

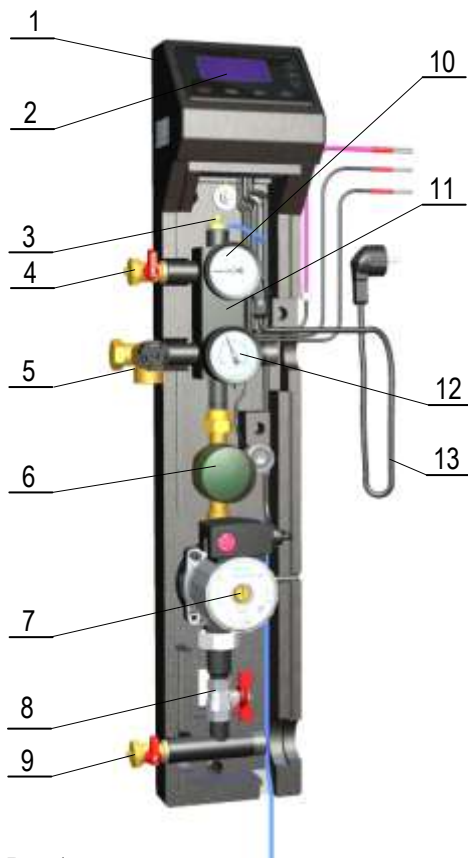
## ASSEMBLY INSTRUCTIONS FOR THE PUMP AND CONTROL UNIT 18e-01

### 1. Use and construction of the pump and control unit

Pump and control unit is used to cooperate with solar collectors in an installation with a required heat transfer fluid. Maximum flow rates of up to 18 l/min can be set, depending on the area of the mounted solar collectors.

The pump and control unit is compacted in a foamed polypropylene cover and it contains accessories necessary for correct functioning of the solar installation.

Construction of the pump and control unit is presented in **Figure 1** below.



Rys. 1

1	Pump and control unit cover
2	G422 controller with 4 temperature sensors
3	Automatic vent with a cable
4	Release valve - top
5	Safety valve 6bar
6	Electronic G-916 flow meter with two LEDs: Green – flow meter supply on Red – fluid flow pulse
7	Circulating pump WILO 15-6
8	Ball valve
9	Release valve - bottom
10	Thermometer 0 – 120°C
11	Air separator with an integrated check valve
12	Manometer 0 – 6bar
13	Power cord

Spacing of  $\varnothing 10$  openings for attaching the unit

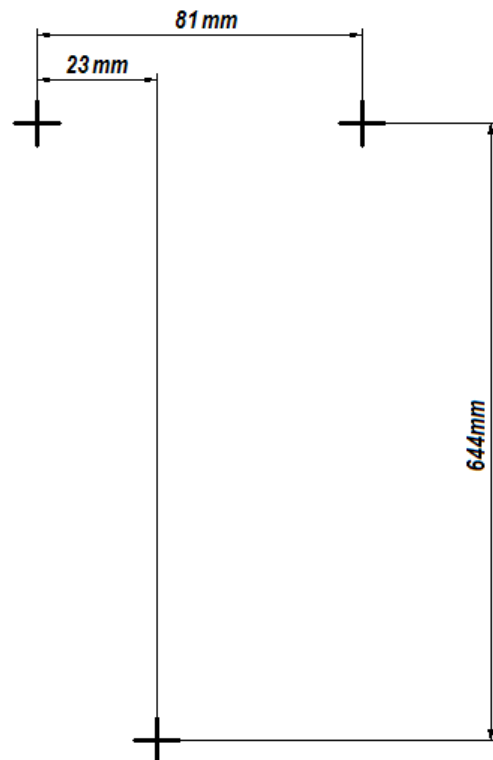


Fig. 2. Diagram of spacing between  $\varnothing 10$  openings necessary for attaching the pump control unit

## 2. Diagram of solar installation connections

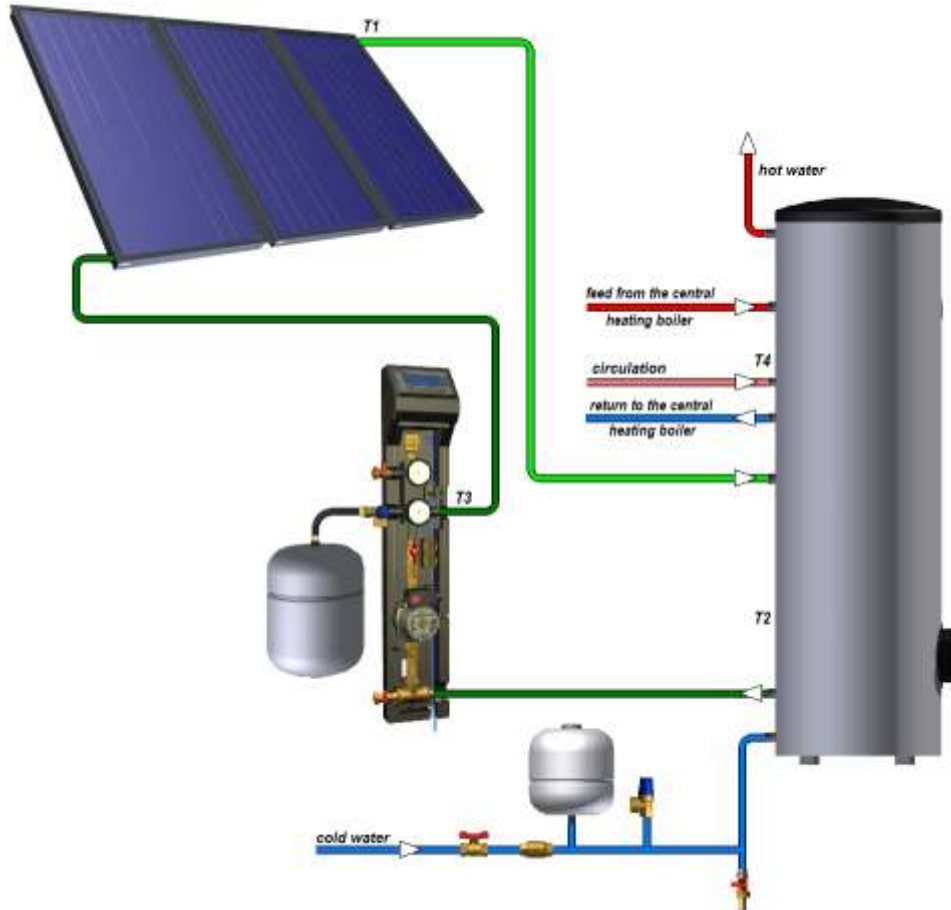


Fig. 3. Schematic diagram of solar installation

## 3. Assembly of the pump and control unit.

Consecutive steps.

- Attach the pump and control unit to the wall using 3 anchor screws in spacing as presented in **Figure 2**.
- Connect the hydraulic connections of the pump and control unit with the solar collectors, the boiler, and the expansion tank, as shown in the schematic diagram of the installation (**Fig. 3**).
- Cold water connection should be done according to the presented schematic diagram of the installation (**Fig. 3**), or the schematic diagram of the installation in a warranty card.
- Place temperature sensors in appropriate locations in the installation and connect to the controller (according to the diagram of electric connections presented in the later part of the instruction).






### Filling and starting the installation.


The installation should be filled with a proper heat transfer fluid, namely **TERMSOL EKO** or **ERGOLID EKO**, which is a water solution of propylene glycol, with a solidification temperature of  $-25^{\circ}\text{C}$  with an addition of an inhibitor pack, protecting the installation from corrosion.

**ATTENTION!!! TERMSOL EKO should not be diluted with water.**

### System filling with heating medium, with the use of a rotary pump unit.

Consecutive steps.

- Unit pipes: connect supply pipe to the lower discharge valve (9), and overflow pipe to the upper discharge valve (4). Fill the unit tank with the heating medium, open discharge valves (4 and 9) and start up the rotary pump.
- After pumping the heating medium for about 30 seconds, close the ball valve (8) inside the pump control unit (open valve causes the liquid to flow through the inner element of the pump control unit).
- Do not switch off the rotary pump until full deaeration of the system – that is, till air bubbles stop appearing in the overflow pipe.
- When air bubbles stop appearing in the overflow pipe, close the upper discharge valve (4) and continue pumping heating medium to the system, to reach system overpressure of  $p = 2.5 \text{ bar}$ , which is measured by pressure gage (12). When required overpressure is reached, close lower discharge valve (9), switch off rotary pump and open the ball valve (8).
- De-aerate the pump (7) in the ZPS pump control unit by unscrewing the pump central screw.
- Insert the controller plug into the  $\sim 230\text{V}$  mains socket and switch on the solar collector pump in the manual mode. In order to switch on the pump in a manual mode, one should:
  - Switch on the controller with the  button - CAUTION!! this will calibrate temperature detectors.
  - Go to MENU pressing the  button.
  - Using the arrow buttons  or  choose the option „Manual control” and confirm pressing  button.
  - Switch off the pump P manually replacing the option „On” with „Off”.
- Remaining air should be removed automatically by opening the manual valve (3).

- h. In case of a reduction or interruption of the flow (message “**flow insufficient**” – confirm with the OK button) turn counter clockwise the circulation pump main screw (11) and let out the air blocking the pump. Continue till full deaeration of the system. If, after 5 minutes, the flow is still insufficient, the controller will issue a “**Pump blocked...**” message – in order to switch the pump on again, press OK button.
- i. In case the pressure measured by the pressure gage (12) is below 1.5 bar, fill in the system to reach required system overpressure of  $p = 2.5$  bar.
- j. Disconnect supply and overflow pipes of the rotary pump.
- k. Set the required flow rate of the heating medium – to do this, choose the option **flow/rotameter**.
- l. Entering the **Nominal** option will switch the pump on and will cause appearance of a new **Current** option. While in the **Nominal** option, input the proper value calculated for the number of solar collectors (count 1.5 l/min per each flat plate collector, or 1.0 l/min per each evacuated tube collector).
- m. If current flow exceeds requirements, reduce rotational speed of the pump, by switching to the lower pump mode.
- n. If, even with the pump switched to the 1-st mode, the flow is still excessive, it can be controlled via the ball valve (8) – closing or opening this valve will change the flow rate. Set the heating medium flow so that values **Nominal** and **Current** are identical.
- o. Input the set circulation pump mode number into the controller.
- p. Return to normal controller mode by triple pressing  button.

#### 4. G422 electronic controller

The controller is an independent control block designed to control circulation pumps and other devices, which may be a part of solar collector installations. G422 controller has 4 temperature sensors, which depending on the selection of one of various installation programmes (schemes), should be placed in appropriate temperature measurement locations indicated in the diagram of the respective installation scheme (see: G422 independent control block operation manual).



Fig. 4. Description of measurement outputs and relay inputs for system no.1.

Output / Input	Description
220V~	Connection to 230V~/ 50 Hz grid
O1	Collector pump output – <b>max. current load 1A</b>
O2	Potential-free output for resistors replacing boiler usable warm water sensor
O3	Circulation pump output – <b>max. current load 8A</b>
T1	Solar collector temperature sensor
T2	Heater temperature sensor – lower coil
T3	Air separator temperature sensor (heating medium return)
T4	Heater temperature sensor – upper coil
F1	Output from the electronic flow meter (EFM) – type G916 5.....+12V 6.....GND 7.....+FRQ 8.....GND
RS485	Input: 9:+A, 10: -B, 11: GND, 12: +12V

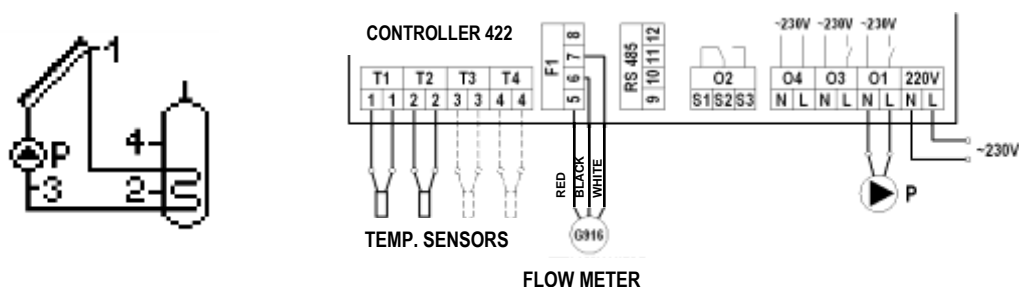


Fig. 5. Schematic and electric diagram of installation no. 1





**ATTENTION!!! Dashed lines refer to optional sensors than can be installed but are not required for correct operation of the controller (Fig. 1).**

### Description of G422 controller

Controller is equipped with an LCD screen and 7 buttons.

After connecting electric connections correctly, turn on the controller by pressing .

In normal operation, the controller's screen displays:

- Current installation scheme number and diagram,
  - Current date and time,
  - Current temperatures in respective measurement locations (a lack of the sensor is indicated by displaying - - -, and damage of the sensor by displaying **Err** messages)
  - During pump's operation (pump symbol flashing) instantaneous power output of solar collectors is displayed.
- Pressing  selects controller's menu.
- Using directional buttons  and  select the desired option and confirm by pressing .

### Description of control parameters for the first programme.

Parameter	Description	Range
<b>Solar collector type</b>	This parameter allows for choosing a type of solar collector (flat or tube). When selecting <b>tube</b> in the period from 8AM to 5PM (at full hour), solar pump turns on for a minute. Since the temperature sensor is located on the bottom of the collector, especially in case of low temperature of the outside air, the temperature measured by the sensor may be different than that inside the collector. If sensor <b>T1</b> reaches the temperature required to start the operation, the pump will start working.	Flat / Tube
<b>Temp. T1&amp;T2 difference – pump ON</b>	It defines operating conditions of the collector pump. If the temperature in solar collectors measured by sensor <b>T1</b> is greater than the sum of $\Delta T1$ and temperature of the water in the water heater <b>T2</b> ( $T1 > \Delta T1 + T2$ ), the pump will switch on. Additionally, to ensure stable operation of the system, hysteresis protection was applied, that is, 1°C for switch-on and 2°C for switch-off.	4 – 15 °C
<b>Max.Temp. T2 OFF collectors' pump</b>	It relates to temperature sensor <b>T2</b> , located on the bottom of water heater. It defines the maximum temperature permitted in the water heater, measured by the sensor <b>T2</b> (above that temperature the solar installation will stop working).	10 – 85 °C
<b>Regulation of collectors' pump</b>	Regulation of the operation speed of the solar collector pump. When ON, the pump speed is adjusted smoothly by the controller to ensure proper flow rate of the heat transfer fluid at any time. When OFF the controller switches the pump on and off alternatively. Switching the pump regulation ON may cause noise level of the solar collector pump to increase, which is a typical phenomenon.	Yes / No
<b>Overheat protection of collectors ON</b>	It enables switching on solar collector pump <b>P</b> to prevent overheating of the installation. When the temperature on the collectors (measured by sensor <b>T1</b> ) reaches 110°C the controller turns the pump on to evacuate excess heat. Once the temperature drops to 100°C or it reaches the preset value for <b>MaxTempT2</b> in the water heater, measured by sensor <b>T2</b> , the pumps is turned off. This parameter is active despite exceeding the maximum water temperature set as <b>T2max</b> .	Yes / No
<b>MaxTemp. T2 overheat protection OFF</b>	It defines the maximum temperature in the water heater at which the overheat protection function is active.	60 – 85 °C
<b>Freezing protection of collectors ON</b>	It applies to countries where heat transfer fluid in the collector circuit is water and defines when the function should be active to prevent the installation from freezing. When ON, solar pump <b>P</b> turns on if water in the water heater, measured by sensor <b>T2</b> is greater than 7°C and temperature on the collectors drops below 0°C. In case of further temperature drop in the water heater up to 4°C or the increase of the temperature on the collectors above 0°C, the pump will turn off. The function is active only when value of the <b>heat transfer fluid</b> parameter is set to 0°C.	Yes / No

### Alarms indicated by the controller

#### Temperature sensor error


The controller is provided with a control function for installed temperature sensors. If any sensor fails or its wire is broken, the sensor will be disconnected and the controller will indicate an alarm for such sensor. In the alarm state, all outputs are OFF. Additionally, when the controller is in the main screen mode, alarm occurrence can be signalled with a sound.


In the alarm mode, it is still possible to view the menu, configure the parameters and control external devices manually. Indication of the failed sensor is presented on the main screen. Temperature value next to the sensor is replaced with "**Err**" code. If the controller reports sensor alarms, check the system for correct installation, connections of sensor and damage of the temperature sensor.

#### No required flow of the heating medium when the pump is operating.

#### Activated setting with the G-916 electronic flow meter: (selection: Flow/Rotameter : Measurement : Elektr.G916)

No flow control is performed in two steps.

**Step I** – (flow signal missing for 20 seconds) the controller generates a sound and displays the message: **NO REQUIRED FLOW. CHECK AND ADJUST**. Press  to close the message and mute the sound.

**Step II** – (flow signal missing for further 5 minutes) the controller stops the pump of solar collectors, generates a sound and displays the message: **NO FLOW, PUMP FAILURE, AIR IN THE SYSTEM, FLOW BLOCKED**. Press  to restart the solar collector pump. If there is still no flow, the alarm will reoccur.

**ATTENTION!!! All options are described in detail in a separate manual of the controller.**