TC3Y

DIN W72×H36mm Freezing/Defrost type

Features

- ON/OFF Control
- Input specification Basic specification: NTC(Thermistor), Option: RTD(DPt100Ω)
- Temperature display range
 NTC sensor type: -40.0 to 99.9°C(40 to 2)
 - NTC sensor type: -40.0 to 99.9°C(-40 to 212°F) RTD sensor type: -99.9 to 99.9°C(-148 to 212°F)
- Supports various delay functions for utilize freezing Auto/Manual Defrost selection function, Start-up delay of compressor, Re-operation delay, Minimum ON time, Delay of defrost-end, Operation delay of evaporation-fan
- Input correction function
- Enable to set operation period for protecting compressor in error.

Please read "Caution for your safety" in operation manual before using.



Ordering information

C 3	YF]-[1	Control output		
			Control output	R	Relay output
			Power supply	1	12-24VDC
				4	100-240VAC 50/60Hz
			Control output type	1	Compressor output
		Ľ		2	Compressor+Defrost output
		Control mode	0	3	Compressor+Defrost+Evaporation output
		Control mode	-	F	Freezing control
	Size			Υ	DIN W72×H36mm
-	igit			3	999(3digit)
Item				TC	Temperature Controller

Specifications

<u>-</u> 3þ	ecilications						
Model		TC3YF-11R ^{*1}	TC3YF-14R*1	TC3YF-21R	TC3YF-24R	TC3YF-31R	TC3YF-34R
Power supply		12-24VDC	100-240VAC 50/60Hz	12-24VDC	100-240VAC 50/60Hz	12-24VDC	100-240VAC 50/60Hz
Allowabl	le voltage range	90 to 110% of rat	ed voltage		•		
Power c	onsumption	Max. 8W	Max. 4VA	Max. 8W	Max. 4VA	Max. 8W	Max. 4VA
Display	method	7 Segment(red) LED method					
Characte	er size(W×H)	7.4×15.0mm					
Indicatio	n range	NTC: -40.0 to 99.9°C(40 to 212°F), RTD: -99.9 to 99.9°C(-148 to 212°F)					
Display	accuracy	(PV ±0.5% or ±1°	C, select the high	er one) rdg ±1dig	it		
Samplin	g period	0.5sec.					
Input se	nsor ^{**2}	NTC: Thermistor, RTD: DPt 100Ω					
Input line	e resistance	Allowable line resistance is max. 5Ω per a wire					
Control	method	ON/OFF control(adjustment sensitivity 0.5 to 5.0°C, 2 to 50°F variable)					
Control output		Compressor outp (250VAC 5A 1a)	out		out (250VAC 5A 1a) 250VAC 10A 1a)		put (250VAC 5A 1a 250VAC 10A 1a) output (250VAC 5A 1
Memory protection		Approx. 10 years(when using non-volatile semiconductor memory)					
Insulation resistance		Min. 100MΩ(at 500VDC megger)					
Dielectri	c strength	2,000VAC 60Hz for 1 minute(between all external terminal and case)					
Noise resistance		±2kV R-phase, S-phase the square wave noise (pulse width: 1us) by the noise simulator					
Relay	COMP	Mechanical: Min. 20,000,000 times, Electrical: Min. 50,000 times(250VAC 5A resistive load)					
life ´	DEF	Mechanical: Min.	20,000,000 times	, Electrical: Min.	100,000 times(250	OVAC 10A resistive	e load)
cycle FAN		Mechanical: Min. 20,000,000 times, Electrical: Min. 50,000 times(250VAC 5A resistive load)					
Vibra-	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz(for 1 min.) in each of X, Y, Z directions for 2 hours					
tion	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz(for 1 min.) in each of X, Y, Z directions for 10 minutes					
Environ- Ambient temperature -10 to 50°C, storage: -20 to 60°C							
ment Ambient humidity		35 to 85%RH, storage: 35 to 85%RH					
Protection	on	Front part: IP65					
Approval		_	c FL us	_	c All us	1—	c Al us
Unit wei	ght	Approx. 143g	•	•	-	*	•

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(A) Photo electric sensor

(B) Fiber optic sensor

(C) Door/Area sensor

(D) Proximity

(E) Pressure sensor

> F) Rotary encoder

(G) Connector/ Socket

(H) Temp. controller

(I) SSR/ Power controller

(J) Counter

(K) Timer

L) Panel neter

(M) Tacho/ Speed/ Pulse meter

(N) Display unit

> ensor ontroller

(P) Switching mode power supply

(Q) Stepper motor& Driver&Controller

(R) Graphic/ Logic panel

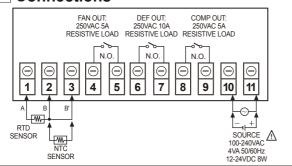
> S) Field network device

T) oftware

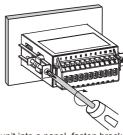
U) Other

 $[\]times$ 2. RTD(DPt100 Ω) type is customizable.

Connections



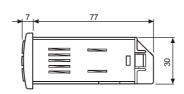
Installations

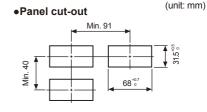


XInsert this unit into a panel, fasten bracket by pushing with tools as shown

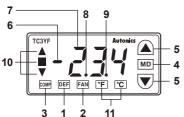
Dimensions







Parts description



- 1. DEF(Defrost output lamp): Light is ON when defrost output is ON.
- 2. FAN(Evaporation-fan output lamp): Light is ON when evaporation output is ON.
- 3. COMP(Compressor output lamp): Light is ON when compressor output is ON.
- 4. MD key: For entering, changing, shifting and saving parameters
- 5. ▼ ▲ key (Setting key: Up/Down): For changing parameters
- 6. -: Displaying minus symbol
- 7. Display process value:

Display a current value (PV) on RUN mode.

Display a parameter and a setting value when setting parameter.

- 8. •(Display a decimal point): Display a decimal point when the time unit is 'Min'
- 9. •(Display a decimal point): Display a decimal point when the temperature unit is '°C'
- 10. Display a deviation(♠, ■, ▼): SV is standard, PV(Present temperature) ♠, ▼(red) / (green)
- 11.Temperature unit(°C, °F): Selectable °C or °F

*When delay time is applied, the output lamp of defrost output, evaporation-fan and compressor is ON simultaneously after the lamp flashes every one second.

Input type and range

Input sensor	Temperature range (°C)	Temperature range (°F)	
RTD(Dpt100Ω)	-99.9 to 99.9	-148 to 212	
Thermistor	-40.0 to 99.9	-40 to 212	

SV Setting

Run mode

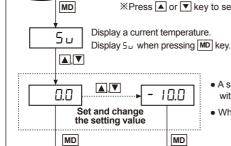
XIf any key is untouched for 60sec., it returns to RUN mode.

*When pressing MD key for displaying setting value, it returns to RUN mode.

※When

▼ key at □.□ , minus values are enable to set.

※Press ▲ or ▼ key to set(change) the value continuously, number is increased(decreased) at high speed.



- A setting value flashes every 0.5 sec., and it is available to change the value with or key.
- When pressing MD key, a setting value is saved and it returns to RUN mode.

Freezing/Defrost type

Parameter 1 group

MD 3 sec

A, **V**

A, **V**

▲, **▼**

▲, **▼**

A, **V**

▲, ▼

lacksquare

1.0

4

30

Π

 $\Omega.\Omega$

40.0

999

0.20

0.20

1.00

50

or

oFF

Run mode

H45

d In

dEE

LBA

пb

L50

H50

Run mode

SdL

ont

d-P

FRn

ΓL

dUL

Unt

LoC MD

MD

↓MD

MD

XIn RUN mode, if Mo key is pressed for 3 sec., it enters into parameter 1 group.

*When entering to parameter 1 group, HE 5 parameter is displayed.

※After checking or changing setting value in each parameter, press

™ key to save and move to next parameter setting.

※Press Mo key for 3 sec. during setting operation, it returns to RUN mode.

Set a hysteresis of compressor output. Set range: 0.5 to 5.0°C(2 to 50°F)

Set a defrosting interval.

Set range: 0 to 24 hours

XIf defrosting interval is set to 0, it is operated as a manual.

Set the time of defrosting operation.

Set range: 0 to 59 min.

XIf defrosting interval is set to 0, it does not operated.

Set monitoring time for loop break alarm

Set range: 0 to 999 sec.

XIf monitoring time is set to 0, LBA does not operated.

Correct an error generated in input sensor. Set range: -10.0 to 10.0°C

Set the low limit value.

Set range: Within the rated temperature range by input sensor

Set the high limit value.

Set range: Within the rated temperature range by input sensor

Parameter 2 group

MD 5 sec ▲, ▼

▲, **▼**

▲, ▼

▲, **▼**

▲, ▼

▲, ▼

▲, ▼

▲, ▼

XIn RUN mode, if M key is pressed for 5 sec., it enters into parameter 2 group.

When entering to parameter 2 group, 5dL parameter is displayed.

XAfter checking or changing setting value in each parameter, press Mo key to save and move to next parameter setting.

※Press MD key for 3 sec. during setting operation, it returns to RUN mode.

Set a start-up delay and re-operation time of compressor.

Set range: 0m10s to 9m59s

Set a minimum ON time to prevent frequent ON/OFF of compressor.

Set range: 0m10s to 5m00s

Set a delay time of defrost-end and evaporation-fan.

Set range: 0m00s to 5m59s

Set the evaporation-fan operation mode.

Set operation interval of compressor in error.

Set range: 0 to 20ms

Set the ON operation ratio(%) of compressor within operation interval in error.

Set range: 0 to 100%

Set a temperature unit.

Set a lock mode.

OFF (T) (I) (I) (I) (I) (I) (I) (I) (I) (I) (I	Е.З
--	-----

	oFF	Unlocks
	L C.2	Locks parameter 1, 2 group
_	LE.I	Locks parameter 2 group
	L C.3	Locks parameter 1, 2 group, temperature SV setting

Factory default

Parameter 1 group

Parameter	Factory default	Parameter	Factory default
H95	1.0	Ind	0
din	Ч	L5u	- 40.0
dEt	30	Н5 о	99.9
LЬЯ	0	When NTC sensor	input unit is °C

Parameter 2 group

Parameter	Factory default	Parameter	Factory default
5dL	0.2.0	CLE	0
ont	0.2.0	dUE	50
drP	1.00	Unt	٥٢
FAn	EF I	LoC	oFF
-			

(A) Photo electric sensor

(B) Fiber optic sensor

(C) Door/Area

(D) Proximity

(E) Pressure

(I) SSR/ Power controller

(J) Counter

(M) Tacho/ Speed/ Pulse meter

(N) Display unit

(P) Switching mode powe supply

motor& Driver&Co

(R) Graphic/ Logic panel

(S) Field network device

(U) Other

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Function and operation

○ Hysteresis [H 5]

- It executes ON/OFF control and controls compressor output.
- The compressor can be damaged by frequent ON/OFF cycle at setting value. Therefore it can establish Hysteresis between activation temperature and deactivation temperature to prevent the compressor.
 - Ex) If TC3YF is established as setting temperature (SV) as -20°C, hysteresis[HY5] as 1.0, the compressor output is ON when it is reached -19°C and it is OFF when it is reached -21°C.
- ※In ON/OFF control, the temperature is lower than SV, the output is OFF and it is ON when it is higher and it is also designated as dual position control.
- ※The setting range of hysteresis is 0.5 to 5.0°C (2 to 50°F).

It corrects an error generated by temperature sensor inputted from external.(set range: -10.0 to 10.0°C / -18 to 18°F)

Ex) When room temperature is -18°C, the display temperature of temperature controller is -20°C, set the input correction [r nb] value as 2.0, it is corrected as -18°C.

O Defrost

When compressor is operated for a long time, the efficiency is lowered by the frost evaporator and freezer built in. A defrost designates to remove frost and ice around the evaporator.

Heating defrost(Auto defrost)

Mount a heater next to an evaporator and operate it with defrost interval [dl n] and time [dE t] of temperature controller, removing frost and ice.

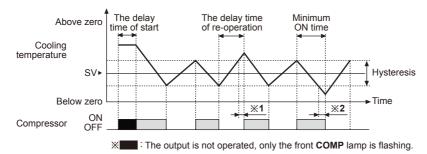
Manual defrost

Manual defrost function operates to defrost by pressing \blacktriangle key for 3 sec. in any time. It ignores defrost cycle and operates defrost during the set time. The set defrost cycle value is not cleared.

- ※Press ▲ key for 3 sec. and it operates defrost during the set defrost time.
- ※Press ▼ key for 3 sec. it switches manual defrost to auto defrost.(At the OFF of defrost output, defrost cycle starts again.)
- *When defrost interval is set to "00", it is only operated as manual defrost.
- When it used as manual defrost, compressor output and evaporation-fan output are OFF when the defrost output is ON.
- ※The setting range of defrost interval [dl n] is 0 to 24 hours and defrost time [dEL] is 0 to 59 min.

Cooling(Compressor) operation

Temperature control: Keep the setting temperature by repeating ON/OFF operation in the range of hysteresis.



• The delay time of start-up and re-operation [5dL]

1) Delay of start-up

- : When applying the power again on a compressor after power is failed, the compressor will be overloaded.

 In this case, delay of start-up prevents curtailing of the life cycle of a compressor. The setting range is 0m10s to 9m59s.

 **The output lamp is ON simultaneously after the lamp flashes every one second during delay time.
- 2) Delay of re-operation
 - : It does not operate within delay time of re-operation after compressor turned OFF to prevent frequent ON/OFF. The setting range is 0m10s to 9m59s.
- X1: For delay time of start-up, compressor output is OFF even when PV is lower than SV. It is turned ON after delay time of re-operation is over.

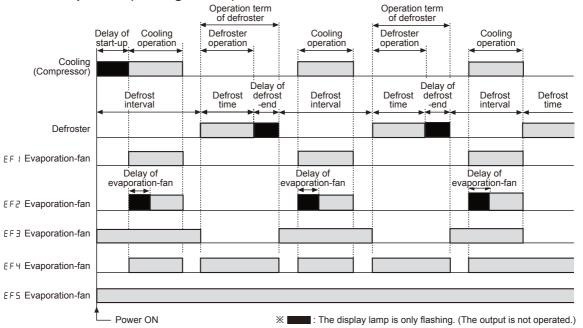
■ Minimum ON time [ont]

Set a minimum ON time to prevent frequent ON/OFF. (set range: 0m10s to 5m00s)

X2: Compressor output is ON even when PV is lower than hysteresis. It is turned to OFF after the minimum ON time is over.

Freezing/Defrost type

O Defrost operation(Heating defrost)



● Defrost interval [dl n]

It starts to defrost for relevant interval. The setting range is 0 to 24 hours. When the defrost interval is set to "00", it is only operated as manual.

Defrost time [dEŁ]

The defroster (heater) is ON during defrost time. The setting range is 0m to 59m.

The delay time of defrost-end / evaporation-fan operation [Dripping Time: dr P]

1)The delay time of defrost-end: It is the time for draining remained drops. After the delay time is over, compressor starts operating. (The setting range: 0m00s to 5m59s)

2)The delay time of evaporation-fan operation: To improve the efficiency of cooling system, the operation of evaporation fan is delayed until evaporation plate gets frozen after compressor operating.

(The setting range: 0m00s to 5m59s)

**The delay time of defrost-end and evaporation-fan operation are applied with one setting time.[dr P]

*When the delay time of defrost-end is finished, defrost is discontinued and defrost interval is repeated.

*The output lamp is ON simultaneously after the lamp flashing every one second during the delay time.

© Evaporation operation mode [FAn]

- Operation mode 1 [EF 1]: It operates same as cooler.
- Operation mode 2 [E F 2]: It operates after the delay time of evaporation-fan operation. OFF during defrost operation.
- Operation mode 3 [EF3]: It is started when the power is applied and only operated during the defrost interval. (It does not any influence upon the freezer.)
- Operation mode 4 [EF4]: The evaporation-fan operates only in the operation term of freezer or defrost, it is OFF when compressor and defroster are stopped.(It is used to control the above zero temperature.)
- Operation mode 5 [EF5]: It is started when the power is applied and it works until the power is failed.

© Error

Err mark and content are flashing every 0.5 sec. when error is occurred.

Err / oPn	Input sensor is disconnected
Err/LBA	Input sensor is normal or freezer temperature is not changed over 1.0°C(°F) for observation time(LbA) of loop break.
Err / LLL	Process temperature (PV) is lower than the display range
Err / HHH	Process temperature (PV) is higher than the display range

*The error display of pPa, LLL, HHH disappears after the abnormal factors are cleared. (Sensor connection/returning to the display range)

(A) Photo electric sensor

(B) Fiber optic sensor

(C) Door/Area sensor (D) Proximity

(E) Pressure

(F) Rotary encoder

(G) Connector/

(H)

(I) SSR/ Power

(J) Counter

(K) Timer

> L) Panel neter

(M) Tacho/ Speed/ Pulse

(N) Display unit

>)) ensor ontroller

(P) Switching mode power supply

(Q) Stepper motor&

motor& Driver&Controll

Graphic/ Logic panel

(S) Field network device

T)

(U) Other

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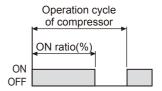
Operation cycle [[LE] / ON duty ratio of compressor in error [dUE]

When an error occurs, repeats ON/OFF operation based on setting values of operation cycle[ELE] and ON duty ratio[dUE] of second setting group to protect the inside of the compressor. This is repeated until error is removed.

**The setting range of operation cycle: 0 to 20 min, The setting range of ON duty ratio: 0 to 100%
Compressor

When operation cycle of compressor is "0", it keeps OFF status in error.
The ON duty ratio [d ⊔ t] is not displayed in error.

**The duty ratio of compressor ON is "100", it keeps ON status in error.



○ Loop Break Alarm (LBA)

When the cooling temperature is not changed over $1.0^{\circ}\text{C}(2^{\circ}\text{F})$ during monitoring time set at loop break alarm[$\lfloor LB \rceil$] parameter, it is regarded as abnormal operation. It displays E_{CC} and $LB \cap B$ every 0.5sec. and the compressor output repeats ON/OFF by the operation cycle[LLE] and ON duty ratio [BLE] setting in error.

Check a compressor and press , veckeys for 3 sec. at the same time and error display is cleared. It operates normally. When set value of LBA is set as "0", LBA function does not operate.(LBA set range: 0 to 999 sec.)

Proper usage

- Please beware not to exceed the rated specification of relay when using relay contact or it may cause a fire withbreakdown.
- Please mount a surge absorption device at coil when controlling high-capacity power relay or a magnet, the counter electromotive force can be flowed into the inside of the device for relay contact operation.
- Please install power switch or circuit-breaker in order to cut power supply off.
- The switch or circuit-breaker should be installed near by users.
- This unit is designed for temperature controlling only. Do not apply this unit as a voltage meter or a current meter.
- In case of using RTD sensor, 3-wire type must be used.
 If you need to extend the line, 3-wires must be used with the same thickness as the line. It might cause temperature difference if the resistance of line is different.

- Please check the polarity and connect correctly when connecting RTD sensor to temperature controller. NTC sensor is a non-polarity.
- In case of making power line and input signal line close, line filter for noise protection should be installed at power line and input signal line should be shielded.
 - (Note) Please make sensor line shortly and use it because the narrow range of input correction range.
- Keep away from the high frequency instruments.(High frequency welding machine & sewing machine, big capacitive SCR controller)
- Please use AWG28-12 for power input and relay output connection, fasten the terminal block as a torque 0.3N·m.
- Installation environment
 - · It shall be used indoor.
 - Altitude Max. 2000m.
 - Pollution Degree 2
 - Installation Category II.

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