

# ELREHA TARN 1370, TARN 21370

Software Version 211204

No. 5311231-01/00 E

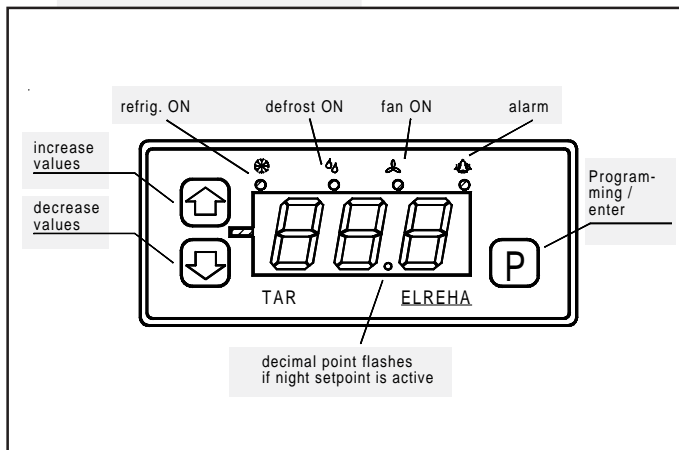
## Features

- 3 control relays:  
R1: Solenoid Valve, R2: Defrost Heater  
R3: Choice of Fan or Alarm
- Programmable Defrost Control by Cycle  
Timer & Temperature with Manual Defrost  
Override Option
- Programmable Fan Control by Time /  
Temperature
- Over-/Under Temperature Alarm
- Operates with TF 201 or TF 501 (Pt1000)-  
sensors



**Please Note Safety Instructions !**

## Operating Elements



### Auto scrolling

Hold '↑/↓'-keys to scroll values automatically.

### Manual Defrost

Manual defrost can be initiated while the display shows the actual value by pushing '↑' for more than 3 seconds - to terminate: press '↓' for more than 3 seconds.

### Control Model Number Display

By holding the "P" key for more than 2 seconds, the Control Model Number will be displayed (137).

## Parameters

All adjustable parameters are assigned a "P" number. See listing on page 2 for details.

### Calling up and editing

Press "P" key ..... parameter number is displayed  
Press '↑/↓' ..... select desired parameter  
Press "P" again ..... parameter value is displayed  
Press '↑/↓' ..... adjust parameter value  
Press 'P' again ..... new value is stored,  
display returns to "P" number.

### Access Authorization

Key parameters have an access code requirement to prevent unauthorized changes from being made. All remaining parameters can be changed without an access code (see PARAMETER Listing on page 2 for parameters requiring code):

Press "P" key ..... parameter number is displayed  
Use "↑/↓" ..... select "P38"  
Press "P" again ..... Display will show "00"  
Use "↑" ..... set value to --88--  
Press "P" again ..... code is stored  
Use "↑/↓" ..... select desired "P" number to adjust

If no key is pressed within four minutes, the access code will cancel and authorization access lock will be restored automatically.



**Functional Description**

**Display & Sensors**

Parameter **P21** allows you to choose display in °C or °F, as well as sensor type and temperature range. The TARN 1370/21370 will operate with any of the following sensor types: TF201, TF 202 as well as TF501 (Pt1000), each of which has a specific temperature range. The display resolution for both sensor inputs is 0.1K (0.2°F).

**Note:** If only one sensor input is needed, the 2<sup>nd</sup> input can be disabled.

**Temperature Control**

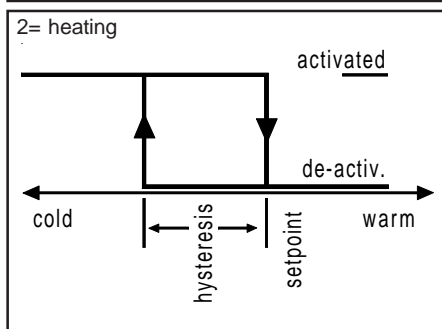
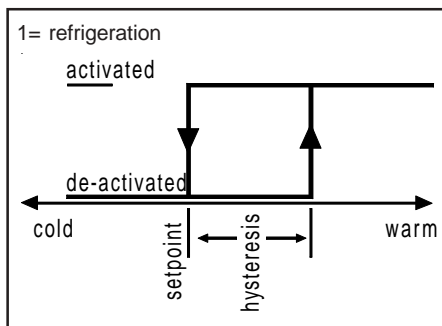
Parameter **(P03)** defines the desired temperature, or "setpoint". The controller compares the actual room temperature, **(P01)**, with the setpoint, and activates the cooling relay as needed. This relay can activate a solenoid valve or a compressor to achieve the desired temperature as defined in **(P03)**. Parameter **(P09)** allows the adjustment of the switching hysteresis (differential) to prevent the system from short cycling. A pause delay **(P11)** prevents the compressor from switching ON again immediately.

**Setpoint range**

With parameters **P07/P08** you can define the range within which the setpoint can be adjusted. This prevents unauthorized personnel from making an adjustment outside of the desired operating range.

**R1 Control Mode**

Parameter **P10** defines the operation mode of R1. Mode 1 = refrigeration, Mode 2 = Heating. See diagrams below for details.



**2nd Setpoint Option**

The controller is equipped with an option to reduce energy consumption by establishing a second setpoint for after hours operation.

Parameter **(P04)** allows you to select the second setpoint. Parameters **(P05/P06)** are used to establish the duration of the second setpoint, which is activated by an internal time switch. When this option is activated, the decimal point on the display will flash.

**Temperature alarm**

An temperature alarm is indicated by :

- an alarm LED on the front of the control
- a built in audible alarm
- an alarm relay (when R3 is designated as an alarm relay in Parameter **P30**).

Parameter **(P30)** allows you to select the Alarm Configuration (ex. Alarm relay active/not active, with audible alarm/without audible alarm, manual reset option active/not active, etc.)

If the temperature measured by the control sensor exceeds the range set by parameters **(P32/P33)**, a delay timer **(P31)** starts. After this timer runs down, an alarm will be activated. **(P32)** (high limit) is relative to setpoints **(P03/P04)**. **(P32)** will adjust proportionally to the setpoints.

**(P18)** displays the remaining time until the alarm is activated. Once the measured temperature is restored within operating range, the relay will reset automatically.

**Defrost**

The R2 output is used to control a defrost device. R1 is automatically disabled when a defrost event is in progress, preventing simultaneous cooling and defrosting.

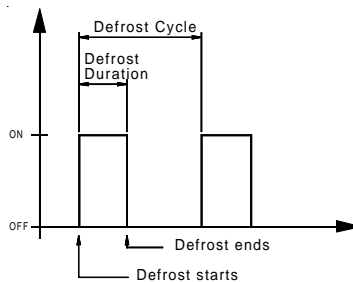
**Defrost Initiation**

- by internal cyclic timer **(P24)**
- manually **(P37)**.

Parameter **(P15)** displays the remaining time until defrost event completion.

**Cyclic Timer**

**P24** defines the time up to the next defrost event, **P28** defines the defrost duration. The cyclic timer starts running with power-up of the controller, the first (automatic) defrost events starts first after the first cycle time is run down.



**Machine Runtime**

If the added power-on times of a connected machine (e.g. compressor) exceed the time defined by **P24**, a defrost cycle starts.

**Defrost Modes**

With **P23** a defrost mode can be selected.

- 1 = *Cyclic Heater or Airflow Defrost*  
Start of defrost cycle switches the defrost relay ON (i.e heater ON) and switches cooling OFF.
- 2 = *Cyclic Hot Gas Defrost*  
Start of defrost cycle switches the defrost relay ON (i.e. bypass-valve open) and switches cooling relay ON (i.e. solenoid valve open).
- 3 = *Heater or Airflow Defrost depending on Machine Runtime*  
Same switching characteristic as Mode 1

4 = *Hot Gas Defrost depending on Machine Runtime*  
Same switching characteristic as Mode 2

5 = *Cyclic Heater or Airflow Defrost + DH*

6 = *Cyclic Hot Gas Defrost + DH*

7 = *Heater or Airflow Defrost depending on + DH*

8 = *Hot Gas Defrost depending on + DH*

**DH** is the 'Display Hold' function (see below)

**Manual Defrost**

- Parameter **P37** enables you to start a defrost cycle by pressing the "↑" key, unless the sensor is already above termination temperature.
- or
- When the control is in its default mode, (P01), and the temperature is on the display, a defrost event can be manually initiated by pressing the "↑" key for more than 2.5 sec.

**Defrost Termination**

- Thermal termination.  
Whenever the evaporator sensor temperature **(P02)** is higher than the defrost termination temperature **(P22)**, defrosting will be terminated.
- Termination by (safety) time.  
The time set by parameter **P28** is the maximum time a defrost cycle can last before it is terminated automatically.
- Manual termination.  
With parameter **P37** you can terminate a defrost cycle by pushing "↓" key.  
or  
While the actual temperature **(P01)** can be read on the display, a defrost cycle can be terminated by holding "↓" key for more than 2,5 seconds.
- If the defrost limit sensor is interrupted, the defrost cycle will be stopped immediately.

After the defrost cycle is terminated, cooling is delayed by parameter **(P29)**. This prevents water drops from freezing on the evaporator coils.

Parameter **(P16)** displays the remaining time before cooling is reinitiated after a defrost event.

**(DH) Display Hold**

This function holds the last measured actual temperature value on the display during a defrost cycle. After the defrost cycle has been terminated, the 'Display Hold' ends if:

- measured Actual Value falls below of the Display Value by 2K  
or
- a fixed 15 minute timer times out.

In Parameter **(P23)**, modes 5 – 8, allow for the Display Hold feature.

**Evaporator Fan Control**

**i** The fan relay can also be used as an alarm relay, selectable by (P30) (see "Temperature alarm").

Parameter (P13) allows you to select from 3 different fan operating modes.

A temporal fan restart delay is active after a defrost cycle (P14).

A thermostatic delay is always active, that means the fan starts only if the temperature measured with the evaporator (limit-) sensor is 3K below the fan trailing temperature (P12).

If this function is not desired, (P12) can be set to its upper limit to make it ineffective.

During drain time (P29) the fan remains off.

**Fan Modes (P13)**

- 1 = Fan runs if compressor output is on. After defrosting, the fan output is OFF until the programmed Fan Delay Time, (P14) is complete.
- 2 = Fan runs continuously, except during defrost and Fan Delay Time (P14) after defrost. Thermostatic fan delay: The fan stops if the temperature measured with the evaporator sensor exceeds P12. If this function is not desired, P12 can be set to its upper limit to make it ineffective.
- 3 = Fan runs if the compressor output is on, and during defrost. The temporal fan delay must be set to "0". This mode can be used for airflow defrost, no thermostatic delay is valid.

(P17) indicates the remaining time before the fan starts again.

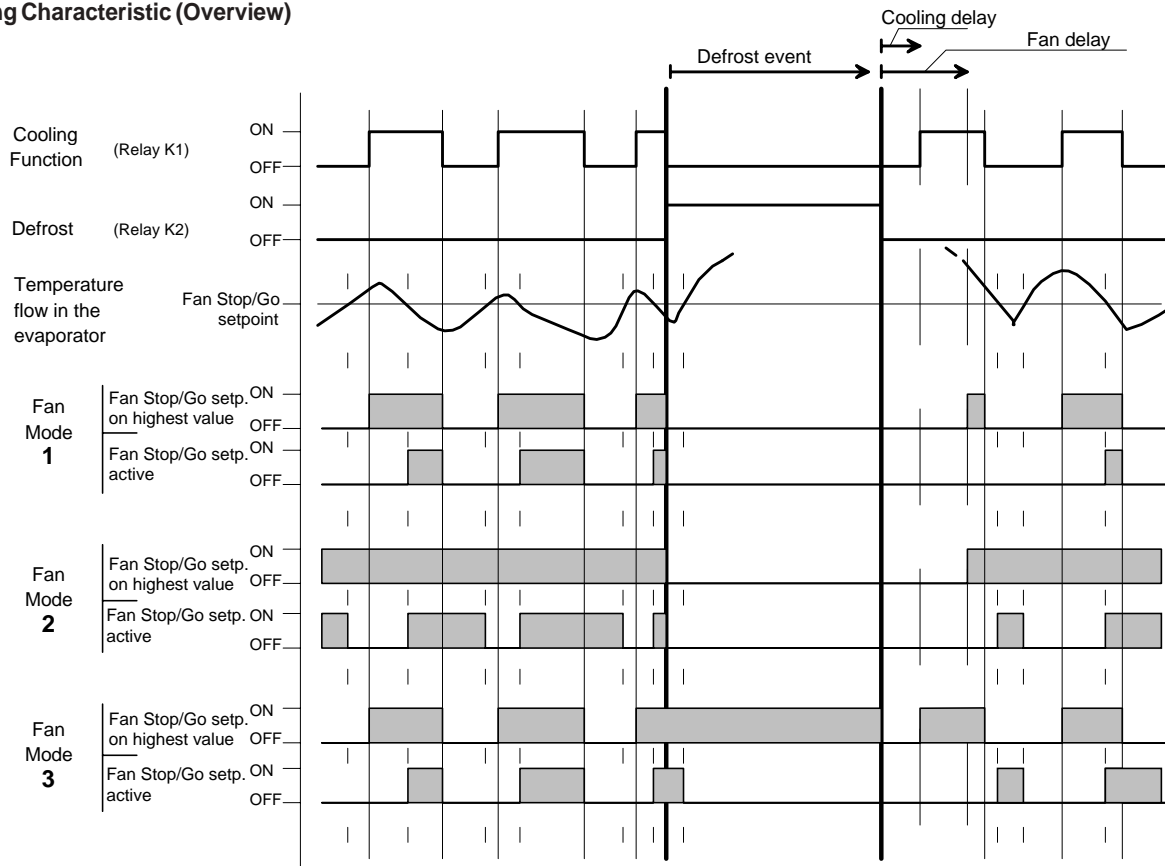
**Practical conditions**

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

If you want to instate a thermostatic delay, select fan mode 2 and adjust setpoint P12.

If you want to instate a thermostatic delay and airflow defrost, please realize a parallel connection of fan relay and defrost relay.

**Switching Characteristic (Overview)**



**Technical Data**

Supply Voltage TARN 1370 .... **230V AC / 50-60 Hz**  
 TARN 21370 ... **115V AC / 60 Hz**  
 Power Consumption ..... appr. 4 VA  
 Contact Rating cooling rel. .... 10A res., 80A (20 msec) / 250V  
 Contact Rating others ..... 5A res. / 250V  
 Operating temperature ..... -10...+50°C (14...122°F)  
 Storage temperature ..... -30...+70°C (-22...158°F)  
 Relative Humidity ..... max. 80% r.H., not condensing  
 Display ..... LED,7-segment,red,character height  
 13mm (.51)  
 Resolution ..... 0,1°C / 0,2°F

Accuracy ..... typ. +/- 1K  
 Temperature sensors ..... TF 201, TF 202 or TF 501 (Pt1000)  
 Control-/Display Range  
 with TF 201, 202 ..... -55...+105°C / -67...221°F  
 with TF 501 ..... -110...+120°C / -166...248°F  
 Data storage parameters ..... unlimited  
 Relay indicators ..... 3 mm, red  
 Electrical connection ..... pluggable screw terminals 2,5mm (.1)  
 Protection ..... IP 54 from front

**CONNECTION & SAFETY INFORMATIONS**

**Please read before Start-up**

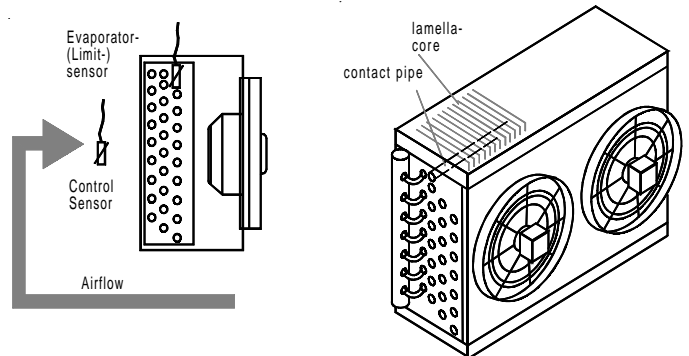
- **Limit of Application:** This product is not designed nor manufactured for use in equipment or systems that are intended to be used under such circumstances that may affect human life.  
For applications requiring extremely high reliability, please contact the manufacturer first
- Electrical installation and putting into service must be done from authorized personnel.
- Please note the local safety instructions !
- Before installation: Check the limits of the controller and your application. Before starting up we recommend you to read the instructions for use, since only by doing so you can avoid damage or malfunction and you will benefit all the advantages offered by this product.
- **During installation and wiring never work when the electricity is not cut-off !**
- **Never operate unit without housing.**
- Mounting the controller close to power relays is unfavourable in case of the electro-magnetic interference.
- Before applying voltage to the controller, make sure that all wiring has been made in accordance with the wiring diagram in this manual. Check, if the supply voltage corresponds to the value printed on the type label.
- Connect 'PE' terminals carefully to ground because otherwise operation of the internal noise filter is disabled.
- Respect the environmental limits for temperature and humidity. Outside these limits malfunctions may occur.
- Observe the maximum admitted current rate for the relays (see technical data). Compare with the peak start-up current of the controlled devices (valve, fan, compressor, heater..)
- Sensor cables may be up to some hundred meters in length. Use shielded sensor cable only. Don't install them in parallel with high-current cables to prevent inductive interference. A cross section of min. 0,5mm<sup>2</sup> is sufficient.
- Shielding has to be connected to PE at the end near the controller
- All used temperature sensors must be identical. Never use different types mixed. This will not work.
- TF-type sensors are moisture-proof but they are not designed for being immersed in water for a long period of time (not pressure-proof). In such a case, always use dip-fittings.



**Installation / Run-Up**

Sensor locations

Control Sensor: In the airflow, at the suction side of the evaporator.  
Limit Sensor: In the lamella core or the contact pipe of the evaporator, at the place ice remains the longest time.



Applications with Airflow-Defrost

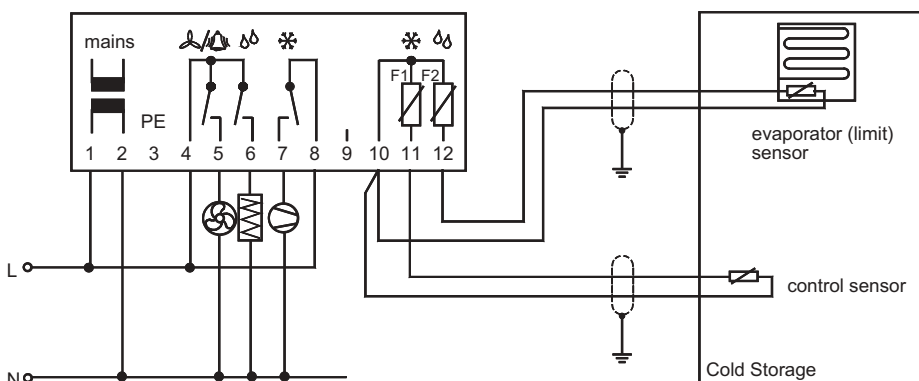
**i** If this defrost method is used, there is no need for a defrost sensor in the evaporator, so the sensor can be disabled. If the correction parameter P20 is set to -10,1, the display shows "oFF" and the sensor is disabled. Correcting the parameter upward enables the sensor again. In this case, the controller terminates a defrost cycle only by time which is set with parameter **P28**. After power-up, display shows the temperature of the control sensor. After entering the access code (see chapter "unlock keys") you have to set the basic configuration of the controller to suit your application:

- kind of temperature sensor and display value (°C/°F) (**P21**, Please note: special access code is '70').  
All entered temperature setpoints will be set to default.
- switching mode of cooling relay (parameter **P10**)
- defrost method (**P23**)
- evaporator fan mode (**P13**)
- defrost cycle and duration (**P24, P28**)
- sensor correction if necessary by **P19/P20**.

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

**See troubleshooting help on next page**

**Application Example**



**Typical parameter values for a cold storage with electric defrost**

|            |     |            |     |
|------------|-----|------------|-----|
| <b>P03</b> | -20 | <b>P22</b> | 14  |
| <b>P07</b> | -15 | <b>P23</b> | 1   |
| <b>P08</b> | -25 | <b>P24</b> | 120 |
| <b>P09</b> | 2   | <b>P28</b> | 30  |
| <b>P10</b> | 1   | <b>P29</b> | 2   |
| <b>P11</b> | 2   | <b>P31</b> | 30  |
| <b>P12</b> | -2  | <b>P32</b> | 7   |
| <b>P13</b> | 1   | <b>P33</b> | -35 |
| <b>P14</b> | 3   |            |     |

**Troubleshooting**

- 1. Which controller do you have ?  
Hold key 'P' for more than 2 seconds, display shows the type of the controller unit (138).
- 2. Do you hold the correct manual ?
- 3. With parameters P01 and P02 such as P15 to P18 (actual temperatures and running delays) you get a first survey about the unit's states.

| problem   | possible reason  |
|---|--|
| <b>Temperature display:</b>   |  |
| Actual display flashes with "-110" appr. "-166"   | Sensor type TF 501 with "°C" appr. "°F" selected, Short circuit in wiring or sensor itself   |
| Actual display flashes with "-55" appr. "-67"   | Sensor type TF 201 with "°C" appr. "°F" selected, Short circuit in wiring or sensor itself   |
| Actual display flashes with "120" appr. "248"   | Sensor type TF 501 with "°C" appr. "°F" selected, Wiring or sensor itself broken   |
| Actual display flashes with "105" appr. "221"   | Sensor type TF 501 with "°C" appr. "°F" selected, Wiring or sensor itself broken   |
| Temp. display does not match with actual temperature.   | Check if reference thermometer is placed at the same position as the sensor head. Then correct sensors.  |
| <b>Programming:</b>   |  |
| Setpoint cannot be adjusted   | High and low limit of the setpoint range are identical   |
| Other values cannot be programmed   | Enter Access Code.   |
| Display is running. All 3 positions change from 111 to 999  | Unit works in selftest mode. Switch power OFF, switch power On again after 15 seconds. Please check sensor corrections now.  |
| You want to set all parameters to default   | Switch power OFF and wait 15 seconds. Hold P-key, switch power ON, unhand P-key. (The display shows first the software-version and then 'deF'. Now all parameter values are lost and are set to default.                   |
| <b>Temperature Control:</b>   |  |
| Room temperature is shown too cold. Cooling is OFF although the room is too hot or: Cooling switches OFF too early. | Sensor 1 and sensor 2 are interchanged, see also above 'Temp.display'  |
| Cooling is always running, although the room is cold enough and the indicator LED 1/Cooling is not ON.              | Wrong switching mode or N/O / N/C-contact interchanged (cool. relay).<br><i>Note: If you change the switching mode, check or select the correct defrost mode !</i>   |
| Temperature too high, indicator LED '1/Cooling' is ON, but cooling does not switch ON.                              | Wrong switching mode or N/O / N/C-contact interchanged (cool. relay).<br><i>Note: If you change the switching mode, check or select the correct defrost mode !</i>   |
| Temperature too high, but cooling does not switch ON.   | Check, if a defrost cycle or the drain time is running.  |
| Cooling works, but fan is OFF.  | Check, if 'fan stop/go temperature' should work and the evaporator temperature is below the setpoint. Check if the fan delay is running  |
| You have selected fan mode 3, but the fan does not work during a defrost cycle.                                     | In this mode the fan delay must be set to '0'. If the evaporator sensor reaches the fan stop/go setpoint, the fan will be switched OFF during the defrost cycle. (appr. short defrost and fan relay with external wiring). |
| You have selected fan mode 2, but fan switches ON and OFF during the cooling phases.                                | Adjust fan stop/go temperature to the highest border   |
| You want to use a thermostatic fan delay, but the fan switches always OFF if cooling switches OFF.                  | Set fan mode to '2', adjust fan stop/go temperature.   |
| <b>Defrost:</b>   |  |
| Does not work.  | Check evaporator sensor position. Check defrost method, -times, -safety time and -termination temperature. Check if fan delay time is too long. Check if fan runs correctly in cooling cycles                              |
| During a defrost cycle cooling starts.  | Defrost mode is set to 'hot gas'. Please set correctly.<br><i>Note: If you change the switching mode, check or select the correct defrost mode !</i>   |

**Failure handling**

If the display flashes with 'minus'-LED:  
= sensor short circuit.  
without 'minus'-LED:  
= sensor interrupted  
Another possible opportunity is that the sensor is the wrong type or out of its specified range.

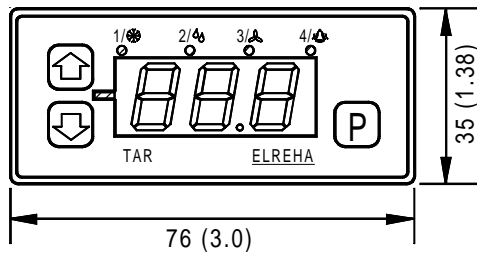


Control sensor disturbance

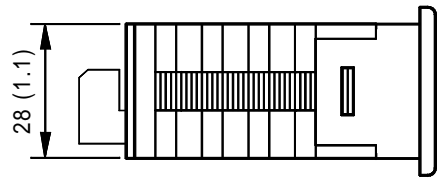
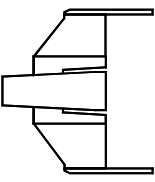
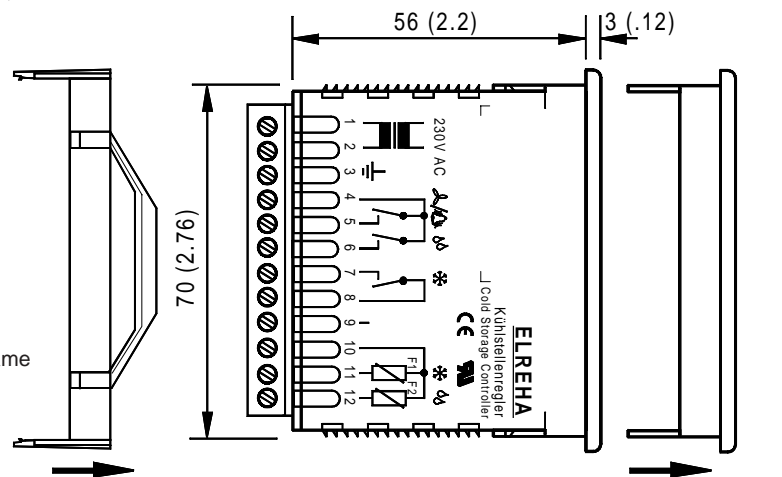
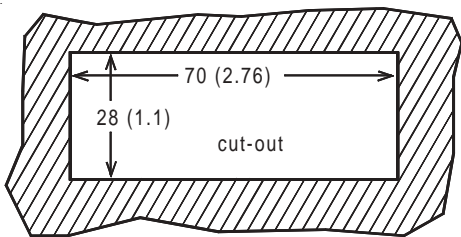
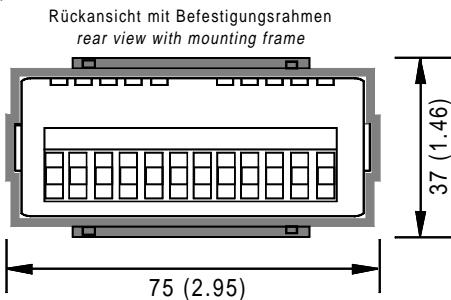
If the control sensor fails, all control functions will be disabled by de-activating the relay outputs. Display shows "oFF" if you select parameters P02 or P20 and the Limitation (Evap.) Sensor is disabled.



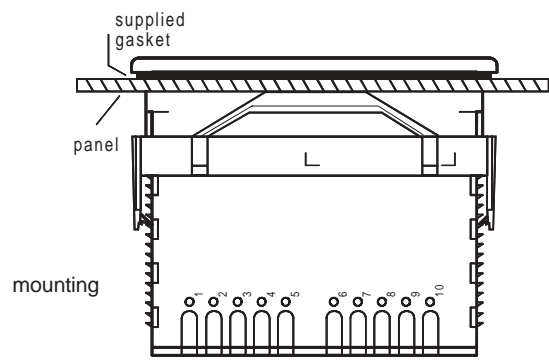
**Dimensions / Wiring TARN 1370, TARN 21370**



Snap in fixing frame from rear side.



Front frame can be removed



**Accessories** (please order separately or in a kit) : 2x Temperature sensors TF 201 or TF 501

**EG-Konformitätserklärung EG-Statement of Conformity**



Für das beschriebene Erzeugnis wird hiermit bestätigt, daß bei bestimmungsgemäßem Gebrauch die Anforderungen eingehalten werden, die in der Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten über die elektromagnetische Verträglichkeit (89/336/EWG) und der Niederspannungsrichtlinie (73/23/EWG) sowie der Änderungsrichtlinien (93/68/EWG) festgelegt sind. Diese Erklärung gilt für alle Exemplare, auf die sich die vorliegende Bedienungsanleitung (die selbst Bestandteil dieser Erklärung ist) bezieht. We state the following: When operated in accordance with the technical manual, the criteria have been met that are outlined in the guidelines of the council for alignment of statutory orders of the member states on electro-magnetic consistency (89/336/EWG) and the Low Voltage Directive (73/23/EWG) as amended by (93/68/EWG). This declaration is valid for those products covered by the technical manual which itself is part of the declaration. Zur Beurteilung des Erzeugnisses hinsichtlich elektromagnetischer Verträglichkeit und der Niederspannungsrichtlinie wurden jeweils die aktuellen Ausgaben der betreffenden Grund- und Fachgrundnormen herangezogen. To meet the requirements, the currently valid versions of the relevant standards have been used.

Diese Erklärung wird verantwortlich vom Hersteller/Importeur  
This statement is made from the manufacturer / importer

abgegeben durch:  
by:

**ELREHA Elektronische Regelungen GmbH**  
**D-68766 Hockenheim**  
(Name / Anschrift / name / adress)

**Werner Roemer, Technischer Leiter, Technical Director**  
**Hockenheim** ..... **21.10.2004** .....  
Ort/city Datum/date Unterschrift/sign

This manual, which is part of the product, has been set up with care and our best knowledge, but mistakes are still possible. If you have any problems, difficulties or questions please don't hesitate asking our technical support. Technical details can be changed without notice, especially the software. Please note that the described functions are only valid for units containing the software with the version-number shown on page 1. Units with an other software number can work a little bit different. You will find this software number on the label of the unit too.

|                        |                            |                            |                |
|------------------------|----------------------------|----------------------------|----------------|
| set up 6.3.2005/tkd/jr | checked: 21.3.2005 lhadidi | approved: 21.3.2005/mv/sha | file#: E155131 |
|------------------------|----------------------------|----------------------------|----------------|

## **To change the Control Setpoint do the following :**

- Press key 'P' ..... any parameter number appears
- Press keys '↑/↓' .... select parameter '**P03**'
- Press "P" again ..... setpoint value appears
- Press keys '↑/↓' .... adjust setpoint value
- Press 'P' again ..... value is stored, back to parameter no.

## **Control Model Number Display**

By holding the 'P' key for more than 2 seconds, Control Model Number will be displayed (**137**).

If no key is pressed within four minutes, the access code will cancel and authorization access lock will be restored automatically.