

**Specialist article**

# ***6 things you need to know in advance about (ev)high- voltage qualification of your employees***

*And how you can even constructively  
compensate for your need for skilled  
personnel with these opportunities*

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## Is it necessary to use electricians for all work on (ev)high-voltage systems?

*A clear no!*

While it is correct that electrical work is only carried out by, or under the direction and supervision of, an electrical specialist, DGUV I 209-093 enables and requires a separate qualification line for work on (ev)high-voltage systems, such as entire vehicles or even components (e.g. for (ev)HV battery production).

**Electrical engineers also require a corresponding qualification for work on (ev)high-voltage systems.**

However, the quite extensive requirements of DGUV I 209-093 also enable non-electrical engineers to be qualified for most work on (ev)high-voltage systems.

**From our training and consulting experience in electrical qualification, we assure you:**

This opens up a very wide range of applications for personnel originally from outside the field in the production and development of (ev)high-voltage vehicles and components.

## So who is allowed to do what?

*Clarify which electrical work your employees have to carry out at all.*

Is it about working near (ev)high-voltage systems, e.g. inside the production hall? Or is it about troubleshooting on the open battery? There is a big difference!



The table on the next page serves as a basic guideline.

# Competence matrix

	<i>lay person</i>	<i>Sensitised LEvel/E</i>	<i>iP Level 1E</i>	<i>SHV Level 2E</i>	<i>SHV with LLW Level 3E</i>
Intended use of intrinsically safe high-voltage vehicles.	✓	✓	✓	✓	✓
Non-electrical work in the vicinity of (ev)HV systems.	✗	✓	✓	✓	✓
Non-electrical work on (ev)HV systems.	✗	✗	✓	✓	✓
(ev)HV electrical work (without disconnection/recommissioning) under the direction and supervision of a SHV.	✗	✗	✓	✓	✓
Independent, defined electrotechnical work (ev-HV), including disconnection and recommissioning.	✗	✗	✗	✓	✓
Required live work, including troubleshooting on the running (ev)HV system.	✗	✗	✗	✗	✓

Legend:

iP(FuP): instructed person

SHV(FHV): specialist (ev)high-voltage

LLW: Live Line Work

**Non-electrical staff can be qualified for electrical work as iP(3-4 hrs. training) or to a SHV (5-10 days training).**

For electrical engineers, a 3-day training course is provided as a SHV.

# Qualification levels

## of the SHV according DGUV Information 209-093

E-Levels	Target group
SHV according Level 2E Entry A Duration: 10 days	Persons without previous electrical knowledge, e.g. automotive mechanics
SHV according Level 2E Entry B Duration: 5 days	Persons with previous electrical knowledge, e.g. automotive mechatronics, mechanical engineers
SHV according Level 2E Entry C Duration: 3 days	Persons with vocational training electrical engineering e.g. system electronics, electrical engineers

S-Levels	Target group
SHV according Level 2S Entry A Duration: 10 days	Persons without previous electrical knowledge, e.g. automotive mechanics
SHV according Level 2S Entry B Duration: 2 days	Persons with previous electrical knowledge, e.g. automotive mechatronics, mechanical engineers
SHV according Level 2S Entry C Duration: 2 days	Persons with vocational training electrical engineering e.g. system electronics, electrical engineers

### The difference between the S-levels and the E-levels

- S levels describe the qualifications for work on series production vehicles (e.g. in workshops).
- E-levels describe the qualifications for work on high-voltage systems in development and production.

**The focus of this paper is on the E-levels, these represent the industry standard.**

## ***What does that mean in concrete terms?***

*This sounds quite abstract so far, but a few examples will make it clearer.*

	<b>Category</b>	<b>Example</b>
anybody	Intended use of intrinsically safe high voltage vehicles.	<ul style="list-style-type: none"> <li>• Driving the electric vehicle - on public roads of course only with a driving licence</li> </ul>
E, iP, SHV, SHV with LLW	Non-electrical work in the vicinity of (ev)HV systems.	<ul style="list-style-type: none"> <li>• Logistics activities in the factory hall</li> <li>• Cleaning of vehicle and surroundings</li> </ul>
iP, SHV, SHV with LLW	Non-electrical work on (ev)HV systems.	<ul style="list-style-type: none"> <li>• Car body work</li> <li>• Work on Boardnet (e.g. 12 V)</li> </ul>
iP, SHV, SHV with LLW	(ev)HV electrical work (without disconnection/recommissioning) under direction/supervision of a SHV.	<ul style="list-style-type: none"> <li>• mechanical installation of the power electronics</li> <li>• mechanical removal of the electric motor</li> </ul>
SHV, SHV with LLW	defined electrotechnical work (ev-HV), including disconnection and recommissioning.	<ul style="list-style-type: none"> <li>• Disconnection according to five safety rules, connection of (ev)HV measuring devices for testing, recommissioning of the vehicle.</li> </ul>
SHV with LLW	Required live work, including troubleshooting on the running (ev)HV system.	<ul style="list-style-type: none"> <li>• Carrying out troubleshooting on running system</li> <li>• Working on the open (ev)HV battery</li> </ul>

**Important:** We strongly recommend that employees without vocational electrotechnical training only work according to specified work instructions.

## What is the focus of an qualification for electrical work?

*It is not about individual tasks, but about the totality of his tasks.*

**It is about the totality of the works, meaning all the works and not the majority of them.**

**Example:** If an employee has to disconnect an electric vehicle himself even once or has to partially determine the system is dead, at least an SHV qualification is required.

If you are sure that certain employees will be working in the electrotechnical environment, but never and under no circumstances run the risk of having to carry out an activity reserved for an SHV, an iP qualification remains the right choice.

**Always observe the competence limits of employees.**





## What is it like to deploy your employees with your clients?

*Clarify which tasks are to be carried out by your employees in detail.*

Only through expert and clear communication can you ensure that employees are neither over- nor under-qualified - both of which happen very easily. And this is despite the fact that you take great care to ensure that your employees are adequately qualified. Unfortunately, in communication it is easy for both sides to tacitly assume different circumstances.

### **Example:**

You employ several technicians who, as experts for LIN and CAN bus in the development area, regularly have to work on electric vehicles for the customer. You can, of course, qualify them as SHV so that they can work independently on the vehicles to ensure that the vehicles are enabled.

**But, is this also sensible and necessary?**



## In short: No

When you talk to your customer, it may become clear that he is reluctant to let your employees disconnect his vehicles electric power system or even put them into operation. For your customer it is more than natural that only his own employees unlock his vehicles and release them for the work of your technicians. He even insists on this. In this case, such a one or two-week SHV qualification for your employees would not be necessary. The three- to four-hour qualification as a instructed person would then be completely sufficient.



**Important:** More dramatic, of course, are the cases in which your employees are supposed to carry out an order and the person in charge prohibits the execution at your expense due to a lack of proof of qualification.



## Is it done with a basic qualification?

*In addition to professional training, consider required instruction and training.*

The good news: Very few comprehensive (ev)high-voltage qualifications have to be repeated in full - of course it is not forbidden.

However, according to DGUV I 209-093 as well as § § 12 ArbSchG and 4 DGUV regulation 1, the employer is obliged to provide annual, professionally appropriate instruction.

	Sensitised Level E	IP Level 1E	SHV Level 2E	SHV with LLW Level 3E
Recurring instruction level E <b>at least once a year</b> Duration: approx. 4 hrs.	✓	✓	✓	* ✓
Retraining <b>all four years</b> Duration: 2 days	✗	✗	✗	✓
Occupational health examination (G25) <b>every three years</b> Duration: 1 h + medical waiting room	✗	✗	✗	✓

\* May be included in the general recurring instruction.

**All these trainings and instructions  
are part of our offer.**



## Are persons with (ev)high-voltage qualification also allowed to carry out other electrical work?

*No, not easily.*

In principle, this would have to be denied. The qualifications according to DGUV I 209-093 are exclusively responsible for the (ev)high-voltage range.

However, in principle there is nothing to be said against an extended qualification, e.g. as an "*electrical specialist for defined tasks*" or as an "*electrically instructed person*". These are separate qualifications, but some of them can be combined.

However, we only recommend doing this if you also have corresponding areas of responsibility for your employees.

Your individual needs must also be determined and assessed individually, and my team and I will be happy to help.

**All these trainings and instructions  
are part of our offer.**

**Any questions? We would like to get to know you.**

*We invite you to a 30-minute consultation on the (ev)high-voltage qualifications of your employees. Free of charge and without obligation, guaranteed!*



*Write or give us a call!*

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## *Columbo-guarantee*

We all know: The best questions all too often come afterwards. Even if it's more than a year after the training: "*One more little question*" is always welcome, we enjoy hearing from you. That's what we stand for.

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