1/32 DIN TEMPERATURE CONTROLLER MANUAL (59424-8)

SAFETY INFORMATION

INSTALLATION

Designed for use:
UL61010-1 Edition 3
To offer a minimum of Basic Insulation only.
Suitable for installation within Category II and III and Pollution Degree 2.
SEE ELECTRICAL INSTALLATION. It is the responsibility of the installation engineer to ensure this equipment is installed as specified in this manual and is in compliance with appropriate working regulations. Compliance shall not be impaired when fitted to the final installation.
The body responsible for the installation is to ensure that supplementary insulation suitable for Installation Category II or III is achieved when fully installed.
To avoid possible hazards, accessible conductive parts of the final installation should be protectively earthed in accordance with UL61010-1 Edition 3 for Class 1 Equipment.
Output wiring should be within a Protectively Earthed cabinet.
Sensor sheaths should be bonded to protective earth or not be accessible.
Live parts should not be accessible without the use of a tool.
When fitted to the final installation, an IEC/CSA APPROVED disconnecting device should be used to disconnect both LINE and NEUTRAL conductors simultaneously. Position the equipment so that it is easy to operate the disconnecting device.
These products are intended for indoor use only

CONFIGURATION

All functions are front selectable. It is the responsibility of the installing engineer to ensure that the configuration is safe. Use the program lock to protect critical functions from tampering.

ULTIMATE SAFETY ALARMS

Do not use SP2 as the sole alarm where personal injury or damage may be caused by equipment failure

⚠ **WARNING:** This product can expose you to chemicals including arsenic, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov
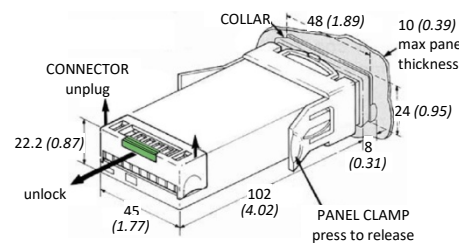
MECHANICAL INSTALLATION

The Controllers are designed to be mounted in a 1/32 DIN panel cutout. The units are sleeve mounted with the front bezel assembly rated NEMA4/IP66 provided that:
– The panel is smooth and the panel cutout is accurate;
– The mounting instructions are carefully followed.

PANEL MOUNTING:

1. Unplug connector before installing the controller if wiring separately.
2. Check the controller is correctly orientated and then slide into the cutout.
3. Slide the clamp over the controller sleeve, pressing it firmly against the panel until the controller is held firmly.
   Note: to remove panel clamp the two side levers should be pressed in.
4. Refit the connector if removed. To further secure the connector, slide the green lock. Push in to lock, pull out to unlock as shown.
5. After installation remove the protective front window label.
6. When refitting the bezel assembly it is important to press it firmly into the sleeve until the latch clicks in order to compress the gasket and seal to NEMA4X/IP66

DIMENSIONS – MM *(INCH)*:

COLLAR — 48 *(1.89)*
10 *(0.39)* max panel thickness
CONNECTOR unplug
24 *(0.95)*
22.2 *(0.87)*
8 *(0.31)*
unlock
45 *(1.77)*
102 *(4.02)*
PANEL CLAMP press to release

CLEANING:

Wipe down with damp cloth (water only)
Note: The controller should be isolated before removing or refitting it in the sleeve, and electrostatic precautions should be observed when handling the controller outside the sleeve.

ELECTRICAL INSTALLATION *(also see important Safety Information)*

OUTPUT DEVICES

Two output devices are fitted to the controllers,
1 Solid state relay driver (SSd) 5Vdc +0/-15%, 10mA non isolating. To switch a remote SSR (or logic)
2 Miniature power relay (rLY) 2A/250V AC resistive, Form A / SPST contacts.

OUTPUT DEVICE ALLOCATION

Either of the outputs may be allocated for the main setpoint (SP1), the remaining being automatically allocated to the second setpoint (SP2).

Designed for use with the following supply voltages:
1). 100 - 240V 50-60 Hz 3VA (nominal) +/-10% maximum permitted fluctuation
2). 12V - 24V (AC/DC) +/-20% 3VA Polarity not required
The controller is fitted with a 250mA time lag fuse

CAUTION: Supply voltage is dependent on the specific model; check the product label to establish the correct voltage.
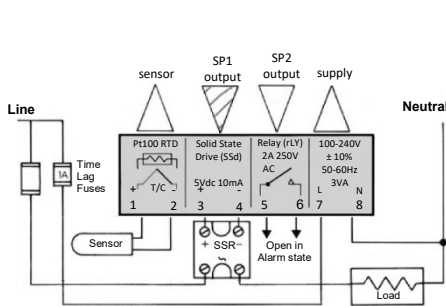
WIRING THE CONNECTOR

Use copper conductors (except on T/C input). Maximum recommended wire size: 32/0.2mm 1.0mm² (18AWG). Field wiring employed must be rated for a maximum of 80 deg C. Prepare the cable carefully, remove a maximum of 6mm insulation and ideally tin to avoid bridging. Prevent excessive cable strain.

INDUCTIVE LOADS

To prolong relay contact life and suppress interference it is recommended engineering practice to fit a snubber (0.1uf/100 ohms) between terminals 5 and 6.
CAUTION: Snubber leakage current can cause some electro-mechanical devices to be held ON. Check with the manufacturers specifications.

PANEL CUTOUT:

DIN PANEL CUTOUT – MM (INCH):

1/32 DIN CUTOUT

	A	B
Cutout size	22.2 +0.3 / 0.0 (0.87 +.012 / 0)	45.0 +0.6 / 0.0 (1.77 +.024 / 0)

Maximum panel thickness = 10mm

MULTIPLE INSTALLATIONS:

1/32 DIN CUTOUT

Guide for vertical & horizontal spacing

	V	H
Minimum	30 *(1.18)*	60 *(2.36)*
Allows clamp removal	30 *(1.18)*	70 *(2.76)*
Allows clamp & connector removal … **Recommended**	35 *(1.38)*	70 *(2.76)*

Optional panel adaptors are available for the controllers to be mounted in a 45x45mm (1/16DIN) cutout.

CONNECTION DIAGRAMS:

Example A: The SSd output is allocated to SP1 and wired to switch the load using an SSR
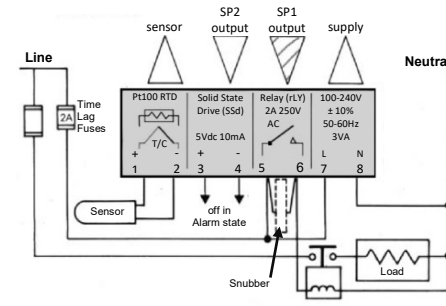
Example B: The relay output is allocated to SP1 and wired to switch the load using a contactor
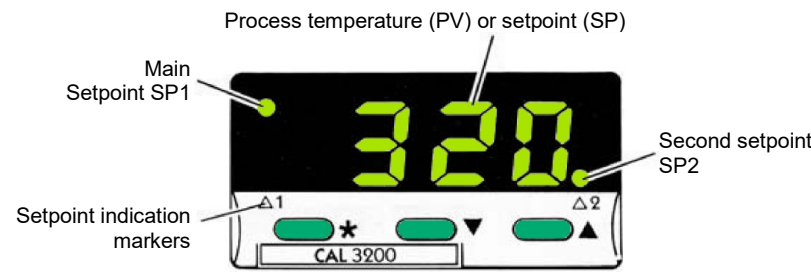
SENSOR SELECTION

Legend	Type	Description	Sensor Range (°C)	Sensor Range (°F)	Linearity
tC b	Thermocouple	Pt-30% Rh/Pt-6%Rh	0 to 1800°C	32 to 3272°F	2.0*
tC E	Thermocouple	Chromel/Con	0 to 600°C	32 to 1112°F	0.5
tC J	Thermocouple	Iron/Constantan	0 to 800°C	32 to 1472°F	0.5
tC K	Thermocouple	Chromel/Alumel	-50 to 1200°C	- 58 to 2192°F	0.25*
tC L	Thermocouple	Fe/Konst	0 to 800°C	32 to 1472°F	0.5
tC n	Thermocouple	NiCrosil/NiSil	-50 to 1200°C	-58 to 2192°F	0.25*
tC r	Thermocouple	Pt-13% Rh/Pt	0 to 1600°C	32 to 2912°F	2.0*
tC s	Thermocouple	Pt-10% Rh/Pt	0 to 1600°C	32 to 2912°F	2.0*
tC t	Thermocouple	Copper/Con	-200 to 250°C	-273 to 482°F	0.25
RTD	Resistance Temperature Detector	Pt100/RTD-2	-200 to 400°C	-273 to 752°F	0.25*

LINEAR PROCESS INPUTS (INPUT MV RANGE: 0 TO 50MV)

Displays	0 - 20mV	4 - 20mV	Setpoint Limits	Linearity
Lin1	0 – 100		0 to 400	± 0.5%
Lin2		0 – 100	-25 to 400	± 0.5%
Lin3	0 – 1000		0 to 3000	± 0.5%
Lin4		0 – 1000	-250 to 3000	± 0.5%
Lin5	0 - 2000		0 to 3000	± 0.5%

Notes: 1) Linearity: 5-95% sensor range
2) * Linearity B:5° (70° - 500°C) K/N:1° >350°C exceptions: R/S: 5°<300°C T:1° <- -25° >150°C RTD/Pt100: 0.5° <-100°C

INSTRUMENT PANEL FEATURES

Process temperature (PV) or setpoint (SP)
Main Setpoint SP1
Second setpoint SP2
Setpoint indication markers

ADJUSTMENTS

To enter or exit **program mode**: Press ▲ ▼ together for 3 seconds
To scroll through **functions**: Press ▲ or ▼
To change **levels** or **options**: Press ✱ ▲ together or ✱ ▼ together
To view setpoint: Press ✱
To increase setpoint: Press ✱ ▲ together
To decrease setpoint: Press ✱ ▼ together
To reset an alarm or fault condition: Press ▲ ▼ together briefly
Notes: If in difficulty by becoming "lost" in program mode, press ▲ and ▼ together for 3 seconds to return to display mode, check the INSTRUMENT ADJUSTMENTS above and try again.

When in program mode, after 60 seconds of key inactivity the display will revert to either **inPt : nonE** or, if the initial configuration has been completed, the measured value. Any settings already completed will be retained.

GETTING STARTED

After power-up the controller requires programming with the following information:
– **Type of Sensor**
– **Operating unit**
– **Allocation of Output Device to SP1/SP2** (Relay or SSd)
– **Temperature Setpoint**

When the above information has been programmed into the controller it will be operational with the following factory settings.

Proportional band/Gain	10ºC/18ºF
Integral time/Reset	5 mins
Derivative time/Rate	25 secs
Proportional cycle-time	20 secs (Typical setting for relay output)
DAC Derivative approach control	1.5 (Average setting for minimum overshoot)

INITIAL SET-UP

On power-up the controller will display the self test sequence followed by the initial display **inPt : none**
Select input sensor.
– **Press and hold ✱** and use the ▲ or ▼ buttons to scroll through the sensor selection list until the correct sensor is displayed. Release the buttons. The display will now read selected sensor type e.g. **inPt : tCs**
– **Press ▲ once** The display will now read **unit : none**

Select unit.
– **Press and hold ✱** and use the ▲ or ▼ buttons to scroll through the unit selection list until the correct unit is displayed. Release the buttons. The display will read selected unit e.g. **unit : °C**
– **Press ▲ once** The display will now read **SP1.d : nonE**

Select SP1 (Main setpoint output device)
– **Press and hold ✱** and use the ▲ or ▼ buttons to select **SSd** or **rLY** as required. The controller will show the selected output device e.g. **SP1.d : SSd**

To enter initial configuration into controller memory
– **Press and hold** both ▲ and ▼ buttons for 3 seconds (settings are not implemented or stored until this is done).
– The display will now read **ParK** and measured input variable (eg. the sensor temperature) **ParK** is displayed because a setpoint has not yet been entered.

To display setpoint
– **Press and hold ✱** The display will now read **unit** (eg. **°C**) followed by **0**

To enter setpoint
– **Press and hold ✱** and use ▲ button to increase or ▼ button to decrease the reading and scroll to required setpoint value. (The digit roll-over rate increases with time).

THE CONTROLLER IS NOW OPERATIONAL WITH FACTORY SETTINGS

Note: For precise control of an application the controller may need to be TUNED. Please see the following section on AUTOTUNE

AUTO-TUNE

This is a single shot procedure to match a controller to the process. Select either **Tune** or **Tune at Setpoint** from the criteria below.

The **Tune** program should be used when the load temperature is at or near ambient. The procedure will apply disturbances when the temperature reaches 75% of the setpoint value, causing overshoot which is monitored in order to adjust the **DAC** overshoot inhibit feature. Care should be taken to ensure that any overshoot is safe for the process.

The **Tune at Setpoint** program is recommended when:
– The process is already at setpoint and control is poor
– The setpoint is less than 100°C
– Re-tuning after a large setpoint change
– Tuning multi-zone and/or heat-cool applications.

Notes: **DAC** is not re-adjusted by Tune at setpoint.
Proportional Cycle Time can be pre-selected before running the Autotune program.

Hereafter in the Manual the symbol (▲ ▼) signifies both buttons are held pressed for 3 seconds to ENTER or EXIT program mode.

TUNE OR TUNE AT SETPOINT PROGRAM

Enter program (▲ ▼) and from the display **tunE : oFF** press and hold ✱ and press ▲ to display **tunE : on** or **tunE : At.SP**
Exit program mode (▲ ▼).

The **TUNE** program will now start. The display will show **tunE** as the process temperature climbs to setpoint.
Note: During tuning, the main setpoint (SP1) LED will flash.

When the **TUNE** or **TUNE AT SETPOINT** program is complete the PID values are entered automatically. The process temperature will rise to setpoint and control should be stable. If not, this may be because optimum cycle time is not automatically implemented. To set the cycle time see **PROPORTIONAL CYCLE-TIME**.

PROPORTIONAL CYCLE-TIME

The choice of cycle-time is influenced by the external switching device or load. eg. Contactor or SSR. A setting that is too long for a process will cause oscillation or a setting that is too short will cause unnecessary wear to an electro-mechanical switching device.
Factory set - To use the 20 sec factory set cycle-time no action is needed whether autotune is used or not.

To Manually Select AUTOTUNE Calculated CYCLE-TIME

When AUTOTUNE is completed, enter program (▲ ▼) and select **CYC.t** in **Level 1**. The display will read **CYC.t:20** (factory setting)
To view the new calculated optimum value, press and hold both ✱ and ▼ buttons until indexing stops. The calculated value will be displayed eg. **A16**. If acceptable, exit program (▲ ▼) to implement this setting.

To Pre-select Automatic Acceptance of AUTOTUNE Calculated CYCLE-TIME

Before AUTOTUNE is initiated select **CYC.t** in **Level1**, press and hold both ✱ and ▼ buttons until indexing stops at **A – –**. Exit program (▲ ▼) to accept calculated value automatically.

To Manually Pre-select Preferred CYCLE-TIME

Before AUTOTUNE is initiated select **CYC.t** in **Level 1**, press and hold both ✱ and ▲ or ▼ buttons until indexing stops at preferred value then exit program (▲ ▼) to accept.

CYCLE-TIME RECOMMENDATIONS

Output device	Factory setting	Recommended minimum
Internal relay :	20 seconds	10 seconds
Solid state drive :	20 seconds	0.1 seconds

SECOND SETPOINT (SP2)

SECOND SETPOINT (SP2) Alarm Output

Configure SP2 output to operate as an alarm from **SP2.A** in Level 2 and set the temperature alarm setting in **SEt.2** Level 1. The alarm will be triggered when the process temperature changes according to the options listed below.

dV.hi	The process rises above the main setpoint by the value entered at **SEt.2**.
dV.Lo	The process falls below the main setpoint by the value entered at **SEt.2**.
Band	The process rises above or falls below the main setpoint by the value inserted at **SEt.2**.
FS.hi	The process rises above the SP2 setpoint assigned in **SEt.2**.
FS.Lo	The process falls below the SP2 setpoint assigned in **SEt.2**.

SUBSIDIARY SP2 MODE

The following additional alarm functions can be added to the above alarm configurations using the features found in **SP2.b** in Level 2

LtCh	Once activated, the alarms will latch and can be manually reset when the alarm condition has been removed by pressing ▲ ▼ together briefly.
Hold	This prevents any alarm operation on power-up and is automatically disabled once the process reaches setpoint in order to allow normal alarm operation.
Lt.ho	Combines the effects of both **LtCh** & **Hold**.
nLin	This setting is used for non-linear cooling only. Do not select if SP2 is to be used as an alarm output.

Remember also to set **CyC.2** to **on.oFF** if SP2 is used for alarms.

SECOND SETPOINT (SP2) Proportional control output

Configure in **Level 1** using **CyC.2** to select proportional cycle time and **bnd.2** to adjust proportioning band.
For Heat/Cool operation see full Operating Manual.
In on/off mode, bnd.2 adjusts SP2 hysteresis.

SP2 OUTPUT AND LED INDICATION STATES - IN ALARM CONDITION

Alarm Type	ON-OFF Operating Mode		Proportional Operating Mode		Legend
	SP2 Output State	SP2 LED State	SP2 Output State	SP2 LED State	
Deviation dV.hi dV.Lo bAnd		🔴	bAnd : on-off mode only	🔴	Output ON (relay or SSd energised)
Full Scale FS.hi FS.Lo		🔴		🔴	Output OFF (relay or SSd de-energised)
CooL Strategy	Temperature above setpoint			🔴	LED ON 🔴

SP2 ALARM ANNUNCIATOR

When an SP2 alarm mode is selected in SP2.A the alarm annunciator -AL- is displayed, alternating with the process temperature, during alarm condition. This annunciator may be disabled by selecting function no.AL : on in level 4.
Note: The alarm will be automatically reset when the temperature returns within the bnd.2 setting in Level 1.
SP2 in cool strategy See section on 'Cool Strategy' within full operating manual

ERROR MESSAGES

Display Flashes	Fault Type	Action
inPt: FAiL	**SENSOR FAULT** Thermocouple burnout; RTD/Pt100 open or short circuit. Also shown when the process is approximately 100°C above or below the selected range value.	Check sensor/wiring
dAtA : FAiL	**NON-VOLATILE MEMORY ERROR**	De-power briefly. Replace unit if problem persists
hAnd : FAiL	**MANUAL POWER ERROR** SP1 set to ON/OFF in CYC.t	Select proportional mode
tunE : FAiL	**IMMEDIATE FAIL ON AUTOTUNE START** Note: To reset and clear error press ▲ ▼ together briefly to cancel message.	1. If display setpoint=0 then enter setpoint 2. If SP1 set to ON/OFF in CyC.t then select proportional mode.
	FAIL LATER DURING AUTOTUNE CYCLE The thermal characteristics of the load exceed the autotune algorithm limits. The failure point is indicated by any display 0.0 in tech e.g. Ctb = 0.0	1. Change conditions. eg. raise setpoint 2. Try tunE : At.SP 3. If the error message persists, call local CAL representative for advice.

FUNCTION LIST (LEVELS 1 TO 4) - LEVEL 1

Function	Options [Factory settings] in brackets	Description
Select Autotune		
tunE	[oFF], on, ParK, At.Sp	Used to switch the Autotune feature on and off, to select ParK or tune at setpoint. ParK temporarily turns the output(s) off. To use select ParK and exit program mode. To disable re-enter program at tunE and select oFF.
SP1 Operating Parameters		
bAnD	0.1 to * C/°F [10°C/18°F]	SP1 proportional band/Gain or Hysteresis * 25% sensor maximum Proportional control eliminates the cycling of on-off control. Heater power is reduced, by time proportioning action, across the proportional band.
int.t	oFF, 0.1 to 60 minutes [5.0]	SP1 integral time/reset Auto-corrects proportional control offset error
dEr.t	oFF 1 - 200 seconds [25]	SP1 derivate time/rate Suppresses overshoot and speeds response to disturbances
dAC	0.5 - 5.0 x bAnd [1.5]	SP1 derivative approach control dAC Tunes warm-up characteristics, independent of normal operating conditions, by controlling when derivative action starts during warm-up (smaller dAC value = nearer setpoint).
CyC.t	A – –, on.oF, 0.1 - 81 sec [20]	SP1 proportional cycle-time (see section above) Determines the cycle rate of the output device for proportional control. Select on.oF for ON/OFF mode.
oFSt	[0] to * °C/°F	SP1 offset/manual reset * ±50% of the bAnd value, but also limited to between -273 & +818. Applicable in proportional and ON/OFF mode with integral disable: Int.t : oFF.
SP.LK	[oFF] on	Lock main setpoint Locks the setpoint preventing unauthorised adjustment.
SP2 Operating Parameters		
SEt.2	0 to * °C/°F [0]	Adjust SP2 setpoint * Deviation Alarms DV.hi, DV.Lo, bAnd 25% sensor maximum. * Full scale alarms FS.hi, FS.Lo sensor range f/s
bnd.2	0.1 - * °C/°F [2.0 °C/3.6°F]	Adjust SP2 hysteresis or proportional band/gain (see CyC.2 setting) * 25% sensor full scale. **CAUTION** Do not set 0.5 x SEt.2 if used with a band alarm (e.g. SEt.2SP2.A = bAnd in level 2) as this would stop the alarm disengaging.
CyC.2	[on.oFF] 0.1–81 seconds	Select SP2 ON/OFF or proportional cycle-time Select on.oFF for ON/OFF mode, or the cycle rate of SP2 output device for proportional mode. Always set to on.oFF if SP2 is used for alarms.

LEVEL 2

Function	Options [Factory settings] in brackets	Description
Manual Control Modes		
SPI.P	0 to 100 % 'read only'	Read SP1 output percentage power
hAnd	[oFF] 1 to 100 % (not in ON/OFF)	SP1 manual percentage power control For manual control should a sensor fail. Record typical SP1.P values beforehand.
PL.1	100 to 0 % duty cycle [100]	Set SP1 power limit percentage Limits maximum SP1 heating power during warm-up and in proportional band.
PL.2	100 to 0 % duty cycle [100]	Set SP2 percentage power limit (cooling)
SP2 Operating Modes		
SP2.A	[none] dV.hi dV.Lo bAnd FS.hi FS.Lo Cool	Main SP2 operating mode
SP2.b	[none] LtCh hoLd nLin	Subsidiary SP2 mode: latch/sequence ,Non-linear cool proportional band See the "SUBSIDIARY SP2 MODE" section on page 1 for more details.
Input Selection and Ranging		
di.SP	[1] 0.1	Select display resolution: for display of process temperature, setpoint, OFSt, Set.2, hi.SC, LoSC
hi.SC	sensor minimum [sensor maximum] °C/°F	Set full scale
Lo.SC	[sensor minimum] sensor maximum °C/°F	Set scale minimum (default 0°C or 32°F)
inPt	[nonE]	Select input sensor (See SENSOR SELECTION table)
Unit	[nonE] °C °F bAr Psi Ph rh	Select °C/°F or process units

LEVEL 3

Function	Options [Factory settings] in brackets			Description
Output Configuration				
SP1.d	[nonE] rLY SSd			Select SP1 output device **Note:** 'Read only' after initial configuration. rSET ALL full reset to factory settings required to change SP1.d subsequently.
SP2.d	[nonE] SSd rLY			Read SP2 output device (read only)
burn	[uP.SC]	SP1	SP2	Sensor burn-out/break protection **CAUTION:** Settings affect fail safe state.
	dn.SC	Upscale	Upscale	
	1u.2d	Downscale	Downscale	
	1d.2u	Downscale	Downscale	
		Downscale	Upscale	
Technical				
rEu.d		SP1	SP2	Select output modes: Direct/Reverse Select Reverse on SP1 for heating - output increases as process value rises Select Direct on SP1 for cooling - output increases as process value falls. For heat & cool applications, select 1r.2d and in Level 2, set SP2.A to Cool **CAUTION:** Settings affect fail safe state.
	[1r.2d]	Reverse	Direct	
	1d.2d	Direct	Direct	
	1r.2r	Reverse	Reverse	
	1d.2r	Direct	Reverse	
rEu.L		SP1	SP2	Select SP1/2 LED indicator modes
	[1n.2n]	Normal	Normal Normal	
	1i.2n	Invert	Invert	
	1n.2i	Normal	Invert	
	1i.2i	Invert		
SPAn	[0.0] to ±25% sensor maximum			Sensor span adjust For recalibrating to align readings with another instrument e.g. External Meter, data logger. See Full Operating Manual (ADVANCED SETTINGS).
ZEro	[0.0] to ±25% sensor f/s			Zero sensor error (see Sensor span adjust above).
ChEK	[oFF] on			Select control accuracy monitor
rEAD	[Var] hi Lo			Read control accuracy monitor
dAtA	[Ct A]; CT b; Ct 1; Ct 2; Ct 3; Ct 4; oS 1; uS and oS 2			Read Autotune tuning cycle data (see Operating Manual)
UEr				Software version number
rSET	[nonE] ALL			Resets all functions to factory settings **CAUTION:** This selection will lose all of the current settings.

LEVEL 4

Access to level 4 is gained through UEr in level 3. Press and hold ▲ or ▼ for 10 seconds.
Enter level 4 at Lock, release ▲ or ▼ together. Display reads LoCK nonE

Function	Options [Factory settings] in brackets	Description
Function Options		
dEr.S	0.1 to 1.0 [0.5]	Derivative sensitivity
di.SS	Dir, 1 to 32 [6]	Display sensitivity dir = direct display of input 1 = maximum, 32 = minimum sensitivity
no.AL	[oFF] on	Disable SP2 alarm annunciator–AL Select on to disable -AL
ProG	[Auto] StAY	Program mode auto-exit switch. Auto-exit returns display to normal if 60 seconds of key inactivity, select StAY to disable
Security		
LoCK	[none] LEV.3 LEV.2 ALL	Program security using Lock LEV.3 locks level 3 and 4 only- Technical Functions. LEV.2 locks levels 2, 3 and 4 only - Configuration and technical Functions. ALL locks all functions LoCK ALL

SPECIFICATION

Thermocouple
Standards: 9 types
IPTS 68 / DIN 43710
CJC rejection: 20:1 (0.05°/°C) typical
External resistance: 100Ω maximum

Resistance thermometer RTD-2/Pt100 2 wire
Standards: DIN 43760 (100Ω 0°C/138.5Ω 100°C Pt)
Bulb current: 0.2mA maximum

Linear process inputs
mV range: -10 to 50mV

Applicable to all inputs (SM = sensor maximum)
Calibration accuracy: ±0.25%SM ±1°C
Sampling frequency: input 10Hz, CJC 2 sec.
Common mode rejection: Negligible effect up to 140dB, 240V, 50-60Hz
Series mode rejection: 60dB, 50-60Hz
Temperature coefficient: 150ppm/°C SM
Reference conditions: 22°C ±2°C, rated voltage after 15 minutes settling time.

Output devices
SSd: Solid state relay driver: To switch a remote SSR 5Vdc +0/-15% 10mA non-isolated
Miniature power relay: form A / SPST contacts (AgCdO) : 2A/250Vac resistive load

General
Supply Voltage: 100-240V ±10% 50-60Hz 3VA - dependent on specific model.
24V ~ ±20% 3VA - dependent on specific model.
12V ~ ±20% 3VA - dependent on specific model.
Displays: 4 Digits, high brightness green or red LED. 10mm (0.4") high.
Digital range: -199 to 9999
Hi-res mode: -199.9 to 999.9
LED output indicators: SP1 round, green or red; SP2 round, green or red
Keypad: 3 elastomeric buttons

Environmental
Humidity: Max 80%
Altitude: up to 2000m
Installation: Categories II and III
Pollution: Degree II
Protection: NEMA 4X, IP66 and Installation Class 2
Safety: UL61010-1 Edition 3.
EMC Emission: EN61326-1:2013 Class B & FCC/CFR 47 Part 15B & Part 18
EMC Immunity: EN61326-1:2013 Table 1
Ambient: 0-50°C (32-130°F)
Mouldings: Flame retardant polycarbonate
Weight: 100g (3.5oz)

Approvals CE, UL & cUL.

FUNCTION MENU

Range of Adjustment shown under description. If applicable, factory settings shown in **bold**.
Note: The letter K appears in the instrument display as the character ᵏ

KEY ▼* OR *▲ TOGETHER TO CHANGE LEVELS OR OPTIONS

LEVEL 4 — dEr.S | di.SS | no.AL | ProG | LoCK
USER-PROTECTED SETTINGS
- Derivative sensitivity 0.1 to 1.0 x dEr.t (0.5)
- Display averaging dir ; 1 to 32
- Disable -AL- alarm display Off ; on
- Disable program auto-exit Auto ; StAY
- Security lock nonE; LEV 3, LEV 2, ALL

LEVEL 3 — SP1.d | SP2.d | burn | rEu.d | rEu.L | SPAn | 2Ero | ChEK | rEAd | dAtA | uEr | rSEt
CONFIGURE OUTPUT | SAFETY SETTINGS | CALIBRATION | PERFORMANCE DATA
- SP1 output device none; rfy; SSd;
- SP2 output device none; SSd; rfy; (read only)
- Sensor burn-out uP.SC; dn.SC; 1u.2d; 1d.2u
- Reverse outputs 1r.2d; 1d.2d; 1r.2r; 1d.2r
- Reverse O/P LEDs 1n.2n; 1i.2n; 1n.2i; 1i.2i
- Span adjustment 0.0 to 25% sensor full scale
- Zero adjustment 0.0 to 25% sensor full scale
- Set Monitor Off; on
- Read Monitor VAr; hi; lo; deg
- Read Tune Data CtA; Ctb; Ct1; Ct2; Ct3; Ct4; oS1; uS; oS2
- Software version consult unit
- RESET nonE, ALL

LEVEL 2 — SP1.P | hAnd | PL.1 | PL.2 | SP2.A | SP2.b | di.SP | hi.SC | Lo.SC | inPt | unit
MANUAL ADJUSTMENTS | SP2 MODES | RANGING | CONFIGURE INPUT
- Read SP1 output % 0 to 100% read only
- SP1 manual output % 0 to100% proportional mode only
- Limit SP1 output % 100 to 0%
- Limit SP2 output % 100 to 0%
- Main SP2 mode nonE; dV.hi; dV.Lo; bAnd; FS.hi; FS.Lo; Cool; EoP
- Second SP2 mode nonE; LtCH hold; Lt.ho; nLin
- Display resolution 1 or 0.1 degree
- Set scale maximum 0.0 sensor max to sensor full scale
- Set scale minimum 0.0 sensor min to sensor full scale
- Select input sensor nonE
- Select display units nonE; C; F; bAr; pSi; Ph; rH; SEt
INITIAL SET-UP ENTRY →

LEVEL 1 — tunE | bAnd | int.t | dEr.t | dAC | CYC.t | oFSt | SP.LY | SEt.2 | bnd.2 | CYC.2
SP1 SETTINGS | SP2 SETTINGS
- Autotune or Park Off; on; ParK; At.SP
- SP1 Prop band (gain)/ hyst 0.1 deg to 25% sensor f/s (10 C / 18 F)
- Integral time (reset) Off; 0.1 to 60 min (5 min)
- Derivative time (rate) Off; 1 to 200 sec (25 sec)
- Derivative approach 0.5 to 5.0 x bAnd (1.5)
- Cycle time or on/off On.oFF; 0.1 to 81 sec (20 sec)
- Offset (manual reset) 0 to 50% x bAnd (Int.t = off)
- Setpoint lock (SP1) Off; on
- Adjust SP2 setpoint +/- sensor full scale
- SP2 prop band/Gain/ hyst 0.1 deg to 25% sensor f/s (2 C / 3.6 F)
- SP2 Cycle on/off On.oFF; 0.1 to 81 sec
↑ PROGRAM ENTRY

KEY ▼ OR ▲ TO VIEW FUNCTIONS