

Manual: QA DHW Boiler

Smart control of hot water heating in storage tanks by electric heating elements — economically from photovoltaic surplus, according to spot prices, or to meet the required comfort level.

Introduction

QA DHW Boiler is an application for controlling electric heating of hot water in storage tanks. It switches and modulates the heating elements according to the required temperature, the input mode and the current data on photovoltaic surplus or electricity spot prices.

The application provides:

- heating in the temperature setpoint modes **Economic**, **Normal**, **Comfort** (required heating) and **Comfort**, **Maximum** (cheap heating),
- continuous and switched power control of the heating elements,
- 1 to 3 outputs and phases, 1 to 2 temperature sensors,
- inputs and outputs via a device integrated in the system, a Shelly Dimmer or the external SHE EX01PV module,
- with the EX01PV module: single-phase (230 V), three-phase and phase-to-phase heating elements (400 V),
- reaction to the HDO high-tariff signal,
- optional control of a safety contactor,
- 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 only,
- heating according to a time schedule supplemented by PV 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 annual 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 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, QA DHW Boiler 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 (one output module must be installed):

- **QA EX01PV** — communicates with the external SHE EX01PV module and controls up to 5 SSR relays, continuous and switched outputs. At the same time, it reads the temperatures from the sensors and the HDO signal. Suitable for most installations (1-phase / 3-phase / phase-to-phase, several heating elements in one tank).
- **QA Shelly Dimmer** — an alternative output for continuous power control of one heating element via Shelly Pro Dimmer (0/1–10 V). We recommend it for **1-phase DHW heating** as a cheaper option for controlling one SSR relay.
- **Device integrated in the HC** — a device installed in the HC that controls the heating element continuously or switches it.

Installation and initial setup

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 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, and it then installs the purchased licences by itself. It provides automatic updates of all SHE applications and easy licence management (requires the "superuser" credentials of the unit). For details, see the separate "Installation Application" manual.
- **Standalone installation file** — the activation form provides links to download an encrypted *.fqax file bound to the entered S/N of the unit. 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** and the monitoring tiles (**DHW Up**, **Setpoint DHW PV**, **Output 1:1**, **Cheap Today**).

Operating prerequisites

- One of the output modules is installed in the unit: QA EX01PV with the EX01PV module, QA Shelly Dimmer (with Shelly Pro Dimmer 0/1–10 V), or a device integrated in the HC that controls the heating power — see the Downstream applications section.
- At least one temperature sensor is installed on the tank (two when measuring both the upper and lower temperature) and integrated into the HC via EX01PV, Shelly Dimmer Pro or a discrete input.
- 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 **QA Spot Pro** 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. The heating element must be equipped with its own safety thermostat.

Warning

The operating thermostat 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, 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, 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 and inputs/outputs.

The additional **monitoring tiles** display current values without the option to intervene — typically **DHW Up** (temperature), **Setpoint DHW PV** (PV temperature setpoint), **Output 1:1** (current output power) and **Cheap Today** (cheap 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 or Shelly Dimmer (if installed), HDO source, temperature sources, outputs.
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 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.

Control state

The upper part of the card displays:

- **Control Mode** — e.g. **AUTO-PV~MAX**, a combination of the selected control mode and the active sources.
- **Input Mode** — current request from the linked QA applications: **PV** (e.g. **CHEAP-MAX**), **EMS**|Energy type, **Spot** (**Active** / **Inactive**).
- **EMS Input** — current EMS state (**Off** / **Active**), **EMS Priority**.
- **Temperature DHW Up** / **Temperature DHW Down** — current temperatures from the sensors.
- **Setpoint PV** — temperature setpoint for the PV mode.
- **Setpoint Basic** — temperature setpoint for required heating.
- **Output** — current output power in %.

Operating mode selection

- **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 works with up to five 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).
- **Setpoint Eco** – temperature setpoint for required heating in the Eco mode.
- **Setpoint Normal** – temperature setpoint for required heating in the Normal mode.
- **Setpoint Comfort** – temperature setpoint for required heating in the Comfort mode.

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), 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 commissioning (kWh).

The energy types in the table are displayed according to the sources enabled on the **Installation** card – typically **Cheap** (summary of the cheap modes PV / SPOT / Extra Cheap), or further items for required heating.

"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. 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). In **HOT WATER HEATING GROUP**, select the group (**Group 1**, **Group 2**, ...) and enter the **Volume of heated water** in litres. The group number is shared with the linked applications (QA DHW Mode, QA Consumption Control, QA Spot) — 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 / Priority 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). Suitable **only for large tanks above 200 l** with a thermostatic valve on the outlet.

EX01PV Configuration

If the installation uses the EX01PV module for continuous power control of the heating element, select it here from the list. 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 SHELLEDIMMER0110VPMG3**). If the device is missing from the list, click **Update** to reload the available devices.

HDO source setting

Select the source of the HDO signal (high tariff). Depending on the HDO state, the application can then block required heating from the grid.

Temperature sources

Select the source for the tank temperature sensor. Supported sources: **EX01PV**, **Shelly Dimmer** and **Device**. The application allows 1 to 2 temperature sensors (typically the upper and lower tank temperature).

Input/output configuration

For the outputs, set:

- **OUTPUT TARGET TYPE** – **EX01PV**, **Shelly Dimmer** or **Device**.
- **TARGET OUTPUT 1 / 2 / 3** – the specific output of the selected source.
- **PHASE OUTPUT 1 / 2 / 3** – the specific phase (L1 / L2 / L3) or a phase-to-phase connection (400 V).
- **Power Output 1 / 2 / 3** – power of the connected heating element.

The lower part of the card displays the current configuration of all 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 phase sequence (direction of the rotating field).