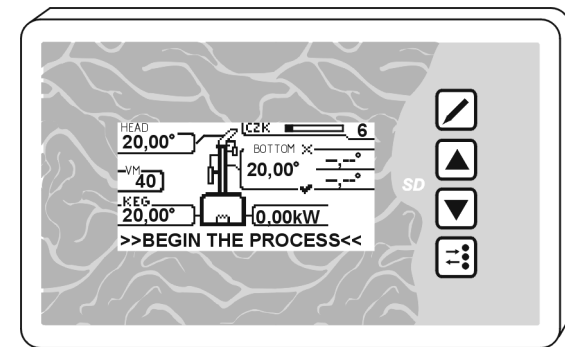


User's manual for „SKN” distillation column controller from version 3.0
Please read this manual before starting operation of the controller.



The SKN controller is designed to control the process of LM/VM distillation column, thanks to suitable options it facilitate process running, or even makes it automatic.

The controller can operate in two modes: OVM or OLM – proper selection is done in additional settings menu. OVM mode is characterized by the use of motorized valve between the column and Liebig cooler, which thanks to electronic control of its opening rate makes it possible to control the steams and thus the speed of hearts receiving, in this case speed reduction could be done automatically. OLM mode is characterized by hearts receiving with the use of two electrovalves, where one of them switches ON only once for preset time. The aim is to rinse out the “OLM shelf” and tubes of the undesirable fractions. All the low-voltage electrovalves are controlled in advanced way, therefore their heating up is reduced and lifetime extended.

The controller operates with CZK bolecki-branded flooding sensor, thanks to it the column flooding can be fully automatic. During execution of the other steps, this sensor can be used as a protection against abnormal operation. Advantage of the CZK sensor is that its installation does not require to interfere in the column construction – does not reduce the pipe bore, and the measurement itself is contactless, from its external side. Process running became even more precise thanks to use of the ambient pressure sensor.

The main features of the equipment:

- Two independent outputs for the 16A 230/400V heaters control.
- Cooling water electrovalve (NO relay output, 230V)
- Three electrovalves for OLM mode (max 12V, 1A, NC).
- Motorized valve to control steams receiving in OVM mode.
- Three thermometers with 0.01°C resolution.
- Contactless, multi-step column flooding sensor.
- Ambient pressure sensor to compensate the “temperature of the day”.
- Graphic display with high contrast, intelligible graphics and text descriptions.
- Saving the process course on SD card, and possibility to upgrade the software by the user himself.

WARRANTY CARD

Equipment name: sknv3

Serial number..... Sales date, stamp

Warranty terms:

- Factory defects revealed within this period will be eliminated within 14 working days from the receiving date at the service station. Before sending back the equipment, please contact the manufacturer.
- The equipment cleaned should be sent back directly to the manufacturer (it significantly shortens the repairing time), at the user cost, in packaging that ensures proper protection for transporting time, together with purchasing receipt and the warranty card properly filled out.
- Please enclose with the card the claimer contact data (shipping address, telephone number) and the defect description.
- The claim will not be recognized if the seal or sticker with serial number is damaged.
- The warranty does not cover the damages that arose not from the manufacturer fault, e.g. unauthorized design modifications, incorrect installation or use, overloading, atmospheric discharge, the mains overvoltage, impurity or flooding, mechanical damages.
- Warranty card that is illegible, not filled out completely, or with signs of unauthorized modifications is invalid!
- This warranty card does not preclude nor limit the consumer rights following from the law provisions.

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1. INSTALLATION GUIDE

- The operating part is to be installed in the area of heaters, inside an enclosure protecting against accidental flooding. At the same time, the enclosure must ensure free air flow that is necessary for cooling of the SSR relay, which controls heaters. The board should be fixed to the enclosure with plastic spacers provided with the set. Fixing it with metal spacers could lead to short-circuit, equipment damage or even electric shock of the user.

- The control panel should be installed in a convenient place, however please remember there is a slot for memory card at the top of the panel – flooding the equipment from this side would surely damage the electronics. The panel has dedicated holder, first put it on and then move it down.

- Please remember the equipment operates under voltage that is dangerous for life. Installation should be performed by a person with appropriate knowledge and authorization. It is strictly forbidden to use the equipment if its enclosure or wiring is damaged, or even if there is suspicion the system may function incorrectly.

- The equipment might turn ON its output at any time without signaling this event, even if it does not result from its operation cycle. Any manipulations on mechanical or electrical part of the system is forbidden when it is physically connected to the mains. It applies also to the low-voltage elements.

- Do not turn the equipment ON if the heaters are not flooded – in case of unexpected turning ON it could lead to their damaging. Please consider to install additional (mechanical) heaters switch.

- The SKN controller has embedded relay (SSR) to control heaters, in normal conditions its lifetime is infinite. However, it does not execute dependable, mechanical heaters disconnection. Moreover, in case of its damaging (overloading, short-circuit, etc.) in most instances it would apply full voltage to heaters although it is turned OFF.

- The power supply connection should be easily accessible, it must make it possible to disconnect the equipment from the mains quickly and without any trouble, at any time.

- Wires and connectors should be appropriate for the power used in the equipment. It is recommended to build a connection box with adequate fuses and anti-shock protection.

- Check the equipment condition periodically. After first operation cycles, especially verify the electrical connections under substantial load, it might be necessary to retighten them.

- It is forbidden to use the system in places, which could catch fire from the cables used, it is forbidden to store flammable things near the operating equipment.

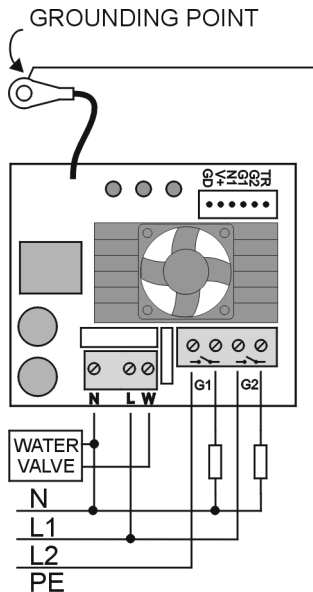
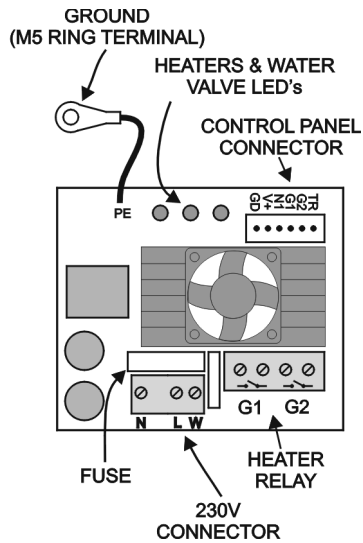
- Metal elements of the equipment should be grounded. Please remember that almost all the fluids perfectly conduct a current, which could kill, therefore all the elements should be grounded despite they are apparently isolated (e.g. with a rubber tube) from the other parts of the construction.

- It is forbidden to leave the system connected to the mains unattended by a person with suitable knowledge and skills.

Electronics supply voltage	230V AC ± 30%
Electronics power consumption	Max 15W
Heaters supply voltage	Max 400V AC
G1, G2 output current	Max 16A
Cooling water valve	NC, 230V AC, max 1A
Receiving valves	NC, 12V DC, max 1A
Motorized valve	12V DC max 50mA
Resolution / Temp. measurement error	0.01°C / ± 3°C @ 0 - 100°C
Resolution / Pressure measurement error	0.1 hPa / 0.5hPa @ 900 – 1100 hPa

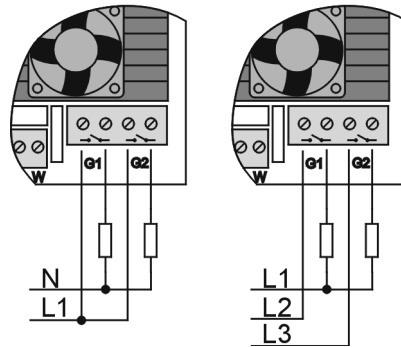
1.1. HIGH-VOLTAGE PART

The following diagrams present connection of this part, and a few options of heaters connection. The mains voltage that is necessary for the electronics operation should be applied to the connector paying attention the phase cable should enter from the "L" side.



max 2x 3,6kW 230V

max 2x 6,4kW 400V



The cooling water valve should be connected to "N" and "W" terminals. Power control is done by the method of group controlling, i.e. turning the heater ON with 50% of power means it will be ON and OFF every 3 seconds. It could cause an irritating effect of light dimming in case of voltage supply from the same phase. To prevent such effect, use different phase for heater supply and different for light supply. Proper power modulation mode could be also helpful, where minimum power setting results in continuous operation of G2 heater and only modulation of G1 (G1 modulation mode, G2 continuous mode, point 3.4.2). If the heaters are of different power, please remember what power is connected to particular output – it will be needed for later equipment set-up.

Yellow-green cable with M5 ring terminal should be connected together with the installation protection cable and metal parts of the column (e.g. to the bolt fixing the factory enclosure of the operating part). This circuit provides anti-shock protection, therefore it should be made with special attention and correctness.

ATTENTION! The "grey" factory enclosure of the operating part ensures proper cooling for the current within 10A (separately for G1 and G2). If the excepted current is higher, please consider putting the operating part in different casing providing better ventilation. The controller displays

DECLARATION OF CONFORMITY

Firma Bolecki seated in Kęty, declares with full responsibility that the SKN product together with the factory sensors conforms to the provisions of the following Directives EMC 2004/108/EC, LVD 2006/95/EC and ROHS 2011/65/EC. To verify the conformity, the following harmonized standards have been used: EN 60730-2-9:2011, EN 60730-1:2012.

Manufacturer data:
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 ul. Żwirki i Wigury 24
 32-650 Kety
 Poland
 forum.bolecki.pl
 office@bolecki.pl

Upgrading always should be done in the following sequence:

- Save the file with software, to be installed in the controller, on the card.
- Verify and eventually change the file name to S_SKN (or S_SKN.hex if your system shows file extensions).
- With the power supply disconnected, insert the card into the controller.
- Turn the controller ON, if the suitable file is detected the SD card icon starts quick blinking, and after a few seconds blinks slower. If the upgrading is successful, after several second the controller restarts itself with the new software version. If instead the SD LED starts regular blinking it means failure. Number of blinks informs the particular reason:

2 blinks: The controller requires upgrading but did not detect the card (e.g. software damaged)

3 blinks: Most likely the file is detected, but its name is incorrect

4 blinks: problem with the file contents (e.g. damaged).

At any problems with the memory card, the first action should be formatting of the FAT32 sub-system files.

6. PROBLEM SOLVING

One of the heaters does not work, its LED on the power supply board is OFF. Verify the connection of both parts of the controller.

One of the heaters does not work, its LED on the power supply board is ON. Verify the heater connection and efficiency.

The controller resets at the moment of the electrovalve turning ON, or the valve becomes hot after some time. Nx PWM parameter value in the additional settings is too low.

The controller displays an error of the settings memory. It is normal after software upgrading. It could also appear in result of some disturbances – e.g. settings saving at the moment of power supply disconnection.

The controller does not start, SD icon at the front panel blinks 2x. Software damaged. It should be upgraded.

The controller does not start, the fan of the operating part does not work. Verify the connection of both parts of the controller, disconnect the sensors and heaters and try to turn the controller OFF.

If the above advices did not solve the problem, please contact the manufacturer.

7. INFORMATION FOR THE CONSUMER

Presented symbol of crossed out basket placed on the products or documentation enclosed with them, informs the non-operational electrical or electronic devices must not be disposed together with the municipal wastes. Proper proceeding in case of disposal, recycle or recovery of sub-assemblies consists in transferring the device to specialized collecting point or to a place where such device can be purchased, where the device will be taken back free of charge and transferred for suitable disposal.



MAINTENANCE

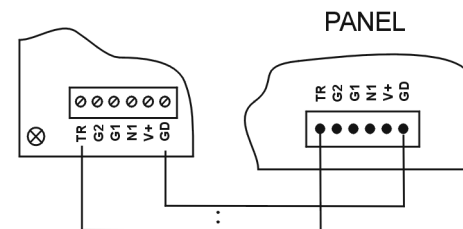
The controller does not require any special maintenance operations. Periodically, verify the condition of wirings and connections that are hidden. The controller disconnected from the mains can be wiped with damp cloth without using any detergents or solvents. When cleaning the column, it is recommended to remove the control panel and pay attention to the operating part (it is recommended also to cover it and put the cables in such a way that nothing will leak down into it).

an alarm and shuts OFF the heaters when temperature in this part of the equipment exceeds 80°C.

1.2 LOW-VOLTAGE PART

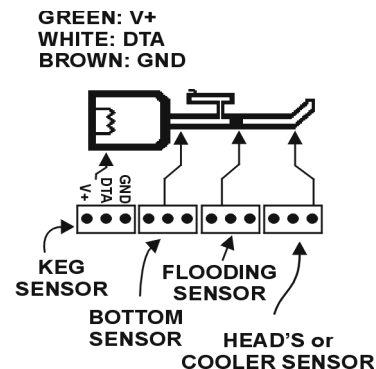
The control panel and the operating part should be connected by a cable provided with the set. Connect the terminals of both parts with identical designation (GD with GD; V+ with V+, etc.).

OPERATING BOARD



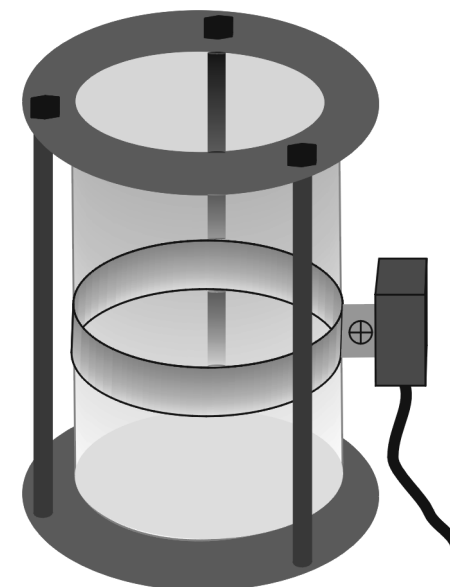
1.2.1 SENSORS INSTALLATION

Temperature sensors should be installed in the column according to the manufacturer's recommendation, leaving about 1 cm of the metal part protruding from its seat just in case it is necessary to remove it (possibility to hold it with pliers or other tool). The particular measuring point on the column should be connected to its respective connector on the panel. Digital thermometers DS18B20 are used as temperature sensors, but the "parasite power" mode is not recommended. Correct connection of the sensors is essential, otherwise they could be damaged.



Flooding sensor is used for contactless detection of alcohol presence behind the sight-glass in the upper part of the column. It could be in form of self-adhesive tape or separate electronic part and metal strip. The self-adhesive version is to be simply applied on the perimeter of the sight-glass – note that any attempt to remove it could end in its damaging.

In case of the version with metal strip suitable for different tube diameters, first cut off or break off the excessive length at the necking. Both ends should be bent perpendicularly at the necking, put on the glass and tightened with the sensor by M3 screw, in such a way that the sensor plate is located between the strip ends, the strip must adjoin with the glass at its entire perimeter. Bending the strip in other place than the necking could cause it to be too loose, and in turn reduction of its sensitivity or even impossibility of correct operation. On the other hand, too tight strip could make the installation more difficult or lead to damaging the sight-glass or the sensor. It is also essential the place of installation of the strip (or the self-adhesive) version. Although the controller settings allow to select the flooding threshold, i.e. whether the detection point is to be under or over the strip, nevertheless 3 cm under and over the strip there should be no metal elements and a filling inside the sight-glass. Installing the strip at the height of springs most likely



will cause the flooding not to be detected. The column construction should be such that the condensed alcohol flows off in the sight-glass axis. If it drips down the walls it could lead to situation in which CZK gives signal similar to flooding. It does not disqualify its operation, however detection of the secondary flooding during the process would fail. In such case, this sensor should be disabled (point 3.4.5).

The sensor cable should be protected against accidental pulling out by its suitable fixing to the column. It is allowable to wash/clean the column with CZK installed on it, however during normal operation both the sensor and the glass should be dry. Do not touch the sensor's elements nor approach it with other things during process running, as it could be interpreted as the secondary flooding and the process will be shut-down (if this sensor is enabled, point 3.4.5).

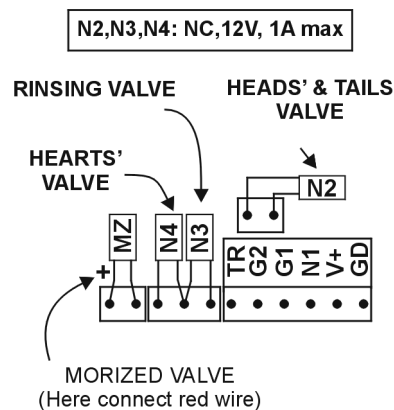
CZK's calibration is automatic at the controller turning ON, it is signaled by quick LED blinking. Disturbing of this process could cause erratic operation of the sensor. Such disturbance is also an alcohol dripping down the sight-glass walls during calibration. Please pay particular attention to it during first processes when you learn the equipment operation and e.g. experiment with flooding threshold.

During the column heating up when the glass is dry, indications should be at the level of 6 ± 2 . If during the column flooding, the CZK's indications reach the value of ~ 30 , it could be admitted the installation was done correctly. Higher indications could be admitted as perfect. Smaller differences of indications could cause problems with clear distinguishing between flooding and other conditions of the column operation.

1.2.2 LOW-VOLTAGE VALVES

The controller utilizes valves for products receiving depending on the operation mode. In OVM mode it is motorized valve for hearts receiving and N2 electrovalve for heads and tails receiving. In OLM mode three electrovalves are used: N2 for heads/tails, N3 as hearts rinsing, N4 for hearts receiving. Only one electrovalve can be open a time, that is why it is necessary to use NC (Normally Closed) valves. Quiet squeaking of the valve during operation is normal. Connection of the valves is shown in the diagram. Polarization (+/-) is important only for the motorized valve.

ATTENTION, disconnection of the valve during operation could lead to its damaging.





2. FIRST START-UP

If the controller is purchased together with the column, most likely it is already set up for it. Please read the documentation provided by the column manufacturer, especially regarding its start-up, in case on any doubt, first contact the column manufacturer. Any changes to the settings listed in this paragraph or their resetting will only cause maladjustment of the controller.

Buttons of the controller are not conventional mechanical push-buttons, but touch-buttons detecting a finger approaching to given area. To avoid accidental action of the buttons, they are interlocked after a few minutes of inactivity. Attempt to touch the buttons will display a screen reminding about the interlock. Also characteristic clicking will not be heard.



Interlock could be removed by a specific sequence of touches, depending on the software version it requires to slide the finger along the buttons from top to bottom, or first touch the button , and then . Please pay attention what the graphics related with interlock present.

Interlock of the buttons could be removed permanently (point 3.4.1), however there is a risk of interpreting some disturbance as a button touch.

In case of the condition with the KEG's/bottom temperature, the user sets up the temperature for the standard 1013 hPa pressure. If the function of correction from the pressure is enabled, the controller recalculates the temperature set up in reference to current pressure value and uses it to verify the condition. The recalculated value is shown in the right side. If the correction is disabled, then the value entered by the user will be used.

Selecting a few options with taking into account the pressure changes allows for more repeatable processes running, irrespective of the conditions changes that occur between them. With the correction function disabled, sometimes the conditions changes between processes could be such great that in one process only part of the tails will be received and other time also steam... water would be caught.

For better orientation, at the bottom of this screen there is current pressure value and information whether the correction is enabled (YES) or disabled (NO). Enabling/disabling of the correction is available in point 3.4.4.

4.2.7 THE END

Functioning of this menu is same as of the previous one. Fulfilling of the selected condition will stop the column operation (valves and heater turning OFF), and after a time specified here also cooling will be shut down. With right setting of this condition, the controller may move to this stage directly from the hearts receiving (omitting the tails stage).

PROCESS SETTINGS #9		
FINISH the process, if		
1. Keg	98,5° → 97,8	X
2. Bot.	> 85,0° → 84,3	X
Cololing time: 1min.		
Act. 989,1hPa Cor: Yes		

5. MEMORY CARD

This equipment makes it possible to save the more important operation parameters to the memory card, or allows for software upgrading by the user

himself. Only SD/Micro SD cards up to 32GB can be used for this equipment. There is no guarantee the equipment will function correctly with all the types of memory card meeting the above requirements.

It is forbidden to shut down the power supply when the controller uses the card (e.g. process running, software upgrading), nor to move or remove the card. It could damage the file or terminate the equipment operation. To hinder the card moving, it enters into the control panel fully, on the other hand it also hinders its removing. To facilitate this action it is recommended to stick a short piece of tape to the card end.

The card is chamfered for the correct inserting. Correct direction is shown on the sticker at back of the controller.

5.1 SAVING OPERATION PARAMETERS TO SD CARD

Every process start in automatic or semiautomatic mode makes the controller to create a new .csv file, to which regularly (every 5 seconds) the data are saved. Active status of saving to memory card is signaled with regular blinking of the SD icon at the front of the controller, the icon lights when at the same moment some operations are performed on the SD card. If there are many files, the card handling could take a lot of time, and in extreme case make the controller operation impossible (it is recommended to keep no more than tens).

The file can be later e.g. imported to the calculation sheet to perform its analysis. Each next file has increasing number in its name, creation date is random.

5.2 SOFTWARE UPGRADE

Software upgrading process is simple, however it could cause the equipment damage, which is not warranted. Do not download software other than the one designed for this equipment. During software upgrading it could come to a situation where the controller stops to operate correctly and e.g. turns its outputs ON (risk of heaters damage, etc.).

The natural effect of software upgrading is signalization of error of the settings saved in the memory. Just in case, before upgrading note (or make photo of) the current settings.

ing, and such action will not “spoil” the settings of the right opening origin. Correction related with the step is done after each MZ closing in effect of exceeding the temperature of the day. It is impossible to specify particular values of these parameters right here, as they depend on e.g. the column or valve type, or process running in such and no other way. The value of initial opening should be established experimentally to obtain nominal flow that the column may give. Similar situation is with the “step” parameter. Its value should be such as during the entire cycle the change was done 2.4 times before achieving the minimum opening. In turn, the minimum opening should be selected to ensure low but distinct flow value - it is explained more precisely in point 3.4.3.

Working with some columns or after gathering more experiences, it could turn out the step function has no real meaning as after 2-3 closings, the volume of hearts is in trace amounts, and the column is willing to give out only the tails.

If you are new in this field, first processes may seem to be difficult, therefore you need to be patient and calm instead of juggling with the parameters. If the set is delivered as complete and set up, then during the first (cognitive) process please limit your own changes and keep to the manufacturer recommendations.

In OLM mode there is a new parameter “rinsing time”, which opens the N3 valve for particular time. This action is done only once, before first opening of the appropriate N4 hearts valve. The purpose of rinsing is to drain the undesirable fractions, accumulated from the beginning of the column operation, from the pool and tubes.

PROCESS SETTINGS #7

HEARTS. Lock when temperature move for 0,15° above day temp.

Rinsing time: 0:20

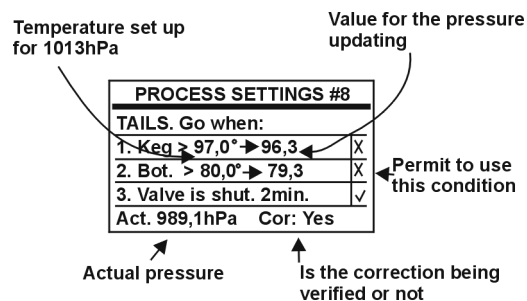
Irrespective of the operation mode, from the moment of the receiving origin, the time starts running that could modify the value of the temperature of the day (point 3.4.4), what should level its change in consequence of the hearts receiving origin. The temperature of the day could be also modified according to the ambient pressure changes, for such action it is necessary to check this permission in point 3.4.4.

In parallel to hearts receiving, the conditions to move to tails and process ending are being verified. With proper process setting, tails stage could be totally omitted.

4.2.6 TAILS

A stage with N2 valve, which previously received the heads. Moving to this one could be caused by fulfilling of any freely selected condition, that should be checked in the right side of the table. The following options are available:

- When KEG's temperature exceeds the specified value
- When the column's bottom temperature exceeds the specified value
- When the receiving valve closes for time exceeding the specified one.



At the beginning phase of use it could be helpful to print the menu map located in the middle page of this manual. It will be easier to find out where you are and what buttons should be touched to get in the required place.

After making sure everything is connected properly, please verify correct operation of the equipment. After flooding the tank with water (at least to cover the heaters), turn ON the controller power supply, for a few seconds there will be logo on the display, at the same time the CZK blinks quickly. After a moment, main screen will appear, please verify correct indications of the sensors and their correct locations (e.g. by disconnecting from the controller and checking which indication will disappear). Then, please verify correct operation of the CZK flooding sensor. It should indicate 6±1, and after approaching a finger to the strip the indication should significantly increase and stop at 99 in case of touching the strip. Next, please test the outputs. In order to do it:

1. Hold your finger touched to the [] button for about 4 seconds. The controller will restart. During logo displaying touch the [] button and wait a moment for menu of additional settings.
2. With the buttons [▲] [▼] move to “output test” and touch the button.
3. In this menu, the buttons works as follows: [] moves to next parameter, [▲] activates given element, [▼] deactivates given element.

Please verify operation of each element, characteristic noise should be heard a moment after turning the heater ON. At the attempt of turning the N2...4 valves ON, the adjacent value will increase and then the valve will turn ON. Increase farther the value, which turns ON the valve by 10% and note it, as it will

be needed later for the controller setting up. Please increase the value with paying proper attention, to not “overlook” the moment of turning ON. Setting the value with excessive reserve may preclude the controller operation or cause unnecessary valve heating. To check the motorized valve polarization, keep the [▲] button touched until the valve turns ON, then blow the air into the hearts receiving tube. If successful, it means the valve is connected correctly.

If everything is OK move to next step, it is reset of settings. To do so, restart the controller, during logo displaying touch the [] button. After the service menu appears select the “Settings reset” and touch the [] button.

The next step should be entering the changes to additional settings available in service menu (point 3.4) and process settings in basic menu (point 4.2). From now on the machine is ready for operation.

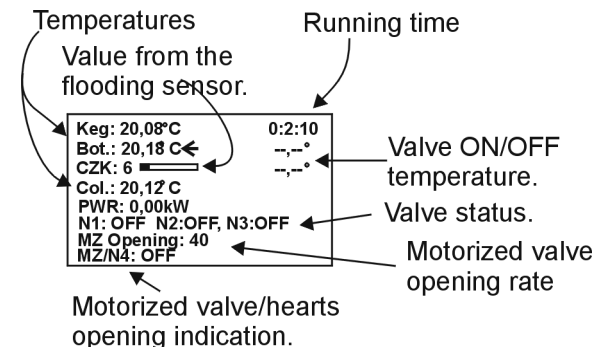
3. SERVICE MENU




This option allows to execute series of operations, which are not necessary during normal use of the equipment. To enter this menu turn ON the controller or touch the [] button for a few second. During logo displaying touch the [] button and wait a few seconds.

Buttons [▲] [▼] change the selected item, to enter the item touch the [] button.


3.1 SEMIAUTOMATIC MODE



Allows to run the process with significant participation of the user. The only automatic operation is interlocking of the MZ and N4 valves responsible for receiving, which are controlled by the “bottom” sensor. At any time the user may change the power value,





opening of the other valves, opening rate of the MZ, interlocking temperature (top value) and receiving origin (bottom value). Changing the MZ opening rate is done similarly as in the automatic mode. If its value is changed and it is open, it will take its new position at the moment of moving to the next parameter with the  button. To verify instantly the position set and eventually to correct it quickly, touch the  button. In this mode, also saving the parameters to SD card is available. Please remember no alarm will appear in case of loosing the communication with the sensor, even is such option if enabled in the controller. To exit this function, reconnect the power supply or keep the  button touched for a few seconds.


3.2 OUTPUTS TEST

In this menu it is possible to verify operation of each output of the controller. Navigation in this menu is looped, to exit it reconnect the power supply or keep the  button touched for a few seconds.


G1, G2 mean heaters, turn them ON with the  button and OFF with the  button. The N1 water valve is controlled the same way.

N2, 3, 4 are low-voltage electrovalves, the button increases their adjacent values. In order to turn the valve ON its values should be set appropriately high. If at the attempt of opening the valve the controller resets or requires a value exceeding 200, it means that given type is inappropriate for operation with this controller. In case of the motorized valve, the  button causes its opening (“+” symbol appears), and the  button closing (“-“ symbol appears). Zero means the valve is stopped.

3.3 SETTINGS RESET

In this option, touching the  button resets all settings to factory settings. Use this option only as the last choice, because it does not wonderfully “cure” the controller and it is not a solution for all the troubles with its operation. On the other hand, it causes necessity to set up all the required parameters again. Most of the troubles usually result from incomprehension of its operation or wrong settings. Reset should be done during first start-up after individual purchase of the controller or after software change (if the controller signals such necessity).

3.4 ADDITIONAL SETTINGS

Here you can change the controller parameters, which are not needed in the basic menu, however are necessary for the controller correct operation. Moving between parameters is done with the  button (it is impossible to come back to the overlooked value). Touching this button at the last parameter in given window, moves you to next window. Passing through all the windows saves the changes and restarts the controller.

3.4.1 DISPLAY

Here you can set up the screen contrast and whether the buttons are to be interlocked after some time of inactivity or not. Disabling the interlock could lead to situation where the controller interprets some disturbance as a button touch.

3.4.2 OUTPUTS SETTING

Operation mode. Gives options between OVM and OLM modes. They differ in the main screen look and the basic menu regarding the settings of hearts receiving (point 4.2.5). In the OVM mode, in the main screen it is possible to set up quickly the MZ valve opening rate. And in the menu (receiving settings) there is a value of the MZ initial opening and its closing step. In the OLM mode, rinsing time with N3 valve, which is to be executed just before hearts receiving, is available in this place.



Heaters control.

G1 modulated, G2 constant. The minimum power value to be set up in the controller is such as the G2 heater power (operating constantly). The entire power control will be done with G1 heater.





G1, G2 modulated. Both heaters turn ON and OFF at the same moment. The mains voltage variations will be more noticeable, but the power could be adjusted in principle from zero.

Both this control methods have one common feature, the controller executes so called group control with control periods of a few seconds. In contrast to phase control, this one eliminate the necessity to use expensive anti-noise filters, ensures good quality of the control, however it might cause light dimming if it is supplied from the same phase as the heaters. “G1 modulated, G2 constant” mode is recommended if the light dimming effect is to be minimized and when the

Valve lock up time	
Actual:	0:00
Previous:	0:00
	0:00
	0:00
Process clock	0:00:00
Pressure:	995,8hPa
Radiator:	23°C

in the file together with the other parameters, indications of the embedded ambient pressure sensor and radiator temperature in the operating part of the controller. Changing between these two screens is done with   buttons (the controller can not be in the editing mode of the upper screen).

4.2 BASIC SETTINGS MENU

Here you can set up the course of the entire process. To enter this menu, touch the  button when one of the mains screens is displayed and it is not in the editing mode. Touching again this button moves you to the main screen. The  button enters the parameter editing, moves to next one, and saves the changes and exits from the editing. If the screen is not in the editing mode,   buttons change the screen displayed.

4.2.1 HEATING UP

Defines the first stage of the process, it is the column heating up. The user has influence on the power of the process running, temperature at the bottom sensor, which turns the water valve (N1) ON and the temperature over which the process moves to flooding mode.

4.2.2 FLOODING

This stage consists of three elements, that can be set up freely. The parameters available include the flooding useful power, heating-up time and pause time, after which next flooding will follow (available in the next window). The idea of such configuration is to better wet the column filling by a multiple flooding, however setting shorter times for each consecutive flooding is to prevent the column over-flooding (each next flooding will be done in shorter time). Pause time and power during the stop allow to decide if the frac-

tions may fall down to the buffer/KEG.

If the column is equipped with the flooding sensor and during flooding the signal exceeds the value set up (point 3.4.6), then the controller terminates further flooding and moves to a pause.

4.2.3 STABILIZATION

Here the user may set up the times and power of the column operation.

4.2.4 HEADS

Heads receiving function by means of the N2 valve is built so as enable multiple heads receiving with additional break for the column stabilization at the end of this stage.

The user has influence on the following parameters:

Power valid for the entire process. **Receiving time** during which the N2 valve is open. **Pause** during which the valve will be closed. **Repetitions**, it is number of receiving/pause cycles. Stabilization, additional time during which the valve will be closed after all cycles and before moving to the next stage. At the end of this stage, the temperature of the day is being established according to which the hearts receiving valves are controlled.

4.2.5 RECEIVING

This menu differs depending on the operation mode (OVM or OLM), the common feature is only the hysteresis of the hearts receiving valve opening/closing.

In OVM mode the parameter of an initial motorized valve opening, and a step reducing consecutive MZ opening is available. Initial opening is also available from the main screen level, if the controller is not in the operation mode. If it is, the changes in the main screen does not effect this parameter. During operation it could be needed to change manually the open-


PROCESS SETTINGS #7


HEARTS. Lock when temperature move for 0,15° above day temp.



**First opening: 20
Step: 5**

4. MAINS SCREEN AND BASIC MENU

These elements are available directly after turning the controller ON, they allow to set up, start and monitor the distillation process.

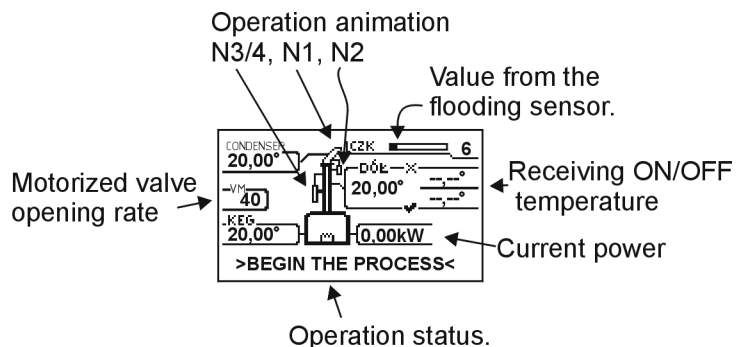
The  button allows navigation between main screens and menus (the controller can not be at this moment in the parameters editing mode).

The  button enters into editing mode, moves to next parameter, and at the end saves the setting and exits from the editing mode. Parameter selected for editing blinks on the screen.

Buttons   change the value of the parameter edited, or rewind the windows, if the controller is in the editing mode.

4.1 MAIN SCREEN, PROCESS START






It consists of two screens. **First of them** presents the column view with the basic operation parameters, such as sensors values, power, valves statuses, current stage performed, etc. In the OVM mode, from this place it is possible to quickly change the MZ opening






rate. If the process is stopped, together with this value also the receiving settings menu will be changed. If the change is done during the process run, then the value in the menu is not changed. It is due to convenience, perhaps it would be changed during hearts receiving, but it is not worthy to set up this parameter every time at the process beginning (usually you start always from the same opening rate). In case of the temperature of the day, the bottom value means beginning point of receiving. The top value makes the receiving to stop and display the total temperature of the day with hysteresis set up in the receiving menu (these values are established automatically before the

origin of the receiving stage). Changing the top value does not result in changing the hysteresis available in the receiving menu.

When the process is stopped, entering the editing mode of this screen gives only the option of process start. Other parameters available in this screen can be changed only after the process is started.

To start the process touch the  button and then the  button. Screen with water test will appear, where you can e.g. verify operation of this system, or prepare it for operation by deaeration, without necessity to search for these options in the controller menu. Performing such a test should become a natural reflex action. Turning the water valve ON/OFF is done with   buttons. To move further, touch the  button – the controller will attempt to make a new file to save the course of operation and the distillation process will be started.

To move to next stage in the process already started or stop it, bring the main screen view by touching the  button until at the very bottom of the display the “START/STOP, NEXT” text begin blinking.

Touch the  button to move to next stage. The  button stops the process. Please bear in mind, that even momentary disturbance of the column operation at a stage close to hearts receiving (e.g. by stopping the process), involves the necessity of re-stabilization, it is starting the operation from this very stage!

Second main screen. It shows information on current and previous valve stopping times during hearts receiving - this information if helpful to establish the column operation status, direction of the changes performed, or simply allows to foresee if the distillation process will end soon. The timer is also available, it starts when the process starts, and the time is saved

minimum power necessary for the column operation is higher then the G2 heater power.

G1, G2 power. The controller indicates the operation power not in percent but in kilowatts (kW). Therefore, to have these indications correct, enter nominal power of particular heaters.

3.4.3 VALVES

Max VM opening. Limits the possibility to set up maximum motorized valve opening (steams flow) in the basic menu.

Min VM opening. Defines the minimum valve opening.

Both these values should be matched experimentally (if not provided by the column manufacturer). The maximum value could be recognized from the fact, that further opening of the valve does not result in increase steams flow/ hearts receiving. Operation in this range is unbeneficial because despite reduction of the opening rate by the controller, receiving would be still at the same level what in turn would quickly lead to destabilization of the column.

Minimum setting should be adjusted so the flow would be at low but distinct value. Bringing to a situation where the controller recognizes the valve as open but physically there is no flow would lead to the column hang-up. It will be impossible to move from hearts receiving to heads receiving or to process end.

N2, N3, N4 PWM parameters define power supply of respective valves. Please enter here the values established during first start-up (point 2).

3.4.4 TEMPERATURE OF THE DAY CORRECTION

Depending on the needs, the controller itself can correct the established temperature of the day, regarding which the hearts receiving is controlled. Two elements re available here:

Correction after particular time. After particular time of the hearts receiving, it allows to shift the valve operating point.

Correction from the pressure. Setting “YES” enables the controller to correct the temperature of the day according to changes of the ambient pressure.

3.4.5 ALARMS FROM THE SENSORS

Alarm from the sensors. Checking respective name makes the controller to react on the sensor loss during the process run. In such case, respective message and audible signal will appear. Then the user has tens of seconds to react (e.g. connect the sensor, or cancel the error), otherwise the process will be terminated.

In case of checking the flooding sensor, when new flooding is detected at later stage then flooding stage, respective message will be displayed. In such case, cancel the message, reduce heaters power or undertake other measures.

Head sensor as...Setting it as the head sensor, only makes it to get respective name in the main screen. In such case it does not have any additional functionality but temperature indication.

Setting it as the “Cooler sensor”, gives it besides different name also protection function in case of cooling water shortage. There is also possibility to set up the temperature, over which an alarm will appear.

3.4.6 INDICATIONS CORRECTION

Here, if required, it is possible to correct sensors indications. Also “**Flooding threshold**” parameter is available. It allows to establish what value from the flooding sensor has to cause shifting from flooding stage to pause, and eventually to activate the alarm of secondary flooding at the later stages.

