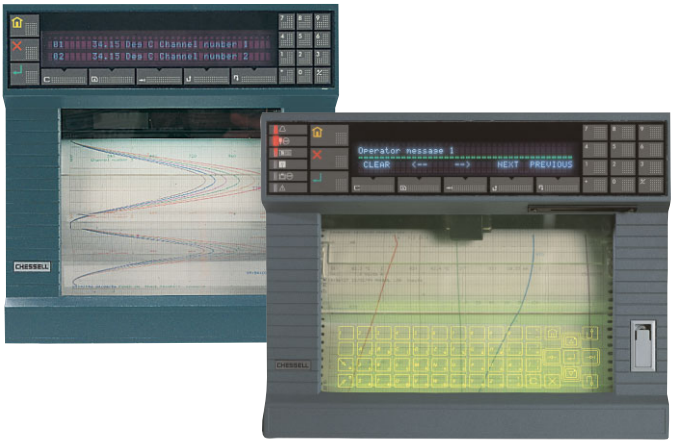
4181M, 4250M

MODELS

- **Multi-point Recording**
  Up to 96 Channels
  Providing 6 Colour traces
- **High Visibility Display**
- **Isolated Universal Inputs**
  Select from mA, mV, V,
  Thermocouples and RTD
- **Annotation**
  Clear text printing of time/
  date and custom messages
- **Data Archiving Facility**
  Store data on a PCMCIA card
- **Powerful Maths Pack**
  Calculate relative humidity,
  Fo value and more
- **Communications**
  Modbus,RS232 or RS485



Large Frame Paper Recorders
Specification Sheet

The 4181M and 4250M are high specification, 180/250mm strip chart recorders, providing multi-point recording for up to 96 Process Variables (48 for the 4181M). Information such as Channel descriptor, alarm status and scale details can be viewed on a high-resolution Vacuum Fluorescent Display. Advanced maths functions allow for complex configurations to be carried out and the results annotated using custom messages to print along side the raw data. Process variables including messages can be archived to an optional integral card reader. The units can be programmed on site via the user interface or a configuration file can be transferred using a PCMCIA card.

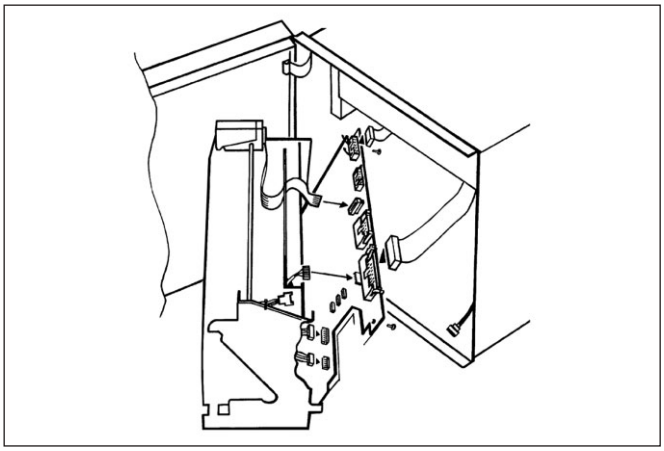
Display
As well as displaying the process variables as a numeric value the 4181M/4250M can provide bargraph indication. The display will automatically cycle through configured PV's, within the selected display group configured

Configuration
In order to prevent unauthorised access the configuration is password protected. Entry of the password provides access to the instrument configuration pages. It is possible to provide the operator access to certain parameters, for example you may require the operator to be able to change the chart speed. These fields can be enabled in the operator access menu.

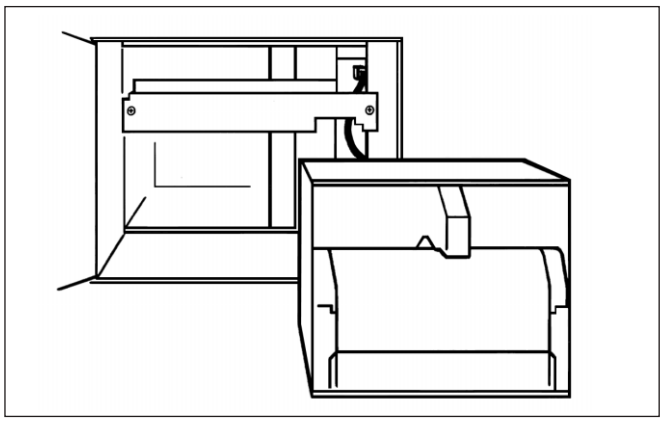
Adaptive Recording
At slow chart speeds it is possible that the input circuit, between chart increments will pick up a spike or other brief disturbance in the measured signal, but that this disturbance will not appear on the chart, even though they may trigger an alarm. With adaptive recording enabled, if a sudden change in the input signal is detected, the recorder will place an additional dot on the chart without the chart being moved. This means that even at the lowest chart speed, unexpected signal changes can still be trended.

invensys
EUROTHERM

Modular Design - All
The modular design of the 4181M and 4250M allows for upgrades to be carried out in situ thus reducing downtime.



4181M Exploded view



4250M Exploded view

Data Archiving
Two log groups are available for sending tabular data to the chart or PCMCIA card. Both log groups can be initiated to print on a chart. However Log group 2 can also be archived to a PC Card automatically at predetermined intervals. Data can be archived as either ASCII for use in spreadsheet, or Packed for viewing using Eurotherm Review software.

Maths Pack
The addition of the advanced maths pack option provides up to 96 derived channels and the ability to carry out complex calculations such as relative humidity and mass flow. Derived channels can be added to the log and display groups for trending and archiving as required.

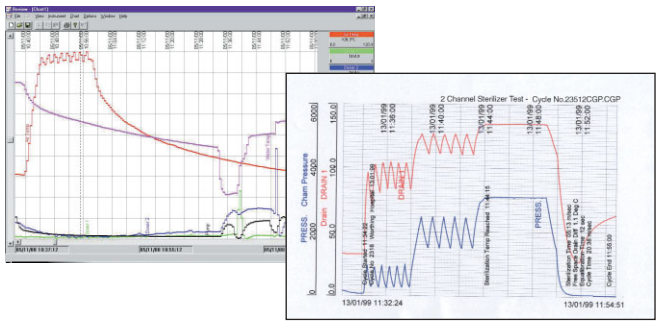
Communications
Supporting either RS232 or RS485 the Serial Communications board provides the means of establishing a link between a recorder and a host computer (using the Gould Modicon MODBUS protocol).

Analogue Output
If required, an input signal or the resulting calculation of a maths channel can be retransmitted to another device. The 4181/4250 provide up to eight analogue outputs per board, each capable of generating a voltage or current output.

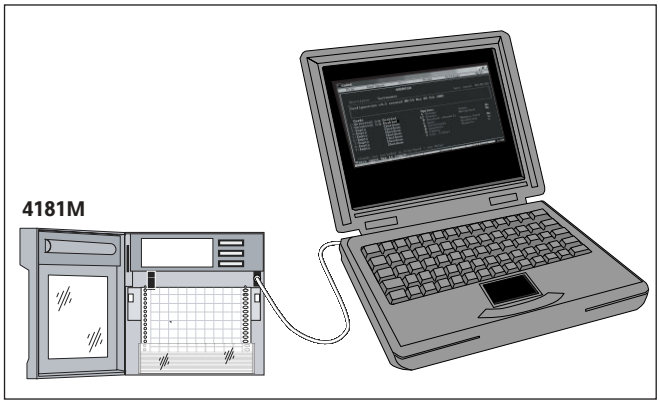
Events
As standard, there are 24 internal events (12 for the 4181), which can be triggered by two configurable input sources. Input sources can be logically ANDed or ORed allowing the use of multiple inputs. An example of the event input would be to provide external chart or logging control.

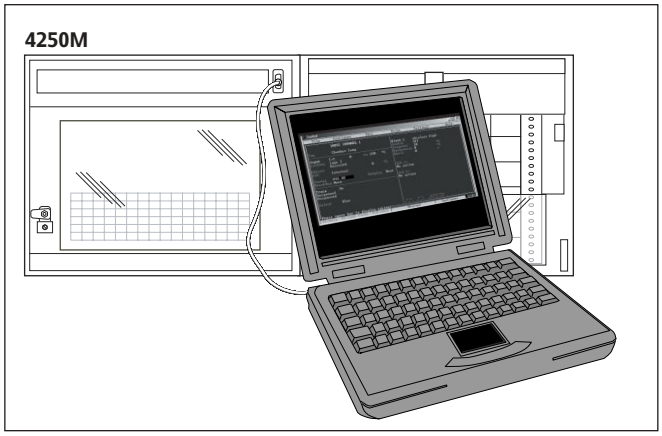
Custom Curve
This option allows the user to enter a Non standard linearisation table. The curve is entered as pairs of points up to a maximum of 32, one representing the input value which will be applied to the recorder (X), the other the output value (Y) which will appear on the display.

Review Package
Offline printing and viewing is made possible by the use of the Review Software package.
It uses the packed data files from the recorders local storage media and imports them into a PC database. Data from one or more archive files can easily be viewed. This data can then be printed or exported as a CSV file.



Configuration Editor
An offline configuration package that allows a recorder configuration to be set up on a PC and transferred either by the standard integral 9-way D-type connector or if fitted the Communications board. Alternatively a configuration file can be transferred using the optional PC card.





TECHNICAL SPECIFICATION

Recorder

Board types

Input board types		8-channel universal; 16-channel dc*
Output board type		8-channel relay; 4/8 channel analogue output (AO)
Max no. of I/O boards per type	4181M	3 x 8-channel input, 3 x relay output; 3 x 16-channel input, 1 x analogue output
Max no. of I/O boards per type	4250M	7 x 8-channel input, 7 x relay output; 6 x 16-channel input, 4 x 8-channel analogue output 7 x 4-channel analogue output
Max number of inputs	4181M	48 dc inputs*; 24 resistance inputs; 39 contact closure.
	4250M	96 dc inputs*; 56 resistance inputs; 78 contact closure
Max number of outputs	Relay o/p	8 x no of free slots.
	4181M Analogue o/p	8
	4250M Analogue o/p	32
Max no. of trended channels	4181M	24 total input/derived
	4250M	45 total input/derived

* Volts, mV, mA, thermocouple and contact closure, but not resistance inputs.

SBC memory size

4181M	256kB RAM + 64kB EEPROM
4250M	512kB RAM + 64kB EEPROM

Environmental Performance

General		To BS2011: 1981
Temperature limits	Operation:	0 to + 50°C
	Storage:	–20 to +70°C
Humidity	4250M Operation/Storage	5 to 85% RH; non-condensing
	4181M Operation:	5 to 80% RH; non-condensing
	4181M Storage	5 to 90% RH; non-condensing
Max. altitude		2000 meters
Protection		IP54 (door and bezel); IP31 (sleeve).
Shock/ Vibration		BS EN61010 1990 (safety); IEC 873: 1986 Also recovers from 2g peak at 10 to 150Hz

Electromagnetic compatibility (EMC)

Emissions	BS EN50081-2
Immunity	BS EN50082-2

Electrical Safety

To BS EN61010: 1990 Class 1.

INSTALLATION CATEGORY II
The rate impulse voltage for equipment on nominal 230V mains is 2500V.

POLLUTION DEGREE 2
Normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected

Physical

4250M	Bezel size (mm)	288mm x 360mm x 53mm deep
	Panel cutout size	273.5mm x 348mm (+ 1.4 – 0mm.)
	Depth behind bezel rear face	450mm. (including rear cover); 410mm.(no rear cover)
	Weight (8-channel instrument)	20kg. max.
4181M	Bezel size (mm)	288mm x 288mm x 45mm deep.
	Panel cutout size	281mm x 281mm (+ 1.4 – 0mm.)
	Depth behind bezel rear face	304mm. (including rear cover); 275mm. (no rear cover)
	Weight (8-channel instrument	12.5kg. max.
Panel mounting angle		Up to ± 30° from vertical.

4181M Printing system

Method		Printhead with black, brown, red, green, blue and violet dotting nibs
Printhead life		> 1.5 million dots per colour (recorder continuously powered)
Dot diameter		0.35 to 0.6mm.
Dot spacing	(vertical)	0.25mm (chart speed <300mm/hr); 0.5mm (600mm/hr); 1mm (1200mm/hr); 1.25mm (1500mm/hr)
	(horizontal)	0.39mm
Characters per line		77
Noise level		55dBA max (door closed)
Maximum trending rate		24 channels per pass (3 seconds)

4250M Printing system

Method		14-needle dot-matrix printhead with 6-colour disposable ribbon cartridge (red, orange, green, blue, violet, black)
Ribbon life		> 5 million dots per colour
Print needle diameter		0.35mm
Dot spacing	(vertical)	0.083mm (chart speed <300mm/hr); 0.17mm (600mm/hr); 0.33mm (1200mm/hr); 0.42mm (1500mm/hr)
	(horizontal)	0.4mm
Characters per line		104
Noise level		55dBA max (door closed)
Maximum trending rate		45 channels/sec (trending)

4181M Paper transport

Type	Tractor feed with selectable chart speed from 1 to 1500mm/hr. (0.4 to 60 inches/hour)
Chart length	22 meters (z-fold - fold depth 75mm)
Chart width	224mm. overall; 180mm. calibrated
Pen-to-paper accuracy	0.25% of calibrated chart width
Transport accuracy	Better than 10mm in 22 meters

4250M Paper transport

Type	Tractor feed with selectable chart speed from 1 to 1500 mm/hr (4250M)
Chart length	22 m x 75mm (z-fold); 32m (roll)
Chart width	274.5mm overall; 250mm. calibrated
Chart visible length	155mm
Resolution (horizontal)	±0.2mm
Pen-to-paper accuracy	0.25% of calibrated chart width
Transport accuracy	Better than 10mm in 32 meters

Performance

Maximum scan and update rate		All parameters in 1 second
Maximum print rate (trending)	4181M	24 channels in 3 seconds
	4250M	45 channels per second
Clock accuracy better than	4181M	60ppm
	4250M	50ppm

Power requirements

Line voltage (45 to 65 Hertz)		90 to 132 Volts or 180 to 264 Volts (User selectable)
Maximum power	4181M	70W
	4250M	120W
Fuse type		Ceramic 20mm. 3.15 Amp. Fast blow
Interrupt protection		100ms at 60% load

Memory Protection

Memory protection	EEPROM (for configuration) Battery-backed RAM for volatile data
RAM / clock-support battery type	Nickel-Cadmium (rechargeable)
Support period (no power to recorder)	3 months min. at 25°C; 1 month min. at 50°C

8-Channel Universal Input Board Specification

General specification

Number of inputs		8
Termination		Edge connector / terminal block
Input types		DC Volts, dc millivolts, dc milliamps (with shunt). Thermocouple, RTD (2- or 3-wire), Ohms, Contact closure
Input type mix		User selectable during configuration
Measurement frequency		All channels in 1 second
Step response to within resolution		2 seconds
Noise rejection	Common mode:	150dB above 45Hz. (Channel-to-channel and Channel-to-ground.)
	Series mode:	67dB above 45Hz.
Maximum common mode voltage		250 Volts
Maximum series mode voltage		10mV at lowest range; 500mV peak at highest range.
Isolation (dc to 65 Hz; BS EN61010)		Installation cat.II Pollution degree 2
	Channel-to-channel	300V (double insulation)
	Channel-to-ground	300V (basic insulation)
Dielectric strength	Channel-to-channel	2350V ac (1 minute type test)
	Channel-to-ground	1350V ac (1 minute type test)
Insulation resistance		50MΩ at 500V dc
Input impedance		>10MΩ (68.8kΩ for 10V ranges)
Over-voltage protection		60 Volts peak; 500 Volts through 50kΩ resistor
Open cct detection (to 200mV range)		65nA current max. 8 seconds recognition time (max.) 40MΩ minimum break resistance

DC input ranges

Ranges available	See table 1
Temperature performance (worst case)	
-10 to +40mV	(80ppm reading + 27.9ppm range)/°C
-50 to +200mV	(80ppm reading + 12.4ppm range)/°C
-0.5 to +1.0V	(80ppm reading + 2.1ppm range)/°C
-5 to +10V (100V with attenuator)	(272ppm reading + 4.7ppm range)/°C
Shunt/Attenuator	Externally mounted resistor modules
Additional error due to above	0.1% (shunt); 0.2% (attenuator)
Performance	See Table 1

Range	Resolution	Performance (worst case) in instrument at 20 °C
–10 mV to + 40 mV	1.4 µV	0.083% reading + 0.056% range
– 50 mV to + 200 mV	14 µV	0.072% reading + 0.073% range
– 0.5 V to + 1 V	37 µV	0.070% reading + 0.032% range
– 5 to + 10 V	370 µV	0.223% reading + 0.034% range

Table 1 DC performance – 8-channel board

TECHNICAL SPECIFICATION (continued)

Thermocouple data

Linearisation errors	0.15°C or better
Bias current	<2nA (<10nA at 70°C)
Cold Junction (CJ) types (selectable)	Off, internal, external, remote
CJ error	0.5°C or better
CJ rejection ratio	25:1 minimum
Remote CJ	Via any user-selected input channel
Upscale/downscale drive	Configurable for each channel
Types and ranges	See Table 2

8-Channel Universal Input Board Specification (cont)

T/C type	Range (*C)	Standard
B	+ 200 to + 1800	IEC584.1:1977
C	0 to + 2300	Hoskins
E	- 200 to + 1000	IEC584.1:1977
J	- 200 to + 1200	IEC584.1:1977
K	- 200 to + 1370	IEC584.1:1977
L	-200 to + 900	DIN 43710
N	- 200 to + 1300	IEC584.1:1977
R	- 200 to + 1760	IEC584.1:1977
S	- 50 to + 1760	IEC584.1:1977
T	- 250 to + 400	IEC584.1:1977
U	- 100 to + 600	DIN 43710-85
NiMoNiCo	–50 to + 1410	ASTM E 1751-95
Platinel II	-100 to + 1300	Engelhard R83

Table 2 Thermocouple types and ranges

3-wire RTD data

RTD linearisations		Pt100, Pt1000, Cu10, Ni100, Ni120
Linearisation errors		0.012°C or better
Influence of lead resistance	error:	0.15% of lead resistance
	mismatch:	1 ohm per ohm.
Types and ranges		See Table 3
Pt100 performance (worst case)		See Table 4

RTD type	Range (*C)	Standard
Pt 100	– 200 to + 850	IEC751: 1981
Pt1000	– 200 to + 850	Based on IEC751: 1981
Cu 10	– 20 to + 250	General Electric
Ni 100	– 50 to + 170	DIN43760
Ni 120	– 50 to + 170	Based on DIN43760

Table 3 RTD types and ranges

Range °C	Resolution	Performance (worst case) in instrument at 20 °C
- 200 to + 200	0.02°C	0.033% reading + 0.32°C
- 200 to + 1000	0.14°C	0.033% reading + 1.85°C

Table 4 Pt 100 performance

Ohms ranges

Ranges	See Table 5	
Temperature performance (worst case)		
	0 to 180Ω	(35ppm reading+34.3ppm range)/°C
	0 to 1.8kΩ	(35ppm reading+14.6ppm range)/°C
	0 to 10kΩ	(35ppm reading+1.9 ppm range)/°C

Range	Lead resistance	Resolution	Performance (worst case) instrument at 20 °C
0 to 180Ω	10Ω	5mΩ	0.033% reading + 0.070% range
0 to 1.8kΩ	10Ω	55mΩ	0.033% reading + 0.041% range
0 to 10kΩ	10Ω	148mΩ	0.037% reading + 0.020% range

Table 5 Ohms ranges

Other linearisations

Tables available	√ value; (value)$^{3/2}$; (value)$^{5/2}$; User defined tables (up to 3 off)

Contact closure (switch) inputs

Type	Volt-free contact
Wetting voltage	2.5 Volts nominal
Minimum latched pulse width	125 ms.
De-bounce	Inherent 1 second

16-Channel DC Input Board Specification

General specification

Number of inputs		16
Termination		Edge connector/terminal block
Input types		DC volts, dc mV, dc mA (with shunt), thermocouple, contact closure (not channels 1, 8 or 16)
Input mix		Software selected on configuration for each channel. (Max. eight different linearisations (including linear) per board
Measurement frequency		All channels in 1 second
Step response to within resolution		1.5 seconds
Noise rejection	Common mode:	150dB above 45 Hz. (Channel-to-channel) and Channel-to-ground.)
	Series mode:	> 60dB between 10 to 100Hz
Maximum series mode voltage		Hardware range +50 mV
Safety isolation (BS EN61010)		Installation cat.II; Pollution degree 2
	Channel-to-channel	300V (double insulation)
	Channel-to-ground	300V (basic insulation)
Dielectric strength	Channel-to-channel	2350V ac continuous
	Channel-to-ground	1350V ac
Input impedance		> 10MΩ (68.8kΩ for 5V range)
Over-voltage protection		60 Volts peak, 500V through 50kΩ resistor
Open cct detection (85 mV range only)		65nA current max. 8 seconds recognition time (max.) 40MΩ minimum break resistance.
Damping		2, 4, 8, 16, 32, 64, 128 or 256 secs. time constant, as configured

DC input ranges

Ranges available	–15mV to +85mV; –1.0V to +5V
Temperature performance (worst case)	
-15mV to +85mV	(80ppm reading+12.9ppm range)/°C
-1V to +5V	(272ppm reading+7.8ppm range)/°C
Shunt	Externally mounted resistor modules
Additional error due to shunt	0.1%.
Performance (worst case)	See Table 6

Range	Resolution	Performance (worst case) in instrument at 20 °C
–15mV to + 85mV	± 5.5µV	0.072% reading + 0.071% range
– 1.0V to + 5V	± 280µV	0.223% reading + 0.055 range

Table 6 DC performance (16-channel board)

Thermocouple data (in addition to the above)

Linearisation errors	0.15°C or better
Bias current	< 2nA (< 10nA at 70°C)
Cold Junction (CJ) types (selectable)	Off, internal, external, remote
CJ error	1°C or better
CJ rejection ratio	25:1 minimum
Remote CJ	Via any user-selected input channel
Upscale drive	Configurable for each channel
Types and ranges	See Table 2

Other linearisations

Tables available	√ value; (value)$^{3/2}$; (value)$^{5/2}$; User defined tables (up to 3 off)

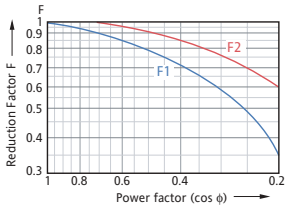
Contact closure inputs (not channels 1, 8 or 16)

Type	Volt-free contact
Wetting voltage	2.5 Volts nominal
Minimum latched pulse width	250ms
De-bounce	Inherent 1 second

Relay Output Board Specification

No of relays per board		8
Contact format		Single pole change-over (single set of common, normally open and normally closed contacts)
Estimated life at 60VA load		1,000,000 operations
Max contact voltage*		250 Volts ac
Max contact current*	Make:	8 Amp
	Continuous:	3 Amps
	Break:	2 Amps
Maximum switchable power*		60 watts or 500VA
Isolation (BS EN61010)		Installation cat. II, Pollution degree 2
	Channel-to-channel	300V ac (double insulation)
	Channel-to-ground	300V ac (basic insulation)
Dielectric strength	Contact-to-contact	1350V ac for 1 min.
	Channel-to-channel	2350V ac for 1 min.
	Channel-to-ground	1350V ac for 1 min.

* With resistive loads.
Derate with reactive or inductive loads according to the graph in which:
F1 = measured on representative samples
F2 = typical values (according to experience)
Contact life = resistive life x Reduction factor



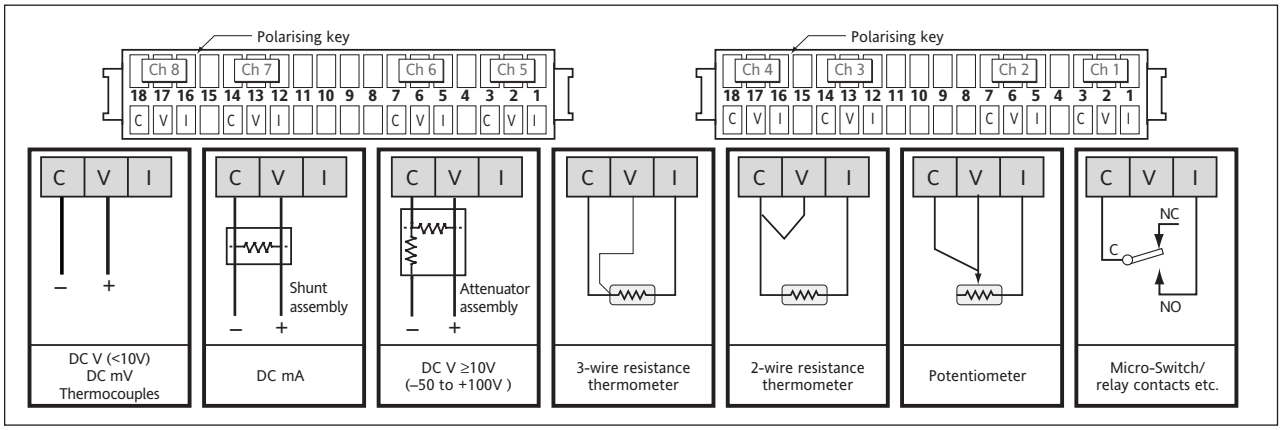
Analogue Output Board Specification

General specification

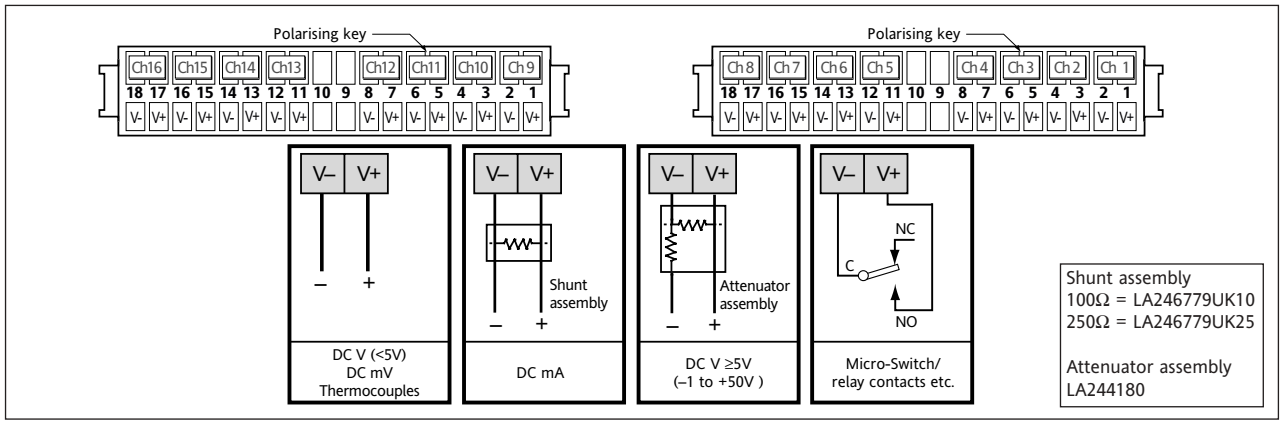
Number of outputs		Four or eight as ordered
Termination		Edge connector / terminal block
Output types		Current or Voltage as configured for each channel
	Current:	0 to 25mA max. at up to 24V
	Voltage:	–1 to 11V at up to 5mA
Output frequency		All channels in 1 second
Output damping		250msec rise time (10% to 90%)
Resolution		0.025% full scale, monotonic.
Isolation (dc to 65 Hz; BS EN61010)		Installation cat. II; Pollution degree 2
	Channel-to-channel:	300V RMS or dc (double insulation)
	Channel-to-ground:	300V RMS or dc (basic insulation)
Dielectric strength (BS EN61010)		(1 minute type tests)
	Channel-to-channel:	2350V ac
	Channel-to-ground:	1350V ac
Insulation resistance		50MΩ at 500V dc

SIGNAL WIRING DETAILS

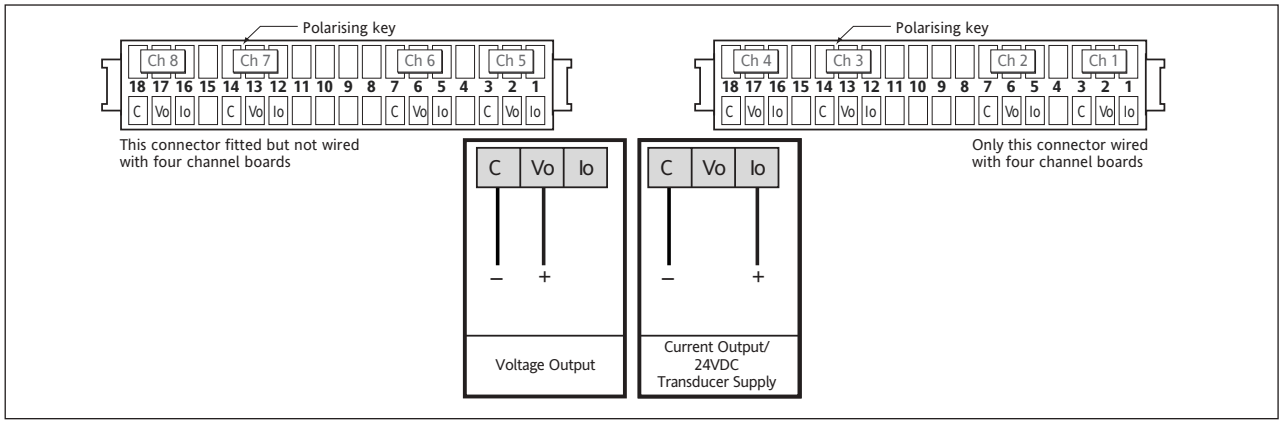
8-channel dc input board (typical inputs)



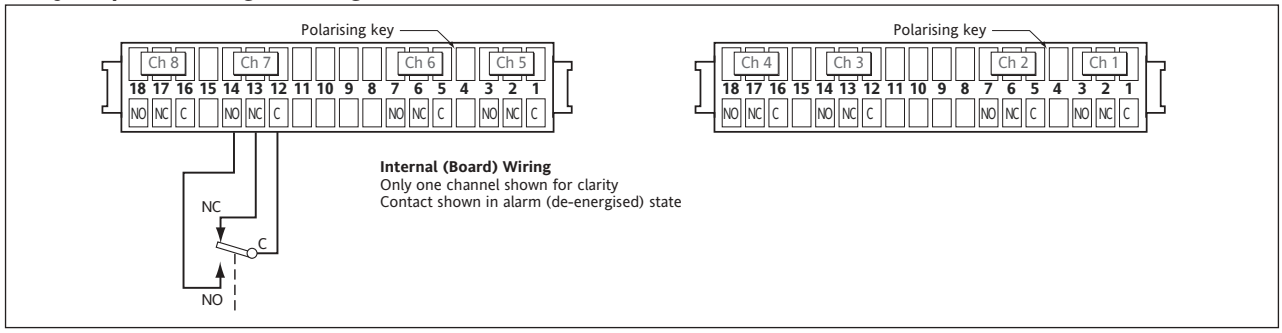
16-channel dc input board (typical inputs)



4- / 8-channel analogue output board (typical outputs)



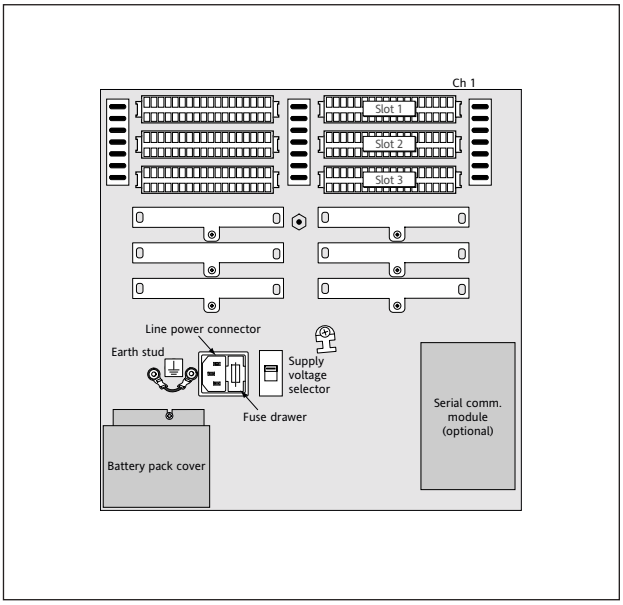
Relay output board signal wiring



Note: For ease of presentation, the orientation of connector blocks are shown horizontal, as installed on model 4181M. For model 4250M the connector blocks are installed vertically.

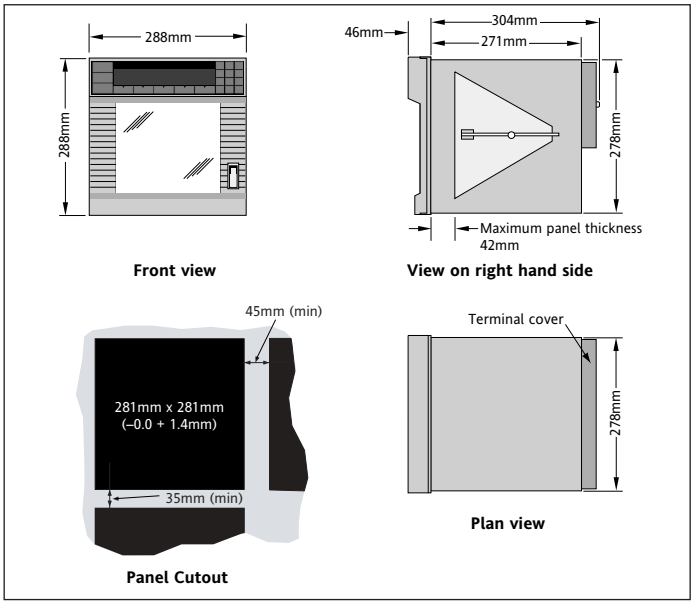
ELECTRICAL INSTALLATION COMPONENT LOCATIONS

4181M

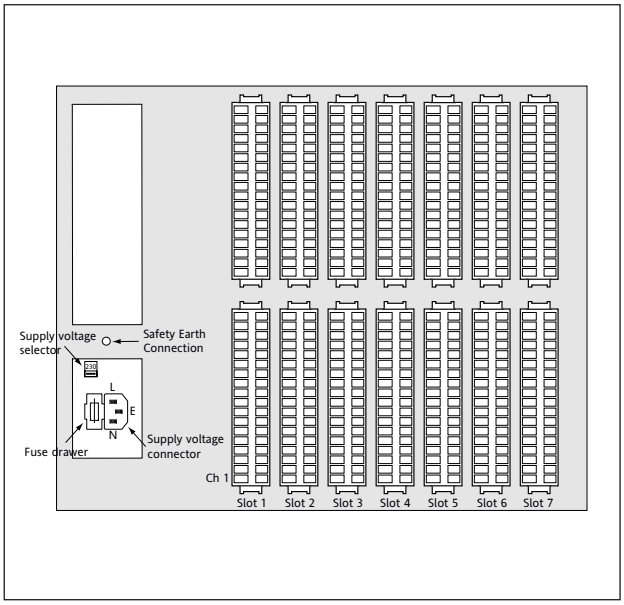


MECHANICAL INSTALLATION

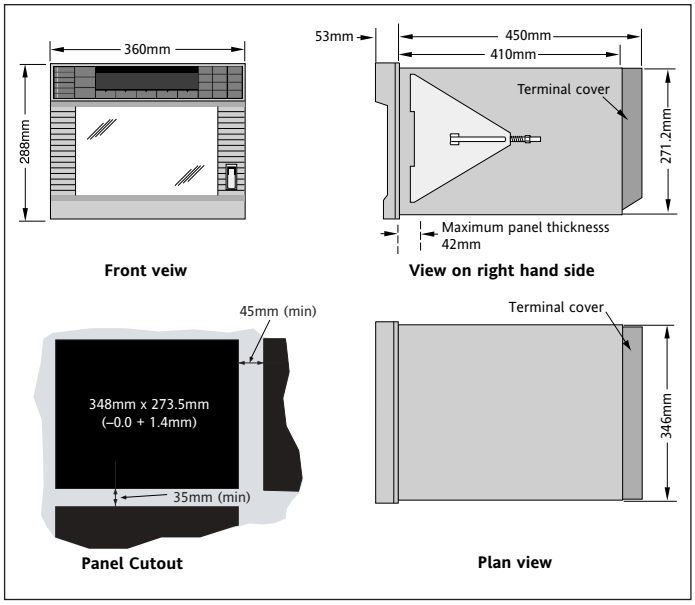
4181M



4250M



4250M



EUROTHERM LIMITED UK
Faraday Close Durrington Worthing BN13 3PL
Tel. +44 (0)1903 268500 Fax +44 (0)1903 265982
Email info@eurotherm.co.uk
www.eurotherm.co.uk

EUROTHERM US
741-F Miller Drive Leesburg VA 20175-8993
Tel. 1-703-443-0000 Fax 1-703-669-1300
Email info@eurotherm.com
www.eurotherm.com

EUROTHERM WORLDWIDE
For contact details in other countries please use:
www.eurotherm.co.uk