invensys
Eurotherm

3216i, 32h8i, 3204i

User Manual

3200i Range Process Indicators and Alarm Units

HA029006/5
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3200i Series Process Indicators and Alarm Units

User Manual Part Number HA029006 Issue 5 Sept-12

Includes 3216i, 32h8i and 3204i Indicators.
Issue 5 of this manual applies to software version 1.03.

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Issue Status of this Manual

Issue 2 applies to software version 1.03 and contains the following changes:-
Load cell and shunt calibration explained in more detail.
Separate 'Set 2' codes for 32h8i/3204i and 3216i for clarity
Add note on sensor break for transducers
Add note on FM and DIN3440 indicators.
Add calibration check in addition to re-calibration.
Add configuration by iTools Wizard
Add Pre-Alarm setpoint parameters

Issue 3 contains the following changes:
Section 8.3.4. change IO-- 1 to OP-- 1
Change power supply frequency specification from 50/60 Hz to 48 to 62 Hz
Section 12.5. add description of enumerations for parameter IM
Section 13.4.1. change the description in the example for Output Calibration.

Issue 4 contains the following changes:
Change power supply frequency specification from 50/60 Hz to 48 to 62 Hz
Section 1.5 and 5.5 change DIN3440 to EN14597 TW
Section 12.5 add description of enumerations for parameter IM
Add section 17 – Index

Issue 5 updates Technical Specification section 15.

1. Installation and Basic Operation

Thank you for choosing this 3200i series Process Indicator.

These are available as:-

Model	Size	Inputs	Outputs
3216i	1/16 DIN	Thermocouple Pt100 RTD V/mA/mV	1 – Relay, Logic, Analogue or dig in 2 – Relay, or Analogue 4 Changeover relay
32h8i	1/8 DIN	Thermocouple Pt100 RTD V/mA/mV 2 Digital	1 Changeover relay 3 Retransmission 4. Changeover relay and Transmitter PSU
32h8i/SG	1/8 DIN	Strain gauge	As 32h8i
3204i	1/4 DIN	As 3216i	As 32h8i

Relay outputs can be configured for alarm and events and analogue retransmission of process variable. 2-wire Modbus digital communications is available in all models.

The indicator may have been ordered to a hardware code only or pre-configured using an optional 'Quick Start' code. The label fitted to the side of the sleeve shows the ordering code of the indicator. If the Quick Code shows ***** the indicator will need to be configured when it is first switched on.

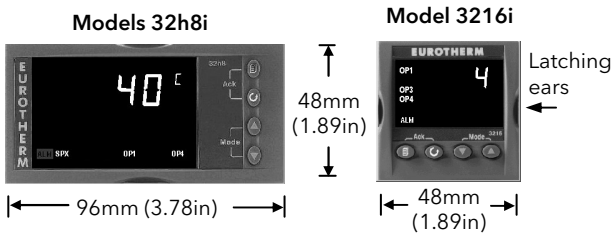
The User Guide supplied with the instrument describes installation and operation in Operator Levels 1 and 2. This Engineering Handbook includes the User Guide but, in addition, explains operation in a deeper level of access (Level 3), and how to configure the instrument (Configuration Level).

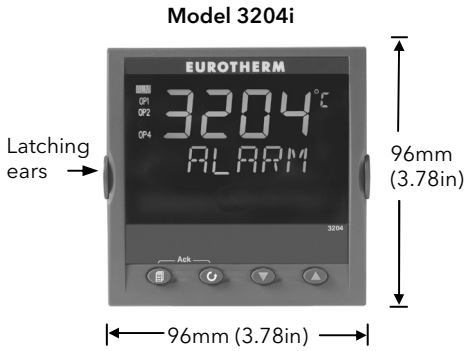
1.1 Unpacking Your Indicator

The following items are included in the box:

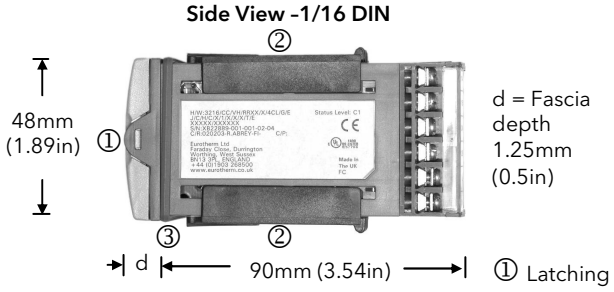
- Indicator mounted in its sleeve
- Two panel retaining clips
- AN IP65 sealing gasket mounted on the sleeve
- Component packet containing a snubber for each relay output and a 2.49Ω resistor for current inputs (see section 2)
- The Installation Guide Part Number HA029994

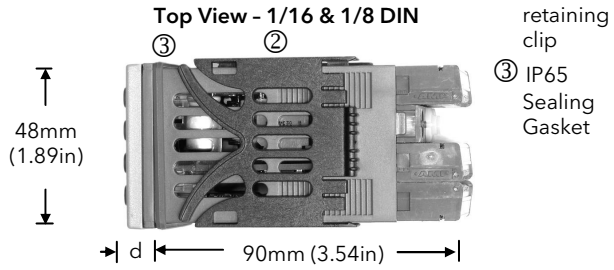
1.2 Dimensions Front Views

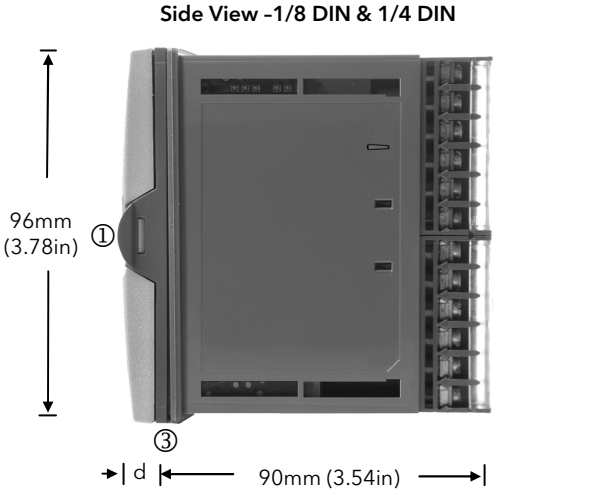




1.3 Dimensions – Side and Top Views







1.4 Step 1: Installation

This indicator is intended for permanent installation, for indoor use only, and enclosed in an electrical panel

Select a location which is subject to minimum vibrations, the ambient temperature is within 0 and 55°C (32 - 131°F) and humidity 5 to 95% RH non condensing.

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

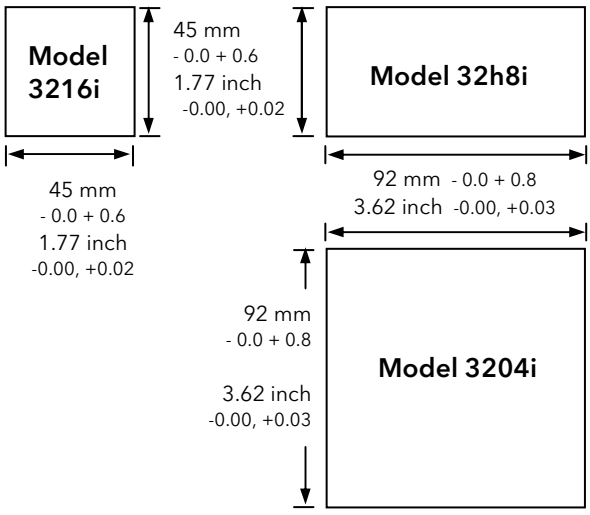
To ensure IP65 and NEMA 4 front sealing against dust and water, mount on a non-textured surface.

Please read the safety information in section 3 before proceeding. The EMC Booklet part number HA025464 gives further installation information.

1.4.1 Panel Mounting the Indicator

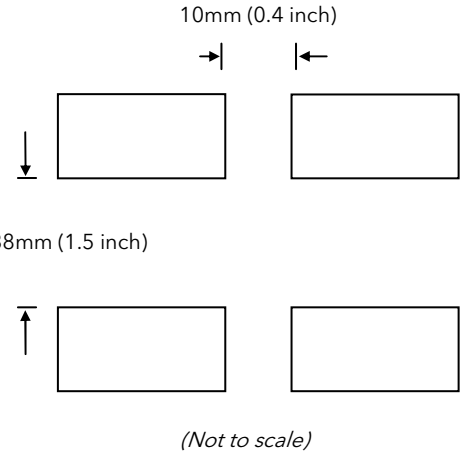
1. Prepare a cut-out in the mounting panel to the size shown. If a number of instruments are to be mounted in the same panel observe the minimum spacing shown.
2. Fit the IP65 sealing gasket behind the front bezel of the indicator
3. Insert the indicator through the cut-out
4. Spring the panel retaining clips into place. Secure the indicator in position by holding it level and pushing both retaining clips forward.
5. Peel off the protective cover from the display

1.4.2 Panel Cut-out Sizes



1.4.3 Recommended Minimum Spacing of Indicators.

Applies to all Model sizes



(Not to scale)

1.4.4 To Remove the Indicator from its Sleeve

The indicator 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.

1.5 Ordering Code (Hardware)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	Quick Start Code (see section 4)

1. Model No.	
3216i	1/16 DIN size
32h8i	1/8 DIN size Horizontal
3204i	1/4 DIN size

2. Function	
AL	Standard Unit
FM	FM Alarm Unit
DN	EN14597 TW alarm unit
SG	Strain Gauge Input 32h8i only

3. Power Supply	
VL	24Vac/dc
VH	100–230Vac

4. Outputs (OP1, OP2, OP3)	
LRXX	OP1 Logic, OP2 Relay (3216i only)
RRXX	OP1 Relay, OP2 Relay (3216i only)
LDXX	OP1 Logic, OP2 Analogue (3216i only)
DRXX	OP1 Analogue, OP2 Relay (3216i only)
RXXX	OP1 Relay (32h8i & 3204i only)
RXDX	OP1 Relay, OP3 Analogue (32h8i & 3204i only)

5. AA Relay (OP4)	
X	Disabled
R	Relay (Form C)

6. Options 3216i, 32h8i and 3204i	
XXX	None
XXL	Digital input A
2XL	RS232 & Digital input A
4XL	RS485 & Digital input A

6. Options 32h8i/SG	
XXX	None
2XX	RS232
4XX	RS485

7. Fascia colour/type	
G	Green
S	Silver

8/9 Product/Manual Language	
ENG	English
FRA	French
GER	German
ITA	Italian
SPA	Spanish

10. Input Adaptor	
XX	None
V1	0-10Vdc
A1	mA Burden Resistor (2.49Ω, 0.1%)

11. Warranty	
Standard	XXXXX
Extended	WL005

12. Certificates	
None	XXXXX
CERT1	Cert of conformity
CERT2	5 Point Factory calibration

13. Custom Label	
XXXXX	None

14. Special and Accessories	
XXXXXX	None
RES250	250Ω for 0-5Vdc OP
RES500	500Ω for 0-10Vdc OP

Example ordering code

32h8i - SG - VH - RXDX - R - 4XL - S - ENG - ENG - XX - XXXXX - XXXXX - XXXXX - XXXXX

This code describes a Silver fascia 1/8 DIN strain gauge indicator with two relays and one analogue output. 100-230Vac supply. EIA485 communications. English language product and manuals.

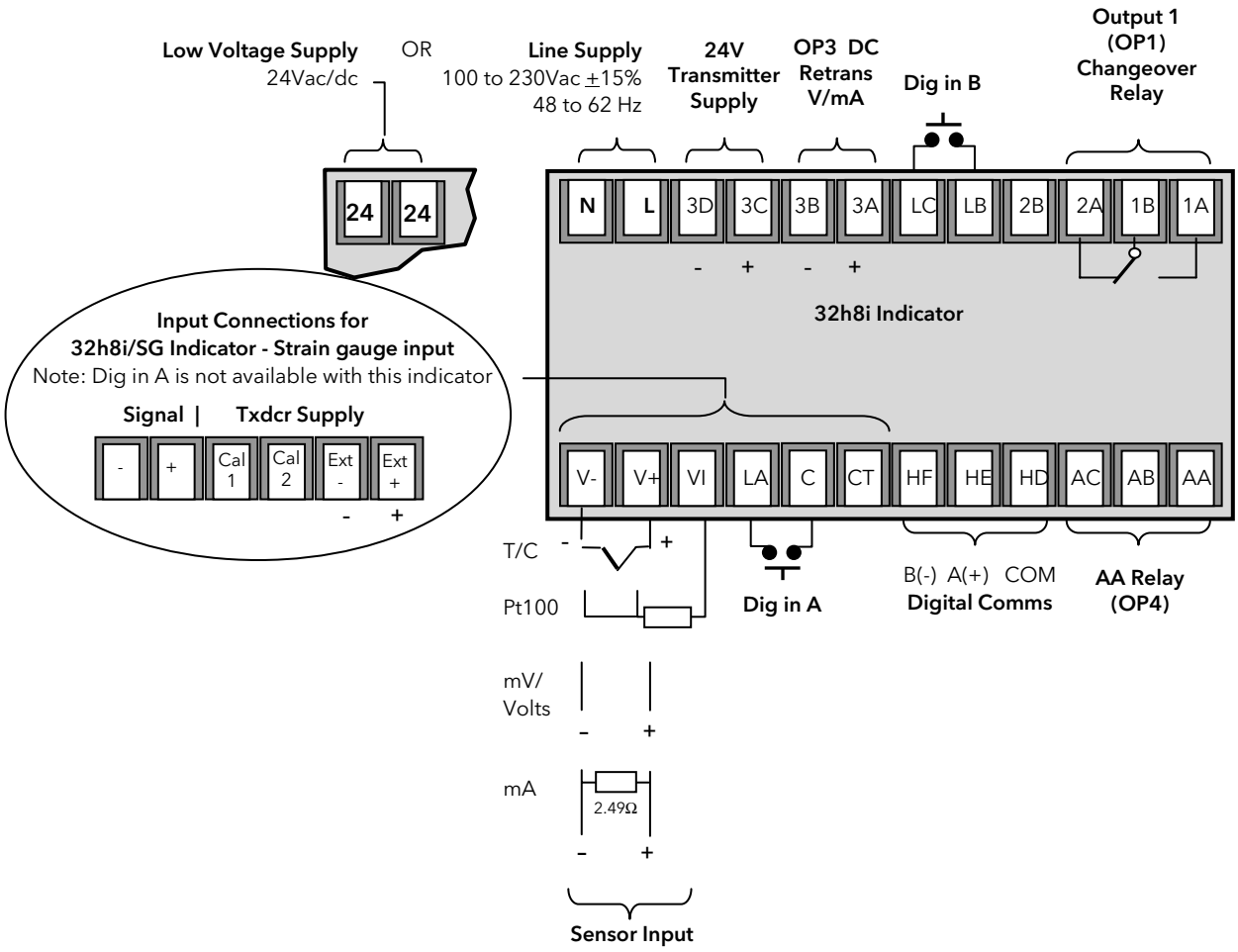
2. Step 2: Wiring

Key to Symbols used in the wiring diagrams

⎍	Logic (SSR drive) output		Relay output		Contact input		mA analogue output

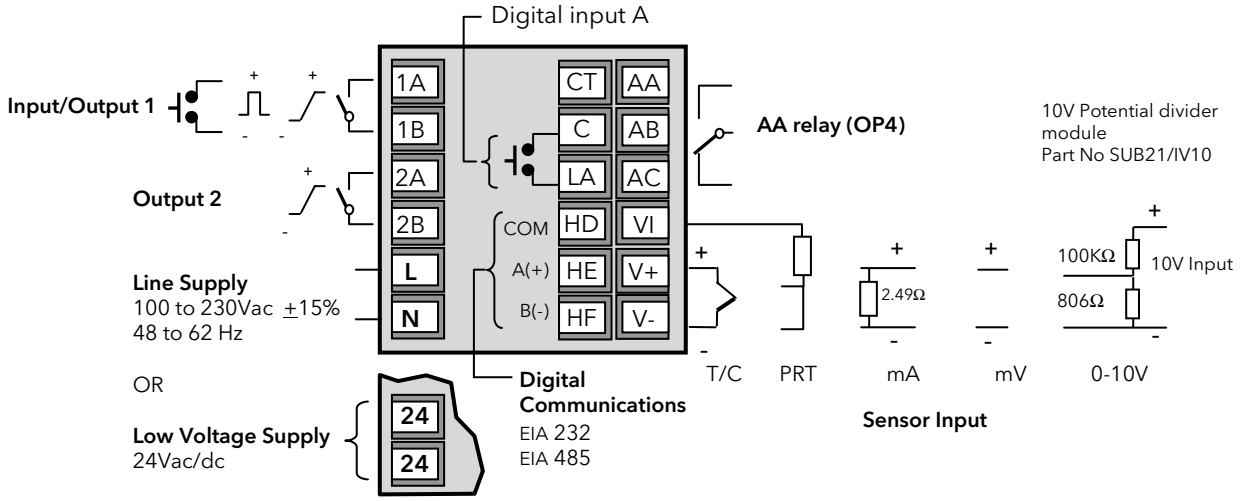
2.1 Terminal Layout 32h8i Indicator

⚠ **Ensure that you have the correct supply for your indicator. Check order code of the indicator supplied**



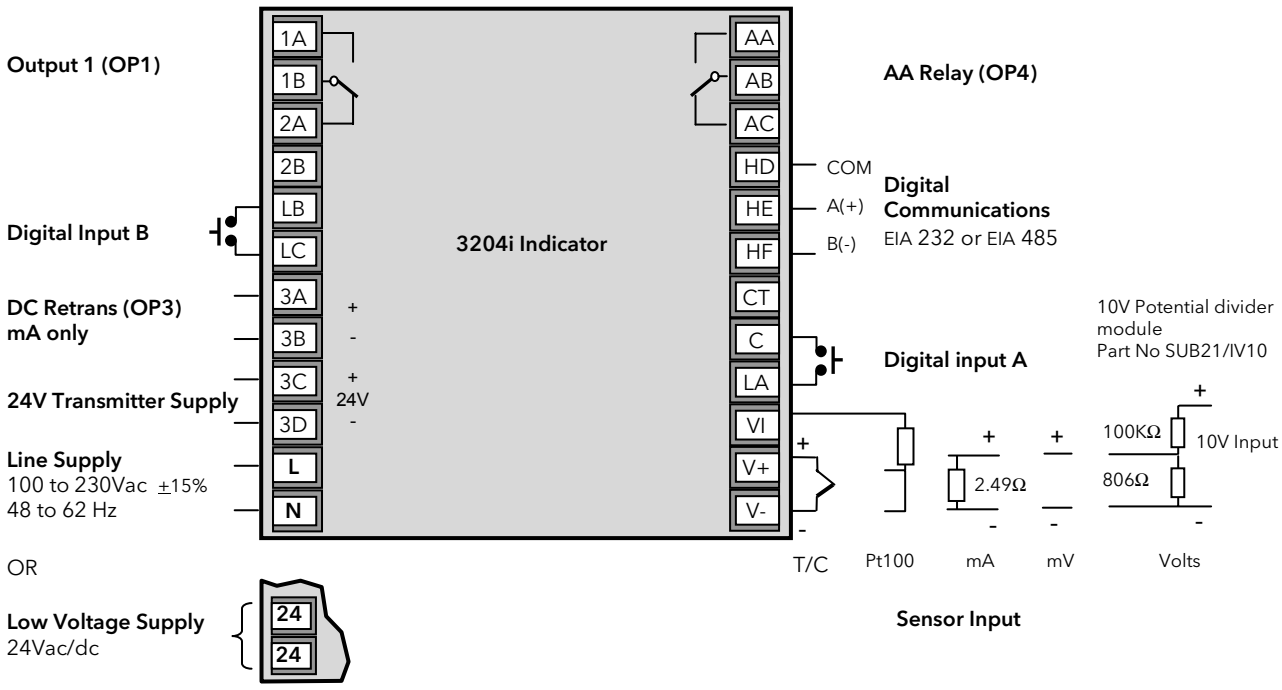
2.2 Terminal Layout 3216i Indicator

⚠ **Ensure that you have the correct supply for your indicator. Check order code of the indicator supplied.**



2.3 Terminal Layout 3204i Indicators

⚠ **Ensure that you have the correct supply for your indicator. Check order code of the indicator supplied**



2.4 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).

2.5 Sensor Input (Measuring Input)

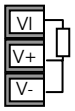
- Do not run input wires with power cables
- When shielded cable is used, it should be grounded at one point only
- Any external components (such as zener barriers) connected between sensor and input terminals may cause errors in measurement due to excessive and/or un-balanced line resistance, or leakage currents.
- Not isolated from the logic outputs & digital inputs

Thermocouple Input

Positive
Negative

- Use the correct compensating cable preferably shielded.
- It is not recommended to connect two or more instruments to one thermocouple

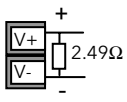
RTD Input



PRT
PRT
Lead compensation

- The resistance of the three wires must be the same. The line resistance may cause errors if it exceeds 22Ω.

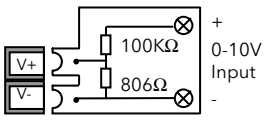
Linear mA, or mV Inputs



Positive
Negative

- For a mA input connect the 2.49Ω burden resistor supplied between the V+ and V- terminals as shown. For mV omit this resistor.

Linear Voltage Inputs



An external potential divider is required for 3216i and 3204i available as part no SUB21/IV10.

Sensor break alarm does not operate if this adaptor is fitted.

2.6 Outputs - 1/8 and 1/4 DIN Indicators

32h8i and 3204i indicators are supplied as standard with two changeover relay outputs as follows:-.

2.6.1 Output 1 & Output 4 (AA Relay)

Relay (Form C, changeover)

- Isolated output 300Vac CATII
- Contact rating:: 2A 264Vac resistive
- Output functions: Alarm/Event

*** General Notes about Relays and Inductive Loads**

High voltage transients may occur when switching inductive loads such as some contactors or solenoid valves. Through the internal contacts, these transients may introduce disturbances which could affect the performance of the instrument.

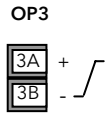
For this type of load it is recommended that a 'snubber' is connected across the normally open contact of the relay switching the load. The snubber recommended consists of a series connected resistor/capacitor (typically 15nF/100Ω). A snubber will also prolong the life of the relay contacts.

A snubber should also be connected across the output terminal of a triac output to prevent false triggering under line transient conditions.

WARNING

When the relay contact is open, or it is connected to a high impedance load, it passes a current (typically 0.6mA at 110Vac and 1.2mA at 230Vac). You must ensure that this current will not hold on low power electrical loads. If the load is of this type the snubber should not be connected.

2.6.2 Output 3 Retransmission (Output 2 3216i)



- Isolated output 300Vac CATII
- Software configurable: 0-20mA or 4-20mA plus 0-5V, 0-10V, 1-5V and 2-10V.
- Max load resistance: 500Ω
- Calibration accuracy: ±(<0.25% of reading + <50µA
- Output functions: PV retransmission.
- Output 2 (3216i) non-isolated

2.6.3 Transmitter Supply

A fixed 24Vdc supply is available to power an external transducer (not 3216i)

- Isolated output 300Vac CATII

2.6.4 Digital Inputs A and B

Digital input A is not available in 32h8i/SG and optionally available on 3216i

- Not isolated from the sensor input
- Switching: 12Vdc at 40mA max
- Contact open > 500Ω. Contact closed < 200Ω
- Input functions: Please refer to the list in the quick codes.

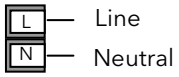
2.6.5 Transducer Supply

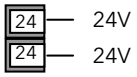
In 32h8i/SG a 10Vdc supply is available as an excitation voltage for a bridge type transducer

- Minimum load resistance 300Ω
- Isolated output 300Vac CATII

2.7 Indicator Power Supply

1. Before connecting the indicator to the power line, make sure that the line voltage corresponds to the description on the identification label.
2. Use copper conductors only.
3. The power supply input is not fuse protected. This should be provided externally.
4. For 24V the polarity is not important.

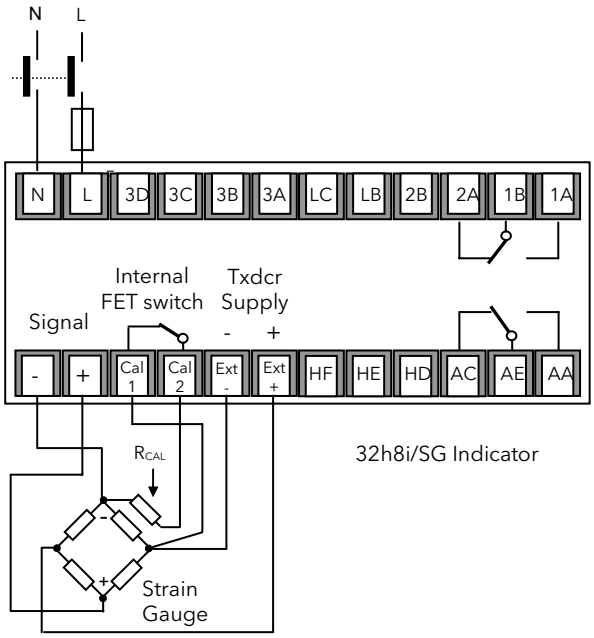




- High voltage supply: 100 to 230Vac, ±15%, 48 to 62 Hz
- Low voltage supply:
  24Vac, -15% +10%
  24Vdc, -15% +20% ±5% ripple voltage
- Recommended external fuse ratings are as follows:-
  For 24 V ac/dc, fuse type: T rated 2A 250V
  For 100 - 230Vac, fuse type: T rated 2A 250V.

2.8 Example Wiring Diagram

This shows 32h8i/SG connections for a strain gauge bridge.



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.

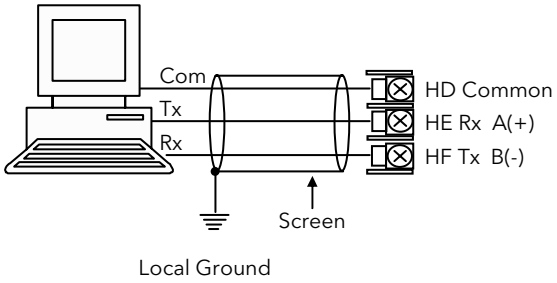
Note: a single switch or circuit breaker can drive more than one instrument.

2.9 Digital Communications (Optional)

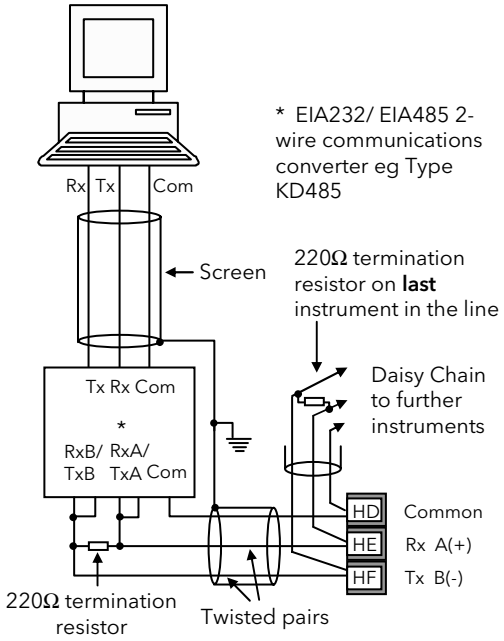
Digital communications uses the Modbus protocol. The interface may be ordered as EIA232 or EIA485 (2-wire).

- Isolated 300Vac CATII.

EIA 232 Connections



EIA 485 Connections



2.10 Additional Connections for 3216i

Connections for the 3216i indicator are similar to the 3216 indicator.

2.10.1 Input/Output 1 & Output 2

I/O1 may be configured as input or output.

Outputs can be logic (SSR drive), or relay, or mA dc.

Input is contact closure.

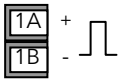
Relay Output (Form A, normally open)

OP1/2

- Isolated output 300Vac CATII
- Contact rating: 2A 264Vac resistive
- Output functions: Alarm or event

Logic (SSR drive) Output

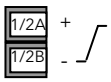
OP1



- Not isolated from the sensor input
- Output ON state: 12Vdc at 40mA max
- Output OFF state: <300mV, <100µA
- Output functions: Alarm or event

DC Output

OP1/2



- Not isolated from the sensor input
- Software configurable: 0-20mA or 4-20mA.
- Max load resistance: 500Ω
- Calibration accuracy: 1%, ±100µA
- Output functions: Retransmission.

Logic Contact Closure Input (OP1 only)

OP1

- Not isolated from the sensor input
- Switching: 12Vdc at 40mA max
- Contact open > 500Ω. Contact closed < 150Ω
- Input functions: Please refer to the list in the Quick Start codes.

3. Safety and EMC Information

This indicator is intended for industrial temperature and process applications when it will meet the requirements of the European Directives on Safety and EMC. Use in other applications, or failure to observe the installation instructions of this handbook may impair safety or EMC. The installer must ensure the safety and EMC of any particular installation.

Safety

This indicator complies with the European Low Voltage Directive 2006/95/EC, by the application of the safety standard EN 61010.

Electromagnetic compatibility

This indicator conforms with the essential protection requirements of the EMC Directive 2004/108/EC by the application of a Technical Construction File. This instrument satisfies the general requirements of the industrial environment defined in EN 61326. For more information on product compliance refer to the Technical Construction File.

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.

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 is 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.

Service and repair

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

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.

Electrostatic discharge precautions

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

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.

3.1 Installation Safety Requirements

Safety Symbols

Various symbols may be used on the indicator. They have the following meaning:

Caution, (refer to accompanying documents)

Equipment protected throughout by DOUBLE INSULATION

☺ Helpful hints

Personnel

Installation must only be carried out by suitably qualified personnel in accordance with the instructions in this handbook.

Enclosure of Live Parts

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

Caution: **Live sensors**

The indicator is designed to operate if the temperature sensor is 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 for use in 230Vac ±15% CATII.

Wiring

It is important to connect the indicator 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.

Power Isolation

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

Overcurrent protection

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

Voltage rating

The maximum continuous voltage applied between any of the following terminals must not exceed 230Vac:

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

The indicator must not be wired to a three phase supply with an unearthed star connection. Under fault conditions such a supply could rise above 240Vac with respect to ground and the product would not be safe.

Conductive pollution

Electrically conductive pollution must be excluded from the cabinet in which the indicator is mounted. For example, carbon dust is a form of electrically conductive pollution. To secure a suitable atmosphere in conditions of conductive pollution, fit 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:-

Installation Category II (CAT II)

For equipment on nominal 230V supply, the maximum rated impulse voltage is 2500V.

Pollution Degree 2

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

Grounding of the temperature sensor shield

In some installations it is common practice to replace the temperature sensor while the indicator 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.

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.

This indicator can be used in addition to a controller as an over temperature device. It is recommended that the relay used to indicate the alarm condition should be set to high alarm configured with sensor break and inverse 'I nu' operation so that it relaxes to the alarm condition when power is removed.

Installation requirements for EMC

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

- For general guidance refer to Eurotherm Controls EMC Installation Guide, HA025464.
- When using relay outputs it may be necessary to fit a filter suitable for suppressing the emissions. The filter requirements will depend on the type of load.
- 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.

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.

4. Switch On

4.1 New Indicator

If the indicator is new and has not previously been configured, or following a 'Cold Start' (section 6.5), it will start up showing the 'Quick Configuration' codes. This is a built in tool which enables you to configure the input type and range, the output functions and the display format.

⚠ **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 instrument to ensure the configuration is correct**

The quick code consists of two 'SETS' of five characters.

The upper section of the display shows the set selected, the lower section shows the five digits which make up the set.

Adjust these as follows:-.

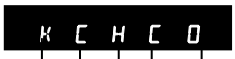
1. Press any button. The first character will change to a flashing '-'.
2. Press ▲ or ▼ to change the flashing character to the required code shown in the quick code tables –see next page. Note: An * indicates that the option is not fitted.
3. Press ○ to scroll to the next character.

☺ You cannot scroll to the next character until the current character is configured.

☺ To return to the first character press ▣.

4. When all five characters have been configured the display will change to RNG.HI followed by RNG.LO which allows range high and low limits to be set.
5. The next press of ○ will select Set 2. Adjust each character as described for Set 1.
6. When the last character has been entered press ○ again, the display will show No EXIT. Continue to press ○ if you wish to repeat the above quick codes or press ▲ or ▼ to YES EXIT if you are satisfied with the quick codes. The indicator will then automatically go to the operator level

SET 1



Input Type	
G	Strain gauge
	32h8i only
Thermocouple	
B	Type B
J	Type J
K	Type K
L	Type L
N	Type N
R	Type R
S	Type S
T	Type T
C	Custom C
RTD	
P	Pt100
Linear (all units)	
M	0-80mV
2	0-20mA
4	4-20mA
Linear 32h8i	
0	0-10Vdc
1	1-5Vdc
3	2-10Vdc
6	0-5Vdc

Display units	
Temperature	
X	None
C	°C
F	°F
K	K
P	%

Decimal point	
0	nnnnn (1)
1	nnnn.n (1)
2	nnn.nn (1)
3	nn.nnn (1)
4	n.nnnn (1)

PV Colour (2)	
32h8i only	
G	Green
R	Red
C	Colour change on Alarm. Green to red
X	Not applicable

Home display	
N	PV only
A	First Alarm SP only
1	PV + Alarm SP
2	PV + Alarm SP (Read only)

32h8I only:			
0	Pa	D	L-m
1	mPa	E	%RH
2	Kpa	G	%O2
3	Bar	H	%CO2
4	mBar	J	%CP
5	PSI	L	V
6	Kg/cm^2	M	Amp
7	mmWG	R	mA
8	inWG	T	mV
9	mmHG	U	Ohm
A	Torr	W	ppm
B	L-H	Y	RPM
		Z	m-s

Set 1 is followed with RNG.HI	Set this for the maximum display range required
Then RNG.LO	Set this for the minimum display range required

Set 2 follows these parameters	See next page

(1) Up to 2 decimal places on 3216i and 3204i
Up to 4 decimal places on 32h8i

(2) Colour change on top part of display only

SET 2 - 32h8i & 3204i

OP1	
X	Unconfigured
Relay or Logic Output	
Alarm 1	
H	High alarm
L	Low alarm
R	Rate-of change - Rising
N	New alarm flag
O	Sensor break
P	Power fail
With sensor Break	
7	High alarm
8	Low alarm
9	Rate-of change
With power Fail	
A	High alarm
B	Low alarm
C	Rate-of change
With sensor Break and power fail	
E	High alarm
F	Low alarm
G	Rate-of change

OP3		
X	Unconfigured	
Analogue Output		
PV Retransmission		
1	4-20mA	
2	0-20mA	
3	0-5Vdc	32h8i only
4	1-5Vdc	
5	0-10Vdc	
6	2-10Vdc	

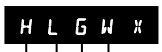
OP4 (AA Relay)	
X	Unconfigured
Alarm 4	
H	High alarm
L	Low alarm
R	Rate-of change-Rising
N	New alarm flag
O	Sensor break
P	Power fail
With sensor Break	
7	High alarm
8	Low alarm
9	Rate-of change
With power fail	
A	High alarm
B	Low alarm
C	Rate-of change
With sensor Break and power fail	
E	High alarm
F	Low alarm
G	Rate-of change

Digital input A and B	
X	Unconfigured
(Dig in A not available on 32h8i/SG)	
W	Alarm acknowledge
K	Keylock
U	Remote up button
D	Remote down button
J	Alarm Inhibit
M	Peak Reset
Y	Freeze PV
V	Recipe 2/1 select
T (1)	Tare correction
Z (1)	Automatic zero and span calibration – 32h8I/SG only

(1) linear ranges only on all indicators

Note:-
Alarm outputs are set to inverted when exiting from Quick Codes

SET 2 - 3216i



IO1 and OP2			
Relay or Logic Output		**Analogue Output**	
Alarm 1		**PV Retransmission**	
H	High alarm	1	4-20mA
L	Low alarm	2	0-20mA
R	Rate-of change-Rising		
N	New alarm flag	X	Unconfigured
O	Sensor break		
P	Power fail		
With Sensor break		**Digital input I/O1 only**	
7	High alarm	W	Alarm acknowledge
8	Low alarm	K	Keylock
9	Rate-of change	U	Remote up button
With power Fail		D	Remote down button
A	High alarm	V	Recipe 2/1 select
B	Low alarm	T	Tare correction
C	Rate-of change	J	Alarm Inhibit
With Sensor break and power Fail		M	Peak Reset
E	High alarm	Y	Freeze PV
F	Low alarm		
G	Rate-of change		

OP4 (AA Relay)	
X	Unconfigured
Alarm 4	
H	High alarm
L	Low alarm
R	Rate-of change-Rising
N	New alarm flag
O	Sensor break
P	Power fail
With sensor Break	
7	High alarm
8	Low alarm
9	Rate-of change
With power fail	
A	High alarm
B	Low alarm
C	Rate-of change
With sensor break and power fail	
E	High alarm
F	Low alarm
G	Rate-of change

Digital input A	
X	Unconfigured
W	Alarm acknowledge
K	Keylock
U	Remote up button
D	Remote down button
V	Recipe 2/1 select
J	Alarm Inhibit
M	Peak Reset
Y	Freeze PV

Note:-
Alarm outputs are set to inverted when exiting from Quick Codes

4.1.1 To Re-Enter Quick Code Mode

If you need to re-enter the 'Quick Configuration' mode this can always be done as follows:-

1. Power down the indicator
2. Hold ⓟ button down and power up the indicator again. Keep the button pressed until you are requested to enter a passcode.
3. Enter a passcode using the ⓐ or ⓥ buttons. In a new indicator the passcode defaults to 4. If an incorrect passcode is entered you must repeat the whole procedure.

☺ Parameters may also be configured using a deeper level of access as described in subsequent chapters of this handbook. If this has been done and the Quick Code Mode is re-entered as described above, then the quick codes are shown with full stops (e.g. G.S.2.G.A.) to indicate that the configuration has been changed.

4.2 Pre-Configured Indicator or Subsequent Starts

A brief start up sequence consists of a self test in which all elements of the display are illuminated and the software version number is shown.

The indicator will briefly display the quick codes during start up and then proceed to **Operator Level 1**.

You will see the display shown below. It is called the HOME display.

32h8i example

☺ If the Quick Codes do not appear during start up, this means that the indicator has been configured in a deeper level of access, as stated opposite. The quick codes may then not be valid and are therefore not shown.

4.3 Front panel layout

① **Beacons:-**

ALM	Alarm active (Red)
OP1	Lit when output 1 is ON
OP2	This appears in 3216i only and is lit when output 2 is ON
OP3	Lit when output 3 is configured to retransmit the process value
OP4	Lit when output 4 (AA relay) is ON
REM	Communications active

② **Operator Buttons:-**

ⓟ From any display - press to return to the HOME display.

ⓡ Press to select a new parameter. Hold down to continuously scroll through parameters**.**

ⓥ Press to change or decrease a value.

ⓐ Press to change or increase a value.

③ **Message Centre**

A scrolling message may appear in this section. For example, if a high alarm is configured to operate output 1, and a low alarm is configured to operate output 4, the scrolling messages 'ALARM 1 HIGH' and 'ALARM 4 LOW' are shown together with the beacons 'ALM', 'OP1' and 'OP4'. 'ALM' flashes if the alarm has not been acknowledged.

If the input sensor is broken '5.br' appears in the top display and the scrolling message 'INPUT SENSOR BROKEN' appears in the message centre.

4.3.1 Alarm Indication

Up to four alarms can be configured. If any alarm occurs, the red ALM beacon will flash. A scrolling text message will describe the source of the alarm, for example ALARM 1H GH. Any output attached to the alarm will operate.

Press and (Ack) together to acknowledge the alarm

If the alarm is still present the ALM beacon will light continuously.

By default alarms are configured as non-latching, de-energised in alarm. If you require latched alarms, please refer to the engineering handbook.

4.3.2 Out of Range Indication

If the input is too high HHHHH will be displayed

If the input is too low LLLLL will be displayed

4.3.3 Sensor Break Indication

An alarm condition (S.br) is indicated if the sensor or the wiring between sensor and indicator becomes open circuit.

For a PRT 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.

For a strain gauge transducer sensor break alarm will be indicated if either signal wires become open circuit or either of the supply wires becomes open circuit.

4.4 Operator Parameters in Level 1

Operator level 1 is designed for day to day operation of the indicator and access to these parameters is not protected by a pass code.

Press to step through the list of parameters. The mnemonic of the parameter is shown in the lower display. After five seconds a scrolling text description of the parameter appears.

The value of the parameter is shown in the upper display. In level 1 the value is read only.

The parameters that appear depend upon the functions configured. They are:-

Parameter Mnemonic	Scrolling text and Description	Availability	
HIGH	**PEAK HIGH**	This is the highest reading that the indicator has recorded since switch on or since it was reset	
LOW	**PEAK LOW**	This is the lowest reading that the indicator has recorded since switch on or since it was reset	
TARE	**TARE FUNCTION** Linear inputs only See also section 4.4.1.	OFF	No tare correction
		On	Select to automatically correct for tare weight
		FAIL	Displayed if the tare correction cannot be made
A1 (----)	**ALARM 1 SETPOINT**	{-----} shows the type of alarm configured. For example HI, LO, ROC. This parameter sets the alarm thresholds.	
A2 (----)	**ALARM 2 SETPOINT**		
A3 (----)	**ALARM 3 SETPOINT**		
A4 (----)	**ALARM 4 SETPOINT**		

4.4.1 Tare Correction

Tare correction is used, for example, when it is required to weigh the contents of a container but not the container itself.

The procedure is to place the empty container on the weigh bridge and 'zero' the indicator. Since it is likely that following containers will have different tare weights the tare function is available in operator level 1.

1. With the empty container placed on the weigh cell, press ⓒ until TARE is displayed.
2. Press ▲ or ▼ to select On
3. The weight of the container will automatically be taken form the total weight.
4. FAIL will be displayed if the tare function fails, for example, if the weight is outside the high and low limits or a sensor break condition occurs. In this case correct the fault and repeat the procedure.

Alternatively, a digital input may have been set by selecting T in the quick codes (section 4.1) to provide this function via an external source such as a switch or pushbutton. In this case pressing the button will have the same effect as selecting 'On' in 2 above.

5. Operator Level 2

Level 2 provides access to additional parameters. It is protected by a security code.

5.1 To Enter Level 2

1. From any display press and hold ▤.
2. After a few seconds the display will show:-

3. Release ▤.
   (If no button is pressed for 45 seconds the display returns to the HOME display)
4. Press ▲ or ▼ to choose LEU 2 (Level 2)

5. After 2 seconds the display will show:-

6. Press ▲ or ▼ to enter the pass code. Default = '2'

7. If an incorrect code is entered the indicator reverts to Level 1.

5.1.1 To Return to Level 1

1. Press and hold ▤
2. Press ▼ to select LEU 1

The indicator will return to the level 1 HOME display.
Note: A pass code is not required when going from a higher level to a lower level.

5.2 Level 2 Parameters

As in Level 1, press ⊙ to step through the list of parameters. The mnemonic of the parameter is shown in the message centre. After five seconds a scrolling text description of the parameter appears.

The value of the parameter is shown in the upper display. Press ▲ or ▼ to adjust this value.

If no key is pressed for 30 seconds the indicator returns to the HOME display.

Backscroll is achieved when you are in this list by pressing ▲ while holding down ⊙.

To return to the HOME display at any time, press ⊡.

The following table shows a list of parameters available in Level 2.

Mnemonic	Scrolling Display and description	Range
PRST	**PEAK RESET** Select On to reset the HIGH and LOW peak values. The display automatically returns to OFF	OFF On
HIGH	**PEAK HIGH** This is the highest reading that the indicator has recorded since switch on or since it was reset	Read only
LOW	**PEAK LOW** This is the lowest reading that the indicator has recorded since switch on or since it was reset	Read only
TARE	**TARE FUNCTION** See also section 4.4.1.	OFF No tare correction On Select to automatically correct for tare weight FAIL Displayed if the tare correction cannot be made
SG.TYP	**STRAIN GAUGE CALIBRATION TYPE** Select the calibration for the type of sensor in use.	SHnt Strain gauge bridge ComP Comparison CELL Load cell
SHUNT	**SHUNT CALIBRATION** To set the high calibration point for a bridge type strain gauge or pressure transducer.	OFF or 40.0 to 100.0%
LO.CAL	**STRAIN GAUGE LOW CAL** 32h8i/SG only. See also section 5.3.	
HI.CAL	**STRAIN GAUGE HIGH CAL** 32h8i/SG only. See also 5.3.	
AUT,SG	**STRAIN GAUGE AUTO CAL** 32h8i/SG only. See also section 5.3.5.	no YES Perform automatic strain gauge calibration
A1 (----)	**ALARM 1 SETPOINT**	(----) shows the type of alarm configured. For example HIGH, LOW,
A2 (----)	**ALARM 2 SETPOINT**	
A3 (----)	**ALARM 3 SETPOINT**	
A4 (----)	**ALARM 4 SETPOINT**	
ADDR	**ADDRESS** Digital communications address for the instrument (if digital communications fitted)	1 to 254
HOME	**HOME DISPLAY** This configures the parameter which will be displayed in the HOME display in normal operation	PV Process variable ALm Alarm setpoint PV.AL PV + Alarm SP PA.ro PV + Alarm SP read only
ID	**CUSTOMER ID** Customised instrument identification number	0 to 9999
REC.NO	**CURRENT RECIPE NUMBER** The recipe currently in use. See also section 5.4.	nonE No recipe 1 - 5 1 to 5 selected FAIL Fail is shown if no recipe is saved
STORE	**RECIPE TO SAVE** See also section 5.4.	nonE No recipe to store 1 - 5 1 to 5 donE Recipe saved

Mnemonic	Scrolling Display and description		Range			
UNITS	**DISPLAY UNITS** The display units are shown in the top right hand corner of the display in normal operation. Units available are:-					
	°C	° C	°F	° F	°K	Kelvin
	nonE	No units displayed	PErc	Percentage	PA	Pascals *
	mPA	Mpascals *	kPA	Kpascals *	bAr	Bar *
	mbAr	milli Bar *	PSi	PSI *	kGcm	kg/sq cm *
	mmwG	mm water gauge *	inwG	inches water gauge *	mmhG	mm mercury *
	torr	Torr *	L-H	Litres per hour *	L-m	Litres per minute *
	Prh	% Relative humidity *	P.O 2	% O2 *	P.CO2	% CO2 *
	P.CP	% carbon potential*	UoLt	Volts *	AmP	Amps *
	mA	milli amps *	mU	milli volts *	Ohm	Ohms *
	PPm	Parts per million *	rPm	Revs per minute *	m-S	milli seconds *
	SEC	Seconds *	min	Minutes *	hrS	Hours *
	PH	Ph *	P.PH	% Ph *	mPH	Miles per hour *
	mG	milli grams *	GrAm	Grams *	kG	Kilo grams *

* These units only appear in 32h8i indicators

☺ Press ⓔ at any time to return immediately to the HOME screen at the top of the list.

☺ Hold ⓒ down to continuously scroll through the above list

5.3 Strain Gauge Calibration

The 32h8i/SG indicator is designed to operate with symmetrical bridge type strain gauges, nominally 350Ω in each arm. It is generally necessary to calibrate the instrument to the transducer in use. This can be done in Operator Level 2 or 3 using any one of three methods. These are:-

CELL. Here a load cell is connected directly to the input terminals marked Signal + and – (section 5.3.1).

COMPARISON. The load cell is connected as above but the calibration is compared with a reference device or reference weight (section 5.3.2).

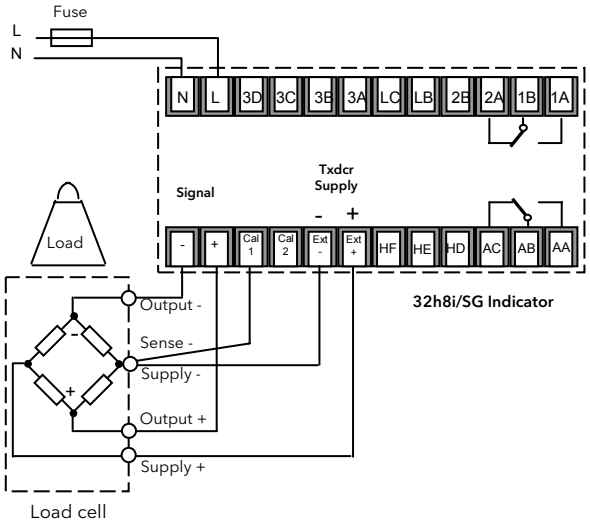
SHUNT. This is so called since it refers to switching a calibration resistor across one arm of a four wire measurement bridge in a strain gauge transducer (section 5.3.3).

To configure the different modes:-

In Level 2, press ⊙ to scroll to SG.TYP and press ▲ or ▼ to select CELL, COMP or SHNT

5.3.1 Load Cell Calibration

Connect a load cell as shown below:-



If a 6-wire load cell is used the –ve Sense should be connected as shown above to the Cal 1 terminal. The +ve sense wire is not connected.

If the load cell is 4-wire connect Cal 1 to the –ve supply, preferably at the load cell.

This wire compensates for voltage drop in the supply to the load cell due to lead resistance.

1. In Level 2, press ⊙ to scroll to LO.CAL.
2. Remove all weight from the load cell and press ▲ or ▼ to select YES
3. The indicator will show bUSY as it calibrates the zero weight condition. PASS or FAIL will be indicated when the low point calibration is complete.
4. Now add a weight which represents the full scale span of the load cell
5. Repeat the above to calibrate the high point – HI.CAL.

5.3.2 Comparison Calibration

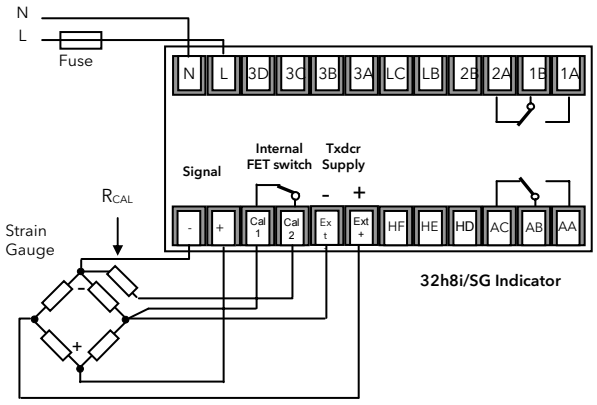
Comparison calibration is most appropriate when calibrating the indicator against a second reference device.

The load cell is connected as shown in the previous example.

1. In Level 2, press ⊙ to scroll to LO.CAL and press ▲ or ▼ to select YES
2. Press ⊙ to scroll to the next parameter - C.ADJ (CALIBRATION ADJUST)
3. Press ▲ or ▼ to set the low value calibration point as indicated by the reference device. As soon as the value is entered the indicator will show bUSY as it calibrates the minimum weight condition. PASS or FAIL will be indicated when the low point calibration is complete.
4. Repeat the above steps to calibrate the high point - HI.CAL

5.3.3 Shunt Calibration

A bridge type strain gauge is connected as shown. Depending on the type of gauge, R_{CAL} may be included internally or supplied as a separate item.



The high (span) and low (zero) adjustment of the transducer can be performed automatically or manually.

Manual allows the low point and high point to be calibrated individually.

Automatic performs both low and high point calibration by the selection of one parameter.

5.3.4 Manual Calibration

1. Remove all pressure from the transducer to establish a zero reference
2. In operator level 2, press ⊙ until SHUNT is shown in the lower display.
3. Press ▲ or ▼ to set the point at which the high calibration is to be done. This is typically 80% of the transducer span
4. Press ⊙ to scroll to LO.CAL and press ▲ or ▼ to select YES
5. The indicator will show bUSY as it calibrates the minimum weight condition. PASS or FAIL will be indicated when the low point calibration is complete.
6. Press ⊙ to scroll to HI.CAL and repeat the above steps to calibrate 80% (as set in 3 above) of the transducer span

The high calibration value may be checked by shorting Cal 1 and Cal 2. For example a 0 – 3000psi probe will read 2400 when Cal 1 and Cal 2 are linked.

5.3.5 Automatic Calibration

1. Remove all pressure from the transducer to establish a zero reference
2. In operator level 2, press ⊙ until AUT.SG is shown in the lower display
3. Press ▲ or ▼ to select YES

The indicator will automatically perform the following sequence:-

a. Disconnect the calibration resistor R_{CAL}
b. Calculate the low point calibration value by continuously averaging two sets of 50 measurements of the input until stable readings are obtained. Lo will be indicated during this process.
c. Connect the calibration resistor by closing a contact between terminals VI and LA

Calculate the high point calibration value by continuously averaging two sets of 50 measurements of the input until stable readings are obtained. Hi will be indicated during this process.

5.3.6 Calibration Using a Digital Input

A digital input may have been set by selecting Z in the quick codes (section 4.1) to allow the transducer to be calibrated automatically via an external source such as a switch or pushbutton. In this case pressing the button will have the same effect as selecting YES in 3 above.

5.3.6.1 Fail

Fail will be displayed in any of the above calibration procedures if the calibration is not possible. For example, the input shows Sensor Break or is out of range or the transducer or load cell is not connected correctly. It is necessary to correct the fault and start the procedure again.

5.4 Recipes

It is possible to store operating values in up to five different recipes by taking a snapshot of the current settings and storing these in a recipe number. Examples, of typical operating parameters may be alarm setpoint values. A particular recipe number may then be recalled for a particular process.

5.4.1 To Store Values in a Recipe

1. In the list of parameters, press ⊙ to select STORE
2. Select a recipe number from 1 to 5 in which to store the current settings. The indicator will show donE when the values are stored. All previous values which may have been stored in this recipe are overwritten.

5.4.2 To Load a Recipe

1. In the list of parameters, press ⊙ to select REC.NO

Select a recipe number from 1 to 5 in which the required settings have been stored. The values will automatically loaded from the recipe. If no values have been stored in that recipe, FAiL will be indicated

5.5 FM and Alarm Units

3200 indicators supplied to Function code FM are FM approved.

3200 indicators supplied to Function code DN are approved to EN14597.

The instrument label is marked accordingly.

In these instruments the alarm operating the AA relay output is set to inverted and latching. This function cannot be altered.

When the instrument is configured using the Quick Start codes (section 4.1), Alarm 1 is used to operate both Outputs 1 and 4 (AA relay). The Quick Start configuration for the AA relay will enable and configure Alarm 4 but Alarm 4 will not be used to operate Output 4.

⚠ If Quick Start is used to configure Alarm 1 as a high alarm and Alarm 4 as a low alarm, then the resulting configuration will be that the high alarm 1 is used to drive both outputs 1 and 4. The low alarm 4 will not be connected to any output.

Further details on latching and blocking alarms can be found in section 10.1.

6. Access to Further Parameters

Parameters are available under different levels of security and are defined as Level 1 (LEV 1), Level 2 (LEV2), Level 3 (LEV 3) and Configuration (CONF). Level 1 has no passcode since it contains a minimal set of parameters generally sufficient to run the process on a daily basis. Level 2 allows access to parameters which may used in commissioning an indicator or settings between different products or batches. This has been described in the previous section.

Level 3 and Configuration level parameters are also available as follows:-

6.1 Level 3

Level 3 makes all operating parameters available and alterable (if not read only). It is typically used when commissioning an indicator

Examples are:-

Range limits, setting alarm levels, communications address.

6.2 Configuration Level

This level makes available all parameters including the operation parameters so that there is no need to switch between configuration and operation levels during commissioning. It is designed for those who may wish to change the fundamental characteristics of the instrument to match the process.

Examples are:-

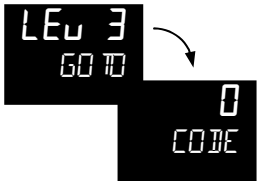
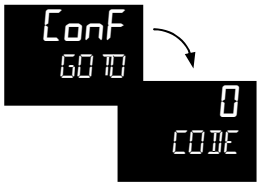
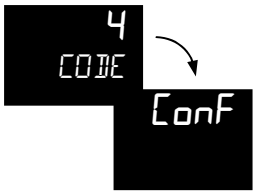
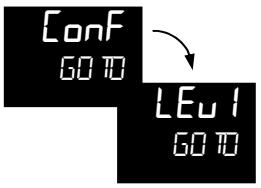
Input (thermocouple type); Alarm type; Communications type.

WARNING

Configuration level gives access to a wide range of parameters which match the indicator to the process. Incorrect configuration could result in damage to the process and/or personal injury. It is the responsibility of the person commissioning the process to ensure that the configuration is correct. In configuration level the indicator is not providing alarm indication. Do not select configuration level on a live process.

Operating Level	Home List	Full Operator	Configuration	Alarms
Level 1	✓			Yes RW
Level 2	✓			Yes RO
Level 3	✓	✓		Yes
Conf	✓	✓	✓	No

6.2.1 To Select Access Level 3 or Configuration Level

Do This	The Display You Should See	Additional Notes
1. From any display press and hold ⓜ for more than 5 seconds	**To Select Level 3** 	The display will pass from the current operating level, for example, LEu 1 to LEu 3 as the button is held down. (If no button is then pressed for about 50 seconds the display returns to the HOME display)
2. Press ▲ or ▼ to enter the passcode for Level 3		The default code is 3: If an incorrect code is entered the display reverts to 'GOTO'. If a correct code is entered the indicator is now in the level 3 will then revert to the HOME display
3. When the LEU3 GOTO view is shown, as in paragraph 1 above, press ▲ to select 'ConF'	**To Select Configuration level** 	Note: ▲ must be pressed quickly before the indicator requests the code for level 3
4. Press ▲ or ▼ to enter the passcode for Configuration level		The default code is 4: If an incorrect code is entered the display reverts to 'GOTO'. If a correct code is entered the indicator is now in Configuration level will now show ConF
5. Press and hold ⓜ for more than 3 seconds 6. Press ▲ to select the required level eg LEV 1	**To Return to a Lower Level** 	The choices are: LEU 1 Level 1 LEU 2 Level 2 LEU 3 Level 3 ConF Configuration It is not necessary to enter a code when going from a higher level to a lower level. Alternatively, press ⓜ and scroll to the ACCES list header, then press ↻ to select the required level. The display will then flash 'ConF' for a few seconds and the indicator will then go through its start up sequence, starting in the level selected. Do not power down while ConF is flashing. If a power down does occur an error message will appear – see section **10.4** 'Diagnostic Alarms'

☺ A special case exists if a security code has been configured as '0' If this has been done it is not necessary to enter a code and the indicator will enter the chosen level immediately.

☺ When the indicator is in configuration level the ACCESS list header can be selected from any view by holding down the ⓜ button for more than 3 seconds. Then press ⓜ again to select 'ACCES'

6.3 Parameter lists

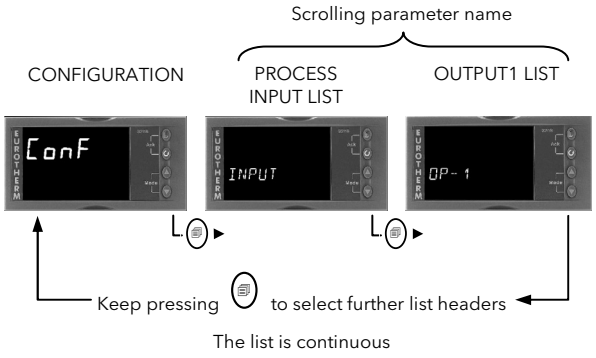
Parameters are organised in lists. The top of the list shows the list header only. The name of the list header describes the generic function of the parameters within the list. For example, the list header 'ALARM' contains parameters which enable you to set up alarm conditions.

6.3.1 To Choose Parameter List Headers

Press . Each list header is selected in turn every time this key is pressed.

The name of the list header appears in the lower display, followed, after a few seconds, by a scrolling longer description of the name.

The following example shows how to select the first two list headers. (Views are shown for 32h8i indicator).



6.3.2 To Locate a Parameter

Choose the appropriate list, then press . Each parameter in the list is selected in turn each time this button is pressed. The following example shows how to select the first two parameters in the ALARM List. All parameters in all lists follow the same procedure. (Views are shown for 32h8i indicator).

Alarm List Header

Parameter 'Value'. In this case set to Full Scale High Alarm

Parameter mnemonic 'A1.TYP' followed by a scrolling message 'ALARM 1 TYPE'

Parameter 'Value'. In this case an 'numerical' value, set to '112'

Parameter mnemonic 'A1.HI' followed by a scrolling message 'ALARM 1 SETPOINT'

Further parameters

☺ Press to jump back to the list header.

6.3.3 How Parameters are Displayed

As shown above. whenever a parameter is selected it is displayed as a mnemonic, of four or five characters, for example 'A1TYP'.

After a few seconds this display is replaced by a scrolling banner which gives a more detailed description of the parameter. In this example 'A1TYP' = 'ALARM 1 TYPE'. The scrolling banner is only shown once after the parameter is first accessed. (Views are shown for 32h8i indicator).

The name of the list header is also displayed in this way.

The upper part of the display shows the value of the parameter.

The lower part shows its mnemonic followed by the scrolling name of the parameter

6.3.4 To Change a Parameter Value

With the parameter selected, press to increase the value, press to decrease the value. If either key is held down the analogue value changes at an increasing rate.

The new value is entered after the key is released and is indicated by the display blinking. The exception to this is output 'Power' when in manual. In this case the value is entered continuously.

The upper display shows the parameter value the lower display shows the parameter name.

6.3.5 To Return to the HOME Display

Press + .

On release of the keys the display returns to the HOME list. The current operating level remains unchanged.

6.3.6 Time Out

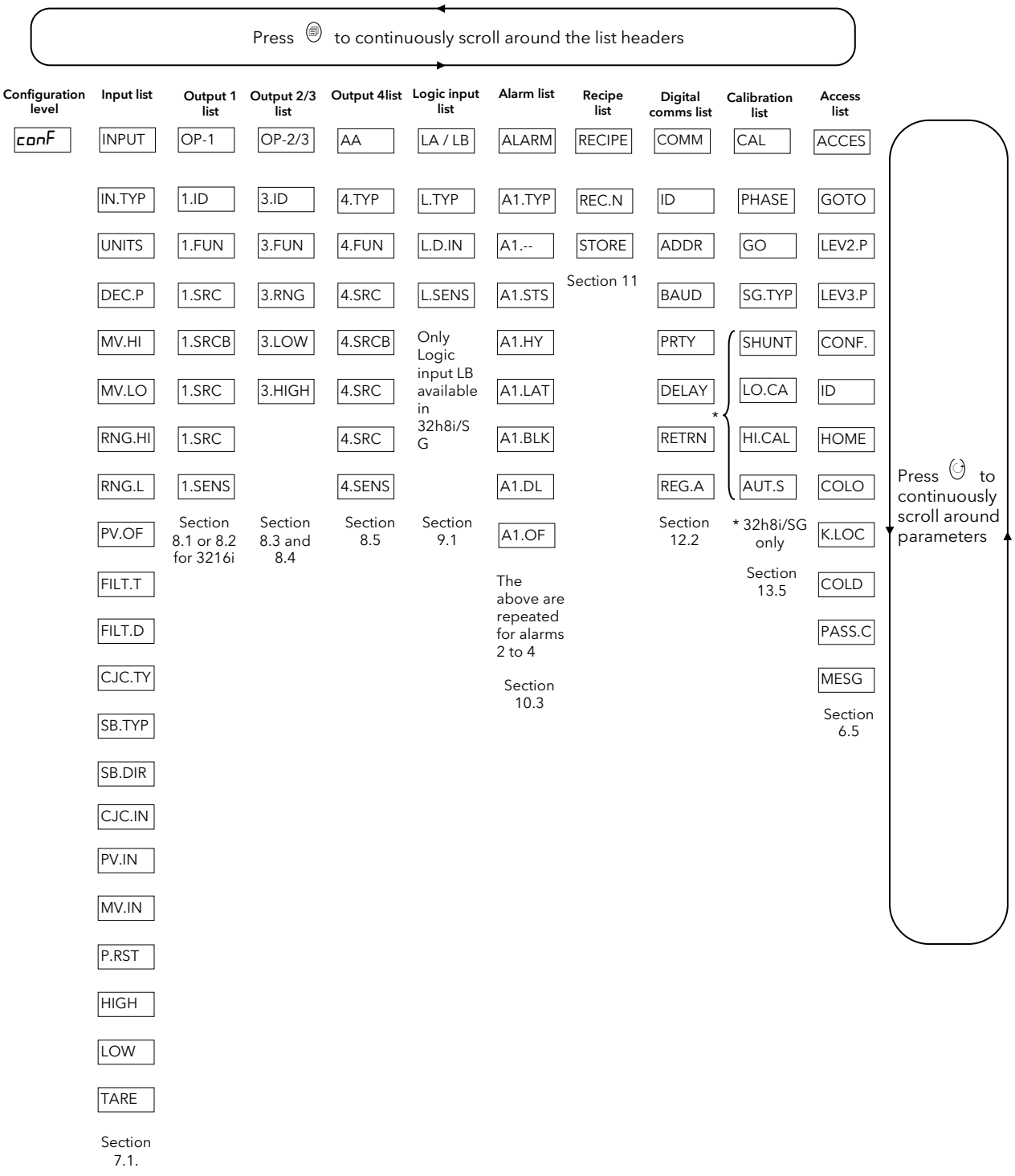
A time out applies to the 'Go To' and 'Control Mode' parameters. If no key presses are detected within a period of 5 seconds the display will revert back to the HOME list.

☺ Press and hold to scroll parameters forward through the list. With depressed, press to scroll parameters backward.

6.4 Navigation Diagram

The diagram below shows the all list headings available in configuration level for 32h8i indicator.

The parameters in a list are shown in tables in the following sections of this manual together with explanations of their meanings and possible use.



☺ Lists may vary depending on the type of indicator and options configured. For example CJC.TYP and CJC.IN only appear if the Input Type is a thermocouple.

6.5 Access Parameters

The following table summarises the parameters available under the ACCESS list header

⚠ The Access List can be selected at any time when in configuration level by holding ⓜ key down for 3 seconds, then press ⓐ or ⓥ with ⓜ still held down.

ACCESS LIST		'ACCS'				
Name	Scrolling Display	Parameter Description	Values Allowed		Default	Access Level
GOTO	GOTO	Allows you to change the access level of the indicator. Passwords prevent unauthorised change	LEu.1	Operator level 1	LEu.1	Conf
			LEu.2	Operator level 2		
			LEu.3	Operator level 3		
			ConF	Configuration level		
LEV2.P	LEVEL 2 PASSCODE	The Level 2 passcode	0-9999 0 = no passcode will be requested		2	Conf
LEV3.P	LEVEL 3 PASSCODE	The Level 3 passcode			3	Conf
CONF.P	CONFIG PASSCODE	To set a Configuration level passcode			4	Conf
ID	CUSTOMER ID	To set the identification of the indicator	0-9999			Conf
HOME	HOME DISPLAY See Note 1	To configure the parameters to be displayed in the HOME display	PV	Process Value – top display Blank lower display	Std	Conf
			ALm	First configured alarm – top Blank lower display		
			PV.AL	PV - top display First configured alarm in lower section		
			PArA	PV - top display First configured alarm read only in lower section		
COLOR	SET TOP DISPLAY COLOUR	To configure the colour of the top section of the display	Gr	Green	Gr	Conf
			rEd	Red		
			G2r	Green normal. Changes to red on alarm		
K.LOCK	KEYBOARD LOCK	To limit operation of the front panel buttons when in operator levels. ☺ If ALL has been selected, then to restore access to the keyboard, power up the indicator with the ⓜ button held down and enter the configuration level passcode as described in section 4.1.1. This will take you to the Quick Code mode. Press ⓒ to EXIT and select YES. The front panel buttons can then be operated as normal.	nonE	Unlocked	nonE	Conf
			ALL	All buttons locked		
			Edit	Edit keys locked		
COLD	COLD START ENABLE/ DISABLE	**Use this parameter with care.** When set to yes the indicator will return to factory settings on the next power up	no	Disable		Conf
			YES	Enable		
PASS.C	FEATURE PASSCODE	To enable chargeable options				Conf
MESG	STATIC HOME MESSAGE	Up to 15 messages can be configured using iTools configuration software. This parameter calls up messages 1 to 15.	OFF	The HOME display is configured according to the parameter HOME above	OFF	Conf
			1 to	Message 1		
			15	Message 15		

The following sections in this handbook describe the parameters associated with each subject. The general format of these sections is a description of the subject, followed by the table of all parameters to be found in the list, followed by an example of how to configure or set up parameters.

7. Process Input

Parameters in the input list configure the input to match your sensor. These parameters provide the following features:-

Input Type and linearisation	Thermocouple (TC) and 3-wire resistance thermometer (RTD) temperature detectors Linear input (-10 to +80mV) through external shunt or voltage divider, mA assumes a 2.49Ω external shunt. See the table in section 7.1.1. for the list of input types available
Display units and resolution	The change of display units and resolution will all the parameters related to the process variable
Input filter	First order filter to provide damping of the input signal. This may be necessary to prevent the effects of excessive process noise on the PV input from causing poor control and indication. More typically used with linear process inputs.
Fault detection	Sensor break is indicated by an alarm message 'Sbr'. For thermocouple it detects when the impedance is greater than pre-defined levels; for RTD when the resistance is less than 12Ω.
User calibration	Either by simple offset or by slope and gain. See section 13.2. for further details.
Over/Under range	When the input signal exceeds the input span by more than 5% the PV will flash indicating under or over range. If the value is too high to fit the the number of characters on the display 'HHHH' or 'LLLL' will flash. The same indications apply when the display is not able to show the PV, for example, when the input is greater than 999.9°C with one decimal point.

7.1 Process Input Parameters

INPUT LIST INPUT						
Name	Scrolling Display	Parameter Description	Value		Default	Access Level
IN.TYP	INPUT TYPE	Selects input linearisation and range	See section 7.1.1. for input types available			Conf L3 R/O
UNITS	DISPLAY UNITS	Display units shown on the instrument	nonE	No units - only for custom linearisation	°C	L3
			For a full list of units see section 7.1.2.			
DEC.P	DISPLAY POINTS	Decimal point position	nnnnn - No decimal point to n.nnnn - four decimal points		nnnnn	Conf L3 R/O
INP.HI	LINEAR INPUT HIGH	High limit for mV (mA) inputs (1) (not 38h8i/SG)	-10.00 to +80.00mV		80.00	Conf
INP.LO	LINEAR INPUT LOW	Low limit for mV (mA) inputs (1) (not 38h8i/SG)	-10.00 to +80.00mV		-10.00	Conf
RNG.HI	RANGE HIGH LIMIT	Range high limit for thermocouple RTD and mV inputs (1)	From the high limit of the selected input type to the 'Low Range Limit' parameter minus one display unit.			Conf L3 R/O
RNG.LO	RANGE LOW LIMIT	Range low limit for thermocouple RTD and mV inputs (1)	From the low limit of the selected input type to the 'High Range Limit' parameter minus one display unit.			Conf L3 R/O
(1) See section 7.1.3 for an example of how to adjust the above four parameters.						
PV.OFS	PV OFFSET	A simple offset applied to all input values. See section 7.1.3.	Generally one decimal point more than PV			L3
FILT.T	FILTER TIME	Input filter time constant (first order digital filter)	OFF to 100.0 seconds		1.6	L3
FILT.D	DISPLAY FILTER	Provides a filter for the displayed value	OFF	No display filter	OFF	L3
			1	Zero the least significant digit		
			2	Zero the two least significant digits		
CJ.TYP	CJC TYPE	Configuration of the CJC type (only shown for thermocouple inputs)	Auto	Automatic	Auto	Conf and if T/C L3 R/O
			0°C	Fixed at 0°C		
			50°C	Fixed at 50°C		
SB.TYP	SENSOR BREAK TYPE	Defines the action which is applied to the output if the sensor breaks (open circuit)	oFF	No sensor break will be detected	on	Conf L3 R/O
			on	Open circuit sensor will be detected		
			LAt	Latching		

SB.DIR	SENSOR BREAK DIRECTION	May be used, for example, in combination with retransmission of PV. The retransmitted value will either go to minimum or maximum output	uP	Up scale. Output goes to maximum	uP	Conf
			dwn	Down scale. Output goes to minimum		
CJC.IN	CJC TEMPERATURE	Temperature measured at the rear terminal block. Used in the CJC calculation (only shown for thermocouple inputs)	Read only			Conf L3 R/O and if T/C
PV.IN	PV INPUT VALUE	Current measured temperature	Minimum display to maximum display range			Conf L3 R/O
MV.IN	MILLIVOLT INPUT VALUE	Millivolts measured at the rear PV Input terminals	xx.xx mV - read only			
P.RST	PEAK RESET	Select ON to reset the HIGH and LOW peak values. The display automatically returns to OFF	OFF		OFF	L1
			On	peak Values reset		
HIGH	PEAK HIGH	This is the highest reading that the indicator has recorded since switch on or since it was reset	Read only			L1
LOW	PEAK LOW	This is the lowest reading that the indicator has recorded since switch on or since it was reset	Read only			L1
TARE	TARE FUNCTION	To select Tare function	OFF	Off	OFF	L1
			On	Tare selected		
			FAIL	Selection of the function failed		
TA.OFS	TARE OFFSET	Allows an offset to be applied to TARE or to be reset to zero	Instrument range. When TARE has been applied the Tare weight is shown here.			L3

7.1.1 Input Types and Ranges

Input Type		Min Range	Max Range	Units	Min Range	Max Range	Units
JtC	Thermocouple type J	-210	1200	°C	-238	2192	°F
ktC	Thermocouple type K	-200	1372	°C	-238	2498	°F
LtC	Thermocouple type L	-200	900	°C	-238	1652	°F
rtC	Thermocouple type R	-50	1700	°C	-58	3124	°F
btC	Thermocouple type B	0	1820	°C	-32	3308	°F
ntC	Thermocouple type N	-200	1300	°C	-238	2372	°F
ttC	Thermocouple type T	-200	400	°C	-238	752	°F
StC	Thermocouple type S	-50	1768	°C	-58	3214	°F
rtd	Pt100 resistance thermometer	-200	850	°C	-238	1562	°F
mu	mV or mA linear input	-10.00	80.00				
VoLt	Volts input	-0.2	12.7				
Cms	Value received over digital communications (modbus address 203). This value must be updated every 5 seconds or the indicator will show sensor break						
SGAu	Strain Gauge 32h8i only						

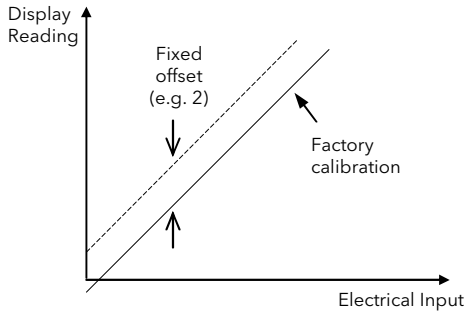
7.1.2 Units

°C	° C	°F	° F	°K	Kelvin	* These units only appear in 32h8i indicators
nonE	No units displayed	PErc	Percentage	PA	Pascals *	
mPA	Mpascals *	kPA	Kpascals *	bAr	Bar *	
mbAr	milli Bar *	PSI	PSI *	kGcm	kg/sq cm *	
mmwG	mm water gauge *	inwG	inches water gauge *	mmhG	mm mercury *	
torr	Torr *	L-H	Litres per hour *	L-m	Litres per minute *	
Prh	% Relative humidity *	PO 2	% O2 *	PCO2	% C/O2 *	
PCP	% carbon potential *	VoLt	Volts *	AmP	Amps *	
mA	milli amps *	mV	milli volts *	Ohm	Ohms *	
PPm	Parts per million *	rPm	Revs per minute *	m-S	milli seconds *	
SEC	Seconds *	min	Minutes *	hrS	Hours *	
PH	Ph *	PPH	% Ph *	mPH	Miles per hour *	
mG	milli grams *	GrAm	Grams *	kG	Kilo grams *	

7.1.3 PV Offset

All ranges of the indicator have been calibrated against traceable reference standards. This means that if the input type is changed it is not necessary to calibrate the indicator. There may be occasions, however, when you wish to apply an offset to the standard calibration to take account of known errors within the process, for example, a known sensor error or a known error due to the positioning of the sensor. In these instances it is not advisable to change the reference (factory) calibration, but to apply a user defined offset.

PV Offset applies a single offset to the temperature or process value over the full display range of the indicator and can be adjusted in Level 3. It has the effect of moving the curve up a down about a central point as shown in the example below:-



7.1.3.1 Example: To Apply an Offset:-

Connect the input of the indicator to the source device which you wish to calibrate to

Set the source to the desired calibration value

The indicator will display the current measurement of the value

If the display is correct, the indicator is correctly calibrated and no further action is necessary. If you wish to offset the reading:-

Do This	Display	Additional Notes
1. Select Level 3 or Conf as described in Chapter 2. Then press ⓟ to select 'INPUT'	INPUT	Scrolling display 'PROCESS INPUT LIST'
2. Press ⓒ to scroll to 'PV.OFS' 3. Press ▲ or ▼ to adjust the offset to the reading you require	2.0 PV.OFS	Scrolling display 'PV OFFSET' In this case an offset of 2.0 units is applied

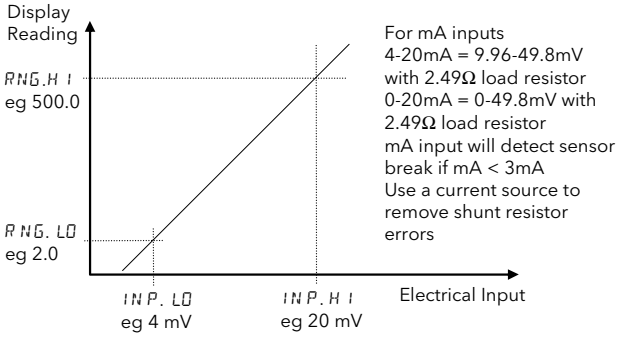
It is also possible to apply a five point offset which adjusts both low and high points. This is done in Level 3 using the CAL List, and the procedure is described in the Calibration section 13.2.1.

7.1.4 PV Input Scaling

Input scaling applies to the linear mV and volts input ranges only. This is set by configuring the INPUT TYPE parameter to mV or VOLT, mV has an input range of –10 to 80mV. Using an external burden resistor of 2.49Ω, the indicator can be made to accept 4-20mA from a current source. Scaling of the input will match the displayed reading to the electrical input levels from the transducer. PV input scaling can only be adjusted in Configuration level and is not provided for direct thermocouple or RTD inputs.

The graph below shows an example of input scaling, where it is required to display 2.0 when the input is 4mV and 500.0 when the input is 20mV .

If the input exceeds ±5% of the INP.LO or INP.HI settings, sensor break will be displayed.



7.1.4.1 Example: To Scale a Linear Input

Select Configuration level as described in Chapter 2. Then:-

Do This	Display	Additional Notes
1. Then press ⓟ to select 'INPUT'	INPUT	Scrolling display 'PROCESS INPUT LIST'
2. Press ⓒ to scroll to 'IN.TYP' 3. Press ▲ or ▼ to 'mV' or VOLT	mV IN.TYP	Scrolling display 'INPUT TYPE'
4. Press ⓒ to scroll to 'INP.HI' 5. Press ▲ or ▼ to '20.00'	20.00 INPHI	Scrolling display 'LINEAR INPUT HIGH'
6. Press ⓒ to scroll to 'INP.LO' 7. Press ▲ or ▼ to '4.00'	4.00 INPLO	Scrolling display 'LINEAR INPUT LOW'
8. Press ⓒ to scroll to 'RNG.HI' 9. Press ▲ or ▼ to '500.0'	500.0 RNG.HI	In operator level the indicator will read 500.0 for a mV input of 20.00
10. Press ⓒ to scroll to 'RNG.LO' 11. Press ▲ or ▼ to '2.0'	2.0 RNG.LO	In operator level the indicator will read 2.0 for a mV input of 4.00

8. Input/Output Channels

Indicators may be ordered with relay, analogue or logic channels to provide different interfaces to plant devices. The connections for these channels is made on terminals 1 to 3.

8.1 Output Channel 1 (OP-1) - 32h8i and 3204i Indicators

Output 1 is always a changeover relay in 32h8i and 3204i indicators and connected to terminals 1A, 1B and 2A. It is typically used to provide external indication of alarms. OP1 beacon is operated from this output.

Output 1 is configured using the parameters in the following table:-

OUTPUT LIST 1 'OP-1'							
Name	**Scrolling Display**	**Parameter Description**	**Value**			**Default**	**Access Level**
1.I D	I/O 1 TYPE	Displays the type of output	rELY	Relay output		rELY	Read only
1.FUNC	I/O 1 FUNCTION	The function may be turned off, otherwise set to d.out	nonE	Disabled. If disabled no further parameters are shown		HEAt	Conf
			d.out	Digital output			
1.SRC.A	I/O 1 SOURCE A	Selects the source of an event which will operate the output relay The output status is the result of an OR of Src A, Src B, Src C, and Src D Up to four events can, therefore, operate the output See section 8.3.2.	nonE	No event connected to the output		nonE	Conf
1.SRC.B	I/O 1 SOURCE B		1.---	Alarm 1	The --- indicates the alarm type. If the alarm is not configured AL.(Alarm no) is shown		
			2.---	Alarm 2			
1.SRC.C	I/O 1 SOURCE C		3.---	Alarm 3			
			4.---	Alarm4			
1.SRC.D	I/O 1 SOURCE D		ALL.A	All alarms. Logical AND of alarms 1 to 4.			
			nw.AL	Any new alarm			
			Pwr.F	Power fail. See also section 8.3.3.			
			O.rnG	Output relay operates if the indicator input is over range			
			Sbr	Sensor break alarm			
			PAL.1	Pre alarm 1			
			PAL.2	Pre alarm 2			
			PAL.3	Pre alarm 3			
			PAL.4	Pre alarm 4			
1.SENS	I/O 1 SENSE	To configure the sense of the output channel. See also section 8.3.1	nor Inu	Normal Inverted		nor	Conf

8.2 Input/Output Channel 1 (I/O-1) - 3216i Indicator

In the case of the 3216i channel 1 can be configured as an input or an output. For 3216i the parameters are defined in the following table:-

INPUT/OUTPUT LIST 1 'IO -1'						
Name	**Scrolling Display**	**Parameter Description**	**Value**			**Default**	**Access Level**
1.ID	IO 1 TYPE	I/O channel 1 hardware type defined by the hardware fitted	nonE	No input or output fitted		As ordered	Read only
			dC.OP	DC output (see note 1)			
			rELY	Relay output			
			LIO	Logic Input/Output			
1.FUNC	IO 1 FUNCTION	I/O channel 1 function.	nonE	Disabled. If disabled no further parameters are shown		nonE	Conf
			d.out	Digital output. Shown if I/O 1 TYPE = rELY or LIO			
			di n	Digital input. Shown if I/O 1 TYPE = LIO			
			PU	Process variable. Shown if I/O 1 TYPE = dc.OP			
1.SRC.A	OUTPUT 1 SOURCE A	These parameters only appear when the channel function is a Digital output, i.e. 1.FUNC = d.out These parameters have the same function as described above See section 8.3.2.	nonE	No event connected to the output		nonE	Conf
1.SRC.B	OUTPUT 1 SOURCE B		1.---	Alarm 1	The --- indicates the alarm type. If the alarm is not configured AL.(Alarm no) is shown		
1.SRC.C	OUTPUT 1 SOURCE C		2.---	Alarm 2			
			3.---	Alarm 3			
1.SRC.D	OUTPUT 1 SOURCE D		4.---	Alarm4			
			ALLA	All alarms. Logical AND of alarms 1 to 4.			
			nw.AL	Any new alarm			
			Sbr	Sensor break alarm			
			PwrF	Power fail. See also section 8.3.3.			
			OrnG	Output operates if the indicator input is over range			
			PAL.1	Pre alarm 1			
			PAL.2	Pre alarm 2			
			PAL.3	Pre alarm 3			
			PAL.4	Pre alarm 4			
1.D.IN	DIGITAL INPUT FUNCTION	This parameter is only applicable to I/O 1 and only appears if the channel function is a Digital IP i.e. 1.FUNC = di n Only one function may be activated by a physical input	nonE	Input not used		AcAL	Conf
			AcAL	Alarm acknowledge			
			tArE	Tare (linear inputs only)			
			AL.in	Alarm inhibit. See note 1			
			PrSt	Peak value reset			
			FrEE	Freezes the current displayed value			
			Loc.b	Front keypad disable (keylock)			
			rEc	Recipe select through IO1 digital input			
1.SENS	IO 1 SENSE	To configure the sense of the input or output channel. See section 8.3.1	nor	Normal		nor	Conf
			Inu	Inverted			
1.RNG	DC OUTPUT RANGE	To configure 0-20mA or 4-20mA output Only appears if the channel is DC output	0.20	0-20mA output			L3
			4.20	4-20mA output			
1.LOW	DC OUTPUT LOW RANGE	To scale the DC output	0 - 3000				Conf
1.HIGH	DC OUTPUT HIGH RANGE						

Note 1:-

DC output calibration is described in section 13.4.

8.3 Output Channel 2 (OP-2) - 3216i Indicator

Output 2 is only available in 3216i. It may be optionally ordered as a normally open relay or analogue output and is available on terminals 2A and 2B. If it is ordered as a relay it can be configured to operate on alarms (the same as I/O1). If it is ordered as analogue it is configured to provide PV re-transmission.

OUTPUT LIST 2 'OP-2'							
Name	**Scrolling Display**	**Parameter Description**	**Value**			**Default**	**Access Level**
2.ID	OUTPUT 2 TYPE	Output channel 2 hardware type defined by the hardware fitted	none	No input or output fitted		As ordered	Read only
			dC.OP	DC output (see note 1)			
			rELY	Relay output			
2.FUNC	OUTPUT 2 FUNCTION	Output channel 2 function.	none	Disabled. If disabled no further parameters are shown		none	Conf
			d.out	Digital output. Shown if O/P 2 TYPE = rELY			
			PV	Process variable. Shown if O/P 2 TYPE = dc.OP			
2.SRC.A	OUTPUT 2 SOURCE A	These parameters only appear when the channel function is a Digital output, i.e. 2.FUNC = d.out These parameters have the same function as described above See section 8.3.2.	none	No event connected to the output		none	Conf
2.SRC.B	OUTPUT 2 SOURCE B		1.---	Alarm 1	The --- indicates the alarm type. If the alarm is not configured AL.(Alarm no) is shown		
2.SRC.C	OUTPUT 2 SOURCE C		2.---	Alarm 2			
			3.---	Alarm 3			
2.SRC.D	OUTPUT 2 SOURCE D		4.---	Alarm4			
			ALLA	All alarms. Logical AND of alarms 1 to 4.			
			nwAL	Any new alarm			
			Sbr	Sensor break alarm			
			PwrF	Power fail. See also section 8.3.3.			
			OrnG	Output relay operates if the indicator input is over range			
			PAL.1	Pre alarm 1			
			PAL.2	Pre alarm 2			
			PAL.3	Pre alarm 3			
			PAL.4	Pre alarm 4			
2.SENS	OUTPUT 2 SENSE	To configure the sense of the relay output. See section 8.3.1.	nor	Normal		nor	Conf
			Inu	Inverted			
2.RNG	DC OUTPUT RANGE	To configure 0-20mA or 4-20mA output Only appears if the channel is DC output	0.20	0-20mA output			L3
			4.20	4-20mA output			
2.LOW	DC OUTPUT LOW RANGE	To scale the DC output	0 - 3000				Conf
2.HIGH	DC OUTPUT HIGH RANGE						

Note 1:-

DC output calibration is described in section 13.4.

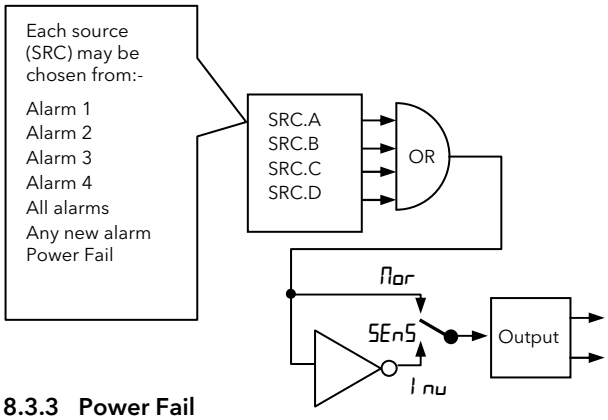
8.3.1 Sense

For an alarm output set this parameter to '*InU*' so that it de-energises to the alarm state.

If the module is an input (3216i channel 1 only), 'normal' means the function is activated when the input contact is closed, and 'inverted' means the function is activated when the input contact is open.

8.3.2 Source

The four parameters SOURCE A, SOURCE B, SOURCE C, and SOURCE D appear when the output is configured as a digital output i.e. '*FUNC*' = '*d.Out*' and provide the facility to connect up to four alarms to operate a single relay output. If any one of the events becomes true then the output relay will operate.



8.3.3 Power Fail

An output, configured as a digital output, can be made to operate following a power fail. It can be acknowledged in the same manner as an alarm but no alarm message is given.

8.3.4 Example: To Configure OP-1 Relay to Operate on Alarms 1 and 2:-

Do This	Display	Additional Notes
1. From any display, press ▤ as many times as necessary to select '*OP-1*'	OP-1	Scrolling display '*OP-1 LIST*'
2. Press ⟳ to scroll to '*1.ID*'	rELY 1.ID	This is the identification of the hardware fitted and cannot be adjusted.
3. Press ⟳ to scroll to '*1.FUNC*' 4. Press ▲ or ▼ to select '*d.out*'	d.out 1.FUNC	The output is configured as a digital output function. Scrolling display '*1O 1 FUNCTION*'
5. Press ⟳ to scroll to '*1.SRC.A*' 6. Press ▲ or ▼ to select the event which you want to operate the output	1. Hi 1.SRCA	The output will activate if either alarm 1 is triggered. Note:- *1.* indicates the alarm number, *Hi* indicates the alarm type. Scrolling display '*OUTPUT 1 SOURCE A*'
7. If a second event is required to operate the same output, press ⟳ to select '*1.SRC.B*' 8. Press ▲ or ▼ to select the second event which you want to operate the output, eg '*AL.2*'	AL 2 1.SRC.B	Scrolling display '*OUTPUT 1 SOURCE B*' Note:- '*2*'. indicates the alarm number, *AL* is displayed if the alarm type is not configured. Continue to select up to four events if required using *1.SRC.C* and *1.SRC.D*
9. Press ⟳ to scroll to '*1.SENS*' 10. Press ▲ or ▼ to select '*InU*'	InU 1.SENS	'Inverted' means a relay output is energised for 0% PID demand 'Normal' means a relay output is energised for 100% PID demand Scrolling display '*1O 1 SENSE*'

8.4 Output Channel 3 (OP-3) – 32h8i, 32h8i/SG and 3204i Indicators

Output 3 is not available in 3216i. In 32h8i, 32h8i/SG and 3204i it is a 0-20mA dc output used for re-transmission of the PV and is available on terminals 3A and 3B. The way in which this output operates is determined by parameters in the OP- 3 List below:-

OUTPUT LIST 3 'OP-3'							
Name	**Scrolling Display**	**Parameter Description**	**Value**			**Default**	**Access Level**
3.I D	OUTPUT 3 TYPE	Output channel 3 hardware type	dC.OP	0-20mA output. See note 1		dC.OP	Read only
3.FUNC	OUTPUT 3 FUNCTION	Output channel 3 function The function may be turned off, otherwise set to PU	nonE	Disabled. If disabled no further parameters are shown			Conf
			PU	Process variable re-transmission			
3.RNG	DC OUTPUT RANGE	Selects the re-transmission output range	0.10	0-10Vdc Output	Not available in 3204i		Conf
			0.5	0-5Vdc Output			
			2.10	2-10Vdc Output			
			1.5	1-5Vdc Output			
			0.20	2-20mA output			
			4.20	4-20mA output			
3.LOW	DC OUTPUT LOW SCALE	To scale the DC output	0- 99999 (9999 for 3204i)				
3.HIGH	DC OUTPUT HIGH SCALE						

Note 1:-

DC output calibration is described in section 13.4.

8.4.1 Output Scaling

The output can be scaled so that the measuring device reads as required. For example, assume the following settings:-

Input mV	Display Reading	3.LOW	3.HIGH	Output device reading mA
0 - 20	0 - 2000	0	2000	0 – 20
0 - 20	0 - 2000	0	3000	0 – 15
0 - 20	0 - 2000	0	1000	0 – 20 since the output saturates. The device will also read 20mA for an input of 10mV and 10mA for an input of 5mV

Note: The above example is shown for output 3 which is only available in 32h8i, 32h8i/SG and 3204i indicators. For 3216i the outputs which can be configured as dc are 1 and 2.

8.5 AA Relay Channel (AA) (Output 4)

This is a changeover relay available in all indicators. Connections are made to terminals AA, AB, and AC. OP4 beacon is operated from the AA relay output channel. Output AA (4) has the same functionality as OP-1 – the parameters are repeated here for clarity.

OUTPUT AA LIST 'AA'							
Name	**Scrolling Display**	**Parameter Description**	**Value**			**Default**	**Access Level**
4.TYPE	OUTPUT 4 TYPE	Displays the type of output	rELY	Relay output		rELY	Read only
4.FUNC	OUTPUT 4 FUNCTION	The function may be turned off, otherwise set to d.out	nonE	Disabled. If disabled no further parameters are shown			Conf
			d.out	Digital output			
4.SRC.A	OUTPUT 4 SOURCE A	Selects the source of an event which will operate the output relay The output status is the result of an OR of Src A, Src B, Src C, and Src D Up to four events can, therefore, operate the output See section 8.3.2.	nonE	No event connected to the output		nonE	Conf
4.SRC.B	OUTPUT 4 SOURCE B		1.---	Alarm 1	The --- indicates the alarm type. If the alarm is not configured AL.(Alarm no) is shown		
4.SRC.C	OUTPUT 4 SOURCE C		2.---	Alarm 2			
			3.---	Alarm 3			
4.SRC.D	OUTPUT 4 SOURCE D		4.---	Alarm4			
			ALL.A	All alarms			
			nw.AL	Any new alarm			
			Sbr	Sensor break alarm			
			Pwr.F	Power fail See also section 8.3.3.			
			OrnG	Output relay operates if the indicator input is over range			
			PAL.1	Pre alarm 1			
			PAL.2	Pre alarm 2			
			PAL.3	Pre alarm 3			
			PAL.4	Pre alarm 4			
4.SENS	OUTPUT 4 SENSE	To configure the sense of the output channel. See also section 8.3.1	nor Inu	Normal Inverted		nor	Conf

9. Digital Input

Availability	32h8i	32h8i/SG	3204i	3216i
Digital Input A	Always	Never	Always	Optional
Digital Input B	Always	Always	Always	Never

9.1 Digital Input Parameters

The input is typically from a voltage free contact, which can be configured to operate a number of functions as determined by parameters in the LA and LB Lists:-

LOGIC INPUT LIST 'LA' / 'LB'						
Name	**Scrolling Display**	**Parameter Description**	**Value**		**Default**	**Access Level**
L.TYPE	LOGIC INPUT TYPE	Input channel type	LIP	Logic input	As order code	Conf Read only
L.D.I N	LOGIC INPUT FUNCTION	To configure the function of the digital input	nonE	Input not used	AcAL	Conf
			AcAL	Alarm acknowledge		
			GAGE	Strain gauge (32h8i only)		
			tArE	Tare (linear inputs only)		
			AL.in	Alarm inhibit. See note 1		
			PrSt	Peak value reset		
			FrEE	Freezes the current displayed value		
			Loc.b	Keylock		
			rEc	Recipe select		
			UP	Remote key 'Up'		
			dwn	Remote key 'Down'		
L.SENS	LOGIC INPUT SENSE	To configure the polarity of the input channel	nor	Normal	nor	Conf
			Inu	Inverted		

Note1:-

This input may be used, for example, in part of an automated process where it is required to prevent alarms from being displayed during a particular part of the process. It should be used with care – blocking alarms or delayed alarms may be an alternative.

10. Alarms

Alarms are used to alert an operator when a pre-set level has been exceeded. They are indicated by a scrolling message on the display and the red ALM beacon. They may also switch an output – usually a relay (see section 8.3.2) to allow external devices to be operated when an alarm occurs.

10.1 Types of Alarm

Up to six different alarms are available:-

1. Alarm 1 2. Alarm 2 3. Alarm 3 4. Alarm 4	Configurable as any of:- Full scale High HI – the alarm is triggered if the PV exceeds a maximum value Full scale Low LO – the alarm is triggered if the PV exceeds a minimum value Rising Rate of Change rroC - the alarm is triggered if the rate of increase in PV exceeds the set level Falling Rate of Change FrroC. - the alarm is triggered if the rate of decrease in PV exceeds the set level
5. Sensor Fault Alarm	The alarm is triggered if the sensor is open circuit
6. Power Fail	An alarm is indicated after a power cycle. It is acknowledged and cancelled using 'Ack' buttons. This may be useful to indicate that a power failure has occurred and the peak values will only apply since return of the power.

Hysteresis is the difference between the point at which the alarm switches 'ON' and the point at which it switches 'OFF'. It is used to provide a definite indication of the alarm condition and to prevent alarm relay chatter.

Latching Alarm is used to hold the alarm condition once an alarm has been detected. It may be configured as:-

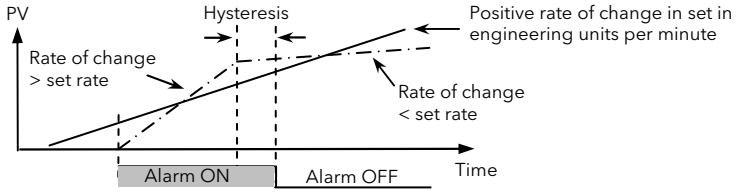
nonE	Non latching	A non latching alarm will reset itself when the alarm condition is removed
AutO	Automatic	An auto latching alarm requires acknowledgement before it is reset. The acknowledgement can occur **BEFORE** the condition causing the alarm is removed.
mAn	Manual	The alarm continues to be active 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.
EvE	Event	ALM beacon does not light but an output associated with this parameter will activate. A scrolling message may be configured using iTools, as described in section 14.5.3. If a message has been configured it will scroll across the display while the event is true. An 'Event' is not acknowledged.

Blocking Alarms The alarm may be masked during start up of a process. Blocking prevents the alarm from being activated until the process has first achieved a safe state. It is used to ignore start up conditions which are not representative of running conditions.

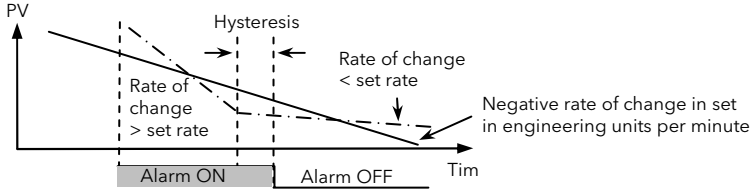
A blocking alarm is re-initiated after a setpoint change.

See section 10.1 for an explanation of the behaviour of blocking alarms under different conditions.

Rising rate of change (units/minute)	An alarm will be detected if the rate of change in a positive direction exceeds the alarm threshold



Falling rate of change (units/minute)	An alarm will be detected if the rate of change in a negative direction exceeds the alarm threshold



10.1.1 Alarm Relay Output

Alarms can operate relay outputs 1, 2 or 4. Any individual alarm can operate an individual output or any combination of alarms, up to four, can operate an individual output. They are either supplied pre-configured in accordance with the ordering code or set up in the Quick Codes or in configuration level.

Section 8.3.2. describes how to configure the alarm outputs using the 'SOURCE' parameters.

10.1.2 Alarm Indication

- ALM beacon flashing red = a new alarm (unacknowledged)
- This is accompanied by a scrolling alarm message. A typical default message will show the source of the alarm followed by the type of alarm. For example, 'ALARM 1 HIGH'
- Using Eurotherm iTools configuration package, it is also possible to download customised alarm messages. An example might be, 'PROCESS TOO HOT'.
- If more than one alarm is present further messages are flashed in turn in the main display. The alarm indication will continue while the alarm condition is present and is not acknowledged.
- ALM beacon on continuously = alarm has been acknowledged.

10.1.3 To Acknowledge An Alarm

Press ⟳ and ▼ 'Ack' together.

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

Non-Latched Alarms

Alarm condition present when the alarm is acknowledged.

- ALM beacon on continuously.
- The alarm message(s) will continue to scroll

This state will continue for as long as the alarm condition remains. When the alarm condition disappears all indication also disappears.

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 acknowledged or the alarm is no longer present.

If the alarm condition disappears before it is acknowledged the alarm resets immediately.

Latched Alarms

See description in section 10.1.

Power Fail Alarm

Alarm condition is indicated when the indicator is switched on.

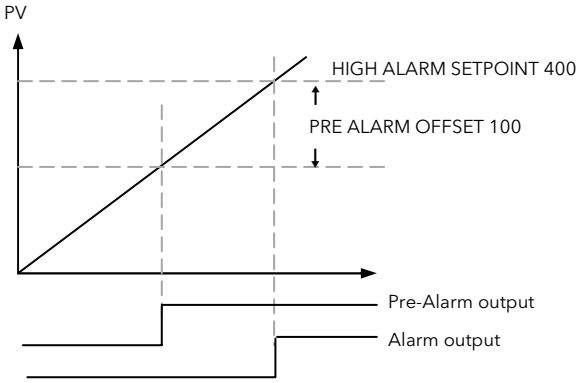
It is reset using 'Ack' buttons

10.1.4 Pre-Alarms

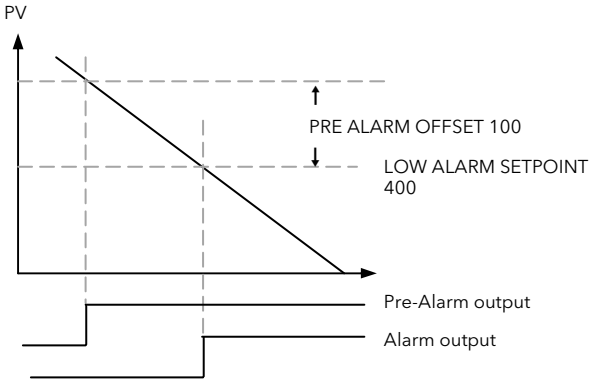
A pre-alarm can be attached to High and Low alarms.

A pre alarm is activated when the PV exceeds a level set as an offset from the ALARM SETPOINT. In this way it always activates a set number of units before the ALARM SETPOINT is reached. It is used to activate a relay, see sections 8.3.2 and 10.1.1.

For example, assume a high alarm setpoint is 400 and the pre-alarm setpoint is 100 then the pre-alarm will activate when the PV = 300.



For a low alarm set to the same values the pre-alarm will activate at 500.



No message is indicated on the instrument display nor is the ALM beacon activated when a pre-alarm occurs. However, a digital output (eg relay), attached to the alarm, is activated and the relevant OP beacon will illuminate.

10.2 Behaviour of Alarms After a Power Cycle

The response of an alarm after a power cycle depends upon the latching type, whether it has been configured to be a blocking alarm, it's state and the acknowledge status of the alarm.

The response of active alarms after a power cycle is as follows:

For a non-latching alarm or an event alarm blocking will be re-instated, if configured. If blocking is not configured the active alarm will remain active. If the alarm condition has gone safe during the down time the alarm will return inactive.

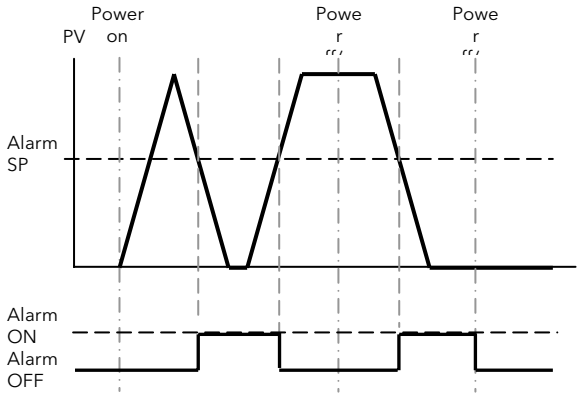
For an auto-latching alarm blocking will be re-instated, if configured, only if the alarm had been acknowledged prior to the power cycle. If blocking is not configured or the alarm had not been acknowledged the active alarm will remain active. If the alarm condition has gone safe during the downtime the alarm will return inactive if it had been acknowledged prior to the power cycle else it will return safe but not acknowledged. If the alarm was safe but not acknowledged prior to the power cycle the alarm will return safe but not acknowledged.

For a manual-latching alarm blocking will not be re-instated and the active alarm will remain active. If the alarm condition has gone safe during the downtime the alarm will return safe but not acknowledged. If the alarm was safe but not acknowledged prior to the power cycle the alarm will return safe but not acknowledged.

The following examples show graphically the behaviour under different conditions:-

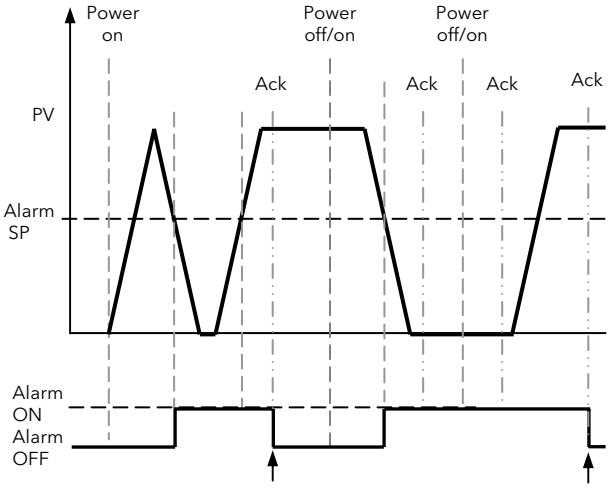
10.2.1 Example 1

Alarm configured as Absolute Low; Blocking: No Latching



10.2.2 Example 2

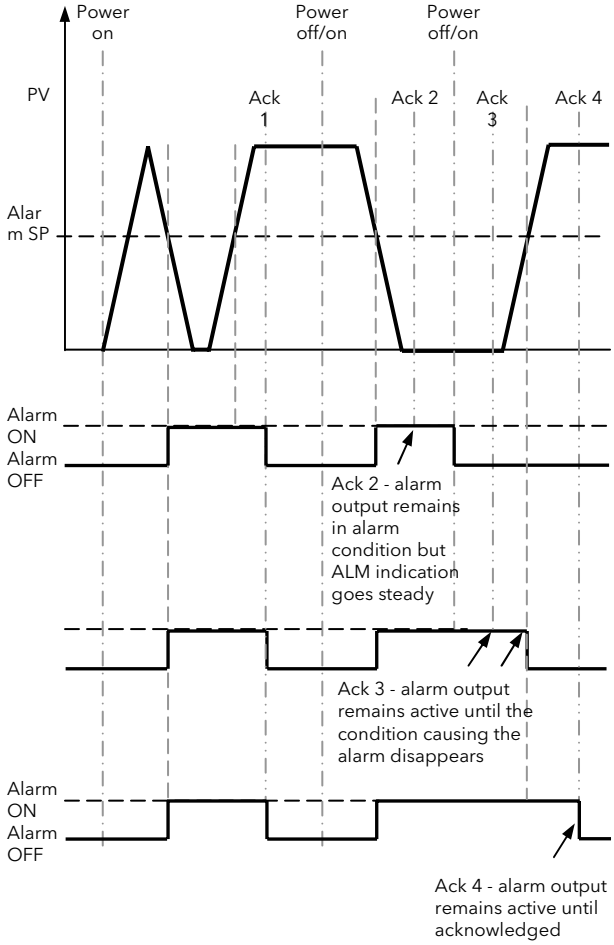
Alarm configured as Absolute Low; Blocking: Manual Latching



Note: The alarm will only cancel when the alarm condition is no longer current AND then it is acknowledged

10.2.3 Example 3

Alarm configured as Absolute Low; Blocking: Auto Latching



10.3 Alarm Parameters

Four alarms are available. Parameters do not appear if the Alarm Type = None. The following table shows the parameters to set up and configure alarms.

ALARM LIST 'ALARM'						
Name	**Scrolling Display**	**Parameter Description**	**Value**		**Default**	**Access Level**
A1.TYP	ALARM 1 TYPE	Selects the type of alarm	nonE	Alarm not configured	As order code	Conf
			Hi	Full Scale High		
			Lo	Full Scale Low		
			rroc	Rising rate of change		
			Froc	Falling rate of change		
A1.---	ALARM 1 SETPOINT	Alarm 1 threshold value. The last three characters show the type of alarm configured from the above list	Instrument range		0	L3
A1.STS	ALARM 1 OUTPUT	Indicates the status of the alarm	OFF	Alarm off		Read only
			On	Alarm on		
A1.HYS	ALARM 1 HYSTERESIS	See description at the beginning of this section	0 to 9999			Conf
A1.LAT	ALARM 1 LATCHING TYPE	See description at the beginning of this section	nonE	Non-latching	As order code	Conf
			Auto	Latching with automatic resetting		
			mAn	Latching with manual resetting		
			Evt	Event (no alarm flashing beacon but messages can be displayed)		
A1.BLK	ALARM 1 BLOCKING	See description at the beginning of this section	no	No blocking	no	Conf
			YES	Blocking		
A1.DLY	DELAY TIME	The alarm will not be indicated until the set time has elapsed	0:00 to 99:59 mm:ss 0:59 = 59 seconds 99:59 = 99 minutes 59 seconds		0:00	
A1.OFS	ALARM SETPOINT OFFSET	Applies a fixed offset to a full scale high or full scale low alarm setpoint. This may be useful when used in conjunction with digital communications, where a variable value may be downloaded during different parts of a process.	Instrument range		0	L3
P1.OFS	PRE ALARM OFFSET	Pre alarm setpoint set as a deviation from the ALARM SETPOINT. Only shown if the alarm is high or low. See section 10.1.4.	Instrument range		0	L3
The above parameters are repeated for Alarm 2, A2; Alarm 3, A3; Alarm 4, A4						

10.3.1 Example: To Configure Alarm 1

Enter configuration level as described. Then:-

Do This	The Display You Should See	Additional Notes
1. Press ▤ as many times as necessary to select 'ALARM'		
2. Press ⊙ to select 'A 1TYP' 3. Press ▲ or ▼ to select the required alarm type		Alarm Type choices are:- nonE Alarm not configured Hı Full Scale High Lo Full Scale Low rroc Rate of change rising Froc Rate of change falling
4. Press ⊙ to select 'A 1- - - ' 5. Press ▲ or ▼ to set the alarm trip level		This is the alarm threshold setting for Alarm 1. Characters (- - -) shown after the alarm number indicate the type of alarm configured from the above list. The alarm threshold is shown in the upper display. In this example the high alarm will be detected when the measured value exceeds 215
6. Press ⊙ to select 'A 1STS'		This is a read only parameter which shows the status of the alarm output
7. Press ⊙ to select 'A 1HYS' 8. Press ▲ or ▼ to set the hysteresis		In this example the alarm will cancel when the measured value decreases 2 units below the trip level (e.g. at 213 units in this example)
9. Press ⊙ to select 'A 1LAT' 10. Press ▲ or ▼ to select the latching type		Latching Type choices are:- nonE No latching AuEo Automatic mAn Manual EuE Event See section 10.1 for an explanation of latching alarms
11. Press ⊙ to select 'A 1BLK' 12. Press ▲ or ▼ to 'YES' or 'No' 13. Repeat the above to configure alarms 2, 3 and 4 if required		
14. Continue to press ⊙ to set up a delay before the alarm is indicated and to set a pre alarm level		

10.4 Diagnostic Alarms

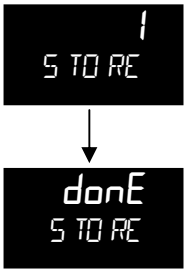
Diagnostic alarms indicate a possible fault within the indicator or connected devices.

Display shows	What it means	What to do about it
E.ConF	A change made to a parameter takes a finite time to be entered. If the power to the indicator is turned off before the change has been entered then this alarm will occur. Do not turn the power off to the indicator while ConF is flashing	Enter configuration mode then return to the required operating mode. It may be necessary to re-enter the parameter change since it will not have been entered in the previous configuration.
E.CAL	Calibration error	Re-instate Factory calibration
E2Er	EEPROM error	Return to factory for repair
EEEr	Non-vol memory error	Note the error and contact your supplier
E.Lin	Invalid input type. This refers to custom linearisation which may not have been applied correctly or may have been corrupted.	Go to the INPUT list in configuration level and set a valid thermocouple or input type

11. Recipe

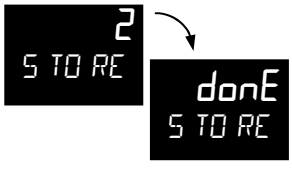
A recipe can take a snapshot of the current values and store these into a recipe number.
There are five recipes available, which can store a range of parameter values for different processes.
Each recipe can be given a name using iTools configuration software.

11.1 To Save Values in a Recipe

Do This	The Display You Should See	Additional Notes
1. Press ⓜ as many times as necessary to select 'RECIP'		Scrolling display RECIPE LIST
2. Press ⓒ to scroll to 'STORE' 3. Press ▲ or ▼ to choose the recipe number to store eg 1		Scrolling display RECIPE TO SAVE The current parameter values are stored in Recipe 1

11.2 To Save Values in a Second Recipe

In this example the alarm 1 high setpoint will be changed and stored in recipe 2. All other values will remain the same as recipe 1:-

Do This	The Display You Should See	Scrolling display **Additional Notes**
1. Press ⓜ to scroll to 'ALARM'		Scrolling display ALARM LIST
2. Press ⓒ to scroll to A1.HI 3. Press ▲ or ▼ to change the value eg 22		Scrolling display ALARM 1 SETPOINT
4. Press ⓜ to scroll to 'RECIP		Scrolling display RECIPE LIST
5. Press ⓜ to 'STORE 6. Press ▲ or ▼ to 2		Scrolling display RECIPE TO SAVE

11.3 To Select a Recipe to Run

Do This	The Display You Should See	Additional Notes
1. Press ⓔ as many times as necessary to select 'RECIP'		Scrolling display RECIPE LIST
2. Press ⓒ to select 'REC.NO' 3. Press ▲ or ▼ to choose recipe number 1		Scrolling display CURRENT RECIPE NUMBER The values stored in Recipe 1 will now be loaded. If a recipe number is chosen which has not been saved then FAIL will be displayed

12. Digital Communications

Digital Communications (or 'comms' for short) allows the indicator to communicate with a PC or a networked computer system.

This product conforms to MODBUS RTU ® protocol a full description of which can be found on www.modbus.org.

Two ports are available both using MODBUS RTU communication facilities:

1. a configuration port - intended to communicate with a system to download the instrument parameters and to perform manufacturing tests and calibration
2. an optional EIA232 or EIA 485 port on terminals HD, HE and HF - intended for field communications using, for example, a PC running a SCADA package.

The two interfaces cannot operate at the same time.

For a full description of digital communications protocols (ModBus RTU) refer to the 2000 series Communications Handbook, part number HA026230, available on www.eurotherm.co.uk.

Each parameter has its own unique ModBus address. A list of these is given at the end of this section.

12.1 Digital Communications Wiring

12.1.1 EIA 232

To use EIA 232 the PC will be equipped with an EIA 232 port, usually referred to as COM 1.

To construct a cable for EIA 232 operation use a three core screened cable.

The terminals used for EIA 232 digital communications are listed in the table below. Some PC's use a 25 way connector although the 9 way is more common.

Standard Cable	PC socket pin no.		PC Function *	Instrument Terminal	Instrument
Colour	9 way	25 way			Function
White	2	3	Receive, RX	HF	Transmit, TX
Black	3	2	Transmit, TX	HE	Receive, RX
Red	5	7	Common	HD	Common
Link together	1 4 6	6 8 11	Rec'd line sig. detect Data terminal ready Data set ready		
Link together	7 8	4 5	Request to send Clear to send		
Screen		1	Ground		

- These are the functions normally assigned to socket pins. Please check your PC manual to confirm.

12.1.2 EIA 485

To use EIA 485, buffer the EIA 232 port of the PC with a suitable EIA 232/RS485 converter. The Eurotherm Controls KD485 Communications Adapter unit is recommended for this purpose. The use of a EIA 485 board built into the computer is not recommended since this board may not be isolated, which may cause noise problems, and the RX terminals may not be biased correctly for this application.

To construct a cable for EIA 485 operation use a screened cable with one (EIA 485) twisted pair plus a separate core for common. Although common or screen connections are not necessary, their use will significantly improve noise immunity.

The terminals used for EIA 485 digital communications are listed in the table below.

Standard Cable Colour	PC Function *	Instrument Terminal	Instrument Function
White	Receive, RX+	HF (B) or (B+)	Transmit, TX
Red	Transmit, TX+	HE (A) or (A+)	Receive, RX
Green	Common	HD	Common
Screen	Ground		

- These are the functions normally assigned to socket pins. Please check your PC manual to confirm .

See section 2.9 for wiring diagrams.

12.2 Digital Communications Parameters

The following table shows the parameters available.

DIGITAL COMMUNICATIONS LIST 'COMS'						
Name	**Scrolling Display**	**Parameter Description**	**Value**		**Default**	**Access Level**
I D	MODULE IDENTITY	Comms identity	nonE	No module fitted	As order code	Conf L3 R/O
			r232	EIA 232 Modbus interface		
			r485	EIA 485 Modbus interface		
ADDR	ADDRESS	Communications address of the instrument	1 to 254		1	L3
BAUD	BAUD RATE	Communications baud rate	1200	1200	9600	Conf L3 R/O
			2400	2400		
			4800	4800		
			9600	9600		
			19.20	19,200		
PRTY	PARITY	Communications parity	nonE	No parity	nonE	Conf L3 R/O
			EuEn	Even parity		
			Odd	Odd parity		
DELAY	RX/TX DELAY TIME	To insert a delay between Rx and Tx to ensure that drivers have sufficient time to switch over.	OFF	No delay		Conf L3 R/O
			On	Fixed delay applied		
RETRN	TRANSMITTED PARAMETER	Master communications broadcast parameter. See section 12.2.2.	nonE	None	nonE	
			PV	Process Variable		
REG.AD	DESTINATION ADDRESS	Parameter added in the Slave address to which the master communications value will be written See section 12.2.1.	0 to 9999		0	

12.2.1 Broadcast Communications

Broadcast master communications, as a simple master, allows the 3200i indicator to send a single value to any number of slave instruments. Modbus broadcast using function code 6 (Write single value) must be used. This allows the 3200i to link with other products, without the need for a supervisory PC, to create a small system solution. The facility provides a simple and precise alternative to analogue retransmission.

The retransmitted parameter is Process Variable. The indicator will cease broadcast when it receives a valid request from a Modbus master - this allows iTools to be connected for commissioning purposes.

Warning

When using broadcast master communications, bear in mind that updated values are sent many times a second. Before using this facility, check that the instrument to which you wish to send values can accept continuous writes. ***Note that in common with many third party lower cost units, the Eurotherm 2200 series and the 3200 series prior to version V1.10 do not accept continuous writes to the temperature setpoint. Damage to the internal non-volatile memory could result from the use of this function. If in any doubt, contact the manufacturer of the device in question for advice.***

When using the 3200 series controllers fitted with software version 1.10 and greater, use the Remote Setpoint variable at Modbus address 26 if you need to write to a temperature setpoint. This has no write restrictions and may also have a local trim value applied. There is no restriction on writing to the 2400 or 3500 series.

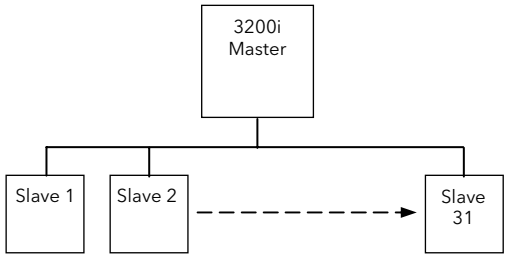
12.2.2 Broadcast Master Communications

The 3200 broadcast master can be connected to up to 31 slaves if no segment repeaters are used. If repeaters are used to provide additional segments, 32 slaves are permitted in each new segment. The master is configured by setting the 'RETRAN' parameter to **Pu**.

Once the function has been enabled, the instrument will send this value out over the communications link every control cycle (250ms).

Notes:-

1. The parameter being broadcast must be set to the same decimal point resolution in both master and slave instruments.
2. If iTools, or any other Modbus master, is connected to the port on which the broadcast master is enabled, then the broadcast is temporarily inhibited. It will restart approximately 30 seconds after iTools is removed. This is to allow reconfiguration of the instrument using iTools even when broadcast master communications is operating.



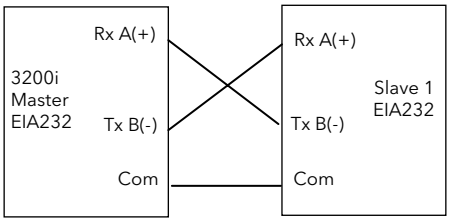
12.2.3 Wiring Connections

The Digital Communications module for use as a master or slave uses terminals HD to HF.

EIA232 Connections

Rx connections in the master are wired to Tx connections of the slave

Tx connections in the master are wired to Rx connections of the slave

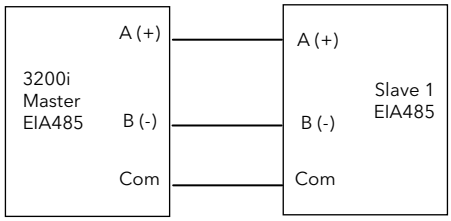


EIA485 2-wire Connections

Connect A (+) in the master to A (+) of the slave

Connect B (-) in the master to B (-) of the slave

This is shown diagrammatically below



12.3 Example: To Set Up Instrument Address

This can be done in operator level 3:-

Do This	Display View	Additional Notes
1. Press ⊙ as many times as necessary to select **'COMMS LIST'**		Scrolling display 'COMMS LIST'
2. Press ⊙ to scroll to **'ID'** 3. Press ▲ or ▼ to select EIA232 or EIA485 comms		Scrolling display 'ID'
4. Press ⊙ to scroll to **'ADDR'** 5. Press ▲ or ▼ to select the address for the particular indicator		Up to 254 can be chosen but note that no more than 33 instruments should be connected to a single EIA485 link. Scrolling display 'ADDRESS'

For further information see 2000 Series Communications Handbook Part No. HA026230 which can be downloaded from www.eurotherm.co.uk.

12.4 DATA ENCODING

☺ Note that the Eurotherm iTools OPC server provides a straightforward means of accessing any variable in the 3200 indicator in the correct data format without the need to consider data representation. However, if you wish to write your own communications interface software, you will need to take the format used by the 3200 comms software into account.

Modbus data is normally encoded into a 16 bit signed integer representation.

Integer format data, including any value without a decimal point or represented by a textual value (for example 'off', or 'on'), is sent as a simple integer value.

For floating point data, the value is represented as a 'scaled integer', in which the value is sent as an integer which gives the result of the value multiplied by 10 to the power of the decimal resolution for that value. This is easiest to understand by reference to examples:

FP Value	Integer Representation
FP Value	Integer Representation
9.	9
-1.0	10
123.5	1235
9.99	999

It may be necessary for the Modbus master to insert or remove a decimal point when using these values.

It is possible to read floating point data in a native 32 bit IEEE format. This is described in the Eurotherm Series 2000 Communications Handbook (HA026230), Chapter 7.

12.5 Parameter Modbus Addresses

Parameter Mnemonic	Parameter Name	Modbus Address (Decimal)
PV.IN	PV (Temperature) Input Value (see also Modbus address 203 which allows writes over Modbus to this variable).	1
RNG.LO	Input Range Low Limit	11
RNG.HI	Input Range High Limit	12
A1.---	Alarm 1 Threshold	13
A2.---	Alarm 2 Threshold	14
	Cal offset 4	26
LOC.t	Local Trim – added to the remote setpoint to compensate for local temperature variations in a control zone.	27
A1.HYS	Alarm 1 Hysteresis	47
	Cal point 4	66
	Cal point 3	67
A2.HYS	Alarm 2 Hysteresis	68
A3.HYS	Alarm 3 Hysteresis	69
A4.HYS	Alarm 4 Hysteresis	71
StAt	Instrument Status. This is a bitmap: B0 – Alarm 1 Status B1 – Alarm 2 Status B2 – Alarm 3 Status B3 – Alarm 4 Status B5 – Sensor Break Status B10 – PV Overrange (by > 5% of span) B12 – New Alarm Status In each case, a setting of 1 signifies 'Active', 0 signifies 'Inactive'.	75
A3.---	Alarm 3 Threshold	81
A4.---	Alarm 4 Threshold	82
Di.IP	Digital Inputs Status. This is a bitmap: B0 – Logic input 1A B1 – Logic input LA B2 – Logic input LB B7 – Power has failed since last alarm acknowledge A value of 1 signifies the input is closed, otherwise it is zero. Values are undefined if options are not fitted or not configured as inputs.	87
FILT.T	Input Filter Time	101
Home	Home Display. 0 – Standard PV display 4 – PV and Alarm 1 setpoint 6 – PV only 7 – PV and Alarm 1 setpoint read only	106
-	Instrument version number. Should be read as a hexadecimal number, for example a value of 0111 hex is instrument V1.11	107
-	Static message	108
-	Instrument type code.	122
HIGH	Peak high	126
LOW	Peak low	127
ADDR	Instrument Comms Address	131
PV.OFS	PV Offset	141
C.Adj	Calibration Adjust	146
IM	Instrument mode 0 – Operating mode - all algorithms and I/O are active 1 – Standby - control outputs are off 2 – Config Mode - all outputs are inactive	199
COLOR	Colour change Green – Red – Green normal/Red on alarm –	200
MV.IN	Input value in millivolts	202
PV.CM	Comms PV Value. This may be used to write to the Process Variable (temperature) parameter over Modbus when a linearisation type of 'Comms' is selected, allowing the instrument to control to externally derived values. If sensor break is turned on, it is necessary to write to this variable once every 5 seconds. Otherwise a sensor break alarm will be triggered as a failsafe. If this is not required, turn sensor break off.	203
		204
CJC.IN	CJC Temperature	215
TARE	Tare enable Off – On – Fail -	223
SBR	Sensor Break Status (0 = Off, 1 = Active)	258
NEW.AL	New Alarm Status (0 = Off, 1 = Active)	260
	Alarm latch status	261
Ac.All	Acknowledge all alarms (1 = Acknowledge	274
A1.STS	Alarm 1 Status (0 = Off, 1 = Active)	294
A2.STS	Alarm 2 Status (0 = Off, 1 = Active)	295
A3.STS	Alarm 3 Status (0 = Off, 1 = Active)	296
A4.STS	Alarm 4 Status (0 = Off, 1 = Active)	297
	Alarm 1 inhibit	298
	Alarm 2 inhibit	299
	Alarm 3 inhibit	300
	Alarm 4 inhibit	301
REC.NO	Recipe to Recall	313
STORE	Recipe to Save	314
Lev2.P	Level 2 Code	515
UNITS	Display Units 0 – Degrees C 1 – Degrees F 2 – Kelvin 3 – None 4 – Percent	516
Lev3.P	Level 3 Code	517
Conf.P	Config Code	518
Cold	If set to 1 instrument will reset to factory defaults on next reset or power cycle.	519
DEC.P	Decimal Point Position	525

	0 – XXXX. 1 – XXX.X 2 – XX.XX	
STBY.T	Standby Type 0 – Absolute Alarm Outputs Active – others off 1 – All outputs inactive	530
uCAL	User Calibration Enable	533
A1.TYP	Alarm 1 Type 0 – Off 1 –Absolute High 2 – Absolute Low 3 – Deviation High 4 – Deviation Low 5 – Deviation Band	536
A2.TYP	Alarm 2 Type (as Alarm 1 Type)	537
A3.TYP	Alarm 3 Type (as Alarm 1 Type)	538
A4.TYP	Alarm 4 Type (as Alarm 1 Type)	539
A1.LAT	Alarm 1 Latching Mode 0 – No latching 1 – Latch - Automatic Reset 2 – Latch – Manual Reset	540
A2.LAT	Alarm 2 Latching Mode (as Alarm 1 Latching Mode)	541
A3.LAT	Alarm 3 Latching Mode (as Alarm 1 Latching Mode)	542
A4.LAT	Alarm 4 Latching Mode (as Alarm 1 Latching Mode)	543
A1.BLK	Alarm Blocking Mode Enable (0 = OFF, 1 = BLOCK)	544
A2.BLK	Alarm Blocking Mode Enable (0 = OFF, 1 = BLOCK)	545
A3.BLK	Alarm Blocking Mode Enable (0 = OFF, 1 = BLOCK)	546
A4.BLK	Alarm Blocking Mode Enable (0 = OFF, 1 = BLOCK)	547
Di.OP	Digital Outputs Status. This is a bitmap: B0 – Output 1A B1 – Output 2A B2 – (not used) B3 – Output 4/AA It is possible to write to this status word to use the digital outputs in a telemetry output mode. Only outputs whose function is set to 'none' are affected, and the setting of any bits in the Digital Output Status word will not affect outputs used for heat (for example) or other functions. Thus it is not necessary to mask in the settings of these bits when writing to this variable.	551
	Alarm 1 delay	552
	Alarm 2 delay	553
	Alarm 3 delay	554
	Alarm 4 delay	555
	Alarm 1 offset	556
	Alarm 2 offset	557
	Alarm 3 offset	558
	Alarm 4 offset	559
OFS.HI	Adjust High Offset	560
OFS.LO	Adjust Low Offset	561
PNT.HI	Adjust High Point	562
PNT.LO	Adjust Low Point	563
SB.TYP	Sensor Break Type 0 – No Sensor Break 1 – Non-Latching Sensor Break 2 – Latching Sensor Break	578
SB.DIR	Sensor break direction Up – Down –	579
Id	Customer ID – May be set to any value between 0-9999 for identification of instruments in applications. Not used by the instrument itself.	629
P1.OFS	Pre alarm offset 1	640
P2.OFS	Pre alarm offset 2	641
P3.OFS	Pre alarm offset 3	642
P4.OFS	Pre alarm offset 4	643
P1.STS	Pre alarm 1 output status	644
P2.STS	Pre alarm 2 output status	645
P3.STS	Pre alarm 3 output status	646
P4.STS	Pre alarm 4 output status	647
PHASE	Calibration Phase 0 – None 1 – 0 mv 2 – 50 mv 3 – 150 Ohm 4 – 400 Ohm 5 – CJC 6 – CT 0 mA 7 – CT 70 mA 8 – Factory Defaults 9 – Output 1 mA low cal 10 – Output 1 mA high cal 11 – Output 2 mA low cal 12 – Output 2 mA high cal 13 – Output 3 ma low cal (3208/3204 only) 14 – Output 3 ma high cal (3208/3204 only)	768
GO	Calibration Start 0 – No 1 – Yes (start cal) 2 – Cal Busy 3 – Cal Pass 4 – Cal Fail Note values 2-4 cannot be written but are status returns only	769
-	Analogue Output Calibration Value	775
SG.TYP	Strain gauge cal type Shunt Comparison Cell	780
SHUNT	Shunt calibration	781
LO.CAL	Strain gauge low cal	782
HI.CAL	Strain gauge high cal	783
AUT.SG	Strain auto No - 1 Yes - 2	784
	Strain gauge adjust	785

K.LOC	Allows instrument to be locked via a key/digital input 0 - unlocked, 1 – all keys locked 2 – Edit keys (raise and lower) disabled 3 – Mode key disabled 4 – Manual mode disabled 5 – Enter standby mode when Mode combination pressed 6 – Timer keys disabled	1104
IN.TYP	Input Sensor Type 0 – J Type Thermocouple 1 – K Type Thermocouple 2 – L Type Thermocouple 3 – R Type Thermocouple 4 – B Type Thermocouple 5 – N Type Thermocouple 6 – T Type Thermocouple 7 – S Type Thermocouple 8 – RTD 9 – millivolt 10 – Comms Input (see Modbus address 203) 11 – Custom Input (Downloadable)	12290
CJ.TYP	CJC Type 0 – Auto 1 – 0 Degrees C 2- 50 Degrees C	12291
mV.HI	Linear Input High	12306
mV.LO	Linear Input Low	12307
L.TYPE	Logic Input A channel hardware type 0 – None 1 – Logic Inputs	12352
L.D.IN	Logic input A function 40 – None 41 – Acknowledge all alarms 42 – Select SP1/2 43 – Lock All Keys 44 – Timer Reset 45 – Timer Run 46 – Timer Run/Reset 47 – Timer Hold 48 – Auto/Manual Select 49 – Standby Select	12353
L.SENS	Configures the polarity of the logic input channel A (0 = Normal, 1 = Inverted)	12361
L.TYPE (LB)	Logic Input B channel hardware type (3208/3204 only) 0 – None 1 – Logic Inputs	12362
L.D.IN (LB)	Logic input B function (3208/3204 only) 40 – None 41 – Acknowledge all alarms 42 – Select SP1/2 43 – Lock All Keys 44 – Timer Reset 45 – Timer Run 46 – Timer Run/Reset 47 – Timer Hold 48 – Auto/Manual Select 49 – Standby Select	12363
L.SENS (LB)	Configures the polarity of the logic input channel B (0 = Normal, 1 = Inverted) (3208/4 only)	12377

ID	Comms Module Type 0 – None 1 – RS485 2 – RS232	12544
BAUD	Baud Rate 0 – 9600 1 – 19200 2 – 4800 3 – 2400 4 – 1200	12548
PRTY	Parity setting 0 – None 1 – Even 2 – Odd	12549
DELAY	RX/TX Delay – (0 = no delay, 1 = delay) Select if a delay is required between received and transmitted comms messages. Sometimes required when intelligent RS485 adaptors are used.	12550
RETRN	Comms Retransmission Variable selection: 0 – Off 1 – Working Setpoint 2 – PV 3 – Output Power 4 – Error	12551
REG.AD	Modbus register address to broadcast retransmission to. For example if you wish to retransmit the working setpoint from one 3200 to a group of slaves, and receive the master working setpoint into the slaves' remote setpoint, set this variable to 26 (the address of the remote setpoint in the slave units).	12552
	Cal 3 offset	12558
	Cal 4 offset	12559
1.ID	IO channel 1 hardware type 0 – None 1 – Relay 2 – Logic I/O	12672
1.D.IN	IO1 Digital input function Logic input function 40 – None 41 – Acknowledge all alarms 42 – Select SP1/2 43 – Lock All Keys	12673
1.FUNC	I/O Channel Function 0 – None (or Telemetry Output) 1 – Digital Output 4 – Digital Input 10 – DC Output no function 14 – DC Output PV retransmission	12674
1.RNG	IO Channel 1 DC Output Range 0 – 0-20mA 1 – 4-20mA	12675
	IO1 low	12676
1.SRC.A	IO Channel 1 Source A 0 – None 1 – Alarm 1 2 – Alarm 2 3 – Alarm 3 4 – Alarm 4 5 – All Alarms (1-4) 6 – New Alarm 9 – Sensor Break Alarm	12677

1.SRC.B	IO Channel 1 Source B As IO Channel 1 Source A (Modbus address 12678)	12678
1.SRC.C	IO Channel 1 Source C As IO Channel 1 Source A (Modbus address 12678)	12679
1.SRC.D	IO Channel 1 Source D As IO Channel 1 Source A (Modbus address 12678)	12680
1.SENS	Configures the polarity of the input or output channel (0 = Normal, 1 = Inverted)	12681
	IO1 high	12682
	IO1 telemetry	12683
2.ID	Output 2 Type 0 – None 1 – Relay 2 – Logic Output	12736
2.FUNC	Output 2 Channel function 0 – None (or Telemetry Output) 1 – Digital Output 10 – DC Output no function 14 – DC Output PV retransmission	12739
2.RNG	IO Channel 2 DC Output Range 0 – 0-20mA 1 – 4-20mA	12740
	Output 2 low	12741
2.SRC.A	Output 2 source A As IO Channel 1 Source A (Modbus address 12678)	12742
2.SRC.B	Output 2 source B As IO Channel 1 Source A (Modbus address 12678)	12743
2.SRC.C	Output 2 source C As IO Channel 1 Source A (Modbus address 12678)	12744
2.SRC.D	Output 2 source D As IO Channel 1 Source A (Modbus address 12678)	12745
2.SENS	Output 2 Polarity (0 = Normal, 1 = Inverted)	12746
	Output 2 high	12747
	Output telemetry	12748
3.ID	Output 3 Type 0 – None 1 – Relay	12800
3.FUNC	Output 3 Channel function 0 – None (or Telemetry Output) 1 – Digital Output 14 – DC Output PV retransmission	12803
3.RNG	IO Channel 3 DC Output Range 0 – 0-20mA 1 – 4-20mA	12804
	Output 3 low	12805
3.SRC.A	Output 3 source A As IO Channel 1 Source A (Modbus address 12678)	12806
3.SRC.B	Output 3 source B As IO Channel 1 Source A (Modbus address 12678)	12807
3.SRC.C	Output 3 source C As IO Channel 1 Source A (Modbus address 12678)	12808
3.SRC.D	Output 3 source D As IO Channel 1 Source A (Modbus address 12678)	12809
3.SENS	Output 3 Polarity (0 = Normal, 1 = Inverted)	12810
	Output 3 high	12811
	Output 3 telemetry	12812
4.TYPE	Output AA Type 0 – None 1 – Relay	13056
4.FUNC	Output 4 Channel function 0 – None (or Telemetry Output) 1 – Digital Output	13059
4.SRC.A	Output AA source A As IO Channel 1 Source A (Modbus address 12678)	13062
4.SRC.B	Output AA source B As IO Channel 1 Source A (Modbus address 12678)	13063
4.SRC.C	Output AA source C As IO Channel 1 Source A (Modbus address 12678)	13064
4.SRC.D	Output AA source D As IO Channel 1 Source A (Modbus address 12678)	13065
4.SENS	Output AA sense (0 = Normal, 1 = Inverted)	13066
TA.OFS	Tare offset	15885

13. Calibration

All ranges are calibrated during manufacture to traceable standards for every input type. When changing ranges it is not necessary to calibrate the indicator. Furthermore, the use of a continuous automatic zero correction of the input ensures that the calibration of the instrument is optimised during normal operation.

To comply with statutory procedures such as the Heat Treatment Specification AMS2750, the calibration of the instrument can be verified and re-calibrated if considered necessary in accordance with the instructions given in this chapter.

For example AMS2750 states:-

"Instructions for calibration and recalibration of 'field test instrumentation' and 'control monitoring and recording instrumentation' as defined by the NADCAP Aerospace Material Specification for pyrometry AMS2750D clause 3.2.5 (3.2.5.3 and sub clauses) including Instruction for the application and removal of offsets defined in clause 3.2.4".

13.1 To Check Input Calibration

The PV Input may be configured as mV, mA, thermocouple or platinum resistance thermometer.

13.1.1 Precautions

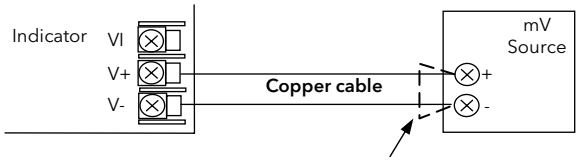
Before checking or starting any calibration procedure the following precautions should be taken:-

1. When calibrating mV inputs make sure that the calibrating source output is set to less than 250mV before connecting it to the mV terminals. If accidentally a large potential is applied (even for less than 1 second), then at least one hour should elapse before commencing the calibration.
2. RTD and CJC calibration must not be carried out without prior mV calibration.
3. A pre-wired jig built using a spare instrument sleeve may help to speed up the calibration procedure especially if a number of instruments are to be calibrated.
4. Power should be turned on only after the instrument has been inserted in the sleeve of the pre-wired circuit. Power should also be turned off before removing the instrument from its sleeve.
5. Allow at least 10 minutes for the instrument to warm up after switch on.

13.1.2 To Check mV Input Calibration

The input may have been configured for a process input of mV, Volts or mA and scaled in Level 3 as described in section 7. The example described in section 7.1.4.1 assumes that the display is set up to read 2.0 for an input of 4.000mV and 500.0 for an input of 20.000mV.

To check this scaling, connect a milli-volt source, traceable to national standards, to terminals V+ and V- using copper cable as shown in the diagram below.



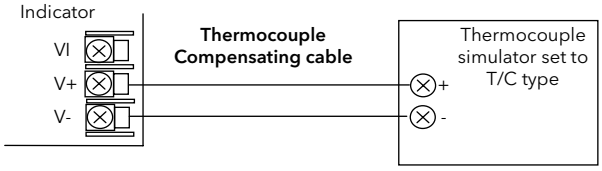
Ensure that no offsets (see sections 7.1.3 and 13.2) have been set in the indicator.

Set the mV source to 4.000mV. Check the display reads 2.0 ±0.25% ± 1LSD (least significant digit).

Set the mV source to 20.000mV. Check the display reads 500.0 ±0.25% ± 1LSD.

13.1.3 To Check Thermocouple Input Calibration

Connect a milli-volt source, traceable to national standards, to terminals V+ and V- as shown in the diagram below. The mV source must be capable of simulating the thermocouple cold junction temperature. It must be connected to the instrument using the correct type of thermocouple compensating cable for the thermocouple in use.



Set the mV source to the same thermocouple type as that configured in the indicator.

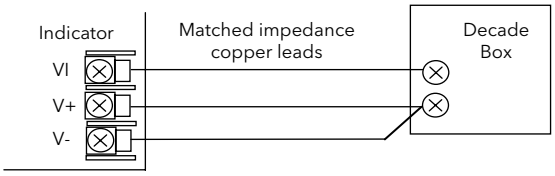
Adjust the mV source to the minimum range. For a type J thermocouple, for example, the minimum range is -210°C. However, if it has been restricted using the Range Low parameter then set the mV source to this limit. Check that the reading on the display is within ±0.25% of minimum range ± 1LSD.

Adjust the mV source for to the maximum range. For a type J thermocouple, for example, the maximum range is 1200°C. However, if it has been restricted using the Range High parameter then set the mV source to this limit. Check that the reading on the display is within ±0.25% of maximum range ± 1LSD.

Intermediate points may be similarly checked if required.

13.1.4 To Check RTD Input Calibration

Connect a decade box with total resistance lower than 1K and resolution to two decimal places in place of the RTD as indicated on the connection diagram below **before the instrument is powered up**. If at any instant the instrument was powered up without this connection then at least 10 minutes must elapse from the time of restoring this connection before RTD calibration check can take place.



The RTD range of the instrument is -200 to 850°C. It is, however, unlikely that it will be necessary to check the instrument over this full range.

Set the resistance of the decade box to the minimum range. For example 0°C = 100.00Ω. Check the calibration is within ±0.25% of 0° ± 1LSD.

Set the resistance of the decade box to the maximum range. For example 200°C = 175.86Ω. Check the calibration is within ±0.25% of 200° ± 1LSD.

13.2 Offsets

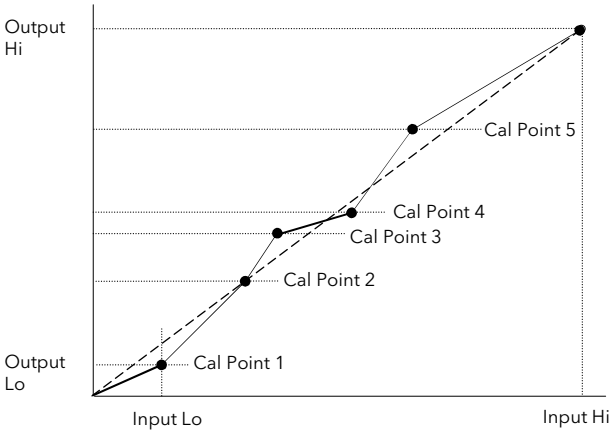
The process value can be offset to take into account known errors within the process. The offset can be applied to any Input Type (mV, V, mA, thermocouple or RTD).

A single offset can be applied - the procedure is carried out in the INPUT list and has been described in section 7.1.3.

It is also possible to adjust the low and high points as a five point offset. This can only be done in **Level 3** in the 'CAL' list and is described below.

13.2.1 Five Point Offset

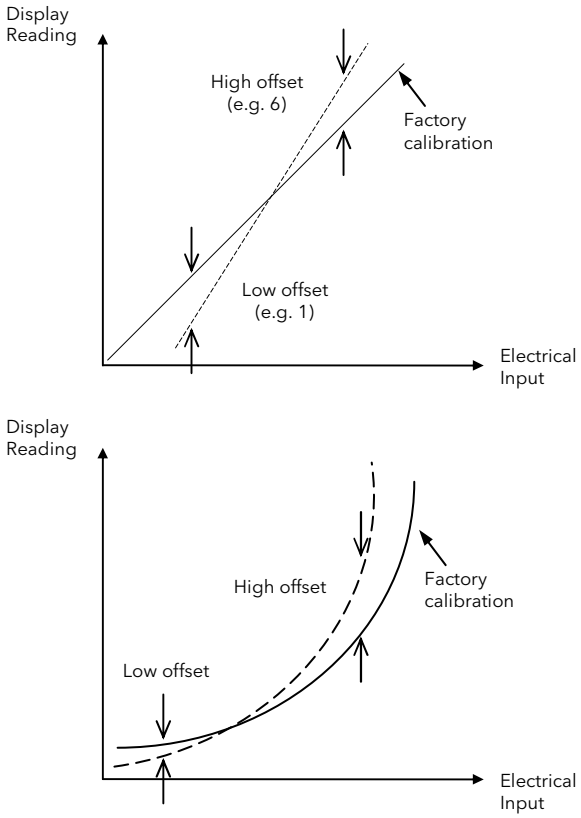
A five point offset may be used to compensate for transducer or measurement non-linearities. The diagram shows an example of the type of discontinuity which might occur in a system.



In this case adjust each point in turn for the VALUE WHICH THE INDICATOR SHOULD READ. For example if the value at point 1 should be 1.2345 then set Pnt. 1 to this value. The following example shows how to do this.

Do This	Display View	Notes
1. Select **Level 3** as described in Chapter 2. Then press to select 'CAL'	CAL	Scrolling message CALIBRATION LIST
2. Press to scroll to 'U.CAL'	IdLE UCAL	Scrolling message USER CALIBRATION
3. Press or to 'Pnt. 1'	Pnt. 1 UCAL	To revert to the original values, select rSEt
4. Press to scroll to 'C.ADJ' 5. Press or to the correct value	40 CADJ	Note:- this is not an offset value
6. Repeat the above for points 1 to 5		

In some cases it will not be necessary to adjust all 5 points. For example, a low and high adjustment may be all that is necessary as shown in the following diagrams.



In this case set PnE. 1 to the required low point value. For the high point value you may select any point PnE.2 to PnE.5. The instrument applies a straight line between the two points.

Note:-

The calibration points must be chosen consecutively – the five point calibration will not work if a higher point is inserted between other points.

13.3 Input Calibration

If the calibration is not within the specified accuracy follow the procedures in this section:-

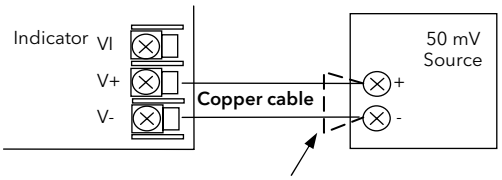
In 3200 series instruments, inputs which can be calibrated are:-

- **mV Input.** This is a linear 80mV range calibrated at two fixed points. This should always be done before calibrating either thermocouple or resistance thermometer inputs. mA range calibration is included in the mV range.
- **Thermocouple** calibration involves calibrating the temperature offset of the CJC sensor only. Other aspects of thermocouple calibration are also included in mV calibration.
- **Resistance Thermometer**. This is also carried out at two fixed points - 150Ω and 400Ω.

The precautions stated in section 13.1.1 should be observed.

13.3.1 To Calibrate mV Range

Calibration of the mV range is carried out using a 50 milli-volt source, connected as shown in the diagram below. mA calibration is included in this procedure.



For best results 0mV should be calibrated by disconnecting the copper wires from the mV source and short circuiting the input to the indicator

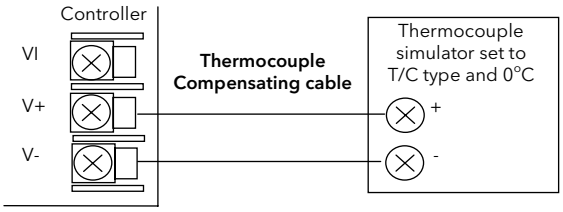
Select **Conf Level** as described in Chapter 2, set the indicator input to mV range, then:-

Do This	Display View	Additional Notes
1. From any display press ⊜ as many times as necessary until the 'CAL' page header is displayed.	CAL	Scrolling display 'CALIBRATION LIST'
2. Press ⊙ to select 'PHASE'	nonE PHASE	Scrolling display 'CALIBRATION PHASE'
3. Set mV source for 0mV		
4. Press ▲ or ▼ to choose '0'	0 PHASE	
5. Press ⊙ to select 'GO' 6. Press ▲ or ▼ to choose 'YES'	YES GO bUSY GO PASS GO	Scrolling display 'CALIBRATION START' The indicator automatically calibrates to the injected input mV.
		As it calibrates the display will show bUSY then PASS, assuming a successful calibration. If it is not successful then 'FAIL' will be displayed. This may be due to incorrect input mV
7. **Set mV source for 50mV**		
8. Press ⊙ to select 'PHASE' **9.** Press ▲ or ▼ to choose '50' 10. Repeat 5 & 6 above	50 PHASE	The indicator calibrates to the high point in the same way as the low point above

13.3.2 To Calibrate Thermocouple Ranges

Thermocouples are calibrated, firstly, by following the previous procedure for the mV ranges, then calibrating the CJC.

This can be carried out using an external CJC reference source such as an ice bath or using a thermocouple mV source. Replace the copper cable shown in the diagram below with the appropriate compensating cable for the thermocouple in use.



Set the mV source to **internal compensation** for the thermocouple in use and set the output for **0mV**. Then:-

Do This	Display View	Additional Notes
1. From the mV calibration, press ▲ or ▼ to select 'CJC'	CJC PHASE	
2. Press ⊙ to select 'GO' 3. Press ▲ or ▼ to choose 'YES'	YES GO bUSY GO PASS GO	The indicator automatically calibrates to the CJC input at 0mV. As it does this the display will show bUSY then PASS, assuming a successful calibration. If it is not successful then 'FAIL' will be displayed. This may be due to an incorrect input mV

13.3.3 To Calibrate RTD Ranges

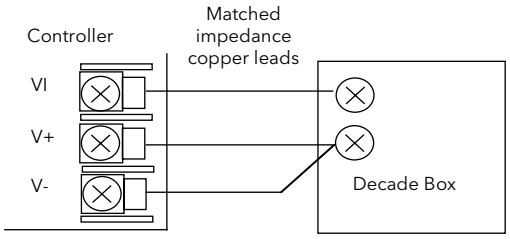
The two points at which the RTD range is calibrated are 150.00Ω and 400.00Ω.

Before starting RTD calibration:

- A decade box with total resistance lower than 1K must be connected in place of the RTD as indicated on the connection diagram below **before the instrument is powered up**. If at any instant the instrument was powered up without this connection then at least 10 minutes must elapse from the time of restoring this connection before RTD calibration can take place.
- The instrument should be powered up for at least 10 minutes.

Before using or verifying RTD calibration:

- The mV range must be calibrated first.



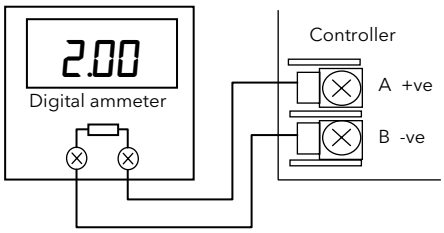
Do This	Display View	Notes
1. From any display press ⧉ as many times as necessary until the 'CAL' page header is displayed.		Scrolling display 'CALIBRATION LIST'
2. Press ⊙ to select 'PHASE'		Scrolling display 'CALIBRATION PHASE'
3. Set the decade box for 150.00Ω		
4. Press ▲ or ▼ to choose '150R'		
5. Press ⊙ to select 'GO'		Scrolling display 'CALIBRATION START'
6. Press ▲ or ▼ to choose 'YES'		
The indicator automatically calibrates to the injected 150.00Ω input. As it does this the display will show bUSY then PASS, assuming a successful calibration. If it is not successful then 'FAIL' will be displayed. This may be due to an incorrect input resistance		
7. **Set the decade box for 400.00Ω**		
8. Press ▲ or ▼ to choose '400R'		
9. Repeat 5 and 6 above to calibrate the high point		
The indicator will again automatically calibrates to the injected 400.00Ω input. If it is not successful then 'FAIL' will be displayed		

13.4 Output Calibration

Output 3 (or outputs 1 or 2 in 3216i) may be configured to re-transmit the PV as an analogue, 0-20mA, 4-20mA or 0-20V, 4-20V signal.

13.4.1 To Calibrate mA Outputs

Assume Output 3 (set to 0-20mA) is to be calibrated. Connect an ammeter to terminals 3A/3B.



Errors in the reading on the ammeter can be calibrated out by selecting the appropriate calibration parameter. For example, if the ammeter reads an error at the zero end select the parameter 3.mA.L. The indicator then outputs 2.0mA. Then select 'VALUE' on the instrument display and adjust this until the error is corrected. Errors at the high end are corrected by the parameter 3.mA.H which outputs 18mA. This is illustrated by the procedure below

Select Configuration level. Then:-

Do This	Display View	Notes
1. From the 'CAL' list header press ⊙ to select 'PHASE' **2.** Press ▲ or ▼ to choose '3.mA.L'	3.mA.L PHASE	Scrolling message 'CALIBRATION PHASE'
3. Press ⊙ to select 'VALUE' 4. Press ▲ or ▼ to adjust this value so that it reads the same value as shown on the ammeter. For example if the meter reads 2.06 then set the controller reading for 206. The decimal point is not displayed on the controller so that 200 represents 2.00.	200 VALUE	Scrolling message 'DC OUTPUT READING'
5. Press ⊙ to go back to 'PHASE' 6. Press ▲ or ▼ to choose '3mA.H'	3.mA.H PHASE	Scrolling message 'CALIBRATION PHASE'
7. Press ⊙ to select 'VALUE' 8. Press ▲ or ▼ to adjust this value so that it reads the same value as shown on the ammeter. The value represents 18.00mA	1800 VALUE	Scrolling message 'DC OUTPUT READING'
For voltage calibration repeat the above procedure using parameters 3.VLo and 3.VHi. The output calibration values are 1000 (1V) and 9000 (9V).		

13.4.2 To Return to Factory Calibration

Select Configuration level.

Then

Do This	Display View	Additional Notes
1. From the 'CAL' list header press ⊙ to select 'PHASE'	nonE PHASE	
2. Press ▲ or ▼ to choose 'FACt'	FACt PHASE	
3. Press ⊙ to select 'GO' 4. Press ▲ or ▼ to choose 'YES'	YES GO PASS GO	The indicator automatically returns to the factory values stored during manufacture

13.4.3 Transducer Calibration

Load cell, strain gauge or four wire bridge pressure transducers can be calibrated in configuration level as well as levels 2 and 3. The procedure is the same as described already in section 5.3.

13.5 Calibration Parameters

The following table lists the parameters available in the Calibration List.

CALIBRATION PARAMETER LIST			'CAL'			
Name	**Scrolling Display**	**Parameter Description**	**Value**		**Default**	**Access Level**
UCAL	USER CALIBRATION	To calibrate the 5 point linerisation table. Not 32h8i/SG	IdLE			L3 only
			Pnt.1			
			Pnt.2			
			Pnt.3			
			Pnt.4			
			Pnt.5			
			rSEt			
PHASE	CALIBRATION PHASE	To calibrate low and high offset	FAct	Return to factory settings	FAct	Factory
			3.U.Hi	High volts output from output 3		
			3.U.Lo	Low volts output from output 3		
			3mA.H	High mA output from output 3		
			3mA.L	Low mA output from output 3		
			nonE	Not selected	nonE	Conf only These parameters do not apply to 32h8i/SG
			0	Select mV i/p low calibration point		
			50	Select mV i/p high calibration point		
			0U	Select V i/p low calibration point		
			10U	Select V i/p high calibration point		
			150r	Select PRT i/p low cal point		
			400r	Select PRT i/p high cal point		
			CJC	Select CJC calibration		
GO	CALIBRATION START	To start the calibration sequence	no	Initial state	no	Conf
			YES	Start		
			buSY	Calibrating		
			PASS	Calibration successful		
			FAi L	Calibration unsuccessful		
SG.TYP	STRAIN GAUGE CALIBRATION TYPE	Selects the calibration for the sensor in use	SHnt	4-wire bridge type pressure transducer	CELL	L2 These three parameters are only available in 32h8i/SG. They are used to calibrate to the strain gauge sensor. See section 5.3.
			CELL	Load cell		
			ComP	Comparison		
SHUNT	SHUNT CALIBRATION	To set the high calibration point for the pressure transducer in use	OFF or 40.0 to 100.0		OFF	
LO.CAL	STRAIN GAUGE LOW CAL	Calibrate the low point	no	Initial state	no	
			YES	Start		
HI.CAL	STRAIN GAUGE HIGH CAL	Calibrate the high point	buSY	Calibrating		
			PASS	Calibration successful		
			FAi L	Calibration unsuccessful		
AUT.SG	STRAIN GAUGE AUTO CAL	When selected this perform an automatic calibration to the strain gauge sensor. See section 5.3.5.	no	Initial state	no	
			YES	Start auto calibration		
			Lo	These parameters automatically appear as the calibration takes place.		
			Hi			
			PASS			
			FAi L			

14. Configuration Using iTools

iTools is a configuration and monitoring package which will edit, store and 'clone' complete instrument configurations.

iTools can be used to configure all the functions of the 3000 series indicators described in this manual. It is also possible using iTools to configure additional functions such as customised messages and parameter promotion. These features are described in this chapter.

You may also wish to refer to the iTools Help Manual Part No. HA028838 which can be downloaded from www.eurotherm.co.uk. for further information on how to install, connect and generally operate iTools.

14.1 Loading an IDM

An IDM is a software file which defines the parameter addresses of a particular build of instrument. This is normally included with your iTools CD and iTools will then recognize the software version of your instrument. Alternatively, download the latest version of iTools. This may be found in www.eurotherm.co.uk.

If the build of your instrument is a non-standard, it may be necessary for you to download the IDM from the Eurotherm web site. The file will be of the format id32i_v107.exe, where id 32i is the instrument and V--- is the software version number of the instrument.

To load the IDM

From windows START., select Programs → Eurotherm iTools → Advanced Tools → IDM Manager. Then Install New IDM.

To register the new IDM

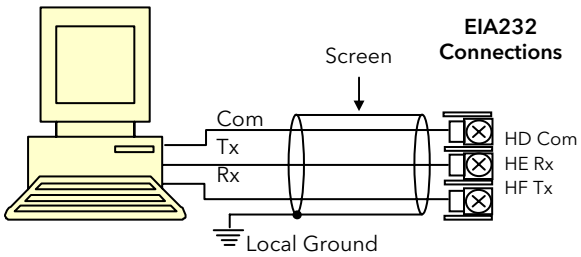
Copy the file to c:\Program Files\Eurotherm\iTools\Devices.

14.2 Connecting a PC to the Indicator

This may be done using digital communications port H or by a configuration clip.

14.2.1 Using the H Communications Port

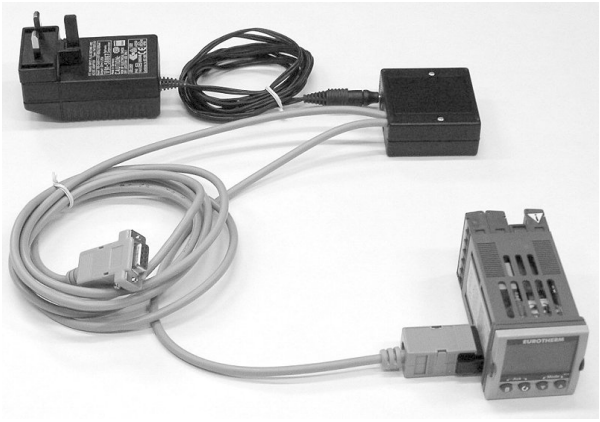
Connect the indicator to the EIA232 serial comms port of the PC shown in the diagram below.



A cable is available from Eurotherm, part number CABLE/9PINPC/NOPLUG/232/3.0m to connect an indicator to the EIA232 port of a PC. The white (transparent) lead of this cable connects to terminal HE and the black lead to terminal HF.

14.2.2 Configuration Clip

A Configuration Clip is available with iTools by quoting part number 3000CK in the iTools ordering code. The clip can be fitted into the side of a indicator as shown below.



The benefit of using this arrangement is that it is not necessary to power the indicator, since the clip provides the power to the internal memory of the indicator.

14.3 Starting iTools

Open iTools and, with the indicator connected, press

on the iTools menu bar. iTools will search the communications ports and TCPIP connections for recognisable instruments. Indicators connected with the configuration clip (CPI), will be found at address 255 regardless of the address configured in the indicator.

When the instrument is detected a screen view similar to the one shown below will be displayed. The browser on the left shows the List Headers. To display parameters within a list double click the Header or select 'Parameter Explorer'. Click on a list header to display parameters associated with this list.

The instrument view may be turned on or off using the 'View' menu and selecting 'Panel Views'.

The instrument may be configured using a **Wizard** or from the browser view. The following pages show a number of examples of how to configure various functions using either of these features.

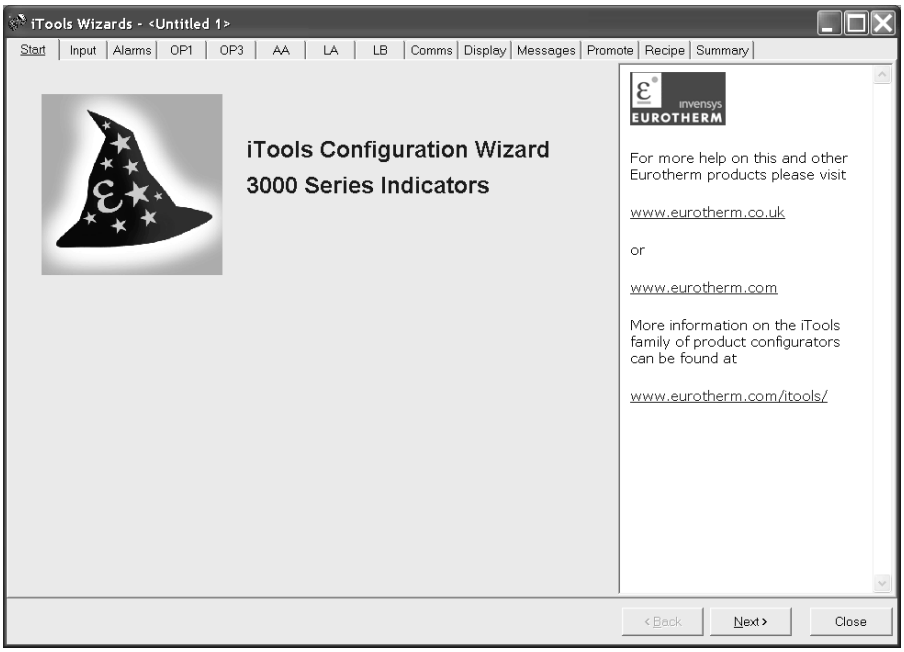
It is assumed that the user is generally familiar with iTools and has a general understanding of Windows.

14.4 Configuring the Indicator Using the Wizard

To open the Wizard press Next>> on the pop up or press

from the iTools view .

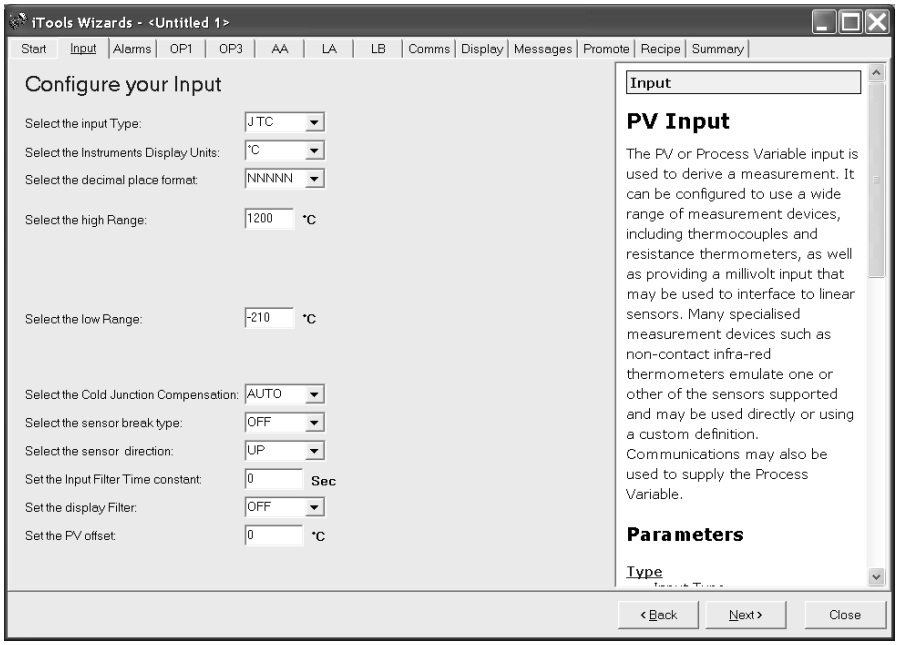
The indicator will be set to configuration level. Since it will not operate the process in configuration level a warning message appears. When this is accepted the Wizard start up screen is shown:-



Select a tab to configure a function

14.4.1 To configure the Input

Select the 'Input' tab



To configure the input type, open the drop down box and select the input to match the sensor in use on your process. When the drop down box is opened the parameter 'help' description is also displayed. This example configures the indicator for a type J thermocouple

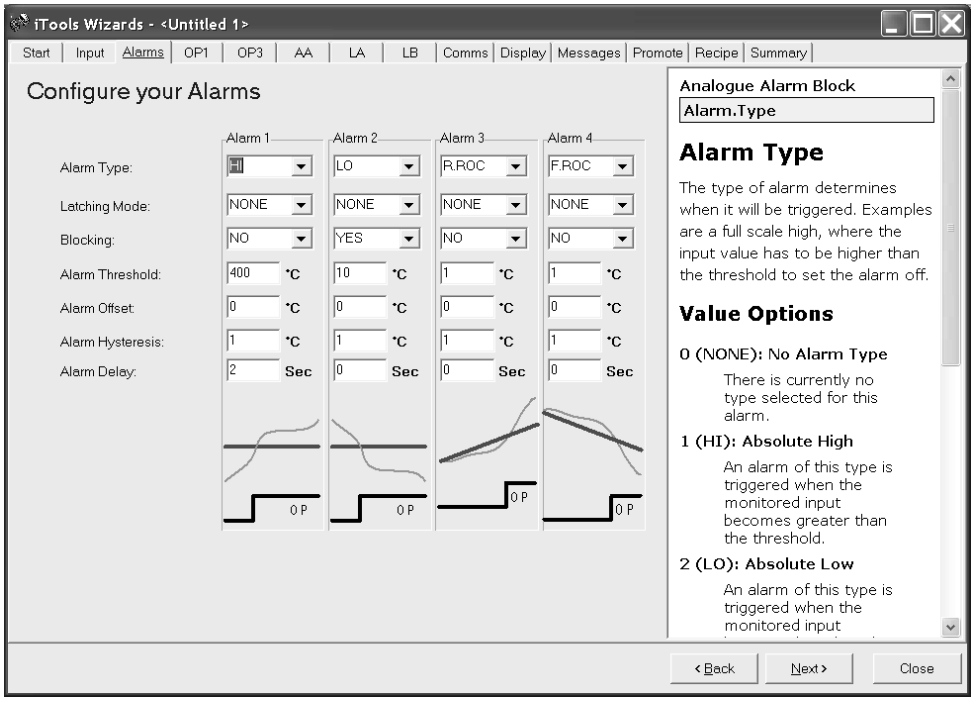
A 'help' text is shown to the right of the wizard. This describes the feature which is selected.

A list of parameters which need to be configured follows this general description. Click on the parameter for a description of its function.

Other functions may be configured using the appropriate tab.

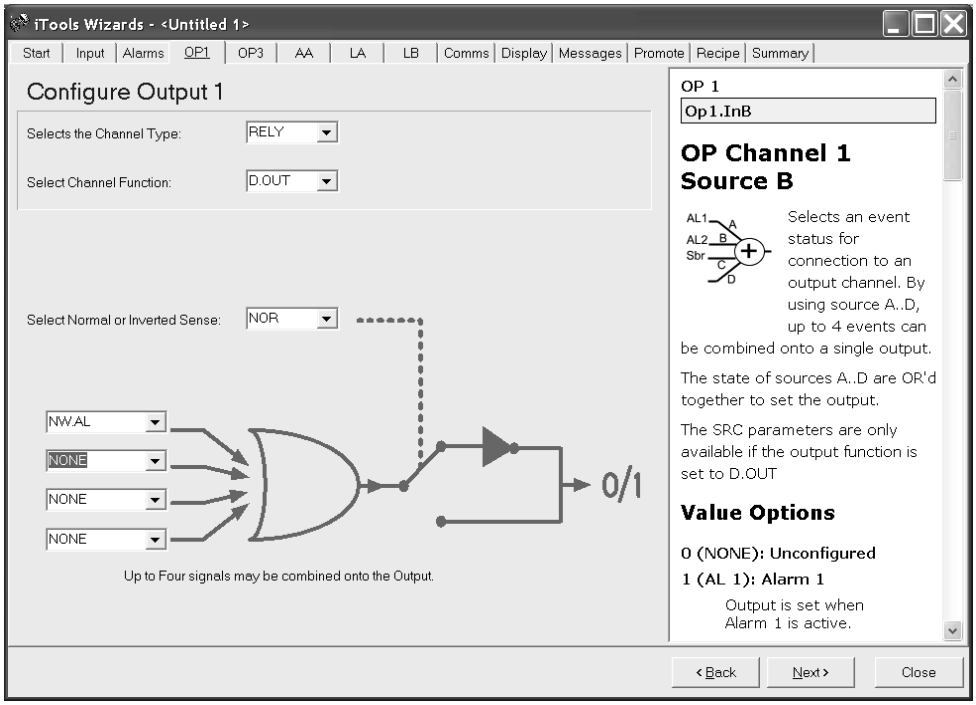
14.4.2 To Configure Alarms

Up to four alarms are available in 3200 series indicators. Set the type of alarm, latching mode, blocking, threshold and hysteresis from drop down menus. Help text is shown together with a pictorial representation of the alarm operation.



14.4.3 To Configure Output 1

In 32h8i (shown in this example) the output is a changeover relay which can be configured to operate when up to four different alarms, selected from the drop down, occur. The example shows the relay configured to operate when any new alarm occurs.



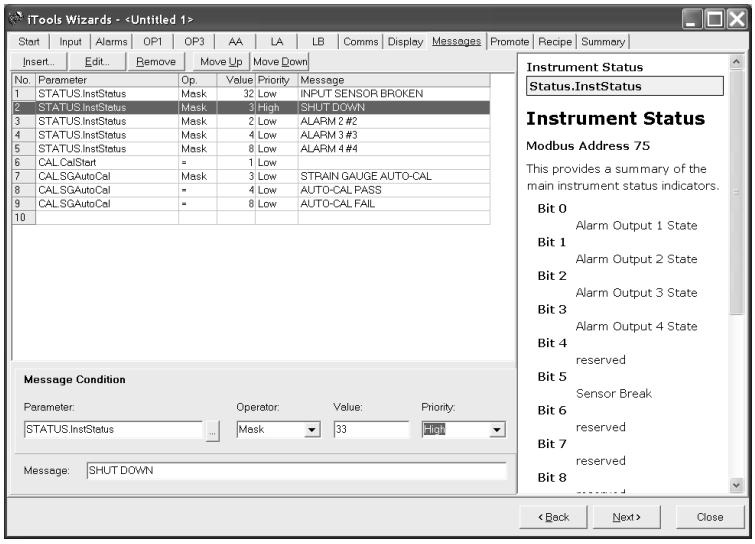
Other features can be similarly configured by selecting the relevant tabs.

14.4.4 To Customise Messages

The message which scrolls across the indicator display during normal operation may be customised.

Select the 'Messages' tab.

In this example the message 'SHUT DOWN' will be displayed if both Alarm 1 and Alarm 2 are active.

Operation	Action	Indication
Add a parameter	Click where the parameter is required Select 'Insert' Choose the parameter from the pop up box eg 'CAL.CalStart' The parameter may be edited, removed or its position changed by selecting the relevant tab	
Set the Operator	From the 'Operator:' drop down box select 'Mask' – see Note 1. Alternatively a message may be configured to appear if the enumeration of the parameter:- = equals the 'Value' <> is greater or less than the 'Value' > is greater than the 'Value' < is less than the 'Value'	
Set the value The bitmap list is given here and in the Digital Comms chapter	1. Click in the 'Value' box and press enter 2. From the pop up box either tick the bit field values or type in the decimal equivalent in 'New Value'. In this example 3 (alarm 1 + alarm 2).	**Instrument Status - Bitmap** B0 – Alarm 1 Status B1 – Alarm 2 Status B2 – Alarm 3 Status B3 – Alarm 4 Status B4 – Auto/Manual Status B5 – Sensor Break Status B6 – Loop Break Status B7 – CT Low load current alarm status B8 – CT High leakage current alarm status B9 – Program End B10 – PV Overrange (by > 5% of span) B11 – CT Overcurrent alarm status B12 – New Alarm Status B13 – Timer/Ramp Running B14 – Remote Fail, New Alarm B15 – Autotune Status In each case, a setting of 1 signifies 'Active', 0 signifies 'Inactive'.
Set the priority	3. From the drop down select Low Medium or High	
Enter the message	4. In the message section enter SHUT DOWN	
Download to the indicator	5. Press 'Update Device Flash Memory' button	

Note 1:- Mask allows any combination of parameters in the above bitmap field to activate the custom message. The table below shows how this operates for the four alarm fields.

Value	Bitmap	Parameter (Alarm) active	Value	Bitmap	Parameter (Alarm) active
1	0001	Alarm 1	5	0101	Alarm 3 + Alarm 1
2	0010	Alarm 2	6	0110	Alarm 2 + Alarm 3
3	0011	Alarm 1 + Alarm 2	7	0111	Alarm 1 + Alarm 2 + Alarm 3
4	0100	Alarm 3	8	1000	Alarm 4

Other parameters can be added by extending this table.

14.4.5 To Promote Parameters

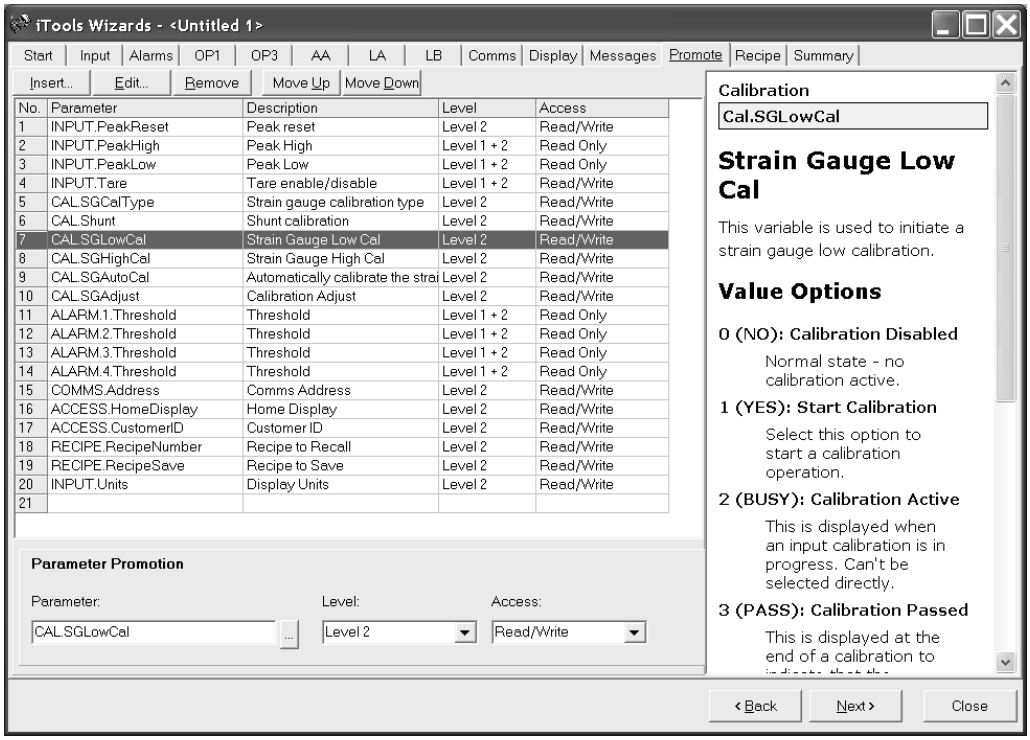
The list of parameters which are available in operator levels 1 or 2 can be changed using the 'Promote' wizard. You can set the access to Read Only or Read/Write

Select 'Promote' tab.

Highlight a parameter.

Select the level of access you wish to be available to the available to the operator and whether it should be Read/Write or Read only.

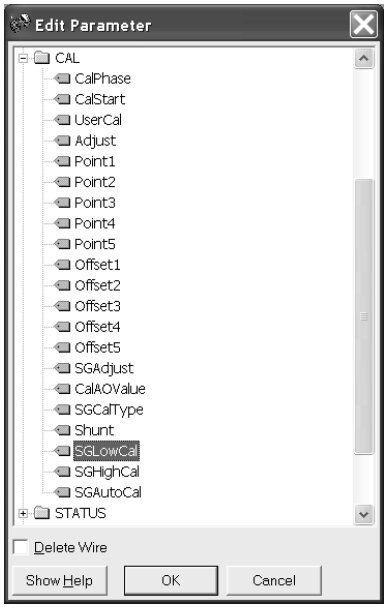
In the example below 'Strain Gauge Low Cal' will be available in Level 2 and will be read and Write access.



The list of parameters which can be made available in operator levels 1 or 2 can be changed using the 'Insert' tab.

Parameters may also be Edited, Removed or Moved up or down the list.

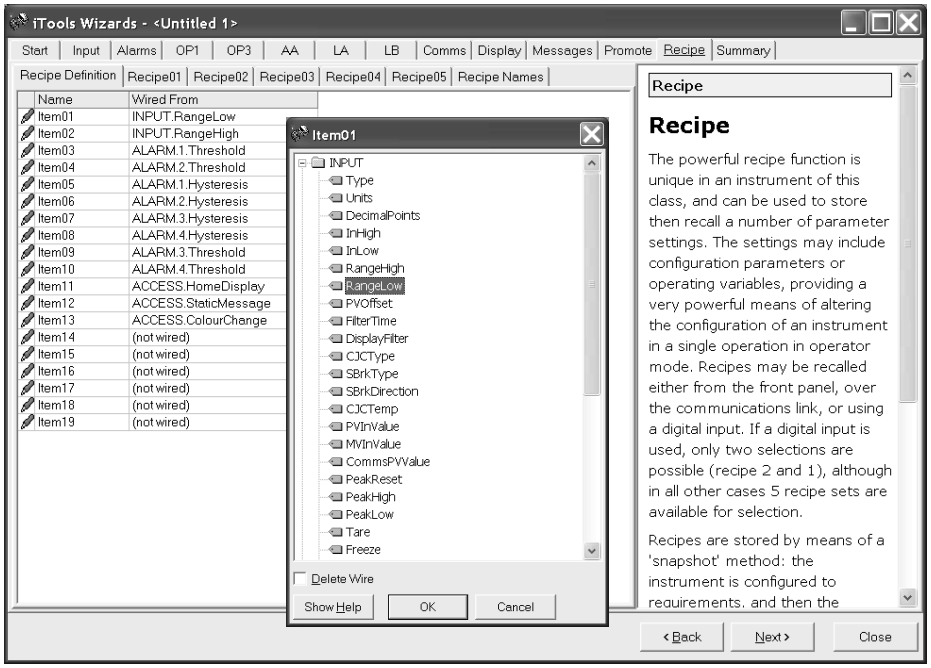
When inserting or editing a pop up box appears as shown.



14.4.6 To Set Up Recipes

There are five recipes available, which can store a range of parameter values for different processes.

Select the 'Recipe' tab



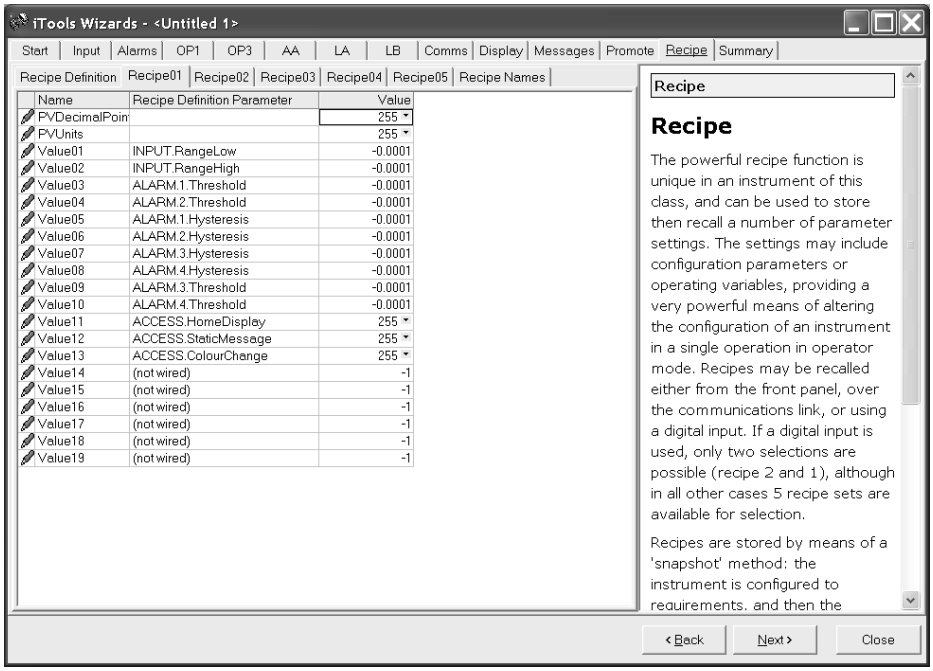
14.4.6.1 Recipe Definition

Select 'Recipe Definition' tab to display the default parameters available to be stored in recipe. Double click on the parameter in the 'Wired From' column, a pop up allows you to delete or change to a different parameter.

14.4.6.2 Editing Recipe Values

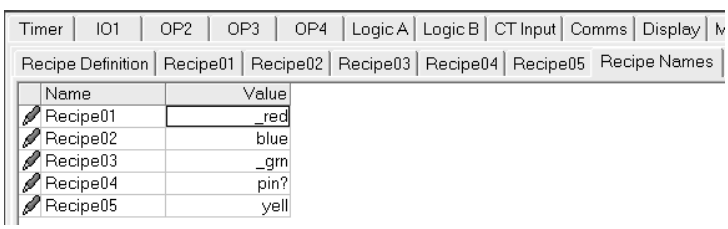
Select any one of the Recipe01 to 05 tabs. It is necessary to set the values of all parameters. Start with the first followed by all other parameters.

To download the new values, press Next> or select any other tab. There is a delay whilst the recipe updates. To ensure the indicator accepts the new recipe values, select another recipe in the indicator itself, then go back to the recipe in which the changes were made.



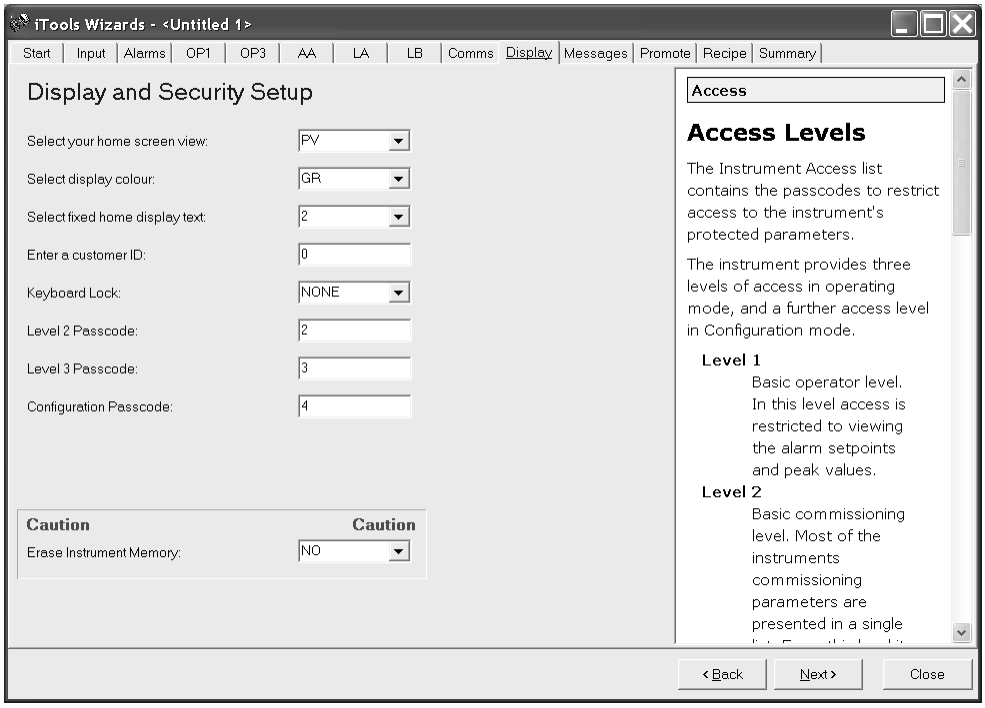
14.4.6.3 Recipe Names

Names can be given to each of the five recipes by directly typing the name in the Value column. Each name is limited to a maximum of four characters – this being the limit of the characters which can be displayed on the front panel of the indicator. A character shown as '?' signifies that it cannot be displayed on the indicator due to font limitations. To download a new recipe name press Next (or Back or select any other tab).



14.4.7 To Customise the Display

Press the 'Display' tab.



The operator display in this example will be green and display PV. A customized static message, up to 9 characters long, may be displayed on the instrument when one particular event is true. This message is taken from the message tab, see section 14.4.4, and in this example will show SHUT DOWN as a non scrolling message when alarm 1 occurs.

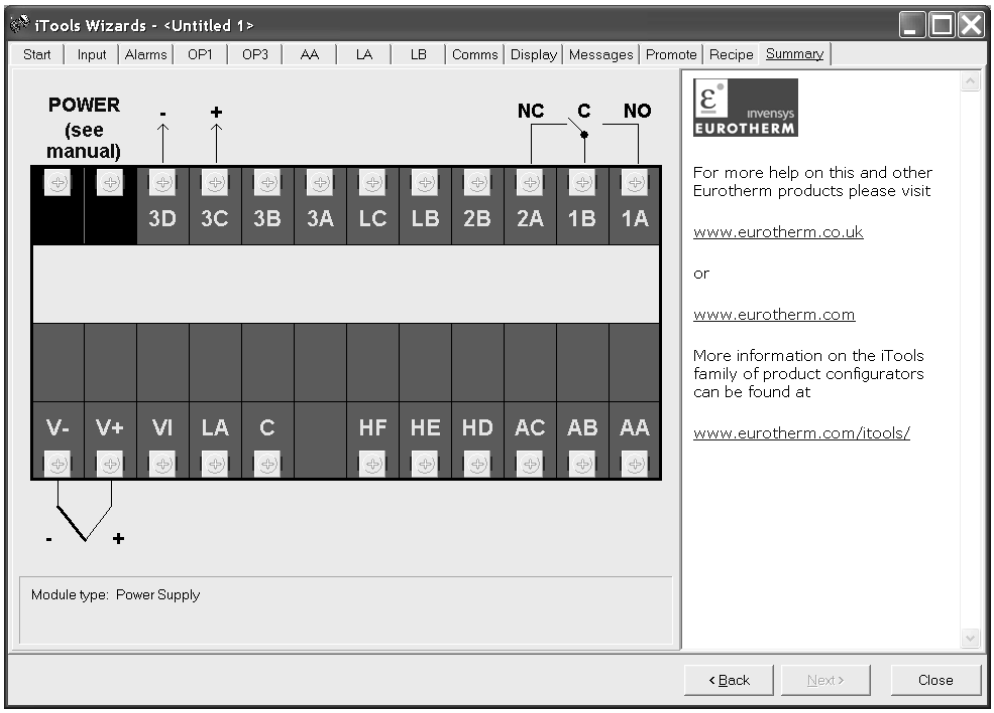
⚠ Erase Instrument Memory must be used with care.

This setting is used to initialise instrument memory to default values. The memory will be cleared when the instrument is next reset or powered up. Following a clear, the instrument will start up in QuickStart mode displaying XXXXX to indicate an unconfigured instrument. The cold start will not erase the calibration.

14.4.8 Summary Tab

The 'Summary' tab shows the terminal connections for the functions which have been configured together with a description of each function.

Press 'Summary' tab.



14.5 Configuring the Indicator Using the Browser Views

Press

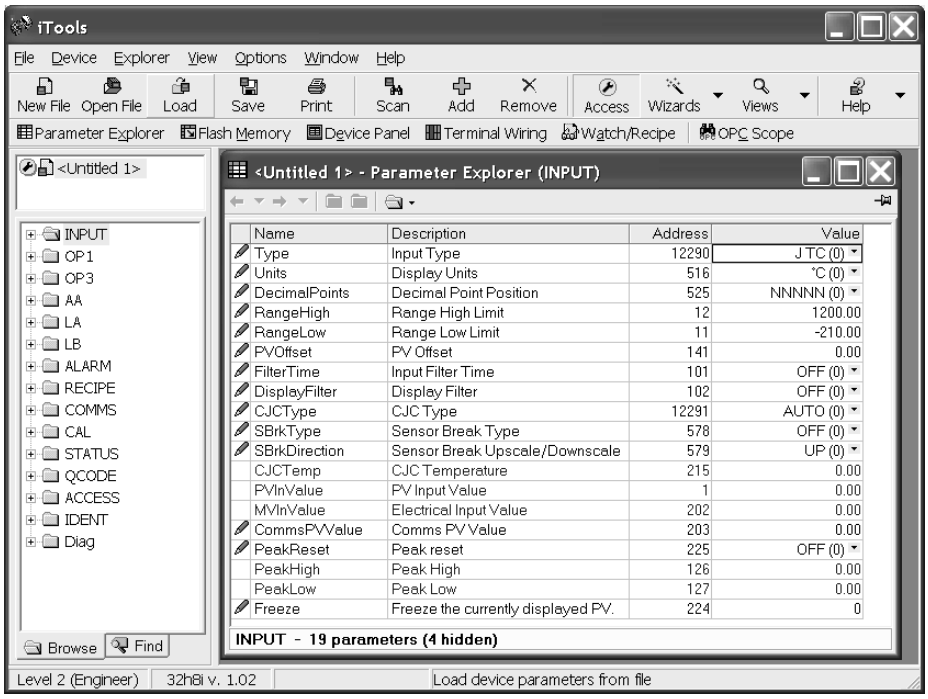
(if necessary) to put the indicator into configuration level.

14.5.1 To configure the Input

Open the parameter list by double clicking INPUT in the browser or selecting 'Parameter Explorer'.

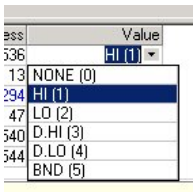
Select input type from the drop down. Other parameters can also be set using the drop downs or by setting the analogue values.

Parameters shown in blue, in the iTools view, are not alterable.

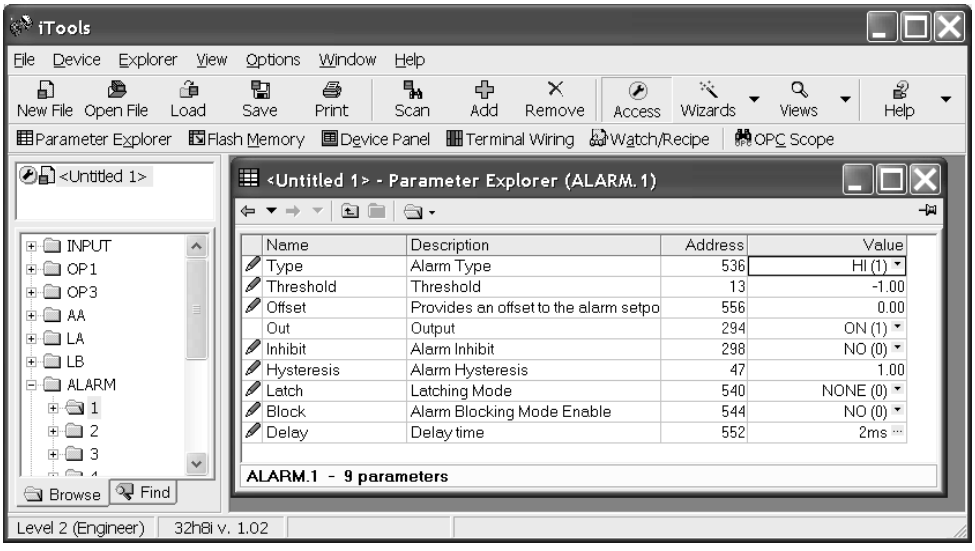


14.5.2 To Configure Alarms

1. Select the list header from the browser – in this case 'ALARM' '1'
2. To configure 'Alarm Type' open the drop down under the 'Value' column



4. Select the alarm type – in this example HI. (1) is the enumeration of the parameter.
5. Select and set all other parameters using the same procedure



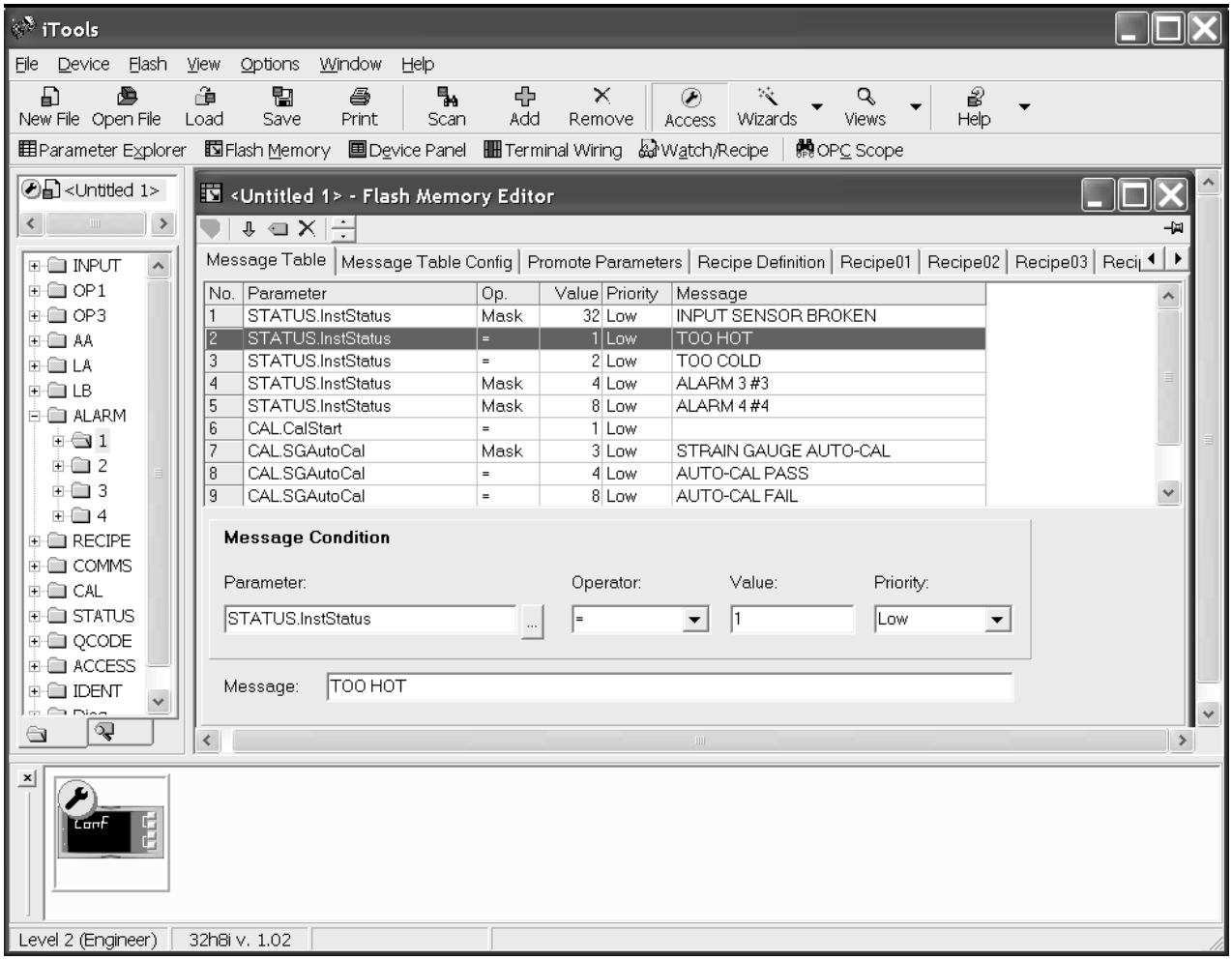
14.5.3 To Customise Messages

In this example the alarm 1 message will read 'TOO HOT'.

1. Press

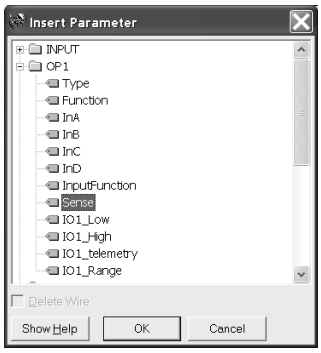
and select the 'Message Table' tag
2. Select Parameter 'ALARM1 #1'
3. In the 'Message Condition' area change 'Message' to SHUT DOWN
4. Press 'Update Device Flash Memory' button

In the example shown below Alarm 2 message has also been configured to 'TOO COLD'

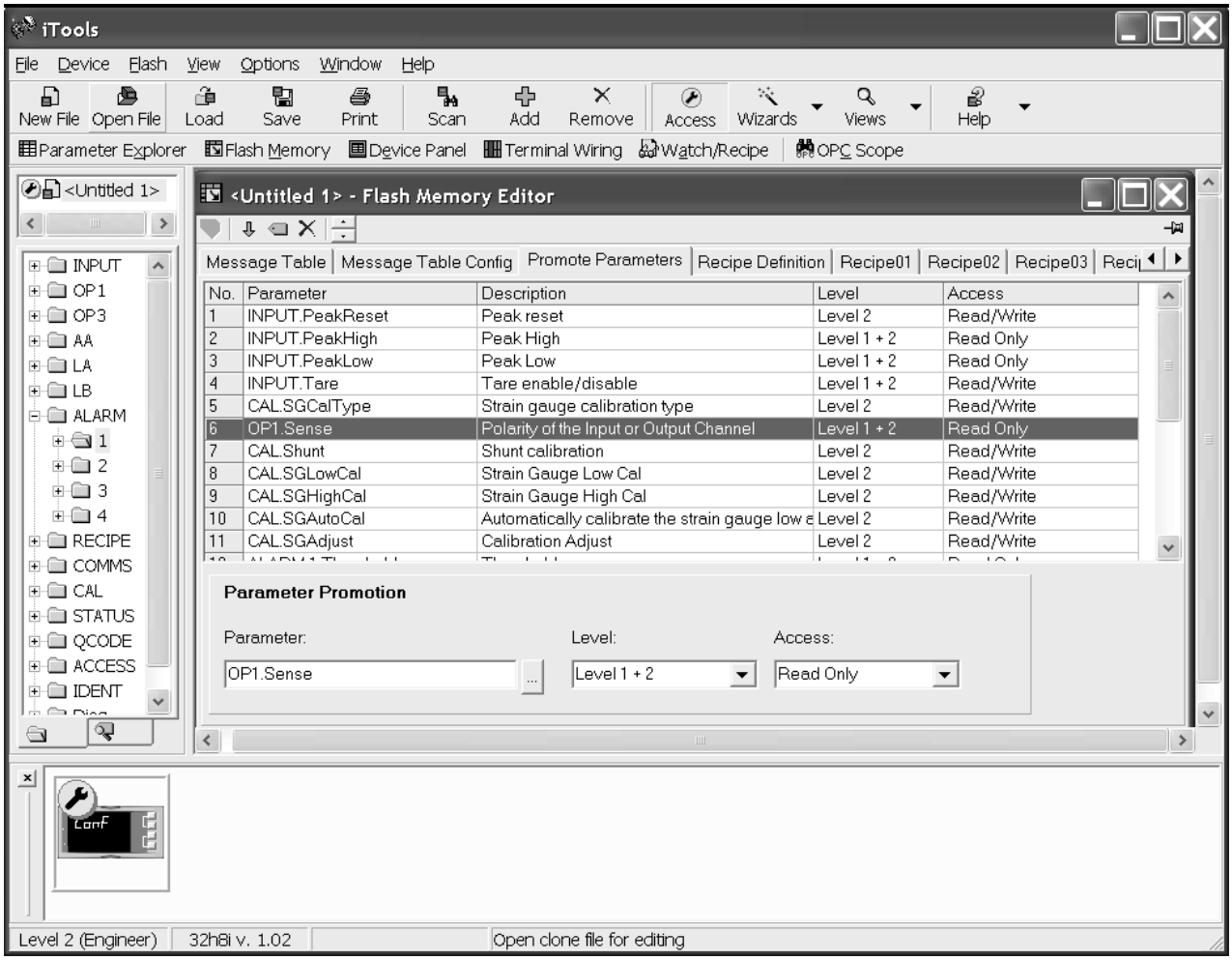


14.5.4 To Promote Parameters

In this example the parameter 'OP1.Sense' is added to the to the Level 2 list.



1. Press Flash Memory and select the 'Promote Parameters' tab
2. Highlight the position where you want the new parameter to be placed
3. Press ⇩ button and from the pop up window select the required parameter
4. In the Level box select Level 2 (or Level 1 + 2 if it is required to display this parameter in Level 1 as well)
5. In the Access box select 'Read Only' or 'Read/Write' as required
6. Press ✕ to remove a selected parameter
7. Press 'Update Device Flash Memory' button

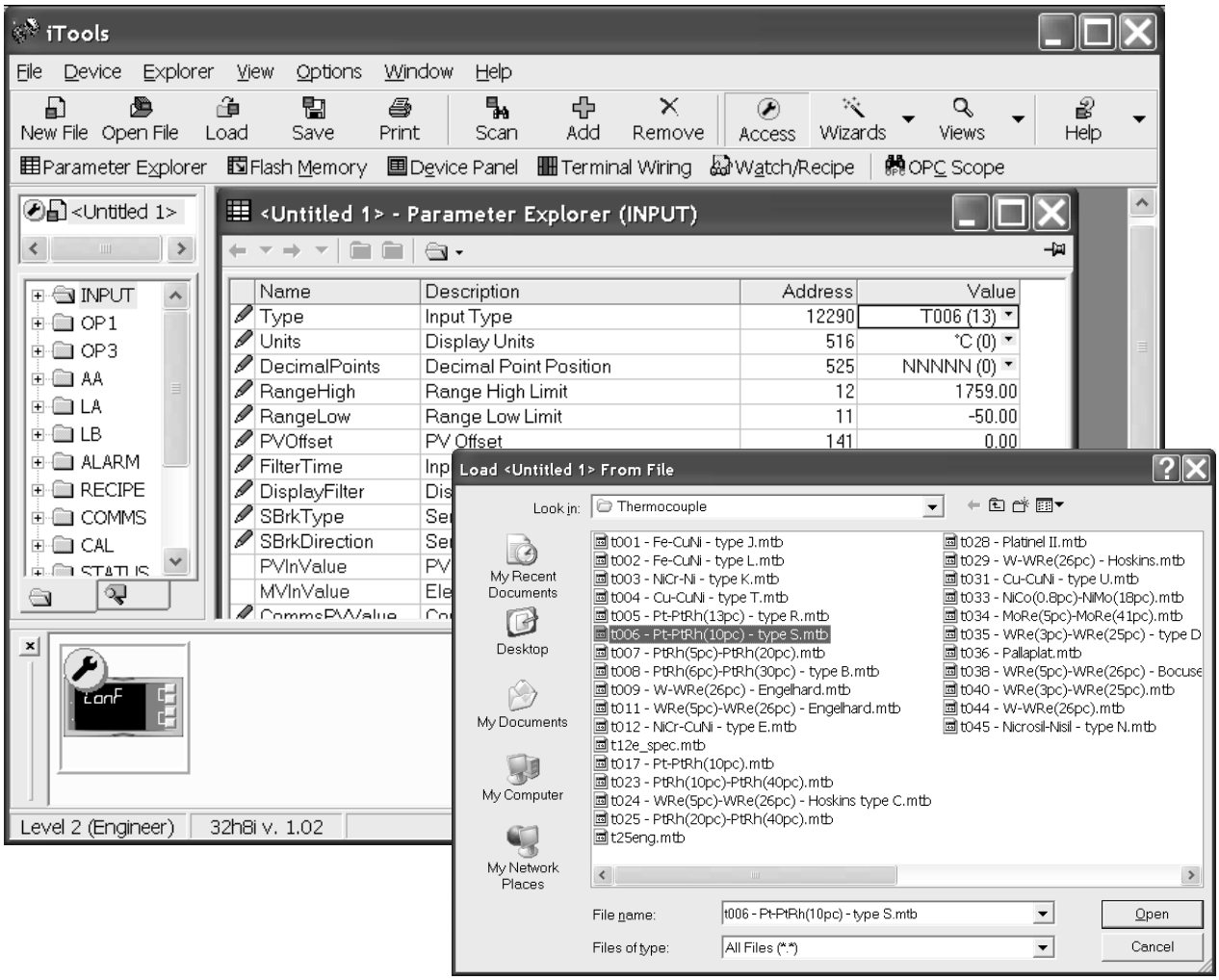


14.6 To Load A Special Linearisation Table

In addition to the built in standard linearisation tables, custom tables can be downloaded from files.

1. Press

2. Select the lineariastion table to be loaded from files with the extension .mtb. Linearisation files for different sensor types are supplied with iTools and may be found in Program Files → Eurotherm → iTools → Linearisations → Thermocouple etc.

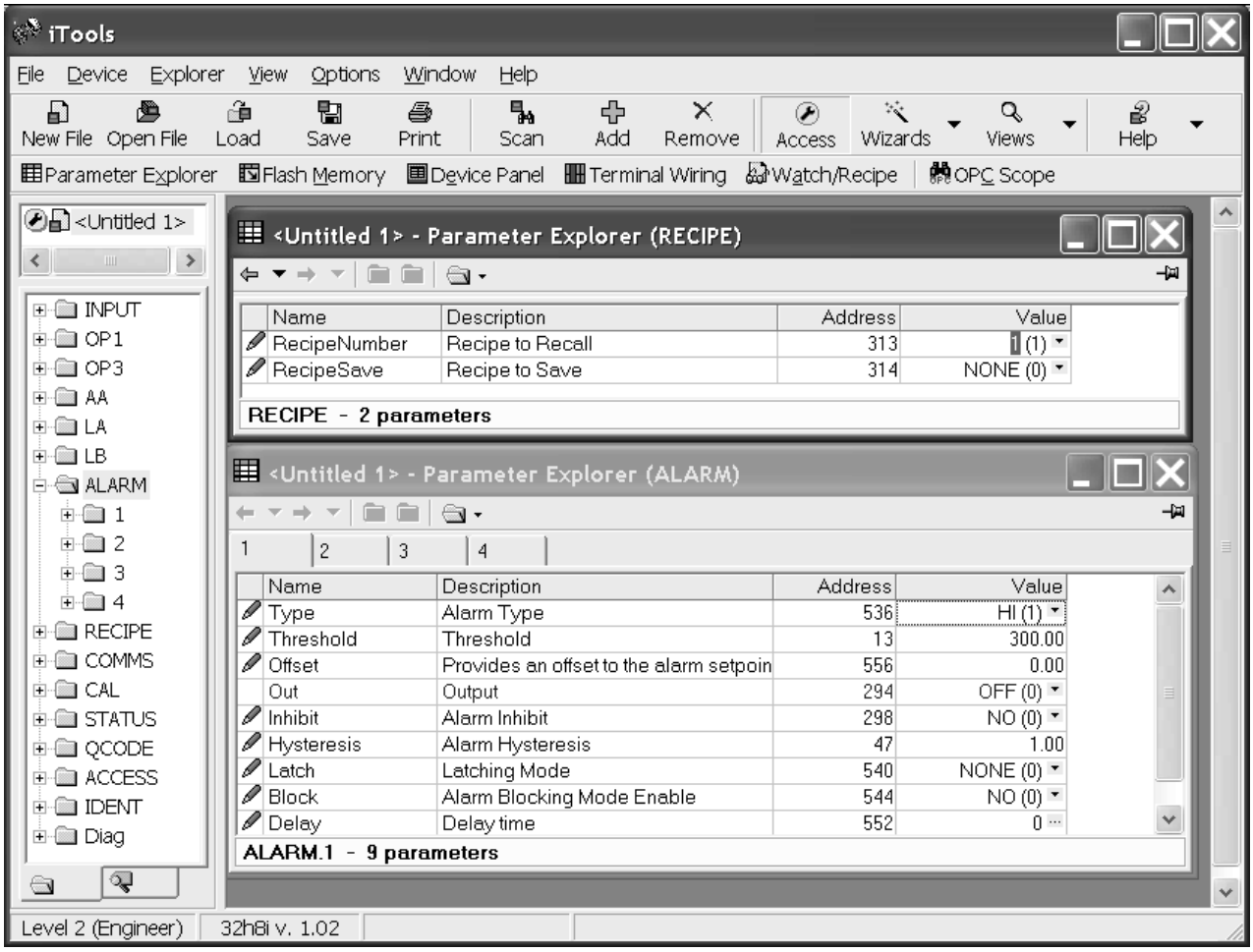


3. In this example a Pt-PTRh(10%) thermocouple has been loaded into the indicator. The indicator will display the linearisation table downloaded:-

14.7 To Set up Recipes

14.7.1 Example:- Set Two Different Alarm Thresholds and Store in Recipes 1 and 2

1. Set an alarm threshold e.g 300.
2. Select 'RECIPE' in the browser
3. In RecipeSave, select the recipe number e.g. 1
4. Set the alarm threshold to another value and save in Recipe 2
5. In RecipeNumber choose the recipe to run. Recipe 1 will now select the first alarm threshold and recipe 2 will select the second alarm threshold.

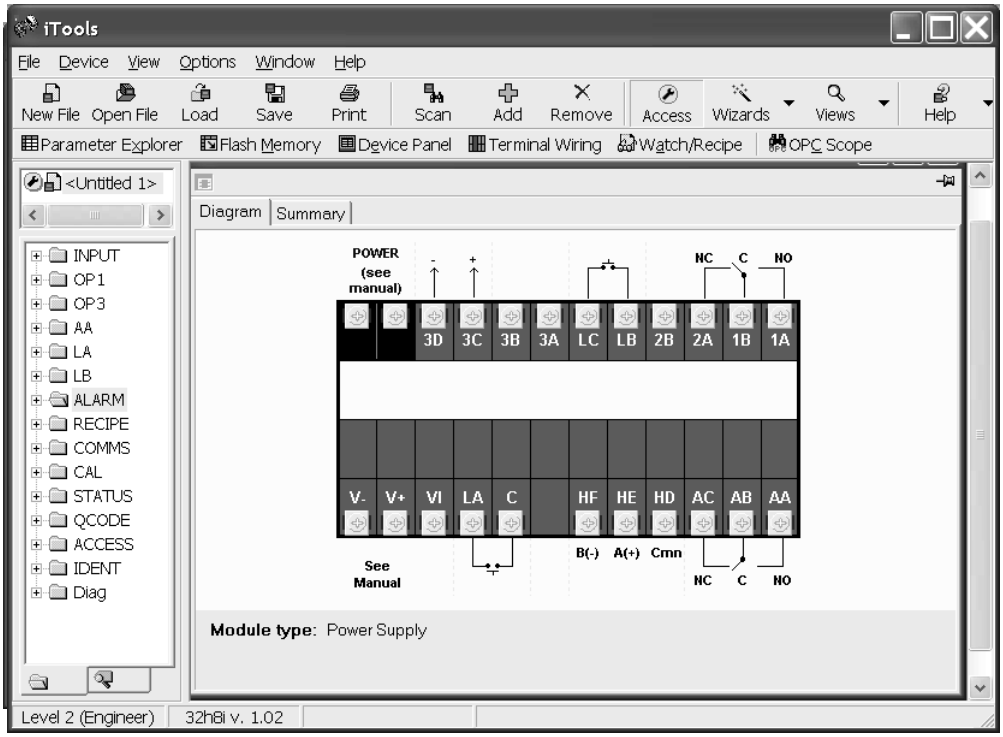


It may be more convenient to open more than one parameter list as shown in the above view. To do this, double click on each list header in turn. The lists can be arranged using Window in the main menu and choose Tile Vertically, Tile Horizontally or Cascade.

14.8 Summary

Press

to display the terminal connections for the functions which have been configured together with a summary of each function.



A summary of the features configured may be selected using the 'Summary' tab.

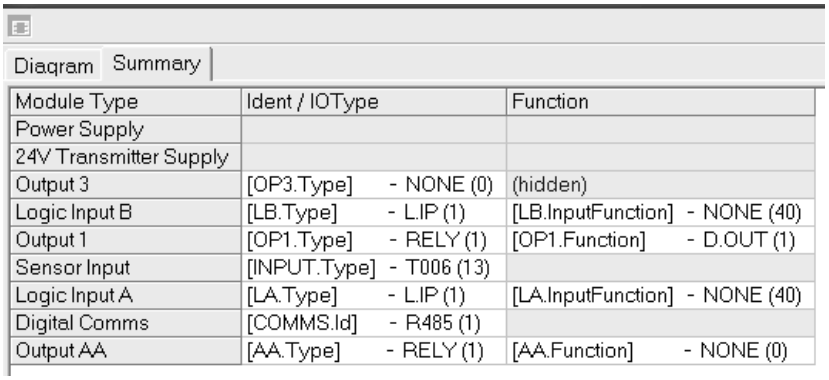


Diagram | Summary

Module Type	Ident / IOType	Function
Power Supply		
24V Transmitter Supply		
Output 3	[OP3.Type] - NONE (0)	(hidden)
Logic Input B	[LB.Type] - L.IP (1)	[LB.InputFunction] - NONE (40)
Output 1	[OP1.Type] - RELY (1)	[OP1.Function] - D.OUT (1)
Sensor Input	[INPUT.Type] - T006 (13)	
Logic Input A	[LA.Type] - L.IP (1)	[LA.InputFunction] - NONE (40)
Digital Comms	[COMMS.Id] - R485 (1)	
Output AA	[AA.Type] - RELY (1)	[AA.Function] - NONE (0)

14.9 Cloning

The cloning feature allows the configuration and parameter settings of one instrument to be copied into another. Alternatively a configuration may be saved to file and this used to download to connected instruments. The feature allows new instruments to be rapidly set up using a known reference source or standard instrument. Every parameter and parameter value is downloaded to the new instrument which means that if the new instrument is used as a replacement it will contain exactly the same information as the original. Cloning is generally only possible if the following applies:

- The target instrument has the same hardware configuration as the source instrument
- The target instrument firmware (ie. Software built into the instrument) is the same as or a later version than that of the source instrument. The instrument firmware version is displayed on the instrument when power is applied.
- Generally, cloning will copy all operational, engineering and configuration parameters that are writable. **The communications address is not copied.**

⚠ **Every effort has been made to ensure that the information contained within the clone files is a replica of that configured in the instrument. It is the users responsibility to ensure that the information cloned from one instrument to another is correct for the process to be controlled, and that all parameters are correctly replicated into the target instrument.**

Below is a brief description of how to use this feature. Further details are available in the iTools Handbook

14.9.1 Save to File

The configuration of the indictor made in the previous sections may be saved as a clone file. This file can then be used to download the configuration to further instruments.

From the File menu use 'Save to File' or use the 'Save' button on the Toolbar.

14.9.2 To Clone a New Indicator

Connect the new indictor to iTools and Scan to find this instrument as described at the beginning of this chapter.

From the File menu select 'Load Values From File' or select 'Load' from the toolbar. Choose the required file and follow the instruction. The new instrument will be configured to this file.

15. TECHNICAL SPECIFICATION

General

Temperature limits	Operation: 0 to 55°C (32 to 131°F), Storage: -10 to 70°C (14 to 158°F)
Humidity limits	Operation: RH: 5 to 90% non-condensing Storage: RH: 5 to 90% non-condensing
Panel sealing	IP 65, Nema 4X
Shock	BS EN61010
Vibration	2g peak, 10 to 150Hz
Altitude	<2000 metres
Atmospheres	Not suitable for use above 2000m or in explosive or corrosive atmospheres.
Electromagnetic compatibility (EMC)	BS EN61326
Electrical safety	BS EN61010 Installation cat. II; Pollution degree 2
Installation category II	The rated impulse voltage for equipment on nominal 230V supply is 2500V
Pollution degree 2	Normally only non conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected.

Physical	3216i	3204i	32h8i
Panel mounting	1/16 DIN	1/4 DIN	1/8 DIN horizontal
Weight grams	250	420	350
Dimensions mm	48W x 48H x 90D	96W x 96H x 90D	96W x 48H x 90D
Panel cut-out dimensions mm	45W x 45H	92W x 92H	92W x 45H

Operator interface

Type	LCD TN with backlight		
Main PV display	3216i 4 digits green	3204i 4 digits green	32h8i 5 digits, green or red
Lower display	5 character starburst, green	5 character starburst, green	9 character starburst, green
Status beacon	Units, outputs, alarms, active setpoint		

Power requirements

3216i	100 to 240Vac, -15%, +10% 48 to 62Hz, max 6W 24Vac, -15%, +10% 24Vdc, -15%, +20%, ±5% ripple voltage, max 6W
3204i, 32h8i	100 to 240Vac, -15%, +10% 48 to 62Hz, max 8W 24Vac, -15%, +10% 24Vdc, -15%, +20%, ±5% ripple voltage, max 8W

Approvals

CE, cUL listed (file ES7766), Gost, FM, EN14597TW approval number TW1222.

Transmitter PSU

Isolation	264Vac double insulated
Output Voltage	24Vdc, 20mA

Communications: serial communications option

Protocol	Modbus RTU slave Modbus RTU Master broadcast (1 parameter)
Isolation	264Vac double insulated
Transmission standard	EIA232 or EIA485 2-wire
Transmission standard	EIA232 or EIA485 2-wire

Process Variable Input

Calibration accuracy	<±0.25% of reading ±1LSD (1)
Sample rate	9Hz (110mS)
Isolation	264Vac double insulated from the PSU and communications
Resolution (µV)	< 0.5µV with 1.6s filter (mV range) < 0.25µV with 1.6s filter (Volts range)
Resolution (effective bits)	>17 bits
Linearisation accuracy	<0.1% of reading
Drift with temperature	<50ppm (typical) <100ppm (worst case)
Common mode rejection	48 - 62 Hz, >-120db
Series mode rejection	48 - 62 Hz, >-93db
Input impedance	100MΩ (200KΩ on volts range C)
Cold junction compensation	>30 to 1 rejection of ambient temperature
External cold junction	Reference of 0°C
Cold junction accuracy	<±1°C at 25°C ambient
Linear (process) input range	-10 to 80mV, 0 to 10V with external potential divider module 100KΩ/806Ω (not 32h8i)
Thermocouple Types	K, J, N, R, S, B, L, T, C, custom download (2)
RTD Type	3-wire, Pt100 DIN43760
Bulb current	0.2mA
Lead compensation	No error for 22 ohms in all 3 leads
Input filter	Off to 100 seconds
Zero offset	User adjustable over the full display range
User calibration	2-point gain & offset

Notes

(1) Calibration accuracy quoted over full ambient operating range and for all input linearisation types.

(2) Contact Eurotherm for details of availability of custom downloads for alternative sensors.

Strain gauge input (32h8i)	
Input type:	350Ω Bridge
Connection:	4 or 6 wire (6 uses internal shunt)
Calibration accuracy:	+0.1% of full scale
Sample time:	9hz (110ms)
Isolation:	264Vac double isolation from the PSU and communications
Excitation:	10Vdc +7%
Sensitivity:	1.4 to 4mV/V
Input span:	-27% to +127% of full scale (approx. –10mV to +5mV):
Zero balance:	+ 25% of full scale
Tare:	+ 25% of full scale
Resolution (mV):	0.3mV/V(typical) with 1.6s filter
Resolution (effective bits):	14.3 bits
Drift with temperature:	<100ppm/°C of full scale
Common mode rejection:	48-62Hz, >-120db
Series mode rejection:	48-62Hz, >-60db
Input filter:	Off to 100s

AA relay	
Type	Form C changeover
Rating	Min: 100mA @ 12Vdc, Max: 2A @ 264Vac resistive
Functions	Alarms or events

Digital input A/B (B not in 3216i), A not on 32h8i with SG or SD)	
Contact closure	Open >600Ω Closed <300Ω
Input current	<13mA
Isolation	None from PV or system 264Vac double insulated from PSU and communications
Functions	Includes alarm acknowledge, keylock, alarm inhibit, freeze display, tare, auto zero, peak reset

Logic I/O module (3216i only)	
Rating	On/High 12Vdc at <44mA Off/Low <300mV at 100µA
Isolation	None from PV or system 264Vac double insulated from PSU and communications
Functions	Alarms or events

Digital input	
Contact closure	Open >500Ω Closed <150Ω
Isolation	None from PV or system 264Vac double insulated from PSU and communications
Functions	Includes alarm acknowledge, keylock, alarm inhibit, freeze display, tare, auto zero, peak reset

Relay output channels		
Type	3216i	Form A (normally open)
	32h8i, 3204i	Form C changeover
Rating	Min: 100mA @ 12Vdc, Max: 2A @ 264Vac resistive	
Functions	Alarms or events	

Analogue output OP1, OP2 (3216i only)	
Rating	0-20mA into <500Ω
Accuracy	± (<0.5% of reading + <100µA)
Resolution	11.5 bits
Isolation	None from PV or system. 264Vac double insulated from PSU and communications.
Functions	Retransmission

OP 3 (not on 3216i)	
Isolation:	264Vac double insulate
Functions:	Retransmission
Current Output	
Rating:	0-20mA into <500Ω
Accuracy:	±(<0.25% of Reading + <50µA)
Resolution:	13.6 bits
Voltage Output (not on 3204i)	
Rating:	0-10V into >500Ω
Accuracy:	±(<0.25% of Reading +<25mV)
Resolution:	13.6 bits

Software features	
Alarms	
Number	4
Type	Absolute high and low, rate of change (rising or falling)
Latching	Auto or manual latching, non-latching, event only
Output assignment	Up to four conditions can be assigned to one output
Custom messages	
Number	15 scrolling text messages
Number of characters	127 characters per message max
Languages	English, German, French, Spanish, Italian
Selection	Active on any parameter status using conditional command
Recipes	
Number	5 with 19 parameters
Selection	HMI interface, communications or dig. IO
Transducer calibration	
Calibration types	Shunt, load cell, comparison
Other features	Auto-zero, tare
Other features	
Display colour (32h8i)	Upper display selectable green or red or change on alarm
Scrolling text	Parameter help, custom messages
Display filter	Off to zero last 2 digits
Peak monitor	Stores high and low values
FM	
Alarm 1 configuration:	Absolute hi or lo, de-energised in alarm Latching output on Form C (AA) Relay All alarms active on sensor break and power fail
Alarm setpoint:	Adjustment protection via password
Configuration security	FM option prevents reconfiguration of alarm config

16. Parameter Index

This is a list of parameters in alpha/numeric order to help locate the section in which they are applicable.

Parameter	Parameter Name	Parameter list & Section
1.D.IN	DIGITAL INPUT FUNCTION	I/O List 3216i section 8.2
1.FUNC	I/O 1 FUNCTION	Output 1 List section 8.1 and 8.2
1.ID	I/O 1 TYPE	Output 1 List section 8.1 and 8.2
1.RNG	DC OUTPUT RANGE	I/O List 3216i section 8.2
1.SENS	I/O 1 SENSE	Output 1 List section 8.1 and 8.2
1.SRC.A	I/O 1 SOURCE A	Output 1 List section 8.1 and 8.2
1.SRC.B	I/O 1 SOURCE B	Output 1 List section 8.1 and 8.2
1.SRC.C	I/O 1 SOURCE C	Output 1 List section 8.1 and 8.2
1.SRC.D	I/O 1 SOURCE D	Output 1 List section 8.1 and 8.2
2.D.IN	DIGITAL INPUT FUNCTION	Output 2 List 3216i only section 8.3
2.FUNC	I/O 2 FUNCTION	Output 2 List 3216i only section 8.3
2.HIGH	DC OUTPUT HIGH RANGE	Output 2 List 3216i only section 8.3
2.LOW	DC OUTPUT LOW RANGE	Output 2 List 3216i only section 8.3
2.RNG	DC OUTPUT RANGE	Output 2 List 3216i only section 8.3
2.SENS	OUTPUT 2 SENSE	Output 2 List 3216i only section 8.3
2.SRC.A	I/O 1 SOURCE A	Output 2 List 3216i only section 8.3
2.SRC.B	I/O 1 SOURCE B	Output 2 List 3216i only section 8.3
2.SRC.C	I/O 1 SOURCE C	Output 2 List 3216i only section 8.3
2.SRC.D	I/O 1 SOURCE D	Output 2 List 3216i only section 8.3
3.FUNC	FUNCTION	Output 3 List section 7.2.6
3.HIGH	DC OUTPUT HIGH SCALE	Output 3 List section 7.2.6
3.ID	OUTPUT 3 TYPE	Output 3 List section 8.4
3.LOW	DC OUTPUT LOW SCALE	Output 3 List section 8.4
3.RNG	DC OUTPUT RANGE	Output 3 List section 8.4
4.FUNC	I/O 1 FUNCTION	Output 4 List (AA Relay) section 8.5
4.SENS	I/O 1 SENSE	Output 4 List (AA Relay) section 8.5
4.SRC.A	I/O 1 SOURCE A	Output 4 List (AA Relay) section 8.5
4.SRC.B	I/O 1 SOURCE B	Output 4 List (AA Relay) section 8.5
4.SRC.C	I/O 1 SOURCE C	Output 4 List (AA Relay) section 8.5
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A1.DLY	DELAY TIME	Alarm List section 10.3
A1.HYS	ALARM 1 HYSTERESIS	Alarm List section 10.3
A1.LAT	ALARM 1 LATCHING TYPE	Alarm List section 10.3
A1.OFS	ALARM SETPOINT OFFSET	Alarm List section 10.3
A1.STS	ALARM 1 OUTPUT	Alarm List section 10.3
A1.TYP	ALARM 1 TYPE	Alarm List section 10.3
ADDR	ADDRESS	Digital Communications List section 12.2
AUT.SG	STRAIN GAUGE AUTO CAL	Calibration List section 13.5
BAUD	BAUD RATE	Digital Communications List section 12.2
CJ.TYP	CJC TYPE	Input List section 7.1
CJC.IN	CJC TEMPERATURE	Input List section 7.1
COLD	COLD START ENABLE/ DISABLE	Access List section 6.5
COLOR	SET TOP DISPLAY COLOUR	Access List section 6.5
CONF.P	CONFIG PASSCODE	Access List section 6.5
DEC.P	DISPLAY POINTS	Input List section 7.1
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E.CaL		Diagnostic Alarm List section 10.4
E.Conf		Diagnostic Alarm List section 10.4
E.Lin		Diagnostic Alarm List section 10.4
E2.Er		Diagnostic Alarm List section 10.4
EE.Er		Diagnostic Alarm List section 10.4
FILT.D	DISPLAY FILTER	Input List section 7.1
FILT.T	FILTER TIME	Input List section 7.1
GO	CALIBRATION START	Calibration List section 13.5
GOTO	GOTO	Access List section 6.5
HI.CAL	STRAIN GAUGE HIGH CAL	Calibration List section 13.5
HIGH	PEAK HIGH	Input List section 7.1 and 4.4
HOME	HOME DISPLAY See Note 1	Access List section 6.5
ID	CUSTOMER ID	Access List section 6.5
ID	MODULE IDENTITY	Digital Communications List section 12.2
IN.TYP	INPUT TYPE	Input List section 7.1
INP.HI	LINEAR INPUT HIGH	Input List section 7.1
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K.LOCK	KEYBOARD LOCK	Access List section 6.5
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L.SENS	LOGIC INPUT SENSE	Digital Input List section

Parameter	Parameter Name	Parameter list & Section
		9.1
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LEV2.P	LEVEL 2 PASSCODE	Access List section 6.5
LEV3.P	LEVEL 3 PASSCODE	Access List section 6.5
LO.CAL	STRAIN GAUGE LOW CAL	Calibration List section 13.5
LOW	PEAK LOW	Input List section 7.1 and 4.4
MESG	STATIC HOME MESSAGE	Access List section 6.5
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P2.OFS	PRE ALARM 2 OFFSET	Alarm List section 10.3
P3.OFS	PRE ALARM 3 OFFSET	Alarm List section 10.3
P4.OFS	PRE ALARM 4 OFFSET	Alarm List section 10.3
P1.STS	Pre alarm 1 output status	Parameter Modbus address list section 12.5
P2.STS	Pre alarm 2 output status	Parameter Modbus address list section 12.5
P3.STS	Pre alarm 3 output status	Parameter Modbus address list section 12.5
P4.STS	Pre alarm 4 output status	Parameter Modbus address list section 12.5
P.RST	PEAK RESET	Input List section 7.1
PASS.C	FEATURE PASSCODE	Access List section 6.5
PHASE	CALIBRATION PHASE	Calibration List section 13.5
PRTY	PARITY	Digital Communications List section 12.2
PV.IN	PV INPUT VALUE	Input List section 7.1
PV.OFS	PV OFFSET	Input List section 7.1
REG.AD	DESTINATION ADDRESS	Digital Communications List section 12.2
RETRN	TRANSMITTED PARAMETER	Digital Communications List section 12.2
RNG.HI	RANGE HIGH LIMIT	Input List section 7.1
RNG.LO	RANGE LOW LIMIT	Input List section 7.1
SB.DIR	SENSOR BREAK DIRECTION	Input List section 7.1
SB.TYP	SENSOR BREAK TYPE	Input List section 7.1
SG.TYP	STRAIN GAUGE CALIBRATION TYPE	Calibration List section 13.5
SHUNT	SHUNT CALIBRATION	Calibration List section 13.5
TA.OFS	TARE OFFSET	Input List section 7.1
TARE	TARE FUNCTION	Input List section 7.1 and 4.4
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