Flexi | X

Installation Manual
Semikron RAC™

Supported Concycle® systems:

CW150xXX4.x / CW200xRP4.x

Supported power stack types:

ConverterTec Service stack™ / Semikron RAC™

Version “3“

April 2024

Document number: D-00010

Contents

1. Safety rules

For working at the Concycle system, the 5 safety rules must be followed:

5 Safety Rules

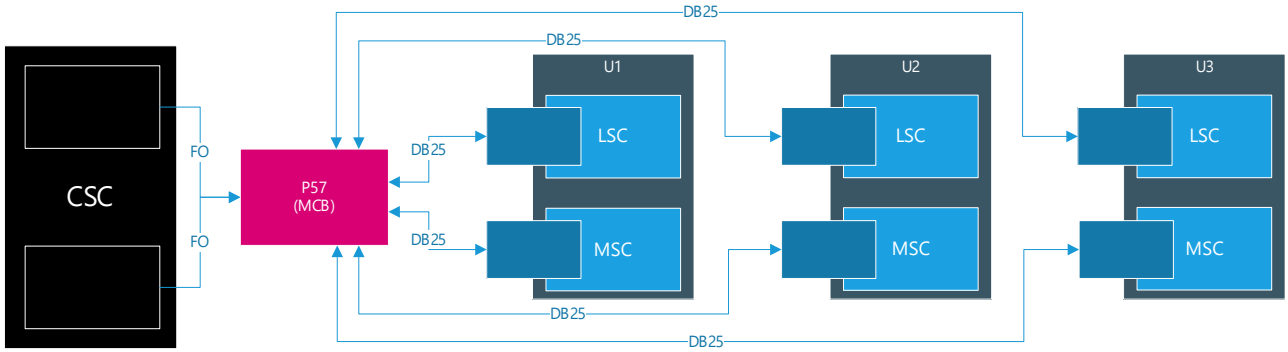
Before starting any work:

- Disconnect completely
- Secure against re-connection
- Verify absence of voltage
- Earthing and short-circuiting
- Protect adjacent live parts

2. Related hardware

Description	Item Number
FlexiX, Semikron RAC 31x, Service Stack kit	I-01300
FlexiX, SDB-SS kit (Service stack distribution board kit)	I-03053
FlexiX, P57 kit	I-02816
FlexiX, Semikron RAC 31x, electronics kit with mounting parts	I-01308
FlexiX, Semikron RAC 310/311S, interface kit	I-01310
FlexiX, Semikron RAC 313/314, interface kit	I-01313
FlexiX, Semikron RAC 31x, Fiber Optics Errors kit	I-01385
FlexiX, Semikron RAC 31x, Power Cables kit	I-0130x
KIT - Fiber Optic Transmitter 2CH	I-06895

3. Functional block diagram



4. Required Tools

- Torque wrench (3,2Nm - 44Nm).
- Ratchet set (socket 7, 8, 13, 17, 19mm; 3, 6, 8mm hex bit).
- Spanner (size 7, 8, 13, 17 and 19mm).
- Screwdriver (Slotted + Philips).
- Screwdriver (Slotted + Philips) 75mm overall length.
- Cutters, wire stripper and crimper
- ESD Protection.
- Personal Protective Equipment (PPE, PSA).
- Drilling machine with M8 metal drill or metal saw.

5. Preparation/Disassembly

5.1. Download CSC data

- Last triggers and Event file(s).
- Parameter file.
- Counter and operating hours.

5.2. Stop the turbine and shut down the converter

- Stop the system via wind turbine control (WTC).
- Switch off the 24VDC (-F8+ -F15).
- Switch off 400V/230V auxiliary voltage.
- Ensure the 5 safety rules are fulfilled!
- Wait until DC-link is discharged to a safe level.

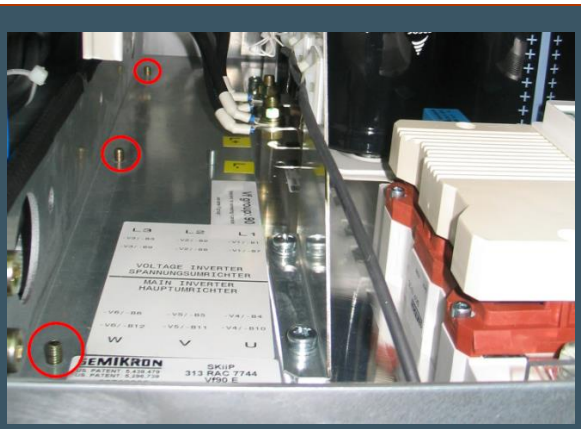
5.3. Disconnect external electrical connections of power stack

Mark all external power stack connections before disconnection!

- Remove the plastic front cover.
- AC power cables from power stack (LSC & MSC) and fix them to the mounting c-rail above to ensure an easy removal.
- dU/dt filter resistor(RAC313 with resistors on stack) and DC-link connections.
- If applicable, disconnect the fiber optic cables from the power stack and fix them to the mounting rail. Old fiber optics will be reused. Mark the fibre optics for the driving signals going to the position of where the P57 board will be installed.
- 24V power supply connector and temperature supervision connector

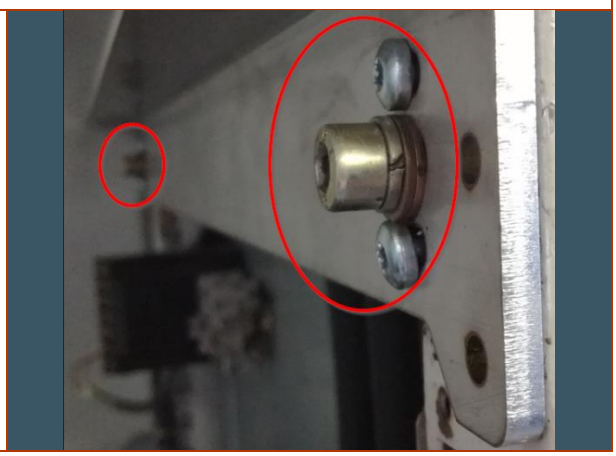
5.4. Power stack removal

- Remove the bottom fixation screws of the power stack (3x left and 3x right side).



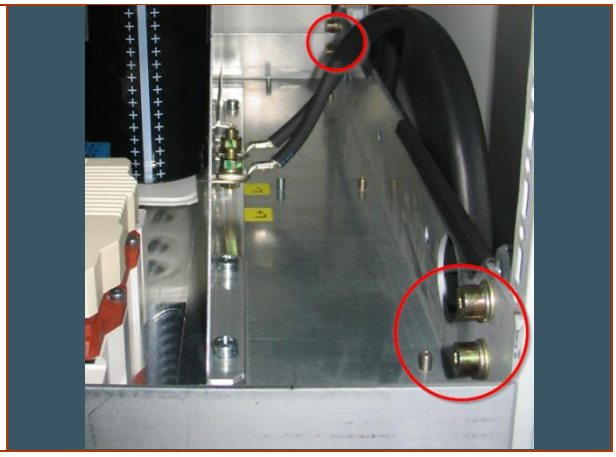
Material available in:
- FlexiX, Semikron RAC, Service Stack kit

- Install the mounting rails(1x left, 1x right) below the power stack using the provided fasteners from the kit



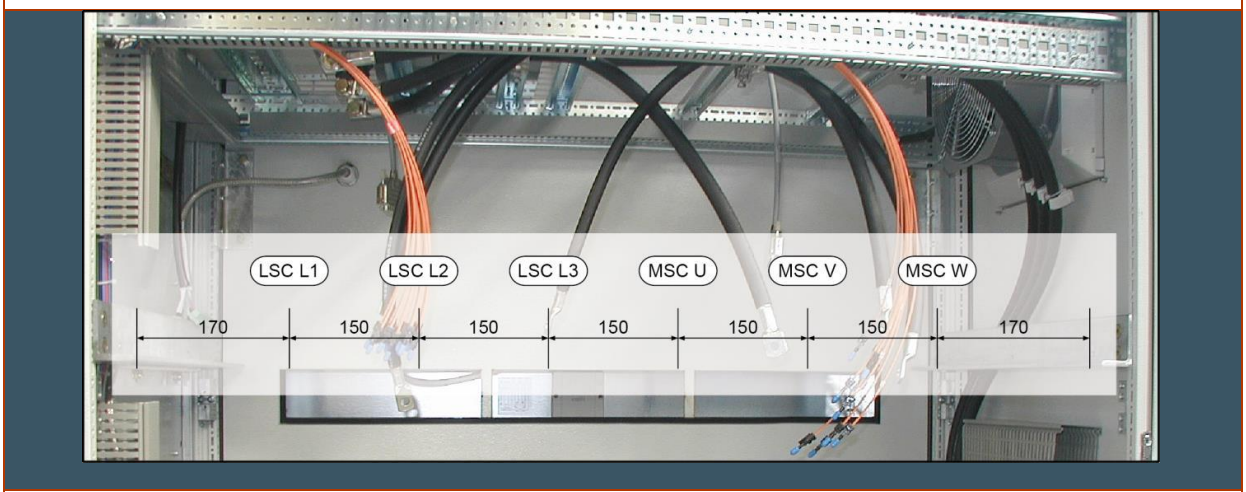
- Remove the side fixation screws of the power stack (4x left and 4x right side)

  *The power stack is no longer fixed and can be removed.
  Weight ~ 100kg.



5.5. Cabinet preparation

Material available in:
- FlexiX, Semikron RAC 31x, Power Cables kit



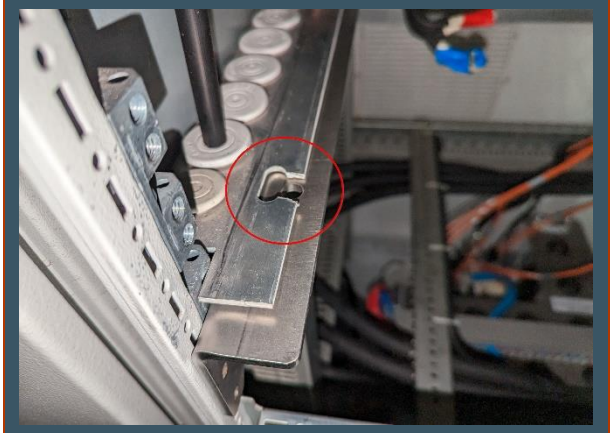
- Once the stack is removed, adjust the power cables to the new connection points.
- Remove the old power cables and the cable clamps fixing.
- Install the new power cables from the installation kit.

- Enlarge the holes of the aluminium plates, so that they fit the holes of the mounting plates(3x left side, 3x right side).

**Risk of material damage due to swarf. Protect the power stack below the mounting rails from swarf.*

- Clean up the converter

**The right side aluminium plate may need additional drilling holes for the new DB25 cables routing in some converters.*



6. Installation of P57(MCB)

3-stack converter: P57 should be mounted on top of the power stack which occupies the middle stack position.
2-stack converter: P57 should be mounted on top of the power stack which occupies the top stack position.

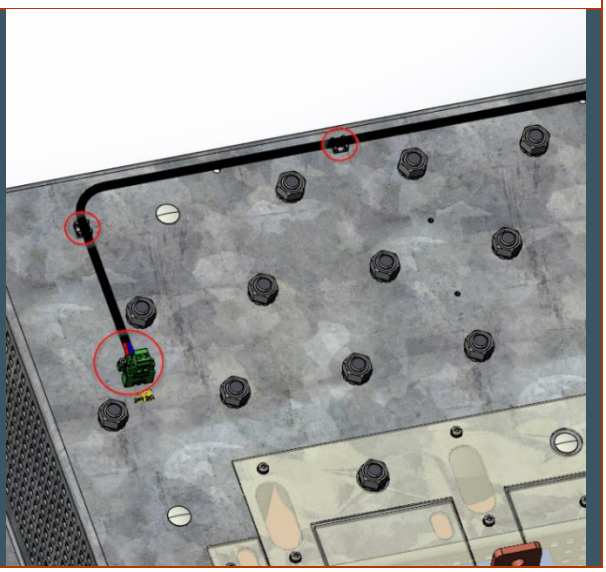
6.1. P57 power supply cable

There are two possible cases. Proceed with one of them accordingly.

6.1.1. Case 1 – P57 on Service Stack™

Material available in:
- FlexiX, P57 kit

- Mount the 2x cable tie holders.
- Mount the 24VDC connector using the M3 fasteners.
- Install the cable and connect it according to the polarity.
- Fix the cable with cable ties to the brackets.
- Apply the 24VDC label.



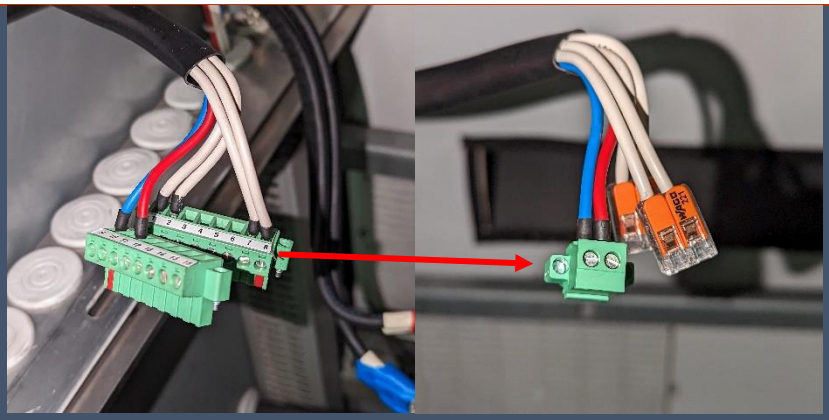
6.1.2. Case 2 – P57 on Semikron RAC™

- P57 power supply cable will be installed later.

6.2. Temperature Supervision

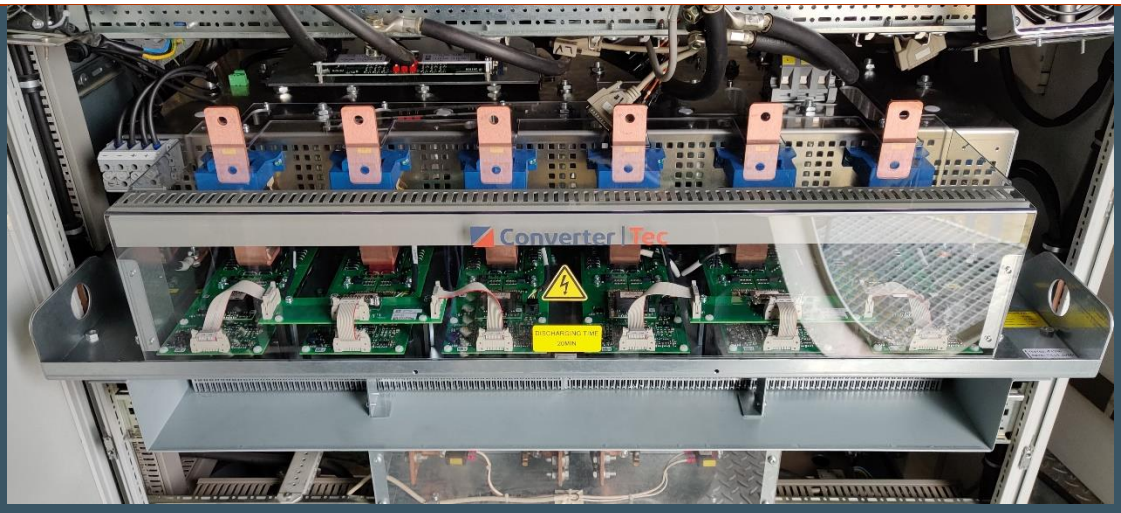
Material available in:

- FlexiX, SDB-SS kit (Service stack distribution board kit)

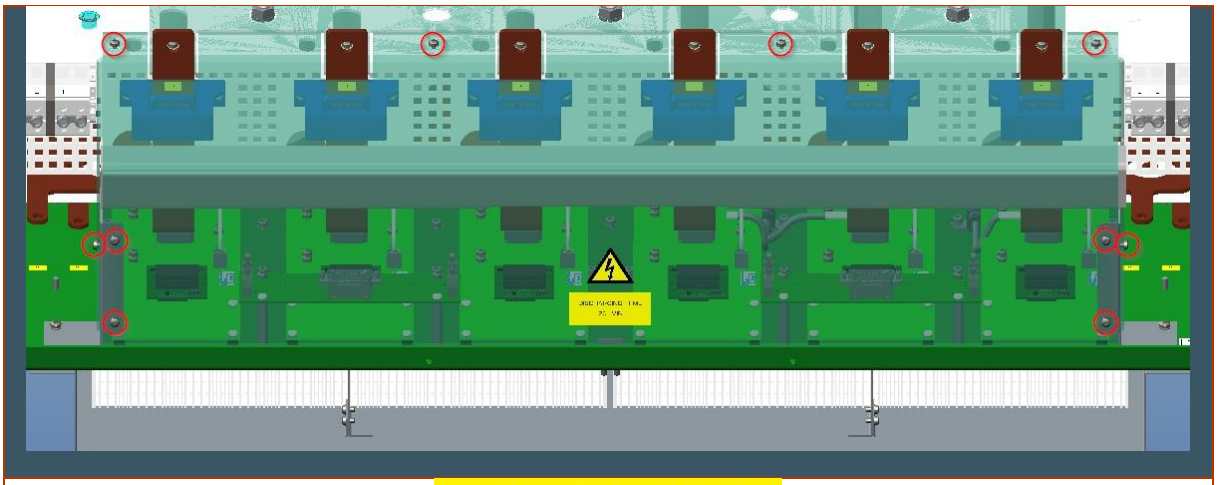


- Use the two-position splicing connectors inside the kit to bridge:
  - X13.1&2
  - X13.7&8

6.3. Service stack™ installation



- Slide Service stack™ into the cabinet.
  Weight ~ 100kg.
- Fix it to the mounting rail using the original fixation screws (3x left and 3x right side).

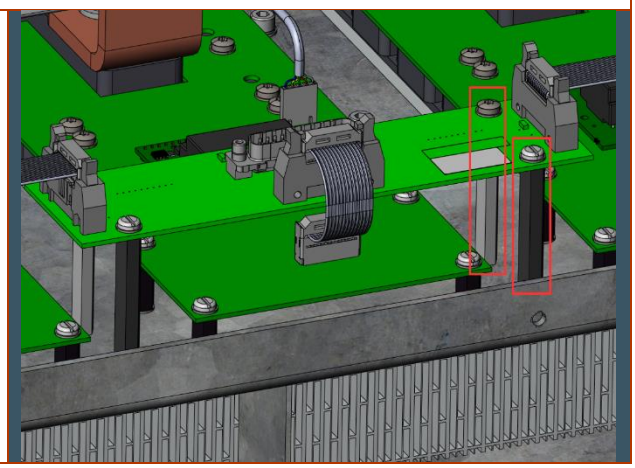


- Remove the 10x screws.
- Remove the plastic cover.

Material available in:

- FlexiX, SDB-SS kit (Service stack distribution board kit)

- Mount 2x metal and 2x plastic standoffs.
- Mount distribution board with 4 screws (2x plastic on plastic standoff, 2x metal on metal standoff)
- Connect 3x IDC cables.



- Perform the same procedure on the other side of the power stack (LSC/MSC).

6.4. Install the FlexiX, Semikron RAC, interface kit

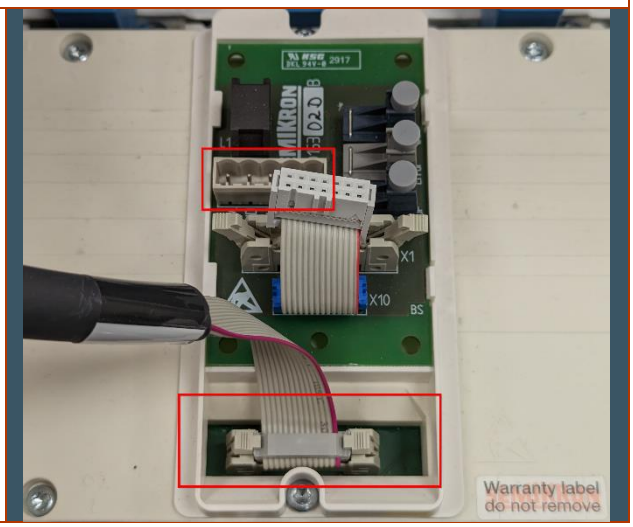
**Install this kit on all Semikron RAC™ power stacks.*

There are two possible cases. Proceed with one of them accordingly.

6.4.1. Case 1 - Install the FlexiX, Semikron RAC 313/314, interface kit

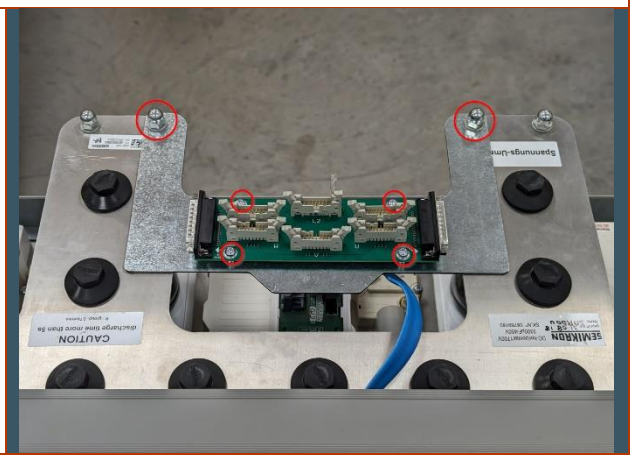
Material available in:
- FlexiX, Semikron RAC 313/314, interface kit

- Disconnect the power supply cable from the F-option
- Disconnect the ribbon cable from the F-option to the Driver board.
- Install the 6x IDC Cables from the driver board of each phase of the power stack to the interface board
  **The connection has to be to the Driver board, not to the F-option!*



Material available in:
- FlexiX, Semikron RAC 313/314, interface kit

**The board must be installed in the back side of the stack*
- Remove the 2x nuts and 2x washers.
- Install the mounting plate for the interface board from the kit
- Fasten the 2x nuts and 2x washers.
- Mount the IB-SK board on the frame
- Install the 4x M4 screws to fix the board

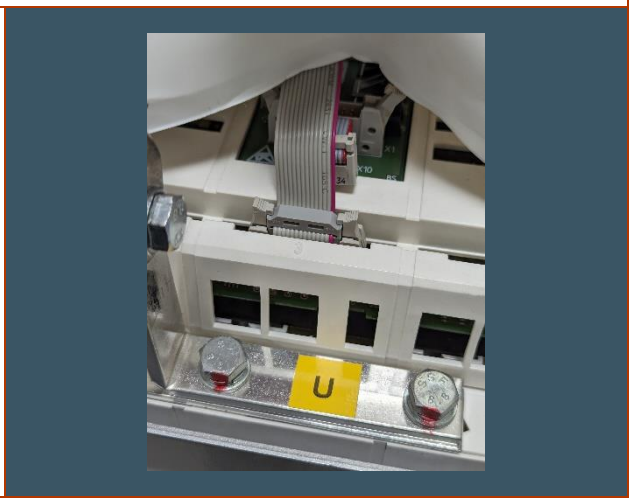


- Perform the same procedure on all Semikron RACs

6.4.2. Case 2 - Install the FlexiX, Semikron RAC 310/311S, interface kit

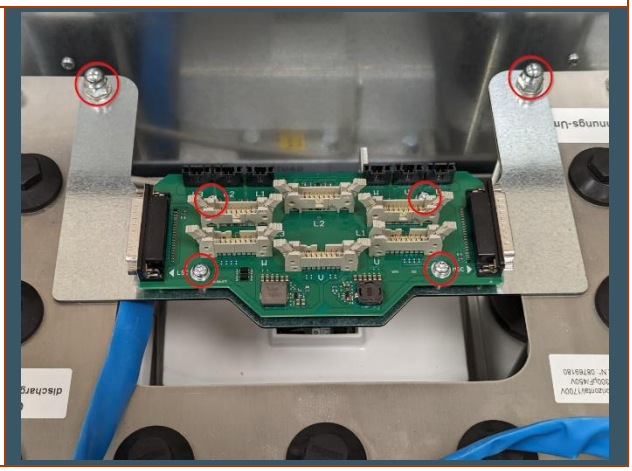
Material available in:
- FlexiX, Semikron RAC 310/311S, interface kit

- Disconnect the power supply cable from the F-option
- Carefully lift the dust protection cover to get access to the Driver board.
- Disconnect the ribbon cable from the F-option to the Driver board.
- Install the 6x IDC Cables to each phase of the power stack from the interface board
  **The connection has to be to the Driver board, not to the F-option!*



Material available in:
- FlexiX, Semikron RAC 310/311S, interface kit

**The board must be installed in the back side of the stack*
- Remove the 2x nuts and 2x washers.
- Install the mounting plate for the interface board from the kit
- Install the 2x nuts and 2x washers
- Mount the IB-SK-ET board on the frame
- Install the 4x M4 screws to fix the board



Material available in:

- FlexiX, Semikron RAC 310/311S, interface kit
- FlexiX, Semikron RAC 31x, Power Cables kit*

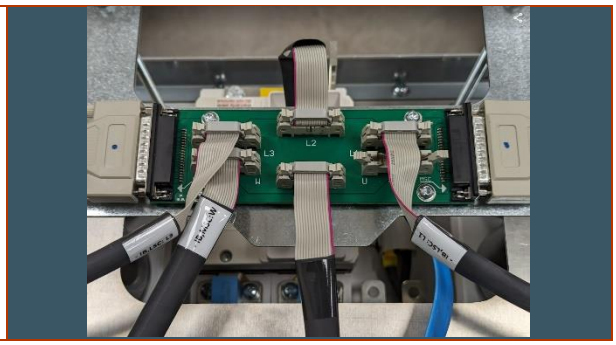
- Install the 6x current transducers from the kit and secure them with cable ties.
  **Be careful with the transducer clip.*
  ***In case of MSC 120 mm² power cables, always install the transducer on the cable lug.*
- Install the 6x current transducer cables from each current transducer to the interface board.

6.5. DB25 cables connection to power stacks

(!) Aluminum side plate might need additional drilling in some converters .

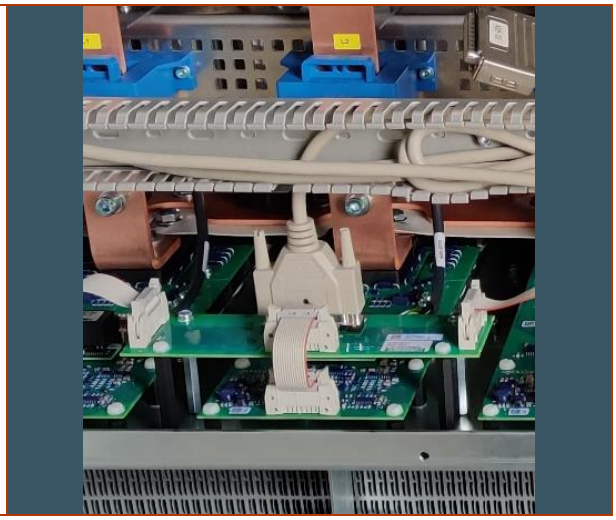
6.5.1. Semikron RAC™

- Connect one DB25 cable to each side of the installed interface board.
  **Use the 3-meter cable for LSC and 2-meter for MSC.*

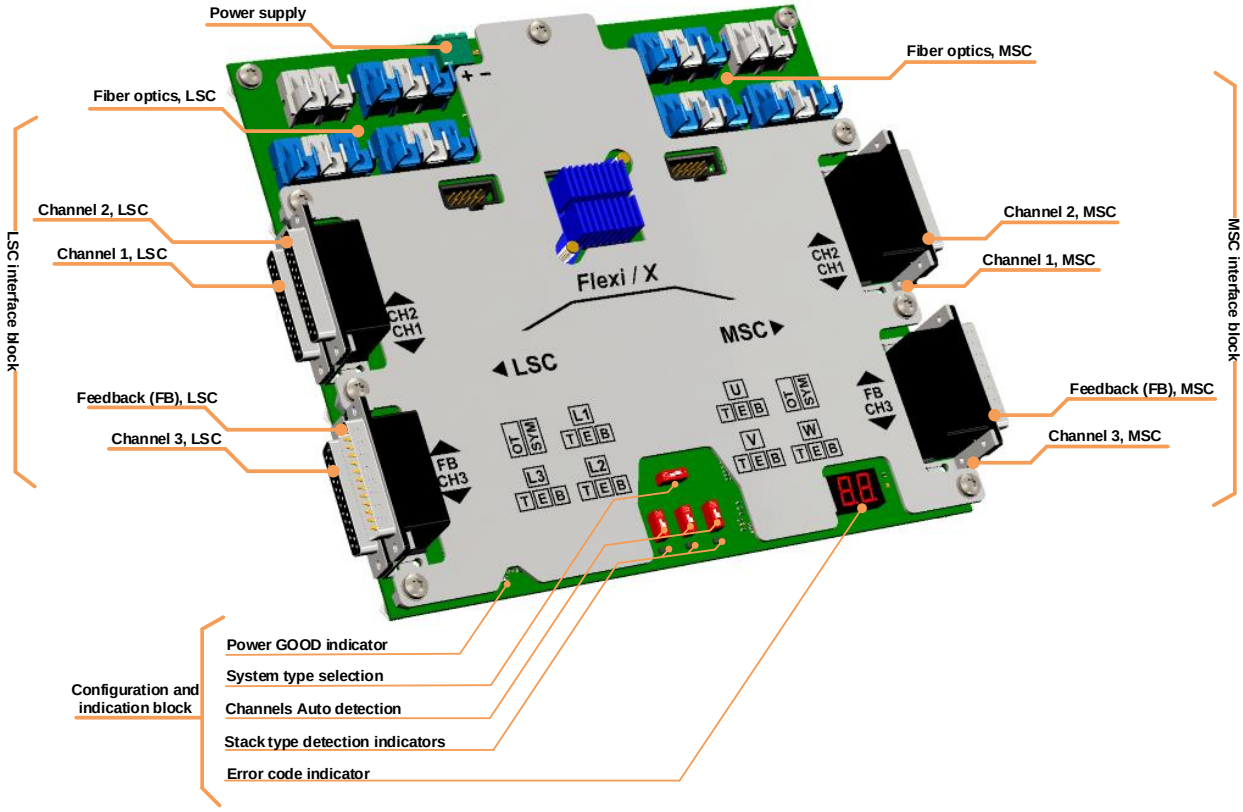


6.5.2. Service stack™

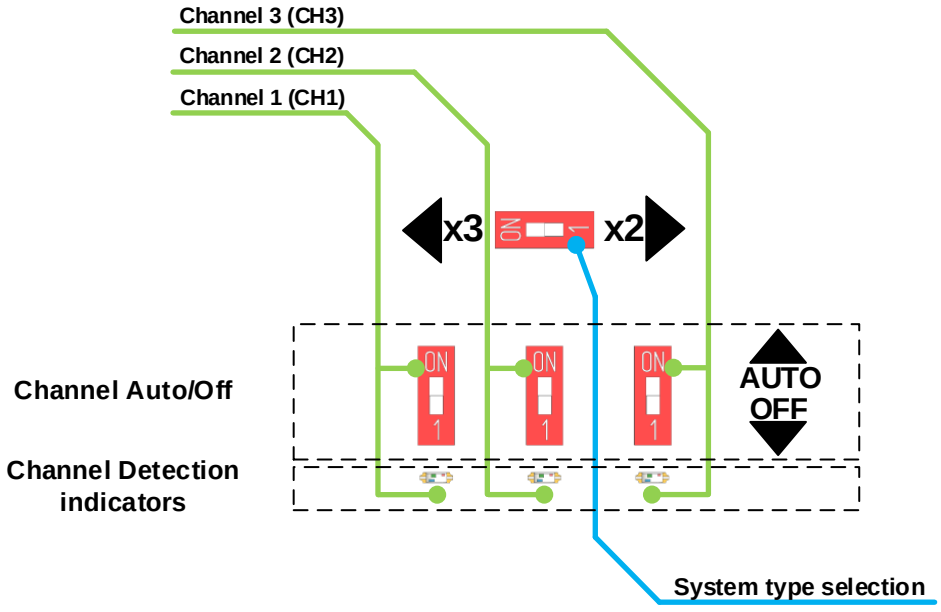
- Connect one DB25 cable to each side of the power stack (LSC & MSC).
  **Use the new DB25 cables from the kit.*
- Mount the front cover to the stack.



6.6. P57 configuration



(!) Changes in configuration must be made when the board is not powered.



6.6.1. Automatic channel detection

Each channel can detect automatically the connected stack type. The 2-position switch can be switched to AUTO or OFF. To each switch there is a corresponding LED indicator, which will show one of the following options shown below.

- ▲**AUTO** – Channel is set to automatic detection and the LED indicator will light in the following according to the connected stack type:
  - Service stack™ as green.
  - Semikron RAC™ 313/314 as blue.
  - Semikron RAC™ 310/311S as magenta.
  - Channel left unconnected as red.
- ▼**OFF**– Channel is OFF and the LED indicator will light in red. This position is used for derating purposes. It will power on the power stack when connected, but with disabled driving signals.

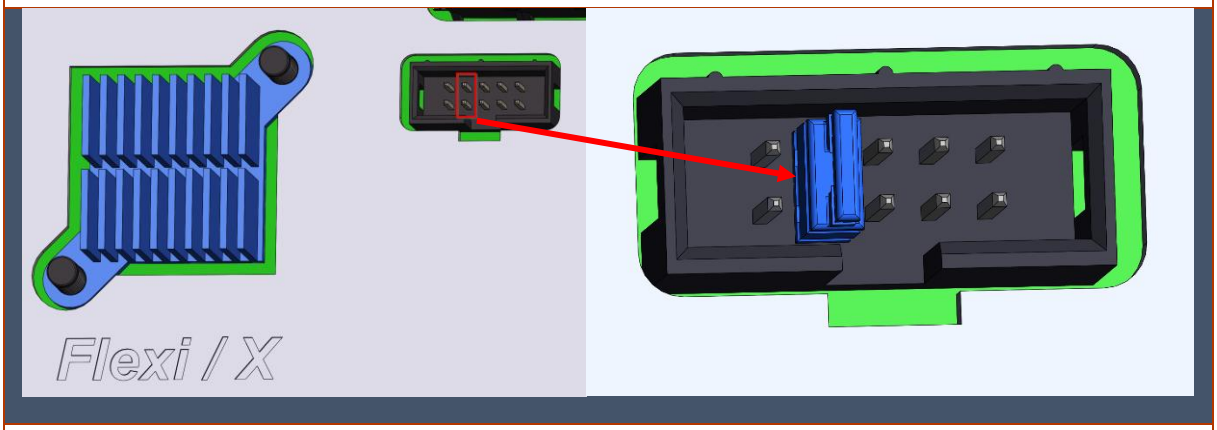
In standard operation all channels should be left in AUTO. If a channel is not used, it will automatically detect the unused channel when there is no power stack connected to it.

(!) All used channels must be switched to AUTO.

(!)When P57 board is used in a Semikron™ system, a jumper setting needs to be performed.

Material available in:

- FlexiX, Semikron RAC 31x, electronics kit with mounting parts



- Place a jumper on the right 10-pin connector of the P57 board onto the indicated pins.

6.6.2. System type selection

The type of the system must be configured correctly to ensure proper operation. The system type selection switch must be moved to the corresponding position:

- ◄x3 – CW2000RP4.x(Semikron RAC™) family
- x2► – CW150xXXx.x(Semikron RAC™) family.

6.7. P57 mounting

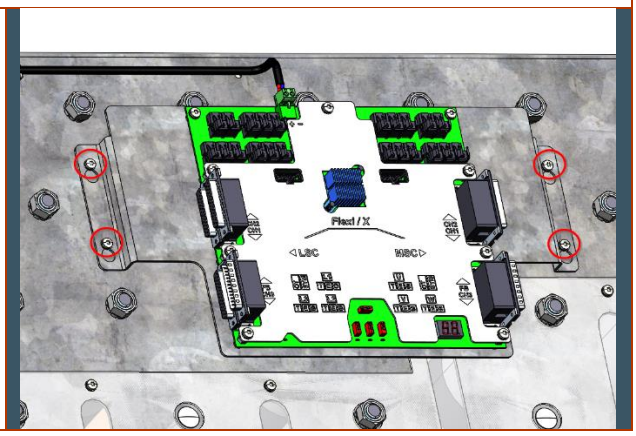
There are two possible cases. Proceed with one of them accordingly.

3-stack converter: P57 should be mounted on top of the power stack which occupies the middle stack position.
2-stack converter: P57 should be mounted on top of the power stack which occupies the top stack position.

6.7.1. Case 1 – P57 on Service Stack™

Material available in:
- FlexiX, P57 kit (ModSTACK based systems)

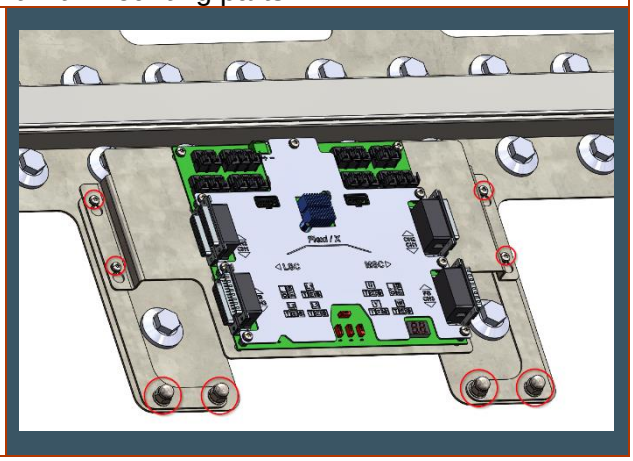
- Mount P57 on top of the Service stack™ using the 4x M4x10 screws.



6.7.2. Case 2 – P57 on Semikron RAC™

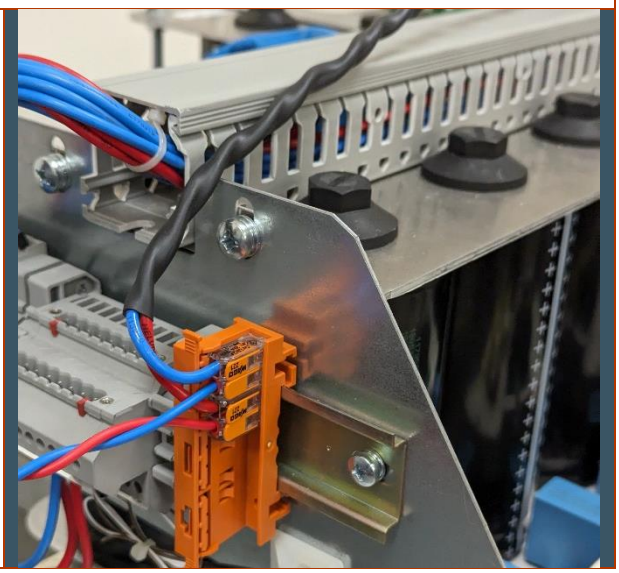
Material available in:
- FlexiX, P57 kit
- FlexiX, Semikron RAC 31x, electronics kit with mounting parts

- Unscrew the 4x M8 nuts from the stack.
- Mount the 2x adaptors to the Semikron RAC power stack.
- Mount the 4x M8 nuts, but do not tighten them yet.
- Mount P57 board to the adaptors using the 4x M4x10 screws.
- Tighten the 4x M8 nuts.



Material available in:
- FlexiX, Semikron RAC 31x, electronics kit with mounting parts
- FlexiX, P57 kit

- Mount the 1x splicing connector holder.
- Mount the 2x splicing connectors.
- Connect the external 24VDC power supply with the 24VDC cable using the splicing connectors that will power up P57 board.

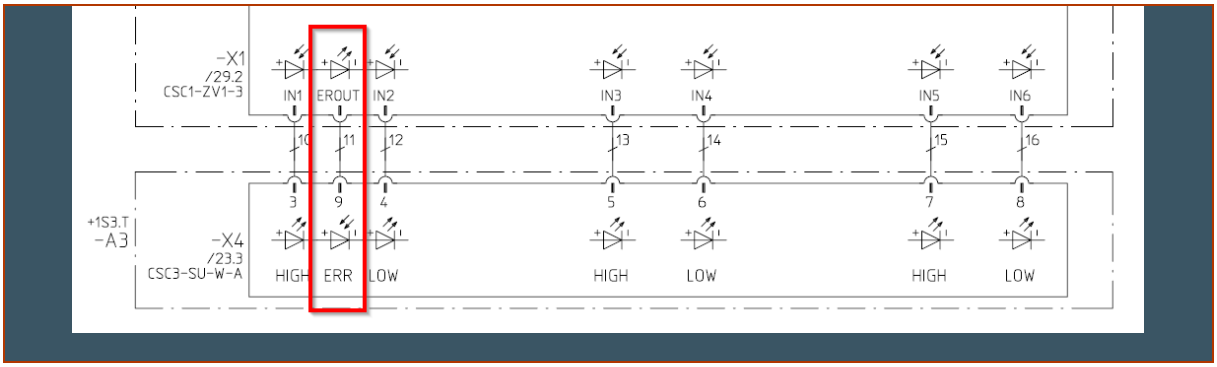


6.8. Fiber optic errors

There are two possible cases. Proceed with one of them accordingly.

In case of any LSC-related error generated from the P57 board all LSC error light outputs of the board will deactivate.
In case of any MSC-related error generated from the P57 board all MSC error light outputs of the board will deactivate.
**The board will indicate the correct fault on its display.*

6.8.1. Case 1 - CSC with 1 common error input per LSC/MSC side

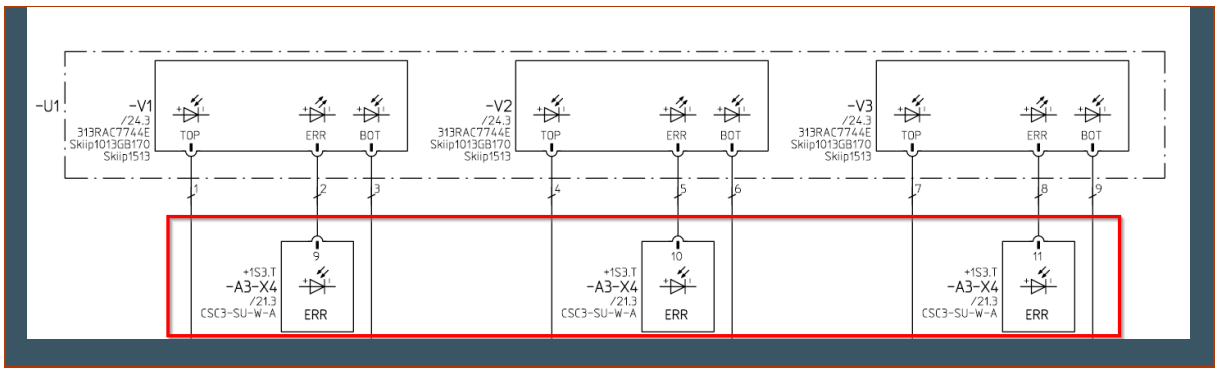


Material available in:
- FlexiX, Semikron RAC 31x, Fiber Optics Errors kit

- Route two new fiber optics from the CSC to P57 board for LSC/MSC errors.
- Connect the fiber optics to the CSC error input according to original schematics.
- Connector the fiber optics to the P57 board the following way:
  LSC error in “L1” error.
  MSC error in “U” error.
  **Old fiber optic errors will not be used. The multiplexer error side will be bypassed.*

6.8.2. Case 2 - CSC with individual error inputs per LSC/MSC side

This case occurs only in the CW150xXX(1,5MW) systems equipped with CSC3 and 6 error inputs per LSC/MSC side or all CW150xXX(1,5MW) upgraded with CSC4.



Material available in:

- KIT - Fiber Optic Transmitter 2CH

**Old fiber optic errors will be reused. 6 fiber optic errors will have to be connected to each side of the CSC (LSC/MSC).*

- Connect 5x LSC fiber optics errors to LSC side on P57 board and LSC side of the CSC.
- Connect 5x MSC fiber optic errors to MSC side on P57 board and MSC side of the CSC.
- Install the 2-channel FO transmitter device from the kit and connect the additional two fiber optics to CSC.
- Connect the 2-channel FO transmitter device power supply from the +24VDC rail of the converter using the cables from the kit.

**In case of a future CSC4 upgrade, keep the "2-channel FO transmitter" in stock.*

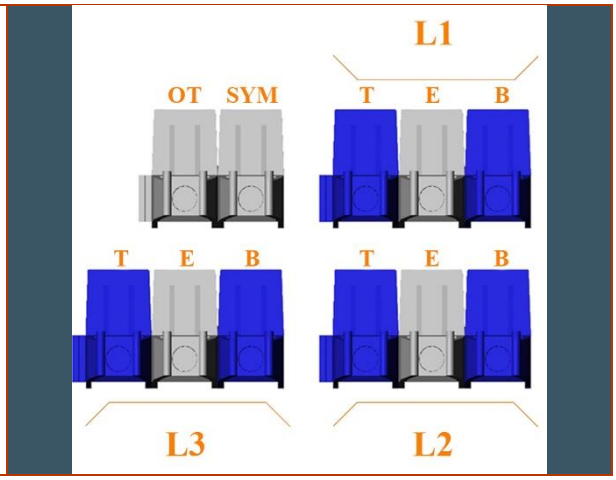
- Validate that both LSC/MSC sides of the CSC generate an error when unplugging one fiber optic from each side of the P57 board.

6.9. Fiber optic driving signals

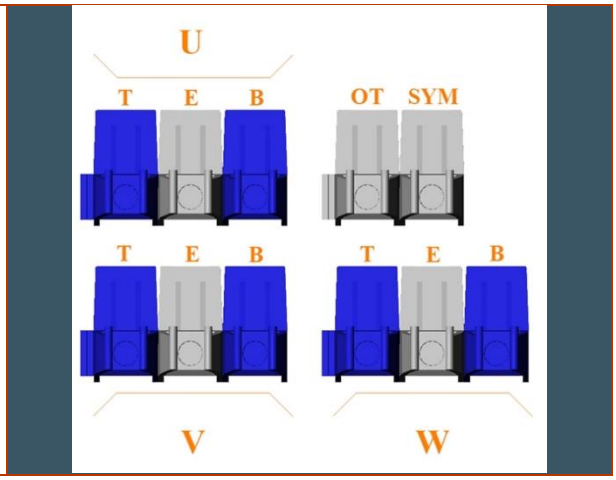
- Use the original fiber optics for the driving signals routed to the power stack where the P57 is installed. If any fibre optic is short, release one from the other stack and reuse it.
- In case this upgrade is performed together with CSC4 upgrade, new fiber optics can be used.

6.10. P57 connection

- Connect all LSC fibre optics driving signals.

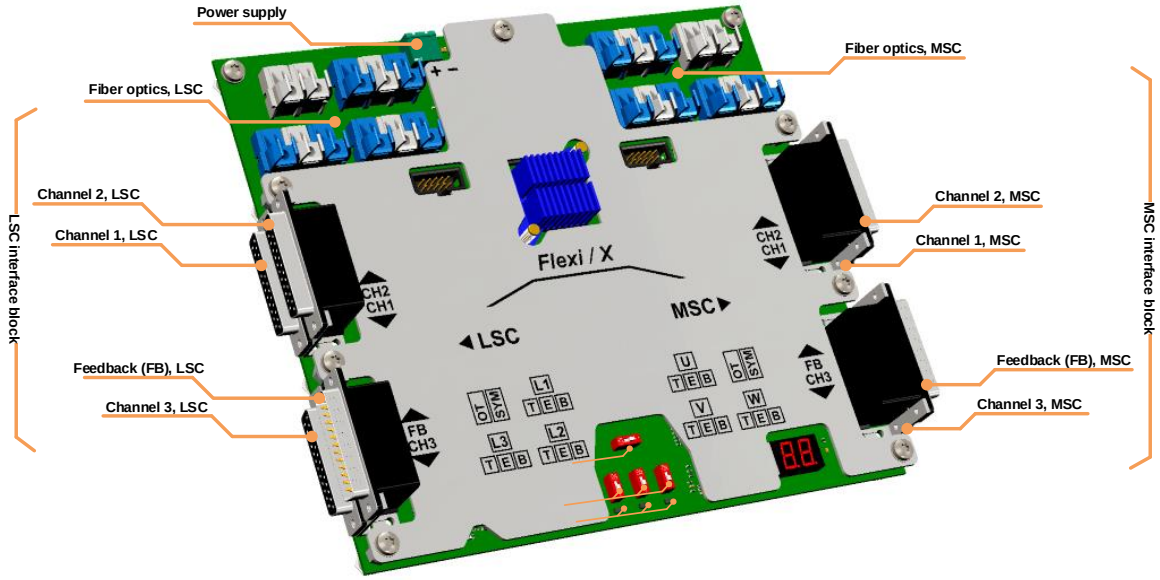


- Connect all MSC fibre optics driving signals.



Material available in:

- FlexiX, P57 kit (ModSTACK based systems)



- Connect DB25 (channel) cables:
  CH1 (top power stack).
  CH2 (middle power stack).
  CH3 (bottom power stack).
- Connect DB25 current measurement cables (Feedback).
- Connect 24VDC power supply.

** LSC & MSC cable from one power stack must be connected at the same channel.*

- Keep away all DB25 cables from the chopper resistor.
- Route all DB25 cables into the cable duct as much as possible.
- Fix the unused DB25 cables to the chassis with cable ties.

6.11. Connection of power stacks

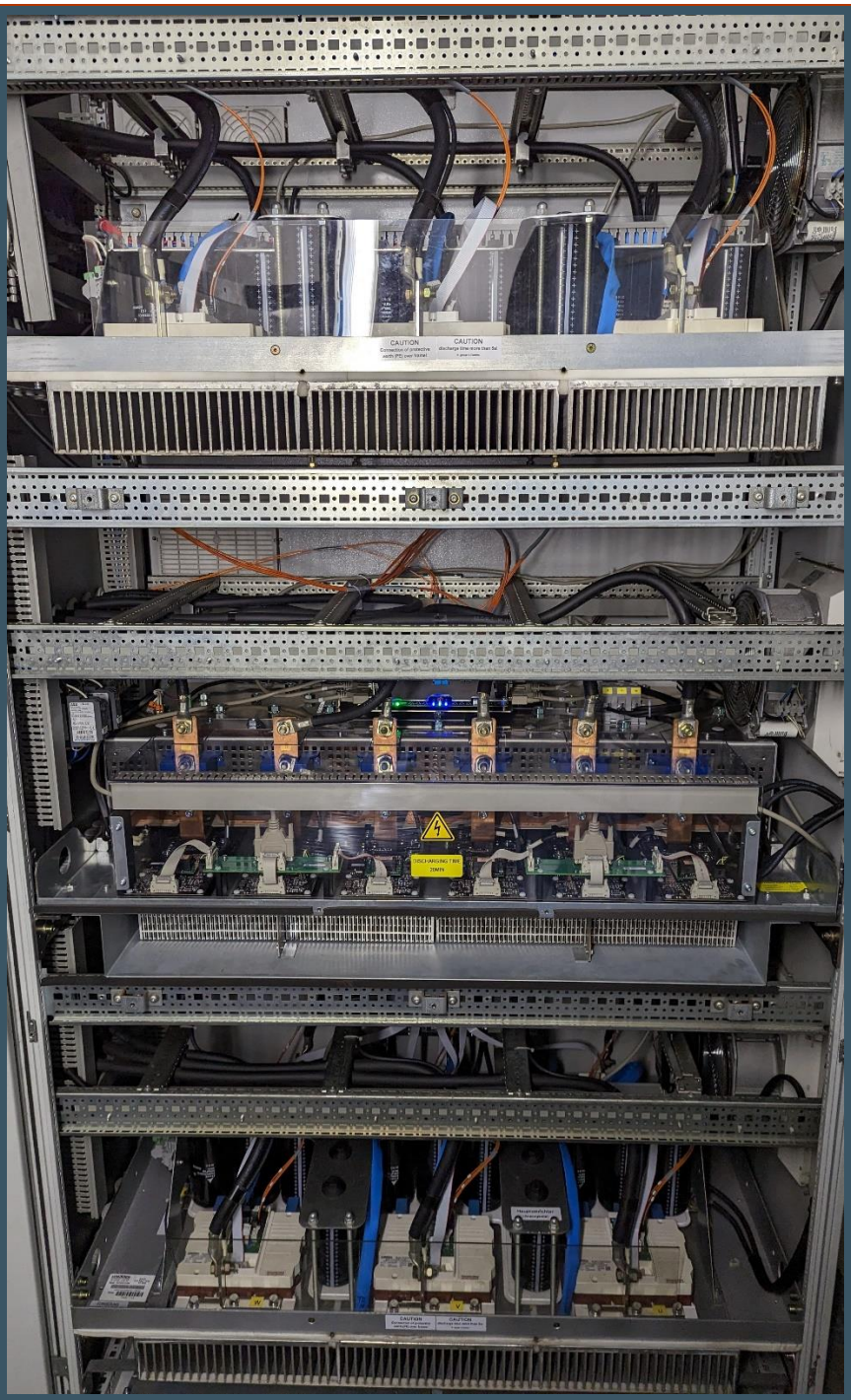
Connect the new power stack according to the markings and circuit diagram.

- Connect AC power cables (LSC & MSC).
  Tightening torque: **45Nm.**

- Connect dU/dt terminal.
  Tightening torque: **3,2 - 3,7Nm.**

- Connect DC-link cables.
  Tightening torque: **22Nm.**

7. Visual inspection



- Check if all steps for the installation are finished and all cables are connected.
- Clean the converter and remove any used tools. Mount all covers, note the serial numbers and close the cabinet before starting the converter.

8. Recommissioning

Ensure that all signals are connected correctly, and all plugs and wires are connected properly. Mount all covers and switch back on the power supply.

Follow your local safety regulation!

The System can be started within automatic mode or (optional) via commissioning mode.

ConverterTec recommends checking the trigger file to prove the proper function of the complete system after successful commissioning!

9. Installation feedback

Feedback Data	
Name of Technician:	
Date of Upgrade:	
Location of Turbine:	
Converter Serial No.:	
Installed IGBT U1 Serial No.:	
Installed IGBT U2 Serial No.:	
Installed IGBT U3 Serial No.:	
P57 board Serial No.:	

Check list	Yes	No
All rework steps done?		
Documentation updated?		
Converter cleaned up and tools removed?		
Concycle system re-commissioned and back in operation?		

Date: _____ **Signature:** _____

Remarks

_____
_____
_____
_____
_____

Please send this information back to:

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10. Document revision history

Date	Version	Changes
November 2023	01	Initial release.
February 2024	02	Changes in 5.5, 6.4, 6.6.1, 6.7.2, 6.8.2.
April 2024	03	Changes in 2, 5.3, 6.8.

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