



Vehicle Commissioning Checklist V2.13

Check done by

Date and Time

MCU Serial No.

HCU Serial No.

ESS Serial No.

DCDC Serial No.

MGU Serial No.

Electrical Test Meter(s) Model

Serial No.

Before executing this checklist, read and understand 9.3.1 HV System Important Safety Information.

All checks listed below have to be done in case of an initial vehicle commissioning!

Prerequisite: MGU Checks (Before Vehicle Assembly!)

Test that must be done before assembly of the MGU on the gearbox respectively mounting the bell housing.

No	Test Item	Description	Reference	Value
1.	Visual inspection - MGU	Check if MGU has visible damage. Component must not be used if it has any damage!	no damage	
2.	Visual inspection - Measuring Adapter	Check if the Measuring Adapter has visible damage. Adapter must not be used if it has any damage!	no damage	
3.	Visual inspection - HV Cables and Connectors	Check if the high voltage cables or connectors outside the ESS compartment assembly have visible damage. High voltage cables and connectors must not be used if they have any damage!	no damage	
4.	Bonding resistance MGU housing parts	The Bonding resistance of each electrically conductive housing part (covers, HV connectors, etc) of the MGU must be checked towards the PE interface ¹ .		
		Cover	< 2 mOhm	
		B-Shield	< 2 mOhm	
		Cooling Jacket	< 2 mOhm	
		Metal Phase caps only: Record highest value measured. Metal phase cap bonding has known inconsistencies and may read higher, up to Open Loop. Please report to Bosch if value has changed significantly since last measurement.	< 2 mOhm	
		AC Connector	< 20 mOhm	

a) Insulation resistance - Measuring adapter (MGU / MCU HVAC Test Box)

For Steps below: Short all HV potentials together. Separately, short LV_GND and HVIL together. Remove any shorts after this test.

Check insulation resistance of the measuring adapter between the HV potentials and the LV_GND & HVIL connections.

No	Test Item	Description	Reference	Value
5.	Continuity Check	<i>Stäubli connector shell <--> LV_GND</i>	<i>Continuity</i>	
6.	Adapter Isolation	<i>Phase U+V+W --> LV_GND + HVIL1 + HVIL2</i>	<i>> 3 GOhm</i>	
		<i>LV_GND + HVIL1 + HVIL2 --> Phase U+V+W</i>	<i>> 3 GOhm</i>	

b) Insulation resistance – MGU

Connect the measurement adapter to the MGU (Stäubli connector), and the LV shorting adapter to the MGU LV connector. Finally, connect the HVIL connector of the HV1 harness to the HVIL connector on the MGU.

Perform the continuity checks first, without any shorting cables on the measurement adapter. After the continuity checks, short all HV potentials together. Separately, short LV_GND and HVIL together. Then proceed with the insulation resistance tests. Insulation resistance is checked in both directions (polarities).

No	Test Item	Description	Reference	Value
7.	Continuity Check	<i>MGU LV shorting adapter <--> LV_GND on the measurement box</i>	<i>Continuity</i>	
		<i>HVIL 1 <--> HVIL 2 (MGU HVIL connector is installed)</i>	<i>Continuity</i>	
		<i>--install shorting cables on measurement adapter--</i>		
8.	MGU Insulation Resistance	<i>Phase U+V+W --> LV GND</i>	<i>> 3 GOhm</i>	
		<i>LV GND --> Phase U+V+W</i>	<i>> 3 GOhm</i>	
		<i>Phase U+V+W --> HVIL (either)</i>	<i>> 3 GOhm</i>	
		<i>HVIL (either) --> Phase U+V+W</i>	<i>> 3 GOhm</i>	

Checks during Vehicle Assembly

No	Test Item	Description	Reference	Value
9.	ESS Compartment Commissioning	<i>The ESS compartment commissioning was performed before the ESS compartment was mounted in the vehicle.</i>	<i>Done</i>	
10.	ESS PE Cable Visual Check	<i>Ensure the PE cable between the ESS compartment bulkhead and the vehicle PE point is properly installed.</i>	<i>Done</i>	
11.	Fitment of LV Harnesses and Connectors	<i>Check if the LV harness and connectors have visible damages.</i>	<i>no damage</i>	
		<i>LV harnesses and connectors must not be used if they have any damage!</i>	<i>LV1</i>	
			<i>LV2</i>	
			<i>LV3</i>	
			<i>LV4</i>	
			<i>LV5</i>	
			<i>LV9</i>	
12.	Bonding resistance Sandwich plate <--> ESS compartment bulkhead	<i>The Bonding resistance from the sandwich plate towards the ESS compartment bulkhead was checked.</i>	<i><20 mOhm</i>	
13.	Cooling circuits & Preconditioning	<i>Both cooling circuits need to be filled and bled. Make sure that the ESS is preconditioned to > 55°C. MGU, MCU & DCDC do not need preconditioning.</i>		

LV System Checks at vehicle assembly

Test that must be done during initial vehicle assembly to ensure LV system function.

No	Test Item	Description	Reference	Value
14.	Reverse Polarity Protection	<i>Ensure that ESS Reset Plug and SDC are not plugged and MSD is OFF.</i>	ESS Plug	
			LV SDC	
			MSD	
15.	LV Power Sequencing Check	<i>Switch DMS to Position 1 (DMS-P1) to provide LV power to system. Verify via telem, RaceCon, CAN, etc.</i>	No HV	
16.	Device Software Check	<i>Check and record SW level of all devices.</i>	Cal Version	
		MCU SW	MCU	
		HCU SW	HCU	
		ESS SW	ESS	
		DCDC SW		
17.	Communication Check	<i>Confirm CAN communication for all devices. Check that plausible values are sent on all signals. In case of errors, re-check LV harnesses.</i>	No CAN errors	
			Plausible	
			Values	

Functional Tests

For the functional tests, the vehicle must be ready for operation. For function test voltage measurements, the LV hatch panel HV measurement adapter may be utilized instead of/in addition to CAN/telemetry.

Ensure the HV Measurement Dummy plug is completely inserted and latched on the LV Hatch panel.

Ensure all HV and LV connectors from ESS compartment to MGU are properly plugged.

Ensure that the ESS Reset and the SDC are plugged, and the MSD is in the ON position.

a) Vehicle State

No	Test Item	Description	Reference	Value
18.		<i>Car lifted with no wheels on the ground, run-up hubs fitted.</i>		

b) Activate the Low Voltage System switching to DMS Position 1 (DMS-P1)

No	Test Item	Description	Reference	Value
19.		<i>!!!Check the safety light status on the vehicle first after switching DMS to Position 1!!! Only proceed if the safety light status is solid green. Otherwise proceed according to 'Emergency Instructions for ESS Red Light Events'.</i>	Solid Green	

c) Activate the High Voltage System switching to DMS Position 2 (DMS-P2)

No	Test Item	Description	Reference	Value
20.		!!!Check the safety light status again after 120s!!! Only proceed if the safety light status is solid green. Otherwise, switch DMS to Position 1 (DMS-P1) again, go through the 'Vehicle De-Commissioning Checklist' and check the vehicle setup.	Solid Green	
21.		Check if the system was powered up by verifying the DCDC and MCU voltage reported on CAN Charlie is in the range of 470VDC - 780VDC.	DCDC (HyCtrl_uDcDcHv) MCU (HyCtrl_uMcuHv)	
22.		Check the Isolation value reported on CAN Charlie is in the expected range.	> 4,000 kOhm < 6,000 kOhm	
23.		Check that the system error level reported on CAN Charlie or telemetry is 2 (Warn driver) or lower.	≤ Lvl 2	

d) Deactivate the High Voltage System

No	Test Item	Description	Reference	Value
24.		Deactivate the High Voltage System by switching the DMS to Position 1 (DMS-P1)		
25.		Check if the system was powered down by verifying that the DCDC voltage reported on CAN Charlie is <60VDC.	<60 VDC	
26.		Check that the MCU was powered down by verifying that the MCU voltage reported on CAN Charlie is <60VDC.	<60 VDC	
27.		Check that the system error level reported on CAN Charlie is 2 (Warn driver) or lower.	≤ Lvl 2	
28.		Switch DMS to Position 0 (DMS-P0) and check that the safety light remains powered on (solid green). The safety light should remain on until the 1,000 second timeout is reached.		

Safety Checks

Activation of the High Voltage System

Make sure that the ESS Reset (Blue), SDC (Green), and HV measurement Dummy plug are plugged in, and the MSD is in the ON position.

No	Test Item	Description	Reference	Value
29.	Emergency Stop	Activate the Hybrid System by setting DMS-P2 and push the Emergency Stop Button. The Hybrid System supply must switch off with a delay of maximum 2 s. After confirmation, perform DMS power cycle.	HV Shutdown	
30.	SDC - DMS-P1	Remove the SDC plug. Confirm via CAN or Telemetry that a FR4 fault is reported, and the system error level is 12 (HyCtrl_errorLevel = Controlled HV Shutdown). After confirmation, restore the LV SDC plug and confirm error healing.	FR4 + ErrorLevel 12 +	
31.	MSD - DMS-P1	Open the MSD. Confirm via CAN or Telemetry that a FR5 fault is reported, and the system error level is 9 (HyCtrl_errorLevel = Inhibit Startup). After confirmation, restore the MSD and confirm error healing.	FR5 + ErrorLevel 9 +	

No	Test Item	Description	Reference	Value
32.	HV Disable Switch-DMS-P1 (only if equipped)	Request 'HV Disable' via hardwired disable switch. Try to activate the Hybrid System by setting DMS-P2. The Hybrid System must stay off and will not be activated after resetting the disable switch. Reactivation of the HV System requires a DMS power cycle.	Switch equipped? HV disable switch: No HV HyCtrl_systemState= 13 (Service)	
33.	System Error CAN requests (optional)	System Error CAN request reaction(s) may be tested if desired by sending request from Torque Master ECU signal TqM_HyCtrl_errorLevelRequest. All tests with Engine off, open clutch, and gearbox in neutral. Make sure there is no load on the HV bus except on the DCDC converter – No MGU load. CAN Requests must be latched by the Vehicle controller (continuously sent). Removal of a request may lead to reactivation of the HV system and / or delivering requested torque!	HyCtrl_errorLevel matches CAN request (TqM_HyCtrl_errorLevelRequest)	
34.	Example	Vehicle System Error Level 8 - Inhibit Driving Activate the Hybrid System and request Vehicle System Error Level 8 - Inhibit Driving. Try to switch in Torque Control and request torque. The Hybrid System must not generate torque.	No Tq Error level 8	

Vehicle Visual Status

No	Test Item	Description	Reference	Value
35.	Vehicle visual marking	High Voltage System deactivated and vehicle in safe state without need for HV safety PPE. Green hat/cone placed on top of car.	Vehicle marked	