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2408
2404

MODELS



Furnace and Kiln Atmosphere Controllers

Specification Sheet

- **Direct connection to most types of Zirconia probe**
- **Control of Carbon potential, % Oxygen or Dewpoint**
- **CO or Hydrogen compensation input**
- **Sooting and probe health alarms**
- **Probe clean output**
- **Profibus-DP or Modbus communications**
- **Two point calibration of probe EMF, probe temp and calculated PV**

The 2404/2408 Atmosphere controllers provide accurate display and control of the carbon level in steel hardening furnaces or ceramic glazing kilns.

They connect directly to a zirconia probe which measures the % oxygen in the furnace. The carbon level is calculated from the oxygen reading and temperature of the probe. An optional third analogue input can continuosly measure the CO or H content to correct the carbon reading or dewpoint calculation.

The controllers are compatible with probes from the following manufacturers:

- Drayton
- Accucarb
- AACC
- SSI
- Macdui
- Bosch Lambda

In addition to carbon level the controllers can be configured to measure and control either:

- The % oxygen or log oxygen
- Dewpoint in °C or °F
- The probe millivolt

Advanced control algorithms ensure accurate, stable control.

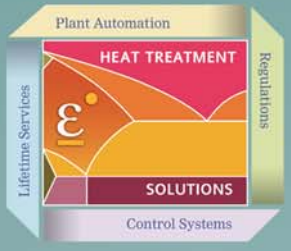
A range of plug-in modules are used to provide control, retransmission and alarm outputs. The control outputs can be mA or volts; time proportioning relay, logic or triac; or raise/lower outputs to a motorised valve.

A probe clean output is available to force compressed air through the probe at regular intervals to blow off soot deposits.

A sooting alarm will warn if carbon deposits build up to a level that can cause false readings.

Probe health is monitored by measuring the time it takes the probe reading to recover from a self-clean operation.

High speed Modbus or Profibus communications, allow supervision by a computer or easy integration into Programmable Control Systems (PLC's).



SPECIFICATION

General

Environmental performance

Temperature limits	Operation:	0 to 55°C
	Storage:	-10 to 70°C
Humidity limits	Operation:	5 to 90% RH non condensing
	Storage:	5 to 90% RH non condensing
Panel sealing:		IP65
Altitude:		<2000 metres
Atmospheres:		Not suitable for use in explosive or corrosive atmosphere

Electromagnetic compatibility (EMC)

Emissions and immunity: BS EN61326

Suitable for domestic, commercial and light industrial as well as heavy industrial. (Domestic/light (Class B) emissions. Industrial environmental immunity.

Under industrial immunity conditions the instrument will not deviate by more than an additional amount equal to the published tolerance.

Electrical safety

BS EN61010 Installation cat. II; Pollution degree 2

INSTALLATION CATEGORY II
The rated 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

Panel mounting	2408:	1/8 DIN
	2404:	1/4 DIN
Weight	2408:	440g max.
	2404:	670g max.
Panel cut-out dims.	2408:	45W x 92Hmm (-0.0 +0.8)
	2404:	92W x 92Hmm (-0.0 +0.8)
Panel depth	Both:	148mm

Operator interface

Type:		Dual 7 segment LED up to 2 decimal places
Display	2408:	Upper 12mm
		Lower 10mm
	2404:	Upper 21mm
		Lower 10mm
Status beacons:		OP1, OP2, SP2, REM
Status indicators:		Auto, manual, run, hold
Access levels:		Operator, full access, Edit, config. Password protected

Power requirements

Supply voltage: 85 to 264Vac,
48 to 62 Hz,
2404 16W max.
2408 13W max.
24Vac, -15%, +10%
24Vdc, -15% +20% ±5% ripple voltage

Inrush current

High Voltage (VH):	30A duration <100µS
Low Voltage (VL):	15A duration <100µS

Approvals

CE, cUL listed (file E57766), Gost
Suitable for use in Nadcap and AMS2750D applications under System Accuracy Test calibration conditions

Analogue inputs

Calibration accuracy:	<±0.2% of reading ±1LSD
Sample rate:	9Hz (110ms)
Isolation:	264Vac double insulation
Input filter:	Off to 999.9. Default 1.6s
Zero offset:	User adjustable over full range
User calibration:	2-point gain & offset
Zircinia probe input:	-200 to +1800mV, >100MΩ input impedance
Probe types:	dryton, Accucarb, AACC, SSI, Macdui, Bosch

Thermocouple

Range:	-100mV to +100mV
Types:	K, J, N, R, S, B, L, T, C, PL2, custom
Resolution (µV):	<3.3µV @ 1.6s filter time
Effective resolution:	15.9 bits
Linearisation accuracy:	<0.2% of reading
Cold junction compensation:	>30:1 rejection of ambient change External reference of 0°C, 45°C and 50°C
Cold junction accuracy:	<±1°C at 25°C ambient

Analogue control output

Type:	Single channel
Rating:	0-20mA <600Ω 0-10Vdc >500Ω
Accuracy:	±2.5%
Resolution:	10 bits
Isolation:	264Vac double insulation

Analogue retransmission output

Type:	Single channel
Rating:	0-20mA <600Ω 0-10Vdc >500Ω
Accuracy:	±0.5%
Resolution:	11 bits

Digital input (LA and LB)

Isolation:		Not isolated from each other. 264Vac double insulation
Rating	Voltage level:	Closed 0 to <11Vdc Open >13 to 24Vdc
	Contact closure:	Open >28kΩ Closed <100
Input functions		Probe clean initiate. Auto/manual select. Setpoint rate limit enable. External gas correction enable

Logic output modules

Module types:		Single channel, triple channel
Isolation:		No channel isolation. 264Vac double insulation from other modules and system
Rating	Single:	12Vdc @ 24mA, source
	Triple:	12Vdc @ 9mA, source
Functions:		Includes control outputs, alarms, events, status

Relay modules

Module types:	Single channel Form A, Single channel Form C, dual channel Form A
Isolation:	264Vac double insulation
Rating:	Min 100mA @ 12Vdc, Max 2A @ 264Vac resistive Min 400,000 (max load) operations with external snubber
Functions:	Includes control outputs, alarms, events, status

Triac modules

Module types:	Single channel, dual channel
Isolation:	264Vac double insulation
Rating:	<1A @ 30-264Vac resistive
Functions:	Includes control outputs, alarms, events, status

Communications

Protocols:	Modbus RTU Slave Profibus DP (24XXf, ES0278/0288 only) EI-Bisync (ES0209 only)
Isolation:	264Vac, double insulated
Transmission standard:	EIA232, EIA485, Profibus (24XXf only)

Software features

Control loop

Control types	ES0278:	PID, OnOff, VP, VPB
	ES0209/ES0288:	PID, OnOff
Cooling types:		Linear, fan, oil, water
Modes:		Auto, manual, forced manual
Overshoot inhibition:		High and low cutbacks
Number of PID sets:		2, selectable on PV
Control options:		Supply voltage compensation, feedforward, output tracking, OP power limiting, SBR safe output
Setpoint options:		Remote SP with trim, SP rate limit, 2nd Setpoint, tracking modes

Setpoint programmer (ES0209/ES0288 only)

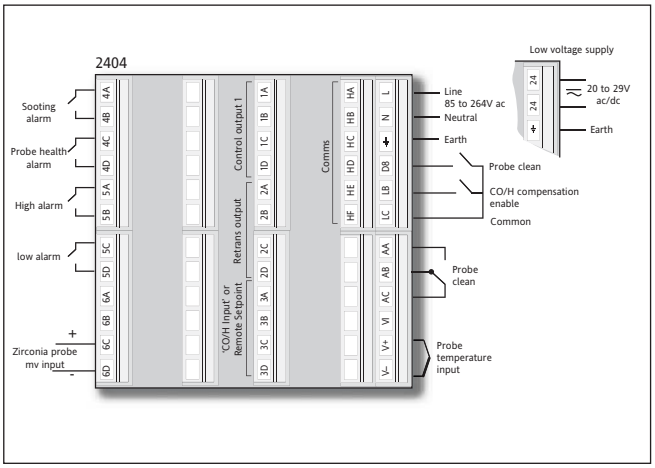
Program function:	Standard 1, 8 segment Optional 4 or 16 segment
Events:	8 with 16 segment programmer
Segment types:	Ramp rate, Ramp time, dwell, call, step
Digital inputs:	Run, Hold, Reset, RunHold, RunReset, ResetRun, Adv Seg, Skip Seg
Servo action:	Process value, setpoint
Power failure modes:	Continue, ramp, reset
Other functions:	Holdback, inputs

Process alarms

Number:	4
Type:	Sooting, probe, health, high, low, devhi, devlo, devband
Latching:	None, auto, manual, event
Other features:	Blocking

Rear terminal connections

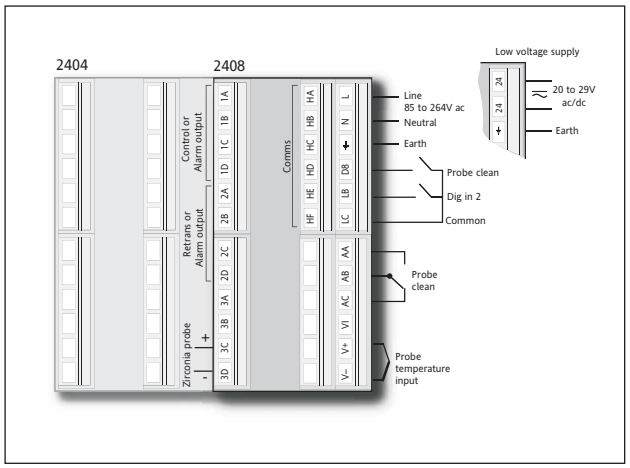
Version ES0278



Version ES0278 offers PID or Motorised Valve control, five standard relay outputs, optional Modbus or Profibus communications and an optional CO input for continuous correction of the carbon potential calculation.
This unit is only available in a 1/4DIN panel size.

Note: All inputs and outputs are provided as standard except Modules 1, 2, 3 and the Comms module which must be specified in the ordering code.

Version ES0209 and ES0288



Version ES0209 offers PID control*, two module slots and optional Modbus or Bisynch communications.
This unit is available in either an 1/8 or 1/4DIN panel size.

(* for Motorised Valve Control select model ES0278)

Note: Modules 1, 2 and the comms module are optional and must be specified in the ordering code.

Ordering code

1	2	3	4	5	6	7	8	9	10	11
					RF	XX				

Model Number

2408	48 x 96mm unit ES0209
2404	96 x 96mm unit ES0209
Profibus units	
2404f	96 x 96mm unit ES0278
2408f	48 x 96mm unit ES0288
2404f	96 x 96mm unit ES0288

1 Function

ES0278*	
CC	Controller only
NF	Controller only
VC	Valve positioner
ES0209 & ES0288 options*	
CC	Controller only
NF	Controller only
P4	PID Controller with 4 x 16 segment program
N4	On/Off Controller with 4 x 16 segment program

** Must be constant with selection in Version field*

2 Supply Voltage

VH	85-264V ac
VL	20-29V dc or ac

3 Module 1

XX	Not fitted
Relay, Logic or Triac control modules	
RH	Relay enrich output
LH	Logic enrich output
TH	Triac enrich output
Changeover relay module	
YH	Enrich output
FH	Full scale high alarm
FL	Full scale low alarm
DB	Deviation band alarm
DL	Deviation low alarm
DH	Deviation high alarm
DC Control module	
H1	0-20mA
H2	4-20mA
H3	0-5V
H4	1-5V
H5	0-10V
Dual relay module	
RD	Enrich + dilute outputs
RM	Valve raise and lower outputs
Dual triac module	
TD	Enrich + dilute outputs
TM	Valve raise and lower outputs

4 Module 2

XX	Not fitted
Relay, Logic or Triac control modules	
RC	Relay dilute output
LC	logic dilute output
TC	Triac dilute output
Changeover relay module	
YH	Dilute output
FH	Full scale high alarm
FL	Full scale low alarm
DB	Deviation band alarm
DL	Deviation low alarm
DH	Deviation high alarm
PO	Program event 1
PE	Program end output
DC Retrans module	
First character	
V-	PV retransmission
S-	Setpoint retransmission
Z-	Error retransmission
Second character	
-1	0-20mA
-2	4-20mA
-3	0-5V
-4	-5V
-5	0-10V
Position feedback module	
VS	Potentiometer valve position feedback

5 Module 3

Version ES0278	
XX	Module not fitted
D5	CO input
W2	4-20mA setpoint
W5	0-10V setpoint
Version ES0209 & ES0288	
D5	Probe mV input

6 Alarm Relay

RF	Fitted unconfigured

7 10amp Output

XX	Not fitted

8 9 Communications

XX	Not fitted
Modbus protocol	
AM	RS232
FM	RS485/422 4-wire
YM	RS485 2-wire
Profibus communications (version ES0278 & ES0288)	
PB	RS485
Bisynch protocol (version ES0209 only)	
AE	RS232
FE	RS485/422 4-wire
YE	RS485 2-wire

10 Manual

XXX	No manual
ENG	English
FRA	French
GER	German
NED	Dutch
SPA	Spanish
SWE	Swedish
ITA	Italian

11 Version

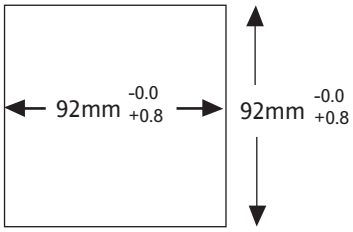
ES0278	1/4Din unit with extended I/O and profibus comms
ES0209 and ES0288	1/8 or 1/4DIN unit with two module slots

Dimensional details

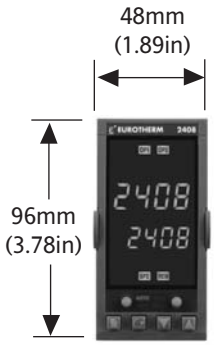
2404

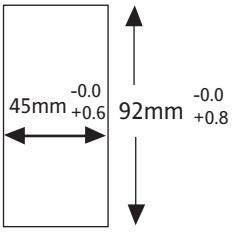


Panel cut-out

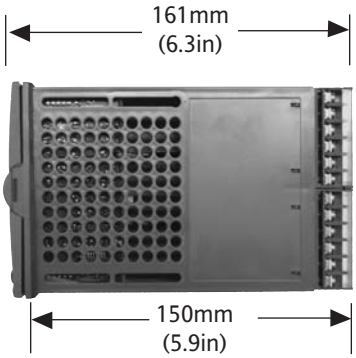


2408





2404/08



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