SHP-O Plus SG-ready alternate setpoints activation

Second Setpoint Activation

The following provides information on the heat pump feature for maximising PV self-consumption and energy savings. It shows the wiring connections that will enable either a higher set point temperature for the SHP hot water heat pump, or a higher temperature set point plus the electric heating element running in parallel for maximum solar utility. The settings are enabled from an external signal transmitter, available from some PV inverters and smart control systems.

The eco temperature setpoint of the STIEBEL ELTRON SHP heat pumps is **61°C**, yet they have the option of heating up to **65°C** when there is ample PV power production, able to provide all the power needed by the units (between 400 W - 700 W compressor, 1500W element). Depending on the wiring of the external switching mechanism, the heat pump can achieve this by compressor only operation (**SG3 mode**) or compressor and element operation (**SG4 mode**).

These temperature points can be adjusted on the **MyStiebel App for iOS and Android.**

This is how it works

Some solar PV inverter models are equipped with relays/switches intended for load control. These can be programmed to operate under different scenarios and situations, such as when:
a Solar power generation surpasses and remains above a certain value, **or if**
b There is export to the electricity grid

These switches can therefore be used for signal control based on **a** and **b** conditions.

The 2nd operating mode forcing 65°C tank temperature is enabled when a VAC signal is provided to the heat pump using this type of controlled switching. This will occur when:
› PV power available is (mostly) enough to operate compressor & fan for several hours
› The electrical energy used is (mostly) self-generated and 'free'.

During this time, heating will store as much energy in the tank as possible.

This turns the unit into a "thermal battery" and since it is storing additional energy it prevents operation at other hours, particularly when there is no solar radiation and when the electrical supply would come solely from the grid.

All that is required is for the heat pump to detect a 230-240 VAC signal at the designated terminals.

A 230-240 VAC switched signal is required from either the heat pump supply (option A) or an external supply (option B).

A bridged connection is required between terminals XD20.2 and XD14N and from the switched signal to XD14.1 for SG 3 mode only (compressor to 65°C) or adding another bridged connection between XD14.1 and XD14.2 if SG4 mode is desired instead (compressor + element to 65°C).

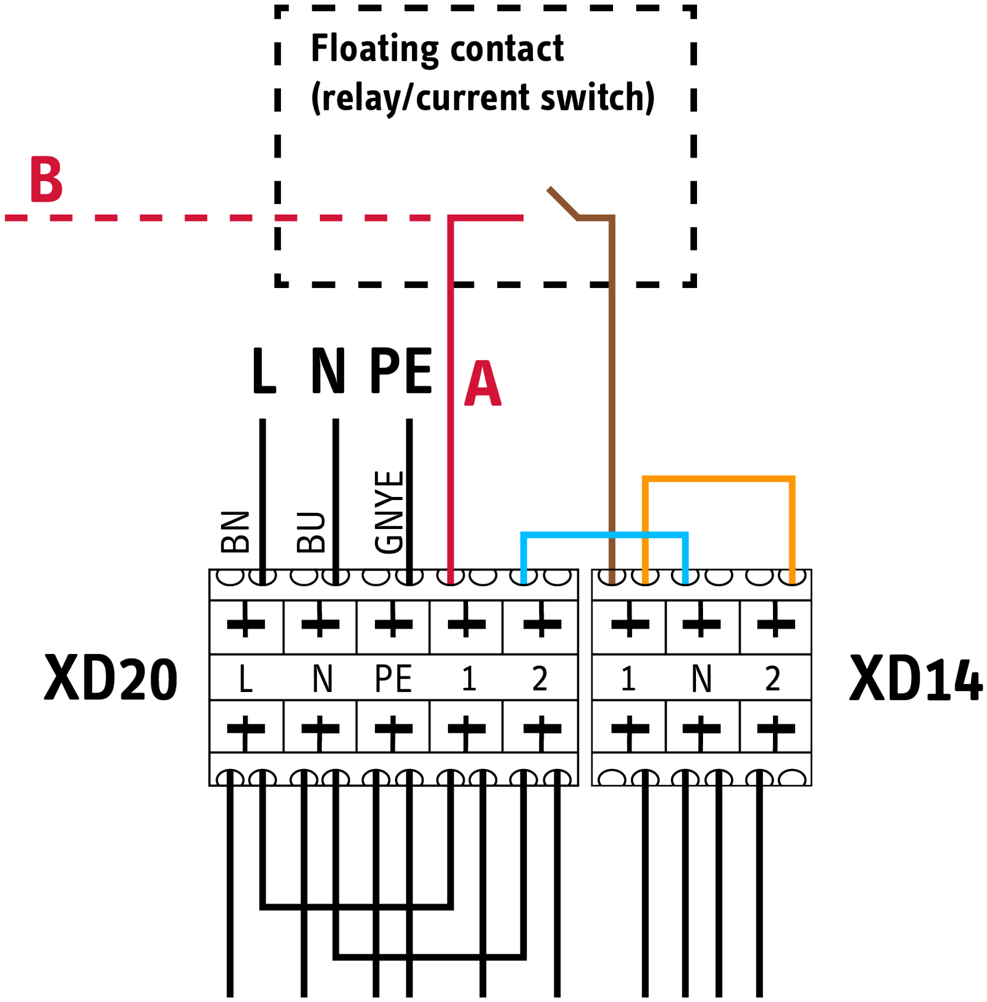


Figure 1. Heat pump to external switch

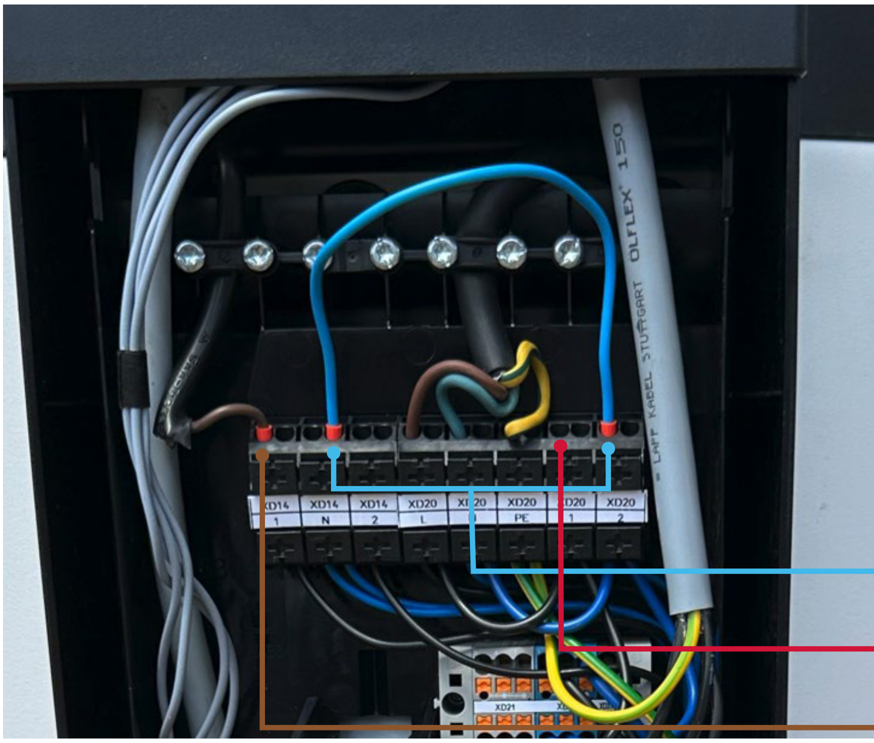
Activation signal
Option **A**: heat pump supply
Option **B**: external supply

SG Mode
SG3: brown wire + blue wire
SG4: SG3 + orange wire

For inverters that do not offer load-control relays, an external current switch can be used.

The current switch takes the place of the inverter relay, providing also a floating contact, also to be wired to the heat pump terminals mentioned above. The contact will open or close depending on the amount of current flow detected from the PV inverter. This current is used as a proxy for PV power production, ultimately achieving the same outcome as above.

Terminal assignment [XD14]	Status	Modes
2 + N	SG1	Standby temperatures
no connection	SG2	Program operation mode
1 + N	SG3	Compressor to 65°C
1 + N + 2	SG4	Compressor + element to 65°C



Only three connections have to be made: XD14.N bridged to XD20.2 (blue cable on top), XD20.1 to one contact of the switching device (red cable to the right), and XD14.1 to the other contact of the switching device (brown cable top left).

Figure 2. Example SG3 activation wiring – XD 14.1 & XD 20.1 are connected to switched contacts of an external mechanism

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MyStiebel App

Use the MyStiebel App to adjust various settings for SG3 and SG4 modes. The app lets you select the temperature and assign the heating cycle modality (Fast, Balanced, Efficient) when the signal is present.

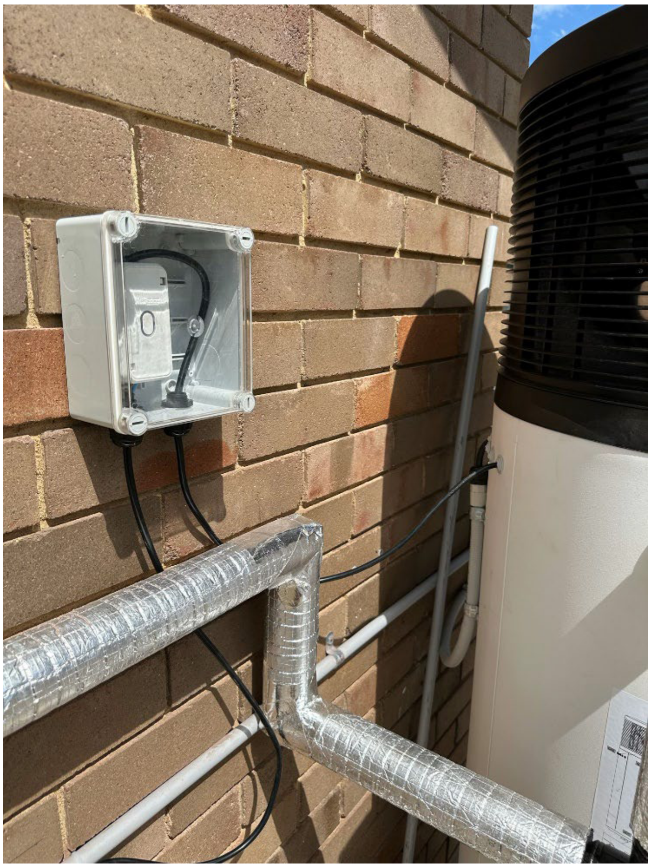

Figure 3. Relay switch signal control

Figure 4. Current switch signal control

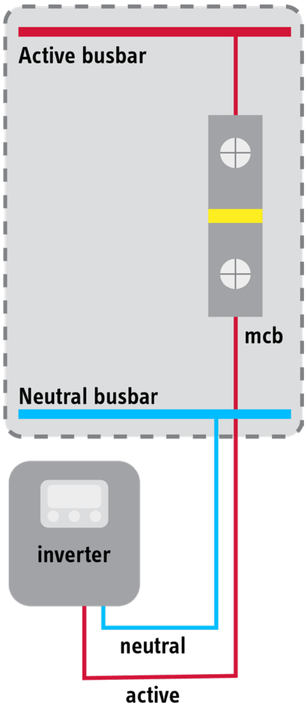

Figure 5. Inverter AC isolation - standard

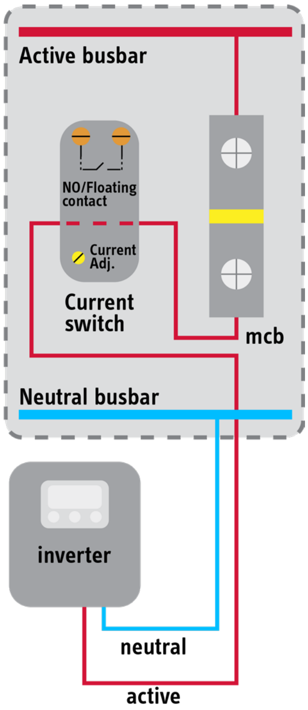

Figure 6. Inverter AC isolation & current switch

In this case, the switching mechanism (Figure 1) can be provided by an externally located current switch with adjustable current threshold. This switch also actuates a normally open/floating contact and does so by sensing a current flow. In this case, the current flow to be detected is that of the PV system, usually the PV inverter(s).

Since **power = current × voltage**, it is easy to calculate the current value equating to a given power production and a matter of adjusting the switch to activate when that value is exceeded.

Example

- A PV power production of no less than 1000 W[3] is desired to enable the second setpoint.
- For voltages between 230-240 VAC, this means a current value in the range 4.1-4.3 amps.
- The current switch contact is wired to the heat pump.
- The switch is adjusted to operate when the current flow from the inverter is at the higher end of the range above, so **4.3 A** (or even higher for a more conservative outcome[1]).

This achieves the same result as an in-built inverter relay operating under condition **a)**.

Since the switch needs to monitor AC current production, it should be located close to the PV system AC output, typically the inverter AC isolator (or multiple inverters, if that is the case). The main switch board will always have such isolators.

The images to the left show the wiring concept[2], with current switch & inverter isolator side by side.

[1] Activation must consider expected on-site baseline consumption and 700 W (max) heat pump consumption, plus min. 10% extra

[2] This information is for guidance only. It must be vetted by a licensed electrical contractor for accuracy, compliance and suitability of installation under all applicable rules and regulations, as the case may be. Only licensed individuals can perform electrical work.

More information & selection of a suitable current switch

Most of these switches have some type of induction core through which the current carrying cable is routed. They usually have a toroidal or rectangular shape with a “hole” in the middle where the cable goes through.

Cores can be solid or split, where the latter allow for non-invasive monitoring and current sensing of electrical equipment already installed (such as multi-meter current measuring “clamps”).

The simplest units are of the solid core type where the only requisite for activation is that a current be detected. When the switching needs to happen at specific current values, means for adjusting the switching value are necessary (usually by a knob or screw, as illustrated in previous image).

Some devices are quite sophisticated, able to provide many features, hysteresis control, large current ranges, high-power contact switching, digital control & data connectivity options, etc. Unsurprisingly, with higher complexity and functionality comes an inevitably higher cost.

For the purpose of this document, there are **only two** basic features required for a current switch to successfully provide the second setpoint control signal:

- Adjustable current, able to select values from a minimum of 3 amps and higher.
- The power production threshold desired (eg. 1000 W[3]) will determine the current selection required, which will determine what adjustment range is necessary
- Normally open (NO)/floating contact, able to switch a 240 VAC, 1 A, load[5] .

Some switches are quite affordable, priced similarly to regular electrical components[6] (eg. RCBO).

Using other control systems

As indicated in the document, the second setpoint functionality is originally intended for use with PV systems, but it can be used with other smart switching mechanisms as well.

As long as a 230-240 VAC signal is present at the terminals indicated, the unit will heat to the higher setpoint temperature. In principle, any energy management system that follows a properly designed control logic protocol aimed at optimising PV power self-consumption will be able to produce the same (or even better) result as intended via PV system switching control.

Please contact our Technical Department for additional information or clarification.

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[3] Current switching load as low as 0.1 amps is also acceptable, depending on the switching mechanism.

[4] Check with your local electrician, electrical supplier or contact Stiebel Eltron for more information.