

selec

TC544A / TC244AX / TC344AX

Operating Instructions



SPECIFICATIONS

Display

4 + 4 digit, 7 segment digital display

LED Indications

1: Output 1 ON

2: Output 2 ON

T: Auto tune

S: Dwell timer

Keys

3 keys for digital setting

INPUT SPECIFICATIONS

Input Signal

Thermocouple (J,K,T,R,S) / RTD (Pt100)

Sampling time

250 ms

Input Filter (FTC)

0.2 to 10.0 sec

Resolution

0.1/1° for TC/RTD input (fixed 1° for R & S type TC input)

Temperature Unit

°C / °F selectable

Indication Accuracy

For TC inputs: 0.25% of FS ±1°

For R & S inputs: 0.5% of FS ± 2°

(20 min of warm up time for TC input)

For RTD inputs: 0.1% of FS ±1°

FUNCTIONAL SPECIFICATIONS

Control Method

1) PID control with auto tuning

2) ON-OFF control

3) Heat-Cool (with auto-tuning)

Proportional Band (P)

1.0 to 400.0°

Integral Time (I)

0 to 9999 sec

Derivative Time (D)

0 to 9999 sec

Cycle Time

0.1 to 99.9 sec

Hysteresis Width

0.1 to 99.9°

Dwell Timer

0 to 9999 min

Manual Reset Value

-19.9 to 19.9°

HEAT COOL PID

Control Method

PID

Proportional Band-Cool

0.0 to 400.0°

Cycle Time-Cool

0.1 to 99.9 sec

Dead Band

SPLL to SPHL (Programmable)

CONTROL OUTPUT

(Relay or SSR user selectable)

Relay 1 Contact (SPDT) (For TC544A : SPST Contact)

5 A resistive@250V AC / 30V DC

Relay 2 Contact (SPDT) (For TC544A : SPST Contact)

5 A resistive@250V AC / 30V DC

SSR Drive Output (Voltage Pulse)

12 VDC, 50 mA

POWER SUPPLY

Supply Voltage

85 to 270 VAC/DC (AC: 50 or 60 Hz)

OPTIONAL - 24 VAC/DC

Power Consumption

6 VA max @230 VAC

Temperature

Operating: 0 to 50°C ; Storage: -20 to 75°C

Humidity (non-condensing)

95% RH

Weight

TC544A:142 gms | TC244AX:190 gms | TC344AX:252 gms

SAFETY PRECAUTIONS

All safety related codifications, symbols and instructions that appear in this operating manual or on the equipment must be strictly followed to ensure the safety of the operating personnel as well as the instrument.

If the equipment is not handled in a manner specified by the manufacturer it might impair the protection provided by the equipment.

Read complete instructions prior to installation and operation of the unit.

WARNING: Risk of electric shock.

WIRING GUIDELINES

WARNING:

- To prevent the risk of electric shock power supply to the equipment must be kept OFF while doing the wiring arrangement. Do not touch the terminals while power is being supplied.
- To eliminate electromagnetic interference use short wire with adequate ratings; twists of the same in equal size shall be made. For the input and output signal lines, be sure to use shielded wires and keep them away from each other.
- Cable used for connection to power source, must have a cross section of 1mm² or greater. These wires shall have insulation capacity made of at least 1.5kV.
- When extending the thermocouple lead wires, always use thermocouple compensation wires for wiring. For the RTD type, use a wiring material with a small lead resistance (5Ω max per line) and no resistance differentials among three wires.
- A better anti-noise effect can be expected by using standard power supply cable for the instrument.

MAINTENANCE

- The equipment should be cleaned regularly to avoid blockage of ventilating parts.
- Clean the equipment with a clean soft cloth . Do not use Isopropyl alcohol or any other cleaning agent.

INSTALLATION GUIDELINES

- This equipment, being built-in-type, normally becomes a part of main control panel and in such case the terminals do not remain accessible to the end user after installation and internal wiring.

- Do not allow pieces of metal, wire clippings, or fine metallic fillings from installation to enter the product or else it may lead to a safety hazard that may in turn endanger life or cause electrical shock to the operator.
- Circuit breaker or mains switch must be installed between power source and supply terminals to facilitate power 'ON' or 'OFF' function. However this switch or breaker must be installed in a convenient position normally accessible to the operator.
- Use and store the temperature controller within the specified ambient temperature and humidity ranges as mentioned in this manual.

CAUTION

- When powering up for the first time, disconnect the output connections.
- Fuse Protection: The unit is normally supplied without a power switch and fuses. Make wiring so that the fuse is placed between the mains power supply switch and the controller. (2 pole breaker fuse- rating: 275V AC,1A for electrical circuitry is highly recommended)
- Since this is a built-in-type equipment (finds place in main control panel), its output terminals get connected to host equipment. Such equipment shall also comply with basic EMI/EMC and other safety requirements like BSEN61326-1 and BSEN61010 respectively.
- Thermal dissipation of equipment is met through ventilation holes provided on chassis of equipment. Such ventilation holes shall not be obstructed else it can lead to a safety hazard.
- The output terminals shall be strictly loaded to the manufacturer specified values/range.

MECHANICAL INSTALLATION

NEW

Outline dimensions (in mm)

Panel cutout dimensions (in mm)

Diagram showing outline dimensions A, B, C, D, E, F, G for the TC544A unit. The unit is shown with its front panel and side profile. Dimensions A and B are the overall width and height. C and D are the width and height of the front panel. E and F are the width and height of the side panel. G is the width of the top panel. The unit is labeled with 'select' and '1 2 3'.

Diagram showing panel cutout dimensions G, F, E, D, C, B, A for the TC544A unit. The unit is shown with its front panel and side profile. Dimensions G and F are the width and height of the front panel. E and D are the width and height of the side panel. C and B are the width and height of the top panel. The unit is labeled with 'select' and '1 2 3'.

MODELS	DIM							
	A	B	C	D	E	F	G	
TC544A	52	52	94	45	4	46	46	
TC244AX	72	72	83.7	67	4.5	69	69	
TC344AX	96	96	73	90.5	5	92	92	

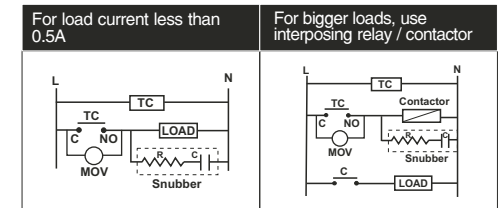
- Prepare the panel cutout with proper dimensions as shown above.
- Remove the clamp from the controller and push the controller into the panel cutout. Insert the clamp from the rear side until the main unit is securely fit into the panel.
- The equipment in its installed state must not come in close proximity to any heating sources, caustic vapors, oils, steam, or other unwanted process by-products.
- Use the specified size of crimp terminals (M3.5 screws) to wire the terminal block. Tighten the screws on the terminal block using the tightening torque within the range of 1.2 N.m.
- Do not connect anything to unused terminals.

EMC Guidelines:

- Use proper input power cables with shortest connections and twisted type.
- Layout of connecting cables shall be away from any internal EMI source.

LOAD CONNECTIONS

- The service life of the output relays depends on the switching capacity and switching conditions. Consider the actual application conditions and use the product within the rated load and electrical service life.
- Although the relay output is rated at 5 amps it is always necessary to use an interposing relay or contactor that will switch the load. This avoids damage to the controller in the event of a fault short developing on the power output circuit.
- Always use a separate fused supply for the "power load circuit" and do not take this from the live and neutral terminals supplying power to the controller.



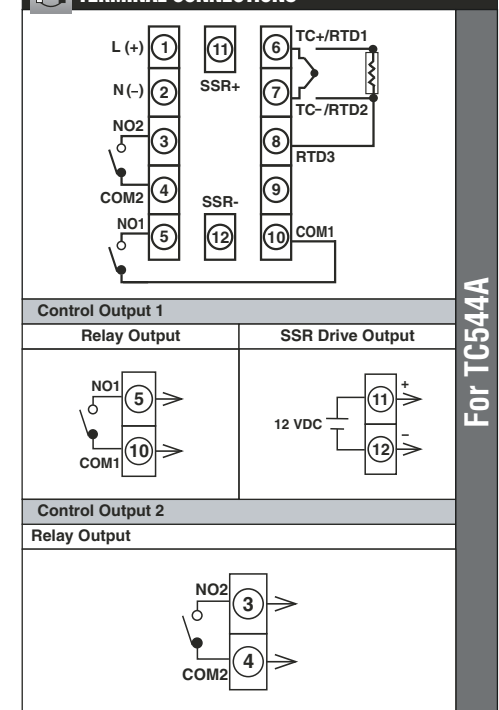
ELECTRICAL PRECAUTIONS DURING USE

Electrical noise generated by switching of inductive loads can create momentary disruption, erratic display, latch up, data loss or permanent damage to the instrument.

To reduce noise:

- Use of snubber circuits across loads as shown above, is recommended.
- Use separate shielded wires for inputs.

TERMINAL CONNECTIONS



For TC544A Continued

For TC244AX

For TC344AX

TERMINAL CONNECTIONS

Measured Value Input

Thermocouple (J, K, T, R, S)	RTD (Pt100)
<p>Connect thermocouple sensor according to polarity shown.</p>	<p>For 2-wire RTD input short terminals 7 and 8</p>

Control Output 1

Relay Output 1	SSR Drive Output	Relay Output 2

Measured Value Input

Thermocouple (J, K, T, R, S)	RTD (Pt100)
<p>Connect thermocouple sensor according to polarity shown.</p>	<p>For 2-wire RTD input short terminals 9 and 10</p>

Control Output 2

Relay Output 1	SSR Drive Output	Relay Output 2

Measured Value Input

Thermocouple (J, K, T, R, S)	RTD (Pt100)
<p>Connect thermocouple sensor according to polarity shown.</p>	<p>For 2-wire RTD input short terminals 11 and 12.</p>

Use only the correct thermocouple wire or compensating cable from the probe to instrument terminals avoiding joints in the cable if possible.
Failure to use the correct wire type will lead to inaccurate readings.
Ensure that the input sensor connected at the terminals and the input type set in the temperature controller configuration are the same.

FRONT PANEL DESCRIPTION

1 Process-value (PV) / Parameter name display	1) Displays a process value (PV). 2) Displays the parameter symbols at configuration mode/online menu. 3) Displays PV error conditions. (refer Table 2 on page 4)
2 Parameter setting display	1) Displays the parameter settings at configuration mode/online menu.
3 Control output 1 indication	The LED is lit when the control output 1 is ON
4 Control output 2 indication	The LED is lit when the control output 2 is ON
5 Tune	Auto tune: Blinking at faster speed.
6 Dwell timer	Blinking: Dwell timer is in progress. Continuous ON: Time over.

FRONT KEYS DESCRIPTION

Functions	Key press
Online	
To view Level 1	Press key for 3 seconds.
To view Level 2	Press key for 3 seconds.
To view Protection Level	Press + keys for 3 seconds.
To view online parameters	Lower display selectable between SET1/SET2/TIME using key. Note: Upper display shows parameter name for 1sec.

NOTE: Elapsed time/Remaining time dependent on the selection Of ONL parameter in level1.

To change online parameter values	Press + / to change parameter value.
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Programming Mode

To view parameters on the same level.	or key once to view the next or previous function in operational menu.
To increase or decrease the value of a particular parameter.	+ to increase and + to decrease the function value. Note: Parameter value will not alter when respective level is locked.

NOTE: The unit will auto exit programming mode after 30 seconds of inactivity.
OR By pressing the or or + keys for 3 seconds.

USER GUIDE

1. Display Bias:

This function is used to adjust the PV value in cases where it is necessary for PV value to agree with another recorder or indicator, or when the sensor cannot be mounted in the correct location.

2. Filter Time Constant

The input filter is used to filter out quick changes that occur to the process variable in a dynamic or quick responding application which causes erratic control. The digital filter also aids in controlling processes where the electrical noise affects the input signal. Larger the value of FTC entered, greater the filter added and the slower the controller reacts to the process and vice versa.

3. Auto tuning:

The Auto-tuning function automatically computes and sets the proportional band (P), integral time (I), Derivative time (D), ARW% and cycle time (CYC.T) as per process characteristics.

- While Auto-tune is in progress, 'T' LED will blink at a faster speed.**
- After Auto-tuning is completed, the 'T' LED stops blinking.**

- If the power goes OFF before auto-tuning is completed, auto-tuning will be restarted at next power ON.
- If auto-tuning is not completed after 3-4 cycles, it is suspected to fail. In this case, check the wiring & parameters such as the control action, input type, etc.
- Carry out the auto-tuning again, if there is a change in setpoint or process parameters.

4. ON/OFF control action (For Reverse Mode):

The relay is 'ON' up to the set temperature and cuts 'OFF' above the set temperature. As the temperature of the system drops, the relay is switched 'ON' at a temperature slightly lower than the set point.

HYSTERESIS:
The difference between the temperature at which relay switches 'ON' and at which the relay switches 'OFF' is the hysteresis or dead band.

5. Manual Reset (for PID control & I=0):

After sometime, the process temperature settles at a point and there is a difference between the set temperature & the controlled temperature. This difference can be removed by setting the manual reset value equal & opposite to the offset.

TIME PROPORTIONAL WITH MANUAL RESET

6. Heat-Cool:

By using a heating and cooling output, a process is able to quickly bring the temperature to setpoint in both directions and limit the amount of overshoot.

Heat-cool control is a very effective way of controlling exothermic processes. (processes that generate their own heat, or processes where ambient temperature is not adequate or fast enough in returning a process back to setpoint)

Cycle time-cool (CYT.C): Generally select 0.2-2 sec if SSR is used, and 10-20 sec if relay output is used. Cycle time-cool is ignored if linear output is used.

Proportional band-cool (PB-C): The cooling proportional band is measured by degrees with range 0.0 to 400.0.

- If cooling action is to be enhanced then decrease PB-C
- If cooling action is too strong then increase PB-C.

Note: The ON-OFF control may result in excessive overshoot and undershoot in the process. It is recommended to use PID control for the heat-cool control to produce a stable & zero offset process value.

DB programming (DB): Deadband (+ve DB) is that area where neither outputs are energized. Overlap (-ve DB) is that area where both the outputs are energized.

- If more positive value of DB is used, an unwanted cooling action can be avoided but an excessive overshoot over the setpoint will occur.
- If more negative value of DB is used, an excessive overshoot over the setpoint can be minimized but an unwanted cooling action will occur.

7. Dwell Timer

A dwell timer is used to control a process at a fixed temperature for a defined period. Once the process reaches the setpoint, dwell timer starts to count from zero until time out. After the time is completed, control output goes OFF and auxiliary output energies as an alarm.

Settings:
DWEL=YES
ACT2=TIME
TIME=2 min
ONL=REMNELPS

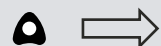
Note:

- S LED blinking indicates dwell timer is in progress. It switches to continuous ON when dwell timer overs.
- Dwell time programmed as OFF will disable the dwell timer.
- When Soak in progress & dwell time modified, new dwell time is applicable.
- The Dwell period can be reduced or increased when the timer is running. If it is reduced to meet the time elapsed, the timer will change to the end state.
- Once the timer output was energized it will remain unchanged until power down

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CONFIGURATION INSTRUCTIONS

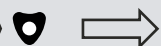
KEY FUNCTIONS



Press once to view online parameters

Press for 3 sec to enter Level 2

Press once to view next parameter in configuration menu



Press for 3 sec to enter Level 1

Press once to view previous parameter in configuration menu



Press for 3 sec to enter protection Level



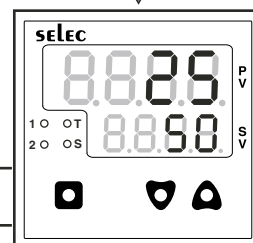
Allows the user to increase or decrease associated parameter value



To exit configuration menu press any of these keys for 3 sec

OPERATIONAL MENU

POWER ON



Note

At power ON lower display shows (momentary) input type selected in Level 1.

Press key for 3 seconds

Press key for 3 seconds

Press keys for 3 seconds

Level 1

Display	Description	Default Value	Range	Display Condition
INPT	Input type (Refer Table 1)	J	J/K/T/R/S/RTD	—
RESL	Display Resolution	1	1/0.1	Not prompted for R & S type
UNIT	Temperature unit	°C	°C/°F	—
SPLL	Set point low limit	-199	Min range of sensor selected to SPHL	—
SPHL	Set point high limit	750	SPLL to Max range of sensor selected	—
FEL	Filter time constant (Refer user guide)	1.0	0.2 to 10.0 sec	—
RC1	Control action for relay 1	RE	RE/FD	Not prompted for HC=YES
CNEL	Control logic	PID	PID/ONF	—
OUT	Control Output selection	RLY	RELAY/SSR	—
DWEL	Dwell mode enable	NO	NO/YES	—
HC	Heat-cool mode selection (Refer user guide)	NO	NO/YES	—
RC2	Control action for relay 2	RE	RE/FD/TIME	When HC=NO, TIME prompted when DWEL=YES
RD2	Relay 2 type	DEV	DEV/ABS	When ACT2=RE/FD
ONL	Online menu for timer	REMN	REMN/ELPS	When DWEL=YES
RPW	Anti-reset windup %	25.0	1.0 to 100.0%	When CNTL=PID
RSF	Factory default (Reset all)	NO	NO/YES	—

Level 2

Display	Description	Default Value	Range	Display Condition
TUNE	Tune (Refer user guide)	OFF	OFF/ON	For CNTL=PID
P	Proportional band	10	1.0 to 400.0°	For CNTL=PID
I	Integral time	120	0 to 9999 sec	For CNTL=PID
d	Derivative time	30	0 to 9999 sec	For CNTL=PID
CYC.n	Cycle time mode	AUTO	AUTO/USR.F	For CNTL=PID
CYC.t	Cycle time	15.0	0.1 to 99.9 sec	For CNTL=PID
HYS1	Hysteresis 1	1.0	0.1 to 99.9°	For CNTL=ONF
MANR	Manual reset	0.0	-19.9 to +19.9°	For CNTL=PID & I=0
Pb.C	Proportional band-cool	10	1.0 to 400.0°	HC=YES
CYC.C	Cycle time-cool	15.0	0.1 to 99.9 sec	HC=YES
HYS2	Hysteresis 2	1.0	0.1 to 99.9°	For HC=NO or HC=YES & CNTL=ONF
ETn	Dwell time (Refer user guide)	OFF	OFF, 1 to 9999 min	When DWEL=YES
DSB	Display bias (Refer user guide)	0.0	-19.9 to 19.9°	—

Protection Level

Display	Description	Default Value	Range	Display Condition
SP1	Lock setpoint 1	UNL	UNLK/LOCK	—
SP2	Lock setpoint 2	UNL	UNLK/LOCK	—
LVL1	Lock level 1	UNL	UNLK/LOCK	—
LVL2	Lock level 2	UNL	UNLK/LOCK	—
DWEL	Lock dwell time	UNL	UNLK/LOCK	Prompted when DWEL=YES

Note

1. Locking parameters (LVL1 or LVL2 or SP or DWEL) will not permit change in the value of respective level parameters. **Time value (online) can be altered only when DWEL is not locked in protection level.**
2. Continuous operation of keys for SP or other parameters makes update speed faster in 3 stages after 3 seconds.

Programming online parameters

Setpoint 1

Default: 50

Range: SPL to SPHL

If upper display is selected as $SEt1$ then,

Pressing **■** key will show on Upper display: $SEt1$

Lower display: <50>

Press **■** + **▲** / **▼** keys to increment/decrement $SEt1$ value.

Setpoint 2/Dead band

Default: 0

Range: SPL to SPHL

If upper display is selected as $SEt2/db$ then,

Pressing **■** key will show on Upper display: $SEt2/db$

Lower display: <0>

Press **■** + **▲** / **▼** keys to increment/decrement $SEt2/db$ value.

Dwell Timer

Default: 0

Range: OFF, 1 to 9999 min

If upper display is selected as ETN/ELP then,

Pressing **■** key will show on Upper display: ETN

Lower display: <OFF>

Press **■** + **▲** / **▼** keys to increment/decrement dwell time value.

INPUT RANGES (Table 1)

FOR RTD

Input	Ranges		
Resolution	1	0.1	
Pt100	°C	-150 to 850	-150 to 850
	°F	-238 to 1562	-199 to 999

FOR THERMOCOUPLE

Input	Ranges		
Resolution	1	0.1	
J	°C	-199 to 750	-199 to 750
	°F	-328 to 1382	-199 to 999
K	°C	-199 to 1350	-199 to 999
	°F	-328 to 2462	-199 to 999
T	°C	-199 to 400	-199 to 400
	°F	-328 to 750	-199 to 750
R & S	°C	0 to 1750	N/A
	°F	32 to 3182	N/A

ERROR DISPLAY (Table 2)

When an error has occurred, the upper display indicates error codes as given below.

Error	Meaning	Control Output Status
SbP	Sensor break / over range condition	OFF
SE	Sensor reverse / under range condition	OFF



CALIBRATION CERTIFICATE

Date:

Model No:

Claimed Accuracy:

For TC inputs: 0.25% of FS $\pm 1^\circ$

For R & S inputs: 0.5% of FS $\pm 2^\circ$

(20 min of warm up time for TC input)

For RTD inputs: 0.1% of FS $\pm 1^\circ$

Sources calibrated against:

Hinditron Multimeter Model 86, Sr. No.:1094

Multimeter calibration report no: 2010 S & C 617

ERTL(W), Mumbai, INDIA

Date:13/05/2010

The calibration of this unit has been verified at the following values:

SENSOR	CALIBRATION TEMP (°C) (0.1 resolution)	DISPLAY VALUE (°C)
K	35.0	35.0
	700.0	700.0
	1350	1350
PT100	0.0	0.0
	500.0	500.0
	800.0	800.0

The thermocouple / RTD curves are linearised in this microprocessor based product; and hence the values interpolated between the readings shown above are also equally accurate; at every point in the curve.

Unit is accepted as accuracy is within the specified limit of claimed accuracy and certificate is valid upto one year from the date of issue.

CHECKED BY:

Selec Controls Pvt. Ltd.

Specifications are subject to change, since development is a continuous process

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