

ENG

User guide

3500 Series

Process Controllers



Invensys

EUROTHERM

3508 and 3504 Process Controllers

Contents

| | | |
|------------|--|-----------|
| 1. | CHAPTER 1 WELCOME | 6 |
| 1.1 | What Instrument Do I Have? | 6 |
| 1.1.1 | Contents of Package..... | 7 |
| 1.2 | 3504 and 3508 Ordering Code | 9 |
| 1.3 | Configuration Code (Quick Start Code)..... | 11 |
| 2. | CHAPTER 2 INSTALLATION | 15 |
| 2.1.1 | Dimensions..... | 15 |
| 2.2 | Panel Cut-out | 16 |
| 2.2.1 | Recommended Minimum Spacing..... | 16 |
| 2.3 | Removing and Replacing the Controller..... | 16 |
| 2.4 | Electrical Connections..... | 17 |
| 2.5 | Wire Sizes | 18 |
| 2.6 | Standard Connections..... | 18 |
| 2.6.1 | PV Input (Measuring Input) | 18 |
| 2.6.2 | Digital I/O | 20 |
| 2.6.3 | Digital (Logic) Outputs | 20 |
| 2.6.4 | Digital (Logic) Outputs used to power a remote 2 wire transmitter..... | 21 |
| 2.6.5 | Digital (Logic) Outputs used to power a remote 3 wire transmitter..... | 21 |
| 2.6.6 | Digital (Logic) Outputs used to power a remote 4 wire transmitter..... | 21 |
| 2.6.7 | Relay Output..... | 22 |
| 2.6.8 | Power Supply Connections..... | 23 |
| 2.7 | Plug in I/O Module Connections..... | 24 |
| 2.7.1 | Relay (2 pin) and Dual Relay Module..... | 24 |
| 2.7.2 | Change Over Relay..... | 25 |
| 2.7.3 | Triple Logic and Isolated Single Logic Output | 25 |

| | | |
|------------|--|-----------|
| 2.7.4 | Triac and Dual Triac | 25 |
| 2.7.5 | DC Control | 26 |
| 2.7.6 | DC Retransmission | 26 |
| 2.7.7 | Dual DC Output..... | 26 |
| 2.7.8 | High Resolution DC Retransmission & Transmitter Power Supply | 27 |
| 2.7.9 | Triple Logic Input..... | 27 |
| 2.7.10 | Triple Contact Input..... | 27 |
| 2.7.11 | 24V Transmitter Supply..... | 28 |
| 2.7.12 | Potentiometer input..... | 28 |
| 2.7.13 | Transducer Power Supply..... | 29 |
| 2.7.14 | Analogue Input (T/C, RTD, V, mA, mV)..... | 30 |
| 2.7.15 | Analogue Input (Zirconia Probe)..... | 31 |
| 2.7.16 | Zirconia Probe Construction..... | 31 |
| 2.7.17 | Zirconia Probe Screening Connections..... | 31 |
| 2.8 | Digital Communications Connections..... | 32 |
| 2.8.1 | Modbus Slave (H or J Module) or ElBisynch..... | 32 |
| 2.8.2 | DeviceNet Wiring..... | 34 |
| 2.8.3 | Example DeviceNet Wiring Diagram..... | 35 |
| 2.8.4 | Profibus..... | 36 |
| 2.8.5 | Example Profibus Wiring..... | 36 |
| 2.8.6 | Ethernet (Modbus TCP)..... | 37 |
| 2.8.7 | I/O Expander..... | 38 |
| 2.8.8 | IO Expander Connections..... | 39 |
| 2.8.9 | Example Wiring Diagram..... | 40 |
| 2.8.10 | Snubbers..... | 41 |
| 3. | CHAPTER 3: GETTING STARTED | 42 |
| 3.1 | Quick Start - New Controller (Unconfigured)..... | 42 |
| 3.1.1 | To Configure Parameters in Quick Start Mode..... | 43 |
| 3.1.2 | Quick Start Parameters..... | 44 |
| 3.2 | To Re-enter Quick Start Mode..... | 51 |

| | | |
|------------|--|-----------|
| 3.2.1 | Power up After a Quick Start Configuration..... | 51 |
| 3.2.2 | Power up After A Full Configuration | 51 |
| 3.3 | Normal Operation | 52 |
| 3.3.1 | Beacon Display and Description | 53 |
| 3.4 | The Operator Buttons | 54 |
| 3.4.1 | Shortcut Key Presses..... | 55 |
| 3.5 | To Set The Required Temperature (Setpoint)..... | 56 |
| 3.6 | To Select Manual Operation..... | 57 |
| 3.7 | Alarm Indication | 58 |
| 3.7.1 | To Acknowledge an Alarm | 58 |
| 3.7.2 | Sensor Break Indication | 59 |
| 3.8 | Summary Pages..... | 60 |
| 3.8.1 | Navigation of Summary Pages..... | 60 |
| 3.8.2 | How to Edit Parameters | 61 |
| 3.8.3 | Access Level 2 | 61 |
| 3.8.4 | Loop Summary..... | 62 |
| 3.8.5 | Program Status Summary | 62 |
| 3.8.6 | Program Edit Summary..... | 67 |
| 3.8.7 | To Create or Edit a Program..... | 67 |
| 3.8.8 | Alarm Summary..... | 73 |
| 3.8.9 | Alarm Settings Summary..... | 73 |
| 3.8.10 | Control Summary..... | 74 |
| 3.8.11 | Transducer Summary..... | 76 |
| 4. | CHAPTER 4 SAFETY AND EMC INFORMATION | 77 |
| 4.1 | GENERAL | 77 |
| 4.1.1 | Safety | 77 |
| 4.1.2 | Electromagnetic compatibility..... | 77 |
| 4.1.3 | Unpacking and storage..... | 78 |
| 4.2 | Service and repair..... | 78 |
| 4.2.1 | <i>Caution:</i> Charged capacitors..... | 78 |

| | | |
|------------|--|-----------|
| 4.2.2 | Electrostatic discharge precautions | 78 |
| 4.2.3 | Cleaning | 78 |
| 4.3 | Installation Safety Requirements | 79 |
| 4.3.1 | Safety Symbols | 79 |
| 4.3.2 | Personnel | 79 |
| 4.3.3 | Enclosure of live parts | 79 |
| 4.3.4 | <i>Caution:</i> Live sensors | 79 |
| 4.3.5 | Wiring | 79 |
| 4.3.6 | Power Isolation | 80 |
| 4.3.7 | Overcurrent protection | 80 |
| 4.3.8 | Voltage rating | 80 |
| 4.3.9 | Conductive pollution | 80 |
| 4.3.10 | Installation Category II | 81 |
| 4.3.11 | Grounding of the Temperature Sensor Shield | 81 |
| 4.3.12 | Over-Temperature Protection | 81 |
| 4.4 | Installation Requirements for EMC | 82 |
| 4.4.1 | Routing of wires | 82 |
| 5. | CHAPTER 5 TECHNICAL SPECIFICATION | 83 |
| 5.1 | Control Options | 83 |
| 5.2 | Display | 83 |
| 5.3 | Standard Digital I/O | 84 |
| 5.4 | All Analogue and PV Inputs | 84 |
| 5.5 | PV Input | 85 |
| 5.6 | Analogue Input Module | 87 |
| 5.7 | Digital Input Modules | 88 |
| 5.8 | Digital Output Modules | 88 |
| 5.9 | Analogue Output Modules | 88 |
| 5.10 | Transmitter PSU | 88 |
| 5.11 | Transducer PSU | 88 |
| 5.12 | Potentiometer Input | 89 |

| | | |
|------|--|----|
| 5.13 | Digital communications | 89 |
| 5.14 | Master communications | 89 |
| 5.15 | Alarms | 89 |
| 5.16 | Setpoint programmer..... | 89 |
| 5.17 | I/O Expander | 90 |
| 5.18 | Advanced functions | 90 |
| 5.19 | General specification | 91 |
| 6. | RESTRICTION OF HAZARDOUS SUBSTANCES..... | 92 |

Issue status of this manual

Issue 9 adds High Resolution Retransmission and Transmitter Power Supply module (order code HR).

3508 and 3504 Process Controllers

1. Chapter 1 Welcome

1.1 What Instrument Do I Have?

Thank you for choosing this Controller.

The 3508 controller is supplied in the standard 1/8 DIN size (48 x 96mm front panel). The 3504 controller is supplied in the standard ¼ DIN size (96 x 96mm front panel). They are intended for permanent installation, for indoor use only, in an electrical panel which encloses the rear housing, terminals and wiring on the back.



3508 Controller



3504 Controller

The functionality of controller depends on the features which have been ordered, see order code section 1.2. Examples are:-

Programmer. A programmer varies the rate of change of setpoint allowing a profile to be set up.

Plug in modules. These provide customised input/output to plant devices.

The functionality of the controller also depends on how it has been configured. When it is first supplied the controller will enter a Quick Configuration mode which allows a basic set of features to be set up, see section 3.1.

This User Guide describes installation and operation 'out of the box'.

Further detailed configuration may be achieved either by using iTools configuration package or entering deeper levels of access. An Engineering Handbook, Part no. HA027988, provides a detailed description together with an explanation of terminology and may be ordered or downloaded from www.eurotherm.com.

1.1.1 Contents of Package

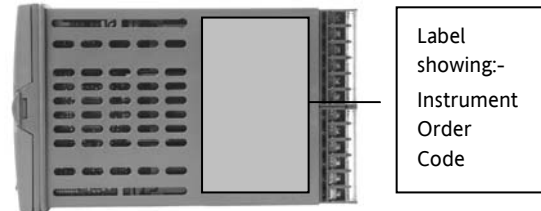
When unpacking your controller please check that the following items have been included.

3508 or 3504 Controller Mounted in its Sleeve

The 3504 contains up to six plug-in hardware modules; the 3508 has up to three. Additionally digital communications modules can be fitted in two positions.

The modules provide an interface to a wide range of plant devices and those fitted are identified by an ordering code printed on a label fixed to the side of the instrument. Check this against the description of the code given in section 1.2 to ensure that you have the correct modules for your application. This code also defines the basic functionality of the instrument which may be:-

- Controller only
- Programmer and controller
- Control type – Standard PID, valve positioner
- Digital communications type
- Options



Panel Retaining Clips

Two clips are required to secure the instrument sleeve in the panel. These are supplied fitted to the sleeve.

Accessories Pack

For each input a 2.49Ω resistor is supplied for mA measurement. This will need to be fitted across the respective input terminals

This User Guide

Issue 8 of this guide applies to instrument software versions, V2.30+, and explains:-

- How to install the controller
- Physical wiring to the plant devices
- First switch on - 'out of the box'.
- Principle of operation using the front panel buttons
- Introduction to configuration through iTools PC software
- Ethernet adaptor if Ethernet communications has been ordered

Accessories

The following accessories may be ordered:-

| | |
|--|---------------------|
| Engineering Manual This may also be downloaded from www.eurotherm.co.uk | HA027988 |
| 2.49Ω Precision resistor | SUB35/ACCESS/249R.1 |
| Configuration IR Clip | ITools/None/30000IR |
| Configuration Clip | ITools/None/30000CK |
| 10In,10Out IO Expander | 2000IO/VL/10LR/10LR |
| 20In,20Out IO Expander | 2000IO/VL/20LR/20LR |

1.2 3504 and 3508 Ordering Code

The controller may have been ordered in accordance with the hardware code listed below. Additionally, it may have been ordered by quoting the 'Quick Code' listed in section 1.3. If ordered to the quick code the controller will be configured in the factory. If it is not ordered using the quick code then it will be necessary to configure the controller when it is first switched on. This is described in Chapter 3.

Hardware/Options Coding

| Model Number | Function | Supply Voltage | Number of Loops | Application | Programs | Recipes | Toolkits | Fascia |
|--------------|----------|----------------|-----------------|-------------|----------|---------|----------|--------|
| | | | | | | | | |

| Model Number | |
|--------------|---------------|
| 3504 | 3504 Standard |
| 3508 | 3508 Standard |

| Supply Voltage | |
|----------------|-------------|
| VH | 100-240Vac |
| VL | 20-29Vac/dc |

| Programs | |
|----------|----------------------|
| X | No programs |
| 1 | 1 prog 20 segments |
| 10 | 10 prog 500 segments |
| 25 | 25 prog 500 segments |
| 50 | 50 prog 500 segments |

| Toolkit Wires | |
|---------------|-----------|
| XXX | 30 wires |
| 60 | 60 wires |
| 120 | 120 wires |
| 250 | 250 wires |

| Function | |
|----------|----------|
| CC | Standard |
| F | Profibus |

| Loops | |
|-------|-----------|
| 1 | One loop |
| 2 | Two loops |

| Recipes | |
|---------|-----------|
| X | No recipe |
| 1 | 1 recipe |
| 4 | 4 recipes |
| 8 | 8 recipes |

| Fascia | |
|--------|-----------------|
| G | Eurotherm green |
| S | Silver |

(1) Provides Valve Position option in Heat/Cool applications. Single channel VP included as standard.

| Application | |
|-------------|-------------------------|
| XX | Standard |
| ZC | Zirconia |
| VP | Dual Valve Position (1) |

Example (order code)

3504/CC/VH/2/XX/50/X/S/R/2/D4/AM/XX/XX/XX/A2/XX/XX/ENG/ENG/XXXXX/XXXXX

This code describes a two loop 3504 with 50 programs. Additional modules for dual relay, analogue control, analogue input and EIA232 communications. English language and manuals with silver fascia.

Input and Output Modules

| I/O Slot 1 | I/O Slot 2 | I/O Slot 3 | I/O Slot 4 (2) | I/O Slot 5 (2) | I/O Slot 6 (2) | H Comms Slot | J Comms Slot | Config Tools | Product Language | Manuals Language | Warranty | Calibration Certificate |
|------------|------------|------------|----------------|----------------|----------------|--------------|--------------|--------------|------------------|------------------|----------|-------------------------|
| | | | | | | | | | | | | |

| IO Slots 1, 2, 3, 4 (2), 5 (2), 6 (2) | |
|---------------------------------------|--|
| XX | None fitted |
| R4 | Change over relay |
| R2 | 2 pin relay |
| RR | Dual relay |
| T2 | Triac |
| TT | Dual triac |
| D4 | DC control |
| DO | Dual DC output 4-20mA OP/24Vdc. Slots 1, 2 and 4 only |
| AM | Analogue input (not slot 2 or 5) |
| D6 | DC retransmission |
| TL | Triple logic input |
| TK | Triple contact input |
| TP | Triple logic output |
| VU | Potentiometer input |
| MS | 24Vdc transmitter PSU |
| G3 | Transducer PSU 5 or 10Vdc |
| HR | High resolution DC retrans & 24Vdc Slots 1, 2 and 4 only |
| LO | Isolated single logic output |

| H Comms Slot | |
|--------------|------------------------------------|
| XX | Not Fitted |
| A2 | 232 Modbus |
| Y2 | 2-wire 485 Modbus |
| F2 | 4-wire 485 Modbus |
| AE | 232 EI-Bisynch |
| YE | 2-wire 485 EI-Bisynch |
| FE | 4-wire 485 EI-Bisynch |
| ET | Ethernet 10base |
| PB | Profibus (3) |
| PD | Profibus with D type connector (3) |
| DN | Devicenet |

| J Comms Slot | |
|--------------|-------------------|
| XX | Not Fitted |
| A2 | 232 Modbus |
| Y2 | 2-wire 485 Modbus |
| F2 | 4-wire 485 Modbus |
| EX | IO Expander |

| Config Tools | |
|--------------|---------------------------|
| XX | None |
| IT | Standard iTools (CD only) |

| Product Language | |
|------------------|---------|
| ENG | English |
| FRA | French |
| GER | German |
| SPA | Spanish |
| ITA | Italian |

| Manual Language | |
|-----------------|---------|
| ENG | English |
| FRA | French |
| GER | German |
| SPA | Spanish |
| ITA | Italian |
| XXX | None |

| Warranty | |
|----------|----------|
| XXXXX | Standard |
| WL005 | Extended |

| Calibration Certificate | |
|-------------------------|-------------------------------------|
| XXXXX | None |
| CERT1 | Cert of conformity |
| CERT2 | Factory input calibration per input |

- (2). I/O slots 4, 5 and 6 are only available on the 3504
- (3). Only available with the Profibus Controller

1.3 Configuration Code (Quick Start Code)

Loop 1

| Config | Loop 1 Units | Loop 1 Function | Loop 1 PV | Loop 1 Range Lo | Loop 1 Range Hi |
|--------|--------------|-----------------|-----------|-----------------|-----------------|
| | | | | | |

| Config | |
|------------|---------------------|
| STD | Standard config (1) |
| CFG | Factory configured |

| Loop 1 units | |
|--------------|------------|
| C | Centigrade |
| F | Fahrenheit |
| % | Percent |
| H | %RH |
| P | PSI |
| B | Bar |
| M | mBar |
| X | None |

| Loop 1 Function | |
|-----------------|----------------------------------|
| PX | Single Chan. PID |
| FX | Single Chan. VP with Feedback |
| VX | Single Chan. VP without Feedback |
| NX | Single Chan. On/Off |
| PP | Dual Chan. PID |
| PN | Dual Chan. PID/OnOff |
| FF | Dual Chan. VP with Feedback |
| VV | Dual Chan. VP without Feedback |
| PF | Dual Chan. PID/VP with Feedback |
| PV | Dual Chan. PID/VP without |

| Loop 1 PV | |
|-----------|----------------|
| X | Unconfigured |
| J | J Thermocouple |
| K | K Thermocouple |
| T | T Thermocouple |
| L | L Thermocouple |
| N | N Thermocouple |
| R | R Thermocouple |
| S | S Thermocouple |
| B | B Thermocouple |
| P | Platinell II |
| C | C Thermocouple |
| Z | Pt 100 |
| A | 4-20mA Linear |
| Y | 0-20mA Linear |
| W | 0-5Vdc Linear |
| G | 1-5Vdc Linear |
| V | 0-10Vdc Linear |
| Q | Custom Curve |

| Loop 1 Range Low | |
|------------------|--------------------------------|
| XXXXX | Enter value with decimal point |

| Loop 1 Range High | |
|-------------------|--------------------------------|
| XXXXX | Enter value with decimal point |

1. If standard config is selected an instrument without configuration will be supplied.

Loop 2

| Loop 2 Units | Loop 2 Function | Loop 2 PV | Loop 2 Range Lo | Loop 2 Range Hi |
|--------------|-----------------|-----------|-----------------|-----------------|
| | | | | |

| Loop 2 Units | |
|--------------|----------------|
| C | Centigrade (2) |
| F | Fahrenheit (2) |
| % | Percent |
| H | %RH |
| P | PSI |
| B | Bar |
| M | mBar |
| X | None |

| Loop 2 Function | |
|-----------------|----------------------------------|
| XX | Single Loop Only |
| PX | Single Chan. PID |
| FX | Single Chan. VP with Feedback |
| VX | Single Chan. VP without Feedback |
| NX | Single Chan. On/Off |
| PP | Dual Chan. PID |
| PN | Dual Chan. PID/OnOff |
| FF | Dual Chan. VP with Feedback |
| VV | Dual Chan. VP without Feedback |
| PF | Dual Chan. PID/VP with Feedback |
| PV | Dual Chan. PID/VP without |

| Loop 2 PV | |
|-----------|----------------|
| X | Unconfigured |
| J | J Thermocouple |
| K | K Thermocouple |
| T | T Thermocouple |
| L | L Thermocouple |
| N | N Thermocouple |
| R | R Thermocouple |
| S | S Thermocouple |
| B | B Thermocouple |
| P | Platinell II |
| C | C Thermocouple |
| Z | Pt 100 |
| A | 4-20mA Linear |
| Y | 0-20mA Linear |
| W | 0-5Vdc Linear |
| G | 1-5Vdc Linear |
| V | 0-10Vdc Linear |
| Q | Custom Curve |

| Loop 2 Range Low | |
|------------------|--------------------------------|
| XXXXX | Enter value with decimal point |

| Loop 2 Range High | |
|-------------------|--------------------------------|
| XXXXX | Enter value with decimal point |

(2). If C or F units are selected they must be the same for both loops.
If C or F are not selected for Loop 1 they cannot be selected for Loop 2

Alarms and Input/Outputs

| Alarm 1 | Alarm 2 | Alarm 3 | Alarm 4 | Logic LA | Logic LB | Relay AA | I/O Slot 1 | I/O Slot 2 | I/O Slot 3 | I/O Slot 4 (3) | I/O Slot 5 (3) | I/O Slot 6 (3) |
|---------|---------|---------|---------|----------|----------|----------|------------|------------|------------|----------------|----------------|----------------|
| | | | | | | | | | | | | |

| Alarm 1 | |
|------------|-----------------|
| XXX | Unconfigured |
| 1__ | Loop 1 |
| 2__ | Loop 2 |
| _FH | Full scale high |
| _FL | Full scale low |
| _DH | Deviation high |
| _DL | Deviation low |
| _DB | Deviation band |

| Alarm 3 | |
|------------|-----------------|
| XXX | Unconfigured |
| 1__ | Loop 1 |
| 2__ | Loop 2 |
| _FH | Full scale high |
| _FL | Full scale low |
| _DH | Deviation high |
| _DL | Deviation low |
| _DB | Deviation band |

| Logic LA | |
|-----------|------------------------|
| XX | Unconfigured |
| 1_ | Loop 1 |
| 2_ | Loop 2 |
| _B | Sensor Break |
| _M | Manual Select |
| _H | Control Ch1 OP |
| _C | Control Ch2 OP |
| _R | Remote SP |
| _S | Setpoint 2 Enable |
| A_ | Alarm |
| _A | Acknowledge All Alarms |
| _1 | Alarm 1 OP |
| _2 | Alarm 2 OP |
| P_ | Programmer |
| _R | Run |
| _H | Hold |
| _A | Reset |
| _1 | Prg Ch1 Event 1 |
| _2 | Prg Ch1 Event 2 |

| Logic LB | |
|-----------|------------------------|
| XX | Unconfigured |
| 1_ | Loop 1 |
| 2_ | Loop 2 |
| _B | Sensor Break |
| _M | Manual Select |
| _H | Ch1 OP |
| _C | Ch2 OP |
| _R | Remote SP |
| _S | Setpoint 2 Enable |
| A_ | Alarm |
| _A | Acknowledge All Alarms |
| _1 | Alarm 1 OP |
| _2 | Alarm 2 OP |
| P_ | Programmer |
| _R | Run |
| _H | Hold |
| _A | Reset |
| _1 | Prg Event 1 |
| _2 | Prg Event 2 |

| Relay AA | |
|-----------|-------------------------|
| XX | Unconfigured |
| 1_ | Loop 1 |
| 2_ | Loop 2 |
| _H | Control Ch1 OP |
| _C | Control Ch2 OP |
| _B | Sensor Break |
| SB | Sensor Break (any loop) |
| A_ | Alarm |
| _A | Any Alarm Active |
| _N | New Alarm Active |
| _1 | Alarm 1 OP |
| _2 | Alarm 2 OP |
| P_ | Programmer |
| _1 | Prg Event 1 |
| _2 | Prg Event 2 |

(3): I/O slots 4, 5 and 6 are only available on the 3504.

Slot Functions 1 – 6 CH1 = Heat, CH2 = Cool

| | |
|-------------------------|-----------------|
| XXX | Unconfigured |
| 1__ | Loop 1 |
| 2__ | Loop 2 |
| Changeover Relay | |
| _HX | Control Ch1 OP |
| _CX | Control Ch2 OP |
| _BX | Sensor Break |
| 2-Pin Relay | |
| _HX | Control Ch1 OP |
| _CX | Control Ch2 OP |
| _BX | Sensor Break |
| Single Logic | |
| _HX | Control Ch1 OP |
| _CX | Control Ch2 OP |
| Single Triac | |
| _HX | Control Ch1 OP |
| _CX | Control Ch2 OP |
| Dual Relay | |
| _HC | Ch1 OP & Ch2 |
| _VT | VP Ch1 |
| _VR | VP Ch2 |
| P12 | Prg Event 1 & 2 |
| P34 | Prg Event 3 & 3 |
| P56 | Prg Event 5 & 6 |
| P78 | Prg Event 7 & 8 |
| A12 | Alarm 1 & 2 OP |
| A34 | Alarm 3 & 4 OP |

| | |
|----------------------------|-------------------------|
| HHX | Ch1 OP for loops 1 & 2 |
| CCX | Ch2 OP for loops 1 & 2 |
| SBR | Sensor Break both loops |
| Dual Triac | |
| _HC | Ch1 OP & Ch2 |
| _VT | VP Ch1 |
| _VR | VP Ch2 |
| P12 | Prg Ch1 Event 1 & 2 |
| P34 | Prg Ch1 Event 3 & 3 |
| P56 | Prg Ch1 Event 5 & 6 |
| P78 | Prg Ch1 Event 7 & 8 |
| A12 | Alarm 1 & 2 OP |
| A34 | Alarm 3 & 4 OP |
| HHX | Ch1 OP for loops 1 & 2 |
| CCX | Ch2 OP for loops 1 & 2 |
| DC Control | |
| _H_ | Ch1 OP |
| _C_ | Ch2 OP |
| DC Retransmission * | |
| _T_ | PV Retransmission |
| _S_ | SP Retransmission |
| Analogue Input * | |
| 2PV | Loop 2 PV |
| _R_ | Remote SP |

| | |
|------------------------------|--|
| Potentiometer Input * | |
| _RS | Remote SP |
| _VF | VP Feedback Ch1 |
| _VG | VP Feedback Ch2 |
| Triple Logic Input | |
| ___ | Select function below for each channel |
| X | Unconfigured |
| M | Loop 1 Manual |
| N | Loop 2 Manual |
| Q | Loop 1 Remote SP |
| V | Loop 2 Remote SP |
| S | Loop 1 Setpoint 2 |
| T | Loop 2 Setpoint 2 |
| E | Acknowledge All Alarms |
| P | Program Run |
| R | Program Reset |
| H | Program Hold |

| | |
|------------------------|--|
| Triple Logic OP | |
| ___ | Select function below for each channel |
| X | Unconfigured |
| F | Loop 1 Ch1 OP |
| G | Loop 1 Ch2 OP |
| K | Loop 2 Ch1 OP |
| L | Loop 2 Control Ch2 OP |
| A | Alarm 1 OP |
| B | Alarm 2 OP |
| C | Alarm 3 OP |
| D | Alarm 4 OP |
| 1 | Program Event 1 |
| 2 | Program Event 2 |
| 3 | Program Event 3 |
| 4 | Program Event 4 |
| 5 | Program Event 5 |
| 6 | Program Event 6 |
| 7 | Program Event 7 |
| 8 | Program Event 8 |

* For range, select from Table A below

| | |
|----------------|----------------|
| Table 1 | |
| A | 4-20mA Linear |
| Y | 0-20mA Linear |
| W | 0-5Vdc Linear |
| G | 1-5Vdc Linear |
| V | 0-10Vdc Linear |

2. Chapter 2 Installation

This instrument is intended for permanent installation, for indoor use only, and to be enclosed in an electrical panel.

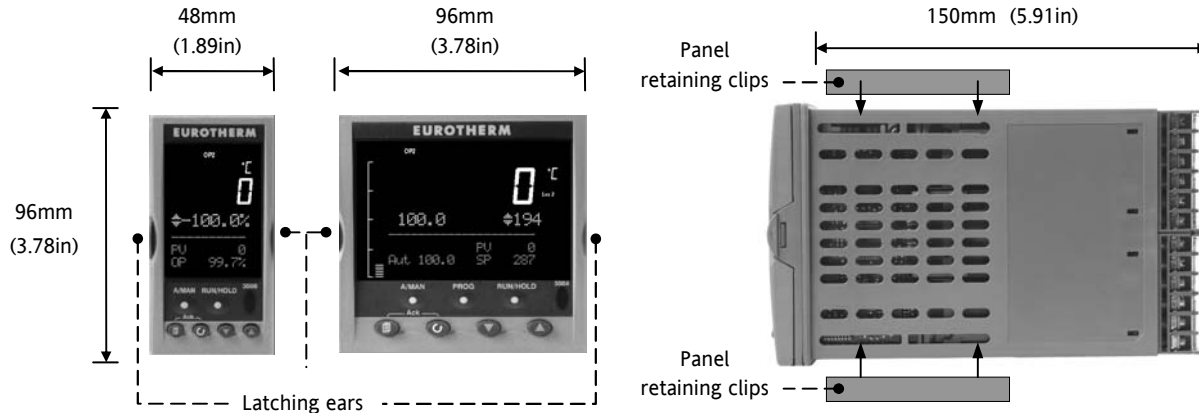
Select a location where minimum vibrations are present and the ambient temperature is within 0 and 50°C (32 and 122°F).

The instrument can be mounted on a panel up to 15mm thick.

To assure IP65 and NEMA 4 front protection, use a panel with smooth surface texture.

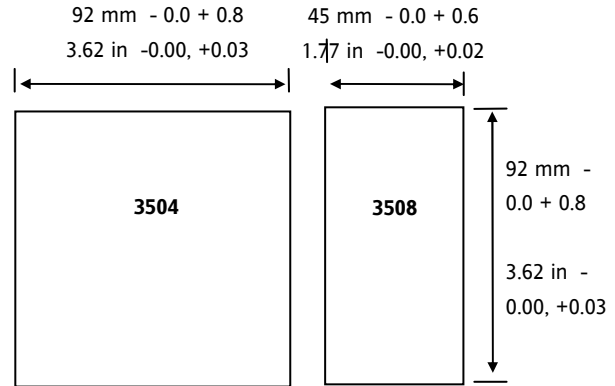
Please read the safety information, at the end of this guide, before proceeding and refer to the EMC Booklet part number HA025464 for further information. This and other relevant manuals may be downloaded from www.eurotherm.com.

2.1.1 Dimensions



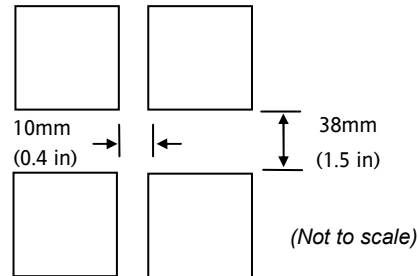
2.2 Panel Cut-out

1. Prepare the panel cut-out to the size shown in the diagram.
2. Insert the controller through the cut-out. The controller may remain in its sleeve when mounting it in the panel.
3. Spring the panel retaining clips into place. Secure the controller in position by holding it level and pushing both retaining clips forward.
4. Peel off the protective cover from the display.



2.2.1 Recommended Minimum Spacing

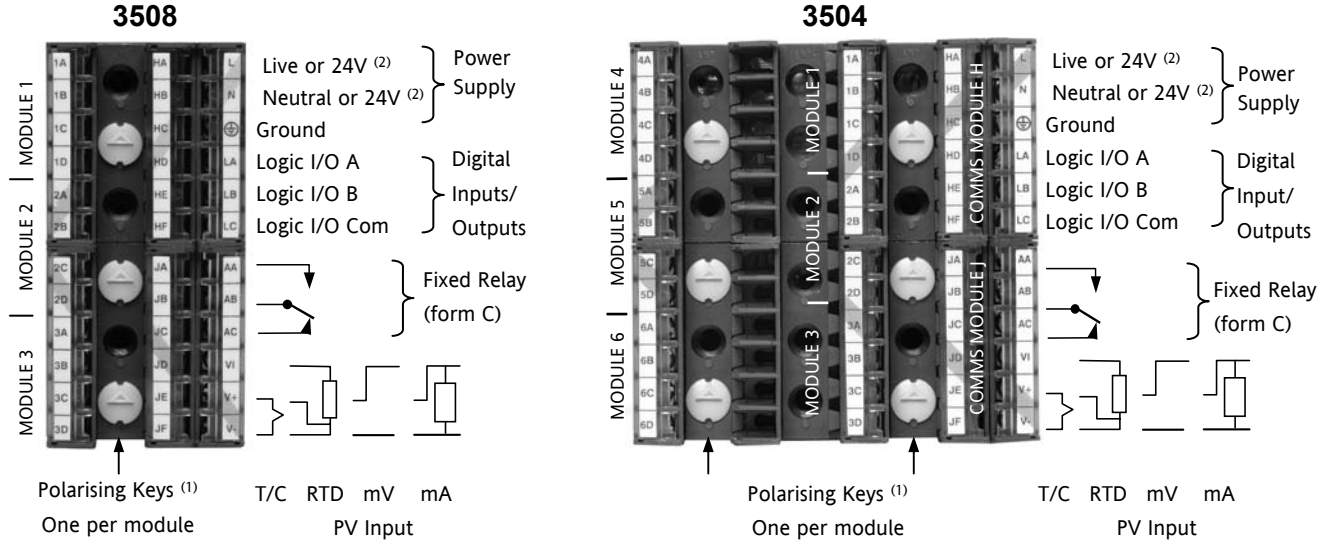
5. The recommended minimum spacing between controllers is to allow sufficient natural air flow and should not be less than that shown.



2.3 Removing and Replacing the Controller

The controller can be unplugged from its sleeve by easing the latching ears outwards and pulling it forward out of the sleeve. When plugging it back into its sleeve, ensure that the latching ears click back into place to maintain the IP65 sealing.

2.4 Electrical Connections



(1) Polarising keys are intended to prevent modules which are not supported in this controller from being fitted into the controller. An example might be an unisolated module (coloured red) from a 2400 controller series. When pointing towards the top, as shown, the key prevents a controller, fitted with an unsupported module, from being plugged into a sleeve which has been previously wired for isolated modules. If an unisolated module is to be fitted, it is the users responsibility to ensure that it is safe to install the controller in the particular application. When this has been verified the polarising key may be adjusted with a screwdriver to point in the down direction.

(2) High or low voltage versions are orderable. Ensure you have the correct version

2.5 Wire Sizes

The screw terminals accept wire sizes from 0.5 to 1.5 mm (16 to 22AWG). Hinged covers prevent hands or metal making accidental contact with live wires. The rear terminal screws should be tightened to 0.4Nm (3.5lb in).

2.6 Standard Connections

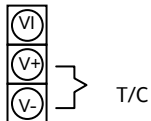
These are connections which are common to all instruments in the range.

2.6.1 PV Input (Measuring Input)

Notes:

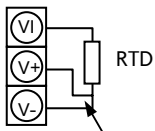
1. Do not run input wires together with power cables
2. When shielded cable is used, it should be grounded at one point only
3. Any external components (such as zener barriers, etc) connected between sensor and input terminals may cause errors in measurement due to excessive and/or un-balanced line resistance or possible leakage currents
4. Not isolated from logic I/O A and logic I/O B

2.6.1.1 Thermocouple or Pyrometer Input



Use the correct type of thermocouple compensating cable, preferably shielded, to extend wiring

2.6.1.2 RTD Input



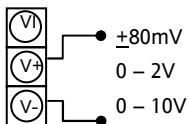
For 2-wire
this is a
local link

The resistance of the three wires must be the same

The line resistance may cause errors if it is greater than 22Ω

Note: the RTD wiring is not the same as 2400 series instruments. It is the same as 26/2700 series

2.6.1.3 Linear Input V, mV and High Impedance V



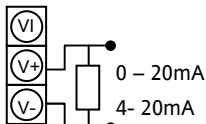
mV range $\pm 40\text{mV}$ or $\pm 80\text{mV}$

High level range 0 – 10V

High Impedance mid level range 0 – 2V. Used for zirconia probe oxygen input.

A line resistance for voltage inputs may cause measurement errors

2.6.1.4 Linear Input mA



Connect the supplied load resistor equal to 2.49Ω for mA input

The resistor supplied is 1% accuracy 50ppm

A resistor 0.1% accuracy 15ppm resistor can be ordered as a separate item. Part No. SUB35/ACCESS/249R.1

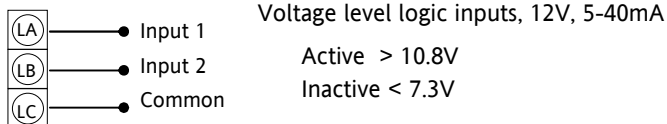
2.6.2 Digital I/O

These terminals may be configured as logic inputs, contact inputs or logic outputs in any combination. It is possible to have one input and one output on either channel.

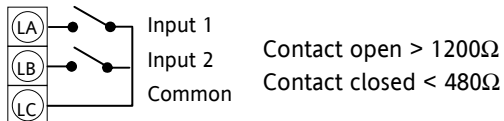


The Digital IO is not isolated from the PV input

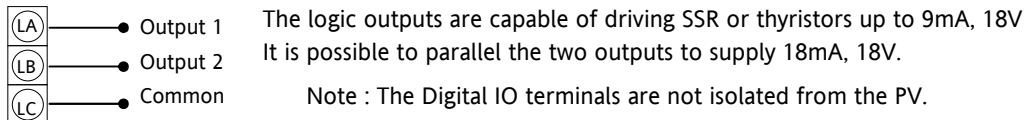
2.6.2.1 Logic Inputs



2.6.2.2 Contact Closure Inputs

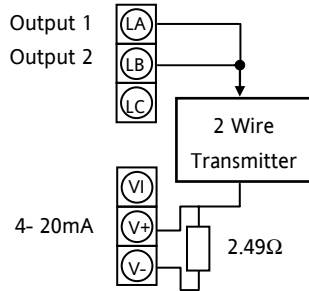


2.6.3 Digital (Logic) Outputs



The fixed digital logic outputs may be used to power remote 2 wire transmitters. The fixed digital I/O are, however, not isolated from the PV input circuit, so this does not allow the use of 3 or 4 wire transmitters. An isolated module must be used for the 3 and 4 wire types.

2.6.4 Digital (Logic) Outputs used to power a remote 2 wire transmitter.

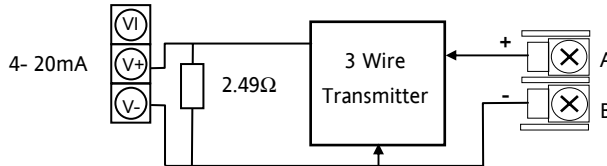


The parallel logic outputs supply >20mA, 18V.

Note : The Digital IO terminals are not isolated from the PV.

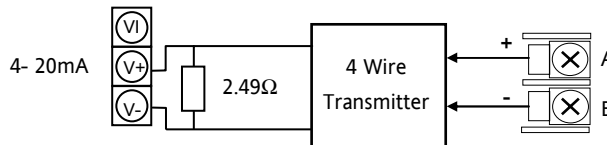
Connect the supplied load resistor equal to 2.49Ω for mA input

2.6.5 Digital (Logic) Outputs used to power a remote 3 wire transmitter.



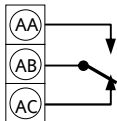
Isolated Transmitter Option
module +24V >20mA

2.6.6 Digital (Logic) Outputs used to power a remote 4 wire transmitter.



Isolated Transmitter Option
module +24V >20mA

2.6.7 Relay Output



Relay rating, min: 1V, 1mAdc. Max: 264Vac 2A resistive

Relay shown in de-energised state

Isolated output 240Vac CATII

2.6.7.1 General Note About Inductive Loads

High voltage transients may occur when switching inductive loads such as some contactors or solenoid valves.

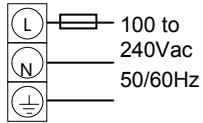
For this type of load it is recommended that a 'snubber' is connected across the contact of the relay switching the load. The snubber typically consists of a 15nF capacitor connected in series with a 100Ω resistor and will also prolong the life of the relay contacts.



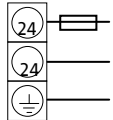
When the relay contact is open and it is connected to a load, the snubber passes a current (typically 0.6mA at 110Vac and 1.2mA at 240Vac). It is the responsibility of the installer to ensure that this current does not hold on the power to an electrical load. If the load is of this type the snubber should not be connected.

See also section 2.8.9 and 2.8.10.

2.6.8 Power Supply Connections



100 to
240Vac
50/60Hz



24V ac
or dc

1. Before connecting the instrument to the power line, make sure that the line voltage corresponds to the description on the identification label
2. For supply connections use 16AWG or larger wires rated for at least 75°C
3. Use copper conductors only
4. For 24V the polarity is not important
5. It is the Users responsibility to provide an external fuse or circuit breaker.

For 24 V ac/dc fuse type T rated 4A 250V

For 100/240Vac fuse type T rated 1A 250V

Safety requirements for permanently connected equipment state:

- a switch or circuit breaker shall be included in the building installation
- it shall be in close proximity to the equipment and within easy reach of the operator
- it shall be marked as the disconnecting device for the equipment

Note: a single switch or circuit breaker can supply more than one instrument

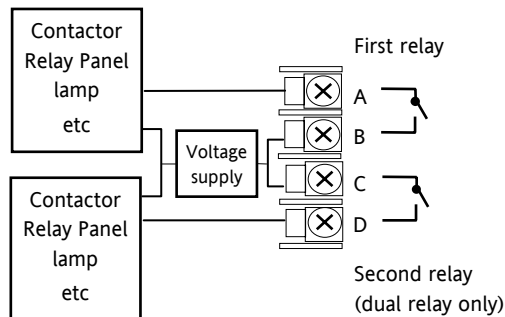
2.7 Plug in I/O Module Connections

Plug in I/O modules can be fitted in three positions in the 3508 and six positions in 3504. The positions are marked Module 1, 2, 3, 4, 5, 6. With the exception of the Analogue Input module, any other module listed in this section, can be fitted in any of these positions. To find out which modules are fitted check the ordering code printed on a label on the side of the instrument. If modules have been added, removed or changed it is recommended that this is recorded on the instrument code label.

The function of the connections varies depending on the type of module fitted in each position and this is shown below. All modules are isolated.

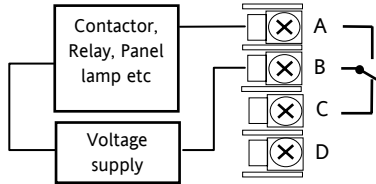
Note: The order code and terminal number is pre-fixed by the module number. For example, Module 1 is connected to terminals 1A, 1B, 1C, 1D; module 2 to 2A, 2B, 2C, 2D, etc.

2.7.1 Relay (2 pin) and Dual Relay Module



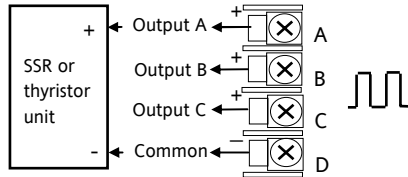
- Hardware Code: R2 and RR
- Relays Rating: 2A, 264Vac max or 1mA, 1V min
- Typical usage: Heating, cooling, alarm, program event, valve raise, valve lower
- Isolated output 240Vac CATII

2.7.2 Change Over Relay



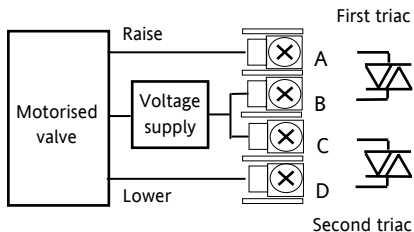
- Hardware Code: R4
- Relay Rating: 2A, 264Vac max or 1mA, 1V min
- Typical usage: Heating, cooling, alarm, program event, valve raise, valve lower.
- Isolated output 240Vac CATII

2.7.3 Triple Logic and Isolated Single Logic Output



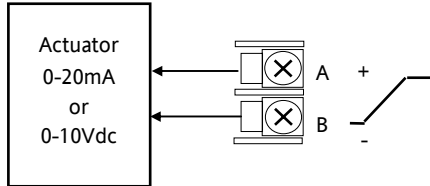
- Hardware Code: TP and LO
- Outputs Rating: (18Vdc at 8mA max.)
- Typical usage: Heating, cooling, program events.
- Isolated output 240Vac CATII
- Single Logic Output connections: D – Common A – Logic Output

2.7.4 Triac and Dual Triac



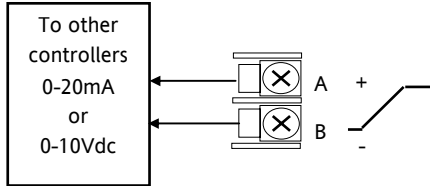
- Hardware Code: T2 and TT
- Combined Output Rating: 0.7A, 30 to 264Vac
- Typical usage: Heating, cooling, valve raise, valve lower.
- Isolated output 240Vac CATII
- Dual relay modules may be used in place of dual triac.
- **The combined current rating for the two triacs must not exceed 0.7A**

2.7.5 DC Control



- Hardware Code: D4
- Output Rating: (10Vdc, 20mA max)
- Typical Usage: Heating, cooling e.g. to a 4-20mA process actuator
- Isolated output 240Vac CATII

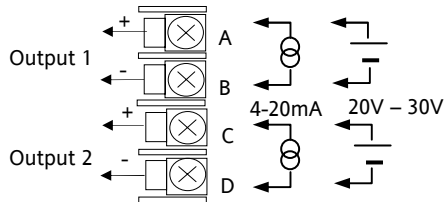
2.7.6 DC Retransmission



- Hardware Code: D6
- Output Rating: (10Vdc, 20mA max)
- Typical Usage: Logging of PV, SP, output power, etc., (0 to 10Vdc or 0 to 20mA)
- Isolated output 240Vac CATII

2.7.7 Dual DC Output

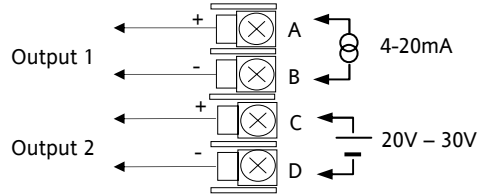
Slots 1, 2 and 4 only



- Hardware Code: DO
- Output Rating: each channel can be 4-20mA or 24Vdc power supply)
- Typical Usage: Control output 12 bit resolution

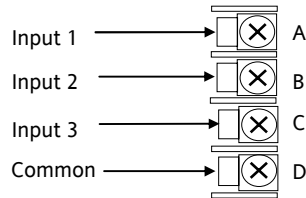
2.7.8 High Resolution DC Retransmission & Transmitter Power Supply

Slots 1, 2 and 4 only



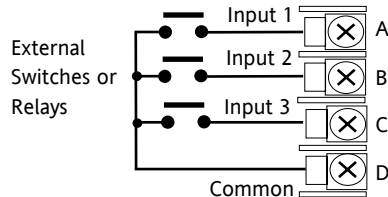
- Hardware Code: HR
- Output Rating: Channel 1 (15 bit 4-20mA). Channel 2 (24Vdc)
- Typical Usage: Retransmission Channel 1. Transmitter power supply Channel 2

2.7.9 Triple Logic Input



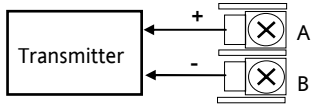
- Hardware Code: TL
- Input Ratings: Logic inputs <5V OFF >10.8V ON Limits: -3V, +30V
- Typical Usage: Events e.g. Program Run, Reset, Hold
- Isolated output 240Vac CATII

2.7.10 Triple Contact Input



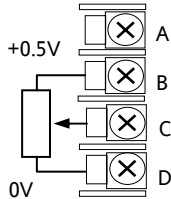
- Hardware Code: TK
- Input Ratings: Logic inputs >28K Ω OFF <100 Ω ON
- Typical Usage: Events e.g. Program Run, Reset, Hold
- Isolated output 240Vac CATII

2.7.11 24V Transmitter Supply



- Hardware Code: MS
- Output Rating: 24Vdc 20mA
- Typical Usage: To power an external transmitter
- Isolated output 240Vac CATII

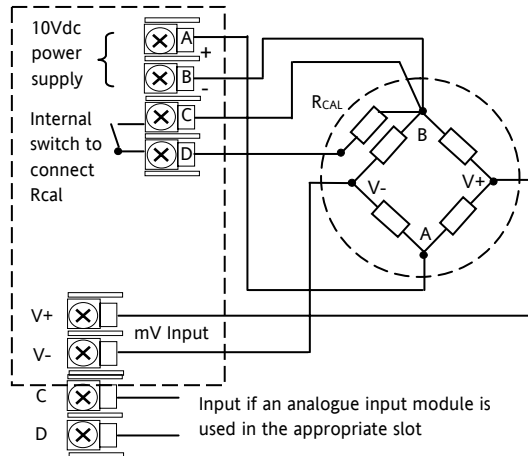
2.7.12 Potentiometer input



- Hardware Code: VU
- Rating: 100 Ω to 15K Ω
- Typical Usage: Valve position feedback, Remote setpoint
- Isolated output 240Vac CATII

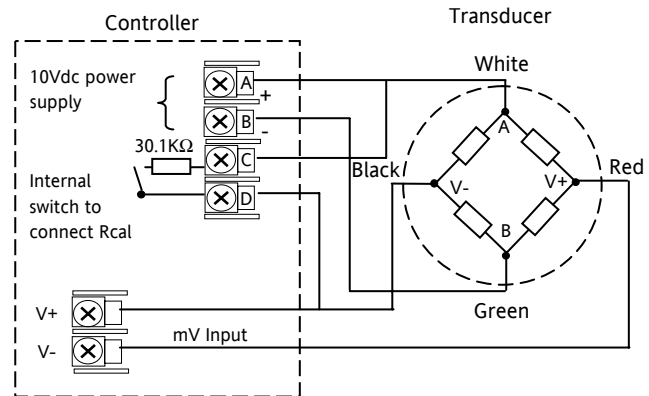
2.7.13 Transducer Power Supply

Transducer with Internal Calibration Resistor



- Hardware Code: G3
- Rating: Configurable 5V or 10Vdc. Minimum load resistance 300Ω
- Typical Usage: Strain Gauge transducer power and measurement
- Isolated output 240Vac CATII

Transducer with External Calibration Resistor

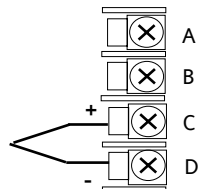


2.7.14 Analogue Input (T/C, RTD, V, mA, mV)

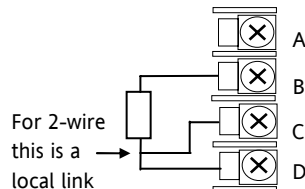
Slots 1, 3, 4 & 6 only

- Hardware Code: AM
- Typical Usage: Second PV input, Remote setpoint
- Isolated 240Vac CATII

Thermocouple

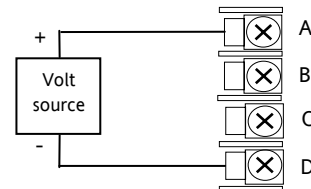


3-wire RTD



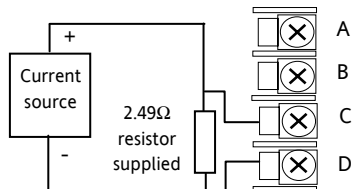
Voltage

-3 to 10V or -1.4 to 2V



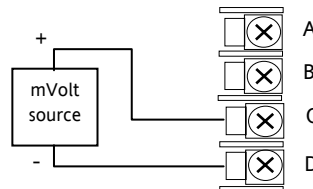
Current

0 to 20mA or (4 to 20mA)



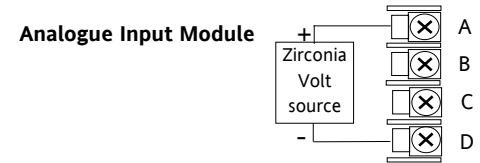
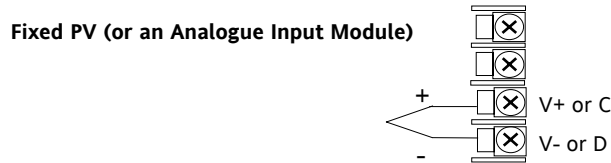
mV

(±40mV or ±80mV)

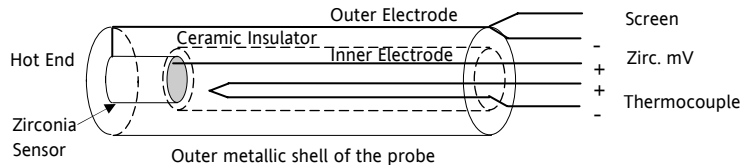


2.7.15 Analogue Input (Zirconia Probe)

- The temperature sensor of the zirconia probe can be connected to the Fixed PV input, terminals V+ and V-, or to an Analogue Input module, terminals C & D. The Volt Source connected to an Analogue Input module, terminals A & D.

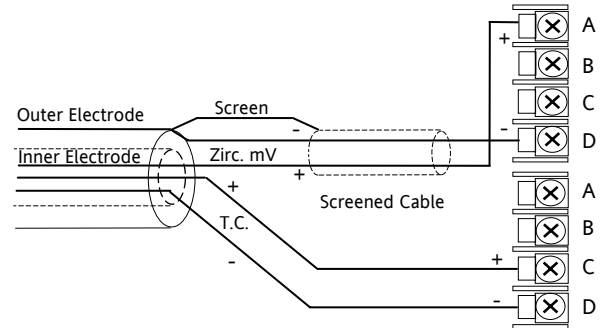


2.7.16 Zirconia Probe Construction



2.7.17 Zirconia Probe Screening Connections

The zirconia sensor wires should be screened and connected to the outer shell of the probe if it is situated in an area of high interference.



2.8 Digital Communications Connections

Digital Communications modules can be fitted in two positions in both 3508 and 3504 controllers. The connections being available on HA to HF and JA to JF depending on the position in which the module is fitted. The two positions could be used, for example, to communicate with 'iTools' configuration package on one position, and to a PC running a supervisory package on the second position.

Communications protocols may be Modbus, EIBisynch, DeviceNet®, Profibus or Modbus TCP.

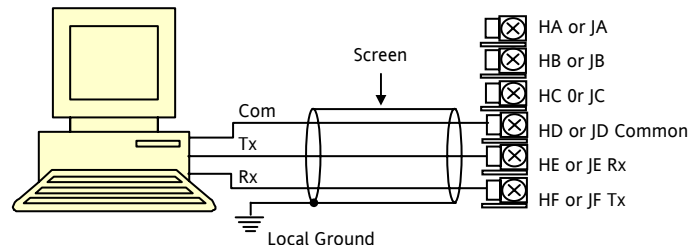
Note:- In order to reduce the effects of RF interference the transmission line should be grounded at both ends of the screened cable. However, if such a course is taken care must be taken to ensure that differences in the earth potentials do not allow circulating currents to flow, as these can induce common mode signals in the data lines. Where doubt exists it is recommended that the Screen (shield) be grounded at only one section of the network as shown in all of the following diagrams.

- Digital communications modules isolated 240Vac CATII

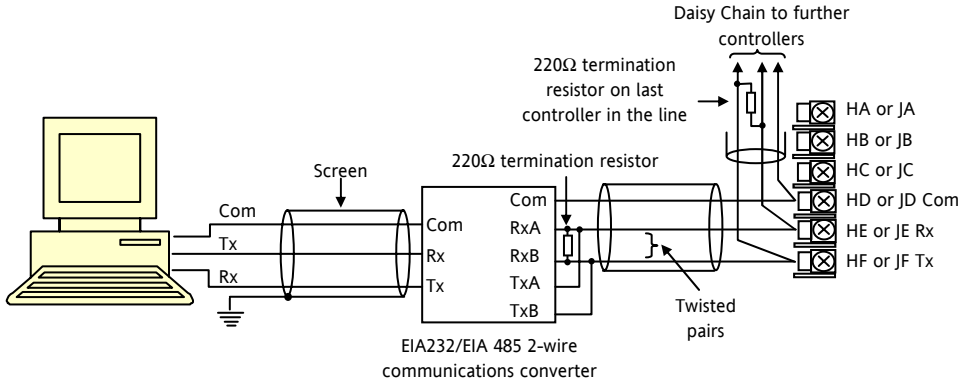
2.8.1 Modbus Slave (H or J Module) or EIBisynch

A further description of Modbus and EIBisynch communications is given in 2000 series Communications Handbook, Part No. HA026230, which can be downloaded from www.eurotherm.com.

EIA232 Connections

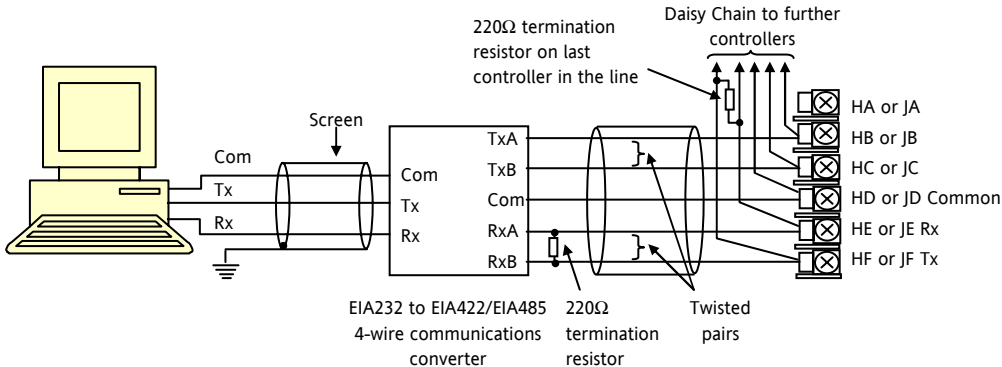


EIA485 2-Wire Connections



The KD485 communications converter is recommended for interfacing to EIA 485. This unit is also used to buffer an EIA 485 network when it is required to communicate with more than 32 instruments on the same bus, and may also be used to bridge 2-wire EIA485 to 4-wire EIA 422.

EIA422/EIA485 4-Wire Connections



The KD485 communications converter is recommended for:
 Interfacing 4-wire to 2-wire connections.
 To buffer an EIA 422/485 network when more than 32 instruments on the same bus are required
 To bridge 2-wire EIA 485 to 4-wire EIA 422.

2.8.2 DeviceNet Wiring

It is not within the scope of this manual to describe the DeviceNet standard. For this please refer to the DeviceNet specification which may be found at www.odva.org.

In practice it is envisaged that 3500 series controllers will be added to an existing DeviceNet network. This section, therefore, is designed to provide general guidelines to connect 3500 series controllers to this network. Further information is also available in the DeviceNet Communications Handbook Part No HA027506 which can be downloaded from www.eurotherm.com.

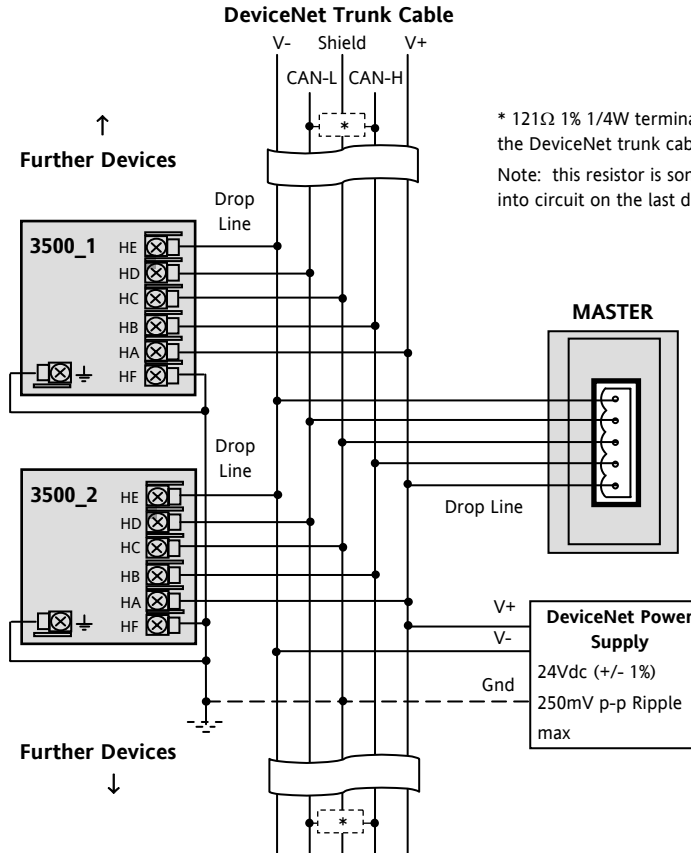
According to the DeviceNet standard two types of cable may be used. These are known as Thick Trunk and Thin Trunk. For long trunk lines it is normal to use Thick trunk cable. For drop lines thin trunk cable is generally more convenient being easier to install. The table below shows the relationship between cable type, length and baud rate.

| | | | |
|-----------------------|--|--------------|--------------|
| <i>Network length</i> | <i>Varies with speed. Up to 400m possible with repeaters</i> | | |
| Baud Rate Mb/s | 125 | 250 | 500 |
| Thick trunk | 500m (1,640ft) | 200m (656ft) | 75m (246ft) |
| Thin trunk | 100m (328ft) | 100m (328ft) | 100m (328ft) |

This table shows standard cable connections.

| Controller Terminal | CAN Label | Wire Colour | Description |
|----------------------------|------------------|--------------------|---|
| HA | V+ | Red | DeviceNet network power positive terminal. Connect the red wire of the DeviceNet cable here. If the DeviceNet network does not supply the power, connect to the positive terminal of an external 24 Vdc power supply. |
| HB | CAN_H | White | DeviceNet CAN_H data bus terminal. Connect the white wire of the DeviceNet cable here. |
| HC | SHIELD | None | Shield/Drain wire connection. Connect the DeviceNet cable shield here. To prevent ground loops, the DeviceNet network should be grounded in only one location. |
| HD | CAN_L | Blue | DeviceNet CAN_L data bus terminal. Connect the blue wire of the DeviceNet cable here. |
| HE | V- | Black | DeviceNet network power negative terminal. Connect the black wire of the DeviceNet cable here. If the DeviceNet network does not supply the power, connect to the negative terminal of an external 24 Vdc power supply. |
| HF | | | Connect to instrument earth |

2.8.3 Example DeviceNet Wiring Diagram



* 121Ω 1% 1/4W terminating resistor must be connected across the blue and white wires at each end of the DeviceNet trunk cable.

Note: this resistor is sometimes included in the master or other devices but should only be switched into circuit on the last device on the trunk cable.

Note:

The DeviceNet network is powered by an external independent 24V supply which is separate from the internal powering of the individual controllers.

Note: Power taps are recommended to connect the DC power supply to the DeviceNet trunk line. Power taps include:

- A Schottky Diode to connect the power supply V+ and allows for multiple power supplies to be connected.

- 2 fuses or circuit breakers to protect the bus from excessive current which could damage the cable and connectors.

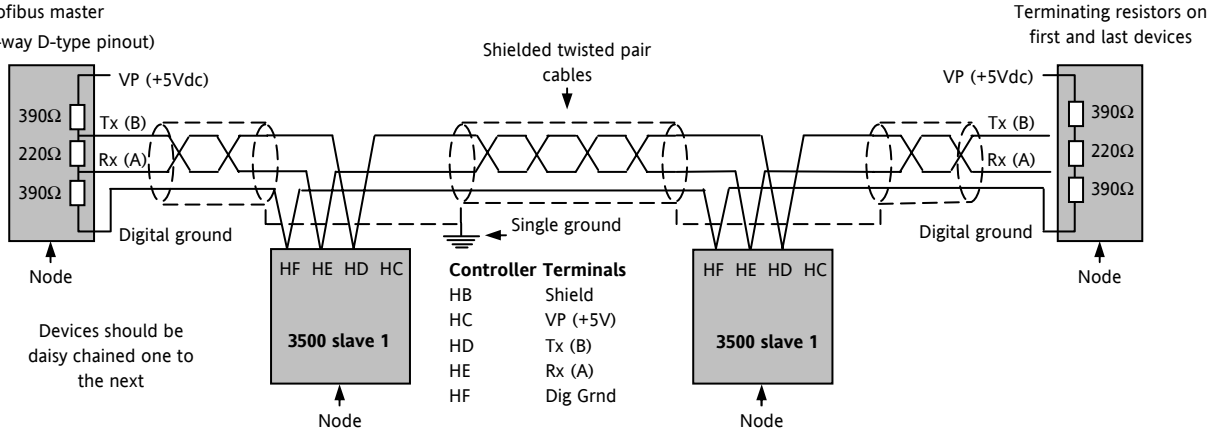
The earth connection, HF, to be connected to the main supply earth terminal at one point only.

2.8.4 Profibus

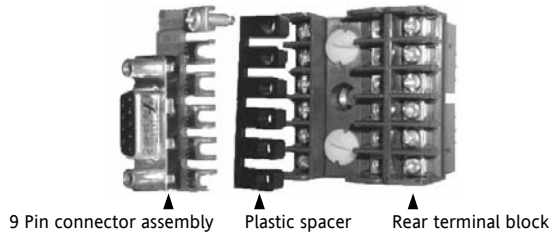
A description of Profibus is given in the Profibus Communications Handbook Part No HA026290 which can be downloaded from www.eurotherm.com.

2.8.5 Example Profibus Wiring

Profibus master
(9-way D-type pinout)

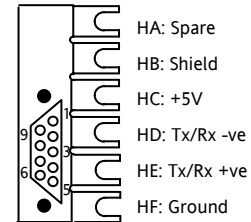


If options code PD is ordered a D Type Connector for rear terminal mounting is supplied



9 pin connections

- Pin 1: Shield
- Pin 3: Tx/Rx +ve
- Pin 5: Ground
- Pin 6: +5V
- Pin 8 : Tx/Rx -ve
- Pin 9: Spare

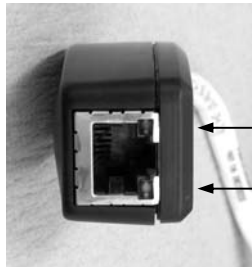


2.8.6 Ethernet (Modbus TCP)

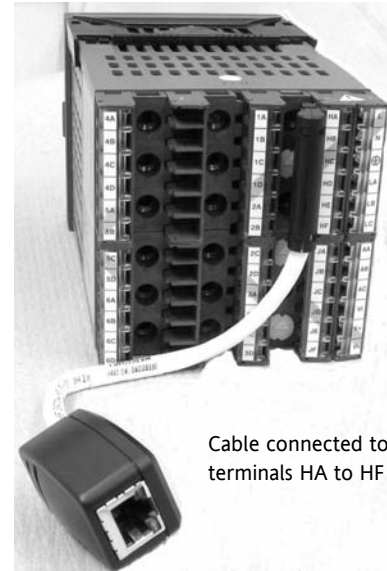
When the controller is supplied with the Ethernet communications option a special cable assembly is also supplied. This cable must be used since the magnetic coupling is contained within the RJ45 connector. It consists of an RJ45 connector (socket) and a termination assembly which must be connected to terminals HA to HF.



View of cable which may also be ordered separately as Part No SUB3500/COMMS/EA



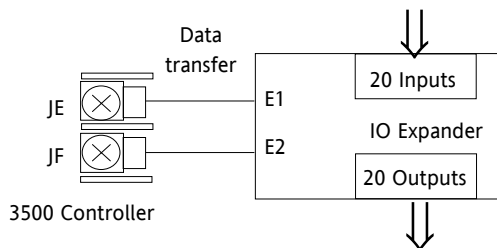
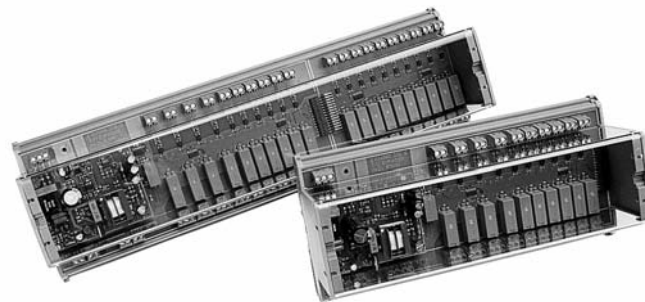
Activity and transmit data LED indicators



Cable connected to terminals HA to HF

2.8.7 I/O Expander

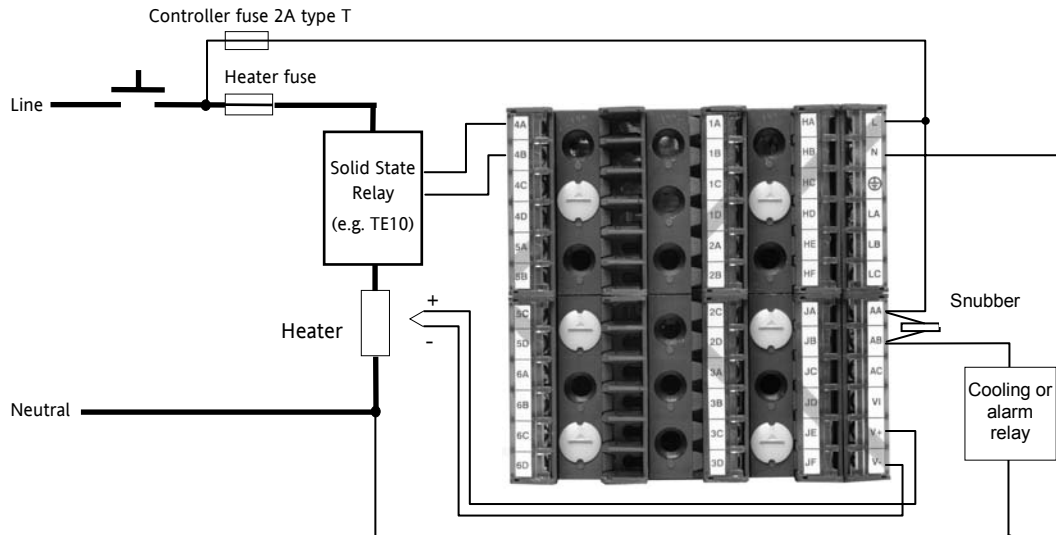
An I/O expander (Model No 2000IO) can be used with 3500 series controllers to allow the number of I/O points to be increased by up to a further 20 digital inputs and 20 digital outputs. Data transfer is performed serially via a two wire interface module (order code EX) which is fitted in digital communications slot J.



A description of the IO Expander is given in Handbook Part No HA026893 which can be downloaded from www.eurotherm.com.

The connections for this unit are reproduced below for convenience.

2.8.9 Example Wiring Diagram



Safety requirements for permanently connected equipment state:

- A switch or circuit breaker shall be included in the building installation
- It shall be in close proximity to the equipment and within easy reach of the operator
- It shall be marked as the disconnecting device for the equipment.

Note: a single switch or circuit breaker can drive more than one instrument.

Please refer to the EMC Electromagnetic Compatibility Handbook Part No. HA025464 for further details of good wiring practice. This can be downloaded from www.eurotherm.com.

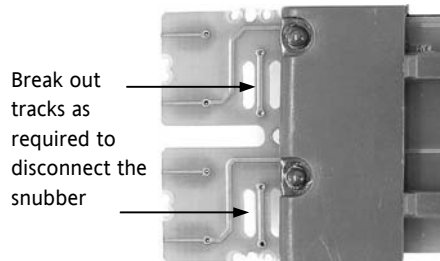
2.8.10 Snubbers

Snubbers are used to prolong the life of relay contacts and to reduce interference when switching inductive devices such as contactors or solenoid valves. The fixed relay (terminals AA/AB/AC) is not fitted internally with a snubber and it is recommended that a snubber be fitted externally, as shown in the example wiring diagram. If the relay is used to switch a device with a high impedance input, no snubber is necessary.

All relay modules are fitted internally with a snubber since these are generally required to switch inductive devices. However, snubbers pass 0.6mA at 110V and 1.2mA at 230Vac, which may be sufficient to hold on high impedance loads. If this type of device is used it will be necessary to remove the snubber from the circuit.

The snubber is removed from the relay module as follows:-

1. Unplug the controller from its sleeve
2. Remove the relay module
3. Use a screwdriver or similar tool to snap out the track. The view below shows the tracks in a Dual Relay Output module.



3. Chapter 3: Getting Started

A brief start up sequence consists of a self test in which all elements of the display are illuminated and the software version is shown. What happens next depends on one of two conditions:-

1. Power up out of the box – when the controller has no preset configuration and is switched on for the very first time it will start up in 'QuickStart mode'. This is an intuitive tool for configuring the controller and is described in section 3.1 below.
2. The controller has been powered up previously and is already configured. In this case go to section 3.3.

3.1 Quick Start - New Controller (Unconfigured)

Quick Start is a tool which enables the controller to be matched to the most common processes without the need to go to full configuration level described in the Engineering Manual Part No. HA027988.

When the controller is switched on for the very first time it will display the 'Startup' screen shown.



3504 Display






3508 Display




Incorrect configuration can result in damage to the process and/or personal injury and must be carried out by a competent person authorised to do so. It is the responsibility of the person commissioning the controller to ensure the configuration is correct




3.1.1 To Configure Parameters in Quick Start Mode







With 'QckStart' selected, press  to scroll through the list of parameters

Edit the parameters using the  or  buttons










Each time  button is pressed a new parameter will be presented

This is illustrated by the following example:- (The views shown are taken from the 3504 controller).

 Tip: From the Startup view, shown in the previous section, you can press  or  to select Configuration Mode. To fully configure the controller refer to the Engineering Handbook Part No HA027988.

 Tip: Backscroll – to scroll back through parameters press and hold  then press  to go back through the list of parameters. You can also press and hold  +  to go forward - this has the same effect as pressing  alone.

Example

| Do This | Display | Additional Notes |
|--|---|---|
| <ol style="list-style-type: none"> From the Start view press  Press  or  to change the 'Units' A different parameter is selected each time  is pressed. |  | <p>The first parameter to be configured is 'Units'. It resides in the 'PV Input List' because it is associated with the process variable.</p> <p>When the required choice is selected a brief blink of the display indicates that it has been accepted</p> |
| <ol style="list-style-type: none"> Continue setting up the parameters presented until the 'Finished' view is displayed. If all parameters are set up as required press  or  to 'Yes' |  | <p>If you wish to scroll around the parameters again do not select Yes but continue to press .</p> <p>When 'Yes' is selected the controller reverts to Auto control. The 'HOME' display - section 3.3 is then shown.</p> |

The following table summarises all the parameters which can be set up by the above procedure.

3.1.2 Quick Start Parameters

Parameters shown in **Bold** are defaults.

| Group | Parameter | Value | | Availability |
|-----------------|---|--|---|--------------|
| LP1 PV Input | Units Used to select the engineering units for the PV. (C, F, K options also change the displayed units) | C, F, K V, mV, A, mA, pH, mmHg, psi, Bar, mBar, %RH, %, mmWG, inWG, inWW, Ohms, PSIG, %O ₂ , PPM, %CO ₂ , %CP, %/sec, Vacuum, sec, min, hrs, None | | Always |
| LP1 PV Input | Resolution - to select the required decimal point position for the PV | XXXXX, XXXX.X, XXX.XX, XX.XXX, X.XXXX | | Always |
| LP1 PV Input | Range Type Used to select the linearisation algorithm required and the input sensor. | Thermocouple: J, K , L, R, B, N, T, S, PL2, C, CustC1(2&3) RTD: Pt100 Linear: 0-50mV, 0-5V, 1-5V, 0-10V, 2-10V, 0-20mA, 4-20mA | | Always |
| LP1 PV Input | IO Type Only shown if custom curve is selected | Thermocpl, RTD, Pyrometer, mV40, mV80, mA, Volts, HIZVolts, Log10 | | |
| LP1 PV Input | Range High/Low Configures the maximum/minimum display range and SP limits | Depends on Range type selected. Default 1372/-200 | | Always |
| LP1 Loop | Control Channel 1. Sets the control type for channel 1 (normally Heat) | PID , VPU, VPB, Off, OnOff | VPU = Boundless valve position control. This is a velocity mode algorithm and does not need a feedback potentiometer VPB = Bounded VP which requires a | Always |
| LP1 Loop | Control Channel 2. Sets the control type for channel 2 | PID , VPU, VPB, Off , OnOff | | Always |

| Group | Parameter | Value | Availability |
|---|--|---|--|
| | (normally Cool) | feedback potentiometer | |
| LP2 PV Input | Source Defines where the PV input is wired to | None , FixedPV, Module6. Available only if an analogue input module is fitted. | If a dual loop controller |
| LP2 PV Input | Units | AbsTemp select this for temperature input. Other choices are:- V. mV, A. mA, pH, mmHg, psi, Bar, mBar, %RH, %, mmWG, inWG, inWW, Ohms, PSIG, %O2, PPM, %CO2, %CP, %/sec, Vacuum, sec, min, hrs, None Note units C, F and K are not available. | If 'Source = Module6 |
| The LP1 parameters listed above are repeated for LP2 if the LP2 PV Input is configured | | | |
| Init LgcIO LA | Logic function (input or output) The LA Logic I/O port can be an output or an input. This parameter is used to select its function. | Not Used , Lp1 Ch1, Lp1 Ch2, Lp2 Ch1, Lp2 Ch2, Alarm 1 to 8, Any Alarm, New Alarm, ProgEvt1 to 8, LP1SBrkOP, LP2SBrkOP*, LPsSBrk*, (outputs) LP1 A-M, LP1 SPsel, LP2 A-M, LP2 SPsel, AlarmAck, ProgRun, ProgReset, ProgHold (Inputs) | [Note 1] [Note 2] * LP2 and LPs (both loops) only shown if the second loop is configured Programmer options only available if the controller is a programmer/controller |
| Init LgcIO LA | Min OnTime | Auto 0.01 to 150.00 | [Note 2] [Note 3] |
| The above two parameters are repeated for the LB Logic I/O (LgcIO LB) | | | |
| Init RlyOP AA | AA Relay output function This relay is always fitted. | Not Used , Lp1 Ch1, Lp1 Ch2, Lp2 Ch1, Lp2 Ch2, Alarm 1 to 8, Any Alarm, New Alarm, ProgEvt1 to 8, LP1SBrkOP, LP2SBrkOP*, LPsSBrk*. | Always. [Note 4] Programmer options only available if the controller is a programmer/controller |

| Group | Parameter | Value | Availability |
|----------|----------------------------|----------------|--------------|
| Init | AA Relay output Min OnTime | Auto | [Note 2] |
| RlyOP AA | | 0.01 to 150.00 | [Note 3] |

Note 1) Parameters only appear if the function has been turned on, eg If 'Control Channel 1' = 'Off', 'Chan 1' does not appear in this list. When a control channel is configured for valve positioning, LgcIO LA and LgcIO LB act as a complementary pair. If, for example, Chan 1 is connected to LgcIO LA (valve raise) then LgcIO LB is automatically set to Chan 1 (valve lower). This ensures the valve is never raised and lowered simultaneously.

The same complementary behaviour also applies to dual output modules and channels A and C of triple output modules

Note 2) If any input function, for example Chan 1, is connected to another input it will not appear in this list

Note 3) Is available if the Control Channel is not On/Off and is allocated to the LA, LB or AA output as applicable

Note 4) For valve position control Chan 1 or Chan 2 will not appear in this list. Valve position outputs can only be dual outputs such as LA and LB or dual relay/triac output modules

3.1.2.1 Modules

The following parameters configure the plug in I/O modules. I/O Modules can be fitted in any available slot in the instrument (6 slots in 3504, 3 slots in 3508). The controller automatically displays parameters applicable to the module fitted - if no module is fitted in a slot then it does not appear in the list.

Each module can have up to three inputs or outputs. These are shown as A, B or C after the module number and this corresponds to the terminal numbers on the back of the instrument. If the I/O is single only A appears. If it is dual A and C appears if it is triple A, B and C appear.

Note 1: If a Dual DC Output module is fitted, it cannot be configured using the Quick Start Code. To configure this module refer to the Engineering Manual part no. HA027988 which can be downloaded from www.eurotherm.com.

Note 2: If an incorrect module is fitted the message 'Bad Ident' will be displayed.

| Module type | Parameter | Value | | Availability | |
|---|------------------------|--|--|----------------------------------|------------------------|
| Change over relay (R4) 2 pin relay (R2) Triac output (T2) | Relay (Triac) function | Not Used All parameters the same as RlyOP AA, including Min OnTime if the OP is a relay | | Always (if the module is fitted) | |
| | Dual Relay (RR) | | | | Relay (Triac) function |
| | Dual triac output (TT) | | | | Relay function |
| Single Logic Output (LO) | Logic Out function | Not Used | | Always (if the module is fitted) | |
| Triple Logic Output (TP) | | All parameters the same as RlyOP AA | | | |
| DC Output (D4) DC Retransmission (D6) | DC Output function | Not Used | Module fitted but not configured | Always (if the module is fitted) | |
| | | LP1 Ch1OP | Loop 1 Channel 1 control output | | |
| | | LP1 Ch2OP | Loop 1 Channel 2 control output | | |
| | | LP2 Ch1OP | Loop 2 Channel 1 control output | | |
| | | LP2 Ch2OP | Loop 2 Channel 2 control output | | |
| | | LP1 SP Tx | Loop 1 setpoint retransmission | | |
| | | LP1 PV Tx | Loop 1 PV retransmission | | |
| | | LP1 ErrTx | Loop 1 error retransmission | | |
| | | LP1 PwrTx | Loop 1 output retransmission | | |
| | | LP2 SP Tx | Loop 2 setpoint retransmission | | |
| | | LP2 PV Tx | Loop 2 PV retransmission | | |
| | | LP2 ErrTx | Loop 2 error retransmission | | |
| | | LP2 PwrTx | Loop 2 output retransmission | | |
| | | Range Type | 0–5V, 1–5V, 1–10V, 2–10V, 0–29mA, 4–20mA | | |
| | | Display High | 100.0 | | |

| Module type | Parameter | Value | | Availability |
|--|----------------------|-----------------|---|---|
| | Display Low | 0 | | |
| Triple Logic Input (TL) Triple Contact Input (TK) | Logic In function | Not Used | Module fitted but not configured | A function can only be allocated to one input. eg if AlarmAck is configured on X*A it is not offered for the other inputs * is the module number. LP2 does not appear if loop 2 is not configured. |
| | | LP1 A-M | Loop 1 Auto/manual | |
| | | LP1 SPsel | Loop 1 SP select | |
| | | LP1 AltSP | Loop 1 Alternative SP select | |
| | | LP2 A-M | Loop 2 Auto/manual | |
| | | LP2 SPsel | Loop 2 SP select | |
| | | LP2 AltSP | Loop 2 Alternative SP select | |
| | | AlarmAck | Alarm acknowledge | |
| | | ProgRun | Programmer run | |
| | | ProgReset | Programmer reset | |
| | ProgHold | Programmer hold | | |
| Analogue Input (AM) | Analogue IP function | Not Used | Module fitted but not configured | LP1 V1Pos and LP1 V2Pos only appear if the control channel 1 or control channel 2 is set to VPB. Remote SP does not appear if the programmer option is supplied. LP2 does not appear if loop 2 is not configured. |
| | | LP1 AltSP | Loop 1 alternative setpoint | |
| | | LP1 OPH | Loop 1 remote OP power max | |
| | | LP1 OPL | Loop 1 remote OP power min | |
| | | LP2 AltSP | Loop 2 alternative setpoint | |
| | | LP2 OPH | Loop 2 remote OP power max | |
| | | LP2 OPL | Loop 2 remote OP power min | |
| | | LP1 V1Pos | To read valve position from the feedback potentiometer loop 1 | |
| | | LP1 V2Pos | | |
| | | LP2 V1Pos | To read valve position from the feedback potentiometer loop 2 | |
| LP2 V2Pos | | | | |

| Module type | Parameter | Value | Availability | |
|-------------------------------|--|---|---|---|
| | Range Type | Thermocouple: J, K, L, R, B, N, T, S, PL2, C. RTD: Pt100 Linear: 0-50mV, 0-5V, 1-5V, 0-10V, 2-10V, 0-20mA, 4-20mA | Not shown if analogue IP function not used | |
| | Display High | 100.0 | These parameters only appear for Linear Range | |
| | Display Low | 0.0 | | |
| Potentiometer Input (VU) | Pot Input function | Not Used | Module fitted but not configured | Ch1VlvPos/Ch2VlvPos only appear if the channel = VPB Remote SP does not appear if the programmer option is supplied. LP2 does not appear if loop 2 is not configured. |
| | | LP1 AltSP | Loop 1 Alternative setpoint | |
| | | LP1 OPH | Loop 1 output power maximum | |
| | | LP1 OPL | Loop 1 output power minimum | |
| | | LP2 AltSP | Loop 2 Alternative setpoint | |
| | | LP2 OPH | Loop 2 output power maximum | |
| | | LP2 OPL | Loop 2 output power minimum | |
| | | LP1 V1Pos | To read valve position from the feedback potentiometer loop 1 | |
| | | LP1 V2Pos | | |
| | | LP2 V1Pos | To read valve position from the feedback potentiometer loop 2 | |
| LP2 V2Pos | | | | |
| Transducer Power Supply (G3) | TdcrPSU function | 5 Volts 10 Volts | Always (if the module is fitted) | |
| Transmitter power supply (MS) | No parameters. Used to show the ID of the module if fitted | | | |

Quick Start parameters continued on next page.





3.1.2.2 Alarms

| Group | Parameter | Value | | Availability |
|----------------------|-----------|---|---|---|
| Init Alarm 1 to 8 | Type | None | No alarm type configured | Always |
| | | Abs High | Absolute high | |
| | | Abs Low | Absolute low | |
| | | Dev High | Deviation high | |
| | | Dev Low | Deviation low | |
| | | Dev Band | Deviation band | |
| Init Alarm 1 to 8 | Source | None | Not connected | Always if Type ≠ None PV Input and ModX Ip do not appear if Type = Deviation |
| | | PV Input | Connected to main process variable does not appear if Alarm Type = Deviation | |
| | | LP1 PV | Connected to Loop 1 process variable | |
| | | LP2 PV | Connected to Loop 2 process variable | |
| | | Module1 - Module6 | Connected to an analogue input module and only of the Alarm Type is not a deviation alarm | |
| Init Alarm 1 to 8 | Setpoint | To adjust the alarm threshold within the range of the source. | | Always if Type ≠ None |
| Init Alarm 1 to 8 | Latch | None | No latching | Always if Type ≠ None |
| | | Auto | Automatic latching see section 3.7.1 | |
| | | Manual | Manual latching see section 3.7.1 | |
| | | Event | Alarm beacon does not light but any output associated with the event will activate and a scrolling message will appear. | |
| Finished | Exit | No | Continue back around the quick configuration list | |
| | | Yes | Go to normal operation. The loop(s) are set to Auto on exit from quickstart mode and the controller re-starts in Level 2. | |

3.2 To Re-enter Quick Start Mode

If you have exited from Quick Start mode (by selecting 'Yes' to the 'Finished' parameter) and you need to make further changes, the Quick start mode can be entered again at any time. The action which takes place depends on one of two previous conditions as follows:-

3.2.1 Power up After a Quick Start Configuration

1. Hold  down then power up the controller. Keep this button pressed until the Quick start screen as shown in section 2.1 is displayed.
2. Press  to enter the quick start list. You will then be asked to enter a passcode.
3. Use  or  to enter the passcode – default 4 – the same as the configuration level passcode. If an incorrect code is entered the display reverts to the 'Quick Start' view section 2.1.

It is then possible to repeat the quick configuration as described previously.





The Quick Start view shown in section 3.1 now contains an additional parameter - '**Cancel**'. This is now always available after a power up, and, if selected, will take you into normal operating mode, section 3.3.

3.2.2 Power up After A Full Configuration

Repeat 1,2 and 3 above.

Full configuration allows a greater number of parameters to be configured in a deeper level of access. This is described in the Engineering Handbook Part No. HA027988.

If the controller has been re-configured in this level, a '**WARNING**' message, '**Delete config?**' - '**No**' or '**Yes**', will be displayed. If 'No' is selected the display drops back to the 'GoTo' screen.

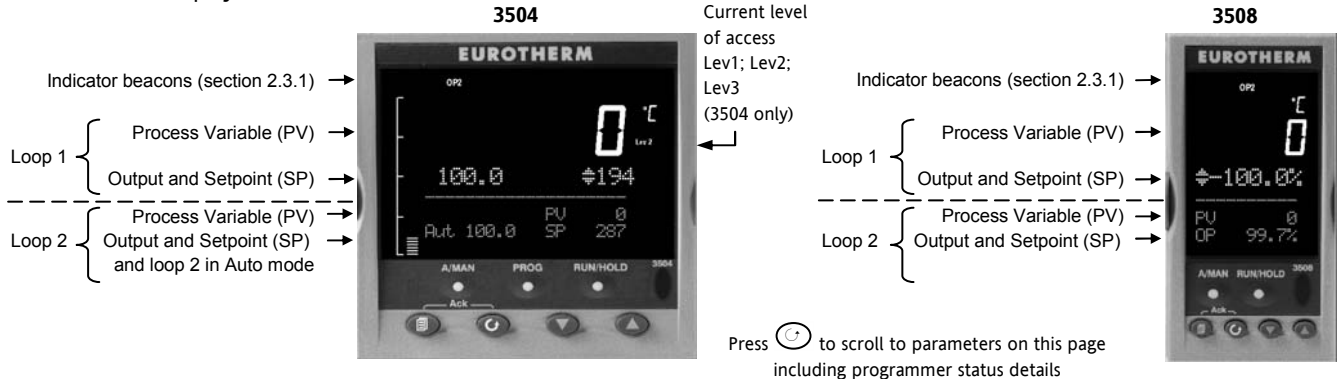
1. Use  or  to select 'Yes'
2. Press  to confirm or  to cancel. (If no button is pressed for about 10 seconds the display returns to the WARNING message).

If 'Yes' is selected the **Quick start defaults** will be re-instated. **All** the Quick start parameters must be reset.

3.3 Normal Operation

Switch on the controller. Following a brief self-test sequence, the controller will start up in AUTO mode (see AUTO/MAN section 3.6) and Operator Level 2 (following Quick Start).

If the controller is configured as a dual loop instrument the start up view shows a summary of the two loops. This is called the HOME display.





If the controller is configured as a dual loop the HOME displays will vary as shown below:-



Other views may be configured as the HOME display and other summary displays can be selected using [Home] button. See Summary Pages section 3.8.

3.3.1 Beacon Display and Description





| Beacon | Description |
|--------|--|
| OP1 | Illuminates when output 1 is ON (normally heating) |
| OP2 | Illuminates when output 2 is ON (normally cooling or alarm) |
| MAN | Illuminates when manual mode active. If the HOME display is showing the dual loop overview, MAN illuminates if Loop 1 is in manual. If the Loop 1 or Loop 2 overviews are being displayed MAN applies to the loop being displayed. |
| REM | Illuminates when alternative setpoint is active |
| SPX | Illuminates when setpoint 2 is active |
| ALM | <p>If an alarm occurs the red alarm beacon flashes. This is accompanied by a message showing the source of the alarm, for example 'Boiler overheating'.</p> <p>To acknowledge press  and . The message disappears. If the alarm condition is still present the beacon lights continuously. When cleared it will extinguish. A description of the alarm operation is given in section 3.7</p> |
| RUN | Illuminates when programmer running – flashing indicates End |
| HLD | Illuminates when programmer held |
| J | Flashes when J Channel comms active |
| H | Flashes when H Channel comms active |
| IR | Flashes when infra red communications active |

In general throughout this handbook instrument views will use the 3504. The displayed information is similar for the 3508 but in some cases is shortened due to display limitations.

3.4 The Operator Buttons






















Page Scroll Lower Raise

| | |
|---|---|
| <p>A/MAN</p> <p>This button can be disabled</p> | <p>Toggles the selected loop between Auto and Manual operation. The action of this button is described in section 3.6.</p> <p>Manual operation means that the controller output power is adjusted by the user. The input sensor is still connected and reading the PV but the control loop is open.</p> <p>Auto means that the controller is automatically adjusting the output to maintain control, ie the loop is closed.</p> <p>If the controller is in manual mode, 'MAN' light will be indicated.</p> <p>If the controller is powered down in Manual operation it will resume this mode when it is powered up again.</p> |
| <p>PROG</p> | <p>To select the programmer summary page</p> |
| <p>RUN/HOLD</p> <p>This button can be disabled</p> | <p>Press once to select a program. Press again to run the selected program. 'RUN' will be indicated in the top banner of the display.</p> <p>Press again to hold a program. 'HLD' will be indicated</p> <p>Press and hold for at least two seconds to reset a program.</p> <p>'RUN' will flash at the end of a program</p> <p>'HLD' will flash during holdback</p> <p>Programmer operation is fully described in chapter 21 of the Engineering Manual</p> |
|  | <p>Press to select new PAGE headings</p> |
|  | <p>Press to select a new parameter in the page</p> |
|  | <p>Press to decrease an analogue value, or to change the state of a digital value</p> |
|  | <p>Press to increase an analogue value, or to change the state of a digital value</p> |

3.4.1 Shortcut Key Presses

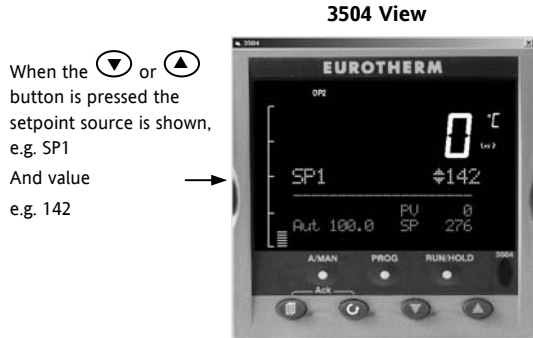
The following Short Cut Key presses are provided:-

| Action | Key Presses |
|----------------------|---|
| Backpage | Press  followed by  . With  held down continue to press  to scroll page headers backwards. (With  still pressed you can press  to page forward. This action is the same as pressing  alone). |
| Backscroll | When in a list of parameters, press  followed by  . With  held down continue to press  to scroll parameters backwards. (With  still pressed you can press  to page forward. This action is the same as pressing  alone). |
| Jump to HOME display | Press  +  |
| Alarm Ack/reset | Press  +  when the HOME screen is being displayed to jump to the 'Acknowledge All alarms' page. Pressing  acknowledges all alarms if it can, see section 3.7.1. Pressing  cancels the operation. |

3.5 To Set The Required Temperature (Setpoint)

A parameter value can be changed if it is preceded by \blacklozenge . In the example shown below this is the setpoint for loop 1.

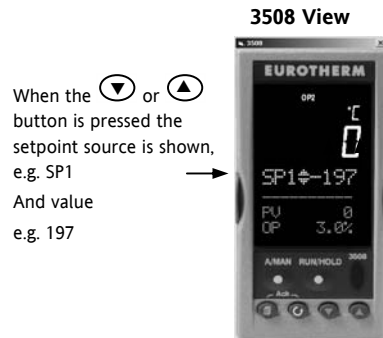
To change the value, press \blacktriangledown or \blacktriangle . The output level shown in the HOME display will change to indicate the source of the setpoint while either of the buttons is pressed, in this example SP 1.



When the \blacktriangledown or \blacktriangle button is pressed the setpoint source is shown, e.g. SP1
And value e.g. 142

Press and hold \blacktriangledown to lower the setpoint

Press and hold \blacktriangle to raise the setpoint



When the \blacktriangledown or \blacktriangle button is pressed the setpoint source is shown, e.g. SP1
And value e.g. 197

Press and hold \blacktriangledown to lower the setpoint

Press and hold \blacktriangle to raise the setpoint

To change Loop 2 setpoint, press \blacklozenge . Loop 2 SP value is preceded by \blacklozenge . Press \blacktriangledown or \blacktriangle as above to change the value. The action is then the same as for loop 1. A momentary press of either button will show the setpoint in use eg SP1.

The new setpoint is accepted when either \blacktriangledown or \blacktriangle is released and is indicated by a brief flash of the setpoint display

If a single loop is configured (or the individual loop summary is selected – see section 3.8.4) pressing \blacktriangledown or \blacktriangle will change the setpoint in the same way as described above.

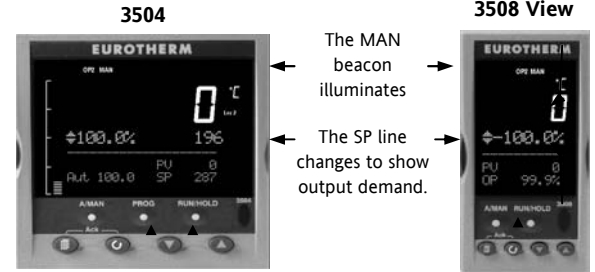
3.6 To Select Manual Operation



Press (A/MAN) button.

If two loops are enabled and the dual loop overview is being displayed, pressing the A/MAN button will toggle loop 1 between Auto and Manual. The beacon 'MAN' will light and the indication of output power is preceded by ∇ .

Press and hold ∇ or \blacktriangle to decrease or increase the output power.



The output power will change continuously while either ∇ or \blacktriangle is pressed

To switch loop 2 between Auto and Manual, press \odot to scroll into the loop 2 section, then press A/MAN.



If loop 1 overview is being displayed, press the A/MAN button to toggle loop 1 between Auto and Manual.

If loop 2 overview is being displayed, press the A/MAN button to toggle loop 2 between Auto and Manual.

If any other overview is being displayed, the first press of the A/MAN button will select the dual loop overview and the action is as described above.

\odot Tip: Summary pages may be disabled in configuration level. If none of the above summary pages are enabled:-

- For a dual loop controller, Auto/Manual cannot be selected.
- If loop 1 is enabled and loop 2 disabled, pressing A/MAN toggles Auto/Manual for loop 1.
- If loop 2 is enabled and loop 1 disabled, pressing A/MAN toggles Auto/Manual for loop 2.


\odot Tip: For a single loop controller, Auto/Manual will apply regardless of whether summary pages are enabled or not.

\odot Tip: If the controller is switched off in either Auto or Manual it will resume the same mode when powered up again.

3.7 Alarm Indication

If an alarm occurs it is indicated as follows:-

The red alarm (ALM) beacon in the top left of the display flashes

Alarm number is indicated together with the flashing 

A default or pre-programmed message appears showing the source of the alarm

Invitation to acknowledge the new alarm



3.7.1 To Acknowledge an Alarm

Press  and  (Ack) together.

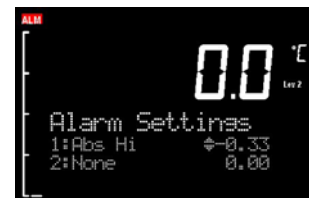
The action, which now takes place, will depend on the type of latching configured

Non Latched Alarms

If the alarm condition is present when the alarm is acknowledged, the alarm beacon will be continuously lit. This state will continue for as long as the alarm condition remains. When the alarm condition disappears the indication will also disappear.

If a relay has been attached to the alarm output, it will de-energise when the alarm condition occurs and remain in this condition until the alarm is acknowledged **AND** it is no longer present.

If the alarm condition disappears before it is acknowledged the alarm indication disappears at the same time.



Automatic Latched Alarms

The alarm continues to be active until both the alarm condition is removed AND the alarm is acknowledged. The acknowledgement can occur **BEFORE** the condition causing the alarm is removed.

Manual Latched Alarms

The alarm continues to be active until both the alarm condition is removed AND the alarm is acknowledged. The acknowledgement can only occur **AFTER** the condition causing the alarm is removed.

3.7.2 Sensor Break Indication

An alarm condition (**Sbr**) is indicated if the sensor or the wiring between sensor and controller becomes open circuit or the input is over-range. The message 'Sbreak' is shown in the message centre together with the source of the sensor connection. This may be 'PVIinput' or 'Modx' if an analogue module is fitted.


For a resistance thermometer input, sensor break is indicated if any one of the three wires is broken.

For mA input sensor break will not be detected due to the load resistor connected across the input terminals.

For Volts input sensor break may not be detected due to the potential divider network connected across the input terminals.

3.8 Summary Pages

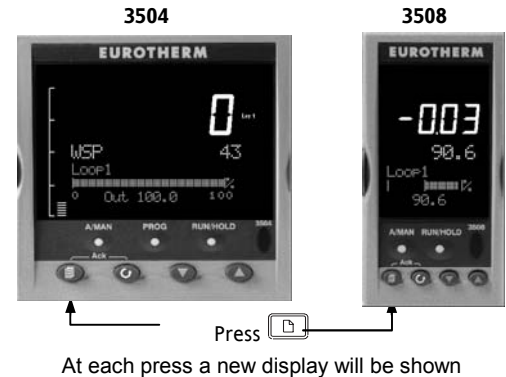
The lower section of the HOME display contains an alpha-numeric message centre. These messages change between different controller types and operating modes and are grouped in summary pages. In addition, each page may be turned on or off in configuration level but, in this section, all possible summary pages are listed. Because of its larger display area the 3504 generally shows more detail than that shown in 3508.

Press  to scroll through a set of pre-defined summary pages. These are typically a summary of programmer, loops and alarm operation. The views shown in this section are typical and may vary from controller to controller.

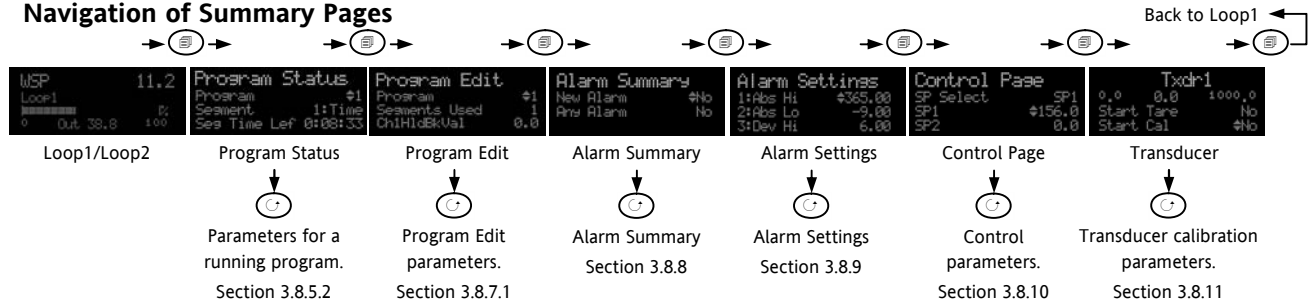
A further eight customised pages and the operating level in which the summary pages are shown can be configured using iTools programming software⁽¹⁾.

A timeout may be set in configuration level ⁽¹⁾ after which the display reverts to the normal HOME display.

(1) see Engineering Handbook, Part No HA027988 which can be downloaded from www.eurotherm.com.




3.8.1 Navigation of Summary Pages



3.8.2 How to Edit Parameters

In any of the summary pages, press  to scroll to further parameters (where applicable).




Press  or  to change the value of the parameter selected.

Any parameter preceded by  is alterable provided the system is in a safe state to allow the parameter to be changed. For example, 'Program Number' cannot be changed if the program is running - it must be in 'Reset' or 'Hold' mode. If an attempt is made to alter the parameter its value is momentarily replaced by '---' and no value is entered.

3.8.3 Access Level 2

Some parameters are protected under a higher level of security – Level 2. In these cases it will be necessary to select 'Access Level 2'. This is carried out as follows:-



1. Press and hold  until the display shows
2. Press  to select Level 2
3. Press  again to enter a security code. This is defaulted to 2. If an incorrect code is entered the display reverts to that shown in 1 above. If the default of 2 is not accepted this means that the code has been changed on your particular controller. It will be necessary to refer to the Engineering Handbook.

'Pass' is displayed momentarily. You are now in Level 2.

3.8.4 Loop Summary

If the selected loop is in Auto the current setpoint value is shown together with the current value of the output power demand shown both as a value and graphically.



If the loop is in Manual mode only the output demand is shown.

If the loop is configured for channel 1 and channel 2, for example, **heat/cool**, the bar graph is bi-directional (+ 100%) as shown:-



If the controller is configured for **valve position** control the user interface will display either heat only or heat/cool summary pages.

Press  again to display a summary for Loop 2.

If both loops are configured the display in section 3.3 is shown.

3.8.5 Program Status Summary

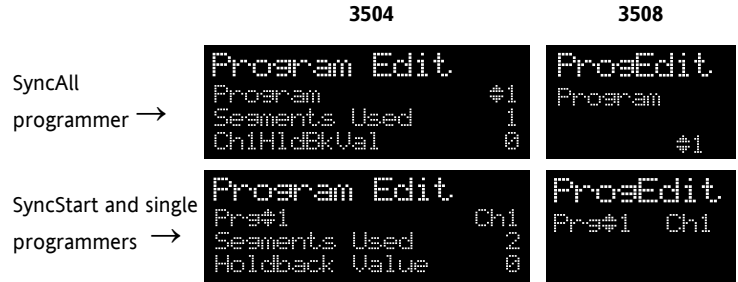
From this page you can select to, Run, Reset or Hold a program and inspect the status of a running program.

It is only shown if the Programmer option has been ordered and enabled.

A programmer varies the rate of change of setpoint and allows a profile to be set up and run.




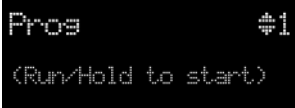







Two program channels are available which can be

run as two separate programmers or as a pair. As a pair they may be configured as **'SyncStart'** where the each programme is synchronised to start at the same time or **'SyncAll'** in which the program automatically synchronises at the end of every segment. Alternatively, only a single program may be run. Up to 50 programs and up to a maximum of 500 segments can be stored and run. Setpoint programming is explained in detail in the 3500 Engineering Manual HA027988.



3.8.5.1 To Select and Run a Program

This example assumes the program to be run has already been entered. To set up or edit a program, see section 3.8.6.


| Action | Do This | The Display You Should See | Additional Notes |
|---|--|---|--|
| Select a Program to run | 1. Press  2. Press  or  to choose the program number to be run |  | In this example Program Number 1 is selected. It may also have a user defined name. In the 3504 Program names can be entered using the off-line programming package 'iTools' |
| Run the selected program | 3. Press  again |  | If a delayed start has been configured the program will start to run after the delay period set.. The 'RUN' beacon is illuminated at the top of the display. The view shown here shows program being run, segment number and type and time left to complete this segment. |
| Select parameters of an operating program | 4. Press  repeatedly to scroll through parameters as listed in the table in section 3.8.5.2. |  | These show current value of channel 1 setpoint and current value of channel 2 setpoint. The target value of channel 1 is also shown. |
| Hold a program | 5. Press  | | Press  again to continue the program. When the program is complete 'RUN' will flash |
| Reset a program | 6. Press and hold  for at least 3 seconds | | 'RUN' will extinguish and the controller will return to the HOME display shown in section 3.3. |

Alternatively, run, hold or reset a program by scrolling to 'Program Status' using  and select 'Run', 'Hold' or 'Reset' using  or .

The  button (3504 only) provides a short cut to the Program Status page from any view.

3.8.5.2 To Inspect/Change the Status of a Running Program

The table in this section lists parameters associated with a program currently in operation. These parameters may be used to inspect the status of the program such as which segment is in operation, time left, etc. In some cases, as stated in the table, the parameter values may be changed.

From the Program Status page, press  to scroll through a list of parameters. These are:-



```

Program Status
Program          #1
Segment         1:Time
Seg Time Left  0:08:21
  
```

| Parameter Name | Parameter Description | Value | | Default | Available in Level |
|------------------|---|--------------------------------|---|---------|---------------------------------|
| Program | Program number (and name if this has been configured) | 1 to max number of programs | | 1 | L1 Alterable when prog in reset |
| Segment | Segment number (and type on 3504) Only appears when the programmer is running | 1 to max number of segments | | | Read only |
| Seg Time Left | Segment Time Left Only appears when the programmer is running | hrs:mins:secs | | | Read only |
| Delayed Start | Program will run after a set time has elapsed. Only shown if delayed start has been configured. | 0:00 to 499:99 | | 0:00 | L1 if configured |
| Status | Program Status. Note, the program can be run or held from this parameter as well as using the Run/Hold button. | End Run Hold Holdback | Prog ended Prog running Prog held In holdback ⁽¹⁾ | | L1 |
| Ch1 PSP (or PSP) | Profile setpoint value channel 1 | | | | L1 Can be changed in Hold |
| Ch2 PSP | Profile setpoint value channel 2 | | | | |

| Parameter Name | Parameter Description | Value | Default | Available in Level |
|------------------------------------|--|---|---------|--------------------|
| Fast Run | This allows the program to be run at a fast rate and may be used for testing the program. It can only be selected before the program is run. | No/Yes | No | L1 |
| Rst UsrVal | User value to be used in reset state. Defines the value for 'UsrValOP'. In segments that specify 'PVEvent', 'UsrValOP' is set to this value Only appears when the program is in reset mode. | | | |
| Ch1 Seg Target (or Segment Target) | Requested setpoint at end of segment | | | |
| Ch2 Seg Target | | | | |
| Seg. Duration (or Segment Rate) | Segment time – Time to Target programmer Rate of change of SP – Ramp Rate programmer | | | |
| Cur. Seg Type | Single programmer only | | | |
| Cycles Left | Number of repeat cycles left to run Can only be changed in Hold or Reset | 1 to maximum number of cycles set | | L1 R/O in Run |
| Events or Rst Events | State of the event outputs when the program is running or when in reset | <input type="checkbox"/> Event inactive <input checked="" type="checkbox"/> Event active | | |
| PrgTimeLeft | Time remaining to end of selected program | hrs:mins:secs | | |
| GoBackCyclesLeft ⁽²⁾ | This parameter displays the number of cycles left if Go Back is configured and active | 1 to maximum number of cycles set | | |

(1):- Holdback

Holdback freezes the program if the process value (PV) does not track the setpoint (SP) by more than a user defined amount. The instrument will remain in HOLDBACK until the PV returns to within the requested deviation from setpoint. The display will flash the HOLD beacon.

In a **Ramp** it indicates that the PV is lagging the SP by more than the set amount and that the program is waiting for the process to catch up.

In a **Dwell** it freezes the dwell time if the difference between the SP and PV exceeds the set limits.

In both cases it maintains the correct dwell period for the product. A more detailed description of Holdback is given in the 3500 Engineering Handbook which may be downloaded from www.eurotherm.com.

In addition to the usual PV Holdback, Holdback is also the state when synchronisation is taking place.

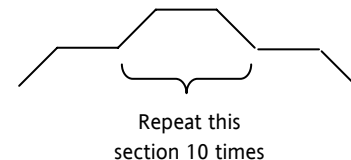
- For a SyncAll programmer, this occurs if Holdback has caused one PSP to be held back while the other has progressed to completion.
- For a SyncStart programmer, this occurs when Ch1/2 is waiting for the other channel.

In both models, it occurs when a Wait segment has been configured and is active. When one channel has reached the end of the first cycle and is waiting for the other channel to complete its first cycle. Both channels will start cycle 2 only when they have both completed. (Implied Sync point at the end of each cycle).

(2):- GoBack

'Go Back' allows segments in a program to be repeated a set number of times. It is useful where it is required to cycle a part of a program within an overall program as illustrated and makes best usage of the number of segments available.

For example, the simple program illustrated uses 7 segments. If it were to use individual segments it would use $10 \times 3 + 4 = 34$ segments. It would also take longer to set up. Further details can be found in Engineering Handbook, Part No HA027988



3.8.6 Program Edit Summary

Allows the program to be created or edited.

Note:- For a SyncStart programmer it is possible to select between Channel 1 and Channel 2.

SyncAll programmer →

```

3504
Program Edit
Program          #1
Segments Used    1
Ch1HldBkVal     0
    
```

3508

```

Program Edit
Program          #1
    
```

SyncStart and single programmers →

```

3504
Program Edit
Pr#1             Ch1
Segments Used    2
Holdback Value   0
    
```




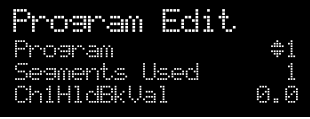



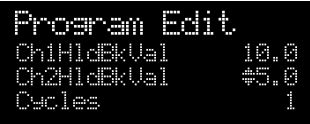
```













Program Edit
Pr#1            Ch1
    
```




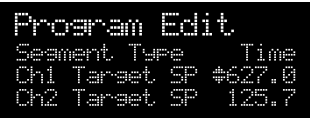











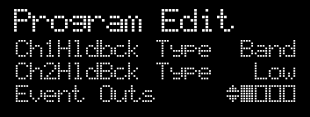
3.8.7 To Create or Edit a Program

A program can be edited in any level. A summary of the Edit Page is given here but for a full description refer to Chapter 22 in the Engineering Manual HA027988. A program may be only edited when it is in Reset or Hold. The views below are taken for a SyncAll programmer.

From the Program Edit summary page:-

| Action | Do This | The Display You Should See | Additional Notes |
|--|--|---|---|
| Select a Program to edit | <ol style="list-style-type: none"> 1. Press  to select 'Program' 2. Press  or  to choose the program number. |  | <p>In this example Program Number 1 is selected. It may also have been given a user defined name.</p> <p>In the 3504 Program names can be entered using the off-line programming package 'iTools'.</p> <p>'Segments Used' is a read only parameter.</p> |
| Set up the value at which holdback becomes operative | <ol style="list-style-type: none"> 3. Press  again to select 'Ch1/2HldBkVal'. 4. Press  or  to choose the holdback value for ch1/2. |  | <p>See previous page for a description of holdback.</p> |

| Action | Do This | The Display You Should See | Additional Notes | | | | | | | | | | | | | | | | |
|--|---|---|--|------|----------------------|------|----------------|-------|---------------------|------|-----------------------|------|--------------------|--------|----------------------|------|--------------------|-----|---------------|
| Set up the number of times a program is repeated | <p>5. Press  again to select 'Cycles'.</p> <p>6. Press  or  to choose the number of repeat cycles.</p> |  | <p>The complete program may be run once or repeated up to 999 times.</p> <p>In this example the program will be repeated six times.</p> | | | | | | | | | | | | | | | | |
| Set up or edit a segment | <p>7. Press  to select 'Segment'</p> <p>8. Press  or  to choose the segment number</p> |  | <p>Up to 50 segments are available in any one program.</p> | | | | | | | | | | | | | | | | |
| Set up the segment type | <p>9. Press  to select 'Segment Type'</p> <p>10. Press  or  to choose the segment type</p> |  | <p>The following choices are available, depending on programmer type. For example SyncAll offers Wait, Time and End only:-</p> <table border="1"> <tbody> <tr> <td>Rate</td> <td>Rate of change of SP</td> </tr> <tr> <td>Time</td> <td>Time to target</td> </tr> <tr> <td>Dwell</td> <td>Soak at constant SP</td> </tr> <tr> <td>Step</td> <td>Step change to new SP</td> </tr> <tr> <td>Wait</td> <td>Wait for condition</td> </tr> <tr> <td>GoBack</td> <td>Repeat previous segs</td> </tr> <tr> <td>Call</td> <td>Insert new program</td> </tr> <tr> <td>End</td> <td>Final segment</td> </tr> </tbody> </table> | Rate | Rate of change of SP | Time | Time to target | Dwell | Soak at constant SP | Step | Step change to new SP | Wait | Wait for condition | GoBack | Repeat previous segs | Call | Insert new program | End | Final segment |
| Rate | Rate of change of SP | | | | | | | | | | | | | | | | | | |
| Time | Time to target | | | | | | | | | | | | | | | | | | |
| Dwell | Soak at constant SP | | | | | | | | | | | | | | | | | | |
| Step | Step change to new SP | | | | | | | | | | | | | | | | | | |
| Wait | Wait for condition | | | | | | | | | | | | | | | | | | |
| GoBack | Repeat previous segs | | | | | | | | | | | | | | | | | | |
| Call | Insert new program | | | | | | | | | | | | | | | | | | |
| End | Final segment | | | | | | | | | | | | | | | | | | |

| Action | Do This | The Display You Should See | Additional Notes |
|---|--|---|---|
| Set up the value of SP required at the end of the segment | 11. Press  to select 'Target SP' for Ch1 and Ch2. 12. Press  or  to choose the value |  | This can be set within the limits of the controller range |
| Set up the segment time | 13. Press  to select 'Duration'. 14. Press  or  to choose the value |  | In this example channel 1 will change from its current value to 627.0 in 5 hours 2 minutes. Channel 2 will change from its current value to 125.7 in the same time period. |
| Set up 'Holdback Type' | 15. Press  to select 'Ch1/2HldBck Type'. 16. Press  or  to choose the value |  | Deviation between SP and PV at which the program is put into a hold condition to wait for the PV to catch up. Only appears if configured. |
| Set up which events operate in the segment | 17. Press  to select 'Event Outs'. 18. Press  or  to turn the event on or off. |  | In this example 4 events have been configured (see Engineering handbook). The first event (which may be wired to a relay output) will be operative during the chosen segment. |

Repeat the above procedure for further segments required in the program. The final segment should be configured as 'End' You can then set up the action required at the end of the program. This may be 'Dwell', 'Reset' or 'SafeOP'.

Further parameters are available in deeper levels of access and are explained in the Engineering Manual HA027988.

3.8.7.1 Program Edit Summary Parameters


The table below shows a list of all possible parameters which may be set up in operator levels 1 and 2 using the procedure in the above example. Parameters only appear in the controller if the relevant option has been configured. Further details are provided in the Engineering Handbook HA027988.

| Para Name | Parameter Description | Value | |
|---------------|--|-----------------------------|--------------------------------------|
| Program | Program number (and name if this has been configured) | 1 to max number of programs | |
| Segments Used | Displays the number of segments in the program. This value automatically increments each time a new segment is added | 1 to max number of segments | |
| Ch1HldBkVal | Channel 1 holdback value | 0 to 99999 | |
| Ch2HldBkVal | Channel 2 holdback value | 0 to 99999 | |
| Cycles | Number of times the whole program repeats | Cont 1 to 999 | Continuous Repeats 1 to 999 times |
| Segment | To select the segment number | 1 to 50 | |
| Segment Type | Defines the type of segment. The type of segment varies depending on whether the program is Single, SyncAll or SyncStart. Call only available in single programmer Rate, Dwell, Step not available in SyncAll programmer | Rate | Rate of change of SP |
| | | Time | Time to target |
| | | Dwell | Soak at constant SP |
| | | Step | Step change to new SP |
| | | Wait | Wait for condition |
| | | GoBack | Repeat previous segs |
| | | Call | Insert new program |
| | | End | Final segment |
| Target SP | Value of SP required at the end of the segment. For a dual channel controller, channel 1 and channel 2 can be set independently. | Range of controller | |
| Ramp Rate | Rate of change of SP. Only shown if the Segment Type = Rate. | Units/sec, min or hour | |

| Para Name | Parameter Description | Value | |
|---------------|--|---|---|
| Holdback Type | Deviation between SP and PV at which the program is put into a hold condition to wait for the PV to catch up. Only appears if configured | Off Low High Band | No holdback PV<SP PV>SP PV<>SP |
| PV Event | To set the analogue PV event in the selected segment. If PV Event ≠ None it is followed by 'PV Threshold' which sets the level at which the event becomes active. Only appears if configured | None Abs Hi Abs Lo Dev Hi Dev Lo Dev Band | No PV Event Absolute high Absolute low Deviation high Deviation low Deviation band |
| Time Event | To allow an On Time and an Off Time to be set in the first program event output. If set to 'Event1' an On time parameter and an Off Time parameter follow. Only appears if configured | Off Event1 | |
| UsrVal | Sets the value of an analogue signal which can be used in the segment. Only appears if configured. Using iTools configuration package, it is possible to give this parameter an 8 character name. | Controller range | |
| PID Set | To select the PID set most relevant to the segment. Only appears if configured | Set1, Set2, Set3 | |
| Event Outs | Defines the state of up to eight digital outputs. The number of event outputs can be configured in configuration level or using iTools as described in the Engineering Manual. Only the number of events configured are shown. | □□□□□□□□ to ■■■■■■■■ or τ□□□□□□□□ to ■■■■■■■■ τ = Time event: □ = event off; ■ = event on | |
| Duration | Time for a Dwell or Time segment. Only shown if Segment Type = Time. | 0:00:00 to 500.00 secs, mins or hours | |

| Para Name | Parameter Description | Value | |
|---------------|---|--|---|
| GSoak Type | Applies a guaranteed soak in a Dwell segment. If configured is followed by a G.Soak Value | Off, Low, High, Band | |
| End Type | Defines the action to be taken at the end of the program | Dwell | Continue at current SP |
| | | SafeOP | Go to a defined level |
| | | Reset | Reset to start of prog |
| Wait For | Only appears if the segment is set as Wait. Defines the condition that the program should wait for. | PrgIn1 | The first four parameters are digital values which can be wired to suitable sources |
| | | PrgIn2 | |
| | | PrgIn1n2 | |
| | | PrgIn1or2 | |
| | | PVWaitIP | Analogue wait value |
| PV Wait | Only appears if 'PVWaitIP' is configured and defines the type of alarm which can be applied. If this parameter is configured it is followed by 'Wait Val' which allows the trip level to be set for the condition to become true | Ch2Sync | A Ch2 segment input |
| | | None | No wait |
| | | Abs Hi | Absolute high |
| | | Abs Lo | Absolute low |
| | | Dev Hi | Deviation high |
| | | Dev Lo | Deviation low |
| GoBack Seg | Only appears if the segment type is 'GoBack'. It defines the segment to return to to repeat that part of the program | Dev Band | Deviation band |
| | | 1 to the number of segments defined | |
| GoBack Cycles | Sets the number of times the chosen section of the program is repeated | 1 to 999 | |
| Call Program | Only applies to single program and only if the segment is 'Call'. Enter the program number to be inserted in the segment | Up to 50 (current program number excluded) | |
| Call Cycles | Defines the number of times the called program repeats | Cont | Continuous |
| | | 1 to 999 | Once to 999 times |

3.8.8 Alarm Summary


Press  to scroll through the alarms.

A New Alarm occurs when any new alarm becomes active. This parameter may be used to activate a relay output to provide external audible or visual indication.

Parameters available are:-

New Alarm Shows 'Yes' when any new alarm occurs (read only)

Any Alarm Shows 'Yes' when any alarm is active (read only)

Ack All? Press  or  to acknowledge all alarms

AnaAlm 1 Shows 'Yes' when analogue alarm 1 is active (read only)

AnAlm1 Ack Press  or  to acknowledge analogue alarm 1

The above two parameters are repeated for all analogue alarms which have been configured (up to 8)

DigAlm 1 Shows 'Yes' when digital alarm 1 is active (read only)

DgAlm1 Ack Press  or  to acknowledge digital alarm 1

The above two parameters are repeated for all digital alarms which have been configured (up to 8)




```
Alarm Summary
New Alarm      #No
Any Alarm      No
```



```
Alm Smary
New Alarm
#No
```

3.8.9 Alarm Settings Summary

All configured analogue alarms (up to eight) will be listed.

Press  to scroll through the alarms.

Press  or  to set the threshold values



```
Alarm Settings
1:Abs HI      #365.00
2:Abs Lo      -9.00
3:Dev HI      6.00
```



```
Alm Sets
1: #365.00
2: -9.00
3: 6.00
```

3.8.10 Control Summary

A Control Summary page is available for both channels. Here you can select and adjust parameters which define the operation of the loops.

On the Control Summary page the following parameters are available:-

```
Control Page
SP Select      SP1
SP1            #156.0
SP2            0.0
```

```
Control
SP            #SP1
SP1          155.6
SP2           0.0
```

| Parameter Name | Parameter Description | Value | Default | Availability |
|----------------|--|---|---------------|---|
| SP Select | To select SP1 or SP2 | Between range limits set in higher levels of access | As order code | Lev1 |
| SP1 | To set the value of SP1 | | | Lev1 |
| SP2 | To set the value of SP2 | | | Lev1 |
| SP Rate | To set the rate at which the setpoints change | | | Lev 1 alterable in Lev2 |
| Tune* | To start self tuning (Level 2 only). When set to 'On' auto-tuning is started. Auto tune sets the 3 term control parameters PB, Ti, Td, CBH, CBL and R2G. A full description is given in the Engineering Handbook HA027988. | Off, On | Off | * Parameter does not appear if control is configured for On/Off |
| PB* | To set proportional band | 0 to 99999 | | |
| Ti* | To set integral time | Off to 99999 | | |
| Td* | To set derivative time | Off to 99999 | | |
| R2G* | To set relative cool gain | 0.1 to 10.0 | | |
| CBH* | To set cut back high | Auto to 99999 | | |
| CBL* | To set cut back low | Auto to 99999 | | |
| OP Hi | To set a high limit on the control output | -100.0 to 100.0% | 100.0 | |
| OP Lo | To set a low limit on the control output | -100.0 to 100.0% | 0.0 | |
| Ch1 OnOff Hyst | Channel 1 hysteresis (Only if configured and for On/Off control) | 0.0 to 200.0 | 10 | |
| Ch2 OnOff Hyst | Channel 2 hysteresis (Only if configured and for On/Off control) | | | |

| Parameter Name | Parameter Description | Value | Default | Availability |
|----------------|--|----------------------|---------|-----------------------------|
| Ch2 DeadB | Channel 2 deadband. To set the period in which there is no output from either channel. (This does not appear if channel 2 is not configured) | Off to 100.0 | | Lev 1- alterable in Lev2 |
| Ch1 TravelT | Motor travel time if valve control output on channel 1 | 0.0 to 1000.0 sec | | |
| Ch1 TravelT | Motor travel time if valve control output on channel 1 | 0.0 to 1000.0 sec | | |
| Safe OP | To set an output level under sensor break conditions | -100.0 to 100.0% | 0.0 | |

3.8.11 Transducer Summary

This display is only shown if the Transducer option has been enabled.

For further details see the 3500 Engineering Manual HA027988.

On the Transducer Summary page the following parameters are available if 'Calibration Enable' has been set to 'Yes' in configuration level:-



| Para Name | Parameter Description | Value | | Default | Availability |
|--------------|--|--------------------------------------|-----------------------------|---------|-------------------------|
| Start Tare | Set to 'Yes' to automatically calculate tare weight | No/Yes | | No | Lev1 or 2 |
| Start Cal | Starts the calibration process. For Load Cell or Comparison calibration 'Start Cal' starts the first calibration point | No Yes | Start calibration | No | Lev1 or 2 |
| Start Hi Cal | For Load Cell or Comparison calibration this starts the second calibration point. | No Yes | Start high calibration | No | Lev1 or 2 |
| Cal Status | Indicates the progress of calibration | Idle | No calibration in progress | | Lev 1 or 2 Read only |
| | | Active | Calibration in progress | | |
| | | Passed | Calibration good | | |
| | | Failed | Calibration bad | | |
| Clear Cal | Clears the current calibration | No Yes | Delete previous cal. values | No | Lev 2 |
| Scale Hi | Sets the scaling output high point. Usually the same as 'Input Hi' | Between Scale Lo and maximum display | | | Lev 2 |
| Scale Lo | Sets the scaling output low point. Usually 80% of 'Input Lo' | Between Scale Hi and min display | | | Lev 2 |
| Input Hi | Sets the scaling input high point | Between Input Lo and max display | | | Lev 2 |
| Input Lo | Sets the scaling input low point | Between Input Lo and min display | | | Lev 2 |

Further customised pages may be available if they have been configured.

4. Chapter 4 Safety and EMC Information

This controller is manufactured in the UK by Eurotherm Ltd.

Please read this section carefully before installing the controller

This controller is intended for industrial temperature and process control applications when it will meet the requirements of the European Directives on Safety and EMC. If the instrument is used in a manner not specified in this manual, the safety or EMC protection provided by the instrument may be impaired. The installer must ensure the safety and EMC of any particular installation.

4.1 GENERAL

The information contained in this manual is subject to change without notice. While every effort has been made to ensure the accuracy of the information, your supplier shall not be held liable for errors contained herein.

4.1.1 Safety

This controller complies with the European Low Voltage Directive 73/23/EEC, by the application of the safety standard EN 61010.

4.1.2 Electromagnetic compatibility

This controller conforms with the essential protection requirements of the EMC Directive 89/336/EEC, by the application of appropriate product specific international standards. This instrument satisfies the general requirements of the commercial and industrial environments defined in EN 61326. For more information on product compliance refer to the Technical Construction File.

4.1.3 Unpacking and storage

The packaging should contain an instrument mounted in its sleeve, two mounting brackets for panel installation and an Installation & Operating guide. Certain ranges are supplied with an input adapter.

If on receipt, the packaging or the instrument are damaged, do not install the product but contact your supplier. If the instrument is to be stored before use, protect from humidity and dust in an ambient temperature range of -10°C to +70°C.

4.2 Service and repair

This controller has no user serviceable parts. Contact your supplier for repair.

4.2.1 **Caution: Charged capacitors**

Before removing an instrument from its sleeve, disconnect the supply and wait at least two minutes to allow capacitors to discharge. It may be convenient to partially withdraw the instrument from the sleeve, then pause before completing the removal. In any case, avoid touching the exposed electronics of an instrument when withdrawing it from the sleeve.

Failure to observe these precautions may cause damage to components of the instrument or some discomfort to the user.

4.2.2 Electrostatic discharge precautions

When the controller is removed from its sleeve, some of the exposed electronic components are vulnerable to damage by electrostatic discharge from someone handling the controller. To avoid this, before handling the unplugged controller discharge yourself to ground.

4.2.3 Cleaning

Do not use water or water based products to clean labels or they will become illegible. Isopropyl alcohol may be used to clean labels. A mild soap solution may be used to clean other exterior surfaces of the product.

4.3 Installation Safety Requirements

4.3.1 Safety Symbols

Various symbols are used on the instrument, they have the following meaning:



Caution (refer to the accompanying documents



Protective Conductor Terminal

4.3.2 Personnel

Installation must only be carried out by suitably qualified personnel.

4.3.3 Enclosure of live parts

To prevent hands or metal tools touching parts that may be electrically live, the controller must be installed in an enclosure.

4.3.4 **Caution: Live sensors**

The controller is designed to operate with the temperature sensor connected directly to an electrical heating element. However, you must ensure that service personnel do not touch connections to these inputs while they are live. With a live sensor, all cables, connectors and switches for connecting the sensor must be mains rated.

The logic IO is not isolated from the PV inputs and all cables, connectors and switches for connecting the sensor must be mains rated.

4.3.5 Wiring

It is important to connect the controller in accordance with the wiring data given in this guide. Take particular care not to connect AC supplies to the low voltage sensor input or other low level inputs and outputs. Only use copper conductors for connections (except thermocouple inputs) and ensure that the wiring of installations comply with all local wiring regulations. For example in the UK use the latest version of the IEE wiring regulations, (BS7671). In the USA use NEC Class 1 wiring methods.

4.3.6 Power Isolation

The installation must include a power isolating switch or circuit breaker. The device should be mounted in close proximity to the controller, within easy reach of the operator and marked as the disconnecting device for the instrument.

4.3.7 Overcurrent protection

The power supply to the system should be fused appropriately to protect the cabling to the units.

4.3.8 Voltage rating

The maximum continuous voltage applied between any of the following terminals must not exceed 264Vac:

- relay output to logic, dc or sensor connections;
- any connection to ground.

The controller must not be wired to a three phase supply with an unearthed star connection. Under fault conditions such a supply could rise above 264Vac with respect to ground and the product would not be safe.

4.3.9 Conductive pollution

Electrically conductive pollution must be excluded from the cabinet in which the controller is mounted. For example, carbon dust is a form of electrically conductive pollution. To secure a suitable atmosphere, install an air filter to the air intake of the cabinet. Where condensation is likely, for example at low temperatures, include a thermostatically controlled heater in the cabinet.

This product has been designed to conform to BSEN61010 installation category II, pollution degree 2. These are defined as follows:-

4.3.10 Installation Category II

The rated impulse voltage for equipment on nominal 230V supply is 2500V.

4.3.10.1 Pollution Degree 2

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

4.3.11 Grounding of the Temperature Sensor Shield

In some installations it is common practice to replace the temperature sensor while the controller is still powered up. Under these conditions, as additional protection against electric shock, we recommend that the shield of the temperature sensor is grounded. Do not rely on grounding through the framework of the machine.

4.3.12 Over-Temperature Protection

When designing any control system it is essential to consider what will happen if any part of the system should fail. In temperature control applications the primary danger is that the heating will remain constantly on. Apart from spoiling the product, this could damage any process machinery being controlled, or even cause a fire.

Reasons why the heating might remain constantly on include:

- the temperature sensor becoming detached from the process
- thermocouple wiring becoming short circuit;
- the controller failing with its heating output constantly on
- an external valve or contactor sticking in the heating condition
- the controller setpoint set too high.

Where damage or injury is possible, we recommend fitting a separate over-temperature protection unit, with an independent temperature sensor, which will isolate the heating circuit.

Please note that the alarm relays within the controller will not give protection under all failure conditions.

4.4 Installation Requirements for EMC

To ensure compliance with the European EMC directive certain installation precautions are necessary as follows:

- For general guidance refer to EMC Installation Guide, HA025464.
- When using relay outputs it may be necessary to fit a filter suitable for suppressing the conducted emissions. The filter requirements will depend on the type of load. For typical applications we recommend Schaffner FN321 or FN612.
- If the unit is used in table top equipment which is plugged into a standard power socket, then it is likely that compliance to the commercial and light industrial emissions standard is required. In this case to meet the conducted emissions requirement, a suitable mains filter should be installed. We recommend Schaffner types FN321 and FN612.

4.4.1 Routing of wires

To minimise the pick-up of electrical noise, the low voltage DC connections and the sensor input wiring should be routed away from high-current power cables. Where it is impractical to do this, use shielded cables with the shield grounded at both ends. In general keep cable lengths to a minimum.

5. Chapter 5 Technical Specification

All figures quoted at an ambient temperature from 0 to 50°C unless otherwise stated.

5.1 Control Options

| | |
|-------------------------|--|
| No. of Loops | 2 |
| Control Loops | On/Off, single PID |
| Control Outputs | Analogue, Time proportioned or Motorised Valve control with or without feedback. |
| Cooling Algorithms | Linear, Water, Fan, Oil |
| Auto/Manual Control | Bumpless transfer or forced manual output. |
| Setpoint rate Limit | Off to 9999.9 engineering units per minute |
| Motorised Valve Control | Valve Position bounded or unbounded. Individual Valve Positions for heat and cool |
| Tuning | One-shot Auto tune or Manual. |
| Loop Alarms | High absolute, Low absolute, Deviation high, Deviation low, Deviation band, All with separate hysteresis. |
| Application Specific | Humidity control, carbon potential |

5.2 Display

| | |
|------------|--|
| 3504 | Primary Large 5 digit display, Information centre 16 character header and 3 lines of 20 characters |
| 3508 | Primary Large 4 1/2 digit display, Information centre 8 character header and 3 lines of 10 characters |
| Technology | LCD with yellow/green backlight Red alarm beacon |

5.3 Standard Digital I/O

| | |
|------------------|--|
| Allocation | 2 Off. Not isolated from each other. Not isolated from the PV inputs Logic Bi-directional input/outputs Logic or Contact closure input |
| Digital inputs | Voltage level: input Inactive 0 to 7.3Vdc, Active 10.8V to 24Vdc Contact closure: input active <480ohms, inactive >1200ohms |
| Digital outputs | 18Vdc at 15mA drive capability, 9mA minimum |
| Changeover relay | Contact rating Min Load 1mA at 1V Max Load 2A at 264Vac resistive 1,000,000 operations with addition of external snubber |

5.4 All Analogue and PV Inputs

| | |
|--------------------|---|
| Sample rate | 9Hz (110msec.) |
| Input filtering | OFF to 999.9 seconds of filter time constant (f.t.c.). Default setting is 1.6 seconds |
| User calibration | Both the user calibration and a transducer scaling can be applied. |
| Sensor break | a.c. sensor break on each input (i.e. fast responding and no dc errors with high impedance sources). |
| Ranges | mV, mA, volts -2V to +10V, -1V to +2V or RTD (pt100), pyrometer inputs |
| Thermocouple types | Most linearisations including K, J, T, R, B, S, N, L, PII, C, D, E with linearisation error < $\pm 0.2^{\circ}\text{C}$ |
| CJC | Automatic (internal), external, 0°C, 45°C, 50°C reference blocks |
| General | Resolution (noise free) is quoted as a typical figure with input filter set to the default value = 1.6 second. Resolution generally improves by a factor of two with every quadrupling of filter time constant Calibration is quoted as offset error + percentage error of absolute reading at ambient temperature of 25°C Drift is quoted as extra offset and absolute reading errors per degree of ambient change from 25°C. |

5.5 PV Input

| | | |
|--------------|--|---|
| Accuracy | $\pm 0.1\%$ $\pm 1\text{lSD}$ | |
| Sample rate | 9Hz | |
| Input filter | Off, 0.2s to 60s filter time constant. default setting 1.6s. | |
| 40mV Range | Range | -40mV to +40mV |
| | Resolution | 1.9 μ V (unfiltered) |
| | Measurement noise | 1.0 μ V peak to peak with 1.6s input filter |
| | Linearity error | 0.003% (best fit straight line) |
| | Calibration error | $\pm 4.6\mu\text{V}$ $\pm 0.053\%$ of measurement, at 25C ambient. |
| | Temperature coefficient | $\pm 0.2\mu\text{V}/\text{C}$ $\pm 28\text{ppm}/\text{C}$ of measurement, from 25C ambient. |
| | Input leakage current | $\pm 14\text{nA}$ |
| | Input resistance | 100M Ω |
| 80mV Range | Range | -80mV to +80mV |
| | Resolution | 3.2 μ V |
| | Measurement noise | 3.3 μ V peak to peak with 1.6s input filter. |
| | Linearity error | 0.003% (best fit straight line) |
| | Calibration error | $\pm 7.5\mu\text{V}$ $\pm 0.052\%$ of measurement, at 25C ambient. |
| | Temperature coefficient | $\pm 0.2\mu\text{V}/\text{C}$ $\pm 28\text{ppm}/\text{C}$ of measurement, from 25C |
| | Input leakage current | $\pm 14\text{nA}$ |
| | Input resistance | 100M Ω |
| 2V Range | Range | -1.4V to +2.0V |
| | Resolution | 82 μ V |
| | Measurement noise | 90 μ V peak to peak with 1.6s input filter |
| | Linearity error | 0.015% (best fit straight line) |
| | Calibration error | $\pm 420\mu\text{V}$ $\pm 0.044\%$ of measurement, at 25C ambient. |

| | | |
|--------------|---------------------------|---|
| | Temperature coefficient | $\pm 125\mu\text{V}/\text{C}$ $\pm 28\text{ppm}/\text{C}$ of measurement, from 25C ambient. |
| | Input leakage current | $\pm 14\text{nA}$ |
| | Input resistance | 100M Ω |
| 10V Range | Range | -3.0V to +10V |
| | Resolution | 500 μV |
| | Measurement noise | 550 μV peak to peak with 1.6s input filter. |
| | Linearity error | 0.007% for zero source resistance (best fit straight line) Add 0.003% for each 10 Ω of source + lead resistance |
| | Calibration error | $\pm 1.5\text{mV}$ $\pm 0.063\%$ of measurement, at 25C ambient. |
| | Temperature coefficient | $\pm 66\mu\text{V}/\text{C}$ $\pm 60\text{ppm}/\text{C}$ of measurement, from 25C ambient. |
| | Input resistance | 62.5k Ω to 667k Ω depending on input voltage. |
| PT100 | Range | 0 to 400 Ω (-200C to +850C) |
| | Resolution | 50mC |
| | Measurement noise | 50mC peak to peak with 1.6s input filter. |
| | Linearity error | 0.033% (best fit straight line) |
| | Calibration error | $\pm 310\text{mC}$ $\pm 0.023\%$ of measurement in C, at 25C ambient. |
| | Temperature coefficient | $\pm 10\text{mC}/\text{C}$ $\pm 25\text{ppm}/\text{C}$ of measurement in C, from 25C ambient. |
| | Lead Resistance | 0 Ω to 22 Ω , matched lead resistances |
| | Bulb current | 200 μA |
| Thermocouple | Uses 40mV and 80mV ranges | |
| | Types | J, K, L, R, B, N, T, S, PL2 and C |
| | Linearisation error | $\pm 0.2\text{C}$ |
| | Internal Cold Junction | Calibration error $\pm 1.0\text{C}$ at 25C ambient. Ambient rejection ratio 40:1 from 25C ambient. |
| | External Cold Junction | 0C, 45C and 50C. |

5.6 Analogue Input Module

| | |
|-----------------|---|
| mV input | 100mV range - used for thermocouple, linear mV source, or 0-20mA with 2.49Ω external burden resistor. Calibration: $\pm 10\mu\text{V} + 0.2\%$ of reading Resolution: 6μV Drift: $< +0.2\mu\text{V} + 0.004\%$ of reading per °C Input impedance: $>10\text{M}\Omega$, Leakage: $<10\text{nA}$ |
| 0 - 2Vdc input | -0.2V to +2.0V range - used for zirconia. Calibration: $\pm 2\text{mV} + 0.2\%$ of reading Resolution: 30μV Drift: $< \pm 0.1\text{mV} + 0.004\%$ of reading per °C Input impedance: $>10\text{M}\Omega$, Leakage: $<20\text{nA}$ |
| 0 - 10Vdc input | -3V to +10.0V range - used for voltage input. Calibration: $\pm 2\text{mV} + 0.2\%$ of reading Resolution: 200μV Drift: $< \pm 0.1\text{mV} + 0.02\%$ of reading per °C Input impedance: $>69\text{K}\Omega$ |
| Pt100 input | 0 to 400ohms (-200°C to +850°C), 3 matched wires - up to 22Ω in each lead without errors. Calibration: $\pm(0.4^\circ\text{C} + 0.15\%$ of reading in °C) Resolution 0.08°C Drift: $< \pm(0.015^\circ\text{C} + 0.005\%$ of reading in °C) per °C Bulb current: 0.3mA. |
| Thermocouple | Internal compensation: CJC rejection ratio $>25:1$ typical. CJ Temp calibration error $<\pm 2^\circ\text{C}$ at 25° ambient 0°C, 45°C and 50°C external compensation available. |

5.7 Digital Input Modules

| | |
|-----------------|--|
| Module type | Triple contact input, Triple logic input |
| Contact closure | Active <100ohms, inactive >28kohms |
| Logic inputs | Current sinking : active 10.8Vdc to 30Vdc at 2.5mA inactive -3 to 5Vdc at <-0.4mA |

5.8 Digital Output Modules

| | |
|--------------------|--|
| Module types | Single relay, dual relay, single triac, dual triac, triple logic module (isolated) |
| Relay rating | 2A, 264Vac resistive (100mA, 12V minimum) |
| Single Logic drive | 12Vdc at 24mA |
| Triple logic drive | 12V at 9mA per output |
| Triac rating | 0.75A, 264Vac resistive |

5.9 Analogue Output Modules

| | |
|--------------|--|
| Module types | 1 channel DC control, 1 channel DC retransmission (5 max.) and dual channel |
| Range | 0-20mA, 0-10Vdc |
| Resolution | 1 part in 10,000 (2,000-noise free) 0.5% accurate for retransmission 1 part in 10,000 2.5% accurate for control |

5.10 Transmitter PSU

| | |
|-------------|---------------|
| Transmitter | 24Vdc at 20mA |
|-------------|---------------|

5.11 Transducer PSU

| | |
|-------------------------|---|
| Bridge voltage | Software selectable 5 or 10Vdc |
| Bridge resistance | 300 Ω to 15K Ω |
| Internal shunt resistor | 30.1K Ω at 0.25%, used for calibration of 350 Ω bridge at 80% |

5.12 Potentiometer Input

Pot resistance 100Ω to 15KΩ, excitation of 0.5 volts

5.13 Digital communications

Allocation 2 modules fitted in slots H & J (isolated)
Modbus: EIBisynch EIA232, 2 wire or 4 wire EIA485, max baud 19.2KB in H module & 9.6KB in J module
Profibus DP High Speed, EIA485, 1.5Mbaud (**Slot H only**)
Ethernet (Modbus TCP) Modbus TCP at IO Base T - slot H only
DeviceNet Maximum baud rate 500KB - slot H only

5.14 Master communications

Allocation Slot J
Modbus EIA485 4-wire or EIA232
Parameters Single parameter master communications

5.15 Alarms

No of Alarms 8 Analogue, 8 digital. Can be wired to any internal parameter. Sensor break alarms are independent from Analogue Alarms. Digital alarms can be + edge, - edge or edge triggered.
Alarm types Full scale, deviation, sensor break plus application specific
Modes Latching or non-latching, blocking, time delay

5.16 Setpoint programmer

Programmer modes Dual programmer – can be configured as two individual single programmers, synchronised start programmer or synchronise in all segments programmer
Programmer types Time to Target or Ramp Rate
No of programs A maximum of 50 programs. Programs can be given user defined 16 character names
No of segments 500 segments total or 50 maximum per program
Event outputs Up to 8, can be assigned individually to segments or called as part of an event group

5.17 I/O Expander

| | |
|----------------|---|
| 10 I/O version | 4 changeover relays, 6 normally open relay contacts, 10 logic inputs |
| 20 I/O version | 4 changeover relays, 16 normally open relay contacts, 20 logic inputs |

5.18 Advanced functions

| | |
|--------------------|--|
| Timers | 4, On Pulse, Off delay, one shot and min-On |
| Totalisers | 2, trigger level & reset input |
| Counters | 2, up or down counters |
| Real time clock | Day of week and time |
| Application blocks | 24 digital operations 24 analogue operations 2 eight input logic operators, 2 eight input analogue operators 16 user values BCD input Customised input linearisations Mathematical Add, Subtract, Multiply, Divide, Constant, Absolute difference, Maximum, Minimum, Sample and Hold, Input 1 to the power of input 2, Square root, Log(10), Ln, 10 to the power of input 1, i.e. to the power of input 1 Logical AND; OR; XOR; Latch; Equal; Not Equal; Greater than; Less than; Greater than or equal to; Less than or equal to. Humidity Wet and dry bulb technique Multi operator block – minimum, maximum, average and sum |
| Software Tools | iTools Configuration Tool OPC Scope Trending and Data logging iClone Lite Lightweight configuration cloning Graphical Wiring Editor Drag and drop wiring tool, self-documenting View Builder Custom Animation Screens iTools Wizard Question and Answer configuration screens |

5.19 General specification

| | |
|-------------------------------|---|
| Supply | 100 to 240Vac -15%, +10%. 48 to 62Hz. 20 watts max Low voltage supply: 24Vac/dc, -15%, +10% |
| Inrush Current | High Voltage controller – 30A duration 100µs Low Voltage controller – 15A duration 100µs |
| Operating ambient | 0°C - 50°C (32°F to 131°F) and 5 to 95% RH non condensing |
| Storage temp | -10°C to +70°C (14°F to 158°F) |
| Panel sealing | IP65, plug in from front panel |
| Dimensions and weight | |
| 3504 | 96H x 96W x 150D (mm) 0.6kg |
| 3508 | 96H x 48W x 150D (mm) 0.4kg |
| Electromagnetic compatibility | EN61326-1 Suitable for domestic, commercial and light industrial as well as heavy industrial environments. (Class B emissions, Industrial Environment immunity). With Ethernet or DeviceNet module fitted product is only suitable for industrial environments, (class A emissions). |
| Safety standards | EN61010, installation category II (voltage transients must not exceed 2.5kV), pollution degree 2. |
| Atmospheres | Not suitable for use above 2000m or in explosive or corrosive atmospheres |

 This controller meets the European directives on safety and EMC

6. Restriction of Hazardous Substances

| Restriction of Hazardous Substances (RoHS) | | | | | | |
|--|--|-----------------|----|--------------------------|------|------------|
| Product group | | 3500 | | | | |
| Table listing restricted substances | | | | | | |
| Chinese | | | | | | |
| 限制使用材料一览表 | | | | | | |
| 产品 | 有毒有害物质或元素 | | | | | |
| 3500 | 铅 | 汞 | 镉 | 六价铬 | 多溴联苯 | 多溴二苯醚 |
| 印刷线路板组件 | X | O | O | O | O | O |
| 附属物 | O | O | O | O | O | O |
| 显示器 | O | O | O | O | O | O |
| 模块 | X | O | X | O | O | O |
| O | 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006标准规定的限量要求以下。 | | | | | |
| X | 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006标准规定的限量要求。 | | | | | |
| English | | | | | | |
| Restricted Materials Table | | | | | | |
| Product | Toxic and hazardous substances and elements | | | | | |
| 3500 | Pb | Hg | Cd | Cr(VI) | PBB | PBDE |
| PCBA | X | O | O | O | O | O |
| Enclosure | O | O | O | O | O | O |
| Display | O | O | O | O | O | O |
| Modules | X | O | X | O | O | O |
| O | Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006. | | | | | |
| X | Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006. | | | | | |
| Approval | | | | | | |
| Name: | | Position: | | Signature: | | Date: |
| Martin Greenhalgh | | Quality Manager | | <i>Martin Greenhalgh</i> | | 29/12/2007 |

INTERNATIONAL SALES AND SERVICE

AUSTRALIA Sydney

Eurotherm Pty. Ltd.
Telephone (+61 2) 9838 0099
Fax (+61 2) 9838 9288
E-mail info.au@eurotherm.com

AUSTRIA Vienna

Eurotherm GmbH
Telephone (+43 1) 7987 601
Fax (+43 1) 7987 605
E-mail info.at@eurotherm.com

BELGIUM & LUXEMBURG Moha

Eurotherm S.A./N.V.
Telephone (+32) 85 274080
Fax (+32) 85 274081
E-mail info.be@eurotherm.com

BRAZIL Campinas-SP

Eurotherm Ltda.
Telephone (+5519) 3707 5333
Fax (+5519) 3707 5345
E-mail info.br@eurotherm.com

DENMARK Copenhagen

Eurotherm Danmark AS
Telephone (+45 70) 234670
Fax (+45 70) 234660
E-mail info.dk@eurotherm.com

FINLAND Abo

Eurotherm Finland
Telephone (+358) 22506030
Fax (+358) 22503201
E-mail info.fi@eurotherm.com

FRANCE Lyon

Eurotherm Automation SA
Telephone (+33 478) 664500
Fax (+33 478) 352490
E-mail info.fr@eurotherm.com

GERMANY Limburg

Eurotherm Deutschland GmbH
Telephone (+49 6431) 2980
Fax (+49 6431) 298119
E-mail info.de@eurotherm.com

HONG KONG & CHINA

Eurotherm Limited North Point
Telephone (+85 2) 28733826
Fax (+85 2) 28700148
E-mail info.hk@eurotherm.com

Guangzhou Office

Telephone (+86 20) 8755 5099
Fax (+86 20) 8755 5831
E-mail info.cn@eurotherm.com

Beijing Office

Telephone (+86 10) 6567 8506
Fax (+86 10) 6567 8509
E-mail info.cn@eurotherm.com

Shanghai Office

Telephone (+86 21) 6145 1188
Fax (+86 21) 6145 1187
E-mail info.cn@eurotherm.com

INDIA Chennai

Eurotherm India Limited
Telephone (+9144) 24961129
Fax (+9144) 24961831
E-mail info.in@eurotherm.com

IRELAND Dublin

Eurotherm Ireland Limited
Telephone (+353 1) 469 1800
Fax (+353 1) 469 1300
E-mail info.ie@eurotherm.com

ITALY Como

Eurotherm S.r.l
Telephone (+39 31) 975111
Fax (+39 31) 977512
E-mail: info.it@eurotherm.com

KOREA Seoul

Eurotherm Korea Limited
Telephone (+82 31) 273 8507
Fax (+82 31) 273 8508
E-mail info.kr@eurotherm.com

NETHERLANDS Alphen a/d Rijn

Eurotherm B.V.
Telephone (+31 172) 411752
Fax (+31 172) 417260
E-mail info.nl@eurotherm.com

NORWAY Oslo

Eurotherm A/S
Telephone (+47 67) 592170
Fax (+47 67) 118301
E-mail info.no@eurotherm.com

POLAND Katowice

Invensys Eurotherm Sp z o.o.
Telephone (+48 32) 2185100
Fax (+48 32) 2177171
E-mail info.pl@eurotherm.com

SPAIN Madrid

Eurotherm España SA
Telephone (+34 91) 661 6001
Fax (+34 91) 661 9093
E-mail info.es@eurotherm.com

SWEDEN Malmö

Eurotherm AB
Telephone (+46 40) 384500
Fax (+46 40) 384545
E-mail info.se@eurotherm.com

SWITZERLAND Wollerau

Eurotherm Produkte (Schweiz) AG
Telephone (+41 44) 787 1040
Fax (+41 44) 787 1044
E-mail info.ch@eurotherm.com

UNITED KINGDOM Worthing

Eurotherm Limited
Telephone (+44 1903) 268500
Fax (+44 1903) 265982
E-mail info.uk@eurotherm.com
Web www.eurotherm.co.uk

U.S.A Leesburg VA

Eurotherm Inc.
Telephone (+1 703) 443 0000
Fax (+1 703) 669 1300
E-mail info.us@eurotherm.com
Web www.eurotherm.com

ED52

© Copyright Eurotherm Limited 2007

All rights are strictly reserved. No part of this document may be reproduced, modified, or transmitted in any form by any means, nor may it be stored in a retrieval system other than for the purpose to act as an aid in operating the equipment to which the document relates, without the prior written permission of Eurotherm limited.

Eurotherm Limited pursues a policy of continuous development and product improvement. The specifications in this document may therefore be changed without notice. The information in this document is given in good faith, but is intended for guidance only. Eurotherm Limited will accept no responsibility for any losses arising from errors in this document.

HA027987/9 CN23826



<http://www.eurotherm.co.uk>