Isolation concepts

Solution in NLG6
Important to know about RCD

An AC leakage current caused by bad insulation is detected by the RCD, which then protects the person by switching off the MAINS-Voltage.

**RCD Class-A:**
- Cheap (3-phase type required)
- Can only detect AC-leakage current
- Very common and widespread
- Can be “blinded” by a DC-leakage current (due to saturation), so that it’s not able to detect an AC-leakage current anymore

**RCD Class-B:**
- Expensive (3-phase type required)
- Can detect AC- and DC-leakage current
- Not common yet
- Non-experts mostly unaware of the significant difference Class-A / Class-B
A small DC-leakage current can blind a class-A RCD. In this case the fault protections of the other devices (including charging cable) are disabled.

**Danger, because other electric devices are not RCD protected any more!**

**expensive Class B RCD needed (solution of some competitors)**
Solution with NLG6 (accepted by VDE)

Because of the reinforced DC-Link insulation from PE, a Class-A RCD is suitable.

===> No danger, RCD protection fully functional.

===> No expensive Class B RCD needed
Galvanic isolation vs. single insulation fault

With a galvanic isolation it is not possible to get a fault current if there is a short circuit from one of the battery terminals to PE, because there is no closed electrical circuit and thus current can not flow.

==> No danger, RCD protection fully functional.

==> No fire hazard.
What’s the benefit of galvanic isolation?

Charger with galvanic isolation
⇒ Bat+/- need just basic isolation from car chassis
⇒ The power flow is principally impossible in case of an internal fault or defective semiconductor
⇒ Isolation faults with Bat +/- can be detected by an isolation monitor

Charger without galvanic isolation
⇒ Bat+/- need reinforced insulation from car chassis
⇒ Every component of the HVDC system needs reinforced insulation!!! (Battery, Motor, inverter, DCDC, heating system, …)
⇒ There must be a DC-fuse to stop the energy flow in case of a defective semiconductor, because the MAINS fuses can not cut a DC-current
⇒ Isolation faults with Bat +/- can not be detected by an isolation monitor
NLG6 Isolation concept

B: Basic insulation
R: Reinforced insulation

AC (MAINS) - Vehicle HVDC

communication vehicle/ChargerCoupler