

FRONIUS SMART METER – APPLICATION GUIDE

An overview on how to use the Fronius Smart Meter under various scenarios in the field

White Paper

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Gender-specific wording refers equally to female and male form.

INTRODUCTION

In this whitepaper, we will discuss how to use the Fronius Smart Meter according to the various scenarios in the field.

1. TYPES OF FRONIUS SMART METERS

The Fronius Smart Meter is a bidirectional meter that records the site's energy consumption. In combination with Fronius Solar.web, the Fronius Smart Meter presents a clear overview of energy consumption. The Fronius Smart Meter is ideally suited for use with the Fronius Symo, Fronius Symo Hybrid, Fronius Galvo, Fronius Primo, and Fronius Eco inverters, in conjunction with Fronius Datamanager 2.0 Card.

Note: All Fronius Smart Meters are compatible only with the Fronius Datamanager 2.0 Card

No	Type	Common area of application	CT requirement
1.	Fronius Smart Meter 63A-1	Single phase residential	No
2.	Fronius Smart Meter 63A-3	Three phase residential	No
3.	Fronius Smart Meter 50kA-3	Three phase commercial	Yes, CT's with 5A secondary current output
4.	Fronius Smart Meter 480 V-3 UL	SWER lines, two phase residential, and three phase commercial	Yes, CT's with 0.333 V secondary output

Table 1: Different types of Fronius Smart Meter

1.0.1 Installation tips on wiring for all the Fronius Smart Meters

- / Always follow AS3000 standard guidelines when installing the Fronius Smart Meter. Please ensure that the Fronius Smart Meter is protected by correct fusing.
- / Wiring between Fronius Smart Meter and inverter should use a CAT5 or CAT6 cable. **Important:** To be compliant with the AS3000 standards, it is recommended to have the CAT5/CAT6 cable in a heat shrink tubing (probably 10mm) when it enters the switchboard part. Alternatively, use a 240V rated CAT5/CAT6 cable – Clipsal CBUS cable.
- / Communication line between the Fronius Smart Meter and the Fronius Datamanager 2.0 Card uses Modbus RTU / RS485 (3 wire connection)
- / Maximum distance of the cable between the Fronius Smart Meter & the Fronius Datamanager Card: 300m (980 feet)

The Fronius **Datamanager 2.0** Card has an orange connector plug, where the communication cables from the Fronius Smart Meter have to be connected. The wiring schematics are discussed in detail for each type of the Fronius Smart Meter in the later sections of this whitepaper.

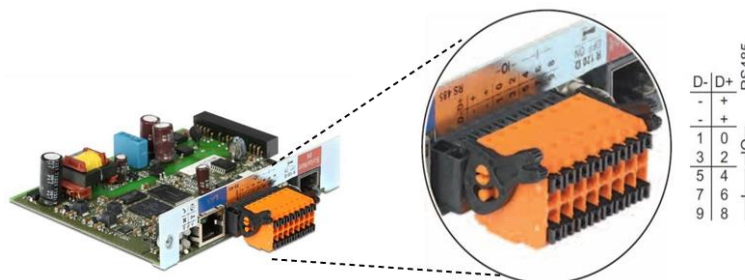


Figure 1: Fronius Datamanager 2.0 Card

1.1 Fronius Smart Meter 63A-1

1.1.1 Key points

- / Area of application: Residential PV systems
- / Voltage rating: 230V
- / Maximum current rating: 63A
- / Network: Single phase network
- / Location: Main switch board, mounted on a DIN rail wired between the site's main AC switch and all site loads, including solar supply main switch → requires 2 poles
- / CT requirement: No



Figure 2: Fronius Smart Meter 63A-1

1.1.2 Schematics

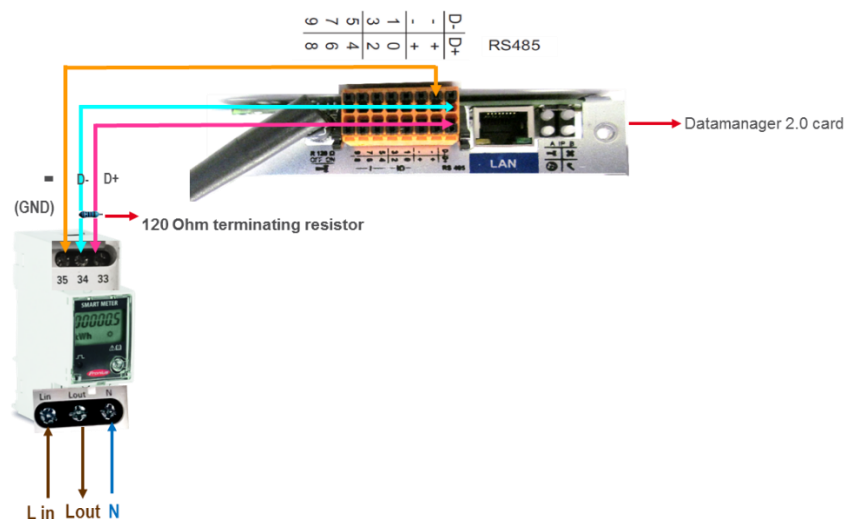


Figure 3: Wiring schematic - Fronius Smart Meter 63A-1

1.1.3 FAQ's

Can a single phase smart meter be used in a three phase network?

No, it can't be used because it will not be able to measure or visualise the power consumed in all the three phases. A three phase Fronius Smart Meter must be used in a three phase supply because the consumption will be measured across all the three phases.

Can a single phase smart meter be used in a single phase SWER connection?

Yes it can be used because the SWER is on the HV side of the transformer (11 – 22kV), so the secondary could be a split phase 480V or single phase 230V depending on the type of transformer. So, if it's a single phase SWER connection (230V) then a single phase smart meter can be used.

1.2 Fronius Smart Meter 63A-3

1.2.1 Key points

- / Area of application: Residential
- / Voltage rating: 400 – 415 V
- / Maximum current rating: 63A per phase
- / Network: Three phase network
- / Location: Main Switch board, mounted on a DIN rail wired between the site's main AC switch and all site loads, including solar supply main switch → requires 4 poles
- / CT requirement: No



Figure 4: Fronius Smart Meter 63A-3

1.2.2 Schematics

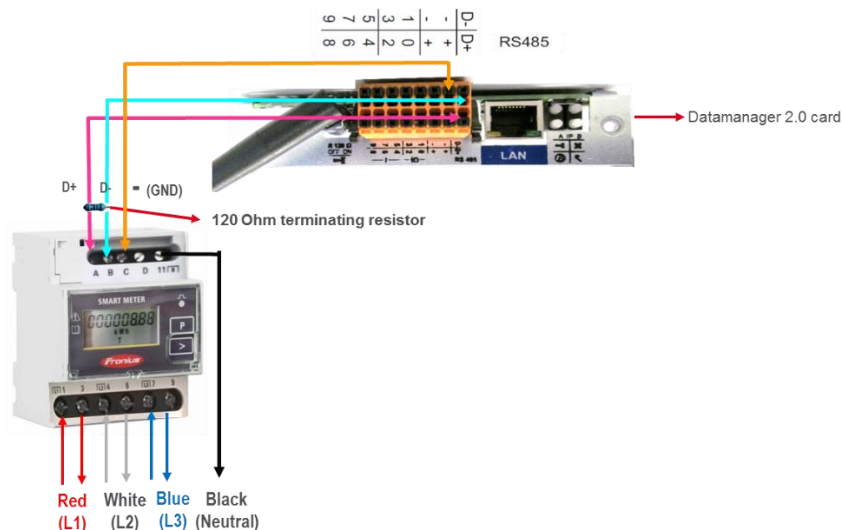


Figure 5: Wiring Schematic - Fronius Smart Meter 63A-3

1.2.3 FAQ's

Can a three phase smart meter be used in a two phase network?

Yes, it can be used if it is not a SWER connection.

1.3 Fronius Smart Meter 50 kA - 3

1.3.1 Key points

- / Area of application: Commercial PV systems
- / Voltage rating: 400 – 415 V
- / Maximum current rating: 50 kA
- / Network: Three phase network
- / Location: Main Switch board mounted on a DIN rail, requires 4 poles
- / CT requirement: Yes, CT's with 5A secondary current output
- / Interface to set the CT ratio: On the Fronius Smart Meter



Figure 6: Fronius Smart Meter 50 kA – 3

1.3.2 Schematics

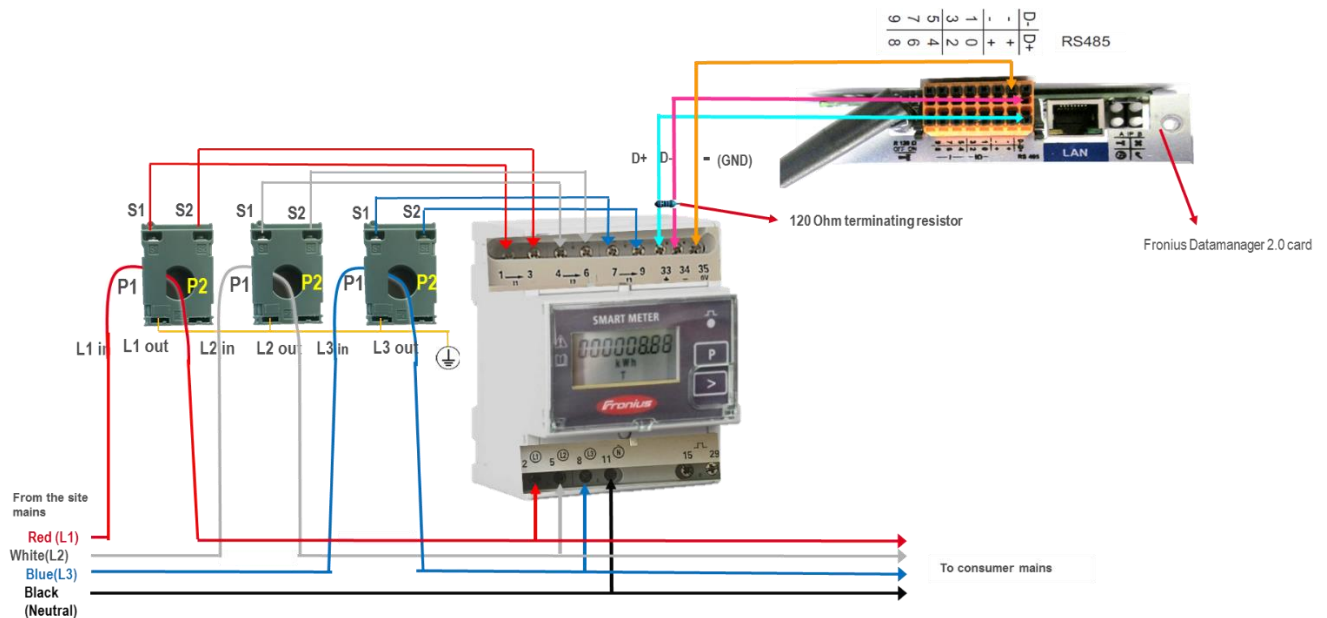


Figure 7: Wiring schematic - Fronius Smart Meter 50 kA - 3

1.3.3 Selection criteria for choosing the CT's:

/ Primary current

The CT's primary current should be equal to or greater than the maximum expected AC current from the grid, per phase. *Important: The closer the expected AC current is to the chosen primary current value, the more precise the measurement will need to be.*

/ Secondary current

5 A

/ Power

The Fronius Smart Meter needs 0.3 VA to carry out its measurements. Losses also occur on the outgoing and return leads. For example: Outgoing and return lead between Fronius Smart Meter and the CT's (together):

/ x 0.5 m = 1 m length with a copper cable cross-section of 1.5 mm² -> 1 x 0.6 VA

/ Fronius Smart Meter self-consumption = 0.3 VA

/ Sum total = 0.9 VA

/ CT's with a rating of 1 VA, 1.5 VA, 5 VA or higher are suitable here

/ Line resistances at different cross-sections (copper wires)

Secondary current [A]	Cross-section [mm ²]	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	-	-	0.6 VA	1.1 VA	2.2 VA

/ Accuracy class

Class 1 or better (Class 0.5, 0.2, etc.) is recommended. Class 1 is equivalent to a deviation of $\pm 1\%$ of the secondary current at maximum power.

/ Assembly

There are two physical types of the CT's: solid core & split core

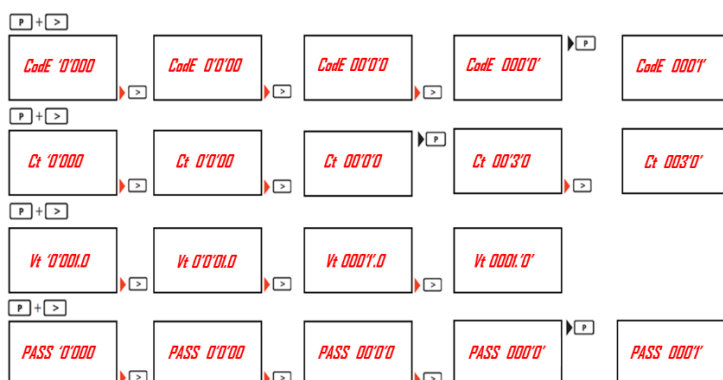
/ Solid core CT's

They form a permanently closed core. Installing a solid core CT requires disconnecting the cable to get it through the CT ring.

/ Split core CT's

They have a "split" in the core that allows the CTs to be placed around the conductor without having to disconnect the conductor or disrupt the wiring. This is advantageous if you cannot shut down the switch board or there are large busbars in the switchboard.

1.3.4 Programming of the CT ratio in the smart meter:



1. Press P and > and enter the password: 0001

2. Set the transmission ratio for the CT, which is given by Primary current: Secondary current. **For example:** If the primary current is 150A and secondary current is 5A, then enter the CT ratio is **0030**

3. Since the VT's (Voltage Transducers are not being used, leave the VT ratio as the default value **0001.0**

4. After setting the transmission ratios, save changes by exiting the menu.

1.3.5 FAQ's

Why is it important to set the CT ratio correctly?

If the CT ratio is set incorrectly then the power values will show unrealistic/wrong values in Fronius Solar.web

1.4 Fronius Smart Meter 480 V – UL

1.4.1 Key points

- / Area of application: Commercial & residential PV systems
- / Voltage rating: 384 V – 552 V
- / Network: Two phase network, three phase network and SWER network
- / Location: Main switch board
- / CT requirement: Yes, CT's with 0.333V secondary voltage output
- / Interface to set the CT ratio: On the Fronius Datamanager Card's web interface



Figure 8: Fronius Smart Meter 480 V UL

1.4.2 Schematics

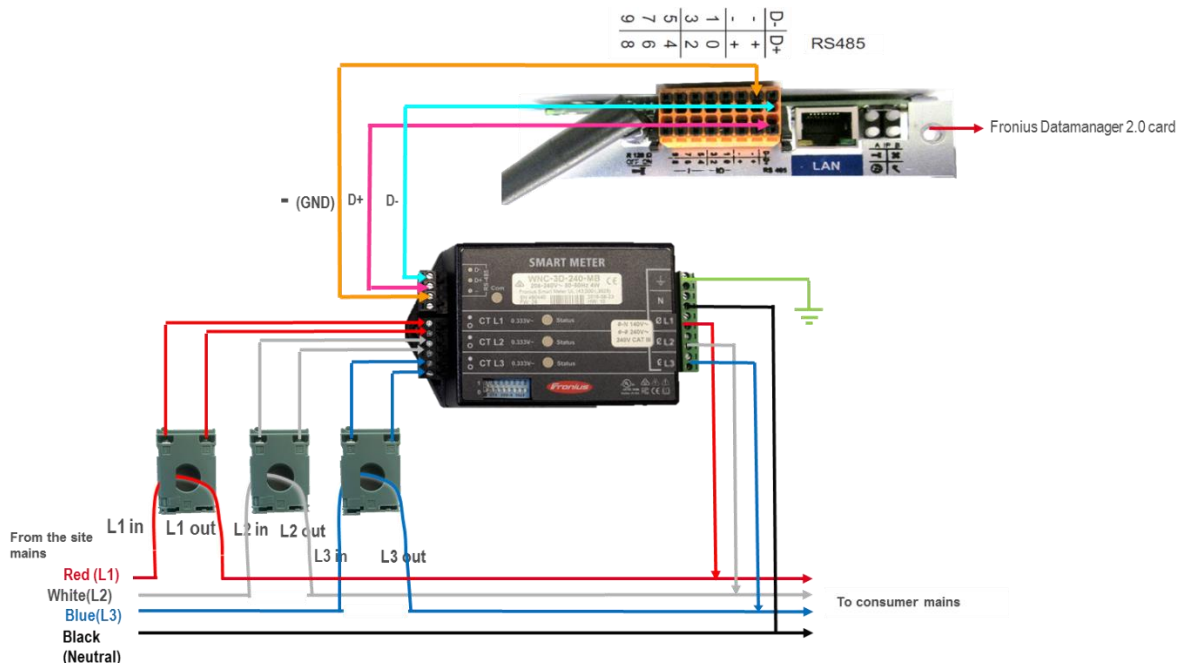


Figure 9: Wiring schematic - Fronius Smart Meter 480 V UL

1.4.3 Selection and connection of the CT's

- / Only CT's with voltage output of 0.333 V may be used, which means that the secondary side must have a voltage output of 0.333 V. The CT's primary current should be equal to or greater than the maximum expected AC current from the grid, per phase. *Important: The closer the expected AC current is to the chosen primary current value, the more precise the measurement will need to be.*
- / Make sure the CT L1 is measuring the current on the same phase being monitored by the L1 voltage input and the same for phases L2 and L3.
- / Mount the current transformers (CTs) around the line conductors. Make sure the CTs face the correct direction. An arrow might indicate either the load or the mains (public grid).
- / If you see strange readings on unused phases, jumper the unused CT inputs for each unused CT, and connect a short cable from the terminal marked with a white dot to the terminal marked with a black dot (refer figure 9).
- / Verify that the LEDs indicate correct operation. This is to verify that the CT phases match the line voltage phases. LED state: green = consumption, red = feed-in. If not sure, turn off all energy sources (inverters). If you have loads on, all phases must be green (consumption)

1.4.4 FAQ's

What are the CT's that can be used for the 480UL smart meter?

For this smart meter only CT's with a secondary voltage output of **0.333 V can be used**. CT's with secondary current output, such as 1 Amp, 2 Amps and 5 Amps will damage the meter and must not be used.

2. FAQ's

I am installing 2 x single phase inverters across 2 different phases and the DNSP requires export limitation per phase, what should be done?

If the DNSP requires export limit on each of the individual phases then a single phase smart meter will need to be used on each phase because the three phase smart meter will not do export limitation per phase. Under this scenario please note that you will not be able to set it up as a single system in Fronius Solar.web

Does a three phase Fronius Smart Meter manage export limitation per phase?

No, it doesn't manage export limitation per phase. It sums up the value across all the three phases and then adjusts to export limitation.

Is it possible to have two Fronius Smart Meters connected individually to two Fronius Datamanager Cards and have it as a single system in Fronius Solar.web?

No, this is not possible because having two smart meters under a single system will lead to an incorrect visualization of the consumption values in Fronius Solar.web. However this is possible when one smart meter is set to feed-in point and the other smart meter is set to consumption path. This configuration is possible only if a combination of Fronius Datamanager 2.0 box and Fronius Datamanager 2.0 card is used.

My customer has a 1.5kW system installed with a third party inverter brand. If he wants to upgrade the system with a Fronius Primo 5 kW inverter in addition to the existing system, where the DNSP requires 5kW export limit, can this be done by using a Fronius Smart Meter?

Yes, if your export limit is equal to or greater than the other inverter's output capacity this can be done. **Please note:** The Fronius Smart Meter will not control the power output of the third-party inverter. **For example:** If the third-party inverter is 1.5 kW and Fronius inverter is 5 kW and there is only 5 kW allowed to export, then the export limitation value that can be set on the Fronius inverter is 3.5 kW.

If there is a site where a Fronius Symo Hybrid is AC-coupled to a Fronius Symo inverter, how would you do export limitation?

Using a Fronius Smart Meter it is possible to export limit on the Fronius Symo Hybrid but not on the Fronius Symo inverter because the Fronius Smart Meter will be connected to the Fronius Symo Hybrid inverter, which in turn cannot be daisy chained with the Fronius Symo inverter.

If there is no sufficient space on the switch board to fit the CT's (in case of a 50 kA Fronius Smart Meter), what's the solution?

In case of space constraints in the switch board, rope CT's can be used. Please note that rope CT's are voltage reference CT's, which are smaller than current reference CT's and can only be used along with the 480VUL Fronius Smart Meter. So, if you have proposed a system with a 50 kA Fronius Smart Meter and you have space constraints in the main switchboard, then you can solve the situation by having a 480V UL Fronius smart meter with rope CT's.

Is it possible to monitor the consumption of a site just by having a Fronius Smart Meter without installing an inverter?

Yes, you can use a Fronius Datamanager 2.0 box and connect the Fronius Smart Meter to it. This can then be added as a PV system in Fronius Solar.web to visualise the consumption values.

3. TROUBLESHOOTING

The Fronius smart meter is not getting detected in the Fronius Datamanager Card's interface and it displays 'timed out' when trying to activate it. What should be done to activate it?

If the software version on the Fronius Datamanager Card is outdated or if less than 3.5.2-1, then the Fronius Smart Meter might not be detected by the Datamanager Card. Please update the software on the Fronius Datamanager Card and once the update is complete, go to the meter settings to activate the meter.

Important: If the Fronius Smart Meter is not detected by the Fronius Datamanager Card even after updating the software on the Fronius Datamanager Card, restart the Fronius inverter and then try activating the Fronius Smart Meter.

A Fronius Smart Meter has been installed but I am unable to visualise the night-time consumption values in Fronius Solar.web. What should be done?

If the night mode on the Fronius inverter is disabled then you might not be able to visualise the consumption values during the night. To activate the night mode, please follow the steps below:



A Fronius 50 kA Smart Meter was installed and it is working but I am getting incorrect consumption values on Fronius Solar.web. What should be done to fix this?

Please check if the CT ratio has been set correctly on the smart meter. Check if the CT's are in the right direction, and if similar coloured wires are used for wiring the CT's please check if the connections/terminals have been swapped. To avoid this issue, it is best to use different colours for wiring the CT's, and also check the S1 & S2 connections for each phase.

A Fronius Smart Meter 480 V UL was installed but the status LED's flash red. What does it indicate?

Since the CT's are directional, if they are mounted backwards or the wiring on their terminals is swapped, then the status LED's flash red indicating that the measured power will be negative. If all the LED's are illuminated red for more than 3 seconds and if it happens repeatedly, please contact Fronius Technical Support.

A Fronius Smart Meter 480 V UL was installed but none of the status LED's are illuminated. What does it indicate?

If none of the LEDs are illuminated, check that the correct line voltages are applied to the meter and check the neutral connection to the Fronius Smart Meter. If the voltages are correct, please contact Fronius Technical support for further assistance.

A Fronius Smart Meter 480V UL was installed but it is not detected by the Fronius Datamanager Card. What should be done?

For the Fronius Smart Meter 480V UL to be recognised, the Fronius Smart Meter will need firmware version 3.7.3-2. If the firmware version on the Fronius Datamanager Card is below 3.7.3-2, then please update it.