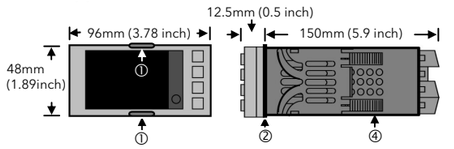
ENG

2408*i* Universal Indicator and Alarm Unit - Installation & Operation

The 2408*i* is a universal indicator which may be ordered or configured to measure a wide range of process inputs including temperature, volts, mV, mA, extruder melt pressure and other process variables from strain gauge or load cell transducers. It can be supplied with up to three plug in modules plus digital communications modules for Modbus, EI-Bisynch, Profibus or Devicenet protocols. The functionality is defined by an order code or it can be configured on site. This User Guide assumes that the instrument has been supplied in accordance with the order code. To configure the instrument and for features not covered here, refer to manual Part No HA027240. This and other documents can be downloaded from www.eurotherm.com.

Parts Supplied and Dimensions



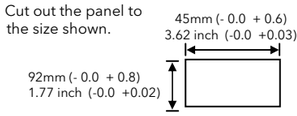
Also supplied
2.49Ω 1% resistor for mA inputs
Snubber
Display units label set

①	Latching ears
②	IP65 Sealing Gasket
③	Panel retaining clips
④	Sleeve

°C	°F	K	kPa	V	mV
m/s	cm/s	l/h	mWG	A	mA
x10	1x10	l/min	T/h	%	%RH
p.s.i	bar	mbar	mPas	%pH	pH
p.s.i.x10	mmHg	Kg/cm²	gal/min	rev/min	mile/h
EUROTHERM					Amps

Installation

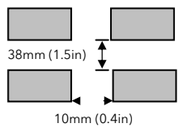
1. Cut out the panel to the size shown.



2. Fit the IP65 sealing gasket behind the front bezel of the instrument
3. Insert the instrument in its sleeve through the cut-out.
4. Spring the panel retaining clips into place. Secure the instrument in position by holding it level and pushing both retaining clips forward.
5. Peel off the protective cover from the display

If the panel retaining clips subsequently need removing, they can be unhooked from the side with either your fingers or a screwdriver.

Recommended Minimum Spacing



To Remove the Instrument from its Sleeve

Turn off power to the instrument and ease the latching ears ① outwards and pull the instrument forward.

When plugging back in ensure that the latching ears click into place to maintain the IP65 sealing.

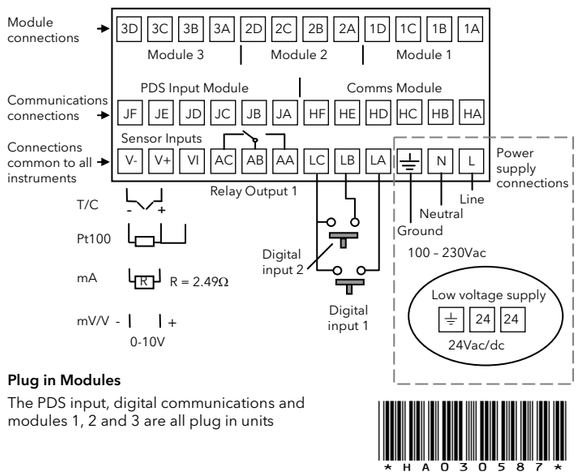
Wiring

The labels on the sides of the instrument identify the ordering code, the serial number and the wiring connections. Check these to ensure that the product is supplied and configured correctly for your application.
Please read '*Safety and EMC Information*' before proceeding.

Wire Sizes

The screw terminals accept wire sizes from 0.5 to 1.5 mm² (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).

Instrument Terminals



Plug in Modules

The PDS input, digital communications and modules 1, 2 and 3 are all plug in units

* H A 0 3 0 5 8 7 *

Plug in I/O Module Connections

Modules are fitted in positions 1, 2 and 3 in accordance with the ordering code. The table below shows the connections for each module and the possible functions they can perform.

Note: On the wiring label the module number precedes the terminal identity letter given in the table below. For example 1A, 1B, 1C etc.

Module Type	Terminal Identity A	B	C	D	Possible Functions
Relay; changeover Order code R4					Alarm or Event
Dual relay (normally open) Order code RR					Alarms or events
DC retransmission Order code D6	+	-			Retransmission of PV
Transmitter supply Order code MS (24V)	+	-			To power transmitters
Strain Gauge Transducer supply (see note 1 below) Order code G3 (5V), G5 (10V)	+	-	See wiring diagram for melt pressure transducer		To power strain gauges
2nd Analogue Input (Analogue Input 2) (Module 3 only Order code D5)			+	-	Thermocouple
					PRT
			+	-	mA (2.49Ω sense resistor)
			+	-	High impedance 0 - 2.0Vdc
			+	-	millivolts
	+			-	0 - 10Vdc
Triple contact input. Order code TK	ip1	ip2	ip3	Com	
Triple digital input. Order code TL	ip1	ip2	ip3	Com	
Triple digital output. Order code TP	op1	op2	op3	Com	

Note 1: By default the transducer supply for input 1 is installed in module position 2
The transducer supply for input 2 is installed in module position 1

Module Ratings

Relays	2A, 264Vac resistive max.
Transmitter Supply	Isolated. 20mA, 24Vdc.
Transducer Supply	Isolated. Configurable 5V or 10Vdc. Minimum load resistance 300Ω.
Triple Digital Input	OFF state: -3 to 5Vdc. ON state: 10.8 to 30Vdc, at 2 to 8mA.
Triple Contact Closure	Powered by controller. Switching current and voltage 24Vdc/20mA nominal. OFF state: >28KΩ resistance. ON state: <100Ω resistance
Triple Digital Output	OFF state output: 0 to 0.7Vdc. ON state output: 12 - 13Vdc, up to 8mA

Notes:
1. All module connections are isolated from the process value, earth, incoming supply and connections to other modules.
2. Digital inputs are non-isolated from the process value.
3. Digital inputs are powered by the indicator. Switching voltage and current 24Vdc/20mA.

Snubbers

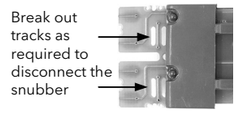
Snubbers are used to prolong the life of relay contacts and to reduce interference when switching inductive devices such as contactors or solenoid valves. The fixed relay (terminals AA/AB/AC) is not fitted internally with a snubber and it is recommended that a snubber be fitted externally. If the relay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

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

To remove the snubber from the relay module:-

1. Unplug the controller from its sleeve
2. Remove the relay module
3. Use a screwdriver or similar tool to snap out the track.

The view shows the tracks in a Dual Relay Output module.



Connections Common to all Instruments

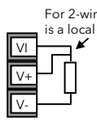
PV Input (Measuring Input)

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

Thermocouple or Pyrometer Input

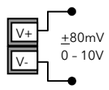
- Sensor input order codes J, K, T, L, N, R, S, B, P, C, D, E, 1, 2, 3, 4, 5, 6, 7, 8.
- Use the correct type of thermocouple compensating cable, preferably shielded, to extend wiring
- It is not recommended to connect two or more instruments to one thermocouple

RTD Input



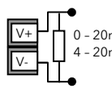
- Sensor input order code Z
- The resistance of the three wires must be the same
- The line resistance may cause errors if it is greater than 22Ω

Linear Input V, mV and High Impedance V



- Sensor input order codes F (-100 to +100mV), W (0 to 5V), G (1 to 5V), V (0 to 10V)
- mV range ±40mV or ±80mV
- High level range 0 – 10V
- A high line resistance for voltage inputs may cause measurement errors

Linear Input mA



- Sensor input order codes Y (0 to 20mA), A (4 to 20mA)
- For mA input connect the 2.49Ω resistor supplied across the input terminals
- The resistor supplied is 1% accuracy 50ppm temperature coefficient

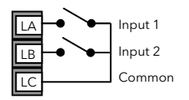
Built in Relay (AA)

This relay may be ordered pre-configured as defined by the order codes listed below.

- Order code RF. The relay is fitted but not configured. To configure refer to manual HA027240, which may be downloaded from www.eurotherm.co.uk.
- Order codes FH - high alarm, FL - low alarm, DB - deviation band, DH - deviation high, DL - deviation low, RA - rate of change (non-latched alarms).
- Order codes HA - high alarm, LA - low alarm, BD - deviation band, AD - deviation high, WD - deviation low, RT - rate of change, NW - new alarm (latched alarms).
- Isolated 240Vac
- Relay rating: Max: 264Vac 2A resistive; min: 1V, 1mAdc to provide sufficient whetting current.
- Relay shown in de-energised state

Digital I/O

Digital inputs 1 and 2 may be ordered unconfigured or pre-configured as defined by the order codes listed below.



- Contact open >28KΩ
- Contact closed <100Ω

The Digital IO is not isolated from the PV input. The controller is designed to operate normally if the input sensor is connected to 230Vac, but in this case these terminals will be at this potential.

Digital input order codes are:-

XX - disabled. To configure refer to manual HA027240, which may be downloaded from www.eurotherm.co.uk.

AC - alarm acknowledge, this has the same function as the ACK/RESET button

KL - keylock, when closed all front panel buttons are disabled

SR - remote setpoint select, open to select local setpoint, closed to select remote setpoint

PV - process value select, open to select input 2, closed to select input 1

J1/J2 - initiate tare correction on strain gauge input 1/2 - see section '*Tare Correction*'.

J3/4 - initiate automatic calibration of strain gauge input 1/2 - see section '*Automatic Zero and Span Calibration of a Strain Gauge Input*'.

Indicator Power Supply

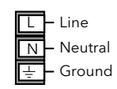
Ensure that you have the correct supply for your indicator

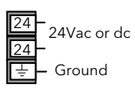
1. Check order code of the indicator supplied. VH high voltage supply, 100 to 230Vac. VL low voltage supply, 24Vac/dc.
2. Use copper conductors only.
3. The power supply input is not fuse protected. This should be provided externally.
4. For 24V the polarity is not important.

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.





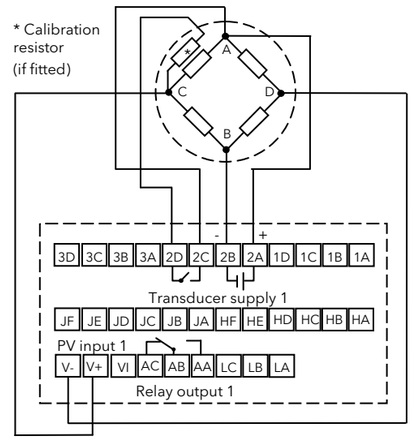
- High voltage supply: 100 to 230Vac, ±15%, 48/62 Hz.
- Low voltage supply: 24Vac, -15%, +10%, 48/62Hz;
  or: 24Vdc -15%, +20%
- Recommended external fuse ratings are as follows:-
  For 24 V ac/dc, fuse type: T rated 2A 250V
  For 100-240Vac, fuse type: T rated 2A 250V.

Melt Pressure Transducer

If the indicator is ordered with option MP it is supplied to measure melt pressure, typically in an extruder application. A Transducer Power Supply module is required in module positions 1 or 2.

The diagram shows the module fitted in position 2.

If input 2 is used in module position 3, the transducer output can be connected to terminals 3C (+) and 3D (-).



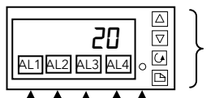
Note: To minimise pick up of noise, it is recommended that screened cables are used for transducer power supply connections

Operation

Switch on the indicator. After a 3 second self-test sequence, you will see the display shown below. It is called the HOME display

The default is actual temperature or process value (PV).

(see '*HOME Display Options*' for other possibilities)



Alarm Beacons: Alarm 1, Alarm 2, Alarm 3, Alarm 4

ACK/ RESET

Operator buttons

- Increase a value
- Decrease a value
- Select a parameter
- Select parameter list headings. See following sections for more details.

Press to acknowledge alarms

To View the Display Units

Momentarily press or .

The temperature units for thermocouple and RTD inputs, are flashed in the display for 0.5 second as follows:

°C Celsius
°F Fahrenheit
°K Kelvin

Note: For linear inputs no units are displayed.

To Return to the HOME Display

Press and together to return to the HOME display

OR

Do not press any button for 45 seconds. This time is reduced to 10 seconds if an alarm is being indicated.

Home Display Options

When shipped from the factory the HOME display will, by default, show the measured temperature (process value). This is shown on the 'front' display. If either or is pressed the display changes to the 'back' display for a period of two seconds. Both the front and back displays can be set up in FULL access level to show different parameters as listed below. This facility is useful, for example, on alarm indicators, where it may be necessary to have quick access to both process value and alarm setpoint.

To set up the front and back displays:-

From the HOME display:-

Press to select dSPF (front) or dSPb (back).

Press or to select the option →

- nonE = Only alarm messages will be shown
- SP = Setpoint for deviation alarms
- rm.SP = Remote setpoint for deviation alarms
- PV.Hi = Displays the maximum value on input 1
- PV.Lo = Displays the minimum value on input 1
- PV = Process value
- AL.SP = Alarm 1 setpoint
- Li = Linearised input 1
- L2 = Linearised input 2

Access Levels

There are four access levels:

- **Operator** - parameters defined in Edit Level can be viewed and adjusted.
- **Full** - all parameters relevant to a particular configuration are visible. All alterable parameters may be adjusted. Generally used to commission the controller.
- **Edit** - used to set up the parameters that you want an operator to be able to see and adjust when in Operator levels 1 and 2.
- **Configuration** - used to set up the fundamental characteristics of the controller.

Access to, Full, Edit and Configuration levels is protected by security codes. For Full and Edit the code is set to '1' when the controller is shipped from the factory. For Configuration refer to manual HA027240.

To Select an Access Level

1. Press to select AccS Li St.
2. Press to select codE. Default 1.
3. Press or to enter the security code. PASS is displayed if the code is correct or the display will remain at 'codE' if the password is incorrect
4. Press to select Goto
5. Press or to select FULL or Edit.

Edit Level

Edit level is used to set which parameters you can view and adjust in Operator level. It also gives access to the 'Promote' feature, which allows you to select and add ('Promote') up to twelve parameters into the HOME display list, thereby giving simple access to commonly used parameters.

Having selected the required parameter, use or to set its availability in Operator levels 1 and 2.

Each parameter can be set to:

ALtr - Makes a parameter alterable in Operator levels 1 and 2.

Pr0 - Promotes a parameter into the Home display list.

rEAd - A parameter, or list header, is read-only *(it can be viewed but not altered)*.

HIdE - Hides a parameter, or list header.

To Return to Operator Level

1. Press to select AccS Li St.
2. Press to select codE and again to select Goto
3. Press or to select OPEr.

Note: in 'Edit' level, the controller will automatically return to operator level if no button is pressed for 45 seconds.

To Adjust Alarm Setpoints

If dSPb is set up as AL.SP (see *Home Display Options*), press or to display the alarm setpoint. Press or again to change the value.

If not, select FULL access level, then:-

Press until the Alarm List (AL) is shown.

Press to select the alarm indicated by the mnemonic in the table below.

Press or to change the alarm setpoint.

Alarm Indication

An alarm is shown when the process conditions exceed a pre-set level (setpoint). It will be displayed as follows:-

1. The relevant alarm beacon will flash
2. A four character alarm message will be shown as a double repeating flash in the main display. This message specifies the alarm number (first character) and the type of alarm (next three characters) as shown in the table below. The message is flashed in addition to the 'front' displayed value.

If more than one alarm is present, the relevant beacon illuminates and further messages are flashed in the main display. The alarm indication will continue as long as the alarm condition is present and is not acknowledged.

Note: the type of alarm is set up in Configuration level as described in handbook HA027240, which may be downloaded from www.eurotherm.co.uk.

Display	Alarm type	Input Source	Alarm description and function
First character			
1---			Alarm 1 is active
2---			Alarm 2 is active
3---			Alarm 3 is active
4---			Alarm 4 is active
Last three characters			
-FSL	Full Scale Low	Main PV	PV is below the low alarm setting on the main PV
-FL 1		PV 1	PV is below the low alarm setting on PV 1
-FL2		PV 2	PV is below the low alarm setting on PV 2
-FSH	Full Scale High	Main PV	PV is above the high alarm setting on the main PV
-FH 1		PV 1	PV is above the high alarm setting on PV 1
-FH2		PV 2	PV is above the high alarm setting on PV 2
-dLo	Deviation Low	Main PV	PV is below the low deviation setting on main PV
-dL 1		PV 1	PV is below the low deviation setting on PV1
-dL2		PV 2	PV is below the low deviation setting on PV2
-dHi	Deviation high	Main PV	PV is above the high deviation setting on main PV
-dH 1		PV 1	PV is above the high deviation setting on PV1
-dH2		PV 2	PV is above the high deviation setting on PV2
Last three characters			
-dEu	Deviation band	Main PV	PV is above or below the high and low deviation setting on main PV
-du 1		PV 1	PV is above or below the high and low deviation setting on PV1
-du2		PV 2	PV is above or below the high and low deviation setting on PV2
-rAt	Rate of change (minutes)	Main PV	PV is changing faster than the rate-of change alarm setting in minutes for main input.
-rAS	Rate of change (seconds)	Main PV	PV is changing faster than the rate-of change alarm setting in seconds for main input.
-rt 1	Rate of change (minutes)	Input 1	PV is changing faster than the rate-of change alarm setting in minutes for input 1.
-rS 1	Rate of change (seconds)	Input 1	PV is changing faster than the rate-of change alarm setting in seconds for input 1.
-rt2	Rate of change (minutes)	Input 2	PV is changing faster than the rate-of change alarm setting in minutes for input 2.
-rS2	Rate of change (seconds)	Input 2	PV is changing faster than the rate-of change alarm setting in seconds for input 2.
-LSP	Setpoint low	Main PV	The setpoint is below the low alarm setting
-HSP	Setpoint high	Main PV	The setpoint is above the high alarm setting
If other messages are flashed, see *'Diagnostic Alarms'*			

Notes:

1. If the **process value flashes** but no other alarm message is displayed, this indicates that the input value is out of range.
2. **Deviation Alarms**. The master setpoint used for deviation alarms is normally derived as a remote input from another device - for example, a temperature controller. The master setpoint can also be internally set within the controller - in this case called the local setpoint value.
3. **Rate of change alarms** may be detected as a positive rate of change or as a negative rate of change. Set the alarm setpoint + or - respectively.

Alarm Relay Output

Any combination of the alarms shown in the table above can operate a particular output (usually the built in relay AA but output modules may also be configured to operate if an alarm occurs). These would normally provide plant safety interlocks or external audio/visual indication. Alarms can be assigned to a particular output in configuration level, or they are supplied pre-configured in accordance with the ordering code.

Navigation Diagram

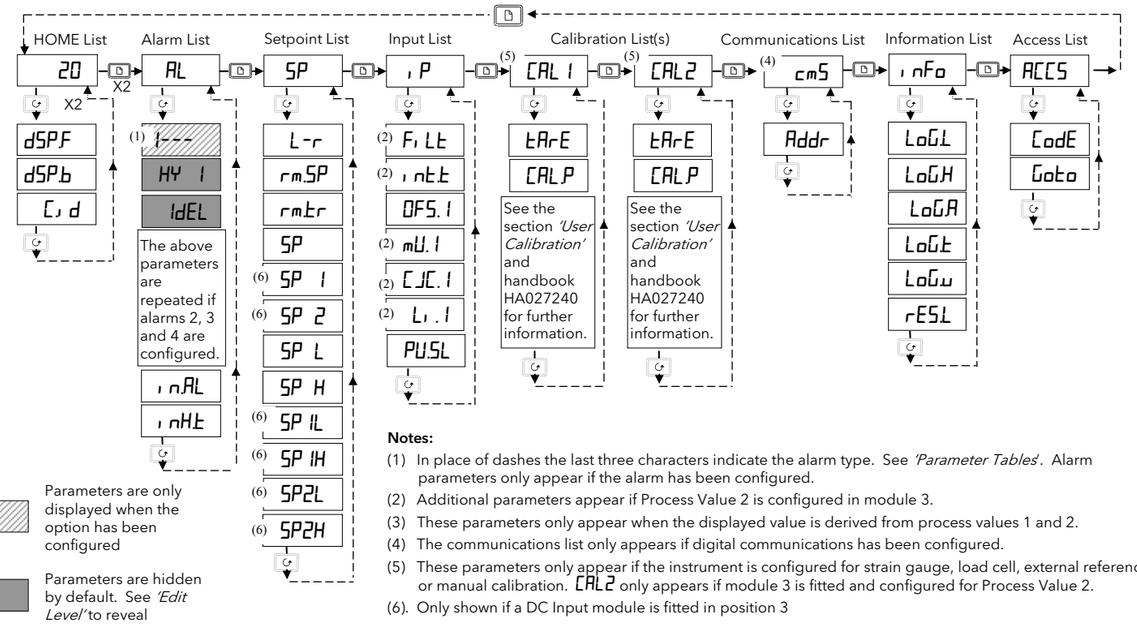
The diagram below shows typical parameters available in Full access level. In practice the parameters that appear will depend on the configuration of the indicator. Further details may be found in the Engineering Handbook HA027240.

Use the following lists to adjust:-

♦ Front and back displays ♦ Alarm setpoints ♦ Setpoints and setpoint limits ♦ Input filter time constants and offsets ♦ User calibration ♦ Communications address

Summary

1. Press to step across the list headings.
2. Press to step down the parameters within a particular list. You will eventually return to the list heading.
3. Press to view the value of a selected parameter. Keep pressing to decrease the value.
4. Press to view the value of a selected parameter. Keep pressing to increase the value.



Parameters are only displayed when the option has been configured

Parameters are hidden by default. See *'Edit Level'* to reveal

Notes:

(1) In place of dashes the last three characters indicate the alarm type. See *'Parameter Tables'*. Alarm parameters only appear if the alarm has been configured.

(2) Additional parameters appear if Process Value 2 is configured in module 3.

(3) These parameters only appear when the displayed value is derived from process values 1 and 2.

(4) The communications list only appears if digital communications has been configured.

(5) These parameters only appear if the instrument is configured for strain gauge, load cell, external reference or manual calibration. CAL2 only appears if module 3 is fitted and configured for Process Value 2.

(6). Only shown if a DC Input module is fitted in position 3

To Acknowledge An Alarm

An alarm can be acknowledged in one of three ways:-

1. Press the ACK/RESET button. (If this does not work it may have been disabled when the indicator was configured).
2. Press and together.
3. If a digital input has been supplied (order code AC) for alarm acknowledge, momentarily activate this input.

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, the double repeating flash of the alarm message will be replaced by a single repeating flash and the alarm beacon will be lit continuously. 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 operate when the alarm condition occurs and remain in the operated condition until the alarm is acknowledged **AND** the alarm condition is no longer present.

If the alarm condition disappears before it is acknowledged the alarm indication disappears as soon as the condition disappears.

Latched Alarms

The indicator may have been configured for Automatic or Manual reset. The action which occurs when the acknowledge button is pressed is described below:-

Automatic.

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

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 alarm condition is removed.

Diagnostic Alarms

In addition to the process alarms given in the previous column, the following alarms may also appear. These warn that a fault exists, either within the indicator or in the connected devices.

Alarm	What it means	What to do about it
Sbr	Sensor break. Open circuit input on whichever input is being used as the PV	Check the sensor or the connections between sensor and indicator for open circuit.
EEEr	Electrically Erasable Memory Error: The value of an operator or configuration parameter has been corrupted.	This fault will automatically select configuration level. Check all configuration parameters before returning to operator level. Once in operator level, check all operator parameters before resuming normal operation. If the fault persists or occurs frequently, return the unit for repair.
Err 1	Error 1: ROM self-test fail	Return the indicator for repair
Err2	Error 2: RAM self-test fail	Return the indicator for repair
Err3	Error 3: Watchdog fail	Return the indicator for repair
Err4	Error 4: Keyboard failure. Stuck button, or a button was pressed during power up.	Switch the power off and then on without touching any of the indicator buttons. If the error continues return the unit for repair.
Err5	Error 5: Input circuit failure	Return the unit for repair
HwEr	Hardware error Indication that a module is of the wrong type, missing, faulty or a new module has been fitted.	Check that the correct modules are fitted. Go to configuration mode and set up the required parameter(s). See handbook HA027240 for further information.
PwrF	Power failure: The line voltage is too low	Check that the supply is within rated limits
rmtF	Remote input fail	Connect an input device (eg. transducer, thermocouple, mA source) to input 2

Digital Communications Connections

Communications protocols may be Modbus or EIBisynch.

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

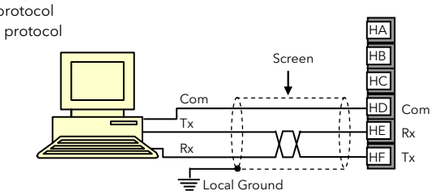
A further description of Modbus and EIBisynch communications is given in 2000 series Communications Handbook, Part No. HA026230, which can be downloaded from www.eurotherm.co.uk.

- Digital communications modules are isolated 240Vac CATII

EIA232 Connections

- Order codes:-

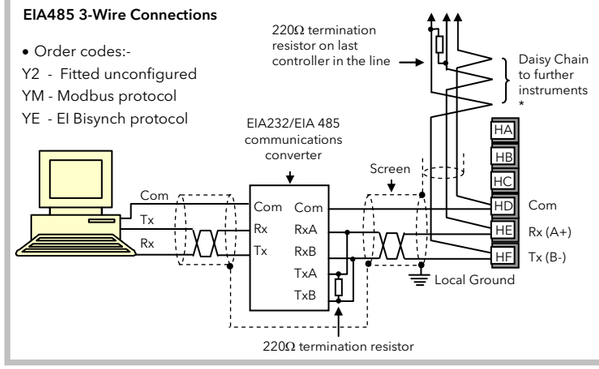
A2 - Fitted unconfgured
AM - Modbus protocol
AE - EI-Bisynch protocol



EIA485 3-Wire Connections

- Order codes:-

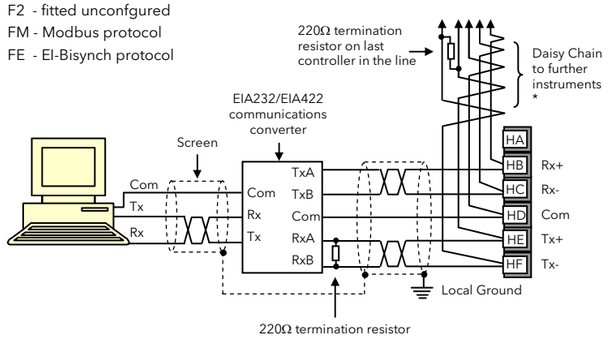
Y2 - Fitted unconfigured
YM - Modbus protocol
YE - EI Bisynch protocol



EIA422/EIA485 5-Wire Connections

- Order codes:-

F2 - fitted unconfgured
FM - Modbus protocol
FE - EI-Bisynch protocol



* The use of bootlace ferrules may be an aid to wiring where two wires are to be connected to the same terminal

The KD485 communications converter is recommended for interfacing to EIA 485. This unit is also used to buffer an EIA 485 network when it is required to communicate with more than 32 instruments on the same bus, and may also be used to bridge 3-wire EIA485 to 5-wire EIA 422.

= Twisted pairs

Safety and EMC Information

This instrument is intended for industrial temperature and process control applications within the requirements of the European Directives on Safety and EMC.
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.

⚠ The safety and EMC protection can be seriously impaired if the unit is not used in the manner specified. The installer must ensure the safety and EMC of the installation.

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

Unpacking and storage. If on receipt, the packaging or unit is damaged, do not install but contact your supplier. If being stored before use, protect from humidity and dust in an ambient temperature range of -20°C to +70°C

Electrostatic discharge precautions. Always observe all electrostatic precautions before handling the unit.

Service and repair. This instrument has no user serviceable parts. Contact your supplier for repair.

Cleaning. Isopropyl alcohol may be used to clean labels. Do not use water or water based products. A mild soap solution may be used to clean other exterior surfaces.

Electromagnetic compatibility. This instrument conforms with the essential protection requirements of the EMC Directive 2004/108/EC, by the application of a Technical Construction File. It satisfies the general requirements of the industrial environment defined in EN 61326.

Caution: Charged capacitors. Before removing an instrument from its sleeve, disconnect the supply and wait at least two minutes to allow capacitors to discharge. Avoid touching the exposed electronics of an instrument when withdrawing it from the sleeve.

Safety Symbols. Symbols used on the instrument have the following meaning:

⚠ Caution, refer to accompanying documents ⏚ Earth symbol

Installation Category and Pollution Degree. This unit has been designed to conform to BSEN61010 installation category II and pollution degree 2, defined as follows:-

Installation Category II (CAT II). The rated impulse voltage for equipment on nominal 230V supply is 2500V.

Pollution Degree 2. Normally only non conductive pollution occurs. However, a temporary conductivity caused by condensation must be expected.

Personnel. Installation must only be carried out by suitably qualified personnel

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

Caution: Live sensors. The controller 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 CATII.

Wiring. It is important to connect the unit in accordance with the data in this sheet ensuring that the protective earth connection is ALWAYS fitted first and disconnected last. Wiring must comply with all local wiring regulations, i.e. UK, the latest IEE wiring regulations, (BS7671), and USA, NEC Class 1 wiring methods.

⚠ Do not connect AC supply to low voltage sensor input or low level inputs and outputs.

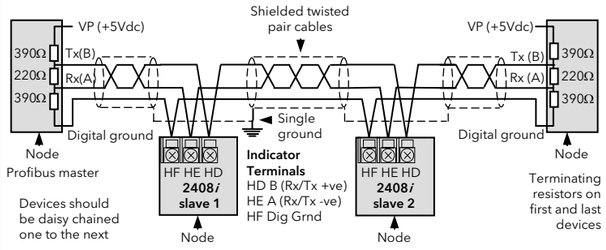
Voltage rating. The maximum continuous voltage applied between any of the following terminals must not exceed 230Vac +15%: relay output to logic, dc or sensor connections; any connection to ground. The controller must not be wired to a three phase supply with an unearthed star connection. Under fault conditions such a supply could rise above 230Vac +15% with respect to ground and the product would not be safe.

Conductive pollution. Electrically conductive pollution i.e. carbon dust, MUST be excluded from the enclosure in which the controller is installed. To secure a suitable atmosphere in conditions of conductive pollution, fit an air filter to the air intake of the enclosure. Where condensation is likely, include a thermostatically controlled heater in the enclosure.

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

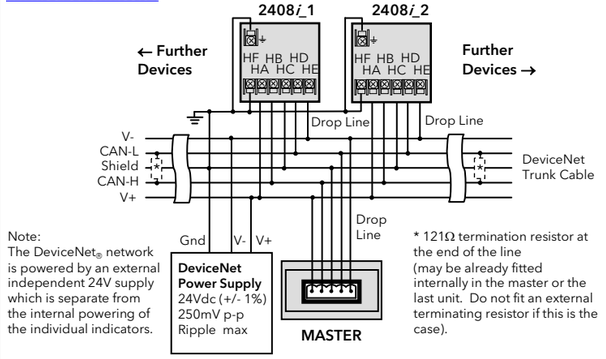
Profibus

Instruments supplied with model numbers 2408*i*/AP and digital communications option PB are fitted with Profibus communications modules in the H slot. A description of Profibus is given in the Profibus Communications Handbook Part No HA026290 which can be downloaded from www.eurotherm.co.uk.



DeviceNet® Wiring

Instruments with digital comms option code DN are fitted with Devicenet communications. Further information is available in the DeviceNet® Communications Handbook Part No HA027506 which can be downloaded from www.eurotherm.co.uk.



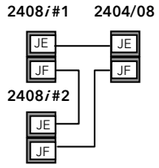
Note:
The DeviceNet® network is powered by an external independent 24V supply which is separate from the internal powering of the individual indicators.

* 121Ω termination resistor at the end of the line (may be already fitted internally in the master or the last unit. Do not fit an external terminating resistor if this is the case).

PDS

PDS (Pulse Density Signaling) is a proprietary technique developed for bi-directional communication over a single pair of wires.

PDS can be used to digitally transmit the setpoint from a 2404/08 master controller (for example) to a number of 2408*i* slaves - see diagram.



Ordering codes:-

M6 - Module fitted but not configured

RS - Setpoint input configured

The PDS module can only be fitted in position J.

This table shows standard cable connections for Devicenet.

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

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

- A Schottky Diode to connect the power supply V+ and allows for multiple power supplies to be connected.
- Two fuses or circuit breakers to protect the bus from excessive current which could damage the cable and connectors.
- The earth connection, HF, should be connected to the main supply earth terminal.

Over Temperature Protection.

A closed loop temperature control system should be provided with an independent over-temperature protection unit to prevent overheating of the process under fault conditions. The 2408*i* could be used in this role. It must have an independent temperature sensor and isolating contactor.

Note: Alarm relays within the temperature controller will not give protection under all failure conditions.

Installation Requirements for EMC. To comply with European EMC directive certain installation precautions are necessary:-

- General guidance. Refer to *EMC Installation Guide*, Part no. HA025464.
- Relay outputs. It may be necessary to fit a suitable filter to suppress conducted emissions. Filter requirements depend on the type of load.
- Table top installation. If using a standard power socket, compliance with commercial and light industrial emissions standard is usually required. To comply with conducted emissions standard.

Restriction of Hazardous Substances (RoHS)

Product group 2400

Table listing restricted substances

Chinese

限制使用材料一览表

产品 2400	有毒有害物质或元素					
	铅	汞	镉	六价铬	多溴联苯	多溴二苯醚
印刷线路板组件	X	O	X	O	O	O
附属物	O	O	O	O	O	O
显示器	X	O	X	O	O	O
模块	X	O	X	O	O	O
O	表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下。					
X	表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的限量要求。					

English

Restricted Materials Table

Product 2400	Toxic and hazardous substances and elements					
	Pb	Hg	Cd	Cr(VI)	PBB	PBDE
PCBA	X	O	X	O	O	O
Enclosure	O	O	O	O	O	O
Display	X	O	X	O	O	O
Modules	X	O	X	O	O	O
O	Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.					
X	Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.					

Approval

Name:	Position:	Signature:	Date:
Kevin Shaw	R&D Director		11th September 2013

IA029470U470 (CN30491) Issue 2 Aug 13

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invensys Eurotherm

Parameter Tables

	Home list	
Home	Measured value	
dSPF	HOME display front.	See section *' Home Display Options'*
dSPb	HOME display back	
C, d	Customer defined identity number 0-9999	

AL	Alarm List	
1---	Alarm 1 setpoint	In place of dashes, the last three letters indicate the alarm type as shown in *Alarm Indication* above. Note: If the alarm is disabled the parameter will not appear in this list.
2---	Alarm 2 setpoint	
3---	Alarm 3 setpoint	
4---	Alarm 4 setpoint	
HY 1	Alarm 1 Hysteresis	Prevents relay 'chatter' by setting a difference between the relay ON and OFF points.
HY 2	Alarm 2 Hysteresis	
HY 3	Alarm 3 Hysteresis	
HY 4	Alarm 4 Hysteresis	
1dEL	Alarm 1 delay	Used to ignore transient alarms. Alarms must be true for the delay time before they become active.
2dEL	Alarm 2 delay	
3dEL	Alarm 3 delay	
4dEL	Alarm 4 delay	
, nAL	Inhibit alarm timer	Used to inhibit alarms for a set period after power up and when a digital input is closed
, nHt	Time alarm inhibited	Used to set the alarm inhibit time

SP	Setpoint list	
L- r	Remote setpoint enable	Loc - Local rmt - Remote
rm.SP	Remote master setpoint (for deviation alarms)	
SP 1	Local master setpoint value for deviation alarms input 1	
SP 2	Local master setpoint value for deviation alarms input 2	
rmtr	Remote setpoint track. Only shown if remote SP is configured	OFF - Local SP does not track remote SP trAc - Local SP tracks remote SP
SP	Setpoint for PV alarms	
SP L	PV Alarm Setpoint low limit	These are repeated for Input 1 and 2 alarms as SP 1L, SP 1H, SP2L, SP2H
SP H	PV Alarm Setpoint high limit	

, P	Input list	
F, LE FLt2	Input 1/2 filter type. See HA027240 for details.	OFF - No filter I nt - Integrating filter StEP - Step
, ntt	Input 1/2 filter time constant	Appears if filter type = I nt Used to reduce process value flicker
StPb	Input 1 filter step band	Appears if filter type = StEP Used to reduce process flicker on weigh scale inputs
OFS 1 OFS2	Calibration offset - input 1/2	Input 2 uses module 3
mU. 1 mU2	Input 1/2 mV measured at the rear terminals	
CJC. 1 CJC2	Input 1/2 Cold junction compensation temperature measured at the rear terminals	
Li .1 Li .2	Input 1 Linearised value Input 2 Linearised value (module 3)	
PUSL	Shows the currently selected PV input.	I P. 1 - Input 1 selected I P.2 - Input 2 selected both - Input 1 and 2 selected

CAL 1	**User Calibration List -** Input 1 (CAL2 is shown if module 3 is configured for DC input	
tArE	Performs automatic 'Tare' correction, on input 1	See the section *'User Calibration'* and handbook HA027240 for further information.
CALP	Calibration password (see following sections)	

cmS	Digital Communications List	
Addr	Communications address	1 to 99 ElBisynch 1 to 254 Modbus

, nFo	Information List	
LoGL	Logged Minimum Process Value	These values are logged by the indicator from switch on. To reset switch the indicator supply off and on again or scroll to rESL and select YES
LoGH	Logged Maximum Process Value	
LoGA	Logged Average Process Value	
LoGt	Time process value is above threshold level	
LoGu	Process value threshold for timer log	
rESL	Logging reset	

ACCS	Access List
CodE	See section *'Access Levels'.*
OPEr	Operator level
FuLL	Full access level
Edi t	To hide, promote or make read only parameters in Operator levels
ConF	Configuration level
CALP	Calibration level

Calibration Password
The following parameters are shown if the correct calibration password is entered. By default CALP = 3.

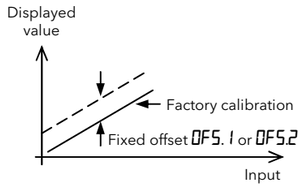
CAL	FAct = select factory calibration USEr = Select User Calibration (see next panel)
tArEu	Tare value. This sets a fixed offset on the tare value. It may be used, for example, if containers of different weights are placed on a pallet of known weight.
SG	Specific gravity multiplier. For materials with specific gravity different from water (1).
If User Calibration is selected:-	
PntL	Start low point calibration
, nPL	Transducer low scale
ScLL	Scale low point
I nPH	Transducer high scale
ScLH	Scale high point

User Calibration

User Calibration is designed to provide the facility for day to day adjustments by the operator. It includes input offset; tare correction; transducer, load cell and comparison adjustments. These are briefly described below but for a full description please refer to manual HA027240 which can be downloaded from www.eurotherm.co.uk.

Calibration Offset

This allows you to apply a single offset to the input to compensate for sensor and other system errors. You can apply a simple fixed offset, independently for each input, over the whole display range using the parameter OFS. 1 or OFS.2 in the , P list.



Two Point Offset

Alternatively, a two point offset may be applied for each input which provides a different offset at the lower and higher ends of the range. This requires access to Configuration Level and is described in issue 2 of Handbook HA027240 which can be downloaded from www.eurotherm.co.uk.

Automatic Zero and Span Calibration of a Melt Pressure Transducer

The indicator can accept up to two transducer inputs. Transducer power supply modules are used to provide an excitation voltage of either 5 or 10Vdc.

A melt pressure transducer is normally calibrated at 0% and 80% of its full range. This is set using parameters ScLL and ScLH as described below.

Wire the transducer as shown overleaf.

Span calibration is performed by applying either:

1. A calibration resistor contained within the transducer assembly
   OR
2. A calibration resistor fitted within the transducer power supply module. The value of this resistor is 30K1Ω.

Calibration Procedure (process input 1).

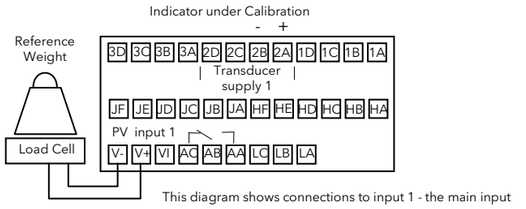
1. Remove any load from the transducer to establish a zero reference.
2. Press [page] until you reach the CAL 1
3. Press [scroll] until you reach the CALP parameter and enter the calibration password using [▲] or [▲], - default value 3.
4. Press [scroll] to show CAL and set this to USEr using [▲] or [▲]
5. Press [scroll] until you reach , nPL (transducer low scale). For a transducer range 0 to 10,000psi set this to 0.
6. Press [scroll] until you reach ScLL (scaling low), and enter the scale low value - normally 0 (0% of transducer range).
7. Press [scroll] until you reach , nPH (transducer high scale). For a transducer range 0 to 10,000psi set this to 10000.
8. Press [scroll] until you reach ScLH (transducer high scaling point), and enter the scale high value - normally 80 (80% of transducer range).
9. Press [scroll] to show PntL (start low point calibration) and set this to on. The indicator will show buSY while it automatically calibrates the transducer, then return to PntL. If the calibration fails tdrF is displayed.

The above procedure may be repeated for input 2 using the list CAL2.

Alternatively, it is possible to order the indicator with a digital input configured to initiate automatic calibration of input 1 or input 2 (digital input code J3 or J4 respectively). In this case making the digital input will have the same effect as paragraph 9 above and will automatically calibrate the strain gauge transducer.

Load Cell Calibration

A load cell with V, mV or mA output may be connected to Input 1 or Input 2 as shown below:-



This diagram shows connections to input 1 - the main input

If Input 2 is used in module position 3, the transducer output can be connected to terminals 3C (+) and 3D (-)

Select User calibration as described in paragraphs 1 to 4 above, then:-

5. Press [scroll] until you reach ScLL (scaling low), and enter the minimum display reading when the transducer has its lowest weight (0 if there is no weight on the transducer).
6. Press [scroll] to show PntL (cal point 1) and set this to on. The indicator will show buSY while calibrating.
7. Repeat for PntH - the maximum display reading when the transducer has its highest weight.

The indicator will flash donE when calibration is complete. If it fails tdrF is displayed.

Note: It is possible to configure external contact inputs to activate PntL and PntH.

Factory Calibration

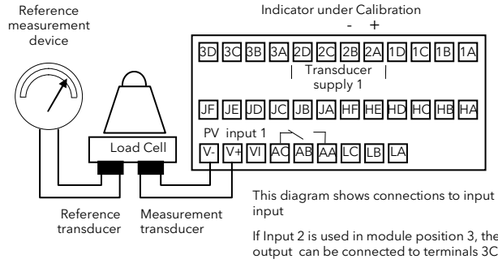
It is always possible to return to the factory calibration by setting CAL to FAct.

Indicator Calibration

Calibration of inputs 1 and 2, and retransmission outputs should not be confused with User Calibration. Calibration of these functions in done in Configuration level and should not normally be necessary. They are, therefore, described in the User Manual HA027240.

Comparison Calibration

This calibrates the indicator against a separate reference instrument.



This diagram shows connections to input 1 the main input

If Input 2 is used in module position 3, the transducer output can be connected to terminals 3C (+) and 3D (-)

In this case the process calibration points are not entered ahead of performing the calibration. The input may be set to any value and, when the system is stable, a reading is taken from the reference measurement device and entered into the indicator. The indicator stores both this new target value and the actual reading taken from its input.

The process is repeated at a different value, with the indicator storing both the new target value and the reading taken from its input.

Select User calibration as described in paragraphs 1 to 4 above then:-

5. Press [scroll] to show PntL (cal point 1) and set this to on. The indicator will alternate between AdJ (adjust) and the value shown in the display.
6. Press [▲] or [▲] to enter the value indicated by the reference instrument.
7. Repeat for PntH - the maximum display reading

- The values are accepted by scrolling away from AdJ
- It is possible to configure external contact inputs to activate PntL and PntH.

Tare Correction or Auto-Tare

This is used, for example, when it is required to weigh the contents of a container but not the container itself. Alternatively, it can be used to set a fixed offset on an initial measured value. By default Tare correction is available in FuLL access level, and is described in the procedure below:-

1. Place the empty container on the weigh cell
2. Repeatedly press [page] until CAL. 1 is displayed.
3. Press [scroll] to select tArE and press [▲] or [▲] to select On
4. The display changes to buSY as the indicator takes the measurement from the strain gauge.
5. The weight of the container will automatically be taken from the total weight and the display will return to the HOME display.

If the calibration fails the alarm message tdrF (transducer fail) will flash.

It may be more convenient to 'promote' the tArE parameter to Operator level as described in the example below. In this case it will be available by pressing [scroll] when in Operator level.

Alternatively, a digital input may have been configured to provide this function via an external source such as a switch or pushbutton (digital input order codes J1 - input 1 or J2 - input 2). In this case pressing the button will have the same effect as selecting 'On' in 3 above.

The above procedure may be repeated for input 2 (if provided) using the list CAL2.

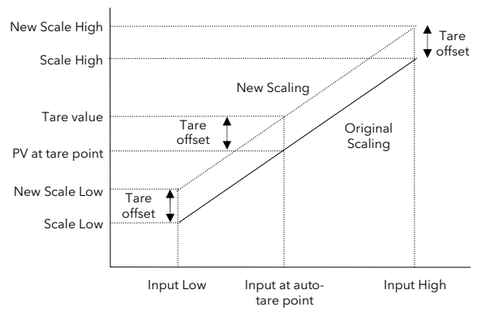
Example 1: To Promote tArE to Operator Level 1

Select Edit level as described in section '*Access Levels*'.
Press [page] to select CAL. 1
Press [scroll] to select tArE and press [▲] or [▲] to select Pro

Tare Value or Display Zero

The parameter Tare Value (tArEu) sets a fixed offset on the tare measurement. This may be used, for example, if containers of different weights are placed on a pallet of known weight. This known weight can then be entered in tArEu.

The effect of Tare Value is to introduce a DC bias to the measurement. A Tare calibration will change the values of 'Scale High' ScLL and 'Scale Low' ScLH as shown in the figure below:-



Having entered a Tare Value, Auto-Tare can be initiated as described in the previous column.

It may be more convenient to 'promote' the tArEu parameter to Operator level as described in the example. In this case it will be available by pressing [scroll] when in Operator level.

Example 2: To Promote tArEu to Operator Level 1

Select FuLL level as described in section '*Access Levels*'.
Press [page] to select CAL. 1
Press [scroll] to select CALP and enter the calibration password (3)
Select Edi t level
Press [page] to select CAL. 1
Press [scroll] to select tArEu
press [▲] or [▲] to select Pro