

Autonics Refrigeration Temperature Controller TF3 SERIES INSTRUCTION MANUAL



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.
- Safety considerations are categorized as follows.
 - 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.
- The symbols used on the product and instruction manual represent the following
 - ⚠ symbol represents caution due to special circumstances in which hazards may occur.

Warning

- 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.
- Install on a device panel to use.** Failure to follow this instruction may result in electric shock or fire.
- 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.
- Check 'Connections' before wiring.** Failure to follow this instruction may result in fire.
- Do not disassemble or modify the unit.** Failure to follow this instruction may result in electric shock or fire.

Caution

- When connecting the power, communication 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, communication input terminal, and use AWG 28-12 cable and tighten the terminal screw with a tightening torque of 0.5N·m for the relay output.** 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.
- Use the unit within the rated specifications.** Failure to follow this instruction may result in fire or product damage.
- 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.
- Do not use the unit in the place where flammable/explosive/corrosive 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

TF	3	3	-	3	4	H	-	T		
Option function*2	No-mark	No option	S	Synchronize defrost	T	RS485 communication	R ^{RS3}	RTC (real time clock)	A ^{RS3}	RS485 communication+RTC (real time clock)
Compressor load capacity	G ^{RS1}	Compressor 20A 1a contact	A	Compressor 5A 1a contact	H	Compressor 16A 1c contact				
Power supply	1	24VAC 50/60Hz, 12-24VDC	4	100-240VAC 50/60Hz						
Output	1CH	1 Compressor output	1CH,	2 Compressor+Defrost or Auxiliary (alarm/evaporator-fan) output	3CH	3 Compressor+Defrost+Auxiliary (alarm/evaporator-fan) output				
Number of input channels	1	1CH input (NTC or RTD) [temperature+digital input (DI)]	3CH	3CH input (NTC)	3	[inlet temperature+defrost temperature+outlet temperature or digital input (DI)]				
Digits	3	999 (3 digit)								
Item	TF	Refrigeration Temperature Controller								

- *1: Only for 1CH input, compressor output model (TF31-1□□□).
- *2: Only for 3CH input model (TF33-□□□□□□). Option function is varied by compressor load capacity and contact.

Compressor load capacity & contact	Synchronize defrost function	RS485 communication	RTC function	RS485 communication+RTC function	No option
Compressor 5A 1a contact	(TF33-□□A-S)	(TF33-□□A-T)	—	(TF33-□□A-A)	—
Compressor 16A 1c contact	—	—	(TF33-□□H-R)	—	(TF33-□□H)

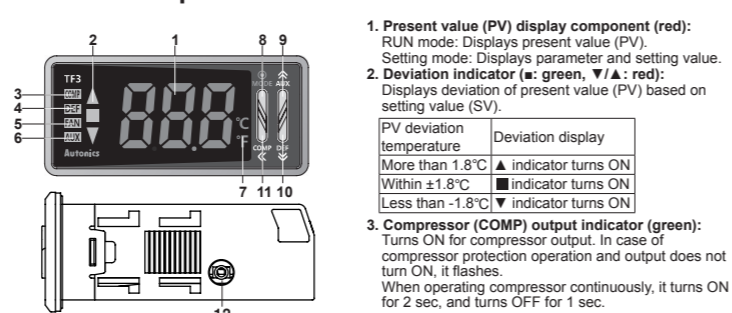
 - *3: Except compressor+defrost or auxiliary (alarm/evaporator-fan) output model (TF33-2□□□□).
 - *4: Only for 3CH input, compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF33-3□□□□) supports buzzer.
 - *5: The above specifications are subject to change and some models may be discontinued without notice.
 - *6: Be sure to follow cautions written in the instruction manual, user manual and the technical descriptions (catalog, homepage).

Specifications

TF3 Series		Model	TF31-□□□□	TF33-□□□□□
Number of channels	1CH	Power supply	100-240VAC~50/60Hz	24VAC~50/60Hz, 12-24VDC
Allowable voltage range	90 to 110% of rated voltage	Power consumption	AC power Max. 8VA (100-240VAC~50/60Hz)	AC/DC power Max. 5VA (24VAC~50/60Hz), Max. 3W (12-24VDC)
Display method	7 Segment LED method (red)	Character size (W×H)	9.4×19.3mm	
Input type	NTC 5kΩ/10kΩ	Sampling period	500ms	
Control	Compressor (COMP) Defrost (DEF) Auxiliary (AUX)	Display accuracy	-At room temp. (23°C±5°C): ±1°C±1 digit	-Out of room temp. range: ±2°C±1 digit
Communication output	—	Control method	ON/OFF control	
Digital input	Contact input: ON Max. 1kΩ, OFF Min. 100kΩ	Hysteresis	0.5 to 5.0°C, 2 to 10°F variable	
Relay life cycle	Compressor (COMP) 5A 1a 16A 1c 20A 1a	Memory retention	Approx. 10 years (non-volatile memory method)	
Defrost (DEF) Auxiliary (AUX)	Mechanical: 5,000,000 operations, Electrical: 50,000 operations (250VAC 5A)	Insulation resistance	Min. 100MΩ (at 500VDC megger)	
Memory retention	Approx. 10 years (non-volatile memory method)	Dielectric strength	AC power 3000VAC 50/60Hz for 1 min (between all terminals and case, power and input circuit)	
Insulation resistance	Min. 100MΩ (at 500VDC megger)	Noise resistance	Square-wave noise by the noise simulator (pulse width: 1μs) ±2kV R-phase and S-phase	
Diode strength	AC/DC power 1000VAC 50/60Hz for 1 min (between all terminals and case, power and input circuit)	Vibration	1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Noise resistance	Square-wave noise by the noise simulator (pulse width: 1μs) ±2kV R-phase and S-phase	Environment	Ambient temp. -10 to 50°C, storage: -20 to 60°C	
Vibration	1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH	
Accessories	Bracket: 2, NTC sensor (5kΩ): 1	Protection structure	IP65 (front case)	
Approval	CE, UL, etc.	Weight*1	Approx. 207g (approx. 105g)	

*1: The weight includes packaging. The weight in parentheses is for unit only. The weight is varied by model option. *2: Environment resistance is rated at no freezing or condensation.

Part Description



- Present value (PV) display component (red):** RUN mode: Displays present value (PV). Setting mode: Displays parameter and setting value.
- Deviation indicator (▲: green, ▼/▲: red):** Displays deviation of present value (PV) based on setting value (SV).

PV deviation 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
- 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.

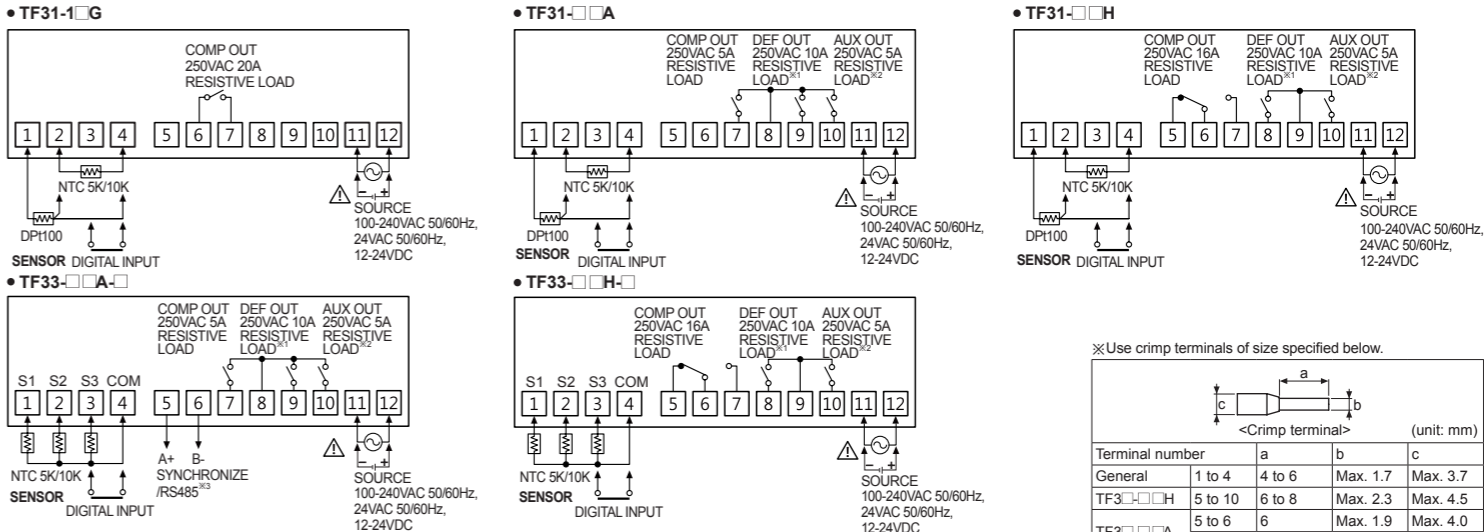
- Defrost (DEF) output indicator (green):** Turns ON for defrost output. Flashes for defrost delay operation. Turns ON for 2 sec and OFF for 1 sec for manual defrost or Power ON defrost.
- Evaporator-fan (FAN) output indicator (green):** Turns ON for evaporator-fan output. Flashes for delay operation of evaporator-fan output.
- Auxiliary (AUX) output indicator (green):** Turns ON for alarm output. Flashes for delay operation of alarm output.
- Unit indicator (red):** Displays temperature unit [unit] of parameter 1 group.
- (MODE) key:** Used for entering parameter setting group, returning RUN mode, moving parameter or saving SV.
- (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.
- (DEF) key:** Used for entering SV setting group or changing setting value. Hold the key over 3 sec to execute/top manual defrost in RUN mode.
- (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 [buzzer] of parameter 1 group is set as [on].)
- Data loader port:** It is for displaying TF3 data at remote display unit (TFD) by connecting phone-jack. In other case, for connecting Autonics SCM-US (USB/Serial converter, sold separately), it is a PC loader port for serial communication for parameter setting or monitoring by PC.

Input Type and Temperature Range

Input type	Decimal point	Display method	Temperature range (°C)	Temperature range (°F)
Thermistor (NTC)	1	n5H	-40 to 99	-40 to 212
	0.1	n5L	-40 to -20 -19.9 to 99.9	-40 to -20 -19.9 to 99.9
	1	n1H	-40 to 99	-40 to 212
	0.1	n1L	-40 to -20 -19.9 to 99.9	-40 to -20 -19.9 to 99.9
RTD*1	1	dPH	-99 to 99	-148 to 212
	0.1	dPL	-99 to -20 -19.9 to 99.9*2	-148 to 212

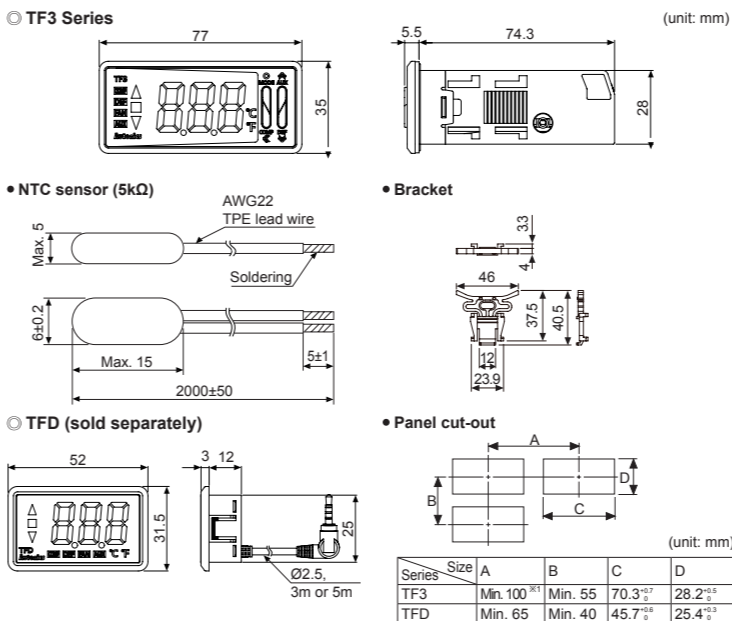
- *1: Only for 1CH input model (TF31-□□□□).
- *2: If PV with "-" sign is over 3 digits (e.g.: -99.9), the numbers below decimal point does not display. You can check it at the comprehensive device management program (DAQMaster) by communicating via PC.

Connections

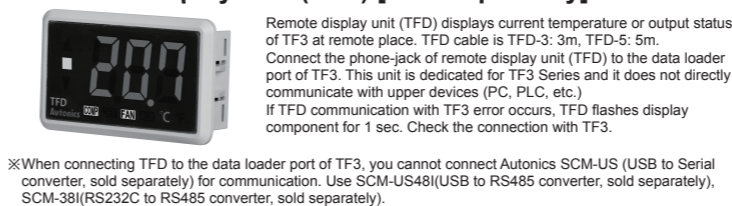


- *1: Only for compressor+defrost or auxiliary (alarm/evaporator-fan) output model (TF31-□□□□), compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF33-□□□□□).
- *2: Only for compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF33-□□□□□).
- *3: Only for synchronize defrost function model (TF33-□□□□-S), or RS485 communication model (TF33-□□□□-T/A).

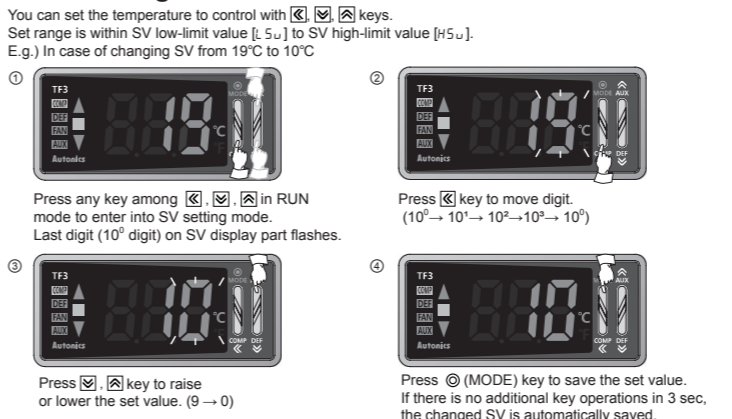
Dimensions



Remote Display Unit (TFD) [sold separately]



SV Settings

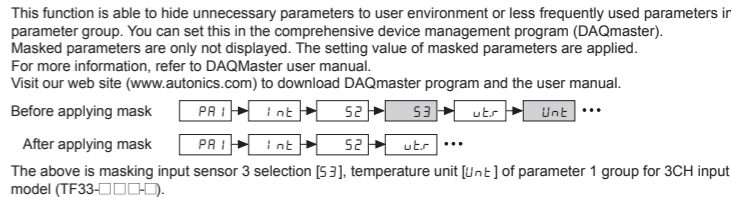


Comprehensive Device Management Program [DAQMaster]

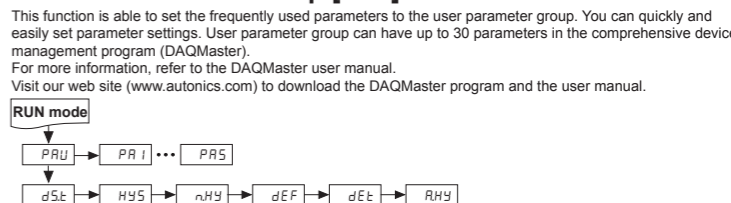
DAQMaster is comprehensive device management program. It is available for parameter setting, monitoring, and user parameter group setting, parameter mask setting for only TF3 Series. DAQMaster can be downloaded from our web site at www.autonics.com.

Item	Minimum specifications
System	IBM PC compatible computer with Pentium III or above
Operations	Windows 98/NT/XP/Mista/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

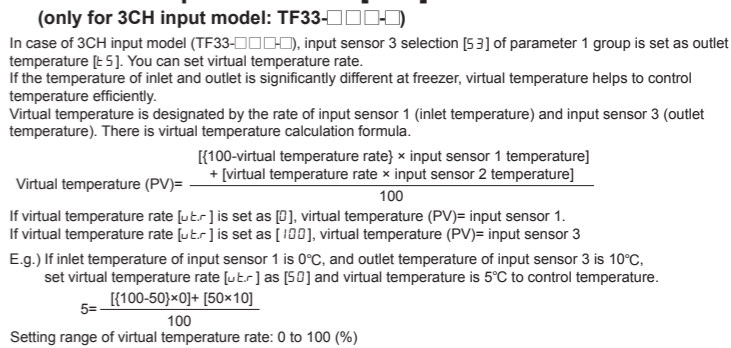
Parameter Mask



Parameter User Group [PRU]



Virtual Temperature Rate [ut.r]



Display Selection [dP.t.]

(only for 3CH input model: TF33-□□□□□)

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

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

