SERVICE OPERATING MANUAL FOR INDEPENDENT CONTROL UNIT

GHC201.07
GHC201.08

Version for cooling and heating appliances

For software version 03A

You are kindly asked to study instructions carefully before connecting and starting up each of our appliances. If you have any doubts, please contact us from 8.00 till 16.00. Any remarks sent to us by e-mail shall be a valuable help.

Table of contents:

I.   GENERAL CHARACTERISTICS

WARNING!!! Since this manual applies to two controllers with the same principle of operation, but difference in the number of relay outputs, in the following part we will refer to the name of only a more complex regulator GHC201.08.

Independent Control Unit called further **GHC201** is a modern, comfortable and easy to operate appliance. It was produced using microprocessor technology and automatic surface assembly.

GHC201.08 has two thermostats. Each of them can used for heating or cooling or one can be used as a universal heating-cooling thermostat.

GHC201 has the ability to select work with one or two temperature sensors and has two relay outputs enabling direct connection for devices operating at 230V with load capacity in accordance with Table 1.

In the GHC201.08 controller there is possibility to define function of every output. Thanks to this feature the device is very easy to suit depending on its application. The controller can be used for instance: there, where one need to turn one heater on, as well as there, where one need to control heating and cooling independently or where one need to control only cooling.

The controller is equipped with sound signaling as standard, which activates when any button is pressed on the keypad and when an alarm occurs.

In order to provide the user with the comfort of using the controller, capacitive (touch) buttons were used in the keyboard.

This thermostat does not require special maintenance; the keyboard was made from a special type of foil resistant to high temperature and most chemicals. It is not permitted to clean it with sharp objects. It is sufficient to clean the front plate with a wet cloth from time to time.

II.   METHOD OF MARKING AND TECHNICAL DATA

Model: **GHC201.0X**

0X – number indicating the version of the controller

07 – one-relay version of controller

08 – two-relay version of controller

Operating Voltage	230V AC +10% -15%
Enviroinment Temperature	od +5°C do +40°C
Humidity	od 20% do 80% RH
Protection Level	IP65 Front side of control panel
Sensors type	NTC 2,2kΩ - range: from -40^{0}C to +60^{0}C

Tabela 1: Marking of transformers and carrying capacity of outlets

Wyjście	Obciążalność	
P1 – Uniwersal	4A	750W
P2 – Uniwersal	2A	450W

Uwaga !!!

- **Total power consumed at once by appliances must not exceed 10A !!!**

III.   HOW TO ORDER

In the order you have to give the full name of the controller in accordance with the marking defined in 'II'

For example.:

GHC201.07   one-relay thermostat
GHC201.08   two-relay thermostat

Additionally you need to give a number and a length of temperature sensors . Standard length of sensors: 2,5m and 3,0m.

IV.   INSTALLATION AND CONNECTION OF GHC201.08

1. Cut a hole with dimensions 28x70 mm in the appliance in the place marked accordingly.

2. All metal elements through which GHC201 or its cables are put should be filed or protected otherwise. I is not permitted to fix GHC201 in a way which allows direct contact with water (e.g. condensing water on the lower cover of the display), touching of evaporator outlet pipe etc. and causes considerable changes of its temperature in comparison with air temperature (e.g. fixing in direct vicinity of the compressor and its accessories, cooling and heated elements).

3. When GHC201.08 is fixed, power cables should be connected in accordance with the description on the casing. In the case of versions GHC201.07 with one relay, the output of the other relay will be unused - it will be marked with a cross on the label with the description - **no wires should be connected to these outputs !!!**

4. Connectors have certification for permanent load 16A !!! They are provided with fine thread and special plates preventing cutting of cables, therefore, when lightly screwed together they will have maximally good contact and if more force is applied, it may damage the thread. *In result the socket may be melted and there might be a short circuit!!!*

5. The whole unnecessary length of cables is shortened by cutting or winding and clipping together by special plastic bands. Cable have to be well-fastened along their whole length and may not touch the compressor and its accessories.

6. If there are heaters, their voltage has to be chosen in such a way that if there is a breakdown of GC201.08 or of an external contactor and they are switched off permanently, there will be no possibility of fire or destruction of the appliance. **If high power heaters are used, safety thermostat must be used on the evaporator unconditionally.** *This thermostat should operate on a different basis, e.g. a mechanical thermostat.*

REPAIR OR CONNECTIONS CAN BE PERFORMED ONLY WITH DISCONNECTED POWER !!!

V.   INSTALLATION OF SENSORS

1. For *every* type of the cooling unit the place of fixing of chamber and evaporator sensor and setting of system parameters GHC201 should be chosen *through experimentation*.

1. **Sensor cables** can be shortened or lengthened in any way according to the following rules:

   - Cable sensor should not be cut at a distance below 0.5 m from the shell

   - It **is not** recommended to lengthen sensor cable above 20 m.

   - SENSOR CABLES CAN BE CONNECTED TO SENSOR CLAMPS IN THE OPERATING UNIT IN ANY WAY!!! (similarly to the method of plugging of the plug in the socket ~230V)

   - cable OMY 2x0.5 mm is recommended for cable lengthening,

   - if cables are lengthened their connection should be done very carefully, every pair of veins should be soldered and heat-shrinking sheaths should be put on them. Then the place of connection should be filled with water-resistant silicone and one more heat-shrinking sheath should be put on..

   - endings of cable connected to the independent control unit should be tinned.

VI.   OPERATION METHOD

A – General Information

1. When the unit is connected to mains a start procedure takes place after which a short signal of buzzer is given and three dots appear for a second on the display, then version of controller's program, and three dots one more time. At that time none of controlled units is switched on. During a test procedure it is better not to touch any of sensors because they are calibrated.
   Touching buttons while test procedure is taken may result in incorrect work of keyboard! In this case you need to disconnect and connect controlled again to power supply.

2. When a test procedure is finished display shows 3 horizontal dashes informing that controller is operated under voltage - if the device has not been turned on before !!! Turning GHC201 on and off take place when you press and hold ⏻ button for 5 seconds. When you hold down the button, a rising sound signal is generated. Temperature from one os sensors (check 'r7' parameter) is displayed.

Controller signals pressing each button by buzzer signal. When controller is switched of the buzzes signals only pressing ⏻ button.

3. Switching on the P1 relay is indicated by a dot on the z display marked with reference number 1. Switching on the relay P2 is signaled by lighting the dot on the display with reference number 2.

B – Functional description of control blocks:

Block 1 controls the devices based on measurements from the sensor 1. There are two types of regulation selected using the 'r5' parameter.

If the parameter **'r5'** has been set to 1, the controller controls the heating and cooling of block 1 separately. The adjustment method is shown in Figure 1:
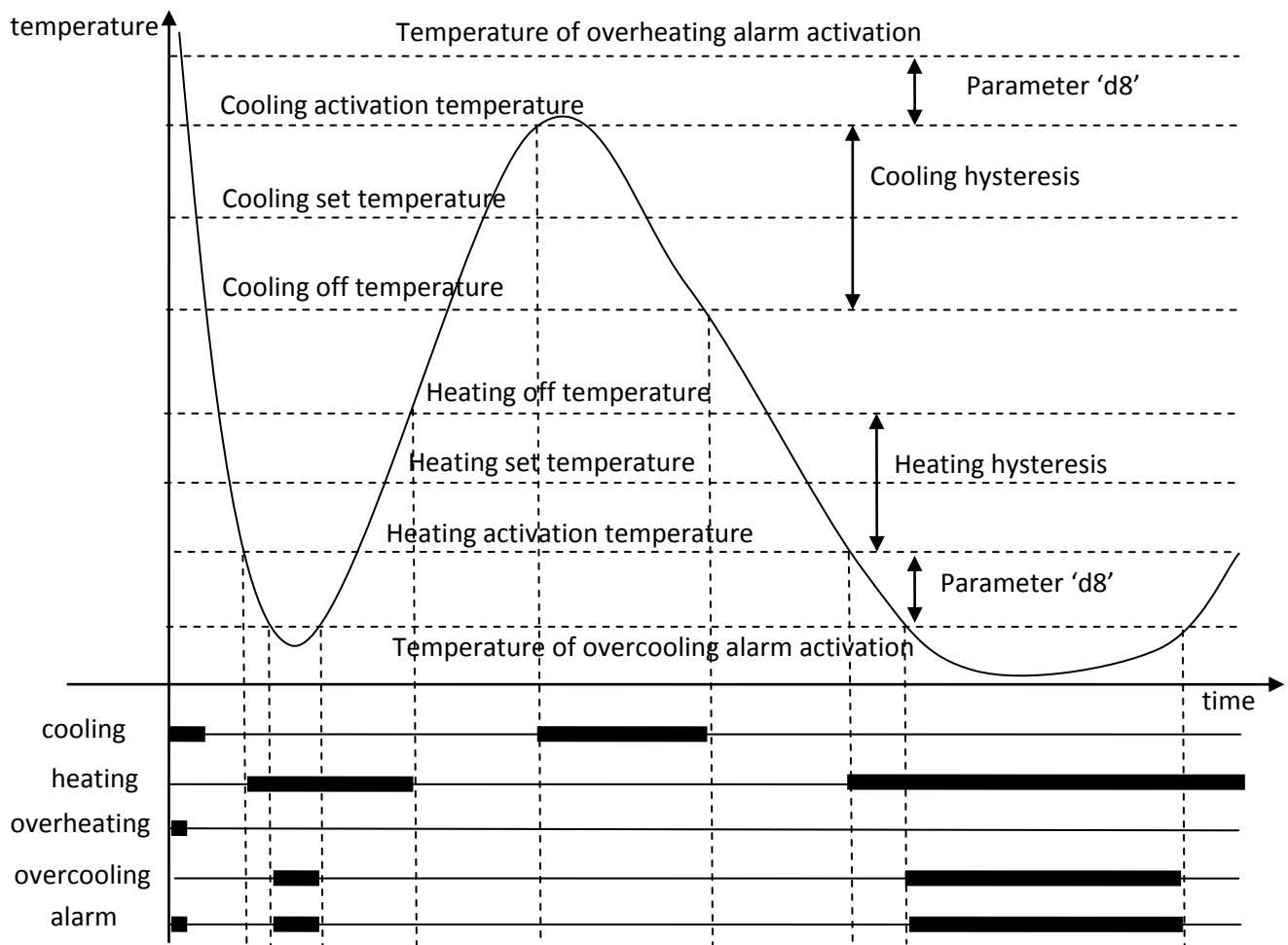
Fig 1. Principle of controlling the relays by the control block in "cooling and heating given separately" - thick line means switching the relay on

'Heating set temperature' is set by the user as parameter 'u1', in range of 'd0' - 'd1-1' (factory setting u1=2).
   'Heating activation temperature' is calculated as 'u1' – value of heating hysteresis 'd2'.
   'Heating off temperature' is calculated as 'u1' + value of heating hysteresis 'd2'.

'Cooling set temperature' is set by the user as parameter 'u2' *in range of* 'u1+1'- 'd1' (factory setting u2=4).
   'Cooling activation temperature' is calculated as 'u2' + value of cooling hysteresis 'd3'.
   'Cooling off temperature' is calculated as 'u2' - value of cooling hysteresis 'd3'.

   If the parameter **'r5'** has been set to 2, the controller controls heating and cooling (in the same range) of block 1. The adjustment method is shown in figure 2:
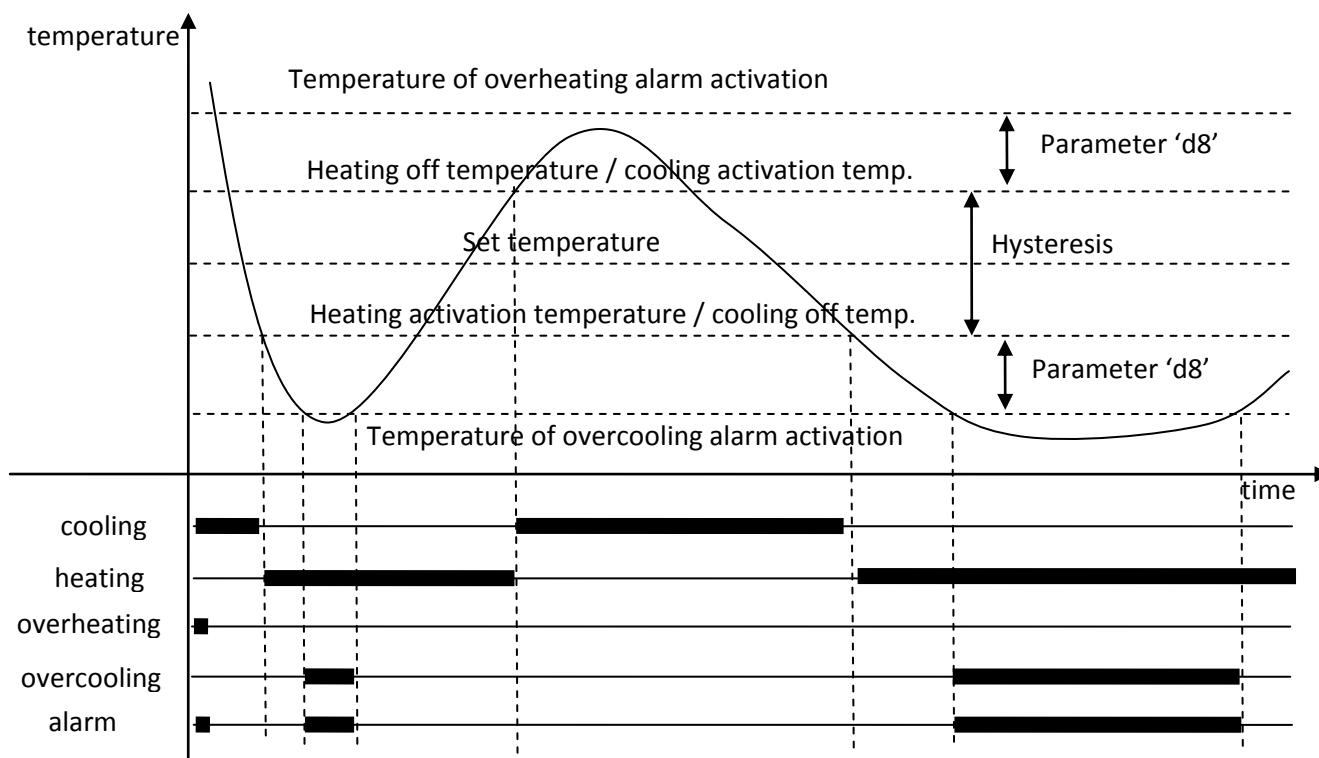
Fig 2. Principle of controlling the relays by the control block in "cooling and heating in the same range" - thick line means switching the relay on

'*Set temperature*' is given by user as 'u1' parameter, in range of 'd0' - 'd1-1' (factory setting: u1=2).
   '*Heating activation temperature / cooling off temp.*' is calculated as 'u1' – value of hysteresis 'd2'.
   '*Heating off temperature / cooling activation temp.*' is calculated as 'u1' + value of hysteresis 'd2'.

The cooling relay is switched on when the following conditions are met:

• *'temperature 1'* is equal to or greater than the 'cooling activation temperature'.
• after the time 'c2' has elapsed since the last cooling shutdown.
• The heating relay is turned off
• after the time 'c2' has elapsed since the power was turned on. *
• after the time 'c6' has elapsed - if the 'c5' parameter has been protected - the maximum working time*

[*]After turning on the controller with ⏻ button, cooling activation time is reduced to:
        - 5 seconds, while 'c2' is different than zero,
        - 0, when 'c2' is zero,

It is made to enable service technicians to quickly switch on the cooling.

The heating relay is switched on when the following conditions are met:

'temperature 1' is equal or smaller than the *'heating activation temperature'*.
- Cooling relay is switched off.

Block 2 is the same as block 1 but it can be turned off ('r6'=0).
Analogous to the description of block 1, if 'r6' = 1 (cooling and heating controlled separately):
The adjustment method is shown in figure 1.

'Heating set temperature' is set by the user by 'u3' parameter, in range of
'd0' - 'd1-1' (factory setting: u3=2).
  'Heating activation temperature' is calculated as 'u3' – value of heating hysteresis 'd5'.
  'Heating off temperature' is calculated as 'u3' + value of heating hysteresis grzania 'd5'.

'Cooling activation temperature' is set by the user by 'u4' parameter, in range of 'u3+1'- 'd1' (factory setting: u4=4).
  'Cooling activation temperature' is calculated as 'u4' + value of cooling hysteresis 'd6'.
  'Cooling off temperature' is calculated as 'u4' - value of cooling hysteresis 'd6'.

If **'r6' = 2** (cooling and heating control in the same range):
The adjustment method is shown in figure 2.

'Set temperature' is set by the user as a 'u3' parameter, in range of 'd0' - 'd1-1' (factory setting: u3=2).
  'Heating activation temperature / cooling off temp.' is calculated as 'u3' – value of hysteresis 'd5'.
  'Heating off temperature / cooling activation temp.' is calculated as 'u3' + value of hysteresis 'd5'.

The cooling relay is switched on when the following conditions are met:
- *'temperature 2'* is equal to or greater than the *'heating activation temperature'*.
- after the time 'c2' has elapsed since the last cooling shutdown.
- The heating relay is turned off
- after the time 'c2' has elapsed since the power was turned on. *
- after the time 'c6' has elapsed - if the 'c5' parameter has been protected - the maximum working time*

[*]After turning on the controller with ⏻ button, cooling activation time is reduced to:
  - 5 seconds, while 'c2' is different than zero,
  - 0, when 'c2' is zero,

It is made to enable service technicians to quickly switch on the cooling.

The heating relay is switched on when the following conditions are met:

- *'temperature 2'* is equal or smaller than the *'heating activation temperature'*.
- Cooling relay is switched off.

C – Programming relays functions

1. Controller has two relays, each of them can be configured independently.
2. Each relay has own parameter which decide about its application.
3. It is not allowed to assign the same function for two relays because only one is supported at the same time.
4. Relay P1 was assigned with r2 parameter.
5. Relay P2 was assigned with r1 parameter.
6. Relays can be assigned with following functions:
   - 0- Unused
   - 1- Block 1 cooling
   - 2- Block 1 heating
   - 3- Overheating alarm for block 1
   - 4- Overcooling alarm for block 1
   - 5- Block alarm (any block)
   - 6- Block 2 cooling
   - 7- Block 2 heating
   - 8- Overheating alarm for block 2
   - 9- Overcooling alarm for block 2
   - 10- any alarm – block 2

   Each relay can be controlled by block 1 or block 2.

7. Function programming is available from the Service Parameters Programming level.
8. Relays should be (look at point 1).
9. There is a possibility not to connect any relay to block – the block serves as a thermometer then.

D – Programming of user parameters

1. To switch on parameters programming mode button 🅿 has to be pressed. After that a diode on a 🅿 button is lighted, it means programming mode is active. For a second name of parameter 'u1' will appear on the display and then the value of this parameter. This value could be changed by using ⭳ or ⭱ buttons, in range:
   U1: 'd0' – 'd1 - 1';
   U2: 'u1+ 1' – 'd1';
   U3: 'd0' – 'd1 - 1';
   U4: 'u3+ 1' – 'd1';

2. By pressing 🅿 button again you save the parameter 'u1' value and switch to programming the next parameter.

3. Depending on the programming of parameters r5 and r6 the list of user parameters may change.

4. If 'r5'=1 parameters 'u1' o 'u2' can be programmed; If 'r5'=2 only parameter 'u1' can be programmed.

5. If 'r6'=1 parameters 'u3' o 'u4' can be programmed; If 'r6'=2 only parameter 'u3' can be programmed; If 'r6'=0 we **cannot** program parameter 'u3' or 'u4'

6. After the last parameter is programmed a led diode on the button is switched off.

E – Alarms and emergency operation

In case of 'sensor 1' failure it occurs:
- Heating and cooling relays (for **block 1**) are controlled in time cycle (clock control)
  For 'c8' time heating relay is switched off and cooling relay is on
  For 'c9' time heating relay is switched on and cooling relay is off
- Switching on all **block 1** alarm relays
- Alarm code **AL1** is displayed

In case of 'sensor 2' failure it occurs
- Heating and cooling relays (for **block 2**) are controlled in time cycle (clock control)
  For 'c8' time heating relay is switched off and cooling relay is on
  For 'c9' time heating relay is switched on and cooling relay is off
- Switching on all **block 2** alarm relays
- Alarm code **AL2** is displayed

If two sensors fail at the same time, alarms **AL1** and **AL2** are displayed alternately.

The controller can report temperature exceeding alarms.
If 'temperature 1' is higher than 'cooling activation temperature for the block 1' + 'd8' overheating alarm relay is switched on and the block 1 alarm relay is switched on to.

If 'temperature 1' is lower or equal to 'heating activation temperature for the block 1' - 'd8' overcooling alarm relay is switched on and the block 1 alarm relay is switched on.

If 'temperature 2' is higher than 'cooling activation temperature for the block 2' + 'd8' overheating alarm relay is switched on and the block 2 alarm relay is switched on to.

If 'temperature 2' is lower or equal to 'heating activation temperature for the block 2' - 'd8' overcooling alarm relay is switched on and the block 2 alarm relay is switched on.

Example 1:
Parameters are set: r5=1 i r6=1

☞ entering the programming mode, **u1** is displayed and next a value of this parameter

☞   change the **u1** parameter value in range of 'd0' – 'd1 - 1'

☞ memorizing **u1** value, **u2** is displayed and a value of this parameter

☞ ⬇ ⬆ change the **u2** parameter value in range of 'u1 + 1' – 'd1'

☞ Ⓟ memorizing **u2** value, **u3** is displayed and a value of this parameter

☞ ⬇ ⬆ change the **u3** parameter value in range 'd0' – 'd1 - 1'

☞ Ⓟ memorizing **u3** value, **u4** is displayed and a value of this parameter

☞ ⬇ ⬆ change the **u4** parameter value in range 'u3 + 1' – 'd1'

☞ Ⓟ memorizing **u4** value and exiting a programming mode

Example 2:
Parameters are set: r5=2 i r6=2

☞ Ⓟ entering the programming mode, **u1** is displayed and next a value of this parameter

☞ ⬇ ⬆ change the **u1** parameter value in range of 'd0' – 'd1 - 1'

☞ Ⓟ memorizing **u1** value, **u3** is displayed and a value of this parameter

☞ ⬇ ⬆ change the **u3** parameter value in range 'd0' – 'd1 - 1'

☞ Ⓟ memorizing **u3** value and exiting a programming mode

Example 3:
Parameters are set: r5=1 i r6=0

☞ Ⓟ entering the programming mode, **u1** is displayed and next a value of this paramete

☞ ⬇ ⬆ change the **u1** parameter value in range of 'd0' – 'd1 - 1'

☞ Ⓟ memorizing **u1** value, **u2** is displayed and a value of this parameter

☞ ⬇ ⬆ change the **u2** parameter value in range of 'u1+1' – 'd1'

☞ Ⓟ memorizing **u2** value and exiting a programming mode

F – Temperature display

1. The controller display temperature from block 1 as a standard
2. If the 'r6' parameter is different than 0 and 'r7'=1, temperature from block 2 is displayed
3. After pressing ⬆ button, the second temperature which is measured is displayed (it blinks), after 5 second has passed controller will automatically return to the display of dominant block temperature

VII. PPROGRAMMING OF SYSTEM PARAMETERS

When the unit is switched on and correctness of its operation has been checked (factory settings are standard settings) setting of system parameters of GHC201.08 begins.

In order to do that, the unit must be switched off with the button (three horizontal lines appear on the screen). ***Then buttons*** ***and*** ***must be pressed and holded. When they are being pressed, the button*** ***must be pressed too*** *(short sound signal is activated).* All three buttons must be pressed together for about 5 seconds. If any of the buttons is released at that time, programming will be interrupted. When this activity is done, diode on button will flash and symbol 'c2' will appear on the display for 1 second. Then the latest programmed value of the parameter will appear. Now, using buttons the new values should be set; every longer pressing of the button will cause quick winding of possible settings. Then should be pressed to accept the set data and start programming of a new parameter.

It is possible to change some settings only if you do not want to change a given parameter, press and GHC201.08 will move to the next parameter.

After entering the last parameter setting and accepting it with the button , it will automatically exit the programming mode and return to STANDBY mode (two horizontal lines on the display).

If no button is pressed within 20 seconds, the device will exit the parameter programming mode.

Notice !!!

Incorrect set of parameters settings may cause a faulty operation!!!

Table 2: Significance of parameters

Para-metr	Opis	Min	Max	Krok	Nastawa fabryczna
c2	Minimal time of compressor stoppage	0	15	1min	**3** min
c5	Maximal time of operation of compressor 0 – no testing (this parameter is off)	0	99	1min	**40** min
c6	Time of compressor stoppage after switching on of protection from parameter 'c5'	1	99	1min	**10** min
c8	Compressor operation time / heater stoppage time if the control sensor is damaged	1	99	1min	**25** min
c9	Compressor stoppage time / heater operation time if the control sensor is damaged	1	40	1min	**5** min
d0	Minimal temperature for a client to set	-40	119	1°C	**1** °C
d1	Maximal temperature for a client to set	d0+1	120	1°C	**10** °C
d2	Heating hysteresis for block 1 or hysteresis when r5=2	1	10	1°C	**2** °C
d3	Cooling hysteresis for block 1	1	10	1°C	**2** °C

d4	Temperature offset for temperature sensor 1	-10	10	1°C	0°C
d5	Heating hysteresis for block 2 or hysteresis when r5=2	1	10	1°C	**2** °C
d6	Cooling hysteresis for block 2	1	10	1°C	**2** °C
d7	Temperature offset for temperature sensor 2	-10	10	1°C	0°C
d8	Temperature deviation out of adjustment range	0	10	1°C	**3** °C
r1	Settings for **P2 relay**: 00- not used 01- block 1 cooling 02- block 1 heating 03- overheating alarm for block 1 04- overcooling alarm for block 1 05- any alarm for block 1 06- block 2 cooling 07- block 2 heating 08- overheating alarm for block 2 09- overcooling alarm for block 2 10- any alarm for block 2	00	10	1	**01**
r2	Settings for **P1 relay** - Values as shown above in r1	00	10	1	**02**
r5	Type of regulating block 1 (always switched on) 01- cooling and heating given separately 02- cooling and heating in the same range	01	02	1	**01**
r6	Type of regulating block 2 00- not used (there is no alarm from the temperature sensor) 01- cooling and heating given separately 02- cooling and heating in the same range	00	02	1	**01**
r7	The dominant regulatory block (from which temperature is displayed) 00- block 1 01- block 2	00	01	1	**00**

VIII.   PROBLEMS AND THEIR REMOVAL

defect symptoms	check
1. Display is not lit although GC201.08 is connected to mains	Check: - if there is voltage 230V on feeding clamps L and N
2. Error of temperature indication	Check: - connection of sensors to connectors - the value of parameter 'd4' - if the sensor is fixed correctly - the condition of the cable of the sensor: the cable cannot have **any** defects - in detail the lookout of external surface of sensor shell to see whether it has not been damaged mechanically.
3. impossible to set	Check:

the required temperature	the value of parameters 'd0' and 'd1' (d0<d1)
4. Compressor does not switch on although it is connected	Check: - if there is voltage 230V on clamps P1 or P2 - value of parameters 'r1' or 'r2'
5. Heater does not switch on although it is connected	Check: - if there is voltage 230V on clamps P1 or P2 - value of parameters 'r1' or 'r2'
6. Buzzer does not switch on although it is connected	Check: - if there is voltage 230V on clamps P1 or P2 - value of parameters 'r1' or 'r2' - value of 'd8' parameter
7. Dots on the display flash, no possibility to switch it on	Check : - the value of feeding voltage - condition of feeding connectors - whether feeding connectors are tightened up
8. ''abnormal' 'strange' operation of the unit	Check: - if there is voltage 230V on feeding clamps L and N - condition of feeding connectors - 'zeroing' of cooling unit - condition of electric system and the number of units connected to one phase (sticker on a case) - weather GHC201.08 was not wetted by water or other liquid - if GHC201.08 is not exposed to humidity or sudden changes of temperature
9. The appliance does not reach the set temperature and does not cool	Check: - what temperature was programmed by the user - set values of particular parameters, in particular 'c2', 'c5', 'd0', 'd1' - the method and place of fixing of the temperature sensor - WHETHER THE UNIT STANDS IN A DRAFT OR IN SUNLIGHT!!! - whether ventilators or air conditioning are installed on the ceiling or nearby

IX.   RETURNS FOR REPAIR

PPUH 'GECO' reserves the right to refuse a free repair of the unit, if the seals are broken !!!

P.P.U.H. 'Geco' Sp. z o. o. is not responsible for loses and damages resulting from provision of information on the method of making changes in the system data of GHC201.07 or GHC201.08 by the producer or its service to the final client, incorrect or non-professional assembly and for loses caused by defective operation of the appliance.

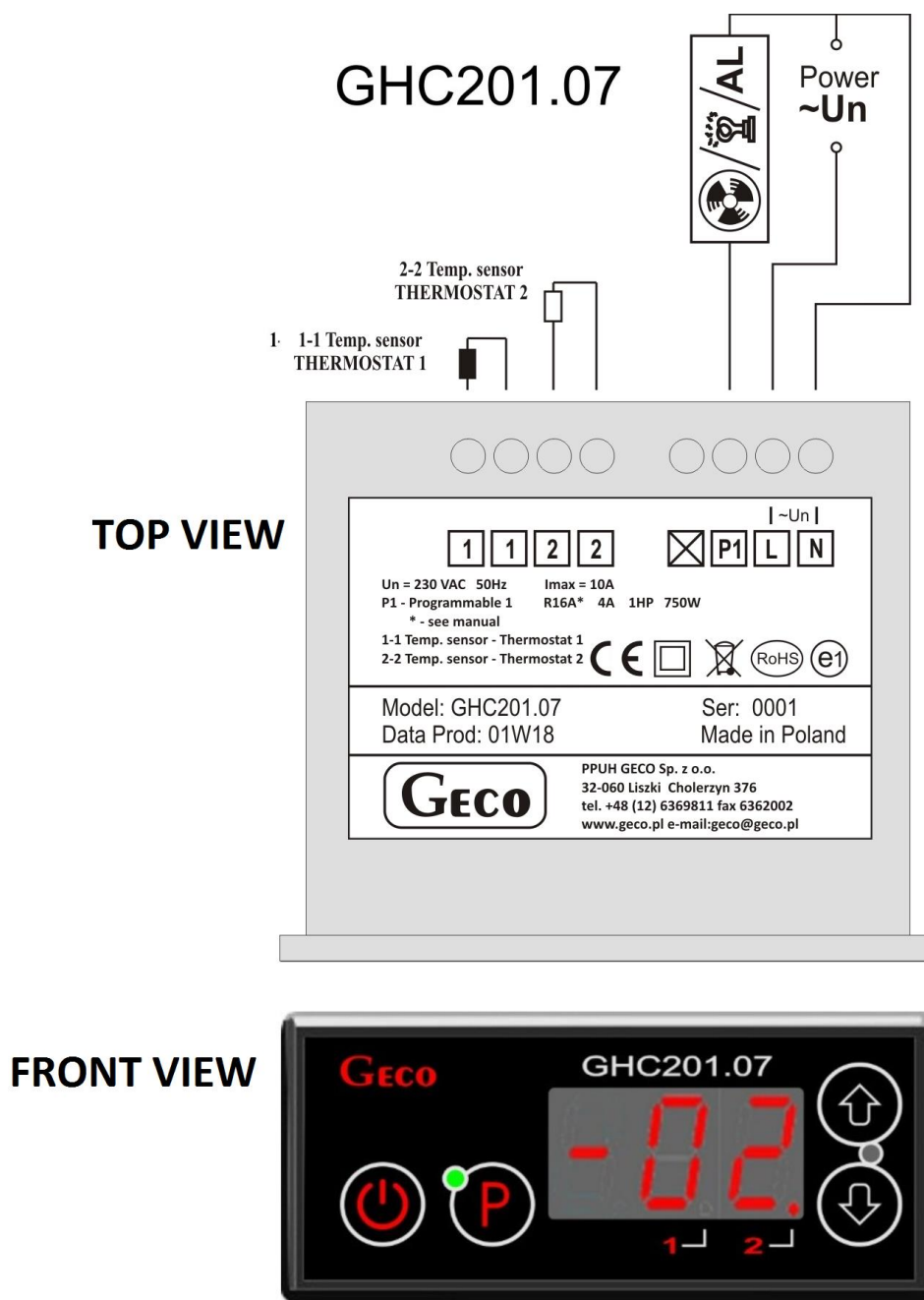## X.   METHOD OF CONNECTION DEVICES TO THE CONTROLLER

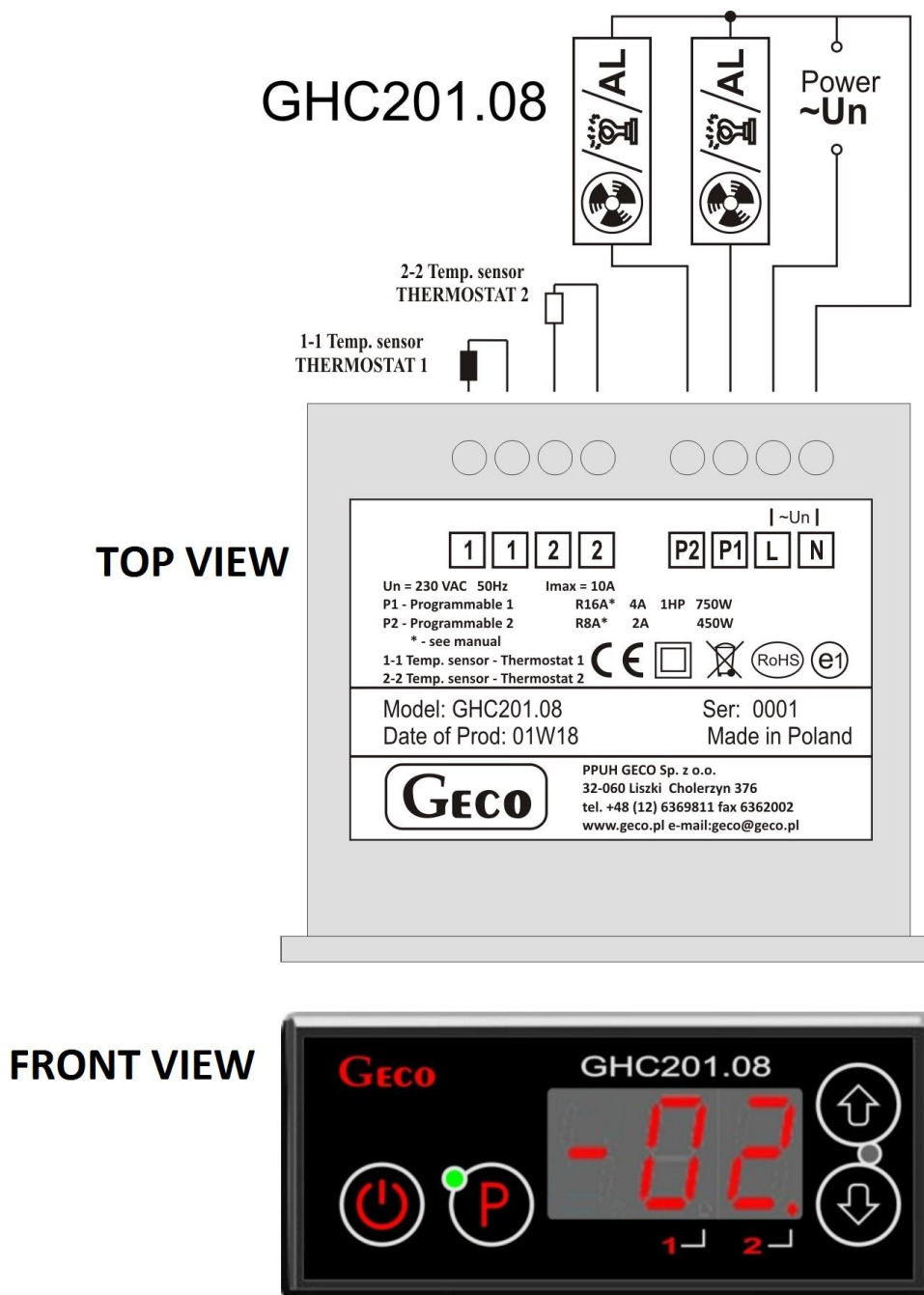*Fig. 1. Diagram of connecting devices and sensors for the GHC201.07 controller.*

Fig 2. Diagram of connecting devices and sensors for the GHC201.08 controller.

XI.   INFORMATION ABOUT MARKING AND COLLECTION OF USED ELECTRICAL AND ELECTRONIC EQUIPMENT

WARNING!

The crossed-out wheelie bin symbol on your product or packaging reminds you that all electrical and electronic products be taken to separate collection at the end of their working life. Do not dispose of these products as unsorted municipal waste take them for recycling. The user is responsible for taking used device to recycling point.
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