

6.00 PARAMETER LIST

#	MEANING	SETTING
SE1	Main Set Point	Range between «LoS» & «HiS»
Si2	Secondary set point	Range between «LoS» & «HiS»
HYS	Thermostat main differential (Hysteresis 1)	Range 0 .. 10 °C
HY2	Thermostat secondary differential (Hysteresis 2)	Range 0 .. 10 °C
dEb	Dead Band	Range 0 .. 10 °C
LoS	Minimum value for SET POINT parameter	Range -50 .. HiS (+100) °C
HiS	Maximum value for SET POINT parameter	Range (-30) LoS .. +154 °C
Act	Action main output	0: cold; 1: heat
Ac2	Action secondary output	0: cold; 1: heat
OFS	Offset, temperature calibration for probe 1	Range -9.9 .. +9.9 °C
OF2	Temperature calibration for probe 2	Range -9.9 .. +9.9 °C
AcY	Anticycling time main output	Range 0 .. 254 (see tis)
di2	Anticycling time secondary output	Range 0 .. 254 (see tis)
LoA	Low limit point of temperature alarm	Range -50 .. HiA (+100) °C
HiA	High limit point of temperature alarm	Range (-30) LoA .. +155 °C
Alr	Alarm mode of operation (ref. probe 1)	0: disabled; 1: enables Hit; 2: enables Lot; 3: enables Hit & Lot
Adi	Alarm delay at Power ON	Range 0 .. 99 min
Ald	Alarm delay on running time	Range 0 .. 99 min
dPt	Defrost period time	Range 1 .. 254 (see tis)
ddt	Defrost duration time	Range 0 .. 99 (see tis)
unt	Temperature displayed unit	0: Celsius; 1: Fahrenheit
dio	Digital input operation mode	0: disabled
did	Digital input delay	Range 0 .. 254 sec
utd	Display update time delay	Range 0 .. 60 sec
rES	Resolution	0: decimal point resolution; 1: unit resolution
tis	Time scale	0: dPt hours, ddt minutes, acy/di2 seconds; 1: dPt minutes, ddt seconds, acy/di2 seconds; 2: dPt hours, ddt minutes, acy/di2 minutes; 3: dPt minutes, ddt seconds, acy/di2 minutes.

7.00 ANOMALIES SIGNALING

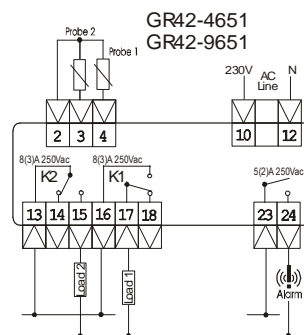
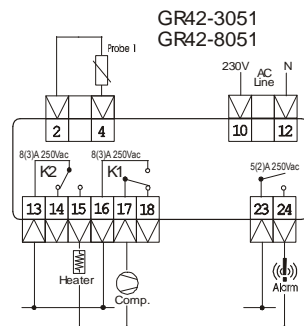
MSG	CAUSE	OUTPUT
Hit blinking	Probe 1 - measured temperature is higher than HiA.	*The alarm relay will switch-on. *The other outputs don't change.
Lot blinking	Probe 1 - measured temperature is lower than LoA.	*The alarm relay will switch-on. *The other outputs don't change.
dOP	(optional)	
PF1	The probe input line 1 is open or short circuited.	* Model with one probe: outputs K1 and K2 will switch-off; model with two probes: only output K1 will switch-off. *Other outputs don't change.
PF2	The probe input line 2 is open or short circuited.	* Output K2 will switch-off. *other outputs don't change.

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8.00 SPECIFICATIONS

DISPLAY: 3 digit, 13.2 mm, high intensity green;
INPUTS: one or two PTC sensor, semiconductor type;
MEASURING RANGE: -50 ... +150 °C / -50 ... +302 °F;
ACCURACY AT 25°C: ±0.5 °C + 1 digit;
RESOLUTION: 0.1 or 1 °C / 0.2 or 2 °F;
OUTPUTS: up to three relays -
 - 1 spdt 250Vac 8A max resistive (0.5hp) – opt. 16A,
 - 1 spdt relay 250Vac 8A max resistive (0.5hp),
 - opt. 1 spst 250Vac 5A max resistive (½hp) for alarm;
POWER SUPPLY: 12 Vac/dc ±10%, or 230 Vac ±10% 50/60Hz, or 115 Vac ±10% 50/60Hz, or 9 ... 24 Vac/dc (switching conf.);
ENVIRONMENTAL CONDITIONS:
 - operating temperature: -5 ... +50 °C;
 - storage temperature: -20 ... +70 °C;
 - relative humidity: 30 ... 90 % non condensing;
 - no shocks or vibrations;
MECHANICAL DATA:
 - plastic housing self extinguishing type UL94V0;
 - connections through terminal block for 2.5mm² gauge wire;
 - protection degree: IP64 for the frontal panel (enclosure IP31).

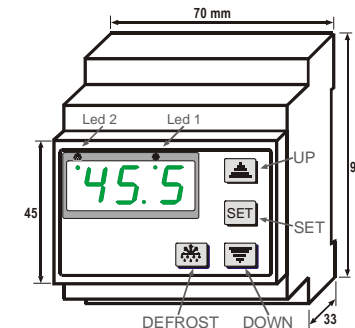
Typical terminal connections (See the label close to the terminals for the right power supply diagram connection).



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FRONTAL PANEL LAYOUT AND FUNCTIONS



Installation and operating instructions

GR 4x Series

Two independent outputs or dead band electronic controller

Rev.: 15-12-2005 Cod.: 00990269

Up: 1) To increase the value of the selected parameter; 2) To scroll the parameters in SET mode; 3) During defrost action, to update the probe 1 temperature; 4) To display the temperature of probe 2.

Down: 1) To decrease the value of the selected parameter; 2) To scroll the parameters in SET mode; 3) To switch-off the optional internal alarm buzzer (optional).

Set: To access the parameter menu to view and change the values. It is also the "Enter" key to confirm the new values.

Defrost: Used to start/stop a manual defrost.

1.00 GENERAL DESCRIPTION AND INSTALLATION NOTICE

The GR models are suitable for a wide range of applications. The GR42 can control a compressor and an heater in dead band mode (only one probe), or it can drive two relays according to different temperature values and one or two probes (two independent outputs controller).

The devices can offer up to three relay outputs (two command outputs plus an alarm output). The Gr is available with off cycle defrost: during the defrost time both outputs are switched off. On request, it can have a built-in transformer to feed it from the main line (230 Vac or 115 Vac). The access to the operating parameters can be prevented by a combination of keys.

The installation must be done only by specialized personnel in according to the rules in force in the country where the controllers are used. The instrument is conceived for controlling and regulation working not for safety function. It must be installed in a place protected from extreme vibrations, impact, water, corrosive gases, and where temperature and moisture do not exceed the maximum rating levels indicated in the specifications. The same directions are valid for the probe installation.

1.10 THE THERMOSTAT PLACE

The probe must be installed in a place protected from direct air flow particularly far from fans and doors, so a better average temperature of the room will be measured. The probe is not waterproof, it should be placed with its head upward, so that drops would not penetrate into the bulb and damage the sensor. Maintain the length of the electrical wires as short as possible in order to keep the noise picked by them at low level, otherwise a shielded wire will be needed, where the shield will be connected to the ground.

1.20 ELECTRICAL WIRING

We recommend to protect the power supply of the controller from electrical noise, spikes, and especially from voltage surges and drops. This can be easily done following these recommendations:

- separate the power supply of the loads (compressor, heaters, fans, etc) from the power supply of the controller. This can alleviate problems related to voltage dips that can arise during the switch-on of the loads, that may interfere with the controller's microprocessor causing unexpected resets.
- the cables of the probes and the ones of the controller supply or the loads must be separated and not close, to reduce spikes and noise on the sensor. This improves the stability of the reading and it also makes the commutation of the device more accurate.

1.30 CRITICAL ENVIRONMENT

For applications in heavy industrial environment these rules should be followed.

- After having identified the source of noise spikes, it is recommended to apply a line filter to the source in question of the type specifically designed to solve EMC (Electromagnetic compatibility) related problems. Sometimes it may be sufficient an RC type filter, also called «snubber», connected in parallel to the external relay coils, or circuit breakers.
- An independent power supply should be used to power the device in extreme conditions.

1.40 MOUNTING

The controller is a Omega Rail Din 4 mounting instrument. We recommend to leave on the rear panel enough room to avoid compression or excessive bending of the cables.

2.00 HOW THE DEVICE WORKS (overview)

The GR42-3xxx and the GR42-8xxx dead band configuration work as indicated on fig. 1; the main output relay (K1) operates at direct action and the other one (K2) operates at reverse action, both referred to the main probe and set point. The instrument can cooling and warming the room in order to maintain the temperature close to the main set value.

The GR42-4xxx and the GR42-9xxx are suitable to regulate the temperature with two independent outputs:

- two independent outputs, one related to the main set point and the other to the second set point (GR42-40xx, GR42-90xx). Both outputs are drove according to the temperature of only one probe, the main probe – fig. 2;
- two independent outputs with two probes – fig. 3 (GR42-46xx, GR42-96xx). Adopting the last setting it will realize a complete two independent stages or outputs controller.

All these configurations are made at the factory, it is not possible to change these configurations by the user.

The GR4x can perform defrost cycles. Every "dpt" hours it will switch off both outputs K1 and K2 for "ddt" minutes. Instead of switch off both outputs, as per factory setting (on request), it can also switch off only K1 and switch on K2 or K3. During a defrost action (ddt) the display does not update the measured temperature.

2.10 Dead band controller: (fig. 1)

K1 - Compressor START temperature: temp Probe1 \geq SET + dEb/2 + HyS; K1 - Compressor STOP temperature: temp Probe1 < SET + dEb/2.
K2 - Heater START temperature: temp Probe1 < SET - dEb/2 - Hy2; K2 - Heater STOP temperature: temp Probe1 \geq SET - dEb/2.

2.20 Two independent outputs with one probe controller (fig. 2 - supposed act=0 and ac2=0):

K1 - Compressor 1 START temperature: temp Probe1 \geq SET + HyS; K1 - Compressor 1 STOP temperature: temp Probe1 < SET.
K2 - Compressor 2 START temperature: temp Probe1 \geq St2 + Hy2; K2 - Compressor 2 STOP temperature: temp Probe1 < St2.

2.30 Two independent outputs with two probes controller (fig. 3 - supposed act=0 and ac2=0):

K1 - Compressor 1 START temperature: temp Probe1 \geq SET + HyS; K1 - Compressor 1 STOP temperature: temp Probe1 < SET.
K2 - Compressor 2 START temperature: temp Probe2 \geq St2 + Hy2; K2 - Compressor 2 STOP temperature: temp Probe2 < St2.

To avoid damages to the compressors it is possible to set an anticycling time against OFF – ON cycles (see "acy" and "dl2" parameters).

2.40 Alarm management and fault tolerance:

All the GR controllers show on display the signals of the alarm conditions (see table 7) and they close an alarm contact relay (if included). You can set and enable the min. and max. temperature (see parameter Alr) alarm set points. This alarm set point must be intended as absolute value of the probe 1 temperature, not related to the main Set Point. To prevent alarm signaling, it is possible set alarm delays at start-up and during running time (see parameters Adi and Ald).

In case of probe failure the GR controllers display a message PF1 or PF2 and switch off the outputs (as per table 7).

Fig. 1 - Dead band control

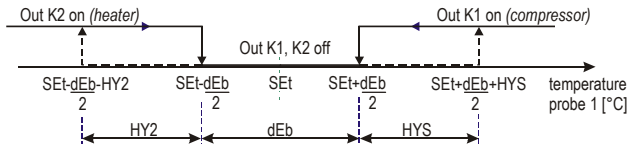
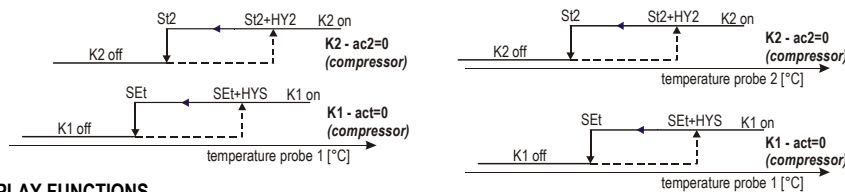


Fig. 2 - example of 2 independent stages with 1 probe Fig. 3 - example of 2 independent outputs with 2 probes



3.00 DISPLAY FUNCTIONS

The display has three digits available, of the seven segment type. During normal working it shows the value of the probe 1 temperature, while in an alarm condition it shows the proper indication as described in the «anomalies signaling» table (7.00).

The leds have the following functions: led n°1 lights on when the output K1 is activated; led n°2 lights on when the output K2 is switched on. Also, the led 2 blinks during the setting operations and when a defrost cycle is activated.

Note: if alarm is activated, push the "▼" key to turn-off the relay or the internal buzzer (if present).

4.00 HOW TO DISPLAY AND ADJUST THE MAIN AND SECONDARY SET POINT

- 1) Press "SET" and hold it for 3s, SET is displayed (main set point);
- 2) For the secondary set point, press "▲" to move to St2 parameter (secondary set point);
- 3) Press "SET" to view the Set Point value, adjust it by using "▲" or "▼";
- 4) Press "SET" to confirm the data, after some seconds the controller will leave the set mode and the data will be stored in the memory.

WARNING: the instrument must not be reset before leaving the set mode, otherwise the new setting will be lost.

Note: it is only possible to choose values for the set point inside the «Los» and «His» range.

4.10 HOW TO DISPLAY THE TEMPERATURE OF THE SECOND PROBE (only for GR42-x6xx)

Press "▲": the temperature of probe 2 will appear on the display.

4.20 HOW TO ADJUST OPERATING PARAMETERS

- 1) Press "SET" and hold it for 10s, the code of the first variable "HyS" will appear;
- 2) Press "▲" or "▼" to scroll all the parameter codes;
- 3) While a code is displayed press "J" to view its content, adjust it by pressing "▲" or "▼";
- 4) Press "SET" to confirm the data, after 10s the controller will leave the set mode and the data will be stored in the memory.

WARNING: the instrument must not be reset before leaving the set mode, otherwise the new setting will be lost.

Note: In every case the controller automatically interrupts any setting operation if any push-button isn't pressed for at least 10 seconds. The new values for time parameters will be active only after the start of the following time cycle.

4.30 HOW TO ACTIVATE MANUALLY A DEFROST CYCLE

Press and hold for 5s the "Defrost" key, the led 2 starts to blink and the controller's outputs (K1 and K2) will switch off for "ddt" minutes.

There are different ways to perform the defrost actions: K1 off and K2 on; K1, K2 off and K3 on; pre-setting only by factory.

4.40 KEYBOARD LOCKING

Press and hold "▼" + "SET" for 10s, in order to lock and unlock the keyboard (pay attention to not modify the set point value, press first "▼" and then "SET" immediately and keep pressed for 10 seconds).

Code displayed for one second: "Pof" – keyboard locked; "Pon" – keyboard unlocked.

When the keyboard is locked it is possible change only the "Set" value.

5.0 GENERAL PARAMETERS DESCRIPTION

SEt - main Set Point: it's the required temperature for the main control.

St2 - secondary set point: it's the required temperature for the secondary control. (only for two stages controller)

HYS - main differential (hysteresis 1): the value that controls the output relay K1, moving the value of the main set point in such a way that the system does not oscillate. (see the figures)

HY2 - secondary differential (hysteresis 2): the value that controls the output relay K2, moving the value of the set point (or the secondary set) in such a way that the system does not oscillate. (see the figures)

dEb – dead band: it is the gap of temperature inside which there are no one control output active.

LoS - low limit of set point: a limit below which it is not possible to move the set point value.

HiS - High limit of set point: a limit above which it is not possible to move the set point value.

Act - main output action: describes the way by which the controller manages the main output - K1. 0: direct/cold action, good for refrigerating units, 1: inverse/heat action, usable for boilers. (only for one or two stages controller)

Ac2 - secondary output action: describes the way by which the controller manages the secondary output - K2. 0: direct/cold action, good for refrigerating units, 1: inverse/heat action, usable for boilers. (only for two stages controller)

OFS - offset of temperature: it is the variation temperature added or subtracted to the temperature measured by the main probe 1 to compensate for any deviation from the real value.

OF2 - offset for probe #2: it is the variation temperature added or subtracted to the temperature measured by the probe 2 to compensate for any deviation from the real value.

AcY – main anticycling delay time: it is the minimum time between two successive output maneuvers (off – on cycle) for the main relay; when the output K1 is switched-off, the controller wait at least "AcY" seconds (or minutes, see tis parameter) to switch on the relay. It is also the delay for the first activation of the relay K1 at the start-up.

dl2 – secondary anticycling delay time: it is the minimum time between two successive output maneuvers (off – on cycle) for the secondary relay; when the output K2 is switched-off, the controller wait at least "dl2" seconds (or minutes, see tis parameter) to switch on the relay. It is also the delay for the first activation of the relay K2 at the start-up.

LoA - low operation point of alarm temperature: a probe 1 temperature limit below which the system goes in alarm and simultaneously the display shows «LoT». If the controller has an alarm relay, it will switched on.

HiA - high operation point of alarm temperature: a probe 1 temperature limit above which the system goes in alarm and simultaneously the display shows «Hit». If the controller has an alarm relay, it will switched on.

Alr - alarm mode of operation: the high and low temperature alarms can be enabled or disabled as required by the installer. The available options are: 0 = all alarms disabled; 1 = only high temperature alarm enabled; 2 = only low temperature alarm enabled; 3 = high and low temperature alarms enabled.

Adi - alarm delay initialization: delay between the power-up of the instrument and the arming of the alarms if enabled.

Ald - alarm delay during running time: it is the elapsed time between the trigger of an alarm and the effective displayed state.

dPt - defrost period time: it is the period of time between two defrost cycles (the time elapsed between two successive defrost actions start). Note: when a manual defrost is called, the time counter is reloaded to "0".

ddt - defrost duration time: it is the time elapsed during the defrost. Usually during this interval the compressor is switched-off to allow a deicing process and, by manufacturer setting, it is possible to switch on other output relay (K2 or K3). If ddt = 0 the defrost function is disabled. During the defrost action the display does not update the probe 1 measured temperature.

unt - displayed unit: it switches the temperature unit between Celsius and Fahrenheit (internal calculations are made in Celsius and then converted to Fahrenheit – there are rounding errors, not all values will be showed).

dio - digital input operation mode: (optional) not defined.

did - digital input delay: (optional) it is the time elapsed between the activation of the digital input and the effective action.

utd – update Time delay: it is the time delay that determines the display updating of the temperature (the min update time of the display is 5 sec.). The switching over of the relay is related only to the acy not to utd values.

rES – resolution: it allows to display the measured value with decimal or unitary resolution.

tis – time scale: it is possible change the base time of the defrost cycles and of the anticycling delay. Setting tis=0 the ddt is measured in minutes, dpt in hours and acy/dl2 in seconds.