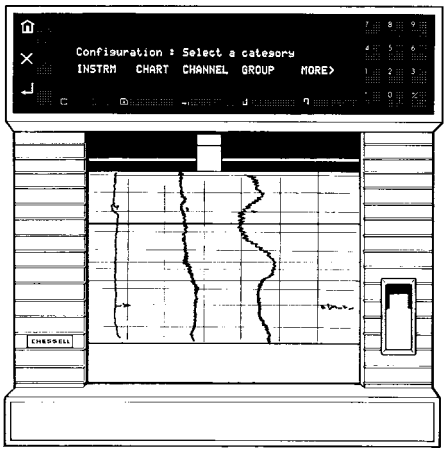
- 180mm Strip Chart Recorder
- Up to 48 inputs
- Six colour, multi-point printing
- Up to 24 concurrent traces
- 80-character vacuum fluorescent display
- Straightforward, plain English configuration
- Data storage to PC memory card
- High speed scanning (all inputs in 1 sec)



The Eurotherm Chessell 4181M, high specification, 180 mm chart recorder combines the latest technology with the proven reliability for which Chessell are renowned. Designed to meet the rigorous requirements of an industrial environment, the recorder is ideal for production or test purposes.

Printing system
Up to 24 channels can be updated and printed every three seconds, using the sophisticated six-colour dot printing system. To produce the clearest, most accurate record, the 4181M employs innovative new printing methods, such as line thickening and adaptive recording. Concurrent annotation of time and date markings, channel tags, scales, alarm messages and so on produce a clear record for later reference. For a full customer record, batch details and logs may also be printed on the chart.

High Visibility Display
The two-line, 80 character vacuum fluorescent display clearly indicates process values, alarms and alarm setpoints. Up to four channel values may be displayed simultaneously, or two channels with full descriptor and engineering units.

Configuration
A password protected configuration menu, using plain English, French or German prompts, gives access to all recorder variables, enabling easy configuration and adjustment in the field. PC software is available for off-line configuration changes which can be transferred over a direct link, or via a memory card.

Input Technology
The 4181M provides inputs of very high accuracy and stability using the latest in Application Specific Integrated Circuits (ASIC) and surface mount technology. All inputs to the 8-channel and 16-channel input boards are scanned in 1 second and are isolated to 250V channel-to-channel and channel-to-ground.

Alarms
Up to four alarms are available per channel. These alarms can be configured as absolute high/low, rate of change rising/falling, deviation in/out or digital change of state. All alarm setpoints are scanned every second.

Options
Memory Card Archiving
Use of the widely accepted PCMCIA standard allows data to be stored in a format readable by commercial spreadsheet packages. Alternatively data can be stored in a format which allows multiple copies to be produced on the chart. The recorder's configuration can also be stored on the card for transfer to another recorder or to a PC for manipulation using the PC configuration editor.

Maths, Timers, Counters, Totalisers
These options provide the recorder with integrating and counting facilities, and with the ability to carry out calculations ranging from simple arithmetic functions such as subtracting one channel from another to complex, application specific functions such as Relative Humidity calculations.

Software
Continuous Emissions Monitoring (CEM) software includes maths pack and timer/ counter/ totaliser funtions, allowing rolling averages, percent of time outside limits etc. to be calculated for NOx, SOx for example.

Serial Communications
Using the MODBUS protocol, the Model 4181M forms an ideal data acquisition unit for a central plant SCADA system. Up to 16 recorders can be linked on an RS422 multi-drop communications loop.

Model 4181M
Specification sheet

TECHNICAL SPECIFICATION (Recorder)

Board types

Input board types	8-channel universal; 16-channel dc*
Output board type	8-channel relay; 4/8 chan analogue
Max number of I/O boards per type	3 x 8-channel input, 3 x relay output; 3 x 16-channel input 3 x analogue o/p
Max number of inputs	48 dc inputs*; 24 resistance inputs; 39 contact closure.
Max number of outputs relay	8 x no of free slots.
Analogue o/p	8
Maximum number of traced channels	24 total input/derived.

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

Environmental Performance

General		To BS2011: 1981
Temperature limits	Operation:	0 to + 50 ˚C
	Storage:	-20 to +70 ˚C
Humidity	Operation:	5 to 80% RH; non-condensing
	Storage	5 to 90% RH; non-condensing
Max. altitude		<2000 metres
Protection		IP54 (door and bezel); IP31 (sleeve).
Shock		BS EN61010 1990 (safety); IEC 873: 1986
Vibration		BS EN61010 1990 (safety); IEC 873: 1986.

Electromagnetic compatibility (EMC)

Emissions	BS EN50081-2
Immunity	BS EN50082-2

Electrical Safety

To IEC 1010: 1990 Class 1.

Physical

Bezel size (mm)	288mm x 288mm x 45 mm deep.
Panel cutout size	281mm x 281mm (+ 1.4 - 0 mm.)
Depth behind bezel rear face	304 mm. (inc. rear cover); 275 mm. (no rear cover)
Weight (Eight-channel instrument)	12.5 kg. max.
Panel mounting angle	Up to ± 30˚ from vertical.

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 0.6 mm.
Dot spacing (vertical)	0.25 mm. (chart speed <300 mm/hr.); 0.5 mm (600 mm/hr); 1 mm. (1200 mm/hr.); 1.25 mm (1500 mm/hr)
Dot spacing (horizontal)	0.39 mm.
Characters per line	77
Noise level	55 dBA max. (door closed).
Maximum trending rate	24 channels per pass (3 seconds)

Paper transport

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

Installation category II: The rated impulse voltage for equipment on nominal 230V mains is 2500V.
Pollution degree 2: Normally, only non-conductive pollution occurs. Ocassionally, however, a temporary conductivity caused by condensation shall be expected.

Recorder Specification (Cont.)

Performance

Maximum scan and update rate	All parameters in 1 second
Maximum print rate (trending)	24 channels in 3 seconds
Maximum chart speed	1500 mm/hr.
Clock accuracy	Better than 60 ppm.

Power requirements:

Line voltage (45 to 65 Hertz)	90 to 132 Volts or 180 to 264 Volts (User selectable).
Maximum power	70 W
Fuse type	Ceramic 20 mm. 3.15 Amp. Fast blow.
Interrupt protection	100 ms at 50% load.
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 I/P 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 45 Hz. (channel-channel and channel-ground.)
	Series mode:	67dB above 45 Hz.
Maximum common mode voltage		250 Volts
Maximum series mode voltage		10 mV at lowest range; 500 mV peak at highest range.
Isolation (dc to 65 Hz; BS EN61010)		Installation cat.2 Pollution degree 2
	channel-to channel	300 V (double isolation)
	channel-to-ground	300 V (basic isolation)
Dielectric strength	channel-to-channel	2350 V ac for 1 minute
	channel-to-ground	1350V ac for 1 minute
Insulation resistance		50 MΩ at 500V dc.
Input impedance		>10 MΩ (68.8kΩ for 10V ranges)
Over-voltage protection		60 Volts peak; 500 Volts through 50 kΩ resistor
Open cct detection (to 200 mV range)		65 nA current max. 8 seconds recognition time (max.) 40 MΩ minimum break resistance.

DC input ranges

Ranges available	See table 1 (max 100V with attenuator)
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)
Typical 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

Thermocouple data

Linearisation errors	0.15 ˚C or better
Bias current	<2 nA (<10 nA 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

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
NiNiMo	0 to + 1300	Eurotherm Recorders
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 DIN 43760

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 Typical Pt100 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) in instrument at 20 ˚C
0 to 180 Ω	10 Ω	5 mΩ	0.033% reading +0.070% range
0 to 1.8 kΩ	10 Ω	55 mΩ	0.033 % reading + 0.041 % range
0 to 10 kΩ	10 Ω	148 mΩ	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 2 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 (inc. 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. (chan-chan and channel-ground.)
	Series mode:	> 60dB between 10 to 100 Hz.
Maximum series mode voltage		Hardware range +50 mV.
Safety isolation (BS EN61010)		Installation cat.ii; Pollution degree 2
	Channel-to-channel	300V (double isolation)
	Channel-to-ground	300V (basic isolation)
Dielectric strength	Channel-to-channel	2350 V ac continuous
	Channel-to-ground	1350V ac
Input impedance		> 10 MΩ (68.8kΩ for 5V range)
Over-voltage protection		60 Volts peak, 500 V through 50 kΩ resistor.
Open cct detection (85 mV range only)		65 nA current max. 8 seconds recognition time (max.) 40 MΩ minimum break resistance.
Damping		2, 4, 8, 16, 32, 64, 128 or 256 secs. time constant, as configured.

16- channel i/p board specification (Cont.)

DC input ranges

Ranges available		-15mV to +85 mV; -1.0 V to +5 V
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
–15 mV to + 85 mV	± 5.5 µV	0.072% reading + 0.071% range
– 1.0V to + 5 V	± 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	< 2 nA (< 10 nA 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 2 off)

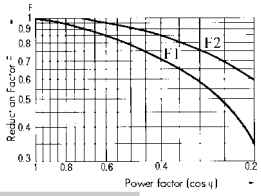
Contact closure inputs (not channels 1, 8 or 16)

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

RELAY OUTPUT BOARD SPECIFICATION

No of relays per board		Eight
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 500 VA
Isolation (BS EN61010)		Installation cat.. II, Pollution degree 2
	Channel-to-channel	300V ac (double isolation)
	Channel-to-ground	300V ac (basic isolation)
Dielectric strength		1350V ac for 1 min. (contact to contact) 2350V ac for 1 min. (channel to channel) 1350V ac for 1 min. (channel to ground)

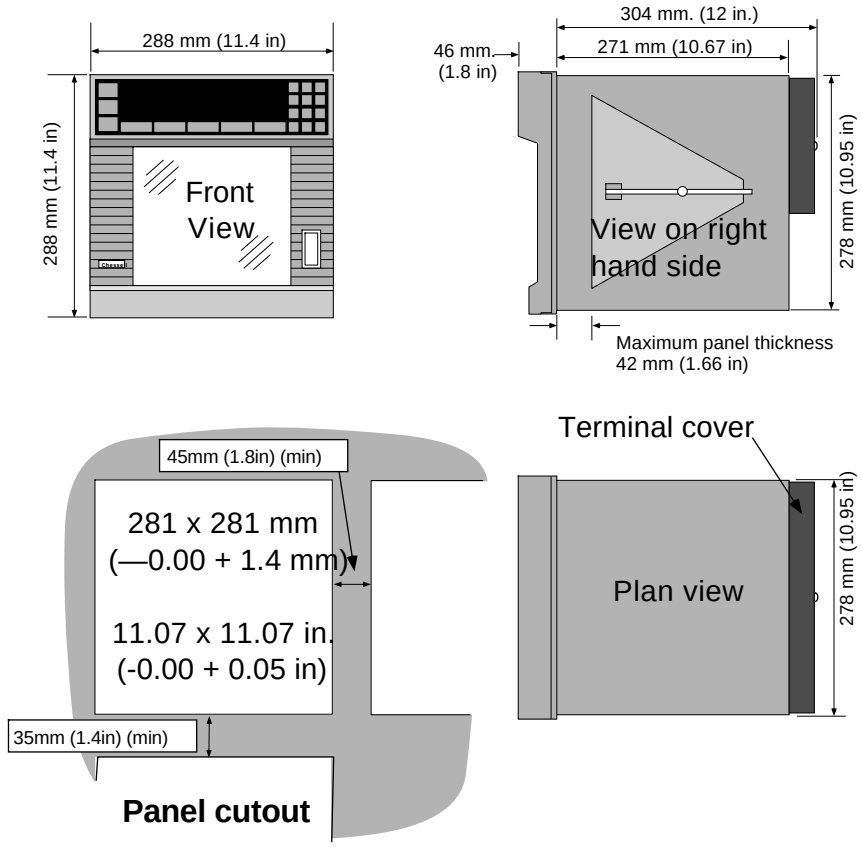
* With resistive loads. Derate with reactive or inductive loads according to the graph in which:
F1 = measured on representitive samples
F2 = typical values (according to experience)
Contact life = resistive life x Reduction factor



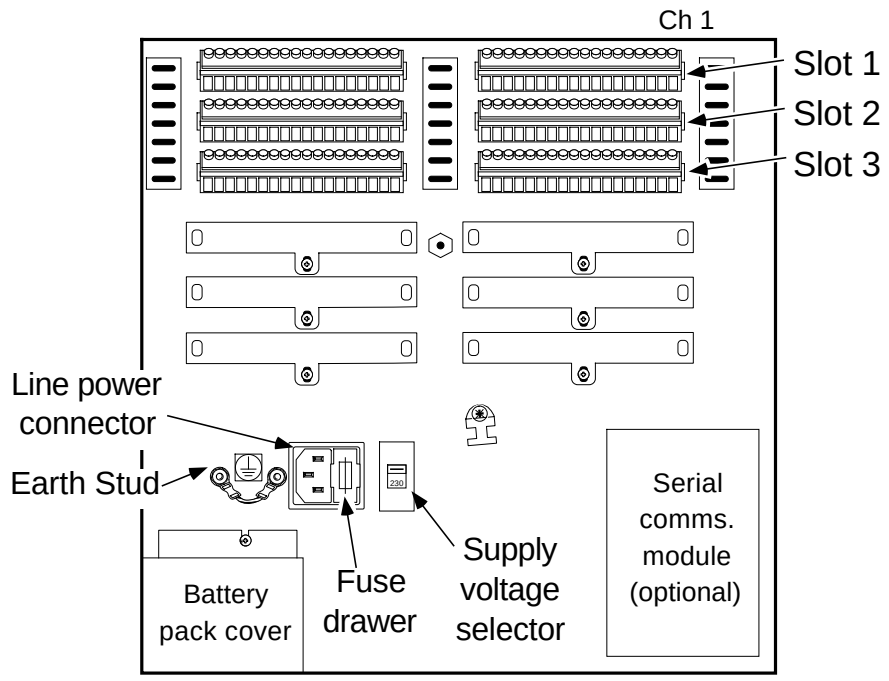
ANALOGUE OUTPUT BOARD SPECIFICATION

General specification

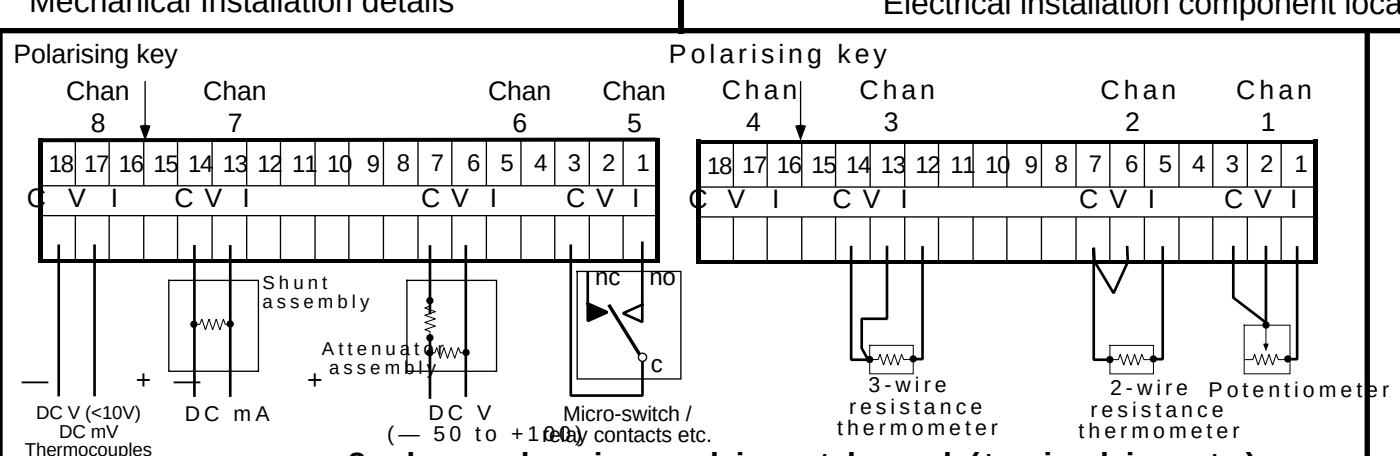
Number of outputs		Four or eight as ordered
Termination		Edge connector / terminal block
Output types		Current or Voltage as configured for each channel
	Current:	0 to 25mA max. at up to 24 V
	Voltage:	-1 to 11V at up to 5 mA
Output frequency		All channels in 1 second
Output damping		250 msec rise time (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:	30V RMS or dc (double isolation)
	Channel-to-ground:	30V RMS or dc (basic isolation)
Dielectric strength (BS EN61010)		(1 minute type tests)
	Channel to channel:	2350 V ac
	Channel to ground:	1350V ac
Insulation resistance		50 MΩ at 500V dc.



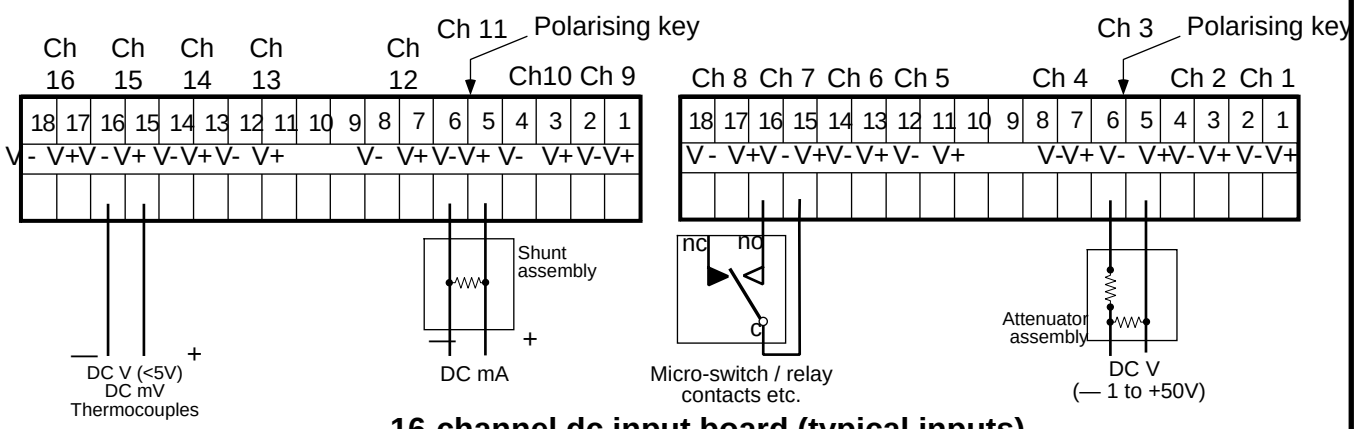
Mechanical Installation details



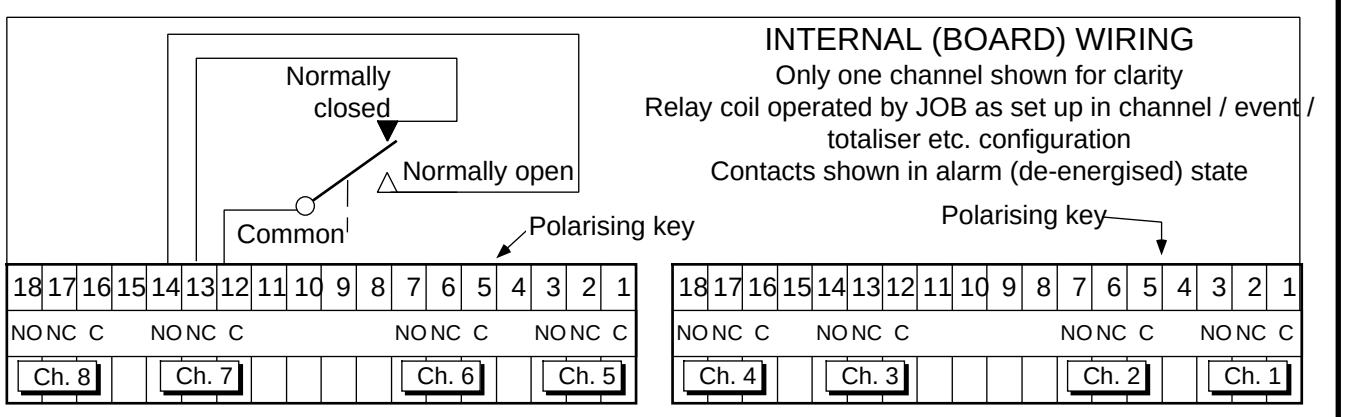
Electrical installation component locations



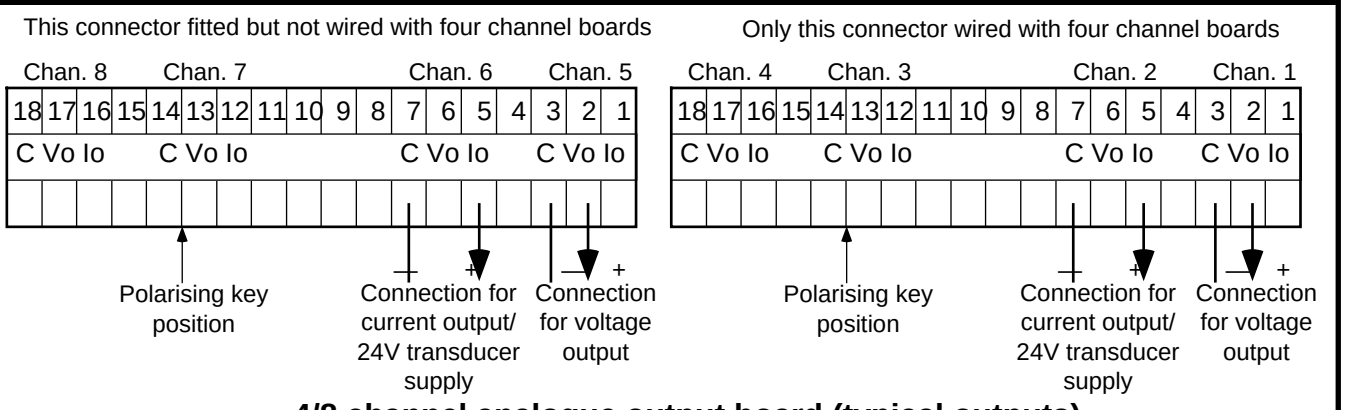
8-channel universal input board (typical inputs)



16-channel dc input board (typical inputs)



Relay output board signal wiring



4/8 channel analogue output board (typical outputs)

Signal Wiring Details

Shunt part n…s: 100Ω = LA246779UK10; 250Ω = LA246779UK25. Attenuator part n…: LA244180

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