# UNR100-03
# Electric power trained vehicles

JASIC Asia Expert Meeting

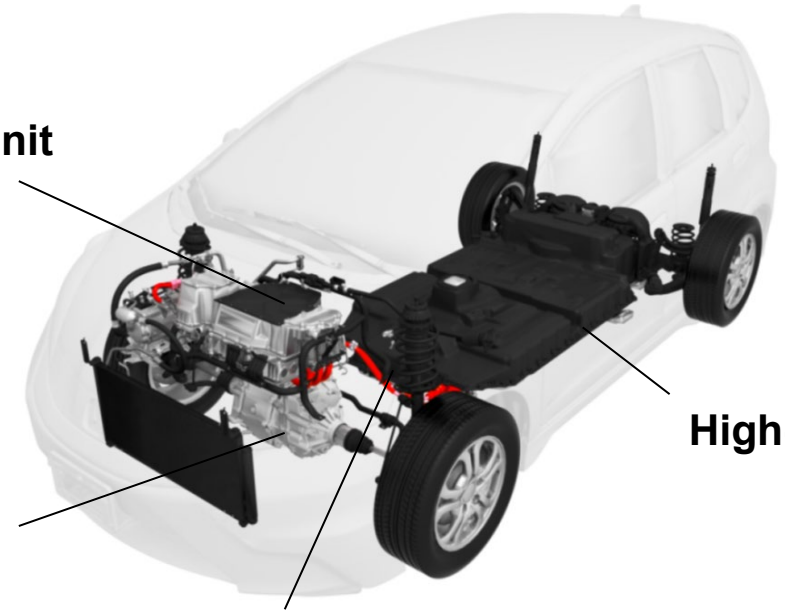
Dec, 2020

JAPAN AUTOMOBILE STANDARDS INTERNATIONALIZATION CENTER

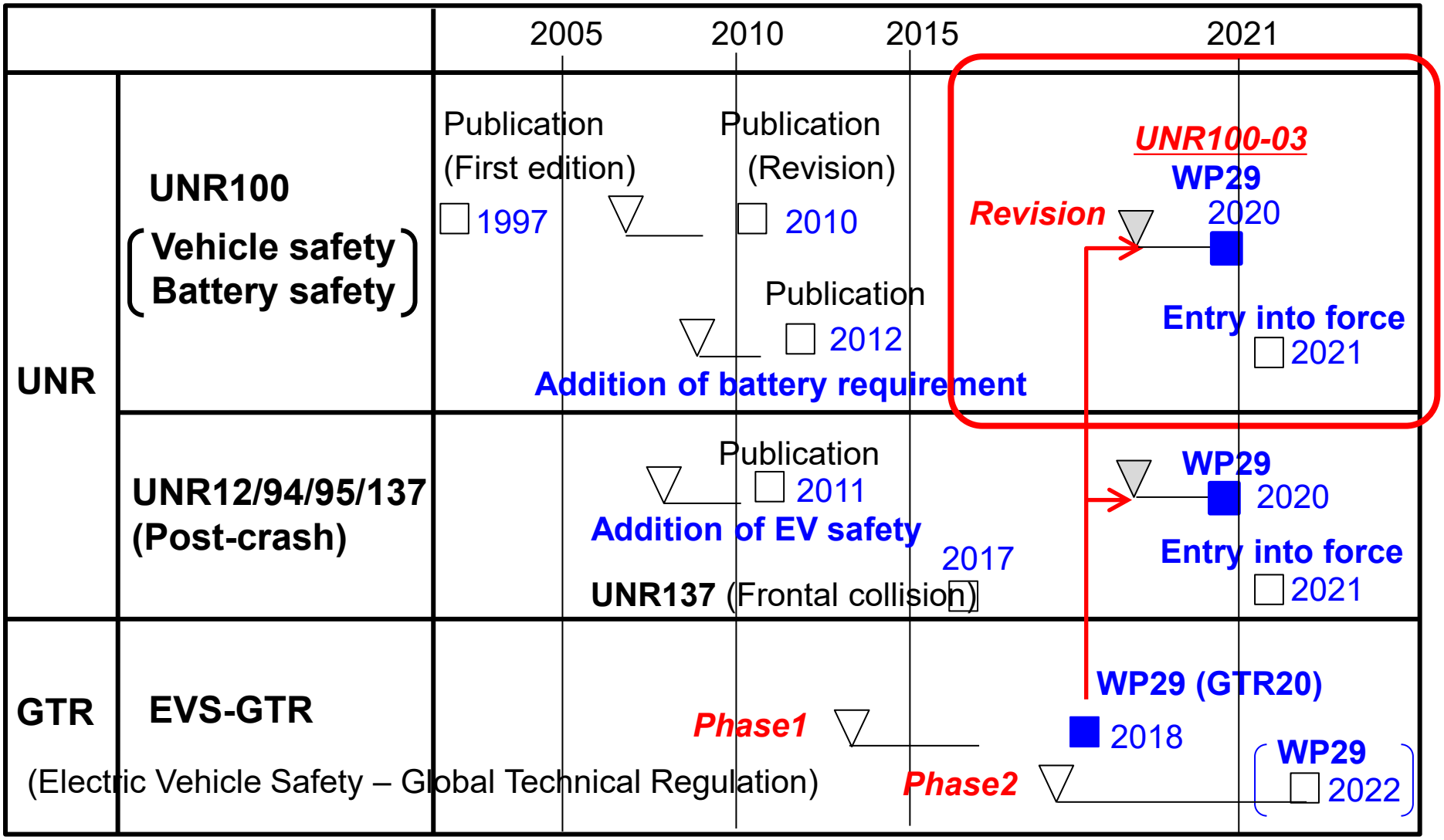
# Contents

## *Potential risk of electrical power train in EV*

- **Electric shock by touching high voltage buses**
- **Overheat by excessive current**
- **Risks related to unique components**
- **Risks related to unique characteristics and operation**




# Rulemaking at UN for EV safety



## ***Scope***

### *1.1. Part I*

Safety requirements with respect to the **electric power train** of road vehicles of categories M and N , with a maximum design speed exceeding 25 km/h, equipped with electric power train, excluding vehicles permanently connected to the grid.

Part I of this regulation does **not cover**;

a. **Post-crash** safety requirements of road vehicles.

b. High voltage components and systems which are **not galvanically connected to the high voltage bus** of the electric power train.

# Scope of UNR100-03

***Scope***

***1.2. Part II***

Safety requirements with respect to the **Rechargeable Electrical Energy Storage System (REESS)**, of road vehicles of categories M and N equipped with electric power train, excluding vehicles permanently connected to the grid.

Part II of this Regulation does **not apply** to a battery whose **primary use** is to supply power for **starting the engine** and/or lighting and/or other vehicle **auxiliaries' systems**.

**<Definition>** 2.37 "Rechargeable Electrical Energy Storage System (REESS)" means the rechargeable energy storage system that provides electric energy for **electrical propulsion**.
A battery whose primary use is to supply power for starting the engine and/or lighting and/or other vehicle auxiliaries' systems is not considered as a REESS.
The REESS may include the necessary systems for **physical support, thermal management, electronic controls and casing**.

# Part I

# Requirements of a vehicle for the electric power train

***Contents in Part 1***

## Modified specifications from Previous UNR100

● : New item　　○ : No-change or partly modified

| Category | Items | UNR100 03 Series |
|---|---|---|
| Protection against electrical shock | Protection against direct contact | ○ |
| | Protection against indirect contact | ○ |
| | Isolation resistance | ○ |
| | Protection against water effects | ● |
| Rechargeable Energy Storage System | Accumulation of gas | ○ |
| | Warning in the event of failure in REESS | ● |
| | Warning in the event of low energy content of REESS | ● |
| Preventing accidental or unintended vehicle movement | | ○ |
| Determination of hydrogen emissions | | ○ |

## 5.1. Protection against electrical shock

2.17. "High Voltage" means the classification of an electric component or circuit, if its working voltage is > 60 V DC or > 30 V AC (rms).

### *5.1.1. Protection against direct contact*

- **Live parts shall comply with paragraphs 5.1.1.1. and 5.1.1.2.**

**5.1.1.1.** Passenger or luggage compartment →**IPXXD**
**5.1.1.2.** Other than the passenger or luggage compartment →**IPXXB**

Electrical protection barriers, enclosures and connectors shall **not** be able to be **opened**, separated or removed **without the use of tools**.

- **Connectors (including the vehicle inlet)**

a. They comply with paragraphs **5.1.1.1.** and **5.1.1.2.** **when separated**, or

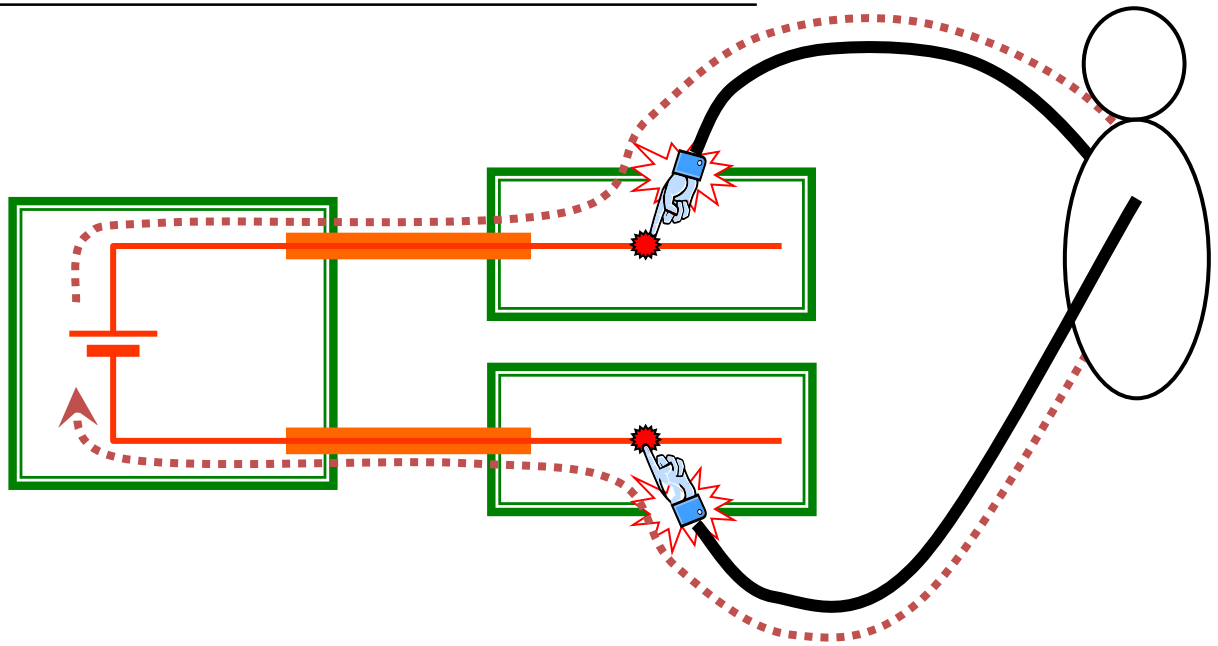
b. They are provided with a **locking mechanism**. Additionally, **other components** shall be **removable** only with the **use of tools.**

c. The voltage becomes equal or **below 60 V DC/ 30 V AC** (rms) within **1 s** after the connector is separated.

## 5.1. Protection against electrical shock

### *5.1.1. Protection against direct contact*

Electric shock due to lack of Direct Contact Protection



Live part (High voltage)

Barriers/enclosures

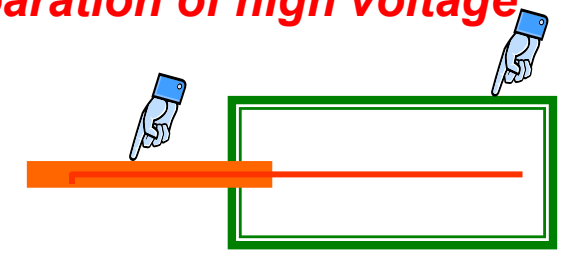
Electrical chassis
(Vehicle Body)

## 5.1. Protection against electrical shock

### *5.1.1. Protection against direct contact*

**Separation of high voltage with barriers/ enclosures or insulation**

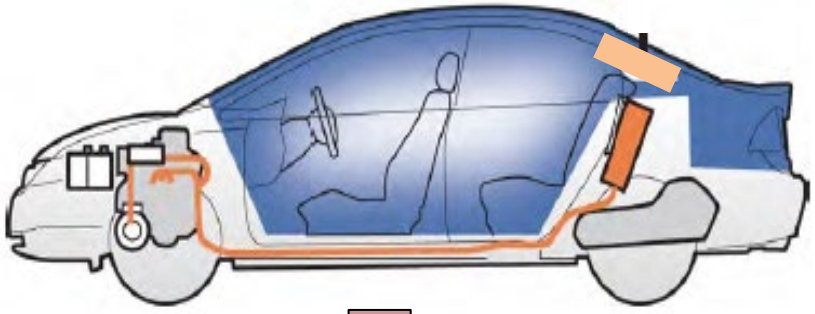
① ***Separation of high voltage***



Live part (High voltage)

Barriers/enclosures

② ***Protection degree***



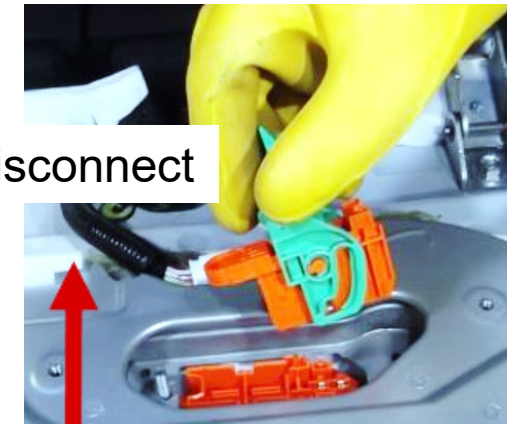
IPXXD

IPXXB

| Places | Protection Degree | Tool |
|---|---|---|
| Passenger compartment or luggage compartment | IPXXD (Wire probe) |  |
| Other places | IPXXB (Finger probe) |   |

## 5.1. Protection against electrical shock

### *5.1.1. Protection against direct contact*



Service disconnect

- **5.1.1.3. Service disconnect**

  →If a service disconnect can be removed without tools, **IPXXB** is required when it is opened or removed.

- **5.1.1.4. Marking**

  5.1.1.4.1. The symbol shall be present **on or near the REESS**.

  5.1.1.4.2. The symbol shall be visible on **enclosures which, when removed, expose live parts**.

High voltage symbol

This provision **shall not apply** to any of the following cases:

a. Where electrical protection barriers cannot be physically accessed, unless **other vehicle components** are removed with the **use of tools**;

b. Where electrical protection barriers are located **underneath the vehicle floor**.

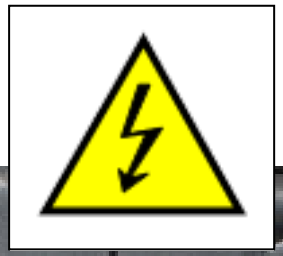
- **5.1.1.4.3.** Cables for high voltage buses shall be identified by having an outer covering with the colour **orange**.

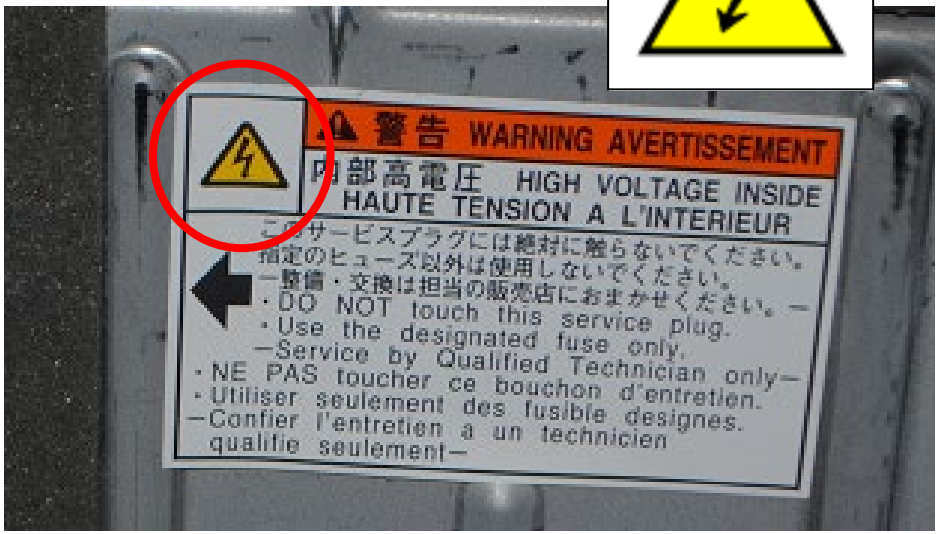
## 5.1. Protection against electrical shock

### *5.1.1. Protection against direct contact*

| Components | Identification |
|---|---|
| Barriers/ enclosures | The high voltage symbol<br>• On or near the REESS<br>• On enclosures that cover high voltage |
| Cables | The orange colour outer covering |

**High Voltage Symbol**






**Orange colored wiring**

## 5.1. Protection against electrical shock

### *5.1.2. Protection against indirect contact*

- 5.1.2.1. **Exposed conductive parts** shall be galvanically connected to the **electrical chassis**.

  *Definition:* 2.20. **"Exposed conductive part"** means the conductive part which can be touched under the provisions of the protection degree **IPXXB**, and which is **not normally energized**, but which can become electrically **energized under isolation failure conditions**.

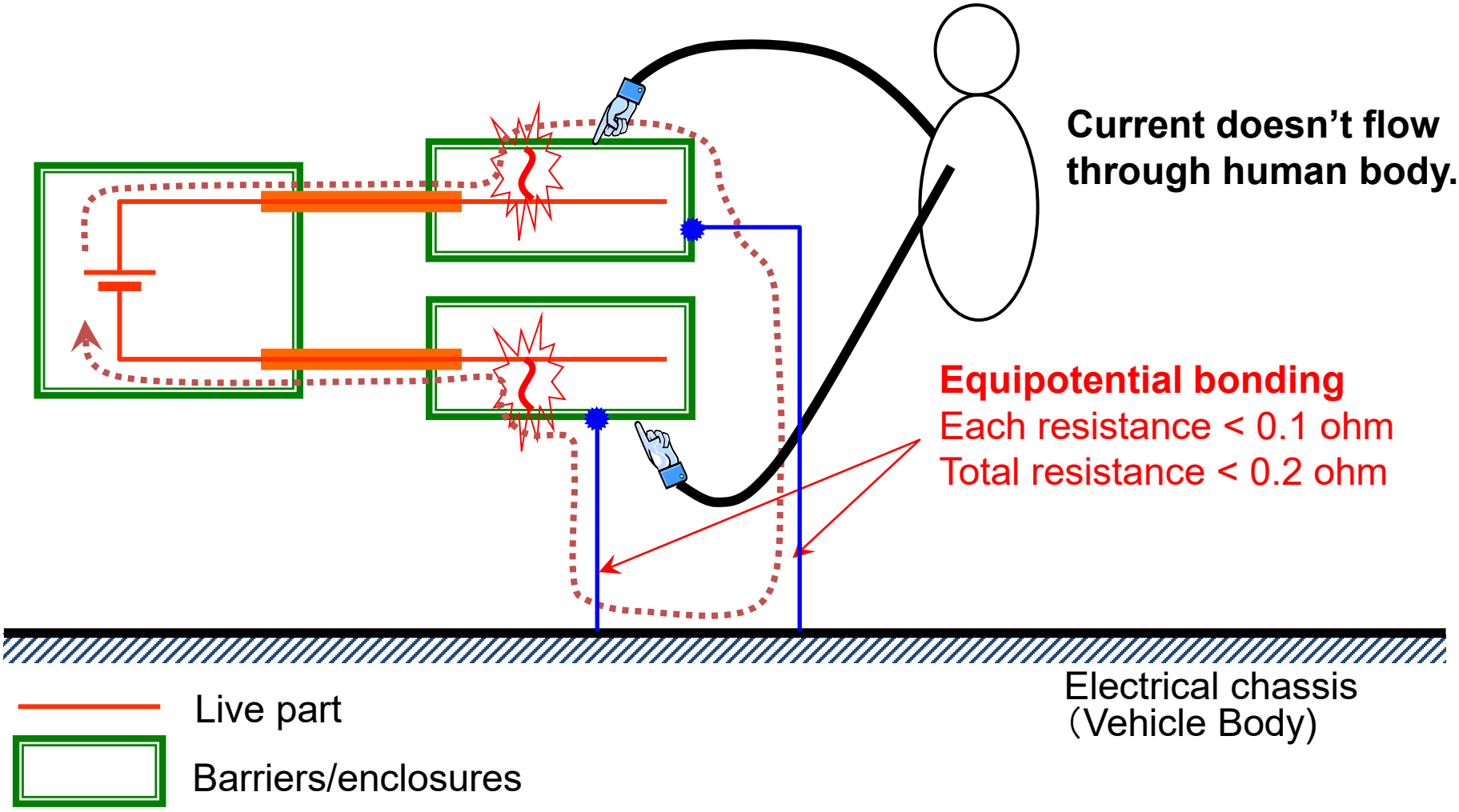
- 5.1.2.2. The resistance between **exposed conductive parts** and the **electrical chassis** **< 0.1 Ω**

  The resistance between **two reachable exposed conductive parts** less than **2.5 m** **< 0.2 Ω.**

- 5.1.2.3. A device to enable the **galvanical connection** of the **electrical chassis** to the **earth ground for the external electric power supply** shall be provided.

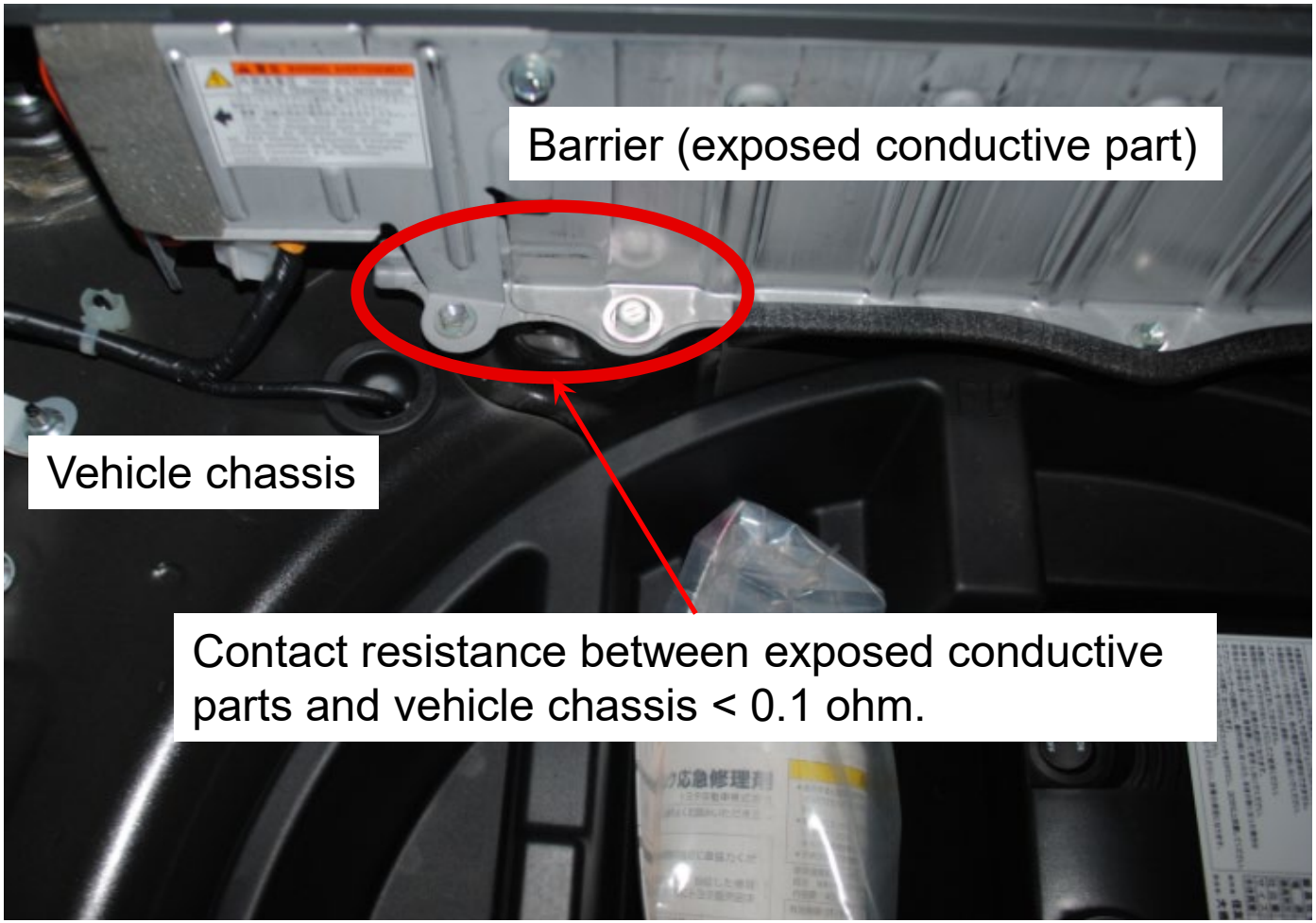
## 5.1. Protection against electrical shock

### *5.1.2. Protection against indirect contact*



## 5.1. Protection against electrical shock

### *5.1.2. Protection against indirect contact*



## 5.1. Protection against electrical shock

### *5.1.3. Isolation resistance*

This paragraph shall **not apply to** electrical circuits where the **DC part is connected to the electrical chassis** and the specific voltage condition is fulfilled.

**5.1.3.1.** AC high voltage buses ≥ **500 Ω/volt** & DC high voltage buses ≥ **100 Ω/volt**

**5.1.3.2.** ***Option 1:*** **Connected AC and DC** high voltage buses ≥ **500 Ω/volt**

***Option 2:*** **Connected AC and DC** high voltage buses > **100 Ω/volt** with AC high voltage buses are protected by one of the 2 following measures.

- **Two or more layers** of solid insulators, barriers or enclosures
- **Mechanically robust** protections that have sufficient durability

**5.1.3.3. Fuel cell vehicles**

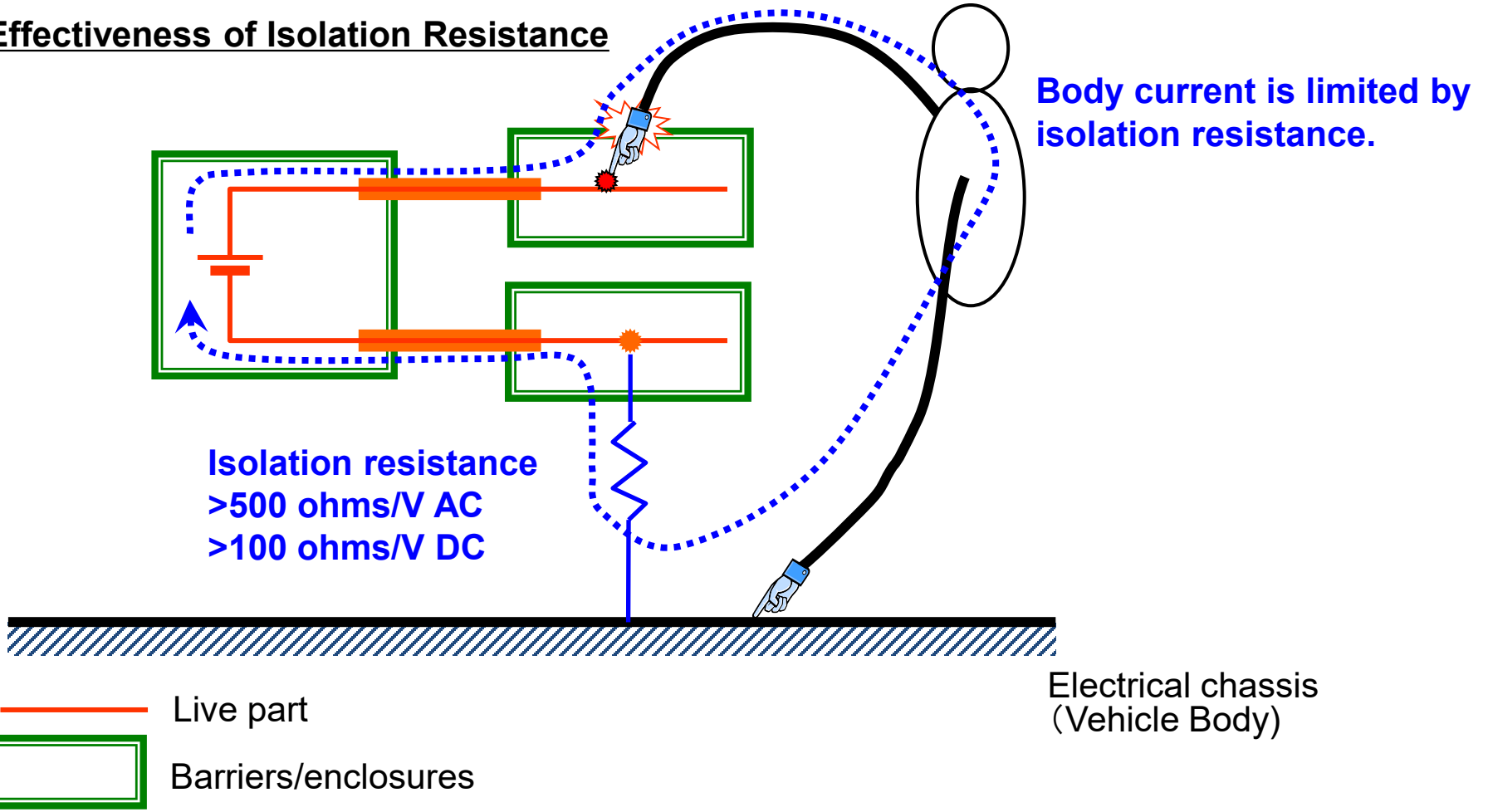
DC buses shall have an **isolation resistance monitoring** system

**5.1.3.4.** The **coupling system** for charging the REESS → same as 5.1.3.1

## 5.1. Protection against electrical shock

### *5.1.3. Isolation resistance*

**Effectiveness of Isolation Resistance**



## 5.1. Protection against electrical shock

### *5.1.4. Protection against water effects.*

5.1.4.1. The vehicle manufacturer can choose **5.1.4.2., 5.1.4.3., or 5.1.4.4**.

5.1.4.2. The manufacturers shall provide **documentation** how **components** outside the passenger compartment comply with the requirements in **Annex 7A**.

5.1.4.3. **Annex 7B** are performed, the **vehicle** shall comply with **isolation resistance** requirements while the vehicle **still wet** and after a **24 hour** pause.

5.1.4.4. An **isolation resistance monitoring system** is provided, and a **warning** shall be indicated. The function shall be confirmed as in **Annex 6**.

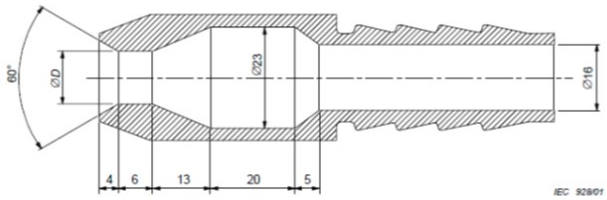
## 5.1. Protection against electrical shock

### *5.1.4. Protection against water effects.*

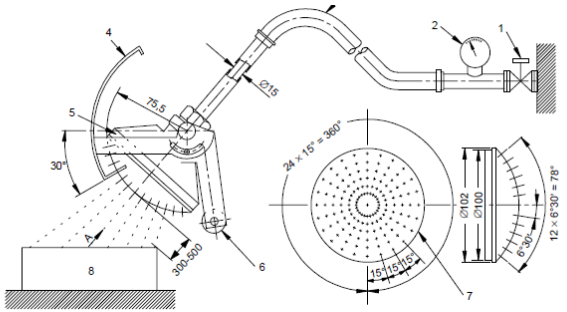
**Annex 7A**
**Verification method for testing authorities confirming document based isolation resistance compliance of electrical design of the vehicle after water exposure**

<Test method>

Spraying the high-voltage **component** or system with a stream of **water** from a **standard test nozzle**.




For components, open underneath




For components, covered from underneath

<Acceptance criteria>

- Isolation resistance requirement is met.
- The parts designed not to be wet are not allowed to be wet.

## 5.1. Protection against electrical shock

### *5.1.4. Protection against water effects.*

**Annex 7B: Vehicle-based test procedure for protection against water effects**

<Test method>

**1. Washing**

All border lines shall be exposed with the **water stream** using a nozzle in Annex 7.

**2. Driving through standing water**

The vehicle shall be driven in **a wade pool, 10cm depth, 500m at 20 km/h**.

**Annex 6: Confirmation method for the function of an on-board isolation resistance monitoring system**

- Measure and determine the isolation resistance of the electric power train, **Ri**.
- Insert a resistor, **Ro**, between the high voltage bus and the electrical chassis.
- A warning shall be indicated to the driver.

*Calculation for R0*

**100 Ω/V →** $1/(1/(95 \times U) - 1/\mathbf{Ri}) \leq \mathbf{Ro} < 1/(1/(100 \times U) - 1/\mathbf{Ri})$

**500 Ω/V →** $1/(1/(475 \times U) - 1/\mathbf{Ri}) \leq \mathbf{Ro} < 1/(1/(500 \times U) - 1/\mathbf{Ri})$

U: working voltage of the electric power train

## 5.2. Rechargeable Energy Storage System (REESS)

### *5.2.3. Warning in the event of failure in REESS*

The vehicle shall provide a warning in the event specified in 6.13. to 6.15.

6.13. Warning in the event of operational failure of vehicle controls that manage REESS safe operation

6.14. Warning in the case of a thermal event within the REESS.

6.15. Thermal propagation.

### *5.2.4. Warning in the event of low energy content of REESS.*

For pure electric vehicles, a warning of low REESS state of charge shall be provided. The manufacturer shall determine the level of REESS energy remaining.

## 5.3. Preventing accidental or unintended vehicle movement

5.3.1. At least a momentary **indication** shall be given when the vehicle is in **"active driving possible mode"** after manual activation of the propulsion system.

2.1. "**Active driving possible mode**" means the vehicle mode when application of pressure to the **accelerator pedal** or release of the **brake system** will cause the electric power train to move the vehicle.

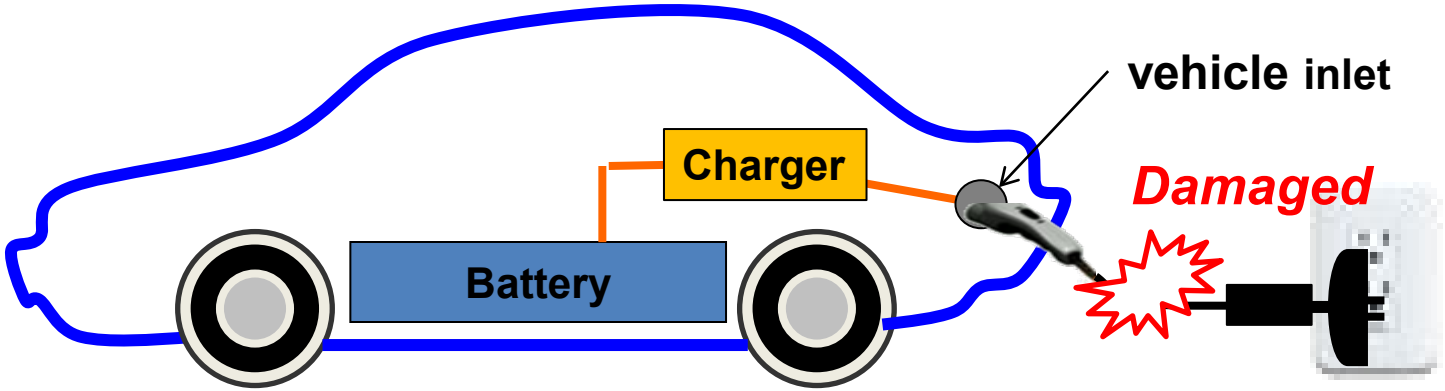
5.3.2. When **leaving the vehicle**, the driver shall be informed by a **signal** if the vehicle is still in the **active driving possible mode**.
Moreover, vehicles of category M2 and M3, this signal shall be given when the **drivers leave their seat**.

5.3.3. If the REESS can be externally charged, **vehicle movement** by its propulsion system shall be **impossible** as long as the **vehicle connector** is connected to the **vehicle inlet**.

5.3.4. The state of the **drive direction** control unit shall be identified to the driver.

## ① *Indication of "Active driving possible mode"*


## ② *Prevention of vehicle movement during charging*



# Part II

# Requirements of a REESS with regard to its safety

***Contents in Part 2***

**Part II: Requirements of a Rechargeable Energy Storage System (REESS) with regard to its safety**

## Modified specifications from Previous UNR100

● : New item ○ : No-change or partly modified

| Items | UNR100 03 Series |
|---|---|
| Vibration | ○ |
| Thermal shock and cycling | ○ |
| Mechanical impact | ○ |
| Fire resistance | ○ |
| External short circuit protection | ○ |
| Over charge protection | ○ |
| Over-discharge protection | ○ |
| Over-temperature protection | ○ |
| Over-current protection | ● |
| Low temperature characteristics | ● |
| Management of gases emitted from REESS | ○ |
| Warning in the event of operational failure of vehicle controls that manage REESS safe operation | ● |
| Warning in the case of a thermal event within the REESS | ● |
| Thermal propagation | ● |

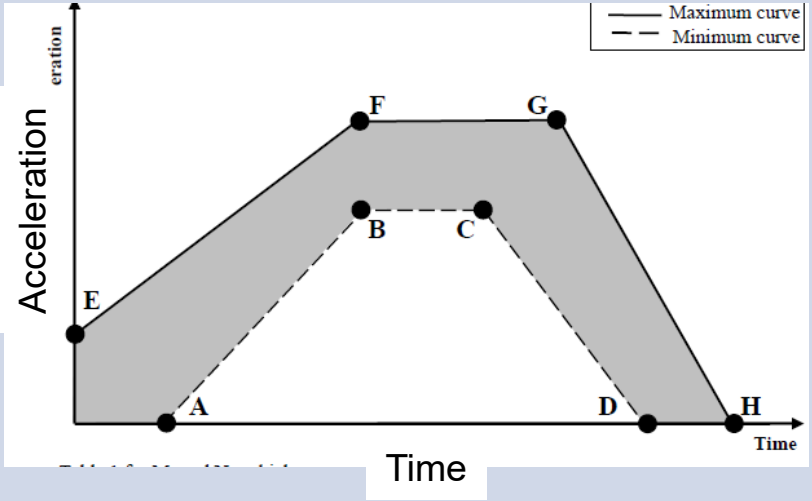
## 6.2. Vibration & Annex 9A

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Purpose</td><td>To verify the safety performance of the REESS under a vibration environment during the normal operation.</td></tr>
<tr><td>Installations</td><td>The REESS should be mounted with its original mounting points as mounted in the vehicle.</td></tr>
<tr><td>Procedures</td><td>A vibration having a sinusoidal waveform with a logarithmic sweep between 7 Hz and 50 Hz and back to 7 Hz traversed in 15 minutes, repeated 12 times for a total of 3 hours in the vertical direction of the mounting orientation.
<table>
<tr><th>Frequency (Hz)</th><th>Acceleration (m/s2)</th></tr>
<tr><td>7 - 18</td><td>10</td></tr>
<tr><td>18 - 30</td><td>gradually reduced from 10 to 2</td></tr>
<tr><td>30 - 50</td><td>2</td></tr>
</table>
</td></tr>
<tr><td>Acceptance criteria</td><td>• There shall be no evidence of: (a) Electrolyte leakage; (b) Rupture; (c) Venting; (d) Fire; (e) Explosion.<br>• Isolation resistance > 100 Ω/Volt (High voltage REESS)</td></tr>
</table>

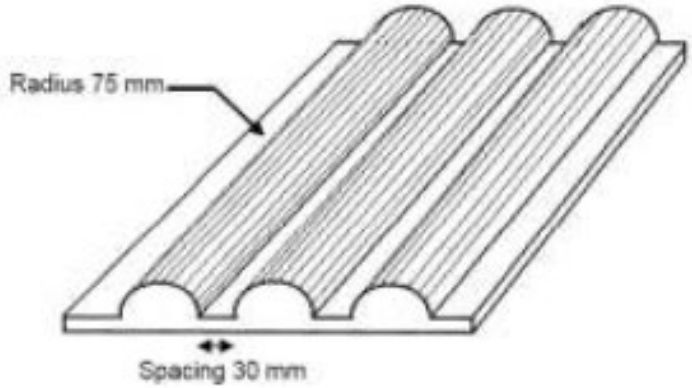
## 6.3. Thermal shock and cycling & Annex 9B

| Item | Description |
|---|---|
| Purpose | To verify the resistance of the REESS to sudden changes in temperature which a REESS would experience during its life. |
| Procedures | • The REESS shall be stored for at least **six hours** at equal to **60 ± 2 C** or higher, followed by storage for at least **six hours** at equal to **-40 ± 2 C** or lower.<br>• The maximum time interval between test temperature shall be **30 minutes**.<br>• This procedure shall be repeated a minimum of **5 total cycles**. |
| Acceptance criteria | • There shall be no evidence of: (a) Electrolyte leakage; (b) Rupture; (c) Venting; (d) Fire; (e) Explosion.<br>• Isolation resistance > 100 Ω/Volt (for high voltage REESS(s)) |

## 6.4.1. Mechanical Shock & Annex 9C

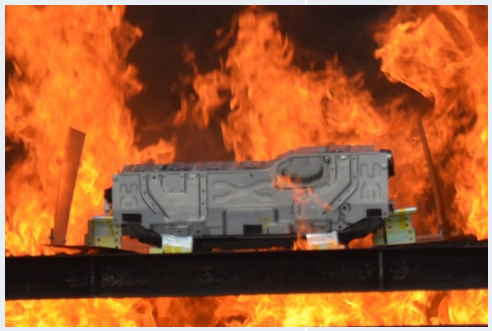
| Item | Description |
|---|---|
| Purpose | To verify the safety performance of the REESS during a vehicle crash. |
| Option 1 | ➢ *Vehicle based test*<br>Crash tests and criteria in UNR94 or UNR137, and UNR 95. |
| Option 2 | ➢ *Component based test*<br>  <br><br>Table 1 for $M_1$ and $N_1$ vehicles:<br>*Point* / *Time (ms)* / *Acceleration (g)* (*Longitudinal*, *Transverse*)<br>A: 20 / 0 / 0<br>B: 50 / 20 / 8<br>C: 65 / 20 / 8<br>D: 100 / 0 / 0<br>E: 0 / 10 / 4.5<br>F: 50 / 28 / 15<br>G: 80 / 28 / 15<br>H: 120 / 0 / 0 |
| Acceptance criteria | • No evidence of: (a) Fire; (b) Explosion; (c)Electrolyte leakage.<br>• REESS(s) shall be retained by its mounting and remain inside its boundaries.<br>• Isolation resistance > 100 Ω/Volt (for high voltage REESS(s)) |

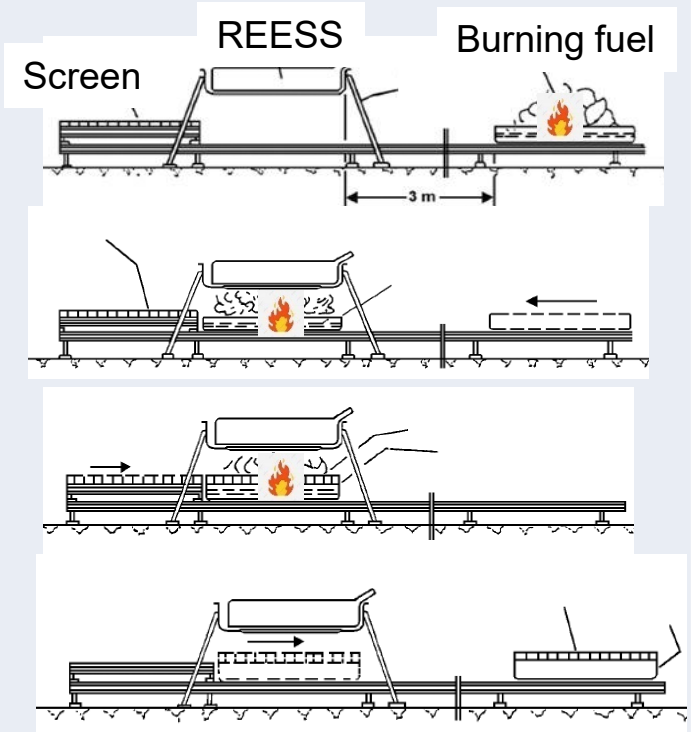
## 6.4.2. Mechanical integrity & Annex 9D

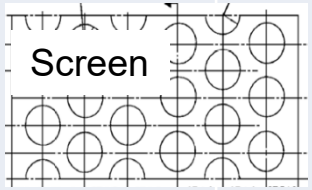
| Item | Description |
|---|---|
| Purpose | To verify the safety performance of the REESS during a vehicle crash. |
| Option 1 | ➢ *Vehicle based test*<br>Crash tests and criteria in UNR94 or UNR137, and UNR 95. |
| Option 2 | ➢ *Component based test*<br>• The REESS shall be crushed with a crush plate with a force of at least **100 kN**, but not exceeding 105 kN.<br>• An onset time less than **3 minutes** and a hold time of at least **100 ms** but not exceeding 10 s.<br>  <br>Dimension of the crush plate:<br>600 mm x 600 mm or smaller<br>  |
| Acceptance criteria | • No evidence of: (a) Fire; (b) Explosion; (c)Electrolyte leakage.<br>• Isolation resistance > 100 Ω/Volt (for high voltage REESS(s)) |

## 6.5. Fire resistance & Annex 9E

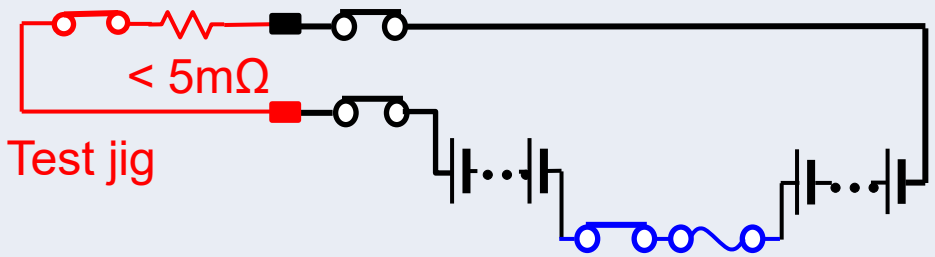
| Item | Description |
|---|---|
| Purpose | To verify that the driver and passengers have enough time to evacuate for the fire due to a fuel spill from the vehicle itself or a nearby vehicle. |
| Procedures | Phase A: **Pre-heating (60s)**<br>Phase B: **Direct exposure to flame (70s)**<br>Phase C: **Indirect exposure to flame (60s)**<br>Phase D: **End of test** (**3hr of observation**)<br>*Separately, LPG burner test is also specified. |
| Acceptance criteria | No evidence of explosion during the test and observation period |





## 6.6. External short circuit protection & Annex 9F

| Item | Description |
|---|---|
| Purpose | To verify the short circuit protection to prevent the REESS from any related severe events by short circuit current. |
| Procedures | The positive and negative terminals of the REESS shall be connected to produce a short circuit. The connection shall have a resistance not exceeding **5 mΩ**.<br>  <br>➢ *End of test*<br>a. The protection function **interrupts** the short circuit current.<br>b. The temperature gradient becomes a less than **4C through 1hour**. |
| Acceptance criteria | • There shall be no evidence of: (a) Electrolyte leakage; (b) Rupture; (c) Venting; (d) Fire; (e) Explosion.<br>• Isolation resistance > 100 Ω/Volt (for high voltage REESS(s)) |

## 6.7. Overcharge protection & Annex 9G

| Item | Description |
|---|---|
| Purpose | To verify the overcharge protection to prevent any further related severe events caused by a too high SOC. |
| Procedures | ➢ *Component-based test*<br>The REESS shall be charged with the **maximum** charge current specified by the manufacturer.<br><br>➢ *End of test*<br>a. REESS overcharge protection **terminates** the charge current, or<br>b. The REESS temperature reaches **10 C** above its maximum operating temperature, or<br>c. **12** hours after the start of charging.<br><br>**Separately, vehicle-based test are also specified.* |
| Acceptance criteria | • There shall be no evidence of: (a) Electrolyte leakage; (b) Rupture; (c) Venting; (d) Fire; (e) Explosion.<br>• Isolation resistance > 100 Ω/Volt (for high voltage REESS(s)) |

## 6.8. Over-discharge protection & Annex 9H

| Item | Description |
|---|---|
| Purpose | To verify the over-discharge protection to prevent any severe events caused by a too low SOC. |
| Procedures | ➢ *Component-based test*<br>A discharge shall be performed with a stable current within the normal operating range as specified by the manufacturer.<br><br>➢ *End of test*<br>a. REESS overcharge protection **terminates** the discharge current. or<br>b. The temperature gradient is less than **4C through 2hr**. or<br>c. The voltage reaches **25%** of its nominal voltage level.<br><br>**Separately, vehicle-based test are also specified.* |
| Acceptance criteria | • There shall be no evidence of: (a) Electrolyte leakage; (b) Rupture; (c) Venting; (d) Fire; (e) Explosion.<br>• Isolation resistance > 100 Ω/Volt (for high voltage REESS(s)) |

## 6.9. Over-temperature protection & Annex 9I

| Item | Description |
|---|---|
| Purpose | To verify the protection to prevent an unsafe state due to internal over-temperature. |
| Procedures | ➢ *Complete REESS test*<br>• The **cooling system** of the REESS shall be deactivated.<br>• The REESS shall be placed in a **convective oven**, and then the temperature is **gradually increased**.<br>• The REESS shall be continuously **charged and discharged** to increase the temperature.<br>➢ *End of test*<br>a. The charge and/or discharge is **inhibited** or limited.<br>b. The temperature of the REESS is **stabilized** by a gradient of less than **4C through 2 hours**.<br>c. Any **failure of the acceptance criteria** is observed.<br><br>**Separately, vehicle-based test are also specified.* |
| Acceptance criteria | • There shall be no evidence of: (a) Electrolyte leakage; (b) Rupture; (c) Venting; (d) Fire; (e) Explosion.<br>• Isolation resistance > 100 Ω/Volt (for high voltage REESS(s)) |

## 6.10. Over-current protection & Annex 9J

| Item | Description |
|---|---|
| Purpose | To verify the overcurrent protection during **DC** external charging to prevent severe events caused by excessive levels of charge current. |
| Procedures | ➢ *REESS test*<br>• The overcurrent level (assuming **failure** of external DC electricity supply equipment) shall be determined.<br>• The charge current is **increased over 5 seconds** from the highest normal charge current to the overcurrent level, then **continued** at this overcurrent level.<br>➢ *End of test*<br>a. The vehicle's overcurrent protection **terminates** the charge current.<br>b. The temperature of the REESS is stabilized by a gradient of less than **4C through 2 hours**.<br><br>**Separately, vehicle-based test are also specified.* |
| Acceptance criteria | • There shall be no evidence of: (a) Electrolyte leakage; (b) Rupture; (c) Venting; (d) Fire; (e) Explosion.<br>• Isolation resistance > 100 Ω/Volt (for high voltage REESS(s)) |

## 6.11. Low-temperature protection

| Item | Description |
|---|---|
| Purpose | • Some kinds of REESS have special chemical reaction which **damage** REESS when charged **at high rates in very cold temperatures**. Subsequent charging of such a damaged REESS may lead to **fire or explosion**.<br>• Rate of charging needs to be **terminated or limited** in very cold temperatures. |
| Procedures | No practical test procedure is available at this time. |
| Acceptance criteria | REESS manufacturer must make available following **documentations**.<br>a. A **system diagram**;<br>b. Written explanation on the **lower boundary temperature** for safe operation of REESS;<br>c. Method of **detecting** REESS temperature;<br>d. **Action** taken when the REESS temperature is at or lower than the lower boundary for safe operation of the REESS. |

## 6.13. Warning in the event of operational failure of vehicle controls that manage REESS safe operation

| Item | Description |
|---|---|
| Purpose | The REESS shall provide a warning in the event of **operational failure** of the vehicle **controls** that manage the safe operation of the REESS. |
| Procedures | No practical test procedure is available at this time. |
| Acceptance criteria | REESS or vehicle manufacturer must make available following **documentations**.<br>a. A **system diagram** that identifies all the vehicle controls that manage REESS operations.<br>b. A written explanation describing the **basic operation** of the vehicle controls that manage REESS operation. |

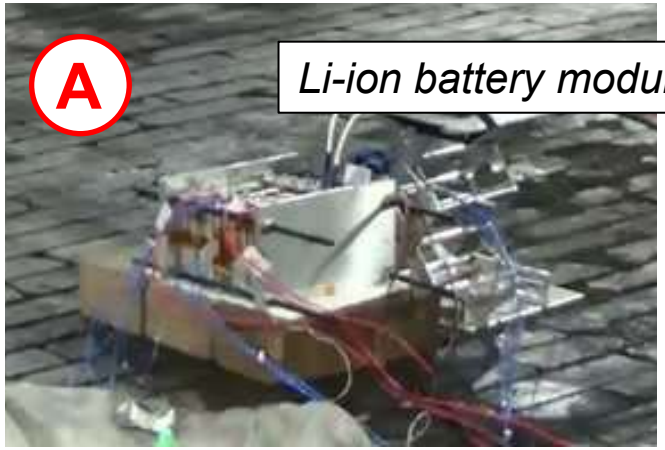
## 6.14. Warning in the case of a thermal event within the REESS

| Item | Description |
|---|---|
| Purpose | The REESS or vehicle system shall provide a signal to activate the warning in the case of a thermal event in the REESS. |
| Procedures | No practical test procedure is available at this time. |
| Acceptance criteria | REESS or vehicle manufacturer must make available following **documentations**.<br>a. The **parameters** and associated **threshold** that are used to indicate a thermal event (e.g. temperature, temperature rise rate, SOC level, voltage drop, electrical current, etc.) to **trigger the warning**.<br>b. A **system diagram** and written explanation describing the **sensors** and **operation** to manage the REESS in the event of a thermal event. |

## 6.15. Thermal propagation

| Item | Description |
|---|---|
| Purpose | To verify that the vehicle occupants should not be exposed to the hazardous environment resulting from a thermal propagation (which is triggered by a single cell thermal runaway). |
| Procedures | A cell thermal runaway needs to be initiated. No specific test procedures are prescribed at present. |
| Acceptance criteria | The REESS shall provide an advance **warning** to allow egress or **5 minutes** prior to the presence of a **hazardous situation** such as fire, explosion or smoke.<br>REESS or vehicle manufacturer must make available following **documentations**.<br>a. The **parameters** which trigger the warning indication.<br>**b. Description** of the warning system.<br>c. A risk reduction **analysis** and the risk mitigation **functions**.<br>d. A **diagram** showing the operation of the relevant systems.<br>e. A description of its **operation strategy**.<br>f. Engineering **documents** (Test, analysis or simulation data). |

## 6.15. Thermal propagation




Test setting (Heater method)
*A heater is attached on a cell.


Outset of a cell thermal runaway


Spreading to adjacent cells
(Thermal Propagation)


Outset of fire

# Future Modification of UNR100

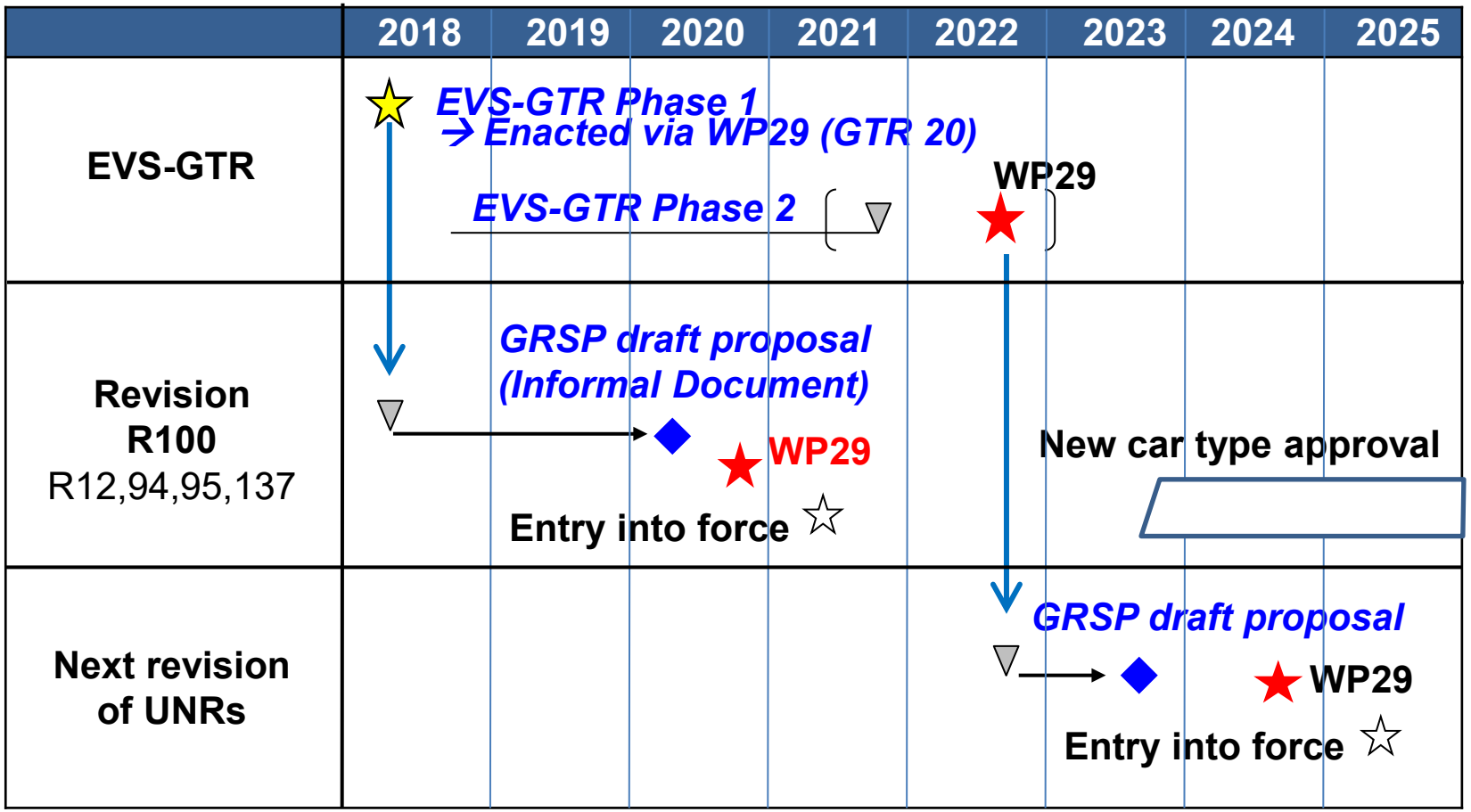
# Future Modification of UNR100

## ■ EVS-GTR (Phase1) status

- Adopted at WP29 in **March 2018** and enacted as **GTR No.20**.
- Revision work of the **related UNR's** has been carried out and the formal documents approved at WP29 in **November 2020**.

## ■ EVS-GTR (Phase2) status

- Debate began in March 2018. (The aim to complete the draft is in 2021.)



# Future Modification of UNR100

## *Major Discussion Items in EVS-GTR Phase 2*

| Item | Status |
|---|---|
| **Thermal propagation** | ***Safety requirements for single cell thermal runaway incidents*** Specific test procedures are being developed. Each country is actively conducting research. |
| **Saltwater immersion** | ***Safety requirements for battery immersion in case of flooding*** The discussion point is whether GTR needs to cover incidents due to natural disasters or not. |
| **REESS vibration** | ***Review of current battery vibration test profile (sine sweep)*** The profile modification based on vehicle rough road driving data is proposed and discussed. |
| **High voltage safety** | ***Proposal of adding and revising requirements*** Isolation resistance measurement option, safety criteria for capacitive energy are discussed. |
| **Gas toxicity** | ***Safety requirements for gases generated from battery*** The research for the identification of toxic gases and those gas concentration measurement method are being conducted. |

# Summary

- EVS-GTR Phase 1 has been approved at WP29 as GTR 20 in March, 2018. Related UN regulations including UN R100 has been revised according to GTR 20 and approved at WP29 in November, 2020.

- Eight new requirements are added into revised UN R100.
  - Part I_ Requirements of a vehicle for the electric power train
    →3 new requirements are added
  - Part II_ Requirements of a REESS with regard to its safety.
    →5 new requirements are added

- EVS-GTR Phase 2 is under discussion to solve remaining issues from Phase 1. New or modified specifications will be incorporated into GTR20, and then, UNR100 in the future.

Thank you!