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# 12 Technical Information

## Conversion Factors

To convert	from	Multiply by	to obtain
<b>Length</b>	in	0.0254	m
	ft	0.3048	m
	m	39.3701	in
	m	3.28084	ft
<b>Area</b>	in <sup>2</sup>	0.00064516	m <sup>2</sup>
	ft <sup>2</sup>	0.092903	m <sup>2</sup>
	m <sup>2</sup>	1,550.0	in <sup>2</sup>
	m <sup>2</sup>	10.7639	ft <sup>2</sup>
<b>Volume</b>	in <sup>3</sup>	0.0000163871	m <sup>3</sup>
	ft <sup>3</sup>	0.028317	m <sup>3</sup>
	gallon	0.0037854	m <sup>3</sup>
	m <sup>3</sup>	1,000.0	litre
	m <sup>3</sup>	61,023.74	in <sup>3</sup>
	m <sup>3</sup>	35.315	ft <sup>3</sup>
	m <sup>3</sup>	264.173	gallon
<b>Mass</b>	lb	0.453592	kg
	kg	2.20462	lb
<b>Density</b>	lb/ft <sup>3</sup>	16.0185	kg/m <sup>3</sup>
	kg/m <sup>3</sup>	0.062428	lb/ft <sup>3</sup>
<b>specific Volume</b>	ft <sup>3</sup> /lb	0.062428	m <sup>3</sup> /kg
	m <sup>3</sup> /kg	16.0185	ft <sup>3</sup> /lb
<b>Temperature</b>	°F	+459.67	°R
	°R	-459.67	°F
	°C	+273.15	K
	K	-273.15	°C
	°C	$t-9/5+32$	°F
	°F	$(T-32)-5/9$	°C
<b>Pressure</b>	psi	6,894.76	Pa
	psi	0.068976	bar
	ft of water	2,988.98	Pa
	in of water	249.082	Pa
	in of Hg	3,376.85	Pa
	Pa	0.000145038	psi
	bar	14.5038	psi
	Pa	0.000334562	ft of water
	Pa	0.00401474	in of water
	Pa	0.00029613	in of Hg
	bar	10 <sup>5</sup>	Pa
	Pa	10 <sup>-5</sup>	bar
	<b>Velocity</b>	fps	0.3048
fpm		0.00508	m/s
mph		0.44704	m/s
m/s		3.28084	fps
m/s		196.85	fpm
m/s		2.23694	mph
<b>Acceleration</b>	ft/s <sup>2</sup>	0.3048	m/s <sup>2</sup>
	m/s <sup>2</sup>	3.28084	ft/s <sup>2</sup>

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To convert	from	Multiply by	to obtain
<b>Force</b>	lb <sub>f</sub>	4.44822	N
	N	0.224809	lb <sub>f</sub>
<b>Flow rate</b>	cfm	0.000471947	m <sup>3</sup> /s
	cfs	0.02831685	m <sup>3</sup> /s
	gpm	0.0000630902	m <sup>3</sup> /s
	gpm	0.0630902	L/s
	m <sup>3</sup> /s	2,118.88	cfm
	m <sup>3</sup> /s	35.3147	cfs
	m <sup>3</sup> /s	15,850.30	gpm
	L/s	15.8503	gpm
	lb/s	0.453592	kg/s
	lb/min	0.00755987	kg/s
	lb/h	0.000125998	kg/s
	kg/s	2.20462	lb/s
	kg/s	132.277	lb/min
	kg/s	7,936.64	lb/h
<b>Energy</b>	ft-lb	1.355818	J
	Btu	1,055.06	J
	J	0.73756212	ft-lb
	J	0.0009478133	Btu
<b>Power</b>	Btu/h	0.2930667	W
	hp	745.6999	W
	tons of refr.	3,516.80	W
	W	3.41219	Btu/h
	W	0.001341022	hp
	W	0.0002843494	tons of refr.
<b>Enthalpy</b>	Btu/lb	2.326009	kJ/kg
	kJ/kg	0.42992095	Btu/lb
<b>Specific Heat</b>	Btu/lb-°F	4.186816	kJ/kg-K
	kJ/kg-K	0.238845	Btu/lb-°F
<b>Entropy</b>	Btu/lb-°R	4.186816	kJ/kg-K
	kJ/kg-K	0.238845	Btu/lb-°R
<b>Conductivity</b>	Btu/h-ft-°F	1.730742	W/m-K
	W/m-K	0.577787	Btu/h-ft-°F
<b>Heat transfer Coefficient</b>	Btu/h-ft <sup>2</sup> -°F	5.678286	W/m <sup>2</sup> -K
	W/m <sup>2</sup> -K	0.1761094	Btu/h-ft <sup>2</sup> -°F
<b>Viscosity</b>	lb/ft-s	1.48816	Pa-s
	lb/ft-h	0.000413378	Pa-s
	centipoise	0.00100	Pa-s
	Pa-s	0.671971	lb/ft-s
	Pa-s	2,419.09	lb/ft-h
	Pa-s	1,000.00	centipoise
<b>Kin. Viscosity</b>	ft <sup>2</sup> /s	0.092903	m <sup>2</sup> /s
	m <sup>2</sup> /s	10.7639	ft <sup>2</sup> /s

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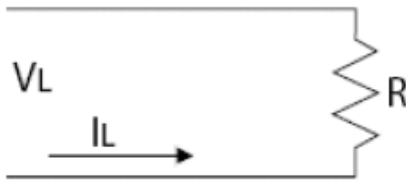
# 12 Technical Information

## Useful Technical Information

### Load Configurations

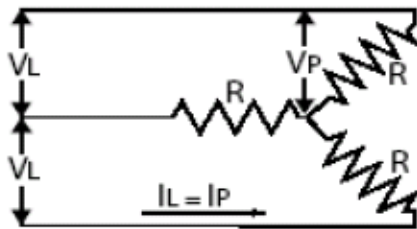
Wt= Total power R = heater resistance  
 VP = phase voltage IP = phase current  
 VL = line voltage IL = line current

Single Phase, Line And Neutral Or Line And Line



$$Wt = VL \times IL \text{ or } VL^2/R$$

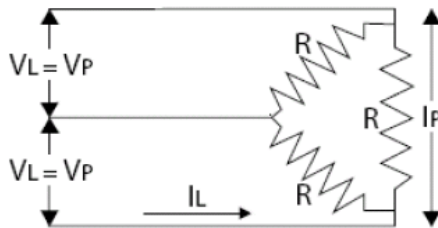
Three Phase, Three Wire, DELTA Configuration



$$Wt = 1.73VL \times IL \text{ or } 3 \times VL^2/R$$

Where  $IL = 1.73 \times IP$

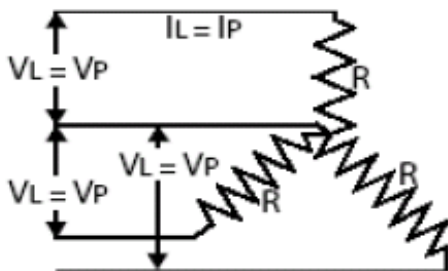
Three Phase, Three Wire, STAR Configuration



$$Wt = 1.73VL \times IL \text{ or } 3 \times VL^2/R$$

Where  $VL = 1.73 \times VP$

Three Phase, Four Wire, STAR Configuration



$$Wt = 3 \times VL \times IL \text{ or } 3 \times VL^2/R$$

Where  $VL = VP$  and  $IL = IP$

### OHM'S Law

$E = I \times R$  where  
 E = Volts, I = Amperes,  
 R = Ohms, W = Watts.

For Heaters

To Determine Watts (W):  
 $W = EI, W = I^2R, W = E^2/R$

To Determine Volts (E):  
 $E = \sqrt{WR}, E = W/I, E = IR$

To Determine Ohms (R):  
 $R = W / I^2 R = E^2/W R = E/I$

To Determine Amperes (I):  
 $I = E/R I = W/E I = \sqrt{W/R}$

Variation of Wattage with Voltage Change

$$W2 = W1 (E2/E1)^2$$

E2 = New Voltage W2= New Wattage

E1 = Original Heater Voltage W1 = Original Wattage

Power (P) required to raise the temperature ( $\Delta T$ ) of a material with specific heat (c) of a specific weight (w) in a required time (t);

$$P(kW) = \frac{w \text{ (kg)} \times c \text{ (kJ/kgK)} \times \Delta T \text{ (K)}}{3600 \times t \text{ (hours)}}$$

Safe Watts density's for silicone heater mats  
 $(W/Area) < 0.6W/cm^2$

Some common specific Heats

Stainless Steel 316	0.49 kJ/kgK
Incoloy	0.54 kJ/kgK
Aluminium	1.00 kJ/kgK
Teflon	1.05 kJ/kgK
Water	4.19 kJ/kgK

### Cooler Fans and Blowers

Cooling fans and blowers can be either -

#### Axial Fans

For relatively high flow rates and low pressures with flow parallel to axis of fan.

#### Centrifugal Or Radial Blowers

For relatively low flow rates and high pressures with flow perpendicular to blower axis. Air enters around center of the fan and exits around the outside. Housing configurations can be un-ducted (open), or ducted (enclosed).

The rate of airflow required for a given temperature increase can be calculated by:

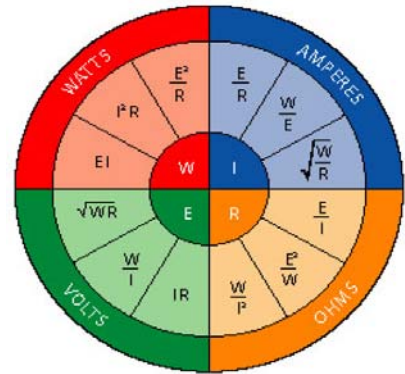
$$V = (3.0 \times W) dt$$

Where

V = Airflow in m<sup>3</sup>/hr

W = Power loss in Watts

dt = Allowed increase in ambient temperature ( $^{\circ}C$ /Kelvin)



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## Float (Level) Switches

Float/Level switches are used to detect liquid or powder levels, or interfaces between liquids. These level switches can be used either as an alarm device or as control switches, turning something on or off, such as a pump, or sending a signal to a valve actuator.

## Flexible Heaters (Silicone Rubber Heater Mats)

Flexible heaters have been developed using new production techniques to position fine resistance wires or an etched foil circuit accurately and precisely over areas of almost any shape and size. The close and even spacing of the wires or the etched foil ensures a uniform distribution of heat over the entire working area. Because of its high temperature tolerance and superb electrical insulating properties, silicone rubber is well suited to the production of heated mats. They are produced by laminating the wire or foil between two sheets of silicone rubber, reinforced with a glass textile to give improved mechanical strength.

Silicone rubber mat heaters can be manufactured to any size and shape to suit customer's applications. Holes and cut-outs to accommodate existing components or obstructions, can be provided as required without disturbing the even distribution of heat. Size is generally limited to 920mm width of our standard material and a practical length of 2000mm. The maximum continuous operating temperature for silicone rubber insulated mat heaters is 180°C, allowing a generous safety margin for short term over temperature excursions as high as 200°C. Heater mats can be supplied with inbuilt temperature sensors for controlling and/or monitoring as well as thermal limiters for over temperature protection.

## Ceramic & Quartz Infra-red Heaters

### Ceramic Infra Red Heaters

Ceramic Elements are the heaters of choice in most applications where radiant efficiency at competitive cost is required.

Long wave radiation for curing heating and drying is an environmentally friendly, portable and cost effective method of heating. They have a cast-in iron-chrome aluminium resistance wire and a glazed ceramic surface which protects the heating coil from the risk of corrosion or chemical attack. Ceramic elements operate in the temperature of 300°C to 730°C (572°F - 1346°F) producing an IR wavelength on the 2 - 10 micron range. Most plastics and many other materials absorb IR best in this range.

### Quartz Infra-red Heaters

Quartz Heaters provide infrared radiation in the medium wavelength range of 1.5 to 5.6 microns. They are favoured in applications where rapid heater response is necessary. They are most cost effective in systems with long heater on cycles as they reach maximum operating temperature in 3-5 minutes. Being similar in size to Ceramic Emitters, they can easily be used in systems where zone control of the heater area is a requirement.

### Quartz Heater Lamps for Catering

The same technology is used in the catering industry. However to avoid food ingress or glass fracture from food splashes hard glass must be used. Jacketed lamps are also available giving the added protection against failure and glass falling into food beneath the lamp as well as giving a wipe clean surface for maintenance and clean-up.

### Helpful hints on PID control

- Rapid cycle time gives better control and prolongs heater life, but shortens output relay life (though a solid state relay avoids this problem).
- Proportioning band should be adjusted so that oscillations just cease; a wide band gives stable control but increases offset from desired set point.
- A properly adjusted Integral parameter eliminates offset; if too fast, oscillation will develop, too slow will give poor response.
- Too much Derivative will cause oscillations, too little will result in overshoot.
- For system start-up, use a large time value for the Integral parameter (so that you basically have proportional control). Adjust this step-wise until offset is eliminated with minimal oscillation around the set-point. Then adjust the Derivative parameter so that any outside disturbances to the system are corrected rapidly but without oscillations.

**IMPORTANT SAFETY NOTE:** when dealing with temperature control systems, it is important to consider the possible effects of a malfunction in any part of the system - any one of many possible malfunctions could cause a dangerous situation if the heating is left permanently switched on. This could be a fault in the sensor, controller, connecting wiring or other outside interference.

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### Methods of Control

#### ON/OFF Control

The controlled element (compressor, heater, valve etc.) can only be on or off, there is no halfway house and the size of the corrective action is unrelated to the temperature deviation. All digital controllers sold by Hawco have an adjustable differential or hysteresis (parameter 1HY or similar), which changes the width of the dead zone between switching off and on. A narrower differential will give smaller temperature swings, but will increase cycling rates and cause increased wear on mechanical relays, heater elements etc. Therefore the differential needs to be adjusted to give the lowest cycling rate that gives an acceptable temperature bandwidth.

Cooling operation – Positive (+) hysteresis. Temperature rise to energise relay.

Heating operation – Negative (-) hysteresis. Temperature falls to energise relay.

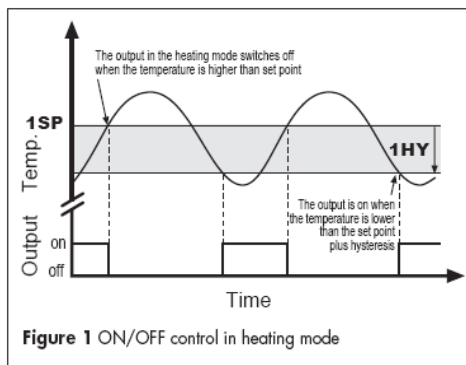


Figure 1 ON/OFF control in heating mode

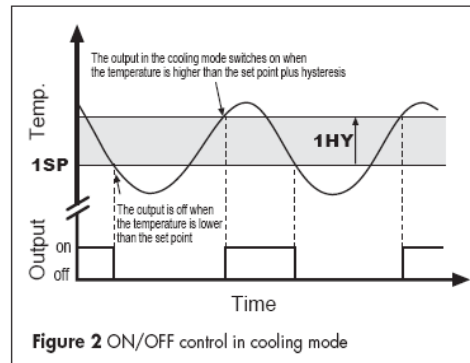


Figure 2 ON/OFF control in cooling mode

#### Proportional Control

The control action can be varied between 0 and 100% of the available response, being tailored to the size of the temperature deviation measured by the sensor. This is particularly helpful where, for example, a work cycle involves the addition of large amounts of cold material, which cool the system down so that it needs rapid heat-up. A large injection of heat would lead to huge overshoot without some form of proportioning action. The example parameter references below relate to those of an LAE LTW15 controller but will be similar in principle to other controller manufacturers.

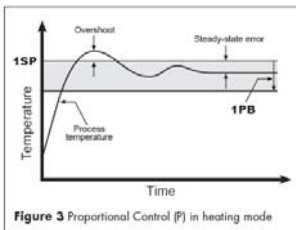


Figure 3 Proportional Control (P) in heating mode

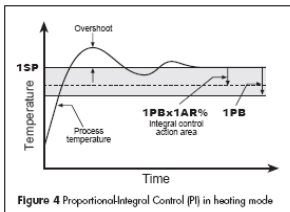


Figure 4 Proportional-Integral Control (PI) in heating mode

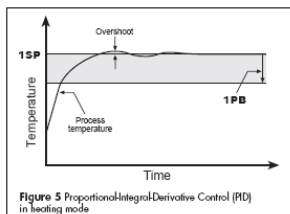


Figure 5 Proportional-Integral-Derivative Control (PID) in heating mode

#### Proportional Control (P)

The temperature is controlled by varying the time of activation of the output when the temperature is inside the proportional band (1PB). The nearer the temperature to set point, the less the time of activation. A small proportional band increases the promptness of response of the system to temperature variations, but tends to make it less stable. A purely proportional control stabilises the temperature within the proportional band but does not cancel the deviation from the set point.

#### Proportional-Integral Control (PI)

The steady-state error is cancelled by inserting an integral action into the control system. The integral action time, (1IT), determines the speed of cancellation of the error, but a high speed (1IT low) may be the cause of overshoot and instability in the response. The integral part normally acts within the proportional band, but this area of action may be reduced in terms of percentage by lowering the integral action reset 1AR. The response overshoot is thus decreased. The integral control is cancelled when the temperature goes outside the area of action of the integral part. With 1IT=0 the integral control is disabled.

#### Proportional-Integral-Derivative Control (PID)

Response overshoot in a system controlled by a PI controller may be reduced by inserting a derivative action in the control. The derivative action is greater the faster the temperature variation within the time unit. A controller with a high derivative action (1DT high) is extremely sensitive to small temperature variations and can make the system instable. With 1DT=0 the derivative control is disabled.

## Outputs

The controller output has to be interfaced to the heat source (or other actuating device) and this is done by various methods, the choice of which depends on the type of process and equipment being used;

## Relay O/P

Used in on/off or time proportioning modes to switch contactors etc.; electromechanical relays are inexpensive, small, usually housed within the controller, but can have limited life if cycled rapidly - where more rapid switching is needed a solid state relay is recommended.

## SSR O/P

This is a switching device which contains 2 SCR's (silicon (Solid State Relay) controlled rectifiers) or a single triac complete with a zero voltage crossover or synchronising drive circuit; it usually takes the form of a potted assembly having no moving parts to wear out, and can be either ac or dc input type.

## Power Control

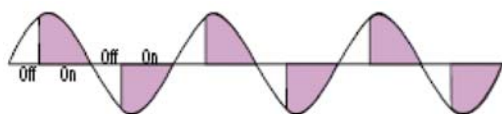
The output relays of temperature controllers are capable of switching currents typically 8, 16 or 20 Amps depending on the model of controller. Most heater loads however, are typically more than the controller's relay can handle. For these applications solid state relays or Thyristor power controllers depending on the type of load and the type of control required, need to be incorporated within the control system.

## Firing Circuits

The devices just described can incorporate special firing circuitry to produce smoother and more accurate control of the load.

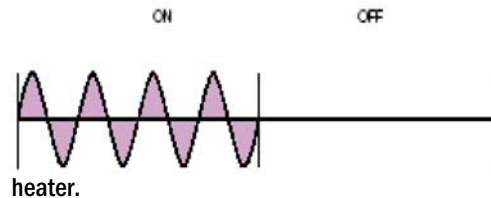
## Burst Firing

This is the most basic and cheapest method to provide variable electrical output power for the control of temperature. This is achieved by triggering the device ON and OFF in multiples of complete mains cycles. This type of control is suitable for loads whose load resistance does not change very much with temperature.



## Phase Angle

This type of control is a more precise method of switching. The device conducts for only part of the AC supply cycle. Therefore if low power is required the device conducts for a small portion of the AC cycle, similarly if half power is required the device is not triggered to conduct until it is 50% of the way through half of a mains cycle. This type of triggering is ideal for low inertia heaters such as lamps and air heater.



## Humidity

A Hygrometer is an instrument used to measure relative humidity (RH) that is the quantity of water vapour present in the air. Hygrometers are often available in versions, which also measure temperature. These are normally called thermo-hygrometers. Relative humidity is expressed as the ratio of the quantity of water vapour present in the air to the quantity, which would reach saturation (100%) at a given temperature.

## Dew Point

The dew point is defined as the lower temperature to which air must be cooled in order for condensation (saturation) to occur. The dew point is dependent on the concentration of water vapour present, and therefore the relative humidity.

## Types of Sensor

Various types of sensors can be used for temperature measurement and control and the most common ones are:

- Thermocouples (T/C)
- Platinum sensors
- Thermistors
- Infra red pyrometers
- Solid state sensors (silicon or germanium)
- Liquid-in-glass (such as mercury thermometers)
- Bimetal (using differential expansion of metals)

The most common of all these, and most numerous in the Hawco catalogue are thermocouples, platinum resistance sensors (also referred to as RTD's, or resistance temperature detectors) and thermistors.

Simple construction  
Sturdy and physically adaptable  
Relatively inexpensive  
Wide measuring range

### Disadvantages

Non-linear over its range  
EMF is very low in some cases  
Reference point (junction) required  
Long term drift  
Lower sensitivity

### Connection to Measurement Instrument

If a T/C is not connected directly to a measuring instrument, e.g. a temperature transmitter, the T/C has to be "extended" up to the transmitter by means of an extension or compensation cable. These cables have the same effect, behaving as if the T/C reached all the way to the transmitter, thus transferring the cold junction to the terminals of the transmitter, where the cold junction compensation is performed.

### Extension & Compensation Cables

#### Extension Cables

These are made from the same materials as the T/C and can be regarded as a direct extension of the T/C with only a very small effect on the accuracy.

#### Compensation Cables

These are used together with T/C's of more expensive materials such as Pt and Rh. The characteristics of compensation cables are very similar to the corresponding T/C. The tolerances are higher, so compensation cables should not be used over certain temperatures, typically 200°C

### T/C Types

There are a number of standardized T/C types available on the market. They all have different characteristics, making them more or less suitable for different applications. The following T/C types are well known and standardized according to the European standard IEC 584 1 (some also according to American standards):

- Type B, Pt30%Rh Pt6%Rh
- Type E, NiCr CuNi
- Type J, Fe CuNi
- Type K, NiCr Ni
- Type N, NiCrSi NiSi
- Type T, Cu CuNi
- Type R, Pt13%Rh Pt
- Type S, Pt10%Rh Pt

### Colour Codes for Thermocouple Sensors

T/C Type	Conductor +	Conductor -	T/C Junction Condition Temp. Range °C	New Int'l. EC 94-33889 BS4933:2011:993	Former British BS 843:1952	French NF-E 12001	German DIN 43714	Japanese to JIS C 1610:1981	American ANSI MC 96.1	Cable Code
K	Ni-Cr	Ni-Al	0 to +1000							KX
J	Fe	Cu-Ni Constantan	+20 to +700							JX
T	Cu	Cu-Ni Constantan	-185 to +300							TX

### Thermistors

(Thermally sensitive resistors)

Thermistors, derived from thermally sensitive resistors, are solid state devices that exhibit a high coefficient of resistivity. They are used to measure temperature typically in the range -50 to 200°C, as well as being incorporated into electrical circuits as protection and compensation devices.

Thermistors are manufactured from complex metal oxides such as cobalt, magnesium, manganese or nickel.

There are two types of Thermistors; an NTC (negative temperature coefficient), whose resistance changes inversely with temperature, and a PTC (positive temperature coefficient) whose resistance changes proportionally to temperature.

There are no industry standard Thermistors, consequently each manufacturer produces devices with unique characteristics in various formats such as bead, disc, washer or chip.

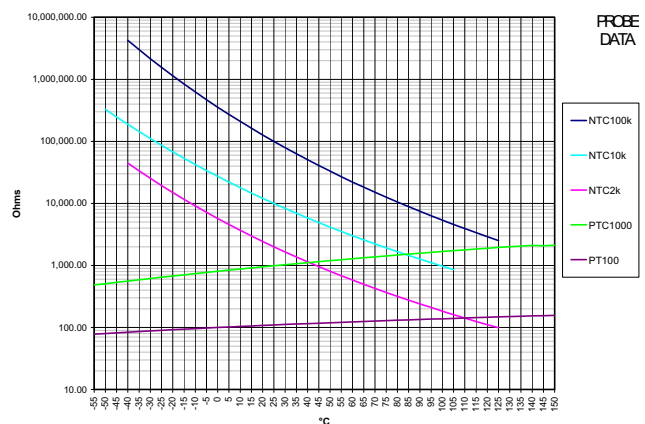
### Advantages

Cost effective in volume  
Stable  
Better accuracy than thermocouples

### Disadvantages

Linear only over a limited temperature range  
No industry standard  
Not always interchangeable

The temperature probes are predominantly used in applications such as HVAC and refrigeration because of their limited temperature range where they are connected directly to the measurement or control instruments or panel meters.



### IP Rating

EN 60529 outlines an international classification system for the sealing effectiveness of enclosures of electrical equipment against the intrusion into the equipment of foreign bodies and moisture. This classification system utilizes the letters "IP" ("Ingress Protection") followed by two or three digits. (A third digit is sometimes used. An "x" is used for one of the digits if there is only one class of protection; i.e. IPX4 which addresses moisture resistance only.)

#### Degrees of Protection - First Digit

The first digit of the IP code indicates the degree that persons are protected against contact with moving parts (other than smooth rotating shafts, etc.) and the degree that equipment is protected against solid foreign bodies intruding into an enclosure.

#### 0 No special protection

1 Protection from a large part of the body such as a hand (but no protection from deliberate access); from solid objects greater than 50mm in diameter

2 Protection against fingers or other object not greater than 80mm in length and 12mm in diameter.

3 Protection from entry by tools, wires, etc., with a diameter of thickness greater than 1.0mm.

4 Protection from entry by solid objects with a diameter or thickness greater than 1.0mm

5 Protection from the amount of dust that would interfere with the operation of the equipment.

6 Dust tight.

#### Degrees of Protection - Second Digit

The second digit indicates the degree of protection of the equipment inside the enclosure against the harmful entry of various forms of moisture (e.g. dripping, spraying, submersion, etc.)

#### 0 No special protection

1 Protection from dripping water.

2 Protection from vertically dripping water.

3 Protection from sprayed water.

4 Protection from splashed water.

5 Protection from water projected from a nozzle

6 Protection against heavy seas, or powerful jets of water.

7 Protection against immersion.

8 Protection against complete, continuous submersion in water.

### Capillary Tube Selection

The capillary tube is one of the most commonly used expansion devices in those cooling systems which work in vapour compression cycles. It is used in all

domestic appliances and also in many commercial designs. It is easy to mount, economic and free from breakdowns.

The selection is based on the practical method of "trial and error", i.e. testing the different capillaries to determine which one gives the best performance. Although simplified calculation models are available, the final adjustment for a given application should be made by practical laboratory tests. This is simply because the cooling system does not operate under constant conditions and the capillary behaviour is therefore directly affected.

Tables are presented at the end of this document for the most suitable capillary selection for a given cooling capacity. These are intended to assist the commencement of laboratory tests, with a view to minimize the number of tests. The tables refer to R12, R22, R134a and R404A.

#### CHOICE OF THE CAPILLARY TUBE

Among the conditions which most affect the flow within the capillary are the inlet and outlet pressures which, in general, correspond to the condensing and evaporating pressures. A practical observation would be that a change of 10 K in the condensing temperature can result in an approximate variation of 5 K in the evaporating temperature.

Using the tables is very simple. In principle, the starting point should be the refrigerant flow but, as a cooling cycle is defined, the flow is proportional to the cooling capacity which is accessed from the compressor catalogue, by using the corresponding cooling capacity and not the flow data

Turn to the relevant refrigerant table, and look for the approximate cooling capacity (kW), and read off the closest diameter and length capillary to achieve it.

#### SEAL OF LIQUID AT THE INLET OF THE CAPILLARY

The refrigerant should enter the capillary in the direction "from top to bottom", i.e. the filter-desiccant inclined (minimum 15°) with the inlet capillary at the lowest level. In this way the refrigerant liquid will accumulate, due to the weight, at the inlet of the capillary producing a "seal of liquid" which impedes vapour from entering. If the direction of the flow is "bottom to top", the liquid only reaches the capillary through being carried on by the velocity of the gas, whilst its natural tendency is to flow back which encourages vapour to bubble through the liquid and enter the capillary. This increases the discharge pressure and reduces the efficiency of the system.

[www.acc-compressors.com](http://www.acc-compressors.com)

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# 12 Technical Information

## Capillary Selection Guide

TABLE FOR REFRIGERANT R134a (LBP)

Q <sub>ASH</sub> Watts	M kg/h	Capillary tube length (m)															
		Capillary tube internal diameter (mm) & Evaporating temperature (°C)															
		0,6		0,7		0,8		0,9		1		1,2		1,5			
		-30	-23,3	-30	-23,3	-30	-23,3	-30	-23,3	-30	-23,3	-30	-23,3	-30	-23,3		
87	1,69	2,81	2,96														
93	1,80	2,47	2,60														
99	1,91	2,18	2,31														
105	2,03	1,95	2,06														
110	2,14	1,75	1,85														
116	2,25	1,58	1,67														
122	2,36	1,43	1,52	3,30	3,48												
128	2,48	1,30	1,38	3,00	3,17												
134	2,59	1,19	1,26	2,74	2,90												
139	2,70	1,10	1,16	2,52	2,66												
145	2,82	1,01	1,07	2,32	2,45												
151	2,93			2,14	2,26												
163	3,15			1,85	1,95	3,82	4,04										
174	3,38			1,61	1,70	3,32	3,51										
186	3,60			1,41	1,49	2,91	3,08										
198	3,83			1,25	1,32	2,58	2,72										
209	4,05			1,11	1,17	2,29	2,42										
221	4,28					2,06	2,17	3,90	4,12								
232	4,50					1,85	1,95	3,52	3,71								
244	4,73					1,68	1,77	3,18	3,36								
256	4,95					1,53	1,61	2,90	3,06								
267	5,18					1,39	1,47	2,65	2,79								
279	5,41					1,28	1,35	2,43	2,56	4,29	4,56						
291	5,63						1,24	2,23	2,36	3,94	4,19						
320	6,19							1,84	1,94	3,25	3,45						
349	6,76							1,54	1,63	2,72	2,89						
378	7,32								1,38	2,31	2,45						
407	7,88								1,19	1,98	2,10						
436	8,45								1,03	1,72	1,83						
465	9,01									1,60	4,11	4,34					
494	9,57									1,41	3,63	3,83					
523	10,14									1,26	3,22	3,40					
552	10,70									1,13	2,88	3,04					
581	11,26									1,01	2,59	2,73					
610	11,82										2,34	2,47					
639	12,39										2,13	2,24					
668	12,95										1,94	2,05					
697	13,51										1,78	1,87					
755	14,64											1,59					
814	15,77											1,36	4,38	4,61			
872	16,89											1,18	3,79	4,00			
930	18,02											1,03	3,30	3,49			
988	19,14												2,91	3,07			
1046	20,27												2,58	2,72			
1104	21,40												2,30	2,42			
1162	22,52												2,06	2,18			

Q<sub>ASH</sub> is the cooling capacity under ASHRAE (LBP) condition corresponding to the indicated mass flow rate M (liquid subcooled down to 32 °C, return gas superheated up to 32 °C)..

The relationship between length and diameter is, approximately:  $(L / L_0) = (D / D_0)^{5,4}$

TABLE FOR REFRIGERANT R134a (HMBP)

Q <sub>ASH</sub> Watts	M kg/h	Capillary tube length (m)																
		Capillary tube internal diameter (mm) & Evaporating temperature (°C)																
		0,7		0,8		0,9		1		1,2		1,5		1,7		2		
		-5	7,2	-5	7,2	-5	7,2	-5	7,2	-5	7,2	-5	7,2	-5	7,2	-5	7,2	
116	2,32	4,11	3,86															
128	2,56	3,40	3,20															
139	2,79	2,88	2,71															
151	3,02	2,45	2,31															
163	3,25	2,12	2,00	4,30	4,04													
174	3,49	1,84	1,74	3,77	3,55													
186	3,72	1,62	1,53	3,32	3,12													
198	3,95	1,43	1,35	2,93	2,76													
209	4,18	1,27	1,21	2,63	2,48													
221	4,42	1,14	1,08			2,36	2,23	4,43	4,16									
232	4,65			2,13	2,00	3,99	3,76											
256	5,11			1,75	1,65	3,31	3,12											
279	5,58			1,47	1,40	2,78	2,63	4,88	4,59									
302	6,04			1,24	1,18	2,36	2,23	4,15	3,91									
325	6,51			1,06	1,02	2,04	1,93	3,60	3,40									
349	6,97					1,77	1,68	3,13	2,96									
372	7,44					1,55	1,47	2,75	2,60									
395	7,90					1,36	1,30	2,42	2,29									
418	8,37					1,21	1,15	2,17	2,06									
442	8,83					1,08	1,03	1,94	1,84	5,19	4,89							
465	9,30							1,74	1,66	4,67	4,42							
523	10,46							1,36	1,30	3,69	3,48							
581	11,62							1,09	1,05	2,99	2,83							
639	12,78									2,46	2,33							
697	13,95									2,05	1,95							
755	15,11									1,73	1,65	5,83	5,50					
814	16,27									1,47	1,42	5,00	4,73					
872	17,43									1,28	1,23	4,38	4,15					
930	18,60									1,11	1,08	3,84	3,64					
988	19,76											3,39	3,22					
1046	20,92											3,00	2,86					
1162	23,25											2,40	2,30	4,80	4,54			
1278	25,57											1,98	1,90	3,94	3,74			
1395	27,89											1,64	1,58	3,28	3,12			
1511	30,22											1,37	1,33	2,79	2,66			
1627	32,54											1,16	1,13	2,38	2,29			
1743	34,87													2,05	1,98	5,01	4,76	
1860	37,19													1,78	1,72	4,42	4,21	
1976	39,52													1,55	1,51	3,90	3,72	
2092	41,84													1,36	1,33	3,45	3,31	
2208	44,17													1,20	1,18	3,08	2,95	
2324	46,49													1,06	1,05	2,75	2,65	
2615	52,30															2,12	2,06	
2906	58,11															1,66	1,63	
3196	63,92															1,35	1,33	
3487	69,74															1,09	1,10	

Q<sub>ASH</sub> is the cooling capacity under ASHRAE (HMBP) condition corresponding to the indicated mass flow rate M (liquid subcooled 9K, return gas superheated up to 35 °C)..

The relationship between length and diameter is, approximately:  $(L / L_0) = (D / D_0)^{5,4}$

TABLE FOR REFRIGERANT R404A (LBP)

Q <sub>ASH</sub> kcal/h	M kg/h	Capillary tube length (m)															
		Capillary tube internal diameter (mm) & Evaporating temperature (°C)															
		0,6		0,7		0,8		0,9		1		1,2		1,5			
		-30	-23,3	-30	-23,3	-30	-23,3	-30	-23,3	-30	-23,3	-30	-23,3	-30	-23,3		
151	3,51	1,39	1,47	3,22	3,38												
157	3,64	1,29	1,36	2,99	3,13												
163	3,78	1,20	1,26	2,77	2,91												
169	3,91	1,11	1,18	2,58	2,71												
174	4,05	1,04	1,10	2,41	2,52												
180	4,18		1,03	2,25	2,36												
186	4,32			2,11	2,21												
192	4,45			1,98	2,08												
198	4,59			1,87	1,96												
203	4,72			1,76	1,84	3,68	3,81										
209	4,86			1,66	1,74	3,48	3,60										
221	5,13			1,49	1,56	3,11	3,22										
232	5,40			1,34	1,40	2,80	2,90										
261	6,07			1,05	1,10	2,20	2,28										
291	6,74					1,77	1,83	3,35	3,49								
320	7,42					1,46	1,51	2,75	2,87								
349	8,09					1,22	1,26	2,30	2,40								
378	8,77					1,04	1,07	1,94	2,03	3,55	3,69						
407	9,44							1,67	1,74	3,04	3,17						
436	10,12							1,45	1,51	2,64	2,74						
465	10,79							1,27	1,32	2,30	2,40						
494	11,46							1,12	1,17	2,03	2,11						
523	12,14								1,04	1,80	1,88						
552	12,81									1,61	1,68						
581	13,49									1,45	1,51						
610	14,16									1,31	1,36	3,54	3,78				
639	14,84									1,19	1,24	3,21	3,43				
668	15,51									1,08	1,13	2,92	3,12				
697	16,19										1,03	2,67	2,85				
755	17,53											2,25	2,41				
814	18,88											1,93	2,06				
872	20,23											1,67	1,79				
930	21,58											1,45	1,56				
988	22,93											1,28	1,37				
1046	24,28											1,13	1,22				
1104	25,63											1,01	1,09	3,54	3,76		
1162	26,98													3,18	3,38		
1278	29,67													2,61	2,77		
1395	32,37													2,18	2,32		
1511	35,07													1,84	1,96		
1627	37,77													1,58	1,68		
1743	40,46													1,37	1,46		

Q<sub>ASH</sub> is the cooling capacity under ASHRAE (LBP) condition corresponding to the indicated mass flow rate M (liquid subcooled down to 32 °C, return gas superheated up to 32 °C)..

The relationship between length and diameter is, approximately:  $(L / L_0) = (D / D_0)^{5,4}$

TABLE FOR REFRIGERANT R404A (HMBP)

Q <sub>ASH</sub> kcal/h	M kg/h	Capillary tube length (m)															
		Capillary tube internal diameter (mm) & Evaporating temperature (°C)															
		0,7		0,8		0,9		1		1,2		1,5		1,7		2	
		-5	7,2	-5	7,2	-5	7,2	-5	7,2	-5	7,2	-5	7,2	-5	7,2	-5	7,2
128	3,12	4,75	4,30														
139	3,41	4,00	3,61														
151	3,69	3,42	3,10														
163	3,97	2,95	2,67														
174	4,26	2,57	2,33														
186	4,54	2,25	2,05	4,62	4,19												
198	4,83	2,00	1,81	4,10	3,72												
209	5,11	1,77	1,61	3,66	3,32												
221	5,39	1,60	1,45	3,28	2,98												
232	5,68	1,44	1,31	2,96	2,69												
256	6,24	1,19	1,08	2,44	2,22	4,61	4,18										
279	6,81			2,04	1,87	3,86	3,52										
302	7,38			1,75	1,60	3,30	2,99										
325	7,95			1,50	1,37	2,84	2,58										
349	8,52			1,30	1,19	2,46	2,24	4,37	3,96								
372	9,08			1,14	1,05	2,17	1,97	3,83	3,48								
395	9,65					1,92	1,75	3,39	3,08								
418	10,22					1,71	1,56	3,02	2,74								
442	10,79					1,53	1,40	2,70	2,46								
465	11,35					1,38	1,26	2,43	2,22								
523	12,77							1,93	1,76								
581	14,19							1,55	1,42	4,16	3,78						
639	15,61							1,27	1,17	3,43	3,11						
697	17,03									2,86	2,61						
755	18,45									2,44	2,23						
814	19,87									2,10	1,92						
872	21,29									1,82	1,67						
930	22,71									1,59	1,47						
988	24,13									1,40	1,29	4,72	4,29				
1046	25,55									1,24	1,15	4,20	3,82				
1162	28,38											3,40	3,11				
1278	31,22											2,80	2,57				
1395	34,06											2,34	2,15	4,63	4,22		
1511	36,90											1,98	1,82	3,93	3,59		
1627	39,74											1,69	1,56	3,38	3,09		
1743	42,58											1,46	1,35	2,93	2,69		
1860	45,42											1,27	1,18	2,56	2,35		
1976	48,25											1,11	1,03	2,25	2,07		
2092	51,09													1,99	1,84	4,87	4,45
2208	53,93													1,77	1,64	4,36	3,99
2324	56,77													1,58	1,47	3,92	3,59
2615	63,87													1,22	1,14	3,06	2,81
2906	70,96															2,44	2,25
3196	78,06															1,99	1,84
3487	85,15															1,64	1,53
3777	92,25															1,37	1,29
4068	99,35															1,16	1,10

Q<sub>ASH</sub> is the cooling capacity under ASHRAE (HMBP) condition corresponding to the indicated mass flow rate M (liquid subcooled 9K, return gas superheated up to 35 °C)..

The relationship between length and diameter is, approximately:  $(L / L_0) = (D / D_0)^{5,4}$ ..

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# Controller Set-Up Instructions



To access Parameters:

**Memory.** Press & hold  $\blacktriangledown$ +temp + $\blacktriangle$  for 4 seconds.

Scroll through parameters via keys  $\blacktriangledown$ + $\blacktriangle$ .

Display it's value by pressing temp and modify using temp + $\blacktriangledown$  or  $\blacktriangle$ .

<b>SP</b>	thermostat Off switching temperature	[SL...Sh]
<b>SL</b>	minimum programmable temperature	[-35°C...Sh]
<b>Sh</b>	maximum programmable temperature	[SL...+15°C]
<b>hy</b>	thermostat On switching hysteresis	[+1...+8°K]
<b>cr</b>	minimum compressor rest time	[0...4 minutes]
<b>cF</b>	compressor safety run incasse of probe failure	[00=40%...01=100%]
<b>dF</b>	number of defrosts within 24 hours	[0...12]
<b>dt</b>	maximum defrost duration	[1...90 minutes]
<b>dL</b>	defrost limit temperature	[+1...20°C]
<b>dM</b>	defrost mode	[0=off cycle; 1=electric; 2= hot gas]
<b>dr</b>	drain time	[0...10 minutes]
<b>th</b>	display control during defrost	[0='TA'...60 minutes='dF']
<b>to</b>	offset of displayed temperature	[-9...+9°K]
<b>tS</b>	slowdown of displayed temperatures	[0...20]

**Exit & save** in 15 seconds of no key activation.

**Manual Defrost:** Press and hold  $\blacktriangledown$ + $\blacktriangle$  simultaneously

**Selectors.** In this mode dipswitches and some default parameters determine control.

**Setpoint** To select the setpoint range, move one of the range selectors to Yes (-35...-20; -19...-4; -3...+12°C). Then move one or more *setpoint modification* selectors.

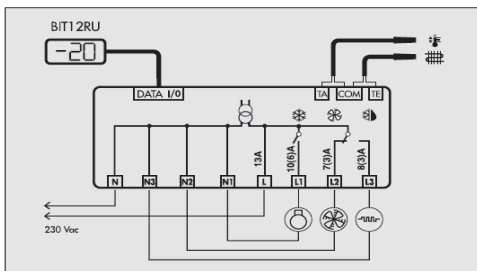
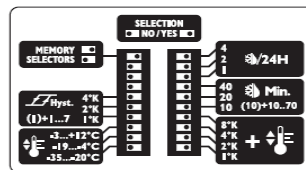
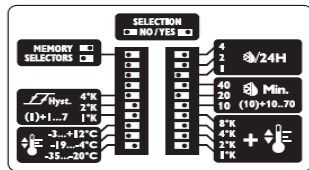
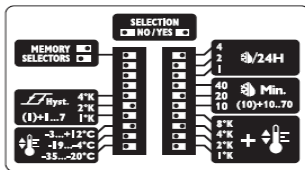
**Hysteresis** Adjustable from 1°K (all No) to 8°K (all Yes) by selecting combinations of dip switches.

**Defrost frequency** Adjustable from 1 to 7 perday.

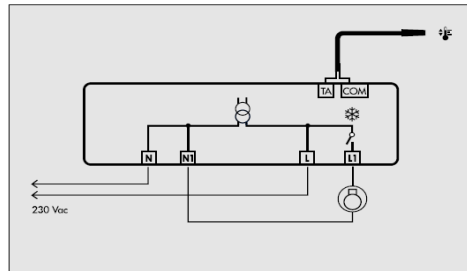
Setting all switches to No excludes defrost.

**Defrost duration** Duration range from 10 minutes (all No) to 80 minutes (all Yes).

Each unit represents 10 minutes.



BIT20B22



BIT20C11

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# 12 Technical Information

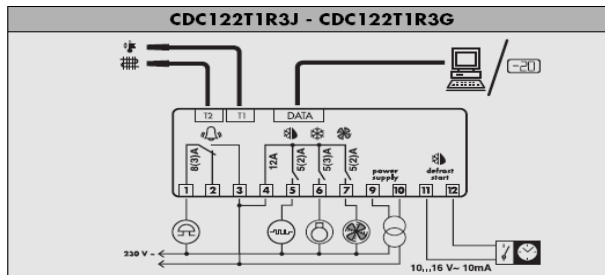
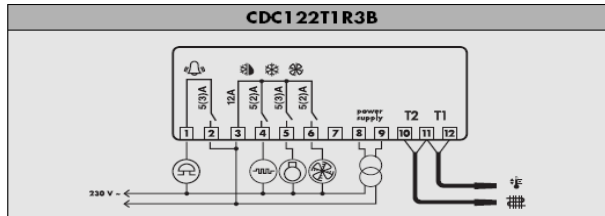
## CDC12



To access Parameters:  
 Press & hold **▼+temp+▲** for 4 seconds.  
 Scroll through parameters via keys **▼+▲**.  
 Display its value by pressing **temp** and modify using **temp+▼** or **▲**.

<b>SPL</b>	Minimum temperature set point	[-50.. +150°]
<b>SPh</b>	Maximum temperature set point	[SPL.. +150°]
<b>hyS</b>	Thermostat on switching hysteresis	[+01.. +20°K]
<b>coF</b>	Cooler minimum off time	[0.. 10 min]
<b>con</b>	Cooler minimum on time	[0.. 10 min]
<b>CDC</b>	Cooler safety run in case of probe failure	[00=off.. 10(0)%=always on]
<b>crS</b>	Cooler re-start delay after power failure	[0.. 120 seconds]
<b>drE</b>	Hours between two defrosts	[0.. 99 hours]
<b>dLi</b>	Defrost limit temperature	[+01.. +70°]
<b>dto</b>	Defrost time out	[1.. 120 min]
<b>drP</b>	Drain time	[0.. 10 min]
<b>diS</b>	Display control during defrost	[-01="dEF"; 00="T3"; 1.. 30 minutes=timed "dEF"]
<b>dtY</b>	Defrost type	[FAn=off cycle; ELE=electrical; GAS=hot gas]
<b>doP</b>	time count for defrost optimisation	[con=continuous; Acc=frost accumulation]
<b>Fct</b>	Evaporator fan control	[01=always on; 00=on/off with cooler; 1.. 10 minutes=delayed off]
<b>FrS</b>	Fan re-start after defrost	[-50.. +150°]
<b>Fid</b>	Ventilation during defrost	[00=off; 01=T2<FrS; 02=always on]
<b>AlO</b>	Low alarm threshold	[-50.. +150°]
<b>Ahi</b>	High alarm threshold	[ALo.. +150°]
<b>AdL</b>	Temperature alarm delay	[-01=excluded; 0.. 120 min]
<b>Ain</b>	Alarm temperature selection	[temperature 1, 2, 3]
<b>oS1</b>	Thermostat probe offset	[-20.. +20°K]
<b>oS2</b>	Evaporator probe offset	[-20.. +20°K]
<b>oS3</b>	Displayed probe offset	[-20.. +20°K]
<b>SiM</b>	Slowdown of displayed temperature	[0.. 200]
<b>Adr</b>	Peripheral number	[0.. 255]

Manual Defrost: Press **☐** + **▼** simultaneously.



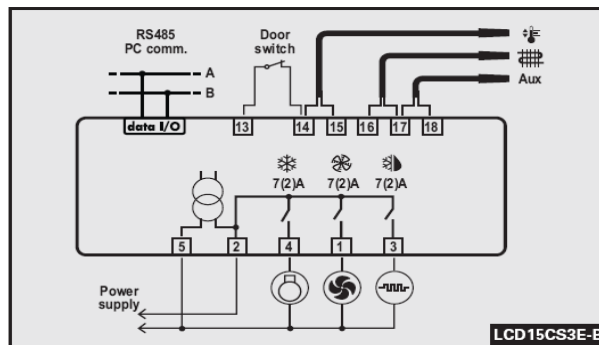
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To access Parameters:  
 Press & hold **◀+set+▶** in sequence.  
 Scroll through parameters using keys **◀** or **▶**.  
 Display it's value by pressing **set** and modify holding **set+◀** or **▶**.

<b>SCL</b>	Readout scale	[1°C/2°C/F]
<b>SPL</b>	Minimum temperature set point	[-30.. SPH°]
<b>SPH</b>	Maximum temperature set point	[SPL.. +30°]
<b>SP</b>	Effective temperature set point	[SPL.. SPH°]
<b>HYS</b>	Thermostat hysteresis	[+0.1.. +10.0°]
<b>CRT</b>	Compressor rest time	[0.. 30 min]
<b>CDC</b>	Compressor regulation with sensor T1 failure	[0.. 10]
<b>CSD</b>	Compressor stop delay from door opening	[0.. 30 min]
<b>FPC</b>	Evaporator fan timed control	[0.. 4]
<b>DFR</b>	Defrosting frequency /24h	[0.. 24]
<b>DLI</b>	Defrost end temperature	[-30.. +30°]
<b>DTO</b>	Maximum defrosting duration	[1.. 120 min]
<b>DTY</b>	Defrost type	[OFF/ELG/GAS]
<b>DRN</b>	Drain down time	[0.. 30 min]
<b>DDY</b>	Defrosting display control	[0.. 60 min]
<b>FID</b>	Fans active during defrost	[YES/NO]
<b>FDD</b>	Fan re-start delay temperature	[-30.. +30°]
<b>FTC</b>	Evaporator fan timed control	[YES/NO]
<b>ATL</b>	Low alarm differential	[-12.. 0°]
<b>ATH</b>	High alarm differential	[0.. +12°]
<b>ATD</b>	Alarm temperature delay	[0.. 120 min]
<b>ADO</b>	Door alarm delay	[0.. 30 min]
<b>AHT</b>	Condenser alarm temperature	[0.. 75°]
<b>AHM</b>	Condenser high temperature alarm operation	[NON/ALR/STP]
<b>ACC</b>	Periodic condenser cleaning	[0.. 52 weeks]
<b>HDS</b>	Sensitivity function eco/heavy duty	[1.. 5]
<b>IISM</b>	2nd set switching mode	[NON/MAN/HDD]
<b>IISL</b>	Minimum 2nd temperature set	[-30.. IIS°]
<b>IISH</b>	Maximum 2nd temperature set	[IISL.. +30°]
<b>IISP</b>	Effective 2nd temperature set	[IISL.. IISH°]
<b>IHY</b>	Hysteresis of 2nd temperature set	[+0.1.. +10.0°]
<b>IIDF</b>	Defrosting frequency /24h in mode 2	[0.. 24]
<b>IIFT</b>	Evaporator fan timed control in mode 2	[YES/NO]
<b>SB</b>	Button enabling	[YES/NO]
<b>DS</b>	Door switch enabling	[YES/NO]
<b>OS1</b>	Probe T1 offset	[-12.. +12°]
<b>T2</b>	Probe T2 enabling	[YES/NO]
<b>OS2</b>	Probe T2 offset	[-12.. +12°]
<b>T3</b>	Probe T3 enabling	[YES/NO]
<b>OS3</b>	Probe T3 offset	[-12.. +12°]
<b>TLD</b>	Delay for min./max. temperature storage	[1.. 30 min]
<b>SIM</b>	Display slowdown	[0.. 100]
<b>ADR</b>	Peripheral address	[1.. 255]

Manual Defrost: Press and hold  for 2 seconds.



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# 12 Technical Information

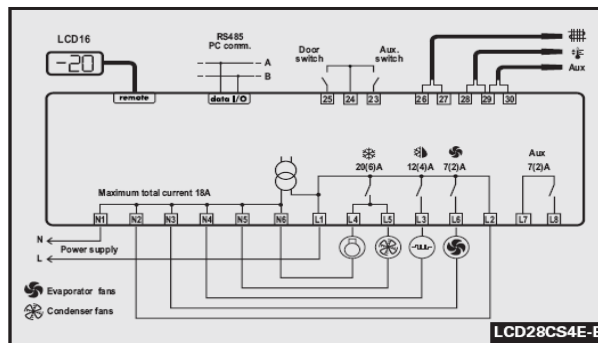
## LCD28



To access Parameters:  
 Press & hold **◀+set+ ▶** in sequence.  
 Scroll through parameters using keys **◀** or **▶**.  
 Display it's value by pressing **set** and modify holding **set+◀** or **▶**.

SCL	Readout scale	[1°C/2°C/°F]
SPL	Minimum temperature set point	[-30.. SPH°]
SPH	Maximum temperature set point	[SPL.. +30°]
SP	Effective temperature set point	[SPL.. SPH°]
HYS	Thermostat hysteresis	[+0.1.. +10.0°]
CRT	Compressor rest time	[0.. 30 min]
CDC	Compressor regulation with sensor T1 failure	[0.. 10]
CSD	Compressor stop delay from door opening	[0.. 30 min]
FPC	Evaporator fan timed control	[0.. 4]
DFR	Defrosting frequency /24h	[0.. 24]
DLI	Defrost end temperature	[-30.. +30°]
DTO	Maximum defrosting duration	[1.. 120 min]
DTY	Defrost type	[OFF/ELE/GAS]
DRN	Drain down time	[0.. 30 min]
DDY	Defrosting display control	[0.. 60 min]
FID	Fans active during defrost	[YES/NO]
FDD	Fan re-start delay temperature	[-30.. +30°]
FTC	Evaporator fan timed control	[YES/NO]
ATL	Low alarm differential	[-12.. 0°]
ATH	High alarm differential	[0.. +12°]
ATD	Alarm temperature delay	[0.. 120 min]
AD0	Door alarm delay	[0.. 30 min]
AHT	Condenser alarm temperature	[0.. 75°]
AHM	Condenser high temperature alarm operation	[NON/ALR/STP]
ACC	Periodic condenser cleaning	[0.. 52 weeks]
HDS	Sensitivity function eco/heavy duty	[1.. 5]
IISM	2nd set switching mode	[NON/MAN/HDD]
IISL	Minimum 2nd temperature set	[-30.. IIS°]
IISH	Maximum 2nd temperature set	[IISL.. +30°]
IISP	Effective 2nd temperature set	[IISL.. IISH°]
IHY	Hysteresis of 2nd temperature set	[+0.1.. +10.0°]
IIDF	Defrosting frequency /24h in mode 2	[0.. 24]
IIFT	Evaporator fan timed control in mode 2	[YES/NO]
SB	Button enabling	[YES/NO]
DS	Door switch enabling	[YES/NO]
OS1	Probe T1 offset	[-12.. +12°]
T2	Probe T2 enabling	[YES/NO]
OS2	Probe T2 offset	[-12.. +12°]
T3	Probe T3 enabling	[YES/NO]
OS3	Probe T3 offset	[-12.. +12°]
TLD	Delay for min./max. temperature storage	[1.. 30 min]
SIM	Display slowdown	[0.. 100]
ADR	Peripheral address	[1.. 255]

Manual Defrost: Press and hold **☐** for 2 seconds.




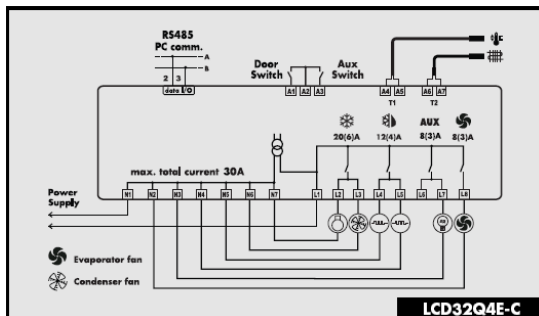
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To access Parameters:  
 Press & hold for 5 seconds **▼+temp+▲** in sequence.  
 Scroll through parameters using keys **▼** or **▲**.  
 Display it's value by pressing **temp** and modify holding **temp+▼** or **▲**

<b>SCL</b>	Readout scale	[1°C/2°C/°F]
<b>SPL</b>	Minimum temperature set point	[-30.. SPH°]
<b>SPH</b>	Maximum temperature set point	[SPL.. +30°]
<b>SP</b>	Effective temperature set point	[SPL.. SPH°]
<b>HYS</b>	Thermostat hysteresis	[+0.1.. +10.0°]
<b>CRT</b>	Compressor rest time	[0.. 30 min]
<b>CDC</b>	Compressor regulation with sensor T1 failure	[0.. 10]
<b>CSD</b>	Compressor stop delay from door opening	[0.. 30 min]
<b>FPC</b>	Evaporator fan timed control	[0.. 4]
<b>DFR</b>	Defrosting frequency /24h	[0.. 24]
<b>DLI</b>	Defrost end temperature	[-30.. +30°]
<b>DTO</b>	Maximum defrosting duration	[1.. 120 min]
<b>DTY</b>	Defrost type	[OFF/ELE/GAS]
<b>DRN</b>	Drain down time	[0.. 30 min]
<b>DDY</b>	Defrosting display control	[0.. 60 min]
<b>FID</b>	Fans active during defrost	[YES/NO]
<b>FDD</b>	Fan re-start delay temperature	[-30.. +30°]
<b>FTC</b>	Evaporator fan timed control	[YES/NO]
<b>ATL</b>	Low alarm differential	[-12.. 0°]
<b>ATH</b>	High alarm differential	[0.. +12°]
<b>ATD</b>	Alarm temperature delay	[0.. 120 min]
<b>ADD</b>	Door alarm delay	[0.. 30 min]
<b>AHT</b>	Condenser alarm temperature	[0.. 75°]
<b>AHM</b>	Condenser high temperature alarm operation	[NON/ALR/STP]
<b>ACC</b>	Periodic condenser cleaning	[0.. 52 weeks]
<b>HDS</b>	Sensitivity function eco/heavy duty	[1.. 5]
<b>IISM</b>	2nd set switching mode	[NON/MAN/HDD]
<b>IISL</b>	Minimum 2nd temperature set	[-30.. IIS°]
<b>IISH</b>	Maximum 2nd temperature set	[IISL.. +30°]
<b>IISP</b>	Effective 2nd temperature set	[IISL.. IISH°]
<b>IIFY</b>	Hysteresis of 2nd temperature set	[+0.1.. +10.0°]
<b>IDF</b>	Defrosting frequency /24h in mode 2	[0.. 24]
<b>IIFT</b>	Evaporator fan timed control in mode 2	[YES/NO]
<b>SB</b>	Button enabling	[YES/NO]
<b>DS</b>	Door switch enabling	[YES/NO]
<b>OS1</b>	Probe T1 offset	[-12.. +12°]
<b>T2</b>	Probe T2 enabling	[YES/NO]
<b>OS2</b>	Probe T2 offset	[-12.. +12°]
<b>T3</b>	Probe T3 enabling	[YES/NO]
<b>OS3</b>	Probe T3 offset	[-12.. +12°]
<b>TLD</b>	Delay for min./max. temperature storage	[1.. 30 min]
<b>SIM</b>	Display slowdown	[0.. 100]
<b>ADR</b>	Peripheral address	[1.. 255]

**Manual Defrost:** Press and hold  for 2 seconds.




# 12 Technical Information

LD1-15

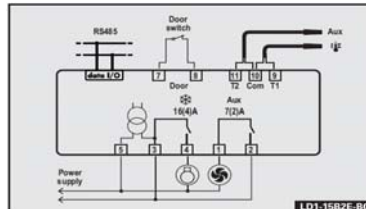
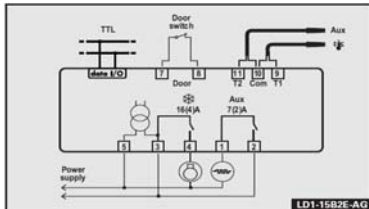
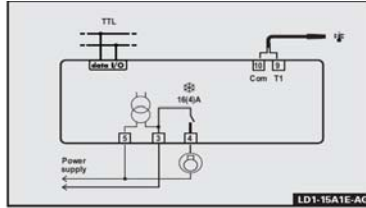
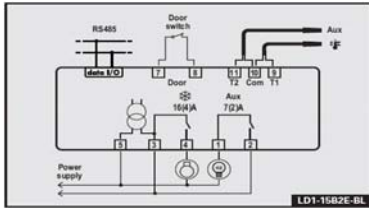


To access Parameters:  
Press & hold O/I + i set for 5 seconds.  
Scroll through parameters using keys ◀ or ▶.  
Display its value by pressing i set and modify using i set+◀ or ▶.

SCL	Readout scale	[1°C/2°C/°F]
SPL	Minimum temperature set point	[-40.. SPH°]
SPH	Maximum temperature set point	[SPL.. +40°]
SP	Effective temperature set point	[SPL.. SPH°]
HYS	Thermostat hysteresis	[+0.1.. +10.0°]
CRT	Compressor rest time	[0.. 30 min]
CDC	Compressor regulation with sensor T1 failure	[0.. 10]
FPC	Evaporator fan timed control	[0.. 4]
DFR	Defrosting frequency /24h	[0.. 24]
1)DLI	Defrost end temperature	[-40.. +40°]
DTO	Maximum defrosting duration	[1.. 120 min]
2)DTY	Defrost type	[OFF/ELE/GAS]
2)DRN	Drain down time	[0.. 30 min]
DDY	Defrosting display control	[0.. 60 min]
ATL	Low alarm differential	[-12.. 0°]
ATH	High alarm differential	[0.. +12°]
ATD	Alarm temperature delay	[0.. 120 min]
3)AHT	Condenser alarm temperature	[0.. 75°]
3)AHM	Condenser high temperature alarm operation	[NON/ALR/STP]
ACC	Periodic condenser cleaning	[0.. 52 weeks]
SB	Button enabling	[YES/NO]
DS	Door switch enabling	[YES/NO]
4)CSD	Compressor stop delay from door opening	[0.. 30 min]
4)ADO	Door alarm delay	[0.. 30 min]
BAU	Manual control enabling	[YES/NO]
OAU	Auxiliary output control mode	[NON/0-1/MAN/FAN/DEF/ALR]
OS1	Probe T1 offset	[-12.. +12°]
T2	Function probe T2	[NON/DEF/CND]
OS2	Probe T2 offset	[-12.. +12°]
TLD	Delay for min./max. temperature storage	[1.. 30 min]
SIM	Display slowdown	[0.. 100]
ADR	Peripheral address	[1.. 255]

**Manual Defrost:** Press and hold  for 2 seconds.


1) Only with T2=DEF; 2) Only with OAU=DEF; 3) Only with T2=CND; 4) Only with DS=YES.

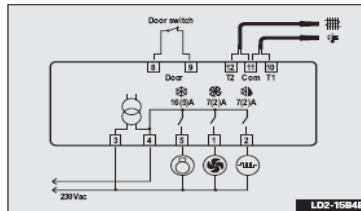
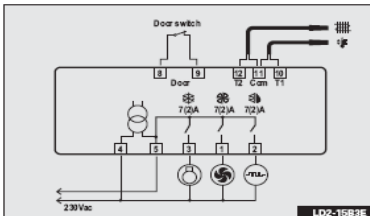




To access Parameters:  
 Press & hold O/I + i set for 5 seconds.  
 Scroll through parameters using keys ◀ or ▶.  
 Display it's value by pressing i set and modify using i set+ ◀ or ▶.

SCL	Readout scale	[1°C/2°C/°F]
SPL	Minimum temperature set point	[-40.. SPH°]
SPH	Maximum temperature set point	[SPL.. +40°]
SP	Effective temperature set point	[SPL.. SPH°]
HYS	Thermostat hysteresis	[+0.1.. +10.0°]
CRT	Compressor rest time	[0.. 30 min]
CDC	Compressor regulation with sensor T1 failure	[0.. 10]
CSD	Compressor stop delay from door opening	[0.. 30 min]
DFR	Defrosting frequency /24h	[0.. 24]
DLI	Defrost end temperature	[-40.. +40°]
DTO	Maximum defrosting duration	[1.. 120 min]
DTY	Defrost type	[OFF/ELE/GAS]
DRN	Drain down time	[0.. 30 min]
DDY	Defrosting display control	[0.. 60 min]
FID	Fans active during defrost	[YES/NO]
FDD	Fan re-start delay temperature	[-40.. +40°]
FTC	Evaporator fan timed control	[YES/NO]
FT1	Fan stop delay	[0.. 180 secs]
FT2	Timed fan stop	[0.. 30 min]
FT3	Timed fan run	[0.. 30 min]
ATL	Low alarm differential	[-12.. 0°]
ATH	High alarm differential	[0.. +12°]
ATD	Alarm temperature delay	[0.. 120 min]
AD0	Door alarm delay	[0.. 30 min]
ACC	Periodic condenser cleaning	[0.. 52 weeks]
HDS	Sensitivity function eco/heavy duty	[0.. 75°]
IISM	2nd set switching mode	[NON/ALR/STP]
IISL	Minimum 2nd temperature set	[-40.. IISH°]
IISH	Maximum 2nd temperature set	[IISL.. +40°]
IISP	Effective 2nd temperature set	[IISL.. IISH°]
IIFY	Hysteresis of 2nd temperature set	[+0.1.. +10.0°]
IIDF	Defrosting frequency /24h in mode	[0.. 24]
IIFT	Evaporator fan timed control in mode	[YES/NO]
SB	Button enabling	[YES/NO]
DS	Door switch enabling	[YES/NO]
OS1	Probe T1 offset	[-12.. +12°]
T2	Function probe T2	[NON/DEF/CND]
OS2	Probe T2 offset	[-12.. +12°]
TLD	Delay for min./max. temperature storage	[1.. 30 min]
SIM	Display slowdown	[0.. 100]
ADR	Peripheral address	[1.. 255]

Manual Defrost: Press and hold  for 2 seconds.



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# 12 Technical Information

LDU15

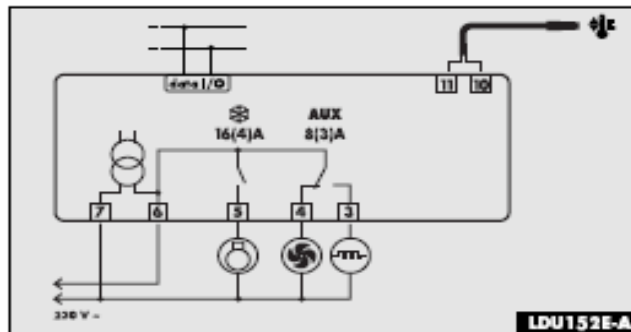
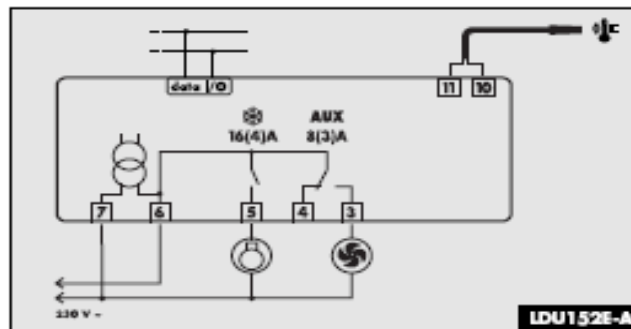
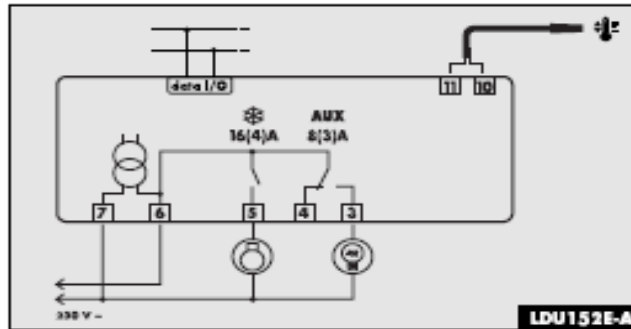


Press & hold ◀+set+ ▶ in sequence.  
 Scroll through parameters using keys ◀ or ▶.  
 Display it's value by pressing set and modify holding set+◀ or ▶.

<b>SCL</b>	Readout scale	[1°C/2°C/°F]
<b>SPL</b>	Minimum temperature set point	[-25.. SPH°]
<b>SPH</b>	Maximum temperature set point	[SPL.. +25°]
<b>SP</b>	Effective temperature set point	[SPL.. SPH°]
<b>HYS</b>	Thermostat hysteresis	[+0.1.. +10.0°]
<b>CRT</b>	Compressor rest time	[0.. 30 min]
<b>CDC</b>	Compressor regulation with sensor T1 failure	[0.. 10]
<b>DFR</b>	Defrosting frequency /24h	[0.. 24]
<b>DTO</b>	Maximum defrosting duration	[1.. 120 min]
<b>DDY</b>	Defrosting display control	[1.. 60 min]
<b>ATL</b>	Low alarm differential	[-12.. 0°]
<b>ATH</b>	High alarm differential	[0.. +12°]
<b>ATD</b>	Alarm temperature delay	[0.. 120 min]
<b>ACC</b>	Periodic condenser cleaning (CLN Alarm)	[0.. 52 weeks]
<b>OAU</b>	Auxiliary output mode of operation	[NON/SBY/MAN/DEF/ALR]
<b>BAU</b>	Auxiliary button mode of operation	[NON/SBY/MAN]
<b>OS1</b>	Probe T1 offset	[-12.5.. +12.5°]
<b>SIM</b>	Display slowdown	[0.. 100]
<b>ADR</b>	Peripheral address	[1.. 255]

To clear CLN: Press ◀ + aux.

**Manual Defrost:** Press and hold ◀ + ▶.





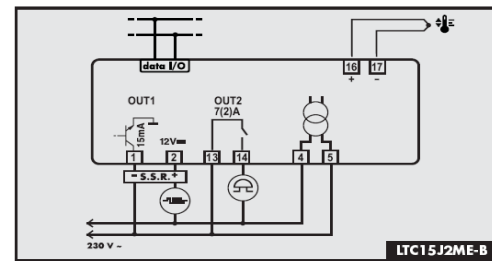
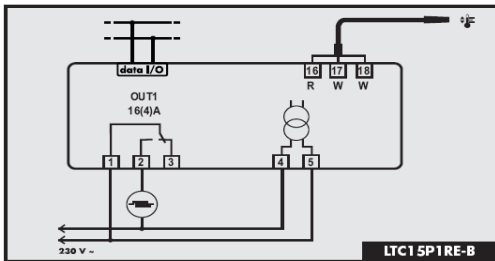
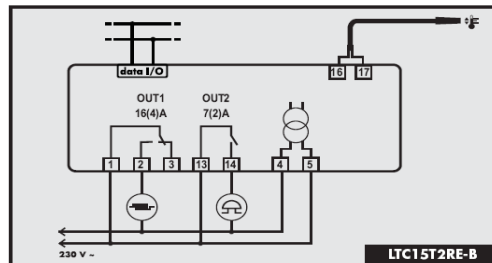
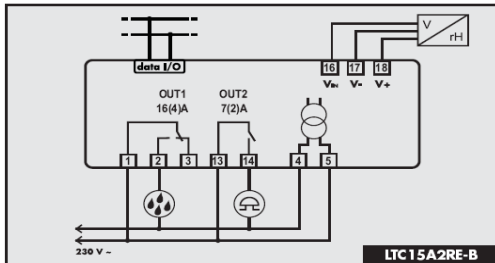
To access Parameters:  
 Press & hold + I/O for 5 seconds.  
 Scroll through parameters using keys ◀ or ▶.  
 Display it's value by pressing set and modify holding set + ◀ or ▶ simultaneously.

<b>INP</b>	Input selection	PTC / NTC
<b>SCL</b>	Reading scale	1°C / 2°C / °F
<b>RLO</b>	Minimum range value	-199...RH1[°]
<b>RHI</b>	Maximum range value	RLO...999[°]
<b>SPL</b>	Minimum temperature setpoint	-199...SPH[°]
<b>SPH</b>	Maximum temperature setpoint	SPL...999[°]
<b>1CH</b>	Control type channel 1	HY / PID
<b>1FN</b>	Function of channel 1 (heating / cooling)	H / C
<b>1SP</b>	Effective temperature set of channel 1	SPL...SPH [°]
<b>1HY</b>	Hysteresis channel 1	-199...199 [°]
<b>1PB</b>	Proportional band channel 1	-199...199 [°]
<b>1IT</b>	Integral action time channel 1	0...999 [s]
<b>1DT</b>	Derivative action time channel 1	0...999 [s]
<b>1AR</b>	Reset of integral action referred to Pb1	0...100%
<b>1CT</b>	Cycle time channel 1	1...255 [s]
<b>1PF</b>	Channel 1 status with faulty sensor	ON / OFF
<b>2CH</b>	Control mode channel 2	NO / THR / ALR
<b>2FN</b>	Function of channel 2 (heating / cooling)	H / C
<b>2MD</b>	Mode setpoint 2 (Absolute/Differential)	ABS / REL
<b>2SP</b>	Effective temperature set channel 2	SPL...SPH [°]
<b>2DF</b>	Temp. differential set2 to set1	-199...199[°]
<b>2HY</b>	Hysteresis channel 2	-199...199 [°]
<b>2CT</b>	Cycle time channel 2	1...255 [s]
<b>2PF</b>	Channel 2 status with faulty sensor	ON / OFF
<b>SB</b>	Button standby enabling	YES / NO
<b>OS1</b>	Probe offset	-120...120[°]
<b>SIM</b>	Display slowdown	0...100
<b>ADR</b>	Peripheral address	1...255

**Display**

---	Internal self-test (3 seconds)	E1	In tuning: timeout 1 error
5.4	Sensor T1 temperature	E2	In tuning: timeout 2 error
or	Over range or breakage T1	E3	In tuning: over range error
Tun/5.4	Instrument in auto-tuning	OFF	Controller standby

For further information or a full set of instructions please contact the sales office.



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# 12 Technical Information

LTR15

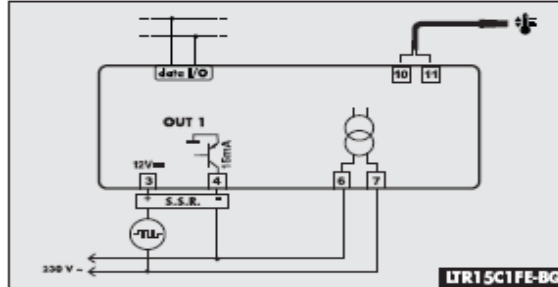
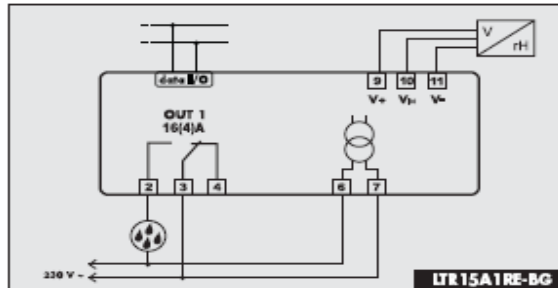
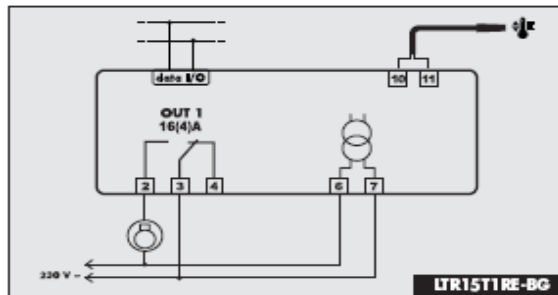


To access Parameters:  
 Press & hold ◀+set+ ▶ in sequence.  
 Scroll through parameters using keys ◀ or ▶.  
 Display it's value by pressing set and modify holding set + ◀ or ▶.

<b>SCL</b>	Readout scale	[1°C/2°C/°F]
<b>SPL</b>	Minimum temperature set point	[-25.. SPH°]
<b>SPH</b>	Maximum temperature set point	[SPL.. +25°]
<b>1SP</b>	Effective temperature set point channel 1	[SPL.. SPH°]
<b>1Y</b>	Control type channel 1	[HY/PID]
<b>1HY</b>	Change-over hysteresis channel 1	[-199...199°]
<b>1PB</b>	Proportional band channel 1	[-199...199°]
<b>1IT</b>	Integral action time channel 1	[0...999 sec]
<b>1DT</b>	Derivative action time channel 1	[0...999 sec]
<b>1AR</b>	Reset of integral action referred to Pb1	[0...100%]
<b>1CT</b>	Cycle time channel 1	[0...255 sec]
<b>1PF</b>	Channel 1 status with faulty sensor	[ON/OFF]
<b>BAU</b>	Operation mode auxiliary button	[NON/SBY]
<b>SIM</b>	Display slowdown	[0...100]
<b>OS1</b>	Sensor correction	[-150...150°]
<b>ADR</b>	Peripheral address	[0...255]

### Display

---	Internal self-test (3 seconds)	<b>E1</b>	In tuning: timeout 1 error
<b>5.4</b>	Sensor T1 temperature	<b>E2</b>	In tuning: timeout 2 error
<b>T1</b>	Over range or breakage	<b>E3</b>	In tuning: over range error
<b>Tun / 5.4</b>	Instrument in auto-tuning	<b>OFF</b>	Controller standby

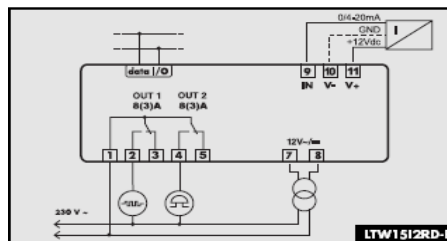
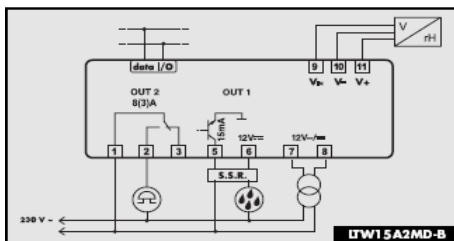
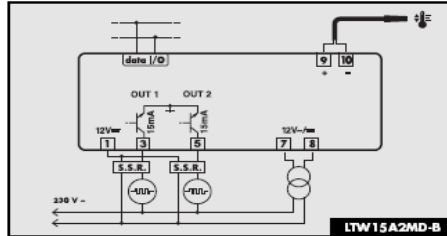
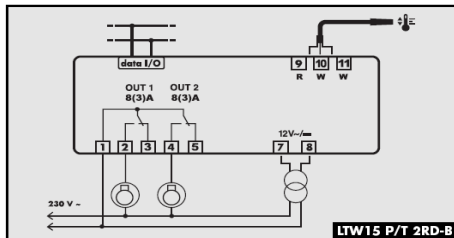


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To access Parameters:  
 Press & hold ◀+set+ ▶ in sequence.  
 Scroll through parameters using keys ◀ or ▶.  
 Display it's value by pressing set and modify holding set+◀ or ▶.

<b>SCL</b>	Readout scale	[0.1°C/1.0°C/1°F]
<b>*INP</b>	Minimum current provided by transmitter	[0mA/4mA]
<b>*RLO</b>	Minimum range value	[-199...RH]
<b>*RHI</b>	Maximum range value	[RLO...999]
<b>SPL</b>	Minimum temperature set point	[-199...SPH°]
<b>SPH</b>	Maximum temperature set point	[SPL...+199°]
<b>1SP</b>	Effective temperature set point channel 1	[SPL...SPH°]
<b>1Y</b>	Control type channel 1	[HY/PID]
<b>1HY</b>	Change-over hysteresis channel 1	[-199...199°]
<b>1PB</b>	Proportional band channel 1	[-199...199°]
<b>1IT</b>	Integral action time channel 1	[0...999 sec]
<b>1DT</b>	Derivative action time channel 1	[0...999 sec]
<b>1AR</b>	Reset of integral action referred to Pb1	[0...100%]
<b>1CT</b>	Cycle time channel 1	[0...255 sec]
<b>1PF</b>	Channel 1 status with faulty sensor	[ON/OFF]
<b>2CM</b>	Control mode channel 2	[ABS/REL]
<b>2SP</b>	Effective temperature set point channel 2	[SPL...SPH°]
<b>2DF</b>	Temp. differential set 2 to set 1	[-150...150°]
<b>2OM</b>	Mode of operation output channels	[FRE/BND]
<b>2Y</b>	Control type channel 2	[HY/PID/ALR]
<b>2HY</b>	Changeover hysteresis channel 2	[-199...199°]
<b>2PB</b>	Proportional band channel 2	[-199...199°]
<b>2IT</b>	Integral action time channel 2	[0...999 sec]
<b>2DT</b>	Derivative action time channel 2	[0...999 sec]
<b>2AR</b>	Reset of integral action referred to Pb2	[0...100%]
<b>2CT</b>	Cycle time channel 2	[0...255 sec]
<b>2PF</b>	Channel 2 status with faulty sensor	[ON/OFF]
<b>LOC</b>	Lock of key	[YES/NO]
<b>SIM</b>	Display slowdown	[0...100]
<b>OS1</b>	Sensor correction	[-150...150°]
<b>ADR</b>	Peripheral address	[0...255]



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# 12 Technical Information

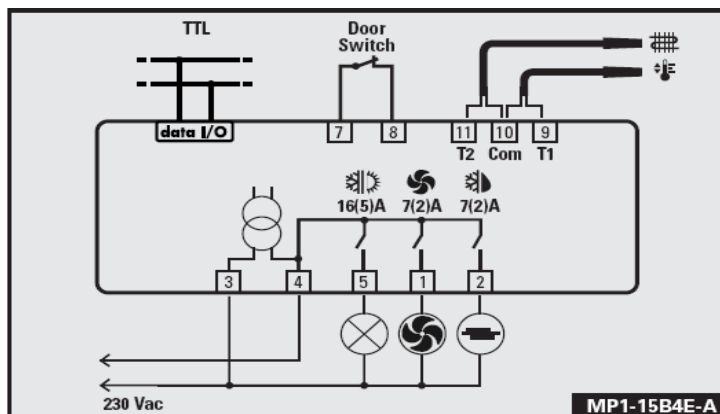
## MP1 "Universal" Controller



To access Parameters:  
 Press & hold O/I + i set for 5 seconds.  
 Scroll through parameters using keys ◀ or ▶.  
 Display it's value by pressing i set and modify using i set+◀ or ▶.

SCL	Readout scale	[1°C/2°C°F]
SPL	Minimum temperature set point	[-40.. SPH°]
SPH	Maximum temperature set point	[SPL.. +40°]
SP	Effective temperature set point	[SPL.. SPH°]
C-H	Cool/Heat	[REF/HEA]
HYS	Thermostat hysteresis	[+0.1.. +100°]
CRT	Compressor rest time	[0.. 30 min]
CT1	Compressor run with T1 failure	[0.. 30 min]
CT2	Compressor stop with T1 failure	[0.. 30 min]
CSD	Compressor stop delay from door opening	[0.. 30 min]
DFR	Defrosting frequency /24h	[0.. 24]
DLI	Defrost end temperature	[-40.. +40°]
DTO	Maximum defrosting duration	[1.. 120 min]
DTY	Defrost type	[OFF/ELE/GAS]
DRN	Drain down time	[0.. 30 min]
DDY	Defrosting display control	[0.. 60 min]
FID	Fans active during defrost	[YES/NO]
FDD	Fan re-start delay temperature	[-40.. +40°]
FTC	Evaporator fan timed control	[YES/NO]
FT1	Fan stop delay	[0.. 180 secs]
FT2	Timed fan stop	[0.. 30 min]
FT3	Timed fan run	[0.. 30 min]
ATL	Low alarm differential	[-12.. 0°]
ATH	High alarm differential	[0.. +12°]
ATD	Alarm temperature delay	[0.. 120 min]
AD0	Door alarm delay	[0.. 30 min]
ACC	Periodic condenser cleaning	[0.. 52 weeks]
IISM	2nd set switching mode	[NON/ALR/STP]
IISL	Minimum 2nd temperature set	[-40.. IISH°]
IISH	Maximum 2nd temperature set	[IISL.. +40°]
IISP	Effective 2nd temperature set	[IISL.. IISH°]
IHY	Hysteresis of 2nd temperature set	[+0.1.. +10.0°]
IIDF	Defrosting frequency /24h in mode	[0.. 24]
IIFT	Evaporator fan timed control in mode	[YES/NO]
SB	Button enabling	[YES/NO]
DS	Door switch enabling	[YES/NO]
INP	NTC/PTC probe select	[SN4/ST1]
OS1	Probe T1 offset	[-12.. +12°]
T2	Function probe T2	[NON/DEF/CND]
OS2	Probe T2 offset	[-12.. +12°]
TLD	Delay for min./max. temperature storage	[1.. 30 min]
SIM	Display slowdown	[0.. 100]
ADR	Peripheral address	[1.. 255]

Manual Defrost: Press and hold  for 2 seconds.



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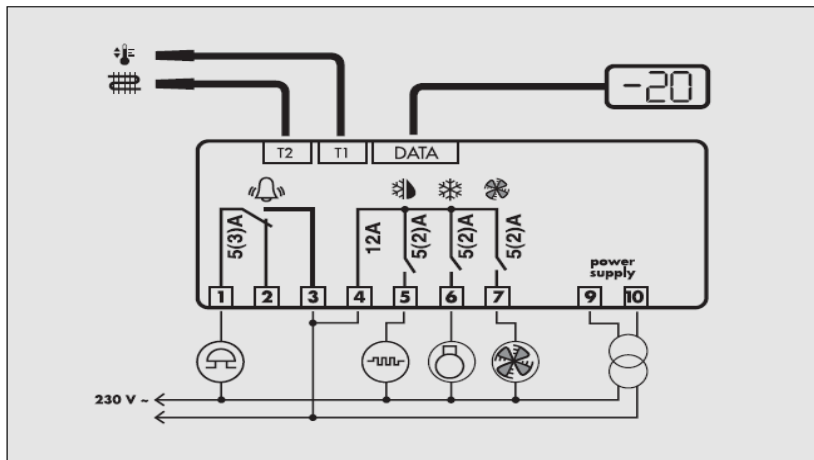


To access Parameters:  
 To access Parameters:  
 Press & hold ◀+set+ ▶ in sequence.  
 Scroll through parameters using keys ◀ or ▶.  
 Display it's value by pressing set and modify holding set+◀ or ▶.

<b>SPL</b>	minimum programmable temperature	[-50 ... +150°]
<b>SPh</b>	maximum programmable temperature	[SPL ... +150°]
<b>hyS</b>	thermostat on switching hysteresis	[+01 ... +20°K]
<b>coF</b>	cooler minimum off time	[00 ... 10 minutes]
<b>con</b>	cooler minimum on time	[00 ... 10 minutes]
<b>cdc</b>	cooler safety run in case of probe failure	[00=off ... 10(0)%=always on]
<b>crS</b>	cooler re-start delay after power failure	[00 ... 120 seconds]
<b>dLi</b>	defrost limit temperature	[+01 ... +70°]
<b>dto</b>	defrost time out	[01 ... 120 minutes]
<b>drP</b>	drain time	[00 ... 10 minutes]
<b>diS</b>	display control during defrost	[-01="dEF"; 00="T3"; 1... 30 minutes=timed "dEF"]
<b>dtY</b>	defrost type	[Fan=off cycle; ELE=electrical; GAS=hot gas]
<b>Fct</b>	evaporator fan control	[-01=always on; 00=on/off with cooler; 1... 10 minutes=delayed off]
<b>FrS</b>	fan re-start after defrost	[-50 ... +150°]
<b>Fid</b>	ventilation during defrost	[00=off; 01=T2<FrS; 02=always on]
<b>AlO</b>	low alarm threshold	[-50 ... +150°]
<b>AhI</b>	high alarm threshold	[ALo ... +150°]
<b>AdL</b>	temperature alarm delay	[-01=excluded; 00... 120 minutes]
<b>Aln</b>	alarm input selection	[probe 1, 2, 3]
<b>oS1</b>	thermostat probe offset	[-20 ... +20°K]
<b>oS2</b>	evaporator probe offset	[-20 ... +20°K]
<b>oS3</b>	displayed probe offset	[-20 ... +20°K]
<b>SiM</b>	slowdown of displayed temperature	[00 ... 200]
<b>Adr</b>	peripheral number	[00 ... 255]

**Manual Defrost:** Press and hold + ▼.

**To set Clock:** Select **Min** and press **temp** + ▼ or ▲. Select **hrS** and press **temp** + ▼ or ▲.



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# 12 Technical Information

SSD90



To access Parameters:

Press and release *i* and scroll to **PC**. Press and hold *i* and set display to **47** with the **▲** key. Release all buttons.

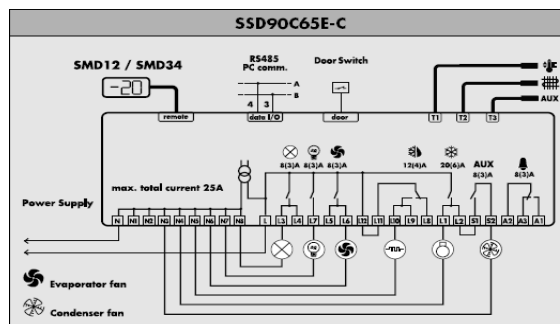
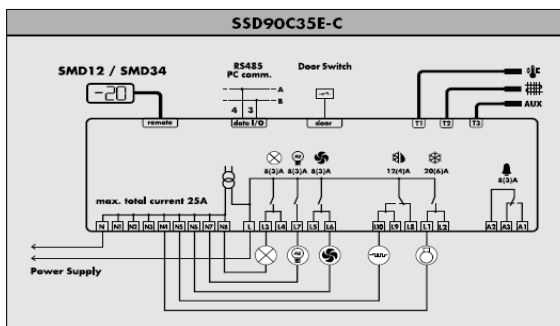
Scroll through parameters using keys **▼** or **▲**.

Display its value by pressing **temp** and modify by using **▼** or **▲** whilst holding **temp** down.

<b>SPL</b>	Minimum temperature set	-40.. SPL [°]
<b>SPH</b>	Maximum temperature set	SPL.. +250 [°]
<b>SP</b>	Actual temperature set	SPL.. SPH [°]
<b>HYS</b>	Thermostat hysteresis	-30.. 0.. +30 [°]
<b>DFR</b>	Defrost frequency /24h	0.. 24
<b>DLI</b>	Defrost end temperature	0.. +70 [°]
<b>DTO</b>	Defrost timeout	1.. 120 [min]
<b>DTY</b>	Defrost type	OFF/ELE/GAS
<b>DRN</b>	Drain down	0.. 30 [min]
<b>DDY</b>	Defrost display control	0.. 60 [min]
<b>FPC</b>	Evaporator fan proportional control	0 ... 5
<b>FDD</b>	Fan re-start temperature	-40.. +70 [°]
<b>ATL</b>	Low alarm differential	-25.. 0 [°]
<b>ATH</b>	High alarm differential	0.. +25 [°]
<b>ATD</b>	Temperature alarm delay	0.. 120 [min]
<b>ADO</b>	Door alarm delay	0.. 120 [min]
<b>ACC</b>	Periodic condenser cleaning	0.. 120 [weeks]
<b>ACT</b>	Condenser alarm temperature	0.. 250 [°]
<b>CSD</b>	Compressor safety stop delay	0.. 30 [min]
<b>CFT</b>	Condenser fan temperature	-40.. +250 [°]
<b>CRT</b>	Compressor rest time	0.. 30 [min]
<b>CDC</b>	Cooling duty cycle for T1 fault	0.. 10
<b>OFF</b>	Standby button enabling	YES/NO
<b>DS</b>	Door switch enabling	YES/NO
<b>LDO</b>	Door controlled lights	YES/NO
<b>T2</b>	Probe T2 enabling	YES/NO
<b>T3</b>	Probe T3 enabling	YES/NO
<b>SCL</b>	Display scale	°C/°F
<b>OS1</b>	probe T1 offset	-15.. +15 [°]
<b>OS2</b>	Probe T2 offset	-15.. +15 [°]
<b>OS3</b>	Probe T3 offset	-15.. +15 [°]
<b>SIM</b>	Display slowdown	0.. 100
<b>ADR</b>	Peripheral address	0.. 255

**Manual defrost:** From the "Info" menu select DF, press *i* button first, then **▲** simultaneously.

**CLN Alarm:** To clear CLN, press I/O to put into standby, clean condenser, press and hold *i* and then press I/O to clear.





To access Parameters:

To access 'F' parameters, press and hold **Prg/mute** for 5 secs.

To access 'C' parameters, press and hold **Prg/mute** for 5 secs. Select 'PS' with **Prg/mute**.

Press **▲/aux** or **def/▼** until displaying '22', confirm by pressing **Prg/mute**.

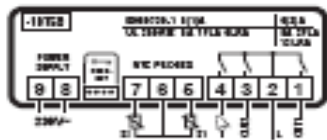
### F Parameters

/5	Select °C or °F	[0=°C; 1=°F]
/6	Decimal Point	[0=0.1°C; 1=1.0°C]
P1	Regulator 1 differential (0=0.5°C)	[0.. +19°C/F]
P2	Regulator 2 differential (0=0.5°C)	[0.. +19°C/F]
dP1	Maximum defrost duration, evaporator	[1.. 250 min]
AL	Low temperature alarm threshold	[-50.. 200°C/F]
AH	High temperature alarm threshold	[-50.. 200°C/F]
H5	Identification code	[-99.. +99]
t	Reserved	[-127.. 127]

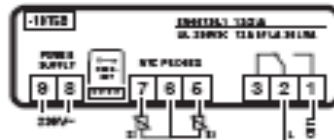
### C Parameters

/2	Measurement Stability	[1.. 15]
/4	Section of displayed probe	[0=S1; 1=S2]
/C	Ambient probe calibration (x0.1°C/F)	[-127.. +127]
r1	Regulator 1 mode	[0=Direct; 1=Remote]
r2	Regulator 2 mode	[0=Direct; 1=Remote]
r3	Minimum allowable set point	[-50.. r4°C/F]
r4	Maximum allowable set point	[r3.. +150°C/F]
r5	Regulator 2 probe	[0=S1; 1=S2]
c0	Output delay on start up of instrument	[0.. 199 sec]
c1	Regulation outputs minimum operation time	[0.. 15 min]
c2	Regulation outputs minimum shut-down time	[0.. 15 min]
c3	Interlock of the regulator start -up	[0=No; 1=Yes]
c4	Minimum time between the start-up of two outputs	[0.. 199 sec]
A0	Alarm differential (0=0.5°C/F)	[0.. 19°C/F]
At	Temperature alarm delay	[0.. 199 min]
Ad	External alarm detection delay from digital input	[0.. 15 min]
dl	Digital input operation mode	[0=Not used; 1=Immediate or delayed alarm (As Ad); 2=Setpoint switching]
H0	Reserved	[0.. 199]
H1	Alarm signal output mode	[0=On; 1=Off]
H2	Mode "Out 2"	[0=Alarm; 1=Regulation]
H3	Keypad disabling	[0=Disabled; 1=Enabled]
H4	Buzzer disabling	[0=Enabled; 1=Disabled]

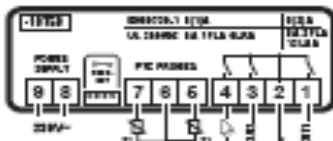
PJ32Z000\*



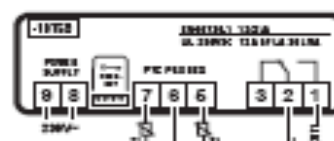
PJ32V0P0\*



PJ32Z600\*



PJ32V6P0\*



PJ32W100\*



PJ32V6E0\*



PJ32W000\*



# 12 Technical Information

IR33



To access Parameters:  
 To access 'F' parameters, press **Prg/mute** for 5 secs.  
 To access 'C' parameters, press and hold for 5 secs **Prg/mute** and **Set**  
 Press **▲/aux** or **def/▼** until displaying '22', confirm by pressing **Set**

## F Parameters

<b>St</b>	Temperaturer setpoint	[r1.. r2°C/F]
<b>rd</b>	Control delta (Hysteresis)	[0.1.. 20°C/F]
<b>dl</b>	Interval between defrosts	[0.. 250 hour]
<b>dt1</b>	End defrost temperature, evaporator	[-50.. 200°C/F]
<b>dp1</b>	Maximum defrost duration, evaporator	[1.. 250 min]
<b>d/1</b>	Display of defrost probe 1	[°C/°F]
<b>AL</b>	Low temperature alarm threshold	[-50.. 200°C/F]
<b>AH</b>	High temperature alarm threshold	[-50.. 200°C/F]
<b>Ad</b>	Low and high temperature signal display	[0.. 250 min]

## C Parameters

<b>/2</b>	Measurement Stability	[1.. 15]
<b>/3</b>	Probe Display Response	[1.. 15]
<b>/5</b>	Select °C or °F	[0=°C; 1=°F]
<b>/6</b>	Decimal Point	[0=0.1°C; 1=1.0°C]
<b>/P</b>	Select type of Probe	[0=NTC (-50.. +90°C); 1=NTC (-40.. +150°C); 2=PTC (-50.. +150°C)]
<b>/A2</b>	Configuration of probe 2	[0=Probe absent, 1=Product probe (Display purpose only), 2=defrost probe, 3=Condenser probe, 4=antifreeze probe]
<b>/A3</b>	Configuration of probe 3	
<b>/A4</b>	Configuration of probe 4	
<b>/A5</b>	Configuration of probe 5	(°C/°F)
<b>/c1</b>	Calibration of probe 1	[-20.. +20°C/F]
<b>/c2</b>	Calibration of probe 2	[-20.. +20°C/F]
<b>/c3</b>	Calibration of probe 3	[-20.. +20°C/F]
<b>/c4</b>	Calibration of probe 4	[-20.. +20°C/F]
<b>rn</b>	Dead band	[0.. 60°C/F]
<b>rr</b>	Reverse differential for control with dead band	[0.1.. 20°C/F]
<b>r1</b>	Minimum setpoint allowed	[-50.. r2°C/F]
<b>r2</b>	Maximum setpoint allowed	[r1.. 200°C/F]
<b>r3</b>	Operating mode	[0=Direct thermostat with defrost control (Cooling); 1=Direct thermostat (Cooling); 2=Direct thermostat (Heating)]
<b>c0</b>	Compressor and fan delay on start up	[0.. 15 min]
<b>c1</b>	Minimum time between successive starts	[0.. 15 min]
<b>c2</b>	Minimum compressor OFF time	[0.. 15 min]
<b>c3</b>	Minimum compressor ON time	[0.. 15 min]
<b>c4</b>	Duty setting	[0.. 100 min]
<b>d0</b>	Type of defrost	[0=Electric Heater by temp.; 1=Hot Gas by temp.; 2=Electric heater by time; 3=Hot Gas by time]
<b>dt2</b>	End defrost temperature, Aux evap	[-50.. 200°C/F]
<b>dp1</b>	Maximum defrost duration, evaporator	[1.. 250 min]
<b>dp2</b>	Maximum defrost duration, aux evap.	[1.. 250 min]
<b>d3</b>	Defrost start delay	[0.. 250 min]
<b>d4</b>	Enable defrost on start-up	[0=No defrost on start-up, 1=Defrost on start-up]
<b>d5</b>	Defrost delay on start up	[0.. 250 min]
<b>d6</b>	Display on hold during defrost	[0.. 2]
<b>dd</b>	Dripping time after defrost	[0..15 min]
<b>d8</b>	Alarm bypass after defrost	[0.. 15 hour]
<b>d9</b>	Defrost priority over compressor protectors	[0=comp. protection respected, 1=Defrost has priority]
<b>d10</b>	Compressor running time	[0.. 250 hour]
<b>d11</b>	Running time temperature threshold	[-20.. +20°C/F]
<b>d/2</b>	Defrost probe 2 reading	[°C/°F]
<b>A0</b>	Alarm and fan differential	[0.1.. 20°C/F]
<b>A1</b>	Type of threshold 'AL' or 'AH'	[0=Relative; 1=Absolute]
<b>Ac</b>	High condensor temperature alarm	[0.. 200°C/F]
<b>AE</b>	High condensor temperature alarm differential	[0.1.. 20°C/F]
<b>Accl</b>	High condensor temperature alarm time	[0.. 250 min]
<b>F0</b>	Fan management	[0=Always On; 1 Controlled according to dT of virtual probe & evap probe; 2=Evap temperature]
<b>F1</b>	Fan start temperature	[-50.. 200°C/F]
<b>F2</b>	Fan OFF with compressor OFF	[0=Fans always on; 1=Fans off when compressor Off]
<b>F3</b>	Fans in Defrost	[0= Off; 1=On]
<b>Fd</b>	Fan OFF after dripping	[0.. 15 min]
<b>H0</b>	Serial address	[0.. 207]
<b>H1</b>	Function of relay 4	0=Alarm OP usually energised; 1=Alarm OP usually non-energised; 2=Auxiliary OP; 3=Light output; 4=Aux evap defrost OP; 5=Pump down valve OP; 6=Condenser fan OP; 7=Delayed compressor output; 8=Aux OP with deactivation when OFF; 9=Light OP with deactivation when OFF; 10=No function 11=Reverse output in control with dead band; 12=Second compressor step output; 13 = Second compressor with step output and rotation
<b>H2</b>	Disable keypad/IR	[0=DE; 1=Nothing; 2=DEF; 3=F; 4=BCD; 5=BCDE]
<b>H3</b>	Remote control enabling code	[0..255]
<b>H4</b>	Disable buzzer	[0=On; 1=Off]
<b>H6</b>	Lock keypad	[0.. 255]

**Manual defrost:** Press & hold for 5 secs **def/▼**.

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Disable Keypad - Key

HACCP PRG/MUTE (mute)	A
UP/AUX (▲/aux)	B
DOWN/DEF (def/▼, defrost)	C
SET (modification of type F parameters)	D
Modification of the setpoint	E
Modification from the remote control	F

Function	M(*)	S	Y	F	C	H(**)	A(***)	D(***)
Temperature Display	x	x	x	x	x	x	x	x
Display second probe with external cor	x	x	x	x	x	x	x	x
Temperature alarm monitoring	x	x	x	x	x	x	x	x
Compressor control		x	x	x	x	x	x	x
Defrost with compressor stop		x	x	x	x	x	x	x
Defrost with heater or hot-gas			x	x	x	x	x	x
Continuous cycle		x	x	x	x	x	x	x
Duty setting	x	x	x	x	x	x	x	x
Evaporator fans				x	x	x	x	x
Auxiliary output 1					x	x	x	x
Auxiliary output 2						x	x	x

(\*) = ir33 only

(\*\*) = powercompact and ir33 DIN only

(\*\*\*) = mastercella only

Display

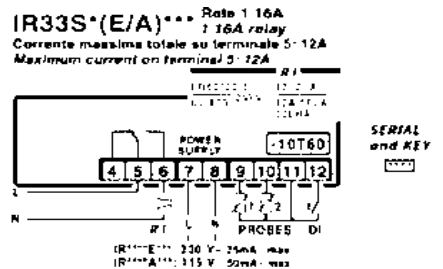
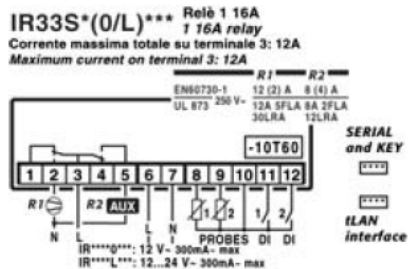
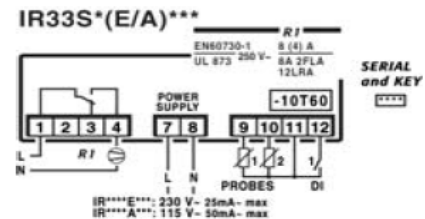
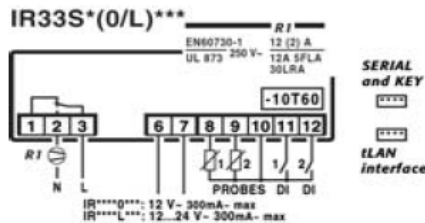
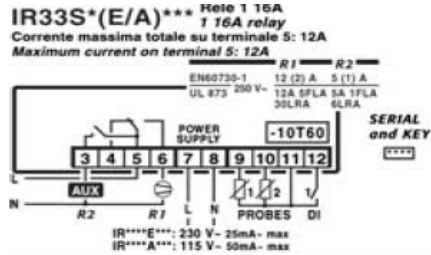
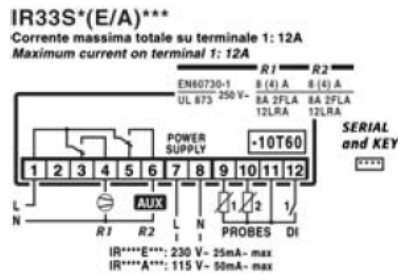
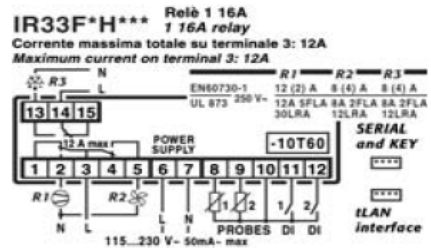
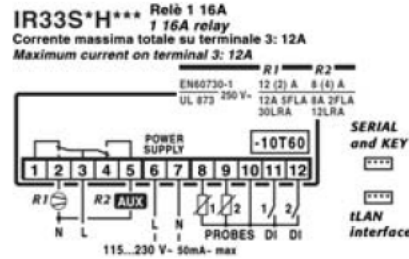
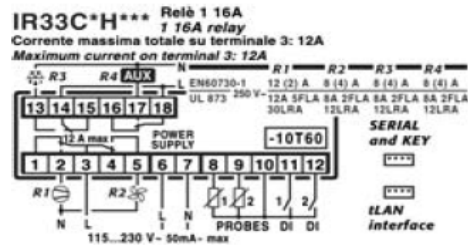
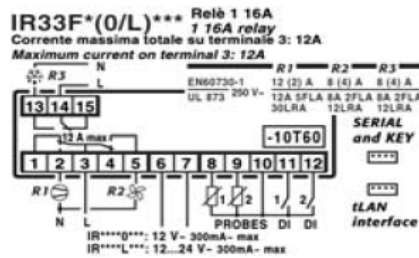
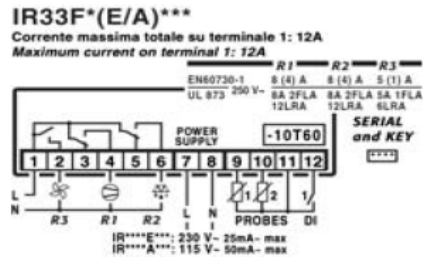
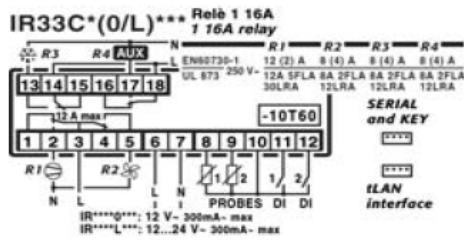
Icon	Function	Description	Normal operation			Start up
			ON	OFF	BLINK	
	<b>Compressor</b>	ON when the compressor starts. Flashes when the activation of the compressor is delayed by safety times.	Compressor on	Compressor off	Awaiting activation	
	<b>Fan</b>	ON when the fan starts. Flashes when the activation of the fan is prevented due to external disabling or procedures in progress.	Fan on	Fan off	Awaiting activation	
	<b>Defrost</b>	ON when the defrost is activated. Flashes when the activation of the defrost is prevented due to external disabling or procedures in progress.	Defrost in progress	Defrost not in progress	Awaiting activation	
	<b>Aux</b>	Flashes if the anti-sweat heater function is active, ON when the auxiliary output (1 and/or 2) selected as AUX (or LIGHT in firmware version 3.6) is activated.	AUX auxiliary output active (version 3.6 light auxiliary output active)	AUX auxiliary output not active	Anti-sweat heater function active	
	<b>Alarm</b>	ON following pre-activation of the delayed external digital input alarm. Flashes in the event of alarms during normal operation (e.g. high/low temperature) or in the event of alarms from an immediate or delayed external digital input.	Delayed external alarm (before the time 'A7' elapses)	No alarm present	Alarms in norm. operation (e.g. High/low temp.) or immediate or delayed alarm from ext. digital input.	
	<b>Clock</b>	ON if at least one timed defrost has been set. At start-up, comes ON for a few seconds to indicate that the Real Time Clock is fitted.	If at least 1 timed defrost event has been set	No timed defrost event set	Alarm clock	On if real time-clock present
	<b>Light</b>	Flashes if the anti-sweat heater function is active, ON when the auxiliary output (1 and/or 2) selected as LIGHT is activated (in firmware version 3.6 it does not flash in anti-sweat heater mode and comes on when the dead band output is active).	Light auxiliary output on (version 3.6 dead band auxiliary output active).	Light auxiliary output off.	Anti-sweat heater function active (version 3.6 does not flash in anti-sweat heater mode)	
	<b>Service</b>	Flashes in the event of malfunctions, for example E2PROM errors or probe faults.		No malfunction	Malfunction (e.g. E2PROM error or probe fault).	
	<b>Display</b>	Shows temperature in range -50 to +150°C. The temperature is displayed with resolution to the tenths between -19.9 and + 19.9 °C (59.9 in firmware revision 3.4). The display of the tenths can be disabled by setting a parameter.				
	<b>HACCP</b>	ON if the HACCP function is enabled. Flashes when there are new HACCP alarms stored (HA and/or HF alarm shown on the display).	HACCP function enabled	HACCP function not enabled	HACCP alarm saved (HA and/or HF)	
	<b>Continuous Cycle</b>	ON when the CONTINUOUS CYCLE function is activated. Flashes if the activation of the function is prevented due to external disabling or procedures in progress (E.g.: minimum compressor OFF time).	Activated	Not activated	Requested	

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# 12 Technical Information

## IR33 Wiring Diagrams

01  
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To access Parameters:

To access 'F' parameters, press **Prg/mute** for 5 secs.

To access 'C' parameters, press and hold for 5 secs **Prg/mute** and **Set**

Press **▲/aux** or **def/▼** until displaying '22', confirm by pressing **Set**

Category	Parameters	Text	Icon
Probe parameters	/	'Pro'	
Control parameters	r	'CTL'	
Compressor parameters	c	'CMP'	
Defrost parameters	d	'dEF'	
Alarm parameters	A	'ALM'	
Fan parameters	F	'Fan'	
Configuration parameters	H configuration	'CnF'	
HACCP parameters	H HACCP	'HcP'	
RTC parameters	rtc	'rtc'	

### F Parameters

<b>St</b>	Temperaturer setpoint	[r1.. r2°C/F]
<b>rd</b>	Control delta (Hysteresis)	[0.1.. 20°C/F]
<b>rt</b>	Temperature monitoring interval	[0.. 999 hours]
<b>rH</b>	Maximum temperature read	[°C/°F]
<b>rL</b>	Minimum temperature read	[°C/°F]
<b>dI</b>	Interval between defrosts	[0.. 250 hour]
<b>dt1</b>	End defrost temperature, evaporator	[-50.. 200°C/F]
<b>dt2</b>	End defrost temperature, aux evaporator	[-50.. 200°C/F]
<b>dP1</b>	Maximum defrost duration, evaporator	[1.. 250 min]
<b>dP2</b>	Maximum defrost duration, aux evaporator	[1.. 250 min]
<b>dd</b>	Dripping time after defrost	[0.. 15 min]
<b>d8</b>	Alarm bypass after defrost	[0.. 15 hour]
<b>d/1</b>	Display defrost probe	[°C/°F]
<b>d/2</b>	Display defrost probe	[°C/°F]
<b>AL</b>	Low temperature alarm threshold	[-50.. 200°C/F]
<b>AH</b>	High temperature alarm threshold	[-50.. 200°C/F]
<b>Ad</b>	Low and high temperature signal display	[0.. 250 min]
<b>F1</b>	Fan start-up temperature	[-50.. 200°C/F]
<b>Fd</b>	Fans off after dripping	[0.. 15 min]

### C Parameters

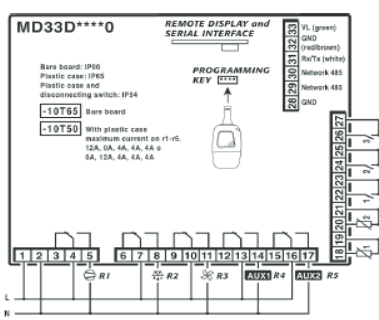
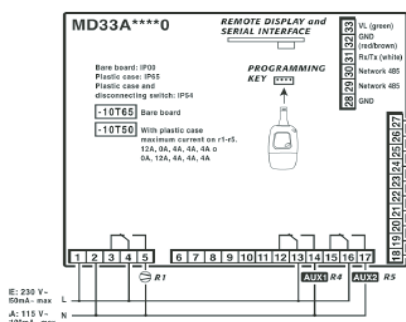
<b>/2</b>	Measurement stability	[1.. 15]
<b>/3</b>	Probe display rate	[0.. 15]
<b>/4</b>	Virtual probe	[0.. 100]
<b>/5</b>	Select °C or °F	[0=°C; 1=°F]
<b>/6</b>	Decimal point	[0=0.1°C; 1=1.0°C]
<b>/tI</b>	Display on internal terminal	[1.. 7]
<b>/tE</b>	Display on external terminal	[0.. 6]
<b>/P</b>	Select type of probe [0=NTC (-50.. +90°C); 1=NTC (-40.. +150°C); 2=PTC (-50.. +150°C)]	
<b>/A2</b>	Configuration of probe 2 [0=Absent; 1=Product; 2=Defrost; 3=Condenser; 4=Antifreeze]	
<b>/A3</b>	Configuration of probe 3 [0=Absent; 1=Product; 2=Defrost; 3=Condenser; 4=Antifreeze]	
<b>/A4</b>	Configuration of probe 4 [0=Absent; 1=Product; 2=Defrost; 3=Condenser; 4=Antifreeze]	
<b>/A5</b>	Configuration of probe 5 [0=Absent; 1=Product; 2=Defrost; 3=Condenser; 4=Antifreeze]	
<b>/c1</b>	Calibration of probe 1	[-20.. +20°C/F]
<b>/c2</b>	Calibration of probe 2	[-20.. +20°C/F]
<b>/c3</b>	Calibration of probe 3	[-20.. +20°C/F]
<b>/c4</b>	Calibration of probe 4	[-20.. +20°C/F]
<b>/c5</b>	Calibration of probe 5	[-20.. +20°C/F]
<b>m</b>	Dead zone	[0.. 60°C/F]
<b>rr</b>	Reverse control delta with dead zone	[0.1.. 20°C/F]
<b>r1</b>	Minimum setpoint allowed	[-50.. R2°C/F]
<b>r2</b>	Maximum setpoint allowed	[r1.. 200°C/F]
<b>r3</b>	Operating mode [0=Direct thermostat with defrost control (Cooling); 1=Direct thermostat (Cooling); 2=Direct thermostat (Heating)]	
<b>r4</b>	Automatic night-time set point variation	[-20.. +20°C/F]
<b>r5</b>	Enable temperature monitoring	[0=Off; 1=On]
<b>c0</b>	Compressor and fan delay on start up	[0.. 15 min]
<b>c1</b>	Minimum time between successive starts	[0.. 15 min]
<b>c2</b>	Minimum compressor OFF time	[0.. 15 min]
<b>c3</b>	Minimum compressor ON time	[0.. 15 min]
<b>c4</b>	Duty setting	[0.. 100 min]
<b>cc</b>	Continuous cycle duration	[0.. 15 hour]
<b>c6</b>	Alarm bypass after continuous cycle	[0.. 15 hour]
<b>c7</b>	Maximum Pump-Down time	[0.. 900 sec]
<b>c8</b>	Compressor start delay after opening	[0.. 60 sec]
<b>c9</b>	Enable autostart function with operation in PD	[0.. 1]
<b>c10</b>	Select Pump-Down by time or pressure	[0.. 1]
<b>c11</b>	Delayed compressor delay	[0.. 250 sec]
<b>d0</b>	Type of defrost [0=Electric Heater by temp.; 1=Hot Gas by temp.; 2=Electric heater by time; 3=Hot Gas by time]	
<b>d3</b>	Defrost start delay	[0.. 250 min]
<b>d4</b>	Enable defrost at start-up	[0.. 1]
<b>d5</b>	Defrost delay on start up	[0.. 250 min]
<b>d6</b>	Display on hold during defrost	[0.. 2]

# 12 Technical Information

## MD33 (MasterCella) Continued

<b>d9</b>	Defrost priority over compressor protectors	[0.. 1]
<b>dC</b>	Time base for defrost	[0.. 1]
<b>d10</b>	Compressor running time	[0.. 250 hour]
<b>d11</b>	Running time temperature threshold	[-20.. +20°C/F]
<b>d12</b>	Advanced defrost	[0.. 3]
<b>dn</b>	Nominal defrost duration	[1.. 100]
<b>dH</b>	Proportional factor for var. of 'dI'	[0.. 100]
<b>A0</b>	Alarm and fan differential	[0.1.. 20°C/F]
<b>A1</b>	Type of threshold 'AL' or 'AH'	[0=Relative; 1=Absolute]
<b>A4</b>	Configuration of digital input 1	[0.. 14]
<b>A5</b>	Configuration of digital input 2	[0.. 14]
<b>A6</b>	Stop compressor on external alarm	[0.. 100]
<b>A7</b>	External alarm detection delay	[0.. 250 min]
<b>A8</b>	Enable alarms 'Ed1' and 'Ed2'	[0.0.. 1°C/F]
<b>A9</b>	Configuration of digital input 3	[0.. 14]
<b>Ac</b>	High condensor temperature alarm	[0.. 200°C/F]
<b>AE</b>	High condensor temperature alarm differential	[0.1.. 20°C/F]
<b>Acd</b>	High condensor temperature alarm time	[0.. 250 min]
<b>AF</b>	Light sensor OFF time	[0.. 250 sec]
<b>ALF</b>	Antifreeze alarm threshold	[-50.. 200°C/F]
<b>AdF</b>	Antifreeze alarm delay	[0.. 15 min]
<b>F0</b>	Fan management	[0=Always On; 1 Controlled according to dT of virtual probe & evap probe; 2=Evap temperature]
<b>F2</b>	Fan OFF with compressor OFF	[0=Fans always on; 1=Fans off when compressor Off]
<b>F3</b>	Fans in Defrost	[0= Off; 1=On]
<b>F4</b>	Condenser fan off temp.	[-50.. 200°C/F]
<b>F5</b>	Condenser fan start differential	[0.1.. 20°C/F]
<b>H0</b>	Serial address	[0.. 207]
<b>H1</b>	Function of relay 4	[0=Alarm OP usually energised; 1=Alarm OP usually non-energised; 2=Auxiliary OP; 3=Light output;4=Aux evap defrost OP; 5=Pump down valve OP; 6=Condenser fan OP; 7=Delayed compressor output; 8=Aux OP with deactivation when OFF; 9=Light OP with deactivation when OFF;10=No function; 11=Reverse output in control with dead band; 12=Second compressor step output; 13 = Second compressor with step output and rotation]
<b>H2</b>	Disable keypad/IR	[0=DE; 1=Nothing; 2=DEF; 3=F; 4=BCD; 5=BCDE]
<b>H3</b>	Remote control enabling code	[0.. 255]
<b>H4</b>	Disable buzzer	[0=On; 1=Off]
<b>H5</b>	Function of relay 5	[0.. 13 (As H1)]
<b>H6</b>	Lock keypad	[0.. 255]
<b>H8</b>	Select output activation with time band	[0.. 10]
<b>H9</b>	Enable set point variation with time band	[0.. 10]
<b>Hdh</b>	Anti-sweat heater offset	[-50.. 200°C/F]
<b>Han</b>	Number of HA events occurred	[0.. 15 min]
<b>HA</b>	Date/time - last HA event	[y=Year; M=Month; d=Day; h=Hr; n=Min; t=Duration (hr)]
<b>HA1</b>	Date/time - 2nd last HA event	[y=Year; M=Month; d=Day; h=Hr; n=Min; t=Duration (hr)]
<b>HA2</b>	Date/time - 3rd last HA event	[y=Year; M=Month; d=Day; h=Hr; n=Min; t=Duration (hr)]
<b>HFn</b>	Number of HF events occurred	[0.. 15]
<b>HF</b>	Date/time - last HF event	[y=Year; M=Month; d=Day; h=Hr; n=Min; t=Duration (hr)]
<b>HF1</b>	Date/time - 2nd last HF event	[y=Year; M=Month; d=Day; h=Hr; n=Min; t=Duration (hr)]
<b>HF2</b>	Date/time - 3rd last HF event	[y=Year; M=Month; d=Day; h=Hr; n=Min; t=Duration (hr)]
<b>Htd</b>	HACCP alarm delay	[0.. 250 min]
<b>td1</b>	Defrost time band 1	[0=no event; 1 to 7=Monday to Sunday; 8=from Monday to Friday; 10=Saturday & Sunday; 11= Everyday; 9=from Monday to Saturday;]
<b>td2</b>	Defrost time band 2	
<b>td3</b>	Defrost time band 3	
<b>td4</b>	Defrost time band 4	
<b>td5</b>	Defrost time band 5	
<b>td6</b>	Defrost time band 6	
<b>td7</b>	Defrost time band 7	
<b>td8</b>	Defrost time band 8	
<b>ton</b>	Light/aux On time band	[D=Day; h=Hour; n=Minute]
<b>tof</b>	Light/aux Off time band	[D=Day; h=Hour; n=Minute]
<b>tc</b>	RTC date/time setting	[y=Year(0.. 99); M=Month(1.. 12); d=Day of the Month(1.. 31); u=Day of the week(1.. 7); h=Hour(0.. 23); n=Minute(0.. 59)]

Manual defrost: Press & hold for 5 secs def/▼.





To access Parameters:

Press & hold **set** key for 5 seconds. Password access if requested, 'PA1' = 135

Scroll through menu using keys **▼** or **▲**, pressing **Set** on Menu headings (CP, diS, CnF, FPr) to access.

Display parameter value by pressing **set** and modify holding **set** + **◀** or **▶**.

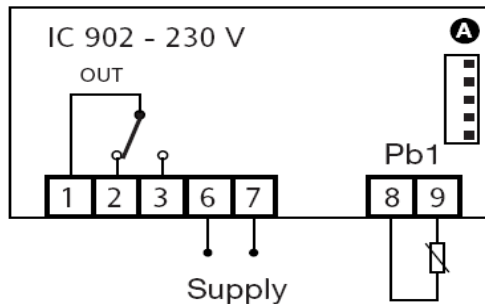
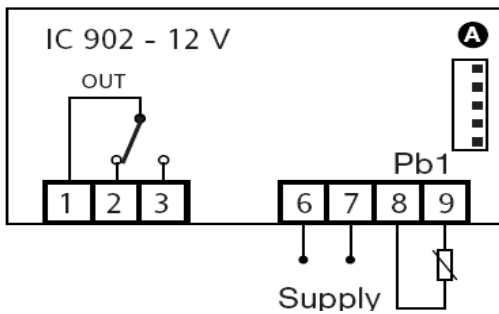
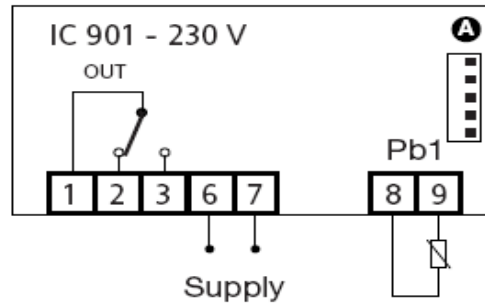
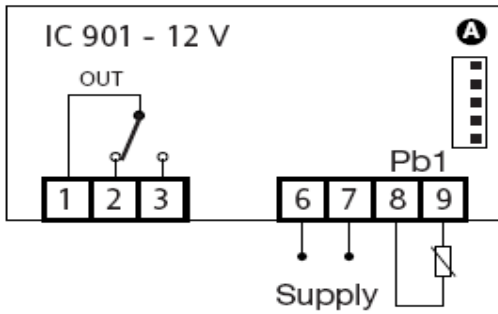
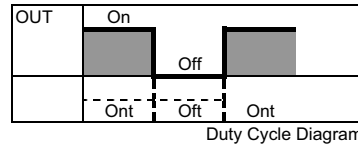
<b>diF</b>	Temperature differential	[1.. 30°C/F]
<b>HSE</b>	Maximum allowable setpoint	[LSE.. 99°C/F]
<b>LSE</b>	Minimum allowable setpoint	[-55.. HSE°C/F]
<b>HC</b>	Heat/Cool mode.	[H/C]
<b>Ont(1)</b>	Regulator activation in event of probe failure	[If Of=0 + Ont=1 Always On; 0.. 250 min]
<b>Of(1)</b>	Regulator de-activation in event of probe failure	[If Of=1 + Ont=0 Always Off; 0.. 250 min]
<b>dOn</b>	Activation delay from switch On of controller	[0.. 250 sec]
<b>dOF</b>	Delay after regulator relay switch Off, (Rest time)	[0.. 250 min]
<b>dbi</b>	Delay between regulator switch Ons	[0.. 250 min]
<b>OdO(!)</b>	Delay time in activating the outputs after switch on/power failure	[0=Inactive; 0.. 250 min]
<b>LOC</b>	Keyboard Lock	{Y/N}
<b>PA1</b>	Password 1	[0.. 250]
<b>CA1</b>	Calibration 1	[-12.. +12°C/F]
<b>dro</b>	Selection of °C or °F	[0=°C, 1=°F]
<b>H00 (!)</b>	Probe type	[0=PTC; 1=NTC]
<b>rEL</b>	Device version, read only parameter	
<b>tAb</b>	Reserved, read only parameter	
<b>UL</b>	Upload: Transferring parameters from instrument copy card	
<b>dL</b>	Download: Transferring parameters from copy card to instrument	
<b>Fr</b>	Format: Erases all data in copy card	

(1) See Duty cycle diagram

(!) Warning: Instrument will need switching Off and On again to complete setting save

When the Sensor detects an error condition the code 'E1' is displayed and the regulator is activated as shown in the duty cycle below.

Ont	Of	Regulator Output
0	0	OFF
0	>0	OFF
>0	0	ON
>0	>0	dc



# 12 Technical Information

IC912 - PT100



To access Parameters:

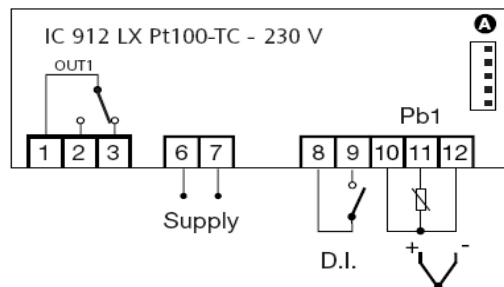
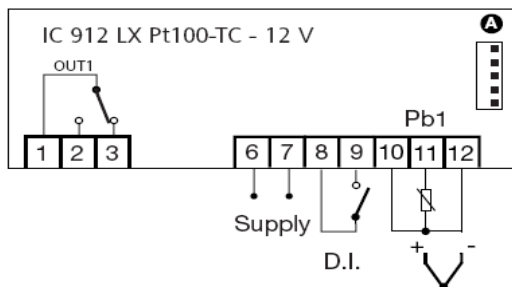
Press & hold **set key** for 5 seconds. Password access if requested, '**PA1**' = 135

Scroll through menu using keys **▼** or **▲**, pressing **Set** on Menu headings (CP, diS, CnF, FPr) to access.

Display parameter value by pressing **set** and modify holding **set + ◀** or **▶**.

<b>HC1</b>	Heat/Cool mode.	[H/C]
<b>OS1</b>	Offset setpoint 1	[-30.. +30°C/F]
<b>db1</b>	Operating range 2	[0.. 30°C/F]
<b>dF1</b>	Temperature differential	[0.. 30°C/F]
<b>HS1</b>	Maximum allowable setpoint 1	[LS1.. Hd1°C/F]
<b>LS1</b>	Minimum allowable setpoint 1	[Ld1.. HS1°C/F]
<b>HA1</b>	Maximum alarm OUT	[LA1.. 1999°C/F]
<b>LA1</b>	Minimum alarm OUT	[-328.0.. HA1°C/F]
<b>dn1</b>	Start up delay. Delay time between relay start up & controller start up	[0.. 250 sec]
<b>do1</b>	Delay after shut-down. Delay time between relay shut-down and subsequent start up	[0.. 250 min]
<b>di1</b>	Delay between start ups. Delay between two consecutive start ups	[0.. 250 min]
<b>dE1</b>	Shut-down delay. Delay between relay shut-down and actual shut-down	[0.. 250 sec]
<b>On1</b>	Regulator activation in event of probe failure	[If Of=0 + Ont=1 Always On; 0.. 250 min]
<b>OF1</b>	Reg. de-activation in event of probe failure	[If Of=1 + Ont=0 Always Off; 0.. 250 min]
<b>dSi</b>	Soft start function	[0.. 25.0°C/F]
<b>dSt</b>	Dynamic step Delay	[0.. 250 H/m/s]
<b>Unt</b>	Units of measurement	[0=Hour; 1=minutes; 2=seconds]
<b>SEn</b>	Outputs enabled	[0=Disabled; 1=OUT 1; 2,3=Not used]
<b>Sdi</b>	Function threshold re-entry	[0.. +30°C/F]
<b>Att</b>	Alarm type	[0=Absolute; 1=Relative]
<b>Afd</b>	Alarm fan differential	[1.0.. 50.0°C/F]
<b>PAO (l)(8)</b>	Power-on alarm override. Alarm exclusion time after power failure	[0.. 10 hour]
<b>SAO</b>	Setpoint alarm override. Time given to reach setpoint until alarm occurs	[0.. 10 hour]
<b>tAO (8)</b>	Temperature alarm override	[0.. 250 min]
<b>dEA (l)</b>	Device address	[0.. 14]
<b>FAA (l)</b>	Family address	[0.. 14]
<b>LOC</b>	Keyboard Lock	[Y/N]
<b>PA1</b>	Password 1	[0.. 250]
<b>PA2****</b>	Password 2 (Access to level 2 parameters)	[0.. 250]
<b>ndt</b>	Number display type. View with decimal point?	[Y/N]
<b>CA1</b>	Calibration 1 (Adds/Subtracts from alue of probe 1)	[-30.. +30°C/F]
<b>CAI</b>	Caclibration intervention	[0=Modifies temp. displayed only; 1=Adds to the temperature used by regulators, not to the temperature displayed; 2=Adds to the temperature used by regulator and display temp.]
<b>LdL</b>	Low display label. (Minimum temperature instrument can display)	[-328.0.. HdL°C/F]
<b>HdL</b>	High display label. (Maximum temperature instrument can display)	[LdL.. 1999°C/F]
<b>dro</b>	Display read out. (Does <u>not</u> change set point etc accordingly)	[0=°F; 1=°C]
<b>H00 (l)</b>	Probe type (PT100, K-Type & J-Type T/C only)	[Pt1; Tcj; Tck]
<b>H02</b>	Time to enable keys, if these are configured for a specific function	[0.. 15]
<b>H05</b>	Display slowdown	[-2=V. Fast; -1=Fast; 0=Normal; 1=Slow; 2=V.Slow]
<b>H06</b>	Key/input aux/door switch light active when instrument is off (but under tension)	[Y/N]
<b>H08</b>	Stand-by mode	[0=Display switch Off; 1=Display On & loads stopped; 2=Display Off & loads stopped]
<b>H10</b>	Delay outputs from power On	[0.. 250 min]
<b>H11</b>	Configure digital inputs	[0.. 9] [0=disabled; 1=SOFT START; 2=Offset setpoint; 3=Outputs stopped; 4=Not used; 5=Aux O/P; 6=Stand-by; 7=Maintenance requested; 8=Ext. Alarm; 9=Ext. Alarm & stop regulators]
<b>H13</b>	Polarity & Priority digital inputs	[no=Normally open; nc=Normally closed; nop=Normally open with polarity; ncp= Normally closed with polarity]
<b>H14</b>	Delay activation Digital input	[0.. 250]
<b>H31(l)</b>	Configurable Up key	[0.. 7] [0=disabled; 1=SOFT START; 2=Offset setpoint; 3=Outputs stopped; 4=Not used; 5=Aux O/P; 6=Stand-by; 7=Maintenance requested]
<b>H32(l)</b>	Configurable Down key	[See H31]
<b>H33(l)</b>	Configurable Esc key (2=Offset setpoint, Default)	[See H31]
<b>rEL</b>	Device version, read only parameter	/
<b>tAb</b>	Reserved, read only parameter	/
<b>UL</b>	Upload: Transferring parameters from instrument copy card	/
<b>dL</b>	Download: Transferring parameters from copy card to instrument	/
<b>Fr</b>	Format: Erases all data in copy card	/

(l) Warning: Instrument will need switching Off and On again to complete setting save





To access Parameters:

Press & hold **set key** for 5 seconds. Password access if requested, 'PA1' = 135

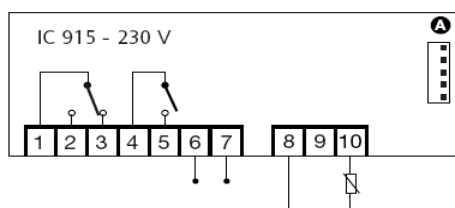
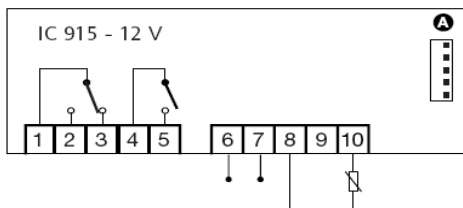
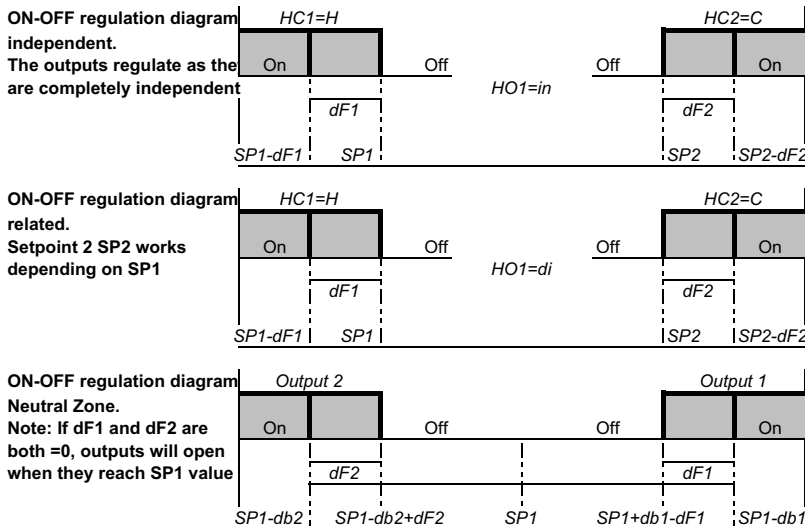
Scroll through menu using keys **▼** or **▲**, pressing **Set** on Menu headings (CP, diS, CnF, FPr) to access.

Display parameter value by pressing **set** and modify holding **set** + **◀** or **▶**.

<b>HC1</b>	Heat/Cool Mode (Regulator 1)	[H/C]
<b>db1</b>	Intervention 1 band	[0.. 30°C/F]
<b>dF1</b>	Differential	[0.0.. 30°C/F]
<b>HS1</b>	Higher SEt. Maximum possible setpoint 1 value.	[LS1.. HdL°C/F]
<b>LS1</b>	Lower SEt. Minimum possible setpoint 1 value.	[Ldl.. HS1°C/F]
<b>dn1</b>	Delay time in activating regulator 1 relay after switch-on of instrument.	[0.. 250°C/F]
<b>do1</b>	Delay after switch off.	[0.. 250 sec]
<b>di1</b>	Delay between switch-ons.	[0.. 250 min]
<b>dE1</b>	Delay before switch-off	[0.. 250 min]
<b>On1</b>	On time (regulator 1) if probe faulty	[1(OF1=0)=Always on; OF1>0=Duty Cycle]
<b>OF1</b>	Off time (regulator 1) if probe faulty	[1(On1=0)=Always Off; On1>0=Duty Cycle]
<b>HC2</b>	Heat/Cool Mode (Regulator 2)	[H/C]
<b>db2</b>	Intervention 2 band	[0.. 30°C/F]
<b>dF2</b>	Differential	[0.0.. 30°C/F]
<b>HS2</b>	Higher SEt. Maximum possible setpoint 2 value.	[LS2.. HdL°C/F]
<b>LS2</b>	Lower SEt. Minimum possible setpoint 2 value.	[Ldl.. HS2°C/F]
<b>dn2</b>	Delay time in activating regulator 2 relay after switch-on of instrument.	[0.. 250°C/F]
<b>do2</b>	Delay after switch off (Regulator 2)	[0.. 250 sec]
<b>di2</b>	Delay between switch-ons (Regulator 2)	[0.. 250 min]
<b>dE2</b>	Delay before switch-off (Regulator 2)	[0.. 250 min]
<b>On2</b>	On time (regulator 2) if probe faulty	[1(OF2=0)=Always on; OF2>0=Duty Cycle]
<b>OF2</b>	Off time (regulator 2) if probe faulty	[1(On2=0)=Always Off; On2>0=Duty Cycle]
<b>LOC</b>	Display lock	[Y/N]
<b>PA1</b>	Password 1	[0.. 250]
<b>ndt</b>	Number display type. View with decimal point?	[Y/N]
<b>CA1</b>	Calibration 1. Temperature added to probe reading	[-30.0.. +30.0°C/F]
<b>dro</b>	Display read-out	[°C/°F]
<b>H00 (1)!</b>	Probe selection type	[PtC=PTC; ntC=NTC]
<b>H01</b>	Outputs	[0=Independent; 1=Related; 2=Neutral Zone]
<b>H10</b>	Delay time in activating outputs after switch on	[0=Inactive; 0<Time delayed]
<b>rEL</b>	Device version, read only parameter	/
<b>tAb</b>	Reserved, read only parameter	/
<b>UL</b>	Upload: Transferring parameters from instrument copy card	/
<b>dL</b>	Download: Transferring parameters from copy card to instrument	/
<b>Fr</b>	Format: Erases all data in copy card	/

(!) Warning: Instrument will need switching Off and On again to complete setting save

(1) The default value is PtC (PTC input, see the label on the instrument).



# 12 Technical Information

ID961



To access Parameters:

Press & hold **set** key for 5 seconds. Password access if requested, **\*PA1 = 135**

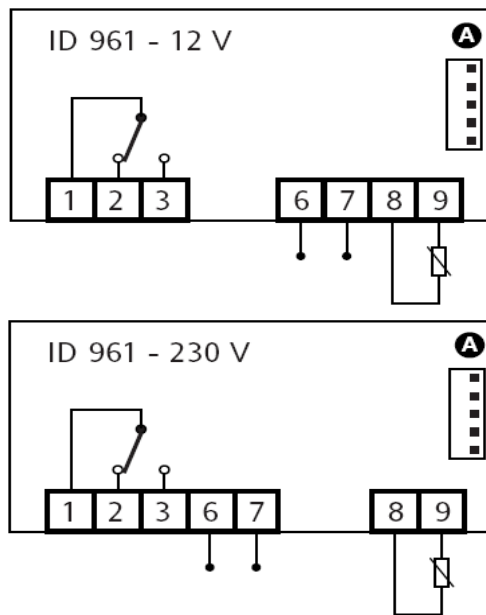
Scroll through menu using keys **▼** or **▲**, pressing **Set** on Menu headings (CP, diS, CnF, FPr) to access.

Display parameter value by pressing **set** and modify holding **set+◀** or **▶**.

<b>Set</b>	Set point	[LSE...HSE°C/F]
<b>diF</b>	DiFferential	[0.1...30.0°C/F]
<b>HSE</b>	Higher SET	[LSE...302°C/F]
<b>LSE</b>	Lower SET	[-55.0...HSE°C/F]
<b>Ont</b>	On time (compressor)	[0...250 min]
<b>OFt</b>	OFF time (compressor)	[0...250 min]
<b>dOn</b>	Power-On delay	[0...250 sec]
<b>dOF</b>	Delay after power-OFF	[0...250 min]
<b>dbi</b>	Delay between power-on	[0...250 min]
<b>OdO</b>	Delay Output from power on	[0...250 min]
<b>dit</b>	Defrost interval time	[0...250 hour]
<b>dCt</b>	Defrost Counting type	[0=Digi Frost®; 1=Real Time; 2=compressor stop]
<b>dOH</b>	Defrost Offset Hour	[0...59 min]
<b>dEt</b>	Defrost Endurance time	[1...250 min]
<b>dSt</b>	Defrost stop temperature	[-50...150°C/F]
<b>dPO</b>	Defrost (at) Power On	[N/Y]
<b>LOC</b>	(keyboard) LOCK	[N/Y]
<b>PA1</b>	PAssword 1	[0...250]
<b>ndt</b>	Number display type, display dicimal point?	[Y/N]
<b>CA1</b>	CAlibration 1	[-12.0...12.0°C/F]
<b>ddl</b>	Defrost display Lock	[0=Displays T1, 1=Display T1 at Def start until set point next reached; 2=Display "def" until setpoint reached]
<b>dro</b>	Selection °C or °F	[0=°C; 1=°F]
<b>H00*</b>	Selection sensor PTC/NTC	[0=PTC; 1=NTC]
<b>reL</b>	ReLease firmware	[0...999]
<b>tAb</b>	Table of parameters	[0...999]
<b>UL</b>	UpLoad	/
<b>dL</b>	DownLoad	/
<b>Fr</b>	Format	/

\* For 230 Va model default value is set to 1 (NTC probe , see label on instrument).

**Manual Defrost:** Press and hold **▲** for 5 secs.



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To access Parameters:

Press & hold **set** key for 5 seconds. Password access if requested, **'PA1' = 135**

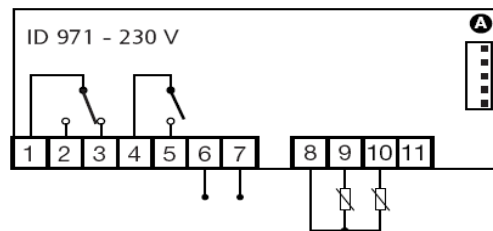
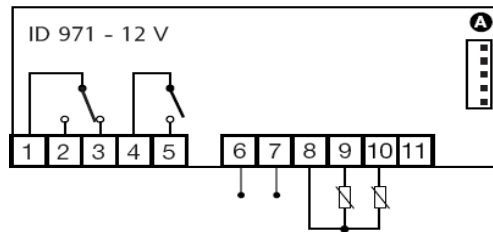
Scroll through menu using keys **▼** or **▲**, pressing **Set** on Menu headings (CP, diS, CnF, FPr) to access.

Display parameter value by pressing **set** and modify holding **set+◀** or **▶**.

<b>Set</b>	Set point	[LSE...HSE°C/F]
<b>diF</b>	DIFferential	[0.1...30.0°C/F]
<b>HSE</b>	Higher SET	[LSE...302°C/F]
<b>LSE</b>	Lower SET	[-55.0...HSE°C/F]
<b>Ont</b>	On time (compressor)	[0...250 min]
<b>OFt</b>	OFF time (compressor)	[0...250 min]
<b>dOn</b>	Power-On delay	[0...250 sec]
<b>dOF</b>	Delay after power-OFF	[0...250 min]
<b>dbi</b>	Delay between power-on	[0...250 min]
<b>OdO</b>	Delay Output from power on	[0...250 min]
<b>dit</b>	Defrost interval time	[0...250 hour]
<b>dCt</b>	Defrost Counting type	[0=Digi Frost®; 1=Real Time; 2=compressor stop]
<b>dOH</b>	Defrost Offset Hour	[0...59 min]
<b>dEt</b>	Defrost Endurance time	[1...250 min]
<b>dSt</b>	Defrost stop temperature	[-50...150°C/F]
<b>dPO</b>	Defrost (at) Power On	[N/Y]
<b>LOC</b>	(keyboard) LOCK	[N/Y]
<b>PA1</b>	PAssword 1	[0...250]
<b>ndt</b>	Number display type, display decimal point?	[Y/N]
<b>CA1</b>	CAlibration 1	[-12.0...12.0°C/F]
<b>ddl</b>	Defrost display Lock	[0..2] [0=Displays T1, 1=Display T1 at Def start until set point next reached; 2=Display "deF" until setpoint reached]
<b>dro</b>	Selection °C or °F	[0=°C; 1=°F]
<b>H00*</b>	Selection sensor PTC/NTC	[0=PTC; 1=NTC]
<b>reL</b>	ReLease firmware	[0...999]
<b>tAb</b>	Table of parameters	[0...999]
<b>UL</b>	UpLoad	/
<b>dL</b>	DownLoad	/
<b>Fr</b>	Format	/

\* For 230 Va model default value is set to 1 (NTC probe, see label on instrument).

**Manual Defrost:** Press and hold **▲** for 5 secs.



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# 12 Technical Information

ID974



To access Parameters:

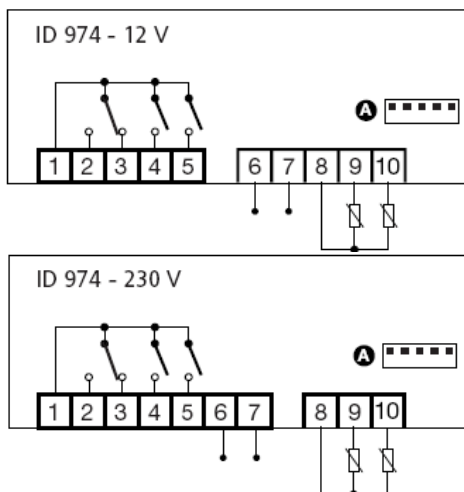
Press & hold **set key** for 5 seconds. Password access if requested, '**PA1**' = 135

Scroll through menu using keys **▼** or **▲**, pressing **Set** on Menu headings (CP, diS, CnF, FPr) to access parameter value by pressing **set** and modify holding **set+◀** or **▶**.

<b>Set</b>	Set point	[LSE... HSE°C/F]
<b>diF</b>	DiFferential	[0.1...30.0°C/F]
<b>HSE</b>	Higher SET	[LSE...302°C/F]
<b>LSE</b>	Lower SET	[-55.0...HSE°C/F]
<b>Ont</b>	On time (compressor)	[0...250 min]
<b>OFt</b>	OFF time (compressor)	[0...250 min]
<b>dOn</b>	Power-On delay	[0...250 sec]
<b>dOF</b>	Delay after power-OFF	[0...250 min]
<b>dbi</b>	Delay between power-on	[0...250 min]
<b>OdO</b>	Delay Output from power on	[0...250 min]
<b>dty</b>	Defrost type	[0=Electric; 1=Hot Gas; 2=Natural defrost]
<b>dit</b>	Defrost interval time	[0...250 hour]
<b>dCt</b>	Defrost Counting type	[0=Digi Frost®; 1=Real Time; 2=compressor stop]
<b>dOH</b>	Defrost Offset Hour	[0...59 min]
<b>dEt</b>	Defrost Endurance time	[1...250 min]
<b>dSt</b>	Defrost stop temperature	[-50... 150°C/F]
<b>dPO</b>	Defrost (at) Power On	[N/Y]
<b>FSt</b>	Fan Stop temperature	[-50... 150°C/F]
<b>FAd</b>	Fan differential	[1.0... 50.0°C/F]
<b>Fdt</b>	Fan delay time	[0... 250 min]
<b>dt</b>	Drain time	[0... 250 min]
<b>dFd</b>	Defrost fan disable	[Y/N]
<b>FCO</b>	Fan compressor Off	[y=Fans on with thermostat; n=Fans Off; d.c.=Duty cycle]
<b>AFd</b>	Alarm fan differential	[1.0... 50.0°C/F]
<b>HAL</b>	Higher alarm	[LAL... 150.0°C/F]
<b>LAL</b>	Lower alarm	[-50.0... HAL°C/F]
<b>PAO</b>	Power-On alarm override	[0... 10 hour]
<b>dAO</b>	Defrost alarm override	[0... 999 min]
<b>tAO</b>	Temperature alarm override	[0... 250 min]
<b>LOC</b>	(keyboard) LOCK	[N/Y]
<b>PA1</b>	PAssword 1	[0...250]
<b>ndt</b>	Number display type, display dicimal point?	[Y/N]
<b>CA1</b>	CAlibration 1	[-12.0...12.0°C/F]
<b>CA2</b>	CAlibration 2	[-12.0...12.0°C/F]
<b>ddl</b>	Defrost display Lock	[0=Displays T1, 1=Display T1 at Def start until set point next reached; 2=Display "deF" until setpoint reached]
<b>dro</b>	Selection °C or °F	[0=°C; 1=°F]
<b>H00(1)</b>	Selection sensor PTC/NTC	[0=PTC; 1=NTC]
<b>H42</b>	Evaporator probe present	[Y/N]
<b>reL</b>	ReLease firmware	[0...999]
<b>tAb</b>	Table of parameters	[0...999]
<b>UL</b>	UpLoad	/
<b>dL</b>	DownLoad	/
<b>Fr</b>	Format	/

(1) For 230 Va models the default value is 1 (NTC input, see the label on the instrument).

**Manual Defrost:** Press and hold **▲** for 5 secs.





To access Parameters:

Press & hold **set key** for 5 seconds. Password access if requested, '**PA1**' = 135

Scroll through menu using keys **▼** or **▲**, pressing **Set** on Menu headings (CP, diS, CnF, FPr) to access.

Display parameter value by pressing **set** and modify holding **set+◀** or **▶**.

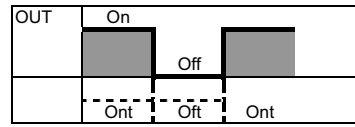
<b>diF</b>	Differential	[0.1.. 30.0°C/F]
<b>HSE</b>	Highest allowable setpoint	[LSE..302°C/F]
<b>LSE</b>	Lower allowable setpoint	[-55.0...HSE°C/F]
<b>OSP</b>	Offset Setpoint	[-30.0...30.0°C/F]
<b>Cit</b>	Compressor minimum on time	[0.. 250 min]
<b>CAt</b>	Compressor max on time.	[0.. 250 min]
<b>Ont (1)</b>	Compressor On time if probe fails	[0..250 min]
<b>OFt (1)</b>	Compressor Off time if probe fails	[0..250 min]
<b>dOn</b>	Compressor delay after instrument Switch-On	[0..250 sec]
<b>dOF</b>	Compressor delay after relay Switch-Off to successive Switch-On	[0..250 min]
<b>dbi</b>	Delay between compress power-on	[0..250 min]
<b>OdO</b>	Output delay after Switch-On or Power failure	[0..250 min]
<b>dtY</b>	Defrost type	[0=Electric; 1=Hot Gas; 2=Natural Defrost]
<b>dit</b>	Defrost interval time	[0.. 250 hour]
<b>dt1</b>	Defrost interval time units	[0= hour; 1=min; 2= sec]
<b>dt2</b>	Defrost duration units	[0= hour; 1=min; 2= sec]
<b>dtCt</b>	Defrost counting type	[0=DIGIFROST@; 1=Real time; 2=Compressor stop]
<b>dOH</b>	Defrost Offset Hour. Start-of-defrosting delay time from start up of instrument	[0.. 59 min]
<b>dEt</b>	Defrost Endurance time. Defrosting time-out; determines duration of defrost	[1.. 250 min]
<b>dSt</b>	Defrost Stop temperature(defined by the evaporator sensor)	[-50.. 150°C/F]
<b>dPO</b>	Defrost at power On (If temperature permits)	[Y/N]
<b>tcd</b>	Compressor minimum On/Off time between defrosts	[-31.. 31 min]
<b>Cod</b>	Compressor off (before defrost). Time for compressor OFF in proximity of the defrost	[0.. 60 min]
<b>Fpt</b>	Fan parameter type. "FSt" parameter mode	[0=Absolute; 1=Relative]
<b>FSt</b>	Fan stop temperature (Evap probe)	[-50.0.. 150.0°C/F]
<b>Fot</b>	Fan start temperature (Evap probe)	[-50.0.. 150.0°C/F]
<b>FAd</b>	Fan starting differential (see par. "FSt" and "Fot").	[1.0.. 50.0°C/F]
<b>Fdt</b>	Fan delay time after defrost	[0.. 250 min]
<b>dt</b>	Drain time	[0.. 250 min]
<b>dFd</b>	Disable fans during defrost	[Y/N]
<b>FCO</b>	Fan control	[y=Fans active (Thermostat, "FSt"); n=Fans off; dc=Duty cycle ("Fon" & "FoF")]
<b>FdC</b>	Fan stop delay time after compressor stop.	[0.. 99 min]
<b>Fon</b>	Fan Off time due to duty cycle (FCO=dc)	[0.. 99 min]
<b>FoF</b>	Fan Off time due to duty cycle (FCO=dc) <b>AL Folder</b>	[0.. 99 min]
<b>Att</b>	Alarm type. "HAL" and "LAL"	[0=Absolute; 1=Relative]
<b>AFd</b>	Alarm fan differential	[1.0.. 50.0°C/F]
<b>HAL</b>	Maximum temperature alarm	[LAL...150.0°C/F]
<b>LAL</b>	Minimum temperature alarm	[-50.0...HAL°C/F]
<b>PAO</b>	Power-on Alarm Override	[0.. 10 hours]
<b>dAO</b>	Defrost alarm override	[0.. 999 min]
<b>tAO</b>	Temperature alarm signal delay time.	[0.. 999 min]
<b>dAt</b>	Defrost alarm time	[n = Does not enable alarm; y = Enables alarm]
<b>AOP</b>	Alarm Output Polarity	[0.. 1] [0 = alarm activated and output disabled; 1 = alarm activated and output enabled]
<b>dEA</b>	Device address: indicates the appliance address to the management protocol	[0.. 14]
<b>FAA</b>	Family address: indicates the appliance family to the management protocol	[0.. 14]
<b>LOC</b>	(keyboard) LOCK	[N/Y]
<b>PA1</b>	Password 1	[0.. 250]
<b>PA2***</b>	Password 2. When enabled (value other than 0) it constitutes the access key	[0.. 250]
<b>ndt</b>	Number display type, display decimal point?	[Y/N]
<b>CA1</b>	CAlibration 1	[-12.0...12.0°C/F]
<b>CA2</b>	CAlibration 2	[-12.0...12.0°C/F]
<b>CA</b>	CAlibration Intervention. Intervention on view offset, thermostat offset or both.	[0=Display temperature only; 1=Mewasured temperature only; 2=Adds to both]
<b>LdL</b>	Low display Label. Minimum value the instrument is able to display.	[-55.0.. 302°C/F]
<b>HdL</b>	High display Label. Maximum value the instrument is able to display.	[-55.0.. 302°C/F]
<b>ddL</b>	Defrost display Lock. Viewing mode during defrosting.	[0=Displays T1, 1=Display T1 at Def start until set point next reached; 2=Display "deF" until setpoint reached]
<b>dro</b>	Selection °C or °F	[0=°C; 1=°F]
<b>ddd</b>	Display read-out	[0=Setpoint; 1=Probe 1; 2=Probe 2]
<b>H00</b>	Selection sensor PTC/NTC	[0=PTC; 1=NTC]
<b>H02</b>	Time to enable keys	[0.. 15 sec]
<b>H21</b>	Configure Digital output 1	[0.. 5]
<b>H22</b>	Configure Digital output 2	[0 = disabled; 1 = compressor;
<b>H23</b>	Configure Digital output 3	2 = defrosting; 3 = fans;
<b>H24</b>	Configure Digital output 4	4 = alarm; 5 = optional]
<b>H31</b>	Configurable Up key	[0 = disabled; 1 = defrosting; 2 = optional; 3 = reduced set (economy)]
<b>H32</b>	Configurable Down key	[0 = disabled; 1 = defrosting; 2 = optional; 3 = reduced set (economy)]
<b>H33</b>	Configurable Fnc key	[0 = disabled; 1 = defrosting; 2 = optional; 3 = reduced set (economy)]
<b>H41</b>	Regulating probe present	[Y/N]
<b>H42</b>	Evaporator probe present	[Y/N]
<b>reL</b>	ReLease firmware	[0...999]
<b>tAb</b>	Table of parameters	[0...999]
<b>UL</b>	UpLoad	/
<b>dL</b>	DownLoad	/
<b>Fr</b>	Format	/

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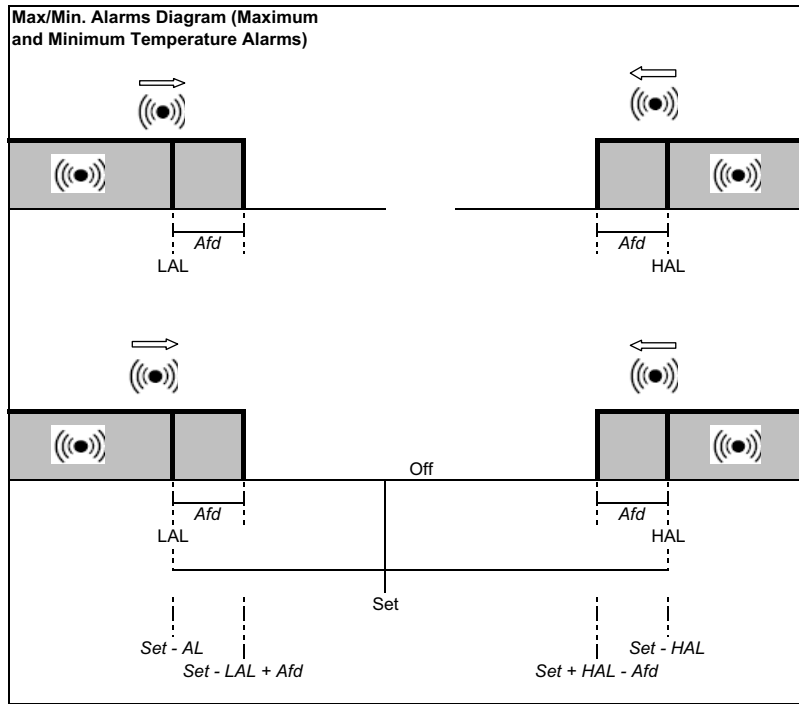
# 12 Technical Information

## ID975 LX (Continued)

Ont	Of	Regulator Output
0	0	OFF
0	>0	OFF
>0	0	ON
>0	>0	dc



Duty Cycle Diagram



The maximum alarm will become when the probe temperature will be:

- (1) higher or equal to HAL if Att=Abs(olute)
  - (2) higher or equal set + HAL if Att=rEL(ative)
- if Att=Abs(olute) HAL should be with sign;
  - if Att=rEL(ative) HAL should be only positive

The minimum alarm will become when the probe temperature will be::

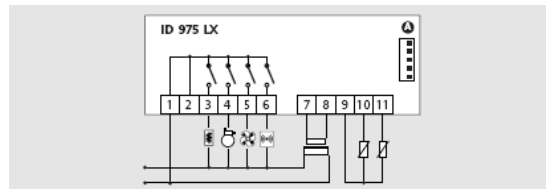
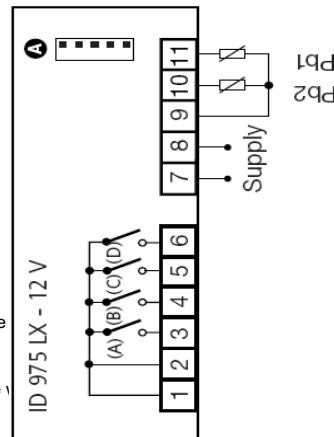
- (1) lower or equal to LAL if Att=Ab(solute)
  - (2) lower or equal to set - LAL if Att=rEL(ative)
- if Att=Ab(solute) LAL should be with sign;
  - if Att=rEL(ative) LAL should be only positive

The maximum alarm will ends when the probe temperature

- (1) lower or equal to HAL - AFd if Att=Abs(olute)
- (2) lower or equal to set + HAL - AFd if Att=rEL(ative)

The minimum alarm will ends when the probe temperature

- (1) higher or equal a LAL + AFd if Att=Abs(olute)
- (2) higher or equal a set - LAL + AFd if Att=rEL(ative)



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To access Parameters:

Press & hold **set key** for 5 seconds. Password access if requested, 'PA1' = 135

Scroll through menu using keys **▼** or **▲**, pressing **Set** on Menu headings (CP, diS, CnF, FPr) to access.

Display parameter value by pressing **set** and modify holding **set+◀** or **▶**.

COMPRESSOR REGULATOR (folder with "CP" label)	
<b>dIF</b>	diFferential. Compressor relay intervention differential; the compressor stops on reaching the Setpoint value (as indicated by the adjustment probe), and restarts at temperature value equal to the Setpoint plus the value of the differential. Note: cannot be 0. [0.1...30.0°C/°F]
<b>HSE</b>	Higer SET. Maximum possible setpoint value. [LSE...302°C/°F]
<b>LSE</b>	Lower SET. Minimum possible setpoint value. [-55.0...HSE°C/°F]
<b>OSP</b>	Offset SetPoint. Temperature value to be added algebraically to the setpoint if reducedset is enabled (Economy function). The reduced set can be enabled by a key configured for this purpose. [-30.0...30.0°C/°F]
<b>Cit</b>	Compressor min on time. Minimum compressor activation time before any possible disabling. If set at 0 it is not active [0...250 min]
<b>CAt</b>	Compressor mAx on time. Maximum compressor activation time before any possible disabling. If set at 0 it is not active. [0...250 min]
COMPRESSOR PROTECTIONS (folder with "CP" label)	
<b>Ont (1)</b>	On time (compressor). Compressor activation time in the event of faulty probe. If set to "1" with Oft at "0" the compressor is always on, while at Oft >0 it functions always in duty cycle mode. See Duty Cycle diagram. [0...250 min]
<b>Oft (1)</b>	OFF time (compressor). Time for which compressor is disabled in the event of a faulty probe. If set to "1" with Ont at "0" the compressor is always off, while at Ont >0 it functions always in duty cycle mode. See Duty Cycle diagram. [0...250 min]
<b>dOn</b>	delay (at) On compressor. Delay time in activating the compressor relay after switch-on of instrument. [0...250 sec]
<b>dOF</b>	delay (after power) OFF. Delay after switch off; the indicated time must elapse between switch-off of the compressor relay and the successive switch-on. [0...250 min]
<b>dbi</b>	delay between power-on. Delay between switch-ons; the indicated time must elapse between two successive switch-ons of the compressor. [0...250 min]
<b>OdO (1)</b>	delay Output (from power) On. Delay time in activating the outputs after switch-on of the instrument or after a power failure. 0= not active. [0...250 min]
DEFROSTING REGULATOR (folder with "dEF" label) (6)	
<b>dtY</b>	defrost type. Type of defrost. 0 = electrical defrost; 1 = cycle reversing defrost (hot gas); 2 = Free mode defrost (compressor disabling). [0.. 2]
<b>dit</b>	defrost interval time. Interval between the start of two successive defrosting operations. 0= the function is disabled (defrost is NEVER performed) [hours/min/sec] [see dt1]
<b>dt1</b>	defrost time 1. Unit of measurement for time between defrosting ("dit" parameter). 0 = "dit" parameter in hours; 1 = "dit" parameter in minutes; 2 = "dit" parameter in seconds. [0.. 2]
<b>dt2</b>	defrost time 2. Unit of measurement for defrosting duration ("dEt" parameter). 0 = "dEt" parameter in hours; 1 = "dEt" parameter in minutes; 2 = "dEt" parameter in seconds. [0.. 2]
<b>dCt</b>	defrost Counting type. Selection of count mode for the defrosting interval. 0 = compressor hour of operation (DIGIFROST® method); Defrosting active ONLY with the compressor on. NOTE: compressor time of operation is counted regardless of the evaporator probe (counting is active if evaporator probe is absent or faulty). The value is ignored if RTC is enabled. 1 = equipment hours of operation; defrost counting is always active when the machine is on and starts at each power-on. 2 = compressor stop. Every time the compressor stops a defrost cycle is performed according to the dtY 3= parameter with RTC. Defrostings at times set by dE1...dE8 parameters, F1...F8 [0.. 3]
<b>"dd" (6)</b>	dE1...dE8 daily defrost start time 1...8. Range 0...23, 24= off (default) [0...23/0...59 hours/min]
<b>"Fd" (6)</b>	holiday defrost start time 1...8. Range 0...23, 24= off (default) [0...23/0...59 hours/min]
	WARNING: d1...d8, F1...F8 parameters are visible only if dit=0, dCt=3 with clock option present. They are included in the dd and Fd folders
<b>dOH</b>	defrost Offset Hour. Start-of-defrosting delay time from start up of instrument. [0.. 59 min]
<b>dEt</b>	defrost Endurance time. Defrosting time-out; duration of defrosting. [1.. 250 hours/min/sec] ec (see dt2)
<b>dSt</b>	defrost Stop temperature. Defrosting end temperature (determined by the evaporator probe). [-50.. 150 °C/°F]
<b>dE2</b>	defrost Endurance time 2nd evaporator. Defrosting time-out on 2nd evaporator; determines duration of defrosting on 2nd evaporator. [1.. 250 hours/min/sec] ec (see dt2)
<b>dS2</b>	defrost Stop temperature 2nd evaporator. Defrosting end temperature (determined by the 2nd evaporator probe). [-50.. 150 °C/°F]
<b>dPO</b>	defrost (at) Power On. Determines if at start-up the instrument must enter defrosting (if the temperature measured by the evaporator allows this operation). y = yes, starts defrost at start-up; n = no, doesn't start defrost. [Y/N]
<b>tcd</b>	time compressor for defrost. Minimum time for compressor On or OFF before defrost. If >0 (positive value) the compressor will be ON for tcd minutes; If <0 (negative value) the compressor will be OFF for tcd minutes. If =0 parameter is disregarded If =0 is ignored min
<b>Cod</b>	Compressor off (before) defrost. Time for compressor OFF in proximity of the defrost cycle. If a defrost cycle is set within the programmed time for this parameter, the compressor is not started up. If =0 function is stopped. min

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FANS REGULATOR (folder with "FAn" label)		
<b>NOTE: for these parameters evaporator means 1st evaporator</b>		
<b>FPt</b>	Fan Parameter type. "FSI" parameter mode. It can be expressed as temperature absolute value or as a value related to the Setpoint. 0 = absolute; 1 = relative.	flag
<b>FSt</b>	Fan Stop temperature. Fan lock temperature; a value, read by the evaporator probe higher than the set value causes the fans to stop. The value is positive or negative and depending on FPt parameter could represent the temperature as an absolute value or relative to Setpoint.	[-50.0..150.0 °C/°F]
<b>Fot</b>	Fan on-start temperature. Fan start temperature; if the temperature read by the evaporator is lower than the value set for this parameter, the fans stay still. The value is positive or negative and depending on FPt parameter could represent the temperature as an absolute value or relative to Setpoint.	[-50.0..150.0 °C/°F]
<b>FAd</b>	FAn differential. Fan activation intervention differential (see par. "FSI" and "Fot").	[1.0.. 50.0 °C/°F]
<b>Fdt</b>	Fan delay time. Delay time at fan activation after a defrosting cycle.	[0.. 250 min]
<b>dt</b>	drainage time. Dripping time.	[0.. 250 min]
<b>dFd</b>	defrost Fan disable. It allows you to select or not select exclusion of the evaporator fans during defrosting. y = yes; n = no.	[Y/N]
<b>FCO</b>	Fan Compressor OFF. It allows you to select or not select fan lock when compressor OFF (switched off). y = fans active (with thermostat; in response to the value read by the defrost probe, see "FSI" parameter); n = fans off; dc = duty cycle (through "Fon" and "FoF" parameters).	[Y/N/DC]
<b>Fod</b>	Fan open door open. Fans active when the door is open Allows you to select the option of stopping the fans when the door is open, and re-starting the fans when door is closed (if they were active). n=fans stop; y=fans unchanged	[Y/N]
<b>FdC</b>	Fan delay Compressor off. Fan switch off delay dime after compressor stop. In minutes. =0 function excluded	[0.. 99 min]
<b>Fon</b>	Fan on (in duty cycle). Time the fans are ON in a duty cycle. Use of fans in duty cycle mode; valid for FCO = dc and H42=1 (evaporator probe present)	[0.. 99 min]
<b>FoF</b>	Fan off (in duty cycle). Time the fans are OFF in a duty cycle. Use of fans in duty cycle mode; valid for FCO = dc and H42=1 (evaporator probe present)	[0.. 99 min]
ALARMS (folder with "AL" label)		
<b>Att</b>	Alarm type. Parameter "HAL" and "LAL" modes, as temperature absolute values or as differential compared to the Setpoint. 0 = absolute value; 1 = relative value.	[0.. 1]
<b>AFd</b>	Alarm dIfferential. Alarm differential.	[1.0.. 50.0 °C/°F]
<b>HAL (5)</b>	Higher ALarm. Maximum temperature alarm. Temperature value (with regard to Setpoint, or as an absolute value based on Att) which if exceeded in an upward direction triggers the activation of the alarm signal. See Max/Min. Alarm Diagram;	[LAL...150.0 °C/°F]
<b>LAL (5)</b>	Lower ALarm. Minimum temperature alarm. Temperature value (with regard to Setpoint, or as an absolute value based on Att) which if exceeded in a downward direction triggers the activation of the alarm signal. See Max/Min. Alarm Diagram;	[-50.0...HAL °C/°F]
<b>PAO (1) (8)</b>	Power-on Alarm Override. Alarm exclusion time after instrument switch on, after a power failure.	[0.. 10 hours]
<b>dAO</b>	defrost Alarm Override. Alarm exclusion time after defrost.	[0.. 999 min]
<b>AOO</b>	Alarm signaling delay after digital input disabling (door open). Alarm is only for high-low temperature alarms.	[0.. 10 hours]
<b>tdO</b>	time out door Open. Time out after alarm signal following digital input disabling (door open)	[0.. 250 min]
<b>tAO (8)</b>	temperature Alarm Override. Temperature alarm signal delay dime.	[0.. 250]
<b>dAt</b>	defrost Alarm time. Alarm signal for defrost end due to time-out. n = does not activate alarm ; y = activates alarm.	[Y/N]
<b>EAL</b>	External Alarm Lock. External alarm to lock loads.	[Y/N]
<b>AOP</b>	Alarm Output Polarity. Polarity of alarm output. 0 = alarm active and output disabled; 1 = alarm active and output enabled.	[0..1]
<b>PbA</b>	Configuring temperature alarm on probe 1 and/or 3. 0 = alarm on probe 1 (thermostation); 1 = alarm on probe 3 (display) ; 2 = alarm on probes 1 and 3 (both thermostation and display); 3 = alarm on probes 1 and 3 (both thermostation and display) on external threshold;	[0.. 3]
<b>SA3</b>	Probe 3 alarm Set-Point (display)	[-50.0..150.0 °C/°F]
<b>dA3</b>	Probe 3 alarm differential (display)	[-30.0.. 30.0 °C/°F]
LIGHTS AND DIGITAL INPUTS (folder with "Lit" label)		
<b>dSd</b>	Enabling light relay by door switch. n = door open, the light does not turn on; y = door open, the light turns on (if it was off).	[Y/N]
<b>dLt</b>	Light relay disabling (switch off) delay (cell light). The cell light will remain on for dLt minutes after closing the door if dSd parameter is set for this.	[0.. 31 min]
<b>OFL</b>	Light switch always disables light relay; enable use of light switch for switching off even if the delay after closing the door is enabled (set by dLt)	[Y/N]
<b>dOd</b>	digital input switches off loads. On digital input command, programmed as the door switch, all loads may be stopped when the door is opened and re-started when the door is closed.	[Y/N]
<b>dAd</b>	loads digital input enabling delay.	[0.. 255 min]

<b>(FOR /CK MODELS ONLY) LINK REGULATOR (folder with "Lin" label)</b>		
L00	Allows selection of the instrument as Master (0), Slave (from 1 to 7), Echo(0, in this case the Echo is a repeater of the Master even if connected to a Slave)	[0.. 7]
L01	Referred to the Master only. Number of Slaves in the network (from 0 to 7). For Slaves/Echoes leave the value =0	[0.. 7]
L02	Presence of local Echoes referred to the single Slave. 0 = local Echo not present; 1 = local Echo present sharing the Slave view at fixed intervals; if Master or Slave identifies that the device is active, and shares in the network, at fixed intervals it's local view. 2 = Echo shows the display of the Slave associated (Slave and associated Echo should have the same L00 address)	[0.. 2]
L03	Referred both to Master and Slave. Simultaneous/sequential defrosting. Master: n = simultaneous; y = sequential. Slave: n = ignore; y = accept.	[Y/N]
L04	Referred to Slave only. n = The Slave shows local values; y = The Slave shows the display of the Master	[Y/N]
L05	Referred both to the Master and the Slave. Master: n = does not ask Slaves to activate remote functions; y = asks Slaves to activate remote functions. Slave: n = ignores remote functions activation; y = accepts remote functions activation.	[Y/N]
L06	Locks resources (compressors, fans, etc) at the end of defrosting. n=no; y=yes PLEASE NOTE: related to ddd parameter which as the priority on this parameter (see)	[Y/N]
<b>(FOR /C /CK MODELS ONLY) NIGHT/DAY REGULATOR (folder with "nad" label)</b>		
E00	Functions disabled during events: 0 = management disabled; 1 = reduced set; 2 = reduced set+light; 3 = reduced set+light+aux. 4= instrument off	[0.. 4]
E01	Event start hours/minutes. Sets the event start time. Starting from this time the "night" mode will be enabled. The length is determined by E02 parameter	[0.. 23/0.. 59 hours/min]
E02	Event duration. Set the event length (type of event, see E00)	[0.. 99 hours]
E03	Enabling daily or holiday defrosting lock. (0= "workdays" defrost sequence defined by d0...d8; 1= "holiday/sunday" defrost sequence defined by F0...F8) <b>PLEASE NOTE: doesn't affect defrosting at intervals as an Every Day event (same defrost schedule for working days/holidays)</b>	[0/1]
<b>COMMUNICATION (folder with "Add" label)</b>		
dEA (!)	dEvice Address. Device address: indicates the appliance address to the management protocol.	[0.. 14]
FAA (!)	FAmily Address: indicates the appliance family to the management protocol.	[0.. 14]
LOC	DISPLAY (folder with "dis" label) (keyboard) LOCK. Keyboard locking. It is still possible to enter parameter programming mode and modify parameters, including the status of this parameter, in order to allow keyboard unlocking. y = yes; n = no.	[Y/N]
PA1	PAssword 1. When enabled (value different from 0) it represent the access key for level 1 parameters.	[0.. 250]
PA2***	PAssword 2. When enabled (value different from 0) it represents the access key for level 2 parameters.	[0.. 255]
ndt	number display type. Display with decimal point. y = yes; n = no.	[Y/N]
CA1	CAlibration 1. Calibration 1. Positive or negative temperature value added to the value read by probe 1, based on "CA" parameter settings.	[-12.0.. 12.0°C/°F]
CA2	CAlibration 2. Calibration 2. Positive or negative temperature value added to the value read by probe 2, based on "CA" parameter settings.	[-12.0.. 12.0°C/°F]
CA3	CAlibration 3. Calibration 3. Positive or negative temperature value added to the value read by probe 3, based on "CA" parameter settings.	[-12.0.. 12.0°C/°F]
CA	CAlibration Intervention. Intervention on display offset, thermostat offset or both. 0 = modifies the temperature displayed only; 1 = adds to the temperature used by regulators, not to the temperature displayed, which stays unchanged; 2 = adds to the temperature displayed that is also used by regulators.	[0/1/2]
LdL	Low display Label. Minimum value the instrument is able to display.	[-55.0.. 302]
HdL	High display Label. Maximum value the instrument is able to display.	[-55.0.. 302]
ddL	defrost display Lock. Display mode during defrosting. 0 = shows the temperature read by the thermostat probe; 1 = locks the reading on the temperature value read by thermostat probe when defrosting starts, and until the next time the Setpoint value is reached; 2 = displays the label "deF" during defrosting, and until the next time the Setpoint value is reached (or until Ldd time-out).	[0/1/2]
Ldd	Lock defrost disable. Time-out value for delock display (DEF label) if reaching the setpoint is too long during defrosting, or if the Link (Master-Slave) communication fails (E7 error)	[0.. 255 min]
dro	display read-out. Select °C or °F to display the temperature read by the probe. 0 = °C, 1 = °F. PLEASE NOTE: switching between °C and °F DOES NOT modify setpoint, differential, etc. (for example set=10°C become 10°F).	
ddd	Selection of the value type to be shown on the display. 0 = Setpoint; 1 = probe 1(thermostat); 2 = probe 2(evaporator); 3 = probe 3 (display).	

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## ID983-985 LX (Continued)

CONFIGURATION (folder with "CnF" label)		
H00 (1)	(1) Probe type selection, PTC or NTC. 0 = PTC; 1 = NTC.	[0/1]
H02	Time to enable keys, if these are configured for a second function. For ESC, UP and DOWN keys configured for a second function (defrost, aux, etc) it set the elapsed time for the rapid activation of the corresponding function. aux function has a fixed time of 1 second	[Y/N]
H06	key/input aux/door switch light active when instrument is off (but power is on)	[0/1/2]
H08	Stand-by operating mode. 0=display switch off; 1= display on and loads stopped; 21= display off and loads stopped;	
H11 (7)	Configuring digital inputs/polarity. 0= disabled; 1 = defrosting; 2 = reduced set; 3 = auxiliary; 4 = door switch; 5 = external alarm. *6 = disable store HACCP alarms (*only in HACCP models) 7 = stand-by (ON-OFF) 8 = maintenance requested	[-8.. 8]
H12 (7)	Configuring digital inputs/polarity. The same as H11. 0 = disabled; (7) WARNING! positive or negative values change polarity	[-8.. 8]
H21 (1)	Digital output 2 configurability. (B) 0 = disabled; 1 = compressor; (default) 2 = defrosting; 3 = fans; 4 = alarm; 5 = auxiliary. 6 = stand-by 7 = light 8 = maintenance requested 9 = defrost on 2nd evaporator	[0.. 9]
H22 (1)	Digital output 1 configurability. (A) The same as H21. (2= defrosting; default)	[0.. 9]
H23 (1)	ONLY ID 985LX(/C/CK) Digital output 3 configurability. (C) The same as H21. (3= fans; default)	[0.. 9]
H24 (1)	ONLY ID 985LX(/C/CK) Digital output 4 configurability. (D) (9) The same as H21. (4= alarm; default)	[0.. 9]
<b>PARAMETER VISIBLE IN MODELS WITH BUZZER.</b>		
H25 (1)	Buzzer configuration. (if present) 0 = disabled; 8= enabled (default); 1-7= not used	[0.. 8]
H31 (1)	UP key configuration. 0 = disabled; 1 = defrosting; 2 = auxiliary; 3 = reduced set point (economy). *4 = reset HACCP alarms (*in HACCP models only) *5 = disable HACCP alarms (*in HACCP models only) 6 = light 7 = stand-by 8 = maintenance required	[0.. 8]
H32 (1)	DOWN key configuration. Same as H31. (0= disabled; default)	[0.. 8]
H33 (1)	ESC key configuration. Same as H31. (0= disabled; default)	[0.. 8]
H41	Control probe presence. n= not present; y= present.	[Y/N]
H42	Evaporator probe presence. n= not present; y= present.	[Y/N]
H43	Display probe presence. n= not present; y= present (display probe ) ; 2EP = present (probe on 2nd evaporator)	[Y/N/2EP]
H45	start defrost type in case of defrost on 2nd evaporator 0= the defrost will be enabled checking if the temperature on the 1st evaporator is lower than dSt; 1= the defrost will be enabled checking if the temperature determined by one of the 2 probes is lower than its end of defrost temperature (dSt for the 1st evaporator, dS2 for the 2nd evaporator) 2= the defrost will be enabled checking if the temperature determined by both probes is lower than the respectively setpoint (dSt for the 1st evaporator, dS2 for the 2nd evaporator)	[0/1/2]
reL	reLease firmware. Device version: read only parameter.	
tAb	tAble of parameters. Reserved: read only parameter.	
<b>label PA2</b> Inside CnF folder it is possible to reach all level 2 parameters from label PA2 by pressing the "set" button SEE 2) level 2 Parameters paragraph		
UL	<b>COPY CARD (folder with "Fpr" label)</b>	
dL	Up load. Programming parameter transfer from instrument to Copy Card.	
Fr	Down load. Programming parameter transfer from Copy Card to instrument. Format. Erases all parameters in the Copy Card. <b>PLEASE NOTE: using "Fr" parameter (Copy Card formatting) the data within the Copy Card will be lost permanently. The operation cannot be cancelled.</b>	

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(1) see Duty Cycle diagram  
 (2) Positive values: active input when the contact is closed; negative values: 1= Active when contact is open  
 (3) This parameter is visible in versions with optional buzzer.  
 (5) If alarm are relative, the HAL parameter must be set to positive values and the LAL parameter to negative values  
 (6) Within the deF folder two folders: "dd" (daily defrost) and "Fd" (Holiday Defrost); the first folder includes de1...de8 parameters (working day defrost start); the second folder, instead includes F1...F8 parameters (Holiday defrost). The two folders are visible only if dit =3 and RTC is present.  
**PLEASE NOTE: DO NOT CONFUSE d0...d6 (days in nad folder) with d01...d08 (daily/working days start time defrost)**  
 (7) WARNING! positive or negative values change polarity  
 (8) Referred exclusively to high and low temperature alarms  
**(9) Example: set H24=9 to manage defrost on 2nd evaporator**  
 \* VALUE column: to be filled in manually, with custom settings (if different from the default value).  
 \*\* LEVEL column: indicates the level of visibility for parameters that can be accessed by a PASSWORD (see the related paragraph)  
 \*\*\*\* PA2 is visible (it will be requested, if specified) at level 1 in CnF folder and can be set (it can be modified) at level 2 in diS folder

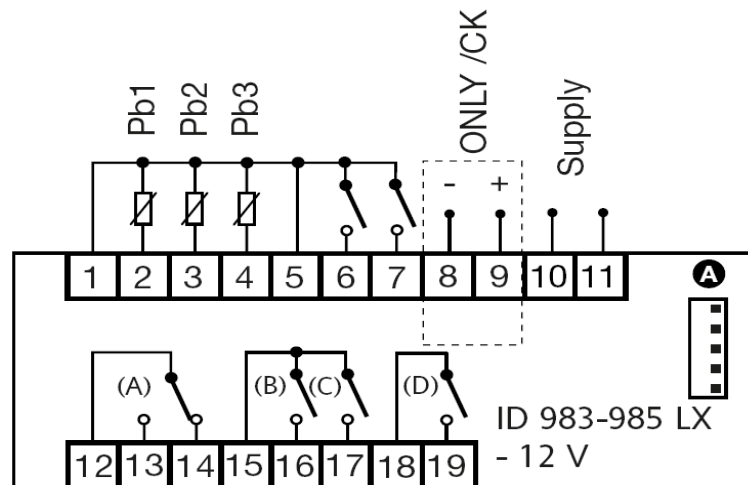
**(!) WARNING!**  
 • If one or more of these parameters highlighted with (!) are modified, the controller must be switched off and switched on again to ensure correct operation.  
 • In any case, it is strongly recommended that you switch the controller off and switch it on again any time parameters have been changed to prevent malfunctioning on configuration and/or timing underway.  
 • folder with "nad" label NIGHT/DAY REGULATOR: ONLY FOR /C /CK MODELS  
 • folder with "Lin" label LINK REGULATOR: ONLY FOR /C /CK MODELS  
 • parameters H23-H24 : ONLY FOR ID 985LX(/C/CK) MODELS  
 • The models ID 983LX M - ID 985LX M do not support 2nd evaporator : the related parameters and functions are not available.

**Duty Cycle Diagram**

Ont, OFt parameters programmed for Duty Cycle

ont	OFt	output compressor
0	0	OFF
0	>0	OFF
>0	0	ON
>0	>0	dc

When the sensor detects an error condition:  
 • the code E1 is displayed  
 • the regulator is activated as indicated by the "Ont" and "OFt" parameters if programmed for the duty cycle:



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