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Technical Manual **Refrig/Freezer Contr.** **TAR 1310 / 2310 / 4310**

5310923- 06/02 E
valid for Software No.950627

General

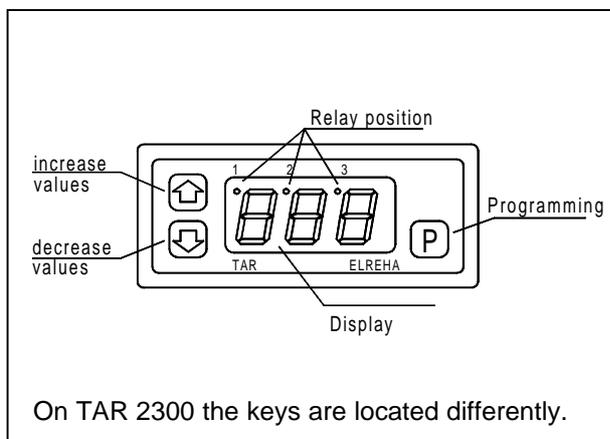
The TAR x31x series controller was designed for controlling refrigeration and freezer devices with all their necessary functions. There are three standard relay outputs available and all operation is made from the front.

Features

Following functions and features are included in the standard type of this controller:

- Displaying actual and set temperatures (optional °C / °F)
- Temperature control with different switching modes.
- Internal defrost timer, different defrost modes
- Defrost termination by time and/or temperature
- Fan control by time or temperature
- Temperature warning (high/low, time-delayed) with integrated buzzer
- Manual defrost
- Sensor correction

Operating and Programming



Operating the TAR is very easy since all parameters can be shown and edited by means of only three keys.

Three seconds after applying voltage to the controller the actual temperature of the room sensor is being displayed.

Calling up Parameters

Upon pressing the "Programming" key one of the parameters numbers is displayed which are listed on page 4 of this manual. Using the ↑ or ↓ key, you can select any other parameter. Upon pressing "P" again, the value of the selected parameter is displayed.

Editing Parameters

A displayed value can be edited by use of the ↑ and ↓ keys. Pressing "P" again brings you back to the parameter list and loads the edited value into the controller.

Unlock Keys

To prevent un-authorized persons from editing parameter values, there is a locking function which allows only the setpoint to be changed at any time. All other parameters must be unlocked beforehand. This means that at parameter P33 a certain value is to be set (---88---) :

- Press "P",
- Use "↑" to select parameter P33
- Press "P" again
- Use "↑" to set value to --88--
- Press "P" again to select parameter to edit.

If no key is hit for about one minute, the access code is cancelled and the editing function is locked automatically.

Function

Display

All temperature values can be displayed in °C or °F. Parameter **P08** allows toggling these two display modes.

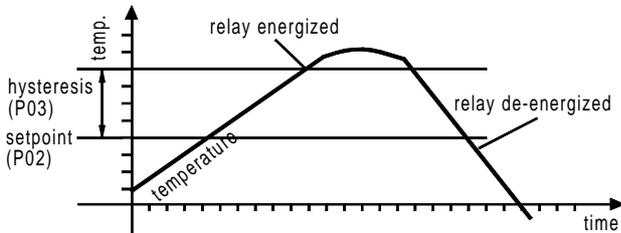
Temperature Control

The controller compares the actual room temperature with the setpoint (**P03**) and, according to the deviation, energizes or de-energizes relay K1. In order to be fail-safe in case of any internal power failure, there is a possibility of selecting the correct switching mode. In refrigeration mode the n/o relay contacts are used so that the load is shut off in case of failure. In freezing mode the load is connected to the n/c contact, having the load running constantly in case of failure.

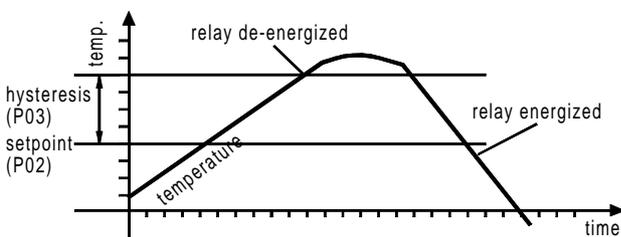
The switching hysteresis (differential) is adjustable to prevent the system from short cycling (parameter **P04**). With parameters **P05/P06** you can limit the setpoint range.

The switching mode (explained before) is set with parameter **P07**.

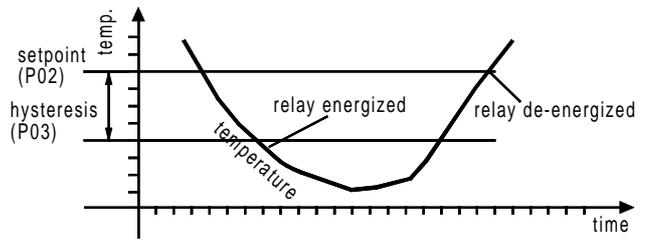
1= Refrigeration



2= Freezing



3= Heating



Temperature Warning

A built-in buzzer comes on when the room temperature exceeds the range set with parameters **P22/P23** and the time delay set with parameter **P24** is over. A relay (K3) is available for remote warning purposes if it is not used for fan control.

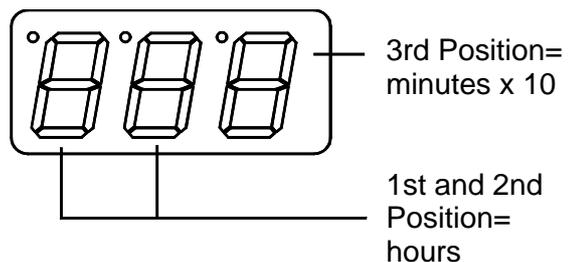
You cancel the alarm by pressing any key. If the K3 relay was selected for alarm function, it will come ON again after the set time delay as long and as often as the temperature stays in the warning area. Parameter **P29** indicates the time to go for the next warning event.

With parameter **P25** you set the alarm mode:

- 0= Buzzer only, relay K3 is used for fan control
- 1= Buzzer + Relay K3; the relay operates fail-safe (de-energized on alarm)
- 2= Buzzer + Relay K3; the relay operates active (energized on alarm)

Internal Timer

The internal timer allows you to set up to four defrost events per day with parameters **P13** through **P16**. The defrost times are set in 10 minute increments in a 24 hour (military) format. The time of the day is set with parameter **P31** for the hour and **P32** for the minutes. The timer is power backed up for about 10 days on power failure. Because the display has three digits only the time value comes in the following format:



Example: 13.20 = 01:20 p.m.

Defrosting

One relay output contact is used to control a defrosting device. Defrosting can be initiated by the internal timer or manually. The defrost times are set with parameters **P13 thru P16**.

The defrosting device is always driven from the n/o contact of relay K2. There is no need for interlocking the defrost with the cooling function since with parameter **P12** you select the defrosting mode and the controller automatically decides on the cooling output. For information there is parameter **P26** showing the remaining time of the momentary defrost cycle until termination by time.

Defrosting Modes (set with P12)

Refrigeration (precondition P07=1)

- 1= *Heater or Free Air Defrost*
Relay K2 is energized and K1 is de-energized.
- 2= *Hot Gas Defrost*
Relays K2 and K1 are energized.

Freezing (precondition P07=2)

- 1= *Hot Gas Defrost*
Relay K2 is energized and K1 is de-energized.
- 2= *Heater or Free Air Defrost*
Relay K2 is energized and K1 is energized

Manual Defrost

Parameter **P30** allows you to start a defrost cycle with the "↑" key, unless the sensor is already above termination temperature.

Defrost Termination

There are three ways for terminating a defrost cycle:

- 1st:** thermal termination.
Whenever the evaporator sensor temperature (P02) is warmer than the temperature limit set with parameter **P11**, defrosting is terminated.
- 2nd:** termination by (safety) time.
The time set with parameter **P17** is the maximum time a defrost cycle can last before it is terminated automatically.
- 3rd:** manual terminating.
Under parameter **P30** you can terminate a defrost cycle by pressing the "↓" key.

Evaporator Fan Control

The K3 relay can be used for controlling the fan, if it is not used for alarm purposes (see P25). Different modes of fan operation can be selected with parameter P20.

Fan Modes

- 1 = Fan runs when compressor output (K1) is on. After defrosting, the fan output is OFF until the programmed Fan Delay Time (P21) is complete.
- 2 = Fan runs continuously, except during defrost and Fan Delay Time (P21).
- 3 = Fan runs when the compressor output (K1) is on, and during defrost. There is no fan delay time.

A thermostatic fan control is always available. Fan runs when sensor temperature (P02) is below setpoint for the programmed Fan Start/Stop Temperature (P19).

If you don't need this function, set parameter P19 to the highest value.

The fan is always run from the n/o contact of relay K3.

When fan delay is active, parameter P28 shows the remaining time.

Parameter Listing

Parameter	Disp only	no Code	Description	Range	Default value
P01	X		Actual Temperature Control Sensor (°C / °F)		
P02	X		Actual Temperature Evaporator Sensor (°C/°F)		
P03		X	Control Setpoint	Upper limit (P05)...low limit (P06)	°0 C
P04			Control differential (hysteresis)	0...10K / 0...17 F	2K
P05			Setpoint high limit	-50°C...50°C / -57°F...121°F	50°C
P06			Setpoint low limit	-50°C / -57°F.....upper limit	-50°C
P07			Switching Mode Relay K1	1= Refrigeration, 2= Freezing, 3= Heating	1 (Refrig.)
P08			Display Mode	1= °Celsius 2= °Fahrenheit	1 (°Celsius)
P09			Correction Control Sensor	-10K...10K / -17F...17F	0K
P10			Correction Evaporator Sensor	-10K...10K / -17F...17F	0K
P11			Defrost Termination Temperature	0...30°C / 32...85°F	10°C
P12			Defrost Method	1=, 2=, depends on (P07) setting, see text	
P13			Defrost time #1	000...235 = 00:00 a.m. ... 11:50 p.m.	Aus *)
P14			Defrost time #2	000...235 = 00:00 a.m. ... 11:50 p.m.	Aus *)
P15			Defrost time #3	000...235 = 00:00 a.m. ... 11:50 p.m.	Aus *)
P16			Defrost time #4	000...235 = 00:00 a.m. ... 11:50 p.m.	Aus *)
P17			Defrost (safety) Time	1...99 minutes	30 minutes
P18			Cooling delay (after defrost)	0...99 minutes	0 minutes
P19			Fan Stop/Go Temperature	total control range	0°C
P20			Fan Mode	1= 2= 3=, see text	1
P21			Fan delay (after defrost)	0...30 minutes	3 minutes
P22			Alarm high limit	-50°C...50°C / -57°F...121°F	50°C
P23			Alarm low limit	-50°C / -57°F....high limit	-50°C
P24			Alarm Delay	1...99 minutes	5 minutes
P25			Alarm / Fan Mode	0= no alarm relay, K3 is fan relay 1= no fan control, K3 warns de-energized 2= no fan control, K3 warns energized	0
P26	X		minutes to go for defrost termination by time		
P27	X		minutes to go for cooling to come on (after defrost)		
P28	X		minutes to go for fan to come on		
P29	X		minutes to go for alarm being activated		
P30		X	Manual Defrost	"key up"= Start Defrost "key down"= Terminate Defrost	
P31		X	time of the day: hours	0...23 hours	
P32		X	time of the day: minutes	0...59 minutes	
P33		X	Acces Code (key unlock)	0...99	0

Parameters

Default values and settings are factory settings.
 Values marked 'X' are for information only and can not be edited.

Note:
 It is possible to reset all parameters to default:
 Switch off supply voltage,
 press and hold the 'P'-key,
 Switch on supply voltage.



The basic setup is complete now and you can edit the setpoints, delay times etc.



If for any reason the actual sensor values displayed should not match with the temperature you read from a high accuracy thermometer, you can correct the error with parameter **P09/P10**.

Failure Mode

In case of sensor failure (short circuit or interrupt) the display starts flashing and the controller interrupts all functions. If there is a control sensor failure, the warning relay comes on after the warning time delay is over.

Installation



Before applying voltage to the controller make sure that all wiring has been made in accordance with the wiring diagram in this manual and is fitting the application.
 Sensor leads may be up to some hundred meters, but should be shielded cable with one end of the shield connected to ground. This avoids irregular switching caused by electromagnetic interference.

Applications with Free-Air Defrost

When this defrost method is used, there is no need for having a defrost sensor at the evaporator. In this case the sensor must be simulated by a fixed resistor (1.3 kOhms).
 The controller then terminates a defrost cycle only by time which is set with parameter **P17**.

Getting Started

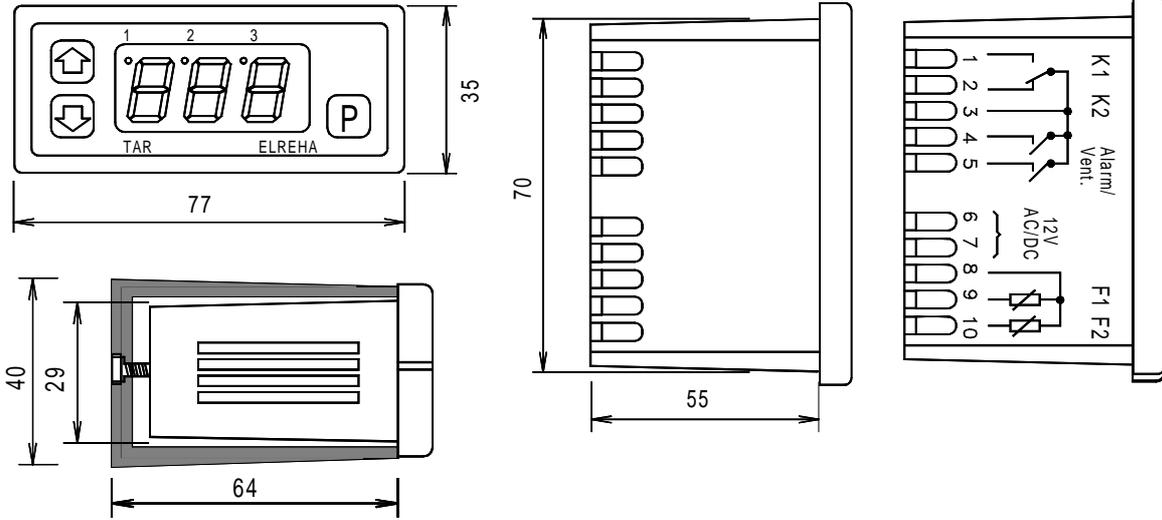
Upon applying voltage to the controller, the display reads the temperature of the control (room) sensor. After you have punched in the access code (see chapter "unlock keys"), you programm the configuration of the controller to suit your application:

- switching mode: parameter P07,
- display mode: P08,
- defrost method: P12
- evaporator fan mode: P20,
- and/or the alarm mode: P25

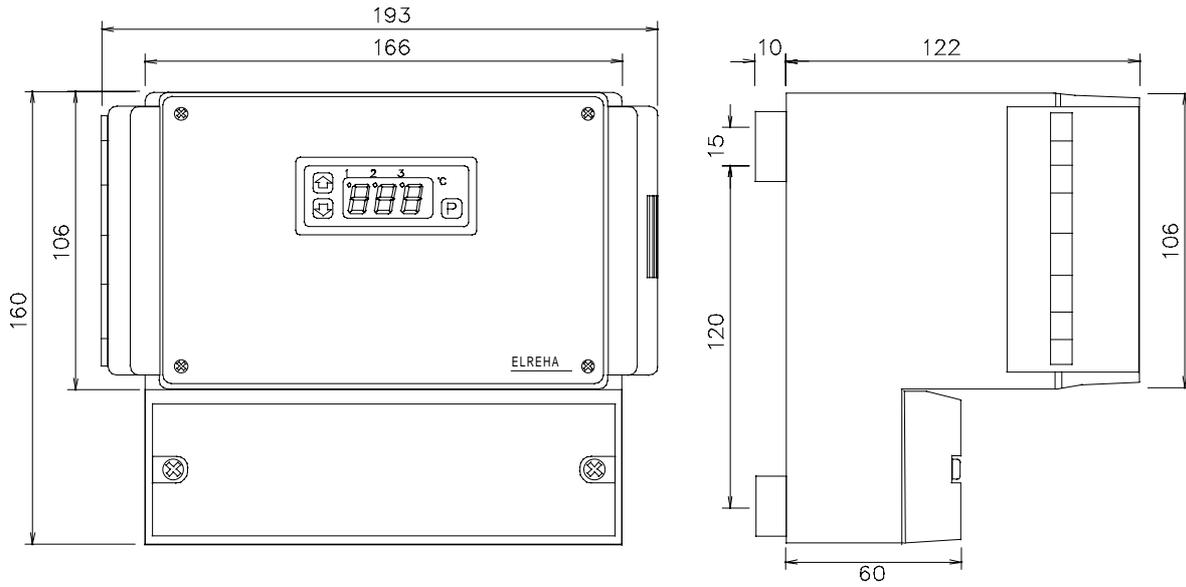
Technical Data

Supply Voltage	
TAR 131x	12 V AC/DC
TAR 231x	230 V AC
TAR 431x	230 V AC
Consumption	apr. 3.5 VA
Contact Rating	8 A resistive 3 A inductive
Temperature range	
working	-10....+55 °C
storage	-30....+70 °C
data storage	unlimited
real time clock	power backup for 10 days
Display	LED red 1/2"
Relay Position Indicator	1.2 mm red
Buzzer	3.5 kHz inter- mittent 84 dB/30cm
Screw terminals	2.5 mm
Protection	
TAR 131x	IP 54 front
TAR 431x	IP 54
TAR 231x	IP 30

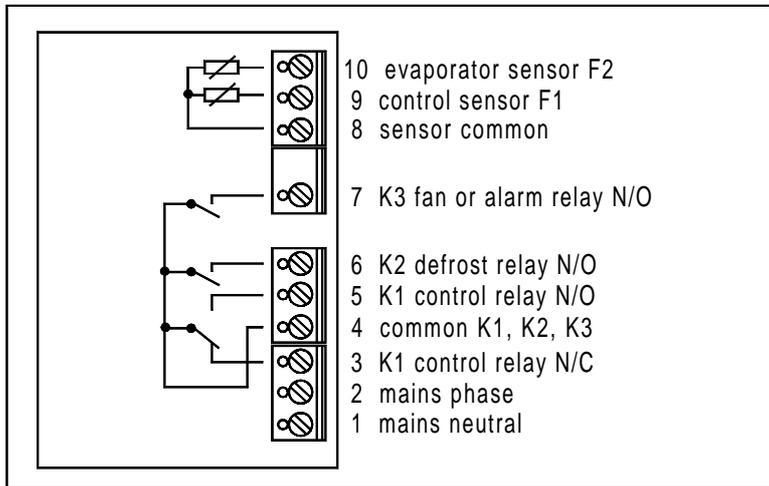
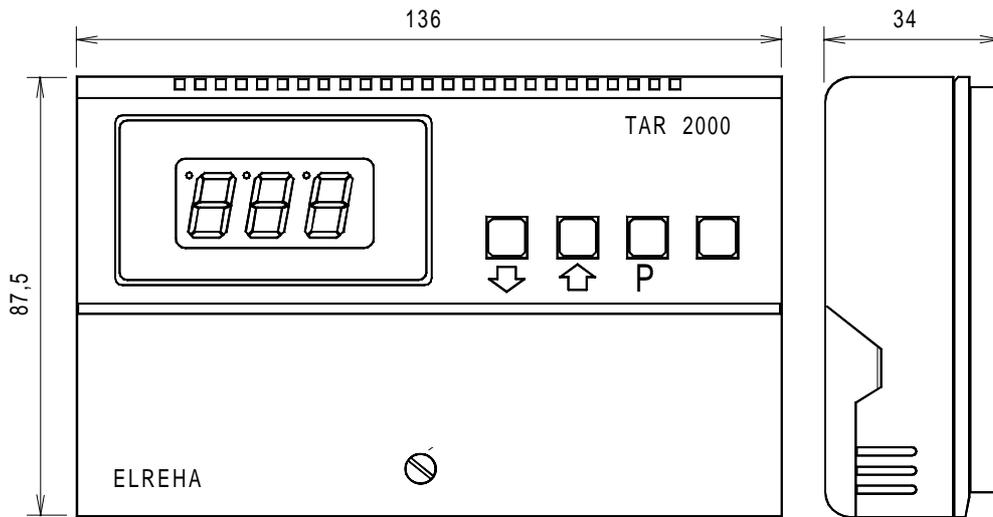
Dimensions and Wiring TAR 1310



Dimensions and Wiring TAR 4310



Dimensions and Wiring TAR 2310



Bottom Case Mounting Holes

