

Connecting a heat pump

to the Fronius energy management system using
Datamanager 2.0

White Paper

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

1 GENERAL INFORMATION

Households can easily increase the rate of self-consumption from their PV system by integrating a Smart Grid Ready heat pump into the energy management system of a Fronius inverter. The inverter then issues a switch-on recommendation to the Smart Grid Ready heat pump that is based on the PV power and power of feeding in, informing the heat pump's controller at what times the heat pump should run in order to consume as much PV power as possible. The inverter thereby switches the heat pump into *increasing temperature mode*, which increases the target temperature of the heat pump. The precise extent to which this temperature is increased varies from manufacturer to manufacturer and is specified in the operating instructions of the respective heat pump.

Switching to *increasing temperature mode* rather than activating the heat pump directly has the advantage that the heat pump's control parameters (minimum running times, target running times, temperatures, etc.) are left unchanged, meaning that user comfort is not impaired. However, for the Smart Grid Ready function to work, the heat pump must be connected to the same meter as the inverter.

1.1 Smart Grid Ready heat pumps – operating mode

The operating mode of a heat pump can be actively influenced via the pump's Smart Grid Ready input. All Smart Grid Ready heat pumps have four operating modes that can be enabled. Fronius recommends switching between modes 2 and 3. The switchover is effected by the closing of an external relay, which in itself is triggered by the Fronius inverter.

Operating mode 1: stop mode

The heat pump is disabled in this operating mode. This mode can be set by the grid operator to come into effect at any time day or night, but for no more than two hours per day. This mode overrides any other heat pump settings.

Operating mode 2: standard mode

In this mode, the heat pump runs in an energy-efficient standard mode with proportional heating of the hot water tank for the maximum two-hour blocked time set by the grid operator. This operating mode is enabled whenever the external relay for triggering the heat pump is open.

Operating mode 3: increasing temperature mode

In this mode, the heat pump operates intensively on heating water and/or the interior of a building. The heat pump does not receive a direct switch-on command, but a recommendation based on the available PV power. This mode is enabled whenever the external relay for activating the heat pump is closed.

Operating mode 4: switch-on command

This is a definitive start-up command, provided this is possible in compliance with the control settings. It must be possible to set the controller for several control models:

Variant 1: The heat pump (compressor) is activated

Variant 2: The heat pump (compressor + electric additional heater) is activated

Source: Bundesverband Wärmepumpe (BWP) e.V. (www.waermepumpe.de)

1.2. Required equipment or materials

- Fronius inverter (Fronius SnapINverter, Fronius IG Plus, Fronius IG, Fronius IG TL) with built-in Fronius Datamanager 2.0 or Datamanager Box 2.0
- Fronius Smart Meter (63A-3, 63A-1, 50kA-3) to detect surplus PV power
- 12 V electrical isolation relay (max. 3.2 W coil capacity), max. switching voltage 230 V AC

1.3 Mode of operation when connected to the digital output on the Datamanager 2.0

Control signals are sent to the Smart Grid Ready input of the heat pump from the digital load management output of the inverter (Datamanager 2.0). Operating modes 2 (standard mode: relay open) and 3 (intensive heating: relay closed) of the heat pump are used here. The heat pump switches between the two modes automatically, depending on the target temperature that has been set. Either the power at the feed-in point or the output power of the inverter may be used as the governing variable. However, we advise that the power at the feed-in point is used to control the heat pump behaviour, as this means that domestic consumption will also be recorded by the Fronius Smart Meter.

2. SETTING UP A SMART GRID READY HEAT PUMP SYSTEM

Step 1: Installing and connecting the external relay

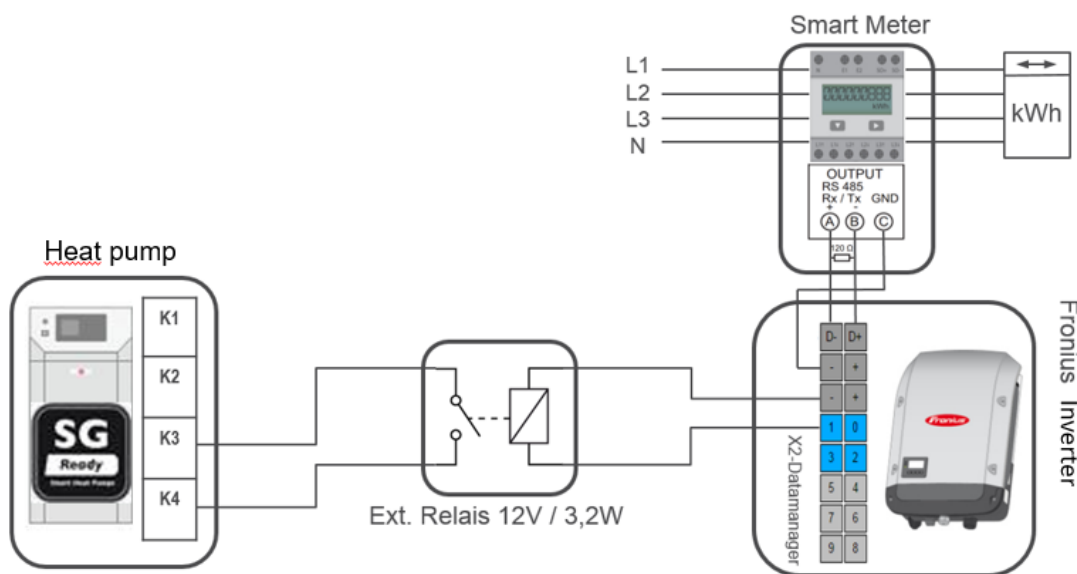


Figure 1: Connection diagram of the external relay for Smart Grid Ready activation

Operating mode**Terminals**

Operating mode 2 – standard mode	Relay open (K3 not connected to K4 on the heat pump)
Operating mode 3 – intensive heating	Relay closed (K3 connected to K4 on the heat pump)

Table 1: Description of the terminals based on an example

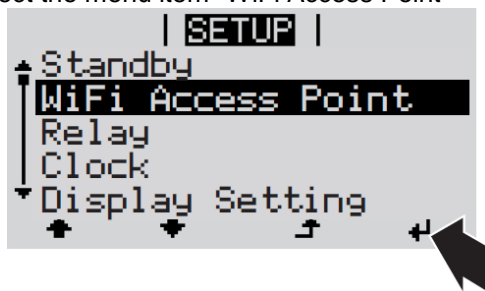
Step 2: Establishing a connection to the inverter

IMPORTANT! In order to establish a connection to the Fronius Datamanager menu, the end device in question (e.g. laptop, smartphone, tablet) must be set up as follows:

- "Obtain IP address automatically (DHCP)" must be activated

Procedure:

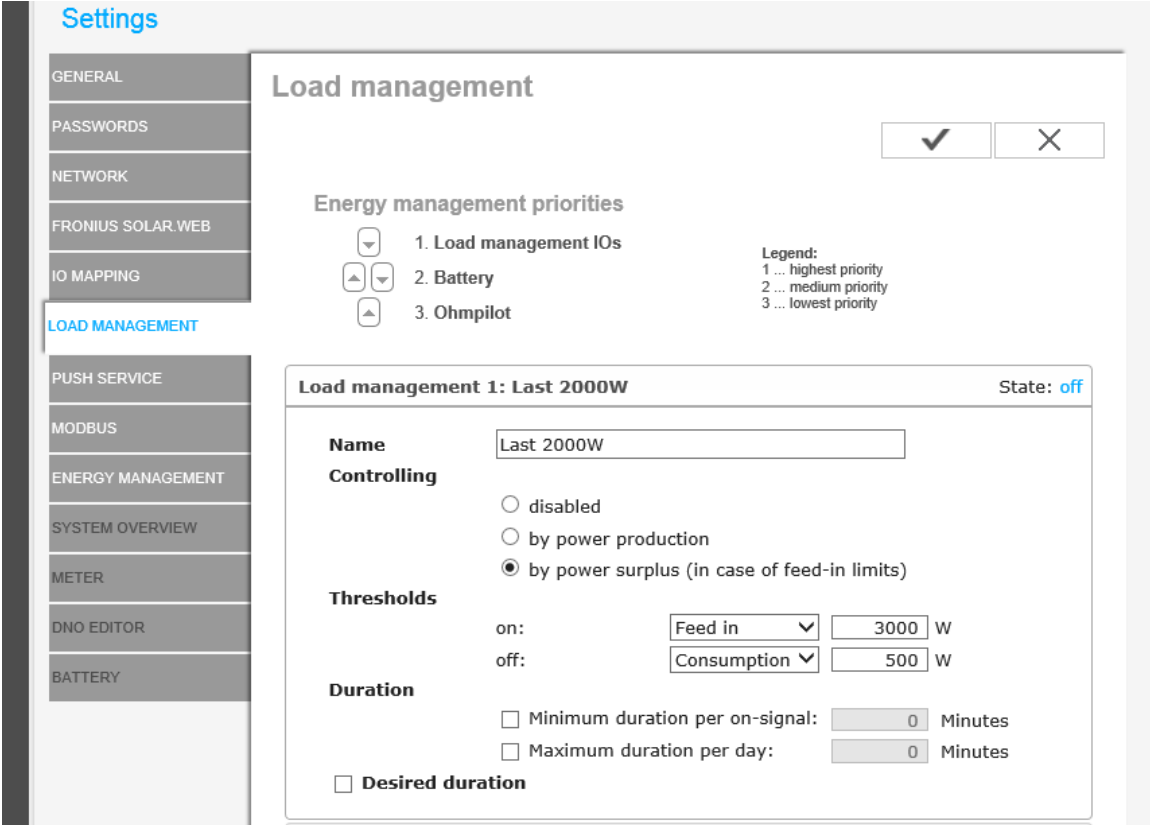
1. Select the menu item "SETUP" on the inverter display
2. Select the menu item "WiFi Access Point"



3. Connect the end device to the WiFi Access Point
 - a. On the end device, search for a network with the name "FRONIUS_239.xxxxx"
 - b. Establish a connection to this network
 - c. Enter password: 12345678
 - d. Enter <http://datamanager> or 192.168.250.181 (IP address of the WLAN connection) into the end device's browser. For a LAN connection, enter 169.254.0.180.

For further information relating to connection establishment, see the Operating Instructions for the Fronius inverter or Fronius Datamanager 2.0.

Step 3: Applying load management settings on the inverter



The screenshot shows the 'Settings' menu on the left with 'LOAD MANAGEMENT' selected. The main area is titled 'Load management' and contains the following sections:

- Energy management priorities:** A list with three items: '1. Load management IOs', '2. Battery', and '3. Ohmpilot'. Each item has a small square icon with an arrow pointing up or down.
- Legend:**
 - 1 ... highest priority
 - 2 ... medium priority
 - 3 ... lowest priority
- Load management 1: Last 2000W** (State: off)
 - Name:** Last 2000W
 - Controlling:**
 - ☐ disabled
 - ☐ by power production
 - ☒ by power surplus (in case of feed-in limits)
 - Thresholds:**
 - on: Feed in (dropdown) 3000 W
 - off: Consumption (dropdown) 500 W
 - Duration:**
 - ☐ Minimum duration per on-signal: 0 Minutes
 - ☐ Maximum duration per day: 0 Minutes
 - ☐ Desired duration

Figure 2: Smart Grid Ready load management settings on the Datamanager web interface

Example:

A heat pump with an electrical power consumption figure of 2,730 W is to be controlled by a Fronius inverter via the Smart Grid Ready input in order to optimise the rate of self-consumption. The digital load management output of the Fronius Datamanager 2.0 is connected to the heat pump's Smart Grid Ready socket via a relay (to ensure electrical isolation). See the relevant installation instructions of the heat pump model in question for the exact connection configuration.

The control parameters for Smart Grid Ready activation are entered on the web interface of the Fronius Datamanager under Settings/Load management. Figure 2 shows the settings for the example described above.

In this example, the digital load management output of the Datamanager 2.0 is activated once a power of feeding in of 3,000 W (heat pump power +10% = $2,730 \times 1.1 \sim 3,000$ W) is exceeded until a reference value of 500 W is measured at the feed-in point. The minimum running time of the heat pump is ensured in this configuration by the heat pump controller, as the switch-on "command" is actually only a switch-on recommendation in this operating mode. The threshold values also depend on the installed capacity of the PV system, so the value for the switch-on threshold should be no more than 70% of the installed PV capacity.

3. APPENDIX

3.1 Datamanager software version 3.2.2 (or older)

Please note that older Fronius Datamanager software versions may have fewer functions. To obtain all the latest functions, it may be necessary to perform a software update. For more information, please see our homepage or follow the link below.

<https://www.fronius.com/en/photovoltaics/products/all-products/system-monitoring/hardware/fronius-datamanager-2-0/fronius-datamanager-2-0>

3.2 Remote control

It is also possible to adjust the settings remotely using a PC, provided it is located in the same LAN network. Additionally, the static IP address in the network settings of the Fronius Datamanager must be used. This IP address can be saved in the browser, making it readily accessible. Some new WLAN routers also allow the URL <http://datamanager/> to be used.

You will need an external IP address to access the system from outside the network. This can be obtained from your IT administrator.

3.3 Examples of relay types

The technical specifications must be observed when selecting the relay (max. coil capacity. 3.2 W, coil voltage, switching voltage and switching current). The following type would be suitable:

Weidmüller relay 6A -MRS 12 VDC 1CO 1 changeover contact



Troubleshooting: Please read the Operating Instructions or call us on:

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