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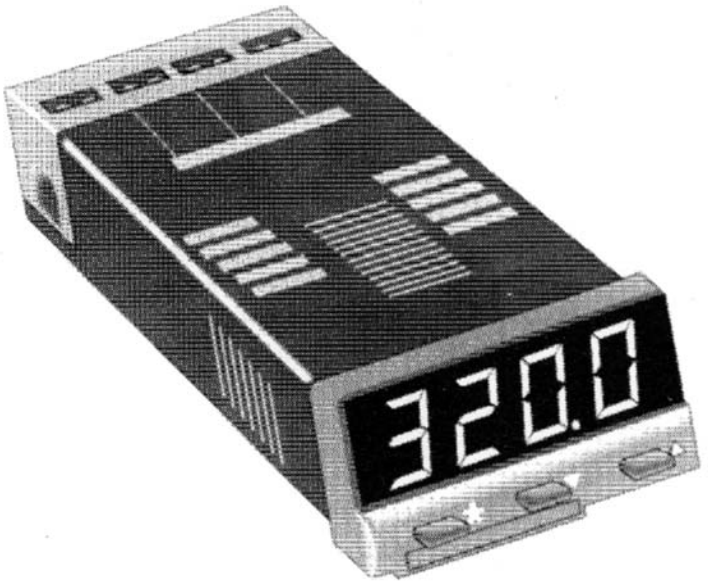
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Find the *OMEGA CN132-24* at our website: ***Click HERE***

CE

User's Guide



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CN132
Temperature/Process Controller

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WARNING: These products are not designed for use in, and should not be used for, patient connected applications.

CN132
AUTOTUNE TEMPERATURE CONTROLLER OPERATOR'S MANUAL

Thank you for choosing the CN132... a new concept in advanced, full feature, compact temperature control. Please . . .

1.  **SCAN** the table of contents and look through the manual. Note sections of interest.
2.  **REVIEW** the important safety information in Section 1 before installation.
3.  **INSTALL & CONNECT** using the instructions in Sections 4 and 5
4.  **SET UP** using the format you prefer...

   –  Detailed step-by-step instructions (see Section 6), or...

   –  Quick instructions for those familiar with micro-processor based controllers (see section 3).

UNPACKING INSTRUCTIONS

Remove the Packing List and verify that you have received all equipment. If you have any questions about the shipment, please call the OMEGA Customer Service Department at 1-800-622-2378 or (203) 359-1660.

When you receive the shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE: The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

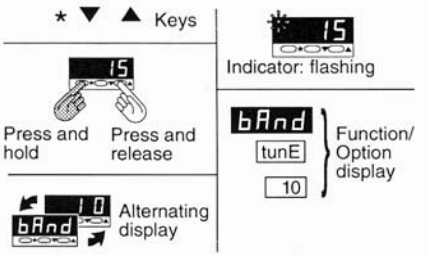
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SECTION 1. SAFETY

1. **INSTALLATION.** Designed for use:
   UL873 - only in products where the acceptability is determined by Underwriters Laboratories Inc.
   EN61010 - 1 within Installation Categories II and III environment and pollution degree 2.
   To avoid possible shock hazard install in a grounded metal enclosure. The sensor sheath and all accessible conductive parts should be grounded. Prevent live parts from being touched. Follow wiring diagrams and the appropriate regulations.
2. **CONFIGURATION:**
   All functions are front key 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.
   3.ULTIMATE SAFETY ALARMS: Normal safety advice:
   Do not use SP2 as the sole alarm where personal injury or damage may be caused by equipment failure.

SYMBOLS USED IN THIS MANUAL:



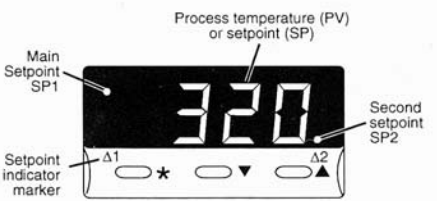
IN BRIEF . . .

Routine adjustments:

- ✱ View setpoint
- ✱▲ Increase setpoint
- ✱▼ Decrease setpoint

To reset alarm or fault message:

- ▼▲ Momentarily press together



SECTION 2 FUNCTIONS MENU AND PROGRAM MODE GUIDE

1. Enter/Exit:



Program mode .Press and hold ▼ ▲ 3 sec.

2. Single level navigation:



3. View/Change Option:



View Function/Option.



Autotune Option value.



Change Option value (or press ✱ ▼). Release: check for correct selection.

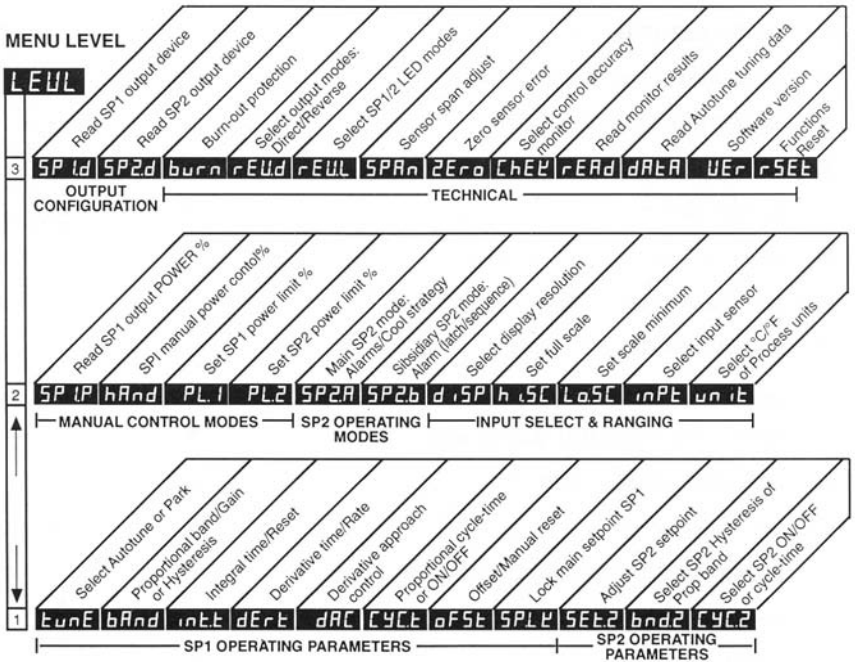
4. Changing menu levels:



Locate level Function.



Select new level.



SECTION 3 QUICK SETUP INSTRUCTIONS

For full instructions, see Section 6.

1. **Power up.**



Alternating display after self-test

2. **Select input sensor.**



To select, press and hold ✱
Press ▲
Check for correct selection.

3. **Select °C/°F.**



Press once...





...to select.

4. **Select main setpoint output device.**



See Section 5.3.
Press once.





Select SSR drive or 2A relay.

IMPORTANT: check that correct device is selected.

For any difficulty in initial configuration:



Press and hold ▼ ▲ 3 sec.
To display the next step, release keys together.

5. **Enter initial configuration.**



Hold both for 3 sec.

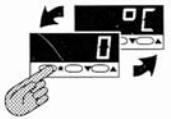


Normal operating mode:
No setpoint entered yet.

6. **Select other functions now or later.**

See guide and menu in Section 2.

7. **Setpoint display/adjust:**



Display setpoint.



To increase setpoint...



To decrease setpoint...

Operational with factory PID settings.

8. **To Autotune:**



Enter program mode.
Hold both for 3 sec.



Entry point...



Select tunE/on



Exit program mode.
Hold both for 3 sec.



Display during Autotune...

NOTE: Setpoint is locked during Autotune. tunE/oFF to adjust.

9. **For optimum cycle-time:**

See Section 9.4.

SECTION 4 MECHANICAL INSTALLATION

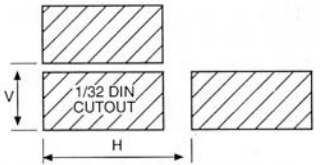
1. Prepare a 1/32 DIN panel cutout:
   45.0mm +0.6/-0 x 22.2mm + 0.3/-0
   1.77″ +0.02/-0 x 0.87″ +0.01/-0
2. Unplug connector now if wiring separately.
   Unlock connector by sliding the green lock outward as shown in 4.2
3. Slide the controller into the cutout.
4. Slide the panel clamp on to the controller and press it firmly against the panel.
   NOTE: To remove the panel clamp, press in the two side levers.
5. Refit the connector if removed. To further secure the connector, slide the green lock inward as shown.

4.1 CN132 CONTROLLER PROTECTION RATING

The CN132 controller front of panel assembly is rated NEMA 4X/1P65 provided that:

- The panel is smooth, and cutout accurate
- The panel clamp is pressed firmly against the panel, ensuring that the clamp springs are fully compressed

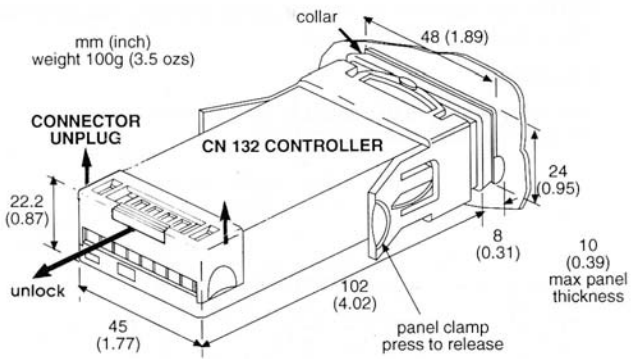
4.2 MULTIPLE CN132 INSTALLATIONS



Spacing Guide:

	V	H
Allows clamp/connector removal*	35 mm (1.38 in)	70 mm (2.76 in)
Minimum	30 mm (1.18 in)	60 mm (2.36 in)
Allows clamp removal	30 mm (1.18 in)	70 mm (2.76 in)

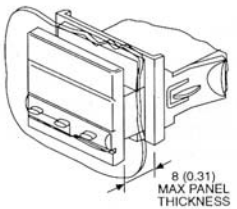
*Recommended



4.3 OPTIONAL 1/16 DIN PANEL ADAPTERS

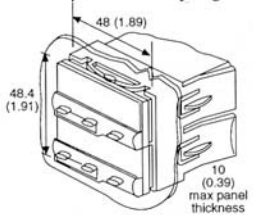
Adapter 48 mm (1.89 in) square enables CN132(s) to be mounted in a 1/16 DIN cutout.

- **1/16 DIN CN132 adapter** accepts one CN132.
  1. Remove collar/gasket from CN132, grip firmly and pull off.
  2. Assemble adapter halves either side of panel and locate pegs.
  3. Slide CN132 into adapter, fit panel clamp, and press firmly against adapter.



1/16 DIN PANEL CUTOUT
45 X 45 +0.6/–0 mm
(1.77 X 1.77 +0.02/–0 in)

- **1/16 DIN CN132 Twin adapter** accepts two CN132s.
  1. Remove collars from both CN132s.
  2. Fit special collars included with twin panel clamp.
  3. Slide both CN132s into cutout. Fit twin panel clamp and press firmly against panel.



PANEL CUTOUT
45 X 46.2 +0.6/–0 mm
(1.77 X 1.82 +0.02/–04 in)

Panel adapters are not NEMA 4X/IP66 rated.

SECTION 5 ELECTRICAL INSTALLATION

⚠ CAUTION RISK OF ELECTRICAL SHOCK

1. Supply Voltage: 100-240V 50-60 Hz±10% 3VA
   12V or 24V (AC/DC)±20% 3VA Polarity not required
2. **Output devices (two)**
   Solid state relay drive [SSd]

   5 Vdc +0/–15%, 10mA non-isolated
   To switch a remote SSR (or logic)

   Miniature power relay [rLY]

   2A/250V~ resistive, Form A/SPST contacts

3. **Output device allocation:**

Either the SSd or the relay may be chosen as the output device for the main setpoint SP1. The remaining device is automatically allocated to the second setpoint SP2. Choose the most suitable output device arrangement for the application, and wire accordingly.

4. **Wiring the 8-way connector:**

Maximum recommended wire: 32/ 0.2 mm 1.0 mm^2 (18AWG 0.04"^{2}). Prepare cables carefully, avoid bridging and excessive cable strain on the connector.

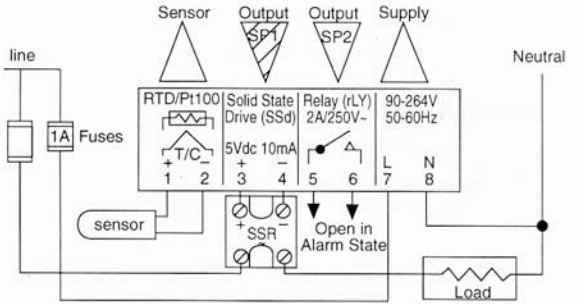
5. **Switching inductive loads with the relay:**

To prolong contact life and suppress interference, it is good engineering practice to fit a snubber (0.1µf/100Ω). See Example B.

CAUTION: Snubber leakage current can cause some electro-mechanical devices to be held ON. Check manufacturer's specification.

Example A

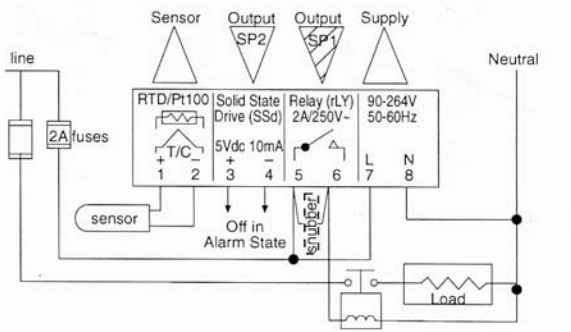
The SSd output is allocated to SP1 and wired to switch the load (heater) using an SSR.



NOTE: for optional 12 or 24V ac/dc models use terminals 7 & 8. Polarity not required.

Example B

The relay output is allocated to SP1 and wired to switch the load (heater) using a contactor.



SECTION 6 INITIAL SET UP

6.1 OVERVIEW

Follow three steps from initial power-up to accurately tuned control.

1. Gather details for initial configuration:

1. The temperature sensor being used (thermocouple or RTD/Pt100)
2. °C or °F
3. Choice of controller output device for the main set-point SP1, either:
   - Solid state relay drive SSd
   - Miniature power relay rLY
4. Select any additional controller functions, e.g., SP2 Alarms, now or later.

2. Set the required temperature.

The controller is now operational with factory PID settings.

3. Tune the CN132 precisely to the application:

- Run the Autotune program. See Section 7. This automatically adjusts the PID control parameters to the characteristics of the application.

  Or...

- Enter PID values manually, where the optimum values are already known.



NOTE: For any difficulty in initial configuration, press and hold ▼ ▲ 3 sec. To display the next step, release keys together.

6.2 INITIAL CONFIGURATION

1. Power up.



Self test sequence (and brief display blanking)



The alternating display shows that no input sensor is selected and that one is required.

2. Enter the input sensor type.



Press and hold ✱
Press ▲ to select the sensor, e.g., "K".
Press ▼ to reverse indexing.

a. Input sensor options
See also Section 16.2.10.

Thermocouples

sensor type	mnemonic	sensor type	mnemonic
B	tcb	N	tcn
E	tcE	R	tcr
J	tcJ	S	tcS
K	tcK	T	tcT
L	tcL		

Resistance Thermometer

RTD-2	
Pt100	rtd

b. Linear process inputs
See Section 16.2.10.



After selection, release ✱. Check that the selection is correct.

3. **To select display in °C or °F:**



Press ▲ once.



The display shows that no display unit is selected.



To select °C or °F (Bar, PSI, pH, Rh) press and hold ✱. Press ▲ to select °C, °F, etc. Release ✱.

Check that the display alternating with [unit] is correct.

4. **To allocate SP1 - main setpoint output device:**



Press ▲ once.



The display shows that no output device has been allocated to SPI.

Available SP1 output devices:



Solid state relay drive



Miniature power relay

The remaining output device is automatically allocated to SP2.



To select SP1 output device, press and hold ✱. Press ▲ to select.

IMPORTANT: Check that correct device is selected. Once entered in memory, it is changeable only on full reset. See Section 16.3.12.

5. **Enter the initial configuration into the controllers memory.**



Press and hold both ▼ and ▲ for 3 sec (display may differ).



Process temperature is displayed. Ambient 23°C and [PArk] alternate, as no setpoint is yet selected.

6. **Display setpoint.**



Press and hold ✱
[°C/0] or [°F/32] alternate.

7. **Adjust setpoint.**



Press and hold ✱
Press ▲ to increase, ▼ to decrease. Flashing LED shows SP1 output ON. The temperature rises.

Controller is operational with factory PID settings:

Proportional band/Gain	10°C/18°F	Integral time/Reset	5 mins
Proportional cycle-time	20 secs	Derivative time/Rate	25 secs
DAC Derivative approach control	1.5		

SECTION 7 AUTOTUNE

7.1 TO USE AUTOTUNE - TUNE PROGRAM

1. **For best results:**
   - Start with the load cool.
   - Set the usual setpoint temperature and use normal load conditions.
2. **Enter program mode.**



Press and hold both ▼ ▲ for 3 sec.



Release together when tunE is displayed on entry to program mode. If display differs, see Section 2 for functions menu.

Press ▼ or ▲ to locate tunE

3. **Select** tunE/on



Press and hold ✱
Press ▲ once.



Release ✱

4. **Start TUNE program.**



Press and hold both ▼ ▲ for 3 sec. To exit program mode starting tunE (display may differ) release ▼ ▲



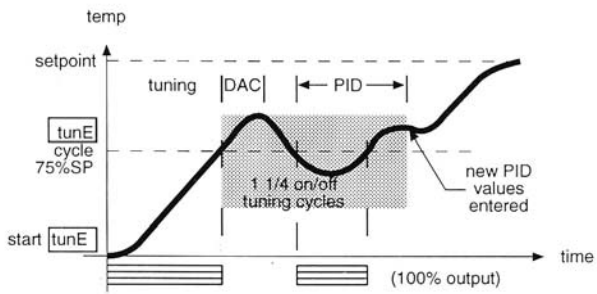
Display during tunE program...
NOTE: Setpoint is locked during tunE To adjust, select tunE/oFF



TUNE program is complete. Alternating display stops. New PID values are entered automatically.



Process temperature climbs to setpoint.



The AUTOTUNE - Tune Program

7.2 MORE ON AUTOTUNE

- **Operation**

Autotune "teaches" the controller the main characteristics of the process. For best results, run Autotune at the usual setpoint temperature under normal load conditions.

Autotune "learns" by cycling the output on and off. The results are measured and used to calculate optimum PID values which are automatically entered in the controller memory.

PID Parameters tuned:

- Proportional band/Gain
- Proportional cycle-time (requires you to manually accept it unless pre-selected; see Section 9)
- Integral time/Reset
- Derivative time/Rate
- Derivative Approach Control (DAC)

Two alternative forms of Autotune are provided, TUNE and TUNE AT SETPOINT. Each is described on the following pages.

- **The Autotune - TUNE program**



To run TUNE select tunE/on. See Section 7.1. Start with the load cool. The output is cycled at 75% of the setpoint value to avoid any overshoot during the tuning cycle. The warm-up characteristics are monitored to set DAC which minimizes overshoot on subsequent warm-ups.

- **The Autotune - TUNE AT SETPOINT program**

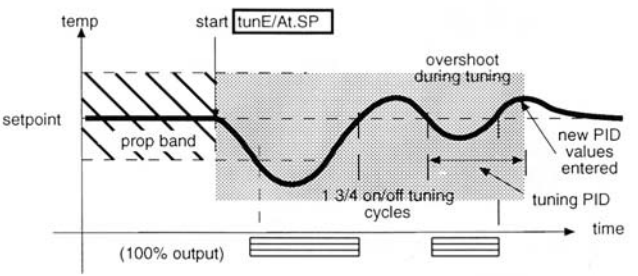


To run TUNE AT SETPOINT select tunE/At.SP. See Section 7.1.3: Press ▲ 3 times. The tuning cycle occurs **at setpoint** and, in some applications, may give better results. See examples below:

The TUNE AT SETPOINT program is recommended:

- When the setpoint is below 100°C/200°F, where TUNE's tuning cycle at 75% setpoint may be too close to ambient to produce good results.
- When the process is already hot and the cooling rate is slow
- When controlling multi-zone or heat-cool applications
- To re-tune if the setpoint is changed substantially from the previous Autotune

NOTE: DAC is not re-tuned by Tune at Setpoint.



The Autotune - TUNE AT SETPOINT Program

SECTION 8 VIEWING AND SELECTING FUNCTIONS

8.1 FUNCTIONS AND OPTIONS

Select the functions of the CN132 from the multi-level menu using program mode.

- For menu of main Functions, see Section 2.
- For Functions and Options list, see Section 16.

- **Definitions:**

  Functions (Fn): The actions the controller can perform

  Options (Opt): The available values for a function



Example:

Function: Proportional band

Option: 15°C/°F selected

Short reference: bAnd/15 (Fn/Opt)

- **Control during programming:**

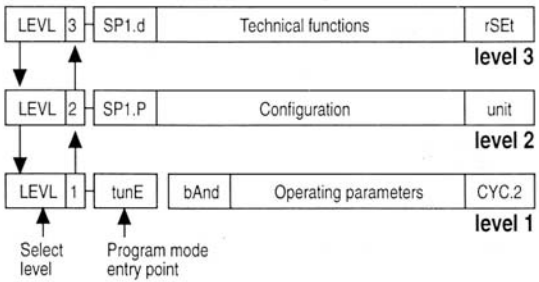
Control with existing settings is maintained during programming. Control with new instructions begins only on exiting program mode, when the controller memory is updated.

- **Hints when using program mode:**

Some options will not adjust! The lock may have been applied. All functions and current options may be viewed even when locked.

Program mode auto-exit: Normal operation is restored, and new instructions entered, if there is no key activity for 60 sec when in program mode (to disable, see Section 14).

- **The multi-level Function and Option menu:**



For menu of main Functions, see Section 2.

8.2 USING PROGRAM MODE

1. **To enter program mode from normal operating mode:**



Press and hold both ▼ ▲ for 3 sec.



Enter program mode at tunE Function on level 1, see diagram on previous page. Release both ▼ ▲ together.

2. **To exit program mode at any time returning to normal operating mode:**



Press and hold both ▼ ▲ for 3 sec.

NOTE: Control begins with any new instructions now entered in memory.

3. **To view Functions on the same level:**



Press ▼ or ▲ once to view the next Function.

Or...



Hold ▼ or ▲ to auto-index through the Functions.

4. **To display the current Option value for a Function:**



On release of ▼ or ▲, Option alternates with the Function:

Function [bAND]

Option [10] °

5. **Autotune Option values:**



Autotune calculated value indicator

If a manual Option is selected, the Autotune value is retained in memory.

6. **To change an Option value or setting:**



Index to the required Function, e.g., [bAnd], press and hold ✱.

Current Option displayed: [10] °



Press ▲ to increase/▼ to decrease, e.g., [bAnd] increased to [15] °. Release ✱



IMPORTANT: Check the new Option value **before** moving to another Function or exiting program mode.

7. **To change menu levels:**



Press and hold ▼ to reach the level selection function.



Release ▼ to display the current level [1]



Press and hold ✱
Press ▲ to increase level (2) or press ▼ to decrease level.



Release ▲ to display the new level [2]

REMINDER: Use ▼ and ▲ to locate Functions on each level. To exit program mode and return to normal operation, press and hold both ▼ ▲ 3 sec or auto-exit program mode after 60 sec of inactivity.

SECTION 9 PROPORTIONAL CYCLE-TIME

Optimum cycle-time is calculated by Autotune TUNE or TUNE AT SETPOINT programs, but not automatically implemented.

The choice of cycle-time is influenced by the external switching device or load, e.g., contactor, SSR, valve.

9.1 ALTERNATIVE CYCLE-TIME SELECTION METHODS

See the instructions opposite:

1. Run Autotune. On completion, check the calculated cycle-time. See Section 9.4.
   - Accept,

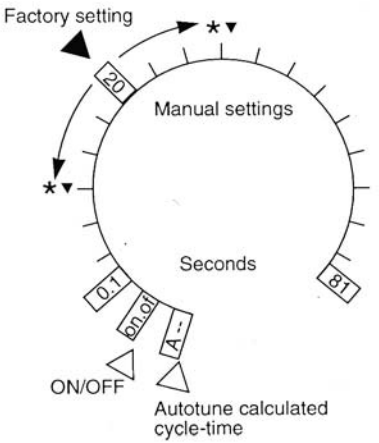
     Or...
   - Select nearest suitable value (20 sec factory setting applies unless replaced)
2. Pre-select automatic acceptance of any calculated Autotune cycle-time. See Section 9.5.
3. Manually pre-select any cycle-time between 0.1 and 81 sec. This will not be changed. See Section 9.6.
4. To use the 20 sec factory set cycle-time, no action is needed whether Autotune is used or not.

NOTE: When an Autotuned cycle-time [A XX] has been accepted, it is automatically updated on each subsequent Autotune.

IF IN DOUBT, USE METHOD 1, ABOVE.

9.2 CYC.T CYCLE-TIME SETTINGS

Analog representation:



9.3 CYCLE-TIME RECOMMENDATIONS

To avoid premature relay failure:

Output device	Cycle-time	Load (resistive)
Internal relay [rLY]	**20 sec or more**	
	Recommended	2A/250V~
	10 sec minimum	
	5 sec minimum	1A/250V~
Solid state drive [SSd]	1–3 sec	SSR
	0.1 sec	Logic/PIM

9.4 TO SELECT AUTOTUNE CALCULATED CYCLE-TIME:

On completion of Autotune:

1. **Enter program mode.**



Press and hold both ▼ ▲ for 3 sec.

2. **Index to cycle-time Function.**



Press and hold ▲



Release ▲; 20 sec factory setting is displayed.

3. **View calculated optimum cycle-time.**



Press and hold ▲. Then press and hold ▼ until indexing stops; e.g., calculated cycle-time is 16 sec. If suitable, proceed to step 5, below.

4. **Manually select more suitable cycle-time.**



If the calculated value is not compatible with the switching device, e.g., 30 sec more suits a contactor, press and hold ✱. Press ▲

5. **Enter the cycle-time in memory.**



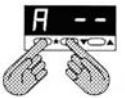
Press and hold both ▼ ▲ for 3 sec to exit program mode and implement the new instructions.

9.5 TO PRE-SELECT AUTOMATIC ACCEPTANCE OF ANY AUTOTUNE CYCLE-TIME:

1. **Before Autotune is selected:**

Enter program mode, index to cycle-time Function CYC.t. See Section 9.4.

2. **Select Autotune calculated cycle time.**



Press and hold ✱. Then press and hold ▼ until indexing stops.

A -- Shows no Autotune cycle-time yet exists.

3. **Autotune tunE/on../At.SP must be selected now, BEFORE exiting program mode.**



Press and hold ▼ to tunE Function.

9.6 TO PRE-SELECT CYCLE-TIME BEFORE AUTOTUNE

1. **Before Autotune is selected:**

Enter program mode. Index to cycle-time Function CYC.t. See Section 9.4.

2. **Select preferred value.**



Press and hold ✱
Then press ▲ to increase (35 sec) or ▼ to decrease.

3. **Exit program mode or index to another function.**

See Section 9.4, step 5,

SECTION 10 USING THE SECOND SETPOINT - SP2

10.1 TO CONFIGURE SP2 AS AN ALARM:

1. Select the main SP2 operating mode in SP2.A. See Section 10.4.
2. If required, select a subsidiary SP2 mode in SP2.b. See Section 10.5.
3. If the factory set 2.0°C/3.6°F hysteresis is unsuitable, change in bnd.2. Set CYC.2 ON/OFF (factory setting).
4. Adjust SP2 setpoint in SEt.2 (to set y° in 10.4).
5. Exit program mode — SP2 is now operational as an alarm.

10.2 TO CONFIGURE SP2 AS A PROPORTIONAL CONTROL OUTPUT:

1. Select the main operating mode in SP2.A. See Section 10.4.
2. Select SP2 proportional band in bnd.2 and SP2 cycle-time in CYC.2
3. Adjust SP2 setpoint in SEt.2 (to set y° in 10.4).
4. Exit program mode - SP2 is now operational as a control output with time proportioning control action.

10.3 SP2 IN COOL STRATEGY

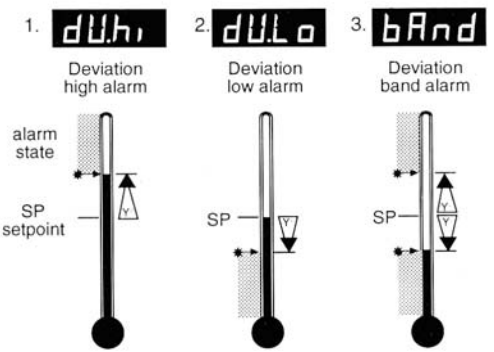
Cool strategy Options:

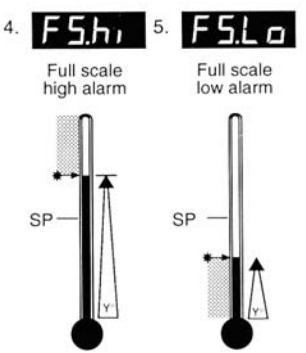
CooL in SP2.A (Selects cool strategy)

nLin in SP2.b (Non-linear proportional band)

10.4 SP2.A MAIN SP2 OPERATING MODE: ALARMS OR COOL STRATEGY

Factory setting nonE





10.5 SP2b SUBSIDIARY SP2 MODE: LATCH/ SEQUENCE OR NON-LINEAR COOL

Factory setting nonE

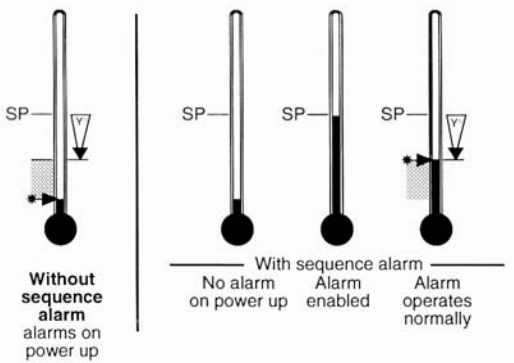
1. LtCh Latch alarm

When selected, the alarm output and indicator latch. To reset, when the alarm condition has been cleared, momentarily press ▼ ▲ together.

2. hoLd Sequence alarm

When selected, in any alarm mode, prevents an alarm on power up. The alarm is enabled only when the process temperature reaches setpoint.

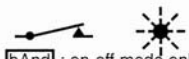
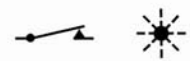
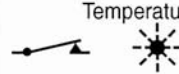
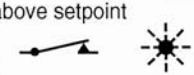
Example: Sequence alarm used with deviation low alarm — dV.Lo



3. LtSq Latch and sequence alarm

10.6 SP2 OUTPUT AND LED INDICATOR STATES

IN ALARM CONDITION

ALARM TYPE	ON-OFF OPERATING MODE		PROPORTIONAL OPERATING MODE	
	SP2 Output state	SP2 LED state	SP2 Output state	SP2 LED state
Deviation dV.hi dV.Lo bAnd				bAnd : on-off mode only
Full Scale FS.hi FS.Lo				
Cool Strategy	Temperature above setpoint 			

 Output ON (Relay or SSd energized)

 Output OFF (Relay or SSd de-energized)

 LED ON

10.7 -AL- SP2 ALARM ANNUNCIATOR

When an SP2 alarm mode is selected in SP2.A the alarm annunciator - AL - is displayed, alternating with process temperature, during an alarm condition (or until reset if the latch alarm is selected).

The annunciator may be disabled. See Section 14. Function no.AL, select Option on

SECTION 11 RANGING AND SETPOINT LOCK

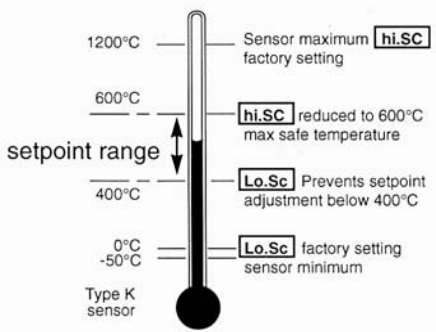
11.1 RANGING - IMPORTANT SAFETY NOTE:

The factory setting of full-scale hi.SC is the sensor maximum value. See Section 16.2.10. This should be reduced to a safe maximum for the plant.

1. hi.SC full-scale and Lo.SC scale minimum

1. hi.SC limits the maximum setpoint adjustment, lo.SC limits the minimum. Both adjust over the full sensor range, including the negative.
2. Factory settings:
   hi.SC = sensor maximum. lo.SC = 0°C/32°F
   Reduce Lo.SC to set below 0°C/32°F
3. hi.SC may not be adjusted below the lo.SC setting, lo.SC not above hi.SC

2. Example: Setpoint limited to 400° - 600°C



11.2 SP.LK SETPOINT LOCK

This function in level 1 enables the machine setter to lock the setpoint, preventing unauthorized adjustment.

SECTION 12 TOOLS TO IMPROVE CONTROL ACCURACY

Use these tools to assist with machine development, commissioning and trouble shooting.

12.1 SP1.P READ SP1 OUTPUT PERCENTAGE POWER

Poor control may be due to incorrectly sized heaters.

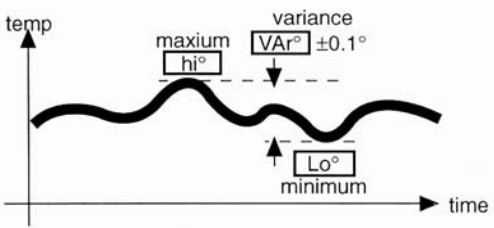
SP1.P constantly displays the output percentage power applied, which at normal setpoint should be within 10–80% (preferably 20–70%) to achieve accurate control.

12.2 ChEK CONTROL ACCURACY MONITOR

12.2.1 Establishing temperature control accuracy, to within 0.1°C/°F:

The monitor is started using CheK and the variance (deviation), maximum and minimum temperatures are displayed and constantly updated in rEAd

12.2.2 Control accuracy monitor - Read-outs:



12.2.3 Using the [ChEK] Control accuracy monitor:

1. To start the monitor select [ChEK] [on]
2. During monitoring, either return to normal operation or remain in program mode.
3. To view monitor readings: Index to [rEAd]



Release ▼ or ▲



4. Press and hold ✱ to display variance (0.6°).



5. Press and hold ✱. Press ▲ once to display maximum (320.3°).



6. Press and hold ✱. Press ▲ once more to display minimum (319.7°).

7. [ChEK] [oFF] stops monitor, retaining readings. Next [ChEK] [on] resets readings.
8. On de-powering: [ChEK] resets to [oFF] and [rEAd] is zeroed.

SECTION 13 OEM PROGRAM SECURITY

13.1 ENTRY TO HIDDEN LEVEL 4

Access level 4 only at [VEr] in level 3.



Press and hold ▼ ▲ 10 sec.



Enter level 4 at [LoCK]
Release ▼ ▲ together.
Factory setting: [nonE]

13.2 PROGRAM SECURITY USING LOCK

Select from 3 [LoCK] options:

Press and hold ✱. Press ▲ to index.



Locks level 3 functions only - TECHNICAL FUNCTIONS.



Locks levels 2 and 3 only - CONFIGURATION AND TECHNICAL FUNCTIONS.

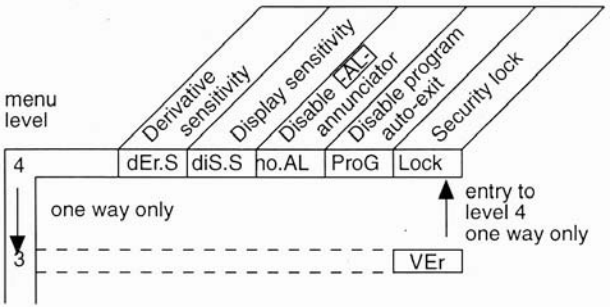


Locks all functions ✱

13.3 NOTES:

- Locked functions and current options may be read.
- ✱ Unrestricted: [LEVL] [VEr] [dAtA] [SP.LK]

SECTION 14 TECHNICAL FUNCTIONS: SECURE LEVEL 4



14.1 dEr.S [0.1] - [1.0] X [dEr.t] [0.5]
Derivative sensitivity

14.2 di.SS [dir] [1] - [32] [6]
Display sensitivity
[dir] = Direct display of input
[1] = Maximum [32] = Minimum sensitivity

14.3 noAL [oFF] [on]
Disable SP2 Alarm annunciator [-AL-]
Select [on] to disable [-AL-]

14.4 ProG [Auto] [StAY]
Program mode auto-exit switch

Auto-exit returns display to normal if 60 sec key inactivity. Select [StAY] to disable.

14.5 LoCK [nonE] [LEV.3] [LEV.2] [ALL]
Program security lock, see Section 13.2.

SECTION 15 ERROR MESSAGES

1. Sensor fault:



Causes:
Thermocouple burnout
RTD/Pt100 short circuit
Negative over-range
Action: Check sensor/wiring.

2. Non-volatile memory error:



Action: De-power briefly.
Replace unit if it persists.

3. Manual power error:



Cause:
SP1 in ON/OFF in [CYC.t]
Action: Select proportional mode.

4. Immediate fail on Autotune start:



Cause:
1. Setpoint unset on new unit.
2. SP1 at ON/OFF in [CYC.t]

Action: Select proportional mode.

NOTE: Message latches. Press ▼ ▲ briefly to reset.

5. Fail during Autotune tuning cycle:

The thermal characteristics of the load exceed the Autotune algorithm limits. The failure point is the first display in [dAtA] with [0.0]

Action:

1. Change the conditions, e.g., raise setpoint.
2. Try [tunE] [At.SP]. See Section 7.2.3.
3. Check [SP1.P] percentage power. See Section 12.1.
4. If the error message persists, call OMEGA for advice.

6. Reading Autotune tuning cycle results in [dAtA]

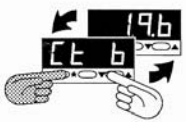
Action:



1. Index to [dAtA]
   Release ▼ or ▲



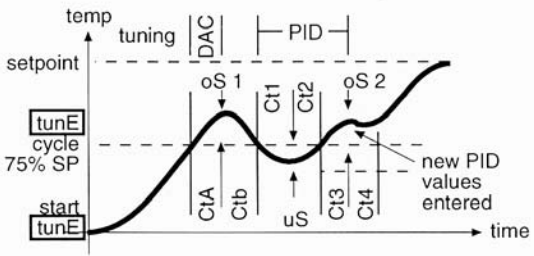
2. Press and hold ✱
   Display [Ct A] value (10.4), i.e., Cycle time 'A' = 10.4 sec



3. Keep ✱ pressed.
   Press ▲ once.
   Displays [Ct b] value (19.6), i.e., Cycle time 'b' = 19.6 sec

4. Repeat step 3 above to view:
   [Ct 1] [Ct 2] [Ct 3] [Ct 4] , [oS 1] [uS] [oS 2]

7. Autotune tuning data and limits:



Autotune limits

Ct (Quarter cycle time): 1–1800 sec/30 min
oS (Overshoot) } max 255°C/490°F
uS (Undershoot) }

SECTION 16 FUNCTIONS AND OPTIONS: LEVEL 1

SELECT AUTOTUNE

16.1.1 **tunE** [oFF] [on] [PArK] [At.SP]

Select Autotune, see Section 7, or PArK. [PArK] temporarily turns the output(s) off. To use, select [PArK] and exit program mode. [oFF] disables. Useful when commissioning fast loads or multizones.

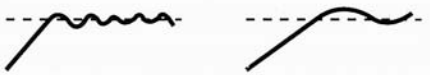
SP1 OPERATING PARAMETERS

16.1.2 **bAnd** [0.1] - [✱] °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 the time propor tioning action, across the proportional band.



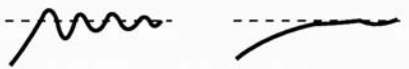
Too narrow (oscillates)
Increase [bAnd]

Too wide (slow warm up and response)
Decrease [bAnd]

16.1.3 [int.t] [oFF] [0.1] - [60] minutes [5.0]

SP1 integral time/Reset

Auto-corrects proportional control offset error



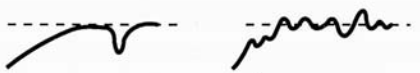
Too short (overshoots and oscillates)

Too long (slow warm up and response)

16.1.4 [dErt] [oFF] [1] - [200] sec [25]

SP1 Derivative time/Rate

Suppresses overshoot and speeds response to distur bances.



Too short (slow warm up and response, under corrects)

Too long (oscillates and over corrects)

16.1.5 [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).



Too small (overshoots)

Too large (slow stepped warm up)

16.1.6 [CYCt] [A --] [on.oF] [0.1] - [81] secs [20]

SP1 Proportional cycle-time, see Section 9.

Determines the cycle rate of the out put device for proportional control. Select [on.oF] for ON/OFF mode.



Ideal

Too long (oscillates)

16.1.7 [oFSt] [0] - [*] °C/°F

SP1 Offset/Manual reset

* ±50% [bAnd] Applicable only in proportional mode with integral disabled [Int.t / oFF]

16.1.8 [SPLr] [oFF] [on]

Lock main setpoint, see Section 11.2.

SP2 OPERATING PARAMETERS

16.1.9 SEt2 [0] - [*] – °C/°F

Adjust SP2 setpoint. See Section 10.

* Deviation alarms [DV.hi] [DV.Lo] [bAnd] 25% sensor maximum

* Full-scale alarms [FS.hi] [FS.Lo]: sensor range

16.1.10 bnd2 [0.1] - [*] °C/°F [2.0°C/3.6°F]

Select SP2 hysteresis or Proportional band/Gain

* 25% sensor maximum

16.1.11 CYC2 [on.oF] [0.1] - [81] sec

Select SP2 ON/OFF or Proportional cycle-time

Select [on.oF] for ON/OFF mode or the cycle rate of SP2 output device for proportional mode.

MANUAL CONTROL MODES

16.2.1 SP1P [0] - [100]% "Read only"

Read SP1 output percentage power. See Section 12.

16.2.2 HAnd [oFF] [1] - [100]% (Not in ON/OFF)

SP1 manual percentage power control

For manual control should a sensor fail. First, record typical [SP1.P] values.

16.2.3 PL.1 [100] - [0]% duty cycle

Set SP1 power limit percentage

Limits max SP1 heating power during warm up and in proportional band

16.2.4 PL.2 [100] - [0]% duty cycle

Set SP2 percent power limit (cooling)

SP2 OPERATING MODES: See Section 10.

16.2.5 SP2A **Main SP2 operating mode**

[nonE] [dV.hi] [dV.Lo] [bAnd] [FS.hi] [FS.Lo] [CooL]

16.2.6 SP2b [nonE] [LtCh] [hoLd] [Lt.ho] [nLin]

Subsidiary SP2 mode: latch/sequence

Non-linear cool proportional band

INPUT SELECTION AND RANGING

16.2.7 d.SP [1] [0.1]°

Select display resolution:

0.1° display of PV, SP, [OFSt] [Set.2] [hi.SC] [Lo.SC]

16.2.8 h.SC [sensor minimum] [sensor maximum] °C/°F

Set full scale. See Section11.1.

16.2.9 Lo.SC [sensor minimum] [sensor maximum] [0°C/32°F]

Set scale minimum. See Section 11.1.

16.2.10 inPt **Select input sensor** [nonE]

Option/ sensor type		sensor range			linearity ±°C
Thermocouples					
tc b	B	0 to 1800°C	32 to 3272 °F	Pt-30% Rh/Pt-6% Rh	2.0*
tc E	E	0 to 600°C	32 to 1112°F	Chromega®/Con	0.5
tc J	J	0 to 800°C	32 to 1472°F	Iron/Constantan	0.5
tc K	K	–50 to 1200°C	–58 to 2192°F	Chromega®/Alomega®	0.25*
tc L	L	0 to 800°C	32 to 1472°F	Fe/Konst	0.5
tc n	N	–50 to 1200°C	–58 to 2192°F	NiCroSil/NiSil	0.25*
tc r	R	0 to 1600°C	32 to 2912°F	Pt-13%Rh/Pt	2.0*
tc S	S	0 to 1600°C	32 to 2912°F	Pt-10%Rh/Pt	2.0*
tc t	T	–200/ 250°C	–273/ 482°F	Copper/Con	0.25*

Resistance thermometer

rtd	–200/ 400°C	–273/ 752°F	Pt100/RTD-2	0.25*

Linear process inputs (input mV range: –10 to 50mV)

	0–20mV	4–20mV	setpoint limits	
Lin1	0 – 100		0 – 400	
Lin2		0 – 100	–25 – 400	
Lin3	0 – 1000		0 –3000	±0.5%
Lin4		0 – 1000	–250 – 3000	
Lin5	0 – 2000		0 – 3000	

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
3. Optional PIM Process Interface Module provides additional input/output options

16.2.11 unit [nonE] [°C] [°F] [bAr] [PSi] [Ph] [rh]

Select °C/°F or process units.

Processor calculates in °C, when °F converts functions marked °C/°F (Process units calculate as °C).

SECTION 16 FUNCTIONS AND OPTIONS: LEVEL 3

OUTPUT CONFIGURATION

16.3.1 SP1.d [nonE] [rLY] [SSd]

Select SP1 output device. See Sections 5.3/6.2.4.

NOTE: "Read only" after initial configuration. [RSEt] [ALL] full reset to factory settings required to change [SP1.d] subsequently.

16.3.2 SP2.d [nonE] [SSd] [rLY] "Read only"

Read SP2 output device. See Sections 5.3/6.2.4.

Shows SP2 output device.

TECHNICAL FUNCTIONS

16.3.3 burn **Sensor burn-out/break protection**

CAUTION: Setting affects fail safe state.

	SP1	SP2
[uP.SC]	Upscale	Upscale
[dn.SC]	Downscale	Downscale
[1u.2d]	Upscale	Downscale
[1d.2u]	Downscale	Upscale

16.3.4 rEUd **Select output modes: Direct/Reverse**

CAUTION: Setting affects fail safe state.

	SP1	SP2
[1r.2d]	Reverse	Direct
[1d.2d]	Direct	Direct
[1r.2r]	Reverse	Reverse
[1d.2r]	Direct	Reverse

Select **Reverse** on SP1 for heating and **Direct** for cooling applications.

16.3.5 **rEUL** **Selection of SP1/2 LED indicator modes**

	SP1	SP2
1n.2n	Normal	Normal
1i.2n	Invert	Normal
1n.2i	Normal	Invert
1i.2i	Invert	Invert

16.3.6 **SPAn** 0.0 - ±25% sensor maximum

Sensor span adjust

For recalibrating to a remote standard, e.g., external meter, data logger

16.3.7 **2Ero** 0.0 - ±25% sensor maximum

Zero sensor error: See SPAn

16.3.8 **ChEt** oFF on

Select control accuracy monitor. See Section 12.2.

16.3.9 **rEAd** VAr° hi° Lo°

Read control accuracy monitor. See Section 12.2.

16.3.10 **dAtA** Ct A Ct b Ct 1 Ct 2 Ct 3 Ct 4 os 1 uS oS 2

Read Autotune tuning cycle data. See Section 15.

16.3.11 **UEr** **Software version number**

16.3.12 **rSEt** nonE ALL

Resets all functions to factory settings

CAUTION: Note current configuration **before** using this function. See Section 18. Initial configuration and OEM settings must be re-entered.

INPUTS: See Section 16.2.10.

SECTION 17 SPECIFICATIONS

Thermocouple – 9 types
Standards: 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
see "PIM process Interface Module" for additional input/output options

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: 150 ppm/°C SM
Reference conditions: 22°c ±2°c, rated voltage, after 15 minutes settling time

OUTPUT DEVICES (Standard): See Section 5.3.

- **SSd:** Solid state relay drive: To switch a remote SSR 5Vdc +0/-15% 10mA non-isolated

- **Miniature power relay:** From A/SPST contacts (AgCd0) 2A/250V~ resistive load

CONTROL CHARACTERISTICS: See Section 16.

SP1 PID Parameters: .1.1-.1.8
SP2 Parameters: .1.9-.1.11
SP2 Operating modes: .2.5-.2.6
Manual control modes: .2.1-.2.4

GENERAL

Supply voltage:	100-240V 50-60 Hz±10% 3VA 12V or 24V (AC/DC)±20% 3VA
Digital LED display:	4 digits, 10mm (0.4in), high brightness green Display range: -199 to 9999
Range:	Sensor limited: 2000°C/3500°F 0.1 hi-res mode – 199.9 to 999.9°
Displaying:	Process temperature (PV), Setpoint (SP), SP1/2 indicators (flashing), Error messages. Function/Option mnemonics
Keypad:	3 Elastomeric buttons

ENVIRONMENTAL	**Approvals**
Safety:	UL873, CSA 22.2/142-87, EN61010
Humidity:	Max. 80%
Altitude:	Up to 2000M
Installation:	Categories II and III
Pollution:	Degree II
Protection:	NEMA 4X, IP66
EMC Emission:	EN 50 081-1, VDE 0871/78 - Class A & B FCC Rules 15 subpart J Class A
EMC Immunity:	En50082-1 RF Field Test: < 200 MHz 1%FS > 200 MHZ 5% FS
Ambient:	0-50°C (32-130°F)
Mouldings:	Flame retardant polycarbonate
Weight:	100g (3.5ozs)

SECTION 18 CUSTOMER CONFIGURATION RECORD

SER No.						
Date						
LEVL						
1. bAnd						
int.t						
dEr.t						
dAC						
CYC.t						
SET.2						
bnd.2						
CYC.2						
2. SP1.P						
SP2.A						
SP2.b						
hi.SC						
Lo.SC						
inPt						
unit						
3. SP1.d						

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **37 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **three (3) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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