

1.	Scope	IMMA comments
1	<p>The following prescription apply to 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 and vehicles of categories L with a maximum design speed exceeding 6 km/h, equipped with one or more traction motor(s) operated by electric power and not permanently connected to the grid, as well as their high voltage components and systems which are galvanically connected to the high voltage bus of the electric power train.</p> <p>This Regulation does not cover post-crash safety requirements of road vehicles.</p>	
2.	<p><b>Definitions</b></p> <p>For the purpose of this regulation the following definitions apply:</p>	<p><i>The definitions below were agreed to be inserted at 9/RESS. IMMA has since 9/RESS added supplementary insulation definition.</i></p> <p><b>Basic insulation:</b> Insulation applied to live parts for protection against direct contact under fault-free conditions</p> <p><b>Double insulation:</b> Insulation comprising both basic insulation and supplementary insulation</p> <p><b>Supplementary insulation:</b> independent insulation applied in addition to basic insulation for protection against electric shock in the event of a failure of the basic insulation</p>

Kommentiert [TG1]: Is out of ISO

Kommentiert [TG2]: Agreed

		<p><b>Reinforced insulation:</b> Insulation of live parts for protection against electric shock equivalent to double insulation. Insulation may compromise several layers which cannot be tested individually as supplementary or basic insulation.</p> <p>Below definition is not necessary anymore (see para 5.1.2.4)</p> <p><b>Class-II</b>  <del>Appliance in which protection against electric shock does not rely on basic insulation only but in which additional safety precautions are provided, such as double insulation or reinforced insulation, there being no provision</del></p> <p>New item:</p> <p><b>withstand voltage</b>(from Section 3 Terms and Definitions of IEC 60664-1)          voltage to be applied to a specimen under prescribed test conditions which does not cause breakdown and/or flashover of a satisfactory specimen</p>
2.1.	<p><b>"Active driving possible mode"</b> means the vehicle mode when application of pressure to the accelerator pedal (or activation of an equivalent control) or release of the brake system will cause the electric power train to move the vehicle.</p>	

Kommentiert [TG3]: Agreed

2.2.	" <b>Barrier</b> " means the part providing protection against direct contact to the live parts from any direction of access.	
2.3.	" <b>Conductive connection</b> " means the connection using connectors to an external power supply when the rechargeable energy storage system (REESS) is charged.	
2.4.	" <b>Coupling system for charging the rechargeable energy storage system (REESS)</b> " means the electrical circuit used for charging the REESS from an external electric power supply including the vehicle inlet.	<b>Below: Renumbered paragraphs from R100R2e.</b>
		2.6. "C Rate" of "n C" is defined as the constant current of the tested-device, which takes 1/n hours to charge or discharge the tested-device between 0 per cent of the state of charge and 100 per cent of the state of charge
2.5.	" <b>Direct contact</b> " means the contact of persons with live parts.	2.7
2.6.	" <b>Electrical chassis</b> " means a set made of conductive parts electrically linked together, whose potential is taken as reference.	2.8
2.7.	" <b>Electrical circuit</b> " means an assembly of connected live parts which is designed to be electrically energized in normal operation.	2.9
2.8.	" <b>Electric energy conversion system</b> " means a system that generates and provides electric energy for electric propulsion.	2.10
2.9.	" <b>Electric power train</b> " means the electrical circuit which includes the traction motor(s), and may include the REESS, the electric energy conversion system, the electronic converters, the associated wiring harness and connectors, and the coupling system for charging the REESS.	2.11
2.10.	" <b>Electronic converter</b> " means a device capable of controlling and/or converting electric power for electric propulsion.	2.12

„in-use “requirements for vehicles of category L (Part 1) – IMMA contribution to 10/RESS 29.10.2013  
RESS-10-3 Rev2

2.11.	"Enclosure" means the part enclosing the internal units and providing protection against direct contact from any direction of access.	2.13
2.12.	"Exposed conductive part" means the conductive part which can be touched under the provisions of the protection degree IPXXB, and which becomes electrically energized under isolation failure conditions. This includes parts under a cover that can be removed without using tools.	2.14
		2.15. "Explosion" means the sudden release of energy sufficient to cause pressure waves and/or projectiles that may cause structural and/or physical damage to the surrounding of the tested-device.
2.13.	"External electric power supply" means an alternating current (AC) or direct current (DC) electric power supply outside of the vehicle.	2.16
2.14.	"High Voltage" means the classification of an electric component or circuit, if its working voltage is > 60 V and ≤ 1500 V DC or > 30 V and ≤ 1000 V AC root mean square (rms).	2.17
		2.18. "Fire" means the emission of flames from a tested-device. Sparks and arcing shall not be considered as flames. 2.19. "Flammable electrolyte" means an electrolyte that contains substances classified as Class 3 "flammable liquid" under "UN Recommendations on the Transport of Dangerous Goods – Model Regulations (Revision 17 from June 2011), Volume I, Chapter 2.3" <sup>1</sup>
2.15.	"High voltage bus" means the electrical circuit, including the coupling system for charging the REESS that operates on high voltage.	2.20

<sup>1</sup> [www.unece.org/trans/danger/publi/unrec/rev17/17files\\_e.html](http://www.unece.org/trans/danger/publi/unrec/rev17/17files_e.html)

2.16.	" <b>Indirect contact</b> " means the contact of persons with exposed conductive parts.	2.21
2.17.	" <b>Live parts</b> " means conductive part(s) intended to be electrically energized in normal use.	2.22
2.18.	" <b>Luggage compartment</b> " <ul style="list-style-type: none"> <li>● <b>of category M and N vehicles</b> means the space in the vehicle for luggage accommodation, bounded by the roof, hood, floor, side walls, as well as by the barrier and enclosure provided for protecting the power train from direct contact with live parts, being separated from the passenger compartment by the front bulkhead or the rear bulk head.</li> <li>● <b>of category L1 to L7 vehicles means the enclosed space in the vehicle intended for luggage accommodation.</b></li> </ul>	2.23
		2.24. "Manufacturer" means the person or body who is responsible to the approval authority for all aspects of the type approval process and for ensuring conformity of production. It is not essential that the person or body be directly involved in all stages of the construction of the vehicle, system or component which is the subject of the approval process.
2.19.	" <b>On-board isolation resistance monitoring system</b> " means the device which monitors the isolation resistance between the high voltage buses and the electrical chassis.	2.25
2.20.	" <b>Open type traction battery</b> " means a liquid type battery requiring refilling with water and generating hydrogen gas released to the atmosphere.	2.26
2.21.	" <b>Passenger compartment</b> " <ul style="list-style-type: none"> <li>● <b>for M and N category</b> means the space for occupant accommodation, bounded by the roof, floor, side walls, doors, window glass, front bulkhead and rear bulkhead, or rear gate, as</li> </ul>	2.27

	<p>well as by the barriers and enclosures provided for protecting the power train from direct contact with live parts.</p> <ul style="list-style-type: none"> <li>for L1 to L7 category means the passenger compartment is bounded by at least 4 of the following elements: the roof, floor, side walls, doors, window glass, front bulkhead and rear bulkhead, or rear gate, as well as by the barriers and enclosures provided for protecting the power train from direct contact with live parts.</li> </ul>	
2.22.	"Protection degree" means the protection provided by a barrier/enclosure related to the contact with live parts by a test probe, such as a test finger (IPXXB) or a test wire (IPXXD), as defined in Annex 3.	2.28
2.23.	"Rechargeable energy storage system (REESS)" means the rechargeable energy storage system that provides electric energy for electrical propulsion.	2.29
		2.30. "Rupture" means opening(s) through the casing of any functional cell assembly created or enlarged by an event, large enough for a 12 mm diameter test finger (IPXXB) to penetrate and make contact with live parts (see Annex 3).
2.24.	"Service disconnect" means the device for deactivation of the electrical circuit when conducting checks and services of the REESS, fuel cell stack, etc.	2.31
		2.32. "State of Charge (SOC)" means the available electrical charge in a tested-device expressed as a percentage of its rated capacity.
2.25.	"Solid insulator" means the insulating coating of wiring harnesses provided in order to cover and protect the live parts against direct contact from any direction of access; covers for insulating the live parts of connectors, and varnish or paint for the purpose of insulation.	2.33

Kommentiert [TG4]: Are two doors are one element?  
With the improved definition the requirement is clarified.

Kommentiert [TG5]: Definition was improved!

		<p>2.34. "Subsystem" means any functional assembly of REESS components.</p> <p>2.35. "Tested-device" means either the complete REESS or the subsystem of a REESS that is subjected to the tests prescribed by this Regulation.</p>
		<p>2.36. "Type of REESS" means systems which do not differ significantly in such essential aspects as:</p> <p>(a) The manufacturer's trade name or mark;</p> <p>(b) The chemistry, capacity and physical dimensions of its cells;</p> <p>(c) The number of cells, the mode of connection of the cells and the physical support of the cells;</p> <p>(d) The construction, materials and physical dimensions of the casing and</p> <p>(e) The necessary ancillary devices for physical support, thermal management and electronic control.</p>
2.26.	<p><b>"Vehicle type"</b> means vehicles which do not differ in such essential aspects as:</p> <p>(a) Installation of the electric power train and the galvanically connected high voltage bus.</p> <p>(b) Nature and type of electric power train and the galvanically connected high voltage components.</p>	2.37
2.27.	<p><b>"Working voltage"</b> means the highest value of an electrical circuit voltage root-mean-square (rms), specified by the manufacturer, which may occur between any conductive parts in open circuit conditions or under normal operating condition. If the electrical circuit is divided by galvanic isolation, the working voltage is defined for each divided circuit, respectively.</p>	2.38

<b>3</b>	<b>Application for approval</b>	
<b>3.1</b>	<b>PART I: APPROVAL OF A VEHICLE TYPE WITH REGARD TO THE HIGH VOLTAGE SYSTEM ELECTRICAL SAFETY, INCLUDING HIGH VOLTAGE SYSTEM</b>	<b>Below blue: Renumbered or aligned paragraphs from R100R2e.</b>
3.1.	The application for approval of a vehicle type with regard to specific requirements for the electric power train shall be submitted by the vehicle manufacturer or by his duly accredited representative.	3.1.1.
3..2.	It shall be accompanied by the under-mentioned documents in triplicate and following particulars:	3.1.2.
3.2.1.	Detailed description of the vehicle type as regards the electric power train and the galvanically connected high voltage bus.	3.1.2.1.
		3.1.2.2. For vehicles with REESS, additional evidence showing that the REESS is in compliance with the requirements of paragraph 6. of this Regulation.
3.3.	A vehicle representative of the vehicle type to be approved shall be submitted to the Technical Service responsible for conducting the approval tests	3.1.3. A vehicle representative of the vehicle type to be approved shall be submitted to the Technical Service responsible for conducting the approval tests and, if applicable, at the manufacturer's discretion with the agreement of the Technical Service, either additional vehicle(s), or those parts of the vehicle regarded by the Technical Service as essential for the test(s) referred to in the paragraph 6. of this Regulation.
3.4	The competent Authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.	
		3.2. Part II: Approval of a Rechargeable Energy Storage System (REESS)



		<p>3.2.1. The application for approval of a type of REESS or separate technical unit with regard to the safety requirements of the REESS shall be submitted by the REESS manufacturer or by his duly accredited representative.</p> <p>3.2.2. It shall be accompanied by the under-mentioned documents in triplicate and comply with the following particulars:</p> <p>3.2.2.1. Detailed description of the type of REESS or separate technical unit as regards the safety of the REESS.</p> <p>3.2.3. A component(s) representative of the type of REESS to be approved plus, at the manufacturer's discretion, and with the agreement of the Technical Service, those parts of the vehicle regarded by the Technical Service as essential for the test, shall be submitted to the Technical Service responsible for conducting the approval tests.</p> <p>3.3. The Type Approval Authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.</p>
<b>4.</b>	<b>Approval</b>	
4.1.	If the vehicle submitted for approval pursuant to this Regulation meets the requirements of Paragraph 5 below and Annexes 3, 4, 5 and 7 to this Regulation, approval of this vehicle type shall be granted.	4.1. If the type submitted for approval pursuant to this Regulation meets the requirements of the relevant parts of this Regulation, approval of that type shall be granted.
4.2.	An approval number shall be assigned to each type approved. Its first two digits (at present 01 for the Regulation in its form) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party shall not assign the same number to another vehicle type.	4.2. An approval number shall be assigned to each type approved. Its first two digits (at present 02 for the Regulation in its form) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party shall not assign the same number to another vehicle type.

**„in-use “requirements for vehicles of category L (Part 1) – IMMA contribution to 10/RESS 29.10.2013  
RESS-10-3 Rev2**

4.3	Notice of approval or of refusal or of extension or withdrawal of approval or production definitely discontinued of a vehicle type pursuant to this Regulation shall be communicated to the Parties to the Agreement applying this Regulation, by means of a form conforming to the model in Annex 1 to this Regulation.	4.3. Notice of approval or of refusal or of extension or withdrawal of approval or production definitely discontinued of a vehicle type pursuant to this Regulation shall be communicated to the Parties to the Agreement applying this Regulation, by means of a form conforming to the model in Annex 1, Part 1 or 2 as appropriate to this Regulation.
4.4	There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation an international approval mark consisting of:	4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle or REESS or separate technical unit conforming to a type approved under this Regulation an international approval mark consisting of:
4.4.1.	A circle surrounding the Letter "E" followed by the distinguishing number of the country which has granted approval <sup>(1)</sup> .	4.4.1. A circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval (x)
4.4.2.	The number of this Regulation, followed by the Letter "R", a dash and the approval number to the right of the circle described in Paragraph 4.4.1.	4.4.2. The number of this Regulation, followed by the letter "R", a dash and the approval number to the right of the circle described in paragraph 4.4.1.
		4.4.3. In the case of an approval of a REESS or a separate technical unit of the REESS the "R" shall be followed by the symbol "ES".
4.5	If the vehicle conforms to a vehicle type approved under one or more other Regulations annexed to the Agreement in the country which has granted approval under this Regulation, the symbol prescribed in Paragraph 4.4.1. need not be repeated; in this case the Regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval	4.5. If the vehicle or REESS conforms to a type approved under one or more other Regulations annexed to the Agreement in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1. need not be repeated; in this case the Regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.

**„in-use “requirements for vehicles of category L (Part 1) – IMMA contribution to 10/RESS 29.10.2013  
RESS-10-3 Rev2**


	under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in Paragraph 4.4.1.	
4.6.	The approval mark shall be clearly legible and shall be indelible.	
		4.6.1. In the case of a vehicle, the approval mark shall be placed on or close to the vehicle data plate affixed by the manufacturer. 4.6.2. In the case of a REESS or separate technical unit approved as a REESS, the approval mark shall be affixed on the major element of the REESS by the manufacturer.
4.7.	The approval mark shall be placed on or close to the vehicle data plate affixed by the Manufacturer.	4.7. Annex 2 to this Regulation gives examples of the arrangements of the approval mark.
4.8.	Annex 2 to this Regulation gives examples of the arrangements of the approval mark.	

5.	Specifications and Tests	Title in R100rev2:  5. Part I: Requirements of a vehicle with regard to its electrical safety
5.1	<b>Protection against electrical shock</b>  These electrical safety requirements apply to high voltage buses under conditions where they are not connected to external high voltage power supplies.	
5.1.1.	<b>Protection against direct contact</b>  The protection against direct contact with live parts shall comply with Paragraphs 5.1.1.1. <b>and</b> 5.1.1.2. <b>and 5.1.1.3</b>  These protections (solid insulator, barrier, enclosure, etc.) shall not be able to be opened, disassembled or removed without the use of tools.	
5.1.1.1.	For protection of live parts inside the passenger compartment or luggage compartment, the protection degree IPXXD shall be provided.	
5.1.1.2.	For protection of live parts in areas other than the passenger compartment or luggage compartment, the protection degree IPXXB shall be satisfied.	<b>For vehicles with a passenger compartment, for protection of live parts</b> in areas other than the passenger compartment or luggage compartment, the protection degree IPXXB shall be satisfied.

Kommentiert [TG6]: Agreed

5.1.1.3	<i>For vehicles of category L without passenger compartment, for protection of live parts, the protection degree IPXXD shall be provided.</i>	
5.1.1.4.	<p><b>Connectors</b></p> <p>Connectors (including vehicle inlet) are deemed to meet this requirement if:</p> <ul style="list-style-type: none"> <li>a) they comply with 5.1.1.1. and 5.1.1.2. when separated without the use of tools, or</li> <li>b) they are located underneath the floor and are provided with a locking mechanism, or</li> <li>c) they are provided with a locking mechanism and other components shall be removed with the use of tools in order to separate the connector, or</li> <li>d) the voltage of the live parts becomes equal or below DC 60V or equal or below AC 30V (rms) within one second after the connector is separated.</li> </ul>	
5.1.1.5.	<p><b>Service disconnect</b></p> <p>For a service disconnect which can be opened, disassembled or removed without tools, it is acceptable if protection degree IPXXB is satisfied under a condition where it is opened, disassembled or removed without tools.</p>	

Kommentiert [TG7]: Has to be discussed again during the 11. RESS Meeting.

<b>5.1.1.6.</b>	<b>Marking</b>	
5.1.1.6.1.	In the case of a REESS having high voltage capability the symbol shown in Figure 1 shall appear on or near the REESS. The symbol background shall be yellow, the bordering and the arrow shall be black.	
		
	Figure 1 - Marking of high voltage equipment	
5.1.1.6.2.	The symbol shall also be visible on enclosures and barriers, which, when removed expose live parts of high voltage circuits. This provision is optional to any connector for high voltage buses. This provision shall not apply to any of the following cases: (a) where barriers or enclosures cannot be physically accessed, opened, or removed; unless other vehicle components are removed with the use of tools  (b) where barriers or enclosures are located underneath the vehicle floor.	
5.1.1.6.3.	Cables for high voltage buses which are not located within enclosures shall be identified by having an outer covering with the colour orange.	
<b>5.1.2.</b>	<b>Protection against indirect contact</b>	
5.1.2.1.	For protection against electrical shock which could arise from indirect contact, the exposed conductive parts, such as the conductive barrier and enclosure, shall be galvanically	

	connected securely to the electrical chassis by connection with electrical wire or ground cable, or by welding, or by connection using bolts, etc. so that no dangerous potentials are produced.	
5.1.2.2.	The resistance between all exposed conductive parts and the electrical chassis shall be lower than 0.1 ohm when there is current flow of at least 0.2 amperes.  This requirement is satisfied if the galvanic connection has been established by welding.	
5.1.2.3.	In the case of motor vehicles which are intended to be connected to the grounded external electric power supply through the conductive connection, a device to enable the galvanical connection of the electrical chassis to the earth ground shall be provided.	
	<b>[In the following cases a galvanical connection of electrical chassis to the earth ground need not be provided:                  a) the vehicle which uses only a dedicated charger that is protected when a fault to a basic isolation arises                  b) the vehicle whose whole vehicle metallic body is protected when a fault to a basic isolation arises                  c) the vehicle which cannot be charged without removing the traction battery pack from the vehicle].</b>	<i>(Move to the lower part of this section)</i>
	The device should enable connection to the earth ground before exterior voltage is applied to the vehicle and retain the connection until after the exterior voltage is removed from the vehicle.	

	Compliance to this requirement may be demonstrated either by using the connector specified by the <b>vehicle ear</b> manufacturer, or by analysis.	
		<p><i>Type approval requirements for off board chargers used only to recharge removable batteries are not applicable</i></p> <p><i>Proposal by IMMA :</i></p> <p>R100 requirements will not apply to chargers for vehicles that use removable batteries whose charging can only be performed when they are removed from the vehicle.</p>
		<p>However, if the protection against electrical shock for the AC system meets the requirements of paragraph 5.1.2.4. the grounding to the earth is not required.</p>
<b>5.1.2.4.</b>		<p>Connection to the earth ground by the vehicle is not required:</p> <p>(a) If an off board charger with a double insulation or reinforced insulation structure between input and output is been required by the vehicle manufacturer. In this case,</p>

Kommentiert [TG8]: It has to be clarified whether a removable REESS is under the scope of UN R100.



		<p>no further vehicle requirements are necessary.  </p> <p>Or</p> <p>(b) The on board charger has a double or reinforced insulation structure between input and the vehicle's exposed conductive parts/electrical chassis.</p> <p>Also IPX5 has to be fulfilled  </p>
		<p>The performance requirements regarding the previously mentioned insulation structure shall comply with the following 5.1.2.4.1 and 5.1.2.4.2, and also 5.1.2.4.3</p>
5.1.2.4.1.		<b>Withstand voltage</b>
5.1.2.4.1.1.		This test shall be conducted according to Annex XX A to this regulation.
5.1.2.4.1.2.		<b>Judgment Criteria Acceptance Criteria</b>
		<p>For off board chargers, the insulation resistance shall be equal to or greater than 7 MΩ when applying DC 500 V between all the inputs and all the outputs connected together</p>

Kommentiert [TG9]: Sentence has to be improved. It may has to be explained which "no further vehicle requirements" are meant.

Kommentiert [TG10]: Sentence may have to be improved.

		For vehicles with on-board (built-in) chargers, the insulation resistance shall be equal to or greater than 7 MΩ when applying DC 500 V DC between all the inputs connected together and the vehicle's exposed conductive parts/electrical chassis
5.1.2.4.2.		<b>Protection against ingress of water</b>
5.1.2.4.2.1.		This test shall be conducted according to Annex XX B to this regulation.
5.1.2.4.2.2.		<del>Judgment Criteria</del> Acceptance Criteria
		The insulation resistance shall be equal to or greater than 7 MΩ, when applying DC 500 V DC
5.1.2.4.3.		Handling instructions
		Appropriate instructions for charging shall be provided in the language of the country where the device or vehicle will be sold and shall be attached to the product and included in the manual. [example of <Cautions> If during charging your vehicle or charger becomes submerged in water you should not touch neither the vehicle nor the charger because of danger of electric shock. Also, do not use the battery nor the vehicle and ask your dealer to take (appropriate) measures.]

Kommentiert [TG11]: Out of IEC 61851 /1 Edition 2 => § 11.5  
 It has to be checked whether 7 is the correct number  
 Agreed

Kommentiert [TG12]: Where should this be in the context of the regulation?  
 Maybe transferred to the marking section of the regulation.

<b>5.1.3.</b>	<b>Isolation resistance</b>	
5.1.3.1.	<p><b>Electric power train consisting of separate Direct Current- or Alternating Current-buses</b></p> <p>If AC <b>high voltage</b> buses and DC <b>high voltage</b> buses are galvanically isolated from each other, isolation resistance between <b>the all</b> high voltage buses and the electrical chassis shall have a minimum value of 100 Ω/volt of the working voltage for DC buses, and a minimum value of 500 Ω/volt of the working voltage for AC buses.</p> <p>The measurement shall be conducted according to Annex 4 "Isolation resistance measurement method".</p>	<p>Electric power train consisting of separate Direct Current- or Alternating Current-buses</p> <p>If AC buses and DC buses are galvanically isolated from each other, <b>the</b> isolation resistance between all high voltage buses and the electrical chassis shall have a minimum value of 100 Ω/volt of the working voltage for DC buses, and a minimum value of 500 Ω/volt of the working voltage for AC buses.</p> <p>The measurement shall be conducted according to Annex 4 "Isolation resistance measurement method".</p>
5.1.3.2.	<p><b>Electric power train consisting of combined DC- and AC-buses</b></p> <p>If AC <b>high voltage</b> buses and DC <b>high voltage</b> buses are galvanically connected isolation resistance between <b>the all</b> high voltage bus and the electrical chassis shall have a minimum value of 500 Ω/volt of the working voltage.</p> <p>However, if all AC high voltage buses are protected by one of the 2 following measures, isolation resistance between the high voltage bus and the electrical chassis shall have a minimum value of 100 Ω/V of the working voltage:</p> <p>a) double or more layers of solid insulators, barriers or enclosures that meet the requirement in Paragraph 5.1.1. independently, for example wiring harness;</p>	<p>If AC buses and DC buses are galvanically connected, <b>the</b> isolation resistance between <b>all</b> high voltage buses and the electrical chassis shall have a minimum value of 500 Ω/volt of the working voltage.</p> <p><b>IMMA confirms that the European Commission has aligned RVFSR accordingly.</b></p>

	<p>(b) mechanically robust protections that have sufficient durability over vehicle service life such as motor housings, electronic converter cases or connectors;                  The isolation resistance between the high voltage bus and the electrical chassis may be demonstrated by calculation, measurement or a combination of both.</p> <p>The measurement shall be conducted according to Annex 4A "Isolation resistance measurement method for vehicle based tests".</p>	
	<p>5.1.3.3. Fuel cell vehicles                  If the minimum isolation resistance requirement cannot be maintained over time, then protection shall be achieved by any of the following:</p> <p>(a) Double or more layers of solid insulators, barriers or enclosures that meet the requirement in paragraph 5.1.1. independently;</p> <p>(b) On-board isolation resistance monitoring system together with a warning to the driver if the isolation resistance drops below the minimum required value. The isolation resistance between the high voltage bus of the coupling system for charging the REESS, which is not energized besides during charging the REESS, and the electrical chassis need not be monitored. The function of the on-board isolation resistance monitoring system shall be confirmed as described in Annex 5.</p>	
5.1.3.4.	Isolation resistance requirement for the coupling system for charging the REESS	

	For the vehicle inlet, <b>in addition to recharge cable if permanently connected to the vehicle of cat L</b> , intended to be conductively connected to the grounded external AC power supply and the electrical circuit that is galvanically connected to the vehicle inlet <b>or to the recharge cable</b> during charging of the REESS, the isolation resistance between the high voltage bus and the electrical chassis shall be at least 1 MΩ when the charger coupler is disconnected. During the measurement, the traction battery may be disconnected.	
5.2.	Rechargeable Energy Storage System (REESS)	
5.2.1.	For a vehicle with a REESS, the requirement of either paragraph 5.2.1.1. or paragraph 5.2.1.2. shall be satisfied.	
5.2.1.1.	For a REESS which has been type approved in accordance with Part II of this Regulation, it shall be installed in accordance with the instructions provided by the manufacturer of the REESS, and in conformity with the description provided in Part 2 of Annex 6 to this Regulation.	
	5.2.1.2. The REESS shall comply with the respective requirements of paragraph 6. of this Regulation.	
	5.2.2. Accumulation of gas Places for containing open type traction batteries that may produce hydrogen gas shall be provided with a ventilation fan or a ventilation duct <b>or any other suitable means</b> to prevent the accumulation of hydrogen gas.	
<b>5.2.3</b>	<b>Protection against Excessive Current</b>  The RESS shall not overheat.	The REESS shall not overheat.

	<p>If the REESS is subject to overheating due to excessive current, it shall be equipped with a protective device such as fuses, circuit breakers or main contactors.</p> <p>However, the requirement may not apply if the manufacturer supplies data that ensure that overheating from excessive current is prevented without the protective device</p>	<p><b>This article is not included for four-wheelers anymore. To be discussed at 10/RESS.</b></p>
<p><b>Previously 5.2.3</b></p>	<p><b>Protection against electrolyte spills (L-category vehicles only)</b></p> <p><b>L category vehicles shall foresee that no spilled electrolyte from the REESS and its components shall reach the driver/ rider as applicable nor any person around the vehicle during normal condition of use and/or functional operation.</b></p> <p><b>Also, L category vehicles shall foresee that electrolyte shall not spill from the vehicle when the vehicle is tilted to the ground or when the REESS is put upside-down.</b></p>	<p><b>IMMA supports the paragraph and the place of the paragraph.</b></p>
	<p>5.3. Functional safety</p> <p>At least a momentary indication shall be given to the driver when the vehicle is in "active driving possible mode".</p> <p>However, this provision does not apply under conditions where an internal combustion engine provides directly or indirectly the vehicle’s propulsion power.</p> <p>When leaving the vehicle, the driver shall be informed by a signal (e.g. optical or audible signal) if the vehicle is still in the active driving possible mode.</p>	

Kommentiert [TG13]: Is now in section 6 of UN R100

Kommentiert [TG14]: Requirement for “tilted vehicles no spillage” has to be improved.

	<p>If the on-board REESS can be externally charged by the user, vehicle movement by its own propulsion system shall be impossible as long as the connector of the external electric power supply is physically connected to the vehicle inlet.</p> <p><b>For an L-cat vehicle, with a permanently connected charge cable, the requirement above is not applicable if using the cable to charge the vehicle prevents the use of the vehicle (e.g. seat cannot be closed, cable disturb the rider to sit, cable disturb the rider to step-in).</b></p> <p>This requirement shall be demonstrated by using the connector specified by the car manufacturer.                  The state of the drive direction control unit shall be identified to the driver.</p>	
5.3.1	<b>Additional functional safety requirements for L-category vehicles.</b>	
5.3.1.1.	<b>At the start-up in order to select the active driving possible mode at least two deliberate and distinctive actions shall be performed by the driver.</b>	
5.3.1.2.	<b>Only a single action shall be required to deactivate the active driving possible mode.</b>	
5.3.1.3	<b>Indication of temporary reduced power (i. e. not resulting from a failure) and/or of SOC of</b>	

	REESS	
5.3.1.3.1.	<del>The vehicle shall have a function/device that visually or audibly warns the driver/rider if the power is automatically reduced below a certain level, (e.g. due to activation of the output controller to protect the REESS or the propulsion system) or due to a low state of charge (SOC).</del>	The vehicle shall have a function/device that <b>indicates</b> to the driver/rider if the power is automatically reduced below a certain level, (e.g. due to activation of the output controller to protect the REESS or the propulsion system) or due to a low state of charge (SOC).
5.3.1.3.2.	<del>The conditions under which these warnings are given shall be determined by the manufacturer. The impact of the power reduction on the safety will be prescribed in [Annex 6.]</del>	The conditions under which these <b>indications</b> are given shall be determined by the manufacturer. A brief description of the power reduction and indicating strategy will be prescribed in Annex 6.  <b>Annex 6 :</b> <b>8.4 System descriptions for low performance driving mode(s)</b> <b>8.4.1 Systems' SOC level(s) for which power reduction is activated, descriptions, rationales</b> <b>8.4.2 Descriptions for systems' reduced power mode(s) and similar mode(s), rationales</b>
5.3.1.4.	<b>Driving or riding backwards</b> <b>It shall not be possible to activate the vehicle reverse control function whilst the vehicle is in forward motion.</b>	
5.4.	Determination of hydrogen emissions	
5.4.1.	This test shall be carried out on all vehicles equipped with open type traction batteries. If the REESS has been approved under Part II of this Regulation and installed in accordance with	

Kommentiert [TG15]: Requirement has to be aligned with RPPR



	paragraph 5.2.1.1. this test can be omitted for the approval of the vehicle.	
5.4.2.	The test shall be conducted following the method described in Annex 7 to the present Regulation. The hydrogen sampling and analysis shall be the ones prescribed. Other analysis methods can be approved if it is proven that they give equivalent results.	
5.4.3.	During a normal charge procedure in the conditions given in Annex 7, hydrogen emissions shall be below 125 g during 5 h, or below 25 x t2 g during t2 (in h).	
5.4.4.	During a charge carried out by a charger presenting a failure (conditions given in Annex 7), hydrogen emissions shall be below 42 g. Furthermore the charger shall limit this possible failure to 30 minutes.	
5.4.5.	All the operations linked to the REESS charging shall be controlled automatically, included the stop for charging	
5.4.6.	It shall not be possible to take a manual control of the charging phases.	
5.4.7.	Normal operations of connection and disconnection to the mains or power cuts shall not affect the control system of the charging phases.	
5.4.8.	Important charging failures shall be permanently indicated. An important failure is a failure that can lead to a malfunction of the charger during charging later on.	
5.4.9.	The manufacturer has to indicate in the owner's manual, the conformity of the vehicle to these requirements.	

5.4.10.	The approval granted to a vehicle type relative to hydrogen emissions can be extended to different vehicle types belonging to the same family, in accordance with the definition of the family given in Annex 7, Appendix 2.	
<b>(previously) 5.2.4</b>	<p><b>Accidental or unintentional detachment (L-category vehicles only)</b></p> <p>The REESS and its components shall be installed in the vehicle in such a way so as to preclude the possibility of inadvertent or unintentional detachment of the REESS.</p> <p>The REESS and its components in L-category vehicles shall not be ejected when the vehicle is tilted to the ground or when the REESS is put upside-down.</p>	<b>To be discussed where to put. IMMA supports the place.</b>
7.	<b>Modifications and extension of the type approval</b>	
8.	<b>Conformity of production</b>	
9.	<b>Penalties for non-conformity of production</b>	
10.	<b>Production definitively discontinued</b>	
11.	<b>Names and addresses of Technical Services responsible for conducting approval tests and of Type Approval Authorities</b>	
12.	<b>Transitional Provisions</b>	

Annex 1 Part 1	Communication (Type approval as vehicle)	
Annex 1 Part 2	Communication (Type approval as battery as component)	
Annex 2	Arrangements for Approval marks	
Annex 3	Protection against direct contacts of parts under Voltage	
Annex 4A	Isolation resistance measurement method for vehicle based tests	
Annex 4	Annex 4B Isolation resistance measurement method for component based tests of a REESS	
Annex 5	Confirmation method for function of on-board isolation resistance monitoring system	
Annex 6 Part 1	Essential characteristics of road vehicles or systems	Additions:  8.4 System descriptions for low performance driving mode(s) 8.4.1 Systems' SOC level(s) for which power reduction is activated, descriptions, rationales 8.4.2 Descriptions for systems' reduced power DEar mode(s) and similar mode(s), rationales
Annex XX		<del>Test procedures for off-board type charger and for vehicle with on-board type charger</del>

Annex XXA		Withstand voltage test
1		<p><b>1. General</b></p> <p>Insulation resistance shall be measured after application of the test voltage to an external charger combined with the vehicle and or to the vehicle with the on-board (built-in) charger</p>
2		<p><b>2.Procedure</b></p> <p>The following testing procedure shall applicable to the type of the charger</p> <p>(a) Off-board type charger</p>
		<p>Between all the inputs and all the outputs, apply a sine-wave test voltage of <math>2 * (U_n + 1200)</math> V rms at a frequency of 50 Hz or 60 Hz for one minute, where <math>U_n</math> is the AC input voltage (rms).</p> <p>Instead of the specified AC sine-wave voltage, the DC voltage whose value is equivalent to the specified sine-wave AC voltage's peak value may be applied for one minute.</p> <p>After the test, measure the insulation resistance between all the inputs and all the outputs.</p>

Kommentiert [TG16]: Can the off-board type charger been deleted?

		<p>(b) For vehicle with on-board (built-in) chargers:</p> <p>Between all the inputs of the charger (plug) and the vehicle’s exposed conductive parts including the electrical chassis if present, apply a AC test voltage of <math>2 \times (U_n + 1200)</math> V rms at a frequency of 50 Hz or 60 Hz for one minute, where <math>U_n</math> is the AC input voltage (rms).</p> <p>The test shall be performed on the complete vehicle.                  All the electrical devices shall be connected.</p>
		<p>Instead of the specified AC voltage, the DC voltage whose value is equivalent to the specified AC voltage’s peak value may be applied for one minute.</p> <p>After the test, measure the insulation resistance between all the inputs and all the outputs.</p>
<b>Annex XX B</b>		<b>Water resistance test</b>
		<p>1.General                  The insulation resistance as described in Annex XXA shall be measured after the water resistance performance test has been conducted.</p>
		<p>2. Procedure                  The following testing procedure shall be applied in accordance with the type of charger.</p>

		<p><del>a) Off board type charger</del></p> <p>After conducting the test of IPX4 under IEC 60529, measure the insulation resistance in accordance with Annex XXA between all the inputs and all the outputs</p> <p><i>The reference to IEC may be replaced with text from the standard</i></p>
		<p>b) For vehicle with on-board (built-in) chargers:</p> <p>After conducting the test of IPX5 under IEC 60529, measure the insulation resistance in accordance with Annex XXA between all the inputs and the vehicle's exposed conductive parts including the /electrical chassis if present</p>
		<p>Justification</p> <p>In IEC61851-1, the “Class II” which has reinforced protection for electrical shock and does not require protective earth connection during charging is described.</p> <p>Performance requirements for “off-board type chargers provided with the vehicle” and “vehicles with on-board charger” pursuant to the structure</p>

Kommentiert [TG17]: Has to be transferred in the requirement part

Kommentiert [TG18]: IEC test has to be displayed here.

		<p>of “Class II”, shall include “dielectric strength, insulation resistance and water resistance”.</p> <p>Refer to EC61851-1 for dielectric strength and insulation resistance, and IEC60529 for water resistance.</p> <p>After riding through rainy weather, it is assumed that the vehicle body could be drenched and that charging would be done in wet and humid surrounding.</p> <p>For vehicles without a protective earth connection when charging should have equivalent electric shock protection to vehicles equipped with a protective earth and that’s why water resistance performance should be equipped taking into account the outdoor use.</p> <p>In addition, it is necessary to mention in the instruction manual that the user should not touch the battery charger nor the vehicle whenever the vehicle and the battery charger are abnormally submerged in flooding water, because of the risk of electric shock.</p>
--	--	---