GUARANTEE CARD

"IGLOO", on a general basis, grants a warranty for the fault-free operation of MRT-1 type regulator for the period of 12 months from date of sale.

NOTE:
Any damages to MRT-2 regulator resulting from the user's fault, and being the effect of failure to observe the operating guidelines provided in these instructions, shall not be covered by the warranty. Any mechanical damages and those resulting from flooding the regulator are also excluded from the guarantee service.

MRT-2/ regulator. factory no: .....
……..

Date of manufacture: …….....
……..

(signature, stamp)

Date of sale: .....
……..

(signature, stamp)

COMMENTS:

ZAKŁAD ELEKTOMECHANIKI CHŁODNICZEJ

IGLOO
BOCHNIA - POLAND

30-700 BOCHNIA ul. Karosek 55a
tel. / fax (0-14) 612-82-62

OPERATING INSTRUCTIONS

THERMOREGULATOR SERIES

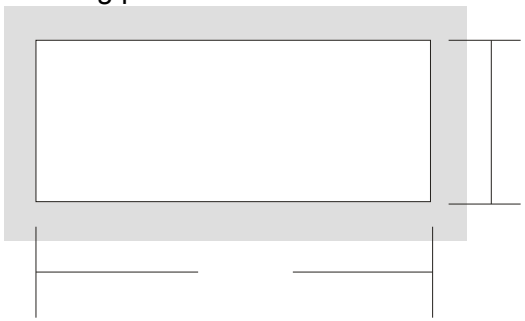
MRT-2

*** Functions are activated with the setting FC = 2

CONNECTING THE REGULATOR TO THE REFRIGERATING SYSTEM

In order to connect the regulator to the refrigerating system proceed as follows:

1. Make the hole in the refrigerating system for mounting the reading and setting panel



2. Place the panel in the made hole.
3. Fit the control panel in the convenient location paying attention to the ambient temperature, which must not exceed 40 ^{O}C.
4. Connect the reading and setting panel with the control panel using the strip cord
5. Place the control probe inside the cooling chamber in the place most convenient for taking temperature measurements, and at the same time protected from being accidentally damaged by stored food products. This probe is equipped with black wire.
6. Place the defrosting probe (probes) on the evaporator in the place where the lowest temperature exists. This probe is equipped with white wire.
7. In the case of using the alarm mode, place the alarm sensor on the condenser or the filter
8. Hook up the regulator according to the markings indicated on the name plate

This instruction is intended for MRT-2 series regulators.
The series comprises the following regulators:

- MRT-2/C
- MRT-2/K
- MRT-2/CW
- MRT-2/E
- MRT-2/D

These regulators differ from each other in the number of control outputs, sensor length and programmed parameters (programmed parameters can be modified in the settings mode).
All the basic parameters of a given type of regulator are provided on the name plate affixed to the housing

MRT-2 series temperature regulator is a universal microprocessor-based temperature controller designed for use in refrigerating systems. The regulator consists of two elements interconnected by a disconnectable wire:

- reading and setting panel
- control panel

Besides the basic function of MRT-2 regulator of controlling the unit, so as to achieve the set temperature and maintain it within the specified limits, it also incorporates other functions:

1. Automatic defrosting performed in the three different optional modes:

- convection defrosting; (MRT-2/C, /K, /CW, /E, /D)
- defrosting by means of heaters; (MRT-2/D, /E)
- hot steam defrosting. (MRT-2/E, /D)

This mode is controlled by one or two temperature probes and protected with time switch limiting the excessively long defrosting time.

2. Dripping mode.
3. Temperature display blocking during defrosting and dripping with time delay of exiting the block mode.
4. Monitoring and acoustic signaling of exceeding the condenser temperature. This is performed by the third probe, which can be set as additional defrosting probe or as the probe monitoring condenser temperature.
5. The function allowing to set up different control temperatures for day and night operation mode.
6. Monitoring and signaling damage of temperature probes.

TECHNICAL DATA

- control temperature range	-40..+30 ^{O}C
- end defrost temperature range	+1..+30 ^{O}C
- alarm signaling temperature range	30..80 ^{O}C
- control hysteresis range	1..20^{O}
- max. defrosting duration	0..3h
- operating time range before defrosting	1..12h
- number of measuring sensors	2 or 3
- length of measuring sensors	1.5 or 3.2m
- control relay contacts rating	30A 250V AC
- lighting relay contacts rating	10A 250V AC
- fan relay contacts rating (for MRT-2/CW, MRT-2/D, MRT-2/E)	10A 250V AC
- heater/valve relay contacts rating (for MRT-2/D, MRT-2/E)	10A 250V AC
- power supply	220V AC +10%-15%
- ambient temperature	+5..+40 ^{O}C
- humidity	20..80%RH
- Degree of protection	IP30

DESIGN

MRT-2 regulator consists of two separable elements interconnected by strip cord:
1. Reading and setting panel

4. setting the max. defrosting time
5. setting the dripping time
6. setting the defrosting method
7. setting the evaporator fan control
8. Setting the time delay for starting the evaporator fan after defrosting

USER'S SETTING

1. preview of the temperature on the defrost probe – short pressing of S button
2. manual activation of defrosting

CONDENSER TEMPERATURE MONITORING MODE

The regulator incorporates the function of monitoring the condenser temperature and acoustic warning when the admissible value is exceeded. This function is activated after setting 3 measuring sensors accordingly. Then the third sensor can be set as the additional defrosting probe or as the condenser temperature monitoring probe.

SERVICE SETTINGS

1. Setting the function of the third probe
2. setting the alarm temperature

ADDITIONAL FUNCTIONS

The regulator incorporates additional function - operation in the day and night mode.
This mode is coupled with the lighting switch. (alternatively – depending on the settings made). Night mode allows to set different control temperatures depending on switching on (day mode) or off the lighting (night mode).
The regulator also incorporates the function of signaling the probe failure. When probe failure is detected corresponding symbol appears on the regulator display, and the regulator goes into continuous operation mode

ADDITIONAL SETTINGS

SERVICE SETTINGS

1. night mode setting

DESCRIPTION OF THE OPERATING CYCLE OF THE REGULATOR

The refrigerating system thermoregulator works in two phases, following one another:

- control phase
- defrosting phase

CONTROL PHASE

On connecting the regulator to the power supply, after 5 sec. delay, the regulator goes into the control phase. In this phase the temperature on the control probe (located in the cooling chamber) is compared with the set points and depending on the result the unit control relay is activated and deactivated. The regulator enables optional setting of the minimal operation time of the unit (even if the temperature is reached before), minimal stand-by of the unit (even if the temperature rises above the set control hysteresis)

NOTE:

For regulators equipped with the output for connecting the limit switch, this output must be shorted, if not used. Otherwise evaporator fan control function will not work

PROBE FAILURE SIGNALING

If probe failure is detected by the regulator, the regulator goes into the continuous operation mode, i.e. it does not control the temperature, nor it enters the defrosting mode. The unit is switched to continuous running. At the same time on the display, instead of the indicated temperature,

C0 symbol appears – which indicates the control probe failure

C1 – indicating defrosting probe failure

C2 – indicating failure to the third probe (present if in the settings mode settings for the third probe have been selected)

MRT-2 regulator also incorporates the systems for unit operation protection:

- minimal stand-by time of the unit;
- minimal operation time of the unit;
- maximum operation time of the unit

MRT-2 thermoregulator is provided with:

- unit on/off switch, which enables at any time to switch off the unit without deenergizing the refrigerating system;
- lighting on/off switch allowing to switch on and off the lighting of the refrigerating system, linked with the function enabling to set up different control temperature settings in the day and night mode;
- manual defrost button, allowing to activate defrosting cycle at any time during operation of the refrigerating system (independently from automatic defrost mode);
- button which allows the preview of the temperature on the defrosting probe(s) and condenser temperature monitoring probe. This button also allows to access the mode of programming the regulator function;
- digital temperature display allowing to monitor on a current basis the temperature inside the refrigerating system (the regulator enables to block the indications of the gauge during defrosting phase and recall the indications with delay on exiting defrosting mode).
- light signaling indicating the operating state of the refrigerating system.

CONTROL OUTPUTS OF THE REGULATOR:

- unit control output (all versions);
- lighting control output (all versions);
- evaporator fan control output (MRT-2/CW/D/E);
- condenser fan control output (MRT-2/E/D);
- heaters/solenoid valve control output (MRT-2/E/D);
- output for connecting the limit switch switching off the evaporator fan (MRT-2/CW/E/D);
- lighting control output in connection with the limit switch (MRT-2/CW/E/D);

Function description	Symbol	Range of settings
ACCESS CODE	**AA**	- 11
Calibration of control probe **	**A1**	+/-10 °C from the indicated values
Calibration of defrosting probe 1 **	**A2**	+/-10 °C from the indicated values
Calibration of defrosting probe 2 **	**A3**	+/-10 °C from the indicated values
Lower control temperature range *	**AF**	-40.+30 °C
Upper control temperature range *	**AH**	-40.+30 °C
Control hysteresis *	**HI**	1..20 °
Minimal stand-by time of the unit	**FA**	0.30 min every 1 min (0 - off)
Minimal operation time of the unit	**FI**	0.60 min every 1 min (0 - off)
Number of defrosting probes	**FC**	1 – 1 probe 2 – 2 probes
End of defrost temperature *	**FE**	1.30 °C
Time between subsequent phases of activation * defrosting	**EC**	0.12 h every 0.5 h (0 – off)
Maximum defrosting time	**EF**	0.3 h every 0.1 h (0 – off)
Time dripping	**EH**	0.60 min. every 1 min. (0 – off)
Defrosting method	**EI**	0 – convection 1 – heaters 2 – by hot steam
evaporator fan control	**HA**	0 – shut down during defrosting 1 – continuous operation
Time of the delay in starting the evaporator fan	**HF**	0..30 min every 1 min. (0 – off)
Night operation mode	**HE**	0 – off 1 - on
Display blocking during defrosting	**HH**	0 – off 1 - on
Maximum operation time of the unit	**CE**	0..9.5 h every 0, 5h (0 – off)
Delay in switching off the display blocking	**EE**	0..30 min. every 1 min (0 – off)
Setting the function of probe no 3 ***	**CA**	0 – defrosting probe 1 – probe alarm
Alarm temperature ***	**C!**	30..70°C (every 1 °C)

* Settings accessible for modification without entering the access code
** Factory-preset (do not change without express need)

The front of the reading and setting panel includes the following:

- lighting switch allowing to switch the lighting of the refrigerating system on and off;
- unit shutting off switch;
- manual defrost button:
- "S" marked button – short pressing displays the temperature on the defrost probe, pressing and holding down the button for longer time moves the user to the regulator programming mode;
- buttons used for setting the control temperature;
- LED indicating the operating state of the refrigerating system – continuous light indicates the working unit, flashing light indicates the unit going into the defrosting mode
- LEDs indicating: setting the control temperature (the last LED flashes), temperature reading on the defrosting probes (1 probe – the last LED is lit, 2 probe – both LEDs are lit), switching off the unit (both LEDs are lit – the display is off)

The rear side of the reading and setting panel contains:

- slot for connecting the control panel using the strip cord;
- the slot for connecting external programmer enabling to program the set operating parameters of the regulator (programming is also possible by accessing the settings mode using S button);

2. Control panel

USER'S SETTINGS

1. switching off/on the lighting
2. setting up the control temperature in the night or day mode – is made using settings buttons "▲", "▼" with the lighting switched on or off

PROGRAMMING

MRT-2 type regulator can be programmed in two ways:

Automatically - using the external programmer plugged into the slot located on the rear reading and setting panel. Automatic programming is done with the regulator being connected to the power supply but with the shut down unit (two indicating LEDs are lit, the display is off);

Manually – pressing and holding down "S" button for approx. 15s allows the user to access the manual programming mode. AA symbol, which stands for the access code, appears on the display.
If correct access code is not entered, subsequent pressing of S button will move the user to the depleted array of possible settings.
In this mode it is possible to make the settings for the following functions:

- lower temperature range
- upper temperature range
- control hysteresis
- end of defrost temperature
- time between subsequent defrosting phases
-

Full array of settings is open on entering the correct access code.

The programming procedure is presented below:.

and maximum operation time of the unit – these are optional settings i.e. they are or not.
In this phase the following settings are possible:

SERVICE SETTINGS

1. setting the initial/end point of the measurement range
2. setting the control hysteresis
3. setting the minimal operation time of the unit
4. setting the minimal stand-by time of the unit
5. setting the maximum operation time of the unit

USER'S SETTINGS

1. setting the control temperature using "▲", "▼" buttons (if the night mode is set, then the settings should be made individually with the lighting switched on – day mode and off - night mode);
2. starting and shutting down the unit

DEFROSTING PHASE
After a specified time (set for service mode) has elapsed, the regulator goes into defrosting phase. In this phase the main task of the regulator is defrosting i.e. removing ice formed on temperature exchange elements – evaporator. Frosting is controlled by one or two probes installed on the elements exposed to frosting.
From the point of view of the user of the refrigerating system, defrosting phase has disadvantageous effect, since at that time the temperature in the cooling chamber rises. Therefore the regulator is capable of blocking the value shown on the display for the time of defrosting. If this function is activated, then in the whole defrosting cycle, the temperature value indicated on the display will be the last temperature value existing before going into the defrosting mode. Unlocking display indications can take place after certain delay in relation to the time of exiting the defrosting mode to allow cooling down and to avoid rapid jumps of temperature indications.

The regulator allows to perform defrosting in three ways by making appropriate service setting:

1. By convection – by shutting down the unit and waiting long enough to let the ice melt down (during defrosting evaporator fan can also shut down);
2. By heaters – by shutting down the unit and switching on the external element heating the evaporator - it allows to considerably accelerate the defrosting process (during defrosting the evaporator fan can also shut down);
3. By hot steam – by inverting the thermal circulation, i.e. the cooling element - evaporator becomes a heating element. In this mode solenoid valve is activated which allows the circulation of the refrigerant to be inversed, the unit goes into continuous operation mode, evaporator fan and condenser fan are shut down. After exiting the defrosting mode the solenoid valve is deactivated, the condenser fan is activated (starts to synchronize with operation of the unit) and the evaporator fan is activated (with time delay).

After finishing the defrosting process the regulator activates the dripping cycle, during which defrosting mode is stopped and the control mode is not activated.

The signal to end the defrosting mode is applied from temperature probes installed on the evaporator. There can be 1 or 2 such a probes. Whereas in the case of two defrosting probes, the same temperature (set to service mode) must appear on both probes. In addition, if the defrosting process takes longer, the end of defrosting is time-controlled, i.e. by means of the service setting a maximum admissible defrosting time is defined. Such a solution protects the products stored in the cooling chamber from excessive temperature increase.

At any time of regulator operation (regardless of the phase) it is possible to preview the temperature existing on the defrosting probes (normally the temperature is displayed by the control probe). This is done by short pressing "S” button.

The regulator is also equipped with a button allowing the User to access the defrosting mode at any time during operation of the system.

Settings related with the defrosting mode:

SERVICE SETTINGS

1. setting the number of defrosting probes
2. setting the temperature of the end of defrosting
3. Setting the operation time in the control phase (the time after which the system goes into the defrosting mode)