Heat pump control via

Fronius energy management

Application guide

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1 BASIC INFORMATION

By integrating a Smart Grid Ready heat pump into the energy management of a Fronius PV inverter, the PV consumption of a household can be increased in a simple way. For this purpose, the inverter of the Smart Grid Ready heat pump provides a PV power or feed-in power-related switch-on recommendation. The heat pump controller is thereby informed to run the heat pump at the time, when PV energy is available to consume as much PV power as possible. The heat pump has switched from the PV inverter to an *increasing temperature mode*, which results in an increase in the desired temperatures of the hot water tank. The increase varies from manufacturer to manufacturer and can be found in the operating manual of the respective heat pump.

Compared to a direct control of the heat pump, the switchover to *increasing temperature mode* will give the advantage that parameters of the heat pump control (minimum running times, target running times, temperatures, etc.) remain untouched and thus the user comfort is not impaired.
Note: This will only work, if the heat pump is connected to the same meter as the PV inverter.

1.1 Smart Grid Ready heat pumps – operating modes

The Smart Grid Ready input of a heat pump can actively influence the operating mode of the heat pump. All Smart Grid Ready heat pumps have four controllable operating modes. Fronius recommends switching between operating modes 2 and 3. The switchover is realized by an external relay, which is controlled by the Fronius PV inverter.

Operating mode 1: stop operation

The heat pump is prevented from operating during this operating mode. In this operation, the network operator assigns a daily fixed blocking time of two max hours per day.

Operating mode 2: standard operation

In this operating mode, the heat pump runs in standard operation. To activate this operating state, the external relay for controlling the heat pump remains open.

<u>Operating mode 3: increasing temperature mode</u>

In this operating mode, the heat pump operates within the regulator in the intensified operation for hot water generation and / or room heating. This is not a direct start-up command, but an activation recommendation corresponding to the available PV power. In order to activate this operating state, the external relay is closed.

Operating mode 4: forced start operation

This is a definite start-up command, as long as this is possible, within the scope of the control settings. The controller must be adjustable for several control models:
Variant 1: The heat pump (compressor) is activated
Variant 2: The heat pump (compressor + electric heating rod) is actively switched on

1.2. Required components:

- Fronius inverter (SnapINverter Galvo, Primo, Symo, Eco) incl. Datamanager card 2.0 or Fronius GEN24 [Plus] inverter
- Fronius Smart Meter (63A-3, 63A-1, 50k-3) or Smart Meter TS (65A-3, 100A-1, 5kA-3)
- 12V Relay (max. 3,2W coil power for SnapINverter/ 6W for GEN24 [Plus]), switching voltage max. 230V AC
- We recommend, for example, a FINDER relay of type 39.11.0.012.00060

1.3. Operation:

The control of the Smart Grid Ready input of the heat pump is controlled by the digital energy management output of the inverter. For this, operating mode 2 (relay open) and operating mode 3 (relay closed) of the heat pump are used. The change between the operating modes is automated, depending on the pre-set temperature target. For control, either the power at the feed-in point or the inverter output can be used. We recommend the regulation of the power at the feed-in point, since the household consumption is taken into account and measured by the Fronius Smart Meter.

2. STEPS TO CONNECT A SMART GRID READY HEAT PUMP

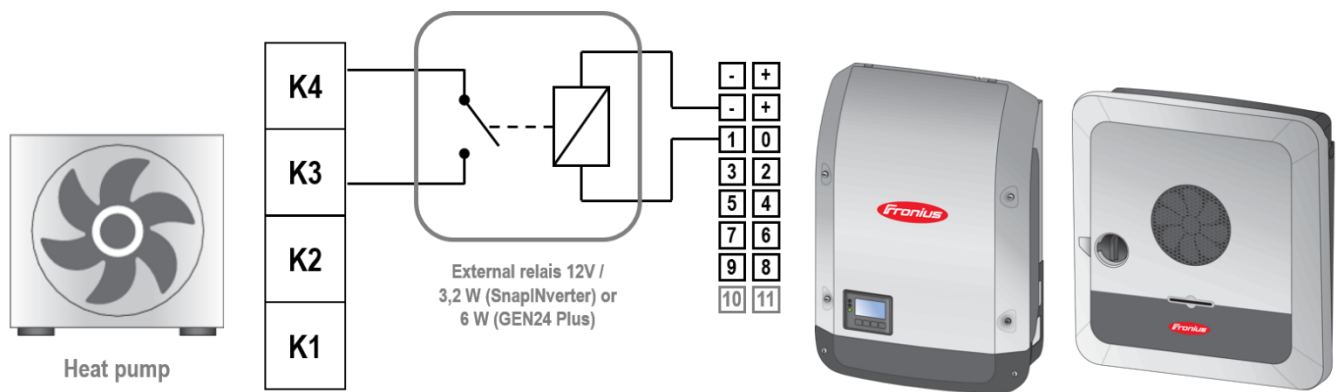## 2.1: Installation and connection of the external relay

Figure 1: Connection diagram of the external relay for the Smart Grid Ready control of a heat pump.

Operating mode	terminals
Operating mode 2 – standard operation	Relay open contact
Operating mode 3 – increasing temperature mode	Relay closed contact

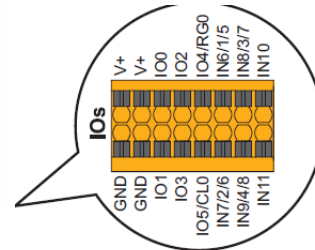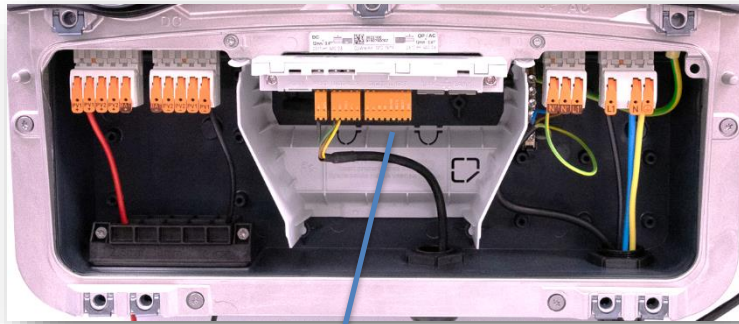## 2.2. Installation and wiring to the Fronius inverter

Figure 2: 16- pole plug on GEN24 [Plus] inverters. Pin IO 0-3 and GND to be used to control the external relay.
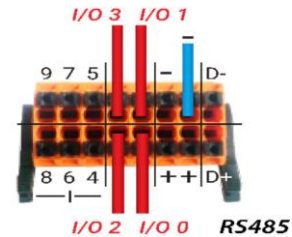

Figure 3: 16-pole plug on SnapINverters (Primo, Galvo, Symo, Eco). Pin IO 0-3 and GND (-) to be used to control the external relay.
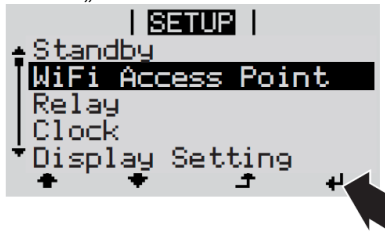
2.3 Connecting to the inverter Web-interface

The settings can be adjusted via the Web interface of the inverters by following these steps:
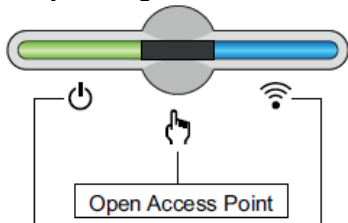
Activate the Wi-Fi hotspot* on the inverter.

2.3.1 Procedure on SnapINverters:
Select the menue „SETUP" on the inverter display.
Select the „WiFi Access Point".

2.3.2 Procedure on GEN24 [Plus] inverters:
 Put your finger in the area between the LED's.

/ Connect your smart device to the Wifi hotspot. Choose the Fronius xx.xxx and enter the password 12345678.
/ Open a web browser and go to http://192.168.250.181
 (Alternatively you can use Fronius Solar.start App on tablet or smart phone).
/ Go to the inverter "Settings"
/ Activate the load management outputs under "I/O Mapping" or "Features and Pins". See Figure 4a and b
/ Configure the load management settings under Load management. See Figure 5a and b
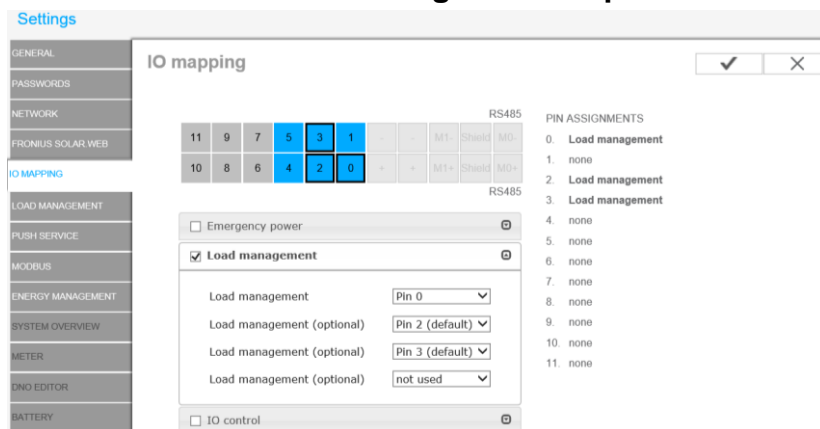
2.4. Activation of load management outputs

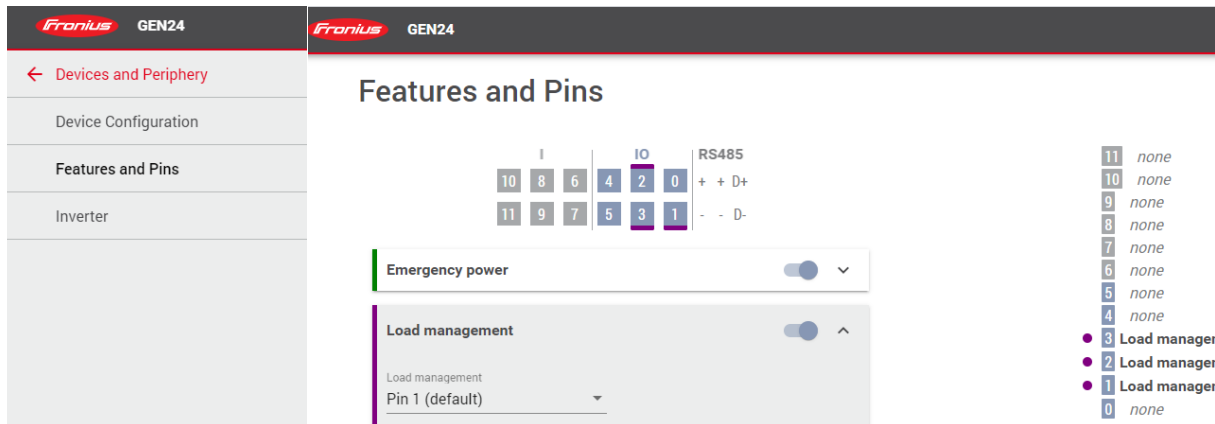Figure 4a: Activation under I/O Mapping with SnapINverters

Figure 4b: Activation of outputs under Features and Pins with GEN24 [Plus]

2.5 Configure load management settings

Before setting the thresholds to switch ON/OFF, following points should be considered
/ Approx. base load of the site should be measured (→ energy meter) or calculated.
/ PV system size known
/ Power requirement of the device to be controlled with the load management function

1. Activate Load management function by selecting "*Controlling: by power production*".
   If a *Fronius Smart Meter* is included in the system, the setting "*by power surplus* " can be chosen.
2. Set "*Thresholds on:*" to level of which the relay should be switched on
3. Set "*Thresholds off:*" to level of which the relay should be switched off
4. Set "*Minimum duration per on signal*' (if required)
5. Set "**Maximum duration per day**" (if required)
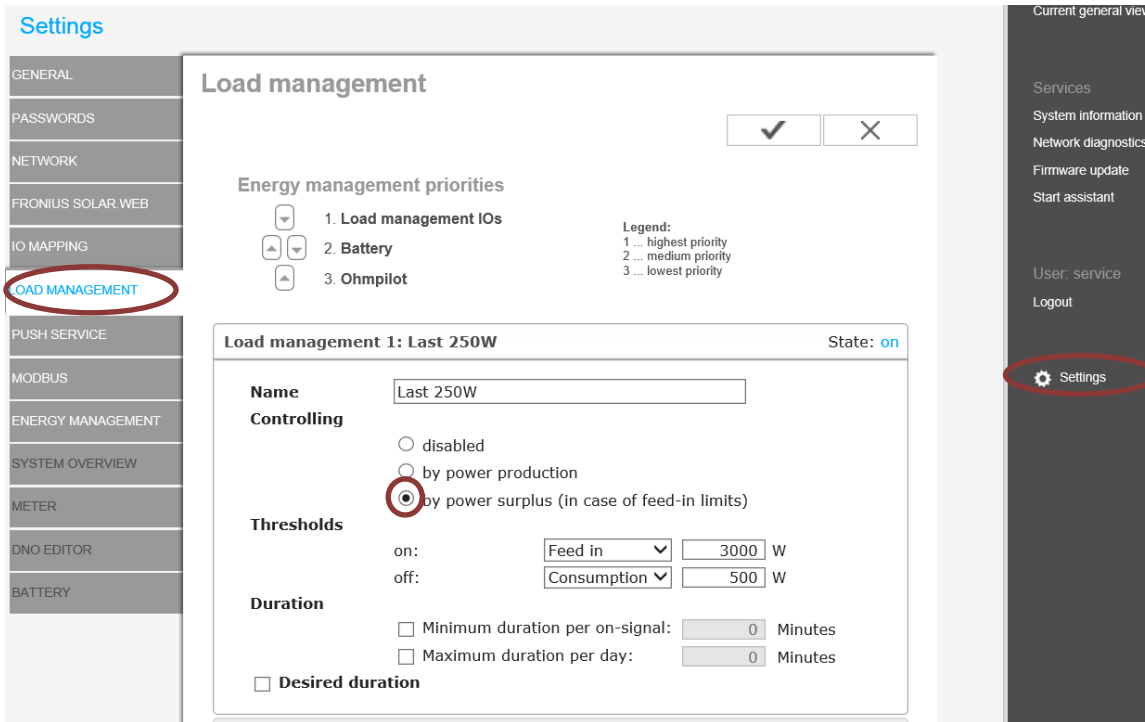6. Click "**Save**" for the settings to be activated

Figure 5a: Web-interface settings on SnapINverters
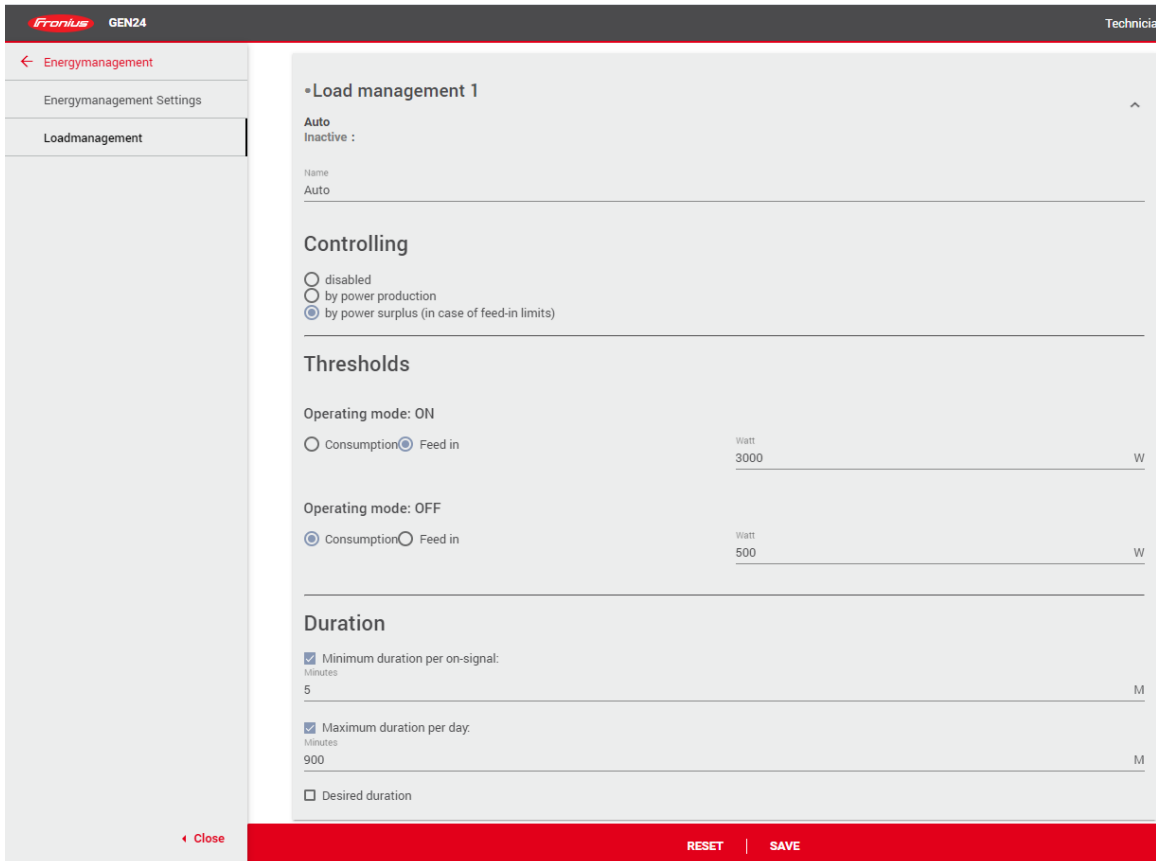

Figure 4: Webinterface settings on GEN24 [Plus] inverters

Example:

A heat pump with an electrical power consumption of 2,730 W has to be controlled by a Fronius inverter using the Smart Grid Ready input. For this purpose, the digital energy management output is connected to the Smart Grid Ready connection of the heat pump via a relay (for potential isolation). The connection configuration of the heat pump can be found in the respective installation instructions for the heat pump model.

The control parameters for the Smart Grid Ready control are entered via the WEB interface of the Fronius inverter under Energy or Load management. Figure 4 shows the settings for the example described above.

In this example, the digital power management output of the inverter is activated until a 500W reference is measured at the feed-in point if the feed-in power of 3,000W (heat pump output + 10% = 2,730 x 1,1 ~ 3,000W) is exceeded. The minimum running time of the heat pump is ensured with this setting via the heat pump control, since this operating mode is only a switching-on recommendation. The threshold values also depend on the PV power installed, so the value of the switch-on threshold should not be more than 70% of the installed PV power.

3. Appendix:

3.1 Datamanger Software Version 3.2.2 (or older) on SnapINverters

Note that older Fronius Datamanager software versions may have fewer functions. In order to receive all current functions a software update has to be carried out. You can find more on our homepage or at the following link.
https://www.fronius.com/cps/rde/xchg/SID-CC75BC00-F2C5992B/fronius_international/hs.xsl/83_20347_ENG_HTML.htm#.V8VSIenylUY

3.2 Remote control

It is also possible to change the settings remotely from a PC, which is located in the same LAN network. To do so, the static IP address has to be used in the inverter network settings. This IP address can be stored in the browser and thus easily accessible. In order to access the system from outside, you need an external IP address, which you will get from the responsible IT administrator.

3.3 Examples for relay types

The technical specifications has to be observed when selecting the relay. (Coil power max. 3.2W for SnapINverter / 6W for GEN24 Plus), coil voltage, switching voltage and switching current)
As an example, following type is suitable:

FINDER des Typs 39.11.0.012.0060

Troubleshooting: Please find more in the operating manual or call:

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