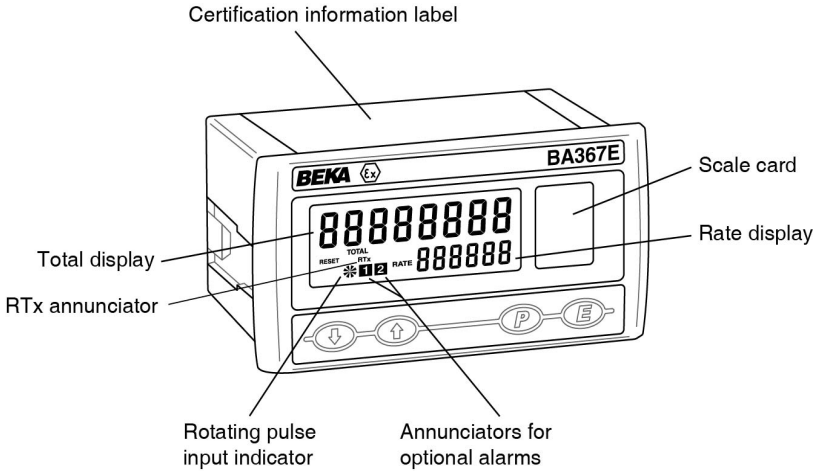
BA367E
One input
Intrinsically safe
Counter

Issue 5



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The BA367E is CE marked to show compliance with the European Explosive Atmospheres Directive 2014/34/EU and the European EMC Directive 2014/30/EU

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1. DESCRIPTION

This intrinsically safe, single channel pulse input Counter may be configured to count input pulses from a wide variety of transducers and to display the total number in engineering units. A smaller six digit display may be activated to show the input pulse rate in engineering units per second, minute or per hour.

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

The BA367E has been certified intrinsically safe for use in gas hazardous areas by Notified Body Intertek Testing and Certification Ltd and complies with the European ATEX Directive 2014/34/EU.

For international applications the BA367E also has IECEx certification which is described in Appendix 1.

For applications in the USA and Canada the BA367E has ETL and cETL certification which is described in Appendix 3.

2. OPERATION

Fig 1 shows a simplified block diagram of the BA367E 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

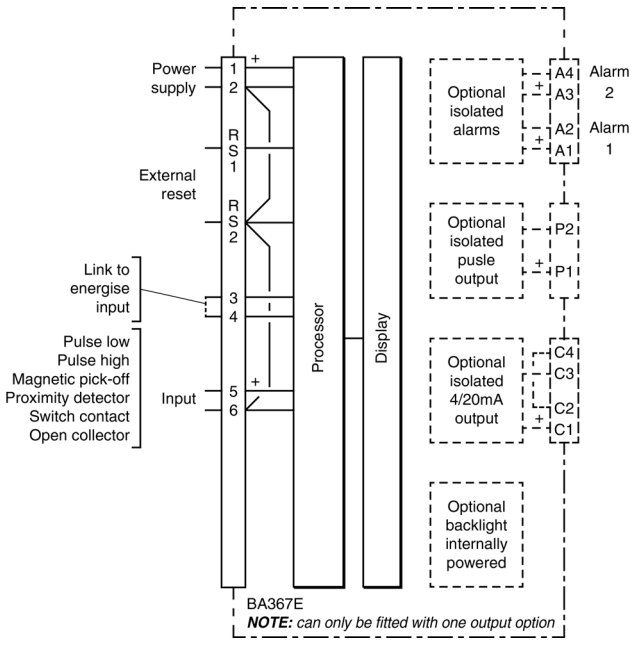


Fig 1 BA367E block diagram

2.1 Initialisation

Each time power is applied to a BA367E 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 BA367E 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 in succession, firmware version number, instrument function `CounterE` and output accessories that are fitted:
  - `A` Dual alarm outputs
  - `P` Pulse output
  - `C` 4/20mA output

Note: When optional alarms are fitted, the BA367E 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 BA367E Counter has two digital displays and associated annunciators, plus a pulse input indicator as shown on page 1.

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. INTRINSIC SAFETY CERTIFICATION

The BA367E Counter has ATEX and IECEx gas certification. This section of the instruction manual describes ATEX gas certification, IECEx and other approvals are each described in separate appendixes to this manual.

3.1 ATEX gas certification

Notified Body Intertek Testing and Certification Ltd have issued the BA367E with an EC-Type Examination Certificate number ITS16ATEX28408X. This confirms compliance with harmonised European standards and it has been used to confirm compliance with the European ATEX Directive for Group II, Category 1G equipment. The Counter carries the community mark and subject to local codes of practice may be installed in any of the European Economic Area (EEA) member countries. ATEX certificates are also acceptable for installations in Switzerland.

This section of the instruction manual describes ATEX installations in explosive gas atmospheres conforming with EN60079-14 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 BA367E Counter has been certified Ex ia IIC T5. When connected to a suitable system it may be installed in:

Zone 0 explosive gas air mixture continuously present.

Zone 1 explosive gas air mixture likely to occur in normal operation.

Zone 2 explosive gas air mixture not likely to occur, and if it does will only exist for a short time.

Be used with gases in groups:

Group A propane
Group B ethylene
Group C hydrogen

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 +70°C.

Note: The specified operating temperature of the BA367E Counter is -40 to +70°C. At temperatures below -20°C the instrument will continue to count but the display digits will change more slowly and the contrast will be reduced.

This allows the BA367E Counter to be installed in all gas Zones and to be used with most common industrial gases except carbon disulphide and ethyl nitrite which have an ignition temperature of 95°C.

3.3 Special conditions for safe use

The ATEX certificate has an 'X' suffix indicating that special conditions apply to prevent an electrostatic charge developing on the outside of the instrument enclosure.

WARNING
To avoid an electrostatic charge being generated instrument enclosure should only be cleaned with a damp cloth.

3.4 Power supply

When installed in a hazardous area the BA367E Counter should be powered via a certified Zener barrier or galvanic isolator from a dc supply located in the safe area or from associated apparatus with an intrinsically safe output.

The input safety parameters of terminals 1 and 2 are:

Ui = 28V dc
Ii = 200mA dc
Pi = 0.84W

Any certified Zener barrier or galvanic isolator with output safety parameters equal to or less than these limits may be used.

The maximum equivalent capacitance and inductance between terminals 1 and 2 is:

Ci = 2nF
Li = 4µH

To determine the maximum permissible cable parameters the above figures, which are small and may be ignored in many applications, should be subtracted from the maximum permitted cable parameters specified for the Zener barrier or galvanic isolator powering the BA367E Counter.

3.5 Pulse input terminals

The BA367E pulse input is a separate intrinsically safe circuit with the negative terminal internally connected to the negative side of the power supply terminal 2 and to the reset terminal RS2. See Fig 1.

Some types of sensor that may be connected to the BA367E input, such as a switch contact or a 2-wire proximity detector, require energising to determine their state. For sensors requiring energising fitting an external link between terminals 3 & 4 of the BA367E connects an internal 7V, 6mA supply to the input. Energising is not required when the BA367E input is connected to a voltage source.

Fitting a link changes the output safety parameters of the BA367E Counter pulse input as shown in the following table which also shows which types of transducer require energising (link fitting).

		Safety parameters		
Type of input	**Link 3 & 4**	**Uo**	**Io**	**Po**
Switch contact	Yes	10.5V	9.2mA	24mW
Proximity detector	Yes	10.5V	9.2mA	24mW
Open collector	Yes	10.5V	9.2mA	24mW
Magnetic pick-off	No	1.1V	0.5mA	0.2mW
Voltage input (low)	No	1.1V	0.5mA	0.2mW
Voltage input (high)	No	1.1V	0.5mA	0.2mW

3.5.1 Transducers that do not require energising

Magnetic pick-offs and voltage pulse inputs do not require energising, see section 3.5. For intrinsic safety purposes, sources of energy with output parameters less than 1.5V; 100mA and 25mW are considered to be *simple apparatus* (Clause 5.7 of EN60079-11), which allows them to be ignored and not documented when assessing an intrinsic safe system.

When terminals 3 & 4 are not linked, the BA367E Counter input terminals comply with the requirements for *simple apparatus,* thus allowing the output parameters to be ignored when assessing the safety of the transducer connected to the input.

This allows almost any certified intrinsically safe voltage pulse or certified magnetic pick-off to be directly connected to the BA367E Counter input providing that:

a. The output parameters of the transducer or circuit are equal to or less than:

Uo = 28V dc
Io = 200mA dc
Po = 0.84W

b. The transducer and associated wiring can withstand a 500V rms insulation test to earth.

The BA367E EC-Type Examination Certificate specifies that the equivalent capacitance and inductance of the BA367E Counter input is:

Ci = 2nF
Li = 4μH

To determine the maximum permissible cable parameters these figures should be subtracted from the maximum permitted cable parameters specified for the transducer connected to the input terminals of the Counter. However, the Counter input parameters are very small and they are unlikely to make any significant difference to the allowable cable parameters.

3.5.2 Transducers that require energising

Switch contacts, proximity detectors and open collector inputs require energising as described in section 3.5. When energised, the output parameters of the BA367E Counter input are:

Uo = 10.5V dc
Io = 9.2mA dc
Po = 24mW

These parameters do not comply with the requirements for *simple apparatus* and should be considered when assessing the safety of the circuits connected to the input of the BA367E Counter.

Any certified intrinsically safe sensor *or simple apparatus* may be connected to a BA367E Counter input when energised, providing that the input parameters of the sensor are equal to, or greater than, the output safety parameters of the BA367E Counter input which are shown above. This is not restrictive and most sensors will comply.

This allows most mechanically operated switches, open collector transistors and certified intrinsically safe NAMUR proximity detectors to be directly connected to a BA367E Counter input providing the device and associated wiring can withstand a 500V rms insulation test to earth and are located within the same hazardous area as the Counter.

The maximum capacitance and inductance that may be safely connected to the Counter input when energised (link connected) is:

Co = 2.4μF
Lo = 200mH

Again this is not restrictive and most transducers will comply.

3.6 Remote reset terminals

The BA367E Counter may be reset to zero or to the reset value by connecting the reset terminals RS1 and RS2 together for more than one second. These two terminals have the following input and output safety parameters:

Uo	=	3.8V dc
Io	=	1mA
Po	=	1mW
Ui	=	28V dc
Ii	=	200mA dc
Pi	=	0.84W

The equivalent capacitance and inductance between them is:

Ci	=	0nF
Li	=	0μH

The maximum capacitance and inductance that may be safely connected between the reset terminals RS1 and RS2 is:

Co	=	40μF
Lo	=	1H

The Counter total display may be reset from within the hazardous area by any mechanically operated switch connected directly to terminals RS1 and RS2. To reset the total display from the safe area a Zener barrier or intrinsically safe relay is required to transfer the contact closure into the hazardous area. Almost any intrinsically safe relay with certification permitting the contacts to be connected to equipment in the hazardous area may be used. A positive polarity Zener barrier may also be used as shown in Fig 2.

Alternatively, the BA367E Counter may be configured so that the total display is reset to zero when the ▼ and ▲ push buttons are operated simultaneously for more than three seconds. See 6.19.

3.7 Certification label information

The 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 and location and the instrument serial number. Non European certification information may also be included.

BA367E Certification information label

4. SYSTEM DESIGN FOR HAZARDOUS AREAS

4.1 Use with Zener barriers

Zener barriers are the least expensive intrinsically safe interface between a safe and hazardous area. However they require a high integrity earth connection that may be expensive to install and they do not provide isolation. When a high integrity earth connection is not already available, it may be less expensive and complicated to use galvanic isolators for the installation of a single BA367E Counter.

Terminals 2, 6 and RS2 of the BA367E Counter are internally connected together. If any of these terminals are earthed, as shown in Figs 2 & 3, the other common terminals should only be connected to the same earth, i.e. the barrier busbar, or to circuits that have 500V insulation to earth.

Any certified Zener barrier may be used with the BA367E Counter providing it's output parameters do not exceed the input parameters of the terminals to which it is connected. Only one polarity of Zener barrier i.e. positive or negative, may be used in a Counter system.

Fig 2 illustrates the basic circuit that is used for all BA367E Counter installations protected by Zener barriers. For simplicity, connections for the optional alarms, pulse output and 4/20mA output are shown separately in section 9 this manual.

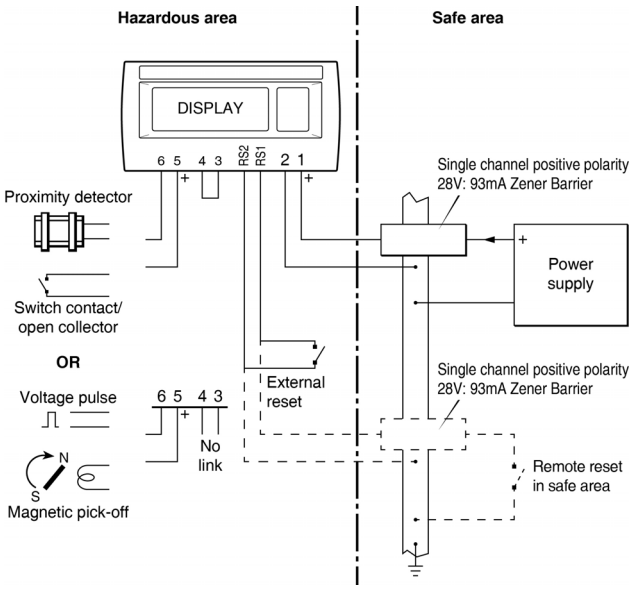


Fig 2 BA367E used with Zener barriers

Alternatively the pulse input source may be located in the safe area. Fig 3 shows how an additional Zener barrier is used to transfer the signal to the Counter in the hazardous area. When more than one Zener barrier is used in a system all must have the same polarity. i.e. all positive or all negative barriers.

When designing a system it is important to remember that terminals 2, 6 and RS2 are interconnected within the BA367E See Fig 1.

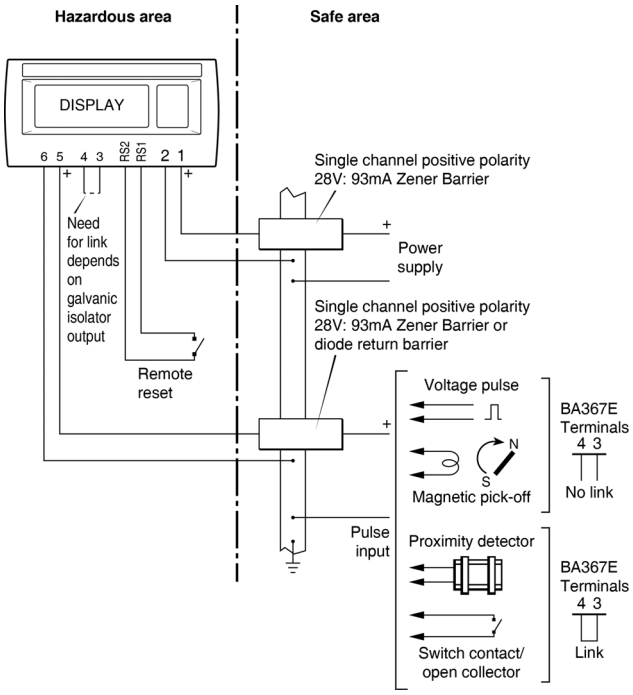


Fig 3 BA367E used with Zener barriers
pulse source in safe area.

4.1.1 Power supply

The BA367E Counter requires a minimum of 10V between terminal 1 & 2 and consumes:

	10mA	without optional backlight
plus	22mA	for optional backlight
plus	6mA	when terminals 3 & 4 are linked

Any certified Zener barrier may be used to power a BA367E Counter providing the output safety parameters of the barrier are equal to or less than the input safety parameters of terminals 1 & 2 of the BA367E Counter.

Although this allows a wide variety of barriers to be used, a positive polarity 28V; 93mA; 300Ω Zener barrier, which has an end-to-end resistance of about 340Ω, is an industry standard device which is frequently used. With this barrier the supply voltage in the safe area, with the counter input energised, must be between 15.5V and the maximum working voltage of the Zener barrier which, depending upon manufacturer, will be approximately 26V. The minimum voltage increases to 23V if a display backlight is fitted.

4.1.2 Pulse input

As shown in Fig 2 the BA367E can count pulses from a wide variety of transducers in the hazardous area, or from the safe area as shown in Fig 3.

No Zener barrier is required in series with the input if the intrinsically safe pulse source is located within the same hazardous area as the BA367E Counter. The following table shows the switching thresholds for the various types of transducer. For reliable counting the pulse input must fall below the lower threshold and rise above the upper threshold.

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

4.1.3 Switch contact input

Any mechanically activated switch contact located in the same hazardous area as the BA367E Counter may be directly connected to pulse input terminals 5 & 6 providing the switch and associated wiring can withstand a 500V rms insulation test to earth. Most magnetically activated reed relays comply with these requirements. The BA367E contains a configurable debounce circuit to prevent contact bounce being counted.

See section 6.6 for details of the maximum counting frequency.

4.1.4 2-wire proximity detector input

Most certified intrinsically safe 2-wire proximity detectors complying with NAMUR switching thresholds may be connected to the BA367E Counter input, providing the input safety parameters of the proximity detector are equal to or greater than the output safety parameters of the Counter inputs i.e.

Ui ≥ 10.5V dc
Ii ≥ 8.2mA dc
Pi ≥ 25mW

and the minimum operating voltage of the proximity detector is less than 7.5V.

See section 6.6 for details of the maximum counting frequency.

4.1.5 Open collector input

Most open collector sensors located in the same hazardous area as the BA367E Counter may be directly connected to pulse input terminals 5 & 6 providing the sensor and associated wiring can withstand a 500V rms insulation test to earth.

See section 6.6 for details of the maximum counting frequency.

4.1.6 Magnetic pick-off input

`CoiL` in the input configuration menu is a low level voltage pulse input intended for use with magnetic pick-off transducers producing an ac output. For a `CoiL` input the pulse input terminals 5 & 6 of the BA367E Counter comply with the requirements of *simple apparatus* allowing connection to any certified intrinsically safe magnetic pick-off within the hazardous area having output parameters equal to or less than:

Uo ≤ 28V dc
Io ≤ 200mA dc
Po ≤ 0.84W

The maximum permitted cable parameters will be defined by the magnetic pick-off's intrinsic safety certificate less the Counters input parameters Ci & Li which are small and can often be ignored,

See section 6.6 for details of the maximum counting frequency.

4.1.7 Voltage pulse input

Two voltage pulse input ranges are selectable in the configuration menu, `VoLt5 L` and `VoLt5 H`. When configured for either of the voltage pulse ranges, the pulse input terminals 5 & 6 of the BA367E Counter comply with the requirements of *simple apparatus* allowing connection to any intrinsically safe voltage source within the hazardous area having output parameters equal to or less than:

Uo ≤ 28V dc
Io ≤ 200mA dc
Po ≤ 0.84W

The maximum permitted cable parameters will be defined by the voltage source intrinsic safety certificate less the BA367E Counter input parameters which are small and can usually be ignored,

See section 6.6 for details of the maximum counting frequency.

4.1.8 Remote reset

The BA367E Counter total display may be remotely reset to zero by connecting terminals RS1 & RS2 together for more than one second. Permanent interconnection inhibits counting. Remote resetting may be accomplished by any mechanically operated switch located in the same hazardous area as the Counter providing it and the associated wiring can withstand a 500V rms insulation test to earth. No Zener barrier is required.

A BA367E may also be remotely reset to zero from the safe area. Any switch may be used but a Zener barrier is required to transfer the contact closure into the hazardous area which may be combined with the supply barrier so that only one package is required. A diode return barrier is not suitable for this application. Fig 2 illustrates how the BA367E may be reset from both the safe and the hazardous area.

Note: The BA367E can be configured to reset the total display to zero when the ▼ and ▲ push buttons are operated simultaneously for more than two seconds - see 6.19.

4.2 Use with Galvanic Isolators

Galvanic isolators are probably the simplest intrinsically safe interface to install as they provide isolation and do not require a high integrity earth connection.

Any certified galvanic isolator with output parameters less than the input parameters of the BA367E having the correct function may be used.

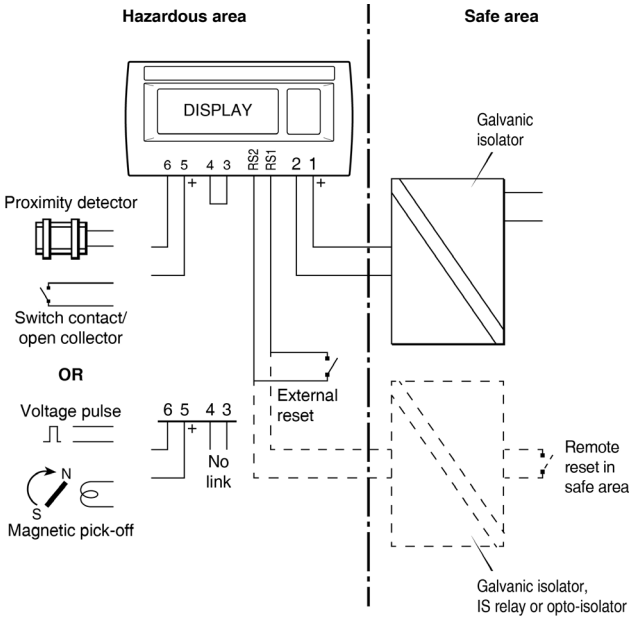


Fig 4 BA367E protected by galvanic isolators.

Fig 4 illustrates the basic circuit that is used for all BA367E Counter installations protected by galvanic isolators. For simplicity, connections for the optional alarms, pulse output and 4/20mA output are shown separately in section 9 of this manual.

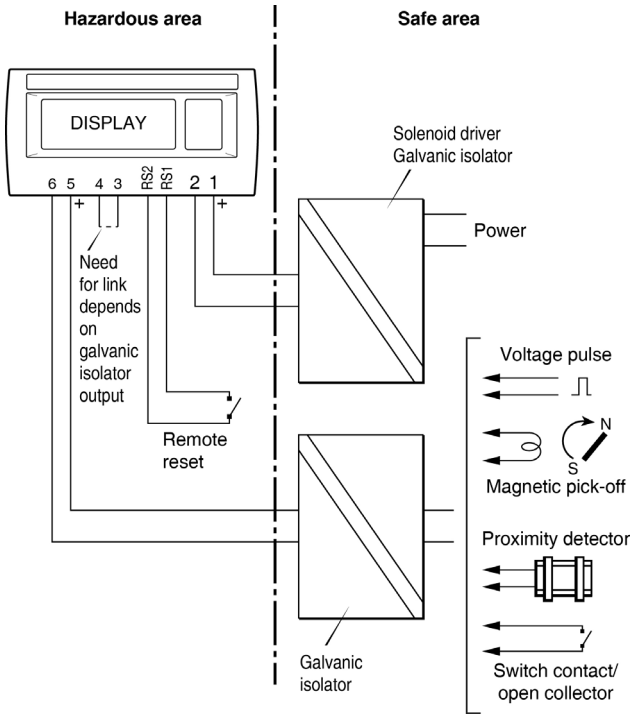


Fig 5 BA367E protected by galvanic isolators. pulse source in safe area.

Alternatively the pulse source may be located in the safe area. Fig 5 shows how an additional galvanic isolator is used to transfer the signal to the BA367E Counter in the hazardous area, although it may be difficult to find isolators for some transducers.

4.2.1 Power supply

The BA367E Counter requires a minimum of 10V between terminal 1 & 2 and consume:

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

Any certified galvanic isolator may be used to power a BA367E Counter providing the output safety parameters of the isolator are equal to or less than the input safety parameters of terminals 1 & 2 of the BA367E Counter. These requirements are not restrictive and allow a wide range of galvanic isolators, such as solenoid drivers, to be used.

4.2.2 Pulse input

As shown in Fig 4 the BA367E can count pulses from a wide variety of transducers in the hazardous area, or from the safe area as shown in Fig 5.

No galvanic isolator is required in series with the input if the intrinsically safe pulse source is located within the same hazardous area as the BA367E Counter.

The following table shows the switching thresholds for the various types of transducer. For reliable counting the pulse input must fall below the lower threshold and rise above the upper threshold.

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

4.2.3 Switch contact input

Any mechanically activated switch contact located in the same hazardous area as the BA367E Counter may be directly connected to pulse input terminals 5 & 6 providing the switch and associated wiring can withstand a 500V rms insulation test to earth. Most magnetically activated reed relays comply with these requirements. The BA367E contains a configurable debounce circuit to prevent contact bounce being counted.

See section 6.6 for details of the maximum counting frequency.

4.2.4 2-wire proximity detector input

Most certified intrinsically safe 2-wire proximity detectors complying with NAMUR switching thresholds may be connected to the BA367E Counter input, providing the input safety parameters of the proximity detector are equal to or greater than the output safety parameters of the Counter inputs i.e.

Ui ≥ 10.5V dc
Ii ≥ 8.2mA dc
Pi ≥ 25mW

and the minimum operating voltage of the proximity detector is less than 7.5V.

See section 6.6 for details of the maximum counting frequency.

4.2.5 Open collector input

Most open collector sensors located in the same hazardous area as the BA367E Counter may be directly connected to the pulse input terminals 5 & 6 providing the sensor and associated wiring can withstand a 500V rms insulation test to earth. This includes most flowmeter optoisolators.

See section 6.6 for details of the maximum counting frequency.

4.2.6 Magnetic pick-off input

CoiL in the input configuration menu is a low level voltage pulse input intended for use with magnetic pick-off transducers producing an ac output. For a CoiL input the pulse input terminals 5 & 6 of the BA367E Counter comply with the requirements of *simple apparatus* allowing connection to any certified intrinsically safe magnetic pick-off within the hazardous area having output parameters equal to or less than:

Uo	≤	28V dc
Io	≤	200mA dc
Po	≤	0.84W

The maximum permitted cable parameters will be defined by the magnetic pick-off's intrinsic safety certificate less the Counters input parameters Ci & Li which are small and can usually be ignored,

See section 6.6 for details of the maximum counting frequency.

4.2.7 Voltage pulse input

Two voltage pulse input ranges are selectable in the configuration menu, UoLt5 L and UoLt5 H. When configured for either of the voltage pulse ranges, the pulse input terminals 5 & 6 of the BA367E Counter comply with the requirements of *simple apparatus* allowing connection to any intrinsically safe voltage source within the hazardous area having output parameters equal to or less than:

Uo	≤	28V dc
Io	≤	200mA dc
Po	≤	0.84W

The maximum permitted cable parameters will be defined by the voltage source intrinsic safety certificate less the BA367E Counter input parameters which are small and can usually be ignored. See section 6.6 for details of the maximum counting frequency.

4.2.8 Remote reset

The BA367E Counter may be remotely reset by connecting terminals RS1 & RS2 together for more than one second. Permanent interconnection inhibits counting. Remote resetting may be accomplished by any mechanically operated switch located in the same hazardous area as the Counter providing it and the associated wiring can withstand a 500V rms insulation test to earth. No galvanic isolator is required.

A BA367E Counter may also be remotely reset from the safe area. Any switch may be used but a galvanic isolator or IS relay is required to transfer the contact closure into the hazardous area. Almost any device with a contact that may be connected to equipment in the hazardous area may be used for this application. Fig 4 illustrates how a BA367E Counter may be reset from both the safe and the hazardous area.

Note: The BA367E can be configured to reset the total display when the ▼ and ▲ push buttons are operated simultaneously for more than two seconds - see 6.19.

5. INSTALLATION

5.1 Location

The BA367E Counter has a robust glass reinforced modified PPO enclosure with a toughened glass window. The front of the instrument has IP66 ingress protection and a gasket seals the joint between the instrument enclosure and the panel. The rear of the instrument has IP20 ingress protection.

The BA367E may be installed in any panel providing that the operating temperature is between -40°C and +70°C and the intrinsic safety requirements are complied with. At temperatures below -20°C the instrument will continue to count but the display will become increasingly slow and the contrast will be reduced.

Figs 6 shows the overall dimensions together with the recommended panel cut-out dimensions. To achieve an IP66 seal between the instrument enclosure and the instrument panel, the smaller cut-out dimensions should be used.

5.2 EMC

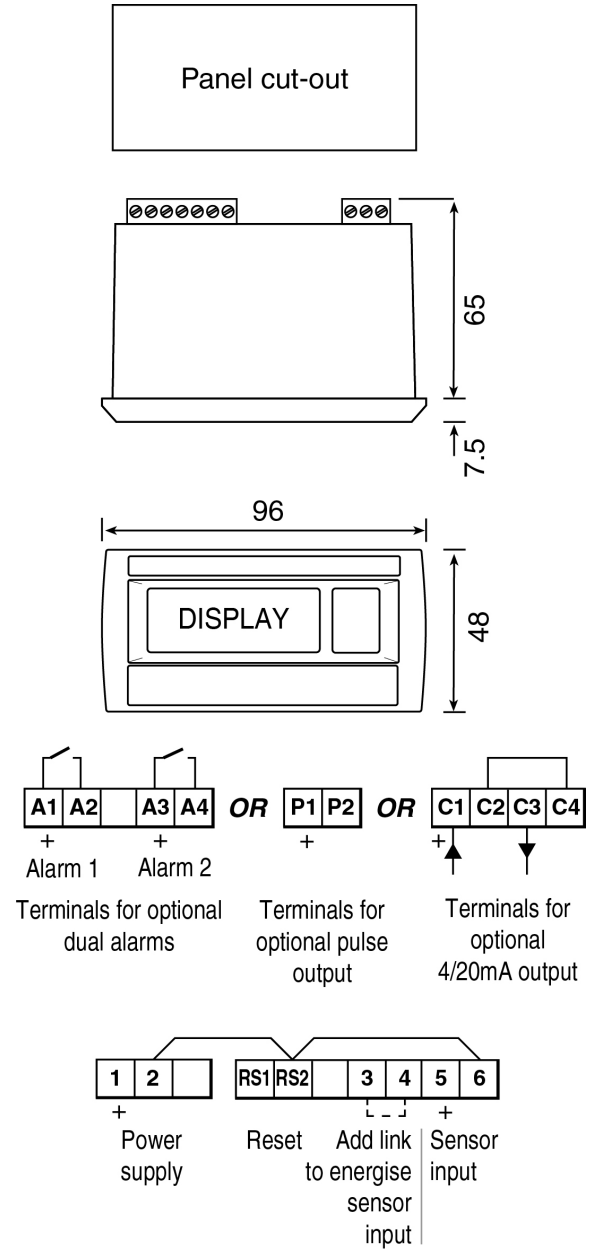
The BA367E Counter complies with the requirements of the European EMC Directive 2014/30/EU. For specified immunity all wiring should be in screened twisted pairs, with the screens earthed at one point within the safe area.

Recommended panel cut-out
dimensions for all installations

Mandatory to achieve an IP66 seal between instrument and panel

90 +0.5/-0.0 x 43.5 +0.5/-0.0

DIN 43700
92.0 +0.8/ -0.0 x 45 +0.6 -0.0



Support panel wiring to prevent vibration damage

Note: Optional backlight is internally powered

Fig 6 BA367E dimensions & terminals

5.3 Installation Procedure

a. Cut the specified aperture in the panel. To achieve an IP66 seal between the instrument enclosure and the instrument panel the aperture must have the tighter tolerances specified in Figs 6.

b. Slide the gasket over the body of the BA367E Counter before inserting the instrument into the panel aperture.

c. Firstly ensure that both the panel mounting clamps are closed by turning the knurled screws fully anti clockwise until the two pips in the clamp foot align with holes in the clamp body.

d. Place a clamp in the recess on each side of the Counter, pulling gently to slide it onto the dovetail as shown in Fig 7. Push the knurled screw slightly forward to engage the thread and tighten by turning clockwise until it is just finger tight. When both clamps are fitted ensure that the gasket behind the front panel bezel is correctly positioned before fully tightening the clamps to secure the instrument. The maximum recommended clamp tightening torque is 22cNm (1.95 lbf in) which is approximately equivalent to finger-tight plus one half turn. **Do not over tighten**.

e. Connect the panel wiring to the rear terminal block(s) as shown in Figs 6. To simplify installation, the terminals are removable so that the panel wiring can be completed before the instrument is installed. To prevent vibration damage **ensure panel wiring is supported.**

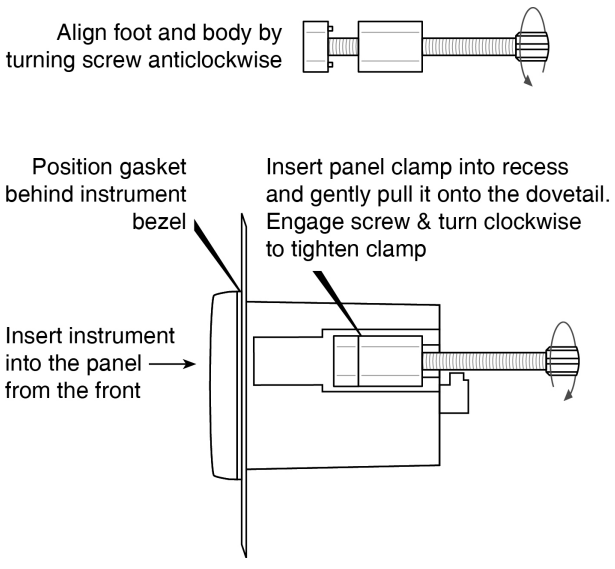


Fig 7 Fitting panel mounting clamps

5.4 Scale card

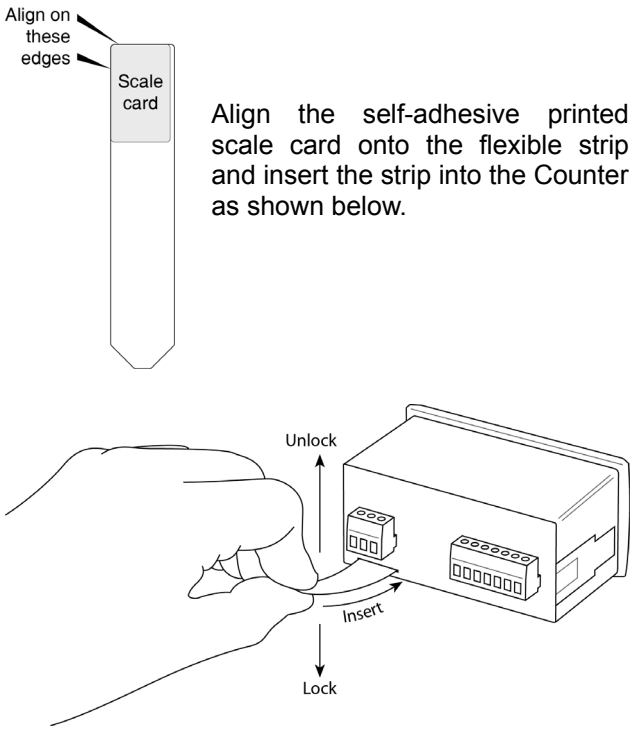
The Counter's units of measurement are shown on a printed scale card in a window at the right hand side of the display. The scale card is mounted on a flexible strip that is inserted into a slot at the rear of the instrument as shown in Fig 8. Thus the scale card can easily be changed without removing the Counter from the panel or opening the instrument enclosure.

New BA367E 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 is available as an accessory from BEKA associates. Custom printed scale cards can also be supplied.

To change a scale card, unclip the tapered end of the flexible strip at the rear of the instrument 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 rear panel.



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

Fig 8 Inserting the flexible strip carrying the scale card into slot at the rear of the BA367E Counter.

6.0 CONFIGURATION & CALIBRATION

The BA367E 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 10.

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 BA367E 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 9 shows the calibration structure of the BA367E Counter. The pulse input is passed to the SCALEr and SCALEt functions allowing the independent rate and total displays to have different engineering units.

SCALEt 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, SCALEt should be set to 2000.

SCALEr 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, SCALEr 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 BA367E uses 'real' decimal points. Moving the position of a decimal point in a scale factor will affect the instrument calibration.

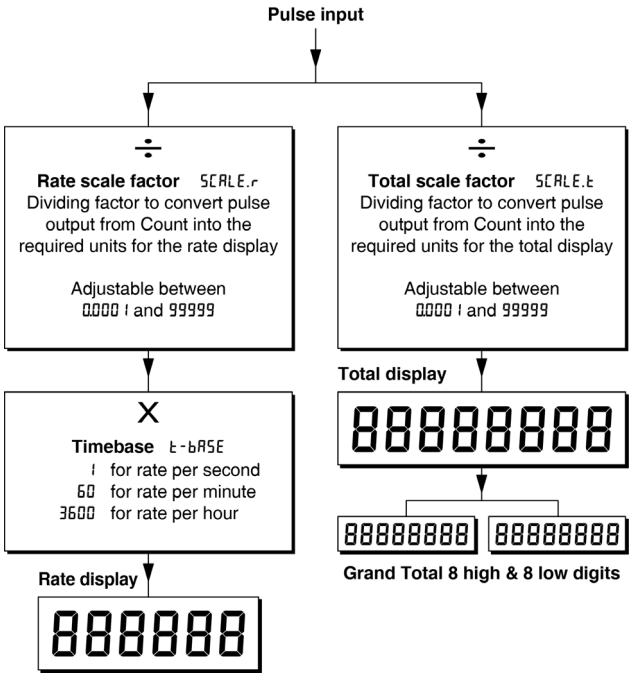


Fig 9 Calibration structure

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 10.

When returning to the display mode following reconfiguration, the BA367E 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 BA367E 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 10 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	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 BA367E 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 three 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 BA367E 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**

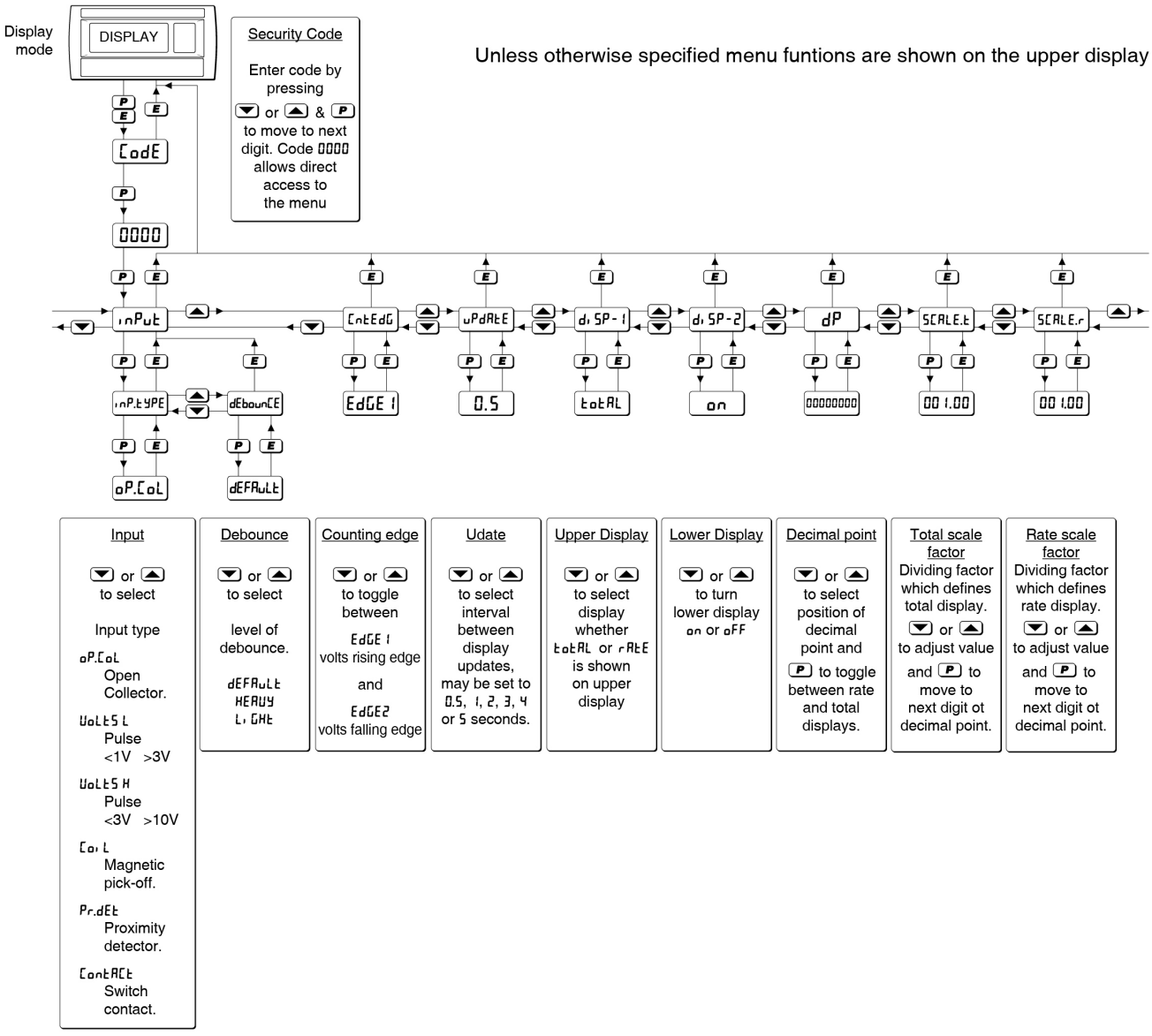
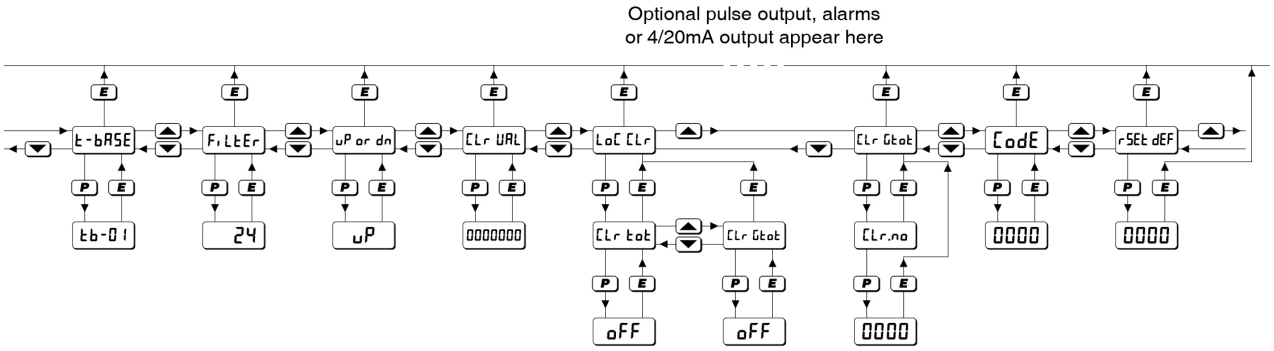


Fig 10 Configuration menu



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
Volts L	Voltage pulse low [1]	1	3V
Volts 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 BA367E 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 4.1.2.

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 BA367E 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 input frequency is 0.01Hz. Below this frequency the rate display will be forced to zero.

6.7 Input pulse counting edge: CnE EdGE

This function defines whether the BA367E 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 BA367E 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	0 0.0.0.0.0	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:

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:

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 BA367E Counter is required to display rate per second, per minute or per hour. See Fig 9.

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 BA367E 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 URL, the BA367E 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 URL

This function defines the value to which the total display is reset when the local or remote reset are operated. This allows the BA367E to be used as a preset down-counter.

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

To check or change the reset value select CLr URL 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 BA367E 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 BA367E Counter is in the display mode by operating the ▼ and ▲ push buttons simultaneously for more than three 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; 4.1.8 and 4.2.8 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 BA367E 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 BA367E 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 BA367E 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 BA367E Counter will display - - - - - - - - before automatically returning to the display mode when the operation is complete.

6.24 Display overflow

The BA367E 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 BA367E 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 BA367E Counter front panel. Similarly the grand total is not to be resettable from the BA367E Counter front panel. To simplify reading the BA367E 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 BA367E may be configured on-site without disconnection from the power supply or from the proximity detector. This example assumes that the BA367E initially has default factory configuration.

If after accessing the configuration menu the interval between operating any front panel push button exceeds one minute the BA367E 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 BA367E 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 10

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 BA367E should be linked together.

Step 3 Select display update

To aid reading the display the BA367E is only to be updated every 3 seconds.
Select uPdRtE from the configuration menu and press P. Using the ▼ or ▲ button select 3 and press E to return to the uPdRtE 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 BA367E is required to display total and rate with no decimal points.

Select dP. from the configuration menu and press P. The BA367E 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 BA367E 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 BA367E 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 BA367E 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 BA367E Counter 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 28V 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

ENSURE PLANT SAFETY BEFORE STARTING MAINTENANCE

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

If a BA367E Counter 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 28V on terminals 1 & 2 with terminal 1 positive
Pulse input indicator not rotating.	No input pulses	Output from transducer. Wiring between transducer and BA367E 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 BA367E 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. 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 BA367E Counter has a window on the right hand side of the display through which a scale card showing the units of measurement such as metres 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 on-site to the Counter without opening the instrument enclosure or removing it from the panel, See section 5.4 of this instruction manual.

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

9.2 Tag information

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

9.3 Alarms

Only one of the following accessories may be fitted: dual alarms, or an isolated pulse output or an isolated 4/20mA output.

The BA367E Counter can be supplied with factory fitted dual solid state single pole alarm outputs that may be independently configured as high or low, rate or total alarms with normally open or normally closed outputs.

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

WARNING

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

When the BA367E power supply is turned off or disconnected, 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 BA367E 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 11. 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

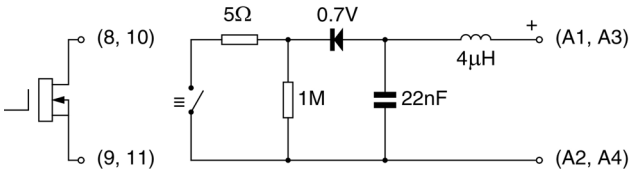


Fig 11 Equivalent circuit of each alarm output

9.3.2 Intrinsic safety

Each alarm output is a separate galvanically isolated intrinsically safe circuit with output safety parameters complying with the requirements for *simple apparatus*. This allows the alarm output terminals A1 & A2 and A3 & A4 to be connected to almost any intrinsically safe circuit protected by a Zener barrier or galvanic isolator providing the output parameters of the circuit do not exceed:

Uo = 28V dc
Io = 200mA
Po = 0.84W

The maximum equivalent capacitance and inductance between each set of alarm terminals is:

Ci = 22nF
Li = 4µH

To determine the maximum permissible cable capacitance Ci should be subtracted from the maximum permitted external capacitance Co specified by the certificate for the intrinsically safe interface powering the alarm circuit, such as the solenoid driver and switch transfer galvanic isolators shown in Fig 12.

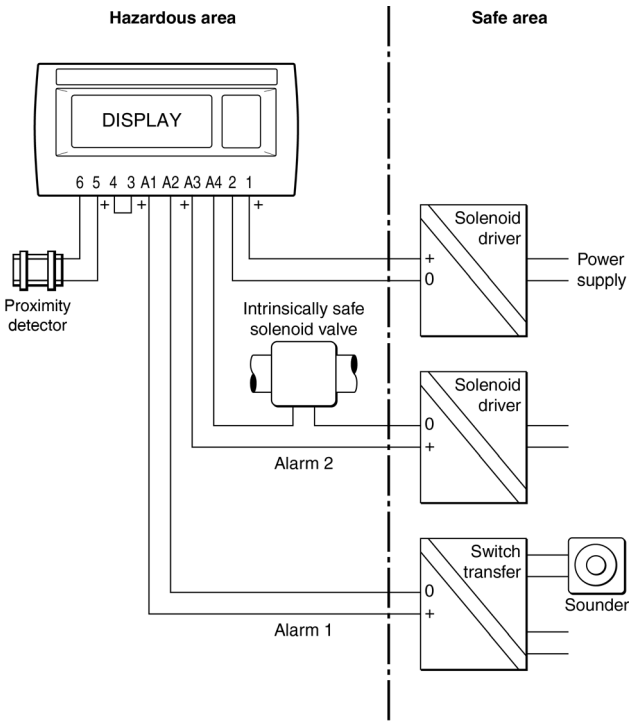


Fig 12 Typical alarm application

9.3.3 Configuration summary

When a BA367E Counter is supplied with alarms the configuration menu is extended as shown in Fig 13. Each alarm may be configured to operate on the rate or total display.

For simplicity Fig 13 only shows the configurable functions on the rate option of alarm AL1, the total options is identical except that the total alarms can not have hysteresis. Configuration of 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
HSter	**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 alarm setpoint and the alarm output being activated. See section 9.3.10
Si 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 and defines a separate security code. See section 9.3.13

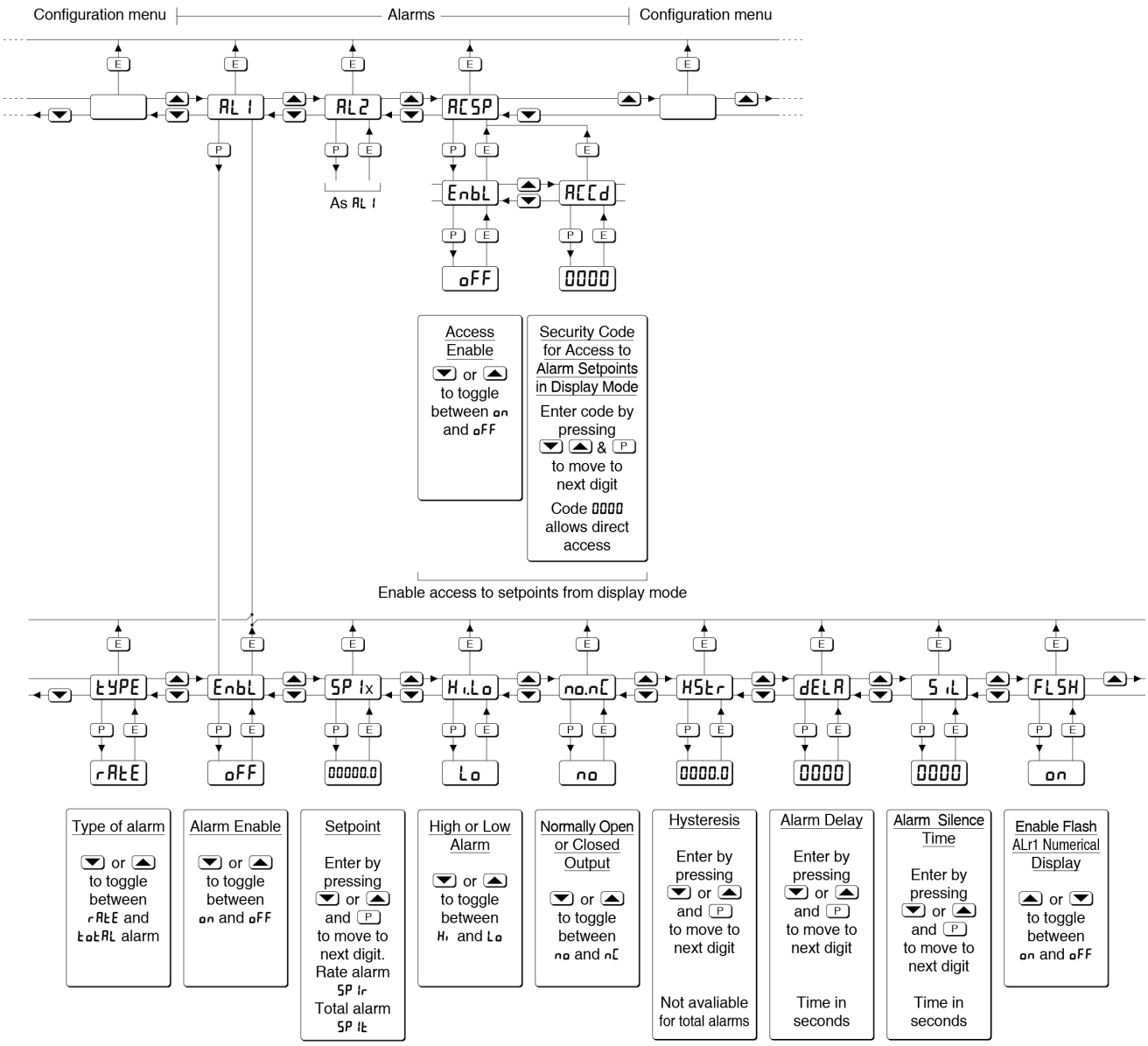


Fig 13 Alarm Configuration Functions in Configuration Menu

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 AL 1 or AL2 from the configuration menu and press P to reach EnbL in the alarm sub-menu. Pressing P will then reveal the existing setting. The function 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 -99999 and 999999, and the total alarm setpoint SP1t and SP2t anywhere between -9999999 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 BA367E 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: HSTr

Hysteresis is only available on rate alarms so the HSTr 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 HSTr 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 HSTr prompt in the alarm sub-menu.

e.g. A BA367E 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.

The alarm annunciator will start flashing immediately an alarm 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: Si 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 alarm silence time. When an alarm is silenced the alarm annunciator will flash until the silence time expires.

To adjust the alarm silence time select Si 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 silence 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 Si 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 BA367E 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 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 sub-menu and press P which will cause the BA367E 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 ACCd prompt. The revised security code will be activated when the BA367E Counter is returned to the display mode. Default security access code 0000 will disable the security code allowing direct access to the setpoints in the display 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 display mode

Access to the two alarm setpoints from the BA367E Counter's display mode is obtained by operating the P and ▲ push buttons simultaneously as shown in Fig 14. 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 configured. If the setpoints are 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 adjust the flashing digit and the P push button to move control to the next digit. If the correct code is entered pressing E will then cause 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 display mode.

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

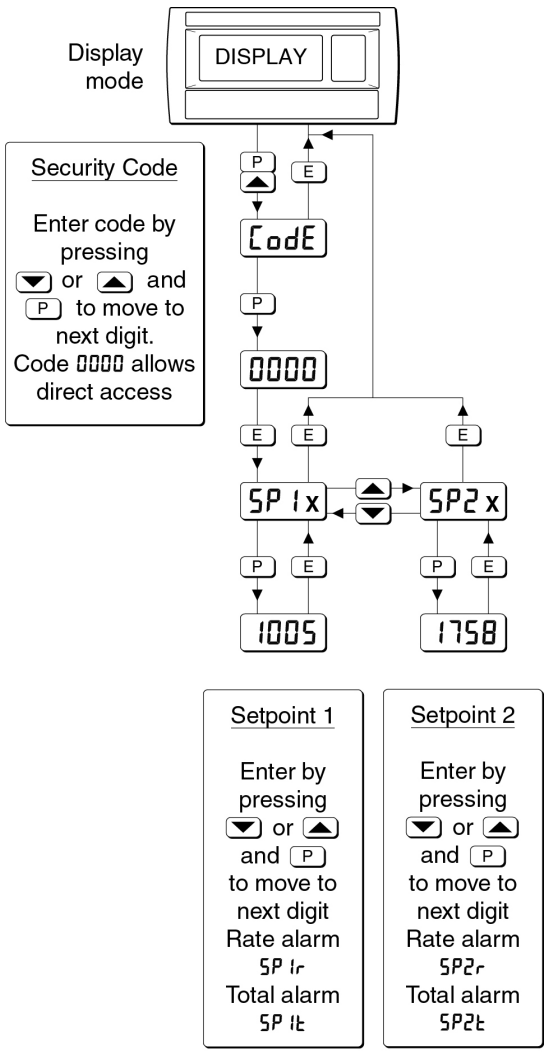


Fig 14 Setpoint adjustment from the display mode

To adjust an alarm setpoint select SP 1x or SP 2x and press (P) which will reveal the current setting. The flashing digit of the setpoint may be adjusted using the (▼) and (▲) push buttons 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 SP 2x prompt from which the other setpoint may be selected, or the instrument may be returned to the display mode by pressing (E) again.

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

9.4 Pulse output

Only one of the following accessories may be fitted: dual alarms, an isolated pulse output or an isolated 4/20mA output.

The BA367E Counter can be supplied with a factory fitted opto-isolated solid state pulse output. The output is an open collector having the following electrical parameters:

Ron	=	60Ω + 3V
Roff	=	1M
Imax	=	10mA

The output pulse may be a duplicate of the input pulse for re-transmission applications, or it may be derived from the total display. When derived from the total display the output pulse frequency may be divided and the output 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 Intrinsic safety

The pulse output is an optically isolated separate intrinsically safe circuit that has zero output safety parameters. The output therefore complies with the requirements *for simple apparatus*. This allows pulse output terminals P1 and P2 to be directly connected to any intrinsically safe circuit protected by a certified Zener barrier or galvanic isolator providing the output parameters do not exceed:

Uo	≤	28V dc
Io	≤	200mA dc
Po	≤	0.84W

The equivalent capacitance and inductance of the pulse output are both zero which allows the maximum permissible cable parameters specified by the certificate for the Zener barrier or galvanic isolator powering the pulse output circuit to be used.

9.4.2 System design

The BA367E Counter pulse output is a passive circuit i.e. not powered, but it is totally isolated from all other Counter circuits. Subject to complying with intrinsic safety interconnection requirements, the terminals P1 and P2 may be connected to another instrument with a open collector input. The pulse output may also be transferred to the safe area via a galvanic isolator or a Zener barrier.

Fig 15 shows how a 2-channel Zener barrier may be used to produce a voltage pulse in the safe area that could be used to drive a safe area counter. The positive terminal of the pulse output circuit P1 is connected to the BA367E Counter's positive supply terminal 1 at the instrument. When an output pulse occurs and the open collector output 'closes', P2 is connected to P1 and a pulse current flows through the diode return barrier and R1 in the safe area. The current flowing in the circuit is determined by resistor R1 which should be chosen to limit the pulse output current to less than 10mA. For a 24V supply R1 should be greater than 2,200Ω.

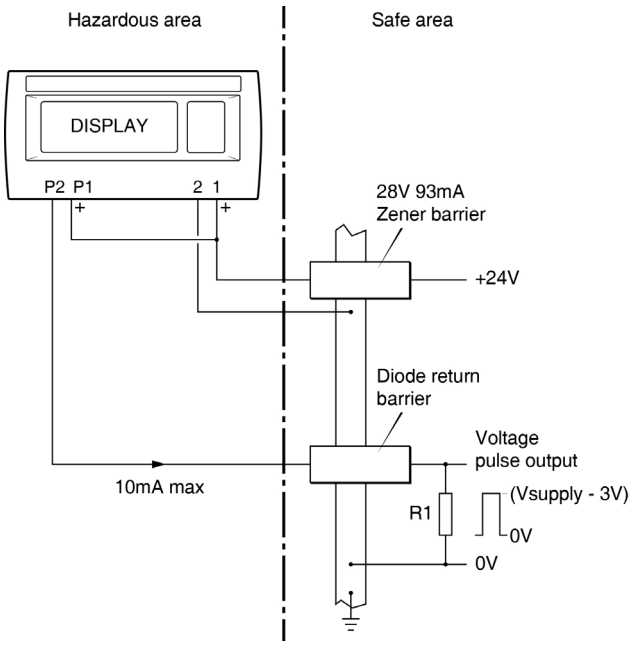


Fig 15 Transferring pulse output to safe area using Zener barriers

9.4.3 Configuration

When a BA367E Counter is supplied with an optional pulse output the configuration menu is extended as shown in Fig 16.

The pulse output sub-menu allows the source of the output pulse to be selected in the SourCE sub-function. For re-transmission applications the output pulse may be a synchronous duplicate of the input pulse by selecting dirECt in the SourCE sub-function.

Selecting SCALEd derives the output pulse from the total display and introduces two additional functions, diVidE and durAti on to the sub-menu allowing the output pulse frequency to be divided and the output pulse width (duration) to be defined. The total display is read every half second and any increase since the last reading copied into the pulse output counter. After dividing by the diVidE function, pulses of width defined by the durAti on function are asynchronously output from this counter as quickly as possible.

If the diVidE 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 BA367E Counter is disconnected or turned off, any stored pulses will not be retained

9.4.4 Access Pulse output sub-menu: PuLSE oP

Access the BA367E Counter configuration menu as described in section 6.2. Using the ▼ and ▲ push buttons scroll though the menu until PuLSE.oP is displayed, pressing (P) will then access the pulse output sub-menu which is shown in Fig 16.

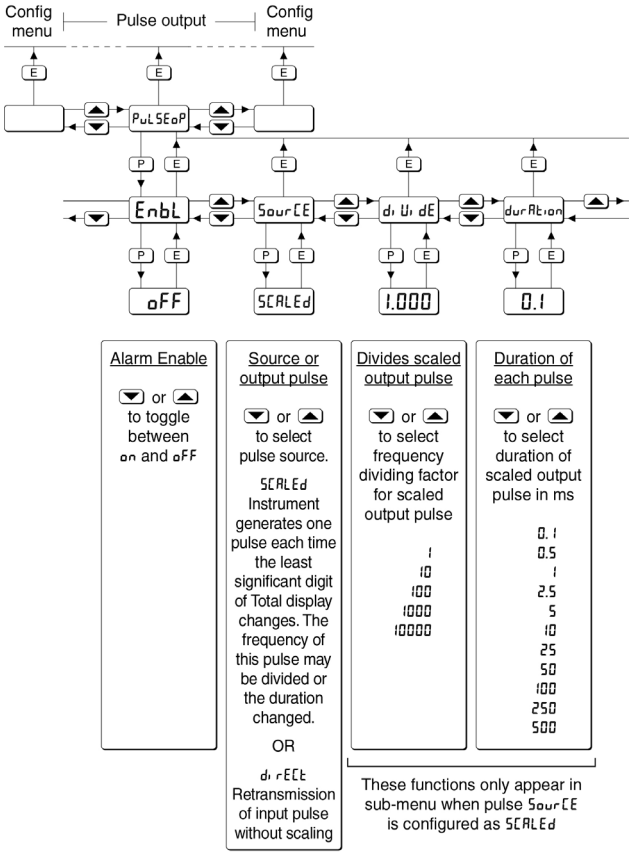


Fig 16 Pulse output configuration sub-menu

9.4.5 Enable pulse output: EnbL

This function allows the pulse output to be disabled or enabled without altering any of the pulse output parameters. Using the ▼ or ▲ push button select EnbL in the pulse output 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.

9.4.6 Source of pulse output: SourCE

The output pulse may be derived from:

dirECt	Output is a duplicate of the input pulse.
SCALEd	Output is derived from the total display. When SCALEd is selected two additional functions, di Ui dE and durAti on, appear in the pulse output sub-menu.

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.

9.4.7 Divide output pulse frequency: di Ui dE

When the output pulse is derived from the total display the output pulse frequency may be divided by:

1
10
100
1000
10000

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

Note: This function only appears in the sub-menu when the output pulse is derived from the the total display.

9.4.8 Output pulse width: durAti on

When the output pulse is derived from the total display, the pulse width is defined by this function. One of 11 pulse widths may be selected in milliseconds:

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 to 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.

Note: This function only appears in the pulse output sub-menu when the output pulse is derived from the total display.

9.5 4/20mA output

Only one of the following accessories may be fitted: dual alarms, or an isolated pulse output or an isolated 4/20mA output.

The BA367E Counter can be supplied with a factory fitted galvanically isolated 4/20mA current sink which may be configured to represent the rate or total display.

9.5.1 Intrinsic safety

The 4/20mA output has been certified as a separate galvanically isolated intrinsically safe circuit complying with the requirements for *simple apparatus.* This allows terminals C1 and C3 to be connected to any intrinsically safe circuit protected by a certified Zener barrier or galvanic isolator providing the output parameters do not exceed:

Uo ≤ 28V dc
Io ≤ 200mA dc
Po ≤ 0.84W

The maximum equivalent capacitance and inductance of the 4/20mA output is:

Ci = 13nF
Li = 4µH

To determine the maximum permissible cable parameters, these figures should be subtracted from the maximum cable capacitance and inductance specified by the certificate for the Zener barrier or galvanic isolator powering the 4/20mA output circuit.

9.5.2 System design

The optional 4/20mA output is a passive current sink i.e. not powered, but it is totally isolated from all other Counter circuits. It is effectively a 2-wire 4/20mA transmitter requiring a minimum supply of 10V with the current being controlled by the BA367E rate or total display. Subject to complying with intrinsic safety interconnection requirements, terminals C1 and C3 may be directly connected to another instrument located in the same hazardous area which will accept a 4/20mA loop powered transmitter input. The 4/20mA current may be transferred to the safe area via a galvanic isolator or Zener barriers.

Fig 17 shows how a 2-channel Zener barrier may be used to power the 4/20mA current output from the safe area, alternatively a galvanic isolator may be used.

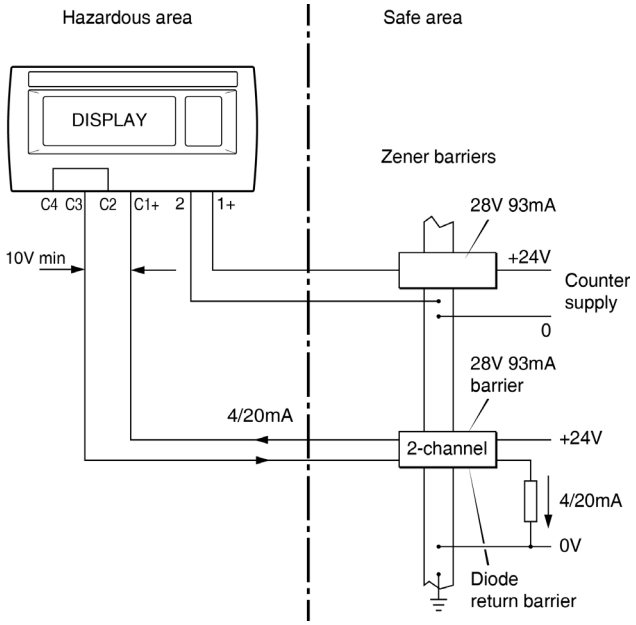


Fig 17 Application of 4/20mA output

9.5.3 Configuration

When a BA367E Counter is supplied with an optional 4/20mA output the configuration menu is extended as shown in Fig 18. 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.

9.5.4 Access 4/20mA output sub-menu: 4-20 oP

Access the BA367E Counter configuration menu as described in section 6.2. Using the ▼ and ▲ 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 18.

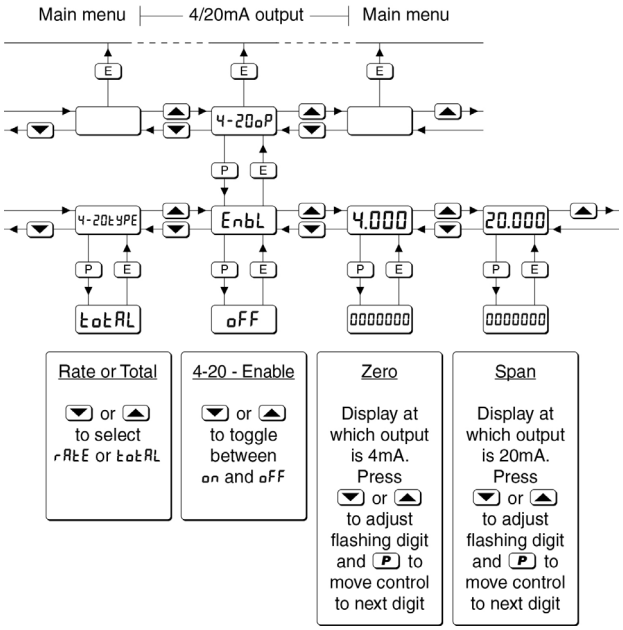


Fig 18 4/20mA output configuration sub-menu

9.5.5 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 1: When the 4/20mA output is disabled by selecting oFF, the output is a constant 3.5mA irrespective of the instrument display.

9.5.6 Select rate or total source: 4-20tYPE

The 4/20mA output current can represent the BA367E Counter's rate or total display and this must be defined before any other 4/20mA current output functions are configured.

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 4-20tYPE prompt.

Note 1: If the controlling source of the 4/20mA output is changed i.e. from rate to total, the 4/20mA output will be disabled and the output will be a constant 3.5mA irrespective of the instrument display. The 4/20mA output must always be re-enabled and reconfigured following the controlling source being changed.

9.5.7 Display which corresponds to 4mA output: 4.000

The BA367E 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 to 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.

9.5.8 Display which corresponds to 20mA output: 20.000

The BA367E 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. to 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.

Note 1: If the BA367E Counter and the 4/20mA current sink output are powered from separate supplies, the 4/20mA output current will continue to flow when the BA367E Counter supply fails or is turned off. Powering both from a common supply eliminates this effect.

9.6 Display backlight

The BA367E 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 or intrinsically safe interface is required, but the BA367E supply current increases as shown below.

	BA367E Maximum current consumption
Without backlight	10.0mA
With backlight	32.5mA
Addition with terminals 3 & 4 linked	6.0mA
Total current	38.5mA max

Appendix 1 IECEx certification

A1.0 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

A1.1 IECEx Certificate of Conformity

The BA367E Counter has been issued with an IECEx Certificate of Conformity number IECEx ITS 16.0004X which specifies the following certification code:

Ex ia IIC T5 Ga -40ºC ≤ Ta ≤ +70ºC.

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

A1.2 Installation

The IECEx intrinsic safety parameters are identical to the ATEX safety parameters described in the main section of this manual and both refer to the same standards. Therefore the ATEX installation requirements specified in sections 3, 4 and 5 of this manual may be used for IECEx installations, but the local code of practice should also be consulted.

A1.3 Special conditions for safe use

The IECEx certificate has an 'X' suffix indicating that special conditions apply to prevent an electrostatic charge developing on the outside of the instrument enclosure.

WARNING
To avoid an electrostatic charge being generated instrument enclosure should only be cleaned with a damp cloth.

Appendix 2 ETL & cETL certification for installations in USA and Canada

A2.0 cETL Mark

For installations in the USA and Canada, the BA367E Counter has ETL and cETL intrinsic safety and nonincendive approval, Control Number 4008610. Copies of the Authorisation to Mark are available from the BEKA associates sales office and www.beka.co.uk

A2.1 Intrinsic safety approval

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

Installations must comply with BEKA associates Control Drawing CI330-52, which is attached to this appendix.

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

ETL and cETL intrinsic safety codes

CL I Div 1 Groups A, B, C, D T5 (US IS gas, Div cert)
CL II Div 1 Groups E, F, G. CL III (US IS dust, Div cert)

CL I Zone 0 AEx ia IIC T5 Ga (US IS gas, Zone cert)
Ex ia IIC T5 Ga (Canadian IS gas, Zone cert)

-40ºC ≤ Ta ≤ 70ºC

A2.2 Nonincendive approval

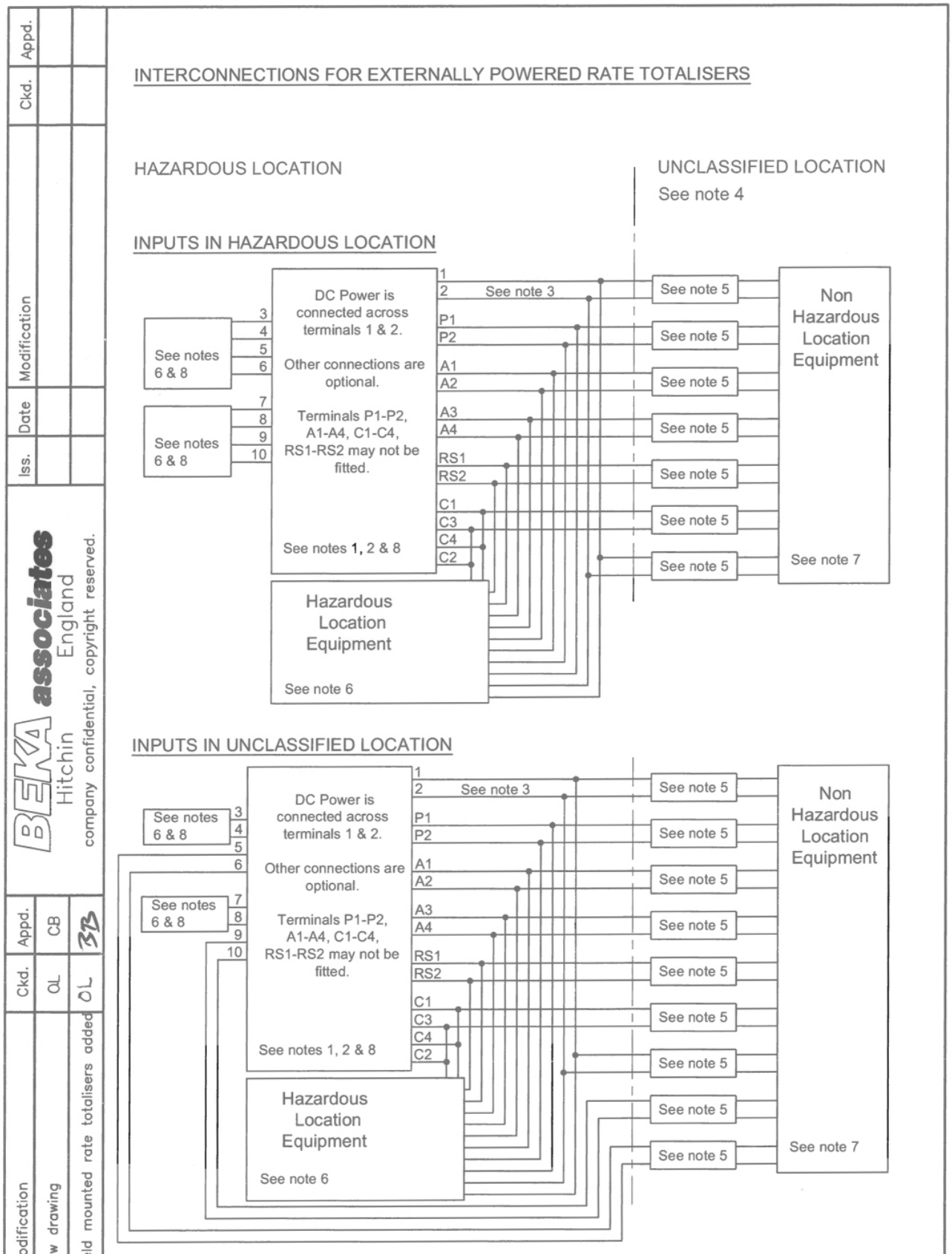
The BA367E Counter also has ETL nonincendive approval allowing installation in Division 2 hazardous (classified) locations without the need for Zener barriers or galvanic isolators.

Installations must comply with BEKA associates Control Drawing CI330-53, which is attached to this appendix, and with the local codes of practice.

ETL and cETL nonincendive codes US & Canada

CL I Div 2 Groups A, B, C, D T5
CL II Div 2 Groups F, G CL III Div 2
-40ºC ≤ Ta ≤ 70ºC

INTERCONNECTIONS FOR EXTERNALLY POWERED RATE TOTALISERS



Iss.	Date	Modification	Appd.	Ckd.	Appd.
1	05.05 2016	New drawing		CB	OL
2	05.08 2016	Field mounted rate totalisers added		OL	BB

BEKA associates Hitchin England

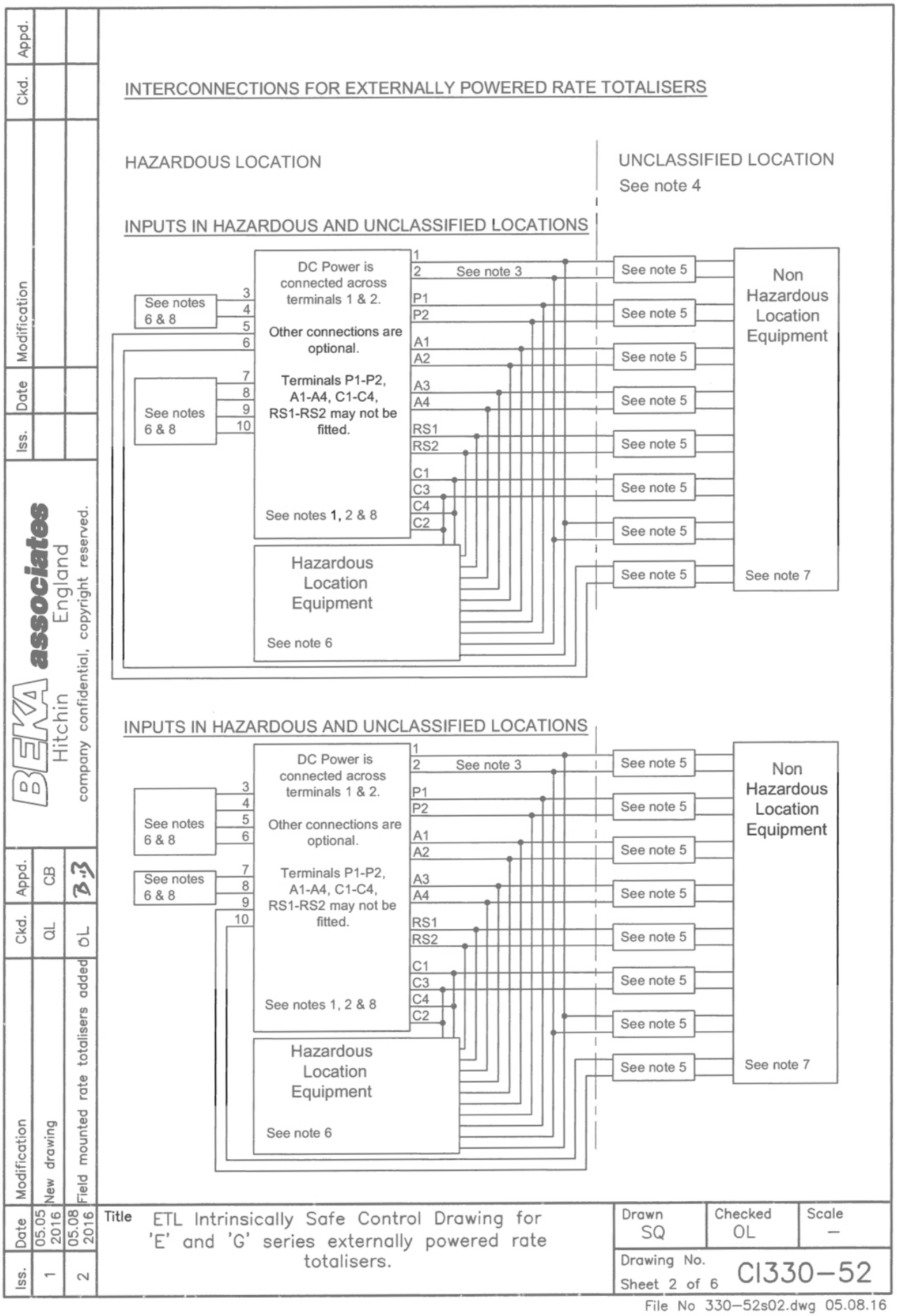
Title: ETL Intrinsically Safe Control Drawing for 'E' and 'G' series externally powered rate totalisers

Drawn	Checked	Scale
SQ	OL	—

Drawing No. CI330–52

Sheet 1 of 6

File No 330–52s01.dwg 05.08.16


INTERCONNECTIONS FOR EXTERNALLY POWERED RATE TOTALISERS
HAZARDOUS LOCATION
UNCLASSIFIED LOCATION
See note 4
INPUTS IN HAZARDOUS AND UNCLASSIFIED LOCATIONS
DC Power is connected across terminals 1 & 2.
Other connections are optional.
Terminals P1-P2, A1-A4, C1-C4, RS1-RS2 may not be fitted.
See notes 1, 2 & 8
See notes 6 & 8
See notes 6 & 8
Hazardous Location Equipment
See note 6
1
2
See note 3
P1
P2
A1
A2
A3
A4
RS1
RS2
C1
C3
C4
C2
3
4
5
6
7
8
9
10
See note 5
Non Hazardous Location Equipment
See note 7
INPUTS IN HAZARDOUS AND UNCLASSIFIED LOCATIONS
DC Power is connected across terminals 1 & 2.
Other connections are optional.
Terminals P1-P2, A1-A4, C1-C4, RS1-RS2 may not be fitted.
See notes 1, 2 & 8
See notes 6 & 8
See notes 6 & 8
Hazardous Location Equipment
See note 6
Non Hazardous Location Equipment
See note 7
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company confidential, copyright reserved.
Appd.
Ckd.
Modification
Date
Iss.
CB
QL
QL
3.3
Field mounted rate totalisers added
New drawing
05.08 2016
05.05 2016
1
2
Title
ETL Intrinsically Safe Control Drawing for 'E' and 'G' series externally powered rate totalisers.
Drawn SQ
Checked OL
Scale –
Drawing No. CI330–52
Sheet 2 of 6
File No 330–52s02.dwg 05.08.16

Notes

1. 1 and 2 input externally powered rate totalisers with model numbers and coding as shown in the following tables.

E PANEL MOUNTING INSTRUMENTS

Type	Model Nos.	Division Marking	Zonal Marking	Ambient Temp.
1 input tachometer 1 input rate totaliser 2 input rate totaliser 1 input counter 2 input counter 1 input timer 2 input timer	BA317E BA318E BA337E BA338E BA388E BA367E BA368E BA377E BA378E	Class I Division 1 Groups A, B, C & D T5 Class II Division 1 Groups E, F & G Class III Division 1	Zone 0 AEx ia IIC T5 Ga	−40°C to +70°C

E−SS PANEL MOUNTING INSTRUMENTS

Type	Model Nos.	Division Marking	Zonal Marking	Ambient Temp. (see note 9)
1 input tachometer 1 input rate totaliser 1 input counter 1 input timer	BA317E−SS BA337E−SS BA367E−SS BA377E−SS	Class I Division 1 Groups A, B, C & D T5 Class II Division 1 Groups E, F & G Class III Division 1	Zone 0 AEx ia IIC T5 Ga Zone 20 AEx ia IIIC T80°C Da	−40°C to +60°C

G FIELD MOUNTING INSTRUMENTS

Type	Model Nos.	Division Marking	Zonal Marking	Ambient Temp. (see note 9)
1 input tachometer 1 input rate totaliser 2 input rate totaliser 2 input counter 2 input timer	BA314G BA334G BA384G BA364G BA374G	Class I Division 1 Groups A, B, C & D T5 Class II Division 1 Groups E, F & G Class III Division 1	Zone 0 AEx ia IIC T5 Ga Zone 20 AEx ia IIIC T80°C Da	−40°C to +60°C

E FIELD MOUNTING INSTRUMENTS

Type	Model Nos.	Division Marking	Zonal Marking	Ambient Temp.
1 input tachometer 1 input rate totaliser 2 input rate totaliser 2 input counter 2 input timer	BA314E BA334E BA384E BA364E BA374E	Class I Division 1 Groups A, B, C & D T5 Class II Division 1 Groups E, F & G Class III Division 1	Zone 0 AEx ia IIC T5 Ga	−40°C to +70°C

2. Terminals 7, 8, 9 and 10 only exist on 2 input instruments.

Iss.	Date	Modification	Ckd.	Appd.
1	05.05 2016	New drawing	OL	CB
2	05.08 2016	Field mounted rate totalisers added	OL	

BEKA associates Hitchin England

Title: ETL Intrinsically Safe Control Drawing for 'E' and 'G' series externally powered rate totalisers.

Drawn	Checked	Scale
SQ	OL	—

Drawing No. CI330−52
Sheet 3 of 6

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3. Installations shall be in accordance with ANSI/ISA RP 12.06.01 'Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations' and the National Electrical Code ANSI/NFPA 70. Installations in Canada shall be in accordance with the Canadian Electrical Code C22.2.

4. The associated protective barriers and galvanic isolators shall be NRTL approved and the manufacturers instructions shall be followed when installing this equipment.
For installations in Canada the associated protective barriers and galvanic isolators shall be NRTL or CSA approved and the manufacturers installation drawings shall be followed when installing this equipment.

5. One single channel or one two channel associated protective barrier or galvanic isolator with entity parameters complying with the following requirements:

Uo	equal or less than	the lowest Ui of the NRTL or CSA approved apparatus installed in the loop.
Io	equal or less than	the lowest Ii of the NRTL or CSA approved apparatus installed in the loop.
Po	equal or less than	the lowest Pi of the NRTL or CSA approved apparatus installed in the loop.
Lo	equal or greater than	the sum of the cable inductances and the internal inductances Li of each NRTL or CSA approved apparatus in the loop.
Co	equal or greater than	the sum of the cable capacitance and the internal capacitance Ci of each NRTL or CSA approved apparatus in the loop.

6. Simple Apparatus as defined in the National Electrical Code ANSI/NFPA 70, or for installations in Canada by the Canadian Electrical Code C22.2 OR:

Ui	equal or greater than	the highest Uo of the NTRL or CSA approved apparatus powering the loop.
Ii	equal or greater than	the highest Io of the NTRL or CSA approved apparatus powering the loop.
Pi	equal or greater than	the highest Po of the NTRL or CSA approved apparatus powering the loop.
Lo	of the NTRL or CSA approved apparatus powering the loop equal or greater than	the sum of the cable inductances and the internal inductances Li of each NTRL or CSA approved apparatus in the loop.
Co	of the NTRL or CSA approved apparatus powering the loop equal or greater than	the sum of the cable capacitances and the internal capacitances Ci of each NTRL or CSA approved apparatus in the loop.

Iss.	Date	Modification	Ckd.	Appd.
1	05.05 2016	New drawing	OL	CB
2	05.08 2016	Field mounted rate totalisers added	OL	BB

BEKA associates Hitchin England

Title: ETL Intrinsically Safe Control Drawing for 'E' and 'G' series externally powered rate totalisers.

Drawn	Checked	Scale
SQ	OL	–

Drawing No. CI330–52
Sheet 4 of 6

File No 330–52s07.dwg 05.08.16

7. The unclassified location equipment shall not use or generate more than 250V rms or 250V dc.

8. Safety parameters

DC Power terminals 1 & 2

Ui	= 28V	Uo = 0
Ii	= 200mA	Io = 0
Pi	= 0.84W	
Ci	= 2nF	
Li	= 4µH	

Terminals RS1-RS2, (optional reset input)

Ui	= 28V	Uo = 3.8V
Ii	= 200mA	Io = 1mA
Pi	= 0.84W	Po = 1mW
Ci	= 0	
Li	= 0	

Terminals 4,5,6 (input A for models in notes 6 and 7), terminals 8,9,10 (input b for models in note 7).

Ui	= 28V	Uo = 1.1V
Ii	= 200mA	Io = 0.5mA
Pi	= 0.84W	Po = 0.2mW
Ci	= 2nF	
Li	= 4µH	

Terminal 3,4,5,6 (input A for models in notes 6 and 7), terminals 7,8,9,10 (input b for models in note 7).

Ui	= 14V	Uo = 10.5V
Ii	= 200mA	Io = 9.2mA
Pi	= 0.7W	Po = 24mW
Ci	= 2nF	
Li	= 4µH	

Optional pulse output terminals P1 & P2

Ui	= 28V	Uo = 0
Ii	= 200mA	Io = 0
Pi	= 0.84W	
Ci	= 0	
Li	= 0	

Optional 4-20mA output terminals C1, C2, C3 and C4

Ui	= 28V	Uo = 0
Ii	= 200mA	Io = 0
Pi	= 0.84W	
Ci	= 2.2nF	
Li	= 4µH	

Optional alarm output terminals A1, A2, A3 and A4

Ui	= 28V	Uo = 1.47V
Ii	= 200mA	Io = 1µA
Pi	= 0.84W	Po = 2µW
Ci	= 22nF	
Li	= 4µH	

9. When installed purely as intrinsically safe equipment in division 1, division 2, zone 0, zone 1 or zone 2, the ambient temperature range of the BA317E-SS, BA337E-SS, BA367E-SS, BA377E-SS, BA314G, BA334G, BA364G, BA374G and BA384G is: -40°C ≤ Ta ≤ +70°C.

Iss.	Date	Modification	Ckd.	Appd.
1	05.05 2016	New drawing	OL	CB
2	05.08 2016	Field mounted rate totalisers added	OL	3.3

BEKA associates Hitchin England

Title: ETL Intrinsically Safe Control Drawing for 'E' and 'G' series externally powered rate totalisers.

Drawn	Checked	Scale
SQ	OL	—

Drawing No. CI330–52

Sheet 5 of 6

File No 330–52s08.dwg 05.08.16

10. **CAUTION** Aluminium and stainless steel certification labels that are mounted on the BA317E, BA318E, BA337E, BA338E, BA367E, BA368E, BA377E, BA378E and BA388E externally powered rate totaliser enclosures may be marked with their maximum capacitance (8pF). The BA317E, BA318E, BA337E, BA338E, BA367E, BA368E, BA377E, BA378E and BA388E enclosures may also carry the following potential electrostatic warning:

WARNING
Potential electrostatic charging hazard clean only with a damp cloth

AVERTISSEMENT
Risque potentiel de charge électrostatique Nettoyer uniquement avec un chiffon humide

Alternatively, the enclosures may be manufactured from a conducting plastic per Article 250 of the National Electrical Code.

11. When mounting the BA317E, BA318E, BA337E, BA338E, BA367E, BA368E, BA377E, BA378E and the BA388E panel mounting externally powered rate totalisers in an enclosure to maintain Type 4 front panel rating:

Minimum panel thickness should be 2mm (0.08inches) Steel
3mm (0.12inches) Aluminium

Outside panel finish should be smooth, free from particles, inclusions, runs or build-ups around cut-out.

Panel cut-out for BA317E, BA327E, BS367E and BA377E shall be:
90.0 x 43.5mm -0.0 +0.5mm (3.54 x 1.71 inches –0.00 +0.02)

Two panel mounting clips are required and each shall be tightened to between: 20 & 22cNm (1.77 to 1.95inLb)

Panel cut-out for BA318E, BA338E, BA368E, BA378E and BA388E shall be:
66.2 x 136.0mm-0.0 +0.5mm (2.60 x 5.35 inches –0.00 +0.02)

Four panel mounting clips are required and each shall be tightened to between: 20 & 22cNm (1.77 to 1.95inLb)

12. When mounting the BA317E-SS, BA337E-SS, BA367E-SS, and BA377E-SS panel mounting externally powered rate totalisers in an AEx e, AEx n, AEx p or AEx t certified enclosure, or an enclosure to maintain IP66 front panel rating, the panel cut-out shall be:

92.0 +0.8/-0.0 x 45.0 +0.6/-0.0mm (3.62 +0.03/-0.0 x 1.77 +0.02/-0.0 inches)

4 panel mounting clamps are required and each shall be tightened to a minimum of 22cNm (1.95inLb).

When correctly installed, the BA317E-SS, BA337E-SS, BA367E-SS and BA377E-SS will not invalidate the certification of an AEx e, AEx n, AEx p or AEx t panel enclosure.

Iss.	Date	Modification	Ckd.	Appd.
1	05.05 2016	New drawing	QL	CB
2	05.08 2016	Field mounted rate totalisers added	OL	3.3

BEKA associates Hitchin England

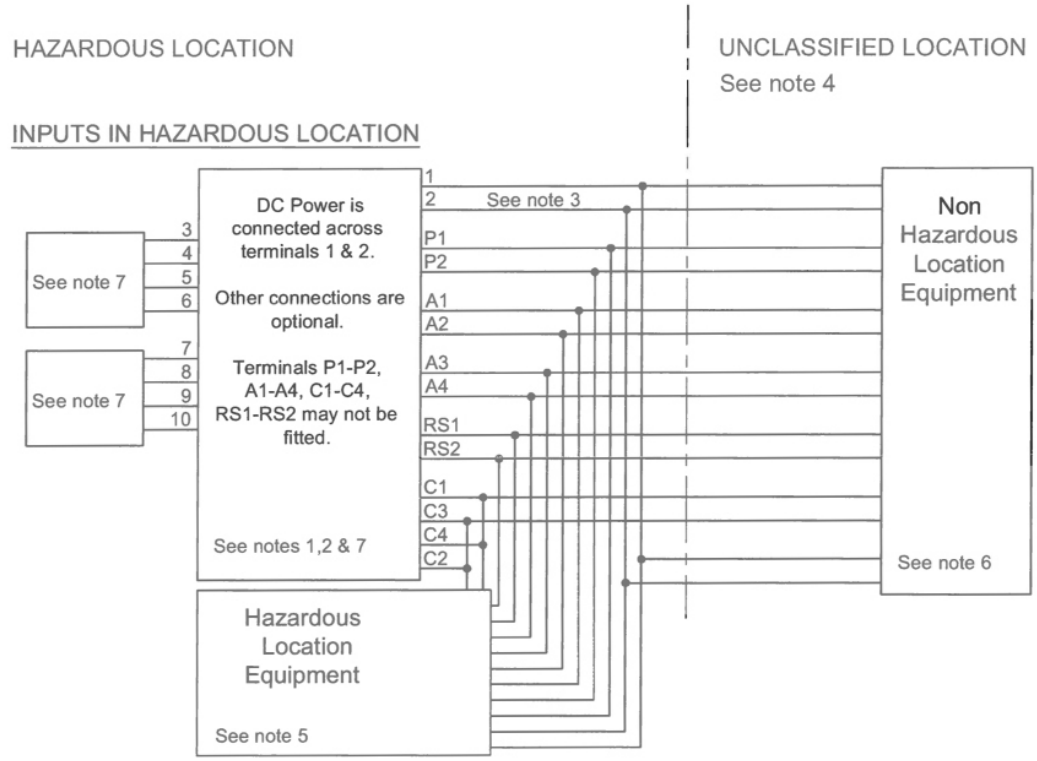
Title: ETL Intrinsically Safe Control Drawing for 'E' and 'G' series externally powered rate totalisers.

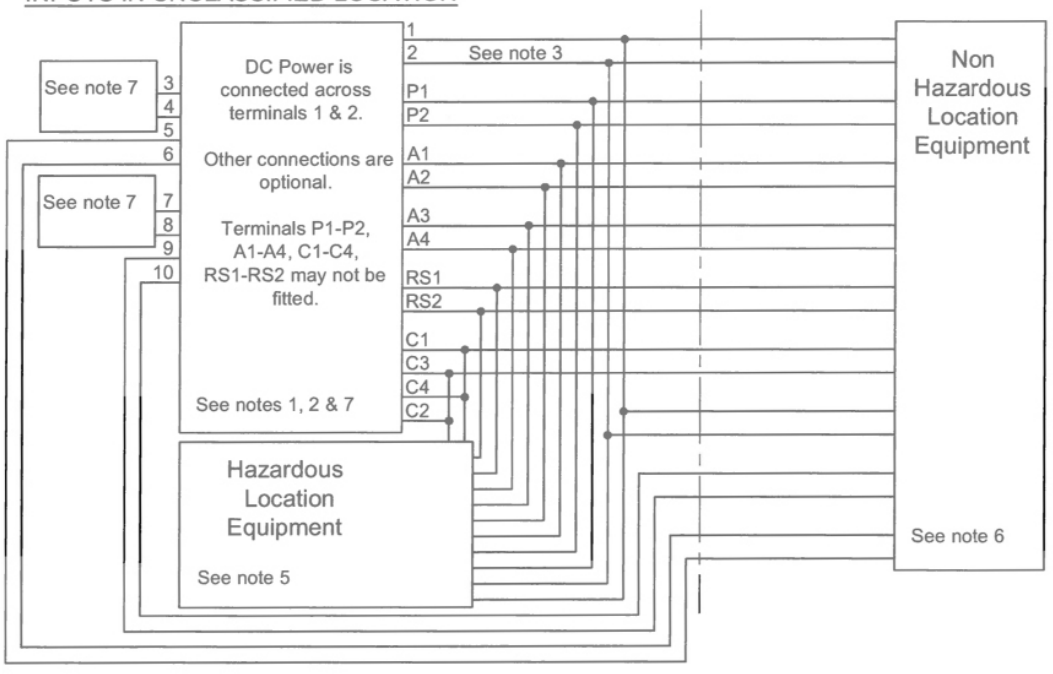
Drawn	Checked	Scale
SQ	OL	–

Drawing No. CI330–52
Sheet 6 of 6

File No 330–52s06.dwg 05.08.16

INTERCONNECTIONS FOR EXTERNALLY POWERED RATE TOTALISERS





Iss.	Date	Modification	Ckd.	Appd.
1	15.06 2016	New drawing	QL	CB
2	05.08 2016	Field mounted rate totalisers added	OL	33

BEKA associates Hitchin England

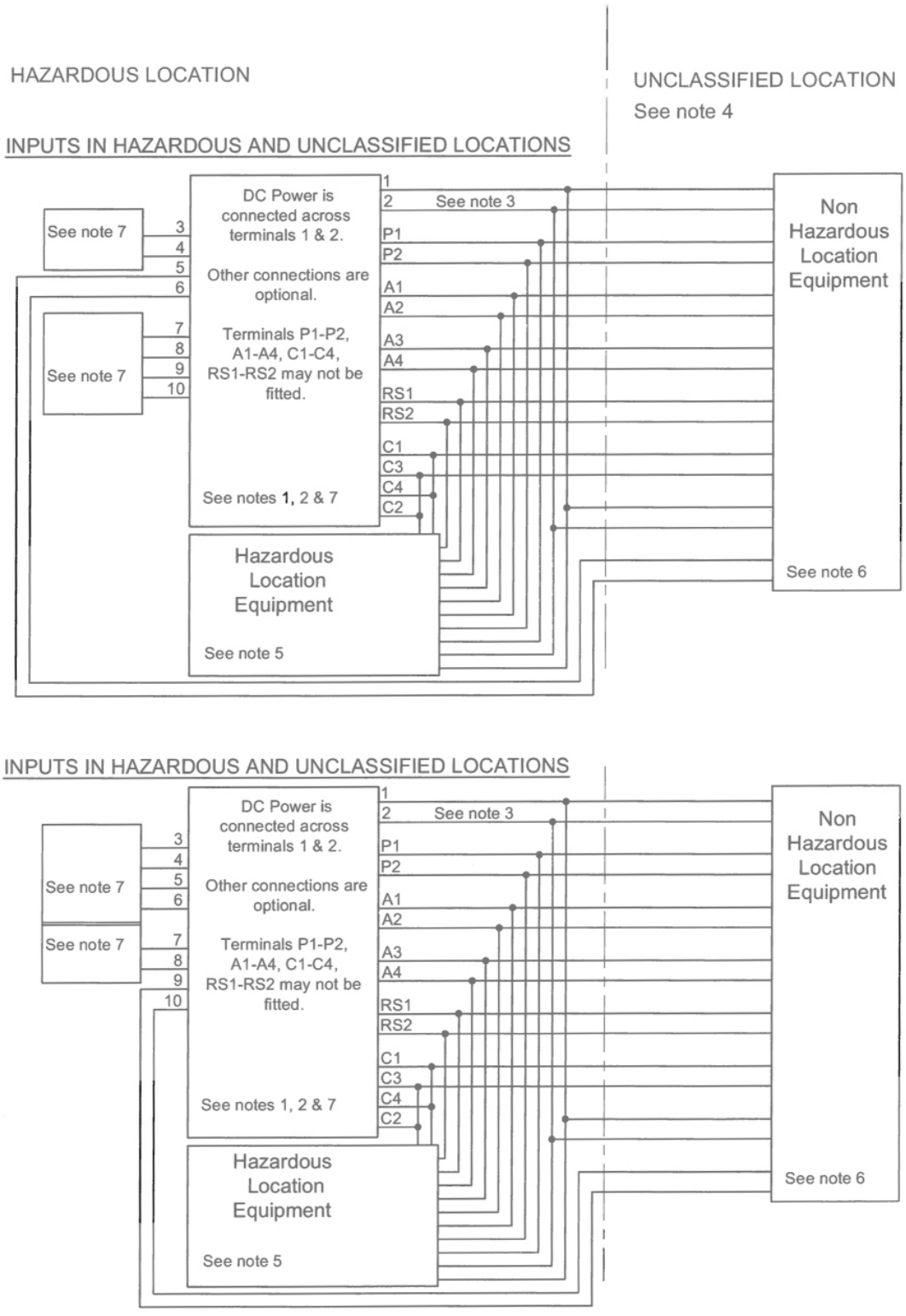
Title: ETL Nonincendive Control Drawing for 'E' and 'G' series externally powered rate totalisers.

Drawn	Checked	Scale
SQ	OL	—

Drawing No. CI330–53
Sheet 1 of 6

File No 330–53s01.dwg 05.08.16

INTERCONNECTIONS FOR EXTERNALLY POWERED RATE TOTALISERS



Iss.	Date	Modification	Ckd.	Appd.
1	15.06 2016	New drawing	OL	CB
2	05.08 2016	Field mounted rate totalisers added	OL	BB

BEKA associates Hitchin England

Title: ETL Nonincendive Control Drawing for 'E' and 'G' series externally powered rate totalisers.

Drawn	Checked	Scale
SQ	OL	—

Drawing No. CI330–53
Sheet 2 of 6

File No 330–53s02.dwg 05.08.16

Iss.	Date	Modification	Ckd.	Appd.
1	05.05 2016	New drawing	QL	CB
2	05.08 2016	Field mounted rate totalisers added	OL	3.3

BEKA associates
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Notes

1. 1 and 2 input externally powered rate totalisers with model numbers and coding as shown in the following tables.

NE PANEL MOUNTING INSTRUMENTS

Type	Model Nos.	Division Marking	Zonal Marking (see note 8)	Ambient Temp. (see note 9)
1 input tachometer 1 input rate totaliser 1 input counter 1 input timer	BA317NE BA337NE BA367NE BA377NE	Class I Division 2 Groups A, B, C & D T5 Class II Division 2 Groups F & G Class III Division 2	Zone 2 AEx nA ic IIC T5 Gc Zone 22 AEx ic tc IIIC T80°C Dc	−40°C to +60°C

E PANEL MOUNTING INSTRUMENTS

Type	Model Nos.	Division Marking	Zonal Marking	Ambient Temp.
1 input tachometer 1 input rate totaliser 2 input rate totaliser 1 input counter 2 input counter 1 input timer 2 input timer	BA317E BA318E BA337E BA338E BA388E BA367E BA368E BA377E BA378E	Class I Division 2 Groups A, B, C & D T5 Class II Division 2 Groups F & G Class III Division 2	None	−40°C to +70°C

E−SS PANEL MOUNTING INSTRUMENTS

Type	Model Nos.	Division Marking	Zonal Marking	Ambient Temp.
1 input tachometer 1 input rate totaliser 1 input counter 1 input timer	BA317E−SS BA337E−SS BA367E−SS BA377E−SS	Class I Division 2 Groups A, B, C & D T5 Class II Division 2 Groups F & G Class III Division 2	None	−40°C to +70°C

NG FIELD MOUNTING INSTRUMENTS

Type	Model Nos.	Division Marking	Zonal Marking (see note 8)	Ambient Temp. (see note 9)
1 input tachometer 1 input rate totaliser 2 input rate totaliser 2 input counter 2 input timer	BA314NG BA334NG BA384NG BA364NG BA374NG	Class I Division 2 Groups A, B, C & D T5 Class II Division 2 Groups F & G Class III Division 2	Zone 2 AEx nA ic IIC T5 Gc Zone 22 AEx ic tc IIIC T80°C Dc	−40°C to +60°C

G FIELD MOUNTING INSTRUMENTS

Type	Model Nos.	Division Marking	Zonal Marking	Ambient Temp.
1 input tachometer 1 input rate totaliser 2 input rate totaliser 2 input counter 2 input timer	BA314G BA334G BA384G BA364G BA374G	Class I Division 2 Groups A, B, C & D T5 Class II Division 2 Groups F & G Class III Division 2	None	−40°C to +70°C

E FIELD MOUNTING INSTRUMENTS

Type	Model Nos.	Division Marking	Zonal Marking	Ambient Temp.
1 input tachometer 1 input rate totaliser 2 input rate totaliser 2 input counter 2 input timer	BA314E BA334E BA384E BA364E BA374E	Class I Division 2 Groups A, B, C & D T5 Class II Division 2 Groups F & G Class III Division 2	None	−40°C to +70°C

Title: ETL Nonincendive Control Drawing for 'E' and 'G' series externally powered rate totalisers.

Drawn	Checked	Scale
SQ	OL	—

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2. Terminals 7, 8, 9 and 10 only exist on 2 input instruments.

3. Nonincendive field wiring installations shall be in accordance with the National Electrical Code ANSI/NFPA 70. The Nonincendive Field Wiring concept allows interconnection of Nonincendive Field Apparatus with Associated Nonincendive Field Wiring Apparatus using any of the wiring methods permitted for unclassified locations. Installations in Canada shall be in accordance with the Canadian Electrical Code C22.2.

4. Classified location equipment shall br NRTL Approved Nonincendive Field Wiring Apparatus or simple apparatus as defined in ANSI/NFPA70. For Canadian installations classified location equipment shall be NRTL or CSA Approved Nonincendive Field Wiring Apparatus.

5. Simple Apparatus as defined in the National Electrical Code ANSI/NFPA 70, 3r for installations in Canada by the Canadian Electrical Code C22.2 or as defined in note 2.

6. The unclassified location equipment shall not use or generate more than 250V rms or 250V dc.

Iss.	Date	Modification	Ckd.	Appd.
1	15.06 2016	New drawing	QL	CB
2	05.08 2016	Field mounted rate totalisers added	OL	2.3

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Title: ETL Nonincendive Control Drawing for 'E' and 'G' series externally powered rate totalisers.

Drawn	Checked	Scale
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7. Safety parameters

DC Power terminals 1 & 2

Ui = 30V
Ii = 100mA

Terminals 4,5,6 (input A for models in notes 5 and 6), terminals 8,9,10 (input b for models in note 6).

Ui = 30V
Uo = 1.1V
Io = 0.5mA

Optional pulse output terminals P1 & P2

Ui = 30V
Ii = 100mA
Uo = 0
Io = 0

Optional alarm output terminals A1, A2, A3 and A4

Ui = 30V
Ii = 200mA
Uo = 1.47V
Io = 1µA

Terminals RS1-RS2, (optional reset input)

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

Terminal 3,4,5,6 (for models in notes 5 and 6), terminals 7,8,9,10 (input b with terminals for models in note 6).

Ui = 15V
Uo = 10.5V
Io = 9.2mA

Optional 4-20mA output terminals C1, C2, C3 and C4

Ui = 30V
Uo = 0
Io = 0

8. The 'AEx ic' in codes refers to instrument push button contacts which are nonincendive.

9. When installed purely as non-incendive equipment, the ambient temperature range of the BA317NE, BA337NE, BA367NE, BA377NE, BA314NG, BA334NG, BA364NG, BA374NG, and BA384NG is: -40°C ≤ Ta ≤ +70°C.

Iss.	Date	Modification	Ckd.	Appd.
1	15.06 2016	New drawing	OL	CB
2	05.08 2016	Field mounted rate totalisers added	OL	BB

BEKA associates Hitchin England

Title: ETL Nonincendive Control Drawing for 'E' and 'G' series externally powered rate totalisers.

Drawn	Checked	Scale
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10. **CAUTION** The BA317E, BA318E, BA337E, BA338E, BA367E, BA368E, BA377E, BA378E and the BA388E Externally Powered rate totaliser enclosures may carry the following potential electrostatic warning:

WARNING
Potential electrostatic charging hazard clean only with a damp cloth

AVERTISSEMENT
Risque potentiel de charge
électrostatique Nettoyer uniquement
avec un chiffon humide

Alternatively, the enclosures may be manufactured from a conducting plastic per Article 250 of the National Electrical Code.

11. When mounting the BA317E, BA318E, BA337E, BA338E, BA367E, BA368E, BA377E, BA378E, BA388E, BA317E-SS, BA337E-SS, BA367E-SS, BA377E-SS, BA317NE, BA337NE, BA367NE & BA377NE panel mounting Externally Powered Rate Totalisers in an enclosure to maintain Type 4 front panel rating:

Minimum panel thickness should be 2mm (0.08inches) Steel
3mm (0.12inches) Aluminium

Outside panel finish should be smooth, free from particles, inclusions, runs or build-ups around cut-out.

Panel cut-out for BA317E, BA337E, BA367E, and BA377E shall be:
90.0 x 43.5mm -0.0 +0.5mm (3.54 x 1.71 inches -0.00 +0.02)

Two panel mounting clips are required for BA317E, BA337E, BA367E, and BA377E and each shall be tightened to between: 20 & 22cNm (1.77 to 1.95inLb)

Panel cut-out for BA318E, BA338E, BA368E, BA378E, and BA388E shall be:
136.0 x 66.2mm -0.0 +0.5mm (5.35 x 2.60 inches -0.00 +0.02)

Four panel mounting clips are required for BA318E, BA338E, BA368E, BA378E, and BA388E and each shall be tightened to between: 20 & 22cNm (1.77 to 1.95inLb)

Panel cut-out for BA317E-SS, BA337E-SS, BA367E-SS, BA377E-SS, BA317NE, BA337NE, BA367NE & BA377NE shall be:
(92.0mm -0.0 +0.8) x (45.0mm -0.0 +0.6)
(3.62 inches -0.00 +0.03) x (1.77 inches - 0.00 +0.02)

Four panel mounting clips are required for BA317E-SS, BA337E-SS, BA367E-SS, BA377E-SS, BA317NE, BA337NE, BA367NE & BA377NE and each shall be tightened to at least: 22cNm (1.95inLb)

Iss.	Date	Modification	Ckd.	Appd.
1	15.06 2016	New drawing	OL	CB
2	05.08 2016	Field mounted rate totalisers added	OL	B.B

BEKA associates Hitchin England

Title: ETL Nonincendive Control Drawing for 'E' and 'G' series externally powered rate totalisers.

Drawn	Checked	Scale
SQ	OL	—

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