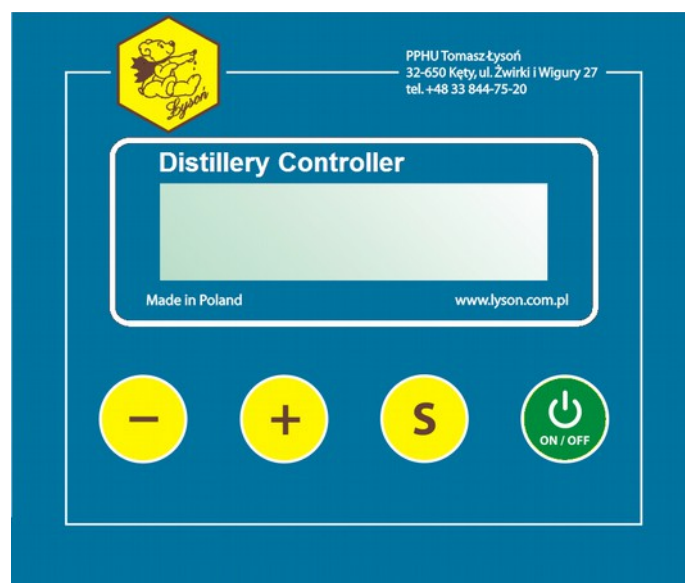


Distiller Controller DC-01



User's manual & configuration



Caution! This DC-01 controller must not be used as a safety device. It is forbidden to install the controller as a sole, safety circuit to prevent the uncontrollable temperature rise.



- **read this manual carefully prior to operating the device**
- **to avoid electrical shock or to avoid controller's damage, mechanical and electrical installation should be performed by qualified staff.**
- **prior to switching the device on, make sure that all wires/cables have been plugged in a correct way**
- **before any cable modification, unplug the device from power source**

How the controller works

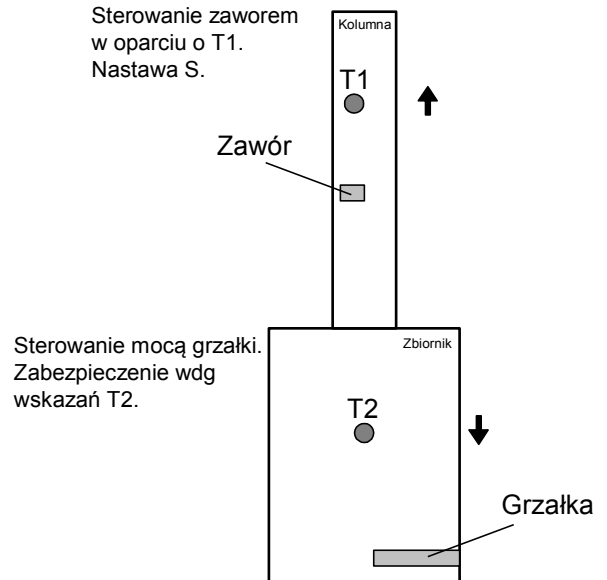


Fig. 1. How DC-01 works

DC-01 controller is equipped with 2 control circuits; circuit one – temperature control and circuit two – power control.

Circuit 1 is a precise thermostat working in the cooling regime and in an ON/OFF mode. Thermostat works with 0,1°C hysteresis. When the circuit is active, controller's output is controlled by indication of sensor T1 and also by „preset temperature” adjustment – S. Once the given temperature has been exceeded, the output is switched on, and temperature too low switches it off. Circuit 2 is to regulate the power of heating system, working either in an open loop or in AKM mode (AKM= automatic power correction). In the open loop heating power (scaled as a % of the maximum power) is set with 1% accuracy. When the heating circuit is on , temperature T1 can be adjusted manually by the power delivered to the heater. Regulating circuit takes into consideration T2 sensor's readings. Condition $T2 > 98^{\circ}\text{C}$ turns the heater off, $T2 < 96^{\circ}\text{C}$ switches it back on again.

In **AKM** mode, the heating power is adjusted automatically as per condition $T1 = Tc$. Once the heating circuit is switched on, the controller automatically corrects heating power, working towards stabilizing the given temperature Tc . The power's correction is based on cyclic (in equal time intervals) comparing of T1 readings against the given temperature. If the measured temperature T1 is higher than the given (set) temperature, the value of power correction unit is deducted from the current heating power. The power is subsequently decreased until the minimal value is reached – described by Pmin parameter. Accordingly,

when the measured current temperature is too low, the heating power is increased by value of power correction unit.

In case the difference of the temperature measured against the set temperature exceeds the value described by parameter T_e , the power is corrected by 2 units of power correction.

In order to ensure the safety of use, the regulating circuit takes into account the T2 sensor's readings. Condition $T_2 > 98^\circ\text{C}$ turns the heater off, whereas $T_2 < 96^\circ\text{C}$ switches it back on again.

AKM mode is controlled by the following parameters:

Pi – value of single power correction, within the range 1...50 [%]

Tc – Set value of stabilized temperature, within the range 78,3...81,0 $^\circ\text{C}$

Ci – Correction's time interval, within the range 1...30 [s]

Te – Absolute deviation of temperature, within the range 0,2...1,5 $^\circ\text{C}$

Pmin – Minimal power, that can be achieved in AKM mode, settable within the range 0...90%

Fs – factory settings, value set to 1 enables the factory settings. Possible settings: 0 and 1

Access to the above parameters is enabled from the AKM menu. To enter the menu press „+” and „-” buttons simultaneously after switching on the controller (when the progress bar is displayed). Alternatively, the other way of entering the menu is to press and hold the „S” button. Having entered into menu mode, release the buttons and follow the instructions below.

+	INCREASING THE VALUE OF MODIFIED PARAMETER.
-	Decreasing the value of modified parameter.
S	Choosing the parameter for modification
ON/OFF	Menu exit (settings are kept as they are)

Controller panel – LCD display

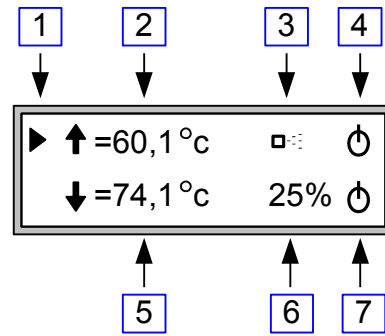


Fig 2. DC-01 controller's LCD display

	FUNKTION DESCRIPTION
1	The displayed symbol indicates the chosen circuit, where the following buttons are active: (+, -, ON/OFF). Button S to choose the appropriate circuit.
2	Current temperature measured by T1 sensor. Pressing the button + or - for short period will display the set („desired”) temperature of circuit 1. The T1 reading is then replaced by „S” reading.
3	Displayed symbol indicates active state of controller's output (OUT1) – the output that controls the cooling system.
4	Displayed symbol indicates the activation of cooling system's controlling circuit. The letter „M” displayed instead of graphics indicates the manual mode – the one in which the output OUT 1 is permanently active.
5	Current temperature measured by T2 sensor.
6	The percentage of power transmitted to the heater.
7	Displayed symbol indicates the activation of heating circuit. The letter „A” displayed instead of „mode: ON” graphics signals the activation of Automatic Power Correction mode.(AKM)

Controller Panel - keyboard

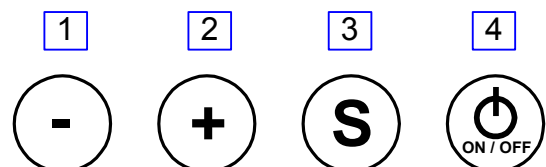


Fig 3. DC-01 controller's keyboard

BUTTON	FUNCTION
1 (-)	<p>Decreasing the value of chosen parameter: S or power</p> <p>The „S” setting is stored on the controller's memory. Settings range for „S” is (50-80°C), and for power output(0-100%). The basic settings step for „S” is 0,1°C, whereas for power: 1%. Pressing the button for short time will display „S” setting, without a change. In AKM mode the range of power is limited by minimal ”Pmin” value.</p>
2 (+)	<p>Increasing the value of chosen parameter: S or power</p> <p>The inputted setting „S” is stored on the controller's memory. Settings range for „S” is (50-80°C), and for power output(0-100%). The basic settings step for „S” is 0,1°C, whereas for power output: 1%. Pressing the button for short time will display „S” setting, without a change.</p>
3 (S)	<p>Selection of active circuit.</p> <p>Pressing this button will result in change of chosen circuit, for which it will be possible to change settings of the required value as well as switching the regulation circuit ON/OFF.</p>
4 (ON/OFF)	<p>Switching the regulation circuit ON/OFF</p> <p>Pressing of this button will result in switching the controll channel ON/OFF. If chanel 1 is chosen, pressing the button for longer period of time whilst controller starts will activate the manual mode – the mode with permanently active cooling output. If the other is chosen, the same action will result in activating AKM mode.</p>

Diagnostics – protection and error codes

DC-01 is equipped with advanced diagnostics procedures – improving safety and comfort of working with the device.

Error messages

- Should any fault occur, it will be displayed on the LCD screen as „E-xxx”, where xxx relates to the number of error as per the table below
- restarting of the controller is possible if: power supply has been switched off, the fault has been removed/repaired, power supply restated.

KOD BŁĘDU	OPIS BŁĘDU
E-100	PROGRAM MEMORY ERROR
E-101	CONFIGURATION MEMORY ERROR
E-102	RAM ERROR
E-200	BUTTON „-” DEPRESSED/BLOCKED
E-201	BUTTON „+” DEPRESSED/BLOCKED
E-202	BUTTON „S” DEPRESSED/BLOCKED
E-203	BUTTON „ON/OFF” DEPRESSED/BLOCKED
E-300	HEATING CIRCUIT PROTECTION ACTIVATED
E-301	T1 SENSOR MALFUNCTION
E-302	T2 SENSOR MALFUNCTION
E-303	T1 TEMPERATURE TOO LOW
E-304	T2 TEMPERATURE TOO LOW
E-305	T1 TEMPERATURE TOO HIGH
E-306	T2 TEMPERATURE TOO HIGH
E-400	PROTECTION LOOP’S CIRCUIT MALFUNCTION

E-303 – measured temperature $T1 < 0^{\circ}\text{C}$.

E-304 – measured temperature $T2 < 0^{\circ}\text{C}$.

E-305 – measured temperature $T1 > 110^{\circ}\text{C}$.

E-306 – measured temperature $T2 > 110^{\circ}\text{C}$.

Technical specification

Each DC-01 controller consists of microprocessor board and powering-executing module which is connected to the controller with special tape. Moreover, it has got dedicated, digital temperature sensors.

MIKROPROCESSOR CONTROLLER

Range of measured temperatures*:	0°C to $+110^{\circ}\text{C}$
Temperature resolution readout:	0.1°C
Maximum temperature reading error:	$\pm 0.5^{\circ}\text{C}$ or the range from 0°C to $+85^{\circ}\text{C}$ $\pm 2^{\circ}\text{C}$ for the range from 86°C to $+90^{\circ}\text{C}$
Typical temperature reading error:	$\pm 0.2^{\circ}\text{C}$ for the range from 0°C to $+80^{\circ}\text{C}$
Range of temperature settings of cooling circuit:	$+50^{\circ}\text{C}$ to $+80^{\circ}\text{C}$
Cooling circuit regulation hysteresis:	$\pm 0.1^{\circ}\text{C}$
Range of temperature settings of heating circuit:	$+78,3^{\circ}\text{C}$ to $+81^{\circ}\text{C}$
Type of heater's power regulation:	Group
Range of power level settings	0% to 100%
Sound allarm:	yes

* readings above $99,9^{\circ}\text{C}$ are displayed as $>100^{\circ}\text{C}$

CONTROLLER'S POWER SUPPLY-EXECUTE MODULE

Module Voltage:	$230\text{V} \pm 10\%$ 50Hz
Module power consumption:	Max. 2,5VA dla 230V
PWR outputs (H C terminals) voltage:	Max. 230VAC
Type of output OUT1 (terminals H1 C):	Relayed, 0V / 230VAC
Type of output OUT2 (terminals H2 C):	Relayed, 0V / 230VAC
Type of output OUT3	Transistor (for SSR) 0V / 5V 25mA
Total maximum load of OUT1 and OUT2 outputs:	3A
Durability of transmitting outputs:	$> 0.7 \times 10^5$ dla 1A 230VAC

SSR TRANSMITTER SPECS

Type of transmitter	Zero engaged
Rated operating Voltage:	Min. 250V AC
Nominal load current:	Min. 25A
Minimal control voltage:	3V DC
Maximum control current:	25mA
Radiator:	As per load