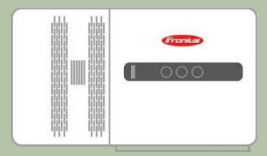
# Fronius Tauro
# Installation, commissioning and service

Fronius International
Information Class: Confidential

# Agenda

- Tauro
  - Hard Facts
  - Tauro.configurator
- Installation instructions
- Fronius Smart Meter 5kA
- Commissioning
- Service





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# Productfeatures & Hardfacts



# Fronius Tauro ECO

| | |
|---|---|
| Power classes: | 50 / 99 / 100 kW |
| MPPT voltage range: | 580 – 930 V |
| MPP Tracker: | 1 |
| Max. input current: | 87,5 A / 175 A |
| Max. PV generator: | 150 % |

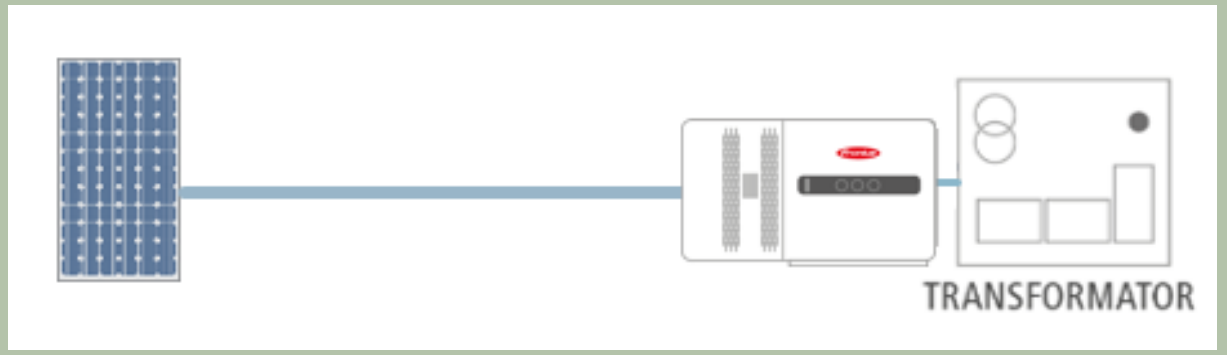


# Fronius Tauro Standard

| | |
|---|---|
| Power class: | 50 kW |
| MPPT voltage range: | 400 – 870 V |
| MPP tracker: | 3 |



# Variants of the Fronius Tauro Customised system solutions




**Design-Topology „PRECOMBINED (P)“**

For central system design

**Design-Topology „DIRECT (D)“**

For decentralised system design



# Precombined and Direct

## What are the differences on the DC side?

**Central system design**



**Decentralised system design**




### „Precombined“ variant

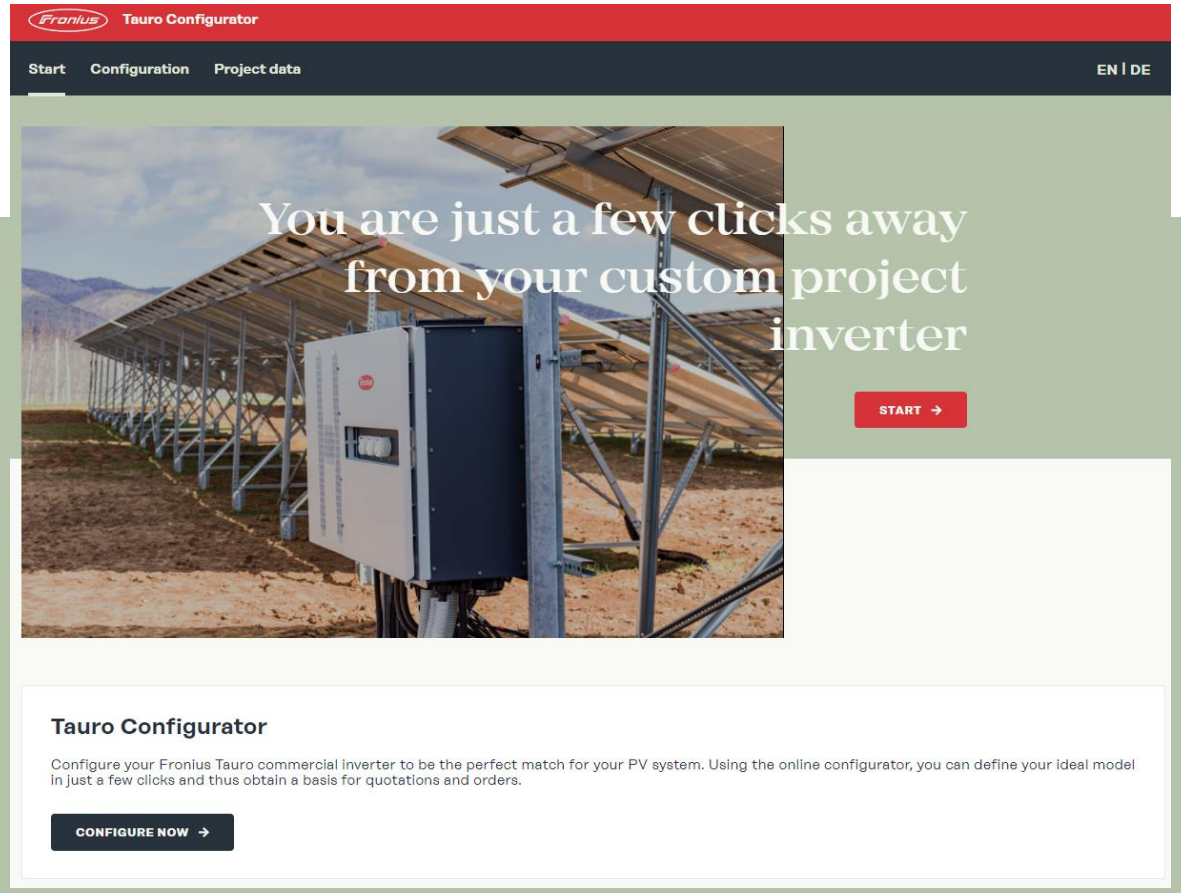
- DC cable 3x up to 95 mm²
- Integrated V-terminals
- AC cable up to 240 mm²

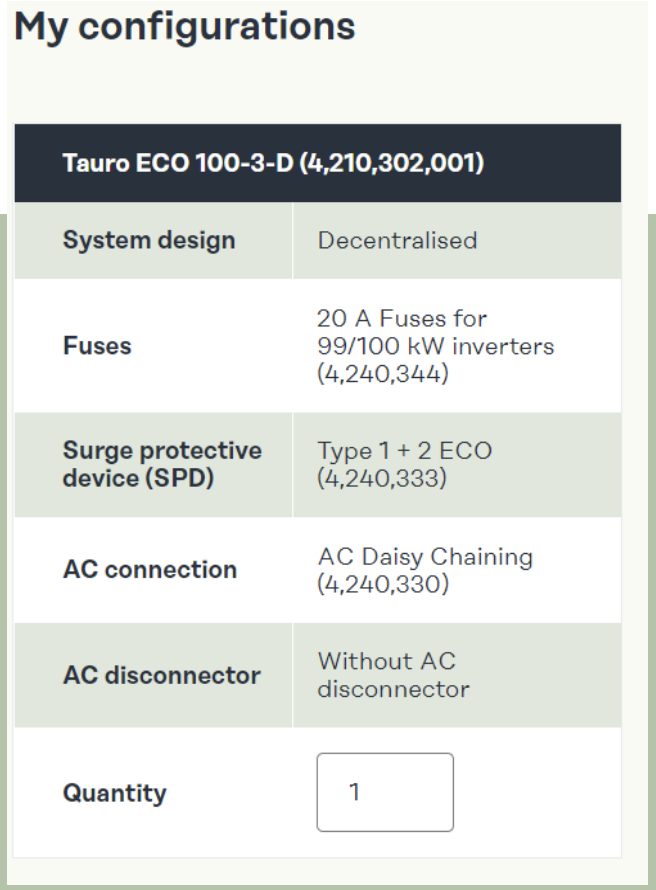
### „Direct“ variant

- MC4 connector integrated
- String fuses integrated (current selectable - 15A /20A)
- AC cable up to 240 mm²

# Tauro configurator

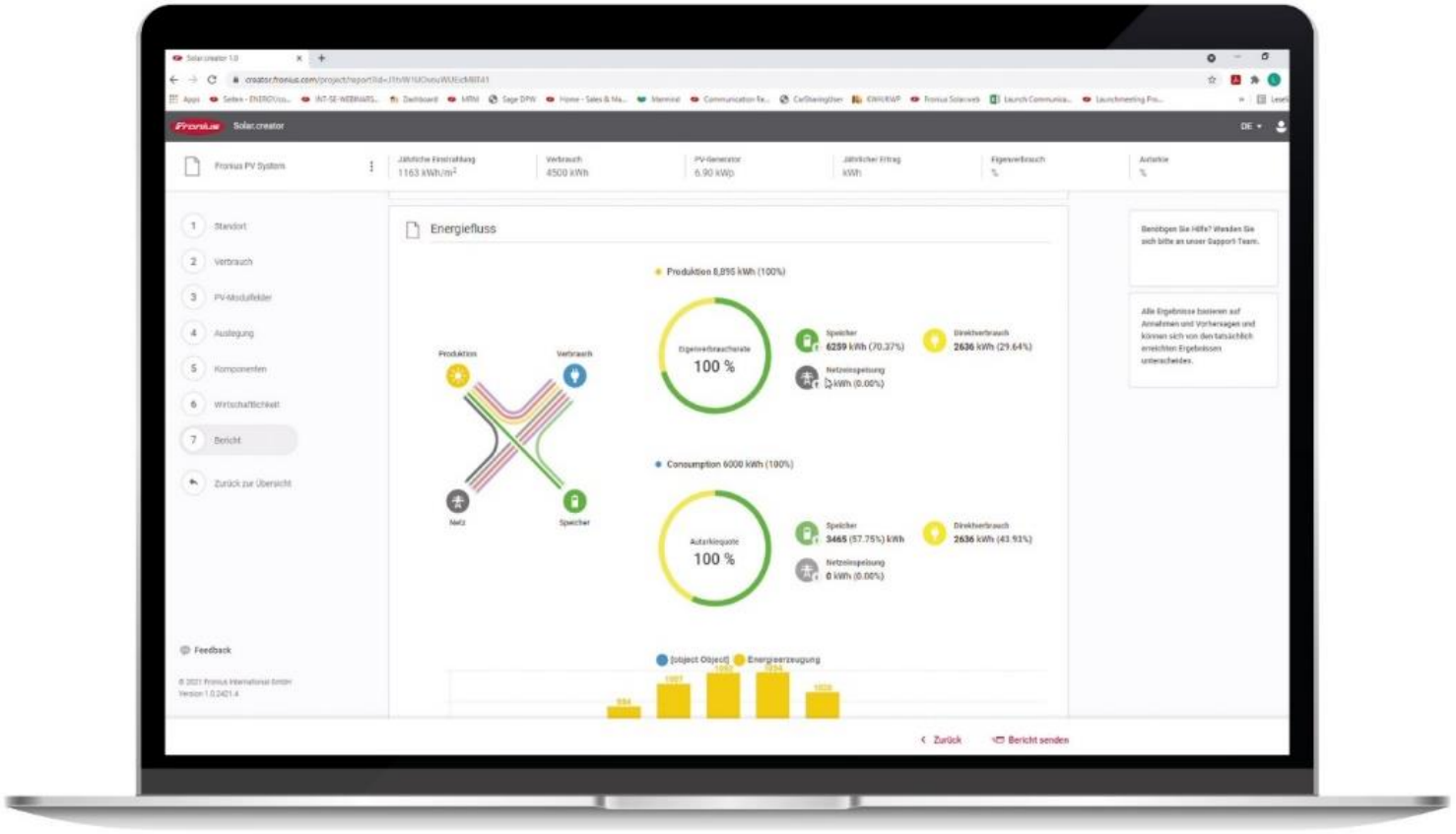
## the right product in just a few steps




https://tauroconfigurator.fronius.com

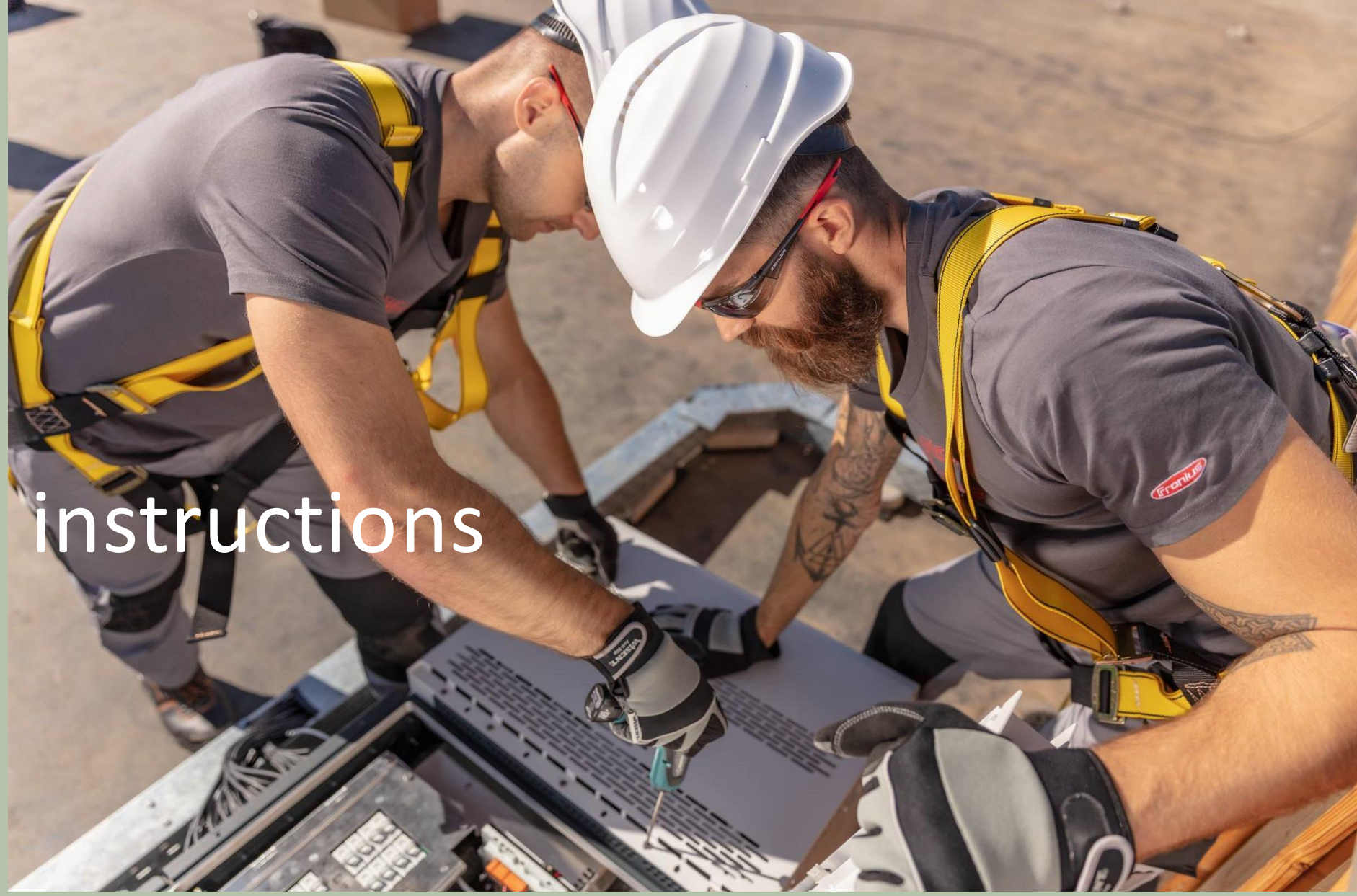
# Fronius Tauro at Solar.creator



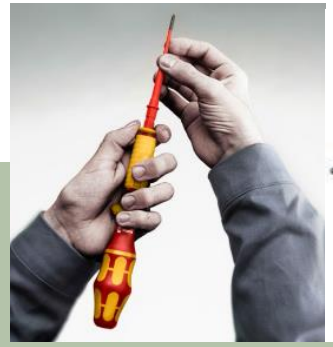
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# Installation instructions



# What do I need for the installation?






Torx T20 and T25 screwdrivers

(Cordless screwdriver only with torque!)




Quick Start Guide

Package insert with product purchase

Available at www.fronius .com




Fronius Solar.start

Mobile terminal with the latest version of the Fronius Solar.start central commissioning app

# How can Tauro be transported?

- Weight 74-103 kg (depending on type)
- Chains and ropes are allowed to be mounted on predefined holding eyes
  - Use of both retaining eyes

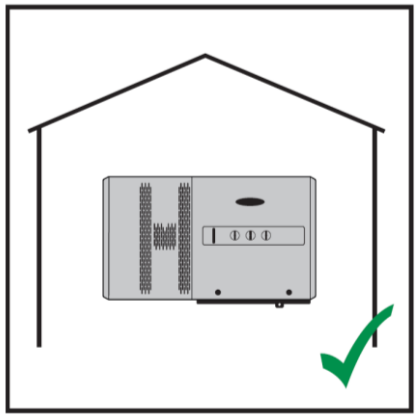


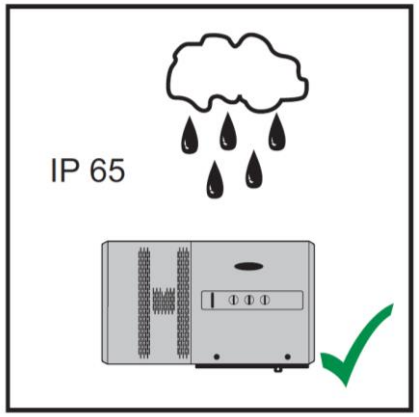
# Location selection

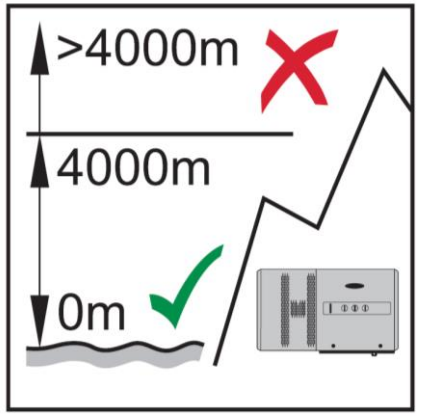
- Indoor and outdoor installation is possible
- Installation on a solid, non-flammable surface
- Up to -40 °C and +60 °C outdoor temperature range
  - Up to -30 °C with built-in AC isolator option

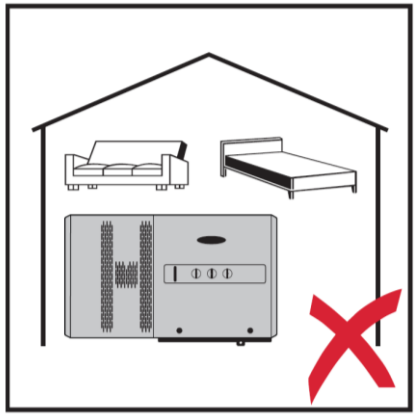


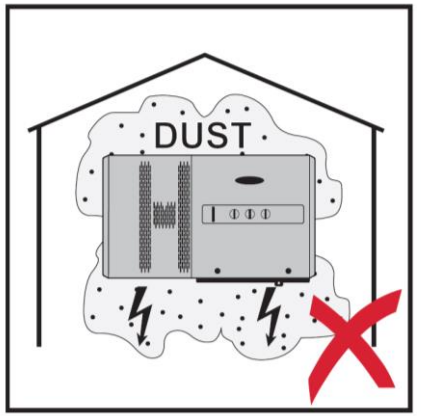
# Installation site

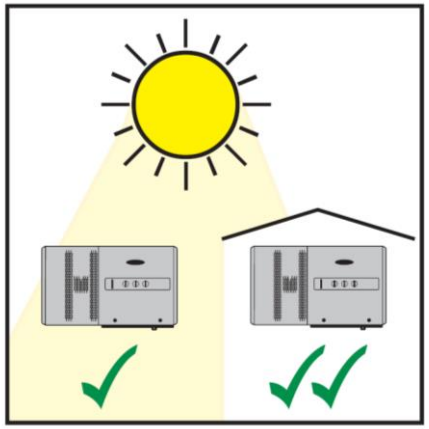


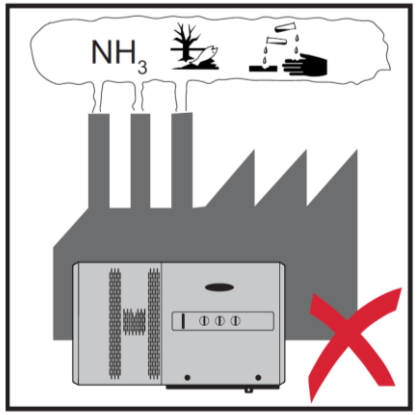


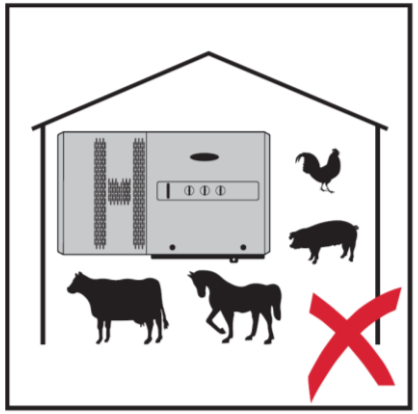





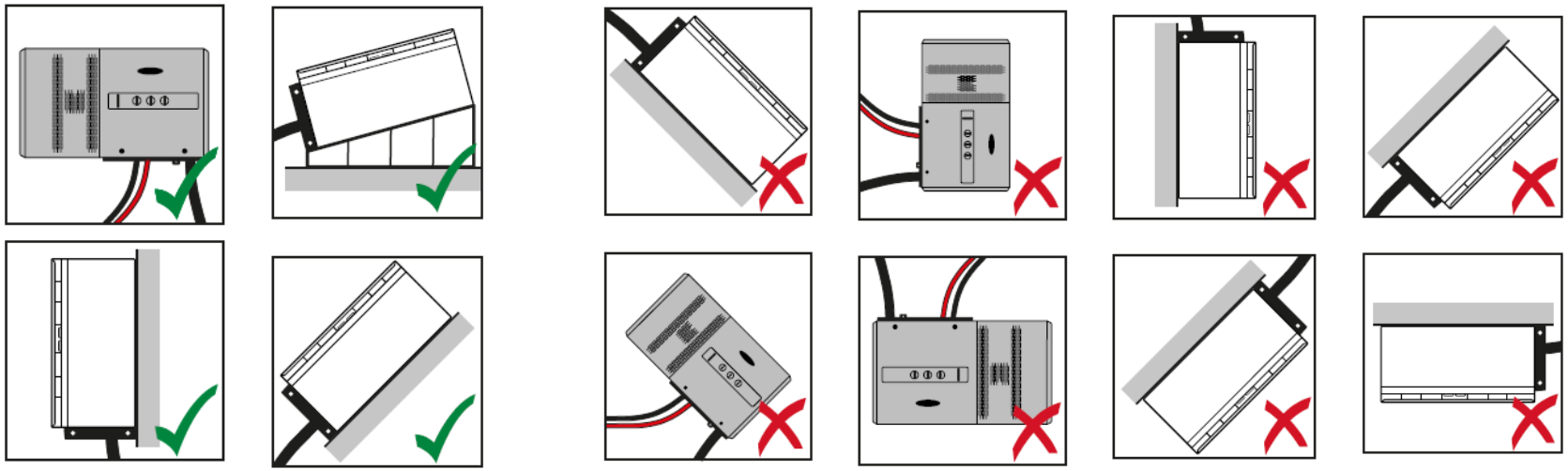




# Mounting position of the inverter

- Surfaces for mounting
- Wall mounting (sufficient load-bearing capacity and fire protection requirements)
- Pole mount (mounting rails behind PV modules directly on the elevation)
- Flat roofs (observe regulations for foil roofs)
- Car park roofing



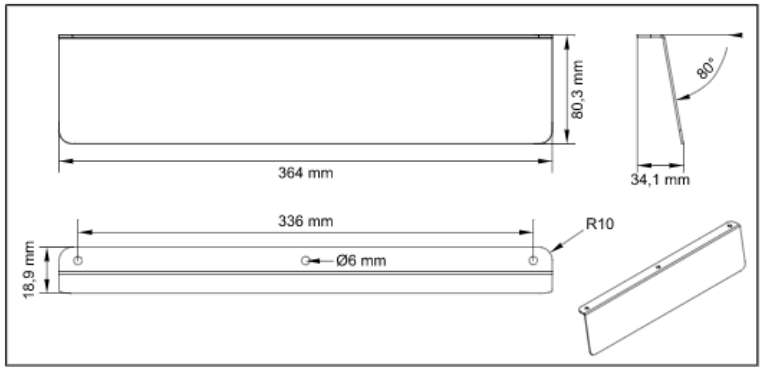
# Optionally available floor racks

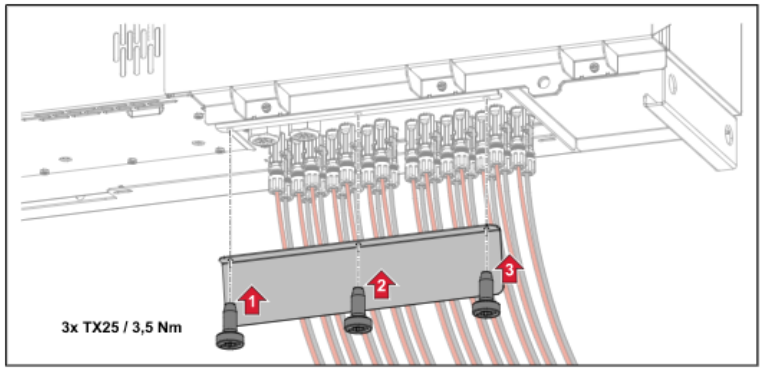
- Mounting of the inverter on a sloping sub-surface possible but not recommended
- Slight inclination of the floor racks for water drainage
- Screwing to the floor must be carried out (depending on conditions, not included in delivery)
- Order floor racks from wholesalers
  - Item article number 4,251,088



# Cover for MC4 connector

- Protection of MC4 connectors from snow / weather / corrosion
- In the standard scope of delivery of the floor racks
- Cover plate can be screwed directly to the inverter



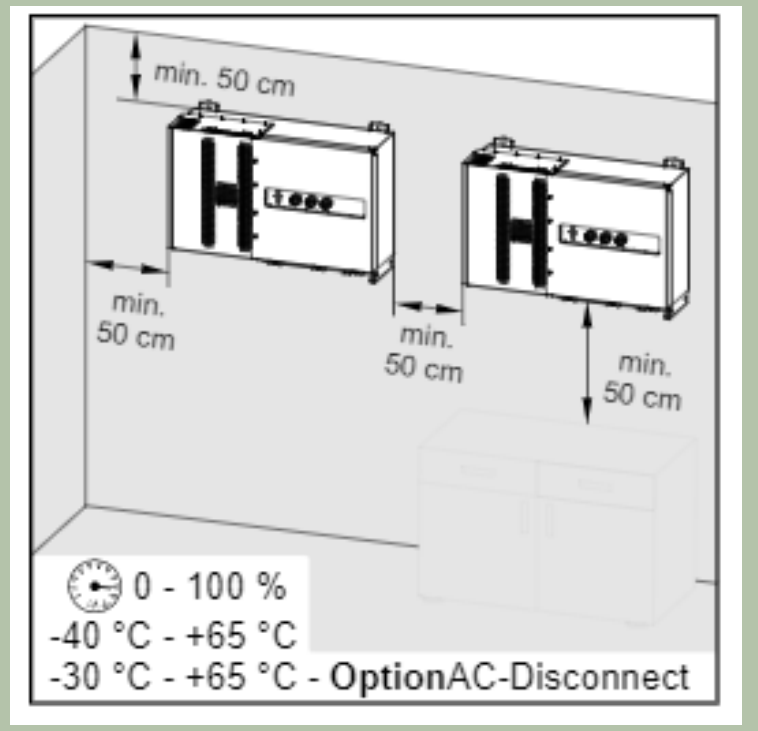



# Wall mounting

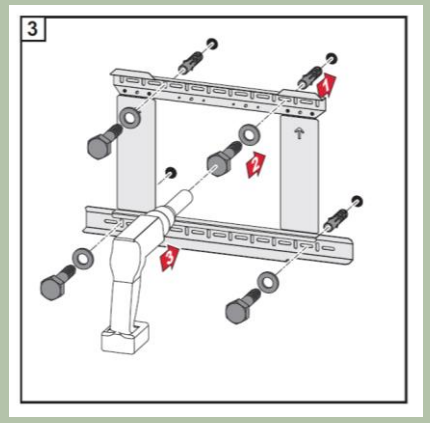


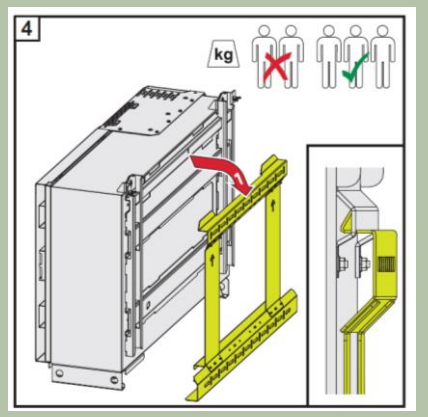
# Observe distances

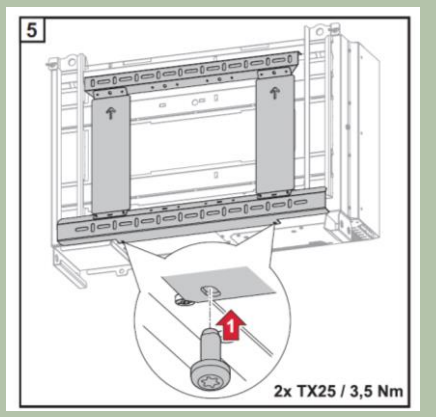
- Lightweight wall mount
- Included as standard
- Distance - **active cooling technology**
- Minimum: 4 screws
- Fixation with 2 screws on the bottom
- 3 persons to lift the unit





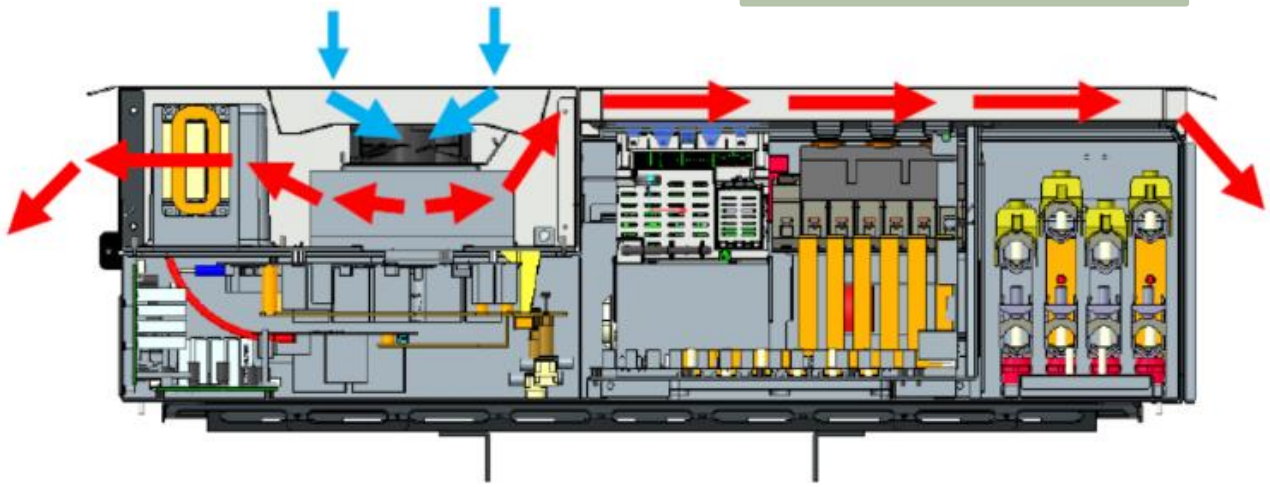



# Active cooling
# More yield through Active Cooling

**Maximum service life despite heat**

- **Double Wall System**
  - Front cover with double-wall insulation
- **Full power up to 50 °C**
  - More yield due to late derating
- **Placement in direct sun**
  - 13.5 °C less due to double-wall cooling
- **Longer service life**
  - Of components and unit

Active Cooling
**ON BOARD**



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# Wiring



# Opening the inverter

- Access to AC and DC connection area
- DC disconnect switch in OFF position
- 7x TX25 gland on the front of the unit
  - Engaging the front cover
- With the A-disconnect option installed → switch off



| Number of DC disconnectors by unit type | | | |
|---|---|---|---|
| **Tauro Direct** | | **Tauro Precombined** | |
| Tauro Eco 50 | 2 | Tauro Eco 50 | 2 |
| Tauro Eco 50, 99 and 100 | 3 | Tauro Eco 50, 99 and 100 | 2 |
| Tauro Standard 50 | 3 | Tauro Standard 50 | 3 |

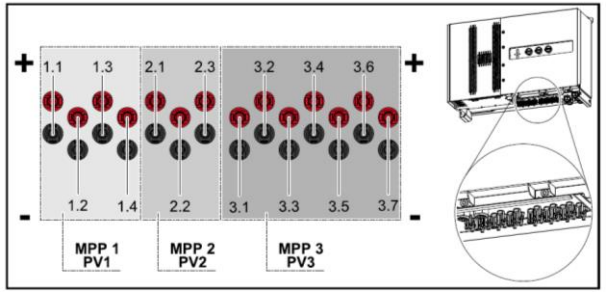
# DC wiring
# Tauro Direct

# Cable connections Tauro Direct

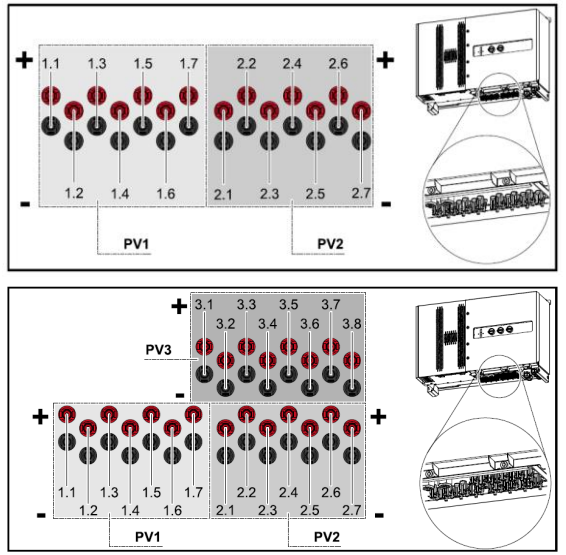
- Decentral topology – Tauro Direct variant
- Direct connections of PV strings
  - 14 strings (50 kW devices)
  - 22 strings (100 kW device)
- MC4 connectors
- No usage of DC combiner boxes



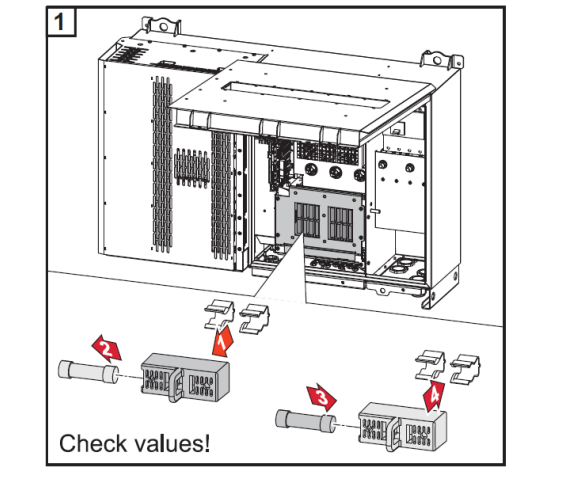

Tauro Standard Direct
50 kW



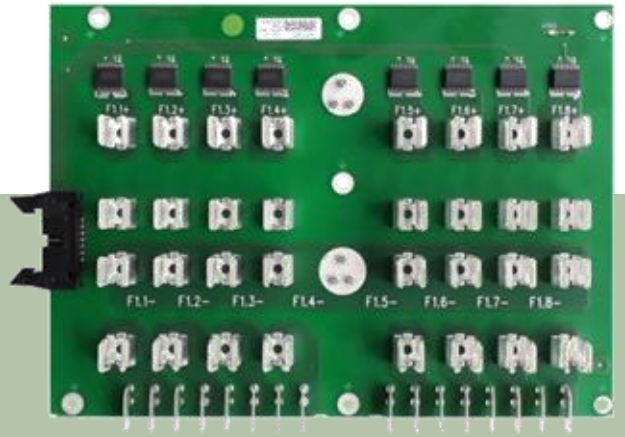

Tauro Eco Direct
50 / 99 / 100 kW



# Integrated string fuses

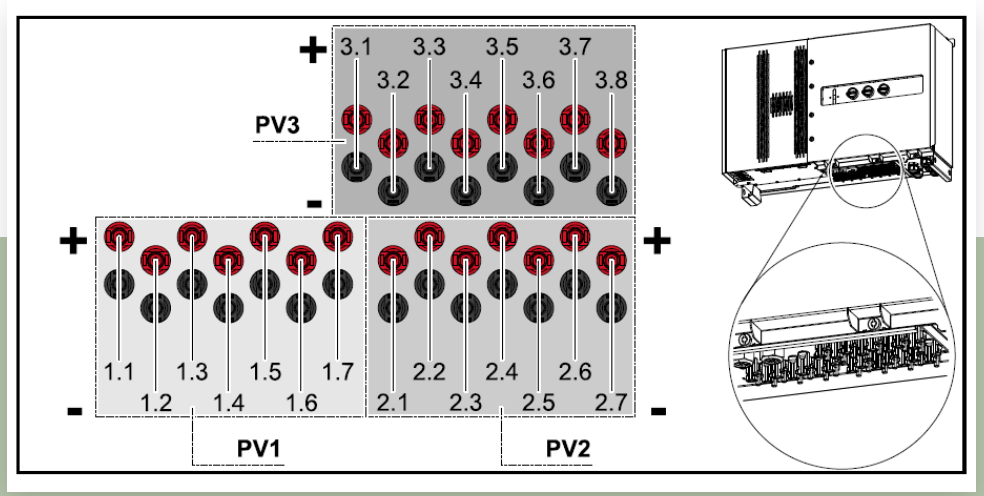




- **15 A / 20 A string fuses** standardized integrated
- Right choice for string fuses
- Easy exchange of fuses possible

# Splitting of PV strings





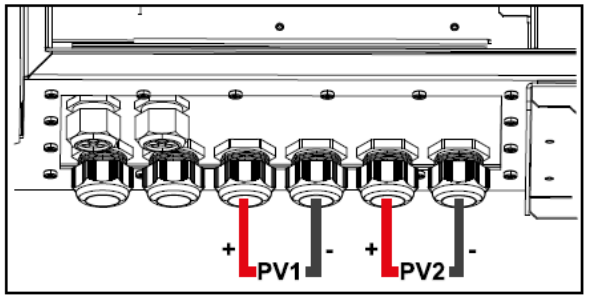

Tauro Eco Direct 100 kW

- PV strings **evenly divided on PV inputs (PV1 / PV2 / PV3)**
- Beginning with odd inputs / fill up the even inputs
- Equal distribution of power

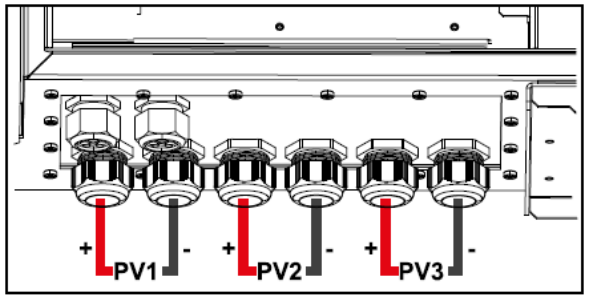
# DC wiring
# Tauro Precombined

# Cable connections Tauro Precombined

- Central topology – Tauro Precombined variant
- Use of DC combiner boxes
- V-clamps for direct connection
- 6 cable inlets
  - 4 x M32 for Tauro Eco variant
  - 6x M32 für Tauro Standard variant




Tauro Eco Precombined
50 / 99 / 100 kW

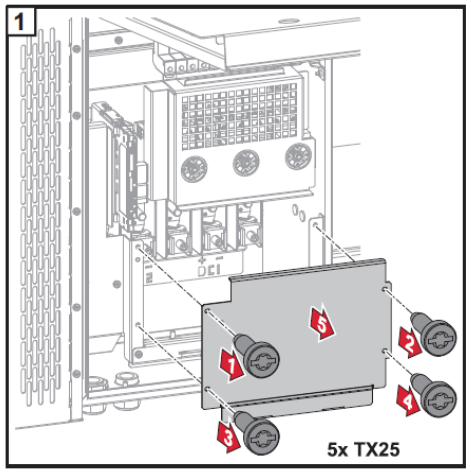


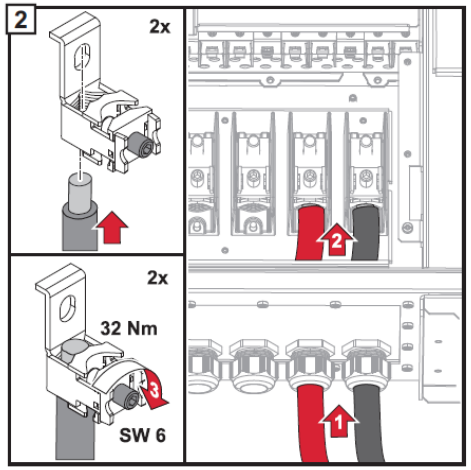

Tauro Standard Precombined
50 kW

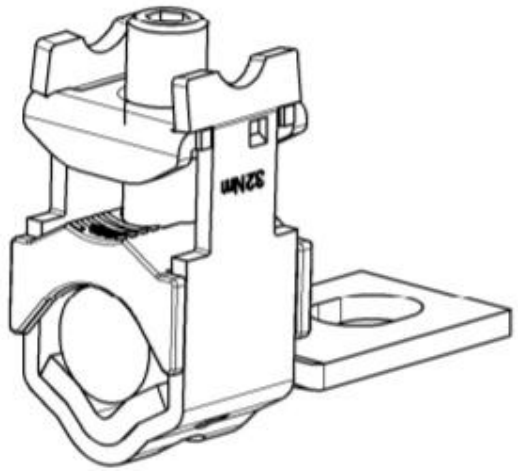


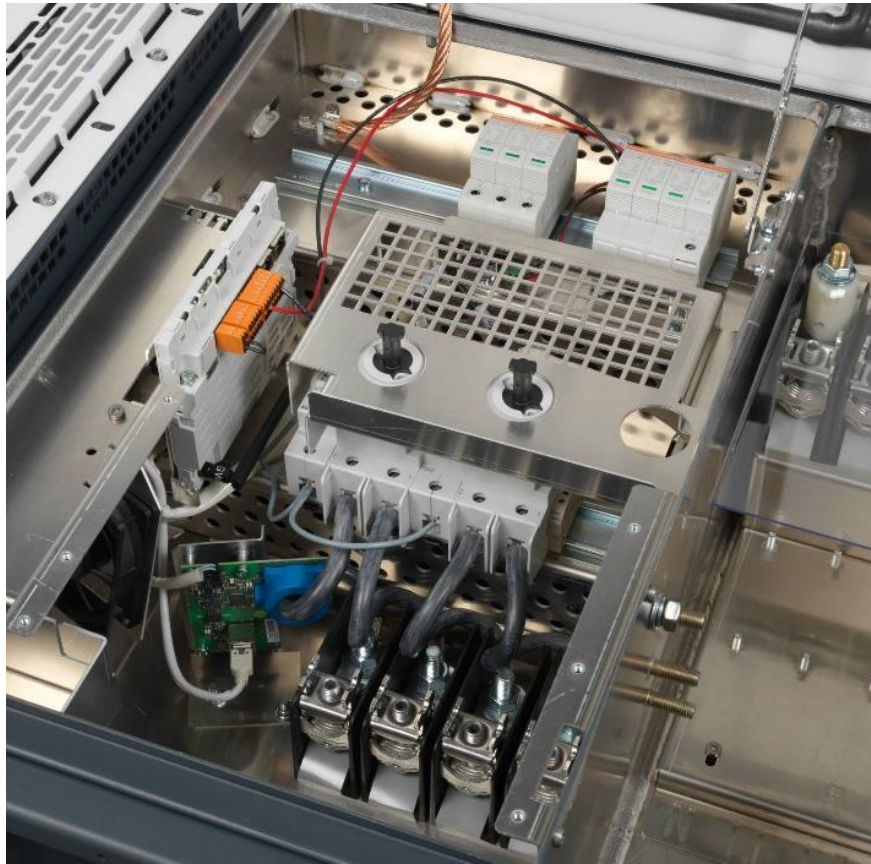
# V-clamps in DC connection area

- No usage of cable lugs necessary
- Fast installation with direct connection





# Permitted DC cable cross sections

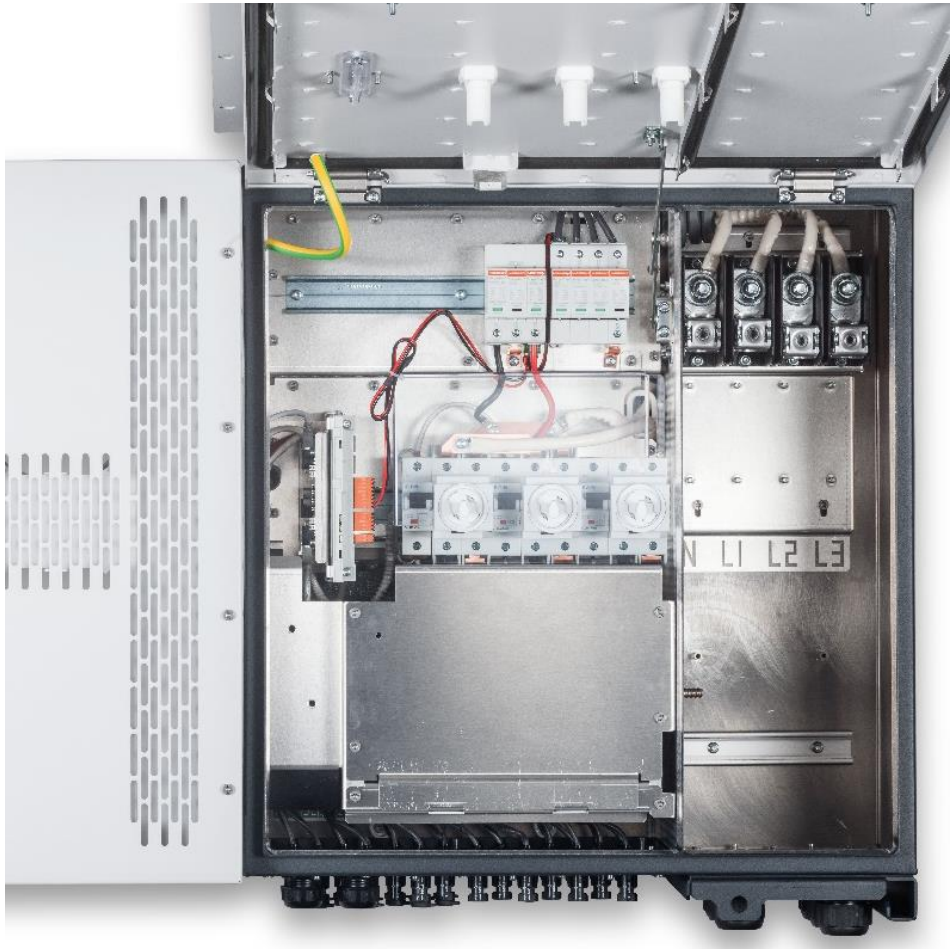
| Power class | Device type | Cable cross section |
|---|---|---|
| Tauro Standard 50<br>Tauro Eco 50 / 99 /100 | Direct | **2,5-10 mm² (see data sheet)** |
| | Precombined | **25-95 mm²** |

- Temperature resistance of DC cables must be at least 90° C
  - Optional available: Fronius protective hoses
- Select sufficiently high cable cross-sections depending on the device type

# DC / AC SPD type 1+2

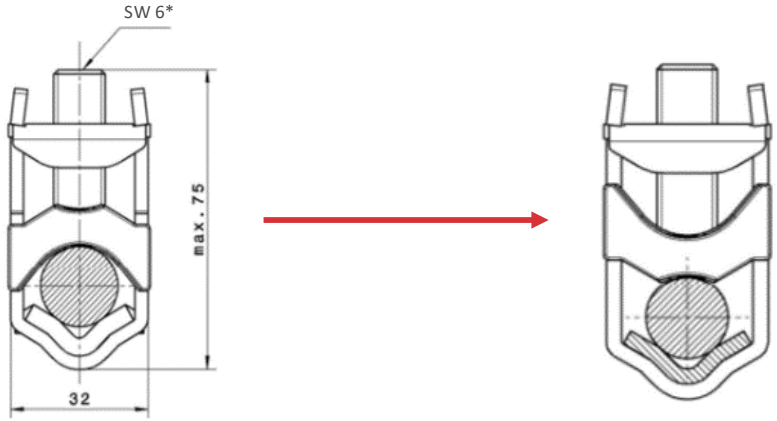
## Monitored, integrated DC overvoltage protection

- No additional box required
- SPD type 1+2 integrated in the device
  - Optional SPD type 2
- High-quality SPD
  - Exchangeable and feedback contact on the data communication unit
  - Individual SPD components can be exchanged



# AC wiring

# V-clamps in AC connection area

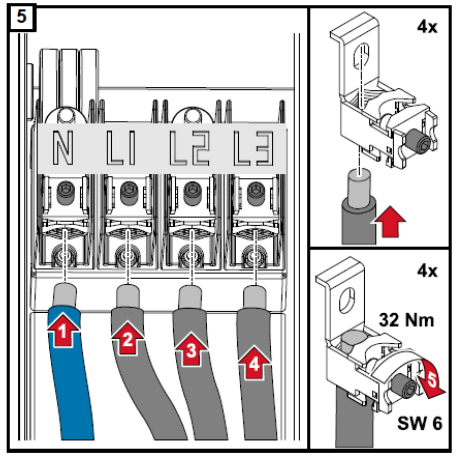


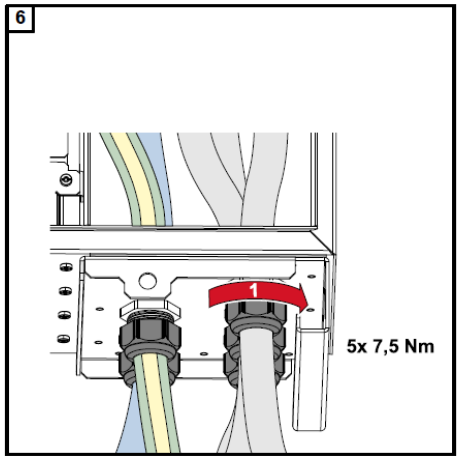

- Connection of following cables
  - RE (solid round conductor)
  - RM (stranded round conductor)
  - SE (solid sector conductor)
  - SM (stranded sector conductor)
  - Fine-core cables only in conjunction with ferrules
    - M10 cable lugs to the M10 threaded bolts
- Delivery condition 25-150 mm²
- Change of clamping area from 185 to 300 mm² possible
- Cable lug alternative (M12 threaded bolts)

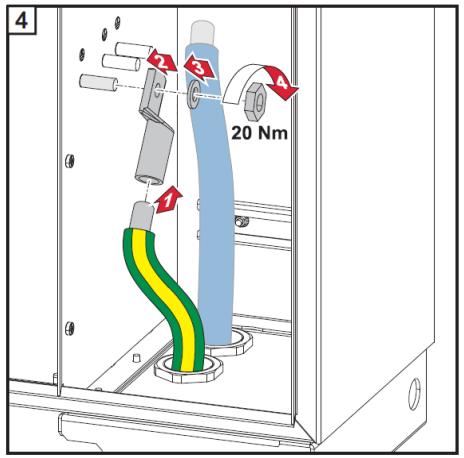


# AC option - Single Core

- 5 cable inlets M40 (single conductor cable)
- Different cable diameters possible (10mm$^2$ to 28 mm$^2$)
- Copper and aluminium cable
- Mind the torques!



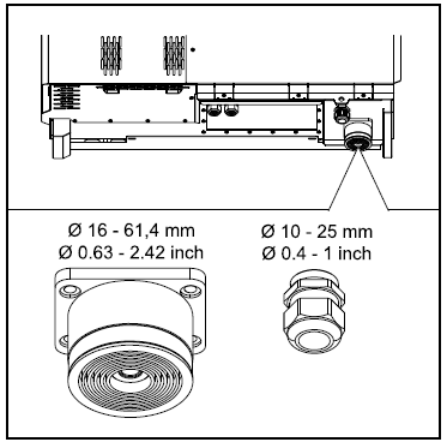



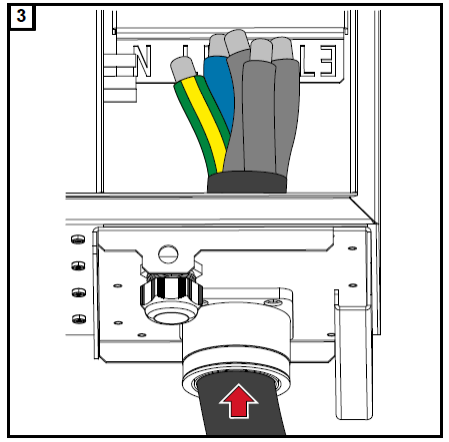



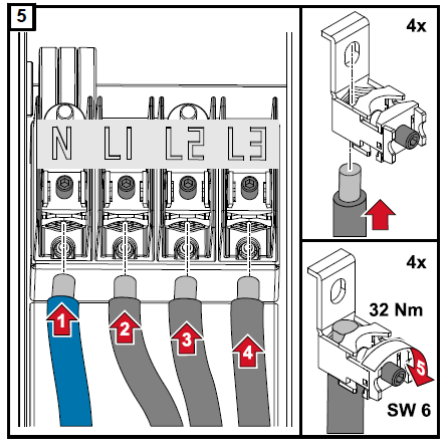



# AC option - Multi Core

- 1 cable inlet (conductor bundle)
- Big cable gland up to 61,4 mm diameter
- Small cable gland up to 25 mm diameter
- Mind the torques!



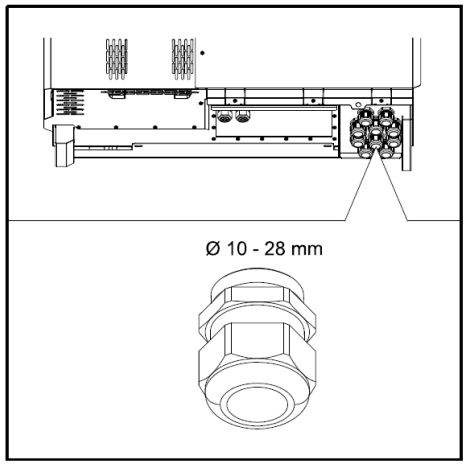



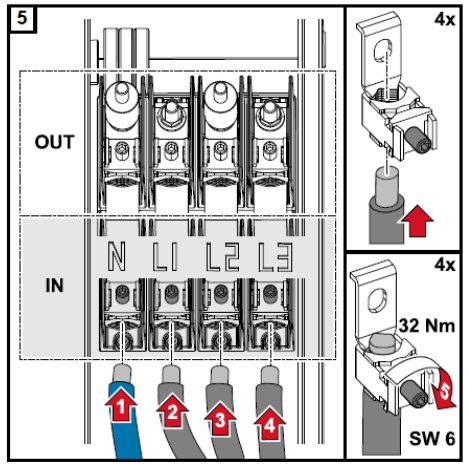



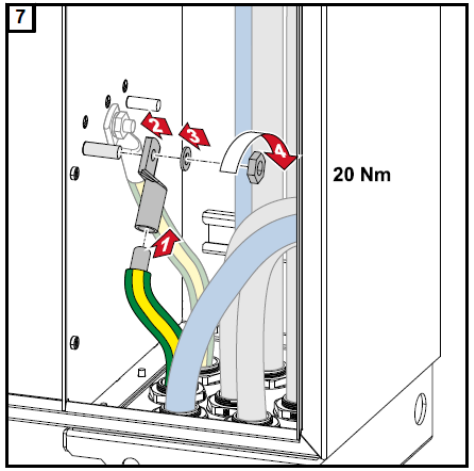



# AC option - AC Daisy Chaining

- 10 cable inlets M32 (single conductor cable)
- AC input and AC output
- First Tauro in chain → Single Core sufficient



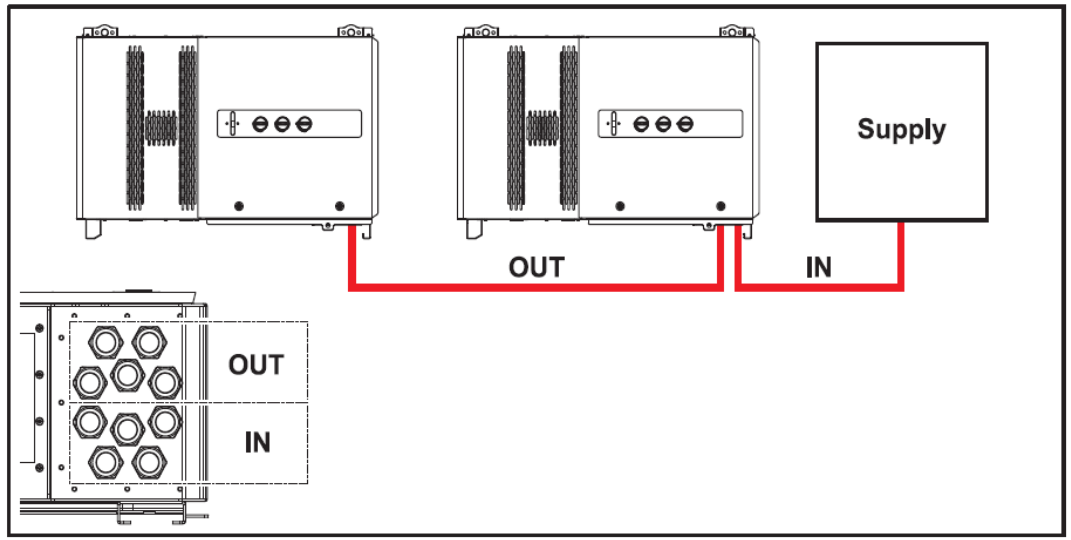



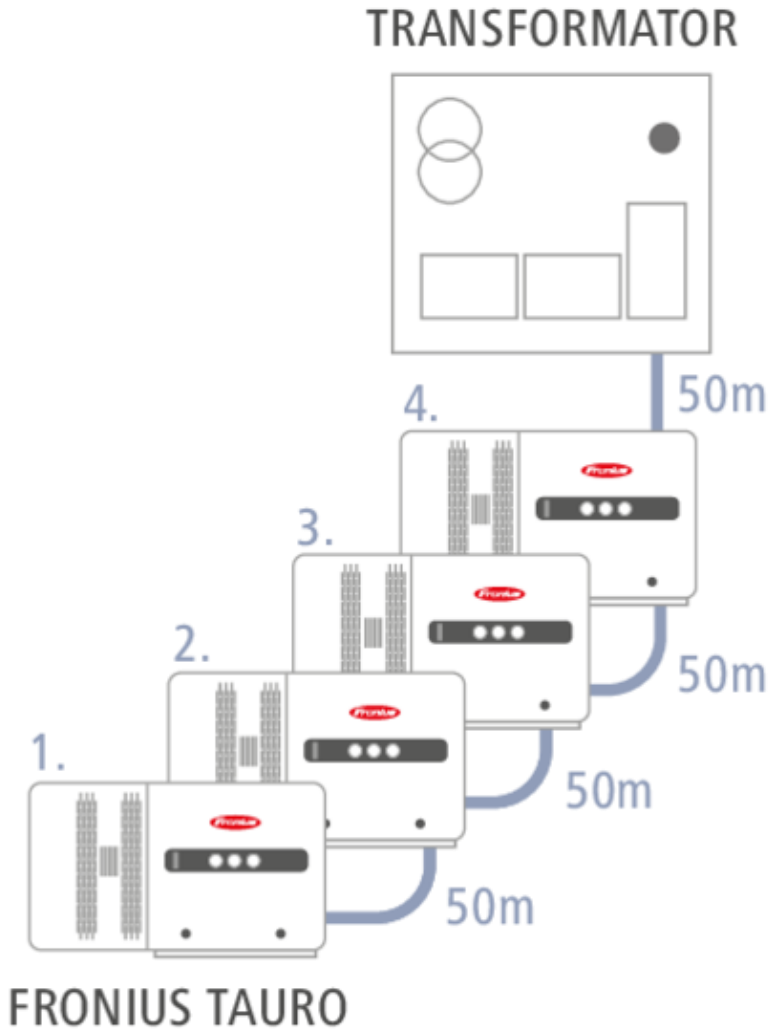






# AC option - AC Daisy Chaining

- Interlinkage of up to 200 kW AC inverter output power
  - 2x 100 kW Tauro / 4x 50 kW Tauro
- Savings in cable costs, wiring effort and additional AC components (AC distribution board, AC disconnector)

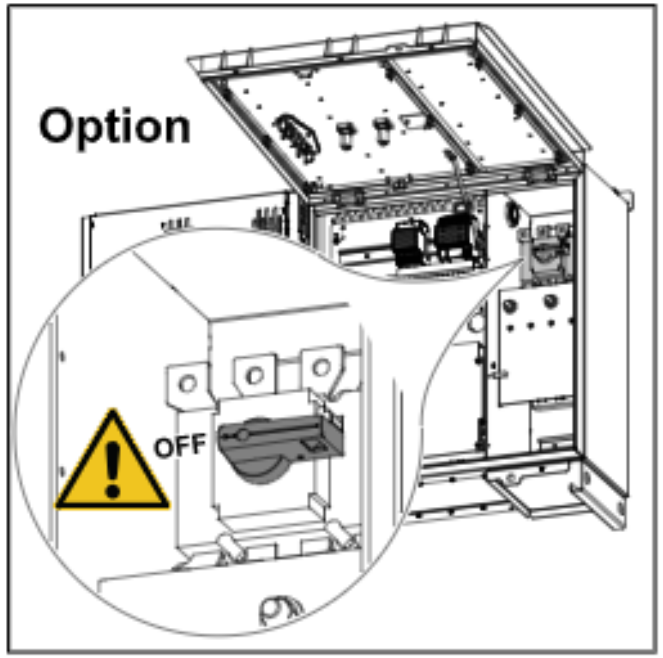


# Option integrated AC disconnector

- Optionally integrated
- Configurable and orderable ex factory
- Available for AC options
  - Single Core
  - Multi Core
- When working within the device: AC disconnector switch on OFF position





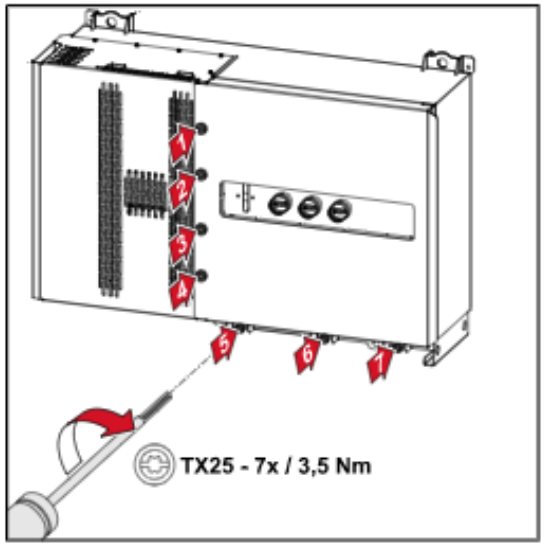
# Up to 240 mm² AC cable cross section

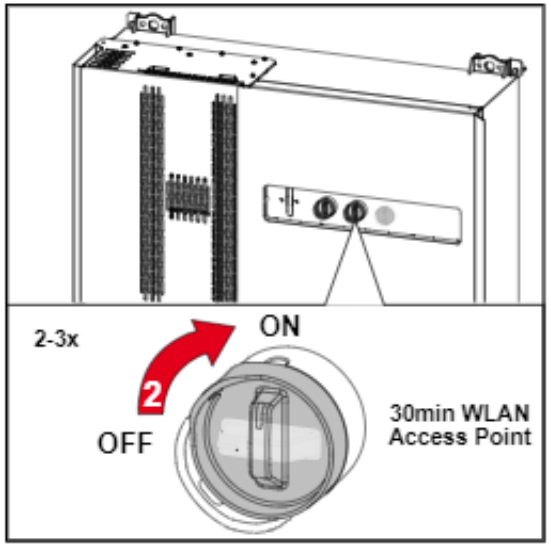
| Power class | Connection variant | Cable cross section |
|---|---|---|
| Tauro Standard 50<br>Tauro Eco 50 | Standard<br>Optional AC disconnector<br>Daisy Chain | **35-240 mm²** |
| Tauro Eco 99<br>Tauro Eco 100 | Standard<br>Optional AC disconnector<br>Daisy Chain | **70-240 mm²** |

- The temperature resistance of the AC cables must be at least 90°C
  - Optional: Fronius protective hoses (article number: 4,251,050) for temperature resistance
- Connection of aluminium cable possible

# Completion of the installation

- Properly carried out AC- / DC cabling
  - Optional: AC disconnector switch on ON position
- Screwing of the front cover
  - 7x TX25 with 3,5 Nm
- Turn on DC disconnector switch
  - Opening the WiFi access point





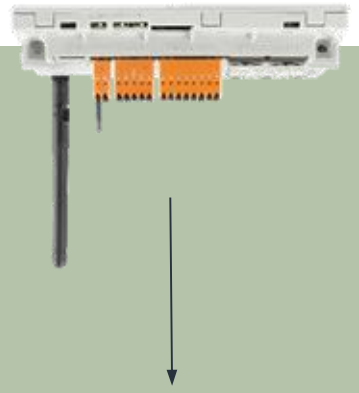

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# Data communication



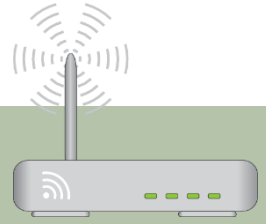
# Data communication unit



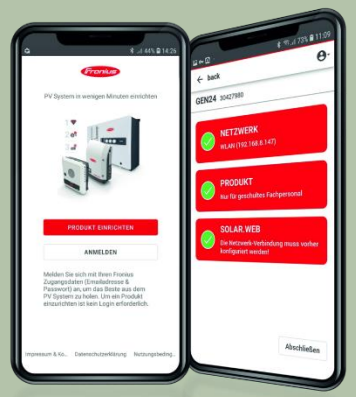



WLAN / LAN

Router



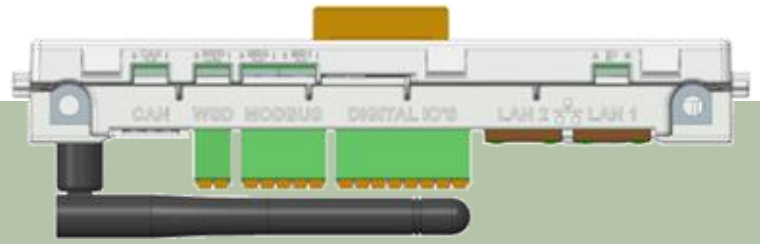





Compatible: all web-based mobile devices (web browser); apps for Android, Apple IOS and Windows (desktop & phone)

Visualisation: www.solarweb.com

# Data communication unit






- LED status display
- Data logger, web-server, WiFi interface card
- Visualisation via Fronius Solar.web portal, Fronius Solar.web app, Solar TV

**Multiple open interfaces**

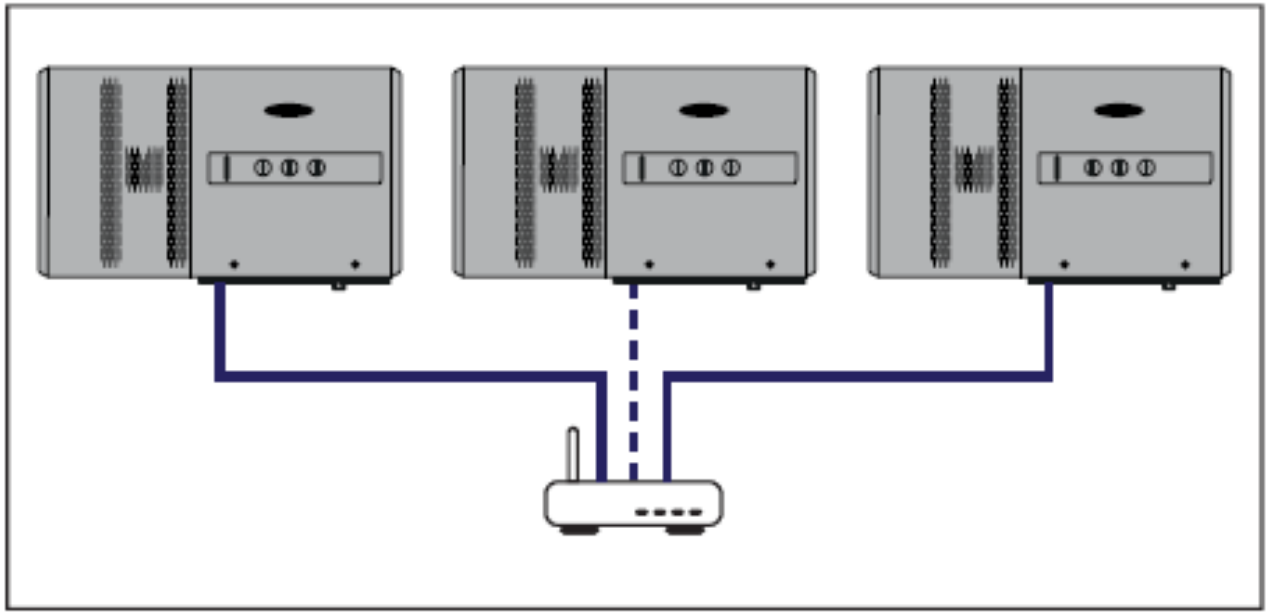
- 2 Ethernet / LAN (LAN1 for direct ethernet connection): Modbus TCP SunSpec or Fronius Solar API JSON protocol (LAN2 for internal use)
- 2 Modbus RTU (RS 485) interfaces
- WSD function
- Digital inputs and outputs (I/O's)

# Cable selection for data communication

| Interface | Max. cable cross section | Max. cable length | Cable recommendation |
|---|---|---|---|
| **LAN** | | **100 m** | **CAT 5 STP** |
| Modbus | 1,5 mm² | 300 m | Min. CAT 5 STP |
| IO | 1,5 mm² | 30 m | Single ladder possible |
| WSD | 1,5 mm² | 100 m | Min. CAT 5 UTP |

# Ethernet wiring

- **Star wiring as an independent and robust cable layout**
  - Easy planning
  - Fail-safe
  - Fast troubleshooting
  - Further LAN switches as signal amplifier
    - POE / outdoor switches

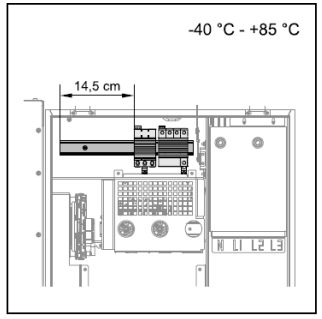


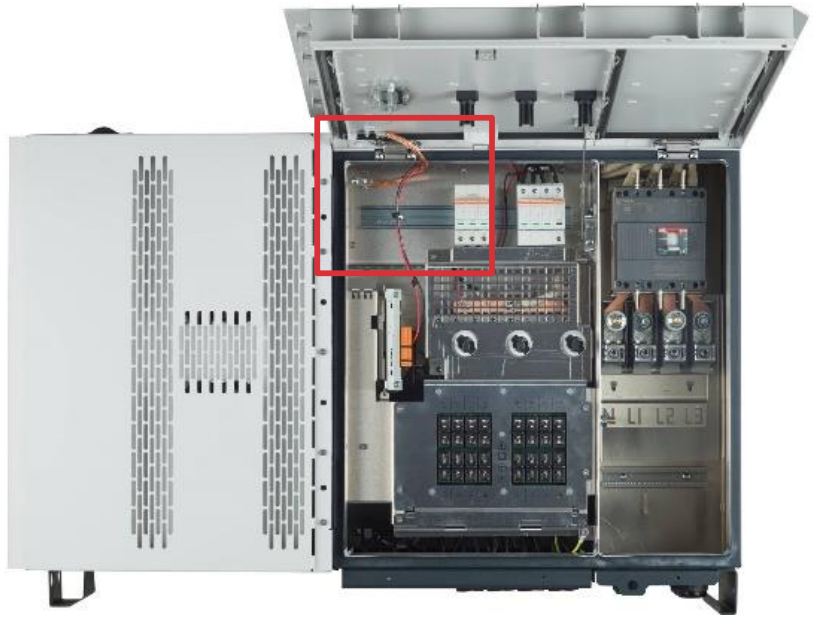
Maximum LAN cable length
100 meter!

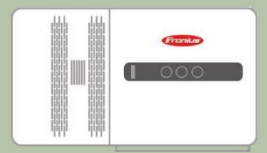
# 3rd party components

- **DIN-rail mounting possibility for 3rd party components**
- Maximum width **14,5 cm (8 TE)**
- Temperature stability of components **from -40°C to +85°C**
- Possibility of installing **LAN switches**
- Power supply via data communication unit
  - USB: 5V / 1A
  - I/O's: 12V / 500mA







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# Fronius Smart Meter



# Commercial Fronius Smart Meter

**50 kA-3**



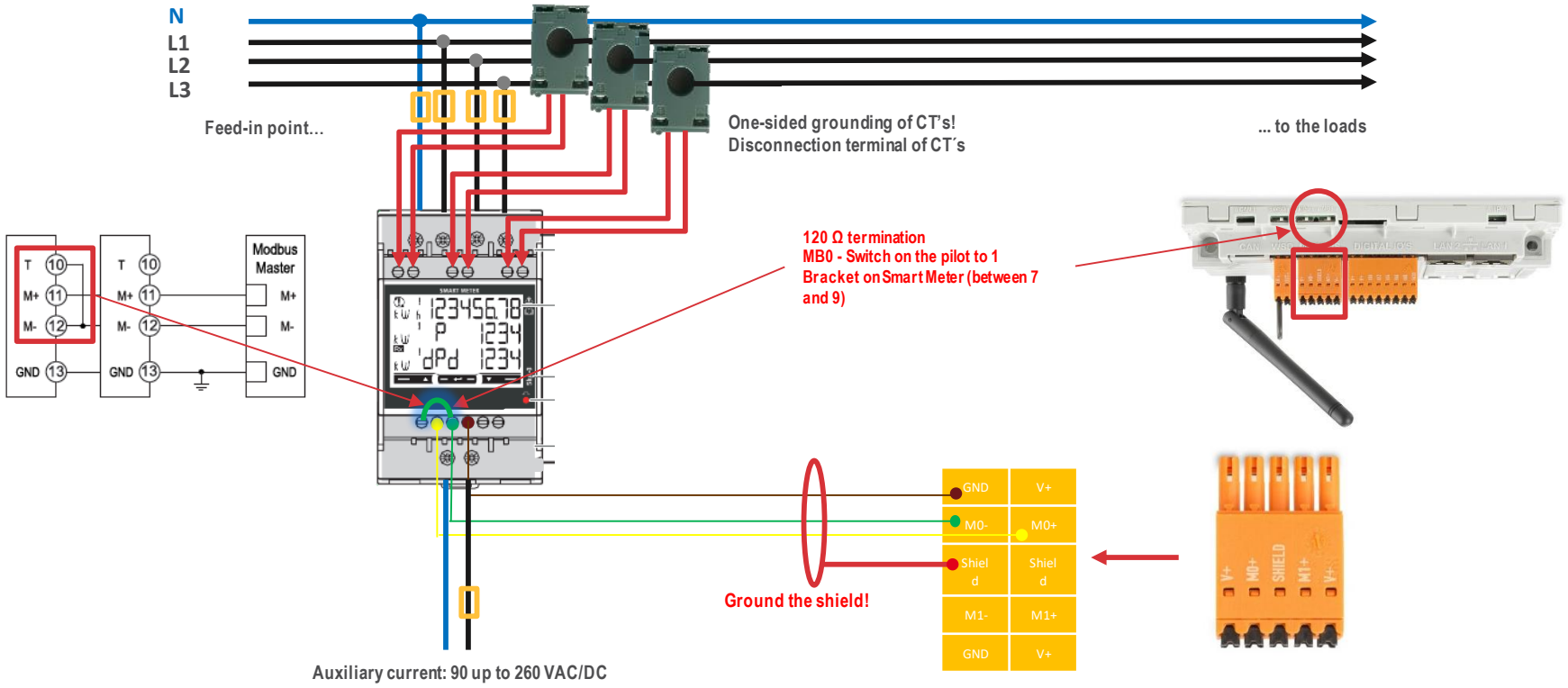

- 3-phase
- External current transformer

**5kA-3**



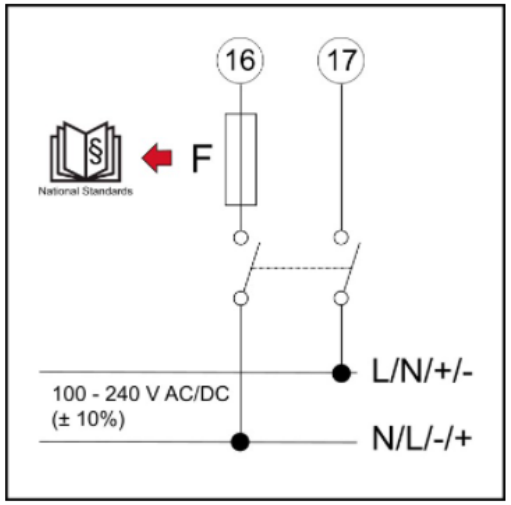

- 3-phase
- External current transformer
- Touchscreen

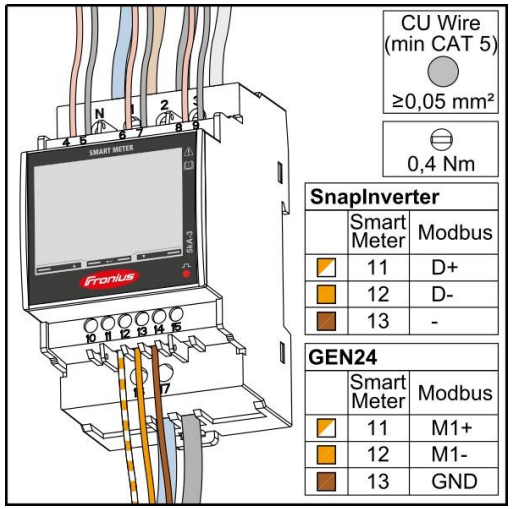
# Fronius Smart Meter TS 5kA-3 wiring



# Protective circuit and auxiliary power

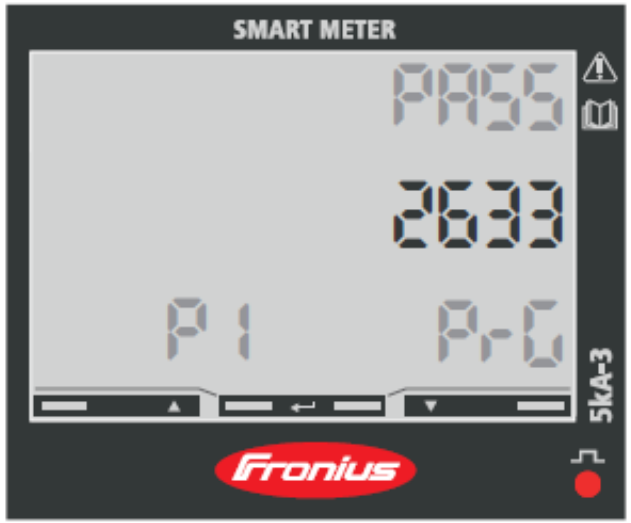
- Disconnecting device required (circuit breaker, switch or disconnector)
- Overcurrent protection required (automatic circuit breaker)
- Consumption **Smart Meter TS 10-30 mA**
- Additional, auxiliary power supply (port 16, 17) required

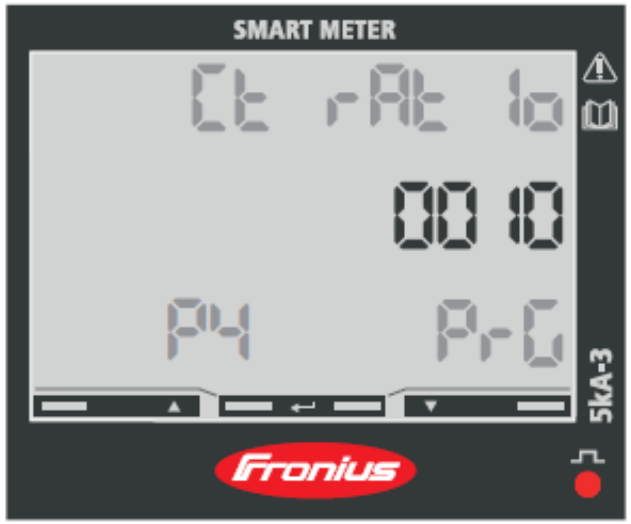


# Transformation ratio of current transformer

- **Code: 2633**
- Calculate transmission ratio
  - Primary (P) : Secondary (S) = CT Factor
  - E. g. 50 : 5 = 0010 → **to be entered CT factor**

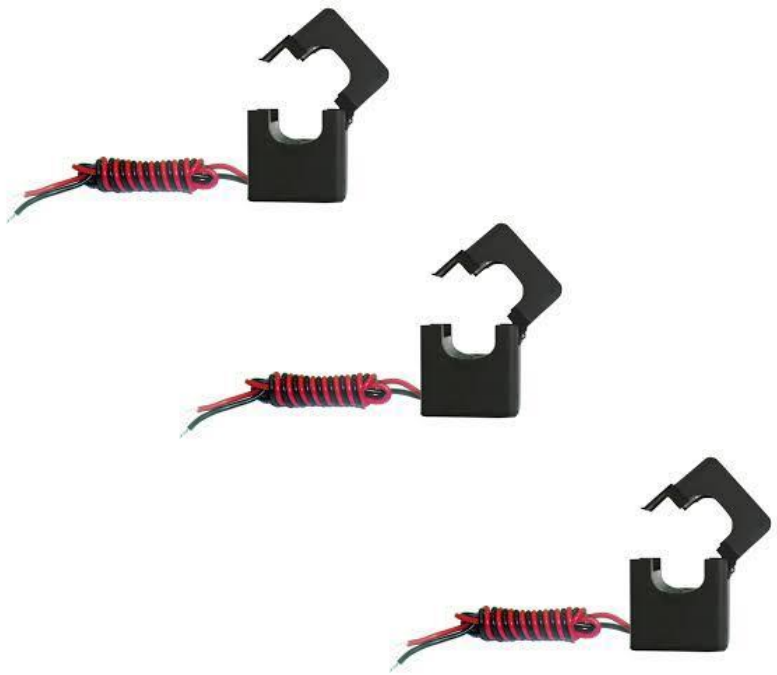



| Symbol | Name | Event | Function |
|---|---|---|---|
| ▲ | Up | 1 x | Scroll one screen forward, increase the value by 1 |
| ▼ | Down | 1 x | Scroll one screen back, decrease the value by 1 |
| ↵ | Enter | 2 seconds | Call up settings, confirm value |

# Selection criteria current transformer

- **Selection support** for current transformers
- More information at www.fronius.com



## Selection criteria for current transformer

**General**
Do not use current transformers with a voltage output.
Current transformers are directional. If they are mounted backwards or with swapped wires, the measured power will be negative.

**Primary current**
Maximum current per phase. A current converter with a primary current greater than the maximum expected current per phase should be selected. The closer the expected current is to this value, the more precise the measurement will be.

**Secondary current**
The current transformer must supply alternating current at a nominal current of 1 or 5 A. The nominal values for the current transformer are listed in the current transformer data sheet.

**Power**
The Fronius Smart Meter TS needs 0.5 VA to carry out its measurements. Losses also occur on the outgoing and return leads. The power of the current converter must be greater than the sum total of the power of the Fronius Smart Meter TS and the leads. The higher the power, the better.

| Line resistances at different cross-sections (copper wires) | | | | | | |
|---|---|---|---|---|---|---|
| Secondary current [A] | Cross-section [mm²] | Line resistances at different lead lengths (outgoing and return lead) | | | | |
| | | 0.5 m | 1.0 m | 2.5 m | 5 m | 10 m |
| 5 | 1.5 | 0.3 VA | 0.6 VA | 1.5 VA | 2.9 VA | 5.8 VA |
| 5 | 2.5 | 0.2 VA | 0.4 VA | 0.9 VA | 1.8 VA | 3.6 VA |
| 5 | 4 | - | - | 0.6 VA | 1.1 VA | 2.2 VA |

*Example*
The length of the outgoing and return lead (0.5 m each) between the Fronius Smart Meter TS and the current transformer is a total of 1 m and has a copper cable cross-section of 1.5 mm²; the line resistance is therefore 0.6 VA according to the table above. The self-consumption of the Fronius Smart Meter TS is 0.5 VA.
Line resistance 0.6 VA + self-consumption 0.5 VA = 1.1 VA
→ A current transformer with a rating of 1.5 VA, 5 VA or higher is suitable here.

**Accuracy class**
Use Class 1 or better (Class 0.5 / 0.2, etc.). Class 1 is equivalent to a deviation of ± 1% of the secondary current at maximum power.

**Mounting**
Rigid or hinged
"Rigid" is usually cheaper with better power and accuracy values. Hinged current transformers can be opened for attachment to the conductor. To prevent it being opened inadvertently, a plastic cable tie can be secured to the current transformer. Hinged current transformers can be installed in a system without interrupting the voltage.

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# Initial commissioning

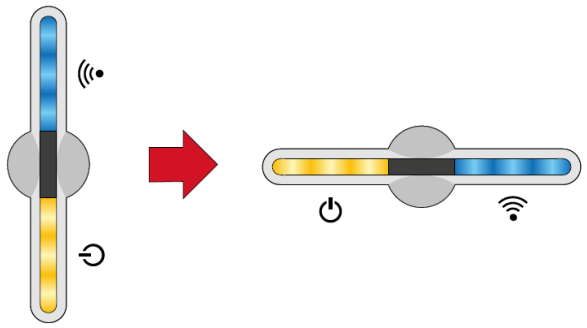


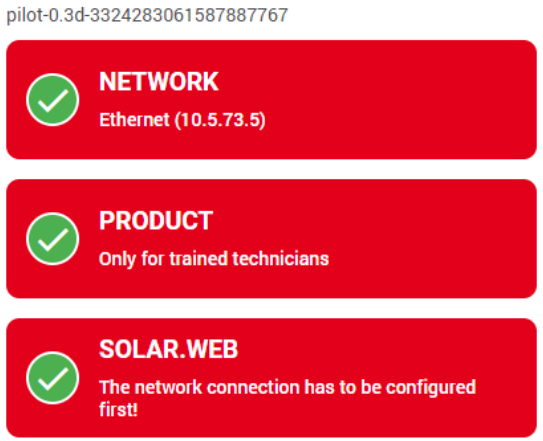
# Initial commissioning

– Correctly completed AC / DC wiring

– Setup settings with initial commissioning

– Setting of the country setup only possible during initial commissioning



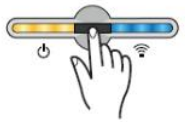




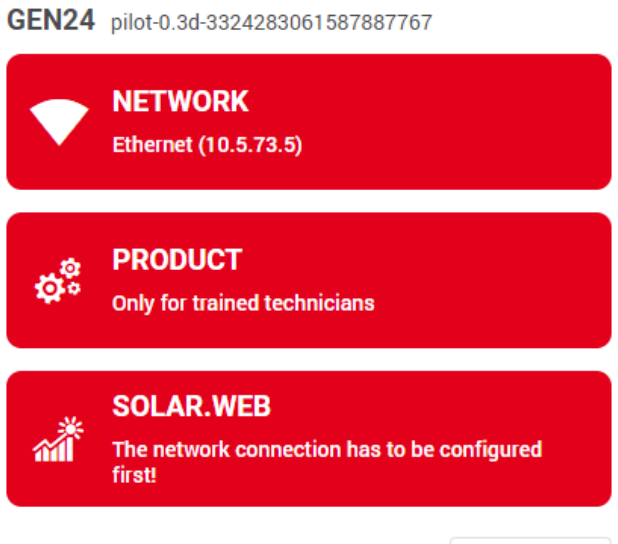

# Installation via browser

## WiFi Connection

- Open access point with one quick push on the inverter
- Connect to the inverter network
  - Name: **FRONIUS_serial number**
  - Password: **12345678**
- Enter IP-adress **192.168.250.181** in the address bar
- Open installation wizard
- Finish in Fronius Solar.web (network connection necessary)



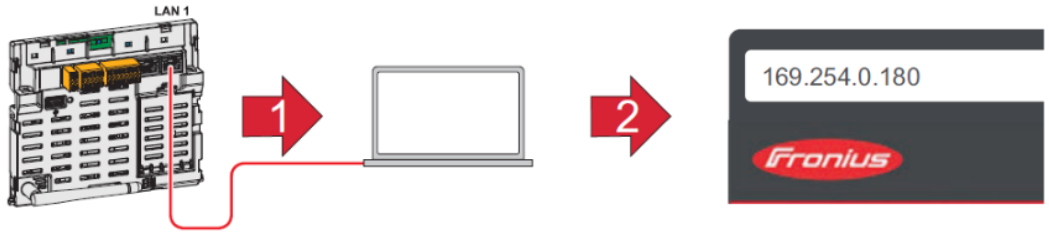


# Installation via browser

## LAN / Ethernet connection

– Connect to inverter via network cable (min. STP)



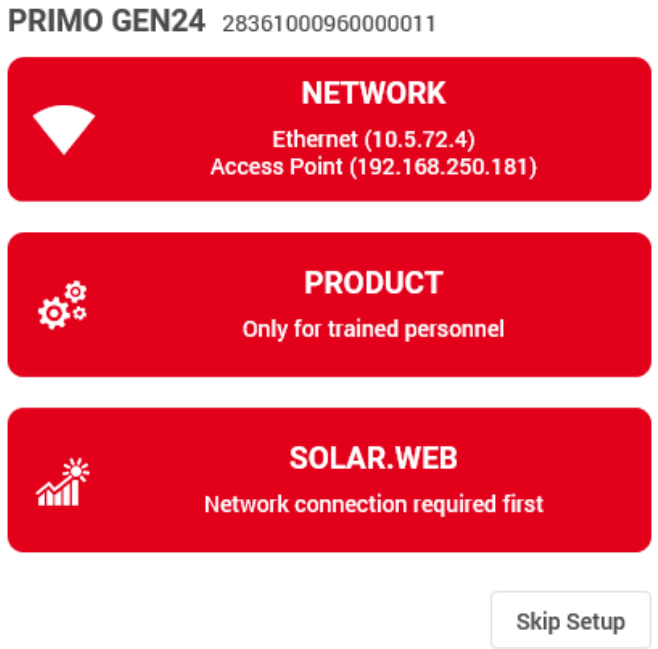

– Use **LAN 1** – interface on the pilot

– No password entry necessary

– Enter IP address **169.254.0.180** in the address bar

– Open installation wizard

– Finish in Fronius Solar.web (network connection necessary)



# What do you have to keep in mind with Windows 10?

**Advice for LAN / WLAN connection with Windows 10**

- When entering the password under Windows 10, the link "Connect using a network security key instead" must first be activated
- Only then it is possible to establish a connection with password: 12345678!



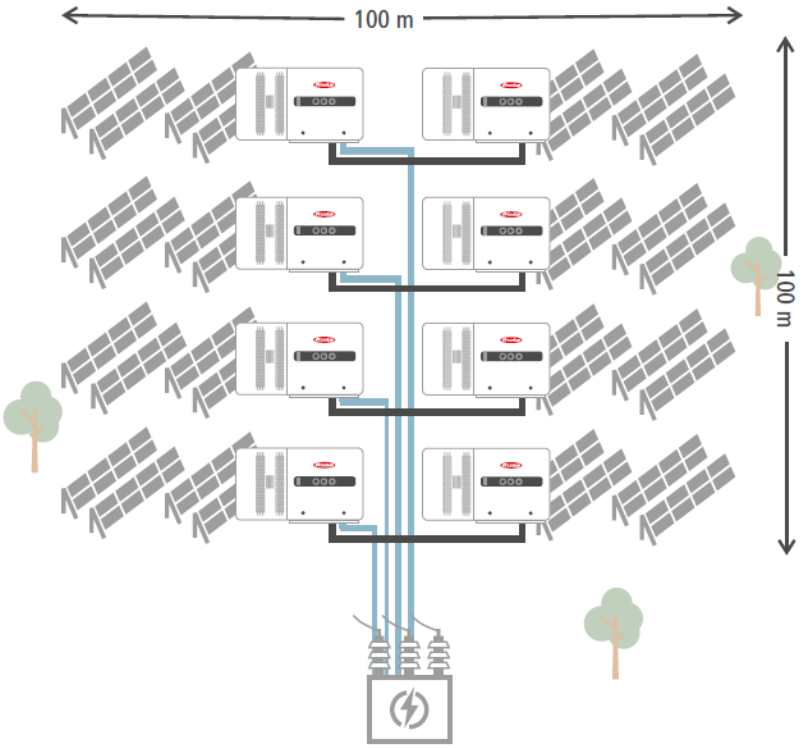

**Important for a smooth connection!**

# Initial commissioning of multiple Tauro devices within one system

# Initial commissioning of larger systems

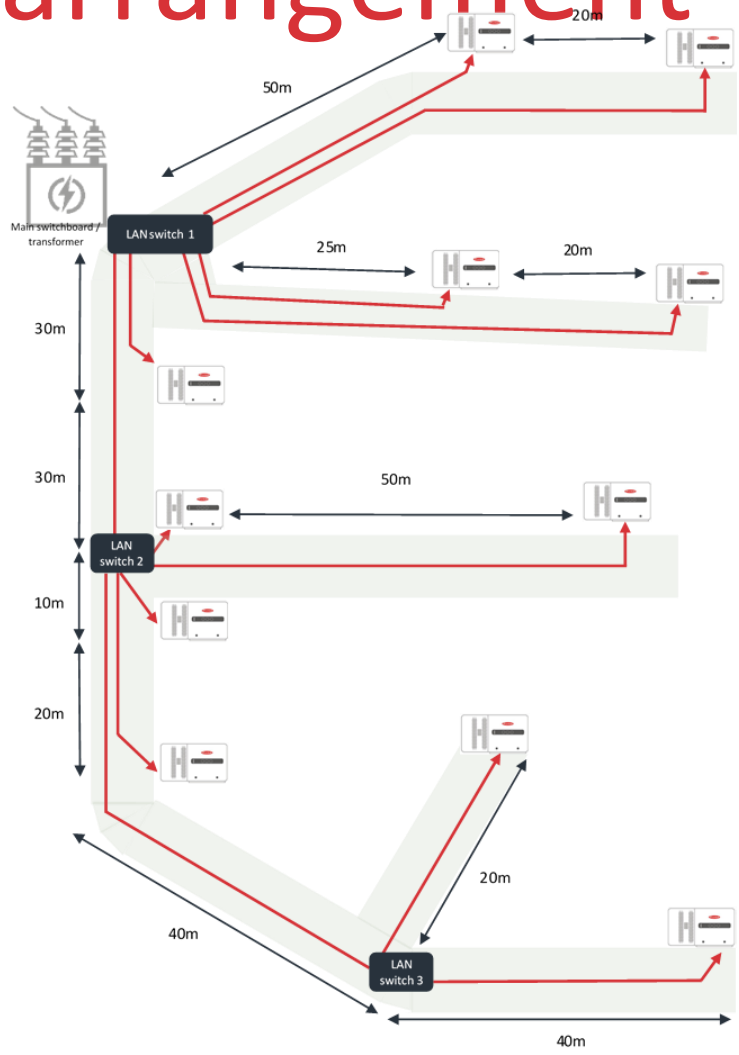
- Common commissioning possible via **central place**
  - Serial numbers and system overview (setup) necessary
- **Individual commissioning** of each Tauro required
  - No copying of commissioning data of one device to the others is possible





# Checklist commissioning star arrangement

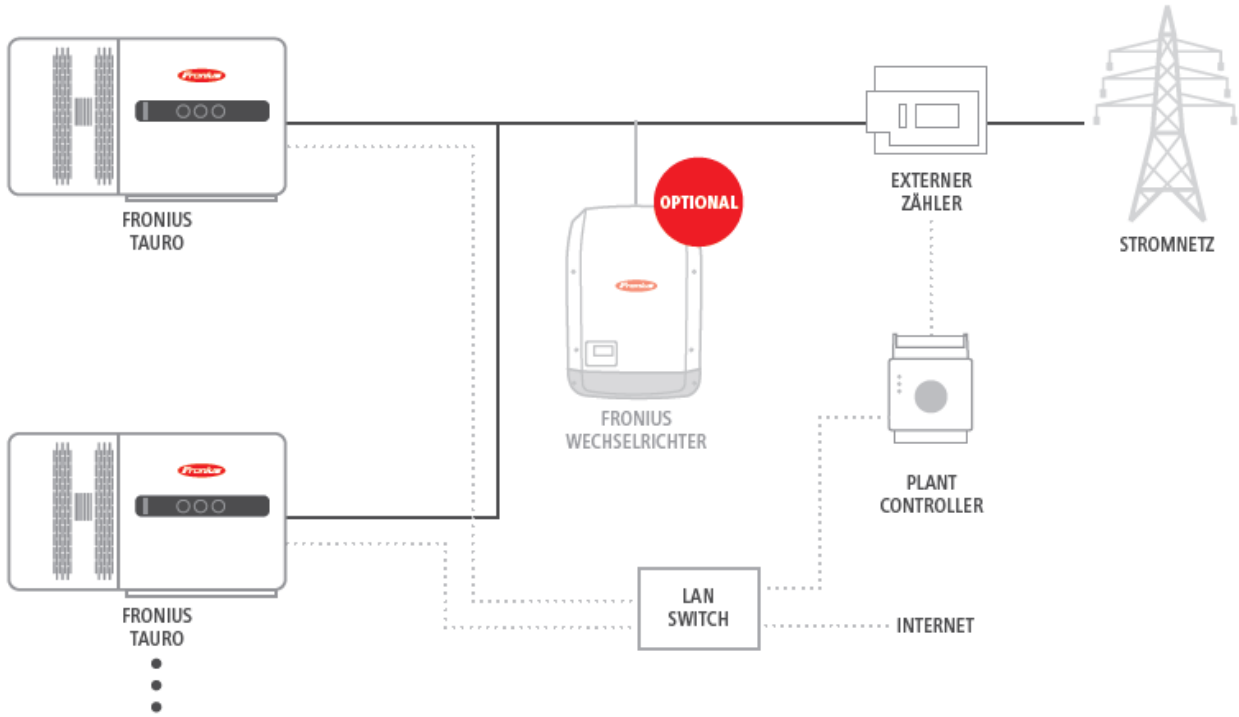
1. Each inverters needs to be connected to the same network
2. Note of installed devices **(serial numbers required)**
3. Direct connection to network / router
4. Check of configured IP addresses (via router or separate tool)
5. Connection via IP addresses to each inverter
6. Check of serial number in the installation wizard
7. **Inverter configurations** can be set



# Integration of a plant controller

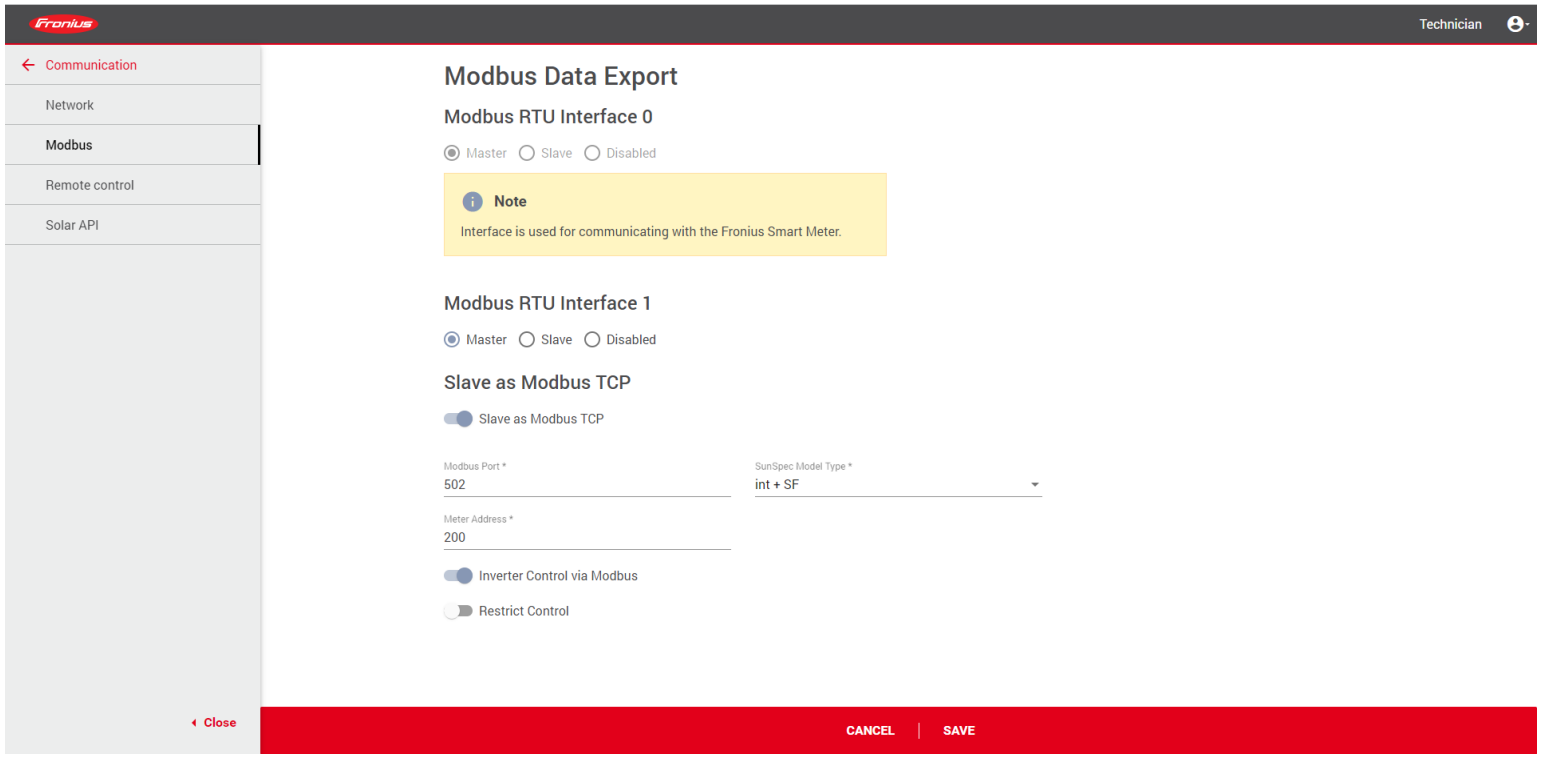
# Operational scenario of plant control

- Multiple Fronius Tauro inverters
- Plant controller
  - e.g. SolarLog, Meteocontrol
- External control and central monitoring
  - Legal requirement of the grid operator
  - Grid conformity
  - Remote control / remote switch-off
  - Guaranteed safety functions
  - Secured data transfer for direct marketing



# Activation of Modbus data export

- Activation “Slave as Modbus TCP”
- Activation of “Inverter control via Modbus ”
- Check sunspec model type – e.g. “int + SF” for Meteocontrol
- Standard TCP port output

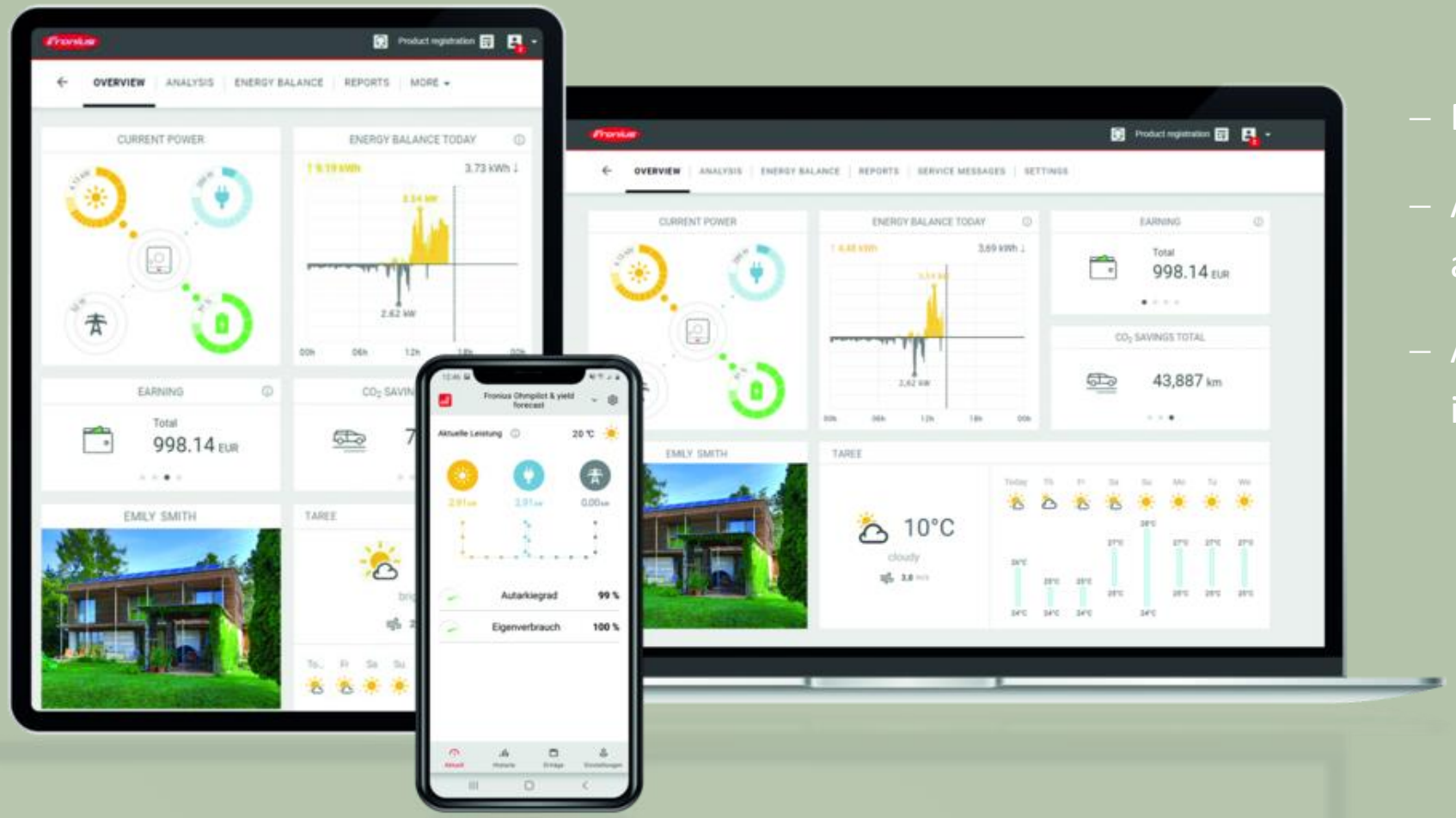


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# Monitoring in Fronius Solar.Web



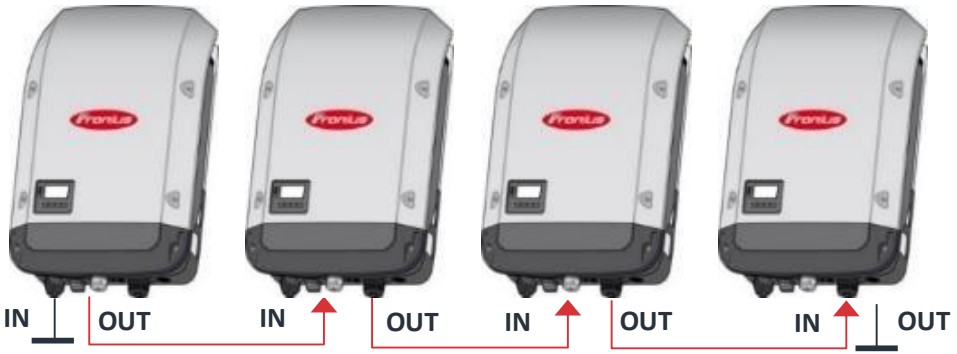
# Solar.Web




- Production always in the view
- All informations anytime and everywhere available
- Automatic notification in case of important incidents

# System combination SnapINverter & Tauro

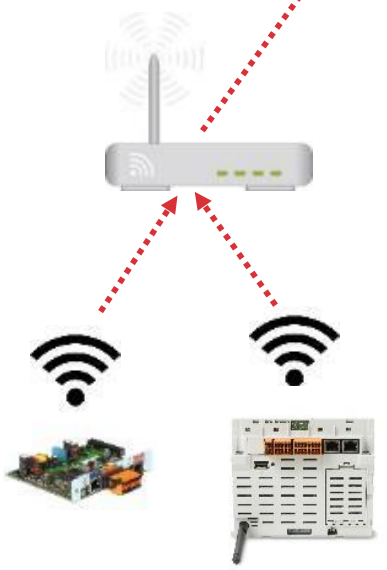
- Systems are combined online via Fronius Solar.web
- No Solar.net connection at the data communication unit (Tauro)

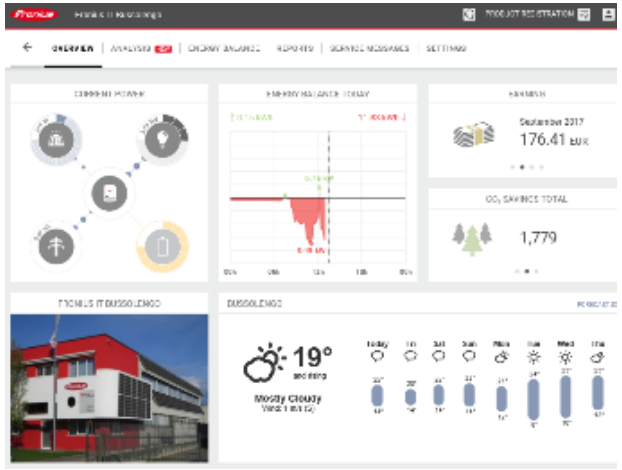



Connection plug!

**Solar.net Ring**

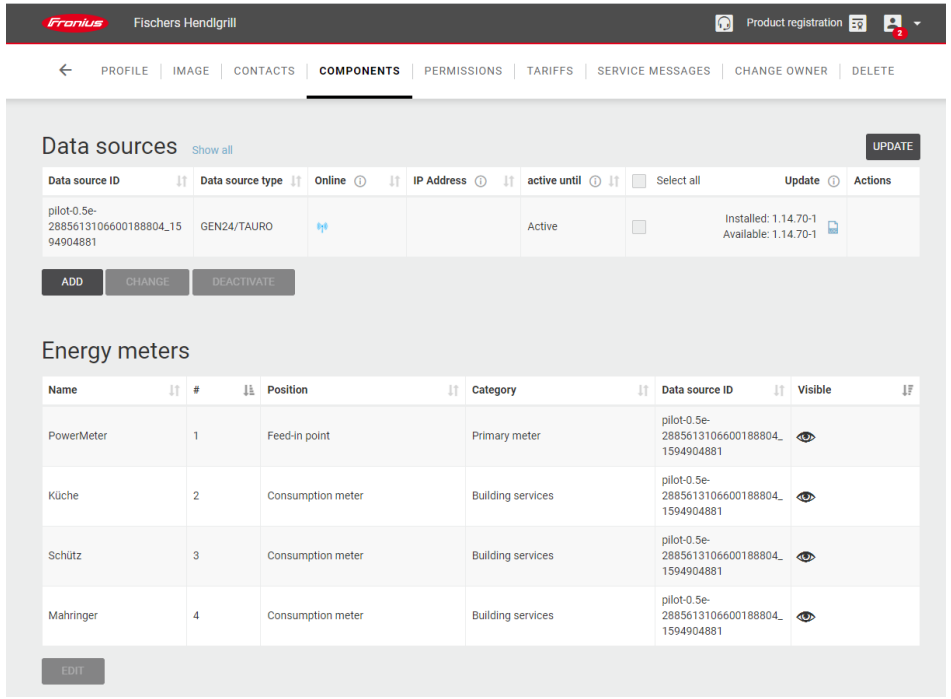
Termination plug!



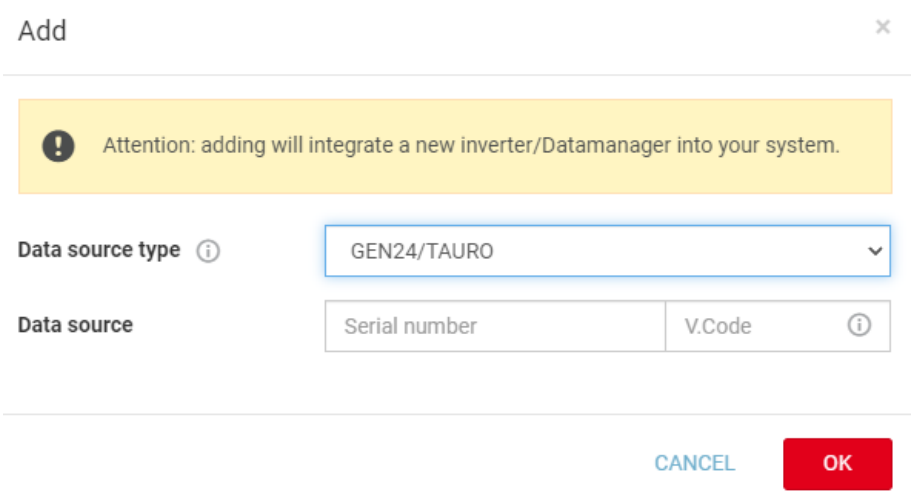





# Adding data sources





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# Service & component exchange



# Cost savings
## with unique service

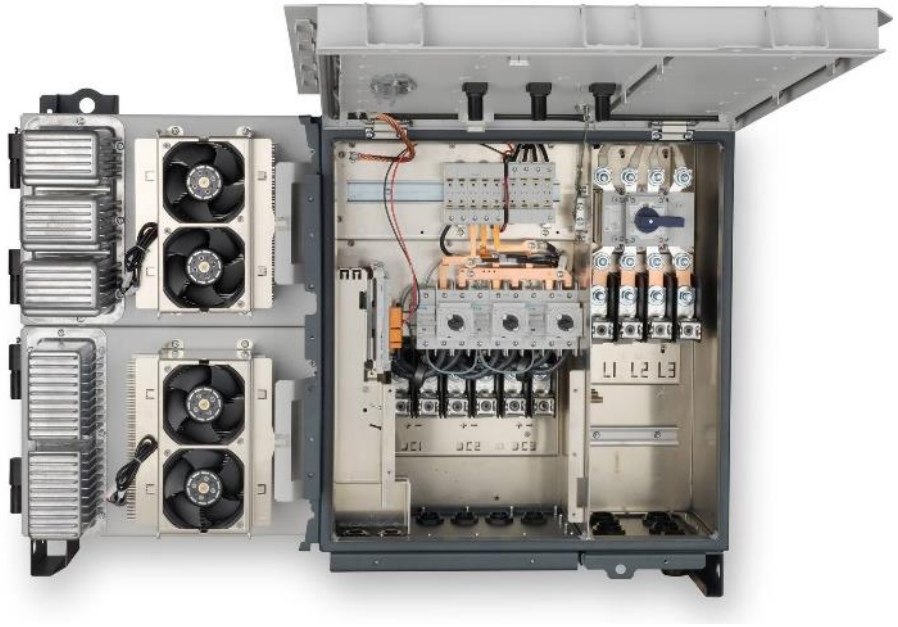
**Fast and easy service**

### NO COMPONENT EXCHANGE REQUIRED

– Exchange of power stage (~ 25 kg) – no need to replace entire inverter

### SIGNIFICANT TIME AND COST SAVINGS

– Only 1 person and trip to site necessary



# Component exchange

**Components**



- AC power unit
- Data communication unit
- AC filter component
- DC filter component
-

**Boards**



- FROFUSE-E
- FROFAP
- FROMO-FUSE
- FRO-STRO
- FROMOCONT

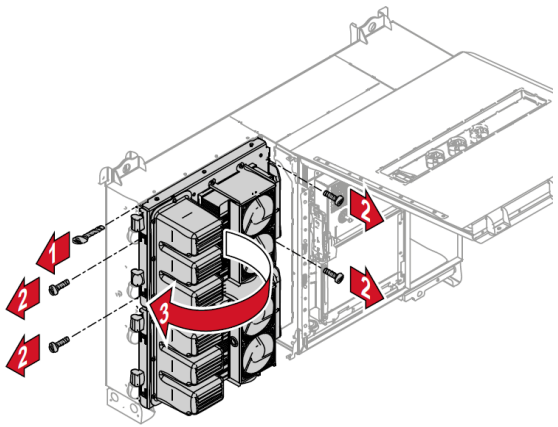
**Mechanical components**



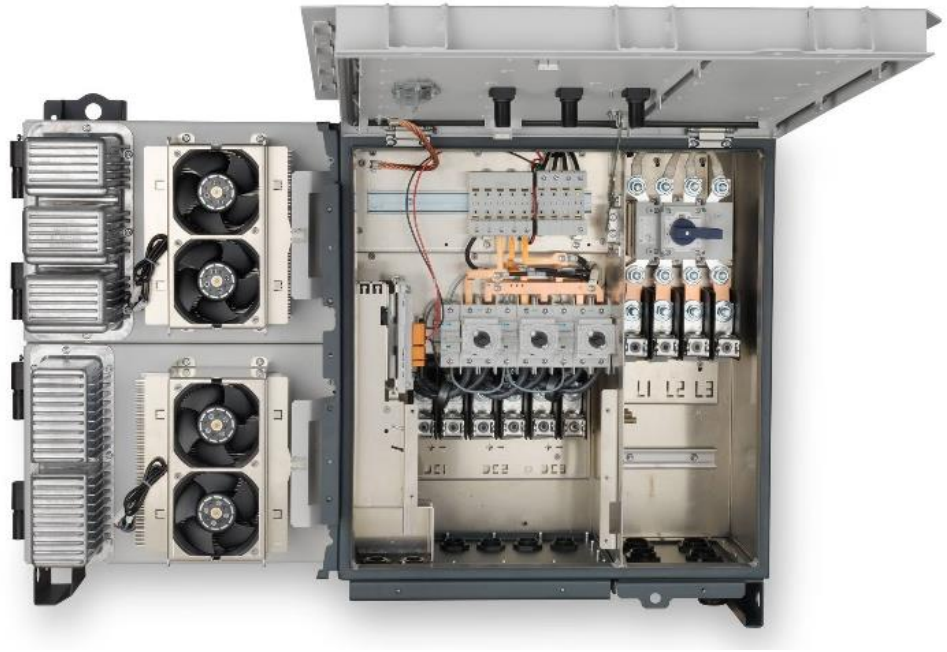
- Switch knob
- AC/DC disconnector
- V-clamps
- Strain reliefs
- SPD
- Fan etc…

# Power unit

- Power stack system (1 or 2 stacks depending on power class)
- TX25 screw connections including second cover part (prior opening of the wing door and fan cover)
- Can be swiveled and lifted out
- Screws have seals – abrasion
  - **Replace with new screws in case of service**



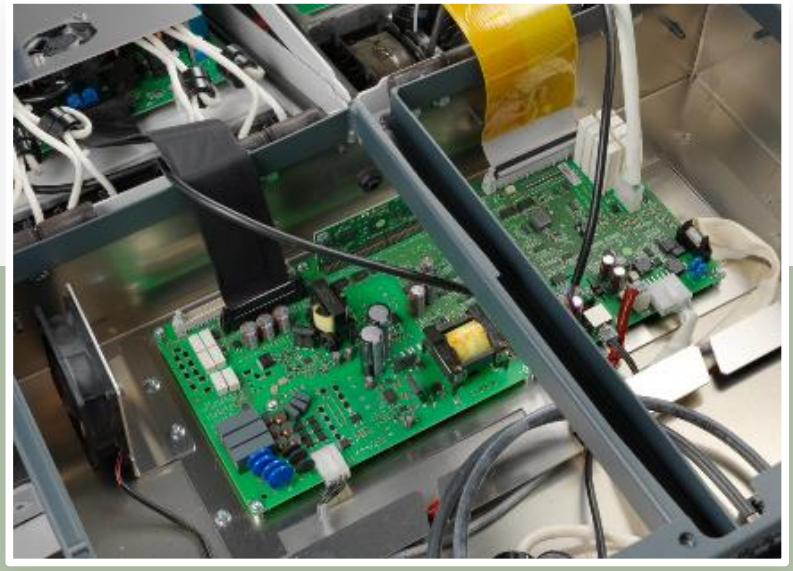


# Licensing




Data communication unit



FROMOCONT

– 2 different exchange scenarios with license requirement!

# What types of licensing are possible?

## Online licensing (recommended)

- Pilot recognizes exchange of each component
- Automatic start-up of the licensing procedure
- Insert serial number or direct scan (mobile device) is possible

## Offline licensing

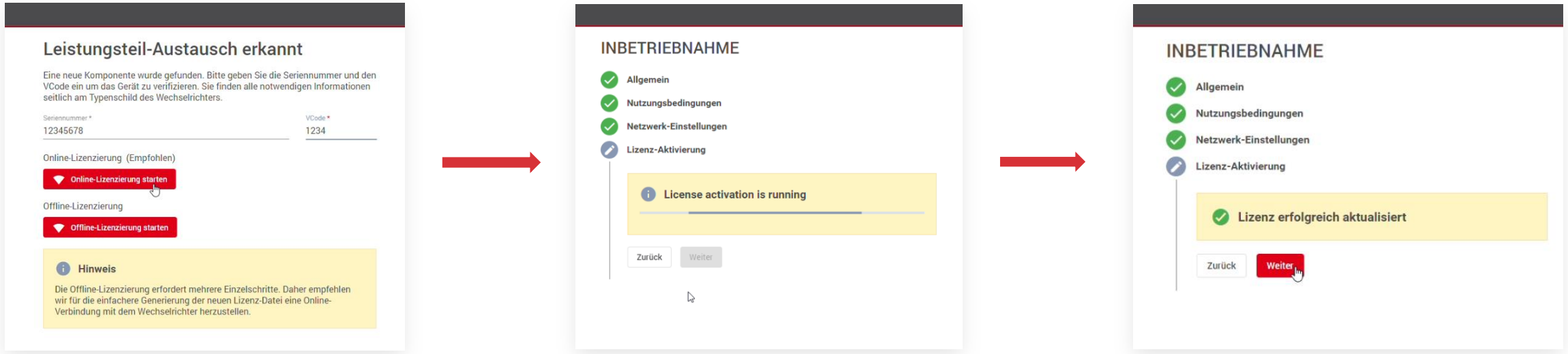
- Pilot recognizes exchange of each component
- Download of **service file**
- Upload service file on www.solarweb.com/licencegenerator

  (Solar.web login required)
- Generate **license file** and upload in the wizard of the licensing procedure (interface)

# Overview of licensing procedure

## Example power unit exchange

- Physical exchange of the power unit
- Opening the WiFi access point and completing the process



# Trainings and education







https://www.fronius.com/de/solarenergie/installateure-partner/service-support/trainings-webinare

New format!
**Online trainings**

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