

Draft proposal

5.4.xx Water immersion

The battery pack or system shall be subject to the water immersion safety test in accordance with 6.2.xx, the following requirements shall be fulfilled:

- If the test is performed in Option 1, there shall be no evidence of fire or explosion;
- If the test is performed in Option 2, the IPX7 requirements shall be fulfilled and there shall be no evidence of leakage, housing crack, fire or explosion, the isolation resistance after the test shall be not less than 100 Ω/V .

6.2.xx Water immersion

6.2.xx.1 Connect the wiring harnesses, connectors and other parts of the DUT in the manner of vehicle connection, and perform the test in one of the following two options:

- Option 1: Immerse the DUT into 3.5% (mass fraction) NaCl solution in the real vehicle assembly direction for 2h, the water shall be deep enough to immerse the DUT ;
- Option 2: Perform the test in accordance with the method and process described in IEC 60529. The DUT shall be completely immersed into water according to the installation state specified by the manufacturer. For DUT with a height less than 850 mm, the lowest point shall be 1,000 mm below the water surface; for DUT with a height equal to or greater than 850 mm, the highest point shall be 150 mm below the water surface. The test lasts for 30 min. The temperature difference between the water and the DUT shall be not more than 5°C.

6.2.xx.2 Remove the DUT out of the water, let stand at the test ambient temperature and observe for 2h.

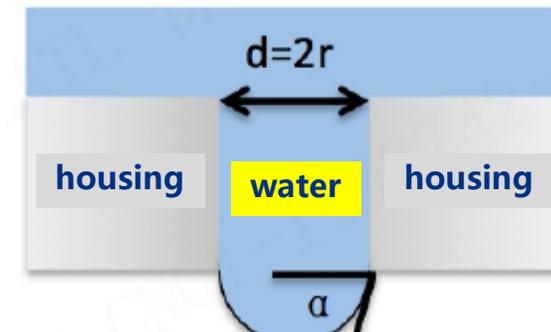
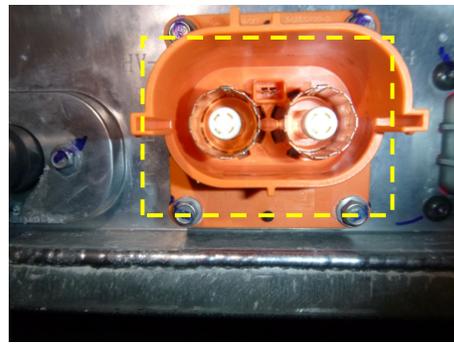
Key Parameter of proposal

- Option 1: Immerse the DUT into 3.5% (mass fraction) NaCl solution in the real vehicle assembly direction for 2h, the water shall be deep enough to immerse the DUT ;
- ✓ This method consider the products without waterproof capability such as air-cooled EESS.
 - ✓ 3.5% salt water is normal concentration of sea water, the electrical conductivity is far more than rainwater which vehicle meet relatively frequency occurrence in the real world



Item	Electrical conductivity (mS/cm)
Rainwater	0.13
1.0% NaCl	17.75
3.5% NaCl	57.00
5.0% NaCl	79.00

- Option 2: the IPX7;
- ✓ Verify the structure of interface such as HV mouth, sealing interface. Water entering is not allowed because of the risk of short circuit in long term use, it is a safety issue
 - ✓ Water intake or not depends on the size of split. We can verify this issue through IPX7



Remaining Points

After the meeting with Russia and Korea, the following three points need further discussion

- Point 1, Higher assessment requirements, such as damage the housing.
 - ✓ The operation 1, the box will fill with salt water, this situation can cover the verification of cracked box. The operation 2 (IPX7) required no water intake, good structural sealing is required to avoid safety problems.

- Point 2, Consider the effect when DUT failure, such as No Venting requirement.
 - ✓ Refer to the logic of different test for different installation location from ISO 16750-4 (Road vehicles — Environmental conditions and testing for electrical and electronic equipment), we can consider different requirement **with the installation location**. If the DUT installed in the passenger compartment, no venting should be met. If not, fire or explosion requirement only.

- Point 3. The mechanical structural effect to immersion
 - ✓ Considering long-term use, the sealing ability and structural strength of DUT will be decrease, it is high risk to happen safety issue under immersion or high pressure and temperature wash car, combined with the high voltage and energy of the battery. Researching and understanding the mechanical structural effect to immersion is necessary.