

AVL HV SAFETY 2000

Art. no. 3206226en



Read this operating manual carefully and thoroughly before beginning work.

This operating manual was written to correspond to the latest state of this series. We reserve the right to make changes in the interest of technical advancement without updating this operating manual at the same time.

All specifications contained herein are non-binding. KTM Sportmotorcycle GmbH specifically reserves the right to modify or delete technical specifications, prices, colors, forms, materials, services, designs, equipment, etc., without prior notice and without specifying reasons, to adapt these to local conditions, as well as to stop production of a particular model without prior notice. KTM accepts no liability for delivery options, deviations from figures and descriptions, misprints, and other errors. The models portrayed partly contain special equipment that does not belong to the regular scope of supply.

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TABLE OF CONTENTS

1	MEANS OF REPRESENTATION	3
1.1	Symbols used	3
1.2	Formats used.....	4
2	SAFETY ADVICE.....	5
2.1	Use definition – intended use.....	5
2.2	Fire hazard	5
3	IMPORTANT NOTES.....	6
3.1	Handling a KTM PowerPack following an accident	6
3.2	Securing workplaces in the workshop ...	7
4	ZERO POTENTIAL.....	8
4.1	Determining that the KTM PowerPack is at zero potential ¶2.....	8
4.2	Ascertaining that the discharge plug is at zero potential ¶2.....	9
4.3	Ascertaining that the motor electronics control unit is at zero potential ¶2.....	11
5	INSULATION MEASUREMENT	14
5.1	Performing an insulation measurement on the KTM PowerPack ¶2.....	14
5.2	Performing an insulation measurement on the discharge plug ¶2.....	15
5.3	Performing an insulation measurement on the motor electronics control unit ¶2	17
5.4	Performing an insulation measurement on the high-voltage wiring harness ¶2.....	19
5.5	Performing an insulation measurement on the stator ¶2.....	20
6	EQUIPOTENTIAL BONDING CHECK	23
6.1	Performing an equipotential bonding check (KTM PowerPack installed) ¶2.....	23
6.2	Performing an equipotential bonding check (KTM PowerPack installed) ¶2.....	25
	INDEX.....	27

1.1 Symbols used

The meaning of specific symbols is described below.

	Indicates an expected reaction (e.g. of a work step or a function).
	Indicates an unexpected reaction (e.g. of a work step or a function).
	Identifies work requiring expert knowledge and technical understanding. In the interest of your own safety, only have these jobs performed by correspondingly trained KTM technical personnel.
H1 V1	All work identified by this symbol requires a level 1 qualification for high-voltage systems. Only this qualification authorizes you to perform non-electro-technical work on a vehicle or on units with a high-voltage system.
H2 V2	All work identified by this symbol requires a level 2 qualification for high-voltage systems. Only this qualification authorizes you to de-energize the electrical system and perform electro-technical work in a de-energized state.
H3 V3	All work identified by this symbol requires a level 3 qualification for high-voltage systems. Only this qualification authorizes you to perform electro-technical work under voltage.
	Indicates a page reference (more information is provided on the specified page).
i	Indicates information with more details or tips.
»	Indicates the result of a testing step.
V	Indicates a voltage measurement.
A	Indicates a current measurement.
Ω	Indicates a resistance measurement.
	Indicates the end of an activity including potential rework.

1 MEANS OF REPRESENTATION

1.2 Formats used

The typographical formats used in this document are explained below.

Proprietary name	Indicates a proprietary name.
Name®	Indicates a protected name.
Brand™	Indicates a brand available on the open market.
<u>Underlined terms</u>	Refer to technical details of the vehicle or indicate technical terms, which are explained in the glossary.

2.1 Use definition – intended use



Warning

Risk of injury Alternating current is not detected by the **AVL DiTEST HV Safety 2000**.

A component with alternating current applied is shown as having zero potential by the **AVL DiTEST HV Safety 2000**.

A measurement of alternating current cannot damage the device.

- Only use the **AVL DiTEST HV Safety 2000** for measuring direct current.

The **AVL DiTEST HV Safety 2000** is for measuring direct current only.

2.2 Fire hazard



Warning

Fire hazard Damaged rechargeable lithium-ion batteries (KTM PowerPacks) present a fire hazard.

Massive mechanical damage may cause an internal cell short circuit and as a consequence may cause the battery to self-ignite.

- Contact the KTM customer service immediately if major damage to the rechargeable lithium-ion battery (KTM PowerPack) has occurred.

There is no particular fire hazard for this vehicle when the rechargeable lithium-ion battery (KTM PowerPack) is intact.

However, should the vehicle catch fire, inform the fire brigade responsible that an electric vehicle with a rechargeable lithium-ion battery is on fire.

3.1 Handling a KTM PowerPack following an accident



Warning

Risk of injury The housing of a damaged lithium-ion battery (KTM PowerPack) could be live.

- Contact the KTM customer service immediately if major damage to the rechargeable lithium-ion battery has occurred.



Warning

Fire hazard Damaged rechargeable lithium-ion batteries (KTM PowerPacks) present a fire hazard.

Massive mechanical damage may cause an internal cell short circuit and as a consequence may cause the battery to self-ignite.

- Contact the KTM customer service immediately if major damage to the rechargeable lithium-ion battery (KTM PowerPack) has occurred.



Warning

Fire hazard Attempts to extinguish a fire with too little water intensify a lithium-ion battery (KTM PowerPack) fire.

Any lithium-ion batteries (KTM PowerPacks) already on fire cannot be extinguished, but only be cooled.

- In the event of lithium-ion battery (KTM PowerPack) fires, always use very large quantities of water to cool any cells not yet burning.



Info

The vehicle is a high-voltage electric motorcycle with a rechargeable lithium-ion battery (KTM PowerPack, 260 V).

The high-voltage components in the vehicle are marked with yellow warning labels.

The high-voltage cabling in the motor case and in the KTM PowerPack is indicated by the orange insulation.

Before beginning work on the vehicle, the main switch on the right of the handlebar must be switched off. Numerous vehicle crash tests that extend beyond the scope of the legal and consumer-protection requirements have demonstrated that the KTM PowerPack guarantees a high level of safety even in the event of accidents.

Risk of electric shock:

- In the event of touching both battery terminals, if each line is touched by one hand respectively.
- In the event of touching one phase and the motor case or the frame respectively if there is a short-circuit to the case from another phase.

Fire hazard:

- Examinations have demonstrated that the KTM PowerPack is highly fire-resistant even when exposed to fires acting on it from outside.

Vehicle fire:

- Causes of fire are reduced to the greatest possible extent by means of analyses and the measures derived from them during development and production.
- If a KTM PowerPack catches fire, the metallic lithium will also burn and continue burning even without a supply of ambient air.
- If large quantities of water are used, the toxic gases produced will be bound and corrosive fluids will be diluted. While the fire will not be extinguished, it will be robbed of energy. This allows the fire to remain under control.



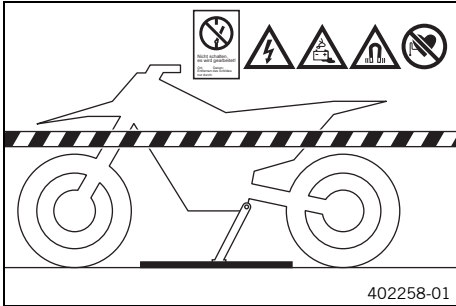
Info

When working on a vehicle which has been in an accident, always wear protective clothing.

Recommended extinguishing agents:

- Depending on the location of use, large quantities of water or foam and, if available, sand or metal fire extinguisher.
- Internal short-circuits resulting in overheating and fire cannot be completely precluded regardless of the time which has elapsed since the damage.
- If in doubt, a controlled battery burn-off may have to be considered.

3.2 Securing workplaces in the workshop



- Safety equipment must be worn at all times when working on the vehicle.
- The workplace for the vehicle must be clearly marked and be equipped with safety measures.

Floor mat (70029006000)
Safety gloves (70029007000)
Inner glove liners (70029008000)
Warning tape (70029015000)
Safety helmet (70029003000)
Safety mask (70029004000)
Holder for safety mask (70029005000)
Prohibition sign (70029009000)
Warning sign (70029010000)
Warning sign (70029011000)
Warning sign (70029012000)
Prohibition sign (70029013000)
Transport system (70029020000)
Fire-resistant cabinet for hazardous goods (70029016000)



4.1 Determining that the KTM PowerPack is at zero potential #2



Warning

Risk of injury The measuring points could be live.

- Use personal protective clothing and comply with the safety measures.

Condition

The KTM PowerPack has been removed.

- Prepare the special tool for measurement.

AVL DITEST HV Safety 2000 (70029068000)

- Start software **HV Safety**.

- Select "**Zero-potential**".

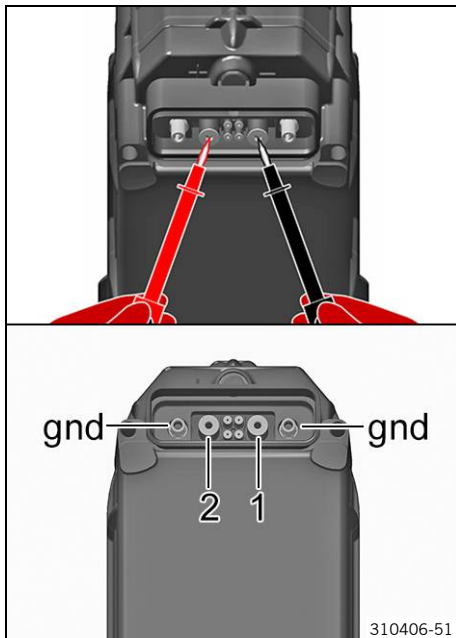
- **V** Measure the voltage between the specified points.
High-voltage plug for KTM PowerPack **FV** pin **1** – High-voltage plug for KTM PowerPack **FV** pin **2**

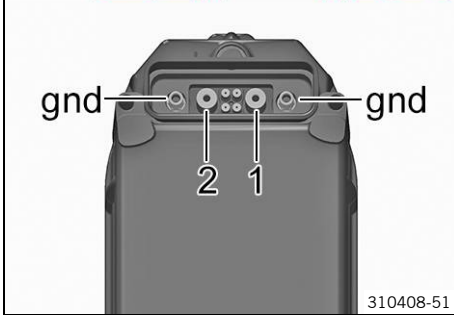
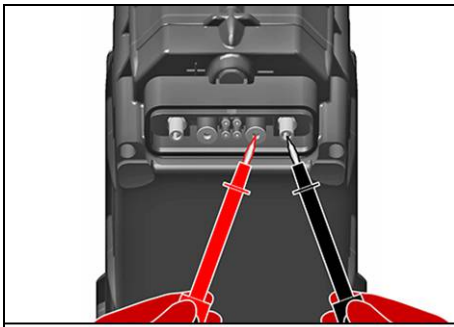
< 40 V

- » If the specified value is not reached:

- Contact KTM customer service.
- Secure the KTM PowerPack in the transport and quarantine box, if necessary.

Transport system (70029020000)



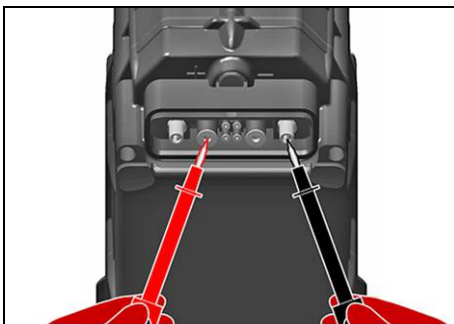


- **V** Measure the voltage between the specified points.
High-voltage plug for KTM PowerPack **FV** pin **1** – High-voltage plug for KTM PowerPack **FV** pin **gnd**

< 40 V

- » If the specified value is not reached:
 - Contact KTM customer service.
 - Secure the KTM PowerPack in the transport and quarantine box, if necessary.

Transport system (70029020000)



- **V** Measure the voltage between the specified points.
High-voltage plug for KTM PowerPack **FV** pin **2** – High-voltage plug for KTM PowerPack **FV** pin **gnd**

< 40 V

- » If the specified value is not reached:
 - Contact KTM customer service.
 - Secure the KTM PowerPack in the transport and quarantine box, if necessary.

Transport system (70029020000)

4.2 Ascertaining that the discharge plug is at zero potential ¶2



Warning

Risk of injury The measuring points could be live.

- Use personal protective clothing and comply with the safety measures.

Condition

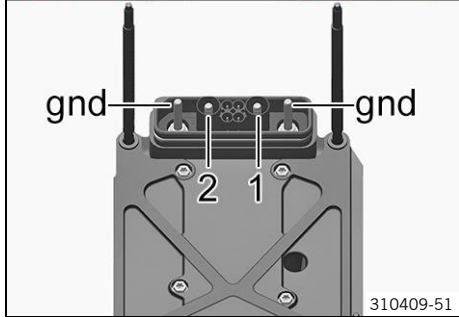
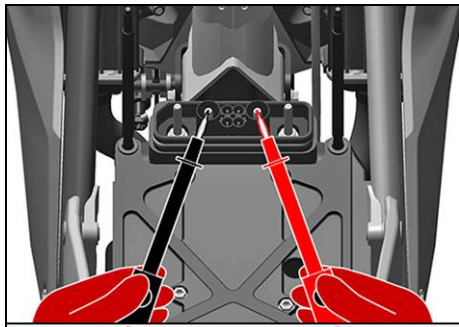
The KTM PowerPack has been removed.

- Prepare the special tool for measurement.

AVL DITEST HV Safety 2000 (70029068000)

- Start software **HV Safety**.
- Select "**Zero-potential**".

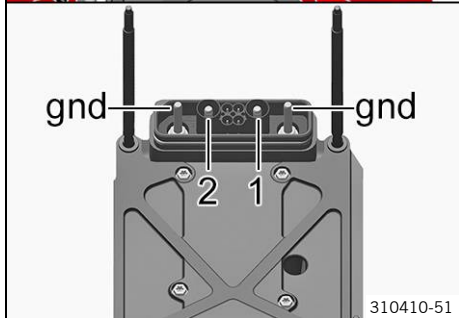
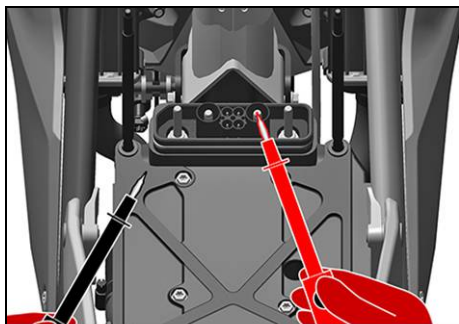
4 ZERO POTENTIAL



- **V** Measure the voltage between the specified points.
Battery discharge plug **FU** pin 1 – Battery discharge plug **FU** pin 2

< 40 V

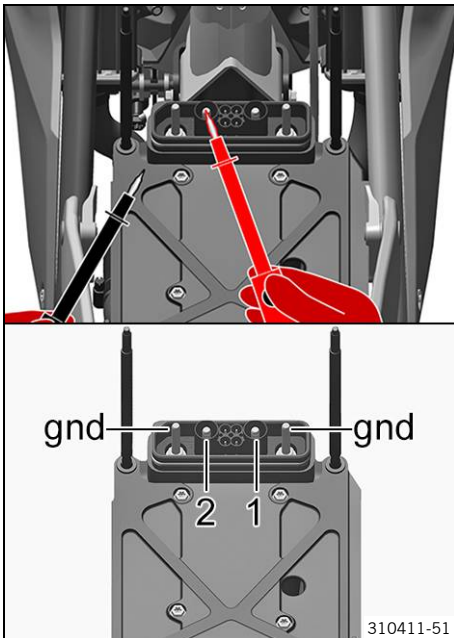
- » If the specified value is not reached:
 - Discharge intermediate circuit capacitors. ¶2



- **V** Measure the voltage between the specified points.
Battery discharge plug **FU** pin 1 – Measuring point Motor case

< 40 V

- » If the specified value is not reached:
 - Discharge intermediate circuit capacitors. ¶2



- **V** Measure the voltage between the specified points.
Battery discharge plug **FU** pin **2** – Measuring point
Motor case

< 40 V

- » If the specified value is not reached:
 - Discharge intermediate circuit capacitors. ¶2

4.3 Ascertaining that the motor electronics control unit is at zero potential ¶2



Warning

Risk of injury The measuring points could be live.

- Use personal protective clothing and comply with the safety measures.

Condition

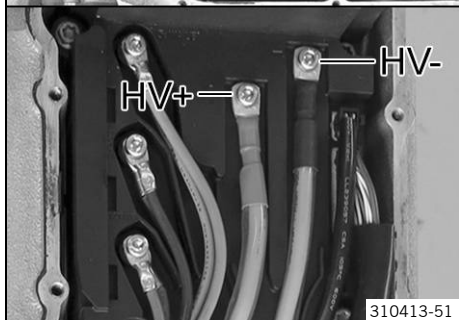
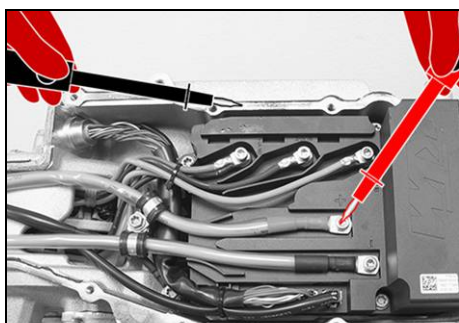
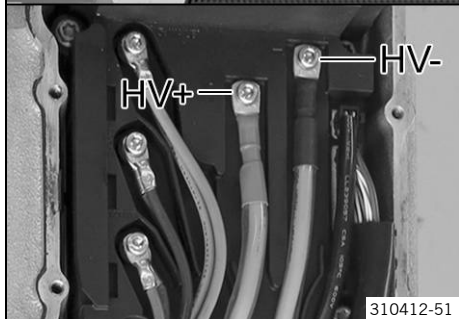
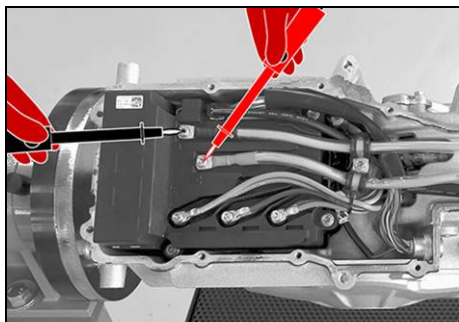
The KTM PowerPack and motor have been removed.

- Prepare the special tool for measurement.

AVL DITEST HV Safety 2000 (70029068000)

- Start software **HV Safety**.
- Select "**Zero-potential**".

4 ZERO POTENTIAL



- **V** Measure the voltage between the specified points.
Measuring point HV+ – Measuring point HV-

< 40 V

- » If the specified value is not reached:
 - Discharge the intermediate circuit capacitors (motor removed). ¶2
- Clean the sealing surface.

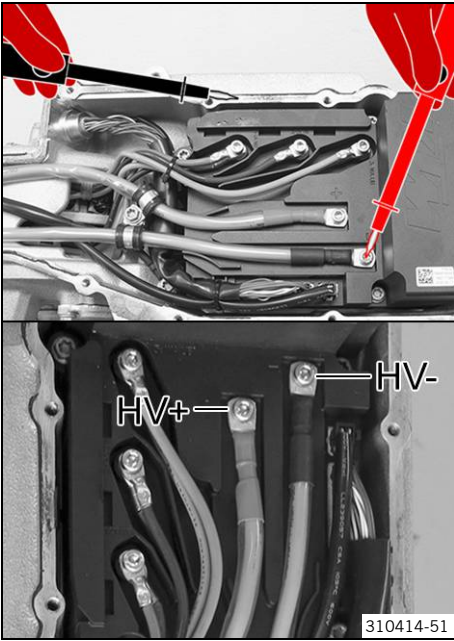
i **Info**

Sealant on the contact surface between the motor housing and the measurement tip can falsify measurements.

- **V** Measure the voltage between the specified points.
Measuring point HV+ – Measuring point Motor case

< 40 V

- » If the specified value is not reached:
 - Discharge the intermediate circuit capacitors (motor removed). ¶2



- **V** Measure the voltage between the specified points.
Measuring point HV- – Measuring point Motor case

< 40 V

- » If the specified value is not reached:
 - Discharge the intermediate circuit capacitors (motor removed). ⚡

5.1 Performing an insulation measurement on the KTM PowerPack #2



Warning

Risk of injury The measuring points could be live.

- Use personal protective clothing and comply with the safety measures.

Condition

The KTM PowerPack has been removed.

- Prepare the special tool for measurement.

AVL DITEST HV Safety 2000 (70029068000)

- Start software **HV Safety**.

- Select "**Insulation measurement**".

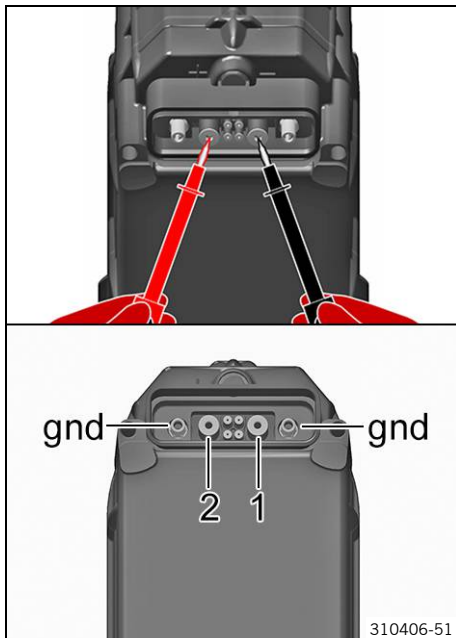
- **V** Measure the voltage between the specified points.
High-voltage plug for KTM PowerPack **FV** pin **1** – High-voltage plug for KTM PowerPack **FV** pin **2**

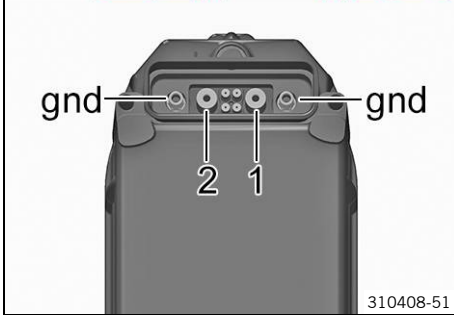
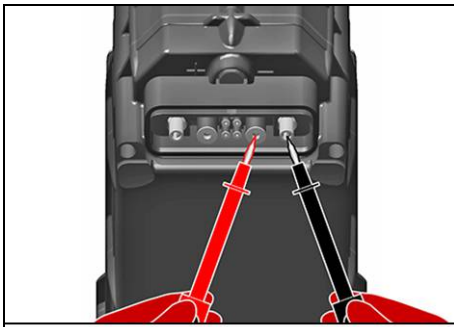
< 10 V

- » If the specified value is not reached:

- Contact KTM customer service.
- Secure the KTM PowerPack in the transport and quarantine box, if necessary.

Transport system (70029020000)



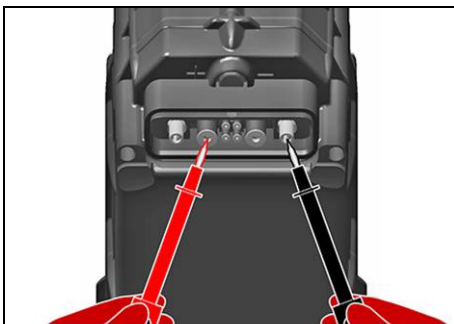


- Ω Measure the resistance between the specified points.
High-voltage plug for KTM PowerPack **FV** pin **1** – High-voltage plug for KTM PowerPack **FV** pin **gnd**

Value as per **HV Safety**

- » If the specified value is not reached:
 - Contact KTM customer service.
 - Secure the KTM PowerPack in the transport and quarantine box, if necessary.

Transport system (70029020000)



- Ω Measure the resistance between the specified points.
High-voltage plug for KTM PowerPack **FV** pin **2** – High-voltage plug for KTM PowerPack **FV** pin **gnd**

Value as per **HV Safety**

- » If the specified value is not reached:
 - Contact KTM customer service.
 - Secure the KTM PowerPack in the transport and quarantine box, if necessary.

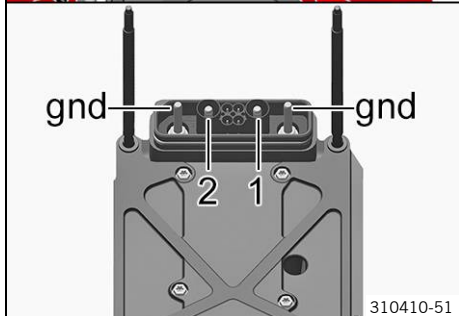
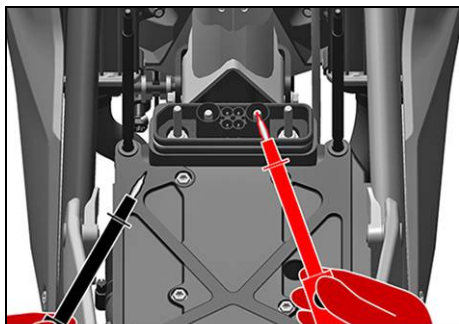
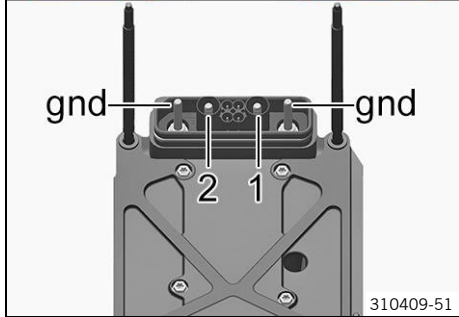
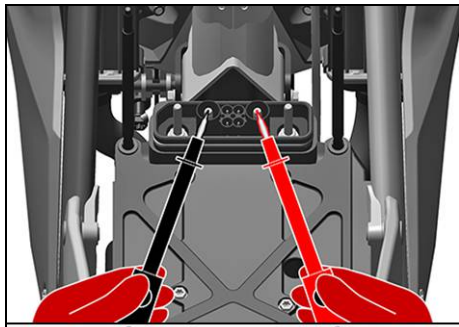
Transport system (70029020000)

5.2 Performing an insulation measurement on the discharge plug ¶2

Warning
Risk of injury The measuring points could be live.
 - Use personal protective clothing and comply with the safety measures.

- Condition**
 The KTM PowerPack has been removed.
- Prepare the special tool for measurement.
- AVL DITEST HV Safety 2000 (70029068000)
- Start software **HV Safety**.
 - Select "**Insulation measurement**".

5 INSULATION MEASUREMENT



- **V** Measure the voltage between the specified points.
Battery discharge plug **FU** pin 1 – Battery discharge plug **FU** pin 2

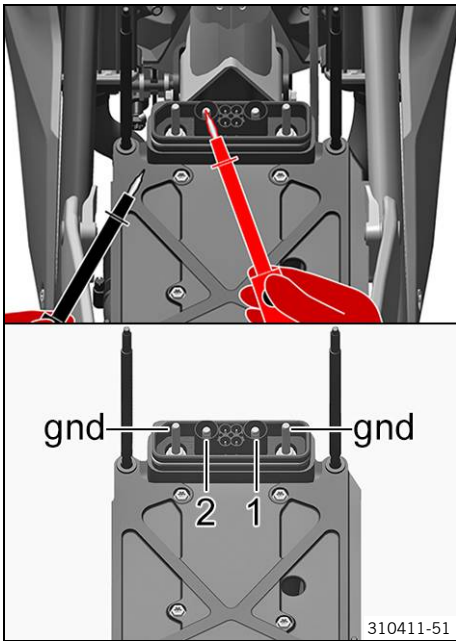
< 10 V

- » If the specified value is not reached:
 - Discharge intermediate circuit capacitors. ¶2

- **Ω** Measure the resistance between the specified points.
Battery discharge plug **FU** pin 1 – Measuring point Motor case

Value as per **HV Safety**

- » If the specified value is not reached:
 - Perform an insulation measurement on the motor electronics control unit. ¶2 (📖 p. 17)



- Ω Measure the resistance between the specified points.
Battery discharge plug **FU** pin **2** – Measuring point
Motor case

Value as per **HV Safety**

- » If the specified value is not reached:
 - Perform an insulation measurement on the motor electronics control unit. ¶2 (p. 17)

5.3 Performing an insulation measurement on the motor electronics control unit ¶2



Warning

Risk of injury The measuring points could be live.

- Use personal protective clothing and comply with the safety measures.

Condition

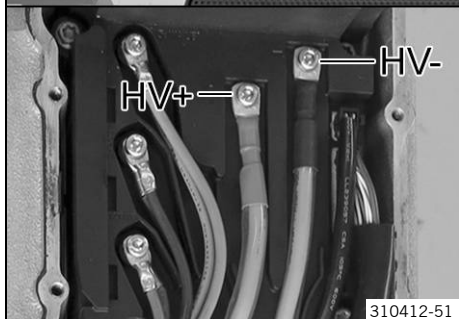
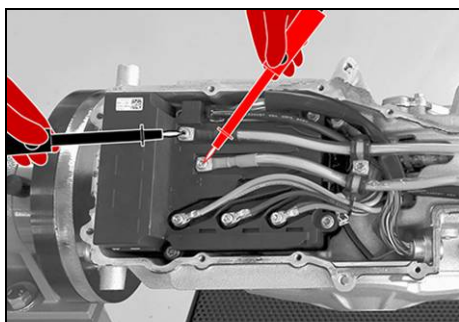
The KTM PowerPack and motor have been removed.

- Prepare the special tool for measurement.

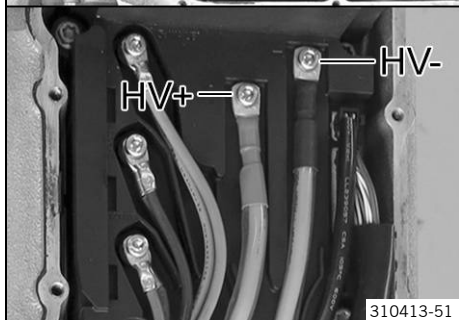
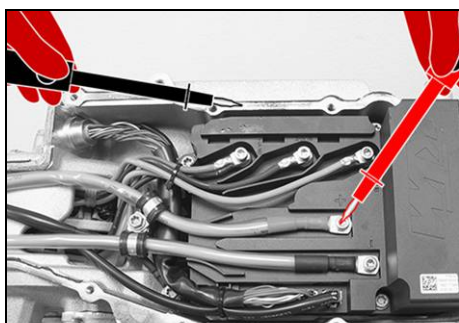
AVL DITEST HV Safety 2000 (70029068000)

- Start software **HV Safety**.
- Select "**Insulation measurement**".

5 INSULATION MEASUREMENT



310412-51



310413-51

- **V** Measure the voltage between the specified points.
Measuring point HV+ – Measuring point HV-

< 10 V

- » If the specified value is not reached:
 - Discharge the intermediate circuit capacitors (motor removed). ¶2
- Clean the sealing surface.

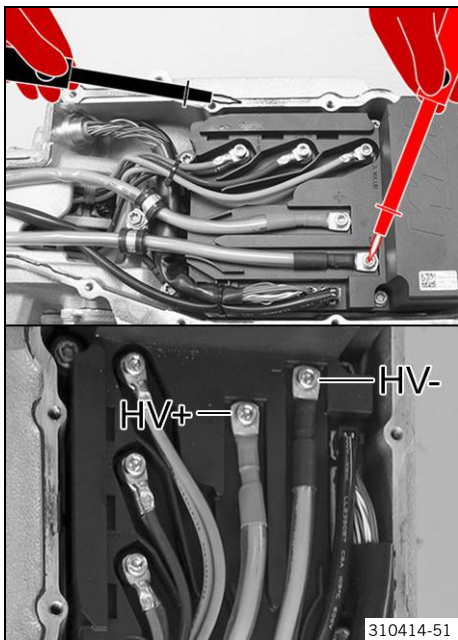
i Info

Sealant on the contact surface between the motor housing and the measurement tip can falsify measurements.

- **Ω** Measure the resistance between the specified points.
Measuring point HV+ – Measuring point Motor case

Value as per **HV Safety**

- » If the specified value is not reached:
 - Perform an insulation measurement on the high-voltage wiring harness. ¶2 (p. 19)
 - Perform an insulation measurement on the stator. ¶2 (p. 20)
 - Change the motor electronics control unit. ¶2Last measure if none of the documented causes leads to elimination of the fault
 - Contact KTM customer service and send in the motor.



- Ω Measure the resistance between the specified points.
Measuring point HV- – Measuring point Motor case

Value as per **HV Safety**

- » If the specified value is not reached:
 - Perform an insulation measurement on the high-voltage wiring harness. ¶2 (p. 19)
 - Perform an insulation measurement on the stator. ¶2 (p. 20)
 - Change the motor electronics control unit. ¶2
- Last measure if none of the documented causes leads to elimination of the fault
 - Contact KTM customer service and send in the motor.

5.4 Performing an insulation measurement on the high-voltage wiring harness ¶2



Warning

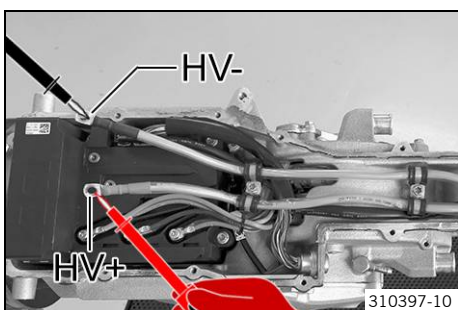
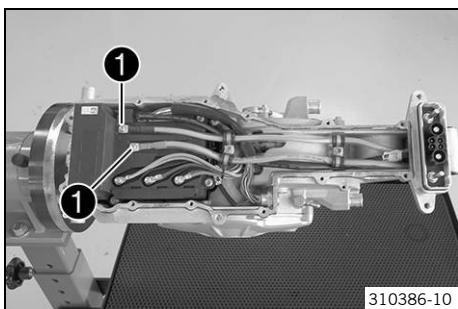
Risk of injury The measuring points could be live.

- Use personal protective clothing and comply with the safety measures.

Condition

The KTM PowerPack and motor have been removed.

- Remove screws ①.



- Prepare the special tool for measurement.

AVL DITEST HV Safety 2000 (70029068000)

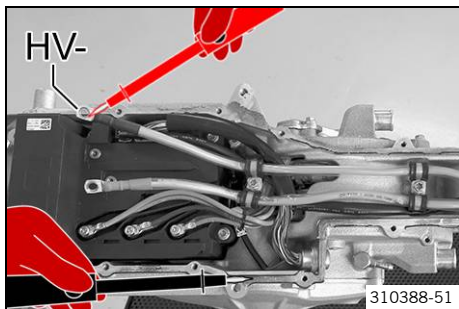
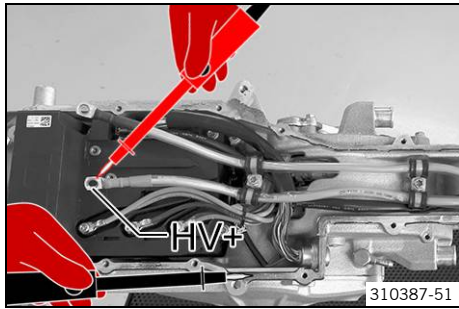
- Start software **HV Safety**.
- Select "**Insulation measurement**".
- **V** Measure the voltage between the specified points.
Measuring point HV+ – Measuring point HV-



Info

This voltage measurement must be performed to ensure that the programmed protocol will run as intended.

< 10 V




- » If the specified value is not reached:
 - Repeat the measurement.

- Clean the sealing surface.




Info

Sealant on the contact surface between the motor housing and the measurement tip can falsify measurements.

-  Measure the resistance between the specified points.
Measuring point HV+ – Measuring point Motor case

Value as per **HV Safety**

- » If the specified value is not reached:
 - Change the high-voltage wiring harness. ¶2

-  Measure the resistance between the specified points.
Measuring point HV- – Measuring point Motor case

Value as per **HV Safety**

- » If the specified value is not reached:
 - Change the high-voltage wiring harness. ¶2

5.5 Performing an insulation measurement on the stator ¶2



Warning

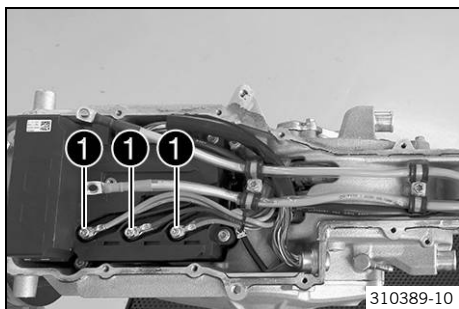
Risk of injury The measuring points could be live.

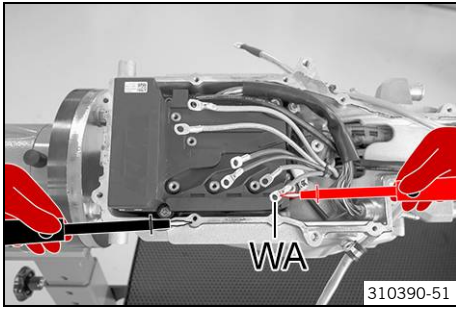
- Use personal protective clothing and comply with the safety measures.

Condition

The KTM PowerPack and motor have been removed.

- Remove screws **1**.





- Prepare the special tool for measurement.

AVL DITEST HV Safety 2000 (70029068000)

- Start software **HV Safety**.
- Select "**Insulation measurement**".
- **V** Measure the voltage between the specified points.
Measuring point WA – Measuring point Motor case

i Info
This voltage measurement must be performed to ensure that the programmed protocol will run as intended.

< 10 V

- » If the specified value is not reached:
 - Repeat the measurement.
- Clean the sealing surface.

i Info
Sealant on the contact surface between the motor housing and the measurement tip can falsify measurements.

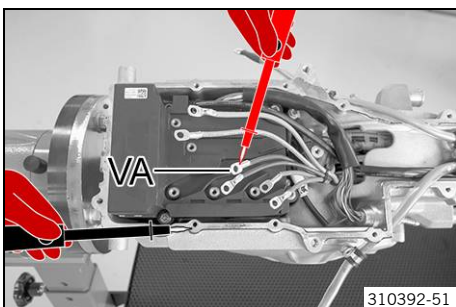
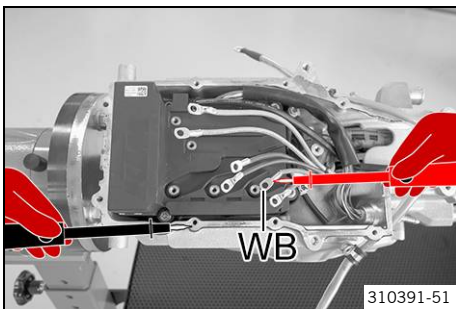
- **Ω** Measure the resistance between the specified points.
Measuring point WA – Measuring point Motor case

Value as per **HV Safety**

- » If the specified value is not reached:
 - Contact KTM customer service and send in the motor.
- **Ω** Measure the resistance between the specified points.
Measuring point WB – Measuring point Motor case

Value as per **HV Safety**

- » If the specified value is not reached:
 - Contact KTM customer service and send in the motor.

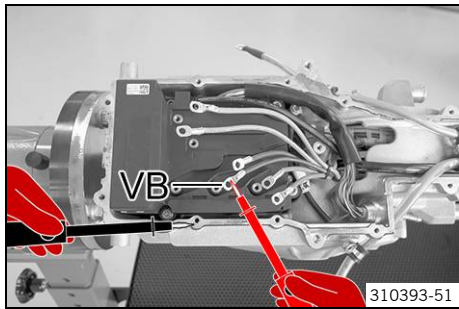


- **Ω** Measure the resistance between the specified points.
Measuring point VA – Measuring point Motor case

Value as per **HV Safety**

- » If the specified value is not reached:
 - Contact KTM customer service and send in the motor.

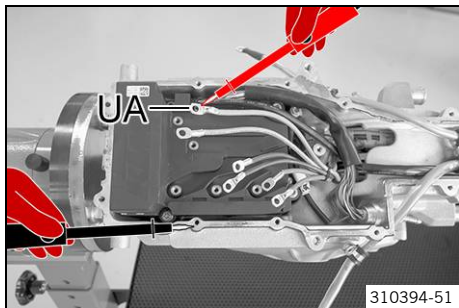
5 INSULATION MEASUREMENT



- Ω Measure the resistance between the specified points.
Measuring point VB – Measuring point Motor case

Value as per **HV Safety**

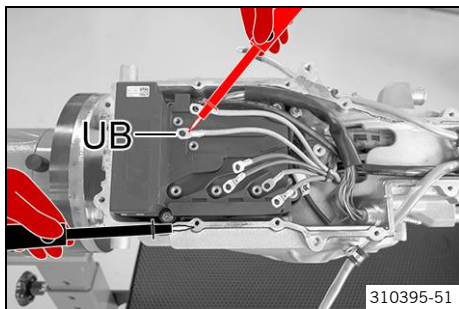
- » If the specified value is not reached:
 - Contact KTM customer service and send in the motor.



- Ω Measure the resistance between the specified points.
Measuring point UA – Measuring point Motor case

Value as per **HV Safety**

- » If the specified value is not reached:
 - Contact KTM customer service and send in the motor.



- Ω Measure the resistance between the specified points.
Measuring point UB – Measuring point Motor case

Value as per **HV Safety**

- » If the specified value is not reached:
 - Contact KTM customer service and send in the motor.

6.1 Performing an equipotential bonding check (KTM PowerPack installed) ¶2



Warning

Risk of injury The measuring points could be live.

- Use personal protective clothing and comply with the safety measures.

Condition


The KTM PowerPack has been removed.

- Prepare the special tool for measurement.

AVL DITEST HV Safety 2000 (70029068000)

- Start software **HV Safety**.

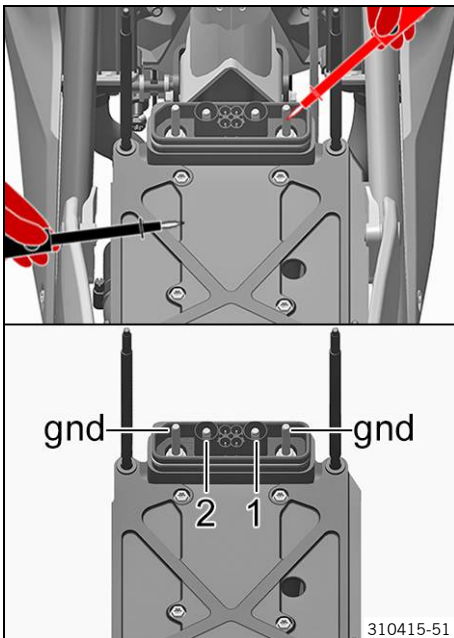
- Select "**Equipotential bonding check**".

-  Measure the resistance between the specified points.
Battery discharge plug **FU** pin **gnd** – Measuring point
Motor case

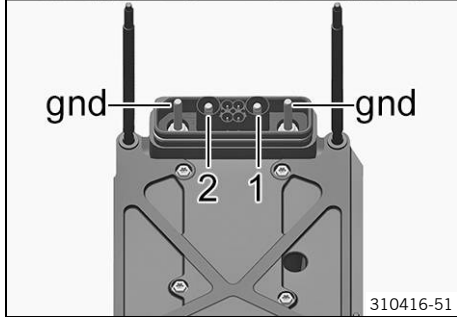
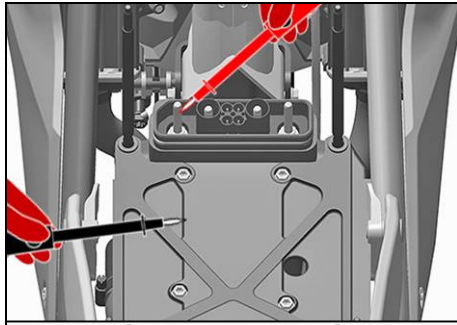
< 0.1 Ω

- » If the specified value is not reached:

- Contact KTM customer service.



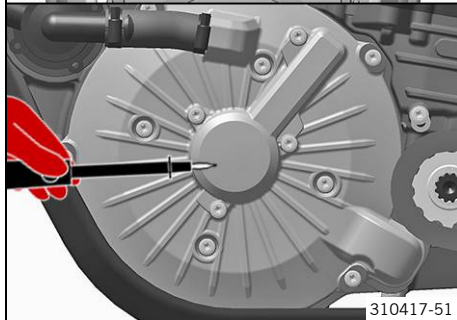
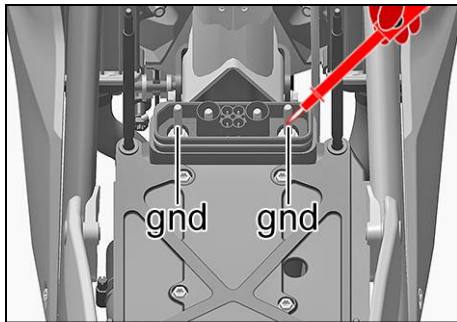
6 EQUIPOTENTIAL BONDING CHECK



- Ω Measure the resistance between the specified points.
Battery discharge plug **FU** pin **gnd** – Measuring point
Motor case

< 0.1 Ω

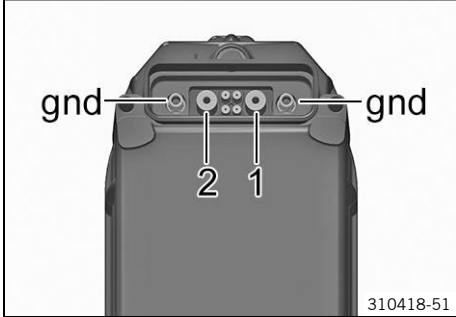
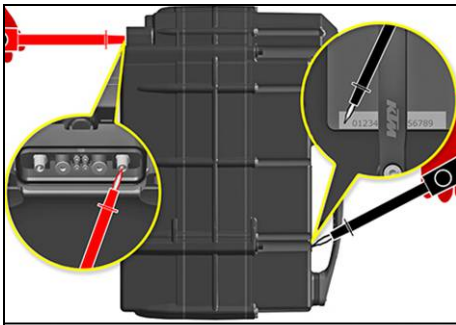
- » If the specified value is not reached:
 - Contact KTM customer service.



- Ω Measure the resistance between the specified points.
Battery discharge plug **FU** pin **gnd** – Measuring point
Motor case

< 0.1 Ω

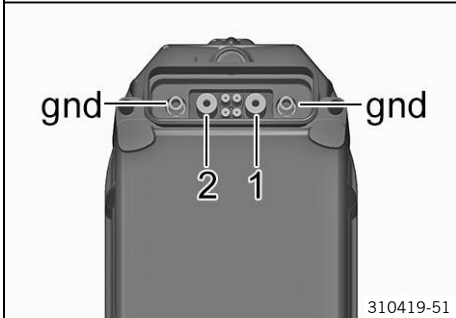
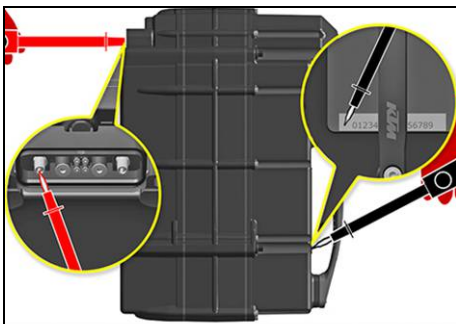
- » If the specified value is not reached:
 - Contact KTM customer service.



- Ω Measure the resistance between the specified points.
High-voltage plug for KTM PowerPack **FV** pin **gnd** –
Measuring point KTM PowerPack housing

< 0.1 Ω

- » If the specified value is not reached:
 - Contact KTM customer service.



- Ω Measure the resistance between the specified points.
High-voltage plug for KTM PowerPack **FV** pin **gnd** –
Measuring point KTM PowerPack housing

< 0.1 Ω

- » If the specified value is not reached:
 - Contact KTM customer service.

6.2 Performing an equipotential bonding check (KTM PowerPack installed) ¶2



Warning

Risk of injury The measuring points could be live.

- Use personal protective clothing and comply with the safety measures.

Condition

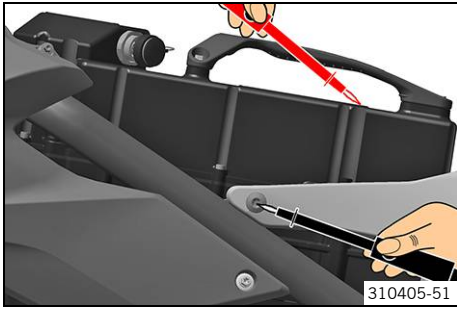
The KTM PowerPack has been installed.

- Prepare the special tool for measurement.

AVL DITEST HV Safety 2000 (70029068000)

- Start software **HV Safety**.
- Select "**Equipotential bonding check**".

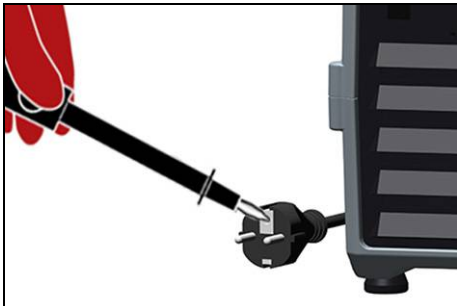
6 EQUIPOTENTIAL BONDING CHECK



- Ω Measure the resistance between the specified points.
Measuring point KTM PowerPack housing – Measuring point Frame

< 0.1 Ω

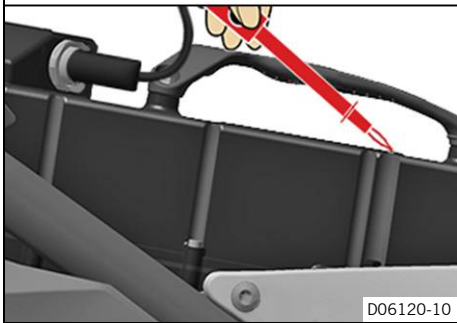
- » If the specified value is not reached:
 - Contact KTM customer service.



- Ω Measure the resistance between the specified points.
Measuring point Power plug – Measuring point KTM PowerPack housing

< 0.1 Ω

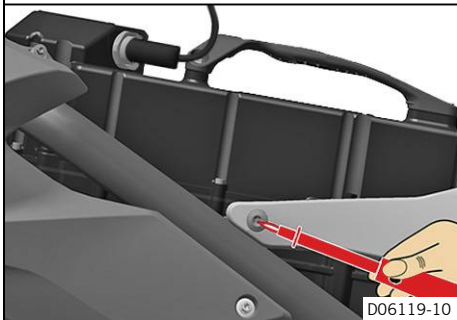
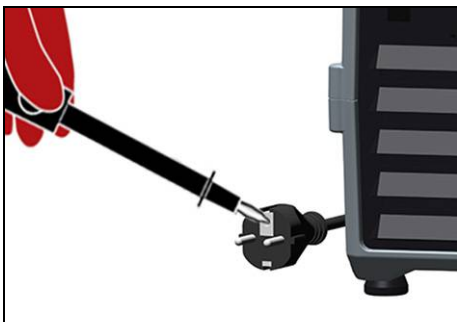
- » If the specified value is not reached:
 - Contact KTM customer service.



- Ω Measure the resistance between the specified points.
Measuring point Power plug – Measuring point Frame

< 0.1 Ω

- » If the specified value is not reached:
 - Contact KTM customer service.



E	
Equipotential bonding check	
performing	23, 25
F	
Fire hazard	5
I	
Insulation measurement	
performing	14-15, 17, 19-20
Intended use	5
K	
KTM PowerPack	
accident, handling following	6
S	
Securing workplaces	
in the workshop	7
U	
Use definition	5
Z	
Zero potential	
ascertaining	8-9
ascertaining (motor removed)	11

READY TO RACE

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Photo: Mitterbauer/KTM