BA374G and BA374E
Intrinsically safe
Two input
Timer and Clock
Issue 2

Certification
information label

TAG NUMBER   SCALE

RESET

External
push buttons

Terminals located
in separate
compartment

TAG NUMBER   SCALE

RESET

Elapsed or
remaining time

Lower display

Annunciators for
optional control outputs

External
push buttons

CONTENTS

The BA374G and BA374E are CE marked to show compliance with the European Explosive Atmospheres Directive 2014/34/EU and the European EMC Directive 2014/30/EU

1. DESCRIPTION

BA374G and BA374E Timer or Clocks are functionally identical and have similar certifications, but differ in mechanical construction and options.

The differences are summarised in the following table.

	BA374G	BA374E
Separate terminal compartment.	No	Yes
Backlight	Option	Yes
Dual control outputs.	Option	Yes
Certification		
IECEx	Gas & dust	Gas
ATEX	Gas & dust	Gas
ETL & cETL	Gas & dust	Gas & dust

The main sections of this instruction manual describe the BA374G, but they also apply to the BA374E. Details of the BA374E mounting and terminals are contained in Appendix 4.

The BA374G and BA374E are intrinsically safe, field mounting instruments with two inputs that can be configured on-site as a Timer or as a Clock.

As a Timer the instruments can measure and display the elapsed time between external events, or control external events via the status output or optional control outputs.

When configured as a Clock, the instruments can display time in a variety of formats and the optional control outputs may be configured to turn *on* and *off* at pre-set times.

This instruction manual is divided into three sections.

Common features
2. Intrinsic safety certification
3. System design for hazardous areas
4. Installations
5. Accessories

Timer
6. Operation as a timer
7. Timer application example
8. Maintenance

Clock
9. Operation as a clock
10. Clock configuration example
11. Maintenance

The BA374G and BA374E have been ATEX certified intrinsically safe by Notified Body Intertek Testing and Certification Ltd and comply with the European ATEX Directive 2014/34/EU.

The main sections of this manual describe ATEX gas certification. See Appendix 1 for details of the BA374G ATEX dust certification. The BA374E does not have ATEX dust certification.

For international applications the BA374G and BA374E also have IECEx certification which is described in Appendix 2. The BA374E does not have IECEx dust certification.

For applications in the USA and Canada the BA374G and BA374E have ETL & cETL certification which is described in Appendix 3.

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

2. INTRINSIC SAFETY CERTIFICATION

The BA374G has IECEx and ATEX gas certification. This section of the instruction manual describes ATEX gas certification. IECEx and other approvals are described in separate appendixes to this manual. The intrinsic safety of the instrument is unaffected by whether the BA374G is configured as a Timer or as a Clock.

2.1   ATEX gas certification

Notified Body Intertek Testing and Certification Ltd have issued the BA374G with an EU-Type Examination Certificate number ITS16ATEX28408X. This confirms compliance with harmonised European standards and this certificate has been used to confirm compliance with the European ATEX Directive for Group II, Category 1G equipment. The instrument carries the community mark and subject to local codes of practice may be installed in any of the European Economic Area (EEA) member countries. ATEX certificates are also acceptable for installations in other countries such as Switzerland.

This 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 of the UK the local Code of Practice should be consulted.

2.2   Zones, gas groups and T rating

The BA374G has been certified Ex ia IIC T5 Ga $-40°C \leq Ta \leq 70°C$. 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

In gases that may be used with equipment having a temperature classification of:
T1   450°C
T2   300°C
T3   200°C
T4   135°C
T5   100°C

At ambient temperatures between -40 and +70°C.

The specified operating temperature of the BA374G is -40 to +70°C. At temperatures below -20°C the display digits will change more slowly and the contrast will be reduced, but the instrument will continue to function

This allows the BA374G 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.

2.3 Special conditions for safe use

CAUTION installation in Zone 0

When installed in a Zone 0 potentially explosive atmosphere requiring EPL Ga apparatus, the instrument shall be installed such that even in the event of rare incidents, an ignition source due to impact or friction between the aluminium label and iron/steel is excluded.

No special conditions apply when the BA374G Timer or Clock is installed in Zone 1 or in Zone 2. This allows the BA374G 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.

2.4   Power supply

When installed in a hazardous area the BA374G must be powered via a certified Zener barrier or galvanic isolator from a dc supply located in the safe area, or from certified associated apparatus with an intrinsically safe output.

The BA374G power supply terminals 1 and 2 input safety parameters are:

U_i =   28V dc
I_i =   200mA dc
P_i =   0.84W

Any certified Zener barrier or galvanic isolator with output safety parameters equal to or less than these limits may be used to power the BA374G.

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

C_i =   2nF
L_i =   4µH

To determine the maximum permissible power supply cable parameters the above figures, which are small and may be ignored for many applications, should be subtracted from the maximum permitted parameters, Co and Lo, specified for the Zener barrier or galvanic isolator powering the BA374G.

2.5   Input terminals

When configured as a Timer the BA374G is controlled via input A and input b which may be individually configured for use with different type of sensors.   Each of the two inputs is a separate intrinsically safe circuit, although the negative side of each input is internally connected to the negative side of the power supply and the reset terminal RS2. See Fig 14 & 20.   The two inputs should not be connected in parallel.

Some types of sensor that may be connected to the BA374G inputs, 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 BA374G for input A and between terminals 7 & 8 for input b, connects an internal 7V, 6mA supply to the respective input.   Energising is not required when a BA374G input is connected to a voltage source.

Fitting an energising link changes the output safety parameters of each BA374G input as shown in the following table which also shows the types of sensor requiring energising (link fitting).

Type of input	Link*	Uo	Io	Po
		Output safety parameters of each input.		
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

*For input A link terminals 3 and 4
*For input b link terminals 7 and 8

2.5.1   Sensors that do not require energising

Sensors with a voltage output do not require energising, therefore terminals 3 & 4 for input A and terminals 7 & 8 for input b should not be linked.

When not energised i.e. without a link each BA374G input complies with the requirements for *simple apparatus*. 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 not to be considered or documented when assessing the safety of an intrinsically safe system, thus simplifying loop assessment.

This allows almost any voltage output sensor to be directly connected to one of the BA374G inputs in a hazardous area providing that:

a. The sensor is a certified intrinsically safe device having output parameters equal to or less than:

$$Uo \quad \leq \quad 28V\ dc$$
$$Io \quad \leq \quad 200mA\ dc$$
$$Po \quad \leq \quad 0.84W$$

or complies with requirements for *simple apparatus.*

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

c. The sensor is located in the same hazardous area as the BA374G.

The BA374G EU-Type Examination Certificate specifies that the equivalent capacitance and inductance of each BA374G input is:

$$Ci \quad = \quad 2nF$$
$$Li \quad = \quad 4\mu H$$

To determine the maximum permissible cable parameters these figures should be subtracted from the maximum permitted output parameters Lo and Co specified by the certificate for the sensor connected to the BA374G input terminals.   The BA374G input parameters are small and therefore unlikely to make a significant difference to the allowable cable parameters.

2.5.2   Sensors that require energising

Switch contacts, proximity detectors and open collector sensors require energising which is achieved by linking two BA374G terminals together for each input as described in section 2.5.   When energised, the output parameters of each BA374G input are:

$$Uo \quad = \quad 10.5V\ dc$$
$$Io \quad = \quad 9.2mA\ dc$$
$$Po \quad = \quad 24mW$$

These parameters do not comply with the requirements for *simple apparatus* and should be considered when assessing the safety of the sensor connected to a BA374G input.

Any certified intrinsically safe sensor may be connected to a BA374G energised input providing that the sensor's input safety parameters are equal to, or greater than, the output safety parameters of the BA374G input shown above.   This is not restrictive and most intrinsically safe sensors will comply. A *simple apparatus* sensor, such as a switch contact, may also be connected.

This allows most mechanically or magnetically operated switches, certified open collector transistors and certified intrinsically safe NAMUR proximity detectors to be directly connected to a BA374G energised input. The sensor and wiring should be able to withstand a 500V rms insulation test to earth and the sensor should be located in the same hazardous area as the BA374G.

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

$$C_o \quad = \quad 2.4\mu F$$
$$L_o \quad = \quad 200mH$$

Again this is not restrictive as the combined capacitance and inductance of most sensors and connecting cable will be less than this.

2.6 Remote reset terminals
Connecting the external reset terminals RS1 and RS2 together will reset the BA374G when configured as a Timer and synchronises the displayed time when configured as a Clock. The two reset terminals have the following input and output safety parameters:

$$U_o \quad = \quad 3.8V$$
$$I_o \quad = \quad 1mA$$
$$P_o \quad = \quad 1mW$$

$$U_i \quad = \quad 28V\ dc$$
$$I_i \quad = \quad 200mA\ dc$$
$$P_i \quad = \quad 0.84W$$

The equivalent capacitance and inductance between them is:

$$C_i \quad = \quad 0nF$$
$$L_i \quad = \quad 0\mu H$$

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

$$C_o \quad = \quad 40\mu F$$
$$L_o \quad = \quad 1H$$

The reset terminals may be directly connected to any mechanically operated switch located within the same hazardous area as the BA374G. The switch and associated wiring should be able to withstand a 500V insulation test to earth.

If the reset switch is required in 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 diode return Zener barrier is not suitable for this application.

When used as a Timer the BA374G may also be reset from the display mode by operating the ▼ and ▲ push buttons simultaneously for more than two seconds. See 6.5.20

2.7 Status output
The BA374G has an intrinsically safe optically isolated open collector status output which has zero output safety parameters and complies with the requirements for *simple apparatus*. This allows the status output terminals P1 and P2 to be connected to any intrinsically safe circuit protected by a certified Zener barrier or galvanic isolator providing the output parameters do not exceed:

$$U_o \quad \leq \quad 28V\ dc$$
$$I_o \quad \leq \quad 200mA\ dc$$
$$P_o \quad \leq \quad 0.84W$$

The equivalent capacitance and inductance of the status 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.

2.8 Optional control outputs
Each of the two factory fitted optional control outputs is a separate galvanically isolated intrinsically safe circuit with output safety parameters complying with the requirements for *simple apparatus*. This allows the control 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 safety parameters of the circuit do not exceed:

$$U_o \quad \leq \quad 28V\ dc$$
$$I_o \quad \leq \quad 200mA\ dc$$
$$P_o \quad \leq \quad 0.84W$$

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

$$C_i \quad = \quad 22nF$$
$$L_i \quad = \quad 4\mu H$$

To determine the maximum permissible cable capacitance C_i should be subtracted from the maximum permitted external capacitance C_o specified by the certificate for the intrinsically safe interface powering the circuit being switched by the control output. See figs 4 & 9.

2.9   Certification label information

The BA374G product certification label is fitted in a recess on the top outer surface of the enclosure. It shows the ATEX, IECEx and ETL certification information plus BEKA associates name and location and the instrument serial number. Certification information from other authorities may also be included.

BA374G Certification information label

3. SYSTEM DESIGN FOR HAZARDOUS AREAS

3.1 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 BA374G.

Terminals 2, 6, 10 and RS2 of the BA374G are internally connected together as shown in Fig 14 & 20. If any of these terminals are earthed, as shown in Figs 1 & 2, the other common terminals should only be connected to the same earth, i.e. the barrier busbar, or to circuits that have at least 500V rms insulation to earth.

Any Zener barrier certified for the gas group in which the BA374G is installed may be used providing the output parameters do not exceed the input parameters of the BA374G terminals to which it is connected. Only one polarity of Zener barrier i.e. positive or negative may be used in each system.

Fig 1 illustrates the basic circuit that is used for all BA374G Timer installations protected by Zener barriers. BA374G Clock installations are the same, except that the two input terminals are not used. For simplicity the status output and the optional control outputs are described separately in sections 3.1.9 and 3.1.10 of this manual.
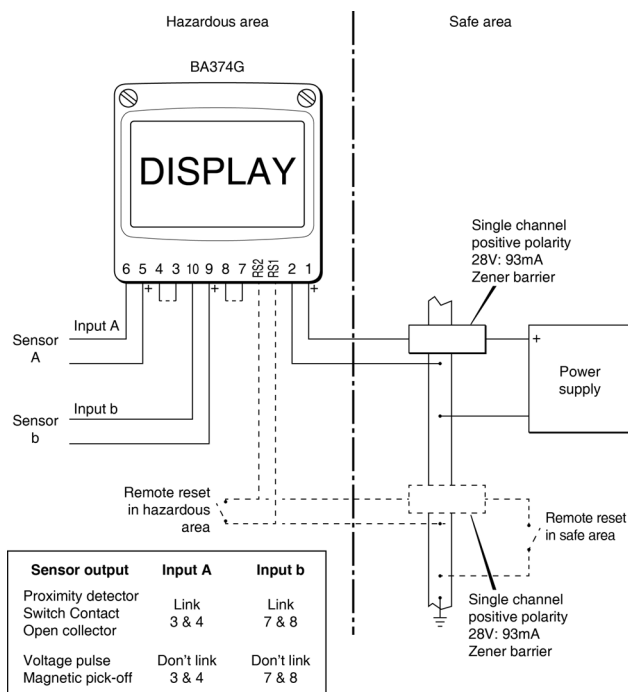
Fig 1 BA374G Timer protected by Zener barriers

Alternatively the sensors may be located in the safe area. Fig 2 shows how additional Zener barriers are used to transfer signals to the Timer 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 Timer system it is important to remember that terminals 2, 6, 10 and RS2 of the BA374G are connected together within the instrument. See fig 14. Similarly, terminals 2 and RS2 are internally connected together when the BA374G is configured as Clock. See Fig 20.
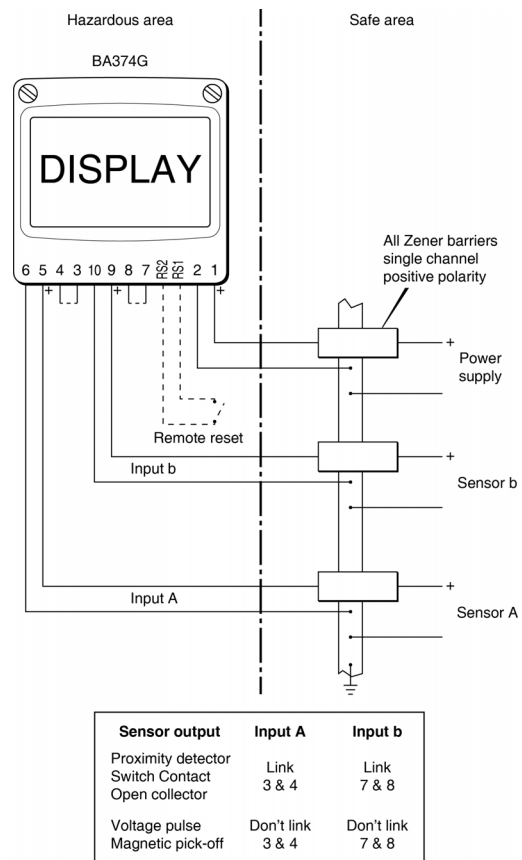
Fig 2 BA374G Timer protected with Zener barriers sensors in the safe area.

3.1.1 Power supply
The BA374G requires a minimum of 10V between terminal 1 & 2 and consumes:

	10mA	BA374G without options
plus	6mA	when terminals 3 & 4 are linked
plus	6mA	when terminals 7 & 8 are linked
plus	16mA	for optional backlight

Any Zener barrier certified for the Zone and gas group in which the BA374G is installed may be used to power the instrument providing the output safety parameters of the barrier are equal to or less than the input safety parameters of terminals 1 & 2.

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 must be between the minimum value shown below and the maximum working voltage of the Zener barrier which, depending upon manufacturer, will be approximately 26V.

	13.5V min	BA374G without options
	18.9V min	BA374G with optional backlight
plus	2.1V	when terminals 3 & 4 are linked
plus	2.1V	when terminals 7 & 8 are linked

3.1.2   Sensor inputs
When configured as a Timer both inputs may be connected to a wide variety of hazardous area sensors as shown in Fig 1, or to safe area sensors as shown in Fig 2. The two BA374G inputs are not used when the instrument is configured as a Clock.

No Zener barrier is required in series with each input if the intrinsically safe sensor is located within the same hazardous area as the BA374G. The following table shows the instrument's input switching thresholds when configured to operate with various sensors. For reliable operation the BA374G input must fall below the lower threshold and rise above the upper threshold.

Sensor	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

Switch contacts, proximity detectors and open collector sensors require energising which is achieved by linking two BA374G terminals together for each input as described in section 2.5.

3.1.3   Switch contact input
Any mechanically activated switch contact may be directly connected to input terminals 5 & 6 or 9 &10 providing the switch is located in the same hazardous area as the BA374G, and the switch and associated wiring can withstand a 500V rms insulation test to earth. Most industrial push buttons and magnetically activated reed relays comply with this requirement.

The BA374G contains a configurable debounce circuit to prevent false triggering of the instrument. Three levels of debounce protection are independently available for each input. See section 6.5.6.

3.1.4   Open collector input
Any certified open collector sensor located in the same hazardous area as the BA374G, such as a mechanically activated opto-isolator may be directly connected to input terminals 5 & 6 or 9 &10. The sensor and the associated wiring must be able to withstand a 500V rms insulation test to earth.

The BA374G contains a configurable debounce circuit to prevent false triggering. Three levels of debounce protection are available See section 6.5.6.

3.1.5   2-wire proximity detector input
Most intrinsically safe NAMUR 2-wire proximity detectors may be connected to a BA374G input, providing the input safety parameters of the proximity detector are equal to or greater than the output safety parameters of a BA374G input. i.e.

U_i	≥	10.5V dc
I_i	≥	9.2mA dc
P_i	≥	24mW

and the minimum operating voltage of the proximity detector is less than 7.5V. The proximity detector must be located in the same hazardous area as the BA374G.

The BA374G contains a configurable debounce circuit to prevent false triggering of the instrument. Three levels of debounce protection are independently available for each input, See section 6.5.6.

3.1.6   Magnetic pick-off input
$CoiL$ in the input configuration menu is a low level voltage pulse input intended for use with an intrinsically safe magnetic pick-off sensor. When configured for 'CoiL' input, the BA374G input complies with the requirements for *simple apparatus* allowing connection to any certified intrinsically safe magnetic sensor having output parameters equal to or less than:

U_o	≤	28V dc
I_o	≤	200mA dc
P_o	≤	0.84W

The maximum permitted cable parameters will be be the sensor's Co and Lo specified on it's intrinsic safety certificate, less the BA374G input parameters Ci and Li which are small and can often be ignored.

The magnetic pick-off must be located within the same hazardous area as the BA374G and with the associated wiring be able to withstand a 500V rms insulation test to earth.

The BA374G contains a configurable debounce circuit to prevent false triggering of the instrument. Three levels of debounce protection are independently available for each input, See section 6.5.6.

3.1.7   Voltage pulse input

Two voltage pulse input ranges are independently selectable in the BA374G Timer configuration menu, ꙮꙮⳑⱦ5 ⳑ and ꙮꙮⳑⱦ5 Ⱨ. When configured for either of the voltage pulse ranges, the input terminals 5 & 6 or 9 & 10 comply with the requirements for *simple apparatus*. This allows the inputs to be connected to any certified intrinsically safe voltage source within the same hazardous area as the BA374G having output parameters equal to or less than:

$$U_o \quad \leq \quad 28V\ dc$$
$$I_o \quad \leq \quad 200mA\ dc$$
$$P_o \quad \leq \quad 0.84W$$

The BA374G Timer may therefore be directly connected to and controlled by most certified intrinsically safe high level voltage signals.

The maximum permitted cable parameters will be defined by the intrinsic safety certification of the voltage source less the BA374G input parameters which are small and can often be ignored.

The BA374G contains a configurable debounce circuit to prevent false triggering of the instrument. Three levels of debounce protection are independently available for each input, See section 6.5.6.

3.1.8   Remote reset

Connecting the external reset terminals RS1 and RS2 together will reset the BA374G when configured as a Timer and synchronise the displayed time to a preset time when configured as a Clock.

Remote resetting may be accomplished by any mechanically operated switch located in the same hazardous area as the instrument providing the switch and the associated wiring can withstand a 500V rms insulation test to earth. No Zener barrier is required.

A BA374G may also be remotely reset from the safe area. Any switch may be used but a Zener barrier is required to transfer the contact closure into the hazardous area. A diode return barrier is not suitable for this application.

Fig 1 illustrates how a BA374G may be reset from both the safe and the hazardous area.

Note: When used as a Timer the BA374G may also be reset from the display mode by operating the ▼ and ▲ push buttons simultaneously for more than three seconds.   See 6.5.20

3.1.9 Status output

All BA374G instruments have an opto-isolated open collector output which can be configured to indicate the status of the instrument, or to perform simple control functions.   The output has the following electrical parameters:

$$R_{on} \quad = \quad 60\Omega\ + 3V$$
$$R_{off} \quad = \quad 1M\Omega$$
$$I_{max} \quad = \quad 10mA$$

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

$$U_o \quad \leq \quad 28V\ dc$$
$$I_o \quad \leq \quad 200mA\ dc$$
$$P_o \quad \leq \quad 0.84W$$

The equivalent capacitance and inductance of the status output are both zero which allows the maximum permissible cable parameters specified by the certificate for the Zener barrier or galvanic isolator powering the status output circuit to be used. The status output is a passive circuit i.e. un-powered open collector, but it is totally isolated from all other circuits.   Subject to complying with intrinsic safety interconnection requirements the terminals P1 and P2 may be connected to another instrument that can accept an open collector input.   The output may also be transferred to the safe area via a galvanic isolator or a Zener barrier.

Fig 3 shows how a 2-channel Zener barrier may be used to transfer the status output to the safe area. The positive terminal of the status output P1 is connected to the instrument's positive supply terminal 1. When the status open collector output is activated, the voltage on terminal P2 rises to the supply voltage less 3V and a current flows through the diode return barrier and resistor R1 in the safe area. This current is defined by R1 which should be chosen to limit the current to less than 10mA. For a 24V supply R1 should be great er than 2,200Ω.
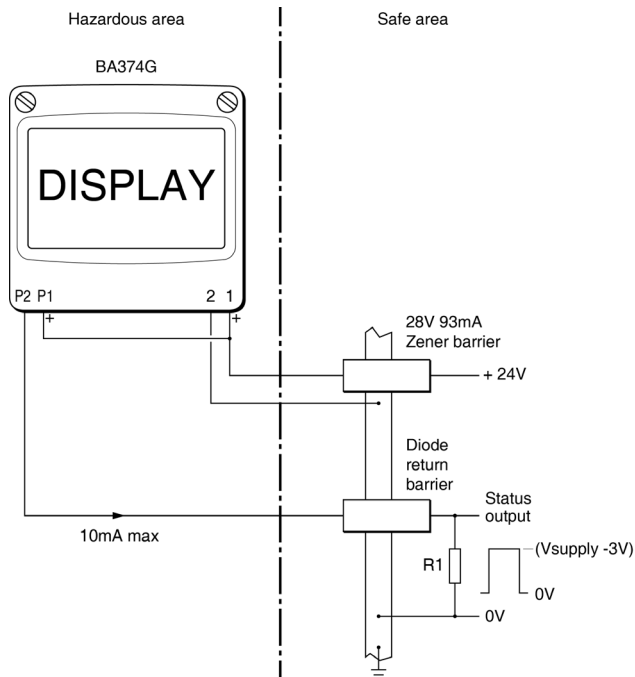
Fig 3 Transferring status output to safe area using Zener barriers.

3.1.10 Control outputs (optional)

Each of the two factory fitted optional control outputs is a galvanically isolated single pole solid state switch as shown in Fig 4. 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.

$$Ron = \text{less than } 5\Omega + 0.7V$$
$$Roff = \text{greater than } 1M\Omega$$

Note: Because of the series protection diode some test meters may not detect a closed alarm output.
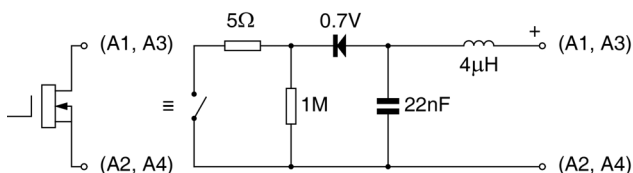
Fig 4 Equivalent circuit of each control output

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

$$Uo \leq 28V \text{ dc}$$
$$Io \leq 200mA \text{ dc}$$
$$Po \leq 0.84W$$

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

$$Ci = 22nF$$
$$Li = 4\mu H$$
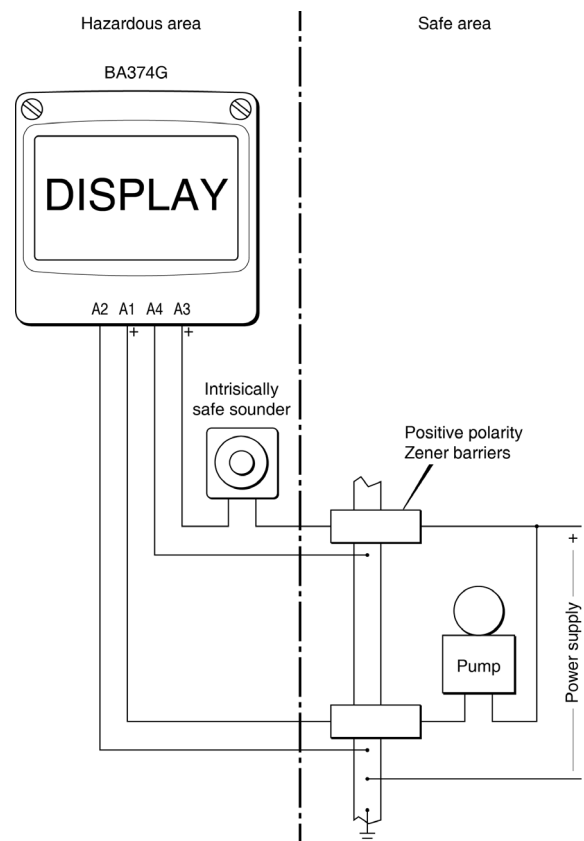
Fig 5 Typical control output application

To determine the maximum permissible cable parameters Ci and Li should be subtracted from the maximum permitted external capacitance Co and inductance Lo specified by the certificate for the Zener barrier powering the circuit as shown in Fig 5.

3.2 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 galvanic isolator certified for the gas group in which the BA374G is installed, with output parameters less than the input parameters of the BA374G having the correct function may be used.

| Sensor output	Input A	Input b
Proximity detector Switch Contact Open collector	Link 3 & 4	Link 7 & 8
Voltage pulse Magnetic pick-off	Don't link 3 & 4	Don't link 7 & 8
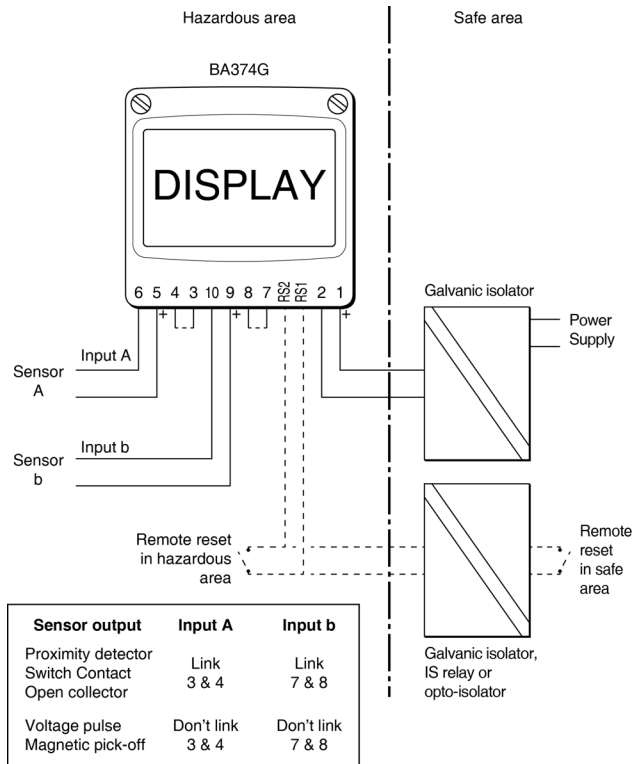
Fig 6 BA374G used with galvanic isolators

Fig 6 illustrates the basic circuit that is used for all BA374G installations protected by galvanic isolators.

Alternatively sensors may be located in the safe area. Fig 7 shows how additional galvanic isolators are used to transfer the sensor output to the BA374G in the hazardous area, although it may be difficult to find isolators for some sensors.   For this application the two BA374G external input conditioning links should be positioned to suite the output of the galvanic isolator not the sensor.
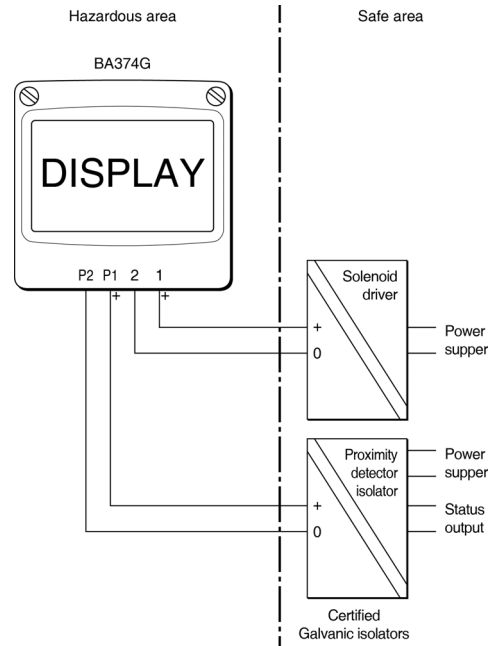
Fig 7   BA374G Timer used with galvanic isolators with sensors in safe area.

3.2.1 Power supply

The BA374G requires a minimum of 10V between terminal 1 & 2 and consumes:

	10mA	BA374G without options
plus	6mA	when terminals 3 & 4 are linked
plus	6mA	when terminals 7 & 8 are linked
plus	16mA	for optional backlight

Any galvanic isolator certified for the Zone and gas group in which the BA374G is installed may be used to power the instrument.   The output safety parameters of the isolator must be equal to or less than the input safety parameters of terminals 1 & 2 and the voltage at terminals 1 & 2 must be greater than 10V.   These requirements are not restrictive and allow a wide range of galvanic isolators, such as solenoid drivers, to be used.

3.2.2   Sensor inputs

As shown in Fig 6 both BA374G inputs can be directly connected to hazardous area sensors, or to safe area sensors via isolators as shown in Fig 7. Galvanic isolators are not required in series with the inputs if the intrinsically safe sensors are located within the same hazardous area as the BA374G.

The BA374G may be used with a wide variety of sensors, the following table shows the switching thresholds for each type. For reliable operation the input signal must fall below the lower threshold and rise above the upper threshold.

Sensor	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

Switch contacts, proximity detectors and open collector sensors require energising which is achieved by linking two BA374G terminals together for each input as described in section 2.5.

3.2.3   Switch contact input

Any mechanically activated switch contact may be directly connected to input terminals 5 & 6 and 9 &10 providing the switch is located in the same hazardous area as the BA374G, and the switch and associated wiring can withstand a 500V rms insulation test to earth. Most magnetically activated industrial push buttons and reed relays comply with these requirements. The BA374G contains a configurable debounce circuit to prevent false triggering of the instrument. Three levels of debounce protection are independently available for each input, See section 6.5.6

3.2.4   Open collector input

Any open collector sensor located in the same hazardous area as the BA374G, such as a mechanically activated opto-isolator may be directly connected to input terminals 5 & 6 and 9 &10. The sensor and the associated wiring must be able to withstand a 500V rms insulation test to earth.

The BA374G contains a configurable debounce circuit to prevent false triggering. Three levels of debounce protection are available See section 6.5.6

3.2.5   2-wire proximity detector input

Most intrinsically safe NAMUR 2-wire proximity detectors may be connected to a BA374G input, providing the input safety parameters of the proximity detector are equal to or greater than the output safety parameters of a BA374G input. i.e.

$$U_i \geq 10.5V \text{ dc}$$
$$I_i \geq 9.2mA \text{ dc}$$
$$P_i \geq 24mW$$

and the minimum operating voltage of the proximity detector is less than 7.5V. The proximity detector must be located in the same hazardous area as the BA374G.

The BA374G contains a configurable debounce circuit to prevent false triggering of the instrument. Three levels of debounce protection are independently available for each input, See section 6.5.6

3.2.6   Magnetic pick-off input

$Coil$ in the input configuration menu is a low level voltage pulse input intended for use with an intrinsically safe magnetic pick-off sensor. When configured for $Coil$ input, the BA374G input complies with the requirements for *simple apparatus* allowing connection to any certified intrinsically safe magnetic sensor having output parameters equal to or less than:

$$U_o \leq 28V \text{ dc}$$
$$I_o \leq 200mA \text{ dc}$$
$$P_o \leq 0.84W$$

The maximum permitted cable parameters will be be the sensor's Co and Lo specified on it's intrinsic safety certificate, less the BA374G input parameters Ci and Li which are small and can often be ignored.

The magnetic pick-off must be located within the same hazardous area as the BA374G and with the associated wiring be able to withstand a 500V rms insulation test to earth.

The BA374G contains a configurable debounce circuit to prevent false triggering of the instrument. Three levels of debounce protection are independently available for each input, See section 6.5.6.

3.2.7 Voltage input

Two voltage input ranges are independently selectable in the BA374G configuration menu, UoLt5 L and UoLt5 H. When configured for either of the voltage pulse ranges, the input terminals 5 & 6 and 9 & 10 comply with the requirements for *simple apparatus*. This allows the inputs to be connected to any certified intrinsically safe voltage source within the same hazardous area as the BA374G having output parameters equal to or less than:

Uo	≤	28V dc
Io	≤	200mA dc
Po	≤	0.84W

The BA374G Timer may therefore be directly connected to and controlled by most certified intrinsically safe high level outputs.

The maximum permitted cable parameters will be defined by the intrinsic safety certification of the voltage source less the BA374G input parameters which are small and can often be ignored,

The BA374G contains a configurable debounce circuit to prevent false triggering of the instrument. Three levels of debounce protection are independently available for each input, See section 6.5.6

3.2.8 Remote reset

When configured as a Timer the BA374G total display may be remotely reset, depending upon configuration, to zero or to 5Et t by connecting terminals RS1 & RS2 together. Permanent interconnection inhibits totalisation. When configured as a Clock connecting terminals RS1 & RS2 together can synchronise the displayed time to a preset time.

Remote resetting or synchronisation may be accomplished by any mechanically operated switch located in the same hazardous area as the BA374G providing it and the associated wiring can withstand a 500V rms insulation test to earth. No galvanic isolator is required.

A BA374G may also be remotely reset or synchronised 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. Fig 6 illustrates how a BA374G Timer may be reset from both the safe and the hazardous area.

Note: The BA374G can also be configured to reset when the ▼ and ▲ push buttons are operated simultaneously in the display mode for more than two seconds - see 6.5.20.

3.2.9 Status output

All BA374G instruments have an opto-isolated open collector output. This output has the following electrical parameters:

Ron	=	60Ω + 3V
Roff	=	1MΩ
Imax	=	10mA

The status 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 status output terminals P1 and P2 to be connected to any intrinsically safe circuit protected by a certified 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 status output are both zero which allows the maximum permissible cable parameters specified by the certificate for the galvanic isolator powering the status output circuit to be used. The status output is an open collector, but it is totally isolated from all other circuits. Subject to complying with the intrinsic safety interconnection requirements, terminals P1 and P2 may be connected to another instrument that can accept an open collector input. The status output may also be transferred to the safe area via a galvanic isolator as shown in Fig 8.

Some galvanic isolators intended for use with a NAMUR proximity detector are suitable for transferring the status signal to the safe area.
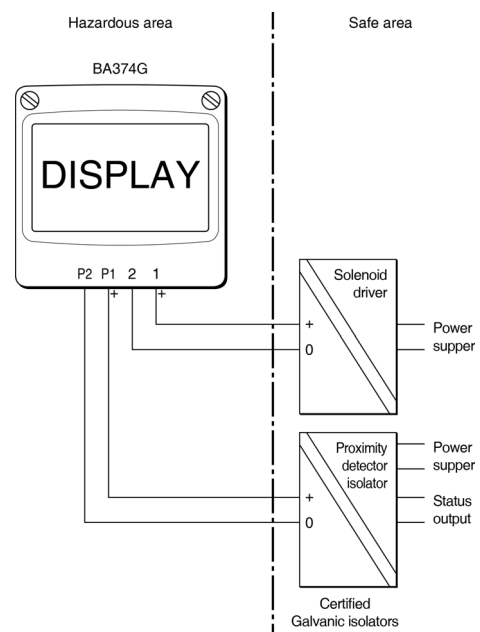

Fig 8   Galvanic isolator used to transfer status output to the safe area.

3.2.10 Control outputs - optional

Each of the two factory fitted optional control outputs is a galvanically isolated single pole solid state switch as shown in Fig 9. 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.

$$Ron = \text{less than } 5\Omega + 0.7V$$
$$Roff = \text{greater than } 1M\Omega$$

Note: Because of the series protection diode some test meters may not detect a closed alarm output
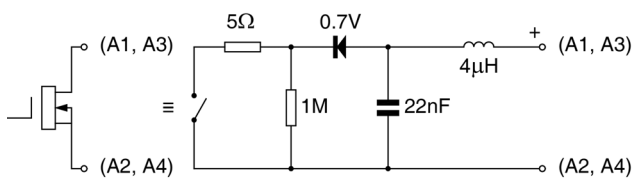
Fig 9 Equivalent circuit of each control output

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

$$Uo \leq 28V\ dc$$
$$Io \leq 200mA\ dc$$
$$Po \leq 0.84W$$

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

$$Ci = 22nF$$
$$Li = 4\mu H\ (\text{Effectively } 0)$$

To determine the maximum permissible cable parameters Ci and Li should be subtracted from the maximum permitted external capacitance Co and inductance Lo specified by the certificate for the galvanic isolator powering the circuit as shown in Fig 10.
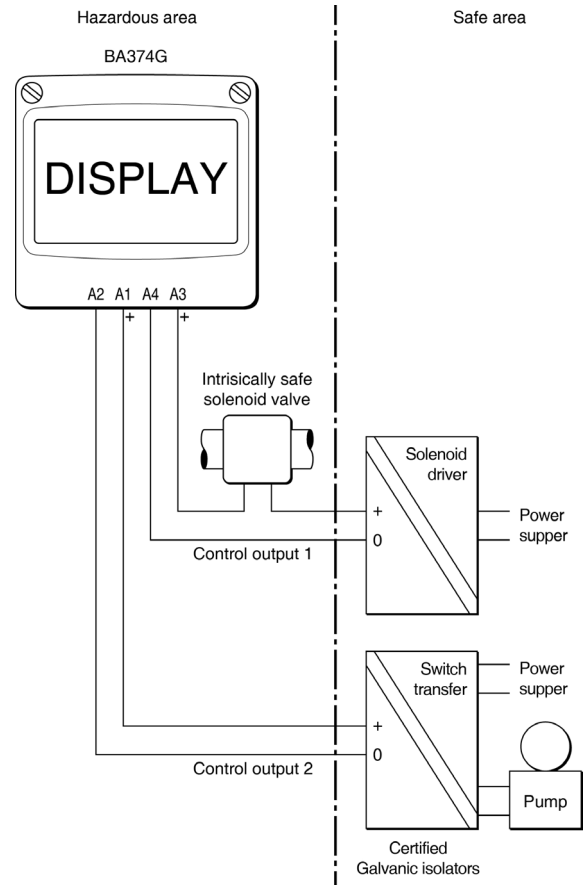
Fig 10 Typical control output application

4. INSTALLATION

4.1 Location

The BA374G Timer or Clock is housed in robust IP66 glass reinforced polyester (GRP) enclosure incorporating an armoured glass window and stainless steel fittings making it suitable for exterior mounting in most industrial on-shore and off-shore installations. The Timer or Clock should be positioned where the display is not in continuous direct sunlight. Special conditions apply for Zone 0 installations, see section 2.3.

Field wiring terminals are located on the rear of the Timer or Clock assembly as shown in Fig 12.

To ensure electrical continuity between the two conduit or cable entries, the enclosure back-box is fitted with a bonding plate which includes an M4 earth stud. The bonding plate may be mounted on the inside or outside of the enclosure. If the carbon loaded GRP enclosure is not bolted to an earthed post or structure, this earth stud should be connected to a local earth or the plant potential equalising conductor.

An insulated M4 stud is provided in the bottom right hand corner of the back-box for interconnecting cable screens.

The BA374G Timer or Clock may be pipe mounted using a BA393G pipe mounting kit, or panel mounted using a BA394G or BA395G panel mounting kit.

4.2 Installation Procedure

Fig 11 illustrates the instrument installation procedure.

A. Remove the Timer or Clock assembly by unscrewing the four captive 'A' screws.

B. Mount the enclosure back-box on a flat surface and secure with screws or bolts through the four 'B' holes. Alternatively use one of the pipe or panel mounting kits which are available as accessories.

C. Remove the temporary hole plug and install an appropriate IP and temperature rated M20 x 1.5mm cable gland or conduit fitting. If two entries are required, the supplied IP66 stopping plug should be replaced with an appropriate IP and temperature rated M20 x 1.5mm cable gland or conduit fitting.

D. Connect the field wiring to the terminals as shown in Fig 12. Replace the instrument assembly on the back-box and evenly tighten the four 'A' screws.
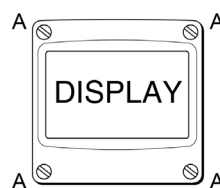
Step A
Unscrew the four captive 'A' screws and separate the indicator assembly and the back-box.
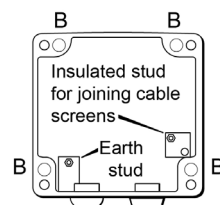
Step B
Secure the enclosure back-box to a flat surface with M6 screws through the four 'B' holes. Alternatively use a pipe mounting kit.
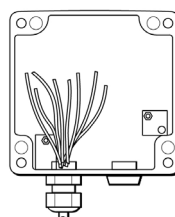
Step C
Remove the temporary hole plug and install an appropriate IP rated cable gland or conduit fitting. Feed the field wiring through the cable entry.
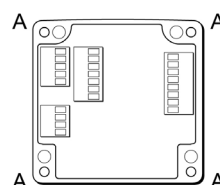
Step D
Terminate field wiring on the indicator assembly. Replace the indicator assembly on the enclosure back-box and tighten the four 'A' screws.

Fig 11 BA374G installation procedure
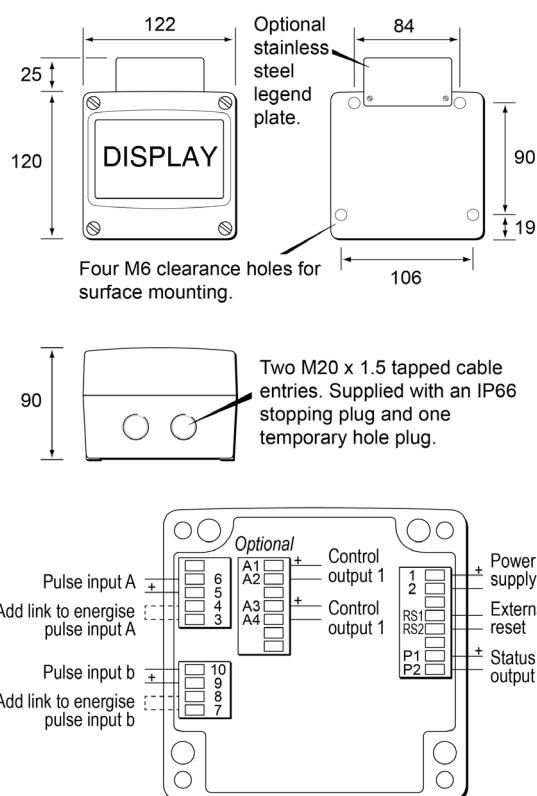
Fig 12 Dimensions and terminal connections

4.3 EMC

The BA374G complies with the requirements of the European EMC Directive 2014/30/EU. For specified immunity all wiring should be in screened twisted pairs, with the screens earthed at one point in the safe area.

4.4 Units of measurement and tag marking on scale card.

The Timer or Clock's units of measurement and tag information are shown on a scale card which slides into the instrument.

New Timer or Clocks are supplied with a printed scale card showing the requested units of measurement and tag information. If this information is not supplied when the instrument is ordered, a blank scale card will be fitted which can easily be marked on-site with a dry transfer or a permanent marker. Custom printed scale cards are available from BEKA associates as an accessory.

To remove the scale card from a Timer or Clock carefully pull the transparent tab at the rear of the instrument assembly away from the assembly as shown in Fig 8a.

Fig 13a Removing scale card

Fig 13b Inserting scale card into the instrument assembly.

To replace the scale card carefully insert it into the slot on the right hand side of the input terminals as shown in Fig 8b. Force should be applied evenly to both sides of the scale card to prevent it twisting. The card should be inserted until about 2mm of the transparent tab remains protruding.

5. ACCESSORIES

5.1 Display backlight

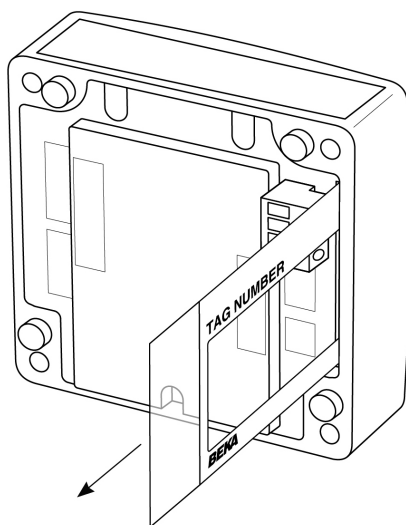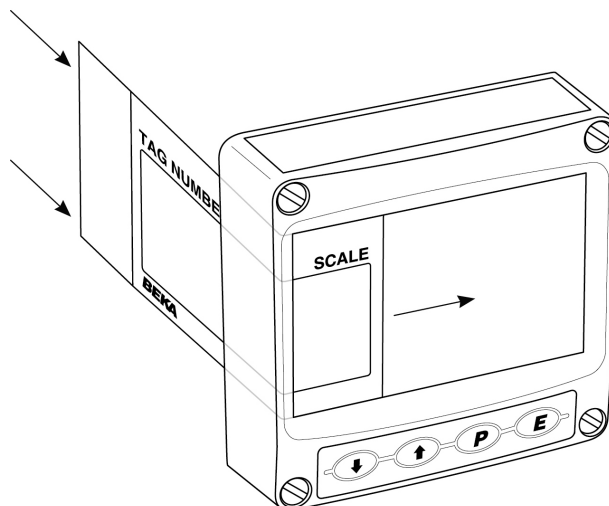The BA374G Timer or Clock can be supplied with a factory fitted backlight that produces green illumination enhancing display contrast and enabling it to be read at night or in poor lighting conditions. The backlight is internally powered from the instrument power supply so no additional wiring or intrinsically safe interface is required, but the supply current increases as shown below.

BA374G configured as Timer current consumption

BA374G Timer or Clock	10mA
Additional for backlight	16mA
Addition with terminals 3 & 4 linked	6mA
Addition with terminals 7 & 8 linked	6mA

Total current	38mA max

BA374G configured as Clock current consumption

BA374G Timer or Clock	10mA
Additional for backlight	16mA

Total current	26mA max

5.2 Control outputs

Although the dual isolated control outputs are factory fitted options, they are described in the main body of this instruction manual as they will be used for the majority of applications. If control outputs are required they should be specified when the instrument is ordered.

5.3 Units of measurement & instrument identification.

New BA374G Timer or Clocks are supplied with a printed scale card showing the units of measurement and tag information specified when the instrument was ordered. If this information was not supplied a blank scale card will be fitted which can easily be marked with a dry transfer or a permanent marker on-site.

Custom printed scale cards are available as accessories and may be easily fitted as shown in section 4.4 of this manual.

The BA374G can also be supplied with a blank or custom laser engraved stainless steel legend plate - see Fig 7. The plate, which after installation is visible from the front of the instrument, is supplied loose with two fixing screws for securing it to the rear of the instrument's back-box. This plate can typically accommodate:

1 row of 5 alphanumeric characters 10mm high

or 1 row of 6 alphanumeric characters 7mm high

or 2 rows of 10 alphanumeric characters 5mm high

5.4 BA393G pipe mounting kit

316 stainless steel pipe mounting kit, attaches a BA374G to any vertical or horizontal pipe with an outside diameter between 40 and 73mm.

5.5 BA394G panel mounting kit

The BA374G may be panel mounted using a BA394G stainless steel panel mounting kit. This secures the BA374G into a panel aperture and maintains the ingress protection of the instrument, but it does not provides an IP66 seal between the front and rear of the panel in which the BA374G Timer or clock is mounted.

5.6 BA494G panel mounting kit

The BA374G may be panel mounted using a BA494G GRP panel mounting kit. This secures the BA374G into a panel aperture, maintains the ingress protection of the instrument and provides an IP66 seal between the front and rear of the panel.

The BA494G kit has ATEX and IECEx intrinsic safety certification confirming that it does not invalidate the intrinsic safety of the BA374G Timer or clock.

6. OPERATION AS A TIMER

When configured as a Timer the BA374G can measure and display the elapsed time between external events.   The Timer can be started and stopped by remote sensors, or from the front panel push buttons.

The addition of optional factory fitted isolated control outputs allows the Timer to control external events such as opening a valve for a predetermined time. Again the Timer can be started and stopped by remote sensors, or from the front panel push buttons.   Timed events can be repeated using the CYCLE function which enables the BA374G Timer to repeat the timing period up to 99 times, or continuously, with a configurable delay between timed periods of up to 100 hours.

The BA374G may be configured to *time-up* from zero to the set time SEt t, or to *time-down* from the set time to zero.   Times may be entered and displayed in hours, minutes or in seconds, or in a combination of units. Elapsed or remaining time is continuously displayed and a separate display may be activated to show the target set time SEt t. Throughout the timing cycle the instrument can be paused and restarted without changing the cycle time. Resetting is accomplished via the front panel push buttons or a remote contact.

A grand total time is maintained by the instrument which can be viewed by operating the front panel push buttons and reset from the display mode or from within the configuration menu.

Fig 14 shows a simplified block diagram of the BA374G when configured as a Timer. The two separate inputs A and b can be individually configured to accept inputs from a wide variety of sensors.   When the sensor requires energising to detect its state, such as a switch contact, open collector or a two wire proximity detector, a link connected between external terminals of the BA374G supplies power to the sensor input terminals.

The optically isolated status control output is a current sink intended for monitoring the Timer's status, but may also be used for simple control applications.

The instrument can be supplied with the following factory fitted accessories:

> Internally powered Backlight

> Dual isolated Control Outputs

The optional, factory fitted, dual isolated solid state control outputs may be independently configured to be activated in any of the timer's state allowing the BA374G Timer to perform a wide variety of tasks.

6.1   Initialisation

Each time power is applied to a BA374G initialisation is performed.   After a short delay the following display sequence occurs:

> All segments of the display are activated

> BA374G is ready to start functioning using the configuration information stored in the instrument's permanent memory.
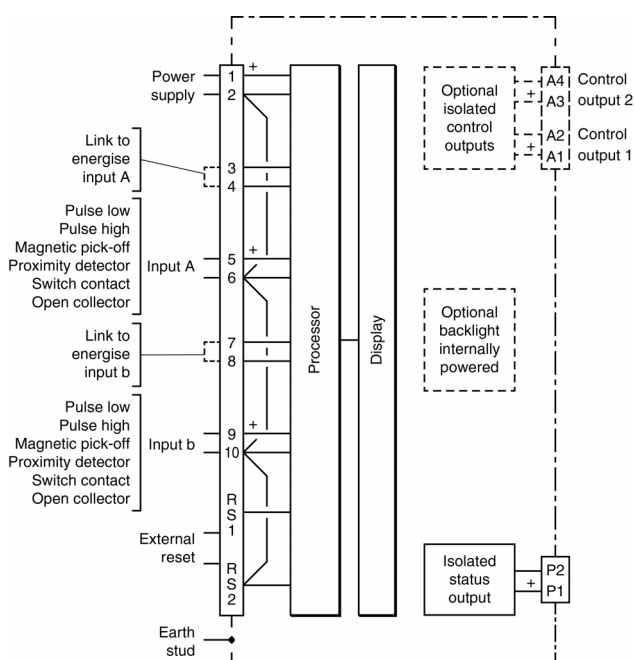

Fig 14   BA374G block diagram with Timer configuration.

6.2   Controls when configured as a Timer

The BA374G is controlled and configured via four front panel push buttons.   In the display mode i.e. when the instrument is timing the push button functions are:

Push Button Functions

▼   When local control is enabled starts the Timer.   See 6.5.9

▲   When local control is enabled stops or pauses the Timer. See 6.5.9

Ⓔ + ▲   Shows the grand total (run time) in hours and tenths of an hour irrespective of Timer configuration. If buttons are held for longer than ten seconds the grand total may be reset to zero if the grand total reset sub-function ⌐Lr ⌐⌐⌐ is enabled in the LoⅭ ⌐5Et configuration function. See 6.5.21

To reset the grand total to zero from the display mode press the Ⓔ + ▲ buttons for ten seconds until ⌐Lr.no is displayed. Using the ▼ or ▲ button change the display to ⌐Lr.YE5 and press Ⓔ.

▼ + ▲   When these two buttons are operated simultaneously for more than two seconds, resets the Timer to zero or to the set time 5Et t depending on whether the Timer is configured to *time-up* or *time-down* This is a configurable function. See 6.5.20

Ⓟ + ▲   When enabled in the configuration menu, operating these two buttons simultaneously provides direct access from the display mode to the set time 5Et t and, if the repeat timing cycle is enabled, to the restart delay ⌐5t dELA   See 6.5.16

Ⓟ + ▼   Shows in succession, firmware version number, instrument function ELAP5E   or   ⌐LoⅭ   and output accessories:
  -A   control outputs
  -P   Status output (always fitted)

Ⓟ + Ⓔ   Accesses the configuration menu

6.3   Displays when configured as a Timer

The BA374G has two digital displays and associated annunciators as shown on front cover of this manual.

Elapsed time   The upper display shows the elapsed time since the Timer was started when *timing-up from zero* and the remaining time when *timing-down* from the set time.   Display may be formatted as hh:mm:ss; hh:mm; mm:ss or ss.

Lower display   The display options available on the lower display depend on whether the Timer repeat cycle function ⌐YⅭLE5, which can repeat the timing period up to 99 times with a configurable delay between periods, is enabled.

⌐YⅭLE5 disabled
The lower display shows the set time 5Et t or the lower display may be disabled if not required. See 6.5.8

⌐YⅭLE5 enabled
The lower display shows the total number of repeat cycles requested together with the number of the current cycle. Each operation may be briefly named at it's start or periodically throughout the cycle.
Alternatively the lower display may be disabled if not required. See 6.5.8

Reset annunciator   Activated while elapsed time is being reset to zero or to the set time 5Et t.

Status output annunciator   RTx shown while status output is activated.

Grand total annunciator   Activated when the grand total time is being shown on the upper display.

Control output annunciators 1 and 2.   Shows status of each optional control outputs.

6.4 Timer structure

Fig 15 illustrates the Timer structure and function. It applies when the instrument is measuring the time between events or is controlling external events.

The circles in Fig 15 represent the five Timer states, *Reset*, *Running, Restart-delay, Paused* and *Complete*. The lines between the circles represent the event required to move the Timer between states. e.g. to initiate timing the Timer is moved from the *Reset* state to the *Running* state by a start event. This could be an input signal at input A or operation of the ▼ button. Similarly, to pause the Timer while it is timing, the Timer must be moved from the *Running* state to the *Paused* state by a stop event which could be an input at input b or operation of the ▲ button.

Reset: rESEt

In this state the Timer is readied for operation. The Timer is stopped and loaded with zero for timing-up to the set time SEt t, or the set time SEt t for timing-down.

Running: run

Entered by a start event from the *Reset* or *Paused* states. The Timer times-up to SEt t or times-down from SEt t to zero depending upon it's configuration.

Paused: PAuSEd

Entered by a stop event from the *Running* or *Restart-delay* states. Timer is stopped, a start event returns the timer to it's previous state.

Restart-delay: dELAY

This state is only accessed when the Timer has been configured to repeat the timing cycle a specified number of times or continuously. The *Restart-delay* state is entered automatically when the set time SEt t has been completed. At the end of the delay time the Timer automatically returns to the *Running* state.
Note: When the Timer leaves the *Running state* for the last time, it moves to the *Complete state* as there is no *Restart-delay* in the last timing cycle.

Complete: donE

Entered automatically from the *Running* state when SEt t has been completed and there are no more cycles to perform.

When the CYCLES function is enabled the timing cycle can be specified to repeat up to 99 times, or can be configured to repeat continuously.

BEKA Application Guide AG374 contains more information about the Timer structur.

6.5   Configuration as a Timer

The BA374G is configured via the four front panel push buttons.   All the configuration functions are contained in an easy to use intuitive menu that is shown diagrammatically in Fig 16.

Each menu function is summarised in section 6.5.2 of this manual and each summary includes a reference to more detailed information.

All new BA374G instruments are supplied configured as requested at the time of ordering. If configuration is not requested, the BA374G will be supplied with default Timer configuration as shown below, but the instrument can easily be re-configured on-site.

Function	Display	Default
Access code	CodE	0000
Function	FunCtion	ELAPSE
Input A	inPut-A	oP.CoL
Input b	inPut-b	oP.CoL
Debounce (each input)	dEbounCE	dEFAuLt
Display 2	diSP-2	Std
Start stop	StArStoP	LoCAL
Units	unitS	12:00:00
Set time	SEt t	00:00:00
Enable repeat cycle	CYCLES	oFF
Access set time from display mode.	ACSEt t	oFF
Direction of count	uP or dn	dn
Recovery from power supply failure.	P-FAiL	idLE
Local total reset	t-rESEt	on
Local grand total reset	Gt-rESEt	oFF
External reset	E-rSEt	Std
Enable status output	EnbL	oFF
Enable control output 1*	EnbL	oFF
Enable control output 2*	EnbL	oFF

* Optional output
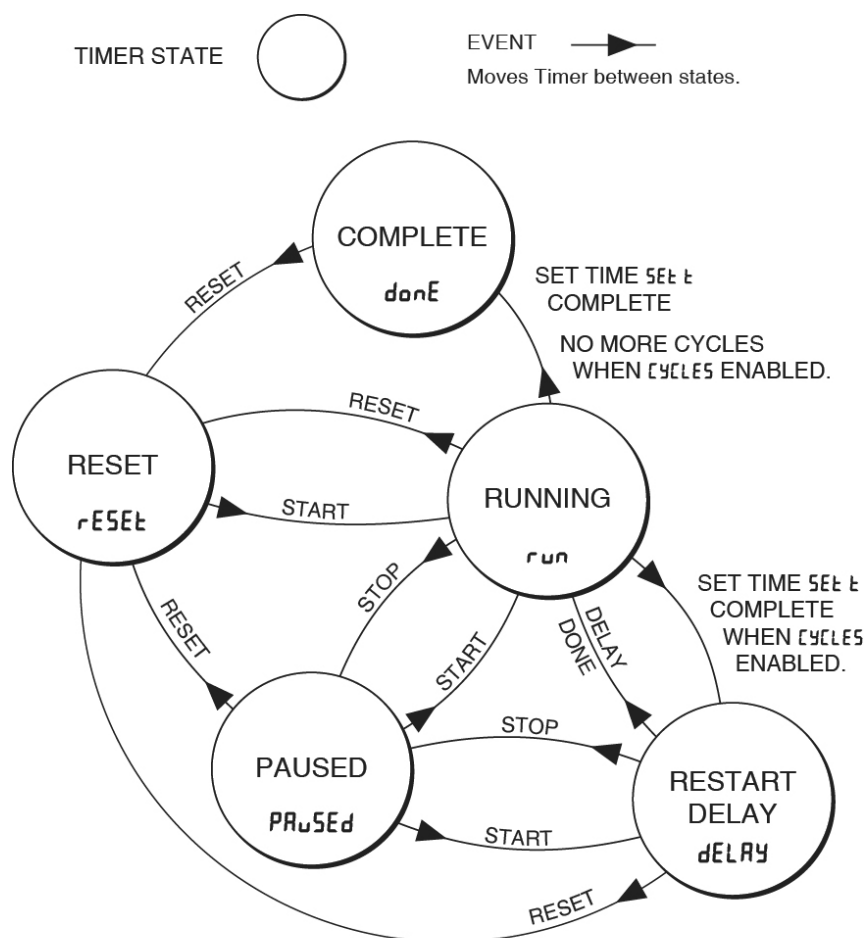
Fig 15 Timer structure showing states and events

6.5.1 Accessing configuration functions

Throughout this manual front panel push buttons are shown as ▼, ▲, P and E. Legends displayed by the instrument are shown in a seven segment font just as they appear on the instrument e.g. ınPut-A and Clr Gtot.

Access to the configuration menu is obtained by operating the P and E push buttons simultaneously. If the instrument is not protected by an access security code the first parameter FunCtı on 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 FunCtı on 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 main configuration menu the required parameter can be selected by scrolling through the menu using the ▼ or ▲ push buttons. The Timer configuration menu is shown diagrammatically in Fig 16.

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

When configuring the Timer or clock if a push button is not operated for a minute, the instrument will automatically return to the display mode without saving any configuration changes. Therefore it is advisable to save configuration changes frequently to avoid losing any configuration changes.

6.5.2 Summary of Timer configuration functions

This section summarises all the Timer configuration functions. When read in conjunction with Fig 16 it provides a quick aid for configuring the Timer. If more detail is required, each section of this summary contains a reference to a full description of the function.

Display	Summary of function

FunCtion   **Instrument function**
Defines the function of the instrument. May be set to:

ELAPSE   Timer configuration
CLoC   Clock configuration

All the entries in this Timer summary assume that the BA374G is configured as a Timer by selecting ELAPSE.
See section 6.5.3

inPut-A   **Configuration of Input A**
Contains a sub-menu with two sub-functions:

inP.tYPE   Selects input sensor type
dEbounCE   Defines input debounce
See section 6.5.4

inP.tYPE
Configures the Timer sensor Input A to accept one of six types of input:
UoLtS L   Voltage pulse <1 >3V
UoLtS H   Voltage pulse <3 >10V
Coi L   Magnetic pick-off
Pr.dEt   Proximity detector *
ContACt   Switch contact *
oP.CoL   Open collector *

* Energise input by linking terminals 3 & 4 for Input A.
See section 6.5.5

dEbounCE
Defines the level of input debounce applied to the input A to prevent false counting:
dEFAuLt
HEAUY
Li GHt
See section 6.5.6

Display	Summary of function

inPut b   **Configuration of input-b**
As configuration of inPut A
* Energise input by linking terminals terminals 7 & 8 for Input b.
See section 6.5.7

diSP-2   **Lower display**
Configures the lower display to show set time SEt t or, when the CYCLES repeat function is activated, the restart delay count-down plus the cycle count number.

With CYCLES not enabled:

Select	Lower display shows
Std	Set time SEt t
oFF	Disables lower display.

See section 6.5.8

With CYCLES enabled:

Select	Lower display shows
Std	Cycle counts requested and counts performed with *time-down* shown during requested delay period. Brief notification of timer status i.e. CYCLE or dELAY at start of each period.
LAbEL	Exactly as Std but with periodic notification of timer status i.e. CYCLE or dELAY.
oFF	Disables lower display.

See section 6.5.8

StArStoP   **Starting and stopping the timer**
Defines how the Timer is started and stopped.

	Start	Stop
ControL 1	A input high	b input high
ControL 2	A input low	b input low
ControL 3	A input high	A input low
ControL 4	A input low	A input high
LoCAL	▼ button	▲ button

High and low inputs are specified for a voltage input. For other types of sensor input, **see section 6.5.9**

Display	Summary of function

unı t5   **Units of display**

Enables the format of the displayed time to be selected.

12:00:00	Hours, minutes & seconds
12:00	Hours & minutes
30:00	Minutes & seconds
30	Seconds

Excludes delay of optional control outputs which is always shown in seconds and the grand total which is always shown in hours.
See section 6.5.10

5Et t   **Set time**

This is the BA374G Timer's setpoint. When controlling an external event via the optional control outputs the BA374G will *time-down* from the set time to zero or *time-up* from zero to the set time.
Note: Timer will only start if a non zero value is entered for set time 5Et t.
See section 6.5.11

CYCLE5   **Repeat timing cycle**

Contains a sub-menu with three sub-functions, EnbL, CYCL Cnt and rSt dELA.
See section 6.5.12

Cycle function enable   **EnbL**

Enables or disables the cycles function without changing the parameters.
See section 6.5.13

Cycle count   **CYCL Cnt**

Defines the number of times that the timer cycle is repeated.
See section 6.5.14

Restart delay   **rSt dELA**

Defines the time delay between timer cycles.
See section 6.5.15

ACSEt t   **Access 5Et t from display mode**

Contains two sub-functions, EnbL which when activated allows the set time 5Et t and restart delay rSt dELA to be adjusted from the display mode. The second sub-function ACCd defines a separate access code to protect access to 5Et t from the display mode.
See section 6.5.16

Display	Summary of function

uP or dn   **Direction of count**

Defines whether the Timer times-up from zero to the set time 5Et t, or times-down from 5Et t to zero.
See section 6.5.17

P-FAı L   **Power Failure**

Defines how the Timer functions when power is restored after a power failure. Contains three alternative options ı dLE, PAu5E and Contı nuE.

Idle   **ı dLE**

Timer returns in stopped state as if having completed single timing cycle displaying Timer value when power was lost. Timing resumes when reset followed by start instructions are received.

Pause   **PAu5E**

Timer returns in paused state displaying Timer value when power was lost. Timing resumes when start instruction is received.

Continue   **Contı nuE**

Timer will continue without any manual intervention.
See section 6.5.18

LoC rSEt   **Local reset**

Contains two sub-functions which when enabled allow the Timer and the grand total, which represents total Timer run-time, to be reset to zero via the front panel push buttons while the Timer is in the display mode.
See section 6.5.19

Local total reset   **rSEt.EnbL**

When on is selected, Timer is reset to zero, or 5Et t if timing-down, when the ▼ and ▲ buttons are operated simultaneously for more than 2 seconds in the display mode.
See section 6.5.20

Local grand total reset   **CLr Gtot**

When on is selected the grand total, which represents total run-time, may be reset to zero by operating the Ⓔ and ▲ buttons simultaneously for more than 10 seconds in the display mode.
See section 6.5.21

Display	Summary of function
E-rSEt	**External reset** Defines the time taken for closure of external contacts connected to terminals RS1 & RS2 to reset the Timer. 5td 1s FASt 2ms **See section 6.5.22**
StAt oP	**Status output** Contains sub-menu with four sub-functions, EnbL, StAt on, StAt oFF and StAtdELA **Note:** Output is a passive open collector. **See section 6.5.23**
	Status output enable EnbL Enables or disables the status output without changing any of the parameters. **See section 6.5.24**
	Status output *on* StAt on Status output turns *on* when the Timer enters the state selected in this function. Output phase can be reversed. **See section 6.5.25**
	Status output *off* StAt oFF Status output turns *off* when the Timer enters the state selected in this function. Output phase can be reversed. **See section 6.5.26**
	Status *on* delay StAtdELA Introduces a specified delay between the *on* condition occurring and the status output being activated. **See section 6.5.27**
oP1	**Control output 1 (Optional)** Contains sub-menu with four sub-functions, EnbL, oP1 on, oP1 oFF and oP1 dELA. **See section 6.5.28**
	Control output enable EnbL Enables or disables control output 1 without changing the parameters. **See section 6.5.29**

Display	Summary of function
	Control output 1 *on* oP1 on Control output 1 turns *on* when the Timer enters the state selected in this function. Output phase can be reversed. **See section 6.5.30**
	Control output 1 *off* oP1 oFF Control output 1 turns *off* when the Timer enters the state selected in this function. Output phase can be reversed. **See section 6.5.31**
	Control output *on* delay oP1 dELA Introduces a specified delay between the on condition occurring and control output 1 closing. **See section 6.5.32**
oP2	**Control output 2 (Optional) oP2** Functions as control output 1. **See section 6.5.28 to 6.5.33**
CLr Gtot	**Resets grand total to zero** This function resets the grand total, which represents the total Timer run-time, from within the configuration menu when CLr YES is selected and SurE is entered to confirm the instruction. **Note:** Once reset, the grand total can not be recovered. **See section 6.5.34**
CodE	**Security code** Defines a four digit alphanumeric code that must be entered to gain access to the instrument's configuration menu. Default code 0000 disables the security function and allows unrestricted access to all configuration functions when the ⓟ and ⓔ buttons are operated simultaneously in the display mode. **See section 6.5.35**
rSEt dEF	**Reset to factory defaults** Resets the BA374G to the Timer factory default configuration shown in section 6.4 Instruction confirmed by entering SurE. **See section 6.5.36**

6.5.3 Instrument function: FunCtion
The BA374G may be configured as a Timer or as a Clock. This section of the instruction manual describes the Timer, for details of Clock configuration see section 9.

To reveal the existing function of the instrument select FunCtion from the configuration menu and press P. If ELAPSE is displayed, the instrument is already configured as a Timer therefore press E to return to the FunCtion prompt in the configuration menu. If CLoC is displayed, press the ▲ or ▼ button to change the setting to ELAPSE followed by the P button which will result in a 0000 prompt being displayed with the first digit flashing. This is a request for the instruction to be confirmed by entering SurE using the ▼ or ▲ button to adjust the flashing digit and the P button to move control to the next digit. When SurE has been entered, pressing E will change the instrument to a Timer and return the instrument to the display mode. To configure the Timer enter the configuration menu by pressing the P and E buttons simultaneously until FunCtion is displayed.

6.5.4 Input A: inPut-A
The inPut-A function contains two sub-functions inP.tYPE which defines the type of sensor that may be connected to the input and dEbounCE which adjust the amount of input noise rejection.

6.5.5 Input type: inP.tYPE
inP.tYPE is a sub-menu in the inPut-A function which defines the type of input sensor that may be connected to input A. To check or change the type of input, select inPut-A in the configuration menu and press P which will reveal the inPtYPE prompt, pressing P again will show the existing input. 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, then press E twice to return to the configuration menu.

One of following six types of input may be selected:

Display	Input type	Switching thresholds	
		Low	High
oPCoL	Open collector[2]	2	10kΩ
UoLtS L	Voltage pulse low[1]	1	3V
UoLtS 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 sensors connected to input A that require energising i.e. a proximity detector, a switch contact or an open collector, terminals 3 & 4 of the BA374G Timer should be linked together.

3. To function correctly, the input signal must fall below the lower switching threshold and rise above the higher switching threshold.

6.5.6 De-bounce: dEbounCE
dEbounCE is an adjustable sub-menu in the inPut-A function which prevents the Timer mis-functioning when the input has noisy edges, such as those resulting from a mechanical contact closing and bouncing. Three levels of protection may be selected and the amount of debounce applied depends upon the type of Timer input that has been selected in the inP.tYPE function.

The following table shows the minimum time that the input signal must be continuously above the upper input switching threshold and continuously below the lower switching threshold to ensure that the Timer processes the input signal. Input switching thresholds are shown in section 6.5.5.

De-bounce level	Min input pulse width	
	Type of Input	
	Contact	All others
dEFAuLt	1600µs	40µs
HEAUY	3200µs	350µs
LiGHt	400µs	5µs

6.5.7 Input b: inPut-b
The inPut-b function and sub-functions are identical to the inPut-A function & sub-functions described in sections 6.5.4, 6.5.5 and 6.5.6.

Notes:
1. Maximum voltage input +28V.

2. For sensors connected to input b that require energising i.e. a proximity detector, a switch contact or an open collector, terminals 7 & 8 of the BA374G Timer should be linked together.

3. To function correctly, the input signal must fall below the lower switching threshold and rise above the higher switching threshold.

6.5.8   Lower display: di5P-2

The configuration options for the lower display vary depending upon whether the repeat timer function CYCLES is enabled.

CYCLES disabled
When the lower display is enabled it shows the set time SEt t

CYCLES enabled
When the lower display is enabled it shows the total number of repeat cycles requested together with the number of cycles performed. During the delay time between cycles the display shows the time until the next cycle starts.

Menu options allow each part of the cycle to be briefly identified at the start of each part, or periodically throughout the cycle.

To check or change the configuration of the lower display select di5P-2 from the configuration menu and press ⓟ which will reveal the existing setting which can be changed by pressing the ▲ or ▼ button followed by the Ⓔ button to enter the selection and return to the configuration menu.

If the CYCLES function is not enabled the following two options are available:

Std   Lower display shows the Timer's set time SEt t, to which the BA374G will *time-up* to, or *time-down* from, depending upon the direction of count selected in the uP or dn function.

oFF   Lower display disabled – see 6.5.17.

If the CYCLES function is enabled the following three options are available:

Std   Lower display shows the number of cycles requested together with the current cycle number.   During the configurable delay period between cycles the display times-down from the requested delay to zero. A brief notification of timer status i.e. CYCLE or dELAY is shown at the start of each period.

$$02 - 11$$

Current   Number of cycles
cycle number.   requested, not
                  shown when cycle is
                  continuously repeated.

LAbEL Exactly the same as Std, but timer status i.e. CYCLE or dELAY is shown periodically.

oFF   Lower display disabled.

6.5.9   Starting & stopping the Timer: StArStoP

The Timer may be started and stopped by signals on Input A and Input b, or by operation of the front panel ▲ or ▼ push buttons.

To check or change the control of the Timer, select StArStoP from the configuration menu and press ⓟ which will reveal the existing setting which can be changed by pressing the ▲ or ▼ button followed by the Ⓔ button to enter the selection and return to the configuration menu.   The options available are shown in the following tables.

Voltage inputs and control from front panel

Display	Start	Stop
Control 1	A input high	b input high
Control 2	A input low	b input low
Control 3	A input high	A input low
Control 4	A input low	A input high
LoCAL	▼ button	▲ button

Contact and open collector inputs

Display	Start	Stop
Control 1	A open	b open
Control 2	A closed	b closed
Control 3	A open	A closed
Control 4	A closed	A open

Proximity detector input
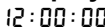
Display	Start	Stop
Control 1	A low current	b low current
Control 2	A high current	b high current
Control 3	A low current	A high current
Control 4	A high current	A low current

6.5.10 Units of display: ⊔∩¡ ㅌ5

Defines the format of all displayed times, except the delay time of the status output and optional control outputs which are always shown in seconds and the grand total which is always shown in hours and tenths of an hour.

To check or change the units of display, select ⊔∩¡ ㅌ5 from the configuration menu and press Ⓟ which will reveal the existing setting which can be changed by pressing the ⮝ or ⮟ button followed by the Ⓔ button to enter the selection and return to the configuration menu.   The options available are shown in the following tables:

> **Display**
> ¡2:00:00   Hours, minutes & seconds
> ¡2:00   Hours & minutes*
>   30:00   Minutes & seconds
>   30   Seconds

* Only available when time specified in seconds for 5㎱ ㅌ and r5t dㅌㄴㅁ are zero or exactly divisible by 60.

The Timer's maximum elapsed time in any format is equivalent to 99hours, 59 minutes & 59 seconds.

Fig 16 Timer Configuration menu

Display mode — DISPLAY

Security Code
Enter code by pressing ▲ or ▼ & P to move to next digit. Code 0000 allows direct access to the menu

CodE
0000

FunCtion
ELAPSE
0000

inPut-A
inP.tYPE
oP.CoL

dEbounCE
dEFAuLt

inPut-b
inP.tYPE
oP.CoL

dEbounCE
dEFAuLt

diSP-2
Std

StArStoP
LoCAL

unitS
12:00:00

SEt t
00:00:00

CYCLES

ACSEt t
EnbL
ACCd
0000

EnbL
oFF

CYCL Cnt
01

rSt dELA
00:00:00

Function
▲ or ▼ to select
Function of instrument
ELAPSE Timer interval measurement
CLoC Clock time display
Confirm selection by entering SurE by pressing ▲ or ▼ and P to move to next digit

Input-A
▲ or ▼ to select
Input type
oP.CoL Open Collector.
VoLtS L Pulse <1V >3V
VoLtS H Pulse <3V >10V
Coi L Magnetic pick-off.
Pr.dEt Proximity detector.
ContACt Switch contact.

Debounce input-A
▲ or ▼ to select
level of debounce.
dEFAuLt
HEAVY
LiGHt

Input-b
▲ or ▼ to select
Input type
oP.CoL Open Collector.
VoLtS L Pulse <1V >3V
VoLtS H Pulse <3V >10V
Coi L Magnetic pick-off.
Pr.dEt Proximity detector.
ContACt Switch contact.

Debounce input-b
▲ or ▼ to select
level of debounce.
dEFAuLt
HEAVY
LiGHt

Lower Display
CYCLES not enabled
▲ or ▼ to select display
Std Set time SEt t
oFF lower display disabled.

CYCLES enabled
▲ or ▼ to select display
Std Count No. & total counts with status shown at start of each opperation.
LAbEL Count No. & total counts with status shown periodically.
oFF lower display disabled.

Start & stop timer
▲ or ▼ to select how timer is controlled
Std Start ▼ button Stop ▲ button
LoCAL Start ▼ button Stop ▲ button
ControL 1 Start A high (open) Stop b high (open)
ControL 2 Start A low (closed) Stop b low (closed)
ControL 3 Start A high (open) Stop b low (closed)
ControL 4 Start A low (closed) Stop b high (open)

Units of display
▲ or ▼ to select
hours minutes seconds
12:00:00
12:00
30:00
30

Set time
▲ or ▼ to adjust value and P to move control to next digit.

Enable access to Set Time from display mode
▲ or ▼ to select on or oFF

Security code for direct access to Set Time
Enter code by pressing ▲ or P and P to move to next digit
Code 0000 allows direct access.

Enable cycle function
▲ or ▼ to toggle between on and oFF

Cycle count
▲ or ▼ to adjust flashing digit and P to move to next digit.
Sets number of cycles to be performed.

Restart delay
▲ or ▼ to adjust flashing digit and P to move to next digit.
Sets delay between cycles in the same units as SCALE t

Timer repeat cycle function

Only included when optional
Control Outputs are fitted

E	E	E	E	E	E	E	E	E	E
uP or dn	P-FAıL	LoC rSEt	E rSEt	StAt oP	oP 1	oP2	CLr Gtot	CodE	rSEt dEF

| P E | P E | P E | P E | P E | P E | | P E | P E | P E |
| dn | ıdLE | rSEtEnbL ← CLr Gtot | Std | | | | CLr. no | 0000 | 0000 |

| P E | | P E | P E | | | | P E | | |
| 0000 | | on | oFF | | As oP 1 | | 0000 | | |

Direction of count

▲ or ▼
to select
uP or dn

Power fail

▲ or ▼
to select how
timer functions
when power is
restored after
failure

ıdLE
Stopped,
requires reset
& start input.

PAuSE
Paused,
requires start
input.

ContınuE
Resumes
timing.

Local total reset

▲ or ▼
to turn the
local total
reset function
on or oFF

When on is
selected
pressing
▲ and ▼
simultaneously
for more than 3
seconds in the
display mode
resets the
total display.

Local grand total clear

▲ or ▼
to turn the
local grand total
reset function
on or oFF

When on is
selected
pressing
E and ▲
simultaneously
for more than 10
seconds in the
display mode
resets the
grand total.

External reset

▲ or ▼
to toggle
between
Std
1s

FASt
?ms

external
contact reset
time.

Clear grand total

▲ or ▼
to select 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 ▲ &
P to move
to next digit.

Reset configuration to Timer factory defaults

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

E	E	E	E
EnbL	oP1 on	oP1 oFF	oP1 dELA

| P E | P E | P E | P E |
| oFF | run | n run | 00000 |

Enable output 1
▲ or ▼
to toggle
between
on and oFF

Output on at
▲ or ▼
to select
required function

run
PAuSE
dELAY
donE
n rESEt
n run
n PAuSE
n dELAY
n donE
rESEt

Select action
that energises
output 1.

Output off at
▲ or ▼
to select
required function

n run
n PAuSE
n dELAY
n donE
rESEt
run
PAuSE
dELAY
donE
n rESEt

Select action
that de-energises
output 1.

Output on delay
▲ or ▼
to adjust
flashing digit

and P
to move
to next digit

Set delay in
seconds before
output 1
is energised.

Output 1 configuration
Only included when optional Control Outputs are fitted

E	E	E	E
EnbL	StAt on	StAt oFF	StAt.dELA

| P E | P E | P E | P E |
| oFF | run | n run | 00000 |

Enable Stat oP
▲ or ▼
to toggle
between
on and oFF

Status output on at
▲ or ▼
to select
required state

run
PAuSE
dELAY
donE
n rESEt
n run
n PAuSE
n dELAY
n donE
rESEt

Select action
that energises
output.

Status output off at
▲ or ▼
to select
required state

n run
n PAuSE
n dELAY
n donE
rESEt
run
PAuSE
dELAY
donE
n rESEt

Select action
that energises
output.

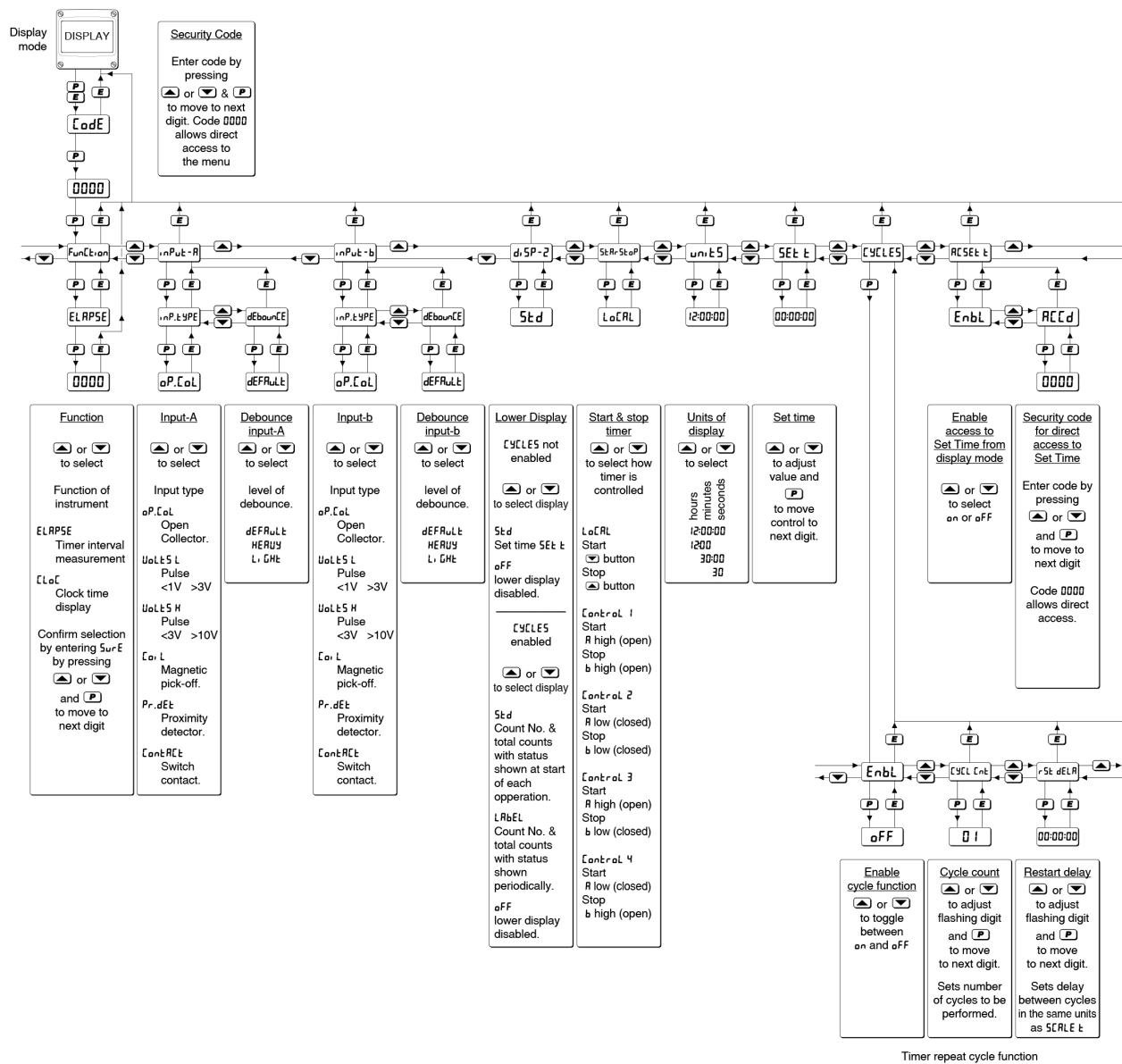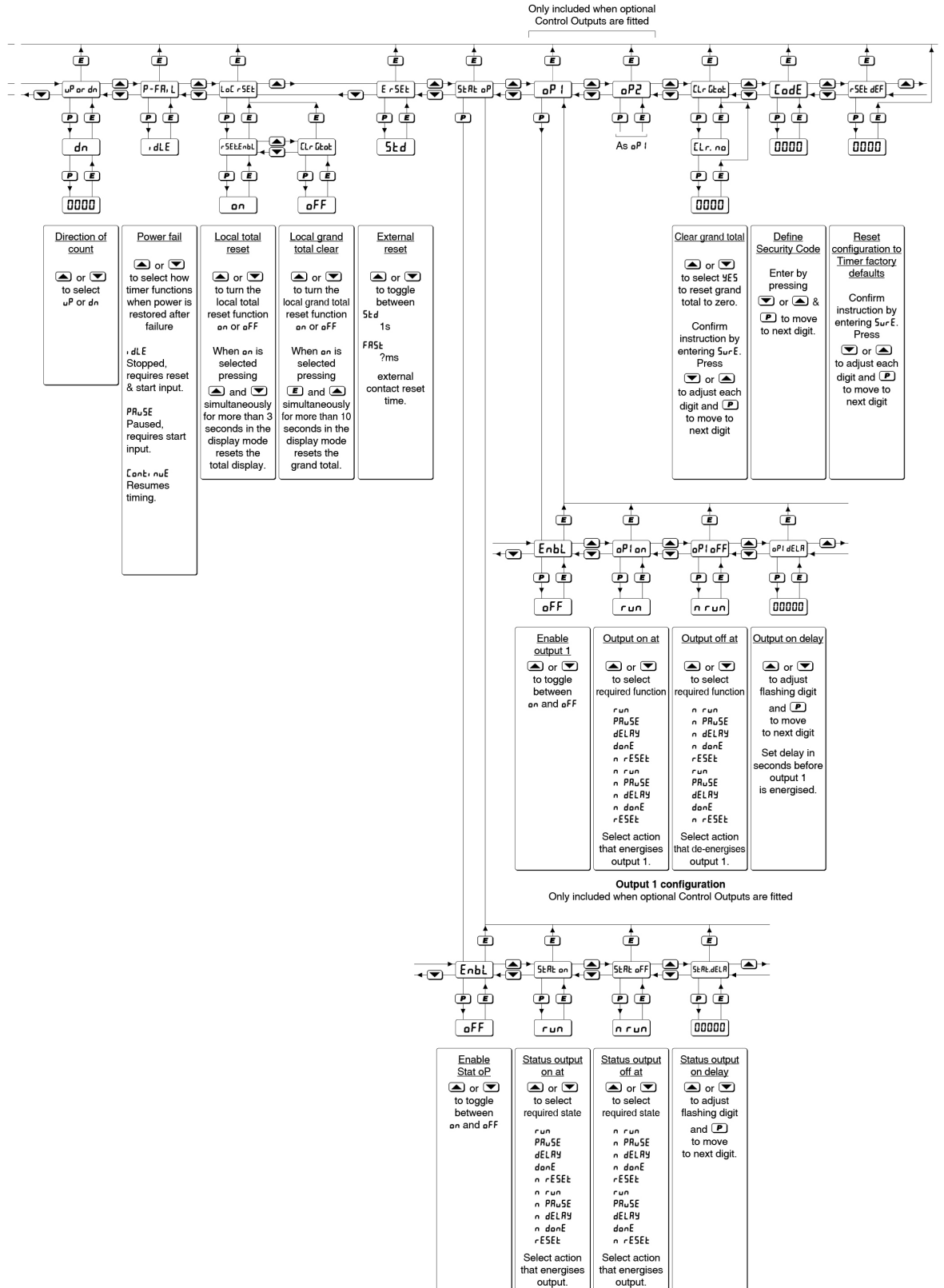**Status output on delay**
▲ or ▼
to adjust
flashing digit

and P
to move
to next digit.

6.5.11 Set time: 5Et t
Set time is the Timer's setpoint. When controlling an external event via the optional control outputs the BA374G will *time-down* from the set time to zero or *time-up* from zero to the set time.

To check or change the set time, select 5Et t from the configuration menu and press ⒫ which will reveal the existing setting displayed in the units defined by the uni t5 function with the most significant digit flashing. The flashing digit may be adjusted by pressing the ⏶ or ⏷ button followed by the ⒫ button to transfer control to the next digit. When set as required, enter the selection and return to the 5Et t prompt in the configuration menu by operating the ⒠ button.

Can also be adjusted from Timer display mode, see 6.5.16.

Note: If 5Et t is zero the Timer will not function when an external start input is received or the ⏷ button is operated.

6.5.12 Repeat timing cycle: CYCLE5
This a powerful function which allows the BA374G timing cycle to be repeated up to 99 times or continuously with a configurable delay between cycles of up to 99hours, 59 minutes & 59 seconds.

To check or adjust the repeat timing cycle, select CYCLE5 from the configuration menu and press ⒫ which will enter a sub-menu containing three sub-functions, EnbL, CYCL Cnt and r5t dELR which are described in the following sections.

6.5.13 Cycle function enable: EnbL
This sub-function allows the repeat timing cycle to be enabled or disabled without altering any of the repeat timing cycle parameters. To check or change the function select EnbL from the repeat timing cycle sub-menu CYCLE5 and press ⒫ which will reveal if the repeat cycle function is on or oFF. The setting can be changed by pressing the ⏷ or ⏶ button followed by the ⒠ button to return to the repeat timing cycle sub-menu.

6.5.14 Cycle count: CYCL Cnt
This sub-function defines the number of times the timer cycle is repeated. It may be set to any number between 1 and 99, or to 00 for continuous repetition. To check or change the function select CYCL Cnt from the repeat timing cycle sub-menu CYCLE5 and press ⒫ which will reveal the number of times the timer cycle is to be repeated with the most significant flashing.   The flashing digit may be adjusted by pressing the ⏶ or ⏷ button followed by the ⒫ button to transfer control to the next digit.

When set as required, enter the selection and return to the CYCL Cnt prompt in the sub-menu by operating the ⒠ button.

6.5.15 Restart delay: r5t dELR
This sub-function defines the time delay between repeat timing periods. It is shown in the format selected in the units function and may be set to any time between zero and the maximum time allowed in the selected format.

Time format selected in uni t5	Maximum delay
12:00:00	99:59:59
12:00	99:59
30:00	5999 :59
30	359999

To check or change the restart delay time select r5t dELR from the repeat timing cycle sub-menu CYCLE5 and press ⒫ which will reveal the delay time in the selected format with the most significant digit flashing. The flashing digit may be adjusted by pressing the ⏶ or ⏷ button followed by the ⒫ button to transfer control to the next digit. When set as required, enter the selection and return to the r5t dELR prompt in the sub-menu by operating the ⒠ button.

Can also be adjusted from Timer display mode, see 6.5.16.

Note: When the repeat timing cycle CYCLE5 is used, there is no restart delay after the final cycle.

6.5.16 Adjusting the set time 5Et t and restart delay r5t dELR from the display mode: RC5Et t
When this function is enabled the Timer's set time 5Et t and restart delay r5t dELR can be adjusted from the display mode by simultaneously operating the ⒫ and ⏶ push buttons. Thus allowing an operator to adjust these parameters without having access to the instrument's configuration menu. The function contains two sub-functions, EnbL which activates the function and RCCd which defines a separate code for access to 5Et t with the Timer in the display mode.

To check or change the function, select RC5Et t in the configuration menu and press ⒫ which will reveal the EnbL prompt, pressing ⒫ again will show if the function is on or oFF. If adjustment of the set time from the display mode is not required press the ⏶ or ⏷ button to select no and then press ⒠ twice to return to the configuration menu. If the function is required, select YE5 and press ⒠ to return to the EnbL prompt from which RCCd, which allows a separate access code to be entered, can be selected by pressing the ⏶ or ⏷ button.

Access to 5EE E from the display mode may be protected by a four digit alphanumeric security code which must be entered to gain access. Default security code 0000 allows unrestricted access. With RCCd displayed, press Ⓟ to enter a new access code. The Timer will display 0000 with one digit flashing. The flashing digit may be adjusted using the ▲ or ▼ push button, when set as required operating the Ⓟ button will transfer control to the next digit. When all the digits have been entered press Ⓔ twice to return to the RC5EE E prompt in the configuration menu. The revised access code will be activated when the BA374G is returned to the display mode.

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

6.5.17 Direction of count: uP or dn

The Timer may be configured to *time-up* from zero to the set time 5EE E while displaying elapsed time, or to *time-down* from the set time 5EE E to zero while displaying the remaining time.

When the repeat timing cycle function CYCLE5 is enabled, it is recommended that a down count is selected so that the progress of the timer can be observed with a known completion time i.e. zero. If set as an up counter, elapsed time will be displayed, but the set time 5EE E at which the timer will stop is not shown.

To check the direction of count, select uP or dn from the configuration menu and press Ⓟ which will reveal the existing setting. This can be changed by pressing the ▲ or ▼ button followed by the Ⓔ button to enter the selection and return to the configuration menu.

6.5.18 Power Fail: P-FAiL

Defines how the Timer powers-up and functions when power is restored after a power supply interruption. Three options are available, idLE, PAu5E and Continue.

idLE   The Timer is stopped in the state it achieves when it has timed-up to 5EE E or timed-down to zero, with the elapsed or remaining time when power was lost shown on the upper display. The Timer must be reset before it can be restarted. If the repeat timing cycle is in use the number of cycles completed will be lost when the Timer is reset.

PAu5E   The Timer is stopped in the state it achieves following receipt of a stop input to pause timing – see Fig 15. The elapsed or remaining time when power was lost is shown on the upper display. Timing resumes when a start instruction is received. If a start input exists when power is restored timing will start immediately.

Continue When power is restored the Timer will continue from where it stopped without any manual intervention.

To check or change the function, select P-FAiL from the configuration menu and press Ⓟ which will reveal the existing setting which can be changed by pressing the ▲ or ▼ button followed by the Ⓔ button to enter the selection and return to the configuration menu.

6.5.19 Local reset: LoC r5EE

The Local reset function contains two separate sub-functions rE5EE.EnbL and CLr GEoE which when enabled allow the Timer and the grand total to be reset via the instrument's front panel push buttons while the Timer is in the display mode.

6.5.20 Local total reset: rE5EE.EnbL

rE5EE.EnbL is a sub-function in the LoC r5EE function which when activated allows an operator to reset the Timer from the display mode by operating the ▲ and ▼ push buttons simultaneously for more than three seconds.

To check or change the local total reset select LoC r5EE in the configuration menu and press Ⓟ which will reveal the rE5EE.EnbL prompt, press Ⓟ again to show if the local total reset is on or oFF. If set as required operate the Ⓔ button twice to return to the configuration menu, or the ▲ or ▼ button to change the setting followed by the Ⓔ button twice to enter the change and return to the LoC.r5EE prompt in the configuration menu.

Note: The Timer may also be reset remotely by connecting terminals RS1 and RS2 together. See section 3.2.8

6.5.21 Local grand total reset: CLr GEoE

The grand total is the total run-time of the Timer that may be viewed by operating the Ⓔ and ▲ push buttons simultaneously in the display mode. When activated CLr GEoE allows an operator to reset the grand total display to zero from the display mode by operating the Ⓔ and ▲ push buttons simultaneously for more than ten seconds.

CLr GEoE is a sub-function in the LoC r5EE menu. To check or change the setting select LoC r5EE in the configuration menu and press Ⓟ which will reveal rE5EE.EnbL. Using the ▼ or ▲ button select CLr GEoE and press Ⓟ to show if local grand total reset is on or oFF. If set as required operate the Ⓔ button twice to return to the configuration menu, or the ▼ or ▲ button to change the setting followed by the Ⓔ button twice to enter the change and return to the LoC r5EE prompt in the configuration menu.

6.5.22 External reset

The Timer may be reset by connecting terminals RS1 and RS2 together. This function defines how long the connection must exist before resetting occurs. When resetting is performed by a manually operated external push button switch, 5td should be chosen. This requires the contact to be closed for one second before resetting occurs which prevents false resetting.

If the Timer is being reset by the a control output or similar apparatus FA5t should be selected.

Select	Resetting time
5td	1s
FA5t	2ms

6.5.23 Status output: 5tAt oP

The status output of the Timer is an opto isolated open collector that can be used for transmitting the status of the Timer to other instruments. It may also be used for simple control applications. When the Status output is *on* the RTx annunciator on the Timer display is activated.

The status output function contains four sub-functions, EnbL, 5tAt on, 5tAt oFF and 5tAtdELA. To gain access to the sub-menu select 5tAt oP in the configuration menu and press ⓟ which will show the EnbL prompt from which the other sub-functions can be accessed using the ▼ or ▲ button.

The status output may be configured to turn *on* when the Timer enters a selected Timer state and to turn *off* when the Timer enters another specified Timer state. e.g. if run is selected in the 5tAt on sub-function and donE is selected the 5tAt oFF function. The status output will turn *on* when the Timer enters the run state and will stay *on* until the Timer enters the donE state. Alternatively, the status output phase may be reversed by selecting the n states such as n rE5Et.

If the status output is required to be *on* in only one Timer state, this can be achieved with the following configuration.

5tAt on	state required	e.g. run
5tAt oFF	n state required	e.g. n run

In this example when the Timer enters the run state the status output turns *on*. When the Timer moves from the run to any other state, the status output turns *off*.

6.5.24 Status output enable: EnbL

This function allows the status output to be enabled or disabled without altering any other status output parameters. To check or change the function select EnbL from the status output sub-menu and press ⓟ to reveal if the status output is on or oFF. The setting can be changed by pressing the ▼ or ▲ button followed by the Ⓔ button to return to the status output sub-menu.

6.5.25 Status output *on* : 5tAt on

The status output may be configured to turn *on* when the Timer enters any one of the five Timer states. Alternatively, the status output phase may be reversed by selecting an n state. This will cause the status output to turn *on* when the Timer enters any other than the specified Timer state. Timer states are shown in Fig 15.

To define when the status output turns *on* select 5tAt on from the sub-menu and press ⓟ to show the existing setting. Pressing the ▼ or ▲ button will scroll through the options:

Display	Status output turns *on* when Timer enters selected state
rE5Et	Reset state
run	Running state
PAu5Ed	Paused state
dELAY	Restart delay state
donE	Complete state

	Status output turns *on* when Timer enters any other than the selected state
n rE5Et	Reset state
n run	Running state
n PAu5Ed	Paused state
n dELAY	Restart delay state
n donE	Complete state

When the required setting has been selected press Ⓔ to enter the selection and return to the status output sub-menu.

6.5.26 Status output *off* : ꟾꟼꟾꟾ ꟾꟾꟾ

The status output may be configured to turn *off* when the Timer enters any one of the five Timer states. Alternatively, the status output phase may be reversed by selecting an ꟾ state. This will cause the status output to turn *off* when the Timer enters any other than the specified Timer state. Timer states are shown in Fig 15.

To define when the status output is *off* select ꟾꟾꟾꟾꟾꟾꟾ from the sub-menu and press Ⓟ to show the existing setting. Pressing the ⏷ or ⏶ button will scroll through the options:

Display	Status output turns *off* when Timer enters selected state
rESEt	Reset state
run	Running state
PAuSEd	Paused state
dELAY	Restart delay state
donE	Complete state

	Status output turns *off* when Timer enters any other than the selected state
n rESEt	Reset state
n run	Running state
n PAuSEd	Paused state
n dELAY	Restart delay state
n donE	Complete state

When the required setting has been selected press Ⓔ to enter the selection and return to the status output sub-menu.

6.5.27 Status output *on* delay time: ꟾꟾꟾꟾꟾꟾꟾꟾ

The status output may be delayed from turning *on* for a fixed time following the selected condition occurring. e.g. when the timer enters the *Run* state. This delay is useful for many control applications, for example when the status output is connected to the reset terminals RS1 and RS2 to automatically reset the BA374G Timer.

This delay can be adjusted in 1 second increments up to 32,400 seconds, which is 9 hours. If a delay is not required zero should be entered. To adjust the delay select ꟾꟾꟾꟾꟾꟾꟾꟾ from the status output sub-menu and press Ⓟ which will reveal the existing delay time with one digit flashing. The flashing digit can be adjusted using the ⏷ or ⏶ button and the Ⓟ button to move to the next digit.   When the required delay has been entered, press Ⓔ to return to the status output sub-menu.

6.5.28 Control output 1 (optional): ꟾꟼ ꟾ

Control output 1 is an optional factory fitted, galvanically isolated solid state switch contact which can be configured to turn *on* and *off* when the Timer enters a specified states. When control output 1 is *on* the '1' annunciator on the Timer display is activated.

The function contains four sub-functions, EnbL, oP1 on, oP1 oFF and oP1 dELA. To gain access to the sub-menu select oP1 in the configuration menu and press Ⓟ which will show the EnbL prompt from which the other sub-functions can be accessed using the ⏷ or ⏶ button.

Control output 1 may be configured to turn *on* when the Timer enters a selected Timer state and to turn *off* when the Timer enters another specified Timer state.   e.g. if run is selected in the oP1 on sub-function and donE is selected the oP1 oFF function. Control output 1 will turn *on* when the Timer enters the run state and will stay *on* until the Timer enters the donE state.   Alternatively, the control output phase may be reversed by selecting the n states such as n rESEt.

If control output 1 is required to be *on* in only one Timer state, this can be achieved with the following configuration.

oP1 on	state required	e.g. run
oP1 oFF	n state required	e.g. n run

In this example when the Timer enters the run state control output 1 turns *on*. When the Timer moves from the run to any other state, control output 1 turns *off*.

Timer configuration examples in section 7.2. and 7.3 of this manual illustrate the use of the control outputs.   Further examples can be found in Application Guide AG374 which is available on the BEKA website.

6.5.29 Control output 1 enable: EnbL

This function allows control output 1 to be enabled or disabled without altering any other control output parameters. To check or change the function select EnbL from the control output 1 sub-menu and press Ⓟ to reveal if control output 1 is *on* or *oFF*. The setting can be changed by pressing the ⏷ or ⏶ button followed by the Ⓔ button to return to the control output 1 output sub-menu.

6.5.30 Control output 1 *on* at: oP1 on

Control output 1 may be configured to turn *on* when the Timer enters in any one of the five Timer states. Alternatively, the control output 1 phase may be reversed, by selecting an n state which will cause the control output to turn *on* when the Timer enters any other than the specified Timer state. Timer states are shown in Fig 15.

To define when control output 1 turns *on* select oP1 on from the sub-menu and press P to show the existing setting. Pressing the ▼ or ▲ button will scroll through the options:

Display	Control output 1 turns *on* when Timer enters selected state
rESEt	Reset state
run	Running state
PAuSEd	Paused state
dELAY	Restart delay state
donE	Complete state

Display	Control output 1 turns *on* when Timer enters any other than the selected state
n rESEt	Reset state
n run	Running state
n PAuSEd	Paused state
n dELAY	Restart delay state
n donE	Complete state

When the required setting has been selected press E to enter the selection and return to the status output sub-menu.

6.5.31 Control output 1 *off* at: oP1 oFF

Control output 1 may be configured to turn *off* when the Timer enters any one of the five Timer states. Alternatively, the phase of control output 1 may be reversed, by selecting an n state which will cause the control output to turn *off* when the Timer enters any other than the specified Timer state. Timer states are shown in Fig 15.

To define when control output 1 turns *off* select oP1 oFF from the sub-menu and press P to show the existing setting. Pressing the ▼ or ▲ button will scroll through the options:

Display	Control output 1 turns *off* when Timer enters selected state
rESEt	Reset state
run	Running state
PAuSEd	Paused state
dELAY	Restart delay state
donE	Complete state

Display	Control output 1 turns *off* when Timer enters any other than the selected state
n rESEt	Reset state
n run	Running state
n PAuSEd	Paused state
n dELAY	Restart delay state
n donE	Complete state

When the required setting has been selected press E to enter the selection and return to the control output 1 sub-menu.

6.5.32 Control output 1 *on* delay time: oP1 dELA

Control output 1 may be delayed from turning on (output closed) for a fixed time following the selected condition occurring. e.g. when the Timer enters the run state. This delay is useful for many control applications, for example when the control output is connected to the reset terminals RS1 and RS2 to automatically reset the BA374G Timer.

The delay can be adjusted in 1 second increments up to 32,400 seconds, which is 9 hours. If a delay is not required zero should be entered. To adjust the delay select oP1 dELA from the control output 1 sub-menu and press P which will reveal the existing delay time with one digit flashing. The flashing digit can be adjusted using the ▼ or ▲ button and the P button to move to the next digit. When the required delay has been entered, press E to return to the control output 1 output sub-menu.

6.5.33 Control output 2 (optional): oP2

Control output 2 is an optional, galvanically isolated solid state switch contact which can be independently configured to turn *on* and *off* when the Timer is any of it's five states. It's functions and configuration are identical to control output 1 described in sections 6.5.28 to 6.5.32. When control output 2 is *on* the '2' display annunciator is activated.

6.5.34 Reset grand total from within the configuration menu: CLr GtoE

The grand total is the total run-time of the Timer that may be viewed by operating the Ⓔ and ⬆ push buttons simultaneously in the display mode.

The grand total can be reset to zero from within the configuration menu using this CLr GtoE function, or from the display mode if CLr GtoE is activated in the local grand total clear function - see 6.5.21

To zero the Timer grand total from within the configuration menu select CLr GtoE and press Ⓟ which will cause the instrument to display CLr.no with no flashing.   Operate the ⬇ or ⬆ push button until CLr.YES is displayed and then press Ⓟ which will result in a 0000 prompt being displayed with the first digit flashing.   This is a request for the instruction to be confirmed by entering SurE using the ⬇ or ⬆ button to adjust the flashing digit and the Ⓟ button to move control to the next digit.   Pressing Ⓔ will then reset the grand total to zero and return the Timer to the configuration menu.

Note:

> Once reset, the grand total can not be recovered.

6.5.35 Security code: CodE

Access to the instrument configuration menu may be protected by a four digit alphanumeric 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 Ⓟ which will cause the Timer to display 0000 with one digit flashing. The flashing digit may be adjusted using the ⬆ or ⬇ push button, when set as required operating the Ⓟ button will transfer control to the next digit. When the new security code has been entered press Ⓔ to return to the CodE prompt. The revised security code will be activated when the Timer is returned to the display mode.

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

6.5.36 Reset configuration to factory defaults rSEt dEF

When the BA374G is configured as a Timer this function resets the instrument to the Timer factory defaults shown in sections 6.4

To reset the configuration select rSEt dEF from the configuration menu and press Ⓟ. The BA374G will display 0000 with the first digit flashing which is a request to confirm the instruction by entering SurE. Using the ⬆ or ⬇ button set the first flashing digit to 5 and press Ⓟ to transfer control to the second digit which should be set to u.   When SurE has been entered pressing the Ⓔ button will reset all the configuration functions and return the instrument to the display mode.

Note:

> rSEt dEF does not reset the grand total to zero.

7. TIMER APPLICATION EXAMPLES

This section illustrates three applications for the BA374G when configured as a Timer.

7.1 Measuring the time that a contact is closed.

In this example a BA374G is required to display the time that a hazardous area contact is closed. The display is required in hours and minutes within the hazardous area and is to be reset to zero by a push button located in the same hazardous area, not by the instrument front panel push buttons. The operator is required to zero the grand total by operating the E + ▲ buttons simultaneously. No security codes are required to protect access to the configuration menu or to the grand total reset.

Figure 17 shows the wiring for the BA374G when powered by a single channel Zener barrier. This example illustrates how the Timer may be started and stopped by one input, the second input is not used in this application.
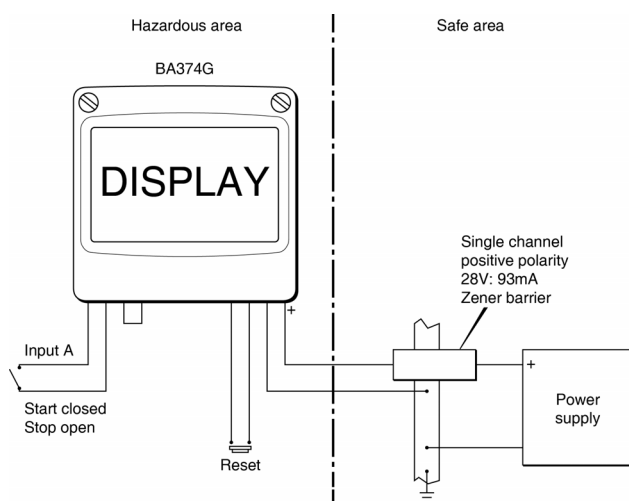
Fig 17 Starting & stopping timer with one input

The required instrument configurations for this example are shown below.

Function	Display	Setting
Access code	CodE	0000
Function	FunCtion	ELAPSE
Input A	inPut-A	ContACt
De-bounce Input A	dEbounCE	dEFAult
Display 2	diSP-2	oFF
Start stop	StArStoP	Control 4
Units	uni tS	12:00
Set time	SEt t	99:59
Direction of count	uP or dn	uP
Local total reset	rESE EnbL	oFF
Local grand total reset	CLr Gtot	on

7.2 Controlling an IS solenoid valve

This example illustrates how a BA374G Timer can open an intrinsically safe solenoid valve for 5 minutes each time the start button is operated. The operator needs to pause the process without affecting the total time that the valve is open. At the end of the process the Timer is required to automatically reset within 10 seconds ready for the next timing cycle to be started.

For this application the BA374G Timer requires dual control outputs which are a factory fitted option and should be specified when the instrument is ordered.

Control output 1 is used to switch the solenoid valve, and control output 2 is wired to the Timer's reset terminals to perform the automatic resetting at the end of the timing cycle, see Fig 14.

The control outputs are configured so that control output 1 is closed when the timer is in the run state and control output 2 is closed when the Timer is in the donE state with a 5 second *on* delay. The sequence of events is shown in Fig 18, and the Timer's configuration is listed at the end of this section.

This valve opening process is to be linked to other processes on the plant, therefore the status output is required to indicate when the 5 minute valve open period has been completed and the Timer has entered the rESEt state ready for the next cycle to be started.

When the start button is operated the Timer enters the run state and control output 1 closes for 5 minutes which opens the solenoid valve. At the end of the 5 minute period, the Timer automatically moves from the run to the donE states and control output 1 opens which closes the solenoid valve. Control output 2 is externally wired to the Timers reset terminals. It is configured to close when the Timer enters the donE state and has been configured with a 5 second on delay. Therefore 5 seconds after the Timer enters the donE state, control output 2 closes and resets the Timer ready to start another cycle when the start button is operated.

If at any time during the cycle the stop button is operated, the Timer will enter the paused state which will stop the process until the start button is operated when it will resume from the place at which it was paused.

In this example Local total reset rESEt.EnbL is on. This enables the Timer to be reset when power is first connected by operating the ▲ and ▼ push buttons simultaneously for more than three seconds.
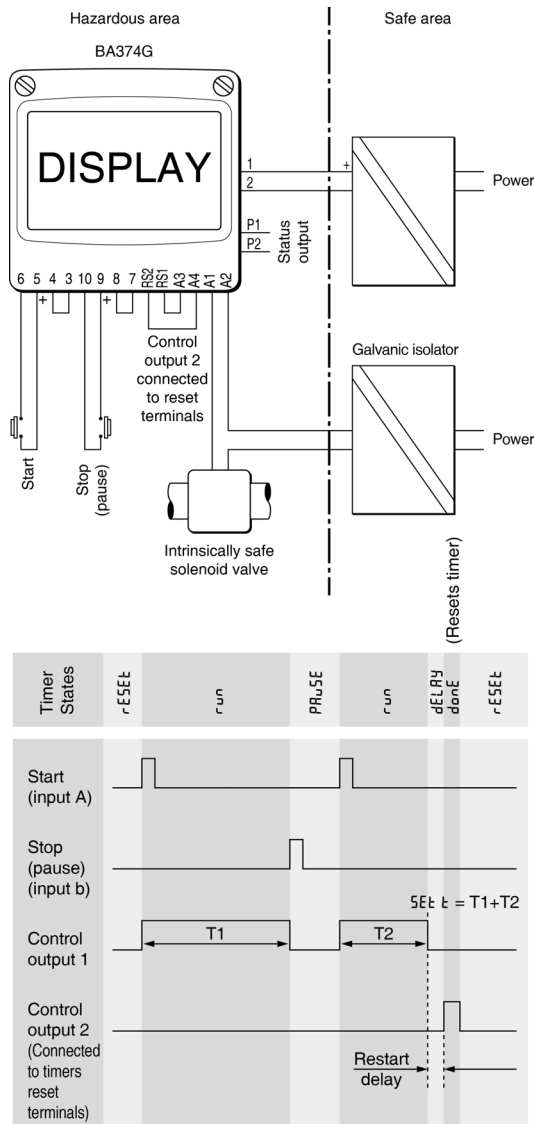
Fig 18 Control of valve in a hazardous area.

The required instrument configurations for this example are shown below.

Function	Display	Setting
Access code	CodE	0000
Function	FunCtion	ELAPSE
Input A	inPut-A	ContACt
Input b	inPut-b	ContACt
De-bounce (both inputs)	dEbounCE	dEFAuLt
Display 2	diSP-2	Std
Start stop	StArStoP	Control 2
Units	unitS	12:00:00
Set time	SEt t	00:05:00
Timer repeat cycle	CYCLES	
Enable repeat cycle	EnbL	oFF
Power failure	P-FAiL	idLE
Local total reset	rESEt.EnbL	on
Local grand total reset	CLr Gtot	oFF
External reset	E rSEt	FASt
Enable status output	EnbL	on
Status output on at	StAt on	rESEt
Status output off at	StAt oFF	n rESEt
Status output delay	StAtdELA	00000
Enable control output 1	EnbL	on
Control output 1 on at	oP1 on	run
Control output 1 off at	oP1 oFF	n run
Control output 1 delay	oP1 dELA	00000
Enable control output 2	EnbL	on
Control output 2 on at	oP2 on	donE
Control output 2 off at	oP2 oFF	n donE
Control output 2 delay	oP2 dELA	00005

7.3 Cycling an IS solenoid valve

In this example a BA374G is required to cycle an intrinsically safe solenoid valve such that it is opens 4 times for 10 minutes at 15 minutes intervals. Once all 4 solenoid valve cycles have been completed a remote "sequence complete" lamp is illuminated in the safe area until the reset push button is operated.

If, during the sequence, power is lost the control outputs are to remain de-engergised when power is restored. The timer is to recommence operating from the last known point when the start push button is pressed.

When the start button is operated control output 1 closes which opens the solenoid valve and the counter *times-down* for 10 minutes. When the elapsed time equals zero, control output 1 opens thus closing the solenoid valve. The timer then counts down the 15 minute delay which is shown on the lower display (display 2). When the delay equals zero, control output 1 closes again for a second 10 minutes, the whole cycle being repeated such that the solenoid valve opens and closes 4 times. After the solenoid valve has closed for a forth time control output 2 closes which illuminates a "Sequence Complete" lamp indicating that the whole operation is finished.

The lamp remains illuminated until the reset push button is operated (The Reset annunciator on the instrument display is activated) at which point control control output 2 is de-energised which turns the lamp off.

Operating the stop button at any time during the timing cycle will pause the cycle. The cycle can be resumed by operating the start button or abandoned by operating the reset button.

Note:
Both the timer (display 1) and delay (display 2) will count down – but the cycle display counts *up* towards its target.
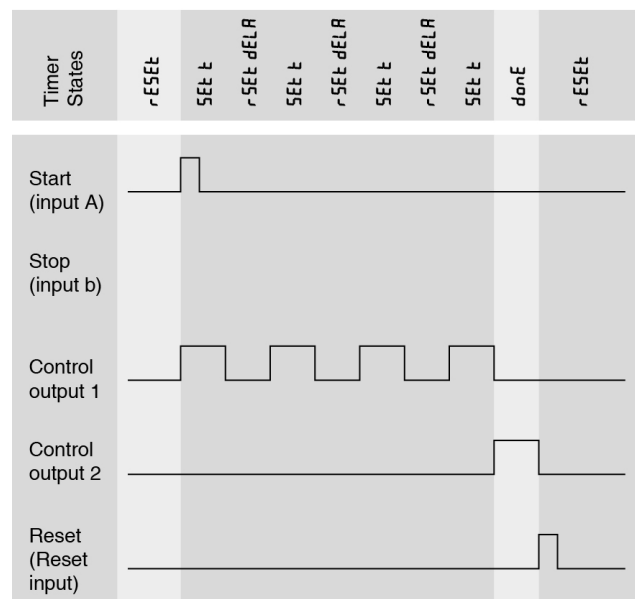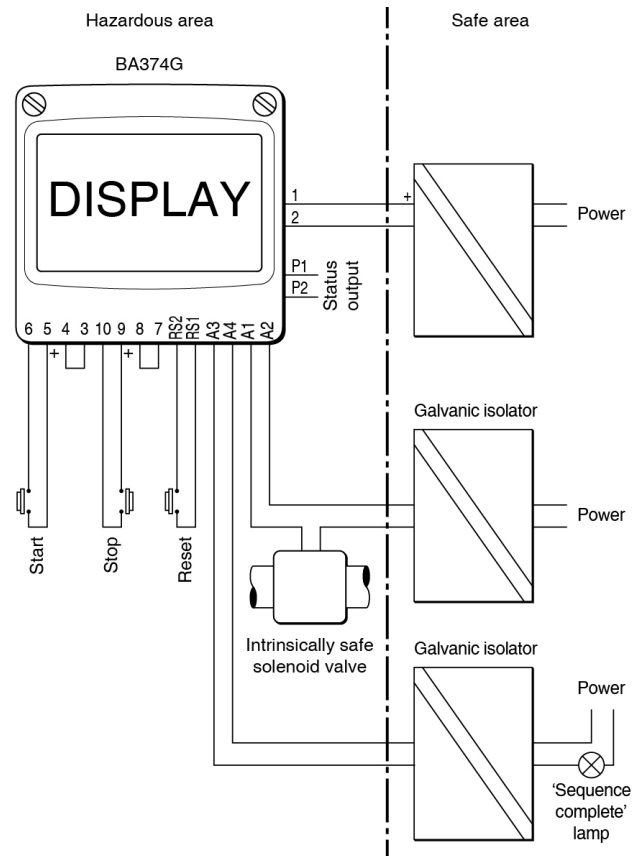
Fig 19   Cycling of IS solenoid valve

The required instrument configurations for this example are shown below:

Function	Display	Setting
Function	FunCtion	ELAPSE
Input A	inPut-A	ContACt
Debounce	dEbounCE	dEFAuLt
Input b	inPut-b	ContACt
Debounce	dEbounCE	dEFAuLt
Display 2	diSP-2	Std
Start stop	StArStoP	Control 2
Units	unitS	120000
Set time	SEt t	001000
Timer repeat cycle	CYCLES	
Enable Repeat Cycle	EnbL	on
Cycle Count	CYCL Cnt	04
Restart delay	rSt dELA	001500
Access set time from display mode	ACSEt-t	oFF
Direction of count	uP or dn	dn
Control output after power restoration	P-FAiL	PAuSE
Local total reset	LoC rSEt	oFF
External Reset Contact Closure Time	E rSEt	Std
Status Output	StAt oP	dEFAuLt
Output 1	oP 1	
Enable control output 1	EnbL	on
Control output 1 *on* at	oP 1 on	run
Control output 1 *off* at	oP 1 oFF	n run
Control output 1 delay	oP 1 dELA	00000
Output 2	oP2	
Enable control output 2	EnbL	on
Control output 2 *on* at	oP2 on	donE
Control output 2 *off* at	oP2 oFF	n donE
Control output 2 delay	oP2 dELA	00000
Local grand total reset	CLr Gtot	oFF
Access code	CodE	0000

Note: Functions in bold are first level menu items.

8. MAINTENANCE when configured as a Timer

8.1 Fault finding during commissioning

If a BA374G fails to function as a Timer during commissioning the following procedure should be followed:

Symptom	Cause	Check:
No display	No power supply, or incorrect wiring. Note: Terminals 2, 6, 10 & RS2 are interconnected within the instrument.	That there is between 10 and 28V on terminals 1 & 2 with terminal 1 positive.
Instrument configuration menu does not correspond with Timer section of this manual.	BA374G may be configured as a clock.	That Funℂtɪon in configuration menu is set to ELAPSE not to ℂLoℂ.
Timer will not start.	Timer not reset	Reset timer via external contact or by operating ▲ and ▼ buttons simultaneously if the local total reset rSEt Enbl function has been activated.
	Set time SEt t has not been entered.	Enter time other than zero for SEt t.
Timer will not respond to sensor inputs.	Input A and/or Input b incorrectly configured, or sensor incorrectly connected.	ɪnPut A and ɪnPut b configuration and that input energising link is correctly fitted for selected sensor.
Control output(s) do not function.	Control outputs have not been enabled.	Enable Control Output(s) in the configuration menu.
Unable to enter configuration menu.	Incorrect security code	That the correct security code is being used. Contact BEKA if the code is lost.

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 BA374G 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.
Timer will not start.	Timer not reset	Reset timer via external contact or by operating ▲ and ▼ buttons simultaneously if local total reset rESEt.Enbl has been activated.
Control output(s) do not function.	Control Outputs have not been enabled.	Enable Control Output(s) in the configuration menu.
Unable to enter configuration menu.	Incorrect security code	That the correct security code is being used. Contact BEKA if code is lost.

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

Note:

If configuration changes are made to any of the following functions the Timer will be forced into a fail safe idle condition. This stops the Timer in the state it achieves when it has timed-up to SEt t or timed-down to 0000. The Timer must be reset before it can be restarted.

ɪnPut A, ɪnPut b, StArtStoP, ℂYℂLES, uP or dn, oP1 and oP2.

8.3   Servicing

We recommend that faulty BA374G Timers are returned to BEKA associates or to your local BEKA agent for repair. It is helpful if a brief description of the fault symptoms is provided.

8.4   Routine maintenance

The mechanical and electrical condition of the instrument should be regularly checked. Inspection frequency should be chosen 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 is always pleased to receive comments from customers about our products and services. All communications are acknowledged and whenever possible, suggestions are implemented.

9.   OPERATION AS A CLOCK

When configured as a clock the BA374G can display local time in a variety of twelve or twenty four hour formats.   The displayed time can be adjusted via the front panel push buttons which may be protected by a user definable four digit security code to prevent unauthorised or accidental adjustment.

The clock may be synchronised to an external time standard via the instrument's reset terminals.   When these two terminals are connected together by an external switch contact, the clock display will be reset to a preconfigured time and will resume running from this time when the contacts are opened.

The optically isolated status open collector output can be used to monitor the clock or to perform simple control functions.

When fitted with the optional galvanically isolated control outputs the clock can be configured to turn each solid state output *on* and *off* twice during each twenty four hour period.

Fig 20 shows a simplified block diagram of the BA374G configured as a clock.

The instrument can be supplied with the following factory fitted accessories:

Backlight Internally powered

Dual isolated control outputs
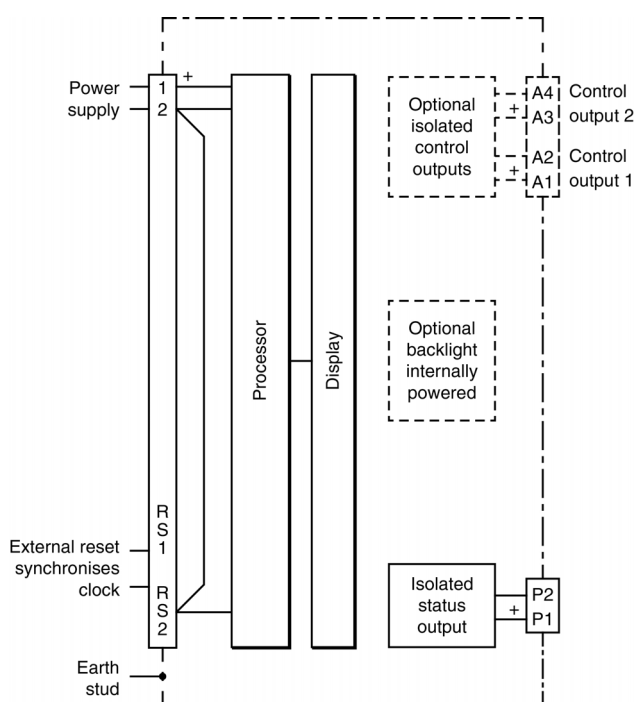
Fig 20   BA374G block diagram with clock configuration.

9.1   Initialisation and loss of power

Each time power is applied to a BA374G initialisation is performed.   After a short delay the following display sequence occurs:

All segments of the display are activated

Instrument starts functioning, using the configuration information stored in the instrument's permanent memory.

Following initialisation, the instrument will display a flashing display which is a request for the local time to be entered.   The clock will not start to function until a display time has been entered, or the remote reset contacts are closed and opened to synchronise the clock to a preconfigured time.

If during normal operation the power supply is interrupted for more than 30ms, the display will return to the flashing condition and the display time will have to be re-entered.   This time may be increased by powering the Clock from a lightly loaded galvanic isolator or via a Zener barrier from an instrument supply with large output capacitance.

9.2   Controls when configured as a clock

The BA374G clock is configured and adjusted via four front panel push buttons.   In the display mode i.e. when the instrument is displaying time, the push button functions are:

Push Button Functions

| P + ▼ | Shows firmware version |
| P + E | Access to configuration menu |

Note: When optional control outputs are fitted, the BA374G clock may be configured to provide direct access to the control outputs from the display mode when the P + ▲ push buttons are operated. - see section 9.4.16

9.3   Displays when configured as a clock

The BA374G clock has a single digital display plus annunciators.

Time display	Shows time in selected 12 or 24 hour format.
Reset annunciator	Activated while clock is being synchronised and external reset contacts are closed.
Status output annunciator	RTx shown while status output is activated.
Control output annunciators	Show status of both optional control outputs.

9.4 Configuration as a Clock

The BA374G 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 21.

Each menu function is summarised in section 9.4.2 of this manual and each includes a reference to more detailed information.

All new BA374G instruments are supplied configured as requested at the time of ordering. If configuration is not requested, the BA374G will be supplied with default Timer configuration as shown in section 6.5.

If a BA374G Clock is requested without detailed configuration information, the instrument will supplied with default Clock configuration as shown below, but can easily be re-configured on-site.

Function	Display	Default
Access code	CodE	0000
Function	FunCti on	CLoC
Display	di SPLAY	12:00
Set display time	SEt	A 12:00:00
Syncronise time	SYnC t	A 12:00:00
Enable status output	EnbL	oFF
Enable control output 1*	EnbL	oFF
Enable control output 2*	EnbL	oFF
Enable access alarm times from display mode.	ACSP	oFF
Access code for alarm times from display mode.	ACCd	0000

Note: * Control outputs are a factory fitted option.

9.4.1 Accessing configuration functions

Throughout this manual push buttons are shown as ▼, ▲, P and E and legends displayed by the Clock are shown in a seven segment font just as they appear on the instrument e.g. di SPLAY and CodE.

Access to the configuration menu is obtained by operating the P and E push buttons simultaneously. If the instrument is not protected by an access security code the first parameter FunCti on 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 FunCti on 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 main configuration menu the required parameter can be selected by scrolling through the menu using the ▼ or ▲ push button. The Clock configuration menu is shown diagrammatically in Fig 21.

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

Display mode

DISPLAY

Security Code

Enter code by pressing
▲ or ▼ & P
to move to next digit. Code 0000 allows direct access to the menu

P
E

CodE

P

0000

P E

FunCtion

P E

CLoC

P E

0000

E

di SPLAY

P E

12:00

E

SEt

P E

A 12:00:00

E

SYnC t

P E

A 12:00:00

E

StRt oP

P

Function

▲ or ▼
to select

Function of instrument

ELAP5E
    Timer

CLoC
    Clock

Confirm selection by entering 5urE by pressing
▲ or ▼
and P to move to next digit

Format of display

▲ or ▼
to select

12:00
12:00:00
24:00
24:00:00

Set display time

▲ or ▼
to adjust each digit and P to move to the next digit

Clock starts from new time when instrument is returned to the display mode

Set synchronisation time

▲ or ▼
to adjust each digit and P to move to the next digit. Clock is set to synchronisation time when reset terminals RS1 & RS2 are connected together, the clock restarts when the terminals are disconnected

E

EnbL

P E

oFF

E

StRt:on 1

P E

A 12:00:00

E

StRt:oFF 1

P E

A 12:00:00

E

StRt:on2

P E

A 12:00:00

E

StRt:oFF2

P E

A 12:00:00

Enable Status output

▲ and ▼
to select

oFF
output dissabled

on: 1
on and off once per 24 nours

on: 2
on and off twice per 24 hours

Set first on time

▲ or ▼
to adjust flashing digit
and P
to move to next digit

Set first off time

▲ or ▼
to adjust flashing digit
and P
to move to next digit

Set second on time

▲ or ▼
to adjust flashing digit
and P
to move to next digit

Set second off time

▲ or ▼
to adjust flashing digit
and P
to move to next digit

Only included when on:1 or on:2 selected in EnbL

Only included when on:2 selected in EnbL

Fig 21 Clock Configuration menu

Only included when optional
Control Outputs are fitted

oP 1   oP2   ACSP   CodE   rSEt dEF

As oP 1

EnbL   ACCd

oFF   0000

0000   0000

Access Enable

▲ or ▼
to select
on or oFF

**Access Code
for adjustment
of Output
on and oFF
Times from
Display Mode**

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

Code 0000
allows direct
access

**Define
Security Code**

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

**Reset
configuration to
clock factory
defaults**

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

EnbL   oP 1:on 1   oP 1:oFF 1   oP 1:on2   oP 1:oFF2

oFF   A 12:00:00   A 12:00:00   A 12:00:00   A 12:00:00

**Enable
output 1**
▲ or ▼
to select

oFF
output dissabled

on:1
on and off once
per 24 nours

on:2
on and off twice
per 24 hours

Set first on time
▲ or ▼
to adjust
flashing digit
and P
to move
to next digit

Set first off time
▲ or ▼
to adjust
flashing digit
and P
to move
to next digit

**Set second
on time**
▲ or ▼
to adjust
flashing digit
and P
to move
to next digit

**Set second
off time**
▲ or ▼
to adjust
flashing digit
and P
to move
to next digit

Only included when on:1
or on:2 selected in EnbL

Only included when
on:2 selected in EnbL

9.4.2 Summary of Clock configuration functions.

This section summarises all the Clock configuration functions. When read in conjunction with Fig 17 it provides a quick aid for configuring the Clock. If more detail is required, each section of this summary contains a reference to a full description of the function.

Display	Summary of function

FunEtion **Instrument function**
Defines the function of the instrument.
May be set to:

    ELAPSE   Timer
    ELoE   Clock

All the entries in this Clock configuration summary assume that the BA374G is configured as a Clock by selecting ELoE.
See section 9.4.3

diSPLAY **Display format**
Defines the clock display format, four alternatives are available.
Select:

  12:00   Twelve hours without seconds
  12:00:00 Twelve hours with seconds
  24:00   Twenty four hours without seconds
  24:00:00 Twenty four hours with seconds
See section 9.4.4

SEt **Set clock display time**
Enables the clock displayed time to be adjusted, the clock resumes operation when the instrument is returned to the display mode.
See section 9.4.5

SYnE t **Synchronising time**
Defines the time to which the clock display is set when the reset terminals RS1 and RS2 are connected together. The Clock restarts from the synchronising time when terminals RS1 and RS2 are disconnected.
See section 9.4.6

Display	Summary of function

StAt oP **Status output**
Status output can turn *on* (open collector on) and *off* (open collector off) once or twice in each twenty-four hour period. This function contains five sub-function:

  EnbL   Enables Status output and defines if it turns *on* and *off* once or twice in each 24 hours.
  StAt:on 1 Time when oP 1 turns *on* 1st time
  StAt:oFF 1 Time when oP 1 turns *off* 1st time
  StAt:on 2 Time when oP 1 turns *on* 2nd time
  StAt:oFF 2 Time when oP 1 turns *off* 2nd time

Note: Output is a current sink.
See sections 9.4.7 to 9.4.9

oP 1 **Control output 1 (Optional)**
Control output 1 can turn *on* (output closed) and *off* (output open) once or twice in each twenty-four hour period. This function contains five sub-function:

  EnbL   Enables output 1 and defines if it turns on and off once or twice in each 24 hours.
  oP 1:on 1 Time when oP 1 turns *on* 1st time
  oP 1:oFF 1 Time when oP 1 turns *off* 1st time
  oP 1:on 2 Time when oP 1 turns *on* 2nd time
  oP 1:oFF 2 Time when oP 1 turns *off* 2nd time
See sections 9.4.10 to 9.4.12

oP2 **Control output 2 (Optional)**
As control output 1 described above.
See section 9.4.13 to 9.4.15

AESP **Access control output alarm-times from display mode.**
Contains two sub-functions, **EnbL** which when activated allows the control output times to be adjusted from the display mode (displaying time). The second sub-function **AEEd** defines a four digit alphanumeric access code which may be used to protect access to the control output times from the display mode. Default code **0000** disables this security feature and allows unrestricted access.
See section 9.4.16

Display	Summary of function

CodE   **Security code**
Defines a four digit alphanumeric code that may be used to protect access to the Clock configuration menu. Default code 0000 disables this security function and allows unrestricted access to all configuration functions when the P and E buttons are operated simultaneously in the display mode.
See section 9.4.17

rSEt dEF   **Reset to factory defaults**
Resets the BA374G to the Clock factory default configuration shown in section 9.4   Instruction confirmed by entering SurE.
See section 9.4.18

9.4.3   Instrument function: FunCtion

The BA374G may be configured as a Timer or as a Clock.   This section of the instruction manual describes the Clock, for details of Timer configuration see section 6.4.

To reveal the existing function of the instrument select FunCtion from the configuration menu and press P.   If CLoC is displayed, the instrument is already configured as a Clock therefore press E to return to the FunCtion prompt in the configuration menu. If ELAPSE is displayed, press the ▲ or ▼ button to change the setting to CLoC followed by the P button which will result in a 0000 prompt being displayed with the first digit flashing.   This is a request for the instruction to be confirmed by entering SurE using the ▲ or ▼ button to adjust the flashing digit and the P button to move control to the next digit.   When SurE has been entered, pressing E will change the instrument to a Clock and return the instrument to the display mode. To configure the Clock enter the configuration menu by pressing the P and E buttons simultaneously until FunCtion is displayed.

9.4.4   Display format: diSPLAY

The BA374G Clock may be configured to display time in a 12 or 24 hour format with or without seconds.   When a 12 hour format is selected, AM is denoted by an A prefix at the left hand side of the display, similarly a P is displayed to denote PM.

To check or change the display format of the Clock, select diSPLAY from the configuration menu and press P which will reveal the existing setting which can be changed by pressing the ▲ or ▼ button followed by the E button to enter the selection and return to the configuration menu.   The options available are shown below:

12:00	Twelve hour format without seconds
12:00:00	Twelve hour format with seconds
24:00	Twenty four hour format without seconds
24:00:00	Twenty four hour format with seconds

9.4.5   Set clock display time: SEt

This function sets the time displayed by the Clock which must be entered each time the BA374G Clock is powered.   Until a set time is entered the Clock will display a flashing 00:00:00 or 00:00 depending upon how it has been configured.

To adjust the clock set time, select SEt from the configuration menu and press P that will show 00 : 00 : 00 or the existing set time with the hours flashing.   When setting the clock display time seconds are always shown. Using the ▲ or ▼ button adjust the flashing hours and then press P to transfer control to the minutes display, pressing P again will transfer control to the seconds display. When adjustment is complete press E to start the Clock and return to the SEt prompt.

9.4.6 Enter synchronising time: 5YnC t

When the external reset terminals RS1 and RS2 are connected together the clock is stopped and the displayed time is set to the synchronising time. When the connection between the reset terminals is removed, the clock restarts from the synchronising time.

To enter the synchronising time, select 5YnC t from the configuration menu and press Ⓟ which will reveal the existing synchronising time with the hours flashing. Using the ▲ or ▼ button adjust the hours and then press Ⓟ to transfer control to the minutes display, pressing Ⓟ again will transfer control to the seconds display. When the synchronising time has been set as required, press Ⓔ to return to the configuration menu.

9.4.7 Status output: 5tRt oP

The status output is an optically isolated open collector that can be used for transmitting the status of the Clock to other instruments. It may also be used for simple control applications. Status *on* is indicated by the RTx display annunciator.
The function contains five sub-functions allowing the Status output open collector to be turned *on* and *off* once or twice in each twenty-four hour period.

EnbL	Number of times status output turns *on* & *off* in 24 hours.
5tRt:on 1	First time Status oP turns *on*
5tRt:oFF 1	First time Status oP turns *off*
5tRt:on 2	Second time Status oP turns *on*
5tRt:oFF 2	Second time Status oP turns *off*

To check or change the function of the status output select 5tRt oP from the configuration menu and press Ⓟ which will reveal the first sub-function EnbL.

9.4.8 Enable Status output: EnbL

This is a sub-function in the Status output function 5tRt which allows the status output open collector to be enabled or disabled without changing any of the *on* or *off* times and also determines whether the status output turns *on* and *off* once or twice in each twenty four hour period.

Select 5tRt in the configuration menu and press Ⓟ which will result in the EnbL prompt being displayed. Pressing Ⓟ again will enter the sub-function from which one of the three options may be selected using the ▲ or ▼ button:

Display	Status output
oFF	Status output disabled
on:1	Turns *on* & *off* once per 24 hours
on:2	Turns *on* & *off* twice per 24 hours

When the required option is displayed operating Ⓔ will enter the selection and return to the EnbL prompt from which another sub-function may be selected.

9.4.9 Status output
On and *off* times: 5tRt:on 1; 5tRt:oFF 1
5tRt:on 2; 5tRt:oFF 2

The status output will have one or two *on* and *off* times depending upon whether it has been configured to turn *on* and *off* once or twice in each 24 hour period. - see 9.4.8.

All of the times are adjusted in the same way. To adjust any of them select 5tRt from the configuration menu and press Ⓟ which will result in the EnbL prompt being displayed. The ▲ or ▼ button will scroll through the sub-functions. Only 5tRt:on 1 and 5tRt:oFF 1 will be present if the status output has been configured to switch *on* and *off* once in a 24 hour period in the EnbL sub-function.

Select the required sub-function

5tRt:on 1	Time status output turns *on* first time
5tRt:oFF 1	Time status output turns *off* first time
5tRt:on 2	Time status output turns *on* second time
5tRt:oFF2	Time status output turns *off* second time

When selected, pressing Ⓟ will show the existing time with the hours flashing. Using the ▲ or ▼ button adjust the hours and then press Ⓟ to transfer control to the minutes display, pressing Ⓟ again will transfer control to the seconds display. When the time has been set as required press Ⓔ to return to the sub-menu from which another *on* / *off* time may be selected for adjustment. When all the *on* / *off* times have been entered, return to the configuration menu by pressing the Ⓔ button twice.

9.4.10 Control output 1: oP1

Control output 1 is an optional factory fitted galvanically isolated solid state switch contact output which can be configured to turn *on* (output closed) and *off* (output open) twice in each twenty-four hour period. The control output status is shown by the 1 control output display annunciator.

Function oP1 contains a sub-menu with five sub-functions:

EnbL	Number of times output 1 turns *on* & *off* in 24 hours.
oP1:on 1	First time oP 1 turns *on* (closes)
oP1:oFF 1	First time oP 1 turns *off* (opens)
oP1:on 2	Second time oP 1 turns *on* (closes)
oP1:oFF 2	Second time oP 1 turns *off* (opens)

To check or change the function of Control output 1 select oP1 from the configuration menu and press Ⓟ which will reveal the first sub-function EnbL.

9.4.11 Enable Control output 1: EnbL

This is a sub-function in the Control output 1 function oP1 which allows output 1 to be enabled or disabled without changing any of the *on* or *off* times and also determines whether output 1 turns *on* and *off* once or twice in each twenty four hour period.

Select oP1 in the configuration menu and press Ⓟ which will result in the EnbL prompt being displayed. Pressing Ⓟ again will enter the sub-function from which one of the three options may be selected using the ▲ or ▼ button:

Display	Control output 1
oFF	Control output 1 disabled
on:1	Turns *on* & *off* once per 24 hours
on:2	Turns *on* & *off* twice per 24 hours

When the required option is displayed operating Ⓔ will enter the selection and return to the EnbL prompt from which another sub-function may be selected if control output 1 has not been disabled.

9.4.12 Control output 1
On and *off* times: oP1:on 1; oP1:oFF 1
oP1:on 2; oP1:oFF 2

The control output will have one or two *on* and *off* times depending upon whether control output 1 has been configured to turn *on* and *off* once or twice in each 24 hour period. - see 9.4.11.

All of the times are adjusted in the same way. To adjust any of them select oP1 from the configuration menu and press Ⓟ which will result in the EnbL prompt being displayed. The ▲ or ▼ button will scroll through the sub-functions. Only oP1:on 1 and oP1:oFF 1 will be present if control output 1 has been configured to switch *on* and *off* once in a 24 hour period in the EnbL sub-function.

Select the required sub-function

oP1:on 1	Time oP1 turns *on* first time
oP1:oFF 1	Time oP1 turns *off* first time
oP1:on2	Time oP1 turns *on* second time
oP1:oFF2	Time oP1 turns *off* second time

When selected, pressing Ⓟ will show the existing time with the hours flashing. Using the ▲ or ▼ button adjust the hours and then press Ⓟ to transfer control to the minutes display, pressing Ⓟ again will transfer control to the seconds display. When the time has been set as required press Ⓔ to return to the sub-menu from which another *on* / *off* time may be selected for adjustment. When all the *on* / *off* times have been entered, return to the configuration menu by pressing the Ⓔ button twice.

9.4.13 Control output 2: oP2

Control output 2 is an optional factory fitted output which can be configured to turn *on* (output closed) and *off* (output open) twice in each twenty-four hour period. The control output status is shown by the 2 control output display annunciator.

Function oP2 contains a sub-menu with five sub-functions:

EnbL	Number of times output 2 turns *on* & *off* in 24 hours.
oP 2:on 1	First time when oP 2 turns *on* (closes)
oP 2:oFF 1	First time when oP 2 turns *off* (opens)
oP 2:on 2	Second time when oP 2 turns *on* (closes)
oP 2:oFF 2	Second time when oP 2 turns *off* (opens)

To check or change the function of Control output 2 select oP2 from the configuration menu and press Ⓟ which will reveal the first sub-funtion EnbL.

9.4.14 Enable control output 2: EnbL

This is a sub-function in the Control output 2 function oP2 which allows output 2 to be enabled or disabled without changing any of the *on* or *off* times and also determines whether output 2 turns *on* and *off* once or twice in each twenty four hour period. Select oP2 in the configuration menu and press Ⓟ which will result in the EnbL prompt being displayed. Pressing Ⓟ again will enter the sub-function from which one of the three options may be selected using the ▲ or ▼ button:

Display	Control output 2
oFF	Control output 2 disabled
on:1	Turns *on* & *off* once per 24 hours
on:2	Turns *on* & *off* twice per 24 hours

When the required option is displayed operating Ⓔ will enter the selection and return to the EnbL prompt from which another sub-function may be selected if control output 2 has not been disabled.

9.4.15 Control output 2
On and *off* times: oP2:on 1; oP2:oFF 1
oP2:on 2; oP2:oFF 2

The control output will have one or two *on* and *off* times depending upon whether control output 2 has been configured to turn *on* and *off* once or twice in each 24 hour period. - see 9.4.14.

All of the times are adjusted in the same way. To adjust any of them select oP2 from the configuration menu and press Ⓟ which will result in the EnbL prompt being displayed. The ▲ or ▼ button will scroll through the sub-functions. Only oP21:on 1 and oP2:oFF 1 will be present if control output 2 has been configured to switch *on* and *off* once in a 24 hour period in the EnbL sub-function.

Select the required sub-function

oP2:on1   Time oP2 turns *on* first time
oP2:oFF1   Time oP2 turns *off* first time
oP2:on2   Time oP2 turns *on* second time
oP2:oFF2   Time oP2 turns *off* second time

When selected pressing Ⓟ will show the existing time with the hours flashing. Using the ▲ or ▼ button adjust the hours and then press Ⓟ to transfer control to the minutes display, pressing Ⓟ again will transfer control to the seconds display. When the time has been set as required press Ⓔ to return to the sub-menu from which another *on / off* time may be selected for adjustment. When all the *on / off* times have been entered, return to the configuration menu by pressing the Ⓔ button twice.

9.4.16 Access control output *on* and *off* times from display mode: ACSP

This function activates a separate menu that provides direct access to the control output's *on* and *off* times when the Clock is is the display mode (displaying time). An operator may therefore adjust the *on* and *off* times without having access to the instrument configuration menu. Further protection is provided by a separate security code. When this function is enabled the *on* and *off* times of the two control outputs may be adjusted from the display mode by simultaneously operating the Ⓟ and ▲ push buttons. The function contains two sub-functions, EnbL which activates the function and ACCd which defines a separate access code that may be used to prevent the *on* and *off* times being accidentally adjusted from the display mode.

To check or change the function, select ACSP in the configuration menu and press Ⓟ which will reveal the EnbL prompt, pressing Ⓟ again will show if the function is on or oFF. If adjustment of the control output times from the display mode is not required press the ▲ or ▼ button to select oFF and then press Ⓔ twice to return to the configuration menu. If the function is required, select on and press Ⓔ to return to the EnbL prompt from which ACCd, which allows a separate access code to be entered, can be selected by pressing the ▲ or ▼ button.

Access to the control output times from the display mode may be protected by a four digit alphanumeric security code which must be entered to gain access. Default security code 0000 allows unrestricted access. With ACCd displayed, press Ⓟ to enter a new access code. The BA374G Clock will display 0000 with one digit flashing. The flashing digit may be adjusted using the ▲ or ▼ push button, when set as required operating the Ⓟ button will transfer control to the next digit. When all the digits have been adjusted press Ⓔ twice to return to the ACSP prompt in the configuration menu. The revised security code will be activated when the BA374G is returned to the display mode.

9.4.17 Security code: CodE

Access to the instrument's configuration menu may be protected by a four digit alphanumeric 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 Ⓟ which will cause the Clock to display 0000 with one digit flashing. The flashing digit may be adjusted using the ▲ or ▼ push button, when set as required operating the Ⓟ button will transfer control to the next digit. When all the digits have been adjusted press Ⓔ to return to the CodE prompt. The revised security code will be activated when the Clock is returned to the display mode.

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

9.4.18 Reset configuration to factory defaults: rSEt dEF

When the BA374G is configured as a Clock, this function resets the configuration to the Clock factory defaults shown in sections 9.4 of this manual.

To reset the instrument configuration select rSEt dEF from the configuration menu and press Ⓟ. The Clock will display 0000 with the first digit flashing which is a request to confirm the instruction by entering SurE. Using the ▲ or ▼ button set the first flashing digit to S and press Ⓟ to transfer control to the second digit which should be set to u. When SurE has been entered pressing the Ⓔ button will reset all the configuration functions to the factory defaults and return the instrument to the display mode as a Clock with default configuration.

10. CLOCK CONFIGURATION EXAMPLE

In this example a BA374G is required to function as a Clock. Time is to be displayed in a 24 hour format including seconds. For external synchronisation the displayed time is required to change to *l2:00:00* when the external reset terminals are connected together.

Both control outputs are required to close and open once in each 24 hour period. Control output 1 (*oP l*) is to turn *on* (close) at *07:30:00* and *off* (open) at *09:30:00*, control output 2 (*oP2*) is to turn *on* (close) at *l8:00:00* and *off* (open) at *22:30:00*.

For this application the operator needs to adjust the control output *on* and *off* times from the display mode via an access code of 1111. To prevent tampering the instrument configuration menu is to be protected by security code of 1209

10.1 Configuration procedure

The BA374G may be configured as a Clock on-site without disconnection from external wiring.

Step 1 Enter the configuration menu

Enter the configuration menu by simultaneously pressing **P** and **E**. Assuming a security code has not already been entered the instrument will respond by displaying *FunCtion* which is the first item in the configuration menu.
See Fig 20.

Step 2 Configure instrument as a Clock

With *FunCtion* displayed press **P** to reveal the existing function of the instrument. If *CLoC* is displayed no change is required, therefore return to the *FunCtion* prompt by pressing the **E** button.

If *ELAPSE* is displayed, press the **▲** or **▼** button to change the setting to *CLoC* followed by the **P** button which will result in a *0000* prompt being displayed with the first digit flashing. This is a request for the instruction to be confirmed by entering *SurE* using the **▼** or **▲** button to adjust the flashing digit and the **P** button to move control to the next digit. Pressing **E** will then change the instrument to a Clock and return the display to *FunCtion* in the configuration menu.
See 9.4.3

Step 3 Select display format

Using the **▲** or **▼** button select *diSPLAY* in the configuration menu and press **P** which will reveal the current display format. Using the **▲** or **▼** button select *24:00:00* which is the required 24 hour format with seconds and press **E** to enter the selection and return to the configuration menu.
See 9.4.4

Step 4 Enter the synchronisation time

Using the **▲** or **▼** button select *SYnC t* in the configuration menu and press **P** to reveal the current synchronisation time with the hours flashing. Using the **▲** or **▼** push button adjust the hours to *l2* and press **P** to transfer control to the minutes. Using the **▲** or **▼** push button adjust the minutes to *00* and press **P** to transfer control to the seconds which should be adjusted to *00*, in the same way. When the seconds are set enter the selection and return to the *rSEt* prompt in the configuration menu by pressing the **E** button.
See 9.4.6

Step 5 Enable control output 1 and enter the *on* and *off* times.

Using the **▲** or **▼** button select *oP l* in the configuration menu and press **P** to reveal the *EnbL* prompt in the control output 1 sub-menu.

In this application control output 1 is required to turn *on* and *off* once every 24 hours. With *EnbL* displayed press **P** and using the **▲** or **▼** button select *on l* followed by the **E** button to return to the *EnbL* prompt.

The control outputs *on* time should now be entered by selecting *oP l:on l* in the control output 1 sub-menu using the **▲** or **▼** button. Pressing **P** will reveal the existing *on* time which should be adjusted to *07:30:00* using the **▲** or **▼** button and the **P** button to transfer control to the following digits. When entered return to the *oP l:on l* prompt by pressing the **E** button.

The *off* time should now be entered by selecting *oP l:oFF l* from the sub-menu and adjusting the time to *09:30:00*. Finally press **E** to return to the *oP l:oFF l* prompt in the sub-menu and press **E** again to return to *oP l* in the configuration menu.

Step 6 Enable control output 2 and enter the *on* and *off* times.
Using the ▲ or ▼ button select oP2 in the configuration menu and press P to reveal the EnbL prompt in the control output 2 sub-menu.   Follow the procedure described in step 5 above, but set control output 2 to turn *on* at 18:00:00 and *off* at 22:30:00.

Step 7 Allow control outputs times to be adjusted from the display mode & enter separate security code.
Using the ▲ or ▼ button select AC5P in the configuration menu and press P to reveal the EnbL prompt, pressing P again will show if this function is on or oFF. Using the ▲ or ▼ button select on followed by E to return to the EnbL prompt.   A separate security code which must be entered to gain access to the alarm times in the display mode, is entered in the ACCd function which may be selected by operating the ▲ or ▼ button once.   Pressing P will reveal the existing access code with one digit flashing. This should be changed to the required code of 1111 by adjusting the flashing digit using using the ▲ or ▼ button and the P button to transfer control to the next digit. When 1111 has been entered press E twice to return to the configuration menu.
See 9.4.16

Step 8 Define the configuration menu security code.
Defining   a   security   code   prevents unauthorised access to the configuration menu. Using the ▼ and ▲ buttons select CodE from the configuration menu and press P which will reveal 0000 with the first digit flashing. This example requires the security code to be 1209, using the ▼ and ▲ buttons set the flashing digit to 1 and press P to transfer control to the second digit. When all have been entered press E to return to the main configuration menu.
See 9.4.17.

Step 9 Return to the display mode
The BA374G is now configured as required for this example.   Pressing the E button will save the configuration and return the BA374G to the display mode with all the digits flashing indicating that the set time has to be entered.

Step 10 Enter the set time
Finally the current time to be displayed by the Clock should be entered. Re-enter the configuration menu by pressing the P and E buttons simultaneously which will result in CodE being displayed. Pressing P will allow the access code 1209 to be entered using the ▼ or ▲ button to adjust the flashing digit and the P button to transfer control to the next digit. When all four digits have been adjusted, pressing E will access the configuration menu. Using the ▼ or ▲ button select 5Et and press P which will reveal 00:00:00 with the hours flashing. Using the ▼ or ▲ button adjust the flashing hours digits.   Press P to transfer control to the minutes and finally to the seconds. When all have been set as required, press E to start the clock from the entered time and return to the display mode.

11. MAINTENANCE when configured as a Clock

11.1 Fault finding during commissioning

If a BA374G fails to function as a Clock during commissioning the following procedure should be followed:

Symptom	Cause	Check:
No display	No power supply, or incorrect wiring. Note: Terminals 2 & RS2 are interconnected within the instrument.	That there is between 10 and 28V on terminals 1 & 2 with terminal 1 positive. That there are no connections to terminals 3, 4, 5, 6, 7, 8, 9 & 10.
Configuration menu does not correspond with the Clock section of this manual.	BA374G is configured as a Timer.	That FunCtion in configuration menu is set to CLoC not to ELAPSE.
Clock display flashes e.g. A 12:00:00	Local time has not been entered.	Enter the local time in the SEt function of the instrument configuration menu.
Control output(s) do not function.	Control outputs have not been enabled.	Enable Control Output(s) in the configuration menu.
Clock will not start	Reset terminals RS1 and RS2 are connected together and the Clock is continuously synchronising.	If reset annunciator on display is activated, disconnect connection between RS1 and RS2.
Unable to enter configuration menu.	Incorrect security code	That the correct security code is being used. Contact BEKA if the code is lost.

11.2 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 BA374G fails after it has been functioning correctly as a Clock, 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.
Clock display flashes 00:00:00	Instrument power supply has been interrupted and local time has been lost.	Enter the local time in the SEt function of the instrument configuration menu.
Control output(s) do not function.	Control outputs have not been enabled.	Enable Control Output(s) in the configuration menu.
Clock will not start	Reset terminals RS1 and RS2 are connected together and the Clock is continuously synchronising.	If reset annunciator on display is activated, if it is disconnect connection between RS1 and RS2.
Unable to enter configuration menu.	Incorrect security code	That the correct security code is being used. Contact BEKA if the code is lost.

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

11.3 Servicing

We recommend that faulty BA374G Clocks are returned to BEKA associates or to your local BEKA agent for repair. It is helpful if a brief description of the fault symptoms is provided.

11.4 Routine maintenance

The mechanical and electrical condition of the instrument should be regularly checked. Inspection frequency should be chosen to suit the environmental conditions.

11.5 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.

11.6   Customer comments

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

APPENDIX 1

ATEX Dust Certification

A1.0   ATEX dust certification
In addition to ATEX certification permitting installation in explosive gas atmospheres which is described in the main section of this instruction manual, the BA374G also has ATEX dust certification.

A1.1   Zones, and Maximum Surface Temperature.
The BA374G has been certified Group II Category 1D   Ex ia IIIC T80°C Da, Ta = -40° to 60°C. When connected to a suitable system it may be installed in:

Zone 20   explosive atmosphere in the form of a cloud of combustible dust in air is continuously present, or for long periods or frequently.

Zone 21   explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur occasionally in normal operation.

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

Be used with dust in subdivisions:
IIIA   combustible flyings
IIIB   non-conductive dust
IIIC   conductive dust

Having a Minimum Ignition Temperature of:
Dust cloud   120°C

Dust layer on Rate   155°C
Totaliser up to 5mm thick

Dust layer on Rate   Refer to
Totaliser over 5mm thick.   EN 60079-14

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

A1.2   Installation and maintenance
The installation requirement described in this manual for use in a gas potentially explosive atmospheres also apply when the Timer or Clock is installed in a dust potentially explosive atmosphere.

The instrument assembly should only be removed from the enclosure back-box when dust can not enter the instrument enclosure. Before replacing the instrument assembly the sealing gasket should be inspected to ensure that it is undamaged and free from foreign bodies.

It is good practice to prevent dust accumulating on the Timer or Clock enclosure. If this can not be avoided, care should be taken to ensure that the layer thickness does not exceed 5mm for dusts having a minimum ignition temperature of 155°C.

APPENDIX 2

IECEx certification

A2.0   The IECEx Certification Scheme
IECEx is a global certification scheme for explosion protected products which aims to harmonise international certification standards. For additional information about the IECEx certification scheme and to view the BEKA associate certificates, please visit www.iecex.com

A2.1   IECEx Certificate of Conformity
The BA374G Timer or Clock and the optional accessories have been issued with an IECEx Certificate of Conformity number IECEx ITS 16.0004X which specifies the following certification codes:

> Ex ia IIC T5 Ga
> Ta = -40°C to 70°C
> Ex ia IIIC T80°C IP66 Da
> Ta = -40°C to 60°C

The specified IECEx gas and dust intrinsic safety parameters are identical to the ATEX safety parameters described in the main section and Appendix 1 of this manual.

The IECEx certificate may be downloaded from the BEKA associate ot the IECEx websites or requested from the BEKA sales office.

A2.2   Installation
The IECEx and ATEX certificates specify identical safety parameters and installation requirements for both approvals as defined by IEC 60079-14. The ATEX installation requirements specified in the main section and Appendix 1 of this manual may therefore be used for IECEx installations, but the local code of practice should also be consulted.

APPENDIX 3

ETL & cETL certification for installations in USA and Canada.

A3.0 cETL Mark
For installations in the USA and Canada, the BA374G Timer or Clock has ETL and cETL intrinsic safety and nonincendive approval, Control Number 4008610.   Copies of the Authorisation to Mark may be downloaded from the BEKA associates website www.beka.co.uk or requested from the BEKA associates sales office

A3.1 Intrinsic safety approval
The US and Canadian standards used for assessment and certification of the BA337E and BA338E 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

USA & Canada
CL I Div 1 Groups A, B, C, D T5
CL II Div 1 Groups E, F, G.
CL III
-40ºC < Ta < 70ºC

USA
CL I Zone 0 AEx ia IIC T5 Ga
Zone 20 AEx ia IIIC T80ºC Da
-40ºC < Ta < 70ºC

Canada
Ex ia IIC T5 Ga
Ex ia IIIC T80ºC Da
-40ºC < Ta < 70ºC

A3.2 Nonincendive approval
The BA374G Timer or Clock 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

HAZARDOUS LOCATION

UNCLASSIFIED LOCATION
See note 4

INPUTS IN HAZARDOUS LOCATION

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

Hazardous Location Equipment

See note 6

See note 3

See note 5

Non Hazardous Location Equipment

See note 7

INPUTS IN UNCLASSIFIED LOCATION

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

Hazardous Location Equipment

See note 6

See note 3

See note 5

Non Hazardous Location Equipment

See note 7

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

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

See notes 6 & 8

See notes 6 & 8

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

Hazardous Location Equipment

See note 6

See note 3

See note 5

Non Hazardous Location Equipment

See note 7

INPUTS IN HAZARDOUS AND UNCLASSIFIED LOCATIONS

See notes 6 & 8

See notes 6 & 8

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

Hazardous Location Equipment

See note 6

See note 3

See note 5

Non Hazardous Location Equipment

See note 7

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

Appd.
Ckd.
Iss. Date Modification

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Title	ETL Intrinsically Safe Control Drawing for 'E' and 'G' series externally powered rate totalisers.	Drawn SQ	Checked OL	Scale —
		Drawing No. Sheet 2 of 6	CI330—52	

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.

Appd.		
Ckd.		
Modification		
Date		
Iss.		

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

Title	ETL Intrinsically Safe Control Drawing for 'E' and 'G' series externally powered rate totalisers.	Drawn SQ	Checked OL	Scale −
		Drawing No. Sheet 3 of 6	Cl330−52	

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.

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

U_i	=	28V	$U_o = 0$
I_i	=	200mA	$I_o = 0$
P_i	=	0.84W	
C_i	=	2nF	
L_i	=	4µH	

Terminals RS1-RS2, (optional reset input)

U_i	=	28V	$U_o = 3.8V$
I_i	=	200mA	$I_o = 1mA$
P_i	=	0.84W	$P_o = 1mW$
C_i	=	0	
L_i	=	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).

U_i	=	28V	$U_o = 1.1V$
I_i	=	200mA	$I_o = 0.5mA$
P_i	=	0.84W	$P_o = 0.2mW$
C_i	=	2nF	
L_i	=	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).

U_i	=	14V	U_o	= 10.5V
I_i	=	200mA	I_o	= 9.2mA
P_i	=	0.7W	P_o	= 24mW
C_i	=	2nF		
L_i	=	4µH		

Optional pulse output terminals P1 & P2

U_i	=	28V	$U_o = 0$
I_i	=	200mA	$I_o = 0$
P_i	=	0.84W	
C_i	=	0	
L_i	=	0	

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

U_i	=	28V	$U_o = 0$
I_i	=	200mA	$I_o = 0$
P_i	=	0.84W	
C_i	=	2.2nF	
L_i	=	4µH	

Optional alarm output terminals A1, A2, A3 and A4

U_i	=	28V	$U_o = 1.47V$
I_i	=	200mA	$I_o = 1µA$
P_i	=	0.84W	$P_o = 2µW$
C_i	=	22nF	
L_i	=	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.

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

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

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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.

		Appd.	Ckd.	Modification	Date	Iss.

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	Appd.	CB	3.3
	Ckd.	QL	OL

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

Title	Drawn	Checked	Scale
ETL Intrinsically Safe Control Drawing for 'E' and 'G' series externally powered rate totalisers.	SQ	OL	–

Drawing No. CI330-52
Sheet 6 of 6

File No 330-52s06.dwg 05.08.16

INTERCONNECTIONS FOR EXTERNALLY POWERED RATE TOTALISERS

HAZARDOUS LOCATION

UNCLASSIFIED LOCATION
See note 4

INPUTS IN HAZARDOUS LOCATION

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 & 7

See note 7

See note 7

Non Hazardous Location Equipment

See note 6

Hazardous Location Equipment

See note 5

INPUTS IN UNCLASSIFIED LOCATION

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 & 7

See note 7

See note 7

Non Hazardous Location Equipment

See note 6

Hazardous Location Equipment

See note 5

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

Title	ETL Nonincendive Control Drawing for 'E' and 'G' series externally powered rate totalisers.	Drawn SQ	Checked OL	Scale —
		Drawing No. Sheet 1 of 6	CI330—53	

File No 330—53s01.dwg 05.08.16

INTERCONNECTIONS FOR EXTERNALLY POWERED RATE TOTALISERS

HAZARDOUS LOCATION

UNCLASSIFIED LOCATION
See note 4

INPUTS IN HAZARDOUS AND UNCLASSIFIED LOCATIONS

See note 7

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 & 7

See note 7

See note 3

Non Hazardous Location Equipment

Hazardous Location Equipment

See note 5

See note 6

Terminals: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, P1, P2, A1, A2, A3, A4, RS1, RS2, C1, C3, C4, C2

INPUTS IN HAZARDOUS AND UNCLASSIFIED LOCATIONS

See note 7

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 & 7

See note 7

See note 3

Non Hazardous Location Equipment

Hazardous Location Equipment

See note 5

See note 6

Terminals: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, P1, P2, A1, A2, A3, A4, RS1, RS2, C1, C3, C4, C2

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

Title	Drawn	Checked	Scale
ETL Nonincendive Control Drawing for 'E' and 'G' series externally powered rate totalisers.	SQ	OL	—

Drawing No. CI330-53
Sheet 2 of 6

File No 330-53s02.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.

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	Drawn	Checked	Scale
ETL Nonincendive Control Drawing for 'E' and 'G' series externally powered rate totalisers.	SQ	OL	−
	Drawing No. Sheet 3 of 6	C1330−53	

File No 330−53s03.dwg 05.08.16

Left margin (title block):

Appd. | Ckd. | Modification | Date | Iss.

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Appd. CB 3.3 | Ckd. QL OL

Modification: New drawing | Field mounted rate totalisers added

Date: 05.05 2016 | 05.08 2016

Iss. 1 | 2

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.

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

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Title		Drawn SQ	Checked OL	Scale —
ETL Nonincendive Control Drawing for 'E' and 'G' series externally powered rate totalisers.		Drawing No. Sheet 4 of 6	CI330−53	

File No 330−53s04.dwg 05.08.16

7. Safety parameters

DC Power terminals 1 & 2

U_i = 30V
I_i = 100mA

Terminals RS1-RS2, (optional reset input)

U_i = 30V
U_o = 3.8V
I_o = 1mA

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

U_i = 30V
U_o = 1.1V
I_o = 0.5mA

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).

U_i = 15V
U_o = 10.5V
I_o = 9.2mA

Optional pulse output terminals P1 & P2

U_i = 30V
I_i = 100mA
U_o = 0
I_o = 0

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

U_i = 30V
U_o = 0
I_o = 0

Optional alarm output terminals A1, A2, A3 and A4

U_i = 30V
I_i = 200mA
U_o = 1.47V
I_o = 1µA

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.

Appd.		
Ckd.		
Modification	Date	Iss.

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

Title		Drawn	Checked	Scale
ETL Nonincendive Control Drawing for 'E' and 'G' series externally powered rate totalisers.		SQ	OL	—
		Drawing No. Sheet 5 of 6	CI330–53	

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)

Title		
ETL Nonincendive	**Drawn** SQ	**Checked** OL	**Scale** —
Control Drawing for 'E' and 'G' series externally powered rate totalisers.	**Drawing No.** Sheet 6 of 6	**CI330-53**	

File No 330-53s06.dwg 05.08.16

Left margin table:

Iss.	Date	Modification	Ckd.	Appd.
1	15.06 2016	New drawing	OL	CB
2	05.08 2016	Field mounted rate totalisers added	OL	8.8

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APPENDIX 4

BA374E Timer or Clock

The BA374E Timer or Clock is functionally identical to the BA374G Timer or Clocks described in the main sections of this manual, but differs in mechanical construction, certification and factory fitted options.

All BA374E Timer or Clocks are fitted with:

A green internally powered display backlight

Dual galvanically isolated alarms

These are only available as factory fitted options for the BA374G Timer or Clock.

A4.1 Mechanical construction

The BA374E is housed in a robust GRP IP66 enclosure with a separate terminal compartment. Section A4.5 of this appendix describes the enclosure and installation procedure.

A4.2 Certification

The BA374E has the same ATEX, IECEx and ETL intrinsic safety certification as the BA374G, but the **BA374E does not have ATEX and IECEx dust certification**.

The safety parameters and certification numbers specified in this manual for the BA374G Timer or Clocks also apply to the BA374E Timer or Clock. Therefore all of the systems described for the BA374G in the main section of this manual may also be used for the BA374E.

A4.3 Location

The BA374E Timer or Clock is housed in a robust IP66 glass reinforced polyester (GRP) enclosure incorporating an armoured glass window and stainless steel fittings. It is suitable for exterior mounting in most industrial installations, including off-shore and waste water treatment sites. The Timer or Clock should be positioned where the display is not in continuous direct sunlight.

The field terminals and the two mounting holes are located in a separate compartment with a sealed cover allowing the instrument to be installed without exposing the display assembly.

The enclosure is fitted with a bonding plate to ensure electrical continuity between the three conduit / cable entries.

A4.4 BA374E Accessories

A4.4.1 Units measurement & instrument identification.

The BA374E is fitted with a blank escutcheon around the liquid crystal display. This can be supplied printed with any units of measurement and tag information specified at the time of ordering. Alternatively, the information may be added on-site via an embossed strip, dry transfer or a permanent marker.

To gain access to the escutcheon remove the terminal cover by unscrewing the two 'A' screws which will reveal two concealed 'D' screws. Remove the push buttons by unscrewing the two 'C' screws and un-plug the five way connector. Finally, unscrew all four 'D' screws and carefully lift off the front of the instrument. The location of all the screws is shown in Fig A4.1.

Add the required legend to the display escutcheon, or stick a new pre-printed self-adhesive escutcheon, which is available from BEKA associates, on top of the existing escutcheon. Do not remove the original escutcheon.

The BA374E can also be supplied with a blank or custom laser engraved stainless steel plate secured by two screws to the front of the instrument enclosure. This plate can typically accommodate:

1 row of 9 alphanumeric characters 10mm high

or 1 row of 11 alphanumeric characters 7mm high

or 2 rows of 18 alphanumeric characters 5mm high.
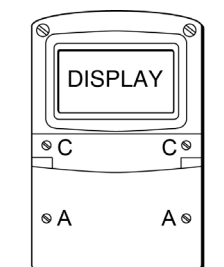
A4.4.2 Pipe mounting kits

The BA374E Timer or Clock is surface mounting, but may be pipe mounted using the BA392D or the BA393 pipe mounting kit.

A4.5 Installation Procedure

Fig A4.1 illustrates the instrument installation procedure.

a. Remove the instrument terminal cover by unscrewing the two captive 'A' screws.

b. Mount the instrument on a flat surface and secure with screws or bolts through the two 'B' holes. Alternatively secure to a vertical or horizontal pipe using a BA392D or BA393 pipe mounting kit.

c. Remove the temporary hole plug and install an appropriate IP rated cable gland or conduit fitting. If more than one entry is required, one or both of the IP66 stopping plugs may be replaced with an appropriate IP rated cable gland or conduit fitting.

d. Connect the field wiring to the terminals as shown in Fig A4.2.

6 Replace the instrument terminal cover and evenly tighten the two 'A' screws.

If the BA374E is not bolted to an earthed post or structure, the earth terminal should be connected to the plant potential equalising conductor.
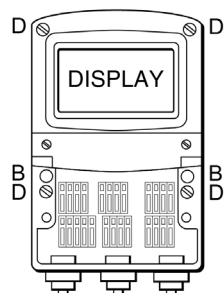
Step A
Remove the terminal cover by unscrewing the two 'A' screws
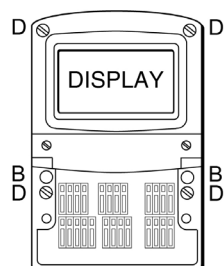
Step B
Secure the instrument to a flat surface with M6 screws through the two 'B' holes. Alternatively use a pipe mounting kit.

Step C and D
Remove the temporary hole plug and install an appropriate IP rated cable gland or conduit fitting and terminate field wiring. Finally replace the terminal cover and tighten the two 'A' screws.
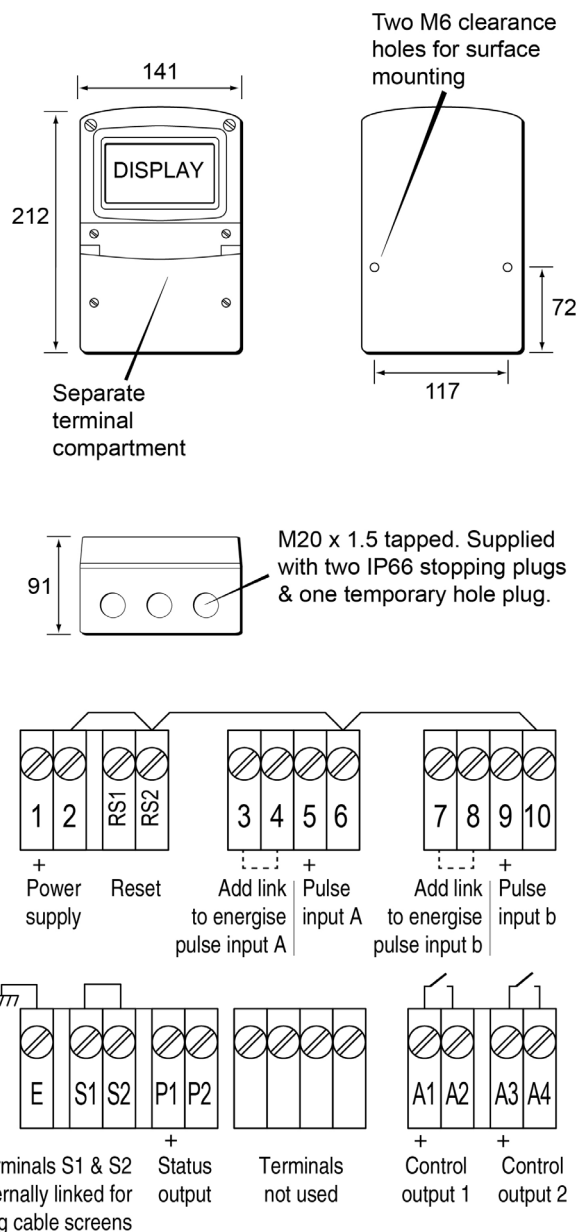
Fig A4.1 BA374E installation procedure

Fig A4.2 Dimensions and terminal connections

A4.6 EMC

The BA374E 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 in the safe area