

Manual: QA DHW Boiler 2 Heating Elements 6SSR

Smart control of hot water heating in larger storage tanks with two heating elements — combination with low-temperature sources (solar collectors, heat pump) and maximum use of photovoltaic surplus.

Introduction

QA DHW Boiler 2 Heating Elements 6SSR is an extended variant of the application for controlling electric hot water heating, designed for **larger-volume storage tanks** fitted with **two heating elements**. It is particularly suitable for installations with **low-temperature heat sources** (solar collectors, heat pump).

The application controls **two heating elements, each with up to 3 phases** (up to 6x SSR outputs in total) and works with up to **three temperature sensors** (upper, middle, lower). Heating logic:

- The **upper heating element** reheats the hot water to the user's setpoint for consumption.
- The **lower heating element** is used to capture as much photovoltaic surplus as possible in periods when none of the low-temperature sources is available.
- PV surplus primarily heats the upper part of the tank; only after it has been preheated is the power also distributed to the lower part.
- When the low-temperature sources (e.g. solar collectors) deliver sufficient power, the lower part of the tank remains reserved for these sources and the photovoltaic energy is used elsewhere.

The application optimally selects the distribution of heating between the upper and lower part of the tank **according to the weather forecast** and the available sources, with the aim of maximising the use of renewable energy sources.

The application also provides:

- heating in the temperature setpoint modes **Economic, Normal, Comfort** (required heating) and **Comfort, Maximum** (cheap heating),
- separate temperature setpoints for the upper and lower part of the tank,
- continuous and switched power control of the heating elements,
- single-phase (230 V), three-phase and phase-to-phase connection (400 V) via the external SHE EX01PV module,
- reaction to the HDO high-tariff signal,
- control of a safety contactor separately for the upper and lower heating element,
- calculation of the required energy for spot-price control,
- alarm notification when the set DHW temperature is exceeded.

Typical operating configurations:

- heating from PV surplus with dynamic distribution between the upper and lower part,
- combined heating PV + solar collectors + required heating by electricity,
- heating according to a time schedule supplemented by surplus,
- heating according to spot prices,
- combinations of the above with priorities from the EMS.

The application works with Mervis SCADA for visualisation and with other QA applications of the Energy Management series — for spot prices, energy sharing, controlled wallboxes, DHW heating and more.

Upstream and downstream applications

Upstream applications

Optional:

- **QA DHW Mode** — higher-level control of the heating modes (Eco / Normal / Comfort / Once) according to the time schedule and the presence mode. It can combine several heat sources according to the seasonal heating mode (solar

collectors, PV, heat pump, gas boiler, electricity) with adjustable priorities. We recommend installing it if you need time schedules, a bivalent heat source or heating planned according to spot prices.

- **QA Consumption Control (EMS)** — central control of energy flows in the house. It provides QA DHW Boiler 2 Heating Elements 6SSR with information on PV surplus, heating priority and phase balance. For example, it can start priority heating when the battery is fully charged.
- **QA HDO** — central reception and distribution of the HDO signal (high / low tariff). Depending on the HDO state, the application can block required heating from the grid. The current HDO signal must be implemented in the HC as a discrete DI.
- **QA Spot Pro** — optimisation of energy purchase and sale on the spot market. It provides the cheapest required heating according to the time schedule and cheap heating with spare energy for the Cheap PV, Cheap SPOT and Extra Cheap modes, and evaluates the price limits set on the Control card.
- **QA OTE** — data basis for spot-price control. It downloads and visualises hourly and 15-minute electricity spot prices from the OTE-CR server. It is required for QA Spot Pro to operate. (Czech Republic only)

Downstream applications

Mandatory:

- **QA EX01PV** — communicates with the external SHE EX01PV module and controls up to **5x SSR continuously** and **6x SSR switched** (on / off), while reading the temperatures from the sensors and the HDO signal. For this variant of the application (6x SSR + up to 3 temperature sensors), **one EX01PV module is sufficient** — some outputs use continuous control, while others use on/off control.

Installation and initial setup of the QA

Installation

Purchase the application in the Smart Home and Energy e-shop (<https://eshop.smarthomeenergy.cz>). After the purchase you receive an e-mail with a link to the activation form, in which you choose one of the two installation methods:

- **Installation via the SHE Installation Application (recommended)** — the activation form provides a link to download the Installation Application. Install it into the unit; it then installs the purchased licences by itself. It provides automatic updates of all SHE applications and easy licence management (requires the “superuser” credentials for the unit). See the separate “Installation Application” manual for details.
- **Standalone installation file** — the activation form provides links to download an encrypted *.fqax file bound to the entered unit S/N. Install the file manually into the unit according to the unit manufacturer’s instructions (logged in as “superuser”). This option does not allow automatic updates.

After a successful installation, the set of cards and tiles belonging to the application appears on the unit desktop in the **Hot water** section:

- **Hotwater boiler** (information tile),
- **Control, Energy, Setting Properties, Installation,**
- monitoring tiles (DHW Up, DHW Down, Setpoint DHW PV, Setpoint DHW Basic, TOU, the individual Outputs 1:2 to 6:1, Cheap Today, Basic Today).

Operating prerequisites

- The **QA EX01PV** application is installed in the unit and an **SHE EX01PV** module covering all 6 SSR outputs and the temperature sensors is wired in the switchboard — see the Downstream applications section.
- **2 to 3 temperature sensors** are installed on the tank — typically **upper** and **lower**, or also **middle** — integrated into the HC via the EX01PV module.
- For heating from photovoltaic surplus, **QA Consumption Control (EMS)** and a QA for communication with the inverter are installed.
- For the spot modes (Cheap PV, Cheap SPOT, Extra Cheap, Basic Spot), **QA OTE** and the **QA Spot Pro** application are installed.
- For the reaction to the high tariff, **QA HDO** is installed with a linked signal source (digital input, EX01PV or FIBARO Smart Implant).
- For time schedules, a bivalent heat source and spot-price control, **QA DHW Mode** is recommended (optional).
- Users who are to receive the alarm notifications **have valid access to the unit**, so that they appear in the list of recipients.

Warning

The application does not provide emergency overheating protection of the tank. Each heating element must be equipped with its own safety thermostat. If a heating element does not have its own safety thermostat, a safety contactor switched by the application must be fitted in the power circuit (see the Safety contactor section on the “Installation” card).

Warning

The operating thermostat of each heating element must be set to a temperature higher than the highest temperature setpoint and must not limit heating in normal operation.

Opening the application control card

To open the application card in a web browser, hover the cursor over a tile (e.g. **Hotwater boiler, Control, Installation**) and click the **eye** icon in the top-right corner of the tile. The card detail with the current state and settings opens.

Warning: Not all cards and tiles are displayed to all users. Each user selects which cards and tiles are displayed on the Display Settings card (sheViewControl application) – levels SHORT, ADVANCED and ADMIN. If you cannot see a described card, check the settings on this card.

User settings

For QA DHW Boiler 2 Heating Elements 6SSR, the following cards and tiles are displayed on the **Hot water** desktop (in the order in which you see them on the desktop):

- **Hotwater boiler** — information tile with the summary state (e.g. AUT-PV~COMF).
- **Control** — operating card (mode selection, temperature setpoints for the upper and lower part, SPOT enabling and price limits).
- **Energy** — summary of the consumed energy by type.
- **Setting Properties** — alarm limits and notification recipients.
- **Installation** — selection of the group, sources, hardware, sensors, outputs for both heating elements and the safety contactor.

The additional **monitoring tiles** display current values without the option to intervene — typically:

- **DHW Up** and **DHW Down** (temperatures),
- **Setpoint DHW PV** and **Setpoint DHW Basic** (temperature setpoints),
- **TOU** (Low tariff / High tariff),
- the individual **Outputs 1:2** to **6:1** (current power on a specific output and phase),
- the summary tiles **Cheap Today** and **Basic Today** (energy received today in kWh).

Initial setup procedure

After the installation is complete, set up the cards in this order — the sets of sections on the other cards change according to the choices made on the Installation card:

1. **Step 1 — “Installation” card** — selection of the heating group, tank volume, priorities, sources, modes, selection of the EX01PV module, HDO source, temperature sources (upper / middle / lower), configuration of the outputs for both heating elements and the safety contactor.
2. **Step 2 — “Setting Properties” card** — alarm limits and notification recipients.
3. **Step 3 — “Control” card** — operating mode selection, entry of the temperature setpoints and enabling / price limits of the spot modes.

The **“Energy”** card is for monitoring only (consumption overview) and does not require any settings.

This manual describes all options that can appear in the user interface — a specific installation displays only the subset corresponding to the selected sources and hardware.

“Hotwater boiler” tile

Summary information tile showing the current control state as a mode abbreviation (e.g. **AUT-PV~COMF** = automatic mode with active PV heating to the Comfort temperature setpoint). It provides a quick overview without the need to open the Control card.

“Control” card

Operating card — it displays the current state, allows manual intervention and sets the temperature setpoints for the individual temperature setpoint modes and for the individual parts of the tank.

Control state

The upper part of the card displays:

- **Control Mode** — e.g. AUTO-PV-COMFORT, a combination of the selected control mode and the active sources.

- **Input Mode** — current request from the linked QA applications: **PV** (e.g. CHEAP~COMFORT), **Basic** (Off / Active), **SPOT** (Active / Inactive).
- **EMS Input** — current EMS state (Off / Active), **EMS Priority**.
- **Temperature DHW Up / Middle / Down** — current temperatures from the sensors (only the sensors enabled on the Installation card are displayed).
- **Setpoint Middle Max / Down Max** — temperature setpoints for the individual parts of the tank (displayed according to the configuration).
- **Setpoint PV / Middle PV / Basic** — temperature setpoints for PV heating (upper and middle part of the tank) and required heating.
- **TOU** — current tariff state (Low tariff / High tariff).
- **Output** — current power of all outputs in %.

Operating mode selection

- **ONCE** — one-off start of heating to the selected temperature setpoint.
- **AUTO** — the application controls heating according to the set parameters and input data.
- **MANUAL ON** — manual switching on of heating to the selected temperature setpoint mode.
- **MANUAL OFF** — manual switching off of heating.

MANUAL- CHEAP Settings

If a cheap heating mode is selected manually, select the temperature setpoint mode: **COMFORT** or **MAX**.

MANUAL- ELECTRO Settings

If a required heating mode is selected manually, select the temperature setpoint mode: **ECO**, **NORMAL** or **COMFORT**.

Temperature Settings

The application supports several temperature setpoint modes. Which of them are displayed on the card depends on the settings and the sources selected on the Installation card:

- **Setpoint PV Comfort** — temperature setpoint for the comfort mode of PV heating.
- **Setpoint PV Max** — temperature setpoint for the PV-Max mode (displayed if PV-Max is enabled on the Installation card).

Basic Setpoint Settings

- **Setpoint Eco** — temperature setpoint for required heating in Eco mode.
- **Setpoint Normal** — temperature setpoint for normal required heating.
- **Setpoint Comfort** — temperature setpoint for comfort required heating.
- **Setpoint Middle Max** — maximum temperature for the middle part of the tank (displayed if the middle sensor is enabled on the Installation card).

Temperature changes are saved automatically.

Energy settings (SPOT price limits)

For each spot mode, enable the operation and enter the maximum price up to which heating in that mode starts. If the DHW is heated in parallel by another source (e.g. gas or solar collectors), you can enter the conditions under which heating from the grid is more advantageous.

- **Basic Energy Price Max** + the **SPOT Basic Enable** button — maximum price for required heating from SPOT and its enabling. The **NOT** option switches the price limit off (heating runs whenever it is required).
- **Cheap PV Energy Price Max** + the **SPOT Cheap PV Enable** button — maximum price and enabling for cheap heating from PV surplus linked to spot prices.
- **Cheap SPOT Energy Price Max** + the **SPOT Cheap SPOT Enable** button — maximum price and enabling for cheap heating from the grid during periods of low spot prices.

- **Spot Extra Cheap Energy** — section with the **Extra Cheap Price Max** field + the **SPOT Extra Enable** button. Maximum price and enabling for extra cheap heating during periods of statistically lowest spot prices. For this mode, the informative values **Buy Price Now**, **Buy Price today Min** and **Buy Price tomorrow Min** are also displayed (the minimum for tomorrow appears only after the prices for the next day are published).

“Energy” card

The card displays a summary **overview of the energy consumed** in the tank by heating type. It is used for monitoring only — no settings are changed here.

The **Energy Overview** table displays for each energy type:

- **Today** — consumption for the current day (kWh).
- **Total** — cumulative consumption since startup (kWh).

The energy types in the table are displayed according to the sources enabled on the Installation card — typically **Basic** (required heating) and **Cheap** (summary of the cheap modes PV / SPOT / Extra Cheap).

“Setting Properties” card

The card is used to set the **alarms** — monitoring of the hot water temperature limit and notification of users.

Alarms Setting

- **Temperature Max** — upper operating limit of the DHW temperature. When it is exceeded, the application stops heating (typically 65 °C).
- **Temperature Alarm** — critical temperature above which the alarm is triggered and a notification is sent (typically 70 °C). The value must be higher than Temperature Max.
- **LIST OF NOTIFICATION USERS** — selection of the recipients to whom the alarm message is sent. Clicking it opens the list of unit users; you can select more than one recipient.
- **Notification period** — interval at which the alarm message is sent repeatedly while the limit remains exceeded (typically 1 hour).

The notification is sent by e-mail and/or as a push notification to the mobile device, according to each user's settings in the central administration of the unit.

“Installation” card

The card is used to set the heating group and to select the sources, hardware and inputs/outputs for both heating elements. After the installation is complete, the other cards are displayed according to the sources selected here.

Warning

When saving the settings, always wait until Run status changes to Running. Do not press the SAVE button earlier. Pressing it repeatedly before the restart is complete may cause configuration errors.

Hot water heating group

The application allows operation of several independent heating groups (e.g. separate hot water tanks in different flats). Select the **Group** (1, 2, ...) and enter the **Volume of heated water** in litres (typically for larger-volume tanks). The group number is shared with the linked applications (QA DHW Mode, QA Consumption Control, QA Spot Pro) — all QA applications with the same heating group number work with the same tank.

Priority settings

The priority determines the order of heating when several sources are combined (e.g. solar + electricity + PV). It applies **only to EMS and spot-price control**. For each priority, set:

- **Priority 1 / 2** — order number (lower number = higher priority).
- **Temperature limit** — temperature limit for switching between priority 1 and 2.

Source configuration

Select the sources the application is to use for heating. The Control card and the linked applications display only the sections corresponding to the sources selected here.

- **Solar collectors** — if a solar circuit is installed.
- **Photovoltaics surplus** — requires a link to QA Consumption Control.
- **Basic electro** — required heating from the distribution grid according to the temperature setpoint.
- **Mode control from EMS** — allows the EMS to start priority heating (e.g. when the battery is fully charged).
- **Basic SPOT** — required heating according to spot prices, with an adjustable maximum price.
- **Cheap SPOT-PV** — cheap heating from PV surplus linked to spot prices.
- **Cheap SPOT-SPOT** — cheap heating from the grid during periods of low spot prices.
- **Extra cheap SPOT** — heating during periods of statistically extra cheap spot prices.

Modes Configuration

- **PV-Max** — enables the PV-Max mode (heating to the maximum temperature from PV surplus). For this variant of the application, we recommend it for using the full capacity of a tank with a thermostatic valve on the outlet.

EX01PV Configuration

Select the EX01PV module from the list (e.g. **QA SHE EX01PV**). If the device is missing from the list, click **Update** to reload the available devices.

Shelly Configuration

If the installation uses a Shelly Dimmer for continuous power control of the heating element, select it here from the list (e.g. **QA SHE ShellyDimmer0110VPMG3**). If the device is missing from the list, click **Update** to reload the available devices.

Input/output configuration

This section configures the type and source of the signals for HDO and the temperature sensors.

- **TYPE OF TOU SOURCE** — type of the HDO signal source (typically **Global variable**).
- **TOU SOURCE** — the specific signal source (e.g. **TOU**).
- **TOU VALUE LOW TARIFF** — variable value corresponding to the low tariff (e.g. **Low**).
- **TEMPERATURE SOURCE TYPE** — source type for the temperature sensors (typically **EX01PV**).
- **TEMPERATURE SOURCE UP** — analogue input of the EX01PV module for the upper sensor (e.g. **AI02**).
- **TEMPERATURE SOURCE: MIDDLE** — analogue input for the middle sensor (optional, or **Disabled**).
- **TEMPERATURE SOURCE DOWN** — analogue input of the EX01PV module for the lower sensor (e.g. **AI01**).

Outputs Heat Middle

The section configures the outputs for the **upper heating element** — up to 3 outputs (one output per phase). First select the **OUTPUT TARGET TYPE** — the type of the target device for the outputs. For each output, set:

- **OUTPUT TYPE** — output control type: **Continuous** (smooth regulation via AO) or switched (on / off via SSR).
- **TARGET OUTPUT** — the specific output of the EX01PV module (e.g. **SSR04, SSR05, AO01**).
- **PHASE OUTPUT** — the specific phase (**Phase 1 / Phase 2 / Phase 3**) corresponding to the phase numbering on the inverter.
- **Power Output** — power of the connected heating element on the given phase (typically 1500 W to 2200 W).

Outputs Heat Down

The section configures the outputs for the **lower heating element** — up to 3 outputs with the same structure as in the Outputs Heat Middle section (OUTPUT TYPE, TARGET OUTPUT, PHASE OUTPUT, Power Output). Typical assignment: **SSR01**, **SSR02**, **AO01** (or other free EX01PV outputs).

Warning

For correct operation, you must set both the correct power of the heating element and the phase that corresponds to the phase numbering on the inverter. The installation must therefore use consistent phase labelling and the same direction of the rotating field.

Safety contactor

The safety contactor is mounted **upstream of the SSR outputs** and is used to disconnect the power supply of the heating element. It is configured **only where the heating element does not have its own safety thermostat** — the application then activates the contactor when the set Temperature Max is exceeded and disconnects the entire supply circuit of the heating element.

A separate contactor can be configured for each controlled heating element:

- **CONTACTOR TARGET TYPE** — type of the target device for switching the contactor: **Disabled** / **EX01PV** / **Device**.
- **TARGET CONTACTOR MIDDLE** — output for switching the contactor of the upper heating element (e.g. **SSR01–SSR05**, **AO01–AO04**, or **Disabled**).
- **TARGET CONTACTOR DOWN** — output for switching the contactor of the lower heating element (same options).

If the heating elements have their own safety thermostat, leave the contactors set to **Disabled**.

Saving the configuration

After setting all sections, click the **SAVE** button. After saving, Run status must change to **Running** — only then is the configuration active.

The lower part of the card displays the **EMS Output Device** overview (the current configuration of all outputs) and the application version (e.g. sheHotwaterPhtv2Heater6SsrEX01PV 1.06.08).