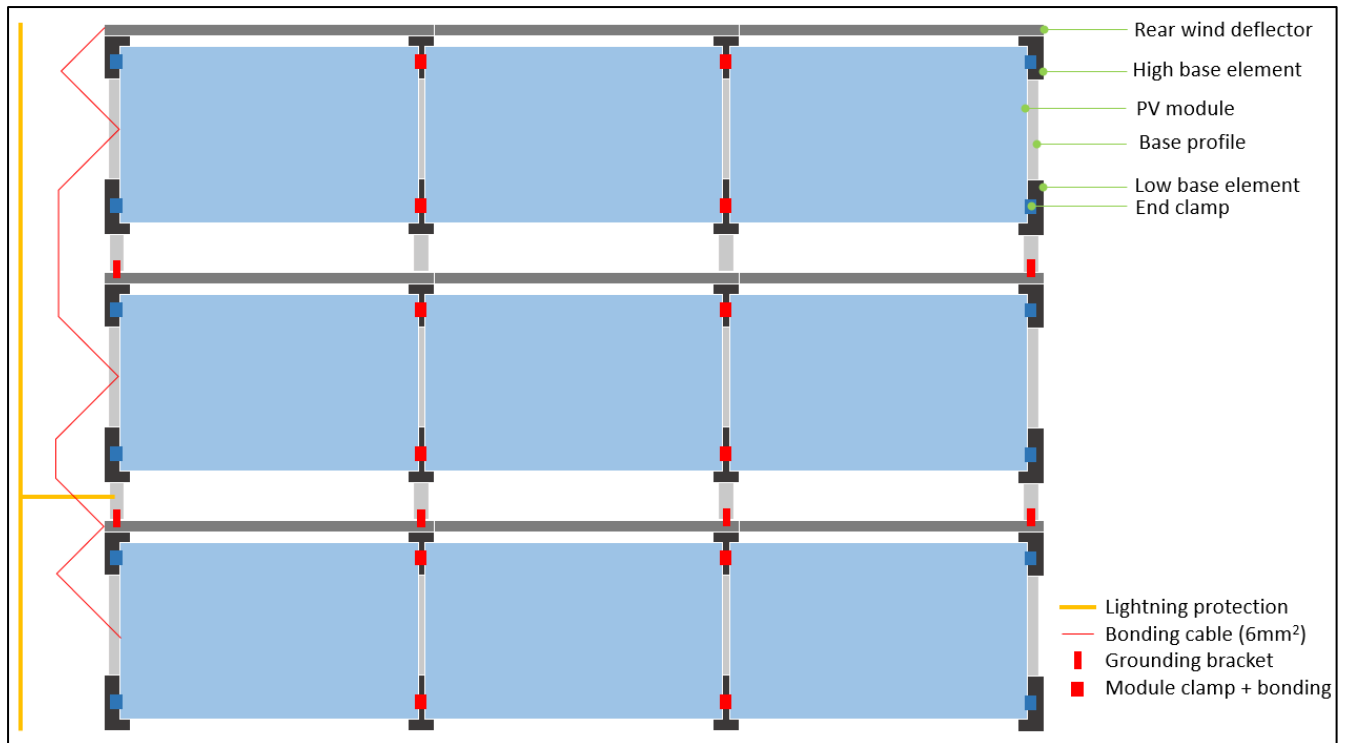


Figure 15, Bonding schematic of PV modules, Base profiles and Rear wind deflectors with Lightning protection



Figure 16, Grounding bracket and Grounding clip on Rear wind deflector

Bonding of Wind deflector left/right

To bond the Wind deflector left and right (**100-7X55, 1007X56**), drive Self drilling screw 6,3 x 32 (**100-3015**) through the hole in the Wind deflector and the Base element into the Base profile. The tightening torque is 4,5 Nm.



Figure 17, Bonding of the Wind deflector left/right using Self tapping screw