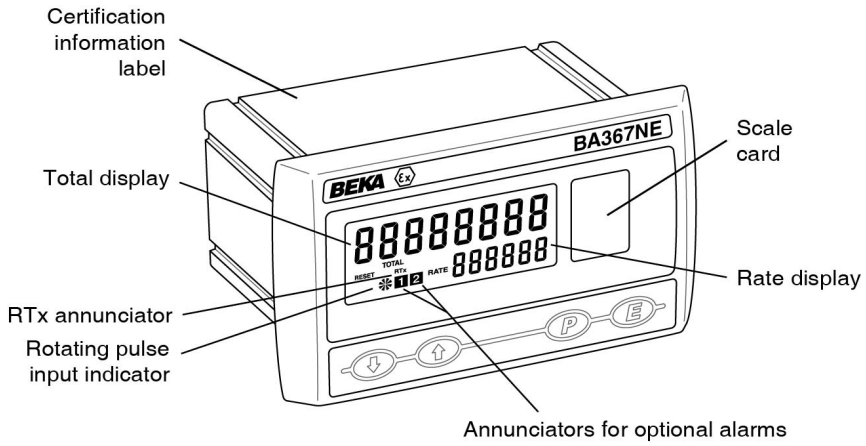
BA367NE
One input
Ex nA and Ex tc
Counter

Issue 7



Issue: 7
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CONTENTS

1. Description

2. Operation
- 2.1 Initialisation
- 2.2 Controls
- 2.3 Displays

3. Certification
- 3.1 ATEX Ex nA certification
- 3.2 Zones, gas groups & T rating
- 3.3 Special conditions for safe use
- 3.4 Power supply
- 3.5 Pulse input terminals
- 3.6 Remote reset terminals
- 3.7 Certification label information

4. System Design for Hazardous Areas
- 4.1 Power supplies
- 4.2 Pulse input
  - 4.2.1 Input switching thresholds
  - 4,2,2 Switch contact input
  - 4.2.3 Open collector input
  - 4.2.4 2-wire proximity detector input
  - 4.2.5 Magnetic pick-off input
  - 4.2.6 Voltage pulse input
- 4.3 Remote reset

5. Installation
- 5.1 Location
- 5.2 Installation procedure
- 5.3 Counter earthing
- 5.4 EMC
- 5.5 Scale card

6. Configuration and Calibration
- 6.1 Configuration structure
- 6.2 Accessing the configuration functions
- 6.3 Summary of configuration functions
- 6.4 Input: ı nPut
- 6.5 Input type: ı nP.tYPE
- 6.6 Input debounce: dEbounCE
- 6.7 Input pulse counting edge: Cnt EdGE
- 6.8 Display update interval: uPdAtE
- 6.9 Upper display: d1 SP-1
- 6.10 Lower display: d1 SP-2
- 6.11 Position of the decimal points: dP
- 6.12 Total scale factor: SCALE.t
- 6.13 Rate scale factor: SCALE.r
- 6.14 Timebase: t-bASE
- 6.15 Display filter: F1 LtEr
- 6.16 Direction of count: uP or dn
- 6.17 Reset value: CLr VAL
- 6.18 Local reset: LoC CLr
- 6.19 Local total reset: CLr tot
- 6.20 Local grand total reset: CLr Gtot
- 6.21 Reset grand total from configuration menu: CLr Gtot
- 6.22 Security code: CodE
- 6.23 Reset configuration to factory defaults: rSEt dEF
- 6.24 Display overflow

7. Configuration example

8. Maintenance
- 8.1 Fault finding during commissioning
- 8.2 Fault finding after commissioning
- 8.3 Servicing
- 8.4 Routine maintenance
- 8.5 Guarantee
- 8.6 Customer comments

The BA367NE is CE marked to show compliance with the European Explosive Atmospheres Directive 2014/34/EU and the European EMC Directive 2014/30/EU

CONTENTS CONTINUED

9. Accessories

9.1 Scale card

9.2 Tag information

9.3 Alarms

9.3.1 Solid state output
9.3.2 Ex nA certification
9.3.3 Configuration summary
9.3.4 Alarm enable: EnbL
9.3.5 Type of alarm: tYPE
9.3.6 Setpoint adjustment: SP 1x & SP2x
9.3.7 Alarm function: Hi.Lo
9.3.8 Alarm output status: no.nC
9.3.9 Hysteresis: HSter
9.3.10 Alarm delay: dELA
9.3.11 Alarm silence time: Si L
9.3.12 Flash display when alarm occurs: FLSH
9.3.13 Access Setpoint: ACSP
9.3.14 Adjusting alarm setpoints from display mode.

9.4 Pulse Output

9.4.1 Ex nA certification
9.4.2 Pulse output configuration: PuLSE oP
9.4.3 Enable pulse output: EnbL
9.4.4 Source of pulse output: SourCE
9.4.5 Divide output pulse frequency: di Vi dE
9.4.6 Output pulse width: durAti on
9.4.7 Pulse storage

9.5 4/20mA output

9.5.1 Ex nA certification
9.5.2 Configuration
9.5.3 4/20mA output: 4-20 oP
9.5.4 Enable 4/20mA output: EnbL
9.5.5 Select rate or total source: 4-20tYPE
9.5.6 Display which corresponds to 4mA output: 4.000
9.5.7 Display which corresponds to 20mA output: 20.000

9.6 Display backlight

Appendix 1 Dust certification

Appendix 2 IECEx certification

Appendix 3 ETL and cETL certification

1. DESCRIPTION

This rugged Ex nA and Ex tc certified, one input Counter may be configured to count input pulses from a wide variety of sensors in a Zone 2 or Zone 22 hazardous area. without the need for Zener barriers or galvanic isolators. The total number of pulses and their rate may be displayed in the same or different engineering units.

This instruction manual supplements the abbreviated instruction sheet supplied with each instrument.

The BA367NE has been issued with a Type Examination Certificate ITS16ATEX48409X by Notified Body Intertek Testing and Certification Ltd. This confirms compliance with the type of protection requirements for non-sparking Ex nA apparatus, and for dust ignition protection by enclosure Ex tc. This certificate has been used to confirm compliance with the European ATEX Directive 2014/34/EU.

For international applications the BA367NE also has IECEx certification which is described in Appendix 2.

For applications in the USA and Canada the BA367NE has ETL and cETL certification which is described in Appendix 3.

2. OPERATION

Fig 1 shows a simplified block diagram of the BA367NE Counter. The instrument can be supplied with a factory fitted internally powered display backlight, plus one of the following three factory fitted accessories:

Dual isolated alarms

or Isolated pulse output

or Isolated 4/20mA output

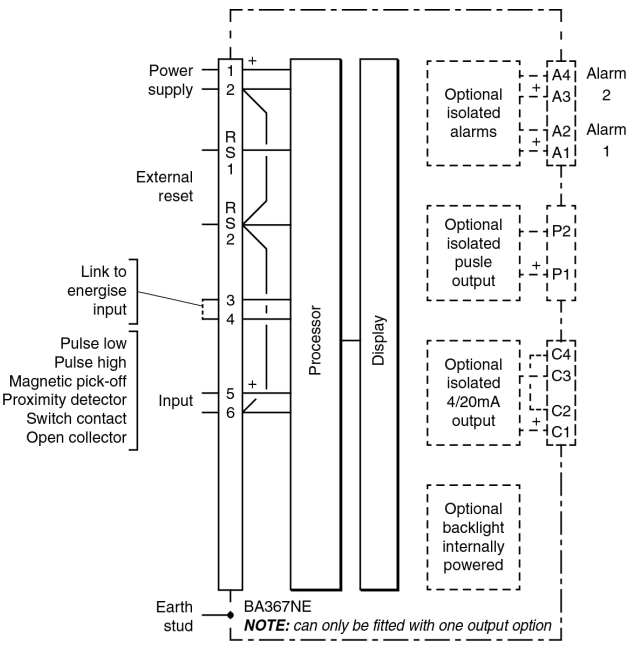


Fig 1 BA367NE block diagram

2.1 Initialisation

Each time power is applied to a BA367NE Counter initialisation is performed. After a short delay the following display sequence occurs:

All segments of the display are activated

Counter starts functioning, using the configuration information stored in the instrument's permanent memory. Unless total and grand total displays have been reset to zero, new pulses will be added to the existing totals.

2.2 Controls

The BA367NE Counter is controlled and configured via four front panel push buttons. In the display mode i.e. when the instrument is counting the push button functions are:

Push Button Functions

P + E Access to configuration menu

▼ + ▲ If Local Total Reset CLr tot in the instrument configuration menu has been activated, operating the ▼ and ▲ buttons simultaneously for three seconds will reset the total display to zero and clear any pulses stored in the optional pulse output.
See 6.19

E + ▼ Grand total - shows Lo followed by least significant 8 digits of the 16 digit grand total.

E + ▲ Grand total - shows Hi followed by the most significant 8 digits of the 16 digit grand total.
If Local Grand Total Reset CLr Gtot in the instrument configuration menu has been activated, operating the E and ▲ buttons simultaneously for ten seconds will result in CLr.no being displayed with the no flashing. Operating the ▲ or ▼ button will change the display to CLr.YES, the E button will then reset the grand total to zero which will be confirmed by a brief display of Gt CLrd. See 6.20

P + ▼ Shows firmware version

Note: When optional alarms are fitted, the BA367NE Counter may be configured to provide direct access to the alarm setpoints from the display mode when the P + ▲ buttons are operated simultaneously. See 9.3.13 and 9.3.14

2.3 Displays

The BA367NE Counter has two digital displays and associated annunciators, plus a pulse input indicator as shown on the front cover of this manual.

Total display Shows the total pulse count on the upper eight digit display. May be reset to zero via front panel push buttons or by a remote reset switch.

Rate Display Shows the pulse rate on the lower six digit display. Total and rate displays may be reversed.

Pulse input indicator This disc in the lower left hand corner of the display 'rotates' for two seconds each time an input pulse is received on either input. Appears to rotate continuously when combined input frequency on both inputs exceeds 0.5Hz.

Reset annunciator Activated while the total display is being reset via the front panel push buttons, or the external reset terminals.

Rate annunciator Identifies rate display

Total annunciator Identifies total display

RTx annunciator Retransmitted pulse annunciator.
Depends upon the setting of SourCE in the pulse output configuration menu.

SCALEd
Annunciator activated each time pulse output open collector is *on*, i.e. Ron is less than 60Ω + 3V.

dirECt:
Annunciator continuously activated.

3. CERTIFICATION

The BA367NE has ATEX and IECEx Ex nA gas and Ex tc dust certification. The main sections of this instruction manual describes ATEX gas certification. ATEX dust certification is described in Appendix 1, d IECEx gas and dust certification in Appendix 2 and ETL & cETL certification in Appendix 3.

3.1 ATEX Ex nA certification

Notified Body Intertek Testing and Certification Ltd have issued the BA367NE with a Type Examination Certificate number ITS16ATEX48409X. This has been used to confirm compliance with the European ATEX Directive for Group II, Category 3G equipment. The instrument carries the Community Mark and, subject to local codes of practice, may be installed in any of the European Economic Area (EEA) member countries and in the EEA EFTA states, Iceland, Liechtenstein and Norway. ATEX certificates are also acceptable in Switzerland and Turkey. The European Commission's Blue Guide lists the member states, overseas countries and territories that have adopted harmonisation legislation.

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

3.2 Zones, gas groups and T rating

The Counter has been certified as Group II Category 3G Ex ic nA IIC T5 Gc apparatus. This is non-sparking apparatus complying with EN 60079-15 *Equipment protection by type of protection 'n'* that minimises the risk of arcs or sparks capable of creating an ignition hazard occurring during conditions of normal operation.

The Counter's front panel push button contacts are non incendive and have been certified intrinsically safe Ex ic without an external Zener barrier or galvanic isolator, as shown on the Type Examination Certificate. This allows the Counter to be adjusted and configured live when installed in a Ex n panel enclosure located in Zone 2.

When connected to a suitable system and correctly mounted in a panel enclosure complying with the requirements for Type of protection 'n', the panel enclosure containing the BA367NE Counter may be installed in:

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 safely 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 and +60°C.

This allows use with all commonly used industrial gases except carbon disulphide CS_2.

3.3 Special conditions for safe use

Special conditions for safe use are specified by the Ex nA certificate indicated by the certificate number's 'X' suffix. These state that the BA367NE Counter should be:

a. Mounted such that the instrument terminals are protected by at least an IP54 enclosure certified to IEC 60079-0 or IEC 60079-15 as appropriate.

b. Be supplied from limited energy circuits with output parameters in normal operation equal to, or less than the instruments input parameters.

These special conditions for safe use can be satisfied by mounting the BA367NE in an Ex n, Ex e or Ex p panel enclosure. For ATEX Category 3 installations in Zone 2, self or third party certified Ex n, Ex e or Ex p panel enclosures may be used. Additional requirement apply for non-metallic panel enclosures.

3.4 Power supply

The input safety parameters for the power supply terminals 1 and 2 are:

Ui = 30dc
Ii = 100mA

This allows the BA367NE to be powered from any dc supply which in normal operation has an output voltage of less than 30V. See section 4.1 for power supply recommendations.

3.5 Pulse input

The BA367NE Counter has a single pair of pulse input terminals 5 and 6 that may be configured for use with different types of sensor.

For sensors that require energising to determine their state, such as switch contacts or a 2-wire proximity detector, an external link between terminals 3 & 4 of the BA367NE connects an internal 7V, 6mA supply to the input terminals. Energising is

not required when the Counter input is connected to a voltage pulse source.

Fitting an external link between terminals 3 & 4 changes the Counter's pulse input safety parameters in normal operation as shown below. This table also shows the types of sensor requiring energising (link fitting).

		Safety parameters		
		Input	Output	
Type of input	**Link 3 & 4**	**Ui**	**Uo**	**Io**
Switch contact	Yes	15V	10.5V	9.2mA
Proximity detector	Yes	15V	10.5V	9.2mA
Open collector	Yes	15V	10.5V	9.2mA
Magnetic pick-off	No	30V	1.1V	0.5mA
Voltage input (low)	No	30V	1.1V	0.5mA
Voltage input (high)	No	30V	1.1V	0.5mA

3.6 Remote reset terminals

The BA367NE total display my be reset to zero by connecting the external reset terminals RS1 and RS2 together for more than one second. The two reset terminals have the following safety parameters in normal operation:

Ui = 30V
Uo = 3.8V
Io = 1mA

3.7 Certification label information

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

BA367NE Certification information label

4. SYSTEM DESIGN FOR HAZARDOUS AREAS

When correctly installed in Zone 2 the BA367NE Counter may be connected to almost any apparatus in the safe area and to Ex n, Ex e, Ex p and Ex d protected apparatus located in Zone 2. Because the BA367NE is not certified intrinsically safe it should not be connected to an intrinsically safe system.

BEKA Application Guide AG310, *Guide for Installation of [extra low voltage d.c.] Ex nA instrumentation*, which can be downloaded from www.beka.co.uk, contains explanations and recommendations for the installation of Ex nA equipment.

In addition to being able to be connected to other equipment in the safe area and in Zone 2, the BA367NE may also be connected to suitably protected and certified equipment located in Zone 1. This is illustrated in Fig 5 and explained in Application Guide AG310.

There are four design requirements:

1. The BA367NE must be installed in a panel enclosure complying with the requirements for Ex n protection as shown in section 5 of this manual.

2. The BA367NE should be powered from a circuit that has output safety parameters in normal operation equal to, or less than, the input safety parameters for terminals 1 and 2 specified by the BA337NG ATEX Type Examination Certificate.

3. Hazardous area apparatus to which the BA367NE is connected should be protected by a technique suitable for the Zone in which the equipment is located such as Ex n or Ex e if located in Zone 2. Equipment protected by intrinsic safety should not be connected to a BA367NE.

4. Wiring should comply with Clause 9 of EN 60079-14.

When designing a system it is important to remember that terminals 2, 6 and RS2 are interconnected within the BA367NE. See Fig 1.

4.1 Power supply

The BA367NE Counter requires a minimum of 10V between terminal 1 & 2 and consumes:

	10mA	without optional backlight
plus	6mA	when terminals 3 & 4 are linked

A 24V dc regulated supply with a current limit located in a safe area is suitable. The power supply should meet the requirements for personnel safety so that 'live maintenance' can safely be performed. The implicit requirement for galvanic isolation from the mains supply ensures that the possible difficulties from circulating earth currents caused by mains faults is minimised. In European terms if the power supply is CE marked it is almost certainly acceptable.

To comply with the requirements of EN 60079:*14 Electrical installations design, selection and erection*, each of the wires entering the hazardous area should be individually fused and contain a means of isolation. These two requirements may be satisfied by using DIN rail mounted terminals incorporating an easily removable fuse which can be extracted to achieve isolation as shown in Fig 2. Clear identification of, and easy access to the means of isolation is essential for their effective use. It is also necessary to ensure that the maintenance procedure makes sure that unauthorised re-closure of the switches does not occur. It is not considered necessary to have a means of isolation or electrical protection for the screen.

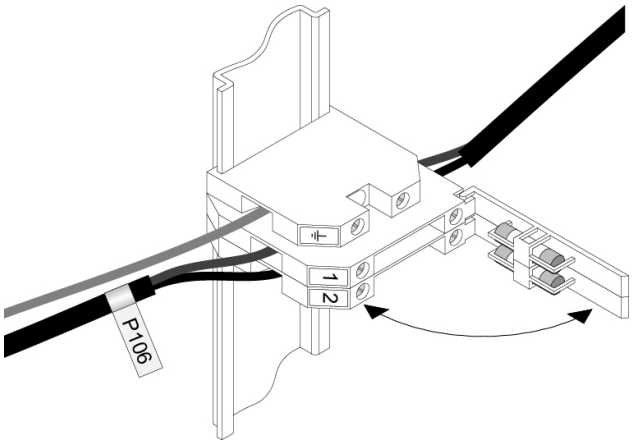


Fig 2 DIN rail mounting terminals incorporating a fuse

For some applications Ex nA instrumentation energised by a current limited power supply or instrument that can be switched off, is considered adequate and to comply with the requirements of the standard.

4.2 Pulse input

The BA367NE can count and display the total number of input pulses received from a wide variety of sensors located in a Zone 2 hazardous area or in a safe area. Fig 3 shows the connections when the sensor is located in Zone 2 and Fig 4 the connections required when the sensor is in a safe area.

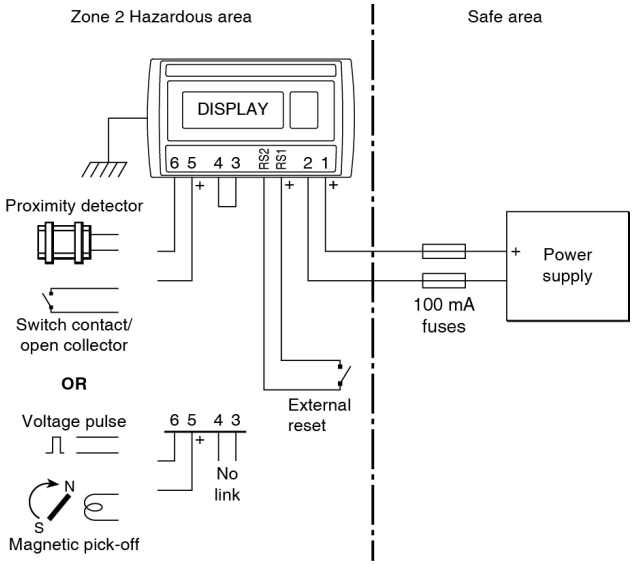


Fig 3 Connections for sensor in Zone 2

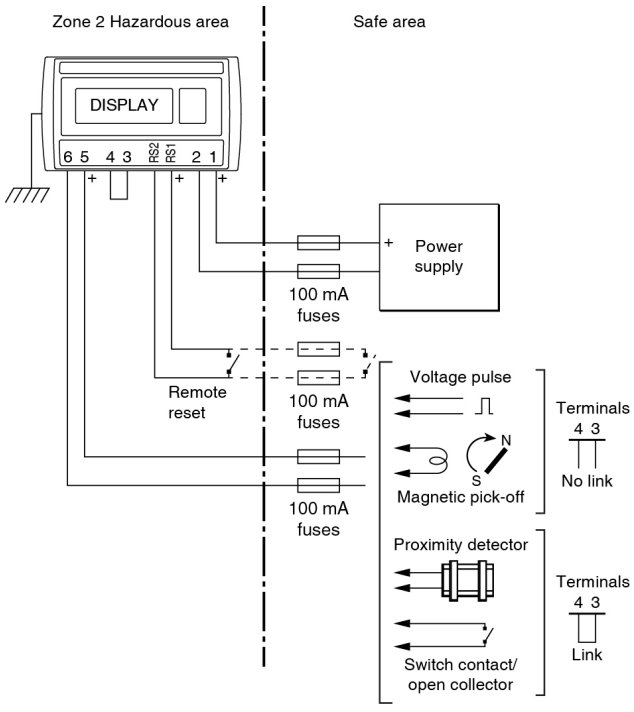


Fig 4 Connections for sensor in safe area

Providing the BA367NE Counter is correctly installed in an Ex n panel enclosure located in Zone 2, the input terminals may be connected to a certified sensor located in Zone 1 as shown in Fig 5. The sensor should have Ex e or Ex d certification permitting installation in Zone 1. Intrinsically safe Ex i certified sensors should not be used.

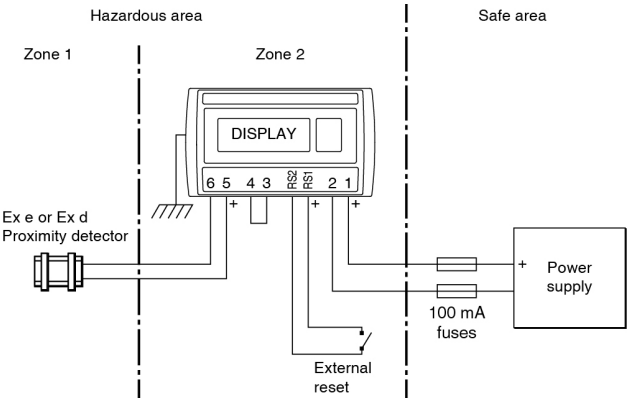


Fig 5 Connection to an Ex d or Ex e sensor in Zone 1

4.2.1 Input switching thresholds
For reliable operation the Counter pulse input must fall below the lower threshold and rise above the upper thresholds shown in the following table.

Input transducer	Switching thresholds	
	Lower	Upper
Open collector	2kΩ	10kΩ
Voltage pulse low	1.0V	3.0V
Voltage pulse high	3.0V	10.0V
Magnetic pick-off	0mV	40mV peak
Proximity detector	1.2mA	2.1mA
Switch	100Ω	1000Ω

Sensors with a switch contact, proximity detector or an open collector output require energising which is achieved by linking Counter terminals 3 and 4.

4.2.2 Switch contact input
Any mechanically or magnetically activated switch contact speed sensor located in Zone 2 or in the safe area may be directly connected to the pulse input terminals 5 and 6 which are non incendive, providing the sensor and associated wiring can withstand a 500V rms insulation test to earth. Most magnetically activated reed relays comply with these requirements. The BA367NE contains a configurable debounce circuit to prevent contact bounce being counted. See section 6.6.

4.2.3 Open collector input
Open collector sensors located in Zone 2 or in the safe area may be directly connected to input terminals 5 & 6 providing the sensor and associated wiring can withstand a 500V rms insulation test to earth.

The BA367NE contain a configurable debounce circuit to prevent false triggering. See section 6.6.

4.2.4 2-wire proximity detector input
Most Zone 2 certified NAMUR 2-wire proximity detectors may be directly connected to a BA367NE input terminals 5 & 6, providing the minimum operating voltage of the proximity detector is greater than 7.5V. The sensor and the associated wiring should be able to withstand a 500V rms insulation test to earth.

The BA367NE contain a configurable debounce circuit to prevent false triggering. See section 6.6.

4.2.5 Magnetic pick-off input
Magnetic pick-off sensors usually have a low level ac voltage output which a BA367NE Counter can sense when configured for a [oil input. The Counter input terminals 5 and 6 may be connected to any Zone 2 certified magnetic pick-off output sensor, providing the output in normal operation is equal to or less than 30V the Counter's Ui. The sensor and associated wiring should be able to withstand a 500V rms insulation test to earth.

The BA367NE contain a configurable debounce circuit to prevent false triggering. See section 6.6.

4.2.6 Voltage pulse input
Two voltage pulse input ranges are selectable in the BA367NE Counter configuration menu, UoLt5L and UoLt5H. The Counter input terminals 5 and 6 may be connected to any Zone 2 voltage pulse output sensor, providing the output in normal operation is equal to or less than 30V the Counter's Ui. The sensor and associated wiring should be able to withstand a 500V rms insulation test to earth.

The BA367NE contain a configurable debounce circuit to prevent false triggering. See section 6.6.

4.3 Remote reset
The BA367NE Counter's total display may be remotely reset to zero by connecting terminals RS1 and RS2 together. Permanent interconnection inhibits the Counter. Remote resetting may be accomplished by any mechanically operated switch located in Zone 2 as the Counter's reset circuit is non incendive. The reset switch and the associated wiring should be able to withstand a 500V rms insulation test to earth.

A BA367NE may also be remotely reset from the safe area. Any switch may be used. Fig 4 illustrates how a BA367NE may be reset from both the safe and the hazardous area.

The BA367NE total display may also be reset when the ▼ and ▲ push buttons are operated simultaneously in the operating mode i.e. when the instrument is counting. See 6.19

5. INSTALLATION

5.1 Location

When installed in a panel enclosure complying with the requirements for Ex n protection the BA367NE may be located in a Zone 2 hazardous area providing that the operating temperature is between –40°C and +60°C and the installation complies with the Counters certification requirements. Certified Ex e panel enclosures are frequently used as Ex n panel enclosures.

The BA367NE Counter has a stainless steel housings with a 7J front of panel impact resistance incorporating a 10mm thick toughened glass window which can withstand a 4J impact. This, together with a captive silicone gasket which seals the joint between the instrument and the panel, enclosure provides IP66 ingress protection. The BA367NE has IP20 rear protection.

Although the front of the BA367NE Counter has IP66 protection, it should be shielded from continuous direct sunlight and severe weather conditions.

Fig 6 shows the overall dimensions of the BA367NE together with the recommended panel enclosure cut-out dimensions.

5.2 Installation Procedure

a. Cut the aperture specified in Fig 6 into the panel enclosure. Ensure that the edges of aperture are de-burred.

b. Inspect the Counter's captive gasket and ensure that it is not damaged before inserting it into the panel enclosure aperture.

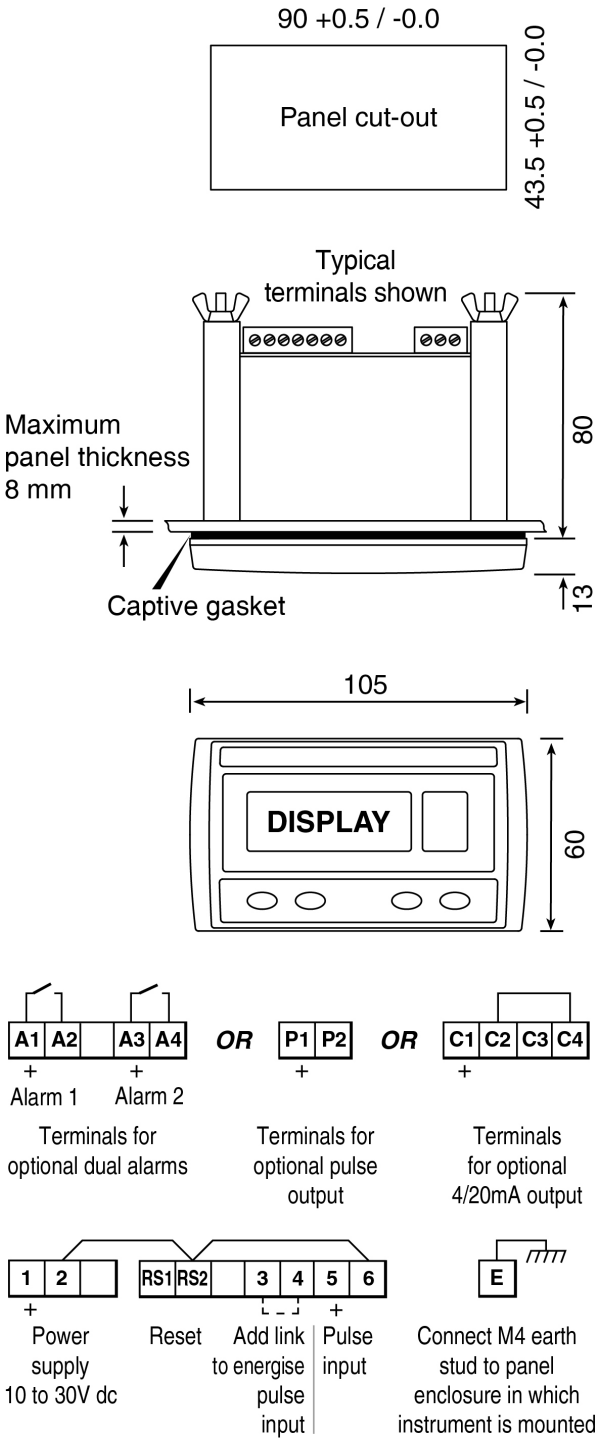
c. If the enclosure panel is less than 1.0mm thick, or is non-metallic, an optional BEKA stainless steel support plate should be slid over the rear of the indicator before the panel clamps are fitted to evenly distribute the clamping force and prevent the enclosure panel being distorted or creeping.

d. 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.

e. Evenly tighten the four clamps to secure the instrument. The recommended minimum tightening torque for each wing nut is 22cNm (1.95 lbf in).

f. 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. Wiring should be supported to prevent damage resulting from vibration.

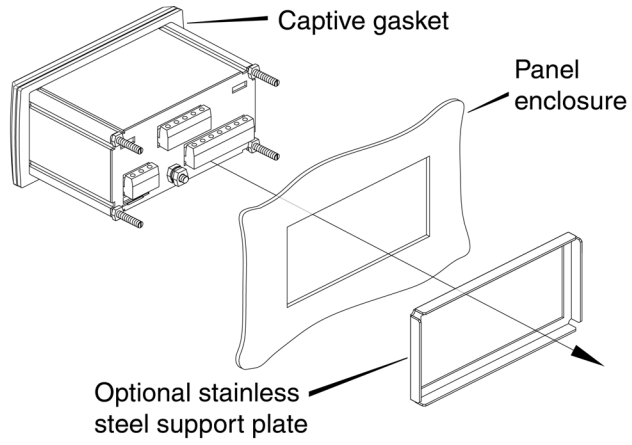
g. Finally, fit a silicone rubber push-on cap to the end of each M3 threaded rod.



Support panel wiring to prevent vibration damage

Note: Optional backlight is internally powered

Fig 6 Dimensions and terminals



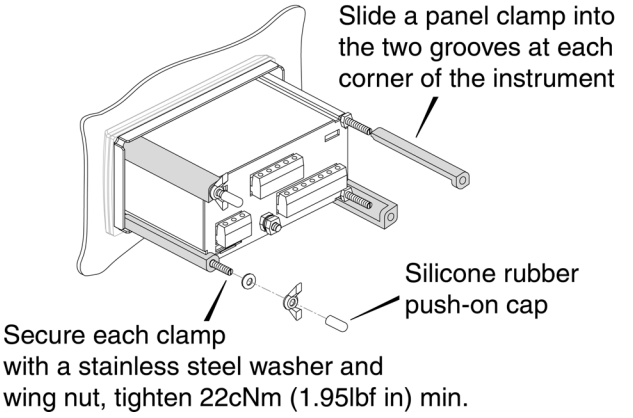


Fig 7 Installation procedure

5.3 Counter earthing

The BA367NE has an M4 earth stud on the rear panel which should be electrically connected to the panel enclosure in which the Counter is mounted, or to the plant equipotential conductor.

5.4 EMC

The BA367NE complies with the requirements of the European EMC Directive 2014/30/EU. For specified immunity all wiring should be in screened twisted pairs, with the screens earthed at one point in the safe area.

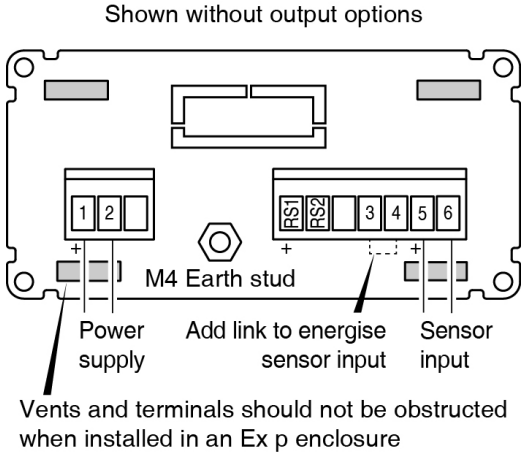


Fig 8 Terminals for field wiring

5.5 Scale card

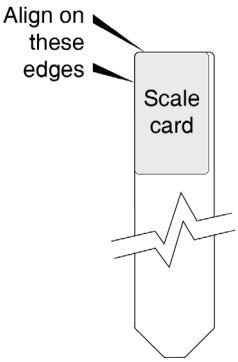
The Counter's units of measurement are shown on a printed scale card in a window at the right hand side of the display. The scale card is mounted on a flexible strip that is inserted into a slot at the rear of the instrument as shown in Fig 9. Thus the scale card can easily be changed without dismantling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

New Counters are supplied with a printed scale card showing the requested units of measurement, if this information is not supplied when the instrument 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 Counter, 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 Counter rear panel.



Align the self-adhesive printed scale card onto the flexible strip and insert the strip into the indicator as shown below.

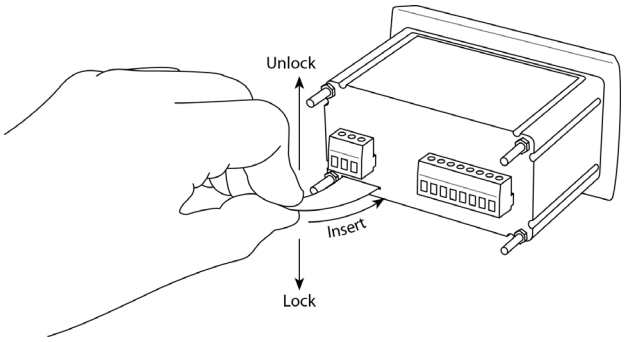


Fig 9 Inserting flexible strip carrying scale card into slot at the rear of Counter.

6.0 CONFIGURATION & CALIBRATION

The BA367NE Counter is configured and calibrated via four front panel push buttons. All the configuration functions are contained in an easy to use intuitive menu that is shown diagrammatically in Fig 11.

Each menu function is summarised in section 6.3 of this manual and each summary includes a reference to more detailed information.

When factory fitted optional dual alarms, pulse output or a 4/20mA output are included, additional functions appear in the configuration menu which are described separately in section 9.

All new BA367NE Counters are supplied calibrated as requested at the time of ordering. If calibration is not requested, Counters will have default configuration as shown in the following table, but can easily be re-configured on-site.

Function	Display		Default
Input			
Input type	inP.tYPE		oP.CoL
Debounce	dEbounCE		dEFAuLt
Counting edge	Cnt EdGE		EdGE 1
Update	uPdAtE		0.5
Upper display	di SP-1		totAL
Lower display	di SP-2		on
Decimal point	dP	Rate	00000.0
		Total	00000000
Total scale factor	SCALE.t		001.00
Rate scale factor	SCALE.r		001.00
Timebase	t-bASE		tb-01
Filter	FiLtEr		24
Counter direction	uP or dn		uP
Clear value	CLr VAL		00000000
Local clear			
Local total reset	CLr tot		oFF
Local grand total reset	CLr Gtot		oFF
Security code	CodE		0000

Note: While the instrument is being configured counting continues so that any input pulses occurring during this time are recorded.

6.1 Configuration structure

Fig 10 shows the calibration structure of the BA367NE Counter. The pulse input is passed to the SCALE.r and SCALE.t functions allowing the independent rate and total displays to have different engineering units.

SCALE.t is a dividing factor that converts the input pulses into the required total display in engineering units. e.g. if the input is two pulses per pump stroke and it is required to display the total number of pump strokes in thousands of strokes, SCALE.t should be set to 2000.

SCALE.r is a dividing factor that converts the input pulses into a rate display with the required engineering units. e.g. if the input is two pulses per pump stroke and it is required to display the pump stroke rate, SCALE.r should be set to 2.0.

The timebase t-bASE is a multiplying factor that determines if the instrument displays pulse rate per second, per minute or per hour.

The BA367NE uses 'real' decimal points. Moving the position of a decimal point in a scale factor will affect the instrument calibration.

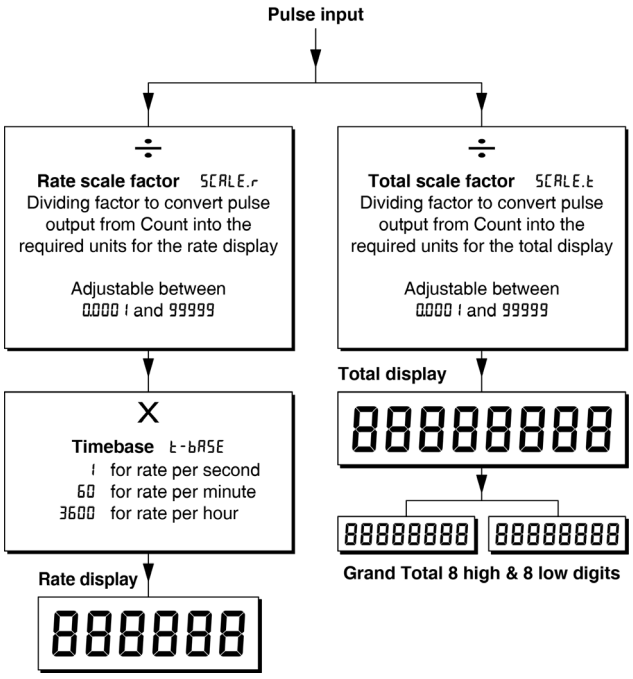


Fig 10 Calibration structure

6.2 Accessing configuration functions

Throughout this manual the instrument front panel push buttons are shown as ▼, ▲, P and E and legends displayed by the instrument are shown in a seven segment font as displayed by the Counter e.g. FiLtEr and SCALE.r.

Access to the configuration menu is obtained by operating the P and E push buttons simultaneously. If the instrument is not protected by a security code the first parameter inPut will be displayed. If a security code other than the default code 0000 has already been entered, the instrument will display CodE. Press P to clear this prompt and enter the security code for the instrument using the ▼ or ▲ push button to adjust the flashing digit, and the P push button to transfer control to the next digit. If the correct code has been entered pressing E will cause the first parameter inPut to be displayed. If an incorrect code is entered, or a push button is not operated within ten seconds, the instrument will automatically return to the display mode.

All configuration functions and prompts are shown on the upper eight digit display.

Once within the configuration menu the required function can be selected by scrolling through the menu using the ▼ and ▲ push buttons. The configuration menu is shown diagrammatically in Fig 11.

When returning to the display mode following reconfiguration, the BA367NE Counter will display dAtA followed by SAVE while the new information is stored in permanent memory.

If after accessing the configuration menu the interval between operating any front panel push button exceeds one minute, the BA367NE will automatically return to the display mode and any configuration changes will not be stored in permanent memory. When making changes to multiple configuration functions, it is therefore sensible to occasionally return to the display mode to save the changes that have already been made.

6.3 Summary of configuration functions

This section summarises all the configuration functions. When read in conjunction with Fig 11 it provides a quick aid for configuring the Counter. If more detail is required, each section contains a reference to a full description of the function.

Display	Summary of function
inPut	**Input** Contains sub-menu with two functions: inP.tYPE — Select Input type dEbounCE — Set debounce **See section 6.4**
	inP.tYPE Configures input to accept one of six types of input: oP.Col — Open collector * VoLtS L — Voltage pulse <1 >3V VoLtS H — Voltage pulse <3 >10V Coil — Magnetic pick-off Pr.dEt — Proximity detector * ContACt — Switch contact * * Link terminals 3 & 4 **See section 6.5**
	dEbounCE Defines level of input debounce applied to the pulse input to prevent false counting: dEFAuLt HEAVY LiGHt **See section 6.6**
Cnt EdGE	**Input pulse counting edge** Defines whether the Counter is incremented/decremented on the leading or trailing edge of an input pulse. **See section 6.7**
uPdAtE	**Display update interval** Defines the interval between display updates between 0.5 and 5 seconds. **See section 6.8**

Display	Summary of function
di SP- 1	**Upper display** Defines whether rAtE or totAL are shown on the upper display. The other variable will be shown on the lower display, providing the lower display is on in function di SP-2. **See section 6.9**
di SP-2	**Lower display** Turns the lower display, which normally shows rate, on or oFF. **See section 6.10**
dP	**Position of decimal points** Defines the position of the decimal point in both the total and rate displays. **See section 6.11**
SCALE.t	**Total Scale Factor** SCALE.t is a dividing factor that converts the number of input pulses into the required total display in engineering units. SCALE.t may be adjusted between 0.0001 & 99999. e.g. if one input pulse represents 1 centimetre of dispensed cable and the total display is required in metres, SCALE.t should be set to 100.0 which is the number of centimetres in a metre. The total display is independent of the rate display. **See section 6.12**
SCALE.r	**Rate scale factor** SCALE . r is a dividing factor that converts the input pulse rate into the required rate display in engineering units. SCALE . r may be adjusted between 0.0001 and 99999. e.g. if one pulse represents 2 pump strokes and the rate display is required in pump strokes, SCALE . r should be set to 2.0. The rate display is independent of the total display. **See section 6.13**

Display	Summary of function
t-bASE	**Timebase** Selectable multiplier allowing rate to be displayed in units per second, per minute or per hour. Select: tb-01 for rate / second tb-60 for rate / minute tb-3600 for rate / hour **See section 6.14**
FiLtEr	**Display filter** Is an adjustable digital filter to reduce the noise on the rate display. The filter has two parameters each represented by a digit adjustable between 0 and 9. The first digit defines the amount of filtering applied to the display, the second digit the deviation from the displayed rate at which the filter will be overridden and the rate display will move rapidly to the new value. **See section 6.15**
uP or dn	**Direction of count** Determines whether input pulses increment or decrement the total display. **See section 6.16**
CLr VAL	**Reset value** Defines a preset number to which the total display will be set when the BA367NE Counter is locally or remotely reset. Enables the instrument to count down from a preset number. **See section 6.17**

Display	Summary of function
LoC CLr	**Local clear** Contains sub-menu with two functions enabling the total and the grand total to be reset via the front panel push buttons while the Counter is in the display mode. **See section 6.18** CLr tot When on is selected total display is reset when ▼ and ▲ buttons are operated simultaneously for more than 2 seconds in the display mode. **See section 6.19** CLr Gtot When on is selected the grand total may be reset when E and ▲ buttons are operated simultaneously for more than 10 seconds in the display mode - see section 2.2 for details. **Note:** Once reset, the grand total can not be restored. **See section 6.20**
CLr Gtot	**Resets grand total to zero from within configuration menu.** This function resets the grand total to zero from within the configuration menu when CLr YES is selected. **Note**: Once reset, the grand total can not be recovered. **See section 6.21**

Display	Summary of function
CodE	**Access code** Defines a four digit alphanumeric code that must be entered to gain access to the configuration menu. Default code 0000 disables the security function and allows unrestricted access to all configuration functions. **See section 6.22**
rSEt dEF	**Reset to factory defaults** Returns the BA367NE Counter to the factory defaults shown in section 6.0 To prevent accidental use the request must be confirmed by entering SurE before the reset will be executed. **See section 6.23**

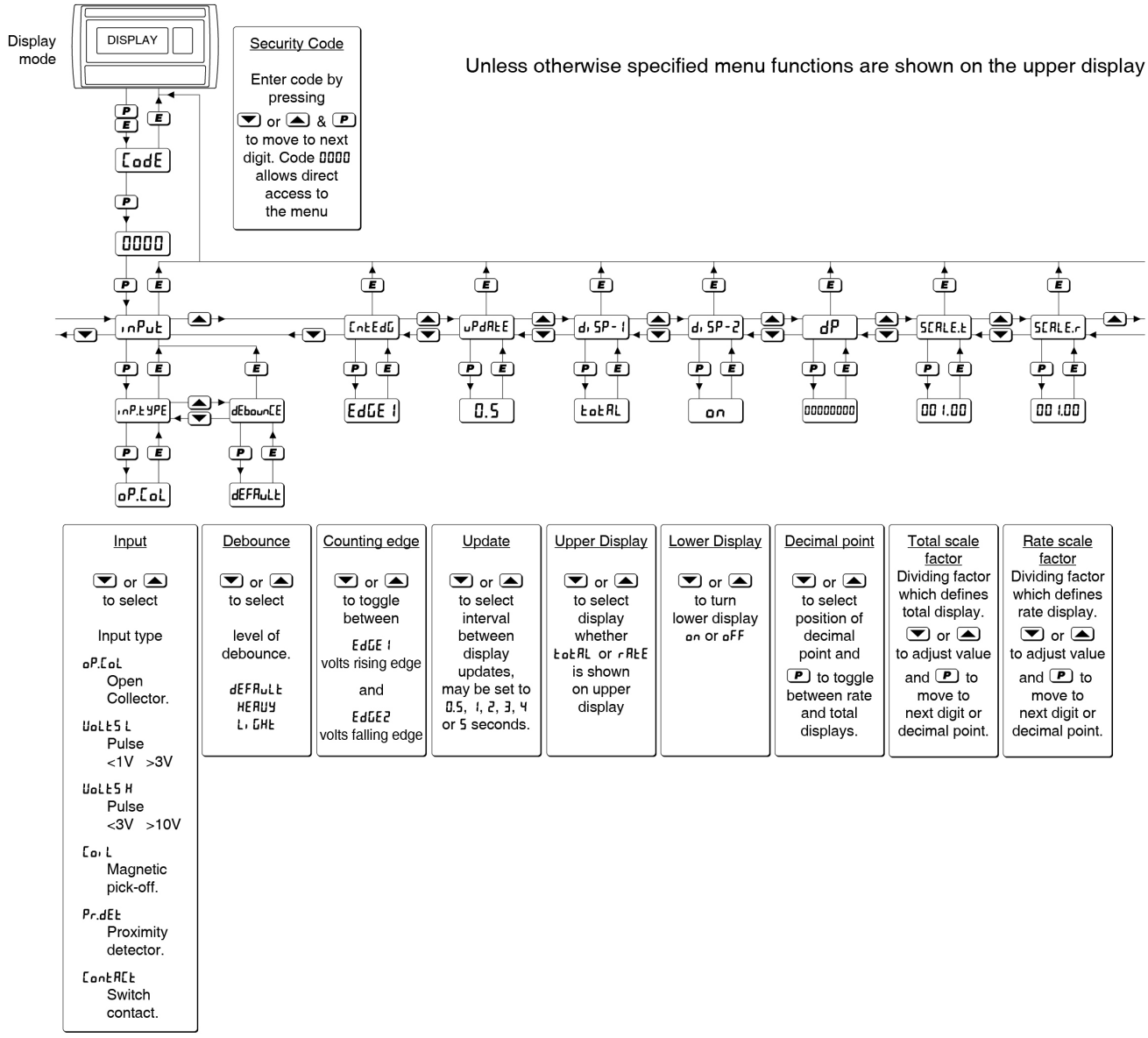
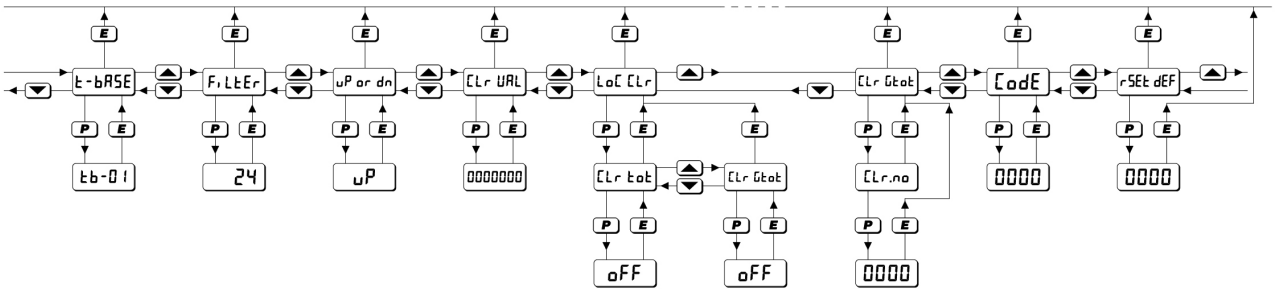


Fig 11 Configuration menu

Optional pulse output, alarms
or 4/20mA output appear here



Timebase

▼ or ▲ to select rate display timebase.

tb-01 for pulses/sec

tb-60 for pulses/min

tb-3600 for pulses/hour

Filter input

▼ or ▲ to adjust value of each digit and P to transfer control to the next digit.

First digit: filter magnitude

Second digit: step response

Note:
While making adjustments the filtered rate display is shown on lower display so stability can be assessed

Direction of count

▼ or ▲ to toggle between uP and dn

Reset value

▼ or ▲ to adjust value of each digit and P to transfer control to the next digit.

Local total reset

▼ or ▲ to turn the local total reset function on or oFF. When on is selected, Total may be reset when ▼ and ▲ are pressed simultaneously for more than 3 seconds in the display mode.

Local grand total reset

▼ or ▲ to turn the local grand total reset function on or oFF. When on, grand total display may be reset when E and ▲ are pressed simultaneously for more than 10 seconds in the display mode.

Grand total reset

Press ▼ or ▲ to select CLr.YES to reset grand total to zero

Confirm instruction by entering SurE. Press ▼ or ▲ to adjust each digit and P to move to next digit

Define Security Code

Enter by pressing ▼ or ▲ and P to move to next digit.

Default code 0000 allows direct access to configuration menu

Reset configuration to factory defaults

Confirm instruction by entering SurE. Press ▼ or ▲ to adjust each digit and P to move to next digit

6.4 Input: inPut

The Input function contains two sub-functions inP.tYPE and dEbounCE that define the type of input and the amount of input noise rejection.

6.5 Input type: inP.tYPE

inP.tYPE is a sub-menu in the inPut function which defines the type of input transducer or input pulse that the instrument will count. To check or change the type of input, select inPut in the configuration menu and press (P) which will reveal the inP.tYPE prompt, pressing (P) again will show the existing Input setting. If set as required press (E) twice to return to the configuration menu, or repeatedly press the (▼) or (▲) button until the required type of input is displayed and then press (E) twice to return to the configuration menu.

One of following six types of input may be selected:

		Switching thresholds	
		Low	**High**
oP.Col	Open collector [2]	2	10kΩ
VoLt5 L	Voltage pulse low [1]	1	3V
VoLt5 H	Voltage pulse high[1]	3	10V
Coil	Magnetic pick-off	0	40mV
Pr.dEt	Proximity detector [2]	1.2	2.1mA
ContACt	Switch contact [2]	100	1000Ω

Notes:

1. Maximum voltage input +28V.
2. For transducers connected to the input that require energising i.e. proximity detectors, switch contacts or open collector transducers, terminals 3 & 4 of the BA367NE should be linked together.
3. To count correctly, the input pulse must fall below the lower switching threshold and rise above the higher switching threshold.
4. See section 6.6 for maximum counting frequency.

6.6 Input debounce: dEbounCE

dEbounCE is an adjustable sub-menu in the inPut function which prevents the input miscounting when the input pulse has noisy edges, such as those resulting from a mechanical contact closing and bouncing.

Three levels of protection may be selected. The amount of debounce applied depends upon the type of Counter input that has been selected in the inP.tYPE function.

Select inPut in the configuration menu and press (P) which will reveal the inP.tYPE prompt, press the (▼) or (▲) button to select dEbounCE followed by (P) to reveal the existing setting. Pressing the (▼) or (▲) button will scroll through the three levels. When the required level has been selected, pressing (E) twice will enter the selection and return the display to the configuration menu.

The following table shows the minimum time that the input pulse must be continuously above the upper input switching threshold and continuously below the lower switching threshold to ensure that the Counter processes the input pulse. Input switching thresholds are shown in section 6.5.

debounce level	**Min input pulse width**	
	Type of Input	
	Contact	**All others**
Default	1600µs	40µs
Heavy	3200µs	350µs
Light	400µs	5µs

The maximum counting frequency of the BA367NE depends upon the debounce level selected, the shape of the input pulse and its amplitude. The following table assumes a square wave input and is included for guidance. The maximum counting frequency will be lower if the input pulses have sloping edges and the pulse amplitude only slightly exceeds the input switching thresholds.

ONLY FOR GUIDANCE		
debounce level	**Max counting frequency**	
	Type of input	
	Contact	**All others**
Default	250Hz	12kHz
Heavy	120Hz	2kHz
Light	1000Hz	100kHz

The minimum counting frequency is 0.01Hz. Below this frequency the rate display is forced to zero.

6.7 Input pulse counting edge: CnE EdGE

This function defines whether the BA367NE Counter is incremented/decremented on the leading or trailing edge of an input pulse.

To check or change the input pulse edge on which the count occurs select CnE EdGE from the configuration menu and press P which will reveal EdGE 1 or EdGE 2. If required press the ▼ or ▲ button to change the setting, followed by the E button to return to the configuration menu.

EdGE 1

Type of input	Counting edge
Voltage	Low to high
Switch contact	Closed to open
Open collector	Closed to open
Proximity detector	High to low current

EdGE 2

Type of input	Counting edge
Voltage	High to low
Switch contact	Open to closed
Open collector	Open to closed
Proximity detector	Low to high current

6.8 Display update interval: uPdAtE

If either the rate or the total display is likely to change rapidly, a longer interval between display updates may simplify reading. This function allows one of six different display intervals between 0.5 and 5 seconds to be selected. The selected display update interval does not affect the update time of any other instrument function.

To adjust the update interval select uPdAtE from the configuration menu and press P to reveal the current update interval. Pressing the ▼ or ▲ button will scroll through the six times. When the required interval has been selected press E to enter the selection and return to the configuration menu.

6.9 Upper display: d1 SP-1

Usually the total count is shown on the larger upper eight digit display, but this function reverses the display locations allowing rate to be shown on the larger upper display and total on the smaller lower display.

To check the setting for the display, select d1 SP-1 from the configuration menu and press P which will reveal if the display is showing rAtE or totAL. The setting can be changed by pressing the ▼ or ▲ button followed by the E button to enter the selection and return to the configuration menu.

6.10 Lower display: d1 SP-2

This function turns the lower display on or oFF. When turned oFF, the BA367NE will only have one eight digit display which may be configured in the d1 SP-1 function to show the total count or rate.

To check the setting for the lower display, select d1 SP-2 from the configuration menu and press P that will reveal if the lower display is on or oFF. The setting may be changed by pressing the ▼ or ▲ button followed by the E button to enter the selection and return to the configuration menu.

6.11 Position of the decimal points: dP

The upper and lower displays have eight and six digits respectively. This function enables the position of the decimal point in both displays to be independently positioned as shown below.

Upper display		
Total	000.0.0.0.0.0	1 of 5 positions or absent
Rate	00.0.0.0.0	1 of 4 positions or absent
Lower display		
Total	0.0.0.0.0.0	1 of 5 positions or absent
Rate	0 0.0.0.0.0	1 of 4 positions or absent

To adjust the position of the decimal points select dP from the configuration menu and press P. The upper display defined as the rate or total display by function d1 SP-1 (section 6.9) will be activated and identified by the display annunciator as Rate or Total. The decimal point, which may be positioned as shown in the table above, is moved by operating the ▼ or ▲ push button. The ▼ button moves the position of the decimal point to the left and the ▲ button moves the decimal point position to the right.

When the decimal point in the upper display has been positioned pressing the P button will transfer control to the lower display variable, but it will be shown and annunciated on the larger upper display. The position of the decimal point may be positioned in the same way by operating the ▼ and ▲ push buttons. When both decimal points are positioned as required, enter the settings and return to the configuration menu by operating the E button.

Note:

Adjustment of a decimal point position will disable the following outputs which must be re-enabled after the adjustment is complete:

Pulse output

Optional Alarm outputs.

Optional 4/20mA output.

6.12 Total scale factor: SCALE.t

SCALE.t is a dividing factor adjustable between 0.0001 and 99999 that enables the total to be displayed in engineering units. e.g. if one input pulse represents 1 centimetre of dispensed cable and the total display is required in metres, SCALE.t should be set to 100.0 which is the number of centimetres in a metre. If a display of the total number of input pulses is required, SCALE.t should be set to 1.0. The total display is independent of the rate display.

To check or change the total scale factor select SCALE.t from the configuration menu and press P which will reveal the existing value with one digit flashing. The value of the flashing digit may be changed by pressing the ▼ or ▲ button. When this digit has been adjusted as required, pressing P will transfer control to the next digit. When all the digits have been adjusted pressing P will transfer control to the decimal point that may be positioned between any of the digits, or may be omitted by moving it to the right of the least significant digit. When the total scale factor has been entered, press P to return to the SCALE.t prompt in the configuration menu.

Note:

Adjustment of SCALE.t will disable the following ouputs which must be re-enabled after the adjustment is complete:

Optional Pulse output

Optional Alarm outputs.

Optional 4/20mA output.

6.13 Rate scale factor: SCALE.r

SCALE.r is a dividing factor adjustable between 0.0001 and 99999 that enables the rate display to be in engineering units. e.g. if one input pulse represents 2 pump strokes and the rate display is required in pump strokes, SCALE.r should be set to 2.0. If just the rate of input pulses is required, SCALE.r should be set to 1.0. The rate display is independent of the total display.

The units of the rate display are counts per unit of time. The unit of time is the timebase of the instrument which is determined by t-bASE described in section 6.14.

To check or change the rate scale factor select SCALE.r from the configuration menu and press P which will reveal the existing value with one digit flashing. The value of the flashing digit may be adjusted by pressing the ▼ or ▲ button.

When this digit has been adjusted as required, pressing P will transfer control to the next digit. When all the digits have been adjusted pressing P will transfer control to the decimal point that may be positioned between any of the digits, or may be omitted by moving it to the right of the least significant digit. When the required rate scale factor has been entered, press E to return to the SCALE.r prompt in the configuration menu.

Note:

Adjustment of SCALE.r will disable the following outputs which must be re-enabled after the adjustment is complete:

Optional Pulse output

Optional Alarm outputs.

Optional 4/20mA output.

6.14 Timebase: t-bASE

The timebase multiplies the rate display by 1, 60 or 3,600 depending upon whether the BA367NE Counter is required to display rate per second, per minute or per hour. See Fig 10.

To check or change the timebase, select t-bASE from the configuration menu and press P which will reveal the current setting. Pressing the ▼ or ▲ button will scroll through the three options:

tb-1	for pulses / second
tb-60	for pulses / minute
tb-3600	for pulses / hour

When the required multiplier is displayed press E to return to the t-bASE prompt in the configuration menu.

6.15 Display filter: FiLtEr

The digital display filter has two independent adjustable parameters enabling the rate display response to be tailored for optimum performance. The filter parameters are controlled by a two digit number. The first digit defines the amount of filtering applied to the display as shown below.

First digit	Filter time constant Seconds
0X	0
1X	1.3
2X	4.3
3X	6.5
4X	8.7
5X	11.3
6X	15.7
7X	20.9
8X	25.2
9X	31.5

The second digit defines the deviation from the displayed rate at which the filter will be overridden and the rate display will move rapidly to the new value.

Second digit	Magnitude of step change which will produce a rapid response
X0	Off
X1	1%
X2	2%
X3	4%
X4	8%
X5	12%
X6	16%
X7	24%
X8	32%
X9	64%

By careful adjustment of the two parameters a stable display with an acceptable input step response can be obtained for most applications.

During commissioning it is recommend that initially the second digit is set to 0 (off) and the first digit is adjusted to provide acceptable rate display stability. The second digit should then be increased until the selected step size is greater than the noise on the display signal, at which setting the rate display will become stable. These will be the optimum filter parameters for acceptable rate display stability and a fast response to a large rate signal change.

To check or change the filter select FiLtEr in the configuration menu and press (P) which will reveal the current settings with the first digit flashing. Pressing the (▼) or (▲) button will adjust the flashing digit and (P) will transfer control to the second digit. While making adjustments the filtered rate display is shown on the lower display so that stability can be assessed while adjustments are being made. When set as required, press the (E) button to enter the revised parameters and return to the FiLtEr prompt in the configuration menu.

6.16 Direction of count: uP or dn

This function defines whether input pulses increment or decrement the total display. i.e. whether the BA367NE is an up-counter or a down-counter.

When configured as a down-counter with a non-zero number entered for the reset value CLr VAL, the BA367NE will count down from the reset value to zero.

To check or change the count direction select uP or dn from the configuration menu and press (P) which will reveal the present setting. uP indicates that the instrument is an up-counter and dn that it is a down counter. Pressing the (▼) or (▲) buttons will toggle the instrument between the two settings. When set as required, press the (E) button to enter the setting and return to the configuration menu.

6.17 Reset value: CLr VAL

This function defines the value to which the total display is reset when the local or remote reset are operated. This allows the BA367NE to be used as a preset down-counter.

When the instrument is used as an up-counter, CLr VAL is normally set to zero.

To check or change the reset value select CLr VAL from the configuration menu and press (P) which will reveal the current setting with one digit flashing. The flashing digit may be adjusted by pressing the (▼) or (▲) button. When this digit is correct, pressing (P) will transfer control to the next digit.

When all the digits have been adjusted press the (E) button to enter the revised number and return to the configuration menu.

6.18 Local reset: LoC CLr

The Local reset function contains two sub-functions CLr tot and CLr GtoT which when enabled allow the total display and grand total to be reset via the instrument front panel push buttons while the BA367NE Counter is in the display mode.

6.19 Local total reset: CLr tot

CLr tot is a sub-menu in the LoC CLr function. When activated it allows an operator to reset the total display to the reset value [see section 6.17] while the BA367NE Counter is in the display mode by operating the ▼ and ▲ push buttons simultaneously for more than two seconds.

To check or change the setting select LoC CLr in the configuration menu and press P which will reveal the CLr tot prompt, operating P again will show if the local total reset is on or oFF. If set as required operate the E button twice to return to the configuration menu, or the ▼ or ▲ button to change the setting followed by the E button twice to enter the change and return to the LoC CLr prompt in the configuration menu.

Note:

The total display may also be remotely reset to the reset value by connecting terminals RS1 and RS2 together for more than one second. See sections 3.6 and 4.3 of this manual.

6.20 Local grand total reset: CLr Gtot

The grand total is a separate sixteen digit counter which is incremented or decremented in parallel with the total display, but is not reset when the total display is reset. The grand total may be viewed in the display mode in two eight digit sections as described in section 2.2 of this manual.

CLr Gtot is a sub-menu in the LoC CLr function which when activated allows the operator to reset the grand total display to zero from the display mode by operating the E and ▲ push buttons simultaneously for more than ten seconds.

To check or change setting select LoC CLr in the configuration menu and press P which will reveal CLr tot. Using the ▼ or ▲ button select CLr Gtot and press P which will show if local grand total reset is on or oFF. If set as required operate the E button twice to return to the configuration menu, or the ▼ or ▲ button to change the setting followed by the E button twice to enter the change and return to the LoC CLr prompt in the configuration menu.

Note:

Once reset, the grand total can not be recovered.

6.21 Reset grand total from configuration menu: CLr Gtot

The grand total is a separate sixteen digit counter which is incremented or decremented in parallel with the total display, but is not reset when the total display is reset. The grand total may be viewed in the display mode in two eight digit sections as described in section 2.2 of this manual.

To zero the grand total from within the configuration menu select CLr Gtot and press P which will cause the instrument to display CLr.no with no flashing. Using the ▼ or ▲ push button change CLr no to CLr YES pressing P will result in the instrument displaying 0000 with the first digit flashing. This is a request to confirm the reset instruction by entering SurE. Using the ▼ or ▲ button set the first flashing digit to S and press P to transfer control to the second digit which should be set to u. When SurE has been entered pressing the E button will reset the grand total which will be confirmed by a brief display of Gt CLrd, the instrument will automatically return to the CLr Gt prompt in the configuration menu.

Note:

Once reset, the grand total can not be recovered.

6.22 Security code: CodE

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 CodE from the configuration menu and press P which will cause the BA367NE Counter to display 0000 with one digit flashing. The flashing digit may be adjusted using the ▼ and ▲ push buttons, when set as required operating the 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 BA367NE Counter is returned to the display mode.

Please contact BEKA associates sales department if the security code is lost.

6.23 Reset configuration to factory defaults: rSEt dEF

This function returns the BA367NE Counter to the factory defaults shown in section 6.0. To prevent accidental use the request must be confirmed by entering SurE before the configuration change will be executed.

Select rSEt dEF from the configuration menu and press P the instrument will display 0000 with the first digit flashing. To confirm the instruction to reset all the configuration functions to factory defaults SurE must be entered. Using the ▼ or ▲ button set the first flashing digit to S and press P to transfer control to the second digit which should be set to u. When SurE has been entered pressing the E button will reset all the configuration functions to the factory default settings and zero both the total display and the grand total. While resetting the BA367NE Counter will display - - - - - - - - before automatically returning to the display mode when the operation is complete.

6.24 Display overflow

The BA367NE Counter total has a maximum display range of -9999999 to 99999999 when shown on the eight digit upper display. If this range is exceeded the display will be as shown below with all of the decimal points flashing:

Underrange	-9.9.9.9.9.9.9
Overrange	9.9.9.9.9.9.9

When the total is shown on the lower six digit display the maximum display range is -99999 to 999999.

When a total overflow occurs the actual total may be obtained from the instrument's grand total display which has sixteen digit - see 2.2.

To prevent future total display overflows occurring the total scale factor SCALE.t and the position of the decimal point in the total display dP should be reviewed.

7. CONFIGURATION EXAMPLE

A BA367NE Counter is required to display the total number of strokes that a reciprocating pump makes in thousands of strokes on the larger upper display and to show the speed of pumping in strokes per hour on the lower display. The stroke sensor is a proximity detector which produces four pulses per stroke. The total display is only to be resettable by an external contact, not from the BA367NE Counter front panel. Similarly the grand total is not to be resettable from the BA367NE Counter front panel. To simplify reading the BA367NE display is to be updated every 3 seconds and to prevent tampering the instrument configuration menu is to be protected by security code 1209.

The BA367NE may be configured on-site without disconnection from the power supply or from the proximity detector. This example assumes that the BA367NE initially has default factory configuration.

If after accessing the configuration menu the interval between operating any front panel push button exceeds one minute the BA367NE will automatically return to the display mode and any configuration changes will not be stored in permanent memory. When making multiple changes it is therefore sensible to occasionally return to the display mode to save the changes that have already been made.

Step 1 **Enter the configuration menu**

Put the BA367NE Counter in the configuration mode by simultaneously pressing the P and E push buttons. Assuming a security code has not already been entered the instrument will respond by displaying InPut which is the first parameter in the configuration menu. See Fig 11.

Step 2 **Select the type of inputs**

With InPut displayed; press P to reveal the InPut.tYPE submenu and press P again to enter the function. Using the ▼ or ▲ button select PrdEt, the input for a 2-wire proximity detector and then return to the InPut prompt in the configuration menu by pressing E twice. A proximity detector requires energising therefore terminals 3 and 4 of the BA367NE should be linked together.

Step 3 Select display update

To aid reading the display the BA367NE is only to be updated every 3 seconds.
Select uPdAtE from the configuration menu and press P. Using the ▼ or ▲ button select 3 and press E to return to the uPdAtE prompt in the configuration menu.

Step 4 Define function of upper display

In the example the total number of strokes is required on the larger eight digit upper display.
Select di SP-1 from the configuration menu and press P which will reveal if the upper display is showing rAtE or totAL. Using the ▼ or ▲ button select totAL followed by the E button to enter the selection and return to the configuration menu.

Step 5 Activate lower rate display

A rate display is required so the lower display must be activated.
Select di SPLAY2 from the main menu and press P to show the existing setting. Using the ▼ or ▲ button select on followed by E to enter the selection and return to the configuration menu.

Step 6 Position of decimal point

In this example the BA367NE is required to display total and rate with no decimal points.

Select dP. from the configuration menu and press P. The BA367NE will show and identify the total display with all the digits activated. Using the ▼ or ▲ button position the decimal point to the right of the least significant digit i.e. not visible.
Operating the P button will show and identify the rate display with all the digits activated, Again using the ▼ or ▲ button position the decimal point to the right of the least significant digit i.e. not visible.
Finally press E to return to the configuration menu.

Step 7 Enter the total scale factor

In this example the proximity detector produce four pulses per pump stroke. The BA367NE is required to display thousands of pump strokes therefore the total scale factor SCALE.t should be set to (4 x 1000) = 4000.

Select SCALE.t from the configuration menu and press P to view the current value with one digit flashing. Use the ▼ or ▲ button to adjust the flashing digit and the P button to transfer control to the next digit and to the decimal point. Enter 4000.0 and return to the SCALE.t prompt in the configuration menu by pressing E.

Step 8 Enter the rate scale factor

The proximity detector produces four pulses per pump stroke and the rate display is required in strokes per hour, therefore the rate scale factor SCALE.r should be set to 4.0.

Select SCALE.r from the configuration menu and press P to view the current value with one digit flashing. Use the ▼ or ▲ button to adjust the flashing digit and the P button to transfer control to the next digit and to the decimal point. Enter 4.0 and return to the SCALE.r prompt in the configuration menu by pressing E.

Step 9 Set the display timebase

In this example the rate display is required in pump strokes per hour.
Select t-bASE from the configuration menu and press P to reveal the current setting. Using the ▼ or ▲ button scroll through the three options and select tb-3600. Return to the t-bA E prompt in the configuration menu by pressing E.

Step 10 Adjust the rate display filter

The rate display filter parameters should be adjusted experimentally after installation to provide a stable rate display with an acceptable step response.

During commissioning it is recommend that initially the second digit of the rate parameters is set to 0 (step response off) and the first digit (amount of filtering) is adjusted to provide acceptable rate display stability.

The second digit should then be increased until acceptable rate display stability is once again achieved.
To adjust the filter parameters select FiLtEr from the main menu and press (P) to reveal the current setting. The first digit will be flashing and may be adjusted using the (▼) or (▲) button. The (P) button will transfer control to the second digit. When both are set as required, return to the FiLtEr prompt in the configuration menu by pressing (E).

Note: While adjusting the filter, the rate is shown on the lower display so that stability can be assessed.

Step 11 Define the security code

Defining an access security code prevents unauthorised access to the configuration menu. Select CodE in the configuration menu and press (P) which will reveal the existing security code with the first digit flashing. Enter the new code 1209 using the (▼) or (▲) button to adjust the flashing digit and the (P) button to transfer control to the next digit. When the new code has been entered, press (E) to return to the configuration menu.

Step 12 Return to the display mode

Following completion of configuration, return the BA367NE to the display mode by pressing (E). The instrument will display dAtA followed by SAVE while the configuration changes are stored in permanent memory.

The BA367NE was assumed to initially have factory default configuration, therefore the counting edge, counting direction, local total and local grand total resets were not reconfigured as they already complied with the requirements for this example.

During commissioning the debounce and filter functions may need adjustment to obtain a stable display.

8. MAINTENANCE

8.1 Fault finding during commissioning

If a BA367NE fails to function during commissioning the following procedure should be followed:

Symptom	Cause	Check:
No display	No power supply, or incorrect wiring. Note: Terminals 2, 6 & RS2 are interconnected within the instrument.	That there is between 10 and 30V on terminals 1 & 2 with terminal 1 positive.
Counter is receiving power but pulse input indicator not rotating.	No input pulses, incorrect input configuration, incorrect linking of terminals 3 & 4.	Input configuration. Linking of terminals 3 & 4. That input signal polarity is correct.
Pulse input indicator rotating but incorrect rate display.	Incorrect rate display calibration	SCALEr t-bASE
Pulse indicator indicator rotating but incorrect total display.	Incorrect total display calibration. Remote reset switch contacts closed.	SCALEt That RESET annunciator is not activated. If it is, check reset wiring and switch.
Unstable rate display	Noisy pulse input signal	Eliminate source of electrical noise. Increase debounce and/or display filter.
Unable to enter configuration menu.	Incorrect security code	That the correct security code is being used. Contact BEKA if code is lost.
Optional 4/20mA or pulse output does not function	Output has been disabled following configuration change	Re-enable output
Optional alarms do not function	Alarms have been disabled following configuration change.	Re-enable both alarms.

8.2 Fault finding after commissioning

EN 60079-17 *Electrical installations inspection and maintenance* permits live maintenance in Zone 2 if a risk analysis demonstrates that this does not introduce an unacceptable risk. The removal of covers [opening of Ex n enclosure] is permitted if this can be done without contaminating the interior of the instrument with dust or moisture. Some end-users may prefer not to permit live maintenance to minimise risk.

ENSURE PLANT SAFETY BEFORE STARTING MAINTENANCE

Live maintenance within the hazardous area should only be performed when it is permitted by risk analysis, or when there is no risk of a flammable atmosphere being present.

If a BA367NE fails after it has been functioning correctly, the following table may help to identify the cause of the failure.

Symptom	Cause	Check:
No display	No power supply.	That there is between 10 and 30V on terminals 1 & 2 with terminal 1 positive
Pulse input indicator not rotating.	No input pulses	Output from sensor. Wiring between sensor and BA367NE Counter
Unstable rate display	Noisy pulse input signal	Locate source of electrical noise, or increase debounce and rate display filter.

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

8.3 Servicing

We recommend that faulty BA367NE Counters are returned to BEKA associates or to our local agent for repair.

8.4 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.

8.5 Guarantee

Instruments 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.

8.6 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.

9. ACCESSORIES

9.1 Scale card

The BA367NE Counter has a window on the right hand side of the display through which a scale card showing the units of measurement is visible. New Counters are fitted with a scale card showing the units of measurement specified when the instrument was ordered, if the units are not specified 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 Counter on-site without opening the instrument enclosure or removing it from the panel, See section 5.5 of this instruction manual.

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

9.2 Tag information

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

9.3 Alarms

The BA367NE can be supplied with factory fitted dual solid state, single pole alarm outputs that may be independently programmed as high or low, rate or total alarms with normally open or normally closed outputs.

Note: Only one of the three output options can be fitted.

Configurable functions for each alarm include adjustable setpoint, alarm delay time and alarm silence time. Hysteresis may be applied to rate alarms.

CAUTION

Alarm outputs should not be used for critical safety applications such as a shut down system.

When the BA367NE Counter power supply is turned off or disconnected, the alarm outputs will open irrespective of whether normally open or normally closed outputs have been selected. When designing a system an open output should therefore be chosen for the alarm condition.

Alarm annunciators on the instrument display indicate the status of each alarm. If an alarm delay or silence time has been selected the annunciator will flash during the delay or silence period.

The BA367NE internal counters are up-dated and compared with the alarm setpoint twice per second, irrespective of the display update time selected. This may result in an alarm being delayed for up to half a second after the rate or total has exceeded the setpoint.

9.3.1 Solid state output

Each alarm has a galvanically isolated single pole solid state switch output as shown in Fig 12. The outputs are polarised and current will only flow in one direction. Terminals A1 and A3 should be connected to the positive side of the supply.

Ron = less than 5Ω + 0.7V
Roff = greater than 1MΩ

Note: Because of the series protection diode some test meters may not detect a closed alarm output.

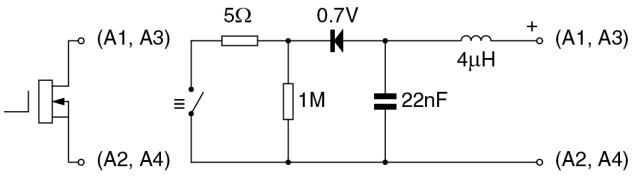


Fig 12 Equivalent circuit of each alarm output

9.3.2 Type nA certification

Each alarm output is a separate galvanically isolated Ex nA circuit with the following input parameters:

Ui = 30V dc
Ii = 200mA

This allows each alarm output to switch any dc circuit providing that in normal operation the maximum supply voltage is not greater than 30V dc and the switched current is not greater than 200mA.

Providing that the BA367NE Counter is correctly installed in a panel enclosure located in Zone 2 complying with the requirements for Ex n protection, the two alarm outputs may be used to switch suitably protected equipment located in Zone 1 or 2 of a hazardous area, or equipment located in a safe area.

Fig 13 shows a typical application in which a BA367NE Counter, mounted in an Ex n panel enclosure located in Zone 2, is displaying the output from a Flameproof Ex d 2-wire flowmeter located in Zone 1. Alarm 1 is switching an Ex e sounder in Zone 1 and alarm 2 is switching a sounder located in the safe area.

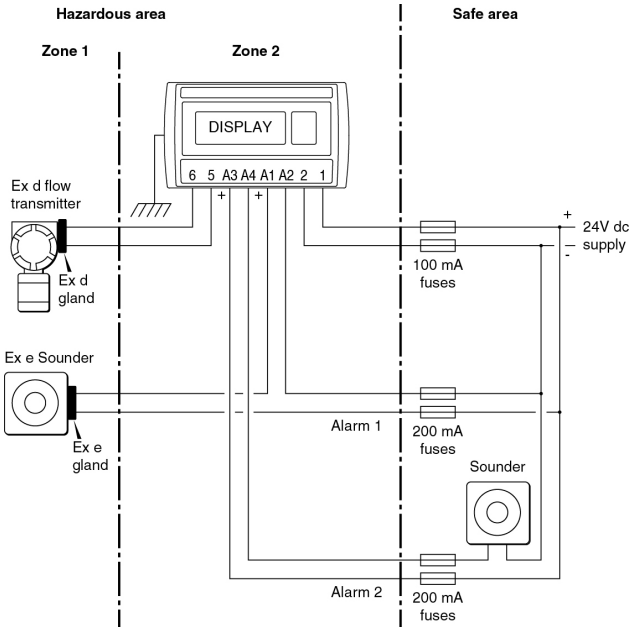


Fig 13 Typical alarm application
(Shown without recommended screened cables)

To comply with the requirements of EN 60079-14 *Electrical installations design, selection and erection*, each of the wires entering the hazardous area should be individually fused and contain a means of isolation. These two requirements are frequently satisfied by using fuse holders with easily removable fuses and removing the fuses to achieve isolation. This is a satisfactory method at the low voltages and currents common in instrumentation systems. Clear identification of, and easy access to the means of isolation is essential for their effective use. It is also necessary to ensure that the maintenance procedure makes sure that unauthorised re-closure of the switches does not occur. It is not considered necessary to have a means of isolation or electrical protection for the screen. Figure 2 illustrates an example of this type of fused terminal block.

For some application Ex nA instrumentation energised by a current limited power supply or instrument that can be switched off, is often considered adequate and to comply with the requirements of the standard.

9.3.3 Configuration summary

When a BA367NE is supplied with alarms the configuration menu is extended as shown in Fig 14. For simplicity Fig 14 only shows the configurable functions on the rate option of alarm AL1, the total options is identical except that total alarms do not have hysteresis. Alarm AL2 is identical to alarm AL1. The following table summarises each of the alarm configuration functions and includes a cross reference to more detailed information. Again only the functions on alarm AL1 are listed.

Display	Summary of function
EnbL	**Alarm enable** Enables or disables the alarm without changing the alarm parameters. See section 9.3.4
tYPE	**Type of alarm** Defines whether the alarm operates on the rate or total display. See section 9.3.5
SP 1r or SP 1t	**Alarm setpoint 1** Adjusts the alarm setpoint. The alarm is activated when the rate or total display equals the setpoint. **Note:** SP 1r is displayed for a rate alarm and SP 1t for a total alarm. See section 9.3.6
Hi.Lo	**Alarm function** Defines whether the alarm has a high or low function. See section 9.3.7
no.nC	**Normally open or normally closed output.** Determines whether the single pole alarm output is open or closed in the non-alarm condition. See section 9.3.8
HSEr	**Hysteresis** Adjusts the alarm hysteresis. Only available on a rate alarm. See section 9.3.9
dELA	**Alarm delay time** Adjusts the delay between the display equalling the setpoint and the alarm output being activated. See section 9.3.10
S. L	**Alarm silence time** Defines the time that the alarm output remains in the non-alarm condition following acceptance of an alarm. See section 9.3.11
FLSH	**Flash display when alarm occurs** When enabled, alternates the rate or total display between process value and alarm reference AL 1 or AL2 when an alarm output is activated. See section 9.3.12
ACSP	**Access setpoint** Sub-menu that enables direct access to the alarm setpoints from the display mode (when BA367NE is counting) and defines a separate security code. See section 9.3.13

9.3.4 Alarm enable: EnbL

This function allows the alarm to be enabled or disabled without altering any of the alarm parameters. Using the ▼ or ▲ push button select AL1 or AL2 from the configuration menu and press P to access the alarm sub-menu. Press the ▼ or ▲ button until EnbL is displayed followed by P which will reveal if the function is on or oFF. The setting can be changed by pressing the ▼ or ▲ push button followed by the E button to return to the alarm sub-menu.

9.3.5 Type of alarm: tYPE

Alarm 1 and Alarm 2 are totally independent, both may be rate or total alarms, or one may be conditioned for rate and the other for total.
Using the ▼ or ▲ push button select tYPE from the selected alarm sub-menu and press P to check or change the function. The ▼ or ▲ push button will toggle the selection between rAtE and totAL, when set as required press the E button to return to the alarm sub-menu.

Note: When tYPE is changed, the alarm configuration is automatically reset to the default values and the alarm is disabled. It must therefore be reconfigured before use.

9.3.6 Setpoint adjustment: SP1x & SP2x

The rate alarm setpoints SP1r and SP2r may be positioned anywhere between 000000 and 999999 and the total alarm setpoint SP1t and SP2t anywhere between 00000000 and 99999999.

All the setpoints are adjusted in the same way, for example to adjust the setpoint of Alarm 1 which has been configured to operate on the rate display. Using the ▼ or ▲ push button select SP1r in the AL1 sub-menu and press P which will reveal the existing setpoint with one digit flashing. The required setpoint can be entered using the ▼ or ▲ push button to adjust the flashing digit and the P button to transfer control to the next digit. When set as required press E to enter the value and return to the SP1r prompt in the alarm 1 sub-menu.

9.3.7 Alarm function: Hi.Lo

Alarm 1 and Alarm 2 are totally independent, both may be Hi or Lo, or one may be conditioned as a Hi alarm and the other as a Lo alarm.
Using the ▼ or ▲ push button select Hi.Lo from the selected alarm sub-menu and press P to check or change the function. The ▼ or ▲ push button will toggle the alarm function between Hi and Lo, when set as required, press the E button to return to the Hi.Lo prompt in the alarm sub-menu.

9.3.8 Alarm output status: no.nC

Each single pole alarm output may be open or closed in the non-alarm condition. When the BA367NE power supply is turned off or disconnected, the alarm output(s) will open irrespective of whether normally open or normally closed outputs have been selected. Therefore when designing an alarm system normally closed nC should be selected so that the output opens when an alarm occurs or if the power supply fails.

Using the ▼ or ▲ push button select no.nC from the selected alarm sub-menu and press P to check or change the function. The ▼ or ▲ push button will toggle the contact status between no and nC, when set as required, press the E button to return to the no nC prompt in the alarm sub-menu.

9.3.9 Hysteresis: HSt r

Hysteresis is only available on rate alarms so the HSt r function only appears in the configuration sub-menu when alarm tYPE has been set to rAtE. During configuration hysteresis is shown in the units of rate previously configured for the rate display.

Using the ▼ or ▲ push button select HSt r in the selected alarm sub-menu and press P which will reveal the existing hysteresis with one digit flashing. The required hysteresis can be entered using the ▼ or ▲ push button to adjust the flashing digit and the P button to transfer control to the next digit. When set as required press E to enter the value and return to the HSt r prompt in the alarm sub-menu.

e.g. A Counter configured to display a rate of 0 to 5000, with a high alarm set at 4000 and hysteresis of 100 will perform as follows:

> High alarm will be activated when rate equals or exceeds 4000, but will not reset until the rate falls below 3900.

9.3.10 Alarm delay: dELA

This function enables activation of the alarm output to be delayed for a fixed time following the alarm condition occurring. The delay can be set in 1 second increments up to 3600 seconds. If a delay is not required zero should be entered.

To adjust the delay select dELA using the ▼ or ▲ push button in the selected alarm sub-menu and press P which will reveal the existing delay time in seconds with one digit flashing. The required delay time can be entered using the ▼ or ▲ push button to adjust the flashing digit and the P button to transfer control to the next digit. When set as required press E to enter the value and return to the dELA prompt in the alarm sub-menu.

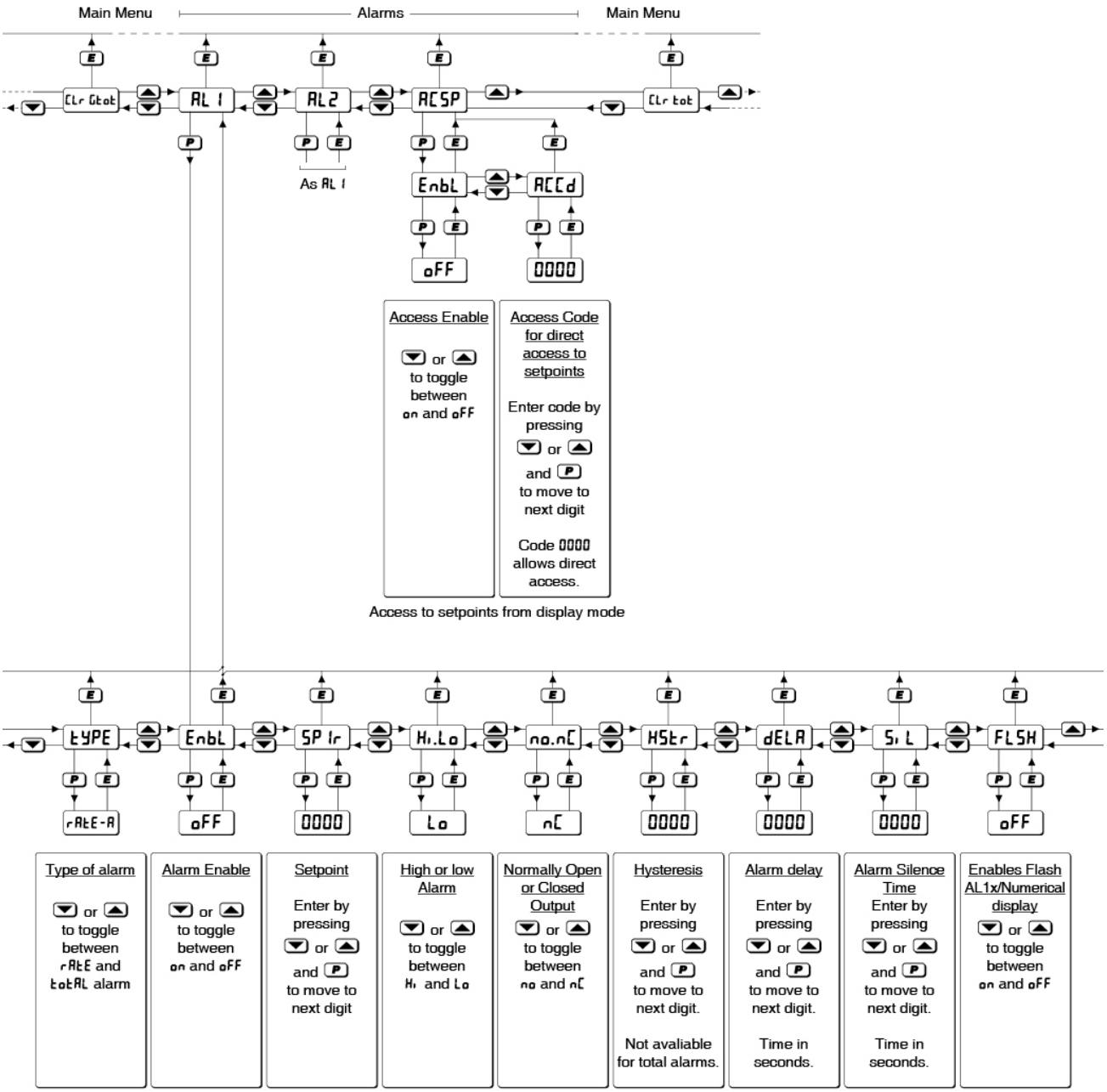


Fig 14 Alarm menu structure

The Counter's alarm annunciator will start flashing immediately an alarm condition occurs and will continue for the delay time, after which the alarm output will be activated and the alarm annunciator will be permanently activated.

9.3.11 Alarm silence time: S, L

The alarm silence function is primarily intended for use in small installations where the alarm output directly operates an annunciator such as a sounder. When the alarm silence time is set to any figure other than zero, the P push button becomes an alarm accept button.

After an alarm has occurred, operating the P button will cause the alarm output to revert to the non-alarm condition for the programmed alarm silence time. When an alarm is silenced by operating the P push button, the Counter's alarm annunciator will flash until the silence time expires.

To adjust the alarm silence time select S, L using the ▼ or ▲ push button in the selected alarm sub-menu and press P which will reveal the existing alarm silence time in seconds with one digit flashing. The required delay time can be entered using the ▼ or ▲ push button to adjust the flashing digit and the P button to transfer control to the next digit. When set as required press E to enter the value and return to the S, L prompt in the alarm sub-menu.

9.3.12 Flash display when alarm occurs: FLSH

In addition to the two alarm annunciators on the left hand side of the Counter display which show the status of both alarms, this function provides an even more conspicuous indication that an alarm condition has occurred.

When enabled, this function alternates the rate or total display between the numerical value and the alarm identification AL1 or AL2 when an alarm occurs.

Using the ▼ or ▲ push button select FLSH from the selected alarm sub-menu and press P to check or change the function. The ▼ or ▲ push button will toggle the function between oFF and on, when set as required, press the E button to return to the FLSH prompt in the alarm sub-menu.

9.3.13 Access Setpoint: ACSP

This function activates a separate menu that provides direct access to the alarm setpoints from the display mode, i.e. when the BA367NE is counting, by simultaneously operating the P and ▲ buttons. An operator can therefore adjust the alarm setpoints without having access to the configuration and alarm sub-menus. Protection against unauthorised or accidental adjustment is provided by a separate security access code.

Using the ▼ or ▲ push button select ACSP from the configuration menu and press P to reach the enable function EnbL. Pressing P will reveal the existing setting which can be toggled between on and oFF by pressing the ▼ or ▲ push button. When set as required, press the E button to return to the EnbL prompt from which a separate security access code can be entered using the ACCd function which can be selected using the ▼ or ▲ push button.

To enter a new security code select ACCd from the ACSP sub-menu and press P which will cause the Counter to display 0000 with one digit flashing. The flashing digit may be adjusted using the ▼ or ▲ push button, when set as required operating the P button will transfer control to the next digit. When all the digits have been adjusted press E twice to return to the ACSP prompt in the configuration menu. The revised security code will be activated when the Counter is returned to the display mode. Default security access code 0000 will disable the security code allowing direct access to the setpoints from the totalisation mode by pressing the P and ▲ buttons simultaneously.

Please contact BEKA associates sales department if the security code is lost.

9.3.14 Adjusting alarm setpoints from the totalisation mode

Access to the two alarm setpoints from the Counter display mode is obtained by operating the P and ▲ push buttons simultaneously as shown in Fig 15. If the setpoints are not protected by a security code the alarm setpoint prompt SP1r or SP1t will be displayed depending upon whether a rate or total alarm has been conditioned. If access to the setpoints is protected by a security code, CodE will be displayed first. Pressing P again will allow the alarm setpoint security code to be entered digit by digit using the ▼ or ▲ button to change the flashing digit and the P push button to move control to the next digit. If the correct code is entered pressing E will result in the alarm setpoint prompt SP1x to be displayed. If an incorrect security code is entered, or a button is not pressed within ten seconds, the instrument will automatically return to the totalisation mode.

Once within the menu pressing the ▼ or ▲ buttons will toggle the display between the two alarm setpoint prompts SP1x and SP2x.

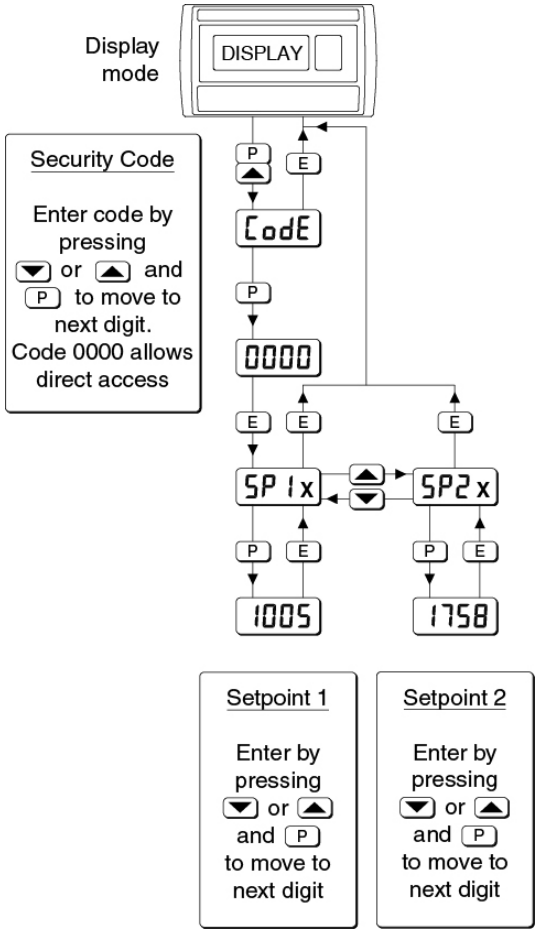


Fig 15 Setpoint adjustment from the totalisation mode

To adjust an alarm setpoint select SP 1x or SP2x and press (P) which will reveal the existing value. The flashing digit of the setpoint may be adjusted using the (▼) or (▲) push button and the (P) button to move control to the next digit. When the required setpoint has been entered, pressing (E) will return the display to the SP 1x or SP2x prompt from which the other setpoint may be selected, or the instrument may be returned to the totalisation mode by pressing (E) again.

Note: Direct access to the alarm setpoints is only available when the menu is enabled - see section 9.3.13

9.4 Pulse output

The BA367NE can be supplied with a factory fitted isolated pulse output for retransmitting pulses to other instruments.

Note: Only one of the three output options can be fitted to a BA367NE Counter.

The pulse output is an open collector with the following parameters:

Ron	=	60Ω + 3V
Roff	=	1M
I max	=	10mA

To retransmit a pulse to another BA367NE Counter the pulse output terminals may be directly connected to the input terminals of the second instrument as shown in Fig 16, alternatively the second instrument may be located in the safe area. The second Counter should be configured for an open collector input.

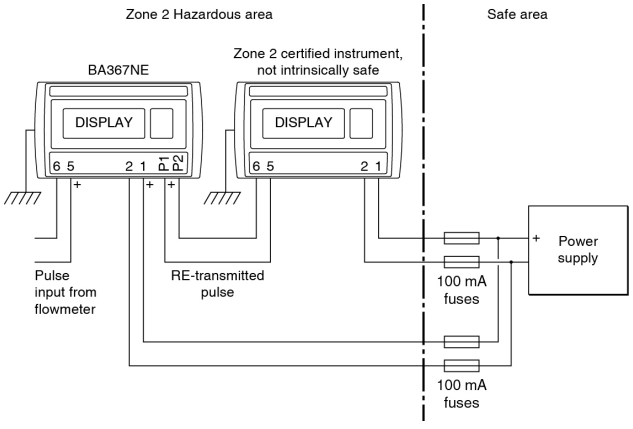


Fig 16 Pulse retransmission to another BEKA 'E' Ex nA instrument.

A voltage output pulse can be generated as shown in Fig 17. The current flowing in the pulse output circuit, which is defined by resistor R1, should be less than 10mA. With a 24V supply R1 should therefore be 2,200Ω or greater.

The output pulse may be a synchronous duplicate of the input pulse for re-transmission applications, or the frequency may be divided and the pulse width defined.

The retransmitted RTx annunciator on the instrument display shows the status of the retransmitted pulse output. Annunciator activation depends upon the setting of SourCE in the pulse output configuration menu.

SCALEd
Annunciator activated each time pulse output open collector is *on*, i.e. Ron is less than 60Ω + 3V.

dirECt:
Annunciator continuously activated

9.4.1 Ex nA certification

The optional pulse output is a separate opto-isolated Ex nA circuit with the following input parameters:

Ui = 30V dc
Ii = 100mA

This allows the pulse output to be connected to any dc circuit providing that in normal operation the maximum supply voltage is not greater than 30V dc.

Providing that the BA367NE Counter is correctly installed in a panel enclosure located in Zone 2 complying with the requirements for Ex n protection, the pulse output may be used to transmit a pulse to any suitably protected equipment, except intrinsically safe equipment, located in Zone 1 or 2 of a hazardous area, or to equipment located in a safe area.

Fig 17 shows a BA367NE Counter mounted in an Ex n panel enclosure located in Zone 2 retransmitting a pulse to the safe area. The current pulse flows through R1 resulting in a voltage pulse output with an amplitude of about 20V.

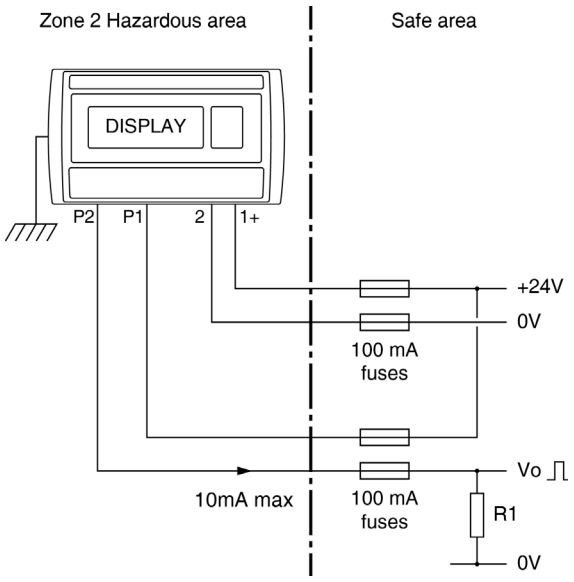


Fig 17 Generating voltage pulse in safe area

To comply with the requirements of EN 60079-14 *Electrical installations design, selection and erection*, each of the wires entering the hazardous area should be individually fused and contain a means of isolation. These two requirements may be satisfied by installing DIN rail mounted terminals incorporating a fuse which can easily be removed as shown in Fig 2 to provide isolation. Clear identification of, and easy access to the means of isolation is essential for their effective use. It is also necessary to ensure that the maintenance procedure makes sure that unauthorised re-closure of the switches does not occur. It is not considered necessary to have a means of isolation or electrical protection for cable screens.

For some application Ex nA instrumentation energised by a current limited power supply or instrument that can be switched off, is often considered adequate and to comply with the requirements of the standard.

9.4.2 Pulse output configuration: PuLSE oP

When a BA367NE is supplied with a factory fitted pulse output the instrument configuration menu is extended as shown in Fig 18. Using the ▼ or ▲ push button scroll though the configuration menu until PuLSE oP is displayed, pressing P will then access the pulse output sub-menu.

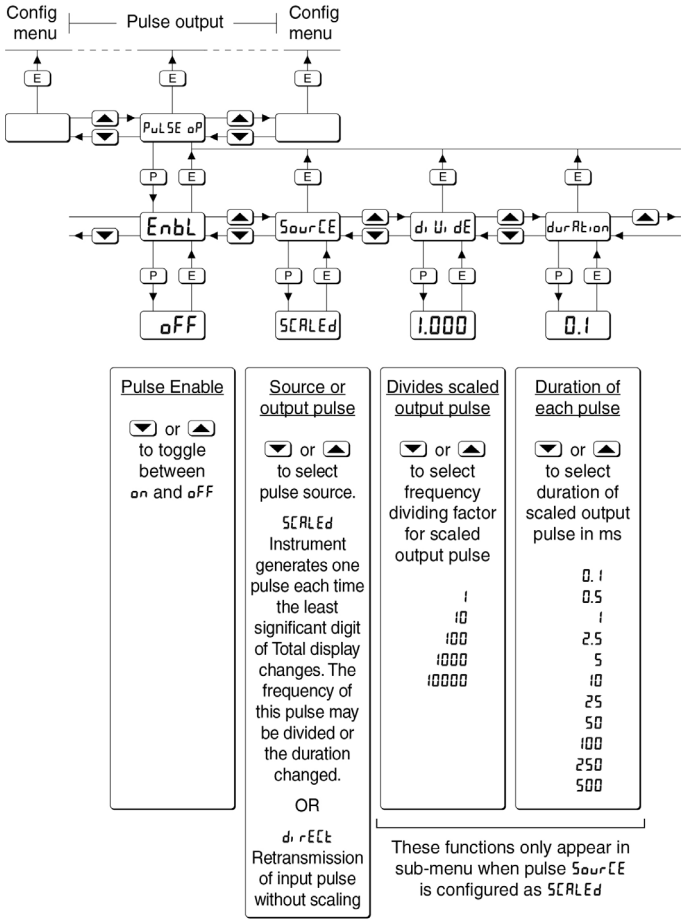


Fig 18 Pulse output configuration sub-menu

9.4.3 Enable pulse output: EnbL

This function allows the pulse output to be enabled or disabled without altering any of the pulse output parameters. Using the ▼ or ▲ push button select EnbL in the pulse output sub-menu and press P which will reveal the existing setting on or oFF. The function can be changed by pressing the ▼ or ▲ push button followed by the E button to return to EnbL prompt in the sub-menu.

9.4.4 Source of pulse output: SourCE

The output pulse may be derived from:

SCALEd	Incrementation of least significant digit of the total display. May be divided and width defined by the di Ui dE and durAti on functions to generate the required output pulse.
dirECt	Output is synchronous duplicate of the Counter input pulse.

Using the ▼ or ▲ push button select SourCE in the pulse output sub-menu and press P to reveal the existing pulse source. The function can be changed by pressing the ▼ or ▲ push button followed by the E button to return to SourCE prompt in the sub-menu.

9.4.5 Divide output pulse frequency: di Ui dE

When SCALEd is selected in the SourCE sub-function (9.4.4) the output pulse is derived from incrementation of the least significant digit of the total display divided by one of the following five factors to produce the output pulse:

1
10
100
1000
10000

Using the ▼ or ▲ push button select di Ui dE in the pulse output sub-menu and press P which will reveal the existing divisor. The selected divisor can be changed by pressing the ▼ or ▲ push button to followed by the E button to return to di Ui dE prompt in the sub-menu.

Note: This function only appears in the pulse output sub-menu when SCALEd is selected in the SourCE sub-function. See 9.4.4.

9.4.6 Output pulse width: durAti on

When SCALEd is selected in the SourCE sub-function (9.4.4) the output pulse width is defined by this function. One of following millisecond pulse widths may be selected:

0.1
0.5
1
2.5
5
10
25
50
100
250
500

Using the ▼ or ▲ push button select durAti on in the pulse output sub-menu and press P which will reveal the existing pulse duration. The value can be changed by pressing the ▼ or ▲ push button to select the required value followed by the E button to return to durAti on prompt in the sub-menu.

Note: This function only appears in the pulse output sub-menu when the SCALEd is selected in the SourCE sub-function. See 9.4.4.

9.4.7 Pulse storage

If the di Ui dE and durAti on functions are configured such that the output pulse frequency with the specified pulse width can not be output in real time, the number of pulses will be stored and transmitted at the maximum possible speed.

When the total display is reset to zero or the power supply to the Counter is disconnected or turned off, any stored pulses will not be retained.

9.5 4/20mA output

The BA367NE Counters can be supplied with a factory fitted isolated 4/20mA output which may be configured to represent the rate or total display.

Note: Only one of the three output options can be fitted.

9.5.1 Ex nA certification

The optional 4/20mA output is a separate galvanically isolated Ex nA circuit with the following input parameters:

Ui = 30V dc

This allows the 4/20mA output to be connected to any dc circuit providing that in normal operation the maximum supply voltage is not greater than 30V dc.

Providing that the BA367NE Counter is correctly installed in a panel enclosure located in Zone 2 complying with the requirements for Ex n protection, the 4/20mA current output may be used to transmit to suitably protected equipment located in Zone 1 or 2 of a hazardous area, or to equipment located in a safe area.

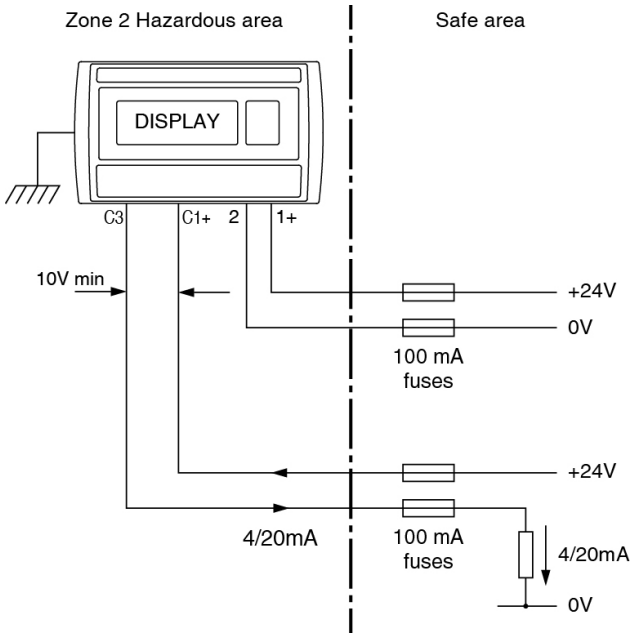


Fig 19 Application of 4/20mA output
(Shown without recommended screened cables)

Fig 19 shows a typical application in which a BA367NE Counter mounted in an Ex n panel enclosure located in Zone 2 is retransmitting the 4/20mA current to the safe area.

To comply with the requirements of EN 60079-14 *Electrical installations design, selection and erection*, each of the wires entering the hazardous area should be individually fused and contain a means of isolation. These two requirements may be satisfied by installing DIN rail mounted terminals incorporating a fuse which can easily be opened as shown in Fig 2 to provide isolation. Clear identification of, and easy access to the means of isolation is essential for their effective use. It is also necessary to ensure that the maintenance procedure makes sure that unauthorised re-closure of the switches does not occur. It is not considered necessary to have a means of isolation or electrical protection for cable screens.

For some application Ex nA instrumentation energised by a current limited power supply or instrument that can be switched off, is often considered adequate and to comply with the requirements of the standard.

9.5.2 Configuration

When a BA367NE Counter is supplied with an optional 4/20mA output the configuration menu is extended as shown in Fig 20. The 4/20mA output sub-menu is accessed via the 4-20 oP function.

The 4/20mA output sub-menu allows the 4/20mA output to be controlled by the rate or the total display and to be scaled.

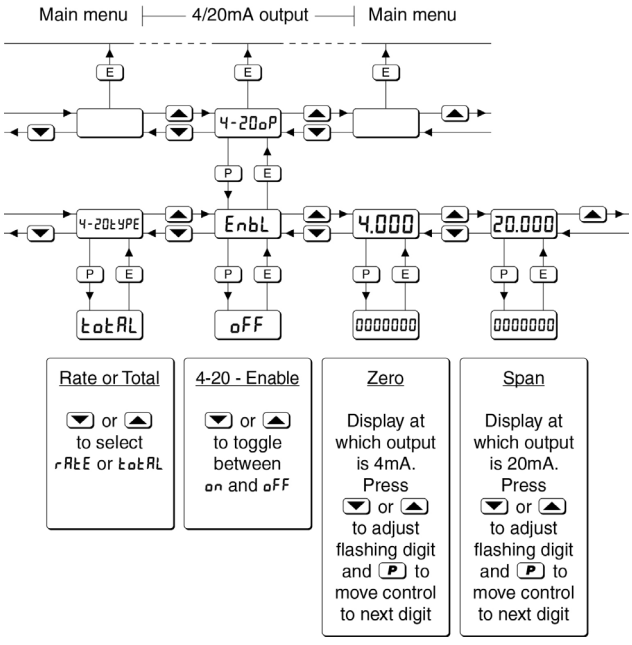


Fig 20 4/20mA output configuration sub-menu

9.5.3 4/20mA output: 4-20 oP

Access the Counter's configuration menu as described in section 6.2. Using the ▼ or ▲ push buttons scroll though the menu until 4-20 oP is displayed, pressing P will then access the 4/20mA output sub-menu which is shown in Fig 20.

9.5.4 Enable 4/20mA output: EnbL

This function allows the 4/20mA output to be disabled or enabled without altering any of the 4/20mA output parameters. Using the ▼ or ▲ push button select EnbL in the 4-20 oP sub-menu and press P to reveal the existing setting on or oFF. The function can be changed by pressing the ▼ or ▲ push button followed by the E button to return to EnbL prompt.

Note: When the 4/20mA output is disabled by selecting oFF, the output is a constant 3.5mA irrespective of the instrument display.

9.5.5 Select rate or total source: 4-20tYPE

The 4/20mA output current can represent the Counter's rate or total display, this should be defined before any other current output functions are adjusted.

Using the ▼ or ▲ push button select 4-20tYPE in the 4/20mA output sub-menu and press P to reveal the existing setting totAL or rAtE. The function can be changed by pressing the ▼ or ▲ push button followed by the E button to return to the 4-20tYPE prompt in the sub-menu.

9.5.6 Display which corresponds to 4mA output: 4.000

The Counter display which corresponds to a 4.000mA output current is defined by this function. Using the ▼ or ▲ push button select 4.000 in the 4/20mA output sub-menu and press P which will reveal the existing rate or total display with one digit flashing. The required display can be entered using the ▼ or ▲ push button to adjust the flashing digit and the P button to transfer control to the next digit. When set as required press E to enter the value and return to the 4.000 prompt in the 4/20mA output sub-menu.

9.5.7 Display which corresponds to 20mA output: 20.000

The Counter display which corresponds to a 20.000mA output current is defined by this function. Using the ▼ or ▲ push button select 20.000 in the 4/20mA output sub-menu and press P which will reveal the existing rate or total display with one digit flashing. The required display can be entered using the ▼ or ▲ push button to adjust the flashing digit and the P button to transfer control to the next digit.

When set as required press E to enter the value and return to the 20.000 prompt in the 4/20mA output sub-menu.

Notes:

1. If the calibration of the rate or total display defined as the source for the 4/20mA output is changed, the 4/20mA output will automatically be set to give a constant 3.5mA output irrespective of the display. The 4/20mA output should always be reconfigured following reconfiguration of the source display.

2. If the Counter and the 4/20mA current sink output are powered from separate supplies, the 4/20mA output current will continue to flow when the Counter supply fails or is turned off. Powering both from a common supply eliminates this effect.

10.6 Backlight

The BA367NE Counter can be supplied with a factory fitted backlight that produce green illumination enhancing display contrast and enabling it to be read at night or in poor lighting conditions. The backlight is internally powered from the instrument power supply so that no additional wiring is required, but the instrument supply current increases.

	Current consumption
Without backlight	10.0mA
Addition for backlight	22.5mA
Addition with terminals 3 & 4 linked	6.0mA
Total current	38.5mA

Appendix 1
Dust certification

A1.0 ATEX dust certification

In addition to ATEX Ex nA certification permitting installation in explosive gas atmospheres which is described in the main section of this instruction manual, all BA367NE Counters have ATEX dust ignition protection by enclosure certification Ex tc permitting installation in combustible dust atmospheres. The front panel push button switches are non incendive and have been certified intrinsically safe Ex ic without the need for Zener barriers or galvanic isolators.

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

The Counter's Ex tc dust input and output safety parameters are identical to the Ex nA gas parameters, therefore all the electrical circuits shown in the main section of this manual may also be used for dust applications.

A1.1 Zones, and Maximum Surface Temperature

The BA367NE has been ATEX dust certified

Group II, Category 3D
Ex ic tc IIIC T80ºC Dc -40 ≤ Ta ≤ 60°C

When connected to a suitable system the Counter may be installed in:

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

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

A1.2 Special conditions for safe use in dust atmospheres.

The BA367NE ATEX Type Examination Certificate has an 'X' suffix to show that special conditions for safe use are specified by the BA367NE Ex ic tc certificate indicated by the certificate number's 'X' suffix. These state that the BA367NE Counter should be:

a. Mounted such that the instrument terminals are protected by at least an IP54 enclosure certified to IEC 60079-15 or IEC 60079-0 as appropriate.
   Note: *An Ex t, Ex n, Ex e or Ex p certified enclosure satisfies this requirement.*

b. Instrument terminals must be supplied from limited energy circuits.
   Note: *This means that the BA367NE should only be connected to circuits with output parameters in normal operation equal to, or less than the instruments input parameters which are the same as the Ex nA input parameters specified in section 3 of this manual.*

A1.3 Maintenance

The IEC guidance on maintenance procedures EN 60079-17 permits live maintenance in Zone 22 if a risk analysis demonstrates that this does not introduce an unacceptable risk. The removal of covers [opening of Ex tc enclosure] is permitted if this can be done without contaminating the interior of the enclosure and instrument with dust or moisture. Some end-users may prefer not to permit live maintenance to minimise risk.

ENSURE PLANT SAFETY BEFORE STARTING MAINTENANCE

Live maintenance within the hazardous area should only be performed when it is permitted by risk analysis or when there is no risk of a flammable atmosphere being present.

Before closing the Ex tc enclosure ensure that the sealing gaskets are undamaged and free from dirt and foreign bodies.

Inspection of **t**he Counters mechanical condition and removal of accumulated dust from the front of the instrument and the outside of the panel enclosure should be regularly performed. The interval between inspections depends upon environmental conditions. Removal of flammable dust should be performed with care to avoid creating a dust cloud.

Appendix 2 IECEx certification

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 BA367NE Counter has been issued with an IECEx Certificate of Conformity number IECEx ITS 16.0005X which specifies the following certification code:

Ex nA ic IIC T5 Gc
Ex ic tc IIIC T80ºC Dc IP66
-40ºC ≤ Ta ≤ 60°C

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

The Counter's front panel push button contacts are non incendive and have been certified intrinsically safe Ex ic, without the need for an external Zener barrier or galvanic isolator, as shown on the IECEx certificate. This allows the Counter to be adjusted and configured live when installed in a Ex n panel enclosure located in Zone 2.

A2.2 Installation

The IECEx safety parameters are identical to the ATEX safety parameters described in the main section of this manual and both refer to equivalent standards. Therefore the ATEX installation requirements specified in the main sections and in Appendix 1 of this manual, also apply for IECEx installations, but the local code of practice should also be consulted.

For ATEX installations self certified Category 3GD equipment, such as enclosures, may be installed in Zone 2 or 22, but self certified equipment is not permitted for IECEx installations.

A2.3 Special conditions for safe use

The IECEx certificate number has an ‘X’ suffix indicating that special conditions apply for safe use. These conditions are identical to the ATEX special conditions for safe use specified in the main sections and in Appendix 1 of this manual.

Appendix 3 ETL & cETL certification for installations in USA and Canada

A3.0 cETL Mark

For installations in the USA and Canada, the BA367NE Counter has ETL and cETL Ex nA and Ex tc approval, Control Number 4008610. Copies of the Authorisation to Mark are available from the BEKA associates sales office and www.beka.co.uk

A3.1 ETL and cETL certification

The US and Canadian standards used for assessment and certification of the BA367E are listed on the cETL Authorisation to Mark.

Installations must comply with BEKA associates Control Drawing CI330-53, which is attached to this appendix.

The ETL and cETL safety parameters are the same as the ATEX and IECEx parameters, the systems shown in sections 3, 4 and 5 of this manual may therefore also be used for US and Canadian installations subject to complying with the local codes of practice.

ETL and cETL codes

CL I Zone 2 AEx nA ic IIC T5 Gc (US gas, Zone cert)

Zone 22 AEx ic tc IIIC T80ºC Dc (US dust, Zone cert)

Ex nA ic IIC T5 Gc (Canadian gas, Zone cert)

Ex ic tc IIIC T80ºC Dc (Canadian dust, Zone cert)

$-40ºC \leq Ta \leq 60ºC$

The Counter's front panel push button contacts are non incendive and have been certified intrinsically safe Ex ic, without the need for an external Zener barrier or galvanic isolator, as shown on the ETL Authorisation to Mark. This allows the Counter to be adjusted and configured live when installed in a Ex n panel enclosure located in Zone 2.