Autonics

Refrigeration Temperature Controller TF3 SERIES

INSTRUCTION MAUAL





Thank you for choosing our Autonics product. Please read the following safety considerations before use

Safety Considerations

**Please observe all safety considerations for safe and proper product operation to avoid hazards. ★▲ symbol represents caution due to special circumstances in which hazards may occur.

▲ Warning Failure to follow these instructions may result in serious injury or death

▲ Caution Failure to follow these instructions may result in personal injury or product damage

- 1. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss, (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.) Failure to follow this instruction may result in fire, personal injury, or economic loss
- 2. Install on a device panel to use.
- Failure to follow this instruction may result in electric shock or fire.

 3. Do not connect, repair, or inspect the unit while connected to a power source.
- Failure to follow this instruction may result in electric shock or fire.
- 4. Check 'Connections' before wiring.
- Failure to follow this instruction may result in fire.
- 5. Do not disassemble or modify the unit.
 Failure to follow this instruction may result in electric shock or fire

▲ Caution

- 1. When connecting the power, communucation input and relay output, use AWG 28~12 cable and tighten the terminal screw with a tightening torque of 0.4N m for the power, communucation input teminal, and use AWG 28~12 cable and tighten the terminal screw with a tightening torque of 0.5N·m for the relay outputl.
- When connecting the sensor input cable without dedicated cable, use AWG 30–14 cable and tighten the terminal screw with a tightening torque of 0.2N·m.

 Failure to follow this instruction may result in fire or malfunction due to contact failure.
- 2. Use the unit within the rated specifications.
- Failure to follow this instruction may result in fire or product damage.

 3. Use dry cloth to clean the unit, and do not use water or organic solvent.
- Failure to follow this instruction may result in electric shock or fire.
- 4. Do not use the unit in the place where flammable/explosive/co osive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present. Failure to follow this instruction may result in fire or explosion
- Keep metal chip, dust, and wire residue from flowing into the unit.
 Failure to follow this instruction may result in fire or product damage.

■ Ordering Information

Olu	ernigi	iiiioiiiiatioii		
F 3	3 - 3 4	4 H – T	No-ma	rk No option
		Option	s	Synchronize defrost
		function**2	T	RS485 communication
			R ^{×3}	RTC (real time clock)
			A ^{**3}	RS485 communication+RTC (real time clock)
		Compressor		
		load capacity	G ^{×1}	Compressor 20A 1a contact
			Α	Compressor 5A 1a contact
			Н	Compressor 16A 1c contact
		Power supply	1	24VAC 50/60Hz, 12-24VDC
			4	100-240VAC 50/60Hz
			1CH	1 Compressor output
	Out	tput		Compressor+Defrost or Auxiliary
			1CH, 2 3CH 3	(alarm/evaporator-fan) output
				3 Compressor+Defrost+Auxiliary (alarm/evaporator-fan) output
	Number of	f input channels	1	1CH input (NTC or RTD) [temperature+digital input (DI)]
			3	3CH input (NTC) [inlet temperature+defrost temperature+ outlet temperature or digital input (DI)]
Dig	jits		3	999 (3 digit)
Item			TF	Refrigeration Temperature Controller

X1: Only for 1CH input, compressor output model (TF31-1□G).

(2: Only for 3CH input mo	del (TF33-	. Option function	is varied by comp	ressor load capacit	ty and contact.
Option function Compressor load capacity & contact	Synchronize	RS485 communication	RTC function	RS485 communi- cation+RTC function	No option
Compressor 5A 1a contact	● (TF33-□□A-S)	● (TF33-□□A-T)	_	● (TF33-3□A-A)	_
Compressor 16A 1c contact	_	_	● (TF33-3□H-R)	_	● (TF33-□□H)

- ※3: Except compressor+defrost or auxiliary (alarm/evaporator-fan) output model (TF33-2□□□

	Specifications TF3 Series				
Model		TF31-	TF33		
Number	of channels	1CH	3CH		
Power	AC power	100-240VAC∼ 50/60Hz			
supply		24VAC~ 50/60Hz, 12-24VDC			
Allowab	le voltage range	90 to 110% of rated voltage			
Power	AC power	Max. 8VA (100-240VAC ~ 50/60Hz)			
consumpt	tion AC/DC power	Max. 5VA (24VAC~ 50/60Hz), Max. 3W (1	2-24VDC)		
Display	method	7 Segment LED method (red)			
Charact	er size (W×H)	9.4×19.3mm			
Innut tur	NTC	5kΩ/10kΩ			
Input typ	RTD	DPt100Ω	—		
Samplin	g period	500ms			
	accuracy	•At room temp. (23°C±5°C): ±1°C±1 digit	•Out of room temp. range: ±2°C±1 digit		
Control	Compressor (COMP)	250VAC∼ 5A, 30VDC 5A, 1a / 250VAC∼ 16A, 24VDC 16A, 1c / 250VAC∼ 20A 1a			
output	Defrost (DEF)	250VAC∼ 10A, 24VDC 10A, 1a			
output	Auxiliary (AUX)	250VAC∼ 5A, 30VDC= 5A, 1a			
Communication output		_	RS485 communication output (Modbus RTU)		
Digital input		Contact input: ON Max. 1kΩ , OFF Min. 10l No contact input: ON residual voltage: Max. outflow current: 4μA			
Control	method	ON/OFF control			
Hysteres	sis	0.5 to 5.0°C, 2 to 10°F variable			

Mechanical: 20,000,000 operations, Electrical: 100,000 operations (250VAC 10A) Auxiliary (AUX) Mechanical: 5,000,000 operations, Electrical: 50,000 operations (250VAC 5A) Approx. 10 years (non-volatile memory method)
te Min. 100MΩ (at 500VDC megger)

Dielectric AC power 3000VAC 50/60Hz for 1 min (between all terminals and case, power and input circuit) strength AC/DC power 1000VAC 50/60Hz for 1 min (between all terminals and case, power and input circuit) Square-wave noise by the noise simulator (pulse width: 1µs) ±2kV R-phase and S-phase 1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours Environment Ambient temp. -10 to 50°C, storage: -20 to 60°C Ambient humi. 35 to 85%RH, storage: 35 to 85%RH Bracket: 2, NTC sensor (5kΩ): 1

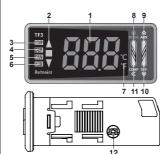
rox. 207g (approx. 105c

Remote display unit [TFD, sold separately

Model	TFD-3	TFD-5	Vibration		1.5mm amplitude at frequency of 10 to 55Hz
Power supply	3.3VDC		VIDIAUUII		(for 1 min) in each X, Y, Z direction for 2 hours
Power consumption	Max. 1W		Enviorn-	Ambient temp.	-10 to 50°C, storage: -20 to 60°C
	7 Segment LED method (red)				35 to 85%RH, storage: 35 to 85%RH
Comm. method	Serial (TTL Level), Half duplex		Protecti	on structure	IP67
Comm. cycle	100ms		Approva	al	CEE
Cable	Ø2.5mm, 3m Ø2.5mm, 5m		Weight ³	£1	Approx. 77g (approx. 48g)

*1. The weight includes packaging. The weight in parentheses is for unit only. The weight is varied by model optic *Environment resistance is rated at no freezing or condensation.

Part Description



- 1. Present value (PV) display component (red): esent value (rv) display component (red):

 JN mode: Displays present value (PV).

 etting mode: Displays parameter and setting value.

 eviation indicator (∎: green, ▼/▲: red):
- Displays deviation of present value (PV) based on

Setting value (SV).		
PV deviation	Dovintion diaplay	
temperature Deviation display		
More than 1.8°C	▲ indicator turns ON	
Within ±1.8°C	■ indicator turns ON	
Less than -1.8°C	▼ indicator turns ON	

- 3. Compressor (COMP) output indicator (green): Turns ON for compressor output. In case of compressor protection operation and output does not turn ON, it flashes. When operating compressor continuously, it turns ON for 2 sec, and turns OFF for 1 sec.
- Defrost (DEF) output indicator (green):
 Turns ON for defrost output. Flashes for defrost delay operation.
 Turns ON for 2 sec and OFF for 1 sec for manual defrost or Power ON defrost.
- Evaporator-fan (FAN) output indicator (green):
 Turns ON for evaporator-fan output. Flashes for delay operation of evaporator-fan output.

- Turns ON for evaporator-fan output. Flashes for delay operation of evaporator-fan output.

 6. Auxiliary (AUX) output indicator (green):

 Turns ON for alarm output. Flashes for delay operation of alarm output.

 7. Unit indicator (red): Displays temperature unit set at temperature unit [Unit] of parameter 1 group.

 8. (MODE) key: Used for entering parameter setting group, returning RUN mode, moving parameter or saving SV.

 9. (AUX) key: Used for entering SV setting group or changing setting value.

 Hold the key over 3 sec to select active/inactive auxiliary output in RUN mode.

 10. (PEF) key: Used for entering SV setting group or changing setting value.

 Hold the key over 3 sec to active/inactive compressor output in RUN mode.

 11. (COMP) key: Used for entering SV setting group, changing setting value, moving digits.

 Hold the key over 3 sec to active/inactive compressor output in RUN mode.

 When buzzer alarm occurs, press the key once to stop the sound. (Only for 3CH input, compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF33-3□□+□) supports buzzer.

 Buzzer [bl 1] of parameter 1 group is set as [an]) Buzzer [b =] of parameter 1 group is set as [o n])
- Bluzzer [Bluz] of parameter ingroups account [Bluz] of parameter ingroups account [Bluz] of parameter ingroups account [Bluz] of parameter account [Bluz] of parameter setting by PC.

Input Type and Temperature Range

Input type		Decimal point	Display method	Temperature range (°C)	Temperature range (°F)
	NTC 5kΩ	1	n 5.H	-40 to 99	-40 to 212
Thermistor (NTC)		0.1	n 5.L	-40 to -20 -19.9 to 99.9	-40 to -20 -19.9 to 99.9 100 to 212
	NTC 10kΩ	1	n LH	-40 to 99	-40 to 212
		0.1	n IL	-40 to -20 -19.9 to 99.9	-40 to -20 -19.9 to 99.9 100 to 212
RTD ^{×1}	DPt 100Ω	1	дР.Н	-99 to 99	-148 to 212
		0.1	dP.L	-99 to -20 -19.9 to 99.9*2	-148 to 212

- XTF3 Series displays only 3 digits. If PV decimal number of shaded temperature range is out of 3 digit. TF3 does not display the numbers below decimal point. You can check it at the comprehensive de management program (DAQMaster) by communicating via PC.
- ※1: Only for 1CH input model (TF31-□□□). X2: If PV with "." sign is over 3 digits (e.g.: -99.9), the numbers below decimal point does not display. You can check it at the comprehensive device management program (DAQMaster) by communicating via PC.

Connections

SENSOR

NTC 5K/10K

DIGITAL INPUT

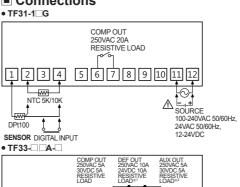
Dimensions

TF3 Series

NTC sensor (5kΩ)

Max. 15

TFD (sold separately)



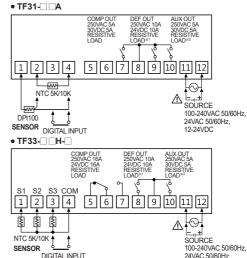
5 6 7 8 9 10 11 12

AWG22

2000±50

TPE lead wire

SYNCHRONIZE



- SOURCE 100-240VAC 50/60Hz, 24VAC 50/60Hz, DIGITAL INPUT 12-24VDC ※1: Only for compressor+defrost or auxiliary (alarm/evaporator-fan) output model (TF3□-2□□-□), compressor+
- defrost+auxiliary (alarm/evaporator-fan) output model(TF3_3____).

 **2: Only for compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF3_3___).

 **3: Only for synchronize defrost function model (TF33-___A-S), or RS485 communication model (TF33-__A-T/A).

Bracket

 \mathbb{A}

Comprehensive Device Management Program [DAQMaster]

• TF31-□ H

NTC 5K/10k

SENSOR DIGITAL INPUT

DPt100

1234 56789101112

XUse crimp terminals of size specified below

<Crimp terminal>

General 1 to 4 4 to 6 Max. 1.7 Max. 3.7

TF3_-_G 6 to 7 6 to 8 Max. 2.3 Max. 4.5

5 to 6 6

7 to 10 6 to 8

General 11 to 12 6

₩OH.

A ⊢,±l SOURCE

100-240VAC 50/60Hz, 24VAC 50/60Hz, 12-24VDC

(unit: mm)

Max. 1.9 Max. 4.0

Max. 2.3 Max. 4.5

Max. 1.9 Max. 4.0

DAQMaster is comprehensive device management program. It is available for parameter setting, monitoring, and user parameter group setting, parameter mask setting for only TF3 Series. DAQMaster can be downloaded

TF3□-□ □A

Item	Minimum specifications		
System	IBM PC compatible computer with Pentium III or above		
Operations	Windows 98/NT/XP/Vista/7/8/10		
Memory	256MB+		
Hard disk	1GB+ of available hard disk space		
VGA	Resolution: 1024×768 or higher		
Others	RS232C serial port (9-pin), USB port		

Parameter Mask

12-24VDC

This function is able to hide unnecessary parameters to user environment or less frequently used parameters in parameter group. You can set this in the comprehensive device management program (DAQmaster) Masked parameters are only not displayed. The setting value of masked parameters are applied. For more information, refer to DAQMaster user manual

Visit our web site (www.autonics.com) to download DAQmaster program and the user manual. Before applying mask PR 1 → 1 nE → 52 → 53 → uEr → UnE ··· After applying mask PR 1 → 1 nE → 52 → uEr ···

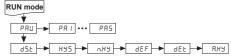
The above is masking input sensor 3 selection [53], temperature unit [Unb] of parameter 1 group for 3CH input

■ Parameter User Group [PRU]

This function is able to set the frequently used parameters to the user parameter group. You can quickly and easily set parameter settings. User parameter group can have up to 30 parameters in the comprehensive device management program (DAQMaster).

For more information, refer to the DAQMaster user manual.

Visit our web site (www.autonics.com) to download the DAQMaster program and the user manual.



The above is setting user parameter group in the DAQMaster with delay display period [d5E] of parameter 1 group, hysteresis [H35], night mode hysteresis [AH3] of parameter 2 group, defrost method [dEF], defrost time [dEE] of parameter 3 group, alarm output hysteresis [RH3] of parameter 4 group.

■ Virtual Temperature Rate [¬Ł.¬]

emperature It 51. You can set virtual temperature rate.

ure of inlet and outlet is significantly different at freezer, virtual temperature helps to control temperature efficiently.

Virtual temperature is designated by the rate of input sensor 1 (inlet temperature) and input sensor 3 (outlet temperature). There is virtual temperature calculation formula

[{100-virtual temperature rate} × input sensor 1 temperature] Virtual temperature (PV)= + [virtual temperature rate × input sensor 2 temperature]

If virtual temperature rate [u.t.r.] is set as [0], virtual temperature (PV)= input sensor 1. If virtual temperature rate [L.F.] is set as [100], virtual temperature (PV)= input sensor 3

E.g.) If inlet temperature of input sensor 1 is 0°C, and outlet temperature of input sensor 3 is 10°C, set virtual temperature rate [u.t.r.] as [50] and virtual temperature is 5°C to control temperature.

5= [{100-50}×0]+ [50×10]

Setting range of virtual temperature rate: 0 to 100 (%)

■ Display Selection [dP.b]

(only for 3CH input model: TF33-

ou can select input sensor to display at present value (PV) display component in RUN mode

Parameter	Description
5 1	Displays PV of input sensor 1 (inlet temperature).
52	Displays PV of input sensor 2 (defrost temperature).
53	Displays PV of input sensor 3 (outlet temperature).
u 5	Displays virtual temperature.

■ Remote Display Unit (TFD) [sold separately]



Remote display unit (TFD) displays current temperature or output status of TF3 at remote place. TFD cable is TFD-3: 3m, TFD-5: 5m. Connect the phone-jack of remote display unit (TFD) to the data loader port of TF3. This unit is dedicated for TF3 Series and it does not directly communicate with upper devices (PC, PLC, etc.)

If TFD communication with TF3 error occurs, TFD flashes display component for 1 sec. Check the connection with TF3.

Min. 100 *1 Min. 55 70.3*

※1. When connecting remote display unit (TFD), or SCM-US, Min. 120

TFD Min. 65 Min. 40 45.7^{+0.6} 25.4^{+0.3}

When connecting TFD to the data loader port of TF3, you cannot connect Autonics SCM-US (USB to Serial converter, sold separately) for communication. Use SCM-US48I(USB to RS485 converter, sold sep SCM-38I(RS232C to RS485 converter, sold separately).

SV Settings

You can set the temperature to control with . . kevs Set range is within SV low-limit value [[.5u_] to SV high-limit value [H5u_] E.g.) In case of changing SV from 19°C to 10°C



Press any key among **(**, **)**, **(** n RUN mode to enter into SV se Last digit (10° digit) on SV display part flashes



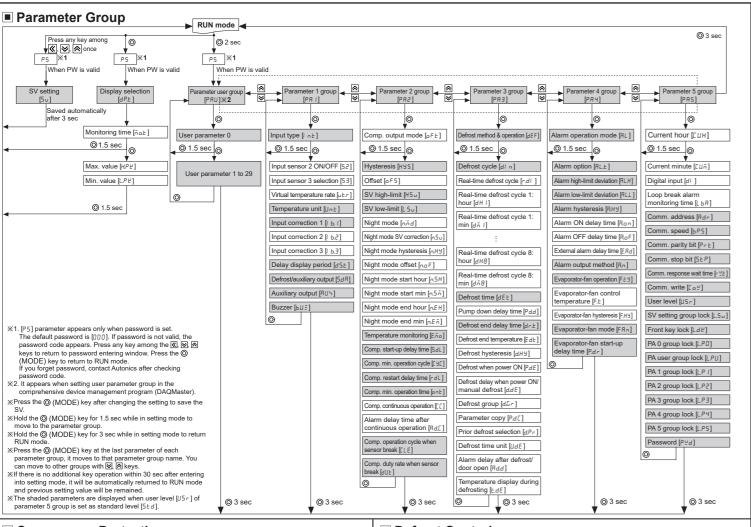
Press 🗷 , 🗟 key to raise



Press (key to move digit.



Press (MODE) key to save the set value the changed SV is automatically saved.



■ Compressor Protection

This function is for preventing compressor from life cycle shortening or malfunction by overload and frequent ON/OFF of compressor. As compressor protection settings, when compressor output does not ON, the front compressor (COMP) output indicator (green) is flashing.

Compressor start-up delay time [5dL]

If power turns ON instantly from break-down or power OFF, it delays start-up during the set time of compressor. Setting range: 0 to 60 (min)

• Compressor restart delay time [rdL]

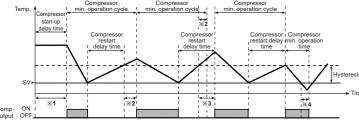
To prevent frequent compressor ON/OFF, set compressor ON time after compressor turns OFF. Setting range: 0 to 60 (min)

• Compressor min. operation time [ant], Compressor min. operation cycle [[46]

To prevent frequent compressor ON/OFF, set min. operation time and min. operation cycle

Setting range of compressor min. operation time: 0 to 60 (min),

Setting range of compressor min. operation cycle: 0 to 60 (min)



- X1. When starting compressor, if present value (PV) is out of hysteresis range, compressor output does not turn ON and the compressor (COMP) output indicator is flashing during compressor start-up delay time
- *22. When compressor delay is completed and it is within compressor min. operation cycle, compressor output does not turn ON and the compressor (COMP) output indicator is flashing. (The latest one has priority between compressor restart delay time and compressor min. operation cycle.)
- X3. When present value (PV) is out of hysteresis, compressor output does not turn ON and the
- compressor (COMP) output indicator is flashing during compressor restart delay time.

 **44. If present value (PV) is below the SV, compressor output maintains ON status during compressor
- min. operation time. After compressor min. operation time, it turns OFF.

 XIf compressor output does not turn ON due to compressor output condition or parameter settings for compressor protection, the compressor (COMP) output indicator is flashing.

★For more information about parameters for compressor prevention, refer to user manu

■ Compressor Control When Sensor Break

perature control is impossible due to sensor break, it controls compressor output by the set operatio cycle and duty ratio to protect control object. Until error is cleared, operation cycle and duty ratio are applied repeatedly. When error is cleared, the compressor operates after completing the currently applied operation cycle

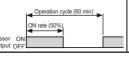
and compressor restart delay time. • Compressor operation cycle when sensor break [ELE]

Set compressor operation cycle when sensor break. Set as [0] and compressor output turns OFF when sensor break.

Compressor duty ratio when sensor break [dU₺]

Set compressor ON duty ratio when sensor break Setting range: 0 to 100 (%)

E.g.) When compressor operation cycle when sensor break [ELE] is set as 60 min and compressor duty ratio when sensor break [dut] is set as 50%, compressor output has 60 min cycle and C turns ON for 30 min and turns OFF for 30 min.



■ **Defrost Control** (except 1CH, compressor output model: TF31-1□□)

When operating a compressor for a long time, an evaporator and a freezer are freezing and thermal efficiency of compressor is decreased. For increasing thermal efficiency, defrost operation helps to remove frost or ice around of evaporator.

Set defrost cycle, time, and end temperature, etc to operate defrost (heater/hot-gas defrost). The front defrost (DEF) output indicator (green) turns ON during defrost output and it flashes during defrost

In case of compressor+defrost or auxiliary (alarm/evaporator-fan) output model (TF3\(\text{D}\-2\)\(\text{D}\-\)), defrost

operation is available when defrost/auxiliary output [5,4] of parameter 1 group is set as defrost [4EF]. Defrost method and operation [dEF]

Parameter	Defrost method	Defrost operation	
HĿñ	Heater defrost	Operates during the set defrost cycle/time	
ű.t ñ	Hot-gas defrost	Operates during the set deliost cycle/time	
HEE	heater defrost	Operates when PV is lower than defrost end temperature during the	
G.E.E	Hot-gas defrost	defrost cycle/time (only for 3CH input model (TF33-□□□-□))	

Defrost cycle [d! ∩]. Defrost time [dE t]

Set defrost cycle and time to operate defrost at every set cycle and during the set time. Defrost cycle setting range: 0 to 24 (hour)/0 to 100 (min)

Defrost time setting range: 1 to 100 (min/sec)

**Compressor operation during defrost is varied by defrost method. In case of heater defrost, compressor output turns OFF, and in case of hot-gas defrost, compressor output turns ON. Evaporator-fan operation is varied by evaporator-fan operation mode setting.

KIn case of RTC function model (TF33-3□□R/A), defrost operates at every specific time. Set real-time defrost cycle [r,d/] of parameter 3 group as [o n] and 8 real-time defrost times are available to set.

 Defrost end temperature [E d E], Defrost hysteresis [dHY] (only for 3CH input model: TF33-□□□□□ Set defrost end temperature and defrost hysteresis from input sensor 2 (defrost temperature). When the measured temperature of defrost sensor is same as the set defrost end temperature, defrost operation is stopped. It is available when input sensor 2 ON/OFF [52] is set as [on] and defrost method and operation [dEF] is set as [HEE] or [GEE].

rost end temperature setting range: -40 to 99 (°C) / -40 to 212 (°F) Defrost hysteresis setting range: 1 to 5 (1.0 to 5.0) (°C) / 2 to 10 (°F)

Manual defrost

Execute defrost manually regardless of the set defrost cycle which consists of defrost method and operation setting. Hold the front key over 3 sec or, turn ON the digital input when digital input [d+] of parameter 5 group is set as [¬d+F] to operate defrost during the set defrost time. The front defrost (DEE) output indicator turns ON for 2 sec and turns OFF for 1 sec during manual defrost. Hold

the front ⊠ key over 3 sec or turn OFF the digital input during manual defrost, and the set de

Defrost synchronization (only for synchronize defrost function model: TF33-□□A-S, RS485 communication model: TE33- \(\Delta \text{-T/A} \)

When connecting over 2 units of TF3, defrost and compressor operation is able to synchronize via synchronize erminal/RS485 communication. It is available for synchronize defrost function model (TF33- A-S), or RS485 communication model (TF33-

A-T/A). [Setting Order] . Connect each other synchronize terminals or RS485 communication terminals of the units which are

- synchronized for defrost.
- 2. Set defrost cycle [df n] same as among the units, (if error occurs, defrost cycle is the setting of each unit) 3. Set defrost group [dLr] as 1 master unit [FR5] and slave unit(s) (up to 5 units) [5LR].

 4. According to defrost operation of Master, the defrost operation of slave(s) executes. (when changing the
- defrost parameters of master, defrost operations of slave(s) are also changed forcibly as same as the defrost operation of master via connected terminals. The defrost parameters of slave(s) are not changed.) XDefrost operation by real-time defrost cycle is not able to synchronize.
- ※Defrost operation of master is prior to the compressor operation of slave.
 ★For more information about parameters for defrost operations, refer to user manual

■ Alarm (except 1CH, compressor output model: TF31-1□□)

Set both alarm operation and alarm option by combining. Alarm function is available for compressor+defrost or auxiliary (alarm/evaporator-fan) output model (TF3□-2□□-). Also defrost/auxiliary output [5,47] of parameter 1 group should be set as alarm [8,6]. In case of compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF3□-3□□-), auxiliary output [AUS] of parameter 1 group should be set as alarm [AUS].

•Alarm operation [AL] Description No alarm output. ON ↑H OFF If deviation between present value Deviation PV -10°C SV 0°C PV 20°C High-limit deviation [AL.H]: Set as 20 (PV) and setting value (SV) is higher than high-limit or low-limit deviation RL.d high, low limit alarm SV. alarm output turns ON. Low-limit deviation [ALL]: Set as 10

•Alarm option [ALE] RLR Standard alarm If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF. RLb Alarm latch *1 If it is an alarm condition, alarm output is ON and maintains ON status. First alarm condition is ignored and from second alarm condition, standard alarm operates ALE When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates Alarm latch and If it is an alarm condition, it operates both alarm latch and standby sequence. When power is RL.d supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates. First alarm condition is ignored and from second alarm condition, standard alarm operates AL.E When re-applied standby sequence \$\text{N2}\$ and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, standard alarm operates. Basic operation is same as alarm latch and standby sequence 1. It operates not only by Alarm latch and power ON/OFF, but also alarm set value, or alarm option changing. When re-applied standby sequence *2 and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates

X1: To clear alarm, turn OFF the power (also digital input [3!] is set as RUN/STOP [5!P] and input is ON for pausing compressor output) or press the front (X2: Condition of re-applied standby sequence for standby sequence: Power ON, changing temperature, alarm settings, switching STOP mode to RUN mode (also digital input [3!] is set as RUN/STOP [5!P] and input turns OFF from ON for operation mode by releasing pause compressor output)

**Digital Input [3!] **X2: Digital input [3!] **X3: Digital input [3!] **X4: D

		Also input sensor 3 selection [5 3] should be set as digital input [8]
Parameter		Function
OFF 0FF No digital input		No digital input
RUN/STOP	SEP	Pauses compressor output. All output indicators turn OFF. When digital input is OFF, it controls normally after compressor restart delay time.
Door switch	45.5	By connecting freezer door switch and digital input contact, it controls compressor/defrost/ evaporator-fan according the door status. Digital input ON (door open): Compressor, defrost, evaporator-fan output turns OFF Digital input OFF (door close): After 1 min, it returns the previous status of door open. (not applied compressor protection operations) Alarm occurs after the time of alarm delay after defrost/door open [Rdd] of parameter 3 group. When operating compressor continuously, compressor start-up time is extended as long as the doo open time.
Night mode ON/OFF	nñd	When digital input turns ON, night mode is active.
External alarm ^{×1}	EAL	When digital input turns ON, alarm output turns ON forcibly. (except alarm is ON) When external alarm delay time [EAd] of parameter 4 group is set, alarm turns ON after the set time.
Defrost ON/OFF ^{×1}	E.d F	When digital input turns ON and it is defrost operation condition, defrost output turns ON. Even though it is defrost operation condition, if digital input turns OFF, defrost output turns OFF also
Manual dofroct ^{×1}	ñdF	When digital input turns ON, it executes manual defrost.

Evaporator-fan Control

X1. Except 1CH, compressor output model (TF31-1□□)

(except 1CH, compressor output model: TF31-1 ...)

To improve the efficiency of cooling, install and control evaporator-fan at evaporator. It is available for compressor+defrost or auxiliary (alarm/evaporator-fan) output model (TF3_-2_ ___). Also defrost/auxiliary output [5,48] of parameter 1 group should be set as auxiliary [845], and auxiliary output [845]

should be set evaporator-fan [Fn-].
It is available for compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF3□-3□-□-). Also, auxiliary output [AU5] of parameter 1 group should be set as evaporator-fan [FAn]

•Evaporator-fan operation [F.Ł ป]
Evaporator-fan operatios by two control methods; [JEF] controls evaporator-fan by measured temperature from defrost sensor or [F.Rn] controls evaporator-fan by compressor/defrost operation.

•Evaporator-fan control temperature [F±] and hysteresis [F±9]
When evaporator-fan operation [F±9] is set as [dEF] controls (evaporator-fan is controlled by measured temperature from defrost sensor), and the temperature of defrost sensor is same as evaporator-fan control temperature [F±], evaporator-fan output turns OFF. Set evaporator-fan control temperature [F±] and evaporator-fan control temperature [F±] is evaporator-fan control temperature [F±].

fan control hysteresis [F,HY].

Evaporator-fan control temperature setting range: -40 to 99 (°C), -40 to 212 (°F)

Evaporator-fan control hysteresis setting range: 1 to 5 (0.5 to 5.0) (°C), 2 to 10 (°F)

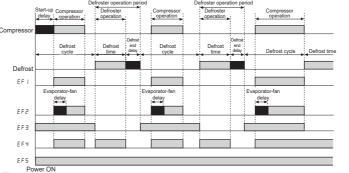
•Evaporator-fan operation mode [F An] and evaporator-fan start-up delay time [P.d.r.]

•When evaporator-fan operation [F.2] is set as [F.R.] for control by compressor/defrost operation, it is available to set [F A n] for evaporator-fan op

Parameter	Operation method
EF I	When compressor operates, evaporator-fan also operates. When compressor operation is finished, evaporator-fan also operation turns OFF. (except compressor operation for hot gas defrost)
EF2	When compressor operates, evaporator-fan operates after the set evaporator-fan start-up delay time. When compressor operation is finished, evaporator-fan operation turns OFF. (regardless of defroster operation)
EF3	When power turns ON, evaporator-fan operates. When defroster operates, evaporator-fan stops. (regardless of compressor operation)
EF4	Evaporator-fan operates only when operating compressor or defrost. Evaporator-fan stops when compressor and defroster stops. (for above zero temperature control)
	Evaporator-fan operates from power ON to power OFF, (regardless of defroster operation of freezer, When

door is open (digital input [d1] is set as RUN/STOP [5½P] or door switch [d5型]), evaporator-fan stops. If evaporator temperature is increased by defrost operation, warm air may flow into cooling system by evaporator-fan operation. Set evaporator-fan start-up delay time [Pdr] to prevent warm air inflow, and it may

ncrease cooling efficiency. Evaporator-fan start-up delay time setting range: 0.00 to 9.59 (0 min 00 sec to 9 min 59 sec)



Power ON

*E: Output does not turn ON but the dedicated indicator flashes at the delay period (compressor, defrost

★For more information about parameters for evaporator-fan control, refer to user manual

■ Parameter Reset

Hold **(**+**≥**+**(**+**≥**) keys for 5 sec to reset all parameters in memory to default value.

Set [nt] parameter to [955] to reset all parameters. In case password function is ON, it is required to enter valid password to reset parameters Password is also reset.

Error Display

	. ,		
Flashing in turn	Description	Troubleshooting	
Er□ ^{*1*2} ↔oPn	When input sensor is break or sensor is disconnected.	Check input sensor status.	
Er □*1↔LLL	If the measured temperature of the dedicated sensor is lower than low-limit temperature among temperature setting range.	It clears when input is within the	
Er □ ^{*1} ↔HHH	If the measured temperature of the dedicated sensor is higher than high-limit temperature among temperature setting range.	display range.	
Err↔LbA	Even though input sensor is normal, freezer temperature does not change over 1.0°C (1.8°F) during loop break alarm monitoring time [L b R].	Check the compressor and hold the <a>+⊠ key at the same time for 3 sec. It clears when input is within the adequate range.	
V1. □ indicates i	anut cancar number of error diaplay priority which ecour	o orror	

Error display priority: Er 1 (input sensor 1) → Er 2 (input sensor 2)→ Er 3 (input sensor 3)→

Er v (virtual temperature) → Er r

%2: E r □ (virtual temperature) is not applicable.

■ Factory Default

• SV setting [5] • Parameter 0 group Parameter Factory default Parameter Factory default

	i dotory doradic						
5 u	0			dР	l.E	5 1	
 Paramete 	r 1 group [F	PR 11		ña	.E	-	
Parameter	Factory default	Parameter	Factory default Paramete	er	Factory d	efault	

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
Int	n 5.H	Unt	٥٢	RU5	oFF
52	oFF	I Ь.	0	ЬИΞ	on
53	d!	d 5.Ł	0.5		
u t.r	0	5.d R	dEF	1	

• Parameter 2 group [P82]

Parameter	Factory default						
oFt	С	n.5 u	1	n.E ñ	0	CC	0
H95	1	n.HY	1	E.ño	oFF	R d.C	2
oF5	0	n.o.F	0	SdL	0	ELE	0
H5u	99	n.5 H	0	[][0	dUL	50
L5u	- 40	n.t ñ	0	rdL	0		
nād	oFF	n.E H	8	ont	0		

Parameter 3 group [PR∃]

Parameter	Factory default						
dEF	H.E.ři	dEt	30	P.d E	oFF	U.d E	нБн
din	Ч	P d.d	0.00	d.d E	0	R d.d	1
r.dl	oFF	dr.t	1.00	d.Gr	oFF	Ł.dE	oFF
dH□	oFF	Edt	4	P.d C	oFF		
dñ□	oFF	d.HY	- 1	d.Pr	oFF		

• Parameter 4 group [₽ЯЧ]

Parameter	Factory default						
RL	AL.d	RHY	1	Rn	no	FAn	EF I
AL.E	RL.R	Ron	0	F.E Y	FAn	P.dr	1.00
AL.H	139	R.o F	0	F.Ł	4		
ALL	139	E,Rd	0	F.HY	1		

Parameter 5 group [PR5]

Parameter	Factory default						
Еин	Random hour	Rdr	0 1	r ü.E	20	L.dť	oFF
[Uñ	Random min	bP5	96	[0"	EnA	L.P.	oFF
dl	oFF	PrE	non	USr	5Ed	Pig	000
LBA	0	5EP	2	L.5 u	oFF		

User Manual

For the detail information and instructions, please refer to user manual and user manual for communication, and be sure to follow cautions written in the technical descriptions (catalog, homepage). Visit our homepage (www.autonics.com) to download manuals

Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents

2. Check the polarity of the terminals before wiring the temperature sensor.

For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.

For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.

3. Keep away from high voltage lines or power lines to prevent inductive noise.

In case installing power line and input signal line closely, use line filter or varistor at power line and shielded

In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.

Do not use near the equipment which generates strong magnetic force or high frequency noise.

4. Do not apply excessive power when connecting or disconnecting the connectors of the product.

5. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.

6. Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.

8. 24VAC, 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.

supply device.

15. Make a required space around the unit for radiation of heat.

13. Make a required space around the unit of radiation of near.
For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
16. Install a surge absorber at each end of inductive load coil when controlling high-capacity power relay or

inductive load (e.g. magnet).

17. Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.

18. Do not wire to terminals which are not used.

21. This unit may be used in the following environments.

Olndoors (in the environment condition rated in 'Specifications')

Opollution degree 2 ②Altitude max. 2.000m

■ Major Products ■ Photoelectric Sensors ■ Temperature Controllers
■ Fiber Optic Sensors
■ Door Sensors
■ Door Side Sensors
■ Counters
■ Counters

witching Mode Power Supplies
ontrol Switches/Lamps/Buzzers
D Terminal Blocks & Cables
tepper Motors/Drivers/Motion Controllers

Graphic/Logic Panels
Field Network Devices
Laser Marking System (Fiber, Co₂, Nd: yag)
Laser Welding/Cutting System

Autonics Corporation

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