Dear Reader,

It was more than 80 years ago that my father founded the Gustav Hensel GmbH in Germany. This was the time when duroplastics became available for the first time for the production of electrical installation products. That was a major factor in the early days of the company.

The use of insulating material for enclosures is the company’s basic philosophy throughout its existence – which is why Hensel also disposes of unique know-how in the development, manufacture and application of such products. At the same time we have been contributing for many decades to the formulation of the relevant standards and regulations.

With the further spread of PV installations and DC generation, the question of protection against electric shock now requires a totally new approach: with the correct installation of our totally insulated products, we guarantee the absolute safety of the generator junction boxes installed. – So you know you are safe!

Sincerely

Felix G. Hensel
Managing partner of Gustav Hensel GmbH & Co. KG

Array junction boxes must be total insulated!

A strong requirement of the IEC standard for protection against electric shock in PV plants.

Grids in building installations are generally grounded. That means, in the event of an electric fault a protective device interrupts the supply in the circuit, for example by MCB or MCCB. The DC power grid from photovoltaic systems (installation between PV module and solar inverter) is not grounded and therefore requires special measures to protect against electrical shock.

How is the protection against electric shock guaranteed in photovoltaic systems on the DC side?
How is the protection against electric shock guaranteed in photovoltaic systems on the DC side?

IEC 60 364-7-712 requires for the installation of photovoltaic (PV) power supply systems:

**Equipment standard**

712.511.1

... The PV array junction boxes, PV generator junction boxes and switchgear assemblies shall be in compliance with IEC 60 439-1 (Since 2010: IEC 61 439-1).

**Protection measures**

712.413.2

Protection by use of class II or equivalent insulation should preferably be adopted on the DC side.

**Why does IEC 60 364-7-712 require protection class II (II) for PV array junction boxes?**

In grounded systems a earth fault short circuit current flows through the protective device and leads to a switch-off.

On the DC side of a PV installation, the maximum short circuit current is the same as the maximum operating current. This means that devices for protection against electric shock, such as MCB or fuses, don’t trip, because the residual current is too low. 

**As a consequence the protection against electric shock is not guaranteed in the event of an electrical fault.**

Total insulated equipment ensure the protection against electric shock by encapsulating a possible electric fault by double or reinforced insulation.

In general, total insulated enclosures (equipment of protection class II) fulfil this requirement.

---

Total insulated array junction boxes (AJB) according to IEC 61 439-1 ensure the protection against electric shock!
Total insulated Hensel array junction boxes (AJB) according to IEC 61 439 Part 1 ensure the protection against electric shock!

This standard specifies requirements and tests that will be placed on an array junction box (AJB), particularly with respect to the required total insulation.

IEC 61439-1 requirements, clause 8.4.3.4 for total insulation

1st The apparatus shall be completely enclosed in insulating material which is equivalent of double or reinforced insulation.

2nd The enclosure shall carry the symbol which shall be visible from the outside.

3rd The enclosure shall at no point be pierced by conducting parts in such a manner that there is the possibility of a fault voltage being brought out of the enclosure.

4th The enclosure shall give at least the degree of protection IP 2XC (see IEC 60529).

5th The enclosure must be accessible only via the use of tools in order to ensure the protection against unintentional contact of accessible live parts and the exposed conductive parts that are only accessible after the cover has been opened.

Testing of enclosures made of insulating material in accordance with IEC 61439-1, 10.9.4

For assemblies with enclosures made of insulating material, an additional dielectric test shall be carried out.

The test voltage has the following values, for example:

<table>
<thead>
<tr>
<th>Max. PV operating voltage</th>
<th>test voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>690-800 V DC</td>
<td>4,245 V</td>
</tr>
<tr>
<td>800-1000 V DC</td>
<td>4,665 V</td>
</tr>
</tbody>
</table>

Conclusion:

- Hensel array junction boxes are total insulated according to the requirements of IEC 61 439-1 and tested up to an operating voltage of 1000 V DC.
- The enclosure is made of high quality polycarbonate.

Specifications:
- Glow-wire test 960 ° C according to IEC 60 695-2-11, self-extinguishing, flame retardant
- UV-resistant according to IEC 61439-1, Clause 10.2.4
- silicone- and halogenfree
- Resistant to weather-related conditions such as rain, ice and snow
- Degree of protection IP 65
- DIN rails or other fixing elements are located exclusively in the interior of the enclosure. Metal parts may not come through the encapsulation.
- No use of metal cable entries.
- Opening and closing performed exclusively with tools!
Installation of total insulated array junction boxes in photovoltaic systems according to IEC standards:

More detailed information on this theme proceed to download at www.hensel.in!

**Product information**
ENYSUN - Safe product solutions for Photovoltaic plants conforming to standards
Grid, on-grid and off-grid systems

**Delivery in India via Hensel authorized distributor network spanning 130 cities and industrial centers.**

**Delivery in South East Asia via Hensel authorized distributor network in all ASEAN countries.**