Eurotherm Companies

UK Regional Sales and Service

Southern Area
Home Counties, South and South East

Eurotherm Ltd
Unit.8 Sackville Trading Estate
Sackville Road, Hove
East Sussex BN3 7AN
Telephone (0273) 206841
Telex 878157
Fax 0273 204902

Midlands Area
Midlands, South Wales, East Anglia and South West

Eurotherm Ltd
Miller House
Corporation Street
Rugby Warwickshire CV21 2DW
Telephone (0788) 82011
Telex 311874
Fax 0788 536249

Northern Area
Northern Counties, North Wales and Scotland

Eurotherm Ltd
4/5 Chetham Court
Calver Road Warrington
Cheshire WA2 8RF
Telephone (0925) 572111
Telex 629852
Fax 0925 413099

Eurotherm Companies

Australia
Eurotherm International Pty. Ltd.
PO Box 1605
Hornsby Northgate
NSW 2077
Telephone (02) 477 7022
Telex AA74362
Fax (02) 477 7758

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
Eurotherm International Benelux B.V.
Herentalsebaan 71-75
2100 Deurne (Antwerpen)
Telephone 03/322 38 70
Fax 03/321 73 63
Telex 33317

Canada
Eurotherm Corporation
1045 McNicoll Avenue
Scarborough, Ontario M1W 3W6
Telephone (416) 497-0155
Telex 06-986766

Denmark
Telemetric Instrument ApS
Finsensvej 86
DK 2000 Frederiksberg
Copenhagen
Telephone Copenhagen (1) 871822
Telex 32317 TELMET S
Fax 1872124

France
Eurotherm Automation
Parc d'Affaires de Dardilly
6 chemin des Joncs, B.P. 55
69572 Dardilly Cedex
Telephone Lyon 78 66 19 43
Telex 380038 EURTERM F
Fax 78 35 24 90
Also regional offices

Hong Kong
Eurotherm (Far East) Limited
21/F Kai Tak Commercial Bldg.
317-321 Des Voeux Road C
Hong Kong
Telephone Hong Kong (5) 411268
Telex 72449 EFELD HX
Fax 5-815 1540

Ireland
Electromation Limited
I.D.A. Industrial Estate
Monread Road
Naas
Co. Kildare
Republic of Ireland
Telephone (045) 79079
Telex 0500-60745
Fax (045) 79069

Italy
Eurotherm S.p.A.
Via XXIV Maggio
22070 - Guanzate (Co.)
Telephone (031) 97-71-03
Telex 380893 EUROTH I
Fax G.R.3 031-97-75-12

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

Netherlands
Eurotherm International Benelux B.V.
Johan Friscostraat 1
2382 HJ Zoeterwoude
Nederland
Telephone Leiden (071) 41 18 41
Telex 39073 EIBNL NL
Fax 071-41 45 26

Sweden
Telemetric Instrument AB
PO Box 24
Hantverkaregatan 18
23200 Arloev
Telephone Malmo (40) 435460
Telex 32317 TELMET S
Fax 40435520

Switzerland
Eurotherm Produkte (Schweiz) A.G.
Kanalstrasse 17
8152 Glattbrugg
Telephone Glattbrugg (01) 810 36 46
Telex 827577 ESAG
Fax 41-1-8108920

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

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

West Germany
Eurotherm Regler GmbH
Ottostrasse 1 Postfach 1453
6250 Limburg a.d. Lahn 1
Telephone Limburg (06431) 29050
Telex 484791 EUROT D
Fax (06431) 290519
Also regional offices

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

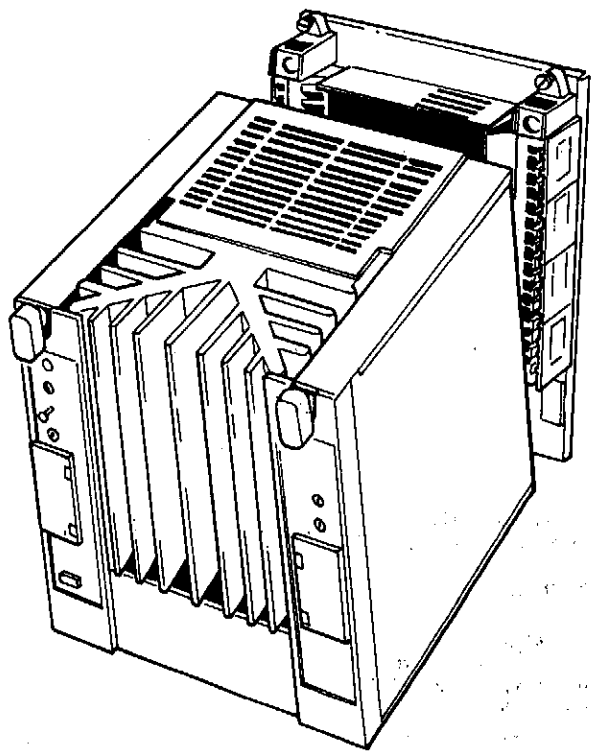
Eurotherm Exports
Faraday Close, Durrington,
Worthing, West Sussex, BN13 3PL
England. Telephone Worthing (0903) 68500
Telex 87114 EUROWG G

Printed in England 0788

EUROTHERM

POWER CONTROLLERS
TYPES 470-472

INSTALLATION AND OPERATING INSTRUCTIONS



Part No. HA020134

470-472W-3

ORDERING INFORMATION

You are welcome to order by description or from the code below which is a useful checklist.

Max Output Current and Load Supply Voltage	Basic Product Code	Max Output Current Code	Load Supply Voltage Code
75A 240V	470	113	13
75A 440V	470	113	28
125A 240V (blown) ●	471	117	13
125A 440V (blown) ●	472	117	28
Driver for external thyristors †	472	000	13
Driver for external thyristors †	472	000	28

● Fan is run from the Driver Supply Voltage.
† thyristors and current transformer (5A) extra.
Other voltages are available

Driver Supply Voltage		Code
100–130V 200–260V	50/60Hz	19
200–260V 350–450V	50/60Hz	43

Nominal Load Current		Code
15A	470	081
25A		082
40A		083
55A		062
75A		113
100A	471	114
125A		117
5A external CT	472	000

Options	Code
No backplate	76
Current limit (Phase angle and PA start FC only)	55

Input, firing and feedback modes are switch selectable

If required 484mm (19 inch) DIN rails to DIN 46277, drilled as detailed overleaf may be ordered as a separate item (Eurotherm Part No. BA016165).

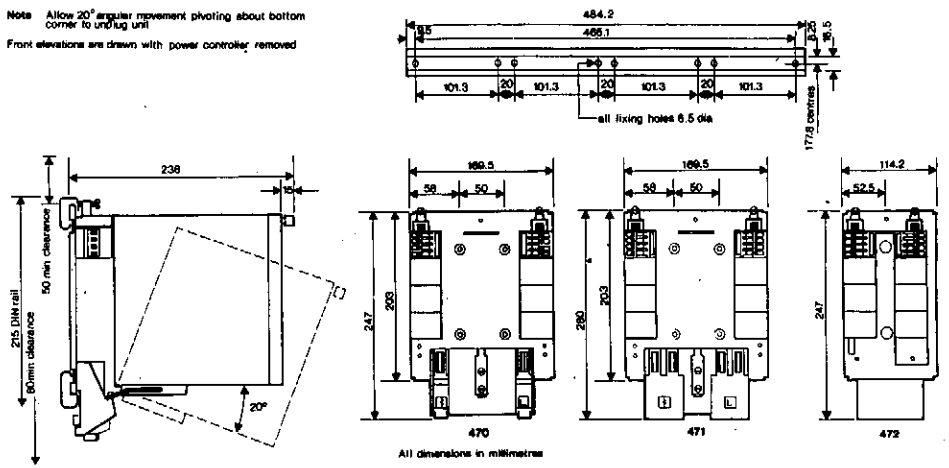
Example Order

To specify:
Controller unit rated at 75A (470-13) and 240V, 50Hz(13), driver supply 240V(19), nominal load current 40A(083).

Write: 470-113-13-19-083-00

Basic product	Max Output Current	Load Supply Voltage Code	Driver supply voltage	Nominal load current	Option	End
470 471 472	–	–	–	–	–	00

Installation and Dimensional Details



INSTALLATION

The units are normally despatched set to 4-20mA input, Phase Angle Firing, 50Hz, see Customer Options for other settings. For each unit a pressed-steel baseplate mounts on a pair of DIN rails or onto a wall or bulkhead, and the unit plugs into its baseplate. Connections for customer wiring form part of the baseplate, wiring being carried out from front with the unit unplugged. The light current wiring uses screw or faston connections, and the heavy current connectors for the power wiring use screw-and-clamp connections. The design makes it easy to keep power and signal wiring apart by running signal wires in trunking above the units and the power cables in trunking below them.
Do NOT mount units one above the other. Allowing adequate ventilation will ensure trouble-free service. With fan-cooled installations the use of fan-failure detection methods is recommended.

Fusing

The fuse fitted to the controller is for the protection of the thyristors only, at the maximum rated current. e.g. 75A or 125A. The installation wiring should therefore be protected by a suitable rated fuse or circuit breaker.

Terminals

Light current — Screw or faston 0.5-2.5mm² wire size, single or multi-strand

Units	Current Range	Wire Size	Strip the Insulation	Min. Tightening Torque
470	15–40A	6–16mm²	14mm	1.0Nm
470/471	50–100A	16–35mm²	17mm	2.16Nm
471	100–150A	50mm² – use a reducer	A/R	1.0Nm

RMS Voltage Rating

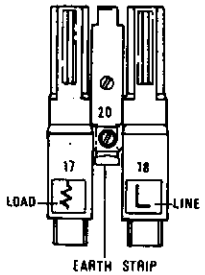
The heavy current supply voltage must be within ±10% of the rated voltage. For example:-
240V 216 to 264 volts RMS
440V 396 to 478 volts RMS

BASEPLATE WIRING

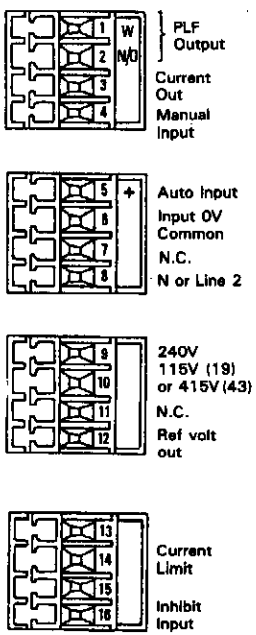
Supply Connection

a) Heavy Current.
470 and 471. The L terminal must be connected to the line supply. One end of the load must be connected to the ⏦ terminal, while the other end of the load is returned to Neutral or L2 as appropriate. See "Terminals" table.

b) Control. The control supply is connected to terminals 8 and 9 or 10. Terminal 8 is the neutral or reference line connection while terminal 9 is used only when the control supply is 240V. Terminal 10 is used for the line supply other than 240 (as specified in the instrument code). The control supply must be within well defined limits, +10% to −15% of the nominal and the same phase as the load.
Connect the earth strip, terminal 20, to ground.



Control Connector (Left Hand)



Control Signal Input

The analogue signal from a controller should be connected to terminals 5 and 6. The correct polarity of this supply must be observed. i.e. terminal 5 is positive and terminal 6 is zero volts reference. Set the input switch to suit the control signal — see Customer Options diagram and Table 1. For Manual input terminal 4 is positive, and terminal 12 is the Reference Voltage Out (for an external 5K ohm setpoint potentiometer or Type 403 unit) — see Customer Options diagram and Table 3. Disconnect terminal 5 when using manual input.

Firing Mode

To select the required firing mode, refer to the Customer Options diagram and Table 2.

Partial Load Failure Output

Partial Load Failure detection is fitted to the unit as standard. A relay output is available from terminals 1 and 2, contacts being open in the alarm state (Fail Safe). Contact rating is 0.25A at 250V ac or 30V dc maximum. Release of this relay coincides with the illumination of the Partial Load Failure indicator mounted on the front panel. When the load resistance increases or goes open circuit the indicator will be illuminated and the relay output will switch. This output is suitable for driving a Eurotherm Type 603 Alarm Collection Unit.

Current Limit (Optional)

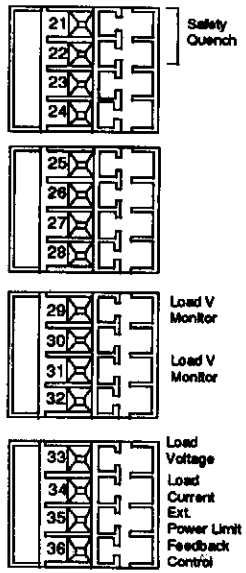
Current limit can be used with phase angle and phase angle start fast cycle firing modes.

Connect the +10V ref. terminal 12 to the current limit setpoint input terminal 14. The front panel current limit control may then be used — see Setting of the Current Limit. An external current limit potentiometer (10K ohms) may be wired to terminal 12 Reference Voltage Out, zero volts terminal 6 and current limit setpoint terminal 14. Turn front panel setpoint control to maximum for external use.

Other Facilities (Control connector)

Terminal 16 is the Inhibit Input. Connect nominal +10 volts to inhibit the output at the next zero crossing. Open circuit or −2 to +1 volt to release. External relay contacts could be used to switch 10V ref. to inhibit terminal. Terminal 3 is the Current Out signal for monitoring or diagnostic purposes. It is a rectified d.c. signal directly proportional to the current in the load, and nominally 2.5V mean (on high impedance meter) at the rated current.

Feedback Connector (Right Hand)



Feedback Control Voltage

The V^2, I^2 or Vxl feedback control voltage is available at terminal 36. It provides 0-10V dc for 0-100% conduction of the thyristors. Only available with phase angle and single cycle firing modes.

Load Current Signal

This is an ac signal directly proportional to the current in the load. It is nominally 0 to 2.5 volts ac. This signal is for monitoring or diagnostic purposes, and is on terminal 34.

Load Voltage Signal

This is a full-wave rectified voltage output signal, 0 to 2.5 volts ac for monitoring or diagnostic purposes, on terminal 33.

Safety Quench

Terminals 21 and 22 must be connected by a link or switch to enable operation. Model 471 has a thermal switch, mounted on the heatsink, internally connected (in series with external link 21-22).

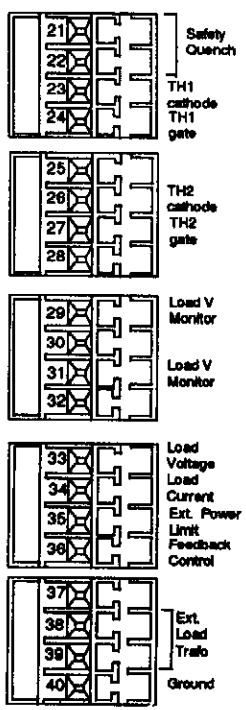
Load Voltage Monitoring

Connections from across the load must be made to terminal 29 (supply) and 31 (load), preferably via 0.25A fuses.

External Power Limit (Option)

Terminal 35 must be connected to the +10 volt reference on terminal 12 to enable the front panel power limit adjustment, limit P max, to be used. If not, power output is zero.

Feedback Connector (Right Hand)



MODEL 472 CONNECTIONS

In addition to the facilities above, the model 472 has the following:

Current Transformer

The output of an external load current transformer (ie ratio Load Current Rating to 5 amp) must be connected to terminals 38 and 39.

Thyristor Connections

Thyristor 1 connects to terminals 23 cathode, and 24 gate. Thyristor 2 connects to terminals 26 cathode, and 27 gate. Maximum allowable gate/cathode wiring length is 80cm. Signal cable size is 1.5 square mm.
Twist each pair of gate/cathode wires together.
Keep gate/cathode wiring separate from any power cables.

Ground Connection

Terminal 40 must be connected to ground.

CUSTOMER OPTIONS

Preset and DIL Switch Locations

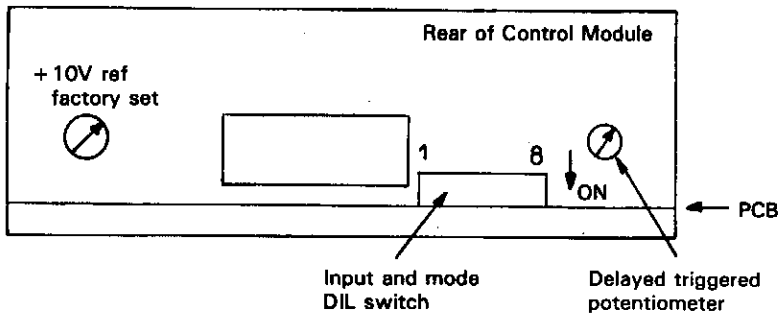


Table 1 Input Amplifier Switches 1 - 4

Input Range	Switch 1	Switch 2	Switch 3	Switch 4	State
0—5V	0	0	0	0	0
0—10V	1	0	0	0	1
1—5V	0	1	0	0	2
1—9V	1	1	0	0	3
0—5mA	0	0	1	0	4
0—10mA	1	0	1	0	5
1—5mA	0	1	1	0	6
1—9mA	1	1	1	0	7
0—20mA	0	0	1	1	8
4—20mA	0	1	1	1	9

1 denotes ON

Table 2 Mode Switches 5-8

Mode	Switch 5	Switch 6	Switch 7	Switch 8
Phase Angle	0	0	0	—
Single Cycle	1	0	0	—
Fast Cycle	1	1	0	—
PA Start FC	1	1	1	—
50Hz	—	—	—	1
60Hz	—	—	—	0

Preset Delayed Triggering and Phase Angle Start

See Preset and DIL Switch Locations. Delayed triggering is used on single cycle control or slow cycle static switching. With DIL switch 5 ON, delayed triggering is obtained by adjusting the potentiometer clockwise. Up to 90 degrees trigger angle in the first half cycle is obtainable. Delayed triggering of the first cycle when using fast cycle control (switch 6) can similarly be obtained. Switch 7 allows longer soft start time periods up to approximately 0.25 seconds when in the fast cycle mode. With current limit option fitted, the delay is fixed at 300ms.

Manual Input

This can be used for test or manual control. DIL switches 1 and 2 change the input scaling (normally 0—5V for control) in the following table.

Table 3

Input Range (Manual)	Switch 1	Switch 2
0 — 5V	0	0
0—10V	1	0
1.25—6.25V	0	1
1.25—11.25V	1	1

Note: Auto input and Manual input are summed, normally either one or the other is used.

Feedback Adjust (I^2, V^2 or VxI)

Adjusts output load power to setpoint relationship. This is normally set to give nominal power (nominal load voltage x nominal load current) output at 100% input signal. Terminal 35 voltage is then +10V. Adjustment is ±30%.

Feedback Control Mode Selection

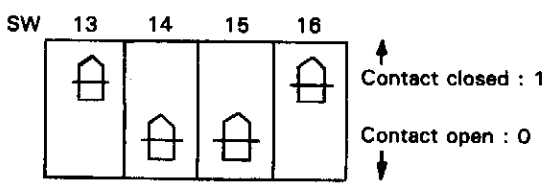
The user has the choice of three feedback control modes obtained by combination of 4 mini switches SW13 to 16.

Table 4

	SW 13	SW 14	SW 15	SW 16
V × I	1	0	0	1
I^2	1	0	1	0
V^2	0	1	0	1

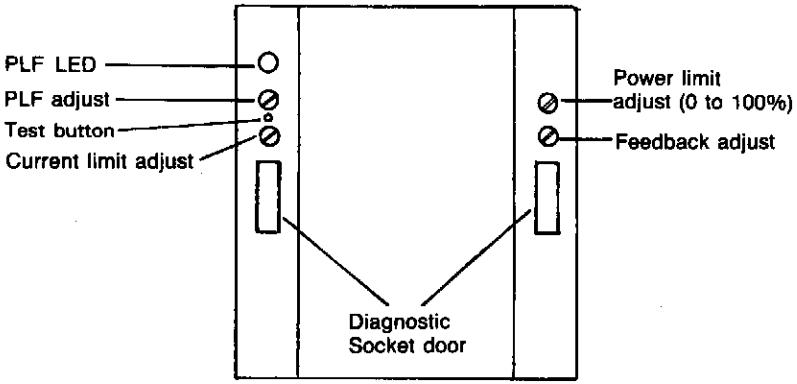
1 denotes switch closed (pushed in the direction of the arrow)

Example: feed-back control mode V × I



OPERATION

Front Panel Controls



PLF Set-Up Procedure

Turn PLF multi-turn potentiometer clockwise until the PLF LED comes on. Then turn the pot back anti-clockwise slowly until the LED just goes off. Check that it has been set up correctly by pressing the test button S1. The LED should come on, and when the button is released , go off after a short delay. The PLF is now set for an 8% to 10% increase in load resistance. If the LED does not come on repeat the above procedure more carefully.

Setting of Current Limit (If fitted)

Current limit will operate in phase angle and PA Start Fast Cycle firing modes. If current limit condition is detected, the mode is changed to phase-angle and current limited as long as the condition exists. First turn the front panel control to its maximum anti-clockwise position and, if available, observe the current limit signal on position 5 of the Diagnostic Unit type 260 to be 0V. Apply maximum control signal to the input terminals and measuring the current in the load with a suitable meter, turn the current limit control in a clockwise direction until the correct full load current is obtained. The respective voltage setting of the current limit control can also be read on the Diagnostic Unit.

Setting Of Power Limit Potentiometer

This potentiometer is used to set the maximum power applied to the load when heating elements require this facility. Set the P max control on the front panel to minimum, anti-clockwise. The current to the load should be monitored while P max is slowly adjusted until the required power is attained. (If not in current limit).

Removal of Controller Unit from Bulkhead or DIN Rail System

The units are plugged into baseplates which are wired and secured to either a wall/bulkhead or DIN rails. Units may be unplugged with power on, but it is advisable to switch off the power first when there is a possibility of a fault condition which could cause arcing across the contacts.
WARNING: THE HEATSINK MAY BE HOT. TAKE GREAT CARE.

Release the top quarter-turn fasteners and pull the unit down to 20° below horizontal and unclip the lower edge.
To refit the unit in the baseplate locate the bottom corner pivot with the unit at 20° to horizontal and lever the unit into its horizontal position. Secure with the quarter-turn fasteners at the top.

Fuse Rating and Access

If a fuse fails, indicated by illumination of the Fuse Failure Indicator, disconnect the supply from the unit and unplug it from its baseplate as described above. The fuse is located at the rear and is visible. Take out the faulty fuse by removing the screw at either end of the fuse. Replace the faulty fuse with the correct replacement type as indicated in the table below. Do not use any other type or fuse wire as this will almost certainly cause considerable damage to the unit the next time a short circuit load fault occurs. The use of any other fuse than that recommended in the table will invalidate the guarantee.

Cable and wiring should still be protected with HRC fuses or circuit breakers as appropriate.

Table 5 Fuse Types

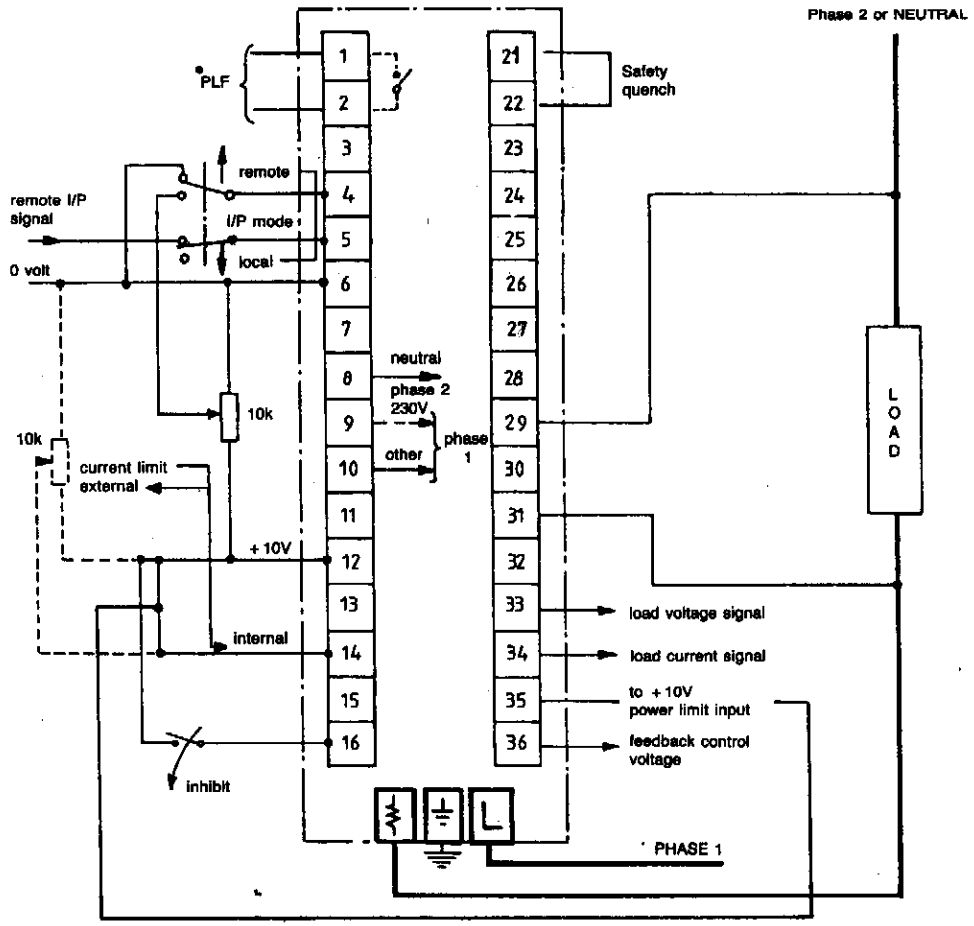
	Current	Voltage max	IR	Brush	GEC	Ferraz	Eurotherm Number
470	75A	660V	EE 1000/90	90 EET	GSG 1000/90	A99958	CH120094
471	125A	660V	EE 1000/150	150 EET	GSG1000/150	C99960	CH120154

Diagnostic Unit Type 260

This unit can be connected via 20-way fascia sockets on the Controller unit and can be used as a diagnostic/test facility for monitoring, commissioning or testing for fault conditions. The digital panel meter allows accurate measurements to be made of all the important analogue signals within the unit. The signal being monitored can also be displayed on an oscilloscope by direct connection to the diagnostic unit. Positions 1 to 20 of the rotary switch allow measurements which can be compared with those illustrated in the Maintenance Manual.

TYPICAL WIRING SCHEMES

Models 470 and 471



Power supply voltage → 230V: terminal 8 and 9
→ other: 8 and 10

Note: terminal 29-31 for load voltage information must be connected as indicated.
(If reversed, not possible to get full power from the unit).

*contact closed: power supply on, unit not in alarm.

Model 472