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Eurotherm Companies
Sales and Service List

Great Britain
Eurotherm Limited
Faraday Close Durrington
Worthing West Sussex BN13 3PL
Telephone Worthing (0903) 68500
Telex 87114 EUROWG G
Also regional offices
Fax 0903 65982

Australia
Eurotherm International Pty. Ltd.
Suite 1A 44-46 Oxford Street
Epping Sydney
New South Wales 2121
Telephone Sydney (02) 869-1099
Telex 74362 EAISY D

Austria
EI Mess-und Regelgeräte-GesmbH
Geiereckstr 18
A-1110 Wien
Telephone Wien (0222) 787601
Telex 113200 EI AUT/A
Fax 3-0222-787605

Belgium Luxemburg & Netherlands
Eurotherm International Benelux B.V.
Johan Frisotraat 1
2382 HJ Zoeterwoude
Nederland
Telephone Leiden (071) 411841
Telex 39073 EIBNL NL

Canada
Eurotherm Corporation
490 McNicoll Avenue
Willowdale Ontario M2H 2E1
Telephone Hamilton (416) 497-0155
Telex 06-986766

Denmark
Telemetric Instrument ApS
GL. Hovedgade 10E
DK 2970 Horsholm
Telephone Copenhagen (2) 861121
Telex 32317 TELSAND S

France
Eurotherm Automation
Parc d'Affaires de Dardilly
6 chemin des Joncs, B.P. 55
69572 Dardilly Cedex
Telephone Lyon (7) 866 19 43
Telex 380038 EURTERM F
Also regional offices

Hong Kong
Eurotherm (Far East) Limited
49-51 Wong Chuk Hang Road
Flat A & B 19/F, Derrick Ind. Building
Aberdeen
Telephone Hong Kong (5) 546391
Telex 72449 EFELD HX

Italy
Eurotherm S.p.A.
Via Della Chiesa 1
22070- Cassina Rizzardi (Como)
Telephone Como (031) 927354
Telex 380893 EUROTH I
Fax 39-31-977512

Japan
Nippon Eurotherm KK
Marushima Building
1-28-2 Chuo
Nakano-ku
164 Tokyo
Telephone Tokyo (03) 363-8324
Telex 02324016 EUROJA J
Fax 03-363-8320

Sweden
Telemetric Instrument AB
PO Box 24
Hantverkaregatan 18
23200 Arloev
Telephone Malmo (40) 435460
Telex 32317 TELMET S

Switzerland
Eurotherm Produkte (Schweiz) A.G.
Kanalstrasse 17
8152 Glattbrugg
Telephone Glattbrugg (01) 810 36 46
Telex 56533 EPSAG CH
Fax 41-1-8108920

U.S.A.
Eurotherm Corporation
11485 Sunset Hills Road
Reston Virginia 22090
Telephone Reston (703) 471 4870
Telex 899449 EUROTHERM RSTN
Also regional offices
Fax 1-703-4373182

West Germany
Eurotherm Regler GmbH
Ottostrasse Postfach 1453
6250 Limburg a.d. Lahn 1
Telephone Limburg (06431) 29050
Telex 484791 EUROT D
Also regional offices

Sales and Service in 32 countries
For countries not listed above all enquiries/orders to:

Eurotherm Exports
Faraday Close, Durrington,
Worthing, West Sussex, BN13 3PL
England. Telephone Worthing (0903) 68500
Telex 87114 EUROWG G

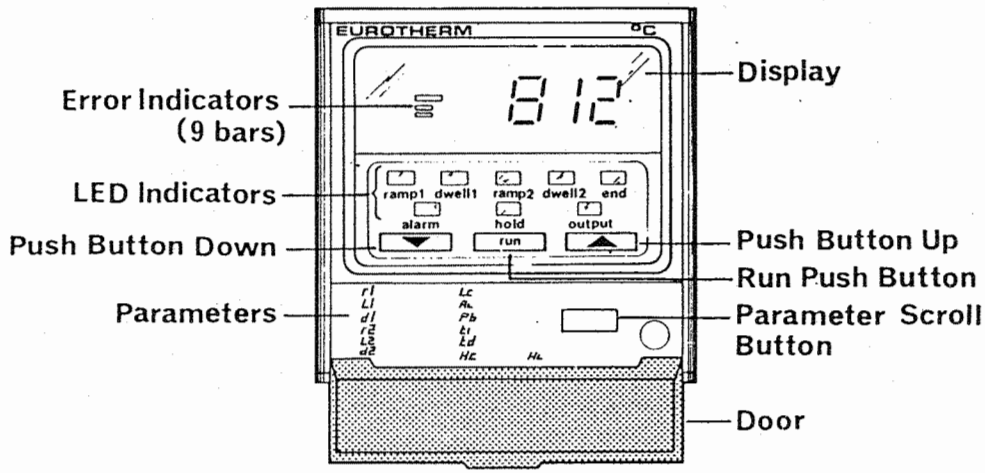
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EUROTHERM

CONTROLLER/PROGRAMMER
TYPE 812

INSTALLATION AND OPERATING INSTRUCTIONS



Part No. HA018875

812W-5

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ORDERING INFORMATION

You are welcome to order by description or by code below which is a useful check list.

Basic Product	Code
Microprocessor Based 3 Term Programmer/Controller	812

Outputs (Heat)

Relay slow cycle with power feedback (2A 240V)	003
Relay on/off (no 3-Term)	028
Logic output unisolated 14V dc min. at 10mA	047
Logic on/off	137
Isolated 1-5V (20mA max.)	068
Isolated 0-5V (20mA max.)	070
Isolated 0-10mA (10V dc max.)	071
Isolated 0-20mA (10V dc max.)	072
Isolated 4-20mA (10V dc max.)	073
Isolated 0-10V (20mA max.)	123
Isolated 5-1V (20mA max.)	128
Isolated 5-0V (20mA max.)	130
Isolated 10-0mA (10V dc max.)	131
Isolated 20-0mA (10V dc max.)	132
Isolated 20-4mA (10V dc max.)	133
Isolated 10-0V (20mA max.)	124

Note: Add 100 to code of dc outputs for reverse LED output indication
E.g. Isolated 0-10V, code 123 + 100 = code 223

Input

See inputs	

Scale

See scale ranges	

Supply Voltage

110V 220V 120V 240V	±10% 50/60 Hz	10 12 24 13
100V 200V		26 27

Alarm Configurations

Number	1st digit	2nd digit	3rd digit
0	--	--	--
1	Band	Non-latching	Energised Alarm
2	Deviation high	--	De-ener. alarm
3	Deviation low	--	

e.g. 312 = Non-latching deviation low alarm, de-energised in alarm state. If no alarm code 000

Options

No power feedback	08
Screw terminals (Fastons standard)	09
No cold junction compensation (50°C ext. ref.)	72
No cold junction compensation (0°C ext. ref.)	11
Downscale thermocouple break action	24
Fascia units not equal to input units (specify blank or units)	29
● Additional undedicated relay in place of alarm	58
Front reset inhibited	55
Setpoint stop (lower)	712(*)
Setpoint stop (upper)	713(*)
Parameter settings	799(*)
Ramp ranges 1 to 9999 U/hour Dwell ranges 0 to 999.9 hours	15
Ramp ranges 0.1 to 999.9U/min Dwell ranges 0 to 999.9 hours	16
Ramp ranges 1 to 9999U/hour Dwell ranges 0 to 999.9 min	17

● Alarm field must be coded 000
(*) Setting

Scale Ranges

Standard ranges	Code		Code		Code
- 500 to + 500	607	0 - 50	629	0 - 1000	617
- 250 to + 750	628	0 - 100	630	0 - 1200	618
- 250 to + 250	608	0 - 200	612	0 - 1500	625
- 125 to + 125	609	0 - 300	613	0 - 1600	619
- 100 to + 400	627	0 - 400	614	0 - 2000	620
- 100 to + 300	626	0 - 500	624	0 - 2400	621
		0 - 600	615	0 - 3000	622
		0 - 800	616	0 - 4000	623



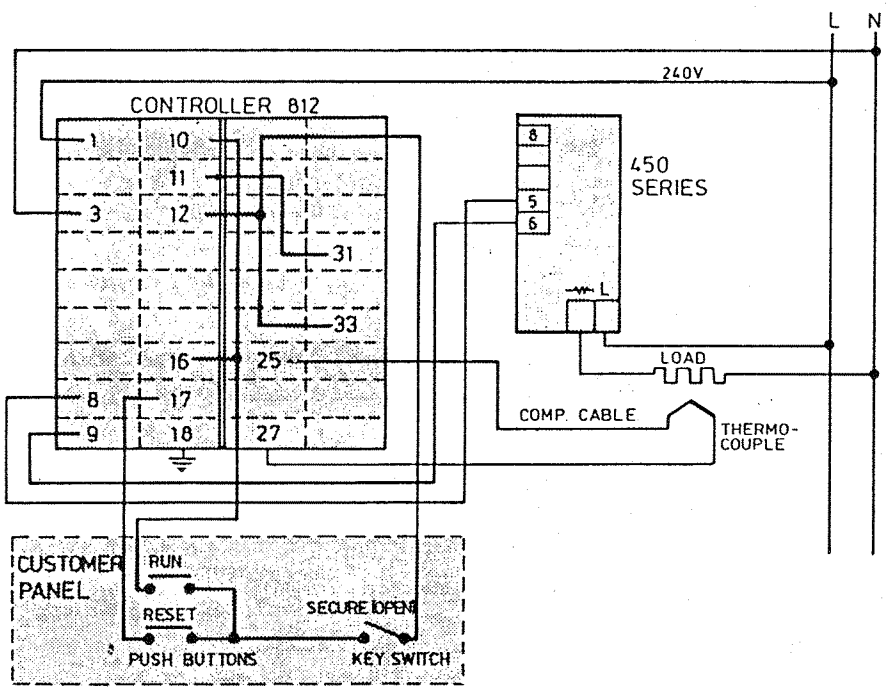
Example order

812 003-003-618 19-09-312-24-16-00 An 812 instrument wi 2A/240V slow cycle relay output/°C type K/0-1200 range/ 24 supply/screw terminals/non-latching deviation low alarm, de energised in alarm/ramp ranges 0.1 to 999.9°C/min, dwell ranges 0 to 999.9 hours.

3. Increase the proportional band setting until the oscillation ceases.
4. PB = 1.5 × Pb for no oscillation
   (Set to next higher value if between fixed settings)
   ti = T seconds
   td = T/10
   (Set to next lower value if between fixed settings)
5. Reset instrument with the values calculated in para. 4 and restart process from cold. If oscillation still results increase proportional band/decrease derivative.

TYPICAL WIRING SCHEMATIC

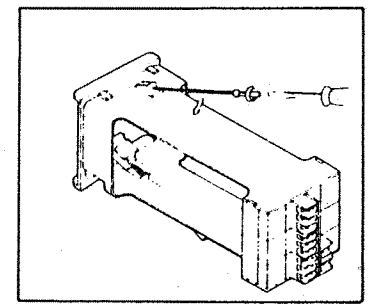
Continuous cycling 812 with customer panel, 'RUN' and 'RESET' buttons with Security Key Switch and Low Deviation Alarm used for automatic 'HOLD-BACK'.



INSTALLATION

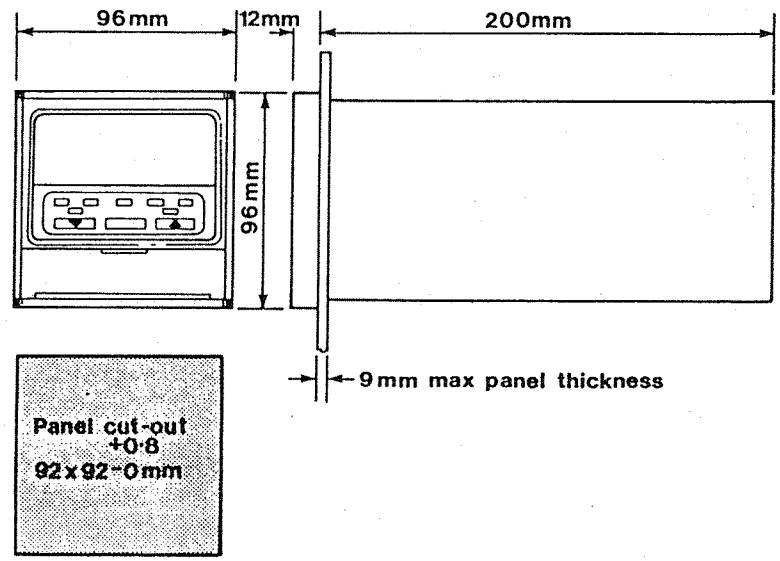
The instrument plugs into a panel-mounting sleeve which requires a DIN size 92 by 92mm cut-out as illustrated. Remove the instrument from the sleeve by opening the front panel door and with a screwdriver turn the screw, in the bottom right-hand corner, counter clockwise. The instrument will start to withdraw from the sleeve and once the screw has been turned to its furthest extent the instrument can be withdrawn by hand. Remove the top and bottom mounting clamps from the sleeve by gently levering outwards and easing downwards inside the sleeve. Insert the sleeve through the cut-out via the front of the panel. Fit the mounting clamps in the slots from inside the sleeve and from the rear of the mounting panel tighten with a screwdriver.

By hand ease the instrument into the sleeve to its furthest extent, about 10mm will be left protruding. With a screwdriver turn the screw in the bottom right-hand corner clockwise until tight. The instrument will be pulled completely into the sleeve, engaging the rear terminals and be fully secured.



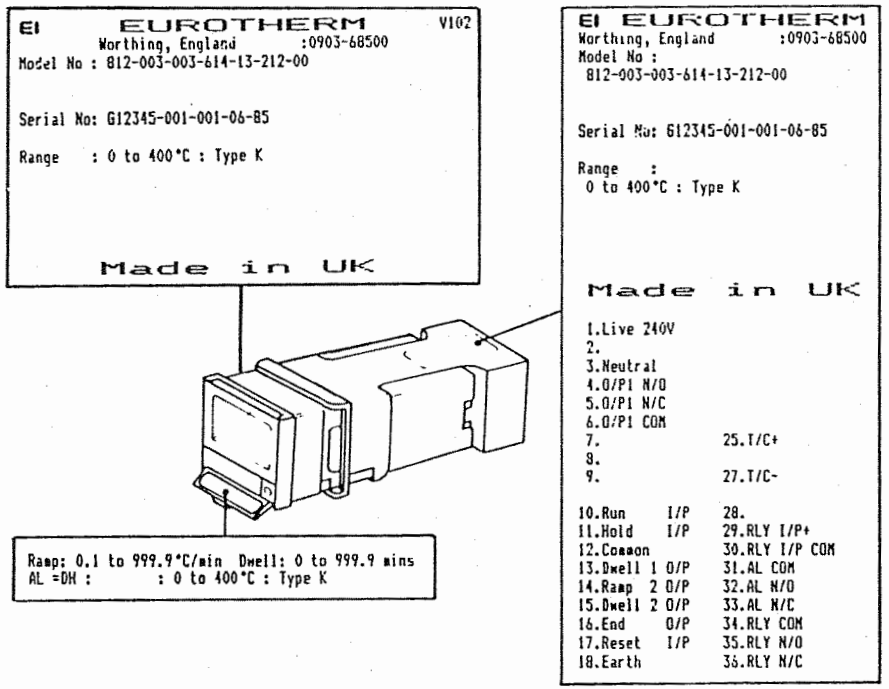
Note: Do not attempt to dismantle the instrument without referring to the Maintenance Manual.

DIMENSIONAL DETAILS



CONNECTIONS AND WIRING

Electrical connections are made via 3-way terminal blocks on the rear of the instrument. All connections are low current and a 16/0.20 mm wire size is adequate. Labels on the instrument and sleeve indicate the specific connections for the instrument.



External Connections

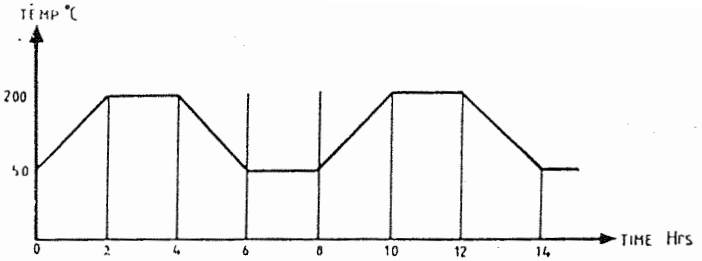
For optimum instrument performance to be guaranteed it is recommended that the following are adhered to:

Supply voltages — connections to ancillary equipment, such as contactors, must be taken directly from the supply and NOT from the supply terminals of the 812 instrument.

Earthing — an effective earth system must be provided. If more than one 812 instrument is installed each instrument must be separately earthed to a common earth point and NOT linked together and then taken to an earth point.

Logic Inputs and Outputs (Programming) — the wiring of the programmer and logic inputs and outputs MUST be kept separate from the other instrument wiring. Where possible screened leads should be used with the screen being connected to the earth terminal on the instrument, terminal 18. The maximum permissible lead length is 0.5m.

General — all low level inputs and outputs such as thermocouple, resistance thermometer and logic should be kept separate from supply and relay output cabling.

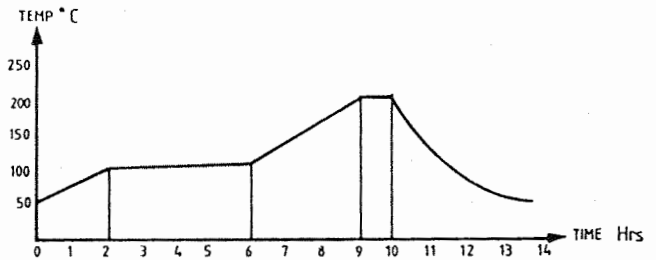


Programmer Settings (Setpoint 50°C)

RAMP 1 = 75°C/hr	RAMP 2 = 75°C/hr
LEVEL 1 = 200°C	LEVEL 2 = 50°C
DWELL 1 = 2 hours	DWELL 2 = 2 hours

2. NATURAL COOLING AT PROGRAM END

If natural cooling is required at the end of a program connect the END logic output on rear terminal 16 to terminal 17, the RESET logic input.



Programmer Settings (Setpoint 50°C)

RAMP 1 = 25°C/hr	RAMP 2 = 50°C/hr
LEVEL 1 = 100°C	LEVEL 2 = 200°C
DWELL 1 = 4 hours	DWELL 2 = 1 hour

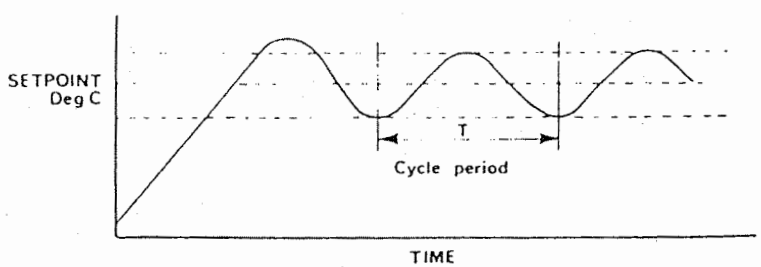
THREE TERM CONTROL PARAMETERS

Three term control parameters values for optimum control is a matter of application. If values are unknown the following method will give acceptable settings which can then be finally adjusted to give the optimum control.

1. Set the following conditions:

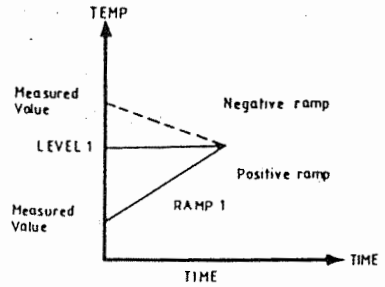
Proportional band, Pb%	= 0.50	Maximum power, HL%	= 100
Integral time, ti	= OFF	Setpoint	= As required
Derivative time, td	= OFF		

2. Switch on the process and observe the start-up and running conditions and note the period T :—



RAMP 1

The first segment of the program is ramp 1. The ramp rate, RAMP 1, and the final temperature, LEVEL 1, must both be set. The direction of the ramp may be either positive or negative as determined by the value of the process measured value at the start and the level 1 setting.



DWELL 1

The dwell period, DWELL 1, commences immediately the setpoint equals the LEVEL 1 setting, and must be set. The dwell period may be omitted by setting DWELL 1 to zero.

RAMP 2

The second ramp, RAMP 2, starts with a setpoint equal to the measured value at the end of the DWELL 1 period. The setpoint is ramped, positively or negatively dependant on the LEVEL 2 setting, at the ramp rate setting, ie RAMP 2.

If this second ramping segment is to be omitted then LEVEL 2 must be set equal to LEVEL 1 and RAMP 2 set to a fast ramp rate, ie a high value.

DWELL 2

The second dwell segment, DWELL 2, commences when the setpoint during RAMP 2 equals LEVEL 2. This segment may be omitted by setting the DWELL 2 period to zero.

At the end of the DWELL 2 period the programmer enters the END state. The setpoint is maintained at LEVEL 2 until either the programmer is RESET or a RUN input received.

NOTE: On a power-down the programmer stores the state it is actioning, ie RESET, RAMP 1, DWELL 1, DWELL 2 or END. When power is restored the programmer returns to the original state it was actioning.

If it was in ramping sequence the ramp will continue from a setpoint equal to the current process measured value. If it was during a dwell sequence the dwell will continue but the dwell period will be affected as follows:— dwell in minutes: by −6 secs. to +26 mins., dwell in hours: by −6mins. to +12 mins.

EXAMPLE PROFILES

1. CYCLING PROGRAMMING

To continuously run a fixed ramp and dwell sequence set the required values for parameters, ie RAMP 1, LEVEL 1, DWELL 1, RAMP 2, LEVEL 2, DWELL 2 and link the END logic output on rear terminal 16 to terminal 10, the RUN logic input.

This may also be achieved for a limited number of cycles using the Loop Counter facility. The END to RUN external link is not required. The Loop Counter parameter is up to the number of required cycles along with the other programmer parameters. The Loop Counter parameter indicates number of loops remaining, including the current loop. When a sequence reaches END the Loop Counter is decremented and checked, a further cycle being initialized if it has not reached zero.

On reaching zero the END state will be entered permanently.

1	Live 240V
2	Live 120V
3	Neutral

Supply

Power supply for the instrument is connected to terminals 1, 2 and 3. Neutral to terminal 3 and either 200/220/240V to terminal 1 or 100/110/120V to terminal 2. The ground connection is made to terminal 18.

18	Earth

Instrument Earth

INPUTS

Suppression Leads

A filter module is fitted, above the input terminal block. Ensure that the GREEN lead is connected to terminal 18 and the BLUE lead is connected to terminal 27 for T/C inputs or to terminal 26 for all other inputs.

Thermocouple

25	T/C +
27	T/C −

Thermocouple connections are made to terminals 25 and 27, positive lead to 25 and negative lead to 27. Compensating cable of the correct type must be used between the thermocouple and the instrument and must be connected in the correct polarity. To check compensating lead polarity lift the leads of the thermocouple, twist them together and apply heat to the junction. The digital readout value should increase.

An open circuit thermocouple normally causes the digital value to move upscale and the heat is turned off. For processes where the heat must remain on for open circuit thermocouple, downscale indication (option 24) is specified.

Error indicators show direction of break protection and when the upper/lower limit of scale is reached the display blanks.

Resistance Thermometer

25	RT (V1)
26	RT (V2)
27	RT (I)

Platinum resistance three wire thermometers are connected to terminals 25, 26 and 27. Connect the single connection side of the bulb to terminal 25 and the double connection to terminals 26 and 27.

25	DC I/P +
26	DC I/P −

Millivolt Signals

Inputs are connected to terminals 25 and 26 as shown.

PROGRAMMER INPUTS

Run

10	Run I/P
12	Common

An active low logic RUN signal is input to terminals 10 and 12. Resistance between 10 and 12 is <30K for a low and >220K ohms for a high signal.

Hold

11	Hold I/P
12	Common

An active low logic HOLD signal is input to terminals 11 and 12. Resistance between 11 and 12 is <30K for a low and >220K ohms for a high signal.

Reset

17	Reset
12	Common

An active low logic RESET signal is input to terminals 17 and 12. Resistance between 17 and 12 is <30K for a low and >220K ohms for a high signal.

HEAT OUTPUTS

Relay

4	O/P 1 N/O
5	O/P 1 N/C
6	O/P 1 COM

The controller is fitted with an output relay, which has a single change-over contact, connected internally between terminals 4, 5 and 6. With no supply to the instrument the relay is de-energised and terminal 4 is normally open (N/O). When the supply is on the relay is energised and the voltage at terminal 6 is switched through to terminal 4. The contact is rated at 2A/264V rms and is suitable only for use with low-power loads. Slow cycle time-proportioning or on-off control is available.

Logic

8	Logic O/P1 +
9	Logic O/P1 –

A logic output is provided at terminal 8 and 9. The output is an unisolated 10mA at 14V dc minimum signal with slow or fast cycle time proportioning or on-off. The output is suitable for use only with the Eurotherm Thyristor Stacks.

Isolated DC

8	DC O/P1 +
9	DC O/P1 –

An isolated dc output is provided at terminals 8 and 9, see code for relevant output.

PROGRAMMER LOGIC OUTPUTS

Dwell 1

13	Dwell 1 O/P
12	Common

An open collector unisolated logic signal, Dwell 1, is available at terminal 13, max drive 15V, max sink 10mA. Connect return line to Common terminal 12.

Ramp 2

14	Ramp 2 O/P
12	Common

An open collector unisolated logic signal, Ramp 2, is available at terminal 14, max drive 15V, max sink 10mA. Connect return line to Common terminal 12.

Dwell 2

15	Dwell 2 O/P
12	Common

An open collector unisolated logic signal Dwell 2, is available at terminal 15, max drive 15V, max sink 10mA. Connect return line to Common terminal 12.

End

16	End O/P
12	Common

An open collector unisolated logic signal, End, is available at terminal 16, max drive 15V, max sink 10mA. Connect return line to Common terminal 12.

Alarm Relay

31	AL COM
32	AL N/O
33	AL N/C

Programmers provided with relay alarm outputs are internally connected to terminals 31, 32 and 33. Terminal 32 is normally open when the relay is de-energised. When energised the voltage at terminal 31 is switched through to the ouput terminal 32. Relay contact rating 1A/264V rms.

Undedicated Relay (Optional in place of Alarm)

28	RLY1 I/P +
30	RLY I/P COM
31	RLY1 COM
32	RLY1 N/O
33	RLY1 N/C

Optionally an undedicated relay may be fitted in place of the alarm relay. This is energised by contact closure across terminals 28 and 30, or by connecting one of the programmer logic outputs to terminal 28 (Common not required).

REAR TERMINALS

Logic Inputs

Logic inputs to the rear terminals are provided for the RUN, RESET and HOLD functions. An unisolated logic input is detected as being active for a resistance of 30K ohms or less between the input and the common terminals. For the non-active condition the resistance is greater than 220K ohm.

Run

The RUN logic input duplicates the front panel RUN button.

Reset

The rear RESET logic input simulates the front panel RESET facility (simultaneously depressing the UP and DOWN buttons). A RESET will have precedence over any other logic inputs that occur simultaneously.

Hold

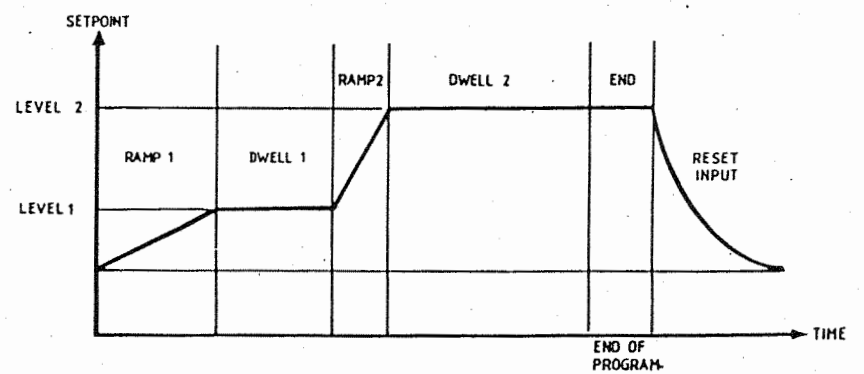
The ramp and dwell segments may be held at any time by applying a logic HOLD input. This input must be made inactive before a RUN can be continued.

Logic Outputs

Four unisolated open-collector logic outputs, are provided at the rear terminals of the instrument. These outputs provide indications of the states DWELL 1, RAMP 2, DWELL 2, END and of driving 15V with a sink capability of 10mA.
These signals are active low. An isolated output may be obtained by linking a logic output to the undedicated relay input.
An indication of the RAMP 1 state is link selectable replacing only one of the normal outputs i.e. DWELL 1, RAMP 2, DWELL 2 or END.

PROGRAMMING

The profile of the 812 is in the format of two ramps and two dwell periods. The first ramp, RAMP 1, starts at the initial setpoint which is equal to the process measured value. This ramp can be positive or negative going at a programmed rate until a preprogrammed level is reached. The setpoint will stay at this level for a period determined by the setting of DWELL 1. Another positive or negative going ramp is now initiated starting at the level at the end of DWELL 1. When the ramp reaches the second preprogrammed level, it stays at that level for the duration of the set DWELL 2 period. At the end of the DWELL 2 period the setpoint is monitored until either the programmer is reset or a run signal is activated.



During a program run parameters can be inspected but not altered. When an active dwell period is being inspected the time to the end of the dwell period is monitored. If a dwell parameter is inspected when the programmer is not in that segment the original full dwell period is displayed.

Hc

Depress the scroll button so that 'Hc' is displayed. Depress the UP/DOWN buttons to set the required cycle time. This is adjustable in 6 steps from 0.3 seconds to 80 seconds.

HL

HL - Maximum Power %

Depress the scroll button so the 'HL' is displayed. Depress the UP/DOWN buttons to set the required power. This is adjustable in 1% steps from 0 to 100%.

Control Variables (steps)

Prop band (%)	0.5, 0.8, 1.1, 1.7, 2.5, 4, 6, 8, 13, 20, 26, 34, 50
Integral (secs)	OFF, 5, 7, 10, 15, 25, 40, 65, 100, 145, 210, 300, 450, 700, 1100, 1700
Derivative (secs)	OFF, 1.5, 2.5, 4, 6, 9, 12, 17, 24, 33, 46, 65, 90, 130, 180
Cycle time (secs)	0.3, 1, 5, 10, 20, 40, 80
Maximum Power (%)	1% increments from 0 to 100%
Ramp rate (units/time)	0.1 increments from 0.1 to 999.9 units/min or 1 unit increments from 1 to 9999 units/hr
Dwell (time)	0.1 increments from 0 to 999.9 mins or 0 to 999.9 hrs.
Level (units)	1 unit increments over the instrument range
Alarm (deg)	0 - 50° in 1° increments

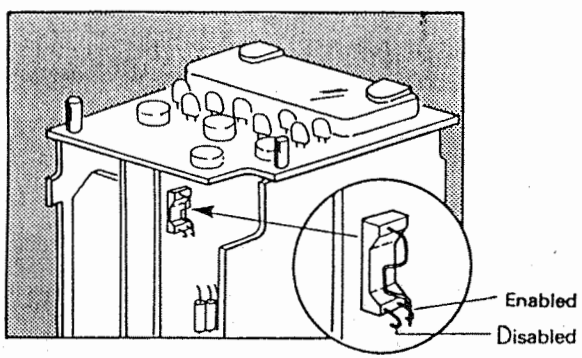
PROGRAMMER CONTROLS

Programming of the instrument is by front panel control buttons/logic inputs to the rear terminals.

FRONT PANEL

Run

Depressing the RUN button starts a programming sequence. The RUN button is only active when the programmer is in either a RESET or END state. The RUN button can be disabled by altering the link position as shown.



Reset

The programmer may be RESET by depressing both the UP and DOWN buttons simultaneously. This facility may be optionally disabled.

Note: *When RESET is actioned the setpoint reverts to the value last set on the controller.*

29	RLY2 I/P+
30	RLY I/P COM
34	RLY2 COM
35	RLY2 N/O
36	RLY2 N/C

Undedicated Relay (Standard)

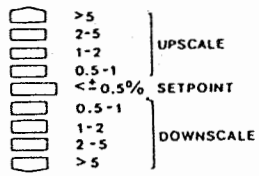
This undedicated relay is connected across terminals 34, 35 and 36. Terminal 35 is normally open when the relay is de-energised. When energised the voltage at terminal 34 is switched through to the output terminal 35. The relay is energised by contact closure across terminals 29 and 30, or by connecting one of the programmer logic outputs to terminal 29 (Common not required).

OPERATION

Temperature Setting

When power is connected the fluorescent indicator panel will display the measured value of temperature in digital form. Depress and release either UP or DOWN button and the display will indicate the setpoint value for five seconds and then revert to the measured value.

To alter the setpoint depress the respective UP/DOWN button and after a delay of five seconds the setpoint will change in the required direction. The nine segment bars situated to the left of the digital readout provide error percentages of measured values of temperature with respect to the set temperature. Illumination of the centre bar only indicates within 0.5% of setpoint.



The bars above and below the centre bar indicate, when illuminated, the upscale and downscale errors respectively, in increasing magnitude. The 812 may be used as a controller but only when in a RESET condition, the programmer section then being inoperative.

Indications

The fluorescent indicator panel indicates measured value, setpoint and all parameters particular to the specific instrument. When a parameter other than measured value is being displayed, indication is provided by means of a flashing dot at the top left of the display.

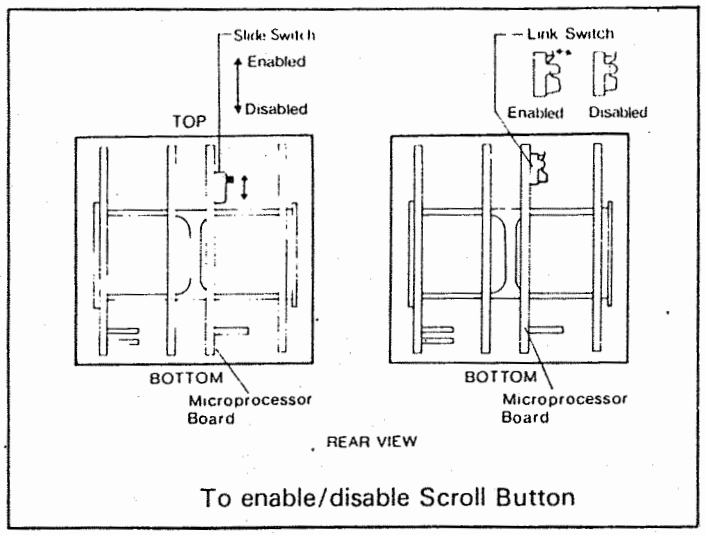
The nine segment bars provide error indications of measured value with respect to the setpoint. In the event of a thermocouple break the numeric display goes blank when the minimum/maximum scale range is reached.

The eight LEDs on the front panel provide the following indications:

ALARM	:	illuminates in the alarm condition
OUTPUT	:	illuminates when a heat output is active
HOLD	:	illuminates when the program is held by an external HOLD input
RAMP 1	:	illuminates when the program is in its first ramp period sequence
DWELL 1	:	illuminates when the program is in its first dwell period
RAMP 2	:	illuminates during the program's second ramp period
DWELL 2	:	illuminates during the program's second dwell period
END	:	illuminates at the completion of the programming sequence

SETTING UP

Setting up is achieved by access of the parameter through a scroll button which is located behind the front door panel. Once the parameters have been set a facility is provided to disable the scroll button if required, providing protection to the set parameters.
To enable/disable the scroll function remove the instrument from its sleeve.



To enable/disable Scroll Button

Locate the switch at the rear of the microprocessor circuit board (as shown). If a slide switch is fitted, slide the switch towards the top of the instrument to enable the scroll button. If a link switch is fitted, press down on the link and engage the hook (as shown). To disable the scroll button slide the switch towards the bottom of the instrument or disengage the link switch as appropriate.

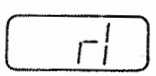
To the left of the scroll button are listed a series of control parameters, pertinent to that instrument. Each parameter is shown in abbreviated form. Operation of the scroll button causes the abbreviation to appear in the right hand segments of the digital fluorescent indicator panel. Depress the UP or DOWN button so the abbreviation is replaced by the value of the parameter. Adjustment of a parameter is achieved by means of the UP/DOWN buttons. Subsequent operation of the scroll button selects the next parameter listed. NOTE: If no action is taken by the operator within eight seconds of the last action, the display will automatically revert to indicating the measured value.

Setting Scroll Parameters

Regardless of whether the instrument is to be used as a programmer/controller, the controller parameters must be set up first.

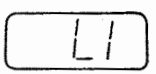
The parameters can only be adjusted when the instrument is in RESET. This can be achieved by depressing the UP and DOWN buttons simultaneously, if not disabled.

PROGRAMMER PARAMETERS



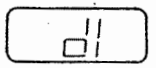
r1 - Ramp Rate 1

Depress the scroll button so that 'r1' is displayed. Depress the UP/DOWN buttons to set the required rate. This is a variable parameter from 0.1 to 999.9 units/minute adjustable in 0.1 steps as standard. A range of 1 to 9999 units/hour is optionally available.



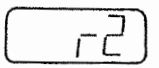
L1 - Level 1

Depress the scroll button so that 'L1' is displayed. Depress the UP/DOWN buttons to set the level that ramp 1 has to reach. This level is adjustable within the display range of the instrument.



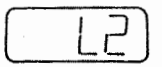
d1 - Dwell 1

Depress the scroll button so that 'd1' is displayed. Depress the UP/DOWN buttons to set the required dwell period. This is a variable parameter from 0 to 999.9 minutes adjustable in 0.1 steps as standard. A range of 0 to 999.9 hours is optionally available.



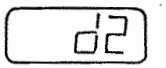
r2 - Ramp Rate 2

Depress the scroll button so the 'r2' is displayed. Depress the UP/DOWN buttons to set to the required rate. This is a variable parameter from 0.1 to 999.9 units/min adjustable in 0.1 steps as standard. A range of 1 to 9999 units/hour is optionally available.



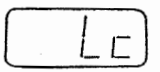
L2 - Level 2

Depress the scroll button so that 'L2' is displayed. Depress the UP/DOWN buttons to set the level that ramp 2 has to reach. This level is adjustable within the display range of the instrument.



d2 - Dwell 2

Depress the scroll button so that 'd2' is displayed. Depress the UP/DOWN buttons to set the required dwell period. This is a continuously variable parameter from 0 to 999.9 mins adjustable in 0.1 steps as standard. A range of 0 to 999.9 hours is optionally available.

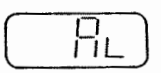


Lc Loop Counter

Depress the scroll button so the 'Lc' is displayed. Depress the UP/DOWN buttons to set the number of program cycles. This is adjustable in integer steps from 1 to 100.

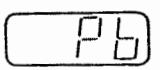
CONTROLLER PARAMETERS

Operate the SCROLL button to display the following parameters in turn, adjusting as required by means of the UP/DOWN buttons.



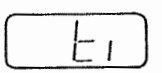
AL — Alarm

Depress the scroll button so that 'AL' is displayed. Depress the UP/DOWN buttons to set the alarm to the required value. For a band alarm setting range is 1 to ±50° about setpoint. A deviation alarm can be set from 1 to 50°. If set to 0 alarm is inhibited.



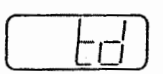
Pb — Proportional Band, On/Off Hysteresis Instrument Span

Depress the scroll button so 'Pb' is displayed. Depress the UP/DOWN buttons to set Pb to required value. The proportional band settings are in 12 steps from 0.5 to 50%. With on/off control instruments Pb sets the ON/OFF hysteresis directly in units 0.5 to 50.



ti - Integral (Secs)

Depress the scroll button so that 'ti' is displayed. Depress the respective UP/DOWN buttons to set the integral time to the required setting in 15 steps from indicating OFF to 1700 seconds.



td - Derivative (Secs)

Depress the scroll button so that 'td' is displayed. Depress the relative UP/DOWN buttons to set the derivative time. The derivative settings are in 14 steps from indicating OFF to 180 seconds.

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