



Fronius Symo Hybrid Wiring examples emergency power switchover



Installation instructions

Grid-connected inverter



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Contents

General.....	4
General.....	4
Cabling variants including emergency power circuits and 3-pin separation e.g. Austria or Australia.....	5
Circuit diagram.....	5
Functions.....	5
Cabling for emergency power circuit and non-emergency power circuits.....	5
Transition from feeding energy into the grid to emergency power mode.....	6
Transition from emergency power mode to feeding energy into the grid.....	6
Cabling variants including emergency power circuits with grid and system protection and 3-pin separation e.g. Austria.....	7
Circuit diagram.....	7
Functions.....	7
Cabling for emergency power circuits and non-emergency power circuits.....	7
Transition from feeding energy into the grid to emergency power mode.....	8
Transition from emergency power mode to feeding energy into the grid.....	9
Cabling variants including emergency power circuits and 4-pin separation e.g. Germany.....	10
Circuit diagram.....	10
Functions.....	10
Cabling for emergency power circuits and non-emergency power circuits.....	10
Transition from feeding energy into the grid to emergency power mode.....	11
Transition from emergency power mode to feeding energy into the grid.....	12
Cabling variants including emergency power circuits with grid and system production and 4-pin separation e.g. Germany.....	13
Circuit diagram.....	13
Functions.....	13
Cabling for emergency power circuits and non-emergency power circuits.....	13
Transition from feeding energy into the grid to emergency power mode.....	14
Transition from emergency power mode to feeding energy into the grid.....	15
Cabling variants including emergency power circuits with grid and system protection and 4-pin separation, e.g. Italy.....	16
Circuit diagram.....	16
Functions.....	16
Cabling for emergency power circuits and non-emergency power circuits.....	16
Transitioning from feeding energy into the grid to backup power mode.....	18
Transition from emergency power mode to feeding energy into the grid.....	18
Description of components.....	19
Description of components for full version.....	19
Emergency power configuration.....	21
Requirements.....	21
Emergency power configuration - overview.....	21
Accessing the CONFIG menu.....	21
Selecting alternative (emergency power) setup.....	22
Configuring the digital I/Os on the Fronius Datamanager.....	22
Configuring the system overview on the Fronius Datamanager.....	23
Configuring the energy management on the Fronius Datamanager (option).....	23
Appendix.....	25
3-pin separation Austria with Solar Battery.....	26
3-pin separation Australia with Solar Battery.....	27
3-pin separation Austria with BYD.....	28
3-pin separation Australia with BYD.....	29
3-pin separation with grid and system protection Austria with Solar Battery.....	30
4-pin separation Germany with Solar Battery.....	31
4-pin separation Germany with BYD.....	32
4-pin separation with grid and system protection Germany with Solar Battery.....	33
4-pin separation with grid and system protection Italy with Solar Battery.....	34
Fronius Symo Hybrid and BYD Battery-Box Premium HV.....	35

General

General

The examples given in this document (in particular cabling variants and Circuit Diagrams) are suggestions only. These examples have been carefully developed and tested. They can therefore be used as a basis for real-life installation. Anyone following or using these examples does so at their own risk.

IMPORTANT!

The applicable national laws, standards and regulations as well as the specifications of the respective grid operator must be taken into account and applied.

It is strongly recommended to coordinate the concrete examples implemented and in particular the specific installation with the grid operator to obtain their explicit approval.

This obligation applies to system constructors in particular (e.g. installers).

The examples suggested here show a backup power supply with or without an external protection relay (external grid and system protection unit). Whether an external protection relay must be used or not is the decision of the respective grid operator.

IMPORTANT!

No uninterruptible power supply (UPS) must be operated in the backup power circuit.

The Installation and Operating Instructions must be read carefully prior to use. If anything is unclear, contact your vendor immediately.



WARNING!

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

Only trained and qualified personnel are authorised to install and commission the system, and only within the scope of the technical regulations.

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

Circuit diagram	<p>The circuit diagram for the cabling variant „3-pin separation Austria with Solar Battery“ can be found in the appendix to this document on page 26.</p> <p>The circuit diagram for the cabling variant „3-pin separation Australia with Solar Battery“ can be found in the appendix to this document on page 27.</p> <p>The circuit diagram Fronius Symo Hybrid and BYD Battery-Box Premium HV can be found in the appendix to this document on page 35.</p> <p>The circuit diagram for the cabling variant „3-pin separation Austria with BYD“ can be found in the appendix to this document on page 28.</p> <p>The circuit diagram for the cabling variant „3-pin separation Australia with BYD“ can be found in the appendix to this document on page 29.</p>
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Functions	<ul style="list-style-type: none"> - 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	<p>The use of contactor K2 is optional in Australia.</p> <p>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.</p> <p>The total load of the emergency power circuits must not exceed the nominal output of the inverter.</p> <p>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.).</p> <p>In emergency power mode, only the emergency power circuits are disconnected from the grid by contactors K1 and K2 3-pin (L1, L2 and L3). The rest of the home network is not supplied with power in this case</p>
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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 relay 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.

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 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 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.
5. The NO contact of relay K3 gives optional feedback to the inverter on whether the locking was successfully performed by relay K3.
6. Based on the feedback from the contactors and the measurements at the inverter terminals and at the Smart Meter, the inverter decides that emergency power mode can be started.
7. The inverter starts emergency power mode after a defined checking period
8. All loads in the emergency power circuits are supplied with power. The remaining loads are not supplied with power and are safely isolated.

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 with grid and system protection and 3-pin separation e.g. Austria

Circuit diagram The circuit diagram "[3-pin separation with grid and system protection Austria with Solar Battery](#)" can be found in the appendix to this document on page 30.

Functions

- Measuring and transferring the required parameters for energy management and Solar.web by the Fronius Smart Meter.
- Monitoring of the voltage and frequency grid parameters by the grid and system protection unit.
- 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.

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 from the grid by contactors K1 and K2 3-pin (L1, L2 and L3). 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.
- Actuation of contactors K1 and K2 is carried out by the external grid and system protection unit.
- The external grid and system protection unit must be installed after the Fronius Smart Meter. Precise installation and cabling notes for the external grid and system protection unit can be found in its separate Operating Instructions.
- The remote trip input of the external grid and system protection unit must be set to NC according to the manufacturer's Operating Instructions.
- An NC contact for relay K3, which activates the remote input of the external grid and system protection unit, 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.

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 an external grid and system protection unit.
2. **Failure of the public grid**
3. The inverter carries out the measures necessary according to the country standard and then switches off.
4. The external grid and system protection unit opens contactors K1 and K2 for grid monitoring. 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. To ensure that the public grid has definitely been disconnected, the NC auxiliary contacts of contactors K1 and K2 give feedback to the external grid and system protection unit.
5. The NC main contact of contactor K4 gives feedback to the inverter that the grid was disconnected by the external ENS.
6. The inverter activates relay K3, which activates the remote input of the external grid and system protection unit via an NC contact. This prevents a connection to the public grid when power returns.
7. The NO contact of relay K3 gives optional feedback to the inverter on whether the locking was successfully performed by relay K3.
8. The inverter decides based on the contactor's feedback as well as the measurement on the inverter terminals and the Smart Meter that the emergency power mode can be activated.
9. The inverter starts emergency power mode after a defined checking period.
10. All loads in the emergency power circuits are supplied with power. The remaining loads are not supplied with power and are safely isolated.

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. On the basis of adjustments that have been carried out, the inverter ends emergency power mode and disconnects the outputs.
6. The inverter deactivates K3. The external grid and system protection unit switches the contactors K1 and K2 after performing the grid checks required by the applicable standards.
7. All circuits are reconnected to the public grid and are supplied by 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

- Circuit diagram** The circuit diagram for the cabling variant "**4-pin separation Germany with Solar Battery**" can be found in the appendix to this document on page **31**.
- The circuit diagram **Fronius Symo Hybrid and BYD Battery-Box Premium HV** can be found in the appendix to this document on page **35**.
- The circuit diagram for the cabling variant "**4-pin separation Germany with BYD**" can be found in the appendix to this document on page **32**.
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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.

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.

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.

Cabling variants including emergency power circuits with grid and system production and 4-pin separation e.g. Germany

Circuit diagram	The circuit diagram " 4-pin separation with grid and system protection Germany with Solar Battery " can be found in the appendix to this document on page 33.
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Functions	<ul style="list-style-type: none"> - Measuring and transferring the required parameters for energy management and Solar.web by the Fronius Smart Meter. - Monitoring of the voltage and frequency grid parameters by the grid and system protection unit. - 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	<p>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.</p> <p>The total load of the emergency power circuits must not exceed the nominal output of the inverter.</p> <p>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.).</p> <p>In emergency power mode, only the emergency power circuits are disconnected 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.</p>
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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.
- Actuation of contactors K1 and K2 is carried out by the external grid and system protection unit.
- The external grid and system protection unit must be installed after the Fronius Smart Meter. Precise installation and cabling notes for the external grid and system protection unit can be found in its separate Operating Instructions
- The remote trip input of the external grid and system protection unit must be set to NC according to the manufacturer's Operating Instructions.
- 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 and is switched via the grid and system protection.
- An NC contact for relay K3, which activates the remote input of the external grid and system protection unit, 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.

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 an external grid and system protection unit.
2. **Failure of the public grid**
3. The inverter carries out the measures necessary according to the country standard and then switches off.
4. The external grid and system protection unit opens contactors K1 and K2 for grid monitoring. 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. To ensure that the public grid has definitely been disconnected, the NC auxiliary contacts of contactors K1 and K2 give feedback to the external grid and system protection unit.
5. 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).
6. The inverter activates relay K3, which activates the remote input of the external ENS via an NC contact. This prevents a connection to the public grid when power returns.
7. The NO contact of relay K3 gives optional feedback to the inverter on whether the locking was successfully performed by relay K3.
8. The inverter decides based on the contactor's feedback as well as the measurements on the inverter terminals and the Smart Meter that the emergency power mode can be activated.
9. The inverter starts emergency power mode after a defined checking period.
10. All loads in the emergency power circuits are supplied with power. The remaining loads are not supplied with power and are safely isolated.

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. On the basis of adjustments that have been carried out, the inverter ends emergency power mode and disconnects the outputs.
6. The inverter deactivates K3. The external grid and system protection unit switches the contactors K1, K2, K4 and K5 after performing the grid checks required by the applicable standards.
7. All circuits are reconnected to the public grid and are supplied by 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 with grid and system protection and 4-pin separation, e.g. Italy

Circuit diagram The circuit diagram "[4-pin separation with grid and system protection Italy with Solar Battery](#)" can be found in the appendix to this document on page [34](#).

- Functions**
- Measuring and transferring the required parameters for energy management and Solar.web by the Fronius Smart Meter.
 - Monitoring of the voltage and frequency grid parameters by the grid and system protection unit.
 - 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.
- Actuation of contactors K1 and K2 is carried out by the external grid and system protection unit.
- The external grid and system protection unit must be installed after the Fronius Smart Meter. Precise installation and cabling notes for the external grid and system protection unit can be found in its separate Operating Instructions
- The remote trip input of the external grid and system protection unit must be set to NC according to the manufacturer's Operating Instructions.
- 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 and is switched via the external grid and system protection unit.
- An NC contact for relay K3, which activates the remote input of the external grid and system protection unit, 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 additional 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.

Transitioning from feeding energy into the grid to backup power mode

1. The public grid is monitored by the inverter's internal grid and system protection unit and by an external grid and system protection unit.
2. **Failure of the public grid**
3. The inverter carries out the measures necessary according to the country standard and then switches off.
4. The external grid and system protection unit opens contactors K1 and K2 for grid monitoring. This disconnects the backup 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. To ensure that the public grid has definitely been disconnected, the NC auxiliary contacts of contactor K1 give feedback to the external grid and system protection unit.
5. The NC main contact of contactors K4 and K5 is 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.
6. The inverter activates relay K3, which activates the remote input of the external grid and system protection unit via an NC contact. This prevents a connection to the public grid when voltage is restored in the grid.
7. The NO contact of relay K3 gives additional feedback to the inverter on whether the locking was successfully performed by relay K3.
8. The inverter decides based on the contactors' feedback as well as the measurement on the inverter terminals and the Smart Meter that backup power mode can be started.
9. The inverter starts backup power mode after a defined checking period.
10. All loads in the backup power circuits are supplied with power. The remaining loads are not supplied with power and are safely isolated.

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. On the basis of adjustments that have been carried out, the inverter ends emergency power mode and disconnects the outputs.
6. The inverter deactivates K3. The external grid and system protection unit switches the contactors K1, K2, K4 and K5 after performing the grid checks required by the applicable standards.
7. All circuits are reconnected to the public grid and are supplied by 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

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

Grid and system protection

Other types and manufacturers are permitted if they are technically and functionally identical to the following type, e.g.:

- manufacturer: Bendner
- type: VMD460-NA-D-2

Fuse protection, grid and system protection or coupling relays

- 3-pin or 1-pin
- 6 A

K1 and K2 - installation contactor with auxiliary contact

- 3-pin or 4-pin (depending on cabling variant)
- 25 A or 63 A (depending on house connection)
- Coil voltage, 230 V AC
- Auxiliary contact
 - 1 NO
 - Switching voltage 12 - 230 V @ 50/60 Hz
 - Short circuit current min. 1 kA

K3 - modular relay

- 2 changeover contacts
- Coil voltage: 12 V DC

K4 and K5 - installation contactor

- 2 NCs 20 A
- Coil voltage, 230 V AC (2P)
- 20 A
- Nominal frequency 50/60 Hz
- Short circuit current = min. 3 kA (Working contacts)

Further requirements

Contactors K1, K2, K4 and K5 must be certified to IEC 60947-4-1. Examples of contactors / relays that meet these requirements are

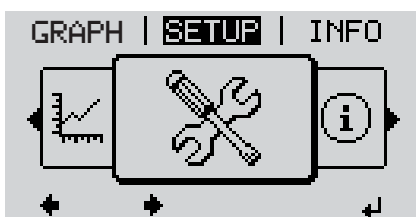
- K1 and K2:
 - Iskra IK63-40 State 2018
 - Schrack BZ326461 State 2018
- K4 and K5:
 - Iskra IK20-02 State 2018
 - Schrack BZ626439 State 2018
- K3:
 - Finder 22.23.9.012.4000
 - Schrack Relay RT424012 (Bracket RT17017, Relay socket RT78725)

Emergency power configuration

- Requirements**
- In order to use the hybrid inverter's emergency power function, the following prerequisites must be fulfilled:
- Correct wiring of the emergency power system in the electrical installation (according to this document) - Check wiring
 - Attach the emergency power sticker supplied with the inverter to the electrical distributor.
 - The meter (Fronius Smart Meter) must be installed at the feed-in point and configured
 - Current system monitoring firmware on the inverter: V 1.3.2-3 or higher. Update the firmware if necessary.

- Emergency power configuration - overview**
- Accessing the CONFIG menu
 - Selecting alternative (emergency power) setup
 - Configuring the digital I/Os on the Fronius Datamanager
 - Configuring the system overview on the Fronius Datamanager
 - Configuring the energy management on the Fronius Datamanager (option)

Accessing the CONFIG menu



- ↑ **1** Press the "Menu" key

The menu level appears.



- 2** Press the unassigned "Menu / Esc" key
5 times

'Access Code' is displayed in the 'CODE' menu; the first digit starts flashing.
The access code for the CONFIG menu is: 39872

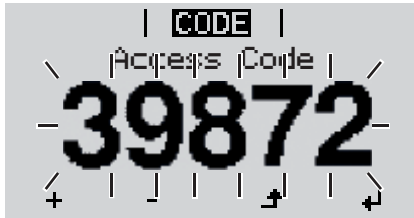
- + - **3** Enter the access code for the CONFIG menu: Use the 'Up' and 'Down' keys to select a value for the first digit of the code

- ↵ **4** Press the 'Enter' key

The second digit flashes.



- 5** Repeat steps 3 and 4 for the second, third, fourth and fifth digits of the access code until...



the selected code starts flashing.

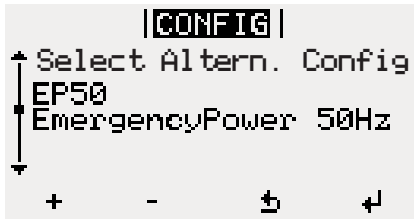
6 Press the 'Enter' key

The first parameter of the CONFIG menu is displayed

Selecting alternative (emergency power) setup

The setups with the designation "EmergencyPower" are available as "Alternative (emergency power) setups":

- EmergencyPower 50Hz: for all countries with a nominal frequency of 50 Hz
- EmergencyPower 60Hz: for all countries with a nominal frequency of 60 Hz



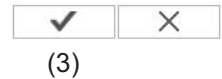
+ - 1 Use the 'Up' and 'Down' keys to select the Alternative (emergency power) setup

2 Press the 'Enter' key

Configuring the digital I/Os on the Fronius Datamanager

- 1 Open the Fronius system monitoring web page (= Fronius Datamanager)
- 2 Select settings
- 3 Sign in as "Service"
- 4 Select IO mapping from the menu
- 5 Switch user
- 6 Activate and open "Emergency power"

IO mapping



RS485	D+	+	+	0	2	4	6	8
RS485	D-	-	-	1	3	5	7	9

PIN ASSIGNMENTS

- 0. Grant emergency power locking
- 1. none
- 2. none
- 3. none
- 4. Emergency power request
- 5. none
- 6. none
- 7. none
- 8. none
- 9. none

AUS - Demand Response Modes (DRM)

Emergency power (1)

Grant emergency power locking

(2) Locking feedback (optional)

Emergency power request

IO control

Load management

Tesla Powerwall

 can be used as an input or output can be used as an input pin already in use

- 7 After installing the wiring, configure the pins under "Emergency power" (1)

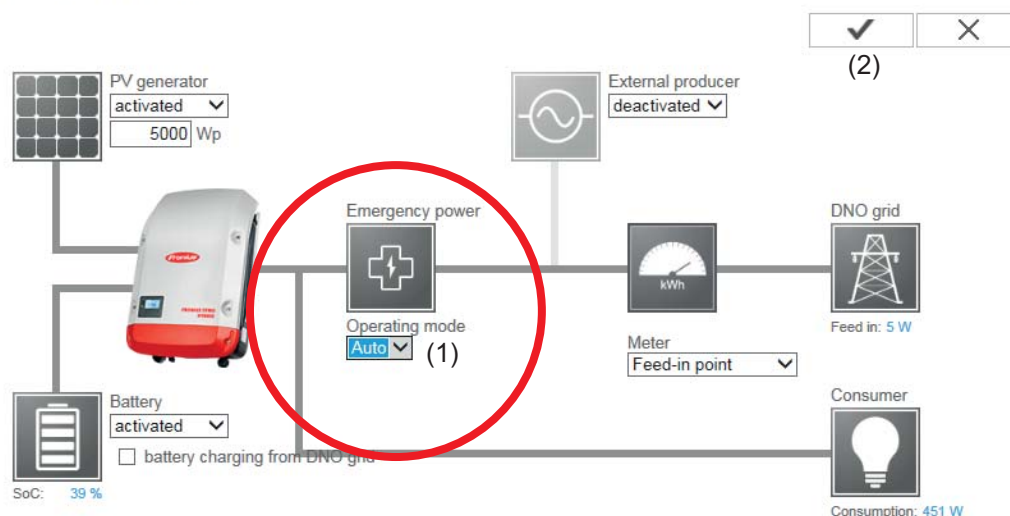
The default values for the pins correspond to the settings used in the document entitled "Fronius Energy Package - Examples of emergency power switchover".

- 8 Check the wiring again
 9 Configure the locking feedback (optional) (2)
 10 Click the "save" button (3) to apply the entries

Configuring the system overview on the Fronius Datamanager

- 1 Under "Settings" on the Fronius system monitoring (= Fronius Datamanager) web page, select "System overview" from the menu
 2 Set the emergency power operating mode (1) to "Auto"

System overview



- 3 Click the "save" button (2) to apply the entries

Configuring the energy management on the Fronius Datamanager (option)

- 1 Under "Settings" on the Fronius system monitoring (= Fronius Datamanager) web page, select "Energy management" from the menu


The remaining battery capacity (1) and SoC warning level (2) can be set under "Energy management".

Energy management

Own consumption optimisation:

Own consumption optimisation: automatic manual
 Target values at the metering point: 5000 W Feed in

Emergency power

 Operating mode: Auto
 Remaining battery capacity: 35 % Soc (1)
 SoC-warning level: 7 % Soc (2)

- 2 Click the "save" button (3) to apply the entries



CHECKLIST - BACKUP POWER

Once installation, configuration, and commissioning have been successfully completed, this checklist must be worked through to ensure the backup power changeover function and backup power mode are operating correctly.

TASK	TEST	CONFIRMATION
The inverter, battery, and all other necessary components have been installed and assembled correctly.		
The backup power changeover unit has been installed and commissioned in accordance with the country-specific installation guidelines and as outlined in the documentation.		
The software settings have been carried out in accordance with the „Backup power configuration“ chapter in the documentation.		
A warning notice has been put on the switch cabinet to warn that a backup power supply has been installed.		
Start the inverter in grid power feed operation.	Check whether the inverter starts in grid power feed operation and a power shift takes place. (Test duration 6 minutes).	
Disconnect the PV system from the public grid. This can be effected using a disconnecting device in the upstream AC path or the disconnecting devices (e.g. NH fuse) of the building connection. The disconnection must occur before the Smart Meter (grid side).	Check whether the inverter starts in stand-alone operation. The changeover can take more than 1 minute.	
Measure the voltage/frequency in the established stand-alone operation.	Set value: 230 V / ± 10 % / 53 Hz USA: 120 V / ± 10 % / 63 Hz	
Reconnect the PV system to the public grid.	The time taken from the end of stand-alone operation until the subsequent connection of the contactors in the backup power changeover unit must be at least 10 seconds. The changeover can take more than 1 minute. Only then may the inverter resume grid power feed operation. This may take several minutes due to national requirements (test duration 6 minutes).	

I hereby confirm that the backup power changeover function and backup power mode are operating correctly.

Place, date

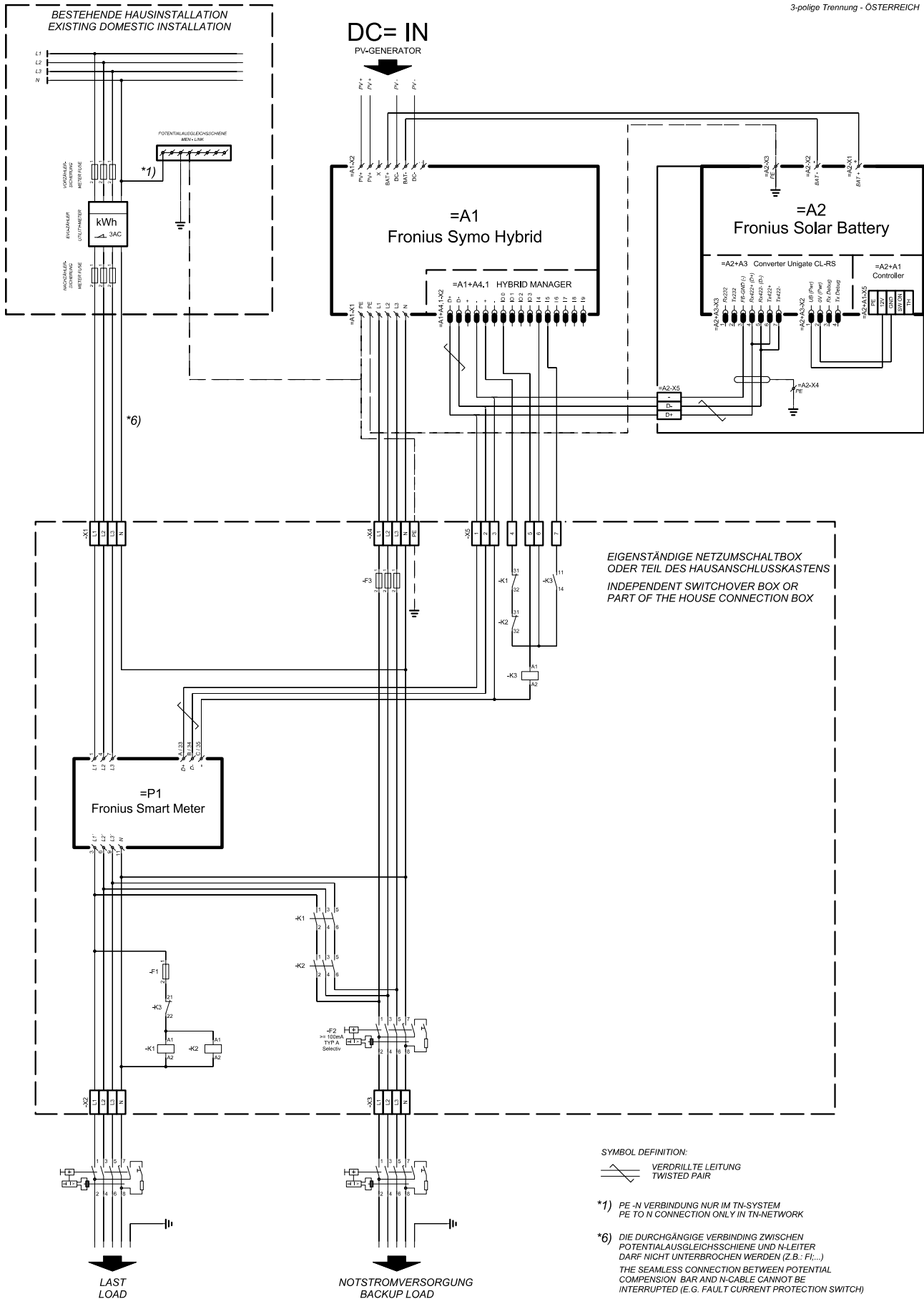
Signature



Appendix

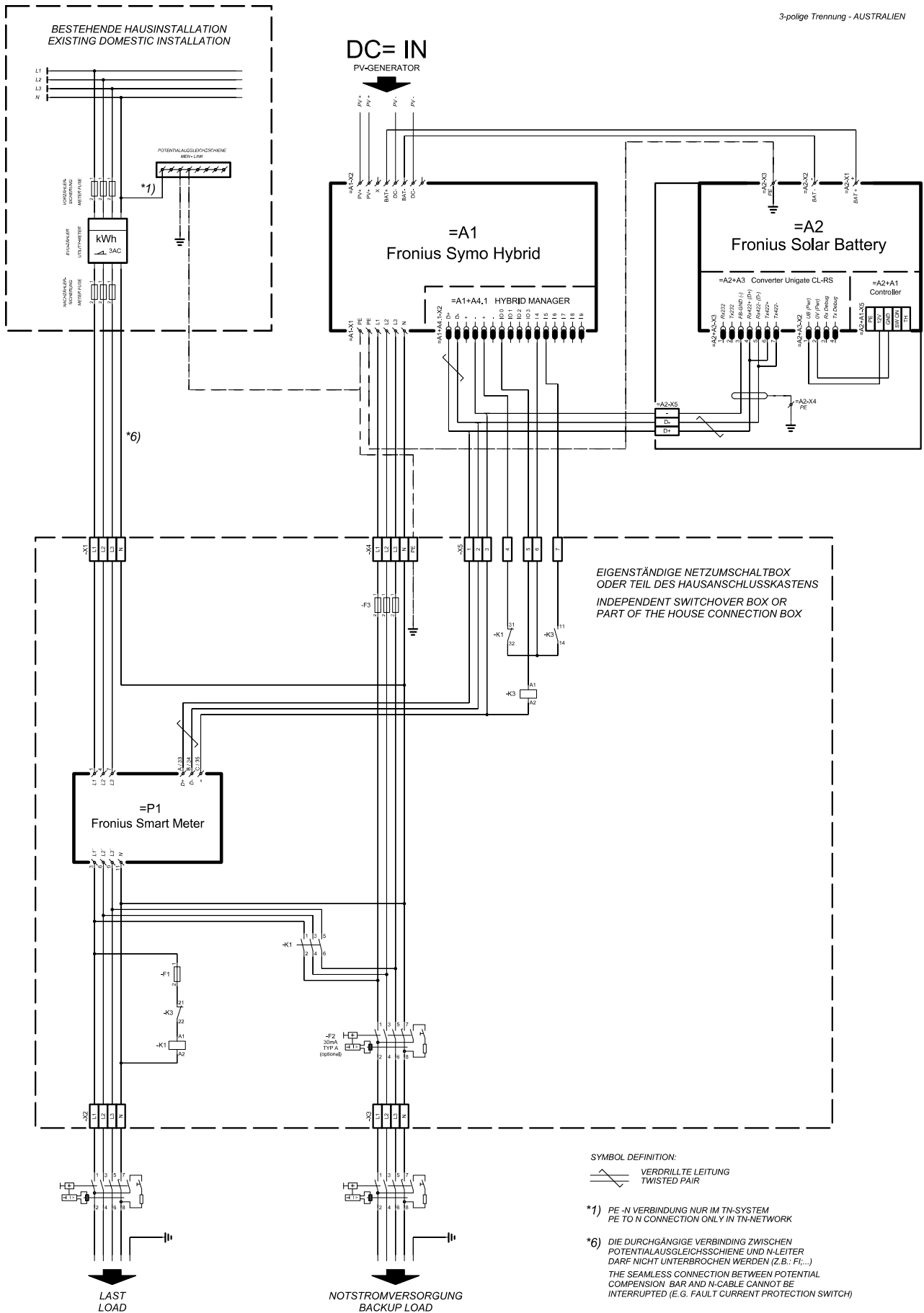
3-pin separation Austria with Solar Battery

3-polige Trennung - ÖSTERREICH



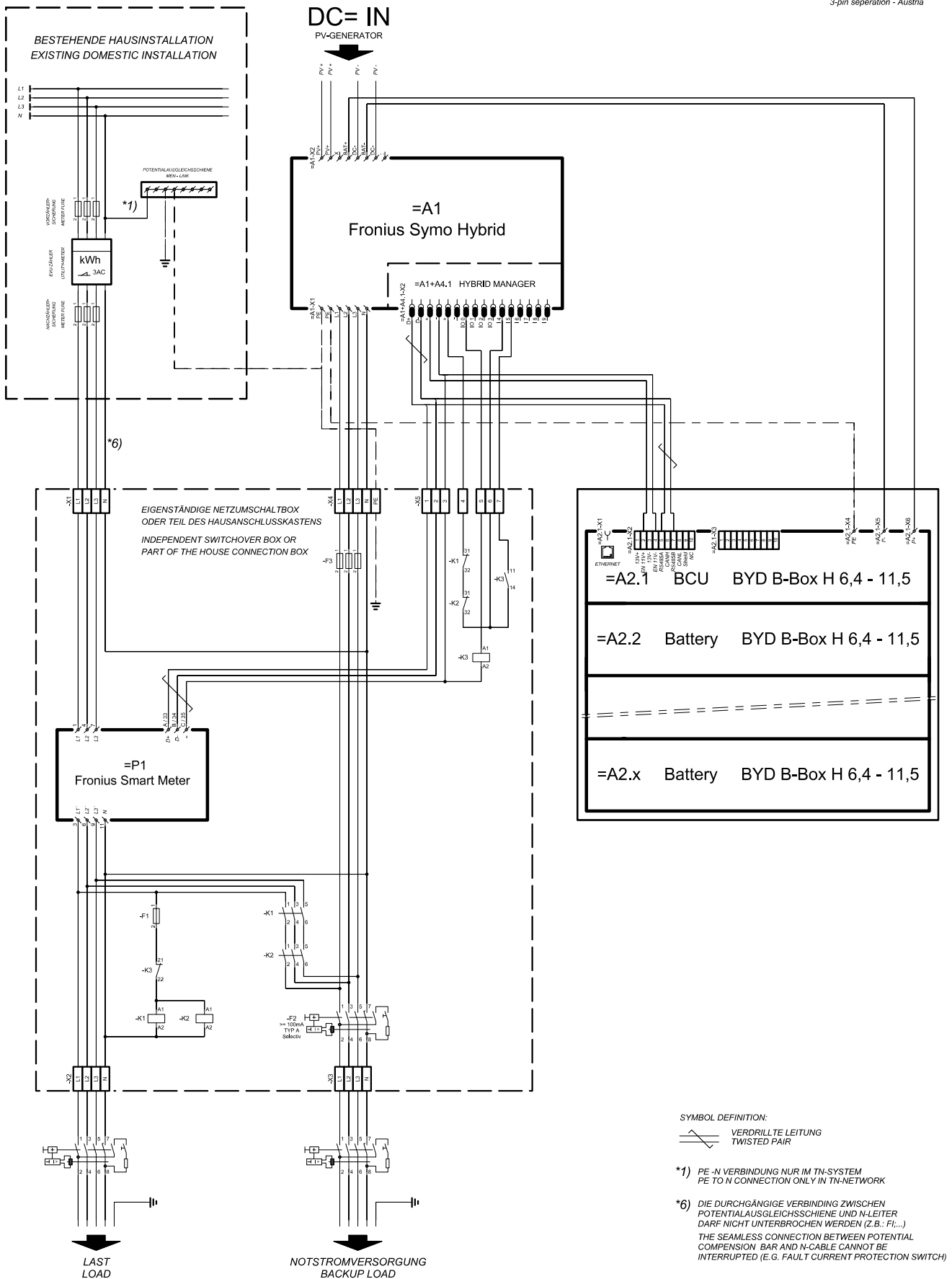
3-pin separation Australia with Solar Battery

3-polige Trennung - AUSTRALIEN



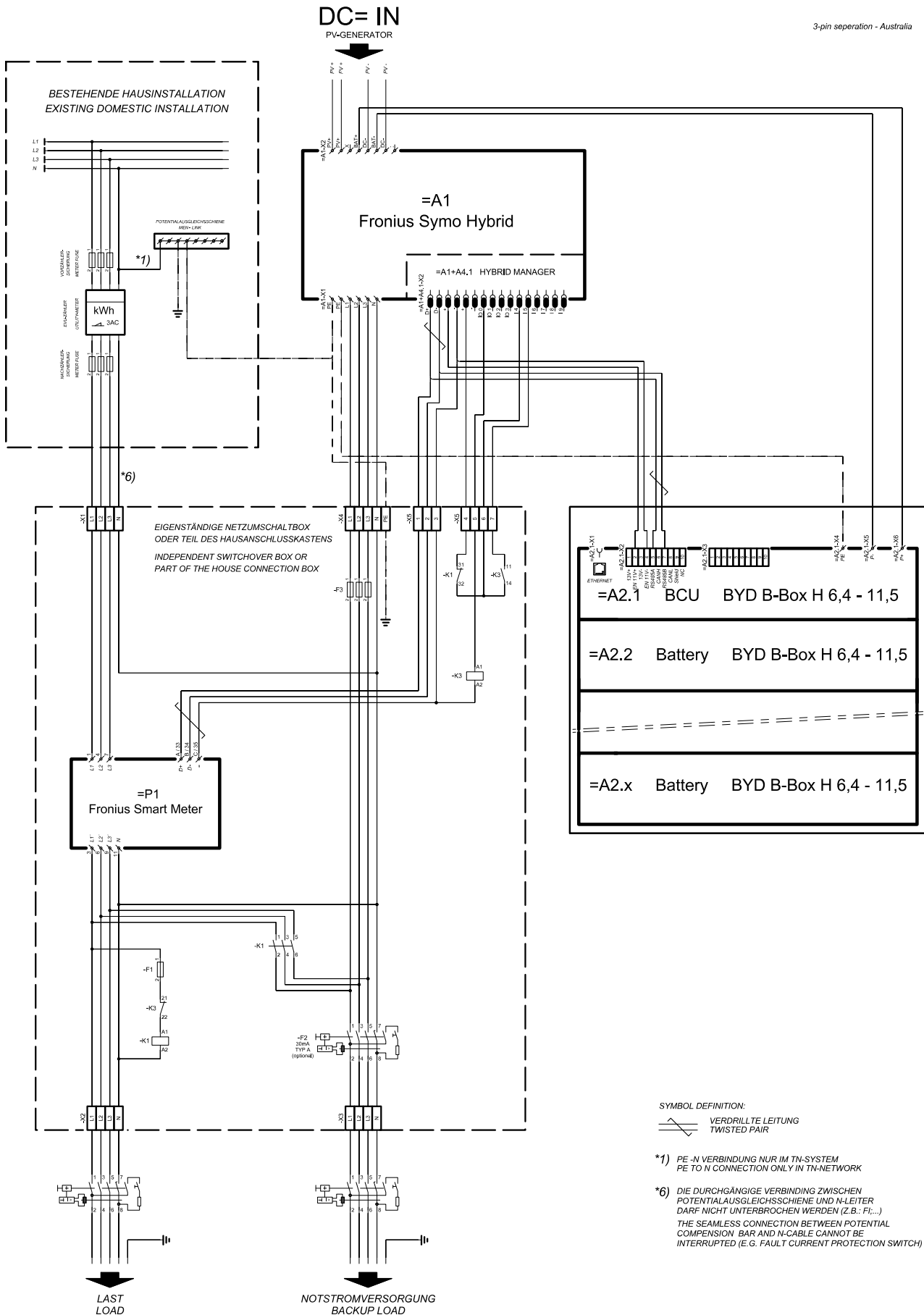
3-pin separation Austria with BYD

3-pin separation - Austria

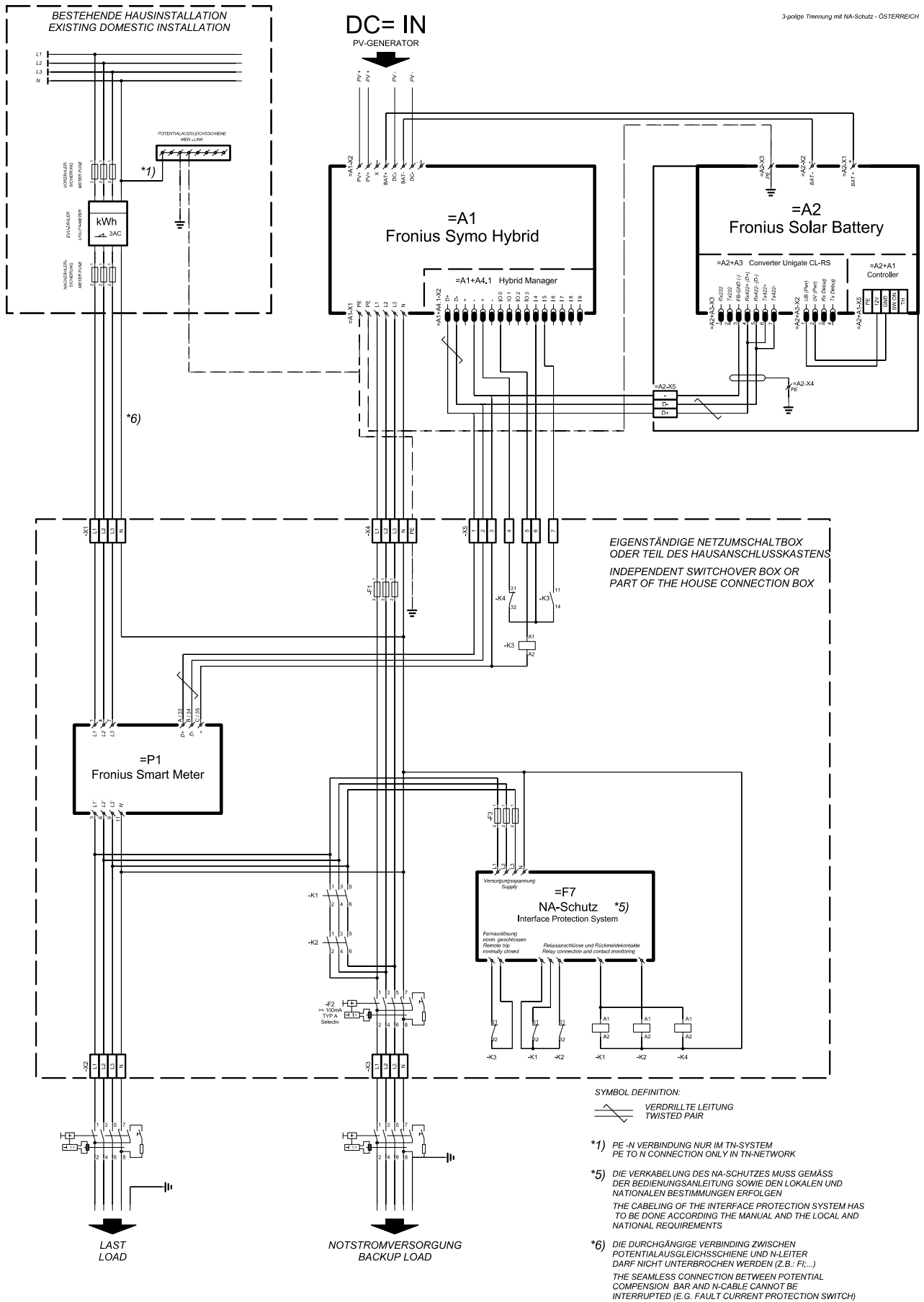


3-pin separation Australia with BYD

3-pin separation - Australia

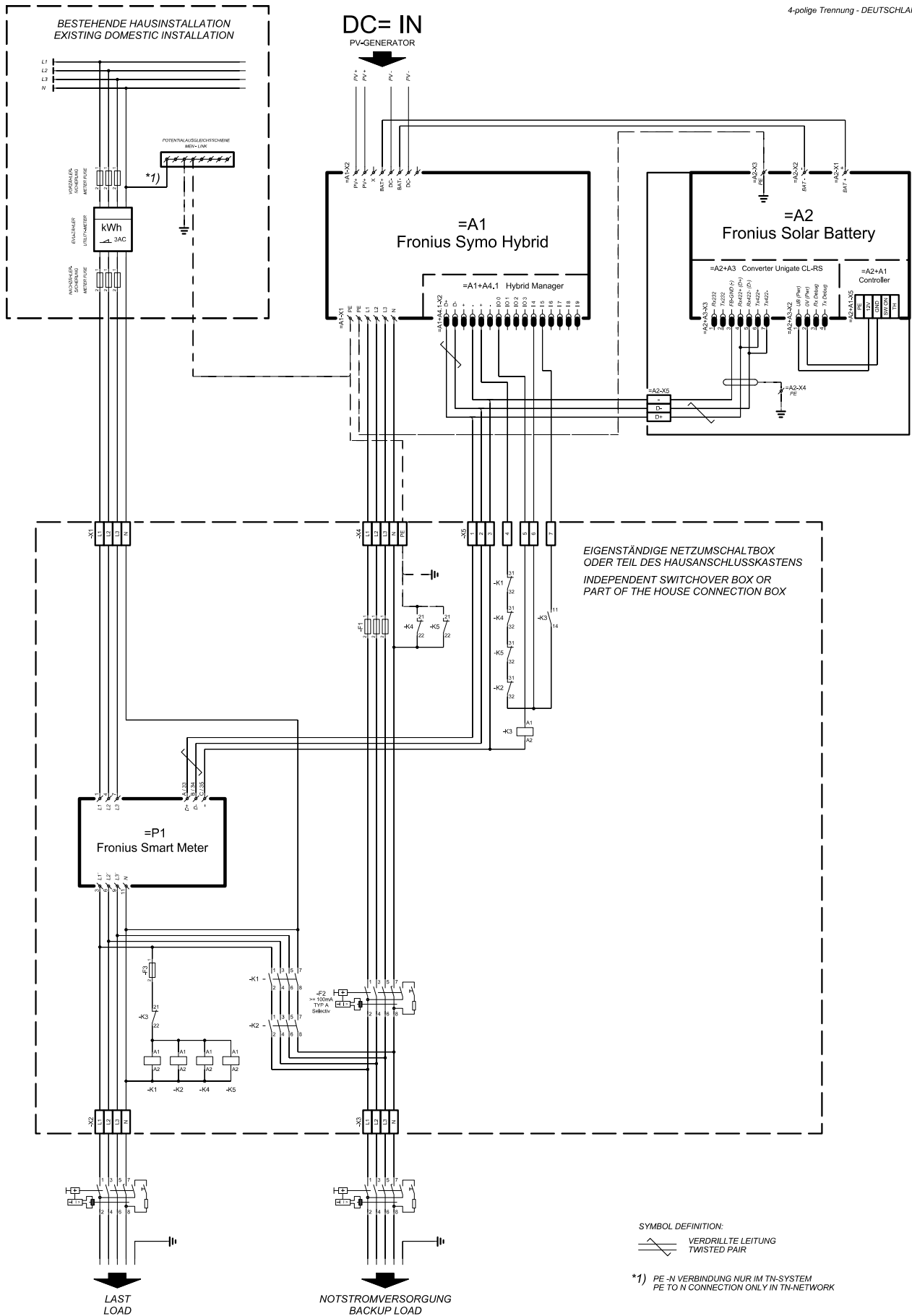


3-pin separation with grid and system protection Austria with Solar Battery



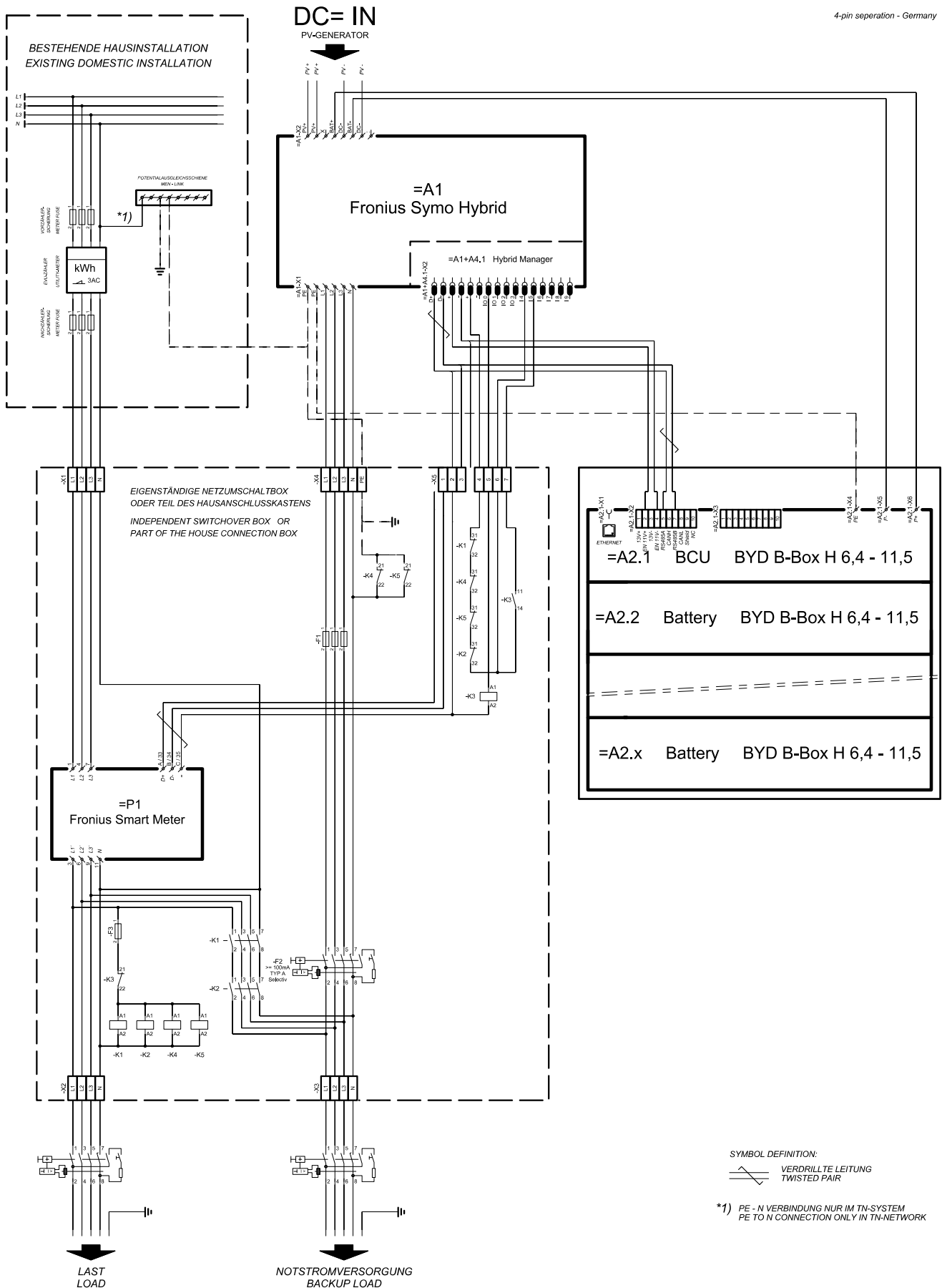
4-pin separation Germany with Solar Battery

4-polige Trennung - DEUTSCHLAND

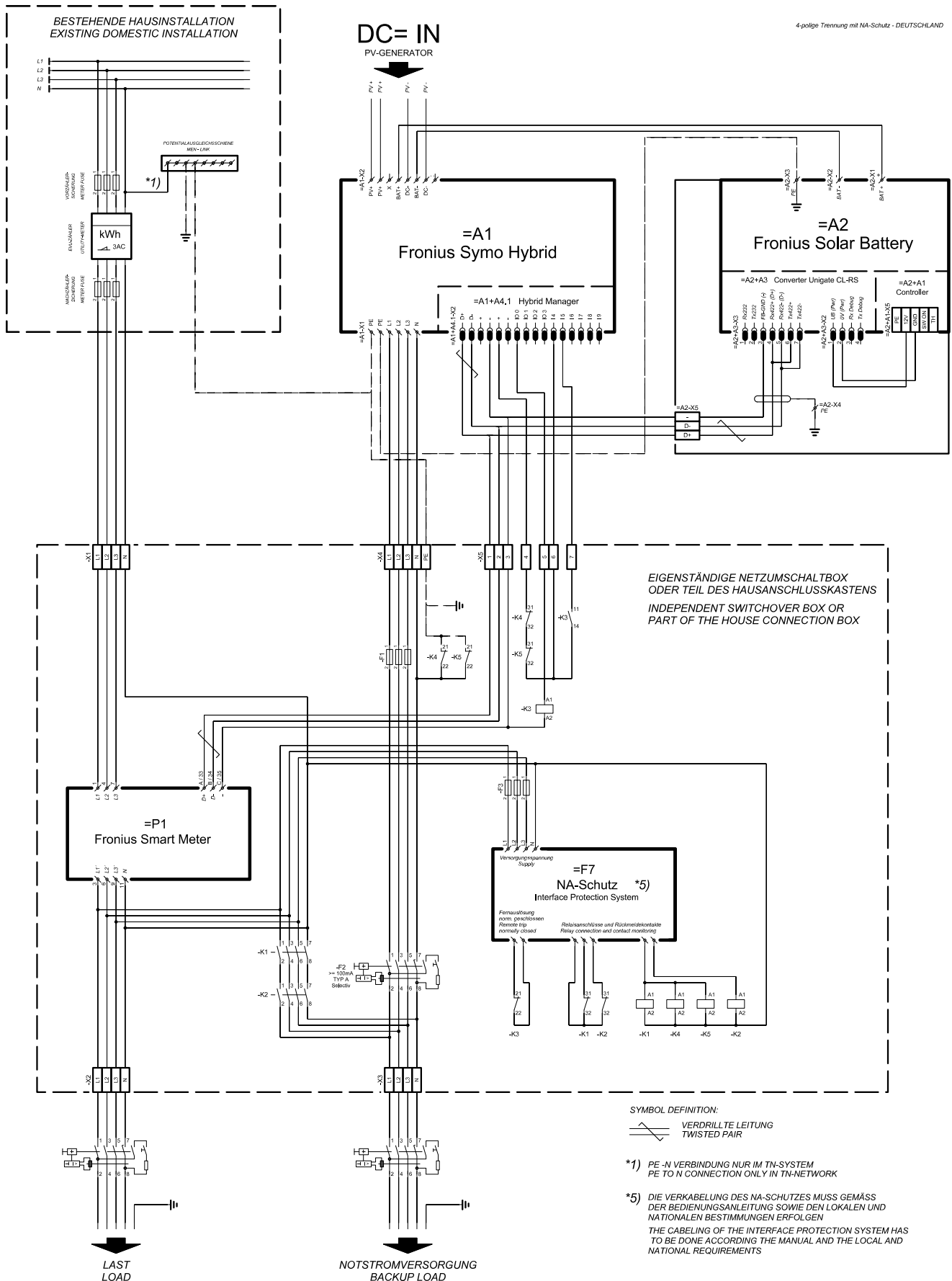


4-pin separation Germany with BYD

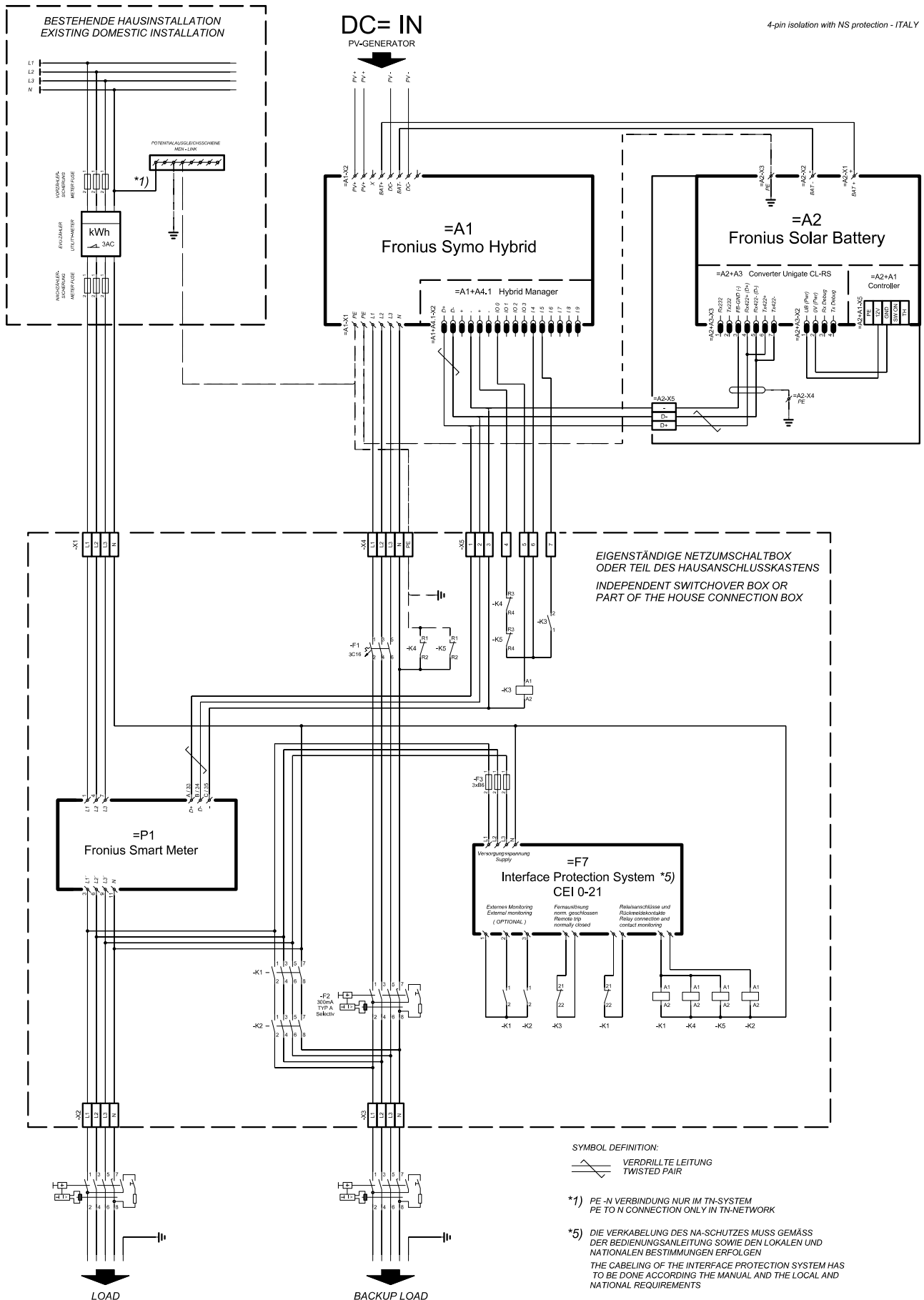
4-pin separation - Germany



4-pin separation with grid and system protection Germany with Solar Battery



4-pin separation with grid and system protection Italy with Solar Battery

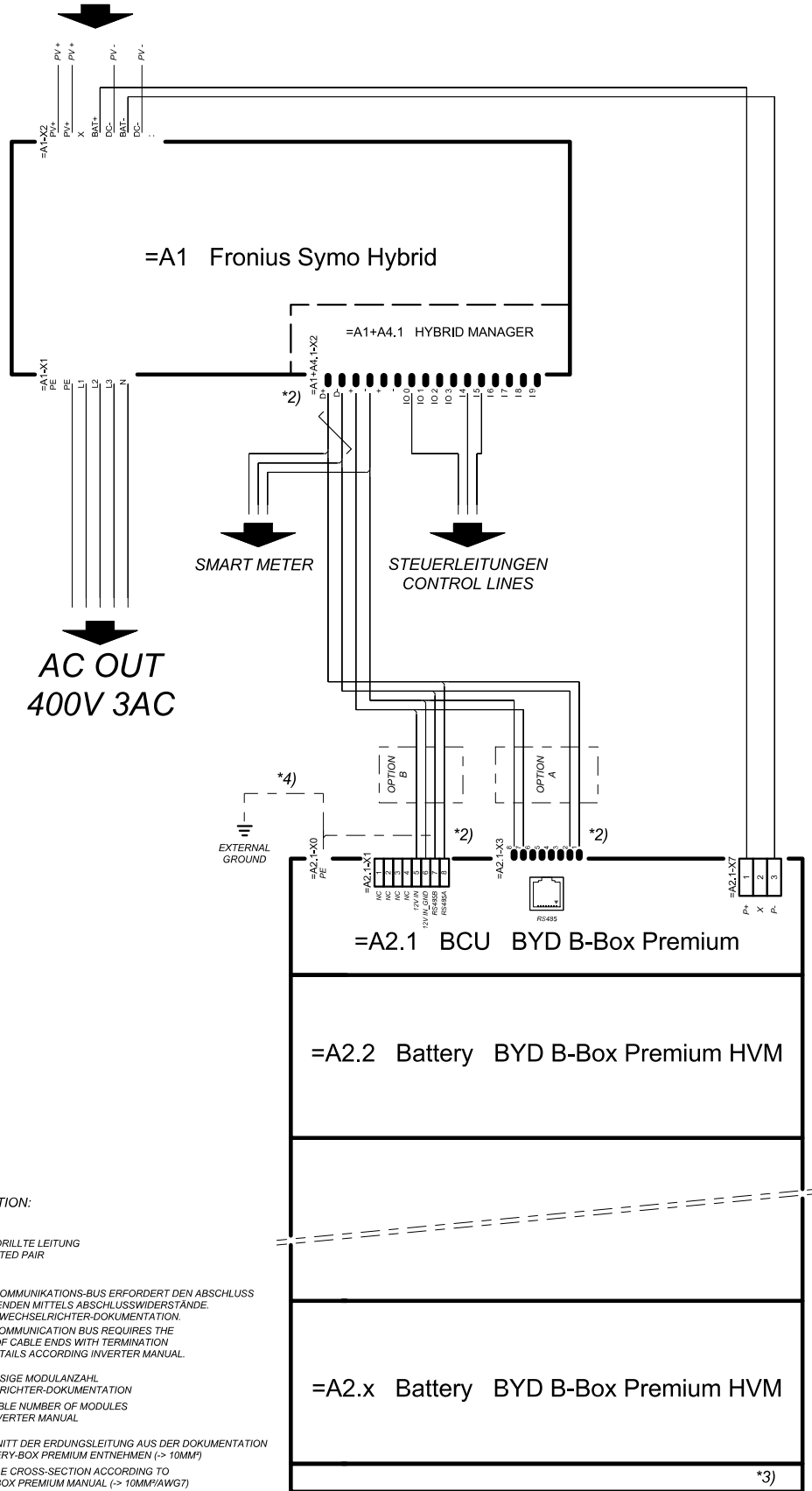


Fronius Symo Hybrid and BYD Battery-Box Premium HV

Fronius Symo Hybrid und BYD Battery-Box Premium HV

DC= IN

PV-GENERATOR
& BATTERY



SYMBOL DEFINITION:

VERDRILLTE LEITUNG
TWISTED PAIR

*2) DER MODBUS-KOMMUNIKATIONS-BUS ERFORDERT DEN ABSCHLUSS DER LEITUNGSENDEN MITTELS ABSCHLUSSWIDERSTÄNDE. DETAILS SIEHE WECHSELRICHTER-DOKUMENTATION.
THE MODBUS COMMUNICATION BUS REQUIRES THE TERMINATION OF CABLE ENDS WITH TERMINATION RESISTORS. DETAILS ACCORDING INVERTER MANUAL.

*3) MIN/MAX ZULÄSSIGE MODULANZAHL LAUT WECHSELRICHTER-DOKUMENTATION
MIN/MAX POSSIBLE NUMBER OF MODULES ACCORDING INVERTER MANUAL

*4) DEN QUERSCHNITT DER ERDUNGSLEITUNG AUS DER DOKUMENTATION DER BYD BATTERY-BOX PREMIUM ENTNEHMEN (-> 10MM²)
REFER PE CABLE CROSS-SECTION ACCORDING TO BYD BATTERY-BOX PREMIUM MANUAL (-> 10MM²/AWG7)

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