HIGH VOLTAGE DIAGNOSTIC SPECIALIST TRAINING AND EQUIPMENT STRATEGY

MODEL

<table>
<thead>
<tr>
<th>F15 PHEV (X5 xDrive40e)</th>
<th>F30 PHEV (330e iPerformance)</th>
<th>G12 PHEV (740e xDrive iPerformance)</th>
<th>G30 PHEV (530e, 530e xDrive iPerformance)</th>
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<tr>
<td>I01 (i3)</td>
<td>I12 (i8 Coupe)</td>
<td>I15 (i8 Roadster)</td>
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SITUATION

The complex electrified drivetrain technology used in BMW BEV (Battery Electric Vehicle) & PHEV (Plug-in Hybrid Electric Vehicle) vehicles requires highly specialized experts to service, diagnose and repair. Technical Service recognizes the need to constantly enhance the level of HV related qualification of our service technicians, by providing improved diagnosis methods and tools.

**Important warning for working on the high-voltage systems on BMW vehicles:**

Only properly trained personnel, who have passed all applicable technical training courses, should perform any maintenance or repairs on any Hybrid or Electric Vehicle. Work performed by unqualified persons may result in severe injury or damage to the vehicle. Additional information is found in Repair Instruction 61 00... Observe safety instructions when handling electric vehicles.

INFORMATION

The ST1821 High Voltage Diagnostic Specialist Certification (HVS) is the next step in the E-mobility service strategy for BMW technicians. The class is designed for Shop Forman (Master Technicians), with Alternative Drive and Battery Rework Certifications (ST1824 and ST1825) with required TSE sponsor recommendation. See Pre-requisites section.

Technicians that have successfully passed the Technical Training course ST1821/ST1606 High Voltage Diagnostic Specialist (HVS) class up to now are allowed to perform voltage verification measurements, to assess the status of the high-voltage system when presented with a "NO Blitz present in KOMBI" situation. This procedure can be performed by using BMW High Voltage Adapter (P/N 83 30 2 449 667), and only after submitting a TSARA case to receive further instructions from Technical Service.

Note: If it was determined that the vehicle required further diagnosis (as manual isolation testing), this could only be done by a specialized expert. Therefore the case was then escalated a Technical Service Engineer (TSE).

What has changed?

High Voltage Diagnostic Specialists will now be able to interact directly with BMW of North America's E-Mobility Engineering, when working on cases where there is a need for a qualified technician to make manual voltage verification measurements; and isolation testing directly on the vehicle.
The HVS Certification class will be updated to now allow the HV Specialist technician to perform these additional tests on vehicles that do not display the Blitz on the KOMBI, or have failed the ISTA isolation test and require a specialized expert to perform a manual test. The class will introduce technicians to the necessary high-voltage equipment, personal protection equipment and the specialized training to perform these manual tests when necessary.

High Voltage Diagnostic Specialists will also be assisted in "real time" remotely by Technical Service personnel, when working on one of these vehicles, with the use of the BMW Smart Glasses ("TSARAvision"). Questions would be answered instantly, data and instructions can be delivered real time, as well as, picture and video sharing may be uploaded directly as the service is being performed. See equipment section for more information.

The ST1821 High Voltage Diagnostic Specialist (HVS) class, which is currently an elective class, will be a mandatory course of Technical Training curriculum beginning in 2020 (One HV Specialist per dealer). Availability of the mandatory Technical Training class will be announced by BMW Group University

**Note:** Enhanced course content will be added to the live course (isolation testing and the required equipment) with no additional days. For technicians who have previously attend the course, a video will be produced to cover the additional content. TMSi will add this requirement to the technician's transcript with a due date of December 31, 2019.

**PRE-REQUISITES**
The pre-requisites for the ST1821/ST1606 High Voltage Specialist Certification (HVS) certification are outlined below:

- BMW hybrid and electric certification to the latest system generation (Gen3/Gen4, etc.)
- ST1824 Alternative Drive Part 1 and ST1825 Alternative Drive Part 2 Classes
- TSE sponsor recommendation (required)
- The candidate must be the actual person that is going to be performing the manual testing.

**EQUIPMENT**
Additionally to already available High-voltage diagnostic tools and equipment, the trained HVS technician should use the following:

- BMW High-voltage adapter (P/N 83 30 2 449 667) - delivered via Auto Shipment
- Fluke 1587/1587 FC or equivalent - in BMW Equipment Program
- Generic DVOM (dedicated for HV diagnosis)
- BMW Smart Glasses (aka "TSARAvision") - delivered via Auto Shipment
- Required personal protection equipment (PPE)- in Tools Program
- HVS training material (will be provided when attending the instructor-led class)

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<tr>
<th>BMW has provided a High-Voltage Adapter (P/N 83 30 2 449 667) especially designed to interface with BMW high-voltage system connectors. The purpose of the breakout box is to allow safe testing of high-voltage circuits to minimize the risk of personal injury and damage to the vehicle. The tool provides built-in safety features such as</th>
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<tr>
<td>• Temperature monitoring of the connectors</td>
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### BMW High-Voltage Adapter

- The necessary built-in resistance to protect the user while testing.

**The BMW High-Voltage Adapter is currently available via the automatic tool shipment program.**

### Fluke 1587 FC Insulation Multimeter

The Fluke 1587 FC meter measures isolation from 50 to 1000 Volts and is commended by BMW to be used in combination with the BMW high-voltage adapter in the diagnosis and service of Hybrid and electric vehicles. This tool is required to identify and validate the status of the high-voltage system and whether the following conditions are acceptable or not for service. This is the tool that BMW authorized to carry out these tests.

**The Fluke 1587 Insulation Multimeter is currently available from the BMW Equipment Program catalog.**

### Recommended Personal Protection Equipment Available through BMW:

**Class 0 Gloves rated at 1000V**  
BMW P/N 81 69 2 355 210 GRUSB 61 19 - 15

Recommended personal protection equipment that may also be locally sourced:

- Insulated floor mat (rated at 30 kV)
- Nonflammable clothing
- ANSI approved EH-rated work shoes

Here is a list of the recommended personal protection equipment (PPE) for use when working on a vehicle with an unknown high-voltage system status. The components offered via BMW part numbers should not be considered optional. However, you may find equivalent replacement in the aftermarket to substitute for our suggestions.

Any externally-sourced tool or part should meet ASTM F1505-01 standards, and meet voltage requirements no less than 1000 volts.
The BMW Smart Glasses ("TSARAvision") are moving BMW Technical Service into the future. The use of these glasses will allow the technical support team to interact directly with the technician and provide live support while the repair or testing is being performed live. These glasses work through a server where both the technical support and the technician connect as with a skype meeting. Questions are answered instantly, data and instructions can now be delivered real time, as well as picture and video sharing may be uploaded directly as the service is being performed.

For high-voltage service and support, the use of these glasses provide an added layer of safety and confidence when a technician is confronted with a hard to diagnose technical issue, or a test procedure that he/she has not performed before and may need assistance with.

For additional information, refer to B04 03 19.

Note: The BMW High-Voltage adapter will be distributed via the automatic tool shipment program (one unit per main location, excluding center which already purchased the adapter from the Tool Program). Refer to Special Tool Bulletin B04 04 19.

The Fluke 1587 Insulation Multimeter is currently available from the BMW Equipment Program P/N 425-35024652, or may be sourced locally. This SIB also references SI B03 01 19 High Voltage Diagnostic Specialist -Training and Equipment - training bulletin.

CERTIFICATION

The ST1821 High Voltage Diagnostic Specialist (HVS) class will be updated to testing competency, and will be a mandatory Technical Training course.

The following chapters will be covered in HVS training:

1. Understanding the Hazards of Electricity
2. Electric Powertrain Service Notes
3. Personal Protection Equipment (PPE)
4. High-voltage System Diagnostic Equipment
5. High-voltage System Safety Measures
6. High-voltage Disconnect Verification
7. High-voltage System Tests
8. High-voltage Components
Note: This training material is NOT available on TIS. It is only available when Technicians attend the instructor-led classes.

## PARTS INFORMATION

### WARRANTY INFORMATION

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Part description</th>
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<tbody>
<tr>
<td>83 30 2 449 667</td>
<td>BMW High-Voltage Adapter (Automatic Tool Shipment)</td>
</tr>
<tr>
<td>425-35024652</td>
<td>Fluke 1587 Insulation Multimeter – BMW Equipment program, or sourced locally</td>
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<tr>
<td>81 69 2 355 210</td>
<td>Class 0 gloves rated to 1000V</td>
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