

APPENDIX B ZIRCONIA CONTROLLER

This chapter has two topics:

- INTRODUCTION AND EXAMPLES OF APPLICATION
- MODIFICATION OF CONFIGURATION AND OPERATING MODES NAVIGATION DIAGRAMS

INTRODUCTION

2400 series zirconia controller offers the opportunity to control the atmosphere of a heat treatment process. In addition to the measurement of level of carbon (carbon potential) or oxygen composition within the furnace, series 2400 zirconia controller also provides dewpoint measurement, provided hydrogen concentration is known, using a standard zirconia probe. Typical application areas are:

- **carburising steel**
- **ceramics**

Zirconia ZrO_2 sensors are designed for measuring the carbon potential in a furnace, where the operating temperature is above 600°C, typical operating temperature is 600 - 1100°C. This zirconia probe is a sandwich of zirconia (zirconium oxide) between two metal electrodes with one side opened to reference air of a known composition. Some zirconia probes are fitted with a thermocouple to give the process temperature at the probe tip. The zirconia probe will output 0.0 - 1.5 volts depending on the probe temperature. The normal operating voltage for carbon potential measurement is 1.0 to 1.3 volts.

Sooting Alarm

The airways in zirconia probes are prone to sooting due to the dirt and fumes present in the furnace atmosphere. The resulting building up of deposits of the zirconia cell can cause the probe to give an inaccurate reading and can damage the furnace and the load being treated. Series 2400 zirconia controller provides an alarm if the level of soot deposits on the probe are excessive. The calculation is defined by the probe manufacturers. It compares the carbon potential calculated with deviation calculation based only on the probe mV signal. If the calculated carbon potential falls outside the allowable band it indicates that the probe has deteriorated outside its tolerance limits and the sooting alarm will be activated. The alarm is only available for carbon potential measurement only.

If the controller detects an alarm condition, it will flash a message of "Soot" in the lower readout of the Home display.

Probe Cleaning(Purging)

To overcome the sooting problem, the probes are cleaned by forcing compressed air through them at regular intervals, which burn off the soot deposits. Typically this is carried out every four to eight hours during a firing cycle. Series 2400 zirconia controllers are equipped with an probe cleaning algorithm which allows automatic or manual cleaning using a logic or relay output.

While the oxygen probe is being cleaned, the controller will freeze the atmosphere PV during the cleaning cycle and will only resume calculating the PV when the probe clean sequence complete. The health condition of the probe is also monitored by comparing the time required for the probe output returns to 95% of its previous value against a predefined recovery time. If the actual recovery time exceeds the set recovery time, an alarm output will be activated. This alarm is available for all zirconia function.

Sensor Break

The controller has two inputs

- **A High Impedance DC Input** fit to Slot 3A.
- **A standard temperature input.**

It is not possible to detect sensor break for the DC input. Hence the controller can only detect sensor break for the standard temperature input. The controller will behave in the same way as a standard controller if the temperature sensor is broken. Please refers to the standard handbook for the details.

TYPICAL ZIRCONIA CONTROLLER CONNECTIONS

Typical hardware required by zirconia controller are:

- Standard temperature input for probe temperature
- DC Input Module installed in the Module 3 position for probe voltage input
- DC Output Module of Dual Relay Module for control output
- Standard Alarm Relay in AA for probe cleaning
- Optional Dual Relay for Sooting Alarm and Probe Health Alarm

A typical wiring diagram is shown in Figure B-1.

MODIFICATION OF THE NAVIGATION DIAGRAM

The navigation diagrams for operating and configuration modes are modified. The changes are highlighted in the Figure B-2 and Figure B-3.

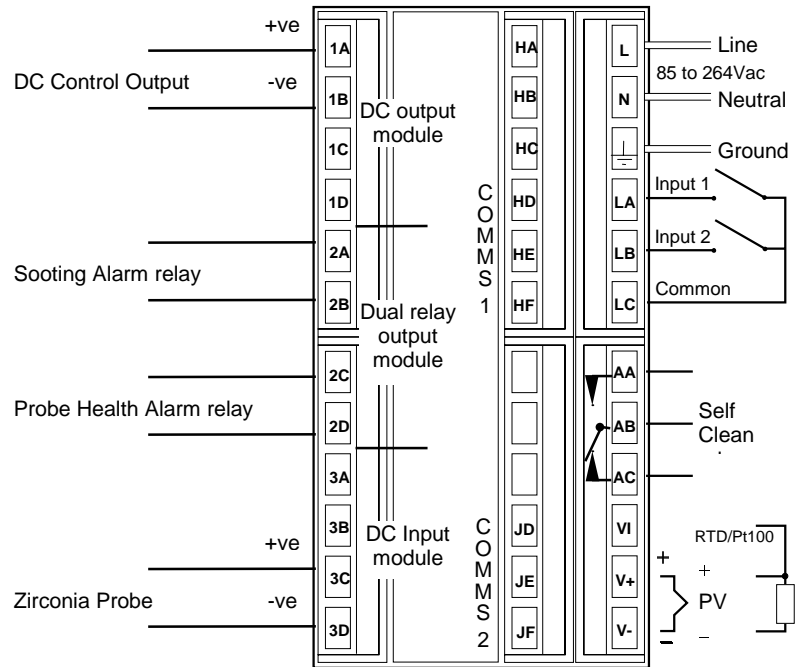
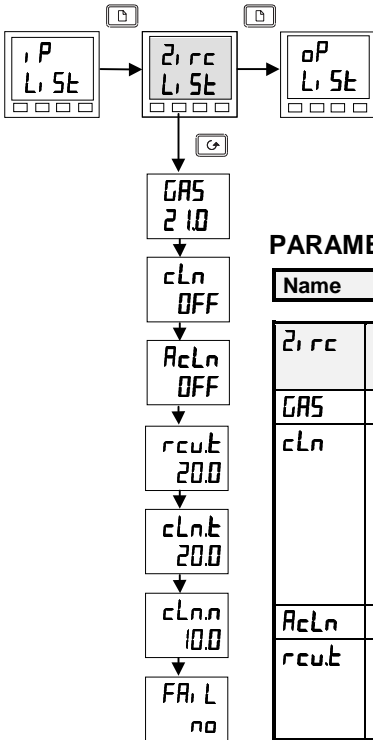


Figure B-1 Zirconia Controller typical connections

OPERATION MODE NAVIGATION DIAGRAM



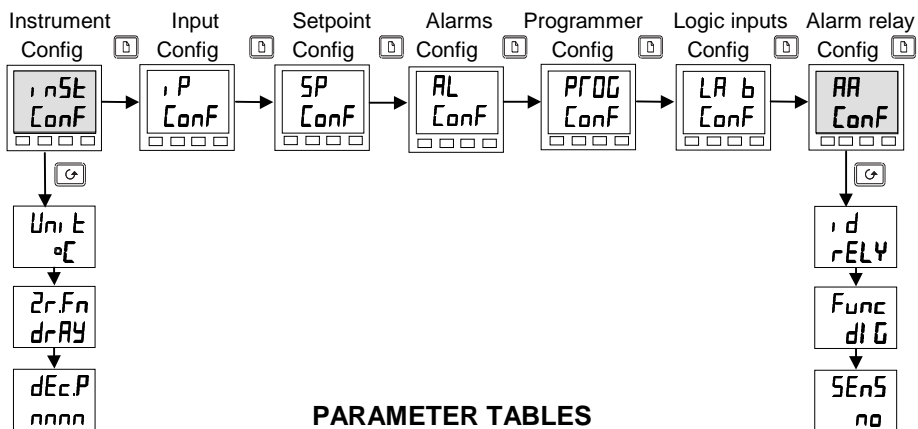
PARAMETER TABLES

Name		Description
Zirconia Controller list		
GAS	300	Reference Gas value.
cLn	307	Clean probe status (on or OFF). It is possible to start and stop the clean probe sequence manually. The Clean probe sequence starts when cLn is switched from OFF to on. The sequence stops and the auto clean timer resets when cLn is switched from on to OFF.
AcLn	301	Auto probe clean switch, (on or OFF).
rcut	302	Time limit for probe recovery after cleaning. Probe health status will set to FALSE if actual recovery time exceeds this limit, (in time unit hours).
cLnt	303	Cleaning time in minutes
cLnn	306	Time to next probe clean (in minutes).
cYct	304	Auto probe cleaning frequency (in hours).
OFF	305	Offset for Process Variable, e.g. %Carbon

Note: The Zirconia Controller List is present only in Zirconia controllers.

Figure B-2 Modification Of Navigation diagram

CONFIGURATION MODE NAVIGATION DIAGRAM (PART A)



PARAMETER TABLES

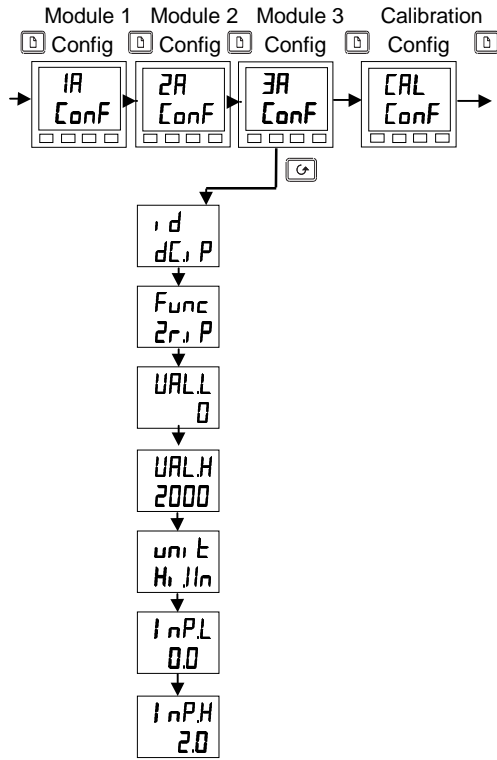
Name	Description
Inst	Instrument list
Zr.Fn	ARCC AACC Probe
	drAY Drayton Probe
(Modbus address 650)	Accu Accucarb Probe
	m21 Marathon Probe
	SSI SSI Probe
	mdu Macdui Probe
	OxY Oxygen in %
	LogO Oxygen in Log'thm unit
	dw.C Dewpoint in Degree C
	dw.F Dewpoint in Degree F

AR	Alarm list
HLth	Probe health status (Modbus address 308)
CLnW	Probe clean valve
Soot	Sooting alarm

Figure B-3a Configuration Mode

Navigation Diagram (Part A)

CONFIGURATION MODE NAVIGATION DIAGRAM (PART B)



Note:
 1. Zirc.iP option is only available for dc.iP module fitted to 3A slot.
 2. The values shown are the default setting for a zirconia probe.
 Input Voltage: 0-2000 mV
 Input Range 0.0-2.0

Figure B-3b Configuration Mode Navigation Diagram (Part B)