

## 1. CAUTION :

- 1.1 Before wiring, please make sure that power is switched off to prevent from getting electric shock.
- 1.2 The product should be avoided to install at humid environment.
- 1.3 To prevent the controller burning out, please make sure the water - proof procedure is undertaken during installation.
- 1.4 Before supplying the power, please always check if the wiring and input power is connected correctly.
- 1.5 Please install according to the wiring diagram, in order to avoid incorrect wiring.
- 1.6 Please always read this in struction carefully before installation. This product is beyond our warranty if any damage is caused by incorrect wiring.

## 2. SPECIFICATION :

- 2.1 Front panel size : 34.5mm ( H ) × 76mm ( L ) ± 2mm
- 2.2 Mounting hole size : 30mm ( H ) × 72mm ( L ) × 85mm ( D ) ± 1mm
- 2.3 Operating environment temperature : -5°C ~ 55°C, < 90%RH ( non - condensing )
- 2.4 Storage environment temperature : -10°C ~ 65°C, < 90%RH ( non - condensing )
- 2.5 Power supply : AC230V ± 10%, single phase 50 / 60Hz
- 2.6 Power consumption : Max. 10 watts ( Controller only )
- 2.7 Temperature sensing / display range : -40°C ~ 70°C, accuracy ± 1 °C, in 0.5°C step.
- 2.8 Output / Input :
  - 2.8.1 Sensor : 2 sets of NTC sensors 1.5m ( L )
  - 2.8.2 Compressor output contact : 7 (3)A / 230VAC
  - 2.8.3 Fan output contact : 3 (1) A / 230VAC
  - 2.8.4 Defrost output contact : 7A / 230VAC
  - 2.8.5 Alarm output : One built - in Buzzer

## 3. FUNCTION :

### 3.1 Button operation :

- 3.1.1 Setup mode : In power on status, press and hold **[Set]** for 3s to enter setup mode, display showing "tS".
  - 3.1.1.1 View parameter values : when parameter code is shown on display, press **[Set]** to view parameter value.
  - 3.1.1.2 Select parameter code : When parameter code is shown in display, press **[▲]** or **[▼]** key to select other parameter codes.
  - 3.1.1.3 Parameter adjustment : When parameter value is displayed or under rapid setup mode, press **[▲]** or **[▼]** to adjust parameter value. Whenever there isa switch in °C and °F readout, the controller will restore to their default values.
- 3.1.2 Rapid setting : In power on status, press and hold **[▼]** for 3 seconds to enter rapid setting mode.
- 3.1.3 Enable / Disable defrost manually : In power on status, press and hold **[▲]** and **[▼]** simultaneously for 3 seconds to enable / disable defrost manually.
- 3.1.4 Parameter lockup : In normal status, press **[Set]** and **[▼]** simultaneously for 3 seconds to lock or unlock parameter values. After lockup, all parameter values can not be adjusted except "tS".
- 3.1.5 Enable / Disable Buzzer alarms : When alarms is ON, press **[▼]** to disable alarm output; Press **[▼]** again to enable alarm output if failure / malfunction has yet to be eliminated.
- 3.1.6 Restore default values : Press **[▲]** and **[▼]** simultaneously before power is supplied to restore default values, display showing "rS". After loading default values, the controller reboots.
- 3.1.7 Indoor temperature record : In power on status, press **[Log]** to view max. temperature or min. temperature record, the display will return to display current cabinet temperature after 5s. Press and hold **[Log]** for 3s, max. and min. temperature record will be eliminated and they will be both recorded as current temperature.

### 3.2 Functions :

#### 3.2.1 Compressor operation :

- 3.2.1.1 Compressor stops operating whenever indoor temperature reaches the setpoint ( tS ); the compressor operates when indoor temperature rises up to setpoint ( tS ) + temperature differential ( td ).
- 3.2.1.2 Compressor delay protection can be set by parameter "AC". The delay time begins to count down whenever compressor is ready to operate; the compressor would not operate if delay time is not run out. When power is supplied, the compressor will still delay 1 minute to operate.
- 3.2.1.3 Defrost by hot gas ( dO = 1 ) :
  - 3.2.1.3.1 When it begins to defrost, defrost output will activated for 30s prior to compressor is enabled.
  - 3.2.1.3.2 when the defrosting completed, defrost output will terminated for 30s prior to compressor is enabled based on temperature.
  - 3.2.1.3.3 Drop period ( dr ) : Compressor will not operate if draining period has yet.



#### 3.2.2 Defrost operation :






- 3.2.2.1 To activate defrosting :
  - 3.2.2.1.1 Defrost automatically : When compressor operation duration reaches ( dF - dt ), it begins to defrost, however, if it is under defrosting by manual at that time, "dt" ( defrost period ) will not be recounted.
  - 3.2.2.1.2 Enable defrosting manually will not interfere the interval of defrost cycles.
  - 3.2.2.1.3 While defrosting is activated, it begins to count down "dt" ( defrost period ).
  - 3.2.2.1.4 The controller will reiterate defrost cycle and defrost period continuously when it finished the whole round.
  - 3.2.2.1.5 Defrosting can be only enabled once at the same defrost cycle.
- 3.2.2.2 Defrost termination :
  - 3.2.2.2.1 Defrosting terminates when defrost period " dt" has been completed.
  - 3.2.2.2.2 Disable defrosting manually will not interfere the interval of defrost cycles.
  - 3.2.2.2.3 Defrosting terminates automatically when failures ( EE, E1, E2 ) occurred.
  - 3.2.2.2.4 When the temperature of evaporator ≥ dS, the defrost will be terminated.
- 3.2.2.3 Defrost by hot gas ( dO = 1 ) :
  - 3.2.2.3.1 When it is ready for defrosting, compressor output will be disabled. "dt" ( defrost period ) begins to count down. after 30s, defrosting output will be enabled. After another 30s, compressor output will be enable again.
  - 3.2.2.3.2 When defrosting is completed, defrosting output will be disabled, it begins to count down the drop period "dr".
- 3.2.2.4 Defrost by heater ( dO = 0 ) :
  - 3.2.2.4.1 When it is ready for defrosting, compressor output will be disabled, defrosting output will be enabled. it begins to count down the defrosting period "dt".
  - 3.2.2.4.2 When defrosting is completed, defrosting output will be disabled, it begins to count down the draining time "dr".
- 3.2.2.5 Whenever "dF" or "dt" has been eset, the new valued will be activated in next defrost cycle.
- 3.2.2.6 Any alarms for failures/malfunction will not interfere the defrosting cycle.

#### 3.2.3 Fan operation :




- 3.2.3.1 During defrosting, fan output will be disabled.
- 3.2.3.2 Under EE, E1, E2 status, fan output will be enabled constantly.
- 3.2.3.3 When temperature of evaporator ≥ fan motor stop temp. ( Ft ), fan output will be disabled.
- 3.2.3.4 If drop period has not completed, the fan output will not be enabled.
- 3.2.3.5 Fan mode ( FC = 0 )
  - 3.2.3.5.1 If compressor output is enabled, the fan output will be enabled.
  - 3.2.3.5.2 If compressor output is disabled, the fan output will be disabled.
- 3.2.3.6 Fan mode ( FC = 1 ) : When temperature of evaporator < fan motor stop temp. ( Ft ), fan output will be enabled.

### 3.2.4 Parameter setup :

3.2.4.1 Parameter selection : Press  or  key to select parameter codes in sequence tS, td, dF, dt, AU, AL, HS, LS, Ad, AC, Cr, CS, Ot, dS, Ft, dr, dO, FC, dL, OU.

3.2.4.2 Display or reset parameter values : Press  to display parameter values while parameter code is displayed. Parameter value will be increasing or decreasing by holding  or  key. Press  again to save parameter values and return to parameter code display. Select "OU" and then press  to save new values and exit parameter setting to normal operation mode.

3.2.4.3 Setup mode would be ended and save parameter values without any key pressed within 15s and return to normal operation mode.

3.2.5 Rapid setup : when "tS" values blinks in display, press  or  key to reset "tS" value, press  key again or press no keys in 5s, the controller will save the new value and return to normal operation mode.

3.2.6 Lock parameter : Parameter can't be reset after being locked, but "tS" can be adjusted. When the display shows "LC", it means parameter has been locked; "UL" means parameter is unlocked.

3.2.7 Indoor temp. lockup ( dL ) : When it is defrosting, under the condition dL = 1, indoor temperature on display will be fixed. When defrosting has completed and indoor temperature reaches the setpoint, current cabinet temperature will begin to be displayed on LED panel.

3.2.8 Max. and min. cabinet temperature record :

3.2.8.1 When cabinet temperature first time  $\leq$  setpoint ( tS ), the controller begins to record max. & min. indoor temperature.

3.2.8.2 Power failure will not harm for indoor temperature record, after power is supplied, temperature record will be recalled by controller's memory.

3.2.9 Parameter memory : If power failure happens, the controller will operate according to previous parameter values after power is supplied again.

3.2.10 Restore default values : The display will be showing "rS", the controller reboots in 5s.

3.2.11 Probe calibration ( Ot ) : When there is an aging or inaccuracy occurred on indoor sensor, users can take this advantage to adjust temperature to a precise temperature.

3.2.12 Abnormal temperature alarm : Alarm starts when indoor temperature exceeds "AU" or drops below "AL".

3.2.13 Circuit board protection : Whenever the temperature of circuit board is out of 95°C, the controller will disable output contacts compulsively, showing "tA" in display and enabling alarms. Once the temperature of circuit board drops below 75°C, "tA" will be released.

### 3.3 LED indicators :

3.3.1 "Comp." compressor indicator .

3.3.1.1 The LED is illuminated constantly when compressor is operating.

3.3.1.2 The LED is blinking for 0.5 second and off for another 0.5 second when compressor is in delay protection

3.3.1.3 The LED is off when the compressor is in stand-by status or in setting mode.

3.3.2 "Defr." defrost indicator

3.3.2.1 The LED is blinking for 0.5 second and off for another 0.5 second when under the defrost mode and there is no any instruction for defrost output.

3.3.2.2 The LED is illuminated constantly when under the defrost mode and defrost output is in the action.

3.3.2.3 The LED is off when under the mode of setting parameter.

3.3.3 "Fan" fan indicator : The LED is illuminated constantly when fan output is in the action. The LED is off when in fan setting mode, or fan output is off.

## 4. FAILURE ELIMINATION :

4.1 Alarm codes :

4.1.1 "UA" indicates indoor temperature  $\geq$  AU ( max. temperature for alarm ), UA and indoor temperature shown on the display alternately.

4.1.2 "LA" indicates indoor temperature  $\leq$  LA ( min. temperature for alarm ), LA and indoor temperature shown on the display alternately.

4.1.3 "tA" indicates circuit board temperature  $\geq$  95°C, and the display shows "tA".

4.2 Error codes : The compressor operates according to Cr / CS cyclically ( When Cr and CS = 0, the compressor operates continuously ).

4.2.1 "EE" indicates memory failure. Please re - supply the power first. If cannot eliminate this failure, please send this faulty controller back to factory.

4.2.2 "E1" indicates indoor probe failure. Please check if probe is in error or replace a new one.

4.2.3 "E2" indicates evaporator probe failure. Please check if probe is in error or replace a new one.

4.2.4 "E3" indicates circuit board probe failure. Please send this faulty controller back to factory.

## 5. PARAMETER LIST :

Code	Function	Range		Default	Unit	Description
		Min	Max			
tS	Setpoint	LS	HS	-18	°C	Compressor stops when it reaches the setpoint.
td	Temp. differential	0.5	10	4	°C	Compressor will start to operate when the temp. = tS + td .
dF	Defrost cycle	0	99	6	hr	Set the interval between defrost cycles ( Including defrost time ).
dt	Defrost period	1	55	30	min	Defrost duration is subject to the present defrost time. Defrost is terminated when defrost time is enough or evaporator temp. $\geq$ dS. Defrost is not performed when dt = 0 or when operation duty is finished but evaporator temp. $\geq$ dS. To start or stop defrost manually is available.
AU	Max.temp. for alarm	AL+1	70	45	°C	This function is available when first time cabinet temp. reaches setpoint. When cabinet temp. $\geq$ AU, UA and cabinet temp. are displayed alternately.
AL	Min.temp. for alarm	-40	AU-1	-40	°C	This function is available when first time cabinet temp. reaches setpoint. When cabinet temp. $\leq$ AL , LA and cabinet temp. are displayed alternately .
HS	Max. setpoint	tS	60	25	°C	To limit the max. setpoint.
LS	Min. setpoint	-40	tS	-30	°C	To limit the min. setpoint. ( Compressor should be capable of LS )
Ad	Alarm delay	0	60	15	min	When Ad = 0 , alarm acts without any time delay .
AC	Compressor delay protection	0	30	1	min	Interval time between compressor stop operation and restart as a compressor protection.
Cr	Compressor operation period under any failure	0	60	15	min	When Cr = 0, compressor is always off when under EE, E1 and E2 failures .
CS	Compressor termination period under any failure	0	60	15	min	With CS = 0 , compressor is always on when under EE, E1 and E2 failures .
Ot	Probe calibration	-12	12	0	°C	Indoor temp. display = temp. of indoor probe + temp. calibration .
dS	Defrost stop temp.	0	70	20	°C	During defrost period , when evaporator temp. $\geq$ dS , defrost is terminated to avoid the damage of the storage.
Ft	Fan motor stop temp.	0	70	15	°C	When the evaporator temp. $\geq$ Ft, fan stops operating.
dr	Drop period	0	60	0	min	Set the drop period at the end of defrost. Compressor is off during this period.
dO	Defrost mode	0	1	0		When dO = 0, defrosting by heater. When Do = 1, defrosting by hot gas.
FC	Fan mode	0	1	1		When FC = 0, fan operates according to compressor. When FC = 1, fan operates continuously.
dL	Indoor temp. lockup	0	1	0		When dL=0, cabinet temp. shows normally during defrost period. When dL=1, cabinet temp. is locked and fixed.
OU	Exit	-	-	-		Exit setting mode.