

- 1 to 6 Universal inputs
- Annotation as standard
- 1 or 2 independent case-mounted PID controllers
- Front panel or PC configuration
- PC Card storage
- Math functions
- Totalizers, Counters and Timers
- MODBUS® Communications
- Up to 18 relay outputs
- Up to four analog outputs

The 394 is a step forward in circular chart recording, tracing up to six signals by using printhead technology common to other successful Eurotherm Chessell Units.

Input technology

Use of the very latest in Application Specific Integrated Circuit (ASIC) and Surface Mount technologies, gives the 394 input circuitry high accuracy and stability. Inputs are fully universal accepting signals from thermocouples, resistance thermometers, potentiometers and digital sources, as well as linear dc voltage and current sources.

Annotation

The use of a multi-point printhead provides the 394 with the ability to print text on the chart including channel values, time, date, scales and totalizer values.

Display

The 394 display consists of a 20-character vacuum fluorescent display and alarm indicators.

Control

Two independent controllers can be case mounted to provide PID control of related process variables

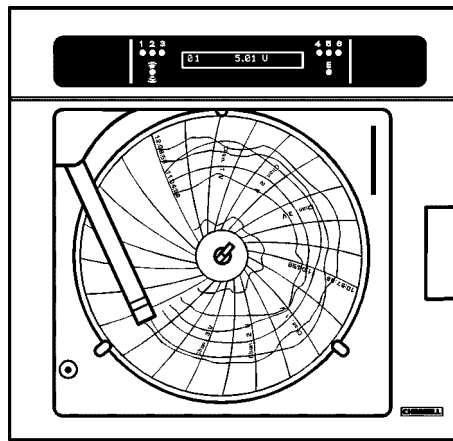
Configuration

The recorder is fully configurable from the front panel using push-button keys to follow a series of text prompts at the display. Access to most functions can be password protected as a part of the configuration process.

The recorder can also be configured from a PC based package, allowing the user to set up the configuration off-site for later downloading to the recorder.

PC-Card Storage

Using the computer industry standard PC memory card, the recorder's configuration can be stored for transfer to another recorder or to a PC for manipulation using the PC configuration tool.



Process data can also be stored on the PC card in a format readable by standard spreadsheet packages, or, alternatively in a compressed format that can be used with the Eurotherm Review software, a Windows based package for viewing and printing charts.

Math, Timers, Counters and Totalizers

These options provide the recorder with integrating and counting facilities, and the ability to carry out calculations ranging from simple arithmetic functions (e.g. subtracting one channel's value from another) to complex application specific functions such as mass flow calculations.

MODBUS® Communications

The communications option uses the MODBUS® RTU protocol to ensure compatibility with standard SCADA software and other types of industrial equipment such as PLCs (the 394 acts as a slave device). The RS485 specification allows multiple instruments on a single communications link.

Relay Outputs

Up to 18 relay outputs can be fitted, driven by any internal recorder event such as channel alarm, totalizer overflow, totalizer output etc.

Analog Outputs

Up to four of the input or maths channels can be output as a linearized current or voltage signal.

Transmitter Power Supply

Up to six current loops can be powered by a built-in 25 Volt dc power supply unit which is suitable for most loops.



EUROTHERM
CHESSELL

Model 394
Specification
Sheet

TECHNICAL SPECIFICATION (Input board)

General

Input types	dc Volts, dc millivolts, dc milliamps (with shunt), Thermocouple, 2/3-wire RTD Contact closure (not chan. 1) >500ms
Input type mix	Freely configurable
Maximum number of inputs	6
Input ranges	-38 to + 38 mV; - 150 to +150 mV; -1V to + 1 V; -10 to + 10 V
Termination	Terminal block
Noise rejection (48 to 62Hz)	Common mode: > 130dB (channel to channel and channel to ground) Series mode: > 60dB
Maximum common mode voltage	250V continuous
Maximum series mode voltage	45mV at lowest range; 12Vpeak at highest range
Isolation (dc to 65 Hz; BS EN61010)	Installation cat. II; Pollution degree 2
Channel - to - channel:	300V RMS or dc (double insulation)
Channel - to - common electronics:	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	2300 Vac
Channel to ground	1350 Vac
Insulation resistance	> 10 MW at 500V dc
Input resistance	38mV, 150 mV, 1 V ranges: > 10MΩ; 10V range: 68.8 kΩ
Over voltage protection (max)	42V RMS (between I and V-); 50V RMS (I and V+) or (V+ and V-)
Open circuit detection drive	± 57nA max
Recognition time	500ms
Minimum break resistance	10MΩ

DC Input ranges

Shunt/Attenuator	Internally mounted resistor modules
Additional error due to shunt	0.1% of input
Additional error due to attenuator	0.2% of input
Leakage current (Max) 38mV range:	1.7nA
Other ranges:	8nA
Performance	See table 1

High	Resolution		Error at 20°C	Temperature coefficient (per °C)
±38mV	1.4μV	Typical	0.035% input + 0.030% range	37ppm of input + 1.03 ppm range
		Max	0.085% input + 0.051% range	80ppm of input + 18.6 ppm range
±150mV	5.5μV	Typical	0.035% input + 0.027% range	35ppm of input + 0.52 ppm range
		Max	0.084% input + 0.038% range	80ppm of input + 7.8 ppm range
±1V	37μV	Typical	0.035% input + 0.024% range	35ppm of input + 0.16 ppm range
		Max	0.084% input + 0.029% range	80ppm of input + 1.6 ppm range
±10V	370μV	Typical	0.076% input + 0.024% range	76ppm of input + 0.35 ppm range
		Max	0.275% input + 0.030% range	272ppm of input + 3.5 ppm range

Table 1 DC Performance

Input board specification (Cont.)

Thermocouple data

Temperature scale	ITS 90
Bias current (maximum)	1.7nA
Cold junction types	Off, internal, external, remote
CJ error	1°C max; instrument at 20°C
CJ rejection ratio	50:1 minimum
Remote CJ	Via any user-defined channel
Upscale/downscale drive	High, Low or None selectable for each thermocouple channel. Channels can be any mix of High and None or Low and None, but High and Low cannot be mixed.

Types and ranges

See table 2

T/C Type	Overall range (°C)	Standard	Max linearization error
B	0 To +1820	IEC 584.1	0 to 400°C: 1.7° 400 to 1820°C: 0.03°C
C	0 to +2300	Hoskins	0.12°C
D	0 to +2495	Hoskins	0.08°C
E	-270 to +1000	IEC 584.1	0.03°C
G2	-0 to +2315	Hoskins	0.07°C
J	-210 to +1200	IEC 584.1	0.02°C
K	-270 to +1372	IEC 584.1	0.04°C
L	-200 to +900	DIN43700:1985 (To IPTS68)	0.20
N	270 to +1300	IEC 584.1	0.04°C
R	-50 to +1768	IEC 584.1	0.04°C
S	-50 to +1768	IEC 584.1	0.04°C
T	-270 to +400	IEC 584.1	0.02°C
U	-200 to +600	DIN43710:1985	0.08°C
Ni/NiMo	0 to +1406	Ipsen	0.14°C
Plantinell	0 to +1370	Engelhard	0.02°C

Table 2 Thermocouple types and ranges

Resistance inputs

Temperature scale	ITS90
Ranges (including lead resistance)	0 to 150Ω, 0 to 600Ω, 0 to 6kΩ
Influence of lead resistance Error:	Negligible (3-wire connection)
Mismatch:	1ΩΩ

Wetting current	250mA typical
Resolution and accuracy	See table 3
RTD types and ranges	See table 4

Range Ω	Resolution		Error at 20°C	Temperature coefficient (per °C)
0 to 150	5mΩ	Typical	0.030% input + 0.047% range	20ppm of input + 2.04 ppm range
		Max	0.045% input + 0.141% range	35ppm of input + 36.6 ppm range
0 to 600	22mΩ	Typical	0.030% input + 0.036% range	20ppm of input + 0.97 ppm range
		Max	0.045% input + 0.069% range	35ppm of input + 14.6 ppm range
0 to 6k	148mΩ	Typical	0.034% input + 0.026% range	20ppm of input + 0.19 ppm range
		Max	0.049% input + 0.032% range	35ppm of input + 1.9 ppm range

Table 3 Resistance ranges resolution and accuracy

RTD Type	Overall range (°C)	Standard	Max linearization error
Cu10	-20 to +400	General Electric company	0.02°C
JPT100	-220 to +630	JIS C1604:1989	0.01°C
Ni100	-60 to +250	DIN43760:1987	0.01°C
Ni120	-50 to +170	DIN43760:1987	0.01°C
Pl100	-200 to +850	IEC 751	0.01°C
Pl100A	-200 to +600	Eurotherm Recorders SA	0.09°C
Pl1000	-200 to +850	IEC 751	0.01°C

Table 4 RTD types, ranges and accuracies

INSTALLATION CATEGORY II

The rated impulse voltage for equipment on nominal 230V mains is 2300V.

POLLUTION DEGREE 2

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

TECHNICAL SPECIFICATION (Recorder)

Board types and hardware options

Standard:	Universal input/control board
Options:	Changeover relay output board Analog output board Communications board Transmitter Power Supply PID controller Case heater PC Card

Environmental Performance

Temperature limits	Operation: 0 to 50°C (options can reduce maximum temp.) Storage: -20 to + 70°C
Humidity limits (non-condensing)	10 to 90%
Protection	Standard: NEMA3 (IP54) Waterproof: NEMA4 (IP65)
Shock	BS EN60873 and BS EN61010
Vibration (BS EN60873)	1g peak at 60Hz to 150Hz
Altitude (max.)	<2000m

Electromagnetic compatibility (EMC)

Emissions:	BS EN50081-2
Immunity:	BS EN50082-2

Electrical safety (BS EN61010)

Installation cat. II; Pollution degree 2

Physical

Bezel size	14.18" (360mm) H x 14.96" (380mm) (When viewed from the front, offset .2" (5mm) right with respect to cutout centerline)
Panel cutout dimensions	13.4" (340.5mm) H x 13.58" (345mm) W (both - 0 + 1mm)
Depth behind bezel rear face	5.9" (150mm)
Weight	3.18lb (7kg) typical
Panel mounting	+5 to -30 degrees from vertical (+ = top overhangs)

Printing system

Pen type	Four color cartridge
Trace resolution	lateral: 0.2mm time: 0.36mm at outer edge of chart
Default trace colors	See table 5
Printhead life	Channel: 1.5 x 10 ⁶ dots black 1.0 x 10 ⁶ dots (other colors)
Update rate	2Hz (1Hz for complex configurations)
Print rate (max)	1 pass every 5s
Text characters per line	39

Paper transport

Type	Stepper motor
Chart type	Circular
Chart speeds	Menu selectable: 12, 24, 48, 72 hours or 7 days/rev User enterable: 1 to 960 hours/rev

Power requirements

Line voltage	Standard: 90 to 264V at 45 to 65Hz Low voltage option: 20 to 53 V ac/dc (ac frequency range: 45 to 400Hz)
Power (Max)	< 100VA (20VA typical)
Fuse type	Not user servicable
Interrupt protection	Standard: 40ms at 75% max instrument load Enhanced: 120ms at 75% max instrument load

TECHNICAL SPECIFICATION (Options)

Serial Communications

Type	RS 485 MODBUS ® RTU
Isolation†	Terminals to ground: 100V RMS/dc (basic insulation)

Math pack

Number of derived channels	16
Level 1 functions	Off, constant, add, subtract, multiply, divide, modulus
Level 2 functions (additional to level 1)	See table 6

Channel average	DV group continuous min	Sample and hold	Zirconia probe
Channel minimum	DV group latching max	Square root	High select
Channel maximum	DV group continuous max	3rd order polynomial	Low select
rolling average	e	Evalue	Switch
Rate of change	log	Relative humidity	Stopwatch
DV group average	10	Linear mass flow	Time stamp
DV grp latching min	log	Square root mass flow	O ₂ correction
			Percentile

Table 6 Level two math functions

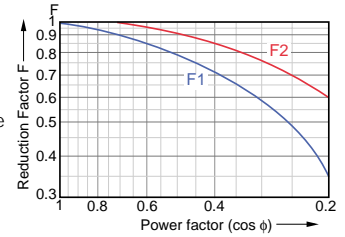
Customer linearization tables

N° of tables available	One
N° of point pairs	32

Relay outputs

Maximum switching power*	500VA or 60W
Maximum breaking current*	2 Amps within above power ratings
Maximum contact voltage*	250V within above power ratings
Isolation†	Contact to contact: 300V RMS or dc (double insulation) Contact to ground: 300V RMS or dc (basic insulation)
Estimated life with resistive loads*	30,000,000 operations

* With inductive loads, derate according to the graph, in which:
contact life = resistive life x F1 or F2
where F1 = measured on representative examples and F2 = typical values according to experience.



Analog (retransmission) outputs

Output ranges (user configurable)	Voltage: 0 to 10V (Source 6.3 mA max) Current: 0 to 20mA (max voltage drop = 18V)
Update rate	1Hz
Step response (10% to 90%)	250ms
Linearity (maximum error)	0.02% of hardware range
Performance	See table 7
Isolation†	Channel to channel: 300V RMS or dc (double insulation) Channel to ground: 300V RMS or dc (basic insulation)

Range Ω		Error at 20°C	Temperature coefficient (per °C)
0 to 10V	Typical	5.7mV +0.08 of output	100µV/°C + 50ppm/°C of output
	Max	11.7mV +0.18 of output	300µV/°C + 70ppm/°C of output
0 to 20mA	Typical	15.3µA +0.11 of output	0.2µA/°C + 50ppm/°C of output
	Max	30.5µA +0.21 of output	1µA/°C + 80ppm/°C of output

Table 7 Analog output performance

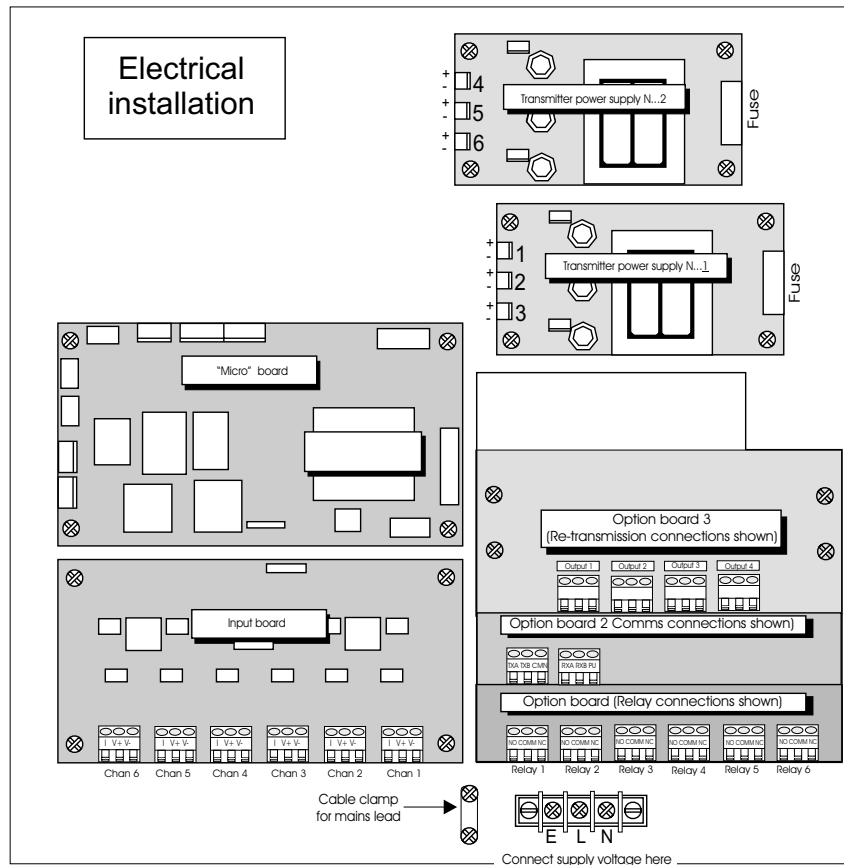
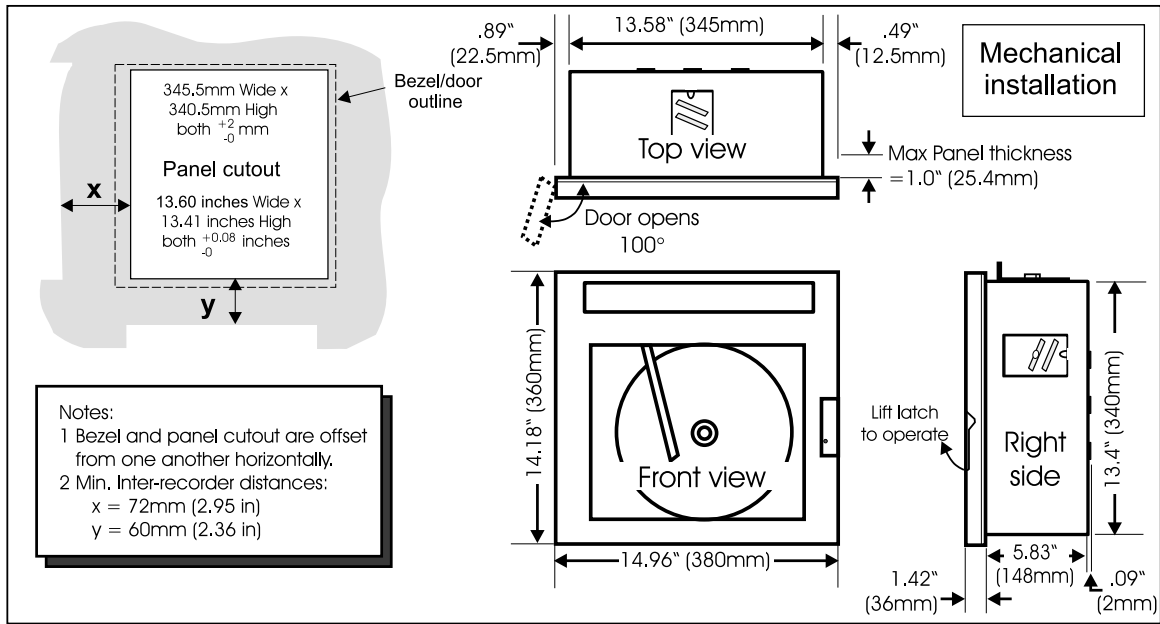
Transmitter Power Supply

Output voltage	3 or 6 x 25Vdc (nom) outputs
Isolation†	Channel to channel: 100V RMS or dc (double insulation) Channel to ground: 100V RMS or dc (basic isolation)

Controllers

Number	Up to 2
Type	Eurotherm type 2216 PID temperature controllers

† All Isolation figures are: DC to 65Hz; BS EN61010 Installation category II; Pollution degree 2



Input board signal wiring

