



# QUALIFICATION FOR WORK ON VEHICLES WITH HIGH-VOLTAGE SYSTEMS Work Package 6.1

ALBERO Project

Description	Qualification Level	Group of People	Features	Duration	Qualification Contents
Non-Electrotechnical Work	1	test driver, workshop staff, body work, wheel and oil changes	Level 1 describes all non-electrical work that must be performed on a vehicle or on equipment with high-voltage systems. Employees must be made aware of the possible electrical hazards of the high-voltage system and instructed in the intended use of the vehicle.	2 to 4 lessons	<ul style="list-style-type: none"> <li>operating vehicles and the associated equipment</li> <li>performing general activities that do not require de-energizing the high-voltage system.</li> <li>performing all mechanical activities on the vehicle (but hands off "orange").</li> <li>disconnecting the high-voltage system, service disconnect/maintenance plug "pull and plug" as an additional safety measure</li> <li>determining the person to be contacted in case of ambiguity</li> <li>impermissible work on the vehicle</li> <li>organizational procedure for electrotechnical work carried out under the direction and supervision of a specialist for high-voltage systems</li> </ul>
Electrotechnical Work	2a	persons without previous electrotechnical knowledge but technical training	For level 2, the specialist knowledge for work on high-voltage systems that are not high voltage intrinsically safe is required. This includes all electrotechnical work that is carried out in a de-energized state. This requires the decommissioning and recommissioning of the HV system in accordance with the application and implementation of the first three rules of the "Five Safety Rules".	at least 100 lessons	<ul style="list-style-type: none"> <li>basic electrical engineering knowledge</li> <li>electrical hazards and first aid</li> <li>protective measures against electrical body flow and fault arcs</li> <li>organization of health and safety during electrical work</li> <li>technical and managerial responsibility</li> <li>employee qualifications in the field of electrical engineering activities</li> <li>use of high-voltage systems in vehicles</li> </ul>
	2b	persons with previous electrical engineering knowledge in the automotive sector (e.g. automotive electricians, automotive mechatronics technicians, automotive mechanics)		at least 48 lessons	<ul style="list-style-type: none"> <li>electrical hazards and first aid</li> <li>protective measures against electrical body flow and fault arcs</li> <li>organization of health and safety during electrical work</li> <li>technical and managerial responsibility</li> <li>employee qualifications in the field of electrical engineering work</li> <li>use of high-voltage systems in vehicles</li> </ul>
	2c	electrical specialists (e.g. industrial electricians, electrical fitters, electrical engineers)		at least 20 lessons	<ul style="list-style-type: none"> <li>technical and managerial responsibility</li> <li>employee qualifications in the field of activity of electrical engineering</li> <li>use of high-voltage systems in vehicles</li> <li>structure and mode of operation of vehicle electrical systems</li> </ul>
Electrotechnical Work under Voltage	3a	employees with a level 2b and 2c qualification	Requirement for qualification to level 3 is a successful qualification to level 2 and a safe performance of the associated practical activities. With the qualification to work under voltage on the high-voltage system, all electrotechnical work on the vehicle can be carried out.	at least 8 lessons	<ul style="list-style-type: none"> <li>definition of the scope of application</li> <li>requirements for live working on the HV system: qualification of the employees, organization of the work, protective and auxiliary equipment to be used</li> <li>practical exercises</li> </ul>
	3b	employees with a level 2a qualification previous education: engineering or scientific studies		at least 48 lessons	<p>Qualification content Level 3a as well as teaching practical content on the following focal points:</p> <ul style="list-style-type: none"> <li>electrical measurement</li> <li>performing measurements according to the electrotechnical standards (e.g. VDE regulations)</li> <li>circuitry</li> <li>use of tools for electrical assembly</li> <li>laying and fastening of cables</li> <li>assembling and wiring circuits according to circuit documents (parts list, terminal diagram, layout plan, circuit diagram)</li> <li>sensor technology in control engineering</li> <li>connecting and operating peripheral devices</li> <li>testing functions on digital switching elements and circuits</li> <li>fault analysis, systematic troubleshooting, use of vehicle- and system-related diagnostic equipment</li> <li>troubleshooting</li> </ul>
	3b	employees with a level 2a qualification previous education: non-electrotechnical skilled worker or journeyman training		at least 100 lessons	<p>Qualification content Level 3a as well as teaching practical content on the following focal points:</p> <ul style="list-style-type: none"> <li>electrical measurement</li> <li>performing measurements according to the electrotechnical standards (e.g. VDE regulations)</li> <li>circuitry</li> <li>use of tools for electrical assembly</li> <li>laying and fastening of cables</li> <li>assembling and wiring circuits according to circuit documents (parts list, terminal diagram, layout plan, circuit diagram)</li> <li>sensor technology in control engineering</li> <li>connecting and operating peripheral devices</li> <li>testing functions on digital switching elements and circuits</li> <li>fault analysis, systematic troubleshooting, use of vehicle- and system-related diagnostic equipment</li> <li>troubleshooting</li> </ul>