



## **Fronius Symo Hybrid BYD B-BOX HV Wiring examples**



Installations instructions

Grid-connected inverter





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**General remarks** The examples illustrated in this document (particularly cabling variants and circuit diagrams) are suggestions only. These examples have been carefully developed and tested, and may therefore be used as the basis for an installation. Anyone following or using these examples does so at their own risk.

**IMPORTANT!**

**You must observe and apply any relevant national laws, standards and provisions, as well as any specifications from the respective grid operator.**

We strongly recommend discussing the specific examples implemented and the specific installation with the grid operator and obtaining their express approval. This obligation applies in particular to those parties responsible for constructing the system (e.g. the installer).

The examples suggested here show the emergency power supply with and without an external protection device. Please consult the respective grid operator to ascertain whether an external protection device is mandatory or not.

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**IMPORTANT!**

**Read the Installation Instructions and Operating Instructions carefully before use.**

Contact your salesperson immediately if anything is unclear.

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**WARNING!**

**Any incorrect installation, commissioning, operation or usage can cause serious injury and/or material damage.**

The system may only be installed and commissioned by specially trained personnel in accordance with the technical regulations.

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# Cabling variants including emergency power circuits and 3-pin separation e.g. Austria or Australia

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## Circuit diagram

The circuit diagram for the cabling variant "3-pin separation Austria" can be found in the appendix to this document on page [12](#).

The circuit diagram for the cabling variant "3-pin separation Australia" can be found in the appendix to this document on page [13](#).

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## Functions

- Measuring and transferring the required parameters for energy management and Solar.web by the Fronius Smart Meter
  - Disconnecting from the public grid to enable operation in emergency power mode if the grid parameters are outside the country-specific standards.
  - Reconnecting to the public grid when the grid parameters are within the limits specified by the country-specific standards.
  - Option of having a separate emergency power circuit or several emergency power circuits that are supplied even during failure of the public grid. The total load of the emergency power circuits must not exceed the nominal output of the inverter. Furthermore, the performance of the attached battery must also be considered. The other circuits are not supplied in the event of a power failure.
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## Cabling for emergency power circuit and non-emergency power circuits

The use of contactor K2 is optional in Australia.

If not all the consumers in the home need to be supplied in an emergency power situation, the circuits need to be divided into emergency power circuits and non-emergency power circuits.

The total load of the emergency power circuits must not exceed the nominal output of the inverter.

The emergency power circuits and non-emergency power circuits must be fused separately according to the required safety measures (residual-current circuit breaker, automatic circuit breaker, etc.).

In emergency power mode, only the emergency power circuits are disconnected from the grid by contactors K1 and K2 3-pin. The rest of the home network is not supplied with power in this case

The following points regarding cabling must be considered:

- The main contacts of contactors K1 and K2 must be installed between the Fronius Smart Meter and the residual-current circuit breaker of the inverter or the residual-current circuit breaker of the emergency power circuits.
- The supply voltage for contactors K1 and K2 is provided by the public grid and must be connected to phase 1 (L1) after the Fronius Smart Meter and fused accordingly.
- An NC contact for contactor K3 interrupts the supply voltage to contactors K1 and K2. This prevents the emergency power network of the inverter from being switched to the public grid.
- The NO contact of relay K3 gives feedback to the inverter on whether the locking was successfully performed by relay K3.
- Additional inverters or other AC sources can be installed in the emergency power circuit after the main contacts of K1 and K2. The sources are not synchronised to the network of the Fronius Symo Hybrid because this emergency power network has a frequency of 53 Hz.

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**Transition from feeding energy into the grid to emergency power mode**

1. The public grid is monitored by the inverter's internal grid and system protection unit and by the Fronius Smart Meter connected to it.
2. **Failure of the public grid**
3. The inverter carries out the necessary measures according to the country standard and then switches off.  
Contactors K1 and K2 drop out. This disconnects the emergency power circuits and the inverter from the rest of the home network and from the public grid, as the main contacts of the contactors K1 and K2 3-pin open. The inverter activates relay K3, which interrupts the supply to contactors K1 and K2. This prevents unintentional activation of contactors K1 and K2 and thus a grid connection when voltage is restored in the grid. The NC auxiliary contacts of contactors K1 and K2 send feedback to the inverter that the contactors are open (a condition for starting the emergency power mode).
4. The NO contact of relay K3 gives optional feedback to the inverter on whether the locking was successfully performed by relay K3.
5. The inverter decides based on both the relay's feedback as well as the measurement that the emergency power mode can be activated.
6. The inverter starts emergency power mode after a defined checking period
7. All loads in the emergency power circuits are supplied with power. The remaining loads are not supplied with power and are safely isolated.

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**Transition from emergency power mode to feeding energy into the grid**

1. The inverter is operating in emergency power mode. The contactors K1 and K2 to the public grid are open.
2. **Public grid available again**
3. The Fronius Smart Meter monitors the grid parameters on the public grid and passes this information to the inverter.
4. After a defined measuring period, the restored public grid is deemed to be stable.
5. The inverter ends emergency power mode and disconnects the outputs.
6. The inverter deactivates K3. The contactors K1 and K2 are reactivated.
7. All circuits are reconnected to the public grid and are supplied by the grid. The inverter, therefore, does not feed anything into the grid.
8. The inverter can start feeding energy into the grid again after performing the grid checks required by the country standard.

# Cabling variants including emergency power circuits and 4-pin separation e.g. Germany

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**Circuit diagram** The circuit diagram can be found in the appendix to this document on page [14](#).

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- Functions**
- Measuring and transferring the required parameters for energy management and Solar.web by the Fronius Smart Meter.
  - Disconnecting from the public grid to enable operation in emergency power mode if the grid parameters are outside the country-specific standards.
  - Reconnecting to the public grid when the grid parameters are within the limits specified by the country-specific standards.
  - Establishing a proper ground connection for emergency power mode to ensure the protection devices function correctly.
  - Option of having a separate emergency power circuit or several emergency power circuits that are supplied even during failure of the public grid. The total load of the emergency power circuits must not exceed the nominal output of the inverter. Furthermore, the performance of the attached battery must also be considered. The other circuits are not supplied in the event of a power failure.
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**Cabling for emergency power circuits and non-emergency power circuits**

If not all the consumers in the home need to be supplied in an emergency power situation, the circuits need to be divided into emergency power circuits and non-emergency power circuits.

The total load of the emergency power circuits must not exceed the nominal output of the inverter.

The emergency power circuits and non-emergency power circuits must be fused separately according to the required safety measures (residual-current circuit breaker, automatic circuit breaker, etc.).

In emergency power mode, only the emergency power circuits are disconnected at all pins from the grid by contactors K1 and K2; a ground connection is only established for these circuits. The rest of the home network is not supplied with power in this case.

The following points regarding cabling must be considered:

- The main contacts of contactors K1 and K2 must be installed between the Fronius Smart Meter and the residual-current circuit breaker of the inverter or the residual-current circuit breaker of the emergency power circuits.
- The supply voltage for contactors K1 and K2 is provided by the public grid and must be connected to phase 1 (L1) after the Fronius Smart Meter and fused accordingly.
- To ensure residual-current circuit breakers function in emergency power mode, the connection between the neutral conductor and the ground conductor must be established as close as possible to the inverter, but in any case before the first residual-current circuit breaker. An NC contact is used for this purpose for each of the main contacts of contactors K4 and K5. This ensures that the ground connection is established as soon as the public grid connection is no longer available.
- As with contactor K1, the supply voltage for contactors K4 and K5 is provided via phase 1 (L1) of the public grid.
- An NC contact for the relay K3 interrupts the supply voltage to contactors K1, K2, K4 and K5. This prevents the ground connection from being immediately disconnected again when power returns to the public grid and the emergency power network of the inverter from being switched to the public grid.
- The NO contact of relay K3 gives feedback to the inverter on whether the locking was successfully performed by relay K3.
- Additional inverters or other AC sources can be installed in the emergency power circuit after the main contacts of K1 and K2. The sources are not synchronised to the



network of the Fronius Symo Hybrid because this emergency power network has a frequency of 53 Hz.

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**Transition from feeding energy into the grid to emergency power mode**

1. The public grid is monitored by the inverter's internal grid and system protection unit and by the Fronius Smart Meter connected to it.
2. **Failure of the public grid**
3. The inverter carries out the necessary measures according to the country standard and then switches off.  
Contactors K1 and K2, as well as K4 and K5, drop out. This disconnects the emergency power circuits and the inverter from the rest of the home network and from the public grid, as the main contacts of the contactors K1 and K2 open at all pins. The NC auxiliary contacts of contactors K1 and K2 send feedback to the inverter that the contactors are open (a condition for starting the emergency power mode).
4. The NC main contacts of contactors K4 and K5 are closed, establishing a connection between the neutral conductor and the ground conductor. The two other NC main contacts of contactors K4 and K5 give feedback to the inverter that the ground connection has been established correctly (a condition for starting the emergency power mode).
5. The inverter activates relay K3, which interrupts the supply to contactors K1, K2, K4 and K5. This prevents unintentional activation of contactors K1, K2, K4 and K5 and thus a grid connection when voltage is restored in the grid.
6. The NO contact of relay K3 gives additional feedback to the inverter on whether the locking was successfully performed by relay K3.
7. The inverter decides based on the contactors' feedback as well as the measurements on the inverter terminals and the Smart Meter that the emergency power mode can be activated.
8. The inverter starts emergency power mode after a defined checking period
9. All loads in the emergency power circuits are supplied with power. The remaining loads are not supplied with power and are safely isolated.

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**Transition from emergency power mode to feeding energy into the grid**

1. The inverter is operating in emergency power mode. The contactors K1 and K2 to the public grid are open.
2. **Public grid available again**
3. The Fronius Smart Meter monitors the grid parameters on the public grid and passes this information to the inverter.
4. After a defined measuring period, the restored public grid is deemed to be stable.
5. The inverter ends emergency power mode and disconnects the outputs.
6. The inverter deactivates K3. The contactors K1, K2, K4 and K5 are reactivated.
7. All circuits are reconnected to the public grid and are supplied by the grid. The inverter, therefore, does not feed anything into the grid.
8. The inverter can start feeding energy into the grid again after performing the grid checks required by the country standard.

# Description of components

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## Description of components for full version

### Fronius Smart Meter

- Type: Fronius Smart Meter 63 A
- Fronius item number: 43,0001,1473
- 230 (400) V - 240 (415) V
- 10 (63) A / 50 Hz - 60 Hz
- Modbus RTU communication

or

- Type: Fronius Smart Meter 50kA-3
- Fronius item number: 43,0001,1478
- 230 (400) V - 240 (415) V
- 10 (63) A / 50 Hz - 60 Hz
- Modbus RTU communication

### External ENS

Other types and manufacturers are permitted if they are technically and functionally identical to the following:

- e.g.: Manufacturer: Bender
- e.g.: Type: VMD460-NA-D-2

### Fuse protection, external ENS

- 3-pin or 1-pin
- 6 A

### K1 and K2 - installation contactor with auxiliary contact

- 4-pin
- 25 A or 63 A (depending on house connection)
- Coil voltage, 230 V AC
- Auxiliary contact 1NC

### K3 - modular relay

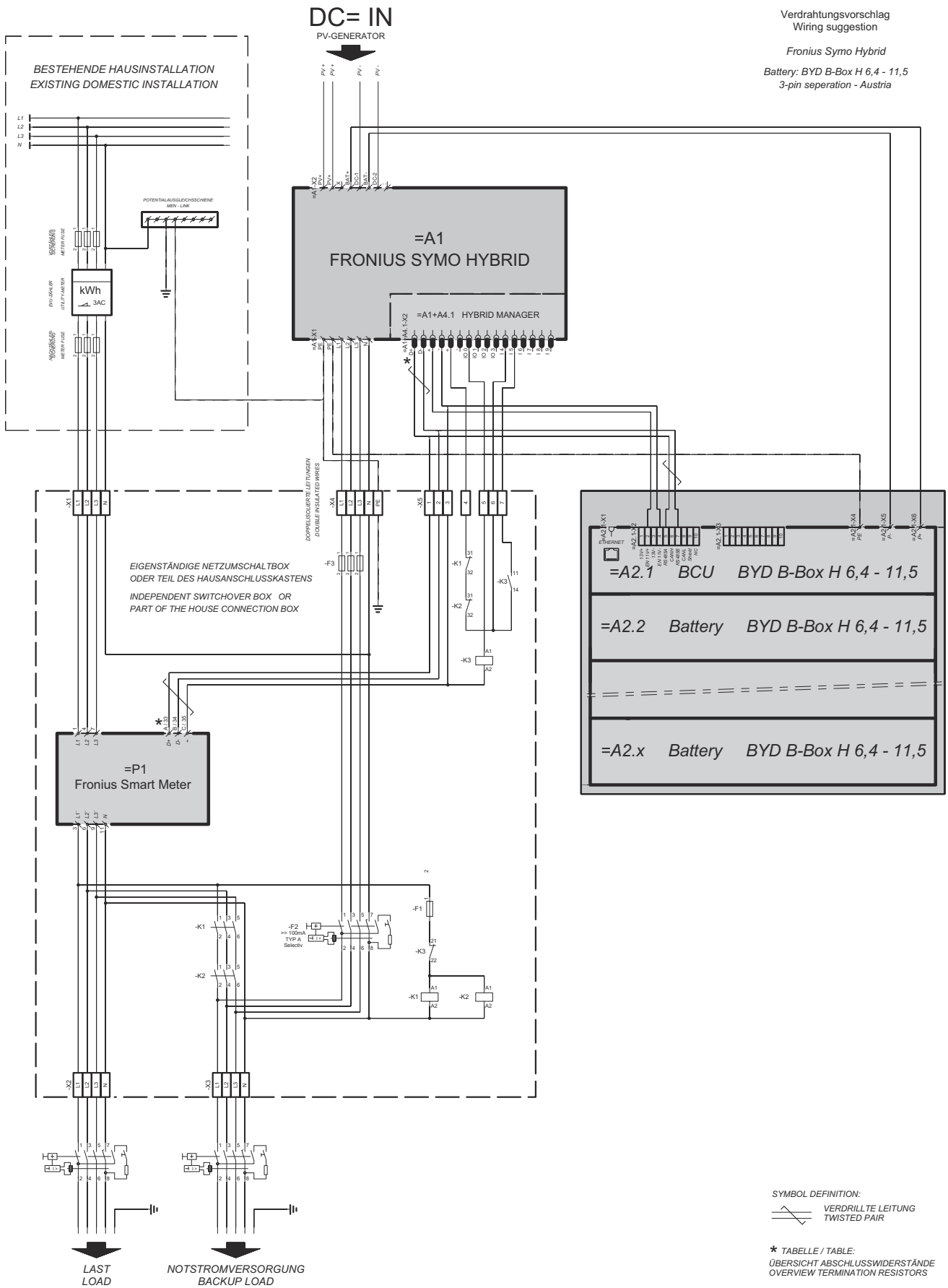
- 2 changeover contacts
- Coil voltage: 12 V DC

### K4 and K5 - installation contactor

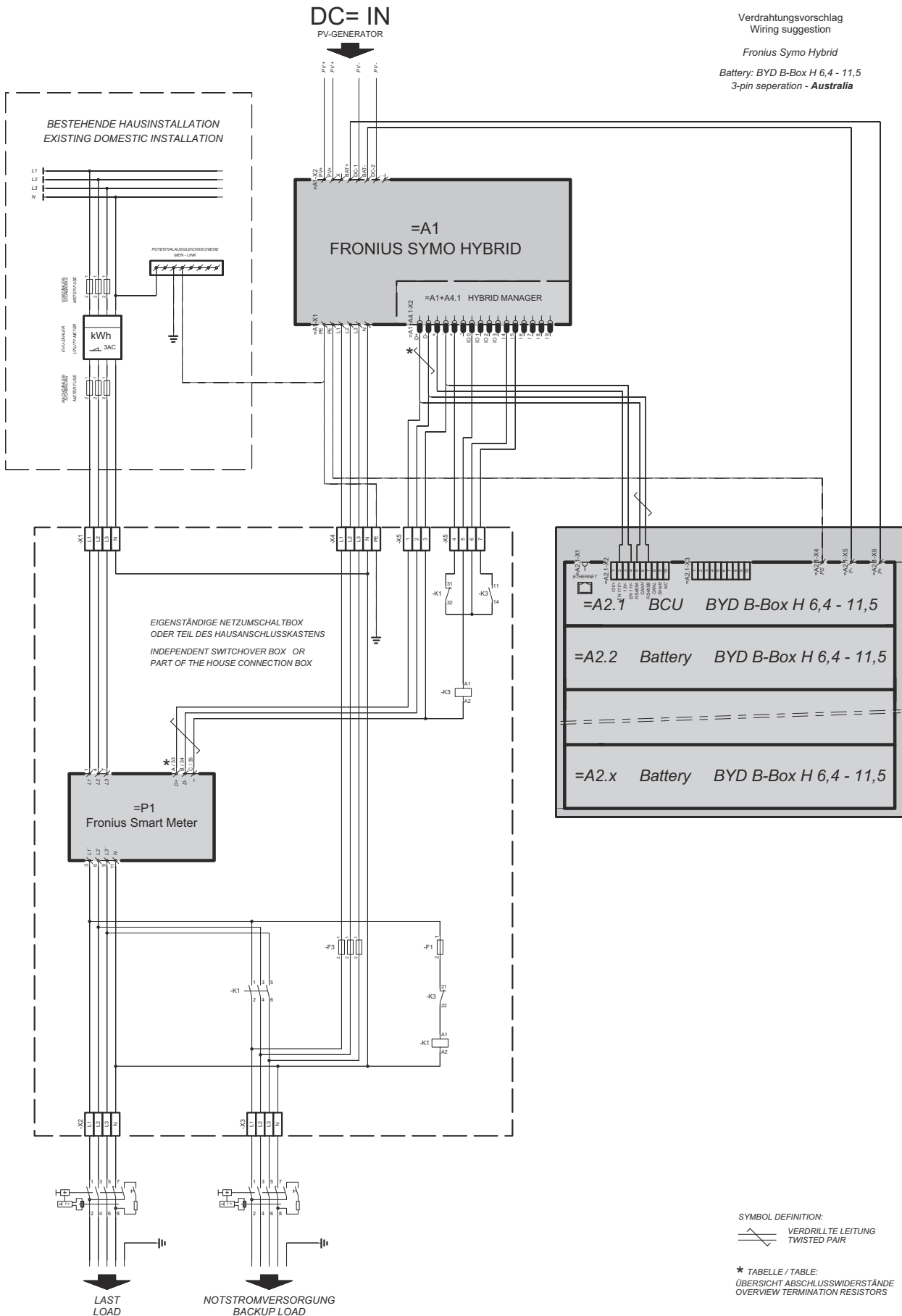
- 2 NCs
- Coil voltage, 230 V AC
- 20 A

# Appendix

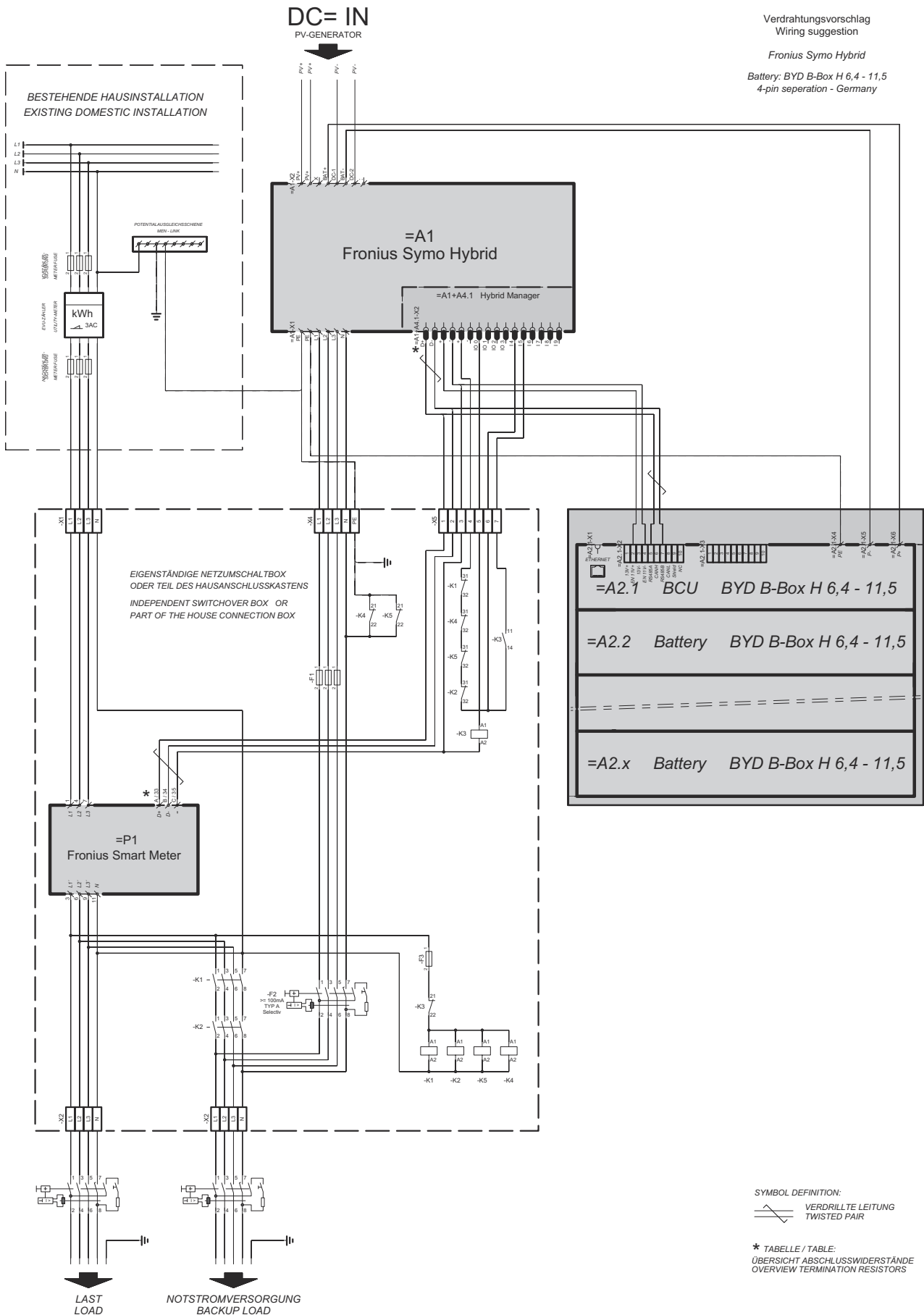
# BYD 3-pin separation Austria



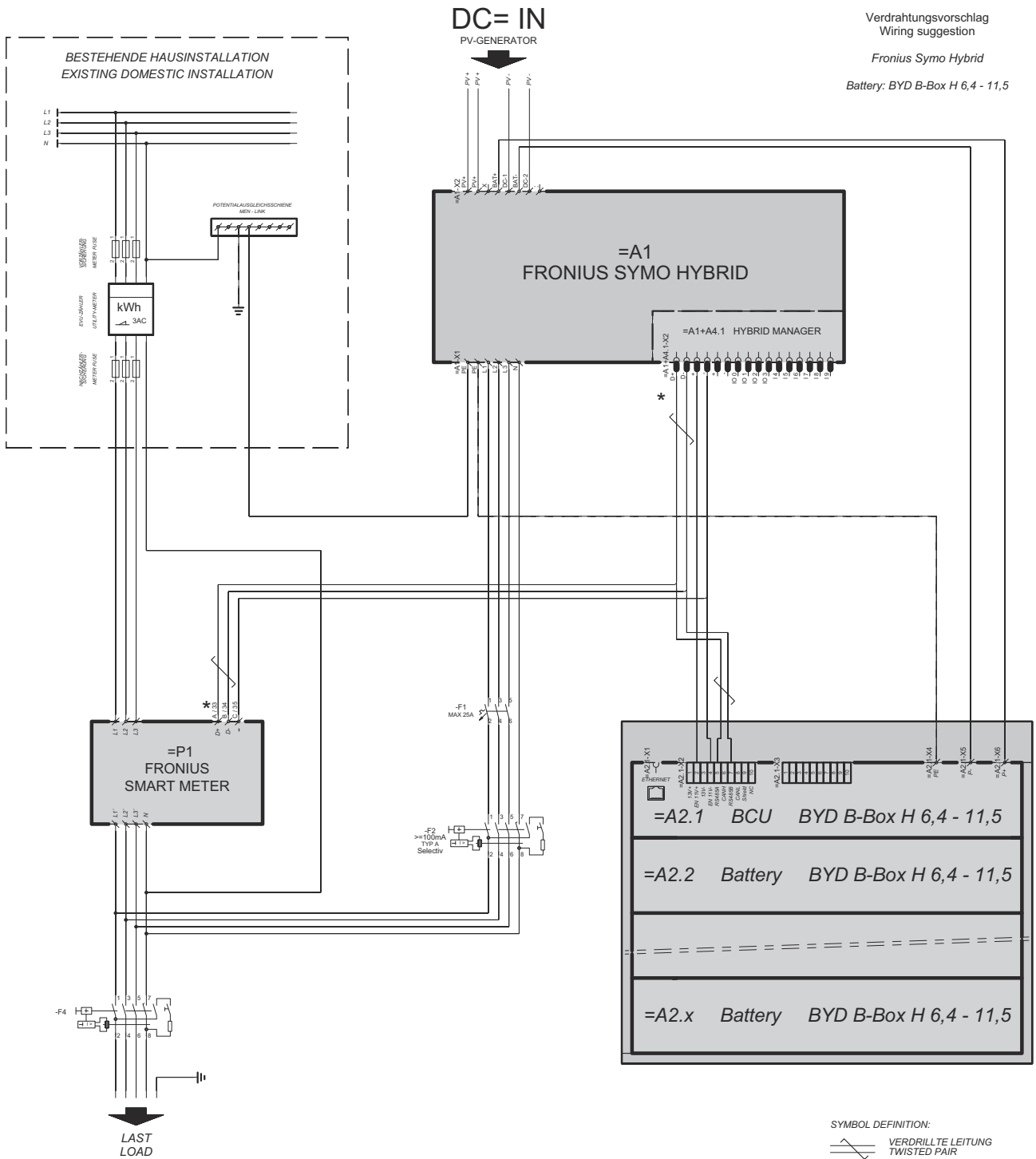
# BYD 3-pin separation Australia



# BYD 4-pin separation Germany



# BYD wiring recommendation



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