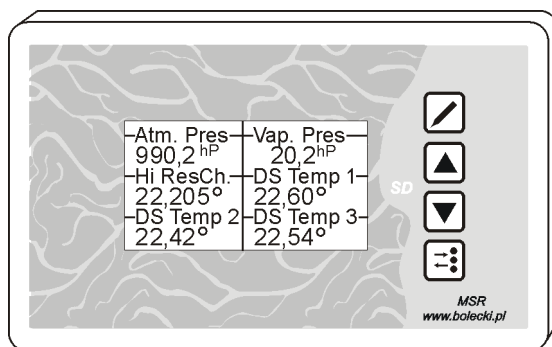


User's manual for „MSR” controller from version 1.30 and for MSR-W version 1.03.
Please read this manual before starting operation of the controller.



MSR controller is designed for 6-point temperature measurement, ambient pressure measurement, positive difference of pressures in two points and for heating element control. For each measuring point it is possible to define upper and lower alarm points, enable trouble signalization with given sensor, and give them user-friendly 8-digit names. SD card makes it possible to archive operation parameters at define interval and to upgrade the software.

The equipment is supplied with 5V from such sources like USB port, phone battery charger, power bank or brand-e operating part (MSR-W). Thanks to possibility to supply the unit from power bank and due to low energy consumption (~250mW), it is possible to operate the equipment for several hours in places with no mains.

Operating module MSR-W is both the operating element for heater control as well as power supply for the control panel. It has embedded temperature sensor, own enclosure and it is designed for installation on the heater and the tank. Thanks to it, the user obtains a function of power controller with automatic heater shut-down if one of the temperature sensors exceeds the value set up. (E.g. during distillation: excessive temperature in the cooler or the KEG). The heater is controlled by group mode, with intervals of a few seconds. It means that 50% setting results in turning the heater ON and OFF for the same periods of time. This operating part has got also a jumper, for selection by the user of two heater operation modes:

1. Jumper set to "00" – Both heaters turn ON/OFF at the same time.
2. Jumper set to "01" – One heater operating in cycles makes continuous operation of the other one. This one will be shut down 5 seconds after the final shut down of the first heater.

Maximum current of each channel is 10A, it equals to 4kW power at 400V or 2.3 kW at 230V. The operating part enclosure makes it also possible to perform the necessary electrical connections, and thanks to the embedded fan provides necessary cooling for the heater control relay. Additionally, this version is protected with temperature sensor. If the radiator temperature exceeds 80oC, the control panels shuts down the heaters and moves into alarm mode.

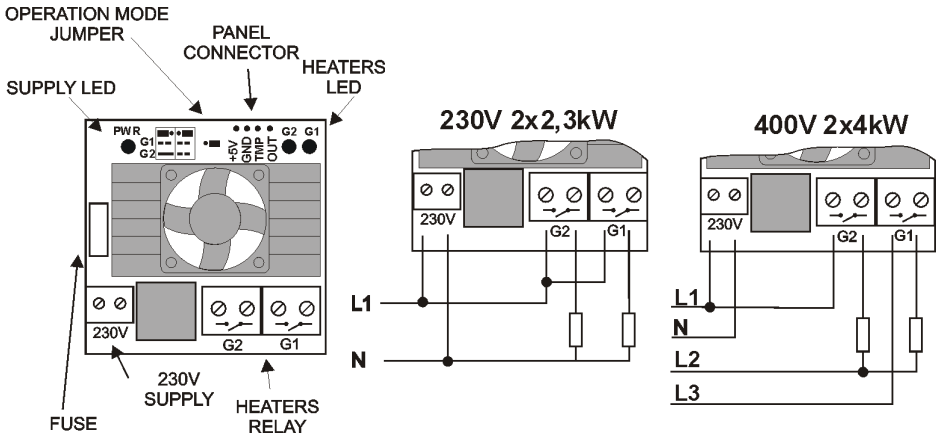
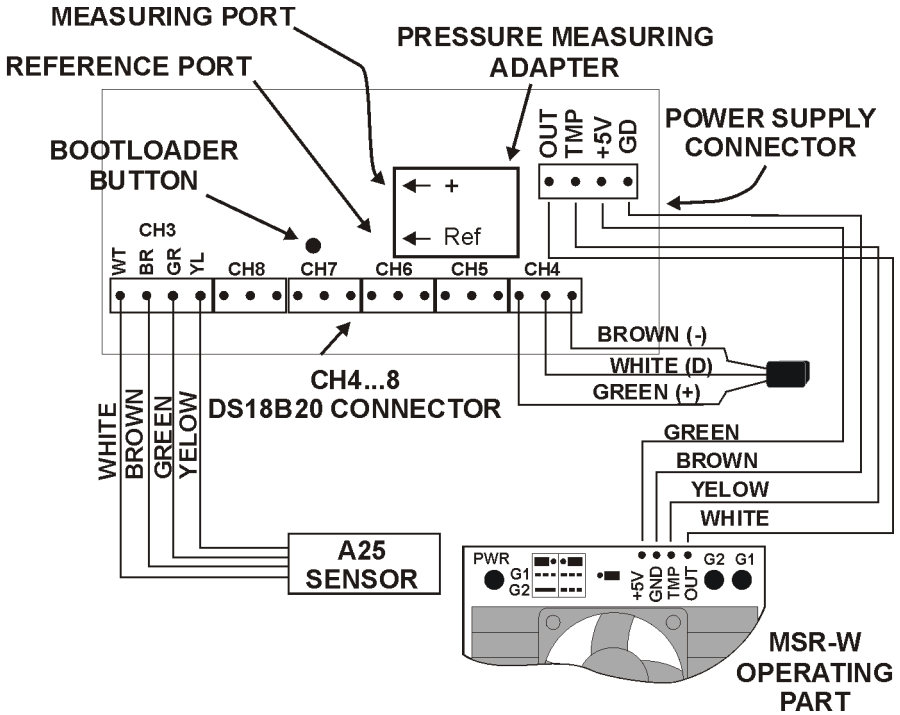
MSR panel parameters

Supply voltage:.....	5V ±0.2V
Average current consumption:.....	<50mA
Temperature measurement range:.....	-30...105oC
Resolution for DS18B20:.....	0.01oC (interpolated)
Resolution / precision for A25:.....	0.001oC (interpolated) / 1oC
Range / resolution / precision for additional pressure:.....	+300hPa in reference to port REF / 0.1hPa / ±2hPA
Operation conditions:....	-5...40oC, 95% RH without condensation water.

Operating part parameters

Electronics supply voltage:.....	230VAC ±10%
Heater supply:.....	max 400VAC / 10A

1. ELECTRICAL CONNECTIONS



1.1 SUPPLY VOLTAGE

The equipment power supply should be applied to 2-pin connector designated as GD/+5V. The voltage should be stabilized and noise-free. Poor power supply could impact adversely the indication quality. Negative cable should be connected to “GD” terminal and positive to “+5V” terminal. In case of using USB cable, make sure to connect red wire to +5V and black to GD, do not connect the other wires and insulate them.

In case of using the branded MSR-W operating part, connect it according to diagram presented in previous page. The mains supply (230V), that is necessary for the MSR operation, should be applied to “230V” connector. The fuse seen in the board protects only this circuit (it is not the heater fuse).

The heater could be supplied with 230V or 400V AC power, G1/G2 connector should be treated as a breaker connected in series. If the heater is supplied from one phase, it should be applied just to this connector.

Control panel should be connected with the operating part as follows, any mistake most likely would lead to failure not covered with warranty. Before making connection, verify the wires colors with respective designations:

- GD – Brown
- +5V – Green
- TMP (radiator temperature measurement) – Yellow
- OUT (heater control output) – White

This version of the operating part has got radiator temperature protection, however it is strictly forbidden to cover ventilation openings during operation. It is also forbidden to use the equipment with removed or damaged enclosure, damaged cables or if there is even suspicion it may function incorrectly.

1.2 TEMPERATURE SENSORS

Six DS18B20 sensors and one A25 bolecki-brand-ed sensor should be connected to this equipment. Their physical resolution is 0.06°C and 0.003°C respectively. MSR interpolates this values to 0.01°C and 0.001°C.

DS18B20 sensors should be connected to CH4...8 inputs, where:

- ground**=GD (brown)
- data terminal**=DT (white)
- supply**=V (green)

The colors in parentheses apply to sensors provided by bolecki.pl

A25 high-resolution sensor should be connected to 4-pin CH3 connector, where:

- Wt= white
- Br=brown
- Gr=green
- Yl=yellow.

Please remember that measurements of such a high resolution could be impacted also by temperature changes affecting the sensor cable. In some cases it would turn out necessary to insulate thermally a part of the cable in the sensor vicinity.

1.3 PRESSURE MEASUREMENTN ADAPTER

Install the adapter only if the equipment is OFF, otherwise its indications could be erratic. There are two pressure sensors inside it. First of them occupies “channel 1” of the equipment and measures ambient pressure. It has not got its own port, its lifetime for the dedicated conditions in principle is infinite. An indication displayed is absolute, it means such as registered without reference to altitude above the sea level. Usually, such indication is lower then the values from weather forecasts or stations, which take into account the altitude of the land above the sea level.

The other sensor (channel 2) has got two ports and measures the positive difference between “+” and “REF” ports. This sensor does not measure negative values (REF higher then +), in such an instance 0 would be displayed. In case of distillation columns, usually pressure in the column is measured in reference to ambient pressure, therefore the “REF” port should be left open “to atmosphere”. The module is calibrated with temperatures and it is not recommend-ed to apply to it a medium of temperature exceeding 50oC, above this value the error could be 2% of maximum range. Temperature of the medium could be seen in the channel 2 settings.


The sensor is made so as the steams, which are not aggressive for electronics and their connections,



could condensate on it. Planning longer module inactivity, being sure it was flooded (drops of condensate in the tube), it is recommended to put the sensor in warm and dry place, it will surely extend its lifetime. The module is not repairable, i.e. defect of one of the sensors requires to replace the entire module.


2. USE

MSR has got buttons that detect approaching finger, it is not needed to push them. After tens of seconds of inactivity the buttons are interlocked, any attempt to touch the button would display the screen presented on the side. To unlock the button, slide the finger along the buttons from top to bottom.



The  button enters into editing mode, moves to next parameter. Touching it at the last parameter, saves the changes and exits from the editing mode. When changing the value it is impossible to enter/exit the menu.

Buttons   change the main screens, navigate in the menu or change values of the parameter edited. To change the parameter quickly, keep the button touched – every few seconds the changes will speed up in cycles (x10 or x100).

The  button moves between the main screens and the menus. It operates only if the controller is not in parameters editing mode.

2.1 MAIN SCREENS

The operation view is divided in two groups: parameters view and event screen.





By default, after turning ON first **main screen (indications)** appears, with 6 optional values measured. The selection is done in point 2.2.3. The second screen is of identical functionality. Such disposition

Top	Cooler
21,93°	22,32°
Bottom	Head
22,20°	22,620°
Keg	Heater
22,42°	3,00 ^{kW} / _{ON}

is useful if number of parameters to be watched exceeds 6, and it is necessary to view many values conveniently.

The screens mentioned include: name assigned to given sensor, its value (“---“ if not detected), blinking symbol if its indication is out of the limits. In such instance there will appear:

“H” if the value exceeds the upper threshold, “L” if below the low threshold or “!” if verification of this sensor is enabled but the equipment lost contact with it.

When **heater output** is pulled out to the main screen, it would be possible to change the heating power from this place. To do so, touch the  button, then set the require value with   buttons and confirm with  button. Power is always indicated in kW, with symbols informing the heater operation status: ON or TEMP. the “TEMP” symbol appears when the heater operation is blocked due to (even momentary) alarm H on the sensors at channel 4 or 8, otherwise symbol “ON” appears. To unlock the heater operation to ON status, restart the equipment or cancel the interlock (point 2.2.2).





Third screen is the **event screen**. Thanks to this screen you can instantly find out what event caused the alarm. It includes 7 lines, each of them encloses information on one event. You can see there a name assigned to given sensor, kind of event:

- Hi-high value exceeded
- Lo-below low value
- Er- connection with the sensor lost
- OK-normal value or correct connection restored.

Cooler Lo	15min
START	20min

And, at the end of the line there is a time that elapsed from the event occurrence. First entry (START) always appears after turning the equipment ON. Any new entry to this list automatically switches the display to the event screen, also periodical sound signal comes out (if the cause is different then “OK”). The screen will not be changed automatically if the equipment displays menu items. First touch of any button, after their unlocking, cancels sound signal for current event list, and only the next touch results in appropriate reaction.

2.2 MENU SCREENS






Here you can set up the entire equipment operation. Moving from the mains screens to the menu is possible with a touch of the  button, touching it again brings you back to the previously displayed main screen. Navigation within this menu is done with the   buttons, to enter and exit the editing of displayed parameters use the  button.

2.2.1 PRESSURE AND TEMPERATURE SETTINGS

Screens for these settings are identical, therefore they will be described in general.

There is the screen title at the top "Channel 1...8" referring to physical places where given sensor is connected.

CHANNEL 1
Name: Atm Pres. Alarm over: 1200,0hPa Alarm below: 900,0hPa Failure check: Yes Offset: 0,0hPa
CHANNEL 3
Name: Head Alarm over: 105,00 ° Alarm below: 98,00° Failure check: Yes Offset: 0,00°


NAME: The user may assign user-friendly 8-character name to given sensor. Touch the  button in order to enter the parameters editing. The character to be selected with the   buttons. The  button moves one place to the left. To move to next parameter, touch the  button. The name entered here will be shown in the main screens, event list and SD card logs.

Alarm if >: exceeding this threshold will activate an alarm. "H" letter will appear next to the value from the sensor in the mains screen (indications), respective message will be also added to the event list.

Alarm if <: decrease below this value will activate an alarm. "L" letter will appear next to the value from the sensor in the mains screen (indications), respective message will be also added to the event list.

Sensor verification: set "YES" if information should appear in case of problems with given sensor. If given sensor is not connected, set "NO".

Offset. Thanks to it you can shift sensor indication by a setpoint. In case of the medium pressure

sensor, touching the  button here results in such offset setting that current indication is zeroed (this process takes a few seconds and the value displayed does not mean correction in hPa). Additionally, also temperature of its interior is displayed.

2.2.2 OUTPUT

This screen includes a few settings related with the heater control output.


OUTPUT 1
Name: Heater Rated power: 3,5kW Default Power: OFF. State: ON (clear) Tmp. Rad: 28 (ON)

Name: the text entered will appear in the main screen window.

Rated power: enter the factory heater power, later power change will be done based on this parameter. Indications of the current power set-up will be incorrect if the operating part is set to " " mode (first heater continuous, second one modulated).

Default status: allows to define the equipment operation after turning it ON. You can select the heater OFF, heater ON with last power used or with set-point power level.

Status: informs if the heater in is operation mode (ON) or blocked (TEMP) due to H alarm at output 4 or 8. Please remember ON symbol does not mean physical voltage presence at the heater. It will also appear if the heater is set to 0kW.

Cancel: when this parameter blinks, touching the  button cancels the heater interlocking caused by the H alarm. If in spite of it, the heater is blocked again, in means one of the sensors is still in alarm mode.

Tmp Rad: Indicates current radiator temperature in the operating part. In case of missing sensor or problems with sensor, instead of temperature value, "- -" symbol will appear. Further symbol ON/OFF informs if the controller is to verify the errors related with this sensor. Setting to ON results in shutting down the heater if the indications are incorrect or exceed 85°C. To unlock the heaters operation, use the above „Cancel" option (after the cause of their interlocking disappears).

Change of the heater power is done from the main screen level, where the heater shortcut was cre-

ated. This operation is explained in the main screen description (point 2.1).

2.2.3 SCREEN SPLIT

Here you can select in which place of the first or second main screen (values), information on the sensor should appear.

SCREEN ARRANGEMENT		
1	Top Bottom Keg	Cooler Head Heater
2	Atm. Pr. Bottom Keg	Ins. Pr Head Heater

2.2.4 DATA LOG

The memory card slot is in the upper part of the enclosure, properly inserted card does not protrude the equipment edge and it could be difficult to remove it. Therefore, it is recommended to stick a short piece of tape to the card end. The equipment allows to save the sensors values to memory card - SD / Micro SD with adapter. It creates LOG.txt file with ascending number in its name, the file creation date is random. Content of the file is arranged so as it could be easily imported e.g. into calculation sheet. Besides the sensor value, each line includes the name created for given sensor and the time of adding this log. This time is also visible at the bottom of this screen, that is why it is easier to analyze what changes has happened after some particular event.

There is no guarantee this equipment will support correctly any memory card. The card should be formatted with FAT32 file system and its capacity should not exceed 32GB. The baud rate depends on the card type and number / size of the files saved to it. When MSR handles the card, the SD icon between the display and the buttons is ON. If it takes distinctly long time, the card should be cleared. In some instances, the equipment

may request to clear (format) the card before entering new logs. Handling the card is temporary suspended when the user touches some button. Status of the LOCK switch, on the card casing, putting the card into read-only mode, is not taken into account. It is forbidden to move the card or remove it from the equipment,

DATA LOGGER
Card status: No Card Log status: OFF. Start delay: 60sec. Interval: 5sec. 00:04:20.

if the saving process is started. It could damage the file or terminate the equipment operation.

Card status: if detected successfully, "In connector" will appear.

Operation status: informs whether saving to the card is ON or OFF. Every time "ON" is set, a new file will be created. When attempting to remove the card or to switch the equipment OFF, this parameter should be switched to "OFF", in order to reduce the risk of damaging and thus losing the file. Removing the card when the SD icon is ON, surely will damage the file, and in worst case the equipment would restart. Status of this parameter is kept after the power supply is OFF, in case of its momentary decay, the equipment start to save the data itself.

Delay after ON: Thanks to suitable setting of this parameter, no short and not needed files will appear on the card. Saving will begin after the time set here elapses from turning the equipment ON.

Interval: Time interval between previous and next entry to the same file.

2.2.5 ADDITIONAL SETTINGS

Currently, you can select here only language options (Polish/English).

MAIN SCREEN

MENU SCREEN

SUPPLY
TURN ON



LOGO

MSR v1.30



Top 21,93°	Cooler 22,32°
Bottom 22,20°	Head 22,620°
Keg 22,42°	Heater 3,00 <small>kW ON</small>



Atm. Pr. 990,2 hP	Ins. Pr. 20,2 hP
Bottom. 22,20°	Head 22,620°
Keg 22,42°	Heater 3,00 <small>kW ON</small>



Cooler Lo START	15min 20min
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CHANNEL 1

Name: Atm Pres.
Alarm over: 1200.0hPa
Alarm below: 900.0hPa
Faliure check: Yes
Offset: 0,0hPa



KANAL 2

Name Vap. Pres.
Alarm over: 25.0hPa
Alarm below : 0.0hPa
Faliure check Yes
Zero 0,0h
Sensor Temp.: 33.2 °



CHANNEL 3

Name: Head
Alarm over: 105,00 °
Alarm below: 98,00°
Faliure check: Yes
Offset: 0,00°



CHANNEL 4

Name: Head
Alarm over: 105,00 °
Alarm below: 98,00°
Faliure check: Yes
Offset: 0,00°



CHANNEL 5

Name: Bottom
Alarm over: 105,00 °
Alarm below: 98,00°
Faliure check: Yes
Offset: 0,00°



CHANNEL 6

Name: Head
Alarm over: 105,00 °
Alarm below: 98,00°
Faliure check: Yes
Offset: 0,00°



ADDITIONAL SETTINGS

Język/Language: PL



DATA LOGGER

Card status: No Card
Log status: OFF.
Start delay: 60sec.
Interval: 5sec.
00:04:20.



SCREEN ARRANGEMENT

1	Top Bottom Keg	Cooler Head Heater
2	Atm. Pres. Bottom Keg	Vap. Pres. Head Heater



OUTPUT 1

Name: Heater
Rated power: 3,5kW
Default Power: OFF.
State: ON (clear)
Tmp. Rad: 28 (ON)



CHANNEL 8

Name: Cooler
Alarm over: 90,00°
Alarm below: 40,00°
Faliure check: Yes
Offset: 0,00°



CHANNEL 7

Name: Water
Alarm over: 55,00°
Alarm below: 40,00°
Faliure check: Yes
Offset: 0,00°

3. SOFTWARE UPGRADE

Upgrading should be done always in the following sequence:

- Save the file with software to be installed in the equipment on the memory card (the file can not be placed in any folder).

- Verify and possibly change the file name to S_MSR (or S_MSR.hex, if your system shows also extensions).

- With the power supply turned OFF, insert the card into the controller. Turn the controller ON with the BOOT button at its back depressed or during operation hold it pressed for a few seconds. The SD icon on the controller will first blink quickly, and then slowly. If the upgrading is successful, the controller will restart itself with the new software version. If, instead the SD LED begin regular blinking it means failure.

Number of blinks responds to particular cause of the failure:

- 2: problem with the card, try to format it correctly or use another one.

- 3: the expected file is not detected.

- 4-6: problem with contents of the file (e.g. damaged).

At any problems with the memory card, the first operation should be formatting the FAT32 sub-system files. Correct upgrading process (software downloading from the card) takes about 10 seconds.

4. RISKS / INFORMATION FOR USERS

- Battery is not supplied with the equipment. Please get familiar with the battery manual and its safe operation.

- Electrical connections should be done in accordance with the law provisions by a person with suitable authorizations. Use wires that are suitable for the voltages and loads present.

- In case of the equipment power supply from the 230V mains, please be aware of the risk of electric shock and fire. Especially, it is forbidden to use the equipment with cables damaged, removed or damaged enclosure, without suitable grounding or if any of its elements does not function correctly.

- The operating part is cooled with embedded fan without thermal protection. It is strictly forbidden to use the equipment with the ventilation openings covered or with cooling hindered somehow.

- The equipment can not be used without supervision or under supervision of persons who do not know how to use it correctly. To avoid any unpleasant events or accidents, the user's manual should be easily accessible.

- Do not use the equipment for the purpose, where its operation could cause a loss.

- Disregard of the above principles could cause such events as the equipment damage, electric shock, fire.

Symbol of crossed out basket placed on the products or documentation enclosed with them, informs the product must not be disposed to the standard waste containers. The user is obliged (under a penalty) to transfer the non-operational devices to specialized collecting point in order to recycle the wastes from electrical and electronic devices, where the device will be taken back free of charge. By ensuring proper disposal you help to protect the environment. In order to obtain more detail information on recycling of this product please contact local authority representative, the waste disposal service provider or a store where such products are sold.

DECLARATION OF CONFORMITY

Firma Bolecki seated in Kęty, declares with full responsibility that the MSR product together with the factory sensors and MSR-W operating part 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. Date of granting the CE mark: 01-2017.

Manufacturer data:

Firma Bolecki
ul. Żwirki i Wigury 24
32-650 Kety
Poland
forum.bolecki.pl
office@bolecki.pl

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WARRANTY CARD

Equipment name: msr

Serial number..... Sales date, stamp

Warranty terms:

- The manufacturer warrants correct operation of the equipment within a period of 24 months from the purchasing date. Warranty period for the MSR-P is 6 months from the purchasing date.
- 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.

Contact data	Defect description