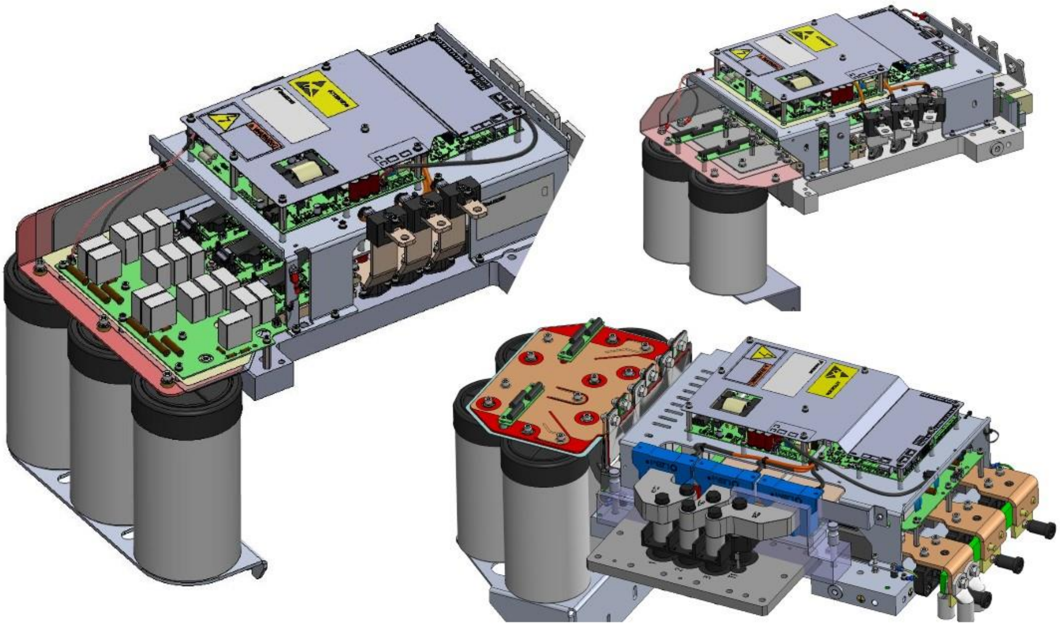
REV	00
Data	April 2023
Supersedes	N/A

Service Manual
DAE VFD main alarms troubleshooting



Original instructions

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2 SCOPE AND APPLICATION

The following information are intended only as a guide for authorized Daikin personnel with a sound basic knowledge of HVAC equipment, mechanical systems, electrical wiring, controls, & microprocessors. Attempts by untrained or unauthorized persons to start, operate and service the equipment can result in equipment failure, personal injury, or death, as well as invalidation of product warranty. It is the responsibility of the technician to ensure that proper safety equipment safe practices are used.

This document explains a common procedure to troubleshoot the Daikin Applied Europe made VFDs.
For **troubleshooting** is meant _the identification of the faulty components within the VFD_.

INFORMATION
Before proceeding with the inverter troubleshooting procedures, make sure that the fault depends exclusively on the VFD. Any kind of anomalies chiller related are not described and faced in this guide since it is assumed that they have already been excluded.

NOTICE
As first step it is important to verify that all the alarms present on the inverter have been correctly downloaded.
Refer to the **7.4: VFD NAV ALARMS SAVING** paragraph for more information

DAE VFD is different sizes: 90 kW,120 kW, 200 kW, 330 kW and 400 kW.
DAE VFD layout is different depending on the VFD size, in particular DC BUS plates layout it is.
To recognize inverter size, refer to the VFD label as on below.

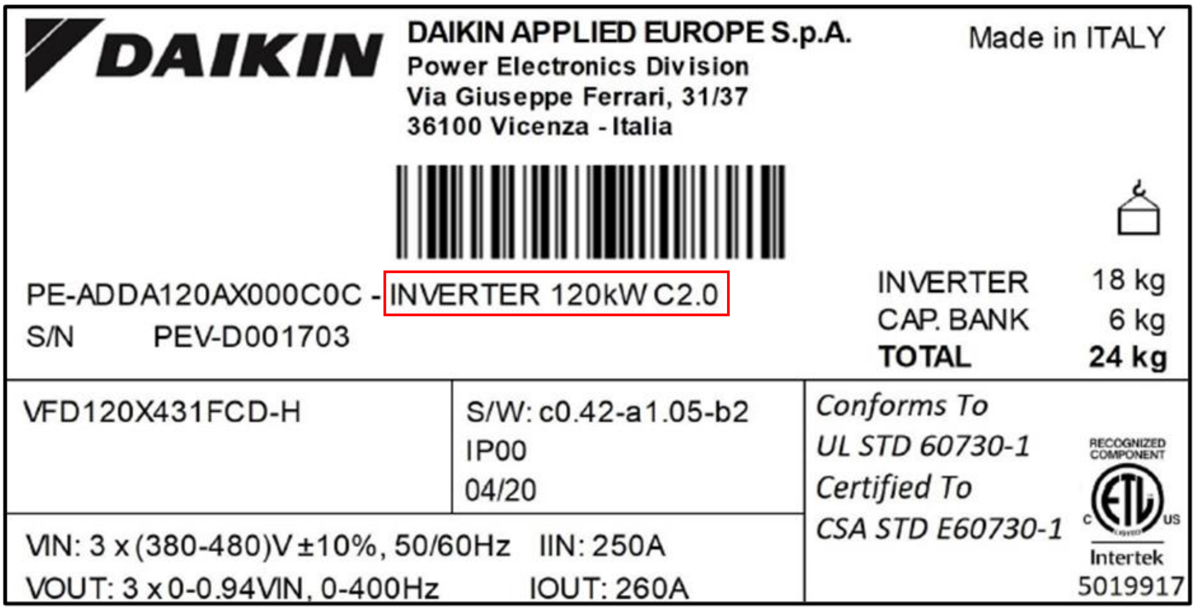


Figure 1 DAE VFD Label

The troubleshooting guide helps the technician on site to verify correct functioning of following main VFD parts such as:

- Regulation Card
- Power Card
- SCR section
- IGBT section
- Driver Card

In case of malfunctioning of Regulation Card and Power Card, the components can be replaced.
In case of SCR section, IGBT section or Driver Card malfunctioning, the entire VFD must be replaced because the components replacement is not possible to be carried out since they are glued inside the VFD.

On the following pictures, the all sizes VFD layout are showed.

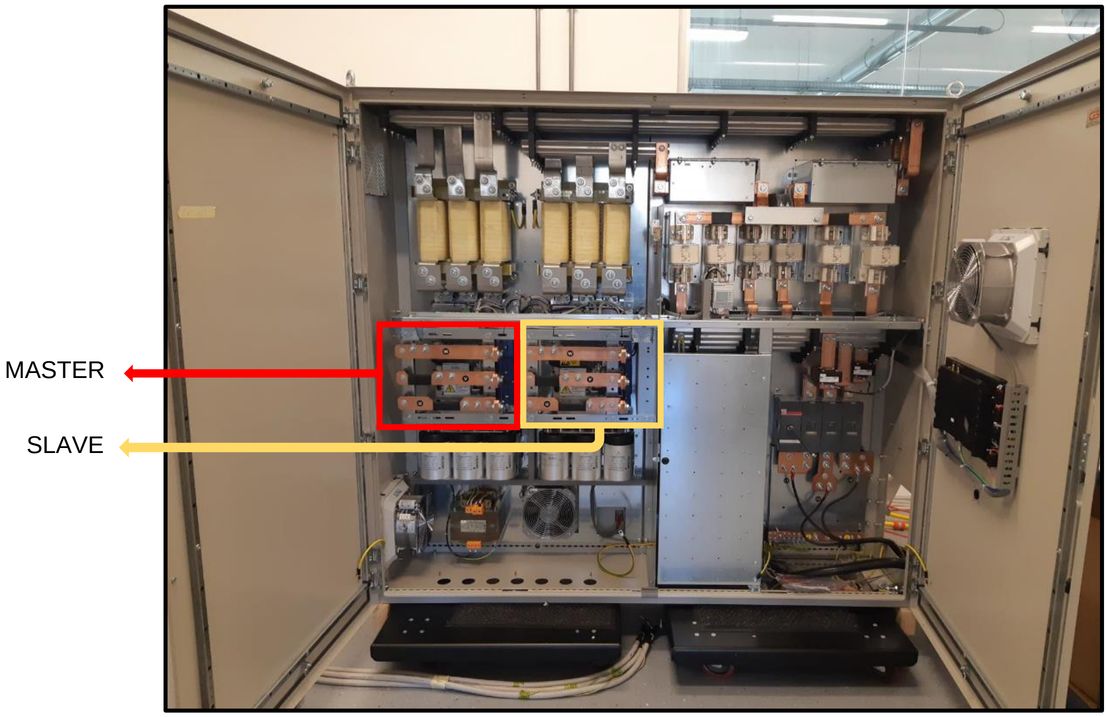


Figure 2 Master/Slave VFD in centrifugal application

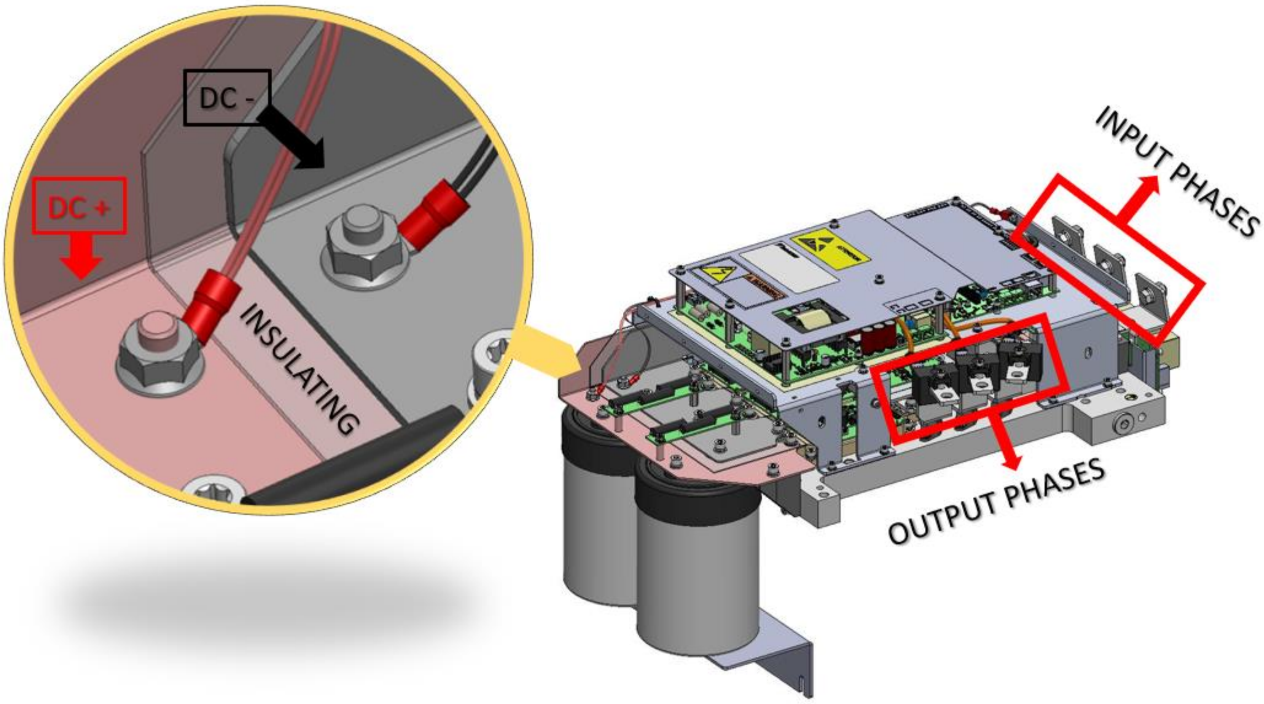


Figure 3 90 kW -120 kW DAE VFD layout

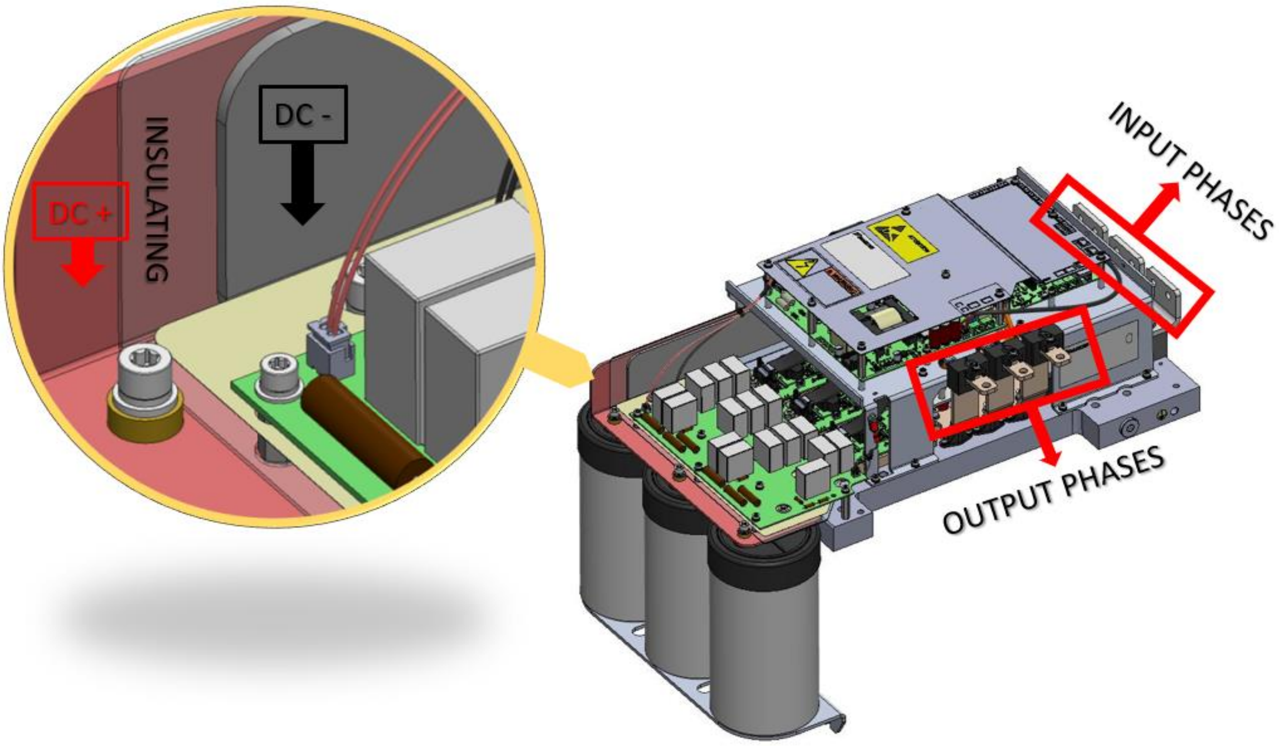


Figure 4 200kW DAE VFD layout

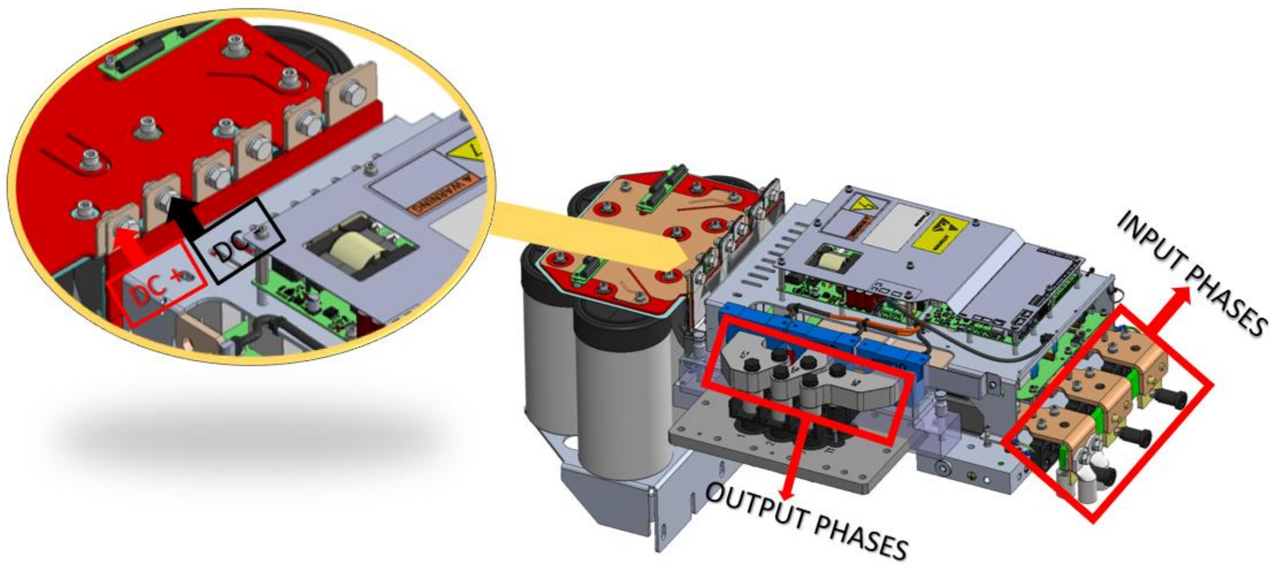


Figure 5 330/400kW DAE VFD layout

NOTICE
If the Alarms occurs systematically, proceed to install the latest correct VFD recipe before starting this Troubleshooting guide.

In chapter **5. ALARM TROUBLESHOOTING**, the most common field alarms are firstly described, in order to fully understand the issue root cause.
The checking procedures on each component are showed in chapter **6. ALARM TROUBLESHOOTING PROCEDURES.**

Further procedures to verify the goodness of VFD are showed in chapter **7. ADDITIONAL PROCEDURES .**

In case of remote factory support by Technical Service Support department (servicesupport@daikinapplied.eu), a detailed report of checks is requested. Table at chapter **10. COLLECTION TABLES** must be filled.

3 SAFETY

Installation, start-up and servicing of equipment can be hazardous if specific factors related to the installation are not considered: operating pressures, presence of electrical components and voltages and the installation site (elevated plinths and built-up up structures). Only properly qualified installation engineers and highly qualified installers and technicians, fully trained for the product, are authorised to install and start-up the equipment safely.

During all servicing operations, all instructions and recommendations, which appear in the installation and service instructions for the product, as well as on tags and labels fixed to the equipment and components and accompanying parts supplied separately, must be read, understood and followed.

Apply all standard safety codes and practices. Wear safety glasses and gloves. Use the proper tools to move heavy objects. Move units carefully and set them down gently.

Only personnel qualified in accordance with IEC (International Electrotechnical Commission) recommendations may be permitted access to electrical components. It is particularly recommended that all sources of electricity to the unit be shut off before any work is begun. Shut off main power supply at the main circuit breaker or isolator.

IMPORTANT: This equipment uses and emits electromagnetic signals. Tests have shown that the equipment conforms to all applicable codes with respect to electromagnetic compatibility.

DANGER: RISK OF ELECTROCUTION

Even when the main circuit breaker or isolator is switched off, certain circuits may still be energized, since they may be connected to a separate power source

DANGER: RISK OF BURNING

Electrical currents cause components to get hot either temporarily or permanently. Handle power cable, electrical cables and conduits, terminal box covers and motor frames with great care

Always disconnect the VFD from the power source before performing any maintenance or adjustment. The VFD shall be deemed off when at least one of the following conditions is met:

- All fuses connected in series with the power supply have been removed
- The main switch is disconnected at all poles
- No power is supplied to the VFD
- The power supply to the solenoid valve circuit is disconnected<
- The DC-Link capacitors are discharged

CAUTION: RISK OF ELECTRIC SHOCK

Before opening the enclosure, wait at least 20 minutes after disconnecting the power supply, as indicated on the label applied on the inverter enclosure. This to make sure that all live parts are discharged. NOTE: residual voltage (< 60 V) may still be present across the DC-Link after 20 minutes.

The device without its cover can be accessed only 20 minutes after the power supply has been switched off. This time allows the DC-Link capacitors to be discharged to a safe voltage level.

CAUTION: RISK OF ELECTRIC SHOCK

In case of malfunctioning of the discharge device integrated into the inverter, the DC-Link capacitors may remain charged even after 20 minutes since disconnection. Never touch the inverter while removing the enclosure. Always check the DC-Link capacitors are discharged at least below 60 V before initiating any operation on the inverter!

CAUTION: RISK OF ARC FLASH

A substantial amount of energy can be stored in the capacitor bank even if its voltage is below 60 V. Do not short-circuit the DC-Link unless the capacitor bank is completely discharged. Before commencing any mechanical work on the inverter, discharge completely the DC-Link by means of a suitable external device or allow enough time for the DC-Link to be completely discharged (< 5 V)

Figure 6 Label: Risk of Electric shock

⚠	**WARNING** Once the cover has been opened, observe ESD precautions and wear protective gloves against electrostatic discharge during maintenance or assembly.

⚠	**DANGER: RISK OF ELECTROCUTION** Before to access the VFD • Wear safety glasses and gloves • Disable the circuit involved by switch • Main line fuses in series to the VFD must be disconnected • Wait till the DC-link capacitor are discharged: wait almost 20 minutes (residual voltage must be under 5 V to be checked with multimeter) • Once the cover has been opened, observe ESD precautions and wear protective gloves against electrostatic discharge during maintenance or assembly

Figure 7 ESD precautions label

4 TOOLS

This manual requires different kind of measurement: voltage, current, resistances.
Depending on the measurement requested, different specification must be respected.

WARNING
Before taking the measurements, check the insultation class.
The minimum insultation class ensures that the multimeter is suitable to reading a rectified voltage safely.

The instruments must have Minimum Instrument Safety Rating: CAT III 1000Vdc

Figure 8 Instrument Safety Rating

4.1 Compressor checks

4.1.1 Screw

4.1.1.1 Insulation Measurement

Tool to use is a Megger with the following characteristics

Figure 9 Megger tester

4.1.1.1.1 Motor Phases Insulation

Test functionality	Insulation test voltages: 1000 V
Insulation test resistance range	MΩ to any GΩ

Table 1 Megger characteristics – Motor Phases insulation

4.1.1.2 Thermal probe insulation (Ohm Mode)

Test functionality	Ω
Resistance range	kΩ to any MΩ

Table 2 Megger characteristics – Thermal probe insulation

4.1.1.3 Resistance Measurement

On motor compressor, the phases and thermal probe, each component resistance can be measured.

Test functionality: Ohm measurement

Test functionality	Ω
Motor phases resistance test resolution	mΩ - 0.1 Ω
Motor phases resistance test range	Refer to [7.3.3 MOTOR PHASES ELECTRICAL CONTINUITY]
Motor Thermal probe resistance test resolution	1Ω
Motor Thermal probe resistance test range	48Ω – 360Ω

Table 3 Megger characteristics – Resistance Measurement

4.1.2 VFD Measurement

On VFD components several test are required: AC/DC Voltages and output current. A general multimer is required with the following characteristics:

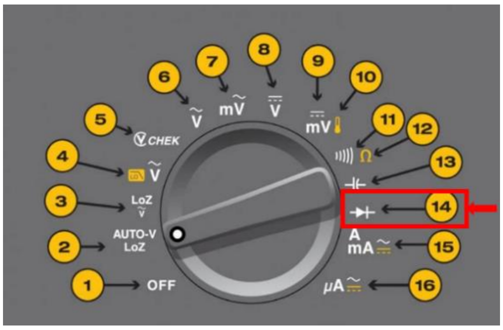
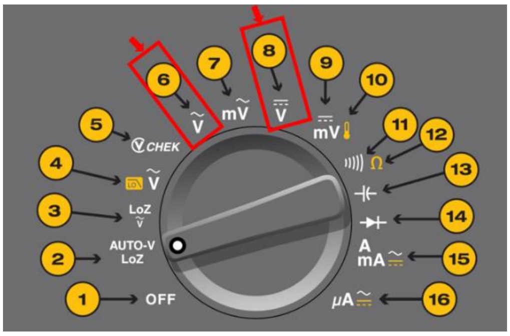
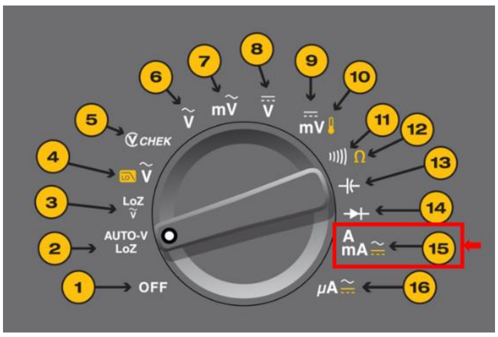
Characteristics	
A. Diode test functionality	
B. Ohm range measurement till MΩ	
C. AC – DC Voltage Measurements	
D. Current measurement	

Table 4 Multimeter characteristics - VFD Measurement

5 ALARM TROUBLESHOOTING

INFORMATION

Before proceeding with the inverter troubleshooting procedures, make sure that the fault depends exclusively on the VFD. Any kind of anomalies chiller related are not described and faced in this guide since it is assumed that they have already been excluded.
Compressor motor must be checked before to start the troubleshooting guide on below showed. Refer to [7.3. COMPRESSOR TESTS](#)

In this chapter alarm troubleshooting for 13.1, 3.x, 5.0, 5.1 alarms are showed.
For each alarm a fault tree analysis is showed to guide the technician on site to follow a correct analysis looking for the root cause of the alarm.
When a component check is required in the fault tree analysis, the block contains a direct link to the procedure explained in [6. ALARM TROUBLESHOOTING PROCEDURES](#)

In case of any case related to warranty or general service case supported by DAE Technical service, the checklist contained in the chapter [10. COLLECTION TABLES](#) must be filled and sent to the factory (DAE Technical Service department).

To find the number of the sub alarm:

- Insert Technician Password
- Move to Main Menu → Alarms → Snapshot → Entry ## → Al[xx]=1.x

Figure 10 Alarm Snapshot Menu

NOTICE

With older versions of VFD Nav firmware an alarm saved as 12.1 could be fake as consequence of alarm 3.X. To verify the actual alarm, connect to VFD Nav and check the alarm section.
Refer to [7.4. VFD NAV ALARMS SAVING](#)

Visible feedabck of VFD Alarm status is given by Regulation Card LED:

LED	Light	Meaning
L1	Red	Alarm
L2	Yellow	Warning
L3	Green	VFD Ready
L4	Green	Power Supply

Table 5 Regulation Card Leds

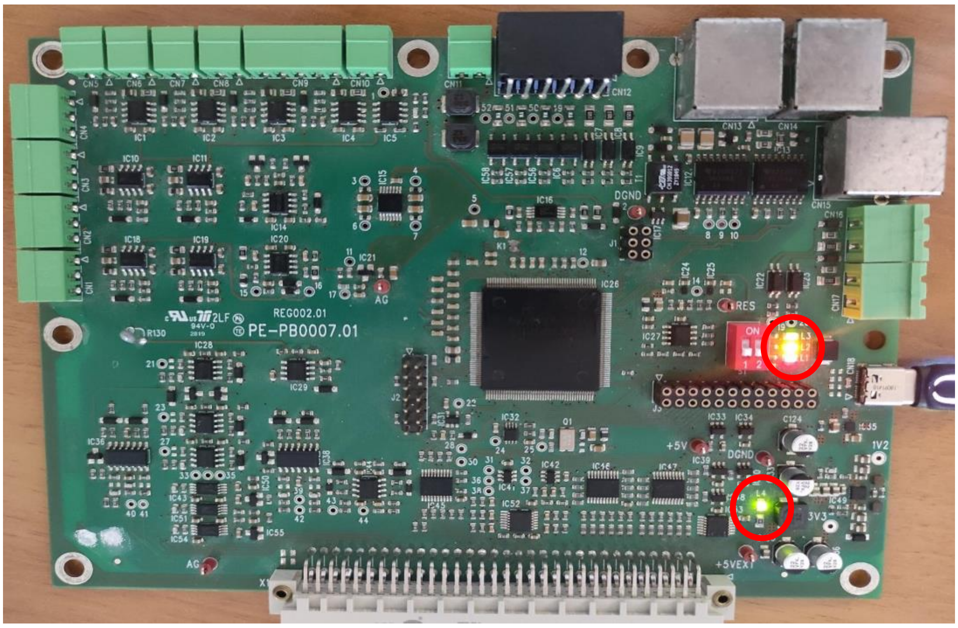


Figure 11 Regulation Card Led

5.1 Alarm 13.1

13.1 alarm code means "Safe Torque Off". The VFD call this alarm when on the Regulation Card port REG_CN13 24V are missing.
The 24V can miss for the following reason:

1. The High-pressure Switches are open → No VFD issue.
2. Failed Power Board.
3. Failed Regulation Card.

All the above possible root causes are deeply investigated in the following fault-tree analysis.

NOTICE
It is possible to update the VFD software through VFD inverter setup.
As standard, recipe upload procedure is not necessary on factory mounted regulation card VFD.
Any recipe upload procedure on factory mounted regulation card VFD must be authorized by Service support department.
In case of any not authorized recipe upload procedure performed on factory mounted regulation card and consequent VFD malfunctioning, components damaging is not covered by warranty terms.

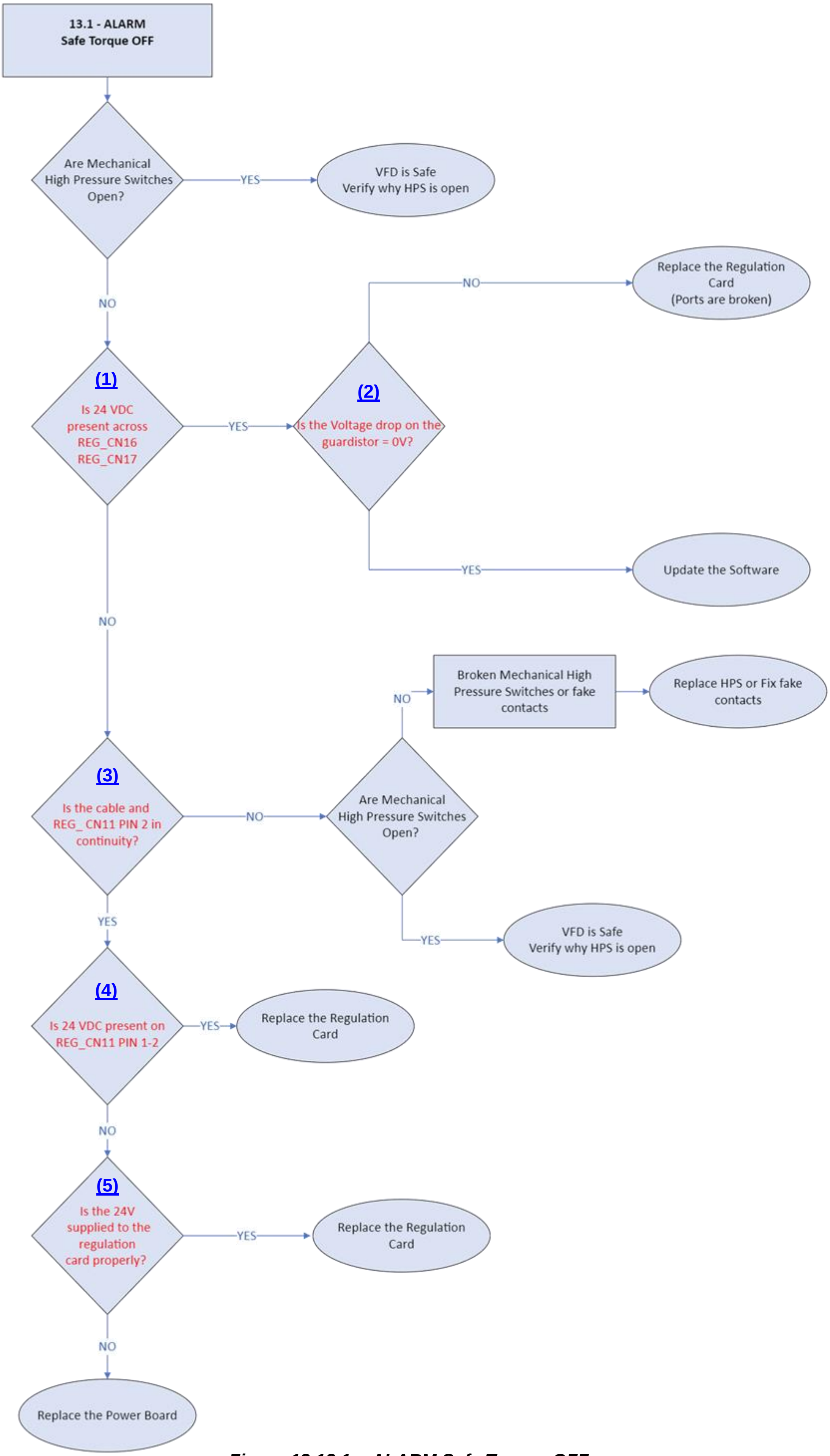


Figure 12 13.1 – ALARM Safe Torque OFF

5.2 Alarm 3.X

3.X alarm code means “Hardware Overcurrent”. An extremely high VFD output current that can cause an hardware fault has reached a level that has set off the alarm .
An extremely high current can be detected for the following reason:

1. Faulty AMPs Transducers
2. Bolts not properly tightened
3. Faulty IGBT/SCR .
4. Faulty Reg. card.
5. Faulty Power Board.
6. Faulty DRV or Flat Cable .

All the above possible root causes are deeply investigated in the following fault-tree analysis.

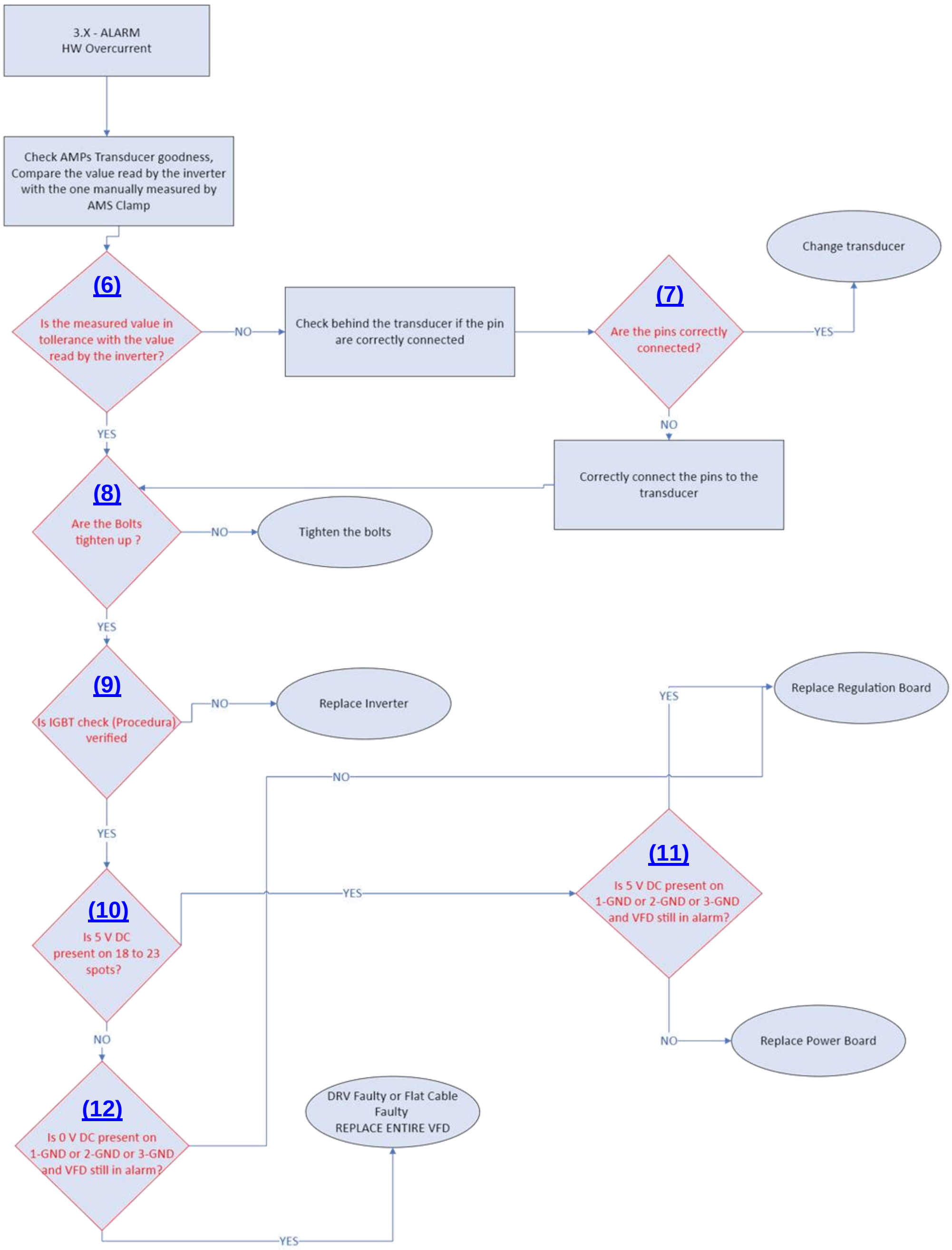


Figure 13 3.X – ALARM HW Overcurrent

5.3 Alarm 5.0

5.0 alarm code means "Motor Temperature Too High". This alarm is triggered when the inverter detect a high motor temperature.
A PTC sensor immersed in the motor windings is connected to the VFD. Depending on PTC resistance value, the inverter can detect a high motor temperature, or a PTC sensors disconnected.
An High Motor Temperature can be detected for the following reasons:

1. Faulty PTC sensor.
2. Other Software/Hardware reasons.

All the above possible root causes are deeply investigated in the following fault-tree analysis.

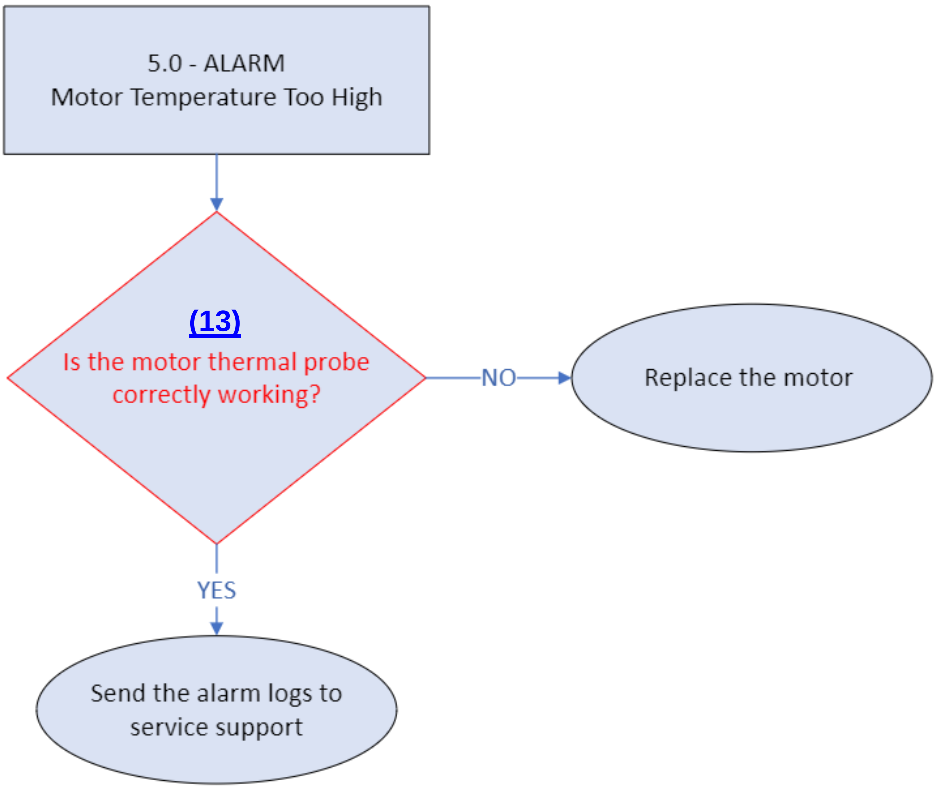


Figure 14 5.0 - ALARM Motor Temperature Too High

5.4 Alarm 5.1

5.1 alarm code means “Radiator Temperature too high”. This alarm is triggered when the radiator temperature is higher than the maximum.
A High Radiator temperature can be detected for the following reasons:

1. VFD Cooling line solenoid valve not correctly mounted
2. Faulty solenoid valve.
3. Other Software/Hardware reasons.

All the above possible root causes are deeply investigated in the following fault-tree analysis.

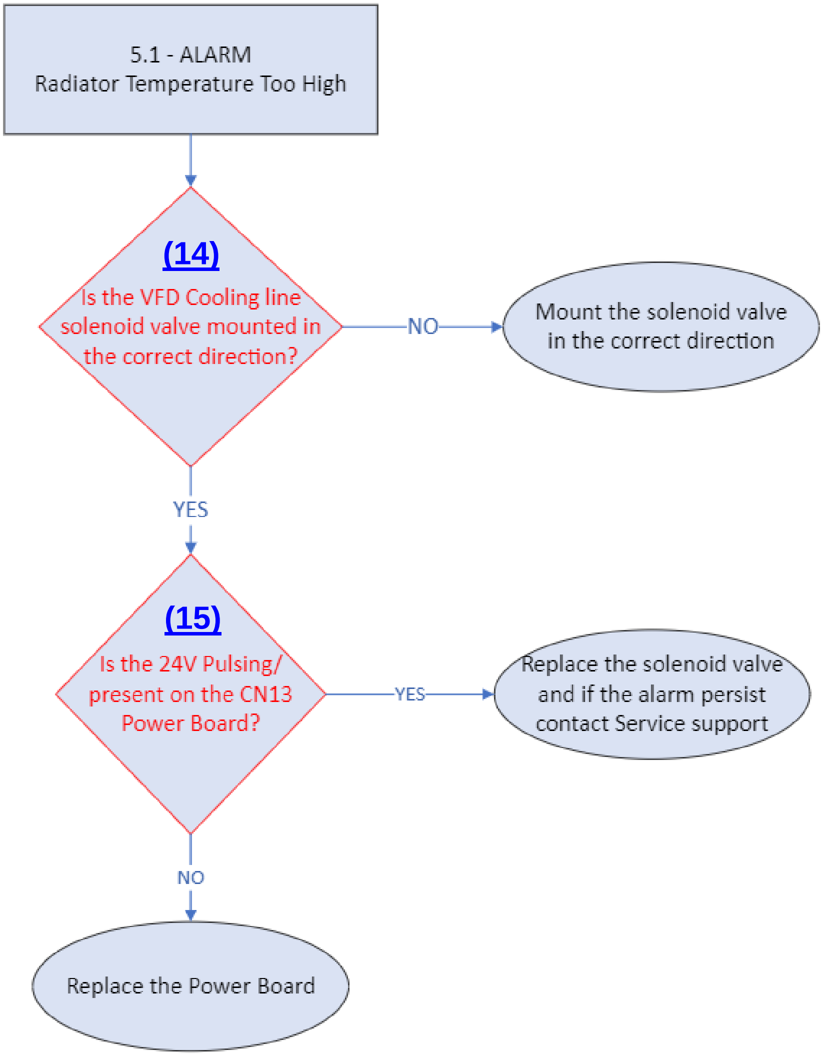


Figure 15 5.1 – ALARM Radiator Temperature Too High

6 ALARM TROUBLESHOOTING PROCEDURES

6.1 REG CARD Check: 24V DC on CN16 – CN17

Is 24 V DC present across REG_CN16 REG_CN17?

⚠	**DANGER: RISK OF ELECTROCUTION** The following check must be carried out with supplied VFD and VFD status in alarm. Take all safety precautions before proceeding.

Type of measurement: DC Voltage

Using a multimeter measure, the voltage across Regulation Card connectors: REG_CN16 and REG_CN17.

- Place the negative lead on the REG_CN16 PIN 2 (0V spot)
- Place the positive lead on the REG_CN16 PIN1 (+24V)

repeat the process for REG_CN17 PIN1 and PIN2.
The two measurements must be respectively equal to 24V DC.

Connector	Red Lead	Black lead	Measurement expected
REG_CN16	PIN 1	PIN 2	24V DC
REG_CN17	PIN 1	PIN 2	24V DC

Table 6 REG CARD Check: 24V DC on CN16 - CN17 Measurement

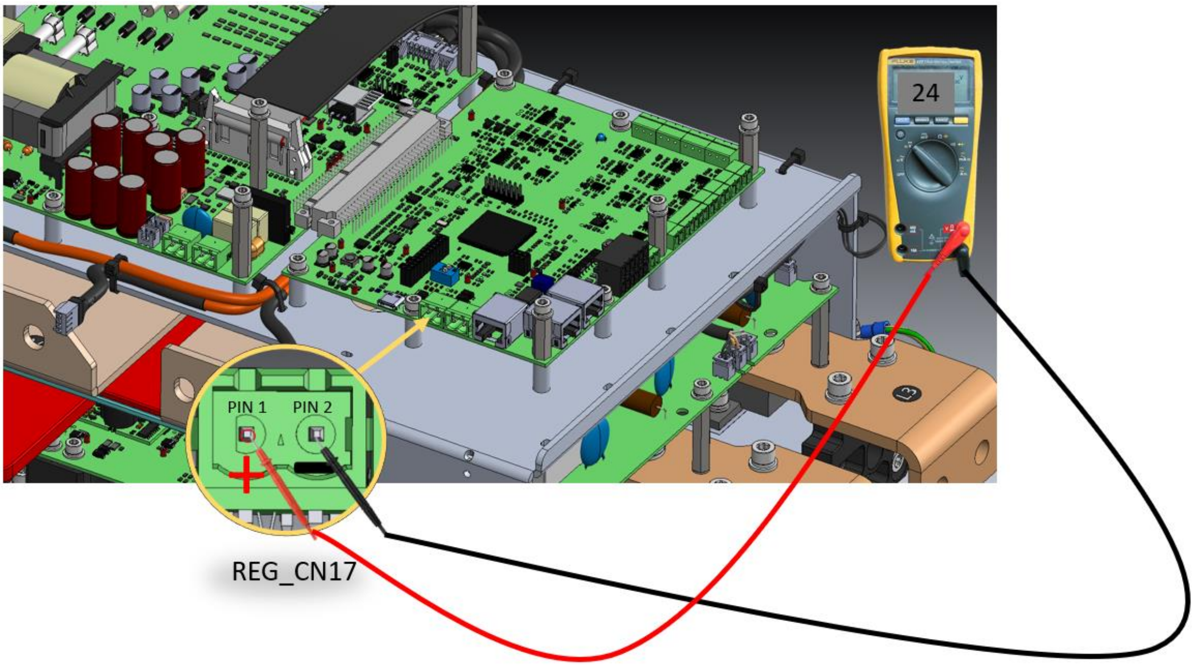


Figure 16 REG CARD Check: 24V DC on CN17

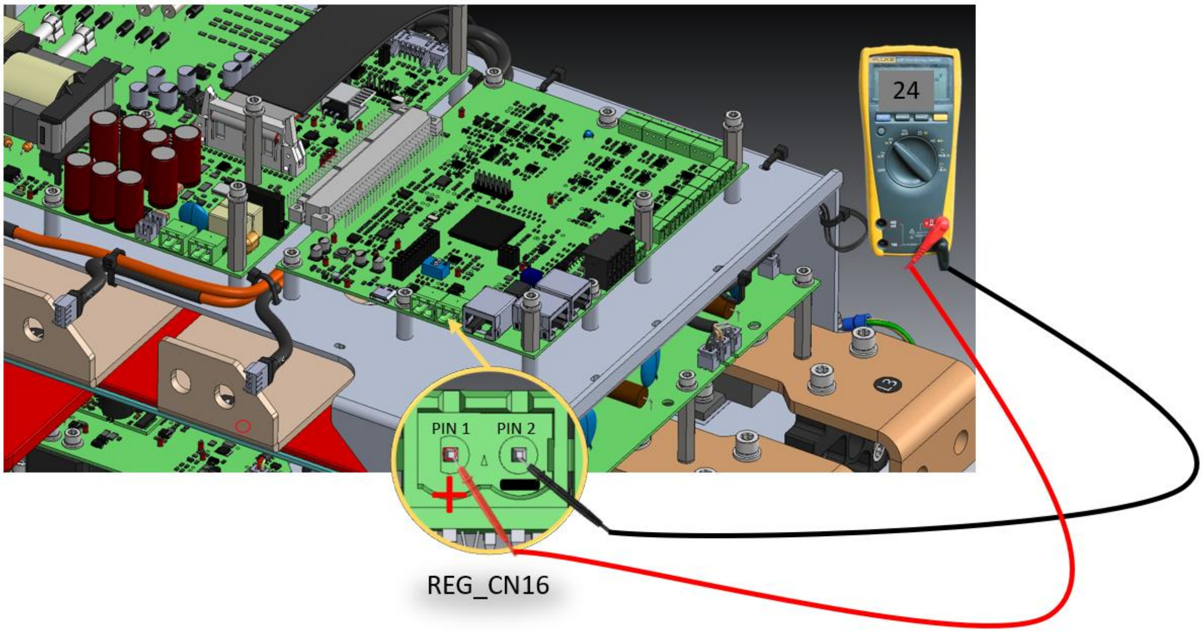


Figure 17 REG CARD Check: 24V DC on CN16

Is 24 V DC present across REG_CN16 REG_CN17?	Action
Yes	Continue with alarm troubleshooting tree. See **6.2 REG CARD CHECK: GUARDISTORS**
No	Continue with alarm troubleshooting tree. See **6.3. REG CARD CHECK: CN11-CN16 CONTINUITY**

6.2 REG CARD Check: Guardistors

Is the Voltage drop on the guardistors = 0V?

⚠	**DANGER: RISK OF ELECTROCUTION** The following check must be carried out with supplied VFD and VFD status in alarm. Take all safety precautions before proceeding.

Type of measurement: DC Voltage

Using a multimeter measure, the voltage across the two spots on the Regulation Card as per the image below.

- Place the negative lead on the spot (1)
- Switch the positive lead on the spot (3) and (2)

The two measurements must be respectively equal to 0V DC.

Red Lead	Black lead	Measurement expected
SPOT (1)	SPOT (3)	0V DC
SPOT (1)	SPOT (2)	0V DC

Table 7 REG CARD Check: Guardistors Measurement

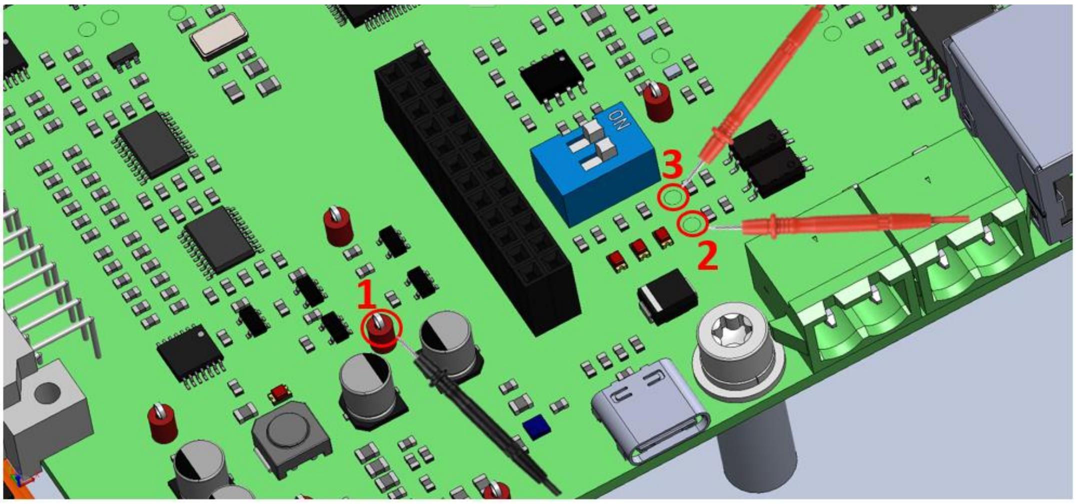


Figure 18 REG CARD Check: Guardistors

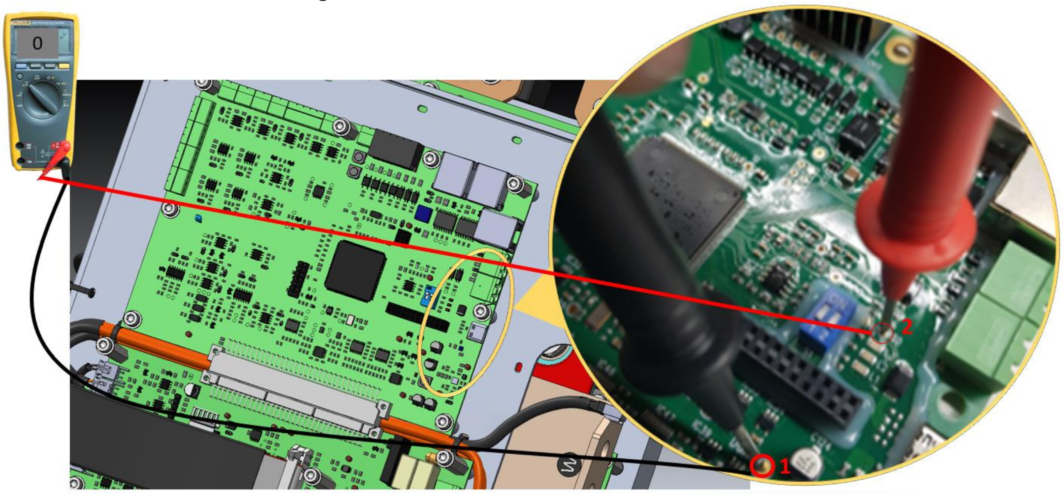


Figure 19 REG CARD Check: Guardistors

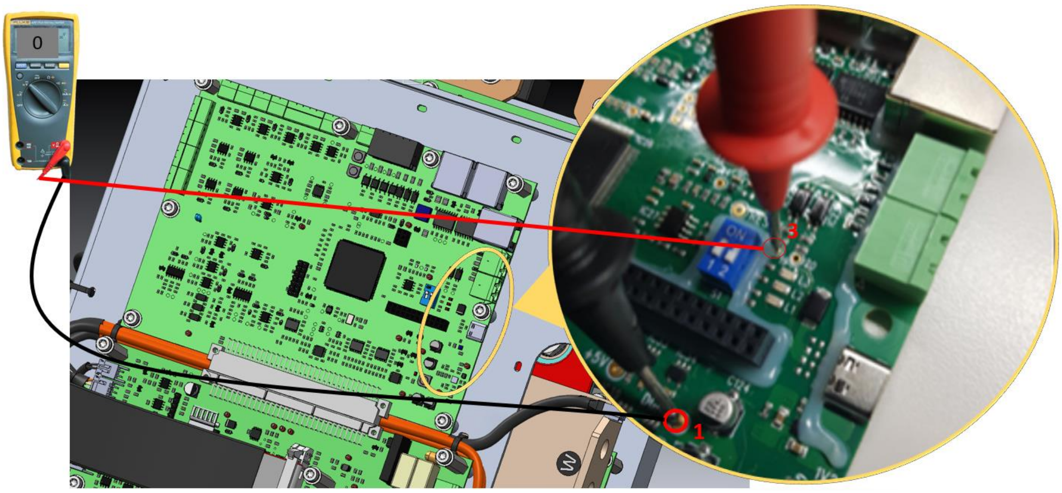


Figure 20 REG CARD Check: Guardistors

Is the Voltage drop on the guardistors = 0V?	**Action**
Yes	Update the software
No	Replace the Regulation Card (Ports are broken)

6.3 REG CARD Check: CN11-CN16 continuity

Is the cable and REG_CN11 PIN 2 in continuity?

DANGER: RISK OF ELECTROCUTION

The following check must be carried out with supplied VFD and VFD status in alarm. Take all safety precautions before proceeding.

Type of measurement: Continuity

Using a multimeter measure, the continuity on the cable across Regulation Card connector: REG_CN11 and REG_CN16.

- Place the negative lead on the REG_CN11 PIN 2 (0V spot)
- Place the positive lead on the REG_CN16 PIN 2 (0V spot)

In case of continuity the multimeter will beep.

Connector	Red Lead	Black lead
REG_CN11 and REG_CN16	REG_CN16 PIN 2	REG_CN11 PIN 2

Table 8 REG CARD Check: CN11 – CN16 continuity Measurement

INFORMATION
The lack of continuity could be a symptom of opening of the high pressure switches or an open cabling (OL).

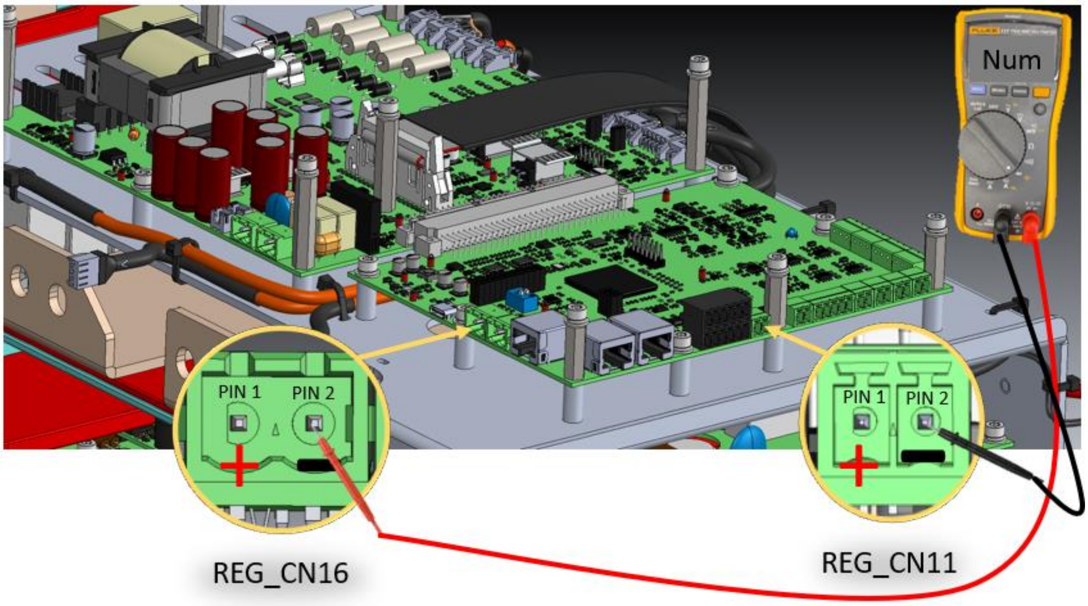


Figure 21 REG CARD Check: CN11 – CN16 Continuity

<table>
<tr><th>Is the cable and REG_CN11 PIN 2 in continuity?</th><th colspan="2">Action</th></tr>
<tr><td>Yes</td><td colspan="2">Continue with alarm troubleshooting tree.
See 6.4. REG CARD CHECK: 24V DC CN11</td></tr>
<tr><td rowspan="2">No</td><td rowspan="2">Check if the Mechanical High Pressure Switches are open.</td><td>Broken Mechanical High Pressure Switches or fake contacts, proceed to replace HPS or Fix fake contacts</td></tr>
<tr><td>VFD is Safe, verify why HPS is open</td></tr>
</table>

6.4 REG CARD Check: 24V DC CN11

Is 24V DC present on REG_CN11 PIN 1-2?

⚠	**DANGER: RISK OF ELECTROCUTION** The following check must be carried out with supplied VFD and VFD status in alarm. Take all safety precautions before proceeding.

Type of measurement: DC Voltage

Using a multimeter measure, the voltage across Regulation Card connector: REG_CN11

- Place the negative lead on the REG_CN11 PIN1 (0V spot)
- Place the positive lead on the REG_CN11 PIN2 (+24V DC)

The measurement must be 24V DC

Connector	Red Lead	Black lead	Measurement expected
REG_CN11	PIN 2	PIN 1	24V DC

Table 9 REG CARD Check: 24V DC CN11 Measurement

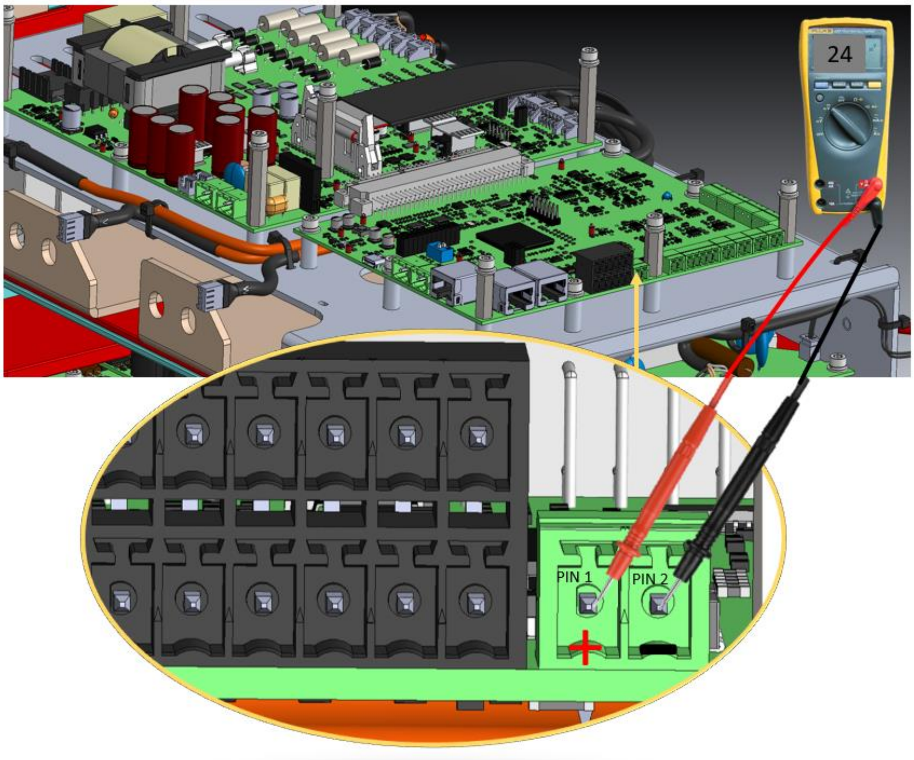


Figure 22 REG CARD Check: 24V DC on CN11

Is 24V DC present on REG_CN11 PIN 1-2?	Action
Yes	Replace the Regulation Card
No	Continue with alarm troubleshooting tree. See **6.5. REG CARD CHECK: 24V DC SUPPLY**

6.5 REG CARD Check: 24V DC Supply

Is the 24V DC supplied to the regulation card properly?

⚠	**DANGER: RISK OF ELECTROCUTION** The following check must be carried out with supplied VFD and VFD status in alarm. Take all safety precautions before proceeding.

Type of measurement: DC Voltage

Using a multimeter measure, the voltage across Regulation Card connectors: REG_CN16, REG_CN17 and REG_CN12.

- Place the positive lead on the REG_CN12 (spot 4)
- Switch the negative lead on the REG_CN16 and REG_CN17 PIN2 (0V SPOT)

The two measurements must be respectively equal to 24V DC.

Connector	Red Lead	Black lead	Measurement expected
REG_CN12 and REG_CN16	REG_CN12 (spot 4)	REG_CN16 PIN 2	24V DC
REG_CN12 and REG_CN17	REG_CN12 (spot 4)	REG_CN17 PIN 2	24V DC

Table 10 REG CARD Check: 24V DC Supply Measurement

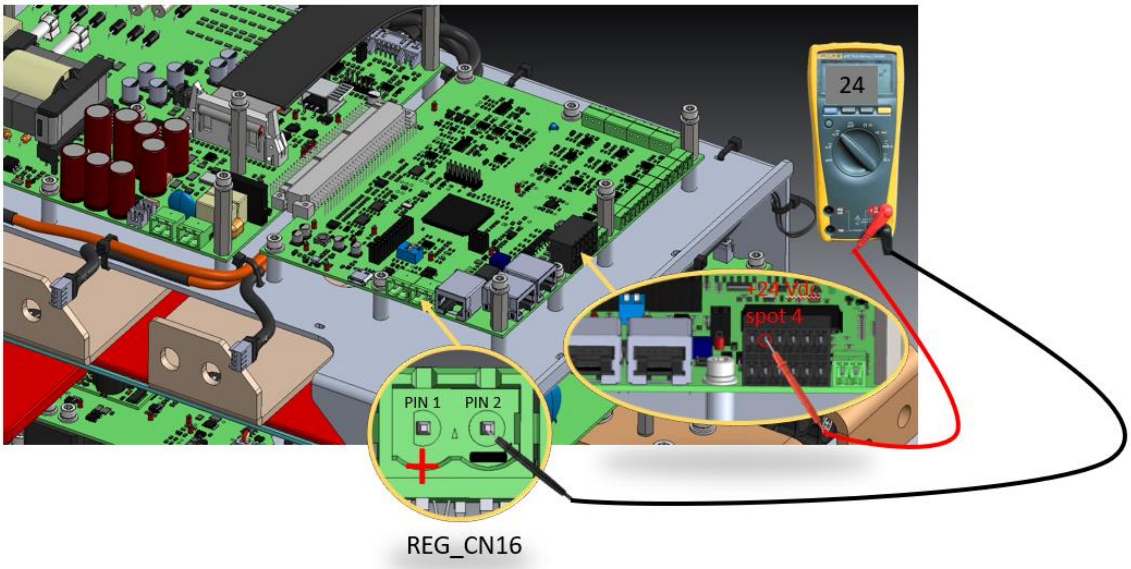


Figure 23 REG CARD Check: 24V DC on CN16

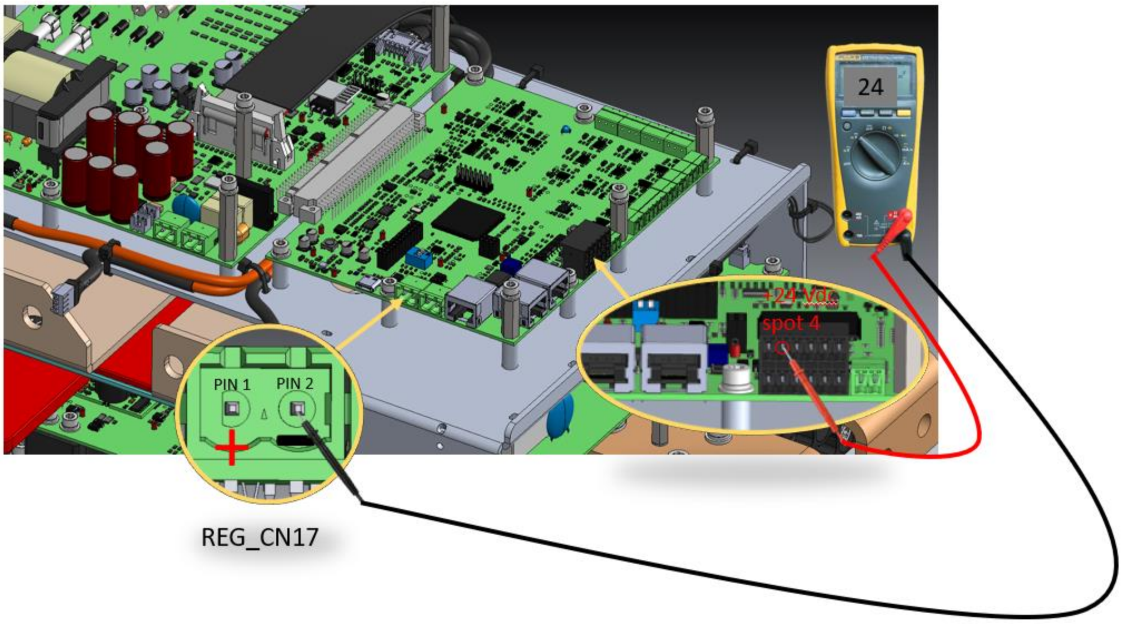


Figure 24 REG CARD Check: 24V DC on CN17

Is the 24V DC supplied to the regulation card properly?	**Action**
Yes	Replace the Regulation Card
No	Replace the Power Board

6.6 CURRENT TRANSDUCER Check: Output current measurement

Is the measured value in tolerance with the value read by the inverter?

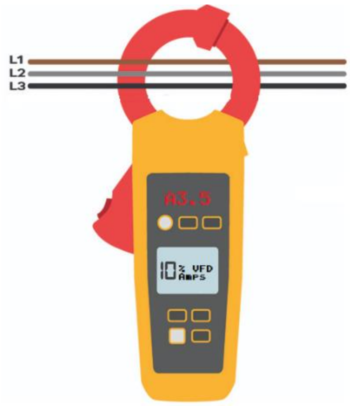


Figure 25 Current measurement

Phase Current	Multimeter Measured Value [A]	Inverter Value [A]	VFD Nav Params
IU			N83
IV			N84
IW			N85

Table 11 Output current measurement

INFORMATION
VFD Nav connection is Required.
Inverter AMPs Transducer VFD Nav Parameter code: N83, N84, N85

Is the measured value in tolerance with the value read by the inverter?	Action
Yes	Continue with alarm troubleshooting tree. See **6.8. MECHANICAL CHECK: OUTPUT SIDE BOLTS CHECK**
No	Continue with alarm troubleshooting tree. See **6.7. CURRENT TRANSDUCER CHECK: OUTPUT CURRENT TRANSDUCER**

6.7 CURRENT TRANSDUCER Check: Output current transducers

Are the pins correctly connected?

Visually check the pins behind the transducer are correctly connected, if not proceed to fix the connection.

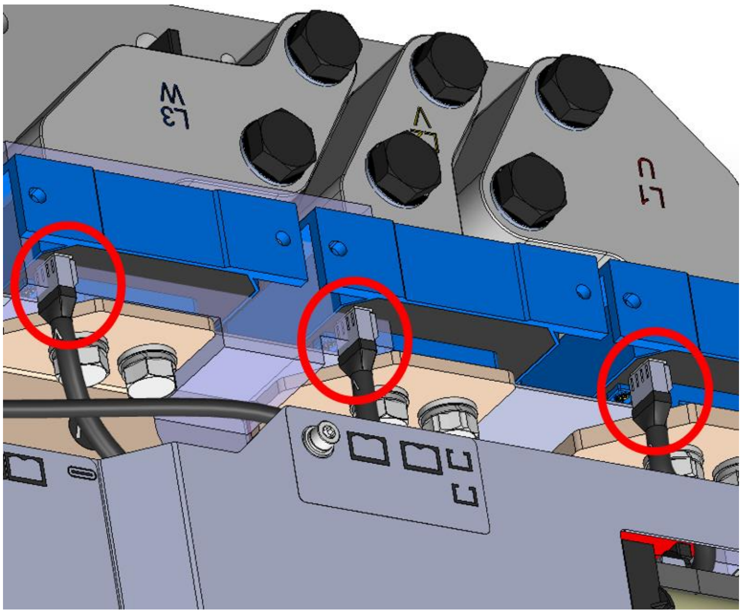


Figure 26 Output current transducer check

Are the pins correctly connected?	Action
Yes	Change transducer
No	Correctly connect the pins to the transducer. Continue with alarm troubleshooting tree. See **6.8 MECHANICAL CHECK: OUTPUT SIDE BOLTS CHECK**

6.8 MECHANICAL Check Output side bolts check

Are the Bolts correctly tighten up?

A. Connection bars to the compressor - the output bars of the inverter

For correct key size, refer to the following table:

VFD Size	Screw size	Tightening torque
330 kW – 400 kW	M10x75	35 Nm
200 kW	M10x45	35 Nm
90 kW – 120 kW	M10x60	35 Nm

Table 12 Connection bars to the compressors – the output bars of the inverter torque

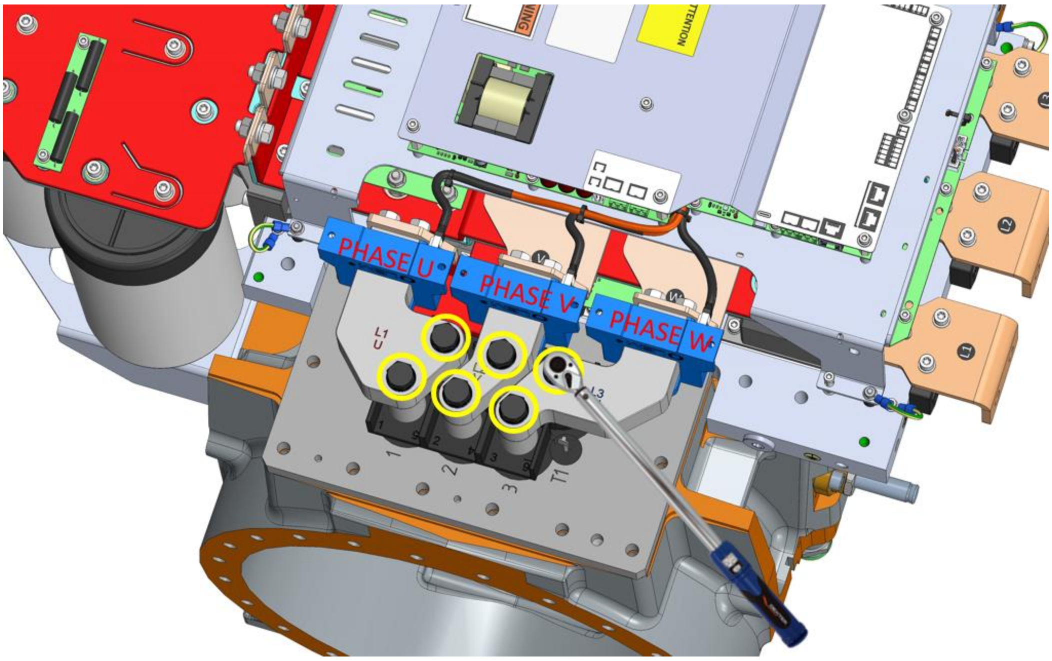


Figure 27 330/400kW DAE VFD Connection bar to the compressor

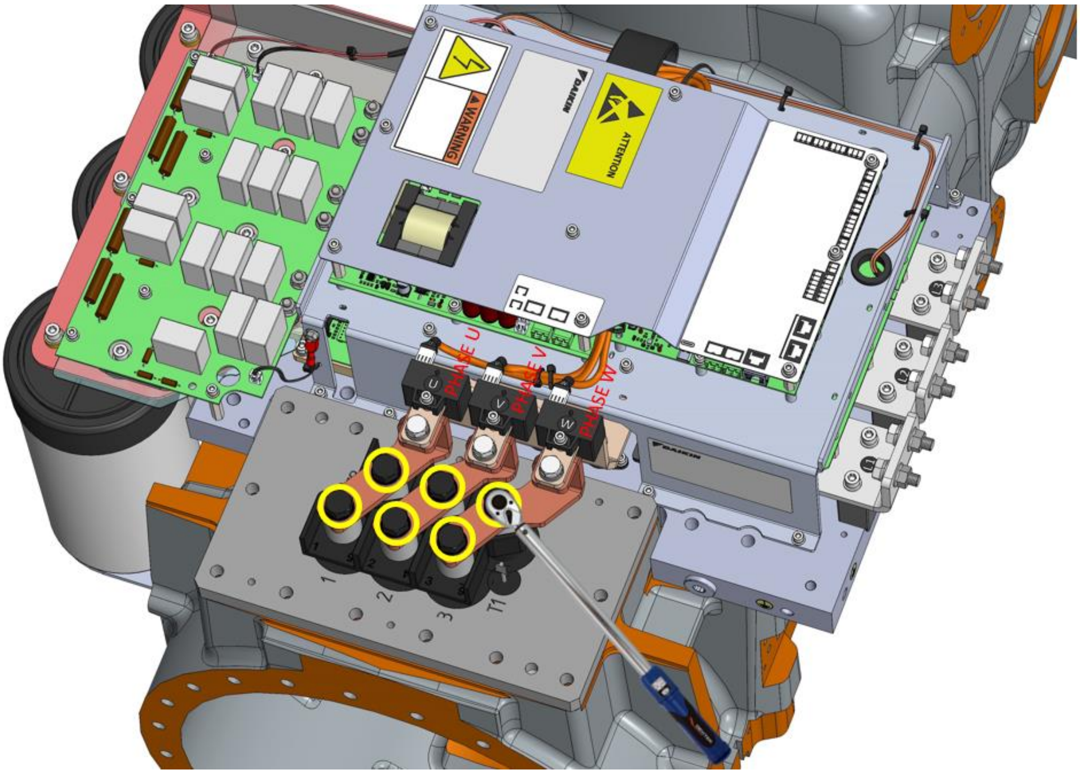


Figure 28 200kW DAE VFD Connection bar to the compressor

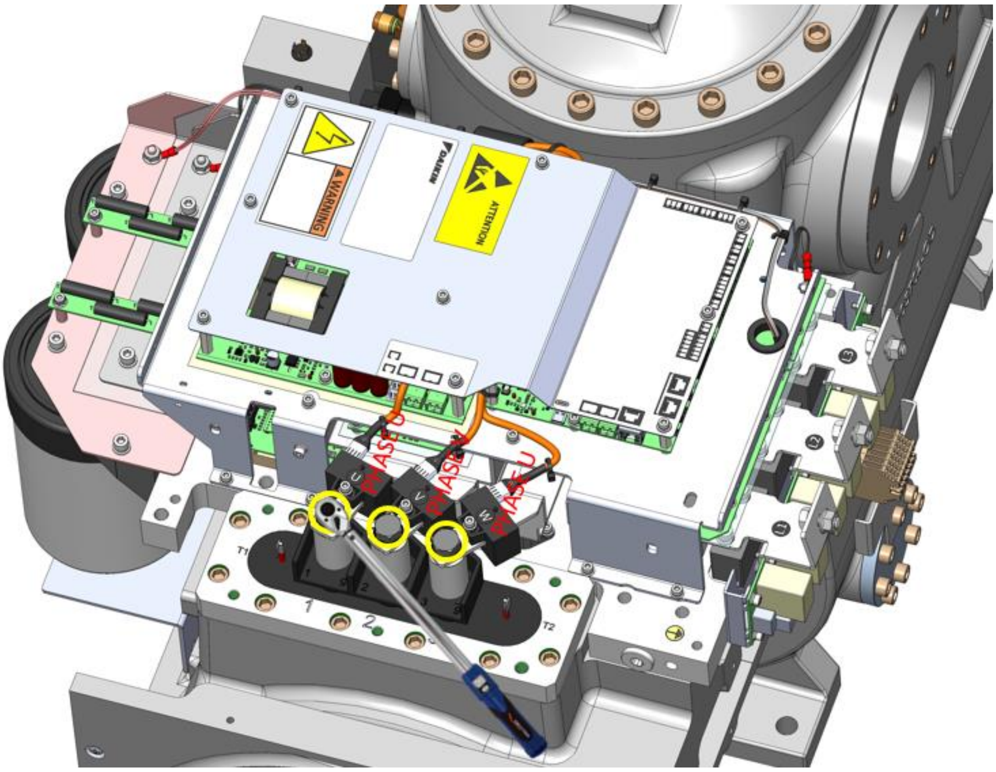


Figure 29 90/120kW DAE VFD Connection bar to the compressor

NOTICE
Only 200kW and 330/400kW inverters

B. Screws connecting to the compressor

For correct key size, refer to the following table:

VFD Size	Screw size	Tightening torque
330 – 400kW	M8X25	25 Nm
200 kW	M8X25	25 Nm

Table 13 Screws connecting to the compressor torque

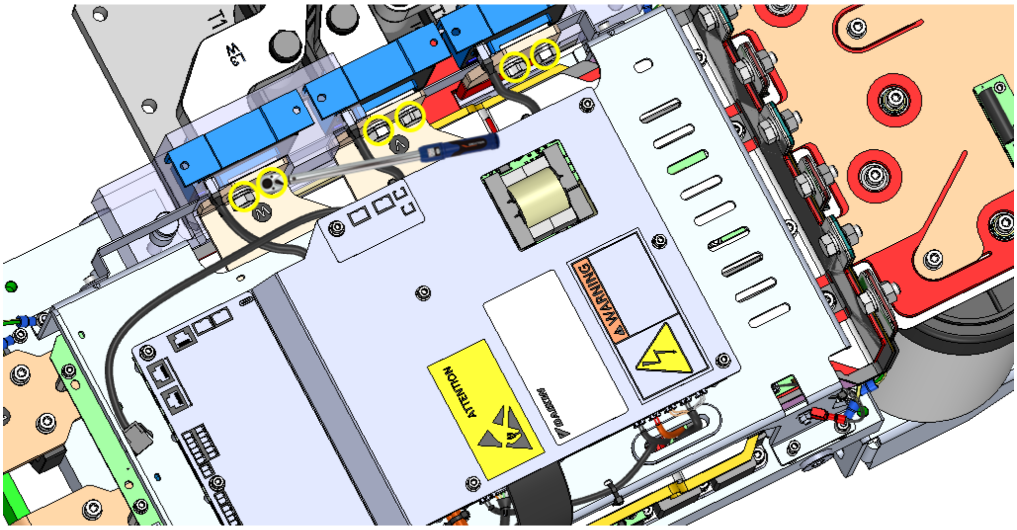


Figure 30 DAE VFD 330/400kW Screws connecting to the compressor

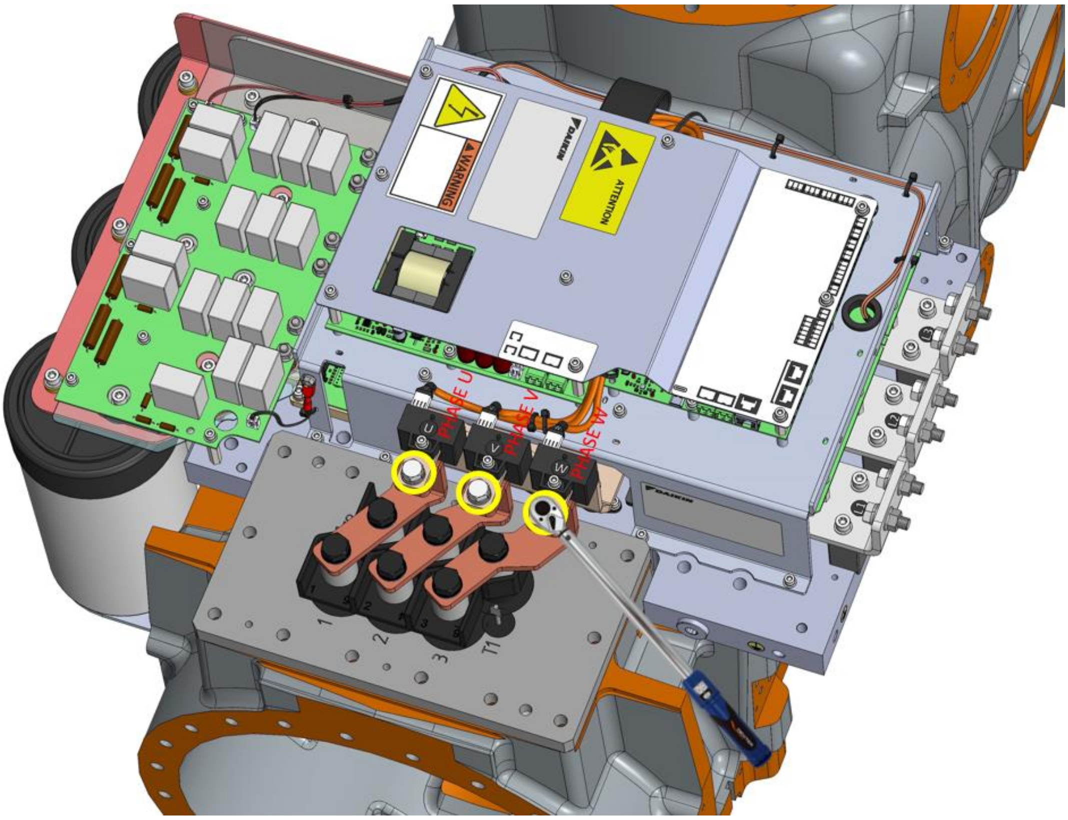


Figure 31 DAE VFD 200kW Screws connecting to the compressor

Are the Bolts correctly tighten up?	**Action**
Yes	Continue with alarm troubleshooting tree. See **6.9. IGBT CHECK**
No	Tighten the bolts

6.9 IGBT check

Is IGBT Check procedure verified?

For IGBT check, the parallel diode is checked.
The tests are carried out with the VFD disconnected and not powered.

> **CAUTION: RISK OF ARC FLASH**
>
> A substantial amount of energy can be stored in the capacitor bank even if its voltage is below 60 V. Do not short-circuit the DC-Link unless the capacitor bank is completely discharged. Before commencing any mechanical work on the inverter, discharge completely the DC-Link by means of a suitable external device or allow enough time for the DC-Link to be completely discharged (< 5 V)

6.9.1 Diode test

Set your multimeter in “Diode test function” and perform a test to the bottom and top IGBT diode, directly and indirectly. Repeat the operation for all three phases

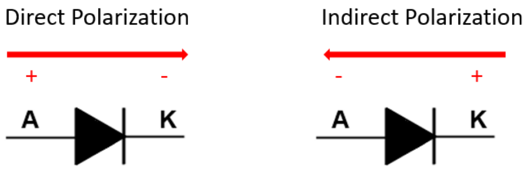


Figure 32 Direct and Indirect polarization in the diodes

a) To perform the **direct polarization diode test** to the top IGBT diode, place the negative lead of the multimeter on DC+ node and switch with the positive lead on all three phase outputs, as shown in the diagram below

b) To perform the **direct polarization diode test** to the bottom IGBT diode, place the positive lead of the multimeter on DC- node and switch with the negative lead on all three phases outputs, as shown in the diagram below

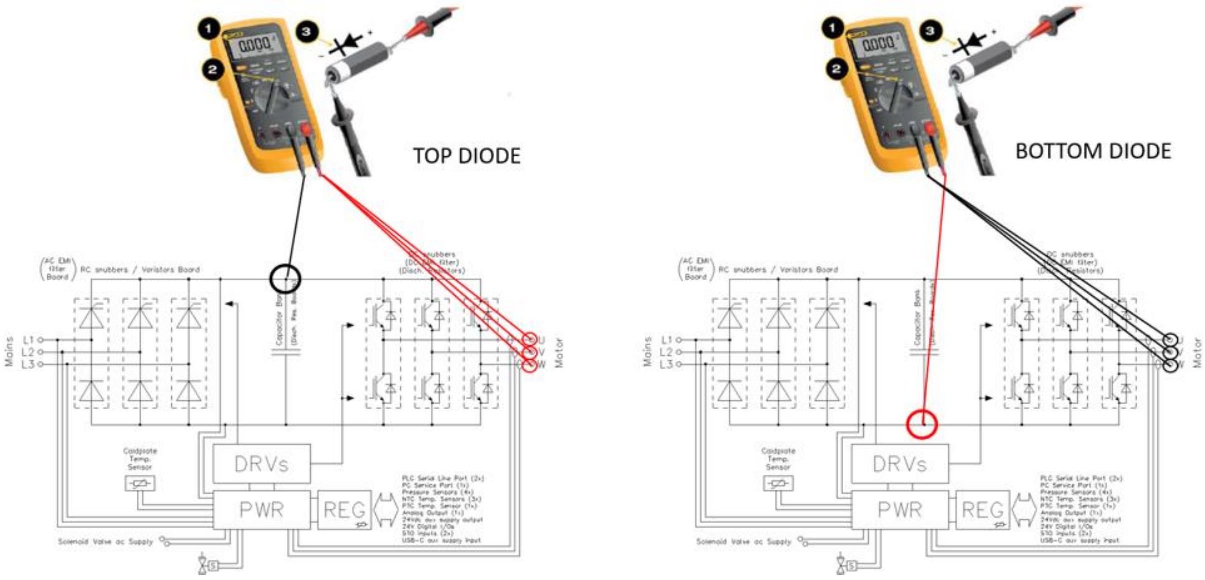


Figure 33 TOP/Bottom IGBT Direct polarization diode test

Refer to paragraph [***8. INVERTER MEASURING POINTS***] to place correctly the multimeter terminals on the phase and DC BUS plate.
Fill in the table in paragraph [***10. COLLECTION TABLES***] with the measurements obtained.

> **INFORMATION**
>
> Check the reference value for determining a functioning diode at paragraph **9.2.1 BOTTOM/TOP IGBT DIODES DIRECT POLARIZATION REFERENCE VALUES**

a) To perform the **indirect polarization diode test** to the top IGBT diode, place the positive lead of the multimeter on DC+ node and switch with the negative lead on all three phase outputs, as shown in the diagram below

b) To perform the **indirect polarization diode test** to the bottom IGBT diode, place the negative lead of the multimeter on DC- node and switch with the positive lead on all three phase outputs, as shown in the diagram below

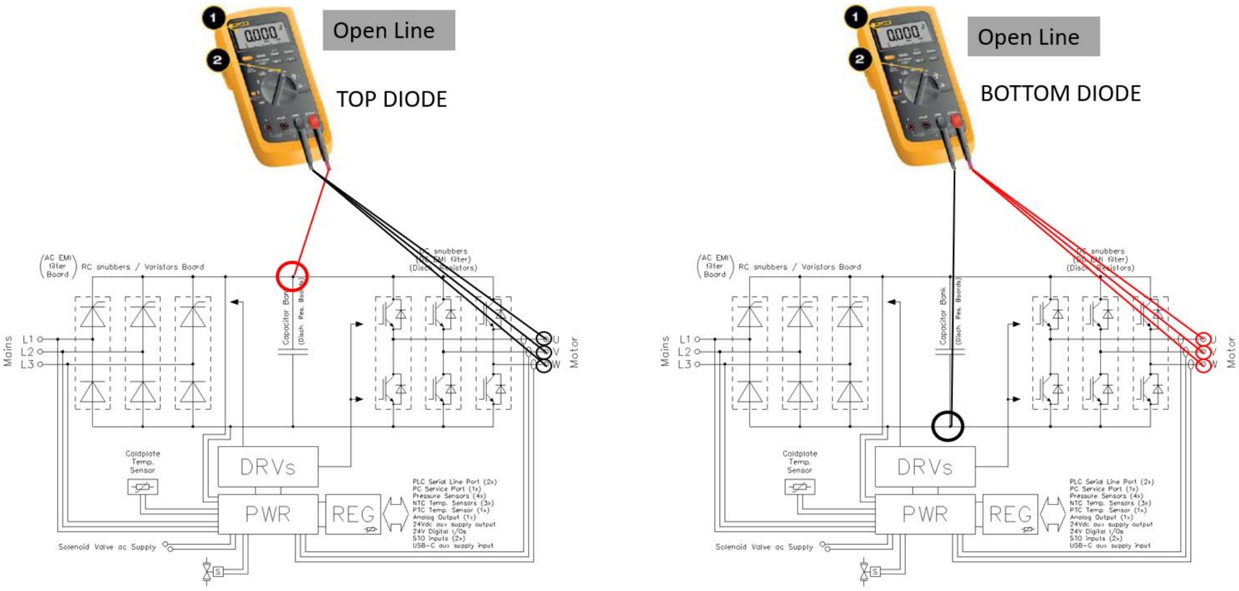


Figure 34 TOP/Bottom IGBT Indirect polarization diode test

Refer to paragraph **8. INVERTER MEASURING POINTS** to place correctly the multimeter terminals on the phase and DC BUS plate.
Fill in the table in paragraph **10. COLLECTION TABLES** with the measurements obtained.

INFORMATION
The reference value for determining a functioning diode is “OL: OPEN LINE”

Is IGBT Check procedure verified?	Action
Yes	Continue with alarm troubleshooting tree. See **6.10. POWER CARD CHECK: 5V DC ON 18 – 23 SPOTS**
No	Replace the inverter

6.10 POWER CARD Check: 5V DC on 18 – 23 spots

Is 5V DC present across 18 to 23 spots?

	DANGER: RISK OF ELECTROCUTION *The following check must be carried out with supplied VFD and VFD status in alarm. Take all safety precautions before proceeding.*

Type of measurement: DC Voltage

Using a multimeter measure, the voltage across Power spots: GND and 18 to 23 spots

- Place the negative lead on the GND spot
- Switch the positive lead from 18 to 23 spot, as shown in the image below

The measurements must be respectively equal to 5V DC.

Red Lead	Black lead	Measurement expected
SPOT (18)	SPOT (GND)	5V DC
SPOT (19)	SPOT (GND)	5V DC
SPOT (20)	SPOT (GND)	5V DC
SPOT (21)	SPOT (GND)	5V DC
SPOT (22)	SPOT (GND)	5V DC
SPOT (23)	SPOT (GND)	5V DC

Table 14 POWER CARD Check: 5V DC on 18 - 23 spots Measurement

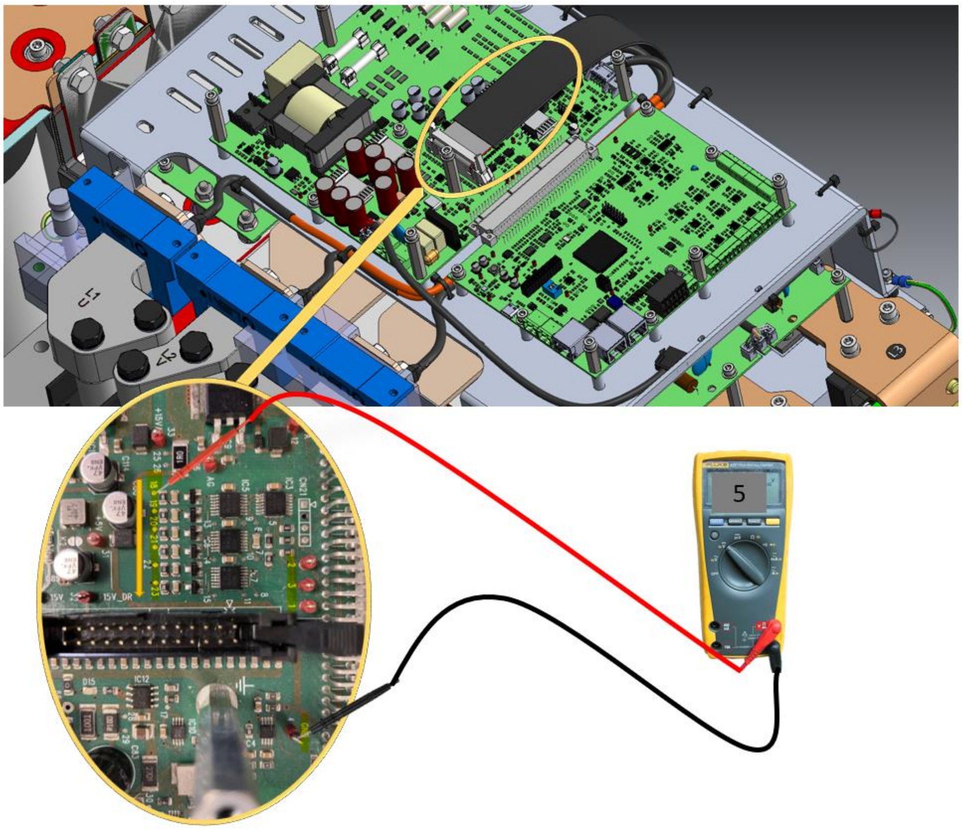


Figure 35 POWER CARD Check: 5V DC on 18 – 23 spots

Is 5V DC present across 18 to 23 spots?	Action
Yes	Continue with alarm troubleshooting tree. See **6.11. POWER CARD CHECK: 5V DC ON 1 2 3 - GND**
No	Continue with alarm troubleshooting tree. See **6.12. POWER CARD CHECK: 0V DC ON 1 2 3 – GND**

6.11 POWER CARD Check: 5V DC on 1 2 3 - GND

Is 5V DC present on 1-GND or/and 2-GND or/and 3-GND and VFD still in alarm?

⚠	***DANGER: RISK OF ELECTROCUTION*** *The following check must be carried out with supplied VFD and VFD status in alarm. Take all safety precautions before proceeding.*

Type of measurement: DC Voltage

Using a multimeter measure, the voltage across Power spots: GND and 1 to 3 spots

- Place the negative lead on the GND spot
- Switch the positive lead from 1 to 3 spot, as shown in the image below

The two measurements must be respectively equal to 5V DC.

Red Lead	Black lead	Measurement expected
SPOT (1)	SPOT (GND)	5V DC
SPOT (2)	SPOT (GND)	5V DC
SPOT (3)	SPOT (GND)	5V DC

Table 15 POWER CARD Check: 5V DC on 1 2 3 - GND Measurement

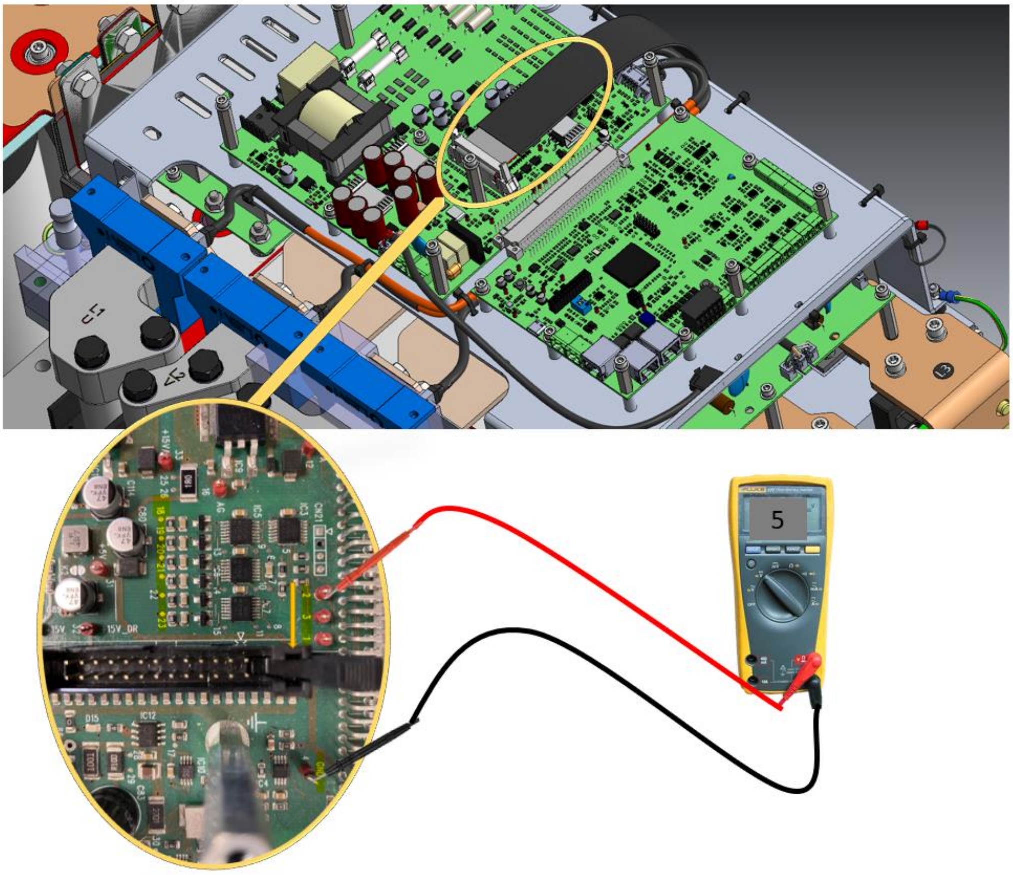


Figure 36 POWER CARD Check. 5V DC on 1 2 3 - GND

Is 5V DC present on 1-GND or/and 2-GND or/and 3-GND and VFD still in alarm?	Action
Yes	Replace Regulation Board
No	Replace Power Board

6.12 POWER CARD Check: 0V DC on 1 2 3 – GND

Is 0V DC present on 1-GND or/and 2-GND or/and 3-GND and VFD still in alarm?

DANGER: RISK OF ELECTROCUTION

The following check must be carried out with supplied VFD and VFD status in alarm. Take all safety precautions before proceeding.

Type of measurement: DC Voltage

Using a multimeter measure, the voltage across Power spots: GND and 1 to 3 spots

- Place the negative lead on the GND spot
- Switch the positive lead from 1 to 3 spot, as shown in the image below

The two measurements must be respectively equal to 5V DC.

Red Lead	Black lead	Measurement expected
SPOT (1)	SPOT (GND)	0V DC
SPOT (2)	SPOT (GND)	0V DC
SPOT (3)	SPOT (GND)	0V DC

Table 16 POWER CARD Check: 0V DC on 1 2 3 - GND Measurement

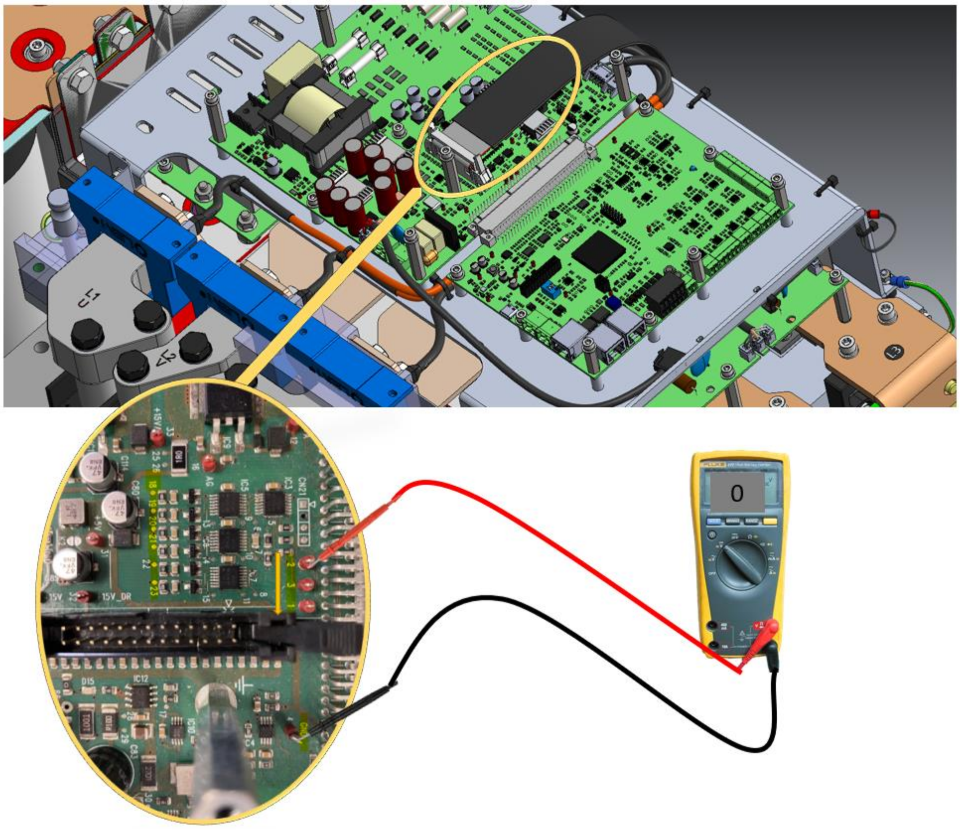


Figure 37 POWER CARD Check: 0V DC on 1 2 3 – GND

Is 0V DC present on 1-GND or/and 2-GND or/and 3-GND and VFD still in alarm?	Action
Yes	DRV Faulty or Flat Cable Faulty REPLACE ENTIRE VFD
No	Replace Regulation Board

6.13 COMPRESSOR Check: Motor thermal probe check

Is the motor thermal probe correctly working?

6.13.1 Terminal thermistor electrical continuity test

Type of measurement: Resistance test - Ω mode

- Turn on the multimeter
- Connect the positive (red tip) and negative lead (black tip) on the two terminal thermistor on the motor terminal block.
- Measure the resistance

The measurement value must be in this range: 48 – 360 Ω at the reference temperature of 15÷35°C

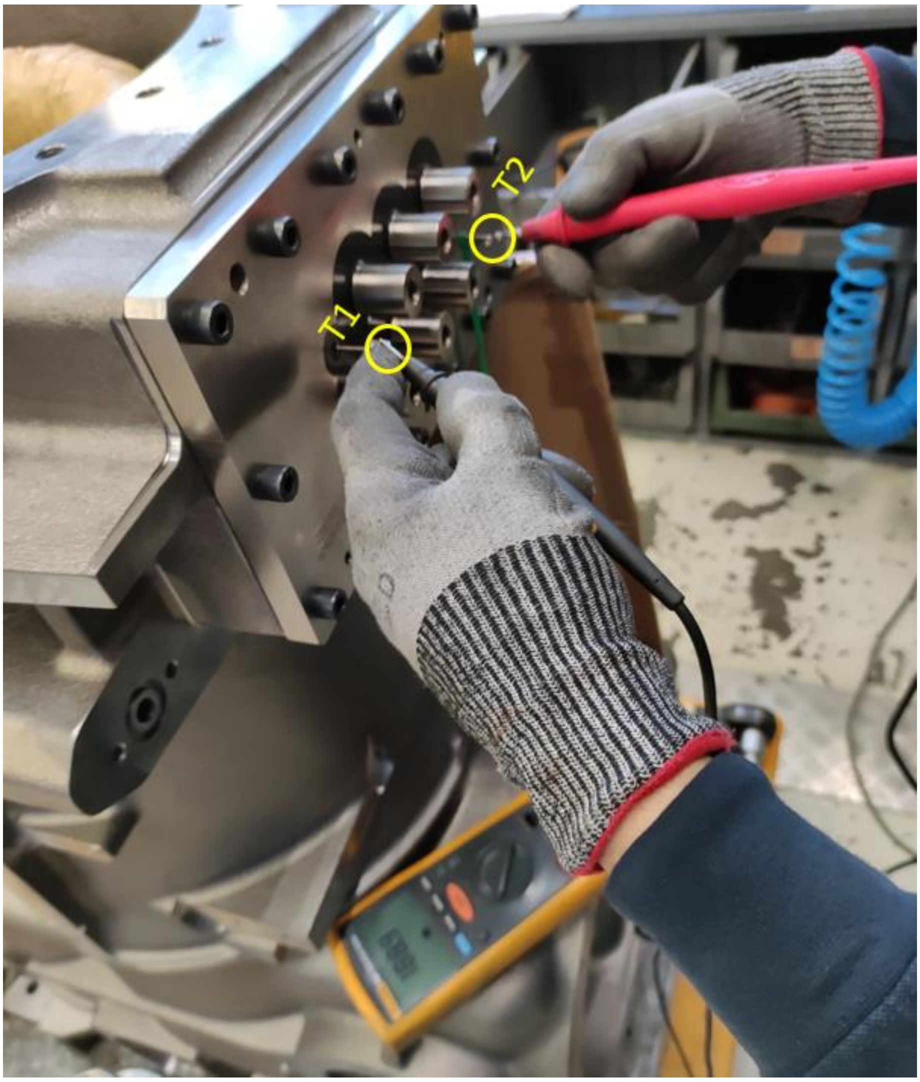


Figure 38 Terminal thermistor electrical continuity test

6.13.2 Electrical insulation terminal thermistor - earth

Type of measurement: Resistance test - Ω mode

- Turn on the multimeter
- Connect the positive (red tip) on each terminal thermistor
- Connect the negative lead (black tip) on the motor terminal plate.
- Measure the resistance

The measurement value must be >22 kΩ

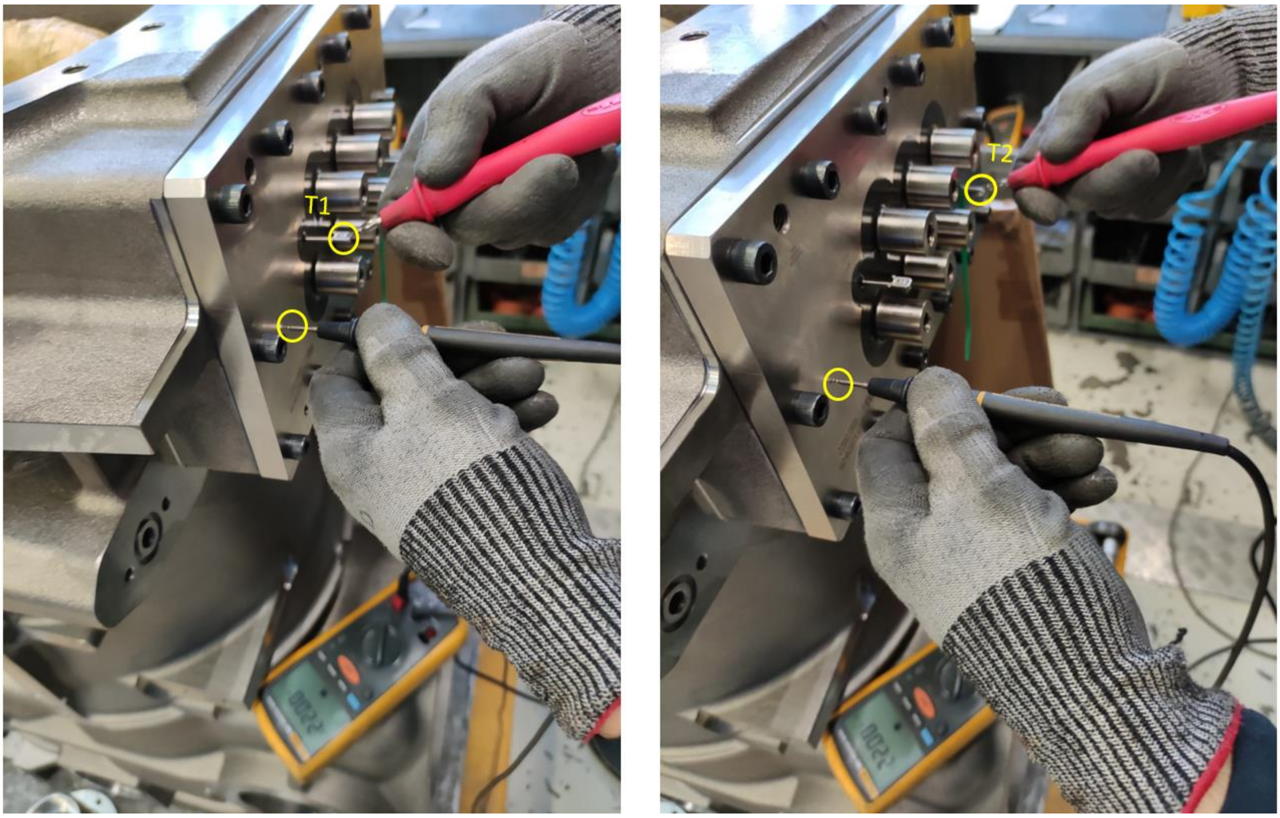


Figure 39 Electrical insulation terminal thermistor - earth

6.13.3 Electrical insulation terminal thermistor - motor phases

Type of measurement: Resistance test - Ω mode

- Turn on the multimeter
- Connect the positive (red tip) on each terminal thermistor
- Connect the negative lead (black tip) on each power terminal
- Measure the resistance

The measurement value must be more than 22 kΩ

RED LEAD	BLACK LEAD	Accettable Value
Thermistor 1	Terminal 1	>22kΩ
Thermistor 1	Terminal 2	>22kΩ
Thermistor 1	Terminal 3	>22kΩ
Thermistor 1	Terminal 4 (if available)	>22kΩ
Thermistor 1	Terminal 5 (if available)	>22kΩ
Thermistor 1	Terminal 6 (if available)	>22kΩ

Table 17 Electrical insulation terminal thermistor 1 – motor phases

RED LEAD	BLACK LEAD	Accettable Value
Thermistor 2	Terminal 1	>22kΩ
Thermistor 2	Terminal 2	>22kΩ
Thermistor 2	Terminal 3	>22kΩ
Thermistor 2	Terminal 4 (if available)	>22kΩ
Thermistor 2	Terminal 5 (if available)	>22kΩ
Thermistor 2	Terminal 6 (if available)	>22kΩ

Table 18 Electrical insulation terminal thermistor 2 – motor phases

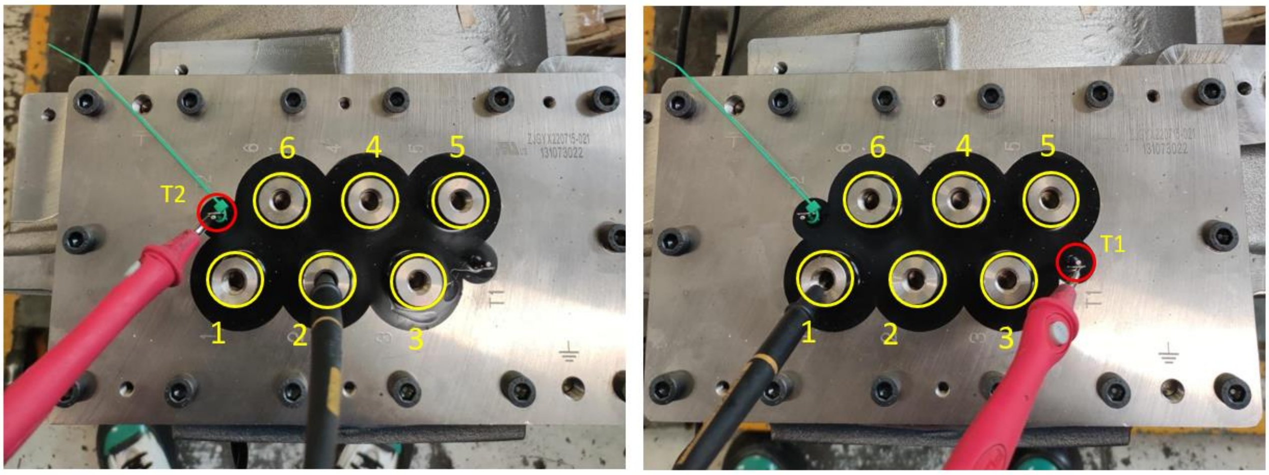


Figure 40 Electrical insulation terminal thermistor – motor phases

Is the motor thermal probe correctly working?	Action
Yes	Send the alarm logs to service support. Refer to [7.4. VFD NAV ALARMS SAVING](#)
No	Replace the motor

6.14 MECHANICAL Check: VFD Cooling line solenoid valve correct assembly

Is the VFD Cooling line solenoid valve mounted in the correct direction?

Ensure the solenoid valve for the VFD cooling line is mounted correctly, and that it isn't upside down. As demonstrated in the image below, you must align the high pressure inlet gas with the valve inlet.

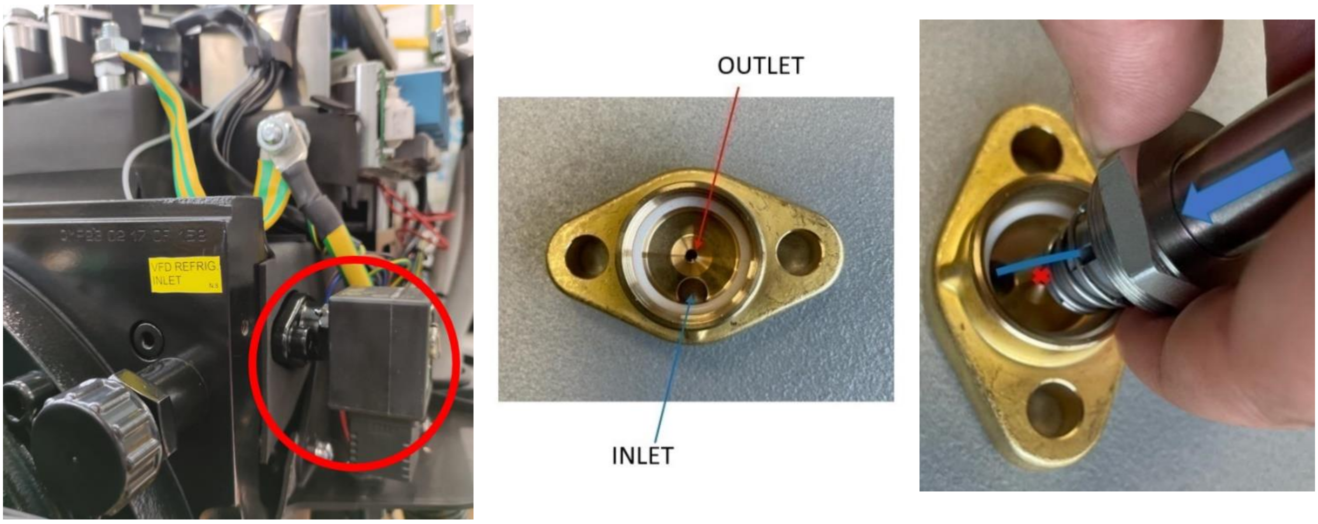


Figure 41 VFD Solenoid Valve installation

Is the VFD Cooling line solenoid valve mounted in the correct direction?	Action
Yes	Continue with alarm troubleshooting tree. See [6.15. POWER CARD CHECK: 24V DC ON CN13](#)
No	Mount the solenoid valve in the correct direction

6.15 POWER CARD Check: 24V DC on CN13

Is 24V DC Pulsing/present on the PWR_CN13

	DANGER: RISK OF ELECTROCUTION *The following check must be carried out with supplied VFD and VFD status in alarm. Take all safety precautions before proceeding.*

Type of measurement: DC Voltage

Using a multimeter measure, the voltage across Regulation Card connector: PWR_CN13

- Place the negative lead on the PWR_CN13 PIN2 (0V spot)
- Place the positive lead on the PWR_CN13 PIN1 (+24V DC)

The measurement must be 24V DC.

Connector	Red Lead	Black lead	Measurement expected
PWR_CN13	PIN 1	PIN 2	24V DC

Table 19 POWER CARD Check: 24V DC on CN13 Measurement

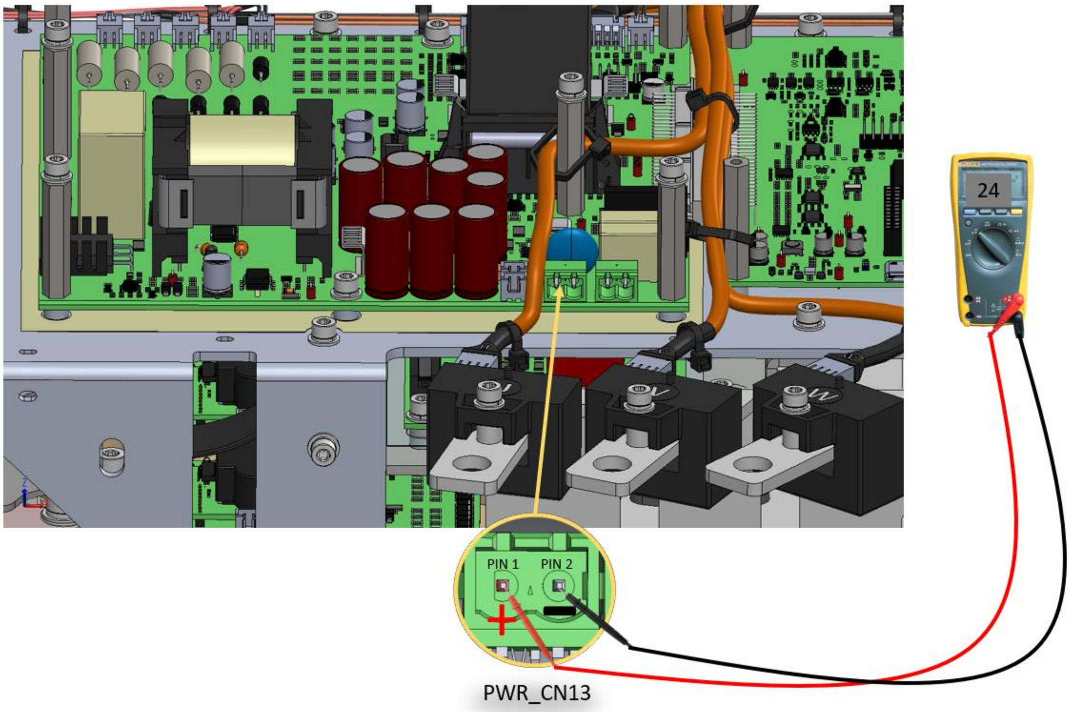


Figure 42 POWER CARD Check: 24V DC on CN13

Is 24V DC Pulsing/present on the PWR_CN13	Action
Yes	Replace the solenoid valve and if the alarm persist contact Service Support
No	Replace the Power Board

7 ADDITIONAL PROCEDURES

In case of DAE VFD failure, the service team may request to send the Alarm logs and to perform additional checks needed to deeply investigate the issues.
In particular, the following procedures are explained in this chapter:

- DC Bus Check
- SCR check
- Megger Test
- VFD Nav Alarms saving

7.1 DC Bus Check

This check consists in measuring the voltage across the DC BUS.
Set your multimeter in “DC Voltage” and perform a test to the DC BUS, **VFD must be powered**.

WARNING

The test is carried out with a **POWERED VFD.** Observe ESD precautions and wear protective gloves

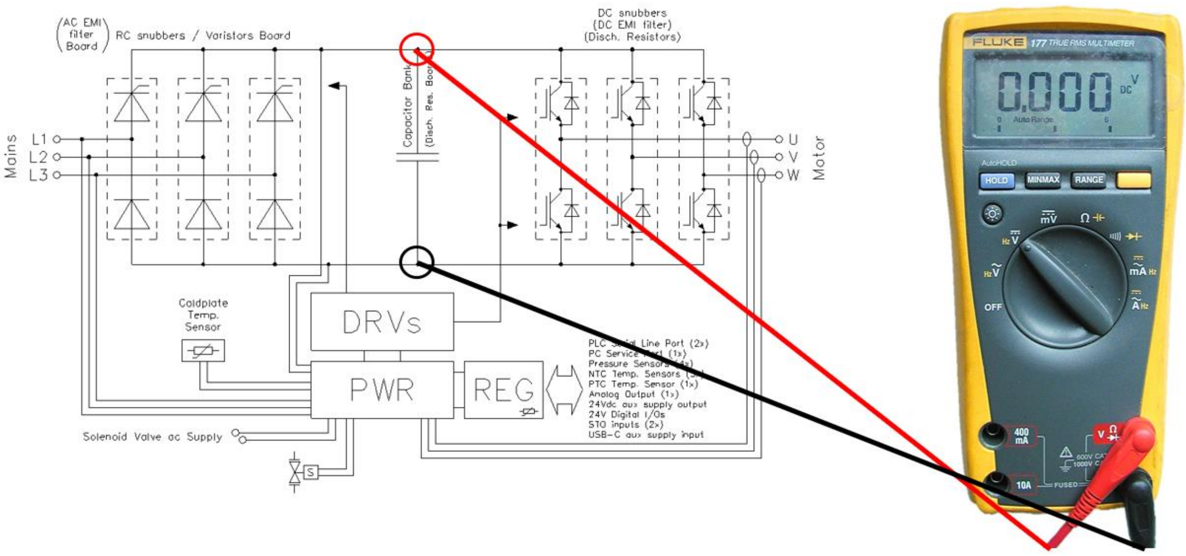


Figure 43 DC-BUS Voltage measurement

Refer to paragraph **8. INVERTER MEASURING POINTS** to place correctly the multimeter terminals on the phase and DC BUS plate.
Fill in the table in paragraph **10. COLLECTION TABLES** with the measurements obtained.

INFORMATION
The reference value for determining a functioning DC-Bus can be determined with average power supply measured * (1,35 to 1,41) Range.
For example if the average power supply is 402V and DC-BUS is 554,8V, the DC-BUS is ok.

7.2 SCR check

SCR section is made by a series of “bottom” diode and a “top” thyristor.
The bottom diode must be checked in diode test function.
Top thyristor must be checked in Ohm mode.
The tests are carried out with the VFD disconnected and not powered

CAUTION: RISK OF ARC FLASH
A substantial amount of energy can be stored in the capacitor bank even if its voltage is below 60 V. Do not short-circuit the DC-Link unless the capacitor bank is completely discharged. Before commencing any mechanical work on the inverter, discharge completely the DC-Link by means of a suitable external device or allow enough time for the DC-Link to be completely discharged (< 5 V)

7.2.1 Diode test

Set your multimeter in “Diode test function” and perform a test to the bottom SCR diode, directly and indirectly.
Repeat the operation for all three phases

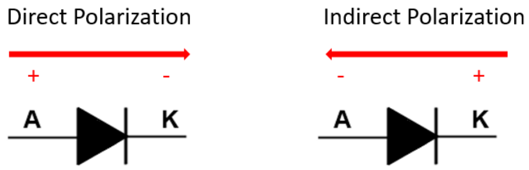


Figure 44 Direct and Indirect polarization in the diodes

INFORMATION

It is not possible to use the diode test for top thyristors.
Refer to paragraph **[7.2.2. Ohm mode test]** for Ohm mode test explanation

---

Refer to paragraph **[8. INVERTER MEASURING POINTS]** to place correctly the multimeter terminals on the phase and DC BUS plate.
Fill in the table in paragraph **[10. COLLECTION TABLES]** with the measurements obtained.

To perform the **direct polarization diode test** to the bottom SCR diode, place the positive lead of the multimeter on DC- node and switch with the negative lead on all three phase inputs, as shown in the diagram below

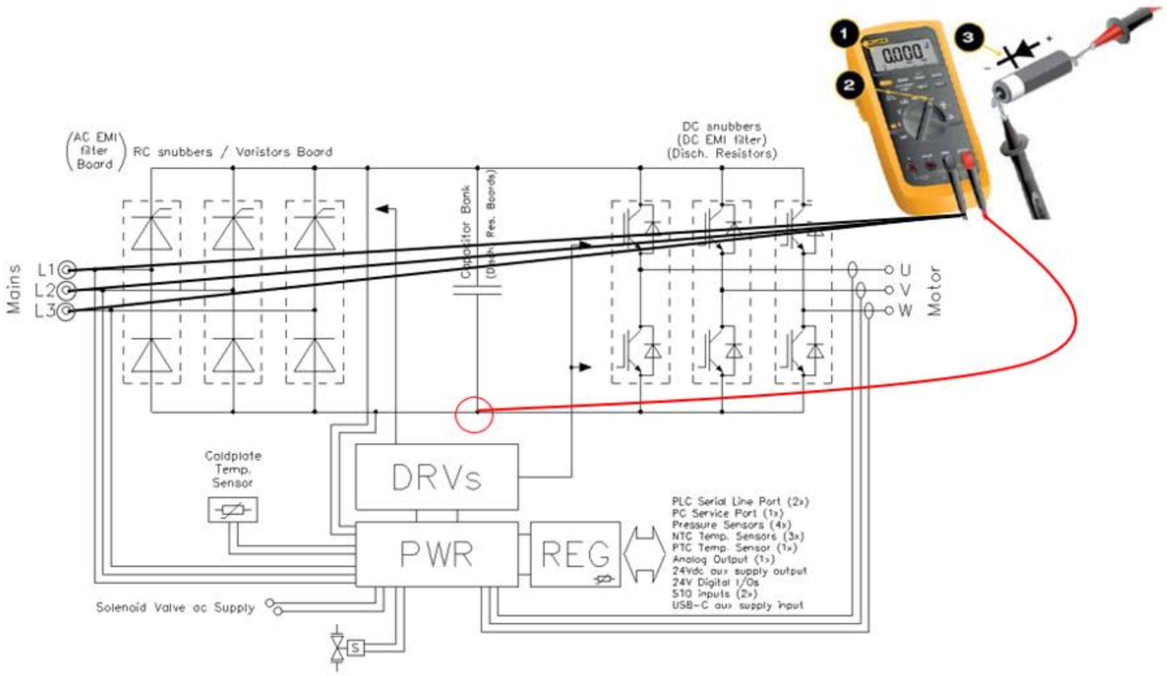


Figure 45 Bottom SCR Direct polarization diode test

Refer to paragraph **[8. INVERTER MEASURING POINTS]** to place correctly the multimeter terminals on the phase and DC BUS plate.
Fill in the table in paragraph **[10. COLLECTION TABLES]** with the measurements obtained.

INFORMATION

Check the reference value for determining a functioning diode at paragraph **[9.1.1 BOTTOM SCR DIODES REFERENCE VALUES]**

To perform the **indirect polarization diode test** to the bottom SCR diode, place the negative lead of the multimeter on DC- node and switch with the positive lead on all three phase inputs, as shown in the diagram below

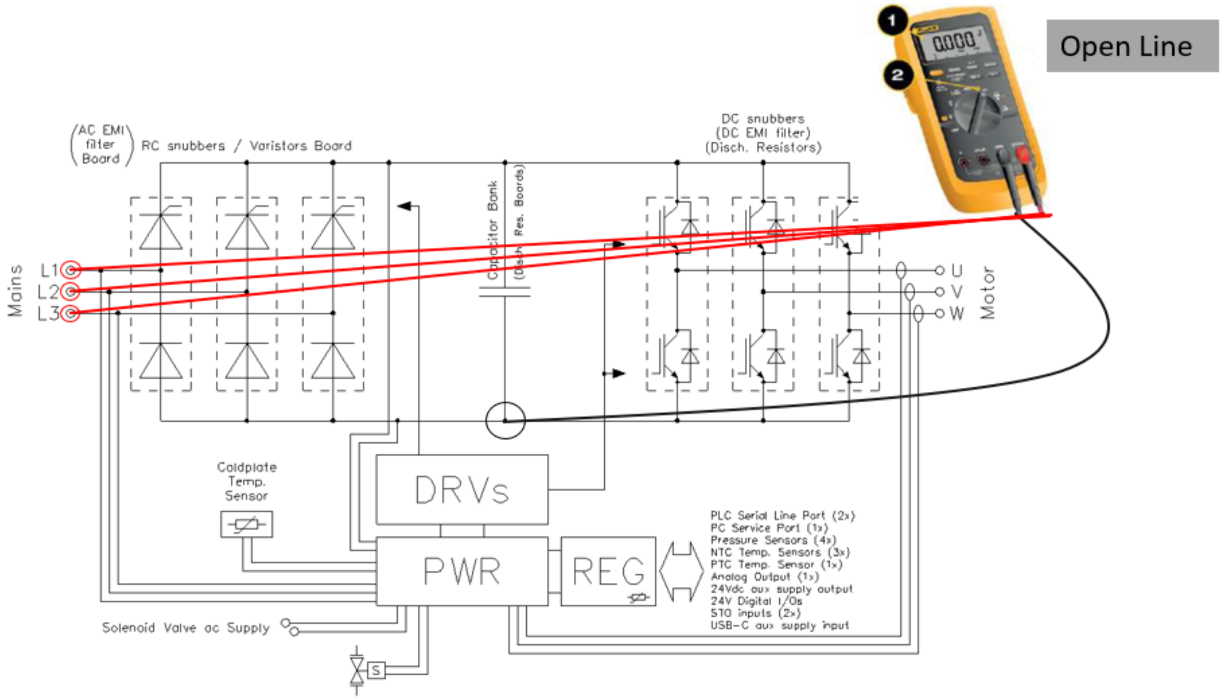


Figure 46 Bottom SCR indirect polarization diode test

Refer to paragraph [8. INVERTER MEASURING POINTS]() to place correctly the multimeter terminals on the phase and DC BUS plate.
Fill in the table in paragraph [10. COLLECTION TABLES]() with the measurements obtained.

INFORMATION

The reference value for determining a functioning diode is “OL: OPEN LINE”

7.2.2 Ohm mode test

Set your multimeter in “Ohm mode function” and perform a test to the top thyristor directly and indirectly. Repeat the operation for all three phases.

To perform the **ohm mode test** to the top SCR thyristor, place the positive lead of the multimeter on DC- node and switch with the negative lead on all three phase inputs, as shown in the diagram below.

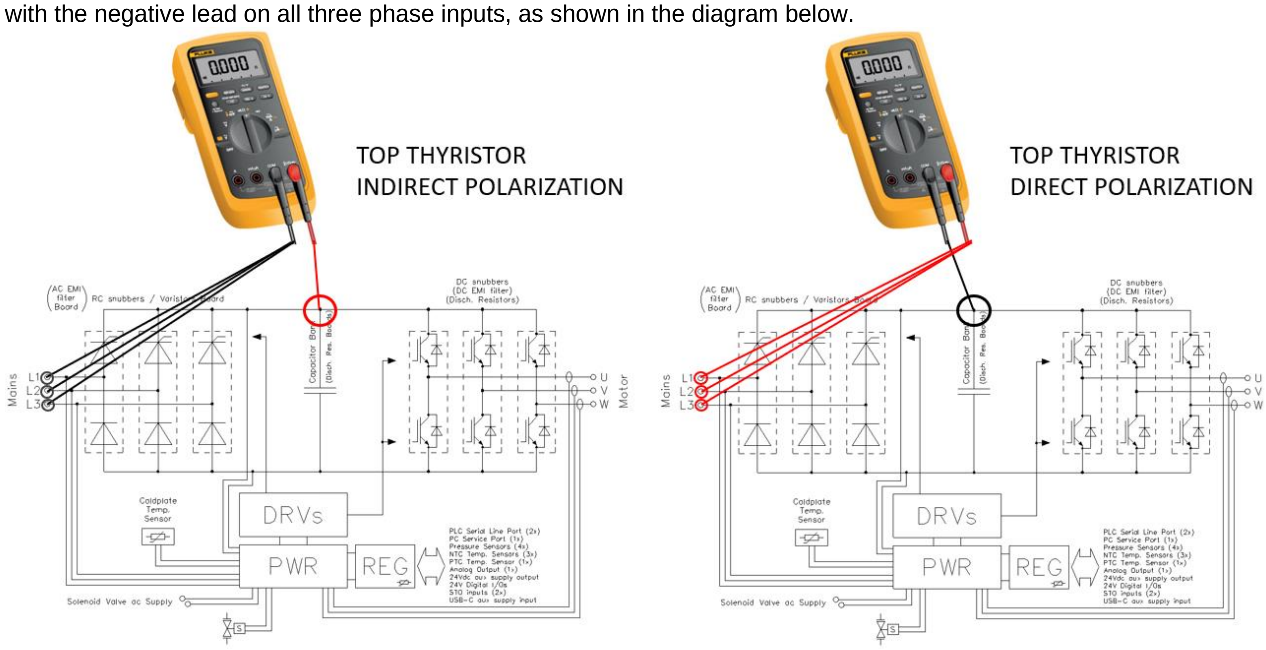


Figure 47 TOP SCR direct/indirect thyristor ohm mode test

Refer to paragraph **8. INVERTER MEASURING POINTS** to place correctly the multimeter terminals on the phase and DC BUS plate.
Fill in the table in paragraph **10. COLLECTION TABLES** with the measurements obtained.

INFORMATION
The expected measured value is a very high resistance.
Refer to paragraph **9.2.1 TOP SCR THYRISTORS RESISTANCE REFERENCE VALUES** for more details

7.3 Compressor Tests

Figure 48 Megger tester

7.3.1 Electrical insulation Motor Phases - Earth

Type of measurement: Insulation test at 1000V

- Turn on the Megger
- Select Megger full scale to 1000V
- Connect the negative lead (black tip) to a metal point of the compressor frame.
- Connect the positive lead (red tip) to the terminal 1 of the compressor terminal block.
- Measure the resistance

Value measure must be more than 11MΩ.

Repeat the test for the terminals 2,3,4,5 and 6 of the terminal block.

RED LEAD	BLACK LEAD	Accettable Value
Terminal 1	Compressor frame	>11MΩ
Terminal 2	Compressor frame	>11MΩ
Terminal 3	Compressor frame	>11MΩ
Terminal 4 (if available)	Compressor frame	>11MΩ
Terminal 5 (if available)	Compressor frame	>11MΩ
Terminal 6 (if available)	Compressor frame	>11MΩ

Table 20 Electrical insulation Motor Phases – Earth sequence

NOTICE
The tests described above must not be performed between the terminals of the electric motor protection thermistors

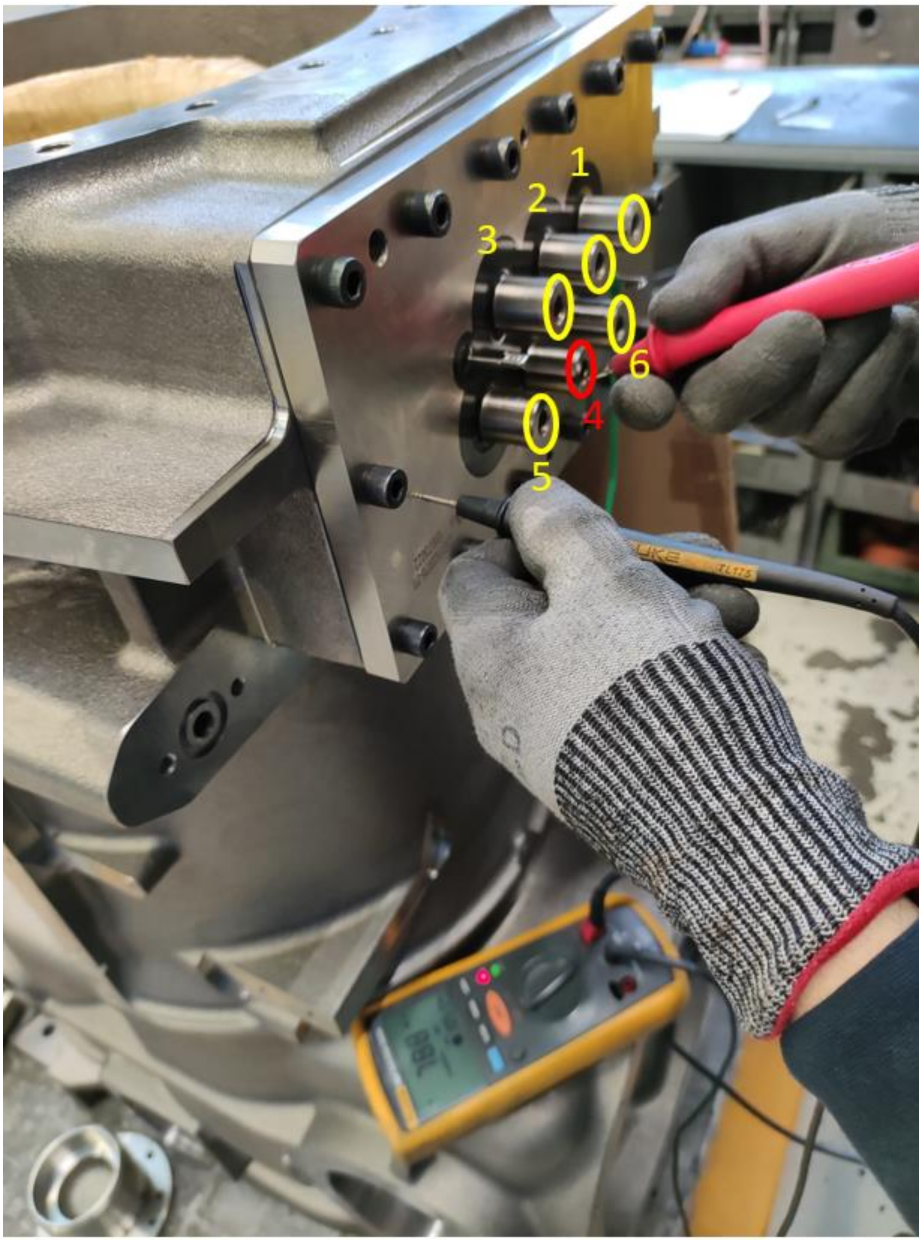


Figure 49 Electrical insulation Motor Phases – Earth

In case any motor phase is not insulated from earth, motor compressor must be replaced.

7.3.2 Electrical insulation between Motor Phases

Type of measurement: Insulation test at 1000V

- Turn on the Megger
- Select Megger full scale to 1000V
- Connect the positive lead (red tip) to the terminal 1 of the compressor terminal block
- Connect the negative lead (black tip) to other terminal winding of the compressor terminal block, respecting the table below
- Measure the resistance

Value measure must be more than 11MΩ.

Check the electrical insulation of each winding with respect to the others respecting the following sequence:

RED LEAD	BLACK LEAD	Accettable Value
Terminal 1	Terminal 2 – 3 – 5 -6	>11MΩ
Terminal 2	Terminal 1 – 3 – 4 - 6	>11MΩ
Terminal 3	Terminal 1 – 2 – 4 - 5	>11MΩ

Terminal 4 (if available)	Terminal 2 – 3 – 5 - 6	>11MΩ
Terminal 5 (if available)	Terminal 1 – 3 – 4 - 6	>11MΩ
Terminal 6 (if available)	Terminal 1 – 2 – 4 - 5	>11MΩ

Table 21 Electrical insulation between Motor Phases sequence

NOTICE
The tests described above must not be performed between the terminals of the electric motor protection thermistors

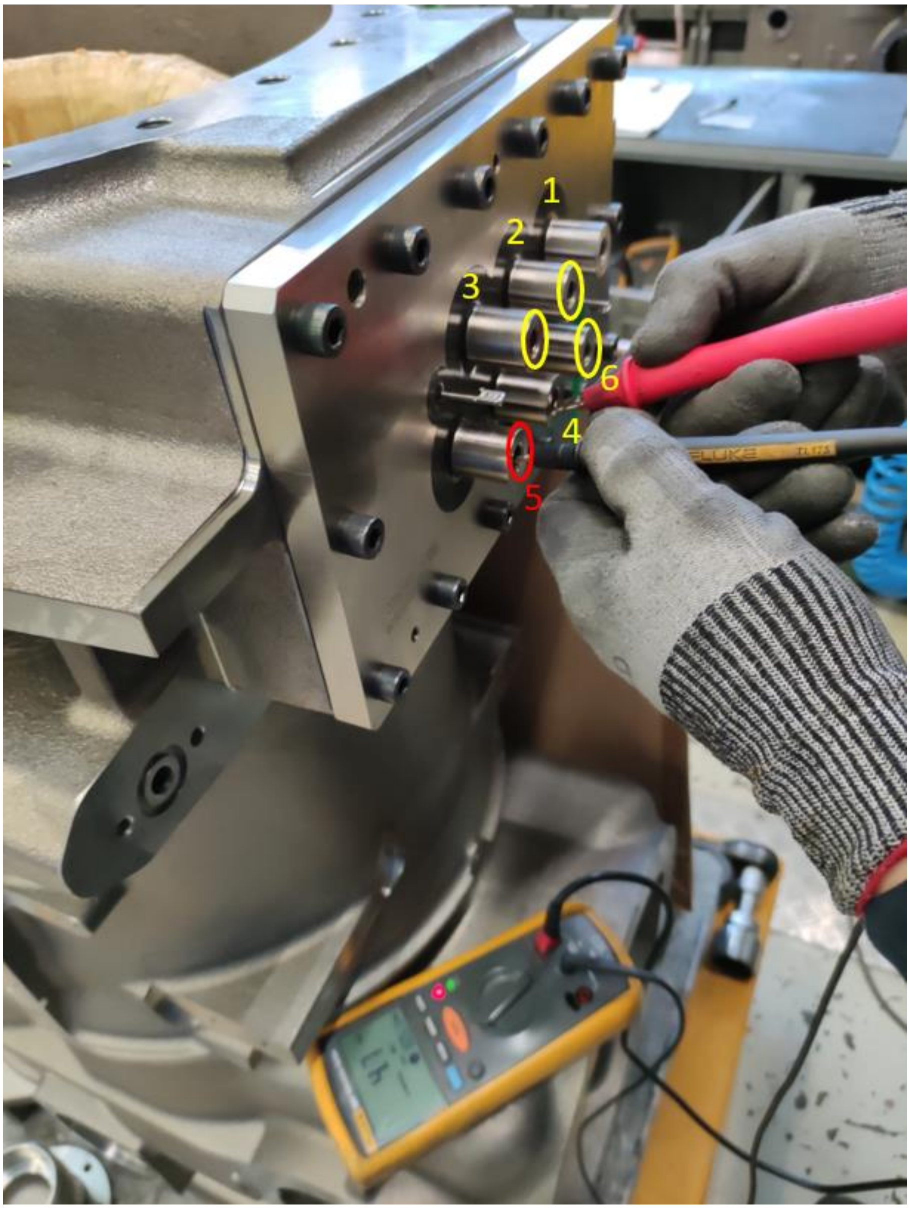


Figure 50 Electrical insulation between Motor Phases

In case any motor phases is not insulated from another one, motor compressor must be replaced.

7.3.3 Motor phases electrical continuity

Type of measurement: Resistance test - Ω mode

INFO
Result of the test depends on multimeter resolution.
In this paragraph are showed result for lower and higher resolution

- Turn on the multimeter
- Connect the positive lead (red tip) to the terminal 1 of the compressor terminal block

- Connect the negative lead (black tip) to other terminal of same winding on the compressor terminal block (4), respecting the table below
- Measure the resistance

Lower resolution: The measurement value must be in this range: 0.1 ÷ 0.3 Ω

Check the electrical continuity of each phase, respecting the following sequence

RED LEAD	BLACK LEAD	Accettable Value
Terminal 1	Terminal 4	0.1 ÷ 0.3 Ω
Terminal 2	Terminal 5	0.1 ÷ 0.3 Ω
Terminal 3	Terminal 6	0.1 ÷ 0.3 Ω

Table 22 Motor phases electrical continuity sequence

Higher resolution: the measurement value depends on Motor Type and compressor model

Motore Type	Code	Compressor Model	Motor terminal resistance from 15 and 35°C [mOhm]
82kW/400V-83Hz	332107677	3100 VVR INV.	50÷60
82kW/380V-60Hz	332107663		60÷70
43kW/400-460V	M331314027	3100	240÷280
60kW/400-460V	M331314047		160÷200
82kW/400-460V	M331314067		78÷130
82kW/400-460V	M330563267	3200	78÷130
138kW/690V	M330870893		90÷100
138kW/400-460V	M330870887		60÷80
82kW/400-460V	332101467	F3AS/L	100÷130
82KW/380V-60Hz	332101464		
180kW/400-460V	332114667	F4AS/L	35÷70
216KW/380V-60Hz	332114664		260÷290

Table 23 Compressor Motor Terminal resistance reference values

Figure 51 Motor phases electrical continuity

7.4 VFD NAV Alarms saving

- **TOOLS REQUIRED**

1. Software “VFD Nav”
2. Laptop
3. USB-C cable
4. PN 5902821: INVERTER VFD DAE TO PC CONNECTING KIT
    - USB – RS485 Converter
    - Connecting cable RS485 Converter to VFD Regulation Card
    - USB-USB type B CABLE

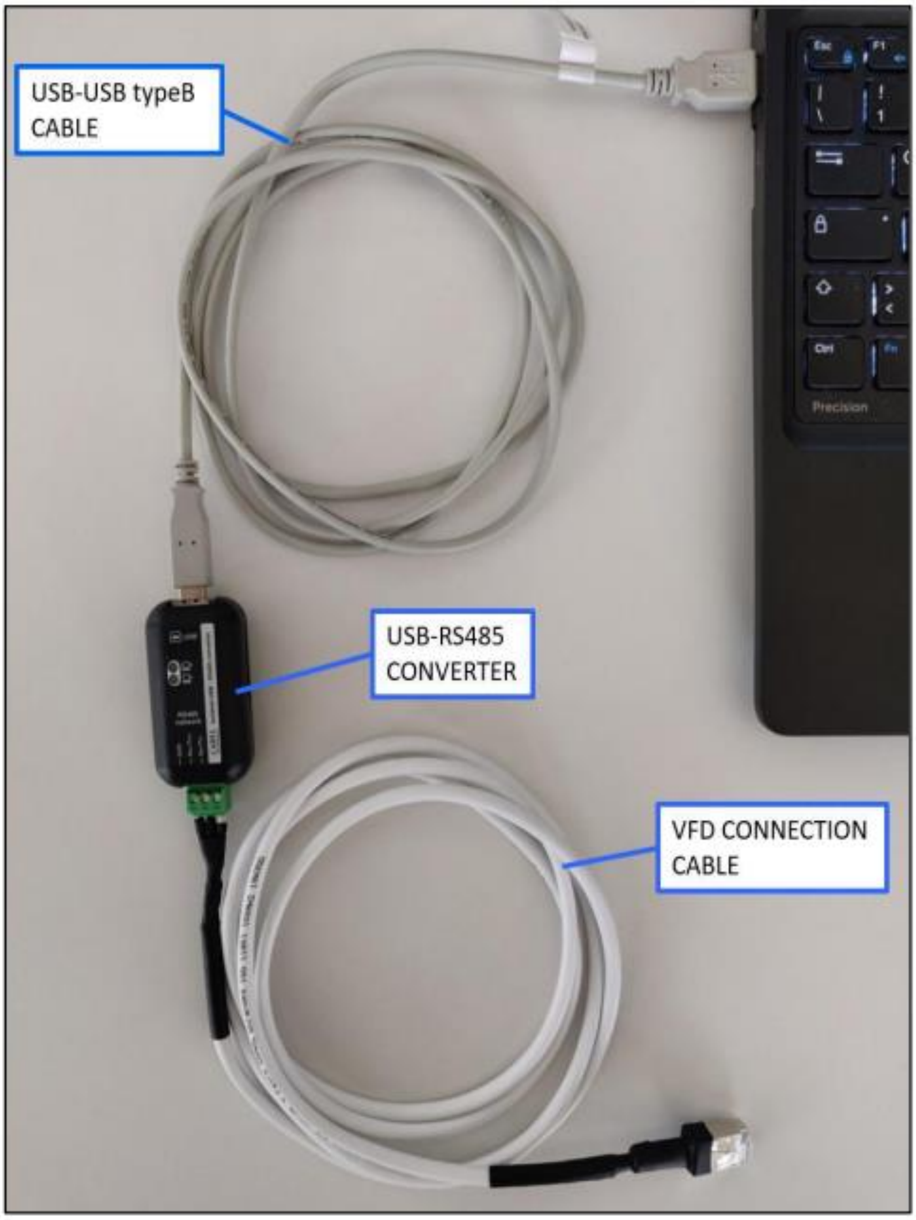


Figure 52 Tools Required

- **CONNECTION**

1. Connect the CONNECTING KIT PN 5902821 to the laptop (USB connection) and to VFD (ethernet connection on REG_CN15)

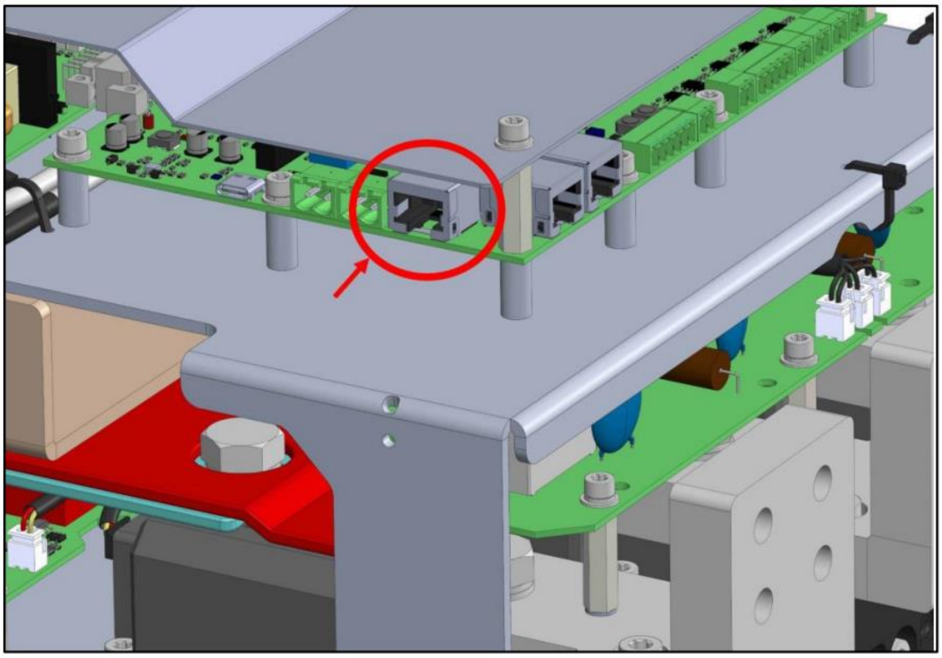


Figure 53 CN15 Connector on regulation board

Regulation card must be supplied providing +5V with USB-C connector

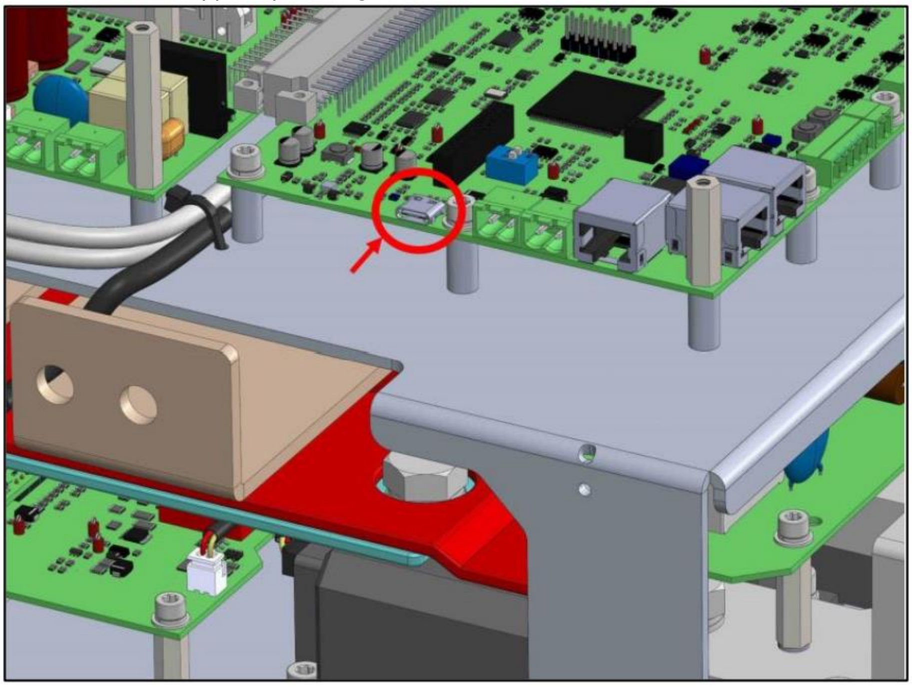


Figure 54 USB-C Connector

NOTICE
It's important that regulation board receive just one power supply. In the case regulation board is mounted on the VFD, it normally receives supply from power board; then verify that there is no residual voltage on DC-link before to supply regulation board by USB-C connector. Power supply both coming from power board and USB-C connector can damage the regulation board

2. Open the software VFD NAV and Using network scan to find out the devices connected. On the "Advanced" button to show the scan parameters

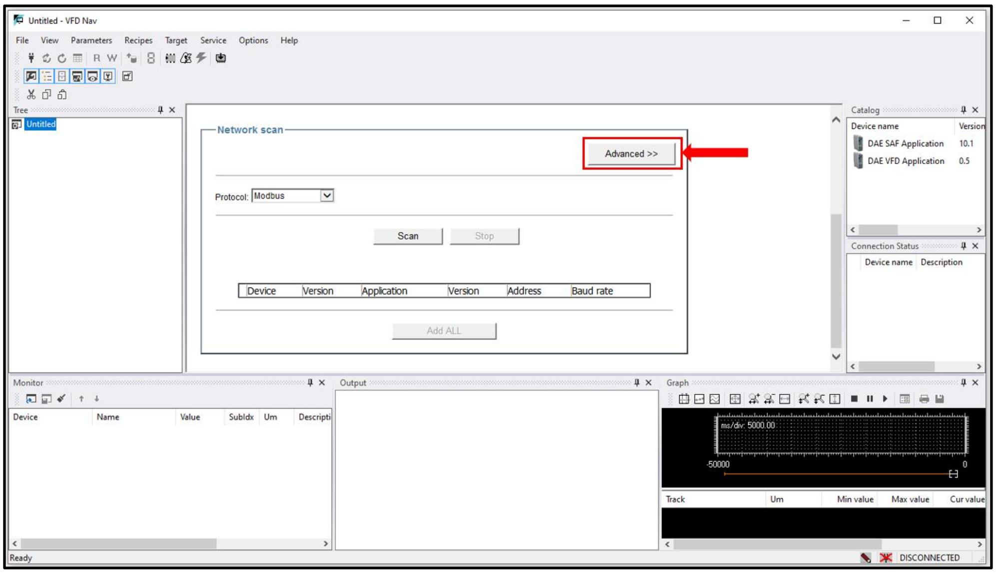


Figure 55 VFD Nav Network scan

3. Set the correct COM port (check in Device Manager of your PC in order to set the correct port) and start the scan by clicking on the “Scan” button.

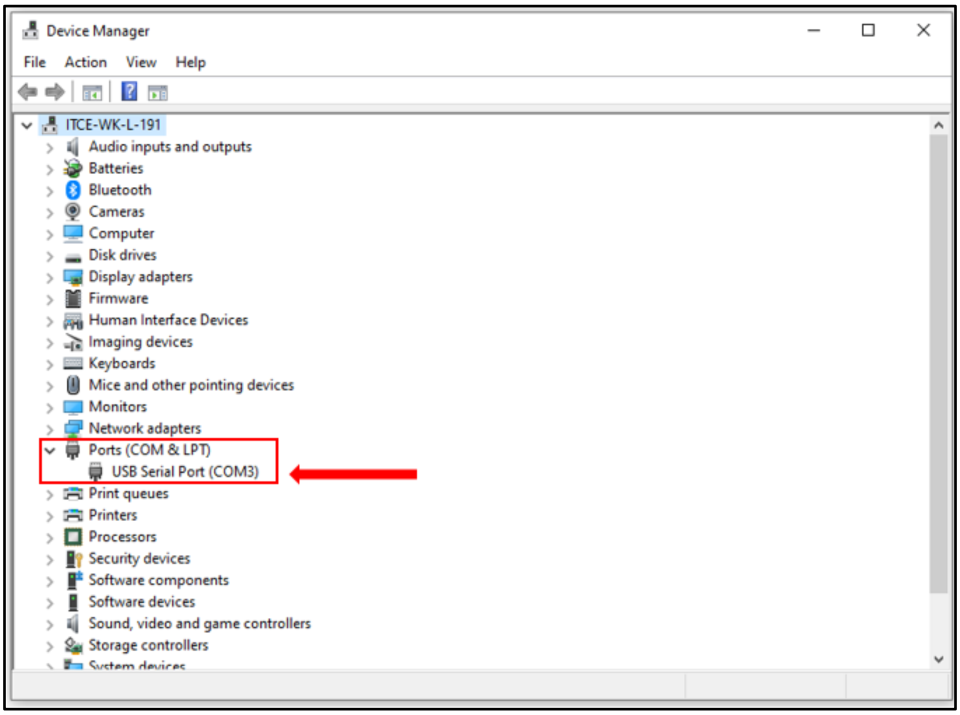


Figure 56 Device Manager

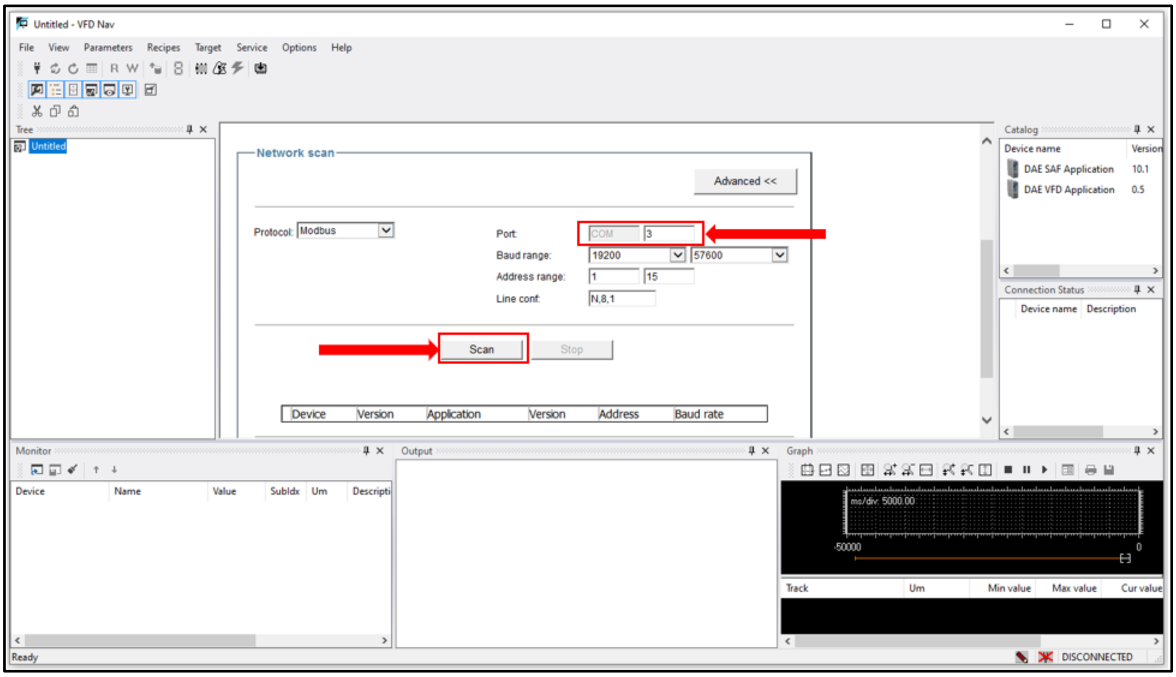


Figure 57 VFD Nav COM Port settings

4. At the end a list of the found devices is shown. Click on the “Add” button to start project.

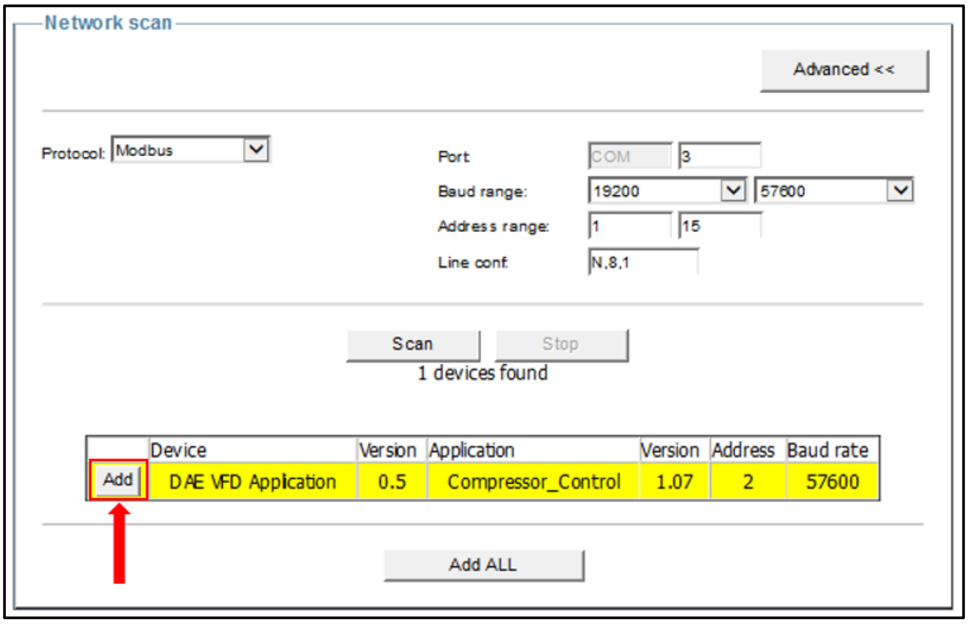
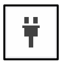


Figure 58 VFD Nav add Device

5. Connect with VFD using the button  on the toolbar
   Status of connection is reported in the following window

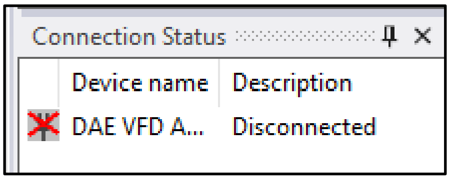


Figure 59 VFD Nav Connection status

6. Change the Menu access level by clicking on the toolbar “File” > “Change Menu Access Level”
7. Select “**Advanced (RW)**” and insert password: [*Daikin18*]

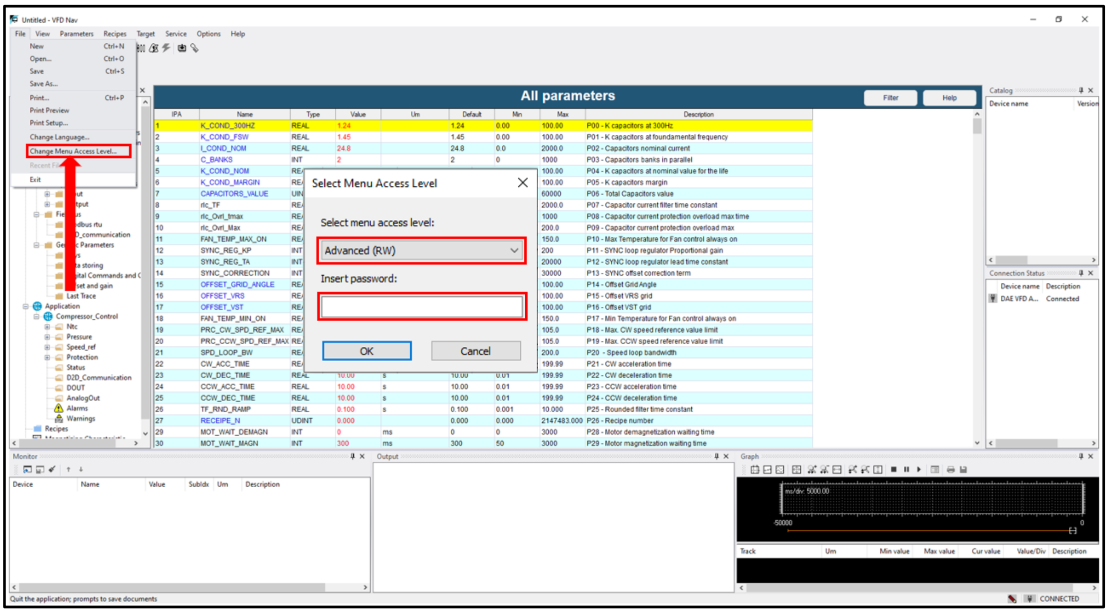


Figure 60 VFD Nav select Menu Access Level

8. Select folder **All parameters** on the project tree
9. On the toolbar go to "Parameters > Read all

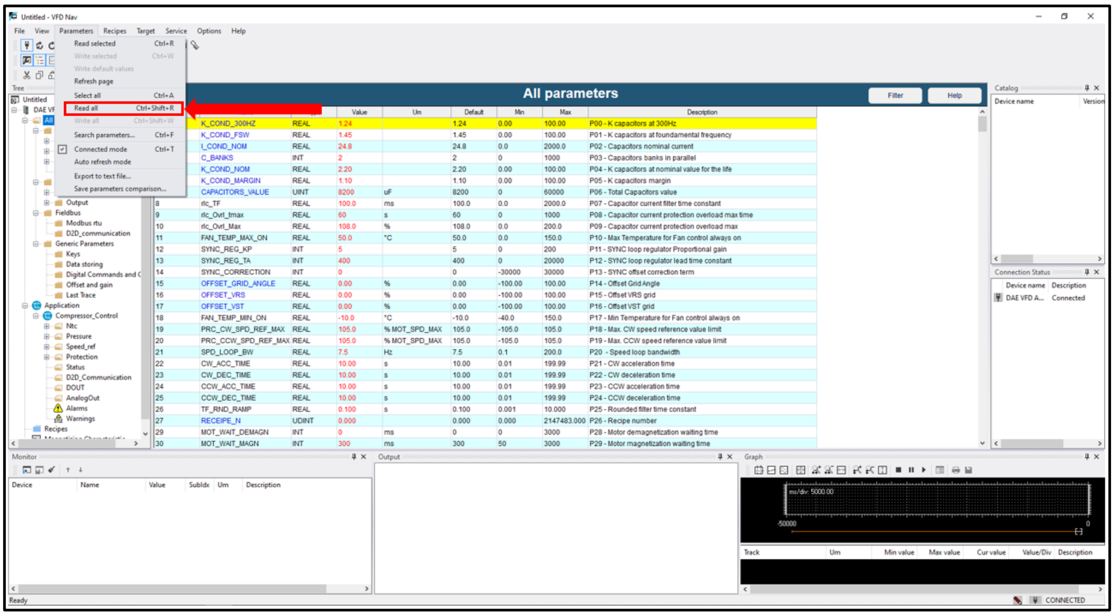


Figure 61 VFD Nav Read all parameters

- **ALARM LOG TRACE DOWNLOADING**

1. Go to **Alarm** folder in the project tree

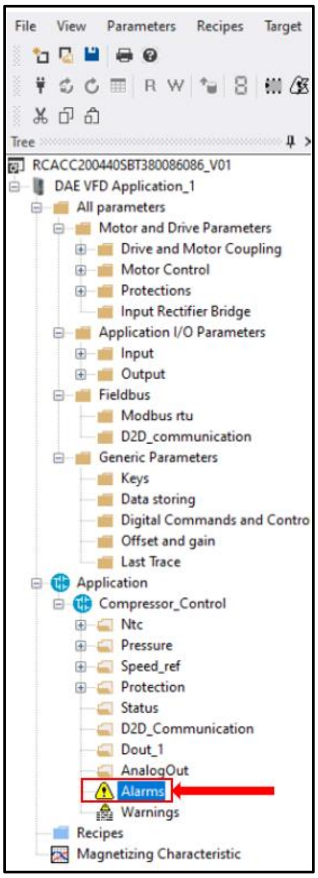


Figure 62 VFD Nav Alarm folder

2. The following window is showed, please make a screenshot

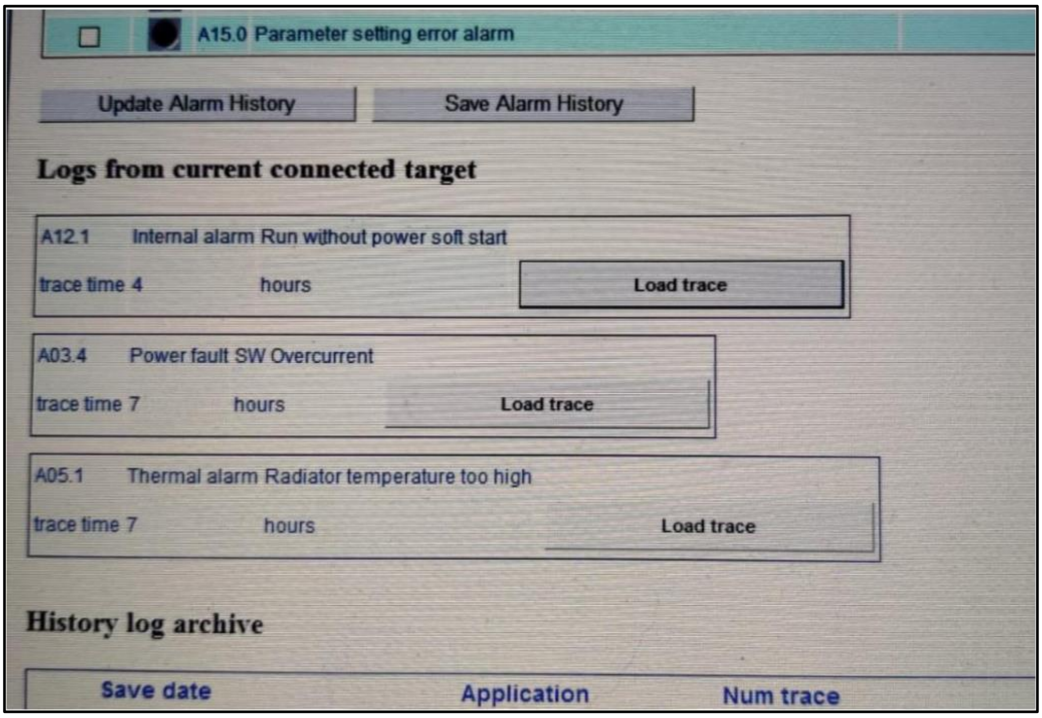


Figure 63 VFD Nav Alarm logs

3. Click on button 

Then for each alarm follow this procedure:

a) Click on 

button (Opening soft scope windows)

b) Click on the button  on the toolbar (show all values: in this way the trend is showed on the graph)

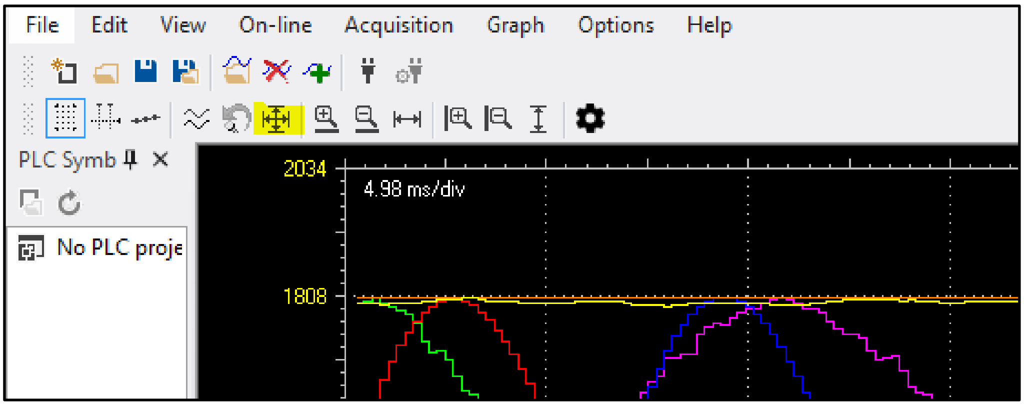


Figure 64 VFD Nav Trend on the graph

c) Save as  (give a name as Logtrace_**AI3_1**: AI3 is ref to kind of VFD alarm, “1” is for first time is occurred, “2” second, etc..)

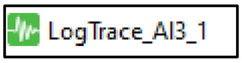


Figure 65 Log Trace

d) Close soft scope window
e) Click on Last Trace on the project tree
f) Select all data in Last Trace menu (shift + click)
g) Go to Parameter > Read All
h) Save as (save the project) and rename as Recepit log_AI3_1 (corresponding number of the point 3)

Figure 66 Recepit log

The purpose is to save soft scope file and corresponding project with parameters (at the end you have “n” log traces files and “n” corresponding project files)
For example, in this case we have Alarm 3 on inverter with 3 occurrences

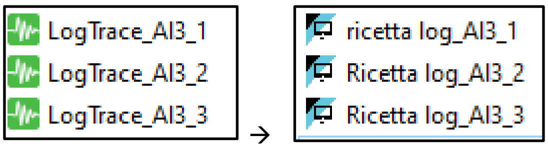


Figure 67 Log Trace and Recipe Log

8 INVERTER MEASURING POINTS

NOTICE
VFD measurements may require the assistance of two technicians, particularly on units with soundproof cabins

8.1 Inverter 90/120kW

8.1.1 DC-BUS Check

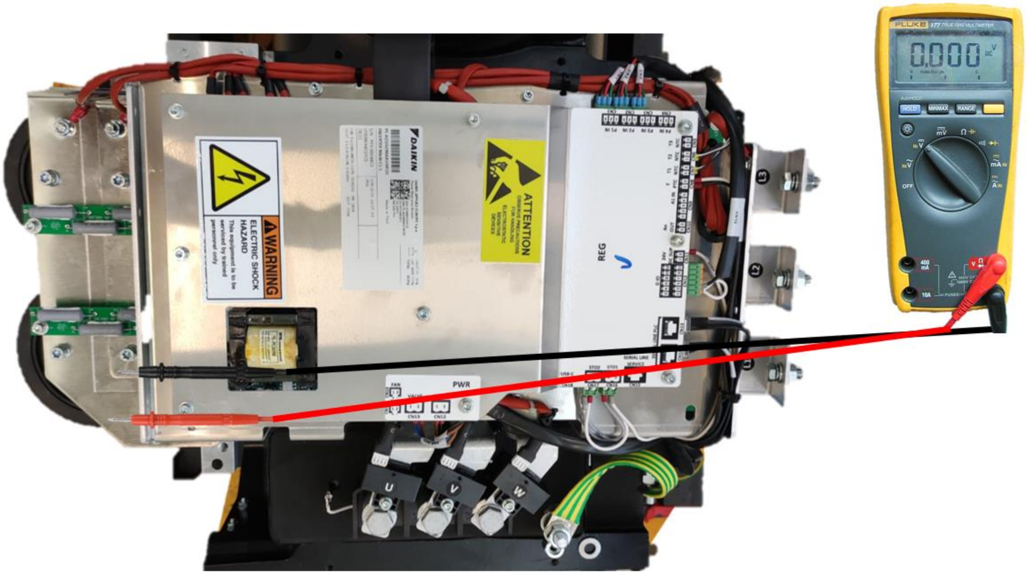


Figure 68 90 kW -120 kW DAE VFD - DC-BUS Check

WARNING
Before carrying out the tests on SCR and IGBT
- VFD Fuses OFF
- VDC Bus = 0 V

8.1.2 Bottom SCR Direct polarization

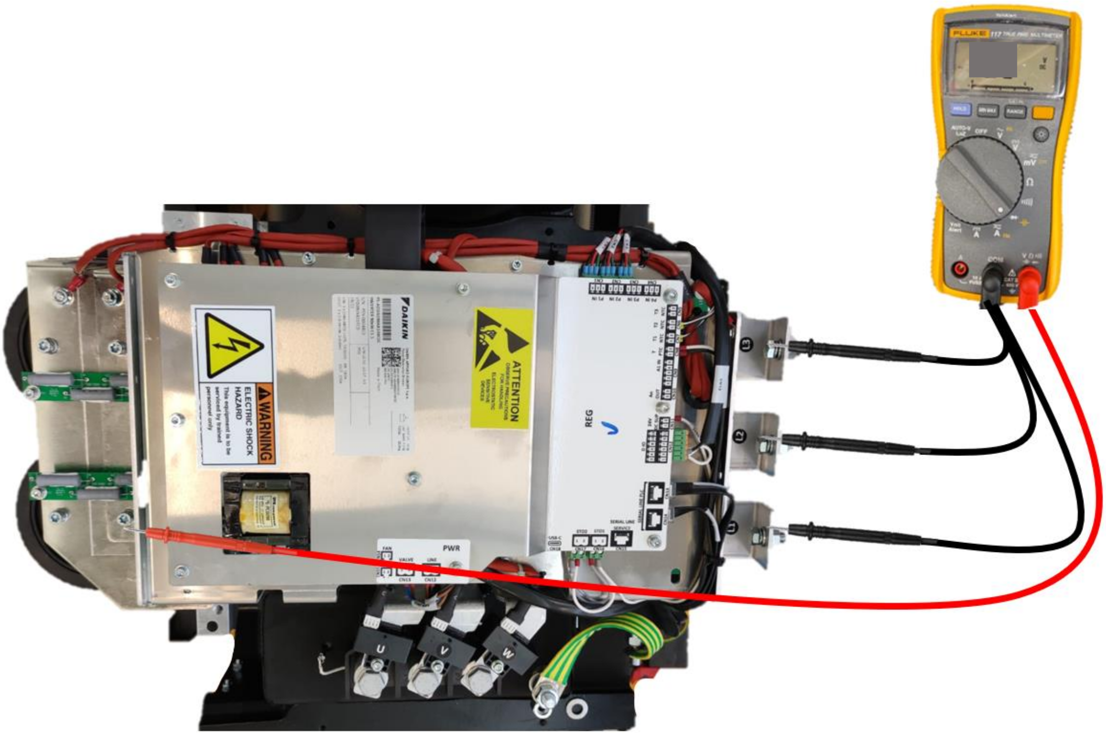


Figure 69 90 kW -120 kW DAE VFD - Bottom SCR Direct polarization

8.1.3 Bottom SCR Indirect polarization

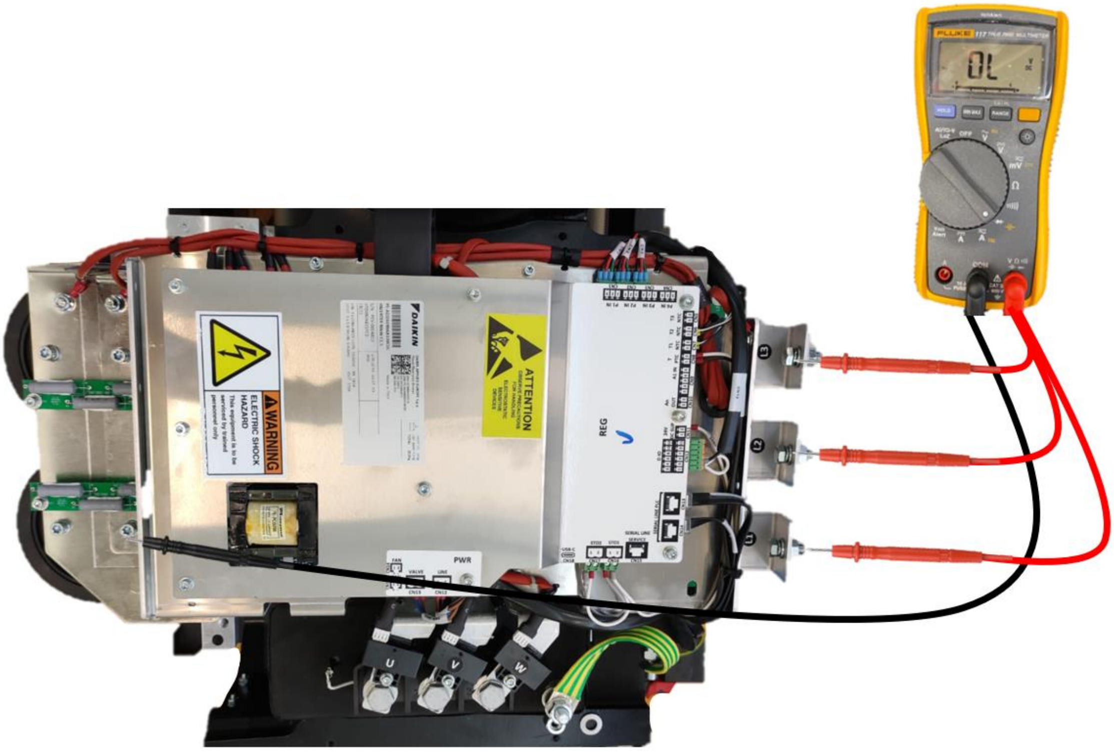


Figure 70 90 kW -120 kW DAE VFD – Bottom SCR Indirect polarization

8.1.4 Top SCR Resistance direct polarization

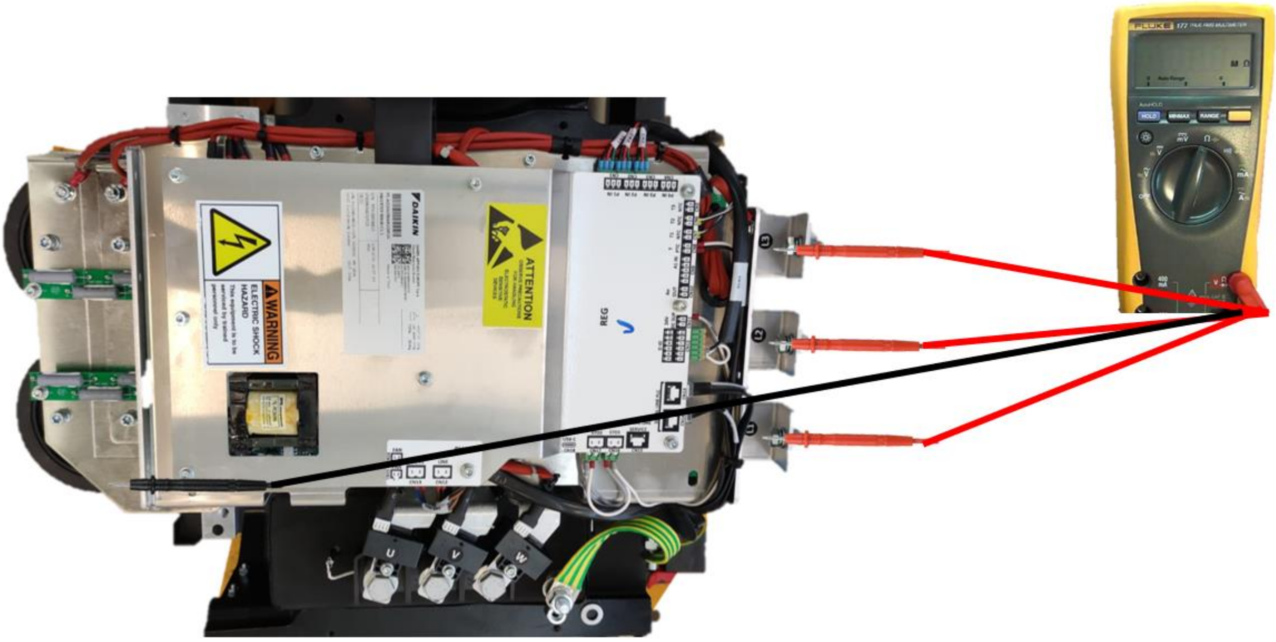


Figure 71 90 kW -120 kW DAE VFD – TOP SCR Resistance direct polarization

8.1.5 Top SCR Resistance indirect polarization

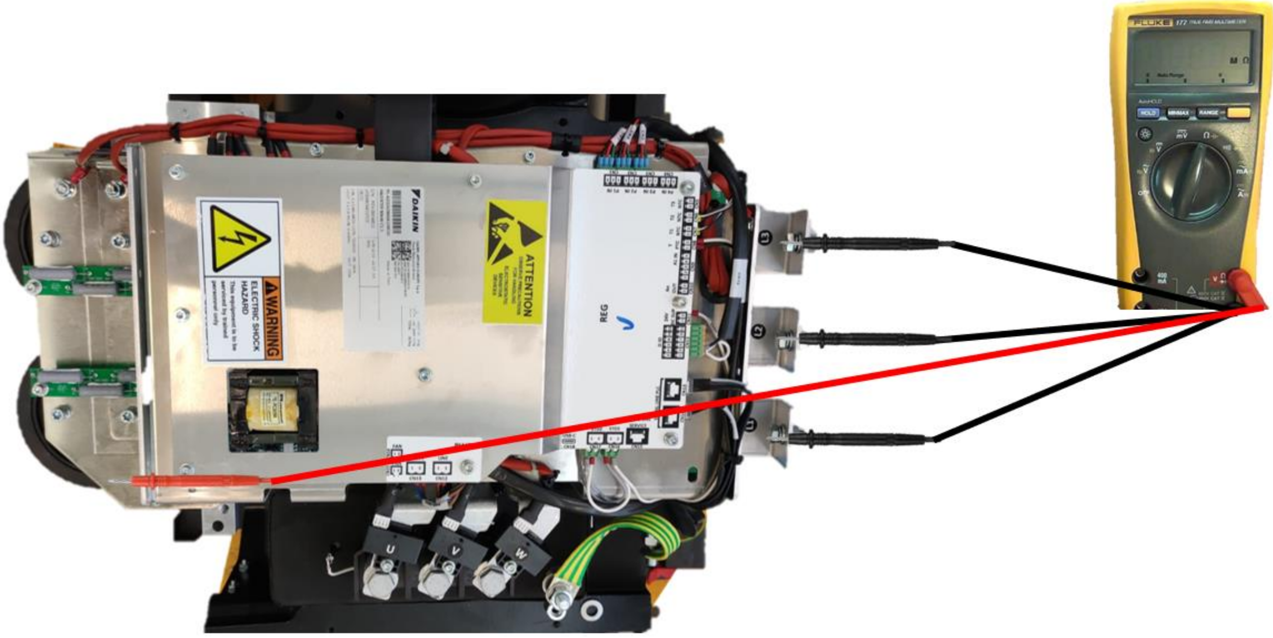


Figure 72 90 kW -120 kW DAE VFD – TOP SCR Resistance indirect polarization

8.1.6 Bottom IGBT Direct polarization

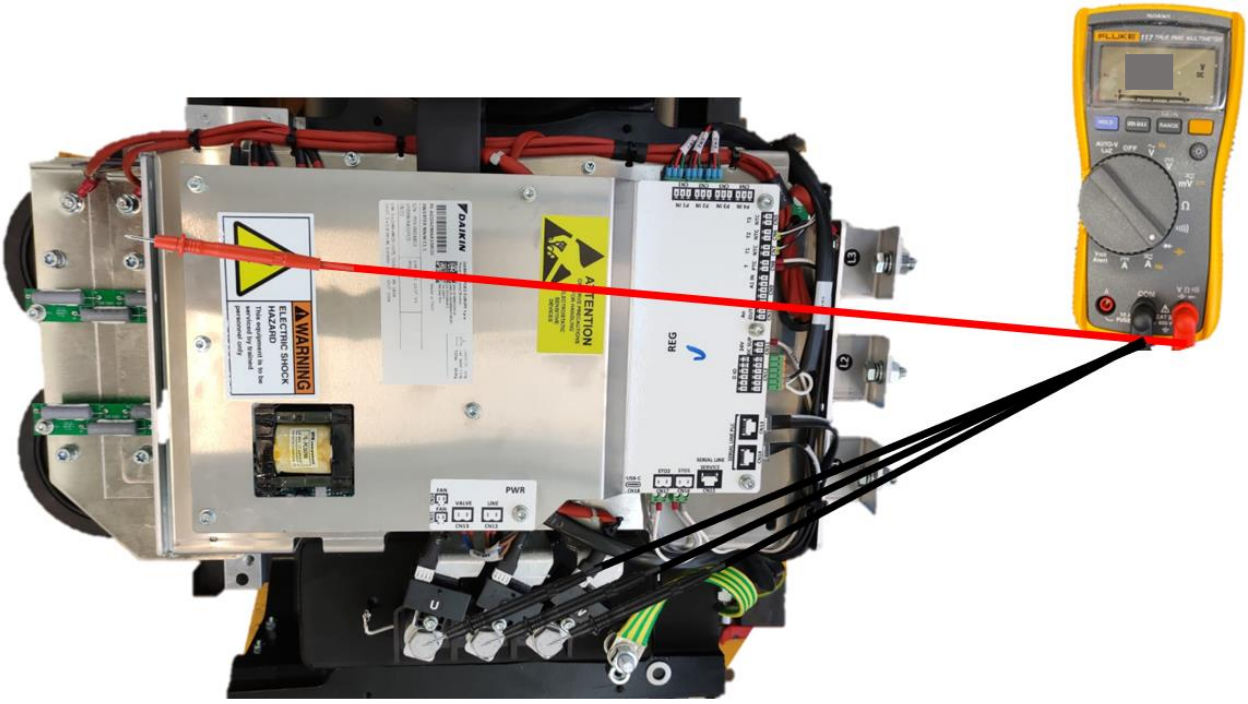


Figure 73 90 kW -120 kW DAE VFD – Bottom IGBT Direct polarization

8.1.7 Bottom IGBT Indirect polarization

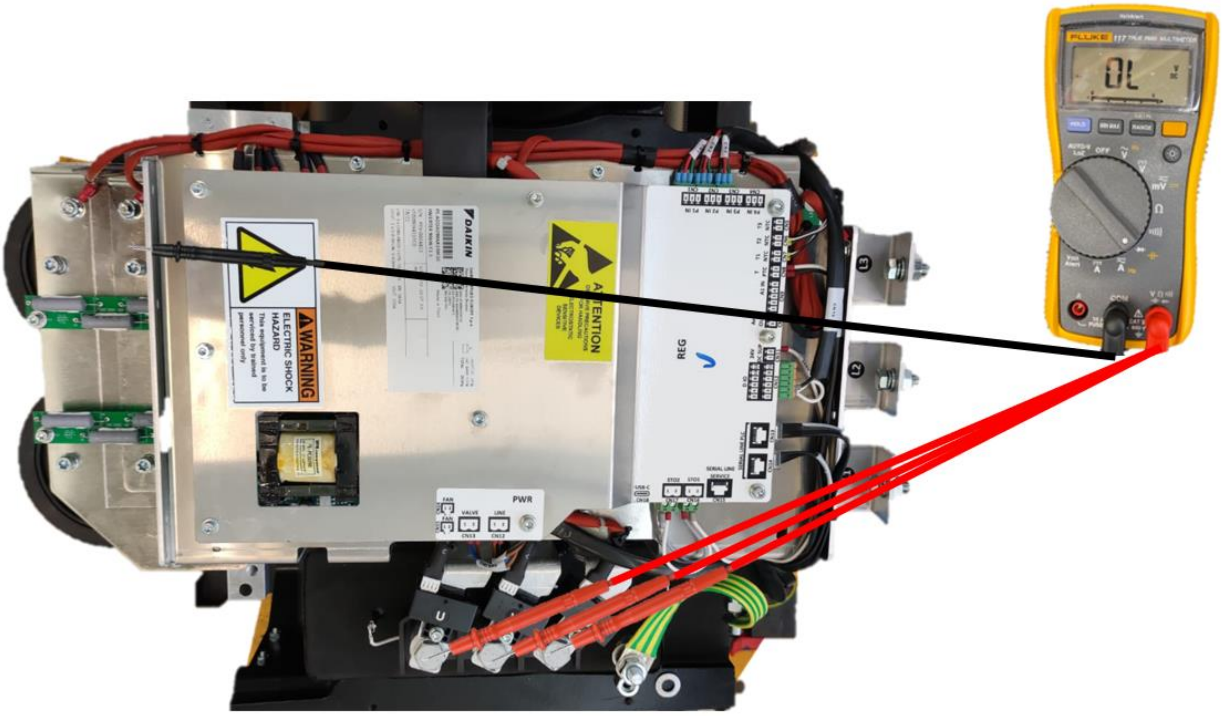


Figure 74 90 kW -120 kW DAE VFD – Bottom IGBT Indirect polarization

8.1.8 Top IGBT Direct polarization

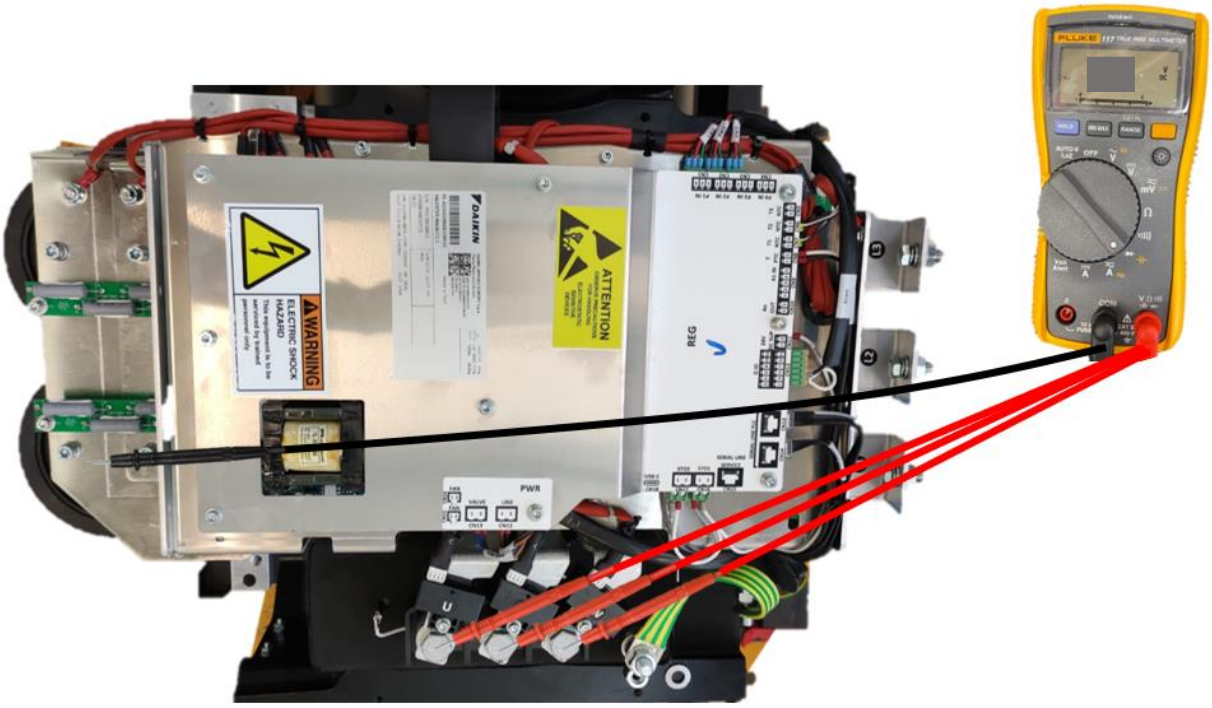


Figure 75 90 kW -120 kW DAE VFD - TOP IGBT Direct polarization

8.1.9 Top IGBT Indirect polarization

Figure 76 90 kW -120 kW DAE VFD - TOP IGBT Indirect polarization

8.2 Inverter 200kW

8.2.1 DC-BUS Check

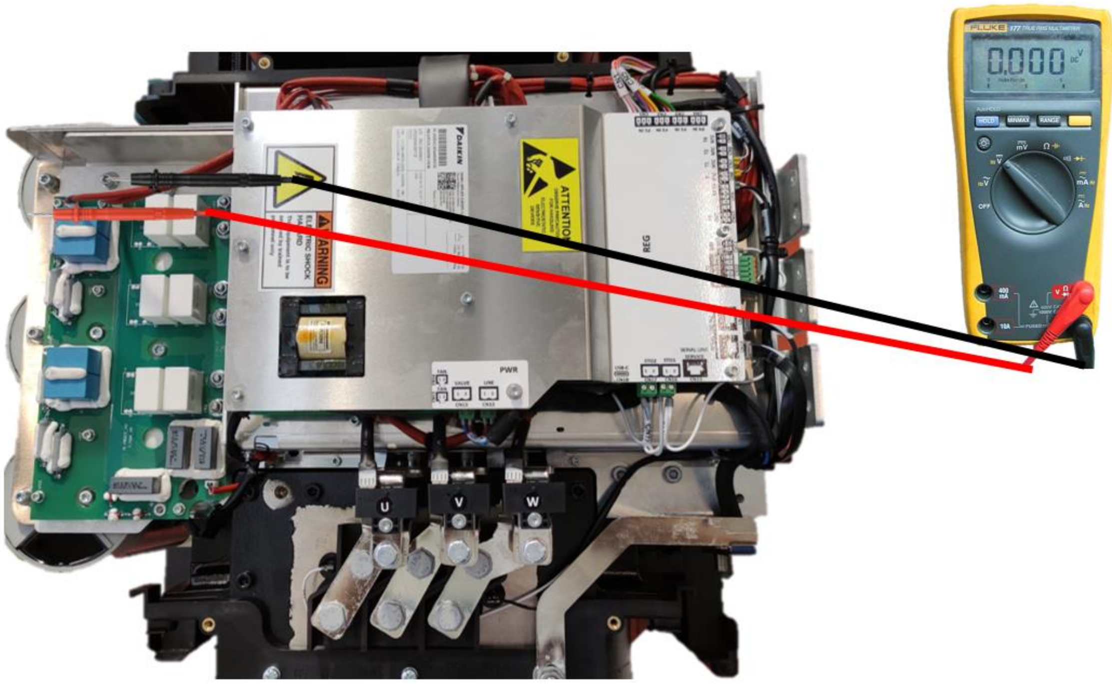


Figure 77 200 kW DAE VFD – DC-BUS Check

8.2.2 Bottom SCR Direct polarization

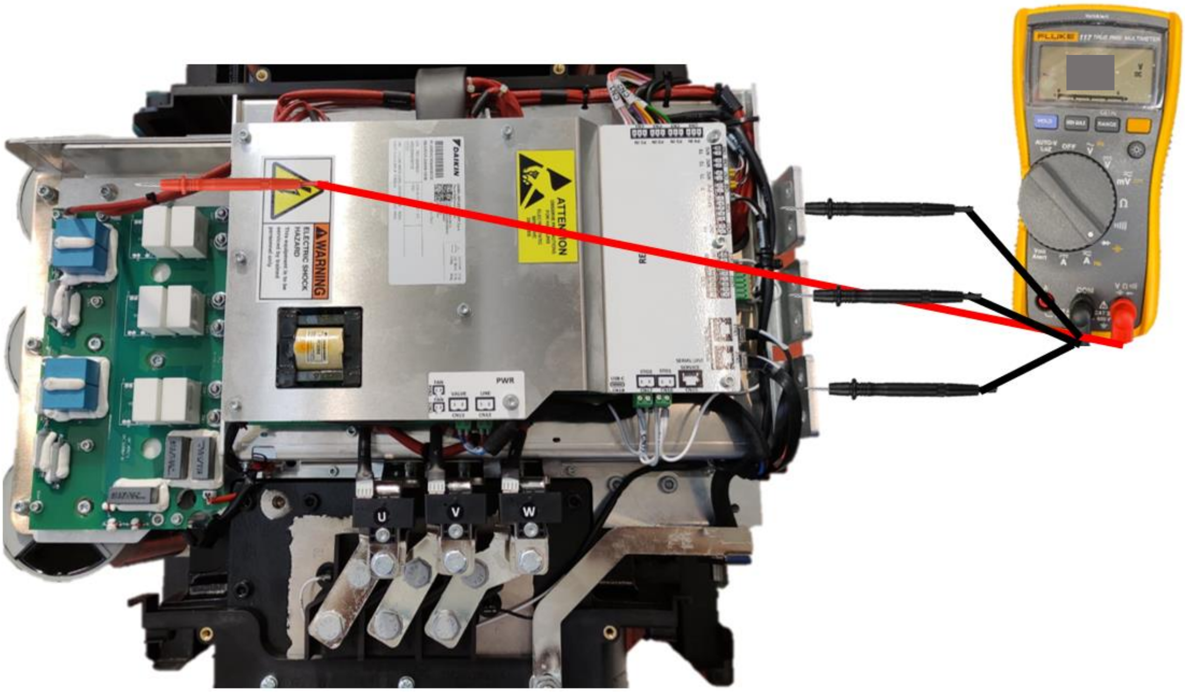


Figure 78 200 kW DAE VFD – Bottom SCR Direct polarization

8.2.3 Bottom SCR Indirect polarization

Figure 79 200 kW DAE VFD – Bottom SCR Indirect polarization

8.2.4 Top SCR Resistance direct polarization

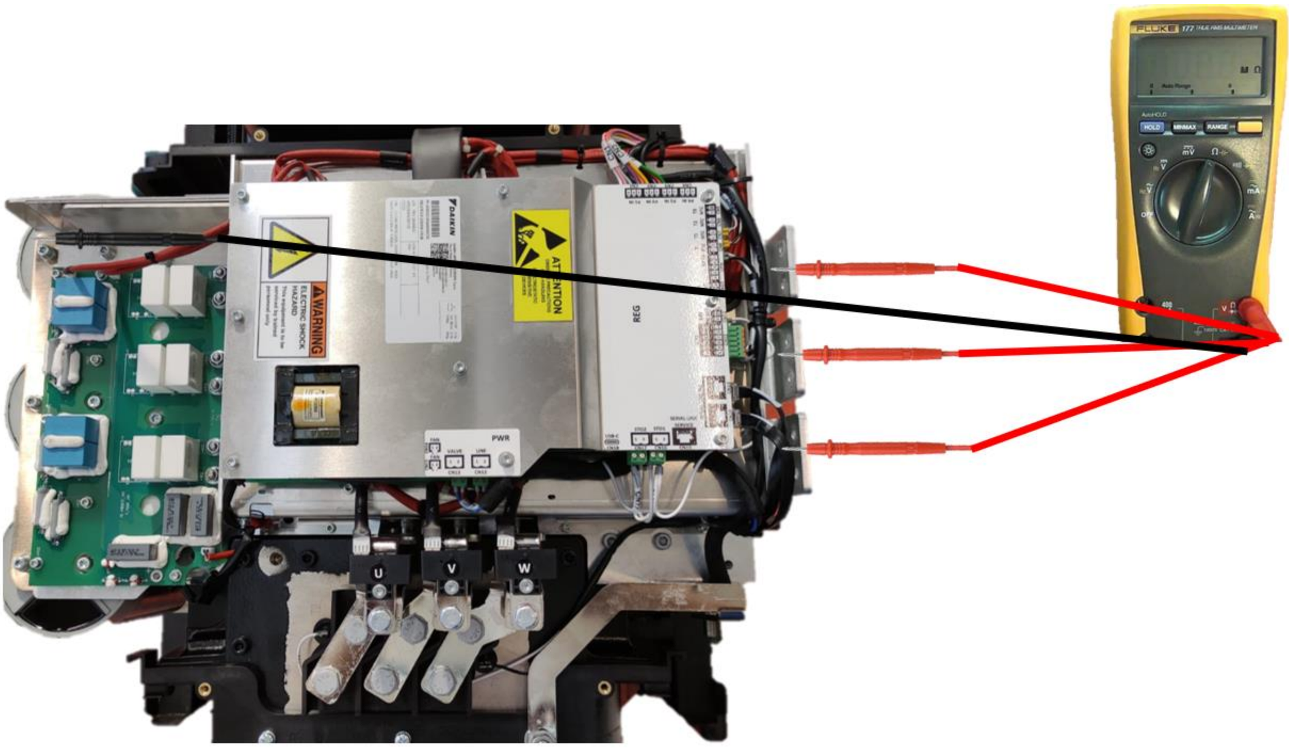


Figure 80 200 kW DAE VFD – TOP SCR Resistance direct polarization

8.2.5 Top SCR Resistance indirect polarization

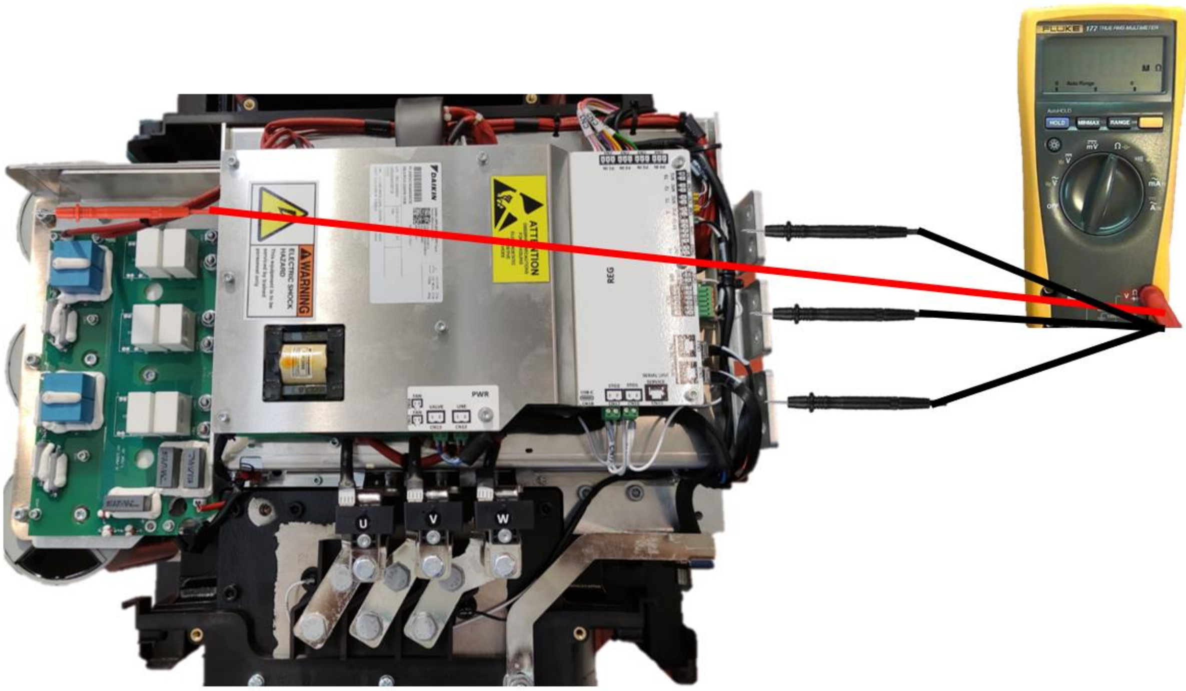


Figure 81 200 kW DAE VFD – TOP SCR Resistance indirect polarization

8.2.6 Bottom IGBT Direct polarization

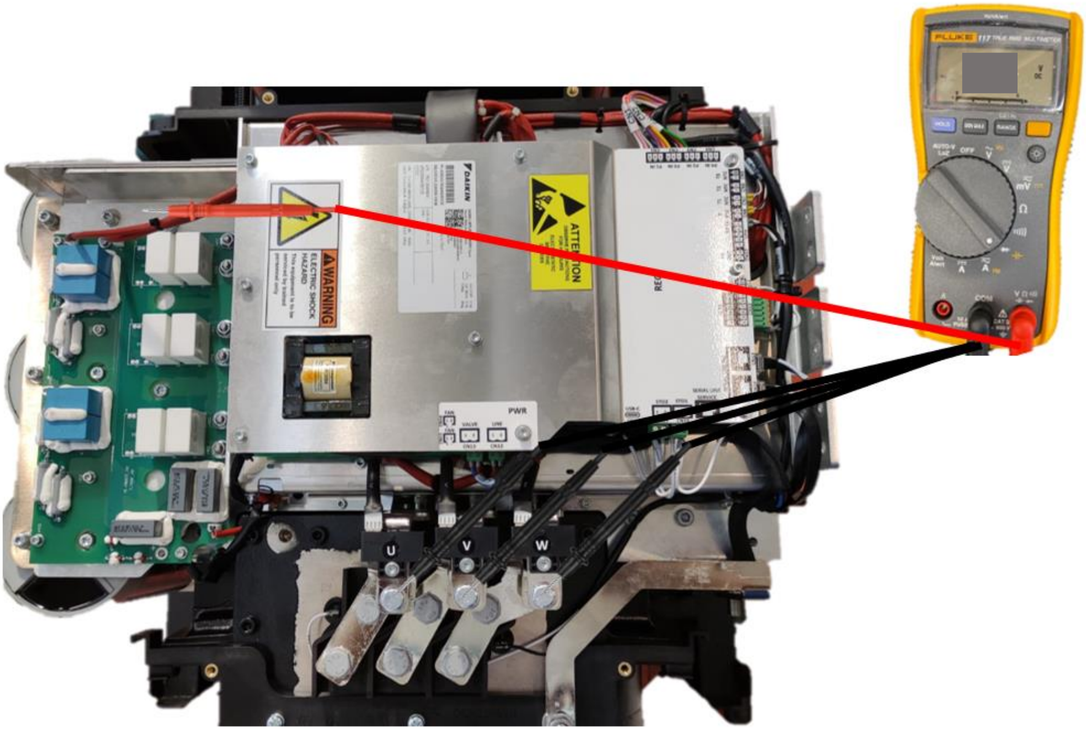


Figure 82 200 kW DAE VFD – Bottom IGBT Direct polarization

8.2.7 Bottom IGBT Indirect polarization

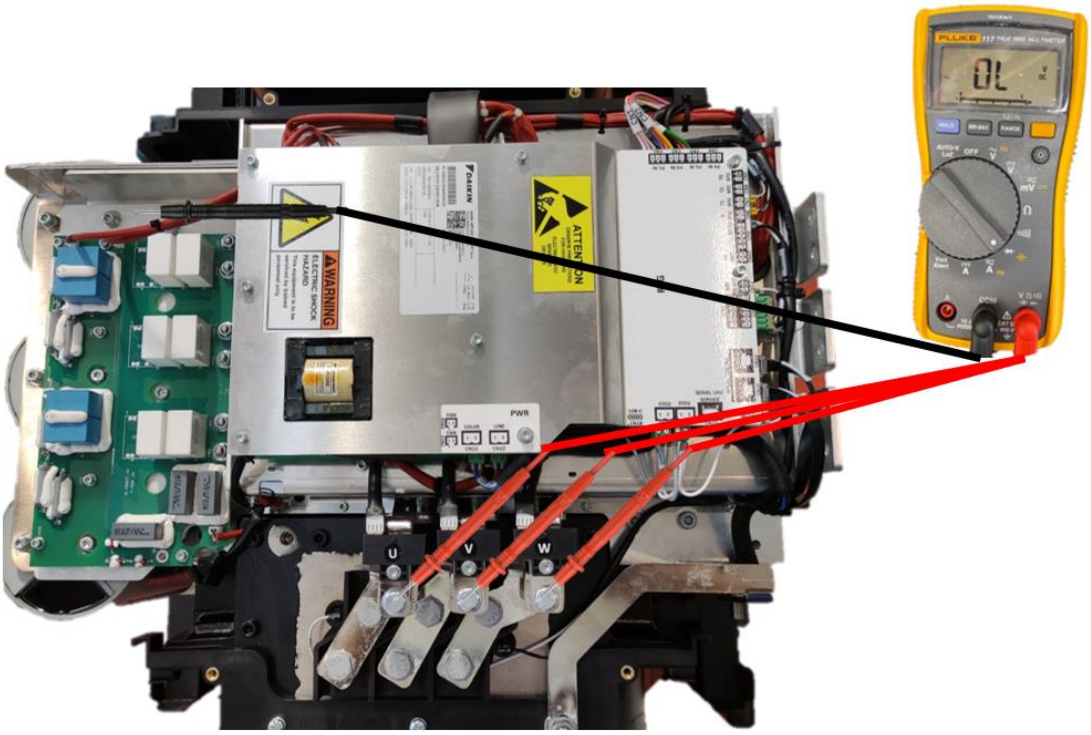


Figure 83 200 kW DAE VFD – Bottom IGBT Indirect polarization

8.2.8 Top IGBT Direct polarization

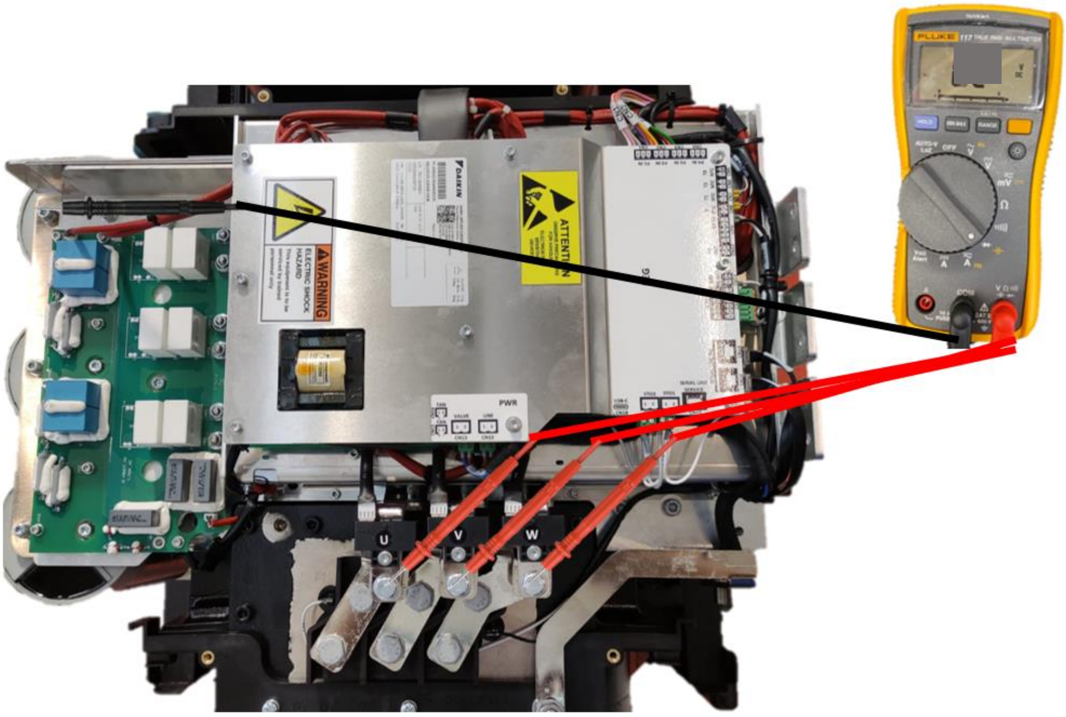


Figure 84 200 kW DAE VFD – TOP IGBT Direct polarization

8.2.9 Top IGBT Indirect polarization

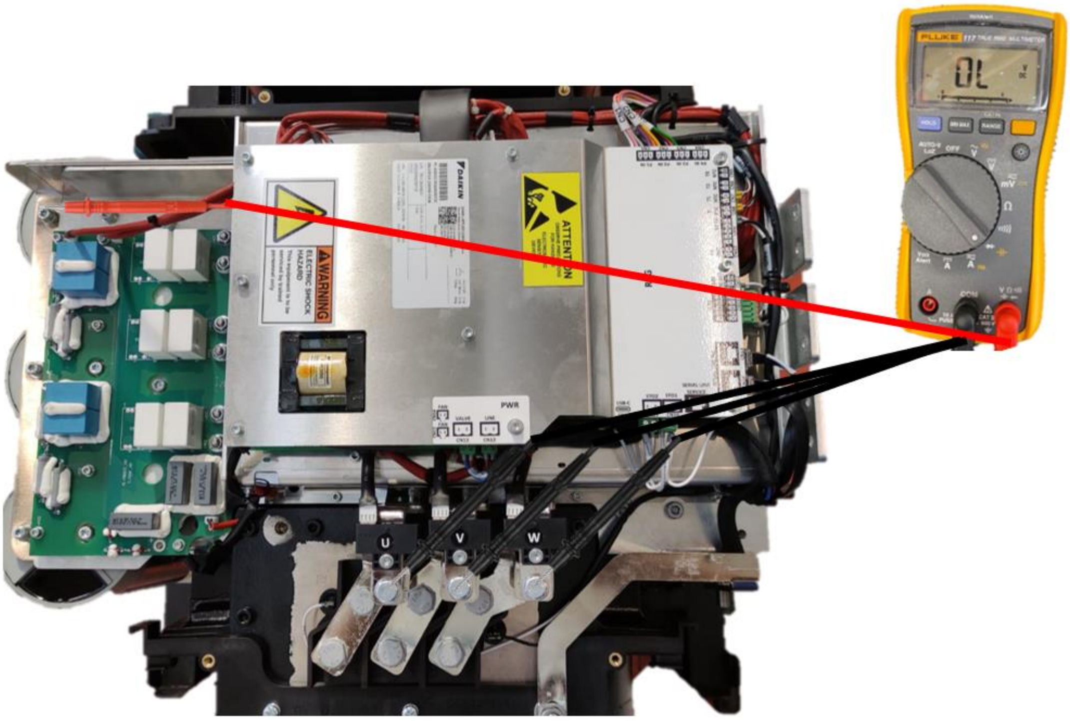


Figure 85 200 kW DAE VFD – TOP IGBT Indirect polarization

8.3 Inverter 330/400kW

8.3.1 DC-BUS Check

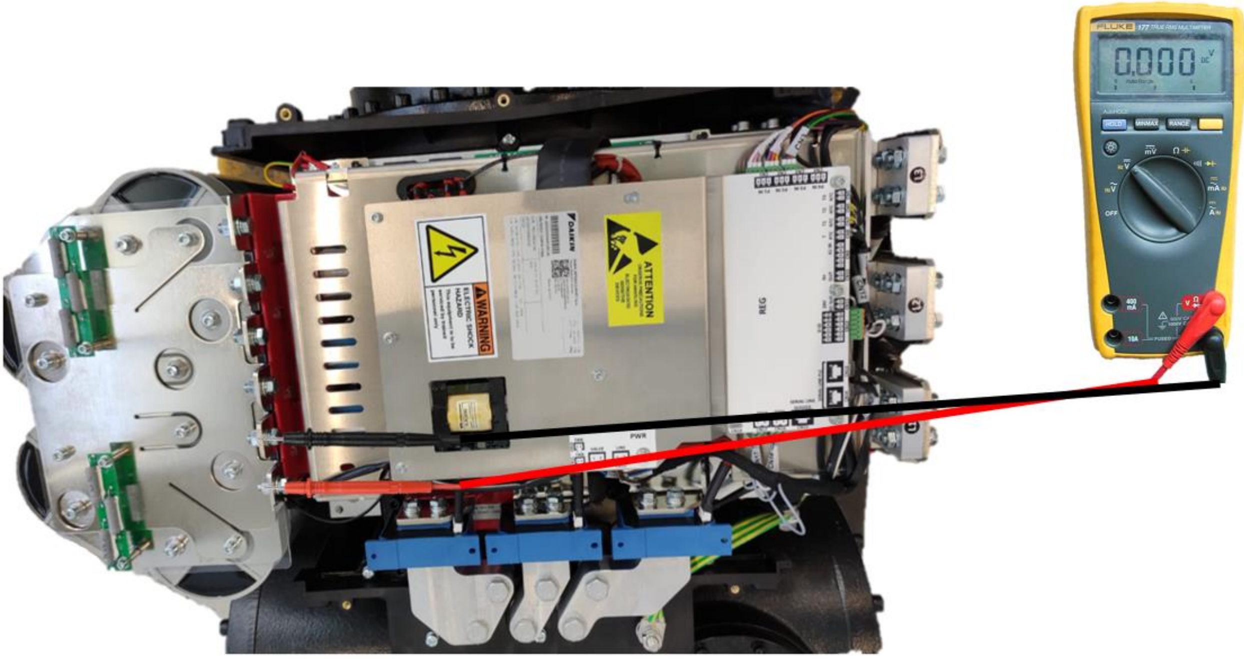


Figure 86 330 kW - 400 kW DAE VFD – DC-BUS Check

8.3.2 Bottom SCR Direct polarization

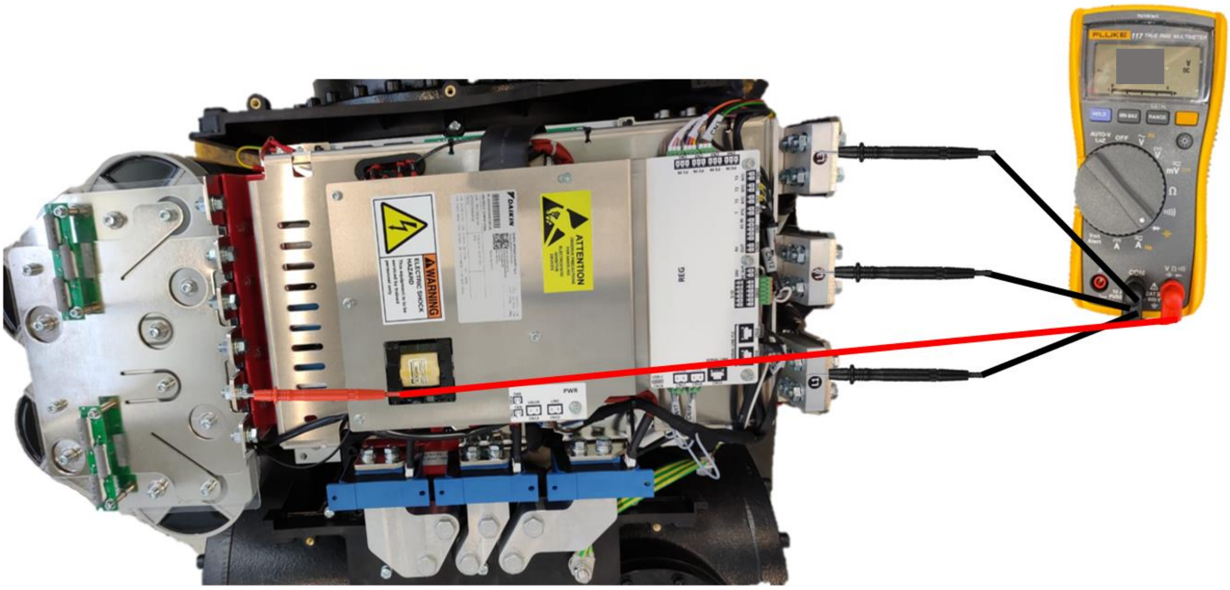


Figure 87 330 kW - 400 kW DAE VFD – Bottom SCR Direct polarization

8.3.3 Bottom SCR Indirect polarization

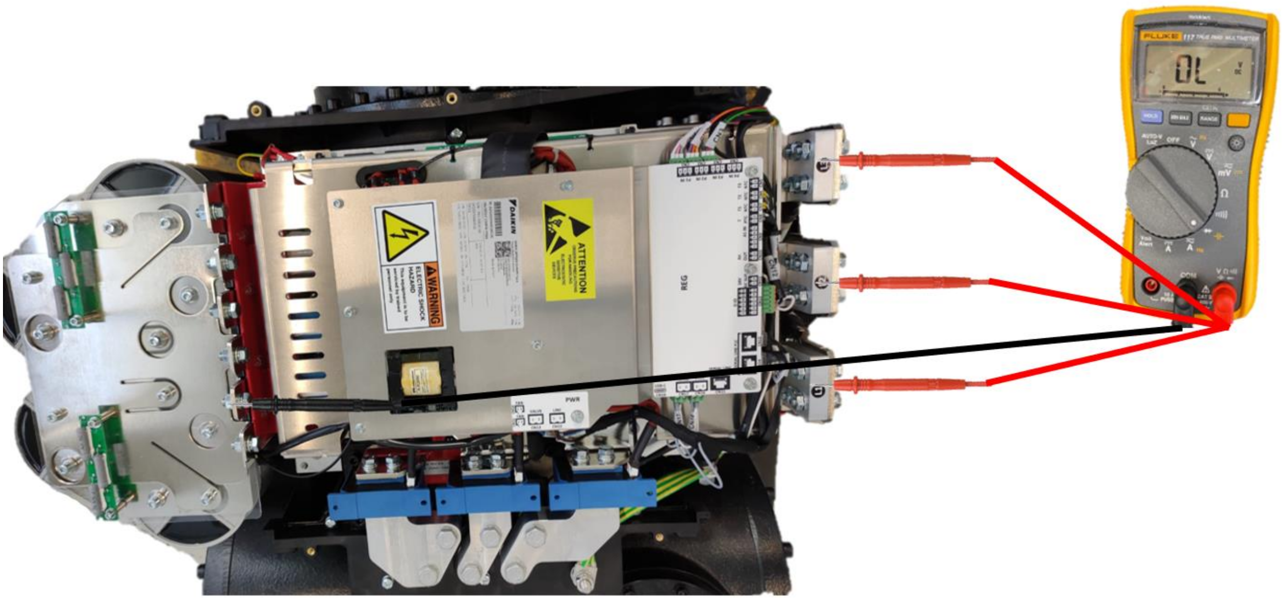


Figure 88 330 kW - 400 kW DAE VFD – Bottom SCR Indirect polarization

8.3.4 Top SCR Resistance direct polarization

Figure 89 330 kW - 400 kW DAE VFD – TOP SCR Resistance direct polarization

8.3.5 Top SCR Resistance indirect polarization

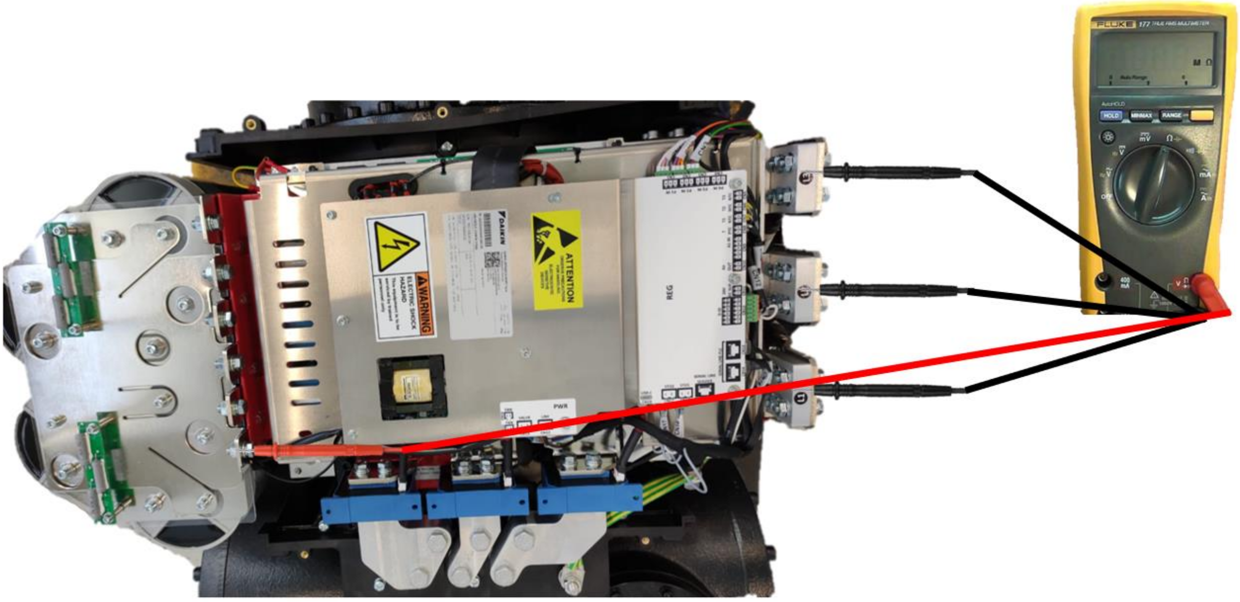


Figure 90 330 kW - 400 kW DAE VFD – TOP SCR Resistance indirect polarization

8.3.6 Bottom IGBT Direct polarization

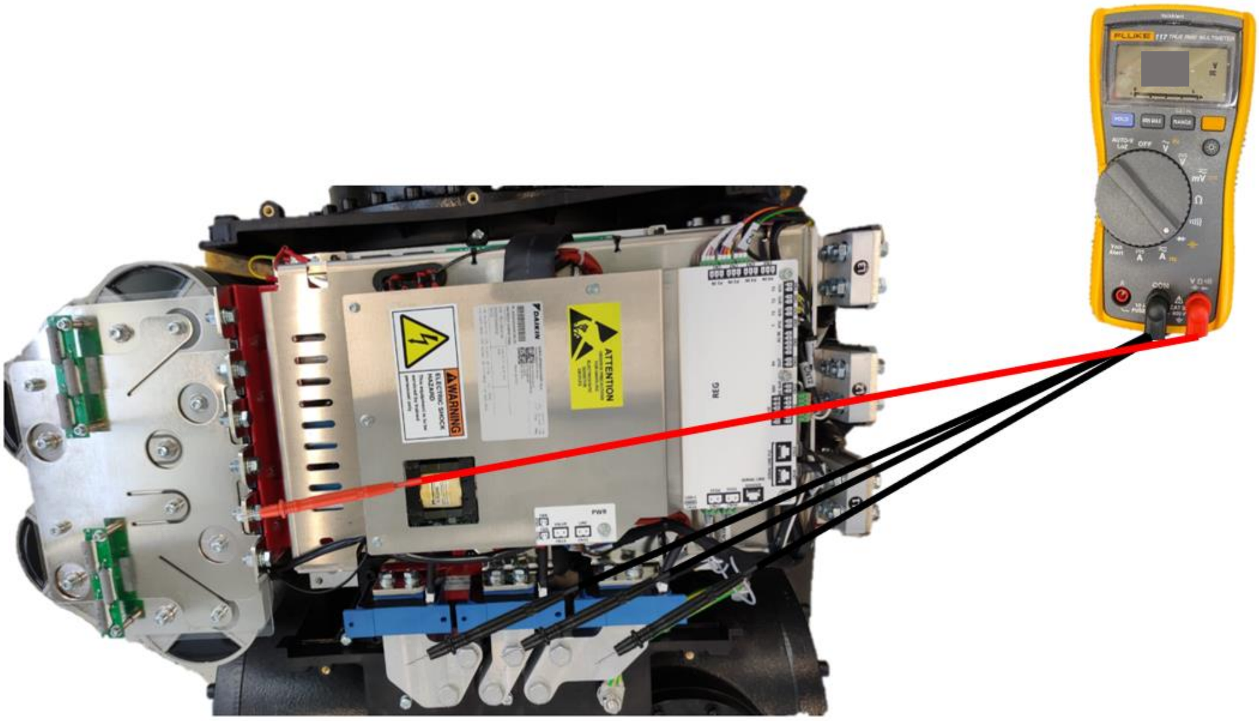


Figure 91 330 kW - 400 kW DAE VFD – Bottom IGBT Direct polarization

8.3.7 Bottom IGBT Indirect polarization

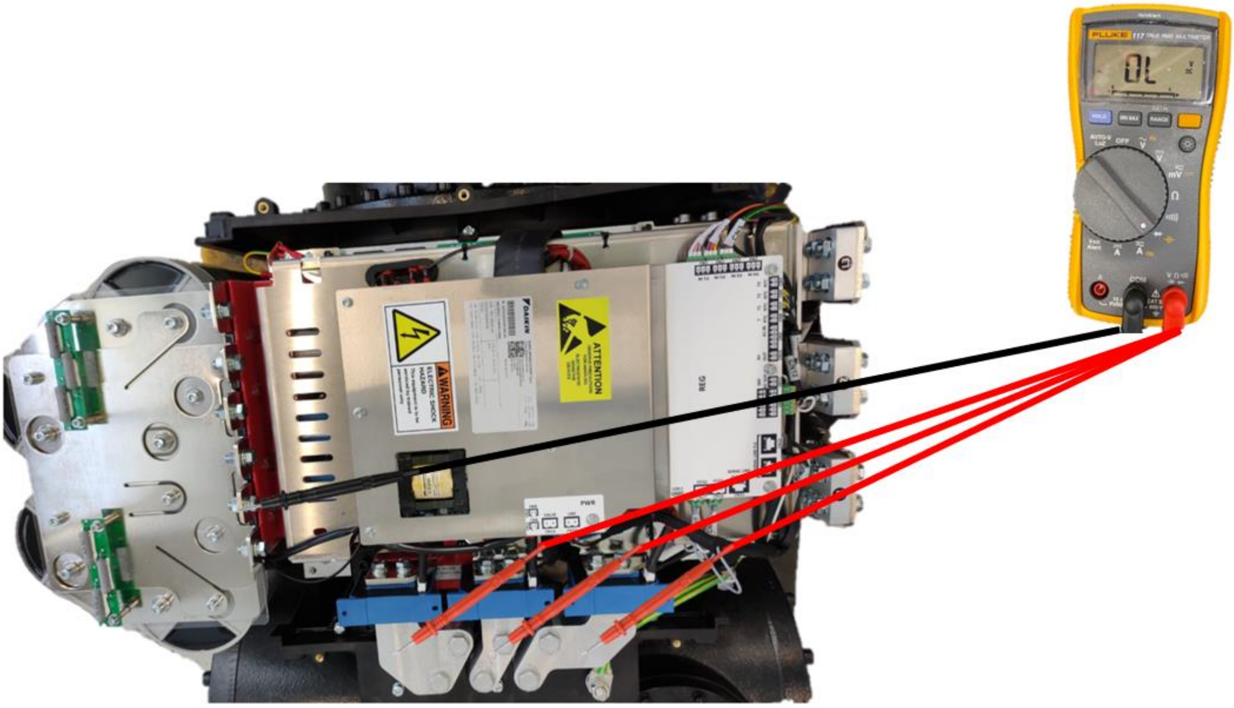


Figure 92 330 kW - 400 kW DAE VFD – Bottom IGBT Indirect polarization

8.3.8 Top IGBT Direct polarization

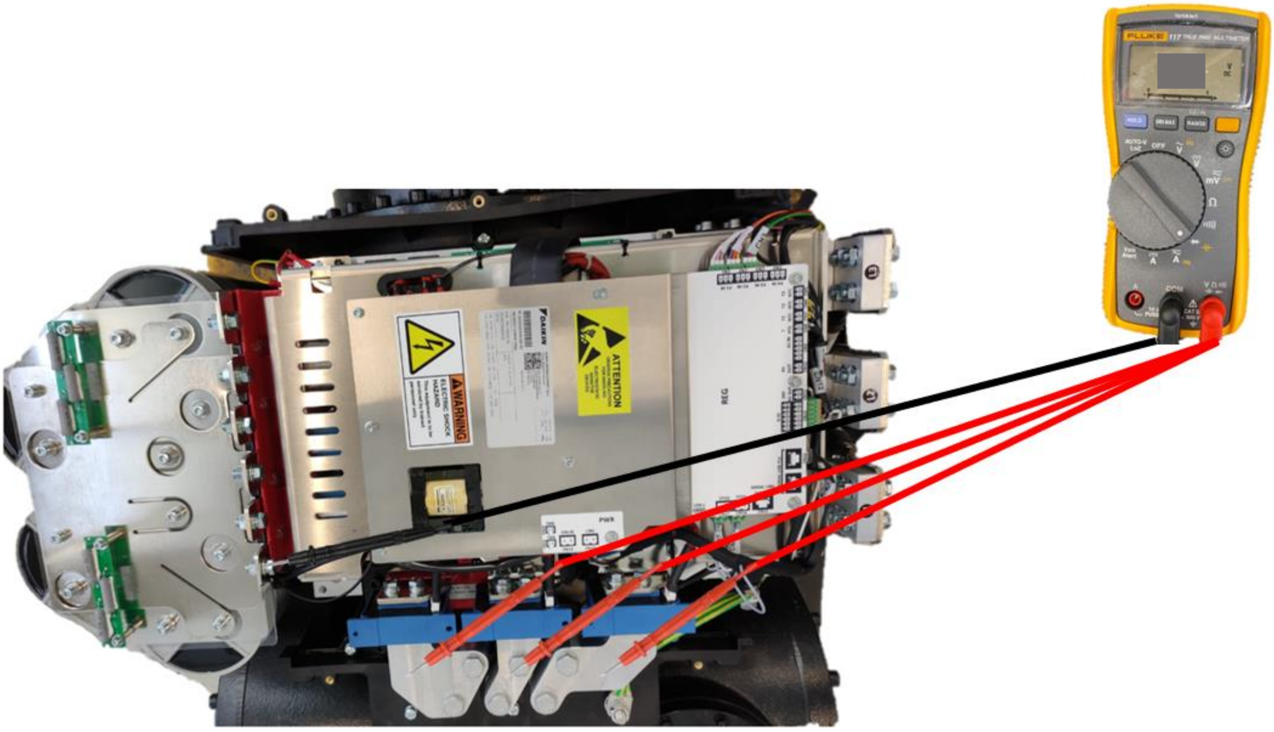


Figure 93 330 kW - 400 kW DAE VFD – TOP IGBT Direct polarization

8.3.9 Top IGBT Indirect polarization

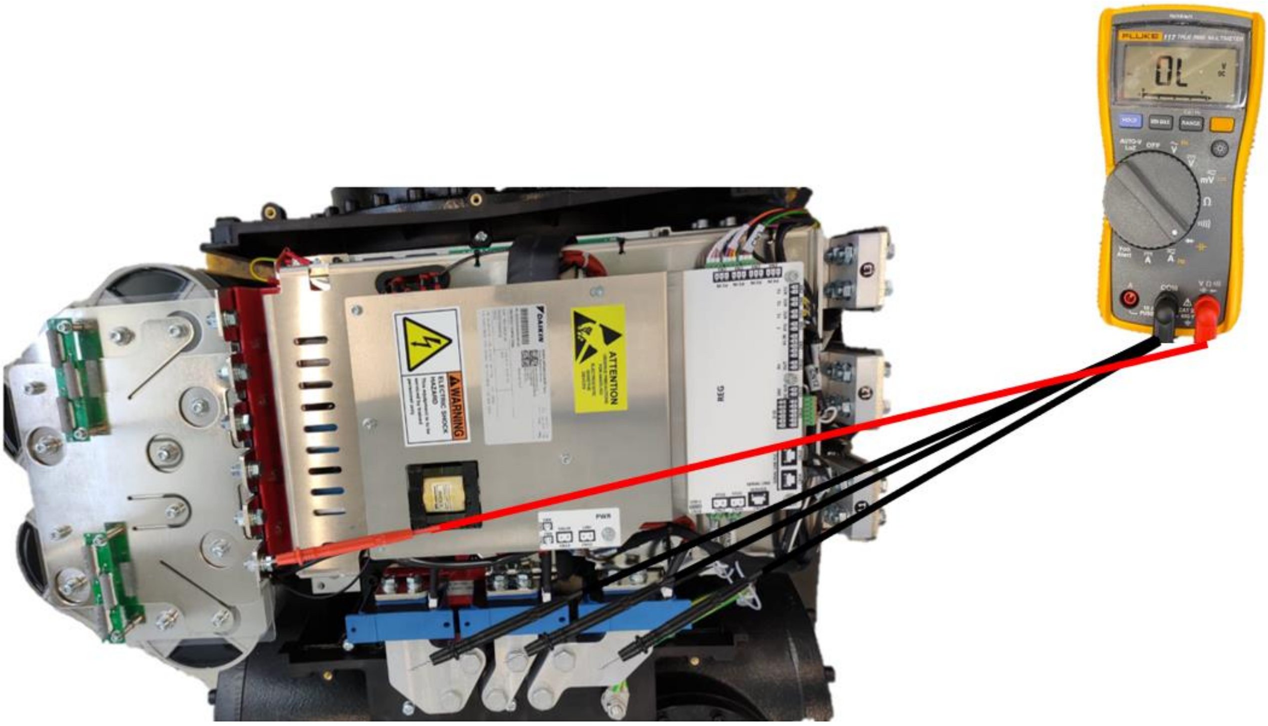


Figure 94 330 kW - 400 kW DAE VFD – TOP IGBT Indirect polarization

9 MEASURMENT REFERENCE VALUES TABLE

INFORMATION
The reference value for each SCR/IGBT model is to be considered for all the three phases.
A damaged SCR/IGBT will cause you to get far out of tolerance measurements

9.1 SCR section

9.1.1 Bottom SCR Diodes reference values

VFD Size [kW]	Bottom SCR Direct [V]	
	Min	**Max**
90kW	0,37	0,48
120kW	0,38	0,48
200kW	0,35	0,46
330/400kW	0,38	0,45

Table 24 Bottom SCR direct reference values

VFD Size [kW]	Bottom SCR Indirect [V]	
	Min	**Max**
90kW	OL	OL
120kW	OL	OL
200kW	OL	OL
330/400kW	OL	OL

Table 25 Bottom SCR indirect reference values

INFORMATION

- In forward bias measurement, an indication of 0,1V or lower indicates a problem with the diode.
- When the readout value is the same in forward and reversed bias the diode is *shorted!*
- When performing reversed biased measurement, the reading should be OL, indicating *an open switch diode.*
- If reading is OL in both reversed and forward biasing the diode is *bad.*

9.1.2 TOP SCR Thyristors resistance reference values

The Ohm mode function is a less accurate measurement than diode test mode.
Moreover, depending on the DAE VFD connection in the electrical switchbox and system the measurement can variate differently in each application.
To evaluate a thyristor as “good”, direct and indirect resistance measurement are “OL: Open Line” or more than hundreds Ω kOhm.
A shorted thyristor reports measurements of very low resistance like 0 Ω Ohm or similar.

9.2 IGBT section

9.2.1 Bottom/TOP IGBT Diodes direct polarization reference values

VFD Size [kW]	Bottom/Top IGBT Direct [V]	
	Min	**Max**
90kW	0,32	0,42
120kW	0,28	0,4
200kW	0,3	0,4
330kW	0,29	0,37
400kW	0,28	0,36

Table 26 Bottom/Top direct reference values

9.2.2 Bottom/TOP IGBT Diodes indirect polarization reference values

VFD Size [kW]	**Bottom/Top IGBT Indirect [V]**	
	Min	**Max**
90kW	OL	OL
120kW	OL	OL
200kW	OL	OL
330kW	OL	OL
400kW	OL	OL

Table 27 Bottom/Top indirect reference values

INFORMATION

- In forward bias measurement, an indication of 0,1V or lower indicates a problem with the diode.
- When the readout value is the same in forward and reversed bias the diode is *shorted!*
- When performing reversed biased measurement, the reading should be OL, indicating *an open switch diode.*
- If reading is OL in both reversed and forward biasing the diode is *bad.*

10 COLLECTION TABLES

In this section you can find the service sheet that can be filled on site for service checks on the compressor motor and DAE VFD.

The numbers of the checks in the sheet are referred to number of procedure of chapters 7 and 8.

Use also the following pictures for components models and serial numbers references

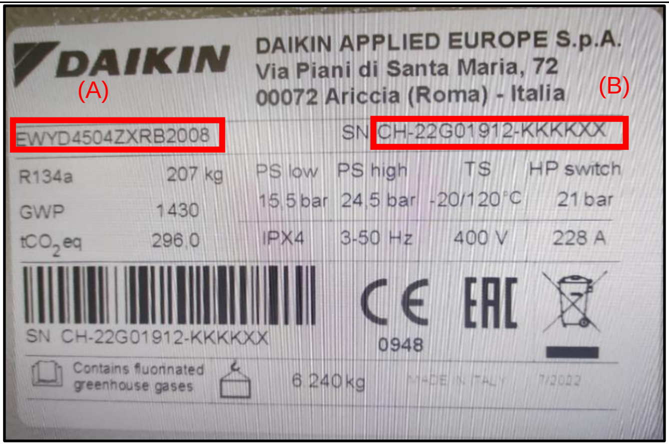
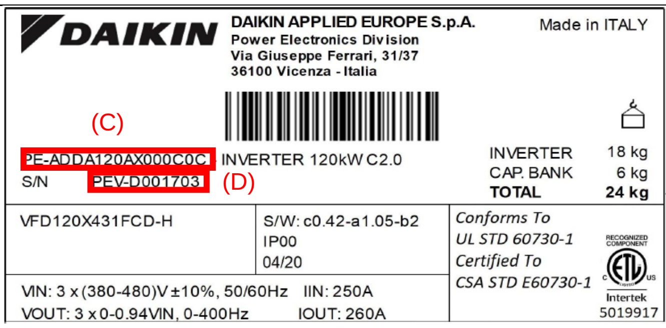
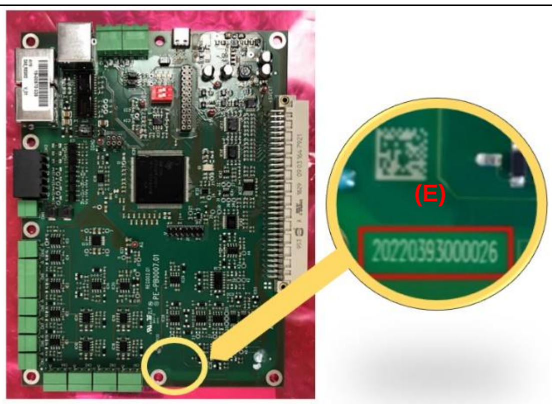
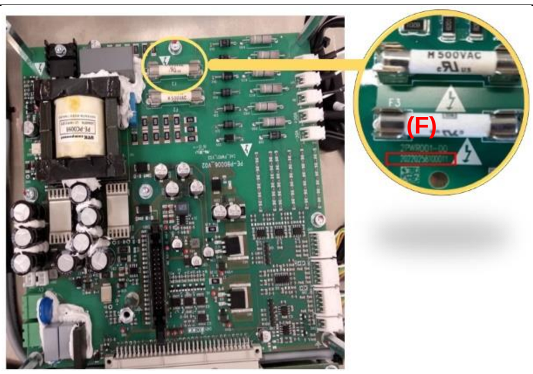
Unit nameplate	
VFD nameplate	
Regulation card serial number	
Powe card serial number	

Table 28 VFD Labels

ALARM TROUBLESHOOTING PROCEDURES

UNIT MODEL (A) : Check unit label	**INVERTER SERIAL NR (D) :** Check VFD Label	Date:
UNIT SERIAL NR (B) : Check unit label	**REGULATION BOARD SERIAL NR (E) :** Check by VFD NAV or on reg. board	Site:
INVERTER MODEL (C) : Check VFD Label	**POWER BOARD SERIAL NR (F) :** Check on power board	Distributor:
MASTER or SLAVE VFD : Only for Centrifugal application	☐ Master ☐ Slave	

PROCEDURES LIST

			Result	
			Ok	Not Ok
COMPRESSOR MOTOR Checks				
7.3.1 Before Troubleshooting	Electrical insulation Motor Phases - Earth			
7.3.2 Before Troubleshooting	Electrical insulation between Motor Phases			
7.3.3 Before Troubleshooting	Motor phases electrical continuity			
6.13	Motor thermal probe check	Is the motor thermal probe correctly working?		
6.13.1	Terminal thermistor electrical continuity test			
6.13.2	Electrical insulation terminal thermistor - earth			
6.13.3	Electrical insulation terminal thermistor - motor phases			
REGULATION CARD Checks				
6.1	24V DC on CN16 - CN17	Is 24V DC present across REG_CN16 and REG_CN17		
6.2	Guardistors	Is the voltage drop on the guardistors = 0V?		
6.3	CN11 - CN16 Continuity	Is the cable and REG_CN11 PIN 2 in continuity?		
6.4	24V DC CN11	Is 24V DC present on REG_CN11 PIN 1-2		
6.5	24V DC Supply	Is the 24V DC supplied to the regulation card properly		
CURRENT TRANSDUCER Checks				
6.6	Output current measurement Check	Is the measured value in tolerance with the value read by the inverter ?		
6.7	Output current transducers Check	Are the pins correctly connected?		
MECHANICAL Checks				
6.8	Output side bolts check	Are the Bolts correctly tighten up?		
6.14	VFD Cooling line solenoid valve correct assembly	Is the VFD Cooling line solenoid valve mounted in the correct direction?		
POWER CARD Checks				
6.10	5V DC on 18 - 23 spots	Is 5V DC present across 18 to 23 spots?		
6.11	5V DC on 1 2 3 - GND	Is 5V DC present on 1-GND or/and 2-GND or/and 3-GND and VFD still in alarm?		
6.12	0V DC on 1 2 3 - GND	Is 0V DC present on 1-GND or/and 2-GND or/and 3-GND and VFD still in alarm?		
6.15	24V DC on CN13	Is 24V DC Pulsing/present on the PWR_CN13		

Original instructions

CE

PROCEDURES LIST

			Result	
			Ok	Not Ok
IGBT Checks				
6.9	IGBT CHECK	Is IGBT Check procedure verified?		
	Bottom IGBT Diodes Measurements (Diode test function)			
	PHASES	**Bottom IGBT Direct [V]**		
		DC - **[(+) Red lead]**		
	U **[(-) Black Lead]**			
	V **[(-) Black Lead]**			
	W **[(-) Black Lead]**			
	PHASES	**Bottom IGBT Indirect [V]**		
		DC - **[(-) Black Lead]**		
	U **[(+) Red lead]**			
	V **[(+) Red lead]**			
	W **[(+) Red lead]**			
	Top IGBT Diodes Measurements (Diode test function)			
	PHASES	**TOP IGBT Direct [V]**		
		DC + **[(-) Black Lead]**		
	U **[(+) Red lead]**			
	V **[(+) Red lead]**			
	W **[(+) Red lead]**			
	PHASES	**TOP IGBT Indirect [V]**		
		DC + **[(+) Red lead]**		
	U **[(-) Black Lead]**			
	V **[(-) Black Lead]**			
	W **[(-) Black Lead]**			
SCR Checks				
7.2	SCR CHECK	Is SCR Check procedure verified?		
	Bottom SCR Diodes Measurement (Diode test function)			
	PHASES	**Bottom IGBT Direct [V]**		
		DC - **[(+) Red lead]**		
	L1 **[(-) Black Lead]**			
	L2 **[(-) Black Lead]**			
	L3 **[(-) Black Lead]**			
	PHASES	**Bottom IGBT Indirect [V]**		
		DC - **(-)**		
	L1 **[(+) Red lead]**			
	L2 **[(+) Red lead]**			
	L3 **[(+) Red lead]**			
	Top SCR Thyristors Measurements (Ohm mode function)			
	PHASES	**Bottom IGBT Direct [Ω]**		
		DC + **(-)**		
	L1 **[(+) Red lead]**			
	L2 **[(+) Red lead]**			
	L3 **[(+) Red lead]**			
	PHASES	**Bottom IGBT Indirect [Ω]**		
		DC + **[(+) Red lead]**		
	L1 **[(-) Black Lead]**			
	L2 **[(-) Black Lead]**			
	L3 **[(-) Black Lead]**			
DC BUS CHECK				
7.1	DC BUS Voltage [V] :			

Original instructions

PRE-TROUBLESHOOTING COMMENTS	
POST-TROUBLESHOOTING COMMENTS	
Defective items found?	
Present during service	
Name :	***Company:***
Name :	***Company:***
Name :	***Company:***
Author:	**Installer:**
Signature:	**Signature:**
Title: Service Engineer	**Title:**

These information are intended only as a guide for authorized personnel with a sound basic knowledge of HVAC equipment, mechanical systems, electrical wiring, controls, & microprocessors.
Attempts by untrained or unauthorized persons to start, operate and service this equipment can result in equipment failure, personal injury, or death, as well as invalidation of product warranty. It is the responsibility of the technician to ensure that proper safety equipment safe practices are used.