

Brief Description

- Cold Storage Controller with 4 relays for Solenoid Valve, Defrost Heater, Alarm Device and Fan
- Digital Input for door-contact
- Defrost Mode selectable, Manual Defrost
- Defrost Termination by time / temperature
- Fan Control by time / temperature
- Over-/Undertemperature Alarm
- Alarm Buzzer and Alarm Relay

Applications

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



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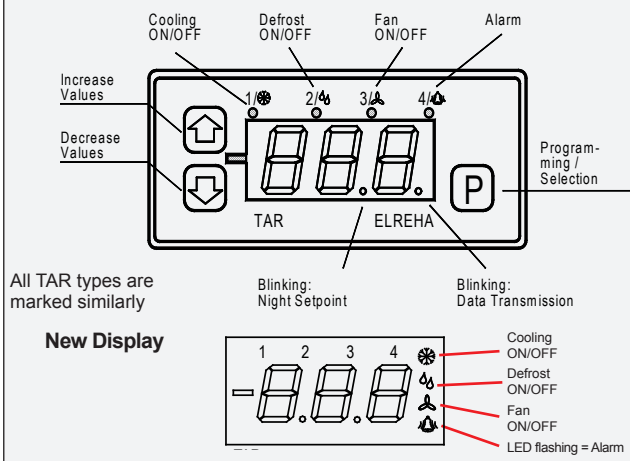
Technical Manual
Software Vers.

5311009-50/30E

Cold Storage Controller

Type **TAR 1810-2**  from Softw.Vers. 1.0.1
TAR 1810-2 K001  from Softw.Vers. 1.0.6
TAR 3810-2 from Softw.Vers. 2.0.0
TAR 5810-2 from Softw.Vers. 1.0.1

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 (hold key for autscroll)
- Press 'P' again parameter value appears
- Use keys '↑/↓' adjust parameter value (hold key for autscroll)
- Press 'P' again value is stored, back to parameter no.

Unlock Keys / Access code

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 as follows:

- enter access code before programming at parameter **P53**
- directly at the parameter to be changed. If a code no. is necessary the display shows "C00". Set the matching code no. by the '↑/↓'-keys (70 or 88, see parameter listing) and confirm by "P".

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

Manual Defrost

While the actual value is visible:

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

Start-up behavior

Directly after start-up the display shows "810" (controller type), after that a display test passes.

How to find out the controller type

- Press key "P" for > 2 sec. = Display shows controller type (**810**)
- Key "↓" additionally = Software version is displayed

Manual controller "wake-up"

If the controller is switched off via interface (e.g. from a PC), the display shows "oFF". By holding key "↓" for > 3 sec. the controller unit engage.

Reset parameters to factory settings

Switch OFF supply voltage, press/hold "P"-key, switch supply voltage ON again. Code request "C" appears. Enter "88", confirm by "P". One by one software version, date and "def" appear. Now all values are reset to factory settings.

Standard Display Selection (TAR 1810-2 K001 only)

If you select any parameter value and you don't touch a button for about 4 minutes, the display switches back to the P01 value by default. If you want to switch to another value, do the following:

- Select desired parameter (P...) and select its value by the "P" button
- Push the buttons '↑/↓' concurrently
- The display shows now "- P -" for a short time, so the new standard display is selected.



Technical Data (see parameter listing for more information)

Supply Voltage.....	see above
Output Relays.....	4x potential free
Contact Rating.....	8A resistive, 3A cos phi 0.4, 250V AC
TAR 1810-2 / 1810-2 K001 (UL).....	resistive: 120/240V AC, 8A, 30 k cycles motor: 125/250V AC, 1/4 HP, 30 k cycles
Ambient Temperature TAR 1810-2 / 1810-2 K001.....	-10...+65°C (14...149°F)
Ambient Temperature TAR 3810-2/5810-2.....	-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 (PTC) or TF 501 (Pt1000)
Display	
(1810-2, 5810-2).....	LED, 7-segment, red, character height 13mm (.51 inch)
(3810-2).....	LED, 7-segment, red, character height 11mm (.433 inch)
Resolution / Accuracy.....	0.1°C / 0.2°F / typ. ±1K
Control-/Display Range with Temperature Sensor Types	
with TF 201.....	-40...+80°C / -40...176°F
with TF 5xx (depending on type) up to.....	-110...+120°C / -166...248°F
Data storage parameters.....	> 20 years
Clock backup.....	typ. 10 days after mains is lost
Relay indicators.....	3 mm, red
Interface.....	E-Link (RS-485)
Electrical connection.....	screw terminals 2,5mm (.1 inch)
Housing / Protection / Digital Input	
TAR 1810-2 / 1810-2 K001.....	77 x 35 mm front frame, IP 54 from front
Digital input for external, potential free contact	
TAR 3810-2.....	for rail mounting, IP 30 (terminals IP 20)
Digital input for mains voltage, 50-60Hz, max. 3mA	
TAR 5810-2.....	96 x 48 mm front frame, IP 54 from front
Digital input for mains voltage, 50-60Hz, max. 3mA	

Accessories (please order separately)

- Temperature sensors TF 201 or TF 501
- Transformer 107-1300-0052 (230V/12V/5VA)



Please note Safety Instructions !
While replacing older types please note
changed functions!

Please read these instructions carefully before applying power. Your attention is drawn to the fact that the warranty is subject to the application of power sources that are within the limits specified in this manual. This documentation was compiled with utmost care, however, we cannot guarantee for its correctness in every respect. 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.

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Para. No.	Disp. only	Code	Description	Range	Default (factory settings)
P01	X		Actual temperature control sensor (°C / °F)		
P02	X		Actual temperature evaporator sensor (°C / °F)		
P03		.no	Control setpoint	Low limit P08...high limit P07	0°C
P04		.88	Control setpoint 2 (night setpoint)	Low limit P08...high limit P07	0°C
P05		.88	ON-time control setpoint 2 (e.g. 193=19:30)	0...235, oFF	oFF
P06		.88	OFF-time control setpoint 2 (e.g. 060=06:00)	0...235, oFF	oFF
P07		.88	Highest adjustable control setpoint	P08...+100 °C (-148...212 °F)	+50 °C
P08		.88	Lowest adjustable control setpoint	-100°C / -148°F up to (P07)	-50°C
P09		.88	Control differential (Hysteresis) of control setpoint	0,3...20,0 K resp. F	2 K
P10		.88	Switching mode of cooling relay K1	1= refrigeration, 2= freezing, 3= Heat	1 (refrigeration)
P11		.88	Refrigeration/Compressor Idle Time	0...59 minutes	2 minutes
P12		.88	Fan stop/go temperature	-100°C...+100°C (Hyst. 3K fixed)	50°C
P13		.88	Fan mode	1=, 2=, 3=, 4= see text	1
P14		.88	Fan delay after defrost	0...30 minutes	3 minutes
P15	X		Minutes remaining until defrost termination		
P16	X		Minutes remaining until refig. restarts after defrost		
P17	X		Minutes remaining until fan restarts		
P18	X		Minutes remaining until alarm is activated		
P19		.88	Control sensor correction	+/-10,0 K/F	0 K
P20		.88	Evaporator sensor correction, switch off	+/-10,0 K/F, oFF	0 K
P21		.70	Sensor type, physical dimensions	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= not used	2
P22		.88	Defrost termination temperature	0,0...30,0°C / 118,0°F	10°C
P23		.88	Defrost method	1= electric, 2= hot gas, 3= electric+AZV, 4= hot gas+AZV	1
P24		.88	Defrost time 1 000...235, oFF	(1.+2 position = hours, 3rd position = minutes x 10)	oFF
P25		.88	Defrost time 2 000...235, oFF		oFF
P26		.88	Defrost time 3 000...235, oFF		oFF
P27		.88	Defrost time 4 000...235, oFF		oFF
P28		.88	Defrost (safety) time	1...120 minutes	30 minutes
P29		.88	Drain time (refrigeration delay after defrost)	0...99 minutes	0 minutes
P30		.88	Alarm mode	0= Alarm relay active ON 1= Alarm relay active OFF	1
P31		.88	Alarm delay	2= like "0", but internal buzzer OFF 3= like "1", but internal buzzer OFF 4= Alarm relay sw. like internal buzzer 5= Rel.4 switches with contr. setpoint 2 alarm message by buzzer/LED 6= Alarm relay switched via DDC only	5 minutes
P32		.88	Alarm high limit temperature (relative to P03)	1...99 minutes, if sensor fails always automatically < 1 minute	100K
P33		.88	Alarm low limit (absolute value)	0...100 K	-100°C
P34		.88	Digital input DI1	± 100 °C (-148...212 °F) oFF = input de-activated	oFF
P35		.88	Digital input DI1 delay	1= door contact (fan OFF immediately, refig OFF after 3 min., alarm after P35) 2= alarm input (alarm after P35) 3= control setpoint 2 ON (after P35, priority higher than by time) 4= defrost ON (after delay P35) 5= controller OFF	2
P36		.88	no function	0...99 minutes	
P40		.88	no function		
P41		.no	Date year		
P42		.no	Date month		
P43		.no	Date day		
P44		.no	Time hours		
P45		.no	Time hours		
P46		.no	Time seconds		
P47		.88	Baudrate (data transfer speed via interface)	1= 1200, 2= 2400, 3= 4800, 4=9600 5= 19200, 6= 28800, 7= 57600	4
P48		.88	Address of the unit in a network	1...78	78
P49		.no	Manual defrost	"↑" = start defrost cycle, "↓" = terminate	
P50		.88	"Display Hold" (DH) while defrost	0 = on, 1 = off	0
P51		.88	ON-time of the cooling relay while a sensor failure (emergency operat.). Part depends on a 30 min.-interval	0...100%	50
P52		.no	Current failure + failure listing	Multiple failures: Scroll by arrow keys	
P53		.no	Access code	0...99	00



If your controller has 44 parameters only, it is an old product, produced up to the year 1998. A matching parameter listing you can find under "www.elreha.de / data sheets / T/x810alt-".



If your controller has 50 parameters only, it is a unit without the annex -2 in its name, which doesn't hold the functions described by parameters P50-53. A matching parameter listing you can find under "www.elreha.de / data sheets / T/x810altversionen.pdf".

Failure handling

Sensor short circuit or broken

If one of the sensors is broken, disconnected or hot-wired, or the value is located outside of the specified range, the display shows "- - -" at first. After 1 minute the display flashes and shows an error code, internal buzzer and alarm relay are activated, as selected with **P30**.

Error codes

E00	no failure	E04	low temp. control sensor
E01	control sensor broken	E05	evap. sensor broken
E02	control sensor hot-wired	E06	evap. sensor hot-wired
E03	excess temp. control sensor	E09	failure at the digital input
		E12	door contact open

Emergency operation of temperature control

While a control sensor failure, the unit starts an emergency mode. The cooling relay is clocking with a %-part (**P51**) of a 30 minutes interval, the fan relay is de-activated. If switching mode 'freezing' is selected, the fan relay switches on to prevent glaciation.

While an evaporator sensor failure, the temperature control functions work normally, but no defrost function can be initiated.

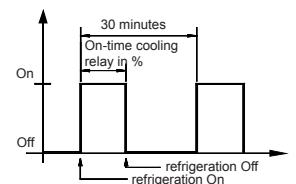
With **P51** = 0 or 100 you can preselect if, while a failure, the relay is switched on or off permanently.

Display shows "oFF" if:

1. ...controller unit is switched OFF via digital input DI1 or via network.

2. ...you select P02 or P20 and the evaporator sensor is switched off.

3. Code "70" has been entered



Functional Description

Display & Sensors

The controller is able to work with temperature sensors of the TF 201 or TF 501 (Pt1000) series, set by **P21**.

Ranges:

P21 = 2 (TF 201)..... -50...+100°C

P21 = 1 (TF 501/Pt1000)..... -100...+300°C

Please note the specific temperature restrictions of the used sensors (e.g. -40...+80°C of the standard-TF-types) and ask for matching types if necessary.

Sensor 2 (evaporator sensor) can be disabled.

Temperature Control

The actual temperature from the control sensor (**P01**) is compared with the control setpoint (**P03**). Depending on the result, the cooling relay switches power relays of compressors or solenoid valves. As switching hysteresis (**P09**) prevents from short cycling, an idle time (**P11**) prevents a compressor from switching ON again immediately. In order to be fail-safe in case of any internal power failure, there is a possibility of selecting the correct switching mode (**P10**). 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, with the load running constantly in case of failure.

Setpoint range

With parameters **P07/P08** you can limit the setpoint range.

Switching mode of relay K1

The switching characteristic of relay K1 (= cooling mode) is defined by parameter **P10** (as explained above).

1= refrigeration

Load is switched by the N/O contact,
If actual value = P03+P09 : Relay K1 activated

2= freezing

Load is switched by the N/C contact,
If actual value = P03+P09 : Rel. K1 de-activated

3= Heating

If actual value = P03-P09 : Rel. K1 is now a heating relay and will be activated

2. Setpoint / day-night-shift

To economize energy, e.g. at night, the unit is able to work with a 2nd setpoint (**P04**). This setpoint can be activated by the internal time-switch (**P05/P06**) or the digital input DI1. The decimal point of the display flashes while the 2nd setpoint is present.

Temperature alarm

An alarm relay (K4) and a built-in buzzer are available for warning purposes. If the temperature measured by the control sensor exceeds the range set by **P32/P33**, then the display flashes and a time delay (**P31**) starts. After this timer is run down, the alarm relay and the buzzer will be activated. **P32** is relative to setpoint **P03**, so **P32** will be shifted the same amount as the setpoint.

– Any keypress resets the buzzer. –

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, relay and buzzer will be reset automatically.

Alarm relay operation modes

With parameter **P30** you select the mode of alarm relay and internal buzzer:

0= Alarm relay active ON

1= Alarm relay active OFF

2= Alarm relay active ON, buzzer de-activated

3= Alarm relay active OFF, buzzer de-activated

4= Alarm relay works like the built-in buzzer, to connect an external horn

5= Continuous ON of relay K4 if control setpoint 2 is being activated. Alarm messages will be forwarded by buzzer/alarm-LED only. With this function, light can be switched by time control.

6= Alarm relay can be switched via data interface only. This works as well as the controller is de-activated by interface or digital input. The switching command keeps stored, so the relay position will be restored after a breakdown of supply voltage.

Additionally, the alarm function can be started by interrupting the digital input DI1 (see **P34**).

Real time clock

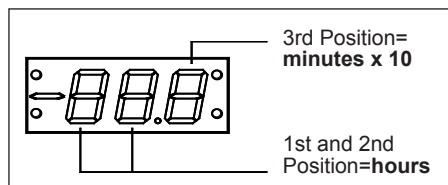
The **TAR** Cold Storage Controller contains a real time clock which allows you to initiate four (8 with **AZV**) defrost cycles a day. The timer has a power backup for about 10 days in case of power failure.

The time of the day and the date can be set with parameters **P41...P45**.

The defrost times are set with **P24...P27** in 10 minute increments in a 24 hour (military) format. Example: 13.20 = 01:20 p.m.

The second setpoint switch is made with **P05/P06**.

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



Switch times can be de-activated by setting to 'OFF'.

Defrost

One relay output is used to control a defrost device.

Defrost Initiation

A. by internal timer, four times available

(**P24...P27**)

B. by digital input DI1 (see chapter 'digital input'). In this case **P35** will take effect as a 'defrost OFF' time.

C. manually (**P49**).

The defrost device is always driven from the n/o contact of relay K2. There is no need for external interlocking the defrost output with the cooling output since the temperature controller is disabled while a defrost cycle. With **P23** you can select four different defrost modes.

Parameter **P15** shows the remaining time of the momentary defrost cycle until termination by time.

Defrost Modes

With **P23** a defrost mode can be set, which works independent from the behaviour of the control relay.

1 = Heater or Free Air Defrost

If a defrost cycle starts, the defrost relay is energized (= heater ON) and K1 terminates cooling. (relay de-activated if P10=1, activated if P10=2)

2 = Hot Gas Defrost

If a defrost cycle starts, the defrost relay is energized (bypass-valve open) and also K1 (solenoid valve open/relay activated if P10=1, de-activated if P10=2).

3 = like 1, but with additional defrost time doubling (**AZV**)

4 = like 2, but with additional defrost time doubling (**AZV**)

Defrost time doubling (**AZV**)

This is a simple function to double the quantity of the potential defrost cycles (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, the unit starts an additional cycle at 2:30 (am) without entering this time.

Manual Defrost Initiation

A. At parameter **P49** with key "⇧"

B. While the display shows the actual temperature by holding the "⇧" key (> 2,5 sec.)

Defrost Termination

A defrost cycle can be terminated as follows :

A: Thermal termination.

Whenever the evaporator sensor temperature (**P02**) exceeds the temperature limit set with parameter **P22**, defrosting will be terminated. If not necessary, switch off the evaporator sensor at **P20**.

B: Termination by (safety) time.

The time set by parameter **P28** is the maximum time a defrost cycle can last before it is terminated automatically.

C: Manual termination.

With parameter **P49** you can terminate a defrost cycle by pressing the "⇧" key. While the actual temperature (**P01**) is on the display, a defrost cycle can be terminated by holding the "⇧" key (> 2,5 sec.)

D. If the defrost limit sensor fails, the defrost cycle will be stopped immediately.

After the defrost cycle is terminated, the beginning of the cooling function is delayed (**P29**). This prevents freezing water drops on the evaporators surface. **P16** shows the remaining time until cooling starts again.

(DH) Display Hold Function

This function allows to hold the last measured actual temperature value on the display during a defrost cycle. After the defrost cycle has been terminated, the display shows the current measured value again. The DH-function can be initiated by **P50**.

Evaporator Fan Control

Four different modes of fan operation can be selected with parameter **P13**.

A temporal fan-ON 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 sensor is 3K below the fan stop/go temperature (**P12**). If this function is not desired, **P12** can be set to its upper border to make it inefficient. While the drain time (**P29**) the fan remains stopped.

Fan Modes (P13)

1 = Fan runs if compressor output (K1) 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 border to make it inefficient.

3 = Fan runs if the compressor output (K1) is on, and during defrost.

The temporal fan delay must be set to "0".

This mode can be used for free air defrost.

4 = Fan runs permanently, except if unit is switched off via interface.

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

Special case

If digital input DI1 is used for door monitoring, the fan will stop immediately if the door opens.

Practical conditions

The fan is always switched by the n/o contact of relay K3.

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.

Digital Input

Digital input DI1 is normally connected to mains voltage (not 1810-2). If this voltage is interrupted, the function set with **P34** is initiated after a time delay (**P35**), which is adjustable within 0...99 min, at '0' the minimum delay is appr. 4 seconds.

CAUTION Using the **TAR 1810-2** this function must be started by opening an external, potential free switch connected to terminals 11/12. **Never connect mains voltage to these terminals, danger of destruction!** This external contact must be suitable for 5VDC/1mA.

- P34=0 Digital input DI1 is de-activated
P34=1 Input DI1 works as a **door-switch**.
- The fan stops immediately,
- Refrigeration stops after 3 minutes,
- after **P35** is run down an alarm will be generated, alarm relay and buzzer will be activated, refrigeration switches ON again.
- P34=2 Digital input DI1 works as **alarm input**. After **P35** is run down, alarm relay and buzzer will be activated.
- P34=3 **Control Setpoint 2** (night-setpoint) is active.
- P34=4 **External defrost** by time switch or similar. A defrost cycle will be started and terminated by time or temperature. After the cycle has been started, no more cycle can be initiated while the time set with **P35**.
- P34=5 **Controller unit OFF**. All control functions will be disabled, the display shows "oFF". This allows to switch off the unit without an alarm message in the network. Relay 1-3 are de-activated, the alarm relay remains in a neutral position.

Networking of TAR-controllers

All TAR/TARP-x8xx controllers can be networked via their built-in RS-485-interface. This network can be controlled by a host unit. This host can be a PC with a qualified software or a SMZ-Frontend-System which allows remote control of units and recording of all parameters.

- Because all units are connected parallel on the data bus, every unit has its own network address (**P48**) to ensure a specific communication.



!! Don't use address 64 !!

- The communication speed is fixed with **P47**, (Default value 9600 Baud).
- Connection is done by commercial databus cable.
- Shielding and ground connectors must be connected to the nearest ground terminal.
- The unshielded part of the data cable must be as short as possible.



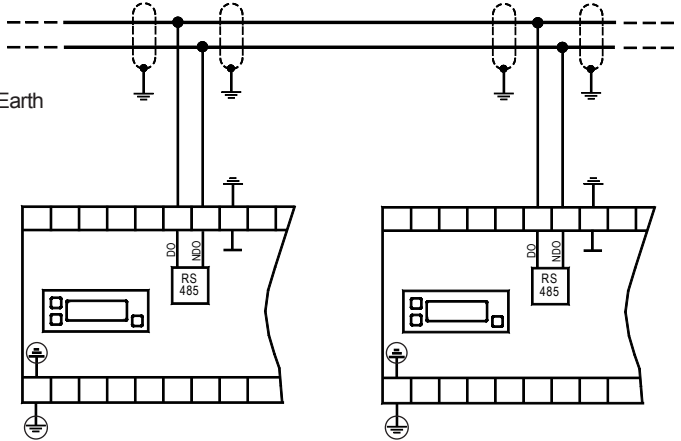
Note



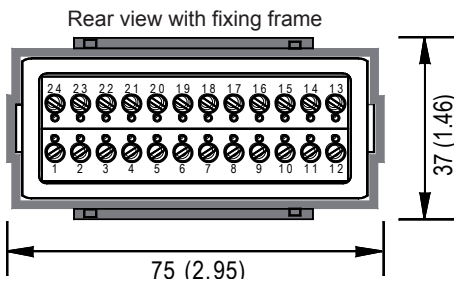
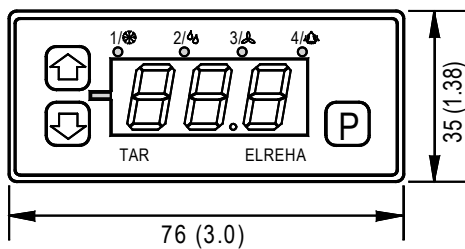
Protective Earth



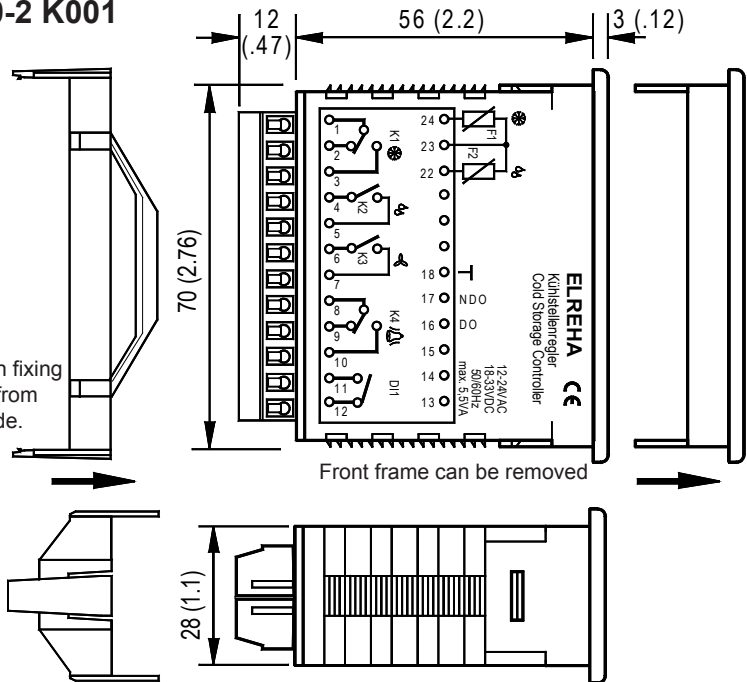
Earth



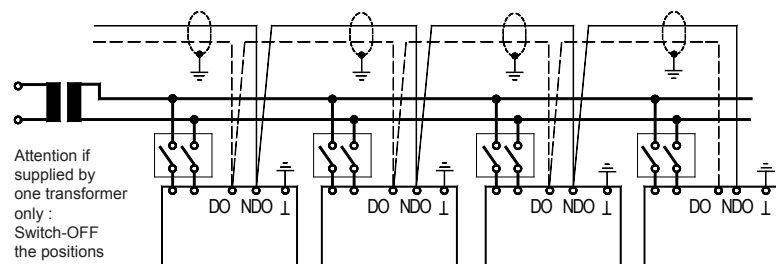
Dimensions / Wiring TAR 1810-2 / 1810-2 K001



Snap in fixing frame from rear side.



Front frame can be removed



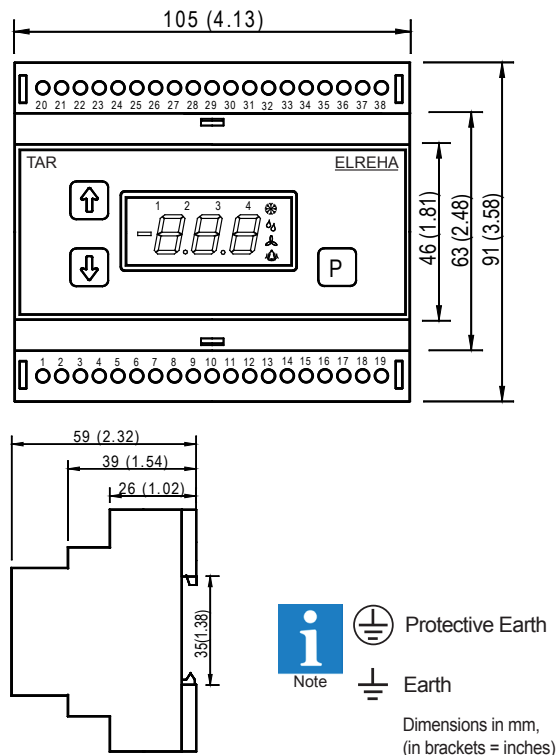
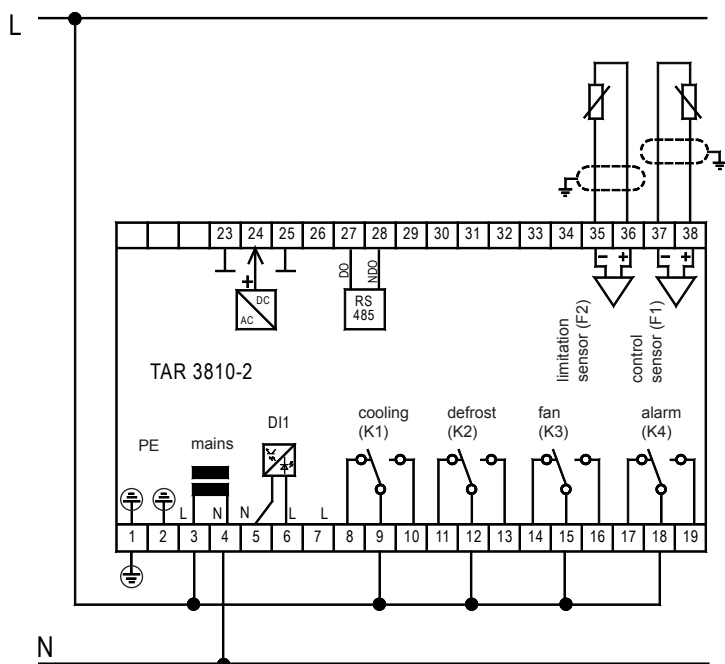
If networked controllers (**18xx-2** types only) are supplied by one transformer only and the single positions must be switched off, use double-pole switches only. If not, the unit will be supplied partially over the shielding of the data connection and continues operation depending on the secondary voltage of the transformer. Please note: If a unit is not supplied, the PC-software notifies a unit breakdown with complete justification !

A better way is not to switch-off the supply voltage but to disable the unit by digital input (P34 = 5).

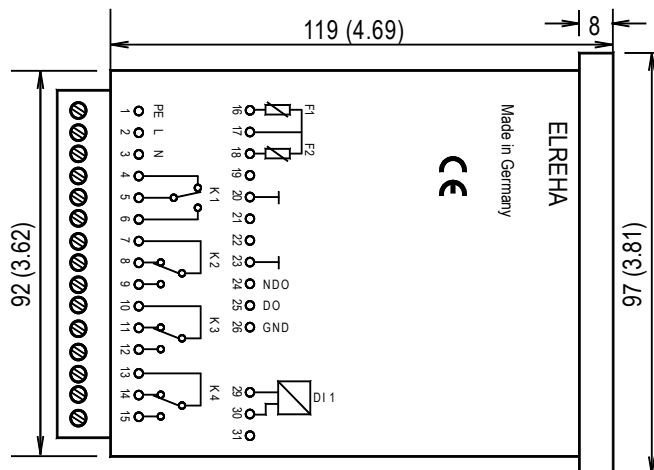
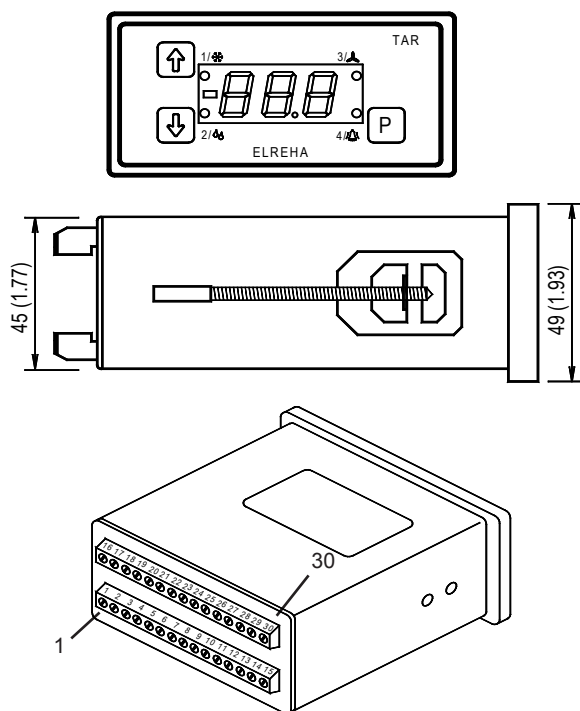


**Never connect secondary coil of the transformer to PE !
Danger of destruction with networking!**

Dimensions / Wiring TAR 3810-2



Dimensions / Wiring TAR 5810-2



Panel housing dep. on DIN 43700/IEC 61554
Cut-out: 92 x 45 mm (b x h)
Tolerances max: +0,8 (b), +0,6 (h)

EC Declaration of Conformity



For the devices **TAR 1810-2, TAR 3810-2 and TAR 5810-2** 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 **12.6.2017**

City

Date

Signature

CONNECTION INFORMATION & SAFETY INSTRUCTIONS

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!



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!** Additionally, the internal noise filter will not work, faulty indicated values may occur.
- Please note the safety instructions and standards of your place of installation!



- 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 0,5mm² as a minimum.
- Mounting the controller close to power relays is unfavourable. Strong electro-magnetic interference, malfunction may occur!
- Take care that the wiring of interface lines meets the necessary requirements.
- 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 and household agents is sufficient to clean the product.

Never use acids or acidic fluids! Risk of damage!

Installation / Run-UpApplications with Airflow Defrost

If this defrost method is used, there is no need for mounting a defrost sensor at the evaporator. In this case 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.

The controller then terminates a defrost cycle only by time which is set by parameter **P28**.

Upon applying voltage to the controller the display shows the temperature of the control (room) sensor. After you have entered the access code (see chapter "unlock keys") you have to program the configuration of the controller to suit your application:

- kind of temperature sensor and display value (°C/°F)
- Please note that you need the special access code '70' to change sensors. Please note that all temperature setpoints will be set to default.
- switching mode of relay K1: parameter P10
- defrost method: P23
- evaporator fan mode: P13
- alarm mode: P30

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

Sensor correction

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 parameters **P19/P20**.

**Changes of the -2 types in comparison to the older ones**

- Different terminal assignment
- Error messages now as codes + error listing
- Unlock code entry now possible at each parameter
- Storage of the last actual value while defrost
- Emergency operation while sensor failures
- 3 new parameters, new codeparameter is (P53)