

# TDR21 - TDR22

## MICROPROCESSOR-BASED DIGITAL ELECTRONIC FREEZER CONTROLLER



### OPERATING INSTRUCTIONS

Vr. 01 (I - GB) - cod.: ISTR 01047

**PREVIOUS STATEMENT:** In this manual are contained all the necessary information for a correct installation and the instructions for the use and the maintenance of the product; we recommend, therefore, to read carefully the following instructions. The maximum care has been used in the realisation of this document, anyway TECNOLOGIC S.p.A. does not assume any responsibility deriving from the use of itself. The same consideration has to be done for each person or Company involved in the creation of this manual. The herewith issue is an exclusive property of TECNOLOGIC S.p.A. which forbids any reproduction and divulgation, although partial, if not expressly authorised. TECNOLOGIC S.p.A. reserves the right to execute aesthetically and functional modifications, at any moment and without any notice.

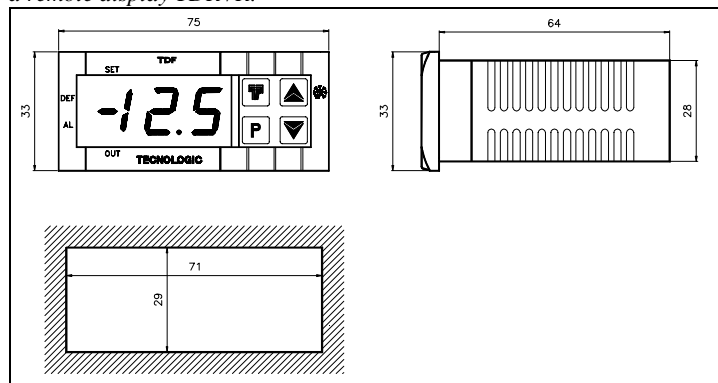
#### INDEX

- 1 GENERAL DESCRIPTION**
  - 1.1 FRONT PANEL
  - 1.2 INSTRUMENT CODE
- 2 TECHNICAL DATA**
- 3 INSTALLATION**
- 4 OPERATING MODE**
  - 4.1 TEMPERATURE ON/OFF CONTROL
  - 4.2 COMPRESSOR PROTECTION FUNCTION
  - 4.3 DEFROST CONTROL
  - 4.4 MANUAL DEFROST
  - 4.5 VISUALISATION OF EVAPORATOR TEMPERATURE (TDR22)
  - 4.6 ALARM FUNCTIONS
- 5 PROGRAMMING**
  - 5.1 PROGRAMMING OF SET-POINT
  - 5.2 PROGRAMMING OF PARAMETERS
- 6 DESCRIPTION OF PARAMETERS**
  - 6.1 PARAMETERS TABLE
- 7 TROUBLES, MAINTENANCE, GUARANTEE**

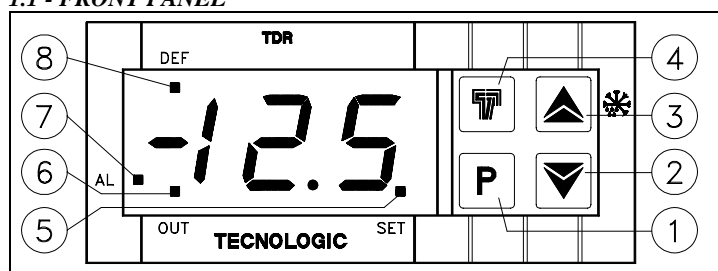
#### 1 - GENERAL DESCRIPTION

TDR21 and 22 models are a digital microprocessor based controllers for refrigeration applications with ON/OFF temperature regulation and with defrosting control at intervals time by electric heater or hot gas/reverse cycle. The process temperature is visualised on 3 red displays while the outputs state on leds, placed near the display. Both instruments are

foreseen with 2 relay outputs : for the compressor (OUT) and for the defroster (DEF), furthermore it has the possibility to have an internal buzzer to signalise the alarms. TDR 22 has two probe inputs : for PTC or NTC, one to measure the room temperature and one to measure the evaporator temperature, while TDR 21 has just the room probe input. Furthermore both instruments can be equipped with an output to connect a remote display TDRVR.



#### 1.1 - FRONT PANEL



**1 - Key P** : Used for the programming of the Set Point and of the functioning parameters.

**2 - Key DOWN** : Used to decrease the programmable values, and to select the parameters

**3 - Key UP/DEFROST** : Used to increase the programmable values, to select the parameters or to activate manual defrosting.

**4 - Key T (logo Tecnologic)** : Used to visualise the temperature measured by the evaporator probe (TDR22)

**5 - Led SET** : Indicates the entering in the set point programming (fixed light) or in the parameters programming (light flashing)

**6 - Led OUT** : Indicates the compressor output state : on (fixed light), off (light off) or inhibited (light flashing)

**7 - Led AL** : Indicates the alarm state : on (fixed light), off (light off) and silenced or memorised (light flashing)

**8 - Led DEF** : Indicates the defrosting state on (fixed light), or the dripping state (light flashing).

#### 1.2 - INSTRUMENT CODE

**TDR 21 a b c dd**

**TDR 22 a b c dd**

**a = INPUTS**

P : For PTC probes (KTY81-121)

N : For NTC probes (103AT-2)

**b = ALARM BY INTERNAL BUZZER**

B : Present

- : Not present

**c = OUTPUT FOR TDRVR REMOTE DISPLAY**

D : Present

- : Not present

**dd = SPECIAL CODES**

-- : Not extractable terminal block

E- : Extractable terminal block

#### 2 - TECHNICAL DATA

##### ELECTRICAL DATA

Supply: 12 VAC/VDC +/- 10%

Frequency AC: 50/60 Hz

Power consumption: 3 VA approx. (without TDR VR), 5 VA approx. (with TDR VR)

**Input/s:** 1 or 2 inputs for PTC temperature probes (KTY 81-121 990  $\Omega$  at 25  $^{\circ}\text{C}$ ) or NTC (103AT-2 10 K $\Omega$  at 25  $^{\circ}\text{C}$ )

**Output/s:** 2 relay outputs (8A-AC1, 3A-AC3 250 VAC) for compressor (OUT) and defroster (DEF)

**Electrical life for relay output:** 100000 operat.

**Protection class against electric shock:** Class II for Front panel

**Insulation:** Reinforced insulation between the low voltage section (relay output) and the front panel; Reinforced insulation between the low voltage section (relay outputs) and the extra low voltage section (supply and inputs); No insulation between supply and inputs

## MECHANICAL DATA

**Housing:** Self-extinguishing plastic, UL 94 V0

**Dimensions:** 33 x 75 mm, depth 64 mm

**Weight:** 120 g approx.

**Mounting:** Flush in panel in 29 x 71 mm hole

**Connections:** 2,5 mm<sup>2</sup> screw terminal block

**Degree of protection of front panel:** IP 65 mounted in panel with gasket

**Pollution situation:** Normal

**Operating temperature:** 0 ... 55  $^{\circ}\text{C}$

**Operating humidity:** 30 ... 95 RH% without condensation

**Storage temperature:** -10 ... +60  $^{\circ}\text{C}$

## FUNCTIONAL DATA

**Temperature Control:** ON/OFF

**Defrost control:** interval cycles by Electric Heating or hot-gas / reverse cycle

**Measurement range:** PTC: -50...150  $^{\circ}\text{C}$  / -58 ... 199  $^{\circ}\text{F}$ ; NTC: -50...50  $^{\circ}\text{C}$  / -58...122  $^{\circ}\text{F}$

**Display resolution:** 1  $^{\circ}$  in all range or 0.1  $^{\circ}$  in range between -19,9 and 19,9

**Overall accuracy:** +/- 0,5 %fs

**Sampling rate:** 2 samples per second

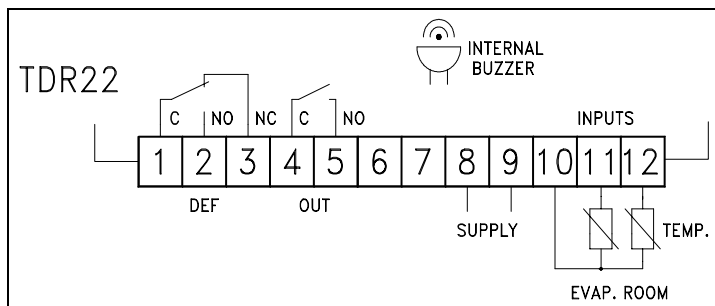
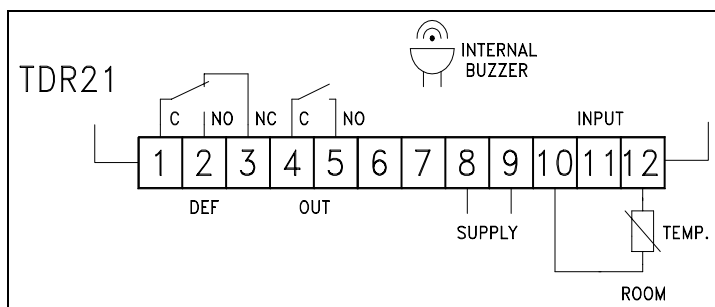
**Action:** 1C type according to EN 60730-1

**Compliance:** ECC directive EMC 89/336 (EN 50081-1, EN 50082-1), ECC directive LV 73/23 and 93/68 (EN 60730-1)

## 3 - INSTALLATION

**MECHANICAL MOUNTING:** The instrument, in case 33 x 75 mm, is designed for panel mounting. Make an hole 29 x 71 mm and insert the instrument, fixing it with the provided special bracket. We recommend to mount the gasket to obtain an IP 65 front protection. Avoid to place the instrument in areas with humidity or dirt. Connect the instrument as far as possible from source of electromagnetic disturbances so as motors, power relays, relays, electrovalves, etc.

**ELECTRICAL CONNECTIONS:** Carry out the electrical wiring connecting only one wire for each terminal, according to the following diagram, check that the power supply is the same as indicated on the instrument and the loads current is not upper than the maximum current admitted. The instrument, being a built in equipment with permanent connection into a cabinet, is not furnished with internal device protecting from overcurrent: it's recommended, therefore, to properly protect all the electric circuits connected to the instrument, with devices (ex. fuses) proportionate to the circulating currents. It's strongly recommended to use cables with proper insulation, according to the working voltages and temperatures. Furthermore, the input cables has to be kept separate from line voltage wiring. If the input cables is screened, it has to be connected on the ground with only one side. It is advisable to check that the parameters are those desired before connecting the outputs to the actuators so as to avoid malfunctioning. Whenever a failure of the instrument could cause dangerous or damaging situations, it should be kept in mind that the plant has to be provided with additional devices to ensure the safety. It's recommended to supply the instrument using the Tecnologic TCTR transformer or equivalent type, and to use one transformer for each instrument. The nominal power of transformer should be at least 3 VA, if the instrument it's not connected with the remote display TDRVR, and at least 5 VA if is used the remote display.



## 4 - OPERATING MODE

### 4.1 - TEMPERATURE ON/OFF CONTROL

The temperature control mode of the instrument by ON/OFF mode occurs on the output OUT according to the Set point fixed and to the differential switching point (par. "d") programmed. The regulator is intended for cooling applications, for this reason the programmable differential is always positive. The operating mode can be also modified by the "Compressor Protection" function, see the next chapter for this function.

### 4.2 - COMPRESSOR PROTECTION FUNCTION

The function "Compressor Protection" is able, for cooling applications, to protect the compressor against "short cycles" by introducing a delay on the output OUT activation. The parameters to be programmed for this function are:

"PS" : Protection type

- 1 - delay before start

- 2 - delay after stop

- 3 - delay between starts

"Pt" : Time delay setting for parameter "PS" (in min.)

The "Compressor Protection" function are automatically disconnected by setting "Pt" = 0.

### 4.3 - DEFROST CONTROL

The automatic control of defrost occurs according to this parameters:

"dt" - Defrost type

- EL - electric heater type (during defrosting, the compressor output is not activated while the defrosting output is activated)

- in - hot-gas / reverse cycle type (during defrosting the compressor and defrost outputs are activated)

"di" - Interval between defrost cycles (in hrs.). It's the time between two successive automatic defrosting cycles.

"dO" : Time delay of automatic defrost start (in min.); it's a delay on the automatic defrosting cycle activation which permits to have defrost intervals with hours and minutes resolution.

"dE" - Maximum length of defrost cycles (in min.). It's the maximum time that lasts a defrosting cycle whether manual or automatic. In TDR 22 at the passing by of this time the defrost is interrupted although has not been reached the end defrosting temperature. (par. "tE").

"tE" : Defrost-Stop temperature (TDR 22 only); it's the temperature value, measured by the probe placed on the evaporator, after which it has to stop the defrost cycle. If the Defrost -Stop temperature wouldn't be reached, defrosting stop would happen at the passing by of the time programmed with "dE" parameter.

"dC" : Defrost interval computation

- ct - based only on compressor running time (output on)
  - rt - based on real time (instrument on)
  - cS - the defrost cycle is activated whenever the output OUT is deactivated (every stop of compressor)
- "td" : Drainage time (in min.); it's a delay on the compressor reactivation, after a defrost cycle, in order to allow the coil drainage.
- "Sd" : Defrost at Power on; it gives the possibility to have a defrost cycle at start-up of the instrument.

#### 4.4 - MANUAL DEFROST

To active manual defrost cycle press key UP /DEFROST, when you are't in programming mode, and holding it down for about 5 seconds after which the led DEF will be on and the instrument will start a defrost cycle.

#### 4.5 - VISUALISATION OF EVAPORATOR TEMPERATURE (TDR 22)

It's possible to visualise the temperature, read by the probe placed on the evaporator, pushing and then releasing the key with Tecnologic logo (T), the display will show then alternatively message "tE" and the measured temperature, for 5 sec., at the passing by of which it will return at the normal functioning, visualising the temperature measured by the room probe.

#### 4.6 - ALARM FUNCTIONS

The instrument has the alarm functions to signalise the probes alarm errors, and high and low room temperature alarm. The alarms are visualised on the display and signalized by means of an internal buzzer (optional). The temperature alarm function works depending on the following parameters :

"HA" - Set High temperature alarm (relative to the Set Point)

"LA" - Set Low temperature alarm (relative to the Set Point)

"Ad" - Alarms differential

"PA" - Alarm delay at power on (in hrs.)

"dA" - Alarm delay after defrost (in min.)

The alarm is operating at the end of the delays and will be on when the room temperature goes upper than the value [Set +HA] or goes lower than the value [Set - LA]. The high and low temperature alarm can be deactivated setting the relative parameters "HA" or "LA" at 0. When the alarm is functioning to stop the buzzer push any of the programming key.

In the mean time of the alarm signalation, although the buzzer is silenced, the instrument signalize the alarm through the AL led and it visualize, during the normal functioning:

- Alternatively "HI" and the temperature measure by the room probe in case of high temperature alarm.

- Alternatively "LO" and the temperature measure by the room probe in case of low temperature alarm.

The instrument offer, furthermore, on par.

"tA" - Alarm memory

the possibility to memorise the alarm.

If "tA" is programmed as "oF", the instrument cancels the alarm signal at cessation of the alarm conditions, if instead it's programmed as "on", as well on the cessation of the alarm conditions it keeps "AL" led flashing, to indicate that occurred an alarm condition. To cancel this alarm memory signalling is then enough to push any key.

### 5 - PROGRAMMING

#### 5.1 - PROGRAMMING OF SET-POINT

Press key P then release it, led SET will on and the SET value will be shown on display. To modify press key UP so as to increase value or DOWN so as to decrease it. These keys count one digit at a time but if the keys are pressed for over one second the value increases or decreases fast so as to reach the desired value immediately. The outgoing from the Set programming mode occurs automatically by not pressing any key for about 5 seconds, thus the room temperature value will again be displayed.

#### 5.2 - PROGRAMMING OF PARAMETERS

To accede to the operating parameters it is necessary to press key P holding it down for about 5 seconds, after which the led SET will flash and the code of the first parameter will be visualized on the display. At this point key P can be released and by pressing UP or DOWN the desired parameter can be selected. Once the parameter on which we intended to

operate has been selected to modify it press P, then released it, the set of the parameter will show up. To modify this value press UP or DOWN so as to increase or decrease the value. Once the desired value has been set press and then release P and the selected parameter code can be read on the display. By pressing UP or DOWN it is therefore possible to choose another one and modify it as previously mentioned. To outgoing from the programming mode no key is to be pressed for about 20 seconds, the instrument will automatically return to normal functioning mode, visualizing the room temperature value.

### 6 - DESCRIPTION OF PARAMETERS

Here following are described all the instrument parameters; pls. note that some of them could do not appear because are according to the kind of used instrument.

#### CC - FIXED PARAMETER

##### MEASURE AND VISUALIZATION

**CA - ROOM PROBE CALIBRATION** : Positive or negative offset which is calculated on probe reading before visualizing and to which the control functioning is also connected.

**CE - EVAPORATOR PROBE CALIBRATION (TDR 22 only)**: Positive or negative offset which is calculated on probe reading before visualizing and to which the end defrost functioning by temperature and fans stop temperature is also connected

**ru - UNIT OF MEASUREMENT**: Determines the visualization of the temperature in Centigrade or Fahrenheit degree. It is to be remember that the change of this parameter modifies the visualization but not the Set and the Set limit ("LS" and "HS") programmed (eg. if the Set was -10°C and the unit changes, the Set will rest -10°F).

**dP - DECIMAL POINT** : Allows the insertion of the decimal point on the display and therefore to determine resolution of the reading value in the range from -19.9 to 19.9 (on= with decimal point, oF= without decimal point)

##### TEMPERATURE CONTROL

**d - DIFFERENTIAL SWITCHING POINT**: Value between starting and stopping of output OUT .

**LS - MINIMUM SET**: Minimum possible Set point value or lower limit of Set point .

**HS - MAXIMUM SET**: Maximum possible Set point value or higher limit of Set point.

**rP - OUT OUTPUT STATE IN CASE OF ERROR ROOM PROBE**:

It permits to decide how has to behave the output OUT in case of room probe error. (of = output deactivated ; on = output activated and deactivated cyclically, depending on the times programmed on par. "t1" and "t2"). If it's desired to have output OUT always activated in case of room probe error, program par. "rP" = on and par. "t2" = 0.

**t1 - ACTIVATION TIME OF THE OUTPUT OUT IN CASE OF ERROR ROOM PROBE**: Whether par. rP is programmed as on, in case of error room probe, the output OUT will be activated for the time programmed on this par. (expressed in min.) to remain then deactivated for the time programmed on par. "t2" and so on.

**t2 - DEACTIVATION TIME OF THE OUTPUT OUT IN CASE OF ERROR ROOM PROBE**: Whether par. rP is programmed as on, in case of error room probe, the output OUT will be activated for the time programmed on par. "t1" to remain then deactivated for the time programmed on this par. (expressed in min.) and so on.

##### DEFROST CONTROL

**dt - DEFROST TYPE**: Selects the type of defrost ( EL = with electric heater, in = hot-gas / reverse cycle).

**di - DEFROST INTERVAL**: Automatic defrost frequency. This time is calculated based on the selection of par. "dC" and is intended in hrs.

**dO - TIME DELAY AUTOMATIC DEFROST START**: It's a delay on the automatic defrosting cycle activation expressed in min.. This parameter can be utilised for a defrost interval with resolution of hrs (par. "di") and min.

**dE - MAXIMUM LENGHT OF DEFROST CYCLES**: Determines the maximum lenght of a manual or automatic defrost cycle and is intended in min.. In TDR 22 after this time the defrost is stopped although has not been reached the defrost stop temperature.

**tE** - DEFROST STOP TEMPERATURE (TDR 22 only): Determines the temperature, measured by the evaporator probe, at which the defrost has to end.

**Et** - DIFFERENTIAL DISPLAY UNLOCK AFTER DEFROST : Temperature differential to unlock the display after the defrost. If it's utilized the option of "dL" parameter display lock during defrost, the display, after defrost will come back to visualize the temperature measured by the probe when it will be gone under the value [Set + Et] or is ended the time programmed to par. "dA".

**EP** - EVAPORATOR PROBE PRESENCE (TDR 22 only): This parameter can be utilized when the evaporator probe is not used (on = used probe, oF = not used probe)

**dC** - DEFROST INTERVAL COMPUTATION: Select the type of computation for defrost interval as based on total compressor running time (ct), as based on real time instrument functioning (rt) or if a defrost cycle is activated whenever the output OUT is deactivated (every stop of compressor) (cS).

**td** - DRAINAGE TIME: Compressor start delay after a defrost cycle to allow coil drainage, intended in min.. During drainage time the led DEF flashing.

**Sd** - DEFROST AT POWER ON: It gives the possibility to have a defrost cycle at start-up of the instrument. ( oF = no defrost at power on, on = start defrost cycle at power on).

**dL** - DEFROST DISPLAY LOCK: Pemits the display visualization lock on the last temperature reading (on) during all the defrost cycle until, at the end of defrost, the room temperature has not reached the value [Set + Et] (see par. "Et") or is ended the time setted on par. "dA". Or it permits the visualization of label "dF" (Lb) during the defrost cycle and, after the defrost, of label "Pd" until, at the end of defrost, the temperature has not reached the value [Set + Et] (see par. "Et") or is ended the time setted on par. "dA". The display will otherwise continue to visualize the temperature measured by the room probe during the defrost cycle (oF).

#### COMPRESSOR PROTECTION AND DELAY AT POWER ON

**PS** - COMPRESSOR TYPE PROTECTION: Select the type of protection for the compressor against "short cycle". The possibles selections are:

1 = delay before start

2 = delay after stop

3 = delay between starts

**Pt** - TIME DELAY COMPRESSOR PROTECTION: Time delay setting for parameter "PS" intended in min.

**od** - OUTPUTS DELAY AT POWER ON: Time delay of outputs activation after power on and expressed in min. During this time the display show alternatively "od" and the measured room temperature.

**HA** - HIGH ALARM: Temperature value in respect with Set point above at which the alarm will be on (The alarm will be on when the room temperature will be upper then the value Set + HA).

**LA** - LOW ALARM: Temperature value in respect with the Set point below at which the alarm will be on (The alarm will be on when the room temperature will be lower then the value Set - LA).

**Ad** - TEMPERATURE ALARMS DIFFERENTIAL: Value between starting and stopping of temperature alarm signal (par. HA and LA).

**tA** - ALARM MEMORY : It permits to decide if the instrument has to cancel the alarm signal at the end of the alarm conditions (oF), or it has to keep the led "AL" flashing to indicate that occurred an alarm (on). To cancel the alarm memory signal it's then enough to push one of the keys.

**PA** - TEMPERATURE ALARMS DELAY AT POWER ON: Time delay after power on during which the temperature alarms will not be activated (expressed in hrs).

**dA** - TEMPERATURE ALARMS DELAY AND UNLOCK DISPLAY DELAY AFTER DEFROST : Time delay after a defrost cycle during which the temperature alarms will not be activated and during which the display (see par. "dL") is locked (expressed in min.).

#### TEMPERATURE SET POINT

**SP** - SET POINT : Set point value

#### **6.1 - PARAMETERS TABLE**

| Par.                      | Description     | Range | Def. | Notes |
|---------------------------|-----------------|-------|------|-------|
| CC                        | Fixed parameter | -     |      |       |
| MEASURE AND VISUALIZATION |                 |       |      |       |

|   |   |                      |     |  |
|---|---|----------------------|-----|--|
| CA  | Room probe calibration  | -15.0 .. +15.0 °C/°F | 0.0 |  |
| CE *  | Evaporator probe calibration                                    | -15.0 .. +15.0 °C/°F | 0.0 |  |
| ru  | Unit of measurement   | C - F                | C   |  |
| dP  | Decimal point   | on - oF              | on  |  |
| TEMPERATURE CONTROL                         |   |                      |     |  |
| d   | Differential  | 0.0 .. 15.0 °C/°F    | 2.0 |  |
| LS  | Minimum Set   | -58...HS °C/°F       | -50 |  |
| HS  | Maximum Set   | LS..199 °C/°F        | 50  |  |
| rP  | OUToutput state in case of error room probe                     | on - oF              | oF  |  |
| t1  | OUT activation time in case of error room probe                 | 1 .. 25 min.         | 1   |  |
| t2  | OUT deactivation time in case of error room probe               | 0 .. 25 min.         | 0   |  |
| DEFROST CONTROL                             |   |                      |     |  |
| dt  | Defrost type  | EL - in              | EL  |  |
| di  | Defrost interval  | 0 ... 31 hrs         | 6   |  |
| dO  | Time delay automatic defrost start                              | 0 ... 59 min.        | 0   |  |
| dE  | Maximum lenght of defrost cycles                                | 1 ... 99 min.        | 30  |  |
| tE *  | Defrost stop temperature  | -58 ... 199 °C/°F    | 8   |  |
| Et  | Differential display unlock after defrost                       | 0 ... 20 °C/°F       | 2   |  |
| EP *  | Evaporator probe presence                                       | on - oF              | on  |  |
| dC  | Defrost interval computation                                    | rt - ct - cS         | rt  |  |
| td  | Drainage time   | 0 ... 99 min.        | 0   |  |
| Sd  | Defrost at power on   | on - oF              | oF  |  |
| dL  | Defrost display lock  | on - oF - Lb         | oF  |  |
| COMPRESSOR PROTECTION AND DELAY AT POWER ON |   |                      |     |  |
| PS  | Compressor type protection                                      | 1 - 2 - 3            | 1   |  |
| Pt  | Time delay compressor protection                                | 0 ... 31 min.        | 0   |  |
| od  | Outputs delay at power on                                       | 0 ... 99 min.        | 0   |  |
| ALARMS                                      |   |                      |     |  |
| HA  | Relative high alarm   | 0 ... 50 °C/°F       | 10  |  |
| LA  | Relative low alarm  | 0 ... 50 °C/°F       | 10  |  |
| Ad  | Temperature alarms differential                                 | 1 ... 20 °C/°F       | 1   |  |
| tA  | Alarm memory  | on - oF              | oF  |  |
| PA  | Temperature alarms delay at power on                            | 0 ... 15 hrs.        | 2   |  |
| dA  | Temperature alarms delay and unlock display delay after defrost | 0 ... 99 min.        | 60  |  |
| TEMPERATURE SET POINT                       |   |                      |     |  |
| SP  | Set Point   | LS...HS °C/°F        | 0.0 |  |

\* : TDR 22 only

#### **7 - PROBLEMS, MAINTENANCE AND WARRANTY**

**ERRORS SIGNALLING:** The instrument display it's used to visualise instrument error conditions, showing the following messages : "E1" or "E2" - Room probe error (E1) or evaporator probe error (E2) interrupted or in short-circuit.

"o1" - "o2" - "u1" - "u2" - Room probe input (1) or evaporator probe input (2) in overrange (o) or in underrange (u).

In these cases verify the correct connection of the probes with the instrument and successively proceed verify itself.

"EE" - Memory error, in this case verify, and if necessary, re-program the functioning parameters.

**WARRANTY AND REPAIRS:** The instrument is under warranty against construction vices or defected material, noticed within 12 months from delivery date. The warranty is limited to the repairs or to the substitution of the instrument. The eventual opening of the housing, the violation of the

*instrument or the wrong use and installation of the product means the automatically decay of the warranty. In case of defected instrument, noticed in warranty period or out of warranty, do contact our sales department to obtain the shipment authorisation. The defected product must be shipped to TECNOLOGIC with the detailed description of the failures found and without any fees or charge for Tecnologic, safe different agreements.*