Product Description
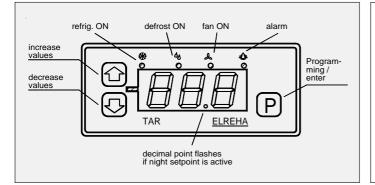
Cold Storage Controller with 4 relays for Solenoid Valve, Defrost heater, Fan and Alarm Forwarding. Usable for any kind of cold storages such as walk-in coolers/freezers, refrigerated shelfs, refrigerated counters, etc..

Start-up / Troubleshooting information you will find on pages 4 + 5.

Operating Elements

increase values
decrease values

refrig. ON   defrost ON   fan ON   alarm

Programming / enter

TAR   ELREHA

decimal point flashes if night setpoint is active

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. All other parameters must be unlocked beforehand.

Press key "P" .... parameter number appears
Use "⇧/⇩" .... select code parameter (P38)
Press "P" again .... parameter value appears
Use "⇧" .... set value to --88--
Press "P" again .... value is stored, back to parameter no.

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

Auto scrolling

Hold '⇧/⇩'-keys to scroll values automatically.

Manual Defrost

Manual defrost can be initiated out of programming mode by depressing '⇧' for more than 2 seconds - to terminate: press '⇩' for more than 2 seconds.

Reading the controller type

Hold key 'P' for more than 2 seconds, the display shows the type of the controller unit (**138**).

Set parameters to factory default

- Switch off supply voltage, press and hold the 'P'-key
- switch on supply voltage
- hold the key for about 5 more seconds

While holding the key, the display shows one by one: software-version, date and 'def.'. 'def' signifies that all parameters are set to default values now.

Technical Data

Supply Voltage .... **12V AC/DC (11-18V DC)**
Power Consumption .... appr. 3 VA
Contact Rating   Cooling Relay .... 10 A (peak 80 A / 10 msec)
                  other relays .... 8A cos phi = 1, 3A ind. / 250V
The current over terminal 7 may not increase 12 A !
Operating temperature .... -10...+55°C (14...131°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 .... typ. unlimited
Clock backup .... typ. 10 days after mains is lost
Relay indicators .... 3 mm, red
Electrical connection .... screw terminals 2,5mm²
Protection .... IP 54 from front

Accessories (please order separately)
Temperature sensors .... 2x TF 201 or TF 501
Transformer .... 107-1300-0052 (230V/ 12V / 5VA)

⚠️ **Please Note Safety Instructions !**
Please note supply voltage when replacing older types !

Param. No.	Code	Description	Range	Default	Your value
P01		Actual temperature control sensor (°C or °F)	*display only*		
P02		Actual temperature evaporator (limit-) sensor	*display only*		
P03	no	Setpoint	Low limit P08...high limit P07	0 °C	
P04	88	2nd Setpoint (Night-Setpoint)	± 100 °C (-148...212 °F)		0
P05	88	Start-up of night-setpoint (in 10 minute steps)	0...235, oFF	oFF	
P06	88	Stop of night-setpoint (in 10 minute steps)	0...235, oFF	oFF	
P07	88	Highest adjustable setpoint	± 100 °C (-148...212 °F)	+50 °C	
P08	88	Lowest adjustable setpoint	-100°C / -148°F up to (P07)	-50°C	
P09	88	Setpoint hysteresis	0,3...20,0 K	2 K	
P10	88	Switching mode cool. (compressor) relay	1= refrigeration, 2= heating	1 (refrig.)	
P11	88	Cooling relay idle time	0...59 minutes	2 minutes	
P12	88	Fan operation threshold	-100°C... +100°C (hyst. 3K fixed)	50°C	
P13	88	Fan operating mode	1=, 2=, 3=, see text	1	
P14	88	Fan delay after defrost	0...30 minutes	3 minutes	
P15		Remaining minutes till defrost ends	*display only*		
P16		Remaining minutes to activate cooling	*display only*		
P17		Remaining minutes to start fan relay	*display only*		
P18		Remaining minutes up to an alarm	*display only*		
P19	88	Calibration control sensor	+/-10,0 K/F	0 K	
P20	88	Calibration evaporator sensor, resp. sensor OFF	+/-10,0 K/F, oFF	0 K	
P21	70	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	
P22	88	Defrost termination temperature in °C or °F	0,0...30,0°C / 118,0°F	10°C	
P23	88	Defrost type (independent from P10)	1= electric, 2= hot gas, 3= electric+AZV, 4= hot gas+AZV	1	
P24	88	Defrost event # 1 000...235, oFF	(1.+.2 position = hours,	oFF	
P25	88	Defrost event # 2 000...235, oFF	3.position = minutes x 10)	oFF	
P26	88	Defrost event # 3 000...235, oFF	"	oFF	
P27	88	Defrost event # 4 000...235, oFF	"	oFF	
P28	88	Defrost safety operation time	1...120 minutes	30 min.	
P29	88	Drain time, refrigeration delay after defrost	0...99 minutes	0 min.	
P30	88	Alarm mode	0= Alarm relay active ON (N / O) 1= Alarm relay active OFF (N / C) 2 / 3= no function 4= Alarm relay resettable (see text) 5= Rel.4 switches with setpoint 2, alarm indicated by LED	1	
P31	88	Alarm delay	1...99 minutes (if sensor fails always < 1 minute + flashing display	5 minutes	
P32	88	Alarm high limit temperature (relative to P03)	0...100 K	100K	
P33	88	Alarm low limit (absolute value)	± 100 °C	-100°C	
P34	no	Clock: hours			
P35	no	Clock: minutes			
P36	no	Clock: seconds			
P37	no	Manual defrost	"⇧"= Start defrost, "⇩"= Terminate		
P38	no	Access Code	0...99	0	

▲

Please note that you need a different code for changing sensor type.

                                                               ▲

Default values are factory set values.

Functional Description

Display & Sensors
All temperature values can be displayed in °C or °F with a resolution of 0,1K (0,2°F). Parameter **P21** allows toggling between these two display modes and to change the type of sensor.
TF201, TF 202 (PTC) as well as TF501 (Pt1000) sensors can be used, but note that this results in different temperature ranges. If not required, 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.
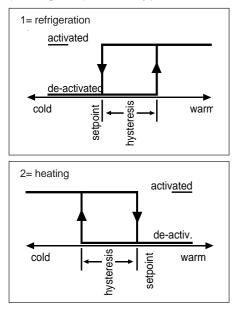The switching hysteresis (differential, **P09**) is adjustable to prevent the system from short cycling. An idle time (**P11**) prevents a compressor from switching ON again immediately.

Setpoint range
P07/P08 limits the setpoint range to prevent the end-user from entering a critical value.

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

1= refrigeration

2= heating

2. Setpoint / 'Night'-setpoint / day-night-shift
To economize energy, e.g. at night, the unit can work with a second setpoint (**P04**). This setpoint can be activated by the internal time-switch (**P05/P06**).

Temperature alarm
An alarm relay is available for warning purposes. If the temperature measured by the control sensor exceeds the range set with parameters **P32/P33** a delay timer (**P31**) starts. After this timer is run down, the alarm relay will be activated. **P32** is located relative to setpoint **P03**, so **P32** will be shifted the same size the setpoint will be shifted.

If the alarm mode P30 is set to '4', the alarm relay can be reset while the temperature is located within the alarm range.

If the temperature has left the range, **P18** shows the remaining time until an alarm occurs. If the temperature comes back to the working range, the relay will be reset automatically.

Alarm relay operation modes
With parameter **P30** you select the alarm relay mode:

0 = Alarm relay active ON
1 = Alarm relay active OFF
2/3 = no function
4 = Alarm relay can be reset while temperature is located within the alarm range. Can be used to drive an external klaxon.
5 = Continuous ON of alarm relay if control setpoint 2 is activated. Alarm messages will be forwarded by alarm-LED only. Function to switch light by time control.

Real time clock
The **TAR** Cold Storage Controller contains a real time clock which allows you to initiate four (8 with AZV) defrost events a day.
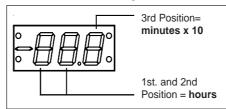The timer has a power backup for about 10 days in case of power failure.
The clock time can be set with parameters **P34** and **P35**. The defrost times are set with **P24** thru **P27** in 10 minute increments in a 24 hour (military) format. Example: 13.20 = 01:20 p.m.
Switch times can be de-activated by setting to '**oFF**'.
The second setpoint switch is made with **P05/P06**.

Because the display has only three digits, the time value comes in the following format:

3rd Position= **minutes x 10**

1st. and 2nd Position = **hours**

Defrost
One relay output is able to control a defrost device. There is no need for external interlocking the defrost output with the cooling output since the temperature controller is disabled while defrost.

Defrost Initiation
● by internal timer, four events available (**P24** till **P27**)
● manually (**P37**).

(i) For information there is parameter **P15** showing the remaining time of the existing defrost event until termination by time.

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

1 = *Heater or Airflow Defrost*
Starting of defrost event switches ON defrost relay (i.e heater ON) and switches OFF the cooling.
2 = *Hot Gas Defrost*
Starting of defrost event switches ON defrost relay (i.e. bypass-valve open) and switches ON cooling relay (i.e. solenoid valve open).
3 = *Heater or Free Airflow Defrost + (AZV)*
Relay characteristic like = 1.
Addtional generated defrost events.
4 = *Hot Gas Defrost + (AZV)*
Relay characteristic like = 2.
Addtional generated defrost events.

Manual Defrost
● Parameter **P37** allows starting a defrost cycle with the "⇧" key, unless the sensor is

already above termination temp.   *or*
● While the actual temperature can be read on display, a defrost event can be initiated by holding the "⇧" 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 on the display, 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, the begin of the cooling function is delayed by (**P29**). This prevents freezing water drops on the evaporators surface. **P16** shows the remaining time until cooling starts again.

Evaporator Fan Control
Three different modes of fan operation can be selected with parameter **P13**.

Fan Modes
1 = *Fan runs if compressor output is on.*
After defrosting 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.*
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 border to make it inefficient.
3 = *Fan runs if the compressor output is on, and during defrost.*
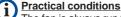The temporal fan delay must be set to "0".

The end of a defrost cycle
A temporal fan-ON delay is active after a defrost event (**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 operation threshold (**P12**).
If this function is not desired, **P12** can be set to its upper border to make it inefficient.
While drain time (**P29**) the fan remains stopped.

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

(i) **Practical conditions**
The fan is always run from the N/O contact of the fan relay.

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 free air defrost, please realize a parallel connection of fan relay and defrost relay.

CONNECTION INFORMATION & SAFETY INSTRUCTIONS

Please read before Start-up

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.

If you notice any damage, the product may <u>not</u> be connected to mains voltage! Danger of Life! A riskless operation is impossible if:
• The device has visible damages
• The device doesn't work
• After a long-time storage under unfavorable conditions
• After inadequate shipping conditions

⚠️ **The product may only be used for the described application.**

• **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 manual 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 !**
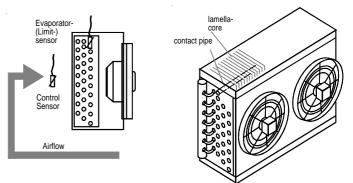• **Never operate unit without housing.**

• 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.
• 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 (fan, compressor,etc.)
• Use shielded cable for sensor elongation only. Don't install them in parallel with high-current cables to prevent inductive interference. A wire gauge of min. 0,5mm² is sufficient.
• Connect shielding to PE at the end near the controller
• All used temperature sensors must be identical. Never use TF 201 and TF 501 mixed. This will not work.
• TF-type sensors 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.

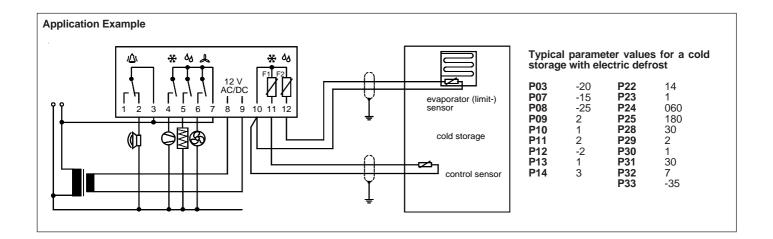### Applications with Airflow-Defrost

ⓘ 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.

After power-up, teh 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').
● switching mode of cooling relay (parameter **P10**)
● defrost method (**P23**)
● evaporator fan mode (**P13**)
● alarm mode (**P30**)
● clock time (**P34-P35**)
● 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

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

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 till P18 (actual temperatures and running delays) you get a first survey about the unit's states.

Problem	Possible reason
Temperature display:	
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.
Programming:	
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 thru 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.
Temperature Control:	
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 output contact interchanged (cool. relay). *Note: If you change the switching mode, check the correct defrost mode !*
Temperature too high, indicator LED '1/Cooling' is ON, but cooling does not switch ON.	Wrong switching mode or output contact interchanged (cool. relay). *Note: If you change the switching mode, check the correct defrost mode !*
Temperature too high, but cooling does not switch ON.	Check, if a defrost event or the drain time is running.
Cooling works, but fan is OFF.	Check, if 'fan operation threshold' 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 event.	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 event. (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 operation threshold" to the highest limit
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 operation threshold"
Defrost:	
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 phases
During a defrost event cooling starts.	Defrost mode is set to 'hot gas'. Please set correctly. *Note: If you change the switching mode, check or select the correct defrost mode !*
Alarm:	
Constant alarm without a real failure.	Check wiring and alarm mode. Can be set to active or passive. (active: relay ON; passive: relay OFF).

Failure Handling

If the display flashes with 'minus'-LED:
= sensor short circuit.
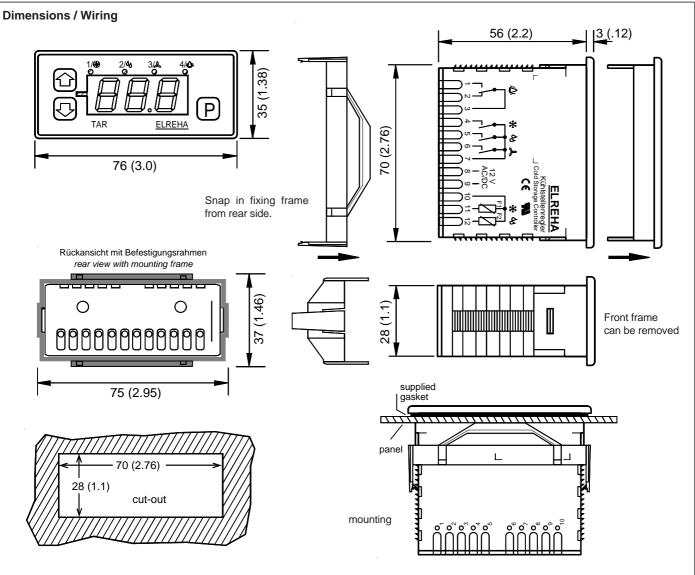without 'minus'-LED:
= sensor interrupted
Another possibility is that the sensor is the wrong type or out of its specified range. The alarm relay will be activated after 1 minute, like preset with **P30**.

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 Limit Sensor is disabled.

Dimensions / Wiring

Snap in fixing frame from rear side.

Rückansicht mit Befestigungsrahmen
rear view with mounting frame

Front frame can be removed

cut-out

supplied gasket

panel

mounting

EG-Statement of Conformity

$C\epsilon$

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). 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 confirmity testing with regard to electromagnetic consistency :

**IEC 1000-4-1, IEC 1000-4-2, IEC 1000-4-3*, IEC 1000-4-4, IEC 1000-4-5,
EN 55011 B, EN 50081, part 1 and 2; EN 50082, part 1 and 2**

This statement is made from the manufacturer / importer
**ELREHA Elektronische Regelungen GmbH
68766 Hockenheim**
(Name / Anschrift / *name / adress*)

by:
Klaus Birkner, **Developement and
and leader of the EMC-Laboratory**

Hockenheim	**23.3.2000**	
Ort/*city*	Datum/*date*	Unterschrift/*sign*

*The conformity with IEC 1000-4-3 is derived from the IEC 1000-4-2 and IEC 1000-4-4 test results. The correlation with IEC 1000-4-3 is based on test results which are located on site at the manufacturer.

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 of this manual. Units with an other version number may work a little bit different.

set up 1.8.2006/tkd/jr	checked: 1.8.2006/ek/al	approved: 1.8.2006/mv/mh