

IMD3

MANUAL INSULATION MONITORING DEVICE



Please note! Safety hazard due to electrical current.

Only qualified personnel are authorized to install this product in the appropriate location, where the area being worked on needs to be closed off to ensure a safe environment.

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1. Safety measures

Read this manual carefully before assembly and commissioning.
Store the manual carefully and pass it on to the next user of this device!

Explanation of symbols used



DANGER!

Safety warning:
failure to comply will lead to
death or serious injury.



WARNING!

Safety warning:
failure to comply can
lead to death.



CAUTION!

Failure to comply can lead to
material damages and limit
the product's performance.



INSTRUCTION

Additional information for
handling the product.

General safety instructions

The manufacturer cannot be held responsible for any damage caused by:

- assembly or connection errors
- damage to the device as a result of mechanical impact and overvoltage
- changes to the device without explicit approval from the manufacturer
- any other uses than described in the manual

For safety reasons, always observe the risks of electrical shocks, fire hazards and injuries during installation and use of electrical devices!

General safety



DANGER!

In case of fire, use a fire extinguisher suitable for electrical devices. Always ensure a fire extinguisher is present during installation and when using this device.



WARNING!

- Only use the device in accordance with the instructions.
- Please note positive (+) and negative (-) poles should never be in contact with each other.
- Disconnect the device from the battery in case of:
 - cleaning and maintenance
 - replacing a fuse (only carried out by experts)
- Before dismantling the device:
 - Disconnect all connections.
 - Ensure there is no voltage on entries and exits.
- If the device or the connection cables are visibly damaged, the device should no longer be used.
- If the connection cables of this device are damaged, these should be replaced by qualified personnel only.
- Repairs to this device should only be carried out by the manufacturer. Improper repairs can lead to serious danger.
- This device cannot be used by children or people with reduced physical, sensory or mental capacities or inadequate experience and knowledge. Users need to have insight in the dangers of operating this device.
- Electrical devices are no toys. Therefore, store and use this device out of reach of children.

**CAUTION!**

- Ensure the set voltage of the device corresponds with the system voltage of the power supply available.
- Be aware other devices do not cause a short circuit at the contacts of the device.
- Store the device in a cool and dry place.

Safety measures when assembling the device**DANGER!**

Do not assemble the device at a location where there's a risk of gas/dust explosions.

**WARNING!**

Ensure a stable assembly!

The device needs to be assembled and secured to prevent falling over, falling down and getting in contact with the area around the connections.

**CAUTION!**

- Do not expose the device to heat sources (sunshine, central heating etc).
- Prevent additional heating of the device.
- Assemble the device in a dry and splash proof location.

Safety measures when assembling the electrical connection of the device**DANGER!**

Danger of fatal electrical shocks!

- When working on an electrical installation, please ensure there is someone nearby who can help you in case of an emergency.
- When installation takes place on a boat: incorrect assembly of electrical devices on boats can lead to corrosion damage of the boat.
- Ensure the device is installed by a qualified technician.

**WARNING!**

- Ensure the cable diameter has the correct size.
- Position the cables ensuring they will not be damaged by doors or bonnets. Crushed or damaged cables can lead to life threatening situations and need to be replaced.
- Ensure the cables do not cause a tripping hazard and ensure damaging the cables is impossible.

**CAUTION!**

- Use cable grommets if cables need to be guided through sheet walls or other grommets which have sharp edges.
- Do not install AC cables and DC cables in the same cable grommet.
- Do not install the cables in a loose manner or in a sharp bent.
- Install the cables using the right tools and materials.
- Do not pull the cables.
- Use cables which are long enough, with the appropriate diameter.

Safety when using the device



WARNING!

If the IMD3 not work properly or the housing is damage, shut off the installation and go to a certified company and let the system inspected to ensure the security of the system, or send the IMD3 back to the factory for repair and testing the unit. Self-repair is not allowed!

CAREFUL!

Do not use the device in case of:

- a salty, humid or wet environment
 - an environment with aggressive vapours
 - an environment with flammable materials
 - an explosive environment
-
- Check if cables and connections are dry before use.
 - Always disconnect the power supply when carrying out maintenance to the device.
 - Parts of the device can still be live after the power supply has been disconnected.
 - Do not remove cables when the device is in use.



CAUTION!

- Prevent the device from being covered or being assembled in an area which is too small.
- Ensure proper ventilation.

2. General description



The IMD3 Insulation Monitoring Device monitors the insulated condition of 230Vac floating circuit installations in vehicles.

The IMD3 has been designed for installations where 230Vac is being generated by inverters.

The IMD3 measures and detects insulation errors between phase and chassis as well as zero and chassis of the 230Vac vehicle installation.

If insulation is below a defined level, the IMD3 switches off the installation to prevent any hazardous situations.

The 'MAINS' connection on the IMD3 can detect whether the vehicle installation is being powered from an external (earthed) 230Vac circuit.

If 230Vac is connected on the MAINS, the insulation measurement is not being used to detect insulation errors but to test if a correct MAINS earthing is in place (by approximation). This is possible as the inverter has redirected the MAINS to the INVERTER circuit, connecting the MAINS with the INVERTER net's PE.



Operation

The IMD3 operates on a 6-60Vdc voltage. (+6-60Vdc on the GND/+Vdc clamps) The DC power line must be fused with a 1 Amp fuse.

The 230Vac floating circuit produced by the inverter is continuously monitored for insulation errors to PE.

The change-over contact (NO/C/NC) manages the inverter activation and deactivation using the 'remote' connector on the inverter. Once the IMD3 is powered, if there are no insulation errors detected, the internal relay activates, enabling the inverter's operation (via the NO/C/NC clamps), indicated by the illumination of the green LED.

Upon detection of an insulation error, the relay disengages and the inverter will be switched off. In such case, -OUT is active and the 'Isolation failure' led flashes.

To reset the 'Isolation failure', press the RESET button for a minimum of 1 second.

Under normal circumstances where 230Vac is present in the MAINS, the IMD3 does not register an 'Isolation failure'. This is due to the inverter redirecting the MAINS to the INVERTER circuit, where PE is connected to zero.

Test button

Press the TEST button for at least 3 seconds to test the IMD3 on the most important internal interruption features (an insulation error is simulated internally).

The 'Isolation failure' notification and the RESET procedure are identical to the notification and procedure during an external insulation error.

Earth fault indicator

If 230Vac is present on the MAINS, the insulation measurement is not used to detect insulation errors instead, it is used to test if a correct MAINS earthing is present (by approximation).

This is possible as the inverter has diverted the MAINS to the INVERTER circuit, and the MAINS earthing is now connected to the INVERTER circuit's PE.

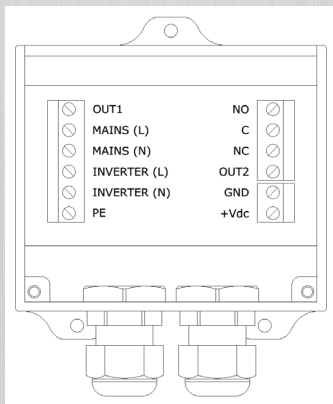
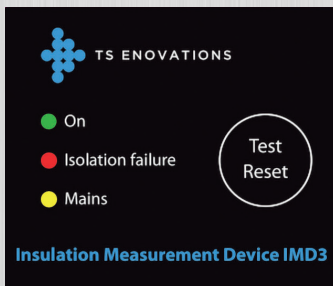
The Earth fault measurement is only activated if 230Vac is detected on the INVERTER. In the event of an earth fault, +OUT becomes activated.

+OUT (via the +OUT clamp) follows the input of the voltage on the connected power supply (+Vdc).



Connections and Led description

	On
	Isolation failure
	MAINS with correct earthing: Yellow MAINS is on constantly
	MAINS without correct earthing: Yellow MAINS is flashing rapidly
NO	Relay contact normally open
C	Relay contact common
NC	Relay contact normally closed
+OUT	+ output 'Earth fault'
GND	DC power supply GND
+Vdc	DC power supply +6..60Vdc (Dedicated power supply) (1 Amp Fuse in Dc Power line)
-OUT	- output 'Insulation error'
MAINS	230Vac L/N of the Mains
INVERTER	230Vac L/N from the inverter (NET)
PE	PE (earthing) of the floating circuit (internally connected to the GND)



3. Installation



Before you start

Switch off the converter and shore connections before installing the IMD3.

Cut and strip cables to a maximum length of 50 mm per cable core. Measurements of the jackets of these cables:

Cable diameter 230Vac sensing: 0.75mm

Remote connection 0.75mm

Dc power line at least 1.0mm

One (1) Amp Fuse in the Dc + Power line

Connect all cables according to diagram 1.



Conditions installation

- Configure the converter in order to generate a floating 230Vac circuit. Read the converter's manual before adapting the converter;
- The IMD3 **cannot** be used in combination with safety components (automatic earth switch or other automated interruption arrangement).

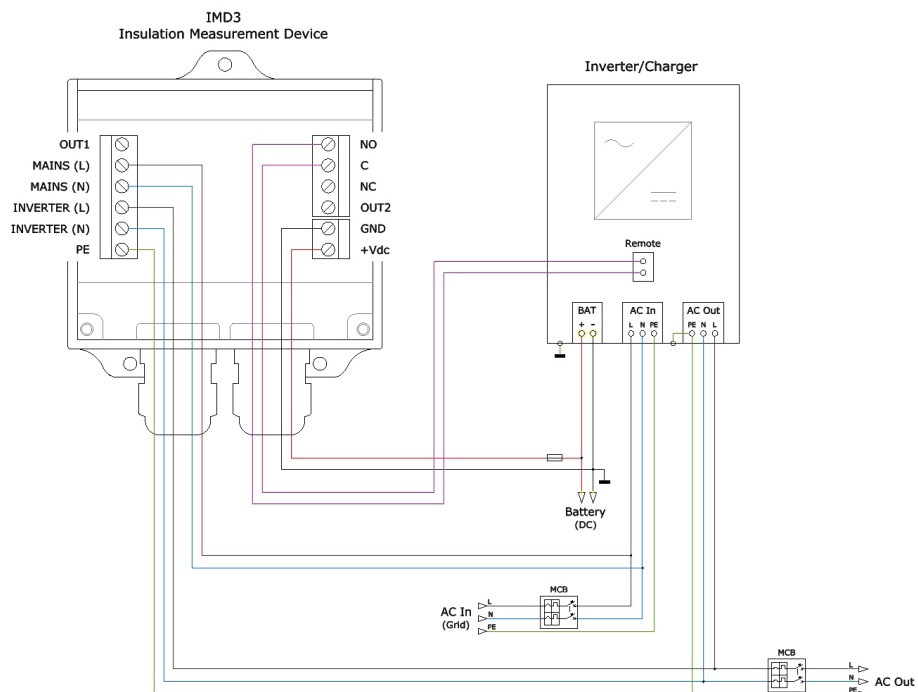
The IMD3 insulation monitoring can only operate correctly if the 230Vac vehicle installation is a floating circuit. Install the IMD3 according to diagram 2, between the Inverter Remote and the IMD3 Remote contacts. Position the IMD3 in a closed off area, which can only be carried out by qualified and authorised personnel.

Important!

- All 230Vac users (WCD's, Lights etc) which have an earth-connection need to be connected to the PE-Pipe or connected directly with the vehicle's chassis.
- When Connected to a an external 230Vac grid make sure this grid is properly grounded and protected by a fuse.



Diagram 1



The Victron cable connections to the inverter are not always the same and with a lithium system an assist must be placed in the inverter. When using only an inverter (no Multi or Quattro), you can use the same connections.



Diagram 2

Inverter/Charger model	Remote Connection & Setup for battery type	
	Victron AGM & GEL Battery Victron Lithium SuperPack Battery	Victron Lithium Battery Smart with VE.Bus BMS Victron Lithium Battery Smart with VE.Bus BMS V2 Victron Lithium Battery Smart with Lynx Smart BMS MG Lithium-Ion LFP Battery with MG Master LV
MultiPlus 12/500/20-16 MultiPlus 12/800/35-16 MultiPlus 12/1200/50-16 MultiPlus 24/500/10-16 MultiPlus 24/800/16-16 MultiPlus 24/1200/25-16	IMD3 Connector MultiPlus Connector REMOTE Setup: Set Dipswitch DS1 to ON	IMD3 Connector MultiPlus Connector TEMP Setup: Safety Switch Assistant must be installed
MultiPlus 12/1600/70-16 MultiPlus 24/1600/40-16	IMD3 Connector MultiPlus Connector REMOTE	IMD3 Connector MultiPlus Connector REMOTE



Diagram 2 (follow-up)

MultiPlus 12/2000/80-32 MultiPlus 24/2000/50-32	IMD3 Connector MultiPlus Connector Remote On/Off	IMD3 Connector MultiPlus Connector Remote On/Off
MultiPlus Compact 12/800/35-16 MultiPlus Compact 12/1200/50-16 MultiPlus Compact 12/1600/70-16 MultiPlus Compact 12/2000/80-30 MultiPlus Compact 24/800/16-16 MultiPlus Compact 24/1200/25-16 MultiPlus Compact 24/1600/40-16 MultiPlus Compact 24/2000/50-30	IMD3 Connector MultiPlus Connector REMOTE SWITCH Setup: Set Dipswitch DS1 & DS2 to OFF	IMD3 Connector MultiPlus Connector T SENSE Setup: Safety Switch Assistant must be installed In systems with a VE.Bus BMS/VE.Bus BMS V2 also Dipswitches must be set: DS1 to ON & DS2 to OFF



Diagram 3

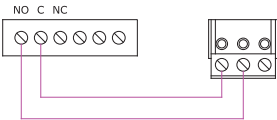
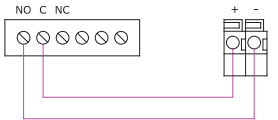
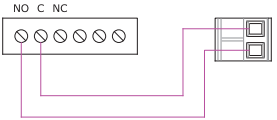
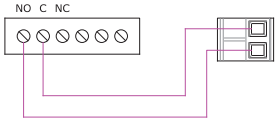
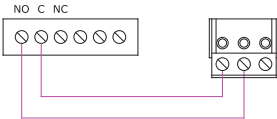
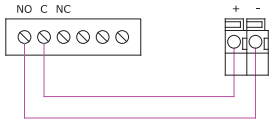
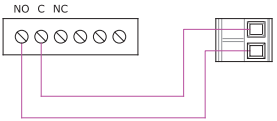
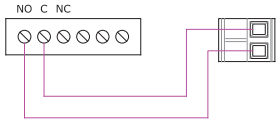
Inverter/Charger model	Remote Connection & Setup for battery type	
	Victron AGM & GEL Battery Victron Lithium SuperPack Battery	Victron Lithium Battery Smart with VE.Bus BMS Victron Lithium Battery Smart with VE.Bus BMS V2 Victron Lithium Battery Smart with Lynx Smart BMS MG Lithium-Ion LFP Battery with MG Master LV
MultiPlus 12/3000/120-16 MultiPlus 12/3000/120-50 MultiPlus 24/3000/70-16 MultiPlus 24/3000/70-50 MultiPlus 24/5000/120-100	IMD3 Connector 	IMD3 Connector MultiPlus Connector T-SENSE  Setup: Safety Switch Assistant must be installed
MultiPlus-II 12/3000/120-32 MultiPlus-II 24/3000/70-32 MultiPlus-II 24/5000/120-50 MultiPlus-II GX 24/3000/70-32	IMD3 Connector 	IMD3 Connector MultiPlus Connector Remote On/Off 



Diagram 3 (follow-up)

Quattro 12/3000/120-50/50 Quattro 12/5000/220-100/100 Quattro 24/3000/70-50/50 Quattro 24/5000/120-100/100 Quattro 24/8000/200-100/100	IMD3 Connector Quattro Connector REMOTE SWITCH 	IMD3 Connector Quattro Connector T-SENSE  Setup: Safety Switch Assistant must be installed
Quattro-II 24/5000/120-50	IMD3 Connector Quattro Connector Remote On/Off 	IMD3 Connector Quattro Connector Remote On/Off 

Safety Switch assistant must be installed in systems with a Ve.Bus BMS/Ve, Bus BMS V2. View Diagram 4.



Diagram 4

- Use VE Configure 3
- Select Tab: Virtual switch
- Select: Do not use VS (Virtual Switch)

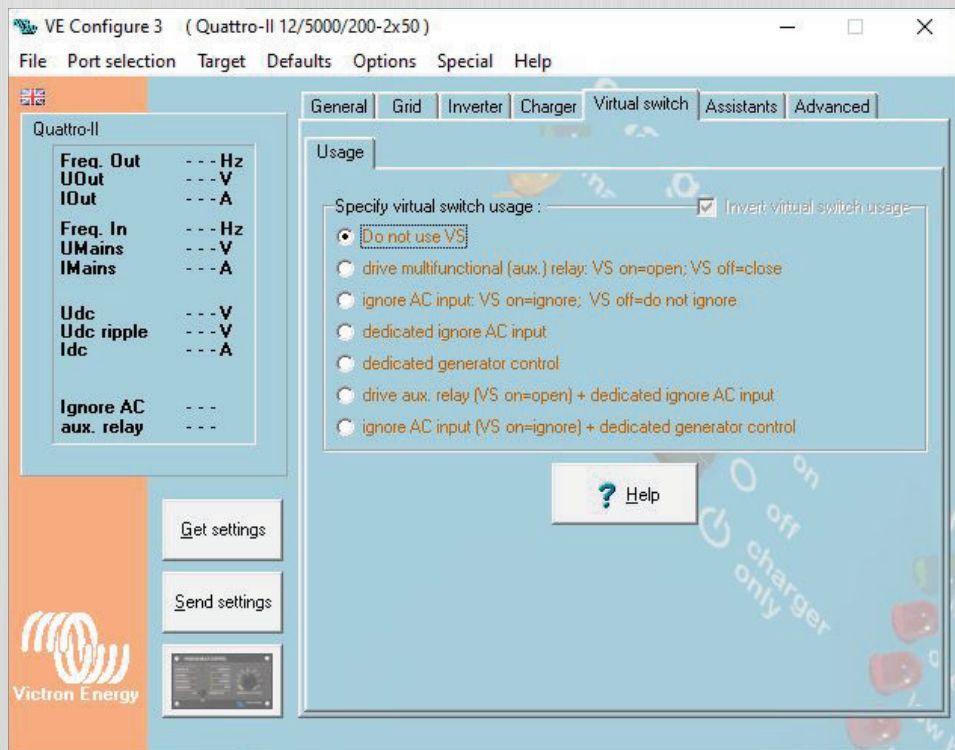




Diagram 4 (follow-up 1/3)

- Select Tab: Assistants
- Select: Add Assistant
- Select: safety switch
- Select: Start assistant and follow instructions

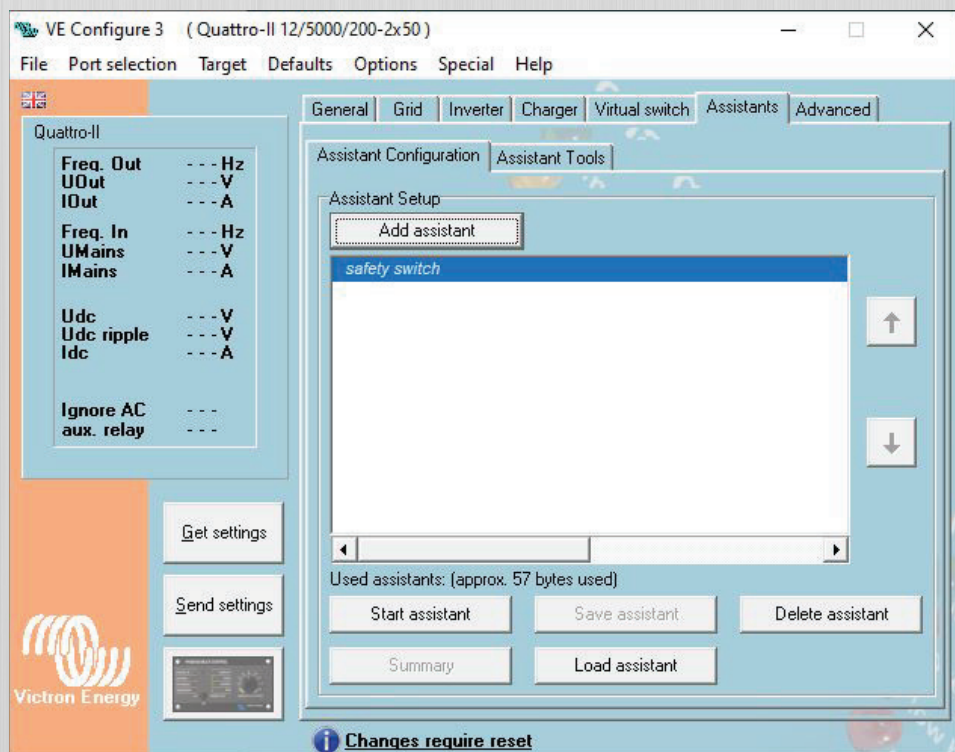




Diagram 4 (follow-up 2/3)

- Window: Welcome -> Select: >>

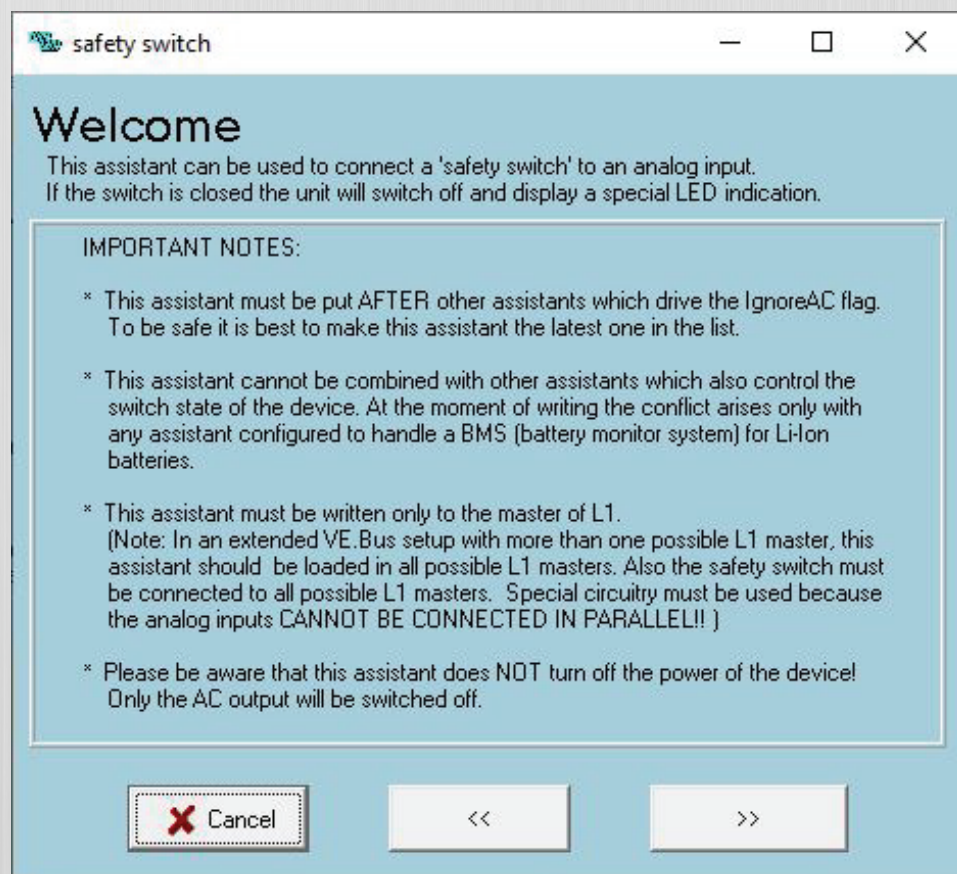




Diagram 4 (follow-up 3/3)

- Window: Input
- Select: Switch the unit off when: temperature sense input is opened
- Select: >>

safety switch

Input

Select the input to which the safety switch is connected and whether the unit should switch off when the contact is opened or when the contact is closed.

Please note:

- * Some models do not have auxiliary inputs, some have 1 and others have 2
- * Temperature compensated charge is disabled when the temp sense input is selected.

Switch the unit off when **temperature sense input** is **opened**.

Cancel << >>

- Select: Send settings
- Select: All settings

4. Floating Circuit

In case of a MultiPlus, a floating circuit is obtained by switching off the internal 'Ground relay'. In Converter operational, the Neutral is no longer connected to 'Earth'.

Use software which includes Victron VE.Config or VictronConnect in order to switch off 'Ground relay'.

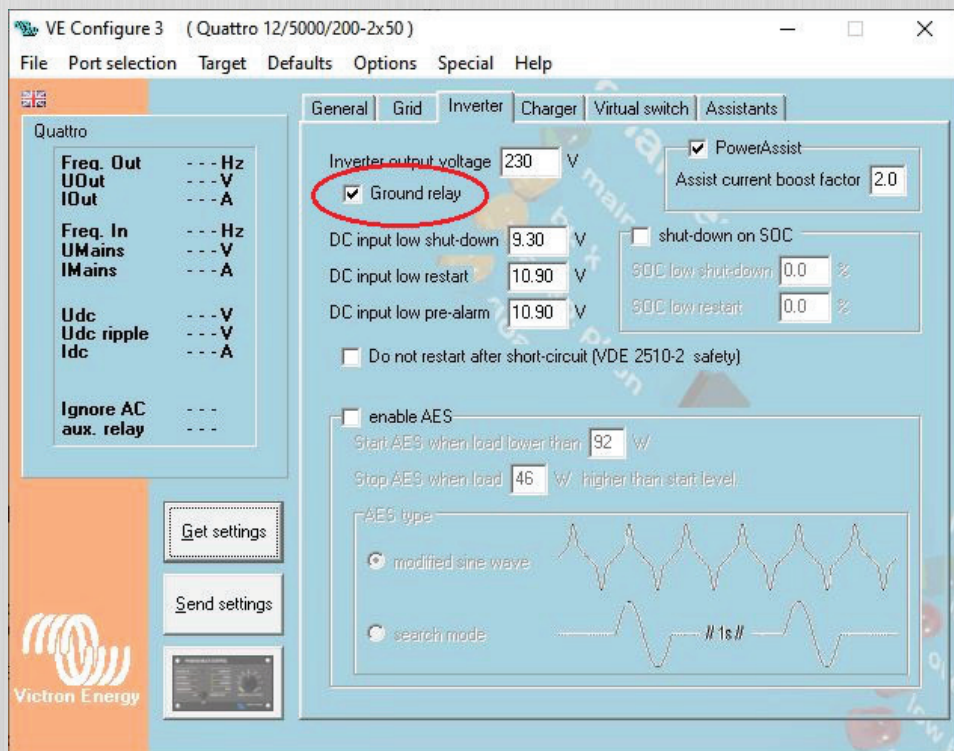
The Insulation Monitor can only operate correctly if the 230VAC vehicle installation is a floating circuit (the Neutral is not connected to 'Earth').

When using only an inverter (no Multi or Quattro), there is no way to do this via the software, and an earth wire must be disconnected or moved to a different terminal inside the inverter itself. You can find this in the user manual of the inverter in question.

In Victron VE.Config: Tab Inverter -> Clear the selection of the 'ground relay' checkbox.



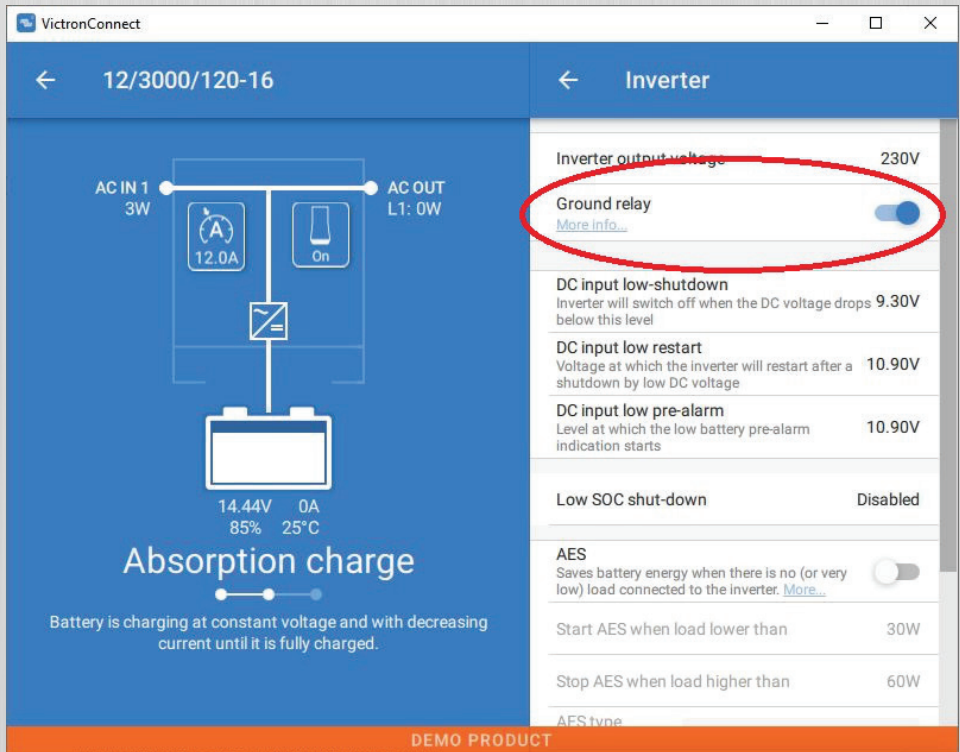
Diagram 5



In VictronConnect: Settings -> Inverter -> Switch off setting 'Ground relay'



Diagram 6



If everything is connected correctly and the ground relay is disabled, you can test whether the isolation guard activates after switching on your inverter.

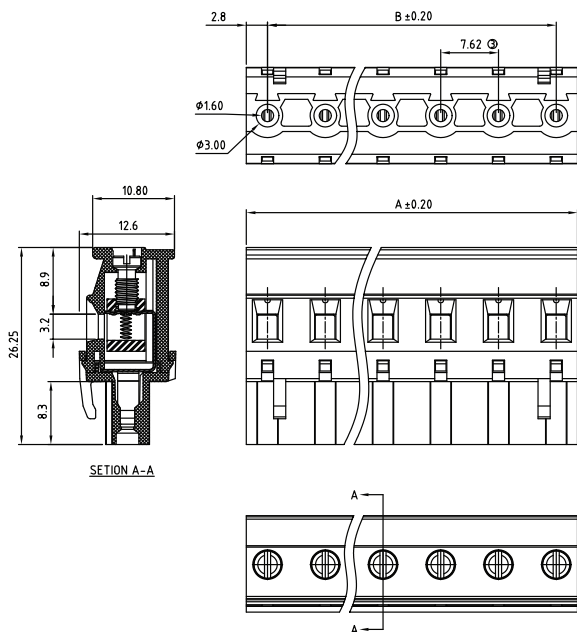


Material of ENCLOSURE

Polycarbonate (Pc), pellets

(+) - Indicate 0~0.5% acid scavengers.

Properties	Test conditions	Test methods	Units	Values
General				
Density		ISO 1183	g/cm ³	1.04
Bulk density		ISO 60	g/cm ³	0.65
Water absorption	24 h - 23°C	ISO 62	%	<0.1
Rheological				
Melt flow rate	200°C - 5 kg	ISO 1133	g/10 min	4
Mechanical				
Tensile stress at yield	50 mm/min	ISO 527	MPa	24
Tensile stress at break	50 mm/min	ISO 527	MPa	29
Tensile strain at break	50 mm/min	ISO 527	%	60
Tensile modulus	1 mm/min	ISO 527	MPa	2000
Flexural strength	2 mm/min	ISO 178	MPa	43
Izod impact strength, notched	+23°C - thickness 3.2 mm	ISO 180/4A	J/m	100
	+23°C - thickness 4 mm	ISO 180/1A	kJ/m ²	8
	-30°C - thickness 4 mm	ISO 180/1A	kJ/m ²	6
Rockwell hardness	L/M scale	ISO 2039/2	-	L70
Thermal				
Vicat softening temperature	10 N - 50°C/h	ISO 306/A	°C	100
	50 N - 50°C/h	ISO 306/B	°C	92
Deflection temperature under load (annealed)	1.8 MPa - 120°C/h	ASTM D 648	°C	86
Coefficient of linear thermal expansion		ASTM D 696	10 ⁻⁵ /°C	9
Thermal conductivity		ISO 8302	W/(K·m)	0.17
Moulding shrinkage		internal method	%	0.4 - 0.7
Flammability				
Flame behaviour	thickness 1.5 mm	UL 94	class	HB
Glow wire test (GWT)	thickness 1.6 mm	IEC 60695-2-1	°C	650
Electrical				
Surface resistivity		IEC 60093	10 ¹⁵ ohm	>1.5
Volume resistivity		IEC 60093	10 ¹⁵ ohm-cm	>7
Comparative tracking index (CTI)	solution A	IEC 60112	-	500
Dielectric strength		IEC 60243	kV/mm	65
Dielectric constant (relative permittivity)	50 Hz	IEC 60250	-	2.5
Dissipation factor	50 Hz	IEC 60250	-	0,0003



SECTION A-A

TECHNICAL CHARACTERISTICS

MATERIAL

INSULATOR: PA 66

FLAMMABILITY RATING: UL94-V0

COLOR: GREEN

METAL HOUSING: BRASS (CuZn)

TERMINAL SCREW: STEEL ZINC PLATING

TERMINAL SCREW SLOT TYPE: "-"

WIRE GUARD: PhBz TIN PLATED

ENVIRONMENTAL

OPERATING TEMPERATURE: -40 UP TO 105°C

COMPLIANCE: LEAD FREE AND ROHS

ELECTRICAL

CURRENT RATING: 15 A

WORKING VOLTAGE: 300 VAC

WITHSTANDING VOLTAGE: 1.6 KV

CONTACT RESISTANCE: 20 mOhm max

STANDARD

UL CERTIFIED E315414

MECHANICAL

SOLID WIRE: 24-12 AWG / 0.205-3.31 MM²

STRANDED WIRE: 24-12 AWG / 0.205-3.31 MM²

TORQUE: 4.3 Lb-In / 0.49 Nm

WIRE STRIPE LENGTH: 6-7 MM

SCREW: M3.0

PITCH: 7.62 MM

PACKAGING

BOX

DIMENSION

A = (NB. PINS -1) x PITCH

B = (NB. PINS x PITCH) - 2.02

NYLON DOME HEADED CABLE GLANDS

Product description:

Dome headed Nylon cable glands suitable for a wide range of applications when connecting cable (non- armoured type) to electrical equipment such as enclosures and ducting. Each gland is supplied complete with locknut and washer

Material:

Body & Nut: PA 66 (Polyamide 66) Seal: Rubber

IP Rating:

IP68

Temperature Rating:

-400°C -1000°C

CE

RoHS

Thread type:

Metric

Sizes, Colours & Pack Quantities:

Refer to table

Packaging:

Polyethylene bag with euro slot. Branded HellermannTyton

Country of origin:

China





5. Technical specifications

Parameter	condition	min	type	max	unit
Dc input clamp +Vdc/GND					
Vin connection voltage reach (clamp +Vdc/GND)		6	12/24/48	60	Vdc
Vin max. voltage (clamp +Vdc/GND)		-	-	70	Vdc
Max Extraneous Dc voltage continuously				70	Vdc
1 Amp Fuse in + Dc Power line			1 Amp		
Ufg Dc voltage Max				265	Vdc
Vin undervoltage UVLO voltage commutation	Relay internally activated	-	-	5.4	Vdc
Vin undervoltage UVLO cut-in voltage		5.8	-	-	Vdc
Iin current/Watts drawn (clamp +Vdc/GND)	Vin = 12.0V/relay active/ green led on	-	11.9/0.1428	-	mA/W
Iin current/Watts drawn (clamp +Vdc/GND)	Vin = 28.8V/relais actief/ led groen aan		4.9/0.0588	-	mA/W
Iin trip current (PPTC resettable fuse)	Internal error	-	100	-	mA
Temperature working range		-10	-	+65	°C
-OUT1- output (Insulation error) (clamp OUT1)					
Vout1 (via N-FET)	Insulation error active, Iout1=80mA	-	-	0.85	Vdc
Iout1 trip current (PPTC resettable fuse)	Vin max = 60V	-	100	-	mA
Iout1 hold current (PPTC resettable fuse)	Vin max = 60V	-	50	-	mA
+OUT2 output (earth fault) (clamp +OUT2)					
Vout2 (via PNP transistor)	Earth fault active	-	Vin-0.45	-	Vdc
Iout2 trip current (PPTC resettable fuse)	Vin max = 60V	-	100	-	mA
Iout2 hold current (PPTC resettable fuse)	Vin max = 60V	-	50	-	mA
Relay contact (clamps NO/C/NC)	(type relay: P2 V23079)				
Max. contact voltage AC		-	-	265	Vac
Max. contact voltage DC		-	-	220	Vdc
Max. contact current	Contact voltage = 240Vac	-	-	0.25	A
Max. contact current	Contact voltage = 30Vdc	-	-	2	A

MAINS input (clamps MAINS L/N)					
Detection MAINS active		180		280	Vac
Detection load	(detection via optocoupler and R=450kΩ)	0.25		0.6	mAac
Ufg Dc voltage Max				265	Vdc
INVERTER input (clamps INVERTER L/N)					
Detection INVERTER active		100		260	Vac
Load detection	(detection via optocoupler and R=450kΩ)	0.25		0.6	mAac
Ufg Dc voltage Max				265	Vdc
Measuring circuit Insulation Monitoring on INVERTER circuit.					
Operating value resistance Riso					
Asymmetrical (phase-PE or zero-PE)	No stress on INVERTER circuit.		$\leq 12 \pm 10\%$		kΩ
Symmetrical (phase-PE and zero-PE),			$\leq 100 \pm 20\%$		kΩ
Response delay			<1		sec
Voltage current			≤ 32		μA
Voltage measurement			- 14.6		Vdc
Technical details					
Where to use	Indoor use only				
Protection category	IP20				
Altitude	2000M Max				
Relative humidity: (non-condensing)	max 95 %				
Overvoltage category	cat III				
Pollution degree of the intended environment	2				
Measurement category	III				
Cleaning and decontamination	Cleaning with damp cloth and do not use aggressive detergents				
Use in parallel	The IMD3 can't be use in parallel or with other insulation monitors				
Internal impedance Zi /Zr	Normal function nominal frequency		450k		
System leakage capacitances Ce and response time	Max 1uF @ 2s response time				
Test voltage				14,6	Vdc
Dimensions	HxWxD cm		11x5,5x7,5		
Weight	240 gram				

EMC reports:

Emission EN 61326-1 (2013)

Immunity EN 61326-1 (2013)

Emission EN 61000-3-2 (2014) & EN 61000-3-2 (2019) (not yet harmonized)

Emission EN 61000-3-3 (2013) + A1 (2019) + A2 (2021) + AC (2022) (not yet harmonized)

Emission / Immunity EN 61326-2-4 (2013)

Electrical Safety IEC 61557-1 IEC 61557-8 IEC 61010-1 IEC 61010-2-030

The EMC reports can be downloaded on our website.



TS ENOVATIONS
INNOVATIVE ENERGY COMPONENTS

Lemsteraak 6 · 2411 NC Bodegraven · The Netherlands
Tel. 0031 (0)172 - 650 737
www.ts-enovations.com

