

## Product Description

Cold Storage Controller with 4 relays (TARN: 3 relays) for Solenoid Valve, Defrost heater, Fan and/or Alarm Forwarding. Usable for any kind of cold storages such as walk-in coolers/freezers, refrigerated shelves, refrigerated counters, etc.. Depending on type, defrost initiating is controlled by a cyclic timer or a real time clock. Housing for panel mounting, 13mm LED-Display.

**Accessories** (please order separately)  
Temperature probe TF 201 or TF 501

## Applications

- Cold rooms, refrigeration units, refrigerated shelves, etc. with
- One evaporator
- Evaporator fan
- Defrost heater, Free-Air Defrost, Hot Gas Defrost



# ELREHA

ELEKTRONISCHE REGELUNGEN GMBH

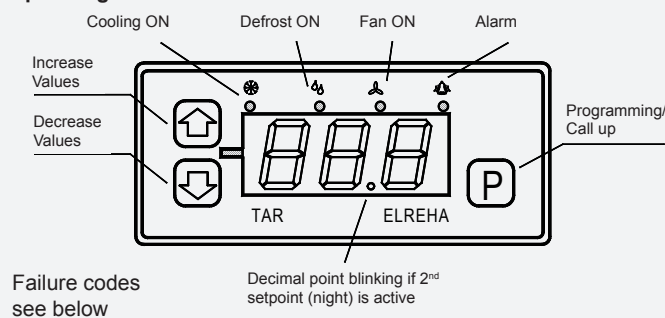
Manual No.  
Software Vers.

**5311009-03/11e<sub>2</sub>**  
1370-2: 1.15 / 1380-2: 1.15

## Cold Storage Controller

<b>TAR</b>	<b>1370-2</b>		(Cyclic Timer)
<b>TAR</b>	<b>1370-2 H</b>		(add. Beeper)
<b>TAR</b>	<b>1380-2</b>		(Real Time Clock)
<b>TARN</b>	<b>(2)1370-2</b>		(Cyclic Timer)
<b>TARN</b>	<b>(2)1380-2</b>		(Realtime Clock)

## Operating Elements



## Parameters

All selectable parameters hold a parameter number (e.g. P03), you will find a listing on the next page.

## Calling up and editing

Press key 'P' ..... parameter number appears  
Use '↑/↓' ..... select desired parameter  
Press 'P' again ..... parameter value appears  
Use keys '↑/↓' ..... adjust parameter value  
Press 'P' again ..... value is stored, back to parameter no.

## Unlock Keys

To prevent un-authorized persons from editing parameter values, there is a locking function which allows only the most important parameters to be changed at any time. The access code can be entered as follows:

- Before programming at P41
  - Directly at the parameter to change. If a code is necessary, the display shows "C". Use "↑/↓" to set the necessary code now and confirm by "P".
- If no key is hit for about four minutes, the editing function is locked again.

## Auto scrolling

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

## Manual Defrost

Manual defrost can be initiated while the display shows the actual value:

- Hold '↑' for more than 2 seconds = Defrost ON
- Hold '↓' for more than 2 seconds = Defrost OFF.

## Reading the controller type

- Hold key 'P' for more than 2 seconds, the display shows controller type (137 resp. 138, at TARN types h37 resp. h38). By pressing "↓" additionally, the software version will be displayed.

## Set parameters to factory default (Init)

Switch off supply voltage, press and hold the 'P'-key, switch on supply voltage again. Code request "C" appears. Enter "88" and confirm by "P". Now the display shows one by one: software- version, date and 'def.', which signifies that all parameters are set to default values now.

## Error Messages / Error Listing

While a failure the display switches to parameter P40 and shows a code.

- Key "P" switches back to the last display
- If multiple failures are present simultaneously, codes can be read by "↑/↓".

## Error Codes

E00 ..... no failure	E04 ..... Control Sensor Undertemp.
E01 ..... Control Sensor broken	E05 ..... Defrost Sensor broken
E02 ..... Control Sensor short circuit	E06 ..... Defrost Sensor short circuit
E03 ..... Control Sensor Overtemp.	



## Technical Data

Supply Voltage	TAR ..... 12V AC (50/60Hz) / 11-18V DC
	TARN 13xx ..... 230V AC (50-60Hz)
	TARN 213xx ..... 115V AC (50-60Hz)
Power Consumption	TAR: max. 3 VA, TARN: max. 4,4 VA
Relays	Cooling TAR (UL) ..... resistive: 120/240V AC, 10A, 30 k cycles
	motor: 120/240V AC, 4A, 30 k cycles
	others TAR (UL) ..... resistive: 120/240V AC, 8A, 30 k cycles
	motor: 125/250V AC, 1/4 HP, 30 k cycles
Cooling	(TAR, TARN) ..... 10A, 80A/10 msec
others	(TAR) ..... 8A res., 3A cosphi=0,4, 250V AC
others	(TARN) ..... 5A res. / 250V AC
<b>!! The max. current over terminal 7 (TARN: Terminal 4) may not increase 12 A !!</b>	
Ambient Temperature TAR (UL).....	-10...+65°C (14...149°F)
Ambient Temperature TARN .....	-10...+55°C (14...131°F)
Storage Temperature.....	-30...+70°C (-22...158°F)
Relative Humidity.....	max. 85% r.H., not condensing
Temperature sensors.....	TF 201, TF 202 or TF 501 (Pt1000)
Display .....	LED, 7-segment, red, character height 13mm (.51 inch)
Resolution / Accuracy .....	0,1°C (0,2°F) / typ. ± 1 K
Control-/Display Range with Temperature Sensor Types	
TF 201/202.....	-40...+80°C / -40...176°F
TF 501 .....	-110...+120°C / -166...248°F
Data storage parameters .....	≥20 years
Clock backup (1380-2 only) .....	typ. 10 days after mains is lost
Alarm Beeper (1370H-2 only) .....	2x per sec.
Relay indicators .....	3 mm, red
Electrical Connection.....	screw terminals 2,5mm <sup>2</sup>
Protection.....	IP 54 from front



**Please Note Safety Instructions !**  
**Please note supply voltage and changed functions when replacing older types !**



## New features compared to the older version (without -2)

- Failures are displayed as error codes now.
- Access codes can be entered directly at the parameter.
- 3 new parameters added.
- Last actual value stored while defrost (P38)
- Emergency mode (P39), - Current Error + Error Listing (P40)
- Codeparameter now is (P41)

*Please read this manual carefully before using the product. The guarantee will lapse in case of damage caused by failure to comply with these operating instructions! We shall not be liable for any consequent loss! We do not accept liability for personal injury or damage to property caused by inadequate handling or non-observance of the safety instructions! The guarantee will lapse in such cases. This manual, which is part of the product, has been set up with care and our best knowledge, but mistakes may occur. Technical details can be changed without notice, especially the software. Please note that the described functions are only valid for units containing the software version-number shown on page 1.*

**ELREHA GmbH**

D-68766 Hockenheim, Germany, Schwetzingen Str. 103  
phone 0 62 05 / 2009-0 - fax 0 62 05 / 2009-39 - sales@elreha.de

ParNo.	Code		Description	Range	Default
		TAR 1370-2 TAR 1380-2 TARN 1370-2 TARN 1380-2			
Default values are factory set.					
P01		x . x . x . x	Actual temperature control sensor (°C or °F)	display only	
P02		x . x . x . x	Actual temp. evaporator sensor (°C or °F)	display only	
P03		x . x . x . x	Setpoint	Low limit P08...high limit P07	0 °C
P04	88	x . x . x	2nd Setpoint (Night-Setpoint)	± 100 °C (-148...212 °F)	0
P05	88	x . x . x	Start-up of night-setpoint (in 10 min. steps)	0...235, OFF	OFF
P06	88	x . x . x	Stop of night-setpoint (in 10 minute steps)	0...235, OFF	OFF
P07	88	x . x . x . x	Highest adjustable setpoint	± 100 °C (-148...212 °F) up to P08	+50 °C
P08	88	x . x . x . x	Lowest adjustable setpoint	-100°C / -148°F up to P07	-50°C
P09	88	x . x . x . x	Setpoint hysteresis	0,0...20,0 K	2 K
P10	88	x . x . x . x	Switching mode cooling relay	1= cooling, 2= heating	1
P11	88	x . x . x . x	Cooling relay idle time	0...59 minutes	2 minutes
P12	88	x . x . x . x	Fan operation threshold	-100°C... +100°C (hyst. 3K fixed)	50°C
P13	88	x . x . x . x	Fan operating mode	1=, 2=, 3=, see text	1
P14	88	x . x . x . x	Fan delay after defrost	0...30 minutes	3 minutes
P15		x . x . x . x	Remaining minutes till defrost ends	display only	
P16		x . x . x . x	Remaining minutes to activate cooling	display only	
P17		x . x . x . x	Remaining minutes to start fan relay	display only	
P18		x . x . x . x	Remaining minutes up to an alarm	display only	
P19	88	x . x . x . x	Calibration control sensor	+/-10,0 K/F	0 K
P20	88	x . x . x . x	Calibration evap. sensor, resp. sensor OFF	+/-10,0 K/F, OFF	0 K
P21	70	x . x . x . x	Sensor type / °C or °F / measuring range	1= TF 501 / °C / -110...+120°C 2= TF 201 / °C / -55...+105°C 3= TF 501 / °F / -166...248°F 4= TF 201 / °F / -67...221°F 5= TF 202 / °C / -55...+105°C 6= TF 202 / °F / -67...221°F	2
Please note the different code for changing sensor type.					
P22	88	x . x . x . x	Defrost termination temperature in °C or °F	0,0...30,0°C / 118,0°F	10°C
P23	88	x . x . x	Defrost type (independent from P10)	1= electric, 2= hot gas, 3= electric+AZV, 4= hot gas+AZV (AZV with 1380-2 only)	1
P23	88	x . x . x	Defrost type (independent from P10)	1= heater by cyclic timer, 2=hot gas by cyclic timer, 3= heater by machine runtime, 4= hot gas by mach.runt.	1
P24	88	x . x . x	Defrost cycle	1...99 hours	4 hours
P24	88	x . x . x	Defrost event # 1, 000...235, OFF	(1.+2 position = hours,	OFF
P25	88	x . x . x	Defrost event # 2, 000...235, OFF	3.position = minutes x 10)	OFF
P26	88	x . x . x	Defrost event # 3, 000...235, OFF	"	OFF
P27	88	x . x . x	Defrost event # 4, 000...235, OFF	"	OFF
P28	88	x . x . x . x	Defrost safety operation time	0...120 minutes	30 min.
P29	88	x . x . x . x	Drain time, refrigeration delay after defrost	0...99 minutes	0 min.
P30	88	x . x . x . x	Alarm Mode, Fan Relay Configuration	0= Alarm relay active ON (N / O) 1= Alarm relay active OFF (N / C) 2= like "0", but internal beeper off 3= like "1", but internal beeper off 4= Alarm relay resettable within alarm range (see text) 5= Rel.4 switches with setpoint 2, alarm by LED only 5= Alarm relay configured as fan relay	1
P31	88	x . x . x . x	Alarm delay	1...99 minutes (if sensor fails < 1 minute + flashing displ.)	5 minutes
P32	88	x . x . x . x	Alarm high limit temperature (relative to P03)	0...100 K (0...100°F)	100K
P33	88	x . x . x . x	Alarm low limit (absolute value)	± 100 °C (-148...212°F)	-100°C
P34		x . x . x . x	Clock: hours		
P35		x . x . x . x	Clock: minutes		
P36		x . x . x . x	Clock: seconds		
P37		x . x . x . x	Manual defrost	"↑"= Start defrost, "↓"= Terminate	
P38	88	x . x . x . x	"Display Hold" (DH) while defrost event	0 = OFF, 1 = ON	0
P39	88	x . x . x . x	ON-time of the control relay while sensor error (Emergency Mode, based on 30 min. interval)	0...100%	50
P40		x . x . x . x	Current error + error listing	Multiple errors present: Use "↑/↓" to read	
P41	no	x . x . x . x	Access Code	0...99	0

## Functional Description

### Display & Sensors

All temperature values can be displayed in °C or °F with a resolution of 0,1K (0,2°F), selectable by **P21**. TF201, TF 202 (PTC) as well as TF501 (Pt1000) sensors can be used, but note that this results in different temperature ranges. Sensor 2 (Evap. Limit Sensor) can be disabled.

### Temperature Control

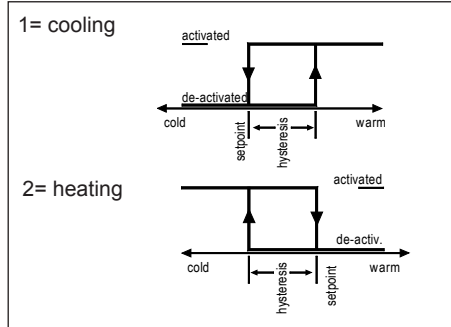
The controller compares the actual room temperature (**P01**) with the control setpoint (**P03**) and activates the cooling relay which is able to switch solenoid valves or compressors. The switching hysteresis (**P09**) prevents the system from short cycling. An idle time (**P11**) prevents a compressor from switching ON again immediately.

### Setpoint range

With **P07/P08** you can limit the setpoint range to prevent the end-user from entering critical values.

### Switching mode of cooling relay K1

The switching behavior of the cooling relay (= cooling mode) is defined by parameter **P10**.

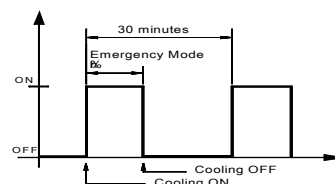


### 2. Setpoint / day-night-shift (1380-2 only)

To economize energy, e.g. at night, the unit can work with a second setpoint (**P04**), which can be activated by the internal time-switch (**P05/P06**).

### Emergency Mode of Temperature Control

If the control sensor fails, the unit starts an emergency mode. The refrigeration relay switches on in a percentage rate of a total period of 30 minutes, preset by **P39**. E.g.: selecting 40% means 12 minutes on, 18 minutes off.



### Temperature alarm

A temperature alarm is indicated by:

- A LED at the front
- An internal beeper (TAR 1370H-2/TARN only)
- An alarm relay (TARN-Types: Only if the fan relay is not in use).

If the temperature measured by the control sensor exceeds the range set by **P32/P33**, **P18** shows the remaining time until an alarm occurs. After the delay timer **P31** is run down, the alarm relay will be activated. **P32** is an alarm offset located relative to the current setpoint **P03** resp. **P04**, so if the setpoint is shifted, the offset remains constant.

*If the alarm mode P30 is set to '4', the alarm relay can be reset while the temperature is located within the alarm range. This is usable e.g. to switch an external signal horn. If the temperature comes back to the working range, the relay will be reset automatically.*

### Alarm relay / Beeper Operation Modes

Parameter **P30** fixes the alarm relay mode:

- 0 = Alarm relay active ON
- 1 = Alarm relay active OFF
- 2 = like 0, but internal beeper off (TARN only)
- 3 = like 1, but internal beeper off (TARN only)
- 4 = Alarm relay can be reset while temperature is located within the alarm range. Can be used e.g. to switch an external horn.
- 5 = Continuous ON of alarm relay if control setpoint 2 is activated (TARN 1380-2 only). Alarm messages will be forwarded by alarm-LED only. Function to switch light by time control.
- 5 = The alarm relay output works as fan relay (TARN types only).

### Alarm Beeper (1370H-2 and TARN only)

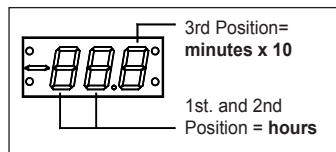
These types contain an integrated beeper (can be disabled by P30), which is activated with the alarm output. The beeper can be reset by any keypress.

### Defrost

The unit is equipped with a defrost relay. There is no need for external interlocking the defrost output with the cooling output since the temperature controller is disabled while defrost. For information there is **P15** showing the remaining time of the existing defrost event until termination by time.

### Defrost by Real time clock (1380-2 only)

This type contains a real time clock with 6 settable times, which allows you to initiate four defrost events a day and to switch to 'night'-setpoint. The timer has a power backup for about 10 days in case of power failure. The clock time can be set by parameters **P34** and **P35** (minutes). Because the display has only three digits, the time value comes in the following format:



The defrost times are set by **P24 - P27** in 10 minute increments in a 24 hour (military) format. Example: 13.20 = 01:20 p.m. Switch times can be de-activated by setting to 'OFF'. The second setpoint depends on **P05/P06**.

### Defrost Modes of the 1380-2 types

**P23** determines the defrost mode, which works independent from the control relay.

- 1 = **Heater or Airflow Defrost**
  - Defrost relay active ON (= defrost heater ON)
  - Cooling relay switches OFF.
- 2 = **Hot Gas Defrost**
  - Defrost relay act. ON (= bypass valve open)
  - Cooling relay keeps the solenoid valve open
- 3 = **Heater or Free Airflow Defrost + (AZV)**  
Relay characteristic like = 1.  
Additional generated defrost events.
- 4 = **Hot Gas Defrost + (AZV)**  
Relay characteristic like = 2.  
Additional generated defrost events.

### Defrost time doubling (AZV, 1380-2 only)

This is a simple function to double the quantity of the potential defrost events (4 → 8). The unit generates new defrost times automatically by adding 12 hours to existing times.

Example:

If a defrost cycle is fixed at 14:30, an additional cycle starts at 2:30am without entering this time.

### Defrost by Cyclic Timer (1370(H)-2 only)

**P24** determines the interval time up to the next defrost event, **P28** fixes the defrost duration. The cyclic timer starts with power-up of the TAR, the first (automatic) defrost event is possible first after the end of the first interval time.

### Defrost modes of the types 1370-2, 1370H-2)

**P23** fixes the defrost mode.

- 1 = **Heater/Airflow Defrost by Cyclic Timer**
  - Defrost relay act. ON (= defrost heater ON)
  - Cooling relay switches OFF.
- 2 = **Hot Gas Defrost by Cyclic Timer**
  - Defrost relay act. ON (= bypass valve open)
  - Cooling relay keeps the solenoid valve open
- 3 = **Heater/Airflow Defrost by Machine Runtime**  
Like 1, but depending on the added ON times of the cooling relay.
- 4 = **Hot Gas Defrost by Machine Runtime**  
Like 2, but depending on the added ON times of the cooling relay.

### Manual Defrost

- At parameter **P37** by key "↑" or
- While the actual temperature can be read on the display, by holding key "↑" key for more than 2 sec.

### Defrost Termination

- **Thermal termination.**  
Defrosting will be terminated whenever the evaporator sensor temperature (**P02**) exceeds the temperature limit set with parameter **P22**.
- **Termination by (safety) time.**  
The time set with 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 pressing "↓" key. or  
While the actual temperature (**P01**) can be read, a defrost event can be terminated by holding "↓" key for more than 2 seconds.
- If the defrost limit sensor is interrupted, the defrost event will be stopped immediately.

After the defrost event is terminated, a drain time **P29** delays the begin of the cooling function. **P16** shows the remaining time until cooling starts again.

### (DH) Display Hold-Funktion

The DH function can be initiated by **P38**. It holds the Actual Value Display while a defrost event. During defrost the display shows the last measured actual value before defrost start. After defrost termination: If the actual value is higher than the stored display value, the display keep unaltered for further 15 minutes max. If the actual value falls 2K below the stored display value, the display shows the actual value again.

### Evaporator Fan Control

Fan operation modes can be selected by **P13**. At TARN-types the alarm relay output can be selected (by **P30**) as fan relay alternatively.

- 1 = **Fan runs if cooling output is active.**  
With defrost termination the fan output is OFF until the Fan Delay Time (**P14**) is run down.
- 2 = **Fan runs continuously, except during defrost and Fan Delay Time (P14) after defrost.**  
Fan trailing: The fan stops if the temperature at the evaporator sensor exceeds **P12**.
- 3 = **Fan runs if the compressor output is on, and during defrost.**  
The temporal fan delay must be set to "0".



For all 3 fan operation modes at the same time there is a thermostatic fan delay active, because the fan starts only if the evaporator temperature falls 3K below P12. If this function is not desired, P12 can be set to its upper threshold to make it inefficient.

### After the end of a defrost cycle

A temporal fan-ON delay is active after a defrost event (**P14**). While drain time (**P29**) the fan remains stopped.

(P17) informs about the remaining time until the fan starts again.

### Practical conditions

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

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

## CONNECTION INFORMATION & SAFETY INSTRUCTIONS



Notice

The guarantee will lapse in case of damage caused by failure to comply with these operating instructions! We shall not be liable for any consequent loss! We do not accept liability for personal injury or damage to property caused by inadequate handling or non-observance of the safety instructions! The guarantee will lapse in such cases.

This manual contains additional safety instructions in the functional description. Please note them!



Danger

If you notice any damage, the product may not be connected to mains voltage! Danger of Life!

A riskless operation is impossible if:

- The device has visible damages or doesn't work
- After a long-time storage under unfavourable conditions
- The device is strongly dragged or wet
- After inadequate shipping conditions
- Never use this product 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.
- **The product may only be used for the applications described on page 1.**
- **Electrical installation and putting into service must be done from qualified personnel.**
- **During installation and wiring never work when the electricity is not cut-off ! Danger of electric shock!**
- **Never operate unit without housing. Danger of electric shock!**
- **All 'PE' terminals must be connected to ground. Danger of electric shock!** Without PE the internal noise filter will not work, faulty indicated values may occur.
- Please note the safety instructions and standards of your place of installation!



Caution

- Before installation: Check the limits of the controller and the application (see tech. data). Check amongst others:
  - Make sure that all wiring has been made in accordance with the wiring diagram in this manual.
  - Supply voltage (is printed on the type label).
  - Environmental limits for temperature/humidity.
  - Maximum admitted current rate for the relays. Compare it with the peak start-up currents of the controlled loads (motors, heaters, etc.).

Outside these limits malfunction or damages may occur.

- Sensor/probe cables must be shielded. Don't install them in parallel to high-current cables. Shielding must be connected to PE at the end close to the controller. If not, inductive interferences may occur.
- Please note for elongation: The wire gauge is not critical, but should have 0,5mm<sup>2</sup> as a minimum.
- Mounting the controller close to power relays is unfavourable. Strong electro-magnetic interference, malfunction may occur!
- All used temperature sensors must be identical. Never use different types at the same time. This will not work.
- TF-type sensors are not designed for being immersed in fluids permanently. In such a case, always use dip-fittings. With extreme temperature variations, the sensor may be damaged.



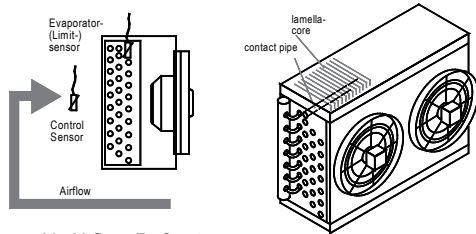
### Cleaning

The use of a dry, lint-free cloth is sufficient to clean the product. Never use liquids or acidic fluids! Risk of damage!

## Installation / Start-Up

### Sensor locations

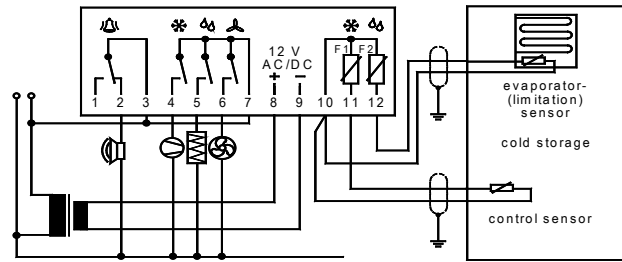
Control Sensor: In the airflow, at the suction side of the evaporator.  
Limit Sensor: In the lamella core or the contact pipe of the evaporator, at the place ice remains the longest time.



### Applications with Airflow-Defrost

**i** With this defrost method, 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.

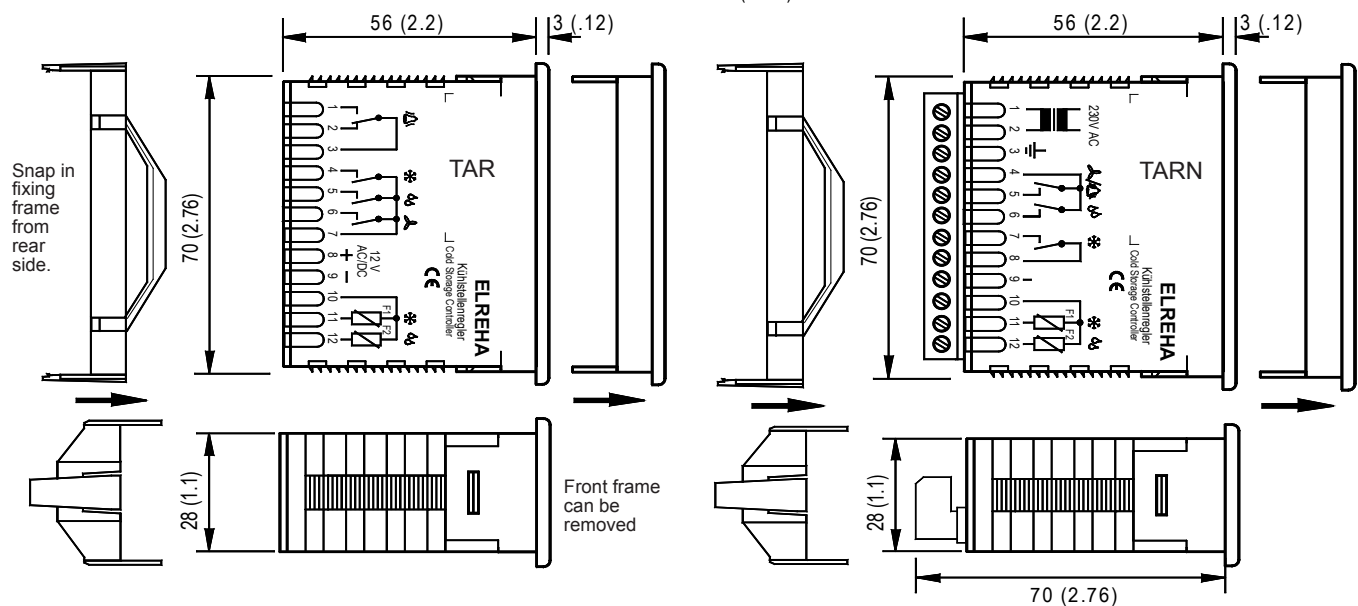
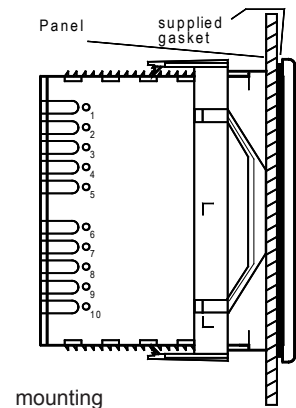
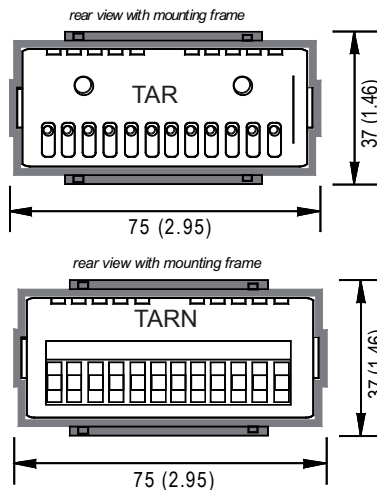
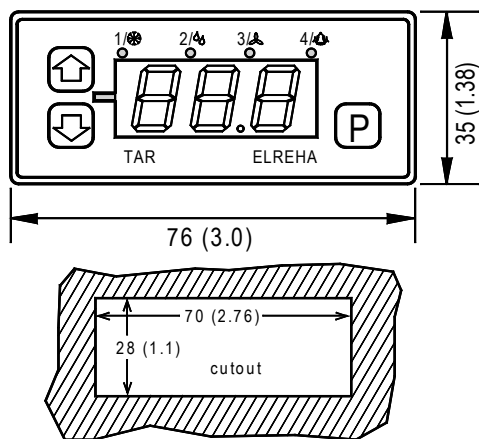
## Application Example:



### Typical parameter values for a 1380-2, appl. with electric defrost

P03.....-20	P11.....2	P23.....1	P30.....1
P07.....-15	P12.....-2	P24.....060	P31.....20
P08.....-25	P13.....1	P25.....180	P32.....7
P09.....2	P14.....3	P28.....30	P33.....-35
P10.....1	P22.....14	P29.....2	

## Dimensions / Wiring



## EC Declaration of Conformity



For the devices **TAR 1370-2, TAR 1370-2 H, TAR 1380-2, TARN 1370-2, TARN 1380-2, TARN 21370-2, TARN 21380-2** we state the following:  
When operated in accordance with the technical manual, the criteria have been met that are outlined in the EMC Directive **2014/30/EC** and the Low Voltage Directive **2014/35/EC**. This declaration is valid for those products covered by the technical manual which itself is part of the declaration.

Following standards were consulted for the conformity testing to meet the requirements of EMC and Low Voltage Guidelines:

EN 55011:2016, EN 61010-1:2010, EN 61326-1:2013

CE marking of year: 2017

This statement is made for the manufacturer / importer

**ELREHA Elektronische Regelungen GmbH**  
**D-68766 Hockenheim**

www.elreha.de

(Name / Address)

by:

**Werner Roemer, Technical Director**

**Hockenheim .....10.4.2017.....**

City

Date

Signature

set up: 11.4.17, tkd/jr

checked: 21.4.17, ek/ha

approved: 21.4.17, mkt/mh

transl.(E):

transl().

corr.: 9.6.17, tkd/jr