Brief Description

- Cold Storage Controller with 4 relays for Solenoid Valve, Defrost Heater, Alarm Device and Fan
- 2x Digital Input for door-contact, ext. defrost,...
- Defrost Mode selectable, Manual Defrost
- Defrost Termination by time / temperature
- Fan Control by time / temperature
- Over-/Undertemperature Alarm
- Alarm Beeper and Alarm Relay
- Analogue Output 0-10V to control or for remote displays
- For Panel-/Door Mounting

Applications

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

Cold Storage Controller

Type

TAR 1820-2

Operating Elements

All TAR types are marked similarly

Blinking: Night Setpoint

Blinking: Data Transmission
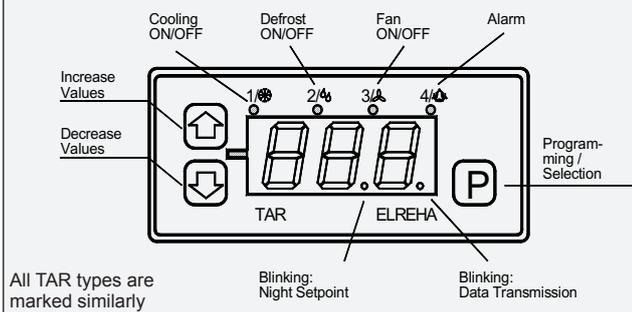
TAR 1820-2
panel mounting
12-24V AC, 18-33V DC

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 autoscroll)
Press "P" again...............parameter value appears
Use keys '⇧/⇩'................adjust parameter value (hold key for autoscroll)
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** or
- 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 80, 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 "820" (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 (**820**)
- 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 and 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. With this, all values are reset to factory settings.

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	E05 ....evap. sensor broken
E01 ....control sensor broken	E06 ....evap. sensor hot-wired
E02 ....control sensor hot-wired	E09.........failure at the digital input 1
E03 .... excess temp. control sensor	E10.........failure at the digital input 2
E04 .... low temp. control sensor	E12......................door contact open

Beeper Reset

The activated beeper can be reset by pressing any key.

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.
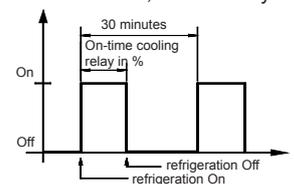
Display shows "oFF" if:
- ...controller unit is switched OFF via digital input DI1 or via network.
- ...you select P02 or P20 and the evaporator sensor is switched off.
- Code "70" has been entered

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

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 unitil refrig. 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,	oFF
P25		88	Defrost time 2 000...235, oFF	3rd position = minutes x 10)	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 2= like "0", but internal beeper OFF 3= like "1", but internal beeper OFF 4= Alarm relay sw. like internal beeper 5= Rel.4 switches with contr. setpoint 2 alarm message by beeper/LED 6= Alarm relay switched via DDC only	1
P31		88	Alarm delay	1...99 minutes, if sensor fails always automatically < 1 minute	5 minutes
P32		88	Alarm high limit temperature (relative to P03)	0...100 K	100K
P33		88	Alarm low limit (absolute value)	± 100 °C (-148...212 °F)	-100°C

P34		88	Digital input DI1	oFF = input de-activated
				1= door contact (fan OFF immediately,
				    refrig 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
					oFF

P35		88	Delay for digital inputs DI1 and DI2	0...99 minutes	2
P36		88	Analogue Output High Limit	± 100 °C (-148...212 °F)	+50
P37		88	Analogue Output Low Limit	± 100 °C (-148...212 °F) max. P36	-50
P38		88	Analogue Output Integral Time (I-part)	0 = oFF, 1 = appr. 0,25 min, 2 = appr. 0,5 min, 3 = appr. 1 min, 4 = appr. 2 min, 5 = appr. 4 min	0
P39		88	Analogue Output Mode	0, 1= proportional, 2= inverted proport. 3 = proportional, coupled to the setpoint 4 = inverted proport. coupled to setpoint	0 = oFF
P40		88	Digital Input DI2	Functions like P34	
P41-43			no function		
P44		no	Time hours		
P45		no	Time minutes		
P46		no	Time seconds		
P47		88	Baud rate (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			Current failure + failure listing	Multiple failures: Scroll by arrow keys	
P53		no	Access code	0...99	00

Technical Data

Supply Voltage ....12-24V AC, 18-33V DC
Power Consumption at 12V / max. supply voltage ....appr. 2,7 VA / 5,5 VA
Operating-/Storage Temp. .... -10..+55°C (14..131°F)/-30..+70°C (-22..158°F)
Relative Humidity ....max. 80% r.H., not condensing
Output Relays ....4x potential free, 8A cos phi = 1, 1/4 HP / 250V
Temperature Sensors .... TF 201 (PTC) or TF 501 (Pt1000)
Analogue Output ....0-10V DC, max. 3mA
Display ....LED, 7-segment, red, character height 13mm (.51)
Resolution / Accuracy ....0,1°C / 0,2°F / typ. ±1K
Control-/Display Range
      with TF 201 (depending on type) up to ..... -55...+105°C / -67...221°F
      with TF 5xx (depending on type) up to.. -110...+120°C / -166...248°F

Data storage parameters ....unlimited
Clock backup ....typ. 10 days after mains is lost
Relay indicators ....3 mm, red
Digital inputs (DI) ....2x for external, potential free N/O contact
Interface ....E-Link (RS-485)
Electrical connection..................................screw terminals 2,5mm (.1)
Housing / Protection ....77x 35 mm front frame, IP 54 from front

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

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...+100°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. A 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 the cooling 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 by a digital input (DI1/DI2). 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, e.g. 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 (see "Digital Input").

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 can be set with parameters **P44** and **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:

3rd Position= **minutes x 10**

1st and 2nd Position=**hours**
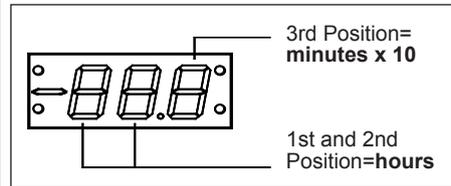
Switch times can be de-activated by setting to '**oFF**'.

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/DI2 (see chapter 'digital input').
In this case P35 will take effect as a 'defrost OFF' time.
C. manually (**P49** or easier, see page 1).

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 the cooling 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 the unit is switched off via interface.*

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

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

ℹ **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.

Voltage Output / Analog Output

The TAR contains an analog 0-10V DC-signal output. Because the output is scalable, it can be used either to forward the actual value of sensor 1 (**P01**) or as a proportional /PI-controller output.

P39 fixes the Analog Output Mode.

P39 = oFF Output is de-activated.

P39 = 1   Output works proportional, that means rising temperature = rising output voltage. **P36/P37** are the values where the output delivers 0V resp. 10V.

P39 = 2   Output works anti-proportional, that means rising temperature = falling output voltage. **P36/P37** are the values where the output delivers 0V resp. 10V.

P39 = 3   Like P39=1 but the values set by P36/P37 work relative to the current setpoint 1 (P03 + offset) and form a proportional band.

   Example:
   P36 = 10°C, P37 = -10°C, P39 = 3,
   P03 = 15°C
   Output Voltages:
   10V at P03 + P36 = 25°C
   0V at P03 - P37 = 5°C

P39 = 4   Like P39=2, but the values set by P36/P37 work relative to the current setpoint 1 (P03 + offset) and form a proportional band.

   Example:
   P36 = 10°C, P37 = -10°C, P39 = 3,
   P03 = 15°C, no current shift
   Output Voltages:
   0V at P03 + P36 = 25°C
   10V at P03 + P37 = 5°C

Example: Actual value Image
You need a remote display or similar, which shows -50°C with 0V DC input voltage and +50°C with 10V DC input voltage:

   P37 = "-50", P36 = "+50", P39 = "1".

Slow-down time / I-part
P38 (slow-down time) fixes the effect of the I-part to the control process in 5 steps. The I-part amount of the controlling variable is identical with the P-part and will be added. The full size of the I-part will effect after P33 has been run down.

Effects of the Slow-down time
When P39 = 1
   Act.Val. = Setpoint: Output 5V ± I-Part
   Act.Val. > Setpoint: Output shifts with I-part
                          to 10V
   Act.Val. < Setpoint: Output shifts with I-part
                          to 0V

When P39=2
   Act.Val. = Setpoint: Output 5V ± I-Part
   Act.Val. > Setpoint: Output shifts with I-part
                          to 0V
   Act.Val. < Setpoint: Output shifts with I-part
                          to 10V

When P39 = 3
   P36/P37 define a proportional band around the active setpoint. The output voltage is 10V at **P03 + P36** and 0V at **P03-P37**.
   Act.Val. = Setpoint: Output 5V ± I-Part
   Act.Val. > Setpoint: Output shifts with I-Part
                          to 10V
   Act.Val. < Setpoint: Output shifts with I-Part
                          to 0V

When P34 = 4
   P36/P37 define a proportional band around the active setpoint. The output voltage is 0V at **P03 + P36** and 10V at **P03-P37**.
   Act.Val. = Setpoint: Output 5V ± I-Part
   Act.Val. > Setpoint: Output shifts with I-Part
                          to 0V
   Act.Val. < Setpoint: Output shifts with I-Part
                          to 10V

After an excursive change of the actual value the P-part is calculated from the max. output voltage and the proportional band:

$$U_x = (10V / (|P36 - P37| [K])) * delta\ Theta\ [K]$$

Example: • 10V U_{out} at +10°C, 0V U_{out} at -10°C
          • aimed setpoint 0°C = 5V U_{out}
          • current actual value 0°C

          Actual value increases by 2K ->

          • U_{out} rises to 6V immediately
          • U_{aus} rises farther, after P38 is run down, 7V will be reached.

TAR 1820-2 and Actuating Drives

Warning   Actuating Drives mostly work with 24V and it seems to be meaningful, to supply the controller and the drive by the same transformer. But in Actuating Drives, supply voltage and control signal are not isolated, this can <u>destroy the TAR</u>. Because of that:

If a TAR 1820-2 has to control an Actuating Drive, it must be supplied by an independent transformer !

Max. Load of the Analogue Output

Achtung   **The Analogue Output of the TAR (terminal 19) is intended for a max. current of 3 mA.**
A higher current may destroy the output !

Digital Inputs

The Digital input DI1 and DI2 are normally bridged by an external, potential free contact. By opening this contact, the function set with **P34** resp. **P40** is initiated after a time delay (**P35**), which is adjustable within 0...99 min, at '0' the minimum delay is appr. 4 seconds.

⚠ CAUTION
- **Never connect mains voltage to these terminals, danger of destruction!**
- This external contact must be suitable for 5VDC/1mA.
- Never assign the same function to both digital inputs!

The functions of P34 and P40

0= Digital input is de-activated
1= Input 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.

2= Digital input works as **alarm input**.
After **P35** is run down, alarm relay and buzzer will be activated.
3= **Control Setpoint 2** (night-setpoint) is active.
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**.
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. Relays 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.
- 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.
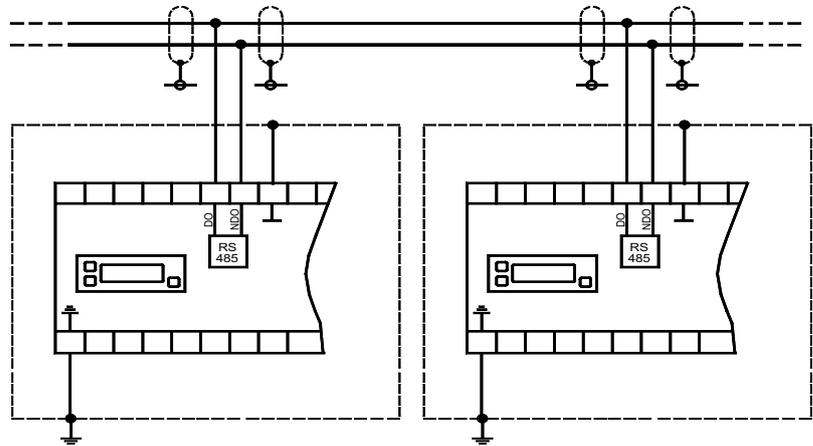
Dimensions / Wiring TAR 1820-2
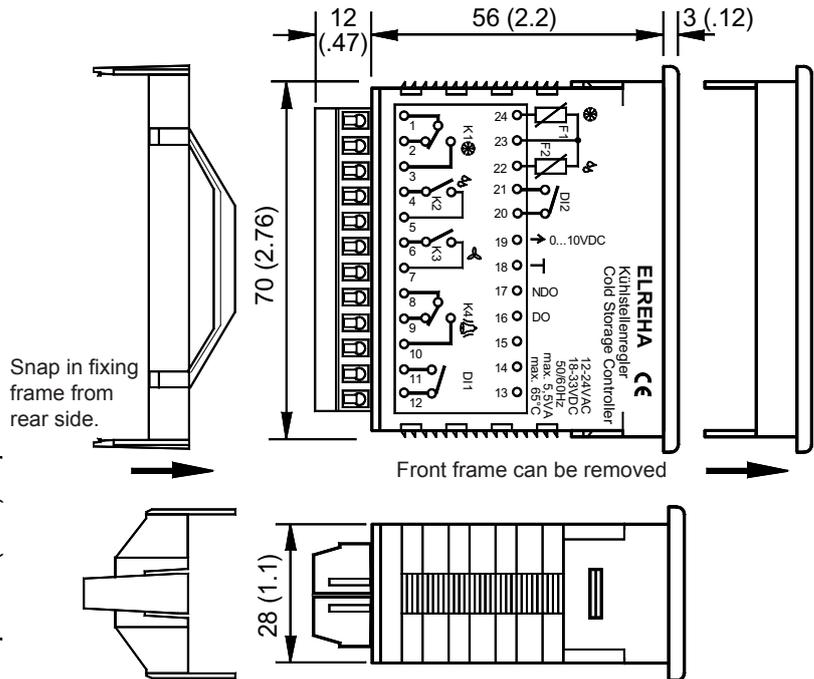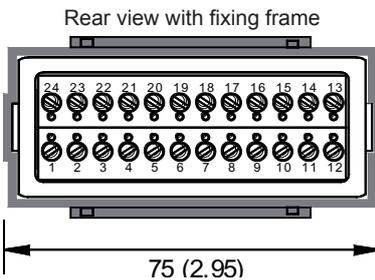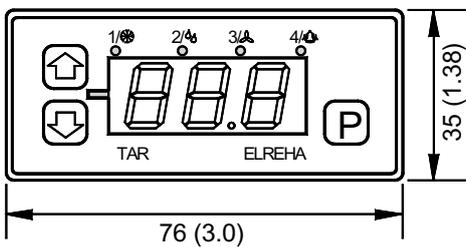
Snap in fixing frame from rear side.

Front frame can be removed

Rear view with fixing frame
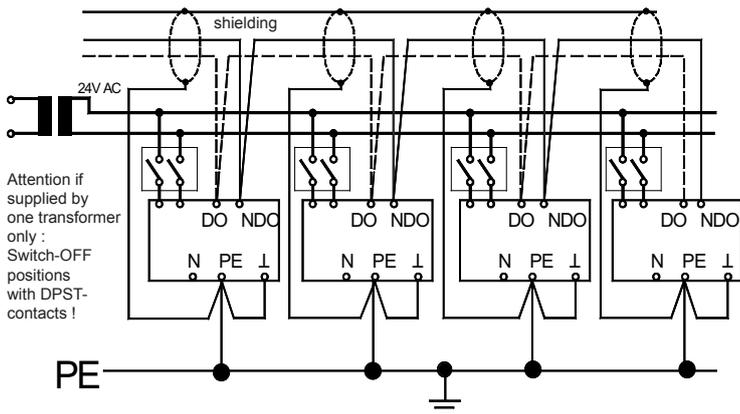
If networked controllers **(18xx-2** types only) are supplied by one transformer only and the single positions must be switched off, use double-pole switches only.
If not, the unit will be supplied partially over the shielding of the data connection and continues operation depending on the secondary 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 a digital input (P34 resp P40 = 5).

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

Attention if supplied by one transformer only : Switch-OFF positions with DPST-contacts !

CONNECTION INFORMATION & SAFETY INSTRUCTIONS

i 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 <u>not</u> 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 draggled 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!

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 0,5mm² 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.

i Notice
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-Up

i Notice
Applications 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 setpoints, 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.**

EG-Konformitätserklärung - *EG-Conformity* CE

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 (2004/108/EG) und der Niederspannungsrichtlinie (2006/95/EG) festgelegt sind. Diese Erklärung gilt für alle Exemplare, auf die sich die vorliegende Bedienungsanleitung (die selbst Bestandteil dieser Erklärung ist) bezieht. Zur Beurteilung des Erzeugnisses hinsichtlich elektromagnetischer Verträglichkeit und der Niederspannungsrichtlinie wurden jeweils die aktuellen Ausgaben der betreffenden Grund- und Fachgrundnormen herangezogen.

For all described products there is a declaration of conformity which describes that, 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 EMC-Directive (2004/108/EC) and the Low Voltage Directive (LVD 2006/95/EC). This declarations are valid for those products covered by the technical manual which itself is part of the declaration. To meet the requirements, the currently valid versions of the relevant standards have been used.

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

ELREHA Elektronische Regelungen GmbH (www.elreha.de)
D-68766 Hockenheim
Werner Roemer, *Technical Director*

Hockenheim.............**11.06.2008**........................

| set up: 11.11.10, tkd/jr | checked: .... | approved: .... | transl.(E): 11.5.11, tkd/jr | transl()............... | corr.: 13.8.13, tkd/jr |