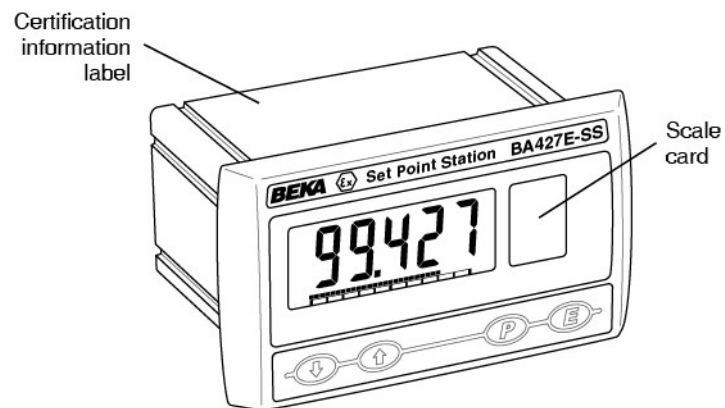


BA427E-SS
intrinsically safe
2-wire 4/20mA
rugged manual set point
station
Issue: 5



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Appendix 1 Dust certification

Appendix 2 IECEx certification

The BA427E-SS is CE marked to show compliance with the European Explosive Atmospheres Directive 2014/34/EU and the European EMC Directive 2014/30/EU.

They are also UKCA marked to show compliance with UK statutory requirements Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations UKSI 2016:1107 (as amended) and with the Electromagnetic Compatibility Regulations UKSI 2016:1091 (as amended).

1. DESCRIPTION

The BA427E-SS is a rugged, intrinsically safe, loop powered panel mounting Set Point Station which enables the current flowing in a 4/20mA loop to be manually adjusted via the front panel push buttons, or an optional external rotary control. The main application is the adjustment of a plant parameter, such as a controller set point or an actuator position, from within a hazardous process area.

Housed in a rugged stainless steel case, the intrinsically safe BA427E-SS may be safely installed in an Ex e, Ex p, Ex n or Ex t panel enclosure without invalidating the panel enclosure's certification.

To simplify adjustment the Set Point Station incorporates a 5 digit display and a 31 segment bargraph which may be calibrated to show the 4/20mA loop current in any linear engineering units. An optional factory fitted backlight, which may be loop or separately powered, enables this display to be read in all lighting conditions.



The BA427E-SS loop current is adjustable between 3 and 22mA but the range may be restricted if only limited adjustment is required. In addition to the output being continuously variable, five pre-set output currents may be configured and subsequently selected from the front panel push buttons. To minimise plant disturbance the maximum output rate of change may be defined.

The BA427E-SS has ATEX and UKEX intrinsic safety certification for use in gas and dust hazardous areas. Both certificates confirm that the front of the instrument complies with Ex e, Ex p and Ex t ingress and impact requirements, which in addition to normal intrinsically safe applications, allows the BA427E-SS to be installed in an Ex e, Ex p or Ex t panel enclosure without invalidating the enclosure's certification.

For international applications the BA427E-SS has IECEx gas and dust certification which is described in Appendix 2.

2. OPERATION

This instruction manual describes ATEX & UKEX system design and installation for use of the BA427E-SS in a gas hazardous area. Please refer to Appendix 1 for details of ATEX & UKEX dust certification and to Appendix 2 for IECEx certification.

Fig 1 shows a simplified block diagram of the BA427E-SS manual Set Point Station. The 4/20mA current flowing in the loop may be manually set at any value between approximately 3 and 22mA using the front panel  and  push buttons. Initially the output current changes slowly, but after the button has been pressed for five seconds the rate of change accelerates to allow large changes to be made quickly. The five pre-set outputs, which are selectable via the instruments front panel push buttons, allow the operator to quickly select frequently used plant set points.

To prevent plant disturbance the maximum rate of output current change initiated by operating the front panel push buttons, switching between pre-set outputs or using an optional external encoder may be defined.

The output resistance of the BA427E-SS is very high, within the specified operating voltage range, the loop current will therefore be unaffected by changes in the supply voltage.

CAUTION

The BA427E-SS output should not be used for critical safety applications.

Versatile calibration facilities allow the 5 digit internal display to show the 4/20mA loop current in linear engineering units. For example, in an application where the BA427E-SS is being used to adjust the set point of a speed controller, the internal indicator may be calibrated to display the required speed in RPM.

For applications in poorly illuminated areas a factory fitted green backlight is available which may be loop or separately powered. When loop powered the backlight produces background illumination enabling the display to be read at night or in poor lighting conditions. No additional power supply, intrinsic safety interface or field wiring are required, but the Set Point Station voltage drop is increased. When separately powered, the backlight is brighter but an additional intrinsic safety interface and field wiring are required.

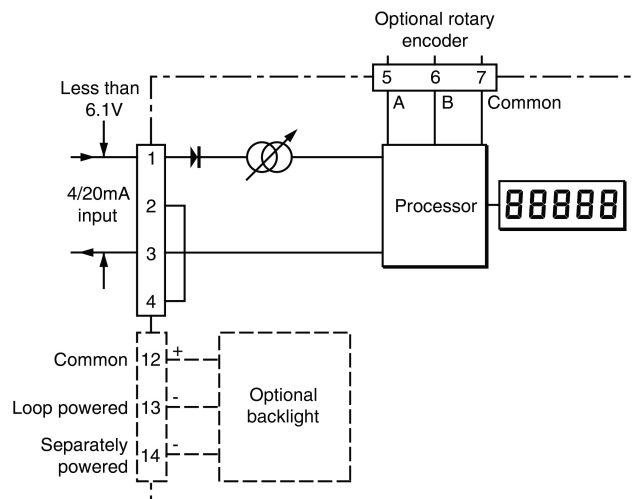


Fig 1 Simplified block diagram of BA427E-SS

2.1 Controls - two handed

The BA427E-SS Set Point Station is controlled and configured via four front panel push buttons located below the display. In the operating mode i.e. when the Set Point Station is controlling the loop current and the display is showing the output in engineering units, these push buttons can have two alternative sets of functions depending upon whether the Set Point Station has been configured for two or single handed operation.

Two handed operation is the default configuration which minimises the possibility of accidental adjustment of the output current by requiring that the **[E]** button be pressed at the same time as the **[▼]** or **[▲]** button to make an adjustment. This configuration also prevents the optional external encoder from adjusting the output current unless the **[E]** button is operated.

[E] + [▼] Output current slowly decreases. After five seconds the rate of change accelerates so that large changes may be made quickly. .

[E] + [▲] Output current slowly increases. After five seconds the rate of change accelerates so that large changes may be made quickly.

[E] Continuously pushing this button for 5 seconds allows the Set Point Station output to be entered in engineering units digit by digit using the **[▼]** or **[▲]** push button to adjust the flashing digit and the **[P]** button to move control to the next digit. When set as required, pressing the **[E]** button will enter the new set point.

[P] While this button is pushed the BA427E-SS Set Point Station will display one of three alternatives depending upon how the instrument has been configured:

Output current mA without bargraph

Output as a % of span

Pre-set outputs in engineering units

The display will flash. While continuing to press the **[P]** button, operating the **[▼]** or **[▲]** button will show the identification of the pre-set closest to the present Set Point Station output, followed by the pre-set value. Operating the **[▼]** or **[▲]** button will scroll through the five pre-sets and an **Abort** position.

Releasing both buttons will leave the selected pre-set value or **Abort** legend flashing for ten seconds, during which time operating the **[E]** button will update the Set Point Station output to the displayed pre-set value. If the **[E]** button is not operated during this period, the Set Point Station output will not be changed and the original engineering display will be shown.

[▼] While this button is pushed the Set Point Station will display the numerical value and analogue bargraph the Set Point Station has been calibrated to display with a 4mA* output. When released the normal display in engineering units will return.

[▼] While this button is pushed the Set Point Station will display the numerical value and analogue bargraph the Set Point Station has been calibrated to display with a 20mA* input. When released the normal display in engineering units will return.

* If the Set Point Station display has been calibrated using the CAL function, calibration points may not be at 4 and 20mA.

[P] + [▼] Firmware number followed by version.

[P] + [E] Access to configuration menu via optional security code.

2.2 Controls - single handed

The BA427E-SS Set Point Station is controlled and configured via four front panel push buttons located below the display. In the operating mode i.e. when the Set Point Station is controlling the loop current and the display is showing the output in engineering units, these push buttons can have two alternative sets of functions depending upon how the Set Point Station has been configured.

For single handed operation only the ▼ or ▲ push button has to be pressed to adjust the output current as shown below. This configuration also allows the optional external encoder to adjust the output current without the E button being operated:

- ▼ Output current slowly decreases. After five seconds the rate of change accelerates so that large changes may be made quickly.
- ▲ Output current slowly increases. After five seconds the rate of change accelerates so that large changes may be made quickly.
- E Continuously pushing this button for 5 seconds allows the Set Point Station output to be entered in engineering units digit by digit using the ▼ or ▲ push button to adjust the flashing digit and the P button to move control to the next digit. When set as required, pressing the E button will enter the new set point.
- P While this button is pushed the BA427E-SS Set Point Station will display one of three alternatives depending upon how the instrument has been configured:

Output current mA without bargraph

Output as a % of span

Pre-set outputs in engineering units

The display will flash. While continuing to press the P button, operating the ▼ or ▲ button will show the identification of the pre-set closest to the present Set Point Station output, followed by the pre-set value. Operating the ▼ or ▲ button will scroll through the five pre-sets and an 'Abort' position.

Releasing both buttons will leave the selected pre-set value or 'Abort' legend flashing for ten seconds, during which time operating the E button will update the Set Point Station output to the displayed pre-set value. If the E button is not operated during this period, the Set Point Station output will not be changed and the original engineering display will be shown.

P + ▼ Firmware number followed by version.

P + E Access to configuration menu via optional security code.

2.3 Displays

The BA427E-SS Set Point Station has a 5 digit display plus a 31 segment bargraph.

The digital display may be calibrated using the RL or SEt functions to display the engineering variable represented by the Set Point Station's 4/20mA output, such as temperature, pressure or speed.

The digital display shows the requested Set Point Station output in engineering units, the digital display will flash until the Set Point Station output is the same as the requested output.

The bargraph, which is not adjustable, always shows the actual Set Point Station output. The bargraph starts and finishes at the two currents at which the digital display was calibrated, usually 4 and 20mA. See sections 6.4 and 6.5.

3. INTRINSIC SAFETY CERTIFICATION

All BA427E-SS Set Point Stations have IECEx, ATEX and UKEX gas and dust intrinsic safety certification. This section of the instruction manual describes ATEX & UKEX gas certification. ATEX & UKEX dust and IECEx approvals are described in Appendixes 1 and 2.

3.1 ATEX & UKEX gas certification

The BA427E-SS has been issued with an EU-Type ATEX Examination Certificate and a UK-Type UKEX Examination certificate. The indicator carries both the EU community CE mark and the UKCA mark. Subject to local codes of practice it may be installed in any of the European Economic Area (EEA) member countries and in the UK.

This section of the instruction manual describes ATEX & UKEX installations in explosive gas atmospheres conforming with EN 60079-14 *Electrical installation design, selection and erection*. When designing systems the local Code of Practice should be consulted.

3.2 Zones, gas groups and T rating

The BA427E-SS Set Point Station has been certified Ex ia IIC T5 Ga. When connected to a suitable system the Set Point Station may be installed in:

Zone 0	explosive gas air mixture continuously present.
Zone 1	explosive gas air mixture likely to occur in normal operation.
Zone 2	explosive gas air mixture not likely to occur, and if it does will only exist for a short time.

Be used with gases in groups:

Group A	propane
Group B	ethylene
Group C	hydrogen

In gases that may be used with equipment having a temperature classification of:

T1	450°C
T2	300°C
T3	200°C
T4	135°C
T5	100°C

At ambient temperatures between:

-40	+60°C	When installed in an Ex e, Ex p or Ex t enclosure.
-40	+70°C	When used as an Ex i instrument not in an Ex e, Ex p or Ex t enclosure.

This allows the BA427E-SS Set Point Station to be installed in all gas Zones and to be used with most common industrial gases except carbon disulphide and ethyl nitrite which have an ignition temperature of 95°C.

3.3 Special conditions for safe use

The ATEX and UKEX intrinsic safety certificates have an 'X' suffix indicating that for some applications special conditions apply for safe use.

When installed in an Ex e, or Ex p panel enclosure all connections to the BA427E-SS must be made by appropriately rated Zener barriers or galvanic isolators.

This means that when installed in an Ex e, or Ex p panel enclosure the BA427E-SS remains an intrinsically safe instrument and must comply with the installation requirements shown in this manual. The certificate also states:

The front of the BA427E-SS stainless steel enclosure complies with the impact and ingress requirements for Ex e, & Ex p type of protection.

Which means that when correctly installed the BA427E-SS Set Point Station does not invalidate the Ex e, or Ex p panel enclosure certification.

3.4 4/20mA output

Input safety parameters for the 4/20mA output, terminals 1 and 3 are:

U _i	=	30V dc
I _i	=	200mA
P _i	=	0.84W

The equivalent maximum capacitance and inductance between the two 4/20mA output terminals 1 and 3 are:

C _i	=	2.2nF
L _i	=	0.01mH (8μH)

Maximum permitted loop cable parameters can be calculated by adding these figures to C_i and L_i of other instruments in the loop and subtracting the totals from the maximum cable capacitance C_o and cable inductance L_o permitted for the Zener barrier, galvanic isolator or associated apparatus powering the loop.

3.5 Certification label information

The certification information label is fitted in a recess on the top outer surface of the instrument enclosure. It shows the IECEx, ATEX and UKCA certification information, instrument serial number, year of manufacture plus BEKA associates name and location.



BA427E-SS certification label

4. SYSTEM DESIGN FOR HAZARDOUS AREAS

4.1 4/20mA loop using Zener barriers

Fig 2 illustrates a typical application in which a BA427E-SS Set Point Station mounted in a hazardous area is being used to adjust the setpoint of a speed controller located in a safe area. To enable the negative side of both the speed controller and the power supply to be connected together and earthed, a Zener barrier is required in series with both the outgoing and return wires connected to the BA427E-SS Set Point Station.

The Zener barrier(s) should be certified with combined output parameters equal to or less than the maximum BA427E-SS input safety parameters. Most Zener barriers are certified Ex ia IIC allowing them to be connected to equipment located in any Zone and to be used with any gas group thus simplifying selection.

For this application a wide range of devices may be used. A 28V; 93mA positive polarity device in the outgoing wire and a diode return barrier in the return wire are industry standard devices which are available from most barrier manufactures often housed in a single package.

The maximum permitted cable parameters are those specified by the Zener barrier certificate, less the sum of equivalent input capacitance and inductance C_i & L_i of all the other instruments in the loop, in this example just the BA427E-SS.

When designing the loop it is necessary to establish that the maximum voltage drop caused by the Set Point Station, both Zener barrier channels, the load (speed controller input) and the cable resistance is always less than the minimum power supply voltage.

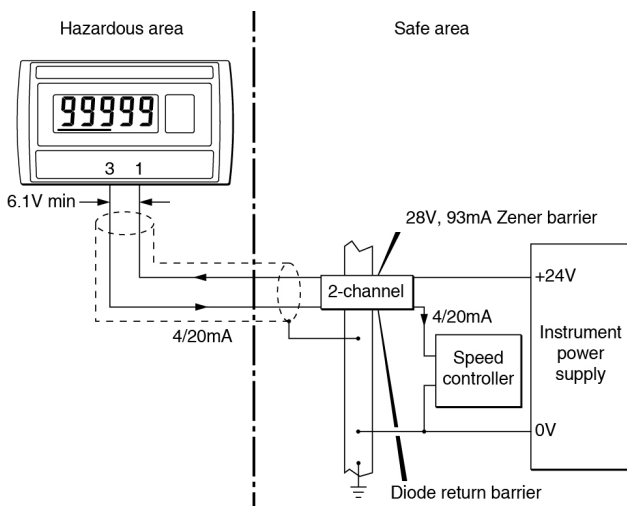


Fig 2 Typical application using barriers

In this example:

Min. operating voltage of BA427E-SS 6.1V

Maximum voltage drop caused by 28V 93mA Zener barrier
(340Ω end-to-end resistance x 20mA)

Maximum voltage drop caused by diode return barrier 1.3V

Maximum voltage drop caused by speed controller input.
(250Ω x 20mA) 5.0V

Maximum voltage drop caused by cable resistance
(10Ω x 20mA) 0.2V

Total maximum voltage drop 19.4V

The minimum power supply voltage must therefore be above 19.4V, but below 25.5V which is the maximum working voltage of a typical 28V Zener barrier.

If the BA427E-SS Set Point Station is fitted with an optional backlight and this is loop powered, the minimum operating voltage of the instrument increases from 6.1 to 10V. See section 8.3.1

4.2 4/20mA loop using Galvanic Isolators

Galvanic isolators, although more expensive than Zener barriers, they do not require a high integrity earth connection. For small systems where a high integrity earth is not already available, the use of galvanic isolators often reduces the overall installation cost.

The example described in section 4.1 can be simplified by the use of a galvanic isolator as shown in Fig 3.

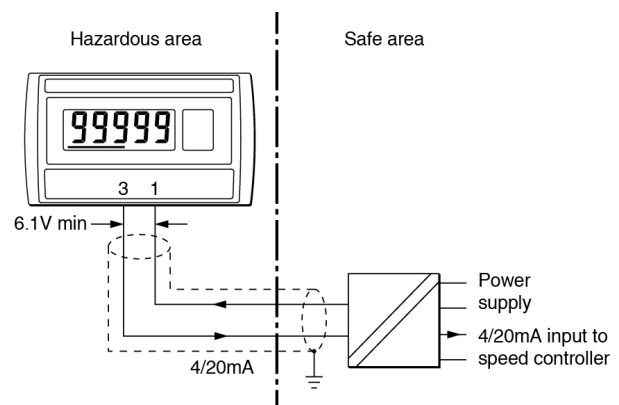


Fig 3 Typical application using a galvanic isolator

Any 4/20mA ATEX certified 4/20mA galvanic isolator with output safety parameters equal to or less than the maximum BA427E-SS certified input parameters may be used.

The maximum permitted cable parameters are those specified on the galvanic isolator certificate, less the sum of equivalent input capacitance and inductance C_i & L_i of all the other instruments in the loop, in this example just the BA427E-SS.

When designing the loop it is necessary to ensure that the supply voltage between terminals 1 & 3 of the BA427E-SS Set Point Station always exceeds 6.1V which is the minimum operating voltage.

If the BA427E-SS Set Point Station includes an optional backlight which is loop powered, the minimum operating voltage of the instrument increases from 6.1 to 10V. See section 8.3.1

4.3 Use in an Ex e or Ex p panel enclosure located in Zone 1 or Zone 2.

The BA427E-SS Set Point Station's ATEX and UKEX certification permits the Set Point Station to be installed in an Ex e IIC Gb increased safety panel enclosure located in Zone 1 or 2, or in an Ex p IIC Gb pressurised panel enclosure located in a Zone 1 or 2 hazardous area. The Set Point Station remains intrinsically safe and must be protected by a Zener barrier or galvanic isolator as described in sections 4.1 and 4.2. When correctly installed the Set Point Station installation does not invalidate the certification of the Ex p or Ex e panel enclosure.

4.3.1 Use in an Ex e panel enclosure located in Zone 1 or Zone 2.

Installation of a BA427E-SS Set Point Station in an Ex e IIC Gb increased safety panel enclosure does not invalidate the Ex e panel's ingress and impact protection as the front of the Set Point Station complies with Ex e impact and ingress requirements. Although mounted in an Ex e panel enclosure, the BA427E-SS Set Point Station remains Group II Category 1G Ex ia IIC T5 Ga intrinsically safe apparatus so must be powered via a Zener barrier or galvanic isolator as described in section 4.1 and 4.2 of this manual.

Some Zener barriers and galvanic isolators are certified for mounting within a protective enclosure located in Zone 2 which may permit them to be mounted in the same Ex e enclosure as the BA427E-SS Set Point Station. Zener barriers and galvanic isolators are not permitted in Ex e enclosures located in Zone 1.

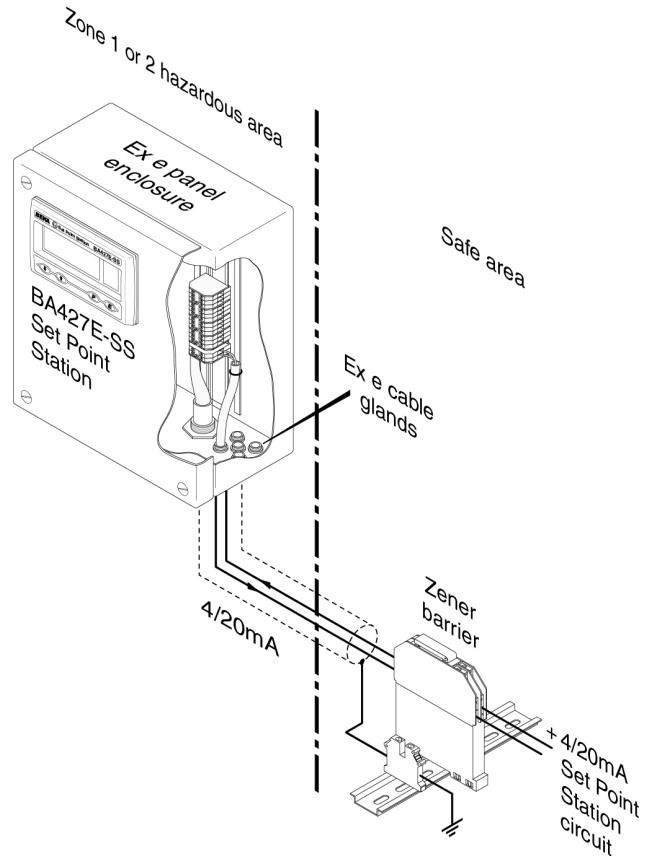


Fig 4 Typical installation in Ex e panel enclosure

The BA427E-SS Set Point Station terminals, the wiring to the Set Point Station and the intrinsically safe interface, if mounted within the enclosure, should be segregated from all other non-intrinsically safe wiring and equipment within the panel enclosure as required by EN 60079-11 *Equipment protected by intrinsic safety* and EN 60079-14 *Electrical installations design, selection and erection*. The Ex e panel enclosure should be fitted with a warning label saying 'Do not open when non-intrinsically safe circuits are energised', alternatively all bare live non-intrinsically safe parts within the panel enclosure should have an IP30 cover carrying a warning label 'Do not open when energised'.

The power dissipation within a BA427E-SS Set Point Station when fitted with an optional backlight which is separately powered is normally about 320mW. In the very unlikely event that both circuits fail to the worst case condition at the same time, the total maximum power dissipation rises to 1.7W which could raise the internal temperature of a small thermally well insulated panel enclosure.

4.3.2 Use in an Ex p panel enclosure located in Zone 1 or Zone 2.

Installation of a BA427E-SS Set Point Station in an Ex p IIC Gb or Ex p IIC Gc pressurised panel enclosure does not invalidate the Ex p panel's impact and ingress protection as the front of the BA427E-SS complies with Ex p impact and ingress requirements. Although mounted in an Ex p panel enclosure, the Set Point Station remains Group II Category 1G Ex ia IIC T5 Ga intrinsically safe apparatus and must therefore be powered via a Zener barrier or galvanic isolator as described in section 4.1 and 4.2 of this manual to ensure that the instrument's front panel push button switches are nonincendive.

When installed in an Ex p panel enclosure the four vents at the rear of BA427E-SS set point station which are shown in Fig 8 should not be obstructed.

Zener barriers and galvanic isolators may be installed in the same Ex p enclosure as the Set Point Station. All may be mounted in an Ex px enclosure installed in Zones 1 or 2, or in an Ex pz enclosure installed in Zone 2, both of which have a non-hazardous interior. Some Zener barriers and galvanic isolators may have certification permitting installation within an Ex py enclosure which has a Zone 2 interior.

The Set Point Station terminals, the wiring to the Set Point Station and the intrinsically safe interface, if mounted within the enclosure, should be segregated from all other non-intrinsically safe wiring and equipment within the panel enclosure as required by EN 60079-11 *Equipment protected by intrinsic safety* and EN 60079-14 *Electrical installations design, selection and erection*.

If live maintenance is anticipated, it is recommended that the Ex p panel enclosure should be fitted with a warning label saying 'Do not open when non-intrinsically safe circuits are energised', alternatively all bare live non-intrinsically safe parts within the panel enclosure should have an IP30 cover carrying a warning label 'Do not open when energised'.

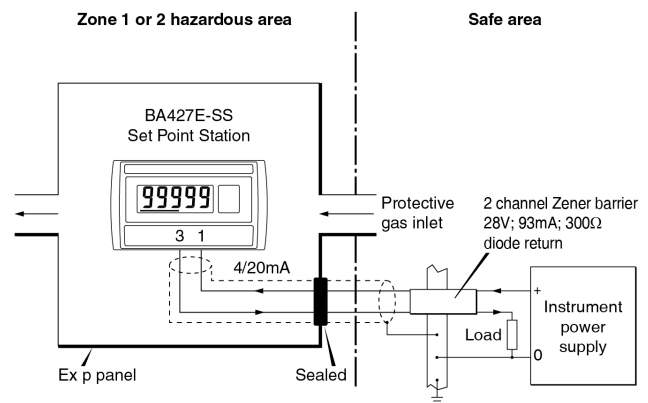


Fig 5 Typical installation in Ex p panel enclosure

5. INSTALLATION

5.1 Location

The BA427E-SS Set Point Station has a stainless steel case with a 10mm thick toughened glass window. The case provides 7J and the window 4J front of panel impact protection. The captive silicone gasket, which seals the joint between the instrument and the panel enclosure, ensures IP66 front of panel ingress protection. The rear of the instrument has IP20 protection.

Although the front of the instrument has IP66 protection, it should be shielded from continuous direct sunlight and severe weather conditions.

The BA427E-SS Set Point Station may be installed in any panel enclosure located in Zone 0, 1 or 2, providing that the operating temperature is between -40°C and +60°C and the installation complies with the instrument's certification requirements.

Installation in Ex e and Ex p panel enclosures is described in sections 4.3.1 and 4.3.2.

Fig 6 shows the overall dimensions of the BA427E-SS together with the recommended panel enclosure cut-out dimensions.

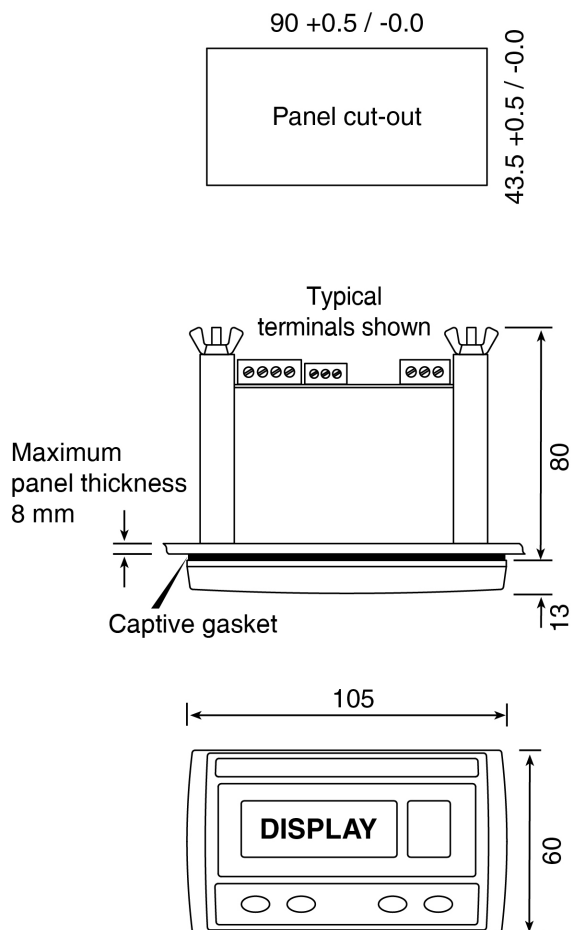


Fig 6 Dimensions

5.2 Installation Procedure

- Cut the aperture specified in Fig 6 in the panel enclosure. Ensure that the edges of the aperture are de-burred.
- Inspect the instrument's captive gasket and ensure that it is not damaged before inserting the Set Point Station into the panel enclosure aperture.
- If the enclosure panel is less than 1.0mm thick, or is non-metallic, an optional BEKA stainless steel support plate should be slid over the rear of the indicator before the panel clamps are fitted to evenly distribute the clamping force and prevent the enclosure panel being distorted or creeping.
- Slide a panel clamp into the two grooves at each corner of the indicator housing with the M3 stud protruding through the hole at the rear of the clamp. Fit the stainless steel spring washer over the stud and secure with the stainless steel wing nut.
- Evenly tighten the four clamps to secure the instrument. The recommended minimum tightening torque for each wing nut is 22cNm (1.95 lbf in).
- Connect the panel enclosure wiring to the rear terminal blocks. To simplify installation, the terminals are removable so that wiring can be completed before the instrument is installed. Cables should be mechanically secured to ensure terminals are not damaged by vibration.
- Finally, fit a silicone rubber push-on cap to the end of each M3 threaded rod.

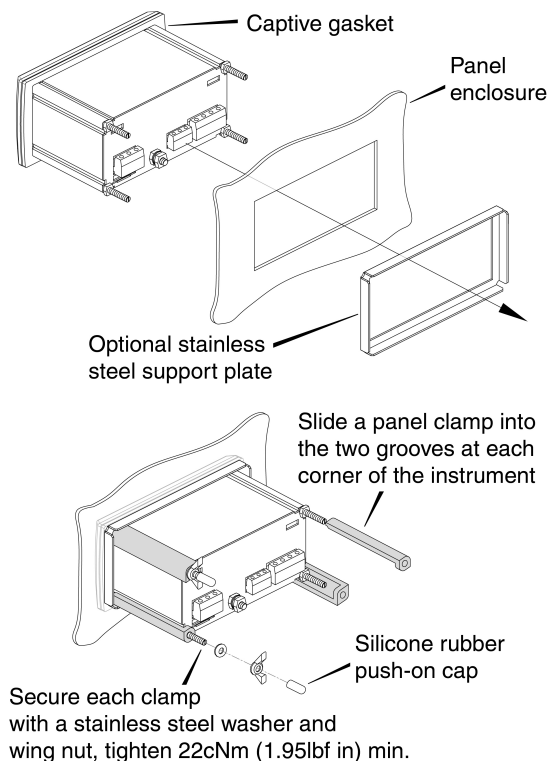


Fig 7 Installation procedure

5.3 Instrument earthing

The BA427E-SS Set Point Station has an M4 earth stud on the rear panel which should be electrically connected to the panel enclosure in which the instrument is mounted, or to the plant equipotential conductor.

5.4 EMC

The BA427E-SS Set Point Station complies with the European EMC Directive and with UK statutory requirements. For specified immunity all wiring should be in screened twisted pairs, with the screens earthed in the safe area.

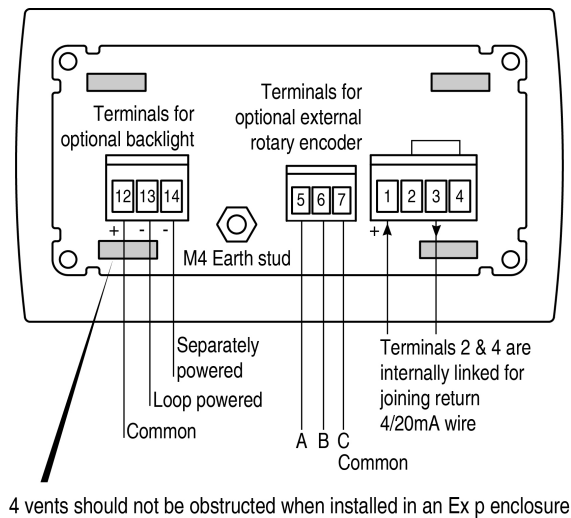


Fig 8 Rear terminals

5.5 Scale card

The Set Point Station's units of measurement are shown on a printed scale card in a window at the right hand side of the display. The scale card is mounted on a flexible strip that is inserted into a slot at the rear of the instrument as shown in Fig 9. Thus the scale card can easily be changed without dismantling the indicator or removing it from the enclosure in which it is mounted.

New instruments are supplied with a printed scale card showing the requested units of measurement, if this information is not supplied when the Set Point Station is ordered a blank card will be fitted.

A pack of self-adhesive scale cards printed with common units of measurement is available as an accessory from BEKA associates. Custom printed scale cards can also be supplied.

To change a scale card, unclip the protruding end of the flexible strip by gently pushing it upwards and pulling it out of the enclosure. Peel the existing scale card from the flexible strip and replace it with a new printed card, which should be aligned as shown below. Do not fit a new scale card on top of an existing card.

Install the new scale card by gently pushing the flexible strip into the slot at the rear of the indicator, when it reaches the internal end-stop secure it by pushing the end of the flexible strip downwards so that the tapered section is held by the rear panel of the indicator.

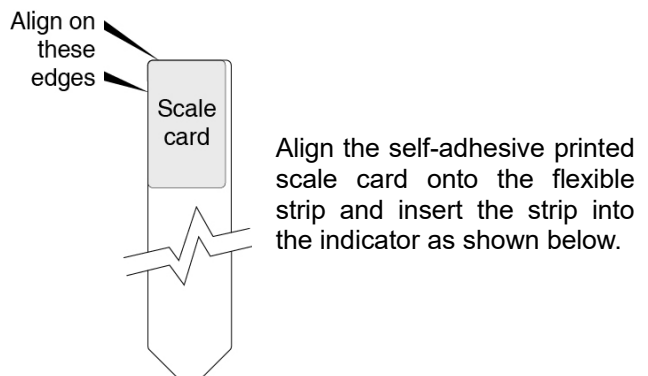


Fig 9 Inserting flexible strip carrying scale card into slot at the rear of Set Point Station.

6. CONFIGURATION AND CALIBRATION

Set Point Stations are configured and calibrated via the four front panel push buttons. All the configuration functions are contained in an easy to use intuitive menu that is shown diagrammatically in Fig 10.

Each menu function is summarised in section 6.1 and includes a reference to more detailed information.

Throughout this manual push buttons are shown as **P**, **E**, **▼** or **▲** and the Set Point Station display legends are shown in a seven segment font as they appear e.g. **RL** and **odE**.

Access to the configuration menu is obtained by operating the **P** and **E** push buttons simultaneously. If the Set Point Station security code is set to the default **0000** the first parameter **rE5n** will be displayed. If a security code other than the default code **0000** has already been entered, the Set Point Station will display **odE**. Pressing the **P** button will result in **0000** being displayed with one digit flashing. To gain access the four digit security code should be entered using the **▼** and **▲** push buttons to set the flashing digit and the **P** button to move control to the next digit. When the correct four digit code has been entered, pressing **E** will cause the first parameter **rE5n** to be displayed. If the code is incorrect, or a button is not pressed within twenty seconds, the Set Point Station will automatically return to the operating mode.

Once within the configuration menu the required parameter can be reached by scrolling through the menu using the **▼** or **▲** push buttons as shown in Fig 10. When returning to the operating mode following recalibration or a change to any function, the Set Point Station will display **dRtR** followed by **SRUE** while the new information is stored in permanent memory.

All new Set Point Stations are supplied calibrated as requested at the time of ordering. If calibration is not requested, instruments will be supplied with the following default configuration:

Default Configuration

Resolution rE5n	10
Display at 4mA output 2ERo	000
Display at 20mA output 5PRn	100.00
Output current limits H-L	03.000 & 22.000
Maximum output rate of change	000
P button in operating mode P.Fn	PC
Pulses per rev of external encoder EnC	12
One or two handed operation Hnd	2 H
Security access code odE	0000

Default configuration can easily be changed on-site.

6.1 Summary of configuration functions



This section summarises each of the configuration functions and includes a cross reference to a more detailed description. Fig 10 illustrates the location of each function within the configuration menu.




Display	Summary of function
rE5n	Adjustment resolution Defines the adjustment resolution of the front panel ▼ and ▲ buttons and the optional external rotary control when adjusting the output current with the Set Point Station in the operating mode. May be set to 1 , 10 or 100 least significant digits of the display. See section 6.2
dP	Decimal point Positions a dummy decimal point between any of the displayed digits or turns it off. See section 6.3

RL and 5Et are alternative ways of calibrating the Set Point Station digital display.

RL	Calibration of the digital display using an external current meter. Preferred method of calibrating the digital display which enables the zero and span of the Set Point Station display to be calibrated to show the engineering units represented by the 4/20mA output. Calibration may be performed at any output current providing the points are at least 4mA apart. Requires an accurate external current meter. See section 6.4
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5Et	Calibration of digital display using internal references. Using the Set Point Station's internal reference, this function enables the digital display to be calibrated to show the engineering units represented by the output current at 4mA and 20mA. Unlike the RL function, an accurate external current measuring instrument is not required and the Set Point Station does not have to be disconnected from the loop, but calibration can only be performed at 4 and 20mA. See section 6.5
------------	--

Display	Summary of function
H--L	High & low current output limits Defines the lower L and upper H , 4/20mA Set Point Station output current limits. See section 6.6
P5E1	Pre-set outputs The values of the five pre-set current outputs are defined by this function. The pre-set output currents are identified 5E1 to 5E5 and are displayed in engineering units. This function only appears in the configuration menu when P5E1 , which allows pre-set values to be viewed and selected in the operating mode, is selected in the P.Fn function. See section 6.7
rRtE	Maximum output rate of change Enables the maximum rate of change of the 4/20mA output current to be defined. Adjustable between approximately 1 and 100 seconds for full scale output travel. 0 disables this rate of change limit. See section 6.8
P.Fn	Function of  push button in operating mode. The Set Point Station may be configured to display the output current in milliamps, the output current as a percentage or to provide access to the five pre-set outputs when the  push button is pressed in the operating mode. See section 6.9

Display	Summary of function
EnE	Encoder In addition to the Set Point Station's 4/20mA output being adjusted by the front panel push buttons, an external quadrature encoder may be connected to provide analogue control. This function allows the number of pulses per revolution of the knob to be entered. See section 6.10
Hnd	One or two handed operation Allows the Set Point Station output current to be adjusted by the front panel  or  push button and by the optional external encoder with or without the  button be pressed at the same time. See section 6.11
Code	Security code Defines a four digit numeric code that must be entered to gain access to the configuration menu. Default code 0000 disables this security function and allows unrestricted access to all conditioning functions. See section 6.12
r5E1	Reset Returns the Set Point Station configuration to the default condition. To prevent accidental use, reset must be confirmed by entering 5urE before it will be executed. See section 6.13

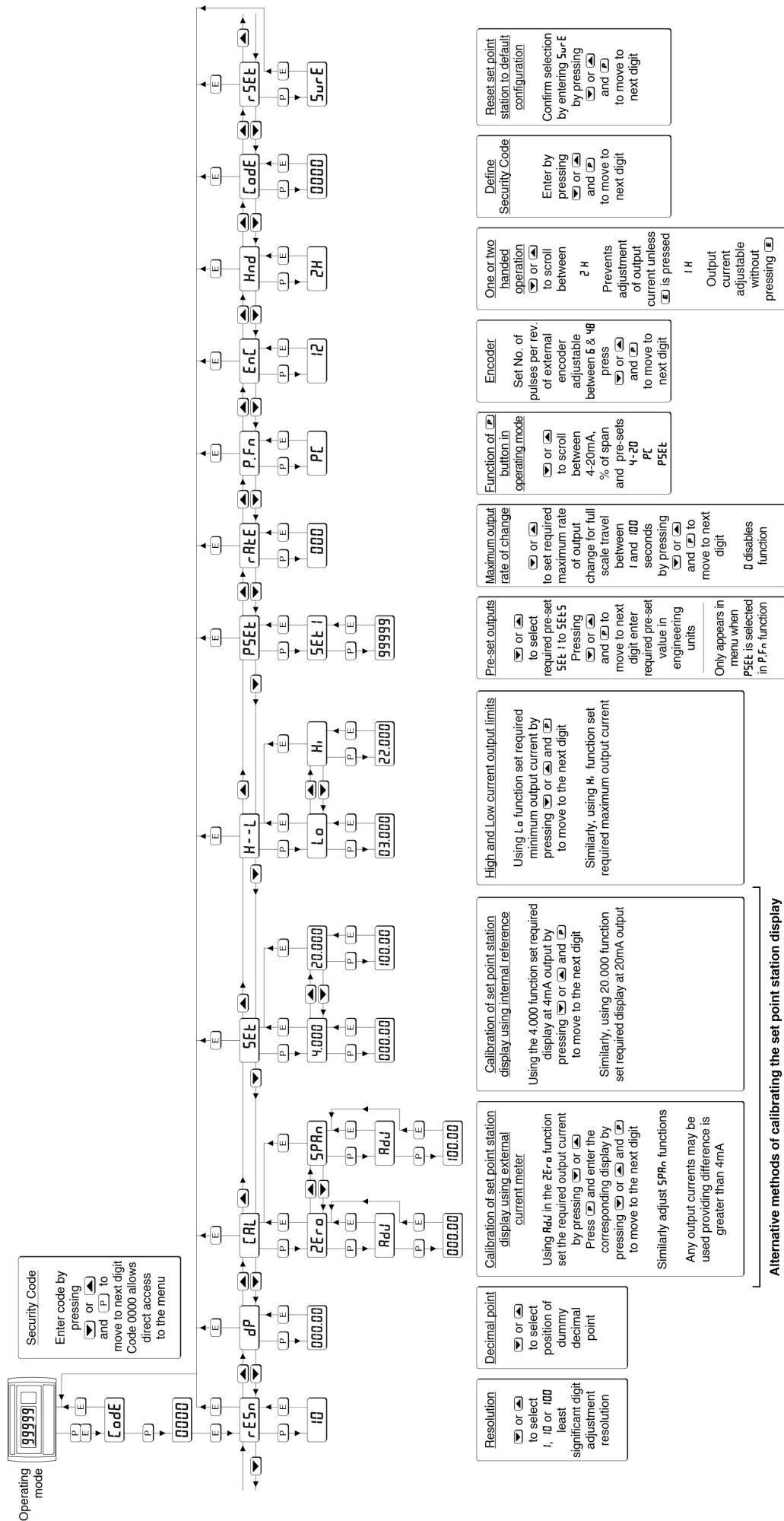


Fig 10 Configuration menu

6.2 Adjustment resolution: $rE5n$

This function enables the adjustment resolution of the front panel \blacktriangledown and \blacktriangle buttons and the optional alternative external rotary control to be defined. One of three different resolutions may be selected 1, 10 or 100 least significant digits of the Set Point Station display. If 10 is selected the least significant displayed digit will always be zero and the second least significant digit will change when the front panel E button plus the \blacktriangledown or \blacktriangle button are pressed in the operating mode, or the optional external rotary control is turned. Similarly, if 100 is selected the least two significant displayed digits will always be zero and the third least significant digit will change when the front panel buttons are operated, or the optional external rotary control is turned.

To define the adjustment resolution select $rE5n$ from the configuration menu and press P which will reveal the current adjustment resolution. To change the resolution press the \blacktriangledown or \blacktriangle button to select 1, 10 or 100, followed by the E button to enter the selection and return to the configuration menu.

Notes:

- This function does not affect the resolution of adjustments made within the configuration menu.
- If a pre-set output has a finer resolution than the selected adjustment resolution, the finer resolution will be used to determine the pre-set output, but the selected resolution will be restored when the output is adjusted using the E button plus the \blacktriangledown or \blacktriangle button in the operating mode.

6.3 Position of the decimal point: dP

A dummy decimal point can be positioned between any of the displayed digits or it may be absent. To position the decimal point, select dP from the configuration menu and press P . The decimal point can be moved by pressing the \blacktriangledown or \blacktriangle push button. If a decimal point is not required it should be positioned beyond the most or least significant digit. When positioned as required press the E button to enter the selection and return to the dP prompt in the configuration menu.

6.4 Calibration of the digital display using an external current meter: RL

This function is the preferred method of calibrating the Set Point Station digital display to show the engineering units represented by the 4/20mA output. The function enables the Set Point Station output current to be set at two different values, Zero and Span, measured by a calibrated external current meter and the corresponding Set Point Station display to be entered.

The bargraph is not displayed while using the RL function.

Although calibration is normally performed at 4.000mA and 20.000mA, other currents may be used providing they differ by more than 4mA.

To calibrate the Set Point Station display, select RL from the configuration menu and press P to enter the $ZEra$ sub-menu used for calibrating the display at the lower of the two output currents, usually 4.000mA. Pressing P again will result in RdJ being displayed which is an invitation to adjust the Set Point Station output current using the \blacktriangledown or \blacktriangle push button. Pressing either of these buttons will cause the output current to change, gradually accelerating as the button is held. Alternatively the external rotary encoder may be used. When the external current meter shows the required lower output current e.g. 4.000mA, press P to reveal the existing Set Point Station digital display with one digit flashing. The flashing digit may be adjusted by pressing the \blacktriangledown or \blacktriangle button, when this digit is set as required pressing P will transfer control to the next digit. When all the digits have been adjusted, press E to enter the setting and return to the $ZEra$ prompt.

Calibration of the Set Point Station display at the upper output current is performed in exactly the same way using the $SPRn$ sub-menu which may be selected from the $ZEra$ prompt using the \blacktriangledown or \blacktriangle button.

To obtain a reverse acting display i.e. the Set Point Station display decreases as the output current increases, the required display value entered into $ZEra$ should be greater than that entered into $SPRn$. The \blacktriangledown and \blacktriangle buttons on the front of the instrument always indicate which way the display will change when the button is pushed.

The bargraph will start at the numerical display entered for $ZEra$ calibration and finish at the numerical display entered for $SPRn$ calibration, except for reverse acting calibration when the bargraph will also be reversed.

Note:

- If the specified $ZEra$ and $SPRn$ output currents do not differ by 4 or more milliamps, they will not be stored when the E button is pressed to return the Set Point Station to the operating mode.

6.5 Calibration of digital display using internal reference: SEt

Using the Set Point Station's internal reference, this function enables the digital display to be calibrated to show the engineering units represented by the output current at 4mA and 20mA.

Unlike the ϵRL function, an accurate external current measuring instrument is not required and the Set Point Station does not have to be disconnected from the loop, however calibration can only be performed at 4mA and 20mA. Although not traceable to a calibrated standard, accuracy is adequate for many industrial applications.

To calibrate the Set Point Station's digital display select $5E\epsilon$ from the configuration menu and press \boxed{P} . The Set Point Station will display 4.000 , pressing \boxed{P} again will reveal the calibrated display at 4mA output with one digit flashing. The flashing digit may be adjusted by pressing the \blacktriangleleft or \blacktriangleright buttons, when the flashing digit is correct pressing \boxed{P} will transfer control to the next digit. When all the digits have been adjusted, press \boxed{E} to return to the 4.000 prompt.

Calibration of the Set Point Station display at 20mA output is performed in exactly the same way using the 20.000 sub-menu which may be selected from the 4.000 prompt using the \blacktriangleleft or \blacktriangleright button. When the display corresponding to a 20mA output has been entered pressing \boxed{E} twice will enter the setting and return to the $5E\epsilon$ prompt in the configuration menu.

The bargraph is not displayed while using the $5E\epsilon$ function

To obtain a reverse acting display i.e. the Set Point Station display decreases as the output current increases, the required display value entered into 4.000 should be greater than that entered into 20.000 . The \blacktriangleleft and \blacktriangleright buttons on the front of the instrument always indicate which way the display will change when the button is pushed.

The bargraph will start at the numerical display entered for 4mA output and finish at the numerical display entered for 20mA output, except for reverse acting calibration when it will also be reversed.

6.6 High & low current output limits: $H-L$

The BA427E-SS output is normally adjustable between 3 and 22mA, but may be restricted by this function if a limited adjustment range is required. e.g. to prevent a dangerously high and/or low temperature being selected when used as the set point input for a temperature controller. When the Set Point Station's output current equals the high limit, $o\overline{u}E\epsilon$ is displayed, similarly $u\overline{n}dE\epsilon$ is displayed when the output current equals the low limit.

To restrict the Set Point Station's output current range select $H-L$ from the configuration menu and press \boxed{P} . Using the \blacktriangleleft or \blacktriangleright button select $L\alpha$ to adjust the lower current output limit, or $H\epsilon$ to adjust upper output current limit. Pressing \boxed{E} will display the selected output current limit in milliamps with one digit flashing.

The flashing digit may be adjusted by pressing the \blacktriangleleft or \blacktriangleright button, when the flashing digit is correct pressing \boxed{P} will transfer control to the next digit. When all the digits have been adjusted press \boxed{E} to return to the $L\alpha$ or $H\epsilon$ prompt followed by \boxed{E} to enter the adjustments and return to the $H-L$ prompt in the configuration menu.

Notes:

- The $L\alpha$ limit can not be adjusted to a value above the present Set Point Station output current, and the $H\epsilon$ limit can not be adjusted to a value below the present Set Point Station output current. The actual Set Point Station output current should therefore be adjusted to within the acceptable output range before the $L\alpha$ and $H\epsilon$ limits are adjusted.
- If any of the five pre-set output currents are set below the $L\alpha$ limit or above the $H\epsilon$ limit, they will not be selectable and $o\overline{u}E\epsilon$ or $u\overline{n}dE\epsilon$ will be displayed.

6.7 Pre-set outputs: $P5E\epsilon$

Up to five pre-set current outputs may be stored and recalled from the front panel push buttons which enables common output currents to be quickly selected. e.g. frequently used operating temperatures when a BA427E-SS is used as the set point input for a temperature controller.

To enter pre-set values select $P5E\epsilon$ from the configuration menu and press \boxed{P} which will result in $5E\epsilon$ ϵ , the first pre-set sub-menu being displayed, pressing \boxed{P} will then reveal the present value in engineering units with one digit flashing. The flashing digit may be adjusted by pressing the \blacktriangleleft or \blacktriangleright button, when the flashing digit is correct pressing \boxed{P} will transfer control to the next digit. When all the digits have been adjusted, press \boxed{E} to return to the $5E\epsilon$ ϵ prompt from which any of the other four pre-sets may be selected via the \blacktriangleleft or \blacktriangleright button and adjusted in the same way as $5E\epsilon$ ϵ .

Notes:

- $P5E\epsilon$ only appears in the configuration menu when $P5E\epsilon$ is selected in the $P.Fn$ menu which defines the function of the \boxed{P} push button in the operating mode. see section 6.9.
- Maximum adjustment resolution is always available for inputting pre-set values and is used to determine the current output when the pre-set is selected, irrespective of the adjustment resolution selected in function $rE5n$ - see 6.2
- If, after calibration of the Set Point Station display, previously entered pre-set values are outside the revised output current range, when selected the pre-set value alternating with $o\overline{u}E\epsilon$ or $u\overline{n}dE\epsilon$ will be displayed.

6.8 Maximum output rate of change: $rRtE$

To minimise plant disturbance when the Set Point Station output current is adjusted, the maximum rate of change is defined by this function. The maximum rate is adjustable between approximately 1 and 100 seconds for full scale output travel from 4 to 20mA. If 0 seconds is selected the function is disabled.

To define the maximum rate of change of the Set Point Station output select $rRtE$ from the configuration menu and press \boxed{P} which will reveal the present maximum rate of change in seconds with one digit flashing. The flashing digit may be adjusted by pressing the \blacktriangledown or \blacktriangle buttons, when the flashing digit is correct pressing \boxed{P} will transfer control to the next digit. When all the digits have been adjusted, press \boxed{E} to enter the new value and return to the configuration menu.

When the output rate of change limitation is functioning, in the operating mode the Set Point Station digital display will show the requested output and will flash until the requested output current is achieved. The bargraph display always shows the Set Point Station's actual output.

Pressing the \boxed{E} button while the output is ramping to a new requested value will stop the output changing.

6.9 Function of the \boxed{P} push button in operating mode: $P.Fn$

Using this function the Set Point Station may be configured to display the output current in milliamps, the output current as a percentage of the output range, or to provide access to the five pre-set outputs when the \boxed{P} button is pressed in the operating mode.

To check or change the function of the \boxed{P} push button select $P.Fn$ from the configuration menu and press \boxed{P} to reveal the present setting. Pressing the \blacktriangledown or \blacktriangle button will scroll the setting between:

$P\%$	Output as a percentage of output range.
$4-20$	Output current in milliamps
$PSEt$	Access to the five pre-set outputs see 6.7

When set as required, press \boxed{E} to return to the $P.Fn$ prompt in the configuration menu.

6.10 Encoder: EnC

For applications requiring the Set Point Station's 4/20mA output current to be controlled by a rotary knob, an external three wire quadrature encoder may be directly connected to terminals 5, 6 and 7.

The BEKA BA490 is a panel mounting encoder that generates 12 contact pulses per revolution which complies with the requirements for *simple apparatus* and is intended for use with the BA427E-SS. Other encoders that produce a different number of contact pulses per revolution may also be used. So that all external encoders have a similar adjustment resolution, the EnC function enables the number of pulses between 6 and 48 per revolution to be defined.

To enter the number of pulses per revolution that the external encoder generates, select EnC from the configuration menu and press \boxed{P} which will reveal the existing setting with one digit flashing. The flashing digit may be adjusted by pressing the \blacktriangledown or \blacktriangle button, when the flashing digit is correct pressing \boxed{P} will transfer control to the other digit. When both digits have been adjusted press \boxed{E} to return to the EnC prompt in the configuration menu.

Section 8.4 contains information about the use of an external rotary encoder.

6.11 One or two handed operation: Hnd

This function defines whether the front panel \boxed{E} button has to be pushed at the same time that the \blacktriangledown or \blacktriangle button is operated, or the optional external encoder is rotated to adjust the Set Point Station's output current. Selecting the two handed operation which requires the \boxed{E} button to be operated which minimises the possibility of accidental adjustment.

To check or change the function select Hnd from the configuration menu and press \boxed{P} to reveal the existing setting. Pressing the \blacktriangledown or \blacktriangle button will toggle between the two settings:

$2H$	Output current can only be adjusted when the \boxed{E} button is pressed.
$1H$	Output current can be adjusted without pressing the \boxed{E} button.

When set as required, press \boxed{E} to return to the Hnd prompt in the configuration menu.

6.12 Security code: $LodE$

Access to the instrument configuration menu may be protected by a four digit security code which must be entered to gain access. New instruments are configured with the default security code 0000 which allows unrestricted access to all configuration functions.

To enter a new security code select $LodE$ from the configuration menu and press \boxed{P} which will cause the Set Point Station to display the existing security code with one digit flashing. The flashing digit can be adjusted using the \blacktriangledown and \blacktriangle push buttons, when set as required operating the \boxed{P} button will transfer control to the next digit.

When all the digits have been adjusted press **[E]** to return to the **Code** prompt. The revised security code will be activated when the Set Point Station is returned to the operating mode. Please contact BEKA associates sales department if the security code is lost.

6.13 Reset to factory defaults: r5Et

This function quickly returns to the BA427E-SS Set Point Station to the factory default configurations shown in section 6.

To reset the Set Point Station select **r5Et** from the configuration menu and press **[P]**. To prevent accidental resetting the request must be confirmed by entering **5urE**. Using the **[▲]** button set the first flashing digit to 5 and press **[P]** to transfer control to the second digit, which should be set to **u**. When **5urE** has been entered pressing the **[E]** button will reset the configuration menus and return the Set Point Station to the operating mode.

7. MAINTENANCE

7.1 Fault finding during commissioning

If a BA427E-SS Set Point Station fails to function during commissioning the following procedure should be followed:

Symptom	Cause	Solution
No loop current	Incorrect wiring	Check wiring There should be 6.1 to 30V between terminals 1 & 3 with terminal 1 positive. With an optional backlight which is loop powered, there should be 10V to 30V between terminals 3 & 12 with terminal 12 positive.
No loop current 0V between terminals 1 & 3 or between terminals 3 & 12 if optional backlight is loop powered.	Incorrect wiring or no power supply	Check supply voltage and voltage drop caused by all the instruments in the loop.
Unstable 4/20mA loop current.	Noisy power supply or insufficient voltage to power all the instruments in the loop.	Eliminate ripple on power supply or increase supply voltage.
Unable to enter configuration menu.	Incorrect security code entered.	Enter correct security code, or contact BEKA if the code has been lost.
BA427E-SS displays L P L o	Voltage between BA427E-SS terminal 1 & 3 is too low,	Increase 4/20mA loop supply voltage.

7.2 Fault finding after commissioning

ENSURE PLANT SAFETY BEFORE STARTING MAINTENANCE

Live maintenance is permitted on intrinsically safe equipment installed in a hazardous area, but only certified test equipment should be used unless a gas clearance certificate is available.

If a BA427E-SS Set Point Station fails after it has been functioning correctly follow the procedure shown in section 7.1. If this does not reveal the cause of the fault, it is recommended that the Set Point Station is replaced.

7.3 Servicing

We recommend that faulty BA427E-SS Set Point Stations are returned to BEKA associates or to our local agent for repair.

7.4 Routine maintenance

The mechanical and electrical condition of the instrument should be regularly checked. Initially annual inspections are recommended, but the inspection frequency should be adjusted to suit the environmental conditions.

7.5 Guarantee

Set Point Stations 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.

7.6 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.

8. ACCESSORIES

8.1 Scale card

The BA427E-SS Set Point Station has a window on the right hand side of the display through which the scale card showing the units represented by the output current such as °C or mBar can be seen. New Set Point Stations are fitted with a scale card showing the units specified when the instrument was ordered, if the units are not specified when the instrument is ordered a blank scale card will be fitted. A pack of scale cards pre-printed with common units of measurement is available as an accessory. These can easily be fitted to the Set Point Station without opening the instrument enclosure or removing it from the panel. See section 5.4 of this instruction manual.

Custom scale cards for applications requiring less common units of measurement are also available.

8.2 Tag information

New Set Point Stations can be supplied with a tag number or application information laser etched onto the rear panel adjacent to the terminals. This tag information is not visible from the front of the instrument after installation.

8.3 Display backlight

The BA427E-SS Set Point Station can be supplied with a factory fitted green backlight that may be loop or separately powered.

When loop powered the backlight produces background illumination enabling the display to be read at night or in poor lighting conditions. No additional power supply, intrinsic safety interface or field wiring are required, but the Set Point Station's minimum operating voltage is increased. When separately powered the backlight is brighter, but an additional intrinsic safety interface and field wiring are required.

Fig 11 Terminals for optional backlight

8.3.1 Loop powering the backlight

The backlight is loop powered by connecting it in series with the Set Point Station's 4/20mA output as shown in Fig 12, which increases the minimum operating voltage to 10V.

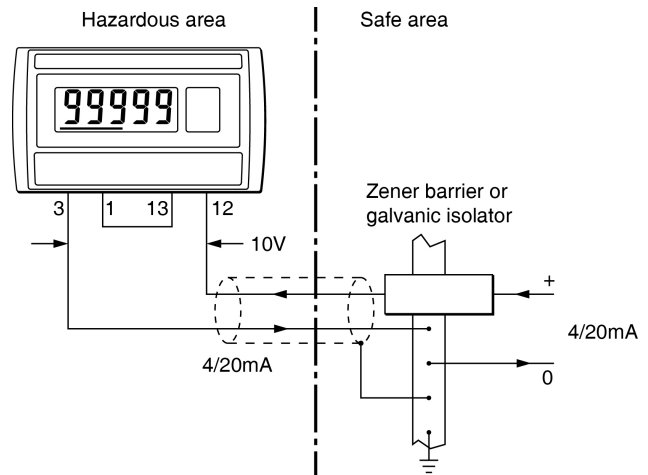


Fig 12 Loop powered backlight

The input intrinsic safety parameters of the combined Set Point Station and backlight are the same as for the Set Point Station alone. Providing the increased voltage drop can be tolerated, the intrinsic safety and system design described in sections 3 and 4 of this manual remain valid with the backlight loop powered.

8.3.2 Separately powering the backlight

The optional backlight may also be powered from a separate safe area power supply via an intrinsically safe interface as shown in Fig 13.

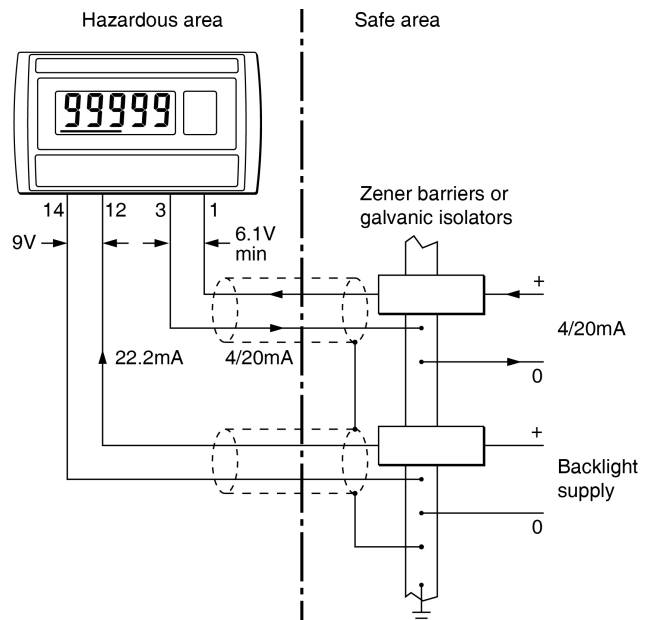


Fig 13 Separately powered backlight

When separately powered the backlight draws a constant current of 22.5mA at or above 9V. Below this voltage the backlight continues to function but with reduced brilliance. Powering the backlight from an adjustable voltage supply allows the backlight brilliance to be adjusted which is a useful feature when the operator's night vision has to be preserved.

Any certified Zener barrier or galvanic isolator may be used to separately power the backlight, providing the output parameters do not exceed:



$$\begin{aligned}U_o &= 30\text{V dc} \\I_o &= 200\text{mA} \\P_o &= 0.84\text{W}\end{aligned}$$



The internal capacitance C_i between terminals 12 & 14 should be subtracted from C_o of the intrinsically safe interface powering the backlight to determine the maximum permissible cable capacitance.

$$\begin{aligned}C_i &= 11\text{nF} \\L_i &= 0\end{aligned}$$

Two separately powered BA427E-SS Set Point Station backlights may be connected in parallel to a single channel 28V, 93mA Zener barrier or galvanic isolator with no noticeable reduction in brilliance when powered from a 24V dc supply.

8.4 External encoder

For applications requiring the output of the BA427E-SS Set Point Station to be controlled externally, terminals 5, 6 and 7 enable a wide range of three wire quadrature encoders with switch contact outputs to be directly connected to the BA427E. The Set Point Station's output current can still be controlled by the  and  buttons when an external encoder is connected.

With two handed operation the encoder only changes the Set Point Station's output when the  button is operated - see section 2.1. Alternatively, with single handed operation it is not necessary to press the  button - see section 2.2.

8.4.1 Intrinsic safety

The intrinsic safety parameters for the external encoder terminals 5, 6 and 7 are:

$$\begin{aligned}U_i &= 30\text{V dc} \\I_i &= 200\text{mA} \\P_i &= 0.84\text{W}\end{aligned}$$

$$\begin{aligned}U_o &= 5.0\text{V dc} \\I_o &= 1.0\text{mA} \\P_o &= 1.25\text{mW}\end{aligned}$$

Equivalent maximum capacitance and inductance between the three encoder terminals 5, 6 and 7 is:

$$\begin{aligned}C_i &= 0 \\L_i &= 0\end{aligned}$$

These parameters are not restrictive and allow a wide range of three wire quadrature encoders with a switch contact output to be directly connected to the BA427E-SS Set Point Station.

8.4.2 System design for hazardous areas

The external encoder must be certified intrinsically safe with input parameters equal to or greater than:

$$\begin{aligned}U_i &= 5.0\text{V dc} \\I_i &= 1.0\text{mA} \\P_i &= 1.25\text{mW}\end{aligned}$$

or output parameters equal to or less than:

$$\begin{aligned}U_o &= 30\text{V dc} \\I_o &= 200\text{mA} \\P_o &= 0.84\text{W}\end{aligned}$$

Alternatively, the encoder must comply with the requirements for *simple apparatus* as specified in Clause 5.7 of EN 60079-11. Most encoders comprising of just two mechanically activated switches will comply with these requirements. See 8.4.3.

If the external encoder is installed in an Ex e, Ex p or Ex t panel enclosure it must maintain the enclosure integrity.

8.4.3 BEKA BA490 rotary encoder

The BEKA BA490 quadrature output Rotary Encoder has been designed to operate with a BA427E-SS Set Point Station. It is an IP66 panel mounting device with a 20mm diameter control knob which complies with the requirements for *Simple Apparatus*. The two output waveforms are shown in Fig 14.

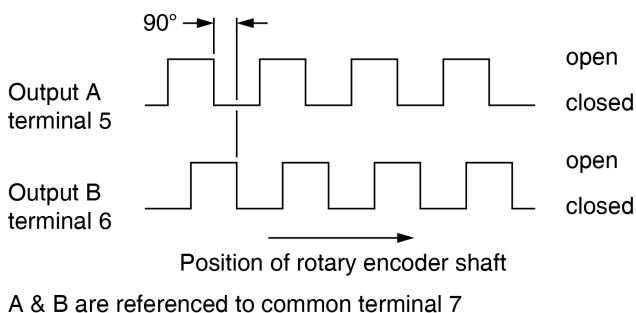


Fig 14 BA490 rotary encoder output waveforms

Interconnections between the BA427E-SS Set Point Station and the external BA490 Rotary Encoder are shown below.

BA427E-SS Terminal Nos.	BA490 Terminal Nos.
5	A
6	B
7	C

The BA490 Rotary encoder must be located in the same hazardous area as the BA427E-SS Set Point Station and the wiring between them must have 500V ac insulation to earth. The BA490 Rotary encoder will **not** maintain the certification of an Ex e, Ex n, Ex p or Ex t panel enclosure.

Appendix 1

Dust certification

A1.0 ATEX & UKEX dust certification

In addition to ATEX & UKEX certification permitting installation in explosive gas atmospheres which is described in the main section of this instruction manual, all BA427E-SS Set Point Stations have ATEX & UKEX certification permitting installation in combustible dust atmospheres.

This appendix describes ATEX & UKEX installations in explosive dust atmospheres conforming with EN 60079-14 *Electrical installations design, selection and erection*. When designing systems for installation the local Code of Practice should be consulted.

The Set Point Station's dust input and output safety parameters are identical to the gas parameters, therefore all the electrical circuits shown in the main section of this manual may also be used for dust applications. Intrinsically safe systems in dust atmospheres only have to comply with IIB requirements. Apparatus certificates for intrinsically safe interfaces usually specify Co and Lo for IIC gases, but for use with apparatus in dust atmospheres these may be increased to the IIB figures. For a IIC interface with a Uo of 28V and an Io of 93mA, Co increases from 83nF to 650nF and Lo increases by a factor of 2.25 for IIB.

A1.1 Zones, and Maximum Surface Temperature

The BA427E-SS has been ATEX & UKEX certified as Group II, Category 2D Ex ia IIIC T80°C Db IP20 apparatus, Ta -40 to 60°C.

When connected to a suitable system the Set Point Station may be installed in:

- Zone 21 explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur occasionally in normal operation.
- Zone 22 explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation, but if it does occur, will only persist for a short period.

Be used with dust in subdivisions:

IIIA	combustible flyings
IIIB	non-conductive dust
IIIC	conductive dust <i>(For use with IIIC conductive dusts special conditions for safe use apply - see section A1.4)</i>

Having a Minimum Ignition Temperature of:

Dust cloud	120°C
Dust layer on indicator up to 5mm thick	155°C
Dust layer on indicator over 5mm thick.	Refer to EN 60079-14

At an ambient temperature between -40 and +60°C

A1.3 Maintenance

ENSURE PLANT SAFETY BEFORE STARTING MAINTENANCE

Live maintenance is permitted on intrinsically safe equipment installed in a hazardous area, but only certified test equipment should be used.

The BA427E-SS Set Point Station has IP66 front of panel protection and a gasket is provided to seal the joint between the instrument and the mounting panel thus preventing dust ingress from the outside of the mounting panel. The rear of the instruments is not sealed, but ATEX dust certification is dependent on the internal conformal coating of the instrument, so dust ingress is acceptable except for use in IIIC conductive dusts - see A1.4. However, the amount of dust accumulating on the rear of the indicator should always be minimised.

A1.4 Special conditions for use in IIIC dusts

The ATEX UKEX certificates for the BA427E-SS Set Point Station have an 'X' suffix indicating that special conditions for safe use are required for installation in IIIC dust atmospheres, the certificate states:

For use in Group IIIC explosive dust atmospheres, the Set Point Station shall be mounted such that the instrument terminals are protected by at least an IP6X enclosure.

This means that a BA427E-SS Set Point Station exposed to a IIIC conductive dust atmospheres should be mounted in an IP6X panel enclosure.

A1.5 Installation in an Ex t panel enclosure within Zone 21 or Zone 22.

Installation of a BA427E-SS Set Point Station in an Ex t panel enclosure does not invalidate the Ex t panel's certification as the front of the BA427E-SS complies with Ex t impact and ingress requirements. Although mounted in an Ex t panel enclosure, the BA427E-SS remain Group II, Category 2D Ex ia IIIC T80°C Db IP20 intrinsically safe apparatus and therefore should be powered via a Zener barrier or galvanic isolator as described in section 4.1 and 4.2 of this manual.

The Zener barrier, galvanic isolator or associated apparatus is usually installed in the safe area, but the inside of an Ex t enclosure is effectively a safe area and the certified intrinsically safe interface may therefore be mounted in the same Ex t panel enclosure as the indicator.

The indicator terminals, the wiring to the indicator and the intrinsically safe interface, if mounted within the enclosure, should be segregated from all other non-intrinsically safe wiring and equipment within the panel enclosure as required by EN 60079-11 *Equipment protected by intrinsic safety* and EN 60079-14 *Electrical installations design, selection and erection*.

If live maintenance is anticipated, it is recommended that the Ex t panel enclosure should be fitted with a warning label saying 'Do not open when non-intrinsically safe circuits are energised', alternatively all bare live non-intrinsically safe parts within the panel enclosure should have an IP30 cover carrying a warning label 'Do not open when energised'.

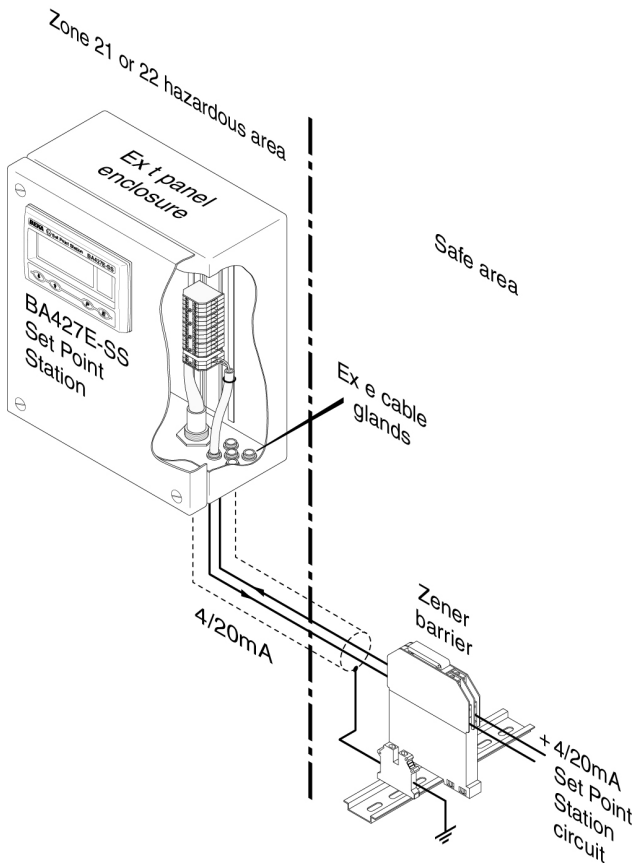


Fig 15 Typical installation in Ex t panel enclosure

APPENDIX 2

IECEx certification

A2.0 The IECEx Certification Scheme

IECEx is a global certification scheme for explosion protected products which aims to harmonise international certification standards. For additional information about the IECEx certification scheme and to view the BEKA associate certificates, please visit www.iecex.com

A2.1 IECEx Certificate of Conformity

The BA427E-SS Set Point Station and the optional accessories have been issued with an IECEx Certificate of Conformity number IECEx ITS 15.0056X which specifies the following certification codes:

Ex ia IIC T5 Ga
Ex ia IIIC T80°C Db IP20
Ta = -40°C to 60°C

The specified gas and dust intrinsic safety parameters are identical to the ATEX & UKEX safety parameters described in this manual.

The IECEx certificate may be downloaded from www.beka.co.uk, www.iecex.com or requested from the BEKA sales office.

A2.2 Installation

IECEx, ATEX and UKEX certificates specify identical safety parameters and installation requirements for both approvals. The ATEX & UKEX gas and dust installation requirements specified in section 5 and Appendix 1 of this manual therefore also apply for IECEx installations, but the local code of practice should also be consulted.