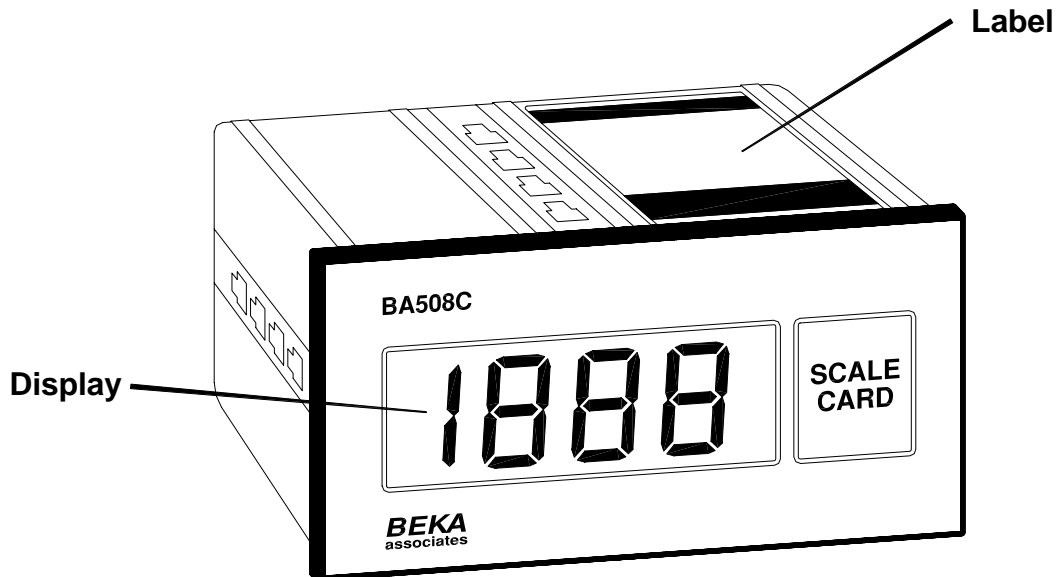


**BA507C & BA508C**  
**loop-powered**  
**3½ digit panel**  
**mounting indicators**

issue 3



**Issue: 3**  
**18<sup>th</sup> September 2008**

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The BA507C and BA508C indicators are CE marked to show compliance with the European EMC Directive 2004/108/EC

## 1. DESCRIPTION

The BA507C and BA508C are loop powered digital indicators which display the current flowing in a 4/20mA loop in engineering units. Both instruments introduce less than a 1.1V drop which allows them to be installed into almost any 4/20mA current loop. No additional power supply or battery is required.

The two indicators are electrically similar, but have different size displays and enclosures.

Model	Display height	Bezel size
BA507C	12.7mm	96 x 48mm
BA508C	25.4mm	144 x 72mm

Both are second generation instruments which have additional features, but remain compatible with the original BA507 and BA508.

The main application of the BA507C and BA508C is to display a measured variable or control signal in a process area. The zero and span of the display are independently adjustable so that the indicators can be calibrated to display any variable represented by the 4/20mA current, e.g. temperature, flow, pressure or level.

## 2. Operation

Fig 1 shows a simplified block diagram of both models. The 4/20mA input current flows through resistor R1 and forward biased diode D1. The voltage developed across D1, which is relatively constant, is multiplied by a switch mode power supply and used to power the analogue to digital converter and liquid crystal display. The voltage developed across R1, which is proportional to the 4/20mA input current, provides the input signal for the analogue to digital converter.

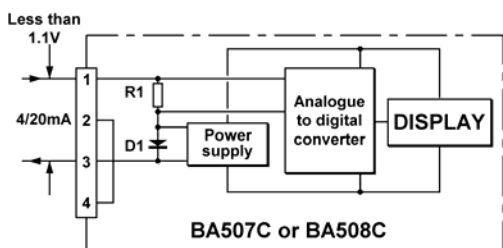


Fig 1 Simplified block diagram

## 3. APPLICATIONS

### 3.1 Transmitter loops

BA507C and BA508C indicators may be connected in series with any 4/20mA current loop providing the loop can tolerate the additional 1.1V required to operate the indicator. Fig 2 illustrates a typical application in which a BA507C or BA508C indicator is connected in series with a 2-wire transmitter.

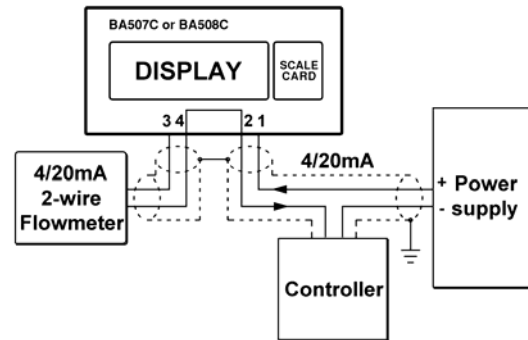


Fig 2 BA507C or BA508C in a transmitter loop

The sum of the maximum voltage drop of all the components must be less than the minimum power supply voltage.

Minimum operating voltage of 2-wire Tx	10.0
Maximum voltage drop caused by controller	5.0
Maximum voltage drop caused by BA507C	1.1
Maximum voltage drop caused by cables	0.4
	16.5V

Therefore at 20mA the power supply in this example must have an output greater than 16.5V

### 3.2 Remote indication

BA507C and BA508C indicators may be driven from any 4/20mA signal to provide remote indication. Fig 3 shows a typical application in which the output from a gas analyser drives a BA507C or BA508C indicator. Again it is necessary to ensure that the voltage capability of the 4/20mA output is greater than the sum of the voltage drops caused by the BA507C or BA508C and cable resistance

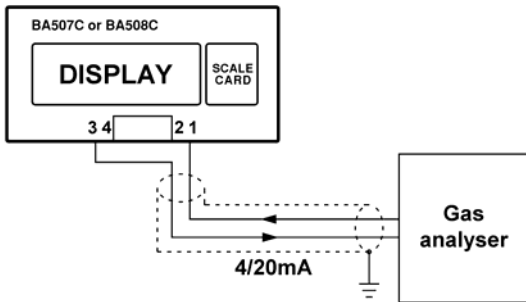


Fig 3 Remote indication

## 4. INSTALLATION

### 4.1 Location

BA507C and BA508C indicators are housed in robust aluminium enclosures with polyester front panels and Noryl bezels. The front of both instruments have IP65 protection, and a gasket seals the joint between each instrument and the panel. The indicators may be installed in any panel providing the environmental limits shown in the specification are not exceeded.

#### Cut-out Dimensions

##### DIN 43 700

$92.0 +0.8/-0.0 \times 45.0 +0.6/-0.0$

To achieve an IP65 seal  
between BA507C and instrument  
panel

$90.0 +0.5/-0.0 \times 43.3 +0.5/0.0$

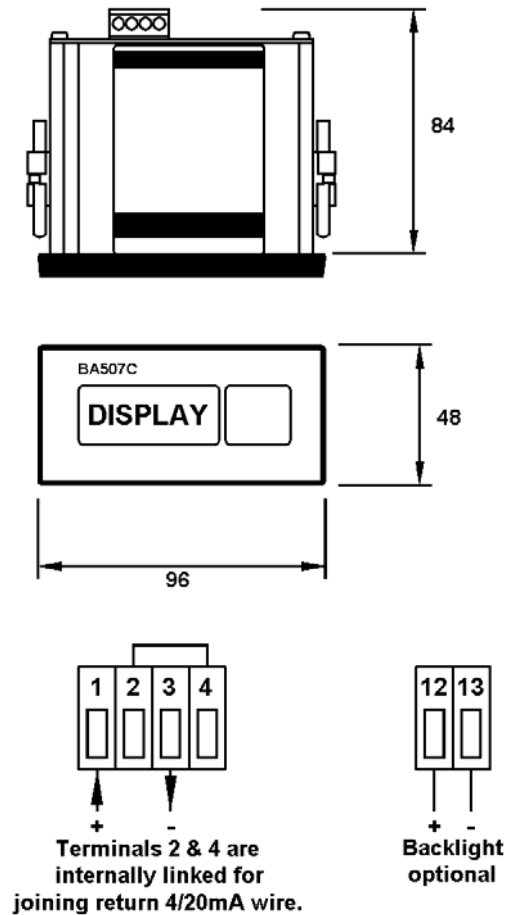


Fig 4A BA507C dimensions

### Cut-out Dimensions

DIN 43 700

138.0 +1.0/-0.0 x 68.0 +0.7/-0.0

To achieve an IP65 seal  
between BA508C and instrument  
panel

138.0 +0.5/-0.0 x 66.2 +0.5/0.0

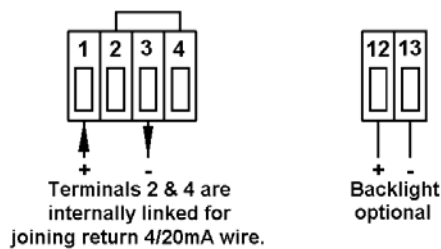
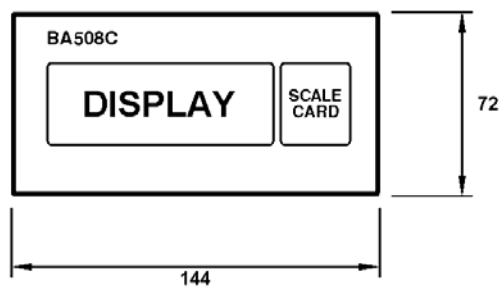
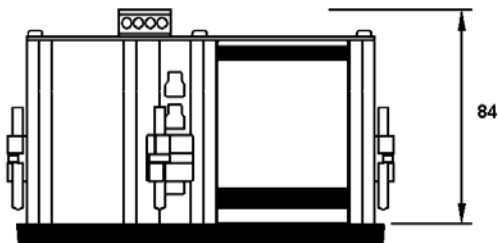


Fig 4B BA508C dimensions

Figs 4A and 4B show the overall dimensions of each instrument and the required panel cut-out dimensions.

### 4.2 Installation Procedure

- Insert the indicator into the instrument panel from the front of the panel.
- Fix a panel mounting clip to each side of the instrument and tighten until the indicator is secure, as shown in Fig 5. **Note:** four clips are required to achieve an IP65 seal between a BA508C enclosure and the instrument panel.
- Connect the panel wiring to the rear terminal block(s) as shown in Figs 4A and 4B. To simplify installation, the terminals are removable so that the panel wiring can be completed before the instrument is installed.

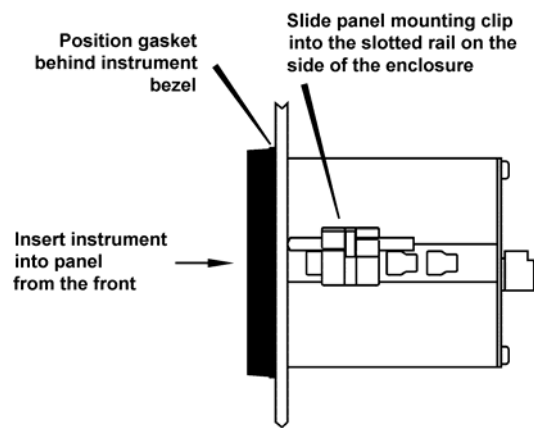


Fig 5 Fitting panel mounting clips

### 4.3 EMC

The BA507C and BA508C comply with the requirements of the European EMC Directive 2004/108/EEC. For specified immunity all 4/20mA wiring should be in screened twisted pairs. The indicator enclosure may be earthed locally by putting a tag under one of the rear panel corner fixing screws. EMC performance is shown in the instrument specification, and copies of the test report are available from BEKA associates.

**5. CALIBRATION**

The BA507C and BA508C will be supplied calibrated as requested at time of ordering. If calibration is not requested, the indicator will be set to display 00.0 with 4.000mA input, and 100.0 with 20.000mA input.

Both instruments are conditioned and calibrated by plug-in links and two multi-turn potentiometers. The potentiometers are accessible through holes in the rear panel, but the rear panel must be removed to gain access to the plug-in links. See Fig 7.

For maximum accuracy, indicators should be calibrated using an external traceable current source with an accuracy greater than 4µA. However, when verification is not required both instruments can be supplied with an optional internal calibrator which allows calibration without the need for external instruments. See section 7.3 for details.

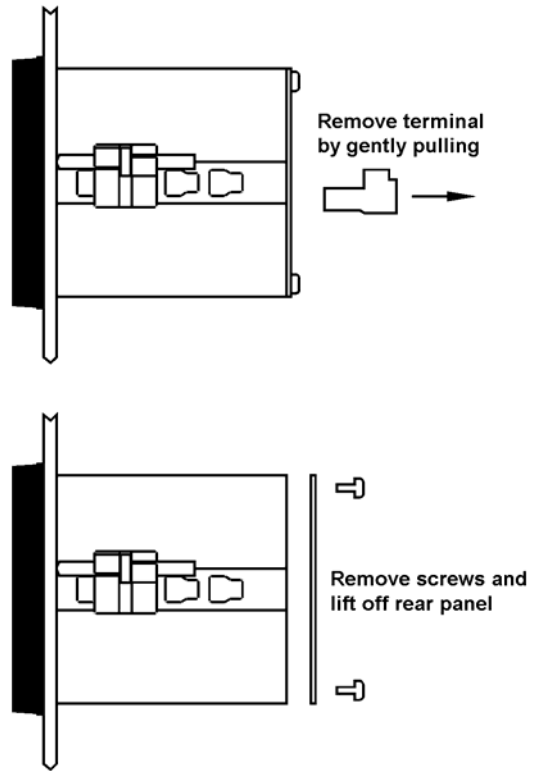


Fig 7 Removal of rear panel

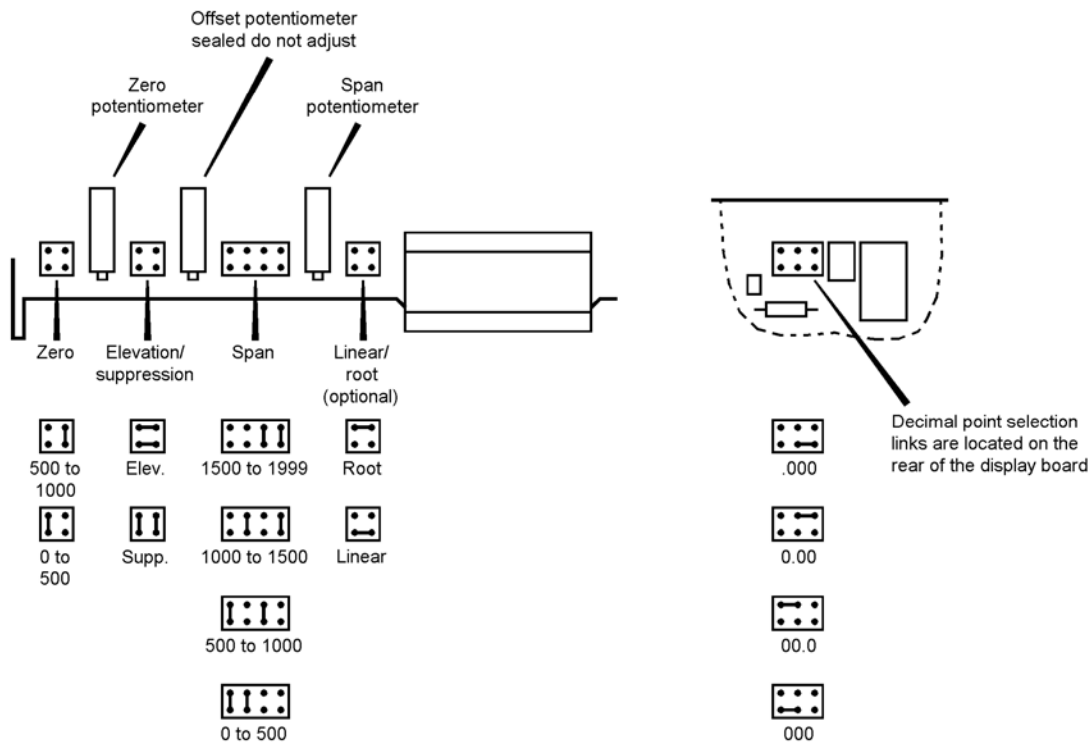


Fig 6 Position of plug-in calibration links and potentiometers

### 5.1 Zero adjustment

Zero is defined as the number displayed by the indicator with a 4.000mA input current, which is adjustable between -1000 and 1000. The zero potentiometer has two ranges, 0 to 500 and 500 to 1000. Zero polarity is defined by the position of the suppression / elevation links which are shown in Fig 6.

#### Suppression / elevation link

Position see Fig 6	Display with 4mA input adjustable between
Elevation	0 and 1000
Suppression	0 and -1000

#### Zero link

Position see Fig 6	Display with 4mA input adjustable between
0 to 500	0 and 500
500 to 1000	500 and 1000

### 5.2 Span adjustment

Span is defined as the difference between the number displayed with 4.000mA input, and the number displayed with 20.000mA input. It is adjustable between 0 and 1999 in four ranges.

Fig 6 shows the position of the span links and the span potentiometer.

#### Span links

Position see Fig 6	Difference in Display with 4 & 20mA input. Adjustable between
000 to 500	000 and 500
500 to 1000	500 and 1000
1000 to 1500	1000 and 1500
1500 to 1999	1500 and 1999

### 5.3 Decimal point

A decimal point may be displayed between any of the four digits. The position or absence of this dummy decimal point is determined by the position of the decimal point link shown in Fig 6. When calculating the required span and zero setting, the decimal point should be ignored.

### 5.4 Reverse action

Normally the instrument display increases as the input current increases, but this can be reversed. Please contact BEKA associates for details.

### 5.5 Calibration example

A BA507C is required to display:

25.0 with 4.000mA input

115.0 with 20.000mA input

i.e.

A zero of positive 250 Ignoring decimal

A span of 900 point

A decimal point in position 00.0

The following adjustments are required:

- Step 1 The BA507C is required to display a positive zero therefore the suppression / elevation links should be put in the elevation position.
- Step 2 The required zero is 250, therefore the zero link should be put in the 0 to 500 position.
- Step 3 The required span is 900, therefore the span links should be placed in the 500 to 1000 position.
- Step 4 The decimal point is required between the least two significant digits, therefore the decimal point link should be placed in the 00.0 position.
- Step 5 With 4.000mA input adjust the zero potentiometer until the indicator displays 25.0
- Step 6 With 20.000mA input adjust the span potentiometer until the indicator displays 115.0

Step 7 Repeat steps 5 and 6 until both calibration points are correct. The span and zero controls are almost independent so it should only be necessary to repeat each adjustment twice.

### 5.6 Over and under-range

If the indicator display range is exceeded, the three least significant digits will be blanked. Under-range is indicated by -1 and over-range by 1. If the display range is not exceeded, both indicators will produce accurate readings outside the 4/20mA current range. Although not guaranteed, most BA507C and BA508C indicators will operate between 3 and 25mA.

## 6. MAINTENANCE

### 6.1 Fault finding during commissioning

If the BA507C or BA508C fails to function during commissioning the following procedure should be followed:

Symptom	Cause	Solution
No display	Incorrect wiring	There should be 1V between terminals 1 & 3 with terminal 1 positive
No display and 0V between terminals 1 and 3	Incorrect wiring or no power supply  Insufficient loop voltage to operate indicator	Check that a current is flowing in the loop  Check supply voltage and voltage drops caused by all components in the loop
Indicator display 1	Positive over-range	The indicator has been incorrectly calibrated and is trying to display a number greater than 1999
Indicator displays -1	Negative over-range	The indicator has been incorrectly calibrated and is trying to display a number less than 1999
Unstable display	4/20mA current has a large ripple	Check loop supply voltage



## 6.2 Fault finding after commissioning

### ENSURE PLANT SAFETY BEFORE STARTING MAINTENANCE

If a BA507C or BA508C fails after it has been functioning correctly, the following procedure should be followed:

Symptom	Cause	Solution
No display and 0V between terminals 1 and 3	No power supply	Check that a current is flowing in the loop
Unstable display	4/20mA input has a large ripple current	Check loop supply voltage

If this procedure does not reveal the cause of the fault, it is recommended that the indicator is replaced.

### 6.3 Servicing

The BA507C and BA508C are difficult to service to component level on-site. All standard BA507C and BA508C indicators are interchangeable, and a single spare assembly can be used to replace any instrument which fails.

We recommend that, except under exceptional circumstances, suspect instruments are returned to BEKA associates or our local agent for repair.

### 6.4 Guarantee

Indicators which fail within the guarantee period should be returned to BEKA associates or our local agent. It is helpful if a brief description of the fault symptoms is provided.

### 6.5. Customer comments

BEKA associates is always pleased to receive comments from customers about our products and services. All communications are acknowledged and whenever possible, suggestions are implemented.

## 7. ACCESSORIES

### 7.1 Scale card

The BA507C and the BA508C have a window on the right hand side of the display to hold a card showing the units of measurement e.g. °C, mBar, RPM. Indicators can be supplied with a printed scale card showing any units specified at the time of ordering. If a printed scale card is not requested, a blank card will be supplied.

Scale cards can easily be marked on site as follows:

- Remove the rear terminal block and the rear panel as shown in Fig 7.
- Carefully pull the indicator assembly from the enclosure.
- Gently pull and then slide the blank scale card towards the display window until it is free. Mark the card with the required legend and replace in the slot.

### 7.2 Tag strip

The BA507C and the BA508C can be supplied with a thermally printed tag strip secured to the rear panel. This tag strip is not visible from the front of the instrument after installation.

### 7.3 Internal Calibrator

Both indicators can be supplied with an optional internal calibrator which simulates 4 and 20mA input currents. This allows rapid calibration without the need for external instruments or disconnection from the 4/20mA input current, but it is not a substitute for calibration with a traceable external current source. Fig 8 shows the position of the calibration links.

An internal calibrator can not be fitted to an instrument with a root extractor.

When using an internal calibrator, the following procedure should be followed. Any input current between 4 and 20mA may be used.

- Step 1 Put the suppression / elevation, zero, span and decimal point links in the required position.
- Step 2 Put the calibrator link in the 4mA position and adjust the zero potentiometer to give the required display at 4mA.
- Step 3 Put the calibrator link in the 20mA position and adjust the span potentiometer to give the required display at 20mA.
- Step 4 Repeat steps 2 and 3 until both calibration points are correct. The span and zero controls are almost independent so it should only be necessary to repeat each adjustment twice.
- Step 5 Return the calibrator link to 'indicate' position. The indicator will now respond to the 4/20mA input current with the revised calibration.

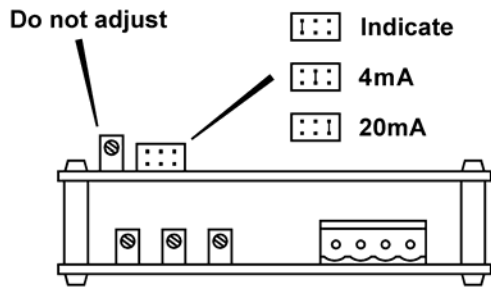


Fig 8 position of internal calibrator links

When calibrating a BA507C or BA508C fitted with a root extractor the zero potentiometer should be adjusted to give the required display at 10% of flow (4.16mA). The zero potentiometer should not be used to set the display to zero with a 4mA input. Zero suppression or elevation may not be used, i.e. 4mA must correspond to zero flow.

For reference, the following table shows the output current from a non-linearised differential flowmeter.

% of full flow	Current output mA
2.5	4.01
10.0	4.16
25.0	5.00
50.0	8.00
75.0	13.00
100.0	20.00

A root extractor can not be fitted to an instrument with an internal calibrator.

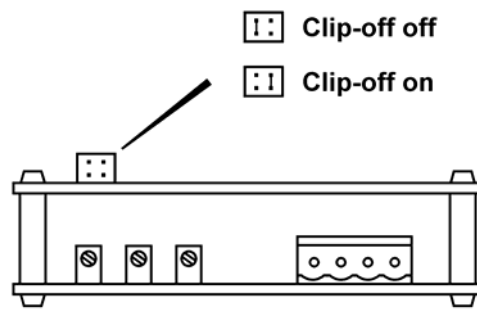


Fig 9 Location of clip-off link

**7.4 Root extractor**

A square root extractor can be fitted to both the BA507C and BA508C enabling them to accurately display the output from a differential flow meter in linear engineering units between 10 and 100% of full flow (4.16 to 20mA). The lineariser continues to operate with reduced accuracy down to 2.5% of maximum flow, or clip-off can be selected which will force the display to zero at flows below 5% (4.04mA). The location of the clip-off plug-in link is shown in Fig 9.

**7.4.1 Calibration example with root extractor**

The BA507C is required to display the output from a differential flowmeter with a maximum flow of 140.0 gallons per minute corresponding to 20mA.

- i.e. A span of 1400 ignoring the decimal point
- A decimal point in position 00.0

The following adjustments are required:

- Step 1 Put the suppression / elevation links in the elevation position.
- Step 2 Put the zero link in the 0 to 500 position.
- Step 3 The required span is 1400, therefore the span links should be placed in the 1000 to 1500 position.
- Step 4 The decimal point is required between the least two significant digits, therefore the decimal point link should be placed in the 00.0 position.
- Step 5 With 4.160mA input current adjust the zero potentiometer until the indicator displays 14.0 (10% of flow). If there is insufficient adjustment to achieve this, put the elevation/suppression links in the suppression position and continue with the calibration procedure.
- Step 6 With 20.000mA input current adjust the span potentiometer until the indicator displays 140.0
- Step 7 Repeat steps 5 and 6 until both calibration points are correct.

### 7.5 Backlight

Both the BA507C and the BA508C can be supplied with LED backlighting to improve display contrast in poorly illuminated areas. The backlight is electrically isolated from the measuring circuit and may be powered from any dc supply having the following output:

BA507C	14 to 30V
BA508C	18 to 30V

The brilliance of the backlight may be reduced by using a supply voltage below the recommended minimum, or by fitting a current limiting resistor in series with the supply.