2416

MODEL

EUROTHERM CONTROLS

Setpoint Programming Controller

- **High stability control**
- **Up to four programs**
- **16 ramp/dwell segments**
- **Two event outputs**
- **PDSIO® master setpoint retransmission**
- **Heating and cooling**
- **Customized operator interface**
- **Heater current display**
- **Load diagnostics**
- **Multiple alarms on a single output**
- **One-shot tuner with overshoot inhibition**
- **Adaptive tuning**
- **Auto/manual button**
- **EIA-485 communications**
- **Plug-in from front**
- **IP 65, NEMA 4X panel sealing**
- **Compliant with European EMC and low voltage safety directives**

The 2416 is an advanced setpoint programming, temperature or process controller in a compact 1/16 DIN size [1.89x1.89x5.91in (48x48x150mm)]. It will store one or four programs of 16 segments each. Two programmable event outputs can be set in each segment to trigger external events. For multi-zone programming, the programmer setpoint can be retransmitted as a master value to a number of slave controllers. The 2416 has a modular hardware construction which will accept up to three plug-in I/O modules and one communication module. The outputs can be configured for heating, cooling, alarms or motorized valve control. It is fully configurable on-site.

Precise control

An advanced PID control algorithm gives stable 'Straight-line' control of the process. A one-shot tuner is provided to set up the initial PID values and to calculate the overshoot inhibition parameters. In addition an adaptive tuner will handle processes with continually changing characteristics. Power feedback employs power control techniques which stabilize the controlled temperature against supply voltage fluctuations on electrically heated loads. Dedicated cooling algorithms ensure optimum control of fan, water and oil cooled systems.

Universal input

A universal input circuit with an advanced analog to digital converter samples the input at 9Hz and continuously corrects it for drift. This gives high stability and rapid response to process changes. High noise immunity is achieved by rejection of 50/60Hz pick-up and other sources of noise. Sensor diagnostics are also provided. The input covers all thermocouple types, Pt100 RTD and linear millivolts or milliamps. Input filtering from 1.0 to 999.9 seconds is included.

Customized operation

Custom LEDs provide a bright, clear display of the process value and setpoint. Tactile push buttons ensure positive operation. Access to other parameters is simple and easy to understand and can be customized to present only those parameters that need to be viewed or adjusted. All other parameters are locked away under password protection. Front panel auto/manual and run/hold buttons are provided.

Instant Accuracy™

Invensys
An Invensys company

PDSIO® Load diagnostics

PDSIO® (Pulse Density Signaling Input/Output) is a major innovation in the 2416. When used in combination with a Eurotherm TE10S solid state contactor (SSC), it allows the logic output of a 2416 to transmit the power demand signal and simultaneously read back load fault alarms and load current on the same pair of wires. These alarms will flash as messages on the controller front panel and can trip the alarm relay. Two alarm conditions will be detected: one, an SSC failure, indicating an open or short circuit condition in the SSC; two, a heater circuit failure, indicating either fuse failure, heater open circuit or line supply absent.

Alarms

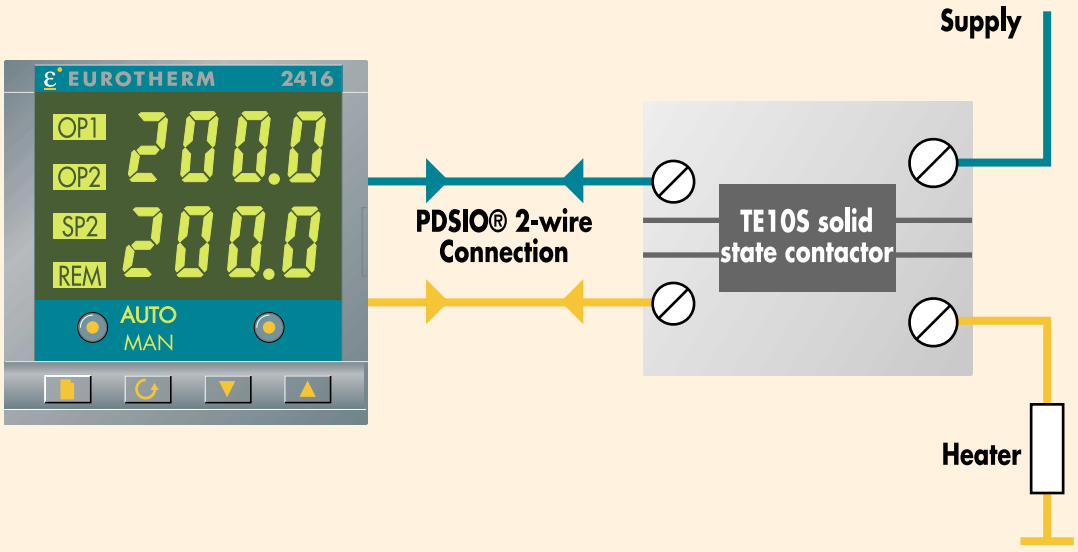
Up to four process alarms can be combined onto a single output. They can be full scale high or low, deviation from setpoint, rate of change or load failure alarms. Alarm messages are flashed on the main display. Alarms can be configured as latching or non-latching and also as 'blocking' type alarms which mean they will become active only after entering a safe state.

Digital communications

EIA-485 serial communications is available with industry-standard protocols including: Modbus®, Eurotherm Bisynch, and SPI*.

**Please consult factory for availability.*

Pulse Density Signaling Input/Output (PDSIO®)



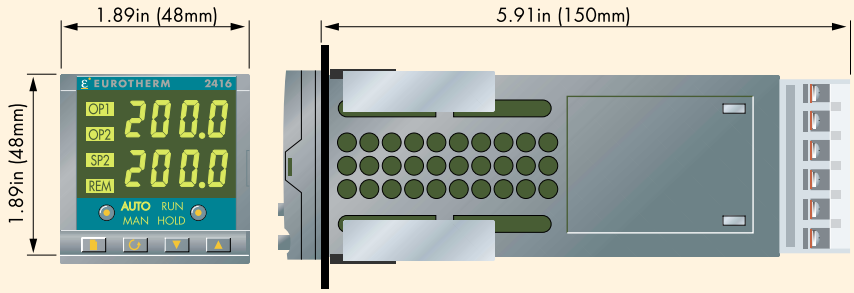
Sensor inputs and display ranges (Temperature scales conform to the ITS90 standard)

	Celsius		Fahrenheit	
Standard Sensor Inputs	Min	Max	Min	Max
J thermocouple	-210	1200	-350	2192
K thermocouple	-200	1372	-325	2500
T thermocouple	-200	400	-325	750
L thermocouple	-200	900	-325	1650
N thermocouple	-250	1300	-420	2370
C thermocouple - W5%Re/W26%Re (Hoskins)	0	2319	32	4200
R thermocouple	-50	1768	-60	3200
S thermocouple	-50	1768	-60	3200
B thermocouple	0	1820	32	3310
Platinell II thermocouple	0	1369	32	2500
RTD/PT100DIN 43760	-200	850	-325	1560
Custom Sensor Inputs (Replaces type C thermocouple)				
E thermocouple	-270	1000	-450	1830
Ni/Ni18%Mo thermocouple	0	1100	32	2012
Pt10%Rh/P140%Rh thermocouple	200	1800	392	3272
Pt20%Rh/Pt40%Rh thermocouple	0	2000	32	3632
W/W26%Re (Englehard) thermocouple	0	2000	32	3632
W/W26%Re (Hoskins) thermocouple	0	2010	32	3650
W5%Re/W26%Re (Englehard) thermocouple	10	2300	50	4172
W5%Re/W26%Re (Bucose) thermocouple	0	2000	32	3632
D thermocouple - W3%Re/W25%Re	0	2400	32	4352
Linear Inputs	-999	9999		

2416 TECHNICAL SPECIFICATION

Input		
General	Range	± 100mV and 0 to 10Vdc (auto ranging)
	Sample rate	9Hz (110mS)
	Calibration accuracy	0.2% of reading, ±1 LSD, ±1°C/F
	Resolution	<1µV for ± 100mV range, <0.2mV for 10Vdc range
	Linearization accuracy	No discernable error
	Zero drift with ambient temperature	< 0.1µV per °C for ±100mV range, 0.1mV per °C on 10Vdc range
	Gain drift with ambient temperature	< 0.004% of reading per °C
	Input filter	1.0 to 999.9 secs
	Zero and span offset	User adjustable over the fully display range
Thermocouple	Types	Refer to Sensor inputs and display ranges table
	Cold junction compensation	Automatic compensation typically >30 to 1 rejection of ambient temperature change External references 32, 113 and 122°F (0, 45 and 50°C)
RTD/PT100	Type	3-wire, Pt100 DIN43760
	Bulb current	0.2mA
	Lead compensation	No error for 22 ohms in all 3 leads
Process	Linear	±100mV, 0 to 20mA or 0 to 10Vdc (All configurable between limits)
	Non-linear	Square root or custom 8 point
Outputs		
Relay	Rating: Form A	Min: 12V, 100mA dc Max: 2A, 264Vac resistive
	Application	Heating, cooling, process output, alarms or program event
Logic	Rating	18Vdc at 24mA (non-isolated)
	Application	Heating, cooling, alarms or program event
		PDSIO® mode 1: Logic heating with load failure alarm
		PDSIO® mode 2: Logic heating with load/SSC failure alarms and load current display
Triac	Rating	1A, 30 to 264Vac resistive
	Application	Heating, cooling or program event
Analog	Range	Non-isolated 0 to 20mA (into 600Ω max) 0 to 10Vdc (both configurable between limits)
	Application	Heating, cooling, process output, alarms or program event
Communications		
Digital	Transmission standard	EIA-485 at 1200, 2400, 4800, 9600, 19,200 baud
	Protocols	Modbus® or Eurotherm Bisynch
PDSIO®	Setpoint input	Setpoint input from master PDSIO® controller. Holdback to master controller
	Setpoint output	Master setpoint retransmission to slave PDSIO® controllers
Control functions		
Control	Modes	PID or PI with overshoot inhibition, PD, PI, P only or On/Off
	Application	Heating, cooling or process output
	Auto/manual	Bumpless transfer or forced manual output
	Setpoint rate limit	0.01 to 99.99 degrees or display units per second, minute or hour
	Cooling algorithms	Linear; Water (non-linear); Fan (minimum on time), Oil, proportional only
Tuning	One-shot tune	Automatic calculation of PID and overshoot inhibition parameters
	Adaptive Tune	Continuous assessment of the PID values
	Automatic droop compensation	Automatic calculation of manual reset value when using PD control
Alarms	Types	Full scale high or low. Deviation high, low, or band. Rate of change
	Modes	Latching or non-latching. Normal or blocking action
		Up to four process alarms can be combined onto a single output
Setpoint programming	Program size	One, four, or 20 programs of 16 segments each
	Event outputs	Up to two – relay, logic or triac
General		
	Display	Dual, 4 digit x 7 segment high intensity LED
	Dimensions and weight	1.89W x 1.89H x 5.91D in (48W x 48H x 150Dmm) 8.82oz (250g)
	Supply	85 to 264Vac, 48 to 62Hz 10watts max
	Temperature and RH	Operating: 32 to 131°F (0 to 55°C), RH: 5 to 90% non-condensing. Storage: 14 to 158°F (-10 to 70°C)
	Panel sealing	IP 65, NEMA 4X
	Electromagnetic compatibility	Meets generic emissions standard EN50081-2 for industrial environments
		Meets general immunity requirements of EN50082-2(95) for industrial environments
	Safety standards	EN61010, installation category 2 (voltage transients must not exceed 2.5kV)
	Atmospheres	Electrically conductive pollution must be excluded from the cabinet in which this controller is mounted. This product is not suitable for use above 6,562ft (2000m) or in corrosive or explosive atmospheres without further protection.

2416 Outline dimensions

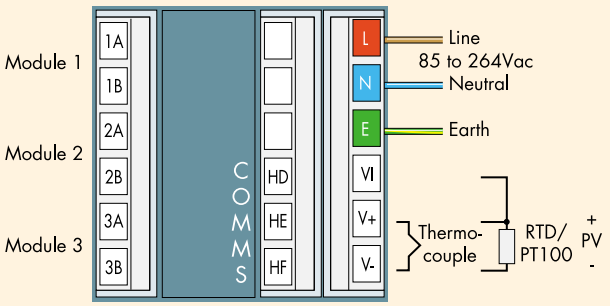


Panel cut-out
1.77in x 1.77in
(45mm x 45mm)
-0.0
+0.6

Rear Terminal Connections

Modules 1, 2 and 3 are plug-in modules. They can be any one of the four types shown below, configured for heating, cooling or alarms.

Terminals	Relay	Logic output	Triac	DC output
A		+		+
B		-		-



Ordering Code

Basic Product	Function	Supply Voltage	Module 1	Module 2	Module 3	Comms*	Manual
2416	CP Single Programmer	VH 85 - 264 Vac	XX Not used	XX Not used	XX Not used	XX Not used	XXX No Manual
	P4 Four Programs	VL 20 - 29 Vac	R2 Relay	R2 Relay	R2 Relay	*EIA-485:*	ENG English
	VP Valve Positioner Programmer		L2 Logic	L2 Logic	L2 Logic	YM Modbus®	FRA French
	V4 Valve Positioner Four Programs		T2 Triac	T2 Triac	T2 Triac	YE EI Bisynch	GDR German
			D2 DC: non-isolated	D2 DC: non-isolated	D2 DC: non-isolated	*PDSIO®:*	ITA Italian
						M6 Remote Setpoint Unconfigured	
						M7 Setpoint Retrans. Unconfigured	
						EIA-232:	
						AM Modbus®	
						AE EI Bisynch	
						EIA-422:	
						FM Modbus®	
						FE EI Bisynch	

The above ordering code specifies only the hardware build. The input type and output control functions must then be configured on-site to suit a particular application. If preconfiguration is required, ask for details on the full ordering code.

Please consult factory for availability.